

Update Réseau express métropolitain

November 2020



- **Project highlights**
- Report on work completed in 2020
- **Exceptional events in 2020**
- Updated schedule
- Question & answer period





Context

- Report on work completed in 2020, under exceptional circumstances
- Analysis of the COVID-19 impact on all REM construction sites
- Technical presentation on two unexpected situations that were beyond our control and occurred within the context of the Mont-Royal Tunnel modernization, requiring special measures to ensure everyone's safety
- Presentation of the updated project schedule



Project highlights



The project



100% automated light rail network

67 km of track

26 stations in the Greater Montréal area

3 connections to the Montréal metro

Work to be completed for this project

A brand new transit network built from A to Z



Work to be completed for this project

Extensive coordination with numerous partners

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MORE THAN **70,000** DOCUMENTS PROCESSED DURING THE DESIGN PHASE



COORDINATION WITH **13** MUNICIPAL PARTNERS AND

8

BOROUGHS



PLANNING WITH PARTNERS

NEARLY **2,000** WORKERS ON THE GROUND IN 2020

+ 30,000

DIRECT AND INDIRECT JOBS CREATED FOR THE EXECUTION PHASE

2020: A defining year

Major milestones to reach







Report on work completed in 2020



Rive-Sud Branch







STATIONS ARE 70 %

COMPLETE





BUILT



RAILS COMING FOR THE SAMUEL-DE CHAMPLAIN BRIDGE



ELEVATED STRUCTURE BUILT



1 MAINTENANCE CENTRE **COMPLETED AT** 75%



CONCRETE BEAMS COMPLETED



Brossard

- Brossard and Du Quartier stations progressing well
- Panama Station and bus terminal under construction
- Maintenance and command centre 75% completed and the Brossard Station bus terminal is under construction
- 3.5 km representative segment being finalized



Testing period on the South Shore

- Confirmation that a testing period will begin in the fall of 2020, on a representative segment
- REM's typical infrastructures (rails, catenary, control and communication system, two stations, platform screen door system, etc.) will be tested under actual Greater Montreal conditions for approximately 13 months.



Rolling Stock

- The first four REM cars arrived in Montreal.
- The next deliveries are scheduled for 2021.
- Production of rolling stock is progressing according to schedule.
- Unveiling in mid-November of the first REM cars at the maintenance centre in Brossard.



Île-des-Sœurs

- Concrete being poured for station foundations
- Elevated structure construction in progress (pillars and beams)
- Île-des-Sœurs Channel bridge under construction



Verdun to downtown

- 1.7 km of the elevated guideway completed
- Rehabilitation of southbound overpass
- Pillars and abutments for widening De La Commune Bridge
- Central Station: removal of railway infrastructures, construction of technical rooms, access to the station and installation of electromechanical equipment

Deux-Montagnes Branch



Outremont

- Édouard-Montpetit: concreting and waterproofing of walls
- Erection of the steel structure and excavation for platforms (in progress)
- Station and platforms: mobilization of equipment, temporary installations and foundations started

Côte-des-Neiges and ¹⁸ City of Mont-Royal

- Removal and reconstruction of railway tracks (electrical power supply, drainage, ballast, rails)
- Construction of Mont-Royal and Canora stations (steel structure and foundations)
- Demolition and reconstruction of Cornwall Bridge and the north deck on the Jean-Talon Bridge

Saint-Laurent

- Track work in the railway right-of-way between Côte-de-Liesse and Du Ruisseau stations
- Côte-de-Liesse and Montpellier stations: foundation construction and start of steel structure erection
- Du Ruisseau Station: foundation construction
- Bois-Franc Station: erection of the structure and exterior finishing

North Shore: Laval and Deux-Montagnes

- Laval: construction of two railway bridges crossing Rivière-des-Prairies
- Laval: road redevelopment in the Sainte-Dorothée sector to eliminate existing grade crossings
- Laval and Deux-Montagnes: relocation of public utilities and work zone preparation
- Laval and Deux-Montagne: Implementation of interim measures in preparation for suspension of service

Anse-à-l'Orme and airport branch

West Island

- Nearly 8 km of structure installed
- 357 of 367 pillars completed
- Installation of a gantry for the elevated structure over Highway 40
- Start of Fairview-Pointe-Claire and Anse à l'Ormes station construction (foundations)

Technoparc and Montréal airport

- Construction of the elevated structure in the Technoparc area
- Assembly of the tunnel boring machine and testing before drilling begins
- Tunnel boring machine put into operation and start of drilling/construction of the tunnel to the airport

Exceptional events in 2020

All sectors and construction sites

COVID-19 shutdown period

Status of the situation

Period during which all REM construction sites were shut down:

Repercussions to date result in a **3- to 6-month delay** of the original schedule.

