FRASER SURREY PORTS LAND
REPORT NUMBER: #20-0173

DESIGN CRITERIA FOR FRASER SURREY PORT LANDS TRANSPORTATION IMPROVEMENT

GREATER VANCOUVER GATEWAY PROGRAM

DECEMBER 18, 2020




DESIGN CRITERIA FOR FRASER SURREY PORTS LAND TRANSPORTATION IMPROVEMENT

GREATER VANCOUVER GATEWAY PROGRAM

FRASER SURREY PORT LANDS

REPORT (FIRST ISSUE)

PROJECT NO.: 20M-00758-00 DESIGN CRITERIA-FSPL_R0
CLIENT REF:#20-0173
DATE: DECEMBER 18, 2020

WSP
SUITE 1000
840 HOWE STREET
VANCOUVER, BC, CANADA V6Z 2M1

T: +1 604 685-9381
F: +1 604 683-8655
WSP.COM

Vinil Reddy
Senior Construction Project Specialist
Vancouver Fraser Port Authority
100 The Pointe, 999 Canada Place
Vancouver, B.C. Canada V6C 3T4

Attention: Vinil Reddy, M.Sc., MBA, PMP, P.Eng., ENV SP

Dear Sir:

Subject: Fraser Surrey Ports Land Transportation Improvement - Design Criteria
Client ref.: #20-0173

WSP is pleased to submit our Design Criteria for your review and consideration. This document provides the documented inputs and design standard requirements from various stakeholders, associations, and municipality used to develop the WSP Team's preliminary design of the Fraser Surrey Port Lands Transportation Improvement Project.

We appreciate collaborating with you and many other stakeholders at VFPA and FSPL on this assignment and look forward to your feedback.

Yours sincerely,

2020-12-18

Valentino Tjia
Senior Project Manager

WSP ref.: 20M-00758-00 DESIGN CRITERIA-FSPL_R0

SUITE 1000
840 HOWE STREET
VANCOUVER, BC, CANADA V6Z 2M1

T: +1 604 685-9381
F: +1 604 683-8655
wsp.com

REVISION HISTORY

FIRST ISSUE

December 18, 2020	Design Criteria Report			
Prepared by	Reviewed by	Approved By		
Kelly Yang, EIT, ENV SP	Robert Livingston, P.Eng.	Valentino Tjia, M.Sc., P.E., P.Eng		

SIGNATURES

PREPARED BY

<professional stamp, if applicable>

December 18, 2020

Kelly Yang, EIT, ENV SP
Junior Engineer, Transportation West

Date

APPROVED[1] BY

2020-12-18

Valentino Tjia, M.Sc., P.E., P.Eng.
Senior Project Manager

Date

WSP Canada Group Limited prepared this report solely for the use of the intended recipient, Vancouver Fraser Port Authority, in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this report. The content and opinions contained in the present report are based on the observations and/or information available to WSP Canada Group Limited at the time of preparation. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP Canada Group Limited does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report. This limitations statement is considered an integral part of this report.

The original of this digital file will be conserved by WSP Canada Group Limited for a period of not less than 10 years. As the digital file transmitted to the intended recipient is no longer under the control of WSP Canada Group Limited, its integrity cannot be assured. As such, WSP Canada Group Limited does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

CONTRIBUTORS

CLIENT

VFPA, Land Operations and Security	Marcus Siu, P. Eng. Tony Benincasa Dennis, Bickel, P.Eng.
VFPA, Engineering	Vinil Reddy, M.Sc., MBA, PMP, P.Eng., ENV SP

WSP

Geotechnical, Pavement Design	Shawn Lapain, P.Eng.
Geotechnical	Lalinda Weerasekara, P.Eng.
Utilities and Drainage	Rob Moore, P.Eng.
Environmental	Michael Taylor, BLA MRM Marina Makovetski, P.Ag.
Sustainability	Nicole Montgomery, M.Sc., LEED AP BD+C
Asset Management	Neil Forrest

SUBCONSULTANTS

Electrical (PBX)	Julian Vasques, P.Eng. and Rob Grant, P.Eng.
Geomatics (Geoverra)	Kent Watson, LSt

TABLE OF CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 GENERAL

This document presents the design criteria for the Fraser Surrey Ports Land Transportation Improvements (FSPL-TI) Project as part of the Greater Vancouver Gateway (GVG) program. The purpose is to define the criteria to be used as part of the engineering design for the new roadway alignment; it is to be considered as a reference source of input data for the engineering team and others as appropriate. More in-depth details are provided in the technical specifications.

