Geotechnical Subsurface Investigation

Adams County/North Adams Regional Wastewater Treatment Plant
Winchester, Ohio

Prepared for:

Adams County Economic & Community Development Office
West Union, OH

Prepared by:

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Verdantas Project No.: 200619

June 11, 2026

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Ms. Holly Johnson, Director
Adams County Economic & Community Development Office
215 N. Cross Street, Suite 101
West Union, OH 45693

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Winchester, Ohio
Project No. 200619

Dear Ms. Johnson:

Following is the report of the geotechnical subsurface investigation performed by Verdantas, LLC. (Verdantas) for the referenced project. The study was performed in accordance proposal No. 061.0000039422, dated December 10, 2025, and authorized in accordance with Purchase Order No 2502279.

Should you have any questions regarding this report or require additional information, please contact our office.

Sincerely,
Verdantas, LLC

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1. PROJECT SUMMARY

1.1 Introduction

This report summarizes Verdantas LLC's (Verdantas) Geotechnical Engineering Services for the proposed Adams County/North Adams Regional Wastewater Treatment Plant (WWTP) project to be located in Winchester, Ohio. This report includes information regarding the document review, field and laboratory testing programs, and conclusions and recommendations related to the Adams County/North Adams Regional WWTP project. This work has been performed according to our proposal dated December 10, 2025 and authorized in accordance with Purchase Order No 2502279.

1.2 Project Description

It is our understanding that the project consists of construction of a new building and process tanks with associated pavements at 480 Graces Run Road in Winchester, Ohio. We understand that the building will be a single-story, slab-on-grade structure, approximately 5,000 square feet in plan. Structural loads were not available at the time of preparing this proposal but are assumed to be light in magnitude. Maximum column loads are assumed to be 20 kips and maximum wall loads are assumed to be 3,000 pounds per lineal foot (plf).

Pavements are anticipated to consist of flexible (asphalt) sections and/or rigid (concrete) sections. Final design grades will result in excavation depths of up to 25 feet within the proposed building areas at finished grade elevations. Process tanks are shown to bear near Elev. 893.5, approximately 45 feet below existing grade. The project will also include the closure of the existing lagoon.

1.3 Project Research

The following list of readily information was reviewed for this project:

- Oho Division of Geological Survey, Bedrock Geology of the Winchester, Ohio Quadrangle, (Schumacher G. A., 1993)

- The OEPA-PTI Issues Plan Set for the Adams County North Adams regional Wastewater Treatment Plant, dated 8-29-2025, prepared by Verdantas

2. SITE CONDITIONS

2.1 Regional Geology and Hydrogeology

The Central Lowland Till Plains physiographic region is dominated by landscapes produced by continental glaciation, including ground moraine plains, end/recessional moraines, intermorainal basins, and broad lowlands. The region includes multiple mapped till-plain districts described in the attached reference (e.g., clayey and loamy till plains and transitional terrains), and it is characterized by widespread Wisconsinan-age glacial till (commonly described as loamy and/or clayey and often high-lime) with varying amounts of outwash and a loess component that ranges from thin to absent depending on the district. Several districts emphasize well-defined moraines separated by flat-lying ground moraine and silt-, clay-, and till-filled lake basins, while others emphasize loamy till plains dissected by steep-valleyed major streams whose valleys may contain outwash and alternate between broad floodplains and narrow reaches; buried valleys are also noted as common in places. Older glacial surfaces within the region are identified as Illinoian-age till plains, described as rolling ground moraine with fewer preserved ice-constructional landforms and with deposits that may be leached and capped by loess. Bedrock beneath the till plains is described as largely Paleozoic carbonate rocks (Ordovician–Silurian) and shales, with local mention of units such as Berea Sandstone and Ohio Shale, commonly buried beneath drift of variable thickness. Relief is generally low to moderate, with local uplands and dissected areas where stream incision increases relief.

In the transition zone between the Illinoian Till Plain and the Dissected Illinoian Till Plain, physiography shifts from a gently to moderately rolling, older Illinoian-age ground moraine surface into increasingly hilly, stream-dissected terrain where valley-side erosion has locally removed the glacial mantle. Hilltops and broad interfluves typically remain capped by silt-loam, high-lime Illinoian-age till with a loess cap, and soils are commonly leached several feet, while adjacent slopes and valley walls increasingly expose bedrock and include mixtures of bedrock- and till-derived colluvium. This transition area retains characteristics of the Illinoian Till Plain such as a general lack of prominent ice-constructional landforms (e.g., moraines, kames, eskers) and the presence of buried valleys; however, it grades toward the Dissected Illinoian Till Plain where stream density increases and modern valleys more frequently alternate between broad floodplains and narrow, bedrock-controlled gorge reaches. Relief correspondingly increases from low, rolling uplands toward moderate local relief along incised drainages, reflecting progressive dissection of the former till plain. Bedrock beneath the drift and colluvium is predominantly Ordovician- and Silurian-age carbonate rocks and calcareous shales, which locally influence slope form, colluvial development, and the tendency for bedrock gorges where incision is greatest.

2.2 Site Reconnaissance

The site location and regional topography of the area are shown on the Site Location Plan included as Plate 1.0 in Appendix A.

The subject property is located in Winchester, Ohio at the site of an existing WWTP along Graces Run Road. The site consists of an approximate 5.9 acre parcel of land with an existing lagoon near the site center. On the south side of the site, is a knoll around which the property access drives are located. A storm sewer crosses the site from the west to east, emptying into an adjacent dendritic stream. Multiple control buildings, service buildings and sheds are located on the property.

Grades at the property range from Elev. 950 ft. to Elev. 892 ft. Surface water flow at the site is generally directed toward the lagoon with grades to the east of the lagoon directing the remaining water into the dendritic drainage channel. No surficial sloughing or significant erosion rills were noted along the slopes at the site.

Figure 1. Project Location, looking north toward existing lagoon.

3. SUBSURFACE EXPLORATION

3.1 Project Exploration Program

The subsurface exploration consisted of ten borings (numbered B-1 through B-10). The boring locations were selected by Verdantas and were staked in the field by our survey crew relative to the Ohio State Plane coordinate system. The locations of the borings are shown on our Exploration Plan, which is included as Plate 2.0 in Appendix A.

Experience indicates that the actual subsoil conditions at a site could vary from those generalized on the basis of test borings made at specific locations. Therefore, it is essential that a geotechnical engineer be retained to provide soil engineering services during the site preparation and pavement construction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations, and to allow design changes in the event subsurface conditions differ from those anticipated prior to the start of construction.

3.2 Boring Methods

The borings were drilled between February 24 and 27 with a CME-55 ATV mounted drill rig advancing 3¼ inch hollow-stem augers, as indicated on the boring logs presented in Appendix B.

Sampling of the overburden soils and bedrock was accomplished ahead of the augers at the depths indicated on the boring logs, with either a 2-inch-outside-diameter (O.D.) split-barrel sampler or 3-inch-O.D., thin-walled Shelby tube sampler in general accordance with the procedures outlined by ASTM D1586 and ASTM D1587, respectively. Split-spoon soil samples were obtained by the Standard Penetration Test Method (ASTM D 1586). The Standard Penetration Test (SPT) consists of driving a 2-inch outside diameter split-spoon sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. The sampler was driven in three successive 6-inch increments, with the number of blows per increment being recorded. The number of blows per increment was recorded at each depth interval, and these data are presented under the “SPT” column on the Logs of Test Borings attached to this report. The sum of the number of blows required to advance the sampler the second and third 6-inch increments is termed the Standard Penetration Resistance, or N-value, and is typically reported in blows per foot (bpf). The N-values were corrected to an equivalent rod energy ratio of 60 percent, N_{60}. Borings B-2, B-4, were extended into the bedrock by rock coring with an NQ2, rock core bit affixed to a double-tube core barrel in general accordance with the procedures outlined by ASTM D2113.

Soil conditions encountered in the test borings are presented in the Logs of Test Borings, along with information related to sample data, SPT results, water conditions observed in the borings, and laboratory test data. In conjunction with published data and typical correlations, the N_{60}-

values can be evaluated as a measure of soil compactness/consistency as well as shear strength.

Field and laboratory data were incorporated into gINT™ software for presentation purposes. It should be noted that these logs have been prepared on the basis of laboratory classification and testing as well as field logs of the encountered soils.

Observations for groundwater were made in the borings during drilling, and at the completion of drilling, before backfilling the boring holes.

A geologist from Verdantas provided technical direction during field exploration, observed drilling and sampling, assisted in obtaining samples, and prepared field logs of the material encountered.

Representative portions of the split-barrel samples were placed in glass jars with lids to preserve the in-situ moisture contents of the samples. The Shelby tubes were capped and taped at their ends to preserve the in-situ moisture contents and densities of the samples, and the tubes were transported and stored in an upright position. The glass jars, and Shelby tubes were marked and labeled in the field for identification when returned to our laboratory.

3.3 Laboratory Review and Testing Program

Upon completion of the fieldwork, the samples recovered from the borings were transported to our Soil Mechanics Laboratory, where they were visually reviewed and classified.

Laboratory testing was performed on selected soil and rock samples to estimate engineering and index properties. Laboratory testing of the selected soil samples included various combinations of the following tests: moisture content, Atterberg limits, gradation (particle-size) analyses, and unconfined compression in accordance with ASTM testing procedures. The results of these tests are summarized in the Tabulation of Laboratory Tests in Appendix C, along with the corresponding laboratory test forms. Additionally, the results of laboratory index tests are presented on the boring logs.

