

**PORT MANN/HIGHWAY 1 PROJECT**

**SCHEDULE 24  
FRASER HEIGHTS CONNECTOR**

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**PART 1  
DESIGN AND CONSTRUCTION**

**1.1 Order of Precedence**

If there is any conflict between the provisions or requirements contained in this Agreement, including Schedule 4 [Design and Construction], and this Schedule, including the Appendices to this Schedule, the provisions or requirements of this Schedule, including the Appendices to this Schedule, shall take precedence for the FHC Work.

**1.2 FHC Design**

- (a) The Concessionaire shall be responsible for the FHC Design which shall be carried out in accordance with this Agreement including in accordance with the provisions and requirements set out in:
  - (i) this Schedule, including the Appendices to this Schedule; and
  - (ii) Schedule 4 [Design and Construction], to the extent applicable to the FHC Work and except as otherwise expressly provided in this Schedule or in Schedule 4 [Design and Construction].
- (b) The Design Management Plan prepared by the Concessionaire and accepted by the Authority's Representative pursuant to Article 1 [Design Management Plan and Technical Appraisal Forms] of Part 3 of Schedule 4 shall include all design activities in respect of the FHC Work.
- (c) The Design and Certification Procedure as set out in Part 3 [Design and Certification Procedure] of Schedule 4 shall apply to the FHC Work, except as otherwise expressly provided in this Schedule.

**1.3 FHC Construction**

- (a) The Concessionaire shall be responsible for the FHC Construction which shall be carried out in accordance with this Agreement including in accordance with the provisions and requirements set out in:
  - (i) this Schedule, including the Appendices to this Schedule; and
  - (ii) Schedule 4 [Design and Construction], to the extent applicable to the FHC Work and except as otherwise expressly provided in this Schedule or in Schedule 4 [Design and Construction].
- (b) The Concessionaire shall not commence or permit the commencement of any FHC Construction except in compliance with Section 2.13 [No Construction] of Part 3 of Schedule 4.

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**1.4 Substantial Completion and Total Completion of the FHC**

The provisions of Part 3 [Design and Certification Procedure] of Schedule 4 shall apply *mutatis mutandis* to the certification of Substantial Completion and Total Completion in respect of the FHC in accordance with Section 6.27 [Substantial and Total Completion of the Fraser Heights Connector] of Part 3 of Schedule 4.

**1.5 [Intentionally Deleted]**



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**PART 1**  
**SCOPE OF FHC WORK**

**1.1 Scope of FHC Work**

Without limiting any other provision of this Agreement, the Constructor shall perform the FHC Design and FHC Construction for the FHC, which consists of the following three sections:

- (a) the SFPR Extension:
  - (i) the west limit of the SFPR Extension is approximately 500 m east of the east abutment of the Fraser Heights Wetlands Bridge;
  - (ii) [Intentionally Deleted]
- (b) the 176 Street Extension, from Barnston Drive to 250 m west of the future intersection with SFPR/104 Avenue, including:
  - (i) the 176 Street/SFPR/104 Avenue intersection; and
  - (ii) the CN Rail Access/104 Avenue intersection; and
- (c) the Golden Ears Connector or GEC (which is also referred to as the Port Kells connector in certain Reference Documents and other information from external sources), from 100 m east of the CN Rail Access/104 Avenue intersection along Daly Road to connect to the GEB Road near 184 Street,

each as more specifically described in this Appendix.

**1.2 Application of this Appendix**

Except to the extent otherwise expressly provided in this Appendix, the provisions of this Appendix apply to each of the SFPR Extension, the 176 Street Extension and the GEC.

**1.3 Application of Schedule 4 [Design and Construction]**

Except to the extent otherwise expressly provided in this Appendix or in Schedule 4 [Design and Construction], the provisions of Schedule 4 [Design and Construction] apply to the FHC to the extent applicable thereto.

**PART 2**  
**LANING AND GEOMETRICS**

**2.1 Application**

- (a) The requirements of this Part apply to all of the FHC.



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- (b) The provisions of Article 1 [Laning and Geometrics Design Criteria] of Part 2 of Schedule 4, except for Section 1.2.17 [Noise Mitigation] thereof, apply to the FHC to the extent applicable thereto.
- (c) The provisions of Article 11 [Cycling and Pedestrian Criteria] of Part 2 of Schedule 4 apply to the FHC to the extent applicable thereto.

**2.2 Order of Precedence**

The FHC Design shall be in accordance with the criteria contained in this Part and the following codes and standards and if there is any conflict between the criteria contained in this Part and any of the Reference Documents, the following shall apply in descending order of precedence:

- (a) the criteria contained in this Part;
- (b) the applicable Ministry Circulars and Technical Bulletins included in the Reference Documents;
- (c) BC Supplement to TAC;
- (d) TAC Geometric Design Guide; and
- (e) MMCD.

**2.3 Roadway Requirements**

- (a) The FHC Design of the roadways shall result in a design that meets the applicable requirements of the Reference Documents and Good Industry Practice.
- (b) The design of the 176 Street/SFPR/104 Avenue intersection and connecting roads shall conform to the basic configuration shown on Diagram S24-A1.
- (c) Design hourly volumes are provided in Part 8 [Traffic Engineering] of this Appendix.
- (d) Typical sections for the roadways shall be in accordance with those applicable typical sections shown in the FHC Reference Concept.

**2.4 Highway Design Criteria**

The following constitute the minimum highway design criteria for the FHC.

**Table 2.4a South Fraser Perimeter Road**

Item	Design Criteria	Notes
Legal Classification	RAD 80	
Posted Speed	80 km/h	(h)
Design Speed	80 km/h	(h)
Basic Lanes	4	
Minimum Radius	250 m	

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Item	Design Criteria	Notes
Equivalent Minimum K Factor		
- Sag	32	(a)
- Crest	36	
Maximum Grade	4%	
Maximum Superelevation	6%	
Minimum S.S.D.	140 m	(b)
Lane Width	3.7 m	(c)
Paved Shoulder Width		
- Outside	2.5 m	(d)
- Inside	1.0 m; increased to 1.7 m as required for sight distance	(e)
Clear Zone		
- Offset Width	Varies	(f)
- Recovery Slope	4:1	
Median Width	2.6 m minimum	(g)
Design Vehicle	WB 20	
Basic Crossfall	2%	

## Notes:

- a) Values shall be based on headlight control for sag curves.
- b) Minimum stopping sight distance (SSD) shown is based on TAC Geometric Design Guide Table 1.2.5.3. The increased SSD value of 210 m shown in TAC Geometric Design Guide Table 1.2.5.4 shall be used where the greater eye height for trucks is not an advantage, such as on horizontal curves with sight line restrictions, at some underpasses in sag situations, and where approaching controlled intersections.
- c) Intersection deceleration and acceleration lanes to be 3.5 m wide with 2.5 m wide shoulders.
- d) Reduced outside paved shoulder width of 2.5 m adopted to match adjacent proposed SFPR shoulder width.
- e) The inside shoulder width varies depending on the overall width of the median and shall not be less than 1.0 m between the concrete median barrier face and the lane line. Refer also to note (g).
- f) TAC sections 3.1.3 and 3.1.4 shall be used when setting clear zone distances. A clear zone distance of 7.5 to 8.5 m for 4:1 fill slopes (foreslopes) and 4.5 to 5.0 m for 3:1 cut slopes (backslopes) shall be incorporated.
- g) Where sight distance is restricted by tight curvature in conjunction with median barrier, a modified median treatment as shown in Section 600 of the BC Supplement to TAC shall be used.
- h) Northwest approach of the SFPR/176 Street/104 Avenue intersection to be designed and posted at 60 km/h.

Table 2.4b 176 Street Extension

Item	Design Criteria	Notes
Posted Speed	60 km/h	
Design Speed	60 km/h	
Basic Lanes	4	(e)
Minimum Radius	130 m	
Equivalent Min K Factor		
- Sag	9(18)	(a)
- Crest	13	
Maximum Grade	6%	(b)
Maximum Superelevation	6%	
Minimum S.S.D.	85 m	(c)

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Item	Design Criteria	Notes
Lane Width	3.6 m	
Paved Shoulder Width		
- Outside	3.0 m	
- Inside	1.0 m	
Clear Zone		(d)
- Offset Width	Varies	
- Recovery Slope	4:1	
Design Vehicle	WB 20	
Basic Crossfall	2%	

## Notes:

- Values shall be based on headlight control for sag curves.
- The existing gradient may be retained along sections with existing physical constraints (e.g. due to topography, property, etc.).
- Minimum stopping sight distance (SSD) shown is based on TAC Table 1.2.5.3. The increased SSD values shown in TAC Geometric Design Guide Table 1.2.5.4 shall be used where the greater eye height for trucks is not an advantage.
- The TAC Geometric Design Guide Sections 3.1.3 and 3.1.4 shall be used when setting clear zone distances.
- Northbound off-ramp shown on Diagram S24-A1 shall be designed as a 50 km/h 1 Lane Ramp in accordance with Table 1.3.3 [Geometric Design Criteria: Interchange Ramps] of Part 2 of Schedule 4.

