Neighbourhood Committee – Édouard-Montpetit Sector

October 10, 2018

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Agenda

- Review of rules
- Follow-up on pending questions and complaints since the last committee meeting
- Governance framework
- Environmental measurements
  - Air quality
  - Noise
- Work status
- Other business: controlled blasting
- Next committee meeting

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Review of rules

Follow-up on pending questions and complaints

Monitoring

School drop-off zone on Claude-Champagne Avenue

– Planning for the drop-off zone is ongoing with NouvLR (production and installation of signage; one to two weeks from receipt of order).

Request for a bike traffic signal at the Willowdale/Vincent-D'Indy intersection

– NouvLR has taken steps to fulfil this request. This will be followed-up on shortly.

Synchronization of traffic lights on Édouard-Montpetit Blvd.

– NouvLR has taken steps to fulfil this request.

– NouvLR will coordinate with the City for the approval and synchronization.

– This will be followed-up on shortly.

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Monitoring

Location of truck waiting zone in front of the early childhood centre's play area on Édouard-Montpetit Boulevard

– Relocation of the waiting zone closer to CEPSUM in accordance with NouvLR's initial proposal.

Request for additional crossing guards on Mont-Royal Avenue and Édouard-Montpetit Boulevard, where they meet Vincent-D'Indy

– Additional signallers will be added at these intersections.

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Monitoring

Data (noise, air quality) access and format

- 24-hr air quality standards and 12-hr noise standards (7 am to 7 pm)
- Air quality: presentation on the City of Montréal's air quality standard and index (hourly)
- Noise: processing of required data, 12-hour timeframe
- Information quickly uploaded to the website

Measurements taken inside the school

- Air quality and noise measurements are taken at measurement stations near the worksite (representing the impact of the worksite).
- Measurements will not be taken inside the school.

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Monitoring

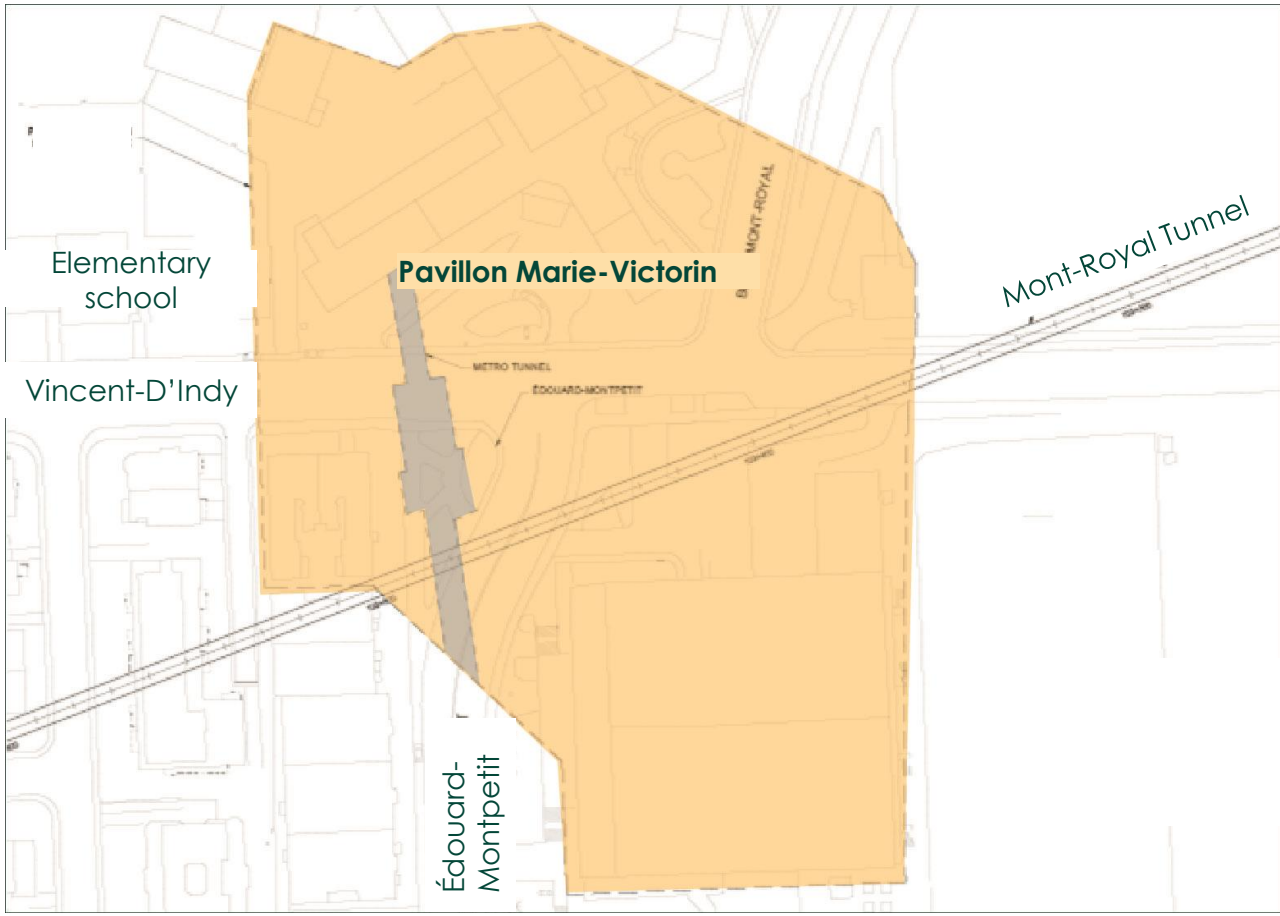
Vibration and dust dispersion perimeter

- Dust controlled at the source by our mitigation measures.
- Residents are located upwind of the prevailing winds.

Radon risk

- This heavy gas follows the path of least resistance, namely the main excavation and the line drill holes.
- The rock is of excellent quality and shows no signs of cracking.

Vibration zone:



Governance framework

Roles and responsibilities

Réseau express métropolitain

Project office

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- Infrastructure engineering, procurement and construction

GROUPE PMM

- Rolling stock, systems, and operation and maintenance services

Project Integration

City of Montréal

Mobilité Montréal committees	**Work impact management committees**	**Coordination committees – government departments, municipalities and partners**	**Coordination committees – ARTM and transit authorities**

More than 20 work planning and monitoring committees

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Design-build

Typical project

Design-build project

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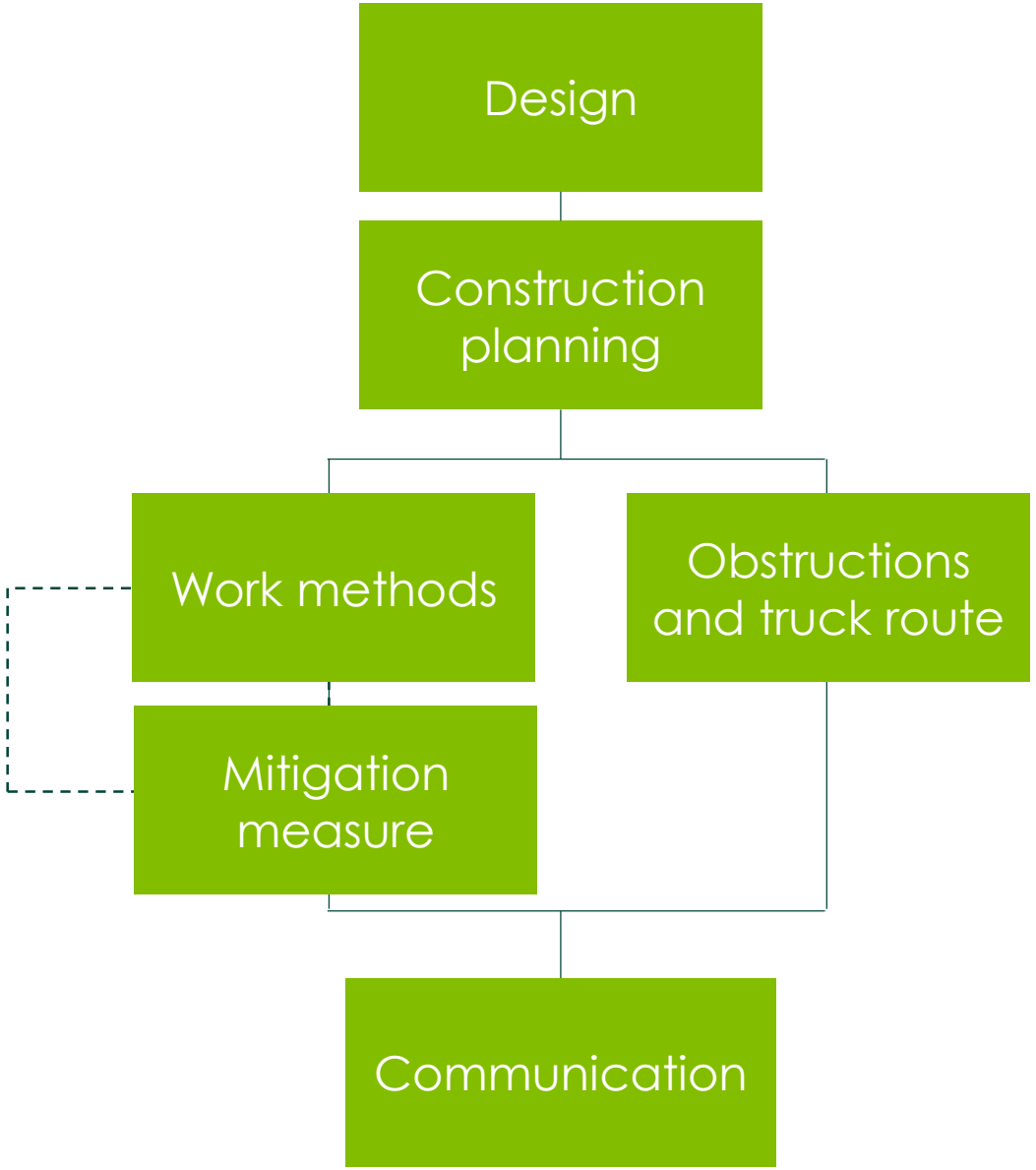
Work phases


