TERRAPEX

SUNCOR ENERGY PRODUCTS PARTNERSHIP

PROPOSED RETAIL FUEL OUTLET

Southeast Corner of Palladium Drive and Campeau Drive

Ottawa, Ontario

GEOTECHNICAL REPORT

January 24, 2020

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DISTRIBUTION: **Suncor Energy Products Partnership** **PROJECT # CO750.00**

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1.0 INTRODUCTION

Terrapex Environmental Ltd. (Terrapex) has been retained by Suncor Energy Products Partnership (Suncor) to carry out a geotechnical investigation for the proposed retail fuel outlet located at the southeast corner of the intersection of Palladium Drive and Campeau Drive in Ottawa, Ontario (the Site).

Authorization to proceed with this study was given by Mr. Rick Lemoine of Suncor.

We understand that it is proposed to develop the site with a fuel retail outlet which will include a retail store (c-store) with drive-thru, a pump island with an overhead canopy, underground storage tanks and an oil change building, the remainder of the site will be covered with asphaltic concrete pavement.

The location of the proposed development is shown on Figure 1: General Site Layout, attached to this report. The base drawing was provided for our use by Suncor Energy Products Partnership.

A grading plan was not available at the time of the investigation, and accordingly the recommendations provided in this report are considered to be preliminary in nature, subject for review and revision upon completion of final design drawings.

The purpose of this investigation was to characterize the subsurface soil and groundwater conditions, to determine the engineering properties of the various soil deposits underlying the site, and to provide geotechnical engineering recommendations pertaining to the proposed development.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the client and the design architects or engineers only. It is assumed that the design will be in accordance with the applicable building codes and standards.

2.0 FIELDWORK

The fieldwork for this investigation was carried out on January 6, 7 and 8, 2020. It consisted of ten (10) boreholes, advanced by a drilling contractor commissioned by **Terrapex**. The locations of the boreholes were chosen by **Terrapex** to provide general coverage of the Site; shown on Figure1: General Site Layout, attached to this report.

The boreholes designated BH104, BH107, BH108, BH109 and BH110, were advanced to depths ranging from 5.2 to 8.7 m below ground surface (mbgs). Five (5) boreholes designated MW101, MW102, MW103, MW105, and MW106, were instrumented with monitoring wells to determine the long term groundwater table at the site; advanced to depths ranging from 6.7 to 8.6 mbgs. Boreholes MW103, BH104 and BH107, were extended to the top of inferred bedrock encountered

at an approximate depth of 8.6 mbgs.

Groundwater level observations were made in the boreholes during and on completion of each of their advancement. The results of the groundwater measurements are discussed in Section 4.7 of this report.

The ground surface elevations at the locations of the boreholes were established by **Terrapex** using a Topcon RL-H5A Horizontal Self-Leveling Rotary Laser. A storm sewer manhole cover located in the westbound lane of the Tanger Outlet mall entrance off of Palladium Drive was used as a benchmark and assigned an arbitrary elevation of 100 m. The approximate location of this benchmark is shown on Figure 1.

Standard penetration tests (SPT) were carried out within the overburden soils in the course of advancing the boreholes to take representative soil samples and to measure penetration index values (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler to 300 mm depth was recorded and these are presented on the logs as penetration index values.

Dynamic Cone Penetration Test (DCPT) was carried out in Boreholes BH104 and BH107 below their sampled depths of 6.7 m. The DCPT was advanced to inferred bedrock situated at an approximate depth of 8.6 mbgs. The DCPT is carried out by advancing a cone with an outside diameter of 50 mm into the ground using standard penetration test (DPSH) energy. The number of blows of the striking hammer required to drive the cone through successive 300 mm depth increments was recorded and these are presented on the logs as penetration index values.

The undrained shear strength of the clay soil was measured by performing in-situ field vane tests and relatively undisturbed thin walled tube samples (Shelby Tube) of the clay soil were collected at depths of 3.0 and 2.3 mbgs in Boreholes MW103 and BH104 respectively.

The results of SPT, DCPT and vane tests are shown on the borehole log sheets provided in Appendix I.

The fieldwork for this project was carried out under the supervision of an experienced technician from this office who laid out the positions of the boreholes in the field; arranged locates of buried services; effected the drilling, sampling and in situ testing; observed groundwater conditions; and prepared field borehole log sheets.

3.0 LABORATORY TESTS

The soil samples retained from the split spoon sampler were properly sealed, labelled and brought to our laboratory. They were visually classified and water content tests were conducted on soil samples retained from Boreholes MW101, MW103, BH104 and BH107. The results of the classification, water contents, SPT, DCPT and vane tests are presented on the borehole log sheets attached in Appendix I of this report.

Grain-size analyses were carried out on four (4) soil samples; Atterberg Limit tests on two (2) soil samples. A One-dimensional Consolidation test was carried on one (1) soil sample. The results of these tests are presented in Appendix II.

In addition, two (2) soil samples were submitted to an analytical laboratory for chemical analyses for pH and soluble sulphate test. The results of this test is enclosed in Appendix III; discussed in Section 5.8 of this report.

4.0 SITE AND SUBSURFACE CONDITIONS

Full details of the subsurface soil and groundwater conditions at the site are given on the borehole Log sheets provided in Appendix I of this report.

The following paragraphs present a description of the site and a commentary on the engineering properties of the various soil materials contacted in the boreholes.

It should be noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design, and therefore, should not be construed as exact planes of geological change.

4.1 SITE DESCRIPTION

The Site is located on the southeast corner of the intersection of Palladium Drive and Campeau Drive, in Ottawa, Ontario, and is currently vacant and undeveloped. It is surfaced with grass and is generally flat, with the ground surface elevations at the locations of the boreholes ranging from 99.2 m at Borehole MW101 to 100.5m at Borehole MW108. The Site is bounded by Campeau Drive to the North, Palladium Drive to the West, and Tanger Outlet Mall to the East and South.

4.2 TOPSOIL

Approximately 40 to 80 mm thick layer of topsoil is present at all Boreholes with the exception of Boreholes BH109 and BH110. It should be noted that the topsoil thickness will vary across the site, and thicker topsoil than that found in the boreholes may be present in places.

4.3 FILL

Fill material is present below the topsoil layer in Boreholes MW101, MW103, MW105, MW106, BH107 and BH108 and at ground surface at Boreholes BH109 and BH110. The fill material consists of silt and clay with some sand and gravel, and trace to some organics, to silty sandy gravel, trace organics. It extends to approximate depths ranging from 0.6 to 1.3 mbgs.

The water content of the tested fill materials from Boreholes MW101, MW103, BH104, BH107 ranges from approximately 15 to 23% by weight; generally being moist to wet in appearance.

Standard penetration resistance in the fill material provided N-values ranging from 3 to 50 for 125

mm of penetration, indicating very dense to loose compactness condition. It should be noted that the higher N-values at surface are a result of frozen ground and large gravel found in the tip of the split spoons (recovered within the fill material at Boreholes MW103 and MW106).

4.4 SILTY CLAY

A deposit of silty clay with a trace sand is present in all boreholes below the fill material and at ground surface in Boreholes BH109 and BH110. The silty clay deposit extends to depths ranging from 3.8 to 5.8 mbgs.

The silty clay is generally brownish grey in color, with occasional oxidized fissures in the upper horizon, becoming grey below depths of 2.5 to 4 mbgs. The water content of the tested samples of the silty clay from Boreholes MW101, MW103, BH104, BH107 ranges from approximately 22 to 44% by weight; generally being moist to wet in appearance with increasing depth.

SPT carried out in the silty clay provided N-values ranging from 0 to 15. The measured undrained shear strength of the silty clay ranged from a high of 79 kPa at shallow depths to a low of 28 kPa near the bottom of the stratum, indicating a stiff to firm consistency. The remoulded shear strength of the silty clay ranged from 11 to 19 kPa. The sensitivity of the silty clay ranges from 2.5 to 3.5, accordingly it is considered to be of medium sensitivity.

Sieve and hydrometer grain size analyses and Atterberg Limits test were carried out on two (2) samples of the silty clay. The test results are enclosed in Appendix II as Figures 2, 4 and 6 and summarized below.

Borehole Number	Sample Depth and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %	Liquid Limit	Plasticity Index	Soil Classification
BH103	2.2-2.8 m (4)	Clay and Silt, trace sand	0	2	41	57	46	42	Inorganic clays of medium plasticity
BH104	3.0-3.7 m (5)	Clay and silt, trace sand	0	4	44	52	43	38	Inorganic clays of medium plasticity

Based on the results of the grain size analyses, the coefficient of permeability (K value) of the silty clay is estimated to be less than 10^{-8} cm/sec, corresponding to very low permeability.

4.5 SILT

A deposit of silt with trace to some sand, and trace to some clay is present in all boreholes below the silty clay with the exception of Boreholes BH108, BH109 and BH110. It extends to depths of 6.7 to 7.3 mbgs.

The silt is generally grey in color. The water content of the tested samples of the silt from Boreholes MW101, MW103, BH104, BH107 ranges from approximately 19 to 35% by weight; generally being wet in appearance.

SPT carried out in the silt provided N-values ranging from 1 to 15, indicating loose to compact

compactness condition.

Sieve and hydrometer grain size analyses were carried out on two (2) samples of the silt soil; the test results are enclosed in Appendix II as Figures 3 and 5, and summarized below.

Borehole Number	Sample Depth and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %
BH103	4.6-5.2 m (7)	Silt, some sand, trace clay	0	16	77	7
BH104	4.6-5.2 m (7)	Silt, some clay, trace sand, trace gravel	1	2	82	15

Based on the results of the grain size analyses, the coefficient of permeability (K value) of the silt is estimated to be in the range of 10^{-4} cm/sec to 10^{-6} cm/sec, corresponding to low to medium permeability depending on amount of clay.

4.6 SANDY GRAVELLY SILT TILL

At Borehole MW103, the silt is underlain by an approximately 1.2 m thick layer of sandy gravelly silt till. The till extends to a depth of 8.6 mbgs and is underlain by inferred bedrock.

SPT carried out in the till provided an N-value of 39, indicating a dense condition compactness condition.

The water content of the sample of the gravelly sandy silt till was determined to be 9 %. The till is grey and moist.

4.7 BEDROCK

DCPT soundings were advanced to refusal at an approximate depth of 8.6 mbgs at Boreholes BH104, and BH107. Borehole BH103 was sampled to a depth of 8.6 mbgs on inferred bedrock. Based on information available from vicinal boreholes, the bedrock consists of limestone.

4.8 GROUNDWATER

Groundwater levels in the monitoring wells were measured on January 10, 2020. The measured groundwater depths with their respective elevations are shown on the individual borehole logs and presented in the table below:

Borehole No.	Groundwater Depth (m)	Groundwater Elevation (m)
MW101	2.59	96.61
MW102	3.02	96.62
MW103	2.59	96.85
MW105	3.45	96.89

MW106	3.89	95.79

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition will likely develop in the spring and following significant rainfall events.

