CHUNG & VANDER DOELEN
ENGINEERING LTD.

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

October 30, 2023
File No.: 1417

Bruce-Grey Catholic District School Board
799 16th Avenue
Hanover, Ontario
N4N 3A1

Attention: Chad Aitken

Re: Preliminary Geotechnical Investigation
Proposed New High School
28th Avenue East, Owen Sound, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) was retained by Bruce-Grey Catholic District School Board to conduct a preliminary geotechnical investigation at the above-noted site.

It is understood that this preliminary geotechnical investigation is for the purpose of land purchase agreement. Additional boreholes for a supplementary investigation will be required when the building location and design are being finalized.

The site is proposed to be developed with a new 2-storey high school without basement and is proposed to be constructed in the centre of the site, as shown on the attached Drawing No. 1. Asphalt-paved driveway and parking areas will be located to the east of the proposed school, fronting 28th Avenue East. A turf athletic field is proposed in the lower western half of the site.

The site currently exists as a vacant field, off 28th Avenue East. The site is 300± m south of the intersection with 16th Street East. The site increases in elevation gradually from east to west, with a grade differential of 3± m from the higher central portion of the site to the eastern portion of the site, towards 28th Avenue East. The centre of the site is relatively flat, followed by a steep decline westward to the west of the site.

FIELD WORK AND LABORATORY TESTING

To investigate the subsurface conditions at the site, nine (9) boreholes were advanced to depths between 4.70 and 7.85 m below existing grade on September 7 and 8, 2023. The borehole locations are indicated on the Borehole Location Plan, Drawing No. 1.

The field work was carried out under the supervision of a member of our engineering team, who logged the subsurface conditions encountered at the boreholes, effected the subsurface sampling, and monitored the groundwater conditions. The boreholes were advanced using a track-mounted drilling rig, supplied, and operated by a specialized contractor. The drill rig was equipped with continuous flight augers and standard soil sampling equipment.

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 and consistency of the soil strata has been inferred from these test results.

Groundwater conditions were monitored during advancement of the borehole augering and immediately following the withdrawal of the drilling augers at each borehole location.

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: Catch basin in the sidewalk, intersection of 16th Street East and 28th Avenue East, as shown on Drawing No. 1

Elevation: 237.26 m (Geodetic)

Four (4) soil samples were submitted to AGAT Laboratories of Mississauga, Ontario for analysis of metals and inorganics, benzene, toluene, ethylbenzene, and xylene (BTEX), and Petroleum Hydrocarbons (PHCs F1-F4). The chemical testing was conducted to provide a preliminary assessment of the environmental quality of potential excess soil which may be generated and removed off-site during construction.

FINDINGS

The nine (9) boreholes contacted between 0.15 and 0.23 m of topsoil at the ground surface. Underlying the topsoil were typically loose to very dense sandy silt till to sand and silt till deposits to the borehole termination depths between 4.70 to 7.85 m below existing grade (corresponding to elevations between 228.3± and 233.7± m). Locally at Borehole 4, a clayey silt till deposit was encountered below the topsoil to a depth of 5.80 m below existing grade (corresponding to an elevation of 232.0± m), followed by a saturated sand deposit to a depth of 6.55 m below existing grade (corresponding to an elevation of 231.2± m).

Groundwater levels were observed drilling and immediately following the withdrawal of the drilling augers. Groundwater depths were measured between 2.6± and 5.4± m below existing grades, corresponding to elevations between 233.3± to 235.9± m.

DISCUSSION and RECOMMENDATIONS

The results of the widely spaced boreholes indicate that the compact to very dense sandy silt till/sand and silt till, and stiff to hard clayey silt till are suitable to support the proposed 2-storey high school building. Conventional strip and spread footing foundations can be used to support the proposed structure. A Geotechnical Reaction at SLS of 150 to 200 kPa can be used depending on the depth/elevation of the footings.

The following table summarizes the highest founding level and elevation for the footing at each borehole location:

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
150 kPa @ SLS, 250 kPa @ ULS			
1	240.00	0.60	239.40
2	238.74	1.34	237.40
3	240.10	0.70	239.40
4	237.79	0.79	237.00
5	240.22	0.62	239.60
200 kPa @ SLS, 300 kPa @ ULS			
1	240.00	0.90	239.10
2	238.74	1.54	237.20
3	240.10	2.10	238.00
4	237.79	2.49	235.30
5	240.22	0.92	239.30

Due to significant variations in ground surface elevation across the site, site grading will be required. It is recommended to construct engineered fill in areas to be raised and to remedy existing poor bearing-support soils in order to suitably support the future building and pavement areas. Imported sand and gravel and/or approved on-site inorganic till soils can be used to construct the engineered fill under controlled and supervised conditions.

Excavations will be made in the moist native sandy silt till/sand and silt till, and clayey silt till, and can be carried out with conventional equipment and 1H :1V side slopes. The groundwater table is located at depths between 2.6± and 5.4± m below existing grade as of September 2023 as recorded at completion of sampling, corresponding to elevations varying between 233.3± to 235.9± m. Therefore, dewatering will not be required and local control of seepage/surface water ingress using conventional sump pumping technique will be feasible for foundation construction.

The floor slab for the proposed school can be constructed as conventional slab-on-grade on the on the native compact to very dense till deposits or engineered fill constructed.

In accordance with The Ontario Building Code 2012 (OBC), the proposed building structures should be designed to resist earthquake load and effects as per OBC Subsection 4.1.8. Based on the anticipated condition of the engineered fill materials, the soil condition encountered at the boreholes and within 30 m depths, the site can be classified as a Site Class C as per OBC Table 4.1.8.4.A (Page B4-16).