Design
Construction planning
Work methods
Obstructions and truck route
Mitigation measure
Communication

Environmental measurements

– Air quality

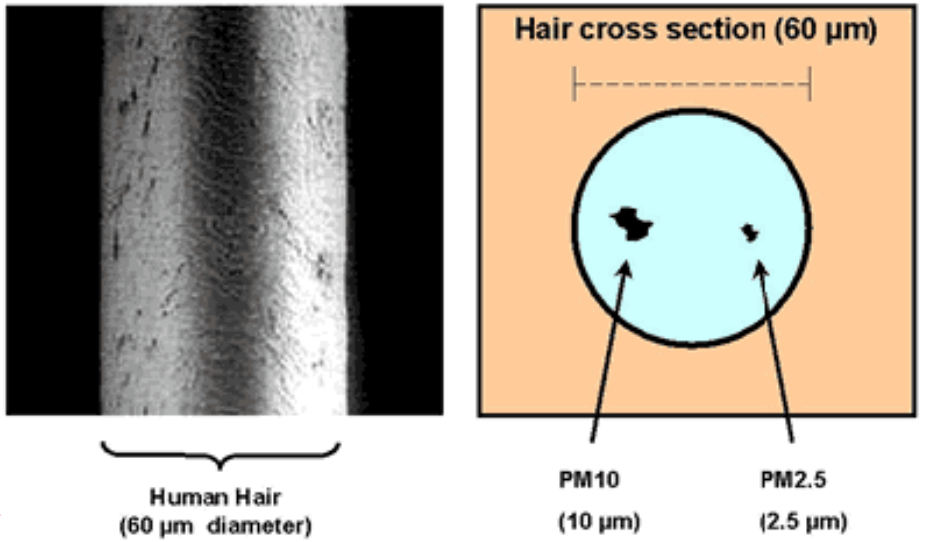
Air quality – Global context

- **MDDELCC CAR* (REM standards):**

Total dust	**120 ug/m³ over 24 hours**
PM2.5 dust	**30 ug/m³ over 24 hours**

Others:

- City of Montréal Total dust 150 ug/m³ over 24 hrs
- Canada PM2.5 27 ug/m³ over 24 hrs
- EPA PM2.5 35 ug/m³ over 24 hrs
- CEE PM2.5 25 ug/m³ over 1 year



Main sources of PM2.5 – City of Montréal

- Transportation 45%
- Wood heating 39%

* CAR: Québec *Clean Air Regulation*

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Air quality – Environmental monitoring

- Installation of two air quality monitoring stations and one noise monitoring station
- 24/7 monitoring to verify compliance with the criteria
- Environmental monitors

Upwind station

Downwind station

Air quality – Mitigation measures

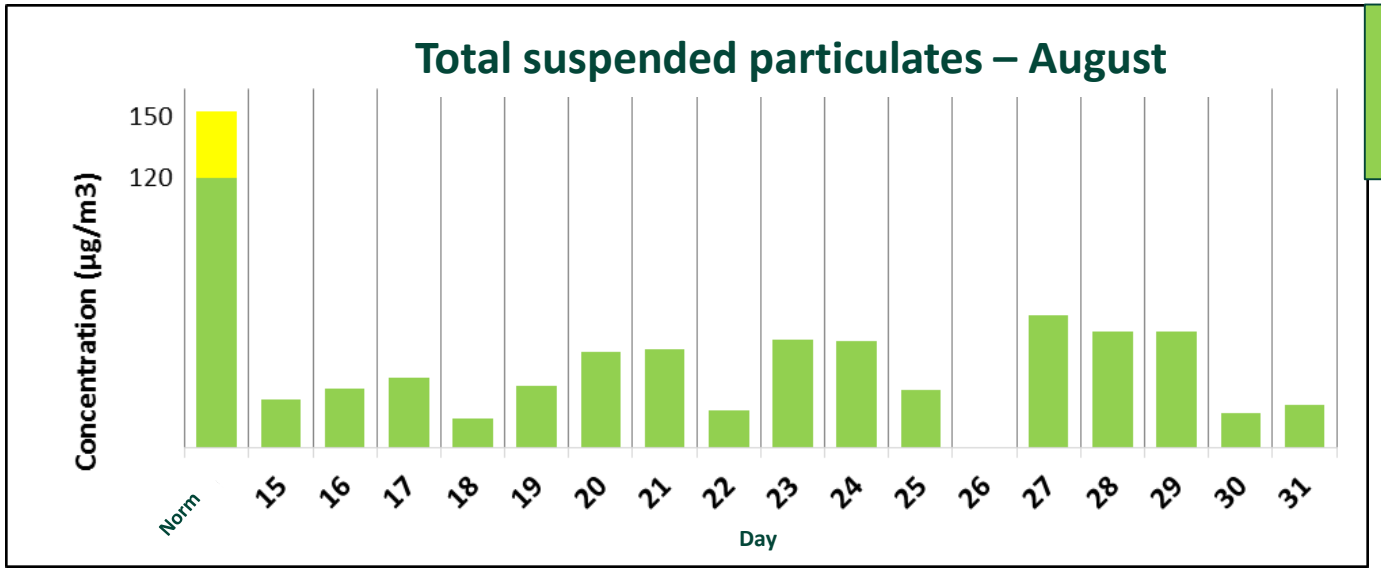
- Dust suppressant
- Clean-up of public roads
- Tarps on dump trucks and material piles
- Blasting mats
- Geotextile membranes

