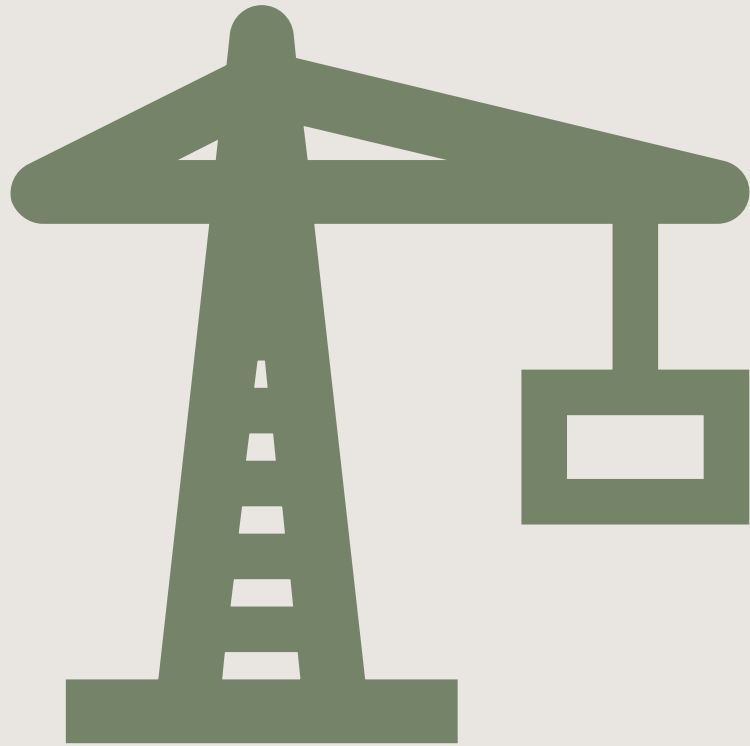


Civil Engineering

By: Sophia, Bermet, Johanna, and
Layla

Building and Mechanical services

Roger Bartosh



Introduction to civil engineering

What does the civil engineer do?



civil engineers in Canada plan, design, develop, and manage construction and infrastructure projects like:



Roads and highways



Bridges and tunnels



Water supply systems and Sewage systems



Airports



Railways

Day – to – day responsibilities



Design and
Planning



Site
Supervision



Geotechnical
Analysis



Project
Management



Regulatory
Compliance



Areas of specialization

- Structural Engineering
- Transportation Engineering
- Water Resources Engineering
- Environmental Engineering
- Municipal Engineering
- Construction Management



Where do they work?

- Engineering consulting firms
- Construction companies
- Government departments (municipal, provincial, or federal)
- Public utilities
- Infrastructure development corporations
- Mining, oil, and gas sectors
- Academia and research

Education and licensing

bachelor's degree in
civil engineering

master's degree may
be required for
specialized roles or
advancement.

Graduates must
register with a
provincial or territorial
engineering
regulatory body

Pass the Professional
Practice Examination
(PPE)

Complete 3-4 years of
supervised
engineering
experience

Demonstrate good
character and English
or French proficiency.

Job demand

01

High demand in provinces like Alberta, British Columbia, and Ontario

02

Civil engineering is listed as an in-demand occupation

03

Green infrastructure, climate-resilient design, and smart city development are creating new opportunities.

Skills and competencies



Strong mathematical
and technical skills



Proficiency in
AutoCAD, Revit, and
design software



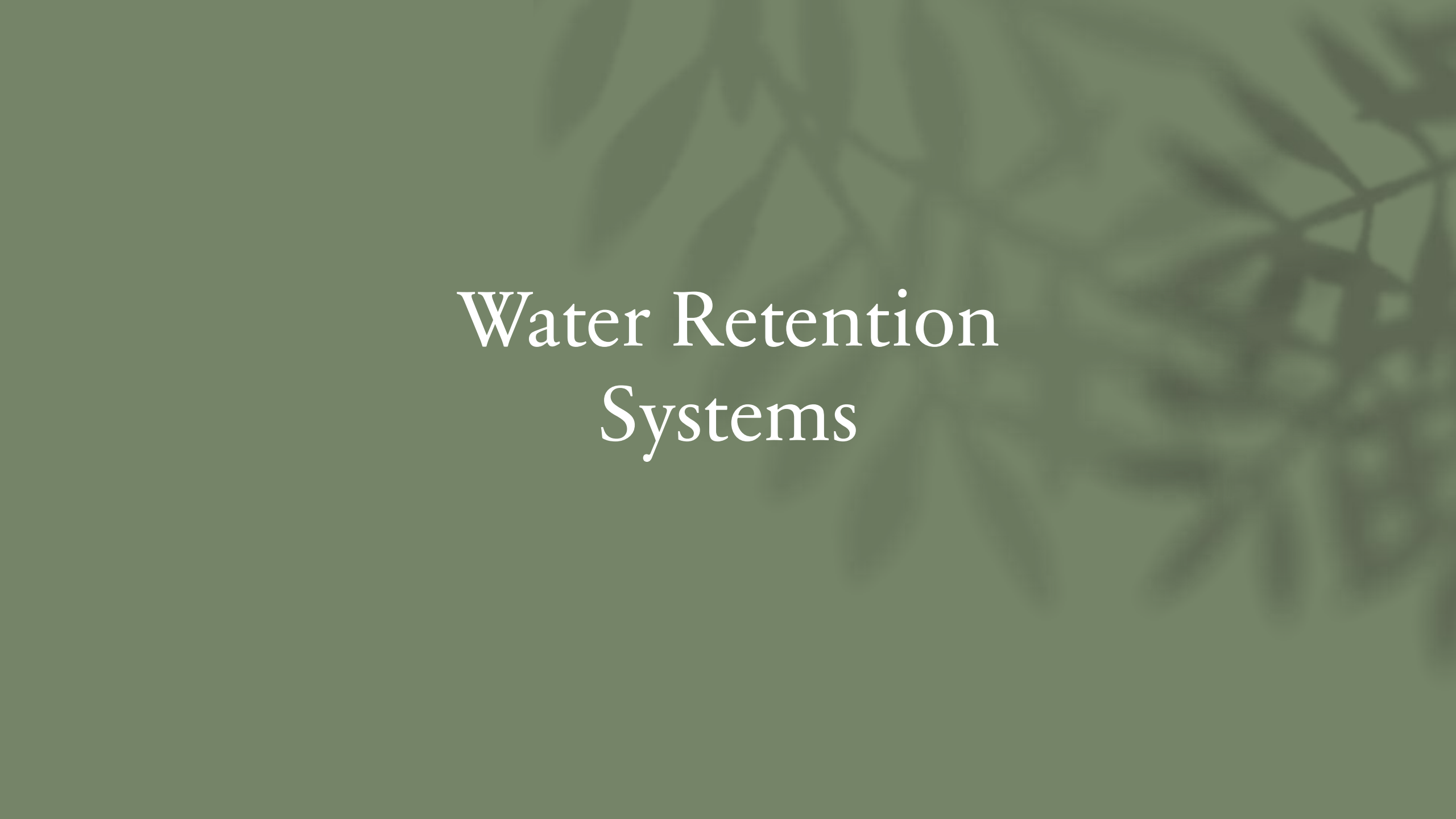
Project
management and
budgeting



Knowledge of
Canadian building
codes



Communication and
teamwork



Water Retention Systems

The Company

STRUCTURE / CIVIL

MTR-00229773-AO

Les Services exp inc.

t : +1.514.931.1080 | f : +1.514.935.1645

1441, boul. René-Lévesque Ouest, bureau 200

Montréal, QC H3G 1T7

CANADA

www.exp.com



Storm

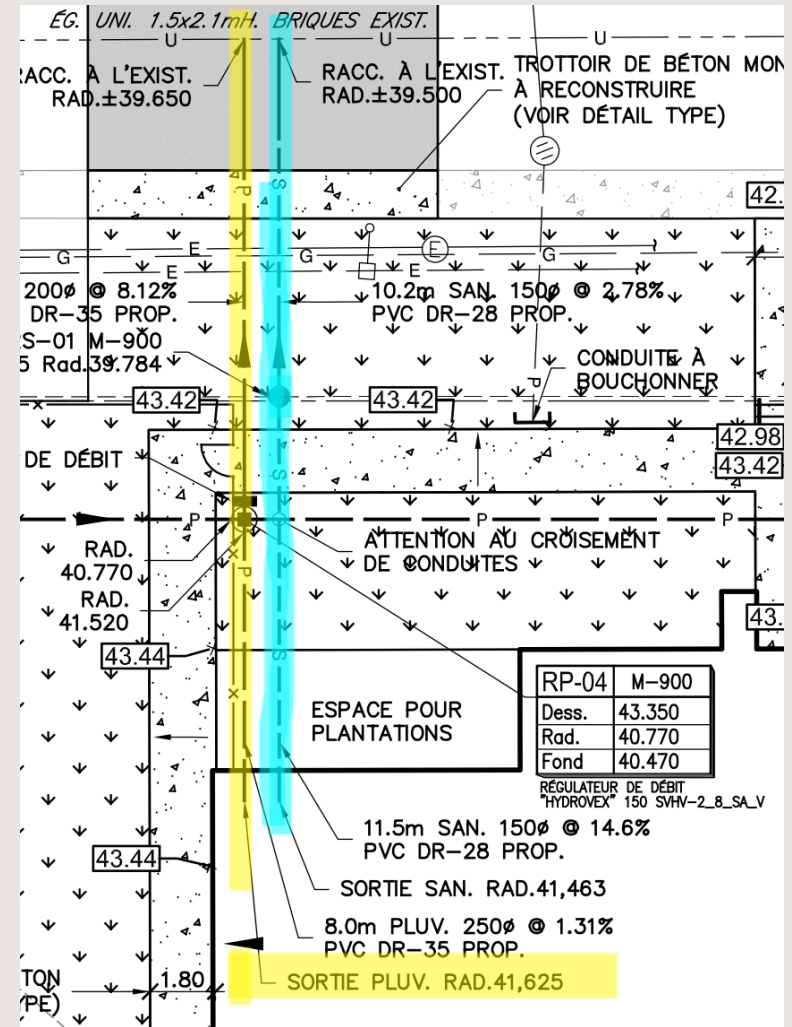
To design the storm drainage system, the civil engineer calculates the worst case scenario of storm water fall rate using:

- Total permeable area
- Municipal rain fall rates

Appendix C

Province and Location	Elev., m	Design Temperature				Degree-Days Below 18°C	.15 Min. Rain, mm	One Day Rain, mm	Ann. Tot. Ppn., mm	Ground Snow Load, kPa		Hourly Wind Pressures			Seismic Data		
		January		July 2.5%						S _s	S _t	1/10 kPa	1/30 kPa	1/100 kPa	Z _a	Z _v	Zonal Velocity Ratio, v
		2.5% °C	1% °C	Dry °C	Wet °C												
Mont-Laurier	225	-29	-32	29	22	5400	28	100	1000	2.4	0.4	0.24	0.28	0.33	4	2	0.10
Montmagny	10	-25	-28	28	22	5100	20	90	1090	2.7	0.5	0.39	0.50	0.63	5	4	0.20
Montréal Region																	
Beaconsfield	25	-23	-26	30	23	4550	23	85	950	2.1	0.4	0.31	0.37	0.44	4	2	0.10
Dorval	25	-23	-26	30	23	4550	23	85	940	2.2	0.4	0.31	0.37	0.44	4	2	0.10
Laval	35	-24	-26	29	23	4600	23	90	1025	2.4	0.4	0.32	0.37	0.44	4	2	0.10
Montréal	35	-23	-26	30	23	4250	23	90	1025	2.4	0.4	0.32	0.37	0.44	4	2	0.10
Montréal-Est	25	-23	-26	30	23	4450	22	90	1025	2.5	0.4	0.31	0.37	0.44	4	2	0.10
Montréal-Nord	20	-23	-26	30	23	4550	23	90	1025	2.4	0.4	0.31	0.37	0.44	4	2	0.10
Outremont	105	-23	-26	30	23	4450	23	90	1025	2.6	0.4	0.31	0.37	0.44	4	2	0.10
Pierrefonds	25	-23	-26	30	23	4550	23	90	960	2.2	0.4	0.31	0.37	0.44	4	2	0.10
St-Lambert	15	-23	-26	30	23	4550	23	90	1050	2.3	0.4	0.31	0.37	0.44	4	2	0.10

