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July 2, 2025

Trio Engineering
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Attn: Mr. Josh Pudelko
President

Re: Preliminary Geotechnical Exploration and Site Feasibility Evaluation
Proposed Sam Cobb Property Subdivision
SWC of Westwinds Ct. and N. Lake Dr.
Oconomowoc, Wisconsin
PSI Project No. 00523532

Dear Mr. Pudelko:

The preliminary geotechnical exploration and site feasibility evaluation for the referenced project has been completed. An electronic copy of the report is being provided via email. Paper copies can be issued upon request. After you have had the opportunity of reading the report, please call at any time with any questions or comments you may have. Professional Service Industries, Inc. (PSI), an Intertek Company, appreciates the opportunity to be of service on this project, and looks forward to continuing as your geotechnical consultant during the design and construction phases, as well as your upcoming projects.

Sincerely,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Christopher D. Volkert
Project Geologist

7/2/25
James M. Becco, P.E.
Principal Consultant



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INTRODUCTION

General

This report presents the results of the preliminary geotechnical exploration and site feasibility evaluation for the proposed Sam Cobb Property Subdivision project located in the Town of Oconomowoc, Wisconsin. The work was performed for Trio Engineering, at the request of Mr. Josh Pudelko.

Purpose

The purpose of this preliminary study was to evaluate the subsurface conditions at specific boring locations on the site, and to provide subsurface information for general site feasibility and preliminary design planning. A comprehensive foundation evaluation and recommendations for specific structures were beyond the scope of this preliminary site evaluation but are recommended as part of design planning.

Scope

The scope of services included a site reconnaissance, the subsurface exploration, an evaluation of soil characteristics by field and laboratory testing, and an evaluation of the data obtained. The scope of the field work, including the number, location, and depth of the borings was determined by PSI in consultation with the client. PSI has not performed an evaluation of any environmental related concerns or conditions. In addition, a slope stability study has not been performed.

Authorization

The description of services and authorization to perform this geotechnical exploration and site feasibility evaluation were in the form of signed PSI Proposal No. 0052-453630, dated June 17, 2025. This report has been prepared on behalf of, and exclusively for the use of Trio Engineering. The information contained in this report may not be relied upon by any other parties without the express written consent of PSI, and acceptance by such parties of PSI's General Conditions.

SITE AND PROJECT DESCRIPTION

Site Features

The project site is located at the southwest corner of Westwinds Court and North Lake Road in Oconomowoc, Wisconsin. At the time of exploration, the majority of the site was covered in trees and vegetation, and contained an access drive through the site. Aerial photos of various years between 1941 to 2024 reviewed on the Waukesha County GIS Map indicate that the project site appeared to be an active fill site in the 1941 to 1990 photos. In the subsequent photos through the 2024 photo, the project site has remained vacant with the access drive being maintained. According to the WI DNR Solid Waste – Landfills and Historic Waste Site

Points map on ArcGIS, the project site is listed as the “Harold Bliss Landfill” and is listed as inactive. The client’s environmental consultant has indicated that “trash is sporadic and limited” and that “there is fill material on the central and northern portions of the property (bricks/asphalt, etc)”. They have also indicated that samples of the fill contained non-hazardous levels of metals and Polynuclear Aromatic Hydrocarbons (PAHs). Volatile Organic Compounds (VOCs) were not detected in analyzed soil samples. In addition, testing for Methane has been performed twice across the site, and there were no detections. The subject site is depicted on the enclosed Boring Location Plan (Figure 1).

The topography of the project site is rolling and generally sloping down from the northwest corner to the southeast portion of the property. Based on a contour map of the project area provided by the client, surface elevations across the site vary by about 16 feet (EL. 871 to EL. 855).

Project Description

Based on the information provided by the client, it is understood that the proposed project includes the subdivision of the project site into three (3) residential lots, each containing a house with an attached garage, walkout basement, and septic tank. As an exception, the Lot 2 house will not have a garage. The planned basement floor elevation for each house is EL. 863, and the planned garage floor elevations are EL. 871.3. Planned finished first floor elevations have not been provided. Based on the grading plan provided by the client, fills of about 1 to 10 feet will be necessary to bring the site to grade around the proposed houses. It is anticipated that underground utilities will be installed using open cut trenching throughout the development.

No other details were provided. Structural loads were not provided for the proposed buildings but are estimated to be light to moderate in magnitude. For this report, it is estimated that maximum column and wall loads will not exceed 50 kips and 5 kips per lineal foot, respectively. When structural loads are determined, PSI must be informed to determine if revisions to this report are necessary.

This preliminary exploration has been commissioned to evaluate the subsurface conditions at widely spaced borings across areas of the subject site, and to provide subsurface information for general site feasibility and preliminary design planning for the proposed development. The number and spacing of the borings requested is not sufficient to serve as a conventional foundation evaluation for the proposed buildings, and for associated pavements and utilities. Therefore, additional borings are necessary and recommended to further evaluate more specific soil conditions and provide subsequent recommendations. In addition, when more specific finished floor, yard, utility invert, and other elevations are determined; and when additional design details of the planned development become available, PSI must be provided an opportunity to review them in order to determine if a redirection of the evaluation and recommendations contained herein is warranted; and to assist with planning future exploration at the site.

