

**SOUTH FRASER PERIMETER ROAD PROJECT
SCHEDULE 5: OMR AND END OF TERM**

**APPENDIX C
END OF TERM SPECIFICATION**

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1 INTRODUCTION

1.1 General

This Appendix defines the scope and level of the requirements for assets to be returned to Province control at the Expiry Date. The objectives of these requirements are to:

- Define minimum required condition levels at the Expiry Date;
- Ensure a suitable distribution of remaining life expectancy to spread future rehabilitation;
- Achieve remaining Design Life expectations; and
- No outstanding safety issues.

1.2 Objective

The intention of the Province is that, at the Expiry Date, the condition of the Concession Infrastructure must meet a minimum standard being defined as the average condition (half way through the asset lifecycle) across the asset base. Furthermore, there needs to be a balanced distribution of structural condition to create a manageable and fundable future annual rehabilitation program. The requirements set out in this Appendix are intended to protect the Province from excessive asset consumption during the Term. The following requirements apply:

- a) Condition – The criteria for assessing condition is based on comparing Remaining Service Life (as described in Article 2 [Determination of Remaining Service Life and Distribution] of this Appendix) with age at the Expiry Date. A better than average condition is achieved when the average Remaining Service Life exceeds the average age. This criterion ensures that the asset is not being consumed.
- b) Remaining Life Distribution – The Remaining Life Distribution (as described in Article 2 [Determination of Remaining Service Life and Distribution] of this Appendix) is intended to ensure a relatively consistent forward workload beyond the Expiry Date.

1.3 Key Performance Measures and other Performance Measures

Notwithstanding the requirements set out in this Appendix, the Concessionaire must also comply with the requirements of the Key Performance Measures (KPMs), Asset Preservation Performance Measures (APPMs) and the Operational Performance Measures (OPMs). The requirements set out in this Appendix are intended to represent the asset condition resulting from the application of appropriate rehabilitation programs and not to significantly influence the Concessionaire's program for the Rehabilitation.

The requirement set out in this Appendix apply at the Expiry Date in addition to all other requirements of this Agreement, including the Asset Preservation Performance Measures and Operational Performance Measures.

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2 DETERMINATION OF REMAINING SERVICE LIFE AND DISTRIBUTION

2.1 Remaining Service Life

The Remaining Service Life (RSL) for the purposes of this Appendix shall be determined in accordance with the following formula:

$$\text{RSL} = (\text{Expected Service Life} \times \text{Life Adjustment}) - \text{Age}$$

Where:

- (a) Expected Service Life = the expected Service Life of the asset component in years taking into account the historic performance of similar construction.
- The Expected Service Life will be a function of treatment type, design, materials, and construction workmanship. Table 2.2 below defines typical expected lives.
- (b) Life Adjustment = the adjustment to the Expected Service Life to account for current asset Condition (as defined in (i) below), past Utilization (as defined in (ii) below) and historic performance of the asset component.
- (i) Condition = typically based on assessment of visual condition. Where the visual Condition exceeds expectations, then Remaining Service Life can be extended (i.e. condition adjustment > 1). Table 2.3 below defines limits of the adjustment.
- (ii) Utilization = where the actual traffic loading is less than that assumed in the Design, the asset is theoretically underutilized thereby extending Remaining Service Life (i.e. condition adjustment > 1).
- (c) Age - = the age of the asset component, in years, between the date of establishment and the current date.

The Remaining Life Distribution for the purposes of this Appendix shall consist of a plot showing the distribution of the Remaining Service Life of assets.

2.2 Expected Service Life

Typical expected service lives for a number of typically used treatment types for the Lower Mainland are as defined in Table 2.2. These are to be taken into consideration when assessing the Expected Service Life of actual and historical rehabilitated treatment lengths, and any variances are to be justified with historical performance data.

