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AN EMPLOYEE OWNED COMPANY



Consulting Engineers • Testing • Inspection Services • Analytical Laboratories

Established 1927

May 31, 2018

Village of West Alexandria
16 North Main Street
West Alexandria, Ohio 45381

Attention: Mayor Carol Lunsford – Village of West Alexandria

Reference: **Geotechnical Exploration Report**
West Alexandria WWTP
West Alexandria, Preble County, Ohio
CTL Project No. 18050006CIN

Dear Mayor Lunsford:

CTL Engineering, Inc. has completed the geotechnical exploration report for the above referenced project. We are providing a digital version (PDF file) of this engineering report via email.

Thank you for the opportunity to provide these services for this project. If you have any questions, please contact our office.

Respectfully Submitted,

CTL ENGINEERING, INC.

A handwritten signature in black ink that reads 'Doug R. Batt'. The signature is written in a cursive style with a large, prominent 'D' and 'B'.

Doug R. Batt, P.E.
Project Manager

GEOTECHNICAL EXPLORATION REPORT

**WEST ALEXANDRIA WASTEWATER TREATMENT PLANT
WEST ALEXANDRIA, PREBLE COUNTY, OHIO**

CTL PROJECT NO. 18050006CIN

PREPARED FOR:

**VILLAGE OF WEST ALEXANDRIA
16 NORTH MAIN STREET
WEST ALEXANDRIA, OHIO 45381**

PREPARED BY:

**CTL ENGINEERING, INC.
2105 SCHAPPELLE LANE
CINCINNATI, OHIO 45240**

MAY 31, 2018



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I. PROJECT LOCATION AND DESCRIPTION

The overall project involves the construction of a new wastewater treatment plant consisting of new structures which are located south-southwest of the existing West Alexandria Wastewater Treatment Plant which is located at the south end of Desota Drive in West Alexandria, Preble County, Ohio.

The treatment plant improvements are listed in Table 1 below along with the preliminary bottom of structure/finish floor elevation, estimated plan dimensions and the corresponding test borings drilled in the vicinity of the structures. Piping and related utility lines between these structures as well as a parking area and a roadway around the boundary of the site are also planned.

Table 1. Test Boring and Proposed Structure Information

Structure	Boring ID No.	Approximate Depth of Structure, ft	Structure Plan Dimensions, ft	Structure Bearing Elevation, ft	Structure/Foundation Description
Lab/Admin Building	9, 14, 15	4	40 x 30	881	Single Story Masonry Structure/Strip Footings
Oxidation Ditch	2, 3, 7, 8, 12, 13	10	100 x 34	875	Concrete Structure/Mat Foundation
Screen Building	8	8	27 x 6	877	Concrete Structure/Mat Foundation
Aerobic Digester Tanks	3, 4, 9	16	60 x 16	869	Concrete Structure/Mat Foundation
Clarifier Tanks	1, 5, 6, 11	19	40 (diameter)	861.5 – 864.5	Concrete Structure/Circular Mat Foundation
UV Disinfection	10	8	40 x 5	871.5	Concrete Structure/Mat Foundation

CTL Engineering, Inc. (CTL) understands that the general purpose of the geotechnical exploration is to determine the subsurface conditions of the site in conjunction with evaluating its suitability for construction of the proposed plant improvements.



II. SUBSURFACE EXPLORATION

Eighteen (18) test borings, designated as B-01-18 through B-18-18, were drilled at the locations shown on the enclosed boring location plan that is attached to this report in Appendix C. The test borings were originally planned for a facility layout that has since been revised. The boring location plan in Appendix C presents the locations of the drilled test borings relative to the proposed structures as identified in Table 1 above. These test borings were drilled to planned depths ranging from 10 feet to 35 feet below the existing ground surface (bgs). The number of test borings and their planned depths were determined by Jones & Henry Engineers (J&H) with input from CTL. Kramer & Associates (project surveyor) located the test borings in the field and determine the coordinates along with the corresponding ground surface elevations. The test boring coordinates and ground surface elevations were provided to CTL by J&H.

The test borings were drilled on March 22 through 28, 2018 by CTL, utilizing hollow stem augers powered by a track-mounted rotary drill rig. Standard Penetration Tests (SPTs) were conducted in the test borings using a 140-pound automatic hammer falling 30 inches to drive a 2-inch O.D. split barrel sampler for 18 inches. The SPTs and split-barrel (spoon) sampling were performed at 2.5 feet and 5 feet intervals to the boring termination depths. In addition, an undisturbed (Shelby) tube sample was obtained at a selected location and depth.

Soil samples obtained from drilling operations were preserved in glass jars, visually classified in the field, and delivered to CTL's materials laboratory for testing and analysis. Representative samples were subjected to laboratory testing including natural moisture content, Atterberg Limits, and particle size analysis. The undisturbed sample's unit weight along with an unconfined compressive strength test was performed on the recovered sample.

Drilling, sampling, field and laboratory testing have been performed according to standard geotechnical engineering practices and current ASTM procedures. Results from the field testing are shown on the enclosed test boring records in Appendix A, and laboratory test results are presented in Appendix B.

III. FINDINGS

A. Geology

According to the Web Soil Survey: Preble County, Ohio (OH135), *United States Department of Agriculture, Natural Resources Conservation Service*, surficial soils mapped at the subject site are described in the table below.



Table 2. Mapped Soil Survey Soils Types

Soil Series	Series Symbol	Drainage Characteristics	Corrosivity Potential Concrete / Steel
Fox silt loam, till substratum 0 to 2 percent slopes	FmA	Well drained with a low runoff class	Low / High
Kendallville-Eldean silt loams, 6 to 12 percent slopes, eroded	KeC2	Well drained with a medium runoff class	Low / Low
Rainsville silt loam, 2 to 6 percent slopes	RaB	Well drained with a low runoff class	Moderate / High
Rodman gravelly loam, 18 to 25 percent slopes, eroded	RnE2	Excessively drained with a medium runoff class	Low / Low

Mapping of the bedrock topography (Bedrock Topography of the West Alexandria, Ohio, Quadrangle, ODNR Geological Survey, Digital Map Series BT-3B, 1999) indicates the elevation of the top of the bedrock surface in the immediate project area is between approximately 800 feet and 850 feet mean sea level (msl). Based on this mapping and the existing ground surface elevation between about 860 and 880 feet msl, the estimated depth to the top of bedrock surface may range from about 10 to 80 feet bgs. It should be noted that the referenced mapping utilizes 25-foot contours that are interpolated from topographic surface features and widely spaced data points where water wells and soil borings have encountered rock and therefore could have a significant elevation disparity within the project limits.

According to the mapping of bedrock geology in the area, (Reconnaissance Bedrock Geology of the West Alexandria, Ohio Quadrangle, ODNR Geological Survey, Digital Map Series BG-2, 1999), the surficial soil deposits on the site are underlain by Ordovician-age sedimentary rock identified as the Waynesville Formation. This formation consists of limestone and shale, averaging 70% shale and 30% limestone. The color is described as gray to bluish gray, weathering to light gray. The bedding is planar to irregular and thin to thick.

B. Observations of the Project

The site is located south of the existing West Alexandria Wastewater Treatment Plant which is located at the south end of Desota Drive in West Alexandria, Preble County, Ohio. The site is located in an agricultural field where at the time



of the field exploration the crops were harvested and remnants (stubble) of the crops remained.

The site has a high point at the site's southern boundary where a hilltop, with an elevation of about 890 feet, is located. From the hilltop at the southern boundary the site's existing grades slope downward to the north and east. At the northeast corner of the site where the existing wastewater treatment plant will connect to the proposed new treatment plant site, the ground surface slopes downward relatively steep to the northeast approximately with a topographic relief of about 20 feet in elevation.

Overhead utility lines were noted on the northeast corner of the site. According to the site plan a water line borders the northern property line and also is aligned along the northeast portion of the property. Manholes were noted within the existing treatment plant property, but there was no other evidence of underground or overhead utilities within the remainder of the project site.

C. General Stratigraphy

A general description of the subsurface materials encountered is presented below. Further details of the subsurface conditions encountered during CTL's geotechnical exploration are presented on the attached test boring records and soil profiles. Results of the soil laboratory tests are also attached.

1. Surficial Materials

The ground surface at each test boring location consisted of the native soils mixed with a small amount of organic material due to plowing of the agricultural field. The thickness of this plow zone was estimated at approximately 1 foot in the field, though organics/vegetative material (crop stubble remnants) were noted in the split spoon samples at a depth of 1.0-2.5 feet in test boring B-14-18.

2. Native Fine-Grained Soils

Beneath the surficial materials, the test borings generally encountered native fine grained (silt and clay) soils to depths ranging from 5.5 to 21.8 feet bgs. These materials were visually described as brown or gray, soft to hard, lean clay with varying amounts of sand and/or gravel, and sandy silty clay.

SPT N-values of the fine grained materials varied widely and ranged from 4 to 46 blows per foot (bpf), with an average value of about 14 bpf. The natural moisture content of these materials ranged from 8 to 28 percent, with an average of about 15 percent.

Six samples of the fine grained soils were tested in the laboratory for Atterberg Limits and particle size analysis. The results of these tests are presented in Appendix B and are summarized herein. The soils were



classified as sandy lean clay (CL) and sandy silty clay (CL-ML) according to the Unified Soil Classification System (USCS). These materials' Liquid Limits ranged from 21 to 42 percent, with Plasticity Indices ranging from 7 to 25 percent. An undisturbed tube sample obtained in boring B-08-18 at a depth of 5 to 7 feet had an unconfined compressive strength of 0.74 ksf with a moist unit weight of 124.1 pcf and a corresponding natural moisture content of 26.9 percent.

3. Native Coarse-Grained Soils

Coarse-grained (sand and gravel) soils were encountered beneath the fine-grained materials in all test borings except B-10-18, B-16-18, and B-17-18. These native granular soils extended down to the planned boring termination depths. Test borings B-03-18, B-06-18, and B-15-18 also encountered a layer of granular soil that were encountered at the ground surface in addition to lower depths that that ranged from 5.5 to 8 feet bgs. The granular soils consisted of very loose to very dense, brown or gray, well-graded sand with gravel, well-graded sand with silt and gravel, well-graded sand with silty clay and gravel, clayey sand, silty sand with gravel, silty clayey sand, and silty clayey sand with gravel. These materials were classified as SW, SW-SM, SW-SC, SC, SM, and SC-SM, according to the Unified Soil Classification System (USCS).

SPT N-values of the granular soils varied widely and ranged from 4 to 88 blows per foot (bpf) with an average of about 40 bpf. The natural moisture content of these soils ranged from 1 to 26 percent, with an average of about 8 percent.

4. Groundwater

The depth to groundwater was recorded both during drilling and at the completion of drilling activities. During drilling, groundwater was encountered in test borings B-02-18, B-04-18, B-05-18, B-06-18, B-08-18, and B-13-18 at depths ranging from 5.0 feet to 15.0 feet bgs (elevation 866.2 feet to 881.5 feet). At the completion of drilling, ground water was encountered in B-02-18, B-04-18, and B-08-18 at depths ranging from 8.0 feet to 12.0 feet bgs (elevation 872.9 feet to 878.8 feet). Table 3 provides detailed information on groundwater depths and corresponding elevations where encountered at the identified test boring locations.

Table 3. Groundwater Depths and Elevations

Boring No.	Nearby Structure(s)	Depth of Structure, feet	Depth (Elevation) to Groundwater During Drilling, feet	Depth (Elevation) to Groundwater After Drilling, feet
B-02-18	Oxidation Ditch	10	5.0 (881.8)	8.0 (878.8)
B-04-18	Aerobic Digester	16	15.0 (871.8)	11.0 (875.8)



Boring No.	Nearby Structure(s)	Depth of Structure, feet	Depth (Elevation) to Groundwater During Drilling, feet	Depth (Elevation) to Groundwater After Drilling, feet
	Tanks			
B-05-18	Clarifier Tanks/ UV Disinfection	19/ 8	13.5 (866.2)	N/A
B-06-18	Clarifier Tanks	19	5.0 (876.9)	N/A
B-08-18	Screen Building/ Oxidation Ditch	8/ 10	10.0 (874.9)	12.0 (872.9)
B-13-18	Oxidation Ditch	10	13.5 (869.4)	N/A

IV. DISCUSSION AND EVALUATION

Based on the bottom of structure/finish floor elevations previously presented in this report, the subsurface information collected from the test borings, laboratory testing, and our engineering analysis, the existing subsurface conditions are generally suitable for the proposed facility. The conditions which were encountered that pose a concern from a geotechnical and construction standpoint along with their implications are addressed below.

A. Re-use of Excavated Materials as Engineered Fill

CTL assumes that potential engineered fill to be used on this site will probably be from on-site excavated areas. If the on-site soils are to be utilized for engineered fill, they are generally suitable for reuse as structural fill, provided that they meet the requirements presented in this report. However, some of the fine-grained soils encountered at the locations of the proposed structures exhibit high moisture contents and will require drying before being used as engineered fill.

B. Groundwater

Based on our experience with the geology at this site, groundwater conditions affecting construction projects are related to trapped or perched water that may occur in irregular, discontinuous zones within the soil overburden, and may also be present at other elevations which were not identified on the test boring records at the time of the exploration. Based on the results of the test borings it appears groundwater bearing strata are present within 5 to 10 feet of the bearing elevations of the proposed structures near test borings B-02-18, B-04-18, B-08-18 and B-13-18.

When these water bearing strata (sand and/or gravel layers) are exposed in excavations (e.g. cut slopes, utility, or footing trenches) they can produce widely varying seepage durations and rates depending on recent rainfall activity and other hydrogeologic characteristics of the area. Therefore, groundwater levels may vary from those measured at the time of drilling and sampling as presented in



this report. If further determination of the site's ground water table and/or piezometric surface is necessary, additional data collection and evaluation by using monitoring wells and or piezometers is recommended.

V. **ANALYSIS AND RECOMMENDATIONS**

Based upon the preceding considerations as well as the subsurface information obtained from the field and laboratory testing and CTL's experience with these soil types, the following recommendations are provided. The design information provided by J&H provides a basis for CTL's recommendations, and has a direct impact on the recommendations presented. If changes to the design information presented in this report are made including construction sequencing/schedules, or additional information is available, CTL should be provided this information for our review, and if necessary, revised and/or additional recommendations can be provided.

A. **Laboratory/Administrative Building**

A finish floor elevation of 883 feet was assumed based on the existing ground surface elevations shown within the building footprint on the site plan. Approximately 1 to 2 feet of cut and fill will be required to achieve finish subgrade for the floor slab based on the approximate building footprint location. Assuming a bottom of footing elevation of 879 feet, the perimeter continuous wall footings will bear within the upper 3 to 5 feet below the existing ground surface. The materials encountered at the proposed foundation bearing elevation in borings B-09-18, B-14-18 and B-15-18 consist of stiff lean clays and loose clayey sands.

A spread foundation bearing directly on these native soils may be sized for a maximum net allowable foundation bearing pressure on the order of 2,000 pounds per square foot (psf). If a higher allowable bearing pressure is desired, it is recommended that the loose granular materials (encountered in B-15-18) be over-excavated in each column or wall spread footing down to an elevation of 875± feet to the underlying stiff lean clay material. The excavation should be backfilled up to the proposed finish subgrade elevation with lean concrete. However, it is anticipated that the upper loose granular soil may not allow for a stable, vertical sidewall footing excavation that can be readily backfilled. Therefore, a mass over-excavation of the entire building footprint may be required in order to facilitate the removal and subsequent placement of engineered fill to the required subgrade elevation. If the over-excavation and placement of engineered fill for backfill is performed, an allowable bearing capacity of 3,000 psf can be achieved. These bearing values would apply to the total design load.

B. **Aerobic Digesters**

The proposed facility plan shows two aerobic digesters being constructed with a future third aerobic digester planned to the immediate north of the first two structures. A bearing elevation of 870 feet was assumed for the aerobic digesters, based on a structure depth of 16 feet and an average existing ground surface



elevations of 886 feet. The materials encountered at the proposed bearing elevation in borings B-03-18, B-04-18, and B-09-18 consist of medium dense to very dense sands. A spread foundation bearing directly on these native soils may be sized for a maximum net allowable foundation bearing pressure of 4,000 pounds per square foot (psf). This bearing value would apply to the total design load.

C. Screen/Grit Building

A bearing elevation of 877 feet was assumed for the screen grit building, based on a structure depth of 8 feet and the existing ground surface elevation of 885 feet. The materials encountered at the proposed bearing elevation in boring B-08-18 consist of stiff to very stiff sandy lean clay. A spread foundation bearing directly on these native soils may be sized for a maximum net allowable foundation bearing pressure of 2,000 pounds per square foot (psf). This bearing value would apply to the total design load.

D. Oxidation Ditches

The proposed facility plan shows two oxidation ditches being constructed with a future third oxidation ditch planned to the immediate north of the first two structures. A bearing elevation of 874 feet was assumed for the oxidation ditches, based on a structure depth of 10 feet and the existing ground surface elevation of 884 feet. The materials encountered at or near the proposed bearing elevation in borings B-02-18, B-03-18, B-07-18, B-08-18, B-12-18, and B-13-18 consist of soft to very stiff sandy lean clay and sandy silty clay.

