MATERIALS TESTING CONSULTANTS

# GEOTECHNICAL DUE-DILIGENCE PHASE REPORT

197 and 203 LAKEWOOD DRIVE SE
EAST GRAND RAPIDS, MICHIGAN

**Prepared For:**

BERGHUIS CONSTRUCTION LLC
Grand Rapids, Michigan

**Prepared By:**

MATERIALS TESTING CONSULTANTS, INC.
Grand Rapids, Michigan

December 2020
MTC Project No. 201530

December 14, 2020
Project No. 201530

Berghuis Construction LLC
3351 O'Brien Rd SW
Grand Rapids, Michigan 49534

Attention: Josh Berghuis

Reference: Report of Geotechnical Due Diligence Phase Investigation
197 and 203 Lakewood Drive SE
East Grand Rapids, Michigan

Dear Mr. Berghuis:

We have completed a due diligence phase geotechnical investigation for the above-referenced project. The purpose of this investigation has been to identify the general subsurface soil conditions in the vicinity of the proposed construction and provide due-diligence phase geotechnical engineering considerations for the project. This work has been performed as described in our email dated November 18, 2020.

Presented herein are descriptions of our understanding of the design considerations, the due-diligence geotechnical investigation, encountered conditions and engineering considerations. The Appendix contains the report limitations and data collected during this investigation.

## DESIGN CONSIDERATIONS

### Available Information

We have been provided the following documents and information for use in this investigation:

- A Parcel Map prepared by Nederveld and dated August 20, 2020 showing the location of the site and the proposed boring locations.
- Email conversations with Josh Berghuis of Berghuis Construction LLC regarding the scope of the study.

Project Description

The site is located at 197 and 203 Lakewood Drive, north of Cotswold Lane and west of Pioneer Club Road as indicated on the attached boring location plan, Figure No. 1. The construction will be a residential structure; however, we understand the project is conceptual in nature at this time and no design information is available. We anticipate the structure will utilize light-framing methods with the potential for a basement. Relatively light structural loads are anticipated (50-kip column loads or less, 3 kip per lineal foot wall loads or less) with minor grade changes on the order of 1 to 2 ft or less within the building area.

Our study consisted of a due-diligence phase investigation to evaluate whether the site appears suitable for conventional construction methods. Considerations provided within this due-diligence phase report should be considered preliminary and should not be utilized for final design. We would be pleased to evaluate the design considerations once available and prepare a design phase geotechnical report.

## INVESTIGATION METHODOLOGY

Conventional soil test borings and sampling along with field engineering reconnaissance were used to investigate the subsurface conditions. Boring locations are shown on Figure No. 1. Investigation procedures, soil classification information and boring logs are provided in the Appendix.

| | |
|---|---|
| Number of Borings | 3 |
| Boring Depth, ft. | 20 |

Borings were drilled and other sampling was conducted solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.

## INVESTIGATION RESULTS

Regional Geology

The *Map of the Surface Formations of the Southern Peninsula of Michigan,* published by the State of Michigan, indicates the site is in an area of moraines. Soil conditions typically are found to be unstratified layers in this type of geologic area. The *Map of Bedrock Topography of the Southern Peninsula of Michigan* indicates bedrock to be at approximately el 600.

Site Conditions

At the time of our field work, the area of investigation was covered with a grassy lawn with a small tree line to the south and a pond to the north. The site, in general, sloped downwards towards the pond area with elevations ranging from approximately 781 ft to 788 ft with site grades in the vicinity of the borings ranging from el 778 to 782. Indications of previous structures such as abandoned foundations or slabs were not observed during our field staking activities.

Subsurface Conditions

The investigation, in general, encountered 6 inches of topsoil at Borings B-1 and B-2 with 12 inches of topsoil noted at Boring B-3. Underlying the topsoil, stiff to hard brown lean clay was encountered to termination at a depth of 20 ft. Poor recovery was noted in Boring B-3, Sample S-1 due to possible coarse gravel or cobble. Whenever cobble is noted, boulder should be expected.

The consistency of cohesive soil is based on both recorded SPT N-values and on estimates of the unconfined compressive strength obtained with a calibrated penetrometer.

Groundwater was not encountered during the drilling activities. Groundwater levels may fluctuate due to seasonal variations such as precipitation, snowmelt, nearby river or lake levels and other factors that may not be evident at the time of measurement. Groundwater levels may be different at the time of construction.

