



CHUNG & VANDER DOELEN
ENGINEERING LTD.

**PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED ELMIRA INDUSTRIAL SUBDIVISION**

1665 Scotch Line Road
Elmira, Ontario

SUBMITTED TO:

1000525725 Ontario Inc.
30 Water Street North
Kitchener, ON
N2H 5A8

ATTENTION:

Mr. Bernie Nimer



CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

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1000525725 Ontario Inc.
30 Water Street North
Kitchener, ON
N2H 5A8

Attention: Mr. Bernie Nimer

RE: Preliminary Geotechnical Investigation
Proposed Elmira Industrial Subdivision
1665 Scotch Line Road, Elmira, Ontario

We take pleasure in enclosing one (1) copy of our Preliminary Geotechnical Investigation Report carried out at the above-referenced Site. Soil samples will be retained for a period of three (3) months and will thereafter be disposed of unless we are otherwise instructed.

If you have any questions or clarifications are required, please contact the undersigned at your convenience.

We thank you for giving us this opportunity to be of service to you.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

Eric Y. Chung, M. Eng., P.Eng.
Principal Engineer

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1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained by 1000525725 Ontario Inc. to carry out a preliminary geotechnical investigation for the proposed development of an industrial subdivision located at 1665 Scotch Line Road in Elmira, Ontario.

The 54.93± ha site is situated east of Elmira and is bounded to the north by Southfield Drive, to the south by Scotch Line Road, and to the west by a creek running parallel to the Waterloo Central Rail Corridor railway tracks. Currently, the majority of the site is comprised of agricultural fields, with a residential dwelling and barn complex located in the very centre of the property.

Currently, a draft plan of the subdivision (see Appendix B), provided by MHBC (February 20, 2025), is available, but a site grading plan has not been prepared at the time of reporting. The draft plan envisions that the industrial area of the subdivision will consist of 11 blocks, encompassing a total area of 36.50± ha. A 1.55± ha stormwater management (SWM) facility is planned in the western section of the site, and the subdivision will be fully municipally serviced with water and wastewater infrastructure.

The Grand River Conservation Authority (GRCA) regulated wetland area located along the western edge of the property is to be preserved. A roadway network, comprising Streets 'A' and 'B' will be constructed throughout the industrial subdivision, connecting it to South Field Drive in the north, and Scotch Line Road to the south. The sections of South Field Drive and Scotch Line Road bordering the subject lands are to be reconstructed and widened in order to accommodate the increased traffic resulting from the proposed industrial subdivision.

The purpose of this investigation was to determine the subsurface soil and groundwater conditions at the site and, based on the findings, to make geotechnical recommendations for:

- Site grading operations and engineered fill construction;
- Excavation condition;
- Groundwater control during construction;
- Preliminary foundation bearing pressures;
- Foundation soil classification for seismic design per OBC 2024;
- Site servicing;
- Pavement design and construction; and
- Estimates of infiltration rates of encountered soil deposits.

This preliminary geotechnical report should be read in conjunction with CVD's Preliminary Scoped Hydrogeological Assessment (April 2025).

2.0 FIELD WORK

Twenty-one (21) boreholes, identified as Boreholes 1 to 21 were advanced to depths between 3.50 and 15.75 m below existing grades between March 26 and April 1, 2024. Fourteen (14) monitoring wells were installed, and these include monitoring wells in Boreholes 1 to 12, as well as nested monitoring wells at Boreholes 4 and 8 (Boreholes 4S/4D and 8S/8D). The borehole/monitoring well locations are



illustrated on the Borehole Location Plan, Drawing No. 1.

The fieldwork was carried out under the supervision of a member of our engineering team, who logged the boreholes, collected subsurface soil samples, and monitored the groundwater conditions. All CVD monitoring well/boreholes logs are included on Enclosures 1 to 23.

The boreholes were advanced using a track-mounted CME-55 drill rig, equipped both with standard 108 mm inner diameter hollow stem augers (HSA) and 152 mm outer diameter solid stem augers (SSA) operated by Davis Drilling Ltd. of Milton, Ontario. Standard penetration tests (SPTs) in accordance with ASTM Specification D1586, were carried out at frequent intervals of depth, and the results are shown on the Borehole Logs as Penetration Resistance or “N”-values. The undrained shear strength of the cohesive soil deposits was determined on the slightly disturbed SPT samples using a field pocket penetrometer. The compactness condition or consistency of the soil strata has been inferred from these various test results.

The borehole locations, temporary benchmark, and associated ground surface elevations were surveyed by CVD for the purpose of this report using a Network RTK Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using The UTM Zone 17N Projection, NAD83(CSRS)v7-2010 datum and Canada Geoid Model HT2_2010v70 (CGVD28).

The referenced temporary benchmark (TBM) is described below:

TBM: Top of culvert on east side of existing railroad tracks, as shown on Drawing No. 1

Elevation: 346.21 m (Geodetic)

3.0 LABORATORY TESTING

Soil samples obtained from the in-situ tests were examined in the field and subsequently brought to our laboratory for visual and tactile examination to confirm field classification. Moisture content determination of all retrieved samples occurred.

In addition, fourteen (14) grain size distribution analyses were carried out on representative soil samples of the major soil deposits to establish the physical and engineering properties as well as assist to provide estimates of infiltration rates of the encountered soil deposits. The results of these tests are presented in Enclosures 24 to 37.

4.0 EXISTING SITE CONDITIONS

The 54.93± ha site is currently used for agricultural purposes and is primarily occupied by grass and/or crop-covered farm fields. The property is bounded to the north by South Field Drive and to the south by Scotch Line Road, which are both connected by an unnamed gravel road which passes through the centre of the site in a north-south orientation. A residential home, multiple barns, and other minor structures exist at the centre of the property. The western boundary of the site is demarcated by the



rail tracks of the Waterloo Central Rail Corridor.

A GRCA regulated wetland consisting of an intermittent creek and various small streams exists next to the railroad along the northwestern section of the property boundary. The wetland is directly connected to Drain No.1 through a culvert located under the railroad tracks along the northern edge of the wetland. Various mid-sized trees and small fences are found throughout the site and define the boundaries of each existing field.

The Town of Elmira is situated directly northwest of the property. North, south, and east of the subject lands are more agricultural fields being used primarily for growing/harvesting various crops as well as for dairy farming. Canagagigue Creek is found approximately $500\pm$ m north of the site, Conestogo River is located approximately $4\pm$ km to the south, and the Grand River is situated approximately $4\pm$ km east of the property.

In terms of local topography, ground surface elevations across the property greatly vary, and the topography can be considered as “rolling land”. The highest elevations are found around the centre of the site, with other local highs occurring along the northern and southern portions of the land. There is a large decrease in elevation from the centre of the Site westwards towards the wetland/creek, as well as a smaller decrease from the centre of the property towards the east. The ground surface elevations at the borehole locations ranged between 345.99 and 356.11 m.

5.0 SUBSURFACE CONDITIONS

The detailed subsurface conditions encountered in the twenty-one (21) boreholes advanced as part of this investigation are shown on the Borehole Log Sheets, Enclosures 1 to 23, inclusive. Enclosure A provides explanations of the various soil abbreviations and terms used on these borehole log sheets.

The following sections provide descriptions of the major soil deposits encountered in the boreholes. The stratigraphic boundaries shown on the borehole logs are inferred from non-continuous sampling conducted during advancement of the borehole drilling procedures, and therefore, represent transitions between soil types rather than exact planes of geologic change. The subsurface conditions will vary between and beyond the borehole locations.

5.1 Topsoil

Topsoil was encountered at the ground surface of all twenty-one (21) boreholes with a measured thickness ranging from 300 to 510 mm. The thickness of topsoil could vary between and beyond the borehole locations.

5.2 Fill

A layer of dark brown to brown fill materials, typically ranging in composition from sandy silt to silty sand, and a clay content ranging from trace clay to clayey, was encountered beneath the topsoil in



twenty (20) of the boreholes (excluding Borehole 8). The fill materials extended to depths between $0.5\pm$ and $2.95\pm$ m below ground surface (bgs). Occasional sand lenses/seams as well as trace amounts of topsoil and trace to some gravel were encountered in most of the boreholes. The lower stratum of fill in Borehole 17 was comprised of silty sand and gravel with occasional cobbles, and occasional brick fragments were encountered in the upper stratum.

The SPT “N”-values measured within the fill deposit ranged from 3 to 32 blows per 300 mm of penetration, indicating a variable very loose to dense compactness condition. Natural moisture contents were measured between 6 and 38%, exhibiting typically a moist to wet moisture condition. Elevated moisture contents are likely due to the presence of topsoil/organics.

5.3 Granular Deposits

A series of granular deposits were found both above and interlayered within the till deposits. The composition of these granular layers varied between silt, sandy silt, sand and silt, silty sand, fine sand, and sand and gravel. Granular deposits were encountered in Boreholes 4, 7, 8, 9, 10, 13, 14, and 16. Occasional clayey seams as well as trace to some gravel were observed within the various granular layers. Notably, a gravelly silty sand layer ($9.3\pm$ to $10.2\pm$ m bgs) was encountered within the sand and silt till deposit in Borehole 4, and silty sand to sand and silt layers were found beneath the sand and silt till deposit in Borehole 8.

These layers extended from $14.1\pm$ to $15.75\pm$ m bgs, at which point Borehole 8 was terminated. The results of five (5) grain size distribution analyses taken from the various granular deposits in Boreholes 4, 7, 8, and 9, are shown graphically on Enclosures 28, 31, and 33 to 35.

Standard penetration testing within the granular deposits yielded “N”-values ranging from 6 to over 50 blows per 300 mm of penetration, indicating a variable loose to very dense compactness condition. Natural moisture contents were measured between 4 and 30%, generally indicating moist to saturated moisture conditions.

5.4 Clayey Silt Till & Sand and Silt Till

The majority of the boreholes were predominantly comprised of either a clayey silt till or a sandy silt to sand and silt till. Most of the boreholes contained a combination of these two deposits, in which typically the clayey silt till was underlain by the sand and silt till. These deposits were encountered in nineteen (19) of the boreholes. Occasional seams and/or minor layers of granular deposits (see Section 5.3) were found interlayered within the till deposits. Occasional cobbles and/or boulders were observed within the till deposits in Boreholes 3, 4, 8, and 11. The results of three (3) grain size distribution analyses taken from the clayey silt till in Boreholes 3, 8, and 10, are shown graphically on Enclosures 26, 32, 36, and 37, and five (5) grain size distribution analyses were taken from the sand and silt till deposit in Boreholes 1, 2, and 4 to 6, are shown graphically on Enclosures 24, 25, 27, 29, and 30.

Standard penetration testing within the till deposits yielded “N”-values ranging from 4 to over 50 blows per 300 mm. The undrained shear strength obtained on retrieved samples of the cohesive clayey silt till



was measured at 180 to over 250 kPa. Based on the above test results, the clayey silt till deposit is considered to have a generally very stiff to hard consistency, while the sand and silt till has a compactness condition generally ranging from compact to very dense. Natural moisture contents were measured between 5 and 27%, and the general plasticity of the clayey silt till deposit was drier than the plastic limit.

5.5 Groundwater

Throughout the field investigation, groundwater conditions were monitored during advancement of boreholes, and water level readings were measured on multiple occasions following the completion of fieldwork in all fourteen (14) installed monitoring wells (monitoring wells BH 1 to 12). Saturated conditions were encountered in seventeen (17) of the twenty-one boreholes drilled during the study.

During the investigation, two (2) aquifers were identified: a shallow groundwater table aquifer existing within the till deposit, predominantly fed by near surface granular seams/layers, and a confined aquifer existing within the deeper granular deposit. In summary, between March and October 2024, the water table aquifer was measured at depths varying from 0.18 to 8.03 m bgs, corresponding to elevations between 343.31 to 353.77 m, with a seasonal variation between individual wells ranging from $0.01\pm$ to $3.96\pm$ m. These large differences are due to the aquitard nature of the clayey silt/sand and silt till.

The shallow groundwater flow direction mimics the local topography of the Site, with groundwater travelling away from the raised plateaus of the centre, north, and south of the property, towards the west (into the wetland and creek) and towards the east (into the adjacent farmlands).

The groundwater measurements for each monitoring well and piezometer collected thus far for the investigation (March to October 2024) are summarized in Table 1, and Figure 5 provides an interpretation of on-site groundwater contours and general groundwater flow directions (both included in Appendix C).

Five (5) single well response tests were performed on monitoring wells located in the shallow water table aquifer. The hydraulic conductivities for the clayey silt/sand and silt till (wells BH 1, 3, 4S, 6, and 9) ranged from 7×10^{-8} to 1×10^{-7} m/s, while the hydraulic conductivity of Borehole 9, which was installed in the shallow sand and silt to sandy silt layer contacted above the sand and silt till, was measured at 1×10^{-6} m/s. These values are consistent with the hydraulic conductivity ranges typically associated with similar soils (Freeze & Cherry, 1979). Hydraulic conductivities calculated from soil grain sizes analysis (using the Hazen Formula) were similar in magnitude to those of the single well response tests. It is noted that the observed groundwater table will fluctuate seasonally, such as during the spring following the period of peak snow melt, and in response to major weather events. It is possible that peak water levels could be up to 0.5 m higher than those measured in this investigation.



6.0 DISCUSSION AND RECOMMENDATIONS

6.1 General

The 54.93± ha site, currently comprised of agricultural fields, is to be redeveloped into an industrial subdivision according to a draft plan of the subdivision (see Appendix B), provided by MHBC (February 20, 2025). A site grading plan was not available at the time of reporting. The industrial area of the subdivision will consist of 11 blocks, encompassing a total area of 36.50± ha.

A 1.55± ha stormwater management (SWM) facility (Block 12) is planned in the western section of the site, and the subdivision will be fully municipally serviced with water and wastewater infrastructure.

The Grand River Conservation Authority (GRCA) regulated wetland area located along the western edge of the property is to be preserved. A roadway network, comprising Streets 'A' and 'B' will be constructed throughout the industrial subdivision, connecting it to South Field Drive in the north, and Scotch Line Road to the south. The sections of South Field Drive and Scotch Line Road bordering the subject lands are to be reconstructed and widened in order to accommodate the increased traffic resulting from the proposed industrial subdivision.

In general, the surficial topsoil was underlain by a 0.5± to 2.95± m thick layer of loose to compact fill materials, typically followed by a generally very stiff to hard clayey silt till and/or a compact to very dense sandy silt to sand and silt till. Most of the boreholes contained a combination of the two till deposits, in which typically the clayey silt till which was underlain by the sand and silt till. Occasional cobbles and boulders were observed within these till deposits. Additionally, occasional seams and/or minor layers of granular deposits were found interlayered within the till deposits. Granular soils varied in composition between silt, sandy silt to silty sand, fine sand, and sand and gravel. It should be noted that the northeastern and northwestern-most corners of the property contain larger concentrations of loose granular deposits, as opposed to the majority of the site which is underlain by till deposits.

Shallow saturated conditions were encountered seventeen (17) of the boreholes. The water table aquifer was measured (during March and October 2024) at depths varying from 0.18 to 8.03 m bgs, corresponding to elevations between 343.31 to 353.77 m. The shallow groundwater flow direction mimics the local topography of the Site, with groundwater travelling away from the raised plateaus of the centre, north, and south of the property, towards the west (into the wetland and creek) and towards the east (into the adjacent farmlands). Hydraulic conductivity analysis conducted on the water table aquifer resulted in values generally ranging from 1×10^{-7} to 1×10^{-6} m/s. It should be noted that groundwater levels could potentially be 0.3± to 0.5± m higher during the peak groundwater period in the spring.

6.2 Site Grading

It should be noted that due to the low infiltration rates of the predominant clayey silt till and sand and silt till deposits found throughout the majority of the site (excluding the northeastern and northwestern-most corners of the property), the water table aquifer significantly drops in elevation in the late summer/fall in comparison to the spring. As such, it is recommended that excavation for the future



development be done during the typically drier summer months when ground water conditions would be expected to lie at lower elevations.

It should be noted that the thickness of the topsoil layer could vary drastically across the site from those reported at the borehole locations. Topsoil stripping operations should be conducted when the ground is not wet and can support construction equipment. Over-stripping can result when the ground conditions are wet and unstable.

Due to significant topographical changes throughout the site, site grading operations involving “cut and fill” procedures are anticipated. Materials to be used as fill during site grading operations are to be suitably handled and placed according to their final use needs.

It is recommended to construct engineered fill in areas to be raised in order to suitably support the industrial building structures, future roadways, and infrastructure servicing.

Fill and/or loose/soft soil conditions were encountered at all borehole locations and extended up to depths of 2.95± m below existing grade. The following table provides the depth and elevation at each borehole location where non-suitable soil conditions were encountered:

Borehole No.	Topsoil Thickness (mm)	Existing Ground Elevation (m)	Thickness of Non-Suitable Soils (m)	Elevation of Suitable Soils (m)
1	330	352.3±	1.5±	350.8±
2	410	352.6±	1.1±	351.5±
3	300	350.2±	0.8±	349.4±
4	380	351.5±	1.5±	350.0±
5	300	353.0±	0.8±	352.2±
6	380	352.9±	1.5±	351.4±
7	510	349.8±	1.5±	348.3±
8	360	356.1±	0.8±	355.3±
9	460	350.8±	2.5±	348.3±
10	300	346.2±	1.5±	344.7±
11	300	352.4±	0.8±	351.6±
12	330	346.5±	1.2±	345.3±
13	300	346.0±	0.6±	345.4±
14	360	350.2±	0.8±	349.4±



Borehole No.	Topsoil Thickness (mm)	Existing Ground Elevation (m)	Thickness of Non-Suitable Soils (m)	Elevation of Suitable Soils (m)
15	510	352.2±	1.2±	351.0±
16	410	353.4±	1.5±	351.9±
17	460	350.6±	2.9±	347.7±
18	460	355.5±	1.5±	354.0±
19	380	354.8±	0.8±	354.0±
20	380	353.6±	1.7±	351.9±
21	380	352.0±	2.3±	349.7±

If there is a shortage of fill, the imported fill should consist of granular-based fill meeting the gradational requirements of OPSS 1010 Select Subgrade Material. The natural moisture content of the imported soil or re-purposed on-site native soil to be used as engineered fill should be within 3% below their optimum moisture content to achieve the specified degree of compaction.

It is recommended that any proposed borrow source materials be tested prior to importing to ensure that the environmental quality of the imported fill meets all environmental approval criteria and to ensure that the natural moisture content of the fill is suitable for compaction.

It is recommended that engineered fill construction be conducted during the summer and early fall months when drier warmer weather conditions typically exist as the onsite fine-grained soils are sensitive to moisture and will become difficult to handle and compact to the specified degree of compaction when wet. Conversely, judicious addition of water may be required for preparing the granular soils to be used for engineered fill purposes.

In general, the majority of the cut materials are expected to be fine-grained soils (silty and clay-rich) which are generally frost-susceptible. Constructing engineered fill, backfilling footings, foundation walls and service trenches using finer-grained soils during the winter months is not advisable, unless suitable weather conditions prevail, the soils are at suitable moisture content, and strict procedures are followed and monitored on a full-time basis by the geotechnical engineer.

The onsite soils are generally susceptible to softening and deformation when exposed to excessive moisture and construction traffic. As a result, it is imperative that the grading/filling operations are planned and maintained to direct surface water run-off to low points and then be positively drained by suitable means. During periods of wet weather, construction traffic should be directed along the designated construction routes so as not to disturb and rut the exposed subgrade soil. Temporary construction roads consisting of clear crushed material (such as crushed stone or recycled concrete) may be required during poor weather conditions such as wet spring or fall.

Engineered fill should be constructed in accordance with the following procedures in order to support



future buildings, infrastructure servicing and roadway pavements.