For the two proposed oxidation ditches where borings B-02-18, B-03-18, B-07-18 and B-08-18 are located, the recommended net allowable bearing capacity is 2,000 psf. For the future oxidation ditch soft compressible lean clay materials were encountered at the foundation bearing elevation in boring B-12-18 and B-13-18. These soils are not suitable for support of the structure. It is recommended that these materials be removed from beneath the proposed foundation bearing elevation down to an elevation of 865 feet. The excavation should be backfilled up to the proposed finish subgrade elevation with new compacted engineered fill. If this undercut is performed, an allowable bearing capacity of 3,000 psf can be achieved. This bearing value would apply to the total design load.

If the conditions at the proposed undercut elevation are not stable it may be necessary to stabilize the subgrade before placing engineered fill by drying and recompacting the material in place; placing a layer of biaxial geogrid followed by 12 inches of crushed granular material such as ODOT Item 304 or No. 57 sized gravel; or chemically stabilizing with lime or cement that meets ODOT requirements. Finish grade would then be re-established by using properly compacted, engineered soil fill. The building may then be supported by a mat foundation constructed into the newly placed, engineered fill.



E. Clarifiers

Bearing elevations ranging from 861.5 feet to 864.5 feet were assumed for the clarifiers, based on a structure depth of 19 feet and the existing ground surface elevation of 882 feet. The materials encountered at the proposed bearing elevations in borings B-01-18, B-06-18, and B-11-18 consist of dense to very dense sands. A spread foundation bearing directly on these native soils may be sized for a maximum net allowable foundation bearing pressure of 4,000 pounds per square foot (psf). This bearing value would apply to the total design load.

F. Site Preparation and Earthwork Recommendations

The following are general recommendations for site preparation. If it is anticipated that construction will occur at the time of year between October and May, the surficial soils are saturated and temperatures are not high enough to dry the soil expediently. Elevated soil moisture contents, for the soil types encountered, are not only difficult to reduce but also have a narrow range where they are suitable for compaction. These issues during the site preparation phase of construction should be taken into consideration when evaluating alternatives and the costs.

1. Strip topsoil, vegetation, and other organic materials or unsuitable materials from the construction area. These materials should be wasted from the site or they may be stockpiled for future use as topsoil or fill in landscape areas.
2. If chemical modification or stabilization is anticipated, based on the time of earthwork construction, a laboratory test program should be planned prior to construction to ensure proper type and amount of chemical additive is utilized for the soils. Usually the time frame for a laboratory testing program is about 4 to 6 weeks.
3. Maintain positive surface drainage to prevent water from ponding on the surface during construction and as part of final grading. Absorption of heavy rainfall, accumulations of water and heavy construction traffic may result in severely lowering the shear strength of the subgrade soils. If precipitation is expected, roll the fill surface with a rubber-tired or steel-drummed roller to improve surface runoff.
5. Contact the Geotechnical Engineer should the subgrade materials become excessively wet, dry, or frozen. If the construction schedule anticipates that earthwork and site work will be performed during typical wet weather months (October through May) the use of mechanical (geogrid and stone) or chemical stabilization is recommended to stabilize the subgrades for floor slabs and pavement and to maintain earthwork schedules. Chemical stabilization is the recommended method for stabilization for both short and long term subgrade support.



6. Engineered fill placement should extend beyond the limits of the proposed buildings and paved areas a minimum horizontal distance equal to the height of fill or 5 feet, whichever is greater.
7. Temporary excavations in excess of 4.0 feet in depth should be sloped or shored in accordance with OSHA regulations.

Due to the depths of some structures, CTL recommends that shoring be utilized along with a support or shield system as specified in OSHA Standard 1926 Subpart P App B.

Vertical trench walls and shoring systems should be designed by a licensed Professional Engineer, registered in the state of Ohio, familiar with the design of earth retention systems. The design should also take into account loading adjacent to the excavation such as foundation or vehicular loads and soil stockpiles. Lateral soil parameters for the design of trench walls and shoring systems are provided in Table 4 below.

Table 4. Soil Parameters for Lateral Earth Pressure

Soil Parameter	Material Type			
	Off-site Clean Granular Engineered Fill	Clayey Sand/ Loose Sand	Lean Clay	Native Dense to Very Dense Sand
Dry Unit Weight, pcf	125	120	120	130
Saturated Unit Weight ¹ , pcf	145	140	140	150
Moist Unit Weight, pcf	135	130	130	140
Angle of Internal Friction, degrees	34	28	20	32
At-Rest Pressure Coefficient, K_o	0.44	0.53	0.66	0.47
Active Pressure Coefficient, K_a	0.28	0.36	0.49	0.31
Passive Pressure Coefficient, K_p	3.54	2.77	2.04	3.25

If groundwater is not drained, saturated or buoyant unit weights are recommended for design.

G. Engineered Fill Recommendations

1. Fill material required for this project may consist of the on-site excavated soils provided that they meet the requirements presented in this section. If grading plans do not provide adequate volumes of suitable excavated materials, borrow material will be required provided they meet the requirements of this report.



2. Limit the fill materials to a Liquid Limit less than 40, a Plasticity Index less than 20, a standard maximum dry density of at least 100 pcf (ASTM D698), a maximum particle size of 3 inches, and less than 3 percent by weight fibrous, organic matter.
3. New compacted engineered fill should be placed in layers not to exceed 8 inches in loose thickness, with each layer compacted to 100 percent of the maximum dry density as determined by ASTM D-698 standard method (AASHTO T-99), or as otherwise directed by the Geotechnical Engineer. The compacted fill should be placed with moisture content within the range of ± 3 percent of the Optimum Moisture Content.
4. CTL recommends field moisture-density tests be performed within the engineered fill for each lift of fill at a rate of at least one test for an area covering approximately every 10,000 square feet of engineered fill placed and compacted. A minimum of two field moisture-density tests should be performed per each entire lift of engineered fill placed and compacted.

Areas that do not meet the specified compaction criteria, based on the testing and observations of the engineering technician observing the earthwork activities and performing the field testing, should be reworked (scarified, moisture conditioned and re-compacted) to a suitable depth and re-tested. If the reworked engineered fill lift does not meet the earthwork specification the Geotechnical Engineer should be contacted to evaluate the current conditions and provide additional recommendations if necessary.

The observation and testing of engineered fill should be performed by qualified field personnel, performing the field density testing activities under the supervision of a registered professional engineer who specializes in geotechnical engineering, and is licensed in the State of Ohio.

H. Slab on Grade Design Recommendations (Lab/Admin Building)

1. CTL has assumed the effective modulus of subgrade reaction available for a suitably placed and compacted engineered fill soil consisting of lean clay (CL) materials is 150 pci.
2. CTL recommends that the slab on grade subgrade surface be observed and approved by the Geotechnical Engineer or his designated representative. If soft, loose, or highly plastic soils are encountered at the proposed subgrade level, these soils should be excavated and replaced with properly compacted engineered fill materials. The depth of the undercut will depend on the specific soil conditions observed by the Geotechnical Engineer or his designated representative.



3. Place a minimum 4-inch layer of clean, compacted gravel or crushed stone beneath the slab to enhance support and provide a working base. The actual thickness of the gravel layer should be based on slab design requirements.
4. Keep the crushed stone or gravel moist, but not wet, immediately prior to grade slab concrete placement to minimize curling of the slab due to differential curing conditions between the top and bottom of the slab.
5. Provide joints in the slabs around columns and along footing supported walls.

I. General Building Foundation Support Recommendations

1. CTL recommends that all bearing surfaces be observed and approved by the Geotechnical Engineer or his designated representative. If marginal soft to medium stiff, loose, or highly plastic soils are encountered these soils should be undercut and removed and lean concrete placed up to the proposed footing bearing elevation.
2. The removal of soil for the construction of the underground structures (oxidation ditch, screen building, aerobic digester tanks, clarifier tanks, and UV disinfection) will result in a net reduction of overburden pressure at the structures' bearing elevations. CTL has determined that the anticipated loads provided by these structures will not increase the bearing pressure to a value higher than what is currently applied by the native soil. Therefore, a potential buoyant condition may occur if the structures are not designed for the case when the groundwater elevation outside the structures is significantly higher relative to the water level within the structures. Therefore, it is recommended that the structures be designed with a dead load that is sufficient to offset buoyant forces. Additional alternatives to resist uplifting forces include 1) anchors or 2) design an active pumping and/or passive system that would lower the surrounding ground water elevation when water levels within the structures are lowered for maintenance or other similar conditions.
3. In general, the anticipated settlements (total and differential) as a result of the above recommended foundation pressures should be within tolerable limits (1 inch total and ½ inch differential, respectively) for a masonry-framed building or a concrete reinforced structure, assuming the foundation soil improvement recommendations in this report are followed.
4. Minimum widths for individual columns and continuous wall footings should be 24 and 18 inches, respectively. Minimum widths are considered advisable to provide a margin of safety against local or punching shear failure.



5. Exterior footings should be constructed at a minimum depth of 36 inches below the lowest adjacent exterior grade to offset the effects of frost penetration. Interior footings in areas of controlled temperature may be constructed at shallower depths below the floor slab provided that the soils supporting the footings exhibit sufficient shear strength for supporting the foundation contact.
6. Protect foundation support materials exposed in open excavations from freezing weather, severe drying, and water accumulation.
7. Remove any soils that become unsuitable due to exposure prior to concrete placement.
8. Excavate only the foundations or bottom of structures that can be placed with concrete the same day. Otherwise place a "lean" concrete mud-mat over the bearing soils if the excavations must remain open overnight or for an extended period of time.
9. Foundation concrete should completely fill the opened excavation. Forming the foundations and then backfilling the space behind the forms tends to allow moisture to penetrate and soften bearing level materials which may result in poor foundation performance.

J. General Groundwater Control Recommendations

It is imperative that a comprehensive groundwater control plan be developed for the underground structures.

Typically, short-term groundwater control required during construction is addressed by dewatering methods utilized to perform construction in the "dry". The methods typically employed for construction in the dry depend on various hydrogeological factors in addition to other factors, including but not limited to:

- recent precipitation,
- the depth of construction,
- duration of the construction,
- the proximity of other proposed structures both in plan location and bottom of structure elevation,
- construction methods.

It is recommended that the dewatering plan be coordinated with the anticipated stage of construction for the structures. If dewatering is achieved by lowering the groundwater elevation, the lowest elevation should be performed initially, in order to minimize the potential settlement from dewatering.

For groundwater encountered at shallower elevations sump and pump methods are typically suitable for relative short term durations. For long term dewatering and/or deeper excavations; 1) well points (vacuum) employed at multiple



elevation stages; or 2) cutoff walls (e.g. soil-bentonite slurry, cement-bentonite slurry, tangent or secant drilled shaft walls, steel sheet piling, etc.) may be more appropriate. The design of a dewatering system is beyond the scope of this exploration. These approaches can be further addressed once details of the facility design are developed.

K. Pavements

The proposed subgrade elevations in the pavement areas are generally within ± 1 foot of the existing ground surface elevations, however the proposed subgrade elevations in the northeast corner of the site were not provided.

1. Subgrade of paved areas should be observed and approved by the Soil Engineer. Soils with a maximum dry weight of less than 100 pounds per cubic foot (pcf) are unsuitable for use in the upper 12 inches of subgrade. Such soils should be replaced with other suitable soils or granular material.
2. The test borings encountered medium stiff to stiff sandy lean clay or loose clayey sand materials at the ground surface. Some of these soils exhibited moisture contents above the optimum value for these soil types. The use of chemical stabilization with lime or Portland cement is recommended in order to stabilize the subgrade and prevent pavement failure due to vertical movement of the subgrade soils. The depth of the stabilization should be a minimum of 14 inches below the planned top of subgrade elevation. For the purpose of a preliminary cost estimate, the amount of lime or cement used for soil modification may be assumed to be about 6 percent by weight. Laboratory testing in accordance with ODOT Item 206 will be required to determine the recommended type of chemical modifier and the amount of chemical modifier to be added to the soil. This testing should be performed by a qualified AMRL accredited laboratory prior to performing the stabilization.
3. Subsequent to site clearing and chemical stabilization and prior to any fill or aggregate placement, all exposed surfaces should be proofrolled with an approved 25-ton loaded, tandem axle truck to verify that a relatively unyielding surface is achieved. Soft or loose soils, if encountered, should be disked, dried and recompacted or undercut and replaced with compacted engineered fill or otherwise as directed by the Geotechnical Engineer.
4. In the event that excessive rutting or deflections occur during proofrolling operations, yielding soils should be addressed as noted in the preceding *Site Preparation and Earthwork Recommendations* section of this report.
5. Near surface soils are predominantly cohesive and will be affected by the moisture content of the soils. Therefore, it is highly recommended that any surface and subsurface water be permanently and quickly drained from the



area to limit the weakening of the subgrade soil used for pavement support. Without drainage, any modification/stabilization procedure undertaken should be considered temporary. It is recommended that a drainage system be designed to permanently dewater the subbase aggregate and associated subgrade soils into the site's storm sewer system or away from any building and pavements. Finger drains should be installed in the area of catch basins.

L. Seismic Site Class Recommendation

CTL recommends the subject property be assigned a seismic site class of D in accordance with the 2011 Ohio Building Code.

VI. CHANGED CONDITIONS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions using generally accepted geotechnical engineering practices. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates drilled, they are not necessarily representative of the subsurface conditions between boring locations or subsurface conditions during other seasons of the year.

In the event that changes in the project are proposed, additional information becomes available, or if it is apparent that subsurface conditions are different from those provided in this report, CTL should be notified so that our recommendations can be modified, if required.

VII. TESTING AND OBSERVATION

During the design process, it is recommended that CTL work with the project designers to confirm that the geotechnical recommendations are properly incorporated into the final plans and specifications, and to assist with establishing criteria for the construction observation and testing.

CTL is not responsible for independent conclusions, opinions and recommendations made by others based on the data and recommendations provided in this report. It is recommended that CTL be retained to provide construction quality control services on this project. If CTL is not retained for these services, CTL shall assume no responsibility for compliance with the design concepts or recommendations provided.



VIII. CLOSING

The report was prepared by CTL Engineering, Inc. (Consultant) solely for the use of The Village of West Alexandria (Client) in accordance with an executed contract. The Client's use of or reliance on this report is limited by the terms and conditions of the contract and by the qualifications and limitations stated in the report. It is also acknowledged that the Client's use of and reliance of this report is limited for reasons which include: actual site conditions that may change with time; hidden conditions, not discoverable within the scope of the assessment, may exist at the site; and the scope of the investigation may have been limited by time, budget and other constraints imposed by the Client.

Neither the report, nor its contents, conclusions or recommendations, are intended for the use of any party other than the Client. Consultant and the Client assume no liability for any reliance placed on this report by such party. The rights of the Client under contract may not be assigned to any person or entity, without the consent of the Consultant which consent shall not be unreasonably withheld.

This geotechnical report does not address the environmental conditions of the site. The Consultant is not responsible for consequences or conditions arising from facts that were concealed, withheld, or not fully disclosed at the time the assessment was conducted.

To the fullest extent permitted by law, the Consultant and Client agree to indemnify and hold each other, and their officers and employees harmless from and against claims, damages, losses and expenses arising out of unknown or concealed conditions. Furthermore, neither the Consultant nor its employees shall be liable to the Owner in an amount in excess of the available professional liability insurance coverage of the Consultant. In addition, Client and Consultant agree neither shall be liable for any special, indirect or consequential damages of any kind or nature.

The Consultant's services have been provided consistent with its professional standard of care. No other warranties are made, either expressed or implied.

Respectfully Submitted,

CTL ENGINEERING, INC.



Josh C. Williams
Project Engineer



Doug R. Batt, P.E.
Project Engineer
License No. E-58801



APPENDIX A
TEST BORING RECORDS



EXPLANATION OF TERMS AND SOIL DESCRIPTIONS
(ASTM D2487 & ASTM D2488)

CONSISTENCY AND RELATIVE DENSITY DESCRIPTIONS

Descriptors for soil consistency used in this report are based upon the Standard Penetration Test (SPT), ASTM D 1587, with the penetration (N) values corrected to N_{60} , based upon the efficiency of the SPT Hammer (Energy Ratio) used for the soil sampling.

