

THE CITY OF EDMONTON

PROJECT AGREEMENT  
VALLEY LINE LRT – STAGE 1

*Schedule 7*

*O&M Performance Requirements*

## SCHEDULE 7

### O&M PERFORMANCE REQUIREMENTS

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## **Schedule 7**

### **O&M Performance Requirements**

#### **1. INTRODUCTION**

This Schedule sets out the requirements for Operations and Maintenance.

The documents forming this Agreement are intended to be complementary and interpreted in harmony so as to avoid conflict, with words and phrases interpreted in a manner consistent with Good Industry Practice. In the case of any conflict, ambiguity or inconsistency between or among any of the requirements, the following principles shall apply:

- (a) unless specifically stated otherwise, the provisions establishing the higher quality, manner or method of performing the Operations and Maintenance, using the more stringent standards, shall prevail, with the intent that the provisions which produce the highest level of quality, safety, Availability, reliability, durability, performance, and service shall govern.

#### **1.1 OPERATIONS AND MAINTENANCE RESPONSIBILITY**

- (a) Notwithstanding any other provision of this Agreement, Project Co shall:
  - (i) operate the System safely at all times during the Operating Hours following instruction by the City to begin Passenger Service unless instructed to cease or suspend Operations by the City. The City shall not instruct Project Co to begin Passenger Service earlier than the start of the applicable Operating Hours on the day following the Service Commencement Date;
  - (ii) have complete control of, and responsibility for, the Operation and Maintenance of the System throughout the Operating Period, except to the extent expressly described in this Agreement as being the responsibility of the City or a City Person;
  - (iii) provide written notice to the City of any conflict or inconsistency between or among the O&M Requirements, as soon as practicable after becoming aware of such conflict or inconsistency;
  - (iv) mitigate the impact on Passenger Service of:
    - (A) system and equipment failures;
    - (B) accidents and emergency incidents;
    - (C) unplanned Track closures;
    - (D) performance of Maintenance activities; and
    - (E) any other event that interrupts or disrupts Passenger Service;

- (v) be responsible for the Operations and Maintenance which shall be carried out during the Operating Period in strict accordance with:
  - (A) all Applicable Laws;
  - (B) the Project Agreement;
  - (C) City Policies; and
  - (D) Good Industry Practice.
  
- (b) develop, implement update and enforce all rules, policies, procedures and hazard mitigation strategies necessary for performance of the Operations and Maintenance in accordance with the System Safety Program;
  
- (c) perform the Operations and Maintenance so as to:
  - (i) ensure the safety of all Persons;
  - (ii) provide an environment that promotes personal security, public safety and Passenger satisfaction at all times;
  - (iii) provide the required level of Passenger Service on a year-round basis, as set out in the Service Level(s) specified by the City, in accordance with Section 5.5 [*System Capacity*] of this Schedule;
  - (iv) maintain compliance with CPTED requirements set out in Schedule 5 [*D&C Performance Requirements*];
  - (v) not create any risk that the City will lose the ISO 14001 certification for the City's environmental management system;
  - (vi) not exceed the noise or vibration limits specified in Sections 1-2.1.3 [*Noise Control*] and 1-2.1.5 [*Vibration Control*] of Schedule 5 [*D&C Performance Requirements*];
  - (vii) maintain ride quality in accordance with the requirements of Section 3-1.1.2 [*Track Alignment*] and Section 7-1.18.5 [*Ride Performance*] of Schedule 5 [*D&C Performance Requirements*], (the "**System Ride Quality**");
  - (viii) provide Passengers and other persons using the System with reliable, clean efficient and courteous service; and
  - (ix) ensure that the System complies with the requirements set out in Schedule 5 [*D&C Performance Requirements*] and is operated and maintained in accordance with Schedule 7 [*O&M Performance Requirements*] of this Agreement.
  
- (d) perform the Maintenance so as to:
  - (i) ensure that the System remains functional, safe, secure, operationally sound, and free from damage;



- (ii) maintain the Availability of the System during the times required in Section 5.1 [Operating Hours] of this Schedule; and
- (iii) satisfy the Handback Requirements in accordance with Appendix 7-A [Handback Requirements] of this Schedule.

**1.2 OPERATIONS AND MAINTENANCE REPORTS AND PLANS**

Prepare and submit all Operations and Maintenance reports and plans to the City in accordance with, and at the times and intervals required by, this Schedule.

**1.2.1 Compliance with Plans**

Implement, and ensure that all Project Co Persons engaged in the Operation and Maintenance comply with the applicable Operations Plans and Maintenance Plans, and any amendments or updates thereto, which have been accepted by the City.

**1.2.2 Review and Amendment of Plans**

Review and amend the Operations Plans and Maintenance Plans, at the required intervals and from time-to-time throughout the Operating Period as necessary to ensure that such plans at all times:

- (a) comply with the Project Agreement;
- (b) comply with Good Industry Practice, as it may evolve;
- (c) comply with changes in Applicable Law; and
- (d) reflect changes in operating conditions.

Prior to implementation of any amendments or updates to an Operations Plan or Maintenance Plan, Project Co shall submit the proposed amendment or update to the City in accordance with Schedule 2 [Submittal Review Procedure].

**2. OPERATING PERIOD JOINT COMMITTEE**

- (a) Not less than 90 days before the Target Service Commencement Date, the City and Project Co will establish, and will maintain throughout the Operating Period, a joint liaison committee (the “**Operating Period Joint Committee**”) consisting of the City’s Representative and Project Co’s Representative and such other members as the parties may agree from time to time.
- (b) The purpose of the Operating Period Joint Committee is to provide a formal forum for the parties to consult and cooperate in all matters relating to the Operations and Maintenance. Any member appointed to the Operating Period Joint Committee will not have any duties or obligations arising out of such appointment independent of such member’s duties or obligations to the party making such appointment.
- (c) The Operating Period Joint Committee:

- (i) shall only have authority as expressly delegated to it by the City and Project Co, and both parties will give reasonable consideration to delegating appropriate authority to permit efficient decision making with respect to the Project;
  - (ii) may strike, establish terms of reference for, delegate authority and appoint members having the necessary experience and qualifications to, such sub-committees as the Operating Period Joint Committee may determine are necessary from time to time and all such sub-committees will report to the Operating Period Joint Committee;
  - (iii) without limiting Section 2(c)(ii) of this Schedule, the Operating Period Joint Committee shall;
    - (A) establish a sub-committee to review each Performance Monitoring Report. This sub-committee shall meet at least once each month, within 5 Business Days after the end of each month to review the applicable Performance Monitoring Report;
    - (B) work with the Communications Working Group following the Service Commencement Date;
    - (C) assume oversight of:
      - (I) the Fire Life Safety Sub-committee;
      - (II) the System Change and Operations Review Sub-committee;
      - (III) the Safety and Security Sub-committee; and
      - (IV) any other sub-committees required by the System Safety Program,
 

from the Construction Period Joint Committee, following the Service Commencement Date;
  - (iv) shall establish protocols and procedures for undertaking the tasks and responsibilities delegated to it, including a co-operative and consultative process to review all documentation submitted to it in relation to the performance of Operations and Maintenance;
  - (v) may make recommendations to the parties on all matters relating to the Project, which the parties may accept or reject in their discretion; and
  - (vi) shall have no authority to agree to any amendments or to give any waivers of this Agreement.
- (d) Subject to the provisions of this Agreement, the members of the Operating Period Joint Committee may adopt such procedures and practices for the conduct of the activities of the Operating Period Joint Committee as they consider appropriate from time to time and:
- (i) may invite to any meeting of the Operating Period Joint Committee such other persons as a member may decide; and

- (ii) receive and review a report from any person agreed to by the members of the Operating Period Joint Committee.
- (e) The Operating Period Joint Committee shall meet at least once every 3 months at a location provided by Project Co in the City of Edmonton (unless otherwise agreed by its members) and from time to time as necessary. If any member of the Operating Period Joint Committee requests an additional meeting, the parties shall act reasonably in accommodating this request.
- (f) Not less than 5 Business Days prior to each meeting of the Operating Period Joint Committee, Project Co shall deliver to the City's Representative:
  - (i) a summary of all Service Performance Measures and NPE trends over the previous 12 month period;
  - (ii) a summary of all Operations and Maintenance activities occurring since the previous meeting of the Operating Period Joint Committee; and
  - (iii) such other information as the City may reasonably request.
- (g) Meetings of the Operating Period Joint Committee shall be convened on not less than 10 Business Days' notice (which notice will also identify the agenda items to be discussed at the meeting), provided that in an emergency a meeting may be called at any time on such notice as may be reasonable in the circumstances.
- (h) The Operating Period Joint Committee shall be chaired by a representative of the City unless the City requires that a representative of Project Co chair the Operating Period Joint Committee.
- (i) Project Co shall keep minutes of all meetings of the Operating Period Joint Committee and any sub-committees and circulate such minutes to the City within 5 Business Days of the applicable meeting.

### 3. MAINTENANCE AND ASSET MANAGEMENT, MONITORING AND REPORTING

#### 3.1 MAINTENANCE AND ASSET MANAGEMENT SYSTEM

Not less than 60 days prior to Service Commencement, supply, implement and maintain a computerized, automated maintenance and asset management system, (the "***Maintenance and Asset Management System***") which complies with ISO 55001: *Asset Management*, and has the following functionality:

- (a) tracking of work orders;
- (b) ability to enter work-order requests initiated by the City and others through the Helpdesk;
- (c) ability for authorized City Persons to remotely track work-orders and work-order requests;
- (d) linking of work-orders and work-order requests to the Asset Register;
- (e) scheduling and tracking tasks, and automatically reporting progress against the schedule;

- (f) recording and tracking of applicable rectification periods;
- (g) recording of asset history in accordance with Section 3.1.2 *[Asset Tagging and Register]* of this Schedule;
- (h) providing an auditable trail for all Maintenance history;
- (i) reporting Maintenance statistics as required by Schedule 16 *[Payment Mechanism]*;
- (j) collecting and archiving all information in such a way that it cannot be lost, degraded, adjusted or otherwise modified unless there is an auditable trail of the modification; and
- (k) be capable of being interrogated remotely by the City in accordance with Section 8 *[Remote Data Queries]* of this Schedule.

### **3.1.1 Maintenance Management**

- (a) Maintenance management procedures shall be implemented and used in conjunction with the asset identification tags, pursuant to Section 9.1 *[Asset Tagging]* of Schedule 4 *[Design and Construction Protocols]*, and Asset Register to manage and track all Maintenance activities during the Operating Period.
- (b) All work-orders for Maintenance activities shall be initiated and tracked using the Maintenance and Asset Management System.
- (c) Not less than 90 days prior to the Target Service Commencement Date establish and then operate a Helpdesk facility whereby work-order requests can be initiated, as a minimum, by Project Co Persons and City Persons (the "**Helpdesk**"). Such facility may be web-based, extranet-based or telephone based. Ensure that the Helpdesk facility:
  - (i) is Available for use and remotely accessible by the City, 24 hours a day 7 days a week;
  - (ii) allows users the ability to report and record:
    - (A) contact information of the person initiating the request;
    - (B) the description of the deficiency being reported; and
    - (C) the location of the affected asset(s).
  - (iii) tracks the time and date the work-order was logged; and
  - (iv) is capable of reporting, as required:
    - (A) progress in response to the work-order (i.e. personnel dispatched, mitigation measures, anticipated time of rectification); and
    - (B) the identity of the person logging the work-order information and any updates to it.

### **3.1.2 Asset Tagging and Register**

- (a) Throughout the Operating Period, asset tags and the Asset Register shall be maintained in compliance with the requirements described in Section 9 [*Asset Tagging and Register*] of Schedule 4 [*Design and Construction Protocols*].
- (b) Maintain the Asset Register up to date throughout the Operating Period and include the following information with respect to each tagged asset:
  - (i) details of all inspections and tests carried out including:
    - (A) identification of the persons responsible for the inspection or test;
    - (B) date of the inspection or test;
    - (C) duration since last inspection, Passenger Service hours or km, as applicable, at time of inspection or test;
    - (D) date of next inspection or test;
    - (E) details of all Project Approvals required/obtained; and
    - (F) reports of inspection findings and recommendations, including remedial actions and implementation plans;
  - (ii) details of all Maintenance activities carried out, including:
    - (A) identification of the responsible supervisor;
    - (B) Maintenance activity start/finish dates;
    - (C) details of all Project Approvals required/obtained; and
    - (D) components/elements which were replaced, repaired or refurbished;
  - (iii) identified trends from the inspection and Maintenance of each asset; and
  - (iv) any other information that may be agreed upon by the City and Project Co.

## **4. OPERATIONAL PERFORMANCE REPORTING**

- (a) Implement and maintain an Operations monitoring system which includes tracking of:
  - (i) Service Performance Measures in accordance with the requirements in Appendix 7-C [*Service Performance Measures*], including:
    - (A) details, on a daily basis during each Payment period, of all scheduled Trips, including those for Special Events. Details for each Trip shall include:
      - (l) the Scheduled Departure Time at each of the Origin Stops and Davies Station; and

- (II) the scheduled Train consist length;
- (B) details of all Trips which fully complied with the requirements of Appendix 7-C [*Service Performance Measures*]; and
- (C) for each Trip which did not fully comply with the requirements of Appendix 7-C [*Service Performance Measures*]:
  - (I) the Actual Departure Time at each of the Origin Stops and Davies Station;
  - (II) the actual Train consist length;
  - (III) the extent over which the Trip was operated (if less than a complete Trip), identified by the first and last Stop or Station served;
  - (IV) details of any Stops or Stations not serviced or not accessible in accordance with 2(d)(i) of Appendix 7-C [*Service Performance Measures*];
  - (V) all Trips which operated with a LRV with a Deficiency in accordance with Section 10.17.2 [*Light Rail Vehicle Maintenance*] of this Schedule; and
  - (VI) the actual Dwell Time where not in accordance with Section 5.3 (b) [*Stop and Station Dwell Times*] of this Schedule.
- (ii) the cause, duration and resolution of all disruptions to Passenger Service;
- (iii) System Ride Quality in accordance with Section 10.2 [*Ride Quality Monitoring*] of this Schedule;
- (iv) Noise and Vibration Monitoring in accordance with Section 10.3 [*Noise and Vibration Monitoring*] of this Schedule;
- (v) training records of all Project Co Persons and/or other persons as necessary;
- (vi) the results of the System Quality Surveys in accordance with Section 7.9.2 [*System Quality Surveys*] of this Schedule;
- (vii) the results of the annual Customer Satisfaction Surveys in accordance with Section 7.9.1 [*Customer Satisfaction Surveys*] of this Schedule;
- (viii) the completion of all Maintenance activities against the schedule included in the applicable Five Year Maintenance Plan;
- (ix) all Nonconformities from their identification to their resolution;
- (x) NPE Points assigned in accordance with Appendix 3 [*Non-Performance Event Points and Default Points*] of Schedule 16 [*Payment Mechanism*]; and
- (xi) the cumulative LRV Kilometers for each LRV during the applicable month.

- (b) Within 5 Business Days after the last day of each month, Project Co shall deliver a performance monitoring report to the City (each, a “**Performance Monitoring Report**”). Each Performance Monitoring Report shall include the following information for the relevant month:
- (i) Operations, as compared to the Service Performance Measures;
  - (ii) the status of Maintenance activities, including a reconciliation of planned vs. completed Maintenance activities;
  - (iii) the Energy Consumption certificates for the applicable month, in accordance with Section 1.5 [*Energy Consumption Data*] of Appendix 4 [*Energy*] of Schedule 16 [*Payment Mechanism*]; and
  - (iv) the cumulative LRV Kilometers for all LRVs from Service Commencement to the end of the relevant month.

The Performance Monitoring Reports shall be made available for review by the Operating Period Joint Committee, or a designated sub-committee, within 5 Business Days after the end of the associated month.

## **5. SERVICE REQUIREMENTS**

### **5.1 OPERATING HOURS**

- (a) All Stops shall be Available from 15 minutes prior to the departure of the first scheduled Train from the applicable Stop to 15 minutes after the departure of the last scheduled Train from that Stop.
- (b) Davies Station and Davies Transit Centre shall be Available from 30 minutes prior to the departure of the first scheduled Train from Davies Station to 30 minutes after the departure of the last scheduled Train from Davies Station.
- (c) The Churchill Connector shall be Available the same hours as the existing Churchill Station.
- (d) Davies Park ‘n’ Ride shall be Available 24 hours a day.
- (e) As a minimum, Trains shall operate in Passenger Service, stopping at each Stop and Station, continuously between the hours set out in Table 5.1. Time tables may include departures beyond these minimum Passenger Service hours as required for service start up and shut down.

**Table 5.1 – Operating Hours**

	Monday to Friday	Saturday	Sunday and Holidays
<b>102 Street Terminus Stop</b>			
First Train departs	5:15 am	5:15 am	5:15 am
Last Train departs	1:00 am	1:00 am	12:30 am
<b>Mill Woods Town Centre Terminus Stop</b>			
First Train departs	5:00 am	5:15 am	5:15 am
Last Train departs	1:00 am	1:00 am	12:30 am

**5.2 TRAVEL TIMES**

Subject to the City maintaining the signal timings in accordance with Section 6-3.4.3 [Signal Timing] of Schedule 5 [D&C Performance Requirements], the maximum scheduled one way Travel Time shall not exceed thirty-two 32 minutes based upon the requirements defined in Section 1-2.1.1.A.4. [Operational Design Parameters] of Schedule 5 [D&C Performance Requirements].

**5.3 STOP AND STATION DWELL TIMES**

- (a) The total Dwell Time at each Stop and Station shall be sufficient to ensure that all Passengers wishing to board and alight from the Train are able to do so in a safe manner. This shall include extended door closing time where requested using the control device at each wheelchair space, or where the Driver identifies there to be a need for additional boarding or alighting time. The Driver shall ensure that all doors are fully closed, locked and free from obstructions before departing.
- (b) Without limiting the preceding paragraph, the minimum Dwell Time at each Stop and Station shall be 7 seconds.

**5.4 OPERATING HEADWAYS**

- (a) Trains in Passenger Service shall operate in accordance with the Operating Headways listed in Table 5.4.

**Table 5.4 - Operating Headways**

Period	Time Period	Weekday	Saturday	Sunday
Early Morning	Start of service – 06:00	10 mins	10 mins	15 mins
AM Peak	06:00 – 10:00	5 mins	10 mins	15 mins
Mid-Day	10:00 – 14:30	10 mins	10 mins	15 mins
PM Peak	14:30 <sup>1</sup> – 18:30	5 mins	10 mins	15 mins
Evenings	18:30 – 21:30	10 mins	15 mins	15 mins
Late Night	21:30 – End of service	15 mins	15 mins	15 mins

Note 1: 5 minute Operating Headway shall begin at the 102 Street Terminus at 14:00.

- (b) Except as required pursuant to Section 5.7 [Special Events] of this Schedule, the Operating Headways applicable on:
  - (i) “Sundays”, shall also apply on:



- (A) all statutory holidays in the Province of Alberta, except as otherwise specified in Section 5.4(b)(ii) [*Operating Headways*]; and
- (B) Heritage Day (the first Monday in August);
- (ii) "Saturdays" shall apply on the following days:
  - (A) Family Day (the third Monday in February);
  - (B) Easter Monday (the Monday immediately following Good Friday);
  - (C) Remembrance Day (November 11) (unless it falls on a Sunday, then Sunday Operating Headways shall apply); and
  - (D) Boxing Day (December 26) (unless it falls on a Sunday, then Sunday Operating Headways shall apply).
- (c) Each Train departing from a Terminus Stop in Passenger Service shall complete its journey to the opposite Terminus Stop, stopping at each Stop and Station.

## **5.5 SYSTEM CAPACITY**

Throughout the Operating Period, the System shall be operated to a fixed time table with increases or decreases to the System Capacity being achieved by increasing or decreasing the number of LRVs in each Train consist.

### **5.5.1 Service Levels**

Subject to Section 5.5.2 [*Service Level Changes*] of this Schedule, the System shall be operated in accordance with the Service Level(s) specified in the applicable Annual Operations Plan as directed by the City in accordance with Section 7.2.2 (c) [*Annual Operations Plan Submittal*] of this Schedule.

### **5.5.2 Service Level Changes**

- (a) Notwithstanding the Service Level(s) set out in the applicable Annual Operations Plan, Project Co shall implement different Service Levels, to either increase or decrease System Capacity, as directed by the City. Where the City directs Project Co to increase or decrease System Capacity, the applicable changes in Service Level shall be implemented within 30 days after receipt of a written demand from the City, such direction will not be treated as a Change.
- (b) In the first and second Service Years after the Service Commencement Date, the City may direct a change from any Service Level to any other Service Level.
- (c) From Service Year three until the Termination Date, the City may direct a change to any Service Level which provides an increase or decrease in service capacity of +/- 750 pphpd from that of the Service Level set out in the applicable Annual Operations Plan for the applicable month of the Service Year. If Project Co's Service Levels increase or decrease by steps of more than +/- 750 pphpd, then the City may require during the Service Year to implement at least one Service Level up and one Service Level down from the one set out in the applicable Annual Operations Plan. For clarity, if for example the City requires:

- (i) an increase in service capacity of +750 pphpd and Project Co's Service Levels increase in steps of +500 pphpd, then Project Co shall increase its Service Levels by two steps, resulting in +1000 pphpd if the City agrees with such increase;
  - (ii) a decrease in service capacity of -750 pphpd and Project Co's Service Levels decrease in steps of -500 pphpd, then Project Co shall decrease its Service Levels by two steps, resulting in -1000 pphpd if the City agrees with such decrease;
  - (iii) an increase in service capacity of +750 pphpd and Project Co's Service Levels increase in steps of +1100 pphpd, then Project Co shall increase its Service Levels by one step, resulting in +1100 pphpd if the City agrees with such increase; or
  - (iv) a decrease in service capacity of -750 pphpd and Project Co's Service Levels decrease in steps of -1100 pphpd, then Project Co shall decrease its Service Levels by one step, resulting in -1100 pphpd if the City agrees with such decrease.
- (d) The City shall not direct Project Co to change the Service Level(s) set out in the applicable Annual Operations Plan more than 3 times within any Service Year.

### **5.5.3 Small Permanent Changes to Service Levels**

- (a) Notwithstanding the City's right to direct Project Co to change Service Levels, in accordance with Section 5.5.2 [*Service Level Changes*] of this Schedule, the City may direct Project Co to make Small Permanent Changes, such direction will not be treated as a Change.
- (b) Small Permanent Changes may include an increase or decrease in Driver Trips or LRV Trips resulting from:
  - (i) changes to the Operating Headways during any period of time in Table 5.4 [*Operating Headways*] of this Schedule provided that under no circumstances shall the Operating Headway be reduced to less than 5 minutes during a Peak Period;
  - (ii) amendments to the duration of time for which a particular Operating Headway is required in Table 5.4 [*Operating Headways*] of this Schedule (e.g. extend or reduce the length of a Peak Period); or
  - (iii) changes to the Operating Hours by up to a maximum of 30 minutes on any day; or
  - (iv) changes to scheduled Train consist lengths.
- (c) For a Service Level, Small Permanent Changes may be requested as long as, on an aggregate basis, the resulting total number of Driver Trips and LRV Trips over a typical 1week period:

- (i) does not exceed the total number of Driver Trips and LRV Trips over a typical 1-week period of the next higher Service Level; if such requests result in the total number of Driver Trips and LRV Trips exceeding the total offered by the next highest Service Level, then the City shall first direct Project Co to implement the next highest Service Level pursuant to Section 5.5.2 [Service Level Changes], and then the City may request Small Permanent Changes with regards to that Service Level;
  - (ii) is not below the total number of Driver Trips and LRV Trips over a typical 1-week period of the next lowest Service Level; if such requests result in total number of Driver Trips and LRV Trips being less than the total offered by the next lowest Service Level, then the City shall first direct Project Co to implement the next lowest Service Level pursuant to Section 5.5.2 [Service Level Changes], and then the City may request Small Permanent Changes with regards to that Service Level;
  - (iii) does not exceed the Maximum Service Level; and
  - (iv) subject to Project Co's obligation to demonstrate that reductions to 15 minute headways would materially impact its ability to perform planned activities as set out in the current Five Year Maintenance Plan, no 15 minute headways are reduced without mutual agreement.
- (d) Where the City directs Project Co to make Small Permanent Changes, the applicable changes in system capacity shall be implemented within 30 days after receipt of a written demand from the City.
- (e) Small Permanent Changes shall not result in more than a 1 hour increase to the aggregate number of Passenger Service hours in a week.

**5.6 MAXIMUM OPERATING SPEED**

The Maximum Posted Speed for each section of the LRT corridor is as set out in Table 5.6 [Maximum Posted Speeds], unless a section of road is designated as a School Zone as defined in the City's Speed Zones Bylaw # 6894 (in which case the bylaw restrictions shall apply):

**Table 5.6 – Maximum Posted Speeds**

Section of the LRT Corridor	From	To	Maximum Posted Speed (kph)
102 Ave (Downtown)	102 Street Stop	102 Ave & 96 St (102 Avenue Tunnel Approach)	30
Tunnel & Tawatinâ Bridge	102 Ave & 96 St (102 Avenue Tunnel Approach)	Muttart Stop	80
Connors Rd	Muttart Stop	Connors Rd & Cloverdale Rd	55
Connors Rd, 95 Ave	Connors Rd & Cloverdale Rd	95 Ave and 85 St	40
85 St and 83 St	95 Ave and 85 St	83 St & 69 Ave	50
Davies Elevated Guideway	83 St & 69 Ave (upon grade separation)	75 St & McIntyre Rd (return to at-grade)	80

Section of the LRT Corridor	From	To	Maximum Posted Speed (kph)
	south of 69 Ave)	running north of McIntyre Rd)	
75 St and 66 St	75 St & McIntyre Rd	Milbourne / Woodvale Stop	55
66 St	Milbourne / Woodvale Stop	66 St & 28 Ave	55
28 Ave	66 St & 28 Ave	Mill Woods Town Centre Stop	50

A Train or other On-track Vehicle shall not, under any circumstances, be operated at a speed that exceeds the Maximum Operating Speed.