Storm

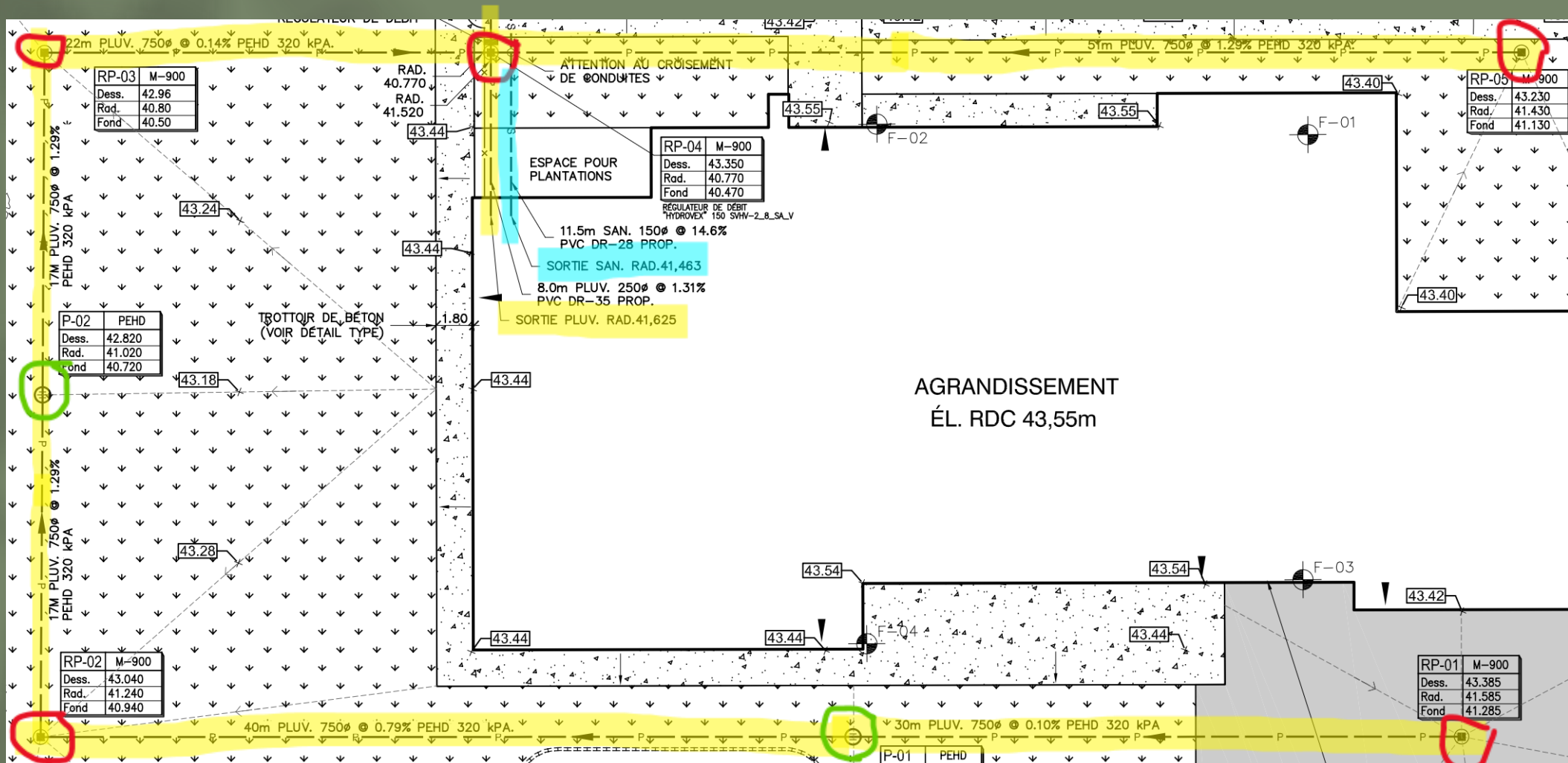


Yellow : storm sewer line

Red : manhole - catch basins (regard puisard)

Green : catch basins (puisards)

Blue : sanitary line



Permeable area

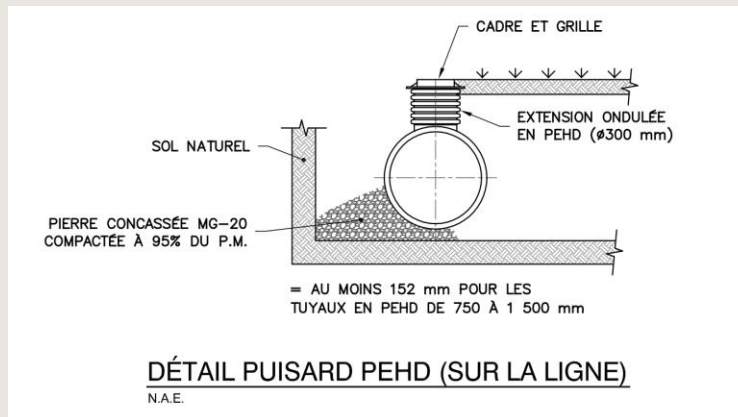




Roof drains in
the new addition
(RWL)

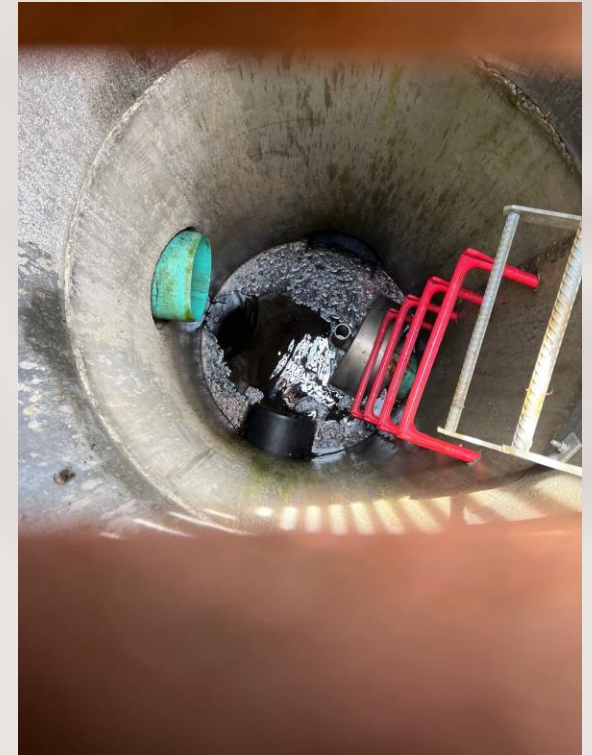
Catch Basins (Puisards)

- Must be installed on the storm sewer line.
- Chimney section: 300 mm diameter.
- Components (frame, grate) must be cast iron, secured with stainless steel bolts and washers.
- Must comply with ASTM F2306.



Manhole – Catch Basin (regard - puisard)

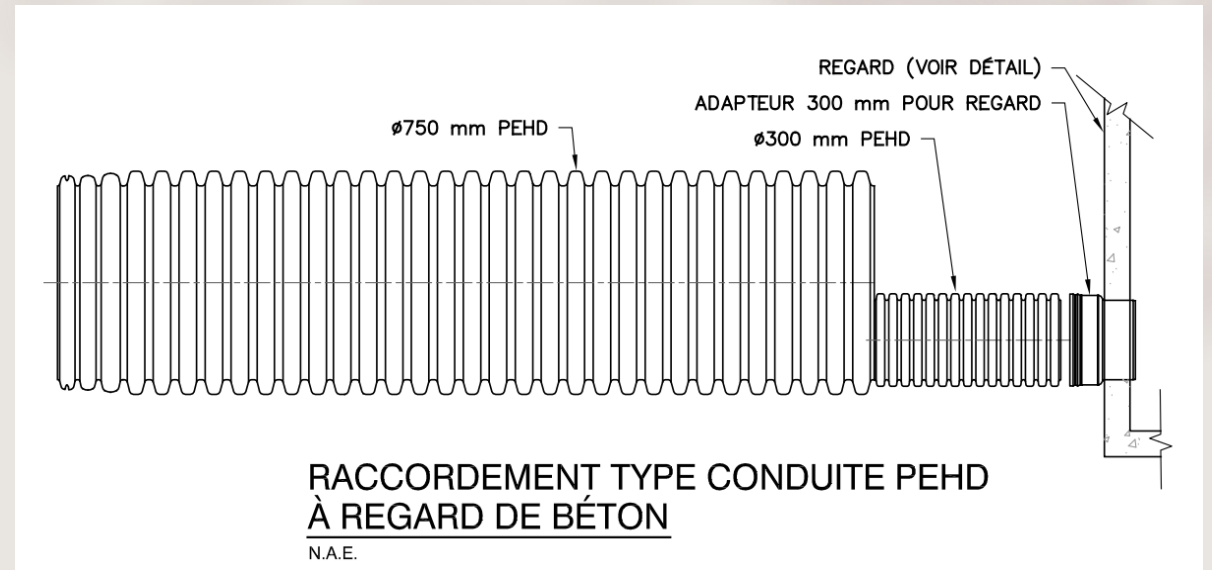
- Must be prefabricated in reinforced concrete.
- Must follow BNQ 2622-420/2009.
- Must include:
 - Rubber gaskets,
 - Steps (echelons),
 - Geotextile membrane (TEX-O-FLEX 40-12 from Solmax-Textel),
 - Proper rubber gaskets at inlets/outlets.



Storm Sewer Pipes

HDPE pipe type connection to concrete inspection chamber

- Must be HDPE (PEHD).
- Must conform to BNQ 3624-120.
- Installation must follow BNQ 1809-300 (standardized specification for underground infrastructure).



Other requirements

Pipe Bedding and Backfill:

- Must use crushed stone MG-20B,
- Not as per typical general clause – instead, per NQ 2560-114/2014.

Testing & Inspection:

- Watertightness tests required.
- CCTV inspections and deformation tests of plastic pipes using a profilometer with a rotating head (as per BNQ 1809-300/2004, Articles 11.2 and 11.4).



