Public Works and Government Services Canada

Reconstruction of section 98 of Queen's wharf
101 Champlain Boulevard, Quebec City

Geotechnical investigation and environmental site assessment

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LVM

Public Works and Government Services Canada

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Revision no.	Date	Description of the change and/or the issue
0A	2010-03-26	Preliminary report
00	2010-10-01	Final report

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1 INTRODUCTION

Public Works and Government Services Canada (PWGSC) retained the services of LVM, consultants in geotechnical engineering and quality control of materials, to carry out a geotechnical study and environmental site assessment for a project to rebuild section 98 of Queen's wharf located at 101 Champlain Boulevard in Quebec City.

This study was carried out according to the terms defined in the Call for Proposals (CFP) number EE517-101067/A and according to our proposals approved by PWGSC.

The purpose of the geotechnical component was to specify the nature and some properties of the subsurface and the groundwater conditions, and to submit geotechnical comments and recommandations for the design of the works.

The purpose of the environmental component was to verify the environmental quality of soils and sediments regarding to the parameters specified in the CFP. This environmental site assessment (ESA) was carried out by the Environment department of Dessau, of which LVM is a subsidiary.

This report contains a description of the project, the site and the regional geology, explanations on the investigation method used in the field and in the laboratory, a description of the nature and a few properties of the materials encountered, the results of the soil environmental assessment works, information on the groundwater conditions, and relevant comments and recommendations pertaining to the project.

The terms defining the scope of the geotechnical study are presented in Appendix 1. It is important to consult these terms to have a good understanding of the report. Appendices 2 to 4 include the boreholes reports, the structural data of the rock and laboratory test results. Appendix 5 includes some documents pertaining to the environmental component: sampling procedures, transport and conservation of samples, summary tables of the results of environmental analyses in the laboratory, certificates of chemical analyses and list of the generic criterias. Finally, Appendices 6 and 7 include photographs and drawings showing the location of the boreholes, the stratigraphic sections and the location of the environmental tests including the analytical results and the probable extent of the contaminated areas.

2 DESCRIPTION OF THE PROJECT, THE SITE AND THE GENERAL GEOLOGY

2.1 PROJECT

The Department of Public Works and Government Services Canada intends to rebuild section 98 of the Queen's wharf. The works will consist of demolishing the upper portion of the existing wharfs and rebuilding them with new walls made of sheet piles, piles-sheet piles or sheet piles-cofferdams.

The demolition will consist of excavating all of the tie rods and anchorage blocks and cutting off the pile heads in the upper part, which will entail excavations on the order of 6 metres in depth approximately.

The new retaining walls of the wharfs will be installed outside the existing walls in the river. Depending on the location, steel sections could be driven into the seabed and/or into the rock. Three types of anchorage systems could be used for the project depending on the available space, namely tie rods with concrete anchorage blocks (sector of boreholes TF-09-09 to TF-11-09 and TF-21-10, TF-22-10, TF-24-10 and TF-25-10), a transfer slab attached to two inclined or vertical piles extended by anchorages in to the rock, or anchorage of the walls directly by inclined piles extended by anchorages in the rock.

2.2 SITE

Section 98 of the Queen's wharfs is located at 101 Champlain Boulevard in Quebec City. Its approximate location is shown on Figure 1 (below). We refer to points A, B, C and D shown on Drawing 0002 placed in Appendix 7 to facilitate the description of the work.

Based on the information provided by PWGSC, section 98 was built during two periods. The docking faces, located between points A and C, date back to 1958, whereas the section further to the south dates back to 1971.

Between points A and C, the wharf is made up of a steel sheet pile curtain wall held partly in place in the exposed portion by one or two rows of tie rods depending on the location. Between points C and D, the work is made up of a sheet pile curtain wall topped with a concrete cope wall. The concrete cope wall is erected on a wooden platform, which itself is supported by wooden piles. This construction principle was also chosen for the part built in 1971, except that the transfer slab is made of concrete and the piles are made of steel.

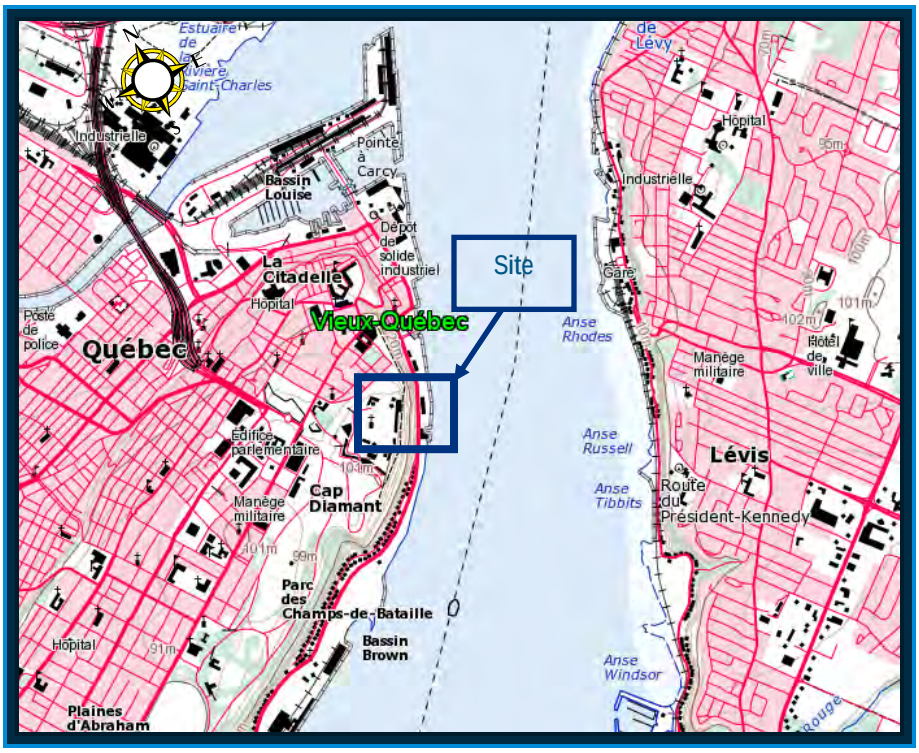
Remains of wooden cribs are still in place below the level of the tie rods.

Different buildings are located along the wharf on the east side of Champlain Boulevard, and a rock cliff (Cap Diamant) runs along the west side of Champlain Boulevard.

The construction work will be done in part in the St. Lawrence River and in part on the wharf. The sector under study is located in a zone of the river subject to strong current and major tides.

Photographs presented in Appendix 6 allow readers to visualize the site and different sectors of the work.

Figure 1 : Approximate location of the site



2.3 GENERAL GEOLOGY

Based on geological maps, the bedrock in the Queen's wharf sector is thought to belong to the Grotte formation, dating back to the Middle Ordovician Era. The rock is visible in a major rock cliff running along the west side. It is grey shale with a moderate to large inclination (53 to 73 degrees) towards the southeast.

The overburder is thought to be of considerable thickness and to be mainly composed of granular materials.

3 INVESTIGATION METHOD

The nature and the properties of the materials were determined based on field and laboratory work.

3.1 FIELD WORK

The sampling program was established by PWGSC. The work was carried out in two phases. The initially planned work program including sixteen (16) boreholes was done during a first phase, from October 21 to November 22, 2009. After a preliminary analysis of the results of the boreholes, PWGSC decided to carry out a second phase comprising eleven (11) additional boreholes, seven (7) of which were done between January 5 and 15, 2010 and four (4) of which were cancelled. The positions of the boreholes are shown on Drawings 0001 to 0003 placed in Appendix 7.

3.1.1 Boreholes

The boreholes are identified TF-01-09 to TF-16-09 and TF-21-10 to TF-27-10. They reached depths varying from 13.93 to 36.22 metres under the ground surface or the seabed. A summary of the boreholes is presented in Table 1 (below).

Table 1 : Summary of the boreholes

BOREHOLE NO.	LENGTH DRILLED (m)			NOTES
	OVERBURDER	ROCK	TOTAL	
Phase 1				
TF-01-09	10.31	4.41	14.72	Drilled from a barge
TF-02-09	12.80	4.85	17.65	Drilled from a barge
TF-03-09	11.94	6.00	17.94	Drilled from a barge
TF-04-09	10.94	6.13	17.07	Drilled from a barge
TF-05-09	8.71	5.22	13.93	Drilled from a barge
TF-06-09	8.53	6.48	15.01	Drilled from a barge
TF-07-09	14.03	6.98	21.01	Drilled from a cantilever
TF-08-09	4.20	25.9	30.10	Drilled from the wharf
TF-09-09	18.30	8.90	27.20	Drilled from the wharf
TF-10-09	19.51	2.22	21.73	Drilled from the wharf
TF-11-09	7.90	11.47	19.37	Drilled from the wharf
TF-12-09	12.31	10.19	22.50	Inside the heliport building

Table: Summary of the boreholes (cont.)

BOREHOLE NO.	LENGTH DRILLED (m)			NOTES
	OVERBURDER	ROCK	TOTAL	
Phase 1 (cont.)				
TF-13-09	15.00	19.84	34.84	Drilled from the wharf
TF-14-09	16.61	17.46	34.07	Drilled from the wharf
TF-15-09	21.00	6.25	27.25	Drilled from the wharf
TF-16-09	24.00	3.07	27.07	Drilled from the wharf
Subtotal	216.09	145.37	361.46	
Phase 2				
TF-17-10				Cancelled
TF-18-10				Cancelled
TF-19-10				Cancelled
TF-20-10				Cancelled
TF-21-10	27.48	5.10	32.58	Drilled from the wharf
TF-22-10	26.80	5.62	32.42	Drilled from the wharf
TF-23-10	24.94	8.01	32.95	Drilled from the wharf
TF-24-10	15.70	7.17	22.87	Drilled from the wharf
TF-25-10	17.33	14.94	32.27	Drilled from the wharf
TF-26-10	23.49	12.73	36.22	Drilled from the wharf
TF-27-10	18.36	16.06	34.42	Drilled from the wharf
Subtotal	154.10	69.63	223.73	
Total	370.19	215.00	585.19	

Boreholes TF-01-09 to TF-06-09 reached depths varying from 13.93 to 17.94 metres under the surface of the seabed. They were done with a Model BBS-2 on-track driller installed on a barge.

The maritime equipment used to make these boreholes included a barge and a tugboat under the responsibility of a captain and a superintendent. The barge used measures 25 feet in width by 53 feet in length and 4 feet in height and is equipped with two anchorage piles 75 feet in length and a winch.

The tugboat remained permanently near the barge to ferry the drilling team back and forth in the evening and the morning, to keep the barge in a fixed position, to carry out the winch and anchorage operations, and to reposition the barge over the different borehole points.

Boreholes TF-07-09 was made using the previously mentioned BBS-2 driller installed on a cantilever. It reached a depth of 21.01 metres under the surface of the seabed. As required by PWGSC, the equipment was installed in such a way as not to apply a pressure in excess of 20 kilopascals on the surface of the wharf.

Boreholes TF-08-09 to TF-16-09 and TF-21-10 to TF-27-10 were done on the pier and inside the building of the heliport with Mobile Drill B-57 and Mobile Drill B-31 model drills on trailers and with a CME-55 model track-mounted. They reached depths varying from 19.37 to 36.22 metres under the surface of the ground or the wharf.

Soil samples were taken using two calibres of split spoons in order to maximize the recovery (calibres "B" and "N" having an exterior diameter of 51 and 63,5 millimetres respectively). Standard penetration test "N" was determined with a calibre "B" spoon in accordance with standard NQ 2501-140. The penetration index measured with a calibre "N" spoon was corrected in order to correlate it with standard penetration index "N". The correlated indicators are identified Nce in the borehole reports. These corrected values are approximate.

All of the soil samples underwent an organoleptic examination in the field. Some of the samples were collected for environmental analysis purposes at the depth intervals stipulated in section 1.4.2 in the Call for Proposals (CFP) document, in accordance with the specifications and recommendations of the *Sampling Guide for Environmental Analyses* as well as the *Environmental site assessment guidelines* issued by the ministère du Développement durable, de l'Environnement et des Parcs du Québec (MDDEP). These samples were divided beforehand into two parts to permit the carrying out in parallel of environmental and geotechnical analyses. A summary of the sampling methods and conservation of soil samples collected for environmental analysis purposes is presented in Appendix 5.

The stones and boulders encountered in the soils were sampled using NX or NQ calibre diamond head core samplers inserted in an NW calibre tubing.

The rock was sampled mainly using a NQ calibre double tube core barrel.

3.1.2 Location and leveling

The location and the tidal elevation of the boreholes were determined by Arpentage F.C. Inc. The locations of the soundings correspond to the requests and the authorizations received on this subject from PWGSC.

3.1.3 Supervision

The field work was carried out under the supervision of soil technicians. They directed and coordinated the operations, identified the samples collected, and prepared the borehole reports in the field.

3.2 LABORATORY

Soil and rock samples collected from the boreholes for geotechnical purposes were sent to our laboratory where they were examined visually by the engineer in charge of the study. Geotechnical tests were carried out on representative samples of the existing soils and rocks to specify their nature and properties.

The soil samples collected for environmental analysis purposes were sent for storage to the Exova laboratory, in Quebec City, within a 2-hour delay. Exova is a MDDEP accredited by the MDDEP laboratory for the pertaining parameters. Among the samples sent, some were the subject to chemical analysis aiming to determine their concentration in different parameters, as stipulated by PWGSC in the CFP (section 1.4.2 b). The samples collected at the surface were analyzed first. Afterwards, some

samples taken at greater depth were analyzed as necessary, according to the surface samples chemical analysis results and according to the instruction issued by the representative of PWGSC.

The list of tests carried out is presented in Table 2 below.

Table 2 : List of laboratory tests

TEST	QUANTITY	
	Phase 1	Phase 2
Geotechnical Engineering		
Sieve analysis LC 21-040	21	15
Sedimentometry LC 21-040	2	--
Water content LC 21-201	21	5
Uniaxial compressive strength ASTM D-2938	5	4
Tensile strength by crushing (Brazilian test) ASTM D-3967	3	3
Environment		
Integrator parameters, hydrocarbons C_{10} to C_{50}	14	7
Metals (As, Cd, Cr, Cu, Hg, Ni, Pb and/or Zn)	18	9
Polycyclic aromatic hydrocarbons (PAH)	21	7
Total organic carbon (TOC)	14	7

Soil and rock samples collected for geotechnical purposes will be kept for a twelve-month period after the date of publication of this report. The soil samples collected for environmental purposes whom had not been used for chemical analysis will be kept for a three-month period from the date of publication of this report. The samples will then be destroyed unless PWGSC gives instructions otherwise.

4 NATURE AND PROPERTIES OF THE MATERIALS

4.1 STRATIGRAPHY

The stratigraphy of the materials found in the boreholes is summarized in Table 3 below and may be visualized on the stratigraphic sections presented in Table 7. A more detailed description of the materials is presented in the following sections as well as in the boreholes reports placed in Appendix 2.

Photographs of the drill sites as well as soil and rock samples are presented in Appendix 6.

It should be noted that the term "depth" always refers to either the surface of the ground or the seabed at the time of the works.

Generally, the stratigraphy may be summarized as follows:

At the site of the wharf

- Pavement structure 0.35 to 2.40 metres thick;
- Backfill 5.40 to 17.50 metres thick;
- Sand with some gravel to gravelly 1.20 to 9.20 metres thick;
- Sandy gravel to sand and gravel 2.30 to 10.80 metres thick;
- Backfill ranging from 1.10 to 4.20 metres in thickness;
- Rock between a depth of 10.00 and 28.00 metres.

Downstream from the wharf in the water

- Probable alluvium deposits ranging between 0.60 and 2.20 metres in thickness;
- Backfill 1.10 to 4.20 metres thick;
- Sand with some gravel to gravelly ranging from 0.90 to 6.20 metres in thickness;
- Gravelly sand to gravel and sand ranging from 1.90 to 9.40 metres in thickness;
- Rock from 10.20 to 16.90 metres in depth;
- Rock between a depth of 10.20 and 16.90 metres.

It should be noted that the depth of the rock and the total thickness of overlying strata increase rapidly from west to east.

Table 3 : Summary of the stratigraphy

BOREHOLE NO.	TF-01-09	TF-02-09	TF-03-09	TF-04-09	TF-05-09	TF-06-09
MAREGRAPHIC ELEVATION (m)	-5.59	-0.96	-1,13	-5.32	-12.11	-11.75
DESCRIPTION	DEPTH/THICKNESS (m)					
Probalbes alluviums (sediments). Presence of shells	0.00 – 0.81 0.81	0.00 – 1.77 1.77	0.00 – 2.18 2.18	0.00 – 1.09 1.09	0.00 – 1.31 1.31	0.00 – 0.61 0.61
Wharf's pavement structure: Bituminous concrete	--	--	--	--	--	--
Slab of concrete cement	--	--	--	--	--	--
20-0 millimeters apparent grade gravel or crushed stone	--	--	--	--	--	--
56-0 millimeters apparent grade crushed stone	--	--	--	--	--	--
Riprap rock shore protection	--	--	--	--	--	--
Wharf's backfill: fragments of schistic rock and/or granular materials	--	--	--	--	--	--
Pieces of cement concrete (probable structure)	--	--	--	--	--	--
Wood (probable crib)	--	--	--	--	--	--
Backfill or probable backfill under the seabed	0.81 – 3.53 2.72	1.77 – 2.90 1.13	2.18 - 4.09 1.91	1.09 – 5.00 3.91	1.31 – 2.90 1.59	0.61 – 2.65 2.04
Sandy silt with a some clay and traces to a some gravel, grey to dark grey, medium to dense compactness.	--	--	--	--	--	--
Sand with a some gravel to gravelly and traces to a some silt, grey, dense to very dense compactness. Presence of cobbles.	3.53 – 7.51 3.98	2.90 – 8.10 5.20	4.09 – 5.90 0.91	5.00 – 10.46 5.46	2.90 – 7.45 4.55	2.65 – 4.27 1.62
Sandy gravel to sand and gravel with traces some silt, grey, dense to very dense compactness. Presence of cobbles and boulders.	7.51 – 10.79 3.28	8.10 – 12.80 4.70	5.90 – 13.49 9.40	10.46 – 12.37 1.91	7.45 – 10.21 2.76	4.27 – 10.82 6.55
Sand with traces some gravel and silt, grey to grayish brown reddish, dense to very dense compactness.	10,79 – 12,10 1.31	--	--	--	--	--
Rock: calcareous shale, grey to dark grey, very poor to excellent quality.	12.10 – 14.72 >2.62	12.80 – 17.65 >4.85	13.49 – 17.94 >4.45	12.37 – 17.07 >4.70	10.21 – 13.93 >3.72	10.82 – 15.01 >4.19
End of the borehole	14.72	17.65	17.94	17.07	13.93	15.01

Notes: > greater than
-- layer not encountered

Table 3 (cont.): Summary of the stratigrahy

BOREHOLE NO.	TF-07-09	TF-08-09	TF-09-09	TF-10-09	TF-11-09	TF-12-09
MAREGRAPHIC ELEVATION (m)	-5.42	6.47	6.47	6.68	6.73	6.80
DESCRIPTION	DEPTH/THICKNESS (m)					
Probalbes alluviums (sediments). Presence of shells	0.00 – 2.07 2.07	--	--	--	--	--
Wharf's pavement structure: Bituminous concrete	--	--	--	0.00 – 0.09 0.09	0.00 – 0.15 0.15	--
Slab of concrete cement	--	--	0.00 – 0.23 0.23	--	--	0.00 – 0.20 0.20
20-0 millimeters apparent grade gravel or crushed stone	--	--	0.23 – 0.80 0.57	0.09 – 0.70 0.61	0.15 – 1.01 0.86	0.20 – 0.70 0.50
56-0 millimeters apparent grade crushed stone	--	--	--	--	--	
Riprap rock shore protection	--	0.00 – 9.14 9.14	--	--	--	--
Wharf's backfill: fragments of schistic rock and/or granular materials	--	9.14 – 14.50 5.36	0.80 – 13.72 12.92	0.70 – 11.59 10.89	1.01 – 7.62 6.61	0.70 – 6.10 5.40
Pieces of cement concrete (probable structure)	--	--	--	--	--	--
Wood (probable crib)	--	--	--	--	--	--
Backfill or probable backfill under the seabed	2.07 – 6.25 4.18	--	--	--	--	--
Sandy silt with a some clay and traces to a some gravel, grey to dark grey, medium to dense compactness.	--	--	--	--	--	6.10 – 6.86 0.76
Sand with a some gravel to gravelly and traces to a some silt, grey, dense to very dense compactness. Presence of cobbles.	6.25 - 12.43 6.18	14.50 – 18.59 4.09	13.72 – 18.30 4.58	11.59 – 12.80 1.21	--	6.86 – 10.37 3.51
Sandy gravel to sand and gravel with traces some silt, grey, dense to very dense compactness. Presence of cobbles and boulders.	12.43 – 16.84 4.41	18.59 – 25.56 6.97	18.30 – 24.82 6.52	12.80 - 18.71 5.91	7.62 – 10.00 2.38	10.37 – 13.22 2.85
Sand with traces some gravel and silt, grey to grayish brown reddish, dense to very dense compactness.	--	--	--	--	--	--
Rock: calcareous shale, grey to dark grey, very poor to excellent quality.	16.84 – 21.01 >4.17	25.56 – 30.10 >4.54	24.82 – 27.20 >2.38	18.71 – 21.73 >3.02	10.00 – 19.37 >9.37	13.22 – 22.50 >9.28
End of the hole	21.01	30.10	27.20	21.73	19.37	22.50

Notes: > greater than
-- layer not encountered

Table 3 (cont): Summary of the stratigraphy

BOREHOLES NO.	TF-13-09	TF-14-09	TF-15-09	TF-16-09	TF-21-10	TF-22-10
MAREGRAPHIC ELEVATION (m)	6.70	6.69	6.67	6.65	6.45	6.42
DESCRIPTION	DEPTH/THICKNESS (m)					
Probalbes alluviums (sediments). Presence of shells	--	--	--	--	--	--
Wharf's pavement structure: Bituminous concrete	--	--	--	--	--	--
Slab of concrete cement	0.00 – 0.23 0.23	0.00 – 0.16 0.16	0.00 – 0.21 0.21	0.00 – 0.20 0.20	0.00 – 0.20 0.20	0.00 – 0.20 0.20
20-0 millimeters apparent grade gravel or crushed stone	0.23 – 0.86 0.63	0.16 – 1.20 1.04	0.21 – 0.70 0.49	0.20 – 1.50 1.30	0.20 – 0.45 0.25	0.20 – 0.45 0.25
56-0 millimeters apparent grade crushed stone	--	1.20 – 1.52 0.32	0.70 – 1.50 0.80	1.50 – 2.40 0.90	--	0.45 – 0.60 0.15
Riprap rock shore protection	--	--	--	--	--	--
Wharf's backfill: fragments of schistic rock and/or granular materials	0.86 – 7.27 6.41	1.52 – 7.62 6.10	1.50 – 13.50 12.00	5.50 – 15.00 9.50	0.45 – 17.22 16.77	0.60 – 12.00 11.40
Pieces of cement concrete (probable structure)	--	--	--	2.40 – 4.70 2.30	--	--
Wood (probable crib)	--	--	--	4.70 – 5.50 0.80	--	--
Backfill or probable backfill under the seabed	--	--	--	--	--	--
Sandy silt with a some clay and traces to a some gravel, grey to dark grey, medium to dense compactness.	7.27 – 8.30 1.03	7.62 – 8.23 0.61	--	--	--	--
Sand with a some gravel to gravelly and traces to a some silt, grey, dense to very dense compactness. Presence of cobbles.	8.30 – 12.19 3.89	8.23 – 11.89 3.66	13.50 – 18.30 4.80	15.00 – 24.00 9.00	17.22 – 22.71 5.49	12.00 – 16.61 4.61
Sandy gravel to sand and gravel with traces some silt, grey, dense to very dense compactness. Presence of cobbles and boulders.	12.19 – 21.76 9.57	11.89 – 21.70 9.81	18.30 – 25.98 7.68	24.00 – 25.55 5.50	22.71 – 27.48 4.77	16.61 – 27.40 10.79
Sand with traces some gravel and silt, grey to grayish brown reddish, dense to very dense compactness.	--	--	--	--	--	--
Rock: calcareous shale, grey to dark grey, very poor to excellent quality.	21.76 – 34.84 >13.08	21.70 – 34.07 >12.37	25.98 – 27.25 >1.27	25.55 – 27.07 >1.52	27.48 – 32.58 >5.10	27.40 – 32.42 >5.02
End of the hole	34.84	34.07	27.25	27.07	32.58	32.42

Notes: > greater than
-- layer not encountered

Table 3 (cont.): Summary of the stratigraphy

BOREHOLES NO.	TF-23-10	TF-24-10	TF-25-10	TF-26-10	TF-27-10
MARGEGRAPHIC ELEVATION (m)	6.57	6.79	6.72	6.86	6.95
DESCRIPTION	DEPTH/THICKNESS (m)				
Probalbes alluviums (sediments). Presence of shells	--	--	--	--	--
Wharf's pavement structure: Bituminous concrete	--	0.00 – 0.13 0.13	0.00 – 0.09 0.09	0.00 – 0.08 0.08	0.00 – 0.10 0.10
Slab of concrete cement	0.00 – 0.25 0.25	--	--	--	0.30 – 0.45 0.15
20-0 millimeters apparent grade gravel or crushed stone	0.25 – 0.76 0.51	0.13 – 0.61 0.48	0.09 – 0.35 0.26	0.08 – 0.91 0.83	0.10 – 0.30 0.20 0.45 – 0.80 0.35
56-0 millimeters apparent grade crushed stone	--	--	--	--	--
Riprap rock shore protection	--	--	--	--	--
Wharf's backfill: fragments of schistic rock and/or granular materials	0.76 - 18.29 17.53	0.61 - 10.70 10.09	0.35 – 7.47 7.12 9.20 – 12.71 3.51	0.91 – 7.47 6.56 10.36 -11.99 1.63	0.80 – 10.57 9.77
Pieces of cement concrete (probable structure)	--	--	--	--	--
Wood (probable crib)	--	--	7.47 – 9.20 1.73	7.47 – 10.36 2.89	--
Backfill or probable backfill under the seabed	--	--	--	--	--
Sandy silt with a some clay and traces to a some gravel, grey to dark grey, medium to dense compactness.	--	--	--	--	--
Sand with a some gravel to gravelly and traces to a some silt, grey, dense to very dense compactness. Presence of cobbles.	18.29 – 21.58 6.09	10.70 – 13.72 3.02	12.71 – 15.01 2.30	11.99 – 21.18 9.19	10.57 – 15.29 4.72
Sandy gravel to sand and gravel with traces some silt, grey, dense to very dense compactness. Presence of cobbles and boulders.	21.58 – 24.38 2.80	13.72 – 19.01 5.29	15.01 – 18.70 3.69	21.18 – 23.49 2.31	15.29 – 21.39 6.10
Sand with traces some gravel and silt, grey to grayish brown reddish, dense to very dense compactness.	24.38 – 28.00 3.62	--	--	--	21.39 – 22.15 0.76
Rock: calcareous shale, grey to dark grey, very poor to excellent quality.	28.00 – 32.95 >4.95	19.01 – 22.87 >3.86	18.70 – 32.27 >13.57	23.49 – 36.22 >12.73	22.15 – 34.42 >12.27
End of the hole	32.95	22.87	32.27	36.22	34.42

Notes: > greater than
-- layer not encountered

4.2 PROBABLES ALLUVIUMS (SEDIMENTS)

A layer of probables alluviums deposits (sediments) was encountered at the surface of the seabed at boreholes TF-01-09 to TF-07-09, over a thickness of 0.61 to 2.18 metres. The materials are mainly made up of sand or silt with traces to some gravel. Their colour varies from brown to grey, their compactness condition varies from very loose to loose, and they contain shells.

Laboratory analyses were done on some probables alluviums samples to specify their nature and properties. The results are summarized in Table 4 and detailed in the figures indicated in Appendix 4.

Table 4: Summary of the properties of some samples of probable alluviums (sediments)

ORIGIN Borehole no. Sample no. Depth (m)	TF-03-09 CF-1 0.00 – 0.61	TF-05-09 CF-1 0.00 – 0.81	TF-06-09 CF-1 0.00 – 0.61
GRANULOMETRIC COMPONENTS (%)			
Gravel	1.0	0.0	28.1
Sand	66.7	96.5	70.8
Silt and clay	32.3	3.5	1.1
Silt	28.4	--	--
Clay	3.9	--	--
WATER CONTENT w (%)	30.5	24.0	--
UNIFIED CLASSIFICATION	SM	SP	SP
FIGURE No.	2	3	4

4.3 WHARF'S PAVEMENT STRUCTURE

A pavement structure was encountered at the warf's surface.

At boreholes TF-10-09, TF-11-09 and TF-24-10 to TF-27-10, the warf's pavement structure is composed of 0.08 to 0.15 metres of bituminous concrete followed by 0.26 to 0.86 metres of 20-0 millimetre apparent grade crushed stone or gravel.

At boreholes TF-09-09, TF-12-09 to TF-16-09 and TF-21-10 to TF-23-10, the warf's pavement structure is made up of a concrete slab measuring from 0.16 to 0.25 metres in thickness, followed by 0.25 to 1.30 metres of 20-0 millimetre apparent grade crushed gravel or stone and, in some areas, from 0.15 to 0.90 metres of 56-0 millimetre apparent grade crushed stone.

At borehole TF-27-10, the previously described pavement made of bituminous concrete or 20-0 millimetre apparent grade crushed stone or gravel lies on a 0.15 metre thick cement concrete slab followed by 0.35 metres of 20-0 millimetre apparent grade crushed stone.

The 20-0 mm apparent grade crushed stone is grey whereas the 20-0 m apparent grade crushed gravel is grey to grayish brown. The compactness of these materials varies from dense to very dense in boreholes TF-09-09 to TF-16-09, whereas the materials were frozen in boreholes TF-21-10 to TF-27-10 at the time the boreholes were made.

Laboratory analyses were done on some samples of this material to specify its nature and properties. The results are summarized in Table 5 and detailed in the figures appearing in Appendix 4.

Table 5 : Summary of the properties of some samples of 20-0 millimetre apparent grade crushed gravel or stone

ORIGIN Borehole no. Sample no. Depth (m)	TF-11-09 CF-1 0.15 – 0.76	TF-23-10 TA-1 0.25 – 0.76
GRANULOMETRIC COMPONENTS (%) Gravel Sand Silt and clay	 27.9 48.5 19.2	 33.9 39.1 27.0
WATER CONTENT w (%)	10.5	5.4
UNIFIED CLASSIFICATION	SM	SM
FIGURE No.	7	13

The 56-0 millimetre apparent grade crushed stone is grey and its compactness varies from average to very dense, except at TF-22-10 where the material was frozen at the time the boreholes was made.

Laboratory analyses were done on a sample of this material to specify its nature and properties. The results are summarized in Table 6 and detailed in the figure indicated in Appendix 4.

Table 6 : Summary of the properties of a sample of 56-0 millimetre apparent grade crushed stone

ORIGIN Borehole no. Sample no. Depth (m)	TF-15-09 CF-2 0.90 – 1.50
GRANULOMETRIC COMPONENTS (%) Gravel Sand Silt and clay	 71.0 22.7 6.3
WATER CONTENT w (%)	6.3
UNIFIED CLASSIFICATION	GP-GM
FIGURE No.	9

It should be noted that a drainage pipe drain and a lighting pipe were intercepted in the wharf pavement at the initial site of borehole TF-13-09. Only the agricultural drain was damaged. Following this incident, the borehole was relocated with the authorization of PWGSC.

4.4 RIPRAP ROCK SHORE PROTECTION

Riprap rock shore protection was encountered at borehole TF-08-09 over a thickness of 9.14 metres. The protection is made up of granite and/or sandstone cobbles and blocs angular in shape. The size of the biggest stone cored in the borehole is 380 millimetres, but the size of the stones visible near the borehole is bigger.

4.5 WHARF'S BACKFILL

Backfill material was encountered under the pavement structure in all of the boreholes located on the wharf. The total thickness varies from 5.36 to 17.53 metres.

The materials are mainly composed of fragments of schistic rock and/or granular material whose size generally corresponds to gravel with some sand to sandy or to sand and gravel. They contain traces to some silt and cobbles reaching up to 200 millimetres in size. The colour of the materials varies from grey to brown and their compactness varies from loose to very dense, but is generally dense to very dense. It should be noted that the presence of wood, cobbles and debris may have increased the height of the values of standard penetration test "N".

Different debris were found in the backfill. The presence of pieces of brick was noted in the samples collected in boreholes TF-08-09, TF-23-10 and TF-27-10 and small pieces of wood were encountered in some locations in boreholes TF-11-09, TF-13-09, TF-15-09, TF-16-09, TF-23-10 and TF-24-10.

Cement concrete was sampled in the backfill of borehole TF-16-09, over a thickness of 0.80 metre. The cement concrete could correspond to the wharf's structure. Based on the observations made in the field, the borehole is located on the edge of the structure and intercepted a thin strip of cement concrete.

Pieces of wood were collected in the backfill in borehole TF-16-09 at a depth of between 4.70 and 5.50 metres, in borehole TF-25-10 at a depth of between 7.47 and 9.20 metres and in borehole TF-26-10 at a depth of between 7.47 and 10.36 metres. The wood could correspond to a part of old cribs.

It should be noted that voids are present in various locations of these backfill materials, as observed in borehole TF-10-09.

Laboratory analyses were carried out on some samples of the wharf's backfill to specify its nature and properties. The results are summarized in Table 7 and detailed in the figures indicated in Appendix 4.

Table 7 : Summary of the properties of some samples of the wharf's backfill

ORIGIN Borehole Sample no. Depth (m)	TF-11-09 CF-7 4.57 – 5.18	TF-13-09 CF-4 2.29 – 2.90	TF-16-09 CF-18 13.70 -14.20	TF-21-10 CF-8 8.99 – 9.60	TF-25-10 CF-6 2.13 – 2.74	TF-26-10 CF-15 11.28 – 11.89
GRANULOMETRIC COMPONENTS (%)						
Gravel	68.0	42.6	75.0	59.3	52.9	38.8
Sand	20.3	43.7	22.2	34.8	41.6	50.2
Silt and clay	11.7	13.7	2.8	5.9	5.5	11.0
WATER CONTENT w (%)	17.5	8.5	12.6	--	--	--
UNIFIED CLASSIFICATION	GP-GM	SM	GW	GW-GM	GP-GM	SP-SM
FIGURE No.	7	8	10	11	14	15

4.6 BACKFILL OR PROBABLE BACKFILL UNDER THE SEABED

Backfill or probable backfill materials were also found under probable alluviums (sediments) in front of the wharf, at the locations of boreholes TF-01-09 to TF-07-09, over a thickness varying from 1.13 to 4.18 metres. They are mainly made up of sand and gravel with traces to some silt. Their colour varies from grey to brown and their compactness ranges from average to very dense.

These materials also contain debris at various locations, such as pieces of glass, plastic and wood as well as organic materials.

Laboratory analyses were carried out on some samples of these materials to specify their nature and properties. The results are summarized in Table 8 and detailed in the figures indicated in Appendix 4.

Table 8 : Summary of the properties of some samples of the backfill or probable backfill under the seabed

ORIGIN Borehole no. Sample no. Depth (m)	TF-01-09 CF-4 2.62 – 3.23	TF-05-09 CF-3 2.28 – 2.89
GRANULOMETRIC COMPONENTS (%)		
Gravel	28.0	35.7
Sand	66.7	47.6
Silt and clay	5.3	16.7
WATER CONTENT w (%)	16.1	10.9
UNIFIED CLASSIFICATION	SP-SM	SM
FIGURE No.	1	3

4.7 SANDY SILT

Layers of sandy silt were found under the backfill or probable backfill materials present under the wharf at the locations of boreholes TF-12-09 to TF-14-09, over a thickness of 0.61 to 1.03 metre. The materials contain some clay and traces to some gravel. They are grey to dark grey in colour and of average to dense compactness.

Laboratory analyses were carried out on a sample of silt to specify its nature and properties. The results are summarized in Table 9 and detailed in the figure appearing in Appendix 4.

Table 9 : Summaries of a sample of silty sand

ORIGIN Borehole no. Sample no. 3 Depth (m)	 TF-13-09 CF-11 7.62 – 8.23
GRANULOMETRIC COMPONENTS (%) Gravel Sand Silt and clay Silt Clay	 0,1 26,5 73,4 60,3 13,1
WATER CONTENT w (%)	 42,6
UNIFIED CLASSIFICATION	ML
FIGURE No.	8

4.8 SAND WITH SOME GRAVEL TO GRAVELLY

All of the boreholes, except for borehole TF-11-09, continued in a sand deposit. The thickness of the deposit varies between 0.91 and 9.19 metres at the borehole points. The sand varies from having some gravel to being gravelly and contains traces to some silt. It is grey and its compactness ranges from dense to very dense. The presence of cobbles and shells was also noted here and there in this deposit. The proportions of gravel and/or silt increase at some locations.

Laboratory analyses were carried out on a few sand samples to specify its nature and properties. The results are summarized in Table 10 and detailed in the figures indicated in Appendix 4.

Table 10 : Summary of the properties of samples of sand with some gravel to gravelly

ORIGIN Borehole no. Sample no. Depth (m)	TF-01-09 CF-6 4.27 – 4.88	TF-03-09 CF-6 4.09 – 4.70	TF-07-09 CF-7 6.25 – 6.86	TF-07-09 CF-9 8.69 – 9.37	TF-09-09 CF-15 15.24 – 15.85	TF-13-09 CF-13 10.67 – 11.28
GRANULOMETRIC COMPONENTS (%)						
Gravel	45.1	38.8	13.7	30.0	15.9	26.3
Sand	44.9	50.3	81.7	56.1	60.8	57.9
Silt and clay	10.0	10.9	4.6	13.9	23.3	15.8
WATER CONTENT w (%)	7.0	9.0	20.8	11.5	12.2	15.2
UNIFIED CLASSIFICATION	SP-SM	SP-SM	SP	SM	SM	SM
FIGURE No.	1	2	5	5	6	8

Table 10 (cont.): Summary of the properties of samples of sand with some gravel to gravelly

ORIGIN Borehole no. Sample no. Depth (m)	TF-16-09 CF-22 19.80 – 20.40	TF-22-10 CF-20 14.32 – 14.93	TF-25-10 CF-20 13.57 – 14.18	TF-26-10 CF-20 16.61 – 17.22	TF-27-10 CF-14 10.57 – 10.99
GRANULOMETRIC COMPONENTS (%)					
Gravel	29.7	21.0	25.7	21.6	38.8
Sand	59.5	70.0	61.6	62.5	47.8
Silt and clay	10.8	9.0	12.7	15.9	13.4
WATER CONTENT w (%)	10.2	18.3	12.7	11.7	--
UNIFIED CLASSIFICATION	SP-SM	SW-SM	SM	SM	SM
FIGURE No.	10	12	14	15	16

4.9 SANDY GRAVEL TO SAND AND GRAVEL

A deposit of sandy gravel to sand and gravel was encountered in all of the boreholes below the previously described sand deposit, except in borehole TF-11-09 where the gravel is located directly under the backfill materials. The thickness of the deposit varies from 1.91 to 10.79 metres. The material is grey. It contains traces to some silt and its compactness varies from dense to very dense. One notes the presence as well as accumulations here and there of cobbles and boulders in the deposit.

Laboratory analyses were done on some samples of this deposit to specify its nature and properties. The results are summarized in Table 11 and detailed in the figures indicated in Appendix 4.

Table 11 : Summary of the properties of samples of sandy gravel to sand and gravel

ORIGIN Borehole no. Sample no. Depth (m)	TF-01-09 CF-10 8.02 – 8.63	TF-07-09 CF-12 12.43 – 13.04	TF-13-09 CF-14 12.19 – 12.80	TF-21-10 CF-22 26.37 – 26.98	TF-25-10 CF-24 15.95 – 16.38
GRANULOMETRIC COMPONENTS (%)					
Gravel	47.5	39.1	41.0	40.6	46.9
Sand	41.1	47.1	42.6	49.0	45.6
Silt and clay	11.4	13.8	16.4	10.4	7.5
WATER CONTENT w (%)	7.7	9.0	10.5	--	--
UNIFIED CLASSIFICATION	SP-SM	SM	SM	SP-SM	SP-SM
FIGURE No.	1	5	8	11	14

Table 11 (cont.) Summary of the properties of samples of sandy gravel to sand and gravel

ORIGIN Borehole no. Sample no. Depth (m)	TF-26-10 CF-24 22.70 – 23.00	TF-27-10 CF-26 16.82 – 17.43
GRANULOMETRIC COMPONENTS (%)		
Gravel	67.5	50.8
Sand	26.6	36.2
Silt and clay	5.9	13.0
WATER CONTENT w (%)	--	--
UNIFIED CLASSIFICATION	GW-GM	GM
FIGURE No.	15	16

4.10 SAND WITH TRACES TO SOME GRAVEL

Layers of sand with traces to some gravel were encountered under the previous materials in boreholes TF-01-09, TF-23-10 and TF-27-10, over a thickness of 0.76 to 3.62 metres. The materials are grey to grey-reddish brown. They contain traces of silt and their compactness is dense to very dense.

Laboratory analyses were carried out on a sample of these materials to specify their nature and properties. The results are summarized in Table 12 and detailed in the figures indicated in Appendix 4.

Table 12 : Summary of the properties of samples of sand with traces to some gravel

ORIGIN Borehole no. Sample no. Depth (m)	TF-23-10 CF-29 24.33 – 24.99	TF-27-10 CF-35 21.39 – 22.00
GRANULOMETRIC COMPONENTS (%) Gravel Sand Silt and clay	 19.4 64.5 16.1	 7.7 85.4 6.9
WATER CONTENT w (%)	--	--
UNIFIED CLASSIFICATION	SM	SP-SM
FIGURE No.	13	16

4.11 ROCK

Rock was encountered in all of the boreholes at a depth varying from 10.00 to 28.00 metres. It is grey to dark grey calcareous shale with calcite veins here and there. The depth of the rock quickly increases in a south-east direction. It was reached between the maximum elevation – 3.27 metres in borehole TF-11-09 to the west and the minimum elevation – 22.57 metres in borehole TF-06-09 to the east.

The rock was sampled over a thickness varying from 1.27 to 13.57 metres up to depths varying from 13.93 to 36.22 metres. The recovery varies from 28 to 100 % and the RQD index varies from 0 to 100 %, which corresponds to a rock of very poor to excellent quality. The quality tends to improve with depth.

Overall, the structural discontinuities observed in the collected samples are associated with the stratification. The inclination of the layering and/or the rock fracturing varies from 10 to 90 degrees in relation to the vertical plane. According to the literature and based on the outcrops located to the west of Champlain Boulevard, the direction of the stratification is south-east with an inclination varying from 53 to 73 degrees.

Photographs of rock samples are presented in Appendix 6. The structural data obtained from a visual examination of the samples are presented in Appendix 3.

Laboratory analyses were carried out on some rock samples to specify certain properties. The results are summarized in Table 13 and detailed in Appendix 3.

The compressive strength of the rock varies from 7.5 to 152.8 MPa whereas the tensile strength varies from 0.61 to 8.03 MPa.

Table 13 : Results of the tests carried out on rock samples

ORIGIN			STRENGTH (MPa)	
Borehole no.	Sample no.	Depth (m)	Uniaxial compressive strength	Indirect tensile strength
TF-01-09	CR-15	12.24 – 13.34	95.3	--
TF-03-09	CR-21	16.87 – 17.94	105.1	--
TF-07-09	CR-21	18.74 – 19.33	7.5 (1)	--
TF-07-09	CR-23	20.13 – 21.01	--	5.74
TF-11-09	CR-21	14.91 – 16.43	19.0 (1)	--
TF-11-09	CR-23	17.95 – 19.37	-	0.61
TF-14-09	CR-25	21.82 – 23.11	86.8	--
TF-14-09	CR-27	24.71 – 26.31	--	5.13
TF-21-10	CR-28	31.36 – 31.60	142.1	--
TF-22-10	CR-35	31.93 – 32.10	144.3	--
TF-23-10	CR-38	32.53 – 32.85	64.6	--
TF-25-10	CR-39	25.21 – 25.55	--	8.03
TF-26-10	CR-37	32.41 – 32.59	--	6.40
TF-27-10	CR-41	25.34 – 25.70	152.8	--
TF-27-10	CR-43	27.94 – 28.17	--	7.12

Note: (1) : low value due to the presence of stratification in the sample

5 ENVIRONMENTAL QUALITY OF THE SOILS

5.1 INTERPRETATIVE FRAMEWORK

Based on the specifications of the Request for Proposals (CFP) documents, the results of the chemical analyses obtained for the soil and sediment samples within the context of this mandate were compared to of the criterias of the *Soil Protection and Contaminated Sites remediation Policy* produced by the MDDEP. This *Policy* describes three criterias, "A", "B" and "C". The "B" and "C" criterias of the *Policy* notably apply to lands having a residential/institutional and commercial/ industrial vocation respectively. Within the context of this mandate, generic criterion "B" of the *Policy* was considered as the maximum threshold concentration applicable for the property under study according to PWGSC's instructions.

The results obtained from the analysis of soil and sediment samples were compared to the values of generic criterion "B" of the MDDEP *Policy* applicable for soils. In addition, the results obtained from the chemical analysis of sediment samples collected during this mandate were also interpreted on the basis of the *Criteria for the Assessment of Sediment Quality in Quebec and Application Frameworks: Prevention, Dredging and Remediation* produced by Environment Canada and the MDDEP. In this case, it is the threshold effect level (TEL) applicable for fresh water that was considered as the comparative criterion for the results of the chemical analyses obtained. However, it should be noted that in the case sediments had to be excavated and transported outside the site, they would have to be managed according to the criteria of the MDDEP's *Policy* applicable for soils.

All of the results of the chemical analyses obtained are shown in Tables 1 and 2, included in Appendix 5. These tables also show the interpretation criteria of the *Policy* or the criteria for the evaluation of the quality of fresh water sediments, as the case may be. Finally, an explanatory sheet of the generic criteria of the MDDEP's *Policy* is included in Appendix 5.

5.2 RESULTS OF THE CHEMICAL ANALYSES

5.2.1 Soils

The results obtained from the chemical analyses of surface soils samples namely between 0.30 and 0.45 metres under ground surface of boreholes points TF-09-09 to TF-16-09 and TF-21-09 to TF-27-09, showed concentrations of petroleum hydrocarbons C_{10}-C_{50} below MDDEP's generic criterion "A", except to sample TF-10-09 CF-2, for which a concentration between "A" and "B" criteria was measured. As for the TOC concentrations measured on these same samples, the values obtained are between 0.17 and 2.34%. It should be noted that the MDDEP's *Policy* does not stipulate any threshold value or comparative criterion for TOC.

Finally, the samples analysed in surface soils revealed metal and/or PAH concentrations within the "A-C" range of the MDDEP's generic criteria at the location of boreholes TF-10-09, TF-12-09, TF-14-09, TF-23-09 and TF-27-09.

In light of this information, some samples collected in boreholes TF-10-09, TF-12-09, TF-14-09, TF-23-09 and TF-27-09 at a greater depth, namely between 1.00 and 2.90 metres under the surface, were analyzed. The results obtained from these chemical analysis revealed concentrations below generic

criterion "A", except to PAH's at the location of borehole TF-10-09 CF-3 for which the results are included in the range of the "A-B" criteria.

5.2.2 Sediments

The surface sediment samples collected from boreholes TF-02-09, TF-04-09 and TF-06-09, namely between 0.00 and 0.20 metre deep, showed concentrations of petroleum hydrocarbons C_{10}-C_{50} and metals below the laboratory detection limit. Also PAH's concentrations measured on these samples are below generic criterion "A", except to samples TF-02 CF-1 and TF-04 CF-1 for which the results are within "A-B" range. In order to specify the extent of the contamination, sediment samples taken in the surface horizon in boreholes TF-01-09 and TF-03-09 were analyzed afterwards, as were samples collected at greater depths in boreholes TF-02-09 and TF-04-09.

Results obtained from the chemical analysis of sediment samples taken at the surface (0.00 to 0.20 metre in depth) boreholes TF-01-09 and TF-03-09 showed concentrations of C_{10}-C_{50}, metals and PAH below the laboratory detection threshold. As for samples collected in the horizon between 1.00 and 1.15 metre in depth, they were analyzed to determine the PAH's concentration in boreholes TF-02-09 and TF-04-09, and revealed concentrations within "A-B" and "B-C" range of generic criteria respectively. Finally, the sample of sediments collected between 1.98 and 2.59 metres in depth at the location of borehole TF-04-09 was analyzed for PAH's and showed concentrations within the range of the "A-B" generic criteria of the MDDEP.

It should be recalled that all of the concentrations measured within the range of the "A-B" generic criteria of the Policy comply with the MDDEP's recommendations for a property having an institutional vocation such as the site under study. However, in the case these materials had to be excavated, then transported off the site under study, they would have to be managed in accordance with the regulations in effect. As for the soils that reveal concentrations comprised within the range of the MDDEP's "B-C" generic criteria, they are non-compliant for a property having an institutional vocation from the standpoint of the Policy.

As discussed previously, the chemical analyses results obtained for the sediment samples collected in boreholes TF-01-09 to TF-04-09 and TF-06-09 were also compared to the Criteria for the assessment of fresh water sediment quality as presented in the St. Lawrence Plan published by Environment Canada and the MDDEP. In this scope, the results obtained revealed PAH's concentrations above the probable effect level (PEL), even the severe effect level (SEL), at the location of boreholes TF-02-09 and TF-04-09.

As for the TOC concentrations measured on the sediment samples collected in boreholes TF-01-09 to TF-06-09, values obtained vary between 0.04 and 0.86%. As discussed previously, no threshold value for TOC is set in the MDDEP's *Policy*.

5.3 ESTIMATE OF CONTAMINATION ZONES

Based on the results obtained from this environmental site assessment work, an estimate of the contamination zones was made. In order to facilitate the planning of potential work, distinct contamination zones were estimated according to the various contaminants encountered. The estimated contamination zones are illustrated on the location map, in Appendix 7.

These estimates are based on certain assumptions, notably regarding the contamination sources, the surface and depth of contamination at certain locations, due to the number and the depth of the samples collected within the context of this mandate. The estimate of contamination zones includes an intrinsic margin of error.

5.3.1 Soils

The chemical analyses results of collected soil samples made it possible to identify contamination of the soils beyond MDDEP's generic criterion "B" near the ground surface (approximately 0 to 0.5 metre deep) in the sector of boreholes TF-23-09 and TF-27-09, namely Zone A identified on Figure 8, Appendix 7, as well as at the location of borehole TF-10-09 located in Zone B. These two contamination zones are representing surfaces estimated respectively at 665 and 170 square metres, for a total volume estimated at 333 cubic metres of contaminated soils.These soils are contamined by metals in the "B-C" range and 85 cubic metres of soils contaminated by PAH's in the "B-C" range of the Policy's criteria.

Soils containing PAH's concentrations within MDDEP's "A-B" criteria range were also observed at the location of borehole TF-10-09 (Zone B) and in the sector of boreholes TF-12-09 and TF-14-09 (Zone E). In the case of Zone B, aera surface of the contamination was estimated at 170 square metres and the contaminated horizon is located from 0.50 metres to 1.50 metre deep, for a contaminated volume in the "A-B" range estimated at 170 cubic metres. As for Zone E, the surface area affected by the contamination is estimated at approximately 430 square metres, whereas the contaminated horizon is located between 0 and 0.50 metre in depth, for a volume estimated at 215 cubic metres of soils contaminated by PAH's at concentrations within the MDDEP's "A-B" generic criteria range.

5.3.2 Sediments

PAH's contaminated sediments were identified at the location of boreholes TF-02-09 and TF-04-09 in concentrations exceeding PEL criteria, even SEL criteria in borehole TF-04-09. Since the work is planned in the sector of borehole points TF-02-09 and TF-04-09 and since sediments present at this location will have to be digged, these sediments do not comply with the applicable criteria for re-spreading them on the seabed of the St. Lawrence River.

Regarding *Policy's* generic criteria (which will be used for an eventual environmental management of digged materials), PAH's concentrations within the "B-C" criteria range were measured at the location of borehole TF-04-09 (Zone D) in the sediment horizon comprised between approximately 1.00 and 1.50 metre. Based on the estimated surface area of Zone D, namely 200 square metres, volume of sediments whose PAH's concentrations are comprised in the "B-C" range of the *Policy's* criteria is estimated at 100 cubic metres.

Finally, PAH's concentrations comprised in the range of the "A-B" criteria were measured at the location of borehole TF-02-09 (Zone C) and TF-04-09 (Zone D). Considering the surface area of these zones, evaluated respectively at 125 and 200 square metres, and contaminated horizons, about 3.00 metres thick in Zone C and 2.50 metres thick in Zone D, the volume of contaminated sediments has been respectively estimated at 375 and 500 cubic metres in the "A-B" range of the *Policy's* criteria.

6 GROUNDWATER

Given the fact that the work is located on the edge of the St. Lawrence River and considering that the soil deposits are for the most part granular, the level of the groundwater is subject to major and regular variations due to the tides. The level of the groundwater also varies with the seasons, precipitations and environmental changes.

It should be noted that the text "Scope and limitations of the geotechnical study" presented in Appendix 1 contains important comments that should be considered to properly interpret groundwater conditions.

7 COMMENTS AND RECOMMENDATIONS

7.1 GENERAL

The comments and recommendations presented in the following paragraphs are based on the results of field and laboratory work as well as the information provided by PWGSC.

Our comments and recommendations are intended for our client and his professionals for the preparation of plans and specifications and the cost estimates. The Contractor will have to rely on his experience and his interpretation of our results in order to determine in what ways the field conditions might influence his work.

Additional comments and recommendations can be provided upon request when the design will be more advanced.

7.2 ENVIRONMENT

The results obtained within the context of the environmental site assessment of soils revealed concentrations of petroleum hydrocarbons C_{10}-C_{50}, metals and/or PAH's comprised within the "A-B" range, as well as copper and PAH's concentrations comprised within the range of the "B-C" criteria of the MDDEP's *Policy*. PAH's concentrations exceeding probable effect level (PEL) criterion were measured in sediment samples analysed.

In light of this information and within the context of the planned work to rebuild section 98 of Queen's wharf, we recommend that the contaminated soils beyond generic criterion "B" of the MDDEP be digged, then disposed of at an authorized centre in compliance with regulation. As for soils with a contamination comprised in the "A-B" range of the generic criteria, they can be left in place. However, in the case these soils have to be removed from the site of origin, digged soils will have to be managed in accordance with *Regulation respecting contaminated soil storage and contaminated soil transfer stations*.

Regarding the identified contaminated sediments, the concentrations measured within the context of this mandate digged do not permit re-spreading them on the seabed of the St. Lawrence River. The sediments that must be excavated within the context of the planned reconstruction work will have to be managed as contaminated soils, according to the criteria of the Soil Protection and Remediation of Contaminated Sites Policy.

7.3 PROPERTIES OF MATERIALS

We encountered the following four main types of materials in the boreholes:

- Backfill;
- Sand with some gravel to gravelly;
- Sandy gravel to sand and gravel;
- Rock.

The main properties of these materials necessary for the calculations of the works were estimated based on the field and laboratory work and based on experience. They are presented in Tables 14 and 15.

The indicated active and passive coefficient of lateral earth pressure presupposes vertical walls, no soil-wall friction and a horizontal ground surface. They will have to be reviewed according to the design hypotheses.

Table 14 : Properties of the main soils encountered

MATERIAL	BACKFILL: ROCK FRAGMENTS AND/OR GRANULAR MATERIALS	SAND WITH A LITTLE GRAVEL TO GRAVELLY WITH TRACES TO SOME SILT	SANDY GRAVEL TO SAND AND GRAVEL WITH TRACES TO SOME SILT
SECTION OF THE REPORT	4.5	4.8	4.9
IDENTIFICATION NUMBER ON THE STRATIGRAPHIC SECTIONS	3	5	6
C' cohesion (kPa)	Nil	Nil	Nil
Effective angle of internal friction (ϕ')	32°	36°	38°
Unit weight γ' (kN/m^3)			
Total wet	19.0	20.0	20.0
Total saturated	21.0	22.0	22.0
Submerged	11.2	12.2	12.2
Coefficients or lateral earth pressure			
At rest (K_o)	0.47	0.41	0.38
Active (K_a)	0.31	0.26	0.24
Passive (K_p)	3.23	3.85	4.17

Table 15 : Properties of the rock

PROPERTIES	TEST RESULTS		AVERAGE OR ESTIMATED VALUE (1)
	MAXIMUM	MINIMUM	
Unit weight γ_t (kN/m^3)	--	--	26
Uniaxial compressive strength U (MPa)	152.8	64.5	113
Tensile strength by crushing R_t (MPa)	8.03	5.13	6.4

Note: (1) : values to be used for the calculation

7.4 DEMOLITION AND PREPARATION OF THE SITE

7.4.1 Excavations

The requirements found in the latest version of the Safety Code for the construction industry and the CSST's requirements will have to be met when carrying out the excavations. For construction purposes, as temporary excavation slopes are involved, it is the Contractor's responsibility to create stable and safe excavation slopes.

