

TECHNICAL SPECIFICATIONS

FOR

**HOWELL COMMUNITY CENTER
HOWELL PUBLIC SCHOOLS
HOWELL, MICHIGAN**

ISSUED FOR BIDS: JULY 30, 2026

A/E NO. 2600-41F0

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SECTION 003132 - GEOTECHNICAL DATA

PART 1 – GENERAL

1.1 GEOTECHNICAL REPORT

- A. An investigation of the site in the vicinity of the building was made for the limited purpose of establishing design parameters to be used by the Architect. Test pit logs and test boring logs from this report are bound into this Project Manual for Bidder's Information.

1.2 INTERPRETATION OF GEOTECHNICAL INFORMATION

- A. Although bidders are encouraged to study this information, the Owner does not present the information to the Contractor as either a fully accurate or a comprehensive indication of subsurface conditions. Bidders are invited to make additional investigations at their own expense.
- B. No claim for extra cost or extension of time resulting from a reliance by the Contractor on information presented in a geotechnical report, boring log, or soil testing log, shall be allowed, except as provided in the General Conditions.

SECTION CONTINUES WITH GEOTECHNICAL DATA

END OF SECTION



GEOTECHNICAL EVALUATION REPORT

HOWELL HIGH SCHOOL INDOOR ATHLETICS ADDITION
1200 WEST GRAND RIVER AVENUE
HOWELL, MICHIGAN

SME Project Number: 099530.00
November 12, 2025





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November 12, 2025

Mr. Paul Pominville
Howell Public Schools
411 North Highlander Way
Howell, Michigan 48843

Via E-mail: pominvip@HowellSchools.com

RE: Geotechnical Evaluation Report
Howell High School Indoor Athletics Addition
1200 West Grand River Avenue
Howell, Michigan 48843
SME Project No. 099530.00

Dear Mr. Pominville:

We have completed our geotechnical evaluation for the referenced project. This draft report presents the results of our observations and analysis, our geotechnical and pavement recommendations, and a discussion of potential construction considerations based on the information disclosed by the borings.

We appreciate this opportunity to be of service. If you have questions or require additional information, please contact me.

Sincerely,

SME

A handwritten signature in blue ink that reads "Alexandra R. Costanzo".

Alexandra R. Costanzo, PE
Project Manager/Project Engineer

Enclosure: SME Geotechnical Evaluation Report; Dated November 12, 2025

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GENERAL COMMENTS

1. INTRODUCTION

This report presents the results of the geotechnical evaluation performed by SME for the proposed Howell High School Indoor Athletics Addition. This evaluation was conducted in general accordance with the scope of services outlined in SME Proposal No. P00899.25, dated March 13, 2025, and revised Change Order Request No. 1 dated August 1, 2025. Our services for this evaluation were authorized by Paul Pominville with Howell Public Schools.

SME received the following information which was used in the evaluation and preparation of this report:

- A site plan titled prepared by Kingscott that includes a depiction of the proposed site improvements, existing site features, and proposed boring locations.
- A rendering of the proposed indoor athletic field building prepared by Kingscott.
- A topographic survey of the campus including existing site features and elevation contours.

SME completed 38 borings (B101 through B118, IT1 through IT4, P1 through P8, and P119 through P126) at the project site on May 2 through 8, 2025, and on August 11 through 12, 2025. Refer to the boring logs included in Appendix A for the specific depth of each individual boring. The approximate boring locations are depicted on Image No. 1 and on the Boring Location Diagram located in Appendix A (Figure No. 1). Soil descriptions and the field and laboratory test results are presented on the boring logs. Exploration and laboratory testing procedures are presented in Section 4.

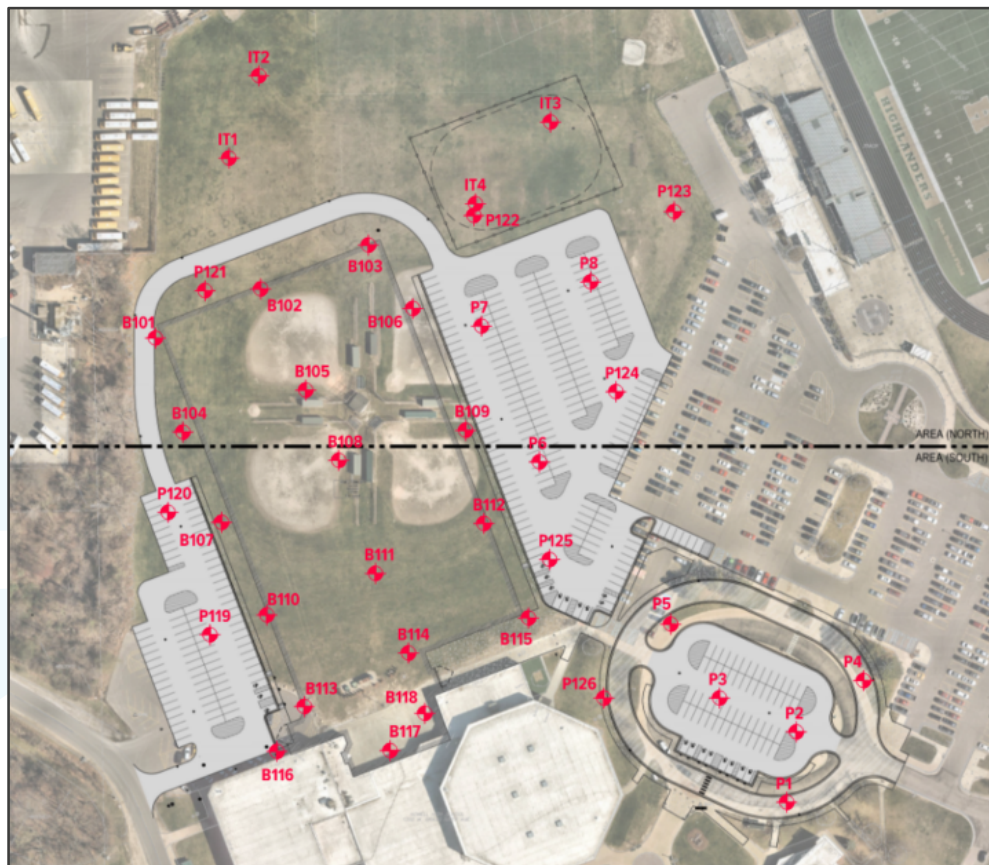


IMAGE NO. 1: Excerpt from Figure No. 1 in Appendix A – Boring Location Diagram (north facing upward).

1.1 SITE CONDITIONS

The project site is located at the existing Howell High School campus in Howell, Michigan. The specific development site currently consists of grass covered areas, existing baseball/softball fields with dugouts, and adjacent sidewalks and parking areas (see Image No. 2). The project site is surrounded by the existing school buildings and sports fields.

Based on the referenced topographic survey, the proposed development area of the site is relatively flat, with existing ground surface elevations between about 913 and 915 feet.

1.2 PROJECT DESCRIPTION

The project will consist of the design and construction of a building addition to the existing Highlander Aquatic and Fitness Center north of the high school building. The building addition will include a single-story office and conference area and a high bay, slab-on-grade athletic field (see Image Nos. 2 and 3). The athletic field portion of the addition is planned to have a plan area of about 166,000 square feet and be a pre-engineered building. We anticipate the office and conference area will likely consist of masonry construction.

Based on emails received from Robert Darvas Associates on July 22 and September 2, 2025, we understand the resultant vertical and horizontal loads on each athletic field building column will be as much as about 250 kips. We anticipate maximum column and wall loads of about 100 kips and 3 kips per foot, respectively, for the office and conference area building addition. However, structural loads for that portion of the addition were not provided.

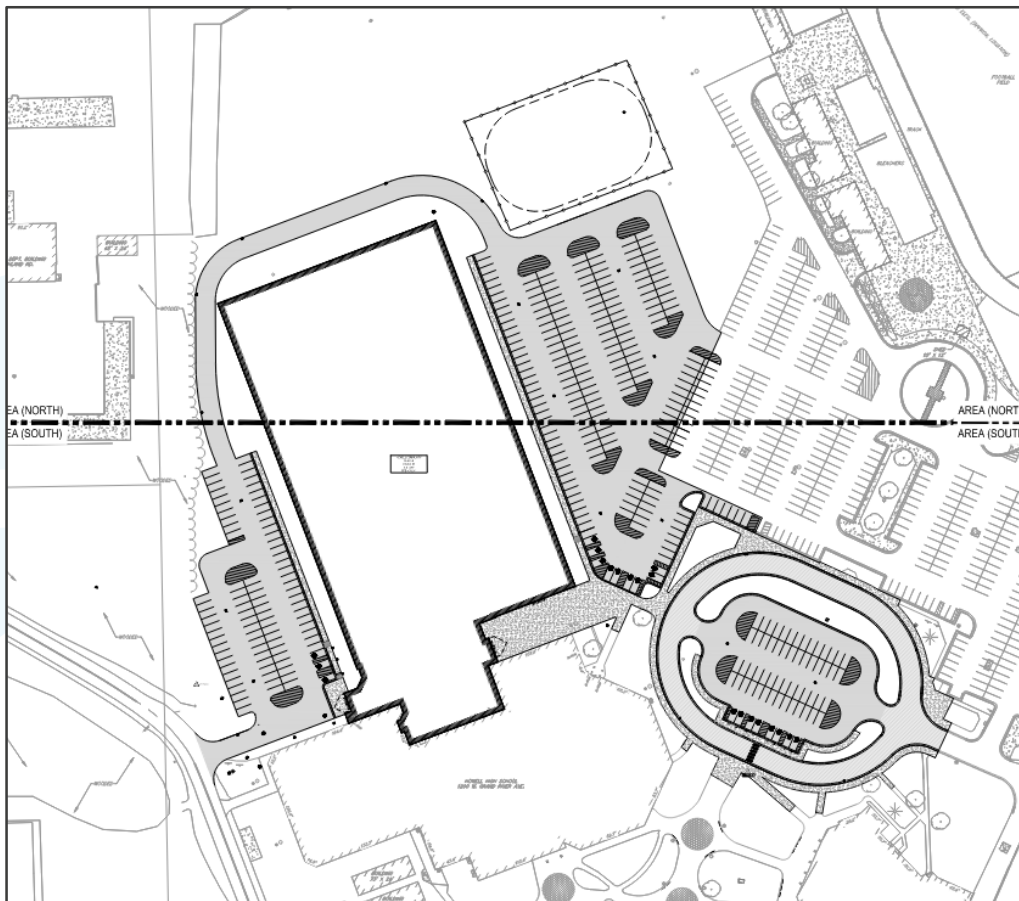


IMAGE NO. 2: Proposed site plan.

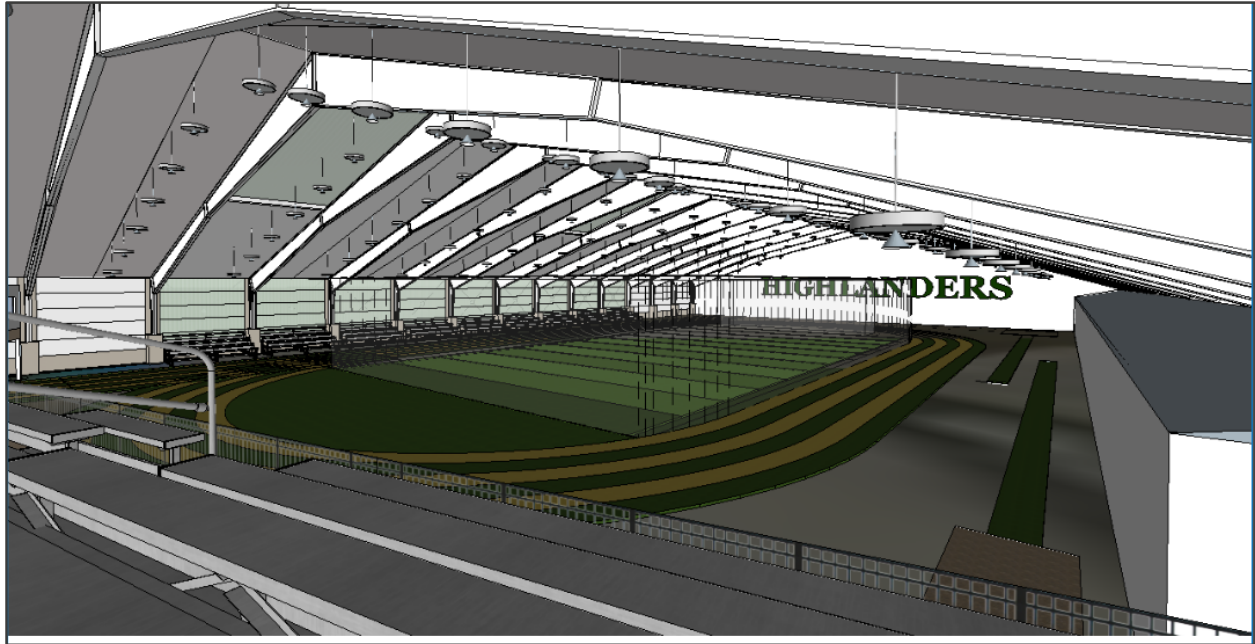


IMAGE NO. 3: Proposed rendering of indoor track addition.

We understand a design finish floor elevation (FFE) of 915.41 feet has been established for the proposed building addition. Based on the referenced topography, about 1 to 2 feet of fill will be required to establish the design subgrade level for the addition.

New asphalt surfaced pavements including car parking lots, bus loop, and an access drive are planned around the west, north, and east sides of the proposed building addition, as depicted in Image No. 2. Additionally, a new stormwater basin is planned to the north of the proposed athletic addition. We anticipate the pavements will be trafficked primarily by cars, with occasional light delivery trucks and buses. Concrete walkways will be constructed along the west and east sides of the building addition. Grading information was not provided for the proposed pavement areas at this time. However, based on the design FFE and the relatively flat existing surface grades, we anticipate relatively minor cuts and fills of less than about 2 feet will be required to establish design pavement subgrade levels. The planned elevations for the stormwater basin have not been provided to us.

The recommendations of this report are based on the information provided above and the results of the field and laboratory evaluation. Contact SME if the final design information is different than discussed herein.

1.3 SUBSURFACE CONDITIONS

Refer to the boring logs for the soil conditions at the specific boring locations. In summary, the soil conditions observed in the borings generally consisted of surficial materials (i.e. topsoil, crushed limestone, gravel, concrete, and/or asphalt) over existing sand and/or clay fill, underlain by organic soils (where encountered), natural sands, and clays that extended to the explored depths of the borings.

Surficial Materials – 2 to 30 inches of topsoil, 2 to 4 inches of crushed limestone, 12 inches of gravel, 5 inches of concrete, and 2 to 4 inches of asphalt were encountered at the surface of the borings.

Existing Gravel Base – 10 to 12 inches of sand and gravel base was encountered below the asphalt pavement or topsoil at borings P1 through P3 and P5.

Existing Fill – Existing sand and/or clay fill was encountered below the surficial materials or existing pavement gravel base at all of the boring locations except for B102, B103, IT1 through IT4, P1, P122, P123, and P124 extending about 0.5 to 6.5 feet below the existing ground surface (corresponding to approximate elevations 906.5 to 914.5 feet). The composition of the fill varied across the site ranging from moderately clean sands (SP-SM), clayey or silty sands (SC to SM), and sandy clays (CL). The granular fill is typically in a loose to dense condition and the clays were typically in a stiff to hard condition. Additionally, the borings had varying amounts of organics and debris. Refer to Section 2.1.4 for additional information about existing fill.

Buried Topsoil, Organic Silt, and Peat – We observed organic material including amorphous peat, organic silt, and/or buried topsoil at the borings listed in Table 1, below. We assume the buried topsoil and some of the organic material was once the natural surface grade that was filled prior to construction of the existing athletic fields. Image No. 4 shows the general area that the organics were encountered and Table 1 provides the depth and elevations at which it was encountered in each location.

TABLE 1: ORGANICS SUMMARY TABLE

BORING NO.	TYPE OF ORGANIC MATERIAL	DEPTH ENCOUNTERED (FT)	TOP ELEVATION (FT)	BOTTOM ELEVATION (FT)
B104	Peat and Organic Silt	6.5	907.5	904.5
B105	Peat	6.5	908.5	907.5
B107	Buried Topsoil and Organic Silt	5	910	908
B108	Peat	6.5	908.5	908
B109	Buried Topsoil	4	911	910
B110	Buried Topsoil	3	911	909.5
B111	Buried Topsoil	3.5	911.5	910.5
B112	Buried Topsoil	3.5	911.5	910.5
P6	Buried Topsoil	1.7	913.3	910
P119	Buried Topsoil	4	910	909
P120	Peat	6.5	908.5	907.5
P125	Buried Topsoil	3	912	910.5

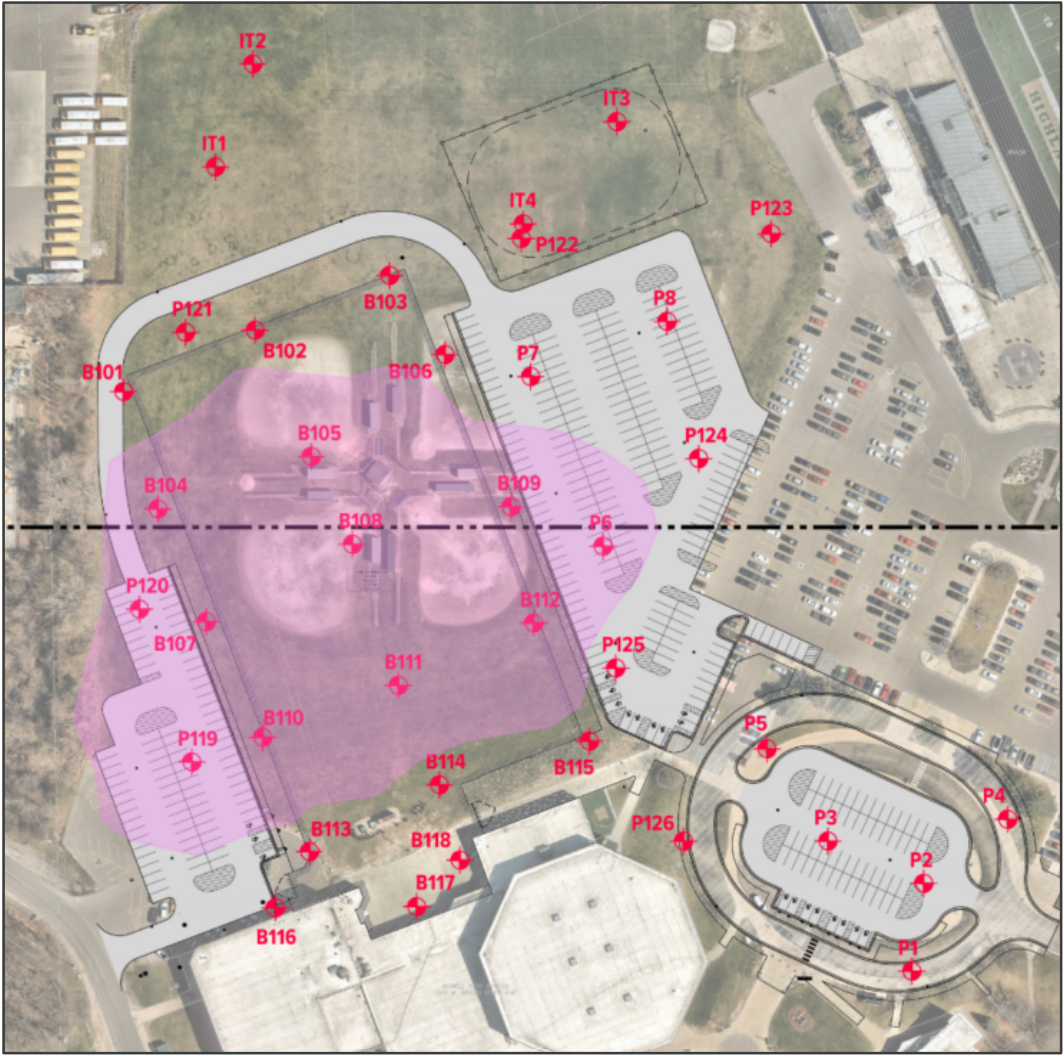


IMAGE NO. 4: Borings containing buried organic deposits (estimated area).

Groundwater was observed in the borings as summarized in Table 2, below.

TABLE 2: GROUNDWATER SUMMARY TABLE

BORING NO.	INITIAL DEPTH OF G.W. (feet)	INITIAL G.W. ELEVATION (feet)	G.W. DEPTH UPON COMPLETION OF DRILLING (feet)	G.W. ELEVATION UPON COMPLETION OF DRILLING (feet)
B101	5	909	10	904
B102	3	912	8	907
B103	3	912	6	909
B104	6	908	6	908
B105	7.5	907.5	7.5	907.5
B106	5.5	909.5	11	904
B107	7	908	11	904
B108	5	910	6	909
B109	5.5	909.5	10	905
B110	7.5	906.5	10	904

BORING NO.	INITIAL DEPTH OF G.W. (feet)	INITIAL G.W. ELEVATION (feet)	G.W. DEPTH UPON COMPLETION OF DRILLING (feet)	G.W. ELEVATION UPON COMPLETION OF DRILLING (feet)
B111	NE	NE	NE	NE
B112	6	909	14	901
B113	5	909	11	903
B114	4.5	910.5	9	906
B115	6	907	13	900
B116	4.5	910.5	6	909
B117	2.5	912.5	16	899
B118	2.5	912.5	7	908
IT1	6	908.5	NE	NE
IT2	19	895	NE	NE
IT3	NE	NE	NE	NE
IT4	9	906	NE	NE
P1	NE	NE	NE	NE
P2	NE	NE	NE	NE
P3	NE	NE	NE	NE
P4	NE	NE	NE	NE
P5	NE	NE	NE	NE
P6	NE	NE	NE	NE
P7	NE	NE	NE	NE
P8	8	907	NE	NE
P119	5	909	5	909
P120	7.5	907.5	7.5	907.5
P121	NE	NE	NE	NE
P122	NE	NE	NE	NE
P123	NE	NE	NE	NE
P124	NE	NE	NE	NE
P125	NE	NE	NE	NE
P126	NE	NE	NE	NE
Min.	3	906.5	5	899
Max.	7.5	912.5	16	909

NOTE: NE = Not Encountered

In organic and cohesive soils (e.g., peat, clays, and silts), a long time may be required for the groundwater levels in the borehole to reach an equilibrium position. Therefore, the use of groundwater observation wells (piezometers) is necessary to accurately determine the hydrostatic groundwater level within cohesive soils as observed at this site.

Refer to the Field Testing Procedures in Appendix B for additional information about groundwater level measurements. If more information regarding groundwater levels at this site is required, then we recommend performing additional subsurface assessment(s).

2. ANALYSIS AND RECOMMENDATIONS

We have provided recommendations for both shallow and deep foundation options for the proposed building. Once a foundation system is chosen, SME can assist in further development of the requirements for the system to support loading conditions of the building.

2.1 EXISTING FILL AND ORGANIC SOIL CONSIDERATIONS

The fill soil types varied from sand to clays with typical depths about 0.5 to 6.5 feet below the existing ground surface. We consider the fill to be undocumented or uncontrolled since the origin of the existing fill is not known, we are not aware of records documenting the fill placement and any compaction operations, and because of the variable composition and density of the fill.

Buried topsoil, amorphous peat, and/or organic silt were encountered below the fill at 12 boring locations as described in Section 1.3 to depths as much as about 7.5 feet below the existing ground surface. We assume based on the composition and the depth of the organics, the original grade at the project site was filled in prior to the construction of the existing athletic fields and parking areas. Based on Historical Aerials, the fields were constructed sometime between 1975 and 1986 during which time the school was constructed in what was originally agricultural land.

The buried topsoil and organic soils underlying the undocumented fill are considered slightly to highly compressible and will consolidate due to any new loads (e.g., foundation, floor slab, and weight of new fill to raise grades) that are applied. This consolidation can result in excessive settlements. There are also risks associated with constructing grade-slabs and foundation on or above existing fill, even where the fill is not underlain by organic soils.

Based on the depth of the existing fill and organic soils and the relatively large area where these soils are present beneath the proposed building addition, removal of the undocumented fill and organic soils is likely not the most cost-effective option for foundation and floor slab support.

Based on the compressible nature of the organic soils and the risks associated with the existing fill soils, we do not recommend constructing grade-slabs or foundations on or above the existing fill and organics. As indicated above, due to the relatively large area beneath the proposed building addition where existing fill and organic soils are present, we anticipate removal and replacement of these soils will not be the most cost-effective option. Therefore, we recommend the use of ground improvement at this site so that the building addition foundation and floor slab can consist of conventional elements that bear on existing, improved soils. The ground improvement elements should extend through the existing fill and organic soils to bear in suitable natural soils below.

Significant settlement of pavements and walkways could occur where grades are raised. We recommend minimizing grade raises in these areas as much as possible to reduce the potential for significant settlement. Refer to Section 2.4 for specific recommendations related to proposed pavement areas.

Our specific recommendations are presented below.

The following report sections are based on the assumption that ground improvement will be performed beneath the building foundation and floor slab. If the project team determines that complete removal and replacement of the existing fill and organic soils may be cost effective, contact SME. Refer to Section 2.4 for considerations for pavement construction in areas of existing fill and where buried topsoil and organic soils were encountered.

2.1.1 GENERAL SITE SUBGRADE PREPARATION

During demolition of the existing structures, fields, and landscaping, remove all below-grade structural items such as foundations, utilities, etc. After demolition, clear the proposed building addition area of asphalt, Portland cement concrete (PCC), vegetation, topsoil, and other deleterious materials to expose suitable underlying inorganic subgrade soils. Extend the clearing and stripping a minimum of 5 feet beyond the limits of the proposed building addition and pavement areas, and areas to receive engineered fill.

The contractor needs to remove ponded surface water and prevent run-off from reaching foundation excavations and areas of prepared subgrade. The contractor needs to also establish positive surface drainage at the onset of construction to mitigate the potential for subgrade disturbance. To reduce the potential of subgrade disturbance across the site, restrict construction traffic to dedicated areas of the site that can be controlled and stabilized as needed.