<u>NON-COHESIVE SOILS</u> <u>[GW, GP, GM, GC, SW, SP, SM, SC]</u>			<u>COHESIVE SOILS</u> <u>[ML, MH, CL, CH]</u>		
<u>Relative Density or Consistency</u>	<u>SPT-N_{60} (blows/foot, bpf)</u>	<u>Suitability</u>	<u>Stiffness or Consistency</u>	<u>SPT-N_{60} (blows/foot, bpf)</u>	<u>Suitability</u>
Very Loose	0 – 4	Poor	Very Soft	0 – 1	Very Poor
Loose	5 – 10	Marginal	Soft	2 – 4	Poor
Medium Dense	11 – 30	Satisfactory	Medium Stiff	5 – 8	Marginal
Dense	31 - 50	Good	Stiff	9 – 15	Satisfactory
Very Dense	Over 50	Very Good	Very Stiff	16 – 30	Good
			Hard	Over 30	Very Good

COMPONENT MODIFIERS

<u>ASTM D2488 (Visual-Manual)</u>		<u>ASTM D2487 (USCS)</u>		<u>Organic Soils</u>	
<u>Modifier</u>	<u>% by Weight</u>	<u>Modifier</u>	<u>% by Weight</u>	<u>Modifier</u>	<u>% by Weight</u>
Trace of	0 – 1	with sand or gravel	15 – 29	Highly	> 10
Traces of	2 – 10	Sandy or Gravelly	≥ 30	Moderately	4 – 10
Little	11 – 20	with silt or clay	5 – 12	Slightly	2 – 4
Some	21 – 35	Silty or Clayey	> 12	Inorganic	< 2
“And”	36 – 50	Organic	$LL_{oven}/LL_{air} < 0.75$		







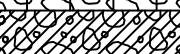
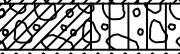

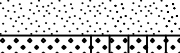











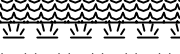
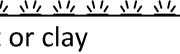
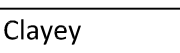
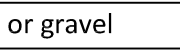
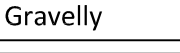

MOISTURE DESCRIPTIONS

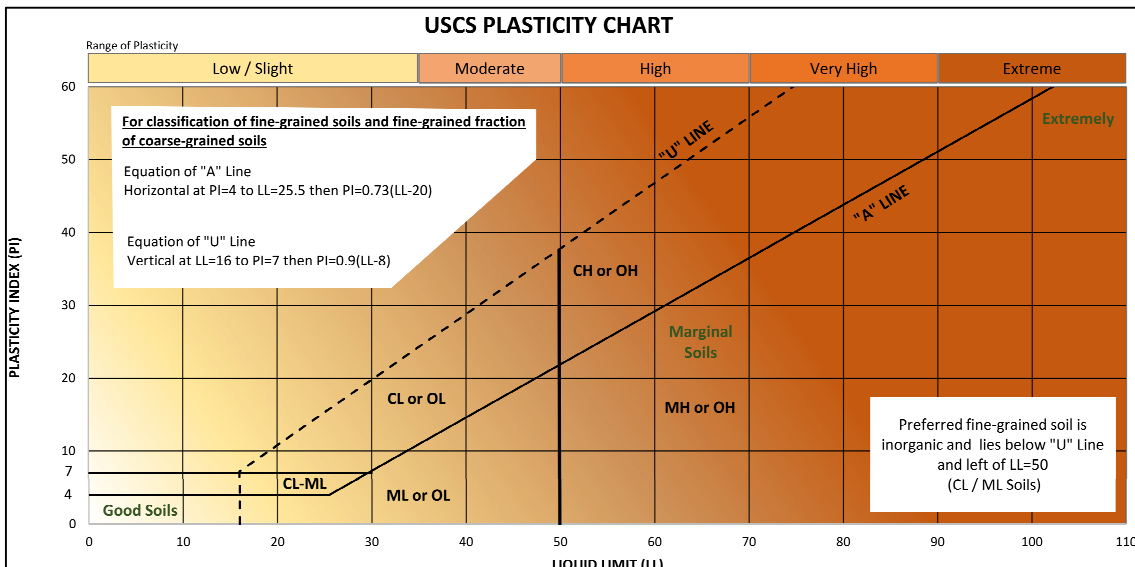
<u>Terms</u>	<u>Non-Cohesive Soils</u>	<u>Cohesive Soils</u>	<u>Suitability</u>
Dry	Moisture Absent	Powdery	Marginal
Damp	Some Moisture	Below Plastic Limit	Good
Moist	Damp to the Touch	Between Plastic and Liquid Limits	Marginal
Wet	Visible Water	Above Liquid Limit	Poor

PARTICLE SIZE DESCRIPTIONS

<u>Component</u>	<u>USCS Particle Size</u>
Boulders	≥ 12-in. (300 mm)
Cobbles	< 12-in. (300 mm) to 3-in. (75 mm)
Coarse Gravel	< 3-in. (75 mm) to 3/4-in. (19.05 mm)
Fine Gravel	< 3/4-in. 19.05 mm) to #4 Sieve (4.75 mm)
Coarse Sand	< #4 Sieve (4.75 mm) to #10 Sieve (2.00 mm)
Medium Sand	< #10 Sieve (2.00 mm) to #40 Sieve (0.425 mm)
Fine Sand	< #40 Sieve (0.425 mm) to #200 Sieve (0.074 mm)
Silt	< #200 Sieve (0.074 mm) to 0.005 mm
Clay	< 0.005 mm

SOIL DESCRIPTIONS BASED ON THE UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

	Major Division	Group Symbol	Letter Symbol	Group Name*			
Coarse Grained Soils Less Than 50 Percent Passing the # 200 Sieve	GRAVEL - Percent GRAVEL > percent SAND	Gravel with < 5% Fines		GW	Well Graded GRAVEL		
				GP	Poorly Graded GRAVEL		
		Gravel with Between 5 and 15% Fines		GW-GM	Well Graded GRAVEL with silt		
				GW-GC	Well Graded Gravel with clay		
				GP-GM	Poorly Graded GRAVEL with silt		
				GP-GC	Poorly Graded GRAVEL with clay		
	Gravel with ≥ 15% Fines		GM	Silty GRAVEL			
			GC	Clayey GRAVEL			
			GC-GM	Silty, Clayey GRAVEL			
			SW	Well Graded SAND			
	SAND - Percent SAND ≥ percent GRAVEL	Sand with < 5% Fines		SP	Poorly Graded SAND		
				SW-SM	Well Graded SAND with silt		
		Sand with Between 5 and 15% Fines		SW-SC	Well Graded SAND with clay		
				SP-SM	Poorly Graded SAND with silt		
			SP-SC	Poorly Graded SAND with clay			
			SM	Silty SAND			
Sand with ≥ 15% Fines			SC	Clayey SAND			
			SC-SM	Silty, Clayey SAND			
Fine Grained Soils 50 percent or more Passing the # 200 Sieve	SILT and CLAY	Liquid Limit Less Than 50		ML	SILT		
				CL	Lean CLAY		
				CL-ML	SILTY CLAY		
				OL	Organic SILT, CLAY, or SILTY CLAY		
		Liquid Limit 50 or Greater		CH	Fat CLAY		
				MH	Elastic SILT		
				OH	Organic SILT or CLAY		
				PT	Peat/Marl		
			Highly Organic Soils			PT	Peat/Marl
			* Additional Modifiers	Coarse Grained Soils	with silt or clay		5 to 12 % Silt or Clay by weight
Silty or Clayey		more than 12 % Silt or Clay by weight					
Fine Grained Soils	with sand or gravel			15 to 29 % Sand or Gravel by weight			
	Sandy or Gravelly			30 % or more Sand or Gravel by weight			



TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-01-18**
 SHEET 1 OF 2
 DATE STARTED : 03-28-18
 DATE COMPLETED : 03-28-18

BORING ELEVATION : <u>883.1 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>640982.8613</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399179.0976</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>30.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
872.6	5	Stiff to Very Stiff, Brown SANDY LEAN CLAY (CL) , Damp to Moist	10.5	SS-1	3 4 5	13	100	16		3.5*	28	15	13
				SS-2	4 4 6	14	100	15	4.5*				
				SS-3	4 6 8	20	100	8	5.0*				
870.1	10	Very Stiff, Gray SANDY LEAN CLAY (CL) , Damp (TILL)	13.0	SS-4	4 5 8	18	100	10		7.0*			
				SS-5	5 10 11	29	67	9	9.0*				
866.3	15	Dense, Brown WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC) , Moist	16.8	SS-6	10 15 20	49	56	8					
				SS-7	18 20 22	59	67	5					

Continued on next page

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER


TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE.GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-01-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
853.1	25	Very Dense, Gray WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC) , Damp		SS-8	20 25 30	77	100	6						
	30			SS-9	23 26 25	71	56	6						
		BOTTOM OF BORING	30.0											

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE_GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-02-18**
 SHEET 1 OF 2
 DATE STARTED : 03-28-18
 DATE COMPLETED : 03-28-18


BORING ELEVATION : 886.8 Feet	RIG TYPE : CME 45	DRILLER : DS
NORTHING : 640984.1213	CASING DIA. : 3.25"	TEMPERATURE : 40s
EASTING : 1399104.1082	CORE SIZE : N/A	WEATHER : Cloudy
DEPTH : 35.0 Feet	HAMMER : Auto	
BORING METHOD: HSA	ENERGY RATIO : 84.1	

GROUNDWATER: ▼ Encountered at 5.0' ▽ At completion 8.0'

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
883.8		Medium Stiff, Brown SANDY LEAN CLAY (CL) , Wet	3.0	SS-1	2 3 3	8	100	17						
	5			SS-2	2 3 4	10	100	13		2.0*				
		Stiff to Very Stiff, Brown SANDY LEAN CLAY (CL) , Wet (TILL)		SS-3	2 3 5	11	100	12		4.5*				
	10			SS-4	4 5 8	18	100	12		5.0*				
876.3		Soft, Gray LEAN CLAY with SAND (CL) , Wet (TILL)	10.5	SS-5	3 1 2	4	100	17		2.5*				
873.8			13.0	SS-6	3 3 3	8	56	10		2.0*				
	15	Medium Stiff, Gray SANDY LEAN CLAY with GRAVEL (CL) , Moist		SS-7	15 16 17	46	67	10		9.0*				
870.0		Hard, Gray SANDY LEAN CLAY with GRAVEL (CL) , Moist	16.8											

Continued on next page

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-02-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
865.0		Hard, Gray SANDY LEAN CLAY with GRAVEL (CL) , Moist	21.8											
	25			SS-8	18 19 25	62	56	5						
	30	Dense to Very Dense, Brown WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC) , Moist		SS-9	18 15 13	39	56	5						
851.8	35	BOTTOM OF BORING	35.0	SS-10	14 16 20	50	67	5						
	40													
	45													

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-03-18**
 SHEET 1 OF 2
 DATE STARTED : 03-28-18
 DATE COMPLETED : 03-28-18

BORING ELEVATION : <u>887.6 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>640985.3813</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399029.1188</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>35.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
882.1	5	Loose to Medium Dense, Brown CLAYEY SAND (SC) , Wet	5.5	SS-1	3 3 2	7	100	15		3.0*	22	14	8
				SS-2	3 3 5	11	100	13		4.5*			
				SS-3	3 3 6	13	67	10		4.0*			
	10	Stiff to Very Stiff, Gray SANDY LEAN CLAY (CL) , Wet (TILL)	16.8	SS-4	3 5 5	14	100	9		6.0*			
				SS-5	3 5 3	11	89	19		3.0*			
				SS-6	3 7 5	17	100	12		5.0*			
	870.8	15	Medium Dense, Gray SILTY CLAYEY SAND with GRAVEL (SC-SM) , Wet	16.8	SS-7	5 6 8	20	100	10		5.5*	18	13
20													

Continued on next page

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE_GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-03-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
865.8		Medium Dense, Gray SILTY CLAYEY SAND with GRAVEL (SC-SM), Wet	21.8											
	25			SS-8	15 20 22	59	56	7						
	30	Very Dense, Brown WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC), Moist		SS-9	15 28 35	88	56	4						
852.6	35	BOTTOM OF BORING	35.0	SS-10	18 23 27	70	67	6						
	40													
	45													

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-04-18**
 SHEET 1 OF 2
 DATE STARTED : 03-28-18
 DATE COMPLETED : 03-28-18


BORING ELEVATION : 886.8 Feet NORTHING : 640986.6413 EASTING : 1398954.1294 DEPTH : 35.0 Feet BORING METHOD: HSA	RIG TYPE : CME 45 CASING DIA. : 3.25" CORE SIZE : N/A HAMMER : Auto ENERGY RATIO : 84.1	DRILLER : DS TEMPERATURE : 40s WEATHER : Cloudy
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GROUNDWATER: ▼ Encountered at 15.0' ▽ At completion 11.0'

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
883.8		Stiff, Brown SANDY LEAN CLAY (CL) , Moist	3.0	SS-1	3 3 4	10	100	23		3.5*			
	5			SS-2	3 3 5	11	100	12		6.0*			
		Medium Stiff to Stiff, Brown SANDY LEAN CLAY (CL) , Wet (TILL)		SS-3	4 4 5	13	100	16		2.0*			
	10			SS-4	3 3 3	8	89	14		3.0*			
876.3			10.5	SS-5	3 4 5	13	100	11		6.0*			
		Stiff to Very Stiff, Gray SANDY LEAN CLAY (CL) , Wet (TILL)		SS-6	3 5 8	18	100	10		6.0*			
870.0			16.8										
	20	Very Dense, Brown WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC) , Damp		SS-7	20 25 25	70	67	4					

Continued on next page

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE.GDT 5/16/18

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-04-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
860.0	25	Very Dense, Brown WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC), Damp Very Dense, Gray WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC), Damp BOTTOM OF BORING	26.8	SS-8	15 20 19	55	56	5						
	30				SS-9	15 25 20	63	67	5					
851.8	35			35.0	SS-10	18 20 22	59	67	6					
	40													
	45													

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE.GDT 5/16/18



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 Cincinnati, Ohio 45240
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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-05-18**
 SHEET 1 OF 2
 DATE STARTED : 03-26-18
 DATE COMPLETED : 03-26-18

BORING ELEVATION : 879.7 Feet	RIG TYPE : CME 45	DRILLER : DS
NORTHING : 641046.8441	CASING DIA. : 3.25"	TEMPERATURE : 40s
EASTING : 1399240.1811	CORE SIZE : N/A	WEATHER : Cloudy
DEPTH : 25.0 Feet	HAMMER : Auto	
BORING METHOD: HSA	ENERGY RATIO : 84.1	

GROUNDWATER: ▼ Encountered at 13.5' At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
871.7	5	Medium Stiff to Stiff, Brown SANDY LEAN CLAY (CL) , Moist	8.0	SS-1	2 3 4	10	100	22		8.0*			
869.2	10	Very Stiff, Brown SANDY LEAN CLAY (CL) , Moist	10.5	SS-2	2 3 3	8	56	17					
				SS-3	1 2 3	7	89			2.0*			
				SS-4	6 7 8	21	89	11		7.5*			
				SS-5	1 2 2	6	56	16			NP	NP	NP
862.9	15	Loose, SILTY SAND with GRAVEL (SM) , Wet		SS-6	2 2 2	6	44	1					
	20	Medium Dense, Gray WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC) , Damp	16.8	SS-7	5 6 7	18	67	7					

Continued on next page

 <p>2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com</p>	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE.GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-05-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
854.7	25	Medium Dense, Gray WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC) , Damp	25.0	SS-8	8 9 10	27	56	8						
		BOTTOM OF BORING												

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-06-18**
 SHEET 1 OF 2
 DATE STARTED : 03-26-18
 DATE COMPLETED : 03-26-18

BORING ELEVATION : <u>881.9 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>641047.8522</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399180.1896</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>30.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at 5.0' At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
873.9	5	Loose, Brown CLAYEY SAND (SC) , Moist	8.0	SS-1	3 3 3	8	100	16		3.0*			
				SS-2	2 2 2	6	89	26		27	17	10	
				SS-3	2 3 4	10	100	12					
				SS-4	4 5 7	17	100	16					
				SS-5	5 7 12	27	100	8					
				SS-6	14 18 14	45	100	6					
				SS-7	13 15 17	45	100	5					
868.9	10	Very Stiff, Gray SANDY LEAN CLAY (CL) , Moist (TILL)	13.0										
868.9	15	Dense, Brown WELL GRADED SAND with SILT and GRAVEL (SW-SM) , Moist											
	20												

Continued on next page

<p>2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com</p>	<p>BORING METHOD</p> <p>HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger</p>	<p>SAMPLING METHOD</p> <p>SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample</p>	<p>ABBREVIATIONS</p> <p>* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N₆₀ - Standard Penetration Normalized to 60% Drill Rod ER</p>
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TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE.GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-06-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
851.9	25	Dense, Brown WELL GRADED SAND with SILT and GRAVEL (SW-SM) , Moist		SS-8	9 12 13	35	56	4						
30	30		BOTTOM OF BORING	30.0	SS-9	10 14 17	43	100	5					
35														
40														
45														

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE_GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-07-18**
 SHEET 1 OF 2
 DATE STARTED : 03-27-18
 DATE COMPLETED : 03-27-18

BORING ELEVATION : <u>884.4 Feet</u> NORTHING : <u>641049.1122</u> EASTING : <u>1399105.2002</u> DEPTH : <u>25.0 Feet</u> BORING METHOD: <u>HSA</u>	RIG TYPE : <u>CME 45</u> CASING DIA. : <u>3.25"</u> CORE SIZE : <u>N/A</u> HAMMER : <u>Auto</u> ENERGY RATIO : <u>84.1</u>	DRILLER : <u>DS</u> TEMPERATURE : <u>50s</u> WEATHER : <u>Cloudy</u>
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GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS							
											LL	PL	PI					
873.9	5	Medium Stiff to Stiff, Brown SANDY LEAN CLAY (CL) , Wet	10.5	SS-1	3 3 4	10	100	24		3.0*								
				SS-2	2 2 3	7	0	14		5.0*								
				SS-3	2 3 5	11	67	14		2.5*								
				SS-4	3 5 4	13	56	15		6.0*								
				SS-5	12 15 16	43	44	14										
				SS-6	10 12 13	35	56	13		3.0*								
				867.7	15	Hard, Gray SANDY LEAN CLAY (CL) , Wet	16.8	SS-7	13 16 17	46	67	6						
					20	Dense to Very Dense, Gray WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist												

