



re: Groundwater Monitoring Program
Proposed Industrial Addition
158 Cardevco Road – Ottawa

to: Pri-Tec Construction Ltd. – Mike Watters – Mike@pritec.ca

date: November 20, 2024

file: PH4559-MEMO.02

Further to your request and authorization, Paterson Group (Paterson) conducted a groundwater monitoring program in support of a Low Impact Development (LID) design for the proposed industrial addition at the aforementioned site. This report should be read in conjunction with Paterson Report PG6233-1 Revision 3 dated November 30, 2023.

1.0 Background Information

Geotechnical field investigations were carried out between May 20, 2022, and March 24, 2023. At that time, a total of six (6) boreholes and three (3) test pits were advanced to a maximum depth of 4.7 m and 3.1 m below existing grade (bgs), respectively. The test holes were distributed in a manner to provide general coverage of the study area, taking into consideration existing site features.

Field Survey

The borehole locations, and ground surface elevations at each borehole location, were surveyed by Paterson using a high precision, handheld GPS and referenced to a geodetic datum. The location and ground surface elevation at each borehole location is presented on Drawing PG6233-1 - Test Hole Location Plan attached to the current memorandum.

Subsurface Profile

The subsurface profile at the borehole locations generally consisted of fill material followed by a native silty sand deposit. The above noted fill layer typically consisted of dense to compact brown silty sand with varying amounts of gravel, crushed stone, and construction debris. The native silt sand with varying amounts of gravel and cobbles was encountered underlying the glacial till. Practical refusal to augering/excavation was encountered in select test holes between 2.1 to 4.3 m bgs.

Details of the subsurface profile can be found in the Soil Profile and Test Data Sheets attached to the current report.

FILE# D07-12-23-0002 SITE PLAN# 19363



Monitoring Well Installation

Typical monitoring well construction details are described below:

- ☐ 1.5 m of slotted 51 mm diameter PVC screen at the base of the aforementioned boreholes.
- ☐ 51 mm diameter PVC riser pipe from the top of the screen to ground surface.
- ☐ No.3 silica sand backfill within the annular space around the screen.
- ☐ Bentonite hole plug placed directly above PVC slotted screen extending to the existing ground surface.
- ☐ The 51 mm diameter PVC riser was covered with a protective steel flush mount well casing at ground surface.

Specific details of the installation of the monitoring well is further included in the Soil Profile and Test Data Sheet attached to the current report.

2.0 Groundwater Monitoring Program

The monitoring well installed at BH 2-23 was equipped with a Van Essen Instrument Mini-Diver Water Level Logger on November 16, 2023, to accurately monitor fluctuations in the groundwater levels. In addition, a Van Essen Instruments Baro-Diver was installed in BH 2-23 to monitor changes in atmospheric pressure. The Mini-Diver was programmed to continuously measure and record groundwater levels throughout the subject site at a rate of 1 reading every 24 hours for a period of approximately 7 months.

The results of the groundwater fluctuations and correlated precipitation events at the monitoring well location between November 2023 and June 2024, have been summarized in Figure 1 attached to the current report.

3.0 Groundwater Monitoring Results

The data presented in Figure 1 illustrates the collected groundwater elevations between November 2023 and June 2024. The groundwater readings measured within the monitoring well varied from an elevation of 114.88 m asl to a maximum elevation of 115.94 m asl. The low and high groundwater elevation are summarized in Table 1 below.



Based on our analysis of the data logger groundwater readings, seasonal groundwater fluctuations can be observed at the well location with a difference in elevation between low and high readings of 1.06 m.

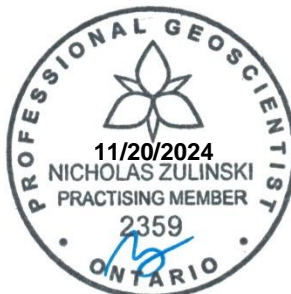
| Table 1: Groundwater Monitoring Summary | | | | |
|---|----------------------------------|-----------------------------------|------------------------------------|---|
| Monitoring Well ID | Ground Surface Elevation (m asl) | Low Groundwater Elevation (m asl) | High Groundwater Elevation (m asl) | Difference in Groundwater Elevation (m asl) |
| BH 2-23 | 117.47 | 114.88 | 115.94 | 1.06 |

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Nicholas Zulinski, P.Ge., géo.



Erik Ardley, P.Ge.