The boring logs, which are included in Appendix B, were prepared by the Project Geotechnical Engineer on the basis of the field logs, the visual classification of the soil samples in the laboratory, and the laboratory test results. A Boring Log Legend is also included in Appendix B, which describe the terms and symbols used on the boring logs. The dashed lines on the boring logs indicate an approximate change in strata as estimated between samples, whereas a solid line indicates that the change in strata occurred within a sample where a more precise measurement could be made. Furthermore, the transition between strata can be abrupt or gradual.

4. SUBSURFACE CONDITIONS

4.1 Stratification

Generally, the ground surface consisted of topsoil and was underlain by native lean clay with varying amounts of sand and gravel likely of glacial origin. Native soils were encountered immediately above the limestone and shale bedrock. More specific descriptions of the subsurface strata are provided below, and the boring logs containing detailed material descriptions are located in Appendix B.

4.1.1 Topsoil

Two to six inches of moderately organic dark brown topsoil was encountered at the ground surface in each of the borings, with the exception of Boring B-2. Topsoil was noted at the location of Sounding S-3, but thickness was not measured.

4.1.2 Native Soils

The subsurface conditions encountered in the borings are consistent with residual soils derived from the in-place weathering of underlying shale and limestone bedrock. The residual profile frequently includes intermixed weathered rock fragments and transitional zones of very stiff to hard clay immediately above bedrock.

The native clayey soils were generally described as lean clay (CL), often sandy, with trace gravel, iron oxide staining, and localized calcite seams. These soils are typically moist and range in color from brown to gray and gray-brown. Near the surface, the lean clays are generally medium stiff to stiff, transitioning with depth into stiff to very stiff and locally very hard materials. In several borings, the soils exhibit increasing density and strength with depth, with frequent descriptions of very stiff to hard lean clay beginning at depths of approximately 10 to 25 feet. Sandy lean clay zones are common in the upper profile, grading into more cohesive lean clay with depth, often containing trace gravel and occasional weathered rock fragments.

At greater depths, the lean clay commonly becomes very stiff to hard and transitions into a weathered rock horizon. This transition is often marked by increased blow counts and the presence of calcite or iron oxide seams.

Moisture contents testing on 21 samples ranged from 11.9 to 28.2 percent and were 19.4 percent on average. Atterberg limits testing on four soil samples yielded liquid limits ranging from 24 to 33 percent, and corresponding plasticity indices ranging from 12 to 15 percent. This data along with the grain size analyses on the same four samples of soil indicate soil classifications of low to moderate plasticity Lean Clay (CL) according to the Unified Soil Classification System (USCS). Three undisturbed soil samples were tested for unconfined compressive strength, yielding results ranging from 1,910 to 4,843 psf. More detailed information on the lab testing is provided in Appendix C.

4.1.3 Bedrock

The overburden soils at the site are underlain by bedrock consisting of interbedded shale and limestone layers. Bedrock was encountered at depths of 5.0 to 40.3 feet below the ground surface in each of the borings, with the exception of borings B-9 and B-10.

According to the 1993 Ohio Department of Natural Resources (ODNR) Division of Geology Geologic Map of the Winchester, Ohio Quadrangle, the bedrock underlying the overburden soils belongs to the Preachersville Formation (identified elsewhere as the Drakes Formation).

> *The Preachersville Formation is comprised of Limestone, Shale, and Dolomite. The Preachersville Formation is approximately 90 percent Shale and 10 percent Limestone and Dolomite. The rock is described as gray and maroon, weathering to a yellowish gray. Bedding is thin to medium, irregular, planar, and wavy throughout the three formations. The thickness ranges from 60 to 130 feet.*

Bedrock in the South Central Ohio Area is typically categorized as highly weathered, weathered, or unweathered, based on the degree of weathering of the shale component. The highly weathered zone is typically the uppermost zone, wherein the shale is brown to olive brown in color and has almost weathered to a clay. In the intermediate weathered zone, the shale is typically olive brown with occasional gray and is stronger than the shale in the highly weathered zone. In the unweathered parent zone, the shale is gray and is stronger than the shale in the weathered zones. Each zone is interbedded with limestone. It is not uncommon for one or both of the weathered bedrock zones to be absent due to differential weathering, erosion, or prior excavation.

Regarding the limestone, these layers are predominantly unweathered, and their strengths are estimated to range from medium strong to very strong (i.e., uniaxial compressive strengths ranging from 4,000 psi to upwards of 30,000 psi). Occasionally, layers are encountered within the bedrock profile where groundwater seepage is concentrated, and weathering of the limestone layers is more advanced.

Borings generally terminated at the top of rock due to auger or split spoon refusal. When sampled, the bedrock generally consisted of highly weathered shale and limestone bedrock. Bedrock was cored in borings B-2 and B-4; however, the shale portions of the rock were washed out during the coring process. Preachersville formation bedrock is also identified as a part of the Drakes Formation within the Cincinnati Arch, and due to the argillaceous and fissile nature of the formation, washing out of shale portions of the rock core is not uncommon.

4.2 Groundwater Conditions

Groundwater was not encountered during drilling in the borings. It should be noted that the boreholes were drilled and backfilled within the same day, and stabilized water levels may not have occurred over this limited time period.

Based on the soil characteristics and moisture conditions encountered in the borings, it is our opinion that the “normal” long-term groundwater table can generally be expected at depths beyond the termination depth of the borings performed for this exploration. This exploration did not include research of possible hydrological influences at the project site. It should be noted that groundwater elevations can fluctuate with seasonal and climatic influences. In particular, “perched” water may be encountered in granular soils that are underlain by relatively impermeable cohesive soils, and near the boundary between clayey overburden and bedrock. Therefore, the groundwater conditions may vary at different times of the year from those encountered during this exploration.

5. ANALYSES AND RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed construction and on the data obtained during the field investigation, as subsurface conditions appear to be generally consistent across the site. If the project information or location as outlined is incorrect or should change significantly, a review of these recommendations should be made by Verdantas. These recommendations are subject to the satisfactory completion of the recommended site and subgrade preparation and fill placement operations described in Section 6 “Construction Recommendations”.

5.1 Existing Lagoon Closure

We understand that the existing lagoon will be closed in conjunction with the construction of the new WWTP facilities. The sewage pumped into the lagoon should be bypassed to the larger basins located to the north of the primary lagoon. During closure of the lagoon, all sediment, organic matter and other waste (collectively referred to as refuse herein) should be removed from the basin bottom and disposed of as required by local ordinances.

Following the removal of the refuse, soils at the excavation bottom should be reviewed by the Project Geotechnical Engineer or his appointed representative to determine the extents of potential undercuts, if required, to expose stiff or better clayey subgrade soils. Over-excavation of these soils should not be omitted as plans for potential future expansions include additional tanks bearing in the existing pond footprint and allowing softened soils to remain beneath new fills would result in potential excessive settlements in the future.

Excavation and compaction within the lagoon should be performed in a manner to mitigate risk to the existing 30 inch CCP/RCP storm sewer which runs through the center of the lagoon body. The depth of this pipe is not known at the time of this report, but is likely to be near the bottom of the lagoon and is expected to be exposed during excavation of the refuse materials.

5.2 Foundations

5.2.1 Process Tank Foundations

The proposed new tank structure will be constructed with a base slab bearing at approximately 22 feet below proposed grade, near Elev. 893.5. Based on the results of the field and laboratory testing for the borings performed for this investigation, the subgrade encountered at the anticipated foundation bearing depth are expected to consist of shale bedrock. While the rock was washed out during coring, it is our opinion that the bedrock is suitable for bearing.

Care must be taken wherever a foundation must be supported by two strata with significantly different stiffness, such as the soils and bedrock encountered at this site, to prevent excessive differential settlement and areas of high stress concentrations within the foundation system. We recommend that foundations bear solely on rock. If soil is encountered in any portion of the excavation, we recommend that the overburden soils are over excavated and brought back up with densely graded aggregate or flowable fill. The flowable fill should have a design strength of at least 30 psi for stability, and not greater than 100 psi so that the material can be excavated in the future.

In foundation excavations with rock sloping less than 10 percent, rock need not be undercut or flattened, except as required to remove an asperity or undulation to meet the minimum thickness of concrete indicated for structural design of the foundation. Should the slope of the foundation excavation exceed 10 percent after removal of any weathered or loose rock, the rock surface must be undercut to create a flatter and more uniform bearing surface. Otherwise, stepped footings or doweling should be used to avoid excessive rock excavation. Additionally, for foundations supported on bedrock, the bedrock surface should be cleared of loose/fractured rock.

We recommend a net allowable bearing capacity (q_a) of 5 tons per square foot (tsf) for foundations bearing on intact shale bedrock. The bearing materials should be field verified as being stable bedrock. Settlement of foundations bearing on rock is expected to be negligible.

Although not anticipated, where unsuitable or unstable soils must be removed and replaced with engineered fill materials, dense-graded aggregate may be utilized above the “normal” groundwater level. However, below the groundwater table, backfill should consist of open-graded materials to allow for drainage and management of groundwater seepage in the bottom of the excavation until the mat foundation is poured. Open-graded material should consist of Ohio Department of Transportation (ODOT) Item 703.01, No 57 or No. 67 stone. Although not anticipated to be prevalent, where undercuts are greater than 12 inches due to excessively soft or saturated subgrades, an allowance can be made for an initial lift of 703.01 No. 1 or No. 2 stone, to be “choked” with an overlying layer of No. 57 or 67 stone. In all cases, these are open-graded aggregate materials for which compaction is not based on Proctor moisture-density relationships. Compaction should be based on observation of several satisfactory passes of a dozer or smooth-drum roller to verify overall stability of the base layer overlying the subgrade.