Supply Sanitary and Storm Systems

Symbols

LÉGENDE

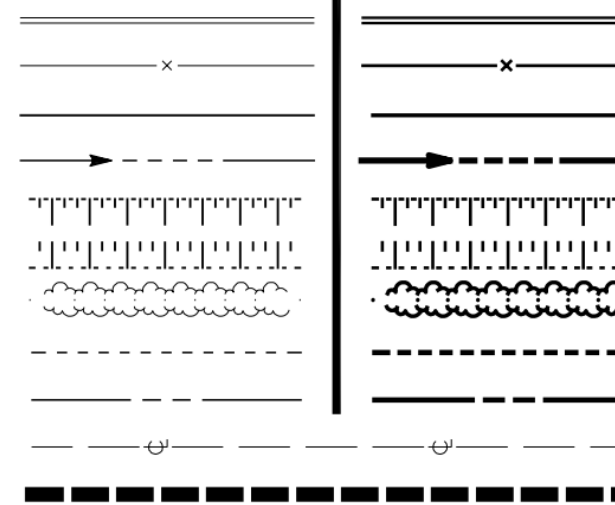
EXISTANT

PROPOSÉ

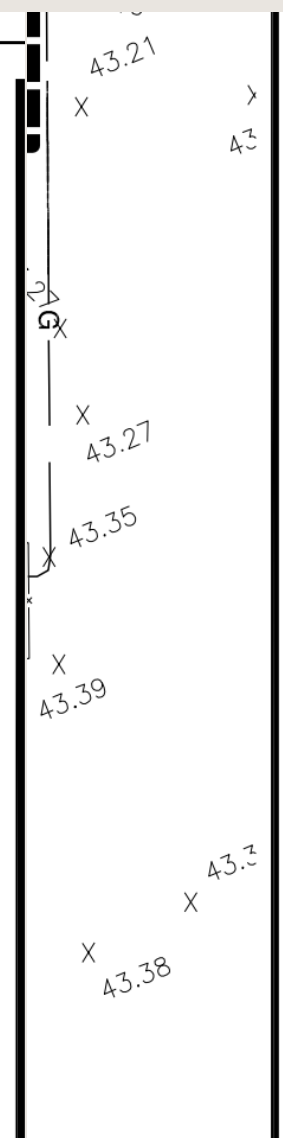
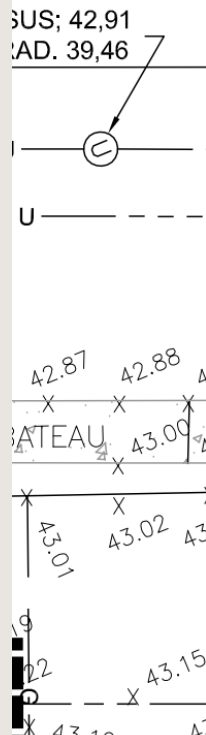
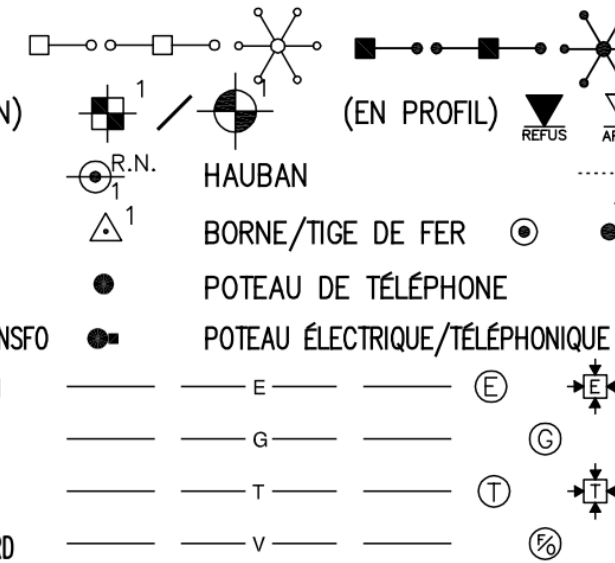
REGARD SAN/UNI/REF/PLUV/E.P.	Ⓢ Ⓤ Ⓡ Ⓟ ⓐ
PUISARD CIRC/CAR/RECT	⊖ ⊞ ⊠
REGARD PUISARD	⊖
POSTE DE POMPAGE	⊞
BORNE D'INCENDIE	⊕
VANNE	⊗
RÉDUIT	⊐
BOUCHON	⊐
ENTRÉE DE SERVICE	v ○
ÉLEVATION	+000,000
ÉGOUT SANITAIRE	-----S-----
ÉGOUT SANITAIRE (PROFIL)	-----S-----
ÉGOUT PLUVIAL	-----P-----
ÉGOUT PLUVIAL (PROFIL)	-----P-----
ÉGOUT UNITAIRE	-----U-----
ÉGOUT UNITAIRE (PROFIL)	-----U-----
CONDUITE DE REFOULEMENT	-----R-----
CONDUITE DE REFOULEMENT (PROFIL)	-----R-----
CONDUITE EAU POTABLE (AQUEDUC)	-----A-----
CONDUITE EAU POTABLE (AQUEDUC) (PROFIL)	-----A-----
DRAIN PERFORÉ	-----F-----
PAVAGE	=====
GRAVIER	-----

●
⊖ ⊞ ⊠
⊖
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-----S-----
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-----U-----
-----R-----
-----R-----
-----A-----
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-----F-----
-----F-----
=====

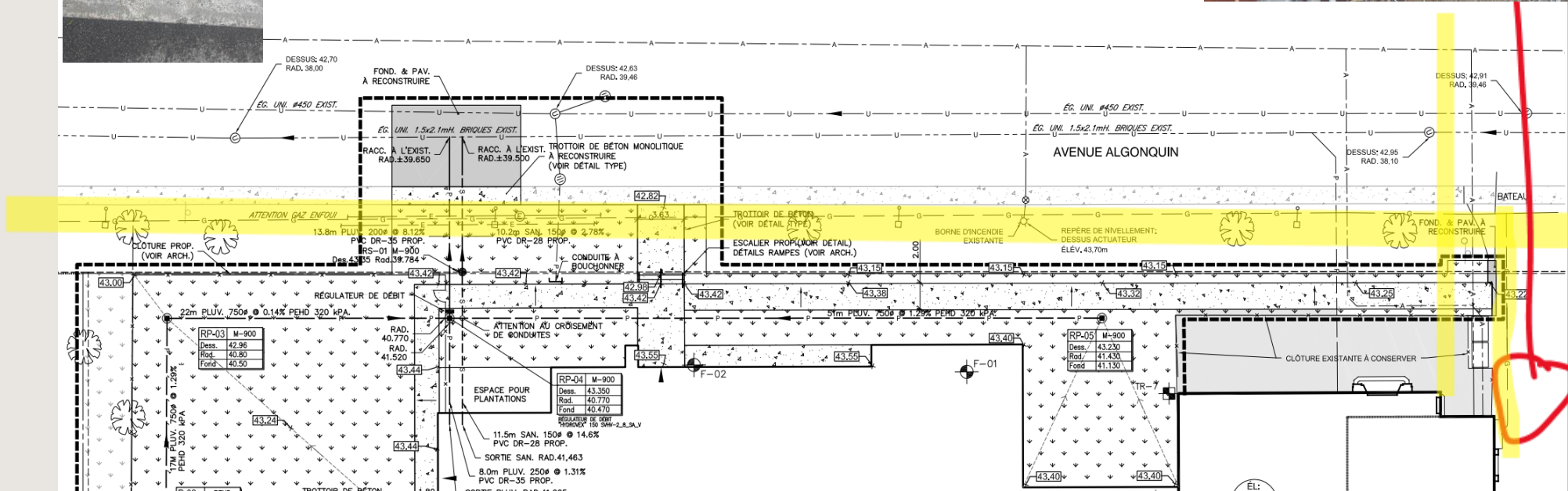
BORDURE
 CLÔTURE
 GLISSIÈRE
 FOSSÉ
 HAUT DE TALUS
 BAS DE TALUS
 HAIE
 LIGNE DE LOT
 LIGNE D'EMPRISE
 LIGNE DE CENTRE
 LIMITE DES TRAVAUX



LAMPADAIRE
 SONDAGE/FORAGE (EN PLAN)
 REPÈRES DE NIVELLEMENT
 STATION D'ARPENTAGE
 POTEAU ÉLECTRIQUE
 POTEAU DE TÉLÉPHONE AVEC TRANSFO
 ÉLEC. ENFOUIE / REGARD / BJ
 GAZ ENFOUI / REGARD
 TÉLÉPHONE ENFOUI / REGARD / BJ
 CABLODISTRIBUTION ENFOUI / REGARD

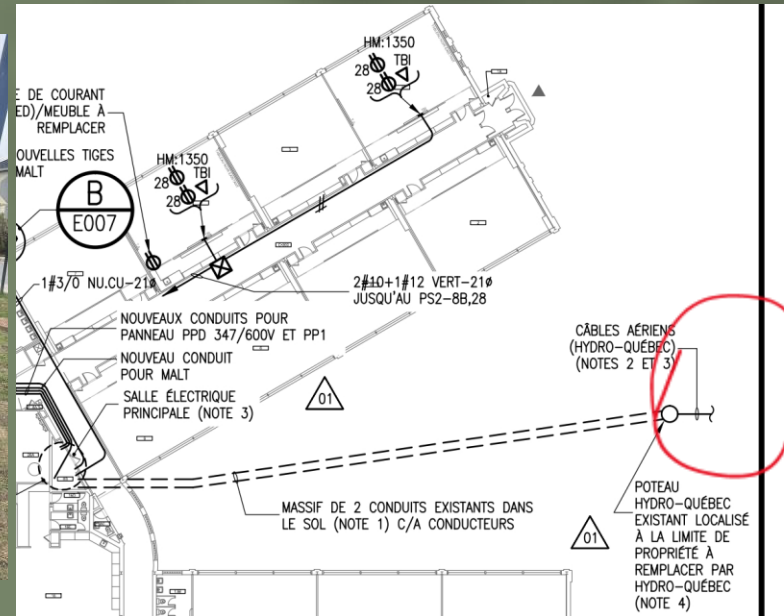


Underground Gas Line Location



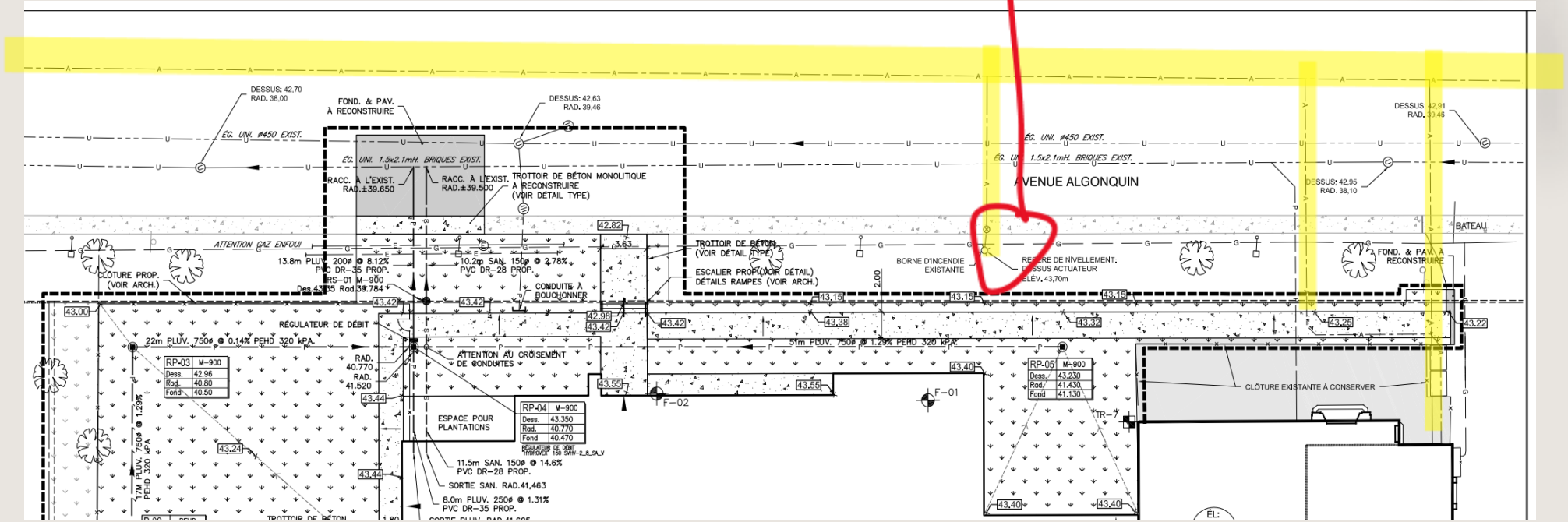
Underground Electrical Entrance Location

The electrical service enters underground from the existing building to the new addition. Power is supplied from the utility pole, which is connected via overhead cables to the homes across the street.



Supply

- Location of aqueduct



Water entrance

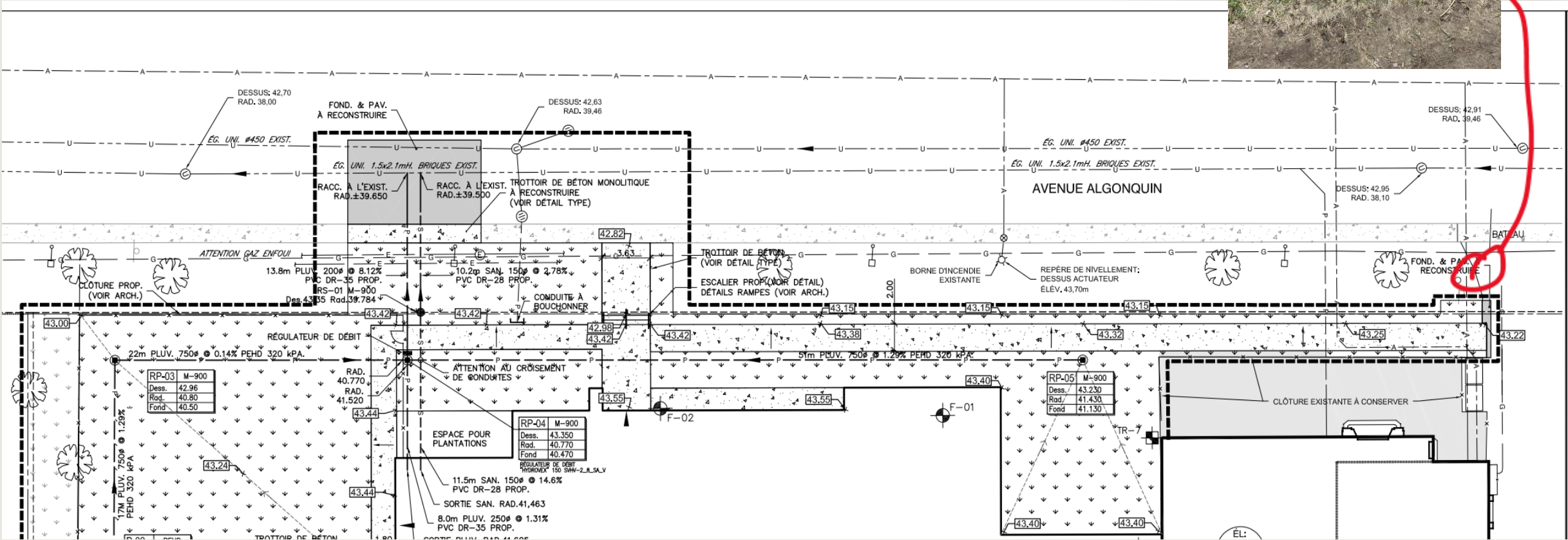
- Couldn't find accurate information on the curb stop location
- We talked to the school, but they couldn't give the information

Curb stops we found on nearby properties (example of what it should look like)



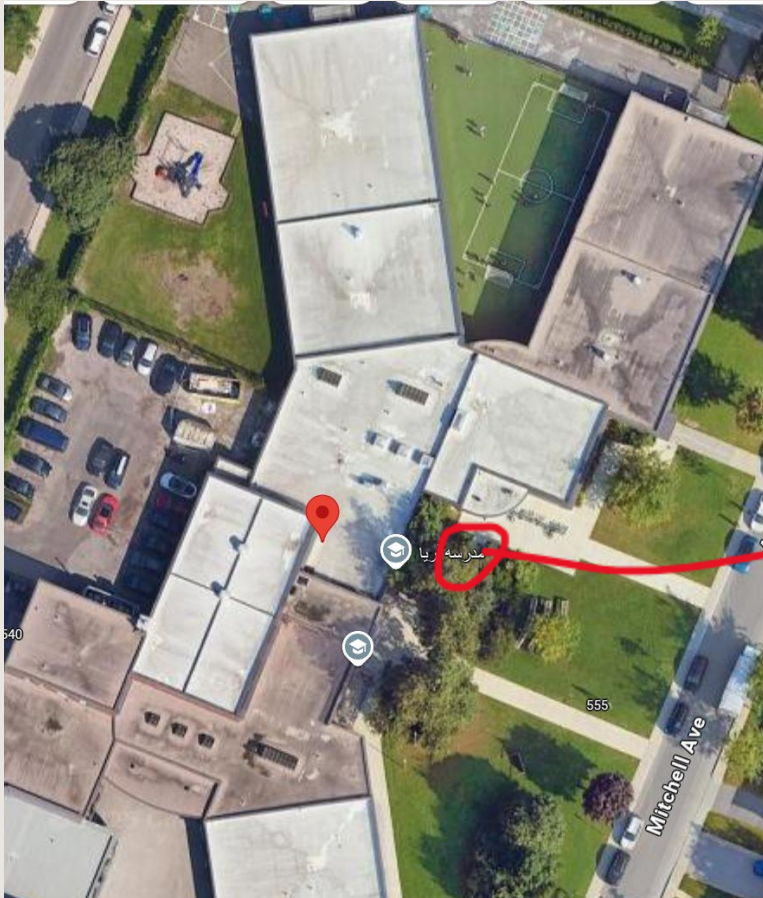
Water entrance

- Hypothetical curb stop locations

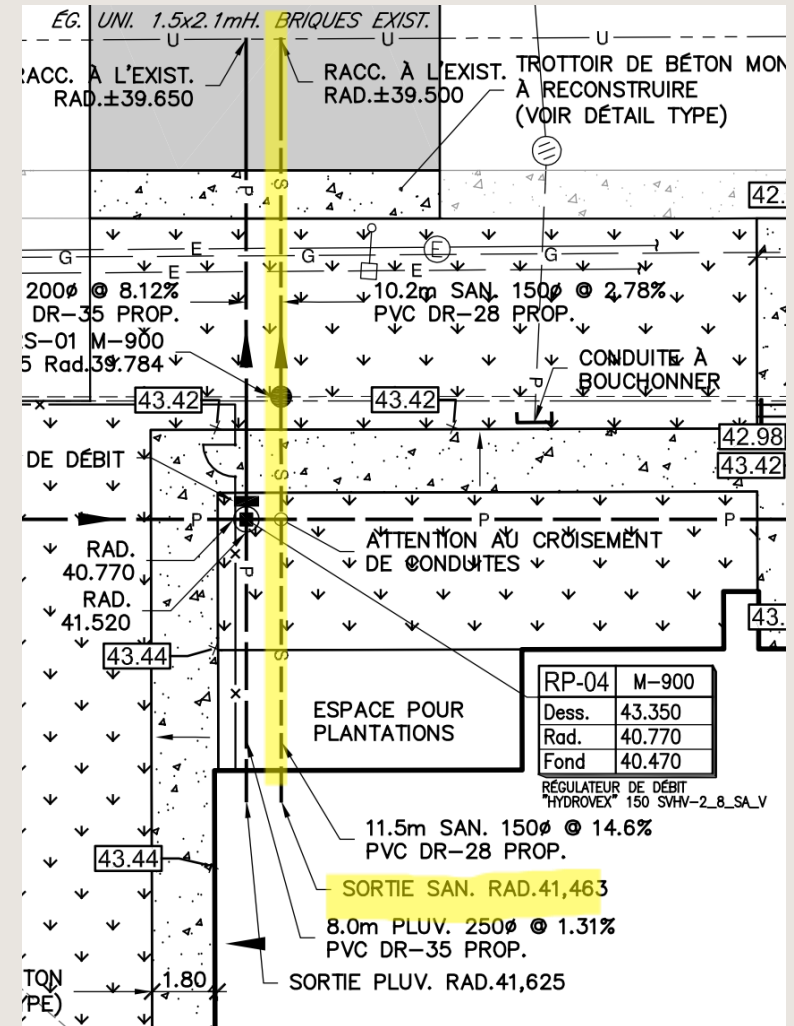


Water entrance

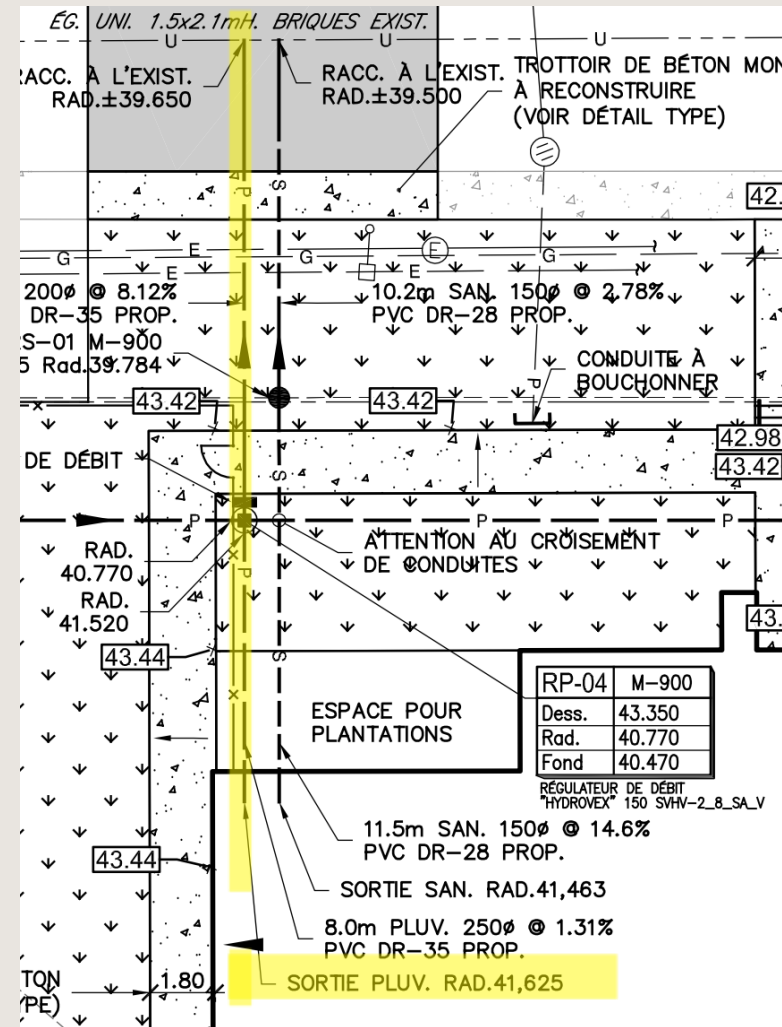
- Hypothetical curb stop locations



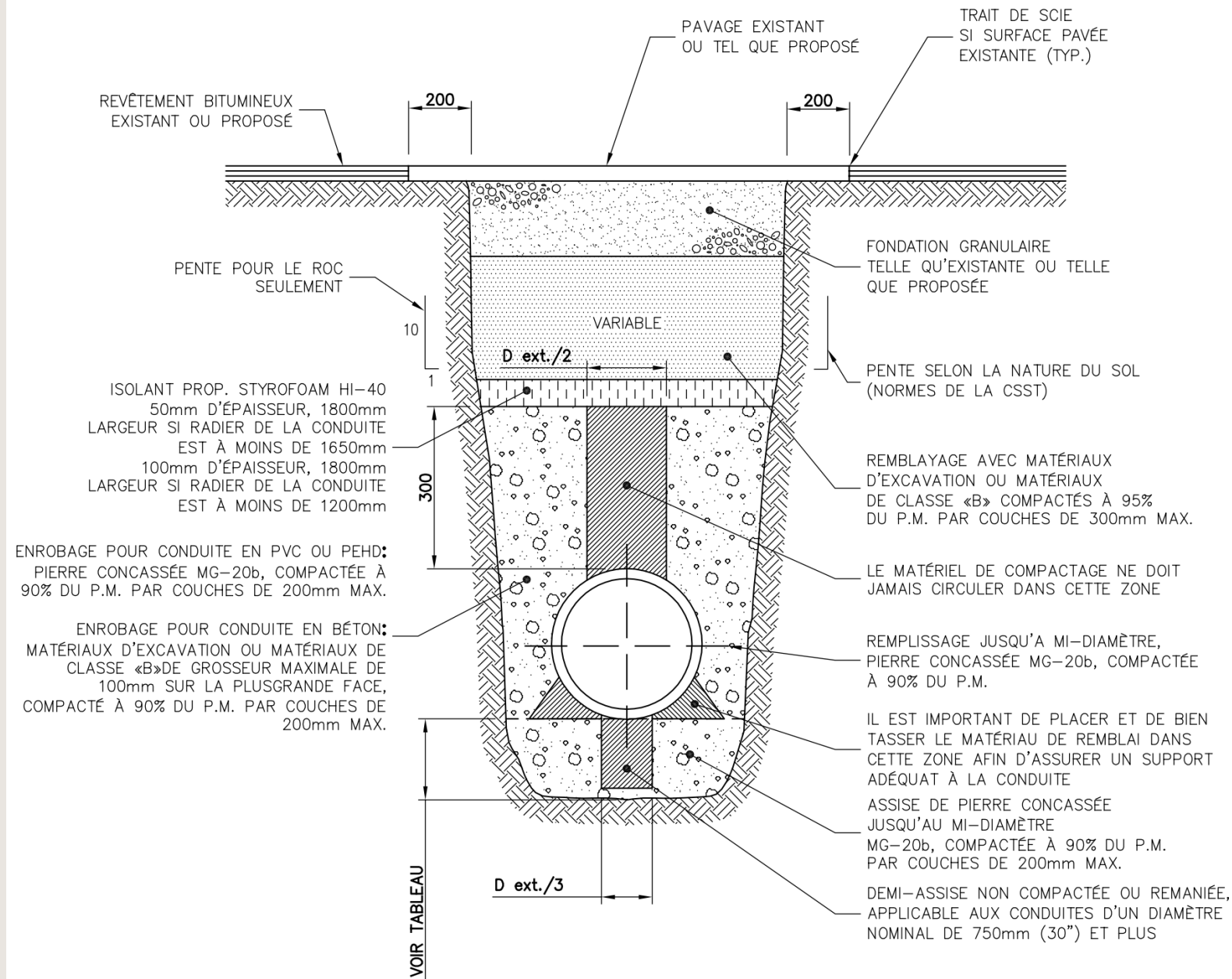
Sanitary



Storm

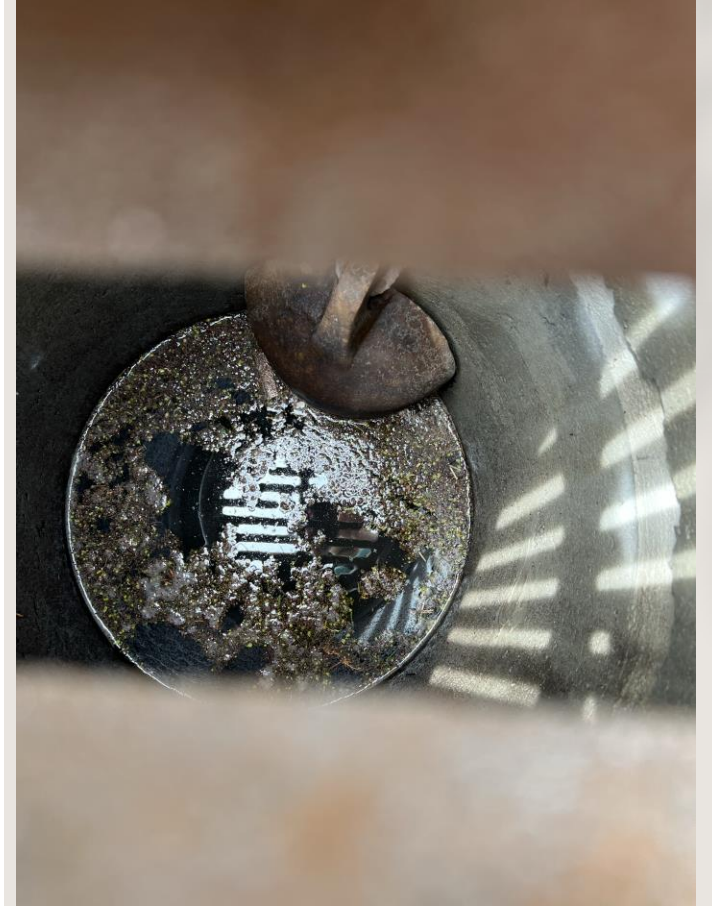
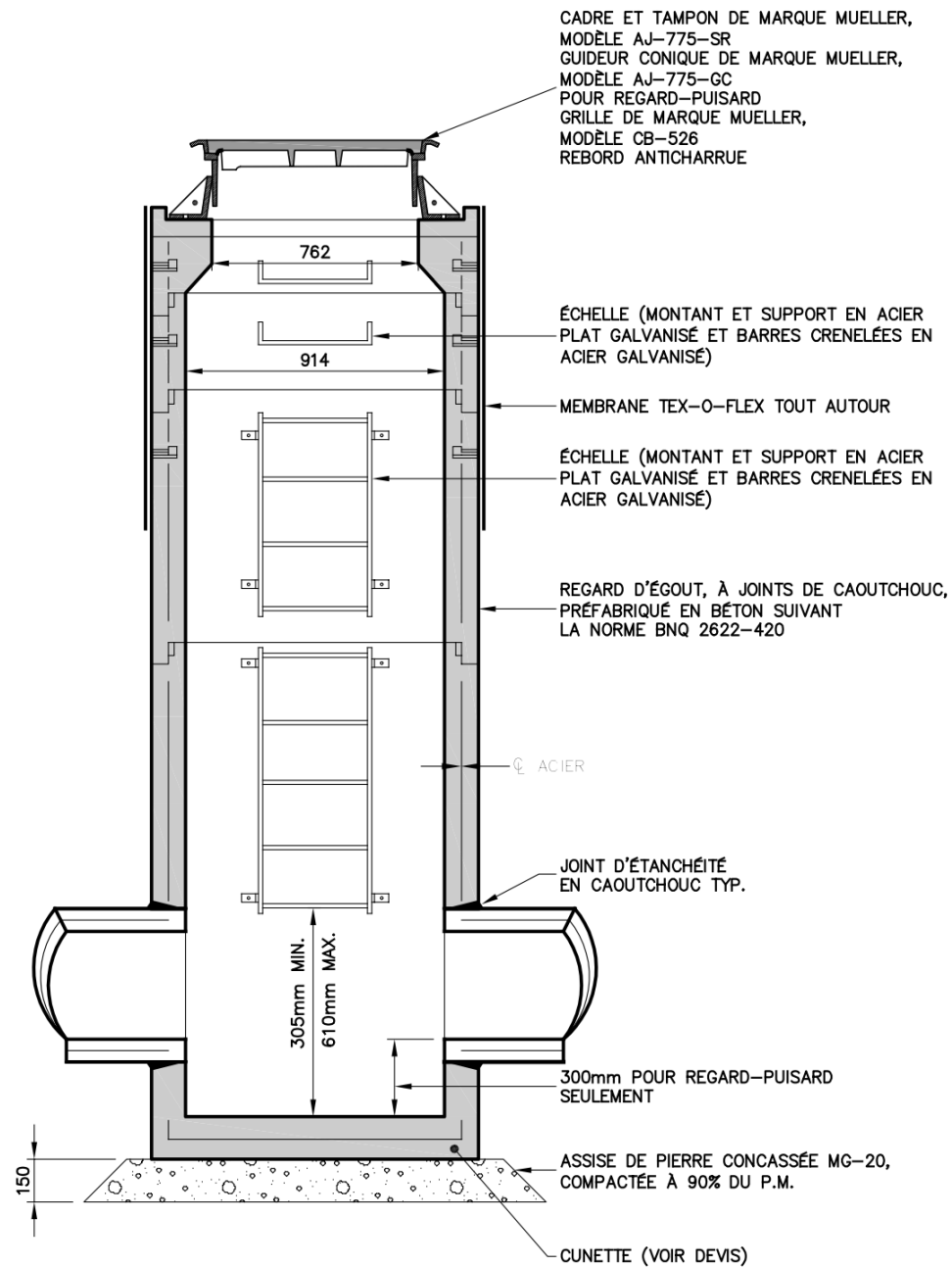


Storm or sanitary Sewer section



SECTION TYPE - ÉGOUT PLUVIAL OU SANITAIRE

N.A.E.



SECTION TYPE - REGARD «M-900»

N.A.E.

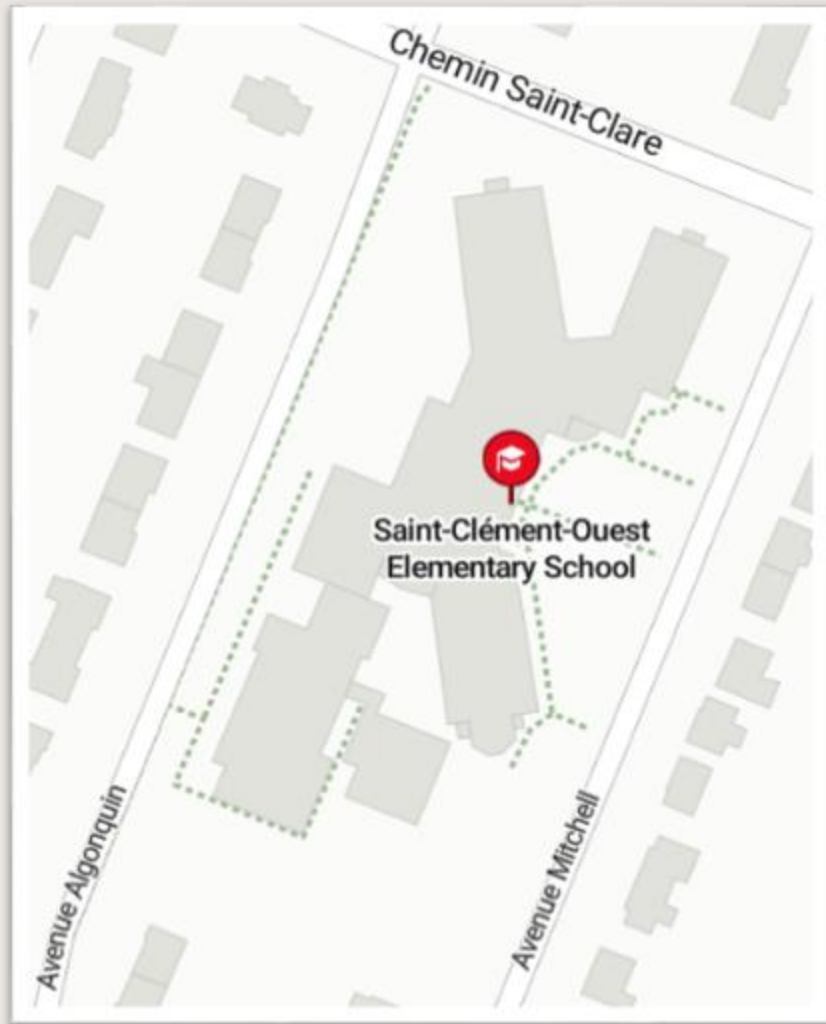
Nominal Diameter of the pipe

DIAMÈTRE NOMINAL DE LA CONDUITE mm (po)		ÉPAISSEUR MINIMALE DE L'ASSISE DANS LE SOL OU DANS LE ROC mm	LARGEUR AU FOND DE LA TRANCHÉE «L» mm
300 ET MOINS	(12" ET MOINS)	150	D ext. + 600
DE 350 À 600	(DE 14" À 24")	150	D ext. + 900
DE 750 À 1200	(DE 30" À 48")	200	D ext. + 1200
DE 1350 À 1500	(DE 54" À 60")	250	D ext. + 1200
1800 ET PLUS	(72" ET PLUS)	300	a) D ext. + 1200, SI LA TRANCHÉE EST ÉTANÇONNÉE b) D ext. + 900, SI LA TRANCHÉE N'EST PAS ÉTANÇONNÉE



Access Ways and Parking

Access Ways

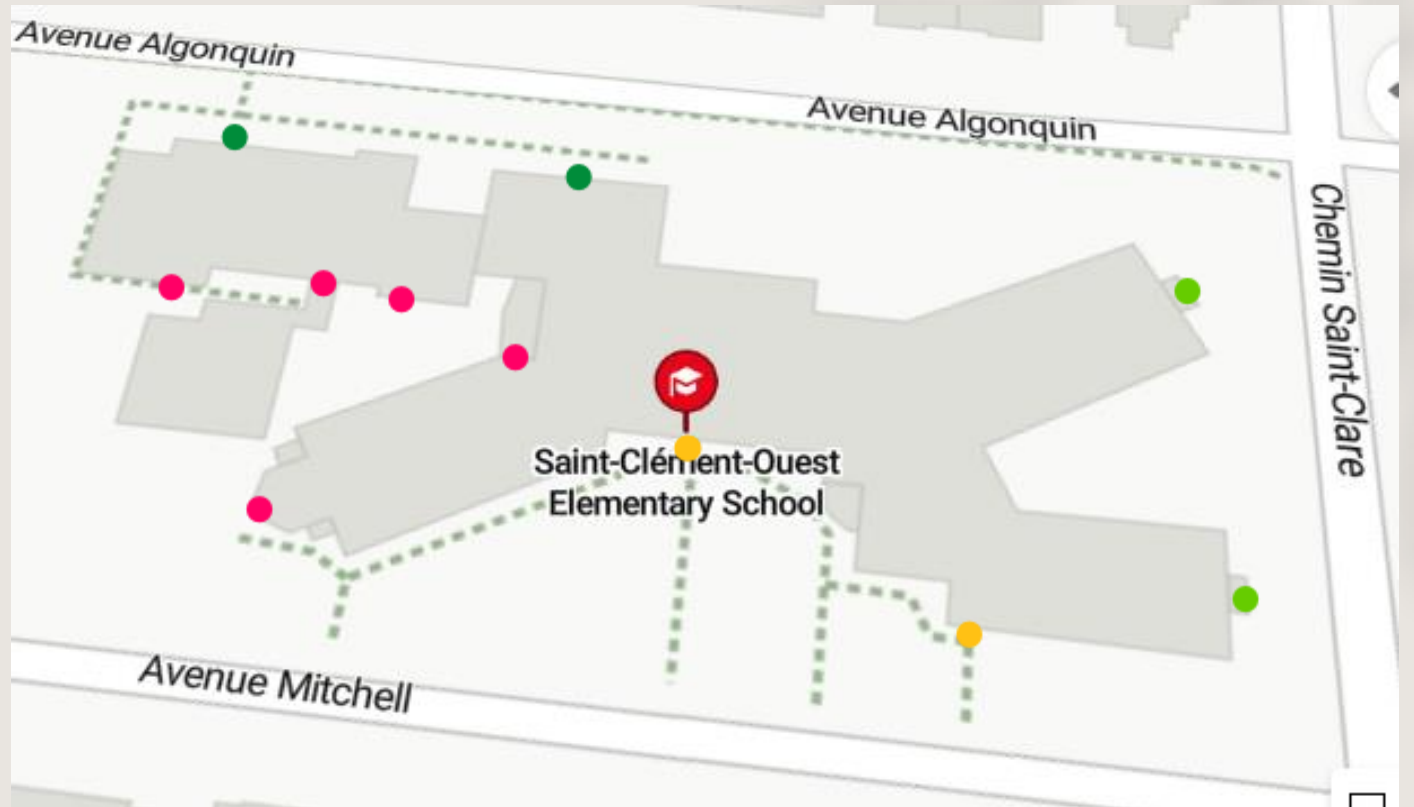


Main streets

- Chemin Saint-Clare
- Avenue Algonquin
- Avenue Mitchell

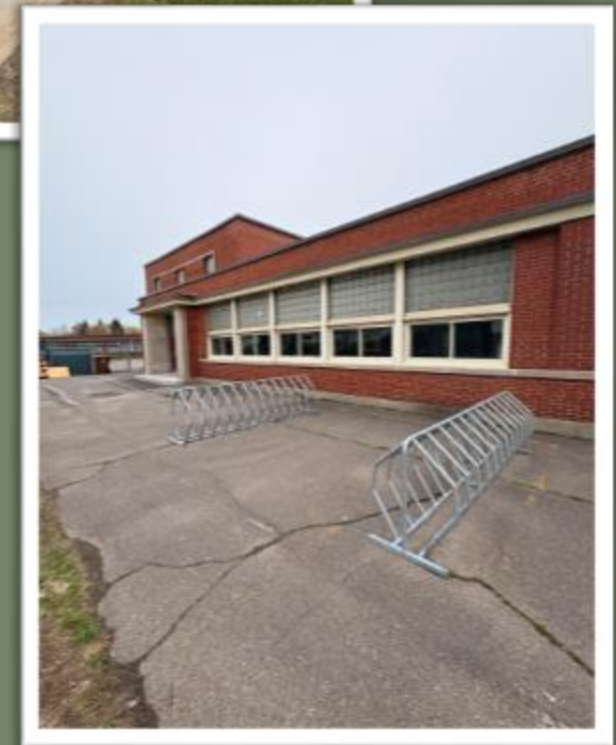
Entrances

- ❖ 2 entrances into the building on Algonquin Avenue
- ❖ 2 on Chemin Saint-Clare
- ❖ 2 on Avenue Mitchell
- ❖ 5 inside the school yard
- ❖ Total of 11 entrances

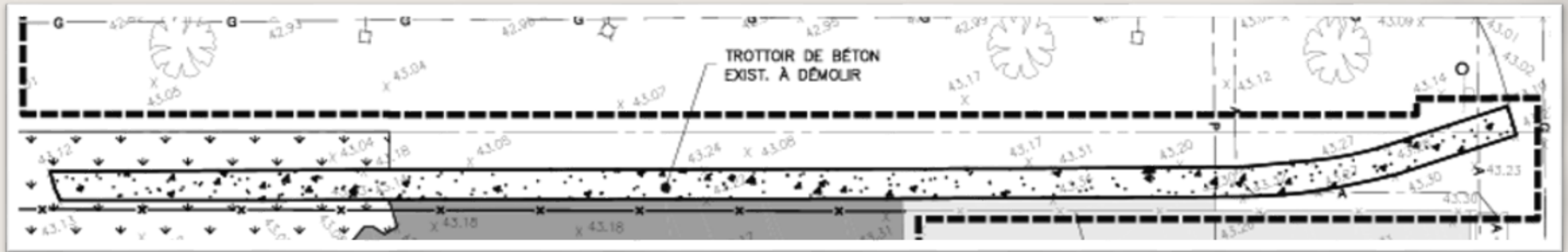


Algonquin Avenue

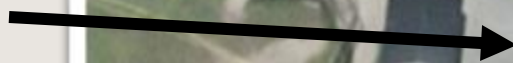
- ❖ New walkway
- ❖ Added stairs
- ❖ Bike racks



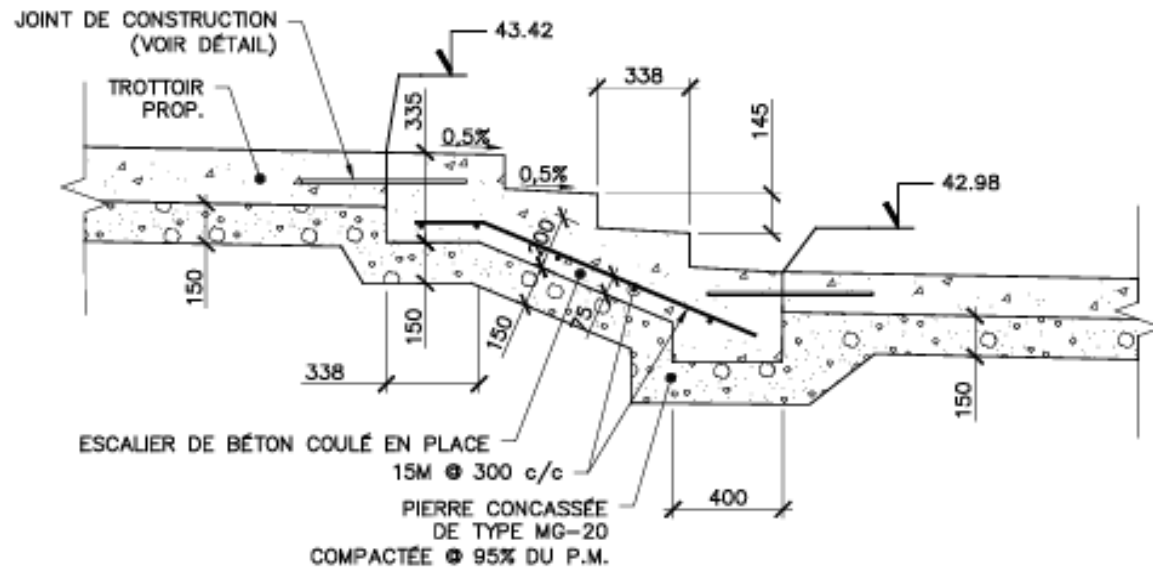
Sidewalk reconstruction



Replaced
concrete
with earth

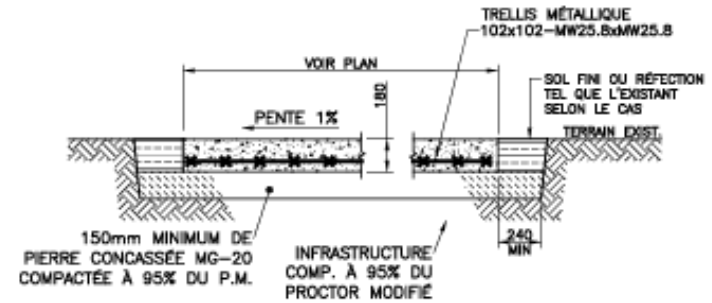


Plan details



DÉTAIL TYPE - ESCALIER

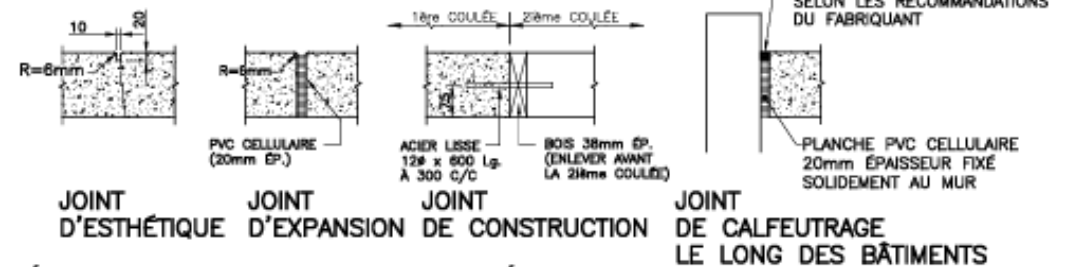
N.A.E.



TROTTOIR DANS UNE PARTIE ENGAZONNÉE

- BÉTON 35MPa À 28 JOURS
- PIERRE NETTE 20mm
- AFFAISSEMENT 60 À 100mm
- AIR ENTRAÎNÉ 5 À 7%
- JOINT D'ESTHÉTIQUE À 2m. C/C MAX.
- FUMÉE DE SILICE 5 À 8%
- JOINT D'EXPANSION À 8m. C/C MAX. (OU À TOUS LES ENDROITS CRITIQUES TELS QUE POTEAUX, BORNES-FONTAINES, INTERSECTIONS DE TROTTOIRS, AUX RAYONS, PUISARDS, MAISONS, DE CHAQUE CÔTÉ DES ENTRÉES CHARRIÈRES.)
- JOINTS DE CONSTRUCTION (À CHAQUE ARRÊT DE PLUS D'UNE HEURE DANS LA POSE DU BÉTON)
- LA SURFACE DOIT ÊTRE FINIE AU BALAI
- CURE JUTE HUMIDE PENDANT 7 JOURS
- TRAITEMENT DE SURFACE IMPERMÉABILISANT "HYDROZO ENVIROSEAL 20"

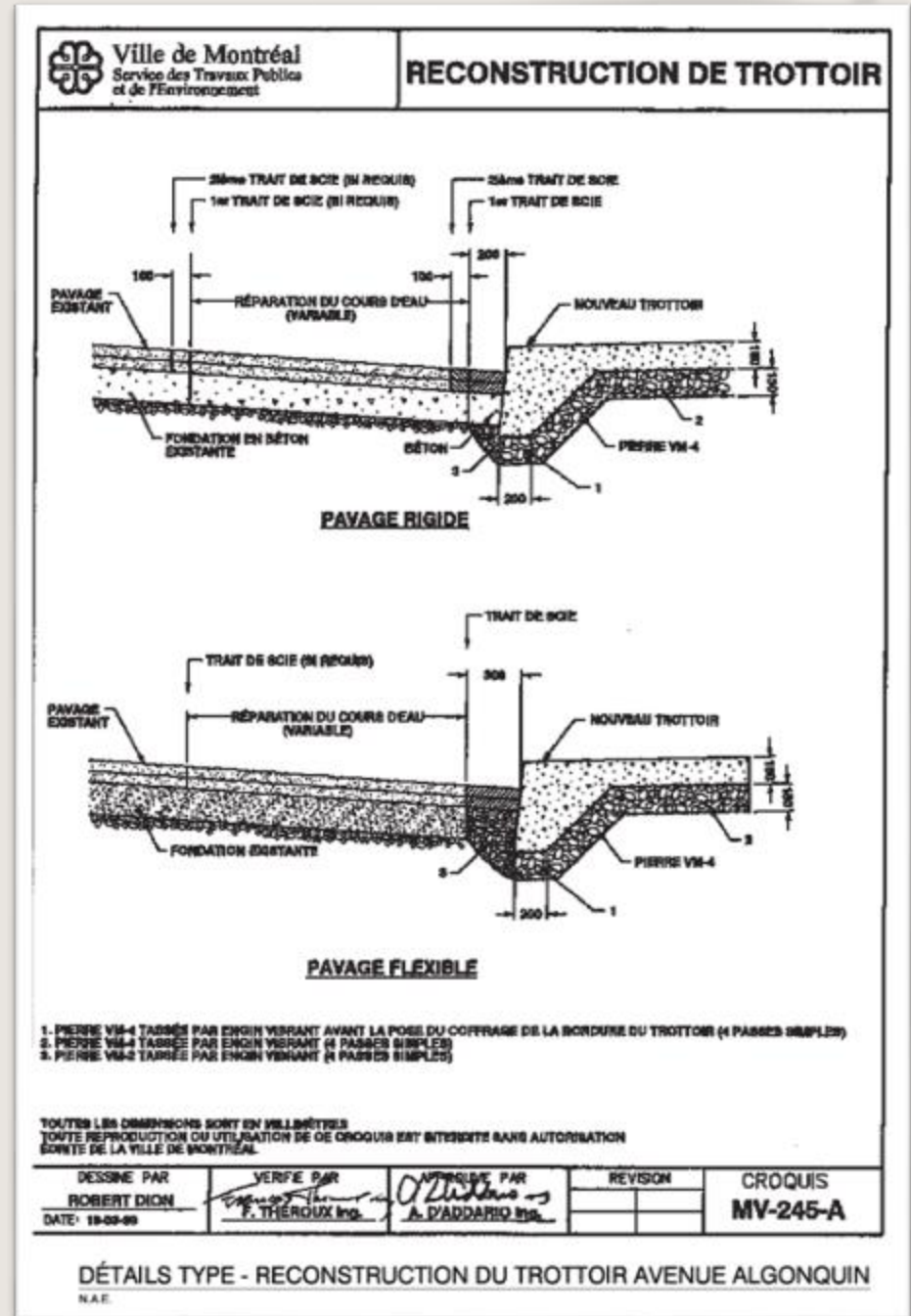
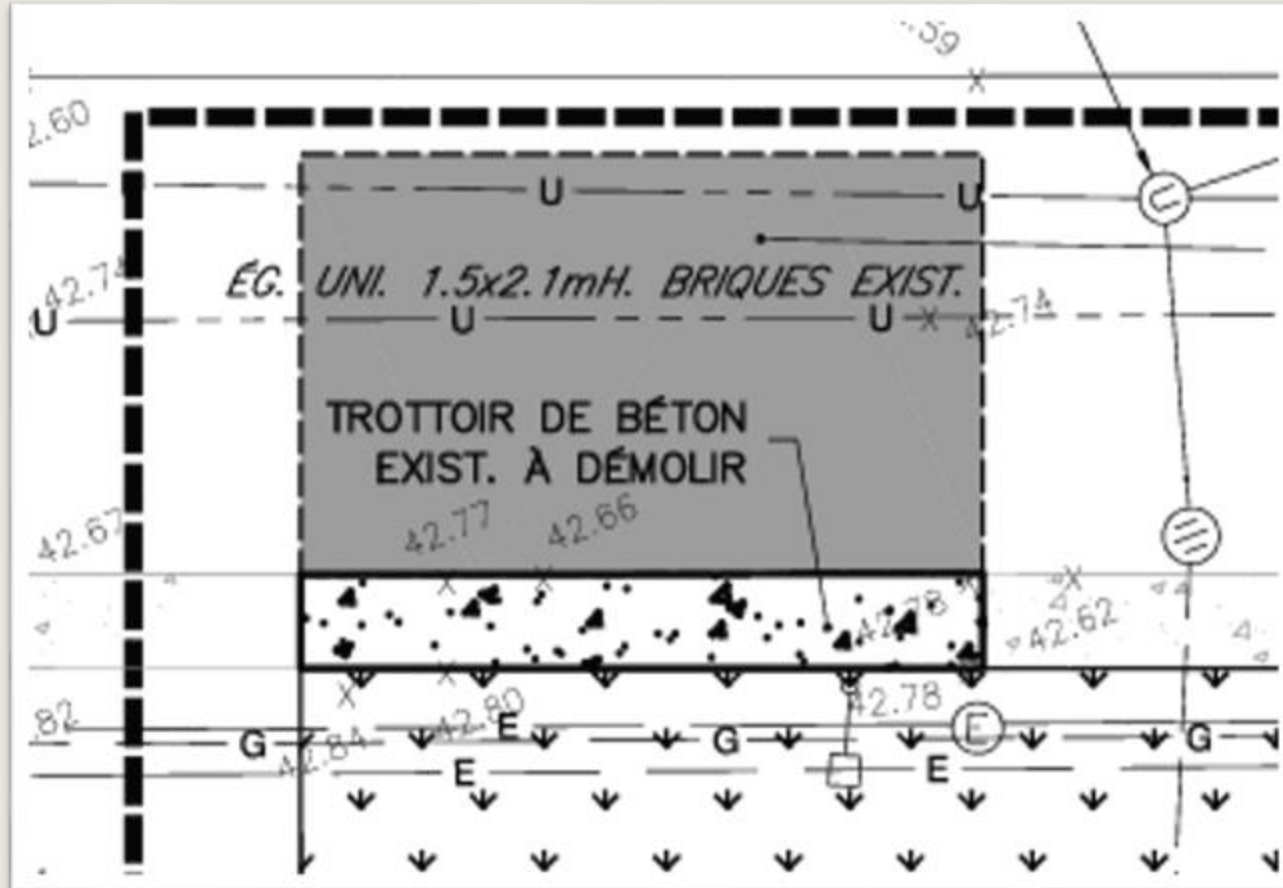
«B»



DÉTAILS TYPE - TROTTOIR DE BÉTON

N.A.E.