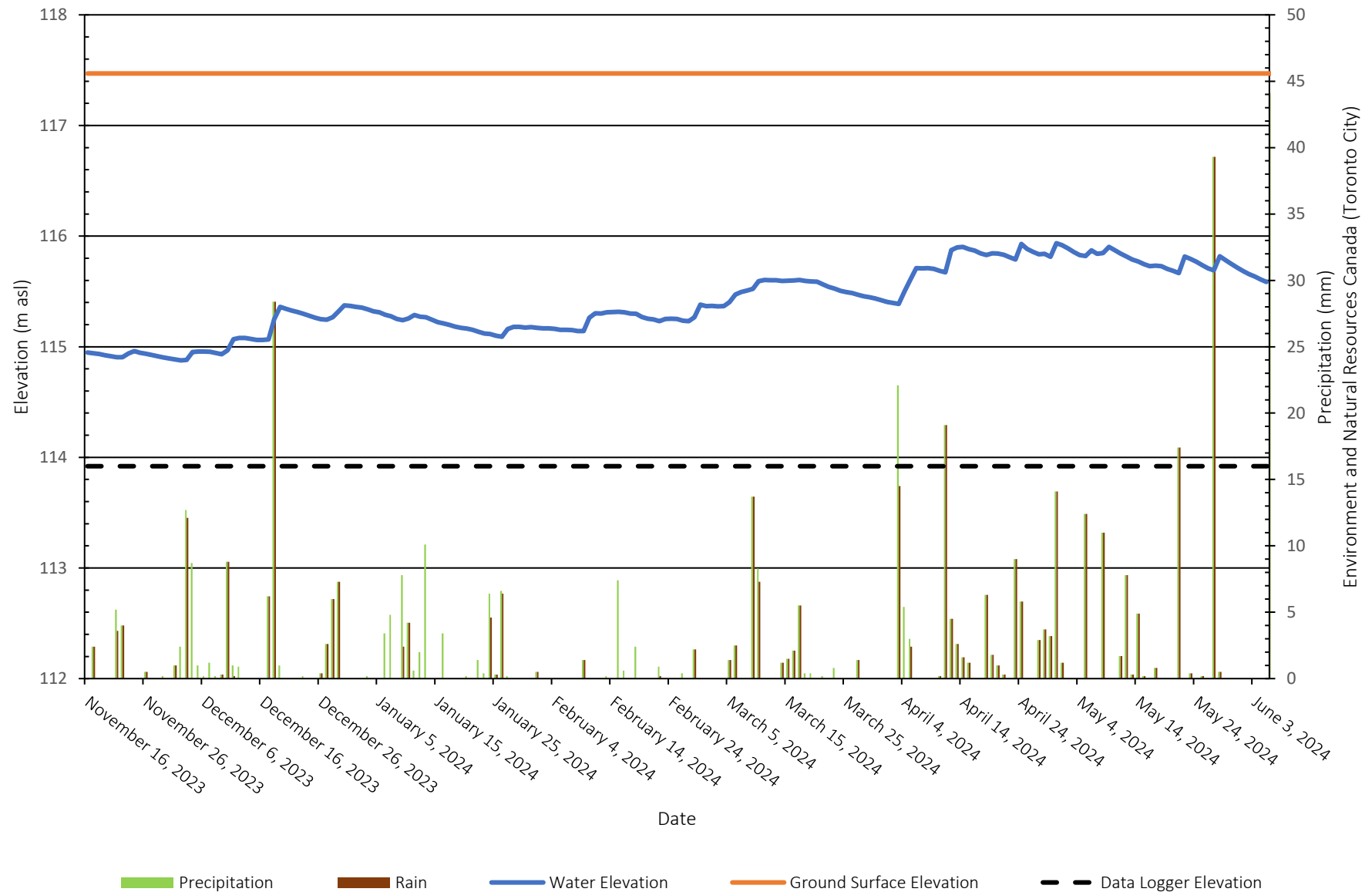
Attachments

- ☐ Figure 1 – Groundwater Monitoring Levels
- ☐ Soil Profile and Test Data Sheets
- ☐ Drawing PG6233-1 – Test Hole Location Plan

FILE# D07-12-23-0002 SITE PLAN# 19363



BH2-23 - Monitoring Well Water Elevations



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
158 Cardevco Road
Ottawa, Ontario