1. All existing topsoil, organic and deleterious materials should be stripped from building and roadway areas. Loose/soft soils encountered within future building areas as presented in the previous table are to also be removed. The inorganic soils may be salvaged for potential reuse as engineered fill;
2. The exposed inorganic subgrade is to be thoroughly recompact by large heavy compaction equipment (10 tonne sheepsfoot compactor is recommended) if it can support such equipment and remaining stable. Careful review and guidance by the geotechnical engineer are recommended should the subgrade become unstable. All prepared subgrade areas are to be inspected by qualified geotechnical personnel prior to placement of fill;
3. The required grades can then be achieved by placing approved inorganic onsite fill in maximum 200 to 300 mm thick loose lifts which are to be thoroughly compacted to at least 98% Standard Proctor maximum dry density (SPMDD). The moisture content of the fill materials should be within 3% below their optimum moisture contents in order to achieve the specified degree of compaction;
4. Engineered fill used to support future buildings, infrastructure servicing and roadway pavements must be placed such that the fill pad extends horizontally outwards at least a distance equal to the depth of fill to be placed;
5. Overly wet and organic materials should be placed in non-structural areas and outside of SWM feature areas where 90% SPMDD is adequate. Alternatively, wet inorganic soils can be mixed with drier soils to produce a suitable moisture content to allow appropriate compaction to occur if conditions dictate; and
6. All fill placement and compaction operations must be supervised on a full-time basis by qualified geotechnical personnel to approve fill material and ensure the specified degrees of compaction have been achieved.

Vibration could be generated from various construction equipment during construction, such as compactors and rollers which could be harmful to surrounding structures and buildings. Peak particle velocity (PPV) of ground motion is widely accepted as the best descriptor of potential for vibration damage to structures. The safe vibration limit can be set to 8 to 25 mm/s PPV, depending on frequency of vibrations and the sensitivity of surrounding structures to vibration.

Due to the relatively isolated location of the site, aside from the Waterloo Central Rail Corridor on the western boundary of the property, it is unlikely that any critical or susceptible infrastructure will be affected by the site grading operations. However, if deemed necessary, vibration monitoring can be performed. Vibration monitoring can be carried out to measure the PPV of ground motion from vibration generated from typical compaction equipment at the beginning of the project in the potentially critical areas. This will set criteria and establish the type of equipment to be used for this project. A pre-construction condition survey could be conducted to document the condition of the existing structures within the possible zone of influence, if necessary.



6.3 Site Servicing

The subdivision will be municipally serviced with watermain and sewers. According to the Region of Waterloo Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) (February 2022), it is anticipated that municipal servicing will generally lie $2.0\pm$ to $3.0\pm$ m below finished grades. The sanitary sewer obvert should be located a minimum of 2.8 m below final road grade, the storm sewer obvert should be located 1.5 m below final road grade, and the top of the watermain pipe should be located 1.8 to 2.0 m below finished grade.

6.3.1 Groundwater Control and Open Cut Excavation

Excavations are expected to be in the order of $1\pm$ to $3.5\pm$ m deep for foundations and site servicing. The excavations will penetrate topsoil, loose to compact fill, and native stiff to hard clayey silt till and/or loose to very dense sand and silt till or other granular deposits. Provided the groundwater is controlled/lowered below the excavation depths, these materials are considered to be Type 3 Soils in accordance with the latest Occupational Health and Safety Act.

Above the groundwater table, uncontrollable groundwater is not expected within the anticipated depths of excavation, and excavations in the Type 3 Soils are expected to remain stable during the construction period provided that side slopes are cut to 1H : 1V from the bottom of the excavation. Where seepage or perched groundwater is encountered, side slopes should be cut to more stable angles of 3H : 1V. The side slopes should be suitably protected from erosion processes. Surface run-off which inadvertently enters the excavation can be controlled by using conventional filtered sump pumping techniques, as and where required.

Where the exposed base subgrade and sidewall soils of the excavation are comprised of saturated granular deposits, it is recommended that groundwater be lowered and controlled to at least 0.6 m below the base of excavations to create and maintain a stable subgrade condition to facilitate pipe laying and backfilling operations or foundation preparation, as well as to ensure cut slope stability.

Given the low hydraulic conductivity of the predominant clayey silt till and sand and silt till deposits, groundwater is expected to be controllable by pumping from filtered sump pits (possibly together with intercept ditching). If the water table at the time of construction is located higher than 0.6 m above the required excavation level, it is possible that local pre-lowering of the groundwater table might be required prior to excavation through the use of well points. It is recommended that CVD be retained to review the design grades and evaluate the need for dewatering.

6.3.2 Pipe Bedding

Any loose, unstable and/or organic soils encountered at the pipe invert should be sub-excavated and replaced with well compacted Granular "A" which should be placed in 150 mm thick layers and compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD). The support of pipes in these areas can also be achieved with non-shrinkable fill if poor soil is encountered at the subgrade level and fully removed.



The bedding requirements for the services should be in accordance with both the Ontario Provincial Standard Drawings OPSD - 802 for flexible and rigid pipes, as well as the Region of Waterloo DGSSMS. The bedding shall be a Class "B" and consist of at least 150 mm thick Granular "A" compacted to at least 95% SPMDD. Granular "A" should be used to backfill around the pipe to at least 150 mm above the top of the pipe.

Particular attention should be given to ensure material placed beneath the haunches of the pipe is adequately compacted. Recycled asphalt will not be allowed to be used in Granular "A" bedding material.

6.3.3 Trench Backfill

Excavated inorganic materials are considered suitable for reuse as trench backfill. If necessary, potential mixing of drier and wetter excavated soils in proper ratios can be done to produce a suitable mixture near the material's optimum moisture content in order to achieve the required compaction specification. Conversely, judicious addition of water may be required if the soils are significantly drier than their optimum moisture content in order to facilitate suitable compaction.

The backfill should be placed in thin layers, 300 mm thick or less dependant on the demonstrated success of compaction based on in-situ density test results. Other types of materials such as organic soils, overly wet soils, boulders, and frozen materials (if work is carried out in the winter months) should not be used for backfilling. All backfill should be compacted to at least 95% SPMDD.

Backfilling operations should follow closely after excavation so that only a minimal length of trench slope is exposed at any one time so as to minimize potential problems. This will potentially minimize over-wetting of the subgrade material. Particular attention should be given to make sure frozen material is not used as backfill should construction extend into the winter season.

It has been our experience that excavated cohesive soils should be broken into smaller pieces (less than 150 mm diameter) before returning into the trench as backfill. This will eliminate "wedging" problems and reduce long term settlement. Particular attention must be made to backfilling the laterals where the trenches are narrow and against the manholes and catch-basins. Thinner lifts and additional compaction must be applied.

Frequent inspection by experienced geotechnical personnel should be carried out to examine and approve backfill material, to carefully inspect placement, and to verify that the specified degree of compaction has been obtained by in situ density testing.

6.4 Footing Foundations

It should be noted that this current preliminary geotechnical investigation is insufficient and not intended for detailed building design purposes. It will be necessary to conduct a geotechnical investigation at each industrial lot in order to provide a detailed, site and project specific report for the design and construction of the proposed development.



Based on the twelve (12) widely spaced boreholes, footings cast on native competent stiff to hard clayey silt till, compact to very dense sand and silt till, and/or compact to dense granular deposits can be designed using a net Geotechnical Reaction of 200 kPa at SLS and Factored Geotechnical Resistance of 300 kPa at ULS.

The following table summarizes the highest founding level and elevation for the footings at the borehole locations:

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
1	352.31	1.61	350.70±
2	352.62	1.52	351.10±
3	350.21	1.01	349.20±
4	351.53	1.73	349.80±
5	353.02	0.82	352.20±
6	352.94	1.84	351.10±
7	349.84	1.84	348.00±
8	356.11	0.91	355.20±
9	350.80	2.60	348.20±
10	346.20	1.60	344.60±
11	352.39	1.09	351.30±
12	346.47	1.77	344.70±

Higher soil bearing capacities may be available for footings founded at elevations lower than those cited above, through a site and project specific geotechnical evaluation.

Footings founded on approved engineered fill can be designed to a net Geotechnical Reaction of 150 kPa at SLS and Factored Geotechnical Resistance of 250 kPa at ULS.

These soil bearing pressures can be achieved provided that the founding subgrade is undisturbed during construction. The majority of the settlements will take place during construction and the first loading cycle of the building. In addition, the footings should be founded below any topsoil, fill, or other deleterious materials on competent undisturbed soils. Spacing between adjacent footing steps should not be steeper than 10H to 7V.



If wet or saturated subgrade conditions are encountered, it is recommended that a 50 mm thick protective concrete slab should be poured and allowed to set on the prepared subgrade to further protect it from disturbance by construction traffic and the elements.

Exterior footings and footings in unheated portions of the building should be provided with a soil cover of not less than 1.2 m or equivalent synthetic thermal insulation for adequate frost protection. The founding subgrade soils must be protected from frost penetration during winter construction.

The footing excavations should be inspected by the geotechnical engineer to ensure adequate soil bearing and proper subgrade preparation.

6.5 Earthquake Considerations

In accordance with The Ontario Building Code 2024 (OBC), the proposed structure should be designed to resist earthquake load and effects as per OBC Subsection 4.1.8.

Based on the condition of the underlying soils encountered at the boreholes, the fact that engineered fill will be constructed to replace loose/soft soils, and our experience with the local soil conditions up to a depth of 30 m, the site can be classified as **Site Class C** as per OBC Table 4.1.8.4.A (Page B4-24).

6.6 Infiltration Rate of Native Soil Deposits

Based on the laboratory gradational results and our experience, the permeability (hydraulic conductivity) and infiltration rate of the notable inorganic soil deposits encountered are estimated and provided in the following table:

Material	Permeability (K) (cm/s)	Infiltration Rate (mm/hr)
Sand and Silt Till (Enclosures 24, 25, 27, 29, and 30)	3×10^{-7} to 1×10^{-6}	<1
Clayey Silt Till (Enclosures 26, 32, 36, and 37)	1×10^{-8} to 1×10^{-7}	<1
Silt, some sand, trace clay (Enclosure 31)	1×10^{-5} to 3×10^{-5}	3 to 5
Sandy Silt (Enclosure 35)	3×10^{-5}	5
Sand and Silt (Enclosures 33 and 34)	3×10^{-4} to 1×10^{-3}	15 to 30



If an infiltration feature is to be included in the development of the property, it should be located below the footing drain/weeper and at least 5 m away from the proposed building footprints. Additionally, the infiltration features should have the base located at least 1.0 m above the groundwater table, and a minimum infiltration rate of 15 mm/hr is required.

Considering the above information, the very low infiltration rate of the native predominant clayey silt till and sand and silt till deposits and the expected relatively low depth of the water table aquifer in peak groundwater periods, enhanced on-site infiltration is likely not feasible. The only potential areas of significant infiltration are located in the northeastern and northwestern-most corners of the Site, where fine granular soils and occasional sand and gravel deposits can be found; however, the lateral extent of these coarser soils is likely limited. The ultimate composition of the subsoils in these areas will need to be further explored if infiltration features are to be considered at these locations.

6.7 Pavement Design and Construction

The earth subgrade soil is generally expected to consist of fine-grained (silty and clay-rich) soils. Cognizant of the traffic volume and the subgrade soils, the following pavement component thicknesses (per Township of Woolwich standards) are considered suitable for industrial roads:

Pavement Component	Local and Collector Road Component Thickness (mm)	Arterial Road Component Thickness (mm)
HL3 Surface Asphaltic Concrete	50	50
HL8 Binder Asphaltic Concrete	90	100
Granular "A" Base Course	210	200
Granular "B" Type II Sub-base Course	450	520
Granular Base Equivalency (GBE)	790	847

Note: GBE denotes Granular Base Equivalency which is calculated using factors of 2 for asphaltic concrete, 1 for Granular "A" base and 0.67 for Granular "B" sub-base

The asphaltic concrete should consist of two layers of HL8 and one top layer of 50 mm thick HL3.

The pavement design considers that road construction will be carried out during the drier time of the year and that the subgrade is stable, not heaving under construction equipment traffic. If the subgrade is wet or unstable, additional granular sub-base may be required.

The subgrade should be prepared in accordance with the recommendations provided in Section 6.2 and Section 6.3 prior to placement of the granular base layers.

The base and sub-base materials should be produced in accordance with the current OPSS specifications and placed and uniformly compacted to at least 100% SPMDD. The asphaltic concrete should be placed and compacted in accordance with OPSS Form 310 and to a minimum of 92% of the Marshall Density



(MRD). Frequent in-situ density testing by this office should be carried out to verify that the specified degree of compaction is being achieved and maintained.

SS-1 or SS-1HH tack coat should be applied to all binder course surfaces and vertical surfaces (i.e., curbs, pavement joints, etc.) prior to placement of asphalt. Refer to OPSS 310 and OPSS 1101 for additional details.

It should be noted that even well compacted trench backfill could settle for a period of time after construction. In this regard, the surface course of the asphaltic concrete should be placed at least one (1) year after trench backfill is completed so as to allow any minor settlements to occur within the trench backfill. The incomplete pavement structure may not be capable of supporting construction traffic. Consequently, minor repairs of the sub-base, base and asphaltic concrete may be required prior to paving with the base course and/or the surface course asphaltic concrete.

Longitudinal sub-drains with positive drainage outlets are recommended to be installed at the subgrade level along the edges of the roadway construction to enhance the performance of the pavement. Systematic drainage of the granular base materials will promote the longevity of the pavement structure. The prepared earth subgrade and final pavement surfaces should be graded to direct water runoff away from buildings, sidewalks, and other similar pertinent structures. The roadway subgrade should be free of depressions and should have a 2% slope from the crown to the edge of the pavement.

6.8 Roadway/Embankment Widening

It is understood that roadway/embankment widening of South Field Drive and Scotch Line Road will potentially occur as part of the roadway reconstruction works. Roadway widening for turning lanes and/or acceleration/deceleration lanes may be required along the northern and southern boundaries of the property along these two (2) roadway project sections.

Widening of the roadway platform shall be constructed by benching of the slopes where required. Benching of earth slopes shall be completed as per requirements of OPSD-208.010.

The embankment side slopes should not be steeper than 2.5H : 1V provided that the embankment fill is constructed in accordance with the following recommendations. The side slopes below the pavement profile should be topsoiled and seeded or sodded for surface erosion protection.

The following procedures are recommended to construct the embankment fill in order to suitably support future pavement widening areas:

1. The fill/widening should be overbuilt and trimmed back to the final configuration.
2. All topsoil, vegetation and deleterious materials are to be excavated from the proposed embankment fill areas to exposed competent inorganic soils. This removal of unsuitable material is to extend to the outside edges of the proposed embankment areas to a horizontal distance at least equal to the thickness of the embankment fill that will be placed on approved subgrade soil.



3. The exposed subgrade surface should be thoroughly proof-rolled and inspected by geotechnical personnel. Any soft spots encountered during the process should be excavated to the level of competent soil.
4. The required grades can then be achieved by placing approved soils (salvaged road base materials and OPSS 1010 Select Subgrade Material) in maximum 200 to 300 mm thick levelled lifts with each lift being compacted to at least 95% SPMDD.
5. Ensure compaction is carried out to the outer edge of the fill placed.
6. Periodic in-situ density testing by this office should be performed during the construction of embankment fill to ensure the specified degree of compaction is being achieved and maintained.

6.9 Handling of Excess Soils

Excess soil may be generated and removed off-site during the construction activities associated with the proposed site works. The management of excess soil is now governed by O.Reg. 406/19, MECP document entitled “On-Site and Excess Soil Management Regulation”. In accordance with the regulation, the Project Leader is responsible for the handling, storage, reuse, transportation, and removal of all soil. To support off-site removal of excess soil, the following is required:

- Planning Documentation
 - Assessment of Past Use
 - Sampling and Analysis Plan
 - Excess Soil Characterization Report
 - Excess Soil Destination Report
- Tracking
- Registry
- Record Keeping

Soil sampling and analysis may be required as per the above-noted MECP document and/or as per the requirement of the receiving site owner(s), depending on the volume of excess soil generated during construction. The analytical results and environmental assessment findings must be disclosed to the receiving site owner(s) and approval by the receiving site owner(s) be obtained prior to exporting/transferring the materials.

If any impacted soils are discovered during construction, CVD should be contacted for sampling and testing to determine the limit of the impacted soils.



7.0 CLOSURE

The Limitations of Report, as quoted in Appendix A, is an integral part of this report.

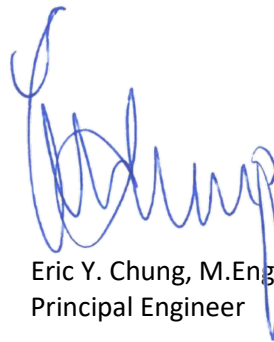
We trust that the information presented in this report is complete within our terms of reference. If there are any further questions concerning this report, please do not hesitate to contact our office.

Yours truly,

CHUNG & VANDER DOELEN ENGINEERING LTD.



Yaroslav Chudin, E.I.T.
Geotechnical Engineering Intern



Eric Y. Chung, M.Eng., P.Eng.
Principal Engineer



APPENDIX A

LIMITATIONS OF REPORT



APPENDIX “A”

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes and their respective depths may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. 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 conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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 the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.



APPENDIX B

Draft Plan (MHBC, February 20, 2025) & CVD Geotechnical Borehole Location Plan



DRAFT PLAN OF SUBDIVISION

Legal Description
PART LOT 83 & 86, G.C.T. WOOLWICH;
AS IN 1267295 (firstly) LYING E OF OF 1288904
TOWNSHIP OF WOOLWICH
REGIONAL MUNICIPALITY OF WATERLOO

Owner's Certificate
I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

DATE: _____
BERNIE NIMER
1000525725 ONTARIO INC.

Surveyor's Certificate
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE: _____
GAVIN P.T. SEAMAN, OLS
SBM GEOMATICS LTD.