5.0 DISCUSSION AND RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from the boreholes advanced at the site by **Terrapex** and are intended for use by the client and design engineers only.

Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations.

The investigation has revealed that below the surficial topsoil layer and locally fill materials extending to a maximum depth of 1.3 mbgs, the native soil consists of stiff to firm silty clay, followed by loose to compact sandy silt deposit, underlain by a layer of gravelly sandy silt till followed by bedrock at an approximate depth of 8.5 mbgs. On the basis of our fieldwork, laboratory tests and other pertinent information supplied by the client, the following comments and recommendations are made.

It should be noted that a grading plan was not available at the time of the investigation, and accordingly the recommendations provided in this report are considered to be preliminary in nature, subject for review and revision upon completion of detailed design drawings.

5.1 SETTLEMENT AND SITE GRADING CONSIDERATIONS

Consideration must be given to potential settlement which may occur due to the grade raise (filling) and the combined loads from the foundations of the building and canopy.

The consolidation test performed on a soil sample retained from Borehole BH103 at 3.0 m depth provided a pre-consolidation pressure (Pc') of approximately 75 kPa, which corresponds to the maximum effective stress to which the silty clay soil has been consolidated by previous loading. Using the sub-surface stratigraphy at BH103 and the groundwater level at 2.5 m below grade, the effective overburden pressure (Po') of the tested sample is estimated to be 50 kPa. The difference between Pc' and Po', 25 kPa, is the available pre-consolidation pressure. The increase in stress on the underlying clay soil due to the combined effects of the foundation loads and grade raise should not exceed the available pre-consolidation pressure in order to avoid unacceptable settlement of the underlying firm clay soil.

Based on the estimated pre-consolidation pressure, settlement of the firm silty clay for grade raises of up to 1 m will be insignificant.

5.2 FOUNDATION DESIGN

In order to provide adequate protection to the foundation soil from freezing temperatures, the exterior foundations should be positioned at a minimum depth of 1.8 m below the exterior grade; for the City of Ottawa area. In this regard, foundations for the proposed C-Store and oil change buildings, and the canopy should be installed at/below a depth of 1.8 m below proposed grade.

It will be possible to utilize conventional spread and wall footings to support the new structures, provided that the foundation design is based on a low value of applied soil bearing pressure, and that the footings are founded above elevation 98.0 m. It is recommended that the footing foundations be designed for a maximum bearing resistance at Serviceability Limit States (SLS) of 100 kPa, and a factored geotechnical resistance bearing resistance at Ultimate Limit States (ULS) of 150 kPa, for vertical and centric loads.

The magnitude of settlement resulting from application of a pressure of 100 kPa at SLS on a maximum 3 m wide square pad footing, or a maximum 1 m wide strip footing will be below 15 mm.

In the event the recommended bearing resistance is not sufficient to support the proposed structures, then it will be necessary to utilize deep foundations systems such as helical piles or driven piles. Based on the borehole findings these foundations will have to be advanced to depths ranging from 7.5 to 8.5 mbgs. For preliminary purposes, it may be assumed that factored load capacities of about 250 kN and 1000 kN may be obtained from helical pile and driven pile foundation systems. **Terrapex** will provide further recommendations should a deep foundation system be preferred.

Uplift resistance should be considered for the design of the canopy structure which is subject to wind uplift forces. The uplift resistance should be provided using the dead weight of the foundation as well the soil weight above the footing of the canopy structures. For design purposes, the unit weight of concrete may be taken as 24 kN/m^3 and the backfill placed above the footings is 18 kN/m^3. If increased uplift capacities are required, this may be achieved by increasing the weight (size) of the foundation, or alternatively, with the use of anchors such as helical piles.

Due to variations in the consistency of the founding soils and/or softening caused by excavation disturbance and/or seasonal frost effects, all footing subgrade must be evaluated by the Geotechnical Engineer prior to placing foundation concrete to ensure that the soil exposed at the excavation base is consistent with the design geotechnical bearing resistance.

The fill soils are susceptible to disturbance when wet, so construction scheduling should consider the amount of excavation left to the elements during foundation preparation. Rainwater entering the foundation excavation must be pumped away (not allowed to pond). The foundation subgrade soils should be protected from freezing conditions, inundation and construction traffic at all times.

It is recommended that the footings placed on the exposed subgrade soils should be poured on the same day as they are excavated, after removal of all unsuitable materials and approval of the

bearing surface by the Geotechnical Engineer. If construction proceeds during freezing weather conditions, adequate temporary frost protection shall be provided for the bearing soils and concrete foundations.

5.3 CONCRETE SLAB-ON-GRADE

The subgrade at the floor slab for the proposed C-Store and oil change buildings should consist of compacted fill soil which is adequate to support a slab-on-grade construction. Subgrade preparation should include the removal of any organic, weak, loose or soft soils. After removal of all unsuitable materials, the subgrade should then be proof-rolled with heavy rubber tired equipment. The proof-rolling operation should be witnessed by the Geotechnical Engineer. Any soft or wet subgrade areas which deflect significantly should be sub-excavated and replaced with suitable approved earth fill material compacted to at least 98% of Standard Proctor maximum dry density (SPMDD).

Where new fill is required, excavated fill materials from the site or similar clean imported fill material may be used, free from topsoil, organic or deleterious matter provided the material is placed in large areas where it can be compacted with heavy compactors. Oversize particles (cobbles, boulders) larger than 150 mm should be discarded from the fill material. The fill material should not be frozen and should not be too wet for efficient compaction (water content at optimum or 2 percent greater than optimum). The fill placement should not be performed during winter months when freezing temperatures occur persistently or intermittently. All fill placed below the slab on grade areas of the buildings must be placed in lifts of 200 mm thickness or less.

It is recommended that a combined moisture barrier and a levelling course, having a minimum thickness of 200 mm and comprised of free draining material such as Granular “A” be provided as a base for the slab-on-grade. The base material should be compacted to 98% of its SPMMD. Alternatively, 19 mm clear stone (OPSS 1004) may be used and compacted by vibration to a dense state, with filter fabric separating the clear stone and the subgrade soils.

Provided the subgrade, under-floor fill and granular base are prepared in accordance with the above recommendations, the Modulus of Subgrade Reaction (Ks) for floor slab design will be 25,000 kPa/m.

The soils at the site are susceptible to frost effects which would have the potential to deform hard landscaping adjacent to the building. At locations where the new structures are expected to have flush entrances, care must be taken in detailing the exterior slabs / sidewalks, providing insulation / drainage / non-frost susceptible backfill to maintain the flush threshold during freezing weather conditions.

5.4 EXCAVATIONS AND GROUNDWATER CONTROL

Based on the field results, temporary excavations for the new structures are not expected to pose any unusual difficulty. Excavation of the soils at this site can be carried out with heavy hydraulic excavators.

All excavations must be carried out in accordance with Occupational Health and Safety Act (OHSA). With respect to OHSA, the fill materials and the stiff to firm silty clay soil are expected to conform to Type 3 soil classification. The wet sandy silt deposit is classified as Type 4 soil.

Temporary excavations for slopes in Type 3 soil should not exceed 1.0 horizontal to 1.0 vertical or flatter. Locally, where very loose and/or soft soils are encountered at shallow depths or within zones of persistent seepage, it may be necessary to flatten the side slopes as necessary to achieve stable conditions. Side slopes of excavations in Type 4 soil should not be any steeper than 1 vertical to 3 horizontal.

For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number designation. Excavation side-slopes should not be unduly left exposed to inclement weather.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation side-walls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects.

Based on the presumed excavation depths for the foundations, and assuming that the excavations will not extend into the wet silt stratum, groundwater problems are not anticipated at the site. Any groundwater that may seep into the excavations is expected to be very minimal and it will be possible to maintain the excavations functionally free of water by means of light duty submersible pumps.

5.5 PAVEMENT DESIGN

It is anticipated that the pavement will support cars and light trucks with occasional heavy tractor trailer truck (fuel delivery vehicle) traffic and the pavement thickness designs provided consider this loading condition.

Preparation of the subgrade for construction of the new pavement should be as described above for the slab-on-glade.

The following pavement thickness designs are provided.

Pavement Component	Component Thickness (mm)	
	Light Duty Pavement	Heavy Duty Pavement
Asphaltic Concrete Surface Course Superpave 12.5, Level B Asphalt (PG58-34)	40	50
Asphaltic Concrete Base Course Superpave 19 mm, Level B Asphalt (PG58-34)	40	60
Granular Base Course (OPSS Granular A)	150	150
Granular Sub-Base Course (OPSS Granular B - Type II)	250	350

The subgrade must be compacted to at least 98% of SPMDD. The granular materials should be placed in lifts not exceeding 200 mm thick and be compacted to a minimum of 100% SPMDD.

Asphaltic concrete materials should be rolled and compacted as per OPSS 310. The granular and asphaltic concrete pavement materials and their placement should conform to OPSS 310, 501, 1010 and 150, and the pertinent Municipality specifications.

Concrete (rigid) pavement is proposed in the area of the pump islands. It is recommended that the granular components placed at the underside of the concrete pavement are laid and compacted in accordance with the granular component layers recommended for the asphaltic concrete (flexible) pavement such that the subgrade profile is maintained at the interface between rigid and flexible pavement structures.

Provided the subgrade, granular sub-base and granular base layers are prepared in accordance with the above recommendations, the concrete slab may be designed with a Modulus of subgrade Reaction (Ks) 25 MPa/m from the surface of the granular material.

The pavement thickness designs provided above presume that construction will take place under favourable conditions. In the event that construction takes place during the spring thaw, the late fall, or following heavy rainfall events, a thicker granular sub-base layer may be required to compensate for reduced subgrade strength, particularly in areas of shallow clayey soils.

The long-term performance of the proposed pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible when fill is placed and that the subgrade is not disturbed and weakened after it is exposed. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be crowned and sloped to provide effective drainage. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Sub-drains may be provided to facilitate effective and assured drainage of the pavement structures as required to intercept excess subsurface moisture and minimize subgrade softening. The invert of sub-drains should be maintained at least 0.3 m below subgrade level.

5.6 LATERAL EARTH PRESSURES

Parameters used in the determination of earth pressure acting on temporary shoring walls are defined below.

Soil Parameters

Parameter	Definition	Units
Φ'	angle of internal friction	degrees
γ	bulk unit weight of soil	kN/m^3
K_a	active earth pressure coefficient (Rankine)	dimensionless
K_o	at-rest earth pressure coefficient (Rankine)	dimensionless
K_p	passive earth pressure coefficient (Rankine)	dimensionless

The appropriate un-factored values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

Soil Parameter Values

Soil	Parameter				
	Φ'	γ	K_a	K_p	K_o
Compact Granular Fill [(1)] - Granular 'B'	32°	22	0.31	3.23	0.47
Fill Materials	28°	18	0.36	2.78	0.53
Silty Clay	27°	17	0.37	2.63	0.55

Notes:

1. Compacted to a minimum of 95% Standard Proctor Maximum Dry Density.
2. Passive and sliding resistance within the zone subject to frost action (i.e. within 1.2 m below finished grade) should be disregarded in the lateral resistance computations.
3. In the case of a structure below the groundwater table, the use of submerged soil weight should be considered along with the appropriate hydrostatic pressures.
4. Temporary and/or permanent surcharges at the ground surface should be considered in accordance with the applicable soil mechanics methods.

