

O-Train Confederation Line Project Update

Transportation Services Department



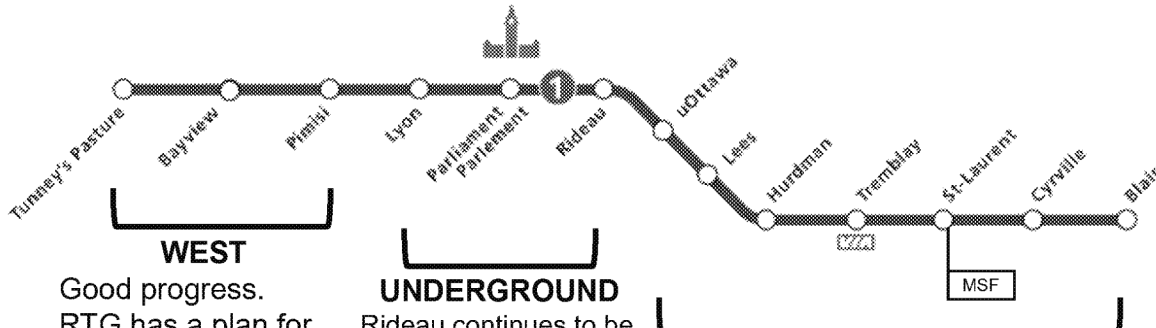
FEDCO
September 10, 2018

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Four Elements To A Rail System

1. Stations:
 - Above ground
 - Underground
2. Track / Catenary / Power Signals
3. Control System (The Brain that operates the entire system)
4. Vehicles

Stations Construction Update

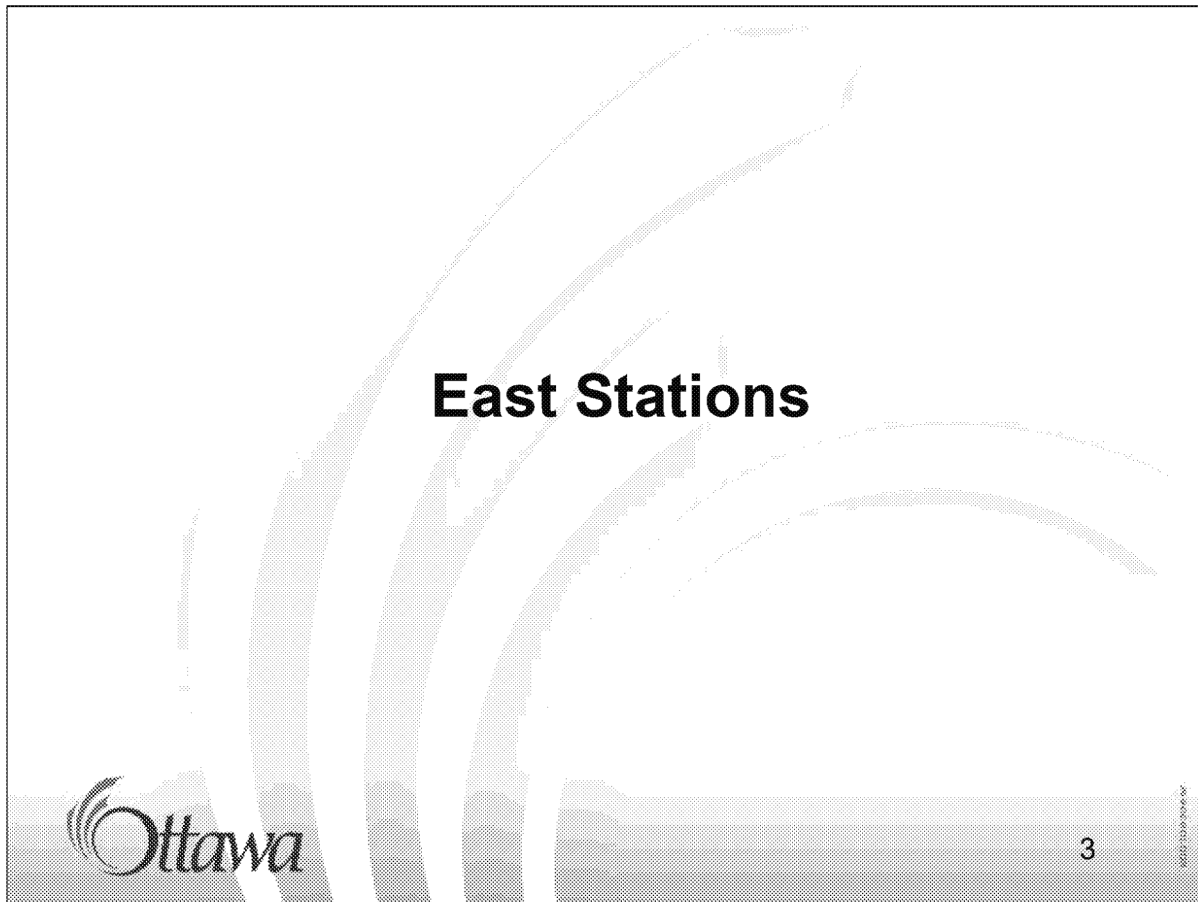


WEST
Good progress. RTG has a plan for concurrent testing and commissioning activities while completing the stations.

UNDERGROUND
Rideau continues to be the station with the most significant amount of construction work remaining. Parliament and Lyon nearing completion. RTG has added extra resources.