Plan details



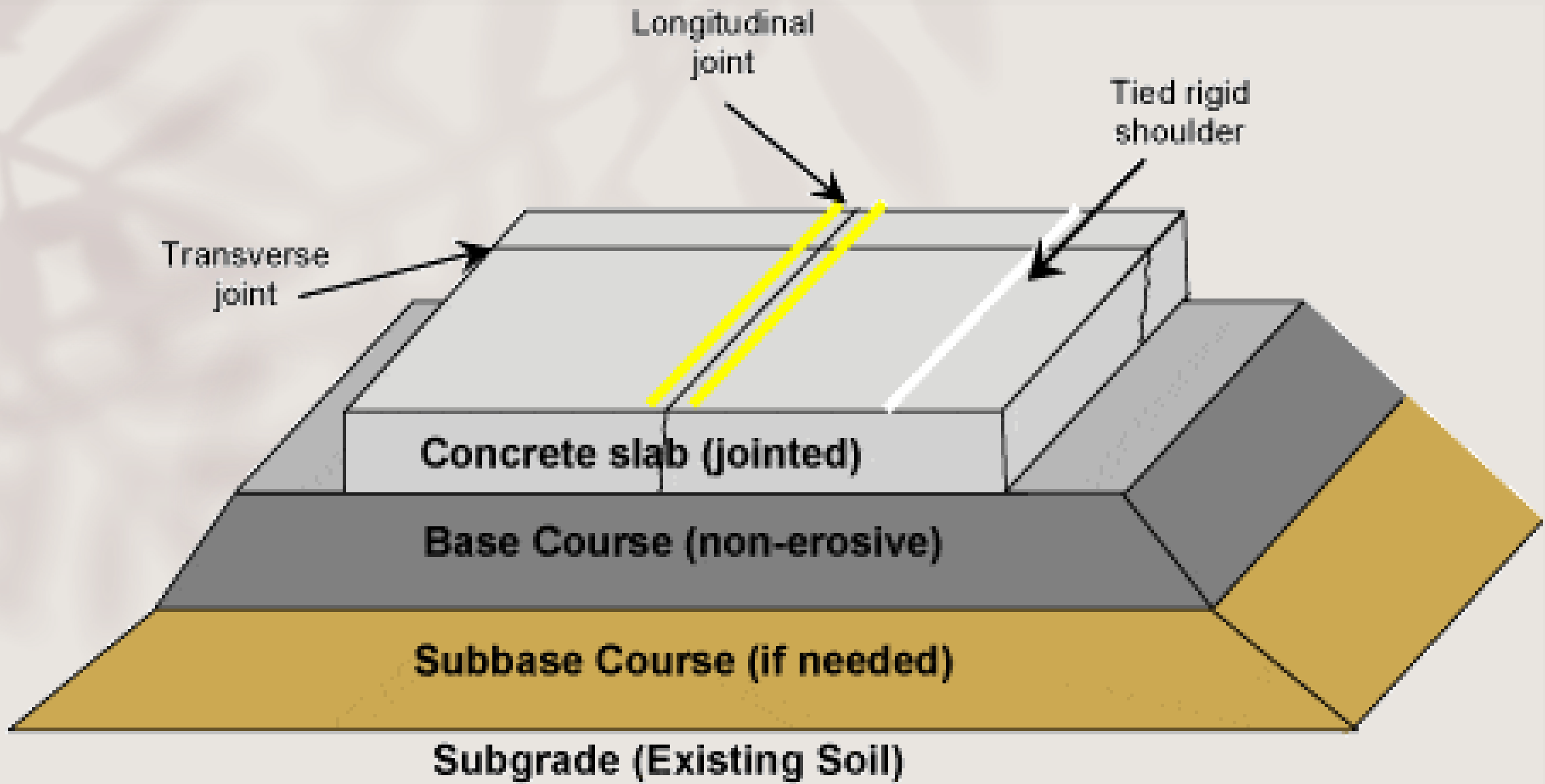
Paving

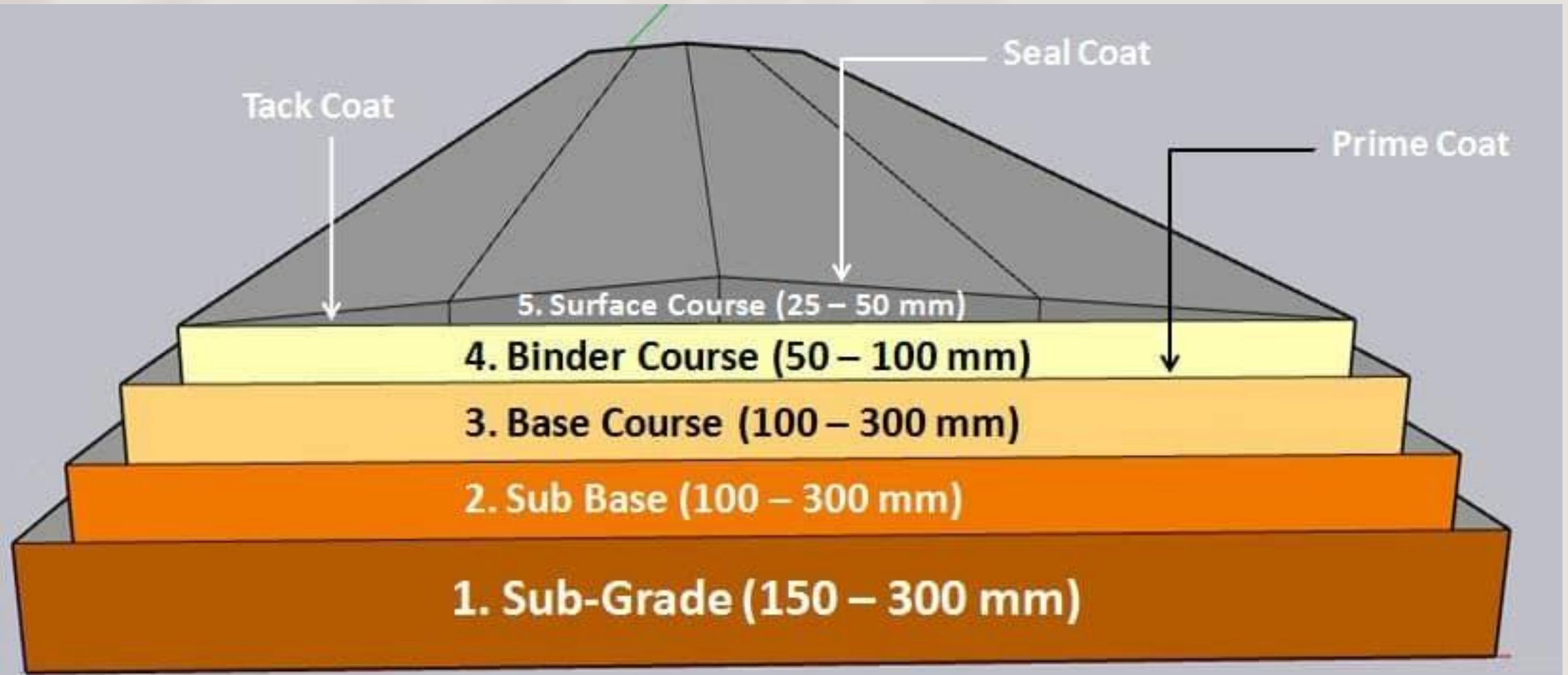
Rigid paving

- ❖ Rigid layer of reinforced or cement concrete as primary structural component
- ❖ Solid and inflexible
- ❖ Provide durability, long life span and withstand heavy loads

Flexible paving

- ❖ Consists of multiple layers of material
- ❖ Load distributing characteristics
- ❖ Provide strength, durability and flexibility





C/S of Flexible Pavement

Chemin Saint-Clare

- ❖ Paved area
- ❖ Gated off

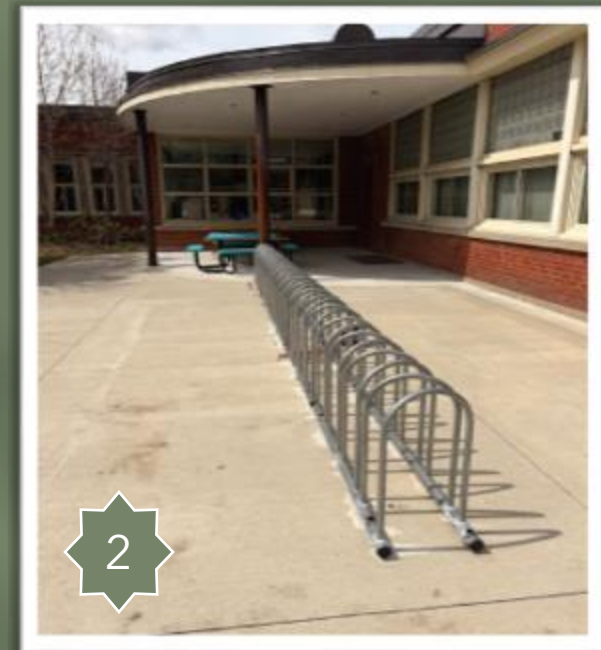


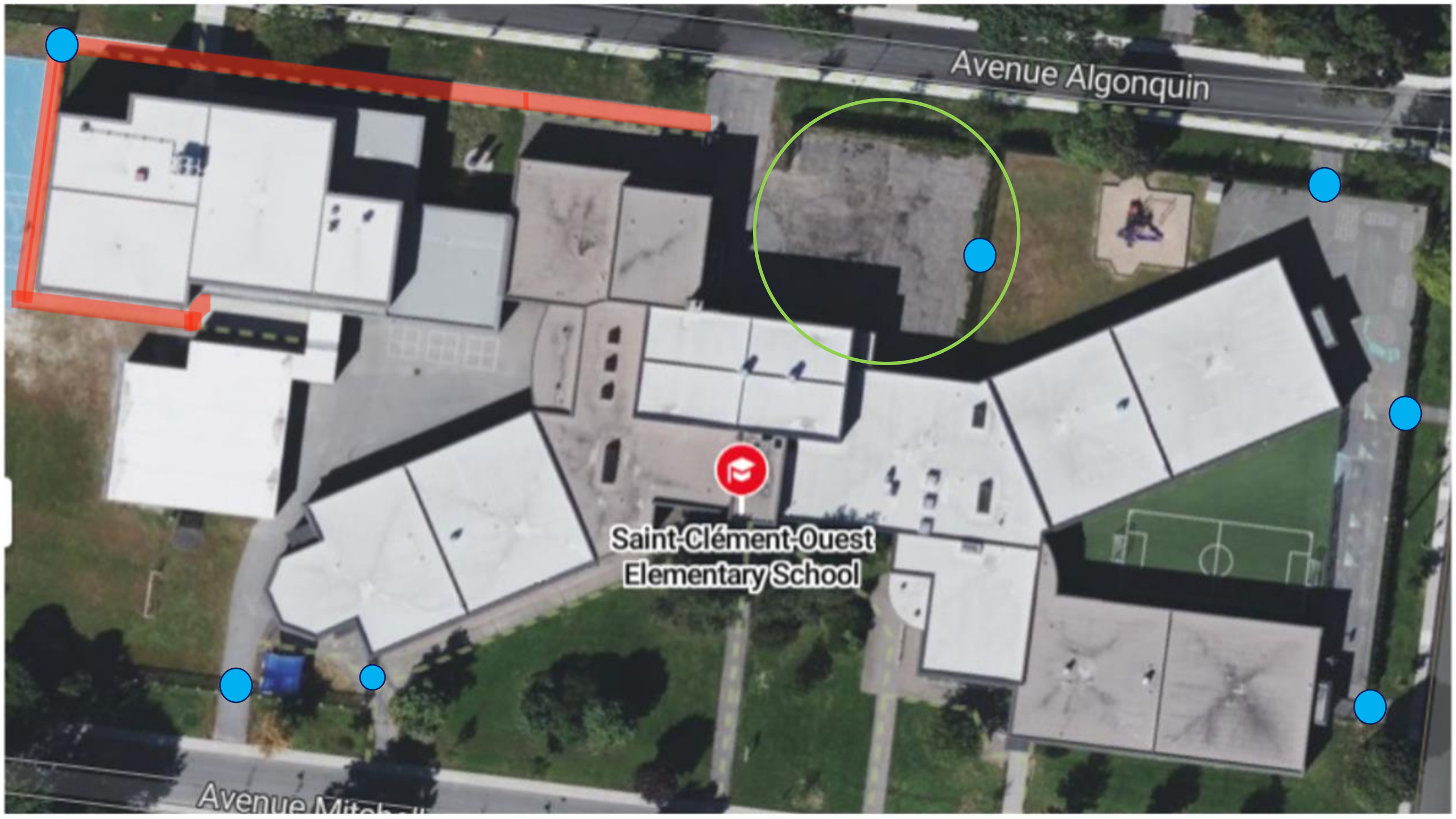
Gate on Avenue
Algonquin



Avenue Mitchell and the school yard

Lots of paved walkways leading from the sidewalk to the building doors + more bike racks





Avenue Algonquin

Saint-Clément-Ouest
Elementary School

Avenue Mitchell

Parking

- ❖ Fenced but open driveway
- ❖ Gate giving access to playground





Thank you!

Any questions?