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<p>Written by</p>	<p>Ernest MOSES/Signalling Stive COMPPER/OCS, TPSS Mariano GARCIA/Guideway Bachar FAWAL/LRV Josmar HERRERA/TVS and Power Shahram SAFAVI/Communications</p>		
<p>Verified by:</p>	<p>Dean GORMAN/Maintenance Rail System Manager</p>	<p align="center">Ensures that the technical/ process accuracy has been checked.</p>	
<p>Approved by:</p>	<p>Alban HOUSSIN/Maintenance Project Manager</p>	<p align="center">Orders, by his signature, the implementation of the document.</p>	

Asset Management Plan

Alstom Ottawa LRT Maintenance Subcontract

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Purpose / Objectives

The purpose of this Initial Asset Management Plan is to describe the procedures applicable for the scope of Alstom Maintenance Subcontract during the first year of application and the following 5-year period for achieving the performance measures specified in the Article 6.0 of the Appendix B, Schedule 15-3 to the Ottawa Light Rail Transit (LRT) Project Agreement (PA).

This document is based on [A1] Schedule 15-3 to Ottawa Light Rail Transit Project Agreement (OTT01: 5429723: v7), and is consistent with the obligations in the Project Agreement within the terms agreed in the Alstom Amended & Restated (A&R) Maintenance Subcontract.

Scope of application

This Initial Asset Management Plan is applicable to all assets included in the System Asset Inventory under the scope of the A&R Subcontract between Alstom & Rideau Transit Maintenance (RTM) during the first year of application. Subsequent annual updates will be done to this document until the Expiry Date, and submitted on December 31 annually, as per required in Table 5.2 of the Appendix B, Schedule 15-3 to PA.

Responsibilities for the execution of this procedure

- Accountable: Maintenance Project Manager for Alstom Ottawa LRT Maintenance Subcontract.
- Responsible: Vehicle and Rail System Engineers for Alstom Ottawa LRT Maintenance Subcontract.
- Players: Vehicle and Rail System Operation Managers, Maintenance Management System (MMS) Supervisor, technicians and operational personnel.

Disclaimer

Alstom has yet to received all the approved versions of the the Asset Register, Operation and Maintenance Manuals, Configuration Management Plan, As-Built Drawings and all other documents as per contract to establish a baseline for the Maintenance Activities. Therefore, this document is based on the Agreement, and what's known at this time.

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Section 1 – Systems Overview

The Ottawa Light Rail Transit System is defined in the [A2] Schedule 15-2 Parts 1 to 5 to the Ottawa Light Rail Transit Project Agreement between The City of Ottawa and Rideau Transit Group (RTG) and it's an indicative based on the initial Configuration given to the City. **The final approved detailed design and Operation Plan will be provided by the Constructor to RTM/Alstom according to its scope of activities, with enough time prior to the agreed Revenue Service Commencement Date.**

1.1. Asset Inventory

The first step in the analysis of Project Co.'s asset inventory was to review the Project Agreement and Subcontractor's contract to understand RTM's maintenance scope.

Due to the unavailability of the Constructor's Asset Register, Alstom has, and continues, to collect asset information from available drawings and conduct field audits to capture and ensure accurate records of infrastructure assets under Alstom maintenance scope.

1.2. Asset Information Management and Inventory Database

1.2.1. Information Management

Both Alstom and RTM has adopted a Maintenance Management System (MMS) to track assets and maintenance activities.

- **Alstom MMS – Global Single Instance (GSI):** Central information system on SAP platform. GSI is deployed to Ottawa LRT Maintenance project in May, 2018.
- **RTM MMS – (Integrated Management Information Reporting System -IMIRS):** Central information system on Agility platform.
- **MMS interface:** Alstom developed an interface for real-time communication between GSI and IMIRS to correspond and track maintenance notifications and activities.

1.2.2. Inventory Database

Asset inventory is the basis of any MMS. IMIRS will contain the full asset inventory, whereas GSI will have a subset pertaining to Alstom maintenance scope. Each asset is organized and structured by location, functionality, and category. For easy communication between the two systems, infrastructure assets will have identical asset structure in both MMS. Due to the complexity of the vehicle, and limitations in IMIRS on configuration management, Alstom will have a different vehicle asset structure from IMIRS. A mapping table is built into the interface to correspond all vehicle maintenance activities at the LRV level.

Assets are classified into the following system:

1. Vehicles

- 34 Light Rail Vehicles (LRV) trains / 3 Non Revenue Vehicles (NRV)

2. Infrastructure

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- Traction Power – Substations (non-linear)
- Communication & Control (non-linear)
- Overhead Catenary System (linear)
- Train Control & Signaling (linear)
- Track & Guideway (linear)
- Tunnel (linear & non-linear)

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Scope	Type	System	Asset	Location	Qty ¹		
ALSTOM	LRV	Phase I	LRV	Fleet	34		
	NRV		Non-Revenue Vehicle	Belfast MSF	3		
	Non-Linear Infrastructure	Traction Power			Substation	10	
				Communications Room	Passenger Stations	13	
				Signal Room	Passenger Stations	4	
				Tunnel Ventilation System (TVS) Room (West & East)	Passenger Stations	8	
				Telephony (Tel)	Passenger Stations	383	
				Public Announcement (PA)	Passenger Stations	1956	
				Ambient Noise Cancellation (ANC)	Passenger Stations	56	
				Closed Circuit Television (CCTV)	Passenger Stations	883	
				Public Information Display System (PIDS)	Passenger Stations	69	
				Intrusion Access Control (IAC)	Passenger Stations	294	
				Guideway Intrusion Device System (GIDS Including TIDS)	Passenger Stations	31	
				Communication & Control	High Speed Data Radio (HSDR)	Passenger Stations	52
					Kiosk	Belfast MSF	7
					Transit Operation Control Centre (TOCC) Room	Belfast MSF	13
					Yard Control Centre (YCC)/BCC Room	Belfast MSF	4
					Electronic Equipment Room	Belfast MSF	1
					Switch Control Room	Belfast MSF	1
					Shared Server Room	Belfast MSF	1
					Auxiliary Communication Room	Belfast MSF	1
			Telephony (Tel)		Belfast MSF	76	
			Public Announcement (PA)		Belfast MSF	N/D	
			Closed Circuit Television (CCTV)		Belfast MSF	133	
			Intrusion Access Control (IAC)		Belfast MSF	78	
			Guideway Intrusion Device System (GIDS)		Belfast MSF	N/D	
			High Speed Data Radio (HSDR)		Belfast MSF	12	
		Linear Infrastructure	Train Control & Signalling		Wayside Radio Unit (WRU)	Wayside Radio Unit (WRU)	Mainline
				Transponders		Mainline	499
				Signal Lights		Mainline	40
					Wayside Radio Unit (WRU)	Belfast Connector & MSF	26
					Transponders	Belfast Connector & MSF	195
					Signal Lights	Belfast Connector & MSF	15
				Overhead Catenary System		Mainline	12.5km
						Belfast Connector & MSF	N/D
				Track & Guideway		Mainline	12.5km
			Belfast Connector & MSF		N/D		
	Switch Point Machine & Heater		Mainline		30		
	Switch Point Machine & Heater		Belfast Connector & MSF		30		
	Tunnel		FTEL	Downtown	25		
			Fire Valves	Downtown	59		
		Sump Pump Room	Downtown	2			
		TVS Station Fans	Downtown	12			