Table 2.4c Golden Ears Connector

Item	Design Criteria	Notes
Legal Classification	RAD 60/ RAU 60	(a)
Posted Speed	60 km/h	
Design Speed	60 km/h	
Basic Lanes	4	
Minimum Radius	130 m	
Equiv Min K Factor		(b)
- Sag	18	
- Crest	13	
Max. Grade	5%	
Max. Superelevation	6%	
Minimum S.S.D.	85 m	(c)
Lane Width	3.6 m	(d)
Paved Shoulder Width		
- Outside	2.0 m	
- Inside	n/a	
Clear Zone		(e)
- Offset Width	Varies	
- Recovery Slope	4:1 or flatter	
Median Width	4.6 m	(f)
Design Vehicle	WB 20	
Basic Crossfall	2%	

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## Notes:

- a) Four-lane GEC to comprise a rural cross section with paved shoulders and ditches to the outside, but incorporating a raised median with curb and gutter at intersections.
- b) Values shall be based on headlight control for sag curves.
- c) Minimum stopping sight distance (SSD) shown is based on TAC Geometric Design Guide Table 1.2.5. The increased SSD values shown in TAC Geometric Design Guide Table 1.2.5.4 shall be used where the greater eye height for trucks is not an advantage.
- d) The lane width shown is the basic through lane width and is exclusive of any curb or gutter offset. Left turn lanes may be up to 0.3 m less than the through lane width (i.e. 3.3 m exclusive of offset).
- e) TAC Design Guide Sections 3.1.3 [The Clear Zone Concept] and 3.1.4 [Applying the Clear Zone Concept] shall be used when setting clear zone distances.
- f) The median width of 4.6 m accommodates a 3.3 m left turn lane adjacent to a 1.3 m raised median at intersections. The 4.6 m is from face-of-curb to face-of-curb lane widths are exclusive of any curb or gutter offset. The median shall not be required between 179 Street intersection and GEB Road intersection.

**Table 2.4d 104 Avenue**

Item	Design	Notes
Legal Classification	UAU 50 / RAD 50	(a)
Posted Speed	50 km/h	(b)
Design Speed	50 km/h	(b)
Basic Lanes	3	(c)
Minimum Radius	75 m / 90 m	(d)
Equiv Min K Factor		(e)
- Sag	12	
- Crest	7	
Max. Grade	7%	(f)
Max. Superelevation	6%	(d)
Minimum S.S.D.	65 m	(g)
Lane Width	3.6 m / 4.3+ m	(h)
Paved Shoulder Width		
- Outside	n/a or 2.0 m	(i)
- Inside	n/a	
Clear Zone		
- Offset Width	Varies	(j)
- Recovery Slope	4:1	
Median Width	Varies	(k)
Design Vehicle	WB 20	
Basic Crossfall	2%	
Sidewalk	1.8 m	(l)

## Notes:

- a) 104 Avenue to comprise curb and gutter as follows:  
 South side: Between west limit of FHC Work and CN Rail/exit ramp intersection.  
 North Side: Between 173 Street and intersection at 176 Street/SFPR (approx. Sta. 102+50 to Sta. 106+00).  
 Beyond these limits, open shoulders and ditches shall be used.
- b) Design/posted speed of 50 km/h shall apply along 104 Avenue and along the western portion of GEC up to Sta. 112+20. East of this latter point a 60 km/h design/posted speed shall apply to the GEC.
- c) Number of basic through lanes varies as follows:  
 Eastbound: 2 basic lanes throughout.

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- Westbound: 2 basic lanes between west of the GEC and just west of the westbound to 176 Street southbound jug-handle; 1 lane westbound thereafter to western Project limit.
- d) Minimum radii based on TAC Geometric Design Guide Table 2.1.2.4 for urban design and TAC Geometric Design Guide Table 2.1.2.3 for rural design, and assuming a maximum superelevation rate of 6%.
  - e) Values shall be based on headlight control for sag curves.
  - f) Maximum grade on 104 Avenue shall not exceed existing maximum grade of approximately 9%.
  - g) Minimum stopping sight distance (SSD) shown is based on TAC Geometric Design Guide Table 1.2.5.3. The increased SSD values shown in TAC Geometric Design Guide Table 1.2.5.4 shall be used where the greater eye height for trucks is not an advantage.
  - h) When adjacent to a curb, the single directional lane or outside lane shall be 4.3+ m wide to accommodate cyclists, exclusive of any curb or gutter offset (i.e. minimum total curb to curb width of 14.0 m). In non curb and gutter areas, where shoulders are incorporated, the single directional lane or outside lane width shall be 3.6 m.
  - i) In non curb and gutter areas, 2.0 m outside paved shoulders shall be used.
  - j) TAC Geometric Design Guide pages 3.1.3.1 to 3.1.4.10 shall be used when setting clear zone distances. In accordance with Technical Bulletin DS96001, the clear zone for curb and gutter designs shall be the greater of 2.0 m from face of curb or 0.5 m behind sidewalk.
  - k) Raised median shall be provided along the portions of 104 Avenue located between the 176 Street/SFPR and CN Access intersections and their approaches (i.e. approx. Sta. 105 to Sta. 109). Minimum median width shall be 4.6 m from face of curb to face of curb. Median shall tie to GEC median width of 4.6 m.
  - l) Sidewalk to be provided on the south side of 104 Avenue adjacent to the proposed curb & gutter (see Note a)), with sufficient allowance to accommodate a future 4.0 m separated multi-use path. For the section of 104 Avenue west of 103B Avenue, the sidewalk shall include a 2.0m boulevard separation.

## **2.5 South Fraser Perimeter Road**

The location of the west limit of the SFPR Extension is approximately 500 m east of the east abutment of the Fraser Heights Wetlands Bridge.

## **2.6 176 Street Extension**

Alignment of the 176 Street Extension at the south limit of FHC Construction shall be coordinated with the Primary Highway Components at Highway 15.

## **2.7 Golden Ears Connector**

The GEC at the east limit of FHC Construction shall match the existing GEB Road intersection, and the Constructor shall complete all works to the intersection so that it is fully operational as a four-leg signalized intersection.

## **2.8 Intersections and Local Roads**

- (a) Existing road allowance connections shall not be closed until roads are realigned or reconnected to the municipal network.
- (b) The Constructor shall design and construct, as necessary, cul-de-sacs for municipal roads that are terminated by the FHC Construction.

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- (c) The Constructor shall design and construct the following intersections and local road connections or terminations to accommodate a WB20 turning vehicle (except cul-de-sacs, which shall be designed and constructed to applicable Municipal standards):
- (i) **104 Avenue / 173 Street**
    - Match to existing 173 Street.
    - Match to existing 104 Avenue west of 173 Street.
  - (ii) **104 Avenue / 103B Avenue**
    - Match to existing 103B Avenue.
    - Provide a westbound to southbound left turn lane.
  - (iii) **104 Avenue / 104A Avenue**
    - Cul-de-sac existing 104A Avenue north of 104 Avenue.
  - (iv) **104 Avenue**
    - Cul-de-sac 104 Avenue at 176 Street (west of the CN Rail crossing).
  - (v) **CN Rail Access / 104 Avenue / 176 Street Northbound Off-ramp**
    - Eastbound to northbound left turn lane.
    - Northbound to eastbound right turn lane.
    - Westbound to northbound right turn lane.
    - Southbound to westbound right turn lane and southbound to eastbound left turn lane.
  - (vi) **176 Street / SFPR / 104 Avenue**
    - Southbound to eastbound dual left turn lanes.
    - Northbound to westbound left turn lane.
    - Eastbound to southbound right turn lane and westbound to northbound right turn lane.
    - Westbound to southbound left turn movement.
    - Westbound to northbound right turn lane to be designed as a 50 km/h one lane on-ramp in accordance with Table 1.3.3 [Geometric Design Criteria: Interchange Ramps] of Part 2 of Schedule 4.
  - (vii) **176 Street / Abbey Drive**
    - Close existing T-intersection and realign Abbey Drive as a frontage road connection immediately adjacent to the west side of 176 Street.
    - Existing residential access along the west side of 176 Street shall be reprovided along this new frontage road, complete with a cul-de-sac on the north end of the frontage road.
  - (viii) **GEC / 177A Street**
    - A T-intersection with westbound to southbound left-turn lane.
    - 177A Street to match existing (12.2 m face-to-face of curb to minimum 5 m beyond turning radii).

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- (ix) **GEC / 179 Street**
  - A four-way intersection connecting to the existing roadway.
  - Eastbound to northbound, and westbound to southbound left-turn lanes.
  - Gated railway crossing including railway signal pre-emption.
  - Tie in to Triggs Road.
  - Maximum grade on 179 Street shall not exceed existing maximum grade of approximately 12.2%.
- (x) **GEC / 182A Street**
  - Cul-de-sac existing 182A Street south of the GEC.
- (d) All left turn lanes shall provide the greater of 30 m or the calculated vehicular storage length requirements (excluding any required parallel lane deceleration lengths).