This section has provided a generalized description of the encountered subsurface soil conditions. The boring logs located in the Appendix should be reviewed for detailed soil descriptions. Some variation between boring locations may be expected.

GEOTECHNICAL DUE DILIGENCE CONSIDERATIONS

Based on the subsurface conditions encountered, conventional shallow foundations and slabs supported on-grade are expected to be feasible for the type of construction anticipated. We provide herein geotechnical considerations to assist with preliminary design, however, it is understood that design considerations (final site grading, finish floor elevations, structural loading) should be provided to us for review prior to final design in order to provide design phase geotechnical recommendations. Upon review of finalized site plans, further investigation may be required for a design phase geotechnical study, which could include additional soil borings, laboratory testing and a detailed evaluation of settlement under final design loading conditions. Additional soil borings may encounter unforeseen conditions which may facilitate the need for different foundation systems.

Foundations

An allowable net bearing pressure on the order of 2500 psf to 3500 psf appears feasible for preliminary foundation design considering total settlement criteria of 1 inch or less can be tolerated.

Foundations for the proposed building are expected to bear on the stiff to hard brown to gray lean clay as encountered in the borings or on approved engineered fill following subgrade preparation.

Site and Subgrade Preparation

Any topsoil, vegetation, roots, and any other miscellaneous debris should be removed from within the proposed construction areas. The limits of the proposed construction area, prior to the placement of any structures or engineered fill material, should be proof-rolled. Proof-rolling is defined as the passing of relatively heavy construction equipment over the soil subgrade under observation by the Geotechnical Engineer. The response of the soil, when subjected to the applied load, is subjectively evaluated by our staff with respect to its ability to support the overlying soil or structure. In areas where excessive deflection is observed, special subgrade preparation measures may be recommended to provide an acceptable subgrade condition. These measures may consist of compaction of the subgrade at moisture contents close to the optimum value, undercutting affected areas and replacing with engineered fill, use of a geotextile separation fabric or some combination of these measures.

The foundation subgrade should be inspected and tested by qualified geotechnical personnel familiar with the geotechnical recommendations. As part of the inspection and testing, the subgrade at each individual bearing element should be verified to be consistent with the conditions encountered in this investigation and the indicated recommended allowable bearing pressures. This testing should include the verification of acceptable unconfined compressive strengths in cohesive soil. Care should be taken to maintain the natural moisture content of clayey subgrade soil which may become soft when saturated from rainfall, etc.

Engineered fill is approved on-site or imported soil placed in uniform layers and compacted to a minimum required density. Cohesive and fine-grained soils may be used as engineered fill, however, due to the need for moisture contents during compaction to be within a relatively narrow range, they are relatively difficult to compact especially in wet or cold weather. Imported fill should meet the requirements for MDOT Class II granular material. MDOT Class II soil should be used as backfill against below-grade walls and foundations.

Groundwater

Groundwater was not encountered in the borings at the time of drilling activities and therefore the control of groundwater for foundation construction is not expected to be of concern on this project.

A perimeter footing drain should be considered in all areas where the building's floor slab is at or below the adjacent exterior elevation.

CLOSURE

In this report, descriptions of the due diligence phase investigation, encountered conditions and due diligence considerations for the project have been provided. The limitations of this study are described in the Appendix.

The considerations presented in this report are based upon limited information regarding the project and a limited number of subsurface samples obtained from various sampling locations and should not be utilized for final design. The samples may not fully indicate the nature and extent of the variations that actually exist between sampling locations. Further investigation may be required for a design phase geotechnical study, which could include additional soil borings, laboratory testing and settlement evaluation. Additional soil borings may encounter differing conditions which may facilitate the need for different foundation systems. For that reason, among others, we strongly recommend that we be retained to observe earthwork construction. If variations or other latent conditions become evident during construction, it will be necessary for us to review these conditions and our recommendations as appropriate.

We appreciate the opportunity to provide this service to you on this project. Should you have any questions or require further assistance, please contact our office.

Sincerely,

MATERIALS TESTING CONSULTANTS, INC.

