

## Region of Waterloo

### Transportation and Environmental Services

#### Rapid Transit

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**To:** Chair Karen Redman and Members of Regional Council

**Date:** February 28, 2019

**File Code:** A02-30/PW

**Subject:** ION Vehicle and Testing Update

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**Recommendation:** For information.

**Summary:** Nil.

**Report:**

As requested by Council on April 18, 2018, Region staff are providing this update on ION LRT vehicles and testing status for the period November 6, 2019 to February 22, 2019.

This update provides a status of vehicles, testing and training status on the Project and events that are scheduled for this winter/spring.

All fourteen vehicles are currently in Waterloo Region. The status of these vehicles is as follows:

- Installation of specialized on-board equipment on all the vehicles was completed in December 2018
- All fourteen vehicles are being used to complete system testing, training and demonstration activities and vehicle modifications
- Vehicle and system integration testing and driver training has resulted in approximately 30,600 km of cumulative travel equaling approximately 800 ION round trips
- All rolling stock vehicle testing required to start revenue service is complete
- Reliability of vehicles is not yet “ready for service”
- Overall reliability of the vehicles continues to be an issue. Bombardier needs to complete significant modifications to address reliability issues. This totals approximately 50 to 100 hours per vehicle of critical work that needs to be completed

before service starts and 200 to 250 hours of work that can be completed after service starts. These types of issues can be expected with an initial run of vehicles.

- Preliminary Acceptance Certificate (PAC) and Final Acceptance Certificate (FAC) processes still need to be completed.

To begin service, vehicles must go through an acceptance process. Significantly, no vehicles are yet fully ready for service, in that they have not yet achieved Preliminary Acceptance Certificate (PAC) or Final Acceptance Certificate (FAC).

Table 1 summarizes the current status of all the vehicles.

### **On-Board Equipment Installation**

Prior to going into service, it is necessary to install certain specialized on-board equipment on each of the vehicles. As part of the Project, GrandLinq is responsible for ensuring the finished vehicle integrates seamlessly with the built system. On-board equipment includes radios, antennas and on-board systems to control gates, crossings, and traffic signals. This also allows the vehicles to communicate with the ION Control Centre. With this equipment, ION can run at service speeds and at consistent times throughout operations. All of the trains had the specialized on-board equipment installed by end of December 2018..

The next major step is to achieve a Preliminary Acceptance Certificate (PAC).

To achieve a PAC on any vehicle, the following needs to be complete:

- Qualification Testing on Pilot Vehicles (in Kingston);
- Vehicles are fully assembled;
- Modifications are completed on the vehicles or plans for implementing the modifications have been accepted by the Region. Modifications are regularly being implemented to ensure reliability of the vehicle fleet; and
- Each vehicle is inspected and completes routine tests. Routine tests are done on every vehicle to make sure all the components of the vehicle work properly.

Currently the remaining item delaying issuance of PAC is the delivery and acceptance of plans to address all open (unresolved) technical items. These items range from quality issues to pending modifications. Each open item requires a detailed plan showing how the issue will be resolved, to the Region's satisfaction. It is expected that this item will be resolved shortly and that PAC will be issued for the vehicles.

The next step following PAC is to achieve Final Acceptance Certificate (FAC) on the vehicle. Once this is complete, the vehicle is ready to carry passengers.

To achieve a FAC on any vehicle, the following needs to be complete after a PAC:

- Completion of all required modifications unless there are specific exceptions made for issues that can be resolved after FAC;

- 600 kilometer “burn-in” test to make sure there are no reliability issues on the vehicle; and
- Finalization of documentation and safety certification

Following issuance of the FAC, the Region takes ownership of the vehicle and the vehicle is provided to GrandLinq to commence start of service.

### **Testing Status**

Prior to revenue service, a significant amount of testing needs to be completed by Bombardier and GrandLinq.

GrandLinq is completing System Integration Testing in Waterloo Region. System Integration Testing tests both the built infrastructure and the vehicle to ensure they are functioning together as designed. Approximately 78 of the 86 tests have been successfully performed. Successful completion of these tests is required to safety approve the system and is critical to starting service.

GrandLinq is also completing rework activities to correct construction related deficiencies through this reporting period.

Bombardier has started dry run tests for burn-in on some vehicles. These dry run tests will not count to official burn in mileage, but will help identify any vehicle reliability issues as soon as possible. Reliability is a concern in reaching start of service. There are 250 to 300 hours per vehicle of modifications required to address the requirements to be “ready for service” and address reliability concerns. There has been improvement in reliability but there is still work to be completed to be “ready for service”. With an initial run of vehicles it is normal to have issues that need to be resolved. Bombardier has committed significant resources to address the issues and to meet the schedule for start of service.

Table 2 shows the current status of testing.

### **Training Status**

GrandLinq/Keolis continues training on the first of three sets of train operators. Once trained, drivers will be supporting the ongoing testing and burn in programme and system demonstration tests as well as ongoing driving to maintain skill levels. All initial driver training is expected to be complete by end of March. After training of individual drivers is complete vehicles will continue to operate to complete testing and burn in activities, to maintain driver skills and to start practising actual operations.

The Bombardier vehicles are complex vehicles that require routine maintenance as well as any necessary repairs or emergency repairs. Training of the staff that will be doing these repairs is continuing. These staff are currently helping to support the vehicles during the testing programme.

Availability of spare parts for the vehicles continue to be a concern. Each of the vehicles require a certain number of consumable spare parts as well as spare parts to address any unforeseen incidents or failures. The list of spare parts to support start of service has been ordered but not yet delivered. Bombardier has committed to providing the spare parts prior to start of service.