The design earth pressures in compacted backfill should be augmented with the dynamic effects of the compaction efforts, which typically are taken as a uniform 12 kPa pressure over the entire depth below grade where the calculated earth pressure based on the above earth pressure factors is less than 12 kPa. However, this dynamic effect should be ignored when calculating the passive resistance for thrust blocks, or other instances where the general stability of the structure relies on the passive resistance.

Walls or bracings subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following formula:

$$P = K(\gamma h + q)$$

where **P** = lateral pressure in kPa acting at a depth h (m) below ground surface

K = applicable lateral earth pressure coefficient

γ = bulk unit weight of backfill (kN/m^3)

q = the complete surcharge loading (kPa)

This equation assumes that positive drainage is provided to ensure that there is no hydrostatic pressure acting in conjunction with the earth pressure.

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction (R) depends on the normal load on the soil contact (N) and the frictional resistance of the soil (tan Φ') expressed as: $R = N \tan \Phi'$. This is an ultimate resistance value and does not contain a factor of safety.

5.7 EARTHQUAKE DESIGN PARAMETERS

Ontario The Ontario Building Code (2012) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.18.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

The parameters for determination of the Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the Ontario Building Code (2012). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (Vs) measurements have been taken. In the absence of such measurements, the classification is estimated on the basis of empirical analysis of undrained shear strength or penetration resistance. The applicable penetration resistance is that which has been corrected to a rod energy efficiency of 60% of the theoretical maximum or the (N60) value.

Based on the borehole information and soundings from DCPT, the subsurface stratigraphy as revealed in the boreholes generally stiff to firm silty clay, followed by loose becoming compact sandy silt, underlain by bedrock at an approximate depth of 8.5 mbgs. Accordingly, the site designation for seismic analysis is Class D according to Table 4.1.8.4.A from the quoted code.

The site specific 5% damped spectral acceleration coefficients, and the peak ground acceleration factors are provided in the 2012 Ontario Building Code - Supplementary Standard SB-1 (September 14, 2012), Table 1.2, location Ottawa, Ontario.

5.8 CHEMICAL CHARACTERIZATION OF SUBSURFACE SOIL

Two (2) soil samples, obtained from Borehole MW103 at 2.3 m depth (Sample 4) and Borehole BH104 at 1.5 m depth (Sample 3), were submitted to AGAT Laboratories for pH index test, and determination of water-soluble sulphate content and its potential of attacking the subsurface concrete.

The test results revealed that the pH index of the soil samples are 7.72 and 7.69. The pH of the two tested samples reveals a slight alkalinity.

The water-soluble sulphate content of the samples are 0.0267% and 0.0013%. The concentration of water-soluble sulphate content of the tested samples is below the CSA Standard of 0.1% water-soluble sulphate (Table 12 of CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack is therefore not required for the sub-surface concrete of the proposed addition.

The Certificate of Chemical Analysis provided by the analytical chemical testing laboratory is contained in Appendix IIV of this report.

6.0 CLOSURE

The conclusion and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

This report was prepared for Suncor Energy Products Partnership by **Terrapex Environmental Ltd**. The material in it reflects **Terrapex Environmental Ltd.** judgement in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions which the Third Party may make based on it, are the sole responsibility of such Third Parties.

We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations or the assumptions made in our analysis. We recommend also that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases when these recommendations are not followed, the company's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs.

The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

Respectfully submitted,

TERRAPEX ENVIRONMENTAL LTD.

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FIGURE 1

GENERAL SITE LAYOUT

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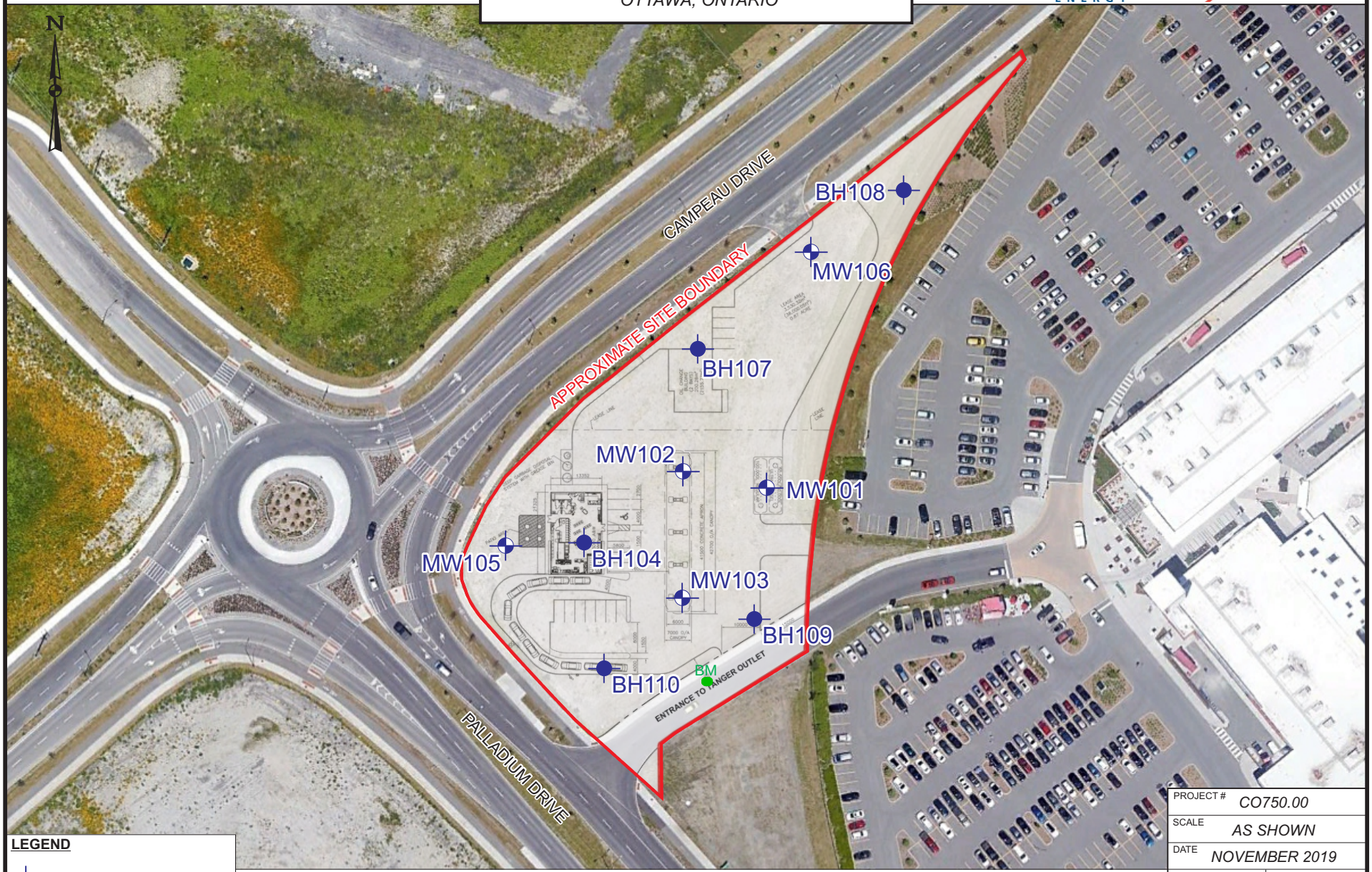
GENERAL SITE LAYOUT

PALLADIUM DRIVE AND CAMPEAU DRIVE
OTTAWA, ONTARIO

CLIENT

SUNCOR ENERGY



LEGEND

- MONITORING WELL
- BOREHOLE

0 25m 50m

SOURCE: GOOGLE EARTH, 2018 IMAGERY.

PROJECT #	CO750.00
SCALE	AS SHOWN
DATE	NOVEMBER 2019
DRAWN	SW
CHECKED	CB
DRAWING #	FIGURE 1

APPENDIX I

BOREHOLE LOG SHEETS

CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon		**BH No.: MW101**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 99.202	
LOCATION: Ottawa, ON	NORTHING: 5016408	EASTING: 426241	PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	CSV (ppm)	Well Construction	REMARKS
	Ground surface elevation = 99.202										Top of Pipe (T.O.P) elevation = 100.145
	60 mm TOPSOIL	0	99.2			1A			< 10		
	stiff, moist, dark brownish grey silty clay, trace organics (FILL)	0.5	98.7	28	23	1B		28	< 10		
	stiff damp	1	98.2	8	32	2		8	< 10		MW101-2 submitted for lab analysis for metals and PAH's
		1.5	97.7	4		3		4	< 10		
	brownish grey SILTY CLAY trace sand	2	97.2	79 (kPa)							Field vane taken at 2.26 m.
		2.5	96.7	4	34	4		4	< 10		MW101-4 submitted for lab analysis for VOC's F1-F4.
	firm moist	3	96.2	1	38	5		1	< 10		
		3.5	95.7	51 (kPa)							Field vane taken at 3.8 m. Remould = 19kPa
		4	95.2								
		4.5	94.7	7	21	6		7	< 10		
	loose wet grey SILT some sand trace clay trace gravel	5	94.2								
		5.5	93.7	8	22	7		8	< 10		
		6	93.2								
		6.5	92.7	7	25	8		7	< 10		
	END OF BOREHOLE										