DATUM Elevations are referenced to a geodetic datum

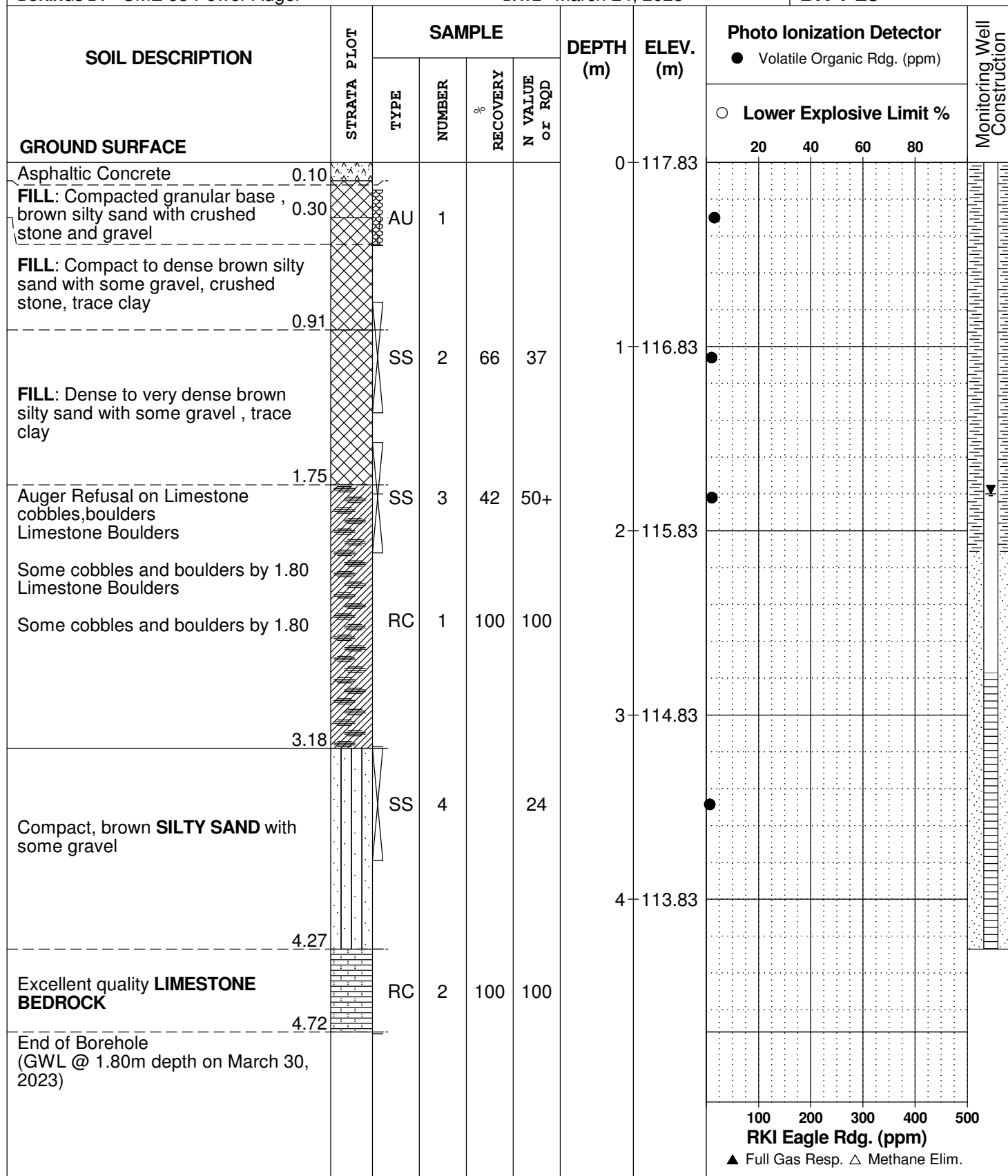
REMARKS

BORINGS BY CME 55 Power Auger

DATE March 24, 2023

FILE NO.
PG5996

HOLE NO.
BH 1-23



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
158 Cardevco Road
Ottawa, Ontario

DATUM Elevations are referenced to a geodetic datum

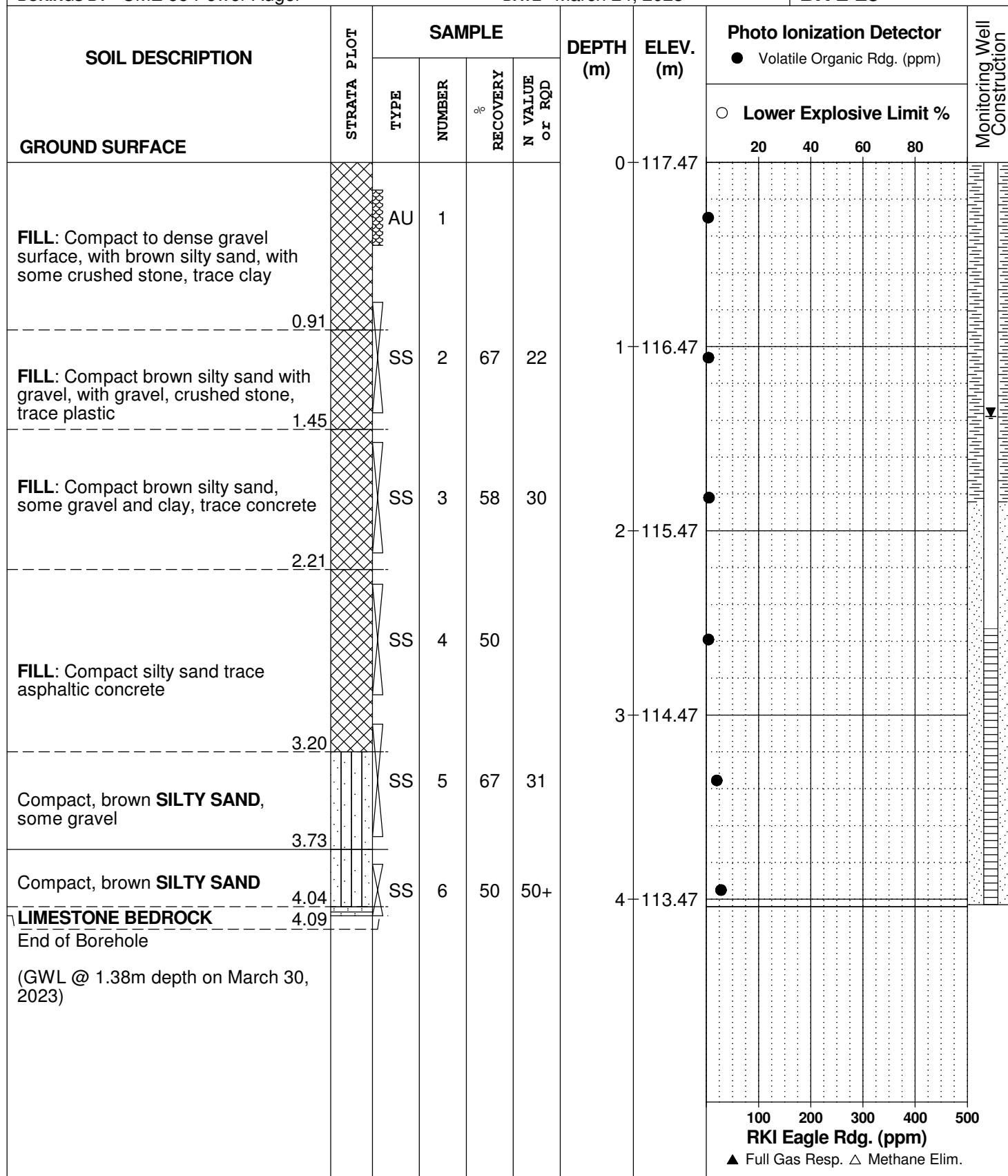
REMARKS

BORINGS BY CME 55 Power Auger

DATE March 24, 2023

FILE NO.
PG5996

HOLE NO.
BH 2-23



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
158 Cardevco Road
Ottawa, Ontario