Sprayer / spraying

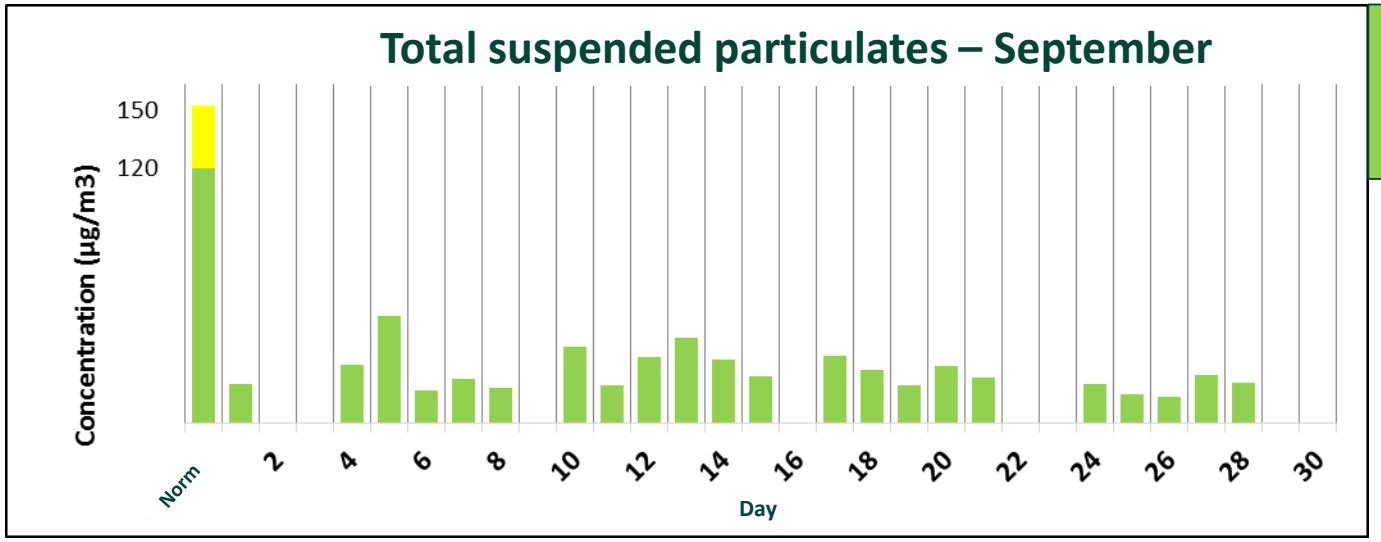
Paving of truck corridor

Air quality – Total suspended particulate count

TSP:
24-hr average – MDDELCC standard



Zero exceedance days



Zero exceedance days

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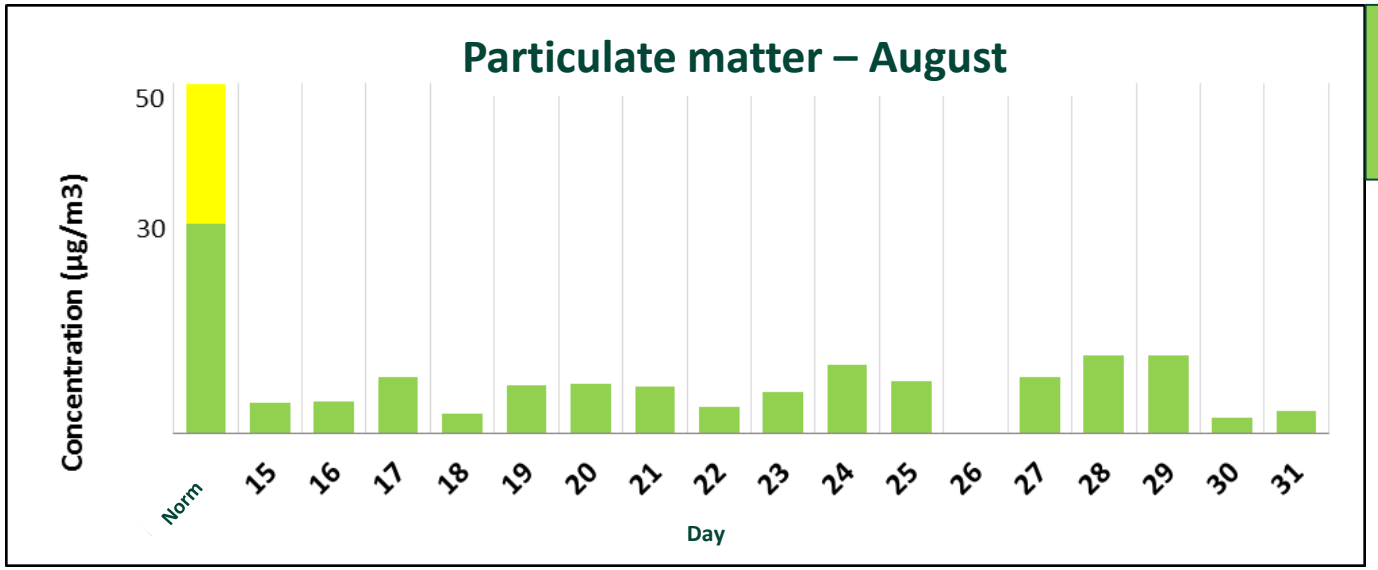
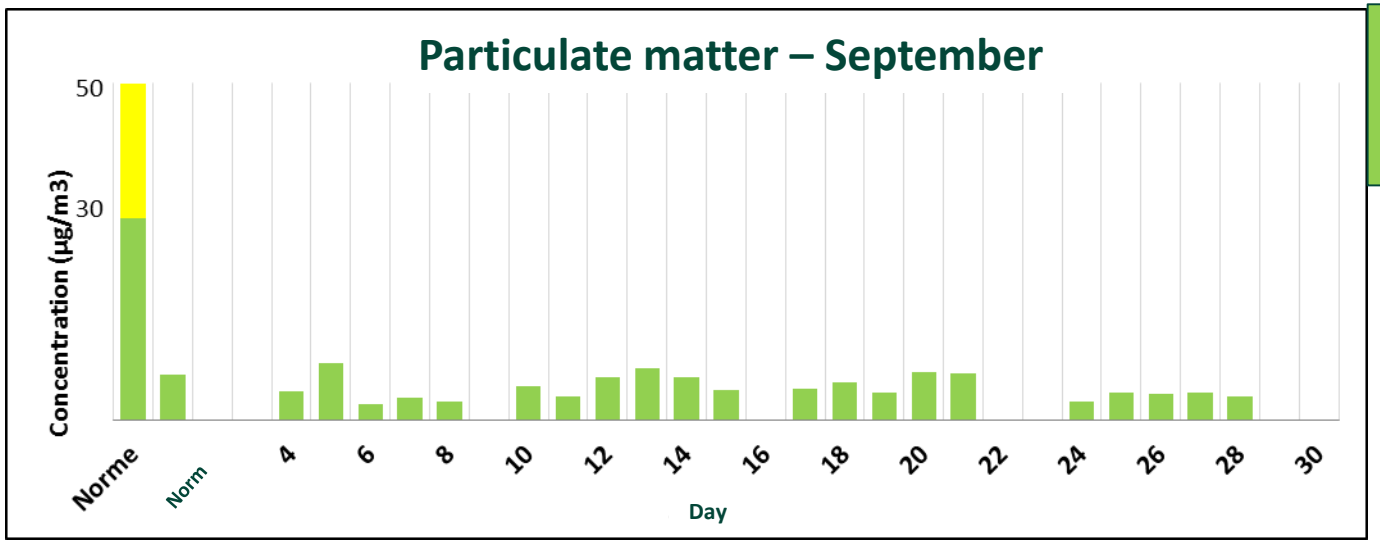
Air quality – Particulate matter count

PM2.5:
24-hr average – MDDELCC standard



Zero exceedance days



Zero exceedance days

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Air quality – Other type of measurement

Explanation of the Montréal Air Quality Index (AQI) monitoring system – Hourly average

Good	Acceptable	Poor
Particulate matter		
AQI		
< 25	> 25, < 50	> 50
Concentration		
< 18	> 18, < 35	> 35
776	**12**	**0**
Total suspended particles		
Concentration		
< 120	> 120, < 300	> 300
772	**10**	**0**

Readings

- 788 hourly measurements between August 15 and October 2
- Weekend = No measurements