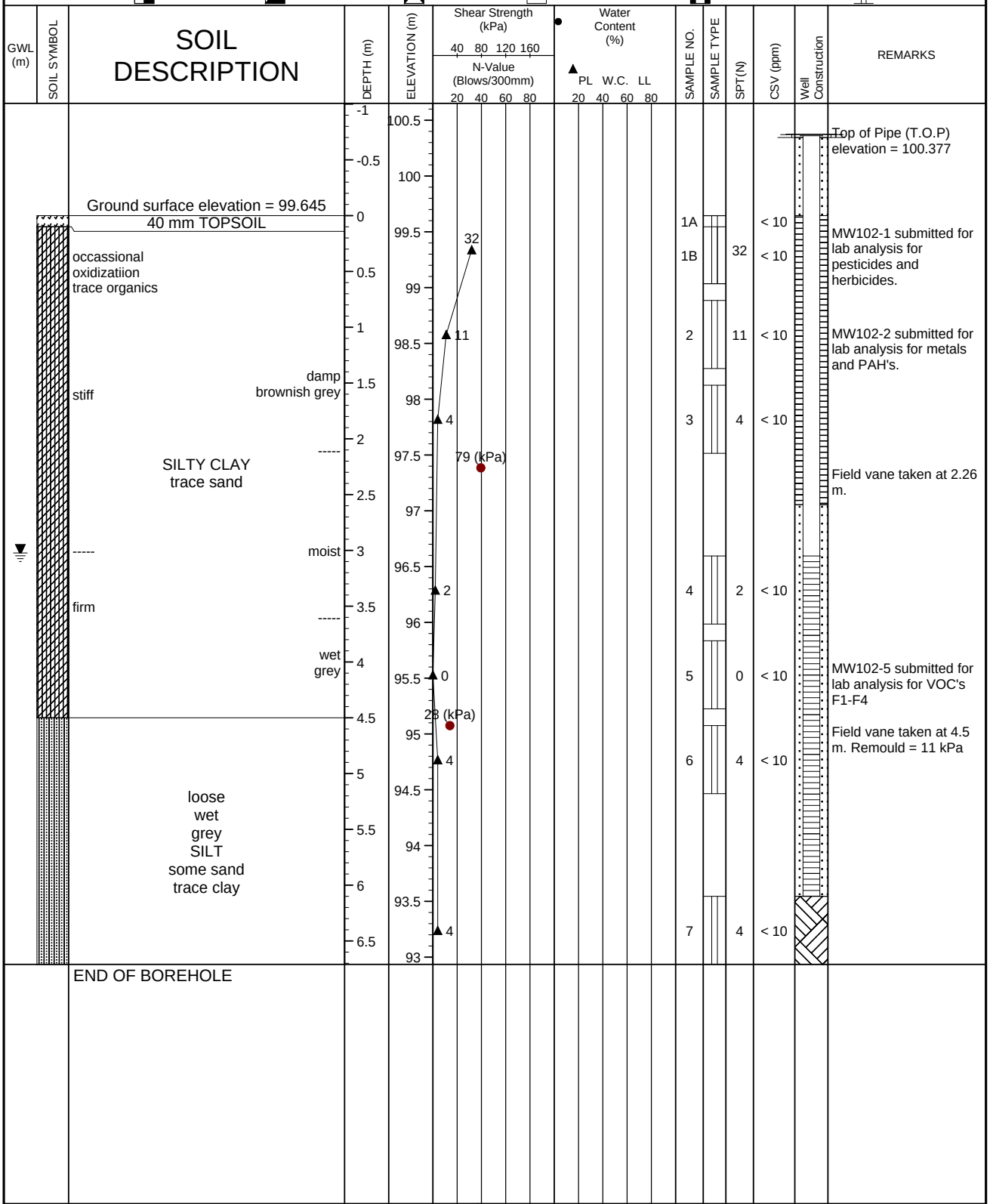
TERRAPEX

LOGGED BY: RH | DRILLING DATE: Jan 6, 2020

REVIEWED BY: VN | Page 1 of 1

CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon		**BH No.: MW102**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 99.645	
LOCATION: Ottawa, ON	NORTHING: 5016413	EASTING: 426219	PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



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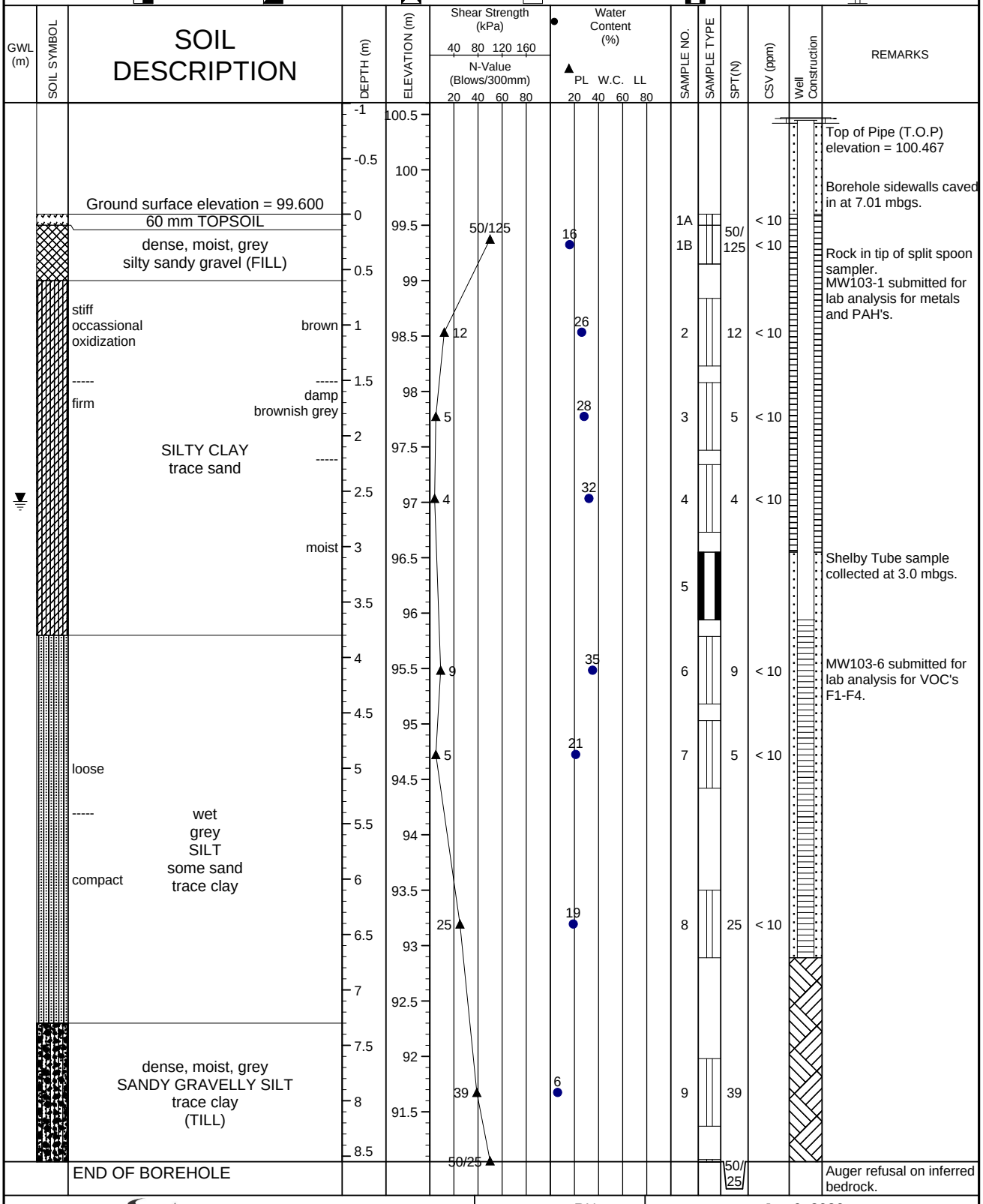
CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon	**BH No.: MW103**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 99.600
LOCATION: Ottawa, ON	NORTHING: 5016379	EASTING: 426219
		PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



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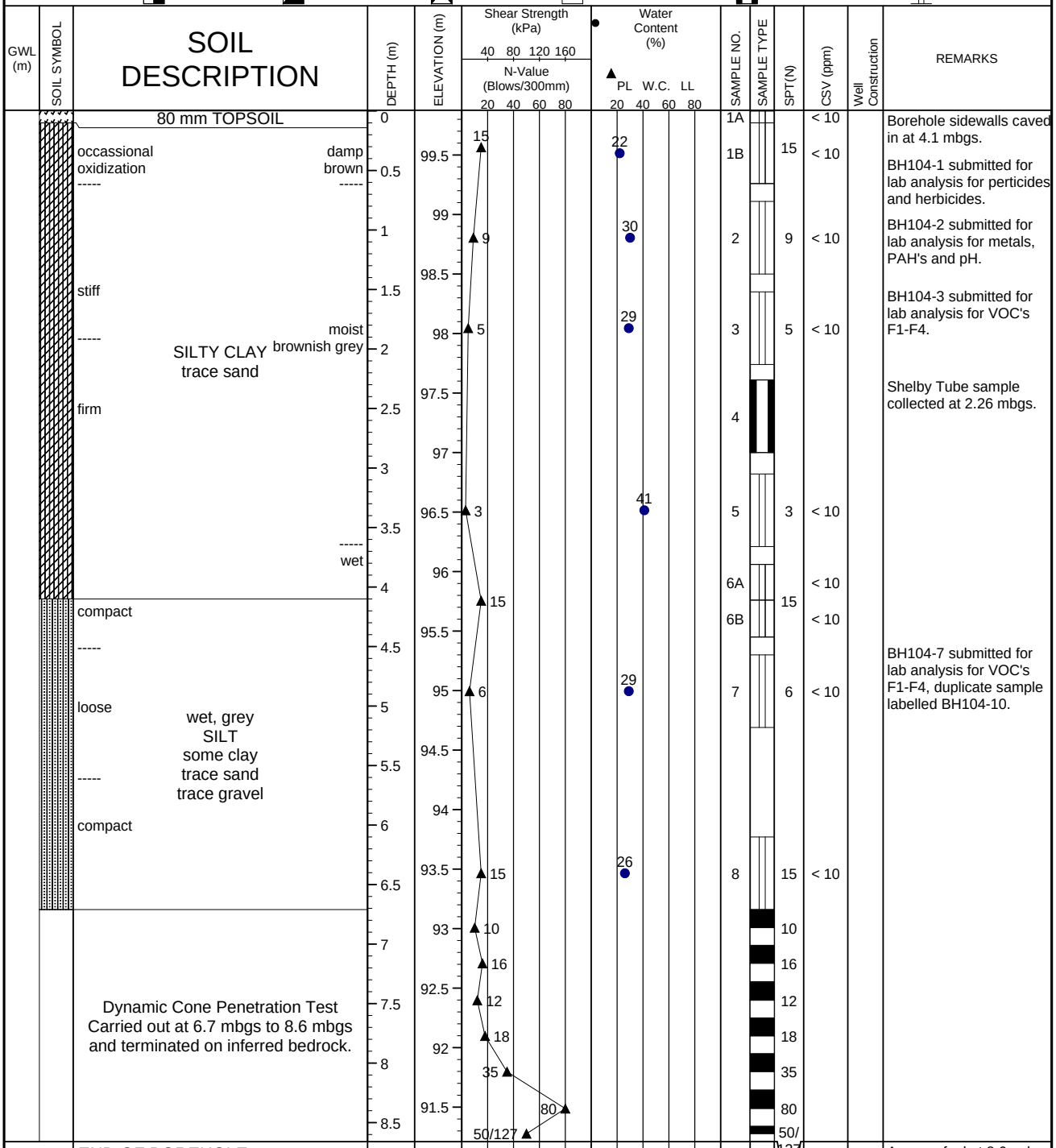
REVIEWED BY: VN	Page 1 of 1

CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/ Split Spoon	**BH No.: BH104**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 99.87
LOCATION: Ottawa, ON	NORTHING: 5016394	EASTING: 426193
		PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



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	REVIEWED BY: VN	Page 1 of 1

CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon		**BH No.: MW105**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 100.276	
LOCATION: Ottawa, ON	NORTHING: 5016394	EASTING: 426173	PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	CSV (ppm)	Well Construction	REMARKS
	Ground surface elevation = 100.276										Top of Pipe (T.O.P) elevation = 101.078
	40 mm TOPSOIL	0	100.276			1A			< 10		
	stiff damp, dark greyish brown ----silty clay, some sand, some gravel (FILL) soft	0.5	100	22		1B		22	< 10		Augers slow to advance from surface to 0.76 m.
		1	99.5	3		2		3	< 10		MW105-2 submitted for lab analysis for metals and PAH's.
		1.5	99								
	stiff moist brownish grey SILTY CLAY trace sand	2	98.5	9		3		9	< 10		
		2.5	98	4		4		4	< 10		MW105-4 submitted for lab analysis for pH.
		3	97.5	79 (kPa)							Field vane taken at 3.0 m.
		3.5	97	4		5		4	< 10		MW105-5 submitted for lab analysis for VOC's F1-F4.
		4	96.5	60 (kPa)							Field vane taken at 3.8m. Remould=20 kPa
		4.5	96								
	loose ----- wet, grey SILT some sand trace clay	5	95.5	8		6		8	< 10		MW105-6 submitted for lab analysis for VOC's F1-F4.
		5.5	95								
	very loose	6	94.5								
		6.5	94	1		7		1	< 10		
	END OF BOREHOLE										

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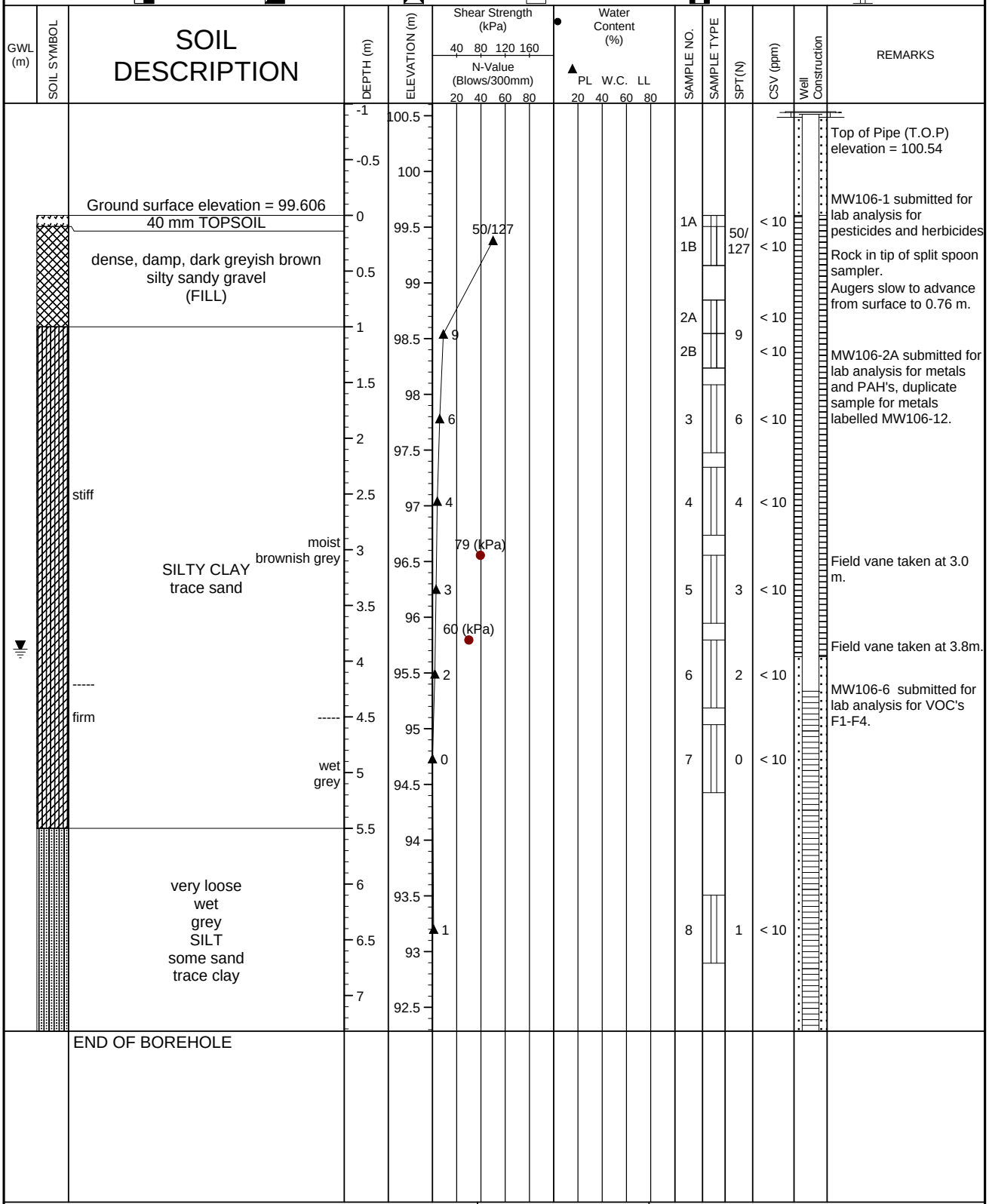
CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon	**BH No.: MW106**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 99.606
LOCATION: Ottawa, ON	NORTHING: 5016471	EASTING: 426253 PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



END OF BOREHOLE

TERRAPEX

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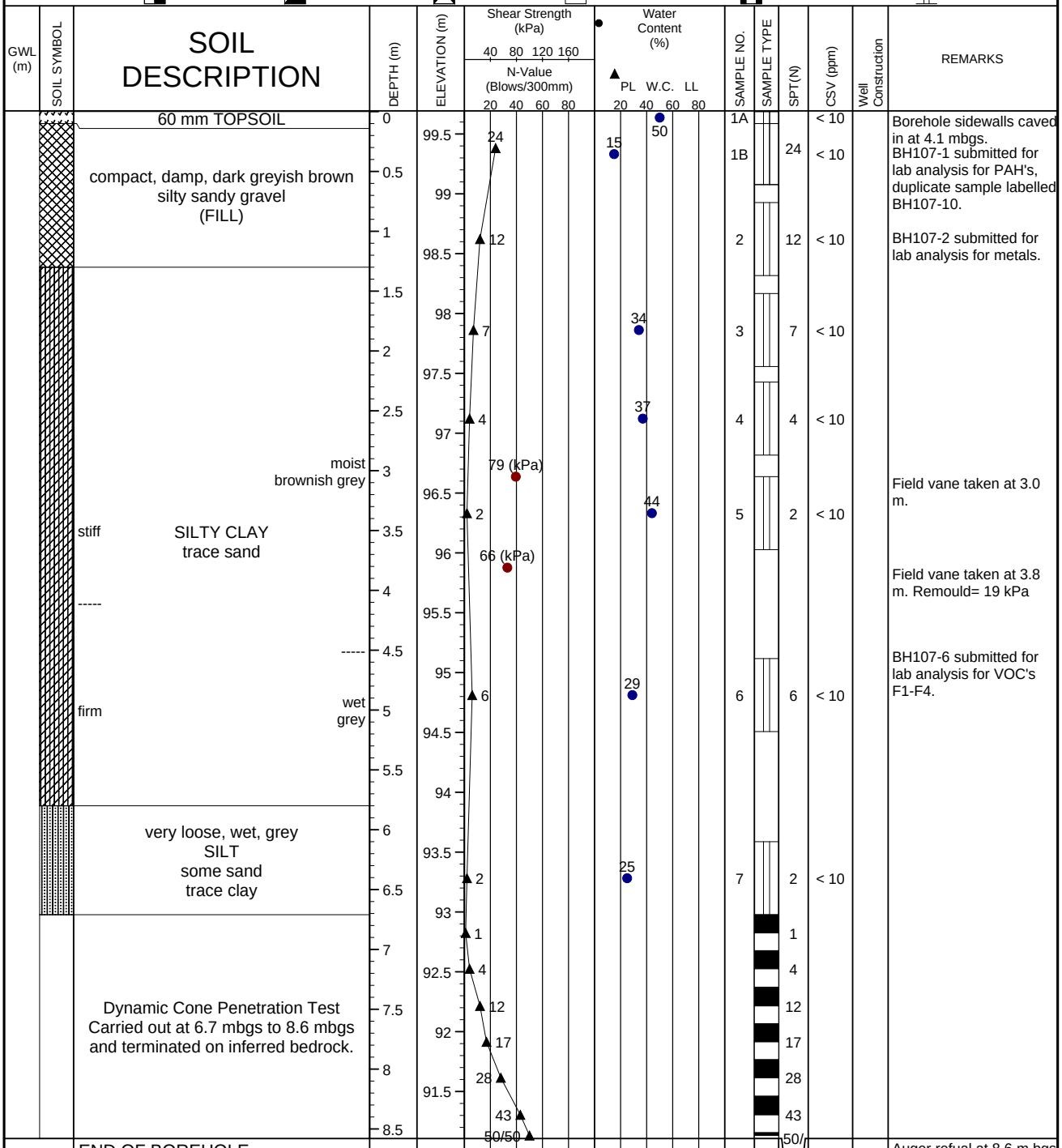
CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/ Split Spoon	**BH No.: BH107**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 99.687
LOCATION: Ottawa, ON	NORTHING: 5016445	EASTING: 426223
		PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



TERRAPEX	LOGGED BY: RH	DRILLING DATE: Jan 7, 2020
	REVIEWED BY: VN	Page 1 of 1

CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon	**BH No.: BH108**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN	ELEV. (m) 100.48
LOCATION: Ottawa, ON	NORTHING: 5016487	EASTING: 426277
		PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	CSV (ppm)	Well Construction	REMARKS
	40 mm TOPSOIL	0				1A			< 10		Borehole remained open and dry on completion.
	dense, moist, dark greyish brown silty sandy gravel, trace organics (FILL)	0.5	100			1B		80	< 10		BH108-1 submitted for lab analysis for metals and PAH's.
		1	99.5	44		2A		44	< 10		BH108-2 submitted for lab analysis for metals and PAH's
		1.5	99			2B			< 10		
		2	98.5	5		3		5	< 10		
	stiff moist brownish grey	2.5	98	4		4		4	< 10		
	SILTY CLAY trace sand	3	97.5								
		3.5	97	4		5		4	< 10		
	-----	4	96.5	2		6		2	< 10		BH108-6 submitted for lab analysis for VOC's F1-F4.
	firm -----	4.5	96								
	wet grey	5	95.5	2		7		2	< 10		
	END OF BOREHOLE										

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CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon	**BH No.: BH109**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN / ELEV. (m) 100.338	
LOCATION: Ottawa, ON	NORTHING: 5016361 / EASTING: 426197	PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	CSV (ppm)	Well Construction	REMARKS
	dense, moist, dark greyish brown silty sandy gravel, trace clay, trace organics (FILL)	0	100	39		1		39	< 10		Borehole remained open and dry on completion. BH109-1 submitted for lab analysis for metals.
		0.5									
		1	99.5	33		2		33	< 10		
		1.5	99								BH109-3 submitted for lab analysis for PAH's, duplicate sample labelled BH109-10.
	moist brownish grey	2	98.5	4		3		4	< 10		
	firm SILTY CLAY trace sand	2.5	98	4		4		4	< 10		BH109-4 submitted for lab analysis for VOC's F1-F4.
		3	97.5								
		3.5	97	2		5		2	< 10		
		4	96.5	2		6		2	< 10		
	----- wet grey	4.5	96								
		5	95.5	1		7		1	< 10		
	END OF BOREHOLE										

