ADDENDUM NUMBER TWO

DUPONT PUMP STATION AND BASIN IMPROVEMENTS – PHASE 2
W-12-026-202

CITY OF CHATTANOOGA, TENNESSEE

The following changes shall be made to the Contract Documents, Specifications, and Drawings:

I. CONTRACT DOCUMENT

- Inclusion of Perry Fiberglass Products as an approved vendor for the FRP ductwork and odor control systems was requested. This inclusion has been disallowed by the Engineer.
- Inclusion of ECS Environmental Solutions as an approved vendor for the odor control systems was requested. This inclusion is acceptable.
- On Drawing ED-1, Detail A, delete note 1.
- The grounding ring shown on Drawing E-13 shall remain but shall not be connected to the tank as shown.
- The attached Section 00 45 47 is added to the specifications.
- Paragraph 2.11 of Section 40 05 50 shall be replaced with the following:

2.11 BACKFLOW PREVENTERS

A. The backflow preventer shall operate on the reduced pressure principle to safeguard potable water supplies against the hazards of cross-connection. The device shall have ductile iron body (ASTM A536) or heavy-duty steel, OS&Y resilient wedge gate valves meeting AWWA C509 specifications, stainless steel spring and flanged end connections. The assembly shall be designed for the same working pressure as the pipeline to which it connects or 175 psi, whichever is greater. All components of the device shall be furnished by a single manufacturer. The device shall be by FEBCO, AMES Fire and Waterworks, Hersey, Cla-Val, Watts, or equal which operates on the reduced pressure principle. Devices classified as double-check type units are not acceptable. All above ground components of the assembly shall be covered by a heated, insulated enclosure as described below.

B. Upon installation and prior to putting the line in service, the unit shall be tested by a registered tester and the results approved by the Owner.

C. All above-ground backflow prevention assemblies shall be covered by an insulated pre-fabricated enclosure. The enclosure shall provide minimum 6.5R factor insulation. Enclosure shall be provided with an internal heater to be powered by a 208-volt, 3-phase supply. Enclosure shall be prefabricated fiberglass or aluminum as manufactured by Hot Box Enclosures or equal.

II. Q&A/COMMENTS

Note: Duplicate questions were provided by several potential bidders. While wording varied slightly, duplicates have been removed.

1. A copy of the sign-in sheet from the Pre-Bid meeting on May 18, 2017 is attached.

2. A copy of the rendering presented at the Pre-Bid meeting is attached.

3. The following specification was missing from the table of contents: 26 36 23 Electrical - Automatic Transfer Switches.

   Response: This was an error on the Table of Contents. This specification does not apply to this project.

4. Is there any cathodic protection for the storage tank for this project?

   Response: No.

5. Can you provide us with a copy of any subsurface investigation report(s) and any drawings of the existing facilities that may be available?

   Response: The Geotechnical Engineering Report prepared by Terracon is attached. Contractors may rely on the data presented in this report. However, reliance on any interpretations of such data, including those interpretations made by Terracon, are at the Contractor's sole risk.

   Any available drawings for the existing facilities will be made available to the successful bidder.

6. An Iran Divestment Act Compliance Certification is required to be submitted with the Bid according to Sections 00 21 13 Article 15.01.G and 00 41 00 Article 7.01D. We have not been able to locate a form for such certification within the Bid Documents. Can you provide us with this form?

   Response: See attached Section 00 45 47.

7. The Davis Bacon wage determination document included with Section 00 80 00 Employment Requirements is not the most current for Decision TN146. Can you provide the bidders with the most current wage determination?

   Response: The latest wage rates are attached.

8. Refer to Drawing ED-1, Detail A for Underground Ductbank. Note 1 indicates that the ductbank is pile supported and references Drawing SZ-10, which is not included with the Bid Documents. Please provide specifications and details for piles required for support of ductbank.

   Response: See Contract Document change above.

9. Section 01 22 00 Measurement and Payment mentions unit price work for several items: conflicts with utilities (1.05.A); trench stabilization (1.05.G); concrete encasement (1.05.N); and manholes (1.06.A). These unit prices are not included on the Bid Form. Please clarify how the above work will be paid for.

   Response: Unit price work is not applicable to this project, and related portions of Section 01 22 00 do not apply. The lump sum bid item is to be inclusive of all materials, equipment, and labor to construct the project as shown in the design documents.

May 19, 2017

Justin C Holland, Administrator
City of Chattanooga

DuPont Phase 2 - Pre-Bid Meeting

Sign-In Sheet

18-May-17

MBWWTP - Training Center

Name	Company	E-mail
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Andrew Romanek	CDM Smith	romanekap@cdmsmith.com

Geotechnical Engineering Report

DuPont Pumping Station and Tank
Chattanooga, Hamilton County, Tennessee
October 17, 2016
Terracon Project No. E2165009

Prepared for:
CDM Smith
Chattanooga, Tennessee

Prepared by:
Terracon Consultants, Inc.
Chattanooga, Tennessee

Terracon

October 17, 2016

CDM Smith
651 East 4th Street, Suite 100
Chattanooga, Tennessee 37403

Attn: Mr. Andrew Romanek, P.E.
P: [423] 771 4495
M: [404] 374 8728
E: romanekap@cdmsmith.com