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Table 2.2: Typical Expected Service Lives for Lower Mainland – Treatment Types	
Treatment Type	Typical Expected Service Life (years)
Reconstruct	19
Mill & Fill (50mm)	14
Overlay (50mm)	14
Hot-in-Place (HIP) – 50mm	8
Hot-in-Place (HIP) with Addmix – 50mm	10
Graded Aggregate Seal – GAS	5.5
Microsurfacing	9

2.3 Condition Life Adjustment Factor Limits

The Life Adjustment for Condition factor is to be calculated as follows:

- (a) if actual Pavement Defect Index (PDI) is less than the typical expected PDI (for the pavement Age), then the factor is equal to 1; or
- (b) if actual PDI is greater than typical expected PDI, then the factor is equal to the actual PDI divided by the typical PDI (for the pavement Age).

The limits for the Life Adjustment for Condition factor based on the pavement Age and PDI are defined in Table 2.3.

Table 2.3: Life Adjustment for Condition – Highway Running Surfaces	
Pavement Age (years)	Typical expected Pavement Defect Index (PDI)
0 to 5	7.4
6 to 10	6.6
11 to 15	5.7
16 to 20	4.7

3 HIGHWAY RUNNING SURFACES

3.1 Remaining Life Distribution

Calculated on a lane-km basis, the Remaining Life Distribution of the asphalt paved Concession Highway running surfaces at the Expiry Date must exist on or above the limits defined in Table 3. The calculations include asphalt paved traffic lanes and asphalt paved Bridge Deck Wearing Surfaces.

Patches (areas less than 400 m²) within the traffic lane shall be deemed to have a surface age the same as the adjacent surface. Where this is not clearly discernable, then the oldest surface age at the location shall be used in the calculations.

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The assessment of Remaining Service Life shall be carried out using the method of calculation specified in Article 2 [Determination of Remaining Service Life and Distribution] of this Appendix or as mutually agreed between the Concessionaire and the Province's Representative at the Expiry Date.

Remaining Service Life (years)	Percentage of Length (Minimum Requirement)
> 1	100.0
> 2	93.1
> 3	86.2
> 4	79.2
> 5	72.3
> 6	65.4
> 7	58.5
> 8	51.5
> 9	44.6
> 10	37.7
> 11	30.8
> 12	23.8
> 13	16.9
> 14	10.0

In addition to this Remaining Service Life condition requirement, the Concessionaire must comply with the pavement profile cumulative distribution tables for Roughness, Rutting and Surface Distress as specified in Table 5.2.3.1 [Cumulative Distribution Limits for Highway Running Surfaces] of Appendix B to this Schedule.

Acceptable Condition (Minimum Requirement): The percentage of length from Table 3 above represents the minimum requirement pursuant to this Agreement as determined by the assessment of Remaining Service Life.

At the Expiry Date the following criteria must be achieved:

- 100% of the Concession Highway surfacing must have a Remaining Service Life exceeding 1 year;
- 10% of the Concession Highway surfacing must have a Remaining Service Life in excess of 14 years; and
- The Remaining Service Life for the balance of the Concession Highway's pavement running surface, at any point, must not fall below a straight line interpolation between the two points above.

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3.2 Localized Settlement

At the Expiry Date any localized settlement must be in accordance with the requirements defined in Section 6.1 [Localized Settlement] of Appendix B to this Schedule.

3.3 Differential Settlement

The actual Foundation, embankment and Roadway deformations shall be measured at the Expiry Date. The Concessionaire shall confirm that the required service and ultimate limit states performance of Structures will not be adversely affected by the actual Foundation deformations.

4 STRUCTURES

4.1 Concrete Wearing Surfaces

The Remaining Service Life for concrete Bridge Deck Wearing Surfaces at the Expiry Date must be a minimum of 30 years. The assessment of Remaining Service Life shall be carried out using the method of calculation specified in Article 2 [Determination of Remaining Service Life and Distribution] of this Appendix or mutually agreed between the Concessionaire and the Province's Representative at the Expiry Date.