## 5.7 SPECIAL EVENTS

### 5.7.1 General

- (a) Upon request from the City to accommodate Special Events, Project Co shall provide additional System Capacity by decreased Operating Headways or extended Operating Hours by adding Driver Trips or LRV Trips. Special Events shall fall into three categories:
- (i) those for which the City will require an increase to System Capacity to accommodate defined number of Passengers over a specified time period, ("**Capacity Based Special Events**");
  - (ii) those for which the City will require decreased Operating Headways or extended Operating Hours, ("**Timetable Based Special Events**"); and
  - (iii) those which require a combination of both (i) and (ii) ("**Capacity and Timetable Based Special Events**").
- (b) At least 90 days before the start of each Service Year, Project Co shall request from the City:
- (i) a list of Special Events scheduled for the applicable Service Year and whether each is a Capacity Based Special Event, a Timetable Based Special Event or a Capacity and Timetable Based Special Event;
  - (ii) the location(s) of each Special Event;
  - (iii) for Capacity Based Special Events the request shall include:
    - (A) the date, time and duration of additional System Capacity to be provided for each Special Event, split by take-in before the event and take-out after the event;
    - (B) the expected number of additional Passengers to be carried on the System for each Special Event, split by take-in before the event and take-out after the event;

- (C) any specific direction from the City with respect to the means by which the additional System Capacity is to be delivered;
- (iv) for Timetable Based Special Events the request shall include:
  - (A) the date, time and duration of the decreased Operating Headways or extended Operating Hours;
  - (B) the required changes to the Operating Headways or Operating Hours; and
  - (C) the expected number of additional Passengers to be carried on the System for each Special Event;
- (v) for Capacity and Timetable Based Special Events the request shall include all the information required in (iii) and (iv); and
- (vi) such other information as Project Co may reasonably require in order to accommodate the additional System Capacity requirements.
- (c) Under no circumstances shall Project Co be required to deliver a System Capacity which exceeds that of the Maximum Service Level.

#### **5.7.2 Known Special Events**

- (a) The City shall provide information as is available to it with respect to known Special Events within 30 days after receipt of Project Co's request.
- (b) As a minimum, the following Special Events are anticipated to occur during each Service Year, (additional Passenger numbers, decreased Operating Headways or extended Operating Hours are provided for guidance only and are to be agreed annually in accordance with the requirements of Sections 5.7.1.(b) [*General*] and 7.2.5 [*Annual Operations Plan*] of this Schedule):
  - (i) Edmonton Oilers hockey games, (Capacity Based Special Event - anticipated additional Passengers = 2,000 travelling to the games and 2000 leaving after the games);
  - (ii) Edmonton Eskimos football games, (Capacity Based Special Event- anticipated additional Passengers = 3,000 travelling to the games and 3000 leaving after the games);
  - (iii) music events at Commonwealth Stadium, Rexall Place or Rogers Place, (Capacity Based Special Event- anticipated additional Passengers = up to 5,000 travelling to the event and 5000 leaving after the event);
  - (iv) K-Days at Northlands Ground (Timetable Based Special Event –Operating Headway of 10 minutes with an extension to the end of the Operating Hours by 30 minutes);

- (v) K-Days Parade Downtown (Capacity Based Special Event - anticipated additional Passengers = 6,000 over the day);
- (vi) New Year's Eve celebration (Capacity and Timetable Based Special Event - anticipated additional Passengers = 3,000 travelling to the event and 3000 leaving after the event with extended Operating Hours until 3 am);
- (vii) Canada Day celebration (Capacity and Timetable Based Special Event - anticipated additional Passengers = 2,000 travelling to the event and 2000 leaving after the event with an Operating Headway of 10 minutes and an extension to the end of the Operating Hours by 30 minutes); and
- (viii) Edmonton Folk Music Festival (Timetable Based Special Event – Maximum Operating Headway of 10 minutes).

### **5.7.3 Unknown Special Events**

- (a) Where unanticipated Special Events are scheduled during a given Service Year, the City shall provide Project Co with as much notice as is reasonably practicable, including the following information with respect to each such Special Event:
  - (i) the date, time and duration of additional System Capacity to be provided;
  - (ii) the expected number of additional Passengers to be carried on the System or the changes to the Operating Headway or Operating Hours;
  - (iii) the location(s) of the Special Event;
  - (iv) any specific direction from the City with respect to the means by which the additional System Capacity is to be delivered; and
  - (v) whether the City considers the Special Event of high or normal importance.
- (b) When the City provides more than 30 days' notice of an unanticipated Special Event, Project Co shall confirm how they will provide the required changes to System Capacity and provide the information required by Section 5.7.5 [*Passenger Capacity Adjustments*].
- (c) Where the City provides less than 30 days' notice of an unanticipated Special Event, within 48 hours of the City's notification, Project Co shall either:
  - (i) confirm the proposed changes to the System Capacity and provide the information required by Section 5.7.5 [*Passenger Capacity Adjustments*]; or
  - (ii) demonstrate to the City that scheduled Maintenance limits the availability of assets and therefore Project Co's ability to provide the requested changes and:
    - (A) for Special Events which the City considers of either high or normal importance, propose alternative changes to the System Capacity which match the City's request as closely as possible and provide the

information required by Section 5.7.5 [*Passenger Capacity Adjustments*]; and

- (B) for Special Events which the City considers of high importance, provide options to change the scheduled Maintenance, including the associated costs and if necessary, changes to other aspects of Passenger Service which, if mutually agreed by both parties, could be implemented in order to provide the requested changes to System Capacity. If Project Co incurs additional costs to change the scheduled Maintenance or change the other aspects of Passenger Service (other than those included in the Special Events Payment) to meet the requirement of the unanticipated Special Events, Project Co shall be compensated for its reasonable additional costs.
- (d) When less than 10 days notification of unknown Special Events is provided, the rate per Driver Trip from Origin Stop to Destination Stop, as applied to calculate the Special Events Payment pursuant to Section 16.4.2.2 [*Special Events Payment*] of Schedule 16 [*Payment Mechanism*], may be increased by the actual additional amount paid as overtime to the Drivers during the unknown Special Event, and in no case exceed double the Drivers' normal paid rate.

#### **5.7.4 Additional Information**

Where the City becomes aware of additional information or of a change in the information previously provided to Project Co with respect to a Special Event, the City shall provide such further information to Project Co as it becomes available.

#### **5.7.5 Passenger Capacity Adjustments**

- (a) Where the City requests additional System Capacity for a Special Event, the City shall direct Project Co to provide capacity for a specified number of additional Passengers on the System. Project Co shall determine what steps are reasonably required to deliver the specified System Capacity, including:
  - (i) accommodating the increased System Capacity within the existing Service Level;
  - (ii) additional LRV Trips;
  - (iii) decreasing the Operating Headways by adding extra Driver Trips (with additional LRV Trips as required), provided that under no circumstances shall the Operating Headway be reduced to less than 5 minutes unless approved in accordance with 5.7.5 (d) [*Passenger Capacity Adjustments*]; or
  - (iv) extending the hours of operation by adding extra Driver Trips (with additional LRV Trips as required),

provided that where the City has given a specific direction with respect to the means by which additional System Capacity is to be delivered, Project Co shall comply with such direction.

- (b) At least 2 Business Days prior to each scheduled Special Event, Project Co shall deliver to the City a detailed breakdown of the steps that it will implement to deliver the specified System Capacity for such event.
- (c) Project Co shall not schedule Maintenance which has the potential to restrict Special Event service on days when there are known Special Events and where the time or duration of a Special Event is changed, Project Co shall make all reasonable efforts to continue providing the additional Passenger Service capacity for such time as directed by the City.
- (d) Notwithstanding the requirements of Section 5.7.5(a)(iii) [*Passenger Capacity Adjustments*], Project Co may request that the City allow Operating Headways at less than 5 minutes for Special Events, provided that:
  - (i) the Special Event is scheduled to occur during an Off Peak Period; and
  - (ii) a minimum 14 day notice is provided to the City, including requested duration and proposed operating headways.

The City shall be under no obligation to approve the request, and, in the event of acceptance will provide a response within 7 days of Project Co's request. Any acceptable Operating Headway adjustments would be applied with no increased risk of deduction to Project Co.

- (e) Along with the detailed breakdown of the steps required to implement the specified System Capacity, Project Co shall also submit to the City, at least 2 Business Days prior to each scheduled Special Event, a detailed schedule of additional Driver Trips and additional LRV Trips required to accommodate each Capacity Based Special Event. Such schedule shall serve as the basis for the calculation of the Service Performance Measures in Appendix 7-C, including Scheduled Trips. When the time or duration of a Special Event is changed, the provision of additional Passenger Service capacity as directed by the City shall also count in the calculation of the Service Performance Measures in Appendix 7-C, and additional Trips reasonably requested by the City shall also count as Scheduled Trips as long as they respect the overall parameters of this Section 5.7.5 [*Passenger Capacity Adjustments*].

## **5.8 OTHER REQUIREMENTS**

### **5.8.1 Operations in the Quarters Tunnel**

Operations in the Quarters Tunnel shall comply with all applicable fire and life safety requirements.

### **5.8.2 Storage of On-track Vehicles**

- (a) Except with the prior agreement of the City, in its discretion, or as provided in Section 5.8.2(b) [*Storage of On-track Vehicles*] of this Schedule, storage of On-track Vehicles shall only be permitted within the Gerry Wright OMF.
- (b) Secondary Tracks, if any, shall only be used for short term storage where required to facilitate the following Operations and Maintenance activities:



- (i) storage of a defective Train until the end of that Operating Day, when it can be recovered to the Gerry Wright OMF;
- (ii) staging of a Train, ready to enter Passenger Service, for up to 90 minutes prior to a Peak Period or Special Event; or
- (iii) storage of rail-borne auxiliary equipment, for up to 3 hours, prior to its use for Maintenance activities scheduled to be performed at night or during the next Off Peak Period.

### **5.8.3 Interaction with Emergency Response Vehicles**

- (a) Unless directed otherwise by a Police Officer or ETS security personnel, Emergency Services vehicles shall have priority over Trains and other On-track Vehicles.
- (b) At all intersections Drivers shall continue to observe all signal indications and make every reasonable attempt to stop so as to provide passage to Emergency Services vehicles where the Driver determines it is safe to do so.
- (c) Operation of Trains and other On-track Vehicles shall comply with all applicable provisions of the Traffic Safety Act (Alberta) and the Use of Highways and Rules of The Road Regulation (Alberta).

### **5.8.4 Grade Crossings**

All On-track Vehicles shall fully clear all Grade Crossings without stopping and within 30 seconds of passing the associated Check-in-B point or release the associated track circuit, unless:

- (a) delayed for a safety reason; or
- (b) the On-track Vehicle is performing scheduled Maintenance activities and:
  - (i) all required Project Approvals have been obtained; and
  - (ii) the appropriate measures to protect vehicular traffic are confirmed to be in place.

### **5.8.5 Stopping Location at Stops and Stations**

Define a stopping location at each Stop and Station for Trains of each consist length and cause all Trains to stop at these locations on each Trip.

## **6. SYSTEM SAFETY PROGRAM**

### **6.1 COMPLIANCE WITH SYSTEM SAFETY PROGRAM**

Project Co shall implement, and ensure that all Project Co Persons comply with, the System Safety Program, including any amendments or updates thereto, which have been accepted by the City.

## 6.2 REVIEW AND AMENDMENT OF SYSTEM SAFETY PROGRAM

- (a) Project Co shall review and amend the System Safety Program when required by the System Safety Program, and from time to time throughout the Operating Period as necessary to ensure that the System Safety Program at all times:
  - (i) reflects the nature of the Services being performed, including any changes in work methods or Hazards associated with the Services;
  - (ii) complies with this Agreement;
  - (iii) complies with Good Industry Practice and all Applicable Law;
  - (iv) complies with the *APTA Manual for the Development of Urban Rail Agency System Safety Program Plans*;
  - (v) addresses all recommendations of any System Safety Program audits; and
  - (vi) address all other events and circumstances that have the potential to impact the safety, or security of the System, the Passengers or users of the System as may be foreseen, acting reasonably.
- (b) Any System Safety Program amendments shall be subject to review by the City in accordance with Schedule 2 [*Submittal Review Procedure*].

## 6.3 SYSTEM SAFETY PROGRAM AUDITS

- (a) The Independent Agency shall perform external safety management peer reviews of the System Safety Program in accordance with the format and content of the *APTA Audit Scheduling Guidelines – Rail Operations*, as required by the *APTA Manual for the Development of Urban Rail Agency System Safety Program Plans*, at least once every 3 years throughout the Term.
- (b) Project Co shall cause the Independent Agency to prepare a comprehensive external safety management peer review report and to deliver a copy to Project Co and the City concurrently. Project Co shall review peer review findings with the Project Co Person(s) responsible for the areas being reviewed. Where a peer review identifies any Nonconformities with the System Safety Program, Project Co shall within fourteen (14) days, prepare and submit to the City a Corrective Action Plan to address and rectify all reported Nonconformities. Project Co shall promptly implement such Corrective Action Plan to which there is no objection by the City and provide a report to the City confirming that each Nonconformity has been rectified.

## 6.4 SYSTEM SAFETY PROGRAM REQUIREMENTS

Without limiting the requirements set out in the *APTA Manual for the Development of Urban Rail Agency System Safety Program Plans*, the Operating Rule Book, Standard Operating Procedures, Emergency Preparedness Plan, Passenger and Public Safety Outreach Program, and the Operations and Maintenance Staffing and Training Plan, included in the System Safety Program, shall include the following content:

#### 6.4.1 Operating Rule Book

Prepare and submit no later than 160 days prior to the Target Service Commencement Date, an operating rule book, based on the outline defined in the Operating Concept Plan, which shall include safety critical procedures and the following listed sections and associated operating rules to account for the principles of operation as set out in Section 7.1 [*Principles of Operation*] of this Schedule:

- (a) general rules (e.g. personal safety, general protection, medical conditions/substance abuse, flagging);
- (b) hand and audible signals;
- (c) switches and derails;
- (d) responsibility and conduct;
- (e) cab security;
- (f) Stops and Stations;
- (g) Grade Crossings;
- (h) crew and lookouts;
- (i) braking;
- (j) storing equipment on Mainline Tracks;
- (k) signal system rules;
- (l) train orders;
- (m) yard rules;
- (n) speed rules;
- (o) track level protection;
- (p) emergencies and incidents; and
- (q) radios and communications,

(collectively, the “**Operating Rule Book**”).

#### 6.4.2 Standard Operating Procedures

Prepare and submit no later than 160 days prior to the Target Service Commencement Date, a bound collection of standard operating procedures, based on the outline defined in the Operating Concept Plan, which shall identify the means by which the applicable Project Co Persons will comply with the applicable Project Requirements and shall include the following listed sections:

- (a) general information;
- (b) communications procedures;
- (c) operations and maintenance facility procedures;
- (d) environmental incidents (e.g. chemical spills, oil spills);
- (e) emergency reporting;
- (f) rail system safety;
- (g) facilities (e.g. custodial contacts, Stop and Station equipment procedures, weather related procedures, Stop and Station systems);
- (h) Track;
- (i) signal systems;
- (j) Traction Power Systems; and
- (k) vehicles,

(collectively, the “**Standard Operating Procedures**”).

#### **6.4.3 Emergency Preparedness Plan**

- (a) Prepare and submit no later than 160 days prior to the Target Service Commencement Date, an emergency preparedness plan that complies with this Section 6.4.3 [*Emergency Preparedness Plan*] of this Schedule, (the “**Emergency Preparedness Plan**”).
- (b) The Emergency Preparedness Plan shall be integrated with the Operating Period Security Program and the Emergency Response Plan.
- (c) Without limiting the Emergency Preparedness Plan requirements as set out in the *APTA Manual for the Development of Urban Rail Agency System Safety Program Plans*, the Emergency Preparedness Plan shall include fire protection manuals, developed in consultation with Edmonton Fire Rescue Services. At minimum, individual fire protection manuals setting out procedures on smoke controls, evacuation routes, fire alarm systems, and communication procedures shall be prepared and submitted to the City for each of the following System facilities:
  - (i) the Quarters Tunnel and Tunnel Approaches;
  - (ii) the Tawatinâ Bridge;
  - (iii) the Davies Elevated Guideway;
  - (iv) the Churchill Connector; and
  - (v) Davies Station.

- (d) The emergency drills included in the Emergency Preparedness Plan shall include:
  - (i) participation in the City's planned emergency exercises which occur a minimum of once per year;
  - (ii) providing Edmonton Fire Rescue Services, Edmonton Police Service and other Emergency Services access to the System and the LRVs for ongoing training purposes at least quarterly; and
  - (iii) such other emergency drills as necessary to comply with the requirements of the *APTA Manual for the Development of Urban Rail Agency System Safety Program Plans*.
- (e) Emergency drills referred to in Section 6.4.3 (d) (i) and (ii) [*Emergency Preparedness Plan*] of this Schedule shall occur at times and dates specified by the City, provided that the City shall give Project Co a minimum 4 week notice. All Trips affected by such drills shall be excluded from the calculation of all Service Performance Measures.

#### **6.4.4 Passenger and Public Safety Outreach Program**

- (a) Prepare and submit an outreach program that complies with this Section 6.4.4 [*Passenger and Public Safety Outreach Program*] of this Schedule, (the "**Passenger and Public Safety Outreach Program**") no later than the earlier of:
  - (i) 160 days prior to the Target Service Commencement Date;
  - (ii) 60 days prior to the start of LRV-Commissioning on any Track outside of the Gerry Wright OMF; or
  - (iii) 60 days prior to the start of Commissioning Work.
- (b) Without limiting the Passenger and Public Safety Outreach Program requirements as set out in the *APTA Manual for the Development of Urban Rail Agency System Safety Program Plans*, the Passenger and Public Safety Outreach Program shall be prepared and implemented in accordance with Section 2.8 [*Safety Programmes*] of Schedule 12 [*Communications Protocols*] and shall include emphasis on the differences between the System and the existing high floor LRT system, including differences in:
  - (i) Transit Signal Priority signals at Grade Crossings;
  - (ii) pedestrian Hazards at Grade Crossings;
  - (iii) operation of audible devices at Grade Crossings;
  - (iv) pedestrian Hazards at Embedded Trackway segments;
  - (v) vehicular Hazards at Grade Crossings, particularly for turning movements onto the Trackway;
  - (vi) vehicular Hazards at Embedded Trackway segments;

- (vii) Passenger Hazards at Stops and Stations;
- (viii) pedestrian Hazards at Quarters Tunnel and Tunnel Approaches;
- (ix) pedestrian Hazards at Elevated Guideways; and
- (x) Low Floor LRV features and functionalities.

#### 6.4.5 Operations and Maintenance Staffing and Training Plan

- (a) Prepare and submit no later than 160 days prior to the Target Service Commencement Date, an operations and Maintenance staffing and training plan that complies with this Section 6.4.5 [*Operations and Maintenance Staffing and Training Plan*], (the “**Operations and Maintenance Staffing and Training Plan**”).
- (b) Without limiting the training and certification requirements as set out in the *APTA Manual for the Development of Urban Rail Agency System Safety Program Plans*, the System Safety Program shall include an Operations and Maintenance Staffing and Training Plan which shall include:
  - (i) Project Co’s staff retention policies;
  - (ii) a breakdown of the full staffing requirements for delivery of Project Co’s Operations and Maintenance obligations, including the categorization of roles and the number of staff within each category, broken down as follows:
    - (A) management staff;
    - (B) Operations staff (e.g. safety officers, control room staff, Drivers);
    - (C) Maintenance staff, divided into specialist areas (e.g. Track maintainers, Traction Power System maintainers);
  - (iii) details of the training to be provided to each identified staff position including the following information, as applicable:
    - (A) a course syllabus;
    - (B) training methods and plans;
    - (C) training tools such as simulators; and
    - (D) training intervals.
  - (iv) details of customer service training to be delivered to Project Co Persons, including an outline of the different training levels aligned with individual roles in order to meet the objectives of the Customer Service Plan.
- (c) At least 30 days prior to the occurrence of any training session involving Project Co Persons, provide written notice to the City’s Representative describing the purpose, scope, timing, location and duration of the training session. Up to 5 City Persons shall be

permitted to attend and participate in such training sessions at no additional cost to the City.

## **7. OPERATIONS REQUIREMENTS**

### **7.1 PRINCIPLES OF OPERATION**

- (a) The System shall be normally operated as a right hand running system, on a Line-of-Sight basis, with the Train Routing and Priority System used for controlling the interface of the LRT and road traffic at Grade Crossings.
- (b) All Drivers shall have normal or corrected 6/6m vision.
- (c) Where the probability of an On-track Obstruction is low, as demonstrated by the Safety and Security Certification Program and taking into account the following considerations, the Line-of-Sight operation may be based on the use of the Train's Hazard Brake instead of the Train's Service Brake:
  - (i) the available forward visibility;
  - (ii) the lower of the Maximum Design Speed and the Maximum Posted Speed;
  - (iii) the braking performance of the Train, taking into account the gradient and brake equipment response time;
  - (iv) the effectiveness of any illumination of the Trackway at night;
  - (v) the Driver Reaction Time;
  - (vi) the visibility of signals and Switch Position Indicators;
  - (vii) the topology of the surrounding area including Roadways, sidewalks, SUP's and amenities;
  - (viii) the Driver's eye height and position;
  - (ix) the height of possible On-track Obstructions above the top of rail;
  - (x) the height of any potential Hazards adjacent to the Trackway; and
  - (xi) any other factors identified through the Safety and Security Certification Program.

### **7.2 OPERATIONS PLANS**

- (a) Prepare and submit each of the Operations Plans described in this Section 7.2 to the City for its review in accordance with Schedule 2 *[Submittal Review Procedure]*.
- (b) Project Co shall consult with the City's Representative in the preparation of all Operations Plans and shall submit draft Operations Plans for review and comment by the Operating Period Joint Committee prior to formal submission of such Operations Plans to the City.

### 7.2.1 Overall Operations Plan Submittal

- (a) Project Co, in consultation with the Design-Builder and the Service Provider, shall prepare and submit an overall operations plan pursuant to Section 7.2.4 [*Overall Operations Plan*] of this Schedule, (the “**Overall Operations Plan**”), which shall be based on the Operating Concept Plan, not later than the following times prior to the Target Service Commencement Date:

- (i) 365 days for a draft version; and
- (ii) 180 days for a final version,

provided that the City’s time for review under Schedule 2 [*Submittal Review Procedure*] shall be 30 days for the draft version.

### 7.2.2 Annual Operations Plan Submittal

- (a) Project Co, in consultation with the Design-Builder and the Service Provider, shall prepare and submit an annual operations plan pursuant to Section 7.2.5 [*Annual Operations Plan*] of this Schedule, (the “**Annual Operations Plan**”), for the first Service Year of the Operating Period not later than the following times prior to the Target Service Commencement Date:

- (i) 150 days for a draft version; and
- (ii) 90 days for a final version.

- (b) For each Service Year after the Service Commencement Date (commencing with the second Service Year following the Service Commencement Date), Project Co shall, in consultation with the Service Provider, prepare and submit a:

- (i) draft Annual Operations Plan for the applicable Service Year, not later than 60 days prior to the start of each Service Year;
- (ii) final Annual Operations Plan for the applicable Service Year, not later than 30 days prior to the start of each Service Year;

- (c) Within 15 days after receipt of the draft Annual Operations Plan for a Service Year, the City shall confirm which Service Level(s) shall be included in the final Annual Operations Plan to be submitted in accordance with this Section 7.2.2 [*Annual Operations Plan*] of this Schedule.

### 7.2.3 Incident Management and Service Recovery Plan Submittal

- (a) Based upon the outline in the Operating Concept Plan, in consultation with the Design-Builder and the Service Provider, prepare and submit an incident management and service recovery plan pursuant to Section 7.2.6 [*Incident Management and Service Recovery Plan*] of this Schedule (the “**Incident Management and Service Recovery Plan**”), for the first Service Year of the Operating Period not later than the following times prior to the Target Service Commencement Date:



- (i) 90 days for a draft version; and
  - (ii) 60 days for a final version.
- (b) Every 5 years after the Service Commencement Date (commencing with the second Service Year following the Service Commencement Date), Project Co shall, in consultation with the Service Provider, prepare and submit a:
- (i) draft Incident Management and Service Recovery Plan for the applicable 5 year period, not later than 60 days prior to the start of each 5 year period; and
  - (ii) final Incident Management and Service Recovery Plan for the applicable 5 year period, not later than 35 days prior to the start of each 5 year period.

#### **7.2.4 Overall Operations Plan**

The Overall Operations Plan shall describe Project Co's operating plans, including:

- (a) Travel Times;
- (b) detailed time tables for Passenger Service including a schedule of service for each Stop and Station;
- (c) daily Passenger Service start-up and shut-down strategies;
- (d) details of Maximum Operating Speeds for each section of Track;
- (e) detailed service plans for each Service Level which shall include the following information:
  - (i) Train consist lengths (linked to the time tables);
  - (ii) hours of operation for each Train consist length; and
  - (iii) the total number of Driver Trips and LRV trips for each standard week;
- (f) a summary of the Operating Rule Book;
- (g) a summary of the Standard Operating Procedures;
- (h) an Incident Management and Service Recovery Plan;
- (i) a performance monitoring and reporting program meeting the requirements set out in Section 4 [*Operational Performance Reporting*] of this Schedule;
- (j) an operational analysis and model demonstrating that items (a) to (h) are in compliance with the Project Requirements, and as a minimum considering and demonstrating the effects of:
  - (i) LRV acceleration and deceleration characteristics under AW2 loading;

- (ii) Trackway grades and curvatures;
- (iii) Line-of-Sight operations taking into account Sighting Distances and Driver Reaction Times;
- (iv) Traction Power System characteristics resulting from load flow analysis and simulation; and
- (v) interaction at Grade Crossings including effects of Transit Signal Priority;
- (k) a strategy for accommodating third party maintenance requirements in accordance with Section 7.10 [*Third Party Maintenance Requirements*] of this Schedule; and
- (l) a strategy to minimize disruption to Operations when directed by the City to accommodate works which encroach on the System.