The on-site subgrade soils (particularly, the existing clay and clayey sand fill) are sensitive to disturbances during construction and the overall success of the subgrade preparation during mass earthwork operations will directly affect the suitability of pavement/slab bearing soils. As such, take care during site earthwork operations to prepare the subgrade for support of the building slab-on-grade and new pavements.

To reduce the amount of potential subgrade improvements required at this site, we recommend the contractor establish positive site drainage as soon as possible and remove ponded water from exposed and prepared subgrades.

2.1.2 GROUND IMPROVEMENT

To reduce the potential for damage to the existing building resulting from vibrations generated during ground improvement installation, we recommend not installing ground improvement within about 10 feet of the existing building foundations.

Based on the soil conditions, it is feasible to support the proposed building addition grade-slab above the existing subgrade soils after implementing ground improvement techniques consisting of aggregate piers. It is also feasible to support the office and conference area building addition on conventional shallow foundations after implementing ground improvement. Based on the anticipated horizontal loads acting the athletic field building columns, we understand deep foundations may be required to provide adequate resistance to horizontal loads.

“Aggregate pier” is a generic name for several types of aggregate columns or piers consisting of crushed aggregate (i.e., crushed stone) that is installed in a pre-drilled hole or deposited at the bottom of a void created by a large vibrator unit. Aggregate piers are most often utilized to improve subgrade conditions for support of foundations and/or grade-slabs by increasing the soil modulus of weaker soils. For this project, the aggregate pier layout can be designed by an aggregate pier specialty contractor to provide more uniform support of the bearing soils and thereby reducing total and differential settlements.

Two methods of aggregate pier installation should be feasible at this site, with the main differences being the types and sizes of equipment used. One method is the Impact® System method by Geopier Foundation Company (Geopier®), which uses a mandrel and tamper foot with Geopier's Rammed Aggregate Pier® (RAP) element to install and compact crushed aggregate placed from the bottom of the mandrel without the need for an open hole. Open hole methods (i.e., where a hole is augered and aggregate is placed from the top) would not likely be feasible at this site due to the existing sand fill and the sand strata interbedded within the clay, which is susceptible to caving. The Impact® System method by Geopier® is illustrated below.

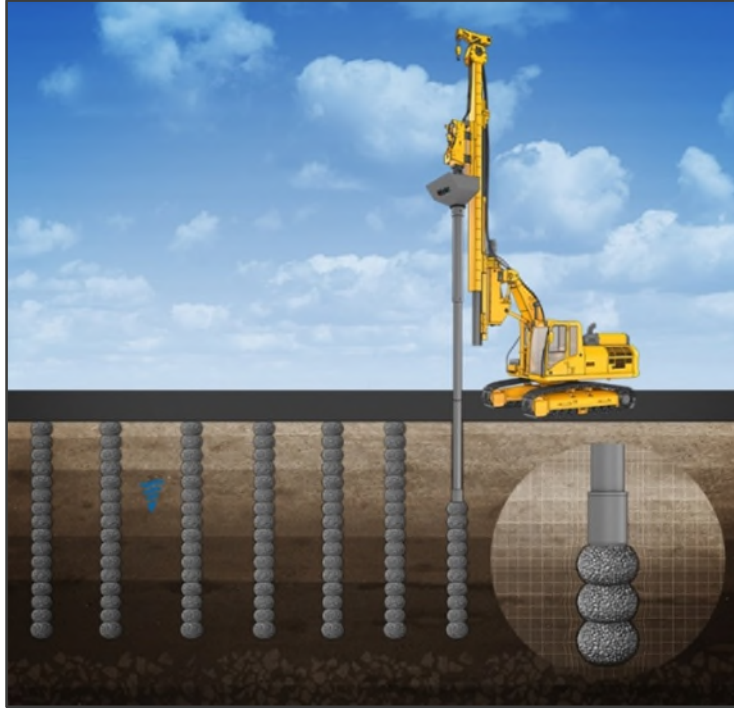


IMAGE NO. 5: Image obtained from Geopier®.

The other method used to install aggregate piers, sometimes called vibratory stone columns, uses a large, powerful vibrator that is inserted into the soil to a prescribed depth, with assistance by air jetting. After achieving the design depth, aggregate is then placed into a hopper at the top of the probe assembly and deposited from a bottom feed unit attached to the tip of the probe. The vibrator is then used to compact both the aggregate and the surrounding soil in successive lifts. This vibratory stone column method of aggregate pier installation is typically capable of achieving a higher degree of soil improvement, per pier, resulting in soil that can support a higher design bearing pressure, compared to the Geopier® system. This greater improvement occurs because the vibrator improves a larger radius of the native soil (i.e., in granular soils), the diameter of the stone column is larger, and the stone is compacted to a greater density resulting in a higher modulus. The vibratory stone column method used by Menards, Keller, Michels, and others, is illustrated below.

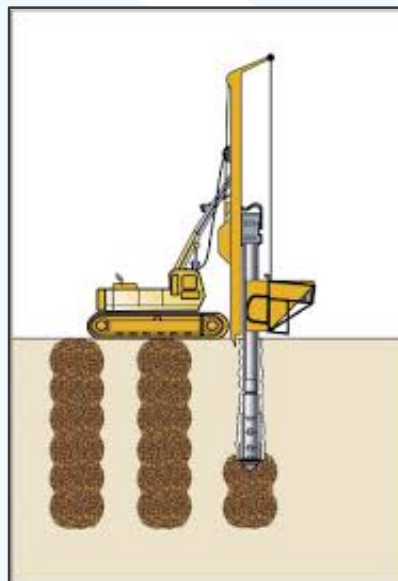


IMAGE NO. 6: Images obtained from Hayward Baker | A Keller Company.

Ground improvement using aggregate piers is typically procured by inviting specialty contractors to respond to a performance specification that provides the foundation layout and loading, the design bearing pressure, the allowable settlement, and any site constraints the contractor must consider during installation of the piers.

The prospective specialty contractors will design a system specifically for the proposed structure and site conditions, which will include the number of pier locations, pier spacing and layout, and pier depths required to achieve the design bearing pressure and to meet the specified settlement requirement. The design bearing pressure and target modulus should be verified by requiring the contractor to perform a plate load test. Ground improvement contractors typically prefer to work from a consistent grade above the design bearing level with the upper layer consisting of an aggregate working surface to improve stability of the subgrade for support of their equipment.

In addition to the ground improvement elements, a Load Transfer Platform (LTP) will be required above the tops of the aggregate piers. The intent for the LTP is to provide a uniform transfer of footing / slab load into the improved subgrade. The LTP typically consists of a compacted crushed aggregate base that is 1 to 4 feet in thickness. The stiffness of the concrete footings / slabs supported by the ground improvement elements can have some effect on the thickness of the load transfer platform, so some coordination with the project structural engineer will be required. The load transfer platform can also double as the leveling course material directly below the floor slab.

The design of this type of ground improvement system is not included in the scope of services for this geotechnical evaluation. If retained via a separate contract, or change order, SME can assist the project in preparing a performance specification outlining the proposed aggregate pier treatment areas, the design bearing pressure the foundation subgrades must achieve, and the settlement criteria for the project. The invited specialty contractors should be asked for a submittal including their experience with similar projects, their proposed work plan, any modifications or proposed alternates to the stated design criteria (such as a different design bearing pressure), schedule, fee and any unit rates that apply to installation of additional piers, obstructions, delays, or other unanticipated events.

There may be differences between contractors and considerations other than price that may influence the selection of an aggregate pier contractor. SME has significant experience with these ground improvement methods and can assist with preparing a performance specification, reviewing contractor submittals, conducting post bid interviews, monitoring pier or column installation, and monitoring and evaluating load test data.

2.1.3 SUBGRADE PREPARATION FOR FLOOR SLABS

As indicated in the previous section, an LTP consisting of a layer of aggregate or sand is typically placed above improved ground, e.g., over the tops of the aggregate piers, and beneath the floor slab to transfer loads to the aggregate piers without creating hard spots directly below the concrete slab. This aggregate or sand layer may include geogrids for reinforcement and the performance specification should indicate whether geogrids are acceptable or not. LTPs for conventional floor slabs are typically in the range of about 12 inches to 2 feet thick and are designed by the specialty contractor in response to a performance specification prepared for contractors using a ground improvement system. Placement and compaction of the LTP should consider associated vibrations with proposed equipment and stability of the existing subgrade at the working level. In addition, ground improvement contractors typically request an aggregate working surface be provided to stabilize the ground surface for support of their equipment during the aggregate pier installation process. This working surface would likely remain in-place below the LTP.

Since floor slabs and mats will be supported on soil that has been improved by aggregate piers, the design modulus will depend primarily on the spacing of the piers in these areas. A design modulus of 150 to 200 pounds per cubic inch (pci) should be achievable, and the design modulus can be included in the aggregate pier specification.

Prior to concrete placement for floor slabs, SME must observe and test the building pad subgrade to identify areas disturbed during construction activities and verify the final subgrade conditions are suitable for floor slab support. Recompact unsuitable subgrade identified by SME or remove and replace it with engineered fill. Proofroll the final subgrade in areas accessible with large equipment. SME needs to test areas inaccessible to proofrolling equipment using hand-operated equipment such as cone penetrometers, hand auger probes, and density gauges.

We recommend the top 6 inches of the slab subbase consist of an approved MDOT Class II granular material to provide a leveling surface for construction of the slab and a moisture capillary break between the slab and the underlying soils. MDOT 21AA dense-graded aggregate can be used as subbase material, instead of the Class II granular material, for improved stability and greater resistance to disturbance due to construction traffic. The thickness of aggregate needed to provide a stable construction platform will depend on the condition of subgrade soils during construction and the type and volume of construction equipment trafficking the prepared subgrade. The granular material or dense graded aggregate must be compacted per Section 2.1.4.

Place a vapor retarder below floor slabs to receive an impermeable floor finish/seal or a floor covering which would retard vapor transmission. The location of the vapor retarder (relative to the subbase) needs to be determined by the design Architect/Engineer based on the intended floor usage, planned finishes, and ACI recommendations.

Separate floor slabs by isolation joints from structural walls and columns to permit relative movement. Allow a minimum of 6 inches of engineered fill between the bottom of the slab and the top of the shallow foundation below.

Protect the slab-on-grade subgrade soils from frost action during winter construction. Frozen soils must be thawed and compacted or removed and replaced prior to slab-on-grade construction.

2.1.4 ENGINEERED FILL REQUIREMENTS

The fill needs to be free of frozen soil, significant organics, and construction debris, potentially expansive and/or chemically active materials, particle sizes hindering compaction, cobbles, and boulders. If the proposed engineered fill soils contain more than four percent organics, or debris larger than 6 inches in nominal diameter, do not use soils for engineered fill. Also, if debris material is significantly variable in nature, suspect in origin, or greater than about five percent of the soil (by weight), do not use soils for engineered fill.

Spread fill in level layers with a loose thickness appropriate for the type of equipment used to obtain compaction, but not exceeding 9 inches thick. Thinner lifts will be required in confined spaces and where compaction is achieved with walk-behind rollers/compactors or plate compactors mounted on a backhoe or excavator (e.g., Ho-Pac®). Compact the fill to a minimum of 95 percent of the maximum dry density as determined in accordance with the Modified Proctor test. Compact sand fill with a smooth drum vibratory roller or vibratory plate compactors. Compact clay fill by overlapping passes with a sheepfoot or padfoot roller at a moisture content between the optimum and two percent below the optimum.

Based on the results of our field and laboratory testing, some, but not all, of the existing inorganic natural soils and existing fill are generally considered suitable for reuse as engineered backfill for foundations and general site grading. However, the clays and sands containing appreciable amounts of clay or silt, designated with USCS group symbols "CL", "SC", or "SM," respectively, are considered moisture-sensitive and could be difficult to compact, particularly when moisture contents are above the optimum moisture content. The contractor should separate soils containing appreciable clay and/or silt from the cleaner sands and moisture-condition soils as-needed by aerating and drying overly wet soils or adding water to overly dry soils so that the required density can be achieved during compaction. Unsuitable soils may be placed in non-structural areas of the site or remove them from the site.

The successful reuse of the on-site clays and clayey and silty sands for engineered fill will depend on the time of year and the care the earthwork contractor uses during construction. During cold and wet periods of the year, the subgrade soils can become overly wet and disturbed, and the clays and clayey and silty sands can be difficult to dry. Earthwork at sites with clayey and silty subgrades is more successfully performed during the warmer and drier months when the likelihood of subgrade disturbance is lower, and the soils are more easily moisture conditioned. If drying of the existing silty and clayey soils cannot be accomplished due to weather or schedule considerations, either use the existing site sands with lower amounts of silt and/or clay as engineered fill or import material. Imported fill needs to be sampled at the source, tested, and approved prior to importing to the site.

Clays and sands containing significant amounts of silt or clay will be difficult to compact with smaller compaction equipment in confined areas such as utility trenches or as foundation excavation backfill. In confined areas, in areas where drainage is required, and in areas where compaction is accomplished primarily by hand-operated equipment, use an approved granular material, such as MDOT Class II granular material as backfill. Based on the borings, we anticipate the on-site natural soils with USCS designation "SP" and "SP-SM" should mostly meet MDOT Class II gradational requirements and be suitable for reuse in areas requiring drainage backfill. However, due to the variability of the soil stratification at this site, we anticipate difficulty identifying and segregating these soils for soil containing significant silt and/or clay. SME should verify the suitability of existing site sands proposed for reuse as drainage fill, by performing gradation analyses during construction.

Coarse crushed aggregate used to backfill undercuts or to stabilize subgrades need to consist of a well graded crushed natural aggregate or clean crushed concrete ranging from 1 to 3 inches in size with no more than seven percent by weight passing the No. 200 sieve. Spread the crushed material in layers not exceeding 12 inches and compact with a vibratory compactor until no further densification is observed. In cases where granular engineered fill will be placed over the crushed aggregate, choke the surface of the coarse crushed material with a layer of at least 6 inches of MDOT 21AA dense-graded aggregate and cover the surface with a suitable non-woven geotextile fabric to prevent migration of the granular engineered fill into the coarser crushed material.

2.2 FOUNDATIONS

We anticipate the proposed offices and conference area building addition can be supported on conventional spread footings after implementation of ground improvement. Based on our correspondence with Robert Darvas Associates, we understand deep foundations may be required to resist horizontal loads on the athletic field building foundation.

2.2.1 SHALLOW FOUNDATIONS

After implementing ground improvement, we anticipate maximum net allowable soil bearing pressures in the range of about 3,000 to 5,000 psf are achievable at this site. Since ground improvement should generally not be performed within about 10 feet of the existing building foundation, new footings that bear on suitable inorganic natural soils at the existing building foundation level can be designed for a maximum net allowable soil bearing pressure of 3,000 psf. New footings must not extend below the bearing depth of existing footings without first underpinning the existing footings.

The benefit of using a higher design bearing pressure should compare the additional ground improvement costs to achieve that bearing pressure with the potential cost savings of constructing smaller column footing sizes, where applicable.

SME is available to consult with the aggregate pier contractor and/or the structural engineer to select an appropriate design bearing pressure. SME can also review contractor submittals that propose using a higher bearing pressure as an alternate. The recommended design net allowable bearing pressure is based on a global safety factor of three or more (for general shear failure). If necessary, the maximum net allowable bearing pressure above may be increased by 33 percent for transient loading (i.e., wind).

For bearing capacity and settlement considerations, we recommend continuous (wall) foundations have a minimum width of 18 inches and isolated (column) foundations have a minimum dimension of 30 inches. In cases where structural loading is light, the minimum recommended foundation size, and not the design bearing pressure, may govern the size of the foundation.

Foundations should be situated a minimum of 42 inches below final site grade in unheated areas to meet building code requirements and for protection against frost action during normal winters. Interior foundations in heated areas of the building can be constructed at shallower levels on suitable soils just below the floor slab. The foundations and proposed bearing soils must be protected from freezing during construction if work occurs in the winter months.

New footings adjacent to existing footings (such as near the existing building) should be constructed at the same bearing level as existing footings to reduce the potential of transmitting additional loads to the existing footings. If the new footings have to be extended deeper than the bearing level of the existing footings, the project structural engineer should evaluate the design and make appropriate modifications to the new footings. Bearing levels for new footings can be established at certain distances from the existing building, depending on the distance between the two bearing levels. As a guideline, the new footing level should be at a level either above or below the existing footing no higher than its horizontal distance from the existing footing, i.e., a 1 to 1 slope between the edges of the two footings. For reasons of constructability, we recommend limiting vertical "steps" to 1 foot for every 3 horizontal feet.

We estimate total settlement for shallow spread or continuous foundations using the recommended maximum net allowable bearing pressure and bearing on suitable soils, as described above, should be 1 inch or less, and differential settlements should not exceed about one-half the total settlement for similarly loaded foundations. These estimated settlements should be incorporated as requirements in a performance specification prepared for ground improvement. Differential settlements between the existing building and the new building could approach 1 inch. We base the settlement estimates on the available boring information, the estimated structural loads discussed in Section 1.2, our experience with similar structures and soil conditions, and field verification of suitable bearing soils by SME.

2.2.2 PRELIMINARY DEEP FOUNDATION RECOMMENDATIONS – DRILLED PIERS

Several types of deep foundations are feasible for support of the proposed athletic field building. However, based on the relatively large horizontal loads, we anticipate using a single drilled pier per column rather than multiple deep foundation elements with pile caps is a cost-effective option.

Since the borings performed to date extended to a maximum depth of 30 feet beneath the existing ground surface, we recommended additional deeper borings be performed. After performing the deeper borings, we will revise and finalize our drilled pier recommendations provided below.

To resist relatively large horizontal loads, the athletic field building columns can be supported on drilled piers with one pier per column. The drilled piers should be straight-shaft piers (i.e., without a bell or enlarged base). The required depth of the drilled piers will primarily depend on the horizontal loads to be resisted rather than the axial loads imposed on the foundations.

SME performed a preliminary lateral pile analysis using the provided estimated column loads and assumed soil conditions below the explored depth of our current borings. The results of the preliminary lateral pile analysis are provided in Image Nos. 7 and 8, below.

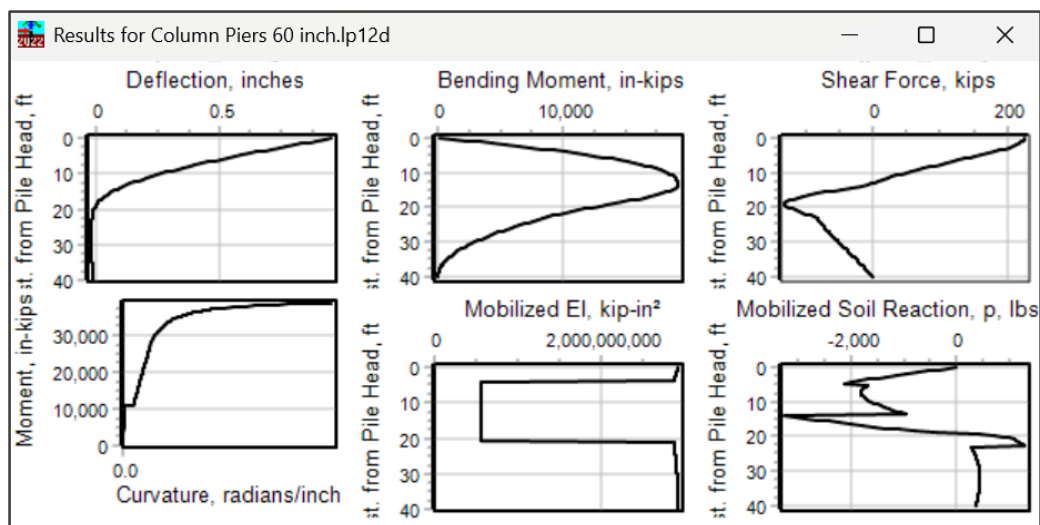


IMAGE NO. 7: 5-foot diameter drilled pier modeled with about one percent steel reinforcement.

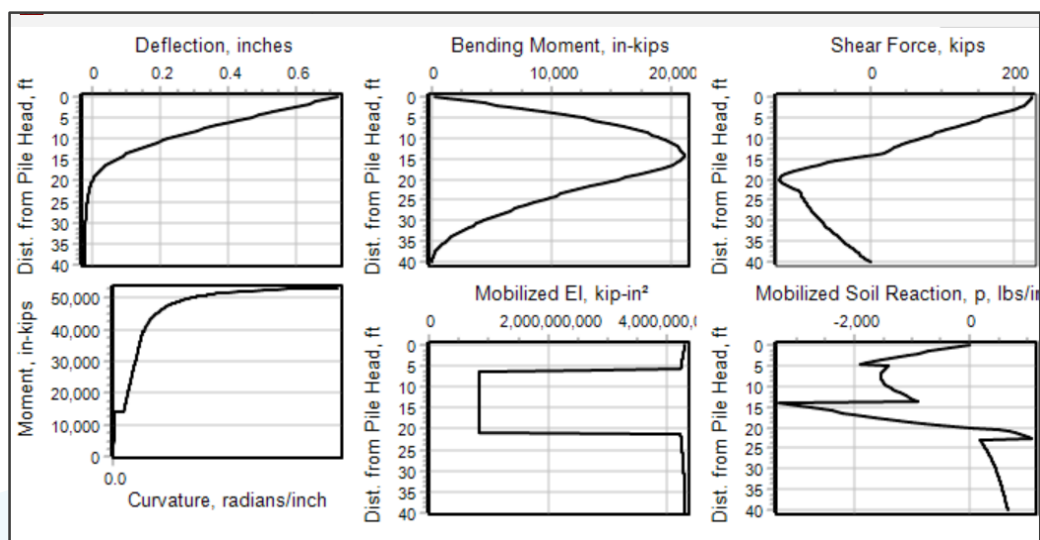


IMAGE NO. 8: 5.5-foot diameter drilled pier modeled with about one percent steel reinforcement.

Based on our preliminary analysis, we anticipate drilled piers will require an embedment of about 40 feet to provide the required resistance to horizontal loads. At these depths, we anticipate an allowable end bearing of at least 4,500 psf. Friction/adhesion along the shaft will provide resistance to uplift loads and additional resistance to compressive loads.

A partial-depth, temporary heavy steel casing (i.e., a surface casing) will be required at drilled pier locations to prevent caving sands near the ground surface, and to maintain alignment and position of the piers. Based on the borings, wet method pier construction (described below) will be required to prevent caving and heaving of sands in the pier excavations.

The bottoms of the drilled pier excavations should be cleaned so the bottoms are free of loose or disturbed soils prior to placement of the concrete. Cleaning of the drilled pier bearing surface may be done mechanically with the auger or "one-eye" bucket. Visual review of bearing surfaces is not possible for wet drilling methods.

Wet method pier construction is used when a dry excavation cannot be maintained and consists of using a drilling slurry (composed of water or a bentonite or polymer mix) to maintain a positive fluid head inside the excavation that is higher than the static groundwater on the outside of the excavation. The concrete

for the pier is placed using “tremie” methods by either gravity or pumping in which the concrete is placed from the bottom of the drilled shaft and thereby displacing the slurry. The tremie pipe should be a minimum of 10 inches in diameter. The end of the tremie pipe must be maintained a minimum of 2 feet into the concrete to prevent mixing of the slurry and concrete. For concrete placement by the tremie method, a slump of 7 to 9 inches and a maximum aggregate size of 3/4-inch is recommended. The required slump should be obtained by using plasticizers or water-reducing agents. Addition of water on site to establish the recommended slump should not be allowed. As the concrete is placed, the slurry is displaced from the top of the excavation either onto the ground or into a recirculation pit/tank. The contractor should submit a mix design for review prior to placing concrete by the tremie method. If recirculation pits/tanks are not utilized for wet pier construction, a significant volume of drilling slurry and cuttings should be expected on the ground surface in the vicinity of the pier excavation. When extracting temporary casings from the excavations, care should be taken to maintain a head of concrete to prevent infiltration of water and soil into the shaft area. The head of concrete should always be greater than the head of water trapped outside the casing, taking into account the differences in unit weights of concrete and water.

To reduce lateral movement of the drilled piers, it is necessary to place the concrete for the drilled piers in intimate contact with the surrounding soil. Any voids or enlargements in the pier shafts due to over-excavation or temporary casing installation must be filled with concrete when the shaft concrete is placed.

Although not encountered at the borings, cobbles and/or boulders should be anticipated at the drilled pier locations. The engineer preparing the project specifications should carefully outline what constitutes an obstruction and how the contractor will be paid for removal of such obstructions. SME would be pleased to provide additional assistance in developing specifications.

Total settlement for drilled pier foundations constructed, as recommended above, and field verified by SME, is expected to be less than about 1/2-inch. The settlement estimate provided is based on the available boring information, estimated structural loads, our experience with similar structures and soil conditions, and field verification of suitable bearing soils by SME.

2.3 SEISMIC SITE CLASS

Based on the subsurface information obtained from the borings to a maximum depth of 30 feet, seismic site Class D applies to this site in accordance with the most current version of the Michigan Building Code (MBC) referencing Table 20.3-1 in ASCE Standard ASCE/SEI 7.

2.4 PAVEMENT DESIGN RECOMMENDATIONS

The following sections of the report present our recommendations for design and construction of the proposed pavement areas at the site, as described in Section 1.2. We have developed the pavement sections based on the information obtained from the borings and the project information discussed in the introduction of this report.

Please note, additional targeted borings performed in/around pavement areas will also help with delineating fill and buried topsoil or organics limits to aid in cost estimating for the project. If desired, SME should be retained to assist with this effort.

Grading plans were not provided to SME at the time of this report, however, as stated in Section 1.2, we anticipate minimal cuts and fills of less than about 2 feet will be required to establish pavement subgrade elevations.

2.4.1 TRAFFIC

Specific traffic count and traffic type information was not provided for developing the pavement design recommendations. Based on the layout depicted in the provided site plan, we anticipate automobiles, light-duty passenger trucks, school buses, and occasional delivery trucks will traffic the site.

For design purposes, we have assumed up to two delivery trucks and 10 school buses will traffic the circle drop-off loop each school day. We have assumed a 200-day (40-week) school year in our design calculations. Based on the traffic data and our assumptions, we estimate up to about 120,000 Equivalent Single Axle Loads (ESALs) will occur over a 20-year period in the heavy-duty circle drop-off loop and up to about 50,000 ESALs will occur over a 20-year period in the standard-duty perimeter drive and vehicle parking areas.

We have also anticipated that periodic passenger vehicles and light-duty maintenance/landscaping vehicles will access the proposed sidewalk/walkway pavements for snow removal and/or maintenance. Regular vehicular traffic was not considered when selecting the recommended design sidewalk/walkway pavement section. Dump trucks, concrete trucks, boom lifts, large landscaping trucks, or other heavy vehicles should not be allowed to traffic the sidewalk/walkways.

If these traffic assumptions are found to be incorrect or if projected site traffic projects are updated or revised, we should be informed and allowed to revise our traffic loading estimates, if needed.

2.4.2 EXISTING FILL CONSIDERATIONS FOR PAVEMENT AREAS

Based on the borings, we anticipate most of the pavement subgrade will consist of existing undocumented sand or clay fill. Where encountered in borings performed in or around pavement areas, the existing fill extended to depths of 1 to 6.5 feet below the surface. A layer of buried topsoil about 1.0 to 1.5 feet thick was encountered below the undocumented fill at borings B107, B109, B110, B112, P119 and P125, extending to depths of 4.5 to 6 feet. A layer of buried topsoil about 3.2 feet thick was encountered below the undocumented fill at boring P6, extending to a depth of about 5 to 6 feet. Organic soils consisting of amorphous peat and organic silt were encountered below the fill or buried topsoil at borings B104, B107, and P120 performed on the west side of the proposed addition. The organic soil deposits ranged in thickness from about 1.0 to 3.0 feet and extended to depths of 7.5 to 9.5 feet below existing ground surface.

Based on the condition of the existing fill encountered in the borings, we believe the existing fill can remain below the pavements provided:

- The subgrade is properly evaluated by SME and prepared as described in Section 2.4.4.
- Buried topsoil is removed below the existing fill.
- Unsuitable fill is undercut and replaced with engineered fill.
- The Owner accepts the associated risks described below.

Where buried topsoil is encountered within proposed pavement areas, the overlying existing fill should be stripped and stored on site for reuse as engineered fill. Buried topsoil should be excavated and properly disposed of. Once the buried topsoil is removed, the engineered fill must be placed within the excavation limits to establish final site grades. We anticipate these conditions in pavement areas associated with borings B109, B110, B112, P6, P119, and P125, where buried topsoil was encountered at relatively shallow depths (within 2 to 3 feet of pavement subgrade). These areas generally include the south half of the east parking lot (around borings B109, B112, P6, and P125) and the south half of the west parking lot (around borings B110 and P119).

The increased risks associated with supporting pavements over the existing fill at this site could include greater than typical post-construction settlement, resulting in differential movements and associated cracking of the pavements. These risks can be reduced, but not eliminated, if SME further evaluates the existing fill at pavements subgrades. If the risks described above are not acceptable to the Owner, the existing fill should be completely removed from within the proposed pavements footprint and replaced with engineered fill.

If the existing fill will remain in-place for support of pavements, further evaluation of the existing fill during construction must be conducted by SME. Further evaluation should include observing the condition of the fill in hand-auger borings or shallow test pits, testing the fill using a dynamic cone penetrometer (DCP), and observing the response of the surface of the fill when subjected to a proofroll. Existing fill to remain in-place should be of sufficient strength and free of deleterious materials, such as excessive debris and organics. Unsuitable existing fill that cannot be improved in-place should be removed (i.e., undercut) and replaced with engineered fill that is placed and compacted per the requirements outlined in Section 2.1.4 of this report.

The recommendations provided in the following report sections are based on the assumption that suitable existing fill will remain in-place and be used to support the pavements. If the Owner does not accept the stated assumptions and risks, please contact SME for revised recommendations.

2.4.3 ORGANIC SOIL CONSIDERATIONS FOR PAVEMENT AREAS

As noted above, peat and organic silt layers were encountered below the fill at borings B104, B107, and P120, performed in or around proposed pavement areas proposed on the west side of the building addition. Pavements constructed on or above these organic soils will be at risk of excessive total and differential settlements (i.e., several inches), resulting in cracking and premature failure. Organic soils degrade and compress over time and are likely to result in uneven settlement and cracking of pavements. There is added risk of uneven settlement in areas where the proposed grades will be raised more than other areas, where the construction will result in higher load increases over existing soils. **Therefore, the organic soils are not considered suitable for support of the proposed pavements without improvement.**

Two common alternatives for constructing pavements in areas of compressible organic soils and other unsuitable soils, such as loose or soft fill, include removing (i.e., undercutting) the unsuitable soils and replacing them with suitable granular engineered fill or crushed aggregates, or improving the organic materials by implementing a surcharging program.

In cases where organic soils cannot be excavated (possibly due to shallow water, deep organic deposits, or limiting environmental factors) and the pavement areas can remain closed for extended periods of time, a surcharge program may be the most economical solution to prepare the subgrade for construction. In a surcharge approach, fills are placed to and above planned final grades to load and compress the organic soils to limit post-construction settlements. We anticipate the surcharge program would require placing between 2 to 5 feet of fill above the design subgrade level, maintaining the surcharge for a duration between 6 to 12 months, and monitoring the results to determine when the surcharge can be removed.

By removing the underlying organics at this site and replacing with engineered fill, or by surcharging/compressing the organics, the significant risk of poor pavement performance related to settlement is greatly reduced. However, additional consolidation of the organic soils (where left in-place in surcharged areas) should be expected to continue over time, at a relatively slow rate, and could result in noticeable additional settlement of the pavements, exceeding 1 inch over years. SME would be pleased to develop a specific surcharge program for this project and site if desired, including recommendations for depth and duration of the surcharge and settlement monitoring.

2.4.4 SUBGRADE PREPARATION FOR PAVEMENTS

The pavement areas should be cleared of existing pavement, unsuitable fill, and other deleterious materials to expose the underlying inorganic subgrade soils. Based on the borings performed in and adjacent to the proposed pavement areas, we expect the exposed subgrade soils at the design subgrade level in the pavement areas will consist predominantly of sand and clay fill. As noted above, buried topsoil and organic soils are present below the existing fill within the proposed pavement areas throughout most of the west and east parking lots and drives (borings B104, B107, B109, B110, B112, P6, P119, P120, and P125). The organic soils, where present, are not considered suitable for support of pavements without significant improvement. Without improving the areas where organic soils are present, the magnitude and variation of settlement will likely result in significant pavement distress and failure. As described in Section 2.4.2 above, we recommend complete removal of the buried topsoil near borings B109, B110, B112, P6, P119, and P125 to suitably prepare the exposed subgrade. As noted in Section 2.4.3 above, as an alternative to undercutting, a surcharge approach can be considered near borings B104, B107, and P120 to improve the underlying organic soils for support of the pavements and reduce the anticipated post-construction settlement.

The surcharge program would consist of using soil to load the pavement areas and pre-compress the underlying organic soils. The weight of the fill would result in settlement of the organic soils during the surcharging operation and reduce (but not eliminate) settlement that would occur during the design life, after removal of the surcharge. Specific surcharging recommendations and an associated surcharging schedule were not included with this report, pending selection of the construction method used to address the poor soils. However, SME can provide specific surcharging recommendations at a later date once the project team and the Owner discuss the constructability issues associated with the organic soils.

In general, the pavement subgrade should be prepared in accordance with Sections 2.1.1 and 2.1.4 of this report, and as follows. Refer to Section 2.4.2 for considerations for pavements constructed over existing fill.

After stripping surficial materials, cutting to design subgrade levels, but prior to raising grades, compact the exposed subgrade to a minimum of 95 percent of the maximum dry density determined by the modified Proctor test. Subgrade preparation and the aggregate base layers need to extend out to at least 18 inches beyond the edge of the pavements to provide lateral support for the outer edges. Proofroll the resulting subgrade using a fully loaded tandem axle dump truck. Areas of unsuitable (e.g., loose, yielding) subgrade revealed during proofrolling should be improved in-place, or removed (undercut) and replaced with engineered fill. Special attention during proofrolling should be directed to the response of the existing fill as a means to judge the suitability of the fill for support of the pavements. Place and compact engineered fill as presented in Section 2.1.4.

Prior to the placement of the sand subbase, we recommend fine-grading the subgrade to slope downward toward the stormwater drainage structures. Fine-grading of the underlying subgrade will be critical to minimize low-spots below the aggregate base where water can pond, likely resulting in moisture changes and undesirable early pavement distress. Fine-grading the subgrade is important for drainage of perched groundwater, and to achieve a uniform thickness of base course to be placed throughout each of the pavement sections. Also, we recommend installing underdrains at/through low-spots in the prepared subgrade to facilitate drainage of perched groundwater.

Limit construction traffic on the prepared subgrade. Use designated haul roads and staging areas for heavy construction vehicles and equipment/materials storage. Haul roads should be constructed using a layer of crushed stone, possibly in combination with a high-strength woven geotextile fabric or geogrid, if necessary, to stabilize and protect the subgrade. Contact SME for assistance with the type and quantity of stabilization required based on field conditions during construction.

The final subgrade elevation in both cut and fill areas should be proofrolled, as described above, and any loose or soft areas should be recompacted, undercut and replaced with engineered fill or crushed aggregate, or stabilized by other means as recommended by SME based on the site conditions at the

time of construction. The criteria for the final proofroll should be a maximum of ½-inch of deflection or rutting. Once the subgrade passes the final proofroll, we recommend the pavement layers be placed soon thereafter to avoid further subgrade disturbance. If additional subgrade disturbance occurs prior to pavement placement, we recommend the subgrade be reevaluated by SME, possibly including another proofroll, to evaluate the severity and identify locations of disturbance.

Unit prices for undercutting and engineered fill should be obtained from bidders, and contingencies for that work could be included in the project budget.

At locations where the new pavement will meet existing asphalt pavement, the edge of the existing pavement should be saw-cut to expose a vertical surface that is clear of debris. If the edge of the existing pavement is deteriorated, additional saw-cutting and removal may be required to achieve a clean vertical surface. Prior to paving, the exposed vertical face should be tack coated to encourage bonding with the new pavement material.

2.4.5 RECOMMENDED PAVEMENT SECTIONS

We have prepared the pavement design recommendations herein based on our experience with similar projects, the conditions disclosed in the soil borings, and AASHTO pavement design methodology. Hot mix asphalt (HMA) material selection is based upon the MDOT Local Agency HMA Selection Guidelines and our experience with local construction materials. The design pavement sections presented herein are anticipated to provide a useful service life of 15 to 20 years for the anticipated traffic loading if constructed and maintained properly. Maintenance activities including patching and crack sealing need to be performed at periodic intervals to maintain the pavement surface and extend the serviceability.

We have also provided a light-duty concrete pavement section for use in proposed pedestrian walkway areas. We recommend the following HMA and concrete pavement sections for the new pavement areas and walkways.

TABLE 3: STANDARD-DUTY HMA PAVEMENT SECTION – VEHICLE PARKING AREAS AND PERIMETER DRIVE

LAYER	MATERIAL	THICKNESS (INCHES)
HMA Wearing Course	MDOT 5EL ⁽¹⁾	1.5
HMA Leveling Course	MDOT 4EL ⁽¹⁾	2.5 ⁽²⁾
Aggregate Base	MDOT 21AA Crushed Natural Aggregate or Crushed Limestone	8.0
Geogrid	Tensar BX1200	1-Layer ⁽³⁾⁽⁴⁾
Granular Subbase	MDOT Class II Sand	12.0

NOTES:

- 1) As modified in Section 2.4.6 – HMA Material Considerations.
- 2) The leveling course thickness may be decreased to 2.0 inches in car parking stalls or other light-duty areas where truck, bus, or other heavy vehicle traffic will not occur.
- 3) Geogrid should be overlapped a minimum of 2 feet. The geogrid layer should extend out from the edge of the pavements overtop organic soils to a minimum distance of 2:1 (V:H) from the edge of the organic soils.
- 4) Geogrid reinforcement layer can be omitted in areas where buried topsoil or organic soils are not present below pavement section and the subgrade passes at thorough proofroll.

TABLE 4: HEAVY-DUTY HMA PAVEMENT SECTION – CIRCLE DROP-OFF LOOP

LAYER	MATERIAL	THICKNESS (INCHES)
HMA Wearing Course	MDOT 4EL ⁽¹⁾	2.0
HMA Leveling Course	MDOT 4EL ⁽¹⁾	2.5
Aggregate Base	MDOT 21AA Crushed Natural Aggregate or Crushed Limestone	10.0
Geogrid	Tensar BX1200	1-Layer ⁽²⁾⁽³⁾
Granular Subbase	MDOT Class II Sand	12.0

NOTES:

- 1) As modified in Section 2.4.6 – HMA Material Considerations.
- 2) Geogrid should be overlapped a minimum of 2 feet. The geogrid layer should extend out from the edge of the pavements overtop organic soils to a minimum distance of 2:1 (V:H) from the edge of the organic soils.
- 3) Geogrid reinforcement layer can be omitted in areas where buried topsoil or organic soils are not present below pavement section and the subgrade passes at thorough proofroll.

TABLE 5: LIGHT-DUTY CONCRETE PAVEMENT SECTION – WALKWAYS

LAYER	MATERIAL	THICKNESS (INCHES)
PCC Surface	MDOT 3500 ⁽¹⁾	6.0 ⁽²⁾
Aggregate Base	MDOT 21AA Crushed Natural Aggregate or Crushed Limestone	6.0
Granular Subbase	MDOT Class II Sand	12.0

NOTES:

- 1) As modified in Section 2.4.7 – PCC Material Recommendations.
- 2) The PCC surface may be reduced to 5 inches thick in areas where vehicle traffic will not occur.

2.4.6 HMA MATERIAL CONSIDERATIONS

We recommend following the MDOT 2020 Standard Specifications for Construction for pavement construction unless modified herein. The final asphalt binder grade should be PG64-28 for the asphalt wearing course mixtures and PG58-28 for the leveling course mixtures. The amount of Reclaimed Asphalt Pavement (RAP) should be limited to MDOT Tier 1 (0 to 17 percent RAP binder by weight) for wearing course mixtures and MDOT Tier 2 (18 to 27 percent RAP binder by weight) for leveling course mixtures.

The asphalt mixtures should be designed for target air voids of three percent and should be compacted to between 94 to 97 percent of the theoretical maximum density as determined per ASTM D2041. We recommend a bond coat of SS-1h emulsion should be required between asphalt layers at a rate of 0.1 gallons/s.y. If a significant time elapses between the placement of subsequent pavement layers, the existing pavement surface should be evaluated, and the surface should be suitably cleaned to remove dust and debris prior to placing the bond coat.

2.4.7 PCC MATERIAL RECOMMENDATIONS

We recommend MDOT 3500 concrete mix be used and modified as noted below. The coarse aggregate should meet the specifications of MDOT 6AA crushed limestone. Gravel or slag aggregates should not be allowed as the coarse aggregate. We recommend ASTM C-1567 tests be performed on the blended materials of aggregate and cement to determine the potential for Alkali Silica Reactivity (ASR). The blend should provide less than 0.1 percent expansion. A mix design should be submitted documenting the results of the ASTM C-1567 testing program. Ground granulated blast furnace slag (GGBFS) may be

used as a mitigation agent for ASR at a cement replacement rate of 20 to 40 percent. The cement type should be Type I/II with air content specified at five to eight percent. If Type IL cement will be used, the contractor should submit a pavement installation and quality control plan to the design engineer for review and approval prior to proceeding with construction, and care should be taken to address the finishing and curing of the concrete. The minimum specified compressive strength of the concrete mixture should be 4,000 pounds per square-inch (psi) at 28 days.

We recommend control joints be spaced at a distance equal to the width of the sidewalk and no more than 10 feet. The length to width ratio of slabs should not exceed 1.25. We recommend slabs utilize welded wire fabric (6x6 – W2.9xW2.9) at mid-depth to maintain aggregate interlock at cracks/joints. Expansion joints (0.5-inch wide) should be installed at the ends of the sidewalks where abutting existing sidewalks. At the abutting ends, we recommend thickening the final 2 linear feet of the new sidewalk slab by 2 inches.

We recommend a broom finish and installing a uniform curing compound meeting the requirements of ASTM C-309 Type 2 at a rate of 1 gallon per 225 square-feet. We recommend all saw cutting be performed as soon as possible after concrete placement, without damaging the finish of the pavement. We recommend the use of soft-cut saws so that sawing can be performed within four hours after concrete placement. Traffic should not be allowed on the concrete until the concrete has reached 75 percent of the design strength.

2.4.8 PAVEMENT DRAINAGE CONSIDERATIONS

The pavement system must be properly drained to reduce the potential of frost heaving and softening of the subgrade due to water infiltrating through cracks. The infiltrated water, if not properly drained, is expected to adversely affect the pavement performance. The new pavement surface needs to be designed and installed to provide positive drainage at a minimum slope of 1.5 percent.

We recommend installing edge/underdrains, where feasible, to facilitate subsurface drainage. Extend edge/underdrains a minimum of 25 feet along the uphill direction at curb inlets and a minimum of 25 feet in four radial directions from catch basins located at low points, if any. Connect edge/underdrains to proposed drainage structures. Excavate the edge/underdrain trenches to a minimum depth of 18 inches below the bottom of the sand subbase and a minimum of 12 inches wide. We recommend the edge/underdrains consist of a 6-inch-diameter, perforated, corrugated plastic drainpipe. Wrap the trench in a nonwoven geotextile fabric and backfilled with aggregate meeting MDOT 34R gradational requirements. The fabric should be overlapped on top. The trench should be backfilled to the proposed bottom elevation of the sand subbase.

2.5 STORMWATER MANAGEMENT SYSTEM

Table 6 below summarizes the location, depth, and elevation of the infiltration tests. SME and Spalding Dedecker jointly determined the locations and depths of infiltration testing as required by local stormwater management regulations. Table 6 also includes the USCS Group Symbol (based on our visual classification) of the soil present at the infiltration test depth based on the conditions observed in the adjacent borings. The planned elevations for the planned stormwater basin have not been provided to us.

Refer to Appendix B for field testing procedures.

TABLE 6: DOUBLE-RING INFILTROMETER FIELD TEST DATA

INFILTRATION TEST LOCATION	TEST DEPTH (FEET)	TEST ELEVATION ¹ (FEET +/-)	USCS ² GROUP SYMBOL	INFILTRATION RATE (INCH/HR.)
IT1	4.2	910.3	SM	9.3
IT2	9.8	904.3	CL	<0.1 [Note 4]
IT3	9.6	904.9	CL	<0.1 [Note 4]
IT4	7.3	907.7	CL	<0.1 [Note 4]

NOTES:

- 1) Test elevation is the ground surface elevation estimated to the nearest ½-foot based on the ground surface elevation obtained at the adjacent boring.
- 2) Unified Soil Classification System (USCS) designation of soil encountered at the test depth in the boring adjacent to the infiltration test locations.
- 3) Infiltration rate is based on the final interval after a stabilized rate was obtained OR the lowest measured rate within the inner pipe.
- 4) Infiltration rate less than that which can be measured with the testing method performed.

The infiltration rates reported in Table 6 should be considered the maximum rate for the tested soil at the tested depth/elevation, under the initial head of 12 inches for the infiltration test. Variations in soil and groundwater conditions can result in different infiltration rates away from the boring/test location.

Test IT2 was performed within a stratum of clay encountered at adjacent boring IT2 extending from about 5 feet to 20 feet below the surface (or approximate elevations 909 feet to 894 feet) and indicated less than 0.1 inch per hour (in./hr.) infiltration (or less than that which can be measured with the testing method performed). Test IT3 was performed within a stratum of clay encountered at adjacent boring IT3 extending from about 7 feet to 20 feet below the surface (or approximate elevations 907.5 feet to 894.5 feet) and indicated less than 0.1 in./hr. of infiltration. Test IT4 was performed within a stratum of clay encountered at adjacent boring IT4 extending from about 5 feet to 9 feet below the surface (or approximate elevations 910 feet to 906 feet) and indicated less than 0.1 in./hr. of infiltration.

Variations in soil and groundwater conditions can result in different infiltration rates away from the boring/test locations. Test IT1 was performed in native silty sands or sands with silt encountered at adjacent boring IT1 extending to a depth of about 9 feet (approximate elevation 905.5 feet). The infiltration rate reported at test IT1 should be considered the maximum rate but may not be achievable due to contamination of the permeable soils with silts, clays, and/or debris during construction and over the lifetime of proposed infiltration features.

Based on the variable elevations and thicknesses of the sand and clay layers at the site, we generally do not recommend relying on significant infiltration rates for storm water management features that are situated below approximate elevation 908 feet. Above approximate elevation 908 feet, infiltration rates are expected to be variable due to the soil and groundwater variations.

Factors, such as the build-up of soil fines or debris, over time, can result in a reduction in the design infiltration rate. It is important to use sediment forebays and other filtering or separation methods to prevent fine soil and debris from entering stormwater management systems that rely on infiltration drainage. Provisions should be included for performing routine maintenance to maintain suitable infiltration properties. Engineering recommendations related to the design of the proposed stormwater management system were not requested and have not been included in our current scope of services. Therefore, SME is not responsible for the interpretation by others of our test results presented in Table 6.

3. EXCAVATION AND GROUNDWATER MANAGEMENT

Groundwater seepage into shallow foundation and utility excavations should be anticipated during construction. We anticipate standard sump pit and pump methods should generally be adequate to control groundwater on a localized and temporary basis for excavations that extend less than about 2 feet below the groundwater level (estimated at elevation 912.5 feet). However, for excavations extending more

than about 1 foot below the groundwater level in sands, higher capacity dewatering techniques such as submersible pumps in slotted casings will be required. However, higher capacity wells/wellpoints may have limited effectiveness at this site due to the frequent and variable depth low-permeability soil strata. . A working surface of either crushed aggregate or crushed concrete may be required to protect the exposed subgrade where seepage is encountered, with multiple sumps embedded in the crushed material for dewatering.

Take care during demolition and earthwork operations to protect adjoining and adjacent utility structures. Do not undermine existing structures. Where necessary, install temporary shoring/bracing to properly shore/brace existing structures and protect them from distress.

The contractor must provide safely sloped excavations or adequately constructed and braced shoring systems in accordance with federal, state, and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground. If material is stored or heavy equipment is operated near an excavation, use appropriate shoring to resist the extra pressure due to the superimposed loads.

Handle, transport, and dispose excavated materials and groundwater in accordance with applicable environmental regulatory requirements. Refer to the project environmental consultant for additional information regarding handling and/or disposal of onsite soils and/or groundwater.

4. EVALUATION PROCEDURES

4.1 FIELD EXPLORATION

The proposed number, locations, and depths of the borings were determined jointly by Kingscott or Spalding DeDecker and SME. SME located the borings in field using our hand-held global positioning system (GPS). The elevations on the boring logs are rounded to the nearest 1-foot and based on the provided topographic map.

The borings were advanced using a rotary drill rig equipped with continuous flight augers. The borings included soil sampling based on Split-Barrel Sampling procedures. The N_{60} -values plotted on the boring logs represent the blow counts obtained in the field adjusted for drill rig hammer efficiency, which is also shown on the logs. The driller sealed recovered split-barrel samples in glass jars.

Groundwater level measurements were recorded during and immediately after completion of each boring. After completion of drilling and obtaining groundwater level measurements, the boreholes were backfilled with auger cuttings. The borings performed through existing concrete or asphalt pavement were topped with asphalt cold patch quick-setting concrete mix.

The Field Testing Procedures in Appendix B provides more detailed descriptions of field tests typically performed by SME and referenced in this report.

Soil samples recovered from the field exploration were taken to our laboratory for further observations and testing.

4.2 LABORATORY TESTING

The laboratory testing program consisted of visual soil classification on recovered samples along with moisture content and hand penetrometer tests on portions of cohesive samples obtained. Loss-On Ignition (LOI) tests were performed on portions of samples that visually appeared to contain organics. The Laboratory Testing Procedures in Appendix B provide descriptions of the laboratory tests referenced above.

Upon completion of the laboratory testing, boring logs were prepared including information on materials encountered, penetration resistances, pertinent field observations made during the drilling operations, and the results of the laboratory tests. Explanations of symbols and terms used on the boring logs are provided on the Boring Log Terminology sheet included in Appendix A. The boring logs are included in Appendix A. The soil descriptions included on the boring logs were developed from both visual classification and the results of laboratory tests.

Soil samples are normally retained in our laboratory for 60 days and then disposed, unless instructed otherwise.

5. SIGNATURES

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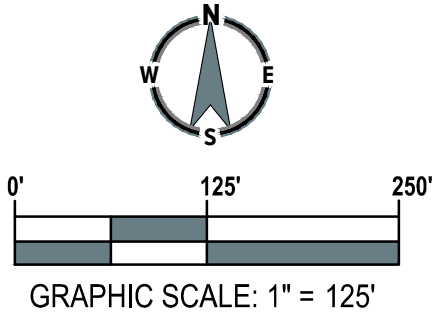
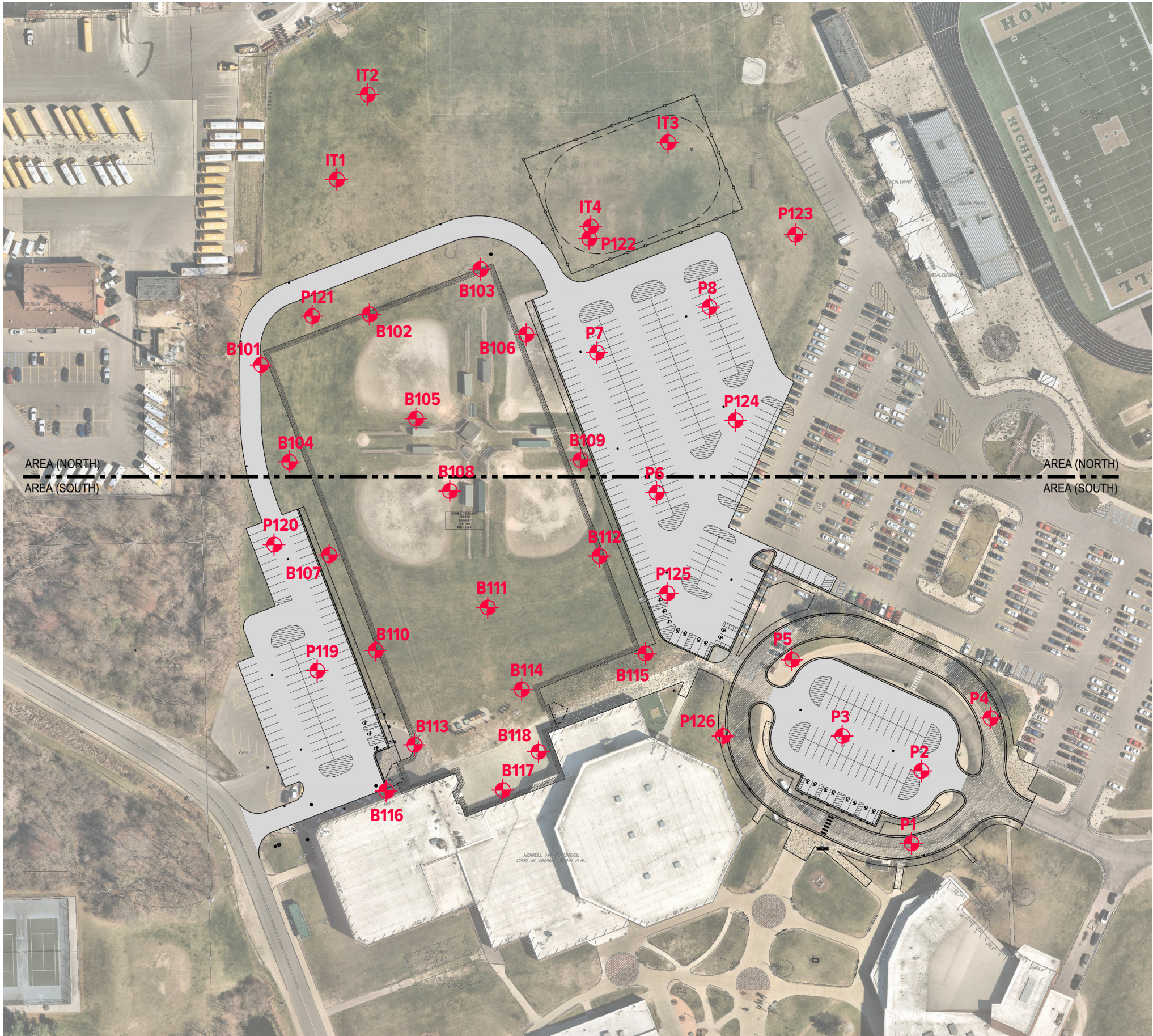
APPENDIX A

BORING LOCATION DIAGRAM (FIGURE NO. 1)

BORING LOG TERMINOLOGY

BORING LOGS (B101 THROUGH B118, IT1 THROUGH IT4, P1 THROUGH P8, AND P119 THROUGH P126)

USACE DCP DATA SHEETS (P1 THROUGH P8, AND P119 THROUGH P126)



LEGEND

 APPROXIMATE BORING LOCATION



- NOTES:
1. AERIAL IMAGE TAKEN FROM NEARMAP WITH A IMAGE DATE ON 4-17-2025.
 2. BASE DRAWING INFORMATION TAKEN FROM A DRAWING TITLED "GENERAL SITE LAYOUT" (SHEET C3.0) WITH A LATEST REVISION DATE OF 6-2-2025, PREPARED BY KINGSCOTT.



SME AND THE SME LOGO ARE FEDERALLY REGISTERED MARKS.
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Project
**HOWELL HIGH SCHOOL
INDOOR ATHELETICS
ADDITION**

Project Location
HOWELL, MICHIGAN

Sheet Name
**BORING LOCATION
DIAGRAM**

No.	Revision Date

Date
09-05-2025

CADD
J. BLAKE

Designer
S. MEEKHOF

Project
099530.00

Figure No.
1

DRAWING NOTE: SCALE DEPICTED IS MEANT FOR 11" X 17"
AND WILL SCALE INCORRECTLY IF PRINTED ON ANY OTHER
SIZE MEDIA

NO REPRODUCTION SHALL BE MADE WITHOUT THE PRIOR
CONSENT OF SME



BORING LOG TERMINOLOGY

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART		
COARSE-GRAINED SOIL (more than 50% of material is larger than No. 200 sieve size.)		
Clean Gravel (Less than 5% fines)		
GRAVEL More than 50% of coarse fraction larger than No. 4 sieve size		GW Well-graded gravel; gravel-sand mixtures, little or no fines
		GP Poorly-graded gravel; gravel-sand mixtures, little or no fines
	Gravel with fines (More than 12% fines)	
		GM Silty gravel; gravel-sand-silt mixtures
		GC Clayey gravel; gravel-sand-clay mixtures
Clean Sand (Less than 5% fines)		
SAND 50% or more of coarse fraction smaller than No. 4 sieve size		SW Well-graded sand; sand-gravel mixtures, little or no fines
		SP Poorly graded sand; sand-gravel mixtures, little or no fines
	Sand with fines (More than 12% fines)	
		SM Silty sand; sand-silt-gravel mixtures
		SC Clayey sand; sand-clay-gravel mixtures
FINE-GRAINED SOIL (50% or more of material is smaller than No. 200 sieve size)		
SILT AND CLAY Liquid limit less than 50%		ML Inorganic silt; sandy silt or gravelly silt with slight plasticity
		CL Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay
		OL Organic silt and organic clay of low plasticity
		MH Inorganic silt of high plasticity, elastic silt
SILT AND CLAY Liquid limit 50% or greater		CH Inorganic clay of high plasticity, fat clay
		OH Organic silt and organic clay of high plasticity
		PT Peat and other highly organic soil
		PT Peat and other highly organic soil

OTHER MATERIAL SYMBOLS		

LABORATORY CLASSIFICATION CRITERIA	
GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3
GP	Not meeting all gradation requirements for GW
GM	Atterberg limits below "A" line or PI less than 4
GC	Atterberg limits above "A" line with PI greater than 7
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3
SP	Not meeting all gradation requirements for SW
SM	Atterberg limits below "A" line or PI less than 4
SC	Atterberg limits above "A" line with PI greater than 7
Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent.....GW, GP, SW, SP More than 12 percent.....GM, GC, SM, SC 5 to 12 percent.....Cases requiring dual symbols • SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel) • SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel) • GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand) • GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand) If the fines are CL-ML: • SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel) • SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel) • GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)	
PARTICLE SIZES	
Boulders	- Greater than 12 inches
Cobbles	- 3 inches to 12 inches
Gravel- Coarse	- 3/4 inches to 3 inches
Fine	- No. 4 to 3/4 inches
Sand- Coarse	- No. 10 to No. 4
Medium	- No. 40 to No. 10
Fine	- No. 200 to No. 40
Silt and Clay	- Less than (0.074 mm)
PLASTICITY CHART	

VISUAL MANUAL PROCEDURE	
When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows: For soils where it is difficult to distinguish if it is a coarse or fine-grained soil: • SC/CL (CLAYEY SAND to Sandy LEAN CLAY) • SM/ML (SILTY SAND to SANDY SILT) • GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY) • GM/ML (SILTY GRAVEL to Gravelly SILT) For soils where it is difficult to distinguish if it is sand or gravel, poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay: • SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand) • SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand) • SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand) • SW/SP (SAND or SAND with Gravel) • GP/GW (GRAVEL or GRAVEL with Sand) • SC/SM (CLAYEY to SILTY SAND) • GM/GC (SILTY to CLAYEY GRAVEL) • CL/ML (SILTY CLAY) • ML/CL (CLAYEY SILT) • CH/MH (FAT CLAY to ELASTIC SILT) • CL/CH (LEAN to FAT CLAY) • MH/ML (ELASTIC SILT to SILT)	
DRILLING AND SAMPLING ABBREVIATIONS	
2ST	- Shelby Tube - 2" O.D.
3ST	- Shelby Tube - 3" O.D.
AS	- Auger Sample
GS	- Grab Sample
LS	- Liner Sample
NR	- No Recovery
PM	- Pressuremeter
RC	- Rock Core diamond bit. NX size, except where noted
SB	- Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted
VS	- Vane Shear
WS	- Wash Sample
OTHER ABBREVIATIONS	
WOH	- Weight of Hammer
WOR	- Weight of Rods
SP	- Soil Probe
PID	- Photo Ionization Device
FID	- Flame Ionization Device
DEPOSITIONAL FEATURES	
Parting	- as much as 1/16 inch thick
Seam	- 1/16 inch to 1/2 inch thick
Layer	- 1/2 inch to 12 inches thick
Stratum	- greater than 12 inches thick
Pocket	- deposit of limited lateral extent
Lens	- lenticular deposit
Hardpan/Till	- an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely
Lacustrine	- soil deposited by lake water
Mottled	- soil irregularly marked with spots of different colors that vary in number and size
Varved	- alternating partings or seams of silt and/or clay
Occasional	- one or less per foot of thickness
Frequent	- more than one per foot of thickness
Interbedded	- strata of soil or beds of rock lying between or alternating with other strata of a different nature
DESCRIPTION OF RELATIVE QUANTITIES	
The visual-manual procedure uses the following terms to describe the relative quantities of notable foreign materials, gravel, sand or fines: Trace - particles are present but estimated to be less than 5% Few - 5 to 10% Little - 15 to 25% Some - 30 to 45% Mostly - 50 to 100%	

CLASSIFICATION TERMINOLOGY AND CORRELATIONS			
Cohesionless Soils		Cohesive Soils	
Relative Density	N ₆₀ (N-Value) (Blows per foot)	Consistency	Undrained Shear Strength (kips/ft ²)
Very Loose	0 to 4	Very Soft	<2
Loose	5 to 10	Soft	2 - 4
Medium Dense	11 to 30	Medium	5 - 8
Dense	31 to 50	Stiff	9 - 15
Very Dense	51 to 80	Very Stiff	16 - 30
Extremely Dense	Over 81	Hard	> 30
Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted. N₆₀ values as reported on boring logs represent raw N-values corrected for hammer efficiency only.			



PROJECT NUMBER: 099530.00

PROJECT LOCATION: Howell, Michigan

BORING METHOD: Solid-stem Augers

CHECKED BY: ARC

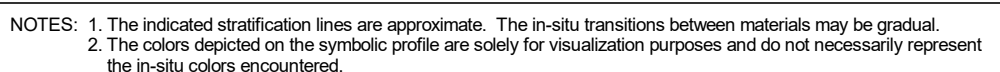


NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

BACKFILL METHOD: Auger Cuttings



CHECKED BY: ARC



11/12/25 8:40:42 AM



BORING B103

PAGE 1 OF 1

BORING DEPTH: 30 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/5/25

COMPLETED: 5/5/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	LEGEND ▼ HAND PENE. ■ TORVANE SHEAR ○ UNC. COMP. □ VANE SHEAR (PK) X VANE SHEAR (REM) ◆ TRIAXIAL (UU) SHEAR STRENGTH (KSF) 1 2 3 4	REMARKS
915	0		6 inches of TOPSOIL								
	0.5		914.5	SB1	24	3	20				
	2.5		912.5			7					
			Fine to Coarse CLAYEY SAND- Few Gravel- Brown- Moist- Medium Dense (SC)								
	5			SB2	24	5	15				
			Fine to Coarse SAND with Silt and Gravel- Brown- Wet- Medium Dense (SP-SM)								
				SB3	24	5	12				
						5					
	8.0		907.0			6					
				SB4	24	4	15	13		4.5+	
						5					
	10					9					
				SB5	18	3	12	15			
						4					
	15					5					
				SB6	18	5	8	11			
			Sandy LEAN CLAY- Few Gravel- Gray- Hard to Stiff (CL)			3					
	20					3					
				SB7	18	2	8	11			
						3					
	25					3					
				SB8	18	5		13			
						6					
	30.0		885.0			7	17				

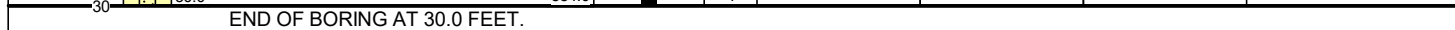
END OF BORING AT 30.0 FEET.

GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	3.0	912.0
▽ AT END OF BORING:	6.0	909.0
BACKFILL METHOD:	Auger Cuttings 30 to 5 feet, Bentonite Chips above 5 feet	

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.



CHECKED BY: ARC



NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

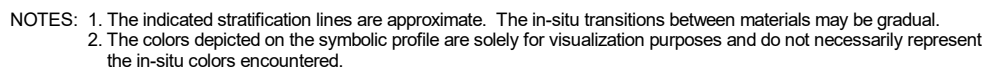
BACKFILL METHOD: Auger Cuttings 30 to 2 feet,
Bentonite Chips above 2 feet



BORING DEPTH: 10 FEET

PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC



BACKFILL METHOD: Auger Cuttings 10 to 2 feet,
Bentonite Chips above 2 feet

11/12/25 8:40:45 AM



BORING B106

PAGE 1 OF 1

BORING DEPTH: 30 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

CLIENT: Howell Public Schools

PROJECT NUMBER: 099530.00

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/5/25

COMPLETED: 5/5/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
915	0		4 inches of Crushed LIMESTONE	SB1	24	3	20				
	0.3		FILL- Fine to Medium SILTY SAND- Brown and Dark Brown- Moist- Medium Dense (SM)			6					
	2.5					9					
	5		FILL- Fine to Medium SAND with Silt- Occasional Clay and Topsoil Seams- Brown- Moist- Medium Dense (SP-SM)	SB2	24	8	13				
	5.5					5					
	5.5		Fine to Coarse SAND with Silt and Gravel- Brown- Wet- Medium Dense (SP-SM)	SB3	24	5	19				
	8.0					7					
	8.0					8					
	10			SB4	24	8	16	12			
	10					7					
	10					5					
	10					6					
	15			SB5	18	4	15	12			
	15					5					
	15					6					
	20		Sandy LEAN CLAY- Sand Layer at 19.5 feet- Gray- Very Stiff to Stiff (CL)	SB6	18	4	12	13			
	20					4					
	20					5					
	25			SB7	18	3	9	12			
	25					4					
	25					3					
	30			SB8	12	6	24	11			
	30					8					
	30					10					
885	30		END OF BORING AT 30.0 FEET.								

GROUNDWATER & BACKFILL INFORMATION

DEPTH (FT) ELEV (FT)

▽ DURING BORING: 5.5 909.5

▽ AT END OF BORING: 11.0 904.0

BACKFILL METHOD:

Auger Cuttings 30 to 5 feet,
Bentonite Chips above 5 feet

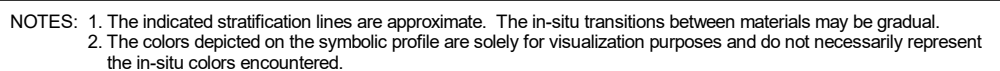
NOTES:

1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.

2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.



CHECKED BY: ARC



11/12/25 8:40:48 AM



BORING B108

PAGE 1 OF 1

BORING DEPTH: 10 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/8/25

COMPLETED: 5/8/25

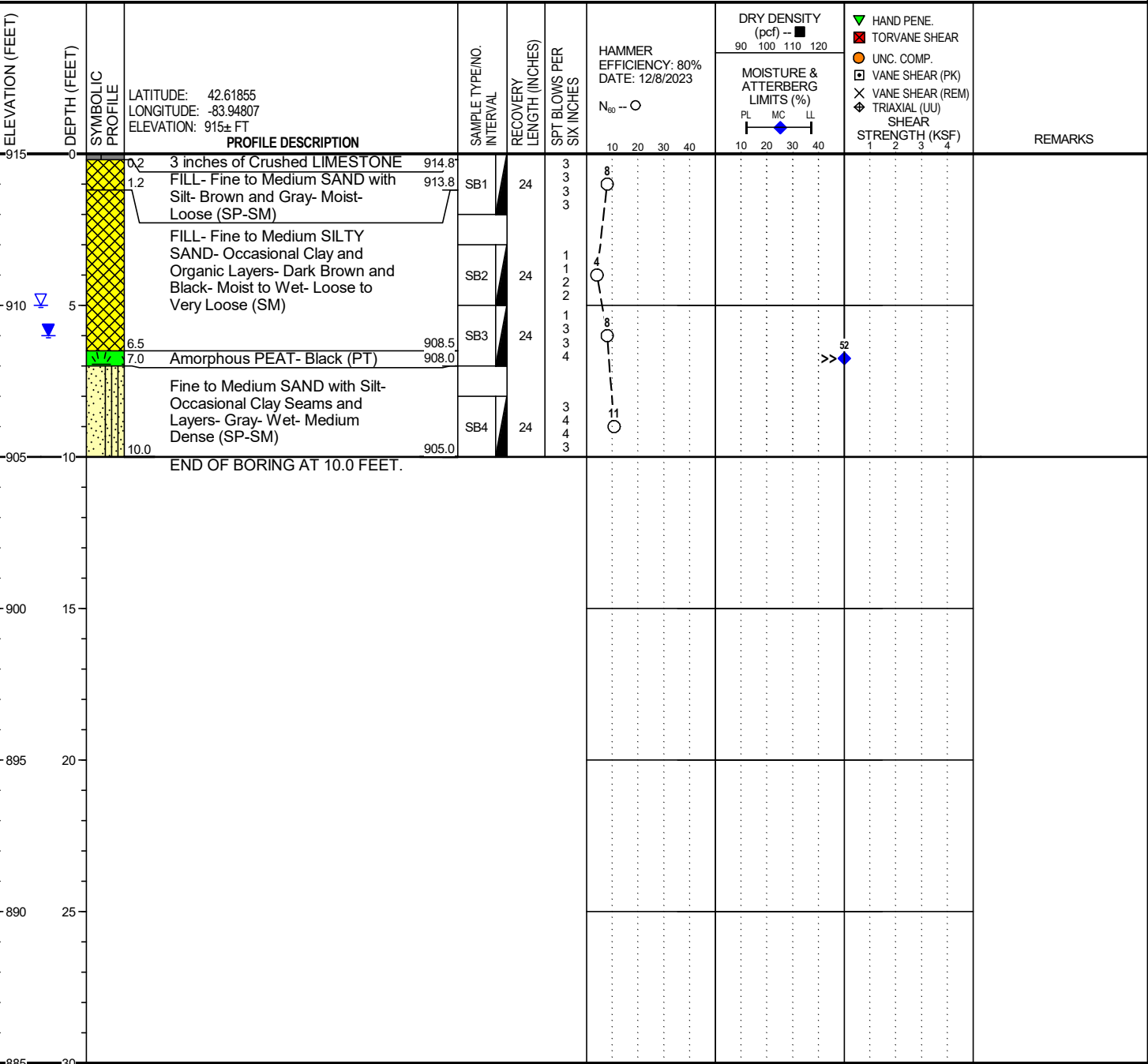
BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

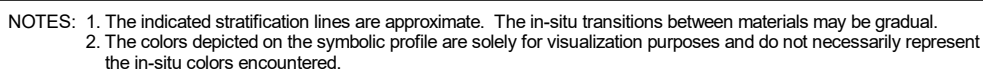
LOGGED BY: SMM

CHECKED BY: ARC



GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.0	910.0
▽ AT END OF BORING:	6.0	909.0
BACKFILL METHOD:	Auger Cuttings 10 to 2 feet, Bentonite Chips above 2 feet	

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.





CHECKED BY: ARC



NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

BACKFILL METHOD: Auger Cuttings 30 to 2 feet,
Bentonite Chips above 2 feet

11/12/25 8:40:51 AM



BORING B111

PAGE 1 OF 1

BORING DEPTH: 10 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/8/25

COMPLETED: 5/8/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61819 LONGITUDE: -83.94791 ELEVATION: 915± FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
915	0			3 inches of TOPSOIL								
				FILL- Fine to Medium SILTY SAND- Occasional Clay Layers- Dark Brown and Brown- Moist- Medium Dense to Loose (SM)	SB1	18	3 4 5 5	12	13			Test was performed on a clay layer.
	3.5			Buried TOPSOIL- Fine to Medium CLAYEY SAND- Dark Brown and Black- Moist- Loose (SC)	SB2	24	4 3 2 4	7	20 26			LOI= 8.2%
910	5			LEAN CLAY- Occasional Root Fibers- Gray- Stiff to Very Stiff (CL)	SB3	24	4 5 5 7	13	16			
	9.0			Sandy LEAN CLAY- Gray- Hard (CL)	SB4	24	5 5 7 8	16	15			4.5+
905	10			END OF BORING AT 10.0 FEET.								
900	15											
895	20											
890	25											
885	30											

GROUNDWATER & BACKFILL INFORMATION
GROUNDWATER WAS NOT ENCOUNTERED
BACKFILL METHOD: Auger Cuttings

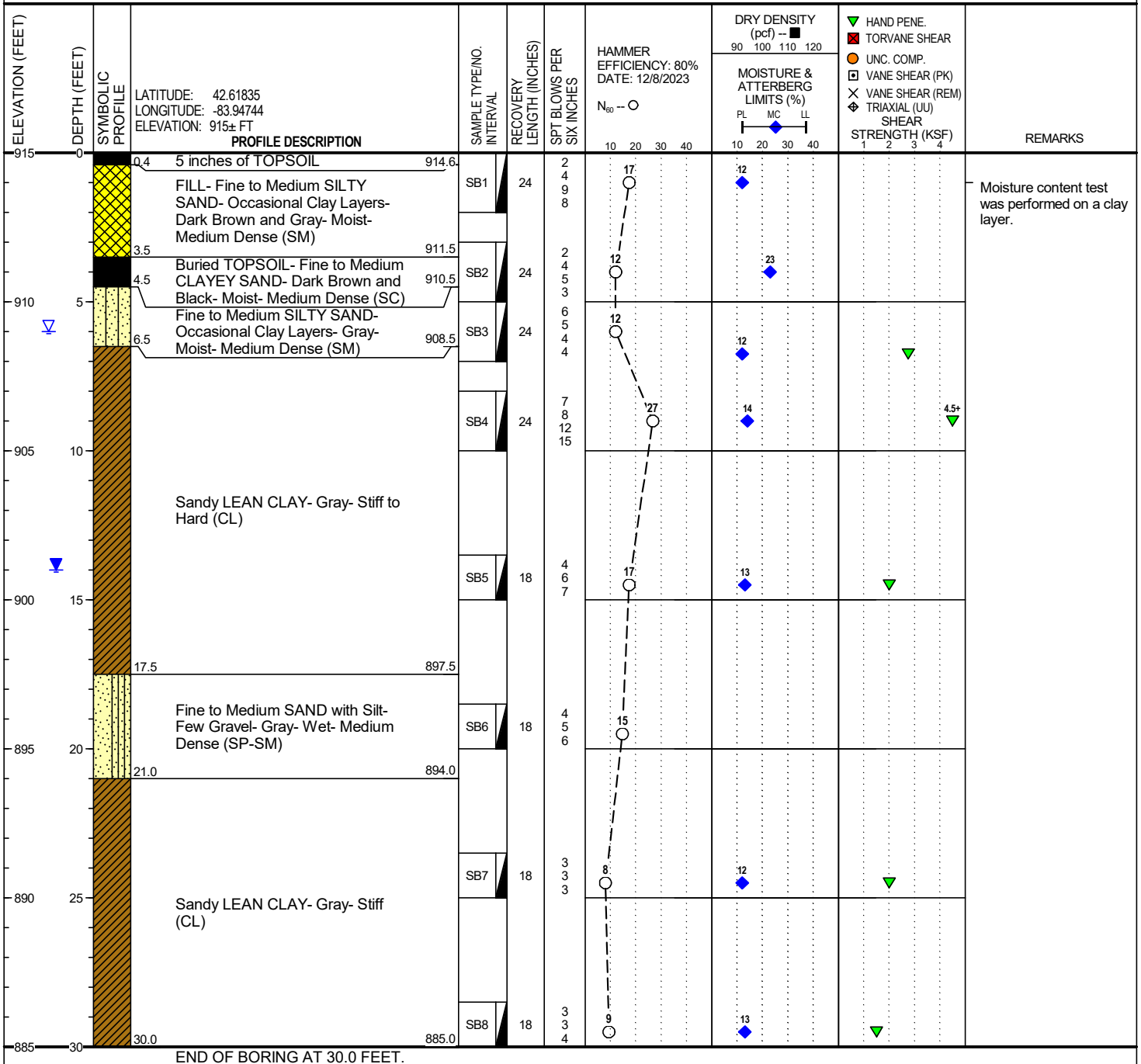
NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.



BORING DEPTH: 30 FEET

PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC



NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

	DEPTH (FT)	ELEV (FT)
 DURING BORING:	6.0	909.0
 AT END OF BORING:	14.0	901.0
BACKFILL METHOD: Auger Cuttings 30 to 2 feet, Bentonite Chjps above 2 feet		

11/12/25 8:40:54 AM



BORING B113

PAGE 1 OF 1

BORING DEPTH: 30 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

CLIENT: Howell Public Schools

DATE STARTED: 5/7/25

DRILLER: RM

PROJECT NUMBER: 099530.00

PROJECT LOCATION: Howell, Michigan

COMPLETED: 5/7/25

RIG NO.: 531 (CME55LCX)

BORING METHOD: Solid-stem Augers

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61776 LONGITUDE: -83.94823 ELEVATION: 914± FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	▼ HAND PENE. ✖ TORVANE SHEAR ● UNC. COMP. ☐ VANE SHEAR (PK) ✕ VANE SHEAR (REM) ◆ TRIAXIAL (UU) SHEAR STRENGTH (KSF) 1 2 3 4	REMARKS
	0			4 inches of TOPSOIL								
	5			FILL- Fine to Medium SILTY SAND- Occasional Clay Seams- Dark Brown and Brown- Moist- Medium Dense to Loose (SM)	SB1	18	2 4 5	12				
910	5				SB2	24	5 3 4 7	9				
	5.5				SB3	24	5 6 8 8	19	12		4.5+	
905	10				SB4	24	5 6 8 9	19	13		4.5+	
				Sandy LEAN CLAY- Gray- Hard to Stiff (CL)								
900	15				SB5	18	4 4 5	12	14			
	18.0											
895	20			Fine SILTY SAND- Gray- Wet- Medium Dense (SM)	SB6	18	3 4 6	13				
	22.5											
890	25				SB7	18	3 3 4	9	12			
				Sandy LEAN CLAY- Few Gravel- Gray- Stiff (CL)								
885	30				SB8	18	3 4 4	11	12			
	30.0			END OF BORING AT 30.0 FEET.								

GROUNDWATER & BACKFILL INFORMATION

DEPTH (FT) ELEV (FT)

▼ DURING BORING: 5.0 909.0

▼ AT END OF BORING: 11.0 903.0

BACKFILL METHOD: Auger Cuttings capped with Asphalt Cold Patch

NOTES:

1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.

2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/12/25 8:40:55 AM



BORING B114

PAGE 1 OF 1

BORING DEPTH: 20 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/8/25

COMPLETED: 5/8/25

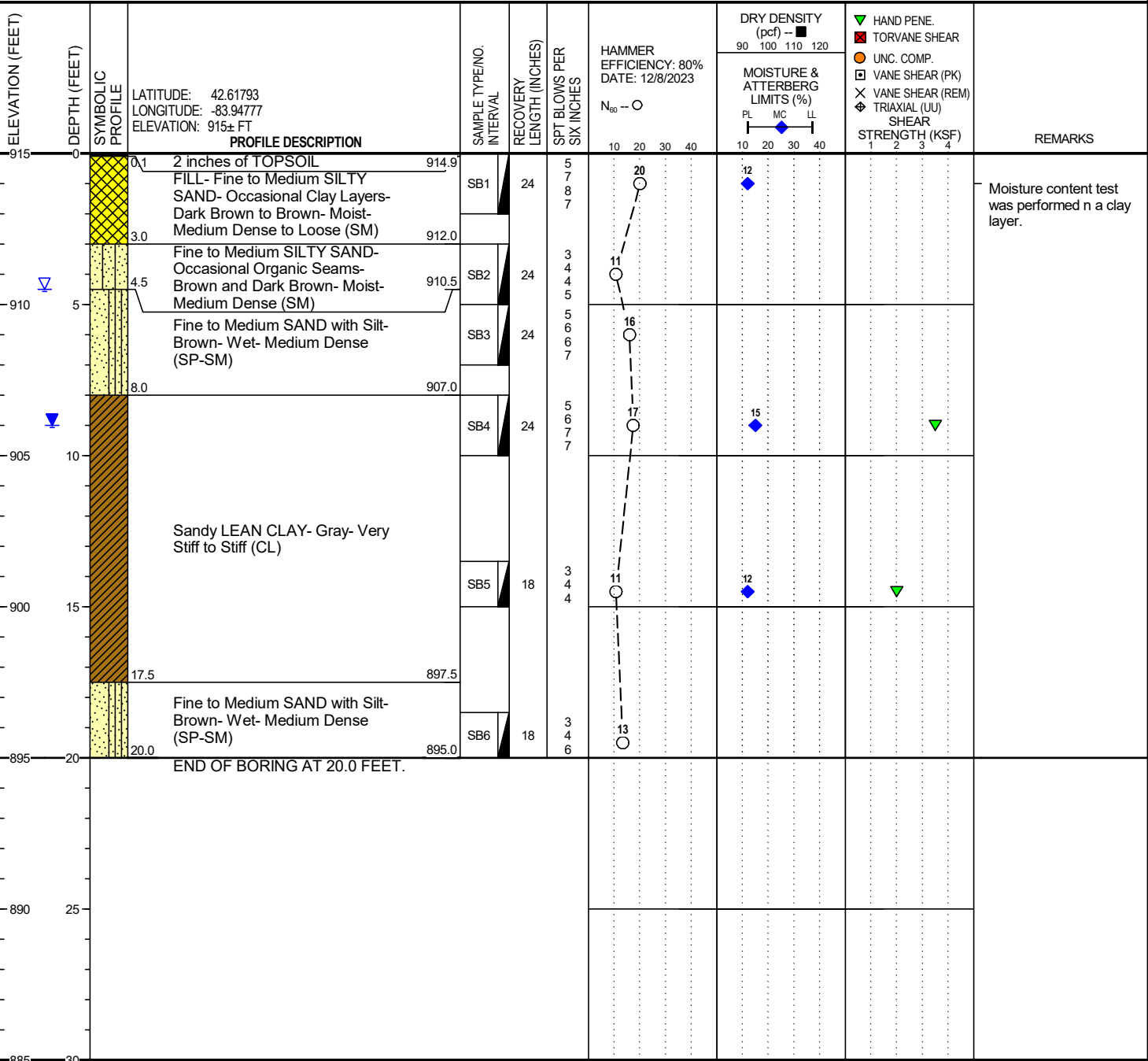
BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC



GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	4.5	910.5
▽ AT END OF BORING:	9.0	906.0
BACKFILL METHOD: Auger Cuttings		

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.



PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC



NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

BACKFILL METHOD: Auger Cuttings 30 to 2 feet,
Bentonite Chips above 2 feet

11/12/25 8:40:58 AM



BORING B116

PAGE 1 OF 1

BORING DEPTH: 20 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/8/25

COMPLETED: 5/8/25

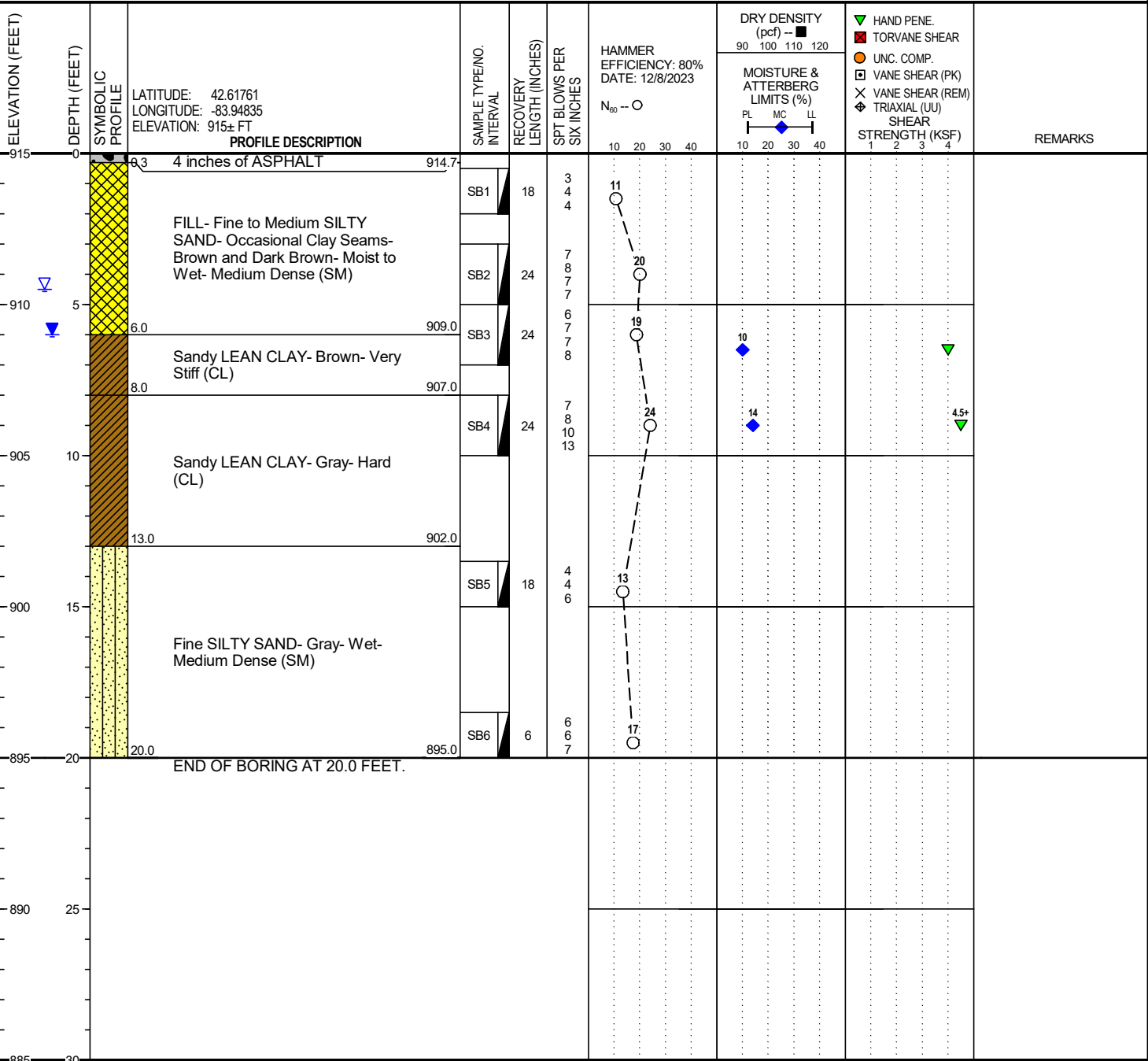
BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

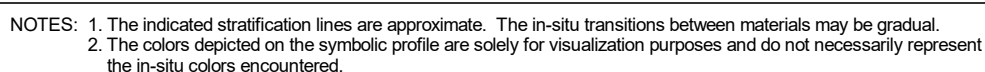


GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	4.5	910.5
▽ AT END OF BORING:	6.0	909.0
BACKFILL METHOD:	Auger Cuttings capped with Asphalt Cold Patch	

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.



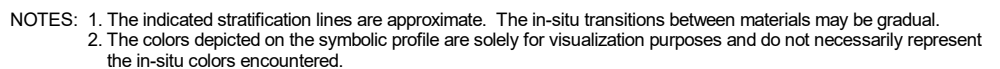
CHECKED BY: ARC





PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC



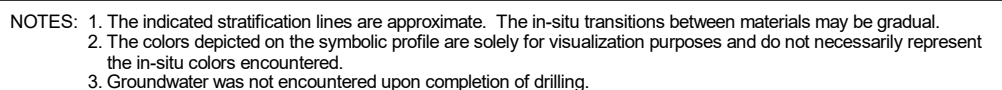
DEPTH (FT) ELEV (FT)

BACKFILL METHOD: Auger Cuttings capped with Concrete



PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC



BACKFILL METHOD: Auger Cuttings capped with EPCO Hole Plug

11/12/25 8:41:02 AM



BORING IT2

PAGE 1 OF 1

BORING DEPTH: 20 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 8/11/25

COMPLETED: 8/11/25

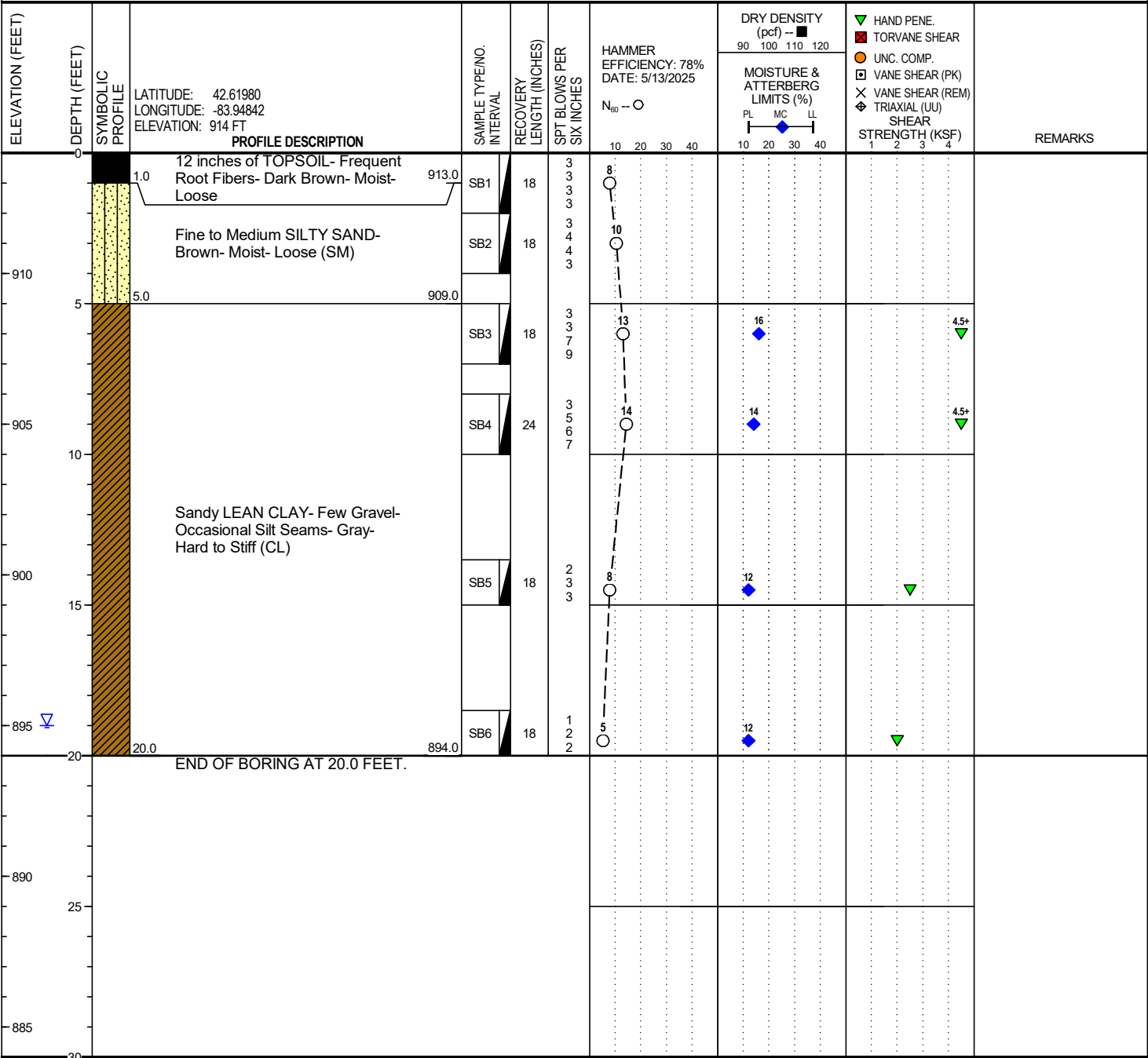
BORING METHOD: Hollow-stem Augers

DRILLER: WN

RIG NO.: 552 (CME 55)

LOGGED BY: SMM

CHECKED BY: ARC



GROUNDWATER & BACKFILL INFORMATION			NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered. 3. Groundwater was not encountered upon completion of drilling.
DEPTH (FT)	ELEV (FT)		
▽ DURING BORING:	19.0	895.0	
▽ AT END OF BORING:	Note 3		
BACKFILL METHOD:	Auger Cuttings & Bentonite Chips capped with EPCO Hole Plug		

11/12/25 8:41:04 AM



BORING IT3

PAGE 1 OF 1

BORING DEPTH: 20 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 8/11/25

COMPLETED: 8/11/25

BORING METHOD: Hollow-stem Augers

DRILLER: WN

RIG NO.: 552 (CME 55)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 78% DATE: 5/13/2025 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
	0		0.7 8 inches of TOPSOIL 913.8	SB1	18	8	27	13		4.5+	
	5		Sandy LEAN CLAY- Few Gravel- Occasional Silt and Sand Seams- Brown- Hard to Stiff (CL)	SB2	18	11	25	14		4.5+	
910			7.0 907.5	SB3	18	2	5	30			Sample SB3 was too disturbed to perform a shear strength test.
	10			SB4	24	3	8	12			
905			Sandy LEAN CLAY- Gray- Very Stiff to Hard (CL)	SB5	18	2	9	12			
900	15					3					
	20		20.0 894.5	SB6	18	3	16	13		4.5+	
895			END OF BORING AT 20.0 FEET.			6					
	25										
890											
	30										
885											

GROUNDWATER & BACKFILL INFORMATION	NOTES:
GROUNDWATER WAS NOT ENCOUNTERED	1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
BACKFILL METHOD: Auger Cuttings capped with EPCO Hole Plug	2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/12/25 8:41:05 AM



BORING IT4

PAGE 1 OF 1

BORING DEPTH: 20 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

CLIENT: Howell Public Schools

PROJECT NUMBER: 099530.00

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 8/11/25

COMPLETED: 8/11/25

BORING METHOD: Hollow-stem Augers

DRILLER: WN

RIG NO.: 552 (CME 55)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)

DEPTH (FEET)

SYMBOLIC PROFILE

LATITUDE: 42.61939

LONGITUDE: -83.94747

ELEVATION: 915 FT

PROFILE DESCRIPTION

SAMPLE TYPE/NO. INTERVAL

RECOVERY LENGTH (INCHES)

SPT BLOWS PER SIX INCHES

HAMMER EFFICIENCY: 78%

DATE: 5/13/2025

N₆₀ -- O

DRY DENSITY (pcf) -- ■

90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)

PL MC LL

▼ HAND PENE.

■ TORVANE SHEAR

● UNC. COMP.

□ VANE SHEAR (PK)

✕ VANE SHEAR (REM)

◆ TRIAXIAL (UU)

▲ SHEAR STRENGTH (KSF)

1 2 3 4

REMARKS

915

0

0.7

8 inches of TOPSOIL

914.3

SB1

15

4

8

8

9

21

910

5

5.0

Fine to Coarse SAND with Gravel- Occasional Root Fibers and Clay Seams- Brown- Moist- Medium Dense (SP)

910.0

SB2

12

6

5

4

3

12

905

10

9.0

Sandy LEAN CLAY- Occasional Silt Seams- Gray- Hard (CL)

906.0

SB3

24

4

7

9

11

21

15

4.5+

900

15

13.5

Fine to Medium SILTY SAND- Occasional Clay Seams- Gray- Wet- Medium Dense (SM)

901.5

SB4

24

3

6

9

11

20

895

20

20.0

Sandy LEAN CLAY- Trace Gravel- Gray- Very Stiff to Stiff (CL)

895.0

SB5

18

2

4

4

10

12

890

25

SB6

18

1

1

1

3

13

885

30

END OF BORING AT 20.0 FEET.

GROUNDWATER & BACKFILL INFORMATION

DEPTH (FT) ELEV (FT)

▼ DURING BORING: 9.0 906.0

▼ AT END OF BORING: Note 3

BACKFILL METHOD: Auger Cuttings capped with EPCO Hole Plug

NOTES:

1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.

2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

3. Groundwater was not encountered upon completion of drilling.

11/12/25 8:41:06 AM



BORING P 1

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 8/12/25

COMPLETED: 8/12/25

BORING METHOD: Solid-stem Augers

DRILLER: WN

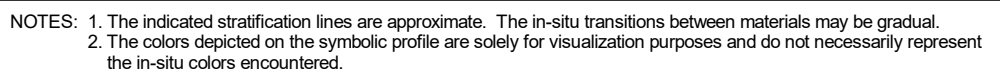
RIG NO.: 552 (CME 55)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61744 LONGITUDE: -83.94611 ELEVATION: 913.5 FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 78% DATE: 5/13/2025 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
	0			4.3 4 inches of ASPHALT 913.2								
	1.3			12 inches of SAND and GRAVEL 912.2								
				LEAN CLAY- Occasional Topsoil and Silt Seams- Brown and Gray- Hard (CL)	SB1	18	5 6 6	16		13	4.5+	
910								16				
	5			5.0 908.5	SB2	18	5 6 8	16		11	4.5+	
				END OF BORING AT 5.0 FEET.								
905												
10												
900												
15												
895												
20												
890												
25												
885												
30												

GROUNDWATER & BACKFILL INFORMATION	
GROUNDWATER WAS NOT ENCOUNTERED	NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
BACKFILL METHOD: Auger Cuttings capped with EPCO Hole Plug	



11/12/25 8:41:08 AM



BORING P 3

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 8/12/25

COMPLETED: 8/12/25

BORING METHOD: Solid-stem Augers

DRILLER: WN

RIG NO.: 552 (CME 55)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 78% DATE: 5/13/2025 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
	0		0.2 2 inches of ASPHALT 912.3								
	1.0		10 inches of SAND and GRAVEL 911.5								
910			FILL- Sandy LEAN CLAY- Few Gravel- Trace Asphalt Millings- Brown- Hard (CL) 909.0	SB1	18	2 4 5	12		17	4.5+	
	3.5										
	5.0		LEAN CLAY- Gray- Hard (CL) 907.5	SB2	18	5 6 6	16		14	4.5+	
5			END OF BORING AT 5.0 FEET.								
905											
10											
900											
15											
895											
20											
890											
25											
885											
30											

GROUNDWATER & BACKFILL INFORMATION	NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
GROUNDWATER WAS NOT ENCOUNTERED	
BACKFILL METHOD: Auger Cuttings capped with Asphalt Cold Patch & EPCO Hole Plug	

11/12/25 8:41:09 AM



BORING P 4

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 8/12/25

COMPLETED: 8/12/25

BORING METHOD: Solid-stem Augers

DRILLER: WN

RIG NO.: 552 (CME 55)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61783 LONGITUDE: -83.94577 ELEVATION: 915 FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 78% DATE: 5/13/2025 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
915	0			0.5 6 inches of TOPSOIL 914.5								
				1.0 FILL- Fine SILTY SAND- Brown- Moist- Medium Dense (SM) 914.0	SB1	18	7 10 15					
				Sandy LEAN CLAY- Brown- Hard (CL)								
910	5			5.0 910.0	SB2	18	8 8 6					
				END OF BORING AT 5.0 FEET.								
905	10											
900	15											
895	20											
890	25											
885	30											

GROUNDWATER & BACKFILL INFORMATION	
GROUNDWATER WAS NOT ENCOUNTERED	
BACKFILL METHOD: Auger Cuttings	NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/12/25 8:41:10 AM



BORING P 5

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 8/12/25

COMPLETED: 8/12/25

BORING METHOD: Solid-stem Augers

DRILLER: WN

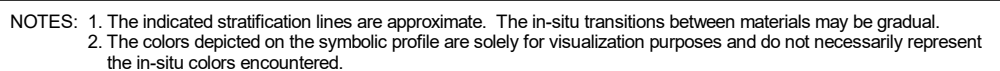
RIG NO.: 552 (CME 55)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61802 LONGITUDE: -83.94662 ELEVATION: 914.5 FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 78% DATE: 5/13/2025 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAxIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
	0			0.7 8 inches of TOPSOIL 913.8								
				1.7 12 inches of SAND and GRAVEL 912.8	SB1	18	3 4 3	9		12		
				FILL- Sandy LEAN CLAY- Few Gravel- Occasional Topsoil Seams- Brown and Dark Brown- Very Stiff (CL) 911.0								
910				Sandy LEAN CLAY- Gray- Hard (CL) 909.5	SB2	18	3 5 5	13		17		
	5			END OF BORING AT 5.0 FEET.								
	10											
	15											
	20											
	25											
	30											

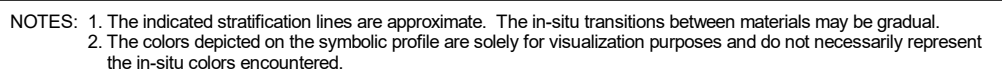
GROUNDWATER & BACKFILL INFORMATION	NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
GROUNDWATER WAS NOT ENCOUNTERED	
BACKFILL METHOD: Auger Cuttings capped with EPCO Hole Plug	





PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC

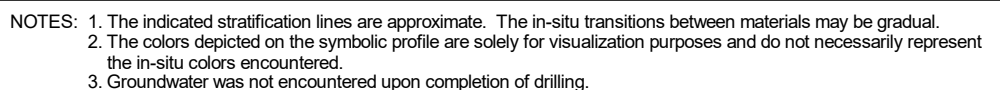


BACKFILL METHOD: Auger Cuttings capped with EPCO Hole Plug



PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC



BACKFILL METHOD: Auger Cuttings

11/12/25 8:41:14 AM



BORING P119

PAGE 1 OF 1

BORING DEPTH: 7 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/7/25

COMPLETED: 5/7/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

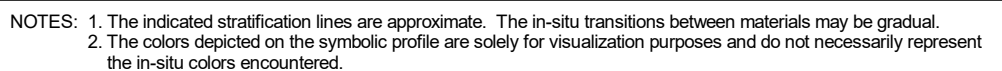
ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	LEGEND ▼ HAND PENE. ■ TORVANE SHEAR ● UNC. COMP. □ VANE SHEAR (PK) X VANE SHEAR (REM) ◆ TRIAXIAL (UU) SHEAR STRENGTH (KSF) 1 2 3 4	REMARKS
913.8	0.2		3 inches of TOPSOIL	SB1	24	3		9			
910.0	4.0		FILL- Sandy LEAN CLAY- Few Gravel- Occasional Root Fibers- Gray, Dark Brown, & Brown- Hard to Very Stiff (CL)	SB2	24	5		15			
909.0	5.0		Buried TOPSOIL- Fine to Medium CLAYEY SAND- Occasional Root Fibers- Dark Brown and Black- Moist- Very Loose (SC)	SB3	24	1		49			LOI= 10.2%
908.0	6.0		Fine to Medium SAND with Silt- Gray- Wet- Medium Dense (SP-SM)			2					
907.0	7.0		LEAN CLAY- Frequent Silt Seams- Gray- Hard (CL)			3		12			
905			END OF BORING AT 7.0 FEET.			5					
900						9					
895											
890											
885											

GROUNDWATER & BACKFILL INFORMATION			NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
DEPTH (FT)	ELEV (FT)		
▼ DURING BORING:	5.0	909.0	
▼ AT END OF BORING:	5.0	909.0	
BACKFILL METHOD: Auger Cuttings			



PROJECT LOCATION: Howell, Michigan

CHECKED BY: ARC



BACKFILL METHOD: Auger Cuttings

11/12/25 8:41:17 AM



BORING P121

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/5/25

COMPLETED: 5/5/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61911 LONGITUDE: -83.94866 ELEVATION: 915± FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
915	0			0.2 3 inches of TOPSOIL 914.8	SB1	24	3	9				
				FILL- Fine to Medium SAND with Silt- Frequent Root Fibers- Occasional Clay Seams- Brown and Dark Brown- Moist- Loose (SP-SM)			4	1				
				3.0			4	1				
				4.0 Fine to Medium CLAYEY SAND- Dark Brown- Moist- Medium Dense (SC) 911.0	SB2	24	5	12	15			
				4.5 910.5			4					
				5.0 910.0			4					
910	5			LEAN CLAY- Frequent Silt Seams- Brown and Gray- Very Stiff (CL)								
				Fine to Medium SILTY SAND- Gray- Moist- Medium Dense (SM)								
				END OF BORING AT 5.0 FEET.								
905	10											
900	15											
895	20											
890	25											
885	30											

GROUNDWATER & BACKFILL INFORMATION		NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
GROUNDWATER WAS NOT ENCOUNTERED		
BACKFILL METHOD: Auger Cuttings		

11/12/25 8:41:18 AM



BORING P122

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/5/25

COMPLETED: 5/5/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61935 LONGITUDE: -83.94747 ELEVATION: 915± FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■		MOISTURE & ATTERBERG LIMITS (%)		REMARKS
									90	100	110	120	
915	0			13 inches of TOPSOIL	913.9	SB1	24	3					
				Fine to Coarse SAND with Silt- Few Gravel- Brown- Moist- Medium Dense (SP-SM)	912.0			6					
				Fine to Coarse SILTY SAND with Gravel- Occasional Clay Seams- Brown- Moist- Medium Dense (SM)	910.0	SB2	24	4					
910	5			END OF BORING AT 5.0 FEET.				13					
905	10												
900	15												
895	20												
890	25												
885	30												

GROUNDWATER & BACKFILL INFORMATION
GROUNDWATER WAS NOT ENCOUNTERED
BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/12/25 8:41:19 AM



BORING P123

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/2/25

COMPLETED: 5/2/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61936 LONGITUDE: -83.94659 ELEVATION: 916± FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
915	0.5	6 inches of TOPSOIL	915.5		SB1	24	5 4 4 5	11 9				
		Fine SAND- Few Silt and Gravel- Brown- Moist- Medium Dense to Loose (SP)			SB2	24	3 4 3 5					
910	5.0	END OF BORING AT 5.0 FEET.	911.0									
905												
900												
895												
890												
30												

GROUNDWATER & BACKFILL INFORMATION	NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual. 2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
GROUNDWATER WAS NOT ENCOUNTERED	
BACKFILL METHOD: Auger Cuttings 5 to 2 feet, Bentonite Chips above 2 feet	

11/12/25 8:41:20 AM



BORING P124

PAGE 1 OF 1

BORING DEPTH: 5 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 5/2/25

COMPLETED: 5/2/25

BORING METHOD: Solid-stem Augers

DRILLER: RM

RIG NO.: 531 (CME55LCX)

LOGGED BY: SMM

CHECKED BY: ARC

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61877 LONGITUDE: -83.94685 ELEVATION: 915± FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 12/8/2023 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. TORVANE SHEAR UNC. COMP. VANE SHEAR (PK) VANE SHEAR (REM) TRIAXIAL (UU) SHEAR STRENGTH (KSF)	REMARKS
915	0			13 inches of TOPSOIL	SB1	24	9 9 4 4	17		14	4.5+	
				Sandy LEAN CLAY- Occasional Sand Layers- Brown- Hard (CL)	SB2	18	5 4 6 3	13		16	4.5+	
910	5			END OF BORING AT 5.0 FEET.								
905	10											
900	15											
895	20											
890	25											
885	30											

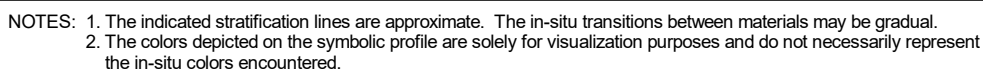
GROUNDWATER & BACKFILL INFORMATION
GROUNDWATER WAS NOT ENCOUNTERED
BACKFILL METHOD: Auger Cuttings 5 to 2 feet, Bentonite Chips above 2 feet

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.



PROJECT LOCATION: Howell, Michigan

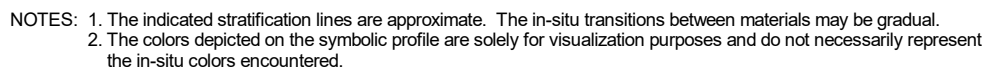
CHECKED BY: ARC



BACKFILL METHOD: Auger Cuttings 7 to 2 feet,
Bentonite Chips above 2 feet



CHECKED BY: ARC





USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition

PROJECT NO.: 099530.00

LOCATION: Howell, Michigan

CLIENT: Howell Public Schools

DATE: 8/12/25

BY: WN

DEPTH TO START OF TEST FROM SURFACE: 0 inches

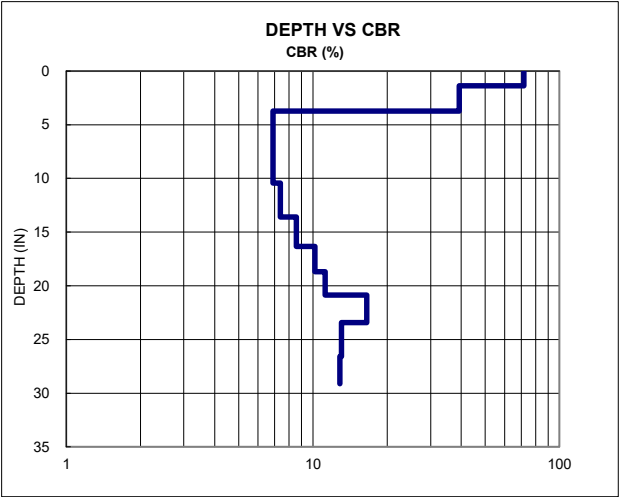
PROBE/CORE: P1

GROUND EL: 913.5 feet

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	325	0						
10	360	35	4	1	71.8	1.4		
10	420	60	6	1	39.3	3.7		
3	505	85	28	1	6.9	7.1		
3	590	85	28	1	6.9	10.4		
3	670	80	27	1	7.4	13.6		
3	740	70	23	1	8.6	16.3		
3	800	60	20	1	10.2	18.7		
3	855	55	18	1	11.2	20.9		
5	920	65	13	1	16.5	23.4		
5	1000	80	16	1	13.1	26.6		
4	1065	65	16	1	12.9	29.1		

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor CBR 5-10: Marginal

CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface

During Drilling: See Note 1

Upon Completion: See Note 1

Depth of Frost From Surface : See Note 1

From	To	Material
		See Note 1



USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition

PROJECT NO.: 099530.00

LOCATION: Howell, Michigan

CLIENT: Howell Public Schools

DATE: 8/12/25

BY: WN

DEPTH TO START OF TEST FROM SURFACE: 0 inches

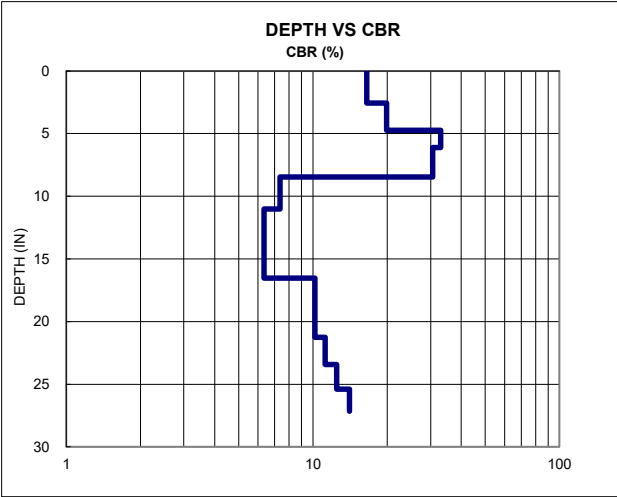
PROBE/CORE: P2

GROUND EL: 913.0 feet

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	350	0						
5	415	65	13	1	16.5	2.6		
5	470	55	11	1	19.9	4.7		
5	505	35	7	1	33.0	6.1		
8	565	60	8	1	30.6	8.5		
3	630	65	22	1	7.4	11.0		
3	700	70	23	1	6.3	13.8		
3	770	70	23	1	6.3	16.5		
3	830	60	20	1	10.2	18.9		
3	890	60	20	1	10.2	21.3		
3	945	55	18	1	11.2	23.4		
3	995	50	17	1	12.5	25.4		
3	1040	45	15	1	14.1	27.2		

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor CBR 5-10: Marginal

CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface

During Drilling: See Note 1

Upon Completion: See Note 1

Depth of Frost From Surface :

See Note 1

From	To	Material
		<u>See Note 1</u>



USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition

PROJECT NO.: 099530.00

LOCATION: Howell, Michigan

CLIENT: Howell Public Schools

DATE: 8/12/25

BY: WN

DEPTH TO START OF TEST FROM SURFACE: 0 inches

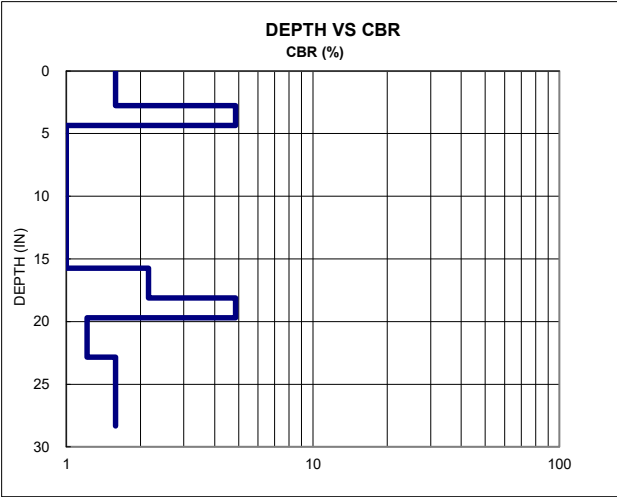
PROBE/CORE: P3

GROUND EL: 912.5 feet

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	310	0						
3	380	70	23	2	1.6	2.8	Very Poor	
3	420	40	13	2	4.9	4.3	Poor	
3	520	100	33	2	0.8	8.3	Very Poor	
2	630	110	55	2	0.3	12.6	Very Poor	
2	710	80	40	2	0.5	15.7	Very Poor	
3	770	60	20	2	2.2	18.1	Very Poor	
3	810	40	13	2	4.9	19.7	Poor	
3	890	80	27	2	1.2	22.8	Very Poor	
3	960	70	23	2	1.6	25.6	Very Poor	
3	1030	70	23	2	1.6	28.3	Very Poor	

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor CBR 5-10: Marginal

CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface

During Drilling: See Note 1

Upon Completion: See Note 1

Depth of Frost From Surface : See Note 1

From	To	Material
		See Note 1



USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition

PROJECT NO.: 099530.00

LOCATION: Howell, Michigan

CLIENT: Howell Public Schools

DATE: 8/12/25

BY: WN

DEPTH TO START OF TEST FROM SURFACE: 0 inches

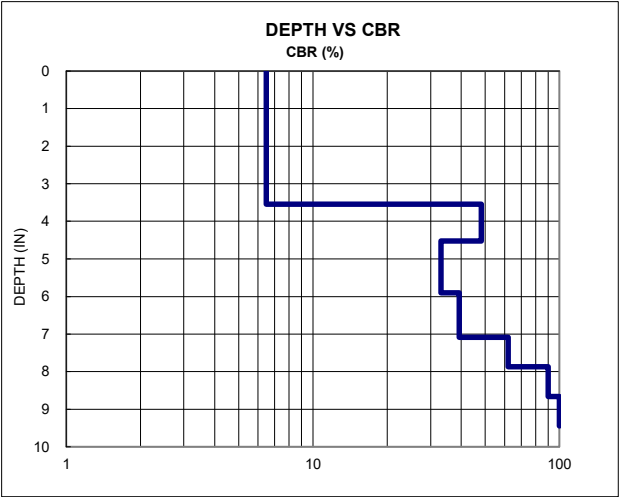
PROBE/CORE: P4

GROUND EL: 915.0 feet

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	150	0						
3	240	90	30	1	6.5	3.5		
5	265	25	5	1	48.1	4.5		
5	300	35	7	1	33.0	5.9		
5	330	30	6	1	39.3	7.1		
5	350	20	4	1	61.8	7.9		
7	370	20	3	1	90.1	8.7		
7	380	10	1	1	100.0	9.1		
17	390	10	1	1	100.0	9.4		
50	395	5	0	1	100.0	9.6		

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor CBR 5-10: Marginal

CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface

During Drilling: See Note 1

Upon Completion: See Note 1

Depth of Frost From Surface : See Note 1

From	To	Material
		See Note 1



USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition

PROJECT NO.: 099530.00

LOCATION: Howell, Michigan

CLIENT: Howell Public Schools

DATE: 8/12/25

BY: WN

DEPTH TO START OF TEST FROM SURFACE: 0 inches

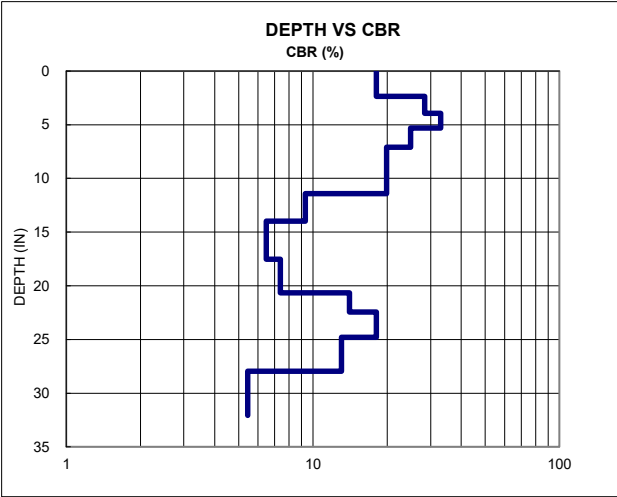
PROBE/CORE: P5

GROUND EL: 914.5 feet

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	180	0						
5	240	60	12	1	18.1	2.4		
5	280	40	8	1	28.4	3.9		
5	315	35	7	1	33.0	5.3		
5	360	45	9	1	24.9	7.1		
5	415	55	11	1	19.9	9.3		
5	470	55	11	1	19.9	11.4		
3	535	65	22	1	9.3	14.0		
3	625	90	30	1	6.5	17.5		
3	705	80	27	1	7.4	20.7		
3	750	45	15	1	14.1	22.4		
5	810	60	12	1	18.1	24.8		
5	890	80	16	1	13.1	28.0		
3	995	105	35	1	5.4	32.1		

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor CBR 5-10: Marginal

CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface

During Drilling: See Note 1

Upon Completion: See Note 1

Depth of Frost From Surface :

See Note 1

From	To	Material
		See Note 1



USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition

PROJECT NO.: 099530.00

LOCATION: Howell, Michigan

CLIENT: Howell Public Schools

DATE: 8/12/25

BY: WN

DEPTH TO START OF TEST FROM SURFACE: 0 inches

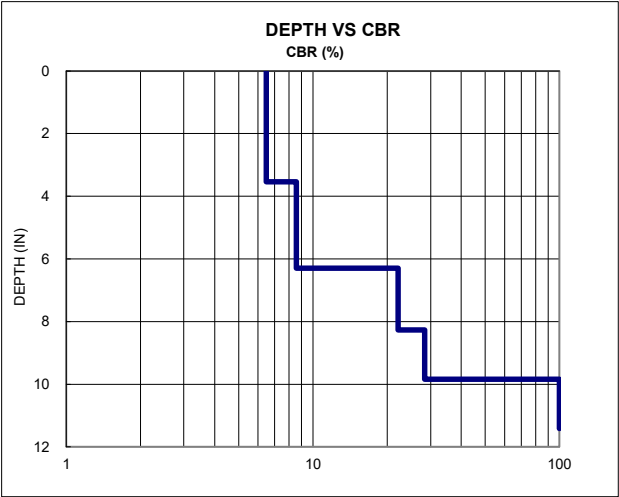
PROBE/CORE: P6

GROUND EL: 915.0 feet

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	140	0						
3	230	90	30	1	6.5	3.5		
3	300	70	23	1	8.6	6.3		
5	350	50	10	1	22.2	8.3		
5	390	40	8	1	28.4	9.8		
10	400	10	1	1	100.0	10.2		
20	410	10	1	1	100.0	10.6		
40	420	10	0	1	100.0	11.0		
30	430	10	0	1	100.0	11.4		
50	435	5	0	1	100.0	11.6		

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions
CBR< 3: Very Poor CBR 5-10: Marginal
CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface
During Drilling: See Note 1
Upon Completion: See Note 1

Depth of Frost From Surface : See Note 1

From	To	Material
		See Note 1



USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition

PROJECT NO.: 099530.00

LOCATION: Howell, Michigan

CLIENT: Howell Public Schools

DATE: 8/12/25

BY: WN

DEPTH TO START OF TEST FROM SURFACE: 0 inches

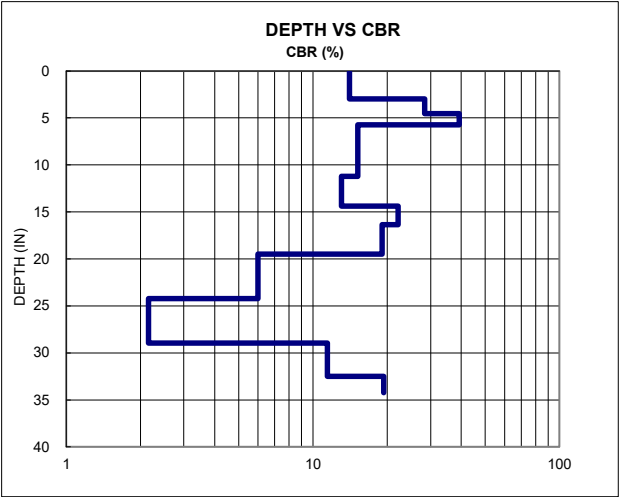
PROBE/CORE: P7

GROUND EL: 915.0 feet

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	155	0						
5	230	75	15	1	14.1	3.0		
5	270	40	8	1	28.4	4.5		
5	300	30	6	1	39.3	5.7		
5	370	70	14	1	15.2	8.5		
5	440	70	14	1	15.2	11.2		
5	520	80	16	1	13.1	14.4		
5	570	50	10	1	22.2	16.3		
7	650	80	11	1	19.1	19.5		
5	770	120	24	1	6.0	24.2		
3	890	120	40	1	2.2	28.9		
5	980	90	18	1	11.5	32.5		
4	1025	45	11	1	19.4	34.3		

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor CBR 5-10: Marginal

CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface

During Drilling: See Note 1

Upon Completion: See Note 1

Depth of Frost From Surface : See Note 1

From	To	Material
		See Note 1



USACE DCP DATA SHEET

PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 8/12/25
BY: WN

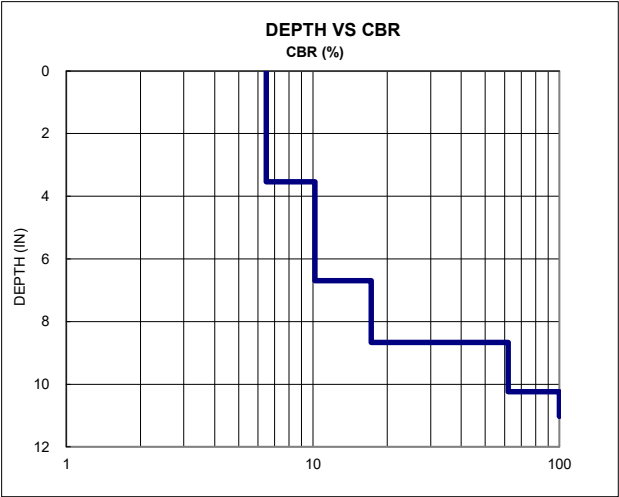
PROBE/CORE: P8
GROUND EL: 915.0 feet

DEPTH TO START OF TEST FROM SURFACE: 0 inches

No. of Blows	Accum. Pen. (mm)	Pen. per Blow Set (mm)	Pen. per Blow (mm)	Hammer Blow Factor	CBR (%)	Depth from Surface (inches)	Comment	Average CBR (%)
0	140	0						
3	230	90	30	1	6.5	3.5		
4	310	80	20	1	10.2	6.7		
4	360	50	13	1	17.3	8.7		
10	400	40	4	1	61.8	10.2		
10	410	10	1	1	100.0	10.6		
10	420	10	1	1	100.0	11.0		
100	425	5	0	1	100.0	11.2		

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions
CBR< 3: Very Poor CBR 5-10: Marginal
CBR 3-5: Poor CBR >10: Good

Depth to Groundwater From Surface
During Drilling: See Note 1
Upon Completion: See Note 1

Depth of Frost From Surface : See Note 1

From	To	Material
		See Note 1



USACE DCP DATA SHEET

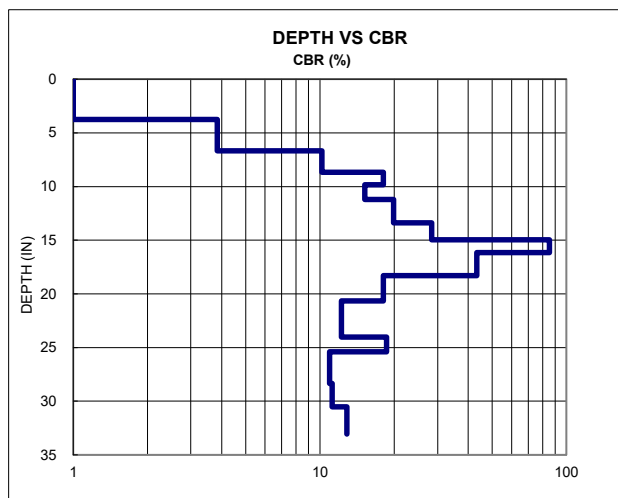
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P119
GROUND EL.: 914±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

From	To	Material
		See Note 1



USACE DCP DATA SHEET

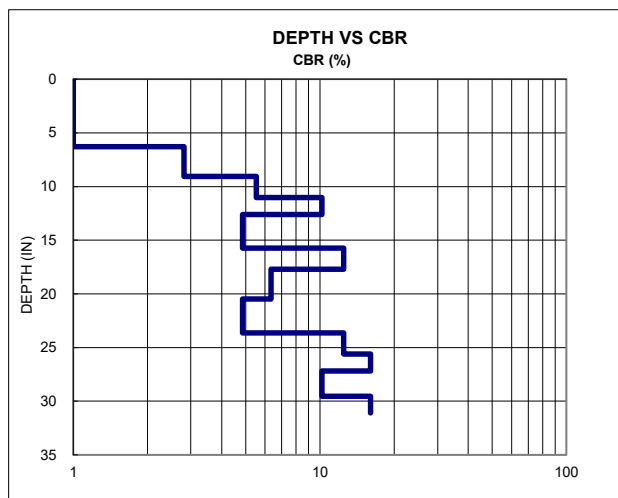
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P120
GROUND EL.: 915±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

[illegible]



USACE DCP DATA SHEET

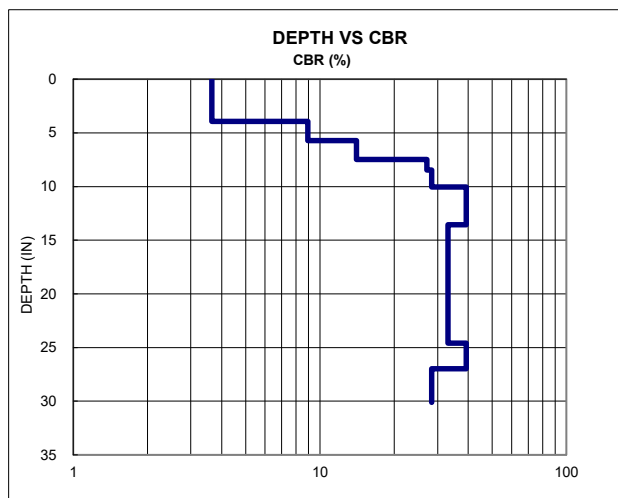
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P121
GROUND EL.: 915±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

From	To	Material
		See Note 1



USACE DCP DATA SHEET

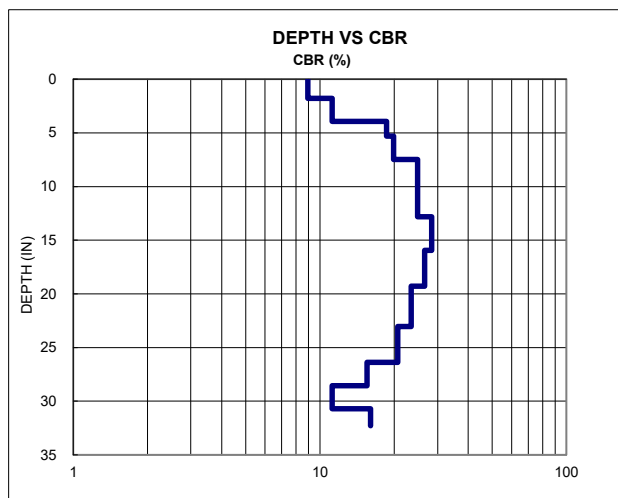
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P122
GROUND EL.: 915±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

From	To	Material
		See Note 1



USACE DCP DATA SHEET

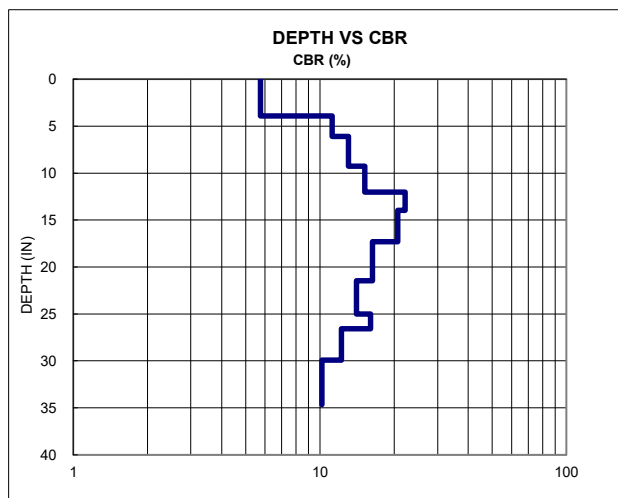
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P123
GROUND EL.: 916±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR< 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

From	To	Material
		See Note 1



USACE DCP DATA SHEET

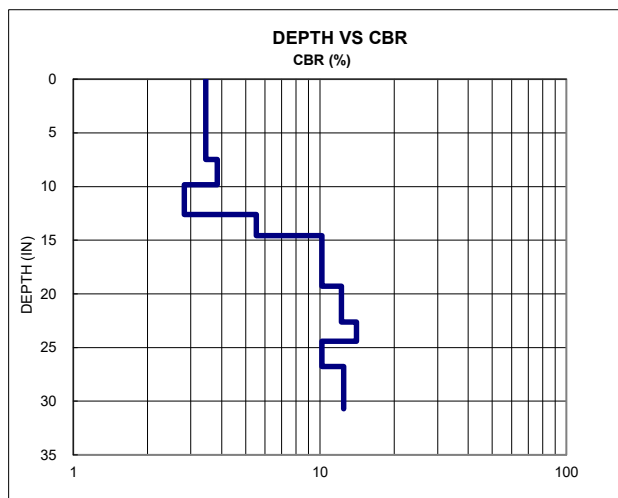
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P124
GROUND EL.: 915±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR < 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

[illegible]



USACE DCP DATA SHEET

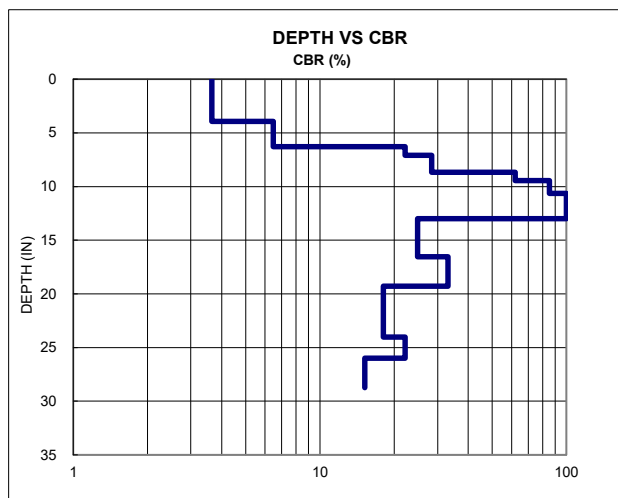
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P125
GROUND EL.: 915±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR < 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

From	To	Material
		See Note 1



USACE DCP DATA SHEET

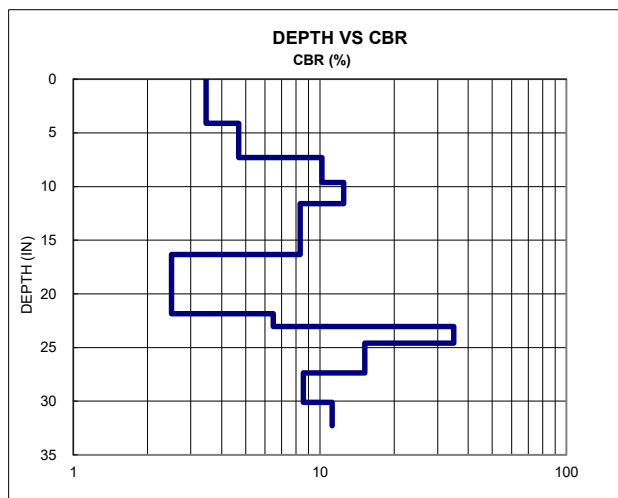
PROJECT: Howell High School Indoor Athletics Addition
PROJECT NO.: 099530.00
LOCATION: Howell, Michigan
CLIENT: Howell Public Schools
DATE: 5/7/25
BY: RM
DEPTH TO START OF TEST FROM SURFACE: 0

BORING: P126
GROUND EL.: 917±

[illegible]

Hammer Blow Factor: 1 for 17.6 lb Hammer and 2 for 10.1 lb Hammer

NOTES: 1) Refer to corresponding Boring Log for soil and groundwater information.



CBR Ranges for Subgrade Conditions

CBR < 3: Very Poor

CBR 3-5: Poor

CBR 5-10: Marginal

CBR >10: Good

Depth to Groundwater From Surface

During Drilling: **See Note 1**

Upon Completion: **See Note 1**

Depth of Frost From Surface : **See Note 1**

From	To	Material
		See Note 1

APPENDIX B
FIELD TESTING PROCEDURES
LABORATORY TESTING PROCEDURES
LIMITATIONS PERTAINING TO SUBSURFACE CONDITIONS

FIELD TESTING PROCEDURES

STANDARD PENETRATION TESTS

The Standard Penetration Tests (SPT) generally follow the American Standard Test Method (ASTM) D-1586 “Standard Test Method for SPT and Split-Barrel Sampling of Soils”. It is typically performed using a 2-inch O.D. split-spoon sampler, which is driven to obtain samples at selected intervals. The number of blows of a 140-pound hammer dropping 30 inches is recorded for each of three or four, 6-inch penetration intervals for an 18 or 24-inch drive at each sample location. The sum of blow counts for the second and third 6-inch penetration intervals equals the raw (uncorrected) N-value for a given sample interval (i.e. 5-4-2, $N = 6$). We periodically calibrate SME’s drill rig auto-hammers. The hammer efficiency determined from this calibration is used to calculate the corrected N-values (N_{60}), as reported on the logs. When sampling in rock or hard soil, where a penetration of 6 inches or less was obtained for 50 hammer blows, the actual blow count and depth of penetration in inches for that interval is recorded (i.e. 50/2”). When sampling in very loose or very soft soil, where a penetration of more than 6 inches is obtained for a single hammer blow, the actual depth of penetration for that hammer blow is recorded (i.e. 1-0-0). Where the sampling equipment advanced under its own weight, “WOH” (weight of hammer) and the corresponding penetration depth are shown on the boring logs.

INFILTRATION TESTS

In-situ infiltration tests generally follow the double-ring infiltrometer field test procedures outlined in Appendix E in the Low Impact Development (LID) Manual for Michigan (dated 2008) prepared by the Southeast Michigan Council of Governments (SEMCOG). This procedure is also referenced in the States of Indiana, Ohio, and Kentucky applicable local manuals. The double-ring infiltrometer field test set-up consists of performing a boring or test pit to the test depth, installing an outer 6-inch-diameter standpipe and an inner 4-inch-diameter standpipe, and then driving the standpipes a suitable distance, per the referenced manual, below the bottom of the test depth. Soil is pre-soaked with approximately 12 inches of water for approximately one hour. The water drop rate per the last 30 minutes of the soaking period determines the subsequent interval for infiltration readings (i.e., 10- or 30-minute intervals). After completing the soaking period, standpipes are filled with water to a height of approximately 12 inches above the test depth, and water level changes in the standpipes are measured with a water level measuring tape with markings every 0.01 feet and recorded after the time intervals. This procedure is repeated until a minimum of four consecutive height changes within 1/4-inch of one another are measured. The height drop that occurred during the final time interval or the average stabilized rate is used to calculate the infiltration rate. After completion of the double-ring infiltrometer field test, the standpipes are removed, and the test hole is backfilled.

DYNAMIC CONE PENETROMETER (DCP)

USACE TESTS

Dynamic Cone Penetrometer (DCP) testing designed by the U.S. Army Corps of Engineers (USACE) is conducted to estimate the California Bearing Ratio (CBR) of the subgrade materials and existing pavement sub-layers. The USACE DCP consists of a 5/8-inch-diameter steel rod with a steel cone attached to one end driven by a sliding dual mass hammer. The rate of penetration per blow is measured at selected penetration, or hammer drop, intervals. CBR is an index commonly used in pavement design that provides an indication of subgrade support characteristics. The Corps of Engineers developed relationships to estimate the CBR value from the results of the USACE DCP test.

SME DCP TESTS

SME Dynamic Cone Penetrometer (DCP) test consists of dropping a 10-pound slide hammer that falls 24 inches and drives a rod with a 1-1/8-inch conical tip into the subgrade. The number of hammer drops required to drive the cone penetrometer are recorded for each six-inch increment and are used to estimate the relative density of the granular soils. The DCP blow counts were used to estimate Standard Penetration Test resistances (N-values) commonly used in geotechnical evaluations, based on empirical correlations developed by SME.

PRESSUREMETER TESTING

Pressuremeter testing in the field models the static loading characteristics of the soil and the resulting analyses based on pressuremeter test results are considered to be a more accurate indicator of the ultimate foundation bearing pressure, and associated settlement, than analyses using empirical correlations based on dynamic test methods, such as the Standard Penetration Test (SPT) and/or dynamic cone penetrometer (DCP) tests. Results of the SPT and/or DCP were recorded, at the pressuremeter test locations and depths to provide additional information on the relative density of the in-place subgrade, and to correlate the pressuremeter test results with data obtained at other site locations. The pressuremeter test depths were selected to provide representative information corresponding to the bearing soils anticipated within the stress influence zone of the proposed footings at the design bearing levels.

In the pressuremeter test, a radial expandable cylindrical probe is inserted into a prepared borehole at the selected testing depth. After obtaining N-values from driving a standard 2-inch O.D. diameter split-spoon sampler, borehole preparation consisted of then driving a 3-inch O.D. split-spoon sampler (or using a roller bit with wash rotary methods) to develop the appropriately sized borehole diameter for the pressuremeter probe. The cylindrical probe was inserted into the borehole to the sampling depth and then expanded against the sides of the borehole by pressurizing fluid within the system using a hydraulic screw-jack console positioned at the ground surface.

Simultaneous measurements of pressure and volume change within the probe were observed at the pressuremeter console and recorded. The pressure was incrementally increased until the maximum probe volume was reached, or until significant creep deformation (soil failure) was observed.

MUCK PROBE

The muck probe consists of a smooth rod about 1/2-inch in diameter manually pushed into the subgrade until encountering significant resistance (determined “by feel”), presumably indicating the bottom of organic soil stratum.

VANE SHEAR TESTING

In-situ vane shear testing generally follows the American Standard Test Method (ASTM) D-2573 “Standard Test Method for Field Vane Shear Test in Cohesive Soil”. Per the ASTM, the field vane shear test consists of placing a four-bladed vane (sized based on the expected cohesive soil strength) in the undisturbed soil and rotating it from the surface at a constant rate to determine the torque required to shear a cylindrical surface with the vane. This torque, or moment, is then converted to the unit shearing resistance of the failure surface by limit equilibrium analysis. Friction of the vane rod and instrument is either minimized during readings by an open hole, casing, or accounted for and subtracted from the total torque to determine the torque applied to the vane. After initially shearing the soil to determine the peak “undisturbed” ultimate shear strength, the test can be repeated to determine the remolded “residual” ultimate shear strength. The ratio of the peak shear strength divided by the remolded shear strength equals the degree of sensitivity.

DEGREE OF SENSITIVITY

DEGREE OF SENSITIVITY	DESCRIPTION
2	Insensitive
4	Moderately Sensitive
8	Extra Sensitive

ELECTRICAL RESISTIVITY TESTING

Field or laboratory resistivity testing generally follows the American Standard Test Method (ASTM) G-57 “Standard Test Method for Measurement of Soil Resistivity Using the Four-Electrode Method”.

FIELD TESTING

Per the ASTM, the field Wenner four-electrode method requires four metal electrode probes placed with equal separation at various distances in a straight line. The probes are inserted in the surface of the soil to a depth not exceeding 5 percent of the minimum separation of the electrodes (or 12 inches maximum, whichever is less). The electrode separation is selected with consideration of the soil strata location and depth of interest. A voltage is impressed between the outer electrodes and the voltage drop between the inner electrodes is measured. The resulting resistivity measurement represents the average resistivity of a hemisphere of soil of a radius equal to the electrode separation.

LABORATORY TESTING

Soil is tamped into a soil box to resemble the compaction where the soil sample was taken until the soil is level with the top of the box. Two brass pins are inserted at the premanufactured distances into the soil sample with two endpins connected to the box. The four test leads are connected to the soil box. A voltage is impressed between the two endpins to measure the resistance, and soil resistivity is calculated based on the product-specified conversion.

CONE PENETRATION TESTING

Cone Penetration Tests (CPT) measures the soil resistance to the penetration of a standard 10 square centimeter (cm) projected area. The cone is hydraulically pushed into the soil at approximately a 2 cm per second rate. Soil resistance is recorded in kilograms per square cm at 20 cm depth intervals. Soil friction values are measured by a friction sleeve at each test interval.

LABORATORY TESTING PROCEDURES

VISUAL ENGINEERING CLASSIFICATION

Visual classification was performed on recovered samples. The appended General Notes and Unified Soil Classification System (USCS) sheets include a brief summary of the general method used visually classify the soil and assign an appropriate USCS group symbol. The estimated group symbol, according to the USCS, is shown in parentheses following the textural description of the various strata on the boring logs appended to this report. The soil descriptions developed from visual classifications are sometimes modified to reflect the results of laboratory testing.

MOISTURE CONTENT

Moisture content tests were performed by weighing samples from the field at their in-situ moisture condition. These samples were then dried at a constant temperature (approximately 110° C) overnight in an oven. After drying, the samples were weighed to determine the dry weight of the sample and the weight of the water that was expelled during drying. The moisture content of the specimen is expressed as a percent and is the weight of the water compared to the dry weight of the specimen.

HAND PENETROMETER TESTS

In the hand penetrometer test, the unconfined compressive strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small calibrated, spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square-foot (tsf). Theoretically, the undrained shear strength of the cohesive sample is one-half the unconfined compressive strength. The undrained shear strength (based on the hand penetrometer test) presented on the boring logs is reported in units of kips per square-foot (ksf).

TORVANE SHEAR TESTS

In the Torvane test, the shear strength of a low strength, cohesive soil sample is estimated by measuring the resistance of the sample to a torque applied through vanes inserted into the sample. The undrained shear strength of the samples is measured from the maximum torque required to shear the sample and is reported in units of kips per square-foot (ksf).

LOSS-ON-IGNITION (ORGANIC CONTENT) TESTS

Loss-on-ignition (LOI) tests are conducted by first weighing the sample and then heating the sample to dry the moisture from the sample (in the same manner as determining the moisture content of the soil). The sample is then re-weighed to determine the dry weight and then heated for four hours in a muffle furnace at a high temperature (approximately 440° C). After cooling, the sample is re-weighed to calculate the amount of ash remaining, which in turn is used to determine the amount of organic matter burned from the original dry sample. The organic matter content of the specimen is expressed as a percent compared to the dry weight of the sample.

ATTERBERG LIMITS TESTS

Atterberg limits tests consist of two components. The plastic limit of a cohesive sample is determined by rolling the sample into a thread and the plastic limit is the moisture content where a 1/8-inch thread begins to crumble. The liquid limit is determined by placing a 1/2-inch-thick soil pat into the liquid limits cup and using a grooving tool to divide the soil pat in half. The cup is then tapped on the base of the liquid limits device using a crank handle. The number of drops of the cup to close the gap formed by the grooving tool 1/2 inch is recorded along with the corresponding moisture content of the sample. This procedure is repeated several times at different moisture contents and a graph of moisture content, and the corresponding number of blows is plotted. The liquid limit is defined as the moisture content at a nominal 25 drops of the cup. From this test, the plasticity index can be determined by subtracting the plastic limit from the liquid limit.

LIMITATIONS PERTAINING TO SUBSURFACE CONDITIONS

EXISTING FILL

It is sometimes difficult to distinguish between existing fill present at a site and natural soils based on samples and cuttings from small-diameter boreholes, especially if portions of the fill do not contain man-made materials, debris, topsoil, or organic layers, and when the fill appears similar in composition to the local natural soils. Therefore, consider the delineation of fill described on the logs, if encountered, to be approximate.

The composition of existing site fill, if encountered, may change abruptly over short distances and will vary from what is reported on the logs. The descriptions of debris within fill may not accurately indicate the quantity, composition, or size of the debris, and may not fully include the types of debris existing within the site fills. Perform test pits if existing fill is encountered to further evaluate the condition of the fill, particularly if the fill will be utilized for support of overlying structures and/or other improvements.

GROUNDWATER

Hydrostatic groundwater levels, and perched groundwater conditions, will fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, and other factors. The groundwater information reported on the logs represent conditions at the time the readings were taken and may vary from the groundwater conditions encountered at other times.

SUBSURFACE PROFILE

The profile described in this report and included on the logs is a generalized description of the conditions observed. The stratification depths described in this report and shown on the logs indicate a zone of transition from one soil type to another. They are not meant to delineate exact depths of change between soil types. Soil conditions may vary between or away from the exploration locations. Refer to the logs for the soil descriptions, rock descriptions (when applicable), and results of the field and laboratory tests at the specific exploration locations.

If only borings with hollow-stem or solid-stem augers are performed, consider thickness measurements of surficial materials reported on the logs (e.g., gravel, asphalt, concrete, aggregate base) to be approximate since mixing of the surface materials with the underlying subgrade can occur while advancing the augers, and it is difficult to measure the thickness of surface materials in small-diameter boreholes. Perform additional evaluations for more accurate measurements of surface materials, such as test pits for topsoil and gravel thicknesses, coring for pavement thicknesses, and hand sampling for aggregate thickness.

RADON

The need for radon control systems for this project was not evaluated as part of our current scope of services. Contact the local building authority to verify whether radon control systems are necessary to meet the applicable local building codes or other requirements. If radon control methods are required, incorporate the recommendations regarding the below-slab leveling course materials and vapor retarders presented in this report with the specific materials and measures necessary to meet the applicable radon control methods. Contact SME for further recommendations.

APPENDIX C

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT GENERAL COMMENTS

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, clients can benefit from a lowered exposure to the subsurface problems 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 below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs 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. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project 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.*

This Report May Not Be Reliable

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

- for a different client;
- for a different project;
- 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, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been 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 your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

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

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment 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 from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed 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 full-time 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 on hand quickly 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 observation.

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 informational 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, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. 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. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any 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 yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

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, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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e-mail: info@geoprofessional.org www.geoprofessional.org

GENERAL COMMENTS

BASIS OF GEOTECHNICAL REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practices to assist in the design and/or evaluation of this project. If the project plans, design criteria, and/or other project information referenced in this report and utilized by SME to prepare our recommendations are changed, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions and recommendations of this report are modified or approved in writing.

The discussions and recommendations contained in this report are based on the available project information, described in this report, and the geotechnical data obtained from the field exploration at the locations indicated in the report. Variations in soil and groundwater conditions commonly occur between or away from sampling locations. The nature and extent of the variations may not become evident until the time of construction. If significant variations are observed during construction, SME must be contacted to reevaluate the recommendations of this report.

In the process of obtaining and testing samples and preparing this report, procedures are followed that represent reasonable and accepted practice in the field of geotechnical engineering. Specifically, field logs are prepared during the field exploration that describe field occurrences, sampling locations, and other information. Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory and differences may exist between the field logs and the report logs.

The engineer preparing the report reviews the field logs, laboratory classifications, and test data and then prepares the report logs. Our recommendations are based on the contents of the report logs and the information contained therein.

REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

Retain SME to review the design details, project plans, and specifications to verify those documents are consistent with the recommendations contained in this report.

REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

Implementation of our recommendations may affect the design, construction, and performance of the proposed improvements, along with the potential inherent risks involved with the proposed construction. The client and key members of the design team, including SME, should discuss the issues covered in this report so the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk, and expectations for performance and maintenance.

FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

SME needs to be retained to continue our services through construction so we may observe and evaluate the actual subsurface conditions relative to the recommendations made in this report, and so we can verify the recommendations of this report are properly implemented during construction. This may avoid misinterpretation of our recommendations by other parties and will allow us to review and modify our recommendations if variations in the site subsurface conditions are encountered.

PROJECT INFORMATION FOR CONTRACTOR

This report and any future addenda or other reports regarding this site needs to be made available to prospective contractors prior to submitting their proposals for their information only and to supply them with facts relative to the subsurface evaluation and laboratory test results. If the selected contractor encounters subsurface conditions during construction, which differ from those presented in this report, the contractor needs to promptly describe the nature and extent of the differing conditions in writing and SME needs to be notified so we can verify those conditions. The construction contract needs to include provisions for dealing with differing conditions, and contingency funds for potential problems during earthwork and foundation construction. We would be pleased to assist with the development of contract provisions based on our experience.

The contractor needs to be prepared to handle environmental conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this site need to be made available for review by bidders and the successful contractor.

THIRD PARTY RELIANCE/REUSE OF THIS REPORT

This report has been prepared solely for the use of our Client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in the project, unless specifically allowed by SME in writing. SME also is not responsible for the interpretation by other parties of the geotechnical data and the recommendations provided herein.



*Passionate People Building
and Revitalizing our World*





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January 13, 2026

Mr. Paul Pominville
Howell Public Schools
411 North Highlander Way
Howell, Michigan 48843

Via E-mail: pominvip@HowellSchools.com

RE: Addendum No. 1 to Geotechnical Evaluation
Howell High School Indoor Athletics Addition
1200 West Grand River Avenue
Howell, Michigan 48843
SME Project No. 099530.00

Dear Mr. Pominville:

This Addendum No. 1 presents additional geotechnical information and recommendations related to the referenced project.

SME prepared and submitted a Geotechnical Evaluation Report dated November 12, 2025, hereafter referred to as the "Geotechnical Report". The information contained in this Addendum No. 1 should not be considered apart from the entire text of the Geotechnical Report, with all of the qualifications and considerations mentioned therein. Questions related to this addendum, or to the Geotechnical Report, should be addressed to SME.

ADDITIONAL EVALUATION PROCEDURES

FIELD EXPLORATION

SME completed two additional borings (B201 and B202) at the site on December 9, 2025. These borings extended to a depth of 50 feet below ground surface, for a total of 100 linear feet. The approximate locations of the additional and previously completed borings are shown on the Boring Location Diagram (Figure No. 1) and in Image No. 1 below.

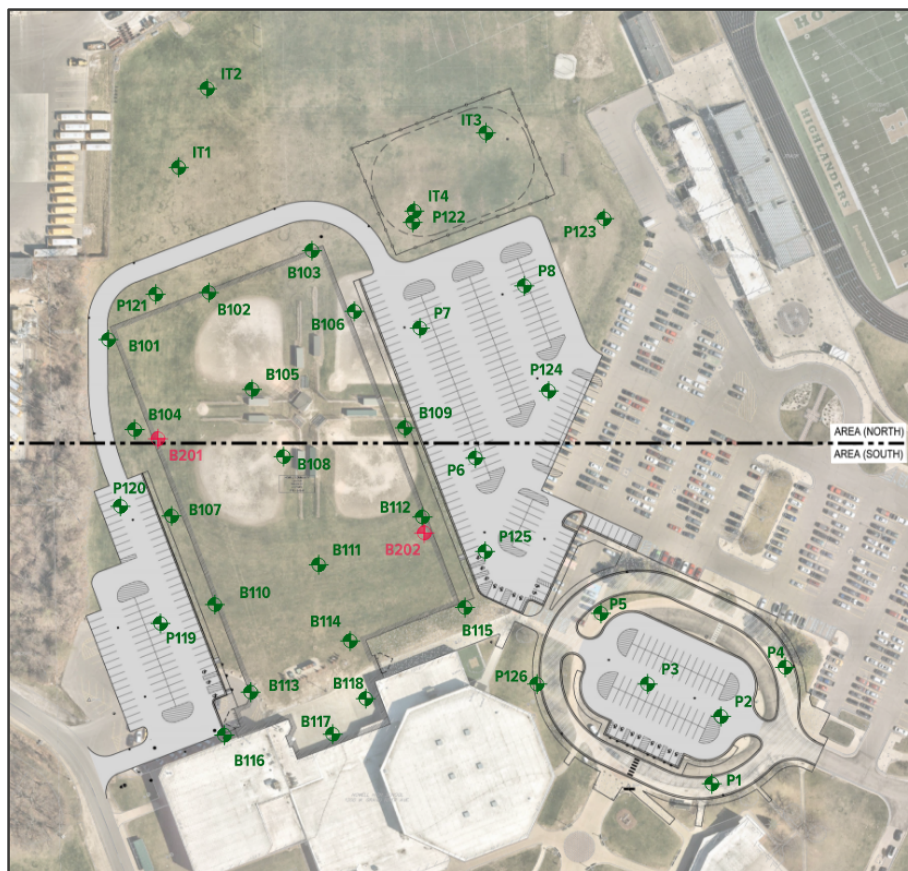


IMAGE NO. 1: Excerpt from Figure No. 1 attached – Boring Location Diagram (north facing upward).

SME and Kingscott jointly determined the number, depths, and locations of the borings. SME staked the boring locations using a handheld GPS and estimated existing ground surface elevations to the nearest 1 foot.

Borings B201 and B202 were performed using a rotary-type drill rig and were advanced using continuous-flight augers. The borings included soil sampling based upon the Split-Barrel Sampling procedure. The N_{60} -values plotted on the boring logs represent the N -values obtained in the field, adjusted for drill rig hammer efficiency, which is also recorded on the boring logs. Portions of recovered split-barrel samples were sealed in glass jars by the driller.

Groundwater level observations in the boreholes were recorded during and immediately after completion of each boring. After collection of groundwater level measurements and samples, borings were backfilled with auger cuttings and capped with EPCO hole plug.

Soil samples recovered from the field exploration were sent to our laboratory for further observation and testing.

ADDITIONAL GEOTECHNICAL LABORATORY TESTING

The laboratory testing program consisted of visual soil classification on recovered samples in general accordance with ASTM D-2488. We also performed moisture content and hand penetrometer tests on portions of cohesive samples obtained. Based on the laboratory testing, we prepared a soil description and assigned a Unified Soil Classification System (USCS) group symbol to each of the soil strata encountered.

Upon completion of the laboratory testing, we prepared boring logs that include the soil descriptions, penetration resistances, pertinent field observations made during the boring operations, and the results of the laboratory testing. Each log also includes the existing ground surface elevation as estimated by SME. The boring logs are attached. Explanations of symbols and terms used on the boring logs are provided on the Boring Log Terminology sheet included.

Soil samples are normally retained in our laboratory for 60 days and are then disposed of, unless instructed otherwise.

SUBSURFACE CONDITIONS (ADDITIONAL BORINGS B201 AND B202)

Refer to the Geotechnical Report for qualifications related to subsurface conditions.

SOIL CONDITIONS

The borings generally encountered surficial topsoil over about 5 to 6.5 feet of existing sand fill. B201 encountered buried topsoil and organic silt below the topsoil to a depth of about 12 feet below the existing ground surface. Natural sand and clay was encountered beneath the existing fill (at boring B201) or organic soil (at boring B202), which extended to the explored depth of the borings.

GROUNDWATER CONDITIONS (BORINGS B201 AND B202)

Groundwater was observed in B201 and B202 as summarized in Table 1.

TABLE 1: GROUNDWATER SUMMARY TABLE

BORING NO.	INITIAL DEPTH OF G.W. (feet) ¹	G.W. DEPTH UPON COMPLETION OF DRILLING (feet) ¹	INITIAL G.W. ELEVATION (feet) ¹	G.W. ELEVATION UPON COMPLETION OF DRILLING (feet) ¹
B201	12	9	902.5	905.5
B202	5.5	NE	909.5	NA

NOTES:

- 1. Depths and elevations are reported to the nearest ½ foot.
- 2. NE = Not Encountered

DEEP FOUNDATION RECOMMENDATIONS – DRILLED PIERS

Several types of deep foundations are feasible for support of the proposed athletic field building. However, based on the relatively large horizontal loads, we anticipate using a single drilled pier per column rather than multiple deep foundation elements with pile caps is a cost-effective option.

To resist relatively large horizontal loads, the athletic field building columns can be supported on drilled piers with one pier per column. The drilled piers should be straight-shaft piers (i.e., without a bell or enlarged base). The required depth of the drilled piers will primarily depend on the horizontal loads to be resisted rather than the axial loads imposed on the foundations.

SME performed a lateral pile analysis using the provided estimated column loads and soil conditions encountered at the borings. The results of the lateral pile analysis are provided in Image Nos. 2 and 3, below.

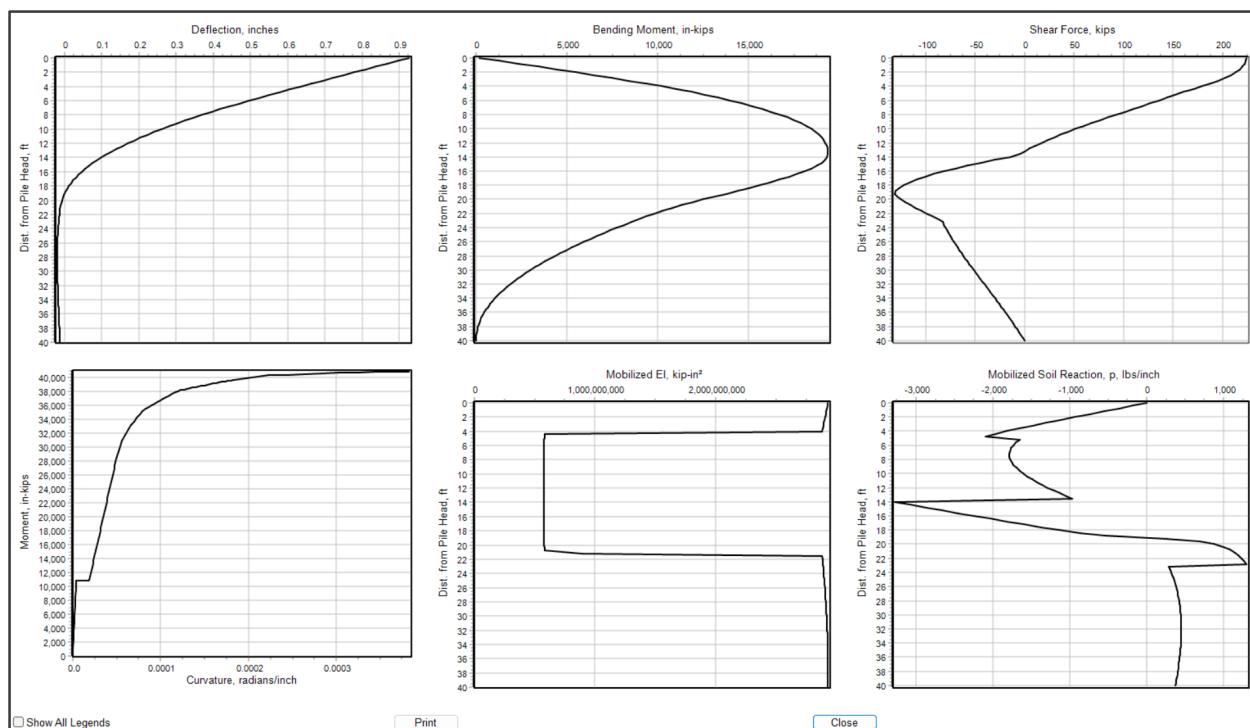


IMAGE NO. 2: 5-foot diameter drilled pier modeled with about one percent steel reinforcement.

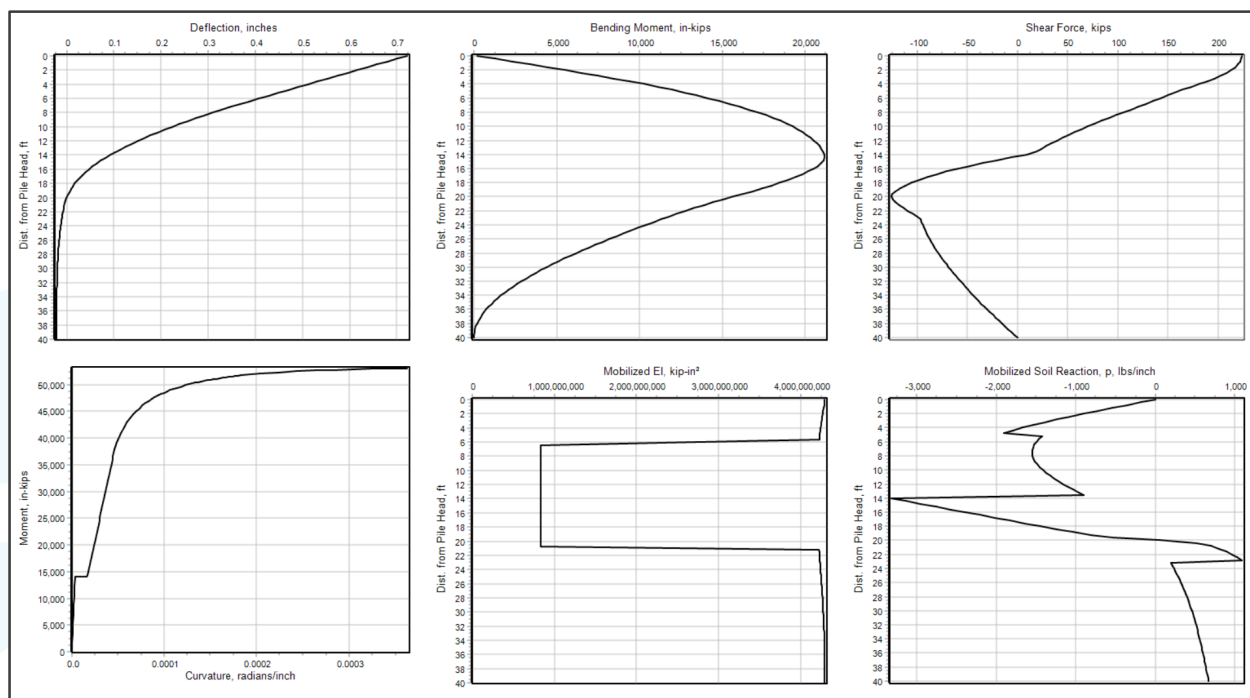


IMAGE NO. 3: 5.5-foot diameter drilled pier modeled with about one percent steel reinforcement.

Based on our analysis, we anticipate drilled piers will require an embedment of about 40 feet to provide the required resistance to horizontal loads. At these depths, we anticipate an allowable end bearing of at least 4,500 psf. Friction/adhesion along the shaft will provide resistance to uplift loads and additional resistance to compressive loads. Based on the provided loading conditions, skin friction/adhesion is not required to verify suitable vertical compressive capacity. If required, SME can provide specific skin

friction/adhesion values for compressive capacity. Downdrag on the piers related to consolidation of organic soils was considered in the above compressive capacity recommendations (i.e., neglecting skin friction/adhesion).

For uplift capacity, an allowable skin-friction/adhesion value of 275 psf is recommended for design (based on a Factor of Safety of 3). Neglect the upper 5 feet of skin friction/adhesion.

A partial-depth, temporary heavy steel casing (i.e., a surface casing) will be required at drilled pier locations to prevent caving sands near the ground surface, and to maintain alignment and position of the piers. Based on the borings, wet method pier construction (described below) will be required to prevent caving and heaving of sands in the pier excavations.

The bottoms of the drilled pier excavations should be cleaned so the bottoms are free of loose or disturbed soils prior to placement of the concrete. Cleaning of the drilled pier bearing surface may be done mechanically with the auger or "one-eye" bucket. Visual review of bearing surfaces is not possible for wet drilling methods.

Wet method pier construction is used when a dry excavation cannot be maintained and consists of using a drilling slurry (composed of water or a bentonite or polymer mix) to maintain a positive fluid head inside the excavation that is higher than the static groundwater on the outside of the excavation. The concrete for the pier is placed using "tremie" methods by either gravity or pumping in which the concrete is placed from the bottom of the drilled shaft and thereby displacing the slurry. The tremie pipe should be a minimum of 10 inches in diameter. The end of the tremie pipe must be maintained a minimum of 2 feet into the concrete to prevent mixing of the slurry and concrete. For concrete placement by the tremie method, a slump of 7 to 9 inches and a maximum aggregate size of 3/4-inch is recommended. The required slump should be obtained by using plasticizers or water-reducing agents. Addition of water on site to establish the recommended slump should not be allowed. As the concrete is placed, the slurry is displaced from the top of the excavation either onto the ground or into a recirculation pit/tank. The contractor should submit a mix design for review prior to placing concrete by the tremie method. If recirculation pits/tanks are not utilized for wet pier construction, a significant volume of drilling slurry and cuttings should be expected on the ground surface in the vicinity of the pier excavation. When extracting temporary casings from the excavations, care should be taken to maintain a head of concrete to prevent infiltration of water and soil into the shaft area. The head of concrete should always be greater than the head of water trapped outside the casing, taking into account the differences in unit weights of concrete and water.

To reduce lateral movement of the drilled piers, it is necessary to place the concrete for the drilled piers in intimate contact with the surrounding soil. Any voids or enlargements in the pier shafts due to over-excavation or temporary casing installation must be filled with concrete when the shaft concrete is placed.

Although not encountered at the borings, cobbles and/or boulders should be anticipated at the drilled pier locations. The engineer preparing the project specifications should carefully outline what constitutes an obstruction and how the contractor will be paid for removal of such obstructions. SME would be pleased to provide additional assistance in developing specifications.

Total settlement for drilled pier foundations constructed, as recommended above, and field verified by SME, is expected to be less than about 1/2-inch. The settlement estimate provided is based on the available boring information, estimated structural loads, our experience with similar structures and soil conditions, and field verification of suitable bearing soils by SME.

We appreciate the opportunity to be of service. If you have questions regarding this addendum or if you require additional information, please contact us.

Sincerely,

SME

PREPARED BY:



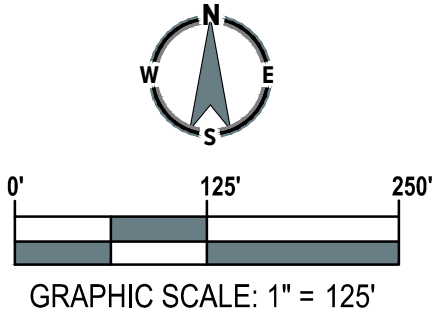
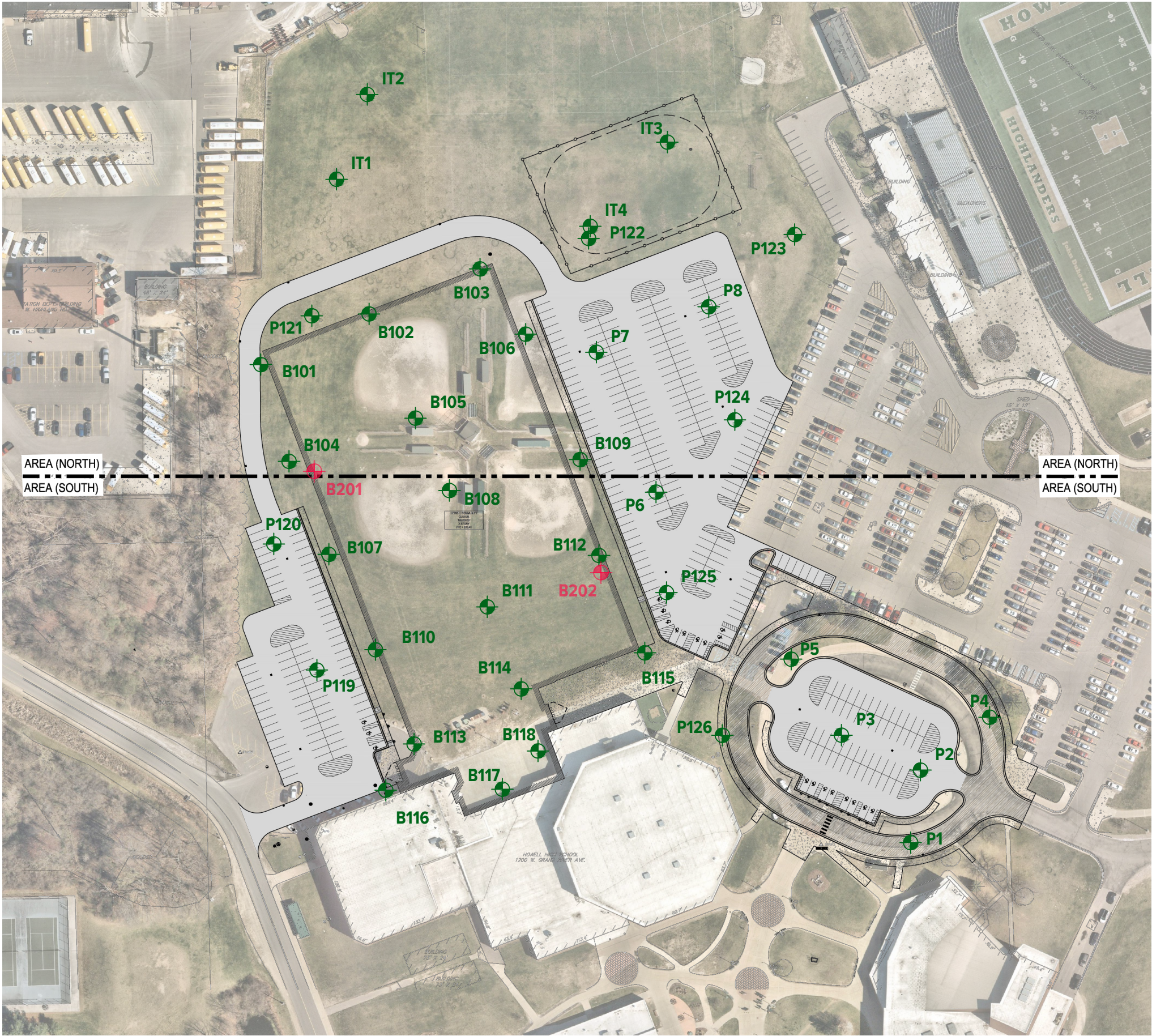
Alexandra R.C. Korinek, PE
Project Engineer

REVIEWED BY:



Paul E. Anderson, PE
Senior Project Engineer

Attachments: Boring Location Diagram (Figure No. 1)
Additional Boring Logs (Borings B201 and B202)



LEGEND

- APPROXIMATE BORING LOCATION
- PREVIOUS APPROXIMATE BORING LOCATIONS FROM AUGUST, 2025



LOCATION MAP
NOT TO SCALE

- NOTES:
- AERIAL IMAGE TAKEN FROM NEARMAP WITH A IMAGE DATE ON 4-17-2025.
 - BASE DRAWING INFORMATION TAKEN FROM A DRAWING TITLED "GENERAL SITE LAYOUT" (SHEET C3.0) WITH A LATEST REVISION DATE OF 6-2-2025, PREPARED BY KINGSCOTT.



SME AND THE SME LOGO ARE FEDERALLY REGISTERED MARKS.
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Project
**HOWELL HIGH SCHOOL
INDOOR ATHELETICS
ADDITION**

Project Location
HOWELL, MICHIGAN

Sheet Name
**BORING LOCATION
DIAGRAM**

No.	Revision Date

Date
12-11-2025

CADD
T. VERLEYE

Designer
S. MEEKHOF

Project
099530.00

Figure No.
1

DRAWING NOTE: SCALE DEPICTED IS MEANT FOR 11" X 17"
AND WILL SCALE INCORRECTLY IF PRINTED ON ANY OTHER
SIZE MEDIA

NO REPRODUCTION SHALL BE MADE WITHOUT THE PRIOR
CONSENT OF SME

1/13/26 9:22:49 AM



BORING B201

PAGE 1 OF 2

BORING DEPTH: 50 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 12/9/25

COMPLETED: 12/9/25

BORING METHOD: Hollow-stem Augers

DRILLER: BS (Strata Drilling)

RIG NO.: CME 55 ATV

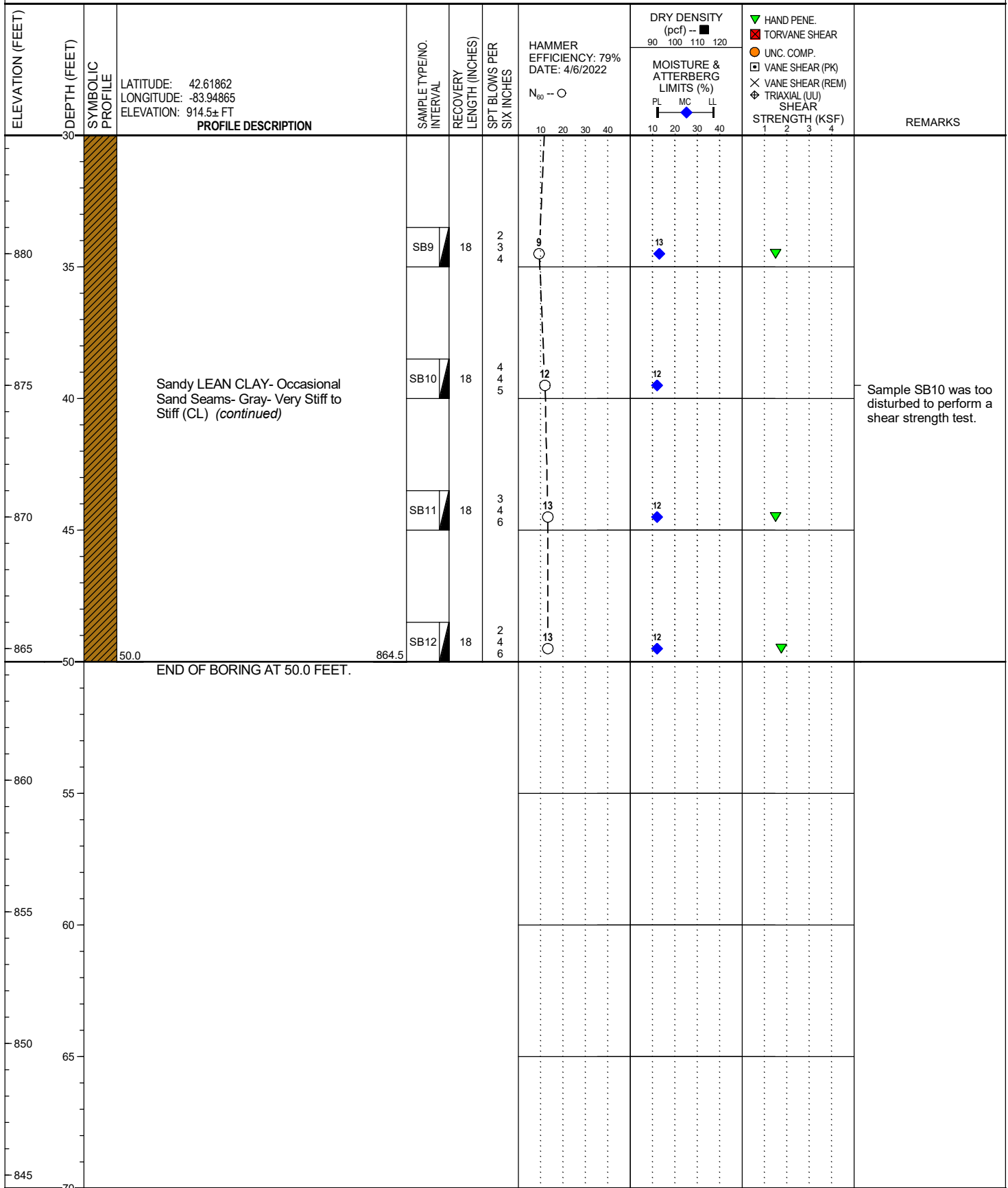
LOGGED BY: ARCK

CHECKED BY: SMM

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 79% DATE: 4/6/2022 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	▼ HAND PENE. ■ TORVANE SHEAR ● UNC. COMP. □ VANE SHEAR (PK) × VANE SHEAR (REM) ◆ TRIAXIAL (UU) SHEAR STRENGTH (KSF) 1 2 3 4	REMARKS
	0		914.2 4 inches of TOPSOIL 914.2	SB1	24	3	20	11		4.5+	Moisture content and shear strength tests were performed on a clay layer.
	5		909.5 FILL- Fine to Medium SILTY SAND- Occasional Clay Layers- Brown and Dark Brown- Moist- Medium Dense (SM) 909.5	SB2	24	7	26				
910						6					LOI = 2.8 percent
	5		906.5 Buried TOPSOIL- Fine to Medium CLAYEY SAND- Dark Brown- Moist- Loose (SC) 906.5	SB3	24	3	7	16			
	10		902.5 Organic SILT- Frequent Roots and Shells- Brown to Dark Gray- Very Loose (OL) 902.5	SB4	24	2	4		122		Sample SB4 was too disturbed to perform a shear strength test.
905						2					
	10		900.5 Fine to Coarse SAND with Gravel- Gray- Wet- Very Loose (SP) 900.5	SB5	18	2	7	16			
900						2					
	15					3					
	20		895 Sandy LEAN CLAY- Occasional Sand Seams- Gray- Very Stiff to Stiff (CL) 895	SB6	18	2	11	19			
	25					3					
890						6	12	15			
	30					3					
885				SB8	18	3	12	10			
	30					6					

GROUNDWATER & BACKFILL INFORMATION		
	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	12.0	902.5
▽ AT END OF BORING:	9.0	905.5
BACKFILL METHOD: Auger Cuttings		

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.



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BORING B202

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BORING DEPTH: 50 FEET

PROJECT NAME: Howell High School Indoor Athletics Addition

PROJECT NUMBER: 099530.00

CLIENT: Howell Public Schools

PROJECT LOCATION: Howell, Michigan

DATE STARTED: 12/9/25

COMPLETED: 12/9/25

BORING METHOD: Hollow-stem Augers

DRILLER: BS (Strata Drilling)

RIG NO.: CME 55 ATV

LOGGED BY: ARCK

CHECKED BY: SMM

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	LATITUDE: 42.61829 LONGITUDE: -83.94743 ELEVATION: 915± FT	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 79% DATE: 4/6/2022 N ₆₀ -- O	DRY DENSITY (pcf) -- ■ 90 100 110 120	MOISTURE & ATTERBERG LIMITS (%) PL MC LL	▼ HAND PENE. ■ TORVANE SHEAR ● UNC. COMP. □ VANE SHEAR (PK) × VANE SHEAR (REM) ◆ TRIAXIAL (UU) SHEAR STRENGTH (KSF) 1 2 3 4	REMARKS
915	0			0.5 6 inches of TOPSOIL 914.5	SB1	24	6	12	17			
				FILL- Fine to Medium CLAYEY SAND- Occasional Clay Layers and Topsoil Seams- Brown and Dark Brown- Moist to Wet- Medium Dense (SC)	SB2	24	5 4 7	25				
910	5			6.5 908.5	SB3	24	6 11 8 8	16	15			
				LEAN CLAY- Frequent Silt Seams- Brown and Gray- Hard to Very Stiff (CL)	SB4	24	3 5 7 6	29	16			4.5+
905	10			13.0 902.0	SB5	18	7 9 13 15	14	11			
900	15				SB6	18	3 5 6	11	12			
895	20			Sandy LEAN CLAY- Occasional Silt and Sand Seams above 33 feet- Gray- Stiff to Hard (CL)	SB7	18	2 4 4	7	13			
890	25				SB8	18	1 2 3	7	12			
885	30						1 2 3	7	12			

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.5	909.5
▽ AT END OF BORING:	Note 3	
BACKFILL METHOD:	Auger Cuttings	

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Groundwater was not encountered upon completion of drilling.

[illegible]