Consideration should be given to buoyancy to evaluate whether the structure, when operating empty, will remain stable under design groundwater table conditions. When considering buoyancy of the structure, the weight of the structure, including the foundation system, can be used to resist uplift. If the structure contains concrete walls, friction factors of 0.40 or 0.30 may be utilized along the face of the structures to mobilize sliding resistance between the installed structures and the granular or cohesive backfill, respectively.

5.2.2 Shallow Foundations

We recommend that the proposed building be supported on shallow foundations, i.e., continuous wall footings and isolated column pads, bearing in new compacted and tested fill, stiff to very stiff native soils, or undisturbed, intact bedrock. The footings may be proportioned for a maximum net allowable bearing pressure of 2,000 pounds per square foot (psf), full dead and full live load. We recommend that the minimum lateral dimensions for continuous wall footings and isolated column footings be at least 18 and 24 inches, respectively. Where mat foundations are used, they should be designed on the basis of a modulus of subgrade reaction of 25 pounds per cubic inch (pci).

Based on the anticipated fill thicknesses, including undercuts, and the maximum net allowable bearing pressure, we anticipate total settlement on the order of 1 inch.

Exterior footings and footings in unheated interior areas should bear at least 30 inches below the lowest adjacent exterior/unheated grade for protection from frost penetration. Additionally, the foundation bearing elevations should not be located higher than a relationship of 2H:1V above proposed adjacent foundations or the inverts of nearby existing or proposed utilities that parallel or nearly parallel the foundations, without a site-specific evaluation of the conditions by the Project Geotechnical Engineer.

Where shallow foundations will be subjected to lateral loads, resistance to overturning and sliding may be evaluated using the parameters provided in Table 5-1. Furthermore, lateral resistance to sliding may be provided by a combination of friction and passive resistance; however, passive resistance should be ignored above the frost penetration depth of 30 inches. It also should be noted that the passive resistance parameters assume a level ground surface. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific parameters. The frictional force should be based on dead normal loads only, and an appropriate factor of safety should be applied to the sliding resistance. Refer to Section 5.6 for lateral earth pressures.

Table 5-1: Design parameters for laterally loaded shallow foundations.

	Designated Value
Soil unit weight, γ (pcf)	125
Internal angle of friction, ϕ (°)	26
Cohesion, c (psf)	0
Ultimate coefficient of static friction, μ_{ult}	0.35 for concrete cast on stiff in-situ clayey soils
	0.49 for concrete cast on 12-inch-thick compacted granular base
	0.40 for formed precast concrete on compacted granular base
Ultimate passive resistance, σ_p[a]	See lateral earth pressure parameters in Table 5-2

Note:

[a] Passive resistance may be considered where concrete is cast against free-standing vertical faces of the indicated soil or bedrock type; however, passive resistance should be ignored in the upper 30 inches below proposed grade due to seasonal variations in moisture and frost penetration. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific recommendations.

5.3 Subgrades

5.3.1 Existing Subgrade

The subgrades that would result upon the satisfactory completion of the site preparation as described in Section 6 of this report are considered generally acceptable for support of the proposed pavements and floor slabs. Based on field and laboratory data developed during this investigation, the upper subgrade soils generally consist of native cohesive soils ranging from

The cohesive soils at the site are considered fair to poor as subgrade materials because they have relatively low permeabilities and a high percentage of silt and clay particles, which makes them susceptible to moisture, frost penetration, and frost heave. Therefore, the cohesive soils will dictate floor slab and pavement design.

Visual classification of the upper subgrade soils indicated the predominant cohesive subgrade soils may be generally classified as Group A-4a or A-6a in accordance with the Ohio Department of Transportation (ODOT) system of soil classification.

Pavement subgrade soils containing more than trace organics (more than nominally 5 percent) should be undercut at least 24 inches below top of subgrade/bottom of stone base elevation. It should be noted that there is risk with only partial removal for long-term settlement that may result in increased required maintenance over the life of the pavements.

Where measured, the moisture contents in the upper 4 feet of the soils are estimated to be significantly above the expected optimum moisture content for these soils (estimated optimum moisture is 10 - 14 percent). Significant remedial action to adjust the moisture contents of the cohesive existing materials, is expected to achieve proper compaction of the subgrade, unless construction occurs during a particularly dry period.

5.3.2 Modified Subgrade

Where soils are dry of optimum, water should be uniformly mixed into the subgrade. Where soils are wet of optimum, lowering the moisture content by scarification and aeration (discing and exposure to sun and wind) may be required. However, this may not be feasible if construction occurs during wet seasonal conditions. Very moist to wet soils will “pump” under the operation of heavy equipment, resulting in deep rutting and perhaps rendering the operation of grading and paving equipment difficult or impossible.

Therefore, other methods of subgrade modification may be required in areas of high moisture content. Modification may be achieved by undercutting and replacement with granular subbase (possibly in combination with a geotextile separation layer or geogrid reinforcement), mixing stone into the subgrade, or treating the subgrade with lime or cement. However, due to relatively small area of construction, the latest option most likely will not be feasible due to high mobilization cost of the equipment. The method of subgrade modification should be determined at the time of construction (See Section 6.1, “Construction Recommendations - Site and Subgrade Preparation”).

5.4 Floor Slabs

It is recommended that all floor slabs be “floating”, that is, fully ground supported and not structurally connected to walls or foundations. This is to reduce the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation. Such movements could be detrimental to slabs that are rigidly connected to the foundations. There may be certain areas where it will be difficult or impractical to make the slab floating. In such areas, it may be necessary to increase the slab thickness and reinforcement to prevent the foundation from cracking the slab and settling independently.

For properly prepared subgrade soils, a modulus of subgrade reaction (k) of 135 pounds per cubic inch (pci) may be used for floor slab design. It is recommended that the floor slab be supported on a minimum 6-inch layer of relatively clean granular material such as sand and gravel or crushed stone. This is to help distribute concentrated loads and provide more uniform subgrade support beneath the slab.

5.5 Groundwater Control

Encountered groundwater conditions were previously discussed in Section 4.2. Based on the limited data available, such as the soil characteristics and the groundwater conditions encountered in the borings, it is our opinion that the “normal” groundwater level may be generally encountered at or near the bedrock surface. It should be noted that “perched” water may be encountered in granular soils that are underlain by relatively impermeable native cohesive soils, or at the soil-bedrock interface.

It is our experience that adequate control of groundwater seepage, “perched” water, or surface water run-off into shallow excavations should be achievable by minor dewatering systems, such as pumping from prepared sumps. Poorly graded sand and sandy silt seams were encountered in the subsurface profile, exhibiting higher permeability than the site's lean clay soils. Water seepage should be anticipated during excavation, particularly in deeper areas. Diligent dewatering may be required for deeper excavations that extend into these layers. Seepage pressures may also destabilize shallower subgrades, potentially requiring dewatering wells prior to excavation to maintain site stability. In the event excessive seepage is encountered during construction, Verdantas may be notified to evaluate whether other dewatering methods are required.

5.6 Below Grade Walls

At the WWTP site, below-grade structures are anticipated to extend approximately 13 to 21 feet below the current grades, except the media filters bearing on shallow foundations. Within these depths, subsoils are anticipated to consist of predominantly native cohesive soils with interbedded seams of native granular soils. The cohesive materials were more predominant throughout the site, and dictate design compared to the other site materials.

Where existing structures, underground utilities, and embankments are located within a distance from the excavation equal to approximately twice the depth of the excavation, an adequate system of sheet piling, temporary post-and-panel, lateral bracing, trench boxes, or an alternate construction procedure may be required to prevent lateral movements that may cause settlement of these entities. Sheet piling may also be used in combination with laid-back slopes limited to the upper portion of the profile to avoid an excessively large, open excavation.

Design of sheet-pile walls or H-pile and lagging systems should be the responsibility of the contractor, since their installation and performance is integrally tied to the contractor's means and methods of construction. In any case, applicable OSHA standards must be followed. It is the responsibility of the installation contractor to develop appropriate installation methods and equipment specifications prior to commencement of work, and to obtain the services of a qualified engineer to design or approve sloped or benched excavations and/or lateral bracing systems as required by OSHA criteria. In addition, OSHA requires that excavations with open-cut slopes higher than 20 feet (not expected for this project), or braced excavation support systems such as sheetpiling or cofferdams be reviewed and designed by a registered professional engineer.

For below-grade walls that are restrained from rotation and are considered rigid and non-yielding, lateral earth pressures should be assumed for “at-rest” conditions. An at-rest lateral earth pressure coefficient (ko) of 0.56 should be used along with a soil unit weight of 125 pounds per cubic foot (pcf) in determining the lateral pressure acting on the walls. For retaining structures or below-grade walls that are not restrained at the top of the wall (including temporary sheet piling for construction), an active lateral earth pressure coefficient (ka) of 0.39 may be used for design. These values are based on the assumption that the existing predominately cohesive soils encountered in the subsurface profile will constitute the major portion of the backfill area and retained earth behind the walls.

Below the groundwater table, an effective unit weight should be utilized by reducing the total unit weight by the unit weight of water (62.4 pcf). Additionally, hydrostatic pressures should be considered below the groundwater level.

Table 5-2: Lateral earth pressures for level (horizontal) ground surfaces.

	Active[a]	At-Rest[a]	Passive[a,b]
Lateral earth pressure coefficient, K	0.39	0.56	2.56
Drained equivalent fluid weight, EFW (pcf)	49	70	320
Undrained equivalent fluid weight, EFW_u (pcf)[c]	87	98	222

Notes:

[a] Parameters are based on level ground surfaces, a soil unit weight (γ) of 125 pcf, and a soil internal angle of friction (ϕ) of 26 degrees.

[b] Passive resistance may be considered where concrete is cast against free-standing vertical faces of soil or bedrock; however, passive resistance should be ignored in the upper 30 inches below proposed grade due to seasonal variations in moisture and frost penetration. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific recommendations.

[c] Includes hydrostatic pressure of 62.4 pcf.

It should also be noted that the above earth pressures are based on a level backfill condition behind the retaining wall. In areas where appreciable sloping materials will be present behind the top of the wall, surcharge loading or equivalent higher earth pressure coefficients should be evaluated, based on the sloping material, backfill slope, and proximity to the wall. In general, 50 percent of the vertical surcharge load should be used for lateral loading in the design of the wall.

5.7 Excavations and Slopes

The sides of temporary excavations for utility installations, and other construction should be adequately sloped to provide stable sides and safe working conditions. Otherwise, the excavation must be properly braced against lateral movements. In any case, applicable Occupational Safety and Health Administration (OSHA) safety standards must be followed.

It should be noted that OSHA requires that excavations with open-cut slopes higher than 20 feet, or braced excavation support systems such as sheet-piling, be reviewed and designed by a registered professional engineer.

Based on the test borings, it is likely that excavations will encounter OSHA Type B soils overlying Stable Bedrock as defined by OHSA. The OHSA Definition of a Type B soil is provided below for reference:

> *Type B Soils are cohesive soils with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa). Examples of other Type B soils are: angular gravel; silt; silt loam; previously disturbed soils unless otherwise classified as Type C; soils that meet the unconfined compressive strength or cementation requirements of Type A soils but are fissured or subject to vibration; dry unstable rock; and layered systems sloping into the trench at a slope less than 4H:1V (only if the material would be classified as a Type B soil)*

For temporary excavations in Type B soils, side slopes must be no steeper than 1 horizontal to 1 vertical (1H:1V).

For permanent excavations and slopes, we recommend that grades be no steeper than 3H:1V without a more extensive geotechnical evaluation of the proposed construction plans and site conditions.

The final determination of the OHSA Soil Type is the responsibility of the contractor at the time of construction as soil conditions may differ from those encountered in the borings performed for this exploration.

5.7.1 Bedrock Excavation

Bedrock is anticipated to be encountered near Elev. 895 across the entirety of the site. Variations from this elevation may occur, how are not anticipated to be significant. Bedrock within the project site is anticipated to contain minimal limestone in beds ranging from 1 to 4 inches thick.

Experience indicates that the overburden soils and the highly weathered and weathered shale zones of the bedrock can be excavated with conventional earthwork construction equipment (i.e., dozers, hoes, loaders, scrapers, etc.), although ripping is necessary to loosen the bedrock so that it can be picked up. Excavations that extend into the unweathered gray shale and limestone bedrock become more difficult with depth, and more ripping may be required to loosen the bedrock.

The Contractor should select a method of excavating that will allow adequate care to be taken to protect nearby residential structures, infrastructure (e.g., water mains, gas mains, etc.), and slopes from vibration or other potential damage that might be caused (or might be perceived to be caused) during bedrock excavation. The Contractor should complete pre-construction reviews of structures and properties located near the proposed bedrock excavations (e.g., the residences at #60 and #66 Eastern Avenue) prior to excavating. The Contractor should also perform vibration monitoring during excavating. Upon completion of work, the Contractor should perform post-construction review of the structures and properties for which pre-construction reviews were performed.

5.7.2 Temporary Shoring

The process tank is anticipated to extend approximately 21 feet below the proposed grade at the site. Within these depths, subsoils are anticipated to consist of predominantly native cohesive soils. Temporary shoring will be required if the excavations are not intended to be sloped. Based on the 3H:1V cut into the hillside to the south of the process tank location, we anticipate that laying back the excavated slopes would be viable. If open excavations are to be used, we recommend that this be performed after the closure of the existing lagoon to lower the risk associated with failure of the northern excavation slope due to the potential of establishing a hydraulic connection between the excavation and a wet lagoon. If the lagoon is to remain open through the installation of the process tank, temporary shoring should be used on excavation of the north side of the tank.

Where existing structures, underground utilities, and embankments are located within a distance from the excavation equal to approximately twice the depth of the excavation, an adequate system of sheet piling, temporary post-and-panel, lateral bracing, trench boxes, or an alternate construction procedure may be required to prevent lateral movements that may cause settlement of these entities. Sheet piling is not anticipated to be viable at this site due to the presence of bedrock at the bottom of the excavation. Rock nailing with a bracing beam at the base of the sheet piles may make sheet piling viable.

Design of Sheet piling or H-pile and lagging systems should be the responsibility of the contractor, since their installation and performance is integrally tied to the contractor's means and methods of construction. In any case, applicable OSHA standards must be followed. It is the responsibility of the installation contractor to develop appropriate installation methods and equipment specifications prior to commencement of work, and to obtain the services of a qualified engineer to design or approve sloped or benched excavations and/or lateral bracing systems as required by OSHA criteria. In addition, OSHA requires that excavations with open-cut slopes higher than 20 feet, or braced excavation support systems such as sheet piling or cofferdams be reviewed and designed by a registered professional engineer.

5.8 Seismic Site Class

Based on the interpretation of the boring data, regional experience, local geology, and the relatively shallow depth to soft bedrock, it is our opinion that the site may be Classified as *Site Class C – Very Dense Sand or Hard Clay* in accordance with ASCE/SEI 7-22.

6. CONSTRUCTION RECOMMENDATIONS

Based on our engineering reconnaissance of the site, the borings, the visual examination of the recovered samples, the laboratory test results, our understanding of the proposed project, our engineering analyses, and our experience as Geotechnical Engineers in theregion, the following conclusions are presented.

6.1 Site and Subgrade Preparation

6.2 Fill Placement and Recommendations

Material for engineered fill or backfill required to achieve design grades may consist of any non-organic soils having a maximum dry density as determined by the Standard Proctor (ASTM D 698) greater than 95 pounds per cubic foot (pcf) and exhibiting a liquid limit of less than 45 percent. On-site soils may be used as engineered fill materials provided that they are free of organic matter, debris, excessive moisture, and rock or stone fragments larger than 3 inches in diameter and exhibit a liquid limit of less than 45 percent. Depending on seasonal conditions, the on-site soil may be wet of optimum. The soil could require scarification and aeration to achieve satisfactory compaction. If the construction schedule does not allow for scarification and aeration activities, it may be more practical or economical to utilize imported granular fill or chemical stabilization utilizing Lime Kiln Dust (LKD).

Fill should be placed in uniform layers no more than 8 inches thick (loose measure) and adequately keyed into stripped and scarified soils. All fill within the proposed gravel pavement subgrades should be compacted to not less than 95 percent of the maximum dry density as determined by ASTM D 698 (Standard Proctor).

Based on the borings, the upper soil profile at the site consists of granular soils. The contractor should be prepared to use a smooth drum roller to provide effective compaction of the granular soils. For new granular engineered fill, compaction of these materials should be performed using a vibratory, smooth-drum roller.

Fill material should not be frozen or placed on a frozen base. It is recommended that all earthwork and site preparation activities be conducted under adequate specifications and properly monitored in the field by a qualified geotechnical testing firm.

Where fill is placed on sloping terrain that is steeper than 6H:1V, the fill should be placed on continuous horizontal benches up the sloping terrain with the initial bench having a minimum width of 15 feet and each subsequent bench being at least 5 feet wide. The initial 15-foot-wide bench should be located at the toe of the proposed fill, The benching operations on the bluff slope should remove surficial very loose to loose sands or medium stiff or softer soils and expose stiff native soils on the surfaces of the benches. The benches should not be made until the fill is ready to be placed. If groundwater seepage is noted on the benches, the Project

Geotechnical Engineer should be contacted for underdrainage recommendations before the soils are replaced and compacted.

6.3 Shallow Foundation Construction Recommendations

We recommend that foundation excavations be cut to neat lines and grades so that concrete may be placed directly against the banks of the excavations without forming. Loose, soft, wet, frozen, or otherwise disturbed materials should be removed from the bearing surfaces of the foundations prior to the placement of reinforcing steel and concrete. If a limestone layer is exposed in the bottom of the footing excavation, we recommend that the excavation be deepened to penetrate the limestone layer, unless it can be determined that there is no softening of the shale beneath the limestone. Additionally, disturbed or loosened beds of limestone should be removed from the bearing surface. If a crusted or saturated surface develops at the bearing surface for a foundation, we recommend that it be skimmed to expose a fresh surface before reinforcing steel and concrete are placed. Foundation concrete should be placed the same day as the excavation is made to prevent saturation or desiccation of the bearing surfaces.

Concrete mud mats may be placed over the bearing surfaces to protect the bearing materials from desiccation or softening via saturation. If concrete mud mats are utilized, the concrete should have a minimum compressive strength of 1,500 psi, and a minimum thickness of 3 inches. The excavated bearing surface should be lowered at least the thickness of the mud mat, and the top of the mud mat should be at or below the design bearing elevation of the foundation. Prior to the placement of the concrete mud mat, the bearing surfaces should be cleaned of loose, soft, wet, frozen, or otherwise disturbed material.

Water should not be allowed to pond on top of either bearing soils or bedrock within footing excavations, or on or around completed footings, in order to reduce potential softening or swelling of the bearing materials.

We recommend that foundation steps have a maximum height of 2 feet and a corresponding minimum length of 4 feet. Reinforcing steel and concrete should remain continuous through the foundation steps.

We recommend that foundation excavations be reviewed by the Project Geotechnical Engineer, or a representative thereof, prior to placing concrete in order to confirm that the bearing materials and surfaces are consistent with the design recommendations of this report.

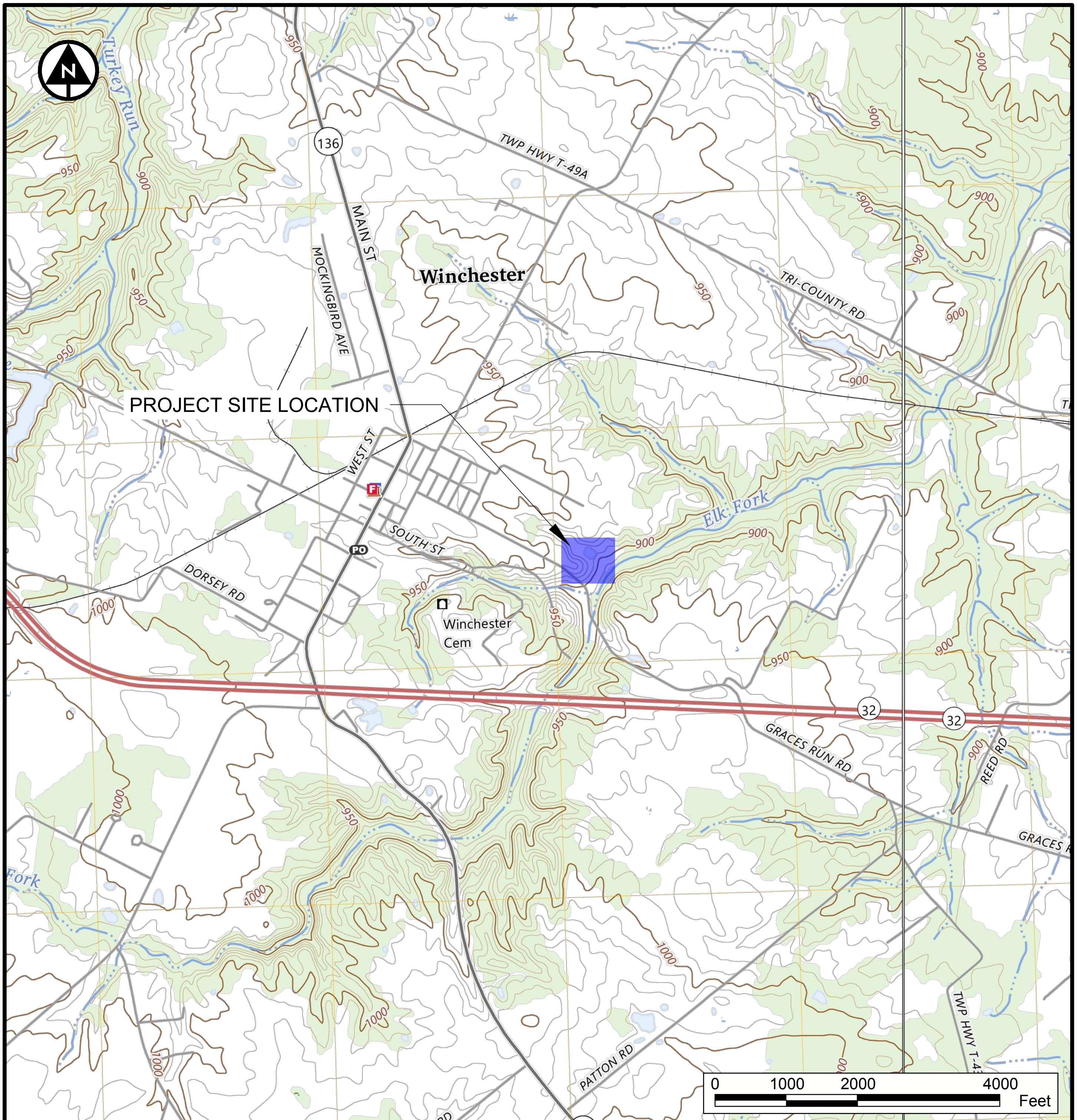
7. QUALIFICATIONS AND LIMITATIONS

The recommendations of this report have been prepared according to generally accepted soil and foundation engineering practice and are based on the conditions encountered explorations performed as part of this investigation at the site. Although soil quality has been inferred from the interpolation of the sampling data, you should explicitly note that subsurface conditions beyond the explorations, in fact, unknown. Should any conditions encountered during construction differ from those described in this report, this office should be notified immediately to review, and possibly modify these recommendations. This report applies solely to the size, type, and location of the structures described herein. If changes are proposed, this report will not be considered valid unless the changes have been reviewed and the recommendations of this report modified and re-approved in writing by Verdantas LLC.

APPENDIX A - Plates

Site Location Plan, Plate 1.0

Boring Location Plan, Plate 2.0



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WINCHESTER ADAMS COUNTY OHIO
480 GRACES RUN ROAD

SITE LOCATION PLAN

ADAMS COUNTY/NORTH ADAMS REGIONAL WASTEWATER TREATMENT PLANT

Project Number	200619
Date	5/7/2026
Author	ASD
Scale	1:2000
Figure	1.0

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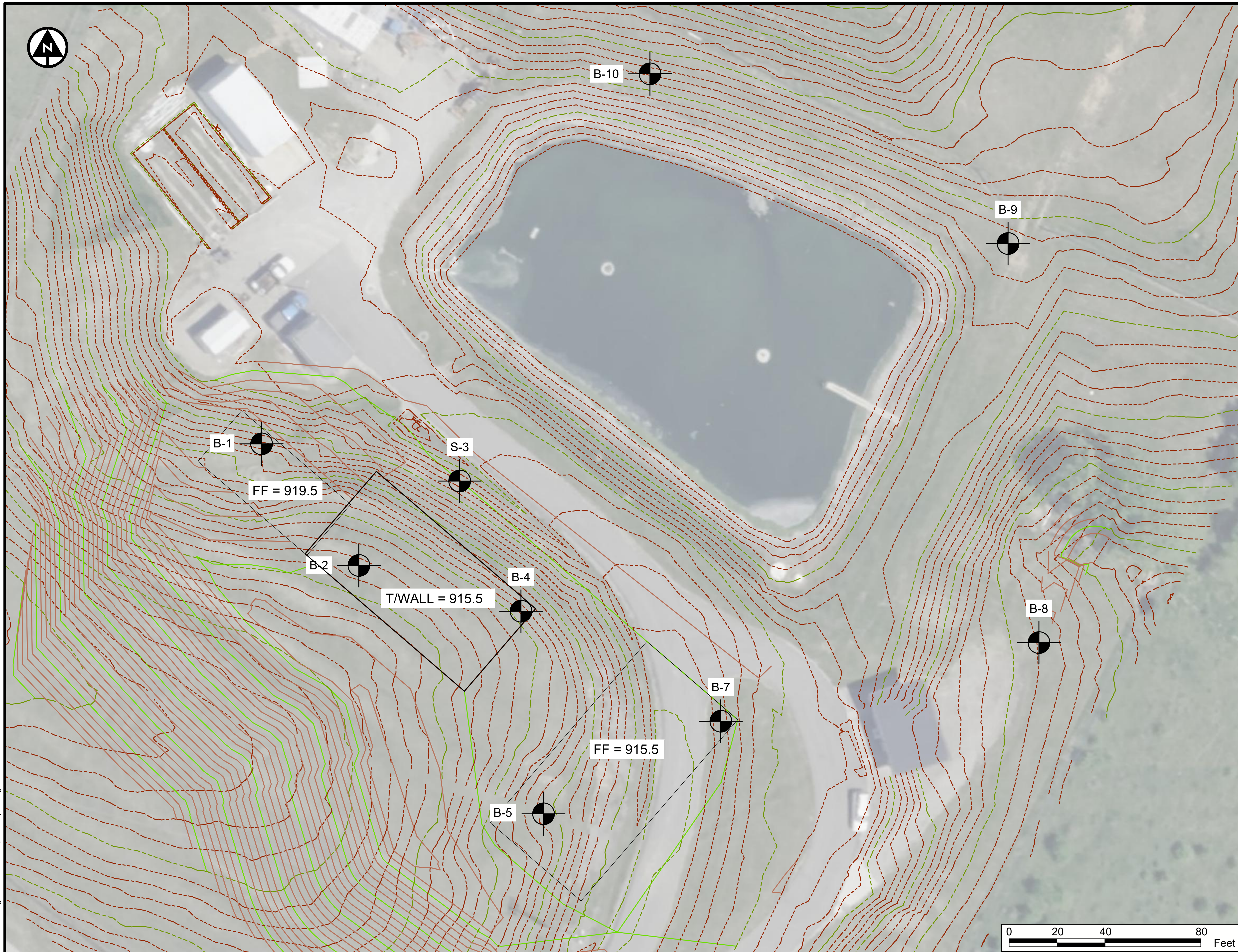
Produced Using Autodesk's Civil 3D Software