### **7.2.5 Annual Operations Plans**

Each Annual Operations Plan shall provide:

- (a) a review of the previous Service Year's Operations including details of:
  - (i) the Service Levels which were operated including any variations throughout the Service Year;
  - (ii) the ridership, including trends, growth, LRV loading factors and ridership by Stop or Station;
  - (iii) the System's reliability and on-time performance;
  - (iv) Energy Consumption trends;
  - (v) Special Events, including ridership and service increases for each Special Event with all additional Driver Trips and LRV Trips identified;
  - (vi) all Small Permanent Changes from the Service Levels set out in the previous Annual Operations Plan with all additional Driver Trips and LRV Trips identified;
  - (vii) all disruptions to Passenger Service and incidents, including details of the cause and any Corrective Action taken to prevent reoccurrence; and
  - (viii) a summary of Nonconformities;
- (b) recommendations as to which Service Levels, as included in Appendix 7-D [*Service Levels*] of this Schedule, that should be considered by the City during which months of the year, based upon the previous Service Year's ridership and LRV loading factors and amended as required by the City following its review of the draft submittal in accordance with Section 7.2.2 [*Annual Operations Plan Submittal*] of this Schedule;

- (c) a list of all Special Events, and the Service Level to be provided for each, for the applicable Service Year, as provided by the City in accordance with Section 5.7 [*Special Events*] of this Schedule;
- (d) details of all known Small Permanent Changes to be operated during the applicable Service Year in accordance with Section 5.5.3 [*Small Permanent Changes to Service Levels*] of this Schedule; and
- (e) details of the anticipated impact on Passenger Service resulting from all planned Maintenance to be performed during the applicable Service Year, including details of Project Co's plans to mitigate such disruptions and their impact on Passenger Service.

#### **7.2.6 Incident Management and Service Recovery Plan**

- (a) Perform a risk assessment of the potential risks to disruption of Passenger Service, taking into account credible system or equipment failures, accidents, emergency incidents, unplanned Track closures, elevator failures, and other sources of interruption, and including all actual disruptions that have previously occurred to Passenger Service, if applicable. On the basis of this risk assessment, define the:
  - (i) mitigation plans to maintain Passenger Service in the event that each potential risk were to occur, including details of how Project Co would maintain compliance with the Project Requirements, including:
    - (A) strategic placement of qualified operations staff to assist with Passenger safety and service;
    - (B) provision of alternate transportation services for Passengers with disabilities;
    - (C) single Track operation;
    - (D) the introduction of Restricted Speeds;
    - (E) turnback of Trains;
    - (F) co-ordination with the City for the introduction of replacement bus services by ETS (at the City's expense), to bridge gaps where Passenger Service is totally disrupted; and
    - (G) other lessons learned from previous disruptions;
  - (ii) processes to determine when Passengers should be disembarked from a Train at the site of an incident and when the affected Train should be moved to a Stop or Station to facilitate easier disembarkation;
  - (iii) procedures for dealing with medical emergencies;
  - (iv) specific procedures for dealing with Passenger disembarkation and evacuation from areas of restricted access including:
    - (A) the Quarters Tunnel and Tunnel Approaches;

- (B) the Tawatinâ Bridge and the South River Valley Elevated Guideway; and
  - (C) the Davies Elevated Guideway; and
  - (D) processes to ensure that opposing Trains are halted to allow Passenger disembarkation to be achieved safely to the adjacent Track in areas where there is no other safe option.
- (b) Acceptable incident management mitigation strategies for specific types of incidents are provided in this Section 10 [*Asset Specific Maintenance Requirements*] of this Schedule and shall be adopted by Project Co in its Incident Management and Service Recovery Plan. Where a specific incident management mitigation strategy has been provided for a type of incident, alternate comparable strategies, acceptable to the City acting reasonably, may be adopted.

#### **7.2.6.1 Service Disruption Protocol**

The Incident Management and Service Recovery Plans shall also include a service disruption protocol for keeping Passengers apprised of disruptions to Passenger Service. At a minimum, this shall include:

- (a) announcement of all disruptions of greater than 5 minutes on-board all affected Trains and at all affected Stops and Stations;
- (b) notification to the City of all disruptions of greater than 10 minutes for announcement across the ETS network or via other media as necessary; and
- (c) dispatch of Project Co personnel to affected Stops and Stations for all disruptions of greater than 30 minutes to provide assistance and information to Passengers.

#### **7.2.6.2 Service Disruption Announcements**

The VMS and / or PA systems at Stops and Stations which are affected by disruptions to Passenger Service, shall be caused to display or announce following information, as applicable:

- (a) for disruptions of between 5 and 10 minutes:
  - (i) revised departure times; and
  - (ii) the reason for the delay;
- (b) for disruptions of greater than 10 minutes:
  - (i) revised departure times;
  - (ii) the reason for the delay; and
  - (iii) regret for the disruption; and
- (c) details of alternative routes or services such as bus bridges as soon as the need is identified in accordance with the Incident Management and Service Recovery Plan.

## **7.2.7 Customer Service Plan**

### **7.2.7.1 Submittal**

- (a) Project Co, in consultation with the Design-Builder and the Service Provider, shall prepare and submit a customer service plan pursuant to Section 7.2.7.2 [Content] of this Schedule, (the "**Customer Service Plan**") not later than the following times prior to the Target Service Commencement Date:

- (i) 270 days for a draft version; and
- (ii) 180 days for a final version,

provided that the City's time for review under Schedule 2 [Submittal Review Procedure] shall be 30 days for the draft version.

### **7.2.7.2 Content**

The Customer Service Plan shall:

- (a) be comprehensive, logically organized, and describe Project Co's philosophy and approach to delivering excellent customer service across all facets of the organization for the Operating Period;
- (b) describe how customer service will be encouraged and supported throughout the organization through employee recruitment and training;
- (c) describe policies that will encourage excellent customer service, empower employees, and facilitate on-going improvement to customer service; and
- (d) describe Project Cos internal procedures, in addition to the Customer Satisfaction and System Quality Surveys, to measure customer service levels and implement changes to training, service quality and performance, equipment and facilities, to improve or enhance customer service as necessary.

## **7.3 SYSTEM SECURITY**

- (a) Provide security of the System pursuant to Schedule 29 [Security Matters].
- (b) Without limiting the security requirements as set out in Schedule 29 [Security Matters] develop formal procedures with the City:
  - (i) for escalating suspected intrusions and trespassing to the ETS Transit Security Control Centre as alarms are received at the OCC, as described in Section 7.4 [Operations Control Centre] of this Schedule;
  - (ii) to administer access permissions for City personnel, and third parties, on both a regular and exceptional basis, with the access card system described in Section

6-1.16.B [*Security and Alarm*] of Schedule 5 [*D&C Performance Requirements*];  
and

- (iii) to request and revoke access permissions for Project Co personnel, and third parties, on both a regular and exceptional basis, with City's "C-Cure" access card system described in Section 6-1.16.D [*Security and Alarm*] of Schedule 5 [*D&C Performance Requirements*].

#### **7.4 OPERATIONS CONTROL CENTRE**

Operate a central Operations Control Centre, from which to:

- (a) manage the scheduling of all Trains;
- (b) oversee, monitor and control all On-track Vehicle movements operating on the Trackway;
- (c) issue operational restrictions to protect persons and equipment from emergent conditions on the Trackway which may impact safety;
- (d) issue track warrants, or other means of protection appropriate to the work being undertaken, to persons that require occupancy of the Trackway for inspections and Maintenance of the System or for any other reason;
- (e) optimize Train operations during Passenger Service disruptions;
- (f) dispatch Project Co Persons to perform remedial actions in response to failures within the System;
- (g) provide support of Helpdesk activities;
- (h) coordinate interactions between all staff identified in the Operations and Maintenance Staffing and Training Plan while engaged in performing Operations and Maintenance of the System;
- (i) coordinate interactions with all third parties engaged in performing Operations and Maintenance of the System or other infrastructure in close proximity to the System;
- (j) monitor security alarming, including door intrusion detection and security motion detection for the facilities identified in Section 6-1.16.B [*Security and Alarm*] of Schedule 5 [*D&C Performance Requirements*] and respond in accordance with the Operating Period Security Program;
- (k) communicate with the City, Emergency Services and other persons as necessary to:
  - (i) organize and direct responses to failures and emergencies;
  - (ii) coordinate System activities with Emergency Services personnel; and
  - (iii) coordinate System Operations with the City during Passenger Service disruptions;

- (l) provide information to Passengers during normal operations, failures and in emergencies in accordance with the requirements of Section 7.8 [*Passenger Information*] of this Schedule;
- (m) monitor and operate the Traction Power System by means of the Traction Power SCADA system;
- (n) operate the Building SCADA system to centrally monitor and respond to conditions within the Building Structures;
- (o) monitor and coordinate System access requirements for Project Co Persons, City Persons and third parties as required from time to time;
- (p) monitor and log the System's operational performance;
- (q) coordinate Infrastructure work to accommodate Over-Dimensional Vehicle movements pursuant to Section 7.5 [*High Load Corridor*] of this Schedule; and
- (r) perform all other roles and duties identified in the System Safety Program.

**7.5 HIGH LOAD CORRIDOR**

- (a) The City shall assist Project Co to obtain a "Generic Restriction", as identified in the Government of Alberta's TRAVIS system, which is referenced by transportation carriers when requesting permits for the movement of Over-Dimensional Vehicles. Project Co shall keep its Generic Restriction current throughout the Term.
- (b) Upon request by a transportation carrier for the movement of an Over-Dimensional Vehicle through the High Load Corridor, Project Co shall:
  - (i) notify the City within 1 Business Day of receiving the request;
  - (ii) subject to both parties acting reasonably, within 2 Business Days of the request, reach agreement with the transportation carrier on a date and time, outside of the Operating Hours, to remove all Infrastructure and any Temporary Works that causes an obstruction to the Over-Dimensional Vehicle within the High Load Corridor in accordance with the requirements of Section 1-2.9 [*High Load Corridor*] of Schedule 5 [*D&C Performance Requirements*]; and
  - (iii) at the date and time agreed in accordance with Section 7.5(b)(i) [*High Load Corridor*], remove the Infrastructure and any Temporary Works that causes obstruction to the Over-Dimensional Vehicle to allow the movement to occur, and then reinstate the Infrastructure and any Temporary Works in accordance with of Section 1-2.9 [*High Load Corridor*] of Schedule 5 [*D&C Performance Requirements*].
- (c) Project Co shall be responsible to seek recovery of the actual costs incurred to permit the movement of the load directly from the transportation carrier.

## 7.6 EXTERNAL ADVERTISING ON LRVS

- (a) Upon request from the City, provide access to an LRV within a temperature controlled, clean and generally dust free location, either in the storage building or maintenance building, at the Gerry Wright OMF for the City's application of external advertising vinyls.
- (b) The LRV and vehicle bay shall be available for a period of 48 consecutive hours, between the end of PM Peak on a Friday and the start Passenger Service on the subsequent Monday.
- (c) the City may request access pursuant to Section 7.6(a) [*External Advertising on LRVs*] of this Schedule, on up to 30 occasions within each Service Year, and will coordinate these requests so as not to occur when Special Events will place large demands on the LRV fleet.
- (d) LRVs with external advertising shall not be kept out of Passenger Service for more than 13 consecutive days to the extent the LRV is in full operational mode and safe for Passenger service. LRVs identified for major rehabilitation in the Five Year Maintenance Plan shall not be targeted by the City for application of external advertising, for the periods identified in the Five Year Maintenance Plan. The City will also exclude LRVs from the provisions of this subsection if involved in a major accident.

## 7.7 LOST AND FOUND

Provide a "lost and found" for the System, such that all:

- (a) lost property found on the System is stored in a secure location, and an electronic inventory kept of the contents;
- (b) reports of lost property as reported by the public are electronically recorded;
- (c) members of the public making "lost and found" inquiries are directed to contact ETS to recover lost property;
- (d) reports of lost property are shared with the ETS central lost property office on a daily basis; and
- (e) lost property is delivered to the ETS central lost property office within 48 hours of being found.

## 7.8 PASSENGER INFORMATION

- (a) Schedule information shall be provided to the City in HASTUS compatible file format.
  - (i) Provide updated schedule information to the City each time a change is made to the standard weekly schedule.
- (b) Passenger information systems and facilities throughout the System shall be operated and maintained such that Passenger information is accurate and current, readily accessible to all Passengers and maintained so as to be clearly visible and legible under all conditions of artificial and natural light.



### 7.8.1 Information on Stops and Stations

- (a) Variable Message Signs at Stops, Stations and the Churchill Connector shall only display transit related information and other messages instructed by the City. At each Stop, Station, and in the Churchill Connector, each VMS shall display the following information:
- (i) first Passenger Service Train arrival time (accurate to within 30 seconds of the actual Train arrival);
  - (ii) first Passenger Service Train arrival Track and direction;
  - (iii) first Passenger Service Train destination;
  - (iv) first Passenger Service Train consist length;
  - (v) second Passenger Service Train arrival time (accurate to within 120 seconds of the actual Train arrival);
  - (vi) second Passenger Service Train arrival Track and direction;
  - (vii) second Passenger Service Train destination; and
  - (viii) second Passenger Service Train consist length.
- (b) At the Terminus Stops, each VMS shall display first and second Train departure track and departure time information rather than arrival times.
- (c) Upon the occurrence of any disruption to the Passenger Service, or operation of ETS services, the VMS shall be caused to display additional information about the Valley Line or information about ETS services as requested by the City.
- (d) The Public Address system at Stops, Stations and in the Churchill Connector shall:
- (i) have a sound volume not exceeding the levels required by Section 6-1.21.3 *[Public Address]* of Schedule 5 *[D&C Performance Requirements]* or such lower volume as may be directed by the City;
  - (ii) only be used to announce transit related information or other messages instructed by the City;
  - (iii) at other than Terminus Stops, announce the arrival of each Train at the applicable Stop or Station 30 seconds prior to Train arrival, and again at the time of Train arrival, and include the arrival Track and destination of the next approaching Train;
  - (iv) at Terminus Stops, announce the Train departure Track, departure time and destination of each Train, 120 seconds prior to and 30 seconds prior to the time of Train departure; and
  - (v) where two Trains are arriving or departing at the same time, the announcements shall be staggered to avoid simultaneous message announcements.

## 7.8.2 Information on LRVs

- (a) Each LRV internal VMS shall alternately display the Train destination and the next Stop or Station.
- (b) Each LRV on-board PA system shall announce details of the Train's destination and the next Stop or Station. This information shall be repeated:
  - (i) upon departure of each Stop and Station;
  - (ii) 30 seconds prior to arrival at each Stop and Station unless otherwise directed not to announce by the City; and
  - (iii) upon arrival at each Stop and Station.
- (c) Upon the occurrence of any disruption to Passenger Service, or operation of ETS services, additional information pursuant to the protocol set out in Section 7.2.6.2 [*Service Disruption Announcements*] of this Schedule shall be announced via the on-board PA system.
- (d) Only transit related information or other messages, as instructed by the City, may be announced or displayed on the LRV PA/VMS systems.
- (e) All external VMS shall, as a minimum, display the Train destination.

## 7.9 CUSTOMER SATISFACTION AND SYSTEM QUALITY SURVEYS

- (a) Prepare and submit to the City for its review in accordance with Schedule 2 [*Submittal Review Procedure*], no later than 160 days prior to the Target Service Commencement Date, a program of surveys that complies with this Section 7.9 [*Customer Satisfaction and System Quality Surveys*] of this Schedule (collectively, the "**Customer Satisfaction and System Quality Surveys**").
- (b) The Customer Satisfaction Surveys and System Quality Surveys shall be conducted by an independent market research firm acceptable to the City acting reasonably and retained by Project Co.

### 7.9.1 Customer Satisfaction Surveys

- (a) Customer Satisfaction Surveys shall be conducted annually, within 60 days of the anniversary of the Service Commencement Date.
- (b) Surveys and survey methods shall be designed so as to capture sufficient input from a broad spectrum of Valley Line users at various times of day so as to provide a representative sample of all System users;
- (c) Design the Customer Satisfaction Surveys to measure System users' perception of the following key aspects of the Valley Line:
  - (i) the overall performance of the System;

- (ii) Project Co staff;
  - (iii) the safety of the System;
  - (iv) the quality and availability of information about the System; and
  - (v) the overall user experience.
- (d) Include standard questions to identify the demographics of the respondents.
  - (e) Amend the Customer Satisfaction Survey questions annually to improve upon the usefulness and quality of the data obtained and to address any identified shortcomings.
  - (f) Include questions as directed by the City acting reasonably.

### **7.9.2 System Quality Surveys**

- (a) System Quality Surveys shall be carried out monthly.
- (b) Design a "Mystery Shopper" survey to assess the conformance of the System to the O&M Requirements.
- (c) Include as a minimum:
  - (i) the accuracy and completeness of information provided via the VMS and PA systems;
  - (ii) the availability of Project Co staff as required;
  - (iii) the cleanliness of Stops and Stations;
  - (iv) the cleanliness of other areas of the System; and
  - (v) the effectiveness of the Winter Maintenance Strategy.
- (d) Record and report trends identified by the System Quality Surveys and utilize the findings to adjust Operations or Maintenance Plans to resolve issues or negative trends.

### **7.10 THIRD PARTY MAINTENCE REQUIREMENTS**

- (a) Accommodate reasonable third party requests to permit the maintenance of buildings and infrastructure and Other Works which are adjacent to or above the System. As a minimum:
  - (i) advise third parties of the occupational health and safety requirements of Project Co as they relate to the System; and
  - (ii) isolate OCS outside of the Operating Hours to accommodate access when requested.

## 8. REMOTE DATA QUERIES

- (a) Prepare and submit a remote data query plan to the City for its review in accordance with Schedule 2 *[Submittal Review Procedure]*, not later than the 8 months prior to the Target Service Commencement Date, that describes:
  - (i) each system for which remote data access functionality, including user configurable querying and report generation is required pursuant to this Agreement;
  - (ii) how security of the information contained within these databases will be managed;
  - (iii) the physical or logical connectivity requirements with the City's corporate IT network;
  - (iv) the process for the City to request remote access to this information; and
  - (v) the procedures for ensuring remote access permissions are periodically reviewed by both Project Co and City and renewed as appropriate.
- (b) All information subject to remote access shall be stored in secure files behind a firewall.
- (c) All reports and queries shall be remotely accessible from industry standard computing devices on the City's corporate IT network and without the need of additional proprietary software.
- (d) Performance and response times of the report and query generation shall be consistent with Good Industry Practice.
- (e) Security for remotely accessing data by City shall be managed by Project Co on a per City Person basis, upon request by the City; such that:
  - (i) data access shall be read only;
  - (ii) user login password resets shall be required every 60 days; and
  - (iii) records shall kept of all database access attempts.
- (f) Provide remote user configurable query and report generation functionality, such that:
  - (i) reports shall be user configurable to be automatically generated in .pdf format, and automatically downloaded or forwarded by email, or other such means, on a periodic interval, using "pre-canned" report templates, user queries, saved queries, or combinations thereof;
  - (ii) queries shall be formed using a variety of methods, including:
    - (A) named queries;
    - (B) templates; and

- (C) context-based (source-based);
- (iii) execution of queries shall support the following functions:
  - (A) undo/redo;
  - (B) scratchpad;
  - (C) caching queries and results of queries;
  - (D) status messaging e.g. # items found, % query completion; and
  - (E) copy/paste;
- (iv) query results shall be capable of being remotely downloaded and saved in readable file formats, including:
  - (A) .mdb (if source data resides in a relational database);
  - (B) .accdb (if source data resides in a relational database);
  - (C) .csv;
  - (D) .xls; and
  - (E) .txt.
- (g) Requests by City for remote data access shall not to be unreasonably withheld or delayed.

## **9. MAINTENANCE REQUIREMENTS**

### **9.1 GENERAL**

Project Co shall conduct all Maintenance, including Custodial Maintenance, Reactive Maintenance, Corrective Maintenance, Preventative Maintenance, and Overhaul Maintenance on the System so as to ensure, in accordance with the relevant provisions of the O&M Requirements:

- (a) safety of the System;
- (b) reliability of the System;
- (c) compliance with the Maintenance Plans described in Section 9.4 [*Maintenance Plans*] of this Schedule, and as updated throughout the Operating Period;
- (d) the Availability of the System, including all Stops, Stations and other facilities and systems;
- (e) the Remaining Useful Life of each component of the System at any given time is in accordance with Appendix 7-A [*Handback Requirements*] of this Section;

- (f) that at any given time the System will be capable of operating safely, with ongoing Maintenance in accordance with the Maintenance Plans described in Section 9.4 [*Maintenance Plans*] of this Schedule;
- (g) the System and all System components are maintained so as to comply with all applicable requirements of this Agreement, including the Schedule 5 [*D&C Performance Requirements*] and the Schedule 7 [*O&M Performance Requirements*];
- (h) compliance with the Integrated Pest Management Plan as updated throughout the Operating Period;
- (i) that except as required to perform snow clearing, the Shared Use Path across the Kâhasinîskâk Bridge shall be Available, in accordance with Section 1-3.1.6 [*Bridge Closure Constraints*] of Schedule 5 [*D&C Performance Requirements*], from the issuance of the Certification of Completion of Kâhasinîskâk Bridge SUP to the Expiry Date, with the exception of a single contiguous maintenance period not to exceed one week; and
- (j) that except as required to perform snow clearing, the Shared Use Path across the Tawatinâ Bridge shall be Available, in accordance with Section 1-3.1.6 [*Bridge Closure Constraints*] of Schedule 5 [*D&C Performance Requirements*], from the issuance of the of Tawatinâ Bridge SUP Completion Certificate to the Expiry Date, with the exception of a single contiguous maintenance period not to exceed one week.

## 9.2 INSPECTION NOTIFICATIONS

- (a) Without limiting, and in addition to, all other reporting or notification requirements described elsewhere in this Agreement, provide the City with five days' notice of all inspection and testing activities with a scheduled interval of 12 months or more.
- (b) The City's Representative and its delegates, subject to complying with all relevant safety procedures, including any relevant health and safety plans for the Operating Period and Project Co's reasonable site rules, may elect to:
  - (i) attend the Site and observe the inspection and testing; and
  - (ii) complete inspection and testing concurrently with Project Co's inspection and testing, provided they do not disrupt Project Co's activities.

## 9.3 GENERAL PERMITTING

- (a) Project Co shall be responsible for obtaining all Project Approvals required in order to carry out the Maintenance of the System.
- (b) For all Maintenance which requires inspectors, workers or equipment to be on, or in close proximity to, Roadways, comply with the City's *Procedures for On Street Construction Safety*. As required, *On Street Construction and Maintenance* (OSCAM) permits or other permissions shall be obtained through the City's normal procedures.

#### 9.4 MAINTENANCE PLANS

- (a) Prepare and submit each of the Maintenance Plans described in Sections 9.4 [*Maintenance Plans*], 9.5 [*Winter Maintenance*] and 9.6 [*Custodial Maintenance Plan*] of this Schedule to the City for its review in accordance with Schedule 2 [*Submittal Review Procedure*].
- (b) Project Co shall prepare Maintenance Plans and shall submit draft Maintenance Plans for review and comment by the Operating Period Joint Committee prior to formal submission of such Maintenance Plans to the City.

##### 9.4.1 Overall Maintenance Strategy Submittal

- (a) Project Co, in consultation with the Design-Builder and the Service Provider, shall prepare and submit an overall Maintenance strategy pursuant to Section 9.4.3 [*Overall Maintenance Strategy*] of this Schedule (the "**Overall Maintenance Strategy**"), not later than the following times prior to the Target Service Commencement Date:
  - (i) 180 days for a draft version; and
  - (ii) 90 days for a final version,

provided that the City's time for review under Schedule 2 [*Submittal Review Procedure*] shall be 30 days for the draft version.