Additional Information Required Under Section 51(17) of the Planning Act
R.S.O. 1990, c.P.13 as Amended
A. AS SHOWN B. AS SHOWN C. AS SHOWN
D. INDUSTRIAL F. AS SHOWN
G. AS SHOWN H. MUNICIPAL WATER SUPPLY I. LOAM
J. AS SHOWN K. ALL SERVICES AS REQUIRED L. AS SHOWN

Area Schedule 30T-_____

DESCRIPTION	BLOCKS	AREA (ha)
Industrial	1-11	36.499
Stormwater Mgmt	12	1.554
Pumping Station	13	0.039
Open Space	14	6.173
Future Development	15-17	3.892
Road Widening	18-28	2.148
0.3m Reserve	29-37	0.030
Roads		4.594
TOTAL	37	54.928

Notes
- ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN
- SITE BOUNDARY, TOPOGRAPHIC BASE PLAN AND WETLAND INFORMATION PREPARED BY SBM GEOMATICS LTD. (MAY 5, 2024)
- CONTOURS, REGION OF WATERLOO (2014)
- REGULATION LIMIT AND FLOODPLAIN (GRCA, 2024)

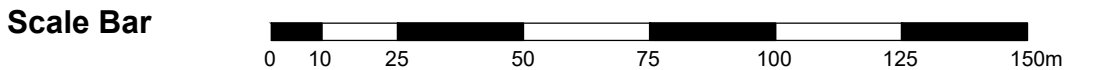
Revision No. Date Issued / Revision By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

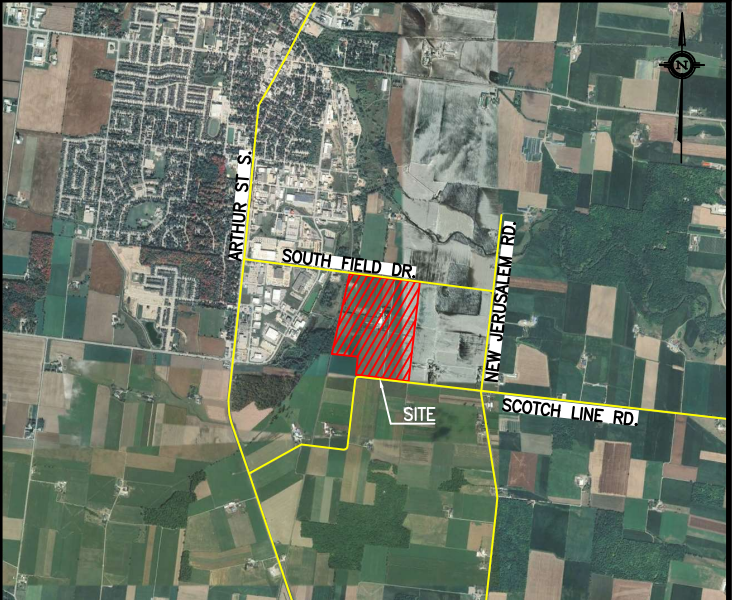
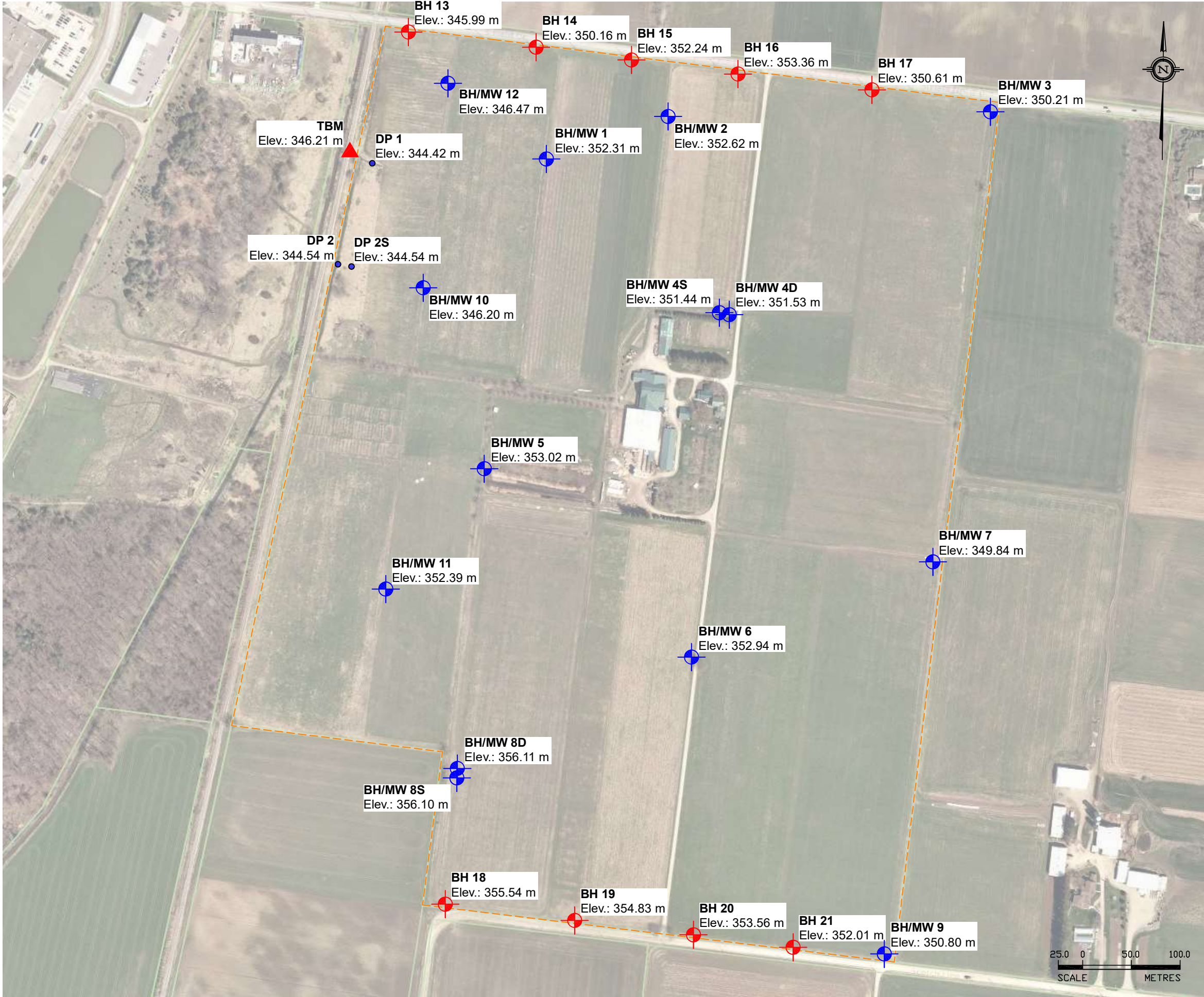
Approval Stamp	Date Feb. 20, 2025
File No. 2388A	
Plan Scale 1:1,500	
Drawn By CAC	
Checked By PC	

Applicant
1000525725 Ontario Inc.
1665 Scotch Line Rd
Elmira, Ontario

File Name DRAFT PLAN Dwg No. 1 of 1



K:\2388A-1965 Scotch Line Rd-Elmira\DP\DraftPlan_20Feb2025.dwg



KEY PLAN SOURCE: Google Earth

- LEGEND**
- TBM: Top of culvert on east side of existing railroad tracks. Elev.: 346.21 m (Geodetic)
 - Borehole Location
 - Borehole and Monitoring Well Location
 - Drive-Point Piezometer Location
 - Site Boundary

Image Ref.: Region of Waterloo GIS; ESRI; Retrieved May 9, 2024.
Elev. Ref.: The borehole locations and associated ground surface elevations were surveyed using a Network RTK Global Navigation Satellite System (GNSS) Receiver. The survey data was collected using UTM Zone 17N Projection, NAD83(CSRS)v7-2010 datum and Canada Geoid Model HT2_2010v70 (CGVD28).

BOREHOLE LOCATION PLAN
Proposed Industrial Subdivision
1665 Scotch Line Road
Elmira, Ontario



CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1 / 519-742-8979

Drawn By: JR/YC	Date: May 2024	File No.: 1650
Checked By: PD	Scale: 1:4000	Drawing No.: 1

APPENDIX C

Table 1 – Summary of Groundwater Levels
Figure 5a & 5b – Shallow Groundwater
Table Interpretation (April 30, 2024)



Table 1: Summary of Water Levels, Elevations & Fluctuations

1665 Scotch Line Road, Elmira
CVD Engineering
Project: 1650

Location	Ground Elevation (mASL)	Top Pipe Elevation (mASL)	Hydraulic Conductivity (m/s)	Water Level (m Below Ground Surface)							Water Elevation (mASL)							Fluctuation Relative to April 16, 2024 (m)			
				19-Mar-24	25-Mar-24	16-Apr-24	30-Apr-24	02-May-24	26-Jul-24	23-Oct-24	19-Mar-24	25-Mar-24	16-Apr-24	30-Apr-24	02-May-24	26-Jul-24	23-Oct-24	30-Apr-24	02-May-24	26-Jul-24	23-Oct-24
BH 1	352.31	353.29	7×10^{-8}			1.44	2.00	1.95	4.09	4.43			350.88	350.31	350.37	348.22	347.88	-0.56	-0.51	-2.65	-2.99
BH 2	352.62	353.62	-			3.76	3.58		4.64	4.64			348.86	349.03		347.98	347.97	0.18		-0.88	-0.88
BH 3	350.21	351.27	1×10^{-7}			0.34	0.18	0.38	0.78	1.37			349.88	350.03	349.84	349.44	348.85	0.15	-0.04	-0.44	-1.03
BH 4D	351.53	352.71	1×10^{-5}			8.36	8.21	8.21	8.84	9.60			343.16	343.32	343.32	342.69	341.93	0.16	0.15	-0.48	-1.24
BH 4S	351.44	352.44	1×10^{-7}			2.63	3.37	3.76	4.39	4.40			348.81	348.07	347.68	347.04	347.04	-0.74	-1.13	-1.76	-1.77
BH 5	353.02	354.22	-			4.84	4.98		7.03	7.54			348.17	348.04		345.99	345.48	-0.13		-2.19	-2.69
BH 6	352.94	353.97	1×10^{-7}			0.90	1.30	1.21					352.04	351.64	351.72			-0.40	-0.32		
BH 7	349.84	350.83	-			0.82	0.82		2.46	4.03			349.02	349.03		347.38	345.82	0.01		-1.64	-3.20
BH 8D	356.11	357.19	-			13.55	13.36		13.77	14.39			342.56	342.74		342.33	341.71	0.19		-0.22	-0.84
BH 8S	356.10	357.08	-			5.15	4.68		2.51	2.33			350.94	351.42		353.59	353.77	0.47		2.64	2.82
BH 9	350.80	351.79	1×10^{-6}			4.00	4.02	4.03					346.80	346.78	346.77			-0.03	-0.03		
BH 10	346.20	347.19	-			1.20	1.07		2.19	3.33			344.99	345.12		344.01	342.86	0.13		-0.99	-2.13
BH 11	352.39	353.48	-			4.07	4.74		8.03				348.32	347.64		344.36		-0.68		-3.96	
BH 12	346.47	347.60	-			0.67	0.59		2.59	3.17			345.81	345.89		343.89	343.31	0.08		-1.92	-2.50
DP 1 In	344.42	346.19	-	-0.29	-0.27	-0.31	-0.29		-0.27	0.32	344.72	344.70	344.74	344.71		344.69	344.10	-0.03		-0.05	-0.64
DP 1 Out	344.42	346.19	-	-0.26	-0.24	-0.26	-0.38		-0.27		344.68	344.67	344.68	344.81		344.69		0.13		0.01	
DP 2 In	344.54	346.12	-	0.93	0.88	0.73	0.65		0.34	0.90	343.61	343.66	343.81	343.89		344.20	343.64	0.08		0.39	-0.17
DP 2 Out	344.54	346.12	-	-0.15	-0.13	-0.14	-0.27		-0.16		344.69	344.67	344.69	344.81		344.70		0.13		0.01	
DP 2S In	344.54	345.98	-			-0.21	-0.14		-0.18				344.75	344.68		344.73		-0.07		-0.02	
DP 2S Out	344.54	345.98	-		-0.14	-0.19	-0.23		-0.13			344.68	344.73	344.77		344.67		0.05		-0.06	

- Notes:
- 1) All Elevations Referenced to Geodetic Survey by CVD
 - 2) **Bolded** elevations represent the maximum water table aquifer elvation at each monitoring well, measured throughout all seasons.
 - 3) Negative water level indicates that water level is above ground
 - 4) : Monitoring well/piezometer dry
 - 5) Negative fluctuation indicates drop in water level relative to baseline

ENCLOSURES



Soil Abbreviations and Terms Used on Record of Borehole Sheets

TERMINOLOGY DESCRIBING COMMON SOIL TYPES:

Topsoil	-	mixture of soil and humus capable of supporting vegetation
Peat	-	mixture of visible and invisible fragments of decayed organic matter
Till	-	unstratified glacial deposit which may range from clay to boulders
Fill	-	soil materials identified as being placed anthropologically

CLASSIFICATION (UNIFIED SYSTEM)

Clay	<0.002mm
Silt	0.002 to .075mm
Sand	0.075 to 4.75mm
	Fine 0.075 to 0.425 mm
	Medium 0.425 to 2.0 mm
	Coarse 2.0 to 4.75 mm
Gravel	4.75 to 75mm
	Fine 4.75 to 19 mm
	Coarse 19 to 75 mm
Cobbles	75 to 300mm
Boulders	>300mm

TERMINOLOGY

Soil Composition	% by Weight
"traces"	<10%
"some"(eg. some silt)	10-20%
Adjective (eg. sandy)	20-35%
"and"(eg. sand and gravel)	35-50%

Standard Penetration Resistance (SPT): Standard Penetration Resistance ('N' Values) refers to the number of blows required to advance a standard (ASTM D1586) 51 mm Ø (2 inch) split-spoon sampler by the use of a free falling, 63.5 Kg (140lbs) hammer. The number of blows from the drop weight is recorded for every 15 cm (6 inches). The hammer is dropped from a distance of 0.76m (30 inches) providing 474.5 Joules per blow. When the sampler is driven a total of 45 cm (18 inches) into the soil, the standard penetration index ('N' Value) is the total number of blows for the last 30 cm (12 inches).

Dynamic Cone Penetration Resistance (DCPT): Dynamic Cone Penetration Resistance is similar to a SPT with the 474.5 Joule/blow impulse provided by the free falling hammer where the split-spoon sampler is replaced by a 51 mm Ø, 60° conical point and the number of blows is recorded continuously for every 30 cm (12 inches).

COHESIVE SOILS CONSISTENCY

	(kPa)	(P.S.F.)	Nominal 'N' Value
Very Soft	<12	<250	0-2
Soft	12-25	250-500	2-4
Firm	25-50	500-1000	4-8
Stiff	50-100	1000-2000	8-15
Very Stiff	100-200	2000-4000	15-30
Hard	>200	>4000	>30

RELATIVE DENSITY OF COHESIONLESS SOIL

	'N' Value
Very Loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

MOISTURE CONDITIONS:

Cohesive Soil
DTPL- Drier than plastic limit
APL- About plastic limit
WTPL- Wetter than plastic limit
MWTPL- Much wetter than plastic limit

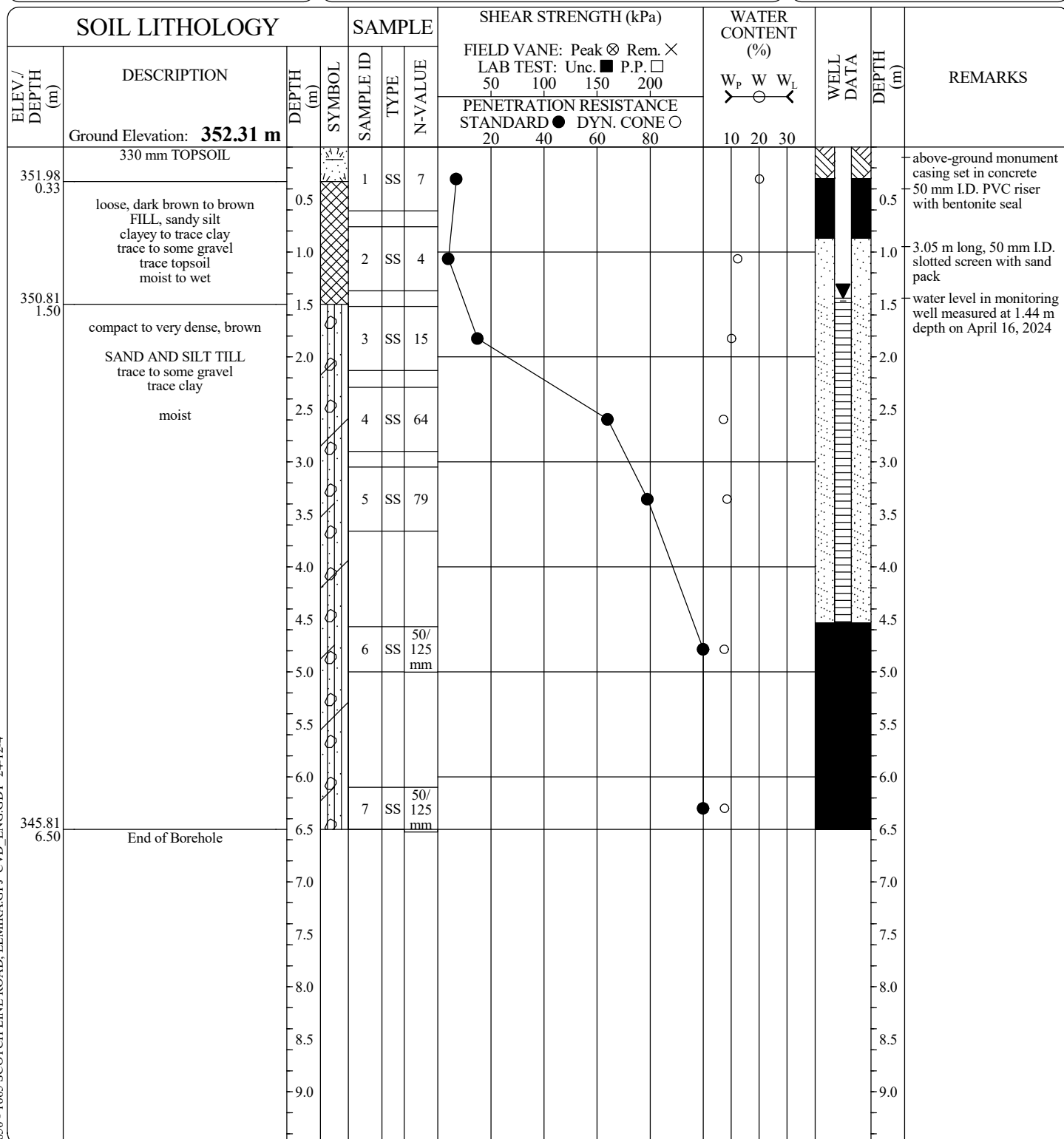
Cohesionless Soil
Damp
Moist
Wet
Saturated

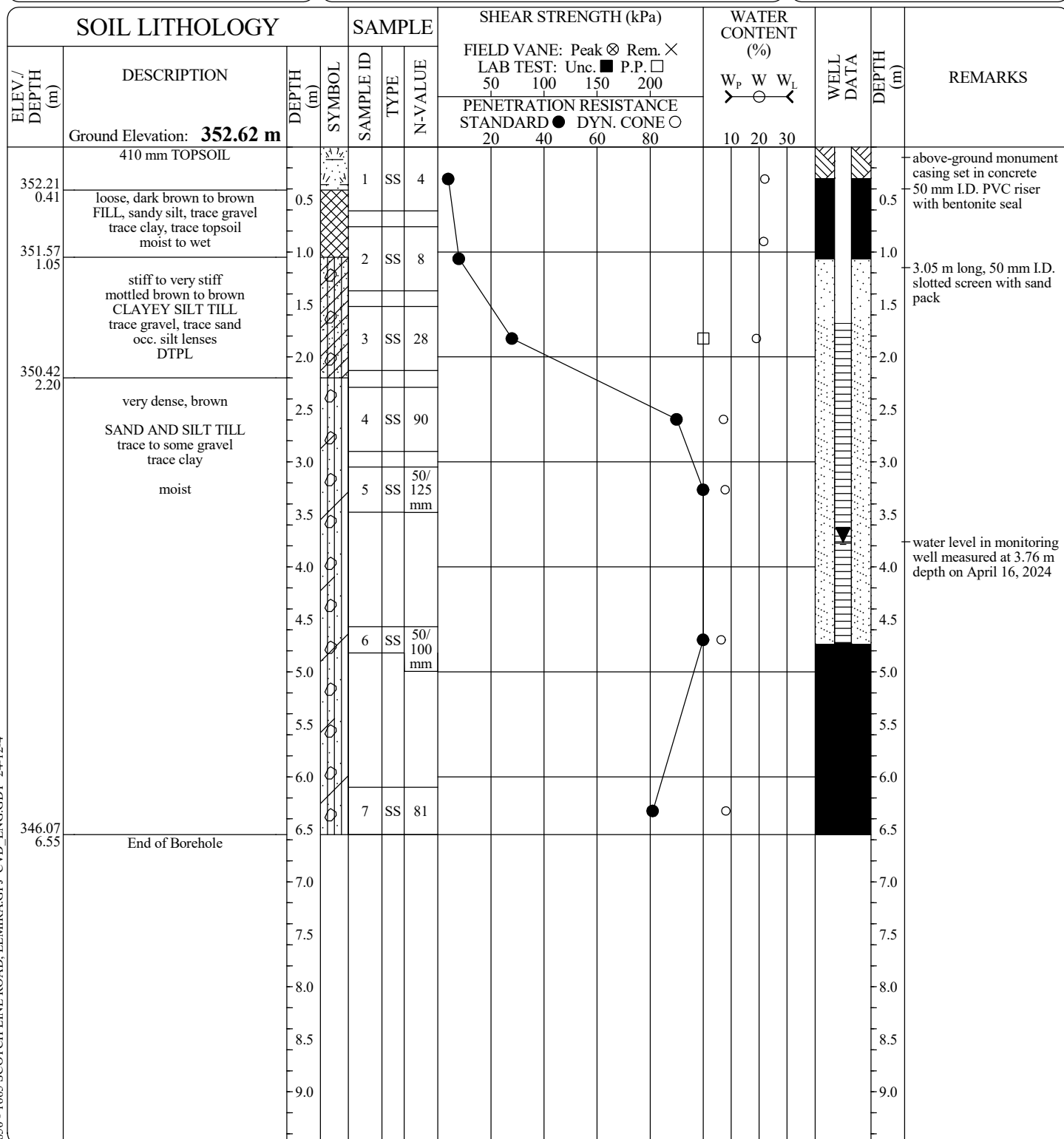
SAMPLE TYPES AND ADDITIONAL FIELD TESTS

SS	Split Spoon Sample (obtained from SPT)	GS	Grab Sample	PP	Pocket Penetrometer
AS	Auger Sample	BS	Bulk Sample	VANE	Peak & Remolded shear
		TW	Thin Wall Sample or Shelby Tube	DMT	Flat Plate Dilatometer