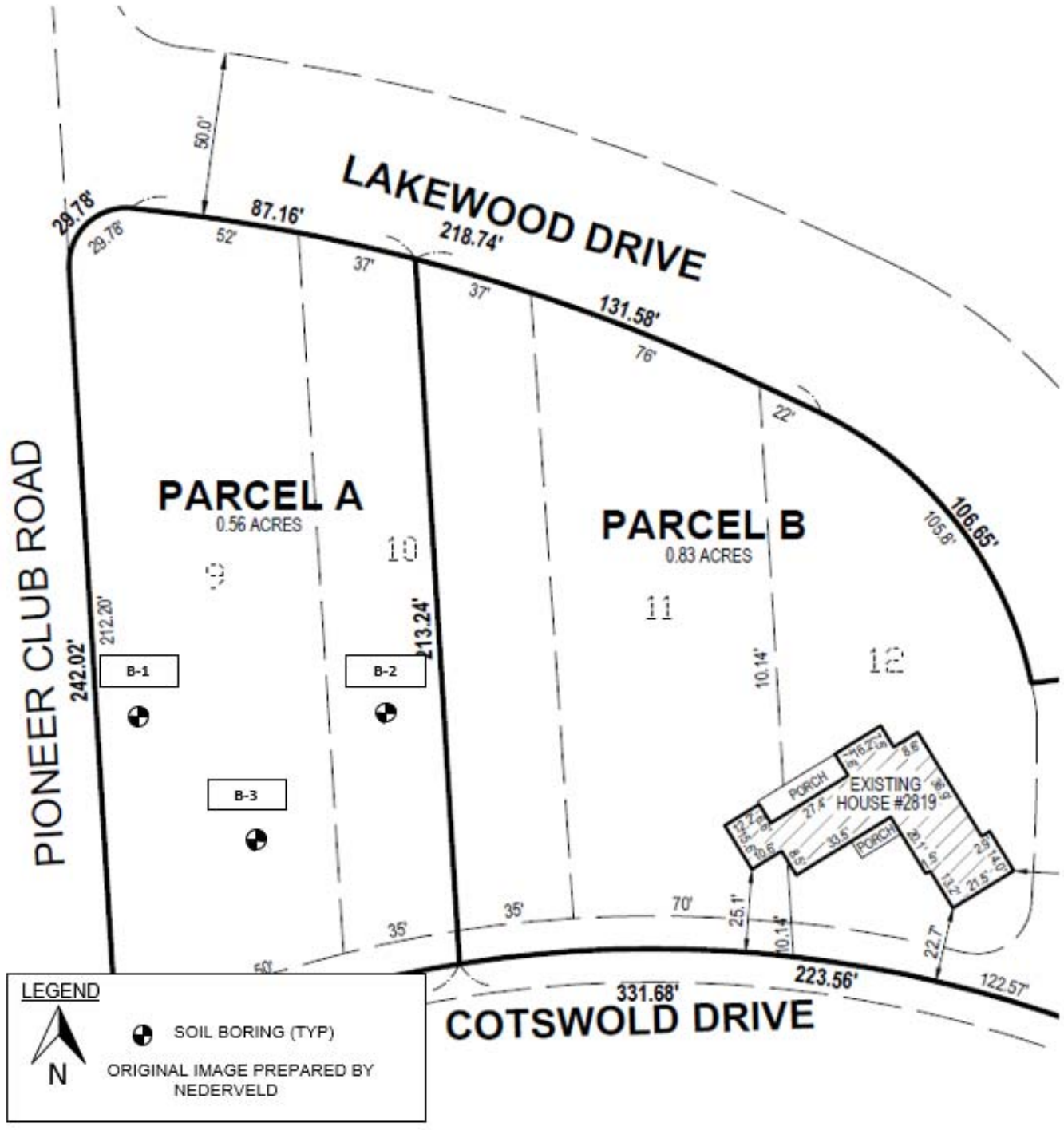
Chelsea L. Kennedy, E.I.T.
Assistant Project Engineer

Todd D. Munger, P.E.
Senior Project Manager

Attachments: Figure No. 1 - Boring Location Plan
Appendix
- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs

*APPENDIX*

- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs




| | | | |
|---|---|---|---|
| TITLE:BORING LOCATION PLAN | | | PROJECT: COTSWOLD LANE DUE DILIGENCE STUDY |
| SCALE: NTS | DATE: 12/3/2020 | PROJECT NO.:201530 | MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 1 | DR. BY: JRS | REV. BY: CK | |

# LIMITATIONS

## Soil Variations

The recommendations in this report are based upon the data obtained from the soil borings. This report does not reflect variations which may occur between these borings, and which would not become evident until construction. If variations then become evident, it would be necessary for a re-evaluation of recommendations of this report, after performing on-site observations.

## Warranties

We have prepared this report in accordance with generally accepted soil and foundation engineering practices. We make no other warranties, either expressed or implied, as to the professional advice provided under the terms of our agreement and included in this report. This report is prepared exclusively for our client and may not be relied upon by other parties without written consent from our office.

## Boring Logs

In the process of obtaining and testing samples and preparing this report, we follow reasonable and accepted practice in the field of soil engineering. Field logs maintained during drilling describe field occurrences, sampling locations, and other information. The samples obtained in the field are subjected to additional testing in the laboratory and differences may exist between the field logs and the final logs. The engineer reviews the field logs and laboratory test data, and then prepares the final boring logs. Our recommendations are based on the contents of the final logs.

## Review of Design Plans and Specifications

In the event that any changes in the design of the building or the location, however slight, are planned, our recommendations shall not be considered valid unless modified or approved in writing by our office. We recommend that we be provided the opportunity to review the final design and specifications in order to determine whether changes in the original concept may have affected the validity of our recommendations, and whether our recommendations have, in fact, been implemented in the design and specifications.

# TEST DRILLING AND SAMPLING PROCEDURES

Test Drilling Methods:

- [X] Hollow stem auger, ASTM D6151
- [ ] Mud rotary, ASTM D5783
- [ ] Casing advancer, ASTM D5872
- [ ] Rock coring, ASTM D2113
- [ ] Cone Penetration Testing, ASTM D5778

*Note: Cone penetration test data can be used to interpret subsurface stratigraphy and can provide data on engineering properties of soils. The ASTM procedure does not include a procedure for determining soil classification from CPT testing. Soil classifications shown on CPT logs are based on published procedures and are not based on physical ASTM soil classification tests.*

Sampling Methods:

- [X] SPT, ASTM D1586, CME Auto hammer (140 lb., 30" drop, 2" OD split spoon sampler)
- [ ] Thin-walled tube sampler (Shelby), ASTM D1587

*Note: The number of hammer blows required to drive the SPT sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6 inch increments are recorded on the boring logs.*

Drill Rig:

- [X] CME 55 (ATV)
- [ ] CME 750 Rubber tired (ATV)
- [ ] CME 95 Truck
- [ ] Geoprobe Direct Push
- [ ] Geoprobe Rotary Sonic

Boreholes Backfilled With:

- [X] Excavated soil
- [ ] Cement bentonite grout
- [X] Piezometer or Monitoring Well (see notes on logs)
- [ ] Concrete or asphalt patch where appropriate

Sample Handling and Disposition:

- [X] SPT samples labeled, placed in jars, returned to MTC Laboratory
- [X] Discard after 60 days

# BORING LOG TERMINOLOGY AND ASTM D 2488 CLASSIFICATION OUTLINE

**TERMS DESCRIBING CONSISTENCY OR CONDITION**

**COARSE-GRAINED** SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

| Descriptive Terms | Relative Density | SPT Blow Count |
|---|---|---|
| Very loose | 0 to 15 % | < 4 |
| Loose | 15 to 35 % | 4 to 10 |
| Medium dense | 35 to 65 % | 10 to 30 |
| Dense | 65 to 85 % | 30 to 50 |
| Very dense | 85 to 100 % | > 50 |

Per ASTM D2487, the following conditions must be met based on laboratory testing to justify the label 'well graded' in a soil description.

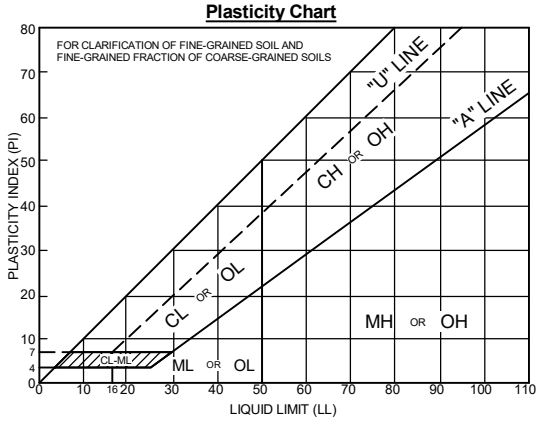
Gravel: $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

Sand: $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

**FINE-GRAINED** SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

| Descriptive Terms | Unconfined Compressive Strength kPa | SPT Blow Count |
|---|---|---|
| Very soft | < 25 | < 2 |
| Soft | 25 to 50 | 2 to 4 |
| Medium stiff | 50 to 100 | 4 to 8 |
| Stiff | 100 to 200 | 8 to 15 |
| Very stiff | 200 to 400 | 15 to 30 |
| Hard | > 400 | > 30 |

**Plasticity Chart**




| MAJOR DIVISIONS | | | | | TYPICAL NAMES |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP-SM | | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SM | | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.

2. "Grades with" or "Grades without" may be used to describe soil when characteristics vary within a stratum.

3. Preserved soil samples will be discarded after 60 days unless alternate arrangements have been made.

## GROUNDWATER OBSERVATIONS:

During - indicates water level encountered during the boring
End- indicates water level immediately after drilling
Date and Depth - Measurements at indicated date

SAMPLE TYPES AND NUMBERING

| | | |
|---|---|---|
| | S | SPT, split barrel sample, ASTM D1586 |
| | U | Shelby tube sample, ASTM D1587 |
| | R | Rock core run |
| | *S | Other than 2" split barrel sample |
| | L | SPT with liner, ASTM D1586 |
| | A | Auger cuttings |
| | G | Geoprobe liner |

MINOR COMPONENT QUANTIFYING TERMS

| | |
|---|---|
| Less than 5% | TRACE |
| 5 to 10% | FEW |
| 15 to 25% | LITTLE |
| 30 to 40% | SOME |
| 50 to 100% | MOSTLY |

GRAIN SIZE

| | |
|---|---|
| BOULDER | >12" |
| COBBLE | 12" to 3" |
| COARSE GRAVEL | 3" to 0.75" |
| FINE GRAVEL | 0.75" to No. 4 |
| COARSE SAND | No. 4 to No. 10 |
| MEDIUM SAND | No. 10 to No.40 |
| FINE SAND | No. 40 to No. 200 |

# LOG OF BORING

**Project No.:** 201530
**Boring No.:** B-1
**Sheet:** 1 of 1

Project: Cotswold Lane Due Diligence Study
Client: Berghuis Construction LLC
Location: East Grand Rapids, Michigan
Drill Type: CME 55
Crew Chief: GS Field Eng.: JRS Rev. By: CK
Coordinates: N=533715.8 E=12793153.1 (MI South ift)
Elevation: 778.0 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 17.0 ft.

Date Begin: 12/07/20 Date End: 12/07/20

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | None |
| Sampler | SPT | 2" | End | NA |
| Core | | | Seepage | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 20.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | DD pcf | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 777.0 | 1 | S-1 | 1.5 | 2-3-6 N=9 | | 6" Topsoil 0.5 | 2.0 | | | |
| 776.0 | 2 | | | | | Brown lean CLAY; mostly clayey fines, moist | | | | |
| 775.0 | 3 | | | | | | | | | |
| 774.0 | 4 | S-2 | 1.5 | 15-17-23 N=40 | | | 4.5+ | | | |
| 773.0 | 5 | | | | | | | | | |
| 772.0 | 6 | | | | | | | | | |
| 771.0 | 7 | S-3 | 1.5 | 14-16-23 N=39 | | | 4.5+ | | | |
| 770.0 | 8 | | | | | | | | | |
| 769.0 | 9 | S-4 | 1.5 | 6-10-13 N=23 | CL | | 4.5+ | | | |
| 768.0 | 10 | | | | | | | | | |
| 767.0 | 11 | | | | | | | | | |
| 766.0 | 12 | | | | | | | | | |
| 765.0 | 13 | | | | | | | | | |
| 764.0 | 14 | S-5 | 1.5 | 7-8-12 N=20 | | | 4.5+ | | | |
| 763.0 | 15 | | | | | | | | | |
| 762.0 | 16 | | | | | | | | | |
| 761.0 | 17 | | | | | | | | | |
| 760.0 | 18 | | | | | | | | | |
| 759.0 | 19 | S-6 | 1.5 | 6-7-10 N=17 | | Grades gray 20.0 | 2.5 | | | |
| 758.0 | 20 | | | | | | | | | |
| | | | | | | End of Boring | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 201530
**Boring No.:** B-2
**Sheet:** 1 of 1

Project: Cotswold Lane Due Diligence Study
Client: Berghuis Construction LLC
Location: East Grand Rapids, Michigan
Drill Type: CME 55
Crew Chief: GS Field Eng.: JRS Rev. By: CK
Coordinates: N=533700.6 E=12793221.8 (MI South ift)
Elevation: 778.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 18.0 ft.

Date Begin: 12/07/20 Date End: 12/07/20

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | None |
| Sampler | SPT | 2" | End | NA |
| Core | | | Seepage | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 20.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | DD pcf | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 777.9 | 1 | S-1 | 1.5 | 2-3-3 N=6 | | 6" Topsoil 0.5 | 1.5 | | | |
| 776.9 | 2 | | | | | Brown lean CLAY; mostly clayey fines, few fine sand, moist | | | | |
| 775.9 | 3 | | | | | | | | | |
| 774.9 | 4 | S-2 | 1.5 | 6-10-12 N=22 | | | 2.5 | | | |
| 773.9 | 5 | | | | | | | | | |
| 772.9 | 6 | | | | | | | | | |
| 771.9 | 7 | S-3 | 1.5 | 7-13-16 N=29 | | | 4.5+ | | | |
| 770.9 | 8 | | | | | | | | | |
| 769.9 | 9 | S-4 | 1.5 | 9-12-20 N=32 | CL | | 4.5+ | | | |
| 768.9 | 10 | | | | | | | | | |
| 767.9 | 11 | | | | | | | | | |
| 766.9 | 12 | | | | | | | | | |
| 765.9 | 13 | | | | | | | | | |
| 764.9 | 14 | S-5 | 1.5 | 5-7-11 N=18 | | | 4.5 | | | |
| 763.9 | 15 | | | | | | | | | |
| 762.9 | 16 | | | | | | | | | |
| 761.9 | 17 | | | | | | | | | |
| 760.9 | 18 | | | | | | | | | |
| 759.9 | 19 | S-6 | 1.5 | 4-7-10 N=17 | | Grades gray 20.0 | 3.0 | | | |
| 758.9 | 20 | | | | | | | | | |
| | | | | | | End of Boring | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 201530
**Boring No.:** B-3
**Sheet:** 1 of 1

Project: Cotswold Lane Due Diligence Study
Client: Berghuis Construction LLC
Location: East Grand Rapids, Michigan
Drill Type: CME 55
Crew Chief: GS Field Eng.: JRS Rev. By: CK
Coordinates: N=533666.9 E=12793175.8 (MI South ift)
Elevation: 781.6 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings. Cave in at 18.0 ft.

Date Begin: 12/07/20 Date End: 12/07/20

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | None |
| Sampler | SPT | 2" | End | NA |
| Core | | | Seepage | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 20.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | DD pcf | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 780.6 | 1 | S-1 | 1.0 | 2-3-6 N=9 | | 12" Brown to black Topsoil 1.0 | 4.5 | | | S-1: Poor recovery; possible coarse gravel / COBBLE |
| 779.6 | 2 | | | | CL | Brown lean CLAY; mostly clayey fines, moist | | | | |
| 778.6 | 3 | | | | | | | | | |
| 777.6 | 4 | S-2 | 1.5 | 7-9-18 N=27 | | | 4.5 | | | |
| 776.6 | 5 | | | | | | | | | |
| 775.6 | 6 | | | | | | | | | |
| 774.6 | 7 | S-3 | 1.5 | 10-18-24 N=42 | | | | | | |
| 773.6 | 8 | | | | | | | | | |
| 772.6 | 9 | S-4 | 1.5 | 7-10-16 N=26 | | | 4.5+ | | | |
| 771.6 | 10 | | | | | | | | | |
| 770.6 | 11 | | | | | | | | | |
| 769.6 | 12 | | | | | | | | | |
| 768.6 | 13 | | | | | | | | | |
| 767.6 | 14 | S-5 | 1.5 | 7-10-16 N=26 | | | 4.5 | | | |
| 766.6 | 15 | | | | | | | | | |
| 765.6 | 16 | | | | | | | | | |
| 764.6 | 17 | | | | | | | | | |
| 763.6 | 18 | | | | | | | | | |
| 762.6 | 19 | S-6 | 1.5 | 3-5-8 N=13 | | Grades gray 20.0 | 2.5 | | | |
| 761.6 | 20 | | | | | End of Boring | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.