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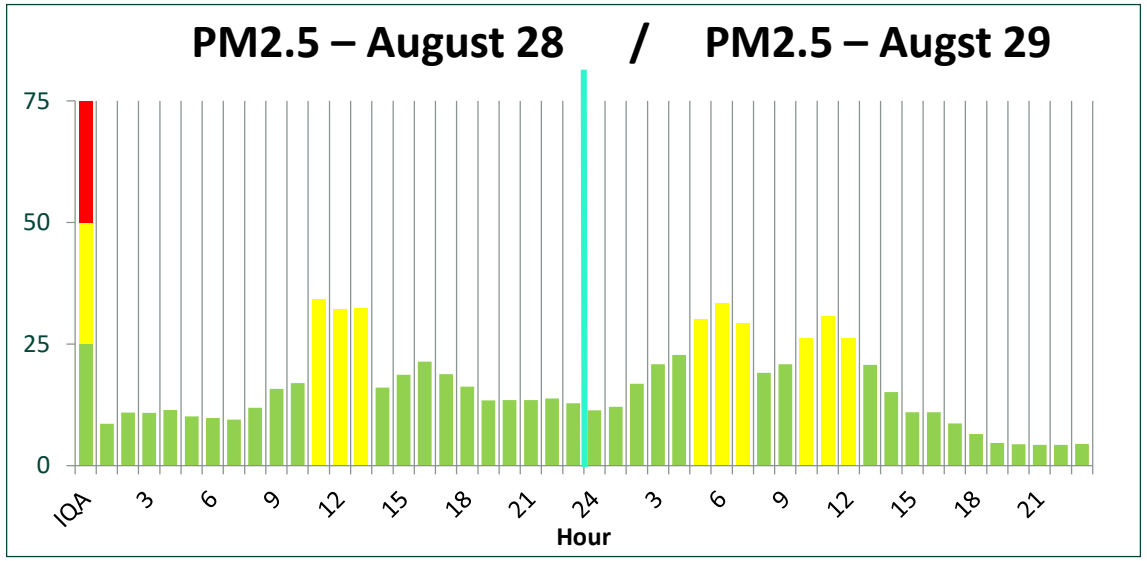
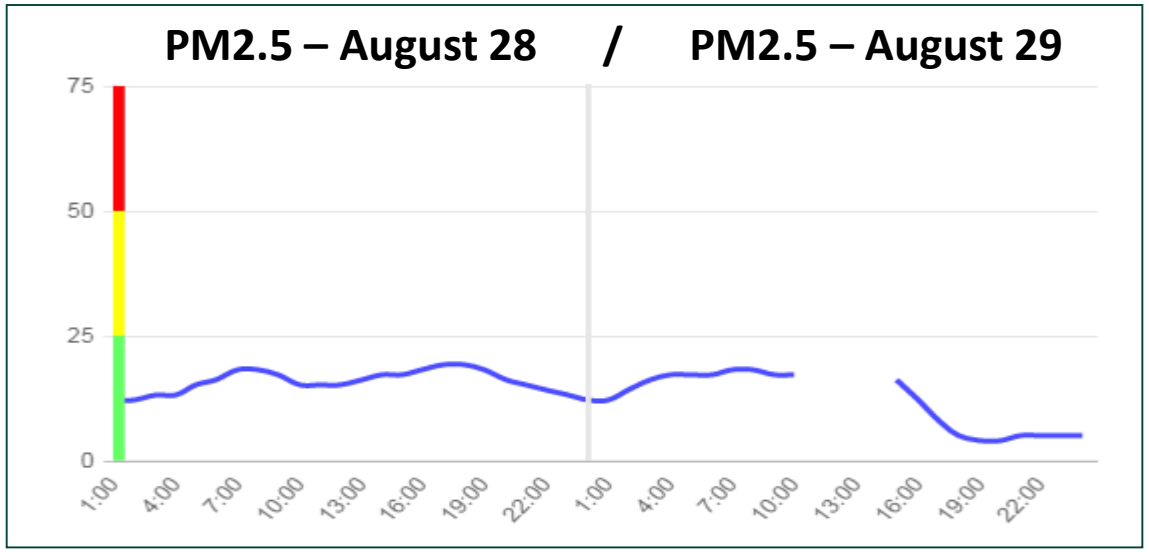
Air quality – Application of AQI





EMP Stations – Measurement of particulate matter (PM2.5) – AQI – Moving hourly average

- Example of the two days with the highest averages
- Paving work next to the measurement station during installation of the worksite (before mitigation measures were implemented)
- Concentration: good and acceptable

In comparison with City of Montréal's measurement

Molson Station – Measurement of particulate matter (PM2.5) – AQI – Moving hourly average

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Environmental measurements

– Noise

Noise – Global context

Period	Noise criteria at EMP
Day (7 am to 7 pm)	Ambient noise prior to work (62 dBA) Average over a 12-hour period
Evening (7 pm to 10 pm)	Ambient noise prior to work (57 dBA) Average over a 3-hour period
Night (10 pm to 7 am)	Ambient noise prior to work (48 dBA) Average over a 1-hour period

Criteria derived from MDDELCC recommendations and adapted to each site based on the initial context

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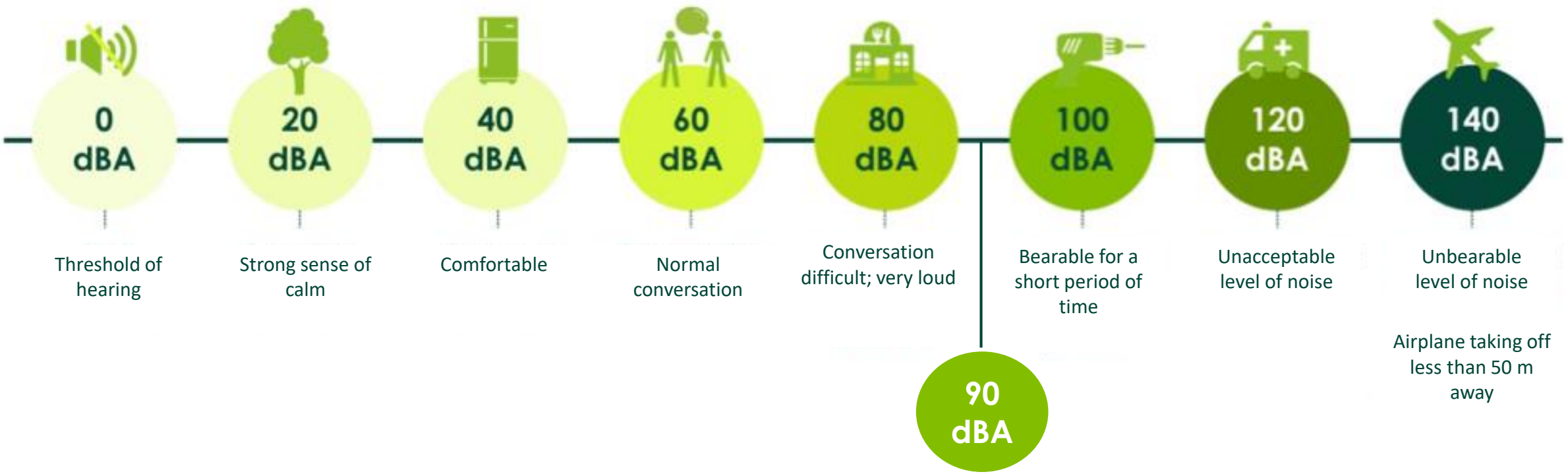
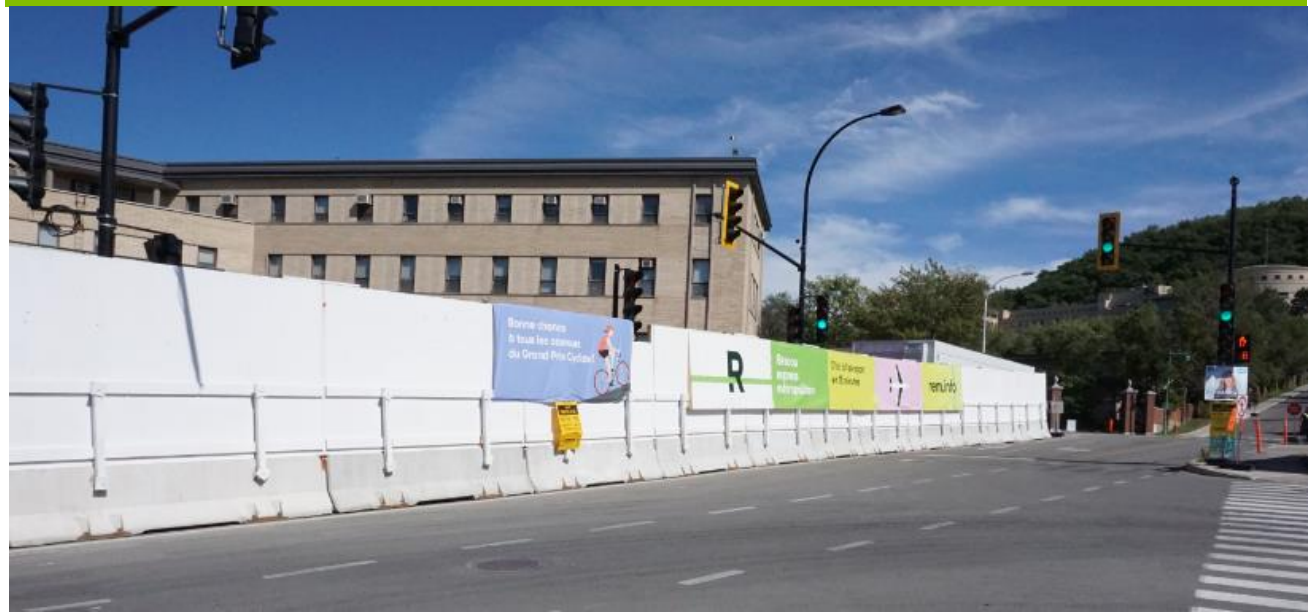
Noise – Understanding the noise scale

Noise scale (in dBA)



Noise – Mitigation measures

Acoustic screens



Equipment with white noise alarms (80%)