DATUM Elevations are referenced to a geodetic datum

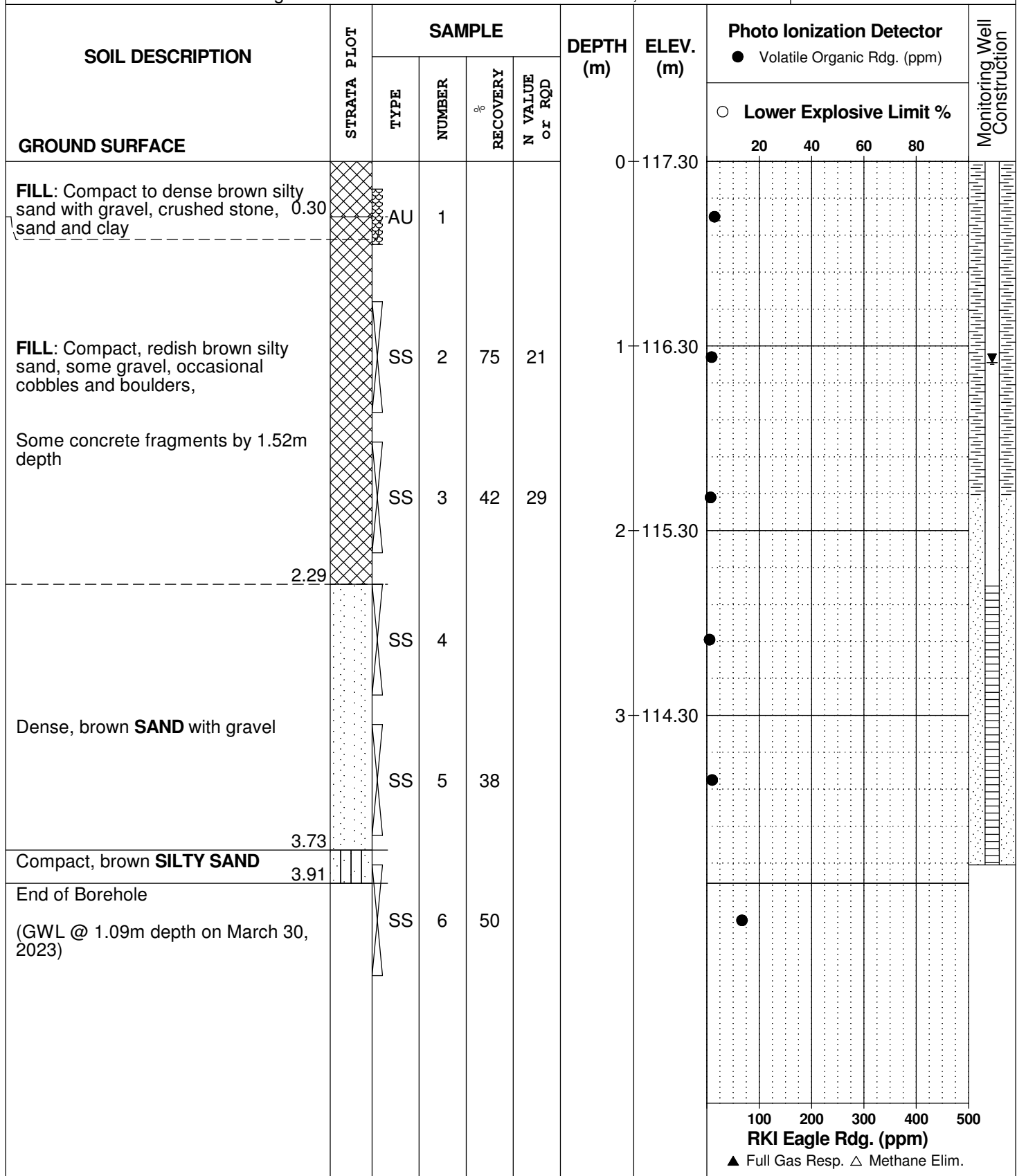
REMARKS

BORINGS BY CME 55 Power Auger

DATE March 24, 2023

FILE NO.
PG5996

HOLE NO.
BH 3-23



DATUM Elevations are referenced to a geodetic datum

FILE NO.
PG5996

REMARKS

HOLE NO.
BH 4-23

BORINGS BY CME 55 Power Auger

DATE March 24, 2023

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Photo Ionization Detector | | | | Monitoring Well Construction | | |
|--|-------------|--------|--------|---------------|-------------------|--------------|--------------|---|---------------------------|----|----|---------------------------------|----|----|
| | | TYPE | NUMBER | % RECOVERY | N VALUE or RQD | | | ● Volatile Organic Rdg. (ppm) | ○ Lower Explosive Limit % | 20 | 40 | | 60 | 80 |
| GROUND SURFACE | | | | | | | | | | | | | | |
| FILL: Compact, brown silty sand with gravel, crushed stone, trace clay | 0.30 | AU | 1 | | | 0 | 117.76 | ● | | | | | | |
| FILL: Compact, brown silty sand with gravel, trace clay | | SS | 2 | 42 | 29 | 1 | 116.76 | ● | | | | | | |
| | | SS | 3 | 42 | 24 | 2 | 115.76 | ● | | | | | | |
| | | SS | 4 | 46 | 22 | | | ● | | | | | | |
| | | SS | 5 | 63 | 40 | 3 | 114.76 | ● | | | | | | |
| Dense to very dense, brown SILTY SAND , some gravel, occasional cobbles | 3.20 | | | | | | | | | | | | | |
| End of borehole | 3.66 | | | | | | | | | | | | | |
| | | | | | | | | 100 200 300 400 500 RKI Eagle Rdg. (ppm) ▲ Full Gas Resp. △ Methane Elim. | | | | | | |

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Photo Ionization Detector | | | | | Monitoring Well Construction |
|--|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|--|------------------------------|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | ● Volatile Organic Rdg. (ppm) ○ Lower Explosive Limit % | | | | | |
| GROUND SURFACE | | | | | | | | 20 | 40 | 60 | 80 | | |
| FILL: Compact to dense brown silty sand with gravel, crushed stone, some clay, occasional brick fragments | | AU | 1 | | | 0 | 117.62 | | | | | | |
| | | SS | 2 | 42 | 7 | 1 | 116.62 | | | | | | |
| FILL: Compact to dense, brown silty sand some gravel and clay | | SS | 3 | 4 | 50+ | | | | | | | | |
| End of borehole | 2.03 | | | | | 2 | 115.62 | | | | | | |
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SOIL PROFILE AND TEST DATA

FILE NO.
PG6233

HOLE NO.
TP 1-22

REMARKS

DATE May 20, 2022

[illegible]