BORING LOCATIONS

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WINCHESTER ADAMS COUNTY OHIO
480 GRACES RUN ROAD

EXPLORATION PLAN

ADAMS COUNTY/NORTH ADAMS REGIONAL WASTEWATER TREATMENT PLANT

Project Number	200619
Date	5/7/2026
Author	ASD
Scale	1:40
Plate	2.0

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Produced Using Autodesk's Civil 3D Software

APPENDIX B – Boring Information

Log of Borings

Legend key

BORING NUMBER B-1

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Verdantas LLC
4420 Cooper Road
Cincinnati, Ohio 45242

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 923 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/26/26 **COMPLETED** 2/26/26
AT TIME OF DRILLING ---
LOGGED BY ASD **CHECKED BY** ASD
AT END OF DRILLING ---
NOTES Auger refusal encountered at 22.5 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80); ▲ SPT N VALUE ▲ (20 40 60 80)
	0	TOPSOIL - 4 Inches (0.3')	SS 1	100	3-5-7 (12)	1.75		
		Moist Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL) (2.5')						
920		Moist Very Stiff Gray/Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL)						
	5		SS 2	100	7-15-9 (24)	4.25		12
915		(10.0')						
	10	Moist Medium Stiff to Stiff Gray/Brown LEAN CLAY w/Sand and Trace Gravel (CL)	SS 3	0	5-3-4 (7)	NR		
910		(14.0')	SS 4	100	4-4-5 (9)	1.25		
	15	Moist Medium Stiff to Stiff Brown and Gray LEAN CLAY w/Gravel, Trace Calcite Stain Seam (CL)	ST 5	42		0.95	112	17
905		(19.5')	SS 6	100	3-2-4 (6)	0.75		
	20	Moist Stiff Gray LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL) (21.5')	SS 7	100	3-10-5 (15)	1.50		28
		Bottom of hole at 21.5 feet.						

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4420 Cooper Road
Cincinnati, Ohio 45242

BORING NUMBER B-2

CLIENT Adams County

PROJECT NAME Adams County WWTP

PROJECT NUMBER 200619

PROJECT LOCATION Winchester OH

DRILLING CONTRACTOR UES JB

RIG NO. TD-2

GROUND ELEVATION 934 ft

DRILLING METHOD 3-1/4 in. HSA

GROUND WATER LEVELS:

DATE STARTED 2/24/26

COMPLETED 2/25/26

AT TIME OF DRILLING ---

LOGGED BY MCM

CHECKED BY ASD

AT END OF DRILLING ---

NOTES Auger refusal encountered at 30.8 feet and 0.3 feet of rock cored.

0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80); ▲ SPT N VALUE ▲ (20 40 60 80)
	0	TOSPOIL - 2 Inches (0.2')						
		Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL)	SS 1	100	2-3-4 (7)	1.25		
930	5		SS 2	100		NI		
925	10	(10.0')						
		Moist Very Stiff Gray/Brown SANDY LEAN CLAY w/Trace Gravel and Calcite Stain Seam (CL)	SS 3	100	6-7-10 (17)	>4.5		16
920	15	@15': w/Trace Iron Oxide Stain Seam	SS 4	100	6-6-8 (14)	>4.5		17
915	20	(20.0')						
		Moist Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 5	100	3-3-5 (8)	2.00		21
910	25	@23': w/Gravel and Trace Calcite Stain Seam (25.0')	ST 7	75		1.08	116	17

(Continued Next Page)

CLIENT Adams County **PROJECT NAME** Adams County WWTP

PROJECT NUMBER 200619 **PROJECT LOCATION** Winchester OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80); ▲ SPT N VALUE ▲ (20 40 60 80)
	25		Moist Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 8	100	3-4-8 (12)	1.25		
905				SS 9	100	3-3-5 (8)	1.25		24
	30		30.0'						
			Moist Very Hard Gray LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL) 30.5'	SS 10	100	4-50/0"	2.00		>>
			Moist Very Dense Gray WEATHERED LIMESTONE 30.8'	SS 11	0		NR		
900	35		Moist Extremely Weak SHALE and Slightly Moist Gray Slightly Weathered LIMESTONE. SHALE Nearly Entirely Washed Out During Coring, But Comprised Approximately 95 Percent Of The Total Rock Within The Core. LIMESTONE Was Thinnly Bedded, In Beds Of 2 To 4 Inches Thick, And Was Very Closely Fractured, And Very Slightly Vuggy. 35.8'	RC 12	7 (7)				

Bottom of hole at 35.8 feet.

Verdantas LLC
4420 Cooper Road
Cincinnati, Ohio 45242

BORING NUMBER S-3

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 918 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/24/26 **COMPLETED** 2/24/26
AT TIME OF DRILLING ---
LOGGED BY MCM **CHECKED BY** ASD
AT END OF DRILLING ---
NOTES Split spoon refusal encountered at a depth of 25.9 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80); ▲ SPT N VALUE ▲ (20 40 60 80)
918	0		Moist Brown LEAN CLAY w/Sand and Trace Gravel (CL)						
915									
	5								
910									
	10								
905									
	15								
900									
	20		20.0'						
			Moist Gray LEAN CLAY w/Sand and Trace Gravel (CL)						
895									
	25		25.0'						
			Moist Gray Extremely Weak Weathered SHALE (bedrock). 25.9'	SS 1	100	37-50	NP		
			Bottom of hole at 25.9 feet.						

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4420 Cooper Road
Cincinnati, Ohio 45242

BORING NUMBER B-4

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 929.5 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/25/26 **COMPLETED** 2/25/26
AT TIME OF DRILLING ---
LOGGED BY MCM **CHECKED BY** ASD
AT END OF DRILLING ---
NOTES Split spoon refusal encountered at a depth of 36.5 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	MC (PL 20 40 60 80 LL) / ▲ SPT N VALUE ▲
	0	TOPSOIL - 6 Inches 0.5'	SS 1	100	2-2-3 (5)	2.75		
		Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL) 5.0'						
925	5	Moist Stiff Brown LEAN CLAY w/Sand, Trace Iron Oxide Stain Seam, and Organics (CL) 5.5'	SS 2	100	4-3-4 (7)	3.50 1.25		22
		Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Gravel (CL) 10.0'						
920	10	Moist Very Stiff Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL)	SS 3	100	10-9-9 (18)	>4.5		
915	15	@15': Stiff, Gray/Brown	SS 4	100	3-4-6 (10)	3.50		
			SS 5	100	3-3-10 (13)	1.50		24
910	20	20.0'						
		Moist Medium Stiff to Stiff Gray LEAN CLAY w/Trace Sand (CL) @20.5': w/Sand and Trace Gravel 22.5'	SS 6	100	3-3-4 (7)	1.50 1.50		
		Moist Very Hard Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 7	100	3-50/4"	1.50		>>
905	25	25.0'						

(Continued Next Page)

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL 20 40 60 80 / ▲ SPT N VALUE ▲ 20 40 60 80
	25		Moist Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 8	100	4-5-5 (10)	1.50		
				SS 9	100		0.75		
900	30		30.0'						
			Moist Medium Stiff to Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL) 32.5'	SS 10	100	3-3-3 (6)	1.25		
			Moist Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 11	100	3-5-7 (12)	1.25		
895	35		35.0'						
			Moist Very Hard Brown/Gray LEAN CLAY w/Sand and Trace Gravel (CL) 35.8'	SS 12	100	10-14-40 (54)	1.50		
			Moist Gray Slightly Weathered Weathered SHALE (bedrock) 36.5'						
890	40		Moist Extremely Weak SHALE and Slightly Moist Gray Slightly Weathered LIMESTONE. SHALE Nearly Entirely Washed Out During Coring, But Comprised Approximately 95 Percent Of The Total Rock Within The Core. LIMESTONE Was Thinnly Bedded, In Beds Of 2 To 3 Inches Thick, And Was Very Closely Fractured. 41.5'	RC 13	7 (7)				

Bottom of hole at 41.5 feet.

BORING NUMBER B-5

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Verdantas LLC
4420 Cooper Road
Cincinnati, Ohio 45242

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 926.5 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/24/26 **COMPLETED** 2/24/26
AT TIME OF DRILLING ---
LOGGED BY MCM **CHECKED BY** ASD
AT END OF DRILLING ---
NOTES Split spoon refusal encountered at a depth of 40.3 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings

Elevations off

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80) ▲ SPT N VALUE ▲ (20 40 60 80)
	0	TOPSOIL - 2 Inches 0.2'						
25		Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL) 2.5'	SS 1	100	2-2-3 (5)	1.50		
		Moist Stiff Brown SANDY LEAN CLAY w/Trace Gravel and Iron Oxide Stain Seam (CL)	SS 2	100	3-4-6 (10)	>4.5		20
20	5		SS 3	100	5-5-6 (11)	4.00		
			SS 4	100	3-5-6 (11)	>4.5		
15	10		ST 5	100		NI		18
			ST 6	33		2.42	122	13
10	15		SS 7	100		NR		
5	20	@20': w/Gravel and Trace Calcite Stain Seam	SS 8	100	5-4-6 (10)	>4.5		14
	25	25.0'						

(Continued Next Page)

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4420 Cooper Road
Cincinnati, Ohio 45242

BORING NUMBER B-5

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80); ▲ SPT N VALUE ▲ (20 40 60 80)
0	25		Moist Medium Stiff to Stiff Gray LEAN CLAY w/Sand and Trace Gravel (CL)	SS 9	100	2-3-3 (6)	1.25		MC 23
-5	30		30.0' Moist Very Stiff Gray LEAN CLAY w/Sand, Gravel, and Trace Calcite Stain Seam (CL)	SS 10	100	6-11-8 (19)	2.00		
-10	35								
	40		40.0' Moist Gray Extremely Weak Weathered SHALE (bedrock). 40.3'	SS 11	100	75/4"	NP		>>

Bottom of hole at 40.3 feet.

