ECS Midwest, LLC

Geotechnical Engineering Report

Proposed Canopy Addition

Outagamie Co. Recycling and Solid Waste – 1419 Holland Road
Appleton, Outagamie County, Wisconsin

ECS Project No. 59:4248

November 22, 2024

ECS MIDWEST, LLC

Geotechnical • Construction Materials • Environmental • Facilities

November 22,2024

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ECS Project No. 59:4248

Reference: Geotechnical Engineering Report
Proposed Canopy Addition
Outagamie Co. Recycling and Solid Waste – 1419 Holland Road
Appleton, Outagamie County, Wisconsin

Dear Ms. Nelson:

ECS Midwest LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of service. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to SCS Engineers during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations to verify subsurface conditions anticipated for this report. Should you have questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

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"ONE FIRM. ONE MISSION."

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EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, we summarized our principal foundation recommendations. Information gleaned from the Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

- The proposed building structure can be supported on a spread footing foundation system. However, the project team should expect over-excavation of existing undocumented fill will be required for shallow footings.

- The proposed new building can be supported by a spread footing foundation system bearing in competent native soils, or on engineered fill overlying competent native soils, which may be designed for a maximum net allowable bearing pressure of 3,000 psf (pounds per square foot). Competent native soils can be identified on the test boring logs as glacial till soils, having Standard Penetration Test (SPT) N-values of at least 9 bpf (blows per foot) or an unconfined compressive strength (Q_p) of at least 1.75 tsf (tons per square foot).

- The project team should expect to provide excavation bracing during the excavation and construction of the proposed foundation so as not to undermine the existing construction or otherwise adversely affect the structural integrity of the existing building.

1.0 INTRODUCTION

ECS prepared this report for the purpose of providing the results of our subsurface exploration and laboratory testing, site characterization, engineering analysis, and geotechnical recommendations for the design and construction of foundations for the proposed structure. The recommendations developed for this report are based on project information supplied by Ms. Debra L. Nelson, PE of SCS Engineers.

ECS provided services in accordance with our Proposal No. 59:6369-GP, dated September 20, 2024, and Service Order as authorized by Ms. Betsy Powers with SCS Engineers, on October 23, 2024, which includes our Terms and Conditions of Service.

This report contains the procedures and results of our subsurface exploration and laboratory testing programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items:

- A brief review and description of our field and laboratory test procedures and results.
- A review of the observed surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil/rock stratigraphy with pertinent available physical properties.
- Final test boring log.
- Recommended foundation type, allowable soil bearing pressure, and estimate of foundation settlement.
- Seismic Design Site Classification.
- Evaluation and recommendations related to groundwater control.
- Recommendations for site preparation and construction of compacted fills, including an evaluation of on-site soils for use as compacted fills to support slabs, minimum compaction levels, and engineered fill material guidelines.
- Recommendations for additional testing and/or consultation that might be required to complete the geotechnical assessment and related geotechnical engineering for this project.

The scope for this geotechnical subsurface exploration and report did not include sampling, testing, or consulting by ECS for environmental purposes.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE/PAST SITE USE

The project site is located at Outagamie County Recycling and Solid Waste facility at 1419 Holland Road in Appleton, Outagamie County, Wisconsin. The site location is shown in the figure below and on the Site Location Diagram in Appendix A of this report:

Site Location (approximately outlined in red)

The general site vicinity consists of farmlands, and residential properties. The site of the proposed construction generally consists of existing parking and driveway areas.

ECS interpreted site specific topography using the Outagamie County interactive GIS map (https://ocgis.maps.arcgis.com/apps/) to estimate the existing site grade elevations. We understand the elevations to be referenced to Mean Sea Level (MSL). According to the interactive map, we anticipate the existing site grade elevations to range from approximately EL. +733 feet to EL. +735 feet above MSL. *Please note, elevations estimated from online resources are approximate and should not be used for final design and construction.*

ECS also visually reviewed historical aerial photographs of the subject site dated between 1992 and 2023 that were obtained from Google Earth. Our visual review of the photographs indicated the existing building located north of the project site, parking lots, and driveways were present from at least 2005. Further, we observed the addition to the existing building located on the northwest side of the proposed canopy. A small structure located at the project site appears to have been demolished sometime in 2021. Following this demolition, the site appears to have remained relatively unchanged. Because of the previous site activities, we anticipate areas of existing fill or remnants of previous construction not encountered by the test borings may be present at the site.

2.2 PROPOSED CONSTRUCTION

The following information represents ECS's understanding and estimates of the proposed construction. It comprises an important part of our engineering review. If changes occur in the nature, design, grades, or locations of the proposed construction, after the completion of this report, the conclusions and recommendations in this report should not be considered valid unless ECS reviews these changes.

ECS understands the proposed project consists of the design and construction of a new 50-foot by 150-foot and 30-foot tall canopy addition to the south side of the existing warehouse building on an existing concrete slab that will remain in place. We understand the proposed canopy will be a steel frame and metal roof structure with approximately 4 steel support columns, supported on concrete sonotube column footings with a 5-foot minimum depth and approximately 16 inches to 36 inches in diameter. The following information further explains our understanding and the anticipated foundation loadings for the planned construction:

PROJECT INFORMATION

Subject	**Design Information / Assumptions**
Building Area	Approximately 7,500 sf (square feet)
Number of Stories	1-story with slab-on-grade
Usage	Storage
Framing (1)	Steel post-frame – Anticipated
Interior Column Loads	35 to 50 kip – maximum – Anticipated
Maximum Wall Loads (1)	2.5 to 5 kip per lineal foot (klf) maximum – Anticipated
Floor Loads (1)	125 psf maximum service load – Anticipated
Planned Finished Floor Elevation	Anticipated to match first floor of existing surrounding buildings
Footing Depth	5 feet minimum

Notes:

(1) Anticipated loads are based on reasonable material and product loads. If final design loads exceed our anticipated loads, then this report needs to be revised to update our foundation recommendations, bearing capacity, and estimated settlement.

Where the borings encounter subsurface conditions that might be detrimental to the support of the proposed construction, ECS anticipates the owner is only willing to accept a low risk of foundation settlement exceeding 1 inch.

If ECS' understanding of the project or the owner's anticipated acceptable risk level are not correct or the design changes, please contact ECS so that we may review these changes and revise our recommendations, as appropriate.

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms, and to evaluate field and laboratory data to assist in the development of geotechnical design and construction recommendations. Our exploration procedures are explained in greater detail in Appendix B including the insert titled "Subsurface Exploration Procedures."

Our scope of service included drilling four (4) Standard Penetration Test (SPT) soil borings extended to a depth of approximately 20 feet below the existing grade within the proposed canopy footprint. SES Engineer personnel selected the general boring locations and depths. ECS personnel located the borings at the site using conventional measuring techniques referenced to existing site features and their approximate locations are shown on the Boring Location Diagram in Appendix A.

Based on the information that SES engineers provided to us, we understand the surface elevation at the boring locations to range from approximately 733.9 to 735.1 feet above MSL. The surface elevation at each boring location can be found on the boring logs included in Appendix B of this report.

3.2 REGIONAL/SITE GEOLOGY

According to the University of Wisconsin Extension Geological and Natural History Survey and U.S. Geological Survey[1,2] the site of the proposed construction lies above Phanerozoic bedrock of the Ordovician System consisting of sedimentary rocks of Paleozoic Age. The bedrock formation generally lies within the Sinnipee Group (Os) which consists of dolomite with some limestone and shale, and includes Galena, Decorah, and Platteville Formations

The soil overburden is mapped to be less than 50 feet thick. The depth to bedrock profile is illustrated in Figure 3.2.1 below and the approximate site location is marked with a red circle.

(Source: *Depth to Bedrock in Wisconsin*, University of Wisconsin Extension Geological and Natural History Survey)

Figure 3.2.1

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[1] Trotta, L.C. and Cotter, R.D. *Depth to Bedrock in Wisconsin*. University of Wisconsin Extension Geological and Natural History Survey, U.S. Geological Survey, USGS, 1973.

[2] Mudrey, M.G., Brown B.A., and Greenburg, J.K. *Bedrock Geologic Map of Wisconsin*. University of Wisconsin Extension Geological and Natural History Survey, 1982.

Well construction reports available from the Wisconsin Department of Natural Resources WDNR (https://widnr.maps.arcgis.com/apps), for wells installed within the vicinity of the project site indicate bedrock to be at a depth of approximately 39 feet or deeper.

3.3 SOIL SURVEY MAPPING

According to the Soil Survey from the USDA - Natural Resources Conservation Service (websoilsurvey.nrcs.usda.gov), which provides soil information to a shallow depth (generally less than 5 feet), the near surface soils are mapped as Winneconne silty clay loam (WnA, WnB). A soil map of the project site is presented in Appendix A. This mapped soil unit is described with the following properties:

- **Winneconne silty clay loam (WnA, WnB), 0 to 6 percent slopes** – Landforms consisting of rises and lake plains over calcareous clayey lacustrine deposits. These soils are generally well drained, classified as being in Hydrologic Soil Group D and having a moderate potential for frost action.

3.4 SUBSURFACE CHARACTERIZATION

The encountered subsurface conditions in the borings appeared inconsistent with published geological mapping because the borings encountered existing fill. A graphical presentation of the generalized subsurface conditions is shown on the Subsurface Cross-Section diagram included in Appendix A. For subsurface information at a specific test boring location, refer to the boring logs in Appendix B. The following Table provides generalized characterizations of the soil strata encountered in the borings:

GENERALIZED SUBSURFACE CHARACTERIZATION

Approx. Depth Increment of Stratum (feet)	Stratum No.	Material Description	Range of SPT(1) N-values (bpf)	Unconfined Compressive Strength, Q_p(2) (tsf)
0 – 1.3	--	**Surface Materials: Asphalt: 2 to 3 inches** **Gravel (Base): 14 to 15 inches**	--	--
1.3 – 3	I	**Undocumented FILL Soils: (USCS: CL, GM, SM):** stiff to very stiff LEAN CLAY WITH SAND, medium dense SILTY GRAVEL and SILTY SAND .	12 – 46	6.0
3 – 20 (EOB)	II	**Glacial Till and Lacustrine Soils (USCS: CL:** Firm to hard LEAN CLAY and LEAN CLAY WITH SAND.	5 – 18	0.5 – 6.0

Notes:

(1) Standard Penetration Testing.
(2) Estimated from calibrated hand penetrometer.

Where the drill crew used discontinuous material sampling intervals at the test borings, ECS inferred conditions between sample intervals. The soil stratification shown on the boring logs represents the interpreted soil conditions at the actual boring locations. Variations in the stratification can occur between sample intervals and boring locations. The subsurface conditions at other times and locations on the site may differ from those found at the boring locations. If different site conditions are encountered during construction, ECS should be contacted to review our recommendations related to the new information.

Because of the limitations of the split-spoon sampler, which has a 1⅜-inch inside diameter, the soil classifications noted on the boring logs may not be representative of the entire soil matrix. Materials larger than the 1⅜-inch inside diameter of the split-spoon sampler cannot be collected and observed directly. Where possible, the drill crew noted the estimated depth of larger diameter materials, such as cobbles and boulders, based on things such as changes in the observed drilling resistance and auger cuttings.

3.5 GROUNDWATER OBSERVATIONS

The drillers observed a measurable groundwater level in the borings except for Boring B-02 during drilling and noted it at a depth of about 16 feet in Boring B-01, 14 feet in Boring B-03, and 8 feet in Boring B-04. However, none of the borings contained a measurable groundwater level at the completion of drilling operations.

Based upon our interpretation of the subsurface data, including water level measurements, the boring with a measurable groundwater level likely encountered perched groundwater. Perched groundwater is distinguished differently from the saturated (water table) aquifer. The following definition can be referenced:

> "Perched water is typically of limited quantity, replenished or recharged very slowly. When encountered in an excavation, perched water will typically drain off very quickly, with limited continuous flow or bleeding, unless a source of recharge, such as a leaking utility is present."
>
> From: *Construction Dewatering and Groundwater Control – New Methods and Applications, 3rd Addition*

A water table aquifer is distinguished from a perched groundwater table based on the water table aquifer's recharge ability, which may be limitless but can be lowered temporarily through adequate dewatering techniques such as deep wells and well points. Perched groundwater is often alleviated in excavations by pumping from sump pits and French drains.

Variations in both perched groundwater and the groundwater table aquifer can occur because of seasonal variations in precipitation, evaporation, surface water runoff, lateral drainage conditions, construction activities, and other factors. The time of year and the weather history during the advancement of the borings should be considered when estimating groundwater levels at other points in time.

3.6 LABORATORY SERVICES

ECS performed classification and index property tests on representative soil samples obtained from the test borings to aid classification of the soils, and to estimate engineering properties.

A geotechnical engineer visually classified each collected soil sample from the test borings based on texture and plasticity using ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)* and ASTM D2487 *Standard Practice for Classification for Engineering Purposes (Unified Soil Classification System (USCS))* as a guide. After classification, the geotechnical engineer grouped the various soil types into the major zones noted on the test boring log in Appendix B of this report. The group symbols for each soil type are indicated in parentheses along with the soil descriptions on the test boring log. The stratification lines designating the interfaces between earth materials on the log are approximate; in-situ, the transitions may be gradual.

ECS performed calibrated hand penetrometer tests (Q_p) on select cohesive soil samples. In the hand penetrometer test, the unconfined compressive strength of a soil sample is estimated, to a maximum of 6.0 tons per square foot (tsf), by measuring the resistance of a soil sample to penetration by a small, calibrated, spring-loaded cylinder. The hand penetrometer test results can be found on the boring logs.

The laboratory testing program included tests using relevant ASTM procedures to determine moisture content, and unconfined compressive strength (Q_u) on select soil samples recovered from the borings. The test results can be found on the boring logs in Appendix B of this report.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposal.

4.0 DESIGN RECOMMENDATIONS

4.1 FOUNDATION DESIGN

Provided subgrades and engineered fills are prepared as recommended in this report. The proposed new canopy structure can be supported by conventional spread footing foundations founded on a competent bearing native soil subgrade. The following parameters are recommended for shallow spread footing foundation design:

SPREAD FOOTING FOUNDATIONS	
Design Parameter	**Recommended Design Value**
Net Allowable Bearing Pressure (1, 5)	3,000 psf (pounds per square foot)
Adequate Bearing Soil Material	Stiff to hard Lean Clay Stratum II or Engineered Fill
Competent Soils Designated Adequate for the Allowable Bearing Pressure	N ≥ 9 bpf Sand or $Q_p \geq 1.75$ tsf Clay
Minimum Width	24 inches (Column Pad) 18 inches (Continuous Footing)
Minimum Exterior Frost Depth (below final exterior grade) (2)	48 inches (Heated Structure) 66 inches (Non-Heated Structure)
Estimated Total Settlement (3)	Less than 1 inch
Estimated Differential Settlement (4)	Less than ½ inch (Between columns)

Notes:

(1) Net allowable bearing pressure is the applied pressure exceeding the surrounding overburden soils

above the base of the foundation and includes a minimum factor of safety of 3.

(2) For frost penetration considerations.

(3) Based on anticipated maximum column/wall loads. If final loads are different, then ECS should be contacted to update the foundation recommendations and settlement calculations.

(4) Based on anticipated maximum column/wall loads and variability in borings. Differential settlement between the addition and existing building may approach the estimated total settlement. Differential settlement can be re-evaluated once the foundation plans are available.

Potential Undercuts: Based on our review of the subsurface information, the contractor should be prepared to over-excavate areas of existing undocumented fill, organic soils (topsoil), native soils that do not meet strength requirements, or other deleterious soils encountered in the foundation excavations. The *Earthwork Operations* Section in this report provides our subgrade preparation recommendations for the construction of spread footing foundations and floor slabs. *ECS anticipates over-excavation to remove existing undocumented fill from below proposed shallow foundations and floor slabs will be required at this site.* Over-excavated material should be backfilled with engineered fill up to the original design bottom of footing elevation.

As an alternative to soil replacement, strip footing pads could be stepped or thickened, and isolated column pads could be uniformly thickened to extend through inadequate bearing materials. If this alternative is utilized, then ECS recommends stepped or thickened footings be designed by the structural engineer.

Foundation Uplift: Resistance to uplift forces will be developed by the dead weight of the structure plus the weight of the soil backfill above the foundation. For uplift resistance, ECS recommends utilizing a backfill unit weight of 125 pounds per cubic foot (pcf) above the water table, and a unit weight of 63 pcf below the water table. It is recommended the backfill be compacted to at least 95 percent of the maximum dry density determined by Modified Proctor test (ASTM D1557). The final design of the foundation for uplift should be based on a minimum factor of safety against uplift of 2.0.

Foundation Lateral Loading: Lateral load resistance will be developed by friction acting at the base of foundations, and the passive earth pressure developed by the footings below-grade. Passive pressure and sliding resistance (friction) may be used in combination, without reduction, in determining the total resistance to lateral loads. The parameters in the following table are recommended for lateral foundation loading:

FOUNDATION LATERAL LOADING RESISTANCE PARAMETERS	
Soil Parameter	**Estimated value**
Coefficient of Passive Earth Pressure (K_p)	3.0
Soil Moist Unit Weight (γ)	125 pcf
Adhesion [*Poured concrete on cohesive soil*] (C_A)	500 psf
Interface Friction Angle [*Poured concrete on cohesive soil*] (ϕ_f)	15°
Sliding Friction Coefficient [*Poured concrete on granular soil*] (μ)	0.32
Passive Equivalent Fluid Pressure (1)	375H (psf)

Notes:

1. Neglect the passive earth pressure on the low side of the wall within the frost zone because of loss of strength seasonally and strain required to mobilize.

The final design of the foundation for lateral loads should be based on a minimum factor of safety against sliding of 1.5 and overturning of 2. Also, if the resultant force of the maximum vertical force does not act within the middle one-third (kern) of the footing, a smaller effective bearing area is expected to occur and thereby result in a higher effective bearing pressure that should be accounted for in the design.

Where utility trenches or other excavations are located adjacent to foundations, the bottom of the footing should be located below an imaginary 1:1 (horizontal to vertical) plane projected upward from the nearest bottom edge of the utility trench.

4.2 SEISMIC DESIGN CONSIDERATIONS

Seismic Site Classification: The International Building Code (IBC) 2015 requires the Site Class for seismic design be based on the upper 100 feet of the soil profile. The three parameters used to classify sites are the shear wave velocity (v_s); the undrained shear strength (s_u); and the Standard Penetration Resistance (N-value). The seismic Site Class definitions for the weighted average of shear wave velocity, shear strength, or SPT N-value in the upper 100 feet of the soil profile are shown in the following Table:

SEISMIC SITE CLASSIFICATION

Site Class	Soil Profile Name	Shear Wave Velocity, Vs, (ft./s)	N value (bpf)	Undrained Shear Strength, Su, (psf)
A	Hard Rock	Vs > 5,000 fps	N/A	NA
B	Rock	2,500 < Vs ≤ 5,000 fps	N/A	NA
C	Very dense soil and soft rock	1,200 < Vs ≤ 2,500 fps	>50	> 2,000
D	Stiff Soil Profile	600 ≤ Vs ≤ 1,200 fps	15 to 50	1,000 to 2,000
E	Soft Soil Profile	Vs < 600 fps	<15	< 1,000

Our exploration included advancement of the borings to a maximum depth of 20 feet below the existing grade. Based on this data and our experience with the soils in the general site vicinity and engineering judgment, the appropriate Seismic Site Class can be characterized as Site Class "D" as shown in the preceding table. The Site Class should not be confused with the Seismic Design Category, which the Structural Engineer typically determines.

If a more favorable Site Class is beneficial to the project, then ECS would be pleased to discuss additional testing capabilities in this regard.

Ground Motion Parameters: In addition to the seismic site classification, ECS has determined the design spectral response acceleration parameters following the IBC methodology (Chapter 20 of ASCE 7). The Mapped Reponses were estimated from the *'ATC Hazards by Location'* website (https://hazards.atcouncil.org/) using Reference Document IBC-2015, Risk Category I, and Site Class D for the address of the project. The design responses for the short period (0.2 sec, S_{DS}) and 1-second period (S_{D1}) are noted in bold at the far-right end of the following Table:

GROUND MOTION PARAMETERS								
Period (sec)	**Mapped Spectral Response Accelerations (g)**		**Values of Site Coefficient for Site Class**		**Maximum Spectral Response Acceleration Adjusted for Site Class (g)**		**Design Spectral Response Acceleration (g)**	
0.2	S_S	0.056	F_a	1.6	$S_{MS}=F_aS_S$	0.089	**$S_{DS}=2/3\ S_{MS}$**	**0.059**
1.0	S_1	0.035	F_v	2.4	$S_{M1}=F_vS_1$	0.084	**$S_{D1}=2/3\ S_{M1}$**	**0.056**

The Site Class definition should not be confused with the Seismic Design Category designation which the Structural Engineer typically assesses. If a higher site classification is beneficial to the project, we can provide additional testing methods that may yield more favorable results.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Demolition

We understand the proposed project includes the demolition of some of the existing structures. ECS recommends remnants of existing structures scheduled for removal and former structures (i.e., pavements, slabs, below-grade walls, footings, and associated excavation, etc.) be completely removed during demolition activities and backfilled with compacted engineered fill to the final design site grades. Care should be taken to protect adjacent buildings, pavements, sidewalks, and hardscapes that will remain in place. ECS understands some demolition contractors may place the debris in excavations from the structure and cap with soil. These methods generally will not provide an adequate subgrade for foundations, slabs, or pavements. The foundation contractor should mobilize appropriate equipment to remove and/or break up existing slabs and other obstructions. Disposal of debris should be in accordance with local, state, and federal regulations for the material type. The resulting excavations should be backfilled with engineered fill compacted in lifts as described in the *Earthwork Operations* Section of this report.

5.1.2 Stripping and Initial Site Preparation

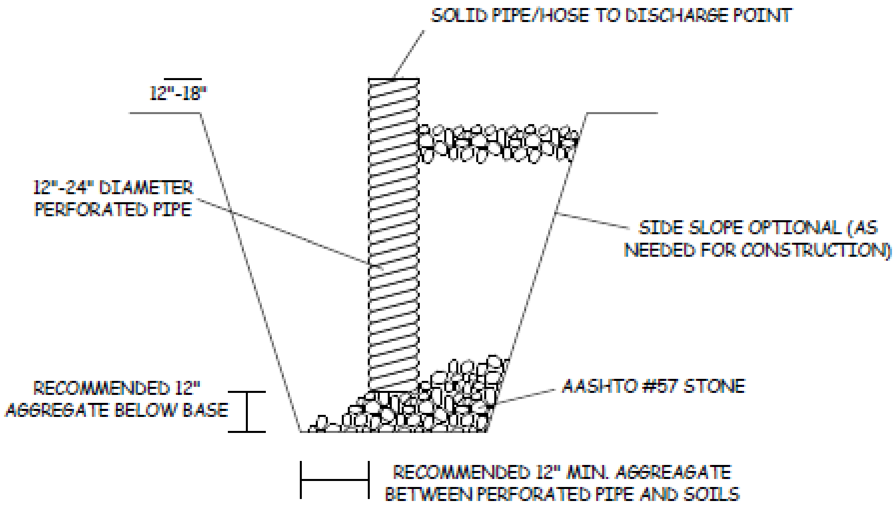
The subgrade preparation should consist of scheduled pavement removal, and the removal of existing undocumented fill, organic soils, and other soft/very loose or deleterious materials from the 5-foot expanded pavement limits, and 5 feet beyond the toe of engineered fills where feasible. ECS should be retained to observe and document that topsoil and other potentially inadequate surficial materials have been removed prior to the placement of engineered fill or construction of structures. Existing utilities not reused should be capped off and removed or properly abandoned in-place in accordance with local codes and ordinances.

5.1.3 Site Temporary Dewatering

The contractor shall make their own assessment of temporary dewatering needs based upon the limited subsurface groundwater information presented in this report. Soil sampling is not continuous, and thus soil and groundwater conditions may vary between sampling intervals (typically 5 feet). If the contractor believes additional subsurface information is needed to assess dewatering needs, then they should obtain such information at their own expense. ECS makes no warranties or guarantees regarding the adequacy of the provided information to determine dewatering requirements; such recommendations are beyond our scope of services.

Dewatering systems are a critical component of many construction projects. Dewatering systems should be selected, designed, and maintained by a qualified and experienced (specialty or other) contractor familiar with the geotechnical and other aspects of the project. The failure to properly design and maintain a dewatering system for a given project can result in delayed construction, unnecessary foundation subgrade undercuts, detrimental phenomena such as 'running sand' conditions, internal erosion (i.e., piping'), the migration of 'fines' down-gradient towards the dewatering system, localized settlement of nearby infrastructure, foundations, slabs-on-grade, and pavements, etc. Water discharged from site dewatering system shall be discharged in accordance with local, state, and federal requirements.

Strategies for Addressing Perched Groundwater: The typical primary strategy for addressing perched groundwater seeping into excavations is pumping from trench (or French) and sump pits with sump pumps. The inlet of the sump pump is placed at the bottom of the corrugated pipe and the discharge end of the sump is directed to an appropriate stormwater drain. A typical sump pump drain (found in a sump pit or along a French drain) is depicted below:



Sump Pit/Pump Diagram

A typical French drain consists of an 18 to 24-inches wide by 18 to 24-inches deep bed of AASHTO No. 57 (or similar open graded aggregate) aggregate wrapped in a medium duty, non-woven geotextile and (sometimes) containing a 6-inch diameter, Schedule 40 PVC perforated or slotted pipe. Actual dimensions should be as determined necessary by ECS during construction. After the installation has been completed, the geotextile should be wrapped over the top of the aggregate and pipe followed by placement of backfill. The top of the drain should be positioned at least 18 inches below the design subgrade elevations. Drains should not be routed within the expanded building limits.

Pumping wells or a vacuum system could also be used to address perched groundwater. These techniques often are only effective during the initial depletion of the perched water quantity and may quickly be ineffective at addressing accumulation of water from rain, snow, etc.

Surface Drainage: The surface soils may be erodible. Therefore, the contractor should provide and maintain good site surface drainage during earthwork operations to maintain the integrity of the surface soils. Erosion and sedimentation controls utilized for the project should be in accordance with sound engineering practices and local requirements. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of 1 percent or steeper to reduce the potential of ponding water and the subsequent saturation of the surface soils.

5.2 EARTHWORK OPERATIONS

5.2.1 Existing Man-Placed Fill

Each of the borings contained existing undocumented fill material that extended to a depth of between approximately 3 and 6 feet below the existing grade. The presence of undocumented fill soils at this site presents a concern for the support of shallow foundations. Undocumented fill presents a risk for nonuniform support and excessive settlement because the soils were previously disturbed and potential variations in the composition and density of this material may exist. Additionally, pockets of deleterious materials may be present within or buried by the existing fill not encountered by the test borings. The risk also increases where the material contains more than 5 percent organic content.

Based primarily on the standard penetration N-values, the risk of total and/or differential foundation settlement exceeding 1 inch associated with the undocumented fill at this site is moderate. ECS recommends removing undocumented fill from below new foundations. The over-excavated material should then be replaced with a properly compacted engineered fill.

5.2.2 Existing/ Previous Construction Considerations

Extreme care should be taken during earthwork and foundation activities adjacent to existing structures scheduled to remain in place. Vibratory compaction equipment can cause interior and exterior building finishes to crack. Mass or localized undercutting adjacent to existing structures may undermine existing foundations and slabs. Excavation below existing foundations and slabs shall consider appropriate preventative measures, such as shoring and underpinning to help prevent loss of subgrade support. In no case shall excavations extend below adjacent foundations and slabs unless the contractor provides underpinning or other forms of engineered support.

Possible remnants of the previous construction on the site may be encountered in the excavations. Site preparation will require complete removal and proper disposal of remnants of previous construction, including foundations, floor slabs, and underground utilities which are not reused. Disposal of debris should be in accordance with local, state, and federal regulations for the material type. Construction remnants left in-place may cause excavation difficulties for new utilities or other future construction.

5.2.3 Excavation Safety

The contractor should make and maintain excavations and slopes in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in OSHA 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; ECS does not imply such responsibility, and the contractor, design team and owner should not infer it.

5.2.4 Engineered Fill

Prior to placement of engineered fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will typically include natural moisture content, Atterberg limits, grain-size distribution, and moisture-density relationships (i.e., Proctors) for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications. Alternatively, Proctor data from other accredited laboratories can be submitted if the test results are within the last 90 days.

Engineered Fill Materials: Materials satisfactory for use as engineered fill should consist of inorganic soils classified as SW, SP, SM, SC, GW, GP, GM, or GC, or a combination of these group symbols, per ASTM D2487, with the following engineering properties and compaction requirements:

ENGINEERED FILL INDEX PROPERTIES	
Subject	**Property**
Liquid Limit (LL) and Plasticity Index (PI)	LL < 40, PI < 20
Maximum Particle Size	3 inches
Maximum Fines Content Passing No. 200 Sieve	25% by dry weight
Maximum Organic Content	5% by dry weight

ENGINEERED FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Modified Proctor, ASTM D1557
Minimum Required Compaction	≥ 95% of Max. Dry Density
Moisture Content	-2 to +3% points of the soil's optimum value
Maximum Loose Thickness	8 inches prior to compaction

If the engineered fill is to provide low-frost susceptible characteristics, then it should be classified as a clean gravel (GP or GW) or clean coarser sand (SW or SP) per the Unified Soil Classification System (ASTM D-2487) and should be properly drained.

Unsatisfactory Materials: Materials that should not be used as engineered fill include topsoil, organic materials (OH, OL), high plasticity clays and silts (CH, MH), and highly frost susceptible silt, sandy silt, silty clay, very silty clayey sand, or very silty sand (ML, CL/ML, or SM) (P200 > 25 percent) soils. Such materials removed during grading operations should be placed in approved off-site disposal areas.

On-Site Borrow: The on-site non-organic moderately SILTY SAND (SM), and SILTY GRAVEL (GM) (P200 ≤ 25 percent) soils encountered in the borings may be feasible to use as engineered fill but should be further evaluated and tested by ECS prior to its use. Soil used as engineered fill should be free of frozen matter, deleterious materials, or chemicals that may result in the material being classified as "contaminated." Some conditions at the time of construction, such as wet or freezing weather, may preclude the use of on-site soil, and it may be necessary to use an imported less moisture sensitive or less frost susceptible granular material. The construction team should anticipate moisture conditioning (mostly drying) of subgrade soils and engineered fill lifts at this site. The soil should not be compacted too dry as it may lose its apparent stability if it later becomes wet.

The construction team should anticipate moisture conditioning (mostly drying) of subgrade soils and engineered fill lifts at this site. The soil should not be compacted too dry as it may lose its apparent stability if it later becomes wet. Soil chemical modification may be helpful to reduce moisture contents of subgrade soils and fills.

Fill Placement: Fill materials should not be placed on frozen soils, on frost-heaved soils, and/or on excessively wet soils. Borrow fill materials should not contain frozen materials at the time of placement, and frozen or frost-heaved soils should be removed prior to placement of engineered fill or other fill soils and aggregates. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

The engineered fill placed below the foundations and within the foundation influence zone should extend 1 foot beyond the outside edges of the footings and from that point, outward laterally 1 foot for every 2 feet of fill thickness below the footing. If lean concrete is utilized to replace weaker/low bearing soils or other poor soils, then lateral over-excavation is typically not necessary, but the excavation should be 1 foot wider than the footing (6 inches on each side), and the lean concrete should be allowed to sufficiently harden prior to placement of the foundation concrete. Use of lean mix concrete to limit lateral over-excavation may not be effective at this site because of caving of excavation sidewalls within the existing fill soils.

5.3 FOUNDATION OBSERVATIONS

Protection of Foundation Excavations: Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, then the softened soils should be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, then a 1 to 3-inch thick "mud mat" of "lean" concrete should be placed on the bearing soils before the placement of reinforcing steel.

Footing Subgrade Observations: It will be important to have ECS observe the foundation subgrade prior to placing foundation concrete, to confirm and document the anticipated bearing soils and the material exposed in the excavations does not exhibit obvious characteristics that would adversely affect the performance of the foundation system.

Where organic soils, soft/very loose soils, or other deleterious materials are observed in the foundation influence zone, we recommend the removal of the incompetent soils. An undercut should be backfilled with engineered fill up to the original design bottom of footing elevation. The original footing is then recommended to be constructed on top of the engineered fill.

6.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by SCS Engineers. If this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, then ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

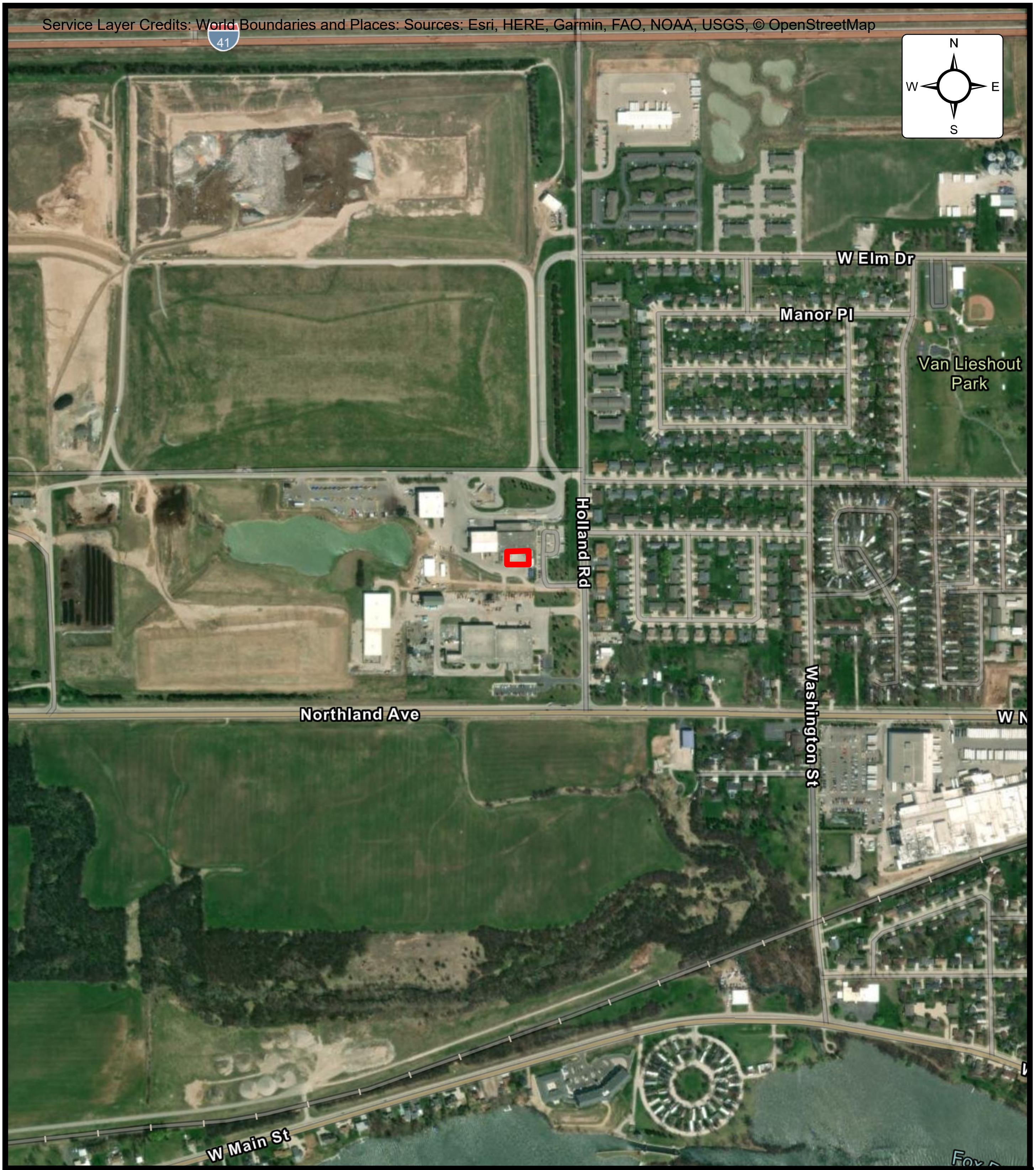
We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Diagrams and Reports

Site Location Diagram
Boring Location Diagram
Subsurface Cross-Section
Soil Survey Map



Service Layer Credits: World Boundaries and Places: Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap

SITE LOCATION DIAGRAM
Proposed Canopy Addition

1419 Holland Road, Appleton, Wisconsin

SCS Engineers

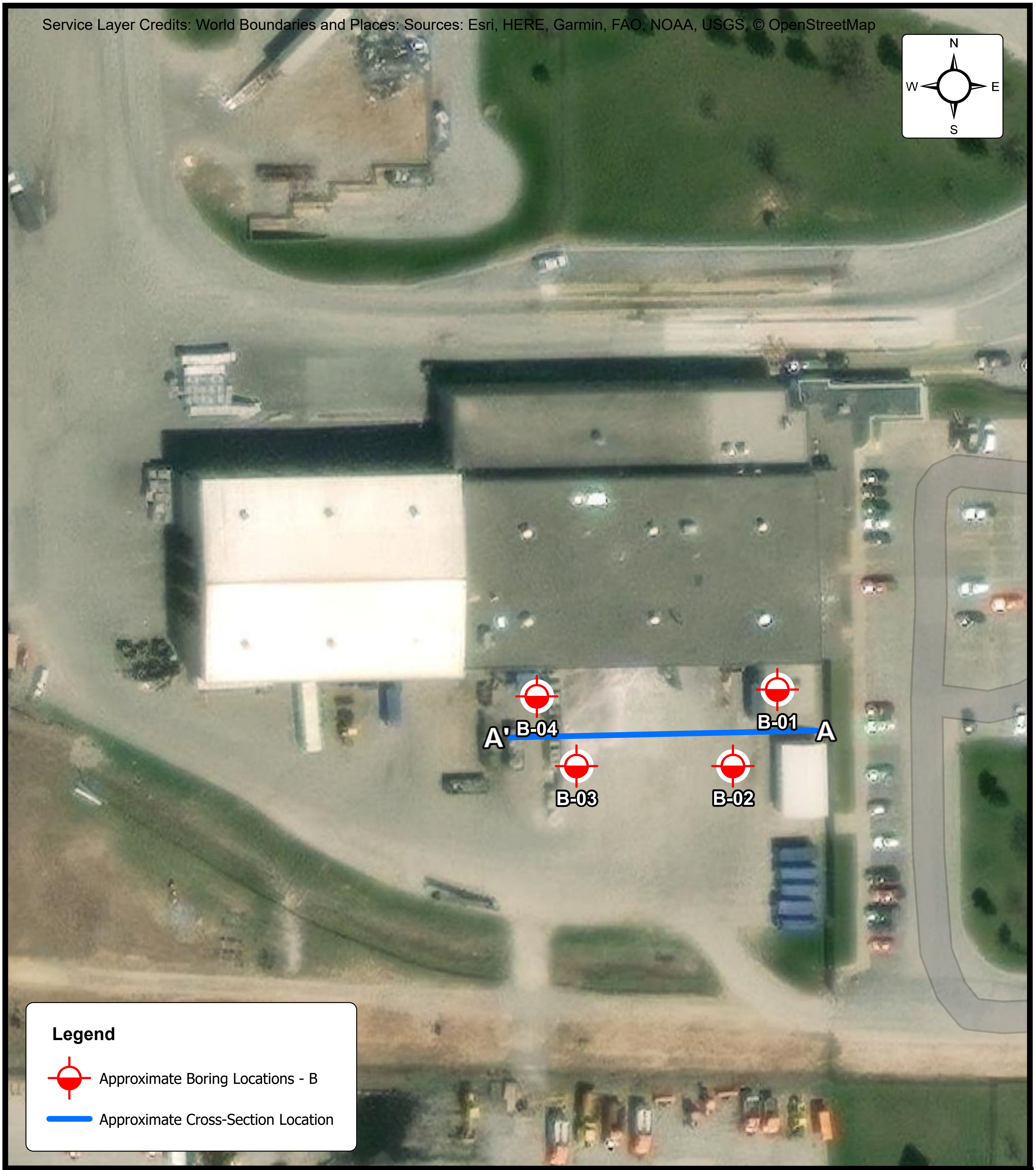
ENGINEER
YPineda

SCALE
1" = 800'

PROJECT NO.
59:4248

SHEET

DATE
10/29/2024



Service Layer Credits: World Boundaries and Places: Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap

BORING LOCATION DIAGRAM
Proposed Canopy Addition

1419 Holland Road, Appleton, Wisconsin

SCS Engineers

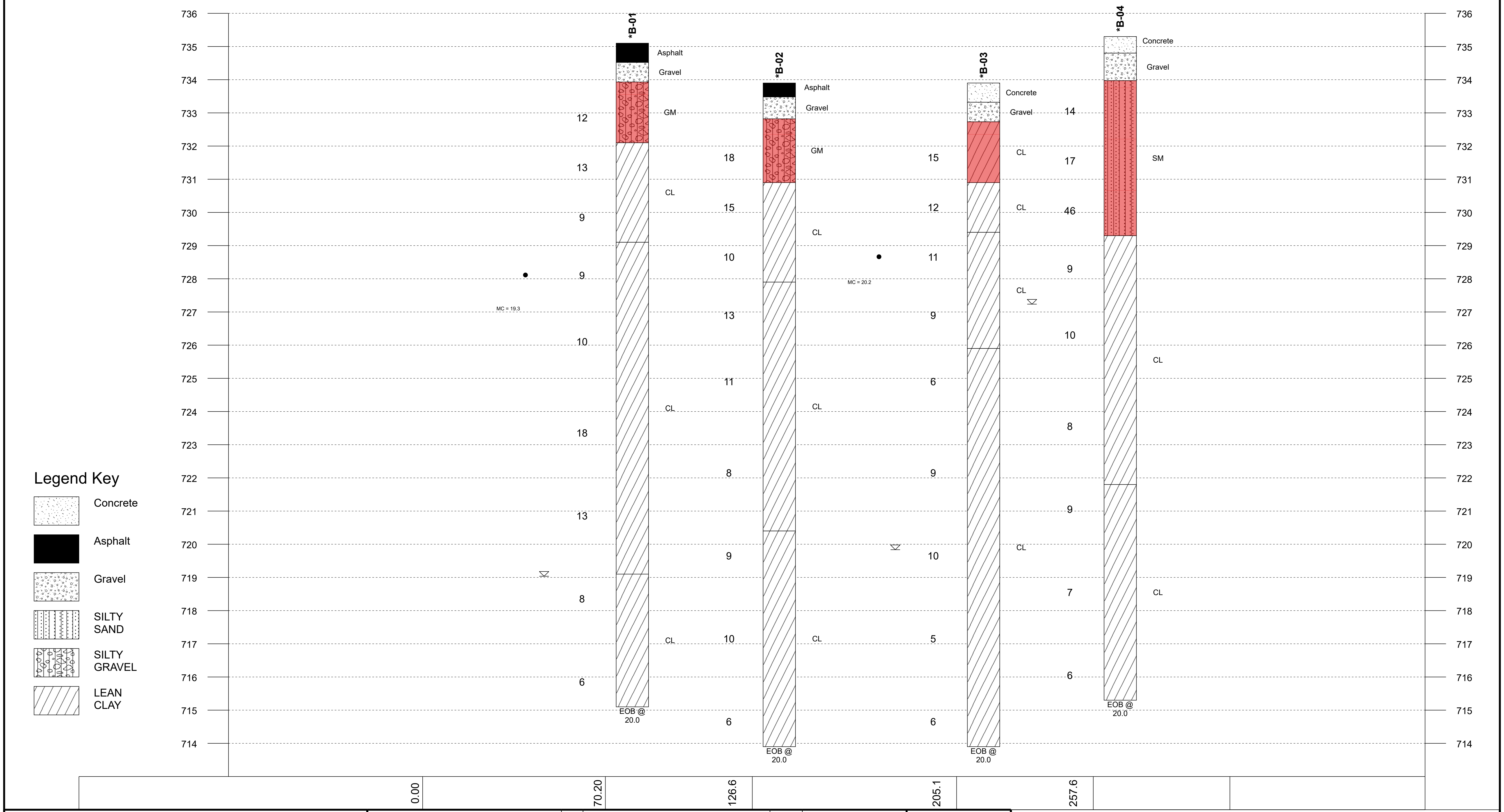
ENGINEER
MAM4

SCALE
1" = 80'

PROJECT NO.
59:4248

SHEET

DATE
11/12/2024



Notes:

1- EOB: END OF BORING AR: AUGER REFUSAL SR: SAMPLER REFUSAL.
2- THE NUMBER BELOW THE STRIPS IS THE DISTANCE ALONG THE BASELINE.
3- SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL INFORMATION.
4- STANDARD PENETRATION TEST RESISTANCE (LEFT OF BORING) IN BLOWS PER FOOT (ASTM D1586).

Plastic Limit Water Content Liquid Limit
X———●———△
[FINES CONTENT %]
BOTTOM OF CASING
LOSS OF CIRCULATION
○ CALIBRATED PENETROMETER

▽	WL (First Encountered)	🟥	Fill
▼	WL (Completion)	🟪	Possible Fill
▽	WL (Estimated Seasonal High Water)	▨	Probable Fill
▽	WL (Stabilized)	🟩	Rock

ECS

GENERALIZED SUBSURFACE SOIL PROFILE

Section line A-A'
Proposed Canopy Addition
SCS Engineers
1419 Holland Road, Appleton, Wisconsin, 54911

Project No: 59:4248 Date: 11/20/2024

Soil Map—Outagamie County, Wisconsin

Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

SOIL SURVEY MAP
Proposed Canopy Addition

1419 Holland Road, Appleton, Wisconsin

SCS Engineers

ENGINEER
YPineda

SCALE
1" = 1mi

PROJECT NO.
59:4248

SHEET

DATE
10/31/2024

APPENDIX B – Field Operations

Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
Reference Notes for Boring Logs
Boring Logs

SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT)
ASTM D 1586
Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

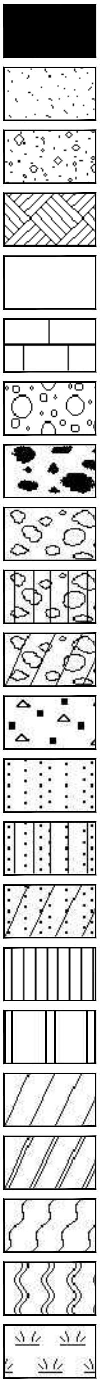
- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 18-24 inches (in 3 or 4 Increments of 6 inches each)

- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet. An approximate 1.5 inch diameter soil sample is recovered.

Drilling Methods May Vary— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]



	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
GW	**WELL-GRADED GRAVEL** **gravel-sand mixtures, little or no fines**
GP	**POORLY-GRADED GRAVEL** **gravel-sand mixtures, little or no fines**
GM	**SILTY GRAVEL** **gravel-sand-silt mixtures**
GC	**CLAYEY GRAVEL** **gravel-sand-clay mixtures**
SW	**WELL-GRADED SAND** **gravelly sand, little or no fines**
SP	**POORLY-GRADED SAND** **gravelly sand, little or no fines**
SM	**SILTY SAND** **sand-silt mixtures**
SC	**CLAYEY SAND** **sand-clay mixtures**
ML	**SILT** **non-plastic to medium plasticity**
MH	**ELASTIC SILT** **high plasticity**
CL	**LEAN CLAY** **low to medium plasticity**
CH	**FAT CLAY** **high plasticity**
OL	**ORGANIC SILT or CLAY** **non-plastic to low plasticity**
OH	**ORGANIC SILT or CLAY** **high plasticity**
PT	**PEAT** **highly organic soils**

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay (“Fines”)		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, QP[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: “Silty”)*	25 - 45	30 - 45

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS[6]

▽	WL (First Encountered)
▼	WL (Completion)
▽	WL (Seasonal High Water)
▽	WL (Stabilized)

FILL AND ROCK

🟥	🟪	⬜	🟩
FILL	POSSIBLE FILL	PROBABLE FILL	ROCK

---

[1] Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2] To be consistent with general practice, “POORLY GRADED” has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3] Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4] Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5] Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). “N-value” is another term for “blow count” and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

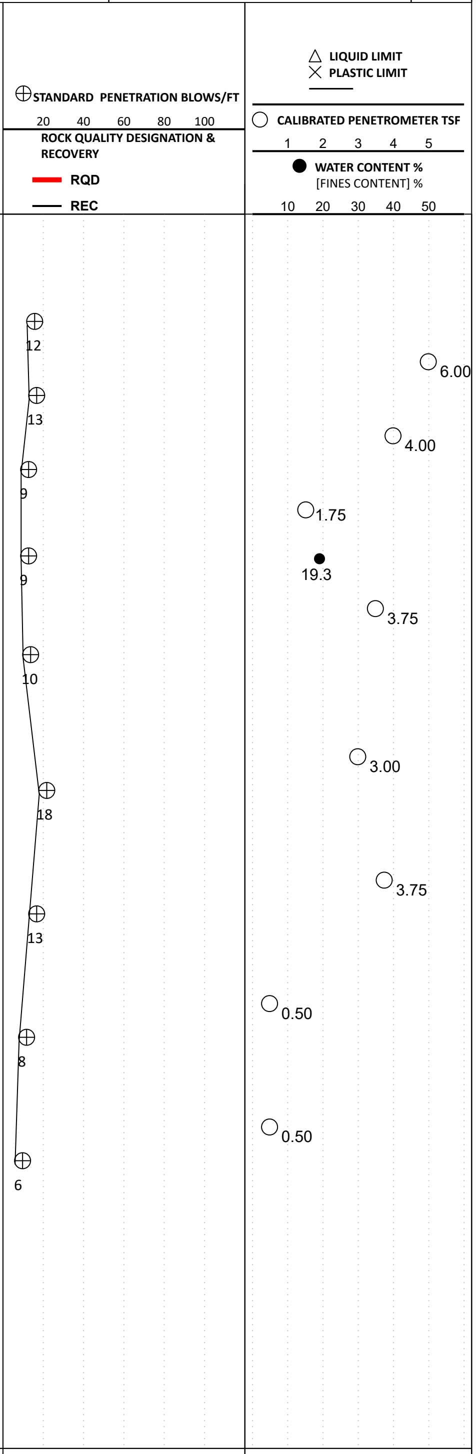
[6] The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7] Minor deviation from ASTM D 2488-17 Note 14.

[8] Percentages are estimated to the nearest 5% per ASTM D 2488-17.

CLIENT: **SCS Engineers**	PROJECT NO.: **59:4248**	BORING NO.: **B-01**	SHEET: **1 of 1**
PROJECT NAME: **Proposed Canopy Addition**	DRILLER/CONTRACTOR: **Ben Broennimann-ECS59**		
SITE LOCATION: **1419 Holland Road, Appleton, Wisconsin, 54911**		LOSS OF CIRCULATION	
LATITUDE: **44.289581**	LONGITUDE: **-88.334373**	STATION:	SURFACE ELEVATION: **735.1**
		BOTTOM OF CASING	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Asphalt Thickness[7"]			
					Gravel Thickness[7"]			
	S-1	SS	18	7	(GM) FILL, SILTY GRAVEL, laminations of clay, brown, moist, medium dense			10-6-6 (12)
	S-2	SS	18	10	(CL) Glacial till, LEAN CLAY WITH SAND, trace gravel, brown, moist, hard		731	3-6-7 (13)
5	S-3	SS	18	6				3-5-4 (9)
	S-4	SS	24	9	(CL) Lacustrine, LEAN CLAY, trace gravel, reddish brown, moist, stiff to very stiff			4-4-5-7 (9)
	S-5	SS	24	24			726	4-4-6-7 (10)
10								
	S-6	SS	18	18				6-8-10 (18)
	S-7	SS	18	18			721	4-5-8 (13)
15								
	S-8	SS	18	14	(CL) Lacustrine, LEAN CLAY, reddish brown, wet, firm	▽		3-3-5 (8)
	S-9	SS	18	18			716	2-2-4 (6)
20					**END OF BORING AT 20.0 FT**			
							711	
25								



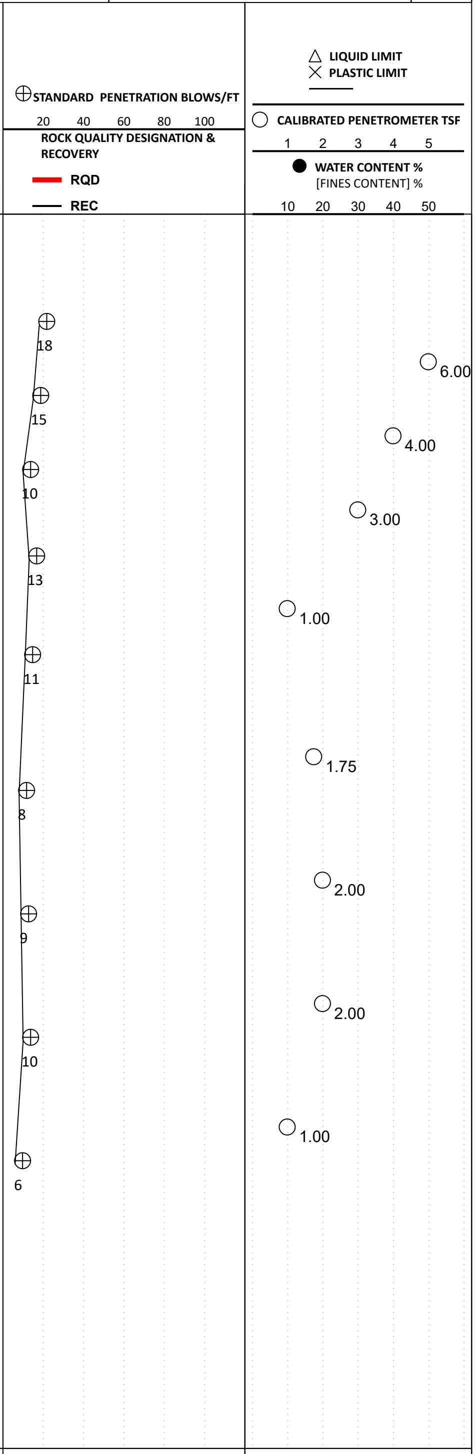
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**16.00**	BORING STARTED: **Nov 07 2024**	CAVE IN DEPTH:
▼ WL (Completion)	**None**	BORING COMPLETED: **Nov 07 2024**	HAMMER TYPE: **Auto**
▽ WL (Seasonal High Water)		EQUIPMENT: **Diedrich D-70** LOGGED BY: **YP**	DRILLING METHOD: **3 1/4" SSA 0' to 18.5'**
▽ WL (Stabilized)			

GEOTECHNICAL BOREHOLE LOG

CLIENT: **SCS Engineers**	PROJECT NO.: **59:4248**	BORING NO.: **B-02**	SHEET: **1 of 1**
PROJECT NAME: **Proposed Canopy Addition**	DRILLER/CONTRACTOR: **Ben Broennimann-ECS59**		
SITE LOCATION: **1419 Holland Road, Appleton, Wisconsin, 54911**		LOSS OF CIRCULATION	100%
LATITUDE: **44.289410**	LONGITUDE: **-88.334600**	STATION:	SURFACE ELEVATION: **733.9**
		BOTTOM OF CASING	

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Asphalt Thickness[5"]			
					Gravel Thickness[8"]			
	S-1	SS	18	9	(GM) FILL, SILTY GRAVEL, laminations of clay, brown, moist, medium dense			14-11-7 (18)
	S-2	SS	18	8	(CL) Glacial till, LEAN CLAY WITH SAND, trace gravel, reddish brown, moist, hard			5-7-8 (15)
5	S-3	SS	18	8			729	4-3-7 (10)
	S-4	SS	24	20	(CL) Lacustrine, LEAN CLAY, trace gravel, reddish brown, moist, very stiff to stiff			4-5-8-10 (13)
	S-5	SS	24	19				6-5-6-5 (11)
10							724	
	S-6	SS	18	18				3-3-5 (8)
	S-7	SS	18	18	(CL) Lacustrine, LEAN CLAY, reddish brown, wet, very stiff to stiff			3-4-5 (9)
15							719	
	S-8	SS	18	11				3-5-5 (10)
	S-9	SS	18	18				2-2-4 (6)
20					**END OF BORING AT 20.0 FT**		714	
25								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**None**	BORING STARTED:	**Nov 07 2024**	CAVE IN DEPTH:	
▼ WL (Completion)	**None**	BORING COMPLETED:	**Nov 07 2024**	HAMMER TYPE:	**Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Diedrich D-70**	LOGGED BY: **YP**	DRILLING METHOD:	**3 1/4" SSA 0' to 18.5'**
▽ WL (Stabilized)					

GEOTECHNICAL BOREHOLE LOG

CLIENT:
SCS Engineers

PROJECT NO.:
59:4248

BORING NO.:
B-03

SHEET:
1 of 1

PROJECT NAME:
Proposed Canopy Addition

DRILLER/CONTRACTOR:
Ben Broennimann-ECS59

SITE LOCATION:
1419 Holland Road, Appleton, Wisconsin, 54911

LOSS OF CIRCULATION

BOTTOM OF CASING

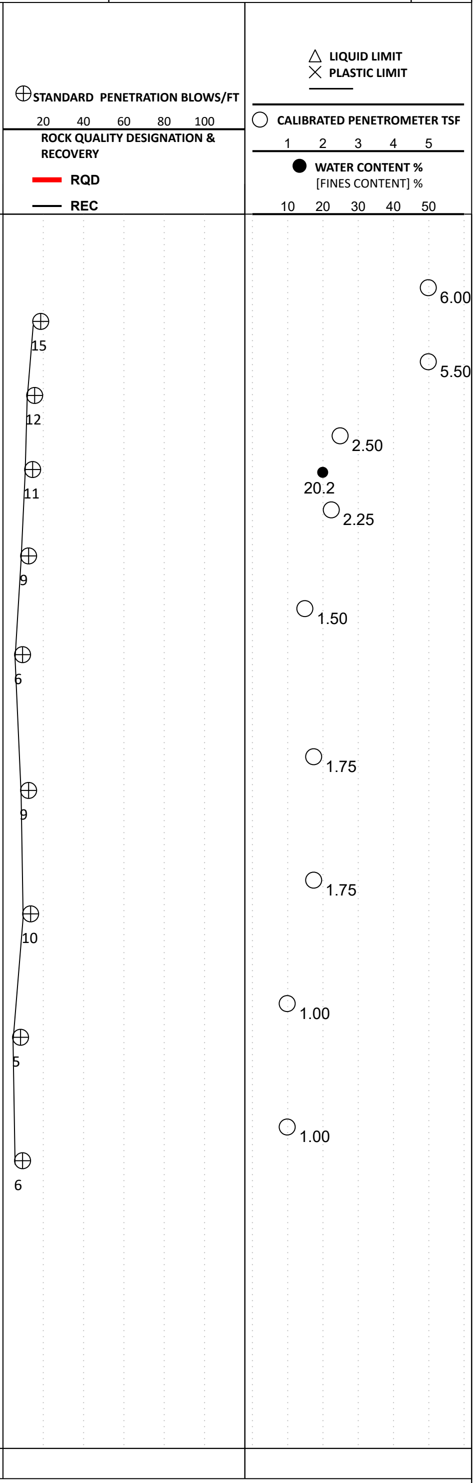
LATITUDE:
44.289410

LONGITUDE:
-88.334900

STATION:

SURFACE ELEVATION:
733.9

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Concrete Thickness[7"]			
					Gravel Thickness[7"]			
	S-1	SS	18	7	(CL) FILL, LEAN CLAY WITH SAND, trace gravel, brown, moist, hard			6-6-9 (15)
	S-2	SS	18	9	(CL) Glacial till, LEAN CLAY WITH SAND, trace gravel, reddish brown, moist, hard			4-5-7 (12)
5	S-3	SS	18	10	(CL) Lacustrine, LEAN CLAY, trace gravel, reddish brown, moist, very stiff		729	3-4-7 (11)
	S-4	SS	24	9				3-4-5-7 (9)
	S-5	SS	24	18	(CL) Lacustrine, LEAN CLAY, reddish brown, moist to wet, stiff			3-3-3-4 (6)
10							724	
	S-6	SS	18	18				3-4-5 (9)
	S-7	SS	18	16		▽		6-5-5 (10)
15							719	
	S-8	SS	18	18				2-2-3 (5)
	S-9	SS	18	18				2-3-3 (6)
20					**END OF BORING AT 20.0 FT**		714	
25								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered) **14.00**

▼ WL (Completion) **None**

WL (Seasonal High Water)

WL (Stabilized)

BORING STARTED: **Nov 07 2024**

CAVE IN DEPTH:

BORING COMPLETED: **Nov 07 2024**

HAMMER TYPE: **Auto**

EQUIPMENT: **Diedrich D-70**

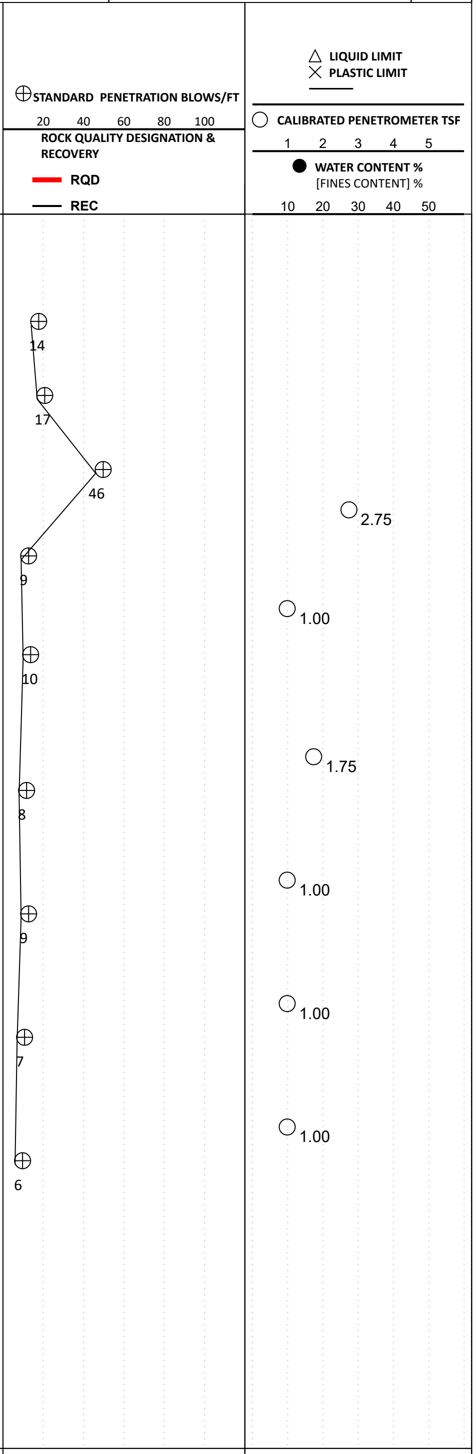
LOGGED BY: **YP**

DRILLING METHOD: **3 1/4" SSA 0' to 18.5'**

GEOTECHNICAL BOREHOLE LOG

CLIENT: **SCS Engineers**	PROJECT NO.: **59:4248**	BORING NO.: **B-04**	SHEET: **1 of 1**	
PROJECT NAME: **Proposed Canopy Addition**	DRILLER/CONTRACTOR: **Ben Broennimann-ECS59**			
SITE LOCATION: **1419 Holland Road, Appleton, Wisconsin, 54911**			LOSS OF CIRCULATION	100%
LATITUDE: **44.289558**	LONGITUDE: **-88.334972**	STATION:	SURFACE ELEVATION: **735.3**	BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					Concrete Thickness[6"]			
					Gravel Thickness[10"]			
	S-1	SS	18	9	(SM) FILL, SILTY SAND, trace gravel, reddish brown to dark brown, moist, medium dense to dense			5-6-8 (14)
	S-2	SS	18	10			731	6-7-10 (17)
5	S-3	SS	18	15				8-21-25 (46)
	S-4	SS	24	13	(CL) Glacial till, LEAN CLAY WITH SAND, trace gravel, brown, moist to wet, very stiff to stiff	▽		8-6-3-4 (9)
	S-5	SS	24	12			726	1-2-8-10 (10)
10								
	S-6	SS	18	18				3-3-5 (8)
	S-7	SS	18	13	(CL) Lacustrine, LEAN CLAY, reddish brown, moist, stiff		721	3-4-5 (9)
15								
	S-8	SS	18	15				3-3-4 (7)
	S-9	SS	18	18			716	2-3-3 (6)
20					**END OF BORING AT 20.0 FT**			
25							711	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	**8.00**	BORING STARTED:	**Nov 07 2024**	CAVE IN DEPTH:
▼ WL (Completion)	**None**	BORING COMPLETED:	**Nov 07 2024**	HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)		EQUIPMENT: **Diedrich D-70**	LOGGED BY: **YP**	DRILLING METHOD: **3 1/4" SSA 0' to 18.5'**
▽ WL (Stabilized)				

GEOTECHNICAL BOREHOLE LOG

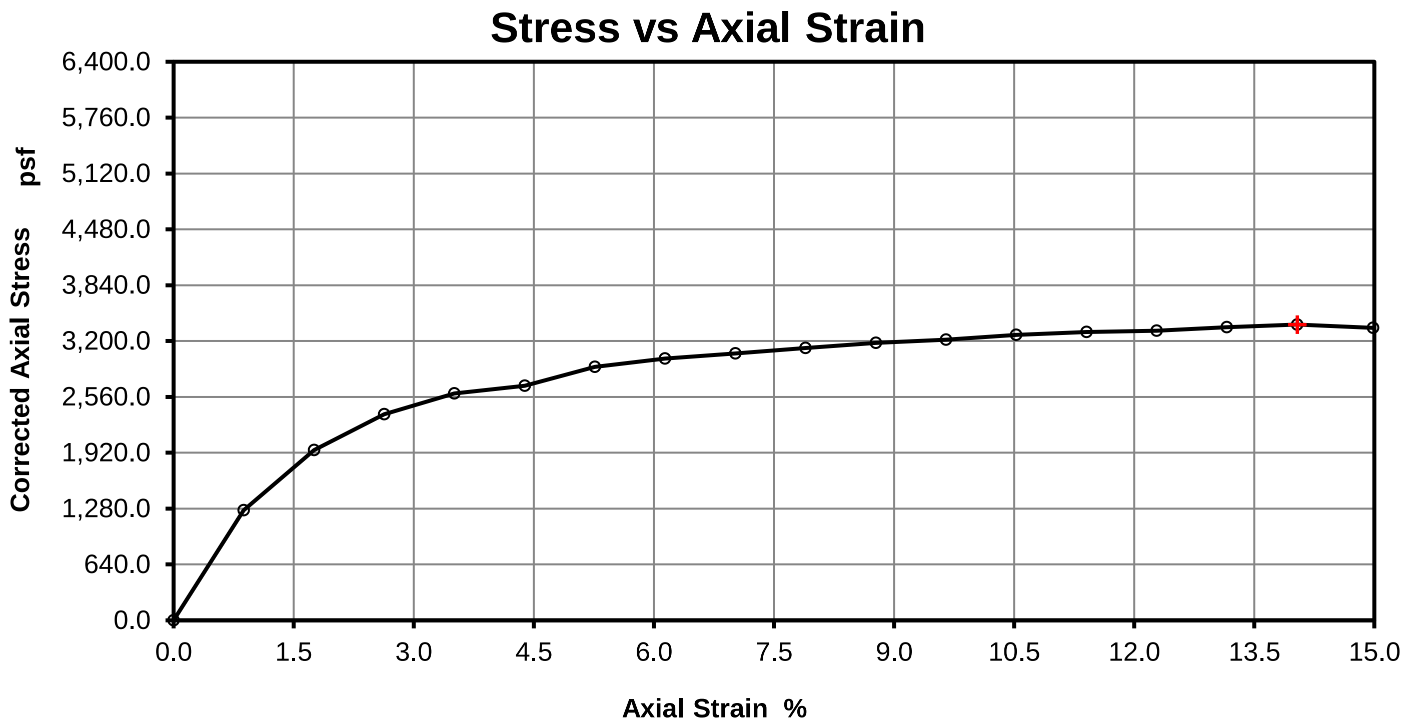
APPENDIX C – Laboratory Testing

Unconfined Compressive Strength Test

Unconfined Compressive Strength Test Report

Initial Conditions

Height		in	2.85
Diameter		in	1.31
Bulk Density		pcf	141.43
Water Content		%	19.2
Dry Density		pcf	118.6
Voids Ratio			0.420
(Specific gravity assumed 2.70)			
Degree of Saturation		%	124
Rate of Strain applied		%/min	0.00
At failure	Axial Strain	%	14.0
	Maximum Stress	psf	3389.0
	Shear Strength	psf	1694.5



Project: Proposed Canopy Addition
Client: SCS Engineers
Sample Source: B-01
Sample Description:

Project No.: 59:4248
Depth (ft): 6 - 8
Sample No.: S-4
Date Reported: 11/15/2024

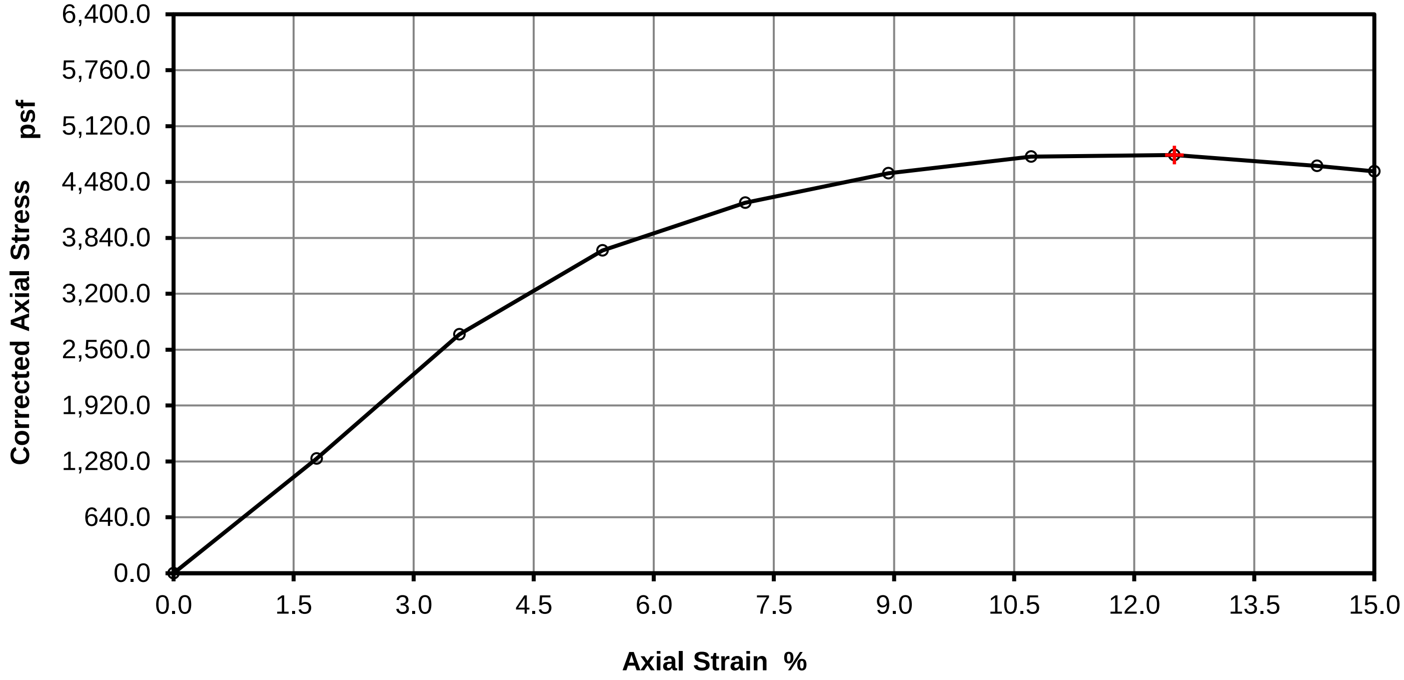
Office / Lab	Address	Office Number / Fax
ECS Midwest LLC - Green Bay	1280 Parkview Road Green Bay, WI 54304	(920)347-9040 (920)347-9044

Tested by	Checked by	Approved by	Date Received	Remarks
EWright	nflory	nflory	11/7/2024	

Unconfined Compressive Strength Test Report

Initial Conditions

Height		in	2.80
Diameter		in	1.35
Bulk Density		pcf	131.52
Water Content		%	20.2
Dry Density		pcf	109.4
Voids Ratio			0.540
(Specific gravity assumed 2.70)			
Degree of Saturation		%	101
Rate of Strain applied		%/min	0.00
At failure	Axial Strain	%	12.5
	Maximum Stress	psf	4788.6
	Shear Strength	psf	2394.3



Stress vs Axial Strain

Project: Proposed Canopy Addition
Client: SCS Engineers
Sample Source: B-03
Sample Description:

Project No.: 59:4248
Depth (ft): 4.5 - 6
Sample No.: S-3
Date Reported: 11/15/2024

Office / Lab	Address	Office Number / Fax
ECS Midwest LLC - Green Bay	1280 Parkview Road Green Bay, WI 54304	(920)347-9040 (920)347-9044

Tested by	Checked by	Approved by	Date Received	Remarks
EWright	nflory	nflory	11/7/2024	

APPENDIX D – Supplemental Report Documents

Important Information about This Geotechnical-Engineering Report

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 <u>not</u> 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 <u>Not</u> 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 <u>not</u> 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 <u>not</u> building-envelope or mold specialists.***

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BUSINESS
ASSOCIATION

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