The scope of this design criteria is limited to the design of roadway environmental, geotechnical, roadway geometrics, storm drainage, utilities, electrical, and at-grade rail crossings. The purpose of this document is to establish design criteria for the project during the preliminary design stage, which will be updated during detailed design of the project to incorporate stakeholder requirements with regards to design principles, codes and standards currently used in the industry.

1.2 SITE DESCRIPTION

The FSPL-TI Project is located in Surrey and is home the Fraser Surrey Port Lands (FSPL), a collection of primarily Vancouver Fraser Port Authority (VFPA)- managed gateway-supportive marine terminals and industrial lands along the south side of the main arm of the Fraser River. See **Figure 1** below showing the map of project location.

Figure A: Project Site Location

The project site is a major regional hub for international trade-related activities through the VFPA. The Project is to address the existing safety and congestion issues along the Robson Road – Timberland Road (North) corridor, which is the central spine of the road network within the Fraser Surrey Port Lands.

2 GENERAL INFORMATION

2.1 ABBREVIATIONS

Key abbreviations used in this document is listed below:

BC MoTI	British Columbia Ministry of Transportation and Infrastructure
BHP Billiton	Broken Hill Proprietary Billiton
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railway Company
CB	Catch Basin
CCME	Canadian Environmental Quality Guidelines
CN	Canadian National Railway
CP	Canadian Pacific Railway
CoD	City of Delta
CoS	City of Surrey
DPWFS	DP World Fraser Surrey
EOR	Environmental Overview Report
FGT	Fraser Grain Terminal
FSPL-TI	Fraser Surrey Port Lands Transportation Improvement
GCM	Government Control Monument
GHG	Green House Gas Emissions
GVG	Greater Vancouver Gateway 2030
GVRD	Grater Vancouver Regional District
IDC Yard	Intermodal Distribution Centre Yard
ISMP	Integrated Stormwater Management Plan
ISI	Institute for Sustainable Infrastructure
MV	Metro Vancouver
NTCF	National Trade Corridors Fund
PARY	Port Authority Rail Yard
PDR	Project Definition Report
RoW	Right of Way
SFPR	South Fraser Perimeter Road

SRY	Southern Railway of British Columbia
TMP	Traffic Management Plan
VACS	Vehicle Access Control System

2.2 UNITS

In general, the International System of Units (SI system) shall be used for this Project.

2.3 LANGUAGE

All documentation shall be in the English language.

2.4 PROJECT DATUM AND SURVEY CONTROL

All survey methodologies are related to a control network of survey points referenced to the provincial integrated Government Control Monument (GCM) coordinate system of UTM NAD83 (CSRS) 4.0.0.BC.1. GVRD Zone 10, elevations are geodetic and referenced to CVD28GVRD2018.

Horizontal: In StarNet, used both GCM'S 10H2595 + 92H0904
Vertical: In StarNet, held the following GCM as fixed elevations: GCM 10H2595 ELV = 2.892m
Scale Factor: 0.9996030 (PUB VALUE FOR 10H2595)
UTM to Ground:
SCALE ABOUT 0,0 @ (1/X OF 0.9996030) 1.00039715767)
THEN SHIFT BY -5000000 NORTHING
Ground to UTM:
SHIFT 5000000 NORTHING THEN SCALE ABOUT 0,0 @ 0.9996030
Location:
GCM 10H2595
Located in Surrey Docks
NE of Parking Lot and S of Alaska Way
at N end of Gunderson Slough

	UTM		LOCAL	
POINT	NORTHING	EASTING	NORTHING	EASTING
15	5447218.969	506095.322	449382.374	506296.322
20016	5449331.135	507258.973	451495.379	507460.435

3 CODES, STANDARDS, SPECIFICATIONS, & REGULATORY REQUIREMENTS

3.1 GENERAL

The precedence applying for use of the codes, standards, specifications, and regulatory requirements for this Project is as follows:

- Regulatory Requirements;
- Municipal Standards;
- Canadian Standards; and
- International Standards.