##### 9.4.2 Five Year Maintenance Plan Submittal

- (a) Project Co, in consultation with the Design-Builder and the Service Provider, shall prepare and submit a five year Maintenance plan pursuant to Section 9.4.4 [*Five Year Maintenance Plan*] of this Schedule (the "**Five Year Maintenance Plan**"), for the first 5 years of the Operating Period not later than the following times prior to the Target Service Commencement Date:
  - (i) 180 days for a draft version; and
  - (ii) 90 days for a final version.
- (b) For each Service Year after the Service Commencement Date (commencing with the second Service Year following the Service Commencement Date), Project Co shall, in consultation with the Service Provider, prepare and submit a:
  - (i) draft Five Year Maintenance Plan for the next 5 year period, not later than 60 days prior to the start of each Service Year; and
  - (ii) a final Five Year Maintenance Plan for the next 5 year period, not later than 30 days prior to the start of each Service Year;

### 9.4.3 Overall Maintenance Strategy

- (a) The Overall Maintenance Strategy shall outline Project Co's approach to scheduling and performing all Maintenance that is required to ensure compliance with Section 9.1 *[General]* of this Schedule, and all other Project Requirements.
- (b) The Overall Maintenance Strategy shall include:
  - (i) Project Co's approach to maintaining the System so as to meet the *Design and Construction Requirements*, including the SUI requirements set out in Part 2 *[Sustainable Urban Integration]* of Schedule 5 *[D&C Performance Requirements]* throughout the Operating Period;
  - (ii) Project Co's organizational structure as it relates to Maintenance staff;
  - (iii) identification of Maintenance tasks to be outsourced to third parties;
  - (iv) a description of Project Co's procedures for:
    - (A) monitoring the condition of the System, and the key assets, in order to identify the need for Maintenance;
    - (B) logging Reactive Maintenance requests and assigning work to appropriately qualified individuals; and
    - (C) carrying out Reactive Maintenance and Corrective Maintenance within the applicable rectification period;
    - (D) a list of what Critical Spares will be inventoried and the applicable time for their replacement when used;
  - (v) a description of how Maintenance activities will be managed to ensure compliance with the requirements of Section 3 *[Maintenance and Asset Management, Monitoring and Reporting]* of this Schedule;
  - (vi) the inspection intervals for all System assets for which the inspection intervals are not specified in Section 10 *[Asset Specific Maintenance Requirements]* of this Schedule;
  - (vii) the inspection methodology and the qualifications required for the individuals undertaking such inspections for all System assets for which specific requirements and qualifications are not specified in Section 10 *[Asset Specific Maintenance Requirements]* of this Schedule;
  - (viii) how inspection results which conclude a need for Maintenance are to be addressed;
  - (ix) how and within which time intervals will inspection results be recorded and associated to each asset in the Asset Register;
  - (x) how inspection results will be analyzed and used to revise the subsequent Five Year Maintenance Plans;



- (xi) an outline of the approach to scheduling and carrying out Preventative Maintenance and Overhaul Maintenance during the Operating Period;
- (xii) a description of the forms of protection that will be required to safely perform the Maintenance and inspection activities;
- (xiii) a description of the approach to ensuring full compliance of Section 10 [*Asset Specific Maintenance Requirements*] of this Schedule;
- (xiv) the planned frequency of all Maintenance activities, broken down by System asset;
- (xv) a detailed management plan for any obsolescence issues such as bulk purchase, alternative suitable components or component re-design, to avoid disruption to Passenger Service caused by obsolescence issues;
- (xvi) the approach to carrying out all Maintenance so as to avoid possible disruption to Passenger Service;
- (xvii) the approach for interfacing to the City's traffic department for Maintenance activities associated with Traffic Signals pursuant to Section 10.9 [*Traffic Signals*] of this Schedule;
- (xviii) the approach to addressing the requirements defined in Section 9.5.1. [*Winter Maintenance Strategy*] of this Schedule; and
- (xix) the approach to identifying and obtaining all Project Approvals required for performance of Maintenance, including OSCAM permits, where applicable;
- (xx) the approach to maintenance of landscaping, which shall be based upon the principles of *City of Edmonton Design and Construction Standards: Volume 5 – Landscaping, 2013* and as a minimum, include specific requirements for soils, Structural Soil Cells, mulches, tree root barriers, plantbed edging, irrigation, landscape sub-drainage, plant materials and seed and sod areas;
- (xxi) the approach to addressing the requirements of Section 1.23 (11) [*Environmental Matters Specific to Operating Period*] of Schedule 10 [*Environmental Performance Requirements*]; and
- (xxii) an outline of the anticipated Overhaul Maintenance for all significant System assets for their entire Design Service Life, including periods of time beyond the Expiry Date.

#### **9.4.4 Five Year Maintenance Plan**

- (a) Each Five Year Maintenance Plan shall include details and scheduling of all planned inspections and the Preventative Maintenance and Overhaul Maintenance to be carried out over the following five year period.

- (b) The Five Year Maintenance Plan shall also identify how the planned activities relate to the Overall Maintenance Strategy.
- (c) During the last four years of the Operating Period, the applicable Five Year Maintenance Plan shall set out the recommended Maintenance to be performed in the years after the Expiry Date.
  - (i) The requirements for Preventative Maintenance shall be generally consistent with the previous years' and should not show a substantial increase in the need for labour hours or cost.
  - (ii) The requirements for Overhaul Maintenance shall be generally in accordance with the actual cycles during the Operating Period. All changes which result in increased Overhaul Maintenance in the five years following the Expiry Date shall be justified by Maintenance records over the Term.
- (d) The Five Year Maintenance Plan shall be a rolling plan covering the next five Service Years. It shall include most detail on the first year of the period and shall include:
  - (i) a review of all Maintenance activities carried out during the previous Service Year with identification of all activities which were scheduled but not completed;
  - (ii) a root cause analysis with respect to each instance of Reactive Maintenance and Corrective Maintenance carried out within the previous Service Year and identification of remedial actions to eliminate such causes;
  - (iii) the findings of any inspections which recommend additional inspections, Corrective Maintenance or revisions to the Preventative Maintenance schedule included in the then current Five Year Maintenance Plan;
  - (iv) a schedule of planned inspections with all changes from the previous Five Year Maintenance Plan identified along with the reason for the alteration;
  - (v) a schedule of all Preventative Maintenance and Overhaul Maintenance planned over the following five year period in view of the expected Service Levels based upon the previous Service Years' ridership and LRV loading factors and with changes from the previous Five Year Maintenance Plan identified along with the reason for the alteration;
  - (vi) an overview of the time, date, duration and anticipated impact of all planned Passenger Service disruptions required to carry out inspection or Maintenance activities;
  - (vii) detailed proposals for all planned Passenger Service alterations or disruptions which are required to carry out the scheduled activities in the first year of the period to allow ETS to schedule replacement bus services;
  - (viii) all Landscape Maintenance Plans for the first year of the period;

- (ix) a schedule of System Ride Quality monitoring in accordance with the requirements of Section 10.2 [*Ride Quality Monitoring*] of this Schedule for the first year of the period;
  - (x) the schedule and location of Noise and Vibration Monitoring, acceptable to the City acting reasonably, in accordance with the requirements of Section 10.3 [*Noise and Vibration Monitoring*] of this Schedule for the first year of the period; and
  - (xi) dates and durations that Passenger Service will be suspended to allow major maintenance activities to take place which will require the City to provide replacement bus services.
- (e) As part of the development of each Five Year Maintenance Plan, review and update as necessary the Design Management Plan and all associated sub-plans as required by Section 6.4 [*Design Management Plan*] of Schedule 4 [*Design and Construction Protocols*].

## 9.5 WINTER MAINTENANCE

- (a) Project Co shall work co-operatively with the City in the preparation of a winter Maintenance strategy, addressing all the requirements of this Section 9.5 [*Winter Maintenance*] and which shall form part of the Overall Maintenance Strategy, (the "**Winter Maintenance Strategy**"). A draft version shall be submitted for review and comment by the Operating Period Joint Committee prior to formal submission of such Winter Maintenance Strategy to the City.
- (b) Project Co shall prepare and submit a Winter Maintenance Strategy not later than the following times prior to the Target Service Commencement Date:
- (i) 180 days for a draft version; and
  - (ii) 90 days for a final version.
- provided that the City's time for review under Schedule 2 [*Submittal Review Procedure*] shall be 30 days for the draft version.
- (c) Winter maintenance shall be planned and carried out to ensure:
- (i) Passenger Service can be delivered in accordance with the requirements of Section 5 [*Service Requirements*] of this Schedule;
  - (ii) Passenger facilities are, safe, accessible and clear of snow and ice in accordance with Table 10.1 [*Stops and Stations Deficiencies*] of this Schedule; and
  - (iii) no disruption is caused to adjacent facilities or infrastructure.
- (d) Project Co shall be responsible for snow and ice control for:
- (i) the whole of the System;

- (ii) the Roadways in the following areas:
  - (A) 102 Avenue from the western curb line of 103 Street to the northwestern curb of Jasper Avenue;
  - (B) 95 Avenue from the northern curb line of Connors Road to the western curb line of 85 Street; and
  - (C) 83 Street from the southern curb line of Whyte (82) Avenue to the north curb line of Argyll Road; and
- (iii) all Passenger Interface Equipment.
- (e) For the areas identified in 9.5(d)(ii) [*Winter Maintenance*] of this Schedule, Project Co shall remove snow transferred from sidewalks by the City or any other Person onto the adjacent Roadways or Trackway.

**9.5.1 Winter Maintenance Strategy**

- (a) The Winter Maintenance Strategy shall identify protocols and methods for preventing snow and ice build-up on the System so as to:
  - (i) maintain walkable surfaces to prevent accumulation of more than 3cm of snow and with no ice build-up which forms a Hazard to Passengers and other users of the System during the Operating Hours specified in Section 5.1 [*Operating Hours*] of this Schedule;
  - (ii) prevent disruption to Passenger Service;
  - (iii) maintain emergency evacuation routes in compliance with the System Safety Program;
  - (iv) ensure that all Platform Access Points are safe for use by Passengers during the hours specified in Section 5.1 [*Operating Hours*] of this Schedule;
  - (v) ensure that Platforms provide safe access to all facilities with which Passengers need to interface and to provide safe boarding of Trains;
  - (vi) ensure that Passenger facilities, forming part of the System, on the Stops and Stations are functioning as intended;
  - (vii) prevent snow or ice falling from roofs or Structures;
  - (viii) ensure that the bus bays and at least 80% of the parking stalls at the Davies Transit Centre and Davies Park 'n' Ride are Available at all times; and
  - (ix) keep bus loading areas and pedestrian access ways at the Davies Transit Centre maintained to the same level as required for Stop and Station accesses.
- (b) At Davies Park'n'Ride, any parking stalls used for either snow storage or other Maintenance activities shall be deemed to be not Available.

- (c) No snow or ice from Trackway may be transferred to or stored on:
  - (i) roads, Trackway crossings, sidewalks or Shared Use Paths;
  - (ii) shrub bed areas;
  - (iii) areas with tree plantings; or
  - (iv) Naturalization Areas or Native Forest Restoration Areas.
- (d) Snow and ice control on Roadways shall be carried out in accordance with the City's *Snow and Ice Control Policy, C409* and the *Community Standards Bylaw #14600*. In accordance with C409, 102 Avenue, 95 Avenue and 83 Street shall be considered Priority 1. When ploughed, each Roadway shall have a clear lane width of at least 3.3m.
- (e) Procedures shall be developed to prevent the release into water bodies of deleterious substances including salt/grit, associated with snow and ice control. The plan shall be compliant with all requirements of the *Environment Canada – Code of Practice for the Environmental Management of Road Salts*.
- (f) Damage to the City's Roadway infrastructure, or other property, caused by Project Co's winter maintenance activities, shall be the responsibility of Project Co. and roadway condition assessments shall be carried out jointly by Project Co and the City, on the Roadways identified in Section 9.5(d)(ii) [*Winter Maintenance Strategy*].
  - (i) The assessments shall take place:
    - (A) in the fall (between September 15 and September 30), of each year to identify the pre-winter condition of the City's infrastructure; and
    - (B) be repeated the following spring (between May 1 and May 15), to identify any damage caused.
  - (ii) The assessments shall include all Infrastructure, as required by either party.
  - (iii) The condition of the paved surface on 102 Avenue shall be included in all 102 Avenue condition assessments.

## 9.6 CUSTODIAL MAINTENANCE PLAN

### 9.6.1 General Requirements

- (a) Project Co shall produce and comply with a custodial Maintenance plan which shall form part of the Overall Maintenance Strategy and shall specify the frequency and levels of cleaning to be provided in order to achieve the requirements of this Section 9.6 [*Custodial Maintenance*] of this Schedule, (the "**Custodial Maintenance Plan**").
- (b) Carry out a program of Custodial Maintenance so that the System exhibits a neat and attractive appearance to Passengers at all times.
- (c) All parts of the System, including:

- (i) Building Structures;
- (ii) Transportation Structures;
- (iii) Trackway;
- (iv) Stops and Stations;
- (v) LRVs;
- (vi) Davies Transit Centre;
- (vii) Davies Park 'n 'Ride;
- (viii) Utility Complexes;
- (ix) Gerry Wright OMF, with the exception of the City Office;
- (x) Public Art, subject to limitations described in Section 9.6.6 [*Public Art*] of this Schedule and based on a maintenance plan for each artwork provided by the City immediately after the installation of the applicable artwork,, and
- (xi) landscaped areas,

and all Passenger Interface Equipment, shall be kept substantially free from the accumulation of litter, dirt and debris.

- (d) The external appearance of the System shall be maintained in compliance with Section 2 [*Sustainable Urban Integration*] of Schedule 5 [*D&C Performance Requirements*].
- (e) Spare parts, materials and equipment required for any Maintenance, shall not be stored in places along the Project corridor which are visible to the public.
- (f) Review the Custodial Maintenance Plan regularly and modify it if the required level of cleanliness is not being achieved.
- (g) Subject to more stringent requirements at Stops or Stations in accordance with Table 10.1 [*Stops and Station Deficiencies*], and on LRVs in accordance with Table 10.17.2 [*LRV Deficiency List*], keep the System clear of any debris or similar which is a public safety issue or biohazard.

### **9.6.2 Passenger Areas**

Ensure that the following elements of Custodial Maintenance are provided for passenger areas:

- (a) Passenger Service cleaning, which may be performed during Passenger Service each day and shall include:
  - (i) dry wiping and dusting of enclosed areas;
  - (ii) litter/debris sweeping;

- (iii) mopping of spills of water or other liquids in internal areas;
  - (iv) inspection and cleaning of washrooms;
  - (v) emptying of garbage containers before they become full;
  - (vi) replenishment of washroom supplies; and
  - (vii) other activities that do not impact on Passenger Service or inconvenience Passengers.
- (b) Other regular cleaning at intervals defined in the Custodial Maintenance Plan, which shall include complete and thorough cleaning of public areas that are normally performed outside of the Operating Hours, and shall include:
- (i) sweeping and mopping;
  - (ii) window/door/wall washing;
  - (iii) floor stripping and waxing;
  - (iv) cleaning escalator cladding;
  - (v) cleaning elevators;
  - (vi) gum removal;
  - (vii) graffiti removal;
  - (viii) poster removal; and
  - (ix) heavy cleaning to include power washing and other such periodic activities that require machinery, special cleaners or methods.

### **9.6.3 Trackways, Parking Lots, Other Public Areas**

Remove litter on all sections of Trackway in Stops and Stations, parking lots and other public areas (whether segregated or not) on a weekly basis. Other section of Trackway shall have litter removed at least monthly.

### **9.6.4 Graffiti and Posters**

Graffiti, vandalism, unauthorized posters, and other defacements shall be removed within 48 hours or in accordance with the requirements in Section 10 [*Asset Specific Maintenance Requirements*] of this Schedule, if more stringent. Offensive graffiti shall, as a minimum, be covered within 12 hours of its identification except for offensive graffiti at Stops or Stations which must be covered within 4 hours of its identification.

### **9.6.5 LRVs**

- (a) The interior of all LRVs shall:

- (i) prior to entering Passenger Service each day, be in a condition such that:
    - (A) advertisements, information panels, walls, floors, and glass are clean, graffiti and poster free and in good condition;
    - (B) panels are properly latched, locked and secured;
    - (C) all doors, HVAC, and lighting are operational;
    - (D) seats are clean and free from tears in upholstery or other defects that would deter a Passenger from using it; and
    - (E) all floors, ceilings, windows, doors, stanchions, handholds and seats are free of dirt, graffiti and litter; and
  - (ii) during Passenger Service, be checked at regular intervals to ensure that they are free of accumulated litter and liquid spills. When litter or liquid spills are discovered they shall be collected or cleaned up when the Train completes the next round Trip.
- (b) The exterior of all LRVs shall:
- (i) on entering Passenger Service each day, be clean, graffiti free and in good condition with equipment covers properly latched, locked and secured;
  - (ii) be cleaned at intervals no greater than every 72 hours to remove dirt accumulated during normal operating conditions; and
  - (iii) have dirt or soil that accumulates due to extraordinary conditions removed on a daily basis within 24 hours of being discovered.

**9.6.6 Public Art**

- (a) Project Co shall notify the City of graffiti, vandalism, unauthorized posters, and other defacements on Public Art within 8 hours of discovery or notification. No attempt shall be made by Project Co to remove, repair or cover graffiti, vandalism, unauthorized posters or other defacements on Public Art.

**10. ASSET SPECIFIC MAINTENANCE REQUIREMENTS**

**10.1 STOPS AND STATIONS**

- (a) Upon identifying, or being notified, of a Deficiency at a Stop or Station or the Churchill Connector, the following procedures shall apply.
  - (i) The time elapsed between the identification or notification of a Deficiency and its rectification, or having the applicable "Acceptable Mitigation Procedure" identified in Table 10.1 [*Stops and Stations Deficiencies*] in place shall not exceed the limits as specified in Table 10.1 [*Stops and Stations Deficiencies*] below or with the Incident Management and Service Recovery Plan if not specified in Table 10.1 [*Stops and Stations Deficiencies*].



- (ii) For the allocation of NPE points in accordance with Appendix 3 [*Non-Performance Event Points and Default Points*] of Schedule 16 [*Payment Mechanism*], defects shall be categorized as either:
  - (A) Critical – where the Deficiency leads to significant risk to public health or has a severe impact on the security or operability of the System;
  - (B) Urgent – where it is important that the Deficiency is addressed in a timely manner; or
  - (C) Routine – when the Deficiency is of a common nature.
- (iii) For Deficiencies not listed in Table 10.1 [*Stops and Stations Deficiencies*] Project Co shall agree a response plan with the City who shall categorize the Deficiency as critical, urgent or routine on the following basis:
  - (A) For Deficiencies identified by Project Co's initial risk assessment, in accordance with Section 7.2.6 (a) [*Incident Management and Service Recovery Plan*], the City shall inform Project Co of their categorization for inclusion in the final version of the Incident Management and Service Recovery Plan; or
  - (B) For Deficiencies identified during the Operating Period, Project Co shall inform the City of the identification of the new Deficiency and the proposed response plan. Each Deficiency identified shall be added to the Incident Management and Service Recovery Plan at the subsequent update in accordance with Section 7.2.3 (b) [*Incident Management and Service Recovery Plan Submittal*].

**Table 10.1 – Stops and Stations Deficiencies**

<b>Deficiency</b>	<b>Priority</b>	<b>Rectification or Mitigation Response Time</b>	<b>Acceptable Mitigation Procedure</b>
Failure to commence snow clearing of any Stops and Stations after the start of accumulating snow fall	Critical	Within 1 hour	N/A
Failure to clear all Stops and Stations to bare surface after the end of accumulating snow fall	Critical	Within 4 hours	N/A
Interruption to CCTV camera coverage of any part of a Platform required for safety reasons by the Safety Management Plan	Urgent	Within 4 hours	Project Co Person present on Platform if field of view is impaired.
Surveillance System failure (one or more Stops or Stations without coverage)	Critical	Within 1 hour	Project Co Person present at each affected Stop or Station.

<b>Deficiency</b>	<b>Priority</b>	<b>Rectification or Mitigation Response Time</b>	<b>Acceptable Mitigation Procedure</b>
Elevator out of service	Critical	Within 30 Minutes	Provide alternate mitigations for mobility challenged persons which may include: a) transportation to or from the affected location to an adjacent Stop or their destination; b) at Davies Station provide assistance to allow mobility impaired passengers to reach the correct platform, the Transit Centre or the parking areas; or c) at the Churchill Connector, provide assistance using or direction to another elevator to reach the Churchill Station mezzanine level.
Passenger emergency phone failure ("blue light phone" failure)	Critical	Within 1 hour	If more than one emergency phone present at Platform it is sufficient to 'bag' the defective phone until repaired. If no other working phone is Available at a Platform then a Project Co Person must be present at the Stop or Station.
Public Address system failure	Urgent	Within 2 hours	Project Co Person present at each affected Stop or Station to communicate urgent messages to Passengers.
Variable Message Display failure	Urgent	Within 48 hours	N/A
Stop Shelter temperature below specified minimum requirements	Urgent	Within 4 hours	N/A
One light fixture failure at a Stop or Station public facility	Routine	Within 72 hours	N/A
Greater than 20% of lights failed at one Stop or Station	Critical	Within 4 hours	Provide temporary lighting of equivalent illuminance, secured to prevent injury to Passengers.
Floor surface adherence – spills or slipping hazards	Urgent	Within 1 hour	Hazard is sufficiently marked and cordoned off and the appropriate response team has been notified
Cleanliness – ad-hoc mess, garbage etc. which is not a public safety issue or biohazard	Routine	Within 24 hours	N/A
Cleanliness – ad-hoc mess, broken glass etc. which is a public safety issue or biohazard	Critical	Within 1 hour	Hazard is sufficiently marked and cordoned off and the appropriate response team have been notified

<b>Deficiency</b>	<b>Priority</b>	<b>Rectification or Mitigation Response Time</b>	<b>Acceptable Mitigation Procedure</b>
Fire alarm failure or Hazard which would adversely affect fire-fighting / evacuation procedures (Davies Station only)	Critical	Within 1 hour	Project Co Person present at Station to act as 'Fire Watch'
Glass – Defective glass panel requiring remediation or replacement	Urgent	Within 24 hours	N/A
Graffiti – offensive as defined in City Policy	Urgent	Covered within 4 hours – removed in accordance with requirements for non-offensive	N/A
Graffiti – non-offensive	Urgent	Removed within 48 hours	N/A
Internal temperature outside of required operating temperature window (Davies Station only)	Routine	Within 24 hours	N/A
Public & transit washrooms (Davies Station only) closed for longer than identified in the Custodial Maintenance Plan during the Operating Hours	Urgent	The time identified in the Custodial Maintenance Plan	Washrooms may be closed to the public for the time stated in the Custodial Maintenance Plan – as soon as this time is elapsed NPE points will be allocated.
Operator washrooms at Davies Station closed for longer than identified in the Custodial Maintenance Plan during the Operating Hours	Urgent	24 hours	N/A
Escalator out of service	Routine	Within 48 hours	N/A
TVM outages due to failure of the TVM Fibre Pair - Single TVM at 1 Stop or Station	Routine	Within 24 hours	N/A
TVM outages due to failure of the TVM Fibre Pair – Multiple TVMs at 1 Stop or Station	Urgent	Within 4 hours	N/A
TVM outages due to failure of the TVM Fibre Pair – Multiple TVMs at more than 1 Stop or Station	Critical	Within 2 hours	N/A

## 10.2 RIDE QUALITY MONITORING

- (a) Measure the System Ride Quality on the LRVs through ride monitoring equipment strategically located within the LRV, together with data logging equipment and the means to record the location of the LRV on the System.
- (b) Determine the positioning of the monitoring equipment on the LRV and demonstrate to the satisfaction of the City acting reasonably that there are sufficient installations located to discern Track induced vibration from LRV initiated vibrations.

- (c) The System Ride Quality results shall be measured and reported against the System Ride Quality requirements.
- (d) Measure System Ride Quality on a minimum of 3 LRVs per month on a rolling program, to be identified in the Five Year Maintenance Plan. The rolling program shall ensure that each LRV is monitored at least once in each 12 month period.

**10.2.1 Method of Measurement**

- (a) Each System Ride Quality test for each LRV shall meet the following criteria:
  - (i) each LRV shall be measured over a round trip from Mill Woods Stop to 102 Street Stop and returning to Mill Woods Stop;
  - (ii) for a measurement trip to be considered a valid representation of a normal journey, the Stop to Stop journey time shall be within 10% of the of the normal Travel Time and the LRVs must stop at all Stops and Stations;
  - (iii) the System Ride Quality shall be measured as an average rms value weighted in accordance with ISO 2631 *Mechanical vibration and shock - Evaluation of human exposure to whole-body vibration*. The results shall be presented as a value for each Stop to Stop (Station) section (from departure to arrival excluding any Dwell Time); and
  - (iv) individual accelerations shall be low pass filtered at 6 Hz. No acceleration shall exceed the following values:
    - (A) Vertical  $5.5\text{m/s}^2$ ; and
    - (B) Lateral  $3.0\text{m/s}^2$ .
- (b) The System Ride Quality test equipment shall provide test results and reports that identify the LRV and the geographical location where instances of System Ride Quality non-compliance were recorded.

**10.2.2 Monitoring and Rectification**

- (a) Monitor and record trends in peak acceleration values and System Ride Quality values to detect deterioration in the condition of the System and to identify individual defects and faults.
- (b) Where the recorded Stop to Stop (Station) rms and accelerations exceed requirements of Section 10.2.1(a)(iv) [*Method of Measurement*] of this Schedule, ride quality shall be deemed to have reached a level where the ride quality is noticeable to Passengers. Such incidents shall be recorded as a Deficiency and classified as either a LRV or Track infrastructure Deficiency, depending on the circumstances found, and Reactive Maintenance or Corrective Maintenance shall be scheduled as required.