March 24, 3030	May 11 to early June 2020			
All REM construction sites shut down following COVID-related governmental directives Design and engineering activities continued	 Gradual resumption of work on all REM construction sites Since May 2020 Implementation of a series of precautions and measures to monitor workers' health so work could continue Impact on procurement Impact on mobility of specialized labourers 			

New measures on the construction sites

Modernization of the Mont-Royal Tunnel

Modernization of a century-old tunnel

5 km of tunnel to modernize from Central Station

trom Central Station to Canora, including addition of McGill and Édouard-Montpetit stations

Two unexpected events beyond our control that occurred in 2020

Following the complete closure of the tunnel as of May 11th

Unplanned detonation of a century-old explosive charge

All measures required to ensure safety of workers, professionals, suppliers and citizens were implemented. Intrusive inspections and discovery of the tunnel's deficient general condition beneath McGill College Avenue

Unplanned detonation of a century-old explosive charge

Status of the situation

May 11, 2020	May and June 2020	July 2020	July 21	After investigation and enquiry:
closure of the Mont-Royal Tunnel	mobilization of teams and preparatory work	start of excavation work	unexpected detonation while drilling in a work face - No workers were injured in this event	Most likely root cause: intersected an old bore hole containing explosive residue dating back to tunnel construction in 1912.

Unplanned detonation of a century-old explosive charge

Cause analysis according to exports

Construction techniques

- Horizontal drill bar with one (1) or four
 (4) drills mounted to it
- Major limitations of drilling equipment in the era:

Limited ability to position accurately and align the hole

Key conclusions from the investigation

The detonation occurred following direct **thermal contact** with nitroglycerin residue, not from vibration.

Three **primary risks** associated with detonation of an explosive charge:

- 1. Rock projections
- 2. Air overpressure
- 3. Fumes

More than **one hundred simulations** to model the extreme conditions of a detonation.

Tests established from various analyses based on the **minimum standards to be met**, in terms of projections, noise and air quality.

Measures implemented to resume modernization work

- Mont-Royal Tunnel
- Requirement to be inside a converted container
- No activity permitted in this area (within 50 metres)

Measures implemented to resume modernization work

Strict measures established and **approved by the CNESST** to resume work, including required employee training

Principles to follow during excavation: (or wherever there is a risk of detonating a potential charge)

Within 585 metres: no workers on foot unless a mitigation measure has been implemented

Within 585 metres: all machinery operators must be inside a converted container

Within 50 metres: no worker or operator permitted

due to the risk of rock projections.

Within 50 metres: use of remote controlled equipment

Status of the situation

2020-05-11	May and June 2020	August 2020	Seri
closure of the Mont-Royal Tunnel	mobilization of teams and preparatory work	opening of the Mont-Royal Tunnel vault beneath McGill College Avenue	to v loca

Series of tests conducted during the summer

to validate the quality of the Mount Royal Tunnel structure located between Central Station and Maisonneuve Street

Very significant deterioration of this southern section of the tunnel, potentially compromising the structural integrity of McGill College Avenue, due to the permeation of water mixed with de-icing salt for more than 60 years.

Mont-Royal Tunnel construction

Double vault built beneath existing McGill College Avenue

Structural deficiencies in the southern section

Three sections of the Mont-Royal Tunnel

North section

Central section

South section

Reinforcement required

Significant reinforcing measures required to ensure long-term integrity of the tunnel

Four scenarios analyzed: Option with the least impact on traffic and the City of Montréal recommended to perform work from the inside.

Commissioning between Central Station and Du Ruisseau

Exceptional events identified:

COVID-19 impact

Unplanned detonation of a century-old explosive charge

General tunnel condition beneath McGill Avenue Reinforcement required and adjustment of work methods to modernize the Mont-Royal Tunnel:

 Commissioning of the segment from Du Ruisseau to Central Station: fall of 2023, i.e. an additional 18 months of work

Close collaboration with the ARTM and Mobilité Montréal

to extend all measures implemented for Deux-Montagnes and Mascouche line users during this period.

Effect of the new scope for modernizing the tunnel Testing period on the Deux-Montagnes, Anse-à-l'Orme and Airport branches

BROSSARD

Cumulative effect on the Airport Branch

- COVID-19 impact of 3 to 6 months, affecting particularly the following elements:
 - Mobility of specialized labourers
 - Supply chain
- Period of about 6 months required for testing
- Delay in launching the tunnel boring machine

Schedule when project was launched in 2018

Updated schedule, taking into account the revised project scope and COVID-19

Question & answer period