4.2 Structures – Stock Condition

The following requirements for the Stock Condition of Structures apply to all Bridges, Major Retaining Walls, Major Culverts, Tunnels and Major Sign Structures. At the Expiry Date:

- (a) the Stock Condition Index for all Bridges must be less than or equal to the requirements defined in Table 7.1.2 [Minimum Stock Condition Index – Bridges] of Appendix B to this Schedule for each age group; and
- (b) the Stock Condition Index for all Major Retaining Walls, Major Culverts, Tunnels and Major Sign Structures must be less than or equal to the requirements defined in Table 7.2.2 [Minimum Stock Condition Index – Other Structures] of Appendix B to this Schedule for each age group.

4.3 Structures – Component Condition

The following requirements for the Component Condition of Structures apply to all Bridges, Major Retaining Walls, Major Culverts, Tunnels and Major Sign Structures at the Expiry Date:

- (a) All Structure Components shall have a Component Condition Rating less than or equal to 3.0 in accordance with the requirements (PAS1 - PAS5) set out in Appendix B [Asset Preservation Specification] to this Schedule.
- (b) 100% of all components of Bridge and retaining walls shall have a Condition State of 3.0 or better in accordance with the requirements (PAS7 - PAS31) set out in Appendix B [Asset Preservation Specification] to this Schedule.

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4.4 Structures – Network Component Condition

The following requirements for the Network Component Condition of Structures apply to all Bridges, Major Retaining Walls, Major Culverts, Tunnels and Major Sign Structures at the Expiry Date:

- (a) The condition of all Structure Network Components shall be such that no action (i.e. physical works or remediation strategies) is required at the Expiry Date for all Concession Highway Component Measures in accordance with the requirements (PAS7 - PAS56) set out in Appendix B [Asset Preservation Specification] to this Schedule.
- (b) The average Condition State of each Network Component type for Bridges must be lower than 2.5 and 2.0 for any primary components (Foundations, abutments, pilings, columns, floorbeams, transoms, stringers, girders, truss chords, truss diagonals, truss verticals, panels, pins, bolts, rivets, sub deck and cross ties) in accordance with the requirements (PAS7 - PAS31) set out in Appendix B [Asset Preservation Specification] to this Schedule.

4.5 Bridges

4.5.1 *Inspection and Maintenance Access*

At the Expiry Date, the Concessionaire shall provide documentation to the Province that describes the maintenance and inspection access procedures used during the Term.

4.5.2 *Settlement*

Actual Foundation deformations shall be measured at the Expiry Date and be consistent with original designed levels. The Concessionaire shall confirm that the required service and ultimate limit states performance of Structures shall not be adversely affected by the actual Foundation deformations. Where Foundation deformations are found to adversely affect the required performance of a Structure, the Concessionaire shall design and implement measures to ensure that the required Design Life and Service Life of the Structure are achieved.

4.6 Noise Barriers

At the Expiry Date the noise barriers must be in accordance with the requirements defined in Section 7.3 [Noise Barrier] of Appendix B to this Schedule.

4.7 Rock/ Soil Anchors and Soil Nails

At the Expiry Date the redundant rock/ soil anchors, soil nails, soil straps and tiebacks which were installed during construction are to be removed and tested. All anchors/ nails and tension members are to be in a better than fair condition. There is to be no significant corrosion present. All anchors/ nails and tension members are to have a Remaining Service Life of 60 years.

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4.8 Major Retaining Walls

All Major Retaining Walls are to have a minimum Remaining Service Life of 60 years at the Expiry Date.

4.9 Structure Inspection

The Concessionaire shall issue a structure inspection certificate for each Structure. All inspections shall be signed and sealed by the Bridge Structural Engineer.

There are to be no outstanding safety issues at the Expiry Date. All safety issues are to be rectified by the Concessionaire prior to the end of the Term.