### 10.3 NOISE AND VIBRATION MONITORING

- (a) Carry out annual noise and vibration monitoring in accordance with this Section 10.3 [*Noise and Vibration Monitoring*], (the “**Noise and Vibration Monitoring**”). Monitoring and reporting of noise and vibration shall be based upon the limits specified in Sections 1-2.1.3 [*Noise Control*] and 1-2.1.5 [*Vibration Control*] of Schedule 5 [*D&C Performance Requirements*].
- (b) Carry out all Noise and Vibration Monitoring in accordance with ISO 1996-1:2003 *Acoustics -- Description, measurement and assessment of environmental noise -- Part 1: Basic quantities and assessment procedures*.
- (c) Each noise measurement shall be performed to:
  - (i) record the dBA  $L_{\max,S}$  for the passage of 10 different LRVs on each Track, at a distance of 10 metres from centerline of Track at an elevation of 1.5m; and
  - (ii) record the mean  $L_{\text{eq},24\text{hr}}$  for each location for a period of no less than 5 days.
- (d) Carry out noise monitoring at a minimum of 5 monitoring locations along the System at locations identified in the Five Year Maintenance Plan.
- (e) Each of the following locations shall be measured once every two years as a minimum:
  - (i) the Quarters Tunnel, in proximity to the ventilation fans; and
  - (ii) a Utility Complex (staggered so all Utility Complexes are measured at least once before any one Utility Complex is measured twice);
- (f) Annually, the measurements shall include the following locations as a minimum:
  - (i) non-residential areas (1 measurement);
  - (ii) where the Track radius is less than 150m (1 measurement); and
  - (iii) in residential areas (2 measurements).
- (g) Carry out vibration monitoring at a minimum of 10 locations along the System at locations identified in the Five Year Maintenance Plan. These locations shall as a minimum include 1 of each of the locations identified in Table 1-2.1.5 [*Vibration Limits*] of Schedule 5 [*D&C Performance Requirements*]. Where access cannot be obtained to a location specified, measurements may be carried out at an alternative, nearby location which shall be agreed with the City.
- (h) The vibration measurements shall be measured during the pass-by of a minimum of 10 different LRVs on each Track, under normal operation and under conditions conducive to repeatable measurements (weather, background noise etc.) as far as is reasonably practicable, such that:
  - (i) LRV identifications and speeds shall be noted with all measurements; and

- (ii) where the measurements have been significantly affected by other vibration sources that are extraneous to the System such measurements shall be discarded and the measurement repeated.
- (i) Additional Noise and Vibration Monitoring measurements shall be scheduled within 5 Business Days upon request by the City, acting reasonably, following any public complaints that the System is not in compliance with the requirements of Sections 1-2.1.3 [*Noise Control*] and 1-2.1.5 [*Vibration Control*] of Schedule 5 [*D&C Performance Requirements*]. If additional Noise and/or Vibration monitoring is undertaken by Project Co as required under this Section 10.3(i) and such monitoring determines that the System is in compliance with the requirements of Sections 1-2.1.3 [*Noise Control*] and 1-2.1.5 [*Vibration Control*] of Schedule 5 [*D&C Performance Requirements*], then the City shall be responsible for the costs and expenses of Project Co to perform the additional Noise and Vibration Monitoring.

### **10.3.1 Monitoring and Rectification**

- (a) Monitor, record and report trends in the noise and vibration from the System.
- (b) If:
  - (i) the mean of the noise levels of the LRVs measured on any one Track is found to be 3 dB(A) or more greater than the mean measured on any previous occasion;
  - (ii) the maximum recorded airborne noise level for any LRV is found to be 3 dB(A) or more greater than the mean of the rest of the measured LRVs recorded in the same survey; or
  - (iii) the noise from Operation of the System is measured to exceed the requirements of Section 1-2.1.3 [*Noise Control*] of Schedule 5 [*D&C Performance Requirements*],

carry out further investigations or inspections to identify the cause and carry out Reactive Maintenance or Corrective Maintenance as required.
- (c) If the measured vibration generated by Operation of the System, including On-track Vehicle movements and all static sources such as HVAC systems, Quarters Tunnel ventilation fans, generators and transformers, as measured on the floor of any occupied space is found to exceed the limits set-out in Table 1-2.1.5 [*Vibration Limits*] of Schedule 5 [*D&C Performance Requirements*], then carry out further investigations or inspections to identify the cause and carry out Reactive Maintenance or Corrective Maintenance as required.

### **10.4 TRACK**

- (a) Maintenance of Track shall be in accordance with the principles of APTA Standard entitled '*Standards for Rail transit Track Inspection and Maintenance*' within Volume 5 – Fixed Structures document number *APTA RT-FS-S-002-02*.

- (b) Determine all acceptable Maintenance and wear tolerances based upon the chosen LRV and Track design parameters and justified by the wheel / rail interface studies performed during the Track Optimization Study in accordance with Section 3-1.1.2 [*Track Alignment*] of Schedule 5 [*D&C Performance Requirements*].
- (c) All acceptable and intervention tolerances and limits to ensure the safe operation of the System and to ensure Passenger comfort shall be included in the Overall Maintenance Strategy.

## **10.5 TPSS**

Traction power substation equipment shall be inspected and tested in accordance with '*Standard for Traction Electrification Substation Inspection, Maintenance and Testing*' within Volume 5 – Fixed Structures document no: *APTA RT-FS-S-004-03*.

## **10.6 OVERHEAD CONTACT SYSTEM**

- (a) OCS equipment shall be inspected and tested in accordance with '*Standard for Traction Electrification Distribution System Inspection, maintenance and testing*' Volume 5 – Fixed Structures reference number: *APTA RT-FS-S-006-03*. Additional Maintenance procedures shall be undertaken in accordance with IEEE Standard 1628-2009 entitled '*IEEE Recommended Practice for Maintenance of DC Overhead Contact Systems for Transit Systems*'.
- (b) Maintain all OCS poles and any equipment mounted on them, including street lighting fixtures where mounted on OCS poles.
- (c) Maintain all neighborhood banner support arms and permit the City to install and remove banners as necessary, provided such installation does not interfere with Passenger Service.

## **10.7 TRACTION ELECTRIFICATION STRAY CURRENT / CORROSION CONTROL**

Maintenance of the System for mitigating Stray Current and resulting corrosion shall be undertaken in accordance with the Stray Current Sub-Plan, and the APTA Standard entitled '*Standard for Traction Electrification Stray Current/Corrosion Control Equipment Inspection and Maintenance*' within Volume 5 – Fixed Structures document reference *APTA RT-FS-S-005-03*.

## **10.8 SIGNALLING EQUIPMENT**

Maintenance of all signalling equipment shall be undertaken in accordance with manufacturer instructions, and the following APTA guidance documents:

- (a) Underground power distribution systems shall be inspected and tested in accordance with '*Recommended Practice for Wayside Signal AC Owner System Inspection and Testing*' within Volume 6 – Signals & Communications document reference: *APTA RT-SC-RP-001-02*.
- (b) TCS and TRPS DC power systems, including batteries, rectifiers and DC/DC converters, shall be inspected and tested in accordance with '*Recommended Practice for Wayside*

*Signal DC Power System Inspection and Testing*, within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-002-02*.

- (c) Snow clearing devices shall be inspected and tested in accordance with *'Recommended Practice for Signal System Snow Melting Equipment Inspection and Testing'*, within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-003-02*.
- (d) Train to Wayside Equipment, including transponders, display panels, control units, antennas and interrogators shall be inspected and tested in accordance with *'Recommended Practice for Train to Wayside Communication System Inspection and Testing'* within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-008-03*.
- (e) Audio Frequency Track Circuit voltages shall be measured and recorded at a minimum interval of every one (1) month. AF Track Circuits used in Vital applications shall be inspected at a minimum interval of every six (6) months, in accordance with *'Standard for Audio Frequency Track Circuit Inspection and Maintenance'* within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-009-03*. AF Track Circuits used in Vital applications shall be tested at a minimum interval of every twelve (12) months, and be performed in accordance with *'Standard for Audio Frequency Track Circuit Inspection and Maintenance'* within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-009-03*.
- (f) Signal cable shall be inspected and tested at a minimum interval of every ten (10) years, in accordance with *'Standard for Cable Plant Inspection and Testing'* within Volume 6 – Signals and Communications document reference *APTA RT-SC-S-011-03*.
- (g) Signal Wayside Equipment Enclosures shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with *'Recommended Practice for signal Equipment Room Inspection'* within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-017-03*.
- (h) Vented batteries shall be inspected and tested in accordance with *'Recommended Practice for Vented Standby Battery/Un-interruptible Power Supply Inspection and Maintenance'* within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-018-03*.
- (i) Vital DC energy sources shall be inspected and tested at a minimum interval of every three (3) months, in accordance with *'Standard for DC Power Supply Ground Detection Inspection and Maintenance'* within Volume 6 - Signals and Communications, document reference *APTA RT-SC-S-020-03*.
- (j) Local control panels shall be inspected and tested in accordance with *'Standard for Local Control Panel Inspection and Maintenance'* within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-023-03*.
- (k) Power Operated Switch Machines shall be inspected and tested at a minimum interval of every six (6) months, in accordance with *'Standard for Electric Switch Machine Inspection and Maintenance'* within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-024-03*. In addition, switch locking tests to ensure the POSM does not



allow the switch to lock with a closed switch point having an opening of 4 mm or more shall be performed at minimum interval of every one (1) month, in accordance with '*Standard for Switch Inspection and Obstruction Tests*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-027-03*.

- (l) Hand throw switches and associated switch circuit controllers shall be inspected and tested at a minimum interval of every three (3) months, in accordance with '*Standard for hand-Operated Switch Machine Inspection and Maintenance*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-026-03* and in accordance with '*Standard for Switch Inspection and Obstruction Tests*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-027-03*.
- (m) Vital relays shall be inspected and tested at a minimum interval of every two (2) years, in accordance with '*Standard for Vital Relay Tests*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-028-03*.
- (n) Inductive loops shall be inspected and tested in accordance with '*Standard for Wayside Inductive Loop Inspection and Testing*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-029-03*.
- (o) Intelligent elements of the TRPS shall be inspected and tested in accordance with '*Recommended Practice for Non-Vital Processor-Based System Inspection, Testing and Configuration Control*', within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-030-03*.
- (p) Wayside signal equipment shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Recommended Practice for Wayside Signal Equipment Inspection*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-033-03*.
- (q) VCs shall be inspected at a minimum interval of every twelve (12) months, in accordance with '*Standard for Vital Processor-based System Inspection, Testing and Configuration Control*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-035-03*. VCs shall also be tested at time of modification, in accordance with '*Standard for Vital Processor-based System Inspection, Testing and Configuration Control*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-035-03*.
- (r) Wayside signals shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Standard for Wayside Signal Inspection and Testing*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-036-03*.
- (s) VCs and intelligent elements of the TRPS shall have their data logging functionality inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Recommended Practice for Signal System Event Recorder and Data Logging Equipment Inspection and Maintenance*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-038-03*.
- (t) Impedance bonds shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Standard for Impedance Bond Inspection and*

*Maintenance*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-043-03*.

- (u) Signal Wayside Equipment Enclosures grounding and ground rods shall be inspected and tested at a minimum interval of every four (4) years, in accordance with '*Standard for Signal equipment Room Grounding System Inspection and Testing*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-045-03*.
- (v) Automatic Grade Crossing Warning Systems shall be inspected and tested in accordance with the minimum intervals stated by, and procedures provided within, Volume 3 – *Standard for Rail Transit System Highway-Rail Rail Grade Crossing Inspection and Maintenance* *APTA RT-RGC-S-001-02 Rev. 1*.

## **10.9 TRAFFIC SIGNALS**

### **10.9.1 Scheduling of Work**

Maintenance, other than Reactive Maintenance to rectify problems as dispatched by the Helpdesk, shall not be performed during rush hours as described in the City of Edmonton document "*Procedures For On-Street Construction Safety*".

### **10.9.2 Documentation**

- (a) Project Co shall submit all forms which are expected to be completed while carrying out Traffic Signal maintenance duties as part of the submission of the Overall Maintenance Strategy.
- (b) All observations where equipment is not performing as intended or expected shall be documented on the appropriate forms.
- (c) Forms shall be completed and submitted to the City within 3 Business Days of the completion of the Maintenance.
- (d) All visits to the Traffic Controller cabinet shall be recorded in a traffic control cabinet log book including:
  - (i) date and time in format of: dd/mmm/yyyy - hh:mm in 24 hour format;
  - (ii) Project Co Person(s) visiting the location;
  - (iii) reason for the visit to the Traffic Control Device; and
  - (iv) action(s) taken.
- (e) The Traffic Controller cabinet log book shall always remain on-site and shall only be removed if specifically requested by the City for information gathering purposes.
- (f) For any equipment that is replaced at any given location, the appropriate equipment replacement form shall be completed and uploaded, with asset information submitted to the City within 3 Business Days of completion of the work.

### **10.9.3 Traffic Signal Maintenance Staff Qualifications**

- (a) Each Project Co Person performing Traffic Signal Maintenance shall be a Certified Journeyman Power Lineman or Power System Electrician or Electrician in accordance with the Electrician Trade Regulation (Alberta).
- (b) Additionally Project Co Persons performing Traffic Signal Maintenance shall be classified as either Tech I or Tech II, having the following qualifications:
  - (i) Tech I requires the following Traffic Signal qualifications recognized by the International Municipal Signals Association (IMSA):
    - (A) IMSA Work Zone Safety; and
    - (B) IMSA Traffic Signals Level I.
  - (ii) Tech II requires the following electronics qualifications recognized by IMSA:
    - (A) Electronics Course Work; and
    - (B) Digital Logic Course Work.
  - (iii) Tech II also requires the following Traffic Signal qualifications recognized by IMSA:
    - (A) IMSA Work Zone Safety;
    - (B) IMSA Traffic Signals Level I;
    - (C) IMSA Traffic Signals Level II; and
    - (D) A minimum 2 years working as a Tech I.

### **10.9.4 Reactive and Corrective Maintenance**

- (a) Upon the identification any issues with a Traffic Control Device by the City, the City may initiate a trouble call by preparing a work order through the Helpdesk. The work order will be used to record any problem with any Traffic Control Device and to initiate and record a repair/check procedure.
- (b) Upon receipt of a work order or upon the identification of any issues with a Traffic Control Device by any other means, schedule all necessary repairs to such Traffic Control Device and other signals, electrical and electronic equipment as may become defective, or damaged, at any time. Emergency service in response to a work order shall begin immediately upon notification of a Deficiency in any device.

#### **10.9.4.1 Reporting**

- (a) The City may initiate a trouble call by preparing a work order through the Helpdesk. The City will provide the following information:
  - (i) date and time the issue was identified;

- (ii) location of the problem; and
  - (iii) a description of the problem.
- (b) Project Co shall record the following information:
- (i) the name of the Project Co Person dispatched and the time;
  - (ii) observed conditions upon arrival at the location; and
  - (iii) time of rectification and action taken or a link to a work order for scheduled repair at a later time.
- (c) The reporting must include enough detail to identify the exact nature of the problem and the component repaired or replaced.
- (d) If in response to a trouble call a full repair cannot be carried out and a temporary repair or other mitigation is used to make the intersection safe, the full repair must be scheduled by creation of a separate work order. The new work order shall include:
- (i) a link to the original work order;
  - (ii) location;
  - (iii) time and date of the original trouble call;
  - (iv) the work to be performed; and
  - (v) time that the repair was completed.

**10.9.4.2 Response Times**

- (a) Time elapsed between notification of an issue with a Traffic Control Device by the City or its identification by Project Co, and the arrival of the repair crew shall not exceed the limits as specified below:

Priority	Response Time	Temporary Repairs and/or Mitigation Completed	Permanent Repairs Completed
High Priority	Within 1 hour	Within 1 hour of site arrival	Within 24 hours
Low Priority	End of next Business Day	Within 1 hour of site arrival	Within 15 Business Days

- (b) High priority occurrences which require immediate response are:
- (i) Traffic Signals out;
  - (ii) Traffic Signals stuck / not cycling / erratic behaviour;

- (iii) Traffic Signals in flash indication (unscheduled);
- (iv) conflicting Traffic Signal indications;
- (v) any signal / pedestrian indication out;
- (vi) pedestrian crosswalk not working / not timing correctly;
- (vii) traffic pole / pedestal down / damaged (damage must be assessed);
- (viii) broken / exposed junction / pull box (must be secured & electrically safe);
- (ix) push button not working / missing;
- (x) Traffic Signal mast arm low / loose;
- (xi) Traffic Signal fixture / backboard loose / twisted;
- (xii) burn out of a portion or all of a lane usage;
- (xiii) overhead span wire (guy or cable) low / loose;
- (xiv) overhead sign low / loose / twisted
- (xv) cabinet hit / damaged;
- (xvi) cabinet door(s) open;
- (xvii) flashing hazard beacon indication out;
- (xviii) flashing crosswalk signal indication out;
- (xix) flashing signal ahead warning beacon out;
- (xx) detection faults (vehicles / pedestrians not being serviced); and
- (xxi) other occurrences which have the potential to disrupt the normal operation of the intersection or the safety of pedestrians, vehicular traffic and the System.

(c) Low priority occurrences which require repairs to be scheduled are:

- (i) pole leaning;
- (ii) pole handhole cover missing (high priority if unsafe);
- (iii) back guy/anchor loose/damaged;
- (iv) riser damaged;
- (v) dark spot in signal head;

- (vi) water in signal head;
  - (vii) detection system faults (where temporary repairs have been made);
  - (viii) loss of communication lines;
  - (ix) communication faults;
  - (x) central traffic control system faults;
  - (xi) push button stuck/loose/damaged (but still operational);
  - (xii) internally lit overhead sign burn out;
  - (xiii) signal pole oscillations;
  - (xiv) data sampling station faults; and
  - (xv) other occurrences of a minor or cosmetic nature which do not have the potential to disrupt the normal operation of the intersection or the safety of pedestrians, vehicular traffic and the System.
- (d) If the repair crew cannot complete a permanent repair, required for a high priority occurrence, within 1 hour of arrival, a temporary repair or other mitigation shall be completed within the 1 hour period to make safe the operation of the intersection.
- (e) Individuals responding to trouble calls shall be qualified as Tech I in accordance with Section 10.9.3 [*Traffic Signal Maintenance Staff Qualifications*] of this Schedule.

## **10.9.5 Preventative Maintenance**

### **10.9.5.1 External Component Maintenance**

- (a) Perform routine inspections and Maintenance of the external components and facilities of all Traffic Control Devices, which does not include the Maintenance within the Traffic Controller cabinet.
- (b) Following external Traffic Controller cabinet assembly, the following are to be included as part of the Maintenance procedures:
- (i) cabinet base seal;
  - (ii) paint; and
  - (iii) corrosion.
- (c) All overhead traffic control signs, which are associated with an intersection, shall be maintained as part of the external component maintenance for that intersection. The following items shall be checked as part of the Maintenance procedures:
- (i) proper orientation and alignment;

- (ii) proper photo cell operation;
  - (iii) replacement of internal bulbs as necessary;
  - (iv) cleaning of the sign face; and
  - (v) checking for cracked or faded sign faces and reporting problems to the City for rectification.
- (d) The following checks, inspections and repairs of fixtures and attachments shall be performed as part of the external component maintenance:
- (i) bulb replacement ensuring proper wattage;
  - (ii) inspection of LED inserts and cleaning of lens;
  - (iii) proper orientation of the lens (focusing);
  - (iv) inspection of gaskets on the lens;
  - (v) inspection of door locking mechanism and hinges;
  - (vi) inspection of the entire fixture orientation including an inspection of the mounting bracket;
  - (vii) inspection of the internal wiring and terminations;
  - (viii) inspection for water intrusion and foreign objects;
  - (ix) programmable heads and louvered heads checked for proper orientation and focusing;
  - (x) louvers and visors inspected to be free of debris, obstructions and damage;
  - (xi) audible pedestrian signals checked for proper operation, orientation and proper audible indication; and
  - (xii) inspection of all push button assemblies.
- (e) The following checks and inspections of cables shall be performed as part of the external component maintenance:
- (i) twisting, cracking, chaffing;
  - (ii) proper slack and strain relief;
  - (iii) proper drip loops; and
  - (iv) proper weather seal at the cable entrance and exits.

- (f) The following fastening items shall be checked as part of the external component maintenance:
  - (i) checking tightness of nuts and bolts;
  - (ii) proper clearances of aerial installations as per the original Design and Construction specifications;
  - (iii) inspection of all stainless steel strapping;
  - (iv) fixture orientation as it relates to proper lock nut and strapping tension;
  - (v) proper tension on all hangers;
  - (vi) observation for any excessive wear on all moving components; and
  - (vii) all fastening equipment shall be inspected for paint, corrosion, and proper alignment.
  
- (g) All poles and pedestals related to Traffic Signals or other traffic operations devices shall be inspected during external Maintenance for:
  - (i) paint wear;
  - (ii) corrosion;
  - (iii) alignment;
  - (iv) handhold covers in place; and
  - (v) proper torqueing of mounting nuts.
  
- (h) Individuals carrying out work as part of the external component maintenance shall be qualified as Tech I in accordance with Section 10.9.3 [*Traffic Signal Maintenance Staff Qualifications*] of this Schedule.

**10.9.5.2 Traffic Controller Cabinet Maintenance**

The Traffic Controller cabinet maintenance shall include the cabinet shell and environmental controls and as a minimum shall include:

- (a) inspection and replacement of filter as required;
- (b) operation of door locks and lubrication as required;
- (c) operation of door seals including a check for water intrusion and repair or replacement as required;
- (d) inspection of the heater and fan for proper operation; and



- (e) confirmation of proper vent opening or closure as dictated by the cabinet climatizing schedule.

As part of the inspection for the Traffic Controller cabinet maintenance, the following items shall be inspected, assessed and repaired as necessary.

<b>Item</b>	<b>Action</b>
Flashers	Confirm for proper operation.
Signal flash operation	Correct displays shown on fixtures as indicated on the cabinet timing sheet.
Controller database	Confirm controller data base matches the timing sheet.
Police & maintenance panels	Check for proper operation of all functions.
Light relays	Confirmation of proper operation of all light relays. This includes at terminal voltage test in both the on and off position.
Vehicle detectors	Proper operation of all vehicle detectors of all types and any detector indicators where applicable. Also verify that time delay mode is timing properly if required.
Pedestrian detectors	Proper operation of pedestrian detectors and any illuminated indications where applicable.
Fireheads	Proper indication of firehead fixture via the Traffic Controller.
Communications unit	Visual inspection for proper operation.
Special control circuits	Confirmation of proper operation of any special control devices/relays external from the Traffic Controller.
Time clocks	Proper operation to a time of day, week, etc.
Line voltage	Check for proper AC line voltage
Connections	Check for proper tightness, frayed wiring, loosening of connections and corrosion.
Grounding strips	Check for proper tightness, frayed wiring, loosening of connections and corrosion

<b>Item</b>	<b>Action</b>
Traffic Controller	Visual inspection of the controller for proper displays and indications and also an inspection of all connectors. Replace controller battery as required.
Conflict monitor	Visual inspection of the monitor for proper displays and indications and also an inspection of all connectors. Replace controller battery as required.
Harnesses	Visual inspection of all harnesses and connectors for damage, improper routing and wear.
Terminals	Check terminal connectors for tight and clean connections.
Grounding	Check ground rod resistance and report on form.
Loops	Visual inspection of loops cut in the pavement.
Absence of Red and +24 V DC Monitor	Confirm cabinet "Flash" operation, with absence of red on each channel and with the absence of +24 V DC.
Batteries	Check for correct Traffic Controller operation with power off for a minimum 5 minutes while ensuring measured voltages are in accordance with manufacturer's specifications. Confirm power off indication is received by OCC.
Low temperature alarm	Confirm annunciation of low temperature alarm to OCC.

- (f) The conflict monitors shall be inspected and tested for proper operation. A 25 volt AC source shall be applied to all field terminations which create a conflicting movement display for all phases found on the controller timing sheet for that intersection. For each termination which represents a conflicting movement, the cabinet must trip the signals to the failsafe mode as indicated on the timing sheet for that location. Verify that the Controller enters and exits the "Flash" mode properly.
- (g) The Traffic Controller unit shall be inspected for proper programming and operation. Programming and operation shall be verified against the controller timing program sheet.
- (h) The following devices and functions shall also be confirmed for proper operation as per the timing sheet if applicable:
  - (i) Signals ahead warning signs;
  - (ii) Master/slave co-ordination;

- (iii) Transit Signal Priority;
  - (iv) Preemption (if applicable); and
  - (v) Dial check for interval base controllers to verify proper operation of interval times and dial change intervals as per the timing sheets.
- (i) Prior to performing Traffic Controller cabinet Maintenance at a location, obtain all applicable Project Approvals and notify the City's Traffic Management Centre that Maintenance will be performed at that site and also notify the Traffic Management Centre when the work is complete.
  - (j) Individuals performing Traffic Controller cabinet maintenance shall be qualified as Tech II in accordance with Section 10.9.3 [*Traffic Signal Maintenance Staff Qualifications*] of this Schedule.

#### **10.9.5.3 Cabinet Climatization**

- (a) A cabinet climatization program shall be produced to prepare all environmentally controlled Traffic Controller cabinets and other associated control cabinets related to traffic operations for winter and/or summer operation.
- (b) Each cabinet shall be visited twice annually (spring and fall).
- (c) During the spring cabinet climatization the following tasks shall be performed:
  - (i) open vent;
  - (ii) check filter for cleanliness, clean or replace if required;
  - (iii) check filter for proper seal to the opening of the cabinet; and
  - (iv) verify proper operation of fan and heater.
- (d) During the fall cabinet climatization the following tasks shall be performed:
  - (i) close vent and verify proper seal to the opening; and
  - (ii) verify proper operation of heater and fan.
- (e) The cabinet climatization schedule shall be included in the Overall Maintenance Strategy and Five Year Maintenance Plans.
- (f) Individuals performing cabinet climatization shall be qualified as Tech II accordance with in accordance with Section 10.9.3 [*Traffic Signal Maintenance Staff Qualifications*] of this Schedule.

#### **10.9.5.4 Timing Checks**

- (a) Timing checks shall ensure the co-ordination between signals which utilize the internal time clocks for synchronization.