Continued on next page

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE_GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-07-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
859.4	25	Dense to Very Dense, Gray WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist	25.0	SS-8	12 18 20	53	56	5						
		BOTTOM OF BORING												

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-08-18**
 SHEET 1 OF 2
 DATE STARTED : 03-27-18
 DATE COMPLETED : 03-27-18


BORING ELEVATION : <u>884.9 Feet</u> NORTHING : <u>641050.3722</u> EASTING : <u>1399030.2108</u> DEPTH : <u>25.0 Feet</u> BORING METHOD: <u>HSA</u>	RIG TYPE : <u>CME 45</u> CASING DIA. : <u>3.25"</u> CORE SIZE : <u>N/A</u> HAMMER : <u>Auto</u> ENERGY RATIO : <u>84.1</u>	DRILLER : <u>DS</u> TEMPERATURE : <u>50s</u> WEATHER : <u>Cloudy</u>
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GROUNDWATER: ∇ Encountered at 10.0' ∇ At completion 12.0'

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
877.9	5	Stiff, Brown SANDY LEAN CLAY (CL) , Moist	7.0	SS-1	4 4 5	13	100	28		4.0*			
				SS-2	3 5 3	11	67	25		3.0*			
				ST-3			100	27	124	0.7 @ 3.2%	26	16	10
	10	Stiff to Very Stiff, Gray SANDY LEAN CLAY (CL) , Wet (TILL)	16.8	SS-4	3 5 7	17	100	11		5.0*	22	14	8
				SS-5	3 3 5	11	100	12		3.0*			
	15			SS-6	3 5 6	15	89	11		2.0*			
868.1	20	Dense to Very Dense, Brown WELL GRADED SAND with GRAVEL (SW) , Moist		SS-7	15 13 15	39	56	6					

Continued on next page

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE.GDT 5/16/18


 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-08-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
859.9	25	Dense to Very Dense, Brown WELL GRADED SAND with GRAVEL (SW) , Moist	25.0	SS-8	15 18 20	53	67	6						
		BOTTOM OF BORING												

 <p>2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com</p>	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE_GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-09-18**
 SHEET 1 OF 2
 DATE STARTED : 03-27-18
 DATE COMPLETED : 03-27-18


BORING ELEVATION : 884.4 Feet	RIG TYPE : CME 45	DRILLER : DS
NORTHING : 641051.6322	CASING DIA. : 3.25"	TEMPERATURE : 50s
EASTING : 1398955.2214	CORE SIZE : N/A	WEATHER : Cloudy
DEPTH : 25.0 Feet	HAMMER : Auto	
BORING METHOD: HSA	ENERGY RATIO : 84.1	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
881.4		Stiff, Brown SANDY LEAN CLAY (CL) , Moist	3.0	SS-1	2 3 4	10	100	16		2.0*			
878.9	5	Stiff, Brown and Gray SANDY LEAN CLAY (CL) , Moist	5.5	SS-2	2 3 5	11	100	17		3.0*			
		Stiff to Very Stiff, Brown SANDY LEAN CLAY (CL) , Moist		SS-3	3 3 5	11	83	12		7.0*			
873.9	10		10.5	SS-4	3 5 7	17	100	10		9.0*			
871.4		Hard, Brown SANDY LEAN CLAY (CL) , Moist	13.0	SS-5	9 11 15	36	56	10		9.0*			
		Very Dense, Brown SILTY CLAYEY SAND (SC-SM) ,		SS-6	12 15 28	60	67	12		3.0*			
867.7	15		16.8										
	20	Dense, Gray WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Wet		SS-7	15 14 18	45	56	4					

Continued on next page

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE.GDT 5/16/18

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-09-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
859.4	25	Dense, Gray WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Wet	25.0	SS-8	15 16 17	46	56	4						
		BOTTOM OF BORING												
	30													
	35													
	40													
	45													

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD


CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-10-18**
 SHEET 1 OF 1
 DATE STARTED : 03-26-18
 DATE COMPLETED : 03-26-18

BORING ELEVATION : <u>879.7 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>641111.8350</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399241.2732</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>10.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS					
											LL	PL	PI			
869.7	10	Stiff, SANDY LEAN CLAY (CL) , Moist	10.0	SS-1	2 3 4	10	100	27		3.5*						
				SS-2	3 3 4	10	67	14	5.5*							
				SS-3	2 4 6	14	100	14	3.5*							
				SS-4	3 4 5	13	56	11	3.0*							
				BOTTOM OF BORING												

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE_GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-11-18**
 SHEET 1 OF 2
 DATE STARTED : 03-26-18
 DATE COMPLETED : 03-26-18

BORING ELEVATION : <u>880.8 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>641112.8430</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399181.2816</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>25.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
877.8		Stiff, Brown SANDY LEAN CLAY (CL) , Moist	3.0	SS-1	3 3 4	10	100	21		5.0*			
	5			SS-2	2 2 3	7	100	13		5.5*			
		Medium Stiff to Stiff, Brown SANDY SILTY CLAY (CL-ML) , Moist		SS-3	3 4 5	13	67	12		3.5*			
870.3	10		10.5	SS-4	4 5 6	15	100	13		6.5*	21	14	7
				SS-5	20 20 13	46	67	6					
	15			SS-6	3 15 11	36	56	5					
		Dense, Brown WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist		SS-7	11 13 15	39	67	5					

Continued on next page

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE.GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-11-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
855.8	25	Dense, Brown WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist	25.0	SS-8	4 12 13	35	44	5						
		BOTTOM OF BORING												

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-12-18**
 SHEET 1 OF 2
 DATE STARTED : 03-26-18
 DATE COMPLETED : 03-26-18

BORING ELEVATION : <u>882.3 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>641114.1030</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399106.2922</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>25.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
871.8	5	Medium Stiff, Brown SANDY LEAN CLAY (CL) , Moist	10.5	SS-1	2 3 3	8	100	28		4.5*				
				SS-2	1 2 3	7	100	20		1.5*				
				SS-3	2 2 3	7	100	21						
				SS-4	2 1 3	6	89	16						
				SS-5	3 5 5	14	100	11		6.5*				
				SS-6	3 2 1	4	67	14				NP	NP	NP
				SS-7	4 4 6	14	67	8						
869.3		Stiff, Brown SANDY LEAN CLAY (CL) , Moist	13.0											
865.5	15	Very Loose, SILTY SAND with GRAVEL (SM) , Wet	16.8											
	20	Medium Dense, Brown WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist												

Continued on next page

 <p>2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com</p>	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-12-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
857.3	25	Medium Dense, Brown WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist	25.0	SS-8	5 6 7	18	56	6						
		BOTTOM OF BORING												
	30													
	35													
	40													
	45													

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-13-18**
 SHEET 1 OF 2
 DATE STARTED : 03-23-18
 DATE COMPLETED : 03-23-18

BORING ELEVATION : 882.9 Feet NORTHING : 641115.3630 EASTING : 1399031.3028 DEPTH : 25.0 Feet BORING METHOD: HSA	RIG TYPE : CME 45 CASING DIA. : 3.25" CORE SIZE : N/A HAMMER : Auto ENERGY RATIO : 84.1	DRILLER : DS TEMPERATURE : 40s WEATHER : Clear
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GROUNDWATER: ▼ Encountered at 13.5' At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
879.9		Stiff, Brown LEAN CLAY (CL) , Moist	3.0	SS-1	3 5 6	15	100	25		6.5*			
877.4	5	Stiff, Brown SANDY LEAN CLAY (CL) , Moist	5.5	SS-2	4 4 5	13	100	18		6.0*			
		Very Stiff, Brown SANDY SILTY CLAY (CL-ML) , Moist (TILL)		SS-3	4 7 8	21	100	12		9.0*			
872.4	10			SS-4	6 9 12	29	100	12		5.0*			
				SS-5	2 2 3	7	100	14		4.0*	21	14	7
867.4	15	Soft to Medium Stiff, Brown SANDY SILTY CLAY (CL-ML) , Moist (TILL)	15.5	SS-6	2 2 1	4	56	16		2.5*			
	20	Very Dense, Brown SILTY CLAYEY SAND with GRAVEL (SC-SM) ,		SS-7	10 16 22	53	100	7					

Continued on next page

 <p> 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com </p>	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING/PIT RECORD 18050006CIN.GPJ CTL CORPORATE.GDT 5/16/18

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-13-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
857.9	25	Very Dense, Brown SILTY CLAYEY SAND with GRAVEL (SC-SM)	25.0	SS-8	12 22 28	70	100	4						
		BOTTOM OF BORING												
	30													
	35													
	40													
	45													

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-14-18**
 SHEET 1 OF 2
 DATE STARTED : 03-23-18
 DATE COMPLETED : 03-23-18


BORING ELEVATION : 882.4 Feet	RIG TYPE : CME 45	DRILLER : DS
NORTHING : 641116.6230	CASING DIA. : 3.25"	TEMPERATURE : 40s
EASTING : 1398956.3134	CORE SIZE : N/A	WEATHER : Clear
DEPTH : 25.0 Feet	HAMMER : Auto	
BORING METHOD: HSA	ENERGY RATIO : 84.1	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
879.4		Stiff, Brown LEAN CLAY (CL) , Moist, with Organics	3.0	SS-1	3 3 6	13	100	23		5.0*			
	5			SS-2	3 4 3	10	100	26					
		Stiff to Very Stiff, Brown SANDY LEAN CLAY (CL) , Wet (TILL)		SS-3	3 6 7	18	100	12		4.5*			
871.9	10		10.5	SS-4	4 4 7	15	100	13		4.5*			
		Hard, Gray SANDY LEAN CLAY (CL) , Damp		SS-5	7 10 12	31	100	10		6.5*			
869.4			13.0	SS-6	6 9 11	28	100	8					
	15	Medium Dense, Brown WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist											
865.6			16.8	SS-7	10 16 19	49	100	5					
	20	Dense to Very Dense, Gray WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist											

Continued on next page

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE.GDT 5/16/18

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP

BORING NO.: **B-14-18**
 SHEET 2 OF 2

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS			
											LL	PL	PI	
857.4	25	Dense to Very Dense, Gray WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist	25.0	SS-8	12 20 23	60	100	7						
		BOTTOM OF BORING												

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



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BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
HSA - Hollow Stem Auger	SS - Split Spoon Sample	* - Hand Penetrometer
SFA - Solid Flight Auger	ST - Shelby Tube Sample	LL - Liquid Limit
RC - Rock Coring	CR - Rock Core Sample	PL - Plastic Limit
MD - Mud Drilling	BS - Bag Sample	PI - Plasticity Index
WD - Wash Drilling		SPT - Standard Penetration Test
HA - Hand Auger		N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-15-18**
 SHEET 1 OF 1
 DATE STARTED : 03-22-18
 DATE COMPLETED : 03-22-18

BORING ELEVATION : <u>880.4 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>641117.8830</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>30s</u>
EASTING : <u>1398881.3240</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Clear</u>
DEPTH : <u>20.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
874.9	5	Loose, Brown CLAYEY SAND (SC) , Moist	5.5	SS-1	3 3 4	10	100	24		6.5*			
				SS-2	2 2 3	7	100	26		2.0*	41	17	24
				SS-3	3 4 4	11	100	12		5.5*			
869.9	10	Stiff to Very Stiff, Brown SANDY LEAN CLAY (CL) , Moist (TILL)	10.5	SS-4	6 8 10	25	100	11		7.0*			
				SS-5	6 8 18	36	100	9					
863.7	15	Medium Dense to Dense, Brown WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist	16.8	SS-6	5 7 9	22	100	7					
				SS-7	13 17 16	46	100	6					
860.4	20	Dense, Gray WELL GRADED SAND with SILTY CLAY and GRAVEL (SW-SC) , Moist	20.0										
		BOTTOM OF BORING											

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE.GDT 5/16/18

 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com	BORING METHOD	SAMPLING METHOD	ABBREVIATIONS
	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-16-18**
 SHEET 1 OF 1
 DATE STARTED : 03-26-18
 DATE COMPLETED : 03-26-18

BORING ELEVATION : <u>879.6 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>641155.4978</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399188.4995</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>10.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
876.6		Medium Stiff, Brown LEAN CLAY with SAND (CL) , Moist	3.0	SS-1	2 2 3	7	100	23		4.5*			
	5			SS-2	3 3 3	8	100	16		3.0*			
		Medium Stiff to Stiff, Brown SANDY LEAN CLAY (CL) , Moist		SS-3	2 2 3	7	56	14		2.0*			
869.6	10	BOTTOM OF BORING	10.0	SS-4	2 3 4	10	67	15		3.5*			

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18

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	HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger	SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample	* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N ₆₀ - Standard Penetration Normalized to 60% Drill Rod ER

TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN


BORING NO.: **B-17-18**
 SHEET 1 OF 1
 DATE STARTED : 03-28-18
 DATE COMPLETED : 03-28-18

BORING ELEVATION : <u>862.8 Feet</u>	RIG TYPE : <u>CME 45</u>	DRILLER : <u>DS</u>
NORTHING : <u>641228.0899</u>	CASING DIA. : <u>3.25"</u>	TEMPERATURE : <u>40s</u>
EASTING : <u>1399276.4504</u>	CORE SIZE : <u>N/A</u>	WEATHER : <u>Cloudy</u>
DEPTH : <u>10.0 Feet</u>	HAMMER : <u>Auto</u>	
BORING METHOD: <u>HSA</u>	ENERGY RATIO : <u>84.1</u>	

GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
859.8		Medium Stiff, Brown SANDY LEAN CLAY (CL) , Moist (FILL)	3.0	SS-1	3 3 3	8	56	18		4.0*			
	5	Stiff, Brown SANDY LEAN CLAY (CL) , Moist		SS-2	3 4 5	13	67	19		4.5*			
854.8			8.0	SS-3	4 4 4	11	72	23		4.0*			
852.8	10	Stiff, Brown LEAN CLAY with SAND (CL) , Moist	10.0	SS-4	4 5 6	15	100	20		2.0*			
		BOTTOM OF BORING											

TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18

 <p>2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com</p>	<p>BORING METHOD</p> <p>HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger</p>	<p>SAMPLING METHOD</p> <p>SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample</p>	<p>ABBREVIATIONS</p> <p>* - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N₆₀ - Standard Penetration Normalized to 60% Drill Rod ER</p>
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TEST BORING RECORD

CLIENT : Village West Alexandria
 PROJECT : West Alexandria WWTP
 LOCATION : 33 Desoto Drive
 PROJECT NO. : 18050006CIN

BORING NO.: **B-18-18**
 SHEET 1 OF 1
 DATE STARTED : 03-28-18
 DATE COMPLETED : 03-28-18

BORING ELEVATION : <u>866.0 Feet</u> NORTHING : <u>641179.5180</u> EASTING : <u>1399275.6343</u> DEPTH : <u>10.0 Feet</u> BORING METHOD: <u>HSA</u>	RIG TYPE : <u>CME 45</u> CASING DIA. : <u>3.25"</u> CORE SIZE : <u>N/A</u> HAMMER : <u>Auto</u> ENERGY RATIO : <u>84.1</u>	DRILLER : <u>DS</u> TEMPERATURE : <u>40s</u> WEATHER : <u>Cloudy</u>
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GROUNDWATER: Encountered at None At completion Dry

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	N ₆₀	RECOVERY (%)	MOISTURE CONTENT	TOTAL UNIT WEIGHT pcf	UNCONF. COMP., ksf	ATTERBERG LIMITS		
											LL	PL	PI
860.5	5	Medium Stiff to Stiff, Brown SANDY LEAN CLAY (CL) , Moist	5.5	SS-1	2 3 3	8	94	18		5.0*	42	17	25
				SS-2	3 5 5	14	100	16		5.0*			
		Dense, Brown WELL GRADED SAND with GRAVEL and SILTY CLAY (SW-SC) , Moist		SS-3	8 10 12	31	56	7					
856.0	10	BOTTOM OF BORING	10.0	SS-4	10 15 14	41	67	8					