5 DRAINAGE AND DEBRIS CONTROL STRUCTURES

At the Expiry Date, the following requirements for Drainage Structures and Debris Control Structures shall apply:

- (a) A Structure Condition Index less than or equal to 3.4 in accordance with the requirements (PAD1) as set out in Table 5.4.4 [Drainage and Debris Control Structures] of Appendix B to this Schedule.
- (b) The condition must be such that no action (i.e. physical works or remediation strategies) is required at the Expiry Date for all Concession Highway Network Component Performance Measures in accordance with the requirements (PAD2-PAD5) as defined in Table 5.4.4 [Drainage and Debris Control Structures] of Appendix B to this Schedule.
- (c) All Drainage Structures and Debris Control Structures, including any existing Drainage Structures or Debris Control Structures which have been modified by the Concessionaire as part of the Project Work, are to have a minimum Remaining Service Life of 20 years at the Expiry Date.

6 PEDESTRIAN AND CYCLING FACILITIES

- (a) Possession of all pedestrian and cycling facilities shall be transferred from the Concessionaire to the Province at the end of the Term, in accordance with Part 14 [Termination] of this Agreement.
- (b) The following requirements shall be met at the Expiry Date:
 - (i) The overall Condition State along the entire length of all pedestrian and cycling facilities which are not part of a Structure shall be no less than 50% Fair, with 100% in a condition better than Poor, where Fair and Poor are defined in accordance with Table 8.2.2 [Pedestrian and Cycling Facilities Condition Rating] of Appendix B to this Schedule.
 - (ii) Pedestrian and cycling facilities which are a component of a Bridge or another Structure (including sidewalks and bicycle lanes) are to meet the requirements outlined in Section 4.1 [Concrete Wearing Surfaces] of this Appendix.

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7 ELECTRICAL ASSETS

7.1 Asset Condition

The following minimum asset condition must be met at the Expiry Date:

- (a) Major electrical/mechanical equipment, remaining operational life = 20 years minimum at the Expiry Date;
- (b) Communications and control systems, remaining operational life = 10 years minimum at the Expiry Date;
- (c) CCTV systems, remaining operational life = 10 years minimum at the Expiry Date;
- (d) Renewable items, reasonable life at the Expiry Date, not less than 50 percent of operational life; and
- (e) Computer hardware and software, remaining operational life = 5 years minimum at the Expiry Date.

7.2 Electrical and System Drawings

At the Expiry Date, the Concessionaire shall provide the Province with a current version of all as-built drawings related to the Project Work, as per the then-current Ministry drafting standards.

8 MINOR ASSETS

- (a) All temporary Signs, signals, and fencing in the Concessionaire's possession that are being used to provide the services shall become the property of the Province at the end of the Term.
- (b) The Concessionaire must demonstrate throughout the Project Term, via the Asset Management Plan established pursuant to Section 4.4 [Asset Management Plan] of Appendix B to this Schedule and the Quality Management System established pursuant to Schedule 7 [Quality Management] to this Agreement, that they shall achieve or exceed at the Expiry Date a Condition State not less than Fair, that is, minor defects present but no repairs required within 12 months and no outstanding safety issues.

9 SPECIAL FACILITIES

Special facilities are nominally defined as those facilities of an uncommon nature within the Ministry asset inventory.

9.1 Condition at Expiry Date

- (a) All special facilities, including both hardware and software, must be in proper working order, and must meet all applicable performance requirements of this Agreement.

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- (b) No hardware or software components of special facilities shall be obsolete or incompatible with the current Province system at that time and all third party software shall be the latest full release version with similar compatibility.
- (c) Preventative maintenance shall have been carried out in accordance with Concessionaire's maintenance program.