EXPLORATION AND LABORATORY PROCEDURES

Scope Summary

The field and laboratory data utilized in the evaluation of the subsurface materials was obtained by drilling exploratory test borings, securing soil samples by the split-spoon sampling method, and subjecting the samples to standard laboratory testing.

Field Exploration

Three (3) soil borings were planned for this project. B-1 through B-3 were drilled within the general development area of the proposed single-family homes to a depth of 20 feet below the existing grade. The soil borings were located in the field by PSI utilizing a handheld consumer grade GPS device. The locations are estimated to be accurate to within several feet. The approximate locations of the borings performed are shown on the Boring Location Plan (Figure 1), which is provided in the Appendix of this report. The surface elevations shown on the logs were estimated by interpolation of a 1-foot contour map of the property, provided by the client. The elevations are estimated to be accurate to within about 1 foot.

The soil test borings were performed with an all-terrain vehicle (ATV) mounted rotary drilling rig utilizing continuous flight hollow stem augers to advance the holes. Representative samples were obtained by the Standard Penetration Test (SPT) method using split-spoon sampling procedures in general accordance with ASTM D-1586 procedures. Samples were collected at 2.5-foot intervals to 10 feet, and then at 5-foot intervals thereafter to the end of the borings. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty (30) inches, required to advance the split-spoon sampler one (1) foot into the soil. The sampler is lowered to the bottom of the drill hole and the number of blows recorded for each of the three (3) successive increments of six (6) inches penetration. The “N” value is obtained by adding the second and third incremental numbers. The SPT provides a means of estimating the relative density of granular soils and comparative consistency of cohesive soils, thereby providing a method of evaluating the relative strength and compressibility characteristics of the subsoils.

The SPT soil samples were transferred into clean glass jars immediately after retrieval and returned to the laboratory upon completion of the field operations. Samples will be discarded unless other instructions are received. The soil samples were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488-75). A description of the subsurface conditions encountered at each boring location is shown on the enclosed Soil Boring Logs. After completion of the borings, the auger holes were backfilled to the ground surface with bentonite.

A copy of the Soil Boring Logs and Boring Location Plan (Figure 1) are enclosed in the Appendix. The soil stratification shown on the logs represents the approximate soil conditions in the actual boring locations at the time of the exploration. The terms and symbols used on the logs are described in the General Notes found in the Appendix.

Laboratory Physical Testing

Soil samples obtained from the exploration were visually classified in the laboratory, and subjected to testing, which included moisture content determinations.

Selected cohesive soil samples were tested in unconfined compression with a controlled strain loading rate and/or with a calibrated hand penetrometer to aid in evaluating the soil strength characteristics. The values of strength tests performed on soil samples obtained by the Standard Penetration Test Method (SPT) are considered approximate, recognizing that the SPT method provides a representative but somewhat disturbed soil sample.

The laboratory testing was performed in general accordance with the respective ASTM methods, as applicable, and the results are shown on the boring logs in the Appendix.

DESCRIPTION OF SUBSURFACE CONDITIONS

General

A description of the subsurface conditions encountered at the test boring locations is shown on the Soil Boring Logs. The lines of demarcation shown on the logs represent an approximate boundary between the various soil classifications. It must be recognized that the soil descriptions are considered representative estimates for the specific test hole location, but those variations may occur between and beyond the sampling intervals and boring locations. Soil depths, topsoil, and layer thicknesses, and demarcation lines utilized for preconstruction planning should not be expected to yield exact and final quantities. A summary of the major soil profile components is described in the following paragraphs.

Soil Conditions

The surface materials at these borings consisted of about 7 to 10 inches of topsoil fill, generally classified as brown silty sand or sandy silt. Below the topsoil fill were fills soils generally comprised of sand with gravel, silty sand with gravel, and sandy clay with gravel to depths of about 8 to 12 feet (EL. 853.5 to EL. 847). Underlying the fill were natural soils generally consisting of brown silty sand with gravel and sandy silt with clay to the termination depths. The cohesive fill soils were very stiff in consistency with unconfined compressive strengths ranging from 2.8 to 4.0 tons per square foot (tsf). The granular fill soils were medium dense to extremely dense with N-values ranging from 10 blows per foot (bpf) to 50 blows per 5 inches of sampler penetration. The natural granular soils were very loose to medium dense with N-values ranging from 2 to 17 bpf.

The fill materials were classified as such based on their varied visual characteristics and composition. However, it must be recognized that in the absence of foreign substances and/or debris within the soil samples obtained, it is often difficult to distinguish between natural soils and clean soil fill.

The foregoing discussion of soil conditions on this site represents a generalized soil profile as determined at the test boring locations. A more detailed description and supporting data for each test location can be found on the individual Soil Boring Logs.

Groundwater Observations

Groundwater observations were made during the drilling operations and in the open boreholes upon completion of drilling and removal of the augers. Groundwater was encountered within all borings during auger advancement at depths of about 8 to 12 feet (EL. 853.5 to EL. 847.0) below the existing grade. Upon completion of drilling and removal of the augers, groundwater was observed in boring B-3 at a depth of about 9 feet (EL. 850.0) below existing grade. No groundwater was observed within the remaining borings upon completion of drilling and removal of the augers.

The groundwater observations reported herein are considered approximate. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics. Longer-term monitoring would be required to further evaluate groundwater levels on this site.