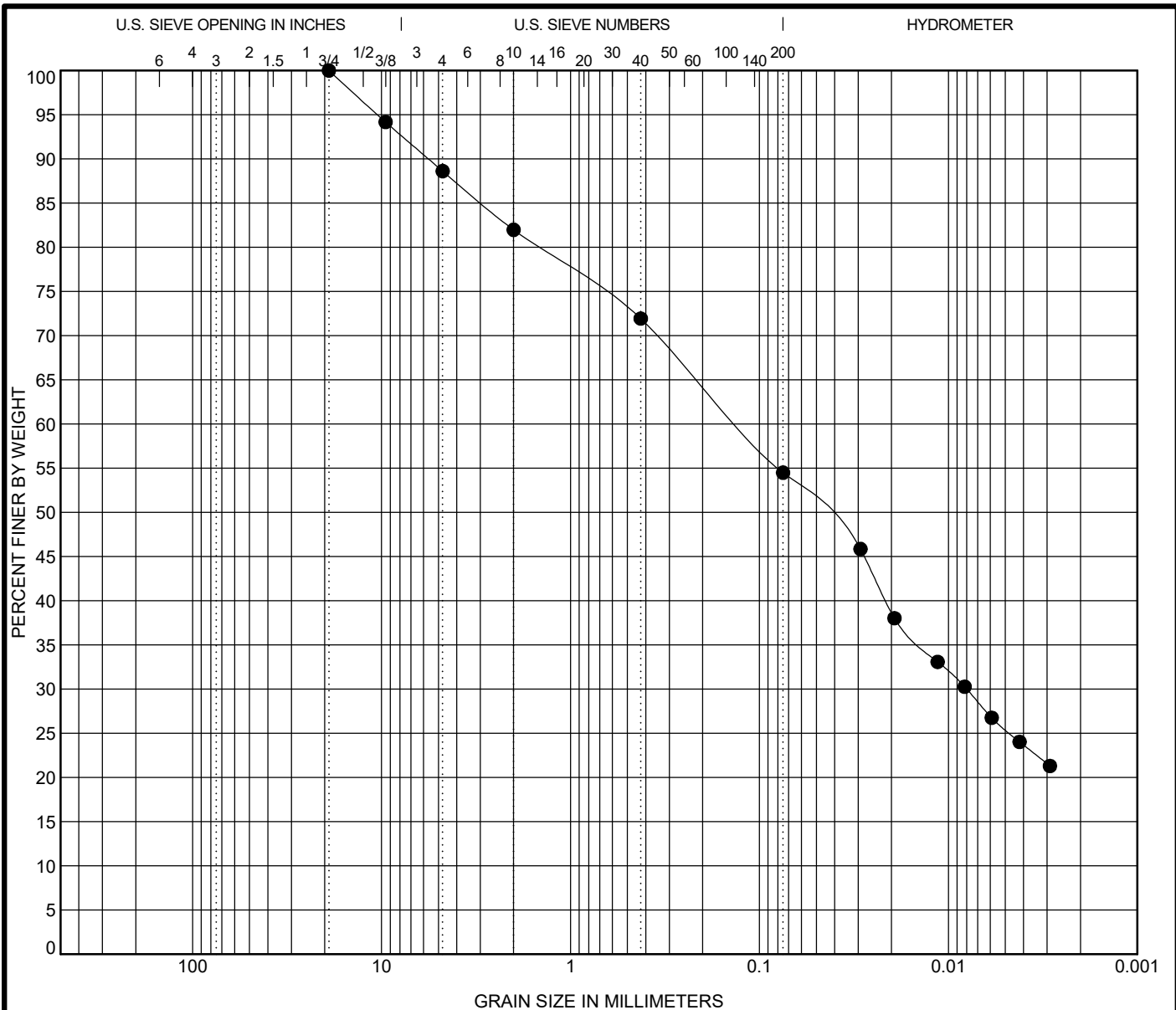
<p> 2105 Schappelle Lane Cincinnati, Ohio 45240 Telephone: 513-722-8665 Fax: 513-834-6650 Email: ctlcin@ctleng.com </p>	<p> BORING METHOD HSA - Hollow Stem Auger SFA - Solid Flight Auger RC - Rock Coring MD - Mud Drilling WD - Wash Drilling HA - Hand Auger </p>	<p> SAMPLING METHOD SS - Split Spoon Sample ST - Shelby Tube Sample CR - Rock Core Sample BS - Bag Sample </p>	<p> ABBREVIATIONS * - Hand Penetrometer LL - Liquid Limit PL - Plastic Limit PI - Plasticity Index SPT - Standard Penetration Test N₆₀ - Standard Penetration Normalized to 60% Drill Rod ER </p>
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TEST BORING/PIT RECORD 18050006CIN.GPJ_CTL CORPORATE_GDT 5/16/18



APPENDIX B
RESULTS OF SOIL LABORATORY TESTS





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification	%MC	LL	PL	PI	Cc	Cu
● B-01-18	SS-1	SANDY LEAN CLAY (CL)	16	28	15	13		

Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-01-18	SS-1	19	0.13	0.046	0.008		11	34	30	25

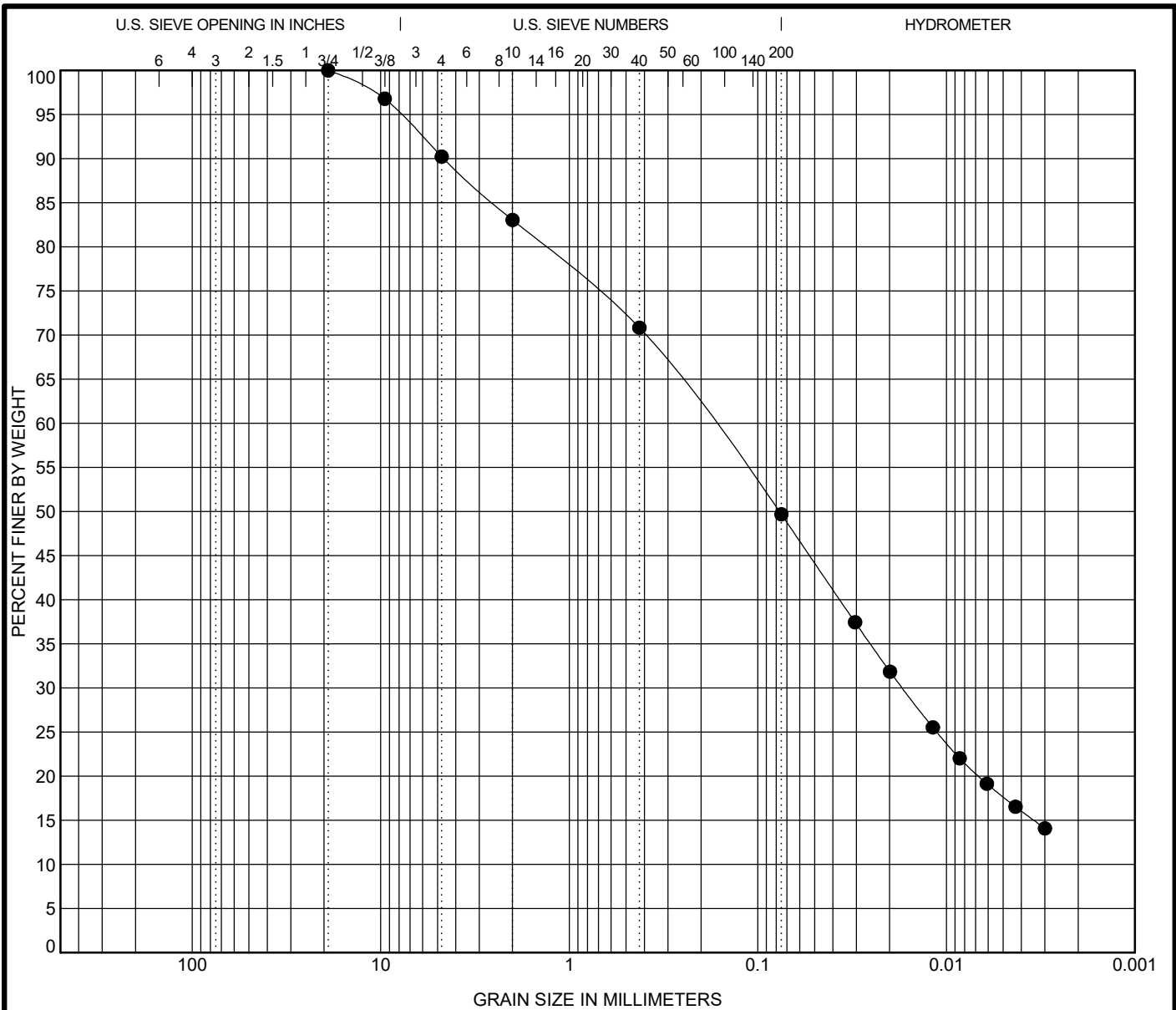
GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)

Project: West Alexandria WWTP
 Location: 33 Desoto Drive
 CTL Project Number: 18050006CIN



CTL Engineering
 2105 Schappelle Lane
 Cincinnati, Ohio 45240
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 Fax: 513-834-6650

CTLLAB_GRAINSIZE_18050006CIN.GPJ CTL CORPORATION.GDT 4/25/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-03-18	SS-1	CLAYEY SAND (SC)					15	22	14	8		

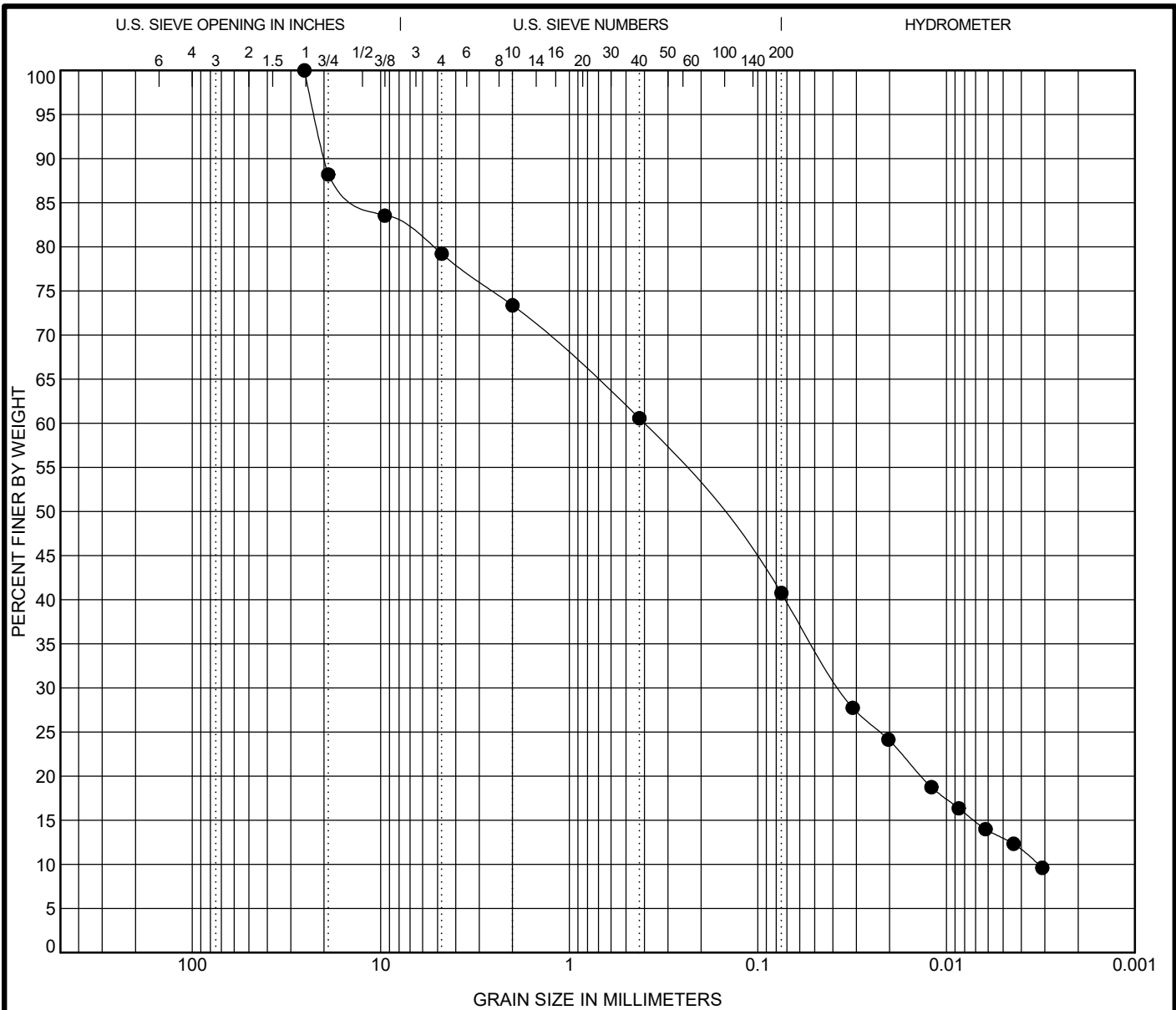
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-03-18	SS-1	19	0.175	0.077	0.017		10	41	31	18

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
 Project: West Alexandria WWTP
 Location: 33 Desoto Drive
 CTL Project Number: 18050006CIN



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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification	%MC	LL	PL	PI	Cc	Cu
● B-03-18	SS-7	SILTY, CLAYEY SAND with GRAVEL (SC-SM)	10	18	13	5	1.01	123.93

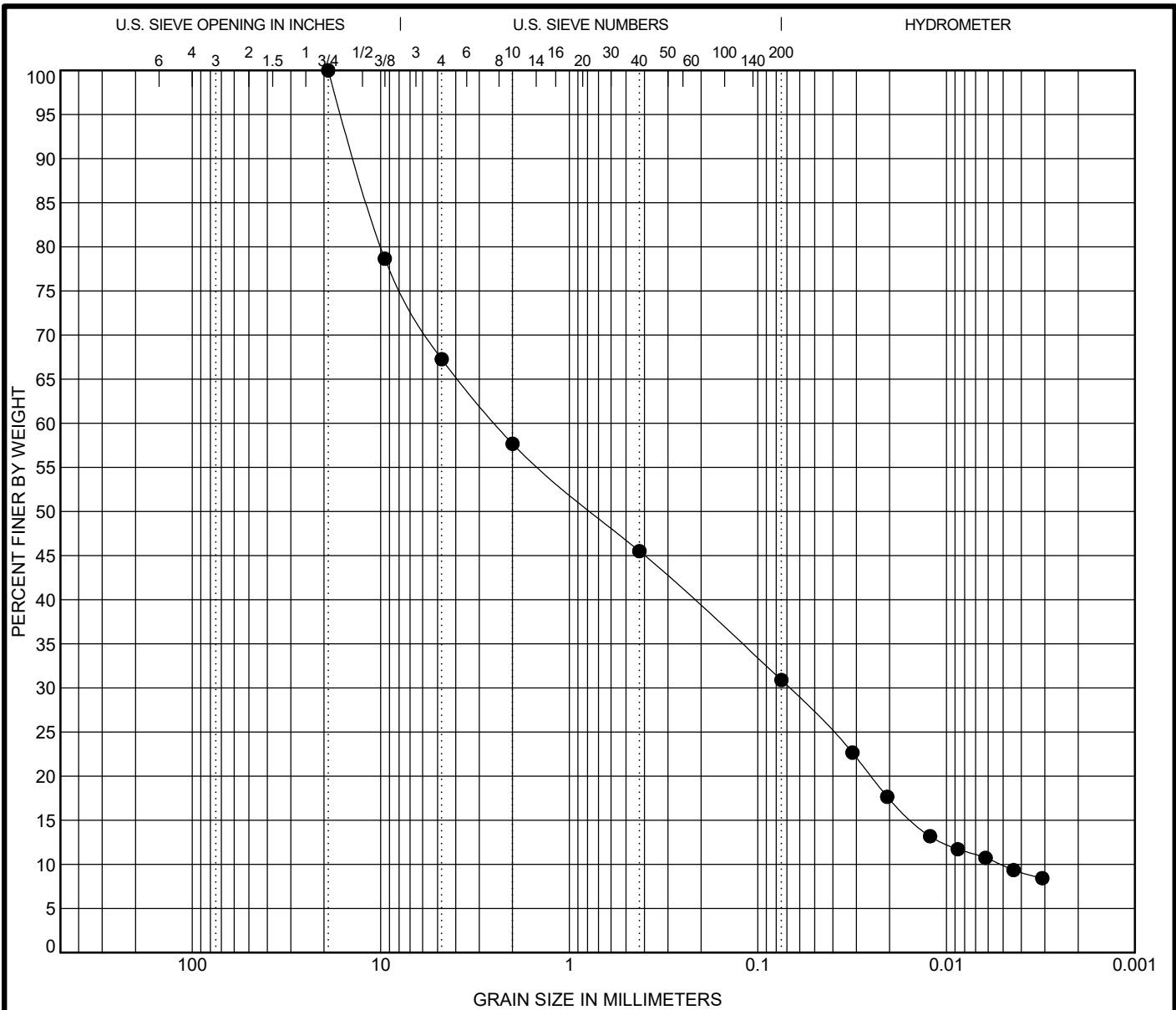
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-03-18	SS-7	25.4	0.404	0.168	0.037	0.003	21	38	28	13

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-05-18	SS-5	SILTY SAND with GRAVEL (SM)					16	NP	NP	NP	0.37	477.93