EAST
Nearing final occupancy, final finishes.





August 28 Photo: Blair Station westbound platform (looking west)

Progress:

Utility cabinet and end of platforms doors completed

Final modifications to elevators completed

3

Blair Station



August 28 Photo: Blair Station westbound platform (looking west)

Progress:

Utility cabinet and end of platform doors completed

Final modifications to elevators completed

Cyrville Station



St-Laurent Station



August 28 Photo: platform level, fare gates (eastbound)

Progress:

Elevator work and signage installation is wrapping up
Utility cabinet installations, tactile wayfinding indicator strips are completed
Public art murals installed

Tremblay Station



August 28 Photo: platform/tracks (eastbound)

Progress:

Elevators and utility cabinets are being finalized

Transit information panels are installed

Fare gates and entrance lanterns are installed

Hurdman Station



August 28 Photo: stairwell lighting & architectural wood ceiling finishes at Hurdman

Progress:

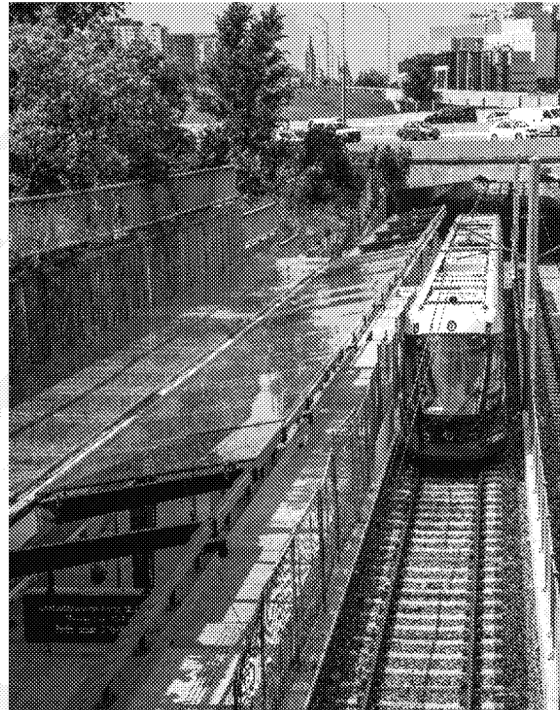
Final concrete work has occurred

Elevator shroud completed

Tactile wayfinding strips installed

Landscaping and concrete bench installations ongoing

Lees Station



Ottawa

9

Left Photo: August 28 Lees Station elevator shrouds, platform
Right Photo: August 28 Lees Station eastbound tracks, train testing

Progress:
Glazing panel installations and caulking ongoing
Landscaping and interlock installations ongoing