EVALUATION AND RECOMMENDATIONS

General Development Considerations

In view of the subsurface conditions encountered in the test borings, together with the structural loading criteria and development grades anticipated, conventional spread footings, along with conventional slab-on-grade construction, can be used for support of the proposed structures. However, fill soils with somewhat variable support characteristics were present to depths varying from about 8 to 12 feet (EL. 853.5 to EL. 847.0) below existing grade. Fill soils are not recommended for foundation support due to potential excessive total and differential settlements. The proposed structures can be supported by means of conventional spread footings extended through the existing fill, to bear on suitable natural soils, or upon newly placed compacted structural fill (or lean concrete mix) used to replace the existing materials. About 5.5 to 12 feet of overexcavation is estimated to be necessary below basement footings (much deeper undercuts will be necessary for typical frost depth excavations in higher portions of the site, such as for garage footings). However, some variation should be expected.

Undercut and other deeper excavations will encroach upon or extend below the groundwater depths encountered in the borings. As such, substantial difficulty with groundwater, and with excavation subgrade and sidewall stability may be experienced. An adequate dewatering effort will be necessary. Additionally, the use of a crushed stone working mat or “mud” mat may be required to establish a stable bearing subgrade for the placement of footings or new fill.

The existing fill and natural soils can generally be utilized for support of the floor slabs after proper subgrade preparation. However, some over-excavation of unsuitable soils may be

necessary. In addition, an increased risk of settlement and related cracking, subsidence, or other distress must be accepted, especially in areas where there new surcharge loads from fill placed to raise grades. A discussion of the foundation design parameters, as well as the support conditions for the floor slab and pavement areas, is included in the following sections.

Site Preparation

The presence of organic topsoil and vegetation in the subgrade can adversely affect the serviceability of structural fills, foundations, floor slabs, pavements, and other structures placed upon them. Approximately 7 to 10 inches of topsoil fill were present on the surface of the site at the boring locations. However, some variation should be anticipated. All topsoil, vegetation, trees, roots and other organic matter/soils must be stripped from the areas of footings, floor slabs, pavements, sidewalks, and other structures.

After stripping the topsoil and vegetation, and cutting any high areas of the site to the planned finished grade, and prior to the placement of new fill which will be placed to raise grades, the subgrade must be thoroughly proofrolled to detect unstable, yielding soils. This should consist of overlapping passes in a perpendicular grid pattern, with a fully loaded tandem-axle dump truck, or other equipment of similar size and weight suitable for the surface conditions. Proofrolling should be performed in consultation with the geotechnical engineer at the time of construction. Some difficulty with subgrade preparation may be experienced, especially in wet or cold weather, or during thawing conditions. Additionally, instability can become more severe and widespread in silty and clayey materials, which are considered to be moderately to highly moisture sensitive. It is generally recommended that earthwork be carried out during relatively warm, dry weather. Any soft, wet, or otherwise unstable zones which cannot be improved by scarification and aeration, must be removed and replaced with compacted structural fill, such as clean crushed stone, possibly in conjunction with the use of a geotextile fabric. Construction delays and difficulty with subgrade stabilization may be experienced if the soils are wet, or are otherwise at high moisture contents at the time of construction.

Every effort must be made to keep excavations dry. If construction proceeds during wet weather, some additional overexcavation may be necessary. If weather permits, the soil could be dried and recompacted. A crushed stone working mat, possibly in conjunction with a geotextile fabric may also be feasible to help stabilize subgrades. Site grading runoff should be directed to catch basins, so that the potential for the softening of the foundation and pavement subgrade soils is reduced.

Where site grades are raised in excess of 2 feet, the first lift of new fill must be placed so as to extend a minimum lateral distance of 5 feet beyond the planned top building pad dimension (for fills less than 5 feet in thickness), or for a distance equal to at least 1 foot laterally beyond the top pad dimension for every foot of fill thickness (for fills greater than 5 feet in depth). Subsequent lifts can then be placed on an approximate 1H:1V slope back up to the planned top perimeter dimension of the pad. Similarly, where undercutting of unsuitable soils is performed beneath foundations, floor slabs, or other structural areas, it is recommended that the removal extend laterally beyond the perimeter of the structure at least 1 foot for every foot

of removal below the planned bearing depth. Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the desired densities.

When a firm and stable subgrade is established, low areas may be raised to planned grades with properly compacted structural fill. Any new fill should be a clean granular soil, such as those materials meeting the gradations outlined in Section 209 or 305 of the State of Wisconsin Standard Specification for Highway and Structure Construction. If fine-grained soils, such as those with high silt or clay content are used, they should generally be placed over large open areas, where conditions are more favorable for the proper placement and compaction of such materials. It must be recognized that high silt or clay content materials are extremely difficult to compact when placed at moisture contents beyond a few percent of the optimum moisture content. Fill must be placed in layers of not more than nine (9) inches in thickness, at moisture contents at or near optimum, and be compacted to a minimum density of 95 percent of the maximum dry density as determined by ASTM designation D-698. Where fill thicknesses exceed 15 feet (including new fills used to raise grades), the compaction percentage must be increased to 98 percent. Portions of the onsite soils encountered in the borings may be suitable to raise grades on the site. However, substantial sorting and moisture conditioning may be necessary. Additionally, long drying times may be required for soils obtained from below the groundwater or perched zones. Silt, clay, and wet granular soils are not suitable for use as compacted fill in trenches, or adjacent to foundation stem walls or retaining walls.

Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the desired densities. This is especially true of clayey soils, where scarification and aeration may be required to achieve near - optimum moisture levels prior to compaction. A sheepsfoot roller is generally required for compaction of clayey soils, whereas a vibratory smooth drum roller is preferred for granular material. Small hand-operated compactors should be used in confined areas; granular fills are generally more readily compacted to the required densities in such applications.

It is recommended that well-graded granular soils be utilized as backfill in new utility trenches and alongside below grade walls to reduce the potential for consolidation and settlement of the fill. All fill soils must be placed and compacted under engineering-controlled conditions, to provide suitable support for overlaying structures and roadways. Additional guidance can be provided at the time of construction in the selection process for grade-raising fill and trench backfill.

The selection of fill materials for various applications should be done in consultation with the soils engineer. Similarly, the evaluation of the subgrade and placement and compaction of fill for structural applications should be monitored and tested by a qualified representative of the soils engineer.

Foundation Evaluation

The following is a general overview of the subsurface conditions for the site, as it relates to foundation analysis, and is only for use in preliminary design planning. Additionally, a specific

bearing pressure, including even the lowest from within the range provided, is not intended to be applied to any particular structure without the performance of additional borings beyond those of this study and/or confirmation of suitability from PSI.

The proposed houses may be supported by a conventional spread foundation system bearing on suitable naturally occurring soils or within structural fill, prepared as discussed in a previous section. Where existing fill soils are present, foundations must be extended to bear upon suitable natural soils, or the fill must be removed and replaced with compacted structural fill or lean concrete mix. Fill soils with somewhat variable support characteristics were present to depths varying from about 8 to 12 feet (EL. 853.5 to EL. 847.0) below existing grade. About 5.5 to 12 feet of overexcavation is estimated to be necessary below basement footings, and undercuts of about 14 to 20 feet are estimated to be necessary for typical frost depth excavations in higher portions of the site, such as for garage footings. For preliminary planning, and dependent upon location and bearing elevation, net allowable soil bearing pressures of 1,000 to 3,000 psf may be considered for conventional spread footings bearing upon suitable natural soils, or upon compacted structural fill (or lean concrete mix) extending to suitable natural soils.

The suitability of the existing soils for support of the proposed foundation must be determined by testing by a qualified geotechnical engineer during construction, utilizing static cone penetrometer tests or dynamic cone penetrometer tests for cohesive and granular soils, respectively. Soft, loose, or otherwise unsuitable materials not disclosed by the borings, may be encountered in the foundation excavations at the bearing elevation. If unsuitable existing soil is present, it must be removed throughout a zone extending one foot laterally for each two feet removed below the foundation, on either side of the planned footing. The over-excavated area must be backfilled with structural compacted fill.

In lieu of the use of compacted structural fill, lean concrete mix can be used to replace the unsuitable soils. The foundation excavations should be about 4 inches wider than the proposed footing width and must extend to suitable natural bearing soils. The concrete must be placed immediately after excavation to avoid intrusion of soil into the excavation. The concrete should contain sufficient aggregate and cement to attain a 28-day compressive strength of at least 1000 psi. Some sloughing or caving of the overlying soils may be experienced. Should this occur during concrete placement, the area must be removed and recast. Additionally, should caving become extensive (such as can more typically occur within granular or soft clay soil), it may be necessary to substantially widen excavations to avoid soil intrusion into the concrete. This may result in the use of additional concrete quantities significantly in excess of preconstruction budget estimates.

Wet soils, and groundwater or perched zones are likely to be encountered within some foundation excavations. A substantial loss in strength along with an extremely soft, loose, unstable or otherwise unsuitable subgrade may develop when the confining effect of the overburden is removed. This may require undercutting and the use of a crushed stone working mat or a “mud mat” to achieve a stable bearing grade. Substantial sloughing and caving may also occur, and dewatering may be required.

All perimeter footings and all footings in unheated areas must be placed at a depth of at least 4 feet (or deeper if required by local code or in accordance with customary practice) below the finished grade for frost protection. Due to periodic severity of winters in this area, it is recommended that footings in poorly heated or unheated areas of the building also be placed at least 4 feet below the adjacent exterior grade. Interior footings not subject to frost action may be placed at a shallow depth of at least 18 inches below the floor slab, provided they bear on suitable natural soils or engineered fills. All footings must be protected from the effects of frost if construction is carried out during winter months.

It is recommended that the footings supporting individual columns have a minimum dimension of 24 inches, and continuous footings have a minimum width of 18 inches, even if the maximum recommended allowable bearing pressure is not fully utilized. In order to minimize the effects of any slight differential movement that may occur due to variations in the character of the supporting soils and any variations in seasonal moisture contents, it is recommended that all foundations be suitably reinforced to make them as rigid as needed.

In general, the performance of the foundation system on this site is dependent on the various factors discussed herein. The excavation, preparation, and concreting of foundations should be monitored and tested by a representative of the soils engineer.

