STORMWATER MANAGEMENT TESTING REPORT

Wilf Campus – Basin Flood Testing

Somerset County, New Jersey

April 25, 2023

Prepared For:
MENLO ENGINEERING ASSOCIATES, INC.
261 Cleveland Avenue
Highland Park, New Jersey 08904

Attn: William A. Lane, P.E.
Vice President

Prepared By:
Geo-Technology Associates, Inc.
Geotechnical and Environmental Consultants

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GTA Project No: 31211977x1

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

April 25, 2023

Menlo Engineering Associates, Inc.
261 Cleveland Avenue
Highland Park, New Jersey 08904

Attn: Mr. William A. Lane, P.E.
Executive Vice President

Re: Stormwater Management Testing Report
Wilf Campus – Basin Flood Testing
Franklin Township, Somerset County, New Jersey

Dear Bill:

In accordance with our agreement dated April 5, 2023 and executed on April 12, 2023, Geo-Technology Associates, Inc. (GTA) has performed a geotechnical exploration for the planning and design of stormwater management (SWM) facilities related to a proposed development to be constructed in Franklin Township, Somerset County, New Jersey. The exploration consisted of excavating 4 test pits, visually classifying the encountered soils, and performing in-situ basin flood tests within 2 proposed SWM basin areas. The results of the field testing, and GTA's recommendations regarding the design and construction of the proposed basins are included in this report.

GTA appreciates the opportunity to have been of assistance to you on this project. Please contact our office at (732) 271-9301 if you have questions or require additional information. Please note that, unless you make other arrangements, GTA will discard all soil samples obtained from the explorations 60 days after the date of this report.

Sincerely,

GEO-TECHNOLOGY ASSOCIATES, INC.

Allison Tether, P.G.
Senior Project Manager

Dennis C. Loh, P.E.
Vice President

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of a geotechnical engineering exploration performed by Geo-Technology Associates, Inc. (GTA) for the planning and design of a stormwater management (SWM) facilities related to a proposed development to be constructed in Franklin Township, Somerset County, New Jersey. The site is at the western terminus of Berger Street and is identified as Lots 54.05 and 55.03 in Block 386.07 on the Franklin Township tax map. The general location of the site is shown on the Site Location Map, which is Figure 1 in Appendix A of this report.

1.1 Study Purpose

GTA conducted this study to develop confirmation-dependent geotechnical engineering recommendations for the proposed SWM facilities to be constructed at the site. The scope of GTA's study included a field exploration and geotechnical engineering analyses. The field exploration included 4 test pit excavations with in-situ basin flood testing within the proposed SWM basin areas. The conclusions and recommendations presented in this report were derived from engineering analyses of field data, and details of the proposed SWM facilities as detailed herein.

1.2 Reference Documents

GTA was provided with grading and utility plans prepared by Menlo Engineering Associates, Inc. (Menlo) dated March 25, 2022 with a latest revision date of April 10, 2023. The plans indicate the site boundaries, existing site features and topography, proposed site grading, and the layout and dimensions of two proposed surface SWM basins. GTA was also provided with an unnamed plan prepared by Menlo that was marked up to show the locations of 2 requested explorations within each basin area and the existing ground surface elevation at each location.

2.0 PROJECT DESCRIPTION

2.1 Site Location

The site is bounded by residential properties along Cedar Brook Drive to the south, Lilac Lane and Buttonwood Drive to the east, and Terry Terrace to the north. Wooded land was present to the west of the site.

2.2 Existing Site Conditions

At the time of our study, the subject site was densely wooded and contained underbrush consisting of bushes, low growing shrubs, and weeds. A small stream running roughly northeast to southwest bisected the site and a sanitary sewer easement ran adjacently northwest along the stream. The two proposed basins will be located in the central portion of the site on each side of the stream.

Based on our visual observations and review of the ground surface topography shown on the plan provided to us, the ground surface generally slopes moderately from about Elevation (EL) 96 feet in the southern portion of the site to about EL 76 feet along the northern and western site boundaries. The bottom of the stream channel is roughly EL 75 feet in the western portion of the site and roughly EL 70 feet in the eastern portion of the site.

2.3 Proposed SWM Basin Construction

The plans indicate proposed Basin #1 will be located on the southern half of the site and will have a footprint area of about 12,100 square feet. The basin bottom will be established at EL 83 feet, corresponding to depths of about 0 to 4 feet below the existing surface grades. Basin #2 will be located on the northern half of the site and will have a footprint area of about 6,200 square feet. The basin bottom will be established at EL 81 feet, corresponding to depths of about 3 to 5 feet below the existing surface grades.