uOttawa Station



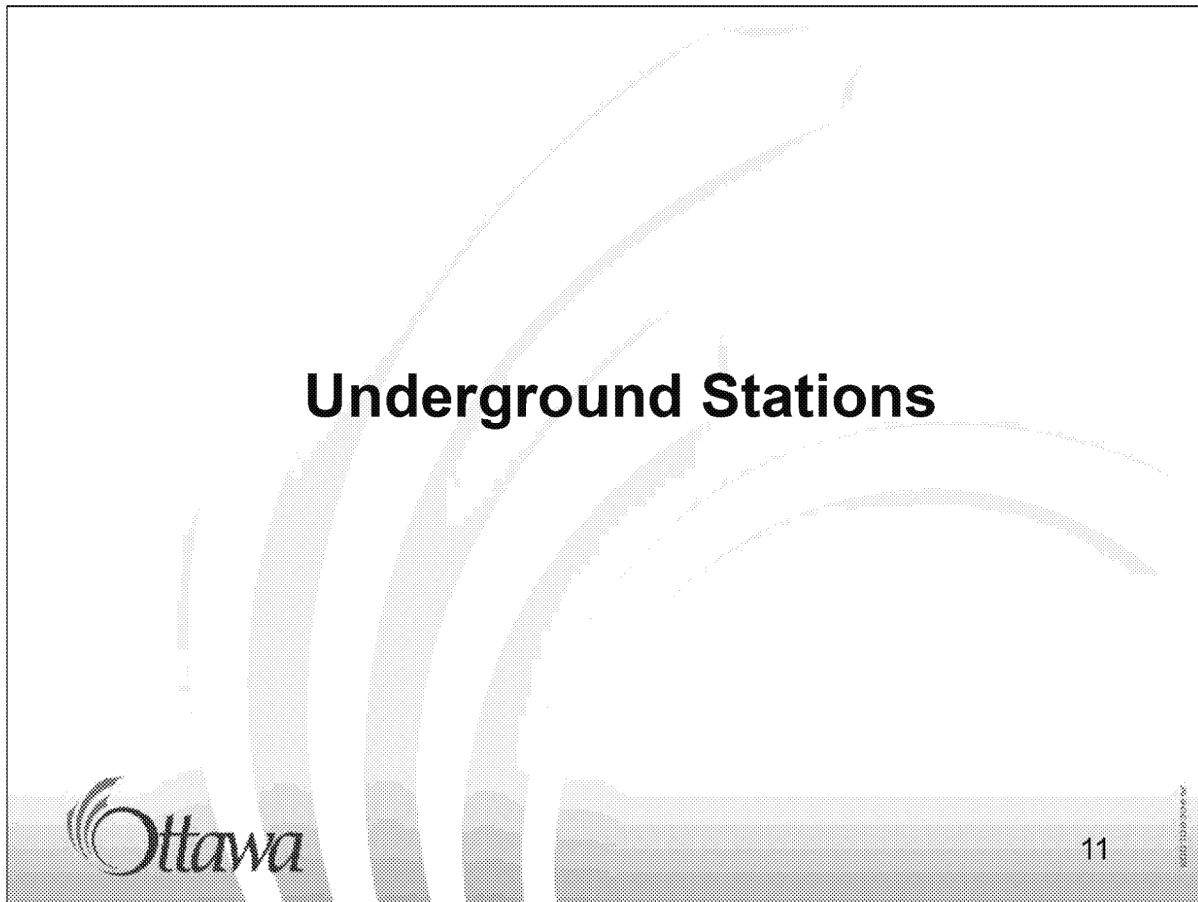
Ottawa

10

August 28: Due to open in the coming weeks, entrance plaza stairs (looking east)

Wood ceiling installations ongoing
Integrated lighting, and other light fixture installations ongoing
All doors and door frames have been installed
Plaza stair railings are installed, along with concrete benches

10



August 28 Photo: Blair Station westbound platform (looking west)

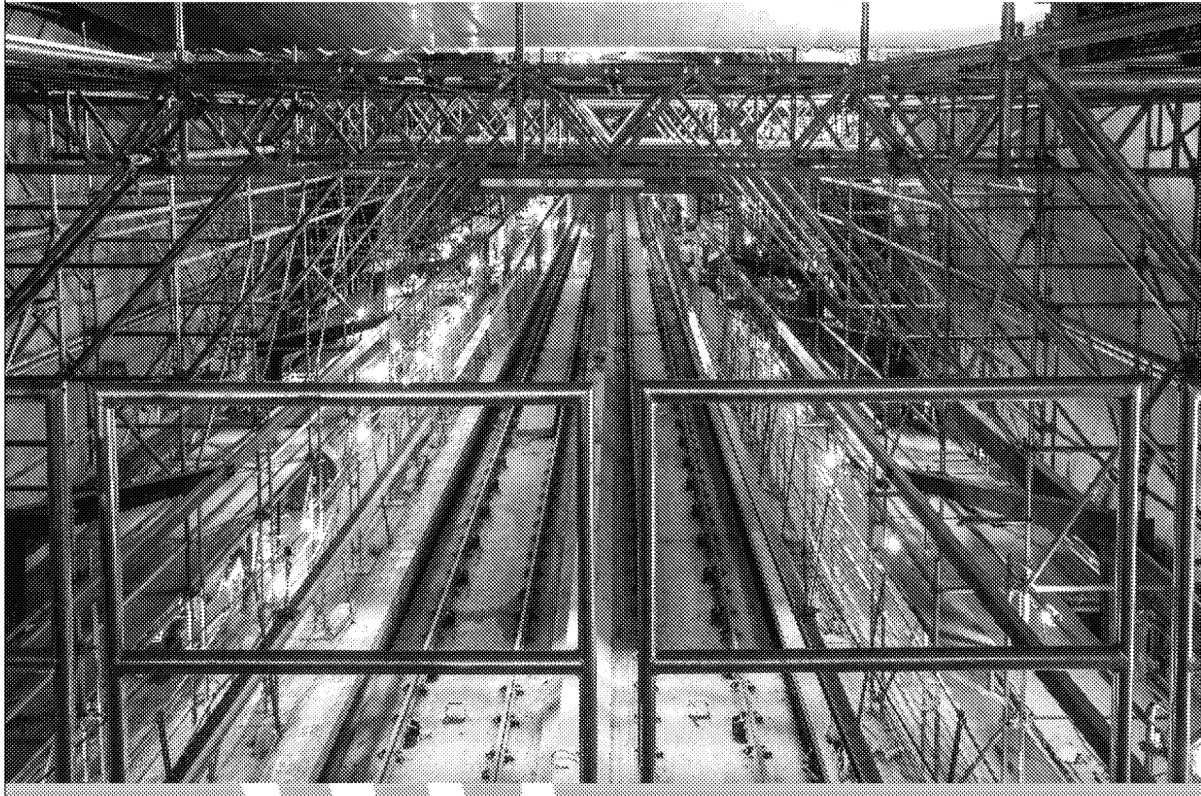
Progress:

Utility cabinet and end of platforms doors completed

Final modifications to elevators completed

11

Rideau Station



August 28 Photo: Ceiling racks, scaffolding and laying of tracks

West TVS sidewalk grate installed, area reinstated
HVAC sidewalk grate installed, area reinstated
Preparatory work for fare gate installations
Bike troughs installed
Elevator and escalator installations ongoing
Platform topping slabs poured, signage band steel installation ongoing
West entrance floor and stair tiling ongoing
East entrance tiling, dry-walling, elevator installation, and escalator commissioning ongoing
Various electrical, mechanical and architectural work

Parliament Station

Better picture
coming



Ottawa

13

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August 28 Photo: Concourse fare vending rough-in

- Platform ceiling grid installations ongoing
- Concourse HVAC rough-ins installed
- Concourse elevator glass installed
- Utility cabinet installations are on-going
- West entrance roofing system installed, and fascia cladding installation ongoing
- East entrance light fixture installations ongoing
- Wayfinding signage installations ongoing
- Station tiling and ceiling panel installations ongoing