¹ Quantity to date

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Scope	Type	System	Asset	Location	Qty ¹
			TVS Jet/Portal Fans	Downtown	10
			TVS Dampers	Downtown	24
			Fire Incident Command Post	Downtown	5
			FTEL	St Laurent	N/D
			Fire Valves	St Laurent	N/D
			Sump Pump Room	St Laurent	N/D
			TVS Station Fans	St Laurent	3
			TVS Jet/Portal Fans	St Laurent	3
			TVS Dampers	St Laurent	12
			Fire Incident Command Post	St Laurent	2

Section 2 – Performance Management Reporting

2.1. Reports

Alstom will produce reports as per noted below:

Stream	Report	Responsibility	Frequency	Due date
Maintenance	Daily Operating Report	RTM Alstom support	Daily	At least two (2) hours prior to the morning meeting
	Monthly Activity Report	RTM Alstom support	Quarterly	7 Days after each completed quarter
	MSC Monthly Reliability & Maintainability Report	Alstom	Quarterly	
	Asset Management Plan (AMP) Update	RTM & Alstom	Annually	December 31
	Annual APPM Achievement Report	RTM & Alstom	Annually	November 30
	Structures Condition Data	RTM	Annually	September 30
	Tunnel Condition Data	Alstom – Except structure	Annually	
	Track Condition Data	Alstom	Annually	
	Vehicle and Systems Condition Data	Alstom	Annually	
	Facilities Condition Data	RTM	Annually	
	Other Asset Classes Condition Data	Other structure – Not Alstom Drainage and Sedimentation Control Structure – Alstom for Tunnel & Track Drainage only Signs – Alstom for Guideway Signs Electrical Components – Alstom for Fire/Life/Safety System only Mechanical Components – Alstom for Fire/Life/Safety & TVS System only Recreational Trails and Sidewalks – Alstom for Fire/Life/Safety System only (Tunnel sidewalk)	Annually	
	MSC System Asset Inventory	Alstom	Annually	
	As built Drawings	Alstom	Annually	
MSC Invoice	RTM & Alstom	Monthly	2 business days from end of Contract month	
Vandalism & Graffiti (Append to Invoice)	RTM & Alstom	Monthly		
MSC Payment Adjustment Report (Append to Invoice)	RTM & Alstom	Monthly		
Finance				

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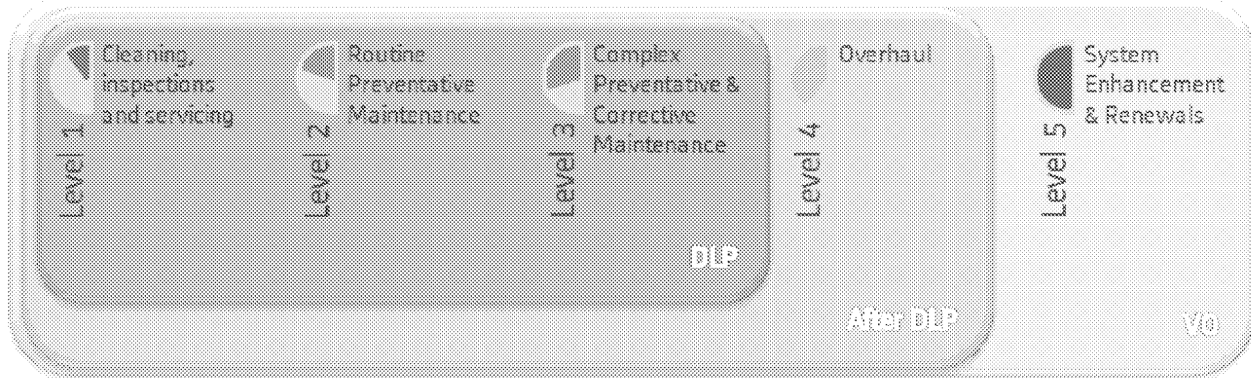
	ASSET MANAGEMENT PLAN Alstom Ottawa LRT Maintenance	Document Reference:	Application date :
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Stream	Report	Responsibility	Frequency	Due date
EHS	MSC Performance Monitoring Report (Append to Invoice)	RTM & Alstom	Monthly	
	MSC Environmental Management Plan	Alstom	Annually	May 1
	MSC Noise & Vibration Survey	Alstom	Biennially	June 1st biennially
	MSC Sustainability Plan	Alstom	Annually	May 1
Quality	MSC Quality Management System	Alstom	Monthly	By the 10 th of each month
	MSC Quality Audit Plan	Alstom	Annually	At twelve monthly intervals following Quality Audit Plan submittal

Section 3 – Scope of Obligations

During the Defect Liability Period (the first 2 years after the handover of the System to Alstom), Alstom Maintenance is responsible for maintenance levels 1 to 3. The replacement of spares, any renewal or retrofit activities are to be performed by RTM.

After the Defect Liability Period, Alstom is responsible for maintenance levels 1 to 4 of the assets under its scope, with exception of the Communications Based Train Control (CBTC) spare parts and performance, which are under Thales responsibility. Any Maintenance Level 5 will be done under a Variation Order.



The definition of each level of maintenance is described below and applies to all maintenance assets:

- Level 1: Cleaning, Inspections and servicing:** corresponds to immediate actions, simple and identified interventions such as servicing, technical cleaning and inspection. These actions allow to restore or to assure the continuity of the service. No special tools are required and only consumable materials are used. Only basic technical knowledge and training are required.
- Level 2: Routine Preventative Maintenance:** Tasks are simple: control, adjustment & setting, standard parts exchange. It can also consist of repairs of subsystems by removal and replacement of one or more Line Replaceable Units (LRU). The actions are of short duration and realized without disturbing the commercial service. This level requires only current technical and industrial means. Only people with good level of training, with the capacity and authorization, according to procedures can assure these operations.

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The Service Orders for Preventative Maintenance are mileage-based for LRVs and time/performance-based for other systems, and are defined in GSI according to the conditions and priorities established in the task lists.