**2.9 Access requirements**

- (a) All private access shall be maintained during FHC Construction.
- (b) The Constructor shall design and construct the following accesses:

- (i) **CN Rail**

A new access to the CN Rail yard north of 104 Avenue is to be relocated towards the east limit of the CN Rail property and incorporated into the intersection with the 176 Street northbound off-ramp (the “**CN Rail Access**”). This shall include works required within CN Rail’s intermodal yard property to tie back in the relocated access with the truck staging area. The Constructor shall arrange directly with CN Rail for any and all access to CN Rail property required by the Constructor for the design and construction of the CN Rail Access pursuant to and in compliance with the CN Rail Property Acquisition Agreement.

- (ii) **Windsor Plywood**

Full access on and off GEC.

Westbound to southbound left turn lane.

- (iii) **Solid Rock Steel Fabricating Company**

Full access on and off GEC (to be shared with Seaside Painters and situated on the joint property line).

- (iv) **Seaside Painters**

Full access on and off 179 Street (plus shared access with Solid Rock Steel situated on the joint property line).

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- (v) **Private Access Opposite 182A Street**  
Full access on and off GEC.
- (vi) **Private Accesses along 176 Street (west side and north of Abbey Drive)**  
Via a new frontage road connection to Abbey Drive.

**PART 3**  
**STRUCTURAL**

**3.1 Application**

- (a) The requirements of this Part do not apply to the 176 Street Extension.
- (b) The provisions of Article 3 [Structural Design Criteria] of Part 2 of Schedule 4 apply to the FHC to the extent applicable thereto, except that Section 3.3.1.10 [Deck Wearing Surface Systems] does not apply to the SFPR Extension and GEC.
- (c) The provisions of Article 4 [Seismic Design Criteria] of Part 2 of Schedule 4 apply to the FHC to the extent applicable thereto.

**3.2 [Intentionally Deleted]**

**3.3 Seismic Design**

- (a) FHC Structures shall be designed and constructed to meet the performance requirements of Economic Sustainability Route Structures as set out in Article 4 [Seismic Design Criteria] of Part 2 of Schedule 4 and Part 2 [Economic Sustainability Route Structures] of Appendix D to Schedule 4.
- (b) [Intentionally Deleted]

**3.4 Settlement**

- (a) The Constructor shall ensure, for the SFPR Extension and the GEC, that Structure Foundations are designed and constructed to satisfy the following performance requirements over the 75-year Design Life of the Structure:
  - (i) transverse differential settlements do not result in a change in the cross fall of the Structure of more than 0.5%;
  - (ii) longitudinal differential settlements do not result in more than a 0.5% change in the vertical profile of the Structure;
  - (iii) approach slabs shall have a maximum differential settlement along the length of the slab of 100 mm; and



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- (iv) minimum vertical clearances are met throughout the Design Life of the Structure without additional intervention, including jacking.
- (b) Long-term settlement of supports over the 75-year Design Life of the Structure, including superstructure deflection and pavement rehabilitation, must be accommodated without reducing the vertical clearance.

**3.5 Predicted Settlements**

- (a) As part of the FHC Design in relation to the SFPR Extension and the GEC, predicted settlements at all corners of every Bridge pier, for 2, 5, 20, 40 and 75 years after the FHC Substantial Completion Date shall be provided. These predictions shall be provided as part of the relevant Interim Design submissions. The predicted settlements shall be presented in a table or drawing that clearly identifies where each settlement prediction is located, shall be accompanied by all relevant calculations, and shall be sealed by the Constructor's Geotechnical Engineer.
- (b) The predicted settlements shall be used to determine if the Constructor has satisfied the performance requirements described in Sections 3.4(a)(i) to (iv) of this Appendix.
- (c) The following monitoring program shall be carried out:
  - (i) at the FHC Substantial Completion Date, the Authority shall survey the top corners of each pier and abutment to determine their 3-dimensional coordinates;
  - (ii) by no more than 4 months and no less than 2 months before the expiry of the Warranty Period, the Authority shall re-survey the piers and abutments to determine absolute and differential settlements that have occurred since the FHC Substantial Completion Date;
  - (iii) measured settlements shall be compared with the settlement predictions provided in the FHC Design;
  - (iv) if measured settlements are equal to or less than predicted in the FHC Design, then the performance requirements listed in Section 3.4 [Settlement] of this Appendix shall be considered to have been satisfied; and
  - (v) if measured settlements are greater than predicted in the FHC Design, then the Constructor shall undertake any and all works required to correct the settlement matters to the satisfaction of the Authority's Representative.
- (d) The Constructor shall carry out a monitoring program during the Warranty Period designed and implemented to monitor the SFPR Extension and the GEC for compliance with the settlement and differential settlement criteria. The frequency of monitoring shall be quarterly for the first and second year of the Warranty Period and semi-annually for the remainder of the Warranty Period.

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**3.6 Reinforcing Steel**

- (a) All parapet and deck reinforcing shall be epoxy coated reinforcing steel. All other reinforcing steel shall be uncoated reinforcing steel.
- (b) Reinforcing steel within all potential plastic hinge zones shall be grade 400W.
- (c) Couplers shall not be used in plastic hinging zones.
- (d) Mechanical connectors for reinforcing bars shall be couplers without bar offset and shall be in accordance with DBSS 412.34.03.
- (e) Welded splices or joints in reinforcing steel shall not be permitted.

**3.7 Prestressing Steel**

- (a) Strands shall be seven wire, uncoated, low relaxation, grade 1860 ultimate.
- (b) Pretensioned strands shall be nominal 13 mm or 15 mm diameter.
- (c) Unbonded post tensioned tendons shall not be used.

**3.8 Deck Concrete Cover**

For Bridge decks, approach slabs and sidewalks the minimum concrete cover to the top steel shall be 70 mm, which 70 mm includes the concrete deck overlay.

**3.9 Deck Concrete**

- (a) For Bridge decks, approach slabs, sidewalks, and concrete deck overlays concrete shall contain 7% to 8% silica fume by weight of Portland Cement for durability.
- (b) The 90 days chloride permeability of the deck and parapets shall not be more than 1000 coulombs. Testing of concrete for verification of this requirement shall be carried out in accordance with the DBSS 211. Primary testing shall be carried out on trial mixes prior to any concrete being placed in the deck and parapets. Results of permeability tests shall be documented and included in the Quality Documentation.
- (c) Superplasticizers are permitted for use in Bridge decks.
- (d) The air content shall be  $6\pm 1\%$  if superplasticizers are used with silica fume.

**3.10 Deck Waterproofing Membrane and Asphalt Overlay**

- (a) Waterproofing membrane and asphalt overlay shall be used on all Bridge decks. Asphalt overlay shall have a maximum thickness of 100 mm.
- (b) Waterproofing membrane shall be in accordance with the Recognized Products List in the "Prefabricated" category under "Deck Membrane Systems".

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- (c) Asphalt (membrane) drains shall be provided in accordance with DBSS. Membrane drains shall be provided at 1.5 m centre longitudinally on the low side of the crossfall, adjacent to cast in place roadside barrier.

**3.11 Approach Slabs**

Approach slabs shall be provided at all abutments, in accordance with the BC Supplement to CAN/CSA-S6-06 and the following:

- (a) approach slabs shall have a 100 mm minimum asphalt overlay. A waterproofing membrane is not required beneath the asphalt;
- (b) 6 m minimum length, continuous, full-width approach slabs at the interface between the Structure and the approach fills shall be provided;
- (c) concrete mix for the approach slabs shall be the same as the Bridge deck; and
- (d) approach slabs shall be designed to ensure a smooth transition between embankments and Bridges.

**3.12 Bearings**

Plots of shear load and shear deflections required in accordance with Section 3.3.1.20(d)(ii)(3) of Part 2 of Schedule 4 shall be submitted to the Authority's Representative.

**PART 4**  
**GEOTECHNICAL**

**4.1 Application**

- (a) The requirements of this Part do not apply to the 176 Street Extension.
- (b) The provisions of Article 5 [Geotechnical Design Criteria] of Part 2 of Schedule 4 apply to the FHC to the extent applicable thereto, except that Section 5.3(f) of Part 2 of Schedule 4 does not apply to the SFPR Extension or the GEC.

**4.2 Geotechnical Assessment**

The Constructor shall include in the assessment the impact of coordination with CN Rail with respect to preloading activities by CN Rail in accordance with the CN Rail Property Acquisition Agreement.

**4.3 Settlement**

- (a) The total and differential settlements of road embankments and pavement surfaces within the SFPR Extension and the GEC during the Warranty Period, excluding seismic and liquefaction induced deformations, shall be such that the cross-slope requirements are met, ponding and sheeting of water is prevented, pavement drainage is maintained and the function of culverts and ditches is preserved. Total settlements shall not exceed 300

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mm with respect to the Design grades. At approach embankments angular distortions of the roadway surface shall not exceed 1:200 over any 10 m length of the embankment.

- (b) Ground improvement techniques, surcharging amounts and surcharging periods required to achieve these requirements shall be specified and monitored by the Constructor's Geotechnical Engineer.

**4.4 Lightweight Fills**

Use of hog fuel as lightweight fill is subject to the conditions specified in Technical Circular T-17/06.

**PART 5**  
**PAVEMENT**

**5.1 Application**

- (a) With the exception only of Section 5.6(d), the requirements of this Part do not apply to the 176 Street Extension.
- (b) The provisions of Article 2 [Pavements] of Part 2 of Schedule 4 apply to the 176 Street Extension to the extent applicable thereto, but do not apply to the SFPR Extension or the GEC.

**5.2 Order of Precedence**

Pavement included within SFPR Extension and the GEC shall be in accordance with the criteria contained in this Part and the following codes and standards, and if there is any conflict between the criteria contained in this Part and any Reference Documents, the following shall apply in descending order of precedence:

- (a) the criteria contained in this Part;
- (b) Technical Circular T-01/04;
- (c) AASHTO Pavement Structures Guide; and
- (d) Asphalt Overlays Manual.

**5.3 Pavement Design Criteria**

The criteria contained in this Part constitute the minimum pavement design criteria.

**5.4 New Pavement Design Criteria**

- (a) The following design criteria and input parameters shall be used in conjunction with the Reference Documents listed in Section 5.2 [Order of Precedence] of this Appendix:

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<b>Asphalt Pavements</b>	
Minimum Analysis Period	25 years
Reliability	R = 85%
Standard Deviation	So = 0.45
Pavement Serviceability Index (PSI):	
Initial Serviceability Index	P <sub>i</sub> = 4.2
Terminal Serviceability Index	P <sub>t</sub> = 2.5

- (b) The pavement designs shall be based on the “design hourly traffic volumes” provided in 0710.10 [Traffic Data Reports] of the FHC Data Room. Equivalent Single Axle Loads (ESALs) shall be calculated assuming an annual compound growth rate of 3.3% and the following:

	NALV Number of equivalent Axle Loads per Vehicle	Percentage of Truck Traffic
Heavy Trucks	2.5	60%
Light trucks	1.2	40%

### 5.5 Pavement Rehabilitation Design

Pavement rehabilitation designs shall be carried out according to the Asphalt Overlays Manual and the Reference Documents listed in Section 5.2 [Order of Precedence] of this Appendix.

### 5.6 General Requirements

In addition to the design requirements for new pavement and pavement rehabilitation described in Sections 5.4 [New Pavement Design Criteria] and 5.5 [Pavement Rehabilitation Design] of this Appendix, the SFPR Extension and the GEC pavement designs shall comply with the following minimum criteria:

- (a) Final travelled surfaces shall be new asphalt pavement.
- (b) Use of concrete within a pavement structure shall not be permitted.
- (c) Use of cement stabilized base shall not be permitted.
- (d) Except for Bridge decks, OGFC shall be provided for all pavement for noise mitigation as the surface course. The OGFC surface course shall be underlain by Superpave.
- (e) The minimum requirement for lower lift asphalt pavement is a Class 1 medium mix.
- (f) Asphalt overlays shall have a minimum thickness of 50 mm.
- (g) For new construction, including ramps and existing roadways, where applicable, the asphalt underlying the OGFC shall have a minimum thickness of 125 mm.

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- (h) The thickness of the OGFC shall not be considered as part of the minimum asphalt thickness.
- (i) All new granular base courses shall have a minimum thickness of 300 mm.
- (j) In areas where there is an increase in the road elevation, new pavements may be constructed without removal of the existing asphalt provided that a 150 mm minimum thickness of new base course gravel is placed on top of the old asphalt surface and the slope of the under laying asphalt permits drainage without ponding of water on top of the old asphalt surface.
- (k) The minimum thickness of gravel base and subbase combined over lightweight fill shall be 1.0 m.
- (l) The minimum thickness of subbase aggregate shall be 1.0 m over native soils.
- (m) River sand shall not be used within 1.0 m of the underside of the asphalt.

**5.7 Milling, Recycling, Reclamation**

Recycling of existing asphalt pavement and granular road materials is acceptable with the following qualifications:

- (a) Asphalt pavement may be milled or pulverized and used in fills within the Project Site that are not:
  - (i) considered to be environmentally sensitive; or
  - (ii) above expanded polystyrene fill.
- (b) If milled asphalt is being used as fill material, the asphalt pavement millings shall be blended uniformly with other granular materials to a ratio of 1 part milled asphalt (maximum): 1 part granular material measured by volume.
- (c) Reclamation of asphalt pavement shall extend to a minimum depth of twice the in-situ asphalt thickness. The resulting blend of pulverized asphalt with granular material shall have a ratio of 1 part asphalt coated particles (maximum): 1 part granular base measured by volume.
- (d) Reclaimed asphalt/granular base blend may be used as base course aggregate or SGSB provided that the resulting gradation of the blend meets the applicable gradations specified in DBSS 202.
- (e) Reclaimed asphalt/granular base blend shall not be used within 150 mm of the base of the asphalt layer.
- (f) All milling shall be conducted in accordance with DBSS 511.

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**5.8 Asphalt Paving**

- (a) All asphalt paving of final roadways shall be conducted in accordance with DBSS 502 and DBSS 501, where DBSS 502 shall take precedence. The bonus/penalty provisions of DBSS 502 shall not apply. Quality indicators shall be tested as per the frequency in DBSS 502 and reject limits with corresponding consequences shall apply.
- (b) The asphalt pavement shall comprise a surface layer of OGFC overlaying Superpave. The lower asphalt layer(s) underlying the Superpave may be Class 1 mix.
- (c) Asphalt used as a levelling course, and for curb or traffic island construction shall be conducted in accordance with DBSS 501 (Hot Mixed Asphalt Pavement).

**5.9 Asphalt Mix Design**

- (a) Superpave asphalt mix designs shall comply with Asphalt Institute SP-2 and Asphalt Institute MS-2.
- (b) The Constructor shall supply Group A asphalt cement having a penetration grade of 80-100 and meet the requirements of DBSS 952. Use of high performance asphalt cements may be considered.

**5.10 OGFC Mix Design Criteria**

OGFC shall form a wearing surface overlying the Superpave. The mix design shall satisfy the following minimum criteria:

(a) **Aggregate Requirements**

The aggregate must be comprised of only crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials, within the gradations limits specified when tested to ASTM C136 and ASTM C117.

Sieve Designation	Percent Passing
16.0 mm	100
12.5 mm	95 - 100
9.5 mm	50 - 70
*4.75 mm	15 - 30
2.36 mm	5 - 15
0.075 mm	2 - 5

\* Coarse aggregate is aggregate retained on the 4.75 mm sieve and fine aggregate is aggregate passing the 4.75 mm sieve when tested to ASTM C136.

**5.11 Physical Property Requirements – Air Voids**

A minimum of 18 percent air voids is required. Air voids are to be tested in accordance with ASTM D3203.

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**5.12 Field Performance Criteria**

- (a) The completed OGFC asphalt pavement shall allow water to drain freely to the curb and/or shoulder locations. The OGFC asphalt pavement must not be permitted to trap or pond water at construction joints or at curb and shoulder locations.
- (b) The OGFC asphalt pavement must retain a minimum 50% of its initial in-situ permeability when tested after five years of operation. For each subsequent 5 year period, the OGFC asphalt pavement must retain a minimum 50% in-situ permeability of the previous tested in-situ permeability value.
- (c) The initial in-situ permeability of the OGFC asphalt pavement shall be established by the Constructor and provided to the Authority's Representative for record purposes within two weeks of placement.
- (d) Unless and until such time as an alternative standard test method is agreed upon by the Authority's Representative, the in-situ permeability of the OGFC asphalt pavement shall be measured using a falling-head permeameter as illustrated in Figure 3.1 of the Oregon F-Mix Interim Report.

**5.13 Pedestrian Facilities**

All off-road pedestrian facilities shall be either asphalt or concrete surfaced having a minimum asphalt and concrete thickness of 50 mm and 100 mm, respectively, overlying 25 mm base gravel having a minimum thickness of 150 mm. A sub-base layer consisting of compacted SGSB and having a minimum thickness of 300 mm shall underly the base layer. Contrary to DBSS 202.26.02, the granular base and sub-base layer shall be compacted to 95 % of the laboratory density obtained by current test method ASTM D698.

**5.14 Access, Detour and Haul Roads**

All temporary access, detour and/or haul roads shall be in accordance with Section 9.6 [Detours and Lane Shifts] of this Appendix.

**5.15 SFPR Extension and GEC Pavement Acceptance at Substantial Completion**

- (a) As a precondition of Substantial Completion of the SFPR Extension and the GEC, a pavement deflection survey shall be carried out using a Falling Weight Deflectometer ("FWD") at a frequency 100 m along each travel lane. The test points shall be staggered by 50 m along adjacent lanes. FWD testing shall be carried out according to ASTM D4694. The representative rebound deflection (the "**Representative Rebound Deflection**") of asphalt pavements shall be compared to the pavement design and verified according to Asphalt Institute MS-17 based on traffic volume/ pavement response relationship.
- (b) The structural parameters such as thickness, strength and quality of materials within the pavement sections shall be evaluated during the FHC Construction phase through the Quality Management Plan.



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- (c) Notwithstanding the minimum criteria contained in this Part or in Technical Circular T-01/04, the pavement acceptance at Substantial Completion of the SFPR Extension and the GEC shall be based on achievement of a minimum Representative Rebound Deflection and a walkover survey carried out with the Authority's Representative as outlined below. These acceptance criteria are in addition to the requirements outlined in DBSS 501 and DBSS 502.
- (d) The Representative Rebound Deflection calculated in accordance with Chapter 6 of Asphalt Institute MS-17 shall not exceed 0.65 mm for pavement acceptance.
- (e) In addition, within one month of the FHC Substantial Completion Date, a walkover survey shall be carried out of the final pavement with the Authority's Representative to identify workmanship defects as per DBSS 502.22.
- (f) Acceptance of the construction of the SFPR Extension and the GEC for the purpose of Substantial Completion of the FHC shall not be final until the minimum Representative Rebound Deflections are met and the workmanship defects are repaired in a manner acceptable to the Authority's Representative.

**5.16 Pavement Acceptance at End of Warranty Period**

- (a) The Constructor is required to conduct and report on the results of the pavement surface distress, roughness (IRI) and rutting surveys for the SFPR Extension and the GEC 60 and thirty 30 days, respectively, prior to the end of the Warranty Period, or as otherwise agreed with the Authority's Representative.
- (b) Pavement surface distress surveys shall be conducted and reported in accordance with the Pavement Surface Condition Rating Manual. The Pavement Distress Index (PDI) shall be calculated using the PDI model set out in the Pavement Surface Condition Rating Manual. The PDI shall meet or exceed 8.5 on a scale of 1 to 10 (10 being best), at the end of the Warranty Period. Without reducing overall pavement thickness, the Constructor shall rectify any pavement that does not meet or exceed the criteria.
- (c) IRI surveys shall be conducted and reported as described in DBSS 502 for smoothness. When measured with a Class 1 Profiler, the IRI shall be 2.0 or smoother at the end of the Warranty Period. Without reducing overall pavement thickness, the Constructor shall rectify any pavement that is rougher than an IRI of 2.0.
- (d) The Bridge deck and approaches within 50 m length of the Bridge deck shall be excluded.
- (e) Rut depth measurements shall be made using automated or manual surveying equipment. Field confirmation must be done over a 500 m test section using the acceptance criteria for initial QA test, as laid out in the Pavement Surface Condition Rating Manual. Without reducing overall pavement thickness, the Constructor shall rectify any pavement that is rutted, for each wheel path, in excess of 10 mm. The same criterion for rutting applies to the asphalt surface on the Bridge deck.

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- (f) Final travelled surfaces within the SFPR Extension and the GEC shall meet the requirements for such surfaces as specified in Schedule 5 [OMR and End of Term] at the end of the Warranty Period.

**PART 6**  
**DRAINAGE AND STORMWATER MANAGEMENT**

**6.1 Application**

- (a) The requirements of this Part apply to all of the FHC.
- (b) The provisions of Article 7 [Drainage Design Criteria] of Part 2 of Schedule 4, except for Table 7.2.2 [Design Frequencies (years) for Hydraulic Structures] therein, apply to the FHC to the extent applicable thereto.

**6.2 Order of Precedence**

Drainage in respect of FHC Design and FHC Construction shall be in accordance with the criteria contained in this Part and the following codes and standards, and if there is any conflict between the criteria contained in this Part and any Reference Documents, the following shall apply in descending order of precedence:

- (a) the criteria contained in this Part;
- (b) BC Supplement to CAN/CSA-S6-06;
- (c) BC Supplement to TAC;
- (d) Best Management Practices for Highway Maintenance Activities;
- (e) Culvert and Fish Passage Fact Sheet; and
- (f) Section 5 [Storm Drainage System] of the Surrey Design Criteria Manual.

**6.3 Criteria and Guidelines for Drainage Design**

- (a) Drainage Infrastructure shall be designed to accommodate the rainfall frequencies set out in Table 6.3.

**Table 6.3: Design Frequencies (years) for Hydraulic Structures**

Road Classification Hydraulic Structures	Low volume	Local	Collector	Arterial
Gutters	-	5	5	5
Stormwater Inlets	-	5	5	5
Storm Sewers	-	10	10	25
Highway Ditches	10	10	10	25
Culverts (< 3 m)	50	50	100	100
Bridges (and culverts > 3 m)	100	200	200	200

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- (b) Drainage Infrastructure shall, where practical, be integrated with the Constructor's obligations and responsibilities set out in this Agreement, including Part 11 [Environmental] of this Appendix. Design of new or replacement culvert crossings shall take into account commitments in relation to length, material, bottom treatments, and current ability to pass fish or provide for wildlife passage.

**PART 7**  
**ELECTRICAL**

**7.1 Application**

- (a) With the exception only of Section 7.5 [Traffic Signals], the requirements of this Part do not apply to the 176 Street Extension.
- (b) The provisions of Article 6 [Electrical, Signals and Lighting Design Criteria] of Part 2 of Schedule 4 apply to the FHC to the extent applicable thereto, except for Section 6.1 [Order of Precedence] which does not apply to the SFPR Extension and GEC.
- (c) The provisions of Article 14 [Intelligent Transportation Systems] of Part 2 of Schedule 4 do not apply to the FHC.
- (d) The provisions of Article 15 [Additional Traffic Measurement Equipment] of Part 2 of Schedule 4 do not apply to the FHC.

**7.2 Order of Precedence**

The FHC Design for all electrical, signals, and systems shall be in accordance with the criteria contained in this Part and the following codes and standards, and if there is any conflict between criteria contained in this Part and any of the Reference Documents, the following shall apply in descending order of precedence:

- (a) the criteria contained in this Part;
- (b) Electrical and Traffic Engineering Manual;
- (c) applicable Technical Bulletins included in the Reference Documents;
- (d) Transport Canada RTD-10;
- (e) BC Supplement to TAC;
- (f) Electrical and Signing Materials Standards;
- (g) Standard Electrical Equipment Maintenance Manual;
- (h) Pedestrian Crossing Control Manual;
- (i) Traffic Control Manual;

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- (j) Traffic Management Guidelines;
- (k) the applicable standards of the City of Surrey; and
- (l) MMCD.

**7.3 General Requirements**

The scope of the electrical work for the FHC includes:

- (a) roadway lighting;
- (b) traffic signals;
- (c) sign structures;
- (d) Intelligent Transportation System conduit system; and
- (e) removal and disposal of existing electrical equipment.

**7.4 Design Requirements**

- (a) The FHC Design shall provide separate services for the lighting under the Municipality of Surrey jurisdiction in accordance with the MMCD.
- (b) Lighting shall be designed and installed at intersections and interchange ramps as warranted by and to the lighting levels set in the Electrical and Traffic Engineering Manual.
- (c) Luminaires on Structures shall have safety cables designed to meet ANSI requirements for vibration.

**7.5 Traffic Signals**

- (a) The Constructor shall undertake the FHC Design and FHC Construction of all signalized intersections required for the FHC in accordance with the requirements of the Electrical and Traffic Engineering Manual and Part 8 [Traffic Engineering] of this Appendix.
- (b) As a minimum, traffic signals shall be installed:
  - (i) at the 176 Street/SFPR/104 Avenue intersection;
  - (ii) at the CN Rail Access/104 Avenue intersection; and
  - (iii) on GEC at the 179 Street intersection.
- (c) Railway crossing designs, including warrants and accommodation for pre-emption, gates and blankout/rail message signage shall be in accordance with Section 1110 of the BC Supplement to TAC and Transport Canada RTD-10.

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- (d) The design, procurement and installation of crossing signal systems and track related infrastructure shall be at the Constructor's cost.
- (e) The Constructor shall incorporate an Advance Warning Flashers (AWF) system along the 176 Street and SFPR Extension approaches to the 176 Street/SFPR/104 Avenue signalized intersection.

**7.6 Sign Structures**

The Constructor shall design, fabricate and install sign Structures in accordance with the Electrical and Signing Materials Standards. Levelling nuts below the base plates are not permitted.

**7.7 ITS Ducts**

The Constructor shall provide a power and communications duct system for the complete length of the SFPR Extension and the 176 Street Extension. Installation shall be in accordance with Figure 1 – Typical ITS Duct System in the Data Room except that road crossings shall be every 600 m, not 200 m as noted.

**7.8 Electrical Servicing**

- (a) The Constructor shall not be required to provide electrical power to the SFPR Extension.
- (b) 347/600V servicing for lighting and traffic signals is not permitted.

**PART 8**  
**TRAFFIC ENGINEERING**

**8.1 Application**

- (a) The requirements of this Part apply to all of the FHC.
- (b) With the exception only of Section 10.5 [Traffic Engineering] thereof, Article 10 [Traffic Engineering and Traffic Performance Criteria] of Part 2 of Schedule 4 does not apply to the FHC.

**8.2 Design Hour Traffic Volumes**

Forecast 2031 AM and PM peak hour turning movement volumes are provided in 0710.10 [Traffic Data Reports] of the FHC Data Room. The truck volumes in Figures 3 and 4 are included in the design hourly volumes in Figures 1 and 2.

**8.3 Intersection Analysis**

- (a) The Constructor shall undertake the necessary traffic analysis to demonstrate that the geometric design and configuration of the intersections, including storage lengths of all left turn movements, shall accommodate the 2031 design hour traffic volumes with respect to the following performance measures as defined in the Highway Capacity Manual:

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- (i) overall intersection LOS D (average vehicle delay less than 55 seconds);
  - (ii) no critical movement shall exceed LOS D; and
  - (iii) no critical movement shall exceed a v/c of 0.85.
- (b) For intersections with less than 200 m separation, the analysis shall demonstrate that the intersections can operate as a network with regard to queue lengths and signal coordination.
- (c) The analysis process and results of the Highway Capacity Manual evaluation including all assumptions shall be submitted to the Authority's Representative in accordance with the Review Procedure.

**8.4 Non Performance Based Intersections**

The performance measures in Section 8.3 [Intersection Analysis] shall not apply to the following intersections:

- (a) 104 Avenue/173 Street;
- (b) 104 Avenue/103B Street;
- (c) GEC/177A Street;
- (d) GEC/179 Street/Triggs Road;
- (e) GEC/182A Street;
- (f) accesses to adjacent properties off GEC; and
- (g) other intersections not impacted by the FHC Work.

Improvements and final lane configuration requirements at these intersections shall be as depicted in the FHC Reference Concept and described in Section 2.8 [Intersections and Local Roads] of this Appendix.

**8.5 Signalized Intersection Design**

- (a) Signalized intersections that are warranted by the design volumes in accordance with the Electrical and Traffic Engineering Manual, the performance specifications in Section 8.3 [Intersection Analysis] of this Appendix, or set out in this Part shall be constructed as part of the FHC Work.
- (b) Initial signal timings shall be designed based on the traffic volumes set out in the "design hourly traffic volumes" provided in 0710.10 [Traffic Data Reports] of the FHC Data Room and additional volume data to be collected on site by the Constructor. It is the Constructor's responsibility to ensure that sufficient traffic data is collected on site to support the design of the traffic signal phasing and timings to the satisfaction of the Authority's Representative. Four signal timing plans (AM, PM, Midday, and off peak)

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shall be designed for each signalized intersection. The Constructor shall also design and install any temporary signal timings that may be required during FHC Construction.

**8.6 Bus Routing**

The Constructor shall liaise with TransLink, the Coast Mountain Bus Company and the City of Surrey to confirm whether bus routes will be affected by the temporary and permanent FHC Work. The Constructor shall accommodate all buses (including the provision of bus stops) on either existing or modified routes within the Project Site as applicable. Bus facilities are to be designed in accordance with the TransLink Infrastructure Design Guidelines.

**PART 9**  
**TRAFFIC MANAGEMENT**

**9.1 Application**

- (a) The requirements of this Part apply to all of the FHC.
- (b) The provisions of Part 4 [Traffic Management] of Schedule 4 apply to the FHC to the extent applicable thereto.

**9.2 Full Closures and Lane Closures**

- (a) All currently provided traffic movements must be accommodated until permanent movements are accommodated.
- (b) Full Closures are not permitted on the following major roads:
  - (i) 104 Street;
  - (ii) 176 Street (SFPR); and
  - (iii) Daly Road (GEC).
- (c) Lane Closures shall be permitted on the above major roads outside the following peak periods (the “**FHC Peak Periods**”):
  - (i) Monday to Friday: 5:00 a.m. to 9:00 a.m. and 3:00 p.m. to 7:00 p.m.; and
  - (ii) Saturday and Sunday: 9:00 a.m. to 5:00 p.m.
- (d) A minimum of a single lane with alternating traffic controlled by flag persons shall be required at all times outside of the FHC Peak Periods on the major roads when work is underway. Delays may not exceed Permissible Delays in Section 9.3 [Permissible Delays] of this Appendix. When FHC Construction is not underway, all lanes shall be re-opened.
- (e) On other minor roads within the Fraser Heights Lands, temporary Full Closures shall be permitted provided that alternative detour routes are provided to the satisfaction of the

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Authority's Representative. Temporary Lane Closures shall be permitted on minor roads at any time subject to compliance with Section 9.3 [Permissible Delays] of this Appendix.

- (f) For each pre-approved Lane Closure or Full Closure, the Constructor shall notify the Provincial Highways Conditions Centre (PHCC) and the City of Surrey as follows:
  - (i) to confirm that the Lane Closure or Full Closure will take place, no later than 6:00 a.m. on the day of the Lane Closure or Full Closure; and
  - (ii) upon actual installation of the Lane Closure or Full Closure and upon its removal.
- (g) In the event of any unplanned or non-approved Full Closure or Lane Closure, the Constructor shall immediately notify the PHCC and the City of Surrey of the Lane Closure or Full Closure implementation and removal, and the reasons therefor.
- (h) When Lane Closures are in place, no interruptions to traffic flow (due to construction related activities) shall be allowed in the open lane at any time.
- (i) The implementation of any detours and/or changes in traffic patterns shall be completed outside of FHC Peak Periods. During FHC Peak Periods, the Constructor shall not engage in any activity that may significantly impede the flow of traffic.
- (j) The Full Closure and Lane Closure restrictions set out in this Section are based on typical daily traffic flows. The hours are deemed minimum durations but may be adjusted at the discretion of the Authority's Representative in consideration of circumstances such as, but not limited to, excessive traffic delays, weekends, Statutory Holidays, Special Events, incidents or accidents.

**9.3 Permissible Delays**

- (a) In this Section and in Sections 9.4 [Obstruction of Traffic] and 9.5 [Rectification of Non-Compliant Stoppages] of this Appendix:
  - (i) **"Stoppage"** means an occasional, temporary interruption of traffic flow, including as a result of a Lane Closure or Full Closure;
  - (ii) **"Ten Minute Stoppage"** means a Stoppage of no more than 10 minutes in one or both directions; and
  - (iii) **"Free Flow Conditions"** means when the traffic queue is cleared and traffic operations return to normal for that time of day.
- (b) No Stoppages shall be permitted during FHC Peak Periods. Outside of FHC Peak Periods, Stoppages shall be limited to Ten Minute Stoppages.
- (c) After any Stoppage, Free Flow Conditions shall be restored before another Stoppage is implemented.



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- (d) The Authority's Representative may, in consideration of circumstances including, but not limited to, excessive traffic delays, weekends, Statutory Holidays, Special Events, incidents or accidents, amend the duration, timing and frequency of permissible Stoppages in respect of the FHC.

**9.4 Obstruction of Traffic**

- (a) The Constructor shall maintain the flow of traffic through the Fraser Heights Lands during FHC Construction.
- (b) Should Ten Minute Stoppages not be reliably controlled and kept within the allowable scheduled Stoppage duration of ten minutes, the use of Ten Minute Stoppages shall not be permitted until such time as the Constructor revises the Traffic Management Plan as it relates to the FHC, in accordance with Part 4 [Traffic Management] of Schedule 4, to rectify the extended Stoppages.

**9.5 Rectification of Non-Compliant Stoppage**

After the occurrence of any Stoppage that is not permitted in accordance with this Part, the Constructor shall review the Traffic Management Plan in respect of the FHC, determine the cause, and develop plans to prevent future non-compliant Stoppages. The Constructor shall revise the Traffic Management Plan as it relates to the FHC in accordance with Part 4 [Traffic Management] of Schedule 4. Only after the Traffic Management Plan, as so revised, has been accepted by the Authority's Representative in accordance with Part 4 [Traffic Management] of Schedule 4 will the Constructor be permitted to continue with Stoppages. No further Stoppages shall be permitted until the Traffic Management Plan as it relates to the FHC has been revised by the Constructor and accepted by the Authority's Representative in accordance with Part 4 [Traffic Management] of Schedule 4.

**9.6 Detours and Lane Shifts**

- (a) This Section replaces DBSS Section 194.27 [Detours].
- (b) The minimum requirements for FHC Construction detours are provided in Table 9.6.

**Table 9.6: Detour Minimum Requirements**

<b>Design Feature</b>	<b>Specification</b>
Design Speed/Posted Speed:	50 km/h or as approved by the Authority's Representative
Design Vehicle:	WB20
Maximum Grade:	As existing
Maximum Superelevation:	6%
Vertical Clearance:	The lesser of 5.0 m or existing
Lane Width:	3.5 m (minimum)
Shoulder (open):	1.5 m (minimum) paved
Side Slopes	3.5 Horizontal: 1 Vertical

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- (c) The Constructor shall prepare an engineering design for detours and Lane Shifts for FHC Construction.
- (d) Temporary access, detour and/or haul roads shall be designed, constructed and operated in accordance with DBSS 165.09.
- (e) Paved surfaces shall be provided at all times for 176 Street, 104 Avenue and Daly Road traffic. Gravelled detours for other roads are permitted but for no longer than 28 days.
- (f) The Constructor shall consider the condition of the pavement used for detours and its impact on the safety and function of the detour. Different pavement surface conditions, such as non-uniform and uneven pavement, may confuse drivers. On some pavement surfaces, permanent markings that have been effectively removed for dry daylight conditions may still appear to be in place under wet conditions. Where these conditions are anticipated or found to exist, the Constructor shall provide either a new pavement lift or milled surface to form a uniform surface and eradicate undesirable pavement markings.
- (g) The detours shall be provided with adequate drainage facilities to prevent ponding and flow of water across the detour. Milled surfaces upon which traffic is to run shall be clean and provide drainage equivalent to or better than the currently existing facilities. Where the detour shifts lanes and alters the existing drainage system, the Constructor shall design and construct drainage facilities to adequately accommodate storm water runoff equivalent to or better than the currently existing facilities and in accordance with Schedule 6 [Environmental Obligations].
- (h) The Constructor shall be responsible for the design, implementation, maintenance and removal of all FHC Construction detours.

**9.7 Temporary Traffic Signals**

The Constructor shall provide temporary signalization, as required, to accommodate traffic detours. Where traffic signals are required, they shall be designed in accordance with Part 7 [Electrical] of this Appendix.

**9.8 Temporary Roadway Lighting**

- (a) Existing lighting, not affected by the Constructor's staging, shall remain operational and maintained by the Constructor until such time as replacement lighting is energized.
- (b) Where temporary roads, detours, or ramps are required, temporary roadway lighting shall be provided to meet the requirements listed in the Electrical and Traffic Engineering Manual. Temporary lighting shall provide and maintain illumination levels in accordance with Part 7 [Electrical] of this Appendix.

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**9.9 Drop-offs**

Notwithstanding that a drop-off template is not provided in this Appendix for the FHC in accordance with Clause 8.5.15 of the Traffic Management Guidelines, the Constructor shall nevertheless comply with the requirements of the Traffic Management Guidelines.

**9.10 Accommodation of Pedestrians and Cyclists**

The Constructor shall ensure that pedestrian and cycling passage is maintained for the duration of FHC Construction and provide clear signing and instruction for pedestrians and cyclists to safely traverse the Fraser Heights Lands.

**9.11 Completed Sections of New Roadway**

Sections of new roadway which are completed before the physical completion of all the FHC Construction, but are not yet open to traffic, shall be delineated with flexible drums and Class 1 barricades in an alternating pattern every 5 metres. Completed sections of the roadway shall only be opened to traffic prior to physical completion of the FHC Construction for FHC Construction staging purposes.

**9.12 Location and Storage of Equipment**

- (a) Unless protected by barrier and/or attenuators, materials and equipment shall not be stored within the greater of 3.0 metres or the clear zone distance of the travelled portion of any roadway.
- (b) Under no circumstances shall materials or equipment storage encroach on sight-line requirements.

**PART 10**  
**SIGNING AND PAVEMENT MARKINGS**

**10.1 Application**

- (a) The requirements of this Part apply to all of the FHC, provided that signing is not required on the SFPR Extension.
- (b) The provisions of Article 8 [Signing and Pavement Marking Design Criteria] of Part 2 of Schedule 4 apply to the FHC to the extent applicable thereto.

**10.2 Signing Requirements**

Signing shall be provided on the GEC and 176 Street Extension in accordance with Schedule 4 [Design and Construction].

**10.3 Materials**

Only new materials shall be used for signing.

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**10.4 Pavement Markings and Delineators**

Temporary markings shall not be applied to final lift pavement.

**PART 11**  
**ENVIRONMENTAL**

**11.1 Environmental Impacts**

- (a) The Constructor shall ensure environmental impacts do not exceed the magnitude and extent identified in:
  - (i) the EA Application for the SFPR Environmental Assessment Certificate for the Fraser Heights Lands; and
  - (ii) submissions during the EA Application review period for the SFPR Environmental Assessment Certificate.
- (b) EA Application submissions for the SFPR Environmental Assessment Certificate during the review period include but are not limited to:
  - (i) all response letters to Environmental Authorities, including those in the FHC Data Room;
  - (ii) SFPR Environmental Management Plan Framework; and
  - (iii) SFPR Stormwater Management Plan Outline.
- (c) The Constructor shall make all reasonable efforts to minimize the harmful alteration, disruption or destruction of fisheries habitat to the satisfaction of Fisheries and Oceans Canada. Maximum allowable impacts to fisheries habitat are defined as 8,200 sq.m aquatic habitat and 67,600 sq.m riparian habitat.
- (d) The Constructor shall construct 9,400 sq.m aquatic and 18,800 sq.m riparian fisheries compensation habitat required to address project related effects to fish and fish habitat to the satisfaction of Fisheries and Oceans Canada within the FHC Lands. As between the parties, the residual required amount of fisheries compensation habitat shall be the responsibility of the Authority.

**11.2 Environmental Permits**

Without limiting the obligations of Section 1.6 [Environmental Permits] of Schedule 6, the Constructor shall be joint signatories with the Authority and/or the Province on the Fisheries Authorization in respect of the FHC Work. For such Fisheries Authorization only, the Authority's Representative shall provide information to support the application on compensatory sites outside of the Project Site.

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**PART 12**  
**LANDSCAPING**

**12.1 Application**

- (a) The requirements of this Part do not apply to the 176 Street Extension.
- (b) The provisions of Article 9 [Landscape and Site Restoration Design Criteria] of Part 2 of Schedule 4 do not apply to the FHC.

**12.2 Design Requirements**

The landscape and site restoration design and construction for the FHC shall conform to the aesthetic requirements for baseline highways, as classified and described in the Manual of Aesthetic Design Practice.

**12.3 Construction Requirements**

The scope of the landscaping work for the FHC includes the design, supply, installation and maintenance during FHC Construction of the following:

- (a) rehabilitation of staging areas to previous state or better;
- (b) Bridge abutment slopes and adjacent approaches;
- (c) areas complementing riparian zone compensation and restoration; and
- (d) landscaped drainage implementations such as swales, water retention ponds and related landforms.

**PART 13**  
**DESIGN REVIEW SUBMISSION REQUIREMENTS**

**13.1 Application**

- (a) The requirements of this Part do not apply to the 176 Street Extension.
- (b) The provisions of Part 3 [Design and Certification Procedure] of Schedule 4, including the applicable requirements of Article 12 [Road Safety Audit] of Part 2 of Schedule 4, apply to the submission of the FHC Design to the extent applicable thereto.

**13.2 Interim FHC Design**

For the SFPR Extension and the GEC, the following interim submissions shall be prepared and submitted to the Authority's Representative in accordance with the Design Management Plan and the informal review process described in Section 2.6 [Interim Design Review] of Part 3 of Schedule 4:

- (a) **Highway Design**

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- (i) complete laning and geometrics, including details for intersection and access treatment;
  - (ii) preliminary guide signing plans;
  - (iii) complete typical sections;
  - (iv) longitudinal profiles;
  - (v) template cross-sections;
  - (vi) drainage and stormwater management facilities;
  - (vii) Utility relocations;
  - (viii) documentation demonstrating compliance with table of environmental commitments and other Constructor environmental obligations;
  - (ix) environmental design drawings; and
  - (x) regulatory agency review correspondence.
- (b) **Structural Design**
- (i) a list of all design codes, criteria, parameters;
  - (ii) a description and general arrangement drawings of all structures including span configurations, retaining walls (their components and drainage requirements), substructures, superstructures, articulation systems, deck details, pier details, seismic load paths, seismic restraints and seismic detailing;
  - (iii) a description of maintenance considerations;
  - (iv) seismic inputs, critical details, and anticipated deformations under different design earthquakes;
  - (v) limits and location of permanent Structures, fill and excavation, overflow channels, construction equipment access and working areas (crane pads, letdown areas), temporary Structures with minimum soffit elevation, temporary foundations, falsework and shoring;
  - (vi) environmental Design Drawings, identifying nature and extent of environmental impacts and preliminary mitigation measures as well as existing water course locations;
  - (vii) full sections (typically at centreline, at Bridge drip line and at 25 m upstream and downstream of centreline) showing rip rap, abutments, high water wetted perimeter at bank full, water channel, existing ground, finished grade and applicable water elevations; and

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(viii) regulatory agency review correspondence.

**(c) Geotechnical**

The Constructor shall provide a geotechnical design Report that contains sufficient detail to describe the geotechnical assessments completed to develop the design of all Bridges, Structures, cut slopes, fills, embankments and pavements. At a minimum, the geotechnical design Report shall contain the following information:

- (i) documentation of any geotechnical investigation work carried out by the Constructor;
- (ii) a summary of subsurface conditions including soil type, soil stratigraphy, and ground water conditions;
- (iii) key geotechnical issues that have an impact on the selection, design, and construction of foundations for both static and seismic loading conditions;
- (iv) basis of establishing total and differential settlements that are tolerable to meet functionality requirements of the proposed design(s);
- (v) methods and parameters used to compute the design geotechnical loads for the shallow and deep foundations and the type, design geotechnical capacity, and design dimensions of the foundation elements, describing all FHC Construction considerations assumed;
- (vi) test methods that shall be used to confirm the in-situ geotechnical capacity of foundations and how the results shall be used to interpret the geotechnical performance factors in accordance with CAN/CSA-S6-06 requirements;
- (vii) lateral load-deformation response of foundations under the design seismic loading criteria including impact of soil liquefaction and other seismic effects on foundation performance and measures proposed to mitigate effects on foundations;
- (viii) basis of estimating short-term and long-term foundation and approach embankment and roadway settlements summarizing the soil parameters used for the different soil strata, loads considered in the analysis of settlements, and methods used to analyze the settlements. The Constructor is to submit settlement analysis of foundations of Structures for review by the Authority's Representative, estimates of the short-term and long-term foundation and approach embankment and roadway settlements justifying the selected Structure configuration and proposed foundation design. The Constructor is to describe measures that shall be implemented to accommodate these settlements to meet the functionality requirements;
- (ix) assessment of impact of settlements, displacements and vibrations associated with the FHC Construction on services, utilities, structures and facilities, within

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and adjacent to the site, and measures required to remediate and/or accommodate the impacts;

- (x) assessment of environmental impacts and associated mitigation for geotechnical activities and potential outcomes;
- (xi) stability of approach embankments under static and seismic loading conditions and criteria established to meet functionality requirements for the structures;
- (xii) surcharge fill heights and estimated durations, use of lightweight fills or other measures required to limit future settlements to those that are tolerable to meet the functionality requirements;
- (xiii) details of ground improvement measures required to meet the performance requirements under static and the design seismic conditions;
- (xiv) types and dimensions of retaining structures considered and design methodologies for both static and seismic loading conditions;
- (xv) types of temporary walls required and design methodologies for static design;
- (xvi) geotechnical monitoring programs to be carried out during the construction period and instrumentation for these programs;
- (xvii) design for new and rehabilitated pavements including all assumptions used in the design and a life-cycle cost analysis which outlines the anticipated long-term maintenance requirements; and
- (xviii) any other details required for understanding, documentation and evaluation of the FHC Design.

Details of all foundations, retaining walls, and approach embankments shall be shown on the drawings.

**(d) Traffic Engineering**

The Constructor shall submit traffic engineering checklists in accordance with the Electrical and Traffic Engineering Manual for each new intersection and each intersection where modifications are proposed (including temporary signal installations).

**(e) Signing and Pavement Markings**

- (i) Signing and pavement marking plans shall be produced and submitted in accordance with Manual of Standard Traffic Signs and Pavement Markings, and the Electrical and Traffic Engineering Manual and shall include the proposed messaging for all custom signs. AutoCAD drawings conventions such as layering, line types, text font and text size shall conform to the drafting standards set out in Section 700 of the Electrical and Traffic Engineering Manual.



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- (ii) Preliminary and concept guide sign plans shall be submitted. These concept guide sign plans shall indicate the location, size, and proposed text of each guide sign.
- (iii) Signage for pedestrians and cyclists shall be included in the signing and pavement marking submissions.
- (iv) Drawings shall identify all signing and pavement markings to be re-used, removed, relocated, or maintained.

**(f) Landscaping**

The Constructor shall submit a design report, complete with photographs, describing the existing landscape inventory and site conditions, and outlining the overall revegetation concept for the area. Sketch drawings and typical sections through interchange loops, medians and roadsides are to be provided, showing the proposed grading and drainage configuration, the planting layout with clear zones and safety setbacks noted, and the grass establishment zones noted. A description is to be provided for how maintenance is proposed to be carried out during the vegetation establishment period for mowing, watering, and invasive plant control. The report is to be in letter size format, with drawings of a scale that is effective in illustrating the proposed design.

**13.3 Final FHC Design**

Final Design Data for the SFPR Extension and the GEC from all design disciplines shall be prepared and submitted to the Authority's Representative in accordance with Part 3 [Design and Certification Procedure] of Schedule 4. Final Design Data shall include all interim Design Data, updated and amended for the final FHC Design and resolution of all issues identified by the Authority's Representative during Interim Design reviews.

**PART 14**  
**FHC RECORD DRAWINGS AND REPORTS**

**14.1 Application**

- (a) The provisions of this Part do not apply to the 176 Street Extension.
- (b) The provisions of Part 3 [Design and Certification Procedure] of Schedule 4 apply to the record drawings and reports for the FHC to the extent applicable thereto.

**14.2 Drawings Standard**

- (a) The original design drawings that the Constructor submits as the Final Design submission for the SFPR Extension and the GEC must not be amended in any way. At the time that the Project is opened for public use and improvements are completed, copies of the original AutoCAD design drawing are to be used and amended, as required, to reflect the actual constructed roadway and amenities. The drawing numbers shall remain the same as the originals for storage and retrieval purposes. Record documents shall be stand-

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alone documents and contain all of the original information, except that which has been changed during FHC Construction.

- (b) The drawings shall be drafted in the format and to the standards of the original design drawings.
- (c) Each item or area on the drawing that has been changed from the original design shall have an 8 mm triangle adjacent to the area of the change with the number of the change inscribed within the triangle. The same number shall be shown cross-referenced in the "Construction Revisions" block with a description of the change beside it. The triangle shall be drawn with the apex of the triangle pointing toward the change.
- (d) All of the drawings shall be included as part of the record documents, except staging drawings.

**14.3 Record Documents for Highways**

After construction, the Constructor shall submit a set of record documents for each highway section to the Authority's Representative, including record drawings, as follows:

- (a) design plans;
- (b) typical cross-sections;
- (c) template cross-sections
- (d) supplemental drawings;
- (e) geometrics and laning;
- (f) profiles;
- (g) signing and markings drawings;
- (h) underground Utility plans;
- (i) landscape plans;
- (j) final record cross section plans and material types on all roadways;
- (k) hydrologic and hydraulic calculations, drawings and maps;
- (l) all quality control folders showing test data and location;
- (m) electrical plans; and
- (n) all final documentation on the Road Safety Audit.

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**14.4 Record Documents for Bridges**

After construction, the Constructor shall submit to the Authority's Representative, a set of record documents for each Bridge as follows:

- (a) copies of all final versions of shop drawings;
- (b) copies of all test results, mill certificates and other quality control monitoring reports and information;
- (c) copies of all geotechnical engineering reports and investigation results;
- (d) daily construction diary;
- (e) a complete log of all concrete placement summaries on a Concrete Inspection Report (Ministry Form H-47);
- (f) a complete driving record for all piling installed, submitted on a full size drawing; and
- (g) a complete record of the as-constructed deck concrete data, submitted on full size drawings, with as-constructed deck concrete data drawings to include:
  - (i) as-constructed deck profiles at 3 m intervals along the centerline of the roadway and at 0.3 m offset from parapet lines, the elevations referenced to a permanent benchmark;
  - (ii) a table of actual elevations compared to design elevations, including plots for each line;
  - (iii) a sketch of the deck showing the direction and extent of each day's placement of concrete;
  - (iv) the concrete design mix and adjustments;
  - (v) records on the number of truck loads cast in the concrete, air and slump content, any changes in conditions (e.g., site conditions, weather, etc.), identity of the placement areas, and concrete cylinder strengths; and
  - (vi) a design folder of design calculations for construction revisions.

**14.5 Record Documents for Retaining Walls**

After construction of all retaining walls, the Constructor shall submit to the Authority's Representative, a set of record documents for each wall as follows:

- (a) copies of all final versions of shop drawings;
- (b) copies of the test results, mill certificates and other quality control monitoring reports and information; and

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- (c) copies of all geotechnical and ground water engineering reports and investigation results.

**14.6 Signing of Drawings**

The record drawings provided in accordance with this Part are to be signed and sealed by the original design engineer to verify that the drawings represent the original design with all design revisions added.

**14.7 Distribution of Drawings**

- (a) The signed drawings are to be forwarded to the Authority's Representative for acceptance under the Consent Procedure. Original drawings shall be accompanied by a CD containing the drawings in AutoCAD format and a CD containing the CAiCE project data archive files.
- (b) After a final review by the Authority's Representative and the Constructor and when the drawings are marked "accepted", they shall be submitted to the Authority's Representative for record purposes.

**PART 15**  
**WORK BY OTHERS**

**15.1 Work by Others**

The Constructor shall be deemed to have made its own investigations with respect to all potential and actual activities that may be taken by third parties adjacent to and during the course of the FHC Work. that could affect the FHC Work, including but not limited to the following:

- (a) **City of Surrey**
  - (i) Sanitary force main along 104 Avenue from 176 Street to 172 Street; and
  - (ii) Proposed future pump station located at 104A Avenue/104 Avenue.
- (b) **CN Rail**

Preloading and truck staging area reconstruction in accordance with the CN Rail Property Acquisition Agreement.
- (c) **Greater Vancouver Sewerage & Drainage District**

Maintenance and replacement of the temporary sanitary interceptor sewer along SFPR west of 173 Street in accordance with Permit #01-006-23344.0.
- (d) **Ministry of Transportation**

Construction of the SFPR west of the Project Site.

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(e) **Tip-Top Development**

- (i) Construction of 177A Street south of Daly Road; and
- (ii) Sanitary sewer construction along Daly Road from 177A Street to 176 Street.

(f) **CN Rail Intermodal Yard Preload**

The Constructor shall coordinate with CN Rail for preload work adjacent to the CN Rail intermodal yard.