Infiltration Rate of Native Soil Deposits

Based on the laboratory gradational results and our experience, the coefficient of permeability and infiltration rate of the predominant deposits encountered throughout the site are estimated and provided in the following table:

Material	Permeability (K) (cm/s)	Infiltration Rate (mm/hr)
Sand/Silt Till (Enclosures 10 and 11)	1×10^{-5}	4
Clayey Silt Till	1×10^{-6}	1

Based on the above-cited infiltration rates, the site soils are not considered suitable for installation of infiltration gallery for storm water management.

Four (4) soil samples were submitted to AGAT Laboratories of Mississauga, Ontario for analysis of metals and inorganics, benzene, toluene, ethylbenzene, and xylene (BTEX), and Petroleum Hydrocarbons (PHCs F1-F4). The chemical testing was conducted to provide a preliminary assessment of the environmental quality of potential excess soil which may be generated and removed off-site during construction.

The Soil, Ground Water and Sediment Standards for Use Under the New Soil Rules and Excess Soil Quality Standards established in accordance with the O. Reg. 406/19 as amended were consulted in the assessment of the soil at the project site.

The analytical results for soils were compared to the following O. Reg. 406/19 regulatory standards:

- Table 1 (Full Depth Background Site Condition Standards) for Residential/Parkland/Institutional/ Industrial/Commercial/Community Property Use (Table 1 RPIICC ESQS)

- Table 2.1 (Full Depth Generic Excess Soil Quality Standards in a Potable Ground Water Condition) for Residential/Parkland/Institutional Property Use (Table 2.1 RPI ESQS)

- Table 2.1 (Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition) for Industrial/Commercial/Community Property Use (Table 2.1 ICC ESQS)

The measured concentrations met Table 1 and 2.1 RPIICC ESQS.

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.

Drake Oldfield
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

SOIL CHEMISTRY RESULTS
(AGAT Laboratories)

AGAT Laboratories

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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: CHUNG AND VANDER DOELEN
311 VICTORIA STREET NORTH
KITCHENER, ON N2H5E1
(519) 742-8979
ATTENTION TO: Nandou Zhou
PROJECT: 1417
AGAT WORK ORDER: 23T068617
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor
DATE REPORTED: Sep 20, 2023
PAGES (INCLUDING COVER): 10
VERSION*: 1

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

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 23T068617

PROJECT: 1417

CLIENT NAME: CHUNG AND VANDER DOELEN

ATTENTION TO: Nandou Zhou

SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

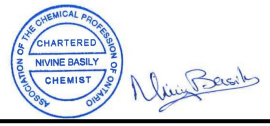
SAMPLED BY:DO

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2023-09-13 **DATE REPORTED: 2023-09-20**

						SAMPLE DESCRIPTION:	BH 2 - SA 2	BH 3 - SA 1	BH 4 - SA 1	BH 6 - SA 2
						SAMPLE TYPE:	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2023-09-07	2023-09-07	2023-09-08	2023-09-08
Parameter	Unit	G / S: A	G / S: B	G / S: C	RDL		5284593	5284603	5284604	5284605
Antimony	µg/g	1.3	40	7.5	0.8		<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]
Arsenic	µg/g	18	18	18	1		5[<A]	5[<A]	5[<A]	5[<A]
Barium	µg/g	220	670	390	2.0		20.5[<A]	27.7[<A]	73.7[<A]	22.2[<A]
Beryllium	µg/g	2.5	8	4	0.5		<0.5[<A]	<0.5[<A]	0.9[<A]	<0.5[<A]
Boron	µg/g	36	120	120	5		11[<A]	10[<A]	20[<A]	12[<A]
Boron (Hot Water Soluble)	µg/g	NA	2	1.5	0.10		<0.10[<C]	<0.10[<C]	0.16[<C]	<0.10[<C]
Cadmium	µg/g	1.2	1.9	1.2	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Chromium	µg/g	70	160	160	5		10[<A]	11[<A]	26[<A]	9[<A]
Cobalt	µg/g	21	80	22	0.8		6.7[<A]	7.4[<A]	12.6[<A]	6.3[<A]
Copper	µg/g	92	230	140	1.0		30.7[<A]	29.8[<A]	21.8[<A]	29.7[<A]
Lead	µg/g	120	120	120	1		5[<A]	6[<A]	8[<A]	4[<A]
Molybdenum	µg/g	2	40	6.9	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Nickel	µg/g	82	270	100	1		13[<A]	14[<A]	27[<A]	13[<A]
Selenium	µg/g	1.5	5.5	2.4	0.8		<0.8[<A]	<0.8[<A]	<0.8[<A]	<0.8[<A]
Silver	µg/g	0.5	40	20	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Thallium	µg/g	1	3.3	1	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Uranium	µg/g	2.5	33	23	0.50		<0.50[<A]	<0.50[<A]	0.63[<A]	<0.50[<A]
Vanadium	µg/g	86	86	86	2.0		18.1[<A]	18.6[<A]	35.1[<A]	18.2[<A]
Zinc	µg/g	290	340	340	5		28[<A]	29[<A]	51[<A]	24[<A]
Chromium, Hexavalent	µg/g	0.66	8	8	0.2		<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Cyanide, WAD	µg/g	0.051	0.051	0.051	0.040		<0.040[<A]	<0.040[<A]	<0.040[<A]	<0.040[<A]
Mercury	µg/g	0.27	0.27	0.27	0.10		<0.10[<A]	<0.10[<A]	<0.10[<A]	<0.10[<A]
Electrical Conductivity (2:1)	mS/cm	0.57	1.4	0.7	0.005		0.111[<A]	0.143[<A]	0.139[<A]	0.120[<A]
Sodium Adsorption Ratio (2:1) (Calc.)	N/A	2.4	12	5	N/A		0.418[<A]	0.161[<A]	0.120[<A]	0.129[<A]
pH, 2:1 CaCl2 Extraction	pH Units				NA		7.35	7.20	7.21	7.35