- **Level 3: Complex Preventative and Corrective Maintenance:** Actions requiring more complex procedures, special tools & tests equipment: repairing subsystem or component exchange. Global adjustment actions are required following a level 3 maintenance intervention. It is performed by technicians with a high level of training and competency.

The corrective maintenance is a work carried out in response to reported problems. The sources can be:

- Daily inspections (level 1)
- Preventative Maintenance (levels 2 & 3)
- Customer reports
- Incidents
- Performance monitoring

Maintenance procedures Level 1, 2 and 3 (preventative) are referenced in the Appendix B - Preventative Maintenance per Asset, as listed below, for the assets as per design.

- Appendix B-1 Maintenance for Rolling Stock (LRV)
- Appendix B-2 Maintenance for Signalling
- Appendix B-3 Maintenance for Communications System
- Appendix B-4 Maintenance for Guideway
- Appendix B-5 Maintenance for TPSS (Traction Power Sub Station)
- Appendix B-6 Maintenance for OCS (Overhead Catenary System)
- Appendix B-7 Maintenance for Non-Revenue Vehicles
- Appendix B-8 Maintenance for Tunnel System

The list of preventative maintenance will be revised and updated as soon as the final System Inventory is available.

- **Level 4: Overhauls:** Actions for which procedures require mastering the technology or requires the whole technical mastery. Special tools and conditions are required. It concerns important labours and specialized repairs.
- **Level 5: System Enhancement & Renewals:** Allows the assets' life spans to be extended by partial reconstruction, renewals or technical update.

Section 4 – Quality and Environmental Management

4.1. Quality Management

The Alstom [A3] QUA-SV-OTT-MAN-001 Project Quality Plan defines the quality processes, and associated tools, to be taken in order to meet the quality requirements within the framework of the A&R Maintenance Subcontract. The Project Quality Plan is based on ISO 9001:2015 requirements and includes:

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- The list of applicable procedures and standards to be followed,
- The description of the quality assurance organization, in terms of roles, responsibilities, and rules for planning, monitoring and coordinating the quality assurance activities,
- The identification of subsidiary plans
- The identification of the quality assurance life-cycle, support processes, and the associated rules, methods and tools to be used.

4.2. Environmental Management

The Alstom [A4] EHS-SV-OTT-MAN-002 Project Environmental Management Plan outlines the actions that will be taken during maintenance activities to mitigate any Environmental impact and ensures that the potential for the occurrence of an Environmental incident is minimized.

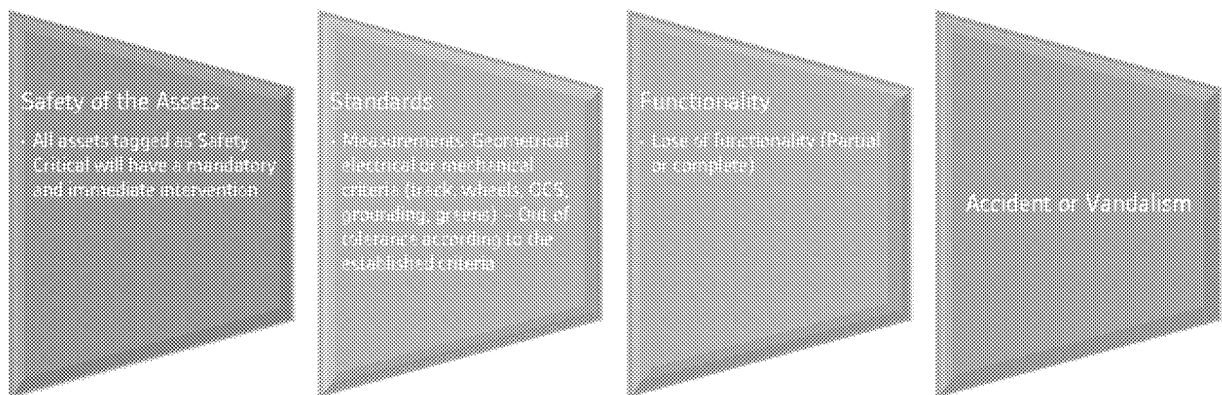
Section 5 – Intervention Criteria for Asset Preservation and Performance Measures (APPM)

The maintenance criteria for interventions are intended to maintain the required levels of service and mitigate risks associated to the performance of the asset. **These criteria will be based on the requirements established in the Operation and Maintenance Manual (OMM) and technical documentation to be provided by the Constructor to RTM/Alstom and will be used to prepare the Preventative Maintenance Schedule.**

Also, the requirements for the Expiry Date are taken into account to define the maintenance interventions and keep an updated record of the assets.

At the time of writing this document, there’s not enough information regarding Power, OCS & Communications to define the specific criteria per asset, so a further update will be performed to this document to reflect the actual data. In the meantime, Alstom know-how will be used to build the Preventative Maintenance per Asset (Appendix B) and the Preventative Maintenance Schedule (Appendix C).

Corrective maintenance will always be expected. However if a particular failure repeats in a short interval of time an investigation will take place to implement all the actions leading to correct the root cause of the failure. The criteria for corrective intervention are based on the following categories:



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Section 6 – Condition Inspection

The approach for preventative maintenance will be based in inspections (either scheduled or condition-based), to ensure the safe operation of the asset according to the acceptable parameters defined in the OMMs. The maintenance personnel will be trained to recognize potentially serious defects and take appropriate action.

Constructor will provide RTM/Alstom with a detailed condition assessment criteria per asset, as per defined by the Constructor and/or other suppliers.

Section 7 – APPM achievements

The approach for assessing the APPM will be a detailed preventative maintenance schedule defined as per the OMMs and the Schedule 15-3.

Section 8 – Deterioration rate and factors affecting APPM

As basic considerations and in order to establish the Initial Maintenance Plan, the following factors are considered:

- Environmental factors (seasons, soil, exposure, etc.)
- Asset characteristics (material, dimensions, quantity, life cycle, etc.)
- Usage

Constructor will provide further information regarding all the factors affecting the performance of the assets. These factors include (but are not limited to):

- Safety requirements
- Past failure history
- Maintenance history
- Updated data regarding age and usage
- Punch list
- Obsolescence Management
- Configuration & Change Management
- Condition assessment policies including guidelines/objectives, operation and maintenance policies from OC Transpo/RTM

Section 9 – Processes for Asset Preservation

The maintenance history, condition assessment, performance monitoring and risk management of each asset will be the factors to identify, program and prioritize the optimal level of maintenance that should be carried out to ensure assets deliver the standard of service required.