3.0 GEOTECHNICAL ENGINEERING STUDY

3.1 Geologic Review

The subject site is situated within the Piedmont physiographic province of New Jersey, which is characterized by a low rolling plain divided by a series of higher ridges, and mainly underlain by slightly folded and faulted sedimentary rocks. The site is underlain by the Passaic Formation of the Lower Jurassic and Upper Triassic Period of the Mesozoic Era, as shown on the *Bedrock Geologic Map of the Bound Brook Quadrangle (OFM 89, 2011)* published by the New Jersey Geological Survey. The formation is described as an interbedded sequence of reddish-brown, and less commonly maroon or purple, fine- to coarse-grained sandstone, siltstone, shaly siltstone, silty mudstone and mudstone, separated by olive-gray, dark-gray, or black siltstone, silty mudstone and shale. The unit is as much as 11,480 feet thick regionally, and generally about 5,800 feet thick in the mapped area.

The surficial geology of the site, as shown on the *Surficial Geology of the Bound Brook Quadrangle, Somerset and Middlesex Counties, New Jersey (OFM 4, 1992)* published by the New Jersey Geological Survey, consists of weathered shale and mudstone residual soils. Residual soils are formed by the decomposition of the underlying parent rock, and typically consist of reddish-brown, red, and reddish-yellow silty clay to clayey silt with some to many angular chips of shale, and are typically less than 10 feet thick in the site locale.

Please refer to the referenced publications for more detailed descriptions of the geologic members.

3.2 Subsurface Exploration

The subsurface exploration program consisted of performing 4 test pit excavations with in-situ infiltration testing at the requested locations. The test pits were excavated on April 10, 2023 by J.A. Neary Excavating using a Case CX160 excavator and extended to depths ranging from approximately 4 to 6 feet below the existing surface grades.

The exploration locations were selected by Menlo and located in the field using a hand-held GPS unit and the existing site features as reference. The approximate locations of the explorations performed for this study are shown on the Test Pit Location Plan, which is included as Figure 2 in Appendix A. Detailed descriptions of the subsurface conditions encountered in the test pits are indicated on the Logs of Test Pits, which are included in Appendix B. The ground surface elevations shown on the test pit logs were obtained from interpolating between topographic contours shown on the plan and should be considered approximate.

The soil samples retrieved from the test pits were delivered to GTA's laboratory for visual classification by a geotechnical engineer and limited laboratory testing. The soil descriptions indicated on the logs are based on visual observations of the individual soil samples as summarized in the Notes for Exploration Logs included in Appendix B, supplemented by the laboratory test results.

3.3 Subsurface Conditions

An approximately 8-inch-thick layer of topsoil was encountered at the ground surface in the test pits performed for this study. The natural soils encountered below the topsoil appear consistent with the geologic mapping, and generally consisted of residual sandy silt (ML) and silty gravel (GM) soils overlying highly-weathered shale bedrock. The surface of weathered rock was encountered at depths ranging from about 1½ to 4½ feet below the existing surface grades. Refusal to further excavation was encountered in the test pits at depths ranging from about 4 to 6 feet below the ground surface.

Groundwater seepage was not encountered the test pits performed for this study. Long-term groundwater readings were not obtained because the test pits were backfilled upon completion for safety considerations. The test pits were performed during the "wet season" as defined by NJDEP as January through April. Therefore, GTA believes the seasonal high groundwater table is below the depths excavated in the test pits.

3.4 Basin Flood Test Results

Due to the presence of shallow bedrock at the site, basin flood testing was performed to establish the permeability rate of the bedrock in accordance with the procedure outlined in Subsection A3 of Chapter 12 of the NJ Stormwater BMP Manual. A basin flood test involves excavating a basin with a minimum bottom area of 50 square feet. If groundwater is observed within the basin, the basin flooding test shall not be used. If no groundwater is observed, the basin shall be filled with 12 inches (about 375 gallons) of water and allowed to drain completely. If the time required for the basin to drain is greater than 24 hours, the test shall be terminated, and the rock shall be considered to be a massive rock substratum. If the basin drains completely within 24 hours, the basin shall be filled with another 12 inches of water. If the basin drains completely within 24 hours of the second filling, the rock shall be considered to be fractured rock substratum, and suitable for infiltration with a design infiltration rate of 0.5 inches per hour.