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 23T068617

PROJECT: 1417

CLIENT NAME: CHUNG AND VANDER DOELEN

ATTENTION TO: Nandou Zhou

SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

SAMPLED BY:DO

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2023-09-13 **DATE REPORTED: 2023-09-20**

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

5284593-5284605 EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

SAMPLED BY:DO

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2023-09-13

DATE REPORTED: 2023-09-20

						SAMPLE DESCRIPTION:	BH 2 - SA 2	BH 3 - SA 1	BH 4 - SA 1	BH 6 - SA 2
						SAMPLE TYPE:	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2023-09-07	2023-09-07	2023-09-08	2023-09-08
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**RDL**		**5284593**	**5284603**	**5284604**	**5284605**
Benzene	µg/g	0.02	0.02	0.02	0.02		<0.02[<A]	<0.02[<A]	<0.02[<A]	<0.02[<A]
Toluene	µg/g	0.2	0.2	0.2	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]
Ethylbenzene	µg/g	0.05	0.05		0.05		<0.05[<B]	<0.05[<B]	<0.05[<B]	<0.05[<B]
m & p-Xylene	µg/g				0.05		<0.05	<0.05	<0.05	<0.05
o-Xylene	µg/g				0.05		<0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	0.05	0.091	0.091	0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]	<0.05[<A]
F1 (C6 - C10)	µg/g	25			5		<5[<A]	<5[<A]	<5[<A]	<5[<A]
F1 (C6 to C10) minus BTEX	µg/g	25	25	25	5		<5[<A]	<5[<A]	<5[<A]	<5[<A]
F2 (C10 to C16)	µg/g	10	26	10	10		<10[<A]	<10[<A]	<10[<A]	<10[<A]
F3 (C16 to C34)	µg/g	240	240	240	50		<50[<A]	<50[<A]	<50[<A]	<50[<A]
F4 (C34 to C50)	µg/g	120	3300	2800	50		<50[<A]	<50[<A]	<50[<A]	<50[<A]
Gravimetric Heavy Hydrocarbons	µg/g	120			50		NA[B]	NA[B]	NA[B]	NA[B]
Moisture Content	%				0.1		13.4	19.6	15.1	11.9
Surrogate	**Unit**		**Acceptable Limits**							
Toluene-d8	% Recovery		60-140				70	75	71	73
Terphenyl	%		60-140				68	90	72	80

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 23T068617

PROJECT: 1417

CLIENT NAME: CHUNG AND VANDER DOELEN

ATTENTION TO: Nandou Zhou

SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

SAMPLED BY:DO

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2023-09-13

DATE REPORTED: 2023-09-20

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - Com/Ind, C Refers to O. Reg. 406/19 TABLE 2.1: Full Depth Potable Ground Water Condition Volume Independent - RP
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

5284593-5284605 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 23T068617

PROJECT: 1417

ATTENTION TO: Nandou Zhou

SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

SAMPLED BY:DO

Soil Analysis

RPT Date: Sep 20, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	5284593	5284593	<0.8	<0.8	NA	< 0.8	127%	70%	130%	103%	80%	120%	86%	70%	130%
Arsenic	5284593	5284593	5	5	0.0%	< 1	114%	70%	130%	104%	80%	120%	111%	70%	130%
Barium	5284593	5284593	20.5	21.0	2.4%	< 2.0	99%	70%	130%	104%	80%	120%	109%	70%	130%
Beryllium	5284593	5284593	<0.5	<0.5	NA	< 0.5	104%	70%	130%	105%	80%	120%	110%	70%	130%
Boron	5284593	5284593	11	11	NA	< 5	81%	70%	130%	110%	80%	120%	102%	70%	130%
Boron (Hot Water Soluble)	5284593	5284593	<0.10	<0.10	NA	< 0.10	93%	60%	140%	107%	70%	130%	106%	60%	140%
Cadmium	5284593	5284593	<0.5	<0.5	NA	< 0.5	114%	70%	130%	105%	80%	120%	108%	70%	130%
Chromium	5284593	5284593	10	10	NA	< 5	101%	70%	130%	91%	80%	120%	92%	70%	130%
Cobalt	5284593	5284593	6.7	7.0	4.4%	< 0.8	104%	70%	130%	102%	80%	120%	106%	70%	130%
Copper	5284593	5284593	30.7	32.2	4.8%	< 1.0	103%	70%	130%	102%	80%	120%	92%	70%	130%
Lead	5284593	5284593	5	5	0.0%	< 1	117%	70%	130%	96%	80%	120%	99%	70%	130%
Molybdenum	5284593	5284593	<0.5	<0.5	NA	< 0.5	112%	70%	130%	106%	80%	120%	115%	70%	130%
Nickel	5284593	5284593	13	14	7.4%	< 1	100%	70%	130%	100%	80%	120%	102%	70%	130%
Selenium	5284593	5284593	<0.8	<0.8	NA	< 0.8	128%	70%	130%	106%	80%	120%	110%	70%	130%
Silver	5284593	5284593	<0.5	<0.5	NA	< 0.5	104%	70%	130%	100%	80%	120%	98%	70%	130%
Thallium	5284593	5284593	<0.5	<0.5	NA	< 0.5	110%	70%	130%	117%	80%	120%	121%	70%	130%
Uranium	5284593	5284593	<0.50	<0.50	NA	< 0.50	112%	70%	130%	94%	80%	120%	109%	70%	130%
Vanadium	5284593	5284593	18.1	18.2	0.6%	< 2.0	113%	70%	130%	107%	80%	120%	113%	70%	130%
Zinc	5284593	5284593	28	29	3.5%	< 5	111%	70%	130%	111%	80%	120%	120%	70%	130%
Chromium, Hexavalent	5284604	5284604	<0.2	<0.2	NA	< 0.2	91%	70%	130%	95%	80%	120%	91%	70%	130%
Cyanide, WAD	5286708		<0.040	<0.040	NA	< 0.040	105%	70%	130%	103%	80%	120%	89%	70%	130%
Mercury	5284593	5284593	<0.10	<0.10	NA	< 0.10	119%	70%	130%	103%	80%	120%	106%	70%	130%
Electrical Conductivity (2:1)	5284593	5284593	0.111	0.105	5.6%	< 0.005	102%	80%	120%						
Sodium Adsorption Ratio (2:1) (Calc.)	5284518		1.83	1.65	10.3%	NA									
pH, 2:1 CaCl2 Extraction	5284564		6.16	6.21	0.8%	NA	102%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:

AGAT Laboratories

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

Quality Assurance

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 23T068617

PROJECT: 1417

ATTENTION TO: Nandou Zhou

SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

SAMPLED BY:DO

Trace Organics Analysis

RPT Date: Sep 20, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	5283027		<0.02	<0.02	NA	< 0.02	75%	60%	140%	88%	60%	140%	73%	60%	140%
Toluene	5283027		<0.05	<0.05	NA	< 0.05	79%	60%	140%	86%	60%	140%	81%	60%	140%
Ethylbenzene	5283027		<0.05	<0.05	NA	< 0.05	75%	60%	140%	98%	60%	140%	110%	60%	140%
m & p-Xylene	5283027		<0.05	<0.05	NA	< 0.05	80%	60%	140%	99%	60%	140%	75%	60%	140%
o-Xylene	5283027		<0.05	<0.05	NA	< 0.05	85%	60%	140%	71%	60%	140%	78%	60%	140%
F1 (C6 - C10)	5283027		<5	<5	NA	< 5	90%	60%	140%	100%	60%	140%	98%	60%	140%
F2 (C10 to C16)	5284190		376	297	23.5%	< 10	118%	60%	140%	117%	60%	140%	124%	60%	140%
F3 (C16 to C34)	5284190		387	330	15.9%	< 50	129%	60%	140%	120%	60%	140%	129%	60%	140%
F4 (C34 to C50)	5284190		< 50	< 50	NA	< 50	72%	60%	140%	128%	60%	140%	128%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories

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CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 23T068617

PROJECT: 1417

ATTENTION TO: Nandou Zhou

SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

SAMPLED BY:DO

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, WAD	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	SEGMENTED FLOW ANALYSIS
Mercury	MET-93-6103	modified from EPA 7471B and SM 3112 B	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE
Sodium Adsorption Ratio (2:1) (Calc.)	INOR-93-6007	modified from EPA 6010D & Analytical Protocol	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6075	modified from EPA 9045D, MCKEAGUE 3.11 E3137	PC TITRATE

AGAT Laboratories

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Method Summary

CLIENT NAME: CHUNG AND VANDER DOELEN

AGAT WORK ORDER: 23T068617

PROJECT: 1417

ATTENTION TO: Nandou Zhou

SAMPLING SITE:28th Avenue East, Owen Sound, Ontario

SAMPLED BY:DO

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Toluene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Ethylbenzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
m & p-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
o-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Xylenes (Total)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
F1 (C6 - C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID

AGAT Laboratories

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Mississauga, Ontario L4Z 1Y2
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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Chung & Vander Doelen Engineering Ltd.
Contact: Nandou Zhao
Address: 311 Victoria Street North
Kitchener, ON, N2H 5E1
Phone: ____ Fax: ____
Reports to be sent to:
1. Email: nandou.zhao@cvdengineering.com
2. Email: drake.oldfield@cvdengineering.com

Project Information:

Project: 1417
Site Location: 28th Avenue East, Owen Sound, Ontario
Sampled By: DO
AGAT Quote #: ____ PO: ____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Regulatory Requirements:

(Please check all applicable boxes)

☑ Regulation 153/04
Table T1 RPIICC (Indicate One)
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☐ Coarse
☐ Fine

☑ Excess Soils R406
Table T2.1 RPI/IC (Indicate One)

☐ Regulation 558

☐ CCME

☐ Sewer Use
☐ Sanitary ☐ Storm
Region

☐ Prov. Water Quality Objectives (PWQO)

☐ Other
Indicate One

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

Report Guideline on *Certificate of Analysis* ☑ Yes ☐ No

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Laboratory Use Only

Work Order #: 23T068617
Cooler Quantity: 1 med
Arrival Temperatures: 9.5 | 9.3 | 8.8
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: Ice

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs Analyze F4G if required ☑ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: PCBs	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	Potentially Hazardous or High Concentration (Y/N)
BH 2 - SA 2	Sept 7/23	AM PM	3	S			☑		☑								
BH 3 - SA 1	Sept 7/23	AM PM	3	S			☑		☑								
BH 4 - SA 1	Sept 8/23	AM PM	3	S			☑		☑								
BH 6 - SA 2	Sept 8/23	AM PM	3	S			☑		☑								
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Drake Oldfield	Sept 13/23	12:00pm	Rhiana C	Sept 13	115

Page 1 of 1

N°:

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

APPENDIX C

COMPARISON OF THE SOIL CHEMISTRY RESULTS TO THE APPLICABLE REGULATORY CRITERIA

ANALYTICAL RESULTS FOR SOIL

MECP Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, December 17, 2020 (O.Reg. 406/19)