Based on the planned maximum excavation depth of approximately six metres, the excavations will mainly be done in backfill materials, for the most part composed of rock fragments and granular

materials. The backfill contains wood and cement concrete. Large rock fragments may also be encountered. The excavation work will also pose difficulties due to the presence of water, currents, waves, the tides and the relative fragile nature of the existing structure. The excavation equipment and methods will have to be adapted to these materials and conditions.

The excavations on the outer side of the wharf (river side) will have to be carried out in such a way as to not adversely affect the wharf stability.

The Contractor will have to use customary precautions in order to avoid causing damages to the parts of the wharf that are to be kept, the adjacent warf, as well as the buildings and other existing structures in the vicinity of his works.

7.4.2 Excavation slopes or retaining structures

The excavation slopes and/or the retaining method will have to ensure the stability of the excavation base and walls, as well as that of the neighbouring existing structures at all times.

In all cases, a regular inspection of the stability of the walls should be made by an experienced geotechnical engineer or an engineer-geologist in order to confirm the slopes and/or to make any required adjustments.

We recommend limiting the slopes of the temporary excavation taluses in the soils to 1.5 horizontal by 1.0 vertical. **These slopes presuppose an adequate dewatering of the soils.** They will need to be adjusted on site based on the conditions actually observed at the time of the work, as well as according to the Contractor's work methods.

If space does not permit the construction of unsupported slopes, an appropriate retaining structure will have to be put in place. In this respect, we recommend that the Contractor retains the services of an expert firm specializing in retaining structures. The work will have to be planned, coordinated and carried out in sequence to ensure the safety of the existing structures and those to be built for the entire duration of the construction and, where applicable, over the long term. The design will have to take into account among other things variations in the level of the groundwater and the level of the river.

7.4.3 Dewatering

The work will have to be planned in such a way as to take into account the major variations in the level of the river due to the tides.

Based on all the available information, **we anticipate major groundwater infiltrations in the excavations from the soils, whose gradation is often coarse and whose permeability is high**. It is also important to note that the level of groundwater varies with the tides.

The groundwater infiltrations as well as the infiltrations associated with precipitation will have to be collected and removed using a method adapted to the project and the specific conditions of the materials in place to ensure the stability of the excavation walls and in such a way that the base of the excavation is kept stable and dry, and that it allows for construction. **In addition, the lowering of the**

groundwater necessary for the dewatering of the trenches should not cause damages to neighbouring structures and works.

7.5 PILES AND SHEETPILES

Based on the information provided, it is likely that the wharf walls formed of sheet piles and/or piles will be driven in the soils without reaching the rock, whereas the piles located behind the wharf walls will sit in the rock.

It is important to note that the existing soils are made up in part of backfill composed of rock fragments of variable dimensions and that may be large, that the backfill contains debris as well as concrete and wood that can be isolated fragments or old structures, and that certain soil layers contain cobbles and boulders, which may be large in size. The methods and equipment for installing piles and sheet piles will have to be adapted to these conditions and include if necessary pre-drilling and/or the reinforcement of the tips of the piles and sheet piles.

The piles and sheetpiles must be designed to support all types of loads to which they may be subject (static and dynamic, lateral, compression, negative friction, frost action) based on the measured and/or estimated properties presented in Chapter 4 and on the borehole reports.

The frost penetration depth is estimated at approximately 2.25 metres under the surface taking into account the environment, namely snow removal in winter and windy conditions along the river.

We recommend checking the compression capacity of a few piles by doing dynamic load tests from the outset of the pile driving work to confirm their capacity and to make adjustments if required. There should be a few tests for each category of piles according to the type and applied load. Stress tests are also recommended to confirm the capacity of a few piles.

Given the type of the rock in place, it is possible that a reduction of the compression capacity of the piles in the rock may be observed a few days after driving in the first piles. The piles will have to be driven in again one or more times if required, until a sufficient capacity is achieved. The pile Contractor will have to be notified of this possibility and will have to take into account the re-driving of the piles in his costs. Cost provisions for additional dynamic tests should also be made.

We recommend making a construction inspection when driving the piles to check, among other things, the quality of the materials and the position and alignment of the piles, and that an appropriate monitoring of the driving work be done.

7.6 ROCK ANCHORS

The design of the rock anchors will have to take into account the following rupture modes:

- tension in the steel rod;
- adherence between the steel rod and the grout;
- adherence between the rock and the grout;
- rupture of the rock mass.

The maximum strength must be calculated for each of these rupture modes, and the most unfavourable strength shall be chosen as the strength to be applied.

In the calculations of the anchorages, we recommend using a service value or the rock grout adhesion equal to the minimum between 1/30 of the compression strength of the grout at 28 days and 750 kPa (including a safety factor of 3). The grout will have to be of the zero-shrink type and have a minimum compression strength of 25 MPa at 28 days. The first two metres of rock will have to be disregarded in the calculations.

We recommend that experienced personnel monitor the construction of the anchors and that the anchors be subject to stress tests to confirm their capacity.

Appendix 1 Scope of the geotechnical study

SCOPE OF THE GEOTECHNICAL STUDY

1.0 Characteristics of soil and rock

The soil and rock characteristics described in this report originate from geotechnical investigations conducted within a given period and correspond to the nature of the terrain only at the specific locations where these investigations were carried out.

Soil and rock formations have natural variations. The limits between the different formations presented in the sounding logs must therefore be considered as transitions between the formations rather than set boundaries. The precision of these limits depends on the type and number of soundings, the sounding methods used, as well as sampling frequency and methods.

The descriptions of the samples taken are based on recognized identification and classification methods used in geotechnics. They can call into play the judgement and interpretation of the personnel who carried out the examination of materials and can be presumed to be accurate and correct in keeping with current best practices in the field of geotechnics. Finally, if tests were carried out, the results of these tests apply solely to the samples tested, as described in this report.

The properties of the soil and rock can undergo significant modifications in the wake of construction activities such as excavation, blasting, pile driving or drainage activities, carried out on the site under study or an adjacent site. They can also be indirectly modified by the exposure of the soil or rock to freezing or weather stresses.

2.0 Groundwater

The groundwater conditions presented in this report apply only to the site under study. The accuracy and representation of these conditions must be interpreted based on the type of instrumentation used, as well as the period, duration, and number of observations carried out. These conditions can vary depending on precipitation, the seasons and, ultimately, the tides. They can also vary as a result of construction activities or the modification of physical elements on the site under study or in its vicinity.

3.0 Use of the report

The comments and recommendations contained in this report are intended primarily for the project's design team. The number of soundings required to identify all of the underground conditions that could impact construction costs, techniques, the choice of equipment and planning of operations could be greater than the number required for design purposes. All contractors bidding on or carrying out the work on the site under study must undertake their own interpretation of the results of the soundings and, if need be, carry out their own investigations to determine how site conditions could influence their operations or work methods.

Any modifications to the design, position and elevation of the works must be quickly communicated to LVM, allowing the validity of the recommendations presented to be verified. Complementary site or laboratory work could ultimately be required.

4.0 Project tracking

The interpretation of the on-site and laboratory results obtained, as well as the recommendations presented in this report, apply solely to the site under study and to the information available about the project at the time this report was drafted.

Information available concerning the site and groundwater conditions increases as construction work progresses. As site conditions were interpreted and correlated between sounding points, LVM should be allowed to verify these conditions, during site visits conducted as work progresses, in order to confirm the information provided by the drillings soundings. If it is not possible for us to conduct these verifications, LVM shall assume no responsibility for geotechnical interpretations by third parties concerning recommendations contained in this report, particularly if the design has been modified or if site conditions different from those described in this report are encountered. The identification of such changes requires experience and must be carried out by a experienced geotechnical engineer.

5.0 Environment

The information contained in this report does not cover the environmental aspects of the site conditions, as these aspects were not included in the study mandate.

Appendix 2 Explanation note on sounding logs and drilling reports

EXPLANATION NOTE ON SOUNDING LOGS

The following sounding logs summarize soils and rock geotechnical properties as well as ground water conditions, as collected during field work and/or obtained from laboratory tests. This note explains the different symbols and abbreviations used in these logs.

STRATIGRAPHIC UNITS

Elevation/Depth: Reference to the geodesic elevation of the soil or to a bench mark of arbitrary elevation, at the location of the sounding. Depth of the different geological boundaries as measured from ground surface. On the left, the scale is in meters while on the right, it is in feet.

Description of the stratigraphic units: Every geological formation is detailed.

The proportion of the different elements of the soil, defined according to the size of the particles, is given following the classification hereafter. The relative compactness of cohesionless soils is defined by the "N" index of the Standard Penetration Test. The consistency of cohesive soils is defined by their shear resistance.

Classification	Particle size (mm)
Clay	< 0.002
Clay and silt (undifferentiated)	< 0.08
Sand	0.08 to 5
Gravel	5 to 80
Cobble	80 to 300
Boulder	> 300

Descriptive terminology	Proportion (%)
"Traces" (tr.)	1 to 10
"Some" (s.)	10 to 20
Adjective (ex.: sandy, silty)	20 to 35
"And" (ex.: sand and gravel)	35 to 50

Compactness of cohesionless soils	Standard Penetration Test index ("N" value), ASTM D-1586 (blows for a 300mm penetration)
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

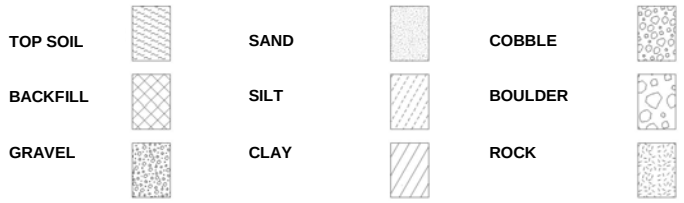
Consistency of cohesive soils	Undrained shear strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Plasticity of cohesive soils	Liquid limit (%)
Low	< 30
Medium	30 to 50
High	> 50

Sensitivity of cohesive soils	$S_t = (C_u/C_{ur})$
Low	$S_t < 2$
Medium	$2 < S_t < 4$
High	$4 < S_t < 8$
Extra-sensitive	$8 < S_t < 16$
Quick (sensitive) clay	$S_t > 16$

Classification of rock	RQD (%)
Very poor quality	< 25
Poor quality	25 to 50
Fair quality	50 to 75
Good quality	75 to 90
Excellent quality	90 to 100

SYMBOLS



WATER LEVEL

This column shows the ground water level, as measured at a given time during the geotechnical investigation. The details of the installation (type and depth) are also illustrated in this column.

SAMPLES

Type and number: Each sample is labelled in accordance with the number of this column and the given notation refers to samples types.

Sub-sample: When a sample contains two or more different stratigraphic units, it is sometimes necessary to separate it and create sub-samples. This column allows for the identification of the latter and the association to *in situ* or laboratory measurements to these sub-samples.

Condition: The position, length and condition of each sample are shown in this column. The symbol shows the condition of the sample, following the legend given on the sounding log.

Size: This column indicates the split spoon sampler size.

"N" index The standard penetration index shown in this column is expressed with the letter "N". This index is obtained with the Standard Penetration Test. It corresponds to the number of blows required to drive the last 300mm of the split spoon, using a 622 Newton hammer falling freely from a height of 762mm (ASTM D-1586). For a 610mm long split spoon, the "N" index is obtained by adding the number of blows required for the driving of the 2nd and 3rd 150mm of the split spoon. Refusal (R) indicates a number of blows greater than 100. A set of numbers such as 28-30-50/60mm indicates that the number of blows required to drive the 1st and 2nd 150mm of the split spoon are respectively 28 and 30. Moreover, it indicates that 50 blows were necessary to get a penetration of 60mm, whereupon the test was suspended.

RQD index: Rock Quality Designation index: This index is defined as the ratio between the total length of all rock cores of 100mm and more in length over the total length of the core run. The RQD index is an indirect measurement of the number of "natural" fractures and of the amount of the alteration in a rock mass.

TESTS

Results: This column shows, for the corresponding depth, the results of tests carried out in the field or in the laboratory (shear strength, dynamic penetration, Atterberg limits with the cone, etc.). For more information, please refer to the legend in the upper part of the sounding log. However, an abbreviation indicating the type of analysis performed is shown next to the sample tested.

Graph: This graph shows the undrained shear strength resistance of cohesive soils, as measured *in situ* or in the laboratory (NQ 2501-200). It is also used to present the Dynamic Cone Penetration Test (NQ 2501-145) results.

Moreover, this graph is used for the representation of the water content and Atterberg limits test results.

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-01-09**
Date: **2009-10-21**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185475.6 (Y)
East 251087.1 (X)
Tidal Elevation **-5.59 (Z)**
Bedrock: 12.10 m End depth: 14.72 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength (Field ▲ ■ / Laboratory △ □)

C_U	Undisturbed (kPa)
C_{UR}	Remoulded (kPa)

LITHOLOGY

ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION
-5.59	
0.00	Probable alluvium : brown sand with traces of silt, very loose compactness.
-6.40	
0.81	Presence of traces of shells. Under sea-bed backfill : dark gray gravelly sand (shale) with traces of silt, medium to dense compactness. Presence of traces of glass and traces of organic matter.
-9.12	
3.53	Brown gravel and sand to gravelly sand with some silt, dense to very dense compactness. Presence of traces of shells.
-11.59	
6.00	Gray-brown gravelly sand with some silt, medium to dense compactness. Presence of traces of shells.
-13.10	
7.51	Brown gravel and sand with some silt, very dense compactness. Presence of cobbles or boulder of 15,20 to 15,50 meters and 13,32 to 16,56 meters.

SAMPLES

TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
CF-1		Intact	N	58	0-0 0-0	0	I	I	Nce= 0 AC
CF-2		Intact	N	16	118-36 8-3	44	I	I	Nce= 35
CF-3		Intact	N	8	45-21 12-9	33	I	I	Nce= 26
CF-4		Intact	N	43	15-9 9-19	18	I	I	AG Nce= 12 W = 16.1
CF-5		Intact	N	66	30-80 55-31	135	I	I	Nce= 105
CF-6		Intact	N	25	24-29 42-43	71	I	I	AG Nce= 57 W = 7.0
CF-7		Intact	N		105-100 /5cm	R	I	I	
CF-8		Intact	N	8	24-23 29-15	52	I	I	Nce= 42
CF-9		Lost	N	0	18-15 10-13	25	I	I	Nce= 19
CF-10		Intact	N	66	61-52 55-69	107	I	I	AG Nce= 84 W = 7.7
CR-11		Core	NQ	64					

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 80

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-01-09**
Date: **2009-10-21**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185475.6 (Y)
East 251087.1 (X)
Tidal Elevation **-5.59 (Z)**
Bedrock: 12.10 m End depth: 14.72 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
			Brown gravel and sand with some silt, dense very compactness.			CR-12			NQ	22					
		-16.38 / 10.79	Gray sand with some silt and traces of gravel, very dense compactness. Presence of pieces of wood.			CF-13			B	5	29-100 /5cm	R	I	I	
		-17.69 / 12.10	Rock : gray calcareous shale, poor to medium quality. The inclination of bedding and fractures of the rock varies from 45 to 70 degrees from the vertical plane.			CF-14			B	44	57-40 112	152	I	I	
						CR-15			NQ	80		27			U= 95,3 MPa
						CR-16			NQ	62		57			
		-20.31 / 14.72	End of sounding at 14,72 meters deep.			CR-17			NQ	100		33			

FIELD AND LABORATORY TESTS: NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION; 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

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Vertical Scale = 1 : 80

EQ-09-Ge-66A R.1 04.03.2009

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-02-09**
Date: **2009-10-26**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185480.1 (Y)
East 251077.9 (X)
Tidal Elevation **-0.96 (Z)**
Bedrock: 12.80 m End depth: 17.65 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength (Field ▲ ■ / Laboratory △ □)
C_U Undisturbed (kPa)
C_{UR} Remoulded (kPa)

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-0.96													
1–3	1	0.00	Probable alluvium : gray-brown sandy silt with traces of clay and traces of gravel, very loose compactness. Presence of shells.			CF-1			N	16	0-0 2-2	2	I	I	Nce= 1 AC
						CF-2			N	100	0-0 2-1	2	I	I	Ncer= 1 AC
		-2.73													
6–8	2	1.77	Under sea-bed probable backfill : gray-brown sand and gravel (slate) with some silt, dense compactness. Presence of pieces of wood.			CF-3			N	57	12-13 28-25	41	I	I	Nce= 33
		-3.86													
10–13	3	2.90	Gray gravelly sand with some silt, very dense compactness.			CF-4			N	0	24-17 8-9	25	I	I	Nce= 19
14–16	4–5					CF-5			N	22	47-32 83	115	I	I	Nce= 90
17–19	5					CF-6			N	33	93-90 63	153	I	I	Nce= 119
20–22	6					CF-7			N	41	14-40 46-47	86	I	I	Nce= 68
23–25	7					CF-8			N	57	56-83 45-45	128	I	I	Nce= 100
26–29	8	-9.06													
27–29		8.10	Gray sand and gravel with some silt, medium compactness.			CF-9			N	49	101-90 50-50	140	I	I	Nce= 109

FIELD AND LABORATORY TESTS: NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120; UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 75

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC + CF-2; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-02-09**
Date: **2009-10-26**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185480.1 (Y)
East 251077.9 (X)
Tidal Elevation **-0.96 (Z)**
Bedrock: 12.80 m End depth: 17.65 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
30–32			Gray sand and gravel with some silt, medium compactness.			CF-10			B	57	10-6 21-27	27	I	I	
33–34	10	-11.30													
		10.34	Gray-brown sand and gravel with some silt, very dense compactness. Presence of wood chips. Presence of sulfur odor.			CF-11			B	33	37-42 28-35	70	M	D	
35–37	11	-12.36													
		11.40	Gray sand and gravel with some silt, very dense compactness.			CF-12			B	49	21-35 32-32	67	I	I	
38–41	12					CF-13			B	40	82-50 /5cm	R	I	I	
		-13.76													
42–43	13	12.80	Rock : dark gray calcareous shale, very poor quality. The inclination of bedding and fractures of the rock varies from 10 to 80 degrees from the vertical plane.			CR-14			NQ	61		0			
44–45						CR-15			NQ	100		13			
46–47	14					CR-16			NQ	100		0			
48–49	15					CR-17			NQ	100		0			
50–51						CR-18			NQ	100		0			
		-16.60													
52–53	16	15.64	Rock : gray calcareous shale, poor to excellent quality. The inclination of bedding and fractures of the rock varies from 30 to 45 degrees from the vertical plane.			CR-19			NQ	100		34			
54–56	17					CR-20			NQ	100		97			
		-18.61													
57–59	18	17.65	End of sounding at 17,65 meters deep.												
60–72	19–22														

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC + CF-2; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-03-09**
Date: **2009-10-28**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185464.7 (Y)
East 251070.6 (X)
Tidal Elevation **-1.13 (Z)**
Bedrock: 13.49 m End depth: 17.94 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-1.13													
		0.00	Probable alluvium : gray silty sand with traces of clay and traces of gravel, very loose compactness. Presence of shells.			CF-1			N	16	0	0	I	I	AG Nce= 0 AC W = 30.5
						CF-2			N	0	0	0	I	I	Nce= 0
		-3.31													
		2.18	Under sea-bed backfill : sand and gravel (slate) with some silt, gray-brown, loose to medium compact. Presence of pieces of wood.			CF-3			N	0	6-8 1-3	9	I	I	Nce= 6
						CF-4			N	16	2-2 11-23	13	I	I	Nce= 9
						CF-5			B	100	100 /10cm	R	I	I	
		-5.22													
		4.09	Gray-brown sand and gravel to gravelly sand with some silt, very dense compactness.			CF-6			B	57	85-38 50-29	88	I	I	AG W = 9.0
						CF-7			B	25	32-30 33-21	63	I	I	
		-7.03													
		5.90	Gray sand and gravel with some silt, very dense compactness.			CF-8			B	100	100 /10cm	R	I	I	
						CF-9			B	38	13-25 50 /10cm	R	I	I	
						CF-10			N	16	62-55 62-72	117	I	I	Nce= 11

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION; 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-03-09**
Date: **2009-10-28**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185464.7 (Y)
East 251070.6 (X)
Tidal Elevation **-1.13 (Z)**
Bedrock: 13.49 m End depth: 17.94 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
30–32			Gray sand and gravel with some silt, very dense compactness.												
33	10					CF-11			N	100	112	R	I	I	
35						CF-12			N	56	68-87 68	155	I	I	Nce= 121
36	11														
37						CF-13			B	33	66-27 54-37	81	I	I	
39		-13.07													
40	12	11.94	gray-brown sand and gravel with some silt, dense compactness. Presence of cobbles and boulders.			CF-14			B	60	50 /5cm	R			
42						CR-15			NQ	56					
43	13														
44		-14.62													
45		13.49	Rock :dark gray calcareous shale, very poor to poor quality. The inclination of the bedding and fractures of the rock varies from 10 to 80 degrees from the vertical plane.												
46	14					CR-16			NQ	100		0			
48						CR-17			NQ	100		26			
49	15														
50						CR-18			NQ	100		0			
52						CR-19			NQ	100		26			
53	16	-17.27													
54		16.14	Roc k : dark gray calcareous shale, poor quality. The inclination of bedding and fractures of the rock varies from 10 to 90 degrees from the vertical plane.			CR-20			NQ	100		36			
57	17					CR-21			NQ	100		48			U= 105,1 MPa
58		-19.07													
59	18	17.94	End of sounding at 17,94 meters deep.												
69	21														
72	22														

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%): Wp W WL; 20 40 60 80 100 120
UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION: 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

Vertical Scale = 1 : 75

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-04-09**
Date: **2009-10-28**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185457.2 (Y)
East 251078.6 (X)
Tidal Elevation **-5.32 (Z)**
Bedrock: 12.37 m End depth: 17.07 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 78

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-5.32													
		0.00	Probable alluvium : brown sand with traces of silt and traces of gravel, loose compactness.												
						CF-1			N	0	2-3 5-6	8	I	I	Nce= 5 AC
	1	-6.41	Presence of shells.												
		1.09	Under sea-bed backfill : brown to dark brown sand with some silt and some gravel, medium to dense compactness.			CF-2			N	8	3-9 44-11	53	I	I	Nce= 43 AC
	2	-7.42													
		2.10	Under sea-bed probable backfill : brown gravel (slate) with some sandy silt, medium to very dense compactness.			CF-3			N	0	15-16 18-19	34	I	I	Nce= 27 AC
	3					CF-4			N	41	15-12 16-15	28	I	I	Nce= 21
	4					CF-5			N	33	61	R	I	I	
	5	-10.32	Presence of a boulder (slate) between 4,40 and 5,00 meters deep.												
		5.00	Brown gravelly sand with some silt, dense compactness.			CF-6			B	49	15-22 25-19	47	I	I	
	6					CF-7			B	25	110-25 87-24	112	I	I	
	7	-12.66													
		7.34	Reddish gray-brown sand with some gravel and a little gravelly silt, medium to very dense compactness.			CF-8			B	90	12-10 10-15	20	I	I	
	8														
	9					CF-9			B	49	52-24 44-29	68	I	I	

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a class "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC + CF-2 and FC-3; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-04-09**
Date: **2009-10-28**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185457.2 (Y)
East 251078.6 (X)
Tidal Elevation **-5.32 (Z)**
Bedrock: 12.37 m End depth: 17.07 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
31–34	10	-15.78	Reddish gray-brown sand with some silt and some gravel to gravelly, medium to very dense compactness.			CF-10			B	20	63-100 /10cm	R	I	I	
35–36	11	10.46 / -16.23 / 10.91	Gray-brown sand and gravel with some silt, very dense compactness.			CF-11			B	67	44-56 117	173	I	I	
37–40	12	-17.69	Gray-brown sand and gravel with some silt, dense compactness. Presence of cobbles and boulders.			CR-12	A		NQ	46					
41–44	13	12.37 / -18.77	Rock : Dark gray calcareous shale, fair to poor quality. The inclination of bedding and fractures of the rock varies from 10 to 85 degrees from the vertical plane.			CR-13	B		NQ	100		56			RQD 56% on part "B"
45–46	14	13.45				CR-14			NQ	100		39			
47–48			Rock : Dark gray calcareous shale, very poor quality. The inclination of bedding and fractures of the rock varies from 15 to 80 degrees from the vertical plane.			CR-15			NQ	100		0			
49–50	15	-20.61				CR-16			NQ	75		0			
51–52	16	15.29				CR-17			NQ	100		58			
53–56	17	-22.39	Rock : Dark gray calcareous shale, bad to fair quality. The inclination of bedding and fractures of the rock varies from 30 to 85 degrees from the vertical plane.			CR-18			NQ	100		46			
57–59	18	17.07	End of sounding at 17,07 meters deep.												
60–75	19–22														

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 78

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a class "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC + CF-2 and FC-3; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-05-09**
Date: **2009-11-02**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185450.0 (Y)
East 251094.1 (X)
Tidal Elevation **-12.11 (Z)**
Bedrock: 10.21 m End depth: 13.93 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)	▼	Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 71

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-12.11													
1-2-3-4	1	0.00	Probable alluvium : brown sand with trace silt, very loose compactness.			CF-1			N	37	0	0	I	I	AG Nce= 0 W = 24.0
		-13.42													
5-6-7-8-9	2	1.31	Under sea-bed backfill : brown sand and gravel (slate) with some silt, dense compactness.			CF-2			N	57	41-29 44-36	73	I	I	Nce= 59
						CF-3			N	57	30-31 32-68	63	I	I	AG Nce= 51 W = 10.9
		-15.01													
10-11-12-13-14	3-4	2.90	Gray-brown gravelly sand with some silt, dense compactness.			CF-4			N	57	39-27 29-97	56	I	I	Nce= 45
15-16-17	5					CF-5			N	63	36-109 100 /10cm	R	I	I	
18-19-20	6					CF-6			N	0	29-47 59-62	106	I	I	Nce= 64
		-18.48													
21-22-23	7	6.37	Reddish gray-brown sand with some silt and some gravel, very dense compactness.			CF-7			N	89	62-110 /13cm	R	I	I	
		-19.56													
24-25-26-27	8	7.45	Gray-brown sand and gravel with some silt, very dense compactness.			CF-8			N	16	26-35 24-24	59	I	I	Nce= 48

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-05-09**
Date: **2009-11-02**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185450.0 (Y)
East 251094.1 (X)
Tidal Elevation **-12.11 (Z)**
Bedrock: 10.21 m End depth: 13.93 m

ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
-20.82 / 8.71	Grey-brown sand and gravel with some silt, dense compactness. Presence of cobbles and boulder.	CR-9			NQ	33					
-22.32 / 10.21	Rock : dark gray calcareous shale, very poor quality. The inclination of bedding and fractures of the rock varies from 15 to 70 degrees from the vertical plane.	CR-10			NQ	100		0			
		CR-11			NQ	100		0			
		CR-12			NQ	100		0			
		CR-13			NQ	100		0			
-23.72 / 11.61	Rock : grey calcareous shale, very poor to medium quality. The inclination of bedding and fractures of the rock varies from 10 to 85 degrees from the vertical plane.	CR-14			NQ	100		35			
		CR-15			NQ	71		0			
		CR-16			NQ	100		67			
-26.04 / 13.93	End of sounding at 13,93 meters deep.										

FIELD AND LABORATORY TESTS: NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION; 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

BOREHOLE REPORT

Client : **Publics Works and Governement Services Canada**

File n°: **P029156-0100**
Borehole n°: **TF-06-09**
Date: **2009-11-03**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185433.3 (Y)
East 251086.6 (X)
Tidal Elevation **-11.75 (Z)**
Bedrock: 10.82 m End depth: 15.01 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength (Field ▲ ■ / Laboratory △ □)
C_U Undisturbed (kPa)
C_{UR} Remoulded (kPa)

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-11.75													
		0.00	Probable alluvium : gravelly sand with traces of silt, loose compactness. Presence of shells.			CF-1			N	3	16-5 4-4	9	I	I	AG Nce= 6
		-12.36 / 0.61	Under sea-bed backfill : gravelly sand (slate) with some traces of silt, dense compactness. Presence of pieces of plastic.			CF-2			N	57	23-33 34-35	67	I	I	Nce= 44
		-14.40 / 2.65	Brown gravelly sand with some silt, very dense compactness.			CF-3			N	74	40-45 55-112	100	I	I	Nce= 79
		-16.02 / 4.27	Gray-brown sand and gravel with some silt, very dense compactness.			CF-4			N	80	64-100 /10cm	R	I	I	
						CF-5			B	0	100 /10cm	R	I	I	
		-18.36 / 6.61	Presence of cobbles and/or boulder between 5,85 and 6,10 meters deep. Reddish gray-brown sand and gravel with some silt, very dense compactness.			CF-6			N	78	69-94 123	217	I	I	Nce= 168
		-19.48 / 7.73	Gray sand and gravel with some silt, very dense compactness.			CF-7			N	44	42-91 122	213	I	I	Nce= 165
		-20.28 / 8.53	Gray sand and gravel with some silt, very dense compactness. Presence of cobbles and boulders.			CR-8			NQ	25		0			

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-06-09**
Date: **2009-11-03**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185433.3 (Y)
East 251086.6 (X)
Tidal Elevation **-11.75 (Z)**
Bedrock: 10.82 m End depth: 15.01 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
33–35	10	-22.57				CR-9	A		NQ	76		0			collected on part "B"
35–42	11–12	10.82	Rock : gray to dark gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 30 to 85 degrees from the vertical plane.			CR-10	B		NQ	100		0			
						CR-11			NQ	100		22			
42–49	12–15	-24.68 / 12.93	Rock : dark gray calcareous shale, medium quality. The inclination of the bedding and fractures of the rock varies from 30 to 85 degrees from the vertical plane.			CR-12			NQ	100		56			
49–50	15	-26.76 / 15.01	End of sounding at 15,01 meters deep.												

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 81

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-07-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185417.1 (Y)
East 251076.4 (X)
Tidal Elevation **-5.42 (Z)**
Bedrock: 16.84 m End depth: 21.01 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)	▼	Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 78

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-5.42													
		0.00	Probable alluvium : gray-brown sand with some silt and traces of gravel, loose to very loose compactness. Presence of shells.			CF-1			N	0	0	0	I	I	Nce= 0
						CF-2			N	16	14-9 3-3	12	I	I	Nce= 8
		-7.49													
		2.07	Under sea-bed probable backfill : gray-brown sandy gravel (slate) with traces of silt, medium compactness.			CF-3			N	8	7-8 14-10	22	I	I	Nce= 16
						CF-4			N	8	12-10 11-12	21	I	I	Nce= 15
						CF-5			N	8	15-19 6-7	25	I	I	Nce= 19
						CF-6			N	0	11-8 11-50	19	I	I	Nce= 13
		-11.67													
		6.25	Gray sand with some gravel and traces of silt, medium compactness.			CF-7			N	49	9-10 22-22	32	I	I	AG Nce= 26 W = 20.8
		-12.89													
		7.47	Gray-brown gravelly sand with some silt, dense to very dense compactness.			CF-8			N	57	22-49 40-96	89	I	I	Nce= 71
						CF-9			B	74	17-26 32-32	58	I	I	AG W = 11.5

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R_t = tensile strenth by crushing (Brazilian test).
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-07-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185417.1 (Y)
East 251076.4 (X)
Tidal Elevation **-5.42 (Z)**
Bedrock: 16.84 m End depth: 21.01 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
32–33–34–35	10		Gray-brown gravelly sand with some silt, dense to very dense compactness.			CF-10			B	74	38-34 35-35	69	I	I	
36–37–38–39	11					CF-11			B	74	19-26 23-39	49	I	I	
40	12	-17.85													
41–42–43	13	12.43	Gray-brown sand and gravel with some silt, very dense compactness. Presence of cobbles and boulders.			CF-12			B	90	46-52 36-74	88	I	I	AG W = 9.4
44–45–46	14					CF-13			B	70	36-56 40-50 /5cm	R	I	I	
47–48–49	15					CR-14			NQ	50					
50		-20.70				CR-15			NQ	0					
51–52–53	16	15.28	Gray sand and gravel with some silt, medium to very dense compactness.			CF-16			B	25	6-6 7-8	13	I	I	
54–55		-22.26				CF-17			B	72	39-85 /10cm	R	I	I	
56–57–58–59–60–61–62–63	17–18–19	16.84	Rock : gray to dark gray calcareous shale, very poor to poor quality. The inclination of the bedding and fractures of the rock varies from 15 to 85 degrees from the vertical plane.			CR-18			NQ	100		16			
						CR-19			NQ	100		0			
						CR-20			NQ	100		0			
						CR-21			NQ	100		31			U= 7,5 MPa(1)
		-24.75													
64–65–66–67–68–69	20–21	19.33	Rock : gray to gray-black calcareous shale, poor quality, fair quality. The inclination of the bedding and fractures-500 of the rock varies from 45 to 85 degrees from the vertical plane.			CR-22			NQ	100		46			
						CR-23			NQ	82		56			R_t= 5,74 MPa
		-26.43													
70–71–72–73–74–75–76	22–23	21.01	End of sounding at 21,01 meters deep.												

(1) Small value due to the presence of stratification in the sample.

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; 20 40 60 80 100 120 — UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION; 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R_t = tensile strenth by crushing (Brazilian test).
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **BBS-2**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-08-09**
Date: **2009-11-12**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185423.3 (Y)
East 251060.3 (X)
Tidal Elevation **6.47 (Z)**
Bedrock: 25.56 m End depth: 30.10 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)	▼	Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 74

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		6.47													
		0.00	Riprap rock shore protection : all from 0 to 380 millimetres thick.												
						CR-1			NQ	31					
						CR-2			NQ	66					
						CR-3			NQ	59					
						CR-4			NQ	33					
						CR-5			NQ	20					

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-08-09**
Date: **2009-11-12**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185423.3 (Y)
East 251060.3 (X)
Tidal Elevation **6.47 (Z)**
Bedrock: 25.56 m End depth: 30.10 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-2.67													
		9.14	Wharf's backfill : gray-black fragments of roc (slate) in the form of sandy gravel with traces of silt, average to very dense compactness. Presence of cobbles whose size does not exceed 0,20 meter. Presence of small pieces of bricks.			CF-6			B	8	14-12 8-7	20	I	I	
						CR-7			NQ	50					
						CF-8			B	57	17-15 50	65	I	I	
						CR-9			NQ	43					
						CF-10			B	41	15-17 35-25	52	I	I	
						CR-11			NQ	58					
						CR-12			NQ	47					
		-8.03													
		14.50	Gray sand with traces of gravel and traces of silt, medium compactness.			CF-13			B	66	6-10 10-13	20	I	I	
		-9.07													
		15.54	Gray gravelly sand with traces of silt, dense compactness. Presence of cobbles.			CF-14			B	49	23-49 25-50	74	I	I	
						CR-15			NQ	33					
						CF-16				67	8-49 56	105	I	I	
						CR-17			NQ	5					
		-12.12													
		18.59	Gray-brown sand and gravel with some silt, dense to very dense compactness. Presence of cobbles and boulders.			CF-18				41	10-15 21-17	36	I	I	
						CR-19			NQ	5					
						CF-20				0	50	R			
						CR-21			NQ	32					

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 74

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-08-09**
Date: **2009-11-12**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185423.3 (Y)
East 251060.3 (X)
Tidal Elevation **6.47 (Z)**
Bedrock: 25.56 m End depth: 30.10 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
73–76	23		Gray-brown sand and gravel with some silt, dense to very dense compactness. Presence of cobbles and boulders.			CR-22			NQ	46					
77–79	24					CR-23			NQ	34					
80–83	25					CR-24			NQ	62					
84		-19.09 / 25.56				CR-25			NQ	45					
85–88	26		Rock : gray calcareous shale, very poor to poor quality. The inclination of the bedding and fractures of the rock varies from 15 to 85 degrees from the vertical plane.			CR-26			NQ	100		0			
89–92	27–28					CR-27			NQ	100		33			
93–96	29					CR-28			NQ	100		11			
97–98	30	-23.63 / 30.10	End of sounding at 30,10 meters deep.			CR-29			NQ	100		33			
99–115	31–34														

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-09-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185496.4 (Y)
East 251093.3 (X)
Tidal Elevation **6.47 (Z)**
Bedrock: 24.82 m End depth: 27.20 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 74

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.47													
		0.00	Concrete slab.												
		6.24	Backfill :												
		0.23	crushed gravel 20-0 mm apparent			CF-1			B	33	14-49 40-33	89	I	I	AC
		5.67	grade as gray-brown sandy gravel												
		0.80	with some silt, very dense			CF-2			B	33	14-45 39-20	84	I	I	
			compactness.												
			Wharf's backfill :												
			gray-brown schistose rock			CF-3			B	16	8-8 12-5	20	I	I	
			fragments in the form of sandy												
			gravel with some silt, loose to												
			dense compactness.			CF-4			B	8	2-3 9-17	12	I	I	
			Presence of cobbles whose size												
			doesn't exceed 0,15 meter.			CF-5			B	0	5-4 3-3	7			
						CF-6			B	8	5-8 20-10	28	I	I	
						CF-7			B	16	11-15 26-14	41	I	I	
						CF-8			B	0	1-1 2-1	3			
						CF-9			B	8	2-2 2-2	4	I	I	
						CF-10			B	13	10-1 2-2	3	I	I	

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-09-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185496.4 (Y)
East 251093.3 (X)
Tidal Elevation **6.47 (Z)**
Bedrock: 24.82 m End depth: 27.20 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-2.67 / 9.14	Wharf's backfill : dark gray schistose rock fragments in the form of sandy gravel with some silt, loose to dense compactness.			CF-11			B	46	5-10 9-9	19	I	I	
						CF-12			B	25	3-6 3-1	9	I	I	
						CF-13			B	17	12-54	R	I	I	
		-7.25 / 13.72	Gray-brown sand with some silt to silt and some gravel, medium to very dense compactness.			CF-14			B	41	15-20 30-50	50	I	I	
						CF-15			B	25	9-15 16-21	31	I	I	AG W = 12.2
						CF-16			B	25	12-12 15-50	27	I	I	
		-11.83 / 18.30	Gray sand and gravel with some silt, dense compactness. Presence of cobbles and boulders.			CR-18			NQ	79					
						CR-19			NQ	32					

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL
20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION
20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

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Vertical Scale = 1 : 74

EQ-09-Ge-66A R.1 04.03.2009

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-09-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185496.4 (Y)
East 251093.3 (X)
Tidal Elevation **6.47 (Z)**
Bedrock: 24.82 m End depth: 27.20 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
73–81	23–24		Gray sand and gravel with some silt, dense compactness. Presence of cobbles and boulders.			CR-20			NQ	25					
						CR-21			NQ	20					
		-18.35 / 24.82	Rock: dark gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 45 to 70 degrees from the vertical plane.			CR-22			NQ	28		0			
						CR-23			NQ	100		0			
						CR-24			NQ	68		0			
		-20.73 / 27.20	End of sounding at 27,20 meters deep.			CR-25			NQ	100		20			

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

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Vertical Scale = 1 : 74

EQ-09-Ge-66A R.1 04.03.2009

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-10-09**
Date: **2009-11-06**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185500.9 (Y)
East 251083.7 (X)
Tidal Elevation **6.68 (Z)**
Bedrock: 18.71 m End depth: 21.73 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 75

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.68													
		0.00	Asphalt.			TA-1									
		6.59	Fill (granular cushion probable): gray crushed stone apparent 20-0 mm grade, dense compactness.			CF-2			N	66	22-46 51-30	97	I	I	Nce= 77 AC
		0.09													
		5.98													
		0.70	Wharf's backfill : gray-brown schistose rock fragments in the form of sandy gravel with some silt, medium to dense compactness. The size of rock fragments doesn't exceed 0,15 meter.			CF-3			N	58	51-65	R	I	I	AC
						CF-4			N	0	37-10 6-8	16			Nce= 11
						CF-5			B	8	32-23 13-10	36	I	I	
			Presence of cobbles between 1,22 and 1,35 meters deep according on the behavior of the drill.			CF-6			N	8	26-13 9-4	22	I	I	Nce= 16
						CF-7			N	0	11-6 14-5	20			Nce= 14
			Presence of a gap between 5,65 and 6,15 meters.			CF-8			N	0	4-0 50	50			Nce= 41
						CF-9			B	16	6-13 11-11	24	I	I	
						CF-10			N	16	21-11 11-13	22	I	I	Nce= 16

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-2 and CF-3, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC + CF-2; Metals (As + Hg)
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-10-09**
Date: **2009-11-06**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185500.9 (Y)
East 251083.7 (X)
Tidal Elevation **6.68 (Z)**
Bedrock: 18.71 m End depth: 21.73 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
			Wharf's backfill : gray-brown schistose rock fragments in the form of sandy gravel with some silt, medium to dense compactness.	CF-11			N	5	8-10 11-17	21	I	I	Nce= 15
				CF-12			B	40	33-50 /10cm	R	I	I	
		-4.91 / 11.59	Brown sand with some gravel and some silt, very dense compactness.	CF-13			B	40	9-31 /10cm	R	I	I	
		-6.12 / 12.80	Brown to gray-brown sand and gravel with some silt, very dense compactness.	CF-14			B	66	37-39 26-10	65	I	I	
				CF-15			B	49	37-37 39-40	76	I	I	
				CF-16			B	57	16-36 43-47	79	I	I	
				CF-17			B	91	24-45 59	104	I	I	
		-10.70 / 17.38	Brown to gray-brown sand and gravel with some silt, very dense compactness. Presence of probables cobbles according on the behavior of the drill.	CF-18			B	57	56-61 44-34	105	I	I	
		-12.03 / 18.71		CF-19			B	24	8-12 20 /12cm	R	I	I	
			Rock : gray calcareous shale, very poor to poor quality. The inclination of the bedding and fractures of the rock varies from 20 to 85 degrees from the vertical plane.	CR-20			NX	46		0			
				CR-21			NQ	100		29			
		-15.05 / 21.73	End of sounding at 21,73 meters deep.										

FIELD AND LABORATORY TESTS: NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION; 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-2 and CF-3, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC + CF-2; Metals (As + Hg)
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-11-09**
Date: **2009-11-13**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185491.9 (Y)
East 251069.1 (X)
Tidal Elevation **6.73 (Z)**
Bedrock: 10.00 m End depth: 19.37 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 75

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.73													
		0.00	Asphalt.												
		6.58 / 0.15	Backfill : gray crushed gravel 20-0 mm apparent grade as gravelly sand with some silt, dense compactness.			CF-1			B	49	16-20 15-16	35	I	I	AG AC W = 10.5
	1	5.82 / 0.91				CF-2			B	49	5-6 7-13	13	I	I	
		5.72 / 1.01	Backfill: 20 mm clean stone.			CF-3			B	51	14-28 50 /8cm	R	I	I	
	2		Wharf backfill : grey-brown to dark gray schistose rock fragments in the form of sandy gravel with some silt, medium to very dense compactness. Presence of cobbles whose size doesn't exceed 0,15 meter. Presence of small pieces of wood between 3,81 and 4,42 meters.			CF-4			B	49	13-7 13-19	20	I	I	
	3					CF-5			B	44	21-28 50	78	I	I	
	4					CF-6			B	33	9-12 9-12	21	I	I	
	5					CF-7			B	41	15-17 19-5	36	I	I	AG W = 17.5
						CF-8			B	25	29-9 6-7	15	I	I	
	6		Presence of small pieces of wood between 6,10 and 6,71 meters.			CF-9			B	16	12-15 14-7	29	I	I	
	7					CF-10			B	82	8-15 30-15	45	I	I	
		-0.89 / 7.62	Sand and gravel with some silt, gray. Presence of cobbles and boulders.			CF-11			B	18	35-50 /13cm	R	I	I	
	8					CR-12			NX	42					

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approx.). Index "N" only valid for a sample size "B".
R_t = tensile strenth by crushing (Brazilian test)
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), Metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-11-09**
Date: **2009-11-13**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185491.9 (Y)
East 251069.1 (X)
Tidal Elevation **6.73 (Z)**
Bedrock: 10.00 m End depth: 19.37 m

LITHOLOGY

ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION
-3.27 / 10.00	Rock : dark gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 10 to 85 degrees from the vertical plane.
-4.85 / 11.58	Rock: gray to gray-black calcareous shale, very poor to good quality. The inclination of the bedding and fractures of the rock varies from 15 to 85 degrees from vertical plane. Presence of a highly fractured zone of 12,80 to 14,91 meters.
-12.64 / 19.37	End of sounding at 19,37 meters deep.

(1) Small value due to the presence of stratification in the sample.

SAMPLES

TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
CF-13				100	50 /10cm	R			
CR-14			NX	70					
CR-15			NX	53		0			
CR-16			NQ	100		0			
CR-17			NQ	100		24			
CR-18			NQ	96		84			
CR-19			NQ	91		22			
CR-20			NQ	31		10			
CR-21			NQ	100		70			U= 19,0 MPa(1)
CR-22			NQ	100		82			
CR-23			NQ	100		61			R_t= 0,61 MPa(1)

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approx.). Index "N" only valid for a sample size "B".
R_t = tensile strenth by crushing (Brazilian test)
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), Metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-12-09**
Date: **2009-11-22**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185448.5 (Y)
East 251048.7 (X)
Tidal Elevation **6.80 (Z)**
Bedrock: 13.22 m End depth: 22.50 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 82

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.80													
		0.00	Concrete slab.												
		6.60	Backfill :												
		0.20	gray crushed stone 20-0 mm												
		6.10	apparent grade, dense												
	1	0.70	compactness.			CF-1			N	49	12-28 28-33	56	I	I	Nce= 45 AC
			Wharf's backfill :												
			gray schistose rock fragments in the form of sandy gravel with traces of silt, medium to dense compactness.			CF-2			N	2	5-10 40-2	50	I	I	Nce= 41
	2														
			Presence of cobbles and blocks according to the behavior of the drill.			CF-3			N	5	56-20 20-8	40	I	I	Nce= 33
	3					CF-4			N	8	17-25 12-13	37	I	I	Nce= 29
		2.99													
	4	3.81	Wharf's backfill :												
			brown schistose rock fragments in the form of sandy gravel with some silt, loose to medium compactness.			CF-5			N	8	3-2 5-19	7	I	I	Nce= 5
	5					CF-6			N	13	4-8 4-5	12	I	I	Nce= 8
						CF-7			N	16	46-15 12-67	27	I	I	Nce= 20
	6	0.70													
		6.10	Brown sandy silt with some gravel and some clay, medium compactness.			CF-8			N	25	1-6 26-11	32	I	I	Nce= 26
		-0.06													
	7	6.86	Gravelly sand with some silt to silty and traces of clay, dense to very dense compactness.			CF-9			N	13	13-30 23-3	53	I	I	Nce= 43
	8		Presence of cobbles according to the behavior of the drill.			CF-10			N	41	0-14 23-40	37	I	I	Nce= 29
						CF-11			N	49	24-41 34-29	75	I	I	Nce= 60
	9														
						CF-12			B	41	11-19 15-20	34	I	I	

RESULTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-12-09**
Date: **2009-11-22**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185448.5 (Y)
East 251048.7 (X)
Tidal Elevation **6.80 (Z)**
Bedrock: 13.22 m End depth: 22.50 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
33–34		-3.57													
34–35		10.37	Gray-brown sand and gravel with some silt, very dense compactness. Presence of cobbles and boulders.			CR-13			NQ	45					
35–36	11														
36–38						CF-14			B	25	20-20 20-26	40	I	I	
38–39	12														
39–41						CF-15			B	75	11-26 26-20	52	I	I	
41–43	13	-6.42													
43–44		13.22	Rock: gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 10 to 60 degrees from the vertical plane.			CR-16			NQ	100					
44–45						CR-17			NQ	100		18			
45–46	14														
46–47						CR-18			NQ	100		22			
47–48						CR-19			NQ	100		0			
48–49	15														
49–50		-8.66				CR-20			NQ	100		0			
50–51		15.46	Rock : gray to dark gray calcareous shale, from poor to excellent quality. The inclination of the bedding and fractures of the rock varies from 15 to 85 degrees from the vertical plane.			CR-21			NQ	92		45			
51–52	16														
52–53						CR-22			NQ	89		27			
53–54						CR-23			NQ	100		76			
54–55	17														
55–58						CR-24			NQ	100		96			
58–59	18														
59–62	19														
62–63						CR-25			NQ	100		57			
63–65	20														
65–68						CR-26			NQ	99		93			
68–69	21														
69–72	22					CR-27			NQ	100		68			
72–73		-15.70													
73–74		22.50	End of sounding at 22,50 meters deep.												
74–75	23														
75–79	24														

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-13-09**
Date: **2009-11-05**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185438.8 (Y)
East 251057.0 (X)
Tidal Elevation **6.70 (Z)**
Bedrock: 21.76 m End depth: 34.84 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:

Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 86

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION
		6.70	
		0.00	Reinforced concrete slab.
		6.47 / 0.23	Backfill: gray crushed gravel 20-0 mm
	1	5.84 / 0.86	apparent grade as gravelly sand with some silt, medium compactness.
	2		Wharf's backfill : gray-brown sand and gravel with traces to some silt, medium to very dense compactness.
	3		
	4	2.13 / 4.57	Wharf's backfill : sand and gravel (slate) with traces of silt, very dense compactness.
	5		
	6	0.60 / 6.10	Wharf's backfill : dark brown sand and gravel with some silt, very dense compactness.
	7	-0.57 / 7.27	Presence of cobbles and small pieces of wood.
	8	-1.60 / 8.30	Dark gray sandy silt with some clay, firm consistency. Presence of shells.
	9		Gray-brown gravelly sand with some silt, very dense compactness. Presence of shells.
	10		

SYMBOLS | WATER LEVEL (m) / DATE

TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
CF-1			B	16	4-6 6-6	12	I	I	AC
CF-2			B	16	6-20 25-35	45	I	I	
CF-3			B	16	17-41 17-13	58	I	I	
CF-4			B	49	14-14 13-11	27	I	I	AG W = 8.5
CF-5			B	16	10-17 37-37	54	I	I	
CF-6			B	16	13-17 39-21	56	I	I	
CF-7			B	11	35-25 35	60	I	I	
CF-8			B	17	50	R	I	I	
CF-9			B	25	4-17 40-17	57	I	I	
CF-10			B	49	6-8 3-2	11	I	I	
CF-11			B	49	1-1 1-1	2	I	I	AG W = 42.6
CF-12			B	8	5-2 5-7	7	I	I	

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-13-09**
Date: **2009-11-05**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185438.8 (Y)
East 251057.0 (X)
Tidal Elevation **6.70 (Z)**
Bedrock: 21.76 m End depth: 34.84 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
34–37	11		Presence of pieces of wood to 9,14 meters. Gravelly sand with some silt, very dense compactness. Presence of shells.			CF-13			B	66	13-32 22-32	54	I	I	AG W = 15.2
39–40	12	-5.49													
		12.19	Gray sand and gravel with some silt, medium to very dense compactness.			CF-14			B	46	14-45 40-50	85	I	I	AG W = 10.5
43	13					CF-15			B	23	14-8 18-34	26	I	I	
46	14														
49	15	-8.30													
		15.00	Gray sand and gravel with some silt, dense compactness. Presence of cobbles and boulders.			CR-16			NQ	42					
53	16														
55	17					CR-17			NQ	41					
59	18					CR-18			NQ	63					
63	19					CR-19			NQ	54					
66	20					CR-20			NQ	47					
69	21					CR-21			NQ	22					
71		-15.06					A								
72	22	21.76	Rock : dark gray calcareous shale, very poor to poor quality. The inclination of the bedding and fractures of the rock varies from 0 to 90 degrees from the vertical plane.			CR-22	B		NQ	98		46			RQD of 46% on part "B"
76	23					CR-23			NQ	100		17			
79	24					CR-24			NQ	100		0			
80						CR-25			NQ	65		0			
82	25					CR-26			NQ	76		0			

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 86

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-13-09**
Date: **2009-11-05**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185438.8 (Y)
East 251057.0 (X)
Tidal Elevation **6.70 (Z)**
Bedrock: 21.76 m End depth: 34.84 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		25.40	Rock : gray calcareous shale, good quality. The inclination of the bedding and fractures of the rock varies from 15 to 85 degrees from the vertical plane.												
						CR-27			NQ	100		76			
						CR-28			NQ	100		76			
						CR-29			NQ	100		83			
						CR-30			NQ	100		80			
						CR-31			NQ	100		89			
						CR-32			NQ	100		86			
		-28.14													
		34.84	End of sounding at 34,84 meters deep.												

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **CME 55**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-14-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185449.8 (Y)
East 251061.9 (X)
Tidal Elevation **6.69 (Z)**
Bedrock: 21.70 m End depth: 34.07 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 54

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.69													
		0.00	Concrete slab.												
		6.53 / 0.16	Backfill: gray crushed stone 20-0 mm apparent grade, dense to very dense compactness.			CF-1			B	33	23-38 38-28	76	I	I	AC
	1	5.49 / 1.20	Presence of a geotextile membrane to 1,20 meters deep.			CF-2			B	11	8-9 23-21	32	I	I	AC
		5.17 / 1.52	Backfill: gray crushed stone 56-0 mm apparent grade, dense to very dense compactness.			CF-3			B	28	10-9 10-28	19	I	I	
	2	4.45 / 2.24	Wharf's backfill : red gravel (slate) with some sand and trace amounts of silt, medium compactness.			CF-4			B	5	12-18 50 /63cm	R	I	I	
	3		Wharf's backfill: gray-brown to dark gray gravel (slate) with some sandy silt, medium to very dense compactness. Presence of cobbles according to the behavior of the drill.			CF-5			B	8	20-23 28-8	51	I	I	
	4					CF-6			B	8	8-7 8-7	15	I	I	
	5					CF-7			B	33	9-29 19-25	48	I	I	
						CF-8			B	8	5-6 10-10	16	I	I	
	6					CF-9			B	57	19-50 /8cm	R	I	I	

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce index = "N" corrected (approx.). Index "N" only valid for a sample size "B".
R_t = tensile strenth by crushing (B.T.)
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), Metals (As + Hg), TOC + CF-2; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 4

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-14-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185449.8 (Y)
East 251061.9 (X)
Tidal Elevation **6.69 (Z)**
Bedrock: 21.70 m End depth: 34.07 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
22			Wharf's backfill : gray-brown to dark gray gravel (slate) with some sandy silt, medium to very dense compactness.												
23	7														
24															
25		-0.93 / 7.62	Presence of cobbles according to the behavior of the drill.												
26	8		Gray sandy silt with some clay and traces of gravel, very loose compactness.			CF-10			B	74	4-2 1-1	3	I	I	
27		-1.54 / 8.23													
28			Dark gray sand with some gravel and traces of silt, medium to very dense compactness.												
29															
30	9		Presence of wood to 9,14 meters deep.												
31			Presence of cobbles according on the behavior of the drill.			CF-11			B	8	6-5 10-11	15	I	I	
32															
33	10														
34															
35															
36	11					CF-12			B	57	9-18 38-50 /8cm	R	I	I	
37															
38															
39		-5.20 / 11.89	Gray sand and gravel with some silt, dense compactness.												
40	12		Presence of cobbles and boulders.			CR-13			NX	67					
41						CR-14			NX	67					
42															
43	13														
44															
45						CR-15			NX	34					
46	14					CF-16			B	66	20-21 38-50	59	I	I	
47															
48						CR-17			NX	67					
49	15														
50															
51						CF-18			B	49	29-27 30-29	57	I	I	
52															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce index = "N" corrected (approx.). Index "N" only valid for a sample size "B".
R = tensile strenth by crushing (B.T.)
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), Metals (As + Hg), TOC + CF-2; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 4

BOREHOLE REPORT

Client : **Publics Works and Governement Services Canada**

File n°: **P029156-0100**
Borehole n°: **TF-14-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185449.8 (Y)
East 251061.9 (X)
Tidal Elevation **6.69 (Z)**
Bedrock: 21.70 m End depth: 34.07 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
53–56	17	-10.52 / 17.21	Gray sand and gravel with some silt, dense compactness. Presence of cobbles and boulders.			CF-19			B	100	40-52 50	102	I	I	
57–59	18		Gray sand and gravel with some silt, dense compactness. Significant presence of cobbles and boulders.			CR-20			NQ	81					
60–62	19					CR-21			NQ	25					
63–65	20					CR-22			NQ	48					
66–69	21					CR-23			NQ	25					
70–71		-15.01 / 21.70	Rock : gray to dark gray calcareous shale, very poor to poor quality.			CR-24	A B		NQ	100		0			
72–74	22					CR-25			NQ	100		26			U= 86,8 MPa
75–76	23	-16.42 / 23.11	Rock : gray calcareous shale, from poor to excellent quality. The inclination of the bedding and fractures of the rock varies from 15 to 75 degrees from the vertical plane. Presence of mechanics fracture.			CR-26			NQ	100		45			
77–83	24–25					CR-27			NQ	100		90			R_t= 5,13 MPa

FIELD AND LABORATORY TESTS: NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION

Remarks: Nce index = "N" corrected (approx.). Index "N" only valid for a sample size "B".
R_t = tensile strenth by crushing (B.T.)
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), Metals (As + Hg), TOC + CF-2; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 4

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-14-09**
Date: **2009-11-09**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185449.8 (Y)
East 251061.9 (X)
Tidal Elevation **6.69 (Z)**
Bedrock: 21.70 m End depth: 34.07 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
85	26		Rock : gray calcareous shale, from poor to excellent quality. The inclination of the bedding and fractures of the rock varies from 15 to 75 degrees from the vertical plane. Presence of mechanics fracture.												
86															
87															
88															
89	27					CR-28			NQ	100		67			
90															
91															
92	28														
93															
94						CR-29			NQ	100		91			
95	29														
96															
97															
98	30														
99						CR-30			NQ	100		94			
100															
101															
102	31														
103															
104						CR-31			NQ	100		82			
105	32														
106															
107															
108	33														
109						CR-32			NQ	100		82			
110															
111															
112	34	-27.38 / 34.07	End of sounding at 34,07 meters deep. Note : the water level varies with the tide.												
113															
114															
115															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce index = "N" corrected (approx.). Index "N" only valid for a sample size "B".
R = tensile strenth by crushing (B.T.)
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), Metals (As + Hg), TOC + CF-2; PDT
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 4 of 4

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Vertical Scale = 1 : 54

EQ-09-Ge-66A R.1 04.03.2009

BOREHOLE REPORT

Client : **Publics Works and Governement Services Canada**

File n°: **P029156-0100**
Borehole n°: **TF-15-09**
Date: **2009-11-12**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185437.1 (Y)
East 251068.2 (X)
Tidal Elevation **6.67 (Z)**
Bedrock: 25.98 m End depth: 27.25 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength (Field / Laboratory)
C_U Undisturbed (kPa) ▲ ■
C_{UR} Remoulded (kPa) △ □

Vertical Scale = 1 : 60

LITHOLOGY

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS
		6.67		
		0.00	Concrete slab.	
		6.46 / 0.21	Backfill: gray crushed stone 20-0 mm apparent grade, dense compactness.	
		5.97 / 0.70	Backfill : gray crushed stone 56-0 mm apparent grade, dense compactness.	
		5.17 / 1.50	Wharf's backfill: gray schistose rock fragments in the form of gravel with some sand to sandy and traces to some silt, dense to very dense compactness. Presence of cobbles whose size doesn't exceed 0,15 meter.	