13

Lyon Station



August 28 Photo: Lyon Concourse ceiling panel progress, floor tiling

Progress:

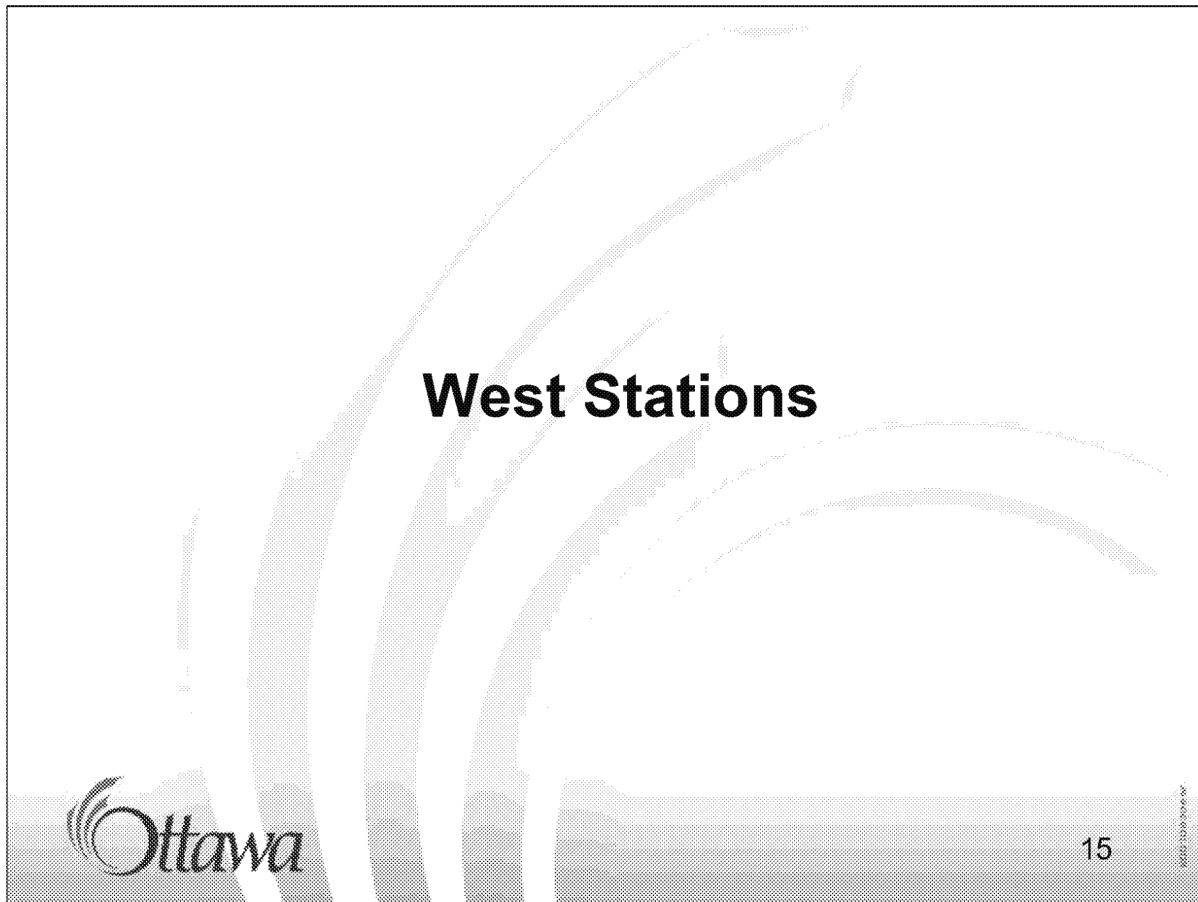
Ceiling panel installation ongoing at all three station levels

Elevator and escalator work is ongoing

Wayfinding signage installations ongoing

Fire, communication, and security systems are installed

Utility cabinet installations are on-going



August 28 Photo: Blair Station westbound platform (looking west)