Dump body for loading trucks

In-the-hole drill

Mitigation measures – Noise

Movable screens

Acoustic screens for truck corridor entrances

Street sweeper: loop to avoid driving in reverse

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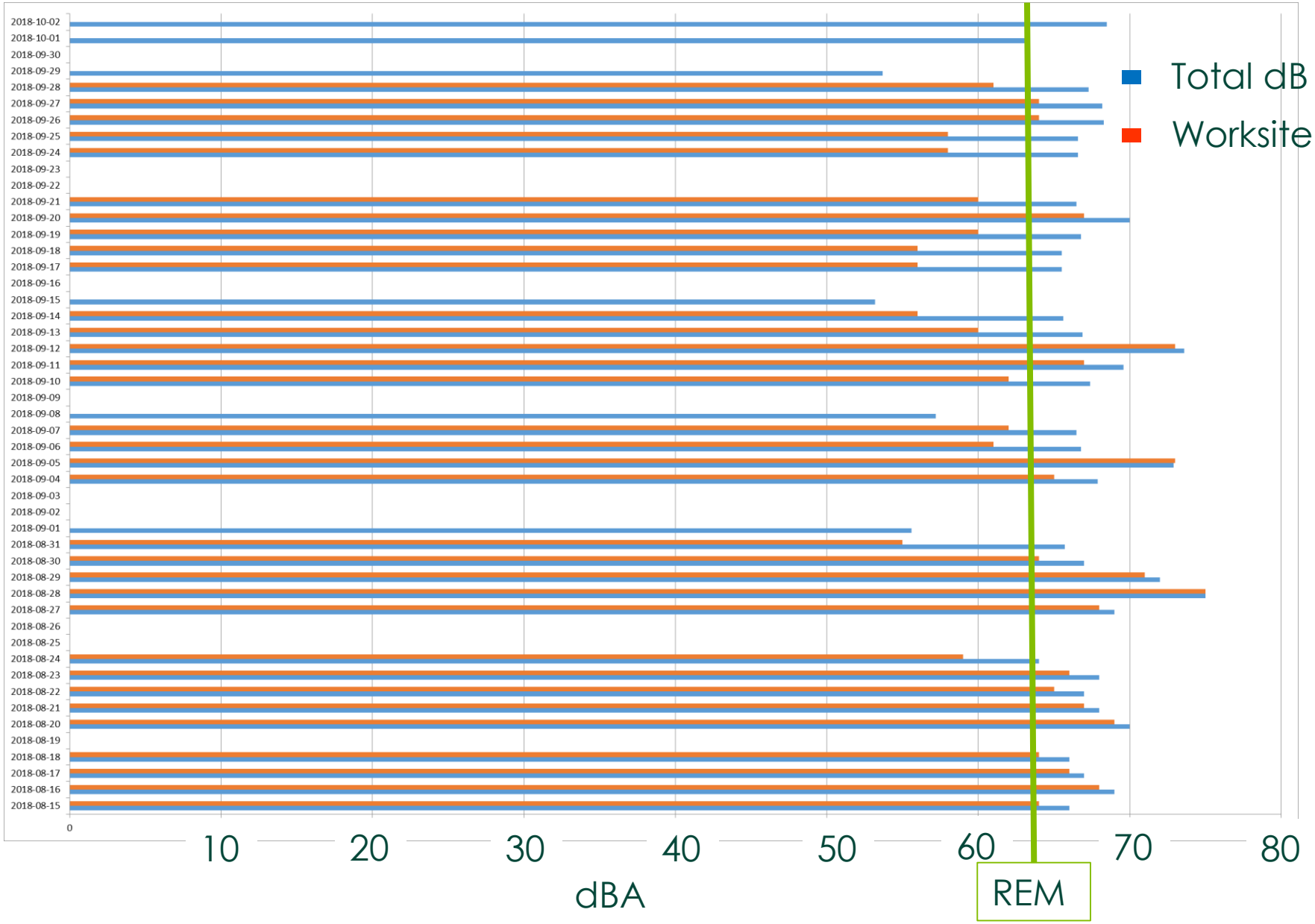
Noise – Measurement report



Measurements taken over 12 hrs – between 7 am and 7 pm

Construction of retaining wall

Demolition of metro entrance

Installation of acoustic screens

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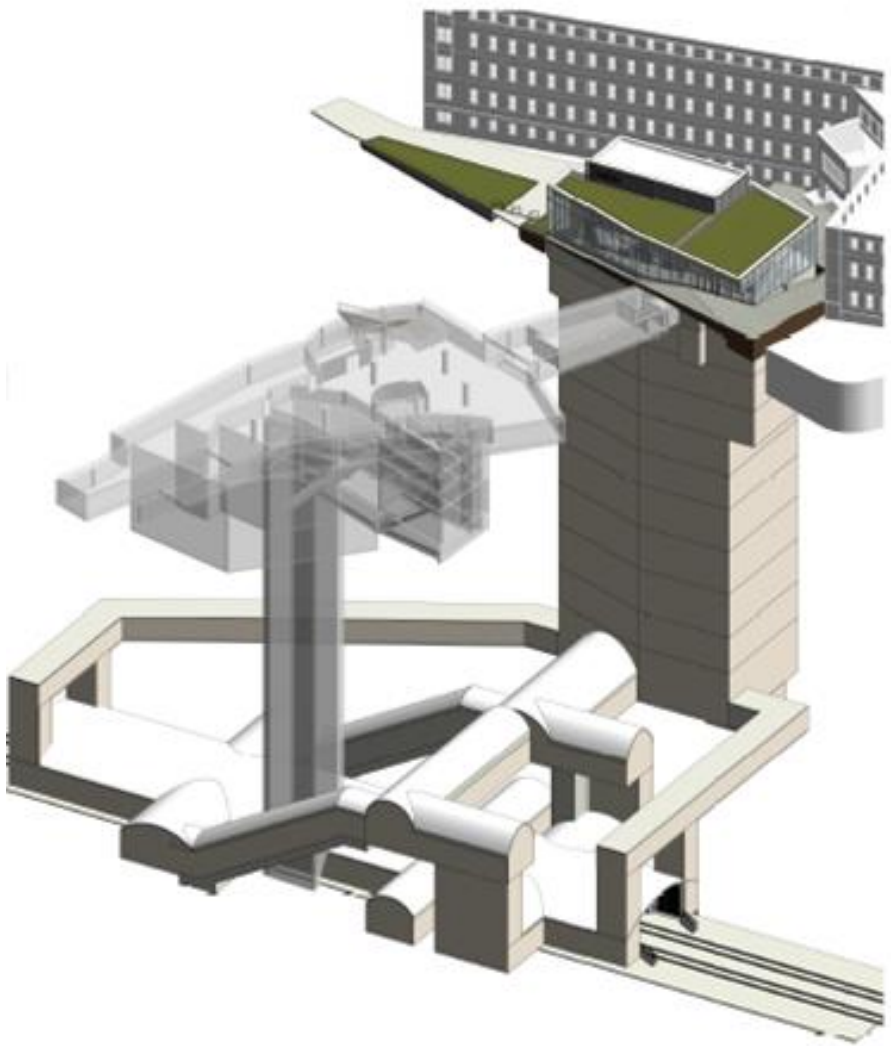
Work status

Projected timeline



June 16, 2018
Closure of Marie-Victorin metro entrance by STM (two entries remain open with no impact on the metro service)