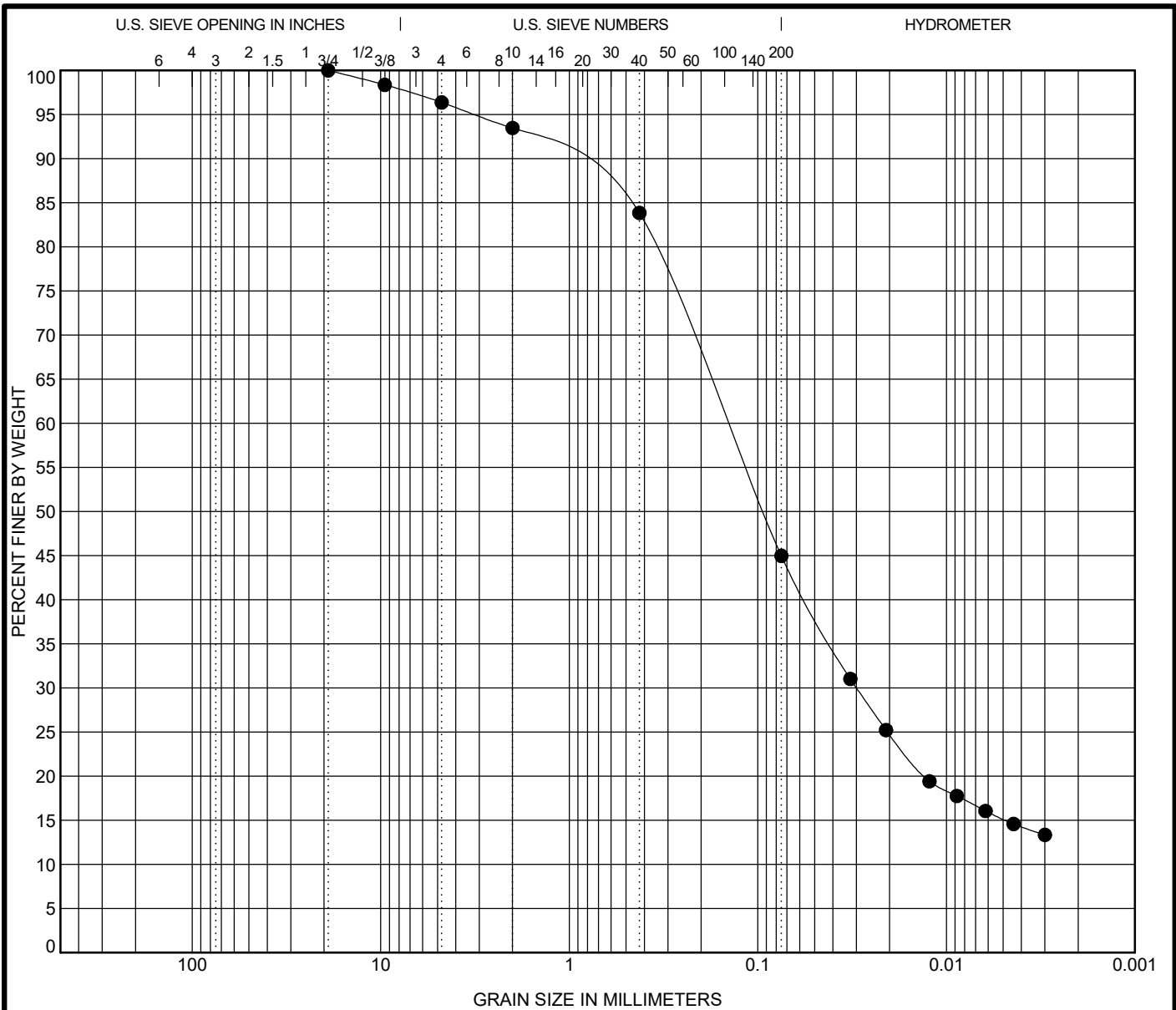
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-05-18	SS-5	19	2.467	0.753	0.068	0.005	33	36	21	10

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
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CTLLAB_GRAINSIZE_18050006CIN.GPJ CTL CORPORATE.GDT 4/25/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-06-18	SS-2	CLAYEY SAND (SC)					26	27	17	10		

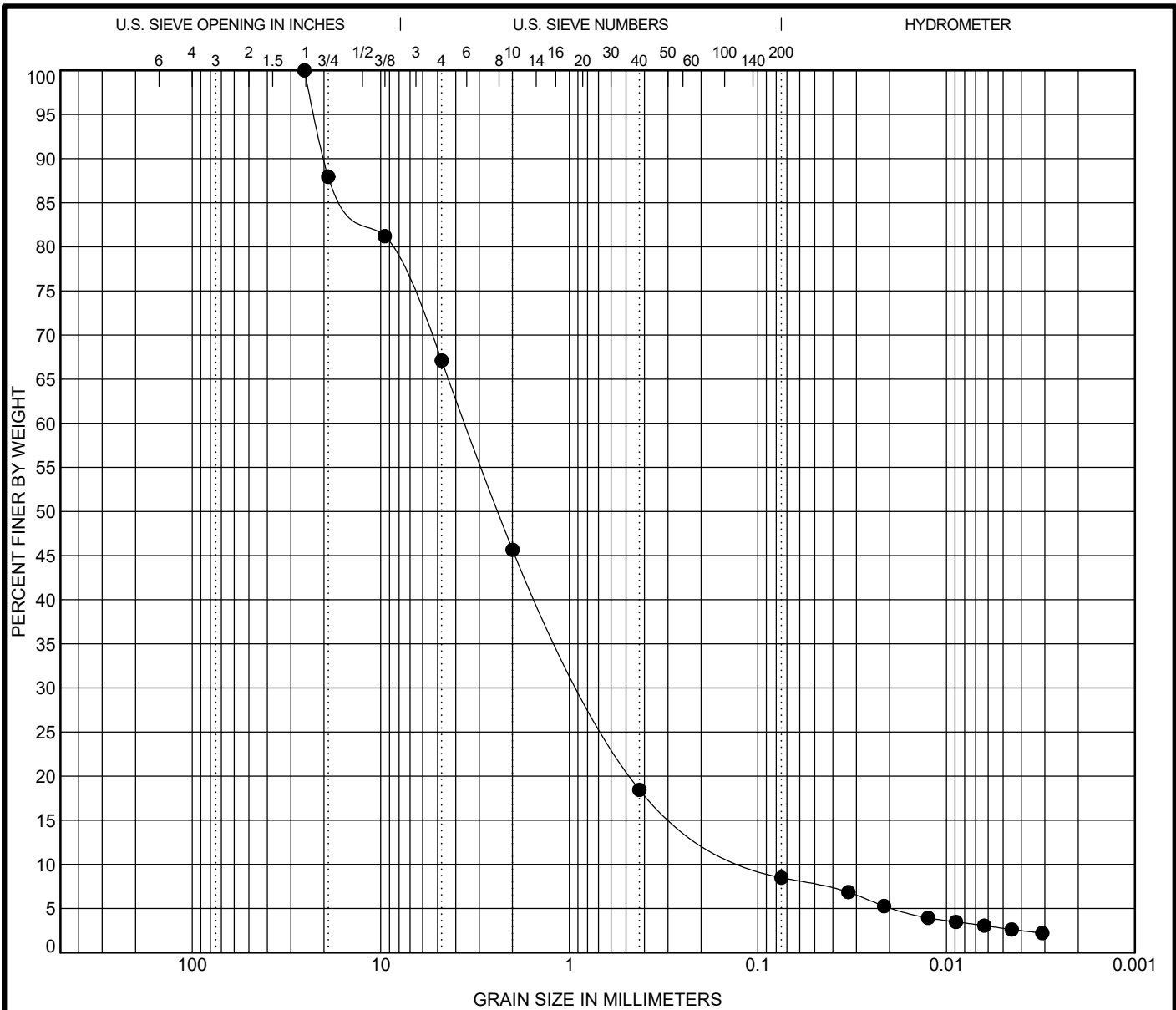
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-06-18	SS-2	19	0.147	0.094	0.03		4	51	30	15

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
 Project: West Alexandria WWTP
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CTLLAB_GRAINSIZE_18050006CIN.GPJ CTL CORPORATE.GDT 4/25/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-06-18	SS-7	WELL-GRADED SAND with SILT and GRAVEL (SW-SM)5					NP	NP	NP	1.93	36.53	

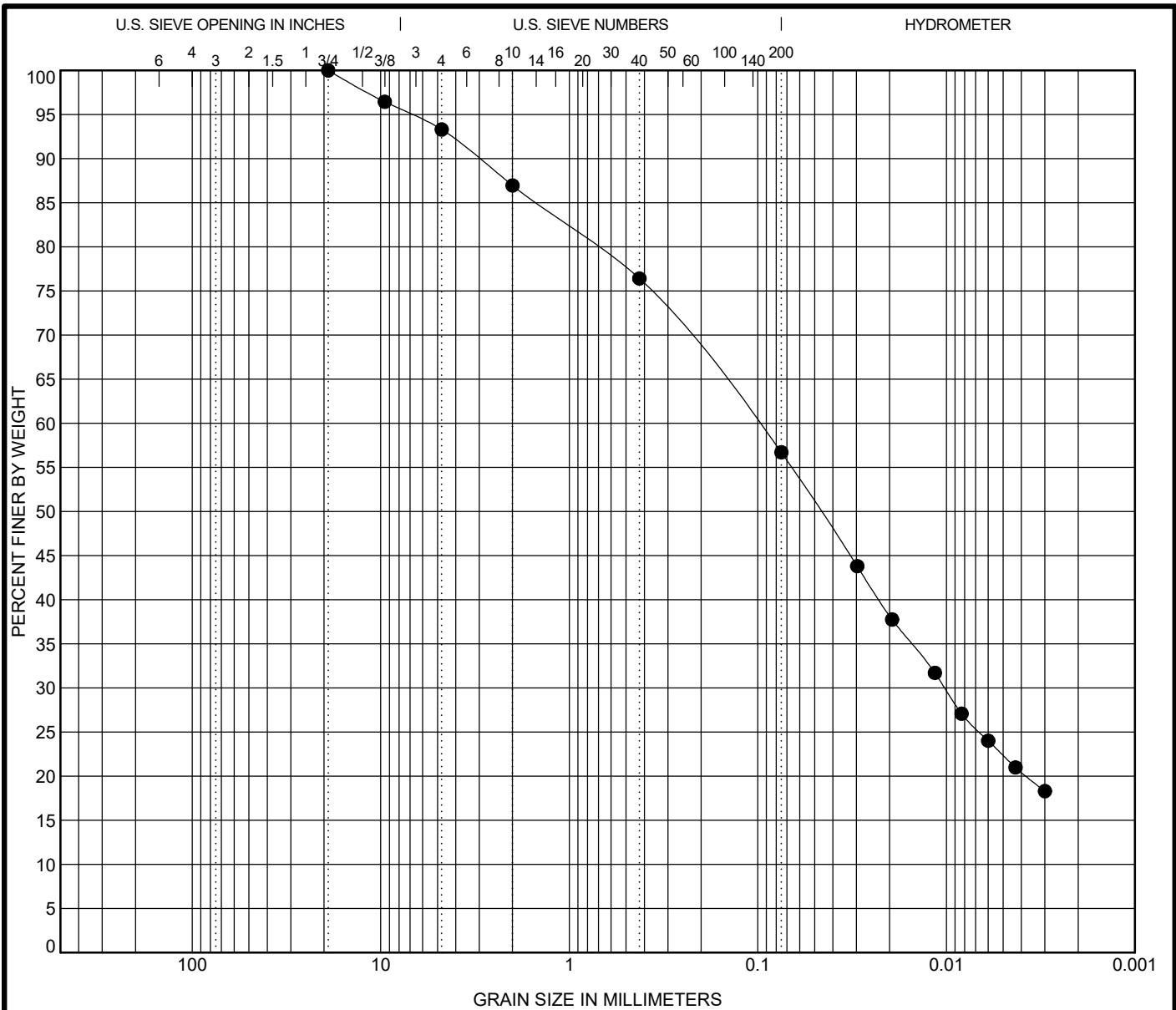
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-06-18	SS-7	25.4	3.565	2.382	0.82	0.098	33	59	5	3

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-08-18	SS-4	SANDY LEAN CLAY (CL)					11	22	14	8		

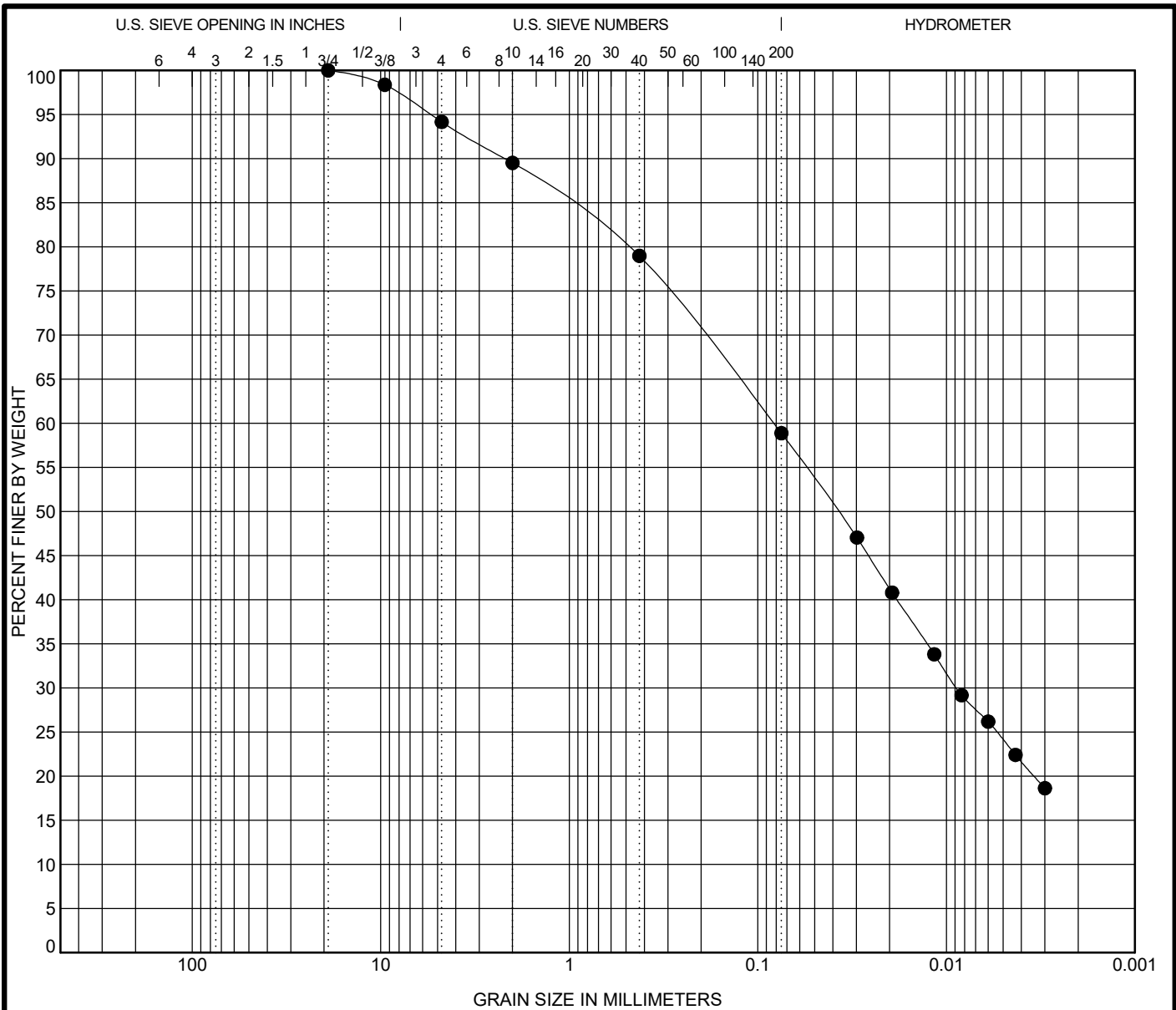
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-08-18	SS-4	19	0.1	0.046	0.01		7	37	34	22

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
 Project: West Alexandria WWTP
 Location: 33 Desoto Drive
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-11-18	SS-4	SANDY SILTY CLAY (CL-ML)					13	21	14	7		

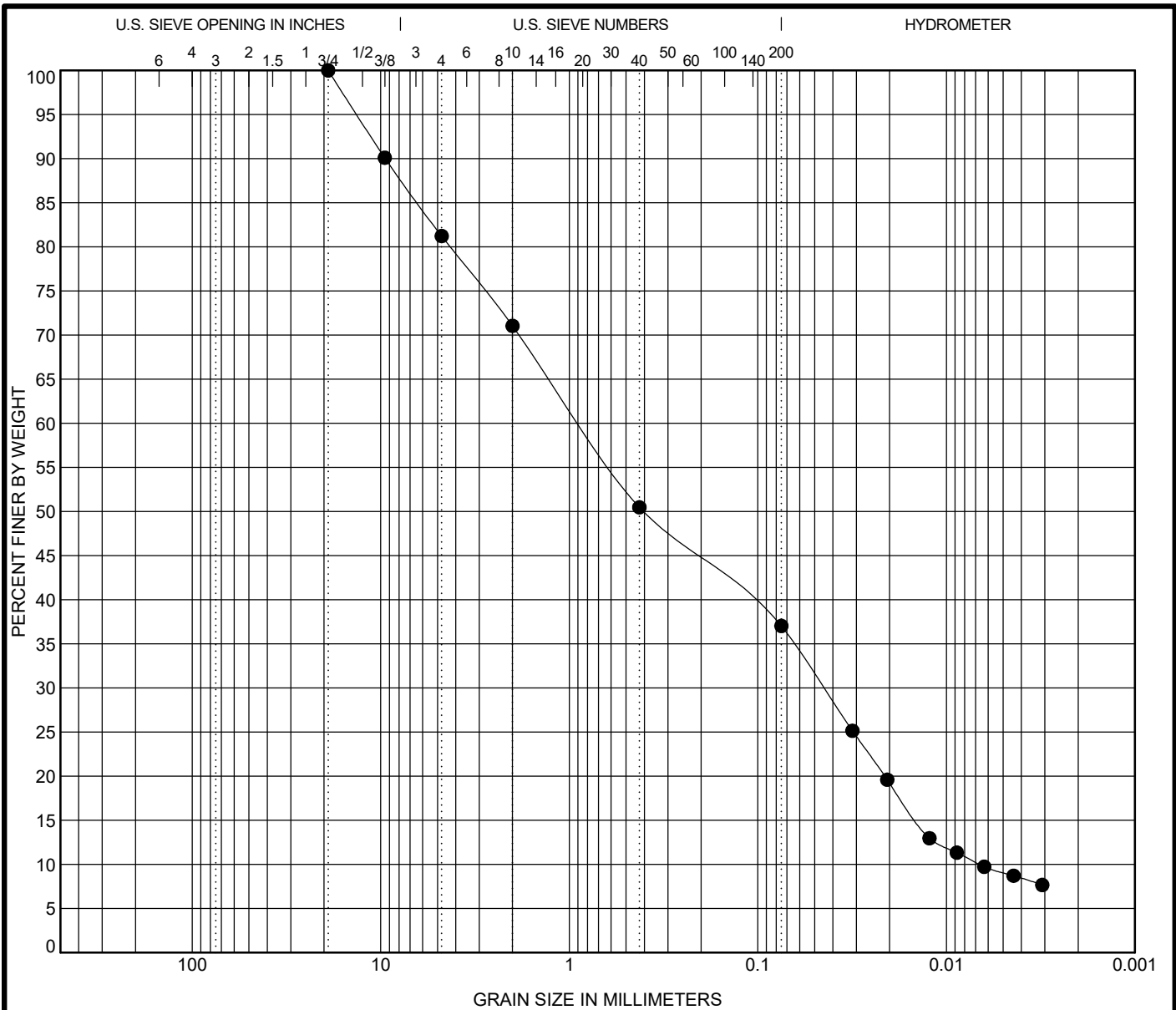
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-11-18	SS-4	19	0.083	0.038	0.009		6	35	35	24