Section 10 – Integration and alignment of routine maintenance activities

Alstom approach for the integration and alignment of maintenance activities and asset preservation work will be done through segmenting of areas to maximize resources and technician availability. **More details will be available once RTM/Alstom receive the complete information on the maintenance requirements per asset.**

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Section 11 – Risk Management & Mitigation Measures

11.1. Railway Safety

The constructor will supply to RTM/Alstom a clear picture of the assets that provide the services, current asset condition, decay profile, mode of failure, and the rehabilitation or replacement required to meet the minimum acceptable level of service, as expected by the customers, without compromising the acceptable level of risk. Based on this information, Alstom provides remedial actions according to its scope, included in the Maintenance & Rehabilitation Plan to reduce safety risks to an acceptable level.

In case of a change in the design is needed, Alstom Maintenance will send a report to RTM, for them to be able to validate its applicability and feasibility with the City.

The acceptance of any remedial action and the residual risk will be agreed between Alstom and RTM.

All the railway systems, subsystems, components or services will be procured, maintained, and tracked so that they can be used and maintained within a level of safety that is equivalent to the level of safety of existing railway systems, subsystems and components and the applicable standards.

Alstom has put in place a [A5] RSA-SV-OTT-MAN-001 Project Safety Management Plan to describe the management of all railway risks imported into the project according to RTM directions including those incurred by the use of subcontractors, their suppliers and other third parties.

Once risks are identified they will be recorded in a risk register owned by RTM. Alstom will participate in an annual review of the risk register performed according to the events associated with maintenance of the assets and the performance reports mentioned in Section 2 –Performance Management Reporting.

11.2. Health & Personnel Safety

Risk Management from the Health & Personnel Safety is addressed in the [A6] EHS-SV-OTT-MAN-001 Project Health & Safety Management Plan and [A7] OTT-GNR-EHS30-LOG-001 EHS Risk Assessment.

11.3. Financial and Managerial Risks

The Risk Management approach for Financial, Opportunities and Ethical risks is described in the [P2] PMT-SV-OTT-MAN-001 Project Management Plan.

Section 12 – Maintenance Services Schedule

Refer to Appendix C Preventative Maintenance Schedule.

Section 13 – Innovation and Improvement of performance and reporting process

Alstom will continue to make improvements to its internal reporting system, as per the requirements made by RTM. The next update will provide more information on improvements and innovations.

Section 14 – Expected condition performance of the Assets

The expected condition performance of the asset over the remainder of the maintenance term will be monitored through Alstom MMS where by RTM can confirmed that all contractual compliances have been achieved. The next update will provide further clarity on the performance of the assets.

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Section 15 – 5-Year Asset Preservation

The Appendix B Preventative Maintenance per Asset and the Appendix C Preventative Maintenance Schedule provide specific details regarding the weekly planned asset preservation works for the following 2 years after the start of revenue service.

An update on this Asset Management Plan, Maintenance Schedule and Maintenance Plan, including the plan for years 2 to 5, will be available once the documentation for the final configuration for Signaling, Communications and Power (TPSS & OCS) done by Constructor is delivered to Alstom through RTM.

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Appendices

A. Definitions and References

A-1. Definitions

For the purpose of this document the following definitions shall apply:

- **Hazard:** A physical situation with a potential for human injury.
- **Risk:** The combination of the frequency or probability, and the consequences of a specified hazardous event.
- **Defect Liability Period:** Set period of time after a construction project has been completed during which a contractor has the right to return to the site to remedy defects.
- **Variation Order:** Alteration to the scope of works in a construction contract in the form of an addition, substitution or omission from the original scope of works

A-2. Abbreviations

- **A&R** Amended & Restated
- **APPM** Asset Preservation and Performance Measures
- **CBTC** Communications Based Train Control
- **GSI** Global Single Instance
- **IMIRS** Integrated Management Information Reporting System
- **LRT** Light Rail Transit
- **LRU** Line Replaceable Units
- **LRV** Light Rail Vehicles
- **MMS** Maintenance Management System
- **MSF** Maintenance and Storage Facility
- **PA** Project Agreement
- **RTG** Rideau Transit Group
- **RTM** Rideau Transit Maintenance

A-3. References

The following documents are referenced through the text.

- [A1]** Schedule 15-3 to Ottawa Light Rail Transit Project Agreement (OTT01: 5429723: v7)
- [A2]** Schedule 15-2 Parts 1 to 5 to the Ottawa Light Rail Transit Project Agreement between The City of Ottawa and Rideau Transit Group (RTG)
- [A3]** QUA-SV-OTT-MAN-001 Project Quality Plan
- [A4]** EHS-SV-OTT-MAN-002 Project Environmental Management Plan
- [A5]** RSA-SV-OTT-MAN-001 Project Safety Management Plan
- [A6]** EHS-SV-OTT-MAN-001 Project Health & Safety Management Plan
- [A7]** OTT-GNR-EHS30-LOG-001 EHS Risk Assessment

A-4. Parent documents

- [P1]** A&R Maintenance Subcontract
- [P2]** PMT-SV-OTT-MAN-001 Project Management Plan

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A-5. Child documents

[C1] MTN-SV-OTT-MAN-002 Maintenance & Rehabilitation Plan

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B. Preventative Maintenance per Asset

The following appendices list the preventative maintenance and related Work Method Statements (WMS) for the assets under Alstom Maintenance Subcontract scope of work. **Upon availability of the specific OMM manuals, this schedule will be updated to include manufacturer recommendations and further information regarding maintenance planning for years 2 to 5 for all the systems.**

B-1. Maintenance for Rolling Stock (LRV)

Interior Cleaning:

Frequency	Asset	Maintenance Activity	Reference Codes
Daily	LRV	Sweeping and Rubbish Pick up	OTT-LRV-MTN30-WMS-001
		General Cleaning	
		Clean Passenger Area wall, panels, doors, ceilings, floors, windows, and seat backs	
		Clean Driver's Cabins and Consoles	
		Clean Driver's Cabins walls, floors and ceiling panels	
		Remove any gum from seats, floor and handrails	
		Remove Door Threshold Ice if required	
21 Days	LRV	Deep Cleaning of the vehicle including Mopping, washing, removing any Gum on floor, burn marks, etc.	OTT-LRV-MTN30-WMS-004
Seasonal (End of winter and End of summer)	LRV	Seats and carpets must be shampooed	OTT-LRV-MTN30-WMS-005
		Repair any paint/glass damage Twice a year the LRV's will be taken off line for thorough breakdown and cleaning, this will include pressure washing and sanitization of the vehicles	

Exterior Cleaning: Trains will be washed on a 3 day cycle. When outside temperature drops below -10 degrees Celsius, the washing shall be suspended to avoid equipment issues.