		Table 1 Residential/ Parkland/ Institutional/ Industrial/ Commercial/ Community Property Use Standard	Table 2.1 Residential/ Parkland/ Institutional Property Use Standard	Table 2.1 Industrial/ Commercial/ Community Property Use Standard	BH 2 - SA 2	BH 3 - SA 1	BH 4 - SA 1	BH 6 - SA 2
Metals & Inorganics	Conductivity (mS/cm)	0.57	0.7	1.4	0.11	0.14	0.14	0.12
	% Moisture (%)	-	-	-	12.4	15.2	18.5	12.8
	pH (pH units)	-	-	-	7.35	7.20	7.21	7.35
	Cyanide, Weak Acid Diss (ug/g)	0.051	0.051	0.051	<0.040	<0.040	<0.040	<0.040
	SAR	2.4	5	12	0.42	0.16	0.12	0.13
	Antimony (Sb)	1.3	7.5	40	<0.8	<0.8	<0.8	<0.8
	Arsenic (As)	18	18	18	5	5	5	5
	Barium (Ba)	220	390	670	20.5	27.7	73.7	22.2
	Beryllium (Be)	2.5	4	8	<0.5	<0.5	0.90	<0.5
	Boron (B)	36	120	120	11	10	20	12
	Boron (B), Hot Water Ext. Available	-	1.5	2	<0.10	<0.10	0.16	<0.10
	Cadmium (Cd)	1.2	1.2	1.9	<0.5	<0.5	<0.5	<0.5
	Chromium (Cr)	70	160	160	10	11	26	9
	Cobalt (Co)	21	22	80	6.7	7.4	12.6	6.3
	Copper (Cu)	92	140	230	30.7	29.8	21.8	29.7
	Lead (Pb)	120	120	120	5	6	8	4
	Mercury (Hg)	0.27	0.27	3.9	<0.10	<0.10	<0.10	<0.10
	Molybdenum (Mo)	2	6.9	40	<0.5	<0.5	<0.5	<0.5
	Nickel (Ni)	82	100	270	13	14	27	13
	Selenium (Se)	1.5	2.4	5.5	<0.8	<0.8	<0.8	<0.8
	Silver (Ag)	0.5	20	40	<0.5	<0.5	<0.5	<0.5
	Thallium (Tl)	1	1	3.3	<0.5	<0.5	<0.5	<0.5
	Uranium (U)	2.5	23	33	<0.50	<0.50	0.63	<0.50
	Vanadium (V)	86	86	86	18.1	18.6	35.1	18.2
	Zinc (Zn)	290	340	340	28	29	51	24
	Chromium, Hexavalent	0.66	8	8	<0.2	<0.2	<0.2	<0.2
Petroleum Hydrocarbons F1-F4	F1 (C6-C10)	25	55	55	<5	<5	<5	<5
	F2 (C10-C16)	10	98	230	<10	<10	<10	<10
	F3 (C16-C34)	240	300	1700	<50	<50	<50	<50
	F4 (C34-C50)	120	2800	3300	<50	<50	<50	<50
BTEX	Benzene	0.02	0.21	0.32	<0.02	<0.02	<0.02	<0.02
	Ethylbenzene	0.05	1.1	1.1	<0.05	<0.05	<0.05	<0.05
	Toluene	0.2	2.3	6.4	<0.05	<0.05	<0.05	<0.05
	Xylenes (Total)	0.05	3.1	26	<0.05	<0.05	<0.05	<0.05

NOTES:

1. Units = ug/g
2. "-" - Paramater not included in chemical analysis
3. "nv" - no value
4. Test results shown in highlighted text exceed the Table 1 Standard for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
5. Test results shown in highlighted text exceed the Table 2.1 Standard for Volume Independent Soil for Residential/Parkland/Institutional Property Use
6. Test results shown in highlighted text exceed the Table 2.1 Standard for Volume Independent Soil for Industrial/Commercial/Community Property Use

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
		BS	Bulk Sample	**VANE**	Peak & Remolded shear
AS	Auger Sample	**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

Enclosure No.: 1
Sheet 1 of 1

FILE No: 1417

BOREHOLE No. 1

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 08 - 23** TO **Sep 08 - 23**

SOIL LITHOLOGY

Ground Elevation: **240.00 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)
239.77	230 mm TOPSOIL	
0.23	compact to very dense brown SANDY SILT TILL to SAND AND SILT TILL some gravel, trace clay occ. cobbles occ. clay lenses/seams moist	0.5 – 4.5
	-------- grey below 4.65 m damp	4.5 – 6.0
	-------- sand and gravel seam/layer saturated --------	6.0 – 6.5
233.45 6.55	End of Borehole	6.5

SYMBOL

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	18
2	SS	17
3	SS	21
4	SS	18
5	SS	42
6	SS	50/ 75 mm
7	SS	90

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

- water level at depth of 4.25 m bgs upon withdrawal of drilling augers

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: 1417

BOREHOLE No. 2

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 07 - 23** TO **Sep 07 - 23**

SOIL LITHOLOGY

Ground Elevation: **238.74 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL
238.59	150 mm TOPSOIL		
0.15	loose to very dense brown SANDY SILT TILL to SAND AND SILT TILL trace gravel occ. cobbles occ. clay lenses/seams moist to wet	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5	
	-------- grey below 3.8 m damp -------- silt layer -------- -------- sand and gravel seam/layer saturated		
232.19 6.55	End of Borehole	7.0 7.5 8.0 8.5	

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	7
2	SS	7
3	SS	24
4	SS	34
5	SS	35
6	SS	45
7	SS	62

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

water level at depth of 5.40 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
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FILE No: 1417

BOREHOLE No. 3

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 07 - 23** TO **Sep 07 - 23**