WATER LEVEL (m) / DATE

SAMPLES

TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
CF-1		Intact	N	75	29-35 49-48	84	I	I	Nce= 67 AC
CF-2		Intact	N	49	21-35 33-38	68	I	I	AG Nce= 55 W = 5.2
CF-3		Lost	N	0	115-60 /10cm	R	I	I	
CF-4		Lost	N	0	10-26 50-50 /5cm	76	I	I	Nce= 61
CF-5		Intact	N	16	9-30 17-9	47	I	I	Nce= 38
CF-6		Lost	N	0	14-86 /5cm	R	I	I	
CF-7		Intact	N	13	14-20 42-50 /10cm	62	I	I	
CF-8		Intact	N	60	28-70	R	I	I	
CR-9		Core	NX	100			I	I	Nce= 50
CF-10		Intact	N	43	31-33 22-15	55	I	I	Nce= 45

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **M. Massicotte, tech. sr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-15-09**
Date: **2009-11-12**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185437.1 (Y)
East 251068.2 (X)
Tidal Elevation **6.67 (Z)**
Bedrock: 25.98 m End depth: 27.25 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
24–25		-0.98 / 7.65	Wharf's backfill : gray schistose rock fragments in the form of gravel with some sand to sandy and traces to some silt, medium compactness. Presence of small pieces of wood between 7,65 and 8,25 meters deep.												
26–27	8					CF-11		X	N	33	8-11 13-12	24	I	I	Nce= 18
28–29		-1.83 / 8.50	Wharf's backfill : gray sand and gravel (slate) with some silt, medium to very dense compactness.												
29–30	9														
31–32						CF-12		X	N	51	6-9 19-45	28	I	I	Nce= 21
33–34	10														
35–36	11					CF-13		X	N	30	10-9 9-8	18	I	I	Nce= 12
37–38															
39–40	12														
41–42						CF-14		X	N	21	8-8 8-13	16	I	I	Nce= 11
43–44	13	-6.83 / 13.50	Gray gravelly sand with some silt, medium to very dense compactness. Presence of cobbles according on the behavior of the drill. Presence of shells.												
45–46	14					CF-15		X	N	79	5-8 12-23	20	I	I	Nce= 14
47–48															
49–50	15														
51–52						CF-16		X	N	67	41-56 14-15	70	I	I	Nce= 56
53–54	16														
55–56	17					CF-17		X	N	87	29-42 62	104	I	I	Nce= 82
57–58															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%)
Wp W WL
20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION
20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **M. Massicotte, tech. sr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-15-09**
Date: **2009-11-12**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185437.1 (Y)
East 251068.2 (X)
Tidal Elevation **6.67 (Z)**
Bedrock: 25.98 m End depth: 27.25 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		-11.63 / 18.30	Gray sand and gravel with some silt, dense compactness. Presence of probables cobbles and boulders according on the behavior of the drill.			CF-18			N	51	39-47 20-26	67	I	I	Nce= 54
						CF-19			B	44	9-17 32-61	49	I	I	
		-14.33 / 21.00	Gray sand and gravel with some silt. Significant presence of cobbles and boulders. (Accumulation of boulders)			CR-20			NQ	22					
						CR-21			NQ	28					
						CR-22			NQ	12					
						CR-23			NQ	50					
						CR-24			NQ	19					
						CR-25			NQ	70					
		-19.31 / 25.98	Rock : dark gray calcareous shale, highly fractured, very poor quality.			CR-26			NQ	49		0			
						CR-27			NQ	100		0			
						CR-28			NQ	100		0			
		-20.58 / 27.25	End of sounding at 27,25 meters deep.												

FIELD AND LABORATORY TESTS: NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **M. Massicotte, tech. sr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

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Vertical Scale = 1 : 60

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-16-09**
Date: **2009-11-11**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185446.9 (Y)
East 251074.5 (X)
Tidal Elevation **6.65 (Z)**
Bedrock: 25.55 m End depth: 27.07 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength (Field ▲ ■, Laboratory △ □)
C_U Undisturbed (kPa)
C_{UR} Remoulded (kPa)

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.65													
		0.00	Concrete slab.												
		6.45 / 0.20	Backfill: gray crushed stone 20-0 mm apparent grade, compact dense to very dense.			CF-1			N	39	23-55 65-38	120	I	I	Nce=95 AC
						CF-2			N	18	20-25 19-16	44	I	I	Nce=35
		5.15 / 1.50	Backfill: gray crushed stone 56-0 mm apparent grade, medium to very dense compactness.			CF-3			N	2	11-23 8-6	31	I	I	Nce=25
		4.25 / 2.40	Concrete. (Probable structure)			CF-4			N		57-43 16-9	59	I	I	Nce=48
						CR-5			NX						
						CF-6				100					
						CR-7			NX	89					
						CR-8			NX	96					
		1.95				CR-9			NX	100					
		4.70	Backfill: Woods. (Probable box) Presence of a strong odor of gasoline.			CF-10			N	51	10-17 20-20	37	P	IM	Nce=29
		1.15 / 5.50	Wharf's backfill : gray-brown schistose rock fragments in the form of gravel with some sand to sandy and traces to some silt, loose to dense compactness. Presence of cobbles whose size does not exceed 0,15 meter. Presence of small pieces of wood.			CF-11			N	28	8-9 8-8	17	I	I	Nce=12
						CF-12			N	20	3-2 4-6	6	I	I	Nce=4
						CR-13			NX	100					
						CF-14			N	13	4-4 2	6	I	I	Nce=4

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL: 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION: 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **M. Massicotte, tech. sr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

Vertical Scale = 1 : 75

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-16-09**
Date: **2009-11-11**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185446.9 (Y)
East 251074.5 (X)
Tidal Elevation **6.65 (Z)**
Bedrock: 25.55 m End depth: 27.07 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
30–32			Wharf's backfill : gray-brown schistose rock fragments in the form of gravel with some sand to sandy and traces to some silt, loose to dense compactness. Presence of cobbles whose size doesn't exceed 0,15 meter.			CF-15		X	N	20	4-2 11-12	13	I	I	Nce=9
33–34	10														
35–36	11					CF-16		X	N	21	7-26 12-8	38	I	I	Nce=30
37–39	12														
40–41						CF-17		X	N	18	7-9 5-6	14	I	I	Nce=9
42–43	13														
44–46	14					CF-18		X	N	60	14-9 27-50 /5cm	R	I	I	AG W = 12.6
47–49	15	-8.35													
		15.00	Gray sand with some gravel and some silt, loose compactness. Traces of shells.												
50–51						CF-19		X	N	79	6-10 4-5	14	I	I	Nce=9
52–53	16														
54		-9.85													
		16.50	Gray gravelly sand with some silt, medium to dense compactness.												
55–56	17					CF-20		X	N	85	5-12 23-27	35	I	I	Nce=28
57–59	18														
60–61						CF-21		X	N	89	33-43 32-35	75	I	I	Nce=60
62–63	19														
64		-12.85													
		19.50	Gray gravelly sand with some silt, dense compactness.												
65–66	20					CF-22		X	B	66	35-29 24-35	53	I	I	AG W = 10.2
67–69	21														
70–71						CF-23		X	B	80	22-38 42-50 /5cm	R	I	I	
72	22														

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **M. Massicotte, tech. sr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

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Vertical Scale = 1 : 75

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-16-09**
Date: **2009-11-11**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185446.9 (Y)
East 251074.5 (X)
Tidal Elevation **6.65 (Z)**
Bedrock: 25.55 m End depth: 27.07 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
74–78	23		Gravelly sand with some silt, very dense compactness.			CF-24			B	87	45-68 68	136	I	I	
		-17.35 / 24.00													
79–83	24–25		Gray sand and gravel with some silt, very dense compactness. Presence of cobbles.			CR-25				32					
						CR-26				72					
		-18.90 / 25.55													
84–89	26–27		Rock : gray calcareous shale, very poor quality. The inclination of bedding and fractures of the rock varies from 15 to 85 degrees from vertical plane.			CR-27				73		16			
						CR-28				32		0			
		-20.42 / 27.07	End of sounding at 27,07 meters deep.												

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), metals (As + Hg), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **UM-2008**

Prepared by: **M. Massicotte, tech. sr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

Vertical Scale = 1 : 75

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EQ-09-Ge-66A R.1 04.03.2009

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-21-10**
Date: **2010-01-05**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185508.1 (Y)
East 251105.7 (X)
Tidal Elevation **6.45 (Z)**
Bedrock: 27.48 m End depth: 32.58 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 74

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.45													
		0.00	Concrete slab.												
		6.25 / 0.20	Backfill :gray crushed stone 20-0 mm apparent grade, frozen.			CF-1		☒	B	67	50 /15cm	R	I	I	AC
		6.00 / 0.45	Wharf's backfill : gray-brown schistose rock fragment in the form of sandy gravel with some silt, medium to very dense compactness. Presence of cobbles whose size doesn't exceed 0,15 meter.			CF-2		☒	B	49	15-18 17-12	35	I	I	
						CF-3		☒	B	8	10-12 15-10	27			
						CF-4		☒	B	8	1-2 6-6	8	I	I	
						CF-5		☒	N	57	10-18 20-50 /8cm	R	I	I	
						CF-6		☒	N	8	11-8 8-12	16	I	I	Nce= 11
						CF-7		☒	N	25	9-9 9-15	18	I	I	Nce= 12

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-21-10**
Date: **2010-01-05**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185508.1 (Y)
East 251105.7 (X)
Tidal Elevation **6.45 (Z)**
Bedrock: 27.48 m End depth: 32.58 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
30–32			Wharf's backfill : gray-brown schistose rock fragment in the form of sandy gravel with some silt, medium to very dense compactness. Presence of cobbles whose size doesn't exceed 0,15 meter.			CF-8			N	16	6-9 7-6	16	I	I	AG Nce= 11
33–36	10–11					CF-9			N	16	6-6 9-6	15	I	I	Nce= 10
37–39		-5.55													
40–43	12–13	12.00	Wharf's backfill : gray-black sand and gravel (slate) with some silt, medium to very dense compactness. Presence of cobbles with size doesn't exceeding 0,10 meter.			CF-10			B	16	10-17 17-18	34	I	I	
44–45						CR-11			NX	33					
46–47	14					CF-12			N	16	6-10 10-12	20	I	I	Nce= 11
48–50	15					CF-13			N	41	15-19 12-19	31	I	I	Nce= 25
51–53	16														
54–56	17	-10.77				CF-14			N	57	19-35 32-47	67	I	I	AG Nce= 54
57–59	18	17.22	Gray-brown gravelly sand with traces of silt, dense compactness.												
60–62	19					CF-15			B	41	24-24 24-22	48	I	I	
63		-12.95													
64–66	20	19.40	Gray gravelly sand with traces of silt, dense to very dense compactness. Presence of cobbles and boulders according on the behavior of the drill.			CF-16			B	41	24-36 36-38	72	I	I	
67–69	21														
70–72						CF-17			B	33	12-24 24-50	48	I	I	

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 74

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-21-10**
Date: **2010-01-05**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185508.1 (Y)
East 251105.7 (X)
Tidal Elevation **6.45 (Z)**
Bedrock: 27.48 m End depth: 32.58 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
73–74		-16.26													
75–76	23	22.71	Gray sand and gravel with some silt, dense to very dense compactness.			CF-18			B	49	88-64 42-28	106	I	I	
77–78															
79	24														
80–81						CF-19			B	41	10-49 50-50	99	I	I	
82	25		Presence of cobbles between 24,84 and 25,50 meters.			CR-20			NX	40					
83–84						CF-21			B	49	17-17 18-18	35	I	I	
85	26														
86–87															
88						CF-22			B	41	19-24 22-18	46	I	I	AG
89	27		Presence of cobbles between 26,98 and 27,48 meters.			CR-23			NX	36					
90		-21.03													
91		27.48	Rock: gray calcareous shale, very poor quality.			CR-24			NQ	100		0			
92	28		The inclination of the bedding and fractures of the rock varies from 60 to 90 degrees from vertical plane.			CR-25			NQ	87		0			
93–94															
95	29					CR-26			NQ	100		14			
96		-22.99	Disaggregated zone from 28,10 to 28,20 meters												
97		29.44	Rock : gray to gray-black calcareous shale, very poor to good. The inclination of the bedding and fractures of the rock varies from 45 to 90 degrees from vertical plane. Presence of calcite veins.												
98	30					CR-27			NQ	100		15			
99–100															
101	31														
102–103															
104						CR-28			NQ	100		75			U= 142,1 MPa
105	32														
106		-26.13													
107		32.58	End of sounding at 32,58 meters deep.												
108	33														
109–110															
111	34														
112–113															
114–115															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL
20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION
20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-22-10**
Date: **2010-01-07**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185541.4 (Y)
East 251121.2 (X)
Tidal Elevation **6.42 (Z)**
Bedrock: 27.40 m End depth: 32.42 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 74

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.42													
		0.00	Concrete slab.												
		6.22 / 0.20	Backfill : gray crushed stone 20-0 mm apparent grade, frozen.			TA-1							I	I	AC
	1	5.97 / 0.45													
		5.82 / 0.60	Backfill : gray crushed stone 56-0 mm apparent grade, frozen.			CF-2			N	49	15-18 12-32	30	I	I	Nce= 24
	2		Wharf's backfill : gray-brown schistose rock fragment in the form of gravel with some sand and some silt, loose to very dense compactness.			CF-3			N	16	10-18 25-50 /13cm	43	I	I	Nce= 34
	3		Presence of cobbles whose size doesn't exceed 0,20 meter.			CR-4			NX	76					
	4					CF-5			N	41	24-12 12-24	24	I	I	Nce= 18
	5		Presence of a layer of sand between 4,42 and 5,03 meters deep.			CF-6			N	16	32-18 50-35	68	I	I	Nce= 55
						CF-7			N	15	7-14 50	64	I	I	Nce= 52
	6					CF-8			N	41	14-32 28-17	60	I	I	Nce= 49
	7		Presence of a layer of sand between 6,71 and 7,32 m deep.			CF-9			N	16	10-13 15-6	28	I	I	Nce= 21
	8					CF-10			N	11	10-3 3-3	6	I	I	Nce= 4
						CF-11			N	11	8-5 5-6	10	I	I	Nce= 7

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC on RT-1 C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-22-10**
Date: **2010-01-07**

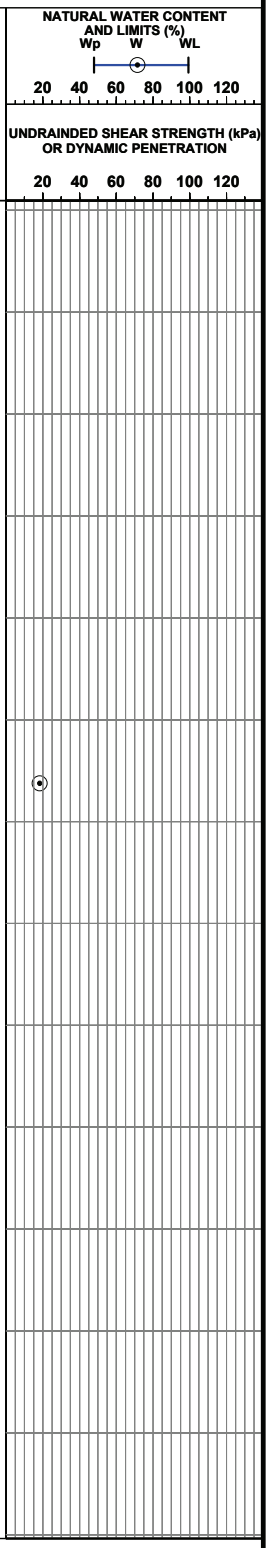
Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185541.4 (Y)
East 251121.2 (X)
Tidal Elevation **6.42 (Z)**
Bedrock: 27.40 m End depth: 32.42 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
30–32			Wharf's backfill : gray-brown schistose rock fragment in the form of gravel with some sand and some silt, loose to very dense compactness. Presence of cobbles whose size does not exceed 0,20 meter.			CF-12			N	18	8-16 50 /13cm	R	I	I	
						CR-13			NX	60					
33–34	10					CF-14			N	16	8-2 2-6	4	I	I	Nce= 2
35–36	11					CF-15			N	16	12-8 8-8	16	I	I	Nce= 11
37–39		-5.58				CF-16			N	11	12-8 7-6	15	I	I	Nce= 10
	12	12.00	Dark gray gravelly sand with traces of silt, medium to dense compactness. Presence of cobbles according on the behavior of the drill.			CF-17			N	20	5-12 25-13	37	I	I	Nce= 29
43	13					CF-18			N	41	7-7 10-13	17	I	I	Nce= 12
46	14					CF-19			N	16	10-10 9-11	19	I	I	Nce= 13
48						CF-20			N	57	14-11 17-20	28	I	I	AG Nce= 21 W = 18.3
49–50	15														
51						CF-21			N	16	11-13 21-19	34	I	I	Nce= 27
52–53	16														
54		-10.19													
55		16.61	Gray sand and gravel with traces to some silt, medium to very dense compactness. Presence of probable cobbles and/or booulders according on the behavior of the drill.			CF-22			N	74	15-20 35-50	55	I	I	Nce= 45
56–57	17														
58–59	18														
60–61						CF-23			N	41	21-30 30-35	60	I	I	Nce= 49
62–63	19														
64						CR-24			NX	70					
65–66	20					CF-25			N	49	12-22 32-32	54	I	I	Nce= 44
67–68															
69	21														
70–71						CF-26			N	49	35-25 30-30	55	I	I	Nce= 45
72															

FIELD AND LABORATORY TESTS



Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC on RT-1 C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Vertical Scale = 1 : 74

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-22-10**
Date: **2010-01-07**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185541.4 (Y)
East 251121.2 (X)
Tidal Elevation **6.42 (Z)**
Bedrock: 27.40 m End depth: 32.42 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
73–76			Gray sand and gravel with trace to some silt, medium to very dense compactness. Presence of probable cobbles and/or booulders according on the behavior of the drill.												
75	23					CF-27			N	74	2-12 15-18	27	I	I	Nce= 20
79–80	24					CF-28			N	8	10-13 13-15	26	I	I	Nce= 20
82–83	25														
85	26		Presence of pieces of wood between 25,60 and 26,21 meters.			CF-29			N	41	25-30 20-15	50	I	I	Nce= 41
89	27	-20.98				CR-30			NX	25					
90–91		27.40	Rock : gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 45 to 90 degrees from the vertical plane. Presence of calcite veins. Highly fractured zones from 27,40 to 27,55 and from 29,95 to 30,00 meters.			CR-31			NQ	100		0			
92	28														
94						CR-32			NQ	99		10			
95	29														
97						CR-33			NQ	93		0			
98	30														
100						CR-34			NQ	84		25			
101		-24.48													
101–102	31	30.90	Rock : gray to dark gray calcareous shale, poor quality. The inclination of the bedding and fractures of the rock varies from 60 to 90 degrees from the vertical plane. Presence of calcite veins.			CR-35			NQ	100		41			U= 144,3 MPa
105	32														
106		-26.00 32.42	End of sounding at 32,42 meters deep.												
108	33														
112	34														
115															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC on RT-1 C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

BOREHOLE REPORT

Client : **Publics Works and Governement Services Canada**

File n°: **P029156-0100**
Borehole n°: **TF-23-10**
Date: **2010-01-08**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185575.3 (Y)
East 251137.1 (X)
Tidal Elevation **6.57 (Z)**
Bedrock: 24.38 m End depth: 32.95 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength (Field / Laboratory)
C_U Undisturbed (kPa) ▲ ■
C_{UR} Remoulded (kPa) △ □

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.57													
		0.00	Concrete slab.												
		6.32	Backfill :												
		0.25	gray crushed stone 20-0 mm			TA-1							I	I	AG AC W = 5.4
		5.81	apparent grade, frozen.												
	1	0.76	Wharf's backfill :			CF-2			N	0	100	R			
			gray-brown schistose rock fragments in the form of gravel with some sand and traces of silt, medium to very dense compactness.			CF-3			N	0	29-24 20-20	44			Nce= 35
	2		Presence of cobbles whose size doesn't exceed 0,20 meter.			CF-4			N	8	18-24 19-23	43	I	I	Nce= 34 AC
	3					CF-5			N	8	12-45 24-15	69	I	I	Nce= 55
	4					CF-6			N	13	46-20 24-21	44	I	I	Nce= 35
	5					CF-7			N	8	30-16 18-22	34	I	I	Nce= 27
	6					CR-8			NX	25					
						CF-9			B	26	9-18 20-12	38	I	I	
	7					CR-10			NX	33					
	8					CF-11			N	23	12-11 9-11	20	I	I	Nce= 14

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL (20 40 60 80 100 120); UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION (20 40 60 80 100 120)

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC on RT-1 C10-C50, PAHs, zinc, copper, metals (As + Hg), TOC + CF-4, zinc, copper
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **M. Trudel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-23-10**
Date: **2010-01-08**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185575.3 (Y)
East 251137.1 (X)
Tidal Elevation **6.57 (Z)**
Bedrock: 24.38 m End depth: 32.95 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
31–32			Wharf's backfill : gray-brown schistose rock fragments in the form of gravel with some sand and traces of silt, medium to very dense compactness. Presence of cobbles whose size doesn't exceed 0,20 meter.			CF-12			N	0	19-33 16-16	49	I	I	Nce= 40
33–34	10					CF-13			B	8	36-24 12-13	36	I	I	
35–36	11					CF-14			N	15	11-32 33-25	65	I	I	Nce= 52
37–38						CF-15			N	16	9-12 15-16	27	I	I	Nce= 20
39–40	12					CF-16			N	13	14-15 13-14	28	I	I	Nce= 21
41–42						CF-17			N	0	15-23 24-35	47			Nce= 38
43–44	13	-7.15 / 13.72	Wharf's backfill : gray gravelly sand with traces of silt, medium to very dense compactness.			CF-18			N	16	3-12 19-24	31	I	I	Nce= 25
45–46	14					CF-19			N	33	56-42 26-18	68	I	I	Nce= 55
47–48		-8.50 / 15.07	Wharf's backfill : dark gray gravel (slate) sand with traces of silt, medium compactness.			CF-20			N	25	28-15 22-13	37	I	I	Nce= 29
49–50	15					CF-21			N	23	11-12 11-11	23	I	I	Nce= 17
51–52	16	-10.19 / 16.76	Wharf's : gray gravelly sand (slate) with some silt, very dense compactness. Presence of pieces of wood and brick.			CF-22			N	54	8-6 13-14	19	I	I	Nce= 13
53–54						CF-23			N	66	11-16 16-35	32	I	I	Nce= 26
55–56	17	-11.72 / 18.29	Presence of cobbles. Gray gravelly sand with some silt, very dense compactness.			CF-24			N	62	30-43 51-49	94	I	I	Nce= 75
57–58															
59–60	18														
61–62	19														
63–64						CF-25			N	0					
65–66	20														
67–68															
69–70	21	-15.01 / 21.58	Gray sand and gravel with some silt, very dense compactness. Presence of cobbles and boulders.			CF-26			N	28	37-50 /8cm	R	I	I	
71–72	22					CR-27			NX	24					
73															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Vertical Scale = 1 : 76

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC on RT-1 C10-C50, PAHs, zinc, copper, metals (As + Hg), TOC + CF-4, zinc, copper
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **M. Trudel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-23-10**
Date: **2010-01-08**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185575.3 (Y)
East 251137.1 (X)
Tidal Elevation **6.57 (Z)**
Bedrock: 24.38 m End depth: 32.95 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
75–77	23		Gray sand and gravel with some silt, very dense compactness. Presence of cobbles and boulders.	CF-28			N	53	105	R	I	I	
78–80	24	-17.81 / 24.38	Gray sand with some gravel and some silt, medium to very dense compactness.	CF-29			N	15	9-10 10-18	20	I	I	AG Nce= 14 W = 13.9
81–84	25												
85–88	26			CF-30			N	68	7-10 18-60 /10cm	20	I	I	Nce= 14
89–91	27			CR-31			NX	54					
92–93	28	-21.43 / 28.00	Rock : gray to dark gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 45 to 90 degrees from the vertical plane. Presence of calcite veins. Highly fractured zone from 28,00 to 28,10 meters. Highly fractured zone from 30,55 to 30,63 meters.	CR-32			NQ	88		0			
94–96	29			CR-33			NQ	100		0			
97–98				CR-34			NQ	100		0			
99–100	30			CR-35			NQ	100		0			
101–102	31			CR-36			NQ	100		15			
103–105	32	-24.86 / 31.43	Rock: gray to dark gray calcareous shale, excellent quality. The inclination of the bedding and fractures of the rock varies from 45 to 90 degrees from the vertical plane. Presence of calcite veins. End of sounding at 32,95 meters deep.	CR-37			NQ	100		15			
106–108	33	-26.38 / 32.95		CR-38			NQ	100		92			U= 64,6 MPa
109–117	34–35												

FIELD AND LABORATORY TESTS: NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; 20 40 60 80 100 120; UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION; 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC on RT-1 C10-C50, PAHs, zinc, copper, metals (As + Hg), TOC + CF-4, zinc, copper
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **M. Trudel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-24-10**
Date: **2010-01-06**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185514.9 (Y)
East 251090.2 (X)
Tidal Elevation **6.79 (Z)**
Bedrock: 19.01 m End depth: 22.87 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 89

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.79											
		0.00	Asphalt.	TA-1							I	I	
		6.66	Backfill :	CF-2			N	100	94-108 70 /8cm	R	I	I	AC
		0.13	gray crushed stone 20-0 mm										
		6.18	apparent grade, frozen.										
	1	0.61	Wharf's backfill :										
			gray schistose rock fragments in	CF-3			N	51	65-54 51-17	105	I	I	Nce= 83
			the form of gravel with some sand	CF-4			N	30	9-13 10-9	23	I	I	Nce= 18
	2		and some silt, loose to very dense compactness.	CF-5			N	30	8-15 105-46	120	I	I	Nce= 95
	3		Presence of cobbles whose size doesn't exceed 0,25 meter.	CR-6			NX	75					
				CF-7			N	10	20-15 12-13	27	I	I	Nce= 21
	4												
	5			CF-8			N	0	14-6 6-6	12			Nce= 8
				CF-9			N	21	9-18 8-4	26	P	M	Nce= 20
	6			CF-10			N	25	11-29 22-27	51	M	I	Nce= 42
	7			CF-11			N	42	69-75	R	I	I	
	8			CF-12			N	0	27-10 36-20	46			Nce= 37
				CF-13			N	15	44-35 42-30	77	I	I	Nce= 62
	9		Presence of wood.	CF-14			N	100	60 /5cm	R	I	I	
	10			CF-15			N	50	70 /10cm	R	I	I	
		-3.92		CR-16			NX	39					

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-2, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **M. Trudel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 2

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-24-10**
Date: **2010-01-06**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185514.9 (Y)
East 251090.2 (X)
Tidal Elevation **6.79 (Z)**
Bedrock: 19.01 m End depth: 22.87 m

LITHOLOGY

ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION
10.70	Gray gravelly sand with some silt, very dense compactness. Presence of cobbles.
-6.93 / 13.72	Gray sandy gravel with traces of silt, very dense compactness. Presence of cobbles and boulders.
-12.22 / 19.01	Rock: gray to dark gray calcareous shale, very poor to poor quality. The inclination of the bedding and fractures of the rock varies from 15 to 90 degrees from the vertical plane. Presence of calcite veins.
-14.53 / 21.32	Fractured zone from 19,01 to 19,40 meters.
	Rock : gray calcareous shale, medium quality.
-16.08 / 22.87	The inclination of the bedding and fractures of the rock varies from 45 to 60 degrees from vertical. Presence of calcite veins.
	End of sounding at 22,87 meters deep.
	Note : Tensile test by crushing the sample CR-34 was impossible, the core has eroded.

SAMPLES

TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
CF-17			N	72	37-57 52-59	109	I	I	Nce= 86
CF-18			N	67	80	R	I	I	
CF-19			N	70	16-60	R	I	I	
CR-20			NX	48			I	I	
CF-21			N	48	19-18 50	R	I	I	
CF-22			N	49	54-39 44-36	83	I	I	Nce= 66
CF-23			N	56	53-92 93-48	185	I	I	Nce= 145
CF-24			N	83	53-108 100	208	I	I	Nce= 162
CR-25			NX	36					
CF-26	A		N	83	70-70 /8cm	R	I	I	
CR-27	B		NX	68					
CR-28			NX	34					
CF-29			N	0	50 /5cm	R			
CR-30			NX	54					
CR-31			NQ	100		0			
CR-32			NQ	100		0			
CR-33			NQ	100		25			
CR-34			NQ	100		55			

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: The water level varies with the tide.
Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
AC : CF-2, C10-C50, PAHs, metals (Cd, Cr, Cu, Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **M. Trudel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 2

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-25-10**
Date: **2010-01-08**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185546.0 (Y)
East 251104.6 (X)
Tidal Elevation **6.72 (Z)**
Bedrock: 18.70 m End depth: 32.27 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 76

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.72													
		0.00	Asphalt.												
		6.63	Backfill:												
		0.09	gray crushed stone 20-0 mm												
		6.37	apparent grade, frozen.												
	1	0.35	Wharf's backfill :												
			schistose rock fragments.												
		5.20	The size of rock fragments												
		1.52	doesn't exceed 0,40 meter.												
	2		Wharf's backfill :												
			brown schistose rock fragment in the form of gravel and sand with trace of silt, medium to very dense compactness.												
	3		Presence of cobbles whose size doesn't exceed 0,15 meter.												
	4														
	5														
	6														
	7														
		-0.75													
		7.47	Presence of wood. (Probable box)												
	8			V											

TYPE AND NUMBER	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Odor	Visual	RESULTS
CR-1		HW	30			I	I	
CR-2		HW	81			I	I	AC
CR-3		HW	83			I	I	
CR-4		HW	64			I	I	
CF-5		N	100	59-36 20 /5cm	R	I	I	
CF-6		N	33	8-35 84-37	119	I	I	AG Nce= 94
CF-7		N	8	12-13 16-16	29	I	I	Nce= 22
CF-8		N	41	3-12 21-19	33	I	I	Nce= 26
CF-9		N	8	3-4 12-23	16	I	I	Nce= 11
CF-10		N	0	2-3 14-5	17			Nce= 12
CF-11			33	4-4 12-15	16	I	I	Nce= 11
CF-12		N	41	31-27 17-15	44	I	I	Nce= 35
CF-13		N	0	6-9 8-17	17			Nce= 23
CF-14		N	0	3-11 4-3	15			Nce= 10

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R = tensile test (Brazilian).
AC : on CR-2, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile Drill B-57**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-25-10**
Date: **2010-01-08**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185546.0 (Y)
East 251104.6 (X)
Tidal Elevation **6.72 (Z)**
Bedrock: 18.70 m End depth: 32.27 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
31		9.20	Wharf's backfill : gray-brown gravel (slate) with some sand and traces of silt, medium compactness.			CF-15			H	16	11-10 13-22	23	I	I	Nce= 12
32															
33	10														
34															
35															
36	11					CF-16			N	74	49-51 38-37	89	I	I	Nce= 86
37															
38						CF-17			N	57	52-27 27-24	54	I	I	Nce= 44
39	12					CR-18			NX	57					
40															
41		-5.99				CF-19			N	41	21-27 12-36	39	I	I	Nce= 48
42		12.71	Gray gravelly sand with some silt, medium to dense compactness. Presence of cobbles according on the behavior of the drill.												
43	13					CF-20			N	41	18-11 14-17	25	I	I	AG Nce= 19 W = 11.4
44															
45															
46	14					CF-21			N	66	25-53 30-41	83	I	I	Nce= 66
47															
48						CF-22			N	57	29-46 54-38	100	I	I	Nce= 79
49	15	-8.29													
50		15.01	Gray sand and gravel with traces to some silt, dense compactness. Presence of cobbles and boulders.												
51															
52						CR-23			NX	93					
53	16					CF-24			N	81	40-44 50 /13cm	R	I	I	AG
54															
55						CR-25			NX	42	28-42 /10cm	R	I	I	
						CF-26			N	80					
56	17					CR-27			NX	46					
57															
58						CR-28			NX	28					
59	18														
60						CF-29			N	66	17-46 63-43	109	I	I	
61		-11.98													
62		18.70	Rock : gray to gray-black calcareous shale, very poor quality. Very fractured zone from 18,70 to 20,14 meters.			CR-30			NX	42		0			
63	19					CR-31			NX	44		0			
64															
65						CR-32			NQ	91		0			
66	20	-13.42													
67		20.14	Rock : gray to dark gray calcareous shale, very poor to excellent quality. The inclination of the bedding and fractures of the rock varies from 45 to 90 degrees from the vertical plan. Presence of calcite veins.			CR-33			NQ	100		72			
68															
69	21														
70						CR-34			NQ	100		24			
71															
72	22														
73						CR-35			NQ	100		30			

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R = tensile test (Brazilian).
AC : on CR-2, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile Drill B-57**

Vertical Scale = 1 : 76

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-25-10**
Date: **2010-01-08**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185546.0 (Y)
East 251104.6 (X)
Tidal Elevation **6.72 (Z)**
Bedrock: 18.70 m End depth: 32.27 m

DEPTH - ft	DEPTH - m	ELEVATION - m DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
75	23		Rock : gray to dark gray calcareous shale, very poor to excellent quality. The inclination of the bedding and fractures of the rock varies from 45 to 90 degrees from the vertical plan. Presence of calcite veins.			CR-36			NQ	100		33			
78	24					CR-37			NQ	99		79			
81						CR-38			NQ	100		79			
84	25					CR-39			NQ	90		76			R_t= 8,03 MPa
88	26					CR-40			NQ	93		64			
91	27					CR-41			NQ	100		50			
94	28					CR-42			NQ	100		100			
98	29					CR-43			NQ	99		100			
103	30					CR-44			NQ	100		60			
105	31	-25.55													
106	32	32.27	End of sounding at 32,27 meters deep.												
108	33														
112	34														
115	35														

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%)
Wp W WL
20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION
20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R_t = tensile test (Brazilian).
AC : on CR-2, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile Drill B-57**

Prepared by: **S.-P. Gravel, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

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Vertical Scale = 1 : 76

EQ-09-Ge-66A R.1 04.03.2009

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-26-10**
Date: **2010-01-15**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185562.2 (Y)
East 251117.7 (X)
Tidal Elevation **6.86 (Z)**
Bedrock: 22.55 m End depth: 36.22 m

Sample condition: Intact, Remoulded, Lost, Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength (Field ▲ ■ / Laboratory △ □)
C_U Undisturbed (kPa)
C_{UR} Remoulded (kPa)

Vertical Scale = 1 : 79

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
		6.86													
		0.00	Asphalt.												
		6.78	Backfill :												
		0.08	gray crushed stone 20-0 mm			CF-1			N	49	14-24 24-17	48	I	I	Nce= 39 AC
		5.95	apparent grade, frozen.												
	1	0.91	Wharf's backfill :			CF-2			N	33	12-14 14-17	28	I	I	Nce= 26
	2		gray-brown schistose rock fragments in the form of gravel with some sand and some gravel, medium to very dense compactness. Presence of cobbles whose size doesn't exceed 0,15 meter.			CF-3			N	41	10-12 15-22	27			Nce= 20
	3					CF-4			N	16	10-13 13-13	26	I	I	Nce= 20
	4					CF-5			N	19	18-15 50 /8cm	R	I	I	
	5					CR-6			NX	55					
						CF-7			N	49	10-25 17-15	42	I	I	Nce= 34
	6					CF-8			N	45	18-25 50 /13cm	R	I	I	
	7					CF-9			N	15	56 /13cm	R	I	I	
		-0.61													
		7.47	Presence of pieces of wood between 7,47 and 7,61 meters deep. (Probable box)			CF-10			N	86	50 /15cm	R	I	I	
	8		Presence of pieces of wood between 8,53 and 10,36 m.			CF-11			N	41	10-10 25-8	35	I	I	Nce= 28
	9					CF-12			N	32	35-50 /8cm	R	I	I	

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120
UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R = tensile test (Brazilian).
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock cor

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 1 of 3

LVM

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-26-10**
Date: **2010-01-15**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185562.2 (Y)
East 251117.7 (X)
Tidal Elevation **6.86 (Z)**
Bedrock: 22.55 m End depth: 36.22 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
32–34	10	-3.50				CF-13			N	33	50 /15cm	R			
		10.36	Backfill : gray-brown sand and gravel (slate) with traces of silt, very dense compactness. Presence of cobbles.			CF-14			N	41	25-35 55-55	90			Nce= 72
35–39	11	-5.13				CF-15			N	82	25-30 45-49	75			AG Nce= 60
	12	11.99	Gray gravelly sand with some silt, dense to very dense compactness. Presence of cobbles according to the behavior of the drill. Presence of shells between 12,04 and 12,29 m.			CF-16			N	28	35-50 /10cm	R			
40–44	13					CF-17			B	74	25-35 38-20	73			
45–46	14					CF-18			B	66	15-18 25-18	43			
47–49	15														
50–51						CF-19			B	25	20-10 25-28	35			
52–53	16														
54–56	17					CF-20			B	25	10-17 17-14	34			AG W = 11.7
57–58			Presence of cobbles between 17,22 and 18,13 m.												
59–61	18					CF-21			B	27	7-8 25-50 /10cm	33			
62–63	19														
64–66	20					CF-22			N	58	35-49 69 /13cm	R			
67–69	21	-14.32													
70–71		21.18	Gray sandy gravel with traces to some silt, dense compactness. Presence of cobbles and boulders.			CF-23			N	8	10-16 17-20	33			Nce= 26
72–74	22														
75–76	23		Presence of cobbles between 23,00 and 23,49 m.			CF-24			N	33	35-60	R			AG
						CR-25			NX	73					

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R = tensile test (Brazilian).
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock cor

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 3

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-26-10**
Date: **2010-01-15**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185562.2 (Y)
East 251117.7 (X)
Tidal Elevation **6.86 (Z)**
Bedrock: 22.55 m End depth: 36.22 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
		23.49	Rock : dark gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 0 to 90 degrees from the vertical plane. Presence of calcite veins. Highly fractured zones from 23,49 to 23,90, from 24,15 to 24,30 and from 24,94 to 25,40 meters.			CR-26			NQ	88		0			
						CR-27			NQ	100		0			
						CR-28			NQ	56		0			
						CR-29			NQ	81		0			
						CR-30			NQ	77		0			
		-19.63				CR-31			NQ	78		0			
		26.49	Rock : gray to gray-black calcareous shale, very poor to good. The inclination of the bedding and fractures of the rock varies from 45 to 90 degrees from the vertical plane. Presence of calcite veins.			CR-32			NQ	81		0			
						CR-33			NQ	100		13			
						CR-34			NQ	100		17			
			Highly altered zone from 30,20 to 30,53 m.			CR-35			NQ	95		29			
						CR-36			NQ	100		96			
						CR-37			NQ	100		92			R_t= 6,40 MPa
						CR-38			NQ	100		88			
						CR-39			NQ	100		93			
		-29.36													
		36.22	End of sounding at 36,22 meters deep.												

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R_t = tensile test (Brazilian).
AC : CF-1, C10-C50, PAHs, metals (Cd, Cr, Cu , Ni, Pb, Zn), TOC
CF=SS=split spoon
CR=RC=Rock cor

Borehole type: **Borehole** Boring equipment: **Mobile drill B-57**

Prepared by: **G. Meunier, tech.** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 3

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Vertical Scale = 1 : 79

EQ-09-Ge-66A R.1 04.03.2009

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Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-27-10**
Date: **2010-01-10**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185582.7 (Y)
East 251121.9 (X)
Tidal Elevation **6.95 (Z)**
Bedrock: 19.81 m End depth: 35.00 m

Sample condition

Intact | Remoulded | Lost | Core

Organoleptic soil examination:
Visual aspect: Non-existent(N); Disseminated(D); Soaked(S)
Odor: Non-existent(N); Light(L); Medium(M); Persistent(P)

Sample type

SS	Split Spoon
TM	Thin wall Tube
PS	Piston Tube
RC	Rock core
TA	Auger
MA	Bulk sample
PW	LVM Mega-Sampler
FG	Frozen ground

Tests

L	Consistency Limits	O.M.	Organic Matter (%)		Water Level
W_L	Liquid Limit (%)	K	Permeability (cm/s)	N	Std Penetration test (blows/150mm)
W_P	Plastic Limit (%)	UW	Unit Weight (kN/m³)	N_C	Dyn. Penetration test (blows/300mm) ●
I_P	Plasticity Index (%)	A	Absorption (l/min. m)	σ'_P	Preconsolidation Pressure (kPa)
I_L	Liquidity Index	U	Uniaxial Compressive strength (MPa)	SCI	Soil Corrosivity Index
W	Natural Water Content (%)	RQD	Rock Quality Designation (%)		
AG	Grain Size Analysis	AC	Chemical Analysis		
S	Hydrometer analysis	P_L	Limit Pressure (kPa)		
R	Refusal	E_M	Pressuremeter Modulus (MPa)		
VBS	Methylene Blue Value	E_r	Modulus of subgrade reaction (MPa)		
RW	Rods Weight	SP_O	Segregation Potential (mm²/H °C)		

Undrained shear strength

		Field	Laboratory
C_U	Undisturbed (kPa)	▲	■
C_{UR}	Remoulded (kPa)	△	□

Vertical Scale = 1 : 60

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE
		6.95			
		0.00	Asphalt.		
		6.85 / 0.10	Backfill : gray crushed stone 20-0 mm apparent grade, frozen.		
		6.65 / 0.30	Concrete.		
		6.50 / 0.45	Backfill : gray crushed stone apparent 20-0 mm grade.		
		6.15 / 0.80	Wharf's backfill : gray-brown schistose rock fragments in the form of gravel with some sand and sandy silt with a little, loose to very dense compactness. Presence of cobbles whose size doesn't exceed 0,15 meter.		

TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
TA-1		Intact					I	I	AC
CF-2		Intact	N	10	42-120 /15cm	R	I	I	AC
CF-3		Intact	N	25	7-55 /5cm	R	I	I	
CF-4		Intact	N	20	11-15 13-29	28	I	I	Nce= 21
CR-5		Lost	NX	25					
CF-6		Lost	N	0	15-15 10-5	25			Nce= 19
CF-7		Intact	N	5	8-11 3-5	14	M	D	Nce=9
CF-8		Intact	N	33	40-28 10-5	38	M	D	Nce= 30
CF-9		Intact	N	25	10-12 14-9	26	I	I	Nce= 20

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R = tensile test (Brazilian).
AC on RT-2, C10-C50, PAHs, zinc, copper, metals (As + Ag), TOC + CF-2, zinc, copper
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **J. Launière, ing. jr** | Approved by: **S. Malenfant, Eng.** | 2010-10-04 | Page: 1 of 4

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-27-10**
Date: **2010-01-10**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185582.7 (Y)
East 251121.9 (X)
Tidal Elevation **6.95 (Z)**
Bedrock: 19.81 m End depth: 35.00 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
24–34	8–10		Presence of a piece of brick between 8,38 and 8,99 m.			CF-10			N	20	10-13 22-16	35	I	I	Nce= 28
						CF-11			N	34	52-96 41-20	137	I	I	Nce= 108
						CF-12			N	13	15-22 25-13	47	I	I	Nce= 38
						CF-13			N	54	7-7 8-12	15			Nce= 10
35–50	10–15	-3.62 / 10.57	Gray sand and gravel to gravelly sand with some silt, very dense compactness. Presence of cobbles and boulders.			CF-14			N	64	27-68 70 /12cm	R			AG
						CF-15			N	10	45 /10cm	R			
						CR-16			NX	64					
						CF-17			N	0	57 /5cm	R			
						CR-18			NX	40					
						CR-19			NX	92					
						CR-20			NX	100					
						CF-21			N	49	21-20 19-24	39			Nce= 32
			Presence of a boulder between 14,40 and 14,80 m.			CR-22			NX	42					
50–58	15–17	-8.34 / 15.29	Gray sandy gravel to gravel and sand with traces to some silt, very dense compactness. Presence of cobbles and boulders.			CF-23			N	20	73-134 /10cm	R			
						CR-24			NX	66					
						CF-25			N	0	49-52 27-25	79			Nce= 63
						CF-26			N	49	37-21 54-23	75			AG Nce= 60
						CR-27			NX	67					

FIELD AND LABORATORY TESTS — NATURAL WATER CONTENT AND LIMITS (%) Wp W WL; UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION

Vertical Scale = 1 : 60

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R = tensile test (Brazilian).
AC on RT-2, C10-C50, PAHs, zinc, copper, metals (As + Ag), TOC + CF-2, zinc, copper
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **J. Launière, ing. jr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 2 of 4

BOREHOLE REPORT

Client : **Publics Works and Governement Services Canada**

File n°: **P029156-0100**
Borehole n°: **TF-27-10**
Date: **2010-01-10**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185582.7 (Y)
East 251121.9 (X)
Tidal Elevation **6.95 (Z)**
Bedrock: 19.81 m End depth: 35.00 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam Odor	Organo. Exam Visual	RESULTS
59–60			Gray sandy gravel to gravel and sand with traces to some silt, medium to very dense compactness. Presence of cobbles and boulders.	CR-28			NX	87					
61				CF-29			N	33	16-14 7-49	21			Nce= 15
62	19												
63				CR-30			NX	30					
64–65				CF-31			N	80	37-91 /10cm	R			
				CR-32			NX	100					
66	20			CF-33			N	57	80-65 43-17	108			Nce= 85
67–68													
69	21												
70		-14.44		CR-34			NX	48					
71		21.39	Gray sand with traces of gravel and traces of silt, dense compactness. Presence of shells.	CF-35				74	0-12 27-103	39			AG Nce= 32
72	22	-15.20											
73		22.15	Rock : gray to dark gray calcareous shale, very poor quality. The inclination of the bedding and fractures of the rock varies from 15 to 80 degrees from the vertical plane. Presence of calcite veins.	CR-36			NX	64		0			
74–75													
76	23			CR-37			NQ	100		0			
77–78		-16.98		CR-38			NQ	85		0			
79	24	23.93	Rock: gray to dark gray calcareous shale, from poor to excellent quality. The inclination of the bedding and/or fracturing of the rock varies from 15 to 80 degrees from the vertical plane. Presence of calcite veins.	CR-39			NQ	100		90			
80–81													
82	25			CR-40			NQ	100		94			
83–84													
85													
86	26			CR-41			NQ	100		64			U= 152,8 MPa
87–88													
89	27		Fractured zone of 26,86 to 27,76 m.	CR-42			NQ	100		41			
90–91													
92	28			CR-43			NQ	94		94			R_t= 7,12 MPa
93													

NATURAL WATER CONTENT AND LIMITS (%) — Wp W WL — 20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION — 20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R_t = tensile test (Brazilian).
AC on RT-2, C10-C50, PAHs, zinc, copper, metals (As + Ag), TOC + CF-2, zinc, copper
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **J. Launière, ing. jr** Approved by: **S. Malenfant, Eng.** 2010-10-04 Page: 3 of 4

Client :

Publics Works and Governement Services Canada

BOREHOLE REPORT

File n°: **P029156-0100**
Borehole n°: **TF-27-10**
Date: **2010-01-10**

Project: **Reconstruction of Section 98 of the Queen's wharf**

Location: **101, Champlain boulevard, Quebec City**

Coordinates (m): North 5185582.7 (Y)
East 251121.9 (X)
Tidal Elevation **6.95 (Z)**
Bedrock: 19.81 m End depth: 35.00 m

DEPTH - ft	DEPTH - m	ELEVATION - m / DEPTH - m	SOIL OR BEDROCK DESCRIPTION	SYMBOLS	WATER LEVEL (m) / DATE	TYPE AND NUMBER	SUB-SAMPLE	CONDITION	SIZE	RECOVERY %	Blows/150mm	"N" or RQD	Organo. Exam: Odor	Organo. Exam: Visual	RESULTS
94			Rock : gray to dark gray calcareous shale, from poor to excellent quality. The inclination of the bedding and fractures of the rock varies from 15 to 80 degrees from the vertical plane. Presence of calcite veins.												
95	29					CR-44			NQ	100		81			
96															
97															
98															
99	30														
100															
101						CR-45			NQ	100		100			
102	31														
103															
104															
105	32														
106						CR-46			NQ	100		82			
107															
108	33														
109															
110						CR-47			NQ	100		100			
111	34														
112		-27.47													
113		34.42	End of sounding at 34,42 meters deep.												
114															
115	35														
116															
117															
118	36														
119															
120															
121	37														
122															
123															
124															
125	38														
126															
127															

FIELD AND LABORATORY TESTS

NATURAL WATER CONTENT AND LIMITS (%)
Wp W WL
20 40 60 80 100 120

UNDRAINDED SHEAR STRENGTH (kPa) OR DYNAMIC PENETRATION
20 40 60 80 100 120

Remarks: Nce = Index "N" corrected (approximate). Index "N" only valid for a sample size "B".
R_t = tensile test (Brazilian).
AC on RT-2, C10-C50, PAHs, zinc, copper, metals (As + Ag), TOC + CF-2, zinc, copper
CF=SS=split spoon
CR=RC=Rock core

Borehole type: **Borehole** Boring equipment: **Mobile drill B-31**

Prepared by: **J. Launière, ing. jr** | Approved by: **S. Malenfant, Eng.** | 2010-10-04 | Page: 4 of 4

Appendix 3 Structural data of the rock

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-01-09*	PAGE:	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*12.24 to 14.72 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
12.24	13.34	- 17.83	- 18.93	CR-15	27	80	St, A	45	22	4	95.3	-	Lr	Du	Fr, La		
13.34	14.11	- 18.93	- 19.70	CR-16	57	62	St, A	45-70	21	4	-	T	Lr	Du	Fr, La		
14.11	14.72	- 19.70	- 20.31	CR-17	33	100	St, A	45	> 30	< 2	-	-	Lr	Du	Fr, La		Presence of mechanical fractures.

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-02-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*12,80 to 17,65 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
12,80	13,21	- 13,76	- 14,17	CR-14	0	61	St, A	-	> 30	< 2	-	T	Lr	Du	La		Very fractured.
13,21	13,89	- 14,17	- 14,85	CR-15	13	100	St, A	15-80	20	4	-	-	Lr	Du	La		Very fractured.
13,89	14,58	- 14,85	- 15,54	CR-16	0	100	St	10-45	20	3	-	-	Lr	Du	La		Very fractured.
14,58	15,14	- 15,54	- 16,10	CR-17	0	100	St	10-45	12	5	-	-	Lr	Du	La		Very fractured.
15,14	15,64	- 16,10	- 16,60	CR-18	0	100	St	30-45	18	3	-	-	Lr	Du	La		Very fractured.
15,64	16,52	- 16,60	- 17,48	CR-19	34	100	St	30-45	13	7	-	-	Lr	Du	Fr, La		
16,52	17,65	- 17,48	- 18,61	CR-20	97	100	St	45	3	56	-	-	Lr	Du	Fr		

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	P029156-0100	DATE:	2009-11-17
		DRILL HOLE NO:	TF-03-09	PAGE	1 OF 1
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	13,61 to 17,94 m	CALIBRE:	NQ

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
13,61	14,21	- 14,74	- 15,34	CR-16	0	100	St, A	10-80	> 35	< 2	-	T	Lr	Du	La		Very fractured.
14,21	15,02	- 15,34	- 16,15	CR-17	26	100	St, A	45-70	> 35	< 2	-	-	Lr	Du	La		Very fractured.
15,02	15,45	- 16,15	- 16,58	CR-18	0	100	St, A	45-80	> 35	< 1	-	-	Lr	Du	La		Very fractured.
15,45	16,14	- 16,58	- 17,27	CR-19	26	100	St, A	30-80	20	8	-	-	Lr	Du	Fr		Very fractured.
16,14	16,87	- 17,27	- 18,00	CR-20	36	100	St	30-80	16	5	-	-	Lr	Du	Fr		
16,87	17,94	- 18,00	- 19,07	CR-21	48	100	St	10-90	12	10	105,1	T	Lr	Du	Fr		

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-04-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*12,37 to 17,07 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
12,37	13,01	- 17,69	- 18,33	CR-13	56	100	St, A	10-80	7	11	-	T	Lr	Du	La		
13,01	14,11	- 18,33	- 19,43	CR-14	39	100	St, A	15-85	> 35	< 3	-	T	Lr	Du	La		Very fractured.
14,11	14,36	- 19,43	- 19,68	CR-15	0	100	St. A	30-60	16	2	-	-	Lr	Du	La		Very fractured.
14,36	15,29	- 19,68	- 20,61	CR-16	0	75	St, A	15-80	> 35	< 3	-	Pr	Lr	Du	La		Very fractured.
15,29	15,82	- 20,61	- 21,14	CR-17	58	100	St	30-80	9	7	-	-	Lr	Du	La, Fr		
15,82	17,07	- 21,14	- 22,39	CR-18	46	100	St	30-85	20	7	-	-	Lr	Du	La, Fr		

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	P029156-0100	DATE:	2009-11-17
		DRILL HOLE NO:	TF-05-09	PAGE	1 OF 1
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	10,21 to 13,93 m	CALIBRE:	NQ

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Remarques ROC : Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
10,21	10,36	- 22,32	- 22,47	CR-10	0	100	St, A	-	> 35	< 1	-	Pr	Lr	Du	La		Very fractured.
10,36	10,88	- 22,47	- 22,99	CR-11	0	100	St, A	30-70	> 35	< 2	-	T	Lr	Du	La		Very fractured.
10,88	11,24	- 22,99	- 23,35	CR-12	0	100	St, A	15-45	> 35	< 2	-	T	Lr	Du	La		Very fractured.
11,24	11,61	- 23,35	- 23,72	CR-13	0	100	St, A	15-45	> 35	< 2	-	-	Lr	Du	La		Very fractured.
11,61	12,33	- 23,72	- 24,44	CR-14	35	100	St	10-85	20	4	-	-	Lr	Du	La, Fr		
12,33	12,40	- 24,44	- 24,51	CR-15	0	71	St, A	-	-	-	-	-	Lr	Du	La, Fr		
12,40	13,93	- 24,51	- 26,04	CR-16	67	100	St	30-80	21	8	-	-	Lr	Du	Fr		

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-06-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*10,82 to 15,01 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
10,82	11,29	- 22,57	- 23,04	CR-9	0	76	St, A	45-80	22	2	-	T	Lr	Du	La	-	Very fractured.
11,29	11,50	- 23,04	- 23,25	CR-10	0	100	St, A	30-80	10	2	-	T	Lr	Du	La, Fr	-	Very fractured.
11,50	12,93	- 23,25	- 24,68	CR-11	22	100	St, A	30-85	35	4	-	-	Lr	Du	Fr	-	Very fractured.
12,93	15,01	- 24,68	- 26,76	CR-12	56	100	St	30-85	25	7	-	-	Lr	Du	Fr	-	

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	P029156-0100	DATE:	2009-11-17
		DRILL HOLE NO:	TF-07-09	PAGE	1 OF 1
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	16,84 to 21,01 m	CALIBRE:	NQ

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Remarques ROC : Grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
De	À	De	À		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
16,84	17,52	- 22,26	- 22,94	CR-18	16	100	St, A	45-85	21	3	-	-	Lr	Du	Fr, La	-	Very fractured.
17,52	18,11	- 22,94	- 23,53	CR-19	0	100	St, A	-	> 30	< 2	-	T	Lr	Du	La	-	Very fractured.
18,11	18,74	- 23,53	- 24,16	CR-20	0	100	St, A	15-85	> 20	< 3	-	T	Lr	Du	La	-	Very fractured. Presence of mechanical fractures
18,74	19,33	- 24,16	- 24,75	CR-21	31	100	St, A	15-45	> 30	< 2	7,5	T	Lr	Du	La	-	Low value of U due of the line stratification in the sample. Very fractured.
19,33	20,13	- 24,75	- 25,55	CR-22	46	100	St	45-85	14	6	-	-	Lr	Du	Fr	-	Rt = 5,74 MPa Rt = tensile strength by crushing (Brazilian test).
20,13	21,01	- 25,55	- 26,43	CR-23	56	82	St, A	45-85	8	13	-	-	Lr	Du	Fr	-	

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-08-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*25,56 to 30,10 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
25,56	26,30	- 19,09	- 20,13	CR-26	0	100	St, A	-	> 30	< 2	-	T	Lr	Du	La	-	Very fractured.
26,30	27,38	- 20,13	- 21,21	CR-27	33	100	St, A	45-85	> 30	< 3	-	T	Lr	Du	La	-	Very fractured. Presence of mechanical fractures
27,38	28,56	- 21,21	- 22,39	CR-28	11	100	St, A	15-85	> 30	< 4	-	T	Lr	Du	La	-	Very fractured.
28,56	30,10	- 22,39	- 23,93	CR-29	33	100	St, A	45-85	29	6	-	T	Lr	Du	Fr, La	-	Very fractured. Presence of mechanical fractures

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-09-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*24,82 to 27,20 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
24,82	25,89	- 18,25	- 19,32	CR-22	0	28	St, A	-	> 50	< 2	-	T	Lr	Du	La	-	Very fractured.
25,89	26,19	- 19,32	- 19,62	Cr-23	0	100	St, A	45-60	7	5	-	T	Lr	Du	La	-	Very fractured.
26,19	26,60	- 19,62	- 20,03	CR-24	0	68	St, A	45-60	10	5	-	T	Lr	Du	La, Co	-	Very fractured.
26,60	27,20	- 20,03	- 20,63	CR-25	20	100	St, A	45-70	17	4	-	T	Lr	Du	La, Co	-	Very fractured.