9.2 Operations and Maintenance Manual

- (a) The Concessionaire shall prepare an Operations and Maintenance Manual (OMM) for each special facility such that such special facility can be used and maintained by the Province after the end of the Term.
- (b) The OMM for each special facility shall be provided to the Province no less than 12 months prior to the Expiry Date. The OMM shall be sufficiently detailed to enable a person unfamiliar with such special facility to efficiently maintain and operate such special facility.
- (c) The OMM shall include comprehensive instructions to operate all aspects of the special facility detailing at a minimum the following content:
 - (i) the purpose and operational objectives of such special facility;
 - (ii) all necessary steps to safely operate such special facility;
 - (iii) any hazards to avoid while operating such special facility;
 - (iv) clear diagrams and/or photographs to illustrate the operational process; and
 - (v) any separate component instruction manuals.
- (d) The OMM shall identify all activities required to maintain the special facility condition and operation including inspections, pro-active component replacements, and routine maintenance, with specific instructions for:
 - (i) daily requirements;
 - (ii) weekly requirements;
 - (iii) monthly requirements;
 - (iv) annual requirements; and
 - (v) history of maintenance services.

10 ASSET INVENTORY AND CONDITION STUDY

The purpose of this study is to undertake an independent current assessment of all project assets inventory and condition at the Expiry Date. In general terms, the scope of these inspections consists of the Concessionaire undertaking the following:

- (a) 100% validation and verification of all inventory;
- (b) identify and document missing, incomplete, or inaccurate Infrastructure inventory information;

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- (c) conduct field investigations to ascertain the current condition of all project inventory;
- (d) compile and summarize the inventory and condition data in a format acceptable to the Province's Representative in accordance with Sections 4.6 [Pavement and Structures Condition Data] and 4.7 [Asset Inventory Data] of Appendix B to this Schedule; and
- (e) document the findings as specified.

The objective of the investigations is to provide the Province with sufficient information to develop an accurate understanding of the current major assets in order to assess future maintenance and rehabilitation requirements.

11 SEISMIC MONITORING SYSTEM

At the end of the Term, all the accumulated data for the Concession Highway's seismic monitoring system, together with its instruments, software and maintenance Records, shall be transferred from the Concessionaire to the Province at the end of the Term in accordance with Part 14 [Termination] of this Agreement.

All seismic monitoring instruments are to have a minimum Remaining Service Life of 10 years at the Expiry Date.

12 LANDFILL SYSTEMS

12.1 Landfill Systems Operations and Maintenance Manual

- (a) The Concessionaire shall prepare a Landfill Systems Operations and Maintenance Manual (LSOMM) for the Landfill Systems, such that the Landfill Systems can be operated and maintained by the Province after the end of the Term.
- (b) The LSOMM for the Landfill Systems shall be provided by the Concessionaire to the Province no less than 12 months prior to the Expiry Date. The LSOMM shall be sufficiently detailed to enable a person unfamiliar with the Landfill Systems to efficiently maintain and operate the Landfill Systems.
- (c) The LSOMM shall include comprehensive instructions to operate all aspects of the Landfill Systems, detailing at a minimum the following content:
 - (i) the purpose and operational objectives of the Landfill Systems;
 - (ii) all necessary steps to safely operate and maintain the Landfill Systems;
 - (iii) any hazards to avoid while operating and maintaining the Landfill Systems;
 - (iv) clear diagrams and/or photographs to illustrate the operational process for the Landfill Systems;
 - (v) detailed information of Landfill System performance inspection and monitoring processes; and
 - (vi) any separate component instruction and operations manuals for the Landfill Systems.

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- (d) The LSOMM shall identify all activities required to maintain the condition and operation of the Landfill Systems, including inspections, pro-active component replacements, and routine maintenance, with specific instructions for:
 - (i) daily, weekly, monthly and annual requirements;
 - (ii) Landfill System inspection and monitoring requirements;
 - (iii) trends in surface water, ground water and leachate chemistry;
 - (iv) gas emission concentrations and pressures records;
 - (v) a complete maintenance and operations history of the landfill; and
 - (vi) actual historical operation, maintenance and performance monitoring costs data for the Landfill Systems for the Term.