LABORATORY TESTS

SG	Specific Gravity	S	Sieve Analysis	W	Water Content
H	Hydrometer	P	Field Permeability	K	Lab Permeability
W_p	Plastic Limit	W_l	Liquid Limit	I_p	Plasticity Index
GSA	Grain Size Analysis	C	Consolidation	UNC	Unconfined compression

FILE No: 1650**BOREHOLE No. 1**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 1650**BOREHOLE No. 2**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

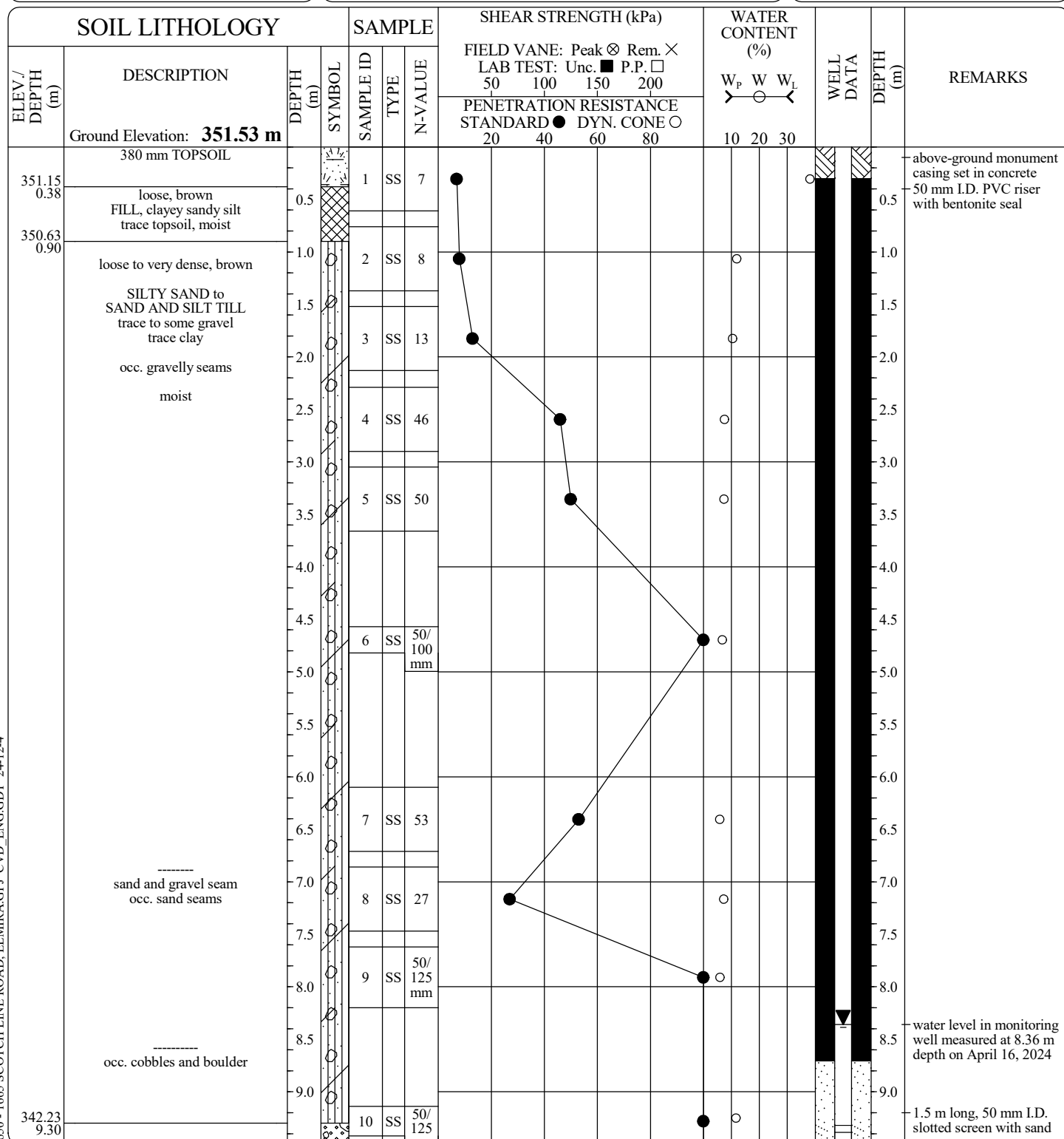
FILE No: 1650**BOREHOLE No. 3**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 26 - 24 TO Mar 26 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □				PENETRATION RESISTANCE					
											STANDARD ● DYN. CONE ○					
Ground Elevation: 350.21 m							20	40	60	80	10	20	30			
349.91 0.30	300 mm TOPSOIL			1	SS	6	●						○			above-ground monument casing set in concrete water level in monitoring well measured at 0.34 m depth on April 16, 2024 50 mm I.D. PVC riser with bentonite seal
349.46 0.75	loose, brown FILL, sand and silt trace gravel, trace topsoil	0.5														
	very stiff to hard mottled brown to brown	1.0		2	SS	18	●				■	○				
	CLAYEY SILT TILL some sand to sandy trace gravel occ. sand lenses occ. cobbles	1.5														
	DTPL	2.0		3	SS	18	●				■	○				
	trace to some sand occ. silt lenses	2.5		4	SS	18	●				■	○				
		3.0														3.05 m long, 50 mm I.D. slotted screen with sand pack
		3.5		5	SS	19	●				■	○				
		4.0														
		4.5														
	some sand to sandy	5.0		6	SS	33	●				■	○				
345.01 5.20	End of Borehole															
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
		9.0														

PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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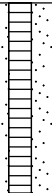
FILE No: 1650**BOREHOLE No. 4D**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**

Machine: **CME-55 Track**
 Method: **Hollow Stem Augers**
 Size: **108 mm I.D.**
 Date: **Mar 28 - 24 TO Mar 28 - 24**

PROJECT MANAGER: **EYC**
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 ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 1650**BOREHOLE No. 4D**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Hollow Stem Augers**Size: **108 mm I.D.**Date: **Mar 28 - 24 TO Mar 28 - 24**

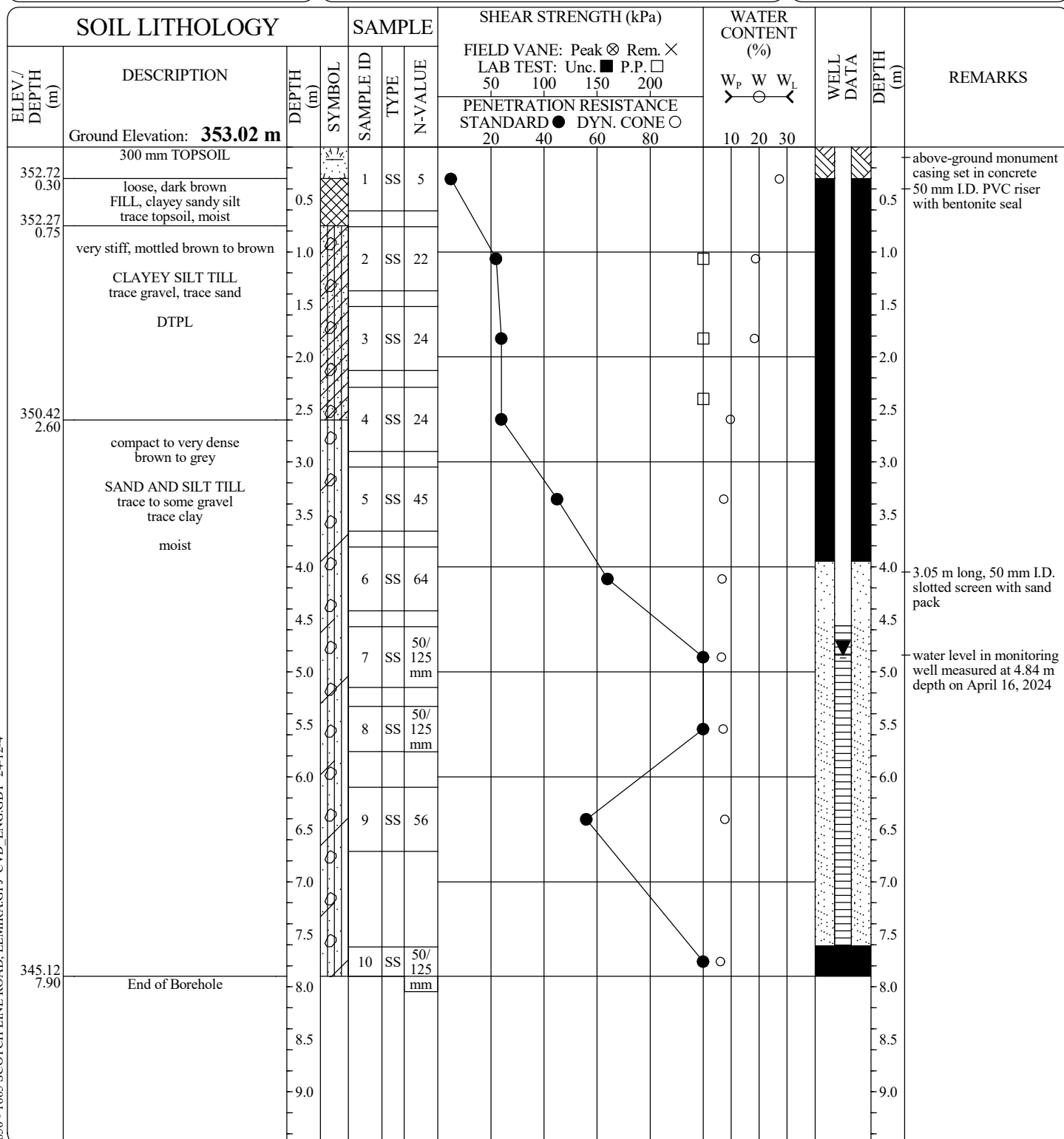
SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _P W W _L ↗ ○ ↖						
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30						
341.33 10.20	very dense, brown GRAVELLY SILTY SAND saturated	10.0				mm										10.0	pack
	very dense, grey to brown SANDY SILT TILL to SAND AND SILT TILL trace to some gravel occ. sand lenses moist	10.5															
		11.0		11	SS	50/ 100 mm						●	○			11.0	
		11.5														11.5	
339.08 12.45		12.0														12.0	
		12.5		12	SS	50/ 125 mm						●	○			12.5	
	End of Borehole	12.5															
		13.0														13.0	
		13.5														13.5	
		14.0														14.0	
		14.5														14.5	
		15.0														15.0	
		15.5														15.5	
		16.0														16.0	
		16.5														16.5	
		17.0														17.0	
		17.5														17.5	
		18.0														18.0	
		18.5														18.5	

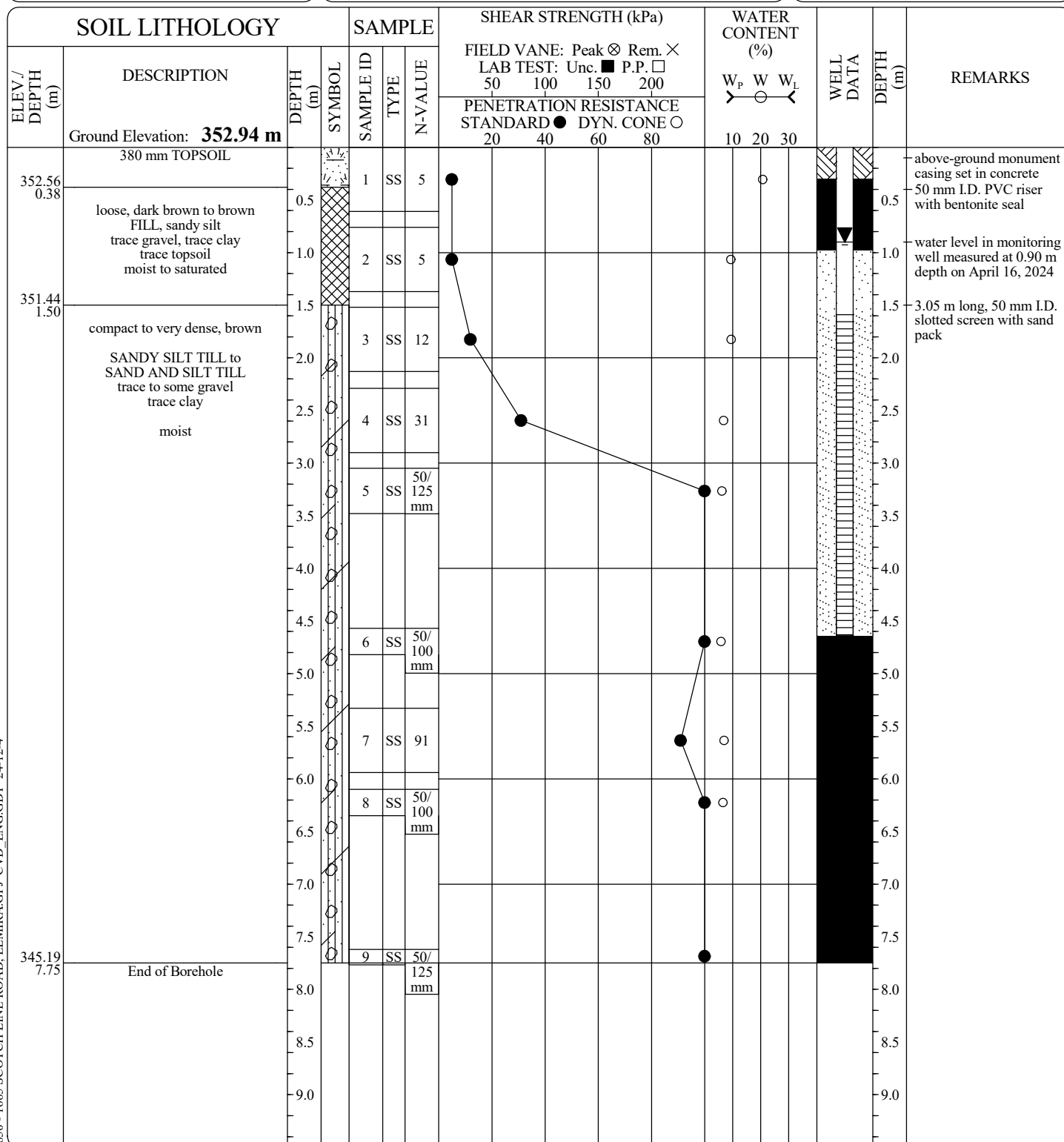
PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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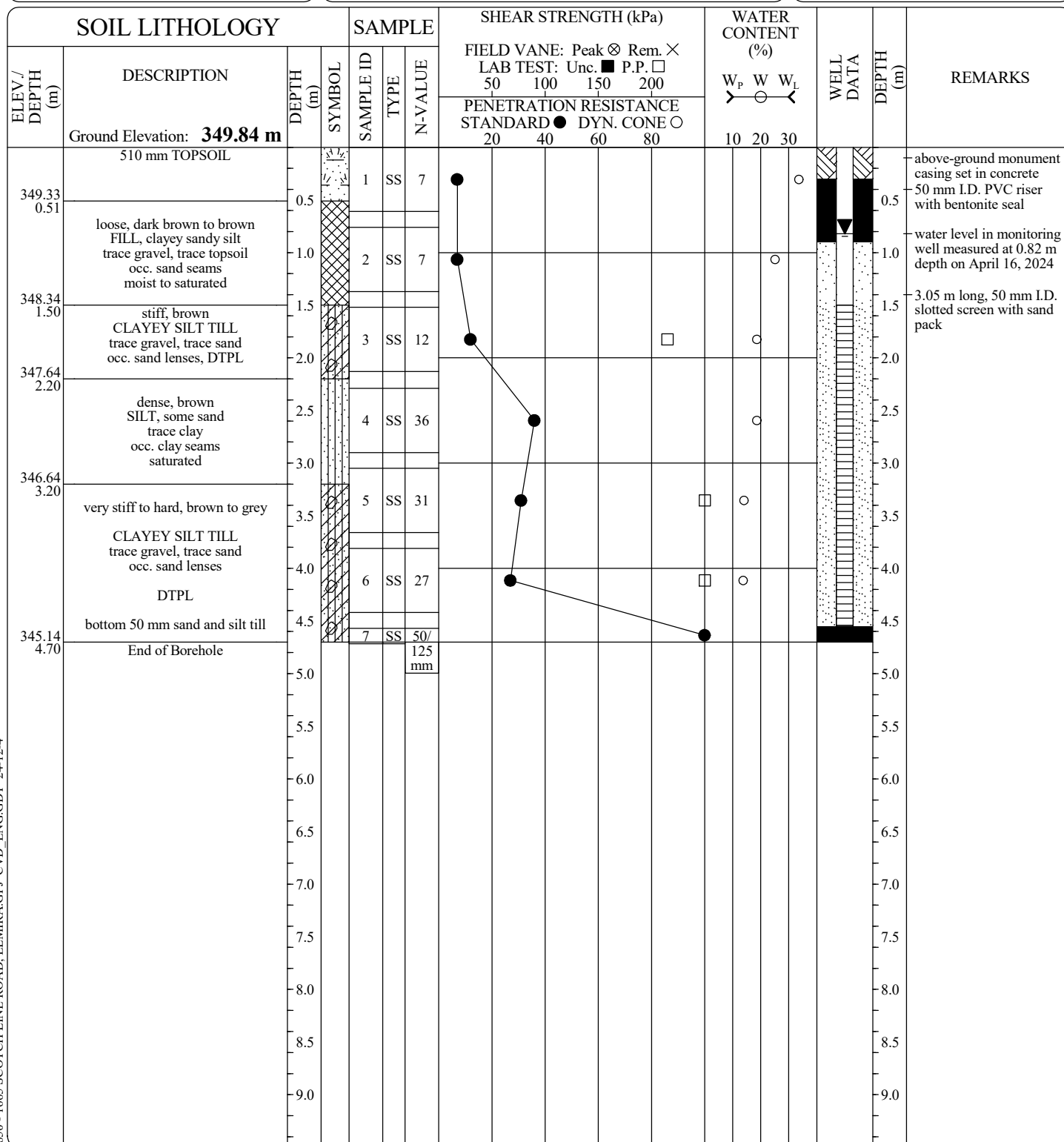
FILE No: 1650**BOREHOLE No. 4S**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 28 - 24 TO Mar 28 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
346.94 4.50	Refer to Borehole No. 4D for soil descriptions and characteristics	0.5														above-ground monument casing set in concrete
		1.0														50 mm I.D. PVC riser with bentonite seal
		1.5														3.05 m long, 50 mm I.D. slotted screen with sand pack
		2.0														
		2.5														
		3.0														water level in monitoring well measured at 2.63 m depth on April 16, 2024
		3.5														
		4.0														
	4.5	End of Borehole														
	5.0															
	5.5															
	6.0															
	6.5															
	7.0															
	7.5															
	8.0															
	8.5															
	9.0															