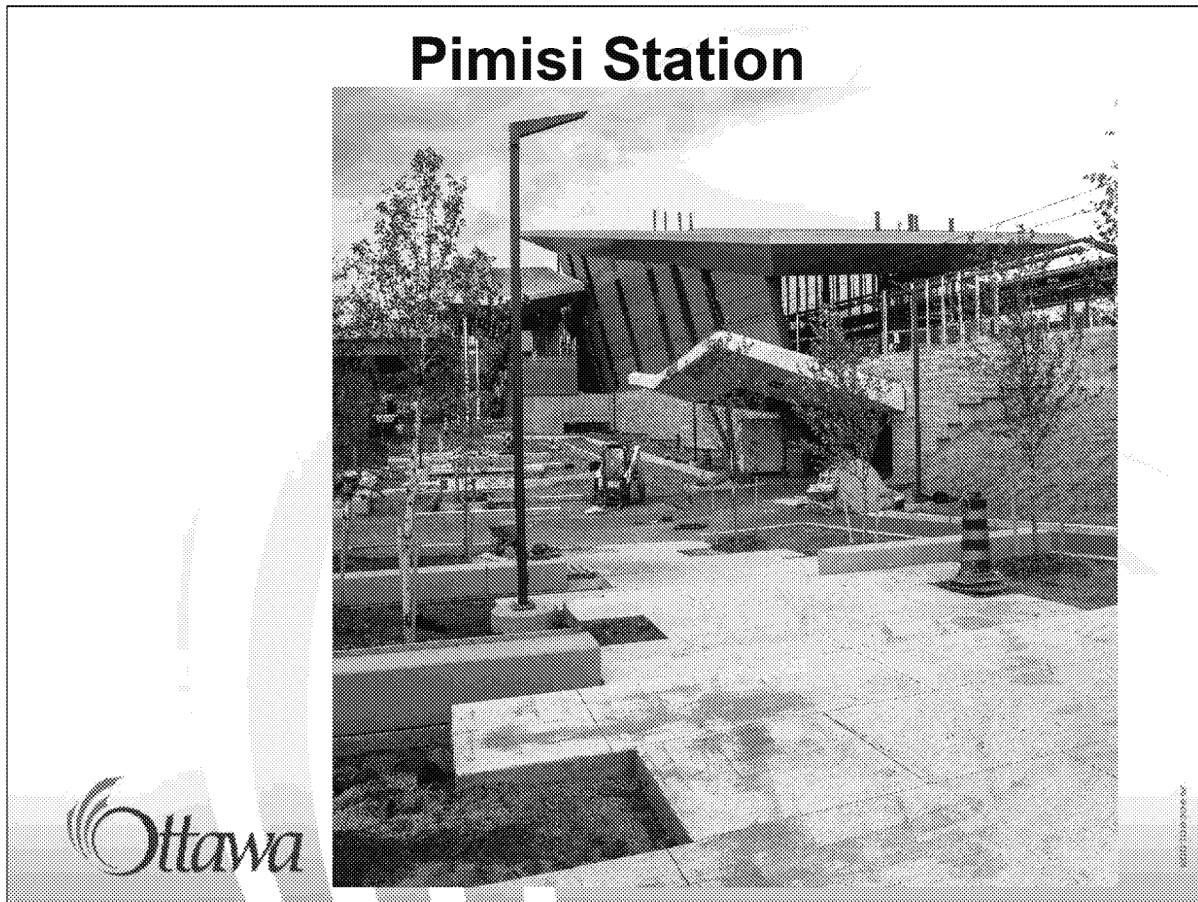
Progress:

Utility cabinet and end of platforms doors completed

Final modifications to elevators completed

15

Pimisi Station



August 28 Photo: northside plaza landscaping progress (looking east)

Progress: □ Landscaping occurring on the north and south sides of the station and MUP areas

Station glazing installation ongoing

Utility cabinet and wood ceiling installations are ongoing

Public art installations continue: Split-ash woven basket, Algonquin Canoe Paddles, Moose sculpture

Bayview Station



August 28 Bayview Station glazing and public art

Progress:

East side glazing installations are completed, north and south side glazing progresses

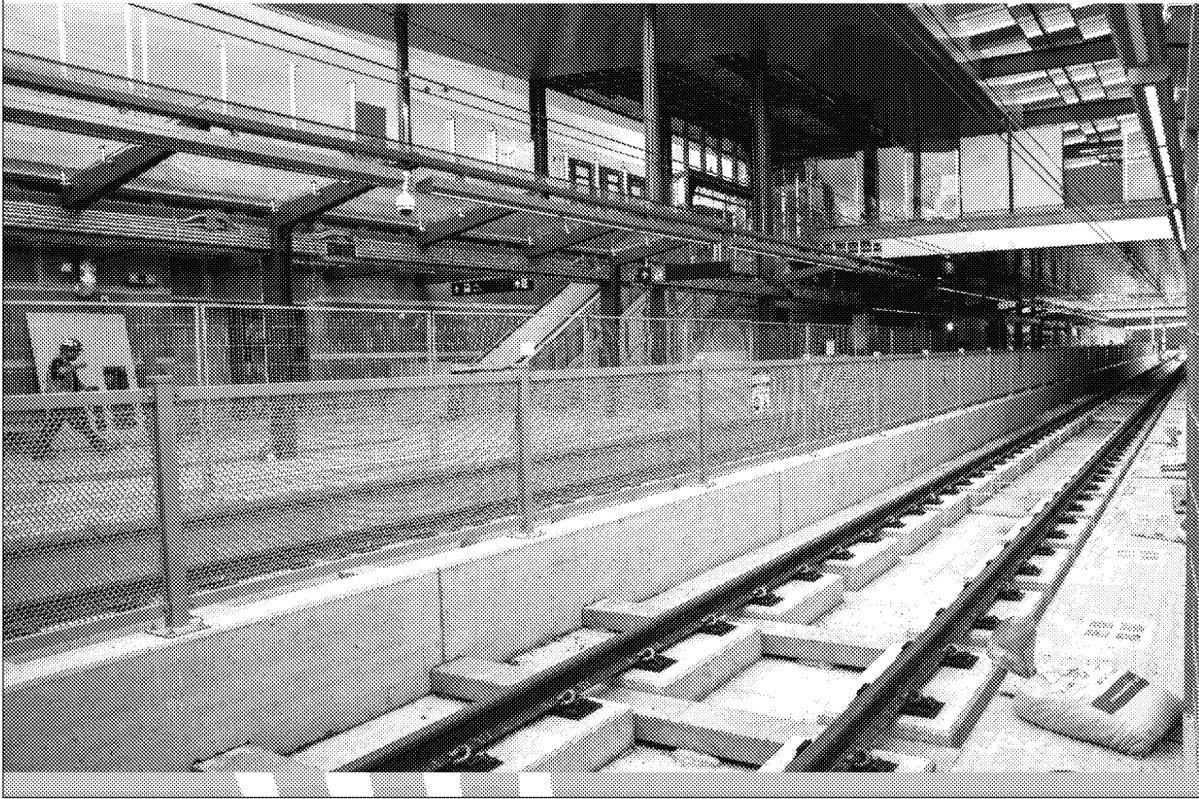
Elevator work continues

Wood ceiling installations continue

Various electrical installations

Prep for signage and fare gate installations

Tunney's Pasture Station



August 28 Photo: Tracks electrified

Progress:

Staircase glazing and handrails installation
Prep for elevator shroud light fixture installation
Wood ceiling installation begins
Public art installed: gradient skylight panels

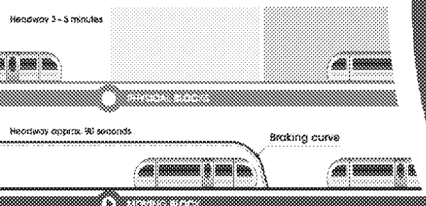
Track / Catenary / Power Signals



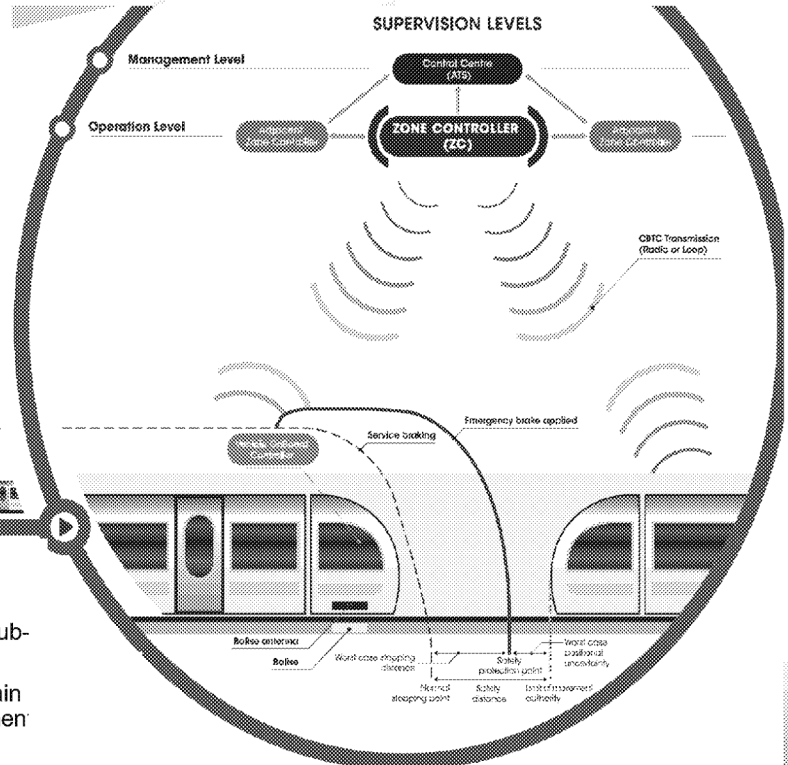
Communication Based Train Control (CBTC)

Sub-systems

- **Zone controller** to monitor & vitally track trains along the guideway; and,
- **On-board Equipment** to supervise train speed & safely control trains (ATP/ATC/ATO/UTO).



- **Communication System** (radio or inductive cable) allows communication with trains and provides a network between all sub-systems; and,
- **Control Centre** for Automatic Train Supervision (ATS) and management of the overall system.



(Image provided by Thales.)

The integration of the entire system is the last step in the testing and commissioning and ensures the reliable operation of the train. It holds all the other systems together, and ensures the smooth operation of many parallel systems. Much like a human brain controls the body, it ensures the lungs are inhaling and exhaling, the heart beats, all while also analyzing and responding to information provided by eyes, ears, nose and touch. If one of these things encounters a problem, the brain is programmed to respond. So is the train control. The train control is constantly monitoring inputs from the train's systems, the zone controllers and the ATS to know how fast the vehicle is traveling, how far it is from a station or another train, if a turn is ahead or if it should be preparing to stop at a station.

The Train control is also always monitoring the many systems and subsystems to identify issues, and respond appropriately to maintain safety. It notifies the ATS should it find an issue in one of the many systems, so we can investigate and repair it. With safety as its core function, should the train control spot a problem that needs to be corrected immediately, it will slow the train to a stop. This is also the case if the train has any break in communication with the Zone Controllers - it will bring the train to a stop to ensure everyone's safety.

This is why we put so much focus on the testing program. We want to have reliable service. We cannot guarantee that until we have tested and tested again to make sure every system on the train, guideway and control rooms are working together seamlessly. It's not good enough that it ran once; it has to run every time. The testing program does not take in just one system. It includes all of the electronic systems on the train, in the control room, along the guideway and the additional systems and links that allow all of these to communicate with each other. If even one connection is off, the train will not operate properly. Like blocking a nerve's connection to the brain, a whole host of problems can occur.

We're currently at the point of installing and testing the train control. You will see the train make multiple trips back and forth as we test and test again every system onboard the trains as well as along the alignment and in the control rooms to make sure they are all working together. This is the only way to ensure that on day one, every connection in our system is transmitting properly so that our service is at the high standard of reliability and safety we've set.