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-12-18	SS-6	SILTY SAND with GRAVEL (SM)					14	NP	NP	NP	0.35	130.61

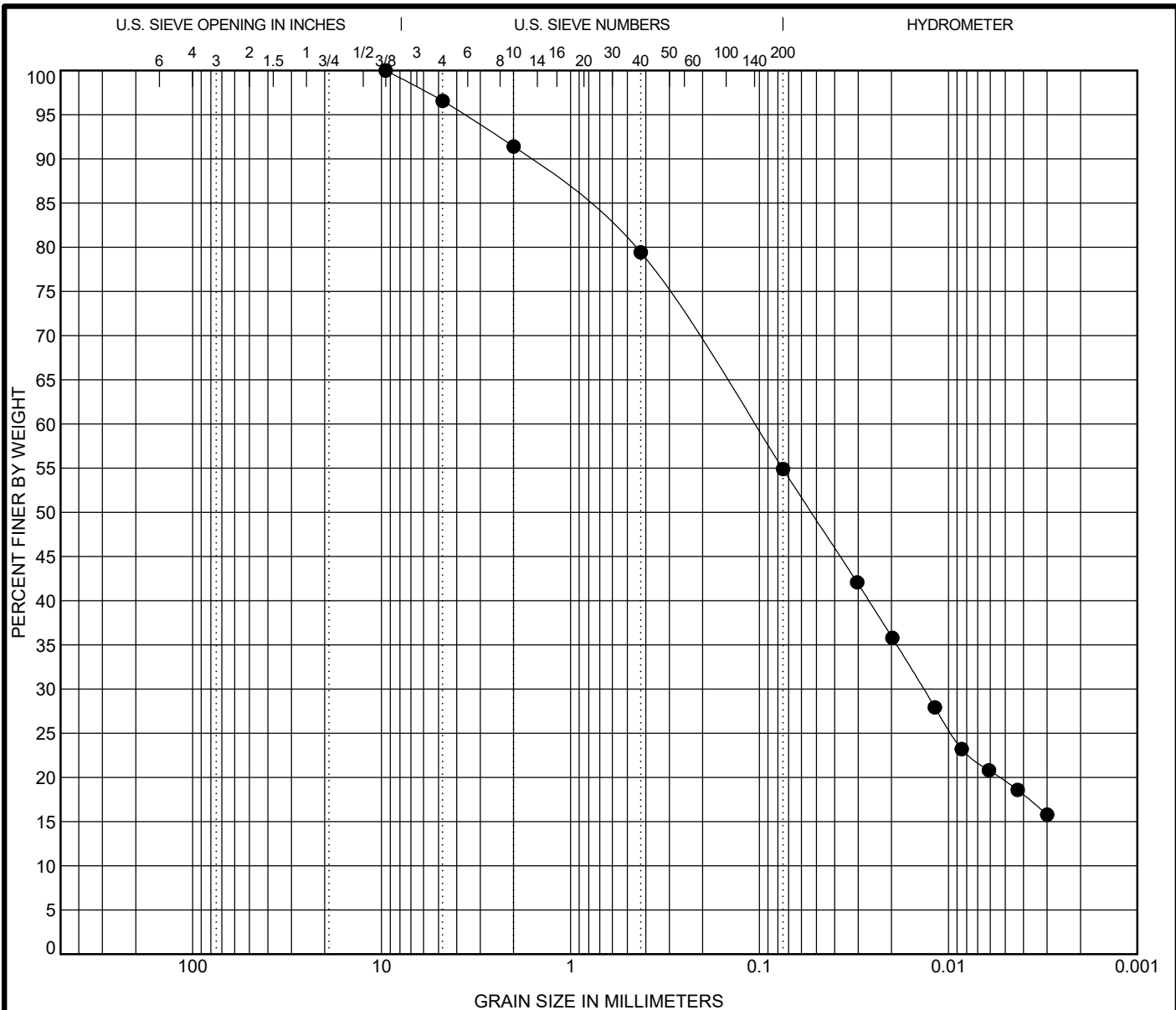
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-12-18	SS-6	19	0.871	0.4	0.045	0.007	19	44	28	9

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
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CTLLAB_GRAINSIZE_18050006CIN.GPJ CTL CORPORATE.GDT 4/25/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-13-18	SS-5	SANDY SILTY CLAY (CL-ML)					14	21	14	7		

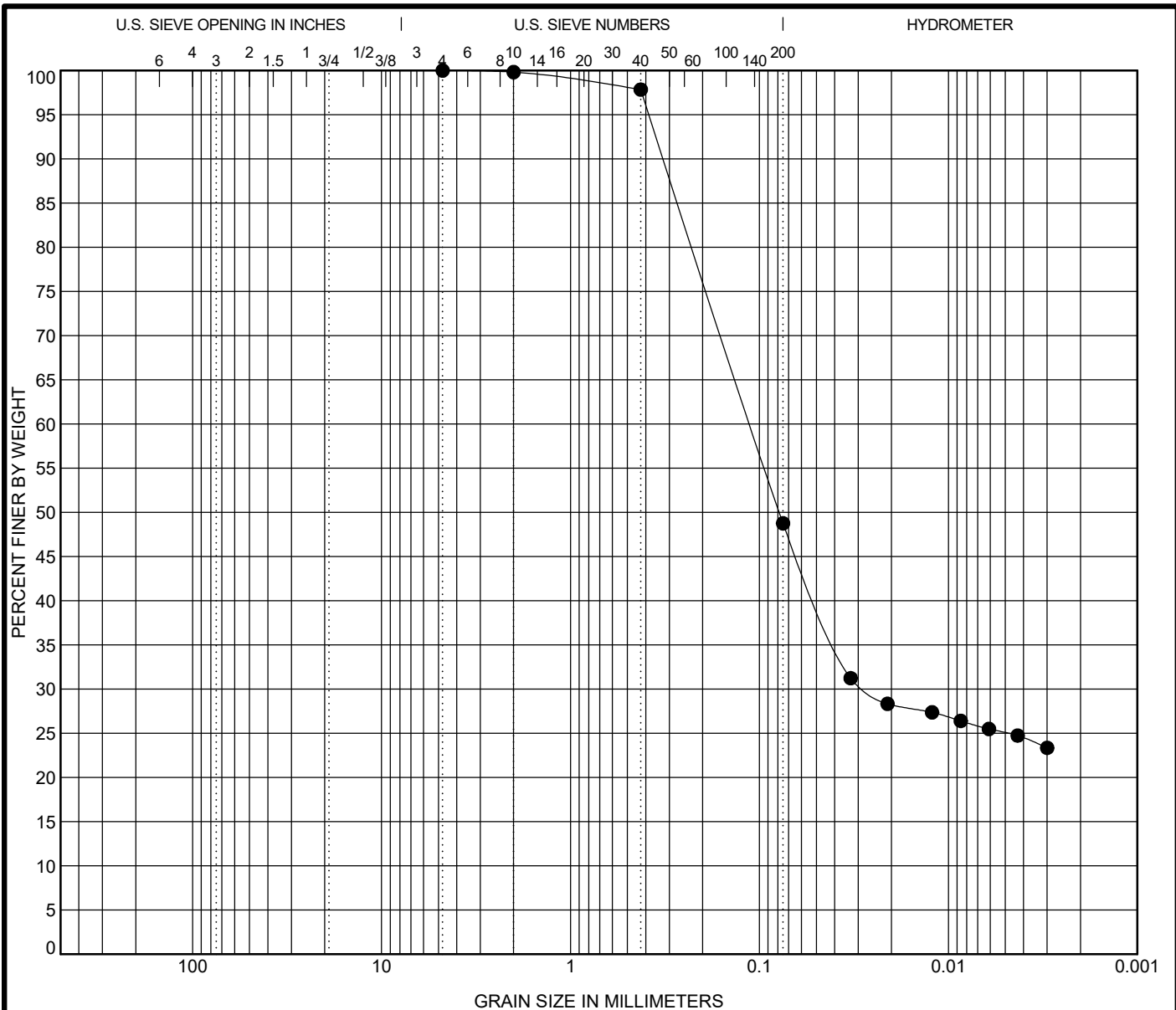
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-13-18	SS-5	9.525	0.108	0.053	0.014		3	42	35	20

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GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
 Project: West Alexandria WWTP
 Location: 33 Desoto Drive
 CTL Project Number: 18050006CIN



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-15-18	SS-2	CLAYEY SAND (SC)					26	41	17	24		

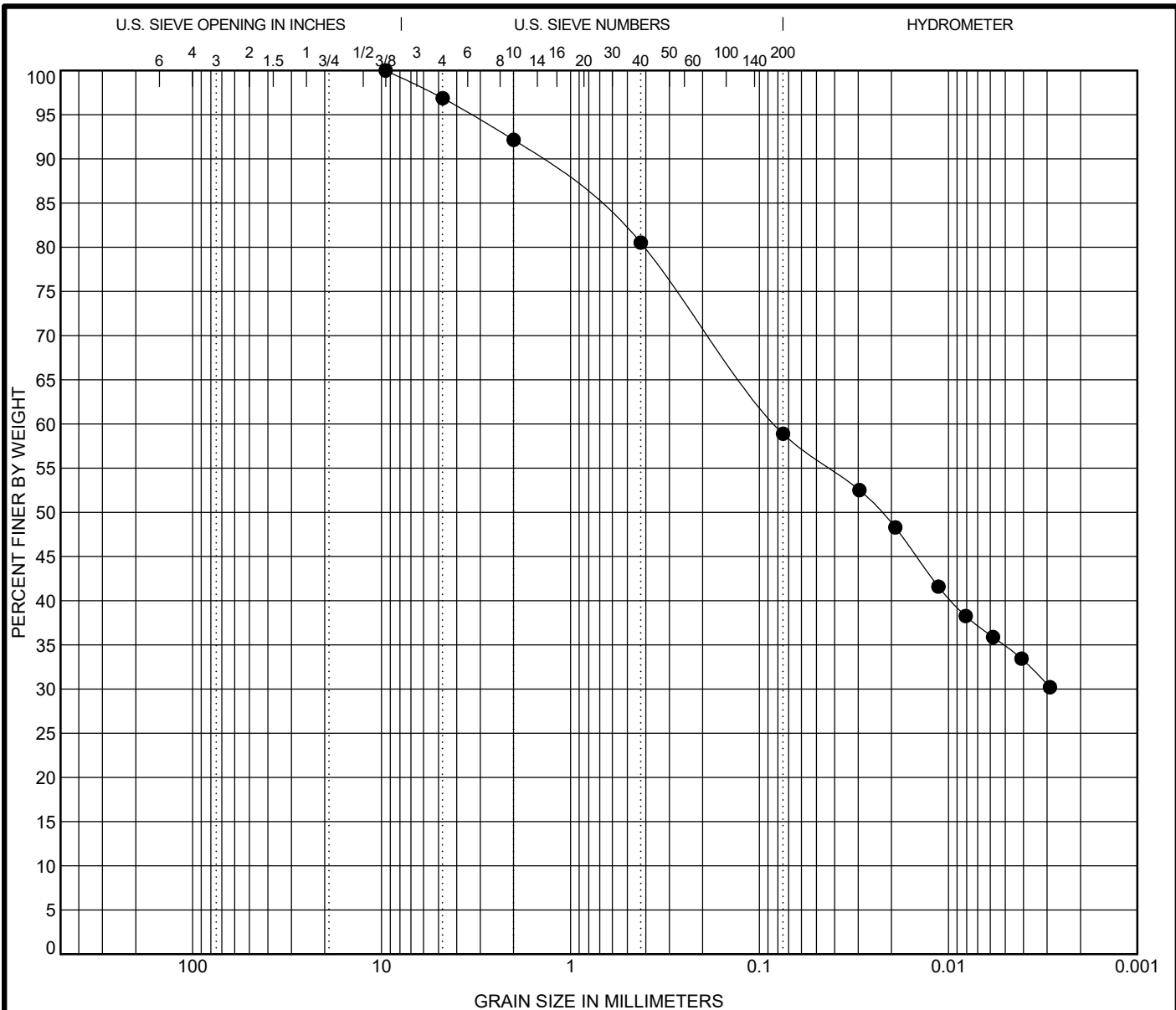
Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-15-18	SS-2	4.75	0.112	0.078	0.027		0	51	24	25

GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
 Project: West Alexandria WWTP
 Location: 33 Desoto Drive
 CTL Project Number: 18050006CIN



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CTLLAB_GRAINSIZE_18050006CIN.GPJ CTL CORPORATE.GDT 4/25/18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen ID	Sample	Classification					%MC	LL	PL	PI	Cc	Cu
● B-18-18	SS-1	SANDY LEAN CLAY (CL)					18	42	17	25		

Specimen ID	Sample	D100	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-18-18	SS-1	9.525	0.082	0.023			3	38	24	35

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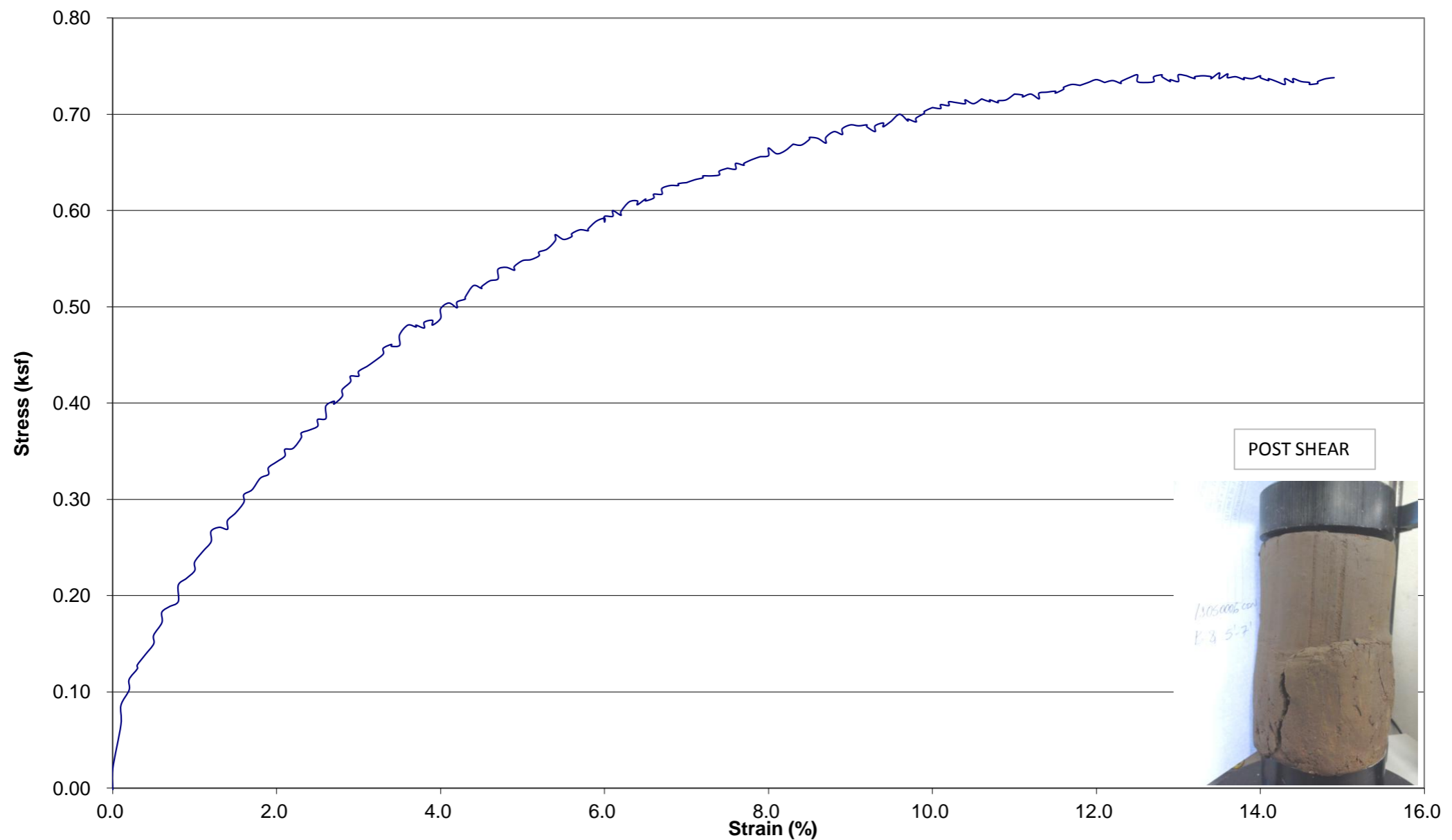
GRAIN SIZE DISTRIBUTION (ASTM D6913, D 7928, D 4318)
 Project: West Alexandria WWTP
 Location: 33 Desoto Drive
 CTL Project Number: 18050006CIN