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-10-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*19,51 to 21,73 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
19,51	20,21	- 12,81	- 13,51	CR-20	0	46	St, A	-	> 30	< 2	-	T	Lr	Du	Fr, La		Very fractured.
20,21	21,73	- 13,51	- 15,03	CR-21	29	100	St, A	20-85	35	4	-	T, Pr	Lr	Du	La		Very fractured. Presence of mechanical fractures

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF
THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-11-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*10,00 to 19,37 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
10,00	10,57	- 3,27	- 3,84	CR-15	0	53	St, A	10-30	8	8	-	T	Lr	Du	La	-	Very fractured.
10,57	11,17	- 3,84	- 4,44	CR-16	0	100	St, A	30-85	> 30	< 2	-	Pr	Lr	Du	La	-	Very fractured.
11,17	11,58	- 4,44	- 4,85	CR-17	24	100	St, A	15-45	> 30	< 2	-	T	Lr	Du	La	-	Very fractured. Presence of mechanical fractures.
11,58	12,80	- 4,85	- 6,07	CR-18	84	96	St, A	45	8	17	-	-	Lr	Du	Fr	-	Presence of mechanical fractures.
12,80	13,89	- 6,07	- 7,16	CR-19	22	91	St, A	45	16	7	-	-	Lr	Du	Fr, La	-	
13,89	14,91	- 7,16	- 8,18	CR-20	10	31	St, A	45-85	> 30	< 3	-	-	Lr	Du	La	-	Very fractured.
14,91	16,43	- 8,18	- 9,70	CR-21	70	100	St	15-45	12	14	19,0	-	Lr	Du	Fr	-	Low value of U due to the laminating line.
16,43	17,95	- 9,70	- 11,22	CR-22	82	100	St	45-85	15	11	-	-	Lr	Du	Fr	-	Rt = 0,61 MPa Rt = tensile strenght by crushing (Brazilian test). Low value of Rt due to the laminating line.
17,95	19,37	- 11,22	- 12,64	CR-23	61	100	St, A	30-85	16	9	-	-	Lr	Du	Fr	-	

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

PROJECT:	Reconstruction of section 98 of Queen's warf	FILE NO:	*P029156-0100*	DATE:	*2009-11-25*
		DRILL HOLE NO:	*TF-12-09*	PAGE	*1* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*13,22 to 22,50 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
13,22	13,99	- 6,42	- 7,19	CR-17	18	100	St, A	15-60	> 30	< 3	-	T	Lr	Du	La	-	Very fractured.
13,99	14,63	- 7,19	- 7,83	CR-18	22	100	St, A	45	16	4	-	-	Lr	Du	La	-	Very fractured.
14,63	14,98	- 7,83	- 8,18	CR-19	0	100	St, A	15-45	> 30	< 2	-	-	Lr	Du	La	-	Very fractured.
14,98	15,46	- 8,18	- 8,66	CR-20	0	100	St, A	10-60	> 30	< 2	-	T	Lr	Du	La	-	Very fractured.
15,46	16,31	- 8,66	- 9,51	CR-21	45	92	St, A	15-85	12	8	-	-	Lr	Du	Fr	-	Presence of mechanical fractures.
16,31	16,68	- 9,51	- 9,88	CR-22	27	89	St	45-70	9	5	-	T	Lr	Du	Fr, La	-	
16,68	17,13	- 9,88	- 10,33	CR-23	76	100	St	45-85	5	11	-	-	Lr	Du	Fr	-	
17,13	18,65	- 10,33	- 11,85	CR-24	96	100	St	45	6	30	-	-	Lr	Du	Fr	-	
18,65	20,13	- 11,85	- 13,33	CR-25	57	100	St, A	15-70	19	8	-	-	Lr	Du	Fr, La	-	Presence of mechanical fractures.

Notes explicatives:

(1) diaclase (Di); stratification (St); clivage (Cl); schistosité (Sc); autres (A)

(2) U: résistance en compression simple de la roche intacte.

(3) traces de sol (T); partiellement remplie de sol (Pr); remplie de sol (Rs);

(4) surface rugueuse (Ru); légèrement rugueuse (Lr); non rugueuse ou polie (Nr);

(5) surface dure (Du); tendre (Te);

(6) surface fraîche (Fr); colorée (Co); légèrement altérée (La); désintégrée (Dés)

PROJECT:	Reconstruction of section 98 of Queen's warf	FILE NO:	*P029156-0100*	DATE:	*2009-11-25*
		DRILL HOLE NO:	*TF-12-09*	PAGE	*2* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*13,22 to 22,50 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
20,13	21,69	- 13,33	- 14,89	CR-26	93	99	St, A	15-85	10	17	-	-	Lr	Du	Fr, La	-	Presence of mecanical fracture
21,69	22,50	- 14,89	- 15,70	CR-27	68	100	St	15-85	9	10	-	-	Lr	Du	Fr	-	

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-13-09*	PAGE	*1* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*21,76 to 34,84 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
De	À	De	À		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
21,76	22,86	- 15,06	- 16,16	CR-22	46	98	St, A	70-90	> 25	< 4	-	-	Lr	Du	La		Very fractured.
22,86	23,85	- 16,16	- 17,15	CR-23	17	100	St, A	0-90	> 35	< 3	-	T	Lr	Du	La		Very fractured.
23,85	24,28	- 17,15	- 17,58	CR-24	0	100	St	15-30	16	3	-	-	Lr	Du	La		Very fractured.
24,28	24,74	- 17,58	- 18,04	CR-25	0	65	St. A	30-80	10	5	-	-	Lr	Du	La		Very fractured.
24,74	25,40	- 18,04	- 18,70	CR-26	0	76	St	15-30	12	6	-	-	Lr	Du	La		Very fractured.
25,40	27,00	- 18,70	- 20,30	CR-27	76	100	St	15-80	16	11	-	-	Lr	Du	Fr		
27,00	28,65	- 20,30	- 21,95	CR-28	76	100	St	45-85	12	15	-	-	Lr	Du	Fr		
28,65	30,20	- 21,95	- 23,50	CR-29	83	100	St	45-85	12	14	-	-	Lr	Du	Fr		
30,20	31,72	- 23,50	- 25,02	CR-30	80	100	St	45-80	11	15	-	-	Lr	Du	Fr		

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-13-09*	PAGE	*2* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*21,76 to 34,84 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
De	À	De	À		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
31,72	33,24	- 25,02	- 26,54	CR-31	89	100	St	45-80	7	25	-	-	Lr	Du	Fr		
33,24	34,84	- 26,54	- 28,14	CR-32	86	100	St	45	7	27	-	-	Lr	Du	Fr		

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-14-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*21,70 to 34,07 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
21,70	21,82	- 15,01	- 15,13	CR-24	0	100	St, A	-	> 20	< 1	-	T	Lr	Du	La		Very fractured.
21,82	23,11	- 15,13	- 16,42	CR-25	26	100	St, A	-	> 60	< 2	86,8	T	Lr	Du	La		Very fractured.
23,11	24,71	- 16,42	- 18,02	CR-26	45	100	St, A	30-45	20	8	-	-	Lr	Du	La, Fr		Presence of mechanical fractures.
24,71	26,31	- 18,02	- 19,62	CR-27	90	100	St	45-70	13	13	-	-	Lr	Du	Fr		
26,31	27,91	- 19,62	- 21,22	CR-28	67	100	St	30-60	13	13	-	-	Lr	Du	Fr		
27,91	29,51	- 21,22	- 22,82	CR-29	91	100	St	45-70	9	20	-	-	Lr	Du	Fr		
29,51	31,03	- 22,82	- 24,34	CR-30	94	100	St	45-70	5	40	-	-	Lr	Du	Fr		
31,03	32,55	- 24,34	- 25,86	CR-31	82	100	St	20-70	11	15	-	-	Lr	Du	Fr		
32,55	34,07	- 25,86	- 27,38	CR-32	82	100	St	15-75	10	17	-	-	Lr	Du	Fr		Presence of mechanical fractures.

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-15-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*25,98 to 27,25 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
25,98	26,39	- 19,31	- 19,72	CR-26	0	49	St, A	-	> 30	< 2	-	Pr	Lr	Du	Dés	-	Very fractured.
26,39	26,54	- 19,72	- 19,87	CR-27	0	100	St, A	-	> 30	< 1	-	Tr	Lr	Du	La	-	Rt = 5,13 MPa Rt = tensile strenght by crushing (Brazilian test) Very fractured.
26,54	27,25	- 19,87	- 20,58	CR-28	0	100	St, A	-	> 30	< 2	-	Tr	Lr	Du	La	-	Very fractured.

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0100*	DATE:	*2009-11-17*
		DRILL HOLE NO:	*TF-16-09*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*25,55 to 27,07 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
De	À	De	À		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
25,55	26,44	- 18,90	- 19,79	CR-27	16	73	St, A	15-85	> 30	< 3	-	-	Lr	Du	La, Co	-	Very fractured.
26,44	27,07	- 19,79	- 27,07	CR-28	0	32	St, A	-	> 30	< 2	-	-	Lr	Du	La	-	Very fractured.

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-11*
		DRILL HOLE NO:	*TF-21-10*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*27, 48 to 32,58 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
27,48	27,91	-21,03	-21,46	CR-24	0	100	St, A	75-90	26	1,6	---	Pr	Lr	Du	La	---	
27,91	28,73	-21,46	-22,28	CR-25	0	87	St, A	60-90	>30	---	---	Pr	Lr	Du	Dés.	---	Disaggregated zone from 28.10 to 28.20 meters.
28,73	29,44	-22,28	-22,49	CR-26	14	100	St, A	60-90	13	5,1	---	T	Lr	Du	La	---	Presence of calcite veins
29,44	30,96	-22,49	-24,51	CR-27	15	100	St	60-90	30	4,9	---	T	Lr	Du	Fr	---	Presence of calcite veins
30,96	32,58	-24,51	-26,13	CR-28	75	100	St	45-60	9	16,2	142,1	---	Lr	Du	Fr	---	

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-15*
		DRILL HOLE NO:	*TF-22-10*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*27,40 to 32,42 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
27,40	27,94	-20,98	-21,52	CR-31	0	100	ST, A	45-70	17	3,0	---	Pr	Lr	Du	La	---	Very fractured zone between 27,40 to 27,55 meters.
27,94	29,46	-21,52	-23,04	CR-32	10	99	St, A	45-90	23	6,3	---	T	Lr	Du	La	---	
29,46	29,90	-23,04	23,48	CR-33	0	93	St, A	60-90	14	2,9	---	T	Lr	Du	Fr	---	
29,90	30,90	-23,48	-24,48	CR-34	25	84	St, A	45-90	21	4,5	---	T	Lr	Du	Fr	---	Fractured zone between 29,95 to 30,05 meters. Presence of calcite veins
30,90	32,42	-24,48	-26,00	CR-35	41	100	St, A	60-90	24	6,1	144,3	---	Lr	Du	Fr	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-15*
		DRILL HOLE NO:	*TF-23-10*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*28,00 to 32,95m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
28,00	28,42	-21,43	-21,85	CR-32	0	88	St, A	45-60	7	5,3	---	Pr	Lr	Du	La	---	Very fractured zone between 28,00 à 28,10 meters.
28,42	28,85	-21,85	-22,28	CR-33	0	100	St, A	45-60	12	3,3	---	Pr	Lr	Du	La	---	
28,85	29,49	-22,28	-22,92	CR-34	0	100	St, A	45-60	16	3,8	---	T	Lr	Du	Fr	---	
29,49	29,91	-22,92	-23,34	CR-35	0	100	St, A	45-90	7	5,3	---	---	Lr	Du	Fr	---	
29,91	30,63	-23,34	-24,06	CR-36	15	100	St,A	45-90	14	4,8	---	---	Lr	Du	Fr	---	Very fractured zone between 30,55 à 30,63 meters.
30,63	31,43	-24,06	-24,86	CR-37	15	100	St, A	60-90	14	5,3	---	---	Lr	Du	Fr	---	
31,43	32,95	-24,86	-26,38	CR-38	92	100	St, A	45-90	11	12,7	64,6	---	Lr	Du	Fr	---	

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-11*
		DRILL HOLE NO:	*TF-24-10*	PAGE	*1* OF *1*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*19,01 to 22,87 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
19,01	19,40	-12,22	-12,61	CR-31	0	100	St, A	---	>30	<1	---	Pr	Lr	Du	Dés.	---	Very fractured
19,40	19,80	-12,61	-13,01	CR-32	0	100	St, A	15-45	6	6	---	---	Lr	Du	La	---	
19,80	21,32	-13,01	-14,53	CR-33	25	100	St, A	15-90	20	7	---	---	LR	Du	Fr	---	Presence of calcite veins
21,32	22,87	-14,53	-16,08	CR-34	55	100	St, A	45-60	16	9	---	---	Lr	Du	Fr	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	P029156-0101	DATE:	2010-01-25
		DRILL HOLE NO:	TF-25-10	PAGE	1 OF 2
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	18,70 to 32,27 m	CALIBRE:	NQ

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
18,70		-11,98		CR-30	0	42	---	---	---	---	---	---	---	---	---	---	Very fractured rock, core with a sample size NX
	19,58		12,86	CR-31	0	44	---	---	---	---	---	---	---	---	---	---	Very fractured rock, core with a sample size NX.
19,58	20,14	-12,86	-13,42	CR-32	0	91	St, A	-	>30	<1	---	Pr	Lr	Du	La	---	Very fractured rock
20,14	21,01	-13,42	-14,29	CR-33	72	100	St, A	60-90	9	8,7	---	T	Lr, Nr	Du	La	---	Presence of calcite veins
21,01	21,83	-14,29	-15,11	CR-34	24	100	St, A	60-90	14	5,5	---	Pr	Lr	Du	La	---	Presence of calcite veins
21,83	22,37	-15,11	-15,65	CR-35	30	100	St, A	45-80	12	4,2	---	T	Lr	Du	Fr	---	
22,37	23,33	-15,65	-16,61	CR-36	33	100	St, A	60-90	17	5,3	---	T	Lr	Du	La	---	Presence of calcite veins
23,33	24,06	-16,61	-17,34	CR-37	79	99	St	60-90	5	12,2	---	---	Lr	Du	Fr	---	
24,06	25,21	-17,34	18,49	CR-38	79	100	St, A	45-90	10	10,5	---	---	Lr	Du	Fr	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-25*
		DRILL HOLE NO:	*TF-25-10*	PAGE	*2* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*18,70 to 32,27 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
25,21	26,19	-18,49	-19,47	CR-39	76	90	St, A	60-90	6	14,0	---	---	Lr	Du	Fr	---	Rt = 8,03 MPa Rt = Tensile strength by crushing (Brezilian test).
26,19	27,47	-19,47	-20,75	CR-40	64	93	St	60-90	15	8,0	---	---	Lr, Nr	Du	La	---	Presence of calcite veins
27,47	28,21	-20,75	-21,49	CR-41	50	100	St	45-90	14	4,9	---	---	Lr	Du	Fr	---	Presence of calcite veins
28,21	29,24	-21,49	-22,52	CR-42	100	100	St	60-80	6	14,7	---	---	Lr Nr	Du	Fr	---	Presence of calcite veins
29,24	30,76	-22,52	-24,04	CR-43	100	99	St	60-80	7	19,0	---	---	Lr	Du	Fr	---	Presence of calcite veins
30,76	32,27	-24,04	-25,53	CR-44	60	100	St, A	45-90	15	9,4	---	---	Lr	Du	Fr	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-18*
		DRILL HOLE NO:	*TF-26-10*	PAGE	*1* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*23,49 to 36,22 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
23,49	23,90	-16,63	-17,04	CR-26	0	88	St, A	60-90	>20	<1	---	Pr	Lr	Du	La	---	Very fractured rock
23,90	24,40	-17,04	-17,54	CR-27	0	100	St, A	50-90	17	2,7	---	Pr	Lr	Du	La	---	Very fractured zone between 24,15 to 24,30 meters
24,40	24,94	-17,54	-18,08	CR-28	0	56	St, A	0-90	>20	<1	---	Pr	Lr	Du	La	---	Very fractured rock
24,94	25,53	-18,08	-18,67	CR-29	0	81	St, A	0-90	>30	<1	---	T	Lr	Du	La	---	Very fractured zone between 24,94 à 25,40 meters.
25,53	26,26	-18,67	-19,40	CR-30	0	77	St, A	0-60	14	4,9	---	T	Lr	Du	Fr	---	Presence of calcite veins
26,26	26,49	-19,40	-19,63	CR-31	0	78	St, A	60-80	3	5,8	---	Pr	Lr	Du	Fr	---	
26,49	27,17	-19,63	-20,31	CR-32	0	81	St, A	45-70	8	7,5	---	---	Lr	Du	Fr	---	Presence of calcite veins
27,17	28,00	-20,31	-21,14	CR-33	13	100	St	45-60	13	6,0	---	---	Lr	Du	Fr	---	
28,00	29,20	-21,14	-22,34	CR-34	17	100	St, A	60-90	23	5,2	---	---	Lr	Du	La	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-18*
		DRILL HOLE NO:	*TF-26-10*	PAGE	*2* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*23,49 to 36,22 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
29,20	30,53	-22,34	-23,67	CR-35	29	95	St, A	0-90	20	6,3	---	---	Lr	Du	Dés.	---	Very altered zone between 30,20 à 30,53 meters.
30,53	31,61	-23,67	-24,79	CR-36	96	100	St, A	50-60	4	22,4	---	---	Lr, Nr	Du	Fr	---	Presence of calcite veins
31,65	33,17	-24,79	-26,31	CR-37	92	100	St	45-60	9	15,2	---	---	Lr, Nr	Du	Fr		Rt = 6,40 MPa Rt = Tensile strength by crushing (Brezilian test) Presence of calcite veins
33,17	34,69	-26,31	-27,83	CR-38	88	100	St	30-60	6	21,7	---	---	Lr, Nr	Du	Fr	---	Presence of calcite veins
34,69	36,22	-27,83	-29,36	CR-39	93	100	St, A	60-90	6	21,8	---	---	Lr, Nr	Du	Fr	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	P029156-0101	DATE:	2010-01-25
		DRILL HOLE NO:	TF-27-10	PAGE	1 OF 2
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	22,15to 24,42 m	CALIBRE:	NQ

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
22,15	22,69	-15,20	-15,74	CR-36	0	64	---	---	---	---	---	---	---	---	---	---	Core with samples size NX
22,69	23,73	-15,74	-16,78	CR-37	0	100	St, A	15-80	23	4,3	---	T	Lr	Du	La	---	
23,73	23,93	-16,78	-16,98	CR-38	0	85	St, A	---	>30	<1	---	Pr	Lr	Du	La	---	Very fractured roc
23,93	24,71	-16,98	-17,76	CR-39	90	100	St, A	45-60	5	13,0	---	T	Lr	Du	Fr	---	Presence of calcite veins
24,71	25,34	-17,76	-18,39	CR-40	94	100	St	45	1	31,5	---	---	Lr	Du	Fr	---	
25,34	26,86	-18,39	-19,91	CR-41	64	100	St, A	15-80	13	10,8	152,8	---	Lr	Du	Fr, La	---	Presence of calcite veins
26,86	27,76	-19,91	-20,81	CR-42	41	100	St, A	15-80	14	6,0	---	---	Lr, Nr	Du	La	---	Presence of calcite veins
27,76	28,38	-20,81	-21,43	CR-43	94	94	St	45-60	2	20,6	---	---	Lr, Nr	Du	Fr	---	Rt = 7,12 MPa Rt = Tensile strength by crushing (Brezilian test)
28,38	29,90	-21,73	-22,95	CR-44	81	100	St, A	15-80	11	12,6	---	---	Lr	Du	Fr, La	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

STRUCTURAL DATA OF

THE ROCK

PROJECT:	Reconstruction of section 98 of Queen's wharf	FILE NO:	*P029156-0101*	DATE:	*2010-01-25*
		DRILL HOLE NO:	*TF-27-10*	PAGE	*2* OF *2*
Location:	101 Champlain Boulevard, Quebec City	DEPTH (m):	*22,15 to 24,42 m*	CALIBRE:	*NQ*

Run (m)		Elevation (m)		Sample no	RQD	Recovery	Discontinuity associated with	Angle in relation to the axis of the core sample	Number of discontinuities	Average spacing	U (MPa)	Conditions of the discontinuities				Water loss	Notes ROCK: Grey to dark grey, calcareous shale
												Fill	Roughness	Hardness	Alteration		
From	To	From	To		(%)	(%)	(1)	(deg)		(cm)	(2)	(3)	(4)	(5)	(6)	(%)	
29,90	31,42	-22,95	-24,47	CR-45	100	100	St	45-60	4	30,4	---	---	Lr	Du	Fr	---	
31,42	32,94	-24,47	-25,99	CR-46	82	100	St	45-60	7	19,0	---	---	Lr	Du	Fr, La	---	Presence of calcite veins
32,94	34,42	-25,99	-27,47	CR-47	100	100	St	45-60	3	37,0	---	---	Lr	Du	Fr	---	Presence of calcite veins

Explanatory notes:

(1) joint (Di); stratification (St); cleavage (Cl); schistosity (Sc); other (A)

(2) U: uniaxial compressive strength of the intact rock.

(3) traces of soil (T); partially filled with soil (Pr); filled with soil (Rs);

(4) rough (Ru); slightly rough (Lr); smooth or polished surface (Nr);

(5) hard (Du); soft (Te) surface;

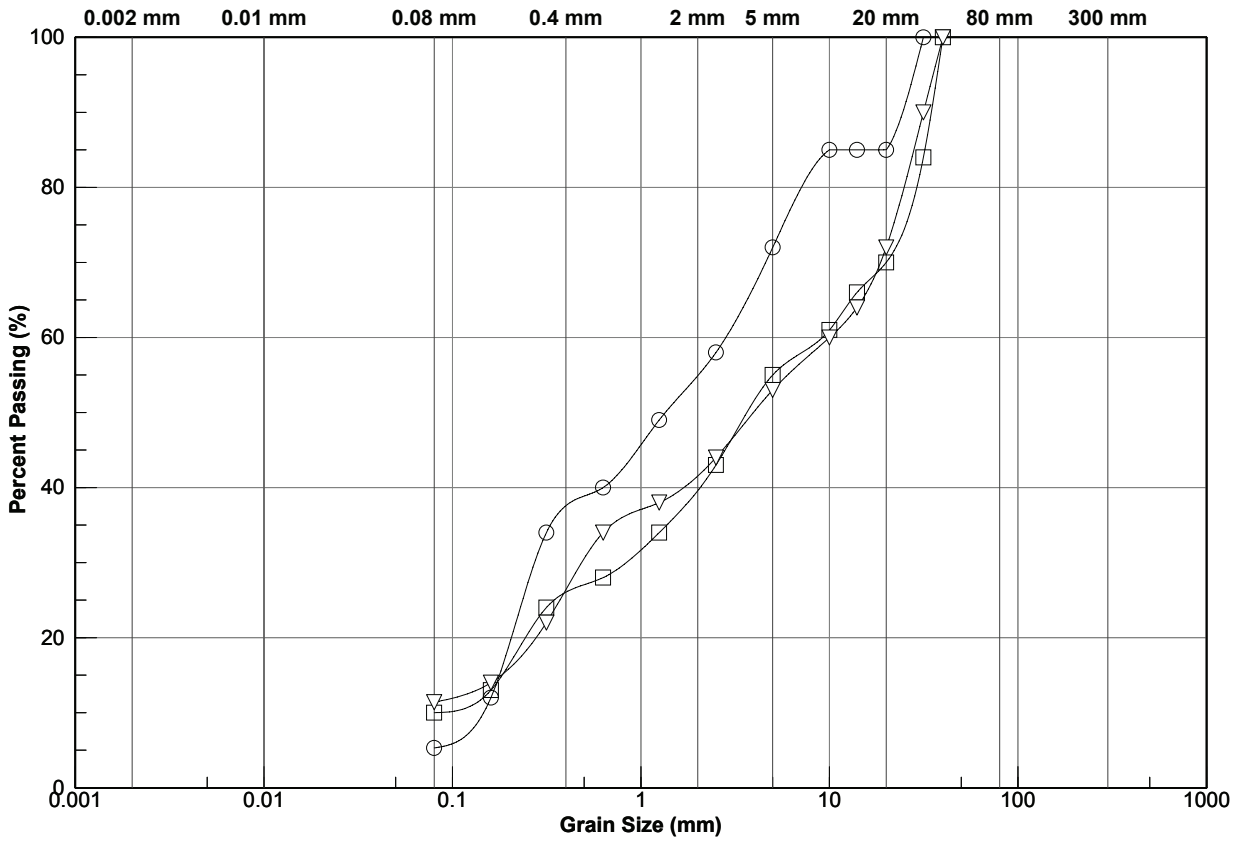
(6) fresh (Fr); coloured (Co); slightly altered (La); disintegrated (Dés) surface

Appendix 4 Results of the laboratory geotechnical tests

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **1**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



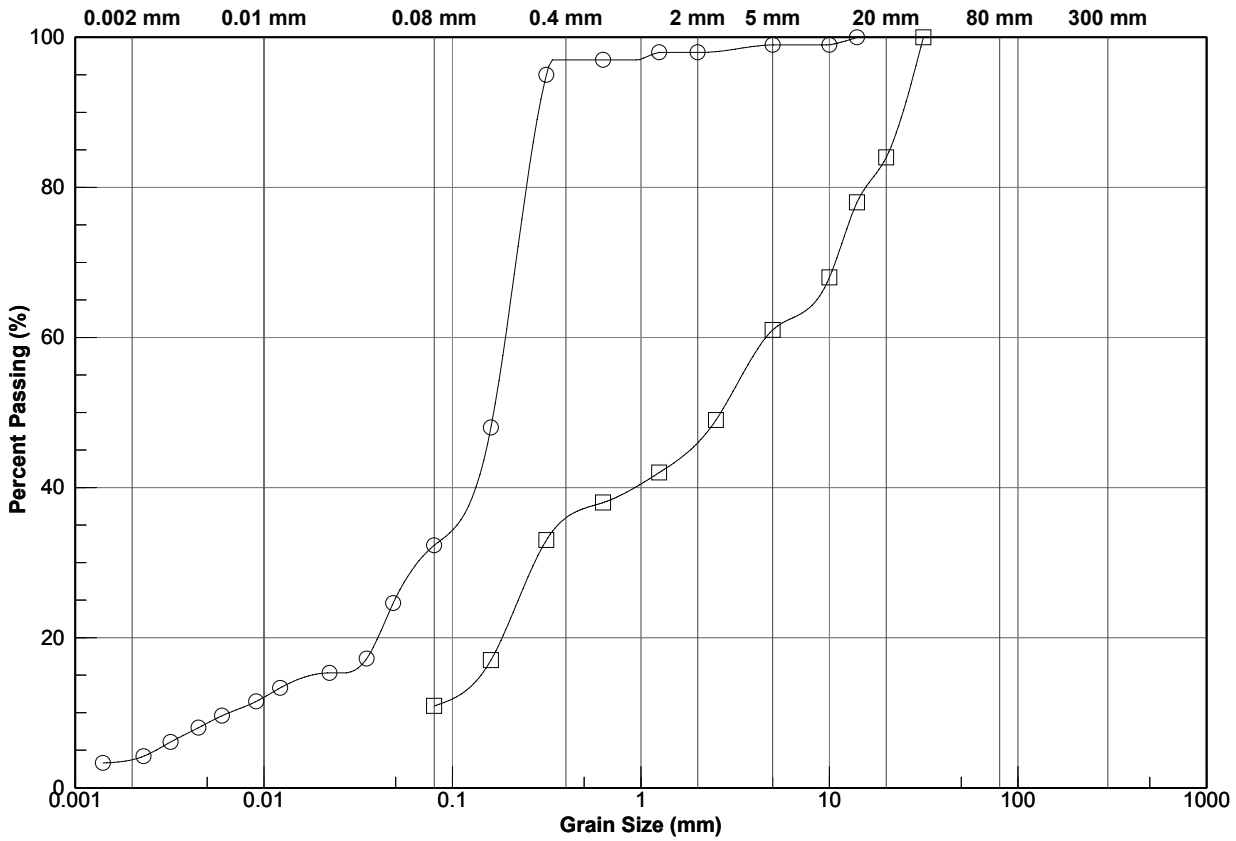
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-01-09	CF-4	2.62 - 3.23	Gravelly sand with traces of silt.	SP-SM
—□—	TF-01-09	CF-6	4.27 - 4.88	Sand and gravel with some silt.	GP-GM
—▽—	TF-01-09	CF-10	8.02 - 8.63	Sand and gravel with some silt.	GP-GM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **2**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



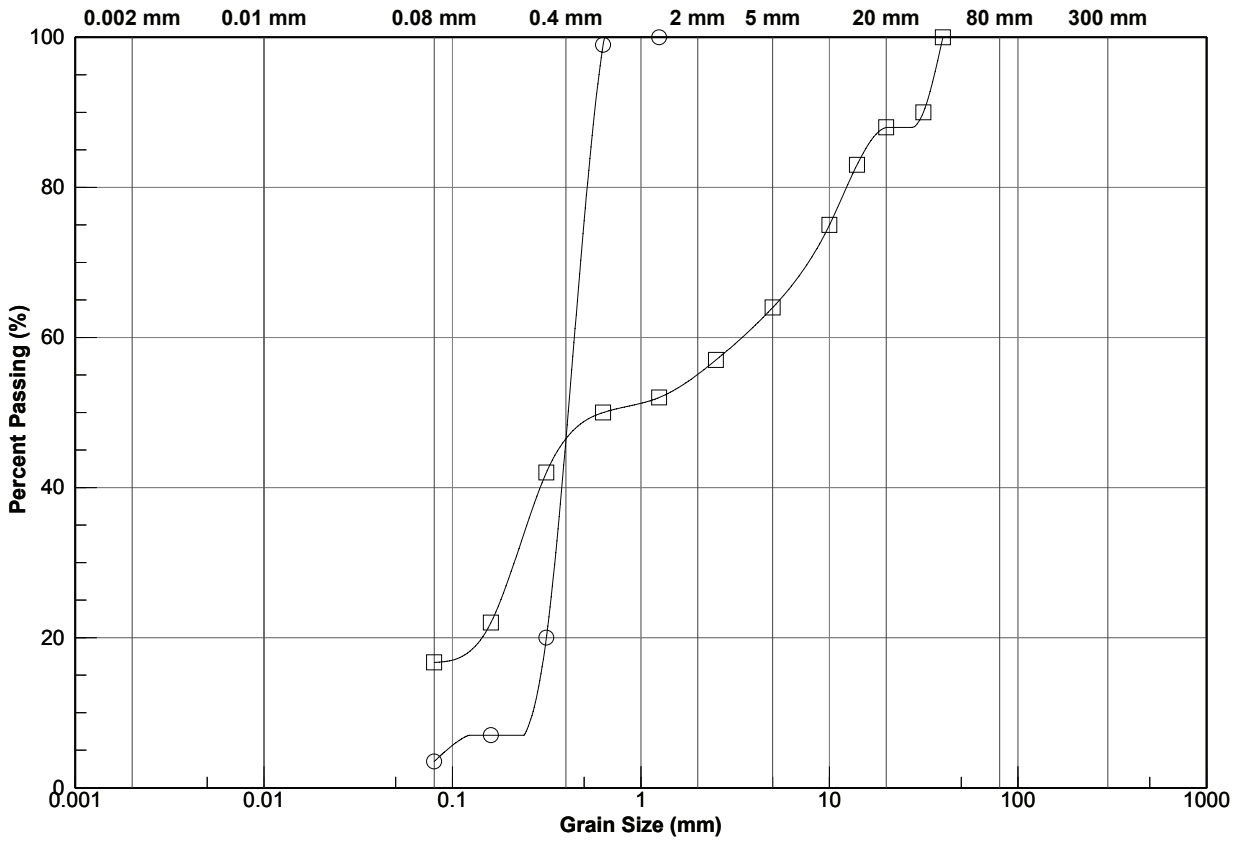
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-03-09	CF-1	0.00 - 0.61	Silty sand with traces of clay and traces of gravel.	SM
—□—	TF-03-09	CF-6	4.09 - 4.70	Sand and gravel with some silt.	SP-SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **3**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



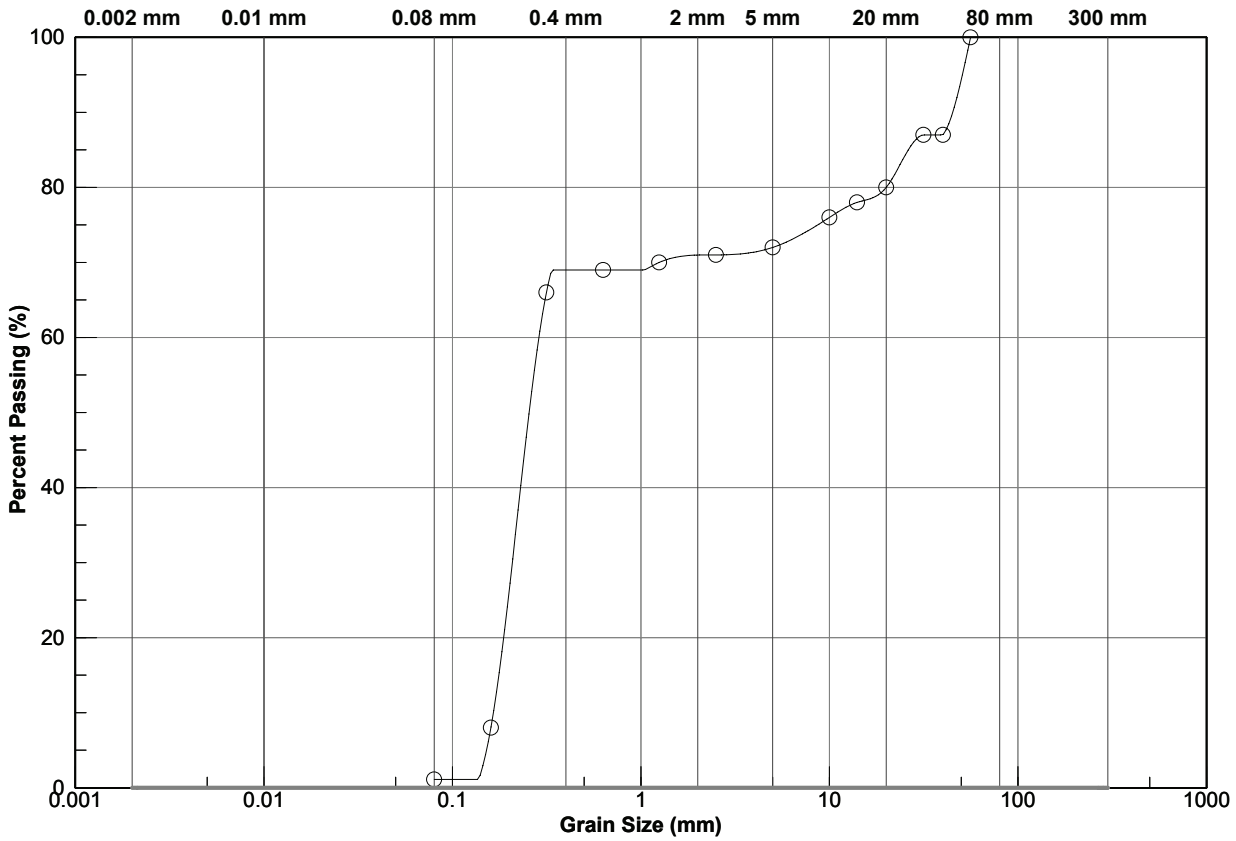
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-05-09	CF-1	0.00 - 0.81	Sand with traces of silt.	SP
—□—	TF-05-09	CF-3	2.28 - 2.89	Sand and gravel with some silt.	SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **4**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



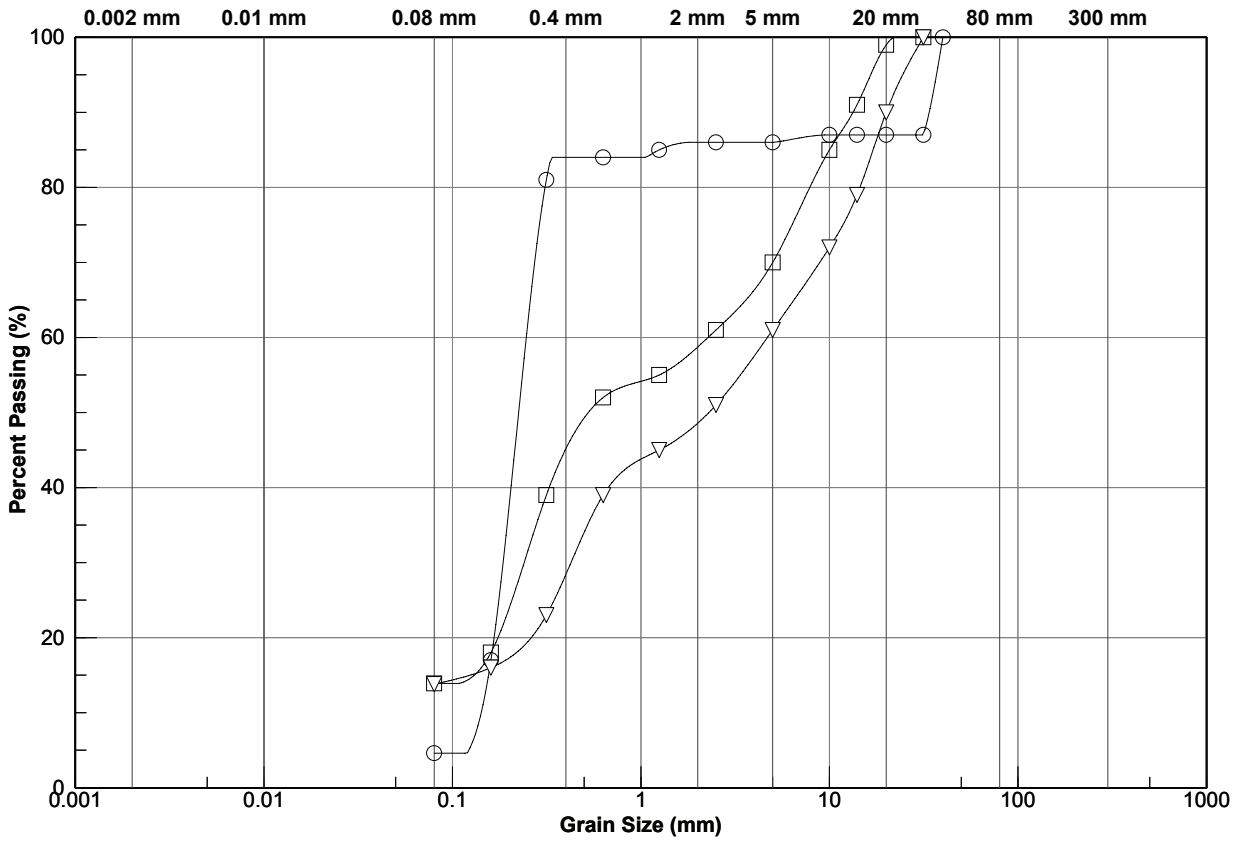
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—⊖—	TF-06-09	CF-1	0.00 - 0.61	Gravely sand with traces of silt.	SP

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **5**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



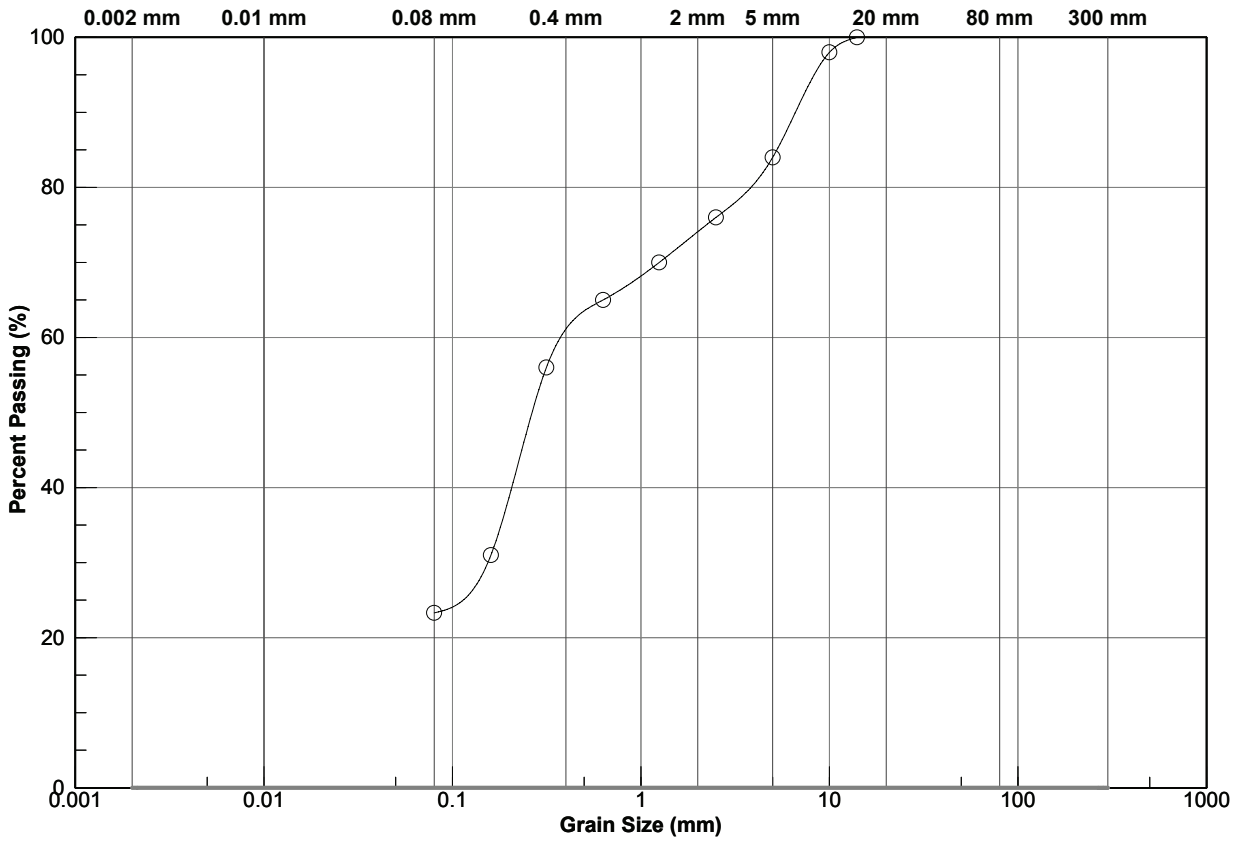
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-07-09	CF-7	6.25 - 6.86	Sand with some gravel and traces of silt	SP
—□—	TF-07-09	CF-9	8.69 - 9.37	Gravelly sand with some silt.	SM
—▽—	TF-07-09	CF-12	12.43 - 13.04	Sand and gravel with some silt.	SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **6**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



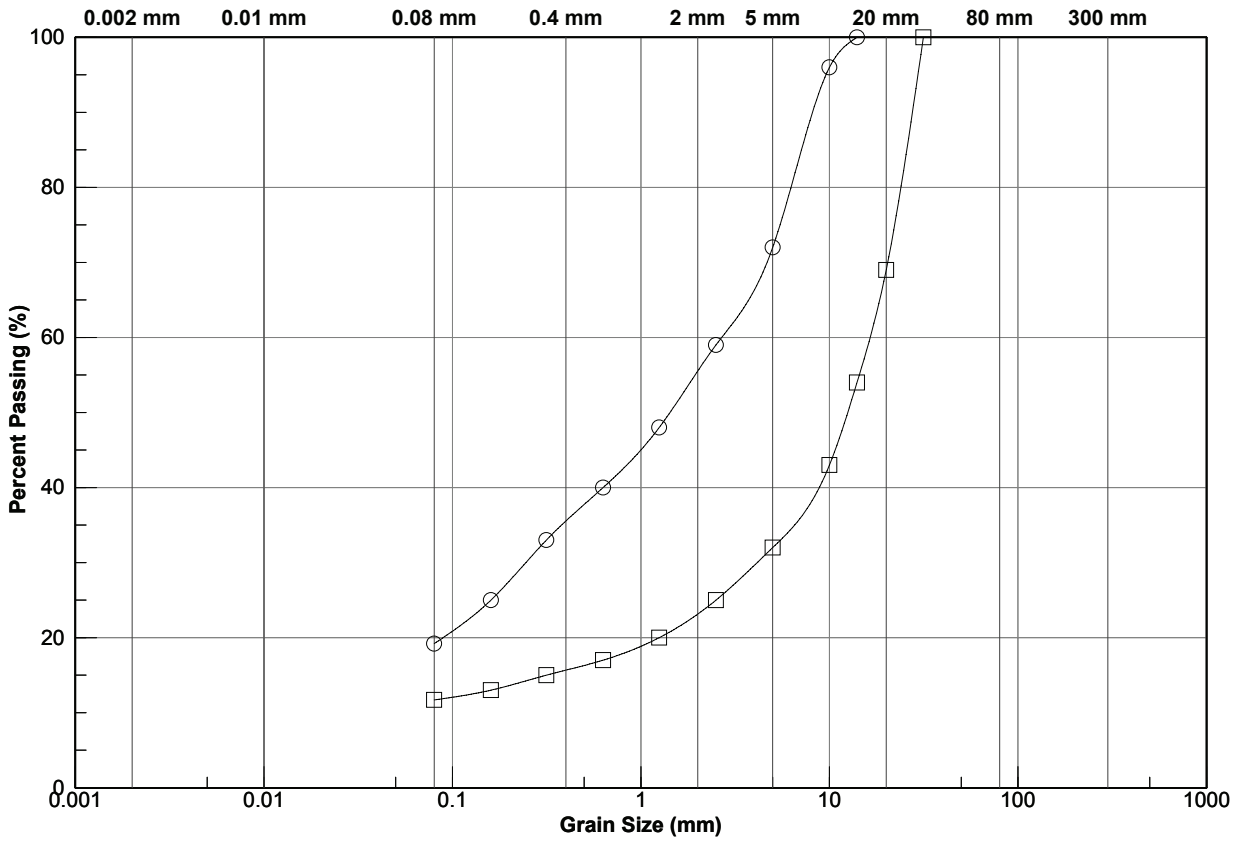
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—⊖—	TF-09-09	CF-15	15.24 - 15.85	Silty sand with some gravel	SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **7**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



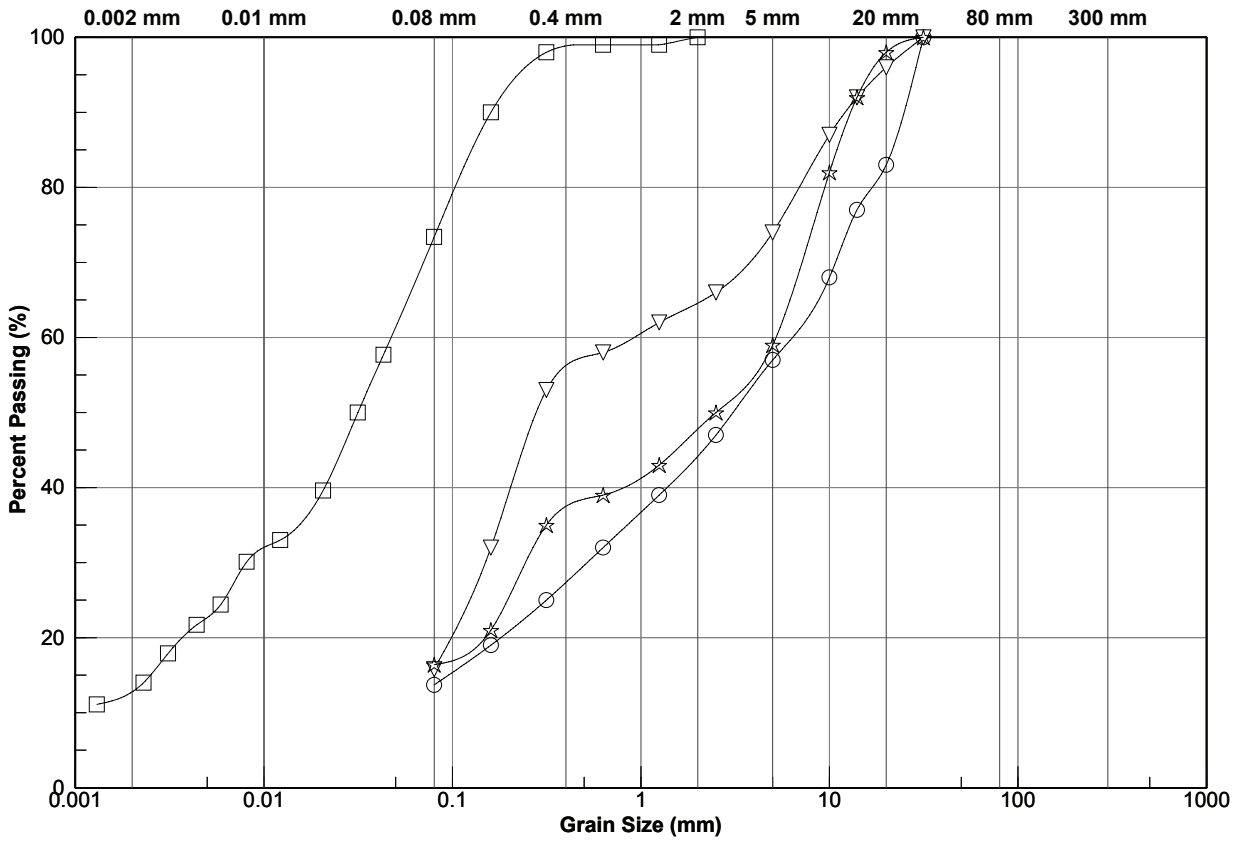
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-11-09	CF-1	0.15 - 0.76	Gravelly sand with some silt.	SM
—□—	TF-11-09	CF-7	4.57 - 5.18	Sandy gravel with some silt.	GP-GM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **8**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



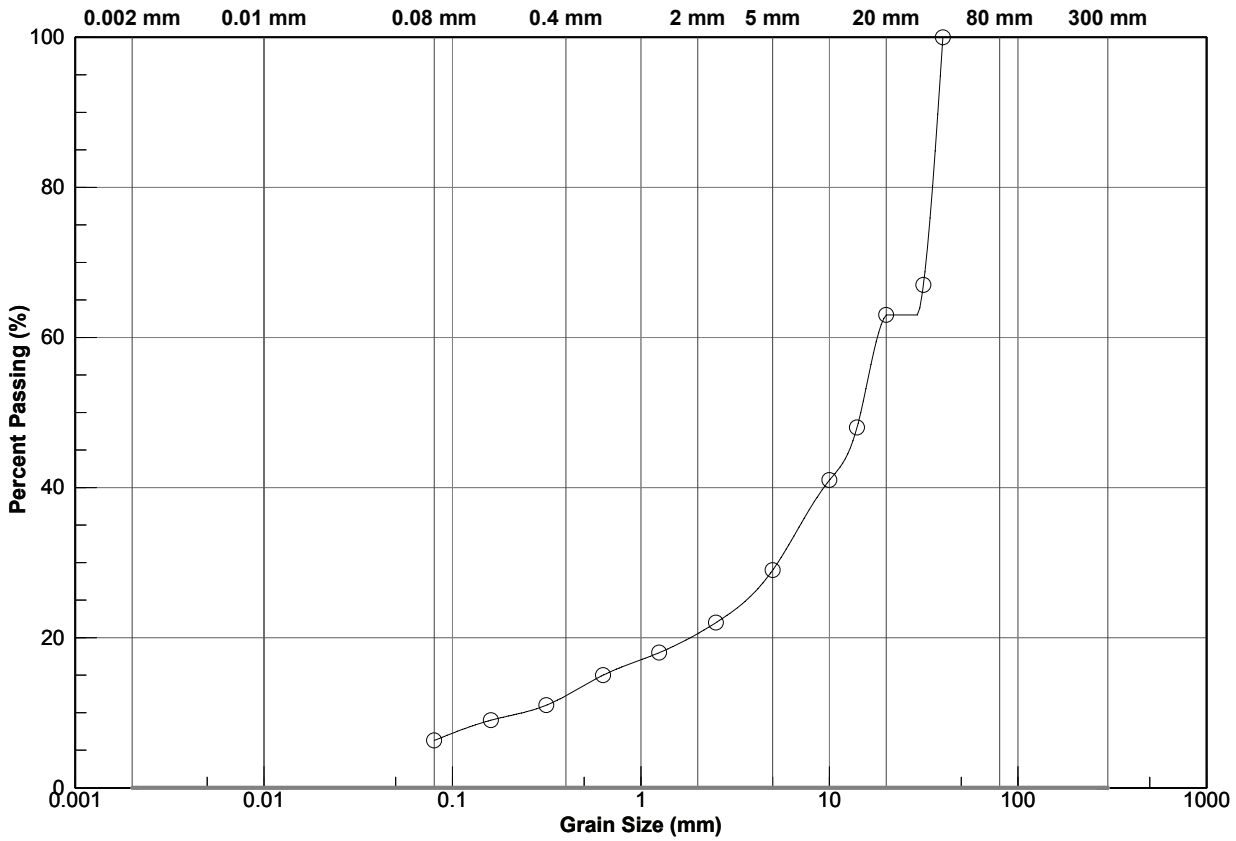
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
○	TF-13-09	CF-4	2.29 - 2.90	Sand and gravel with some silt.	SM
□	TF-13-09	CF-11	7.62 - 8.23	Sandy silt with some clay and traces of gravel.	ML
▽	TF-13-09	CF-13	10.67 - 11.28	Gravelly sand with some silt.	SM
☆	TF-13-09	CF-14	12.19 - 12.80	Sable et gravier avec un peu de silt.	SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **9**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



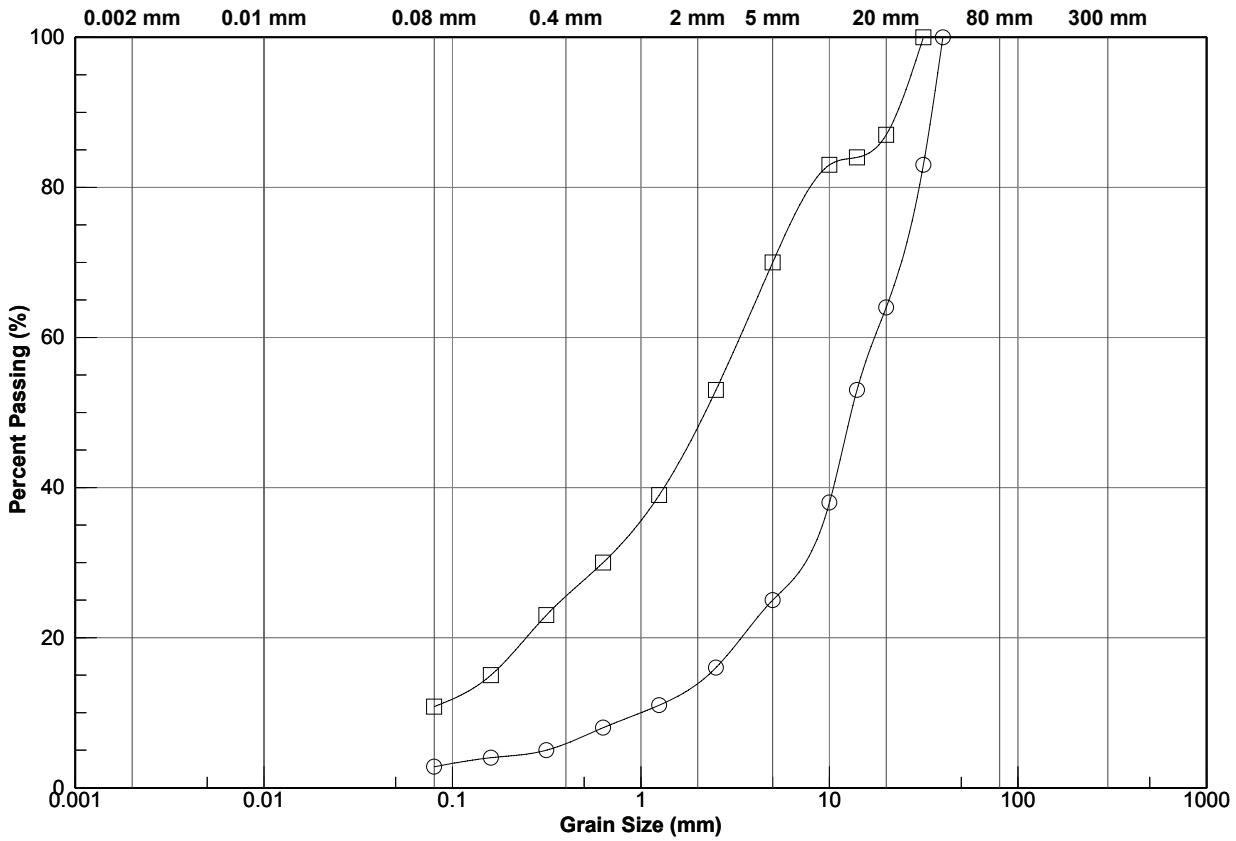
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-15-09	CF-2	0.89 - 1.50	Sandy gravel with traces of silt.	GP-GM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **10**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



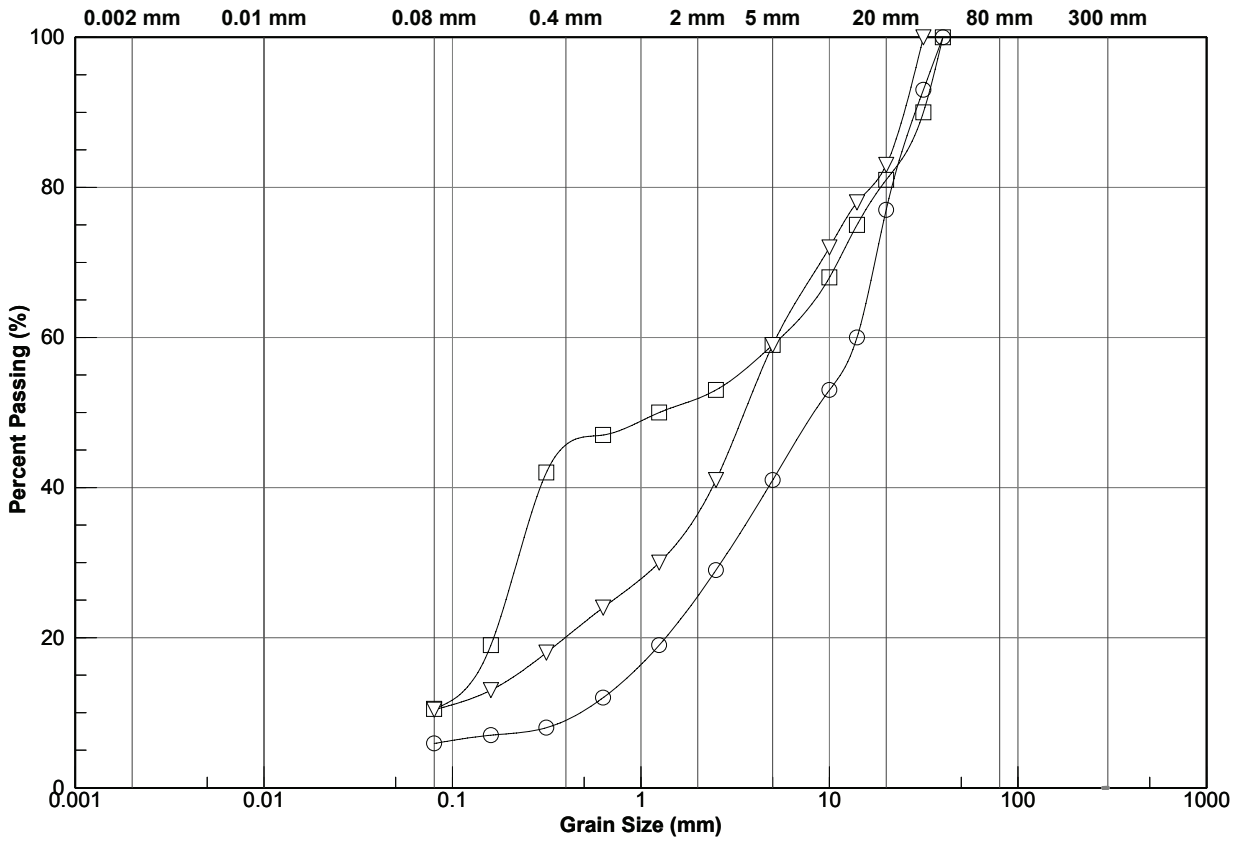
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-16-09	CF-18	13.70 - 14.20	Sandy gravel with traces of silt.	GW
—□—	TF-16-09	CF-22	19.80 - 20.41	Gravelly sand with some silt.	SP-SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **11**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



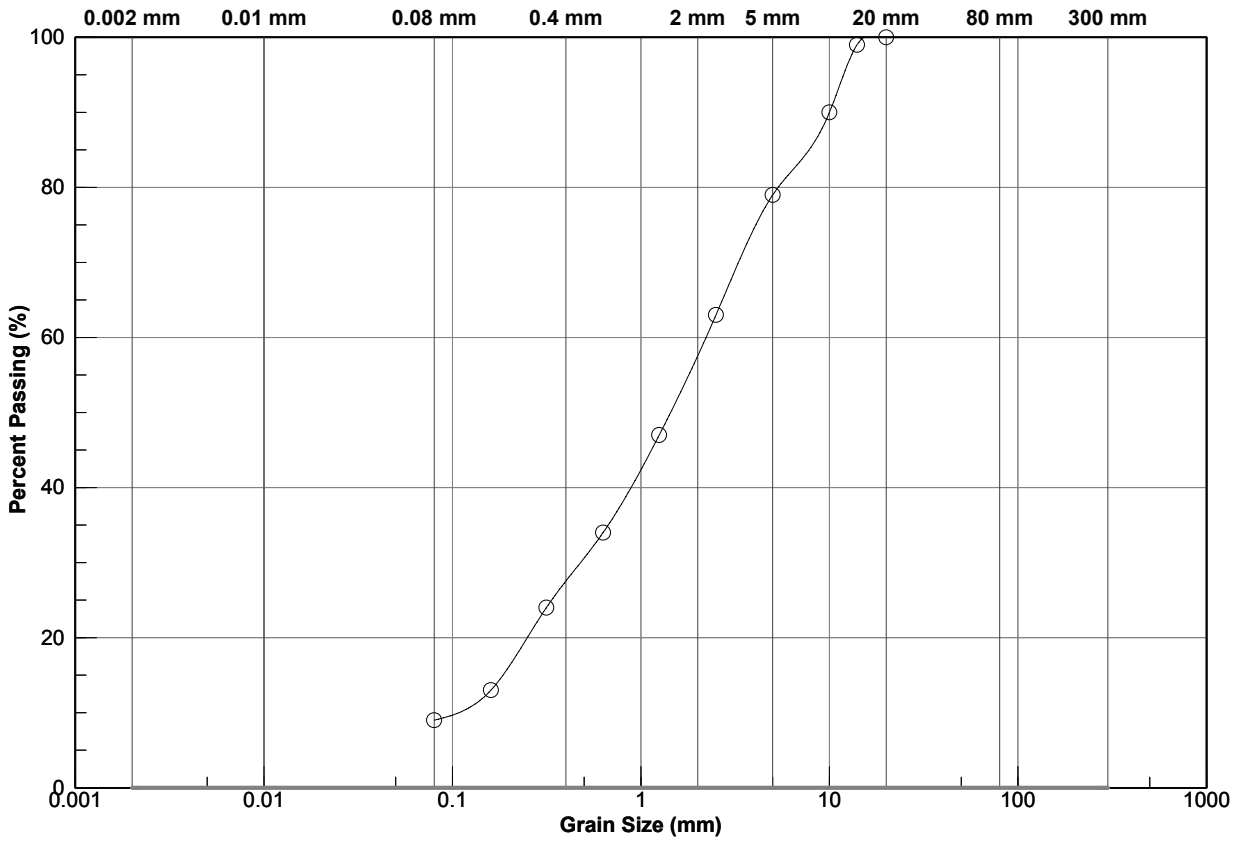
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
○	TF-21-10	CF-8	8.99 - 9.60	Sandy gravel with traces of silt.	GW-GM
□	TF-21-10	CF-14	16.61 - 17.22	Sand and gravel with some silt.	SP-SM
▽	TF-21-10	CF-22	26.37 - 26.98	Sand and gravel with some silt.	SP-SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **12**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



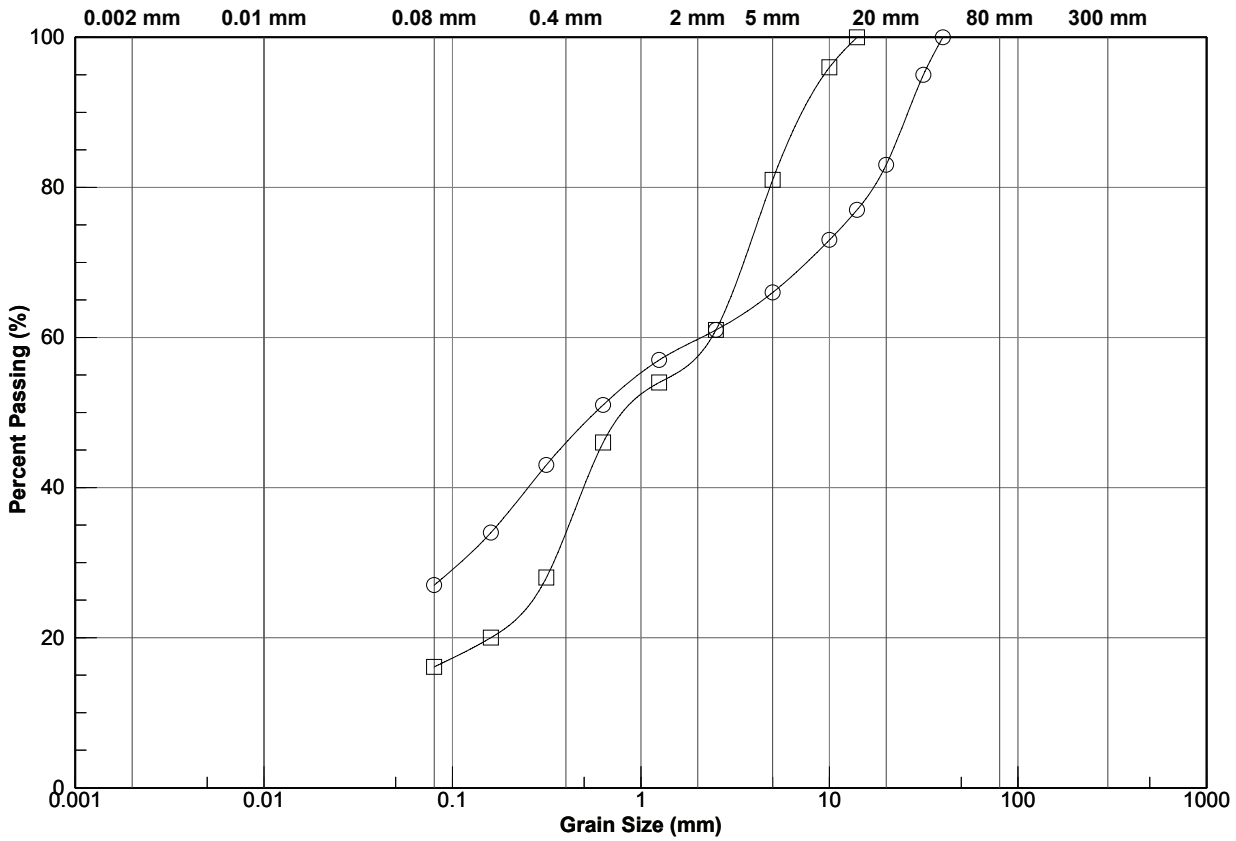
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—⊖—	TF-22-10	CF-20	14.32 - 14.93	Gravelly sand with traces of silt.	SW-SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **13**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



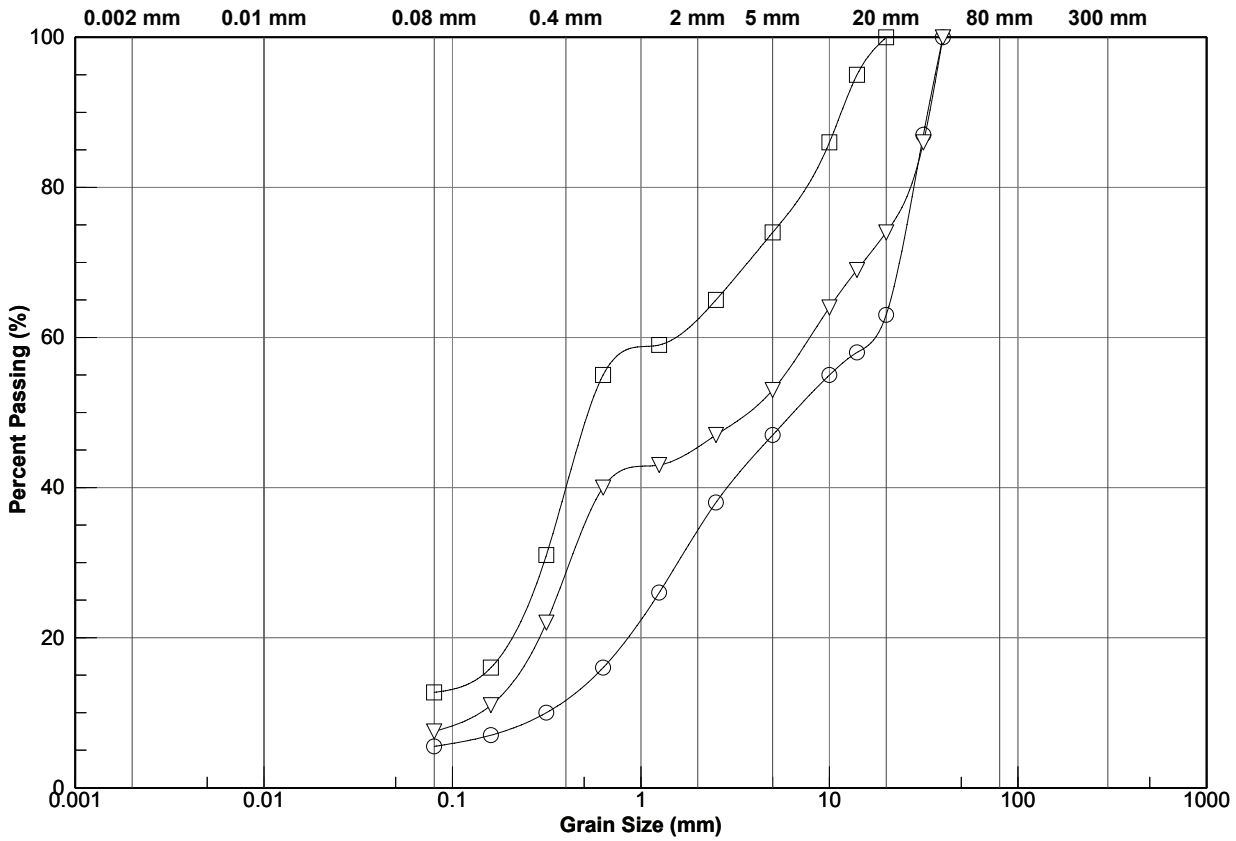
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-23-10	TA-1	0.25 - 0.76	Silty sand and gravel.	SM
—□—	TF-23-10	CF-29	24.38 - 24.99	Sand with some gravel ant some silt.	SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **14**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



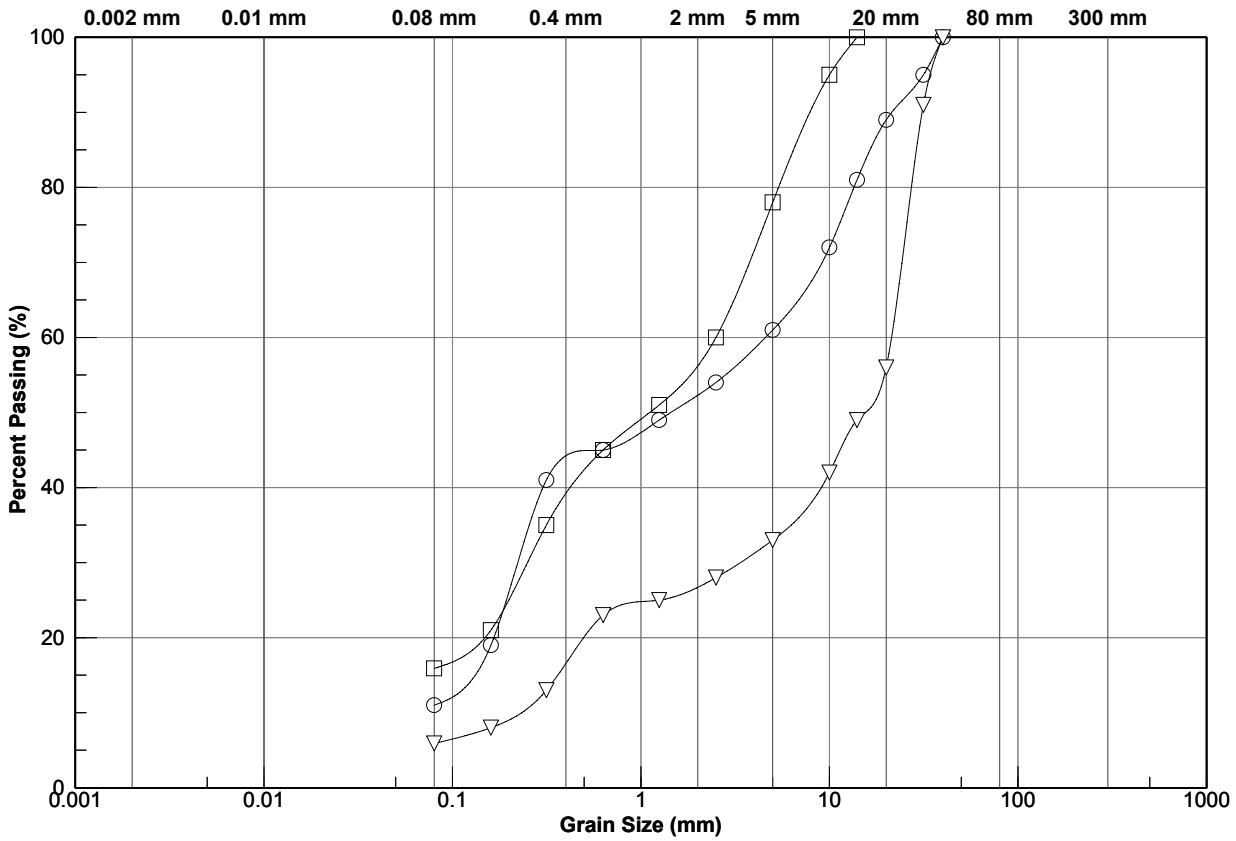
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-25-10	CF-6	2.13 - 2.74	Gravel and sand with traces of silt.	GP-GM
—□—	TF-25-10	CF-20	12.80 - 13.41	Gravelly sand with some silt.	SM
—▽—	TF-25-10	CF-24	15.95 - 16.38	Sand and gravel with traces of silt.	SP-SM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **15**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



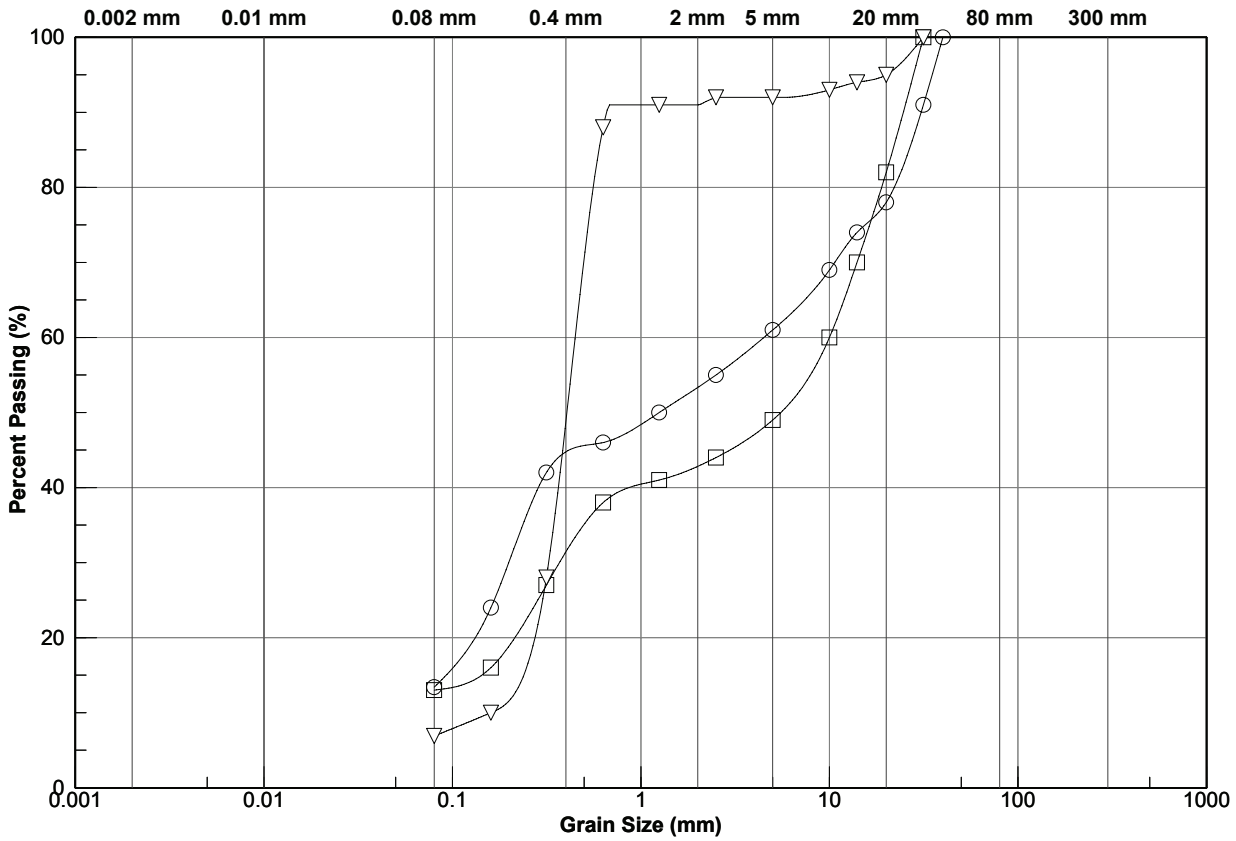
CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-26-10	CF-15	11.28 - 11.89	Sand and gravel with some silt.	SP-SM
—□—	TF-26-10	CF-20	16.61 - 17.22	Gravely sand with some silt.	SM
—▽—	TF-26-10	CF-24	22.70 - 23.00	Sandy gravel with traces of silt.	GW-GM

GRAIN-SIZE ANALYSIS

Project: **Reconstruction of Section 98 of the Queen's wharf** Figure n° : **16**

Location: **101, Champlain boulevard, Quebec City** File n° : **P029156-0100**



CLAY	SILT	SAND			GRAVEL		COBBLE	BOULDER
		FINE	MEDIUM	COARSE	FINE	COARSE		

Symbol	Borehole n°	Sample n°	Depth (m)	Description	USCS class. (ASTM D-2487)
—○—	TF-27-10	CF-14	10.57 - 10.99	Sand and gravel with some silt.	SM
—□—	TF-27-10	CF-26	16.82 - 17.43	Gravel and sand with some silt.	GM
—▽—	TF-27-10	CF-35	21.39 - 22.00	Sand with traces of gravel and traces of silt.	SP-SM

Appendix 5 Procedures for the collection, transportation and conservation of samples

Tables summarizing the results of the environmental laboratory tests

Certificates of chemical analyses and list of generic criteria

LVM

SAMPLING, TRANSPORTATION AND PRESERVATION PROCEDURES FOR SAMPLES

All sampling, transportation and preservation procedures for soil and water samples collected by Technisol Environnement are subject to a rigorous control policy. These procedures comply with norms recommended, among others, by the *ministère du Développement durable, de l'Environnement et des Parcs* and are briefly presented below.

1.0 SAMPLING PROCEDURES

1.1 Soils

Soil samples are collected using the appropriate sampling instruments (shovels, trowels, split spoon, augers, etc.) which are cleaned between each sampling according to the procedure indicated in section 2.0.

Each sample is placed in a glass jar with a capacity varying between 50 and 500 ml, depending on the parameters of analyses. The glass jars are filled to full capacity (with no head space) and are equipped with a cover made of an aluminum or Teflon sheet.

When quantities of available soils allow it, and when the substances to be found are hydrocarbons, duplicate soil samples are taken, using the methodology described in section 3.0, to measure the hydrocarbon vapour concentrations.

1.2 Water

When collecting water samples from a monitoring well, the well is drained before taking the sample in order to ensure that the sample is representative of groundwater. In cases when the groundwater is in a permeable layer, the draining method consists in purging at least three times the volume of standing water in the monitoring well and sand filter (considering its porosity.) If the groundwater is located in a low permeable layer, which does not allow for such a volume of water to be extracted, the well is then drained of at least one time its volume of standing water or dried.

Water samples are collected using either a bailer or Waterra-type manual pumps. If a reusable valve sampler is used, it is cleaned between each sampling according to the procedure indicated in section 2.0.

Appropriate containers are used for each of the samples collected, depending on the analytical parameters. Water samples are placed in a container with a capacity of 1,000 ml if the analytical parameters are petroleum hydrocarbons C_{10}-C_{50}. If the identified parameters are volatile aromatic hydrocarbons or any other type of analysis by GC/MS, the samples are placed in a 40 ml vial.

If free phase hydrocarbons are detected at the surface of the groundwater, the samples will not be collected. In this case, however, the thickness of the hydrocarbon free phase is measured using an interface probe or a bailer with an adaptor.

1.3 Free phase products

Free phase products can be sampled, if required and if there is a sufficient quantity at the surface of the well, using a dedicated bailer or an appropriate pump. The freephase sample collected is then placed in a glass jar.

2.0 CLEANING PROCEDURES FOR SAMPLING INSTRUMENTS

When they are not assigned to any particular sampling station, all sampling instruments are cleansed and rinsed according to the rigorous procedure dictated by the *ministère du Développement durable, de l'Environnement et des Parcs (MDDEP)* in the Guide d'échantillonage à des fins d'analyses environnementales (cahier 1) 1994.

3.0 MEASURING HYDROCARBON VAPOURS CONCENTRATIONS FROM SOIL SAMPLES

Hydrocarbon vapours emanating from soil samples are measured with a calibrated and portable Gastech-type hydrocarbon vapour analyser (1238 model) or a similar instrument presenting a 10 ppm detection limit. Hydrocarbon vapour concentrations exceeding 500 ppm are expressed in percentage of the lower explosiveness limit (LEL).

The sample to be submitted for hydrocarbon reading is placed in a 250 ml or 500 ml container in order to ensure that half the container is filled with non-packed soil. The container is then covered with a sheet of aluminum or Teflon before the lid is screwed on. Whenever possible, the sample is kept in a warm place for 15 minutes before the vapour concentrations accumulated in the bead space are measured. In other cases, the containers are kept warm and the hydrocarbon vapour readings are taken at the end of the day of sampling.

Values obtained from the hydrocarbon vapour readings are combined to visual observations made on the site and are used to help guiding our selection of samples to be sent to the laboratory for chemical analyses. In some cases, these readings are observations that can be helpful to evaluate the vertical extent of the contamination at the location of soundings.

4.0 QUALITY CONTROL OF SAMPLING PROCEDURES

In compliance with recommendations stipulated in Cahier 1 of the abovementioned MDDEP's *Guide d'échantillonage*, at least 10 % of samples must have systematic duplicates.

Furthermore, field blank and transport samples must be prepared and analyzed when appropriate. Preparation of these samples must comply with the procedure detailed in section 3.2 (Cahier 1) of the *Guide d'échantillonage*.

5.0 IDENTIFICATION, TRANSPORTATION AND PRESERVATION OF SAMPLES

All soil and water samples collected on the site are dully identified, stored in appropriate coolers and maintained at a temperature of approximately 4 ^{o}C from the time they are collected to the time they are delivered at the laboratory. If the sample cannot be delivered to the laboratory on the same day, they are stored in refrigerator at our office. Whenever possible, the samples are delivered to the laboratory, along with a dully completed delivery slip, less than 24 hours after the completion of field work.

The soil and water samples that are not used for chemical analyses or hydrocarbon vapour readings are stored in the laboratory for at least one month after the date of collection. After that time, they are eliminated unless specific instructions are received from an authorized representative of the client to proceed otherwise.

DESSAU

Table 1: Results of chemical analysis of sediments
Environmental Site Assessment
Section 98 - 101 Champlain Boulevard, Quebec City (Quebec)

Ref/N. : P029156-0150

Parameters	Units	Criteria for sediment environmental quality evaluation (1)					Analytical Results							
		Category 1		Category 2		Category 3	1416155	1416161	1416162	1416156	1416159	1416160	1432553	1409239
		REC(2)	TEC(2)	OEC(2)	PEC(2)	FEC(2)								
Sample							**TF-01-09 CF-1**	**TF-02-09 CF-1**	**TF-02-09 CF-2**	**TF-03-09 CF-1**	**TF-04-09 CF-1**	**TF-04-09 CF-2**	**TF-04-09 CF-3**	**F-6 19-11-09**
Sampling date							**2009-10-20**	**2009-10-23**	**2009-10-23**	**2009-10-26**	**2009-10-28**	**2009-10-28**	**2009-10-28**	**2009-11-19**
Depth (m)							0,00 - 0,20	0,00 - 0,20	1,00 - 1,15	0,00 - 0,20	0,00 - 0,20	1,00 - 1,15	1,98 - 2,59	0,00 - 0,20
HP C_{10} - C_{50}	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	<100
Metals														
Arsenic (As)	mg/kg	4,1	5,9	7,6	17	23	1,2	1,8	-	1,8	1	-	-	1,2
Cadmium (Cd)	mg/kg	0,33	0,6	1,7	3,5	12	0,15	0,30	-	0,31	0,16	-	-	0,11
Chrome (Cr)	mg/kg	25	37	57	90	120	8	14	-	17	10	-	-	6
Cuivre (Cu)	mg/kg	22	36	63	200	700	4	12	-	12	3	-	-	6
Mercure (Hg)	mg/kg	0,094	0,17	0,25	0,49	0,87	**0,17**	**0,2**	-	**0,19**	0,07	-	-	0,09
Nickel (Ni)	mg/kg	ND	ND	47	ND	ND	10	15	-	14	8	-	-	6
Plomb (Pb)	mg/kg	25	35	52	91	150	10	12	-	8	23	-	-	6
Zinc (Zn)	mg/kg	80	120	170	310	770	45	**94**	-	67	33	-	-	30
HAP														
Acénaphtène	mg/kg	0,003 7	0,006 7	0,021	0,089	0,94	<0,003	**0,028**	**0,120**	0,012	<0,003	**0,350**	**0,300**	0,006
Acénaphtylène	mg/kg	0,003 3	0,005 9	0,03	0,13	0,34	0,007	0,014	**0,061**	0,008	<0,003	**0,041**	**0,045**	<0,003
Anthracène	mg/kg	0,016	0,047	0,11	0,24	1,1	**0,019**	**0,056**	**0,160**	**0,045**	0,007	**0,560**	**0,320**	**0,023**
Benzo(a)anthracène	mg/kg	0,014	0,032	0,12	0,39	0,76	**0,027**	**0,060**	**0,230**	**0,038**	0,006	**0,720**	**0,280**	0,007
Benzo(a)pyrène	mg/kg	0,011	0,032	0,15	0,78	3,2	**0,025**	**0,047**	**0,200**	**0,035**	0,006	**0,670**	**0,190**	<0,005
Benzo(b+j+k)fluoranthène	mg/kg	-	-	-	-	-	0,051	0,100	0,360	0,070	0,007	1,10	0,340	0,012
Benzo(c)phenanthrène	mg/kg	-	-	-	-	-	<0,005	<0,020	<0,020	<0,005	<0,005	<0,030	<0,005	<0,005
Benzo(g,h,i)pérylène	mg/kg	-	-	-	-	-	0,021	0,050	0,200	0,032	0,006	0,470	0,140	<0,005
Chrysène	mg/kg	0,026	0,057	0,24	0,86	1,6	**0,033**	**0,071**	**0,250**	**0,052**	0,011	**0,720**	**0,370**	0,010
Dibenzo(a,h)anthracène	mg/kg	0,003 3	0,006 2	0,043	0,14	0,2	0,004	0,008	0,030	0,006	<0,003	**0,095**	0,035	<0,003
Dibenzo(a,i)pyrène	mg/kg	-	-	-	-	-	<0,01	<0,03	0,05	<0,01	<0,01	<0,05	0,04	<0,01
Dibenzo(a,h)pyrène	mg/kg	-	-	-	-	-	<0,01	<0,03	<0,03	<0,01	<0,01	<0,05	0,02	<0,01
Dibenzo(a,l)pyrène	mg/kg	-	-	-	-	-	<0,01	<0,03	<0,03	<0,01	<0,01	<0,05	0,04	<0,01
7,12-Diméthylbenzo (a) anthracène	mg/kg	-	-	-	-	-	<0,005	<0,020	<0,020	<0,005	<0,005	<0,030	<0,005	<0,005
Fluoranthène	mg/kg	0,047	0,11	0,45	2,4	4,9	**0,064**	**0,240**	**0,580**	**0,087**	0,020	**1,70**	**0,780**	0,028
Fluorène	mg/kg	0,01	0,021	0,061	0,14	1,2	<0,005	**0,048**	**0,110**	**0,011**	<0,005	**0,250**	**0,170**	**0,020**
Indéno (1,2,3-cd) pyrène	mg/kg	-	-	-	-	-	0,015	0,038	0,150	0,026	<0,005	0,400	0,130	<0,005
3-Méthylcholanthrène	mg/kg	-	-	-	-	-	<0,005	<0,020	<0,020	<0,005	<0,005	<0,030	<0,005	<0,005
Naphtalène	mg/kg	0,017	0,035	0,12	0,39	1,2	0,007	<0,020	**0,032**	0,010	<0,005	**0,089**	**0,140**	0,016
Phénanthrène	mg/kg	0,025	0,042	0,13	0,52	1,1	**0,043**	**0,230**	**0,600**	**0,096**	0,013	**1,80**	**1,10**	**0,030**
Pyrène	mg/kg	0,029	0,053	0,23	0,88	1,5	**0,053**	**0,200**	**0,480**	**0,072**	0,023	**1,40**	**0,660**	0,026
2-Méthylnaphtalène	mg/kg	0,016	0,02	0,063	0,2	0,38	<0,005	<0,020	**0,041**	0,007	<0,005	**0,100**	**0,350**	0,011
1-Méthylnaphtalène	mg/kg	-	-	-	-	-	<0,005	<0,020	<0,020	<0,005	<0,005	0,071	0,200	0,007
1,3-Diméthylnaphtalène	mg/kg	-	-	-	-	-	<0,005	0,029	0,094	0,014	<0,005	0,150	0,430	0,006
2,3,5-Triméthylnaphtalène	mg/kg	-	-	-	-	-	<0,005	<0,020	0,037		<0,005	0,069	0,140	<0,005
COT	%	-	-	-	-	-	0,65	0,57	-	0,86	0,19	-	-	0,04

Notes:

(1) : Criteria for evaluating the quality of freshwater sediments (Plan Saint-Laurent, Environnement Canada et MDDEP)
(2) : REC = Rare effect concentration; TEC = Threshold effect concentration; OEC = Occasional effect concentration; PEC = Probable effet concentration; FEC = Frequent effect concentration

-	: Untested
0,8	: Concentration in the range REC-TEC.
5,9	: Concentration in the range TEC-OEC.
300	: Concentration in the range OEC-PEC.
300	: Concentration above PEC.

* The results expressed in mg / kg in this table are reported on dry basis.

DESSAU

Table 2 : Results of chemical analysis of soils (1 de 2)
Environmental Site Assessment
Section 98 - 101 Champlain Boulevard, Quebec City (Quebec)

N/Réf. : P029156-0150

Parameters	Units	Politic[1] / RPRT [2]			RESC [3]	Analytical Results												
		A	B / Appendix 1	C / Appendix 2	Appendix 1	1397208	1397372	1397379	1406157	1416160	1432553	1406160	1406161	1416158	1412879	1413616	1432485	1406162
Sample						**TF-01-09 CF-1**	**TF-02-09 CF-1**	**TF-03-09 CF-1**	**TF-04-09 CF-1**	**TF-04-09 CF-2**	**TF-04-09 CF-3**	**TF-09-09 CF-1**	**TF-10-09 CF-2**	**TF-10-09 CF-3**	**TF-11-09 CF-1**	**TF-12-09 CF-1**	**TF-12-09 CF-4**	**TF-13-09 CF-1**
Sampling date						**2009-10-20**	**2009-10-23**	**2009-10-26**	**2009-10-28**	**2009-10-28**	**2009-10-28**	**2009-11-06**	**2009-11-05**	**2009-11-05**	**2009-11-12**	**2009-11-20**	**2009-11-21**	**2009-11-03**
Depth (m)						0,00-0,20	0,00-0,20	0,00-0,20	0,00-0,20	1,00-1,15	1,98-2,59	0,30 - 0,45	0,30 - 0,45	1,00 - 1,15	0,30 - 0,45	0,30 - 0,45	2,29 - 2,90	0,30 - 0,45
HP C_{10} - C_{50}	mg/kg	300	700	3 500	10 000	<100	<100	<100	<100	-	-	<100	**620**	220	250	<100	-	<100
Métaux																		
Argent	mg/kg	2	20	40	200	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/kg	6	30	50	250	1,4	1,8	1,6	1,0	-	-	0,7	**8,2**	2,6	1,3	5,6	-	1,7
Baryum	mg/kg	200	500	2 000	10 000	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/kg	2	5	20	100	<0,5	<0,5	<0,5	<0,5	-	-	<0,5	<0,5	<0,5	<0,5	<0,5	-	<0,5
Cobalt	mg/kg	15	50	300	1 500	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrome	mg/kg	85	250	800	4 000	8	15	15	4	-	-	5	8	6	6	8	-	5
Cuivre	mg/kg	40	100	500	2 500	13	12	11	3	-	-	3	**59**	14	8	35	-	6
Étain	mg/kg	5	50	300	1 500	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganèse	mg/kg	770	1 000	2 200	11 000	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercure	mg/kg	0,2	2	10	50	0,03	0,06	0,04	0,02	-	-	0,01	0,15	0,02	0,01	0,07	-	0,02
Molybdène	mg/kg	2	10	40	200	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/kg	50	100	500	2 500	9	13	18	7	-	-	10	21	9	8	14	-	12
Plomb	mg/kg	50	500	1 000	5 000	11	12	8	35	-	-	<5	**150**	23	<5	**81**	8	10
Zinc	mg/kg	110	500	1 500	7 500	49	93	55	27	-	-	13	100	30	18	60	-	22
HAP																		
Acénaphtène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	0,35	0,3	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1
Acénaphtylène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	**0,5**	<0,1	<0,1	<0,1	<0,1	<0,1
Anthracène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	0,1	0,56	0,32	<0,1	**3,2**	**0,3**	<0,1	<0,1	<0,1	<0,1
Benzo(a)anthracène	mg/kg	0,1	1	10	34	<0,1	0,1	<0,1	**0,4**	**0,72**	**0,28**	<0,1	**1,6**	0,1	<0,1	0,1	<0,1	<0,1
Benzo(a)pyrène	mg/kg	0,1	1	10	34	<0,1	0,1	<0,1	**0,3**	**0,67**	**0,19**	<0,1	**1,2**	0,1	<0,1	0,1	<0,1	<0,1
Benzo(b+j+k)fluoranthène	mg/kg	0,1	1	10	136	<0,1	0,1	<0,1	**0,7**	**1,1**	**0,34**	<0,1	**3,1**	**0,2**	<0,1	**0,2**	<0,1	<0,1
Benzo(c)phenanthrène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1
Benzo(g,h,i)pérylène	mg/kg	0,1	1	10	18	<0,1	<0,1	<0,1	**0,2**	**0,47**	**0,14**	<0,1	**0,8**	0,1	<0,1	0,1	<0,1	<0,1
Chrysène	mg/kg	0,1	1	10	34	<0,1	0,1	<0,1	**0,4**	**0,72**	**0,37**	<0,1	**2,0**	**0,3**	<0,1	**0,2**	<0,1	<0,1
Dibenzo(a,h)anthracène	mg/kg	0,1	1	10	82	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	**0,2**	<0,1	<0,1	<0,1	<0,1	<0,1
Dibenzo(a,i)pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	0,1	<0,1	<0,1	<0,1	<0,1	<0,1
Dibenzo(a,h)pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1
Dibenzo(a,l)pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	**0,2**	<0,1	<0,1	<0,1	<0,1	<0,1
7,12-Diméthylbenzo (a) anthracè	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1
Fluoranthène	mg/kg	0,1	10	100	100	<0,1	0,3	<0,1	**0,8**	**1,7**	**0,78**	<0,1	**3,5**	**0,3**	<0,1	**0,2**	<0,1	<0,1
Fluorène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	0,25		<0,1	0,1	<0,1	<0,1	<0,1	<0,1	<0,1
Indéno (1,2,3-cd) pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	**0,2**	**0,4**	**0,13**	<0,1	**0,8**	0,1	<0,1	0,1	<0,1	<0,1
3-Méthylcholanthrène	mg/kg	0,1	1	10	150	<0,1	<0,1	<0,1	<0,1	<0.1	<0.1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1
Naphtalène	mg/kg	0,1	5	50	56	<0,1	<0,1	<0,1	<0,1	<0.1	0,14	<0,1	**0,2**	<0,1	<0,1	<0,1	<0,1	<0,1
Phénanthrène	mg/kg	0,1	5	50	56	<0,1	**0,2**	<0,1	**0,4**	**1,8**	**1,1**	<0,1	**0,9**	**0,2**	<0,1	**0,2**	<0,1	<0,1
Pyrène	mg/kg	0,1	10	100	100	<0,1	**0,2**	<0,1	**0,6**	**1,4**	**0,66**	<0,1	**3,7**	**0,4**	<0,1	**0,2**	<0,1	<0,1
2-Méthylnaphtalène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	0,1	0,35	<0,1	**0,2**	<0,1	<0,1	<0,1	<0,1	<0,1
1-Méthylnaphtalène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	<0.1	0,2	<0,1	0,1	<0,1	<0,1	<0,1	<0,1	<0,1
1,3-Diméthylnaphtalène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	0,15	0,43	<0,1	**0,2**	<0,1	<0,1	<0,1	<0,1	<0,1
2,3,5-Triméthylnaphtalène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	<0.1	0,17	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1
COT	**%**	**-**	**-**	**-**	**-**	0,65	0,57	0,86	0,19	-	-	0,58	2,34	0,67	0,65	1,73	-	1,08

Notes:

(1) : Politics of soil protection and rehabilitation of contaminated land (MDDEP)
(2) : Regulations on the Protection and Land Rehabilitation (Government of Quebec)
(3) : Regulation respecting the burial of contaminated soils (Quebec Government)

- : Not analyzed
0,8 : Concentration in the range of AB Policy criteria.
5,9 : Concentration in the range of BC Policy criteria and higher standards of Schedule 1 to the Regulation on the Protection and Land Rehabilitation
300 : Concentration above the criteria of the Policy and higher standards of Schedule 2 to the Regulation on the protection and rehabilitation of land
300 : Concentration exceeds the standards of Schedule 1 to the Regulation respecting the burial of contaminated soils

* The results expressed in mg / kg in this table are reported on dry basis.

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Table 2 : Results of chemical analysis of soils (2 de 2)
Environmental Site Assessment
Section 98 - 101 Champlain Boulevard, Quebec City (Quebec)

N/Réf. : P029156-0150

Parameters	Units	Politic[1] / RPRT [2]			RESC [3]	Analytical Results												
		A	B / Appendix 1	C / Appendix 2	Appendix 1	1406163	1416157	1407216	1412880	1424450	1424445	1424439	1432542	1424449	1427708	1427701	1429256	1432484
Sample						**TF-14-09 CF-1**	**TF-14-09 CF-2**	**F-15-09 CF-1**	**F-16-09 CF-1**	**TF-21-10 CF-01**	**TF-22-10 TA-1**	**TF-23-10 TA-1**	**TF-23-10 CF-4**	**TF-24-10 CF#2**	**TF-25-10 CF2**	**TF-26-10 CF-1**	**TF-27-10 TA-1**	**TF-27-10 CF-2**
Sampling date						**2009-11-09**	**2009-11-09**	**2009-11-12**	**2009-11-11**	**2010-01-05**	**2010-01-07**	**2010-01-12**	**2010-01-08**	**2010-01-06**	**2010-01-18**	**2010-01-12**	**2010-01-13**	**2010-01-13**
Depth (m)						0,30 - 0,45	1,00 - 1,15	0,30 - 0,45	0,30 - 0,45	0,30 - 0,45	0,30 - 0,45	0,30 - 0,45	2,29 - 2,90	0,30 - 0,45	0,30 - 0,45	0,30 - 0,45	0,30 - 0,45	1,52 - 1,83
HP C_{10} - C_{50}	mg/kg	300	700	3 500	10 000	<100	-	<100	<100	<100	<100	<100	-	<100	<100	<100	<100	-
Métaux																		
Argent	mg/kg	2	20	40	200	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/kg	6	30	50	250	0,8	-	0,8	1,3	<0,5	0,9	<0,5	-	1,3	<0,5	0,8	<0,5	-
Baryum	mg/kg	200	500	2 000	10 000	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/kg	2	5	20	100	<0,5	-	<0,5	<0,5	<0,5	<0,5	<0,5	-	<0,5	<0,5	<0,5	<0,5	-
Cobalt	mg/kg	15	50	300	1 500	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrome	mg/kg	85	250	800	4 000	7	-	4	6	4	7	7	-	6	5	5	3	-
Cuivre	mg/kg	40	100	500	2 500	4	-	4	9	8	23	**120**	11	13	9	9	**220**	13
Étain	mg/kg	5	50	300	1 500	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganèse	mg/kg	770	1 000	2 200	11 000	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercure	mg/kg	0,2	2	10	50	<0,01	-	<0,01	<0,01	0,02	<0,01	<0,01	-	0,02	0,01	0,02	<0,01	-
Molybdène	mg/kg	2	10	40	200	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/kg	50	100	500	2 500	11	-	8	8	6	10	27	-	10	5	7	49	-
Plomb	mg/kg	50	500	1 000	5 000	5	-	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	-
Zinc	mg/kg	110	500	1 500	7 500	14	-	25	17	15	25	**130**	40	23	11	16	**200**	21
HAP																		
Acénaphtène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Acénaphtylène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Anthracène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Benzo(a)anthracène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Benzo(a)pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Benzo(b+j+k)fluoranthène	mg/kg	0,1	1	10	136	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Benzo(c)phenanthrène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Benzo(g,h,i)pérylène	mg/kg	0,1	1	10	18	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Chrysène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Dibenzo(a,h)anthracène	mg/kg	0,1	1	10	82	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Dibenzo(a,i)pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Dibenzo(a,h)pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Dibenzo(a,l)pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
7,12-Diméthylbenzo (a) anthracène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Fluoranthène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Fluorène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Indéno (1,2,3-cd) pyrène	mg/kg	0,1	1	10	34	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
3-Méthylcholanthrène	mg/kg	0,1	1	10	150	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Naphtalène	mg/kg	0,1	5	50	56	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Phénanthrène	mg/kg	0,1	5	50	56	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
Pyrène	mg/kg	0,1	10	100	100	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
2-Méthylnaphtalène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
1-Méthylnaphtalène	mg/kg	0,1	1	10	56	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
1,3-Diméthylnaphtalène	mg/kg	0,1	1	10	56	**0,2**	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
2,3,5-Triméthylnaphtalène	mg/kg	0,1	1	10	56	0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	-	<0,1	<0,1	<0,1	<0,1	-
COT	%	-	-	-	-	0,42	-	0,29	0,34	0,50	0,38	0,20	-	0,46	0,31	0,32	0,17	-

Notes:

(1) : Politics of soil protection and rehabilitation of contaminated land (MDDEP)
(2) : Regulations on the Protection and Land Rehabilitation (Government of Quebec)
(3) : Regulation respecting the burial of contaminated soils (Quebec Government)

- : Not analyzed
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5,9 : Concentration in the range of BC Policy criteria and higher standards of Schedule 1 to the Regulation on the Protection and Land Rehabilitation
300 : Concentration above the criteria of the Policy and higher standards of Schedule 2 to the Regulation on the protection and rehabilitation of land
300 : Concentration exceeds the standards of Schedule 1 to the Regulation respecting the burial of contaminated soils

* The results expressed in mg / kg in this table are reported on dry basis.