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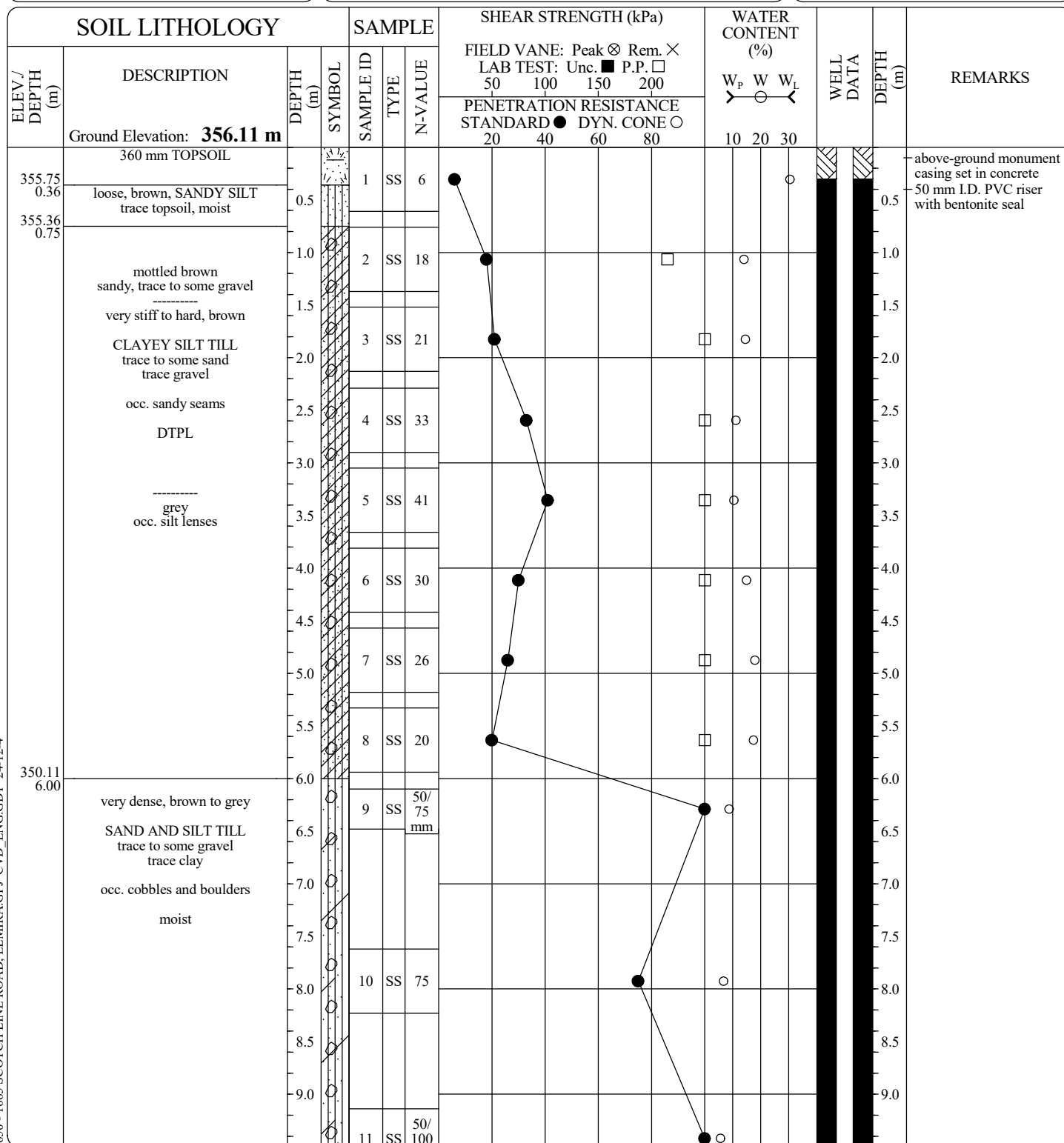
FILE No: 1650**BOREHOLE No. 5**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 28 - 24 TO Mar 28 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: 1650**BOREHOLE No. 6**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 28 - 24 TO Mar 28 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 1650**BOREHOLE No. 7**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 26 - 24 TO Mar 26 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 1650**BOREHOLE No. 8D**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**

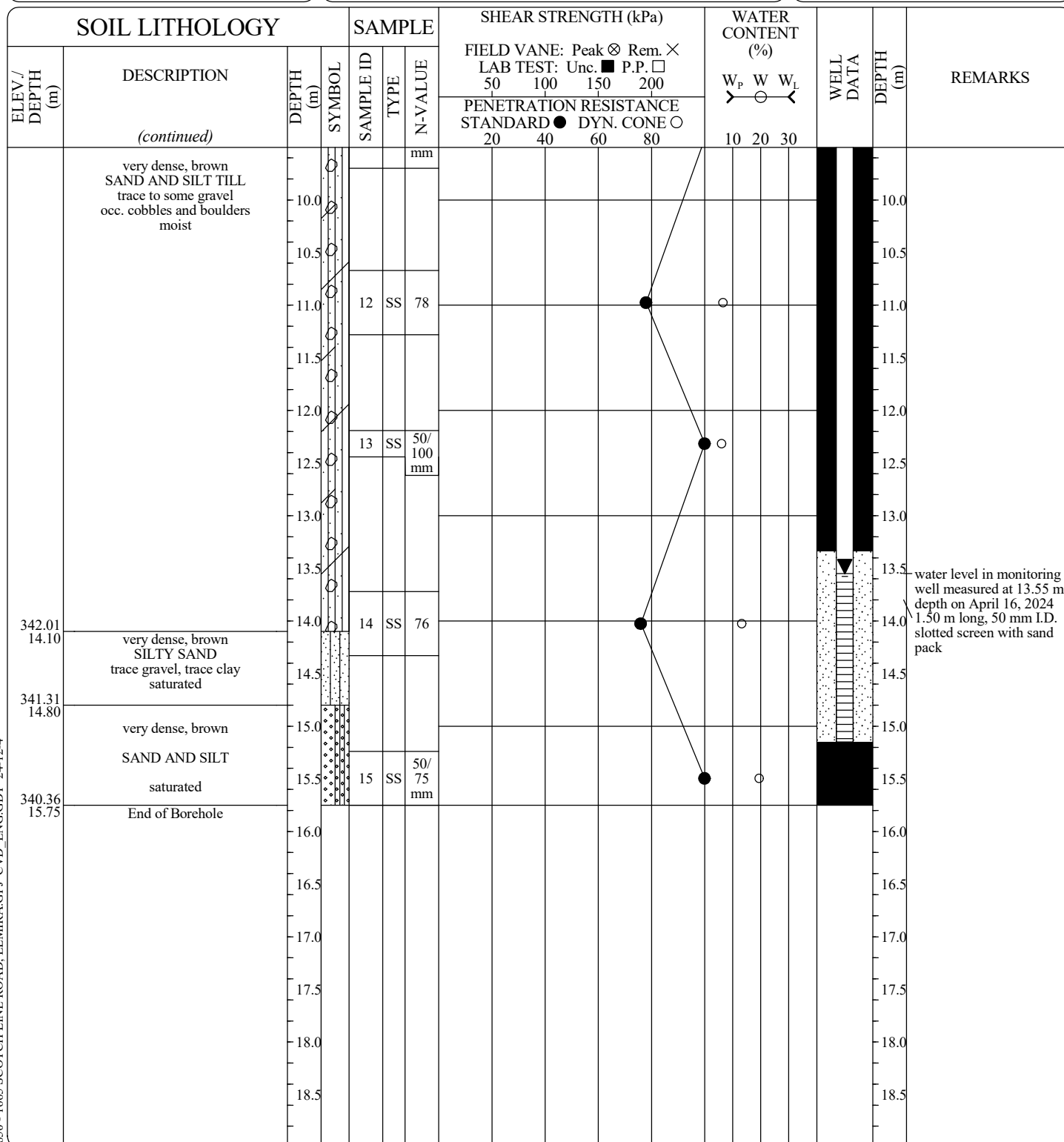
Machine: **CME-55 Track**
 Method: **Hollow Stem Augers**
 Size: **108 mm I.D.**
 Date: **Mar 27 - 24 TO Mar 27 - 24**



CVD BOREHOLE (2017) 1650 - 1665 SCOTCH LINE ROAD, ELMIRA.GPJ CVD_ENGG.DAT 24-12-4

PROJECT MANAGER: **EYC**
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ENGINEERING LTD.**

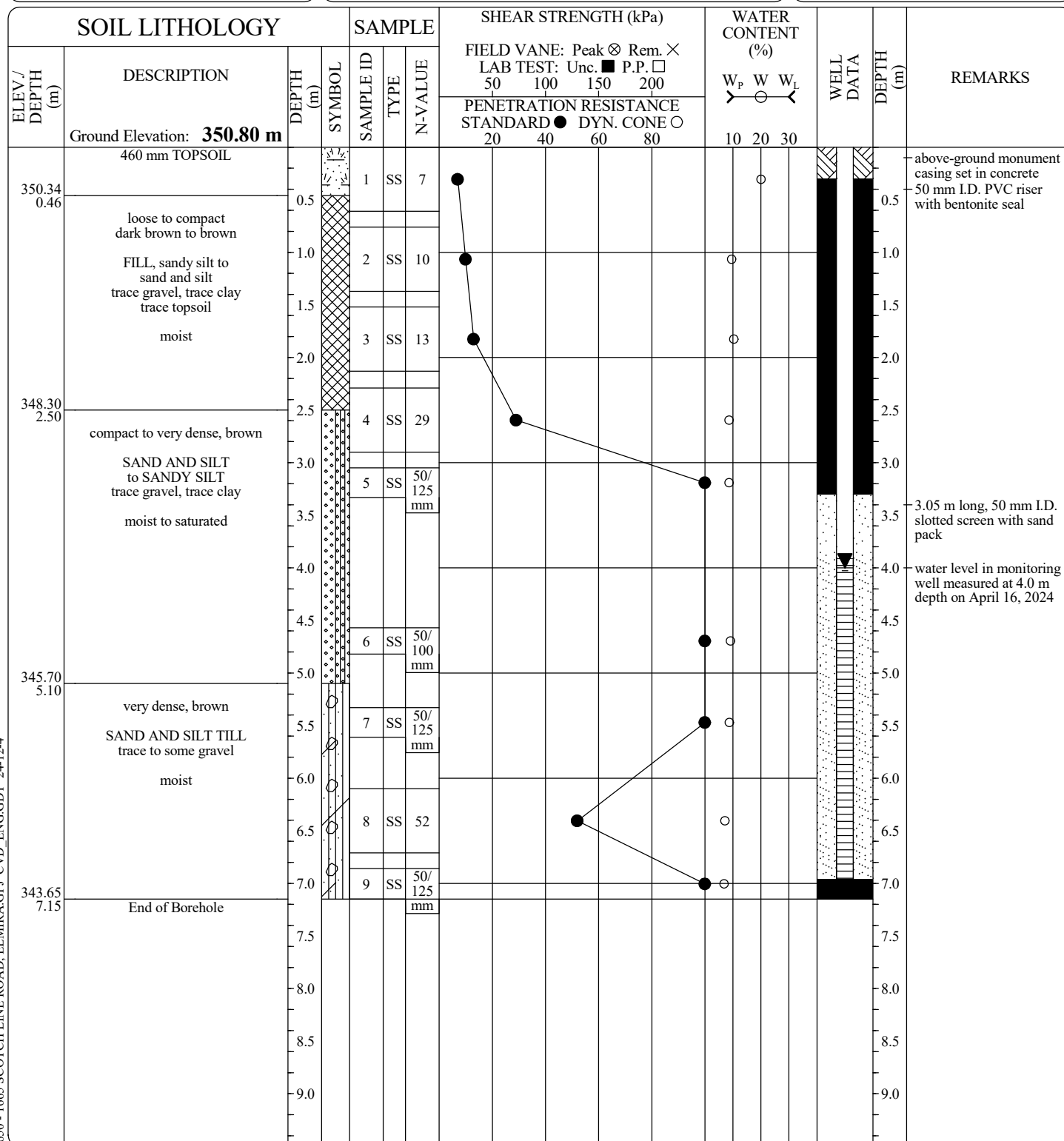
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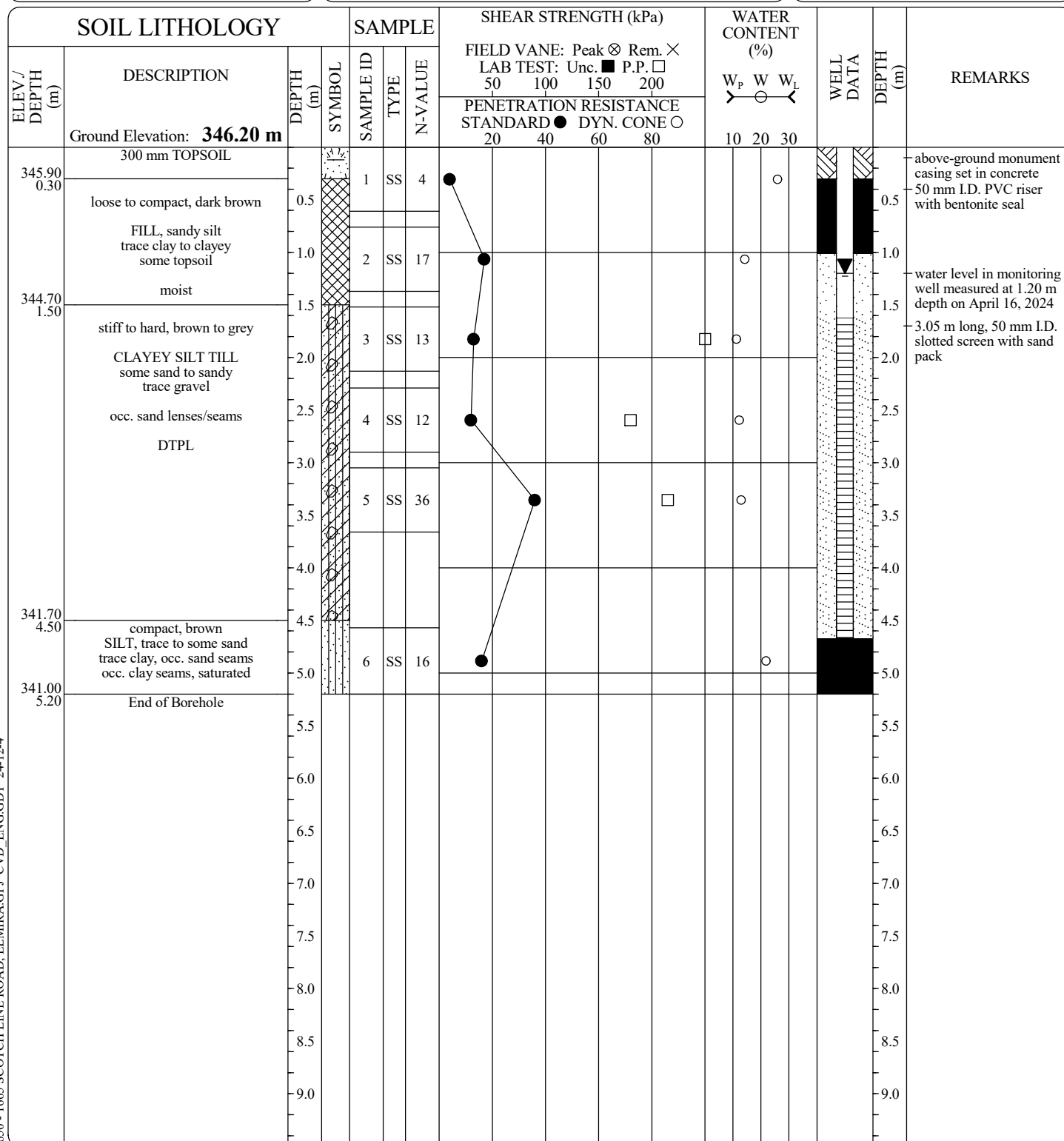
FILE No: 1650**BOREHOLE No. 8D**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Hollow Stem Augers**Size: **108 mm I.D.**Date: **Mar 27 - 24 TO Mar 27 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
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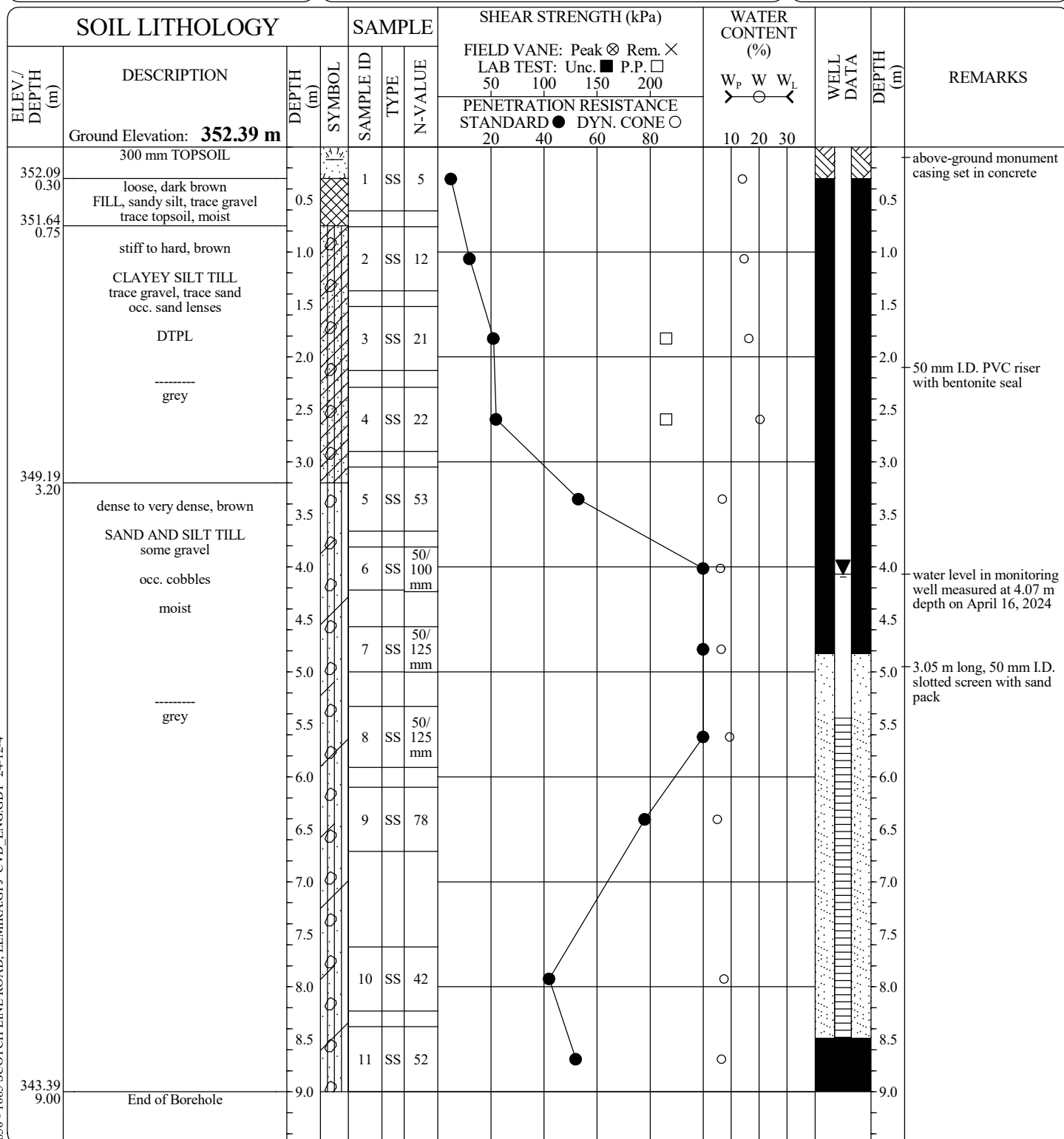
FILE No: 1650**BOREHOLE No. 8S**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 27 - 24 TO Mar 27 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. ×				LAB TEST: Unc. ■ P.P. □					
							50 100 150 200				PENETRATION RESISTANCE					
							STANDARD ● DYN. CONE ○				20 40 60 80					
Ground Elevation: 356.10 m							W _p W W _L				10 20 30					
350.75 5.35	Refer to Borehole No. 8D for soil descriptions and characteristics	0.5														above-ground monument casing set in concrete 50 mm I.D. PVC riser with bentonite seal
		1.0														
		1.5														
		2.0														3.05 m long, 50 mm I.D. slotted screen with sand pack
		2.5														
		3.0														
		3.5														
		4.0														
		4.5														
		5.0														water level in monitoring well measured at 5.15 m depth on April 16, 2024
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
	9.0															
End of Borehole		5.5														

PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: 1650**BOREHOLE No. 9**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 26 - 24 TO Mar 26 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
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ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 1650**BOREHOLE No. 10**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
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ph. (519) 742-8979, fx. (519) 742-7739

FILE No: 1650**BOREHOLE No. 11**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 27 - 24 TO Mar 27 - 24**PROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
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FILE No: 1650**BOREHOLE No. 12**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80					
Ground Elevation: 346.47 m																
346.14 0.33	330 mm TOPSOIL															above-ground monument casing set in concrete 50 mm I.D. PVC riser with bentonite seal water level in monitoring well measured at 0.67 m depth on April 16, 2024
	loose to compact dark brown to mottled brown FILL, sandy silt trace to some gravel trace clay, trace topsoil moist	0.5		1	SS	5										
345.27 1.20		1.0		2	SS	10										3.05 m long, 50 mm I.D. slotted screen with sand pack
	stiff to very stiff, brown	1.5														
	CLAYEY SILT TILL some sand to sandy trace gravel	2.0		3	SS	14										
	DTPL	2.5		4	SS	16										
		3.0														
	----- grey	3.5		5	SS	24										
		4.0														
	----- freq. sandy silt seams	4.5														
		5.0		6	SS	15										
341.27 5.20	End of Borehole															
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
		9.0														

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FILE No: 1650**BOREHOLE No. 13**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80					W _p W W _L ↗ — ○ — ↖ 10 20 30
Ground Elevation: 345.99 m																
345.69 0.30 345.49 0.50	300 mm TOPSOIL			1	SS	9	●						○			water level at 0.9 m depth upon withdrawal of drilling augers
	loose, brown, FILL sandy silt, trace topsoil, moist	0.5														
	loose to compact, brown															
	SANDY SILT to some sand trace gravel, trace clay	1.0		2	SS	10	●						○			
	occ. silt seams occ. clay lenses/seams	1.5														
	wet to saturated	2.0		3	SS	9	●						○			
343.59 2.40	loose, brown SAND AND GRAVEL trace silt, saturated	2.5		4	SS	9	●						○			borehole open to 3.65 m depth upon withdrawal of drilling augers
343.04 2.95	very stiff, grey CLAYEY SANDY SILT TILL trace gravel, occ. silt seams DTPL	3.0														
342.34 3.65	End of Borehole	3.5		5	SS	19	●					□	○			
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
		9.0														

water level at 0.9 m depth
upon withdrawal of
drilling augersborehole open to 3.65 m
depth upon withdrawal of
drilling augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: 1650**BOREHOLE No. 14**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _P W W _L ↗ ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80									
											10 20 30					
	Ground Elevation: 350.16 m															
	360 mm TOPSOIL															
349.80 0.36	loose, dark brown, FILL sandy silt, trace gravel, trace clay occ. sand lenses, moist	0.5		1	SS	6	●							○		
349.41 0.75																
		1.0		2	SS	7	●							○		
		1.5														
		2.0		3	SS	8	●							○		
	loose, brown Fine SAND some silt moist	2.5		4	SS	5	●							○		
		3.0														
		3.5		5	SS	9	●							○		
346.51 3.65	End of Borehole															borehole open and dry to 3.65 m depth upon withdrawal of drilling augers
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
		9.0														

borehole open and dry to
3.65 m depth upon
withdrawal of drilling
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: 1650**BOREHOLE No. 15**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				WATER CONTENT (%) W _p W W _L					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
Ground Elevation: 352.24 m																
351.73 0.51 351.04 1.20 350.04 2.20 348.74 3.50	510 mm TOPSOIL	0.5		1	SS	6	●							○		borehole open and dry to 3.5 m depth upon withdrawal of drilling augers
	loose, brown FILL, clayey sandy silt trace gravel, trace clay moist to wet	1.0		2	SS	7	●							○		
	firm to very stiff, brown CLAYEY SILT TILL trace gravel, trace sand occ. silt lenses DTPL	1.5		3	SS	16						□				
	very dense, brown SAND AND SILT TILL some gravel	2.5		4	SS	50								○		
	moist	3.0		5	SS	50/125 mm								○		
	End of Borehole	3.5														
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
		9.0														

borehole open and dry to
3.5 m depth upon
withdrawal of drilling
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: 1650**BOREHOLE No. 16**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Apr 01 - 24 TO Apr 01 - 24**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ ⊙ ↖					
Ground Elevation: 353.36 m							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
	410 mm TOPSOIL															
352.95 0.41	loose, dark brown, FILL sandy silt, trace gravel trace clay, moist	0.5		1	SS	6	●							○	water level at 0.3 m depth upon withdrawal of drilling augers	
352.61 0.75																
	loose, brown SANDY SILT trace clay saturated	1.0		2	SS	7	●							○		
351.91 1.45	stiff, brown CLAYEY SILT trace gravel, trace sand occ. sand lenses DTPL to APL	1.5														
		2.0			3	SS	8	●							○	
		2.5														
		2.5		4	SS	11	●							○		
350.41 2.95	compact, brown SANDY SILT occ. clay seams, saturated	3.0														
		3.5			5	SS	21	●							○	
349.71 3.65	End of Borehole	3.5													borehole open to 3.65 m depth upon withdrawal of drilling augers	
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
		9.0														

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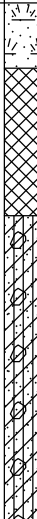
FILE No: 1650**BOREHOLE No. 17**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 26 - 24 TO Mar 26 - 24**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↔ — ○ — ↔					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
Ground Elevation: 350.61 m																
350.15 0.46	460 mm TOPSOIL	0.5		1	SS	6	●						○		borehole cave-in and water level at 1.5 m depth upon withdrawal of drilling augers	
	loose to compact, dark brown FILL, silty sand to sand and silt trace gravel occ. brick fragments moist	1.0		2	SS	13	●						○			
349.11 1.50	compact to dense FILL, sand and gravel some silt to silty trace topsoil occ. cobbles wet to saturated	1.5		3	SS	24	●						○			
		2.0														
347.66 2.95	hard, brown to grey CLAYEY SILT TILL some sand, trace gravel, DTPL	2.5		4	SS	32	●						○			
		3.0														
346.96 3.65	End of Borehole	3.5		5	SS	37	●						□	○		
		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5														
		7.0														
		7.5														
		8.0														
		8.5														
		9.0														

borehole cave-in and water level at 1.5 m depth upon withdrawal of drilling augers

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FILE No: 1650**BOREHOLE No. 18**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 27 - 24 TO Mar 27 - 24**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS		
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ ○ ↖						
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30						
355.08 0.46	460 mm TOPSOIL	0.5 1.0 1.5 2.0 2.5 3.0 3.5		1	SS	5	●									water level at 0.9 m depth upon withdrawal of drilling augers	
354.04 1.50	loose, mottled brown to brown																
	FILL, clayey sandy silt trace topsoil																
	moist																
	stiff to hard, brown																
	CLAYEY SILT TILL trace to some sand trace gravel																
351.89 3.65	DTPL																
351.89 3.65	End of Borehole															borehole open to 3.65 m depth upon withdrawal of drilling augers	

water level at 0.9 m depth
upon withdrawal of
drilling augersborehole open to 3.65 m
depth upon withdrawal of
drilling augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: 1650**BOREHOLE No. 19**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 26 - 24 TO Mar 26 - 24**

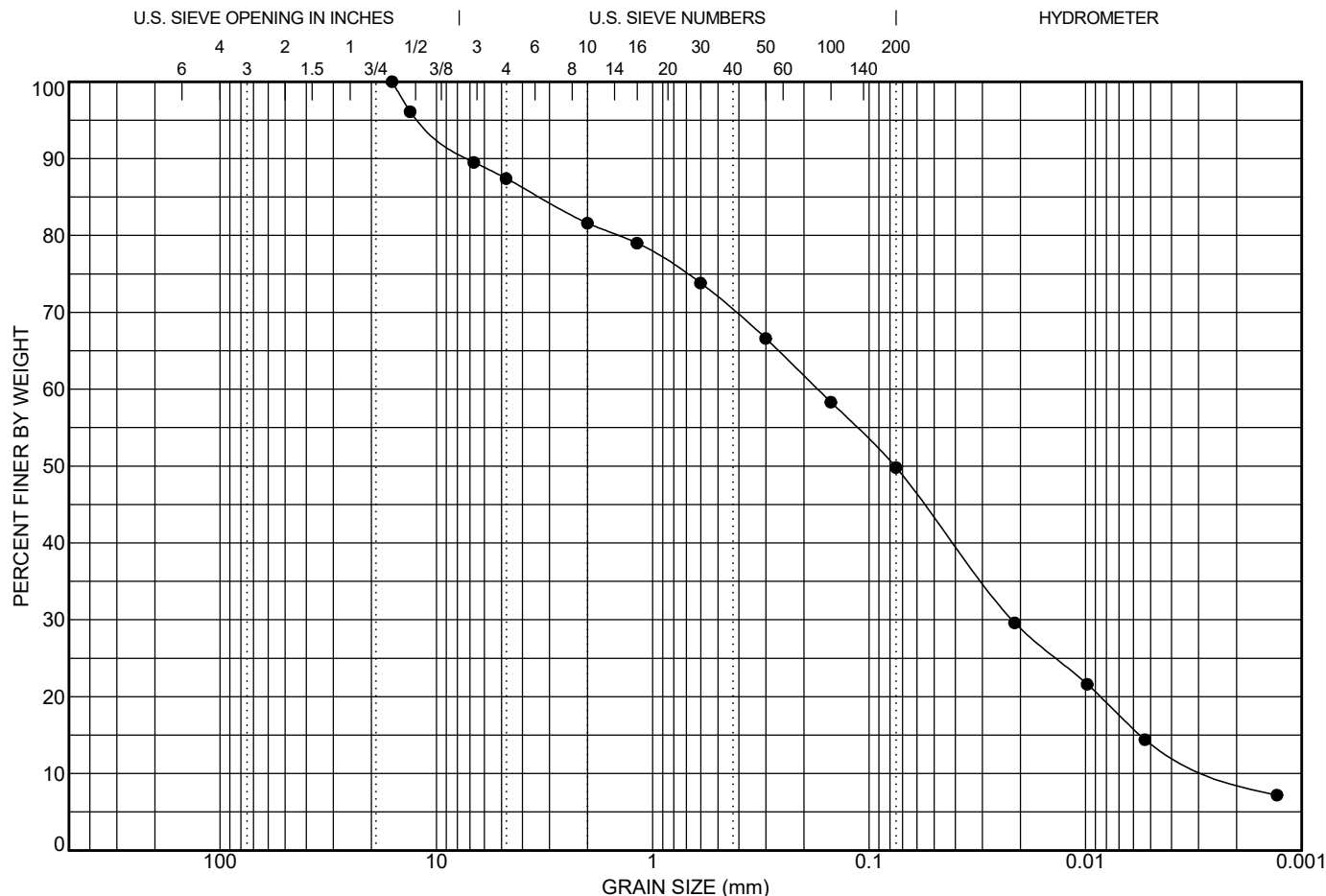
SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _P W W _L ↗ ○ ↖						
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80										
											10 20 30						
Ground Elevation: 354.83 m																	
	380 mm TOPSOIL																
354.45 0.38	loose, dark brown, FILL, sandy silt, trace gravel trace topsoil, moist sandy stiff to hard, brown CLAYEY SILT TILL trace to some gravel trace to some sand occ. silt lenses DTPL	0.5		1	SS	6	●							○			
354.08 0.75																	
		1.0		2	SS	10	●								○		
		1.5															
		2.0		3	SS	15	●								○		
		2.5															
		2.5		4	SS	38							■		○		
		3.0															
351.53 3.30	very dense, brown SAND AND SILT TILL some gravel, moist	3.5		5	SS	53								○			
351.18 3.65																	
	End of Borehole																
		4.0														borehole open and dry to 3.65 m depth upon withdrawal of drilling augers	
		4.5															
		5.0															
		5.5															
		6.0															
		6.5															
		7.0															
		7.5															
		8.0															
		8.5															
		9.0															

borehole open and dry to
3.65 m depth upon
withdrawal of drilling
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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FILE No: 1650**BOREHOLE No. 20**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 26 - 24 TO Mar 26 - 24**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ — ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
Ground Elevation: 353.56 m																
353.18 0.38	380 mm TOPSOIL			1	SS	5	●									
352.81 0.75	loose, dark brown, FILL sandy silt, trace gravel trace topsoil, moist	0.5											○		0.5	
	loose, brown FILL, clayey silt some sand, trace gravel moist	1.0		2	SS	9	●							○	1.0	
351.86 1.70	loose, very dense, brown SAND AND SILT TILL trace to some gravel trace clay moist	1.5													1.5	
		2.0		3	SS	4	●							○	2.0	water level at 1.85 m depth upon withdrawal of drilling augers
		2.5													2.5	
		3.0													3.0	
350.06 3.50	End of Borehole	3.5		5	SS	50/ 125 mm								○	3.5	borehole open to 3.5 m depth upon withdrawal of drilling augers
		4.0													4.0	
		4.5													4.5	
		5.0													5.0	
		5.5													5.5	
		6.0													6.0	
		6.5													6.5	
		7.0													7.0	
		7.5													7.5	
		8.0													8.0	
		8.5													8.5	
		9.0													9.0	

water level at 1.85 m
depth upon withdrawal of
drilling augersborehole open to 3.5 m
depth upon withdrawal of
drilling augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.22	76.99	16	0.173	0.022	0.002	12.6	37.6	49.8	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 1 - SA 3; 1.50 to 2.10 m depth
Sample No.: 1-3
Date Sampled: Apr. 01 - 2024
Sampled By: RS
Lab No.: 442
Date Tested: May. 10 - 2024
Type of Material: Sand and Silt Till, some gravel, trace clay

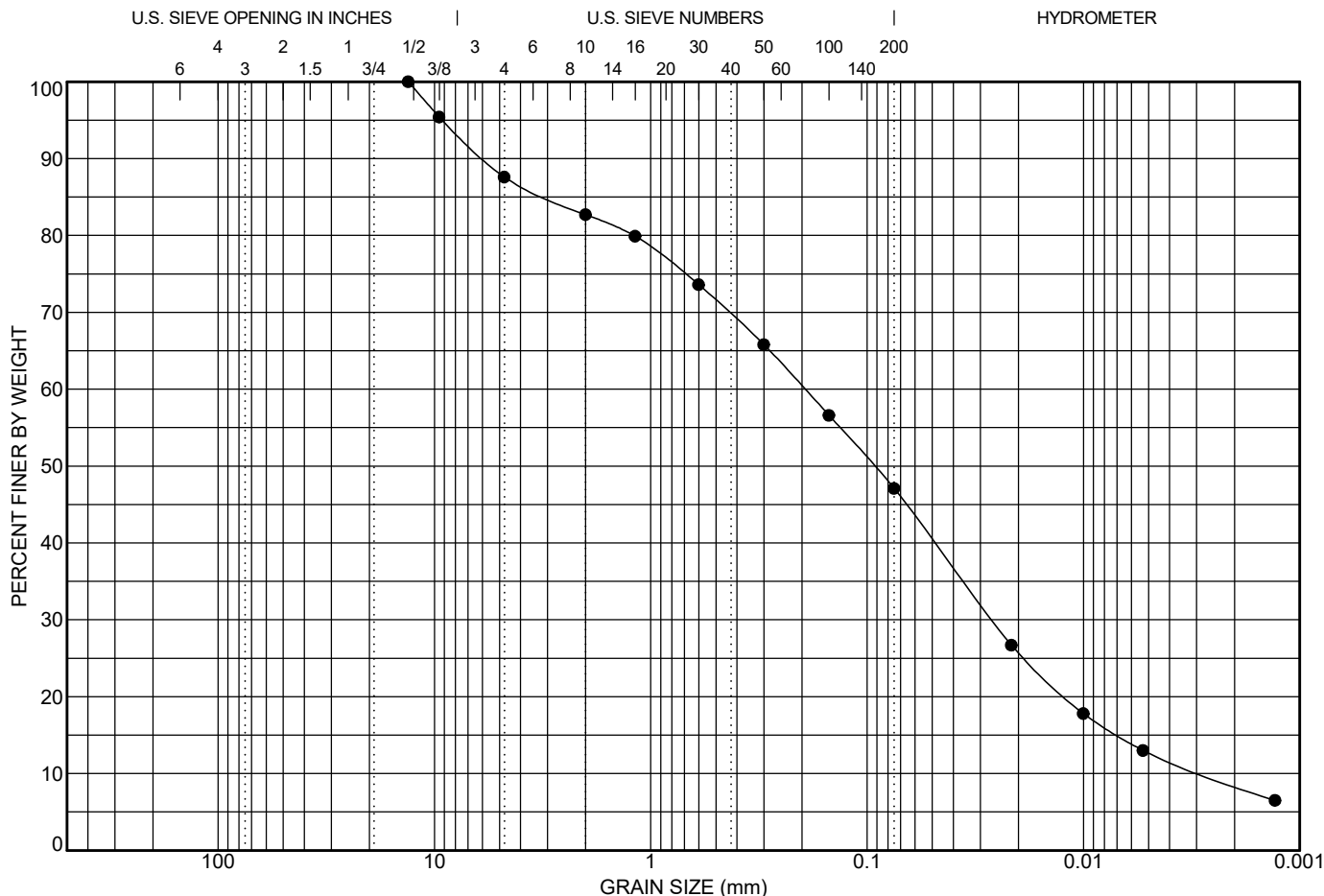
Sieve Size (mm)	Percent Passing	No Specifications



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 Fax: 519-742-7739
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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 24



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.29	69.95	13.2	0.194	0.026	0.003	12.4	40.5	47.1	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 2 - SA 5; 3.05 to 3.50 m depth
Sample No.: 2-5
Date Sampled: Apr. 01 - 2024
Sampled By: RS
Lab No.: 443
Date Tested: May. 10 - 2024
Type of Material: Sand and Silt Till, some gravel, trace clay