In the event of an inconsistency, conflict, or discrepancy between any of the standards, specifications, and regulatory requirements, the most appropriate and stringent requirement applicable to the Project shall prevail to the extent of the inconsistency, conflict, or discrepancy.

The FSPL TI preliminary design is based on the latest relevant codes and standards as of December 2020. The codes and standards are referred to in the Project Definition Report and this document as appropriate.

3.2 REGULATORY REQUIREMENTS

All aspects of the Project (i.e., design, construction, commissioning, and operation) shall comply with the requirements of the latest versions of all relevant regulatory requirements.

3.3 CANADIAN CODES AND STANDARDS

The design, construction, and installation must comply with relevant Canadian codes and standards.

3.4 INTERNATIONAL STANDARDS

Where applicable Canadian standards do not exist, or cannot be applied, other industry recognised international standards and recommended practices, such as US standards, AASHTO, and British standards may be used.

3.5 AUTHORITY HAVING JURISDICTION

Vancouver Fraser Port Authority is the authority having jurisdiction with the exception of emergency services. City of Surrey is the authority having jurisdiction outside FSPL. SRY is the authority having jurisdiction over ownership and operation of SRY tracks within the FSPL. BNSF is the authority having jurisdiction over ownership and operation of BNSF tracks within the FSPL.

4 FACILITY FUNCTIONAL REQUIREMENTS

Design criteria for the Project components are presented in the following sections.

4.1 DESIGN LIFE

The shall be designed for minimum design service lives of

- Roadway pavement shall be designed for a minimum design service life of 20 years; and
- Utilities, electrical, and storm drainage facilities shall be designed for a minimum design service life of 50 years.

The design service lives are subject to the implementation of the following inspection and maintenance strategies:

- Routine inspection for deterioration and damage, under the direction of a professional engineer; and
- Repair of deteriorated and/or damaged areas.

"Design Service Life" is defined as the period of time over which it is economically practical to carry out regularly scheduled maintenance and periodic refurbishment of the item in question in order to maintain the design load carrying capacity and operational function.

4.2 STORM DRAINAGE SYSTEM

The underpass storm drainage systems which lead to the existing municipal storm sewers and ultimately the Fraser River outfalls, shall be designed to meet the following functional requirements:

- Positive drainage shall be provided for the system operation and sizing shall meet the design flow requirements;
- The system shall be designed to avoid standing water or ponding along the roadway or within the railway area below the underpass; and
- An oil interceptor shall be installed to treat collected drainage from the road storm drainage system as required to meet applicable standards.

"Standing Water" or "Ponding" is defined as a localized area of water that does not flow, with a depth of water that measures at least 25mm or greater.

4.3 SUSTAINABILITY

project scope shall be designed and constructed in accordance with the Institute for Sustainable Infrastructure (ISI) Envision framework. The project is currently reviewing a minimum level of certification under Envision Version 3 (V3), as verified by ISI. If VFPA is interested in applying for certification, VFPA (with the assistance of certified professionals from WSP) will be responsible for design submission to ISI, the Contractor will be responsible for providing documentation to VFPA for a construction submission to ISI that meets the requirements of V3 to achieve accreditation.

As Envision covers all aspects of the project from inception through construction, it is recognized that all partners must work collaboratively towards a common target - each doing what is within their mandate and control.

VPFA has conducted a feasibility review of Envision V3 credits and developed a scorecard which sets desired levels of achievement for each applicable credit, along with identifying the partners responsible for the target.

5 ENVIRONMENTAL LOADS AND EFFECTS

Environmental loads for structural design shall be in accordance with the data published in the current supplement to the National Building Code of Canada (NBCC), or as developed from analysis of other site-specific data obtained from Environment Canada or other sources. The relevant NBCC data assumed in the preliminary design, together with other site-specific information, is included here.

5.1 RAINFALL

Rainfall data to be used for the design of the underpass shall be as specified in the NBCC for Surrey, BC, and are as follows:

- Fifteen (15) Minutes: 10 mm
- One Day: 80 mm (extreme recorded at YVR is 89.4 mm)
- Annual Total Precipitation: 1,000 mm (extreme recorded at YVR is 1,199 mm)
- Rainfall for the remainder of the project shall be as per the Surrey Intensity-Duration-Frequency (IDF) data.

Storm drainage systems shall be designed to a 1 in 5 year design storm.

To address climate change, include a minimum of 15% increase in rainfall values.

6 GEOTECHNICAL DESIGN CRITERIA

Overall geotechnical design of the Project shall be in accordance with the professional engineering principles and practices generally accepted as best industry practices in Canada.

6.1 APPLICABLE CODES AND STANDARDS

- BC MoTI – Pavement Structure Design Guidelines – Technical Circular T-01/15, BC Ministry of Transportation and Infrastructure, 2015.
- Canadian Highway Bridge Design Code CSA S6:19 (2019).
- BC MoTI 2020 Pavement Surface Condition Rating Manual, BC Ministry of Transportation and Infrastructure, 2020.
- AASHTO Guide for Design of Pavement Structures (1993).
- Master Municipal Construction Documents (MMCD) Platinum Edition (2009).
- City of Surrey Design Manual and Construction Documents.
- Canadian Foundation Engineering Manual (2006).

6.2 SEISMIC PERFORMANCE REQUIREMENTS

According to the recommendations given in the CSA S6:19, the road is to be designated as a *Major Route,* with respective to its seismic performance. As such, at least 50% of travel lanes should be available for traffic after a 1/475 return period earthquake.

6.3 PAVEMENT DESIGN REQUIREMENTS

- Design life of the pavement = 20 years
- Reliability level = 90%
- Initial Serviceability = 4.2
- Terminal Serviceability = 2.5

7 CIVIL AND ELECTRICAL DESIGN CRITERIA

The following section details the design criteria for roadway geometrics, storm drainage, utilities and electrical.

7.1 ROADWAY GEOMETRICS

By-laws, regulations, specifications, and design guidelines of the following relevant authorities shall be adhered to:

— Transportation Association of Canada (TAC) "Geometric Design Guide for Canadian Roads, June 2017;
— "Surrey Subdivision & Development By-law No.8830", 2017;City of Surrey Design Criteria Manual, April 2020;
— TAC "Manual of Uniform Traffic Control Devices for Canada" (MUTCD), Fifth Edition, January 2014;
— Master Municipal Construction Documents (MMCD) Design Guidelines, 2014
— MMCD Platinum Edition, 2009;
— Transport Canada's Grade Crossing Standards, July 2014, and
— Transport Canada's Standards Respecting Railway Clearances, May 1992.

Design criteria for roadways shall be as presented in **Table A.**

Table 7-1: Roadway Design Criteria

Item	Robson Road – Timberland Road Corridor	Guidelines	Comments/Notes
Design Classification	Urban Arterial Undivided (UAU)	TAC, Table 2.6.2	
Posted Speed (km/h)	50	Existing condition	
Design Speed (km/h)	50	TAC, Table 2.6.2	
Basic Lanes	2		One EB and one WB lane for through movement and an additional lane provided for one inbound truck auxiliary lane to access DPWFS site.
Minimum Radius (m)	110	TAC, Table 3.2.3, Table 3.2.5	The minimum radius for maximum 0.02m/m adverse crown roadway sections. See Note 1
Minimum K Factor Sag	6	TAC, Table 3.3.5	

Item	Robson Road – Timberland Road Corridor	Guidelines	Comments/Notes
Minimum K Factor Crest	7	TAC, Table 3.3.2	Based on TAC Stopping Sight Distance (SSD) of 65m.
Maximum Longitudinal Grade (%)	6	TAC, Table 3.3.1	
Minimum Longitudinal Grade (%)	0.5	TAC, Section 3.3.2.5	TAC, Section 3.3.2.5 states 0.5% for curbed roadways. Where there are at-grade rail crossings situated on the roadway, existing grades will be maintained.
Max. Transverse Grade (%)	5	TAC, Section 3.5.2.8, 3.5.3.2.3	See Note 2
Min. Transverse Grade (%)	0.8	TAC, Section 3.5.3.1	See Note 2
Minimum SSD (m)	65m	TAC, Table 3.3.2	
Lane Width	3.3m (min.) 3.7m (max.)	TAC, Table 4.2.3	Lane widths are designed to 3.6m wide, consistent with existing conditions
Vertical Clearance (m)	5.0m	TAC, Section 3.3.5.5, Roads Bullets #4,5&6	5.5m vertical clearance for overhead signs will be provided where possible.
Shoulder Width Outside (m)	1.5m – 3.0m		A 3.0m wide shoulder is provided along the west edge of the new Timberland Road South to allow other vehicles to pass if a truck breaks down on the main through lane. A 1.5m wide shoulder is provided to give opportunity for passenger vehicles to pass a left-turning vehicle at Timberland Wye Intersection.
Design Vehicle	WB-20 Tractor Semi Trailer		In addition to the WB-20, flat deck trailers are seen to be in operation. Both WB-20 and Transcraft DTL-3000 48ft models are used for modelling purposes.
Median width	3.6m	TAC Figure 4.5.2	See Note 3

Notes:

1. As detailed in *Section 3.2.2.6 Minimum Radius: Design Doman*, horizontal alignment and super-elevation requirements in low speed urban conditions should also consider other constraints such as drainage and physical controls.

2. Roadway surface cross-slopes should be adequate to provide proper drainage. Where a street is upgraded through a developed urban area, it is often not possible to adhere to typical cross-slopes range from 1.5-2.0%. Where possible, a transverse grade of 2.0% is used; however, minimum transverse grade of 0.8% and maximum grade of 5% will be used to where the road edge is required to tie-into existing conditions.
3. A 3.6m arterial median width complete with concrete median barriers is provided where new road is to be constructed. Where median barriers are required for physical separation of opposing traffic flows within an existing roadway footprint, 1.0m median width is provided in accommodate a typical concrete median barrier.

7.2 STORM DRAINAGE

The development of the storm drainage design should also comply with the following VFPA and City of Surrey guidance:

— City of Surrey Engineering Department Design Criteria Manual (April 2020)
— South Westminster Integrated Stormwater Management Plan (ISMP), City of Surrey (February 2015)
— Project & Environmental Review Guidelines – Developing Your Stormwater Pollution Prevention Plan, Vancouver Fraser Port Authority (July 2015)

The storm drainage system shall be designed to meet the following servicing objectives, as per the City of Surrey Design Criteria Manual (April 2020).

a. A minor system, with a conveyance capacity up to the 1:5-year return period storm under free flow conditions, to minimize inconvenience of frequent surface runoff.

b. A major system, with a conveyance capacity up to the 1:100-year return period storm, to provide safe conveyance of flows and to minimize damage to life and property.

Any oil water interceptors shall be designed to CCME standards and have the capacity to convey 90% of the 1:10-year return period storm flows. The design of the oil water interceptors will be discussed and coordinated with the environmental team and the City of Surrey.

Storm drainage shall be analyzed using computer simulation programs based on the Hydrograph Method or the rational method depending on the size of the drainage area. Rainfall data will be collected from the Kwantlen Park IDF data from the City of Surrey Design Criteria Manual (April 2020), as per **Figure 2** below.