CBTC Testing & Commissioning Process

Four step process involving:

- System Integration Testing;
- System Acceptance Test;
- Safety Case; and,
- Trial Operations.



Communications Based Train Control

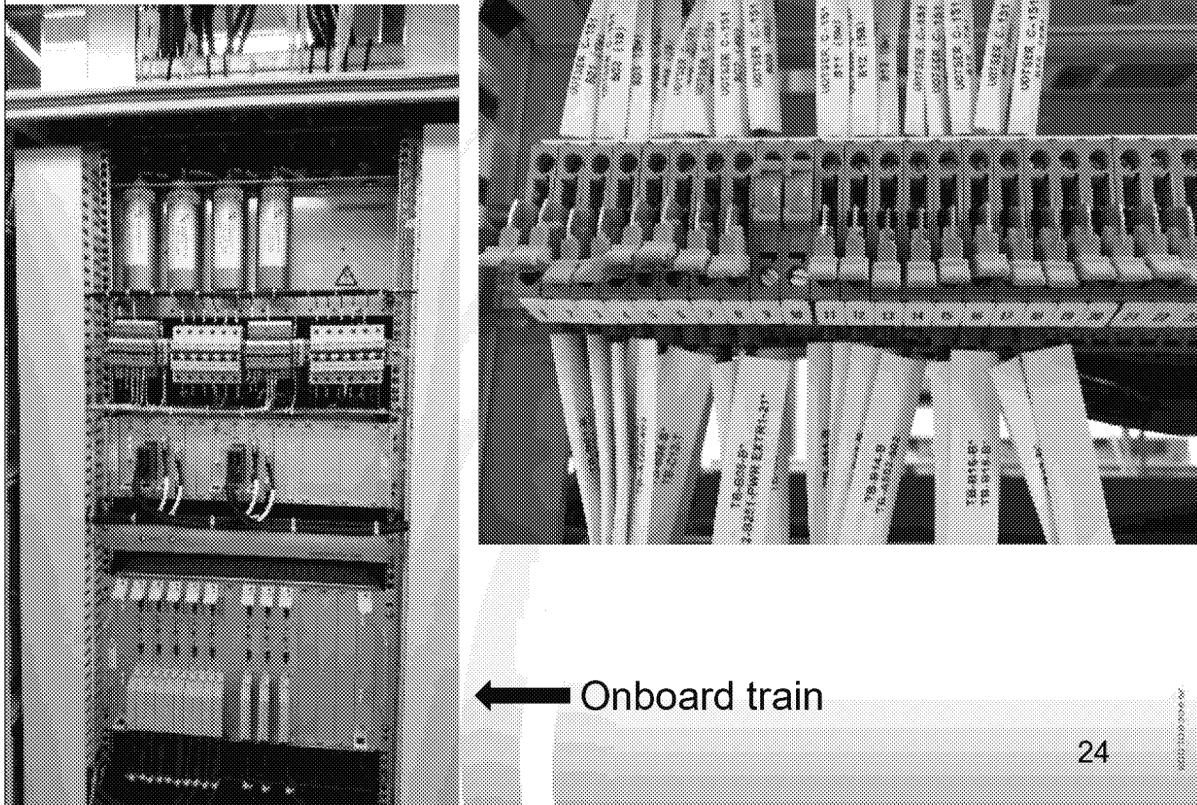
- One of the most complex part of the project;
- Critical focus currently on testing and commissioning of CBTC and systems as they are vital to successful completion and delivery;
- CBTC is the system that controls the train – the brain; and,
- It's hidden from view but is essential to the safe, reliable operation of the system.
- Key systems that work together as part of CBTC:
 - System and Train Controllers;
 - Zone Controller; and,
 - Automatic Train Supervision (ATS).
- RTG is making good progress.



Vehicles – Trains

- Trains & CBTC system need to be communicating continuously throughout the entire corridor;
- To date, not all trains are fully outfitted with this capability;
- Trains need extensive trial running with full capabilities - communicating end-to-end along the corridor; and,
- City requires 34 vehicles fully tested and commissioned to ensure service can be provided to the level prescribed in the Project Agreement.

Control Systems Components With The Train



Left hand image shows the system controller located onboard a train, just behind the cab. Right hand image is a close up of the numerous connections required to make these systems work together.

System and Train controllers work together. Located on board the train, they coordinate all of the trains many electronic systems, and control its brakes, doors and motors. It also has the important job of communicating the train's location to equipment along the line.

By communicating to Zone Controllers, (a more detailed description of their role follows on the next slide) along the line, the CBTC system knows where a train is on the line, within 25 metres of its precise location. Other systems used in traditional rail can only locate a train's position within one kilometre. This is a big advantage of the CBTC system. Knowing the more precise location of the train gives us flexibility and improves headways so our overall system is more efficient.

Testing & Commissioning Of Trains

- Trains are now able to move in Automatic Train Operation (ATO) mode between Blair & uOttawa stations;
- Along the western corridor, trains are now electrified with testing underway;
- CBTC testing in the west has commenced;
- Train movements in the tunnel has started; and,
- CBTC in the tunnel is scheduled to start in a few weeks.



Two Car Train Testing

- When in service, trains will operate in a two car configuration;
- Testing of two cars coupled together has started in the east end and will eventually need to be done along the entire rail corridor from Tunney's to Blair; and,
- We required end-to-end running of 2 car trains with full functionality (Tunney's to Blair), which has not occurred.