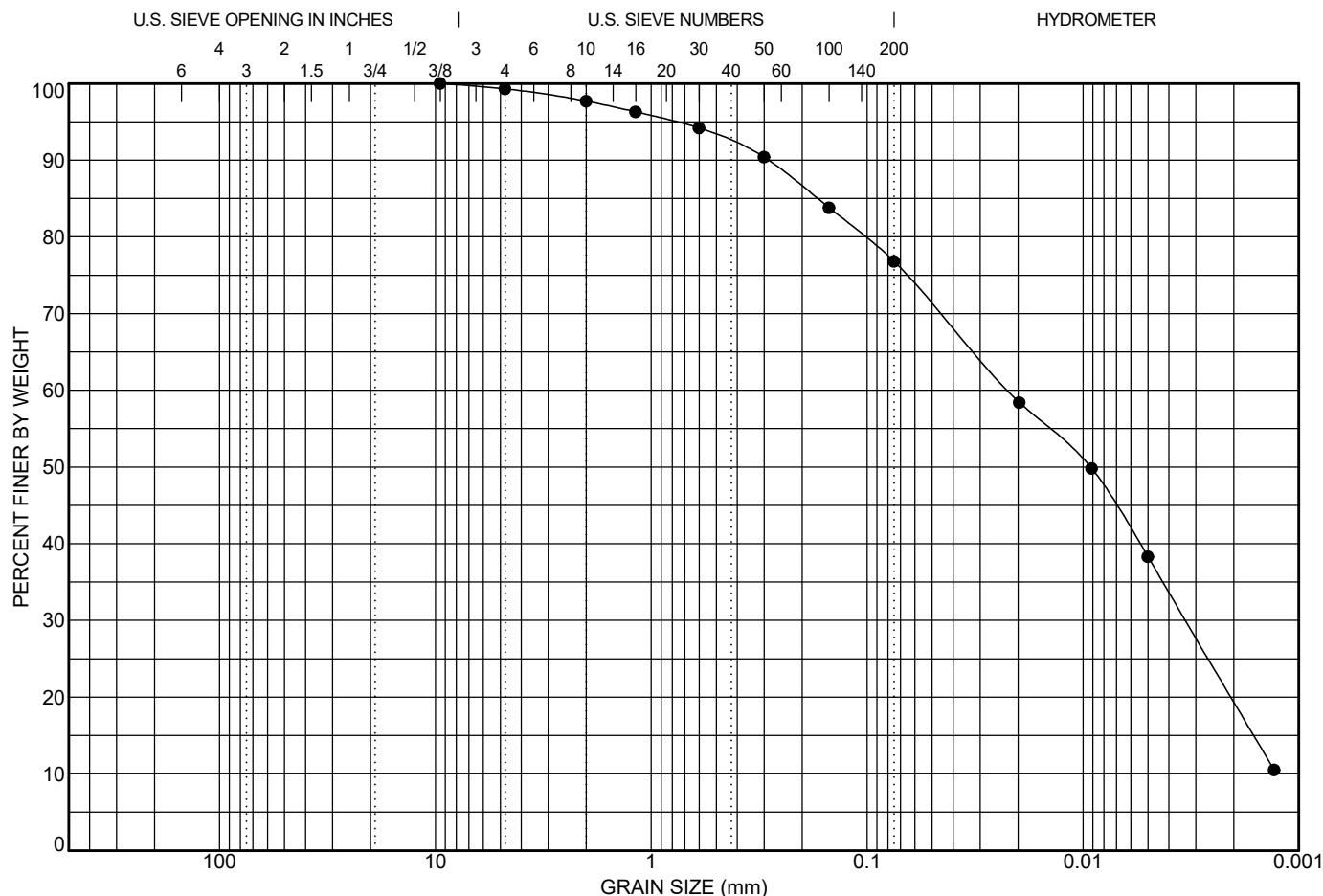
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 25



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					9.5	0.022	0.003		0.7	22.5	76.8	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 3 - SA 4; 2.30 to 2.90 m depth
Sample No.: 3-4
Date Sampled: Mar. 26 - 2024
Sampled By: RS
Lab No.: 444
Date Tested: May. 10 - 2024
Type of Material: Clayey Sandy Silt Till

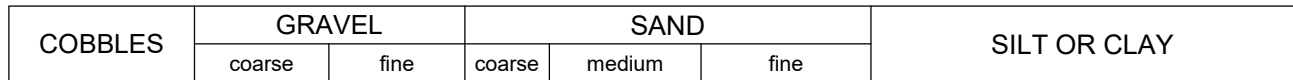
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 26



Date:	May. 10 - 2024	Sieve Size (mm)	Percent Passing	No Specifications
Client:	1000525725 Ontario Inc.			
Contractor:				
Source:				
Sampled From:	BH 4 - SA 5; 3.05 to 3.65 m depth			
Sample No.:	4-5			
Date Sampled:	Mar. 28 - 2024			
Sampled By:	RS			
Lab No.:	445			
Date Tested:	May. 10 - 2024			
Type of Material:	Gravelly Silty Sand Till, trace clay			



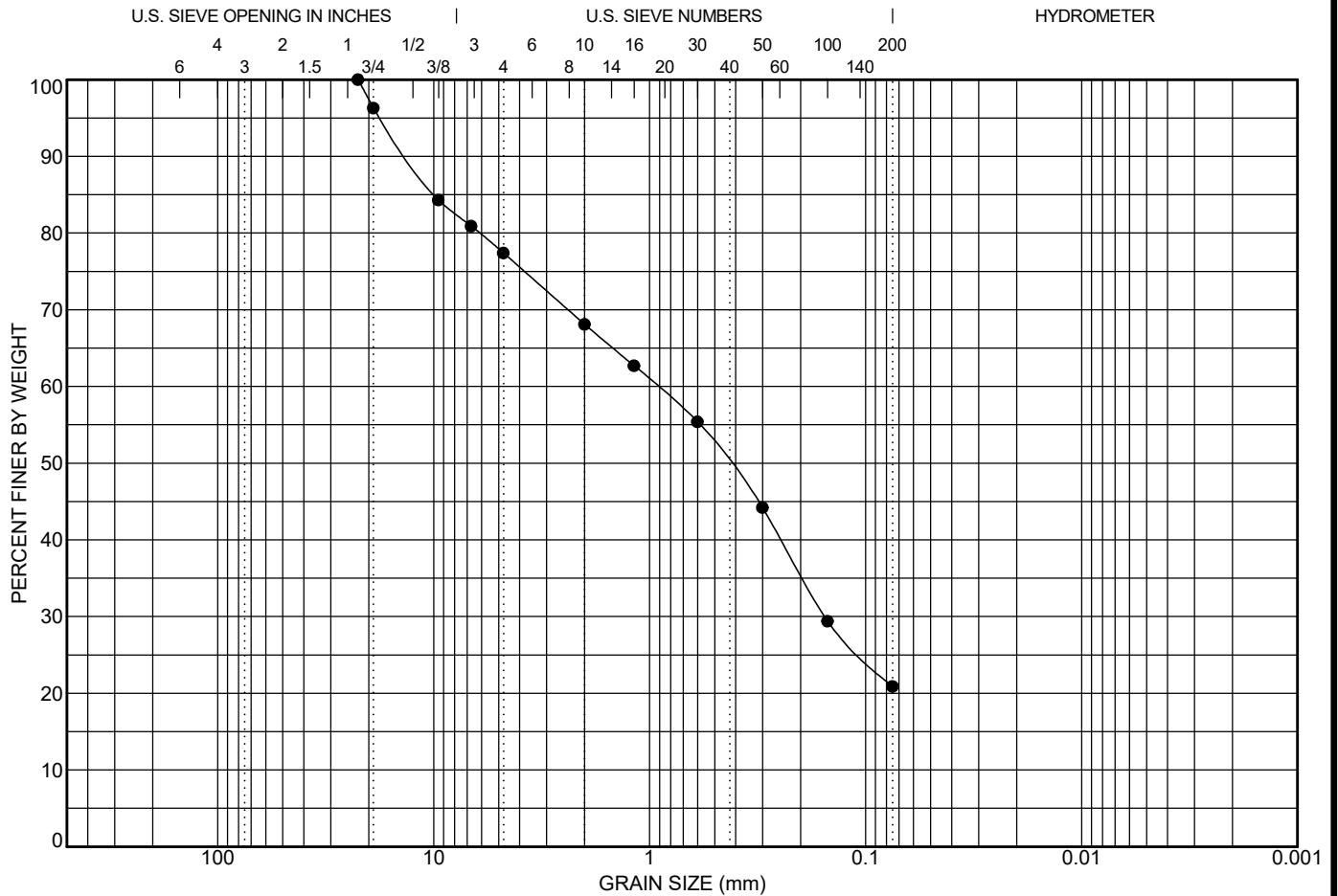
GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision

Location: 1665 Scotch Line Road, Elmira, Ontario

File No.: 1650

Enclosure No.: 27



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					22.4	0.919	0.154		22.6	56.5	20.9	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 4 - SA 10; 9.30 to 9.40 m depth
Sample No.: 4-10
Date Sampled: Mar. 28 - 2024
Sampled By: RS
Lab No.: 446
Date Tested: May. 10 - 2024
Type of Material: Gravelly Silty Sand

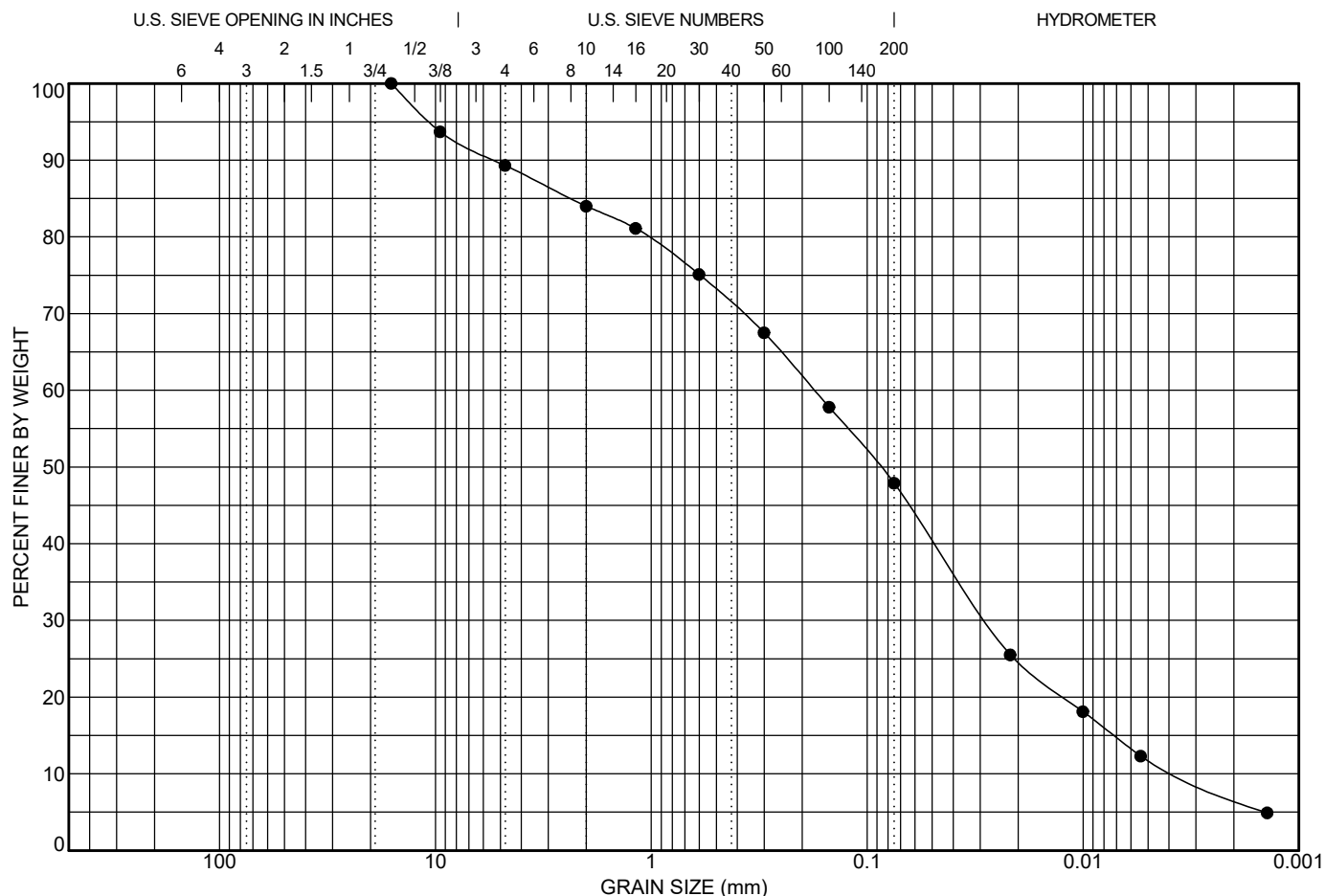
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 28



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.24	49.45	16	0.176	0.028	0.004	10.7	41.4	47.9	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 5 - SA 7; 4.60 to 5.10 m depth
Sample No.: 5-7
Date Sampled: Mar. 28 - 2024
Sampled By: RS
Lab No.: 447
Date Tested: May. 10 - 2024
Type of Material: Sand and Silt Till, some gravel, trace clay

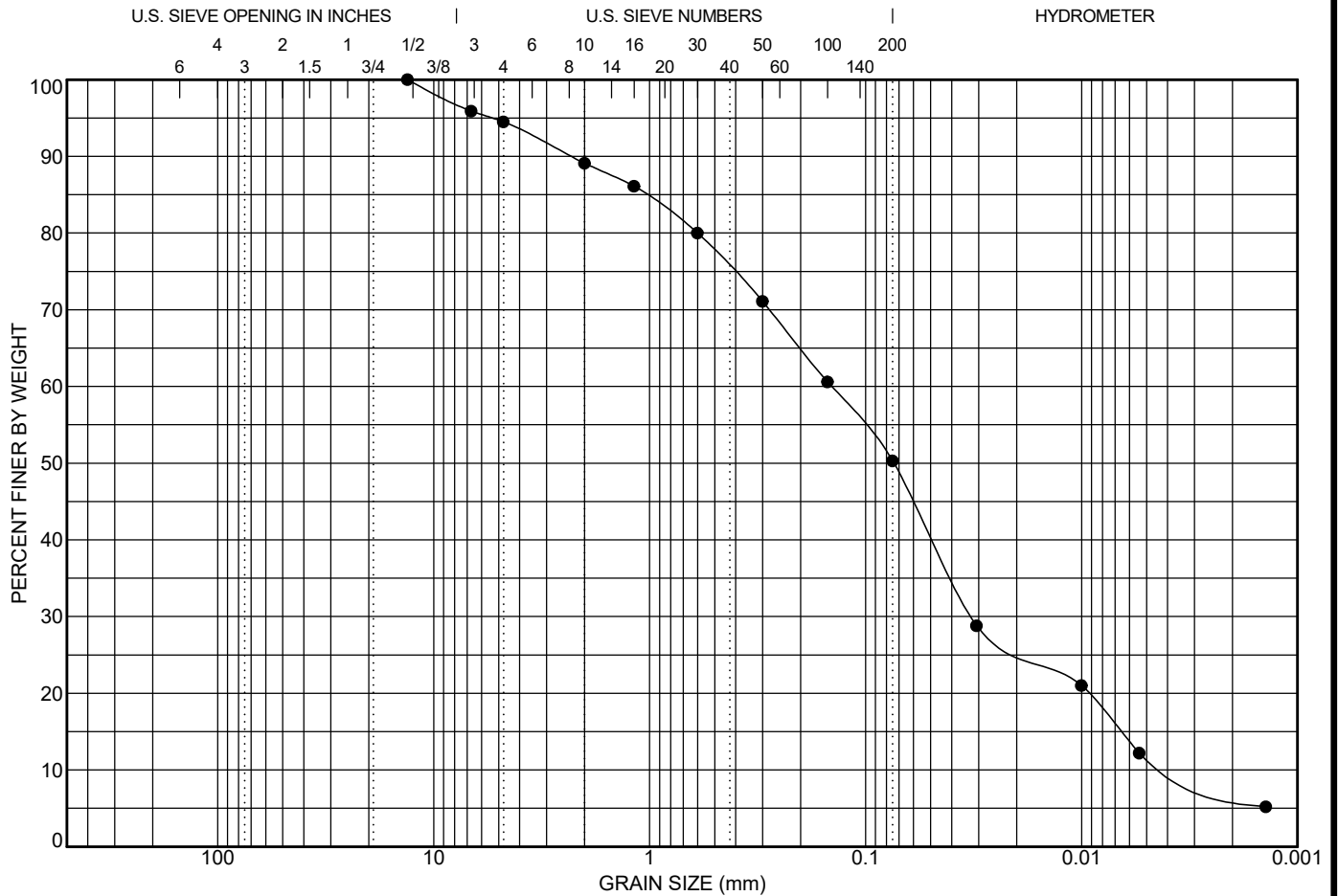
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 29



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			2.03	40.78	13.2	0.144	0.032	0.004	5.5	44.2	50.3	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 6 - SA 4; 2.30 to 2.90 m depth
Sample No.: 6-4
Date Sampled: Mar. 28 - 2024
Sampled By: RS
Lab No.: 448
Date Tested: May. 10 - 2024
Type of Material: Sand and Silt Till, trace gravel, trace clay

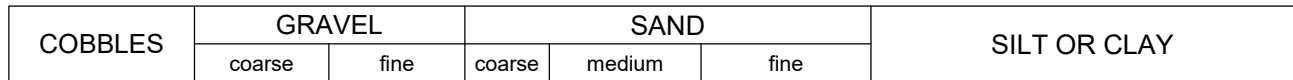
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 30



Date:	May. 10 - 2024	Sieve Size (mm)	Percent Passing	No Specifications
Client:	1000525725 Ontario Inc.			
Contractor:				
Source:				
Sampled From:	BH 7 - SA 4; 2.30 to 2.90 m depth			
Sample No.:	7-4			
Date Sampled:	Mar. 26 - 2024			
Sampled By:	RS			
Lab No.:	449			
Date Tested:	May. 10 - 2024			
Type of Material:	Silt, some sand, trace clay			



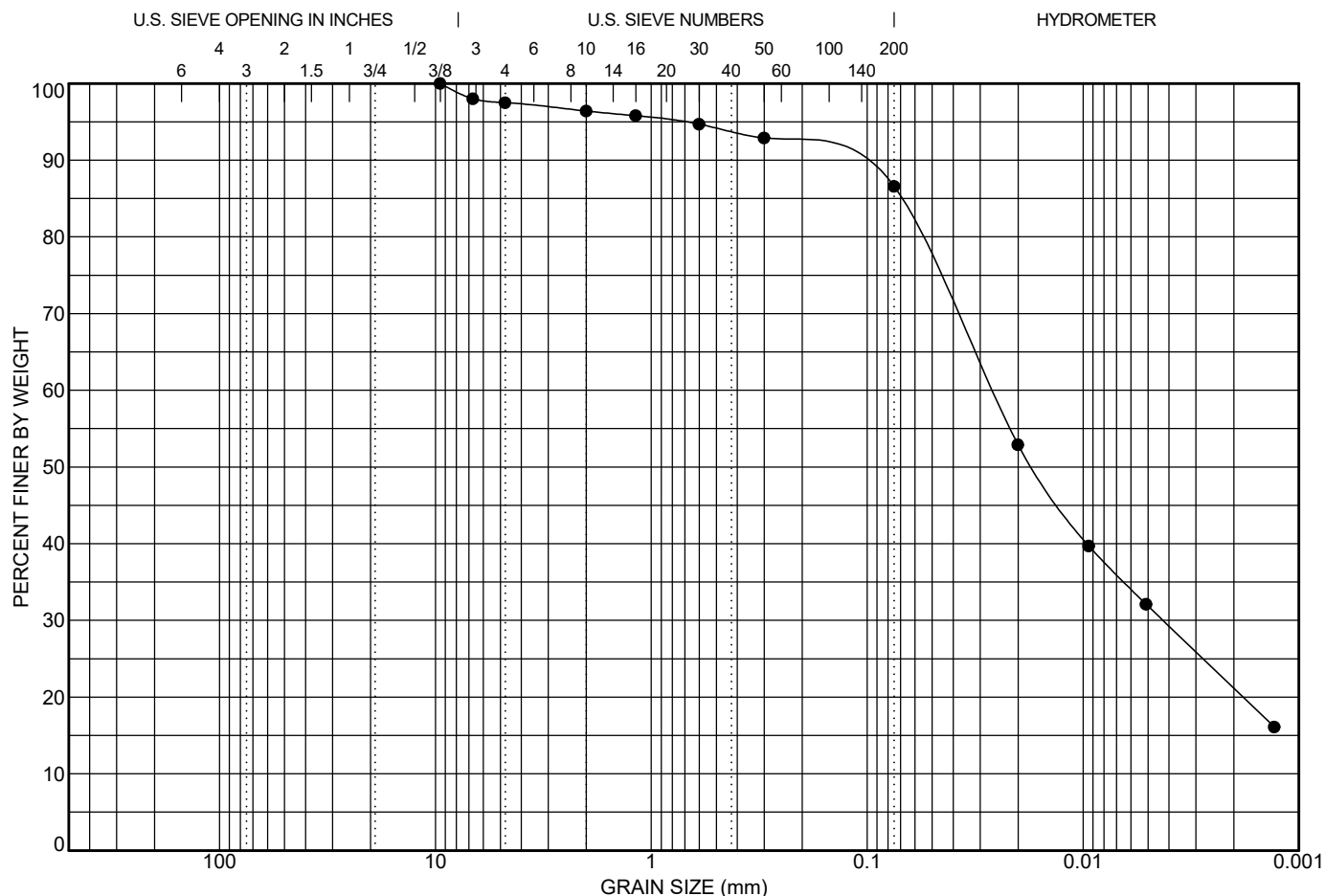
GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision

Location: 1665 Scotch Line Road, Elmira, Ontario

File No.: 1650

Enclosure No.: 31



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					9.5	0.026	0.004		2.5	10.9		86.6

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 8 - SA 5; 3.05 to 3.65 m depth
Sample No.: 8-5
Date Sampled: Mar. 27 - 2024
Sampled By: RS
Lab No.: 450
Date Tested: May. 10 - 2024
Type of Material: Clayey Silt Till, some sand, trace gravel

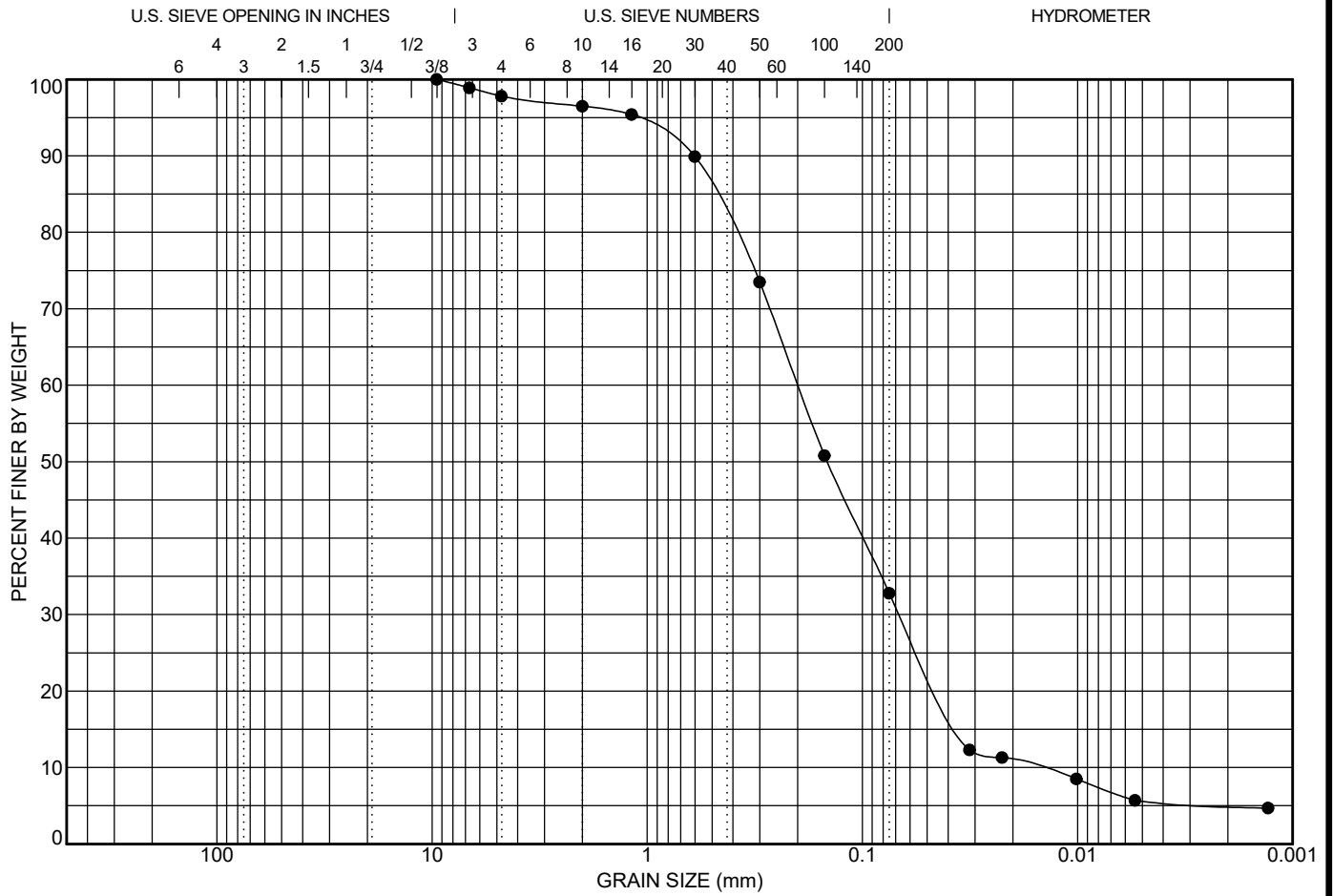
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 32



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.45	12.84	9.5	0.199	0.067	0.015	2.2	65.0	32.8	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 8 - SA 14; 14.10 to 14.30 m depth
Sample No.: 8-14
Date Sampled: Mar. 27 - 2024
Sampled By: RS
Lab No.: 451
Date Tested: May. 10 - 2024
Type of Material: Silty Sand, trace gravel, trace clay

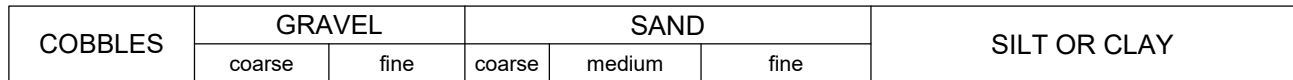
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 33



Date:	May. 10 - 2024	Sieve Size (mm)	Percent Passing	No Specifications
Client:	1000525725 Ontario Inc.			
Contractor:				
Source:				
Sampled From:	BH 8 - SA 15; 15.25 to 15.70 m depth			
Sample No.:	8-15			
Date Sampled:	Mar. 27 - 2024			
Sampled By:	RS			
Lab No.:	452			
Date Tested:	May. 10 - 2024			
Type of Material:	Silt and Sand			



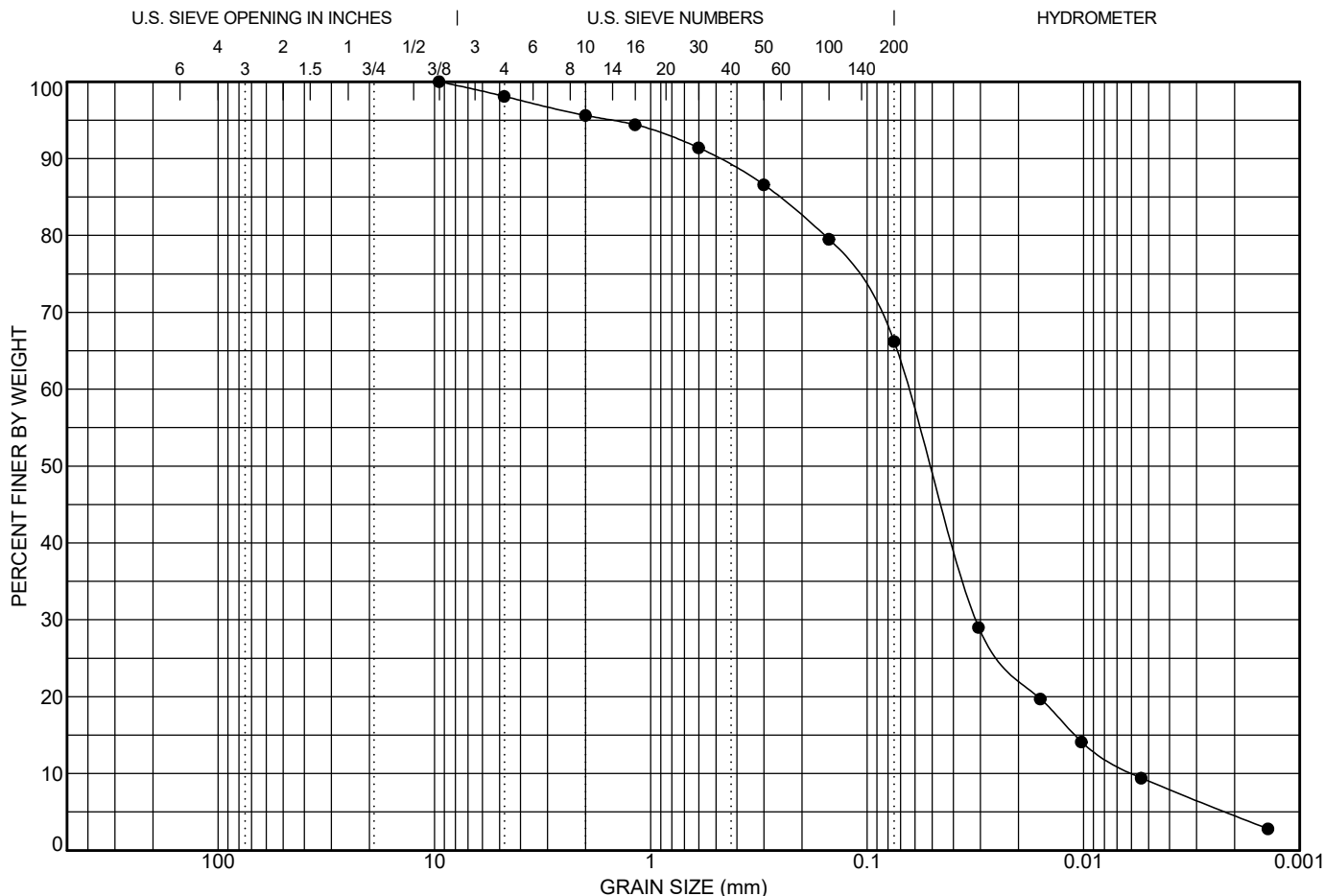
GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision

Location: 1665 Scotch Line Road, Elmira, Ontario

File No.: 1650

Enclosure No.: 34



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			2.58	11.02	9.5	0.065	0.031	0.006	1.9	31.9	66.2	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 9 - SA 6; 4.55 to 4.80 m depth
Sample No.: 9-6
Date Sampled: Mar. 26 - 2024
Sampled By: RS
Lab No.: 453
Date Tested: May. 10 - 2024
Type of Material: Sandy Silt, trace gravel, trace clay

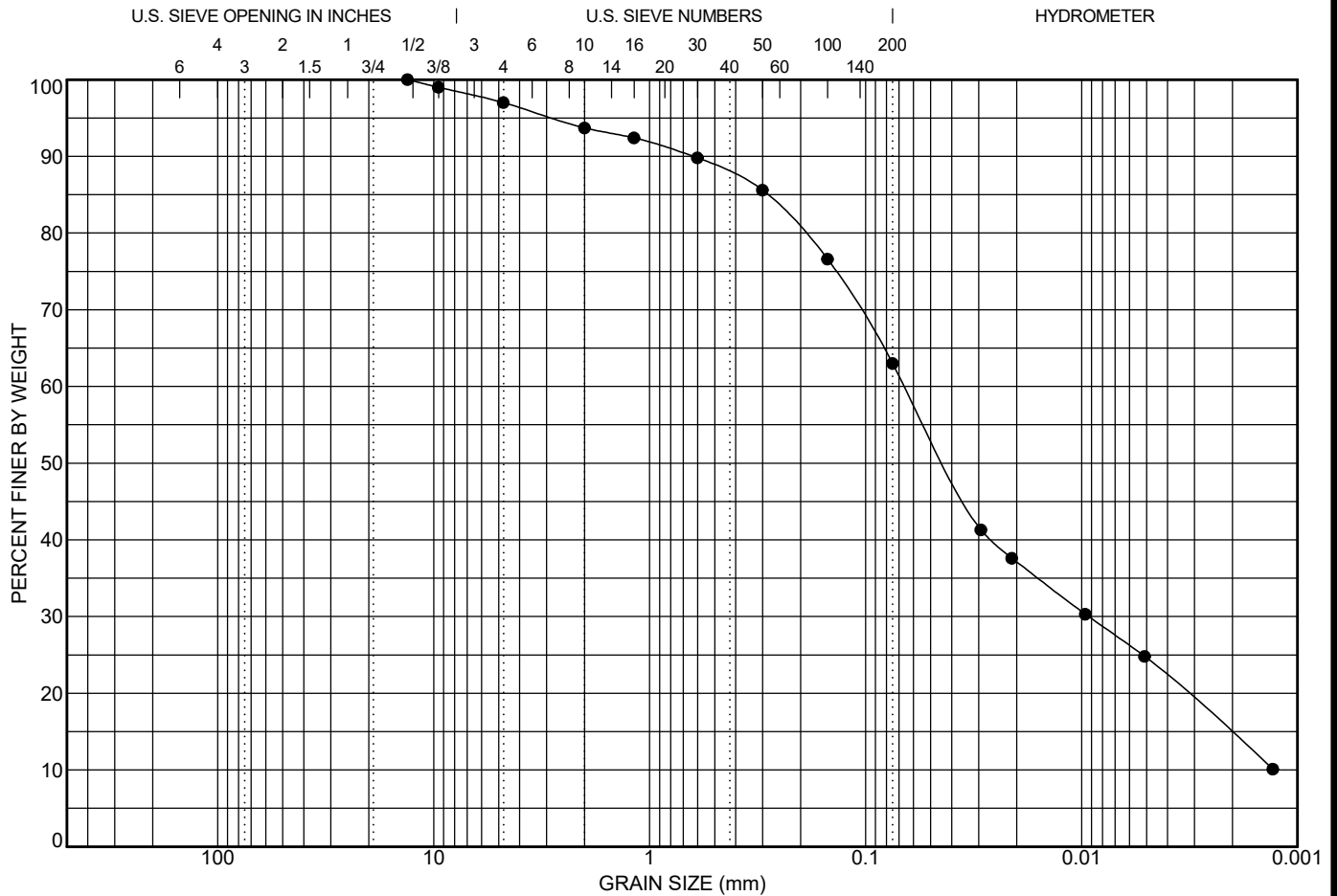
Sieve Size (mm)	Percent Passing	No Specifications



**CHUNG & VANDER DOELEN
ENGINEERING LTD.**
 311 Victoria Street North
 Kitchener, Ontario N2H 5E1
 Telephone: 519-742-8979
 Fax: 519-742-7739
 e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 35



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					13.2	0.066	0.009		3.0	34.0		63.0

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 10 - SA 4; 2.30 to 2.90 m depth
Sample No.: 10-4
Date Sampled: Apr. 01 - 2024
Sampled By: RS
Lab No.: 454
Date Tested: May. 10 - 2024
Type of Material: Clayey Sandy Silt Till, trace gravel

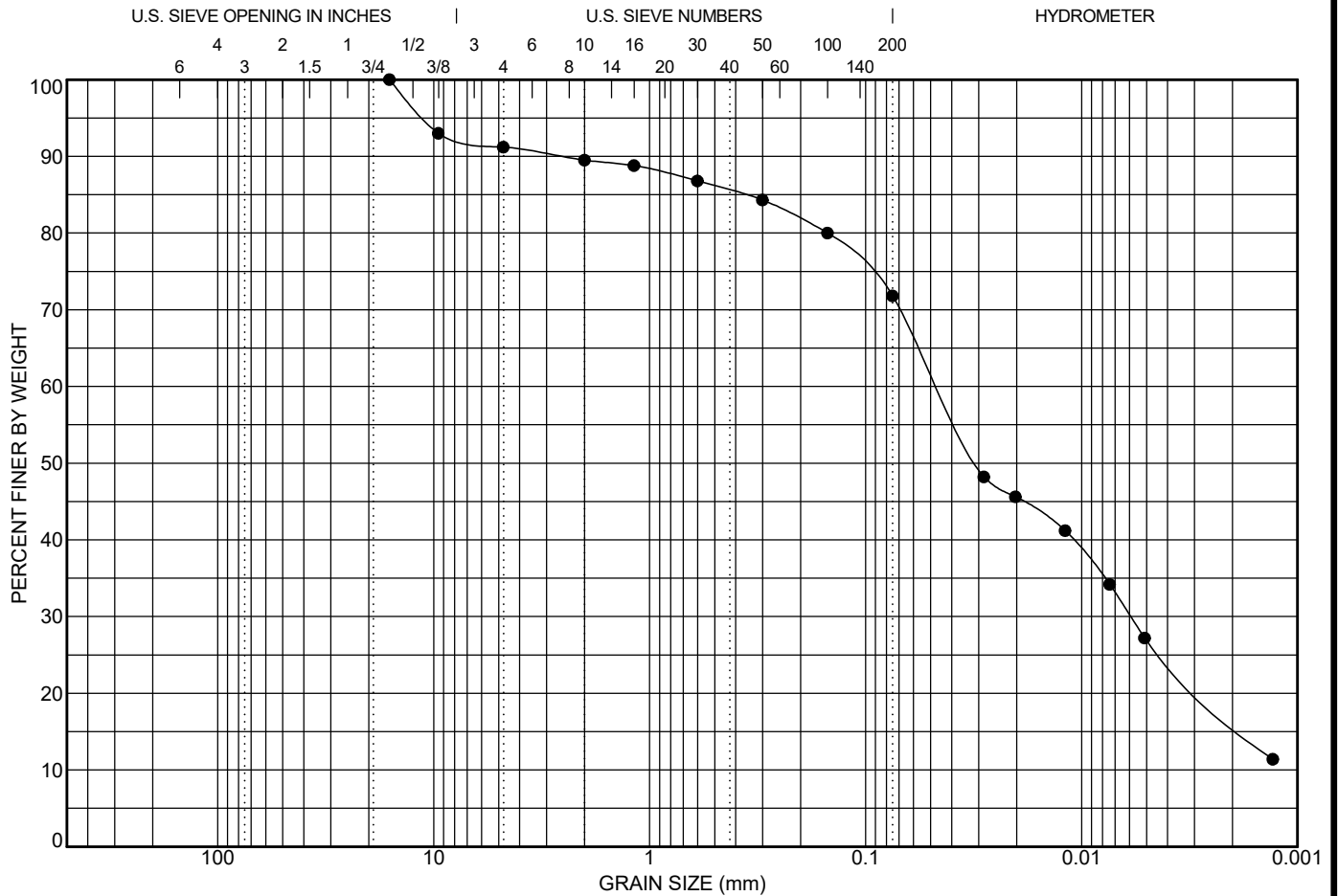
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 36



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					16	0.046	0.006		8.8	19.4	71.8	

Date: May. 10 - 2024
Client: 1000525725 Ontario Inc.
Contractor:
Source:
Sampled From: BH 12 - SA 3; 1.50 to 2.10 m depth
Sample No.: 12-3
Date Sampled: Apr. 01 - 2024
Sampled By: RS
Lab No.: 455
Date Tested: May. 10 - 2024
Type of Material: Clayey Silt Till, some sand, trace gravel

Sieve Size (mm)	Percent Passing	No Specifications



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 Fax: 519-742-7739
 e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

Project: Elmira Industrial Subdivision
Location: 1665 Scotch Line Road, Elmira, Ontario
File No.: 1650
Enclosure No.: 37

FILE No: 1650**BOREHOLE No. 21**Client: **1000525725 Ontario Inc.**Project: **Elmira Industrial Subdivision**Location: **1665 Scotch Line Road, Elmira, Ontario****EQUIPMENT DATA**Machine: **CME-55 Track**Method: **Solid Stem Augers**Size: **152 mm O.D.**Date: **Mar 26 - 24 TO Mar 26 - 24**

SOIL LITHOLOGY			SAMPLE		SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □	PENETRATION RESISTANCE STANDARD ● DYN. CONE ○	W _p	W	W _L			
	Ground Elevation: 352.01 m													
351.63 0.38	380 mm TOPSOIL	0.5		1	SS	3								
	very loose to compact dark brown to brown	1.0		2	SS	5								
	FILL, sandy silt to sand and silt trace to some gravel trace clay, trace topsoil moist	1.5		3	SS	16								
349.71 2.30	dense to very dense, brown	2.5		4	SS	34								
	SAND AND SILT TILL trace to some gravel moist	3.0		5	SS	57								
348.36 3.65	End of Borehole	3.5												
		4.0												
		4.5												
		5.0												
		5.5												
		6.0												
		6.5												
		7.0												
		7.5												
		8.0												
		8.5												
		9.0												

borehole open and dry to
3.65 m depth upon
withdrawal of drilling
augersPROJECT MANAGER: **EYC****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739