- (b) This Maintenance task shall be performed as a verification of the operation of the Traffic Signals. Entrance to the traffic control cabinet for this procedure shall not be required.
- (c) Each intersection shall be verified for proper timing and operation of:
  - (i) main street and side street minimum and maximum timings for vehicle phases;
  - (ii) main street and side street timings for pedestrian phases;
  - (iii) verification of operation of detection on all approaches; and
  - (iv) co-ordination of the start of main street green between intersections.
- (d) These checks shall be performed on all timing plans in which the intersection operates during the time of day and week in which they operate. The phasings or time of day plans of the traffic controller shall not be altered.
- (e) Each signal shall be checked twice annually during its off-peak plan. Each intersection shall be checked annually during each of the time of day plans in which it operates each week.
- (f) Signal co-ordination bar charts shall be generated. The marked up bar charts shall be returned to the City's Traffic Controller centre for review and will be logged on file.
- (g) Individuals performing timing checks shall be qualified as Tech II in accordance with Section 10.9.3 [*Traffic Signal Maintenance Staff Qualifications*] of this Schedule.

#### **10.9.5.5 General Repairs**

- (a) This Section 10.9.5.5 describes the requirements for performing general Maintenance for all Traffic Control Devices. This includes all Maintenance that is performed at any location at any time whether performed as Reactive Maintenance, Corrective Maintenance or Preventative Maintenance.
- (b) All Maintenance to Traffic Control Devices and their supporting structures shall be performed in a manner to restore those devices and structures to the operational function requirements as they were originally designed.
- (c) All equipment shall be replaced with "like" equipment. Only City approved materials are accepted for use while performing general Maintenance.
- (d) For all general Maintenance which requires equipment to be replaced at any location an equipment replacement form must be completed. If the equipment types are not listed on the provided form, then a description of the equipment removed and replaced must be provided in the comment section of the form.

#### **10.10 COMMUNICATIONS**

Maintenance of all communications equipment shall be undertaken in accordance with manufacturer instructions, and the following APTA guidance documents:

- (a) Surveillance Systems shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Standard for Closed Circuit Television (CCTV) Inspection, Testing and Maintenance*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-012-03*.
- (b) PA/VMS system shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Recommended Practice for Passenger Information System Inspection and Maintenance*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-013-03*.
- (c) Fibre optic networking equipment shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Recommended Practice for Fiber Optic Multiplexer (FOM) Inspection and Maintenance*' within. Volume 6 – Signals and Communications, document reference *APTA RT-SC-RP-014-03*.
- (d) Emergency and life safety phones shall be inspected and tested at a minimum interval of every one (1) month, in accordance with '*Standard for Emergency Telephone and Passenger Assistance Device Inspection and Maintenance*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-015-03*.
- (e) SCADA systems shall be inspected and tested in accordance with the minimum intervals stated by, and procedures provided within, '*Standard for Supervisory Control and Data Acquisition (SCADA) System inspection and Maintenance*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-034-03*.
- (f) Fire detection systems shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Standard for Fire Detection System Inspection and Testing*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-042-03*.
- (g) Radio systems shall be inspected and tested at a minimum interval of every twelve (12) months, in accordance with '*Recommended Practice for Radio Communication System Inspection and Testing*' within Volume 6 – Signals and Communications, document reference *APTA RT-SC-S-046-03*.

## **10.11 TRANSPORTATION STRUCTURES**

No component or element of a Transportation Structure may show any evidence of deterioration or loss in structural strength and each component and element shall operate safely and in a manner consistent with Alberta Infrastructure's *Bridge Inspection and Maintenance* (BIM) system.

### **10.11.1 Transportation Structure Inspection Requirements**

#### **10.11.1.1 General**

- (a) Undertake inspection and testing of the Transportation Structures to measure and determine compliance to the Transportation Structure Condition Requirements, as set out in Sections 10.11.3 [*Tawatinâ Bridge Stay Cable Inspections*] of this Schedule, in accordance with Alberta Infrastructure's BIM system.

- (b) The Alberta Infrastructure BIM system consists of two levels of inspection. Only level 1 inspections as defined in Section 10.11.1.2 [*Routine Level 1 Inspections*] of this Schedule shall apply.

#### **10.11.1.2 Routine Level 1 Inspections**

- (a) Level 1 inspections are routine inspections undertaken on a regular inspection cycle. These are primarily a visual inspection without the use of specialized equipment for testing or for access unless otherwise specified.
- (b) Level 1 inspections shall be undertaken by qualified bridge inspectors with a current Class A certification under Alberta Infrastructure's BIM system unless otherwise specified.
- (c) Level 1 inspections of Transportation Structures shall be completed as follows:
  - (i) initial inspection within 30 days after issuance of the applicable Construction Certificate; and
  - (ii) every 21 months after the initial inspection.
- (d) The routine inspection cycle may be shortened if deemed necessary by the inspector due to condition, functionality, or use of the Transportation Structures.
- (e) Each routine level 1 inspection shall be completed within +/- one month of the originally scheduled date of the routine level 1 inspection, as set out in the Five Year Maintenance Plan.

#### **10.11.1.3 Tawatinâ Bridge Stay Cable Inspections**

- (a) Submit a Stay Cable Inspection Manual for the Tawatinâ Bridge (the "**Stay Cable Inspection Manual**") not less than 4 months prior to the Target Service Commencement Date which shall provide guidelines and procedures for inspecting and maintaining the stay cables. At a minimum, the manual shall address the items listed in Section 7.7 '*Cable Inspection & Maintenance Manual*' of '*PTI DC45.1 Recommendations for Stay-Cable Design, Testing, and Installation*'.
- (b) In addition to the routine level 1 inspection requirements of Section 10.11.1.2 [*Routine Level 1 Inspections*] of this Schedule, and in addition to inspections required by the stay cable supplier and by the condition of the stay cables, the following stay cable inspections shall be carried out for the Tawatinâ Bridge:
  - (i) stay cables shall be visually monitored on a regular basis for excessive wind induced vibrations or damage;
  - (ii) inspection of stay cables shall be close-up hands-on visual inspections. The inspections shall be carried out by an inspector with previous experience in the inspection of stay cables;
  - (iii) in-depth inspections of the stay cables shall be carried out two years after Service Commencement Date and every six years thereafter. As a minimum the

inspections shall meet the requirements of Section 7.3 'Condition Evaluation' of 'PTI DC45.1 Recommendations for Stay-Cable Design, Testing, and Installation'; and

- (iv) if evidence of deterioration is noted during routine level 1 or in-depth inspections, additional non-destructive evaluation and monitoring of the stay cables shall be carried out as required to determine the cause of the deterioration and its effects on stay cable performance. The scope and details of the non-destructive inspections shall be developed by Project Co and submitted to the City for acceptance.

## **10.11.2 Transportation Structure Maintenance Requirements**

### **10.11.2.1 Structural and Operations Nonconformities**

- (a) Structural and Operations Nonconformities are Deficiencies in the Transportation Structure which the inspector deems to compromise the safety or operation of the System and shall require Reactive Maintenance.
- (b) When structural and Operations Nonconformities are identified, act promptly to make safe the System and commence work to rectify a structural or Operations Nonconformities within 60 days of identification. Structural and Operations Nonconformities include the following:
  - (i) misalignment or cracking to steel girders caused by collision damage, overloads or other causes;
  - (ii) excessive cracking, spalling or reinforcement damage to concrete girders caused by collision damage, overloads or other causes;
  - (iii) deck joint components protruding above the deck surface; and
  - (iv) misalignment, cracking or rupture of barrier components caused by collision damage or other causes.
- (c) For structural and Operations Nonconformities that may not be effectively repaired or rectified during inclement weather, the required time period for commencement of work may be extend up to 180 days provided that Project Co:
  - (i) acts promptly to make safe the System; and
  - (ii) implements a process of regular monitoring of the Deficiency to ensure that it remains safe.

### **10.11.2.2 Corrective Maintenance**

If the inspector deems that Deficiencies do not adversely impact the structural integrity of the Transportation Structure and that they will not impede operations they shall be categorized as requiring Corrective Maintenance. These findings shall be reported in the annual update of the Five Year Maintenance Plan and the work to rectify these Deficiencies shall be completed within 20 months of identification.

### **10.11.2.3 Preventative Maintenance**

The Five Year Maintenance Plan shall include annual washings of the bridge decks.

### **10.11.2.4 Overhaul Maintenance Requirements**

At least one month prior to commencement of any Overhaul Maintenance on a Transportation Structure, submit detailed design drawings and construction specifications for the proposed work to the City in accordance with Schedule 2 *[Submittal Review Procedure]*.

### **10.11.3 Transportation Structure Condition Requirements**

The state of the individual Transportation Structure components listed in this Section 10.11.3 *[Transportation Structure Condition Requirements]* shall be maintained throughout the Operating Period so as to be in accordance with the conditions listed herein:

#### **10.11.3.1 Concrete Decks**

- (a) Unless noted otherwise, concrete decks shall not have any physical defects or chemical deterioration.
- (b) Concrete decks cast-to-grade shall not have any cracks greater than 0.1mm in width and a linear measurement of 0.2m of cracking per square metre of deck area.
- (c) The underside of all concrete decks shall be free of stains.
- (d) Any cracking on the deck underside shall be limited to a maximum width of 0.3mm.

#### **10.11.3.2 Curbs, Barriers, Medians and Track Slabs**

- (a) Curbs, barriers, medians and track slabs shall exhibit no physical defects or chemical deterioration. Any scaling shall be limited to light scaling over a maximum surface area of 10% of the face and top of the curb, barrier, median or track slab.
- (b) Cracking of curbs, barriers, medians and Track Slabs shall be limited to a maximum width of 0.3mm occurring at a maximum frequency of one crack every 2m over the length of the Structure.
- (c) There shall be no exposure of Utility voids or other formed voids beneath curbs, barriers, medians and Track Slabs.
- (d) Differential movement, of curbs, barriers, medians and Track Slabs, in the horizontal or vertical direction shall be limited to 6mm.
- (e) Expansion joints in curbs, barriers, medians and Track Slabs shall be free for movement and not cracked or spalled.

#### **10.11.3.3 Barriers**

- (a) Barriers shall be free of collision damage, horizontal and vertical misalignment, loose connections and missing nuts and bolts.



- (b) Steel barrier components shall be free of deformation, cracks, and corrosion.
- (c) Anchor bolts shall have proper alignment and firm anchorage.
- (d) There shall be no physical defects or chemical deterioration in the grout pads of barriers.

#### **10.11.3.4 Deck Joints**

- (a) Deck joints shall be vertically aligned, properly anchored, have freedom of movement and not have variation in the gap opening more than 10% along the length of the deck joint. There shall be no missing or loose bolts.
- (b) All deck joints shall capture and manage deck drainage such that it does not come into contact with the concrete and steel surfaces of other bridge elements.
- (c) For gland type joints, there shall be no signs of leakage or holes or damage to the seal or leakage around the joint.
- (d) Steel components shall be free of deformation, cracks and corrosion.

#### **10.11.3.5 Deck Drainage Systems**

- (a) The build-up of gravel or debris shall not cause any ponding on the bridge deck or impede the flow of water away from the deck.
- (b) Deck drains and pipes shall not be clogged with debris.
- (c) Down spouts shall be low enough to prevent splashing of water on superstructure and substructure elements.
- (d) There shall be no ponding of water on the deck more than 48 hours after the most recent rain event.

#### **10.11.3.6 Concrete Girders**

- (a) Concrete girders shall not have any physical defects or chemical deterioration or staining.
- (b) Any cracks or defects in the pre-stressed concrete girders shall meet the requirements of Section 4-4.5.11 [*Concrete Defects or Early Handover Deficiencies*] of Schedule 5 [*D&C Performance Requirements*].
- (c) Any cracking of reinforced concrete girders shall be limited to a maximum width of 0.3 mm and a maximum linear measurement of 1 m of cracking per square metre.
- (d) There shall be no signs of damage or deterioration due to impacts or collisions.

#### **10.11.3.7 Steel Girders**

- (a) Steel girders shall be free of harmful corrosion, notches and cracks.

- (b) Bolted connections shall be free of deformation, warping and missing, worn, sheared or deformed fasteners.
- (c) Web stiffeners shall not have any evidence of buckling.
- (d) Girders shall not show any evidence of sags, buckling, bowing or twisting.
- (e) All welds shall be free of cracks.
- (f) There shall be no signs of damage or deterioration due to impacts or collisions.

**10.11.3.8 Coatings**

- (a) Coatings shall be intact and effective in preventing corrosion and loss of section.
- (b) There shall be no rusting, peeling, blistering, discolouration or other defects.
- (c) The paint protection system shall be free of signs of cracking, peeling, or chipping of the paint protection system.

**10.11.3.9 Walkways and Shared Use Paths**

- (a) Surfaces shall be smooth but have adequate traction and be free of debris.
- (b) There shall be no physical defects or chemical deterioration. Any scaling shall be limited to light scaling over a maximum surface area of 10% of the sidewalk area.
- (c) Any cracking shall be limited to a maximum width of 0.3mm and a maximum linear measurement of 1m of cracking per square metre of sidewalk area.
- (d) Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

**10.11.3.10 Bearings**

- (a) Bearings shall be operational and shall be free of all debris that may impede movement.
- (b) Expansion bearings shall have available travel relative to temperature without excessive vibrations or movement under loading.
- (c) Coating system on bearings shall be functioning and intact.
- (d) Component parts shall have proper alignment, proper contact surfaces and minimum resistance.
- (e) Bearing pads and plates shall be in proper position.
- (f) There shall be no physical defects or chemical deterioration in the grout pads.
- (g) Elastomeric components shall be free of cracks and splits along the edges. Minor bulging of the elastomeric components shall be limited to 10% of the component thickness.

- (h) Anchor bolts shall have proper alignment and firm anchorage.
- (i) Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

**10.11.3.11 Bearing Seats and Caps**

- (a) Bearing seats and caps shall not have any rotation or displacement.
- (b) There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum area of 10%.
- (c) Any cracking shall be limited to a maximum width of 0.3mm and a maximum linear measurement of 1m of cracking per square metre.
- (d) The bottoms of bearing seats shall not be exposed due to soil settlement or other reasons.
- (e) Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

**10.11.3.12 Backwalls and Breastwalls**

- (a) There shall not be any significant loss of material below the backwall or breastwall.
- (b) There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.
- (c) Any cracking shall be limited to a maximum width of 0.3mm and a maximum linear measurement of 1m of cracking per square metre.
- (d) Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

**10.11.3.13 Wingwalls and Retaining Walls**

- (a) Wingwalls and retaining walls shall have proper vertical and horizontal alignment. The bottoms of these elements shall not be exposed due to soil settlement or other reasons.
- (b) There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.
- (c) Any cracking shall be limited to a maximum width of 0.3mm and a maximum linear measurement of 1m of cracking per square metre.
- (d) Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

**10.11.3.14 Piers**

- (a) Piers shall not have any evidence of collision damage or damage due to ice or debris.

- (b) Visible piles shall not have any evidence of bowing or misalignment due to deterioration, impact, excessive loads or unintended lateral loading.
- (c) There shall be no signs of heaving or settlement.
- (d) There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.
- (e) Any cracking of concrete components shall be limited to a maximum width of 0.3mm and a maximum linear measurement of 1m of cracking per square metre.
- (f) Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

**10.11.3.15 Nose Plates**

- (a) There shall be no missing plate sections or loose connections.
- (b) There shall not be loss of section due to corrosion.
- (c) Nose plates with impact damage shall be repaired or replaced.

**10.11.3.16 Concrete Finishes**

- (a) Concrete finishes in visible areas shall not be stained, chipped or peeling.

**10.11.3.17 Riprap Slope Protection**

- (a) Any settlement of the headslope fill in the vicinity of any abutment shall be limited to 150mm.
- (b) Slope or scour rock riprap protection shall be of the required gradation and quality as specified in the applicable Final Design.
- (c) There shall not be scour or erosion around or under the riprap.
- (d) Average rock size and thickness of the rock layer shall be as specified in the applicable Final Design.

**10.11.3.18 Concrete Slope Protection**

- (a) Any settlement of the headslope fill in the vicinity of any abutment shall be limited to 150mm.
- (b) Gaps between the abutment and the slab shall be limited to 50mm.
- (c) There shall be no crushing of concrete around the pier or bulging at the toe.
- (d) There shall be no physical defects or chemical deterioration. Any scaling shall be limited to light scaling over a maximum surface area of 10% of the slope protection area.

- (e) Any cracking shall be limited to a maximum width of 0.3mm and a maximum linear measurement of 1m of cracking per square metre of the slope protection area.
- (f) Drainage shall not penetrate below the slab and there shall be no presence of voids below the slab.

**10.11.3.19 Stay Cables**

- (a) The anchorages and saddles shall have no corrosion staining or cracking.
- (b) The outer stay pipe surface shall be uniform, sound and with no evidence of splitting or corrosion staining.
- (c) The protective tape on the outer stay pipe shall not be torn.
- (d) The welds in the outer stay pipe shall be sound.
- (e) Accessories such as neoprene sleeves, boots, dampers, clamps, ties, etc. shall fit properly and not be deteriorated.
- (f) The stay cables shall have uniform cable sag.
- (g) The stay cables shall be concentric within their guide pipes.

**10.11.3.20 Embankments**

- (a) Embankments shall not show any signs of instability such as slumping, excessive settlement, or cracking.
- (b) Embankments shall not show any signs of erosion such as gulying or erosion or scour along the toe of the sideslope.
- (c) The slope of the embankment shall be as specified in the applicable Final Design.

**10.11.3.21 Culvert Headwalls and Collars**

- (a) Headwalls and collars shall not have excessive settlement or rotation and must be securely connected to the barrel or bevel section.
- (b) Headwalls and collars shall not show any signs of piping, scour or erosion.
- (c) There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.
- (d) Any cracking shall be limited to a maximum width of 0.3 mm and a maximum linear measurement of 1 m of cracking per square metre.
- (e) Steel components shall not have excessive corrosion, loss of section or loose connections.

#### **10.11.3.22 Culvert Barrels**

- (a) For flexible culverts, any deformation (dimensional change) shall not exceed 7% of the design dimensions.
- (b) There shall be no physical defects or chemical deterioration of concrete culverts. Any scaling shall be limited to light scaling over a maximum surface area of 10%.
- (c) Any cracking shall be limited to a maximum width of 0.3 mm and a maximum linear measurement of 1 m of cracking per square metre.
- (d) Circumferential seams shall not be misaligned between adjoining sections.
- (e) There shall be no evidence of infiltration of backfill material caused by improper connections or separation of adjoining sections.
- (f) Circumferential and longitudinal seams shall not have any cracks.
- (g) Longitudinal seams shall not have any signs of bolt tipping, distortion, cusping, improper nesting or signs of corrosion.
- (h) Steel culvert material may have some superficial rust but no pitting or loss of section.

#### **10.11.3.23 Other Transportation Structure Elements**

Other Transportation Structure elements not listed in these requirements shall be maintained in accordance with Section 1.1 (d) of this Schedule and functioning as designed throughout the Operating Period.

#### **10.11.4 Connors Road Wildlife Underpass Structure**

Maintenance of the Wildlife Underpass Structure at Connors Road shall exclude all planting, landscaping and other non-structural treatments which are specifically installed to encourage its use by wildlife. Obtain the agreement of the City prior to carrying out any Maintenance of the Wildlife Underpass Structure at Connors Road, such that disruptions to wildlife are avoided.

### **10.12 TUNNEL INSPECTIONS**

These tunnel requirements apply to the Quarters Tunnel structure, and are in addition to the general Transportation Structures requirements set out in Section 10.11 [*Transportation Structures*] of this Schedule.

#### **10.12.1 Tunnel Inspection Requirements**

- (a) Inspections of the civil and structural elements of the Quarters Tunnel shall be carried out by an engineering firm or individual, with demonstrated experience in tunnel inspection and rehabilitation services, as defined herein.
- (b) Inspection of the civil and structural elements of the Quarters Tunnel shall follow the guidelines included in the FHWA Highway and Rail Transit Tunnel Inspection Manual (*Tunnel Inspection Manual*), 2005 Edition for such elements.

- (c) Where the term “tunnel inspection” is used in this Section 10.12 [*Tunnel Inspections*], it refers to the inspection of civil and structural elements of the Quarters Tunnel only as defined in the FHWA *Highway and Rail Transit Tunnel Inspection Manual*.

#### **10.12.2 Tunnel Inspection Frequency**

- (a) Inspections of tunnel civil and structural elements shall follow “up-close procedures” as detailed in the FHWA *Highway and Rail Transit Tunnel Inspection Manual* and shall be conducted at the following minimum intervals:
  - (i) annually, for the first 2 years after the Service Commencement Date;
  - (ii) biennially for the next 4 years after the Service Commencement Date;
  - (iii) an inspection 10 years after the Service Commencement Date; and
  - (iv) subsequent inspections after the 10 year inspection shall be conducted at least every 5 years.
- (b) Supplemental inspections of the civil and structural elements of the Quarters Tunnel shall be undertaken after extreme load events, fire incidents or other emergency condition which threatens the integrity of the permanent tunnel structure.

#### **10.12.3 Tunnel Inspection Reporting**

- (a) Tunnel inspection reports for inspection of the civil and structural elements of the Quarters Tunnel shall be developed following the guidelines included in the FHWA *Highway and Rail Transit Tunnel Inspection Manual*.
- (b) Tunnel inspection reports shall be uploaded to the Asset Register within 60 days of each tunnel inspection.

#### **10.12.4 Tunnel Infiltration Requirements**

Throughout the Operating Period, infiltration shall comply with the requirements of Section 4-5.12.3 [*Infiltration*] of Schedule 5, [*D&C Performance Requirements*].

#### **10.12.5 Tunnel Repairs**

- (a) Tunnel repairs shall be prioritized in the tunnel inspection reports following procedures set out in the FHWA *Highway and Rail Transit Tunnel Inspection Manual*.
- (b) Repairs shall be completed in accordance with the recommended repair completion schedule included in the FHWA *Highway and Rail Transit Tunnel Inspection Manual*.
- (c) Deformations of the tunnel that impinge on required running clearances at any time shall require Reactive Maintenance.

## **10.13 GEOTECHNICAL MONITORING**

### **10.13.1 North River Bank Cut and Cover Tunnel / Tunnel Approach**

- (a) An instrumentation program to monitor the vertical and lateral displacements of the valley slope throughout the Operating Period shall be implemented for the Quarters Tunnel, including the associated approaches and north abutment of the Tawatinâ Bridge.
- (b) The instrumentation program shall be extensive enough to detect ground movements occurring within a zone defined as:
  - (i) 30m east and 30m west of the centreline of the nearest Track;
  - (ii) the toe of the valley slope to the south; and
  - (iii) a distance of 15m behind the slope crest to the north.
- (c) As a minimum, the instrumentation shall include slope inclinometers, settlement points and survey markers.
- (d) The results of slope monitoring shall be provided to the City within one week of the date of measurements.
- (e) Post construction monitoring of the valley slope shall be performed every 4 months or more frequently if deemed necessary by Project Co's geotechnical consultant based on Good Industry Practice and observed performance.
- (f) The occurrence of an observed cumulative lateral displacement of 20 mm or a movement rate of 10 mm per year at any location shall require the implementation of a more comprehensive slope monitoring program, including additional instruments and increased monitoring frequency, and conducting a detailed review of the slope condition by the Project Co's geotechnical consultant. The review shall include an assessment of the cause(s) and the impact of the observed movements on the performance of the:
  - (i) Mined Tunnel;
  - (ii) North River Bank Cut and Cover Tunnel;
  - (iii) North River Bank Tunnel Approach; and
  - (iv) north abutment of the Tawatinâ Bridge,

and the preparation of a plan of mitigation measures to arrest the slope movement should the magnitude of movement or the movement rate continue to increase.

- (g) The occurrence of an observed cumulative lateral displacement of 40mm or a movement rate of 20mm per year at locations within the slope zone stabilized per the requirements of Section 4-3.3.2 [*Geotechnical*] of Schedule 5 [*D&C Performance Requirements*] shall necessitate the implementation of suitable mitigation measures to arrest the slope movement and prevent further degradation in the slope condition.



- (h) Notwithstanding (g) above, the maximum slope movements shall not exceed the limits that can be tolerated by the North River Bank Cut and Cover Tunnel / Tunnel Approach structures over the span of each of their respective Design Service Life.

#### **10.13.2 Connors Road Trackway**

- (a) An instrumentation program to monitor the vertical and lateral displacements of the valley slopes throughout the Operating Period shall be implemented for the Connors Road Trackway.
- (b) The instrumentation program shall be extensive enough to detect ground movements within a minimum area extending from a station 180 m east of the existing pedestrian bridge to 40 m west of the Cloverdale Hill road (east to west), and from 50m downslope of the Trackway centreline to 50m upslope of the Trackway centreline (north to south).
- (c) As a minimum, the instrumentation shall include slope inclinometers, settlement points and survey markers.
- (d) The results of slope monitoring shall be provided to the City within one week of the date of measurements.
- (e) Post construction monitoring shall be performed every 4 months or more frequently if deemed necessary by Project Co's geotechnical consultant based on Good Industry Practice and observed performance.
- (f) The occurrence of an observed cumulative lateral displacement of 20 mm or a movement rate of 10 mm per year at any location shall require the implementation of a more comprehensive slope monitoring program, including additional instruments and increased monitoring frequency, and conducting a detailed review of the slope condition by the Project Co's geotechnical consultant. The review shall include an assessment of the cause(s) and the impact of the observed movements on the performance of the Connors Road Trackway, and the preparation of a plan of mitigation measures to arrest the slope movement should the magnitude of movement or the movement rate continue to increase.
- (g) The occurrence of an observed cumulative lateral displacement of 40 mm or a movement rate of 20 mm per year at any location shall necessitate the implementation of suitable mitigation measures to arrest the slope movement and prevent further degradation in the slope condition.
- (h) Notwithstanding (g) above, the maximum slope movements shall not exceed the limits that can be tolerated by the Connors Road Trackway over its Design Service Life.

#### **10.14 DAVIES TRANSIT CENTRE AND PARK AND RIDE**

- (a) A minimum of 80% of the total parking stalls in the Davies Park 'n' Ride shall be Available for use at all times. In accordance with Section 9.5.1 [*Winter Maintenance Strategy*] of this Schedule, any parking stalls used for snow storage or other Maintenance Activities, including any loss of stalls due to closures required for performing Maintenance shall be deemed to be not Available.