Four basins with dimensions of approximately 10 feet by 5 feet were excavated at the requested locations. The basins were terminated at depths ranging from about 4 to 6 feet below the ground surface due to refusal to further excavation in weathered rock. Following refusal in the weathered rock stratum, water was poured into the test basins to 12 inches above the basin bottom levels. The results of the in-situ basin flood testing are summarized in the following table.

SUMMARY OF IN-SITU BASIN FLOODING TEST RESULTS

Basin Location	Existing Ground EL (ft.)	Basin Flooding Test Depth (ft.)	Drop in Water after 24-Hours (in.)	Drop in Water 24-Hours after Refill (in.)	Design Infiltration Rate (in/hr)
TP-301	84	5½	12	12	0.5
TP-302	84	6	12	12	0.5
TP-303	83.5	4½	12	12	0.5
TP-304	85	4	12	12	0.5

Following the initial 24-hour presoak period, it was observed that the water drained completely at all 4 basin locations. The basins were refilled to 12 inches above the basin bottom levels. Following the second 24-hour period, it was observed that all basins had completely drained again. Therefore, the shale bedrock can be classified as a fractured rock substratum with a design infiltration rate of 0.5 inches per hour.

4.0 CONCLUSIONS AND RECOMMENDATIONS

We believe the basin flood test results indicate that infiltration of collected stormwater is generally feasible at the basin locations and proposed bottom elevations indicated on the plan provided to

us. However, because the basin bottom elevations will in some areas be established within the residual soils above the surface of highly-weathered rock, undercutting and replacement of the fine-grained residual soils may be necessary during construction.

Construction oversight by competent engineering personnel during installation of stormwater management facilities is critical to successful functioning of the system. Ideally, construction oversight should be provided by the geotechnical engineer, or qualified representative, retained by the project owner to document construction operations and assure that project specifications and special construction requirements are met. Periodic inspection and maintenance of the system will be required to maximize the efficiency and design life of the system.

5.0 ADDITIONAL SERVICES

We recommended that GTA be retained during construction of the subject project to provide geotechnical consultation and construction observation and testing services as outlined below:

- Review final site plans to evaluate if they conform to the intent of this report.
- Provide on-site observation during SWM basin construction.

6.0 LIMITATIONS

This report, including all supporting test pit logs, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by GTA in connection with this Project have been prepared for the exclusive use of Menlo Engineering Associates, Inc. (Client) pursuant to the Agreement between GTA and Client dated April 5, 2023 and executed on April 12, 2023, and in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Client is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. Test pits indicate subsurface conditions only at specific locations and times, and only at the depths penetrated. They do not necessarily reflect strata or variations that may exist between the exploration locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations of subsurface conditions from those described in this report are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed, and conclusions of this report are verified in writing. GTA is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of GTA.

The scope of our services for this geotechnical exploration did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

This report and the attached logs are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

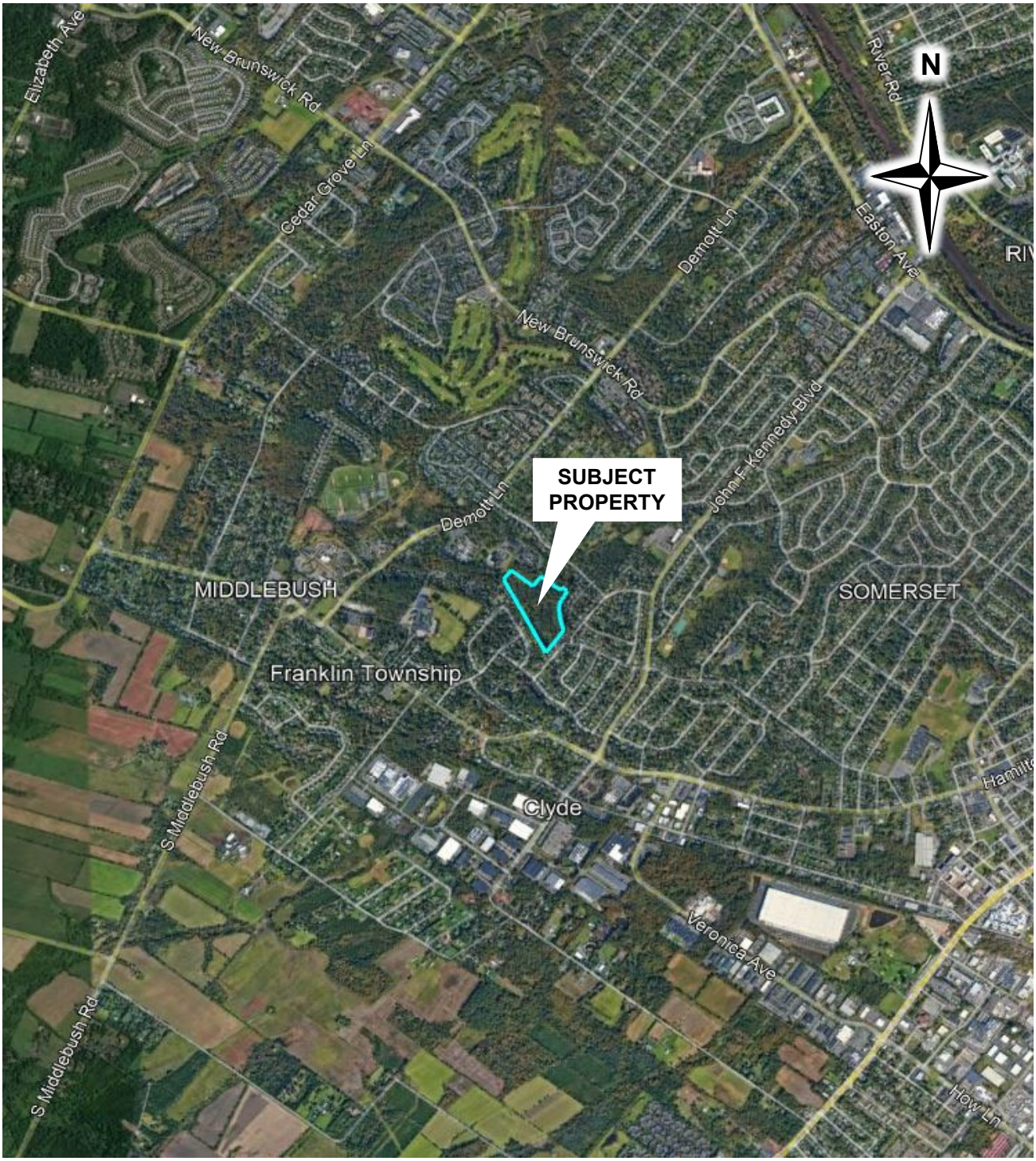
While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX A

Figures



Note: Site boundary is approximate.

SITE LOCATION MAP

14 Worlds Fair Drive, Suite A
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

WILF CAMPUS -
BASIN FLOOD TESTING

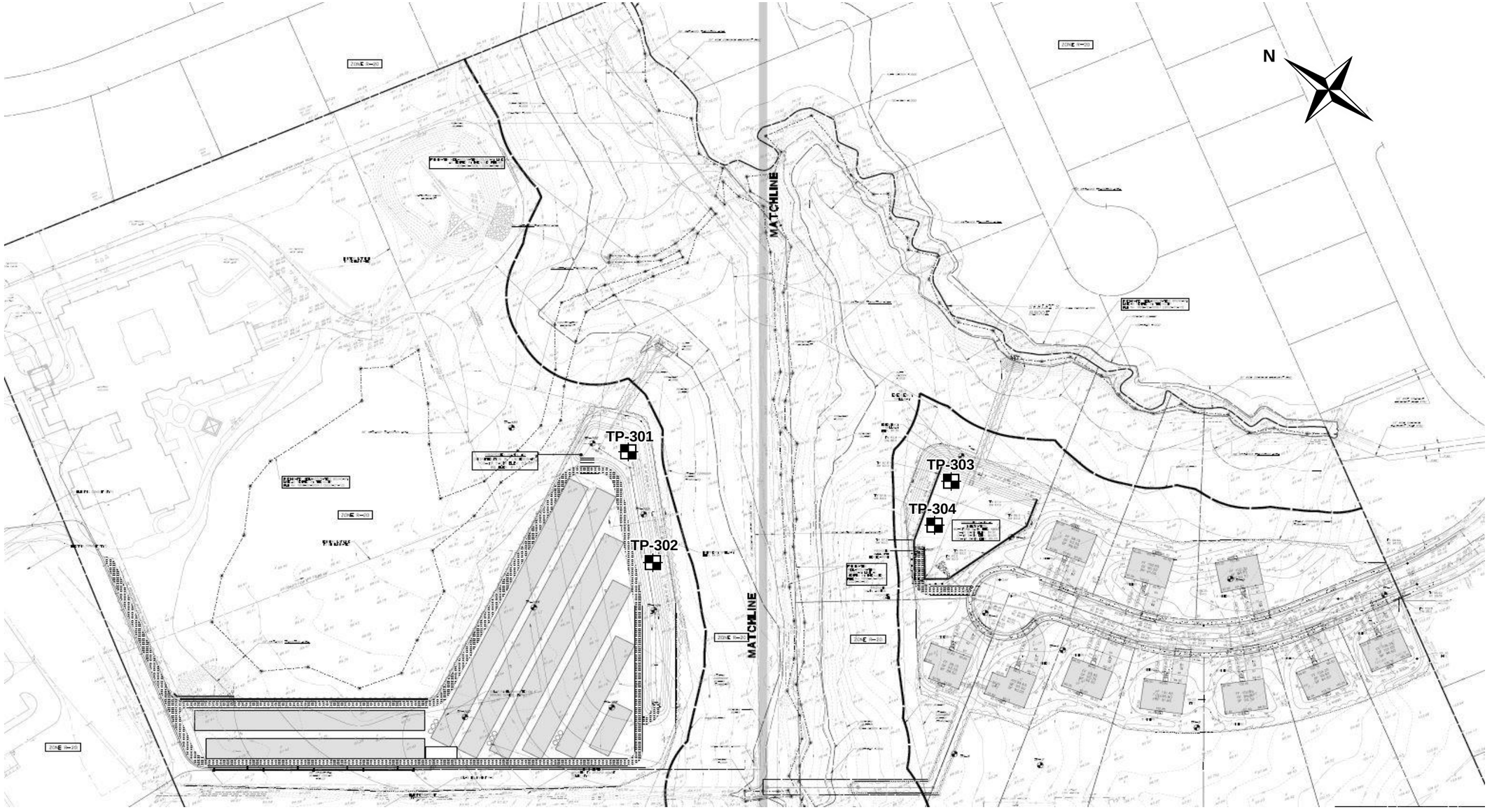
Franklin Township
Somerset County, New Jersey

Prepared For: Menlo Engineering Associates, Inc.

SOURCE: Google Maps

SCALE: NTS	DATE: APR. 2023	PROJECT #: 31211977x1

Figure 1



*Base plan provided by Menlo Engineering Associates, Inc. titled "Grading & Utility Plan" dated March 25, 2022 with a latest revision date of April 10, 2023.

LEGEND:

TP-30X

Indicates the numbers and approximate locations of test pits performed by GTA for this study.

TEST PIT LOCATION PLAN

14 Worlds Fair Drive, Suite A
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

WILF CAMPUS - BASIN FLOOD TESTING

Franklin Township
Somerset County, New Jersey

Prepared For: Menlo Engineering Associates, Inc.

DESIGN BY: *	DRAWN BY: AFS	REVIEWED BY: AMT
SCALE: NTS	DATE: MAR. 2023	PROJECT #: 31211977x1

Figure 2

APPENDIX B

Exploration Logs

NOTES FOR EXPLORATION LOGS

KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)				SYMBOLS GRAPHIC	SYMBOLS LETTER
COARSE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 15% PASSING THE NO. 200 SIEVE)			GW
					GP
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)			GM
					GC
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LESS THAN 15% PASSING THE NO. 200 SIEVE)			SW
					SP
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)			SM
					SC
FINE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILT OR CLAY (<15% RETAINED ON THE NO. 200 SIEVE) SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED ON THE NO. 200 SIEVE) SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED ON THE NO. 200 SIEVE)	SILTS AND LEAN CLAYS LIQUID LIMIT LESS THAN 50			ML
					CL
					OL
		ELASTIC SILTS AND FAT CLAYS LIQUID LIMIT GREATER THAN 50			MH
					CH
					OH
HIGHLY ORGANIC SOILS					PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS WHICH CONTAIN AN ESTIMATED 5 TO 15% FINES BASED ON VISUAL CLASSIFICATION OR BETWEEN 5 AND 12% FINES BASED ON LABORATORY TESTING; AND FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSS-HATCHED AREA. FINE-GRAINED SOILS ARE CLASSIFIED AS ORGANIC (OL OR OH) WHEN ENOUGH ORGANIC PARTICLES ARE PRESENT TO INFLUENCE ITS PROPERTIES. LABORATORY TEST RESULTS ARE USED TO SUPPLEMENT SOIL CLASSIFICATION BY THE VISUAL-MANUAL PROCEDURES OF ASTM D 2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