The Path To Revenue Service Availability (RSA)

- Completion of all civil work;
- Completion of all mechanical and electrical systems;
- Full vehicle complement of 34 vehicles with full functionality tested and signed off;
- Completion of all customer facing elements, signage, next train announcements, public announcement system, wayfinding, ticket machines, fare gates, etc.; and,
- Commissioning and system performance verification;



RSA

- System-wide integration testing;
- Maintenance readiness;
- Operational readiness;
- Safety and system assurance; and,
- Sign off by the Safety Auditor.

Revenue Service Availability

The Project Agreement defines RSA and includes the following:

- Trial Running:
 - Objective is to exercise the complete integrated System, including all sub-systems, operating personnel, and operating procedures to confirm revenue service commencement;
 - Project Co is required to conduct the trial running for final acceptance which will be conducted for a period of 12 consecutive days following successful completion of testing and commissioning; verification by Project Co that there are no deficiencies to prevent safe running of the System; and verification that there are an adequate number of trained staff to operate the System; and,
 - At the end of this exercise, the integrated system will be ready for Revenue Service Commencement.



Revenue Service Availability *(Cont'd)*

- Trial Running *(cont'd)*:
 - The objective of this stage is to operate a full regular scheduled service on the full line using the peak and non-peak schedules for an extended period.
- The train will move into full service from Tunney's to Blair after:
 - Full testing, commissioning and trial running is complete;
 - An independent Safety Auditor signs off on the System; and,
 - Revenue Service Availability is met.

Key Activities To Monitor

- Rideau station;
- Multiple trains operating in full CBTC mode along the eastern alignment;
- Vehicle and systems testing along the western alignment, and in the tunnel;
- End-to-end vehicle testing from Blair Station to Tunney's Pasture Station;



Key Activities to Monitor *(Cont'd)*

- End-to-end systems verification (all systems);
- Safety and assurance;
- SCADA in full operation (system used to monitor and control the LRT);
- Full fleet operational testing from Blair Station to Tunney's Pasture Station in full CBTC mode; and,
- As the stations are completed, final inspections, code compliance, etc.

November 2 Revenue Service Availability

- RTG has been meeting with the City to discuss the November 2 RSA date;
- RTG position is that they can achieve the November 2, 2018 RSA with the city agreeing to a revised and reduced scope of work;
- RTG has tabled a proposal that the city has reviewed in detailed;
- It includes a modification to the Fleet size, partial station opening and reducing the requirements prescribed in the Trail Running clause of the Project Agreement;
- Other high level options were also tabled with the city such as partial line openings and soft starts;
- The city reviewed and assessed all the options and they have all been rejected based on the following:



November 2 Revenue Service Availability

Important background:

- The confederation Line is a conversion of one of the busiest LRT's in North America;
- Unlike "green field" or "line extensions" the line is required to handle the very significant passenger loads that are currently using our BRT;
- The PA includes a Trial running requirement which is the demonstration of the ability of the system to function from end to end safely, reliably handling the passenger loads at the headways and total travel times that RTG included in their bid



November 2 Revenue Service Availability

City position:

- The city has been clear with RTG that a modified Fleet size will put the city at risk in it's ability to operate the system as planned and promised to our customers;
- A dilution of the prescribed Trial running requirements that are outlined in the PA and have been contractually agreed to by RTG degrades the ability of the city to be assured that the system will operate as designed – a risk that the city is not prepared to take;
- The stations have all been planned to provide access from all modes. Partial opening of any station will impact transfer points, multimodal linkages, introduces confusions to our customers, impacts mobility, access, egress etc. and will also deter from that important first impression;



November 2 Revenue Service Availability

City position (Cont'd):

- RTG has been contracted to design, build, test and commission the entire system. They are obligated to complete all these tasks and the city has been firm in its position in that we will hold RTG accountable to its contractual obligations;
- The options put forward by RTG transfers the risks to the city on many fronts including operationally, reputationally, and potentially additional costs;
- Our customers have undergone significant changes and they should not be subject to any additional changes to their daily commutes

Based on this and the detailed assessments by the City and its expert advisors, the city is of the view that the LRT system will not enter revenue service in 2018 and the launch will be pushed in 2019



Protecting The City's Investments

- A timely completion is in the best interest of both the City of Ottawa and RTG.
- The City continues to use all its tools contained in the PA, including:
- All remaining milestone payments continue to be deferred;
- City costs are being deducted from future milestone payments;
- Monthly service payments to RTM have been withheld until the light rail system is turned over to the City; and,
- If RTG does not achieve November 2 RSA date, the \$1M Liquidated Damage Clause will be applied



Protecting The City's Investments

- Revised schedules are common in infrastructure projects of this size and scope.
- As part of the P3, the City put measures in place to protect the taxpayer.
- These measures were in the form of a P3 Alternative Finance and Procurement process, which ensures:
 1. Taxpayers are protected;
 2. Customers get the safe, convenient and reliable world-class transit system they paid for; and,
 3. The proponent is responsible for the delivery of the system in accordance with the Project Agreement.



Completing The O-Train Confederation Line

The City's priorities:

- Provide Ottawa with a safe, reliable and world-class transit system;
- Ensure that safety is the top priority; and,
- Protect the interests of taxpayers, transit users and all residents of Ottawa.