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4420 Cooper Road
Cincinnati, Ohio 45242

BORING NUMBER B-7

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 919 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/27/26 **COMPLETED** 2/27/26
AT TIME OF DRILLING ---
LOGGED BY MCM **CHECKED BY** ASD
AT END OF DRILLING ---
NOTES Split spoon refusal encountered at a depth of 27.8 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80)	SPT N VALUE (20 40 60 80)
	0	TOPSOIL - 6 Inches (0.5')	SS 1	100	2-3-4 (7)	3.00			
		Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL) (5.0')							
915	5	Moist Stiff Brown LEAN CLAY w/Sand, Trace Gravel, and Iron Oxide Stain Seam (CL)	SS 2	100	3-5-8 (13)	3.50			
		@7.5': w/Trace Calcite Stain Seam	SS 3	100	3-5-8 (13)	4.00		19	
910	10	@10': Very Stiff	SS 4	100	4-8-8 (16)	3.50			
		@12.5': Stiff	SS 5	100	3-6-8 (14)	>4.5			
905	15	@15': Very Stiff	SS 6	100	4-6-10 (16)	4.00		17	
			SS 7	100	3-8-8 (16)	3.50			
900	20	@20': Stiff (22.5')	SS 8	100	4-3-8 (11)	3.50			
		Moist Hard Brown LEAN CLAY w/Sand, Trace Gravel, Calcite Stain Seam, and Iron Oxide Stain Seam (CL)	SS 9	100	4-29-18 (47)	3.25		19	
895	25								

(Continued Next Page)

CLIENT Adams County **PROJECT NAME** Adams County WWTP

PROJECT NUMBER 200619 **PROJECT LOCATION** Winchester OH

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL MC LL 20 40 60 80 / ▲ SPT N VALUE ▲ 20 40 60 80
	25		@25': Very Hard 26.0'	SS 10	100	3-18-35 (53)	3.00 NP		
890			Moist Gray Extremely Weak Weathered SHALE (bedrock). 29.0'	SS 11	22	38-41-50 (91)	NI		
			Bottom of hole at 29.0 feet.						

VDT_GEOTECH_STANDARD 200619.GPJ GINT US LAB.GDT 6/4/26

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4420 Cooper Road
Cincinnati, Ohio 45242

BORING NUMBER B-8

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 899 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/27/26 **COMPLETED** 2/27/26
AT TIME OF DRILLING ---
LOGGED BY MCM **CHECKED BY** ASD
AT END OF DRILLING ---
NOTES Split spoon refusal encountered at a depth of 10.3 feet.
0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80); ▲ SPT N VALUE ▲ (20 40 60 80)
	0		TOPSOIL - 4 Inches (0.3')	SS 1	100	3-3-4 (7)	3.00		
			Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL) (2.5')						
895			Moist Stiff Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL) (5.0')	SS 2	100	3-5-6 (11)	3.50		23
	5		Moist Gray Extremely Weak Weathered SHALE (bedrock).	SS 3	100	50/4"	NP		>>
890	10		(10.3')	SS 4	100	50/4"	NP		7 >>
			Bottom of hole at 10.3 feet.						

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BORING NUMBER B-9

CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 917 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/27/26 **COMPLETED** 2/27/26
AT TIME OF DRILLING ---
LOGGED BY ASD **CHECKED BY** ASD
AT END OF DRILLING ---
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL 20 40 60 80; ▲ SPT N VALUE ▲ 20 40 60 80
	0		TOPSOIL - 3 Inches 0.3'	SS 1	100	2-1-2 (3)	2.50		▲
915			Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL)	SS 2	100	2-3-4 (7)	2.75		▲
	5		5.0'						
			Moist Stiff Brown LEAN CLAY w/Sand, Trace Gravel, and Iron Oxide Stain Seam (CL) 6.5'	SS 3	100	3-4-6 (10)	3.25		▲

Bottom of hole at 6.5 feet.

BORING NUMBER B-10

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CLIENT Adams County
PROJECT NAME Adams County WWTP
PROJECT NUMBER 200619
PROJECT LOCATION Winchester OH
DRILLING CONTRACTOR UES JB
RIG NO. TD-2
GROUND ELEVATION 913.5 ft
DRILLING METHOD 3-1/4 in. HSA
GROUND WATER LEVELS:
DATE STARTED 2/27/26
COMPLETED 2/27/26
AT TIME OF DRILLING ---
LOGGED BY MCM
CHECKED BY ASD
AT END OF DRILLING ---
NOTES
0hrs AFTER DRILLING Backfilled w/Cuttings

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	UNCONF. COMP. STR. (tsf)	DRY UNIT WT. (pcf)	PL / MC / LL (20 40 60 80); ▲ SPT N VALUE ▲ (20 40 60 80)
	0		TOPSOIL - 3 Inches (0.3')	SS 1	100	3-3-3 (6)	2.50		▲
			Moist Medium Stiff to Stiff Brown SANDY LEAN CLAY w/Trace Organics (CL) (2.5')						
910			Moist Medium Stiff to Stiff Brown LEAN CLAY w/Sand and Trace Gravel (CL) (5.0')	SS 2	100	3-3-4 (7)	2.50		▲
	5		Moist Stiff Gray/Brown LEAN CLAY w/Sand, Trace Gravel, and Calcite Stain Seam (CL) (6.5')	SS 3	100	3-4-8 (12)	>4.5		▲

Bottom of hole at 6.5 feet.

LEGEND KEY

Unified Soil Classification System Soil Symbols

- GW - WELL GRADED GRAVEL Includes Gravel-Sand mixtures, little or no fines.
- GP - POORLY GRADED GRAVEL Includes Gravel-Sand mixtures, little or no fines.
- GM - SILTY GRAVEL Includes Gravel-Sand-Silt mixtures.
- GC - CLAYEY GRAVEL Includes Gravel-Sand-Clay mixtures.
- SW - WELL GRADED SAND Includes Gravelly Sands, little or no fines.
- SP - POORLY GRADED SAND Includes Gravelly Sands, little or no fines.
- SM - SILTY SAND Includes Sand-Silt mixtures.
- SC - CLAYEY SAND Includes Sand-Clay mixtures.
- ML - SILT Includes Silt with Sand and Sandy Silt.
- CL - LEAN CLAY Includes Sandy Lean Clay and Lean Clay with Sand and Gravel.
- MH - ELASTIC SILT Includes Sandy Elastic Silt and Elastic Silt with Sand.
- CH - FAT CLAY Includes Sandy Fat Clay and Fat Clay with Sand.
- CL-ML - SILTY CLAY Includes Clayey Silt of low plasticity.
- OL - ORGANIC SILT and ORGANIC CLAY of low plasticity.
- OH - ORGANIC SILT and ORGANIC CLAY of medium to high plasticity.
- Pt - PEAT Includes humus, swamp and other soils with high organic content.
- FILL MATERIAL - Includes controlled and non-controlled soil and non-soil materials.
- TOPSOIL
- ASPHALT - Bituminous Asphalt
- CONCRETE - Includes broken concrete rubble.

Sample Symbols

- SS - Split Spoon
- ST - Shelby Tube
- RC - Rock Core
- GS - Geoprobe Sleeve
- AU - Auger Cuttings
- GB - Grab

Notes:

1. Exploratory borings were drilled using3¼-inch inside-diameter hollow stem augers.

2. These logs are subject to the limitations, conclusions, and preliminary recommendations in the report and should not be interpreted separate from the report.

3. The borings were located in the field by Verdantas in accordance with the proposed boring plan. Ground surface elevations were estimated using Google Earth.

4. Unconfined Compressive Strength:
   NP = Non-Plastic
   NR = No Recovery
   NI = Not Intact

APPENDIX C – Laboratory Test Data

Tabulation of Laboratory Tests

Particle-Size Analysis Test Forms

Soil Unconfined Compressive Strength Test Forms

Project: Adams County/North Adams Regional Wastewater Treatment Plan

Project Number: 200619

Boring No.	Sample No.	Sample Interval	Moisture Content (%)	Dry Unit Weight (pcf)	Atterberg Limits (%)			Gradation Analysis (%)						USCS Classification	Unconfined Compressive Strength (psf)
					LL	PL	PI	Gravel	C. Sand	M. Sand	F. Sand	Silt	Clay		
B-1	SS-2	5.0 - 6.5	11.9												
	ST-5	14.0 - 16.0	17.2	112.3											1,910
	SS-7	20.0 - 21.5	28.2												
B-2	SS-3	10.0 - 11.5	15.7		24	12	12	3.0	7.0	7.0	17.0	24.0	42.0	CL	
	SS-4	15.0 - 16.5	16.7												
	SS-5	20.0 - 21.5	20.7												
	ST-7	23.0 - 25.0	17.2	116.5											2,167
	SS-9	27.5 - 29.0	23.9												
B-4	-	5.5 -	22.3												
	SS-5	17.5 - 19.0	23.9												
B-5	SS-2	2.5 - 4.0	20.1												
	ST-5	10.0 - 10.5	18.3		29	16	13	10.0	4.0	6.0	14.0	23.0	43.0	CL	
	ST-6	10.5 - 12.5	13.3	122.0											4,843
	SS-8	20.0 - 21.5	14.1												
	SS-9	25.0 - 26.5	22.9												
B-7	SS-3	7.5 - 9.0	19.1		30	16	14	3.0	2.0	4.0	16.0	25.0	50.0	CL	
	SS-6	15.0 - 16.5	16.8												
	SS-9	22.5 - 24.0	19.5												
B-8	SS-2	2.5 - 4.0	23.0												
B-8	SS-4	10.0 - 10.3	6.5												
B-9	BS-1	0.0 - 6.0	20.5												
B-10	BS-1	0.0 - 3.5	22.0		33	18	15	2.0	6.0	4.0	14.0	23.0	51.0	CL	