**Unconfined Compression Test Results
ASTM D 2166, D 5102**

CTL ENGINEERING, INC.
2860 Fisher Road Columbus, Ohio 43204

Sample ID: B-8, ST-1, 5'-7'
Avg. Sample Height (in.): 5.78
Avg. Sample Diameter (in.): 2.88
Height-to-diameter ratio: 2.01
Ultimate Strength (ksf): 0.74
Shear Strength (Ksf): 0.37
Avg. Rate of Strain to Failure(%): 3.21
Strain at Failure (%): 13.50
Initial Dry Density (pcf): 97.79
Moisture Content (%): 26.9 (Obtained Post Shear)
Visual Description: Brown, Sandy Lean Clay (CL)
Degree of Saturation: NA
Sensitivity: NA
Failure Type: Diagonal Shear

Client: Village West Alexandria
Project: West Alexandria WWTP
Location: 33 Desoto Drive, West Alexandria,
Preble County, Ohio
Project No. 18050006CIN
Lab Code No. 18050741COL
Date Tested: 5/4/2018
Reviewed by: DB



APPENDIX C

BORING LOCATION PLAN & SOIL PROFILES



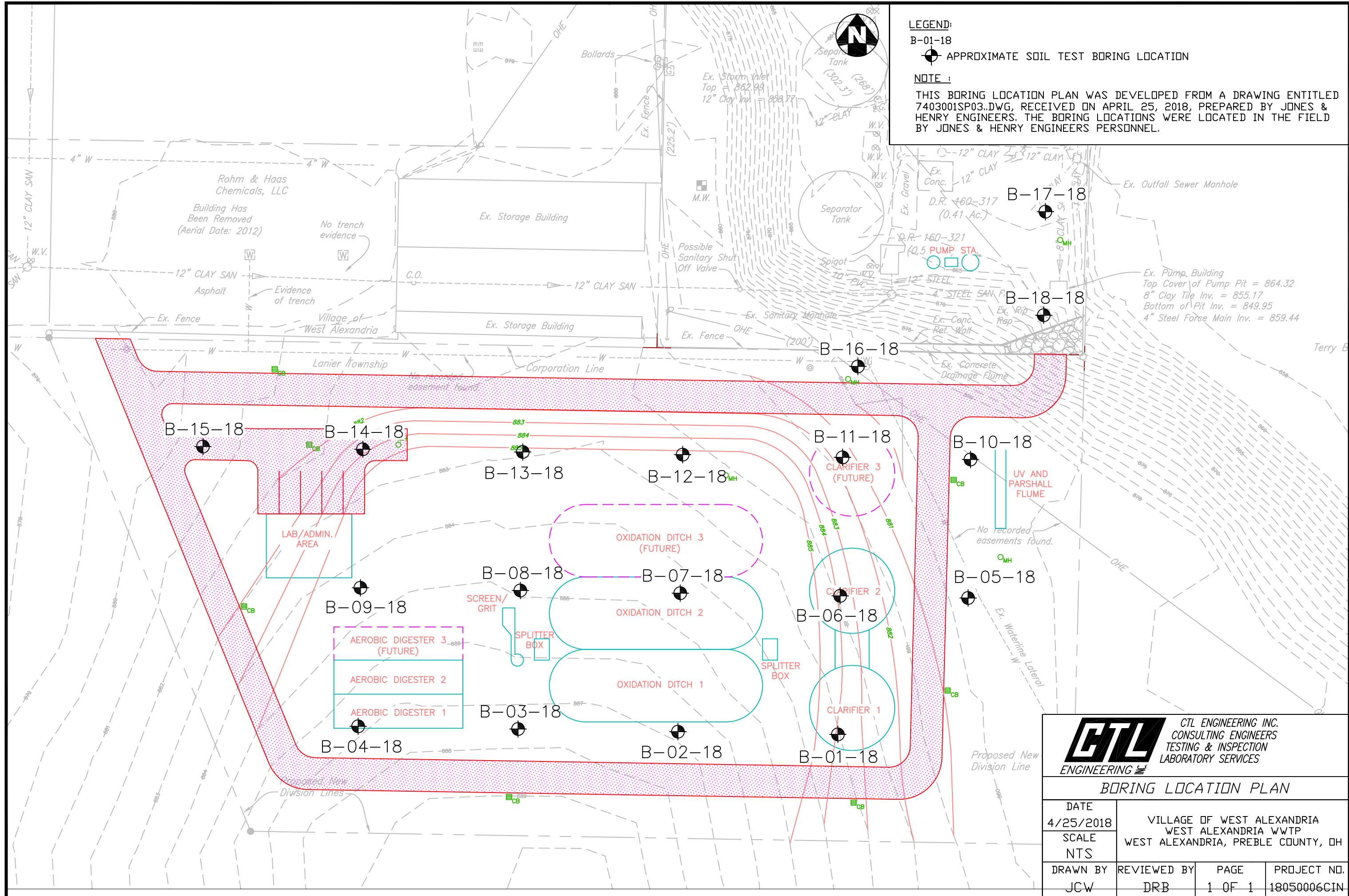
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B-01-18

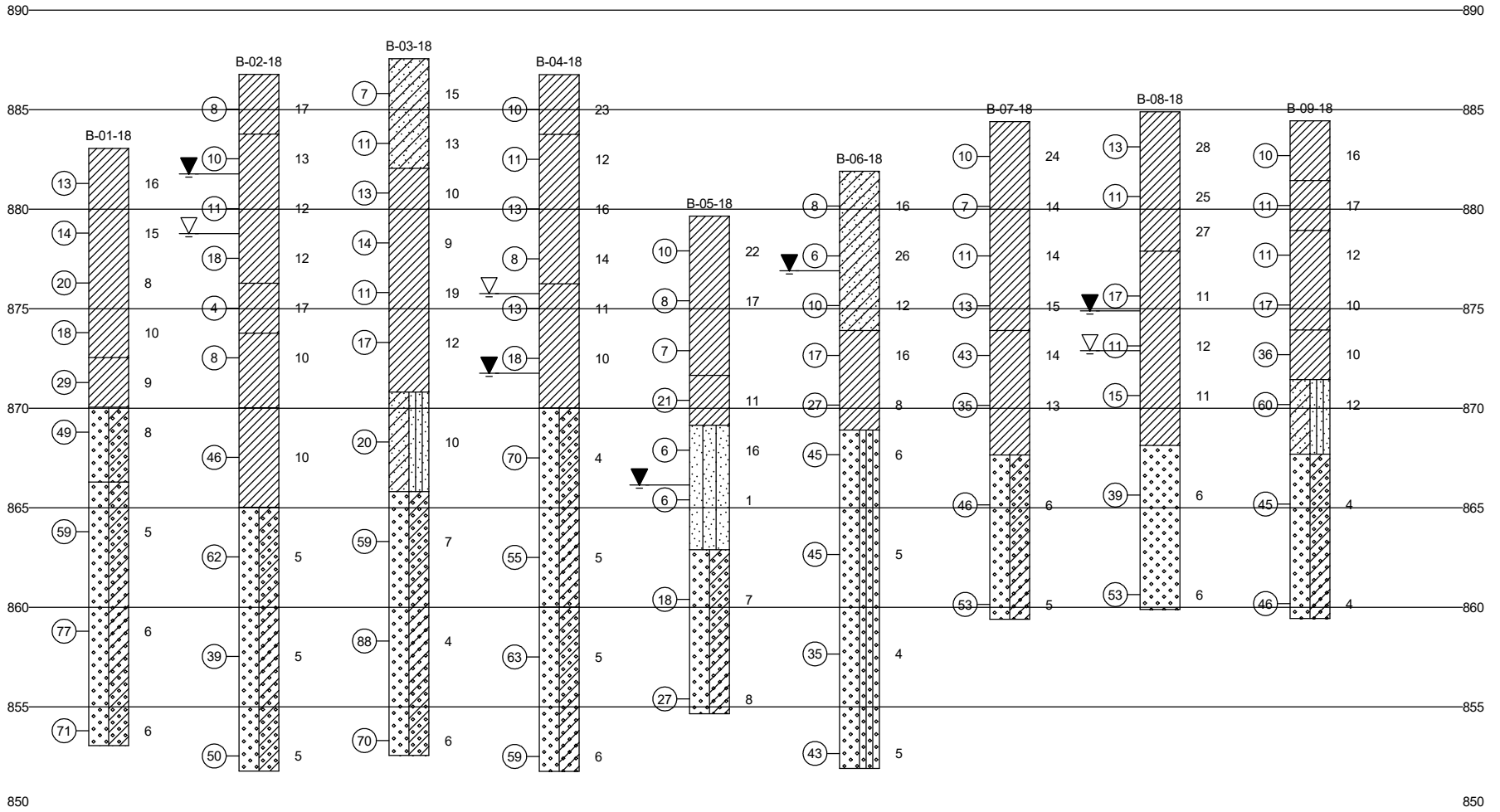
⊙ APPROXIMATE SOIL TEST BORING LOCATION

NOTE:

THIS BORING LOCATION PLAN WAS DEVELOPED FROM A DRAWING ENTITLED 7403001SP03.DWG, RECEIVED ON APRIL 25, 2018, PREPARED BY JONES & HENRY ENGINEERS. THE BORING LOCATIONS WERE LOCATED IN THE FIELD BY JONES & HENRY ENGINEERS PERSONNEL.



 CTL ENGINEERING INC. CONSULTING ENGINEERS TESTING & INSPECTION LABORATORY SERVICES			
BORING LOCATION PLAN			
DATE	VILLAGE OF WEST ALEXANDRIA WEST ALEXANDRIA WWP		
4/25/2018	WEST ALEXANDRIA, PREBLE COUNTY, OH		
SCALE	NTS		
DRAWN BY	REVIEWED BY	PAGE	PROJECT NO.
JCW	DRB	1 OF 1	18050006CIN



TOPSOIL	GP-GM	SP	SC	CH	LIMESTONE
ASPHALT	GP-GC	SW-SM	SC-SM	MH	FILL
GW	GM	SW-SC	ML	OH	
GP	GC	SP-SM	CL	PT	
GW-GM	GC-GM	SP-SC	CL-ML	SHALE	
GW-GC	SW	SM	OL	SILTSTONE	

LEGEND

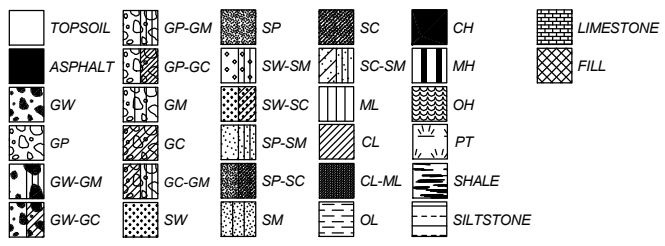
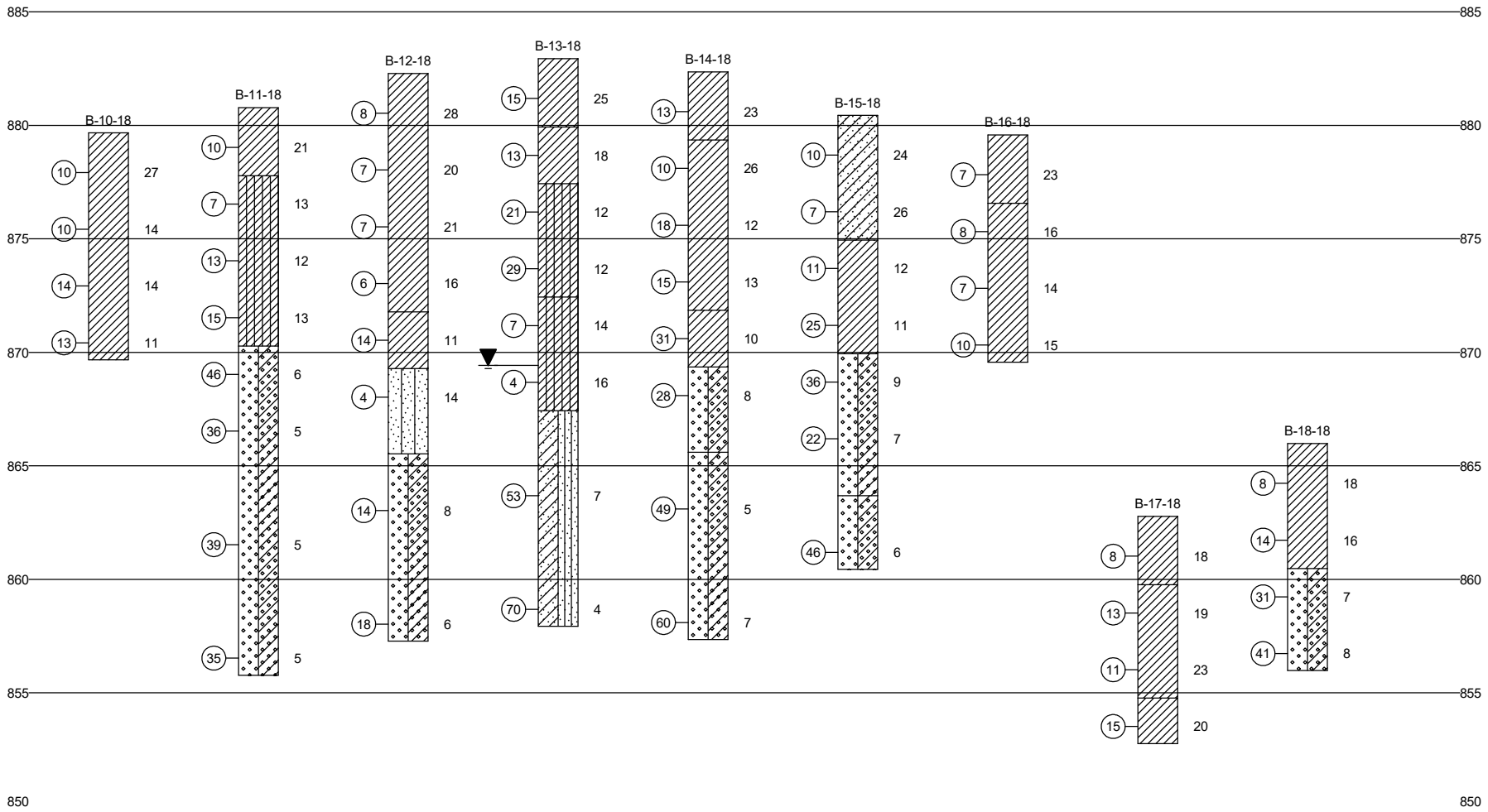
- GROUND WATER DURING DRILLING
- GROUND WATER AT COMPLETION OF DRILLING
- GROUND WATER AT "N" HOURS AFTER COMPLETION
- MOISTURE CONTENT IN PERCENT (w)
- STANDARD PENETRATION IN BLOWS PER FOOT NORMALIZED TO 60 PERCENT DRILL ROD ENERGY RATIO

CTL ENGINEERING, INC.
CONSULTING ENGINEERS
2105 SCHAPPELLE LANE
CINCINNATI, OHIO 45240

SOIL PLAN/PROFILE

Village West Alexandria
West Alexandria WWTP
33 Desoto Drive

DATE 5/16/2018	PAGE 1 OF 1	PROJECT NUMBER 18050006CIN
SCALE AS SHOWN		
DRAWN BY JW		



LEGEND

- GROUND WATER DURING DRILLING
- GROUND WATER AT COMPLETION OF DRILLING
- GROUND WATER AT "N" HOURS AFTER COMPLETION
- MOISTURE CONTENT IN PERCENT (w)
- STANDARD PENETRATION IN BLOWS PER FOOT NORMALIZED TO 60 PERCENT DRILL ROD ENERGY RATIO

			CTL ENGINEERING, INC. CONSULTING ENGINEERS 2105 SCHAPPELLE LANE CINCINNATI, OHIO 45240
SOIL PLAN/PROFILE			
DATE	4/24/2018		Village West Alexandria West Alexandria WWTP 33 Desoto Drive
SCALE	AS SHOWN		
DRAWN BY	PAGE	PROJECT NUMBER	
JW	1 OF 1	18050006CIN	