Ground Elevation: **240.10 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE
239.90	200 mm TOPSOIL				
0.20	loose, dark brown trace rootlets	0.5	1	SS	9
	---				
	compact to very dense brown	1.0	2	SS	27
	SANDY SILT TILL to SAND AND SILT TILL some gravel, trace clay	1.5	3	SS	11
	occ. cobbles occ. clay lenses/seams	2.0			
	moist	2.5	4	SS	24
		3.0			
		3.5	5	SS	35
	---				
	grey below 3.8 m	4.0			
	damp	4.5			
		5.0	6	SS	75
		5.5			
		6.0			
	---				
	gravelly sand seam/layer	6.5	7	SS	51
	---	7.0			
		7.5			
232.25			8	SS	50/100 mm
7.85	End of Borehole	8.0			
		8.5			

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

REMARKS

- water level at depth of 4.25 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

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FILE No: 1417

BOREHOLE No. 4

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 08 - 23** TO **Sep 08 - 23**

SOIL LITHOLOGY

Ground Elevation: **237.79 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)
237.64 / 0.15	150 mm TOPSOIL	
	stiff to hard brown CLAYEY SILT TILL some sand, trace gravel occ. cobbles DTPL to APL	0.5 – 5.5
	-------- grey below 3.35 m	
231.99 / 5.80	very dense, grey Medium to Fine SAND trace to some silt, trace gravel occ. silt seams saturated	6.0 – 6.5
231.24 / 6.55	End of Borehole	

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	10
2	SS	11
3	SS	8
4	SS	18
5	SS	50/ 100 mm
6	SS	20
7	SS	88

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

REMARKS

water level at depth of 4.40 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

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FILE No: 1417

BOREHOLE No. 5

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 07 - 23** TO **Sep 07 - 23**

SOIL LITHOLOGY

SAMPLE

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	WELL DATA	DEPTH (m)	REMARKS
	Ground Elevation: **240.22 m**								
240.02	200 mm TOPSOIL								
0.20	compact to very dense brown SANDY SILT TILL to SAND AND SILT TILL some gravel, trace clay occ. cobbles occ. clay lenses/seams moist	0.5		1	SS	10		0.5	
		1.0		2	SS	39		1.0	
		1.5		3	SS	29		1.5	
		2.0						2.0	
		2.5		4	SS	18		2.5	
		3.0						3.0	
		3.5		5	SS	31		3.5	
	-------- grey below 3.8 m damp	4.0						4.0	
		4.5		6	SS	28		4.5	
		5.0						5.0	
		5.5						5.5	
		6.0		7	SS	50/ 140 mm		6.0	
233.67		6.5						6.5	
6.55	End of Borehole								borehole open and dry upon withdrawal of drilling augers
		7.0						7.0	
		7.5						7.5	
		8.0						8.0	
		8.5						8.5	

PROJECT MANAGER: **EYC**

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FILE No: 1417

BOREHOLE No. 6

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 08 - 23** TO **Sep 08 - 23**

SOIL LITHOLOGY

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL
	Ground Elevation: **238.32 m**		
238.09	230 mm TOPSOIL		
0.23	loose to very dense brown SANDY SILT TILL to SAND AND SILT TILL trace gravel, trace clay occ. cobbles occ. to freq. clay lenses/seams moist -------- grey below 3.8 m damp	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5	
233.62 4.70	End of Borehole	5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5	

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	10
2	SS	9
3	SS	10
4	SS	17
5	SS	52
6	SS	50/ 125 mm

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

- water level at depth of 4.45 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

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FILE No: 1417

BOREHOLE No. 7

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 08 - 23** TO **Sep 08 - 23**

SOIL LITHOLOGY

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL
	Ground Elevation: **238.30 m**		
238.07	230 mm TOPSOIL		
0.23	loose to very dense brown SANDY SILT TILL to SAND AND SILT TILL trace gravel, trace clay occ. cobbles occ. clay lenses/seams occ. sand seams moist -------- grey below 2.9 m damp	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5	
233.25		5.0	
5.05	End of Borehole		

SAMPLE

SAMPLE ID	TYPE	N-VALUE
1	SS	7
2	SS	17
3	SS	17
4	SS	19
5	SS	67
6	SS	83

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

water level at depth of 2.60 m bgs upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

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Enclosure No.: 8
Sheet 1 of 1

FILE No: 1417

BOREHOLE No. 8

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 07 - 23** TO **Sep 07 - 23**

SOIL LITHOLOGY

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE
	Ground Elevation: **233.83 m**					
233.63	200 mm TOPSOIL					
0.20	loose to very dense brown SANDY SILT TILL to SAND AND SILT TILL trace gravel, trace clay occ. cobbles occ. clay lenses/seams moist -------- grey below 2.45 m damp -------- occ. sand pockets/lenses	0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		1 2 3 4 5 6	SS SS SS SS SS SS	7 13 29 89 63 92
228.78		5.0				
5.05	End of Borehole					

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

DEPTH (m)

REMARKS

borehole open and dry upon withdrawal of drilling augers

PROJECT MANAGER: **EYC**

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FILE No: 1417

BOREHOLE No. 9

Client: **Bruce-Grey Catholic District School Board**

Project: **Proposed New High School**

Location: **28th Avenue East, Owen Sound, Ontario**

EQUIPMENT DATA

Machine: **Diedrich D50T**
Method: **Solid Stem Auger**
Size: **152 mm O.D.**
Date: **Sep 07 - 23** TO **Sep 07 - 23**

Ground Elevation: **233.33 m**

ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SAMPLE ID	TYPE	N-VALUE	REMARKS
233.18	150 mm TOPSOIL					
0.15	loose to very dense brown SANDY SILT TILL to SAND AND SILT TILL trace gravel, trace clay occ. cobbles occ. clay lenses/seams moist	0.5	1	SS	7	
		1.0	2	SS	16	
		1.5	3	SS	15	
		2.0				
		2.5	4	SS	24	
		3.0				
	-------- grey below 3.35 m damp	3.5	5	SS	53	
		4.0				
		4.5				
228.28		5.0	6	SS	63	
5.05	End of Borehole					borehole open and dry upon withdrawal of drilling augers
		5.5				
		6.0				
		6.5				
		7.0				
		7.5				
		8.0				
		8.5				