SOIL PROFILE AND TEST DATA

FILE NO.
PG6233

HOLE NO.
TP 1A-22

REMARKS

BORINGS BY Excavator

DATE 2022 May 20

[illegible]

SOIL PROFILE AND TEST DATA

FILE NO.
PG6233

HOLE NO.
TP 2-22

REMARKS

BORINGS BY Excavator

DATE 2022 May 20

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | | | |
|---|-------------|--------|--------|---------------|-------------------|--------------|--------------|--|----|----|----|----------------------------|--|--|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | ○ Water Content % | | | | | | | |
| | | | | | | | | 20 | 40 | 60 | 80 | | | | |
| GROUND SURFACE | | | | | | | | | | | | | | | |
| FILL: Dense brown silty sand with gravel and crushed stone | | G | 1 | | | 0 | 117.58 | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| FILL: Compact brown silty sand with gravel, crushed stone and brick fragments | | G | 2 | | | 1 | 116.58 | | | | | | | | |
| | | | | | | | | | | | | | | | |
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| | | G | 3 | | | 2 | 115.58 | | | | | | | | |
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| | | | | | | | | | | | | | | | |
| Compact brown SILTY SAND with gravel, trace cobbles | | | | | | 3 | 114.58 | | | | | | | | |
| | | | | | | | | | | | | | | | |
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| End of Test Pit | | | | | | | | | | | | | | | |
| Refusal to excavation on bedrock surface at 3.12 m depth | | | | | | | | | | | | | | | |
| (Open hole GWL at 1.8 m depth) | | | | | | | | | | | | | | | |

20406080100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

| | |
|-------|----------|
| DATUM | Geodetic |
|-------|----------|

REMARKS

BORINGS BY Excavator

DATE 2022 May 20

FILE NO.
PG6233

HOLE NO.
TP 3-22

[illegible]

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

| | | |
|------------------|---|--|
| Desiccated | - | having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc. |
| Fissured | - | having cracks, and hence a blocky structure. |
| Varved | - | composed of regular alternating layers of silt and clay. |
| Stratified | - | composed of alternating layers of different soil types, e.g. silt and sand or silt and clay. |
| Well-Graded | - | Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution). |
| Uniformly-Graded | - | Predominantly of one grain size (see Grain Size Distribution). |

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

| Compactness Condition | 'N' Value | Relative Density % |
|-----------------------|-----------|--------------------|
| Very Loose | <4 | <15 |
| Loose | 4-10 | 15-35 |
| Compact | 10-30 | 35-65 |
| Dense | 30-50 | 65-85 |
| Very Dense | >50 | >85 |

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

| Consistency | Undrained Shear Strength (kPa) | 'N' Value |
|-------------|--------------------------------|-----------|
| Very Soft | <12 | <2 |
| Soft | 12-25 | 2-4 |
| Firm | 25-50 | 4-8 |
| Stiff | 50-100 | 8-15 |
| Very Stiff | 100-200 | 15-30 |
| Hard | >200 | >30 |

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, S_t , is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

| | |
|---------------------|----------------|
| Low Sensitivity: | $S_t < 2$ |
| Medium Sensitivity: | $2 < S_t < 4$ |
| Sensitive: | $4 < S_t < 8$ |
| Extra Sensitive: | $8 < S_t < 16$ |
| Quick Clay: | $S_t > 16$ |

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

| RQD % | ROCK QUALITY |
|--------|--|
| 90-100 | Excellent, intact, very sound |
| 75-90 | Good, massive, moderately jointed or sound |
| 50-75 | Fair, blocky and seamy, fractured |
| 25-50 | Poor, shattered and very seamy or blocky, severely fractured |
| 0-25 | Very poor, crushed, very severely fractured |

SAMPLE TYPES

| | | |
|----|---|---|
| SS | - | Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT)) |
| TW | - | Thin wall tube or Shelby tube, generally recovered using a piston sampler |
| G | - | "Grab" sample from test pit or surface materials |
| AU | - | Auger sample or bulk sample |
| WS | - | Wash sample |
| RC | - | Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits. |

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

| | | |
|-----|---|---|
| WC% | - | Natural water content or water content of sample, % |
| LL | - | Liquid Limit, % (water content above which soil behaves as a liquid) |
| PL | - | Plastic Limit, % (water content above which soil behaves plastically) |
| PI | - | Plasticity Index, % (difference between LL and PL) |
| Dxx | - | Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size |
| D10 | - | Grain size at which 10% of the soil is finer (effective grain size) |
| D60 | - | Grain size at which 60% of the soil is finer |
| Cc | - | Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$ |
| Cu | - | Uniformity coefficient = D_{60} / D_{10} |