Re: **Geotechnical Engineering Report**
DuPont Pumping Station and Tank
1615 Memphis Drive
Chattanooga, Tennessee
Terracon Project No. E2165009

Mr. Romanek:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number PE2165009R2, dated September 25, 2016. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed tank and other equipment planned at the site.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

DEREK L. HODNETT
REGISTERED GEOLOGIST

George Malouf, P.E.
Project Geotechnical Engineer
Tennessee P.E. No. 118439

Derek L. Hodnett, P.E., P.G.
Chattanooga Office Manager
Tennessee P.E. No. 23205

Enclosures
cc: 1 – Client (PDF)
1 – File

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EXECUTIVE SUMMARY

A geotechnical exploration has been performed for the proposed DuPont Pumping Station and Tank to be located near 1615 Memphis Drive in Chattanooga, Hamilton County, Tennessee. This report addresses foundation recommendations for the proposed tank and other equipment, along general earthwork recommendations applicable to the project.

Based on the information obtained from our exploration, the following geotechnical considerations were identified:

- Soil borings generally encountered relatively stiff soil in the upper 20 to 40 feet of the soil column; however, zones of relatively soft soil were encountered beneath these depths in the majority of the borings. The results of rock coring in the proposed storage tank area indicated the presence of pinnacled bedrock. The bedrock surface was found to be irregular and sloping in localized areas at depths of about 50 to 80 feet below existing grade.

- In our opinion, the proposed wet weather pump station and other proposed equipment to be located in the northern portion of the site may be supported on shallow foundation systems bearing on the stiff native soil encountered. Equipment pits varying in depth from 10 to 24 feet below final grade will be constructed in this area. Based on groundwater readings at the site, a need for dewatering should be anticipated during excavation and pit construction.

- Based on the subsurface conditions, anticipated loading, and settlement tolerances, we recommend supporting the proposed storage tank on deep foundations bearing in the underlying bedrock. This report provides design recommendations for steel H-Piles and closed-end pipe piles filled with concrete. Other systems, such as drilled piers and micropiles, were also considered. Based on the subsurface conditions, the contractor should anticipate hard driving conditions prior to refusal. We recommend the use of driving points to reduce damage to the pile.

- Various pile sections are provided in Section 4.3.2 of this report as options. Once a pile type, hammer, and design capacity are selected, Terracon should be retained to develop refusal criteria and to observe installation. Based on the varying subsurface conditions encountered at the site, we recommend performing two pile load tests in the field to insure actual capacities are in line with the design capacities.

- According to the 2012 International Building Code, the seismic classification at this site is Site Class C.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
DUPONT PUMPING STATION AND TANK
1615 MEMPHIS DRIVE
CHATTANOOGA, HAMILTON COUNTY, TENNESSEE

Terracon Project No. E2165009
October 17, 2016

1.0 INTRODUCTION

This geotechnical engineering report has been completed for the proposed DuPont Pumping Station and Tank to be located near 1615 Memphis Drive in Chattanooga, Hamilton County, Tennessee. For the purposes of this investigation, 15 soil borings were drilled at the site to depths ranging from approximately 30 to 84½ feet below the existing ground surface (bgs). Rock cores were obtained in seven of the borings. Logs of the borings along with a Site Location Map (Exhibit A-1) and Exploration Plan (Exhibit A-2) are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil and rock conditions
- groundwater conditions
- earthwork
- lateral earth pressures
- seismic considerations
- foundation design and construction

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Exhibit A-2: Exploration Plan.
Structure	The project will include a circular, prestressed concrete, 7.5 MG water storage tank, approximately 210 feet in diameter and about 30 feet high. A 5 MGD wet-weather pumping station (upgradable to 8.25 MGD), roughly 80 feet by 80 feet in plan dimensions will also be constructed. The pumping station will include a wet-well, electrical room, pumps, and other equipment. The building will be a split-faced CMU with pitched metal roof.
Finished floor elevation	661 feet above MSL, per Site Layout and Grading Plan, Sheet C-3, dated April, 2016.

Item	Description	
Maximum loads	Water Storage Tank: 2,000 psf (assumed) Pumping Station: 50 kips per column, 3 kips per linear foot for structural wall loads (assumed)	
Grading	Based on the Site Layout and Grading Plan, Sheet C-3, dated April, 2016, approximately 3 to 8 feet of new fill will be required to bring the tank area to final grade.	
Cut and fill slopes	No steeper than 3H:1V	
Below grade areas	**Structure:**	**Interior Depth (ft):**
	Wet Weather Pump Station	24
	Flow Splitter Box	21
	Diversion Structure	21
	Valve Vault	~10
	Flow Return Meter Vault	~10

2.2 Site Location and Description

Item	Description
Location	This project is located near 1615 Memphis Drive in Chattanooga, Hamilton County, Tennessee. The proposed tank will be located southwest of the existing pumping station.
Existing improvements	Existing pumping station located in the northeast portion of the site. The proposed tank area is undeveloped.
Current ground cover	Heavily wooded
Existing topography	Based on provided topographic drawings, the site slopes gently downwards from northeast to southwest, from approximately 660 to 650 feet above MSL.

3.0 SUBSURFACE CONDITIONS

3.1 Geology

The project site is located within the Valley and Ridge Physiographic Province, which is comprised of sedimentary sequences that were deposited during the Paleozoic Era. According to the geologic mapping of the area, the project site is underlain by the Ordovician-aged Knox Group, which includes the Newala, Kingsport, Mascot Dolomite, Longview Dolomite, and Chepultepec Dolomite Formations. This geology consists of cherty dolomite and limestone and often displays erosional unconformity.

It should be noted that the site is underlain by a carbonate formation, which may be susceptible to dissolution along joints and bedding planes in the rock mass. This results in voids and solution channels within the rock strata and a highly irregular bedrock surface. The weathering of the bedrock and subsequent collapse or erosion of the overburden into these openings results in what is referred to as karst topography, if there is an abundance of voids and solution channels. Any construction in karst topography is accompanied by some degree of risk for future internal soil erosion and ground subsidence that could affect the stability of the proposed structure.

3.2 Typical Profile

For the purposes of this study, 11 soil borings, designated Borings B-1 through B-11, were drilled within the proposed tank and pump station areas. Supplemental exploration to further characterize the underlying bedrock at the site, additional borings B-4a, B-5a, B-6a, and B-9a were drilled and cored after preliminary evaluation of the initial exploration and laboratory results. Approximate locations of the borings can be seen on the attached Exploration Plan, Exhibit A-2.

Soil Borings B-1, B-2, and B-3 were drilled at the location of the wet weather pump station, flow splitter box, and diversion structure, respectively. The borings generally encountered a mixture of stiff to very stiff fat clays and medium dense to dense clayey sand with gravel (angular rock fragments) to the boring termination depths of 35 to 50 feet below the ground surface. Medium stiff fat clay was encountered near a depth of 50 feet in Boring B-1 and in the upper 3 feet in Boring B-2.

Borings B-4 through B-11, B-4a, B-5a, B-6a, and B-9a were located in the vicinity of the proposed storage tank. The borings generally encountered stiff to very stiff fat clay with varying angular rock content in the upper 20 to 40 feet of the soil column. However, zones of soft to medium stiff soil were encountered at depth in 11 of the 12 borings drilled in the area of the proposed storage tank, with Standard Penetration Test (SPT) N-values as low as zero to two blows per foot at some locations. The soft to medium stiff zones varied in thickness from 5 feet to as thick as 40 feet in Boring B-7. The following table displays the auger refusal depths of the tank-area borings.

Location	Auger Refusal Depth, feet	Location	Auger Refusal Depth, feet
B-4	>30*	B-7	67.3
B-4a	56.8	B-8	30.4
B-5	>30*	B-9	>30*
B-5a	63.0	B-9a	40.5
B-6	>30*	B-10	30.4
B-6a	59.1	B-11	54.8

* Borings terminated prior to auger refusal

Rock coring was performed in Borings B-4a, B-5a, B-6a, B-7, B-9a, B-10, and B-11 beneath the depth of auger refusal. The rock cores predominately encountered limestone interbedded with dolomite and clay seams. Rock recovery and Rock Quality Designation (RQD) were observed to be variable. In four of the seven locations cored, little to no rock was recovered in zones varying in thickness from 5 to 20 feet, indicative of clay seams and pinnacled bedrock. Coring was terminated in Boring B-6a and B-9a at depths of 84.3 and 67.5 feet, respectively, due to the core barrel angling off too severely on pinnacled rock. Higher rock recovery was observed in the remaining core locations.

Specific conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A.

3.3 Groundwater

Groundwater was encountered at the following locations and depths during drilling:

Location	Depth to Water, feet
B-1	44
B-4	24
B-4a	39
B-5a	48
B-6a	32½
B-11	25

Additionally, temporary monitoring wells were installed at Boring Locations B-1 and B-2. In April, 2016, water levels of approximately 18 feet and 13½ feet below existing grade were recorded in Borings B-1 and B-2, respectively.

Groundwater was not evident in the remaining boreholes during drilling operations; however, this does not necessarily mean these borings terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than

the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. During periods of wet weather, water can become perched in the softer soils near the surface.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The subsurface investigation generally encountered stiff clay in the upper 20 to 40 feet of the soil column. Zones of relatively soft soil were encountered at depth in the majority of the borings. Based on the anticipated net loading conditions and footing dimensions, the proposed wet weather pump station and additional equipment to be located in the northern portion of the site (flow splitter box, diversion structure, valve vault, and flow return meter vault) can be supported on shallow foundations bearing on the stiff and medium dense native soil encountered at the site. Additional shallow foundation design information is provided in Section 4.3.1 of this report.

Equipment pits varying in depth from about 10 to 24 feet are planned for the equipment mentioned above. Based on the groundwater levels encountered in the borings during drilling, groundwater readings from the temporary wells installed at Locations B-1 and B-2, and the proximity to the Nickajack Lake (Tennessee River), a need for dewatering should be anticipated during equipment pit construction. Tailwater elevations below Chickamauga Dam fluctuate, but is currently reported between 633 and 634 feet. A combination of fat clay and clayey sand with gravel was encountered in the vicinity of the proposed pits. Granular materials encountered in the pit excavations will be more susceptible to water infiltration.