	DESCRIPTION		GRAPHIC SYMBOLS
ADDITIONAL DESIGNATIONS	TOPSOIL		
	MAN MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATIONS	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" OF PENETRATION OR LESS, AUGER PENETRABLE	

COARSE-GRAINED SOILS
(GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D 1586

FINE-GRAINED SOILS
(SILT AND CLAY)

CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN:
WOH = WEIGHT OF HAMMER
WOR = WEIGHT OF ROD(S)

SAMPLE TYPE

DESIGNATION	SYMBOL
SOIL SAMPLE	S-
SHELBY TUBE	U-
ROCK CORE	R-

WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	▽
UPON COMPLETION OF DRILLING	▼
24 HOURS AFTER COMPLETION	▼

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

LOG OF TEST PIT NO. TP-301

PROJECT: **Wilf Campus - Basin Flood Testing**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**
CLIENT: **Menlo Engineering Associates, Inc.**

PROJECT NO.: **31211977x1**

DATE STARTED: **4/10/2023**
DATE COMPLETED: **4/10/2023**
CONTRACTOR: **J.A. Neary Excavating**
EQUIPMENT: **Case CX160**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **84 Ft.**
DATUM: **Topo**
LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0				
				8 In. of Topsoil	
83.3		ML		Red-brown, moist, Sandy SILT	
82.0	2	HW		Red-brown, moist, Highly-weathered ROCK (Shale)	- Approximate basin bottom EL 81 Ft.
	4				
78.5				Test pit complete at 5-1/2 Ft. due to refusal on highly-weathered rock.	- Basin Flood Test performed at 5-1/2 Ft.
	6				
	8				
	10				
	12				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite A
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-301

LOG OF TEST PIT NO. TP-302

PROJECT: **Wilf Campus - Basin Flood Testing**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**
CLIENT: **Menlo Engineering Associates, Inc.**

PROJECT NO.: **31211977x1**

DATE STARTED: **4/10/2023**
DATE COMPLETED: **4/10/2023**
CONTRACTOR: **J.A. Neary Excavating**
EQUIPMENT: **Case CX160**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **84 Ft.**
DATUM: **Topo**
LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0				
				8 In. of Topsoil	
83.3		ML		Red-brown, moist, Sandy SILT with gravel	
	2				
					- Approximate basin bottom EL 81 Ft.
	4				
79.5		HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
78.0	6			Test pit complete at 6 Ft. due to refusal on highly-weathered rock.	- Basin Flood Test performed at 6 Ft.
	8				
	10				
	12				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite A
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-302

LOG OF TEST PIT NO. TP-303

PROJECT: **Wilf Campus - Basin Flood Testing**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**
CLIENT: **Menlo Engineering Associates, Inc.**

PROJECT NO.: **31211977x1**

DATE STARTED: **4/10/2023**
DATE COMPLETED: **4/10/2023**
CONTRACTOR: **J.A. Neary Excavating**
EQUIPMENT: **Case CX160**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **83.5 Ft.**
DATUM: **Topo**
LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0				
				8 In. of Topsoil	
82.8		ML		Red-brown, moist, Sandy SILT	- Approximate basin bottom EL 83 Ft.
82.0		HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
	2				
	4				
79.0				Test pit complete at 4-1/2 Ft. due to refusal on highly-weathered rock.	- Basin Flood Test performed at 4-1/2 Ft.
	6				
	8				
	10				
	12				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

GEO-TECHNOLOGY ASSOCIATES, INC.
14 Worlds Fair Drive, Suite A
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-303

LOG OF TEST PIT NO. TP-304

PROJECT: **Wilf Campus - Basin Flood Testing**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**
CLIENT: **Menlo Engineering Associates, Inc.**

PROJECT NO.: **31211977x1**

DATE STARTED: **4/10/2023**
DATE COMPLETED: **4/10/2023**
CONTRACTOR: **J.A. Neary Excavating**
EQUIPMENT: **Case CX160**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **85 Ft.**
DATUM: **Topo**
LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0				
				8 In. of Topsoil	
84.3		ML		Red-brown, moist, Sandy SILT	
83.5		GM		Red-brown, moist, Silty GRAVEL	
	2				- Approximate basin bottom EL 83 Ft.
82.5		HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
81.0	4			Test pit complete at 4 Ft. due to refusal on highly-weathered rock.	- Basin Flood Test performed at 4 Ft.
	6				
	8				
	10				
	12				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

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14 Worlds Fair Drive, Suite A
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-304