Starting July 23, 2018
Worksite mobilization

Starting mid-August, 2018
Metro entrance demolition begins

Starting September 17
Start of excavation and boring

Starting October 22
Continuation of shaft excavation and start of control blasts

- End of October – Beginning of November
  Installation of crane

Winter 2019
Excavation of ventilation galleries, lobby and mezzanine

Fall 2019
Excavation of tunnel

**** Design and planning in development; subject to change***

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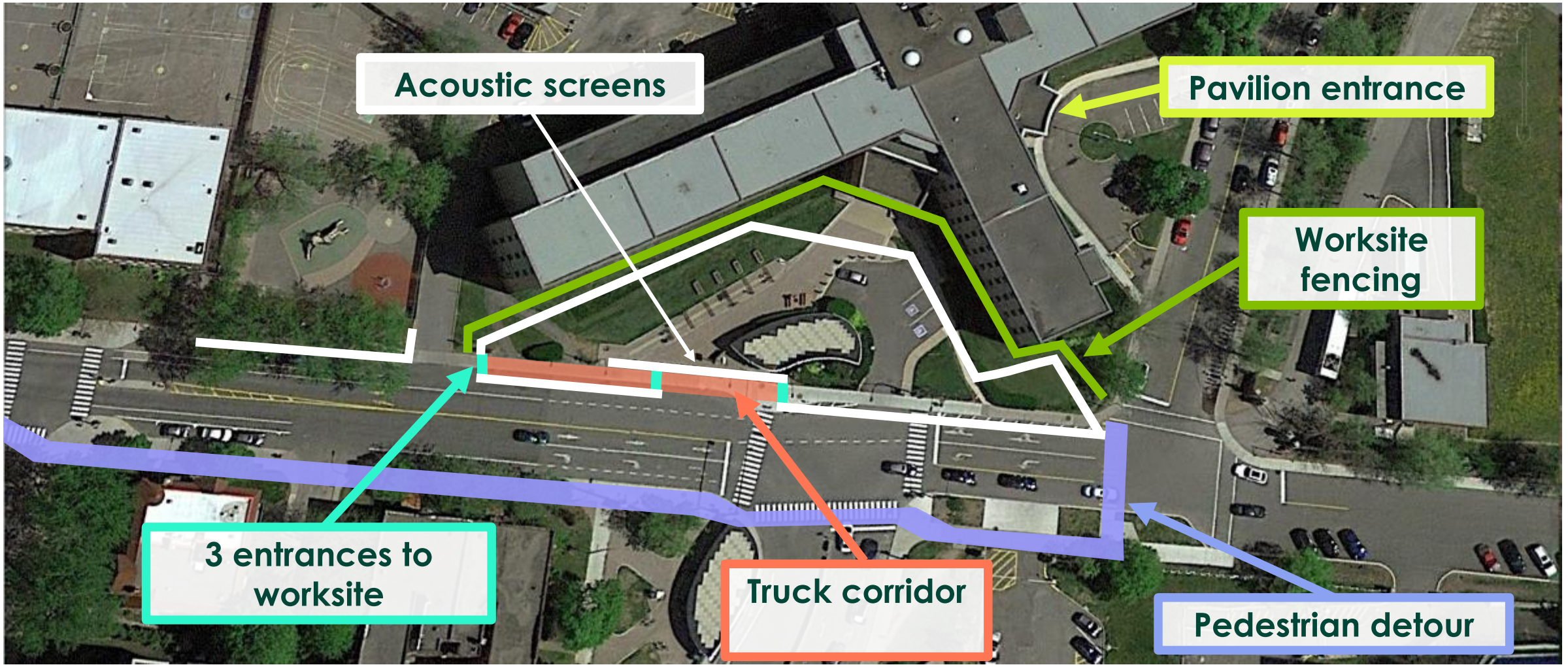
Work area


Acoustic screens
Pavilion entrance
Worksite fencing
3 entrances to worksite
Truck corridor
Pedestrian detour

Work carried out – Illustration

- Mid-July: Worksite starts being built and traffic management plan implemented (detours, bike path detour)

Mid-August: Demolition of metro entrance

September: Drilling begins to prepare for controlled blasting

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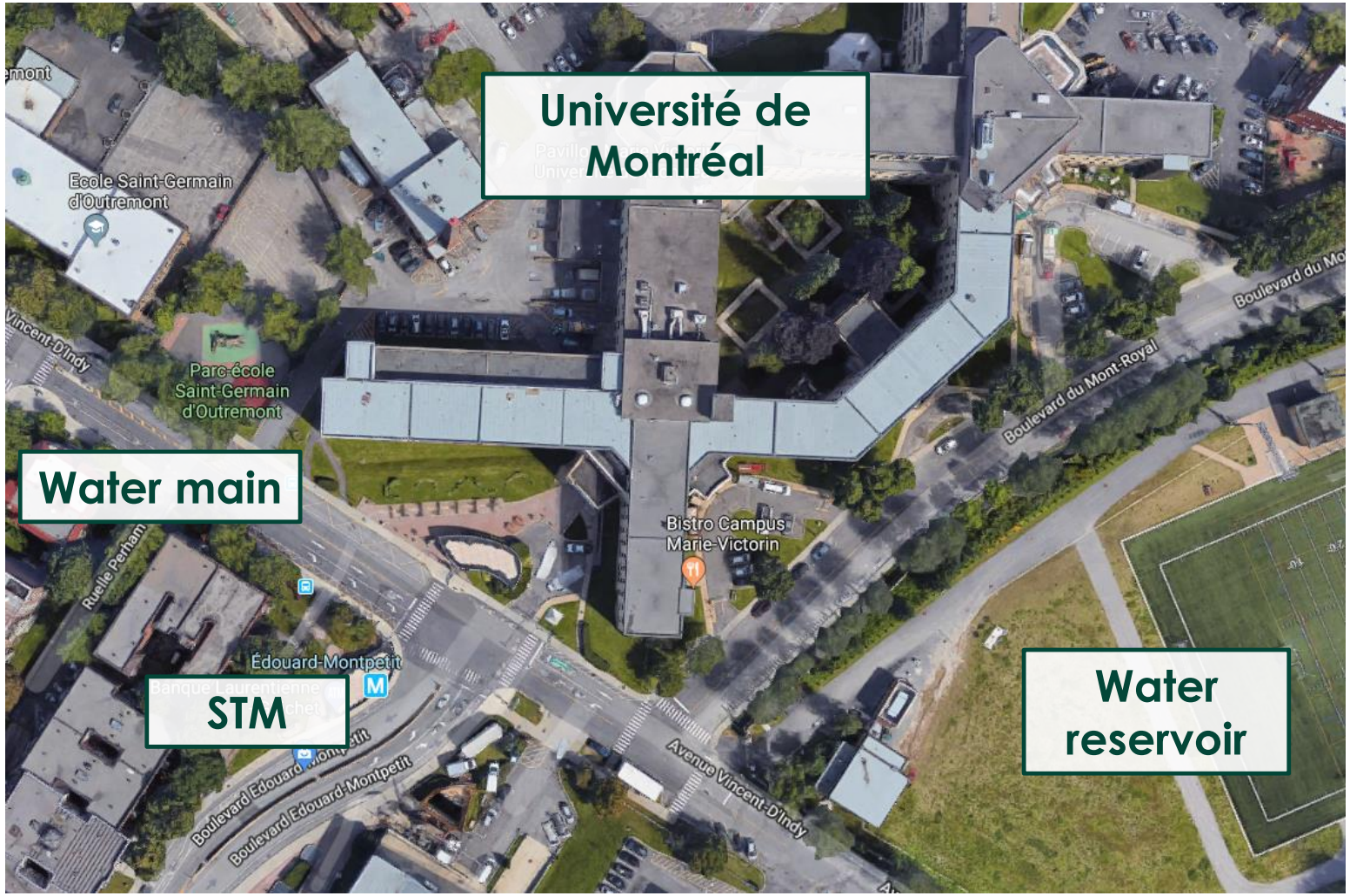
Controlled blasting

Review of site constraints



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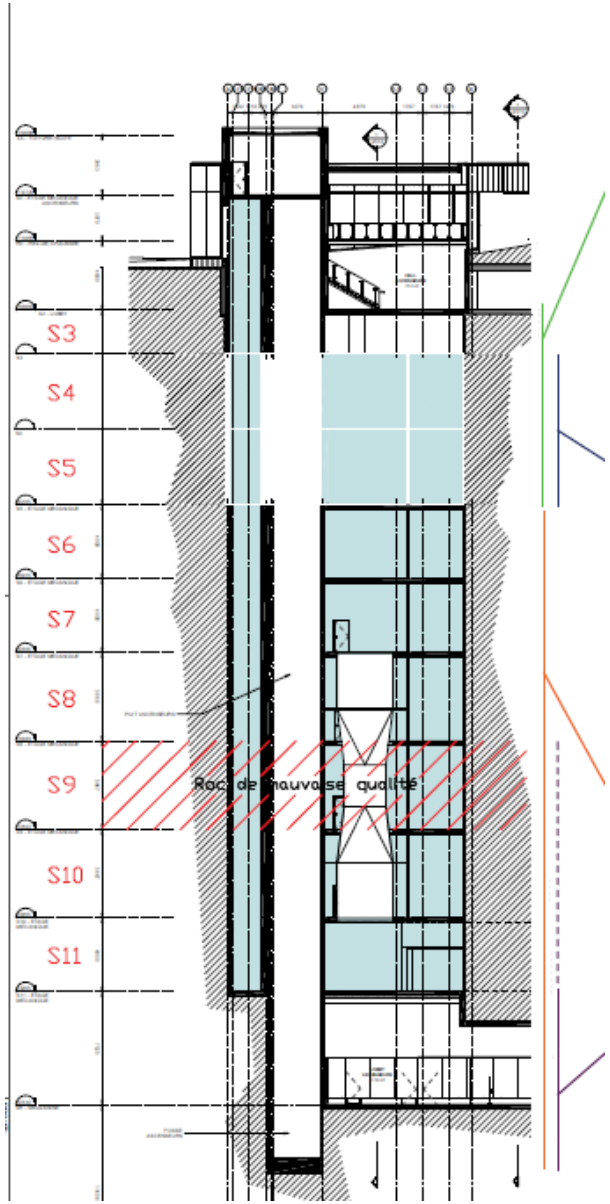
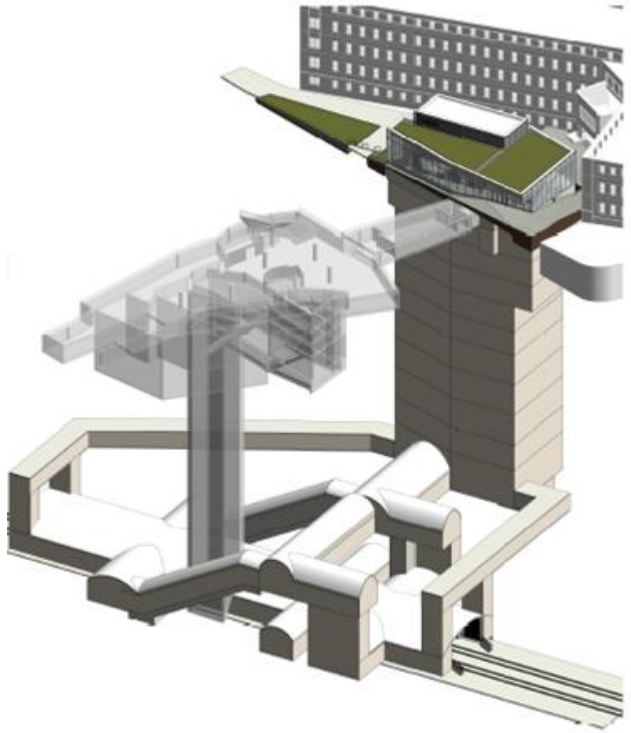
Underground excavation of shafts

Level of excavation – Cross-sectional view

S2 – S3 surface structures

S6 – STM blue line





Analysis of blasting issues

3 factors considered in advance

Integrity

- Vibrations vs. neighbouring structures

Construction security

- Rock projections
- Handling and transportation of explosive material

Environment

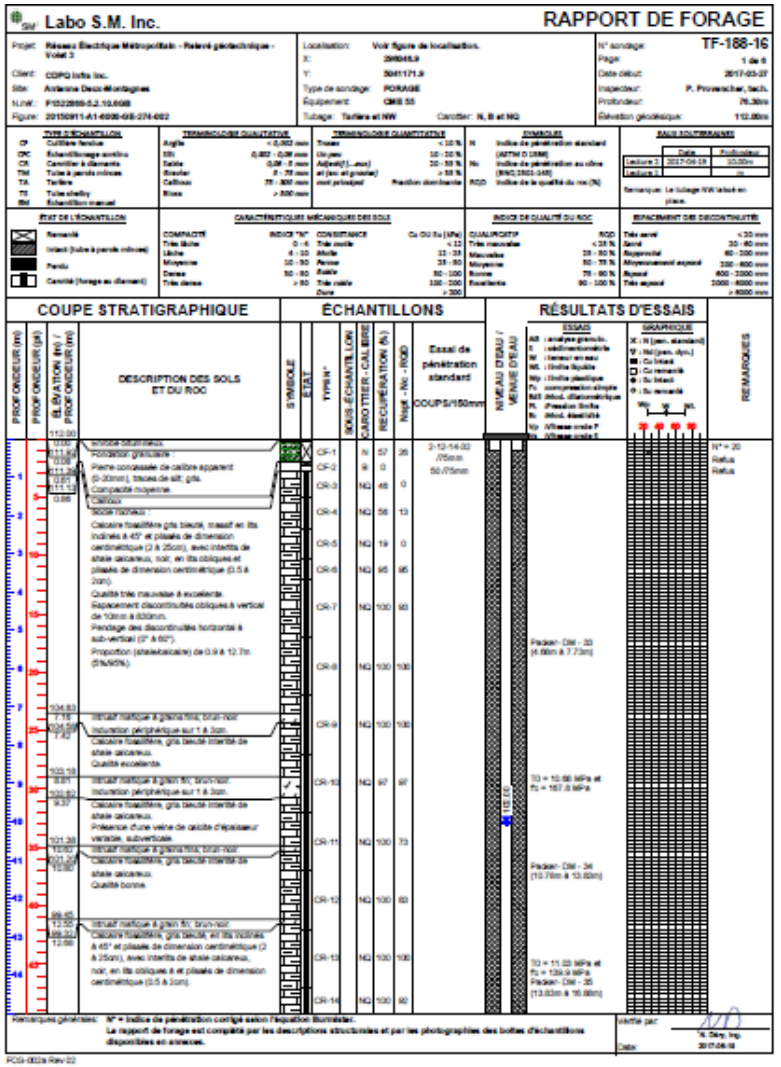
- Blast fumes (NOx and CO)

Analysis of blasting issues
Investigation drilling

Drilling report

- Prepared by an external firm
- Result: quality rock

Drilling report example


Labo S.M. Inc.

RAPPORT DE FORAGE

TF-188-16

COUPE STRATIGRAPHIQUE

ÉCHANTILLONS

RÉSULTATS D'ESSAIS

DESCRIPTION DES SOLS ET DU ROC

Essai de pénétration standard

REMARQUES

Vibration criteria

STM	
Station	
0 to 10 mm/s	No intervention required
10 to 25 mm/s	Establish Frequency / Velocity relation with letter of attestation
Interstation	
< 4 Hz	5 mm/s
5 to 14 Hz	12.7 mm/sec
15 to 40 Hz	25 mm/sec
> 40 Hz	50 mm/sec

City of Montréal
Vibration limit in mm/s

Category	Frequencies (Hz)		
	< 10 Hz	**10 – 50 Hz**	**> 50 Hz**
1 – Commercial or industrial buildings as well as sewers, water lines	20	20 – 35	35
2 – Residential buildings and those that are similar in their use or construction	5	5 – 15	15 – 20
3 – Very sensitive buildings (e.g. historical buildings)	3	3 – 8	8 – 15

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Installation of seismographs

19 seismographs

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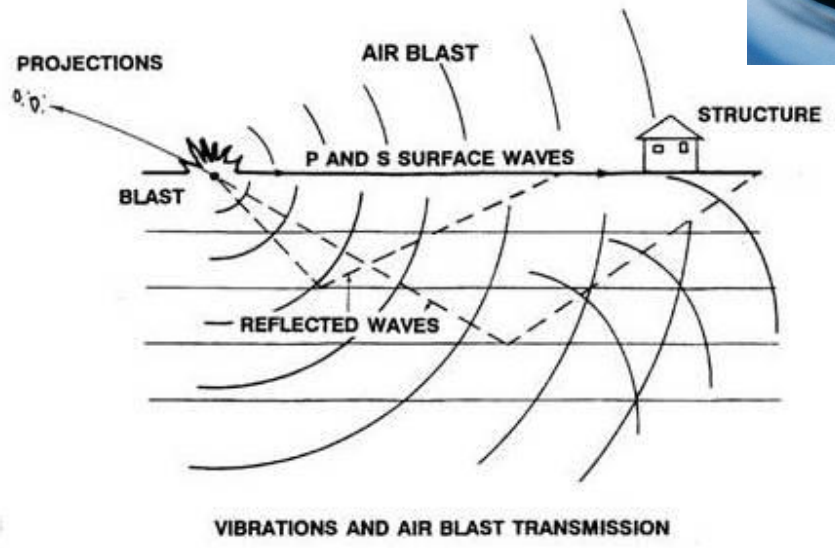
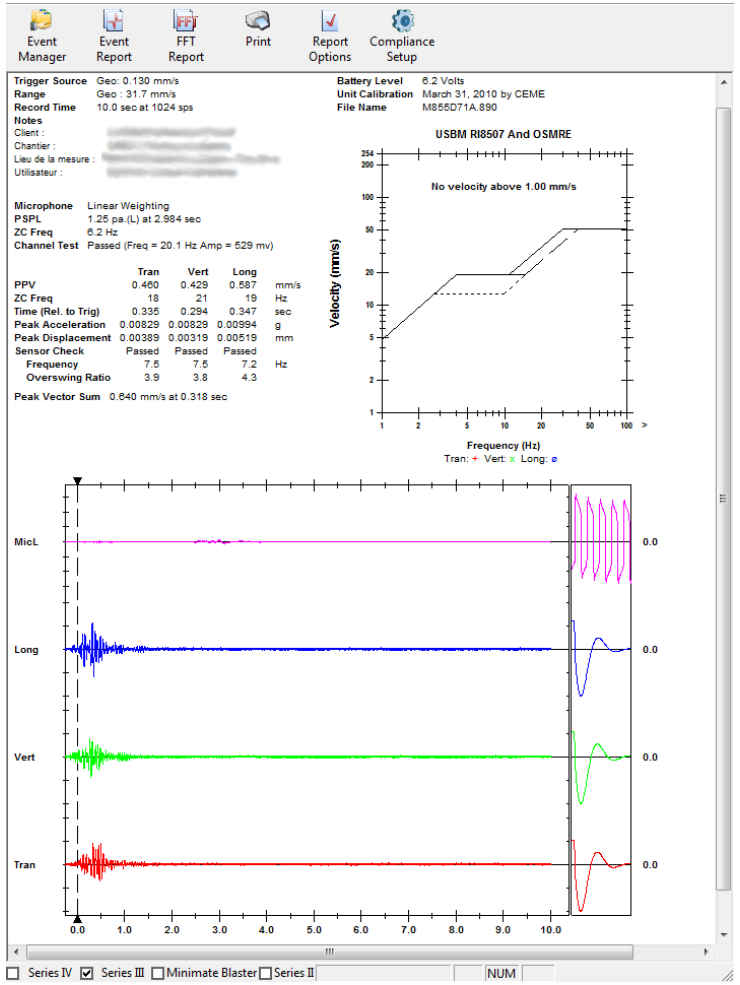
Vibration