- (b) No more the 25% of the total number of bus bays at the Davies Transit Centre may be closed or obstructed during the hours set out in Section 5.1(b) *[Operating Hours]*. No bus bay may be closed for longer than:
  - (i) 14 consecutive days; or
  - (ii) 21 days in any Service Year.

Project Co shall provide at least 28 days notification to the City prior to closure of a bus bay and at least seven (7) days notification to the City prior to the bus bay being reopened.
- (c) The movement of buses in and out of the Davies Transit Centre shall be accommodated at all times.

## **10.15 STORMWATER MANAGEMENT**

Implement, maintain, monitor, update, and manage Stormwater Management protocols that meet provincial and municipal standards, including the City's Drainage Bylaw (No. 16200), and provincial requirements for water quality and quantity (flow).

### **10.15.1 Inspection and Testing**

- (a) An initial test is required 60 days following the Service Commencement Date from which a performance baseline shall be developed. Subsequent inspection and testing is to be carried out at least annually for comparison to the performance baseline. Variances in system performance from the performance baseline results shall not exceed the tolerances established in the *City Design and Construction Standards Volume 3 [Drainage]*, or within 20% of the benchmark, whichever is the lesser.
- (b) Inspection and testing shall:
  - (i) identify and undertake water quality testing requirements to confirm the water quality treatment performance of all water quality treatment measures, including:
    - (A) sampling frequency and locations (upstream and downstream of treatment measures);
    - (B) minimum storm size requirements for sampling;
    - (C) water quality parameters to be monitored and reported on;
    - (D) release reporting requirements in accordance with the Drainage Bylaw (No. 16200);
    - (E) reporting requirements; and
    - (F) minimum performance requirements for each water quality parameter shall conform with the requirements of Section 3-4.3.2 *[Water Quality Treatment]* of Schedule 5 *[D&C Performance Requirements]*.

- (ii) identify and undertake peak flow reduction testing requirements to confirm peak flow reduction goals are being achieved throughout the Operating Period, including:
  - (A) sampling frequency and locations (upstream and downstream of peak flow reduction measures);
  - (B) minimum storm size requirements for sampling;
  - (C) reporting requirements; and
  - (D) minimum peak flow reduction performance requirements shall conform with the requirements of Section 3-4.4.2 [*Peak Flow Mitigation*] of Schedule 5 [*D&C Performance Requirements*].
- (iii) measure and monitor:
  - (A) leakage allowances;
  - (B) alignment tolerances (settlement);
  - (C) peak flow mitigation goals (e.g. LID measures);
  - (D) the function of the energy dissipaters that receive drainage pipe discharge and identify erosion concerns;
  - (E) vegetation/ground below the Davies Elevated Guideway signs of spill over following major rain events;
  - (F) stormwater flood control (e.g. SWM ponds); and
  - (G) water quality treatment goals (e.g. sediment capture);
- (iv) observe and record:
  - (A) any ponding issues;
  - (B) erosion, slumping and overgrowth; and
  - (C) inspect filter media and filter drains to verify they are allowing acceptable filtration.
- (v) Rectify all Deficiencies within 10 days and undertake follow-up inspection and/or testing 10 days thereafter.

### **10.15.2 Reactive Maintenance**

Any situation that may negatively impact:

- (a) Operations;
- (b) the public well-being;

- (c) downstream City sewer or drainage systems, watercourses or the environment unless cause by an incident upstream of Project Cos responsibility;

or that may include spilled materials that have potential to have deleterious effects shall be deemed to be an emergency incident and shall trigger the following Reactive Maintenance requirements:

- (a) notification of the incident to the City within 4 hours of becoming aware of the emergency incident;
- (b) initiation of a response within 30 minutes of becoming aware of the emergency incident with immediate action to contain it, including containment of spilled materials and measures to prevent further spills; and
- (c) full containment and clean-up of any spills within 24 hours of the emergency incident.

### **10.15.3 Preventative Maintenance**

Preventative Maintenance of the Stormwater Management system shall:

- (a) be performed so as to prevent contaminants entering the downstream drainage systems or the environment;
- (b) not flush sediment from traps into the downstream drainage systems;
- (c) remove minor blockages and debris in the drainage system at 6 month intervals and prior to the start of winter in October of each year;
- (d) control vegetation as needed – use of fertilizers, pesticides and herbicides are to be not permitted to ensure they do not contribute to water pollution or degrade naturalized environments;
- (e) ensure ponded water is not present for more than 72 hours and no algae formation is visible;
- (f) rectify issues due to erosion, slumping and overgrowth;
- (g) ensure snow or ice build-up does not impact the performance of the drainage system, cause a Hazard or impact Operations; and
- (h) clean all grit traps, clean-outs and catch basins of all grit in April of each year.

## **10.16 LANDSCAPING**

### **10.16.1 General**

- (a) Project Co shall maintain all aspects of the landscape to the standards set out in the *Valley Line LRT Project Landscape Design Standards*, a copy of which is included in the Disclosed Data. The duration of Project Co's landscape maintenance obligations is specified in Section 1.19 [*Completion and Handback of Landscaping, Native Forest*

*Restoration and Naturalization]* of Schedule 10 [*Environmental Performance Requirements*].

- (b) Landscape Maintenance shall focus on horticultural practices that produce vigorous and healthy plant material.
- (c) Landscape Maintenance shall provide the following results:
  - (i) clean landscape areas, free of debris and refuse;
  - (ii) aesthetic and high quality spaces;
  - (iii) healthy and vigorous plant material; and
  - (iv) landscape materials and elements free from damage or deterioration.
- (d) Landscape Maintenance shall employ on ecologically sound practices, including:
  - (i) integrated pest management;
  - (ii) plant health care;
  - (iii) composting;
  - (iv) application of organic mulches;
  - (v) use of organic fertilizers; and
  - (vi) use of organic or environmentally-friendly weed control products and methods.
- (e) Maintenance of existing trees shall be the responsibility of the City.

#### **10.16.2 Landscaping Maintenance Plans**

- (a) Project Co shall prepare and submit landscape Maintenance plans that include detailed descriptions of maintenance strategies and practices required for all landscape, Native Forest Restoration Areas and Naturalization Areas, (the “**Landscape Maintenance Plans**”), which shall include strategies and methods for the following aspects of landscape Maintenance:
  - (i) weed control;
  - (ii) integrated pest management;
  - (iii) turf management, including reseeding;
  - (iv) fertilizers, top-dressings, and soil amendments;
  - (v) mulches;
  - (vi) pruning;

- (vii) mitigation measures for landscape areas affected by roadway salts; and
- (viii) landscape protection measures to prevent third party damage (i.e. preventing pedestrians from walking across seeded areas).

**10.16.3 Landscaping Inspection Requirements**

- (a) Project Co shall inspect all landscape, Native Forest Restoration Areas and Naturalization Areas monthly during the growing season to ensure compliance with Maintenance requirements.
- (b) Project Co shall maintain a landscape inspection and Maintenance log for all landscape, Native Forest Restoration Areas and Naturalization Areas (the "**Landscape Inspection and Maintenance Log**"), which shall include the following information:
  - (i) inspection reports, including:
    - (A) date of inspection;
    - (B) condition of landscape areas;
    - (C) Deficiencies and measures for correction or rectification;
    - (D) dead or missing plants and required plant material replacements;
    - (E) any indications of plant disease or decline in plant health; and
    - (F) soil tests; and
  - (ii) all landscape Maintenance activities conducted, including date, location and description of activities,

The Landscape Inspection and Maintenance Log shall be updated and submitted to the City every 3 months during the growing season.

**10.16.4 Weed Control**

- (a) For the purpose of this Schedule 7 [*O&M Performance Requirements*] the following plant species are considered weeds:
  - (i) all species designated as "prohibited noxious" or "noxious weeds" as per the Alberta Weed Control Act;
  - (ii) dandelions, jimsonweed, quack grass, horsetail, morning glory, rush grass, mustard, lambsquarter, chickweed, crabgrass, Canadian thistle, tansy, ragwort, bermuda grass, bindweed, bent grass, perennial sorrel, brome grass, red root, pigweed, buckweed, scentless chamomile, toadflax, foxtail and perennial sow thistle; and
  - (iii) in shrub and perennial beds any plant species not identified in the Final Design.
- (b) Maintain landscape elements to the following weed control standards:

- (i) landscape planting beds, Native Forest Restoration Areas and Naturalization Areas shall be kept weed free. Weed control activities shall be conducted a minimum of ten times in each area over the growing season; and
- (ii) sod areas shall not exceed a weed threshold of 3 weeds per m<sup>2</sup>. Seeded areas shall not exceed a weed threshold of 5 weeds per m<sup>2</sup>.

**10.16.5 Soils**

- (a) Maintain and top all planting bed and tree trench soils to original design levels and standards if settlement or washouts occur. Mulch shall be pulled back prior to the addition of soil. Plants shall be lifted and replanted to required planting depth.
- (b) Landscape soils shall be analysed by an accredited soils testing lab if plant material, including turf, shows signs of decline. Soil treatments or amendments shall be recommended by an agronomist or Arborist and included in the Maintenance activities.

**10.16.6 Mulches**

- (a) All mulches shall be topped up annually to their specified depth with mulch matching the original design requirements.

**10.16.7 Tree Root Barrier**

- (a) Tree root barrier shall be monitored for frost heaving and reinstalled if frost heaving occurs.

**10.16.8 Plant Bed Edging**

- (a) Planting beds shall be maintained with a clean cut edge annually if an edging product (i.e. aluminum edger) is not used.
- (b) Plant edging materials, if used, shall be monitored for frost heaving and reinstalled if frost heaving occurs.

**10.16.9 Pruning**

- (a) Dead, damaged or diseased branches shall be pruned within one month of identification, unless horticultural practices, such as the Elm Pruning Ban, dictate specific seasonal timing.

**10.16.10 Plant Removal and Replacement**

- (a) Dead plants or plants in poor horticultural condition shall be removed within one month of identification.
- (b) Diseased plants that cannot be successfully treated shall be removed immediately upon identification.
- (c) Plant replacements shall occur within three months of identification, or immediately the following spring if identified in late autumn.

- (d) Turf areas with bare spots over 500mm diameter three months after seed installation shall be reseeded immediately.
- (e) Turf shall be reseeded or overseeded throughout the Operating Period to produce turf surface with no bare spots over 150mm diameter.

**10.16.11 Protected Trees**

- (a) Root and branch management procedures of and damage to Protected Trees during the Operating Period shall follow the protocols set out in Section 2-14.13 [*Tree Retention, Relocation, Removal and Protection*] of Schedule 5 [*D&C Performance Requirements*], including keeping a Tree Management Log and conducting a Tree Risk Assessment if applicable.

**10.17 LIGHT RAIL VEHICLES**

**10.17.1 Light Rail Vehicle Inspections**

Daily pre-Passenger Service inspections shall be undertaken of the LRVs, to confirm:

- (a) the acceptable custodial condition of vehicles pursuant to Section 9.6.5 [*LRVs*] of this Schedule;
- (b) the exterior and interior surfaces, including any decals and advertising vinyls, are in a good state of repair and there is no evidence of damage or excessive accumulation of wear and tear to such surfaces,
- (c) successful functionality checks of safety critical equipment, for example external lighting, warning devices, brakes and door systems; and
- (d) the acceptable condition of equipment or features with which Passengers interface, such as Passenger alarm points and Passenger information and address systems.

**10.17.2 Light Rail Vehicle Maintenance**

- (a) Procedures for removing defective LRVs from Passenger Service shall be included in the Incident Management and Service Recovery Plan. Following the identification or notification of the Deficiency, a defective LRV shall have the applicable action(s) described in “Acceptable Incident Management Mitigation” performed in accordance with the Deficiency priorities listed in Table 10.17.2 [*LRV Deficiency List*]. If no applicable action(s) described in “Acceptable Incident Management Mitigation” can be performed, the affected LRV shall be removed from Passenger Service in accordance with the Deficiency priority as set out in Section 10.17.2(b) [*Light Rail Vehicle Maintenance*].
- (b) Each Deficiency shall prompt the following response based upon the defined priority of the Deficiency as listed in Table 10.17.2 [*LRV Deficiency List*]:
  - (i) Critical:
    - (A) Train consists of a single LRV - disembark all Passengers at the next Stop or Station. Remove the affected Train from Passenger Service and replace it with another Train; or



- (B) Train consists of multiple LRVs – disembark all Passengers at the next Stop or Station, or if it is safe to do so, move Passengers to another LRV in the affected Train and lock down the affected LRV. Replace the affected LRV before the affected Train next departs from the Mill Woods Town Centre Terminus Stop.
- (ii) Urgent – complete the Trip on which the Deficiency is identified and then replace the LRV in Passenger Service at the end of the next full southbound Trip. Regularly advise Passengers over the LRV PA/VMS of the Deficiency.
- (iii) Routine – replace or remove the Train from Passenger Service at the next reduction of the fleet. Regularly advise Passengers over the LRV PA/VMS of the Deficiency.

**Table 10.17.2 – LRV Deficiency List**

<b>Deficiency</b>	<b>Priority</b>	<b>Acceptable Incident Management Mitigation</b>
Floor Surface Adherence – spills or slipping Hazards	Urgent	Mess / Hazard is cleaned up / removed
Cleanliness – ad-hoc mess, garbage, strong odour etc. which is not a public safety issue or biohazard	Urgent	Mess is cleaned up / rectified
Cleanliness – ad-hoc mess, broken glass etc. which is a public safety issue or biohazard	Critical	N/A
LRV door (a door on any side fails)	Routine	N/A
LRV door (multiple doors on any side fail)	Urgent	N/A
Ambient temperature inside vehicle outside of the range permitted for Category B vehicles in accordance with EN 14750	Urgent	As indicated in the System Safety Program, depending on the severity of the temperature variance
Graffiti – offensive as defined in City Policy	Urgent	Graffiti is covered or removed while the LRV is in Passenger Service and then treated as Routine
Graffiti – non-offensive	Routine	N/A
VMS failure – Single VMS	Routine	N/A
VMS failure – Multiple VMS	Urgent	N/A
PA failure – Partial	Routine	N/A
PA failure - complete	Urgent	N/A
Operations radio failure	Urgent	N/A
Driver communication failure – no communication with OCC available	Critical	N/A
Any other conditions identified in the System Safety Program which present Hazards to Passengers	Critical	As indicated in the System Safety Program
Inability to maintain horizontal and/or vertical clearance tolerances to Platform edges	Urgent	In addition to removing the train as specified unloading and loading of passengers must be supervised at the remaining LRT stops
Failure of any braking system	Critical	Operate the LRV in a degraded mode as permitted by the System Safety Program

<b>Deficiency</b>	<b>Priority</b>	<b>Acceptable Incident Management Mitigation</b>
Failure of a single external headlight, tail light or directional indicator light on the front or rear facing cab of a Train	Urgent	N/A
Failure of a single external light on the side of an LRV	Routine	N/A
Failure of a single audible warning device	Urgent	N/A
Failure of all audible warning devices	Critical	N/A
Failure of more than one external headlight, tail light or directional indicator light on the front or rear facing cab of a Train	Critical	N/A
Failure of more than one external light on the side of an LRV	Urgent	N/A
Windscreen wipers / washers failure	Urgent	N/A
Wheels - flat spots exceed in-service requirements as per the vehicle supplier or 25mm in length whichever is more restrictive	Urgent	N/A

(c) For any other LRV Deficiencies that arise, Project Co shall, as part of the System Safety Program , formulate a response plan acceptable to the City that:

- (i) assigns the appropriate priority;
- (ii) sets the time period in which the LRV shall be removed from service; and
- (iii) lists mitigation procedures,

failure to remove the LRV from Passenger Service or mitigate the Deficiency within the time period identified in the response plan could result in the accumulation of NPE Points as per the specified priority.

(d) Maintain all LRVs in a condition such that they are Available for use in Passenger Service, subject to Overhaul Maintenance or other Maintenance required as a result of routine use and accidents or incidents.

## **10.18 PUBLIC ART**

(a) Except as provided in section 10.18 (b), the City will retain responsibility for all Corrective Maintenance, Reactive Maintenance, Preventative Maintenance and Overhaul Maintenance of Public Art. Where Public Art can only be accessed from parts of the System where access is normally restricted, Project Co shall facilitate reasonable requests for access, from the City. Requests for access may be made to perform the following activities:

- (i) visual assessments and Maintenance inspections;

- (ii) photography;
  - (iii) restoration and conservation;
  - (iv) de-installation and re-installation; and
  - (v) relocation or removal as determined by the City.
- (b) Project Co shall be responsible for all Maintenance of:
- (i) any power supply to each item of Public Art (if applicable), to the applicable power outlet or other demarcation point as agreed;
  - (ii) all lighting of Public Art except for lighting which forms part of the Public Art; and
  - (iii) all supporting structures for Public Art which are supplied by Project Co.
- (c) All damage or noticeable deterioration of an artwork, identified by Project Co staff during Custodial Maintenance or at any other time, shall be reported to the City's Representative within 24 hours. All damaged artworks shall be made safe and any detached elements shall be collected and stored for collection by the City. Damaged glass artwork shall be replaced with standard glass to restore the original functionality of the facility in which the artwork was installed. The City will replace the artwork at its discretion.

#### **10.19 SOFTWARE SYSTEMS**

Keep all supported software systems up to date with vendor supplied patches, fixes, service bulletins and other updates unless there is a demonstrable conflict with other system or risk of negative impact upon Operations.

#### **10.20 LIGHTING**

Maintain lighting levels in accordance with the design requirements set out in Section 2-6 [*Lighting*] of Schedule 5 [*D&C Performance Requirements*]. Upon the identification of a Deficiency, return lighting to the designed levels within the following timescales:

- (a) 72 hours for any single luminaire out; or
- (b) 24 hours if multiple luminaires are out.

### **11. OPERATIONS AND MAINTENANCE MANUAL**

- (a) Not less than 24 months prior to the Expiry Date, Project Co shall prepare and submit an Operations and Maintenance manual for the System with sufficient detail to permit the System to be operated and maintained by the City after the Expiry Date, (the "***Operations and Maintenance Manual***"). At the Expiry Date the manual shall reflect all changes to Operations and Maintenance procedures in existence at that time.
- (b) The Operations and Maintenance Manual shall include a comprehensive update to the Operating Rule Book and Standard Operating Procedures as set out in Section 6.4 [*System Safety Program Requirements*] of this Schedule.

- (c) The Operations and Maintenance Manual shall identify all activities required to maintain the System to meet the Service Performance Measures for a minimum of 5 years following the Termination Date including inspections and routine maintenance with specific instructions for:
  - (i) Daily requirements;
  - (ii) Weekly requirements;
  - (iii) Monthly requirements;
  - (iv) Annual requirements; and
  - (v) A history of all Maintenance activities undertaken by Project Co.
- (d) During the 12 months prior to the Expiry Date, Project Co shall provide training and access to the System to City Persons in order to facilitate the transfer of knowledge and experience.

## APPENDIX 7-A – HANDBACK REQUIREMENTS

### 1. GENERAL

At the Termination Date, Project Co will relinquish all interests in the System and shall handback the System to the City.

- (a) This section sets out:
  - (i) the Handback Requirements for Project Co and the standards Project Co shall meet to facilitate the eventual transfer of all interests in the System and its assets to the City (“***the Handback Requirements***”); and
  - (ii) the procedure under which the City and Project Co shall undertake joint inspections and surveys of the System in preparation for such transfer of interests, and the planning and performance of any remedial work required to fulfill the Handback Requirements.
- (b) Project Co shall perform Operations and Maintenance:
  - (i) so that at any time the System can continue to be operated at a level commensurate with that required by this Agreement for the following 5 years, if maintained in accordance with the relevant Five Year Maintenance Plan delivered in the last Service Year;
  - (ii) such that, on the Termination Date, the System and its assets will be in a condition as required by Section 2 [*System Condition*] of this Appendix 7-A; and
  - (iii) in accordance with the requirements set out in Schedule 10 [*Environmental Performance Requirements*], such that at all times, the Lands and the System comply with the requirements in that Schedule.

### 2. SYSTEM CONDITION

- (a) Project Co shall Maintain the System throughout the Operating Period, in accordance with the Maintenance Plans, such that, on the Termination Date, the assets of the System for which a Remaining Useful Life has not been specified in Section 2 [*System Condition*] of this Appendix 7-A, shall be in a condition consistent with:
  - (i) the System having been designed and constructed in accordance with the Design and Construction Requirements;
  - (ii) Project Co having Operated and Maintained the System in accordance with the O&M Requirements; and
  - (iii) the remaining Overhaul Maintenance, set out in the applicable Maintenance Plans having been carried out as required.
- (b) Without limiting the preceding paragraph, Project Co shall perform the Operations and Maintenance in such a manner that on Termination Date, the Remaining Useful Life of

the assets of the System shall be equal to the Design Service Life of the asset less the time since Service Commencement, except for the following assets, which, to the extent the Agreement is terminated on the Expiry Date, shall have a Remaining Useful Life on the Expiry Date of at least:

<b>System Assets</b>	<b>Remaining Useful Life (Years)</b>
Bridges and Elevated Guideways - Joints	5
At grade Trackway - Joints	5
Track – At-grade Crossings	10
Rail Systems	5
Traction Power System (not including OCS)	10
Elevators, Escalators, automatic doors and other mechanical systems at Stations, Stops and Churchill Connector	5
Gerry Wright OMF – LRV maintenance shop(s) and equipment within	10

### 3. **HANDBACK CONDITION ASSESSMENT**

- (a) In conjunction with the preparation of the Five Year Maintenance Plan for the Service Year at 7 years and 2 years prior to the Expiry Date, or promptly following an earlier termination of this Agreement in accordance with its terms, Project Co and the City shall perform a joint inspection and survey of all System components and assets, (the “**Handback Survey**”), which shall include:
- (i) a review of the historical Maintenance information from the Maintenance and Asset Management System as described in Section 3.1 [*Maintenance and Asset Management System*] of this Schedule;
  - (ii) any inspections and non-destructive testing of System components and assets required by either Project Co or the City;
  - (iii) at the inspection performed two (2) years prior to the Expiry Date or at an inspection carried out following an earlier termination, at Project Co’s expense,
    - (A) the dynamic performance of the Kâhasinîskâk Bridge performed in accordance Section 4-3.7.4 [*Dynamic Behaviour*] of Schedule 5 [*D&C Performance Requirements*];
    - (B) “reference” strands from at least two stay cables of the Tawatinâ Bridge shall be removed and inspected. A minimum of two and a maximum of four “reference” strands shall be removed and inspected to determine the condition of the stay cables;

- (C) remove, inspect and rehabilitate as necessary, one bearing, selected by the City from each of the following Transportation Structures:
  - (I) Tawatinâ Bridge;
  - (II) South River Valley Elevated Guideway;
  - (III) Kâhasinîskâk Bridge;
  - (IV) Davies Elevated Guideway; and
  - (V) Whitemud Drive LRT Bridge.

Bearings that cannot be rehabilitated shall be replaced;

- (D) carry out an environmental testing program at the Gerry Wright OMF, and at each Utility Complex where historical use during the Operating Period suggests that there is a risk of Contamination, the scope of which shall be acceptable to the City, acting reasonably. The program shall include soil, groundwater and other testing to identify whether any Contamination described in any of Sections 1.12(9)(b), (c), or (d) [*Contaminated Sites*] of Schedule 10 [*Environmental Performance Requirements*] is present. The testing and analysis shall be consistent with the scope that would be expected in a typical phase 2 site assessment for a site that has been used for 30 years as an operations and maintenance facility or Utility Complex, as applicable; and
  - (E) confirmation that the inventory of Critical Spares is in compliance with those defined in the Overall Maintenance Strategy.
- (b) If any Handback Survey indicates that any assets of the System are not in a condition consistent with the Handback Requirements, within 15 days following the completion of each Handback Survey, Project Co shall, in co-operation with the City, prepare a complete list of Deficiencies, (the "**Handback Deficiencies**") and deliver to the City the list of Handback Deficiencies. Subject to the right of the parties to refer matters related to the accuracy or completeness of the list of Handback Deficiencies to the Dispute Resolution Procedure, the list of Handback Deficiencies shall include all items required by the City to be included on such list.
  - (c) Within 45 days after submitting the list of Handback Deficiencies, Project Co shall deliver to the City:
    - (i) a proposal as to the additional works (if any are required over and above the scheduled Preventative Maintenance and Overhaul Maintenance) required to be carried out to the System in order to correct the Handback Deficiencies and satisfy the Handback Requirements, (the "**Handback Works**"); and
    - (ii) a proposal for carrying out the Handback Works, describing the total works to be carried out as well as the method and schedule for carrying out such works. Where applicable the works shall be consistent with and integrated into the Five Year Maintenance Plan then in effect.

- (d) the Parties shall jointly retain a qualified third party to prepare an independent valuation of the cost of performing the Handback Works, (the "**Handback Amount**"), which valuation will include an itemised breakdown of the Handback Amount.

#### 4. COMPLETION OF HANDBACK WORKS

- (a) Subject to Section 16.6 [*City's Remedial Rights*] of the Project Agreement, within 10 Business Days after agreement between the Parties, or determination in accordance with the Dispute Resolution Procedure, of the Handback Works identified in each Handback Survey and determination of any associated Handback Amount, Project Co shall:
  - (i) deliver to the City a letter of credit equal to the Handback Holdback, as defined in Section 16.5.4.1 [*Substitution Letter of Credit*] of Schedule 16 [*Payment Mechanism*]; or
  - (ii) elect to have holdbacks on Payments which Project Co is entitled to until such holdbacks aggregate to the value of the Handback Holdback as defined in Section 16.5.4 [*Handback Holdback*] of Schedule 16 [*Payment Mechanism*];

and at its own cost and expense, carry out the Handback Works in accordance with its proposal notwithstanding that the actual cost of the Handback Works may be higher than the Handback Amount.