Frequency	Asset	Maintenance Activity	Reference Codes
3 days	LRV	3D-Cust-Automatic Train Wash	OTT-LRV-MTN30-WMS-002

Daily LRV Inspection:

Frequency	Asset	Maintenance Activity	Reference Codes
Daily	TCMS	LRV Reset	OTT-LRV-MTN30-WMS-003
	Battery	Check Battery Voltage and current	
	Defroster	Functionality test	
	Cabin Heater	Functionality test	
	Wipers and Windshield Washer	Functionality test	
	Sunblind	Functionality Test	
	Horn/Bell	Functionality Test	
	Lighting	Functionality Test	
	Sanding	Functionality Test	

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Frequency	Asset	Maintenance Activity	Reference Codes
	Greasing	Functionality Test	
	Doors	Functionality Test	
	Brakes	Check there is no door Fault on DDU	
	Major Faults Lights	Check there is no brake Fault on DDU	
		Check there is major Fault on the SIG box	

Weekly Inspection

Frequency	Asset	Maintenance Activity	Reference Codes
1,920 Km* (Weekly)	Wheel	Check the Wheel Fasteners	OTT-LRV-MTN10-WMS-001
		Check the witness lines on the Wheel Center	
		Check the Wheel Shunts	

* Limited to one double LRV per week (3% of the wheels per week)

Gearbox Oil Change*

Frequency	Asset	Maintenance Activity	Reference Codes
5,000 km**	Gearbox	Oil Draining	OTT-LRV-MTN10-WMS-016
		Oil Filling	

* Please note the Gearbox oil capacity is about 5.4 L

** This activity takes place only one time (first 5,000 KM) per LRV

25,000 km Inspection:

Frequency	Asset	Maintenance Activity	Reference Codes
25,000 (3 months)	Pantograph	Inspection of screws, insulators, buckled frame parts, damper, Sprig chain, and bearings	OTT-LRV-MTN10-WMS-002
		Inspection of the collector head assembly for carbons wear	
		Inspection of the pantograph assembly components	
		Inspection of the shunts and spindle drive for any signs of cracks or flaking	
		Inspection of the head rest and down stop bumpers	
		Inspection of the heater kit fuse	
		Timing Inspection for raising and lowering the Pantograph	
	HVAC	Visual inspection of all cables	OTT-LRV-MTN10-WMS-002
		Inspection of the smoke detector	
		Replacement of Mix and Fresh Air Filters	
	Bogie	Inspection of Bogie Axle beam	OTT-LRV-MTN10-WMS-002
		Inspection of bogie frame	
		Inspection of Transmission (Coupling, Motor, and Gearbox)	
		Inspection of Bogie suspension (Primary and secondary)	
		Inspection of car body to bogie connection (slewing ring and traction	

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Frequency	Asset	Maintenance Activity	Reference Codes
		rod)	OTT-LRV-MTN10-WMS-002
		Inspection of the brakes disc and brake piping	
		Inspection of the track brakes	
		Inspection of the sanders	
		Inspection of the Wheel Flange Lubrication	
		Inspection of earth/current return unit	
	Coupler	Inspection of all coupler Components	
		Functional checking of mechanical couple/uncoupling	
		Functional checking of mechanical couple/uncoupling	
		Replacement of the PPS Copper contact	

30,000 km Inspection

Frequency	Asset	Maintenance Activity	Reference Codes
30,000 km (4 months)	Cabin Heater	Visual inspection of the unit	OTT-LRV-MTN10-WMS-003
		Cleaning dirt and debris	
		Functionality test	
	Bogie	Inspection of Bogie Wheel, Shunts, and Motor	

50,000 km Inspection:

Frequency	Asset	Maintenance Activity	Reference Codes
50,000 (6 months)	Master Controller Key	Lubrication of the Cylinder Lock	OTT-LRV-MTN10-WMS-004
	Track Brakes	Cleaning of the magnetic brakes shoes	OTT-LRV-MTN10-WMS-004
	Bogie	Inspection of Bogie Sensors	OTT-LRV-MTN10-WMS-004
		Inspection of Wheel Flange Lubricator for any signs of leak	
		Inspection of the reaction rod	
		Inspection of Slewing ring	
		Inspection of the anti-roll bar	
	Coupler	Inspection of the wiring assembly	OTT-LRV-MTN10-WMS-004
		Functional checking and cleaning of coupler electric head	
		Functional checking of Vertical and horizontal alignment	
		Functional Check of the re-centering	
		Functional and Visual Check of the folding joint	
	Battery	Cleaning and Lubrication of the automatic coupler	OTT-LRV-MTN10-WMS-004
Topping up the electrolyte			

100,000 km Inspection – Year 1:

Frequency	Asset	Maintenance Activity	Reference Codes
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Frequency	Asset	Maintenance Activity	Reference Codes
100,000 km (12 months)	APS	Visual Inspection, Cleaning , Event Recorder Statement	OTT-LRV-MTN10-WMS-005
		Cleaning of Heat Exchanger.	
	Battery	Checking Charger Voltage Checking Temperature Sensor	OTT-LRV-MTN10-WMS-005
		Checking connections and tightening torques	
		Checking voltage of each cell Visual Inspection	
		Greasing	
		Topping up the Electrolyte	
	Bogie	Inspection of the Bogie One shot task on the Bogie	OTT-LRV-MTN10-WMS-005
	Booster	Inspection of the fixation of the Upper Cover	OTT-LRV-MTN10-WMS-005
		Inspection of the Cabin Booster	
	Coupler	Inspection of the Automatic Coupler	OTT-LRV-MTN10-WMS-005
	Brakes	Emergency Brake/Maximum Service Brake Testing	OTT-LRV-MTN10-WMS-005
		Rolling Back protection testing	
		Inspection of Relay Power Module and auxiliary contact on HSCB	
		Check TTCU Thermostat	
	Doors	Functional Test, Inspection of the Doors	OTT-LRV-MTN10-WMS-005
		Tightening check of the LH Hanger Assembly	
		Visual Inspection of Grounding Braid fixation of DCU	
		Inspection and lubrication of the Door Panel (Seals & Glasses)	
	Cab – Electrical fitting	Test of Command of the Major Fault	OTT-LRV-MTN10-WMS-005
		Check operation of Windshield Wiper	
		Calibration of the Digital Display Unit	
		Check the operation of the Microphone	
		Check the operation of the driver hand set	
Inspection of the bypass cabinet.			
Inspection of the timer windscreen wiper			
Inspection of the Wind Shield			
Exterior Fitting	Inspect mechanical connection of Truck Skirt	OTT-LRV-MTN10-WMS-005	
	Inspect Mechanical connection of fixed outside panel		
	Inspect mechanical connection of the Mud Flap		
	Inspect mechanical connection of Roof Fairing and Rubber Guards		
	Inspect mechanical connection of Top Cover		
	Inspect mechanical connection of Cable		

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Frequency	Asset	Maintenance Activity	Reference Codes
		Duct Cover	
		Inspect mechanical connection of Snow Plug Rubber	
		Inspect mechanical connection of Window bracket	
	FSD	Functional Detection of the Fire Detection System	OTT-LRV-MTN10-WMS-005
	Gangway	Check outer/inner/bottom bellows for cracks and damage	OTT-LRV-MTN10-WMS-005
		Check the Rubber sealing for the outer bellows.	
	Heater	Check the ventilation flow on CAB	OTT-LRV-MTN10-WMS-005
	HVAC	Replacement of Switch HPCO	
		Visual Inspection of Damper for free motion and inspection of motors	
		Test and visual inspection of heater and temperature switch	
		Cleaning and Visual inspection of damage for Condenser and Draining Pipe.	
		Cleaning and visual inspection of damage for the Evaporator	
		Cleaning and inspection of blower, bearing noise and rubbing on housing	
		Visual inspection of controller for damage and downloading unit operation	
	Inter Car	Inspection of damper, equipped transversal damper, connecting link	OTT-LRV-MTN10-WMS-005
		Inspection and greasing of bearing assembly	
		Inspection of Articulation attachment	
	Interior Cab - Fitting	Inspection of Sun blind	OTT-LRV-MTN10-WMS-005
		Greasing of the Tip-up spring	
		Inspection of the Foot rest	
		Check Yellow Safety Walk Strip	
	LVIV Box	Functional test of ground circuit breaker	OTT-LRV-MTN10-WMS-005
		Measuring of Resistance	
	Pantograph	Inspection of the earth braid	OTT-LRV-MTN10-WMS-005
	Pneumatic Circuit	Inspection of the Pneumatic Circuit	OTT-LRV-MTN10-WMS-005
	Sanding And Greasing	Check Control of Sanding Flow.	OTT-LRV-MTN10-WMS-005
		Visual Inspection and Cleaning of Sanding System	
		Check for pressure from the Sanding and Greasing Control Panel	
	Traction	Visual Inspection and Cleaning of Air grids (Near inductor and Motor fans)	OTT-LRV-MTN10-WMS-005
		Visual Inspection of Traction converter gaskets.	
		Visual Inspection and cleaning of Line	

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Frequency	Asset	Maintenance Activity	Reference Codes
		Inductors	
		Visual Inspection of the Main Power Contacts	
		Inspection of Circuit Breaker Case.	
		Visual Inspection and smoothing of horns and ceramics	
		Visual Inspection and smoothing of Power Contacts	

150,000 km Inspection:

Frequency	Asset	Maintenance Activity	Reference Codes
150,000 km (18 months)	Bogie	Inspection of the Bogie	OTT-LRV-MTN10-WMS-017

200,000 km Inspection - Year 2:

Frequency	Asset	Maintenance Activity	Reference Codes	
200,000 (24 months)	AGTU	Removal/Installation of the Hose pipe	OTT-LRV-MTN10-WMS-006	
	Brakes	Replacement of brake pads	OTT-LRV-MTN10-WMS-006	
	CVS		Inspection and checking of the auxiliary contacts	OTT-LRV-MTN10-WMS-006
			Visual Inspection of the electromagnet wiring of ARC1512 circuit breaker	
			Visual Inspection of the wiring	
			Checking resistance value and insulation resistance values	
			Removal/installation, and Visual Inspection of the pre-charge circuit	
			Checking contact resistance of pre-charge contactor and measurement of its resistance	
	Doors		Mounting/Dismounting of the power module ONIX 852 DLP	OTT-LRV-MTN10-WMS-006
			Functional Test of Emergency Handles	
			Inspection of the tightening threaded anti-unscrew of the overcenter shaft	
			Inspection of the Microswitch S850 (door opened and closed)	
			Inspection of the bumper	
			Cleaning and Lubrication of the Upper rail	
			Tightening check of the vertical shaft LH	
			Tightening check of the lateral support RH	
	HVAC		Inspection of the buffer	OTT-LRV-MTN10-WMS-006
		Cleaning and Lubrication of the carriage assembly		
		Cleaning and visual inspection of the frame, cover bracket, and condition of attaching hardware	OTT-LRV-MTN10-WMS-006	

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300,000/330,000/375,000 km Inspection -Year 3:

Frequency	Asset	Maintenance Activity	Reference Codes
300,000 and 330,000 km (36 months)	Bogie	Inspection of the Bogie	OTT-LRV-MTN10-WMS-007
375,000 km	Inter Car	Replacement of equipped transversal damper for overhaul	OTT-LRV-MTN10-WMS-007

400,000 km Inspection -Year 4:

Frequency	Asset	Maintenance Activity	Reference Codes
400,000 km (48 months)	Battery	Replacement of the heaters	OTT-LRV-MTN10-WMS-008
	CVS	Replacement of the ceramic arc chute of line contactor	
		Replacement of the varistor and protection of line contactor	

500,000 km Inspection -Year 5:

Frequency	Asset	Maintenance Activity	Reference Codes
500,000 km (60 months)	Battery	Cleaning	OTT-LRV-MTN10-WMS-009
		Removal/Installation of the battery	
		Electrical Reconditioning of the battery	
	CVS	Replacement of the GMV Bearings	OTT-LRV-MTN10-WMS-009
	Doors	Inspection of the Microswitch S850 (door opened and closed)	
	Doors	Lubrication and adjustment of the bowdens cables for emergency handle and lock our device	OTT-LRV-MTN10-WMS-009
	FSD	Change detectors	
	GANGWAY	Checking wearing parts of floor plate equipped	OTT-LRV-MTN10-WMS-009
TRACTION	Inspection of HV/LV connection	OTT-LRV-MTN10-WMS-009	

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B-2. Maintenance for Signalling

Frequency	Asset	Maintenance Activity	Reference Codes
Daily	ATS(Automatic Train Supervision)/DCS(Data Communication System) Racks	Signal Control Room (SCR) Inspection	OTT-SIG-MTN10-WMS-018
Monthly	ATS/DCS Racks	Electronic Equipment Room (EER) & SCR Inspection (BMSF) Signal Equipment Room (SER) Inspection (Station)	OTT-SIG-MTN10-WMS-019
	SER (Signal Equipment Room)		OTT-SIG-MTN10-WMS-027
	VOBC (Vehicle On Board Controller)	VOBC Inspection	OTT-SIG-MTN10-WMS-023
Quarterly	ZC (Zone Controller)	EER&SCR Inspection (BMSF) SER Inspection (Station)	OTT-SIG-MTN10-WMS-001
	EPC (Electronic Point Controller) Rack		OTT-SIG-MTN10-WMS-003 OTT-SIG-MTN10-WMS-005
	PDR (Power Distribution Rack)		OTT-SIG-MTN10-WMS-007 OTT-SIG-MTN10-WMS-009
	Relay Rack		OTT-SIG-MTN10-WMS-010
	CTF (Cable Termination Frame)		OTT-SIG-MTN10-WMS-013
	Workstation/Printers		Work Stations / Printers Inspection
	Signal Lights	Equipment along the guideway Inspection	OTT-SIG-MTN10-WMS-016
Bi-Annual	ATS/DCS Racks	EER Inspection (BMSF) SER Inspection (Station)	OTT-SIG-MTN10-WMS-020
	VOBC (Vehicle On Board Controller)	VOBC Inspection	OTT-SIG-MTN10-WMS-031
Annual	SER (Signal Equipment Room)	EER Inspection (BMSF) SER Inspection (Station)	OTT-SIG-MTN10-WMS-028
	Transponder Tags	Equipment along the guideway Inspection	OTT-SIG-MTN10-WMS-015
	Wayside Radio Unit		OTT-SIG-MTN10-WMS-012
	Signal Lights		OTT-SIG-MTN10-WMS-017
	Pull Boxes		OTT-SIG-MTN10-WMS-029
	VOBC (Vehicle On Board Controller)	VOBC Inspection	OTT-SIG-MTN10-WMS-024