Table 5.3.1:Rainfall IDF Data – Kwantlen Park

Duration	Return Period Rainfall Amounts (mm)						Years
	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	(2013)
5 Min	3.7	5.7	7.0	8.6	9.8	11.0	52
10 Min	5.3	7.9	9.6	11.8	13.4	14.9	52
15 Min	6.4	9.1	10.9	13.2	14.9	16.6	52
30 Min	8.5	11.7	13.8	16.5	18.6	20.5	52
1 Hr	11.8	15.0	17.2	19.9	21.9	23.9	52
2 Hr	17.3	21.2	23.8	27.1	29.5	31.9	52
6 Hr	33.5	40.3	44.9	50.6	54.9	59.1	52
12 Hr	49.5	61.6	69.6	79.7	87.2	94.7	52
24 Hr	66.9	86.1	98.8	114.8	126.6	138.5	52

Interpolation Equation of IDF Curve

$R = A \times T^B$ where: R = Rainfall (mm/hr), A and B = Coefficients, based on return period

	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
R-mean (mm/hr)	16.9	24.0	28.8	34.8	39.2	43.7
A	12.852	17.286	20.186	23.818	26.499	29.158
B	-0.482	-0.520	-0.535	-0.550	-0.558	-0.564

Notes: 1. Atmospheric Environment Service (AES) Gauge - 1996.

Figure 2: IDF Rainfall Data from the City of Surrey Design Criteria Manual (April 2020)

Where connecting proposed drainage infrastructure into the existing drainage system, the capacity of this downstream system to convey any additional flows will be verified during the design phase. Given most of the existing drainage system discharges into the Fraser River, tidal levels can have a significant impact on downstream capacity. As per the Aplin & Martin Fraser Surrey Docks LP Stormwater Conveyance Assessment (April 9, 2018), two high winter tide levels should be considered for the 1:5-year return period event:

- 1.968m-geodetic (peak tide level recorded on January 29, 2018)
- 2.55m-geodetic (peak tide level recorded over the last 10-years)

7.3 UTILITIES

The utilities affected by this project fall under the jurisdiction of several different owners, including VFPA, FortisBC, BC Hydro, Telus, Shaw, CP Rail, Metro Vancouver, and the City of Surrey. Each will require different design considerations pending on discussions of intentions with the relevant planning groups. All considerations will be maintained in a Utility Matrix to maintain design criteria requirements and design intentions as they develop.

The standards for design are unique for each owner and utility type. Several standards are known, such as the City of Surrey Design Criteria Manual for the design of drainage, water, and sanitary systems. Existing City utilities seem to be located under easement/right-of-ways, which will be discussed with City. Other utility owners will dictate documents to provide design standards for their assets as needed if affected by the project.

The design of utility realignments will depend on the intentions and requirements dictated by the utility owners. Coordination may include design and construction being carried out by the owner or some combination of utility owner and project involvement. If the design is to be completed as part of the project, standards and design methods will be coordinated with the owner of that respective utility.

Opportunities to update and upgrade utility systems may be considered as part of the design, where financially suitable and responsible. Likewise, it may be determined that some utilities may not need redesign and reconnection because of redundancies, allowing for abandonment. These decisions will need to come from discussions with utility owners.

During discussion with utility owners, there will also need to be opportunities to determine the degree of acceptable interruption for on-going services as a result of construction. This may dictate the need for critical temporary solutions to allow for uninterrupted service where redundancies can't be relied on. This may include such designs such as by-pass mains.

7.3.1 UTILITY LOCATIONS

The Contractor shall be responsible for confirming the actual locations of all utilities now or hereafter located on, in, under, or over the Project Site and Project Infrastructure and ensuring that its Subcontractors and employees of any of them are made aware of such locations as necessary to ensure compliance at all times with the provisions of this Schedule. The Contractor shall not rely on location plans, as-built drawings supplied by Utility Suppliers or other similar documents for confirming locations of utilities.

7.3.4 WATER DISTRIBUTION SYSTEM

All design and relocation of water pipes and facilities, such as hydrants, will be completed with coordination with the VFPA and the City of Surrey.

Where service connections need to be adjusted, servicing agreements will be coordinated with the City. The affected property will likely need to approve of these potential works and should be notified of potential service disruptions during construction.

New fire hydrants will be required to service the extended road between Robson St and South Timberland Ave. The new hydrants shall be designed to meet the City of Surrey Design Criteria Manual. This includes:

a. Hydrants will not be spaced more than 210m apart, including both sides of the major roads discussed in Section 2.5.6.

b. Principal entrance of all buildings shall not be more than 100m from a hydrant.

c. A sufficient number of fire hydrants will be provided within 300m, measured along City roads, from the principal entrance of the building to deliver the total Design Fire Flow

7.4 ELECTRICAL

For this project, all roads are within VFPA jurisdiction. Similarly to other VFPA projects, all electrical design and construction related to this project will be undertaken in accordance with the relevant MoTI Standards.

7.4.1 ELECTRICAL STANDARDS FOR LIGHTING AND TRAFFIC SIGNALS

LED fixtures have been utilized to reduce consumption costs while also improving fixture lifespan. These fixtures are the same used in the South Shore Corridor to provide standardized maintenance between areas. Lighting levels have been designed to achieve optimal illumination comparable to that of previous VFPA projects.

Street Lighting
For this project, all roads are within VFPA jurisdiction. Similar to other VFPA projects, lighting levels will be as per the RP-8-18, Table 11.1 and also shown below.

Roadway	Classification	Pedestrian Activity	Ave. Luminance	Ave. Uniformity Ratio	Max. Uniformity Ratio	Max. Veiling Luminance Ratio
Robson Road	Major	Low	0.6	3.5	6.0	3.0

(Based on RP-8-18, table 11.1)

All lighting along Robson Road will be shoulder mounted luminaire poles, similar to existing MoTI luminaires along the area. The luminaire fixtures will be Lighting Emitting Diode (LED) type. All luminaire poles will be 9m davit style pole. The design will follow the MoTI standards.

Intersections
As the new Timberland Road intersection will be within VFPA jurisdiction, the design of the intersection will follow the MoTI standards. All traffic signal equipment will be from the MoTI Approved Materials and Products (Latest Edition).

The new traffic signal intersection at Timberland Road will require full illumination as per RP-9-18, Table 12-1.

Intersection	Functional Classification	Pedestrian Activity	Ave. Illuminance	Ave. Uniformity Ratio
Timberland Road	Major/Major	Low	18.0	3

(Based on RP-8-18, table 12-1)

VACS Area

Table 7-2: VACS Lighting Levels

ROADWAY/AREA NAME	MINIMUM AVERAGE HORIZONTAL ILLUMINATION (LUX)	MAXIMUM AVERAGE TO MINIMUM UNIFORMITY RATIO (AVG/MIN)
VACS Zone Transition Areas	30	3:1
VACS Zone	50	3:1

Based on TAC Guide For Design of Roadway Lighting, Chapters 15, 16

All lighting fixtures within the VAC areas will be Lighting Emitting Diode (LED) type. All luminaire poles will be 9m davit style pole. The design will follow the MoTI standards.

Wire Theft Deterrence

Within the VFPA jurisdiction, the following wire theft prevention strategies will be employed for this project:

- Junction boxes between poles will be eliminated, where practical.
- Security bolts will be installed on junction box lids and pole hand-hole covers.
- Alarm monitoring will be included on all control cabinet and kiosk doors.

8 AT-GRADE RAIL CROSSING DESIGN CRITERIA

8.1 RAILWAY INFRASTRUCTURE

The following parameters shall be used for the design of SRY and VFPA tracks.

8.2 CODES AND STANDARDS

All track and trackwork should be designed in accordance with current governing codes, regulations, standards and practices as follows:

- TC E-05 – Standards Respecting Railway Clearance – Latest Edition
- TC E-54 – Rules Respecting Track Safety – Latest Edition
- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering - Latest Edition
- American Railway Engineering and Maintenance-of-Way Association (AREMA) Portfolio of Trackwork Plans - Latest Edition

8.3 TRANSPORT CANADA REGULATIONS, ACTS, AND GUIDELINES

All rail authorities fall under the jurisdiction of Transport Canada. Therefore, all tracks on within FSPL must meet federal Transport Canada regulations, acts and guidelines.