SHEAR STRENGTH (kPa)
FIELD VANE: Peak ⊗ Rem. ×
LAB TEST: Unc. ■ P.P. □
50 100 150 200
PENETRATION RESISTANCE
STANDARD ● DYN. CONE ○
20 40 60 80

WATER CONTENT (%)
W_P W W_L
10 20 30

WELL DATA

PROJECT MANAGER: **EYC**

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Kitchener, Ontario N2H 5E1
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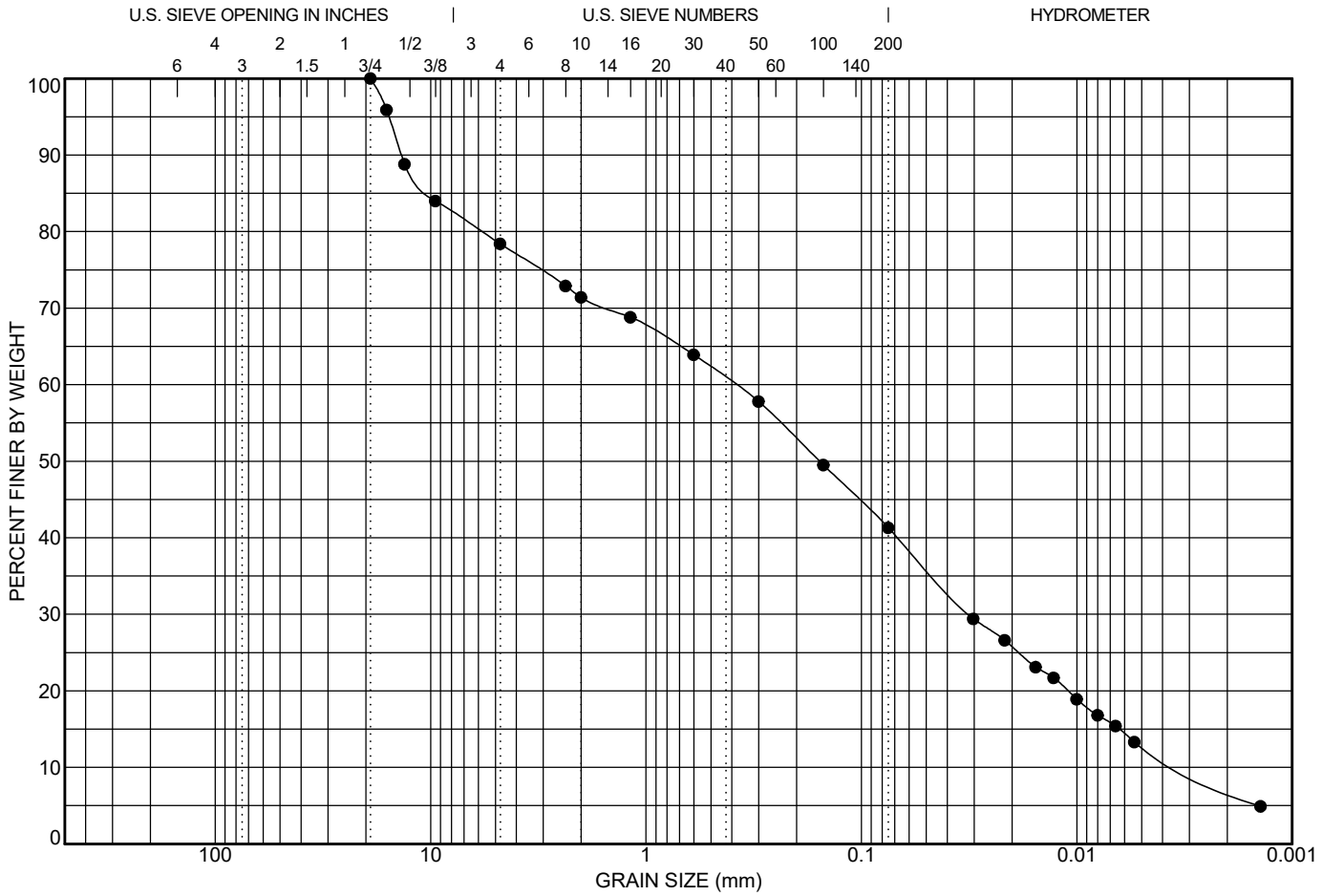

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.82	121.23	19	0.385	0.032	0.003	21.6	37.1	41.3	

Date: Oct. 23 - 2023
Client: Bruce-Grey Catholic District School Board
Contractor:
Source:
Sampled From: BH 3 - SA 3; 1.50 to 1.95 m depth
Sample No.: 3-3
Date Sampled: Sep. 07 - 2023
Sampled By: DO
Lab No.: 1242
Date Tested: Sep. 20 - 2022
Type of Material: Sand and Silt Till, some gravel, trace clay, occ. cobbles

Sieve Size (mm)	Percent Passing	No Specifications

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e-mail: info@cvdengineering.com

GRAIN SIZE DISTRIBUTION

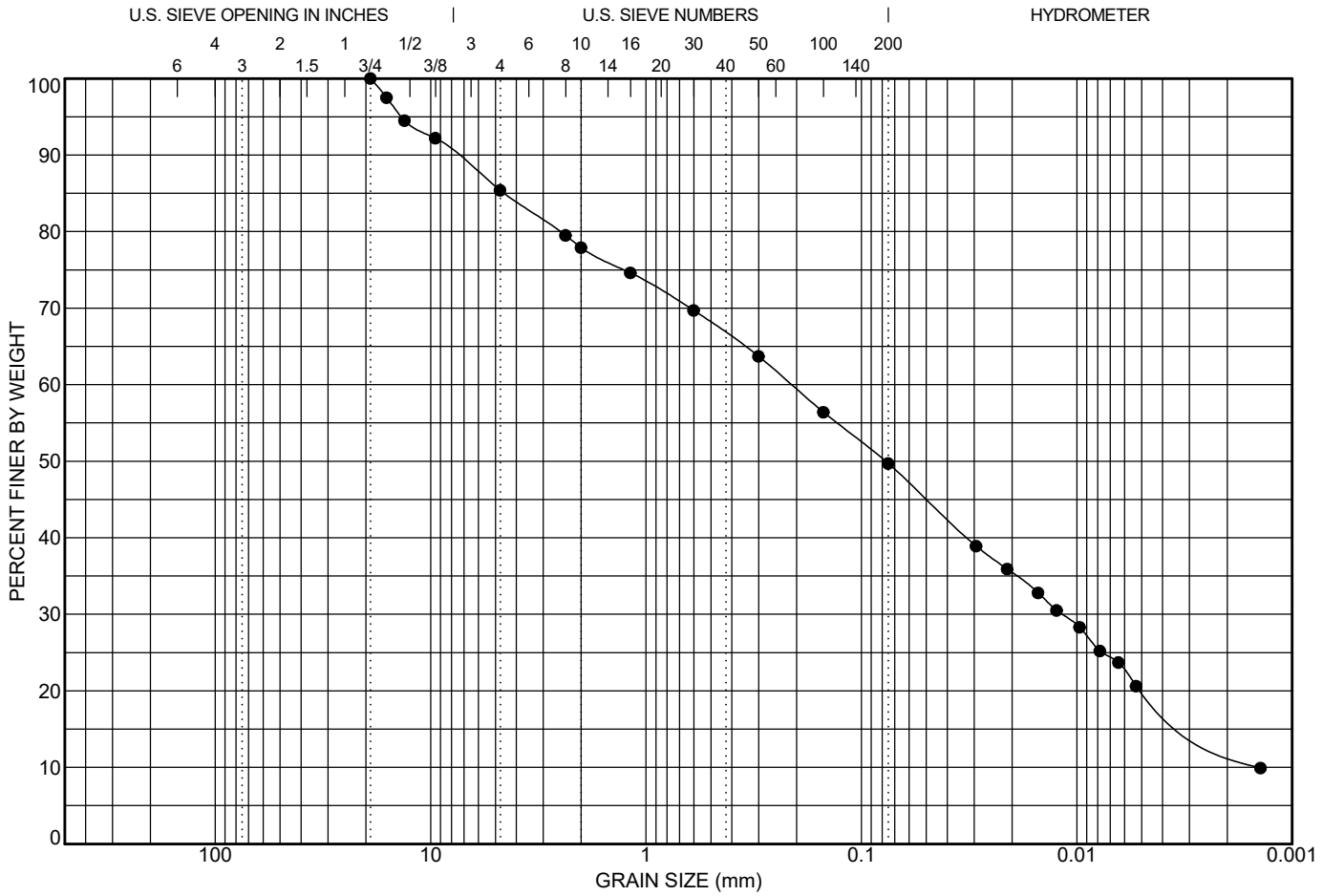
Project: Proposed New High School

Location: 28th Avenue East, Owen Sound, Ontario

File No.: 1417

Enclosure No.: 10

DM - NO SPECIFICATIONS 1417 28TH AVENUE E, OWEN SOUND.GPJ LAW LNDN.GDT 23-10-30



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.46	148.94	19	0.211	0.012	0.001	14.6	35.7	49.7	

Date: Oct. 23 - 2023
Client: Bruce-Grey Catholic District School Board
Contractor:
Source:
Sampled From: BH 5 - SA 4; 2.30 to 2.75 m depth
Sample No.: 5-4
Date Sampled: Sep. 07 - 2023
Sampled By: DO
Lab No.: 1243
Date Tested: Sep. 20 - 2022
Type of Material: Sand and Silt Till, some gravel, trace clay, occ. clayey seams

Sieve Size (mm)	Percent Passing	No Specifications

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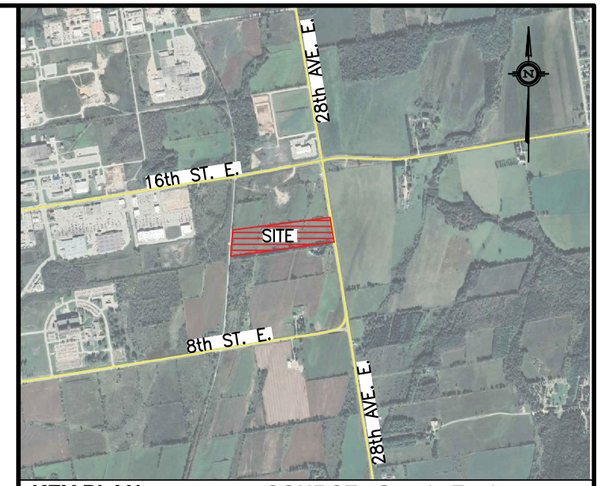
GRAIN SIZE DISTRIBUTION

Project: Proposed New High School

Location: 28th Avenue East, Owen Sound, Ontario

File No.: 1417

Enclosure No.: 11



KEY PLAN **SOURCE:** Google Earth

LEGEND

TBM: Catch Basin in the sidewalk, intersection of 16th Street East and 28th Avenue East.
Elev.: 237.26 m (Geodetic)

Borehole Location

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 New High School

28th Avenue East
Owen Sound, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD.

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

Drawn By: DO	Date: October 2023	File No.: 1417
Checked By: EYC	Scale: N.T.S.	Drawing No.: 1