The results of our settlement calculations for the proposed storage tank indicate that total consolidation settlement on the order of 7 to 14 inches may occur if the tank is supported on shallow foundations. Furthermore, we anticipate significant differential settlement due to the variability in soil consistency and bedrock depth. Based on the soil conditions encountered and the settlement tolerances, we recommend supporting the proposed tank on deep foundation systems extending to the underlying bedrock.

Driven and drilled deep foundations systems were both considered for the support of the tank. After discussion with the client and deep foundation contractors, this report recommends supporting the proposed tank on driven steel piles extending to bedrock based on anticipated subsurface conditions and the associated costs for installation. Design recommendations for driven H-Piles and closed-end pipe pills filled with concrete are provided in Section 4.3.2 of this report. Terracon also considered drilled shafts and mircopiles. Because of the variable rock quality, anticipated groundwater conditions and depth to rock, Terracon believed driven piles would be more economical. Recommendations for other deep foundations can be provided upon request.

Variations in soil conditions could be encountered during construction. To establish correlations between the anticipated subsurface conditions described in this report and the actual subsurface conditions encountered during the construction phase, we recommend that an engineer or qualified soils technician perform continuous field observation and review during the soils-related phase of the construction.

4.2 Earthwork

The actual construction means and methods are the responsibility of the contractor(s). The following construction related items pertain to general site preparation for foundation, floor slab, and pavement support and are not intended to address all possible construction related concerns.

4.2.1 Site Preparation

After clearing the wooded site and stripping topsoil, organic soil and roots, the exposed subgrade should be proof-rolled to aid in locating loose or soft areas prior to the placement of new fill. Proof-rolling can be performed with a loaded tandem axle dump truck. Soft, wet and low-density soil should be removed or compacted in place prior to placing fill. In general, we anticipate the exposed subgrade will be relatively stable upon exposure; however, near-surface zones of medium stiff soil were encountered in Borings B-2, B-5, and B-9.

The highly-plastic, cohesive soils encountered in the borings will be sensitive to disturbance from construction activity and water seepage. If precipitation occurs prior to or during construction, the near-surface, fine-grained soils could increase in moisture content and become more susceptible to disturbance. Construction activity should be monitored, and should be curtailed if the construction activity is causing subgrade disturbance. A Terracon representative can help with monitoring and developing recommendations to help aid in limiting subgrade disturbance.

4.2.2 Fill Material Requirements

The onsite soils generally appear suitable for reuse as fill material, provided they are moisture conditioned as recommended in this report. Based on the provided grading plan, offsite borrow material will be required to reach the final subgrade elevations. Borrow material should meet the material requirements in the following table.

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Onsite soil	CL, CH, SC, SC-SM (LL≤60, PI≤35)	All locations more than 2 feet below proposed subgrade elevations
Low- to medium-plasticity borrow[2]	CL, SC, GC (LL≤50, PI≤30)	All locations and elevations.
Well-graded granular	GW	All locations and elevations.

[1] Compacted structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
[2] Borrow soil should have a maximum dry density of at least 95 pcf or greater as determined by ASTM D698.

4.2.3 Fill Placement and Compaction Requirements

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 2 to 4 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.
Compaction Requirements [1]	98% of the material's maximum standard dry density as determined by ASTM D698 (standard Proctor).
Moisture Content – Cohesive Soil	Within the range of 1% below to 2% above optimum moisture content as determined by the standard Proctor test at the time of placement and compaction
Moisture Content – Granular Material	Workable moisture levels [2]

[1] We recommend testing engineered fill for compaction and moisture content during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
[2] Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

4.2.4 Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cohesive fill in non-pavement areas to reduce the infiltration and conveyance of surface water through the trench backfill.

Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath buildings and pavements should be effectively sealed to restrict water intrusion and flow through the trenches that could adversely affect foundation and pavement subgrades. We recommend constructing an effective clay "trench plug" that extends at least 5 feet out from

the face of the building exterior or where trench backfill daylights on cut or fill slope faces. The plug material should consist of clay compacted at a water content at or above the soil's optimum water content. The clay fill should be placed to completely surround the utility line and be compacted in accordance with recommendations in this report.

4.2.5 Grading and Drainage

Adequate positive drainage should be provided during construction and maintained throughout the life of the development to prevent an increase in moisture content of the foundation, pavement, and backfill materials. Surface water drainage should be controlled to prevent undermining of fill slopes and structures during and after construction.

Gutters and downspouts that drain water a minimum of 10 feet beyond the footprint of the proposed structures are recommended. This can be accomplished through the use of splash-blocks, downspout extensions, and flexible pipes that are designed to attach to the end of the downspout. Flexible pipe should only be used if it is daylighted in such a manner that it gravity-drains collected water. Splash-blocks should also be considered below hose bibs and water spigots.

4.2.6 Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and re-compacted prior to floor slab and pavement construction and observed by Terracon.

Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the building and pavement areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils. Surface water control in the form of sloping surfaces, drainage ditches and trenches, and sump pits and pumps will be important to avoid ponding and associated delays due to precipitation and seepage.

All excavations should be sloped or braced as required by OSHA regulations to provide stability and safe working conditions. Temporary excavations will be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be braced or sloped to comply with applicable local, state and federal safety regulations, including the current Occupational Health and Safety Administration (OSHA) Excavation and Trench Safety Standards.

Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that Terracon is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

4.3 Foundations

In our opinion, the proposed wet weather pump station and additional equipment to be located in the northern portion of the site (flow splitter box, diversion structure, valve vault, and flow return meter vault) can be supported on shallow foundations bearing on the stiff and medium dense native soil encountered at the site. Shallow foundation design recommendations for these structures are presented in Section 4.3.1.

We recommend supporting the proposed water storage tank on driven deep foundation systems. Section 4.3.2 provides design recommendations for driven H-Piles and closed-end pipe piles filled with concrete.

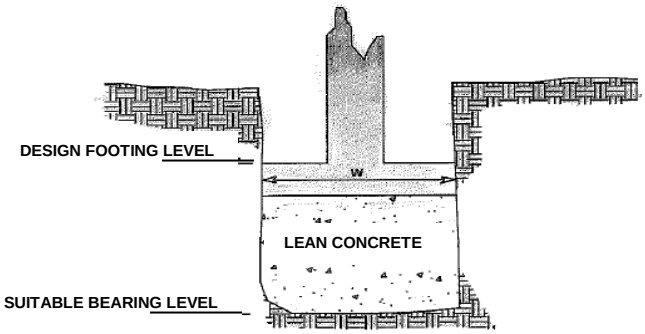
4.3.1 Shallow Foundation Design Recommendations (Ancillary Structures Only)

Description	Column	Wall
Net allowable bearing pressure[1]	2,500 psf	2,500 psf
Minimum dimensions	24 inches	18 inches
Minimum embedment below finished grade[2]	18 inches	18 inches
Approximate total settlement[3]	< 1 inch	<1 inch
Estimated differential settlement[3]	≤ ¾ inch between columns	≤ ¾ inch over 40 feet
Ultimate coefficient of sliding friction [4]	0.35	0.35
Allowable Passive Pressure[3]	325 psf per vertical foot, up to 1,000 psf	

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable fill or soft soil, if encountered, will be undercut and replaced with engineered fill.
2. For frost protection and to reduce the effects of seasonal moisture change.
3. The foundation settlement will be dependent on variations in the subsurface profile, structural loading conditions, embedment depth of the footings, and quality of the earthwork operations. The stated settlement estimate does not include any movement stemming from karst-related ground subsidence or movement associated with placing foundations above undetected, inadequate existing fill.
4. The sides of the excavation for the spread footing foundation must be nearly vertical and the concrete should be placed neat against these vertical faces for the passive earth pressure values to be valid. If the loaded side is sloped or benched and then backfilled, the allowable passive pressure will be significantly reduced. Passive resistance in the upper 3 feet of the soil profile should be neglected. If passive resistance is used to resist lateral loads, the base friction should be neglected.

The base of all foundation excavations should be free of water and loose soil and rock prior to placing concrete. Concrete should be placed soon after excavating to reduce the potential for bearing soil disturbance. If the soils at bearing level should become excessively dry, disturbed, saturated, or frozen, the affected soil should be removed prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. We recommend retaining the geotechnical engineer to observe and test the foundation bearing materials.

We recommend retaining Terracon to observe and test the foundation bearing materials. If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations as described in the following diagram.



LEAN CONCRETE BACKFILL

NOTE: Excavation in sketch shown vertical for convenience. Excavations should be sloped as necessary for safety.

4.3.2 Deep Foundation Design Recommendations

Based on the subsurface conditions, proposed loading, and settlement tolerances, the proposed storage tank should be supported by deep foundations extending to the underlying bedrock encountered at the site. The depth to bedrock was observed to vary in the soil borings but was generally encountered between depths of 50 to 80 feet below the existing ground surface.

The results of the rock coring performed in seven borings indicated pinnacled bedrock and rock lenses may be encountered during pile installation at several locations. The contractor should anticipate hard driving conditions prior to refusal. This report recommends the use of steel H-Piles or closed-end pipe piles filled with concrete. To reduce the risk for damaging the piles due to hard driving conditions, we recommend reinforcing the pile tips with driving points. The following table provides allowable capacities for individual piles:

Pile Type	Pile Cross Section	Allowable Capacity, tons	Recommended Minimum Hammer Driving Energy, ft-lbs
H-Piles	10x42	45	19,000
	12x53	56	25,000
	14x73	78	25,000
Closed-End Pipe Piles filled with Concrete [1]	10 in	80	25,000
	12 in	100	27,000

[1] Based on the anticipated hard driving conditions, we recommend using extra-strong pipe pile sections.

Alternative pile sections can be evaluated if requested. In addition to the pipe pile sections listed above, oil-field pipe rejected due to tolerance or other non-quality reason may be considered as a cost-saving pile alternative. Terracon can evaluate allowable capacities based on material properties and pile dimensions provided to us.

Because of the pile capacities recommended and the zones of lower quality rock encountered at the site, Terracon recommends performing two pile load tests to verify the design capacities are being met in the field. At least one of these pile load tests should be targeted in the area of low quality rock, such as in the vicinity of boring B-6A.