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B-3. Maintenance for Communications System

Frequency	Asset	Maintenance Activity	Reference Codes
Daily	SCADA (<i>Supervisory Control & Data Acquisition</i>)	Inspection - SCADA	OTT-COM-MTN10-WMS-020
Monthly	SCADA	Inspection - SCADA	OTT-COM-MTN10-WMS-021
Quarterly	PIDS (<i>Public Information Display System</i>)	Inspection - Stations	OTT-COM-MTN10-WMS-003
	PA (<i>Public Announcement</i>)		OTT-COM-MTN10-WMS-006
	GIDS (<i>Guideway Intrusion Detection System</i>)		OTT-COM-MTN10-WMS-012
	IAC (<i>Intrusion Access Control</i>)		OTT-COM-MTN10-WMS-014
	CTS (<i>Communication Transmission System</i>)		OTT-COM-MTN10-WMS-018
	CCTV (<i>Closed Circuit Television</i>)		OTT-COM-MTN10-WMS-029
	HSDR (<i>High Speed Data Radio</i>)		OTT-COM-MTN10-WMS-024
	Telephony		OTT-COM-MTN10-WMS-026
	Communication Kiosk		OTT-COM-MTN10-WMS-001
	FIDS (<i>Fence Intrusion Detection System</i>)		Inspection - BMSF
	IAC (<i>Intrusion Access Control</i>)	Inspection - TPSS	OTT-COM-MTN10-WMS-014
	SCADA		OTT-COM-MTN10-WMS-022
	Telephony		OTT-COM-MTN10-WMS-026
Bi-Annual	Telephony	Inspection-Stations & TPSS	OTT-COM-MTN10-WMS-027
	SCADA	Inspection - SCADA	OTT-COM-MTN10-WMS-022
Annual	PIDS (<i>Public Information Display System</i>)	Inspection - Stations	OTT-COM-MTN10-WMS-004
	PA (<i>Public Announcement</i>)		OTT-COM-MTN10-WMS-007
	GIDS (<i>Guideway Intrusion Detection System</i>)		OTT-COM-MTN10-WMS-013
	IAC (<i>Intrusion Access Control</i>)		OTT-COM-MTN10-WMS-015
	CTS (<i>Communication Transmission System</i>)		OTT-COM-MTN10-WMS-019
	CCTV (<i>Closed Circuit Television</i>)		OTT-COM-MTN10-WMS-030
	HSDR (<i>High Speed Data Radio</i>)		OTT-COM-MTN10-WMS-025
	Telephony		OTT-COM-MTN10-WMS-028
	SCADA		OTT-COM-MTN10-WMS-023

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Frequency	Asset	Maintenance Activity	Reference Codes
	Communication Kiosk	Inspection - BMSF	OTT-COM-MTN10-WMS-002
	FIDS (Fence Intrusion Detection System)		OTT-COM-MTN10-WMS-017

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B-4. Maintenance for Guideway

Frequency	Asset	Maintenance Activity	Reference Codes
Weekly	Concrete Double Cross Over & Turnouts Track Fasteners Ballast Concrete Ties Timber Ties Insulated Bonded Joint Expansion Joint Switch Machine Switch Heater Restraining Rail Jordan Rail Signage Concrete Slabs Floating Concrete Slab Concrete Rail Plinths MOW Access Pad Drainage Level Crossings	Visual Weekly Inspection	OTT-GWY-MTN10-WMS-001
Monthly	Concrete Double Cross Over & Turnouts Fasteners Ballast Concrete Ties Timber Ties Restraining Rail Jordan Rail Signage Concrete Slabs Floating Concrete Slab Concrete Rail Plinths Switch Machine Switch Heater Drainage	Detailed Double Cross Over & Turnouts Inspection	OTT-GWY-MTN10-WMS-002
	Track Fasteners Ballast Concrete Ties Timber Ties Restraining Rail Jordan Rail Concrete Slabs Floating Concrete Slab Concrete Rail Plinths Switch Machine Switch Heater MOW Access Pad Drainage	Detailed Track Inspection	OTT-GWY-MTN10-WMS-003

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Frequency	Asset	Maintenance Activity	Reference Codes
	Level Crossings		
	Switch	Cust Grasing & Cleaning Switch	OTT-GWY-MTN30-WMS-003
	Expansion Joint	Detailed Expansion Joint Inspection	OTT-GWY-MTN10-WMS-004
Quarterly	Sign Guideway Post Guideway Fence Guideway Gates Bridge Steel Pipe Support Bridge Chain Link Fence MSF Interior/Exterior Post MSF Interior/Exterior Fence MSF Interior/Exterior Gates Connector Fence Barrier	Visual Signage & Fence Inspection	OTT-GWY-MTN10-WMS-005
	Track Concrete Double Cross Over & Turnouts Cross Over Concrete Slabs Tunnel Connector Yard	Guideway & Maintenance shop Cleaning	OTT-GWY-MTN10-WMS-006
Seasonal	Vegetation	Vegetation Control	OTT-GWY-MTN10-WMS-008
	Snow	Snow Removal (Snow Blower Backpack)	OTT-GWY-MTN30-WMS-002
	Snow	Snow Removal	OTT-GWY-MTN30-WMS-001
Bi-Annual	Track Restraining Rail Jordan Rail Expansion Joint	Complete Track Alignment Inspection (Track Tracer)	OTT-GWY-MTN10-WMS-007
Annual	Switch Machine Switch Heater	Complete Track Asset Inspection	OTT-GWY-MTN10-WMS-009
	Expansion Joint	Complete Expansion Joint Annual	OTT-GWY-MTN10-WMS-010
	Concrete Double Cross Over & Turnouts Fasteners Ballast Concrete Ties Timber Ties Restraining Rail Jordan Rail Signage Concrete Slabs Floating Concrete Slab Concrete Rail Plinths Switch machine	Complete Double Cross Over & Turnouts Inspection	OTT-GWY-MTN10-WMS-011