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Certificate of Analysis

Request number: **09-313204**

Date Received: 2009-10-27

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
Québec, Québec, Canada
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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313204

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397208**
Your Reference	TF-01-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-10-27

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2009-10-29
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299260
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.4 (<A)
Cadmium (Cd)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	8 (<A)
Copper (Cu)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	13 (<A)
Lead (Pb)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	11 (<A)
Mercury	Preparation	2009-10-29
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-10-29
Result as per dry weight	Sequential No.	299276
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.03 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313204

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.		**1397208**
Your Reference		TF-01-09 CF-1
Matrix		Soil
Sampled by		M. Simon-Pierre Gravel
Site sampled		Quai de la Reine, Qc
Date sampled		2009-10-20
Date received		2009-10-27

Parameter(s)

Parameter(s) / Method / Reference		
Nickel (Ni)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2009-10-30
	Sequential No.	299259
Nickel (Ni)	mg/kg	9 (<A)
Total organic carbon	Preparation	2009-10-30
LECO combustion Sub-contracted work. Result as per dry weight.	Analysis	2009-10-30
	Sequential No.	NA
Total organic carbon	%C	0.65
Zinc (Zn)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2009-10-30
	Sequential No.	299259
Zinc (Zn)	mg/kg	49 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313204

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397208**
Your Reference	TF-01-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-10-27

Parameter(s) Method Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2009-10-29
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-10-29
	Sequential No.	299250
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-10-29
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-10-29
	Sequential No.	299249
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313204

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397208**
Your Reference	TF-01-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-10-27

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	86%
Fluoranthene-d10	%	102%
Chrysene-d12	%	91%
Water (% humidity)	Preparation	2009-10-28
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-10-29
	Sequential No.	299257
Water (% humidity)	%	18

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313204

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 299257					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 299249					
Naphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.7	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.9	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	5.2	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.7	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.0	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.3	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	1.8	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 299250					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313204

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1400	1200 - 1800
Mercury					
Sequential ID No.: 299276					
Mercury	mg/kg	< 0.01	<0.01	3.6	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 299259					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	96	80 - 120
Chromium (Cr)					
Sequential ID No.: 299259					
Chromium (Cr)	mg/kg	< 2	<2	99	80 - 120
Copper (Cu)					
Sequential ID No.: 299259					
Copper (Cu)	mg/kg	< 1	<1	100	80 - 120
Arsenic (As)					
Sequential ID No.: 299260					
Arsenic (As)	mg/kg	< 0.5	<0.5	99	80 - 120
Nickel (Ni)					
Sequential ID No.: 299259					
Nickel (Ni)	mg/kg	< 2	<2	100	80 - 120
Lead (Pb)					
Sequential ID No.: 299259					
Lead (Pb)	mg/kg	< 5	<5	100	80 - 120
Zinc (Zn)					
Sequential ID No.: 299259					
Zinc (Zn)	mg/kg	< 5	<5	100	80 - 120

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-313225**

Date Received: 2009-10-27

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
Québec, Québec, Canada
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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313225

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397372**
Your Reference	TF-02-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Qc, quai de la Reine
Date sampled	2009-10-23
Date received	2009-10-27

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2009-10-29
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299260
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.8 (<A)
Cadmium (Cd)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	15 (<A)
Copper (Cu)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	12 (<A)
Lead (Pb)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	12 (<A)
Mercury	Preparation	2009-10-29
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-10-29
Result as per dry weight	Sequential No.	299276
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.06 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313225

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397372**
Your Reference	TF-02-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Qc, quai de la Reine
Date sampled	2009-10-23
Date received	2009-10-27

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	299259
Nickel (Ni)	mg/kg	13 (<A)
Total organic carbon	Preparation	2009-10-30
LECO combustion	Analysis	2009-10-30
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.57
Zinc (Zn)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	299259
Zinc (Zn)	mg/kg	93 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313225

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397372**
Your Reference	TF-02-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Qc, quai de la Reine
Date sampled	2009-10-23
Date received	2009-10-27

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2009-10-29
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-10-29
	Sequential No.	299251
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-10-29
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-10-29
	Sequential No.	299249
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	0.2 (A-B)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	0.3 (A-B)
Pyrene	mg/kg	0.2 (A-B)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	0.1 (A)
Chrysene	mg/kg	0.1 (A)
Benzo (b, j & k) fluoranthene	mg/kg	0.1 (A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313225

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397372**
Your Reference	TF-02-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Qc, quai de la Reine
Date sampled	2009-10-23
Date received	2009-10-27

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	0.1 (A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	82%
Fluoranthene-d10	%	98%
Chrysene-d12	%	94%
Water (% humidity)	Preparation	2009-10-28
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-10-29
	Sequential No.	299257
Water (% humidity)	%	24

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313225

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 299257					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 299249					
Naphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.7	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.9	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	5.2	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.7	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.0	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.3	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	1.8	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 299251					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313225

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1500	1200 - 1800
Mercury					
Sequential ID No.: 299276					
Mercury	mg/kg	< 0.01	<0.01	3.6	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 299259					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	96	80 - 120
Chromium (Cr)					
Sequential ID No.: 299259					
Chromium (Cr)	mg/kg	< 2	<2	99	80 - 120
Copper (Cu)					
Sequential ID No.: 299259					
Copper (Cu)	mg/kg	< 1	<1	100	80 - 120
Arsenic (As)					
Sequential ID No.: 299260					
Arsenic (As)	mg/kg	< 0.5	<0.5	99	80 - 120
Nickel (Ni)					
Sequential ID No.: 299259					
Nickel (Ni)	mg/kg	< 2	<2	100	80 - 120
Lead (Pb)					
Sequential ID No.: 299259					
Lead (Pb)	mg/kg	< 5	<5	100	80 - 120
Zinc (Zn)					
Sequential ID No.: 299259					
Zinc (Zn)	mg/kg	< 5	<5	100	80 - 120

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-313226**

Date Received: 2009-10-27

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
Québec, Québec, Canada
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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313226

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397379**
Your Reference	TF-03-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-10-27

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2009-10-29
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299260
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.6 (<A)
Cadmium (Cd)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	15 (<A)
Copper (Cu)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	11 (<A)
Lead (Pb)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight	Sequential No.	299259
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	8 (<A)
Mercury	Preparation	2009-10-29
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-10-29
Result as per dry weight	Sequential No.	299276
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.04 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313226

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.		**1397379**
Your Reference		TF-03-09 CF-1
Matrix		Soil
Sampled by		M. Simon-Pierre Gravel
Site sampled		Quai de la Reine, 101, boul. Champlain, Qc
Date sampled		2009-10-26
Date received		2009-10-27

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	299259
Nickel (Ni)	mg/kg	18 (<A)
Total organic carbon	Preparation	2009-10-30
LECO combustion	Analysis	2009-10-30
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.86
Zinc (Zn)	Preparation	2009-10-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-10-30
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	299259
Zinc (Zn)	mg/kg	55 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313226

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397379**
Your Reference	TF-03-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-10-27

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2009-10-29
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-10-29
	Sequential No.	299251
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-10-29
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-10-29
	Sequential No.	299249
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313226

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1397379**
Your Reference	TF-03-09 CF-1
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-10-27

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	89%
Fluoranthene-d10	%	100%
Chrysene-d12	%	95%
Water (% humidity)	Preparation	2009-10-28
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-10-29
	Sequential No.	299257
Water (% humidity)	%	30

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313226

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 299257					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 299249					
Naphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.7	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.9	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	5.2	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.7	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.0	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.3	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	1.8	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 299251					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-313226

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1500	1200 - 1800
Mercury					
Sequential ID No.: 299276					
Mercury	mg/kg	< 0.01	<0.01	3.6	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 299259					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	96	80 - 120
Chromium (Cr)					
Sequential ID No.: 299259					
Chromium (Cr)	mg/kg	< 2	<2	99	80 - 120
Copper (Cu)					
Sequential ID No.: 299259					
Copper (Cu)	mg/kg	< 1	<1	100	80 - 120
Arsenic (As)					
Sequential ID No.: 299260					
Arsenic (As)	mg/kg	< 0.5	<0.5	99	80 - 120
Nickel (Ni)					
Sequential ID No.: 299259					
Nickel (Ni)	mg/kg	< 2	<2	100	80 - 120
Lead (Pb)					
Sequential ID No.: 299259					
Lead (Pb)	mg/kg	< 5	<5	100	80 - 120
Zinc (Zn)					
Sequential ID No.: 299259					
Zinc (Zn)	mg/kg	< 5	<5	100	80 - 120

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-315014**

Date Received: 2009-11-12

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

	Sample(s)			
Lab. No.	**1406157**	**1406160**	**1406161**	**1406162**
Your Reference	TF-04-09 CF-1	TF-09-09 CF-1	TF-10-09 CF-2	TF-13-09 CF-1
Matrix	Soil	Soil	Soil	Soil
Sampled by	M. Simon P. Gravel	M. Gilles Meunier	M. Simon P. Gravel	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain
Date sampled	2009-10-28	2009-11-06	2009-11-05	2009-11-03
Date received	2009-11-12	2009-11-12	2009-11-12	2009-11-12
Parameter(s) Method Reference				
Arsenic (As)	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	300915	300915	300915	300915
Arsenic (As)	mg/kg	1.0 (<A)	0.7 (<A)	8.2 (A-B)	1.7 (<A)
Cadmium (Cd)	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	300951	300951	300951	300951
Cadmium (Cd)	mg/kg	< 0.5 (<A)	< 0.5 (<A)	< 0.5 (<A)	< 0.5 (<A)
Chromium (Cr)	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	300951	300951	300951	300951
Chromium (Cr)	mg/kg	4 (<A)	5 (<A)	8 (<A)	5 (<A)
Copper (Cu)	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	300951	300951	300951	300951
Copper (Cu)	mg/kg	3 (<A)	3 (<A)	59 (A-B)	6 (<A)
Lead (Pb)	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	300951	300951	300951	300951
Lead (Pb)	mg/kg	35 (<A)	< 5 (<A)	150 (A-B)	10 (<A)
Mercury	Preparation	2009-11-16	2009-11-16	2009-11-16	2009-11-16
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-11-16	2009-11-16	2009-11-16	2009-11-16
Result as per dry weight MA. 200 - Hg 1.0 R4	Sequential No.	300833	300833	300833	300833
Mercury	mg/kg	0.02 (<A)	<0.01 (<A)	0.15 (<A)	0.02 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

	Sample(s)			
Lab. No.	**1406157**	**1406160**	**1406161**	**1406162**
Your Reference	TF-04-09 CF-1	TF-09-09 CF-1	TF-10-09 CF-2	TF-13-09 CF-1
Matrix	Soil	Soil	Soil	Soil
Sampled by	M. Simon P. Gravel	M. Gilles Meunier	M. Simon P. Gravel	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain
Date sampled	2009-10-28	2009-11-06	2009-11-05	2009-11-03
Date received	2009-11-12	2009-11-12	2009-11-12	2009-11-12
Parameter(s) Method Reference				
Nickel (Ni)	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
	Sequential No.	300951	300951	300951	300951
Nickel (Ni)	mg/kg	7 (<A)	10 (<A)	21 (<A)	12 (<A)
Total organic carbon	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
LECO combustion Sub-contracted work. Result as per dry weight.	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
	Sequential No.	NA	NA	NA	NA
Total organic carbon	%C	0.19	0.58	2.34	1.08
Zinc (Zn)	Preparation	2009-11-17	2009-11-17	2009-11-17	2009-11-17
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2009-11-17	2009-11-17	2009-11-17	2009-11-17
	Sequential No.	300951	300951	300951	300951
Zinc (Zn)	mg/kg	27 (<A)	13 (<A)	100 (<A)	22 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1406163**
Your Reference	TF-14-09 CF-1
Matrix	Soil
Sampled by	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 boul. Champlain
Date sampled	2009-11-09
Date received	2009-11-12

Parameter(s)

Parameter(s) / Method / Reference		
Arsenic (As)	Preparation	2009-11-17
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-11-17
Result as per dry weight	Sequential No.	300915
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	0.8 (<A)
Cadmium (Cd)	Preparation	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17
Result as per dry weight	Sequential No.	300951
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	< 0.5 (<A)
Chromium (Cr)	Preparation	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17
Result as per dry weight	Sequential No.	300951
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	7 (<A)
Copper (Cu)	Preparation	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17
Result as per dry weight	Sequential No.	300951
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	4 (<A)
Lead (Pb)	Preparation	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17
Result as per dry weight	Sequential No.	300951
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	5 (<A)
Mercury	Preparation	2009-11-16
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-11-16
Result as per dry weight	Sequential No.	300833
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	<0.01 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

	Lab. No.	**1406163**
	Your Reference	TF-14-09 CF-1
	Matrix	Soil
	Sampled by	M. Gilles Meunier
	Site sampled	Quai de la Reine, 101 boul. Champlain
	Date sampled	2009-11-09
	Date received	2009-11-12
Parameter(s)		
Method		
Reference		
Nickel (Ni)	Preparation	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	300951
Nickel (Ni)	mg/kg	11 (<A)
Total organic carbon	Preparation	2009-11-17
LECO combustion	Analysis	2009-11-17
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.42
Zinc (Zn)	Preparation	2009-11-17
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-17
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	300951
Zinc (Zn)	mg/kg	14 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

	Sample(s)			
Lab. No.	**1406157**	**1406160**	**1406161**	**1406162**
Your Reference	TF-04-09 CF-1	TF-09-09 CF-1	TF-10-09 CF-2	TF-13-09 CF-1
Matrix	Soil	Soil	Soil	Soil
Sampled by	M. Simon P. Gravel	M. Gilles Meunier	M. Simon P. Gravel	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain
Date sampled	2009-10-28	2009-11-06	2009-11-05	2009-11-03
Date received	2009-11-12	2009-11-12	2009-11-12	2009-11-12
Parameter(s) Method Reference				
Petroleum hydrocarbons (C10-C50)	Preparation	2009-11-16	2009-11-16	2009-11-16	2009-11-16
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-11-16	2009-11-16	2009-11-16	2009-11-16
	Sequential No.	300817	300817	300817	300817
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)	<100 (<A)	620 (A-B)	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-	-	-	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-	-	-	-
	Sequential No.	NA	NA	NA	NA
Petroleum hydrocarbons identification		ND	ND	*	ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-11-16	2009-11-16	2009-11-16	2009-11-16
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-11-16	2009-11-16	2009-11-16	2009-11-16
	Sequential No.	300814	300814	300814	300814
Naphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.2 (A-B)	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.1 (A)	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.2 (A-B)	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.2 (A-B)	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.5 (A-B)	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.1 (A)	<0.1 (<A)
Phenanthrene	mg/kg	0.4 (A-B)	<0.1 (<A)	0.9 (A-B)	<0.1 (<A)
Anthracene	mg/kg	0.1 (A)	<0.1 (<A)	3.2 (A-B)	<0.1 (<A)
Fluoranthene	mg/kg	0.8 (A-B)	<0.1 (<A)	3.5 (A-B)	<0.1 (<A)
Pyrene	mg/kg	0.6 (A-B)	<0.1 (<A)	3.7 (A-B)	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)
Benzo (a) anthracene	mg/kg	0.4 (A-B)	<0.1 (<A)	1.6 (B-C)	<0.1 (<A)
Chrysene	mg/kg	0.4 (A-B)	<0.1 (<A)	2.0 (B-C)	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	0.7 (A-B)	<0.1 (<A)	3.1 (B-C)	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

	Sample(s)			
Lab. No.	**1406157**	**1406160**	**1406161**	**1406162**
Your Reference	TF-04-09 CF-1	TF-09-09 CF-1	TF-10-09 CF-2	TF-13-09 CF-1
Matrix	Soil	Soil	Soil	Soil
Sampled by	M. Simon P. Gravel	M. Gilles Meunier	M. Simon P. Gravel	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain	Quai de la Reine, 101 boul. Champlain
Date sampled	2009-10-28	2009-11-06	2009-11-05	2009-11-03
Date received	2009-11-12	2009-11-12	2009-11-12	2009-11-12
Parameter(s) Method Reference				
Benzo (e) pyrene	mg/kg	0.2	<0.1	1.1	<0.1
Benzo (a) pyrene	mg/kg	0.3 (A-B)	<0.1 (<A)	1.2 (B-C)	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	0.2 (A-B)	<0.1 (<A)	0.8 (A-B)	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.2 (A-B)	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	0.2 (A-B)	<0.1 (<A)	0.8 (A-B)	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.2 (A-B)	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1	<0.1	0.1	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)	0.1 (A)	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)	<0.1 (<A)
Recuperation %					
Acenaphtene-d10	%	101%	96%	94%	121%
Fluoranthene-d10	%	124%	123%	122%	132%
Chrysene-d12	%	105%	112%	115%	111%
Water (% humidity)	Preparation	2009-11-13	2009-11-13	2009-11-13	2009-11-13
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-11-15	2009-11-15	2009-11-15	2009-11-15
	Sequential No.	300799	300799	300799	300799
Water (% humidity)	%	16	8	9	5

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1406163**
Your Reference	TF-14-09 CF-1
Matrix	Soil
Sampled by	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 boul. Champlain
Date sampled	2009-11-09
Date received	2009-11-12

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2009-11-16
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-11-16
	Sequential No.	300817
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-11-16
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-11-16
	Sequential No.	300814
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	0.2 (A-B)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	0.1 (A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1406163**
Your Reference	TF-14-09 CF-1
Matrix	Soil
Sampled by	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 boul. Champlain
Date sampled	2009-11-09
Date received	2009-11-12

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	120%
Fluoranthene-d10	%	117%
Chrysene-d12	%	105%
Water (% humidity)	Preparation	2009-11-13
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-11-15
	Sequential No.	300799
Water (% humidity)	%	5

Comments:

1406161 TF-10-09 CF-2 * Hydrocarbons in the region of oil

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results - Part 2

Parameters (Sequential ID No.)	Units	Duplicate Value 1	Duplicate Value 2	Duplicate Difference (%)
Mercury				
Sequential ID No: 300833	(Sample no)		(1406161)	
Mercury	mg/kg	0.15	0.13	14.3

Comments

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Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 300799					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 300814					
Naphthalene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.8	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.6	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.6	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	6.0	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.6	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.5	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.7	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.7	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.5	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.5	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	2.4	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 300817					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315014

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1300	1200 - 1800
Mercury					
Sequential ID No.: 300833					
Mercury	mg/kg	< 0.01	<0.01	3.3	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 300951					
Cadmium (Cd)	mg/kg	< 0.5	< 0.5	130	98 - 146
Chromium (Cr)					
Sequential ID No.: 300951					
Chromium (Cr)	mg/kg	< 2	< 2	120	99 - 149
Copper (Cu)					
Sequential ID No.: 300951					
Copper (Cu)	mg/kg	< 1	< 1	750	627 - 941
Arsenic (As)					
Sequential ID No.: 300915					
Arsenic (As)	mg/kg	< 0.5	<0.5	150	107 - 199
Nickel (Ni)					
Sequential ID No.: 300951					
Nickel (Ni)	mg/kg	< 2	< 2	98	80 - 120
Lead (Pb)					
Sequential ID No.: 300951					
Lead (Pb)	mg/kg	< 5	< 5	90	71 - 106
Zinc (Zn)					
Sequential ID No.: 300951					
Zinc (Zn)	mg/kg	< 5	< 5	870	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-315173**

Date Received: 2009-11-16

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315173

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1407216**
Your Reference	F-15-09 CF-1
Matrix	Soil
Sampled by	M. Massicotte
Site sampled	Quai de la Reine
Date sampled	2009-11-12
Date received	2009-11-16

Parameter(s)

Parameter(s) / Method / Reference		
Arsenic (As)	Preparation	2009-11-18
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-11-18
Result as per dry weight	Sequential No.	301008
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	0.8 (<A)
Cadmium (Cd)	Preparation	2009-11-18
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-18
Result as per dry weight	Sequential No.	301044
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	< 0.5 (<A)
Chromium (Cr)	Preparation	2009-11-18
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-18
Result as per dry weight	Sequential No.	301044
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	4 (<A)
Copper (Cu)	Preparation	2009-11-18
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-18
Result as per dry weight	Sequential No.	301044
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	4 (<A)
Lead (Pb)	Preparation	2009-11-18
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-18
Result as per dry weight	Sequential No.	301044
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	< 5 (<A)
Mercury	Preparation	2009-11-18
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-11-18
Result as per dry weight	Sequential No.	301014
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	<0.01 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315173

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1407216**
Your Reference	F-15-09 CF-1
Matrix	Soil
Sampled by	M. Massicotte
Site sampled	Quai de la Reine
Date sampled	2009-11-12
Date received	2009-11-16

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2009-11-18
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-18
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	301044
Nickel (Ni)	mg/kg	8 (<A)
Total organic carbon	Preparation	2009-11-19
LECO combustion	Analysis	2009-11-19
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.29
Zinc (Zn)	Preparation	2009-11-18
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-18
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	301044
Zinc (Zn)	mg/kg	25 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315173

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1407216**
Your Reference	F-15-09 CF-1
Matrix	Soil
Sampled by	M. Massicotte
Site sampled	Quai de la Reine
Date sampled	2009-11-12
Date received	2009-11-16

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2009-11-18
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-11-18
	Sequential No.	301030
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-11-18
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-11-18
	Sequential No.	301059
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315173

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1407216**
Your Reference	F-15-09 CF-1
Matrix	Soil
Sampled by	M. Massicotte
Site sampled	Quai de la Reine
Date sampled	2009-11-12
Date received	2009-11-16

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	79%
Fluoranthene-d10	%	85%
Chrysene-d12	%	73%
Water (% humidity)	Preparation	2009-11-17
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-11-18
	Sequential No.	301018
Water (% humidity)	%	8

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE
Alain Perron
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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315173

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 301018					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 301059					
Naphthalene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.8	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.5	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.7	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	3.8	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	0.7	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	1.8	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	0.8	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	1.6	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	1.9	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	1.7	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 301030					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315173

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1200	1200 - 1800
Mercury					
Sequential ID No.: 301014					
Mercury	mg/kg	< 0.01	<0.01	3.6	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 301044					
Cadmium (Cd)	mg/kg	< 0.5	< 0.5	130	98 - 146
Chromium (Cr)					
Sequential ID No.: 301044					
Chromium (Cr)	mg/kg	< 2	< 2	110	99 - 149
Copper (Cu)					
Sequential ID No.: 301044					
Copper (Cu)	mg/kg	< 1	< 1	780	627 - 941
Arsenic (As)					
Sequential ID No.: 301008					
Arsenic (As)	mg/kg	< 0.5	<0.5	150	107 - 199
Nickel (Ni)					
Sequential ID No.: 301044					
Nickel (Ni)	mg/kg	< 2	< 2	100	80 - 120
Lead (Pb)					
Sequential ID No.: 301044					
Lead (Pb)	mg/kg	< 5	< 5	88	71 - 106
Zinc (Zn)					
Sequential ID No.: 301044					
Zinc (Zn)	mg/kg	< 5	< 5	910	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-315622**

Date Received: 2009-11-19

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
Québec, Québec, Canada
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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Comments

The analysis of cadmium (Cd) was performed by ICP-MS and not by graphite furnace. (GFAA).

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315622

P.O. Number	Your Project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1409239**
Your Reference	F-6 19-11-09
Matrix	Sediment
Sampled by	M. David Ouzilleau
Site sampled	Quai de la Reine
Date sampled	2009-11-19
Date received	2009-11-19

Parameter(s)

Method Reference		
Cadmium	Preparation	2009-11-25
Acid digestion, GFAA analysis Result as per dry weight EPA3050, MA. 200 - Met 1.0	Analysis	2009-11-25
	Sequential No.	301627
Cadmium	mg/kg	0.11

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315622

P.O. Number	Your Project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1409239**
Your Reference	F-6 19-11-09
Matrix	Sediment
Sampled by	M. David Ouzilleau
Site sampled	Quai de la Reine
Date sampled	2009-11-19
Date received	2009-11-19

Parameter(s)

Parameter(s) / Method / Reference		
Arsenic (As)	Preparation	2009-11-25
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-11-25
Result as per dry weight	Sequential No.	301624
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.2 (<A)
Chromium (Cr)	Preparation	2009-11-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-25
Result as per dry weight	Sequential No.	301623
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	6 (<A)
Copper (Cu)	Preparation	2009-11-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-25
Result as per dry weight	Sequential No.	301623
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	6 (<A)
Lead (Pb)	Preparation	2009-11-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-25
Result as per dry weight	Sequential No.	301623
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	6 (<A)
Mercury	Preparation	2009-11-24
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-11-24
Result as per dry weight	Sequential No.	301548
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.09 (<A)
Nickel (Ni)	Preparation	2009-11-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-11-25
Result as per dry weight	Sequential No.	301623
MA. 200 - Mét 1.1 R4		
Nickel (Ni)	mg/kg	6 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315622

P.O. Number	Your Project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1409239**
Your Reference	F-6 19-11-09
Matrix	Sediment
Sampled by	M. David Ouzilleau
Site sampled	Quai de la Reine
Date sampled	2009-11-19
Date received	2009-11-19

Parameter(s)

Parameter(s) / Method / Reference		
Total organic carbon	Preparation	2009-11-24
LECO combustion Sub-contracted work. Result as per dry weight.	Analysis	2009-11-24
	Sequential No.	NA
Total organic carbon	%C	0.04
Zinc (Zn)	Preparation	2009-11-25
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2009-11-25
	Sequential No.	301623
Zinc (Zn)	mg/kg	30 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315622

P.O. Number	Your Project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1409239**
Your Reference	F-6 19-11-09
Matrix	Sediment
Sampled by	M. David Ouzilleau
Site sampled	Quai de la Reine
Date sampled	2009-11-19
Date received	2009-11-19

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2009-11-25
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-11-25
	Sequential No.	301640
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-11-23
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-11-24
	Sequential No.	301478
Naphtalene	mg/kg	0.016
1-Methylnaphtalene	mg/kg	0.007
2-Methylnaphtalene	mg/kg	0.011
1,3-Dimethylnaphtalene	mg/kg	0.006
Acenaphtylene	mg/kg	< 0.003
Acenaphtene	mg/kg	0.006
2,3,5-Trimethylnaphtalene	mg/kg	< 0.005
Fluorene	mg/kg	0.020
Phenanthrene	mg/kg	0.030
Anthracene	mg/kg	0.023
Fluoranthene	mg/kg	0.028
Pyrene	mg/kg	0.026
Benzo (c) phenanthrene	mg/kg	< 0.005
Benzo (a) anthracene	mg/kg	0.007
Chrysene	mg/kg	0.010
5-Methylchrysene	mg/kg	< 0.005
Benzo (b, j & k) fluoranthene	mg/kg	0.012

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315622

P.O. Number	Your Project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1409239**
Your Reference	F-6 19-11-09
Matrix	Sediment
Sampled by	M. David Ouzilleau
Site sampled	Quai de la Reine
Date sampled	2009-11-19
Date received	2009-11-19

Parameter(s) Method Reference		
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.005
Benzo (e) pyrene	mg/kg	0.006
Benzo (a) pyrene	mg/kg	< 0.005
3-Methylcholanthrene	mg/kg	< 0.005
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.005
Dibenzo (a,h) anthracene	mg/kg	< 0.003
7H-Dibenzo (c,g) carbazole	mg/kg	< 0.005
Benzo (g,h,i) perylene	mg/kg	< 0.005
Dibenzo (a,l) pyrene	mg/kg	< 0.010
Dibenzo (a,e) pyrene	mg/kg	< 0.010
Dibenzo (a,i) pyrene	mg/kg	< 0.010
Dibenzo (a,h) pyrene	mg/kg	< 0.010
Recuperation %		
Acenaphtene-d10	%	88
Fluoranthene-d10	%	96
Chrysene-d12	%	96
Water (% humidity)	Preparation	2009-11-25
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-11-26
	Sequential No.	301747
Water (% humidity)	%	19

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315622

P.O. Number	Your Project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Cadmium					
Sequential ID No.: 301627					
Cadmium	mg/kg	< 0.05	<0.05	120	98 - 146
Water (% humidity)					
Sequential ID No.: 301747					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 301478					
Naphtalene	mg/kg	< 0.005	0.023	0.14	0.12 - 0.28
1-Methylnaphtalene	mg/kg	< 0.005	0.008	0.16	0.12 - 0.28
2-Methylnaphtalene	mg/kg	< 0.005	0.013	0.096	0.072 - 0.17
1,3-Dimethylnaphtalene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Acenaphtylene	mg/kg	< 0.003	<0.003	0.17	0.12 - 0.28
Acenaphtene	mg/kg	< 0.003	<0.003	0.18	0.12 - 0.28
2,3,5-Trimethylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.09 - 0.21
Fluorene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Phenanthrene	mg/kg	< 0.005	0.006	0.19	0.12 - 0.28
Anthracene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Fluoranthene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Pyrene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Benzo (c) phenanthrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) anthracene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Chrysene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
5-Methylchrysene	mg/kg	< 0.005	<0.005	0.10	0.12 - 0.28
Benzo (b, j & k) fluoranthene	mg/kg	< 0.005	<0.005	0.68	0.48 - 1.1
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.005	<0.005	0.14	0.12 - 0.28
Benzo (e) pyrene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Benzo (a) pyrene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
3-Methylcholanthrene	mg/kg	< 0.005	<0.005	0.33	0.24 - 0.56
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.005	<0.005	0.17	0.12 - 0.28
Dibenzo (a,h) anthracene	mg/kg	< 0.003	<0.003	0.15	0.12 - 0.28
7H-Dibenzo (c,g) carbazole	mg/kg	< 0.005	<0.005	0.13	0.12 - 0.28
Benzo (g,h,i) perylene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Dibenzo (a,l) pyrene	mg/kg	< 0.01	<0.01	0.14	0.12 - 0.28

Comments

Sequential ID no. 301478 : Blanc positif soustrait des échantillons / Positive result for blank subtracted from sample result

Sequential ID no. 301623 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-315622

P.O. Number	Your Project ID.	Project Manager
NA	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Dibenzo (a,e) pyrene	mg/kg	< 0.01	<0.01	0.30	0.24 - 0.56
Dibenzo (a,i) pyrene	mg/kg	< 0.01	<0.01	0.31	0.24 - 0.56
Dibenzo (a,h) pyrene	mg/kg	< 0.01	<0.01	0.26	0.24 - 0.56
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 301640					
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1200	1200 - 1800
Mercury					
Sequential ID No.: 301548					
Mercury	mg/kg	< 0.01	<0.01	3.2	2.1 - 4
Chromium (Cr)					
Sequential ID No.: 301623					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 301623					
Copper (Cu)	mg/kg	< 1	2	830	627 - 941
Arsenic (As)					
Sequential ID No.: 301624					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 301623					
Nickel (Ni)	mg/kg	< 2	<2	110	80 - 120
Lead (Pb)					
Sequential ID No.: 301623					
Lead (Pb)	mg/kg	< 5	<5	100	71 - 106
Zinc (Zn)					
Sequential ID No.: 301623					
Zinc (Zn)	mg/kg	< 5	<5	890	665 - 998

Comments

Sequential ID no. 301478 : Blanc positif soustrait des échantillons / Positive result for blank subtracted from sample result

Sequential ID no. 301623 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-316391**

Date Received: 2009-11-27

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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Québec, Québec, Canada
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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-316391

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

	Sample(s)	
Lab. No.	**1412879**	**1412880**
Your Reference	TF-11-09 CF-1	F-16-09 CF-1
Matrix	Soil	Soil
Sampled by	M. Gilles Meunier	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 Boul. Champlain, Ouébec	Quai de la Reine, 101 Boul. Champlain, Ouébec
Date sampled	2009-11-12	2009-11-11
Date received	2009-11-27	2009-11-27

Parameter(s) Method Reference			
Arsenic (As)	Preparation	2009-12-01	2009-12-01
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302048	302048
Arsenic (As)	mg/kg	1.3 (<A)	1.3 (<A)
Cadmium (Cd)	Preparation	2009-12-01	2009-12-01
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302047	302047
Cadmium (Cd)	mg/kg	<0.5 (<A)	<0.5 (<A)
Chromium (Cr)	Preparation	2009-12-01	2009-12-01
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302047	302047
Chromium (Cr)	mg/kg	6 (<A)	6 (<A)
Copper (Cu)	Preparation	2009-12-01	2009-12-01
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302047	302047
Copper (Cu)	mg/kg	8 (<A)	9 (<A)
Lead (Pb)	Preparation	2009-12-01	2009-12-01
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302047	302047
Lead (Pb)	mg/kg	<5 (<A)	<5 (<A)
Mercury	Preparation	2009-12-01	2009-12-01
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Hg 1.0 R4	Sequential No.	302060	302060
Mercury	mg/kg	0.01 (<A)	<0.01 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-316391

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

		Sample(s)	
	Lab. No.	**1412879**	**1412880**
	Your Reference	TF-11-09 CF-1	F-16-09 CF-1
	Matrix	Soil	Soil
	Sampled by	M. Gilles Meunier	M. Gilles Meunier
	Site sampled	Quai de la Reine, 101 Boul. Champlain, Québec	Quai de la Reine, 101 Boul. Champlain, Québec
	Date sampled	2009-11-12	2009-11-11
	Date received	2009-11-27	2009-11-27
Parameter(s) Method Reference			
Nickel (Ni)	Preparation	2009-12-01	2009-12-01
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302047	302047
Nickel (Ni)	mg/kg	8 (<A)	8 (<A)
Total organic carbon	Preparation	2009-12-02	2009-12-02
LECO combustion	Analysis	2009-12-02	2009-12-02
Sub-contracted work. Result as per dry weight.	Sequential No.	NA	NA
Total organic carbon	%C	0.65	0.34
Zinc (Zn)	Preparation	2009-12-01	2009-12-01
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-01	2009-12-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302047	302047
Zinc (Zn)	mg/kg	18 (<A)	17 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-316391

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

		Sample(s)	
	Lab. No.	**1412879**	**1412880**
	Your Reference	TF-11-09 CF-1	F-16-09 CF-1
	Matrix	Soil	Soil
	Sampled by	M. Gilles Meunier	M. Gilles Meunier
	Site sampled	Quai de la Reine, 101 Boul. Champlain, Québec	Quai de la Reine, 101 Boul. Champlain, Québec
	Date sampled	2009-11-12	2009-11-11
	Date received	2009-11-27	2009-11-27
Parameter(s) Method Reference			
Petroleum hydrocarbons (C10-C50)	Preparation	2009-12-01	2009-12-01
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-12-01	2009-12-01
	Sequential No.	302021	302021
Petroleum hydrocarbons (C10-C50)	mg/kg	250 (<A)	< 100 (<A)
Petroleum hydrocarbons identification	Preparation	-	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-	-
	Sequential No.	NA	NA
Petroleum hydrocarbons identification		*	ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-12-01	2009-12-01
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-12-01	2009-12-01
	Sequential No.	302019	302019
Naphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-316391

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

	Sample(s)	
Lab. No.	**1412879**	**1412880**
Your Reference	TF-11-09 CF-1	F-16-09 CF-1
Matrix	Soil	Soil
Sampled by	M. Gilles Meunier	M. Gilles Meunier
Site sampled	Quai de la Reine, 101 Boul. Champlain, Québec	Quai de la Reine, 101 Boul. Champlain, Québec
Date sampled	2009-11-12	2009-11-11
Date received	2009-11-27	2009-11-27

Parameter(s) Method Reference			
Benzo (e) pyrene	mg/kg	<0.1	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Recuperation %			
Acenaphtene-d10	%	93%	88%
Fluoranthene-d10	%	97%	95%
Chrysene-d12	%	88%	83%
Water (% humidity)	Preparation	2009-11-30	2009-11-30
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-12-01	2009-12-01
	Sequential No.	302032	302032
Water (% humidity)	%	4	8

Comments:

1412879 TF-11-09 CF-1 * Concentration too low for interpretation

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-316391

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 302032					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 302019					
Naphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.6	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.9	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	5.8	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.6	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	0.8	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.2	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.1	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	2.5	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 302021					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-316391

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	< 100	1300	1200 - 1800
Mercury					
Sequential ID No.: 302060					
Mercury	mg/kg	< 0.01	<0.01	3.4	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 302047					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	130	98 - 146
Chromium (Cr)					
Sequential ID No.: 302047					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 302047					
Copper (Cu)	mg/kg	< 1	<1	860	627 - 941
Arsenic (As)					
Sequential ID No.: 302048					
Arsenic (As)	mg/kg	< 0.5	<0.5	150	107 - 199
Nickel (Ni)					
Sequential ID No.: 302047					
Nickel (Ni)	mg/kg	< 2	<2	110	80 - 120
Lead (Pb)					
Sequential ID No.: 302047					
Lead (Pb)	mg/kg	< 5	<5	94	71 - 106
Zinc (Zn)					
Sequential ID No.: 302047					
Zinc (Zn)	mg/kg	< 5	<5	920	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-317186**

Date Received: 2009-12-07

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date on samples stored at 4°C.

The analysis of cadmium (Cd) was performed by ICP-MS and not by graphite furnace. (GFAA).

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416155**
Your Reference	TF-01-09 CF-1 {1397208}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-12-07

Parameter(s)

Method / Reference		
Cadmium	Preparation	2009-12-14
Acid digestion, GFAA analysis Result as per dry weight EPA3050, MA. 200 - Met 1.0	Analysis	2009-12-14
	Sequential No.	303019
Cadmium	mg/kg	0.15

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416155**
Your Reference	TF-01-09 CF-1 {1397208}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-12-07

Parameter(s)

Parameter(s) / Method / Reference		
Arsenic (As)	Preparation	2009-12-14
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303018
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.2 (<A)
Chromium (Cr)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	8 (<A)
Copper (Cu)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	4 (<A)
Lead (Pb)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	10 (<A)
Mercury	Preparation	2009-12-15
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-12-16
Result as per dry weight	Sequential No.	303125
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.17 (<A)
Nickel (Ni)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Nickel (Ni)	mg/kg	10 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416155**
Your Reference	TF-01-09 CF-1 {1397208}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-12-07

Parameter(s)

Method / Reference		
Zinc (Zn)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	303017
Zinc (Zn)	mg/kg	45 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416155**
Your Reference	TF-01-09 CF-1 {1397208}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-12-07

Parameter(s)

Method / Reference		
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-12-14
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-12-14
	Sequential No.	302632
Naphtalene	mg/kg	0.007
1-Methylnaphtalene	mg/kg	<0.005
2-Methylnaphtalene	mg/kg	<0.005
1,3-Dimethylnaphtalene	mg/kg	<0.005
Acenaphtylene	mg/kg	0.007
Acenaphtene	mg/kg	<0.003
2,3,5-Trimethylnaphtalene	mg/kg	<0.005
Fluorene	mg/kg	<0.005
Phenanthrene	mg/kg	0.043
Anthracene	mg/kg	0.019
Fluoranthene	mg/kg	0.064
Pyrene	mg/kg	0.053
Benzo (c) phenanthrene	mg/kg	<0.005
Benzo (a) anthracene	mg/kg	0.027
Chrysene	mg/kg	0.033
5-Methylchrysene	mg/kg	<0.005
Benzo (b, j & k) fluoranthene	mg/kg	0.051
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.005
Benzo (e) pyrene	mg/kg	0.022
Benzo (a) pyrene	mg/kg	0.025
3-Methylcholanthrene	mg/kg	<0.005
Indeno (1,2,3-cd) pyrene	mg/kg	0.015
Dibenzo (a,h) anthracene	mg/kg	0.004
7H-Dibenzo (c,g) carbazole	mg/kg	<0.005
Benzo (g,h,i) perylene	mg/kg	0.021
Dibenzo (a,l) pyrene	mg/kg	<0.01

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	1416155
Your Reference	TF-01-09 CF-1 {1397208}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Qc
Date sampled	2009-10-20
Date received	2009-12-07

Parameter(s) Method Reference		
Dibenzo (a,e) pyrene	mg/kg	<0.01
Dibenzo (a,i) pyrene	mg/kg	<0.01
Dibenzo (a,h) pyrene	mg/kg	<0.01
Recuperation %		
Acenaphtene-d10	%	96%
Fluoranthene-d10	%	94%
Chrysene-d12	%	97%
Water (% humidity)	Preparation	2009-10-28
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-10-29
	Sequential No.	NA
Water (% humidity)	%	18

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Cadmium					
Sequential ID No.: 303019					
Cadmium	mg/kg	< 0.03	<0.05	130	98 - 146
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 302632					
Naphtalene	mg/kg	< 0.005	<0.005	0.15	0.12 - 0.28
1-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.12 - 0.28
2-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.077	0.072 - 0.17
1,3-Dimethylnaphtalene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Acenaphtylene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
Acenaphtene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
2,3,5-Trimethylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.09 - 0.21
Fluorene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Phenanthrene	mg/kg	< 0.005	0.007	0.18	0.12 - 0.28
Anthracene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Fluoranthene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (c) phenanthrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) anthracene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Chrysene	mg/kg	< 0.005	<0.005	0.23	0.12 - 0.28
5-Methylchrysene	mg/kg	< 0.005	<0.005	0.12	0.12 - 0.28
Benzo (b, j & k) fluoranthene	mg/kg	< 0.005	<0.005	0.77	0.48 - 1.1
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.005	<0.005	0.16	0.12 - 0.28
Benzo (e) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
3-Methylcholanthrene	mg/kg	< 0.005	<0.005	0.35	0.24 - 0.56
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Dibenzo (a,h) anthracene	mg/kg	< 0.003	<0.003	0.16	0.12 - 0.28
7H-Dibenzo (c,g) carbazole	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Benzo (g,h,i) perylene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Dibenzo (a,l) pyrene	mg/kg	< 0.01	<0.01	0.16	0.12 - 0.28
Dibenzo (a,e) pyrene	mg/kg	< 0.01	<0.01	0.34	0.24 - 0.56
Dibenzo (a,i) pyrene	mg/kg	< 0.01	<0.01	0.41	0.24 - 0.56
Dibenzo (a,h) pyrene	mg/kg	< 0.01	<0.01	0.47	0.24 - 0.56

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Mercury					
Sequential ID No.: 303125					
Mercury	mg/kg	< 0.01	<0.01	3.0	2.1 - 4
Chromium (Cr)					
Sequential ID No.: 303017					
Chromium (Cr)	mg/kg	< 2	<2	120	99 - 149
Copper (Cu)					
Sequential ID No.: 303017					
Copper (Cu)	mg/kg	< 1	<1	750	627 - 941
Arsenic (As)					
Sequential ID No.: 303018					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 303017					
Nickel (Ni)	mg/kg	< 2	<2	94	80 - 120
Lead (Pb)					
Sequential ID No.: 303017					
Lead (Pb)	mg/kg	< 5	<5	91	71 - 106
Zinc (Zn)					
Sequential ID No.: 303017					
Zinc (Zn)	mg/kg	< 5	<5	830	665 - 998

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317186

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results - Part 2

Parameters (Sequential ID No.)	Units	Duplicate Value 1	Duplicate Value 2	Duplicate Difference (%)
Mercury				
Sequential ID No: 303125	(Sample no)		(1416155)	
Mercury	mg/kg	0.17	0.18	5.7

Comments

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Certificate of Analysis

Request number: **09-317187**

Date Received: 2009-12-07

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date on samples stored at 4°C.

The analysis of cadmium (Cd) was performed by ICP-MS and not by graphite furnace. (GFAA).

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317187

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416156**
Your Reference	TF-03-09 CF-1 {1397379}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-12-07

Parameter(s)

Method / Reference		
Cadmium	Preparation	2009-12-14
Acid digestion, GFAA analysis Result as per dry weight EPA3050, MA. 200 - Met 1.0	Analysis	2009-12-14
	Sequential No.	303019
Cadmium	mg/kg	0.31

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317187

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416156**
Your Reference	TF-03-09 CF-1 {1397379}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-12-07

Parameter(s)

Parameter		
Arsenic (As)	Preparation	2009-12-14
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303018
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.8 (<A)
Chromium (Cr)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	17 (<A)
Copper (Cu)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	12 (<A)
Lead (Pb)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	8 (<A)
Mercury	Preparation	2009-12-15
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-12-16
Result as per dry weight	Sequential No.	303125
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.19 (<A)
Nickel (Ni)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Nickel (Ni)	mg/kg	14 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317187

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416156**
Your Reference	TF-03-09 CF-1 {1397379}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-12-07

Parameter(s)

Method / Reference		
Zinc (Zn)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	303017
Zinc (Zn)	mg/kg	67 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317187

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416156**
Your Reference	TF-03-09 CF-1 {1397379}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-12-07

Parameter(s)

Method Reference		
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-12-14
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-12-14
	Sequential No.	302632
Naphtalene	mg/kg	0.010
1-Methylnaphtalene	mg/kg	<0.005
2-Methylnaphtalene	mg/kg	0.007
1,3-Dimethylnaphtalene	mg/kg	0.014
Acenaphtylene	mg/kg	0.008
Acenaphtene	mg/kg	0.012
2,3,5-Trimethylnaphtalene	mg/kg	<0.005
Fluorene	mg/kg	0.011
Phenanthrene	mg/kg	0.096
Anthracene	mg/kg	0.045
Fluoranthene	mg/kg	0.087
Pyrene	mg/kg	0.072
Benzo (c) phenanthrene	mg/kg	<0.005
Benzo (a) anthracene	mg/kg	0.038
Chrysene	mg/kg	0.052
5-Methylchrysene	mg/kg	<0.005
Benzo (b, j & k) fluoranthene	mg/kg	0.070
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.005
Benzo (e) pyrene	mg/kg	0.028
Benzo (a) pyrene	mg/kg	0.035
3-Methylcholanthrene	mg/kg	<0.005
Indeno (1,2,3-cd) pyrene	mg/kg	0.026
Dibenzo (a,h) anthracene	mg/kg	0.006
7H-Dibenzo (c,g) carbazole	mg/kg	<0.005
Benzo (g,h,i) perylene	mg/kg	0.032
Dibenzo (a,l) pyrene	mg/kg	<0.01

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317187

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416156**
Your Reference	TF-03-09 CF-1 {1397379}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, Boul. Champlain, Qc
Date sampled	2009-10-26
Date received	2009-12-07

Parameter(s) Method Reference		
Dibenzo (a,e) pyrene	mg/kg	<0.01
Dibenzo (a,i) pyrene	mg/kg	<0.01
Dibenzo (a,h) pyrene	mg/kg	<0.01
Recuperation %		
Acenaphtene-d10	%	94%
Fluoranthene-d10	%	94%
Chrysene-d12	%	97%
Water (% humidity)	Preparation	2009-10-28
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-10-29
	Sequential No.	NA
Water (% humidity)	%	30

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317187

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Cadmium					
Sequential ID No.: 303019					
Cadmium	mg/kg	< 0.03	<0.05	130	98 - 146
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 302632					
Naphtalene	mg/kg	< 0.005	<0.005	0.15	0.12 - 0.28
1-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.12 - 0.28
2-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.077	0.072 - 0.17
1,3-Dimethylnaphtalene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Acenaphtylene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
Acenaphtene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
2,3,5-Trimethylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.09 - 0.21
Fluorene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Phenanthrene	mg/kg	< 0.005	0.007	0.18	0.12 - 0.28
Anthracene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Fluoranthene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (c) phenanthrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) anthracene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Chrysene	mg/kg	< 0.005	<0.005	0.23	0.12 - 0.28
5-Methylchrysene	mg/kg	< 0.005	<0.005	0.12	0.12 - 0.28
Benzo (b, j & k) fluoranthene	mg/kg	< 0.005	<0.005	0.77	0.48 - 1.1
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.005	<0.005	0.16	0.12 - 0.28
Benzo (e) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
3-Methylcholanthrene	mg/kg	< 0.005	<0.005	0.35	0.24 - 0.56
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Dibenzo (a,h) anthracene	mg/kg	< 0.003	<0.003	0.16	0.12 - 0.28
7H-Dibenzo (c,g) carbazole	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Benzo (g,h,i) perylene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Dibenzo (a,l) pyrene	mg/kg	< 0.01	<0.01	0.16	0.12 - 0.28
Dibenzo (a,e) pyrene	mg/kg	< 0.01	<0.01	0.34	0.24 - 0.56
Dibenzo (a,i) pyrene	mg/kg	< 0.01	<0.01	0.41	0.24 - 0.56
Dibenzo (a,h) pyrene	mg/kg	< 0.01	<0.01	0.47	0.24 - 0.56

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317187

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Mercury					
Sequential ID No.: 303125					
Mercury	mg/kg	< 0.01	<0.01	3.0	2.1 - 4
Chromium (Cr)					
Sequential ID No.: 303017					
Chromium (Cr)	mg/kg	< 2	<2	120	99 - 149
Copper (Cu)					
Sequential ID No.: 303017					
Copper (Cu)	mg/kg	< 1	<1	750	627 - 941
Arsenic (As)					
Sequential ID No.: 303018					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 303017					
Nickel (Ni)	mg/kg	< 2	<2	94	80 - 120
Lead (Pb)					
Sequential ID No.: 303017					
Lead (Pb)	mg/kg	< 5	<5	91	71 - 106
Zinc (Zn)					
Sequential ID No.: 303017					
Zinc (Zn)	mg/kg	< 5	<5	830	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-317188**

Date Received: 2009-12-07

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date.

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317188

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416157**
Your Reference	TF-14-09 CF-2
Matrix	Soil
Sampled by	M. Gilles Meunier
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-11-09
Date received	2009-12-07

Parameter(s)

Parameter(s) / Method / Reference		
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-12-09
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-12-09
	Sequential No.	302635
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317188

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416157**
Your Reference	TF-14-09 CF-2
Matrix	Soil
Sampled by	M. Gilles Meunier
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-11-09
Date received	2009-12-07

Parameter(s) Method Reference		
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	93%
Fluoranthene-d10	%	86%
Chrysene-d12	%	83%
Water (% humidity)	Preparation	2009-12-09
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-12-10
	Sequential No.	302779
Water (% humidity)	%	9

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317188

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 302779					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 302635					
Naphthalene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.6	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.8	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	4.9	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.2	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	0.8	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	1.6	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	1.5	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	2.0	1.6 - 3.7

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-317189**

Date Received: 2009-12-07

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

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P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date.

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317189

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416158**
Your Reference	TF-10-09 CF-3
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101 boul. Champalin, Qc
Date sampled	2009-11-05
Date received	2009-12-07

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2009-12-10
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-12-10
Result as per dry weight	Sequential No.	302786
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	2.6 (<A)
Cadmium (Cd)	Preparation	2009-12-10
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-10
Result as per dry weight	Sequential No.	302785
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2009-12-10
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-10
Result as per dry weight	Sequential No.	302785
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	6 (<A)
Copper (Cu)	Preparation	2009-12-10
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-10
Result as per dry weight	Sequential No.	302785
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	14 (<A)
Lead (Pb)	Preparation	2009-12-10
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-10
Result as per dry weight	Sequential No.	302785
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	23 (<A)
Mercury	Preparation	2009-12-10
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-12-10
Result as per dry weight	Sequential No.	302787
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.02 (<A)

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Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317189

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416158**
Your Reference	TF-10-09 CF-3
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101 boul. Champalin, Qc
Date sampled	2009-11-05
Date received	2009-12-07

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2009-12-10
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-10
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302785
Nickel (Ni)	mg/kg	9 (<A)
Total organic carbon	Preparation	2009-12-10
LECO combustion	Analysis	2009-12-10
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.67
Zinc (Zn)	Preparation	2009-12-10
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-10
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	302785
Zinc (Zn)	mg/kg	30 (<A)

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Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317189

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416158**
Your Reference	TF-10-09 CF-3
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101 boul. Champalin, Qc
Date sampled	2009-11-05
Date received	2009-12-07

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2009-12-09
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2009-12-09
	Sequential No.	302729
Petroleum hydrocarbons (C10-C50)	mg/kg	220 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		*
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-12-09
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-12-09
	Sequential No.	302635
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	0.2 (A-B)
Anthracene	mg/kg	0.3 (A-B)
Fluoranthene	mg/kg	0.3 (A-B)
Pyrene	mg/kg	0.4 (A-B)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	0.1 (A)
Chrysene	mg/kg	0.3 (A-B)
Benzo (b, j & k) fluoranthene	mg/kg	0.2 (A-B)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317189

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416158**
Your Reference	TF-10-09 CF-3
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101 boul. Champalin, Qc
Date sampled	2009-11-05
Date received	2009-12-07

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	0.2
Benzo (a) pyrene	mg/kg	0.1 (A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	0.1 (A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	0.1 (A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	91%
Fluoranthene-d10	%	88%
Chrysene-d12	%	84%
Water (% humidity)	Preparation	2009-12-09
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-12-10
	Sequential No.	302779
Water (% humidity)	%	5

Comments:

1416158 TF-10-09 CF-3 * Concentration too low for interpretation

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317189

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 302779					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 302635					
Naphthalene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.6	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.8	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	4.9	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.2	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	0.8	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	1.6	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	1.5	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	2.0	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 302729					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317189

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1300	1200 - 1800
Mercury					
Sequential ID No.: 302787					
Mercury	mg/kg	< 0.01	<0.01	3.4	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 302785					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	110	98 - 146
Chromium (Cr)					
Sequential ID No.: 302785					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 302785					
Copper (Cu)	mg/kg	< 1	<1	740	627 - 941
Arsenic (As)					
Sequential ID No.: 302786					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 302785					
Nickel (Ni)	mg/kg	< 2	<2	98	80 - 120
Lead (Pb)					
Sequential ID No.: 302785					
Lead (Pb)	mg/kg	< 5	<5	84	71 - 106
Zinc (Zn)					
Sequential ID No.: 302785					
Zinc (Zn)	mg/kg	< 5	<5	800	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-317190**

Date Received: 2009-12-07

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date on samples stored at 4°C.

The analysis of cadmium (Cd) was performed by ICP-MS and not by graphite furnace. (GFAA).

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317190

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416159**
Your Reference	TF-04-09 CF-1 {1406157}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-28
Date received	2009-12-07

Parameter(s)

Method / Reference		
Cadmium	Preparation	2009-12-14
Acid digestion, GFAA analysis Result as per dry weight EPA3050, MA. 200 - Met 1.0	Analysis	2009-12-14
	Sequential No.	303019
Cadmium	mg/kg	0.16

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317190

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416159**
Your Reference	TF-04-09 CF-1 {1406157}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-28
Date received	2009-12-07

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2009-12-14
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303018
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.0 (<A)
Chromium (Cr)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	10 (<A)
Copper (Cu)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	3 (<A)
Lead (Pb)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	23 (<A)
Mercury	Preparation	2009-12-15
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-12-16
Result as per dry weight	Sequential No.	303125
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.07 (<A)
Nickel (Ni)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Nickel (Ni)	mg/kg	8 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317190

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416159**
Your Reference	TF-04-09 CF-1 {1406157}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-28
Date received	2009-12-07

Parameter(s)

Method / Reference		
Zinc (Zn)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	303017
Zinc (Zn)	mg/kg	33 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317190

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	1416159	1416160
Your Reference	TF-04-09 CF-1 {1406157}	TF-04-09 CF-2
Matrix	Sediment	Sediment
Sampled by	M. Simon-Pierre Gravel	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-28	2009-10-28
Date received	2009-12-07	2009-12-07

Parameter(s)

Parameter(s) / Method / Reference			
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-12-14	2009-12-14
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2009-12-14	2009-12-14
	Sequential No.	302632	302632
Naphtalene	mg/kg	<0.005	0.089
1-Methylnaphtalene	mg/kg	<0.005	0.071
2-Methylnaphtalene	mg/kg	<0.005	0.10
1,3-Dimethylnaphtalene	mg/kg	<0.005	0.15
Acenaphtylene	mg/kg	<0.003	0.041
Acenaphtene	mg/kg	<0.003	0.35
2,3,5-Trimethylnaphtalene	mg/kg	<0.005	0.069
Fluorene	mg/kg	<0.005	0.25
Phenanthrene	mg/kg	0.013	1.8
Anthracene	mg/kg	0.007	0.56
Fluoranthene	mg/kg	0.020	1.7
Pyrene	mg/kg	0.023	1.4
Benzo (c) phenanthrene	mg/kg	<0.005	<0.03
Benzo (a) anthracene	mg/kg	0.006	0.72
Chrysene	mg/kg	0.011	0.72
5-Methylchrysene	mg/kg	<0.005	<0.03
Benzo (b, j & k) fluoranthene	mg/kg	0.007	1.1
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.005	<0.03
Benzo (e) pyrene	mg/kg	0.007	0.42
Benzo (a) pyrene	mg/kg	0.006	0.67
3-Methylcholanthrene	mg/kg	<0.005	<0.03
Indeno (1,2,3-cd) pyrene	mg/kg	<0.005	0.40
Dibenzo (a,h) anthracene	mg/kg	<0.003	0.095
7H-Dibenzo (c,g) carbazole	mg/kg	<0.005	<0.03
Benzo (g,h,i) perylene	mg/kg	0.006	0.47
Dibenzo (a,l) pyrene	mg/kg	<0.01	<0.05

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317190

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416159**	**1416160**
Your Reference	TF-04-09 CF-1 {1406157}	TF-04-09 CF-2
Matrix	Sediment	Sediment
Sampled by	M. Simon-Pierre Gravel	M. Simon-Pierre Gravel
Site sampled	Quai de la Reine, 101, boul. Champlain, Qc	Quai de la Reine, 101, boul. Champlain, Qc
Date sampled	2009-10-28	2009-10-28
Date received	2009-12-07	2009-12-07

Parameter(s) Method Reference			
Dibenzo (a,e) pyrene	mg/kg	<0.01	0.13
Dibenzo (a,i) pyrene	mg/kg	<0.01	<0.05
Dibenzo (a,h) pyrene	mg/kg	<0.01	<0.05
Recuperation %			
Acenaphtene-d10	%	100%	78%
Fluoranthene-d10	%	92%	92%
Chrysene-d12	%	90%	88%
Water (% humidity)	Preparation	2009-11-13	2009-12-11
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-11-15	2009-12-13
	Sequential No.	NA	302994
Water (% humidity)	%	16	24

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317190

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Cadmium					
Sequential ID No.: 303019					
Cadmium	mg/kg	< 0.03	<0.05	130	98 - 146
Water (% humidity)					
Sequential ID No.: 302994					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 302632					
Naphtalene	mg/kg	< 0.005	<0.005	0.15	0.12 - 0.28
1-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.12 - 0.28
2-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.077	0.072 - 0.17
1,3-Dimethylnaphtalene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Acenaphtylene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
Acenaphtene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
2,3,5-Trimethylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.09 - 0.21
Fluorene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Phenanthrene	mg/kg	< 0.005	0.007	0.18	0.12 - 0.28
Anthracene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Fluoranthene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (c) phenanthrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) anthracene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Chrysene	mg/kg	< 0.005	<0.005	0.23	0.12 - 0.28
5-Methylchrysene	mg/kg	< 0.005	<0.005	0.12	0.12 - 0.28
Benzo (b, j & k) fluoranthene	mg/kg	< 0.005	<0.005	0.77	0.48 - 1.1
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.005	<0.005	0.16	0.12 - 0.28
Benzo (e) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
3-Methylcholanthrene	mg/kg	< 0.005	<0.005	0.35	0.24 - 0.56
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Dibenzo (a,h) anthracene	mg/kg	< 0.003	<0.003	0.16	0.12 - 0.28
7H-Dibenzo (c,g) carbazole	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Benzo (g,h,i) perylene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Dibenzo (a,l) pyrene	mg/kg	< 0.01	<0.01	0.16	0.12 - 0.28

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317190

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Dibenzo (a,e) pyrene	mg/kg	< 0.01	<0.01	0.34	0.24 - 0.56
Dibenzo (a,i) pyrene	mg/kg	< 0.01	<0.01	0.41	0.24 - 0.56
Dibenzo (a,h) pyrene	mg/kg	< 0.01	<0.01	0.47	0.24 - 0.56
Mercury					
Sequential ID No.: 303125					
Mercury	mg/kg	< 0.01	<0.01	3.0	2.1 - 4
Chromium (Cr)					
Sequential ID No.: 303017					
Chromium (Cr)	mg/kg	< 2	<2	120	99 - 149
Copper (Cu)					
Sequential ID No.: 303017					
Copper (Cu)	mg/kg	< 1	<1	750	627 - 941
Arsenic (As)					
Sequential ID No.: 303018					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 303017					
Nickel (Ni)	mg/kg	< 2	<2	94	80 - 120
Lead (Pb)					
Sequential ID No.: 303017					
Lead (Pb)	mg/kg	< 5	<5	91	71 - 106
Zinc (Zn)					
Sequential ID No.: 303017					
Zinc (Zn)	mg/kg	< 5	<5	830	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **09-317191**

Date Received: 2009-12-07

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date on samples stored at 4°C.

The analysis of cadmium (Cd) was performed by ICP-MS and not by graphite furnace. (GFAA).