- Velocity of particles (mm/sec)
- Size (mm)
- Acceleration (g)
- Frequency (Hz)



VIBRATIONS AND AIR BLAST TRANSMISSION



Monitoring and forecasting of blasting vibrations

Mitigation of vibrations (empirical formula)

$$V = K\,[d/w^{1/2}]^{\beta}$$

- V: Velocity of particles (mm/s)
- W: Maximum load per excavation (kg)
- d: Distance (m)
- K and β: Constants (ISEE, beginning constants; β = -1.6 and k = 1140)

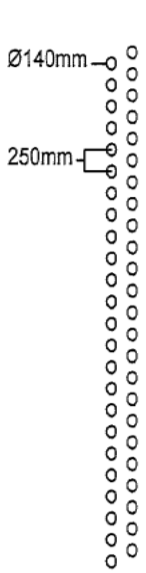
Preventive measures
Control of rock walls

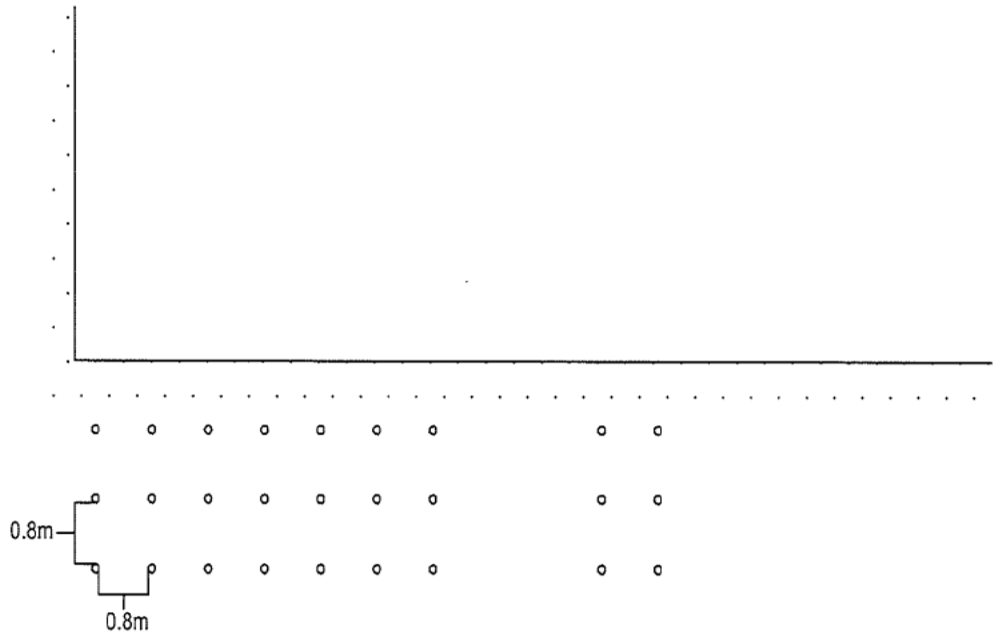
Large-diameter line drilling technique

- Boring of closely spaced holes along an axis
- Large-diameter boring (140 mm)
- Void ratio of more than 56%
- No explosive charge
- Boring carried out prior to blasting the mass
- Line drilling doubled by offset bore holes in critical areas

Preventive measures
Control of rock walls

Large-diameter line drilling technique
Reduction of blast vibrations





Two-row line drilling

Single-row line drilling

Preventive measures

Materials used

Packaged explosives

- Impermeable
- Optimal efficiency
- Limits the risk of dispersion and fumes

i-kon™
DIGITAL ENERGY CONTROL

Electronic detonators

- Optimal efficiency
- Precision of ignition
- Greater control

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Preventive measures
Control of rock projections

Projections = ZERO tolerance

- Each blast is filmed and analyzed
- Use of geotextile membranes and blasting mats to cover the entire surface of each blast

Covering procedure

Control of blast fumes

Carbon monoxide (CO)

- Colourless and odourless
- Requires the installation of CO detectors inside all structures located within a 100-m perimeter of the blast (BNQ standard)

Control of blast fumes

Nitrogen oxides (NOx)

- Visible, orange to brown coloured fumes

Possible causes:

- Explosive contaminated by water
- Product fallen into cavities and/or cracks in the rock mass
- Less-than-favourable geology – highly altered rock

Solutions:

- Exclusive use of packaged explosives
  - Product contained within cartridges
  - Explosive with excellent water-resistance
- Large-diameter line drilling to promote the dissipation of fumes
- Removal of blasting mats after each blast

Delivery and storage of explosives

- Explosives are not allowed to be stored on site
- Daily delivery limited to the quantities required for blasting
- Any unused explosive must be returned to the manufacturer
- Delivery truck must remain below grade and locked at all times
- Separate compartments to keep explosives and detonators apart
- Only assigned personnel holding a current general explosives permit will be allowed to handle explosives and blasting accessories

Safety measures during controlled blasting

Audible warning (12 whistles) and pause

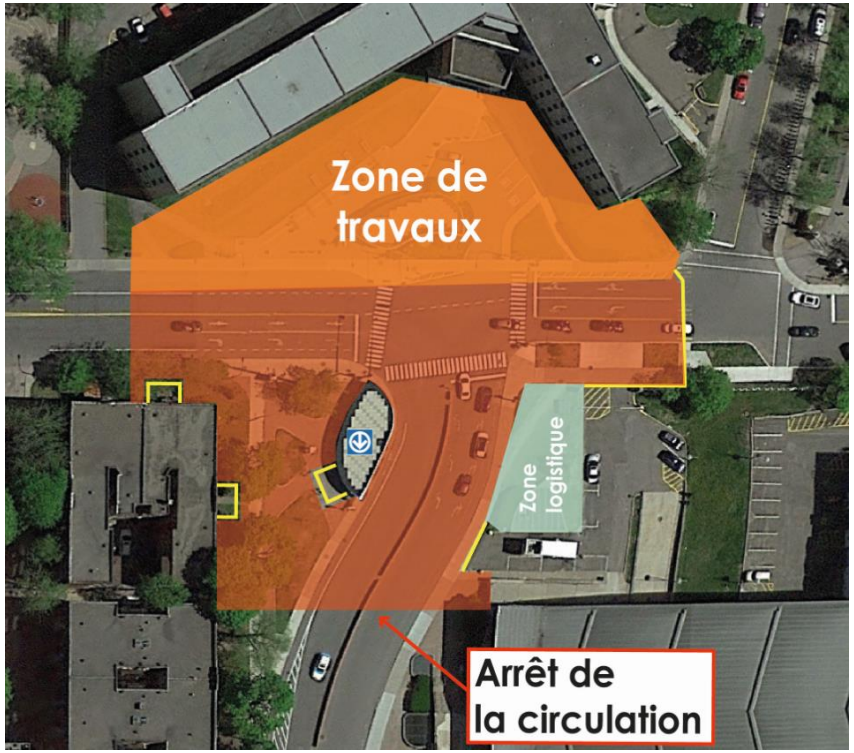
Boring

Blasting

Audible warning + return to work

Collection and evacuation of debris with a crane using a truck

Reopening to traffic



NouvLR's commitment

Quality of personnel

- Blasting experts
- Blast vibration experts
- Experienced project manager
- Experienced superintendent
- Experienced drillers
- Experienced blasters

Team effort with highly qualified personnel
Fully supported by NouvLR's senior management

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NouvLR's commitment

Strict and rigorous control for each blast

- Drill boss (consistency)
- Depths of borings
- Control of explosives loading
- Control of ignition sequence
- Complete covering of blasts
- Rigorous monitoring of vibrations
- Systematic analysis of results
- Immediate adjustment of drilling and blasting parameters based on results

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Date, location and topics of the next meeting

REM.INFO

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