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$

Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

| | | |
|------------|---|--|
| p'_o | - | Present effective overburden pressure at sample depth |
| p'_c | - | Preconsolidation pressure of (maximum past pressure on) sample |
| Ccr | - | Recompression index (in effect at pressures below p'_c) |
| Cc | - | Compression index (in effect at pressures above p'_c) |
| OC Ratio | | Overconsolidation ratio = p'_c / p'_o |
| Void Ratio | | Initial sample void ratio = volume of voids / volume of solids |
| Wo | - | Initial water content (at start of consolidation test) |

PERMEABILITY TEST

| | | |
|---|---|--|
| k | - | Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test. |
|---|---|--|

SYMBOLS AND TERMS (continued)

STRATA PLOT



Topsoil



Asphalt



Fill



Peat



Sand



Silty Sand



Silt



Sandy Silt



Clay



Silty Clay



Clayey Silty Sand



Glacial Till



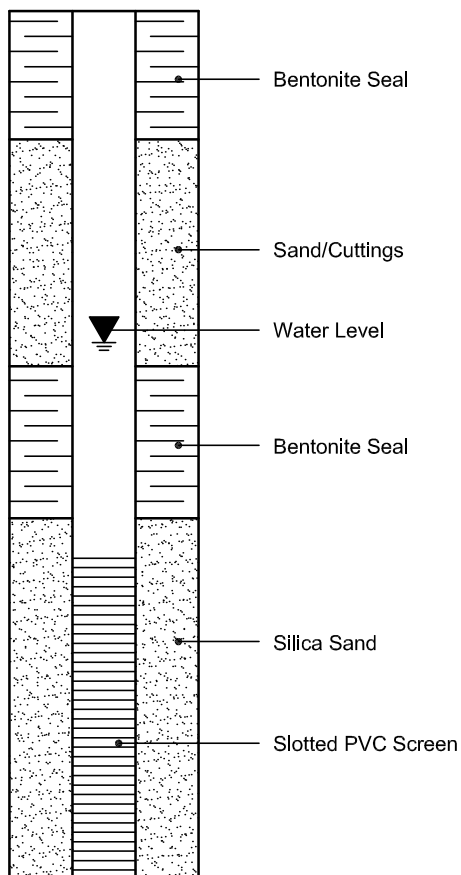
Shale



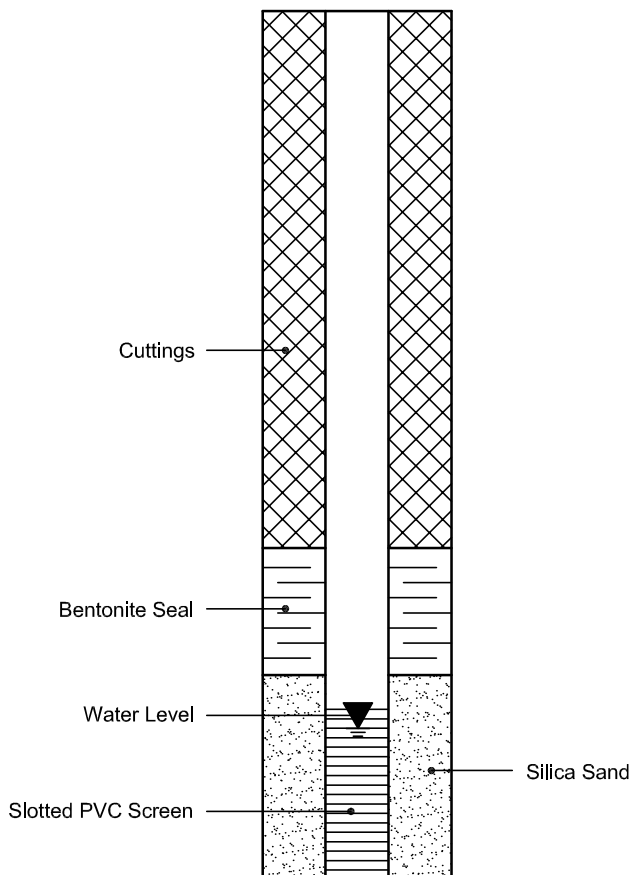
Bedrock