Terracon should be retained to develop pile refusal criteria once the pile type, hammer, and final design capacities are developed. Typical refusal criteria of 10 blows per inch is common for end-bearing piles on bedrock. Specific refusal criteria form the project will be dependent on the pile section selected, capacity, and equipment used to drive the pile.

Because of the variable rock quality, especially areas of low recovery/RQD, we anticipate the piles will penetrate into the weathered rock. Consequently, the piling contractor should anticipate hard driving conditions prior to reaching refusal.

A representative of this office should observe the pile driving process to verify that all piles are driven to refusal and to record the driving characteristics of each pile. Piles that terminate at depths above 45 feet below the existing ground surface are probably not founded on competent bedrock and should not be relied upon for support. Installed piles that do not meet the refusal criteria may be rejected or redesigned for a reduced carrying capacity. Replacement piles may be necessary in some cases.

4.4 Floor Slabs

Prior to floor slab construction or the placement of new fill, the exposed subgrade should be proof-rolled as described in Section 4.2 of this report. Any areas identified as unstable should be stabilized by undercutting and replacement with soil or aggregate, or other acceptable means determined by a geotechnical engineer such as soil stabilization, utilizing a stabilization fabric, or possibly scarifying the exposed subgrade and allowing air-drying.

4.4.1 Floor Slab Design Recommendations

Item	Description
Floor slab subgrade support	Native soil passing a proofroll test or properly placed and compacted fill [1,2]
Modulus of Subgrade Reaction	125 pounds per square inch per inch (psi/in)
Aggregate base course/capillary break [2]	4 inches of granular material

1 Floor slabs should be structurally independent of any building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.

2 The floor slab design should include a capillary break, comprised of free-draining, compacted, granular material, at least 4 inches thick. The granular material for use as sub-base below slabs shall be an approved coarse-grained material and meet the following requirements:

Particle Size:	1 inch (max)
Percent Passing No. 200 Sieve:	10 percent (max)
Plasticity Index:	6 (max)
Liquid Limit:	25 (max)

Where appropriate, saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks in pavement areas that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder/barrier.

4.4.2 Floor Slab Construction Considerations

On most project sites, the site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of base rock and concrete and corrective action will be required.

We recommend the area underlying the floor slab be rough graded and then compacted prior to final grading and placement of base course aggregate. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the base course aggregate and concrete.

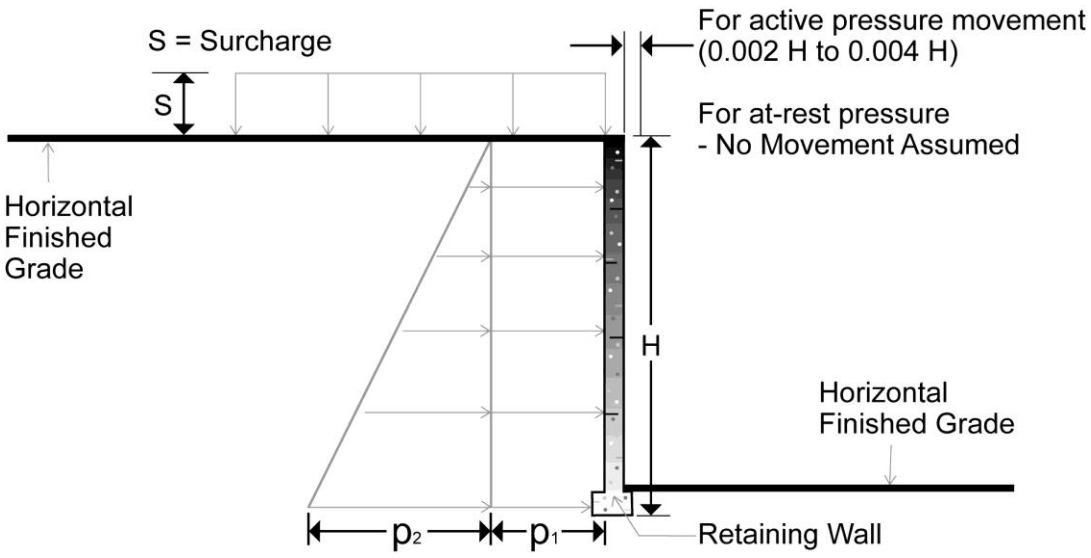
4.5 Seismic Considerations

Code Used	Site Classification
2012 International Building Code (IBC)[1]	C[2]

1. In general accordance with ASCE-7 Chapter 20; Table 20.3-1.
2. The 2012 International Building Code (IBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. For the purposes of this study, the Refraction Microtremor (ReMi) system was used to calculate the average weighted shear-wave velocity profiles across the site. Two seismic arrays, designated A-A' and B-B', were conducted at the project site to collect shear-wave velocity information for the upper 100' of the subsurface. Based on the two seismic arrays A-A' and B-B', average weighted shear-wave velocity values for the upper 100 feet of the subsurface were 1,706 ft/sec and 1,554 ft/sec, respectively.

4.6 Lateral Earth Pressures

Reinforced concrete walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction, and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement occurs. The "at-rest" condition assumes a fixed wall with no movement. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.