All rail and rail tracks should be designed in accordance to the current governing codes, regulations and standards:

- Transport Canada (TC E-05) Standards Respecting Railway Clearances – May 1992
- Transport Canada (TC E-31) Rules Respecting Track Safety - Dated November 3, 2008, and
- Transport Canada's Grade Crossing Standards, July 2014.

The series of Transport Canada acts and regulations governing at-grade crossings are:

- Railway Safety Act (R.S.C. 1985, c. 32 (4th Supp.)) - Dated May 24, 2016
- Grade Crossing Regulations (SOR/2014-275) - Dated March 01, 2019
- Grade Crossing Standards - Dated January 1, 2019
- Railway Signal & Traffic Control Systems Standards (TC E-17) - Dated June 4, 2007
- Canadian Road/Railway Grade Crossing Detailed Safety Assessment Field Guide - Dated April 2005
    - Where inconsistencies exist with Grade Crossing Regulations (SOR/2014-275), SOR/2014-275 shall apply
- Railway Safety Management System Regulations (SOR/2001-37) - Dated May 24, 2016
- Pedestrian Safety at Grade Crossing Guide (Final Draft) - Dated September 2007

8.4 DESIGN CRITERIA

At minimum, all grade crossing shall have the following characteristics:

— Smooth and continuous crossing surface that is situated 0.5m or more beyond travelled surface or shoulder,
— Signage providing warning of a grade crossing and number of tracks at a grade crossing, and
— Pavement markings in accordance to MUTCDC.

Additional requirements such as signage, pavement markings, and warning systems for grade crossings are detailed in Transport Canada's Grade Crossing Standards depending on site-specific conditions.

8.5 OPERATION

All rail operations and systems shall be designed to meet the operating conditions and the requirements of PARY Operating Procedures and SRY Operating Procedures.

8.6 CLEARANCES

A standard clearance envelope for tracks shall be applied from all fixed features. For determining clearances, mobile equipment on fixed runways working adjacent to tracks, such as rail mounted gantry cranes, shall be considered fixed features. All clearance diagrams shall be perpendicular to the plane of the top of rail.

Clearance envelopes will comply with the clearance requirements presented in Transport Canada Standard Respecting Railway Clearances. The horizontal clearance envelope and minimum distance between track centers shall comply with the values shown in **Table 8-1** below with due allowance for super-elevation and curvature:

Table 8-1: Horizontal Clearance Envelopes from Transport Canada

Track Type*	Allowance (m)
Main Tracks	3.96
Main and Siding Tracks	4.27
Main or Running Tracks and Parallel Yard Tracks	4.27
Yard Tracks	4.11
Ladder and Other Tracks	4.57
Parallel Ladder Tracks	5.49
Freight Shed Tracks	3.66
Team Tracks in Pairs	3.66
Passenger Station Tracks Without Platform Between	3.96

*Note majority of tracks within the project site FSPL are siding tracks.

All existing structures which met previous clearance requirements but encroach the most recent standards are permitted to remain until the restrictive feature is modified or replaced. Additional exceptions are discussed in Transport Canada Standard Respecting Railway Clearances Section 4.

8.7 GRADING AND STORM WATER DRAINAGE

Drainage for SRY tracks along the existing Timberland Road South will be maintained after the proposed road widening which will result in a partial infill of the west ditch. It is expected the partially infilled ditch will provide sufficient capacity to collect stormwater flowing from the SRY tracks. In comparison to the existing condition where stormwater from Timberland Road South is also collected into the west ditch, stormwater falling within the new widened road will now be captured by roadside catch basins and conveyed through a closed pipe as described in Section 7.2. Preserving the west ditch can slow down the run-off from the track area, provided temporary water detention, and maintain aesthetic and ecological value to the surrounding landscape and overall site design.