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Frequency	Asset	Maintenance Activity	Reference Codes
	Switch heater Drainage		
	Bumping post Friction Wheel Stop Welded Wheel Stop	Complete Rail Arrestor Inspection	OTT-GWY-MTN10-WMS-012
	Concrete Double Cross Over Turnouts Track Restraining Rail Jordan Rail Expansion Joint	Complete Rail Flaw Detection Inspection	OTT-GWY-MTN10-WMS-013
	Concrete Double Cross Over Turnouts Track Expansion Joint	Complete Heavy Geometry Inspection (10,000lbs x Wheel)	OTT-GWY-MTN10-WMS-014
	Maintenance shop Track	Complete Maintenance shop Track Inspection	OTT-GWY-MTN10-WMS-015

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B-5. Maintenance for TPSS (Traction Power Sub Station)

Frequency	Asset	Maintenance Activity	Reference Code
Monthly	Building assembly	TPSS Visual Inspection	OTT-TPS10-MTN10-WMS-001
	HVAC (<i>Heating Ventilation & Cooling</i>) Filter		
	Extinguisher		
Bi-Annual	Building	TPSS Cleaning and SCADA remote testing	OTT-TPS10-MTN10-WMS-003
	SCADA (<i>Supervisory Control & Data Acquisition</i>)		
	Fire Detection System	Fire Detection System Inspection	OTT-TPS10-MTN10-WMS-004
Annual	DC (<i>Direct Current</i>) Breaker	TPSS Annual inspection	OTT-TPS10-MTN10-WMS-002
	AC (<i>Alternating Current</i>) Breaker		
	Rectifier Transformer		
	Battery Charger + Battery bank		
	Battery bank		
	Disconnect Switch		
	E-Stop (<i>Emergency Stop</i>)		
	HVAC General Inspection		
	Feeder Cables	Feeder Cables Insulation tests	OTT-TPS10-MTN10-WMS-005

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B-6. Maintenance for OCS (Overhead Catenary System)

Frequency	Asset	Maintenance Activity	Reference Code
Monthly	Messenger & Wire Assembly	Visual Environment OCS inspection	OTT-OCS10-MTN10-WMS-007
	Pole & Foundation		
	Cantilever Assembly		
	Midpoint Anchors		
	Fixed Termination		
	Section Insulator		
	Head-Span Assembly		
	Cross Span Assembly		
	Negative Return		
Quarterly	Crossovers	OCS Specific Inspection	OTT-OCS10-MTN10-WMS-001
	Overlap system		
	Transition to Rigid rail		
	Splices		
	Section Insulator		
	Insulating distance		
	Anchors		
	YODS (<i>Yard Overhead Disconnect Switch</i>)/MODS (<i>Motor Operated Disconnect Switch</i>)		
Bi-Annual	Contact Wire	OCS Height and Stagger control – Track Tracer	OTT-OCS10-MTN10-WMS-003
	Tensioning Assembly Fixed termination Assembly	OCS Tensioning devices and Fixed Terminals Inspection	OTT-OCS10-MTN10-WMS-002
Annual	Messenger & Wire Assembly	OCS Inspection	OTT-OCS10-MTN10-WMS-005
	Surge Arrestor		
	Guying		
	Rigid Rail		
	Pole & Foundation		
	Protective Device		
	Screening Device		
	Grounding System Assembly	Grounding & Bonding System	OTT-OCS10-MTN10-WMS-004
	Bonding System Assembly	YODS/MODS Electrical Inspection	OTT-OCS10-MTN10-WMS-006
	YODS System Assembly		
	MODS System Assembly		
5 Yearly	Contact Wire	OCS Contact Wire diameter Ctrl	OTT-OCS10-MTN10-WMS-008

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B-7. Maintenance for Non-Revenue Vehicles

Frequency	Asset	Maintenance Activity	Reference Code
Weekly	Knox Kershaw	Inspection	Operation, Maintenance & Parts Manual KBR860 Ballast Regulator
Monthly	OCS Vehicle	Inspection	RR Ottawa LRT Truck – Neotec Maintenance Manual
	Geismar KGT	Inspection	KGT-E Use & Maintenance Handbook
	Know Kershaw	Inspection	Operation, Maintenance & Parts Manual KBR860 Ballast Regulator
Bi-Annual	OCS Vehicle	Inspection	RR Ottawa LRT Truck – Neotec Maintenance Manual
	Geismar KGT	Inspection	KGT-E Use & Maintenance Handbook
	Know Kershaw	Inspection	Operation, Maintenance & Parts Manual KBR860 Ballast Regulator
Annual	OCS Vehicle	Inspection	RR Ottawa LRT Truck – Neotec Maintenance Manual
	Geismar KGT	Inspection	KGT-E Use & Maintenance Handbook

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B-8. Maintenance for Tunnel System

Frequency	Asset	Maintenance Activity	Reference Code
Monthly	Tunnel Ventilation System	TVS Monthly inspection	OTT-COM-MTN10-WMS-008
Quarterly	Fire and Life Safety System	3M-FDAS Inspection	OTT-COM-MTN10-WMS-032
Bi-Annual	Tunnel Ventilation System	6M-Prev-TVS Inspection	OTT-COM-MTN10-WMS-009
	Fire and Life Safety System	6M-Prev-Tunnel Lighting Inspection	OTT-COM-MTN10-WMS-034
Yearly	Tunnel Drainage	1Y-Prev-SUMP Inspection	OTT-COM-MTN10-WMS-011
	Fire and Life Safety System	1Y-Prev-FDAS Inspection	OTT-COM-MTN10-WMS-033
		1Y-Prev-Tunnel Lighting Inspection	OTT-COM-MTN10-WMS-035
	Tunnel Ventilation System	1Y-Prev-TVS Inspection	OTT-COM-MTN10-WMS-010

Note: The Tunnel Ventilation System, Tunnel Drainage and Fire and Life System service maintenance plans will be updated when more documentation will be received.

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C. Preventative Maintenance Schedule

Click in the icon below to open the schedule:



AMP-Preventative
Maintenance Schedule

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Control Sheet

Version	Date	Content of Modification	Author(s)
A	23/08/2018	First issue.	Ernest Moses Stive Compper Mariano Garcia Bachar Fawal
B	29/01/2019	Updates to documentation references and frequencies as per the latest maintenance schedules. Appendix B-8. Maintenance for Tunnel System added	Ernest Moses Stive Compper Mariano Garcia Bachar Fawal Josmar Herrera Shahram Safavi

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