Floor Slab and Pavement Subgrades

Prior to constructing the floor slabs or pavements, and prior to the placement of any fill used to raise grades, the exposed subgrade must be prepared utilizing the proofrolling procedures described previously. In areas that exhibit soft, yielding or unstable soil conditions, the following remedial measures are recommended to provide a stable subgrade. It must be recognized that some soils present on this site are highly sensitive to increases in moisture and construction disturbance. It will therefore be necessary to maintain these materials in a relatively dry condition to allow for proper subgrade preparation. It is recommended that the proofrolling operations be monitored by a representative of the geotechnical engineer to ensure that a firm, suitable subgrade is present prior to placement of new fills, or to construction of floor slabs and pavements.

Localized wet, soft or unstable areas can be undercut to such depths determined necessary in the field to reach stable material, and the area backfilled with imported crushed stone, such as the 1¼-inch gradation specified in Section 305 of the WisDOT Standard Specifications, placed and compacted as recommended in the Site Preparation section of this report. If relatively thick zones or areas of extensive yielding are observed, and they cannot be stabilized by normal discing, aeration and recompaction procedures, undercutting and replacement with crushed stone and geotextile fabric (if needed) may also be required in these areas.

The floor slab(s) may be designed utilizing an estimated modulus of subgrade reaction of 125 pci based on the presence of suitable and stable soils, prepared as discussed in this report. However, this is based on common range values obtained from 1 ft. x 1 ft. plate load tests on

specific soil types. Depending on how the slab load is applied, the value may need to be modified for larger areas using the following:

Modulus of Subgrade Reaction $k_s = (\frac{k}{B})$ for cohesive soil

$k_s = k\,(\frac{B+1}{2B})^2$ for cohesionless soil

where: k_s = coefficient of vertical subgrade reaction for loaded area
k = coefficient of vertical subgrade reaction for a 1x1 foot square area
B = width of area loaded, in feet

The final design and detailing should be performed by a qualified structural engineer based on the intended slab use, loading conditions and anticipated subgrade conditions.

A granular mat, which can be designed as a drainage layer, should be provided below the floor slab. This must be a minimum of six (6) inches in thickness and properly compacted**.** In moisture sensitive areas, a vapor retarder may be placed beneath the floor slab or base course, however, it is recommended that the architect be consulted in this regard. The proper use of a vapor retarder may not completely prevent moisture beneath or on top of slabs. If the base course contains sharp particles, a cushion layer of sand approximately 2 inches in thickness may be required to provide protection from puncture.

The floor slabs should be suitably reinforced to make them as rigid as necessary and proper joints provided at the junction of slabs and the foundation system so that a small amount of independent movement can occur without causing damage. Large floor areas must be provided with joints at frequent intervals (maximum spacing of 30 times the slab thickness, per ACI) to compensate for concrete volume changes (shrinkage). Where the slab will be supporting live loads, such as from moving vehicles, joints must be keyed or dowelled to permit proper load transfer. It is recommended that appropriate construction methods and curing procedures be used to minimize shrinkage and curling of the floor slabs.

Below Grade Walls

It is recommended that a drainage course be placed beneath the floor slab and alongside below grade walls, and that a drain tile system be placed alongside the basement foundation to alleviate excessive lateral pressure on the walls. The drainage system should be connected to adequate sumps for drainage and be properly discharged in accordance with all state and local discharge requirements. Drain tile should have a minimum diameter of four (4) inches and should be wrapped with an appropriate filter fabric. Drainage pipes should be surrounded by clean gravel and extend up to the near ground surface in window well areas. At least six (6) inches of clean ¾ inch stone should be utilized for the free draining layer beneath the floor areas.

The below grade walls must be backfilled for a lateral distance of 3 to 4 feet with a well-graded, free draining granular material. This should be placed in lifts not exceeding 12 inches in

thickness and be compacted to at least 95 percent of the Standard Proctor density. Based upon the use of a clean, crushed stone fill (ϕ=30; γ_m =130 pcf), and a drained condition, an equivalent fluid pressure of 65 psf may be used as the horizontal component of earth pressure at rest. However, when a proposed fill material has been selected, a representative sample must be submitted to PSI for testing to verify the above values and associated recommendations. Silt and clay soils, organic soils, and wet granular materials are not suitable for use as backfill alongside basement walls. It must be recognized that the above value is based upon a drained condition and is exclusive of traffic and other surcharge loads near the walls, which must be factored into the design.

Exterior/Unheated Area Slabs

Based on the borings, entry slabs, sidewalks, aprons, and other slabs in some exterior or unheated areas may bear upon silty or clayey soils in most areas. Such materials are highly frost susceptible and poorly drained. Slabs placed directly upon such soils are subject to heaving and subsequent settlement due to freeze/thaw cycles. This can result in cracking, misalignment, and other related effects (especially at joints). It is recommended that consideration be given to limited undercutting of the frost susceptible materials to a depth of 1 to 2 feet below the slab, and replacement with well graded, properly placed and compacted granular soils. A properly designed underdrain system connected to the municipal sewer (if permissible) or directed to on-site stormwater management areas should also be incorporated to reduce the potential effects of freeze/thaw cycles.

Uplift Considerations

The below grade septic tanks may experience the effects of hydrostatic or other uplift forces, especially considering the groundwater levels encountered in the borings and the planned basement floor elevations. Careful design planning and compliance with applicable regulatory codes will be essential.

The uplift force can be resisted by the dead weight of the structure and the weight of the soil above the horizontal projection of the tank. A moist unit weight of 120 pounds per cubic foot (pcf), and a buoyant unit weight of soil of 60 pcf may be used, above and below the groundwater, respectively, when calculating the weight available to resist uplift force, based upon the existing soils and the use of well-graded granular backfill. The soil mass may be estimated by a line extending from the base of the footing to the surface, rotated outward from the footing, 20° from vertical. All soil within the “wedge” shaped geometry may be used to resist uplift. The effects of uplift may also be reduced with the incorporation of a suitably designed anchoring system (which may be necessary dependent upon the depth of the tanks and the groundwater level)

Utility Construction

The on-site soils can generally be used for support of utility lines. However, some undercutting of soft, wet, low strength, or otherwise unsuitable soils, in conjunction with the placement of

crushed stone or other suitable granular backfill will likely be necessary, and may become extensive when encroaching upon or extending below the groundwater or perched zones. Some difficulty with the stability of utility trenches may also be experienced, especially in the presence of water. The use of sloping, shoring, bracing, or trench boxes will likely be required. Utility construction should be performed in accordance with “The Standard Specifications for Sewer and Water Line Construction” for the State of Wisconsin.

It is recommended that well graded granular soils such as those specified in Tables 37 and 39 of the Standard Specification for Sewer and Water Construction be utilized as backfill in utility trenches to reduce the potential for consolidation and settlement of the backfill. All fill soils must be properly placed and compacted under engineering-controlled conditions to provide suitable support for overlaying structures and roadways. Silty and clayey soils, organic soils, and wet materials are not recommended for use as backfill within utility trenches due to the substantial difficulty of obtaining proper compaction in confined areas. Substantial importing of suitable granular fill may be required.

As with all excavation work, all open cut trenches must be properly shored and braced as required by applicable federal and state OSHA codes, and as necessary to protect life and property.

CONSTRUCTION CONSIDERATIONS

Groundwater Control

Groundwater observations were made during the drilling operations and in the open boreholes upon completion of drilling and removal of the augers. Groundwater was encountered within all borings during auger advancement at depths of about 8 to 12 feet (EL. 853.5 to EL. 847.0) below the existing grade. Upon completion of drilling and removal of the augers, groundwater was observed in boring B-3 at a depth of about 9 feet (EL. 850.0) below existing grade. No groundwater was observed within the remaining borings upon completion of drilling and removal of the augers.

On the basis of the observations, some difficulty with groundwater may be experienced. The use of a conventional sump pump placed in the bottom of conventional excavations may be suitable for isolated low volume perched zones. However, for excavations encroaching upon or extending below the groundwater (such as for footing undercuts or deeper utilities); or for larger volume perched zones, prolonged dewatering with a series of sumps and high-capacity pumps (with sufficient lifting capacity) may be necessary to facilitate construction.

Since portions of the anticipated subgrade soils are subject to softening when exposed to free moisture, every effort should be made to keep excavations dry. Site grading should be performed to direct runoff away from the construction area, so that the potential for the softening of the subgrade soils is reduced.

Seasonal variations, site drainage conditions, soil permeability, and other factors can cause groundwater and/or perched zones to be present in the upper soils at varying times of the year.

Excavations and Site Drainage

Sloping, shoring or bracing of excavation sidewalls will be necessary to facilitate construction and to protect life and property. Substantial sloughing and caving may occur within unprotected excavations, especially within loose granular and soft/low strength clay soils. The degree of excavation instability problems is dependent upon the depth and length of time that excavations remain open, excavation bank slopes, water levels and the effectiveness of any dewatering systems. All excavation work must be performed in accordance with OSHA and local building code requirements.

Where excavations encroach upon or extend below the groundwater or perched zones and into granular or soft clay soils, a substantially unstable subgrade may develop when the confining effect of the overburden is removed. Significant sloughing or caving of sidewalls may also occur. Some over-excavation of softened or loosened soils, in conjunction with the use of a crushed stone working mat, may be necessary to establish a stable bearing subgrade. Additionally, significantly widened excavations may result, or be required to maintain or achieve sidewall stability.

All excavations must be performed with caution and utilize methods which will prevent undermining or destabilization of slopes, buildings, utilities, pavements, sidewalks or other structures. The use of a properly designed shoring and bracing, sheet piling, or underpinning system must be utilized as necessary to adequately protect buildings, utilities, pavements, and other structures. This must be performed by an experienced specialty contractor. Additionally, extreme care must be used during the installation of any bracing system, especially those using driven or vibratory methods, in order to avoid damaging existing buildings, utilities, and other structures. Consideration should be given to the performance of video and/or photographic documentation of the condition of nearby buildings, utilities, and other structures prior to installation. In addition, monitoring of such structures must be performed from the time of commencement and extending through completion of the installation activities.

It is mandated that excavations, whether they be for utility trenches, or footing excavations, be constructed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. PSI recommends that these regulations be strictly enforced; otherwise, workers could be in danger and the owner(s) and the contractor(s) could be liable for substantial penalties. The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 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. PSI is providing this information solely as a service to our client. PSI does not assume responsibility for

construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

Since the subgrade soils are generally sensitive to moisture, every effort should be made to provide adequate drainage across the site during construction, and to prevent ponding of runoff on the subgrade. These soils are also subject to erosion caused by runoff, and erosion control measures should be implemented where needed or required by local ordinances.

Seismic Design Considerations

The soils encountered in the borings are estimated to meet the criteria for Site Class D in accordance with 1613.2.5.2 of the International Building Code-2018 (which directs to the simplified design procedure outlined in ASCE 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures).

GENERAL COMMENTS

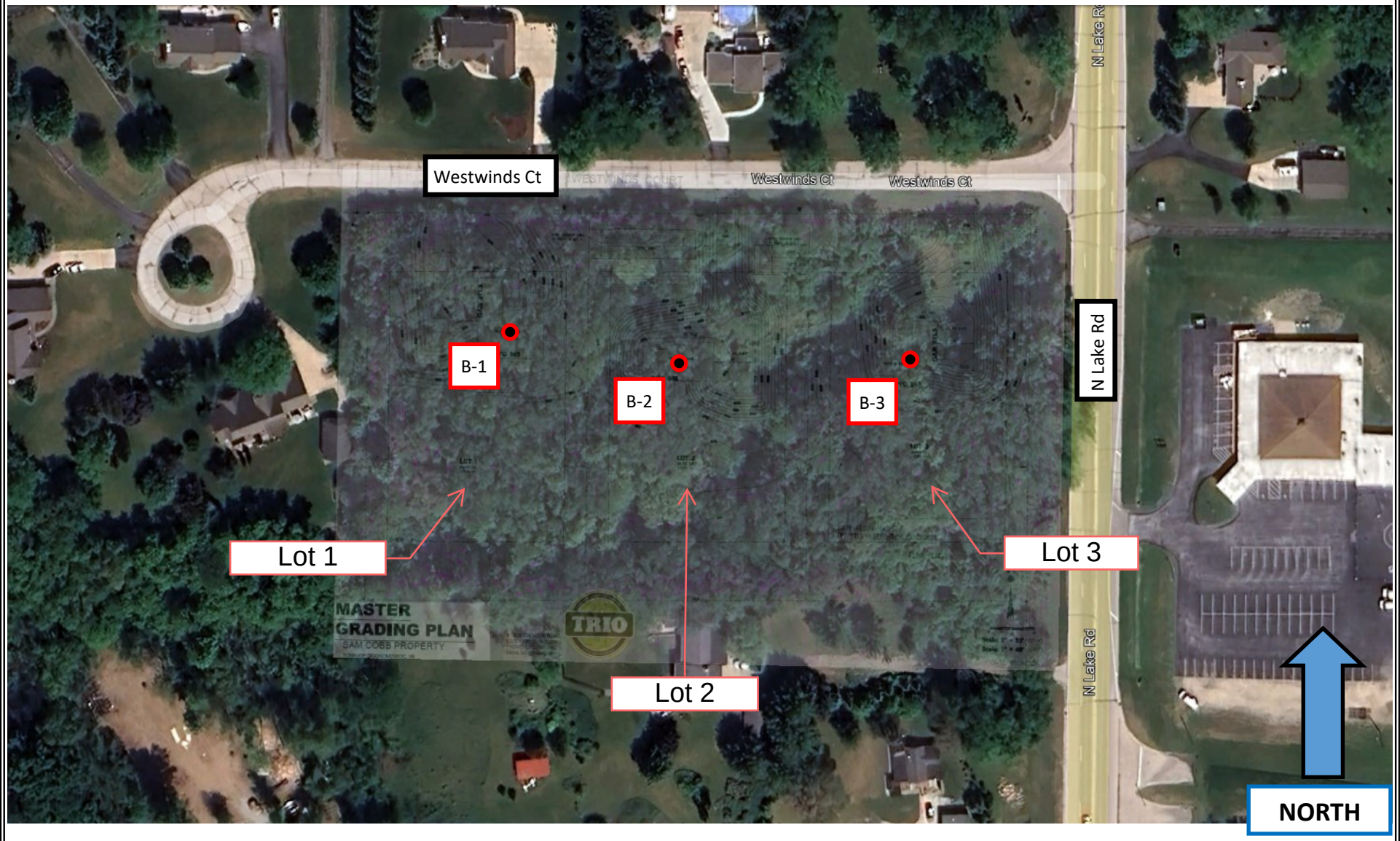
This geotechnical exploration and evaluation have been prepared to aid in the evaluation of the subsurface conditions on this site. The recommendations presented herein are based on the available soil information and the preliminary project information provided. Any changes in the planned project activities should be brought to the attention of the soil engineer to determine if modifications in the recommendations are required. The final design plans and specifications should also be reviewed by the soil engineer to determine that the recommendations presented herein have been interpreted and implemented as intended.

This geotechnical study has been conducted in a manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings, recommendations and opinions contained herein have been promulgated in accordance with generally accepted practice in the fields of foundation engineering, soils mechanics, and engineering geology. No other representations expressed or implied, and no warranty or guarantee is included or intended in this report.

It is recommended that the earthwork and foundation operations be monitored by the soil engineer, to test and evaluate the subgrade stability, bearing capacities, and the selection, placement and compaction of controlled fills. WisDOT Standard Specifications for Highway and Structure Construction can also serve as a guide in implementing the subgrade preparation and other earthwork operations.