### **Schedule and start of service**

Based on the current schedule for the completion and testing of Bombardier vehicles and GrandLinq's schedule for system integration testing, and driver and mechanic training, it is expected that service will start in spring 2019. Regional staff will continue to closely monitor Bombardier's and GrandLinq's progress and schedule, and will work diligently with them to get the system into service as soon as it is feasible and safe to do so. Staff will also exercise all financial and legal mechanisms available to the Region to expedite the schedule and minimize any negative impacts on the Region. Starting service in spring 2019 aligns with the start of spring service for Grand River Transit and will allow the LRT service to integrate smoothly into the overall transit network.

### **Events**

ION vehicle events have continued through the winter, including a Saturday ION Station Tour. As part of that tour, an ION vehicle stopped at nine stations along the route.

Residents had an opportunity to tour the train at each of the nine stations visited, with staff from ION and Grand River Transit present to answer questions on ION safety, ION service and GRT integration.

As part of the tour, Keolis also collected non-perishable food items for the Food Bank of Waterloo Region.

Further station tours are planned for the spring, with staff focusing on providing information on how to use and ride the service. As part of these upcoming tours, staff will demonstrate how to use fare vending machines and how to pay for rides using the EasyGO fare card.

Ride guides and promotional items will also be available as part of these tours.

Dates and stations visited are being finalized and this information will be publicized widely in advance of the tours.

A total of eight vehicle events have now taken place, with many of these events coinciding with other established community events. Over 5,000 residents have toured an ION vehicle as part of these events.

### **Corporate Strategic Plan:**

The report supports Focus Area 3.1 of Council's Strategic Focus: Develop an implementation plan for light rail transit including corridor and station area planning.

**Financial Implications:**

The approved capital budget for the LRT project totals \$868 million, with funding provided by the Federal Government (\$265 million), Provincial government (\$325 million) with the balance funded by the Region including the repayment over the next 30 years of \$131 million of funding provided by GrandLinq. The RT project and some Grand River Transit service improvements are funded through annual property tax increases in the three cities until 2020 and related fare revenue.

Currently it is anticipated that the schedule changes and associated costs can all be accommodated within the approved rapid transit funding strategy. As has been noted in previous reports the Region will seek to recover from Bombardier any additional costs incurred as a result of the delays in vehicle delivery.

**Other Department Consultations/Concurrence:**

This report was prepared with input from Corporate Services.

**Attachments:**

Table 1: Current Status of Light Rail Vehicles

Table 2: Testing Status

**Prepared By: Thomas Schmidt**, Commissioner, Transportation and Environmental Services

**Approved By: Thomas Schmidt**, Commissioner, Transportation and Environmental Services

**Table 1: Current Status of Light Rail Vehicles**  
*All vehicles are currently owned by Bombardier and have not been accepted by the Region.*

Vehicle Number	GrandLinq On-board Equipment Installation	Open Items Inspection	PAC	Burn In Kilometres	FAC
501	Installed	Not started	No	0	Total of approximately 310 hours of modifications
502	Installed	Not started	No	0	Total of approximately 283 hours of modifications
503	Installed	Inspected: 73 closed 25 still open	No	0	Total of approximately 302 hours of modifications
504	Installed	Not started	No	0	Total of approximately 287 hours of modifications
505	Installed	Not started	No	0	Total of approximately 280 hours of modifications
506	Installed	Not started	No	0	Total of approximately 274 hours of modifications
507	Installed	Not started	No	0	Total of approximately 283 hours of modifications
508	Installed	Not started	No	0	Total of approximately 266 hours of modifications
509	Installed	Not started	No	0	Total of approximately 268 hours of modifications

Vehicle Number	GrandLinq On-board Equipment Installation	Open Items Inspection	PAC	Burn In Kilo-metres	FAC
510	Installed	Not started	No	0	Total of approximately 310 hours of modifications
511	Installed	Not started	No	0	Total of approximately 349 hours of modifications
512	Installed	Not started	No	0	Total of approximately 263 hours of modifications
513	Installed	Not started	No	0	Total of approximately 313 hours of modifications
514	Installed	Not started	No	0	Total of approximately 315 hours of modifications

**Table 2: Testing Status in Waterloo Region**

Test	Status	Notes
Bombardier Qualification (Train-Wayside Communications)	Paused	This tests Train-Wayside communications for vehicle diagnostics and other information to be transmitted to the control centre from terminal stations. Waiting on software upgrades to continue.
GrandLinq System Integration	Ongoing	<p>Testing continues on vehicles with specialized on-board equipment. Testing will include Radios, Automatic Train Protection (allows train to run faster on railway right of ways), Traffic Signal Priority, Automatic Vehicle Location, and Track Switch System and on-board systems to control gates, crossings, and traffic signals.</p> <p>Simultaneous Train Start test planned for February. Two coupled vehicles, fully loaded with simulated passenger weight will depart a station at the same time at maximum power to confirm substation power is adequate at highest load.</p> <p>Completion of crossing gates tests, runtime tests, headway tests, and communications tests planned for late February and early March.</p>
Vehicle Pre service mileage ("Dry-run burn in")	Ongoing	Over 30,600 KM travelled at the same time as driver training activities. This activity helps to Identify faults and reliability issues with the vehicles and infrastructure.
Vehicle Burn-in	Not started	To be started once reliability modifications are completed on vehicles.
Simulation / Demonstration	Not started	<p>System is run as if it was in service, but will not be picking up passengers.</p> <p>Last step in test process, all other tests need to be completed first.</p>