GRAIN SIZE DISTRIBUTION

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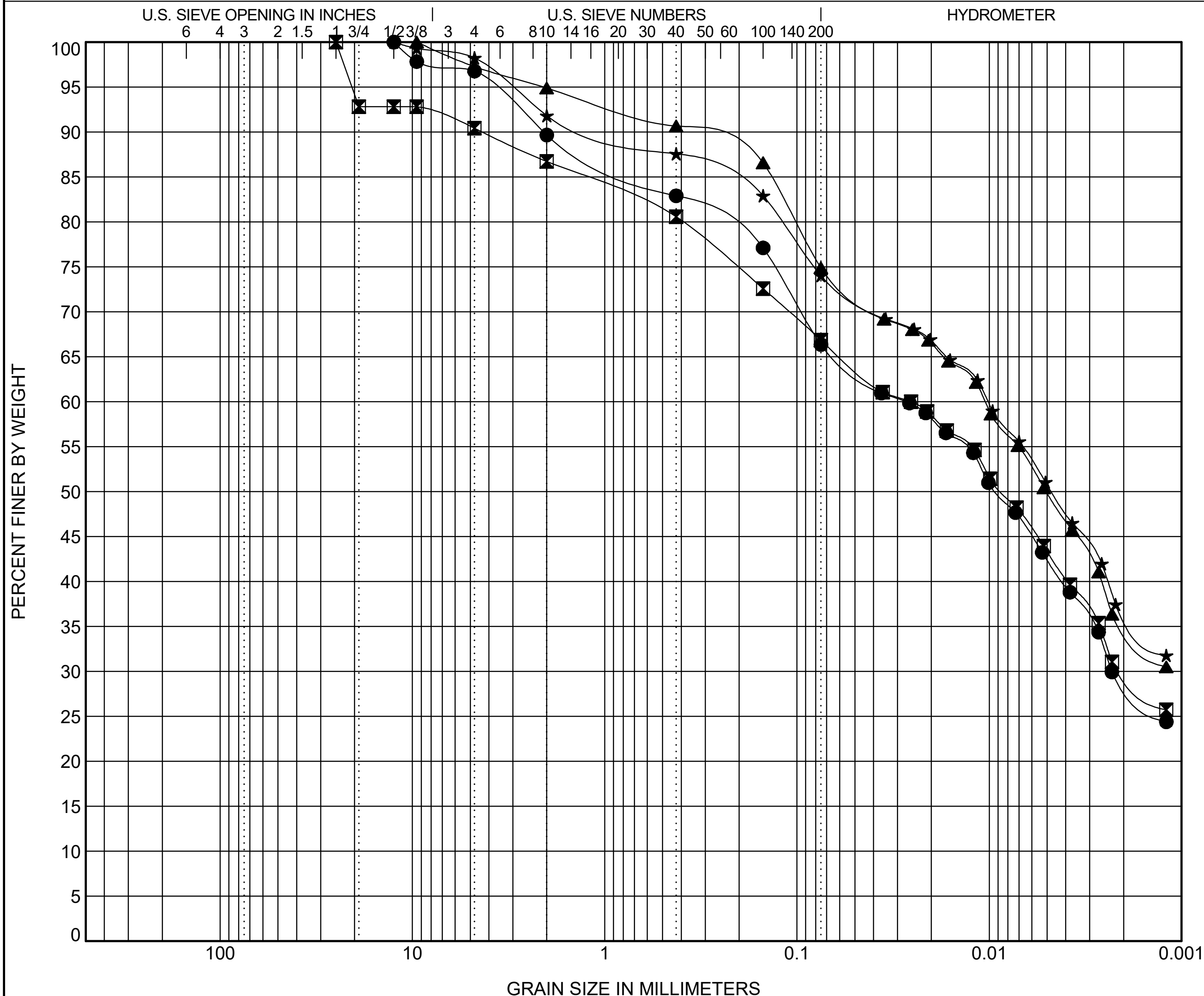
CLIENT Adams County **PROJECT NAME** Adams County WWTP

PROJECT NUMBER 200619 **PROJECT LOCATION** Winchester, OH



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
● B-2	10.0	**SANDY LEAN CLAY (CL)**	24	12	12		
⊠ B-5	10.0	**SANDY LEAN CLAY (CL)**	29	16	13		
▲ B-7	7.5	**LEAN CLAY with SAND (CL)**	30	16	14		
★ B-10 BS	0.0	**LEAN CLAY with SAND (CL)**	33	18	15		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-2	10.0	12.5	0.027	0.002		3.2	30.4	23.9	42.5
⊠ B-5	10.0	25	0.026	0.002		9.6	23.6	23.4	43.4
▲ B-7	7.5	9.5	0.01			2.7	22.4	25.0	49.9
★ B-10 BS	0.0	12.5	0.01			1.8	24.2	23.2	50.8

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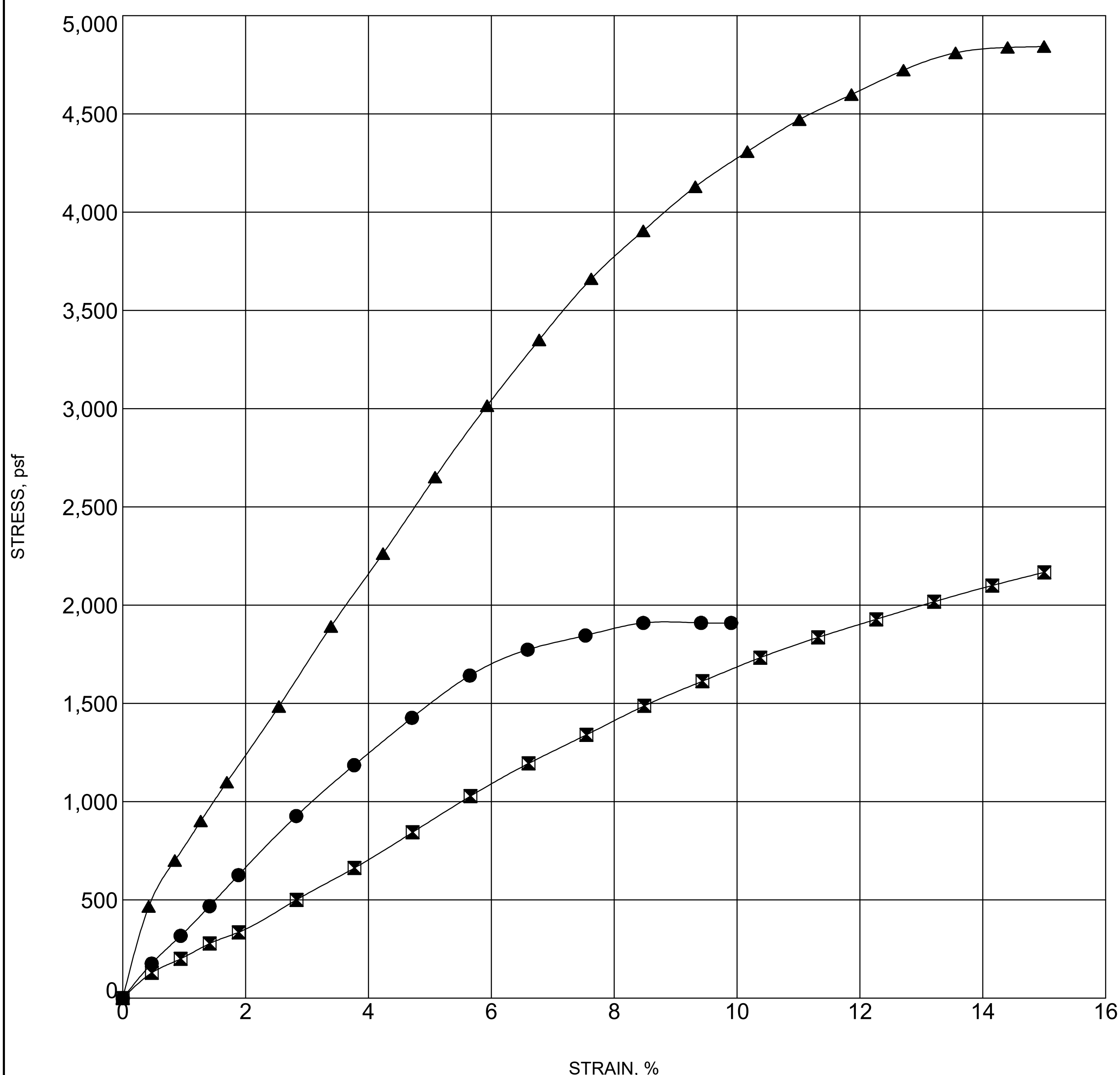
UNCONFINED COMPRESSION TEST

CLIENT Adams County **PROJECT NAME** Adams County WWTP

PROJECT NUMBER 200619 **PROJECT LOCATION** Winchester, OH



	Specimen Identification		Classification	γ_d	MC%
●	**B-1**	**14.0**		**112**	**17**
⧗	**B-2**	**23.0**		**116**	**17**
▲	**B-5**	**10.5**		**122**	**13**