Appendix

Figure 1 – Boring Location Plan
Soil Boring Logs
General Notes



intertek psi	Sam Cobb Property Oconomowoc, WI	SCALE: 1 inch = 130 feet (approx.)
		DATE: 06/26/2025
	FIGURE 1: BORING LOCATION PLAN	PROJECT NUMBER: 00523532

BORING B-1

DATE STARTED:	6/23/25	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	6/23/25	**DRILLER:** JF	**LOGGED BY:** DT
COMPLETION DEPTH	20.0 ft	**DRILL RIG:**	Mobile Drill B-57
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	860.0 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	

REMARKS:

Water

While Drilling	8 feet
Upon Completion	Not Observed
Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil Fill, Brown Silty Sand With Gravel, Moist (7"± Thick)	TPSL FILL		18	
		1	2	Fill, Gray Silty Fine to Medium Sand With Gravel, Moist	FILL	13-6-5 N=11		
		2	0	Fill, Brown Sandy Clay With Gravel, Very Moist		7-8-7 N=15		No Recovery
855	5	3	2		FILL	7-7-7 N=14		
		4	1	Brown Silty Fine Sand With Gravel, Wet	SM	2-1-1 N=2		
850	10							
		5	3	Brown Silty Fine to Coarse Sand With Gravel, Wet	SM	5-6-4 N=10	14	
845	15							
		6	3			4-4-5 N=9	18	
840	20			End of Boring at 20 feet Cave-In at 6 feet				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

intertek psi

Professional Service Industries, Inc.
821 Corporate Court, Suite 100
Waukesha, WI 53189
Telephone: (262) 521-2125

PROJECT NO.:	00523532
PROJECT:	Sam Cobb Property
LOCATION:	W380N6197 Hwy 67
	Oconomowoc, WI

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-2

DATE STARTED:	6/23/25	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	6/23/25	**DRILLER:** JF	**LOGGED BY:** DT
COMPLETION DEPTH	20.0 ft	**DRILL RIG:**	Mobile Drill B-57
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	861.5 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	

REMARKS:

Water

While Drilling	8 feet
Upon Completion	Not Observed
Delay	N/A

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Brown Sandy Silt With Gravel, Moist (10"± Thick)	TPSL FILL		25		
860				1	18	Fill, Very Pale Brown Fine to Medium Sand With Gravel		25-27-35 N=62	2	>>	
				2	16		FILL	21-49-50/5"	2		
	5										
855				3	12			17-9-6 N=15	3		
						Yellowish-Brown Silty Fine Sand With Gravel, Wet					
				4	18			7-7-10 N=17	11		
	10										
850							SM				
				5	16			9-8-9 N=17	23		
	15										
845						Yellowish-Brown Silt Medium to Coarse Sand With Gravel					
							SM				
				6	14			10-8-8 N=16	15		
	20					End of Boring at 20 feet					
						Cave-In at 5 feet					

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Telephone: (262) 521-2125

PROJECT NO.: 00523532
PROJECT: Sam Cobb Property
LOCATION: W380N6197 Hwy 67
Oconomowoc, WI

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-3

DATE STARTED:	6/23/25	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	6/23/25	**DRILLER:** JF	**LOGGED BY:** DT
COMPLETION DEPTH	20.0 ft	**DRILL RIG:**	Mobile Drill B-57
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	859.0 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	

REMARKS:

Water

While Drilling	12	feet
Upon Completion	9	feet
Delay	N/A	

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil Fill, Brown Silty Sand With Gravel, Moist (8"± Thick)	TPSL FILL		25		
				1	14	Fill, Brown and Grayish-Brown Sandy Clay With Gravel, Moist	FILL	20-21-16 N=37	14	Q_r = 2.8 tsf	
855				2	16	Fill, Brown Fine to Medium Sand With Gravel and Clay, Moist	FILL	6-8-11 N=19	7		
	5			3	18	Fill, Gray Silty Fine to Medium Sand With Gravel and Clay, Moist	FILL	3-4-6 N=10	20		
850				4	6	Fill, Brown Sandy Clay With Gravel, Moist	FILL	11-8-5 N=13	12		
	10					Gray Sandy Silt With Clay Lenses, Wet					
845				5	6			10-8-6 N=14	23		
	15						ML				
840				6	16			2-4-4 N=8	20		
	20					End of Boring at 20 feet Cave-In at 10 feet					

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The stratification lines represent approximate boundaries. The transition may be gradual.

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

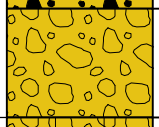
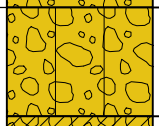
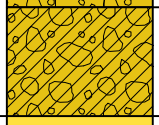
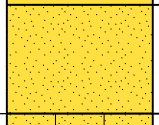
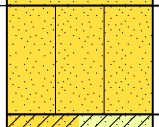
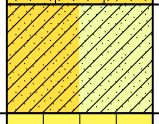
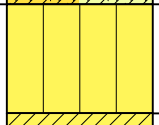
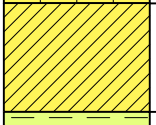
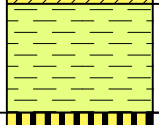
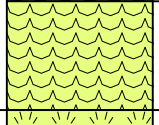
Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
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 (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

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