- (b) Notwithstanding:
  - (i) acceptance of any Handback Works or the Handback Amount;
  - (ii) the participation of the City in a Handback Survey or other condition assessment; or
  - (iii) the complete or partial carrying out of the Handback Works,

Project Co shall not be released from any obligation to conduct any other inspection or to perform any other works in accordance with this Agreement.

- (c) The Handback Holdback will be paid to Project Co or the Handback Holdback permitted to be reduced as the Handback Works are completed, in accordance with Section 16.5.4 [*Handback Holdback*] of Schedule 16 [*Payment Mechanism*]. The City, acting reasonably, shall determine the value of the completed Handback Works.
- (d) Not more than 6 months prior to the Expiry Date or within 6 months after and earlier termination, the Parties shall perform a final Handback Survey to confirm that all the Handback Works have been completed and that the System complies with the Handback Requirements.
- (e) On or within 5 Business Days after the Expiry Date, or 3 months following an earlier termination, or such longer period of time that the City shall agree acting reasonably, the City shall either:



- (i) issue to Project Co a handback certificate confirming completion of the Handback Works (the “**Handback Certificate**”) and return any remaining Handback Holdback to Project Co in accordance with Section 16.5.4 [*Handback Holdback*] of Schedule 16 [*Payment Mechanism*]; or
- (ii) notify Project Co of its decision not to issue the Handback Certificate:
  - (A) stating the reasons for such decision;
  - (B) setting out each aspect in which the Handback Works have not been completed or the System does not comply with the Handback Requirements; and
  - (C) stating the City’s reasonable estimate of the cost of the remaining Handback Amount,

and in this circumstance, the City shall be entitled to keep the remaining Handback Holdback or to draw on the Letter of Credit posted by Project Co in respect of the remaining Handback Works.

## APPENDIX 7-B – EARLY HANDOVER ITEMS

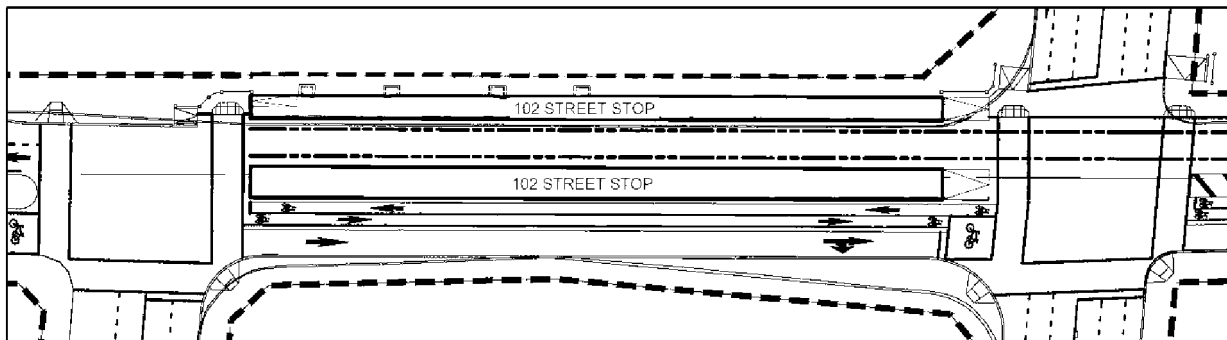
### 1. GENERAL

Early Handover Items are those elements of the Infrastructure which Project Co shall design and construct but for which it shall not be responsible for the Operation or Maintenance.

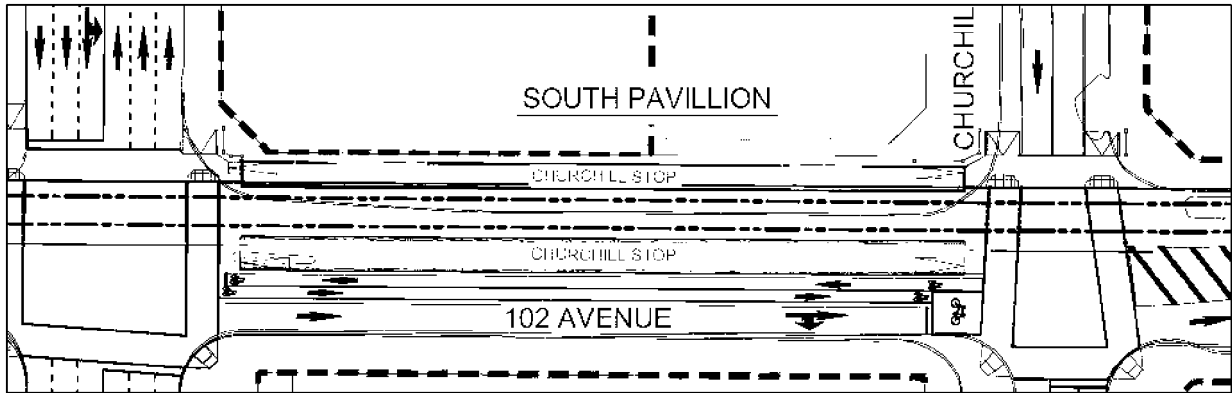
The following are the Early Handover Items:

- (a) all Roadways, parking lots, crosswalks, sidewalks and Shared Use Paths within the Lands, excluding:
  - (i) Roadways, parking lots, crosswalks, sidewalks and SUP within the limits of Davies Site;
  - (ii) Roadways, parking lots, crosswalks, sidewalks and SUP within the Gerry Wright OMF Site;
  - (iii) the portion of the North River Bank Tunnel Approach Access Road between the North River Bank Tunnel Approach and the SUP between Cameron Avenue and Louise McKinney Riverfront Park;
  - (iv) the Tawatinâ Bridge SUP and the SUP on the Kâhasinîskâk Bridge;
  - (v) crosswalks, sidewalks and SUP within, or forming part of, a Platform:
    - (A) for all Stops on 102 Avenue to the extents shown highlighted in the following three diagrams;

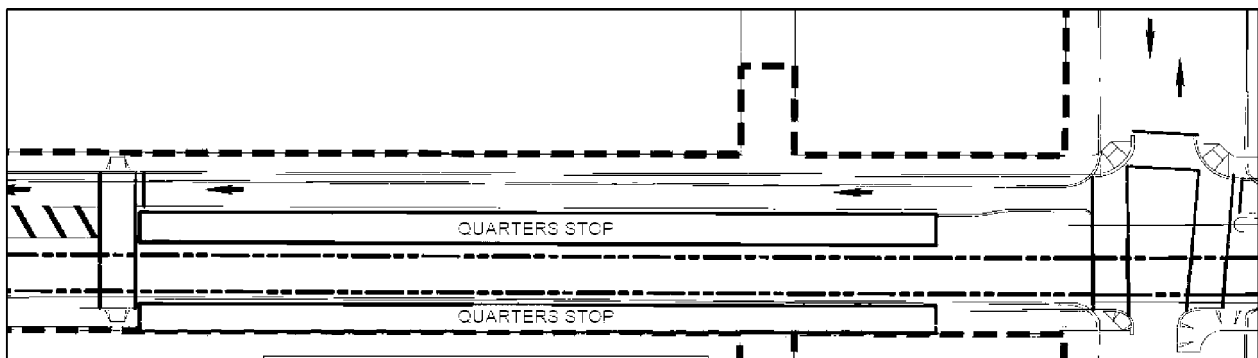
**Figure 1 – 102 Street Stop**



**Figure 2 – Churchill Stop**



**Figure 3 – Quarters Stop**



- (B) for all other Stops:
  1. the full width and length of the Platforms;
  2. all ramps to the Platforms;
  3. all accesses as far as the nearest connection to an SUP, sidewalk or crosswalk; and
  4. all Track crossings; and
- (vi) Roadways, crosswalks, sidewalks and SUP which cross the Tracks to a distance of 3m from the nearest Track centerline;
- (b) all street furniture, lighting and poles, excluding:
  - (i) all street furniture, lighting and poles on Roadways, crosswalks, sidewalks and SUP that not Early Handover Items;
  - (ii) OCS Poles and shared-use poles;
  - (iii) all street lights and pedestrian lights on 102 Avenue;

- (iv) all lighting where shared-use poles “Type 3”, “Type 4”, or “Type 5” are used, pursuant to Section 2-9.8 [*Overhead catenary System*] of Schedule 5 [*D&C Performance Requirements*];
  - (v) Traffic Signal Equipment; and
  - (vi) safety barriers as defined in Section 2-4.5.3 [*Safety Barriers*] of Schedule 5 [*D&C Performance Requirements*] which are used to protect the Trackway.
- (c) all elements of the Stormwater Management System located within the Lands, excluding:
- (i) all Track drainage infrastructure located within, or below, the Trackway, including Track drainage infrastructure:
    - (A) in the Quarters Tunnel and Tunnel Approaches; and
    - (B) on, or associated with, an Elevated Guideway;
  - (ii) storm sewer leads from the Track drainage connecting to storm sewer system manholes or catch basin manholes outside the Trackway;
  - (iii) conveyance sewer from the 102 Avenue Cut and Cover Tunnel, to the extent that any portion is located below the Trackway;
  - (iv) the flow management from the North River Bank Tunnel Approach area including a rain garden and any associated plant materials if part of the design solution;
  - (v) the elements supporting and including the Muttart Stormwater Management Facility and any associated plant materials;
  - (vi) Stormwater Management infrastructure within the limits of the Davies Site;
  - (vii) Stormwater Management infrastructure within the limits of the Gerry Wright OMF Site;
  - (viii) the 41 Avenue flow equalization chamber;
  - (ix) any drainage infrastructure located between the Trackway and the east road right of way along 66 Street, including any swales and storage facilities;
  - (x) all plant materials being part of a Stormwater Management Facility , which shall be subject to the landscape maintenance obligations as specified in Section 1.19 [*Completion and Handback of Landscaping, Native Forest Restoration and Naturalization*] of Schedule 10 [*Environmental Performance Requirements*]; and
  - (xi) the 102 Avenue conveyance pipe or stormwater storage facility, between 96 Street and 97 Street, if access to the facility for Maintenance is provided from within the Trackway.
- (d) the Whitemud Drive Pedestrian Bridge;

- (e) the Existing Whitemud Drive Bridge;
- (f) the Muttart Pedestrian Bridge;
- (g) City Fibre;
- (h) City Cabinets;
- (i) City-FDF;
- (j) ETS LAN Cabinets;
- (k) Churchill Connector building SCADA;
- (l) City's "C-Cure" card readers; and
- (m) Property Fences.

## 2. **WARRANTY**

- (a) Project Co shall provide a deficiency warranty on all Early Handover Items for a period of two (2) years, commencing from the Service Commencement Date, (the "**Warranty Period**").
- (b) The terms of the Warranty shall be:
  - (i) If an Early Handover Deficiency is discovered during the Warranty Period and if the City has notified Project Co in writing of such Early Handover Deficiency before the expiry of the Warranty Period, Project Co shall, at its own risk and expense:
    - (A) remedy without delay, and in accordance with the Project Agreement, such Early Handover Deficiency;
    - (B) repair or replace any portion of the Infrastructure damaged as a result of such Early Handover Deficiency or damaged by the remedy of such Early Handover Deficiency;
    - (C) repair or replace all equipment, materials, supplies, or work performed by others, that is damaged as a result of such Early Handover Deficiency, or damaged by the remedy of such Early Handover Deficiency; and
    - (D) repair or replace any property, including land belonging to the City, or others, which is damaged as a result of the Early Handover Deficiency or damaged by the remedy of such Early Handover Deficiency.
  - (ii) Should Project Co fail to remedy an Early Handover Deficiency, or commence a remedy on an Early Handover Deficiency, in accordance with Section 2(b)(i) of this Appendix 7-B, within 30 days of the City providing a notice to Project Co to remedy the same, the City may proceed with any activities necessary to remedy the Early Handover Deficiency and Project Co shall be liable to and shall indemnify the City for any and all reasonable costs and expenses incurred by the

City in doing so and the City may retain and deduct such amount from payments or other monies due, or which may become due, to Project Co, howsoever arising.

- (iii) Project Co further warrants any and all corrective actions it performs in respect of Early Handover Deficiencies appearing during the Warranty Period until the end of the Warranty Period.
  - (iv) Project Co shall immediately advise the City of any Early Handover Deficiency that it discovers or becomes aware of during the Warranty Period.
  - (v) Project Co shall perform its warranty obligations in a manner that keeps disruptions to the City's continued operations at a minimum.
  - (vi) acceptance of the Early Handover Items by the City, Certificate of the Early Handover Completion by the Independent Certifier, or payment for Completion of the Early Handover Works, shall not relieve Project Co from any responsibility for Early Handover Deficiencies.
- (c) Where repairs must be made immediately due to an immediate concern for public safety, the City shall have the right to undertake such repairs. Cost of such repairs shall be deducted from payment to Project Co. If such repair work is executed by the City, the performance of the work does not void the warranty.

### **3. ADDITIONAL WARRANTIES**

Without limiting the requirements of Section 2 [*Warranty*] of this Appendix 7-B, Project Co shall obtain additional warranties where specified by the Project Requirements. Such warranties shall be issued on the terms specified by the Project Requirements to the benefit of the City.

## **4. EARLY HANDOVER REPAIR AND INSPECTION PROCEDURES**

### **4.1 ROAD REQUIREMENTS**

- (a) Any required pavement patching or subsidence repair shall include at least 50mm milling to overlay. No feathering may be used.
- (b) Upon request during the Warranty Period, Project Co shall perform the following inspection by the City to prepare Roadways for:
  - (i) the surface improvement identified for inspection shall be clean and free of debris;
  - (ii) all roads and gutters shall be water flushed one hour prior to inspection; and
  - (iii) deficient areas shall be marked with spray paint and cross referenced to the numbering system used on the written Early Handover Deficiency list.

#### **4.2 STORMWATER MANAGEMENT REQUIREMENTS**

- (a) A CCTV inspection of the sanitary and storm sewer Early Handover Items shall be completed in accordance with Section 02954 of the *Valley Line LRT Drainage Design and Construction Standards* and the associated inspection results shall be provided to the City 2 months prior to the end of the Warranty Period.
- (b) Any additional CCTV inspection of the sewers to verify the City's interpretation of Stormwater Management As Built Drawings or to inspect Early Handover Deficiency repairs shall be done at Project Co's expense.

#### **4.3 LANDSCAPE REQUIREMENTS:**

- (a) Follow maintenance requirements as identified in the City of Edmonton *Design and Construction Standards Volume 5, Landscaping*.

## APPENDIX 7-C – SERVICE PERFORMANCE MEASURES

### 1. GENERAL

- (a) The Service Performance Measures set out in this Appendix 7-C shall be used to determine the Operating Period Payment Adjustment in accordance with Section 16.5 [*Operating Period Payment Adjustment*] of Schedule 16 [*Payment Mechanism*].
- (b) Each Service Performance Measure shall have an associated Daily Payment Entitlement (DPE) (if a daily measure) and a Monthly Payment Entitlement (MPE) which shall be calculated as detailed in each Service Performance Measure. The Final Monthly Entitlement will be calculated in accordance with Section 7 [*Calculation of Final Monthly Entitlement*] of this Appendix 7-C.
- (c) For the purpose of this Appendix, all calculations will be rounded to four (4) significant figures. For clarity, if the Monthly Payment Entitlement for Monthly Trip Completions for month (t) ( $MPE_t$ ) is equal to 0.9600/0.9900, then the  $MPE_t$  will equal 0.9697 (this calculation assumes that the Performance Shortfall Factor for month (t) is equal to 1).
- (d) All scheduled Trips during the Operating Hours, including those resulting from Special Events or Small Permanent Changes, shall be included in the calculations of the Service Performance Measures except for *Excluded Trips* as defined in subparagraph (f) below.
- (e) If all Trips on any given Operating Day are Excluded Trips then the Daily Payment Entitlement (DPE) for that Operating Day shall be 100%.
- (f) For the purposes of this Appendix 7-C an *Excluded Trip* shall mean either a Cancelled Trip as described in subparagraph (g) below, a Disrupted Trip as described in subparagraph (h) below or an Overloaded Trip as described in subparagraph (i).
- (g) A *Cancelled Trip* is a Trip which is cancelled due to City required emergency drills in accordance with Section 6.4.3(e) [*Emergency Preparedness Plan*] of this Schedule.
- (h) Subject to subparagraph (i) below, a Disrupted Trip is a Trip which does not achieve full credit in the calculation of any Service Performance Measure because Project Co is prevented, hindered or delayed in the performance of the Passenger Service by any one or more of the following events, conditions or circumstances where the adverse impact or effect on Passenger Service persists for a continuous period of 8 hours or more:
  - (i) illegal acts or alleged illegal acts, or investigations by Governmental Authorities arising from such acts;
  - (ii) vehicular or pedestrian collisions;
  - (iii) an investigation or a directive by a Governmental Authority in respect of the Lands;
  - (iv) weather conditions which limit visibility to less than the designed Sighting Distances over more than 30% of the Trackway; or



- (v) loss of primary power from an electric Utility Company affecting more than one TPSS.
- (i) For the purposes of this Appendix 7-C an *Overloaded Trip* is a Trip on which Passenger loading on an LRV reaches AW3 capacity. In order to claim an Overloaded Trip as an Excluded Trip, Project Co must demonstrate that at least 50% of all Trips in any one hour period, in the same direction for five consecutive days are Overloaded Trips.
- (j) Project Co may not claim a Disrupted Trip if only one Mainline Track is affected by one or more of the events described in subparagraph (h) above:
  - (i) during an Off Peak Period; and
  - (ii) for every second Trip during a Peak Period.
- (k) Project Co may claim an Excluded Trip for the purposes of the calculation of Service Performance Measures as provided for in this Appendix 7-C by following the procedure for claiming a Relief Event set out in Section 13.4 [*Procedure on Relief Event*] as if the Excluded Trip was a Relief Event and on the basis that the only relief that Project Co shall be entitled to claim is the assertion of the occurrence of a Cancelled Trip, Disrupted Trip or an Overloaded Trip for the purposes of this Appendix 7-C.

For clarity:

- (i) Section 13.1.2. [*Exclusions from Relief Events*], to the extent applicable, shall apply to a claim or assertion of an Excluded Trip; and
- (ii) no other relief as provided for in Section 13 [*Relief Events*] of this Agreement may be claimed by Project Co as a result or consequence of an Excluded Trip, unless the event, condition or circumstance in question otherwise qualifies as a Relief Event.

## 2. TRIP COMPLETION

- (a)  $TC\%$  = "Trip Completion %" calculated as follows:

$$TC\% = \frac{\sum \text{Trip Completion Credits}}{\sum \text{Scheduled Trips}}$$

Where:

- (i)  $\sum$  **Scheduled Trips** = Number of Trips scheduled from Origin Stop to Destination Stop over a given period according to the Service Level and Small Permanent Changes, as agreed and modified between the City and Project Co from time to time, and including Trips for Special Events once agreed with the City and scheduled.
- (ii)  $\sum$  **Trip Completion Credits** = the sum for each Trip operated over the given period, calculated as follows:

$$= \sum (CL \times TD \times SS \times DT)$$

Where:

- (b) **CL = Consist Length**

$$CL = \frac{\sum \text{Consist Length Credits}}{\sum \text{Consist Length Scheduled}}$$

Where:

- (i)  $\sum$  **Consist Length Credits** = the sum of LRVs, which do not have any Deficiencies that require them to be removed from Passenger Service in accordance with Table 10.17.2 [*LRV Deficiency List*] of Section 10.17.2 [*Light Rail Vehicle Maintenance*] of Schedule 7, which make up the Train for the given Trip.
- (ii)  $\sum$  **Consist Length Scheduled** = the number of LRVs scheduled to make up the consist of the current Trip. Where a Train consisting of two LRVs shall count as 2 or a Train consisting of 3 LRVs shall count as 3.
- (c) **TD = Trip Distance** = 1, except when 102 Street Stop and Mill Woods Town Centre Stops are not both serviced during the Trip, then:
- (i) If the Train:
- (A) Departs from or ends at either 102 Street Stop or Mill Woods Town Centre Stops; and
- (B) Travels from Quarters Stop as far as (or further than) Davies Station, or vice versa; then TD is calculated as follows:

$$= \frac{\text{Actual Trip Length}}{\text{\# of Stops and Stations on the System}} \times 0.7$$

**Where:**

**Actual Trip Length** = the number of Stops and Stations inclusive, from the actual Origin Stop to the actual Destination Stop for that Trip.

(ii) If the Train:

- (A) Does not serve either 102 Street Stop or Mill Woods Town Centre Stops; or
- (B) Does not travel from Quarters Stop and at least as far as Davies Station, or vice versa; then TD is calculated as follows:

$$= \frac{\text{Actual Trip Length}}{\text{\# of Stops and Stations on the System}} \times 0.5$$

**Where:**

**Actual Trip Length** = the sum of the number of Stops and Stations inclusive, served on any portion of the Scheduled Trip.

(iii) Otherwise, TD= 0.

(d) **SS = Stops/Station** = 1, except when any Stop or Station is not accessible in the direction of the Train, or when the minimum Stop and Station Dwell Times are not met at any Stop or Station:

(i) then

$$SS = \frac{\text{\# of Stops and Stations which are fully Accessible}}{\text{\# of Stops and Stations serviced during the Trip}}$$

**Where:**

- (A) each Stop shall count as 1 unit and Davies Station shall count as three units;
- (B) a Stop or Station being “accessible” means that the Station or Stop is safe to Passengers and that Passengers have access to and egress from Trains, subject to mitigation measures being provided to accommodate Passengers with disabilities in the event of an Elevator being out of service at Davies Station; and
- (C) the number of Stations and Stops serviced during the Trip shall be the number of Stops and Stations between, and including, the Origin Stop and the Destination Stop.

- (e) **DT = Departure Time** = 1, except when Train departs from the Origin Stop more than 32 minutes after its scheduled departure time, then:
  - (i) [0].

2.1

DAILY TRIP COMPLETION

s.25

2.2

**MONTHLY TRIP COMPLETION**

s.25

**3. MONTHLY EARLY DEPARTURES**

s.25

#### 4. LATE DEPARTURES

(a)  $LD\%$  = "Late Departures %" calculated as follows:

$$LD\% = \frac{(\sum \text{Trip Completion Credits} - \sum \text{Late Departure Deductions})}{\sum \text{Scheduled Trips}}$$

Where:

- (i)  $\sum$  **Scheduled Trips** = Number of Trips scheduled from Origin Stop to Destination Stop over a given period according to the Service Level and Small Permanent Changes, as agreed and modified between the City and Project Co from time to time, and including Trips for Special Events once agreed with the City and scheduled.
- (ii)  $\sum$  **Trip Completion Credits** = the sum for each Trip over the given operating period, calculated in accordance with Section 2 [*Trip Completion*] of this Appendix 7-C.
- (iii)  $\sum$  **Late Departure Deductions** = the sum for each Trip over the given operating period, calculated as follows:  
$$= \sum (LDOS + LDDS)$$

Where:

(b) **LDOS = Late Departure from Origin Stop** = 0, except:

- (i) 0.5 if the Train leaves more than 15 minutes after the Scheduled Departure Time from the Origin Stop, the Train leaves the Origin Stop later than the next scheduled Trip or if the Trip is cancelled;
- (ii) 0.375 if the Train leaves between 10 minutes and 15 minutes after the Scheduled Departure Time from the Origin Stop, while not leaving later than the next scheduled Trip;
- (iii) 0.25 if the Train leaves between 5 minutes and 10 minutes after the Scheduled Departure Time from the Origin Stop, while not leaving later than the next scheduled Trip;
- (iv) 0.125 if the Train leaves between 3 minutes and 5 minutes after the Scheduled Departure Time from the Origin Stop;

(c) **LDDS = Late Departure from Davies Station** = 0, except:

- (i) 0.5 if the Train leaves more than 15 minutes after the Scheduled Departure Time from Davies Station, the Train leaves Davies Station later than the next scheduled Trip or if the Trip is cancelled;



- (ii) 0.375 if the Train leaves between 10 minutes and 15 minutes after the Scheduled Departure Time from Davies Station, while not leaving later than the next scheduled Trip;
- (iii) 0.25 if the Train leaves between 5 minutes and 10 minutes after the Scheduled Departure Time from Davies Station, while not leaving later than the next scheduled Trip;
- (iv) 0.125 if the Train leaves between 3 minutes and 5 minutes after the Scheduled Departure Time from Davies Station.

4.1

**DAILY LATE DEPARTURES**

s.25

4.2

MONTHLY LATE DEPARTURES

s.25

**5. PUNCTUAL DEPARTURE OF FIRST AND LAST SCHEDULED TRIPS**

s.25

6.

## PERFORMANCE SHORTFALL FACTOR

s.25

## 7. CALCULATION OF FINAL MONTHLY ENTITLEMENT

- (a) The 'Final Monthly Entitlement %' ( $FME_m$  %) in respect of each month  $m$  during the Operating Period shall be calculated as follows:

$$FME_m \% = \sum_{SPM} (MPE_{PM\ m} \times Weighting_{PM})$$

Where:

- (i)  $PM$  is each Service Performance Measure listed above;
- (ii)  $MPE_{PM\ m}$  = the Monthly Payment Entitlement for the relevant Service Performance Measure  $PM$  in month  $m$ , calculated in accordance with this Appendix.
- (iii)  $Weighting_{PM}$  = the payment weighting specified for that Service Performance Measure as specified above.

## APPENDIX 7- D – SERVICE LEVELS

### 1. SERVICE LEVEL TABLES

s.25

s.25



s.25