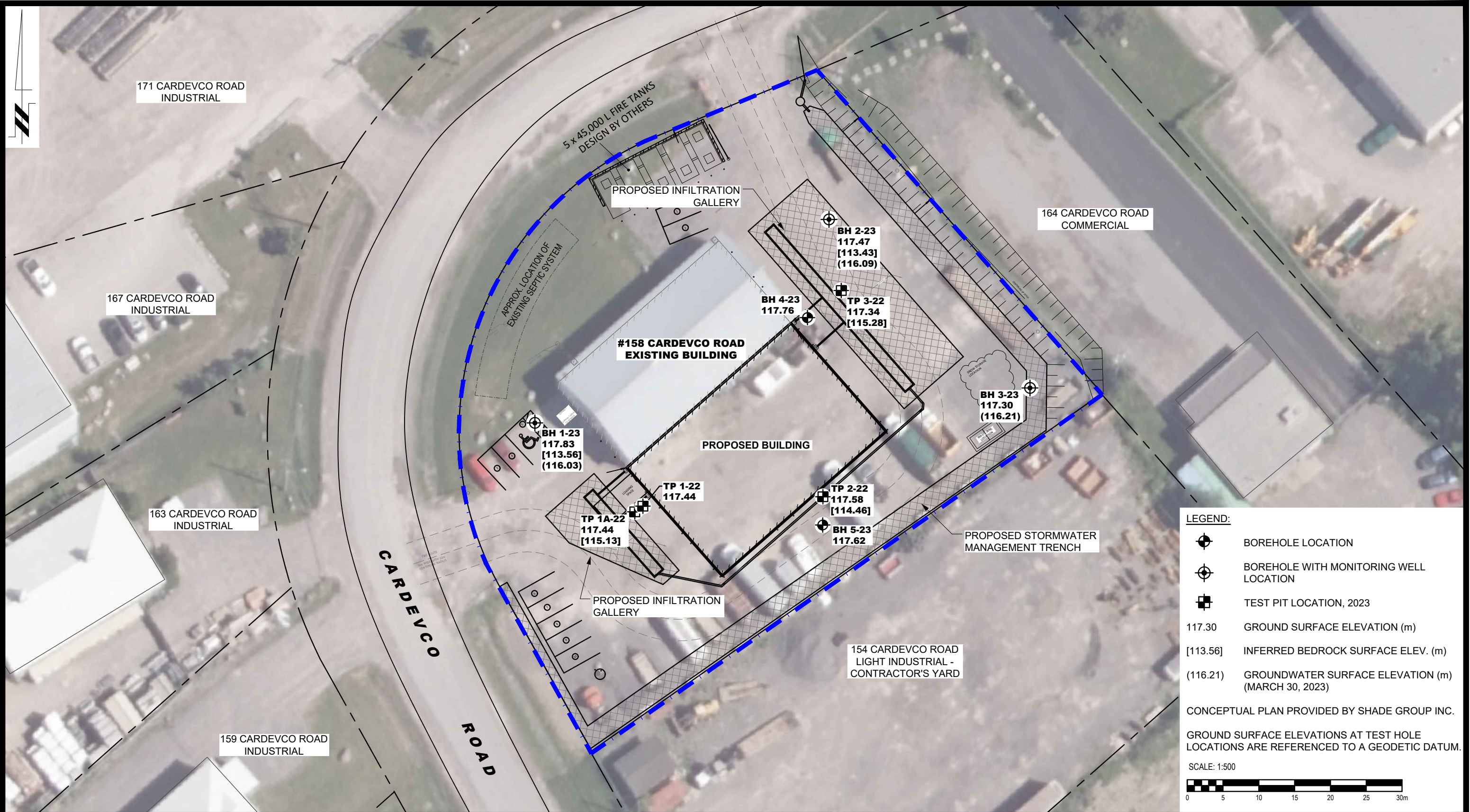
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION, 2023

117.30 GROUND SURFACE ELEVATION (m)
[113.56] INFERRED BEDROCK SURFACE ELEV. (m)
(116.21) GROUNDWATER SURFACE ELEVATION (m) (MARCH 30, 2023)

CONCEPTUAL PLAN PROVIDED BY SHADE GROUP INC.

GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:500

| | | | | | | | | | |
|--|----------------------------|------------|---------|--|--|--|--|-----------------|---------------------------|
| <div>9 AURIGA DRIVE OTTAWA, ON K2E 7T9 TEL: (613) 226-7381</div> | | | | <div>WHELAN TRUCK REPAIR GEOTECHNICAL INVESTIGATION PROPOSED BUILDING ADDITION 158 CARDEVCO ROAD</div> <div>OTTAWA, ONTARIO</div> <div>Title: TEST HOLE LOCATION PLAN</div> | | | | Scale: 1:500 | Date: 12/2023 |
| | | | | | | | | Drawn by: NFRV | Report No.: PG6233-1 |
| | | | | | | | | Checked by: BN | Dwg. No.: PG6233-1 |
| | | | | | | | | Approved by: SD | Revision No.: 1 |
| NO. | REVISIONS | DATE | INITIAL | | | | | | |
| 1 | REVISE TO UPDATE SITE PLAN | 11/11/2024 | NZ | | | | | | |