TERRAPEX

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REVIEWED BY: VN	Page 1 of 1

CLIENT: Suncor Energy Products Partnership	METHOD: Hollow Stem Augers/Split Spoon	**BH No.: BH110**
PROJECT: SE corner of Palladium Drive and	PROJECT ENGINEER: VN / ELEV. (m) 99.445	
LOCATION: Ottawa, ON	NORTHING: 5016373 / EASTING: 426237	PROJECT NO.: CO750.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	CSV (ppm)	Well Construction	REMARKS
		dense, damp, brown silty sandy gravel, trace clay (FILL)	0	99	70		1		70	< 10		Borehole sidewalls caved in at 4.57 mbgs.
			0.5									
			1	98.5	6		2		6	< 10		BH110-2 submitted for lab analysis for metals and PAH's.
			1.5	98								
		firm moist brownish grey SILTY CLAY trace sand	2	97.5	4		3		4	< 10		
			2.5	97	4		4		4	< 10		BH110-4 submitted for lab analysis for VOC's F1-F4.
			3	96.5								
			3.5	96	7		5		7	< 10		
			4	95.5								
		loose, wet, grey SILT some sand trace gravel	4.5	95								
			5	94.5	7		6		7	< 10		
		END OF BOREHOLE										

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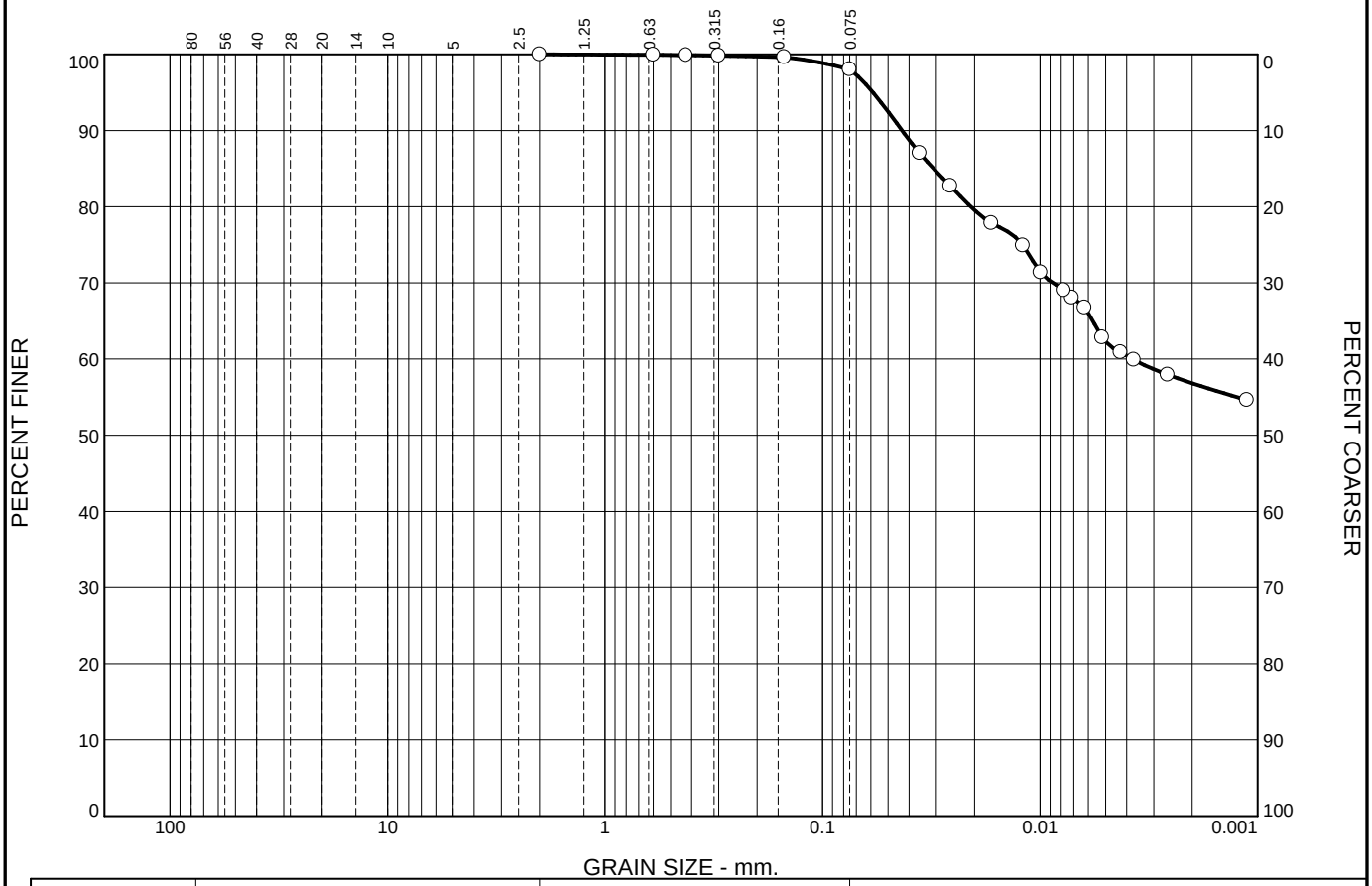
APPENDIX II

LABORATORY TEST RESULTS

Grain Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	0	0	2	41	57

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0309	0.0038						

Material Description	USCS	AASHTO
○ SILT and CLAY, trace sand		

Project No. CO750.00 **Client:** Suncor Energy Products Partnership

Project: SE corner of Palladium Drive and Campeau Drive

○ **Sample Number:** MW103-4

Remarks:

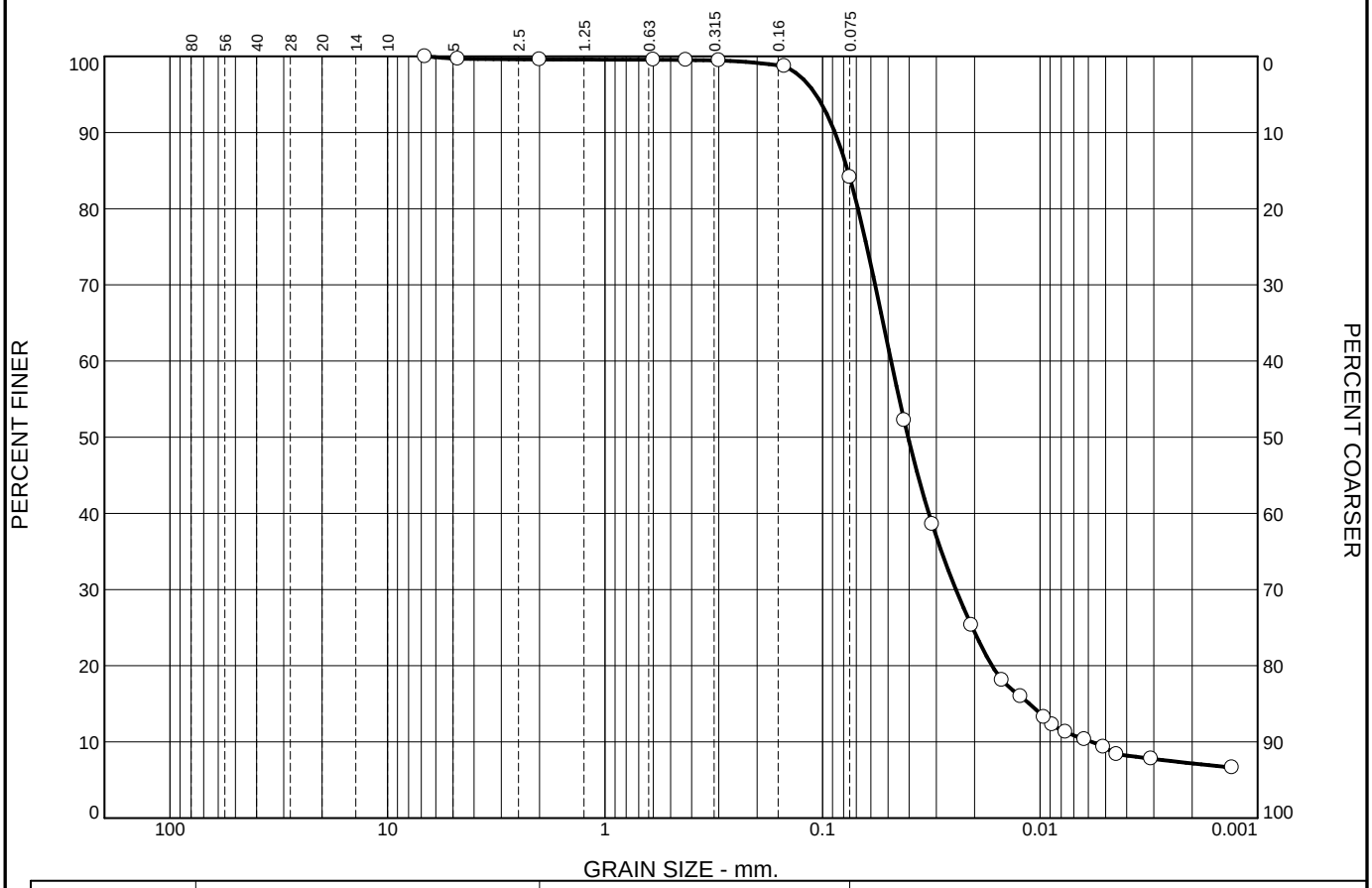
○*Tested on Jan 15, 2020

Terrapex

Figure 2

Tested By: RH **Checked By:** VN

Grain Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	0	0	16	77	7

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0765	0.0484	0.0404	0.0244	0.0112	0.0058	2.12	8.37

Material Description	USCS	AASHTO
○ SILT, some sand, trace clay		

Project No. CO750.00 **Client:** Suncor Energy Products Partnership

Project: SE corner of Palladium Drive and Campeau Drive

○ **Sample Number:** MW103-7

Remarks:

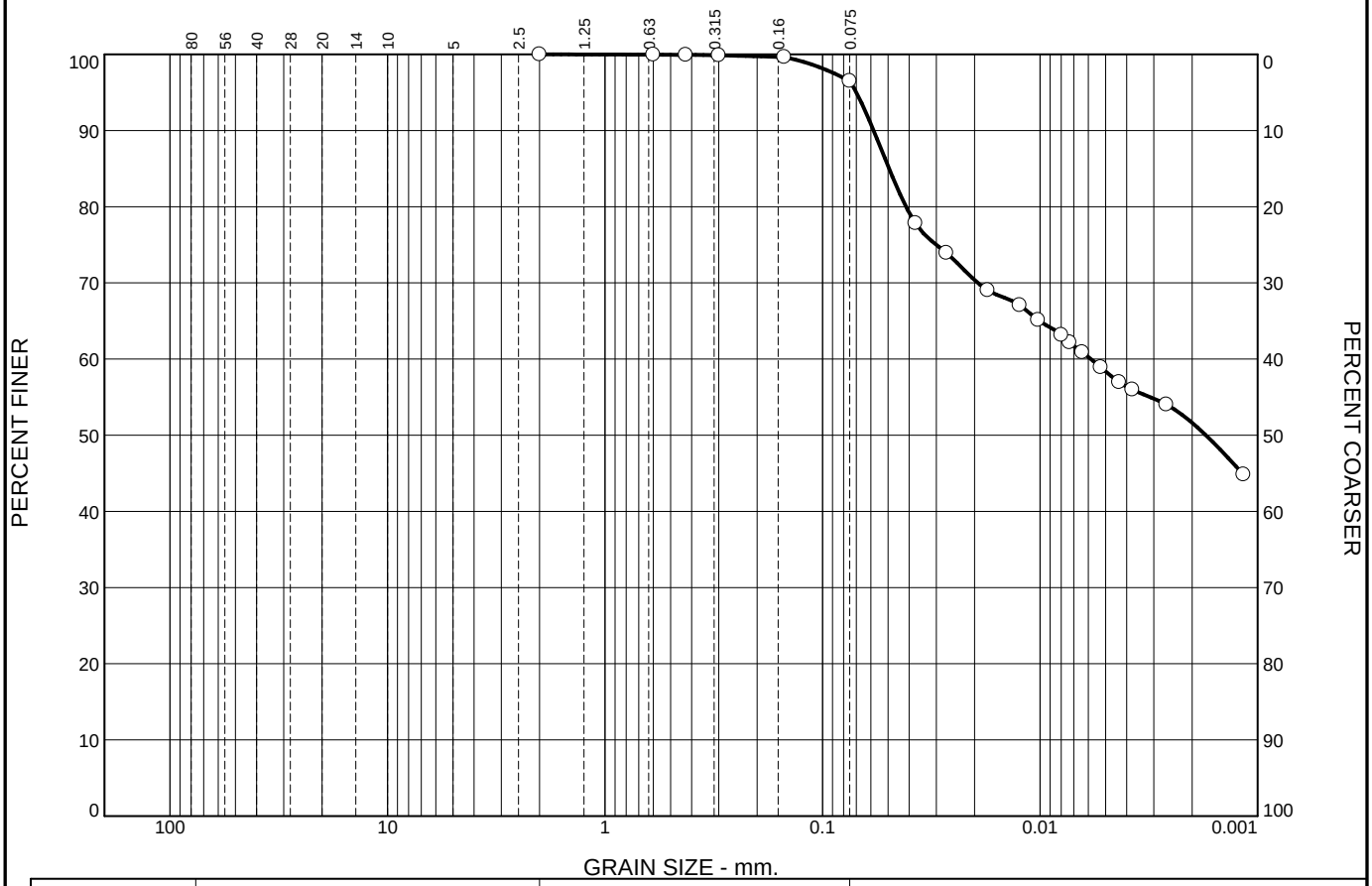
○* Tested on Jan 15, 2020

Terrapex

Figure 3

Tested By: RH **Checked By:** VN

Grain Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	0	0	4	44	52

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0495	0.0058	0.0017					

Material Description	USCS	AASHTO
○ CLAY and SILT, trace sand		

Project No. CO750.00 **Client:** Suncor Energy Products Partnership

Project: SE corner of Palladium Drive and Campeau Drive

○ **Sample Number:** BH104-5

Remarks:

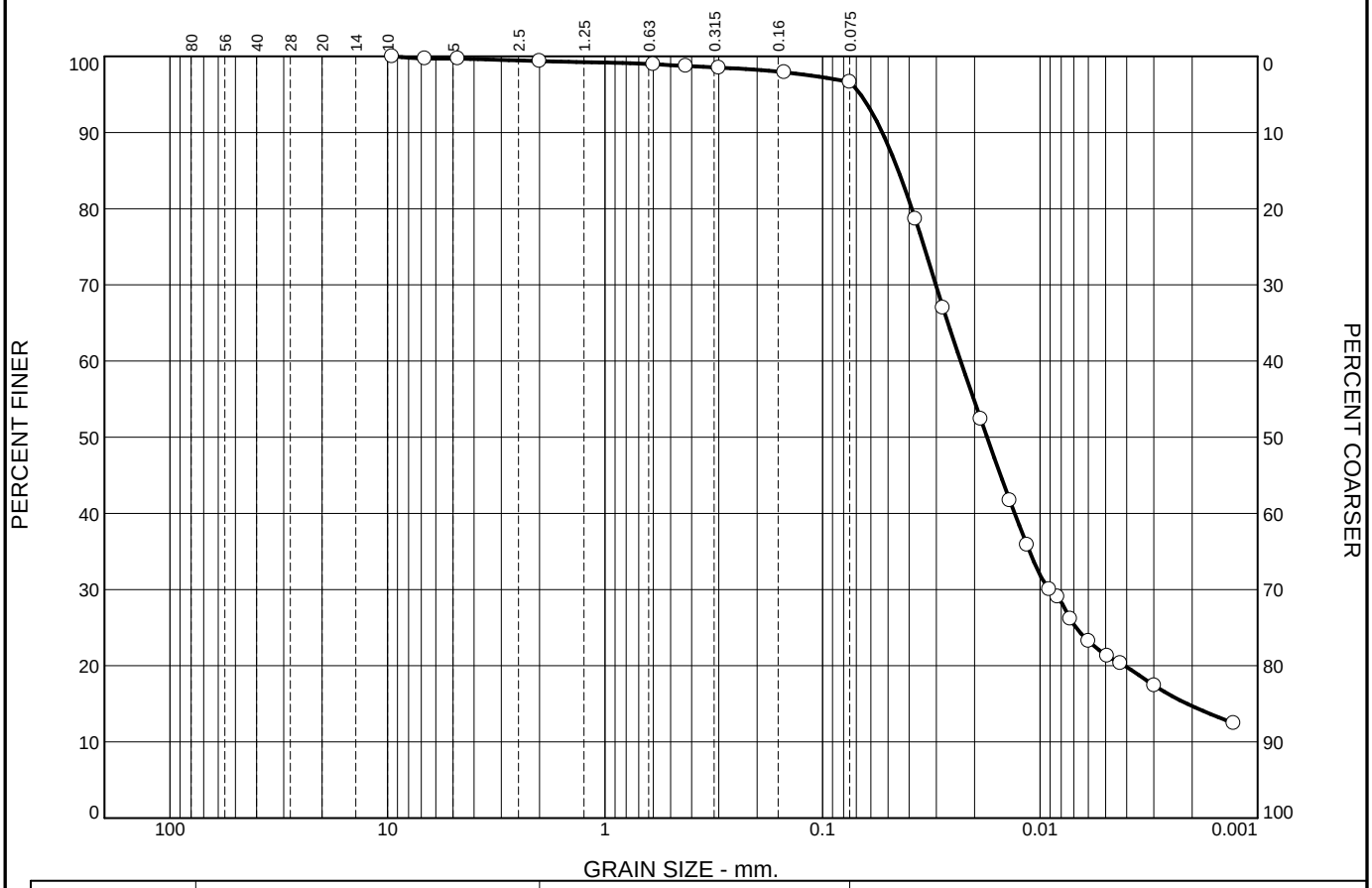
○* Tested on Jan 15, 2020

Terrapex

Figure 4

Tested By: RH **Checked By:** VN

Grain Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	1	0	2	82	15

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0449	0.0232	0.0175	0.0090	0.0021			

Material Description	USCS	AASHTO
○ SILT, some clay, trace sand, trace gravel		

Project No. CO750.00 **Client:** Suncor Energy Products Partnership

Project: SE corner of Palladium Drive and Campeau Drive

○ **Sample Number:** BH104-7

Remarks:

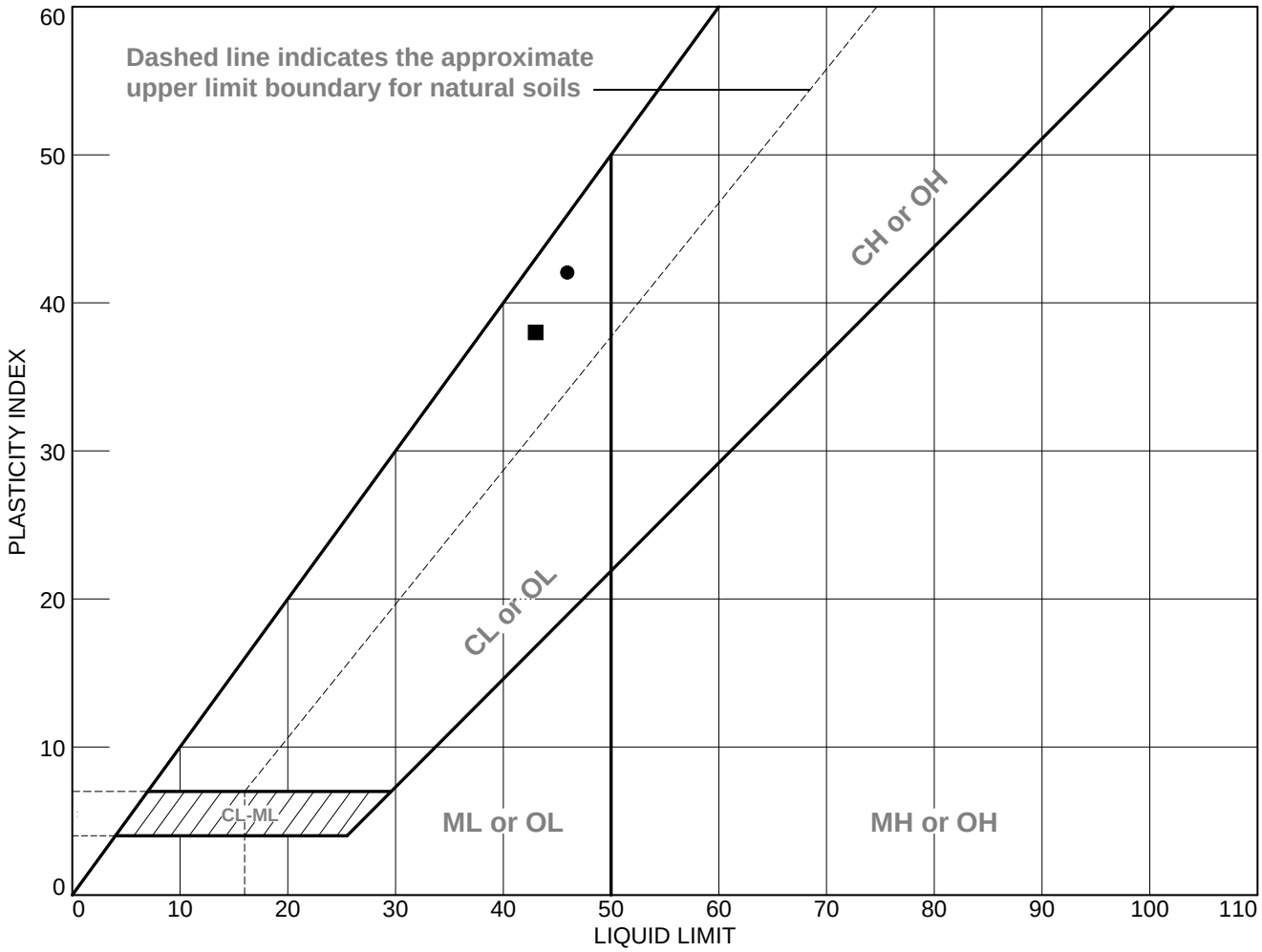
○* Tested on Jan 15, 2020

Terrapex

Figure 5

Tested By: RH **Checked By:** VN

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

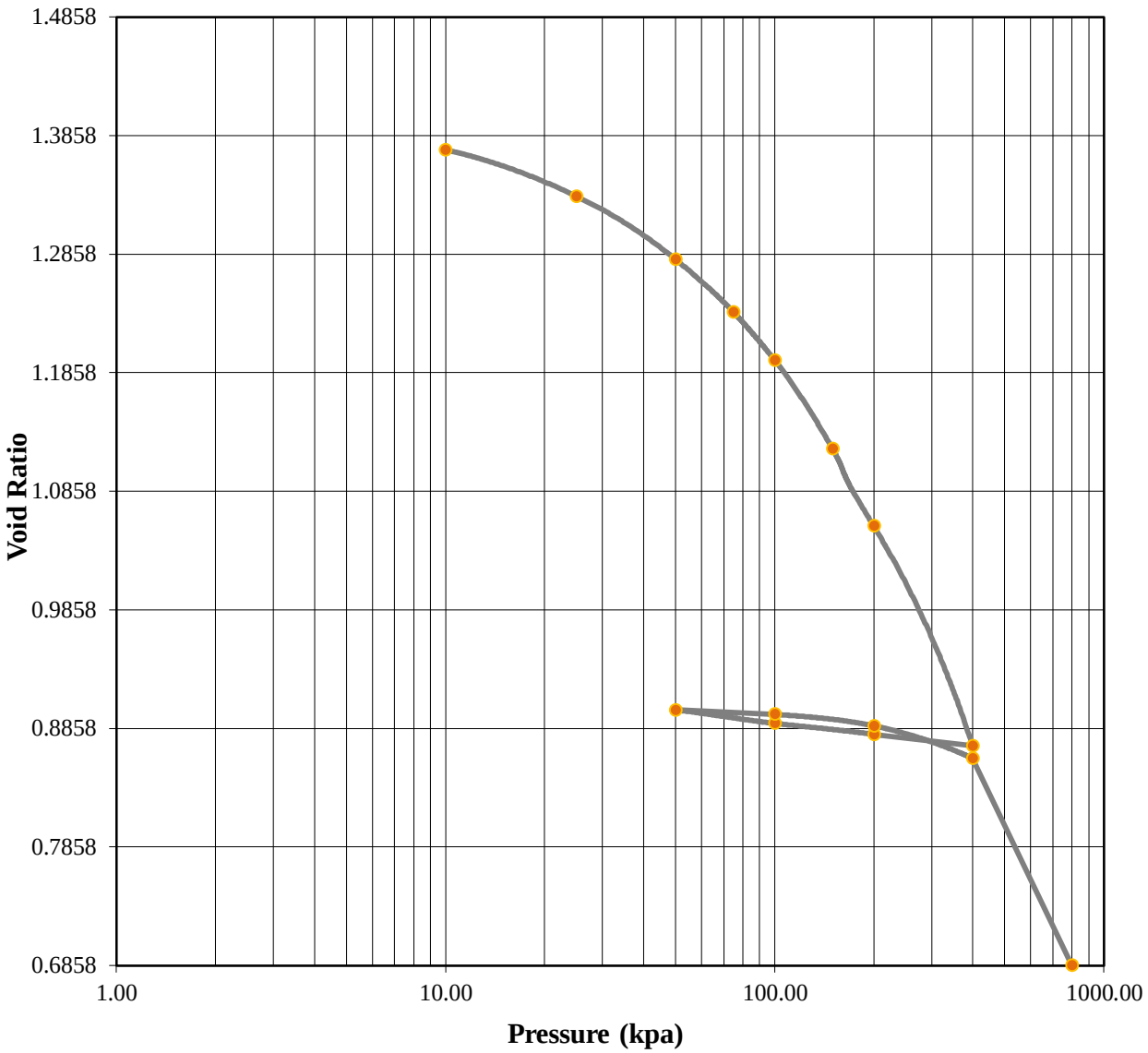
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		MW103-4			4	46	42	CL
■		BH104-5			5	43	38	CL

Terrapex

Client: Suncor Energy Products Partnership
Project: SE corner of Palladium Drive and Campeau Drive

Project No.: CO750.00 **Figure** 6

Consolidation Test
Test Results



	Before	After			
Moisture (%):	53.82	31.74	**Liquid Limits:**	0	**Test Date:**
Dry Density (g/cm3):	1.10	1.55	**Plastic Limits:**	0	
Saturation (%):	101.95	119.18	**Plasticity Index (%):**	0	
Void Ratio:	1.3929	0.6845	**Specific Gravity:**	2.650	Assumed

Soil Description:

Project Number:	CO750.00	**Depth:**		**Remarks:**
Sample Number:	5	**Boring Number:**	103	
Project:				
Client:				
Location:				

APPENDIX III

CERTIFICATE OF CHEMICAL ANALYSIS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: SUNCOR ENERGY PRODUCTS PARTNERSHIP, ON

ATTENTION TO: Rick Lemoine

PROJECT: CO750.00; Outlet #: 10565; Activity Code: A2

AGAT WORK ORDER: 20Z563414

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Supervisor

DATE REPORTED: Jan 21, 2020

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 20Z563414

PROJECT: CO750.00; Outlet #: 10565; Activity Code: A2

CLIENT NAME: SUNCOR ENERGY PRODUCTS PARTNERSHIP

ATTENTION TO: Rick Lemoine

SAMPLING SITE:Palladium Drive, Ottawa

SAMPLED BY:RH

Inorganic Chemistry (Soil)

DATE RECEIVED: 2020-01-14

DATE REPORTED: 2020-01-21

		SAMPLE DESCRIPTION:		MW103-4	BH104-3
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2020-01-06	2020-01-06
Parameter	Unit	G / S	RDL	861346	861350
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.72	7.69
Sulphate (2:1)	µg/g		2	267	13

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

861346-861350 Sulphate was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SUNCOR ENERGY PRODUCTS PARTNERSHIP

AGAT WORK ORDER: 20Z563414

PROJECT: CO750.00; Outlet #: 10565; Activity Code: A2

ATTENTION TO: Rick Lemoine

SAMPLING SITE:Palladium Drive, Ottawa

SAMPLED BY:RH

Soil Analysis

RPT Date: Jan 21, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Soil)															
pH, 2:1 CaCl2 Extraction	866994		7.74	7.75	0.1%	NA	100%	80%	120%	NA			NA		
Sulphate (2:1)	863278		392	391	0.3%	< 2	101%	70%	130%	109%	70%	130%	113%	70%	130%

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
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FAX (905)712-5122
http://www.agatlabs.com

Time Markers

AGAT WORK ORDER: 20Z563414

PROJECT: CO750.00; Outlet #: 10565; Activity Code: A2

CLIENT NAME: SUNCOR ENERGY PRODUCTS PARTNERSHIP

ATTENTION TO: Rick Lemoine

Sample ID	Sample Description	Sample Type	Date Sampled	Date Received
861346	MW103-4	Soil	06-JAN-2020	14-JAN-2020

Inorganic Chemistry (Soil)

Parameter	Date Prepared	Date Analyzed	Initials
pH, 2:1 CaCl2 Extraction	21-JAN-2020	21-JAN-2020	MM
Sulphate (2:1)	21-JAN-2020	21-JAN-2020	LC

Sample ID	Sample Description	Sample Type	Date Sampled	Date Received
861350	BH104-3	Soil	06-JAN-2020	14-JAN-2020

Inorganic Chemistry (Soil)

Parameter	Date Prepared	Date Analyzed	Initials
pH, 2:1 CaCl2 Extraction	21-JAN-2020	21-JAN-2020	MM
Sulphate (2:1)	21-JAN-2020	21-JAN-2020	LC

AGAT Laboratories

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Method Summary

CLIENT NAME: SUNCOR ENERGY PRODUCTS PARTNERSHIP

AGAT WORK ORDER: 20Z563414

PROJECT: CO750.00; Outlet #: 10565; Activity Code: A2

ATTENTION TO: Rick Lemoine

SAMPLING SITE:Palladium Drive, Ottawa

SAMPLED BY:RH

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only
Work Order #: 2075634 14
Cooler Quantity: one ice pack
Arrival Temperatures: 3.9 | 4.1 | 4.0
LT- 2.9 | 2.6 | 3.3
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes:

Report Information:
Company: Terrapex Environmental Ltd.
Contact: Craig Beaton
Address: 20 Gurdwara Road
Ottawa, ON K2E 8B3
Phone: 613-745-6471 Fax: 613-745-0796
Reports to be sent to:
1. Email: ~~C.Beaton@terrapex.com~~ R.herzog@terrapex.com
2. Email:

Regulatory Requirements: ☒ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use ☐ Sanitary ☐ Storm
Region (Indicate One)

☐ Regulation 558 ☐ CCME ☐ Prov. Water Quality Objectives (PWQO) ☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on Certificate of Analysis ☐ Yes ☒ No

Turnaround Time (TAT) Required:
Regular TAT ☐ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:
Project: CO750.00
Site Location: Palladium Drive, Ottawa
Outlet #: 10565
Sampled By: RH
AGAT Q: PO: 4700005669
If quote is not provided, client will be billed full price for analysis.

Bill To Same: Yes ☑ No ☐
Company: Terrapex Environmental
Email: accounts.payable@terrapex.com

Activity
Assessement (circle one) ☐ A1 ☑ A2 ☐ AR ☐ AV
Remediation (circle one) ☐ RE ☐ RX ☐ RI ☐ RA
Contaminant Management (circle one) ☐ M ☐ MW ☐ MV

Craig phoned 2020-01-14 9h51 invoice to Rick Lo

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	All Metals ☐ 153 Metals (excl. Hydrides)	Hydride Metals ☐ 153 Metals (Incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	✓ pH + Soluble Sulphate					Potentially Hazardous or High Concentration (Y/N)
MW103-4	01/06/2020	13:00	1	S		N																✓				
BH104-3	01/06/2020	16:00	1	S		N																✓				

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
RACHEL GREGORY RGregory	2020/01/14	09:05	[illegible]	2020/01/14	9h05
			Shaumin Jan 15/2020		10:10am

jars used and not returned:
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N°: