



Report of Geotechnical Investigation

**Grove Street
Embankment Slope Failure
Along North Bank of
Ford Lake
Ypsilanti, Michigan**

Prepared for:

OHM Advisors
34000 Plymouth Road
Livonia, Michigan 48150

G2 Project No. 193278
July 26, 2019



CONSULTING
GROUP

July 26, 2019

Mr. Matt Parks
OHM Advisors
34000 Plymouth Road
Livonia, Michigan 48150

Re: Report of Geotechnical Investigation
Grove Road Slope Stability
Grove Road between Margarita Street and Loon Feather Point Park
Ypsilanti, Michigan 48198
G2 Project No. 193278

Dear Mr. Parks:

We have completed the geotechnical investigation of the slope failure along Grove Road between Margarita Street and Loon Feather Point Park in Ypsilanti, Michigan. This report presents the results of our observations and analyses and our recommendations for earthwork operations and construction considerations as they relate to the geotechnical conditions on site.

We appreciate the opportunity to be of service to you and look forward to discussing the recommendations presented. In the meantime, if you have any questions regarding our report or any other matter pertaining to the project, please contact us.

Sincerely,

G2 Consulting Group, LLC

Tyler S. Hesse, E.I.T.
Staff Engineer

TSH/MSS/nab

Mark S. Stapleton, P.E.
Project Manager

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EXECUTIVE SUMMARY

We understand that the proposed project consists of stabilizing a failing slope on the north side of Ford Lake in Ypsilanti, Michigan. Grove Road is at the top of the failing slope and runs approximately parallel with Grove Road and the Ford Lake shoreline. The adjacent sidewalk, south of Grove Road, has experienced settlement on the order of 1/2 to 2 feet since the documented slope failure. The most pronounced slope failure has occurred in the vicinity of our soil boring B-03.

We drilled four (4) borings (B-01 through B-04) within the influence of the observed slope failure, extending to a depths ranging from 40 to 75 feet below the existing road surface. In addition, we attempted to perform hand auger soil borings along the existing embankment slope face. Approximately 6 to 8 inches of asphalt are present within the soil boring locations. Granular fill soils consisting of sand, clayey sand, and silty sand underlie the asphalt within the soil boring locations and extend to approximate depths of 8-1/2 to 11 feet below the road surface. Native gravelly sand underlies the fill soils within soil borings B-01 and B-02 and extend to approximate depths of 12 to 16-1/2 feet below the road surface. In general, alternating strata of silty clay, silt, and clayey silt underlie the native gravelly sand within B-01 and B-02 and the fill soils within B-03 and B-04 and extend to the explored depths ranging from 40 to 73-1/2 feet. Hand auger boring along the B-03 slope was attempted, but very loose silty and clay deposits prevented further advancement of borings.

Groundwater was not encountered within the upper 10 feet during drilling operations within B-01 and B-03. Mud-rotary drilling operations were used to advance the soil boring beyond a depth of 10 feet to the explored depths. Direct groundwater observations could not be made beyond a depth of 10 feet within B-01 and B-03 due to the use of drilling fluid. However, an open standpipe piezometer well was installed within soil boring B-03, and preliminary well readings indicate that groundwater is approximately 43-1/2 feet below the road surface. Within B-02 and B-04, groundwater measurements were performed during and upon completion of drilling operations. Groundwater was encountered at approximately 8 to 10-2/3 feet below the road surface during drilling operations within B-02 and B-04. Upon completion of drilling operations; groundwater was measured at approximately 16 to 23 feet below the road surface.

We performed slope stability analyses of four slope profiles along Grove Street. The two analyzed slope profiles coincide with the approximate soil boring B-03 and B-02 location. Based on our analyses, we believe the slope failure is due to surficial sloughing of the upper soils along the slope face, and is not due to deep-seated global slope instability. The effective stress analyses show that the existing slope has a factor of safety against surficial sloughing as low as 0.328 in some areas for the effective stress soil condition (drained soil condition). The analyses indicate that the slope is currently surficially unstable.

We performed analyses of a cantilevered sheet pile wall using the SupportIT v. 2.34 computer program. The profile section at Station 03+25 was used for analyses, since this profile shows the greatest required retained height of approximately 15 feet. Based on the anticipated ground surface and assumed loading conditions, the steel sheet pile wall should consist of 40-foot long ASTM A572 Grade 50 steel sheet piles having a minimum section modulus of 48.4 in³/ft and a minimum moment of inertia of 428.1 in⁴/ft. Steel sheet piles with these properties could expect top-of-wall deflections of approximately 1-1/4 inches. If smaller deflections are required, a sheet pile with a larger moment of inertia should be used. Installing the steel sheet piling along the proposed alignment will minimize roadway settlement; however, it will not prevent further surficial sloughing of the embankment slope face in front (down slope) of the sheet pile wall. The effective stress analyses show that the slope with the cantilevered sheeting as proposed will have a factor of safety against deep seated failure of about 1.32 in some areas for the effective stress soil condition (drained soil condition). The analyses indicate that the proposed would be acceptable.

The backfill adjacent to the sheet pile wall should consist of MDOT Class II sand to maintain drained conditions. Weep holes and/or wall drains should be constructed to allow the backfill to drain.



PROJECT DESCRIPTION

We understand that the proposed project consists of stabilizing a failing slope on the north side of Ford Lake in Ypsilanti, Michigan. Grove Road is at the top of the failing slope and runs approximately parallel with Grove Road and the Ford Lake shoreline. The adjacent sidewalk, south of Grove Road, has experienced settlement on the order of 1/2 to 2 feet since the documented slope failure. The most pronounced slope failure has occurred in the vicinity of our soil boring B-03.

The road surface elevation of Grove Road, in the failure area, ranges from approximately 726 to 731 feet. The existing slope is generally inclined approximately 2 horizontal units to 1 vertical units (2H:1V); however, there are isolated areas along the slope face that have inclinations as steep as 1H:1V. We understand that there is a vertical scarp which parallels Grove Road. The water surface elevation within Ford Lake was not available at the time of this report; however, for evaluation purposes, we have assumed a high-water elevation of 684 feet in our analysis.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project is as follows:

1. We drilled four (4) borings (B-01 through B-04) within the influence of the observed slope failure, extending to a depths ranging from 40 to 75 feet below the existing road surface.
2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, as well as grain-size-distribution, dry density, and unconfined compressive strength determinations.
3. We prepared this preliminary engineering report. Our preliminary report includes descriptions of the current slope conditions of the failed sloped area, a discussion of possible causes of the slope failure, and a general description of immediate corrective slope stabilization measures.

FIELD OPERATIONS

G2 Consulting Group, in conjunction with OHM Advisor and the Washtenaw County Road Commission, selected the number, depth, and location of the soil borings. The soil boring locations were determined in the field by use of GPS assisted mobile technology and measuring from known surface features using conventional taping methods by a G2 staff engineer. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1.

The soil borings were drilled using a truck-mounted rotary drill rig. Within soil borings B-01 and B-03, continuous flight, 4-inch diameter, solid-stem augers were used to advance the boreholes to a depth of 10 feet at which steel casing was installed and the remainder of the soil boring was drilled using mud-rotary drilling methods. However, continuous flight, 3-1/4-inch diameter, hollow-stem augers were used to advance the boreholes to the explored depth within soil borings B-02 and B-04. Soil samples were obtained at intervals of 2-1/2 feet within the upper 10 feet and at 5 foot intervals thereafter. These samples were obtained by the Standard Penetration Test method (ASTM D 1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). Blow counts for each 6-inch increment and the resulting N-values are presented on the individual soil boring logs.

Soil samples were placed in sealed containers in the field and brought to our laboratory for testing and classification. During field operations, the driller maintained logs of the encountered subsurface conditions, including changes in stratigraphy and observed groundwater levels. The final boring logs are based on the field logs supplemented by laboratory classification and test results. After completion of



drilling operations, the boreholes were backfilled with auger cuttings.

LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to analyzing the stability of the failing slope. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System. Laboratory testing consisted of natural moisture contents, grain-size-distribution, and unconfined compressive strength determinations. The aforementioned laboratory testing was performed in accordance with:

- “Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass” (ASTM D2216).
- “Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis” (ASTM D6913).
- “Standard Test Method for Particle-Size Analysis of Soils” (ASTM D422).
- “Standard Test Method for Unconfined Compressive Strength of Cohesive Soil” (ASTM D2166).

The unconfined compressive strengths were determined by ASTM D2166, and a spring-loaded hand penetrometer. As specified by ASTM D2166, the unconfined compressive strength of cohesive soils is determined by axially loading a small cylindrical soil sample under a slow rate of strain. The unconfined compressive strength is defined as the maximum stress applied to the soil sample before shear failure. If shear failure does not occur prior to a total strain of fifteen percent, the unconfined compressive strength is defined as the stress at a strain of fifteen percent. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring-loaded cylinder.

The results of the moisture contents, dry densities, and unconfined compressive strengths are indicated on the soil boring logs at the depths the samples were obtained. In addition, the grain-size distribution determined using ASTM D422 and DD166, as well as the Unconfined Compressive Strengths determined using ASTM D2166 are represented graphically in the Appendix as Figure Nos. 5 and 6, respectively. We will hold the soil samples for 60 days from the date of this report. If you would like us to retain the samples beyond this date, or you would like the samples, please let us know.

SITE CONDITIONS

The slope failure is located along south side of Grove Road from Margarita Street to Loon Feather Point Park, north of Ford Lake, in Ypsilanti, Michigan. In general, the failing slope is wooded, and covered with thick brush. In addition, the soils underlying the sidewalk pavement running parallel to the south side of Grove Road have settled, creating an underlying void. The adjacent sidewalk, south of Grove Road, has experienced settlement on the order of 1/2 to 2 feet since the documented slope failure. The most pronounced pavement settlement and cracking indicating slope failure is centralized in the vicinity of our soil boring B-03.

Based on our preliminary investigations, Google Earth Po indicates the road surface elevation of Grove Road, in the failure area, ranges from approximately 726 to 731 feet. These general elevation estimations were confirmed with topographic surveys provided. The existing slope is generally inclined approximately 2 horizontal units to 1 vertical units (2H:1V); however, there are isolated areas along the slope face that have inclinations as steep as 1H:1V. The water surface elevation within Ford Lake was not available at the time of this report; however, for evaluation purposes, we have assumed a high-water elevation of 684 feet in our analysis, or about 45 feet below the ground surface. As reported previously



in this report, we have been informed of a vertical scarp face running parallel to Grove Road.

SUBSURFACE CONDITIONS

General

The Soil Boring Location Plan, Plate No. 1, Soil Boring Logs, Figure Nos. 1 through 4 are attached to this report. The soil profiles described below are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the boring logs and elsewhere in this report are presented on Figure No. 8.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between borings. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transition may be more gradual than what is shown. We have prepared the boring logs on the basis of laboratory classification and testing, as well as field logs of the soils encountered.

Soil Conditions

Approximately 6 to 8 inches of asphalt are present within the soil boring locations. Granular fill soils consisting of sand, clayey sand, and silty sand underlie the asphalt within the soil boring locations and extend to approximate depths of 8-1/2 to 11 feet below the road surface. Native gravelly sand underlies the fill soils within soil borings B-01 and B-02 and extend to approximate depths of 12 to 16-1/2 feet below the road surface. In general, alternating strata of silty clay, silt, and clayey silt underlie the native gravelly sand within B-01 and B-02 and the fill soils within B-03 and B-04 and extend to the explored depths ranging from 40 to 73-1/2 feet.

In general, the clayey sand fill soils are loose to medium compact in relative density, with Standard Penetration Test (SPT) N-Values ranging from 10 to 12 blows per foot (bpf); however, the clayey sand fill soils within B-02 are very loose in relative density, with a SPT N-Value of 4 bpf. The silty sand fill soils within B-01 are medium compact in relative density, with SPT N-Values ranging from 20 to 21 bpf; however, the silt sand fill soils within B-04 are very loose in relative density, with an SPT N-Value of 1 bpf. The sandy fill soils within B-02 and B-04 are very loose to loose in relative density, with SPT N-Values ranging from 1 to 5 bpf; however, the upper sandy fill soils within B-03 and B-04 are medium compact in relative density, with SPT B-Values ranging from 15 to 24 bpf. The native gravelly sand soils are medium compact to compact in relative density, with SPT N-Values ranging from 20 to 55 bpf. In general, the native silty clay soils are very stiff to hard in consistency, with natural moisture contents ranging from 13 to 21 percent, and unconfined compressive strengths ranging from 5,000 to 9,000 pounds per square foot (psf); however, the upper native silty clay fill soils within B-01 are stiff to very stiff in consistency, with natural moisture contents ranging from 17 to 23 percent, and unconfined compressive strengths ranging from 2,000 to 4,000 psf. In general, the native silt soils are medium compact to compact in relative density, with SPT N-Values ranging from 25 to 48 bpf; however, the lower native silt soils within B-01 are compact in relative density, with an SPT N-Value of 92 bpf. The native clayey silt soils are compact to very compact in relative density, with SPT N-Values ranging from 31 to 82 bpf.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between borings. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transitions may be more gradual than what are shown. We have prepared the boring logs on the basis of laboratory classification and testing as well as field logs of the soils encountered.

Soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the boring logs and elsewhere



in this report are presented on Figure No. 7.

Groundwater Conditions

Groundwater was not encountered within the upper 10 feet during drilling operations within B-01 and B-03. Mud-rotary drilling operations were used to advance the soil boring beyond a depth of 10 feet to the explored depths. Direct groundwater observations could not be made beyond a depth of 10 feet within B-01 and B-03 due to the use of drilling fluid. However, an open standpipe piezometer well was installed within soil boring B-03, and preliminary well readings indicate that groundwater is approximately 43-1/2 feet below the road surface. Within B-02 and B-04, groundwater measurements were performed during and upon completion of drilling operations. Groundwater was encountered at approximately 8 to 10-2/3 feet below the road surface during drilling operations within B-02 and B-04. Upon completion of drilling operations; groundwater was measured at approximately 16 to 23 feet below the road surface.

Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variation and following periods of prolonged precipitation. It is likely that the groundwater elevation is directly related to the water surface elevation of the nearby Ford Lake to the south. It should also be noted that groundwater observations made during drilling operations in predominately cohesive soils are not necessarily indicative of the static groundwater level. This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

SLOPE STABILITY ANALYSES

We performed slope stability analyses of four slope profiles along Grove Street. The two analyzed slope profiles coincide with the approximate soil boring B-02 and B-03 locations. We conducted analyses to determine the stability of the current slope configurations. The current slope profiles were taken from the Preliminary Belle River Road Slope Failure Repair drawings prepared by OHM. Outputs from our analyses are presented on Figure Nos. 10 through 13.

Stability analyses were performed using the method of slices computer program SLIDE (Version 6.0). Where appropriate, stability analyses were performed for both undrained (total stress) and drained (effective stress) soil conditions. Stability failure generally takes place by slippage along a surface of nearly circular cross section. The self-weight of the soil within the failure arc and the slope configuration contribute to developing the driving forces for slope failure. The resisting forces against slope failure are influenced by the shear strength of the soil mass along the failure arc plane and the slope configuration. The resulting factor of safety for slope stability is the ratio of the resisting force-moments to the driving force-moments.

The following design soil parameters were assumed in our stability analyses:

Soil Boring B-02 Station - 1+89

Soil Layer Elevations (ft)	Soil Type	Unit Weight (pcf)	Undrained (Total Stress)		Drained (Effective Stress)	
			Cohesion (psf)	Phi (deg)	Cohesion (psf)	Phi (deg)
> 717	Fill: Clayey Sand	120	0	30	0	30
713-717	Gravelly Sand	120	0	35	0	35
680-717	Silty Clay	120	3,000	0	0	32
< 680	Silt	120	0	35	0	35

Soil Boring B-03 Station - 3+25

Soil Layer Elevations (ft)	Soil Type	Unit Weight	Undrained (Total Stress)	Drained (Effective Stress)
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		(pcf)	Cohesion (psf)	Phi (deg)	Cohesion (psf)	Phi (deg)
> 715	Fill: Sand	120	0	30	0	30
700-725	Silty Clay	120	3,000	0	0	32
< 700	Silt	120	0	35	0	35

Based on our analyses, we believe the slope failure is due to surficial sloughing of the upper soils along the slope face, and is not due to deep-seated global slope instability. The effective stress analyses show that the existing slope has a factor of safety against surficial sloughing as low as 0.328 in some areas for the effective stress soil condition (drained soil condition). The analyses indicate that the slope is currently surficially unstable.

SLOPE REPAIR

General

We understand a steel sheet pile wall has been proposed in order to stabilize the slope and minimize additional settlement of road surface. The steel sheet pile wall will be installed approximately 14 feet north of edge of the roadway pavement. The preliminary plans show 40-foot long sheet pile sections with toe elevations ranging from approximately 691 to 684 feet.

Sheet Pile Wall

We performed analyses of a cantilevered sheet pile wall using the SupportIT v. 2.34 computer program. The profile section at Station 3+24 was used for analyses, since this profile shows the greatest required retained height of approximately 15 feet. Our analyses considered both short-term (undrained soil) conditions that could occur during construction and during the early life of the wall, and long-term (drained soil) conditions that could occur during the remaining life of the wall. The soil parameters for soil boring B-03 were assumed in our sheet pile wall evaluation.

Installing the steel sheet piling along the proposed alignment will minimize roadway settlement; however, it will not prevent further surficial sloughing of the embankment slope face in front (down slope) of the sheet pile wall. The sloughing will continue across locally unstable portions of the slope face until equilibrium is achieved. It can be anticipated that surficial slope equilibrium will be achieved once the embankment face consistently reaches a slope equivalent to the drained friction angle. For purposes of these analyses, we have assumed the embankment slope below the wall line will eventually achieve a slope inclination equal to the drained friction angle of 28° or approximately 2H:1V.

Based on the anticipated ground surface and assumed loading conditions, the steel sheet pile wall should consist of 40-foot long ASTM A572 Grade 50 steel sheet piles having a minimum section modulus of 48.4 in³/ft and a minimum moment of inertia of 428.1 in⁴/ft. Outputs from our analyses are presented on Figure Nos 9.

Steel sheet piles with the above mentioned properties could expect top-of-wall deflections of approximately 2 inches. If smaller deflections are required, a sheet pile with a larger moment of inertia should be used. No deflection criteria were provided at the time of this report. Once deflection criteria are determined, G2 should be notified in order to revise the cantilevered steel sheet pile recommendations.

The backfill adjacent to the sheet pile wall should consist of MDOT Class II sand to maintain drained conditions. Weep holes and/or wall drains should be constructed to allow the backfill behind the wall to drain. These drainage measures will minimize entrapment of water within the granular backfill behind the sheet pile wall and prevent the buildup of hydrostatic pressure. Weep holes should be spaced no greater than every 4 lineal feet of wall and should be located near the base of the wall.



Site Preparation

We anticipate earthwork operations will consist of removing any topsoil or vegetation from the fill areas, visually evaluating the subgrade, and placing engineered fill to achieve the proposed finished grade elevation. We recommend all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by qualified personnel under the direction of a licensed engineer.

At the start of earthwork operations, any existing topsoil or vegetation should be removed from the fill areas. Prior to placing any engineered fill, the exposed subgrade should be visually evaluated for instability and/or unsuitable soil conditions by a qualified field technician. Any unstable or unsuitable areas should be improved by additional compaction or removed and replaced with engineered fill.

In areas where granular engineered fill will be placed on a sloped cohesive subgrade, we recommend the cohesive soils be benched on a 2-foot run by 2-foot rise pattern in order to prevent a slip surface between the two dissimilar materials. We recommend only light compaction equipment, such as walk-behind plate compactors, be used to compact the granular engineered fill within the influence of the steel sheet pile wall. The influence of the sheet pile wall is the lateral distance delineated by a plane extending upward from the bottom of the retained soil at a 1:1 slope.

Engineered fill should be free of organic matter, frozen soil, clods, or other harmful material. The fill should be placed in uniform horizontal layers that are not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D 1557). All engineered fill material should be placed and compacted at approximately the optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade.

GENERAL COMMENTS

The scope of the present investigation was limited to evaluation of subsurface conditions for slope evaluation. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation. We have based the analyses and recommendations submitted in this report upon the data from soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual boring locations and the actual sheet pile wall location. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

Soil conditions at the site could vary from those generalized on the basis of soil borings made at specific locations. It is, therefore, recommended that G2 be retained to provide soil engineering services during the site preparation and slope reconstruction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.

APPENDIX

Soil Boring Location Plan	Plate No. 1
Soil Boring Logs	Figure Nos. 1 through 4
Sieve Analysis	Figure 5
Unconfined Compressive Strength Test	Figure 6
Atterberg Test Results	Figure 7
General Notes	Figure 8
SupportIT Analyses	Figure No. 9
Slide Analyses	Figure Nos. 10 through 13

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-01

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Asphalt (8 inches)	0.7						
		Fill: Loose to Medium Compact Clayey Sand with trace silt and gravel		S-01	5 5 7	12			
5			5	S-02	3 4 6	10			
		Fill: Medium Compact Light Brown Silty Sand		S-03	7 7 13	20			
10			10	S-04	6 9 12	21			
		Compact Gravelly Sand		S-05	13 27 28	55			
15			15						
		Stiff to Very Stiff Dark Gray Silty Clay		S-06	9 13 15	28	17.2		2000*
20			20						
				S-07	7 12 17	29	18.8		4000*
25			25						

SOIL / PAVEMENT BORING 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Total Depth: 75 ft
Drilling Date: June 13, 2019
Inspector: T. Hesse
Contractor: Brax Drilling
Driller: A. Guzdial

Water Level Observation:
Groundwater data not available due to mud-rotary drilling method

Notes:
* Calibrated Hand Penetrometer

Drilling Method:
4- inch flight auger 1o 10 feet; 3-7/8-inch mud rotary thereafter

Excavation Backfilling Procedure:
Borehole backfilled with grout

Figure No. 1a

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-01

CONSULTING GROUP

SUBSURFACE PROFILE			SOIL SAMPLE DATA						
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
30		Stiff to Very Stiff Dark Gray Silty Clay <i>(continued)</i>	30	S-08	7 10 14	24	19.2		4000*
35			S-09	3 6 15	21	22.7		4000*	
40			S-10	5 7 14	21	21.9	128	2240	
45			S-11	5 6 17	23				
50			S-12	11 15 17	32				
		Compact Dark Gray Silt							

SOIL / PAVEMENT BORING, 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Total Depth: 75 ft
Drilling Date: June 13, 2019
Inspector: T. Hesse
Contractor: Brax Drilling
Driller: A. Guzdial

Water Level Observation:
Groundwater data not available due to mud-rotary drilling method

Notes:
* Calibrated Hand Penetrometer

Drilling Method:
4- inch flight auger 1o 10 feet; 3-7/8-inch mud rotary thereafter

Excavation Backfilling Procedure:
Borehole backfilled with grout

Figure No. 1b

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-01

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
55		Compact Dark Gray Silt (continued)	55	S-13	9 16 18	34			
60			60	S-14	7 13 20	33			
65			65	S-15	14 17 25	42	15.2		6000*
70			70	S-16	33 38 47	85	13.4		9000*
75		Very Compact Dark Gray Silt	75	S-17	27 42 50/3"	---			

Total Depth: 75 ft End of Boring @ 75 ft
 Drilling Date: June 13, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Water Level Observation:
 Groundwater data not available due to mud-rotary drilling method

Notes:
 * Calibrated Hand Penetrometer

Drilling Method:
 4- inch flight auger 1o 10 feet; 3-7/8-inch mud rotary thereafter

Excavation Backfilling Procedure:
 Borehole backfilled with grout

Figure No. 1c

SOIL / PAVEMENT BORING 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-02

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Asphalt (8 inches)	0.7						
		Fill: Very Loose Brown Clayey Sand with trace silt and gravel		S-01	2 2 2	4			
5			4.0	S-02	1 2 2	4			
		Fill: Very Loose to Loose Brown Sand with trace gravel		S-03	2 2 3	5			
			8.5						
10		Medium Compact Brown Gravelly Sand	10	S-04	5 8 12	20			
		Very Stiff to Hard Dark Gray Silty Clay with trace sand	12.0						
15			15	S-05	4 7 12	19	13.6		9000*
		Very Stiff to Hard Dark Gray Silty Clay with trace sand	20	S-06	7 10 11	21	16.8		5000*
25			25	S-07	5 6 8	14	18.3	135	6020

SOIL / PAVEMENT BORING 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Total Depth: 40 ft
 Drilling Date: June 14, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Drilling Method:
 3-1/4 inch inside diameter hollowe-stem auger

Water Level Observation:
 10-2/3 feet during drilling operations; 23 feet upon completion

Notes:
 Borehole collapsed at 23 ft after auger removal
 * Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
 Borehole backfilled with auger cuttings

Figure No. 2a

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-02

CONSULTING GROUP

SUBSURFACE PROFILE			SOIL SAMPLE DATA						
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
30		Very Stiff to Hard Dark Gray Silty Clay with trace sand (continued)	30	S-08	4 6 11	17	18.0		6000*
35			S-09	5 7 11	18	16.5		9000*	
40			S-10	4 8 13	21	20.2		6000*	
40.0			End of Boring @ 40 ft		40				
45			45						
50			50						

SOIL / PAVEMENT BORING 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Total Depth: 40 ft
 Drilling Date: June 14, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Drilling Method:
 3-1/4 inch inside diameter hollowe-stem auger

Water Level Observation:
 10-2/3 feet during drilling operations; 23 feet upon completion

Notes:
 Borehole collapsed at 23 ft after auger removal
 * Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
 Borehole backfilled with auger cuttings

Figure No. 2b

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-03

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Asphalt (8 inches)	0.7						
		Fill: Medium Compact Brown Sand with trace gravel		S-01	6 8 7	15			
5			4.0	S-02	2 3 3	6			
		Fill: Very Loose to Loose Brown Sand with trace silt and gravel		S-03	1 WOH WOH	---			
10			10.0	S-04	WOH WOH 1	---			
15		Hard Gray Silty Clay, occasional cobbles and silt lenses	15	S-05	5 10 15	25	16.8		9000*
20			20	S-06	7 11 16	27	17.8	130	9340
25		Medium Compact to Compact Dark Gray Silt with trace sand	22.5						
25			25	S-07	19 22 26	48			

Total Depth: 73.5 ft
 Drilling Date: June 12, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Water Level Observation:
 Groundwater data not available due to mud-rotary drilling method

Notes:
 * Calibrated Hand Penetrometer

Drilling Method:
 4- inch flight auger 1o 10 feet; 3-7/8-inch mud rotary thereafter

Excavation Backfilling Procedure:
 Well Installed - Borehole backfilled with 30 feet of sand; grout thereafter

Figure No. 3a

SOIL / PAVEMENT BORING, 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-03

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)	
30		Medium Compact to Compact Dark Gray Silt with trace sand <i>(continued)</i>	30	S-08	8 13 16	29				
			33.0							
35			Medium Compact Light Gray Silt with trace sand	35	S-09	6 13 17	30			
				39.0						
40			Medium Compact Dark Gray Silt with trace sand	40	S-10	10 12 13	25			
		44.0								
45		Compact Dark Gray Clayey Silt with occasional sand and gravel lenses	45	S-11	10 7 13	20				
			50							
50			50	S-12	9 14 17	31				

SOIL / PAVEMENT BORING 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Total Depth: 73.5 ft
 Drilling Date: June 12, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Water Level Observation:
 Groundwater data not available due to mud-rotary drilling method

Notes:
 * Calibrated Hand Penetrometer

Drilling Method:
 4- inch flight auger 1o 10 feet; 3-7/8-inch mud rotary thereafter

Excavation Backfilling Procedure:
 Well Installed - Borehole backfilled with 30 feet of sand; grout thereafter

Figure No. 3b

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-03

CONSULTING GROUP

SUBSURFACE PROFILE			SOIL SAMPLE DATA							
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)	
55		Compact Dark Gray Clayey Silt with occasional sand and gravel lenses <i>(continued)</i>	55	S-13	15 16 20	36				
60			60	S-14	18 21 21	42				
			63.0							
			64.0	Hard Dark Gray Silty Clay						
65			65	S-15	17 30 50/5"	---				
			63.0							
			64.0							
		Very Compact Dark Gray Clayey Silt								
70			70	S-16	19 32 50/4"	---				
			73.5							
		End of Boring @ 73.5 ft								
75			75	S-17	38 54/4"	---				

SOIL / PAVEMENT BORING 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Total Depth: 73.5 ft
 Drilling Date: June 12, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Water Level Observation:
 Groundwater data not available due to mud-rotary drilling method

Notes:
 * Calibrated Hand Penetrometer

Drilling Method:
 4- inch flight auger 1o 10 feet; 3-7/8-inch mud rotary thereafter

Excavation Backfilling Procedure:
 Well Installed - Borehole backfilled with 30 feet of sand; grout thereafter

Figure No. 3c

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-04

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Asphalt (6 inches)	0.5						
		Fill: Medium Compact Brown Sand with trace silt and gravel, occasional cobbles		S-01	7 11 13	24			
5			5	S-02	5 7 9	16			
		Fill: Very Loose Brown Silty Sand with trace gravel	6.0	S-03	1 WOH 1	---			
			9.0	S-04	1 3 4	7	16.3		9000*
10		Very Stiff to Hard Dark Gray Silty Clay with trace sand		S-05	5 11 13	24	16.8		6000*
15			15	S-06	6 9 13	22			
		Medium Compact Dark Gray Silt with trace sand	18.0						
20			20	S-07	4 8 11	19	17.6	126	6150
		Very Stiff to Hard Dark Gray Silty Clay with trace sand	24.0						
25			25						

Total Depth: 40 ft
 Drilling Date: June 14, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Water Level Observation:
 8 feet during drilling operations; 16 feet upon completion

Notes:
 Borehole collapsed at 16 ft after auger removal
 * Calibrated Hand Penetrometer

Drilling Method:
 3-1/4 inch inside diameter hollowe-stem auger

Excavation Backfilling Procedure:
 Borehole backfilled with auger cuttings

SOIL / PAVEMENT BORING 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Figure No. 4a

Project Name: Grove Road Slope Stability

Project Location: 1340 Grove Road
Ypsilanti, Michigan

G2 Project No. 193278

Latitude: N/A Longitude: N/A



Soil Boring No. B-04

CONSULTING GROUP

SUBSURFACE PROFILE			SOIL SAMPLE DATA						
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
30		Very Stiff to Hard Dark Gray Silty Clay with trace sand (continued)	30	S-08	5 7 9	16	18.0		6000*
35			S-09	4 7 12	19	17.4		7000*	
40			S-10	5 8 15	23	17.2		9000*	
40.0			End of Boring @ 40 ft		40				
45			45						
50			50						

Total Depth: 40 ft
 Drilling Date: June 14, 2019
 Inspector: T. Hesse
 Contractor: Brax Drilling
 Driller: A. Guzdial

Water Level Observation:
 8 feet during drilling operations; 16 feet upon completion

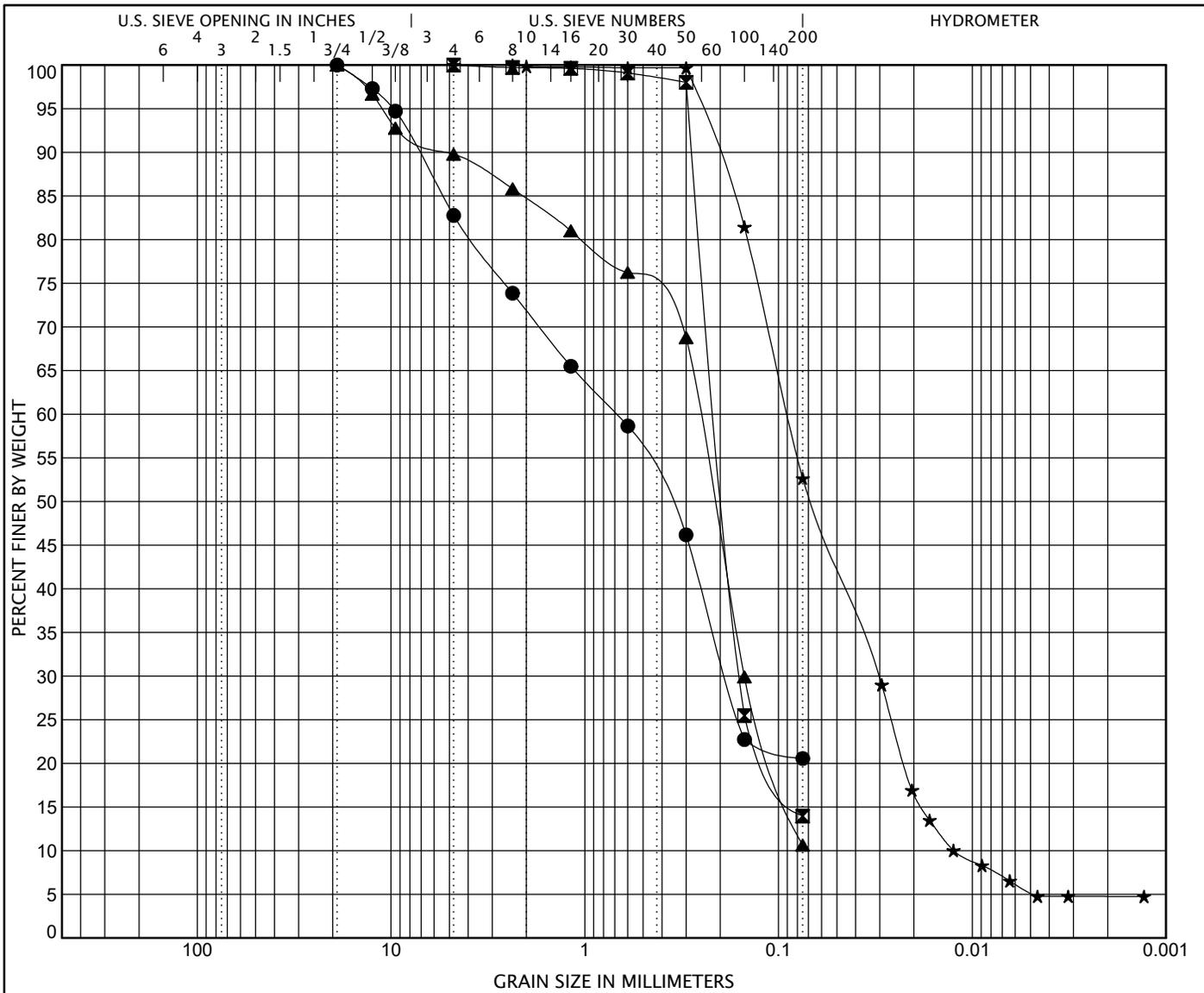
Notes:
 Borehole collapsed at 16 ft after auger removal
 * Calibrated Hand Penetrometer

Drilling Method:
 3-1/4 inch inside diameter hollowe-stem auger

Excavation Backfilling Procedure:
 Borehole backfilled with auger cuttings

SOIL / PAVEMENT BORING. 193278.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 7/2/19

Figure No. 4b



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Description	LL	PL	PI	Cc	Cu
● B-01 S-02	Brown Clayey Sand with trace gravel and silt					
■ B-01 S-04	Light Brown Silty Sand					
▲ B-03 S-03	Brown Sand with trace silt and gravel				1.2	3.5
★ B-03 S-13	Gray Silt				0.8	7.2

Specimen ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-01 S-02	19	0.686	0.186		17.2	62.2	20.6	
■ B-01 S-04	4.75	0.209	0.157		0.0	86.0	14.0	
▲ B-03 S-03	19	0.257	0.15		10.2	79.2	10.6	
★ B-03 S-13	4.75	0.09	0.03	0.012	0.0	47.3	47.4	5.2

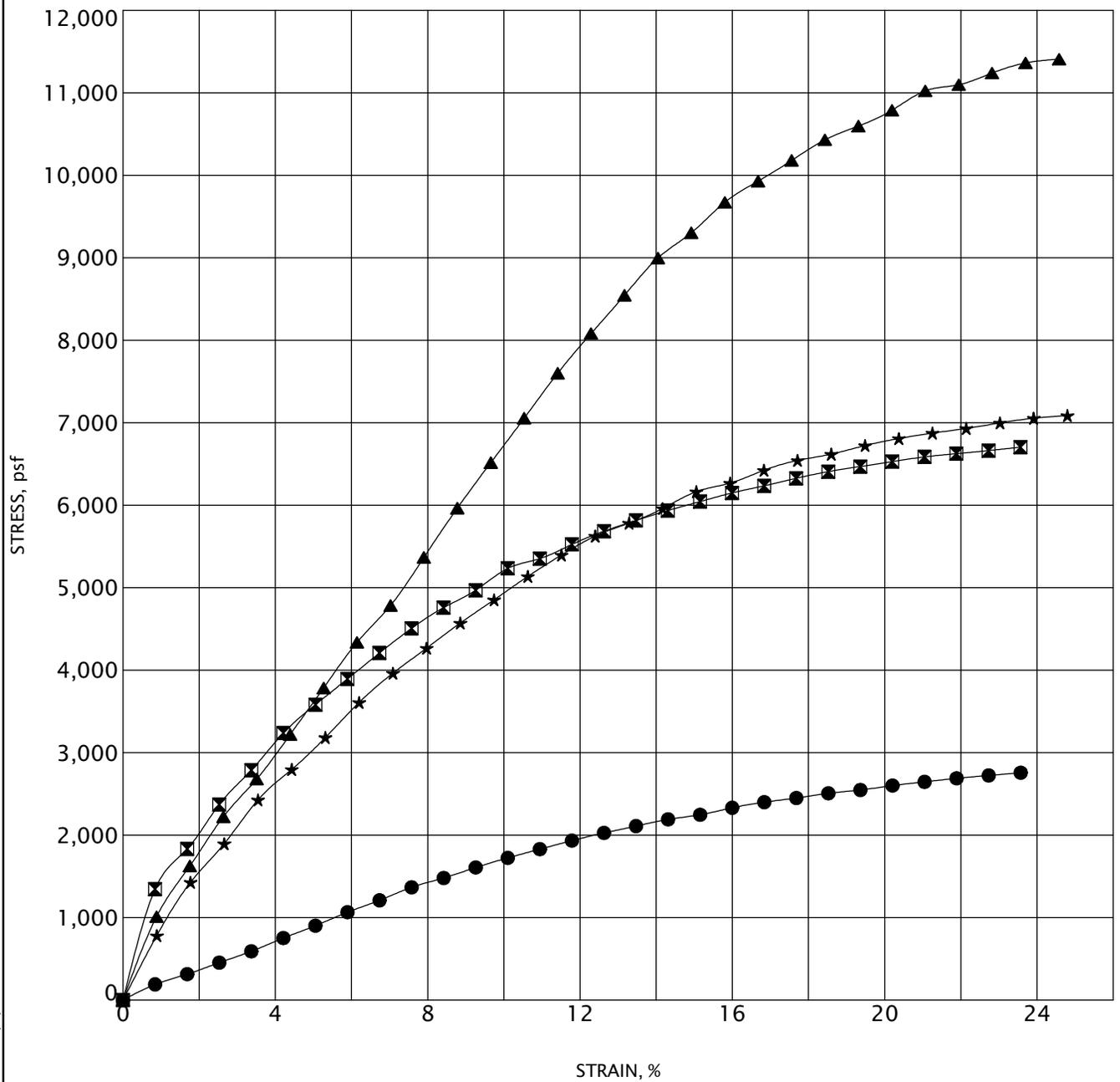
GRAIN SIZE DISTRIBUTION

Project Name: Grove Road Slope Stability
 Project Location: 1340 Grove Road
 Ypsilanti, Michigan
 G2 Project No.: 193278



Figure No. 5

US_GRAIN_SIZE_193278.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 7/1/19



Specimen	Classification	MC%	γ_d	UC
● B-01 S-10	Stiff Dark Gray Silty Clay	22	128	2240
◻ B-02 S-07	Very Stiff Dark Gray Silty Clay	18	135	6020
▲ B-03 S-06	Hard Gray Silty Clay	18	130	9340
★ B-04 S-07	Very Stiff Dark Gray Silty Clay	18	126	6150

UNCONFINED COMPRESSIVE STRENGTH TEST

Project Name: Grove Road Slope Stability
 Project Location: 1340 Grove Road
 Ypsilanti, Michigan

G2 Project No.: 193278

Figure No. 6



GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders	- greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel - Coarse	- 3/4 inches to 3 inches
- Fine	- No. 4 to 3/4 inches
Sand - Coarse	- No. 10 to No. 4
- Medium	- No. 40 to No. 10
- Fine	- No. 200 to No. 40
Silt	- 0.005mm to 0.074mm
Clay	- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

- AS - Auger Sample - Cuttings directly from auger flight
- BS - Bottle or Bag Samples
- S - Split Spoon Sample - ASTM D 1586
- LS - Liner Sample with liner insert 3 inches in length
- ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
- PS - Piston Sample - 3 inch diameter unless otherwise noted
- RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

Client: OHM Advisors
 Site: 34000 Plymouth Road
 Tel: (734) 522-6711

Title: Grove Street Slope Stability
 Designer: T. Hesse
 Page: 1
 Date: 6.19.19

Sheet: PZC 26
 Works: Permanent
 Pressure: Rankine
 Analysis: Net Pressure
 FOS: 1.50
 Toe: Cantilever

	Maximum	d (ft)
○	1361.3 psf	15.00
□	78122.8 ftlb/ft	18.48
●	1.9 in	0.00

G2 Project No. 193278
 Section A-A

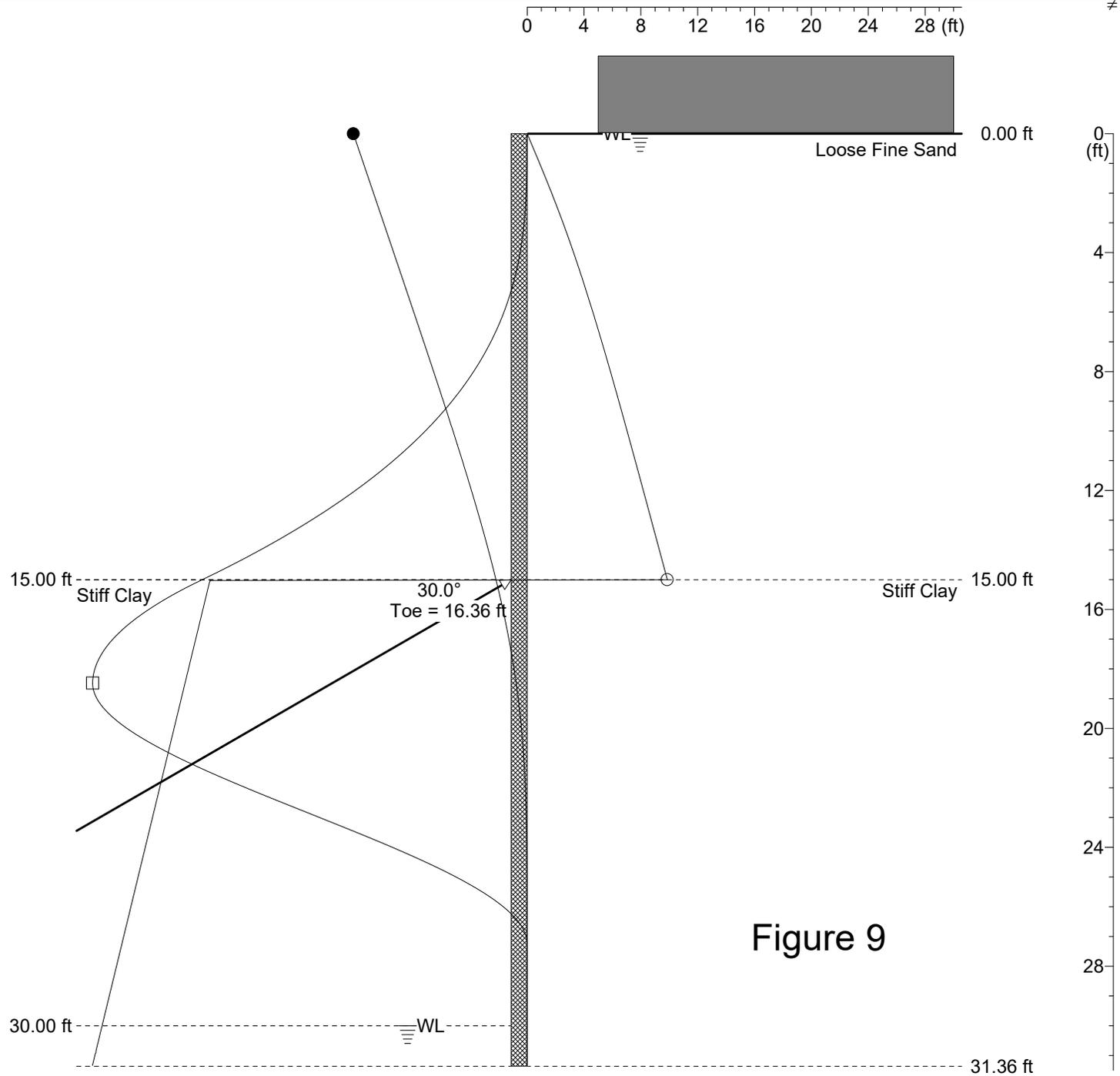


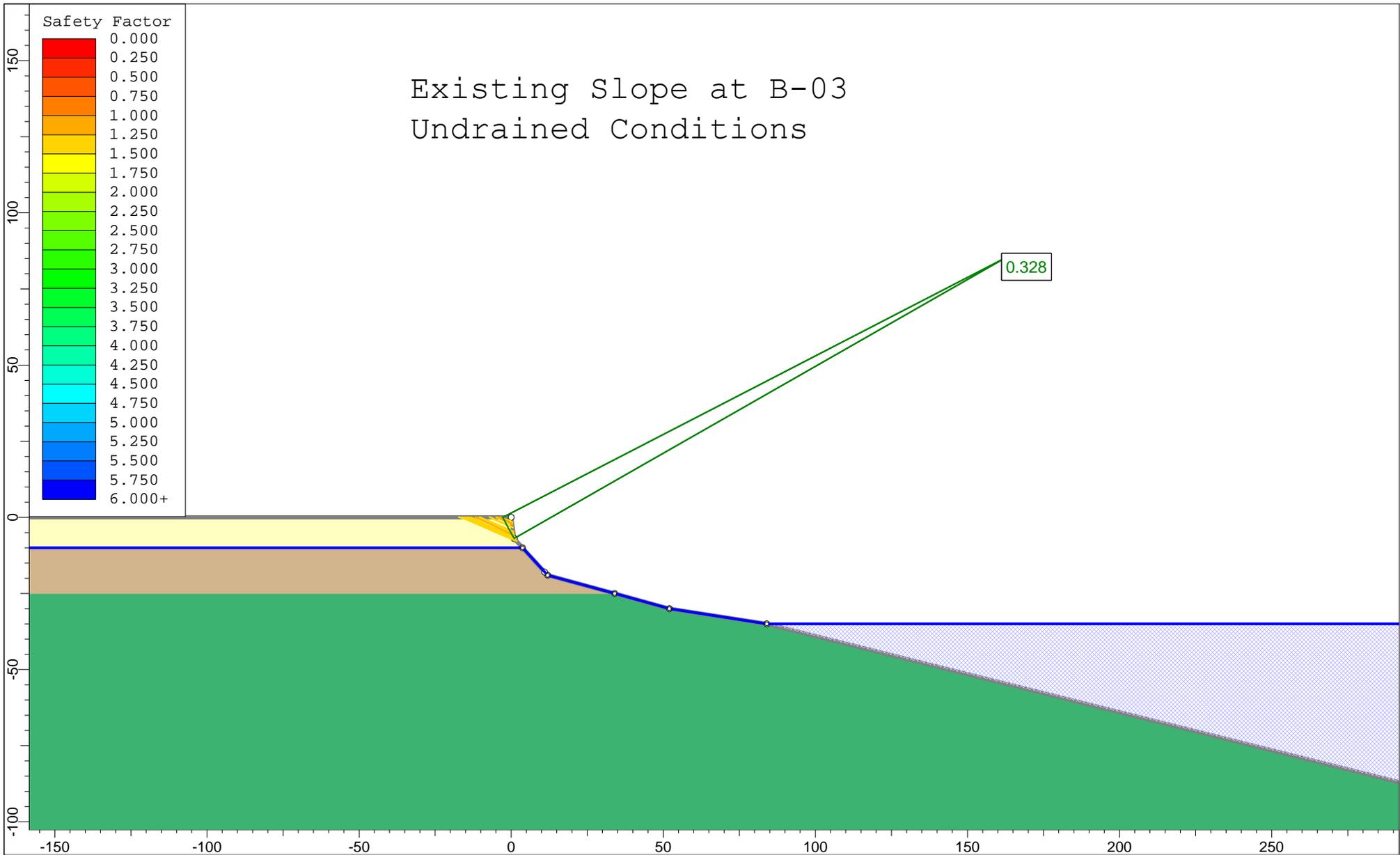
Figure 9



G2 Consulting Group

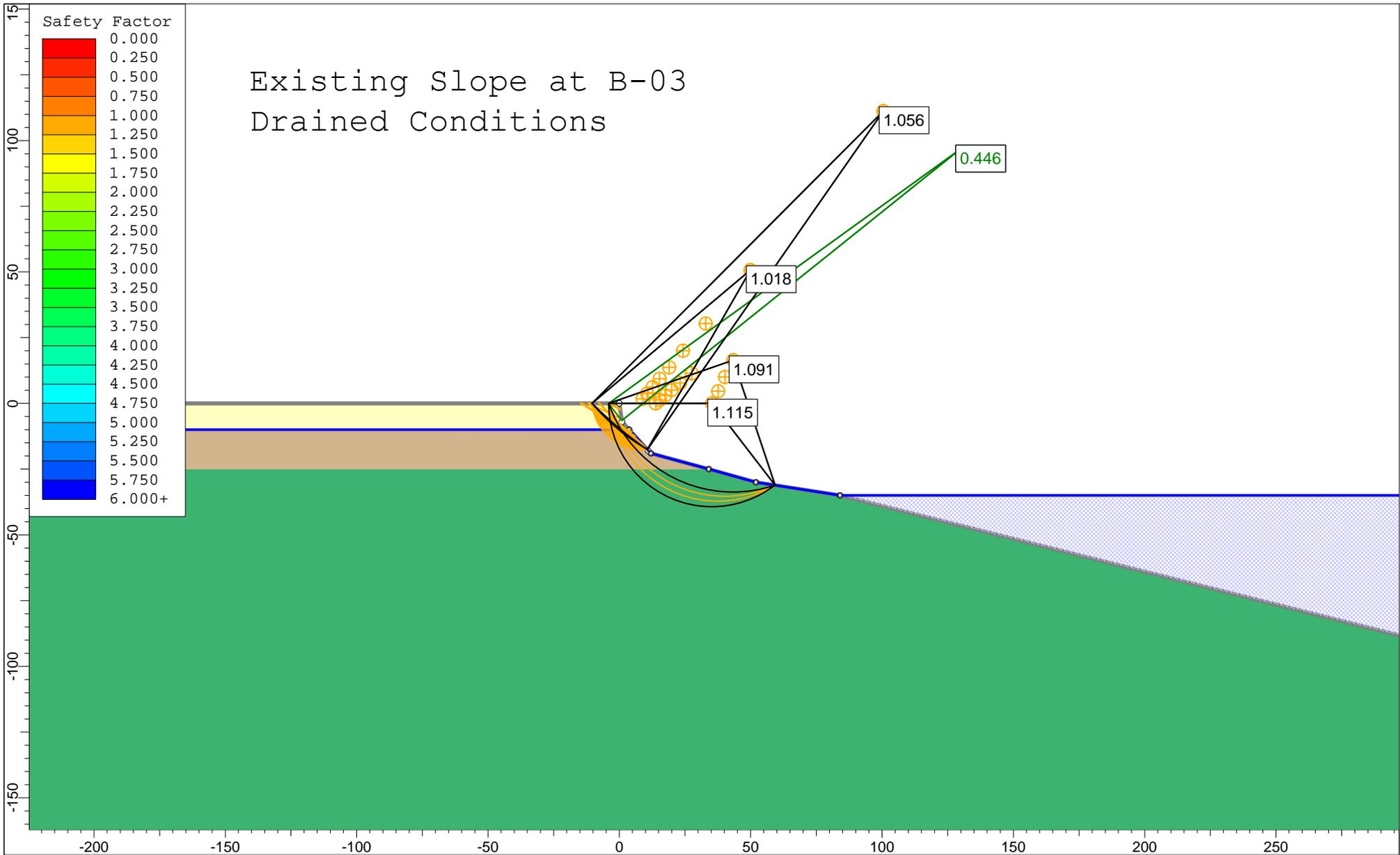
SupportIT, v2.37

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 Web: www.GTSOFT.org



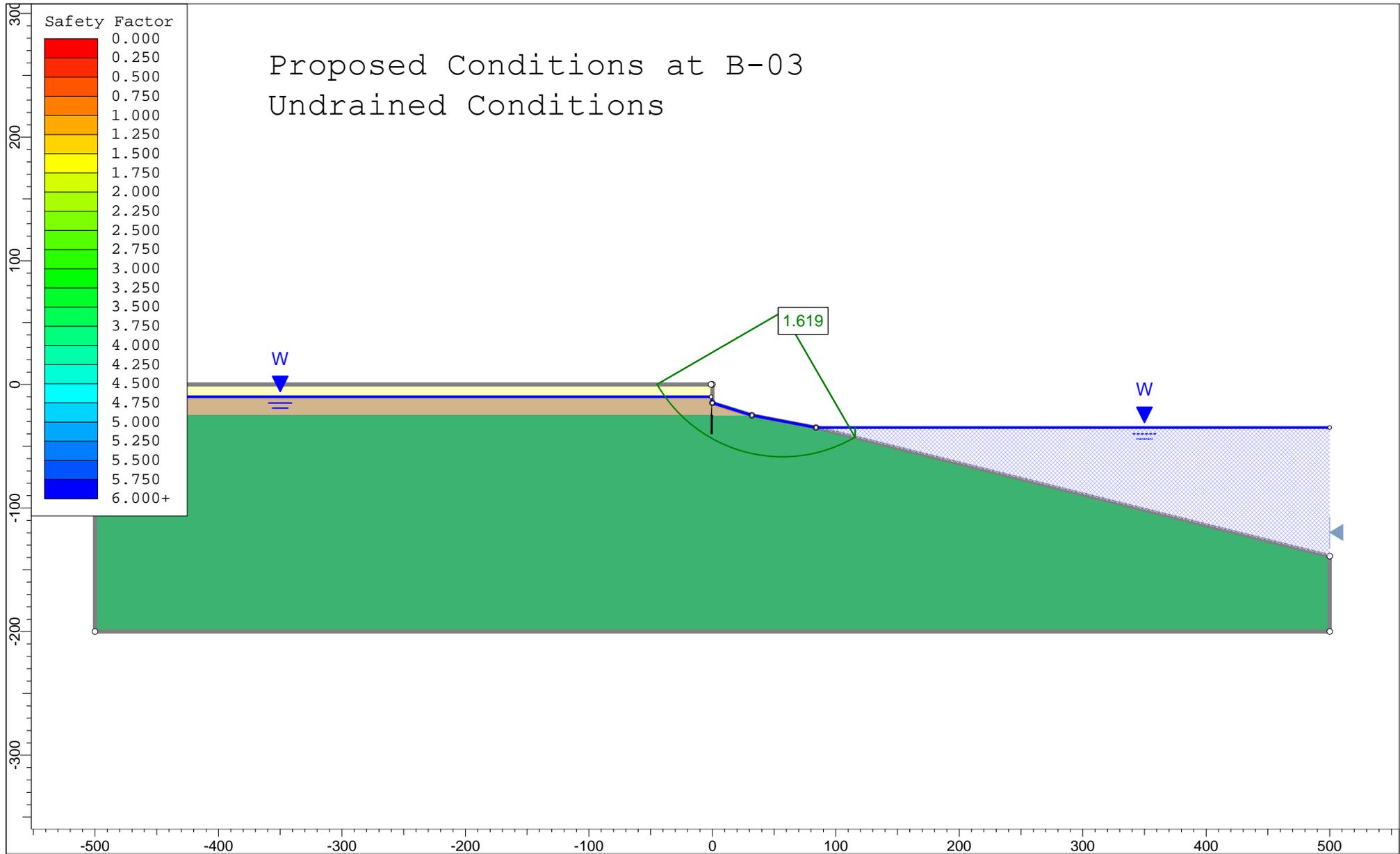
SLIDEINTERPRET 6.031

Project		Grove Street Boring B-3		Figure 10	
Analysis Description					
Drawn By			Scale	Company	
Date			1:524	Boring B3.slim	
7/1/2019, 9:34:03 AM			File Name		



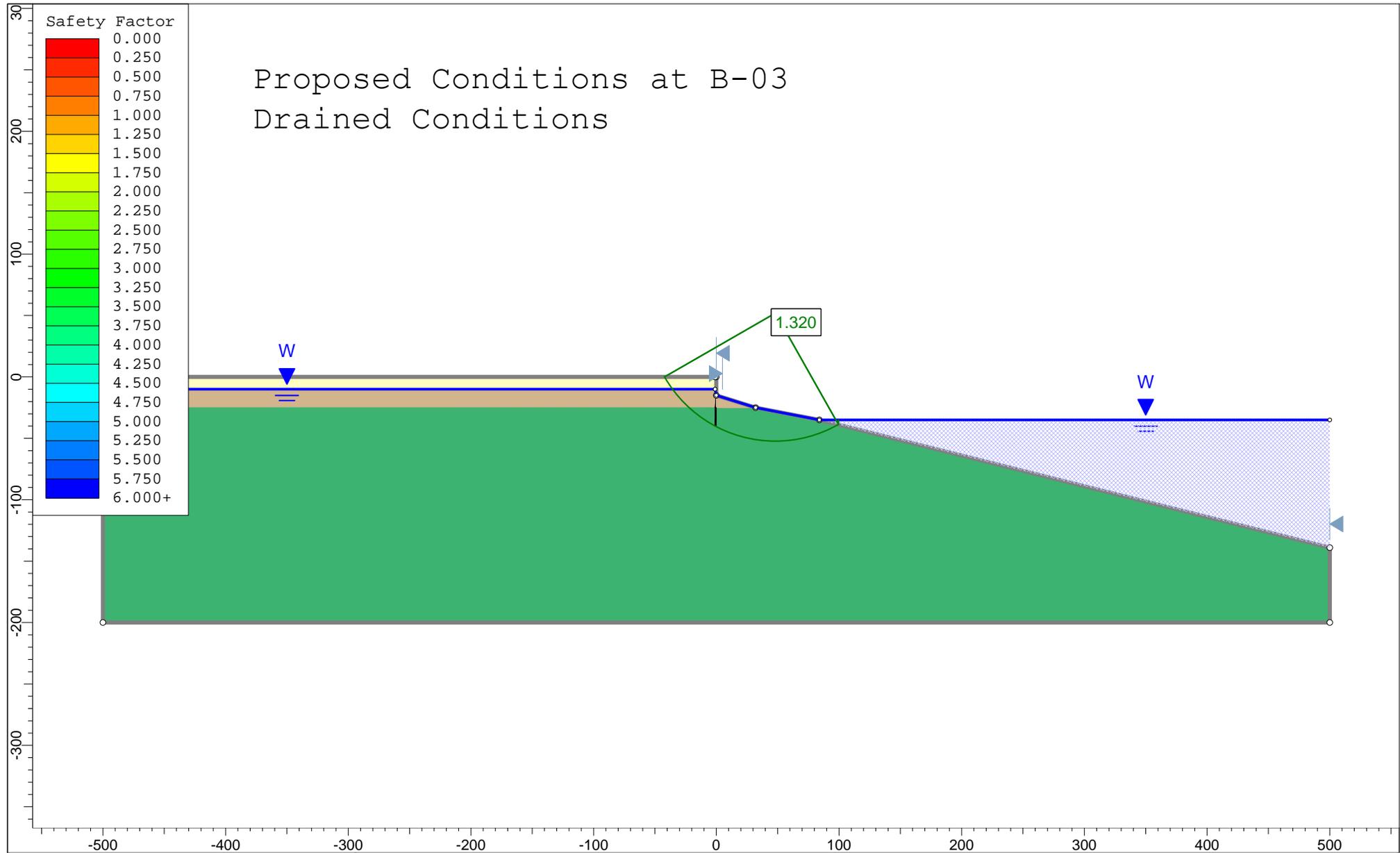
SLIDEINTERPRET 6.031

Project		Grove Street Boring B-3		Figure 11	
Analysis Description					
Drawn By		Scale	1:607	Company	
Date		7/1/2019, 9:34:03 AM		File Name	
				Boring B3 long term.slim	



SLIDEINTERPRET 6.031

Project		SLIDE - An Interactive Slope Stability Program		Figure 12	
Analysis Description					
Drawn By		Scale	1:1290	Company	
Date		7/3/2019, 2:44:13 PM		File Name	
				Boring B3 Short Term Proposed Condition.slim	



SLIDEINTERPRET 6.031

Project			SLIDE - An Interactive Slope Stability Program		Figure 13
Analysis Description					
Drawn By			Scale	1:1297	Company
Date			7/3/2019, 2:44:13 PM		File Name
					Boring B3 Long Term Proposed Condition.slim

Log of Well Installation



Project Name: Grove Road Slope Stability
 Project Number: 193278

Date: 7/2/19
 Weather: Sunny, 80°F

Well Number: B-03

Top of Casing Elevation: EL 100

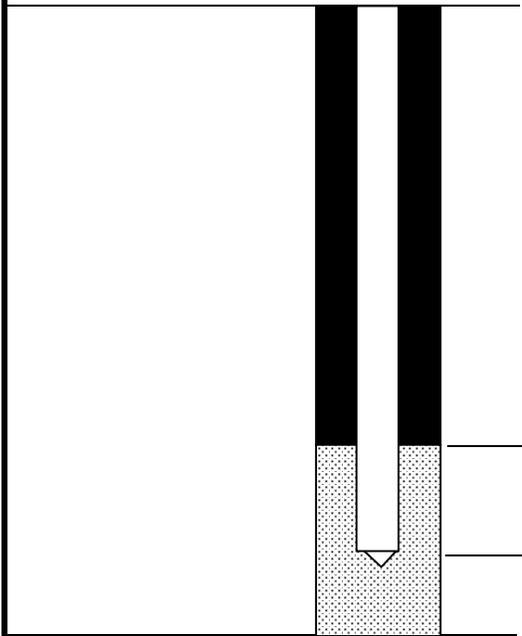
Date of Installation: 6/12/19

Ground Surface Elevation: EL 100

Generalized
Subsurface
Profile

Length of Casing
Above Ground: 0

Well Screen Elevation: 37



Bottom Depth
of Bentonite: 63 feet

Bottom Depth
of Well: 73 feet

Depth of
Borehole: 73.5 feet

Well
Diameter: 3 inch
 Total Length: 73 ft
 Material: Slotted PVC
 Cap? (Y/N): Y

Well Screen
Diameter: 3 inch
 Length: 10 ft
 Mesh:
 Material: Slotted PVC
 Screen Plug? (Y/N):

Protective
Casing
Material:
 Diameter:
 Length:
 Lock? (Y/N):

DRILLING INFORMATION		FIELD NOTES	Water Level Info.		
Drilling Contractor:	<u>Brax Drilling</u>		Bags of Sand Used:	<u>5</u>	Date
Driller:	<u>A. Guzdial</u>	Bags of Cement Used:		<u>6/18/19</u>	<u>56.5</u>
Inspector:	<u>T. Hesse</u>	Bags of Bentonite Used:		<u>6/24/2019</u>	<u>58.5</u>
Drilling Method:	<u>3-7/8 inch Mud Rotary</u>	(Pellets or Powder)		<u>7/1/2019</u>	<u>58</u>
Drilling: Start:	<u>6/12/2019 0:00</u>	Other Materials Used:			
Finish:	<u>6/14/2019 0:00</u>				
Borehole Diameter:	<u>3-7/8 inches</u>				

FIELD LOG NOTES	AS-BUILT COORDINATES
1)	