Earth Pressure Coefficients

Earth Pressure Conditions	Coefficient for Backfill Type	Equivalent Fluid Density (pcf)	Surcharge Pressure, p_1 (psf)	Earth Pressure, p_2 (psf)
Active (K_a)	Granular - 0.33	40	(0.33)S	(40)H
	Lean Clay - 0.42	50	(0.42)S	(50)H
At-Rest (K_o)	Granular - 0.46	55	(0.46)S	(55)H
	Lean Clay - 0.58	70	(0.58)S	(70)H
Passive (K_p)	Granular - 3.0	360	---	---
	Lean Clay - 2.4	290	---	---

Applicable conditions to the above include:

- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 **H** to 0.004 **H**, where **H** is wall height
- For passive earth pressure to develop, wall must move horizontally to mobilize resistance
- Uniform surcharge, where S is surcharge pressure
- Maximum in-situ soil backfill weight of 120 pcf
- Horizontal backfill, compacted between 95 and 98 percent of standard Proctor maximum dry density
- Loading from heavy compaction equipment not included
- No hydrostatic pressures acting on wall
- No dynamic loading
- No safety factor included in soil parameters
- Ignore passive pressure in frost zone

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, a value of 0.30 should be used as the ultimate coefficient of friction between the footing and the underlying soil.

Due to the anticipated groundwater levels discussed earlier in this report, combined hydrostatic and lateral earth pressures should be calculated for clay backfill using an equivalent fluid weighing 90 and 100 pcf for active and at-rest conditions, respectively. For granular backfill, an equivalent fluid weighing 85 and 90 pcf should be used for active and at-rest conditions, respectively. These pressures do not include the influence of surcharge, equipment, or floor loading, which should be added. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

5.0 GENERAL COMMENTS

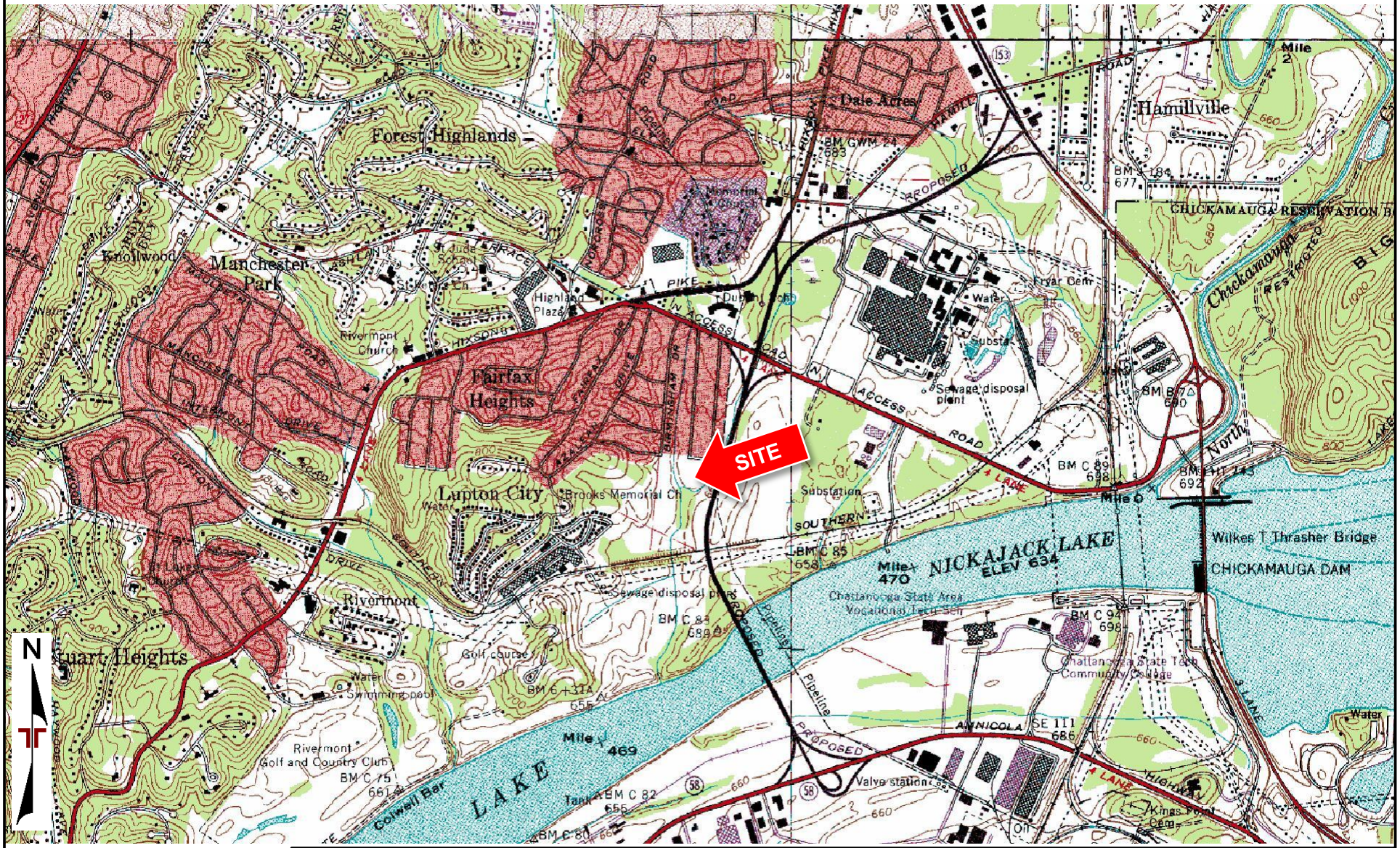
Terracon should be retained to review the final plans and specifications so comments can be made regarding interpretation and implementation of our recommendations in the design and specifications. Terracon should be retained to provide observation and testing services during grading, excavation, foundation, and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, and bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: .