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317191

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416161**
Your Reference	TF-02-09 CF-1 {1397372}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Quai de la Reine. Qc
Date sampled	2009-10-23
Date received	2009-12-07

Parameter(s)

Method / Reference		
Cadmium	Preparation	2009-12-14
Acid digestion, GFAA analysis Result as per dry weight EPA3050, MA. 200 - Met 1.0	Analysis	2009-12-14
	Sequential No.	303019
Cadmium	mg/kg	0.30

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317191

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416161**
Your Reference	TF-02-09 CF-1 {1397372}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Quai de la Reine. Qc
Date sampled	2009-10-23
Date received	2009-12-07

Parameter(s)

Parameter(s) / Method / Reference		
Arsenic (As)	Preparation	2009-12-14
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303018
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	1.8 (<A)
Chromium (Cr)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	14 (<A)
Copper (Cu)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	12 (<A)
Lead (Pb)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	12 (<A)
Mercury	Preparation	2009-12-15
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2009-12-16
Result as per dry weight	Sequential No.	303125
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.20 (A)
Nickel (Ni)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight	Sequential No.	303017
MA. 200 - Mét 1.1 R4		
Nickel (Ni)	mg/kg	15 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317191

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416161**
Your Reference	TF-02-09 CF-1 {1397372}
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Quai de la Reine. Qc
Date sampled	2009-10-23
Date received	2009-12-07

Parameter(s)

Method / Reference		
Zinc (Zn)	Preparation	2009-12-14
QC087-07 / Acid digestion, ICP analysis	Analysis	2009-12-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	303017
Zinc (Zn)	mg/kg	94 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317191

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	1416161	1416162
Your Reference	TF-02-09 CF-1 {1397372}	TF-02-09 CF-2
Matrix	Sediment	Sediment
Sampled by	M. Simon-Pierre Gravel	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Quai de la Reine. Qc	101, boul. Champlain, Quai de la Reine. Qc
Date sampled	2009-10-23	2009-10-23
Date received	2009-12-07	2009-12-07

Parameter(s)

Parameter(s) / Method / Reference			
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2009-12-14	2009-12-14
QC058-97 / Dichloromethane extraction, GC-MS analysis	Analysis	2009-12-14	2009-12-14
Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Sequential No.	302632	302632
Naphtalene	mg/kg	<0.02	0.032
1-Methylnaphtalene	mg/kg	<0.02	<0.02
2-Methylnaphtalene	mg/kg	<0.02	0.041
1,3-Dimethylnaphtalene	mg/kg	0.029	0.094
Acenaphtylene	mg/kg	0.014	0.061
Acenaphtene	mg/kg	0.028	0.12
2,3,5-Trimethylnaphtalene	mg/kg	<0.02	0.037
Fluorene	mg/kg	0.048	0.11
Phenanthrene	mg/kg	0.23	0.60
Anthracene	mg/kg	0.056	0.16
Fluoranthene	mg/kg	0.24	0.58
Pyrene	mg/kg	0.20	0.48
Benzo (c) phenanthrene	mg/kg	<0.02	<0.02
Benzo (a) anthracene	mg/kg	0.060	0.23
Chrysene	mg/kg	0.071	0.25
5-Methylchrysene	mg/kg	<0.02	<0.02
Benzo (b, j & k) fluoranthene	mg/kg	0.10	0.36
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.02	<0.02
Benzo (e) pyrene	mg/kg	0.042	0.15
Benzo (a) pyrene	mg/kg	0.047	0.20
3-Methylcholanthrene	mg/kg	<0.02	<0.02
Indeno (1,2,3-cd) pyrene	mg/kg	0.038	0.15
Dibenzo (a,h) anthracene	mg/kg	0.008	0.030
7H-Dibenzo (c,g) carbazole	mg/kg	<0.02	<0.02
Benzo (g,h,i) perylene	mg/kg	0.050	0.20
Dibenzo (a,l) pyrene	mg/kg	<0.03	<0.03

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317191

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1416161**	**1416162**
Your Reference	TF-02-09 CF-1 {1397372}	TF-02-09 CF-2
Matrix	Sediment	Sediment
Sampled by	M. Simon-Pierre Gravel	M. Simon-Pierre Gravel
Site sampled	101, boul. Champlain, Quai de la Reine. Qc	101, boul. Champlain, Quai de la Reine. Qc
Date sampled	2009-10-23	2009-10-23
Date received	2009-12-07	2009-12-07

Parameter(s) Method Reference			
Dibenzo (a,e) pyrene	mg/kg	<0.03	0.050
Dibenzo (a,i) pyrene	mg/kg	<0.03	0.050
Dibenzo (a,h) pyrene	mg/kg	<0.03	<0.03
Recuperation %			
Acenaphtene-d10	%	82%	83%
Fluoranthene-d10	%	88%	95%
Chrysene-d12	%	90%	99%
Water (% humidity)	Preparation	2009-10-28	2009-12-11
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2009-10-29	2009-12-13
	Sequential No.	NA	302994
Water (% humidity)	%	24	30

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317191

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Cadmium					
Sequential ID No.: 303019					
Cadmium	mg/kg	< 0.03	<0.05	130	98 - 146
Water (% humidity)					
Sequential ID No.: 302994					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 302632					
Naphtalene	mg/kg	< 0.005	<0.005	0.15	0.12 - 0.28
1-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.12 - 0.28
2-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.077	0.072 - 0.17
1,3-Dimethylnaphtalene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Acenaphtylene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
Acenaphtene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
2,3,5-Trimethylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.09 - 0.21
Fluorene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Phenanthrene	mg/kg	< 0.005	0.007	0.18	0.12 - 0.28
Anthracene	mg/kg	< 0.005	<0.005	0.18	0.12 - 0.28
Fluoranthene	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (c) phenanthrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) anthracene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Chrysene	mg/kg	< 0.005	<0.005	0.23	0.12 - 0.28
5-Methylchrysene	mg/kg	< 0.005	<0.005	0.12	0.12 - 0.28
Benzo (b, j & k) fluoranthene	mg/kg	< 0.005	<0.005	0.77	0.48 - 1.1
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.005	<0.005	0.16	0.12 - 0.28
Benzo (e) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
3-Methylcholanthrene	mg/kg	< 0.005	<0.005	0.35	0.24 - 0.56
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Dibenzo (a,h) anthracene	mg/kg	< 0.003	<0.003	0.16	0.12 - 0.28
7H-Dibenzo (c,g) carbazole	mg/kg	< 0.005	<0.005	0.19	0.12 - 0.28
Benzo (g,h,i) perylene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Dibenzo (a,l) pyrene	mg/kg	< 0.01	<0.01	0.16	0.12 - 0.28

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 09-317191

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Dibenzo (a,e) pyrene	mg/kg	< 0.01	<0.01	0.34	0.24 - 0.56
Dibenzo (a,i) pyrene	mg/kg	< 0.01	<0.01	0.41	0.24 - 0.56
Dibenzo (a,h) pyrene	mg/kg	< 0.01	<0.01	0.47	0.24 - 0.56
Mercury					
Sequential ID No.: 303125					
Mercury	mg/kg	< 0.01	<0.01	3.0	2.1 - 4
Chromium (Cr)					
Sequential ID No.: 303017					
Chromium (Cr)	mg/kg	< 2	<2	120	99 - 149
Copper (Cu)					
Sequential ID No.: 303017					
Copper (Cu)	mg/kg	< 1	<1	750	627 - 941
Arsenic (As)					
Sequential ID No.: 303018					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 303017					
Nickel (Ni)	mg/kg	< 2	<2	94	80 - 120
Lead (Pb)					
Sequential ID No.: 303017					
Lead (Pb)	mg/kg	< 5	<5	91	71 - 106
Zinc (Zn)					
Sequential ID No.: 303017					
Zinc (Zn)	mg/kg	< 5	<5	830	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-319262**

Date Received: 2010-01-12

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
Québec, Québec, Canada
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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319262

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.		**1424439**
Your Reference		TF-23-10 TA-1
Matrix		Soil
Sampled by		M. Mario Trudel
Site sampled		Quai de la reine, 101 boul. Champlain
Date sampled		2010-01-12
Date received		2010-01-12
Parameter(s)		
Method		
Reference		
Arsenic (As)	Preparation	2010-01-13
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304429
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	<0.5 (<A)
Cadmium (Cd)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	7 (<A)
Copper (Cu)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	120 (B-C)
Lead (Pb)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	<5 (<A)
Mercury	Preparation	2010-01-13
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2010-01-13
Result as per dry weight	Sequential No.	304455
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	<0.01 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319262

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1424439**
Your Reference	TF-23-10 TA-1
Matrix	Soil
Sampled by	M. Mario Trudel
Site sampled	Quai de la reine, 101 boul. Champlain
Date sampled	2010-01-12
Date received	2010-01-12

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428
Nickel (Ni)	mg/kg	27 (<A)
Total organic carbon	Preparation	2010-01-14
LECO combustion	Analysis	2010-01-14
Sub-contracted work. Result as per dry weight.	Sequential No.	304493
Total organic carbon	%C	0.20
Zinc (Zn)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428
Zinc (Zn)	mg/kg	130 (A-B)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319262

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1424439**
Your Reference	TF-23-10 TA-1
Matrix	Soil
Sampled by	M. Mario Trudel
Site sampled	Quai de la reine, 101 boul. Champlain
Date sampled	2010-01-12
Date received	2010-01-12

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2010-01-14
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2010-01-14
	Sequential No.	304560
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-01-14
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2010-01-14
	Sequential No.	304561
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319262

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1424439**
Your Reference	TF-23-10 TA-1
Matrix	Soil
Sampled by	M. Mario Trudel
Site sampled	Quai de la reine, 101 boul. Champlain
Date sampled	2010-01-12
Date received	2010-01-12

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	78%
Fluoranthene-d10	%	91%
Chrysene-d12	%	78%
Water (% humidity)	Preparation	2010-01-12
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-01-13
	Sequential No.	304430
Water (% humidity)	%	7

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319262

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 304430					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 304561					
Naphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.5	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.8	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	4.6	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	1.9	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	1.7	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	1.7	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	1.8	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 304560					

Comments

Sequential ID no. 304428 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319262

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1300	1200 - 1800
Mercury					
Sequential ID No.: 304455					
Mercury	mg/kg	< 0.01	<0.01	3.2	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 304428					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	120	98 - 146
Chromium (Cr)					
Sequential ID No.: 304428					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 304428					
Copper (Cu)	mg/kg	< 1	1	800	627 - 941
Arsenic (As)					
Sequential ID No.: 304429					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 304428					
Nickel (Ni)	mg/kg	< 2	<2	98	80 - 120
Lead (Pb)					
Sequential ID No.: 304428					
Lead (Pb)	mg/kg	< 5	<5	86	71 - 106
Zinc (Zn)					
Sequential ID No.: 304428					
Zinc (Zn)	mg/kg	< 5	<5	790	665 - 998

Comments

Sequential ID no. 304428 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-319265**

Date Received: 2010-01-12

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319265

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1424445**
Your Reference	TF-22-10 TA-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-07
Date received	2010-01-12

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2010-01-13
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304429
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	0.9 (<A)
Cadmium (Cd)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	7 (<A)
Copper (Cu)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	23 (<A)
Lead (Pb)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304428
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	<5 (<A)
Mercury	Preparation	2010-01-13
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2010-01-13
Result as per dry weight	Sequential No.	304455
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	<0.01 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319265

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1424445**
Your Reference	TF-22-10 TA-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-07
Date received	2010-01-12

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428
Nickel (Ni)	mg/kg	10 (<A)
Total organic carbon	Preparation	2010-01-14
LECO combustion	Analysis	2010-01-14
Sub-contracted work. Result as per dry weight.	Sequential No.	304493
Total organic carbon	%C	0.38
Zinc (Zn)	Preparation	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428
Zinc (Zn)	mg/kg	25 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319265

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1424445**
Your Reference	TF-22-10 TA-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-07
Date received	2010-01-12

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2010-01-14
QC063-97 / Hexane extraction, GC-FID analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304560
MA. 400 - Hyd. 1.1		
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis	Analysis	-
C10-C50 chromatogram interpretation	Sequential No.	NA
MA. 408 - Ide.Pet.1.0		
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-01-14
QC058-97 / Dichloromethane extraction, GC-MS analysis	Analysis	2010-01-14
Result as per dry weight	Sequential No.	304561
EPA3540, 8270 / MA. 400 - HAP 1.1		
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319265

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.		**1424445**
Your Reference		TF-22-10 TA-1
Matrix		Soil
Sampled by		G. Meunier
Site sampled		Quai de la reine
Date sampled		2010-01-07
Date received		2010-01-12
Parameter(s)		
Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	74%
Fluoranthene-d10	%	85%
Chrysene-d12	%	70%
Water (% humidity)	Preparation	2010-01-12
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-01-13
	Sequential No.	304430
Water (% humidity)	%	8

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319265

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 304430					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 304561					
Naphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.5	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.8	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	4.6	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	1.9	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	1.7	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	1.7	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	1.8	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 304560					

Comments

Sequential ID no. 304428 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319265

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1300	1200 - 1800
Mercury					
Sequential ID No.: 304455					
Mercury	mg/kg	< 0.01	<0.01	3.2	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 304428					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	120	98 - 146
Chromium (Cr)					
Sequential ID No.: 304428					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 304428					
Copper (Cu)	mg/kg	< 1	1	800	627 - 941
Arsenic (As)					
Sequential ID No.: 304429					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 304428					
Nickel (Ni)	mg/kg	< 2	<2	98	80 - 120
Lead (Pb)					
Sequential ID No.: 304428					
Lead (Pb)	mg/kg	< 5	<5	86	71 - 106
Zinc (Zn)					
Sequential ID No.: 304428					
Zinc (Zn)	mg/kg	< 5	<5	790	665 - 998

Comments

Sequential ID no. 304428 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-319269**

Date Received: 2010-01-12

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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P.O. Number	Your project ID.	Project Manager
171 786	PO29156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319269

P.O. Number	Your Project ID.	Project Manager
171 786	PO29156-0150	M. Martin Fleury

	Sample(s)	
Lab. No.	**1424449**	**1424450**
Your Reference	TF-24-10 CF#2	TF-21-10 CF#01
Matrix	Soil	Soil
Sampled by	M. Mario Trudel et M. Gilles M	M. Mario Trudel et M. Gilles M
Site sampled	Quai de la reine	Quai de la reine
Date sampled	2010-01-06	2010-01-05
Date received	2010-01-12	2010-01-12

Parameter(s) Method Reference			
Arsenic (As)	Preparation	2010-01-13	2010-01-13
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2010-01-14	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304429	304429
Arsenic (As)	mg/kg	1.3 (<A)	<0.5 (<A)
Cadmium (Cd)	Preparation	2010-01-13	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428	304428
Cadmium (Cd)	mg/kg	<0.5 (<A)	<0.5 (<A)
Chromium (Cr)	Preparation	2010-01-13	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428	304428
Chromium (Cr)	mg/kg	6 (<A)	4 (<A)
Copper (Cu)	Preparation	2010-01-13	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428	304428
Copper (Cu)	mg/kg	13 (<A)	8 (<A)
Lead (Pb)	Preparation	2010-01-13	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428	304428
Lead (Pb)	mg/kg	<5 (<A)	<5 (<A)
Mercury	Preparation	2010-01-13	2010-01-13
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2010-01-13	2010-01-13
Result as per dry weight MA. 200 - Hg 1.0 R4	Sequential No.	304455	304455
Mercury	mg/kg	0.02 (<A)	0.02 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319269

P.O. Number	Your Project ID.	Project Manager
171 786	PO29156-0150	M. Martin Fleury

		Sample(s)	
	Lab. No.	**1424449**	**1424450**
	Your Reference	TF-24-10 CF#2	TF-21-10 CF#01
	Matrix	Soil	Soil
	Sampled by	M. Mario Trudel et M. Gilles M	M. Mario Trudel et M. Gilles M
	Site sampled	Quai de la reine	Quai de la reine
	Date sampled	2010-01-06	2010-01-05
	Date received	2010-01-12	2010-01-12
Parameter(s) Method Reference			
Nickel (Ni)	Preparation	2010-01-13	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428	304428
Nickel (Ni)	mg/kg	10 (<A)	6 (<A)
Total organic carbon	Preparation	2010-01-14	2010-01-14
LECO combustion	Analysis	2010-01-14	2010-01-14
Sub-contracted work. Result as per dry weight.	Sequential No.	304493	304493
Total organic carbon	%C	0.46	0.50
Zinc (Zn)	Preparation	2010-01-13	2010-01-13
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-14	2010-01-14
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	304428	304428
Zinc (Zn)	mg/kg	23 (<A)	15 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319269

P.O. Number	Your Project ID.	Project Manager
171 786	PO29156-0150	M. Martin Fleury

	Sample(s)	
Lab. No.	**1424449**	**1424450**
Your Reference	TF-24-10 CF#2	TF-21-10 CF#01
Matrix	Soil	Soil
Sampled by	M. Mario Trudel et M. Gilles M	M. Mario Trudel et M. Gilles M
Site sampled	Quai de la reine	Quai de la reine
Date sampled	2010-01-06	2010-01-05
Date received	2010-01-12	2010-01-12

Parameter(s) Method Reference			
Petroleum hydrocarbons (C10-C50)	Preparation	2010-01-14	2010-01-14
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2010-01-14	2010-01-14
	Sequential No.	304560	304560
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-	-
	Sequential No.	NA	NA
Petroleum hydrocarbons identification		ND	ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-01-14	2010-01-14
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2010-01-14	2010-01-14
	Sequential No.	304561	304561
Naphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319269

P.O. Number	Your Project ID.	Project Manager
171 786	PO29156-0150	M. Martin Fleury

	Sample(s)	
Lab. No.	**1424449**	**1424450**
Your Reference	TF-24-10 CF#2	TF-21-10 CF#01
Matrix	Soil	Soil
Sampled by	M. Mario Trudel et M. Gilles M	M. Mario Trudel et M. Gilles M
Site sampled	Quai de la reine	Quai de la reine
Date sampled	2010-01-06	2010-01-05
Date received	2010-01-12	2010-01-12

Parameter(s) Method Reference			
Benzo (e) pyrene	mg/kg	<0.1	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)	<0.1 (<A)
Recuperation %			
Acenaphtene-d10	%	72%	72%
Fluoranthene-d10	%	88%	84%
Chrysene-d12	%	74%	68%
Water (% humidity)	Preparation	2010-01-12	2010-01-12
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-01-13	2010-01-13
	Sequential No.	304430	304430
Water (% humidity)	%	8	10

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319269

P.O. Number	Your Project ID.	Project Manager
171 786	PO29156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 304430					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 304561					
Naphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.5	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.8	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	4.6	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	1.9	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	1.7	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	1.7	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	1.8	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 304560					

Comments

Sequential ID no. 304428 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-319269

P.O. Number	Your Project ID.	Project Manager
171 786	PO29156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1300	1200 - 1800
Mercury					
Sequential ID No.: 304455					
Mercury	mg/kg	< 0.01	<0.01	3.2	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 304428					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	120	98 - 146
Chromium (Cr)					
Sequential ID No.: 304428					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 304428					
Copper (Cu)	mg/kg	< 1	1	800	627 - 941
Arsenic (As)					
Sequential ID No.: 304429					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 304428					
Nickel (Ni)	mg/kg	< 2	<2	98	80 - 120
Lead (Pb)					
Sequential ID No.: 304428					
Lead (Pb)	mg/kg	< 5	<5	86	71 - 106
Zinc (Zn)					
Sequential ID No.: 304428					
Zinc (Zn)	mg/kg	< 5	<5	790	665 - 998

Comments

Sequential ID no. 304428 : Cu : Blanc positif non soustrait des échantillons / Positive result for blank not subtracted from sample result

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-320185**

Date Received: 2010-01-22

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
Québec, Québec, Canada
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Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320185

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427701**
Your Reference	TF-26-10 CF-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-12
Date received	2010-01-22

Parameter(s)

Parameter(s) / Method / Reference		
Arsenic (As)	Preparation	2010-01-25
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305191
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	0.8 (<A)
Cadmium (Cd)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	5 (<A)
Copper (Cu)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	9 (<A)
Lead (Pb)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	<5 (<A)
Mercury	Preparation	2010-01-25
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2010-01-25
Result as per dry weight	Sequential No.	305168
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.02 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320185

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427701**
Your Reference	TF-26-10 CF-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-12
Date received	2010-01-22

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	305208
Nickel (Ni)	mg/kg	7 (<A)
Total organic carbon	Preparation	2010-01-26
LECO combustion	Analysis	2010-01-26
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.32
Zinc (Zn)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	305208
Zinc (Zn)	mg/kg	16 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320185

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427701**
Your Reference	TF-26-10 CF-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-12
Date received	2010-01-22

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2010-01-25
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2010-01-25
	Sequential No.	305176
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-01-25
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2010-01-25
	Sequential No.	305175
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320185

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427701**
Your Reference	TF-26-10 CF-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-12
Date received	2010-01-22

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	84%
Fluoranthene-d10	%	107%
Chrysene-d12	%	88%
Water (% humidity)	Preparation	2010-01-22
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-01-25
	Sequential No.	305172
Water (% humidity)	%	10

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320185

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 305172					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 305175					
Naphthalene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.5	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.7	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	5.6	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.8	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.6	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.9	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	3.1	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 305176					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320185

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1200	1200 - 1800
Mercury					
Sequential ID No.: 305168					
Mercury	mg/kg	< 0.01	<0.01	3.0	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 305208					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	130	98 - 146
Chromium (Cr)					
Sequential ID No.: 305208					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 305208					
Copper (Cu)	mg/kg	< 1	<1	890	627 - 941
Arsenic (As)					
Sequential ID No.: 305191					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 305208					
Nickel (Ni)	mg/kg	< 2	<2	110	80 - 120
Lead (Pb)					
Sequential ID No.: 305208					
Lead (Pb)	mg/kg	< 5	<5	92	71 - 106
Zinc (Zn)					
Sequential ID No.: 305208					
Zinc (Zn)	mg/kg	< 5	<5	940	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-320189**

Date Received: 2010-01-22

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
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Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320189

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427708**
Your Reference	TF-25-10 CF2
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine, 101 boul. Champlain - Qc
Date sampled	2010-01-18
Date received	2010-01-22

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2010-01-25
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305191
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	<0.5 (<A)
Cadmium (Cd)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	5 (<A)
Copper (Cu)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	9 (<A)
Lead (Pb)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight	Sequential No.	305208
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	<5 (<A)
Mercury	Preparation	2010-01-25
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2010-01-25
Result as per dry weight	Sequential No.	305168
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	0.01 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320189

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427708**
Your Reference	TF-25-10 CF2
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine, 101 boul. Champlain - Qc
Date sampled	2010-01-18
Date received	2010-01-22

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	305208
Nickel (Ni)	mg/kg	5 (<A)
Total organic carbon	Preparation	2010-01-26
LECO combustion	Analysis	2010-01-26
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.31
Zinc (Zn)	Preparation	2010-01-25
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-01-26
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	305208
Zinc (Zn)	mg/kg	11 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320189

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427708**
Your Reference	TF-25-10 CF2
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine, 101 boul. Champlain - Qc
Date sampled	2010-01-18
Date received	2010-01-22

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2010-01-25
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2010-01-25
	Sequential No.	305176
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-01-25
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2010-01-25
	Sequential No.	305175
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320189

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1427708**
Your Reference	TF-25-10 CF2
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine, 101 boul. Champlain - Qc
Date sampled	2010-01-18
Date received	2010-01-22

Parameter(s) Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	74%
Fluoranthene-d10	%	102%
Chrysene-d12	%	79%
Water (% humidity)	Preparation	2010-01-22
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-01-25
	Sequential No.	305172
Water (% humidity)	%	5

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320189

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 305172					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 305175					
Naphthalene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.9	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.5	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.7	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	5.6	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.8	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.6	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.9	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	3.1	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 305176					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320189

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1200	1200 - 1800
Mercury					
Sequential ID No.: 305168					
Mercury	mg/kg	< 0.01	<0.01	3.0	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 305208					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	130	98 - 146
Chromium (Cr)					
Sequential ID No.: 305208					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 305208					
Copper (Cu)	mg/kg	< 1	<1	890	627 - 941
Arsenic (As)					
Sequential ID No.: 305191					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 305208					
Nickel (Ni)	mg/kg	< 2	<2	110	80 - 120
Lead (Pb)					
Sequential ID No.: 305208					
Lead (Pb)	mg/kg	< 5	<5	92	71 - 106
Zinc (Zn)					
Sequential ID No.: 305208					
Zinc (Zn)	mg/kg	< 5	<5	940	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-320568**

Date Received: 2010-01-28

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date.

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available ND : Not Detected

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320568

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1429256**
Your Reference	TF-27-10 TA-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la Reine
Date sampled	2010-01-13
Date received	2010-01-28

Parameter(s)

Method / Reference		
Arsenic (As)	Preparation	2010-01-29
QC091-08 / Acid digestion, ICP-MS analysis	Analysis	2010-02-01
Result as per dry weight	Sequential No.	305470
MA. 200 - Mét 1.1 R4		
Arsenic (As)	mg/kg	<0.5 (<A)
Cadmium (Cd)	Preparation	2010-01-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-01
Result as per dry weight	Sequential No.	305468
MA. 200 - Mét 1.1 R4		
Cadmium (Cd)	mg/kg	<0.5 (<A)
Chromium (Cr)	Preparation	2010-01-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-01
Result as per dry weight	Sequential No.	305468
MA. 200 - Mét 1.1 R4		
Chromium (Cr)	mg/kg	3 (<A)
Copper (Cu)	Preparation	2010-01-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-01
Result as per dry weight	Sequential No.	305468
MA. 200 - Mét 1.1 R4		
Copper (Cu)	mg/kg	220 (B-C)
Lead (Pb)	Preparation	2010-01-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-01
Result as per dry weight	Sequential No.	305468
MA. 200 - Mét 1.1 R4		
Lead (Pb)	mg/kg	<5 (<A)
Mercury	Preparation	2010-02-01
QC068-96 / Acid digestion, AA (cold-vapor) analysis	Analysis	2010-02-01
Result as per dry weight	Sequential No.	305565
MA. 200 - Hg 1.0 R4		
Mercury	mg/kg	<0.01 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320568

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

	Lab. No.	**1429256**
	Your Reference	TF-27-10 TA-1
	Matrix	Soil
	Sampled by	G. Meunier
	Site sampled	Quai de la Reine
	Date sampled	2010-01-13
	Date received	2010-01-28

Parameter(s)

Method / Reference		
Nickel (Ni)	Preparation	2010-01-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	305468
Nickel (Ni)	mg/kg	49 (<A)
Total organic carbon	Preparation	2010-02-01
LECO combustion	Analysis	2010-02-01
Sub-contracted work. Result as per dry weight.	Sequential No.	NA
Total organic carbon	%C	0.17
Zinc (Zn)	Preparation	2010-01-29
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-01
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	305468
Zinc (Zn)	mg/kg	200 (A-B)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320568

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1429256**
Your Reference	TF-27-10 TA-1
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la Reine
Date sampled	2010-01-13
Date received	2010-01-28

Parameter(s)

Method / Reference		
Petroleum hydrocarbons (C10-C50)	Preparation	2010-02-01
QC063-97 / Hexane extraction, GC-FID analysis Result as per dry weight MA. 400 - Hyd. 1.1	Analysis	2010-02-01
	Sequential No.	305564
Petroleum hydrocarbons (C10-C50)	mg/kg	<100 (<A)
Petroleum hydrocarbons identification	Preparation	-
GC-FID analysis C10-C50 chromatogram interpretation MA. 408 - Ide.Pet.1.0	Analysis	-
	Sequential No.	NA
Petroleum hydrocarbons identification		ND
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-01-29
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2010-01-29
	Sequential No.	305460
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320568

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.		**1429256**
Your Reference		TF-27-10 TA-1
Matrix		Soil
Sampled by		G. Meunier
Site sampled		Quai de la Reine
Date sampled		2010-01-13
Date received		2010-01-28
Parameter(s)		
Method Reference		
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	94%
Fluoranthene-d10	%	131%
Chrysene-d12	%	98%
Water (% humidity)	Preparation	2010-01-28
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-01-29
	Sequential No.	305461
Water (% humidity)	%	9

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320568

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 305461					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 305460					
Naphthalene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.7	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	1.0	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.6	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	6.1	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.6	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.9	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.5	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.6	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.7	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	2.9	1.6 - 3.7
Petroleum hydrocarbons (C10-C50)					
Sequential ID No.: 305564					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-320568

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Petroleum hydrocarbons (C10-C50)	mg/kg	< 100	<100	1300	1200 - 1800
Mercury					
Sequential ID No.: 305565					
Mercury	mg/kg	< 0.01	<0.01	3.2	2.1 - 4
Cadmium (Cd)					
Sequential ID No.: 305468					
Cadmium (Cd)	mg/kg	< 0.5	<0.5	120	98 - 146
Chromium (Cr)					
Sequential ID No.: 305468					
Chromium (Cr)	mg/kg	< 2	<2	130	99 - 149
Copper (Cu)					
Sequential ID No.: 305468					
Copper (Cu)	mg/kg	< 1	<1	750	627 - 941
Arsenic (As)					
Sequential ID No.: 305470					
Arsenic (As)	mg/kg	< 0.5	<0.5	140	107 - 199
Nickel (Ni)					
Sequential ID No.: 305468					
Nickel (Ni)	mg/kg	< 2	<2	95	80 - 120
Lead (Pb)					
Sequential ID No.: 305468					
Lead (Pb)	mg/kg	< 5	<5	85	71 - 106
Zinc (Zn)					
Sequential ID No.: 305468					
Zinc (Zn)	mg/kg	< 5	<5	800	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-321571**

Date Received: 2010-02-10

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

1260, boulevard Lebourgneuf, bureau 250
Québec, Québec, Canada
G2K 2G2
Telephone : (418) 626-2054
Fax : (418) 647-2540

P.O. Number	Your project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Comments

The criteria from the "Politique de protection des sols et de réhabilitation des terrains contaminés" included in this certificate are for information only.
The A criteria for all metals correspond to those of the "Basses-Terres du St-Laurent" region.
The D criteria correspond to the "Règlement sur l'enfouissement des sols contaminés". These criteria are included in this certificate for information only.

This version replaces and cancels all earlier version.

NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321571

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1432484**
Your Reference	TF-27-10 CF-2
Matrix	Soil
Sampled by	G. Meunier
Site sampled	Quai de la reine
Date sampled	2010-01-13
Date received	2010-02-10

Parameter(s) Method Reference		
Copper (Cu)	Preparation	2010-02-11
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2010-02-12
	Sequential No.	306150
Copper (Cu)	mg/kg	13 (<A)
Zinc (Zn)	Preparation	2010-02-11
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2010-02-12
	Sequential No.	306150
Zinc (Zn)	mg/kg	21 (<A)

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE
Alain Perron
2003-052
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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321571

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Copper (Cu)					
Sequential ID No.: 306150					
Copper (Cu)	mg/kg	< 1	<1	760	627 - 941
Zinc (Zn)					
Sequential ID No.: 306150					
Zinc (Zn)	mg/kg	< 5	<5	920	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-321572**

Date Received: 2010-02-10

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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P.O. Number	Your project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Comments

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321572

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1432485**
Your Reference	TF-12-09 CF-4
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine
Date sampled	2009-11-21
Date received	2010-02-10

Parameter(s)

Method / Reference		
Lead (Pb)	Preparation	2010-02-11
QC087-07 / Acid digestion, ICP analysis Result as per dry weight MA. 200 - Mét 1.1 R4	Analysis	2010-02-12
	Sequential No.	306150
Lead (Pb)	mg/kg	8 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321572

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1432485**
Your Reference	TF-12-09 CF-4
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine
Date sampled	2009-11-21
Date received	2010-02-10

Parameter(s)

Method Reference		
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-02-11
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2010-02-11
	Sequential No.	306131
Naphthalene	mg/kg	<0.1 (<A)
1-Methylnaphthalene	mg/kg	<0.1 (<A)
2-Methylnaphthalene	mg/kg	<0.1 (<A)
1,3-Dimethylnaphthalene	mg/kg	<0.1 (<A)
Acenaphthylene	mg/kg	<0.1 (<A)
Acenaphthene	mg/kg	<0.1 (<A)
2,3,5-Trimethylnaphthalene	mg/kg	<0.1 (<A)
Fluorene	mg/kg	<0.1 (<A)
Phenanthrene	mg/kg	<0.1 (<A)
Anthracene	mg/kg	<0.1 (<A)
Fluoranthene	mg/kg	<0.1 (<A)
Pyrene	mg/kg	<0.1 (<A)
Benzo (c) phenanthrene	mg/kg	<0.1 (<A)
Benzo (a) anthracene	mg/kg	<0.1 (<A)
Chrysene	mg/kg	<0.1 (<A)
Benzo (b, j & k) fluoranthene	mg/kg	<0.1 (<A)
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.1 (<A)
Benzo (e) pyrene	mg/kg	<0.1
Benzo (a) pyrene	mg/kg	<0.1 (<A)
3-Methylcholanthrene	mg/kg	<0.1 (<A)
Indeno (1,2,3-cd) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,h) anthracene	mg/kg	<0.1 (<A)
Benzo (g,h,i) perylene	mg/kg	<0.1 (<A)
Dibenzo (a,l) pyrene	mg/kg	<0.1 (<A)
Dibenzo (a,e) pyrene	mg/kg	<0.1
Dibenzo (a,i) pyrene	mg/kg	<0.1 (<A)

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321572

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1432485**
Your Reference	TF-12-09 CF-4
Matrix	Soil
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine
Date sampled	2009-11-21
Date received	2010-02-10

Parameter(s) Method Reference		
Dibenzo (a,h) pyrene	mg/kg	<0.1 (<A)
Recuperation %		
Acenaphtene-d10	%	86%
Fluoranthene-d10	%	93%
Chrysene-d12	%	87%
Water (% humidity)	Preparation	2010-02-10
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-02-11
	Sequential No.	306129
Water (% humidity)	%	15

Comments:

1432485 TF-12-09 CF-4 Polynuclear aromatic hydrocarbons (PAH's) : Analyses requested and performed more than 14 days after sampling date.

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321572

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 306129					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 306131					
Naphthalene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
1-Methylnaphthalene	mg/kg	< 0.1	<0.1	1.1	0.8 - 1.8
2-Methylnaphthalene	mg/kg	< 0.1	<0.1	0.6	0.48 - 1.1
1,3-Dimethylnaphthalene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Acenaphthylene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Acenaphthene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
2,3,5-Trimethylnaphthalene	mg/kg	< 0.1	<0.1	0.9	0.6 - 1.4
Fluorene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Phenanthrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Anthracene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Fluoranthene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (c) phenanthrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Benzo (a) anthracene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Chrysene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (b, j & k) fluoranthene	mg/kg	< 0.1	<0.1	5.3	3.2 - 7.4
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.1	<0.1	1.0	0.8 - 1.8
Benzo (e) pyrene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Benzo (a) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
3-Methylcholanthrene	mg/kg	< 0.1	<0.1	2.3	1.6 - 3.7
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Dibenzo (a,h) anthracene	mg/kg	< 0.1	<0.1	1.2	0.8 - 1.8
Benzo (g,h,i) perylene	mg/kg	< 0.1	<0.1	1.4	0.8 - 1.8
Dibenzo (a,l) pyrene	mg/kg	< 0.1	<0.1	1.3	0.8 - 1.8
Dibenzo (a,e) pyrene	mg/kg	< 0.1	<0.1	2.3	1.6 - 3.7
Dibenzo (a,i) pyrene	mg/kg	< 0.1	<0.1	2.4	1.6 - 3.7
Dibenzo (a,h) pyrene	mg/kg	< 0.1	<0.1	2.6	1.6 - 3.7
Lead (Pb)					
Sequential ID No.: 306150					

Comments

RDL : Reported Detection Limit

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321572

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Lead (Pb)	mg/kg	< 5	<5	87	71 - 106

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-321592**

Date Received: 2010-02-10

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

DESSAU (Lebourgneuf)

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P.O. Number	Your project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Comments

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NA : Information Not Available

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321592

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1432542**
Your Reference	TF-23-10 CF-4
Matrix	Soil
Sampled by	M. Mario Trudel
Site sampled	Quai de la reine - 101, Boul. Champlain
Date sampled	2010-01-08
Date received	2010-02-10

Parameter(s) Method Reference		
Copper (Cu)	Preparation	2010-02-11
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-12
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	306150
Copper (Cu)	mg/kg	11 (<A)
Zinc (Zn)	Preparation	2010-02-11
QC087-07 / Acid digestion, ICP analysis	Analysis	2010-02-12
Result as per dry weight MA. 200 - Mét 1.1 R4	Sequential No.	306150
Zinc (Zn)	mg/kg	40 (<A)

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321592

P.O. Number	Your Project ID.	Project Manager
171786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Copper (Cu)					
Sequential ID No.: 306150					
Copper (Cu)	mg/kg	< 1	<1	760	627 - 941
Zinc (Zn)					
Sequential ID No.: 306150					
Zinc (Zn)	mg/kg	< 5	<5	920	665 - 998

Comments

RDL : Reported Detection Limit

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Certificate of Analysis

Request number: **10-321593**

Date Received: 2010-02-10

Date Certificate Issued: 2010-09-08

Certificate Version: 1

☑ Official Certificate of Analysis

☐ Preliminary Certificate of Analysis

Client

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P.O. Number	Your project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Comments

Analyses requested and performed more than 14 days after sampling date on samples stored at 4°C.

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Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321593

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1432553**
Your Reference	TF-04-09 CF-3
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine - 101, boul. Champlain
Date sampled	2009-10-28
Date received	2010-02-10

Parameter(s)

Method Reference		
Polynuclear aromatic hydrocarbons (PAH's)	Preparation	2010-02-12
QC058-97 / Dichloromethane extraction, GC-MS analysis Result as per dry weight EPA3540, 8270 / MA. 400 - HAP 1.1	Analysis	2010-02-12
	Sequential No.	306212
Naphtalene	mg/kg	0.14
1-Methylnaphtalene	mg/kg	0.20
2-Methylnaphtalene	mg/kg	0.35
1,3-Dimethylnaphtalene	mg/kg	0.43
Acenaphtylene	mg/kg	0.045
Acenaphtene	mg/kg	0.30
2,3,5-Trimethylnaphtalene	mg/kg	0.14
Fluorene	mg/kg	0.17
Phenanthrene	mg/kg	1.1
Anthracene	mg/kg	0.32
Fluoranthene	mg/kg	0.78
Pyrene	mg/kg	0.66
Benzo (c) phenanthrene	mg/kg	<0.005
Benzo (a) anthracene	mg/kg	0.28
Chrysene	mg/kg	0.37
5-Methylchrysene	mg/kg	0.021
Benzo (b, j & k) fluoranthene	mg/kg	0.34
7,12-Dimethylbenzo (a) anthracene	mg/kg	<0.005
Benzo (e) pyrene	mg/kg	0.15
Benzo (a) pyrene	mg/kg	0.19
3-Methylcholanthrene	mg/kg	<0.005
Indeno (1,2,3-cd) pyrene	mg/kg	0.13
Dibenzo (a,h) anthracene	mg/kg	0.035
7H-Dibenzo (c,g) carbazole	mg/kg	<0.005
Benzo (g,h,i) perylene	mg/kg	0.14
Dibenzo (a,l) pyrene	mg/kg	0.038

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Certificate of Analysis

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321593

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Sample(s)

Lab. No.	**1432553**
Your Reference	TF-04-09 CF-3
Matrix	Sediment
Sampled by	M. Simon-Pierre Gravel
Site sampled	Quai de la reine - 101, boul. Champlain
Date sampled	2009-10-28
Date received	2010-02-10

Parameter(s) Method Reference		
Dibenzo (a,e) pyrene	mg/kg	0.030
Dibenzo (a,i) pyrene	mg/kg	0.044
Dibenzo (a,h) pyrene	mg/kg	0.021
Recuperation %		
Acenaphtene-d10	%	97%
Fluoranthene-d10	%	106%
Chrysene-d12	%	102%
Water (% humidity)	Preparation	2010-02-10
QC047-96 / Solid dried at 105℃ MA. 100 - S.T. 1.0	Analysis	2010-02-11
	Sequential No.	306129
Water (% humidity)	%	23

Note: Results pertain only to the samples submitted for analysis.

Alain Perron, chemist

CHIMISTE Alain Perron 2003-052 QUÉBEC

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Certificat d'analyses

Client: **DESSAU (Lebourgneuf)**

Request Number: 10-321593

P.O. Number	Your Project ID.	Project Manager
171 786	P029156-0150	M. Martin Fleury

Quality Control Results (CQ)

Parameters (Sequential ID No.)	Units	RDL	Blank	Certified Control Result	Certified Control Expected Range
Water (% humidity)					
Sequential ID No.: 306129					
Water (% humidity)	%	< 1	<1	50	40 - 60
Polynuclear aromatic hydrocarbons (PAH's)					
Sequential ID No.: 306212					
Naphtalene	mg/kg	< 0.005	<0.005	0.16	0.12 - 0.28
1-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.16	0.12 - 0.28
2-Methylnaphtalene	mg/kg	< 0.005	<0.005	0.090	0.072 - 0.17
1,3-Dimethylnaphtalene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Acenaphtylene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
Acenaphtene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
2,3,5-Trimethylnaphtalene	mg/kg	< 0.005	<0.005	0.14	0.09 - 0.21
Fluorene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Phenanthrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Anthracene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Fluoranthene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Pyrene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Benzo (c) phenanthrene	mg/kg	< 0.005	<0.005	0.22	0.12 - 0.28
Benzo (a) anthracene	mg/kg	< 0.005	<0.005	0.23	0.12 - 0.28
Chrysene	mg/kg	< 0.005	<0.005	0.23	0.12 - 0.28
5-Methylchrysene	mg/kg	< 0.005	<0.005	0.12	0.12 - 0.28
Benzo (b, j & k) fluoranthene	mg/kg	< 0.005	<0.005	0.77	0.48 - 1.1
7,12-Dimethylbenzo (a) anthracene	mg/kg	< 0.005	<0.005	0.15	0.12 - 0.28
Benzo (e) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (a) pyrene	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
3-Methylcholanthrene	mg/kg	< 0.005	<0.005	0.36	0.24 - 0.56
Indeno (1,2,3-cd) pyrene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Dibenzo (a,h) anthracene	mg/kg	< 0.003	<0.003	0.19	0.12 - 0.28
7H-Dibenzo (c,g) carbazole	mg/kg	< 0.005	<0.005	0.20	0.12 - 0.28
Benzo (g,h,i) perylene	mg/kg	< 0.005	<0.005	0.21	0.12 - 0.28
Dibenzo (a,l) pyrene	mg/kg	< 0.01	<0.01	0.19	0.12 - 0.28
Dibenzo (a,e) pyrene	mg/kg	< 0.01	<0.01	0.35	0.24 - 0.56
Dibenzo (a,i) pyrene	mg/kg	< 0.01	<0.01	0.36	0.24 - 0.56
Dibenzo (a,h) pyrene	mg/kg	< 0.01	<0.01	0.42	0.24 - 0.56

Comments

RDL : Reported Detection Limit

Appendix 6 Photographs

PHOTO #1: View of TF-01-09 drilling from the barge.

PHOTO #2: View of TF-07-09 cantilevered drilling.

PHOTO #3: View of TF-12-09 drilling inside heliport building.

PHOTO #4: View of helicopter protection measures.

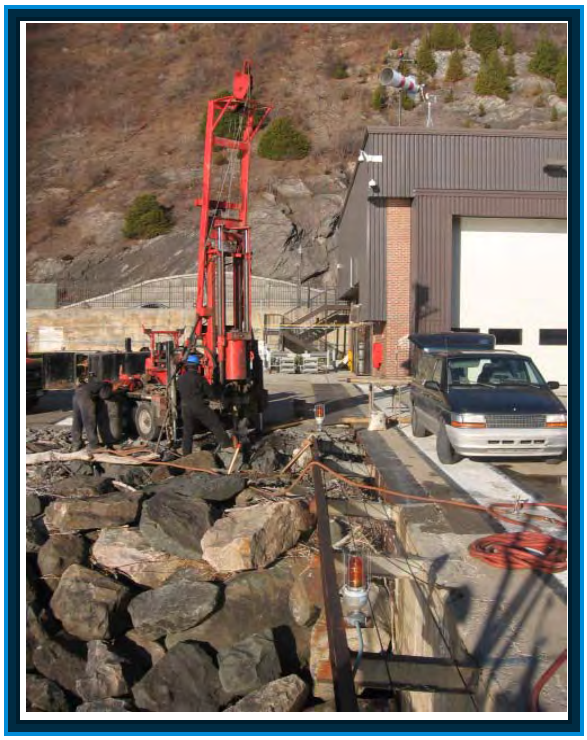


PHOTO #5: View of TF-08-09 rock drilling at the edge of the wharf.

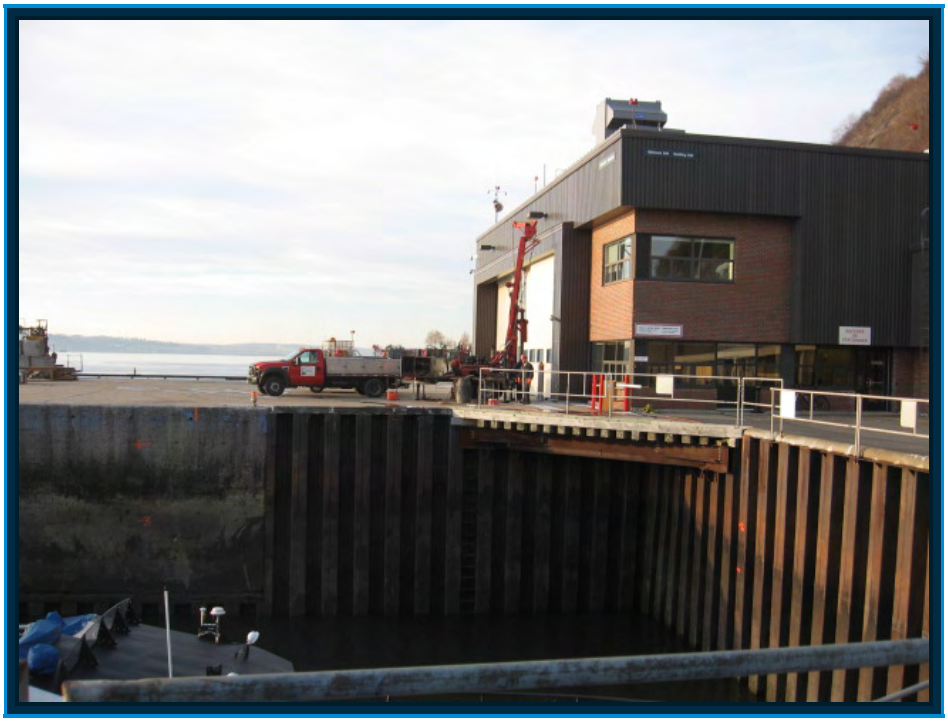


PHOTO #6: View of TF-14-09 drilling at the wharf near the heliport building.

PHOTO #7: View of TF-21-10 drilling at the wharf.

PHOTO #8: View of TF-26-10 drilling at the wharf.

PHOTO #9: Backfill sample (CF-8) taken from the TF-08-09 borehole, from a depth between 10.67 and 11.02 metres.

PHOTO #10: Backfill sample (CF-11) (rock fragments) taken from the TF-08-09 borehole, from a depth between 12.80 and 13.22 metres.

PHOTO #11: Sample (CF-14) of sand and gravel with traces of silt taken from the TF-08-09 borehole, from a depth between 15.54 and 16.15 metres.

PHOTO #12: Backfill sample (CF-1) (crushed stone with an apparent 20-0 millimetre calibre) taken from the TF-11-09 borehole, from a depth between 0.15 and 0.76 metres.

PHOTO #13: Backfill sample (CF-5) (schistic rock fragments) taken from the TF-11-09 borehole, from a depth between 3.05 and 3.50 metres.

PHOTO #14: Sample (CF-13) of sand and gravel with traces of silt taken from the TF-11-09 borehole, from a depth between 9.10 and 9.20 metres.

PHOTO #15: Sample (CF-29) of sand and gravel with traces of silt taken from the TF-22-09 borehole, from a depth between 25.60 and 26.21 metres.

PHOTO #16: Backfill sample (CF-2) (schistic rock fragments) taken from the TF-26-10 borehole, from a depth between 0.91 and 1.52 metres.

PHOTO #17: Backfill sample (CF-7) (schistic rock fragments) taken from the TF-26-10 borehole, from a depth between 5.18 and 5.79 metres.

PHOTO #18: Backfill sample (CF-11) (wood chips) taken from the TF-26-10 borehole, from a depth between 8.23 and 8.84 metres.

PHOTO #19: Rock core samples (CR-15 to CR-17) taken from the TF-01-09 borehole, from a depth between 12.24 and 14.72 metres below the seabed.

PHOTO #20: Rock core samples (CR-14 to CR-20) taken from the TF-02-09 borehole, from a depth between 12.80 and 17.65 metres below the seabed.

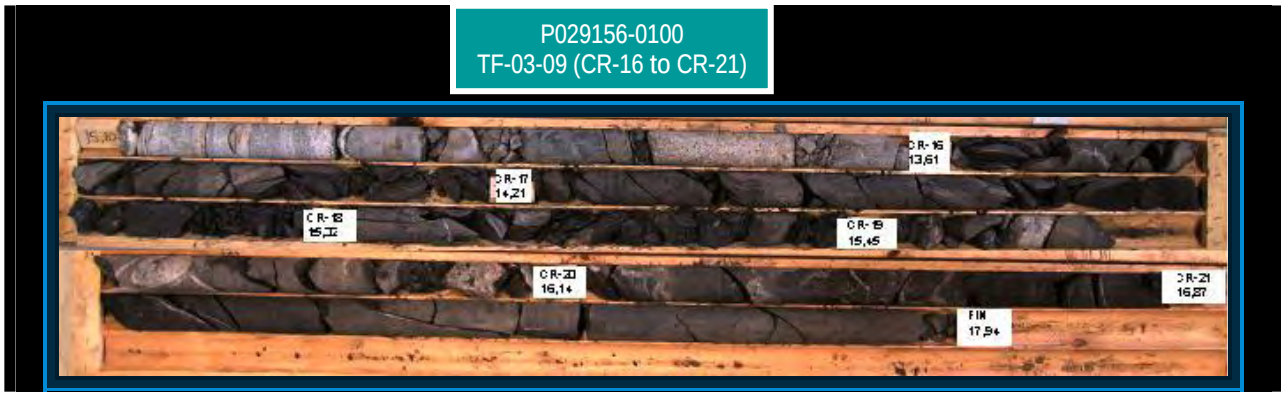


PHOTO #21: Rock core samples (CR-16 to CR-21) taken from the TF-03-09 borehole, from a depth between 13.61 and 17.94 metres below the seabed.

PHOTO #22: Rock core samples (CR-13 to CR-18) taken from the TF-04-09 borehole, from a depth between 12.37 and 17.07 metres below the seabed.

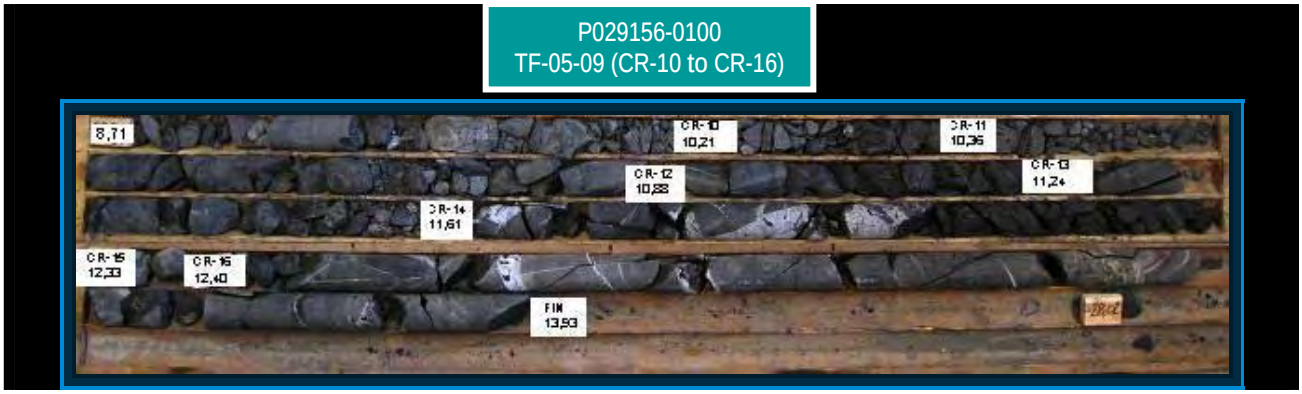


PHOTO #23: Rock core samples (CR-10 to CR-16) taken from the TF-05-09 borehole, from a depth between 10.21 and 13.93 metres below the seabed.

PHOTO #24: Rock core samples (CR-9 to CR-12) taken from the TF-06-09 borehole, from a depth between 10.82 and 15.01 metres below the seabed.

PHOTO #25: Rock core samples (CR-18 to CR-23) taken from the TF-07-09 borehole, from a depth between 16.84 and 21.01 metres below the seabed.

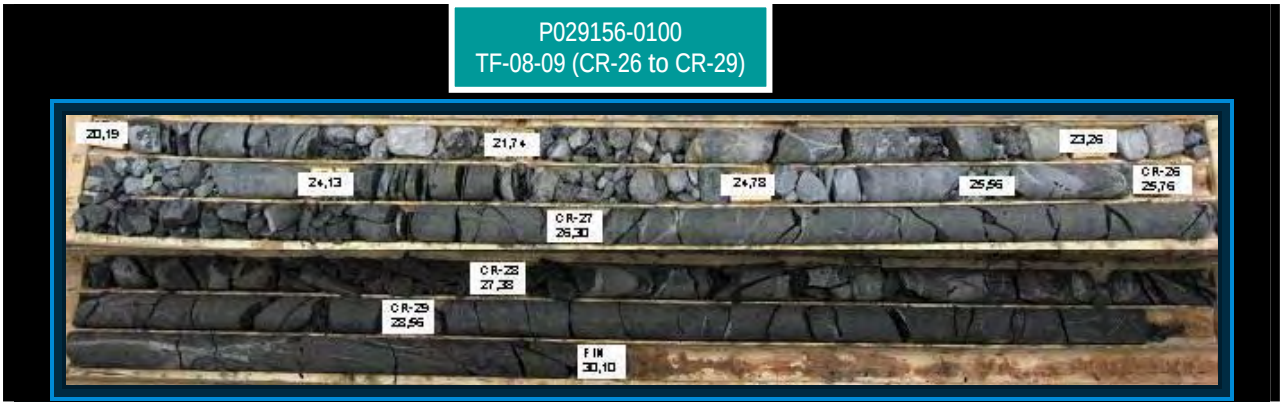


PHOTO #26: Rock core samples (CR-26 to CR-29) taken from the TF-08-09 borehole, from a depth between 25.56 and 30.10 metres below the site's surface.

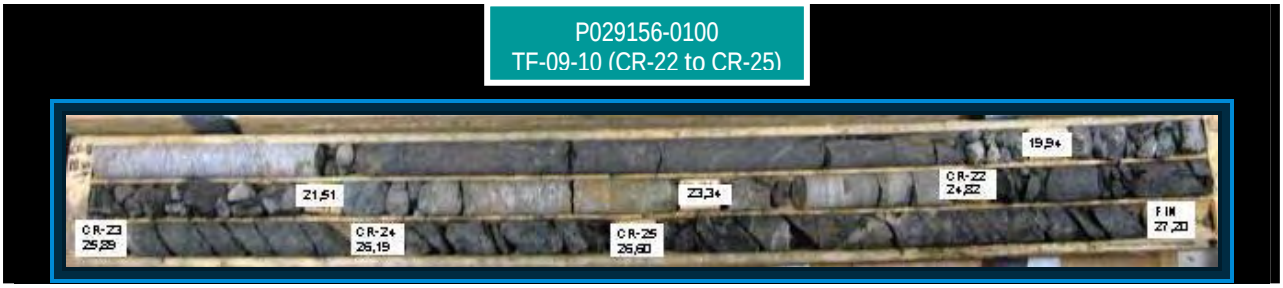


PHOTO #27: Rock core samples (CR-22 to CR-25) taken from the TF-09-09 borehole, from a depth between 24.82 and 27.20 metres below the site's surface.

PHOTO #28: Rock core samples (CR-21) taken from the TF-10-09 borehole, from a depth between 20.21 and 21.73 metres below the site's surface.

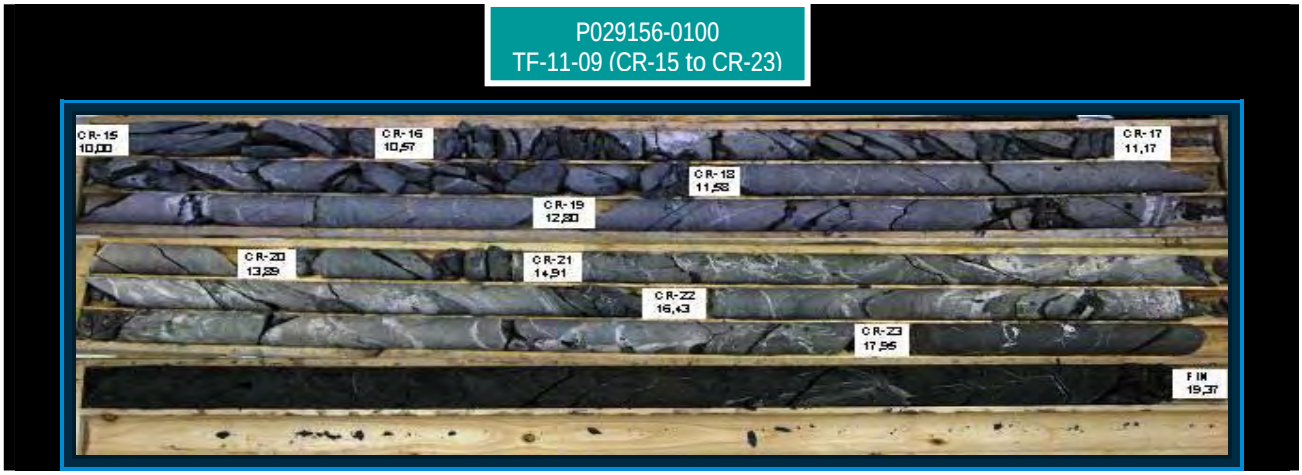


PHOTO #29: Rock core samples (CR-15 to CR-23) taken from the TF-11-09 borehole, from a depth between 10.00 and 19.37 metres below the site's surface.

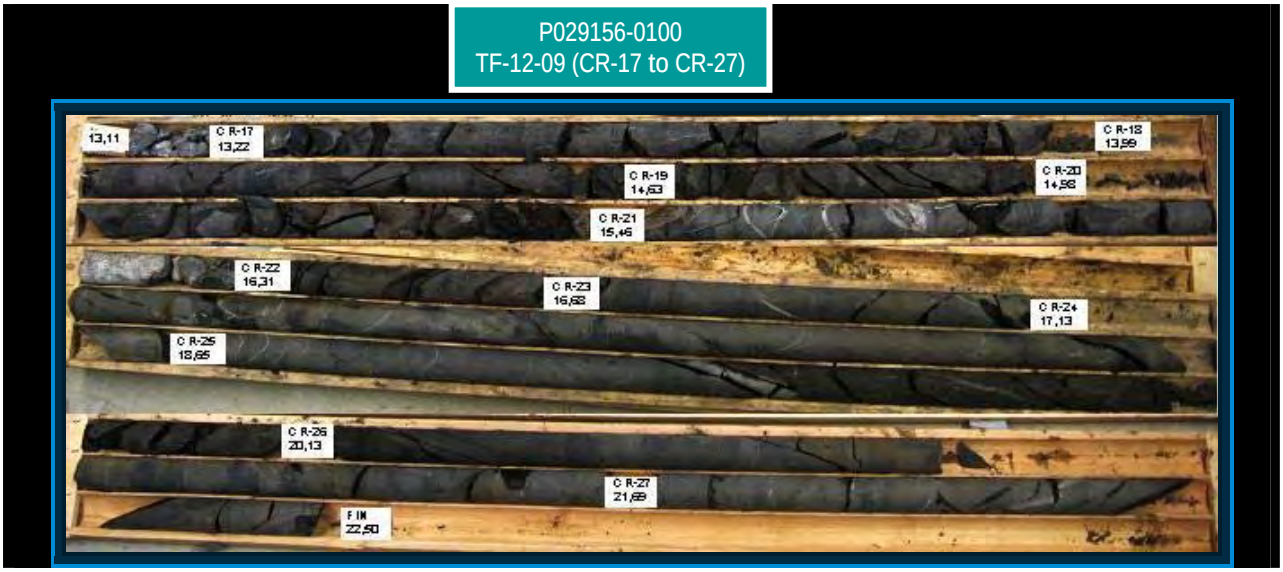


PHOTO #30: Rock core samples (CR-17 to CR-27) taken from the TF-12-09 borehole, from a depth between 13.22 and 22.50 metres below the site's surface.

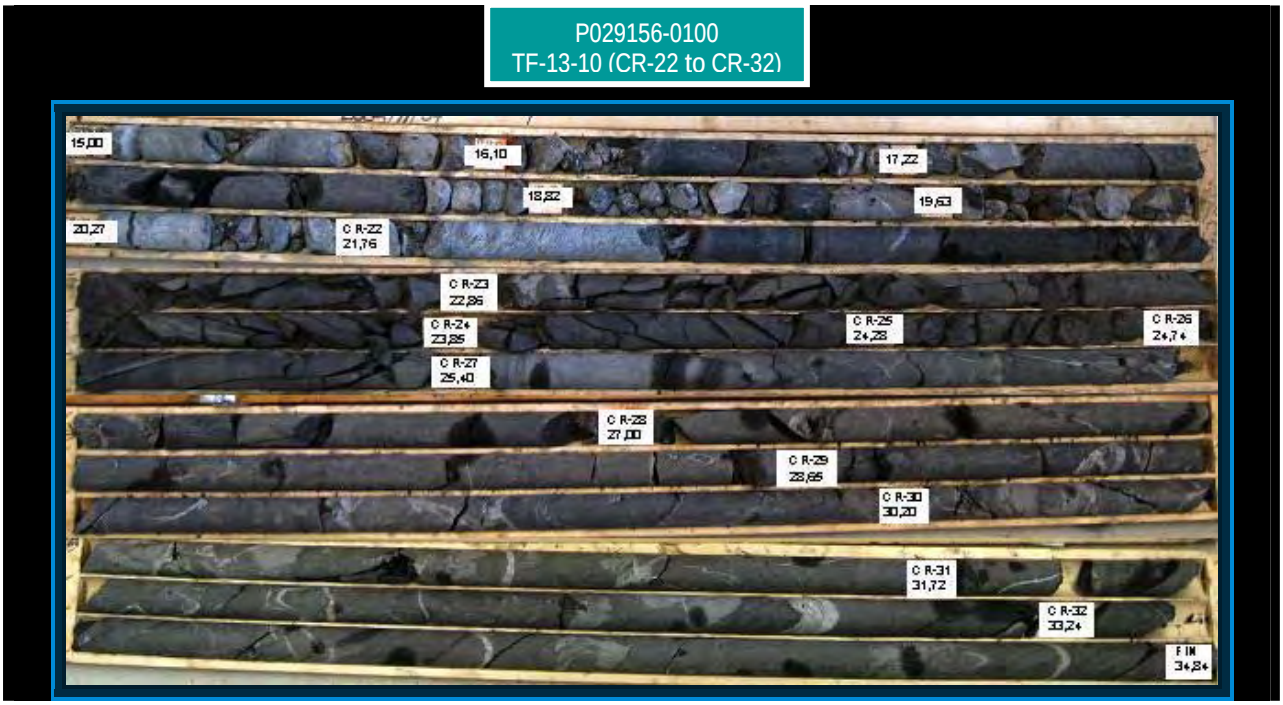


PHOTO #31: Rock core samples (CR-22 to CR-32) taken from the TF-13-09 borehole, from a depth between 21.76 and 34.84 metres below the site's surface.

P029156-0100
TF-14-09 (CR-24 to CR-32)

PHOTO #32: Rock core samples (CR-24 to CR-32) taken from the TF-14-09 borehole, from a depth between 21.70 and 34.07 metres below the site's surface.

P029156-0100
TF-15-10 (CR-26 to CR-28)

PHOTO #33: Rock core samples (CR-26 to CR-28) taken from the TF-15-09 borehole, from a depth between 25.98 and 27.25 metres below the site's surface.

P029156-0100
TF-16-09 (CR-27 to CR-28)

PHOTO #34: Rock core samples (CR-27 to CR-28) taken from the TF-16-09 borehole, from a depth between 25.55 and 27.07 metres below the site's surface.

P029156-0100
TF-21-10 (CR-24 to CR-28)

PHOTO #35: Rock core samples (CR-24 to CR-28) taken from the TF-21-09 borehole, from a depth between 27.48 and 32.58 metres below the site's surface.

P029156-0100
TF-22-10 (CR-31 to CR-35)

PHOTO #36: Rock core samples (CR-31 to CR-35) taken from the TF-22-09 borehole, from a depth between 27.40 and 32.42 metres below the site's surface.

P029156-0100
TF-23-09 (CR-32 to CR-38)

PHOTO #37: Rock core samples (CR-32 to CR-38) taken from the TF-23-09 borehole, from a depth between 28.00 and 32.95 metres below the site's surface.

PHOTO #38: Rock core samples (CR-31 to CR-34) taken from the TF-24-09 borehole, from a depth between 19.01 and 22.87 metres below the site's surface.

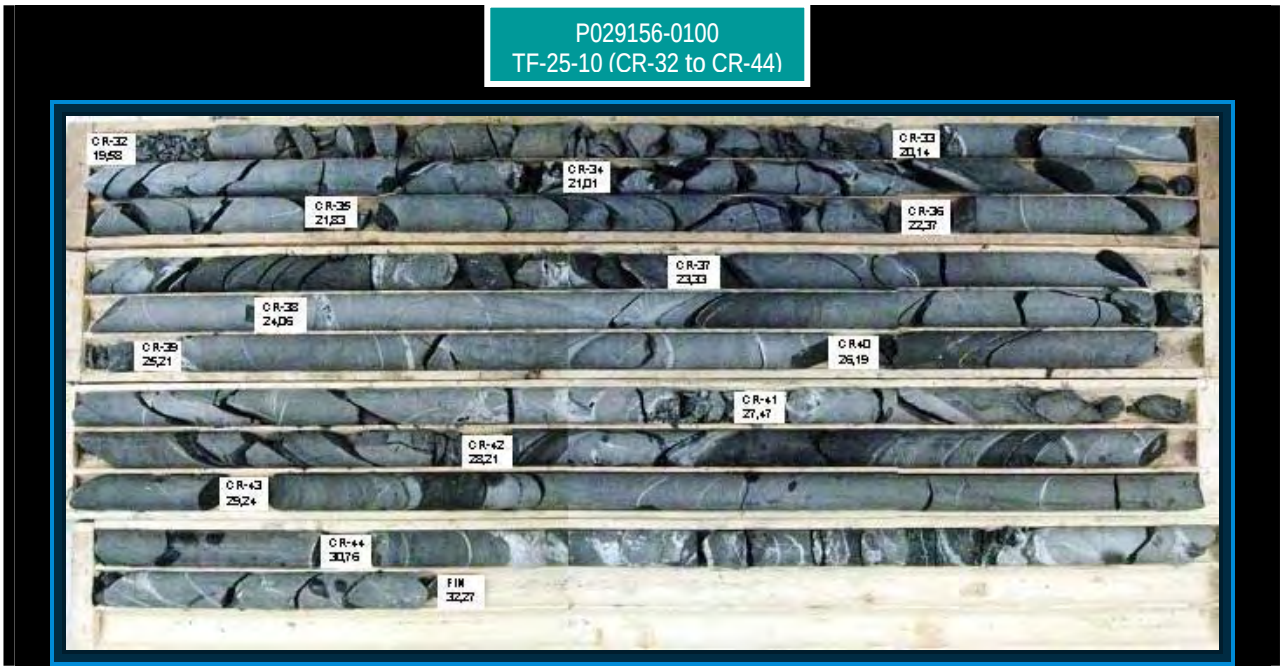


PHOTO #39: Rock core samples (CR-32 to CR-44) taken from the TF-25-09 borehole, from a depth between 19.58 and 32.27 metres below the site's surface.

PHOTO #40: Rock core samples (CR-26 to CR-39) taken from the TF-26-09 borehole, from a depth between 23.49 and 36.22 metres below the site's surface.

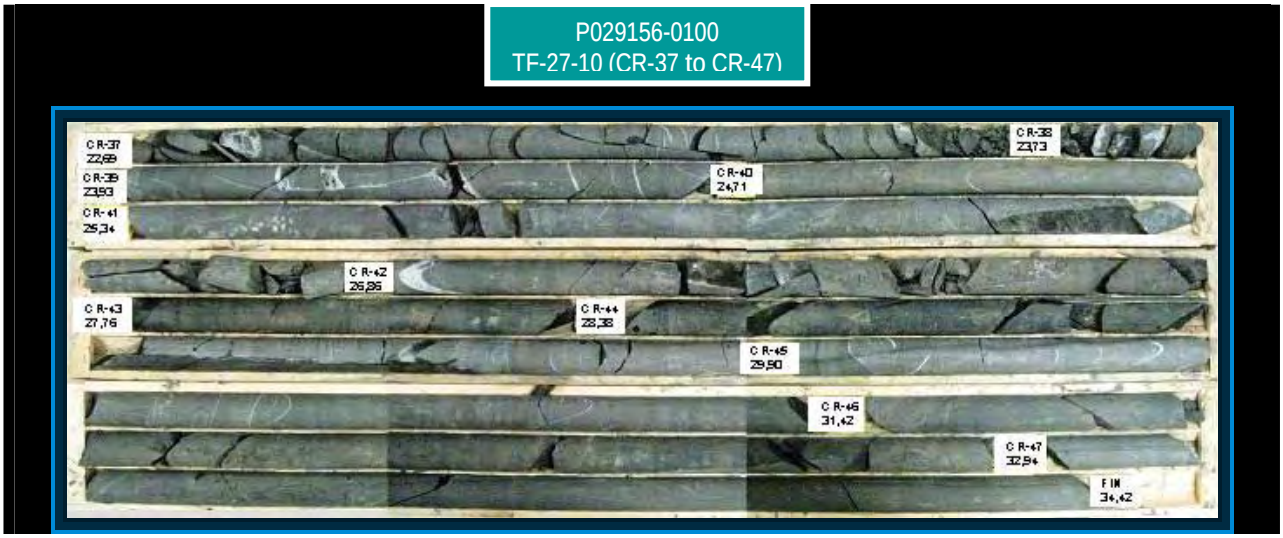
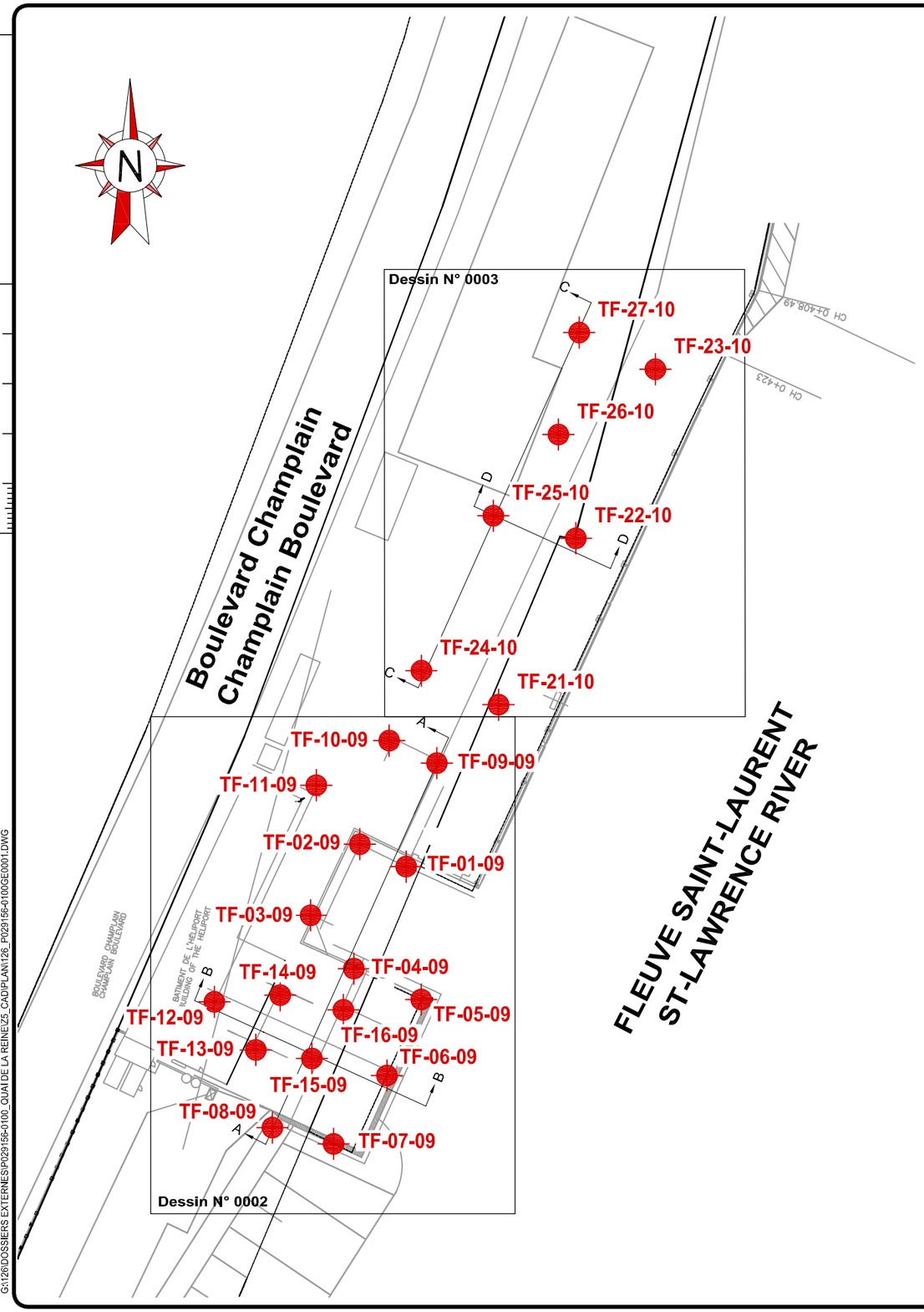


PHOTO #41: Rock core samples (CR-37 to CR-47) taken from the TF-27-09 borehole, from a depth between 22.69 and 34.42 metres below the site's surface.

Appendix 7 Location drawings of boreholes, geologie sections and results of the environmental analyses and probable extent of the contaminated zones



LÉGENDE - LEGEND :

DessIn N° 0003	Délimitation d'un dessin Drawing delimitation
TF-01-09 (-5,59)	Forage no TF-01-09 et élévation (m) Borehole no. TF-01-09 and elevation (m)

NOTES :

1-Ce dessin nous a été fourni par le client et sert uniquement à la localisation du site, des sondages et des coupes stratigraphiques.
2-La localisation des sondages a été effectuée par la firme d'arpentage "Arpentage F.C.Inc.".

1-This drawing was transmitted by the client and is used solely to locate the site, the boreholes and the geologic sections.
2-The boreholes locations were surveyed by "Arpentage F.C.Inc." land surveyers.

RÉV.	A - M - J DATE	DESCRIPTION	Préparé Par	Vérifié Par

ÉMISSIONS / RÉVISIONS - ISSUES / REVISIONS

TOUTES LES DIMENSIONS DEVRONT ÊTRE PRISES ET VÉRIFIÉES AVANT DE COMMENCER LES TRAVAUX
ALL DIMENSIONS MUST BE TAKEN AND CHECKED BEFORE BEGINNING THE WORKS

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Seals

Client

Travaux publics et Services gouvernementaux Canada

Références du client
Client's references

Projet
Project

RECONSTRUCTION DE LA SECTION 98 DU QUAI DE LA REINE

SECTION 98 OF QUAI DE LA REINE RECONSTRUCTION

101, BOUL. CHAMPLAIN, QUÉBEC

Titre
Title

Étude géotechnique / Geotechnical investigation
Plan d'ensemble / global plan

LVM TECHNISOL

LVM-Technisol inc.
425, 3ième Avenue, suite 400
Lévis (Québec) G6W 5M6
Téléphone : 418.835.9889
Télécopieur : 418.835.5851

Préparé / Prepared	S.Malenfant	Discipline	Géotechnique
Dessiné/ Drawn	V.Tessler	Échelle / Scale	1 : 1 000
Vérifié / Checked	S.Malenfant	Date	mars 2010
Chargé de projet / Project Manager	S.Malenfant	Nº de séquence / Sequence Nº	01 de 08

Serv. maître M. dept.	Projet / Project	Lot Work pckg.	Sous-Lot Sub-w.p.	Disc.	Nº Dessin Drawing Nº	Rév.
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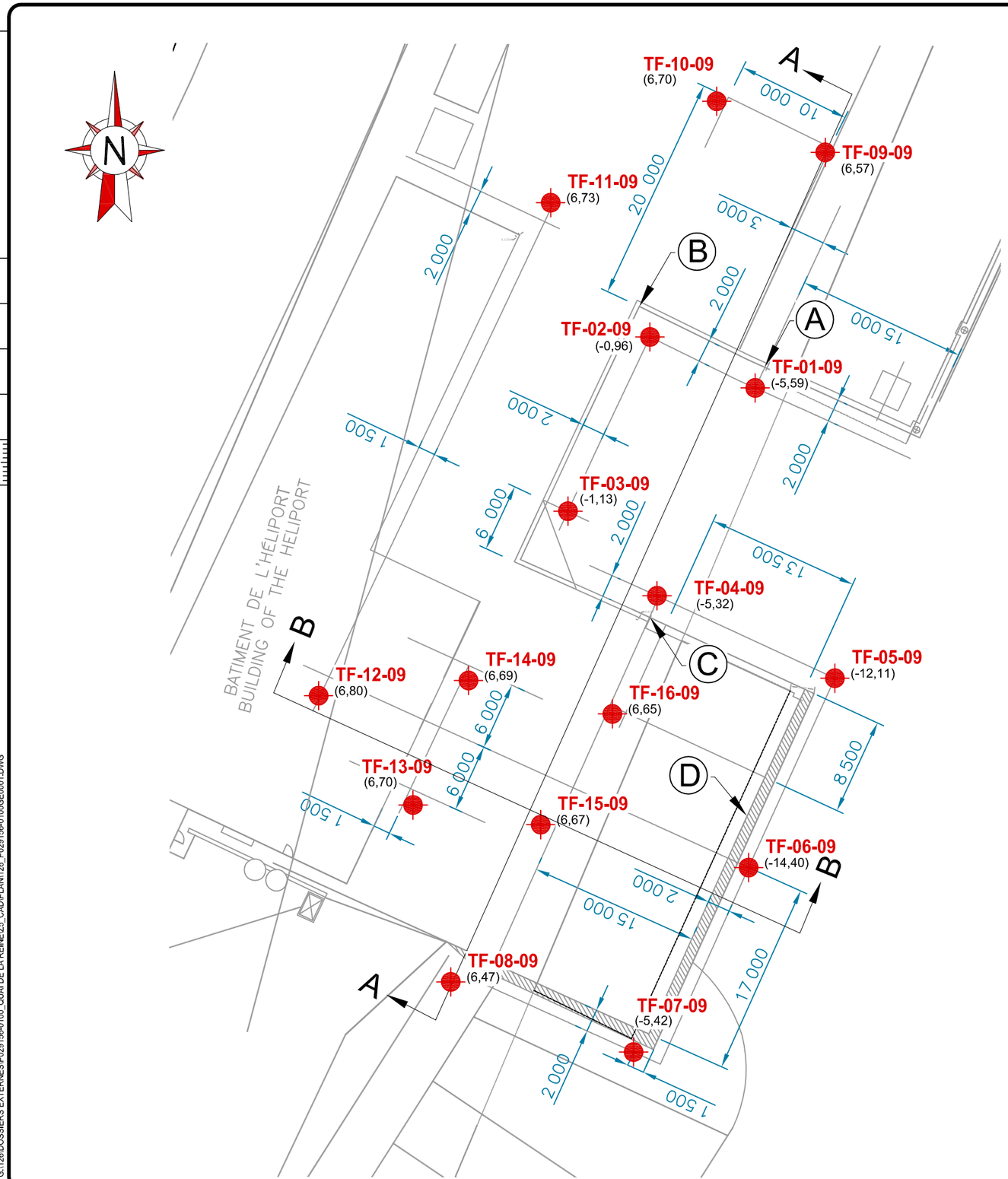

LÉGENDE-LEGEND :

TF-01-09 (-5,59) — Forage no TF-01-09 et élévation (m) / Borehole no. TF-01-09 and elevation (m)

A — point A

K — K — Coupe stratigraphique / Voir les dessins Nos 4 et 5 / Geologic section / See drawing Nos 4 and 5

NOTES :

1-Ce dessin nous a été fourni par le client et sert uniquement à la localisation du site, des sondages et des coupes stratigraphiques.
2-La localisation des sondages a été effectuée par la firme d'arpentage "Arpentage F.C.Inc.".

1-This drawing was created from the original file transmitted by the client and shall only be used for showing the location of the sites, boreholes and geological profiles.
2-The boreholes localisation was doing by surveying firm "Arpentage F.C.Inc.".

RÉV.	A - M - J DATE	DESCRIPTION	Préparé Par	Vérifié Par

ÉMISSIONS / RÉVISIONS - ISSUES / REVISIONS

TOUTES LES DIMENSIONS DEVRONT ÊTRE PRISES ET VÉRIFIÉES AVANT DE COMMENCER LES TRAVAUX
ALL DIMENSIONS MUST BE TAKEN AND CHECKED BEFORE BEGINNING THE WORKS

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Client's references

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RECONSTRUCTION DE LA SECTION 98 DU QUAI DE LA REINE

SECTION 98 OF QUAI DE LA REINE RECONSTRUCTION

101, BOUL. CHAMPLAIN, QUÉBEC

Titre
Title

Étude géotechnique / Geotechnical investigation
Localisation des sondages / Boreholes location
TF-01-09 à TF-16-09

LVM TECHNISOL
LVM-Technisol inc.
425, 3ième Avenue, suite 400
Lévis (Québec) G6W 5M6
Téléphone : 418.835.9889
Télécopieur : 418.835.5851

Préparé / Prepared	S.Malenfant	Discipline	Géotechnique
Dessiné/ Drawn	V.Tessier	Échelle / Scale	1 : 400
Vérifié / Checked	S.Malenfant	Date	mars 2010

Chargé de projet / Project Manager: S.Malenfant

Nº de séquence / Sequence Nº: 02 de 08

Serv. maître M. dept.	Projet / Project	Lot Work pckg.	Sous-Lot Sub-w.p.	Disc.	Nº Dessin Drawing Nº	Rév.
072	P029156	0100		GE	0002	00

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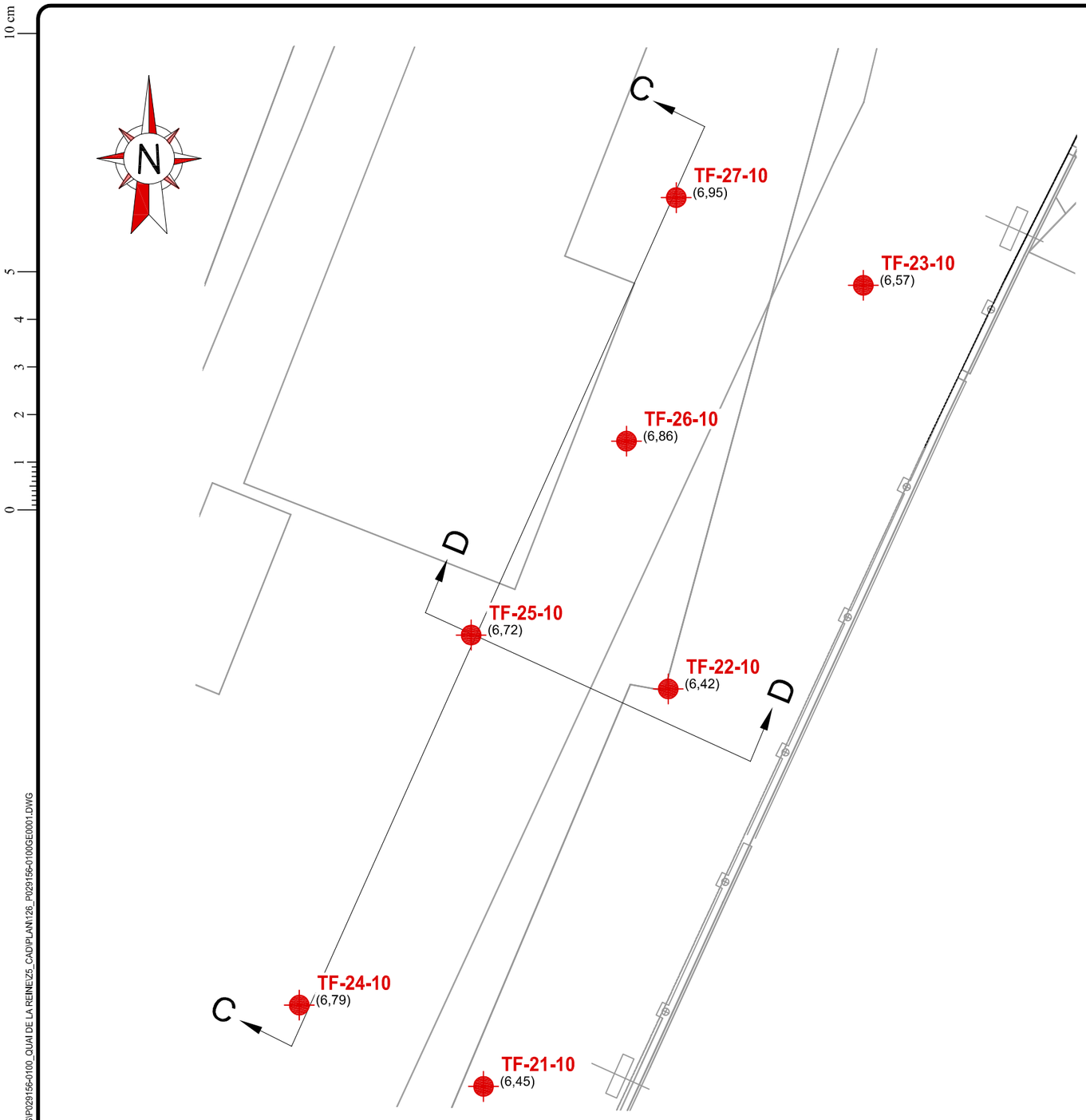

LÉGENDE -LEGEND :

TF-21-10 (6,45) — Forage no TF-21-10 et élévation (m) / Borehole no. TF-21-10 and elevation (m)

K — K — Coupe stratigraphique / Voir les dessins Nos 6 et 7 / Geologic section / See drawing Nos 6 and 7

NOTES :

1-Ce dessin nous a été fourni par le client et sert uniquement à la localisation du site, des sondages et des coupes stratigraphiques.

2-La localisation des sondages a été effectuée par la firme d'arpentage "Arpentage F.C.Inc.".

1-This drawing was created from the original file transmitted by the client and shall only be used for showing the location of the sites, boreholes and geological profiles.

2-The boreholes localisation was doing by surveying firm "Arpentage F.C.Inc.".

RÉV.	A - M - J DATE	DESCRIPTION	Préparé Par	Vérifié Par

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Client's references

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Project

RECONSTRUCTION DE LA SECTION 98 DU QUAI DE LA REINE

SECTION 98 OF QUAI DE LA REINE RECONSTRUCTION

101, BOUL. CHAMPLAIN, QUÉBEC

Titre
Title

Étude géotechnique / Geotechnical investigation
Localisation des sondages / Boreholes localisation
TF-21-10 à TF-27-10

LVM TECHNISOL

LVM-Technisol inc.
425, 3ième Avenue, suite 400
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Télécopieur : 418.835.5851

Préparé / Prepared	S.Malenfant	Discipline	Géotechnique
Dessiné/ Drawn	V.Tessier	Échelle / Scale	1 : 400
Vérifié / Checked	S.Malenfant	Date	mars 2010
Chargé de projet / Project Manager	S.Malenfant	N° de séquence / Sequence N°	03 de 08

Serv. maître M. dept.	Projet / Project	Lot Work pckg.	Sous-Lot Sub-w.p.	Disc.	N° Dessin Drawing N°	Rév.
072	P029156	0100		GE	0003	00

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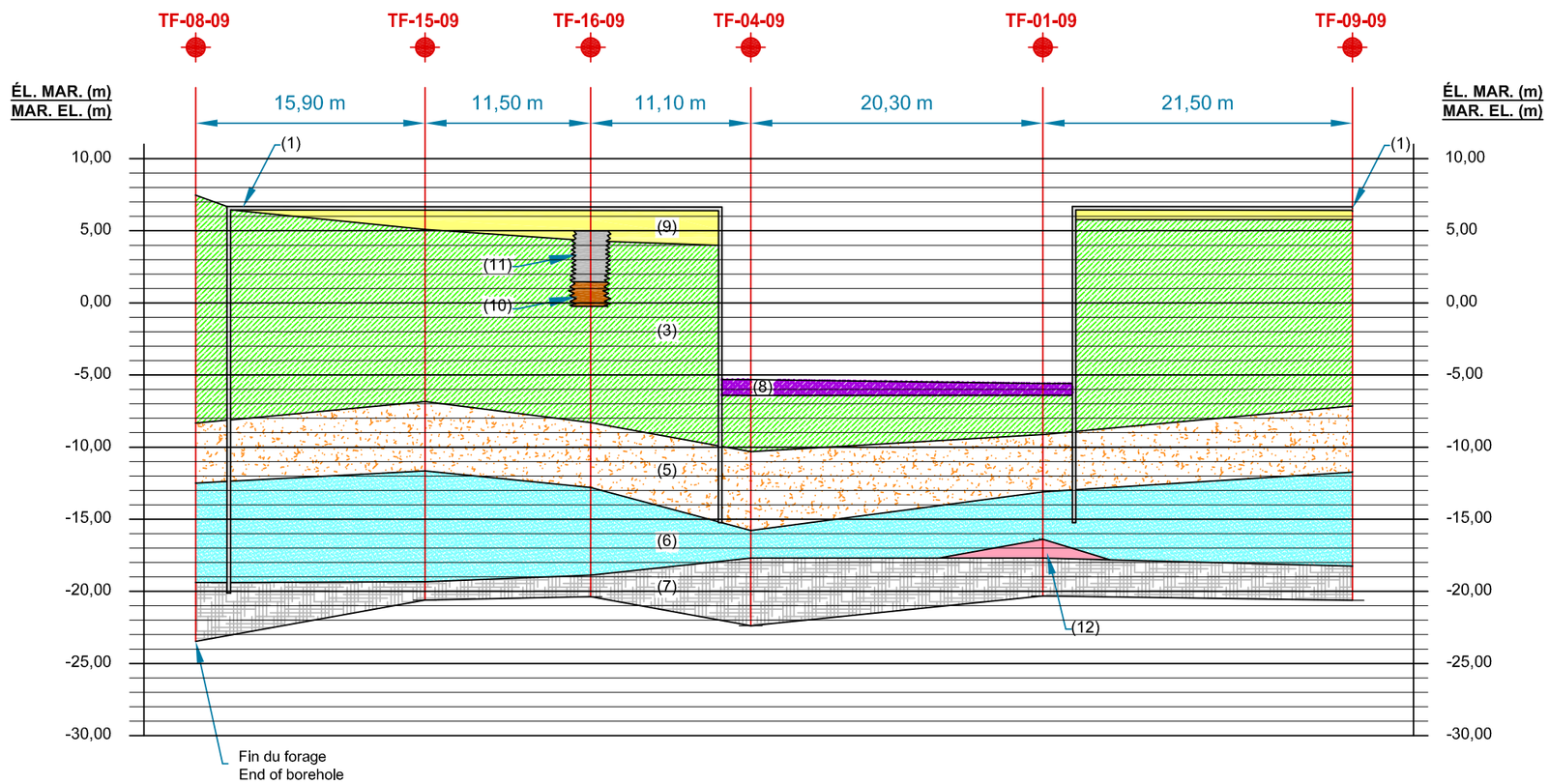
NOTE :
La corrélation entre les points de forages résulte d'une interprétation.
Correlation between boreholes results from an interpretation.



COUPE STRATIGRAPHIQUE A-A
GEOLOGIC SECTION A-A

Légende / Legend:

- (1) Dalle de béton de ciment / Concrete slab
- (2) Béton bitumineux / Asphalt
- (3) Remblai du quai ou sous le fond marin / Wharf backfill or under sea-bed backfill
- (4) Silt sableux / Sandy silt
- (5) Sable avec un peu de gravier à graveleux et avec des traces à un peu de silt. Présence de cailloux. / Sand with some gravel to gravelly and traces to some silt. Presence of cobbles.
- (6) Gravier sableux à sable et gravier avec des traces à un peu de silt. Présence de cailloux et blocs. / Sandly gravel to sand and gravel with traces to some silt. Presence of cobbles and boulders.
- (7) Socle rocheux / Bedrock
- (8) Alluvions probables / Probable alluvions
- (9) Gravier ou pierre concassée / Crushed stone or gravel
- (10) Morceaux de bois (caisson probable) / Pieces of wood (probable crib)
- (11) Béton de ciment (structure probable) / Concrete structure (probable structure)
- (12) Sable avec des traces de silt et des traces de gravier / Sand with traces of silt and traces of gravel

RÉV.	A - M - J DATE	DESCRIPTION	Préparé Par	Vérifié Par

ÉMISSIONS / RÉVISIONS - ISSUES / REVISIONS

TOUTES LES DIMENSIONS DEVRONT ÊTRE PRISES ET VÉRIFIÉES AVANT DE COMMENCER LES TRAVAUX
ALL DIMENSIONS MUST BE TAKEN AND CHECKED BEFORE BEGINNING THE WORKS

Sceaux
Seals

Client

Travaux publics et Services gouvernementaux Canada

Références du client
Client's references

Projet
Project

RECONSTRUCTION DE LA SECTION 98 DU QUAI DE LA REINE

SECTION 98 OF QUAI DE LA REINE RECONSTRUCTION

101, BOUL. CHAMPLAIN, QUÉBEC

Titre
Title

Étude géotechnique / Geotechnical investigation
Coupe stratigraphique A-A / Geological profile A-A

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LVM-Technisol inc.
425, 3ième Avenue, suite 400
Lévis (Québec) G6W 5M6
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Préparé / Prepared	S.Malenfant	Discipline	Géotechnique
Dessiné/ Drawn	V.Tessier	Échelle / Scale	1 : 400
Vérifié / Checked	S.Malenfant	Date	mars 2010
Chargé de projet / Project Manager	S.Malenfant	Nº de séquence / Sequence Nº	04 de 08

Serv. maître / M. dept.	Projet / Project	Lot / Work pckg.	Sous-Lot / Sub-w.p.	Disc.	Nº Dessin / Drawing Nº	Rév.
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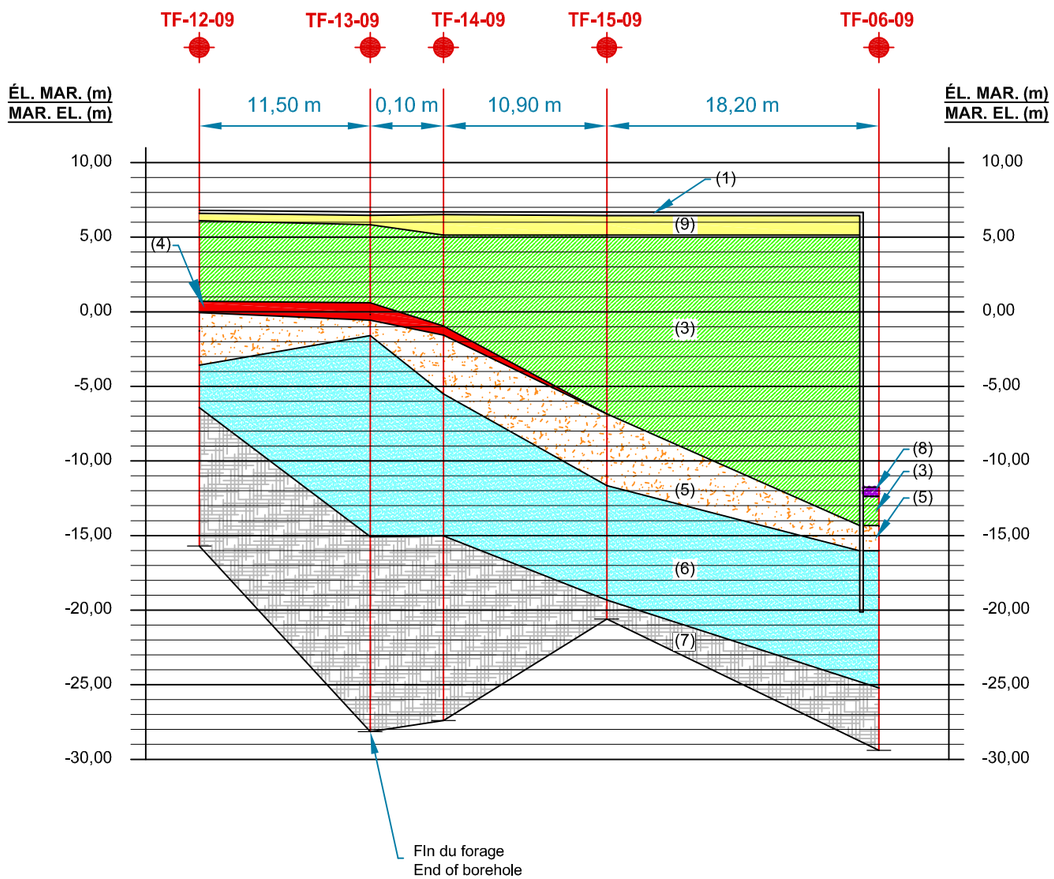

COUPE STRATIGRAPHIQUE B-B
GEOLOGIC SECTION B-B

NOTE :
1-La corrélation entre les points de forages résulte d'une interprétation.
2-La longueur entre les forages TF-13-09 et TF-14-09 est de 0,10 mètres, mais le dessin a été ajusté pour bien voir la stratigraphie présente.

1-Correlation between boreholes results from an interpretation.
2-The lent between boreholes TF-13-09 et TF-14-09 is 0,10 meters, but the drawing was adjusted to have a well seeing of the section.

Légende / Legend:

- (1) Dalle de béton de ciment / Concrete slab
- (2) Béton bitumineux / Asphalt
- (3) Remblai du quai ou sous le fond marin / Wharf backfill or under sea-bed backfill
- (4) Silt sableux / Sandy silt
- (5) Sable avec un peu de gravier à graveleux et avec des traces à un peu de silt. Présence de cailloux. / Sand with some gravel to gravelly and traces to some silt. Presence of cobbles.
- (6) Gravier sableux à sable et gravier avec des traces à un peu de silt. Présence de cailloux et blocs. / Sandly gravel to sand and gravel with traces to some silt. Presence of cobbles and boulders.
- (7) Socle rocheux / Bedrock
- (8) Alluvions probables / Probable alluvions
- (9) Gravier ou pierre concassée / Crushed stone or gravel
- (10) Morceaux de bois (caisson probable) / Pieces of wood (probable crib)
- (11) Béton de ciment (structure probable) / Concrete structure (probable structure)
- (12) Sable avec des traces de silt et des traces de gravier / Sand with traces of silt and traces of gravel

RÉV.	A - M - J DATE	DESCRIPTION	Préparé Par	Vérifié Par

ÉMISSIONS / RÉVISIONS - ISSUES / REVISIONS

TOUTES LES DIMENSIONS DEVRONT ÊTRE PRISES ET VÉRIFIÉES AVANT DE COMMENCER LES TRAVAUX
ALL DIMENSIONS MUST BE TAKEN AND CHECKED BEFORE BEGINNING THE WORKS

Seceaux / Seals

Client

Travaux publics et Services gouvernementaux Canada

Références du client / Client's references

Projet / Project

RECONSTRUCTION DE LA SECTION 98 DU QUAI DE LA REINE

SECTION 98 OF QUAI DE LA REINE RECONSTRUCTION

101, BOUL. CHAMPLAIN, QUÉBEC

Titre / Title

Étude géotechnique / Geotechnical investigation
Coupe stratigraphique B-B / Geological profile B-B

LVM TECHNISOL
LVM-Technisol inc.
425, 3ième Avenue, suite 400
Lévis (Québec) G6W 5M6
Téléphone : 418.835.9889
Télécopieur : 418.835.5851

Préparé / Prepared	S.Malenfant	Discipline	Géotechnique
Dessiné/ Drawn	V.Tessier	Échelle / Scale	1 : 400
Vérifié / Checked	S.Malenfant	Date	mars 2010
Chargé de projet / Project Manager	S.Malenfant	Nº de séquence / Sequence Nº	05 de 08

Serv. maître / M. dept.	Projet / Project	Lot / Work pckg.	Sous-Lot / Sub-w.p.	Disc.	Nº Dessin / Drawing Nº	Rév.
072	P029156	0100		GE	0005	00

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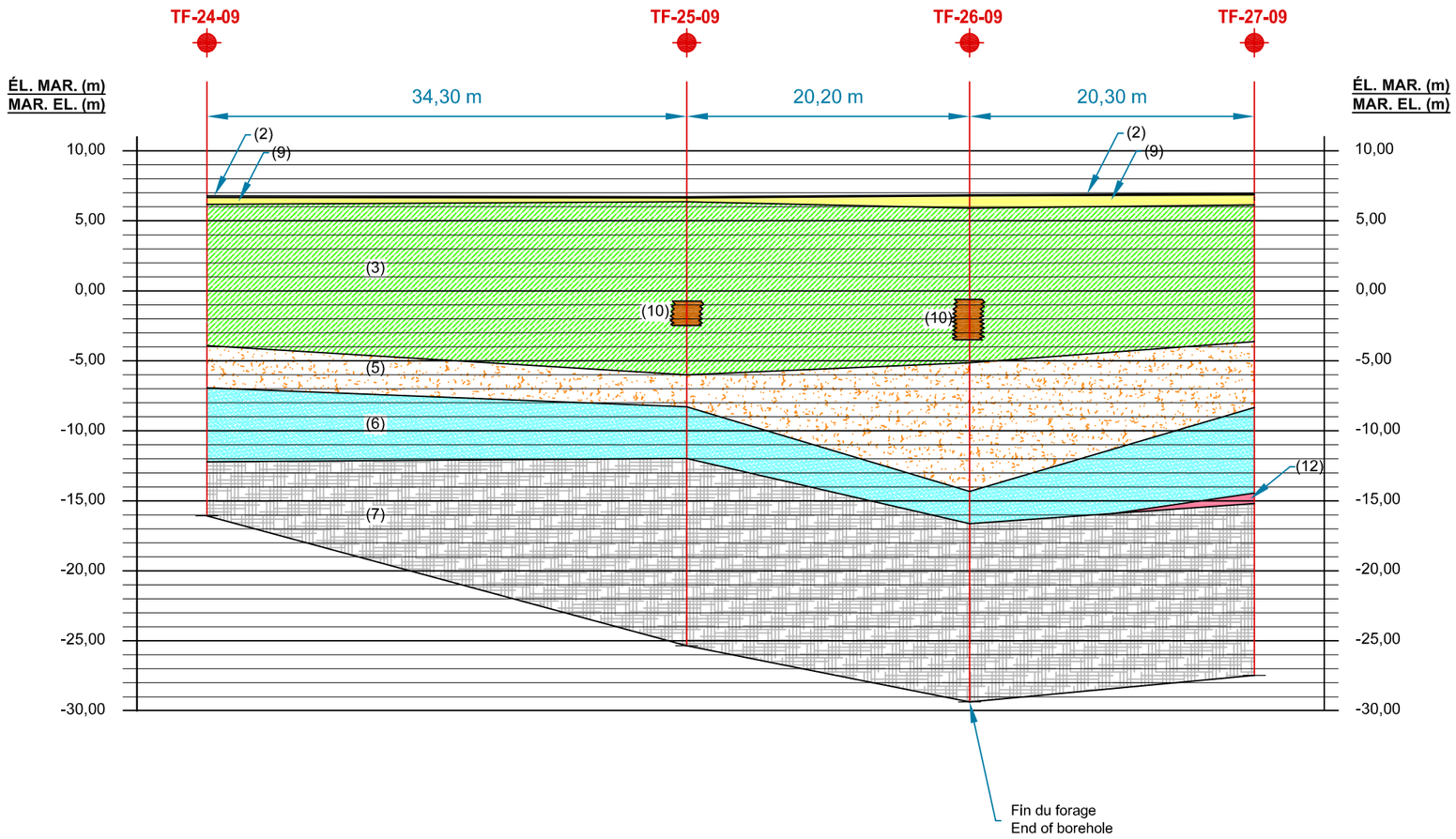
NOTE :
La corrélation entre les points de forages résulte d'une interprétation.
Correlation between boreholes results from an interpretation.



COUPE STRATIGRAPHIQUE C-C
GEOLOGIC SECTION C-C

Légende / Legend:

- (1) Dalle de béton de ciment / Concrete slab
- (2) Béton bitumineux / Asphalt
- (3) Remblai du quai ou sous le fond marin / Wharf backfill or under sea-bed backfill
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RÉV.	A - M - J DATE	DESCRIPTION	Préparé Par	Vérifié Par

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Seceaux / Seals

Client

Travaux publics et Services gouvernementaux Canada

Références du client / Client's references

Projet / Project

RECONSTRUCTION DE LA SECTION 98 DU QUAI DE LA REINE

SECTION 98 OF QUAI DE LA REINE RECONSTRUCTION

101, BOUL. CHAMPLAIN, QUÉBEC

Titre / Title

Étude géotechnique / Geotechnical investigation
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Préparé / Prepared	S.Malenfant	Discipline	Géotechnique
Dessiné/ Drawn	V.Tessier	Échelle / Scale	1 : 400
Vérifié / Checked	S.Malenfant	Date	mars 2010
Chargé de projet / Project Manager	S.Malenfant	Nº de séquence / Sequence Nº	06 de 08

Serv. maître M. dept.	Projet / Project	Lot Work pckg.	Sous-Lot Sub-w.p.	Disc.	Nº Dessin Drawing Nº	Rév.
072	P029156	0100		GE	0006	00

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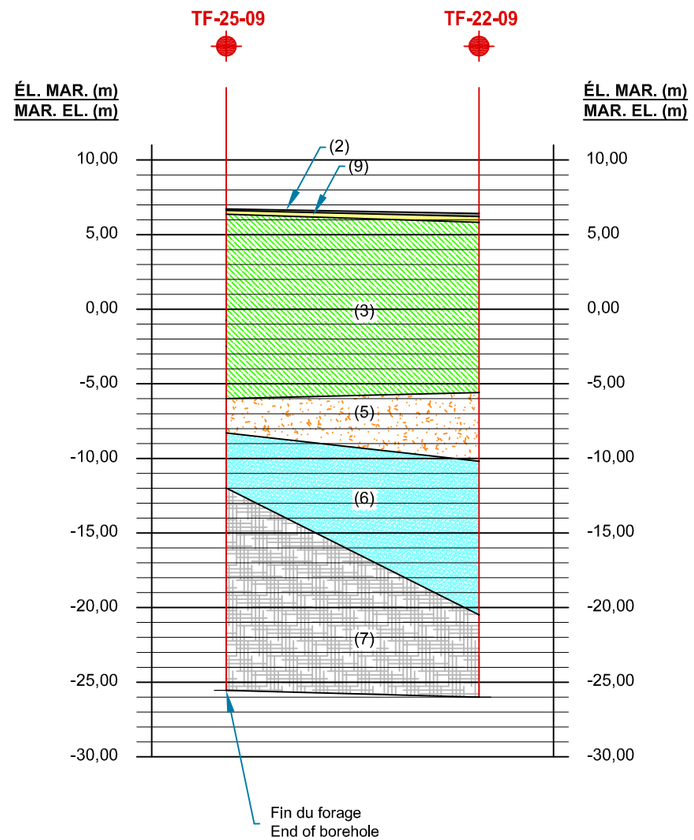
10 cm

NOTE :
La corrélation entre les points de forages résulte d'une interprétation.
Correlation between boreholes results from an interpretation.



COUPE STRATIGRAPHIQUE D-D
GEOLOGIC SECTION D-D

Légende / Legend:

- (1) Dalle de béton de ciment / Concrete slab
- (2) Béton bitumineux / Asphalt
- (3) Remblai du quai ou sous le fond marin / Wharf backfill or under sea-bed backfill
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RÉV.	A - M - J DATE	DESCRIPTION	Préparé Par	Vérifié Par

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Seceaux
Seals

Client

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Références du client
Client's references

Projet
Project

RECONSTRUCTION DE LA SECTION 98 DU QUAI DE LA REINE

SECTION 98 OF QUAI DE LA REINE RECONSTRUCTION

101, BOUL. CHAMPLAIN, QUÉBEC

Titre
Title

Étude géotechnique / Geotechnical investigation
Coupe stratigraphique D-D / Geological profile D-D

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Préparé / Prepared	S.Malenfant	Discipline	Géotechnique
Dessiné/ Drawn	V.Tessier	Échelle / Scale	1 : 400
Vérifié / Checked	S.Malenfant	Date	mars 2010
Chargé de projet / Project Manager	S.Malenfant	Nº de séquence / Sequence Nº	07 de 08

Serv. maître M. dept.	Projet / Project	Lot Work pckg.	Sous-Lot Sub-w.p.	Disc.	Nº Dessin Drawing Nº	Rév.
072	P029156	0100		GE	0007	00

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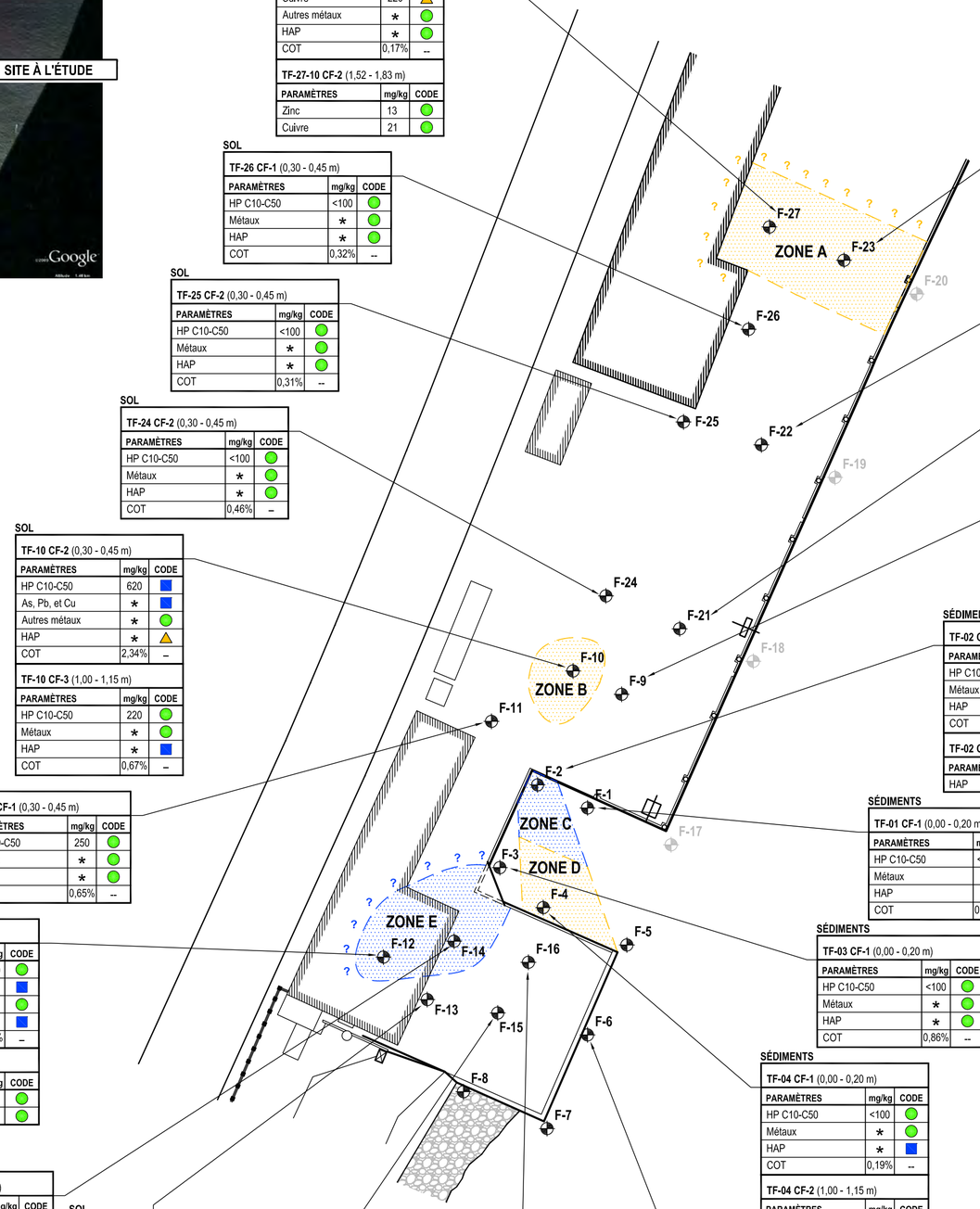

SOL

TF-27 TA-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Zinc	200	■
Cuivre	220	▲
Autres métaux	*	●
HAP	*	●
COT	0,17%	--

TF-27-10 CF-2 (1,52 - 1,83 m)

PARAMÈTRES	mg/kg	CODE
Zinc	13	●
Cuivre	21	●

SOL

TF-26 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,32%	--

SOL

TF-25 CF-2 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,31%	--

SOL

TF-24 CF-2 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,46%	--

SOL

TF-10 CF-2 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	620	■
As, Pb, et Cu	*	■
Autres métaux	*	●
HAP	*	▲
COT	2,34%	--

TF-10 CF-3 (1,00 - 1,15 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	220	●
Métaux	*	●
HAP	*	■
COT	0,67%	--

SOL

TF-11 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	250	●
Métaux	*	●
HAP	*	●
COT	0,65%	--

SOL

TF-12 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Plomb	81	■
Autres métaux	*	●
HAP	*	■
COT	1,73%	--

TF-12 CF-4 (2,29 - 2,90 m)

PARAMÈTRES	mg/kg	CODE
Plomb	8	●
HAP	*	●

SOL

TF-14 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	■
COT	0,42%	--

TF-14 CF-2 (1,00 - 1,15 m)

PARAMÈTRES	mg/kg	CODE
HAP	*	●

SOL

TF-13 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	1,08%	--

SOL

TF-15 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,29%	--

SOL

TF-16 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,34%	--

SÉDIMENTS

F-06 19-11-09 (0,00 - 0,20 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,04%	--

SOL

TF-23 TA-1 (0,30 - 0,45m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Zinc	130	■
Cuivre	120	▲
Autres métaux	*	●
HAP	*	●
COT	0,20%	--

TF-23-10 CF-4 (2,29 - 2,90 m)

PARAMÈTRES	mg/kg	CODE
Zinc	11	●
Cuivre	40	●

SOL

TF-22 TA-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,38%	--

SOL

TF-21 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,50%	--

SOL

TF-09 CF-1 (0,30 - 0,45 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,58%	--

SÉDIMENTS

TF-02 CF-1 (0,00 - 0,20 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	■
COT	0,57%	--

TF-02 CF-2 (1,00 - 1,15 m)

PARAMÈTRES	mg/kg	CODE
HAP	*	■

SÉDIMENTS

TF-01 CF-1 (0,00 - 0,20 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,65%	--

SÉDIMENTS

TF-03 CF-1 (0,00 - 0,20 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	●
COT	0,86%	--

SÉDIMENTS

TF-04 CF-1 (0,00 - 0,20 m)

PARAMÈTRES	mg/kg	CODE
HP C10-C50	<100	●
Métaux	*	●
HAP	*	■
COT	0,19%	--

TF-04 CF-2 (1,00 - 1,15 m)

PARAMÈTRES	mg/kg	CODE
HAP	*	▲

TF-04-09 CF-3 (1,98 - 2,59 m)

PARAMÈTRES	mg/kg	CODE
HAP	*	■

ÉCHELLE GRAPHIQUE
0 15,0 30,0 45,0 m

ESTIMATION DES ZONES CONTAMINÉES

Zone	Superficie (m^2)	Intervalle (m)	Épaisseur (m)	Contaminant(s) et plage de contamination	Quantité (m^3)
A	± 665,0	0,00 - 0,50	0,5	Métaux (B-C)	± 333,0
B	± 170,0	0,00 - 0,50 0,50 - 1,50	0,5 1,0	HAP (B-C) HAP (A-B)	± 85,0 ± 170,0
C	± 125,0	0,00 - 3,00	3,0	HAP (A-B)	± 375,0
D	± 200,0	0,00 - 1,00 + 1,50 - 3,00 1,00 - 1,50	2,50 0,5	HAP (A-B) HAP (B-C)	± 500,0 ± 100,0
E	± 430,0	0,00 - 0,50	0,50	HAP, Métaux	± 215,0
				TOTAL :	**± 1778,0**

Notes

LÉGENDE

- Limite du quai
- Forage (LVM, 2009-2010)
- Forage non réalisé
- Bâtiment
- Zone estimée de contamination

PRÉSENTATION DES RÉSULTATS ANALYTIQUES DES SOLS

Intervalle de sol dans lequel l'échantillon fut prélevé (m)

SOL

Nom de l'échantillon (x,xx à x,xx)		
PARAMÈTRE	mg/kg	CODE
Paramètre analytique	( )	1

code de couleur en fonction de la plage de contamination

1 **CODE DE COULEUR**

● Plage " ≤A" ▲ Plage "B-C" ◆◆ Plage ">RESC"
■ Plage "A-B" ◆ Plage "C-RESC"

( ) Concentration

(*) Le code de couleur indiqué correspond au niveau maximal de concentration mesurée pour l'un ou plusieurs des composés appartenant au paramètre analytique

RESC : Valeur limite de l'*Annexe I du Règlement sur l'enfouissement des sols contaminés*

Note : Les critères « B » et « C » correspondent respectivement aux valeurs limites des *Annexes I et II du Règlement sur la protection et la réhabilitation des terrains* (RPRT)

ND : Non détecté

Client

TRAVAUX PUBLICS ET SERVICES GOUVERNEMENTAUX CANADA

Références du client

TPSGC, Région de Québec, n° projet : R.020430.001, 2008

Projet

CARACTÉRISATION ENVIRONNEMENTALE DANS LE CADRE DES TRAVAUX D'ÉTUDE GÉOTECHNIQUE

QUAI DE LA REINE

101, BOULEVARD CHAMPLAIN, QUÉBEC (QUÉBEC)

Titre

FIGURE 8

PLAN DE LOCALISATION ET RÉSULTATS ANALYTIQUES DES SOLS

LVM TECHNISOL

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Préparé	M. Fleury	Discipline	Environnement
Dessiné	G. Godmaire	Échelle	1 : 750
Vérifié	M. Fleury	Date	2010-06-11

Chargé de projet: **S. Malenfant**

No. de séquence: 08 de 08

Serv. maître	Projet	Lot	Sous-Lot	Disc.	Nº Dessin	Rév.
129	P029156	0150	000	EN	0108	00