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	GFM
Drawn by:	GFM
Checked by:	DLH
Approved by:	DLH

Project No.	E2165009
Scale:	1"=2,000'
File Name:	E2165009
Date:	10/12/2016

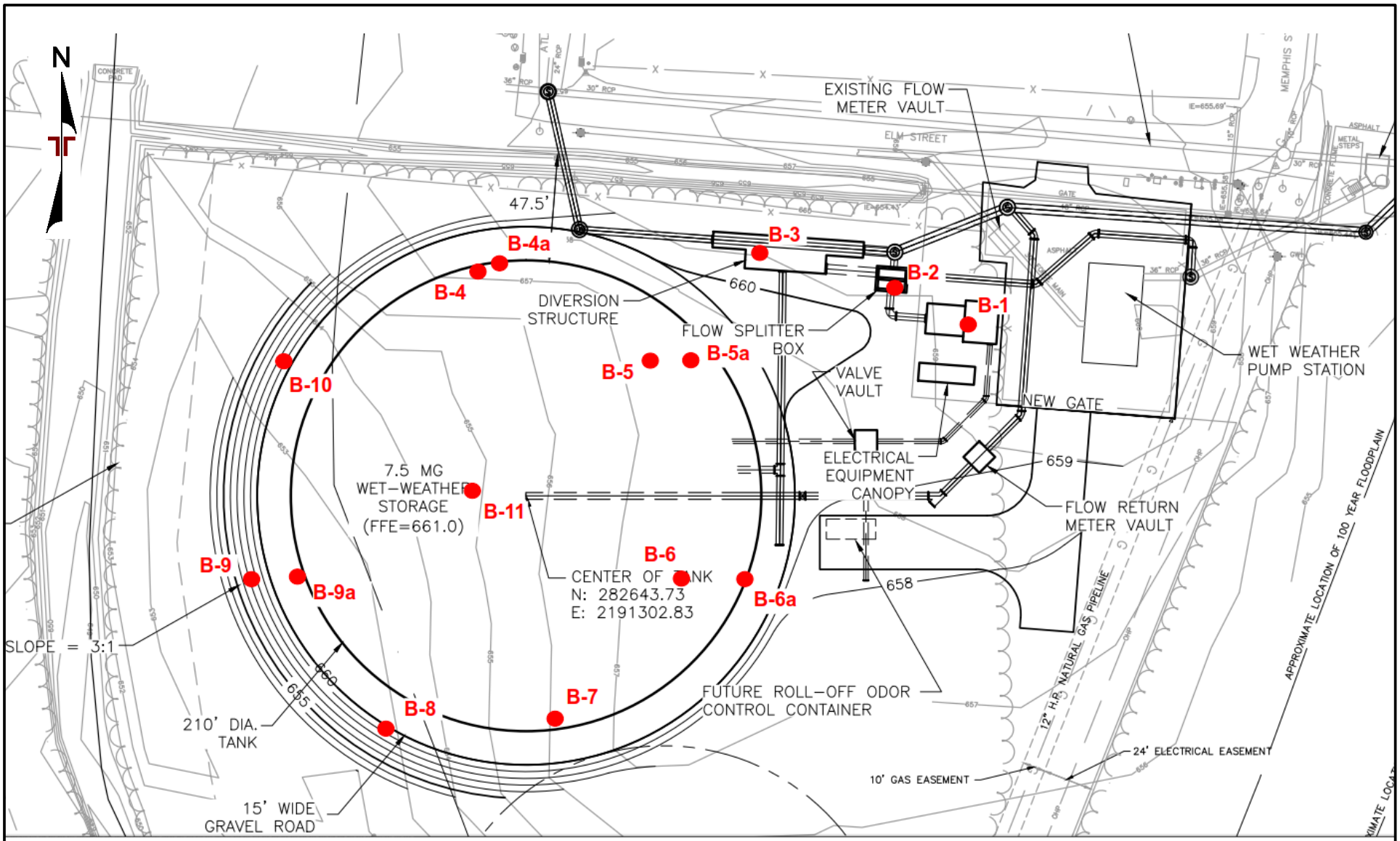
Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN 37406-1030

SITE LOCATION

Proposed Water Storage Tank and Pump Station
Dupont Parkway and South Elm Street
Chattanooga, TN

Exhibit

A-1



BASE DRAWING PROVIDED BY THE CLIENT

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	GFM
Drawn by:	GFM
Checked by:	DLH
Approved by:	DLH

Project No.	E2165009
Scale:	1" ≈ 60'
File Name:	E2165009
Date:	10/12/2016

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN 37406-1030

EXPLORATION PLAN

Proposed Water Storage Tank and Pump Station

Dupont Parkway and South Elm Street
Chattanooga, TN

Exhibit

A-2

Field Exploration Description

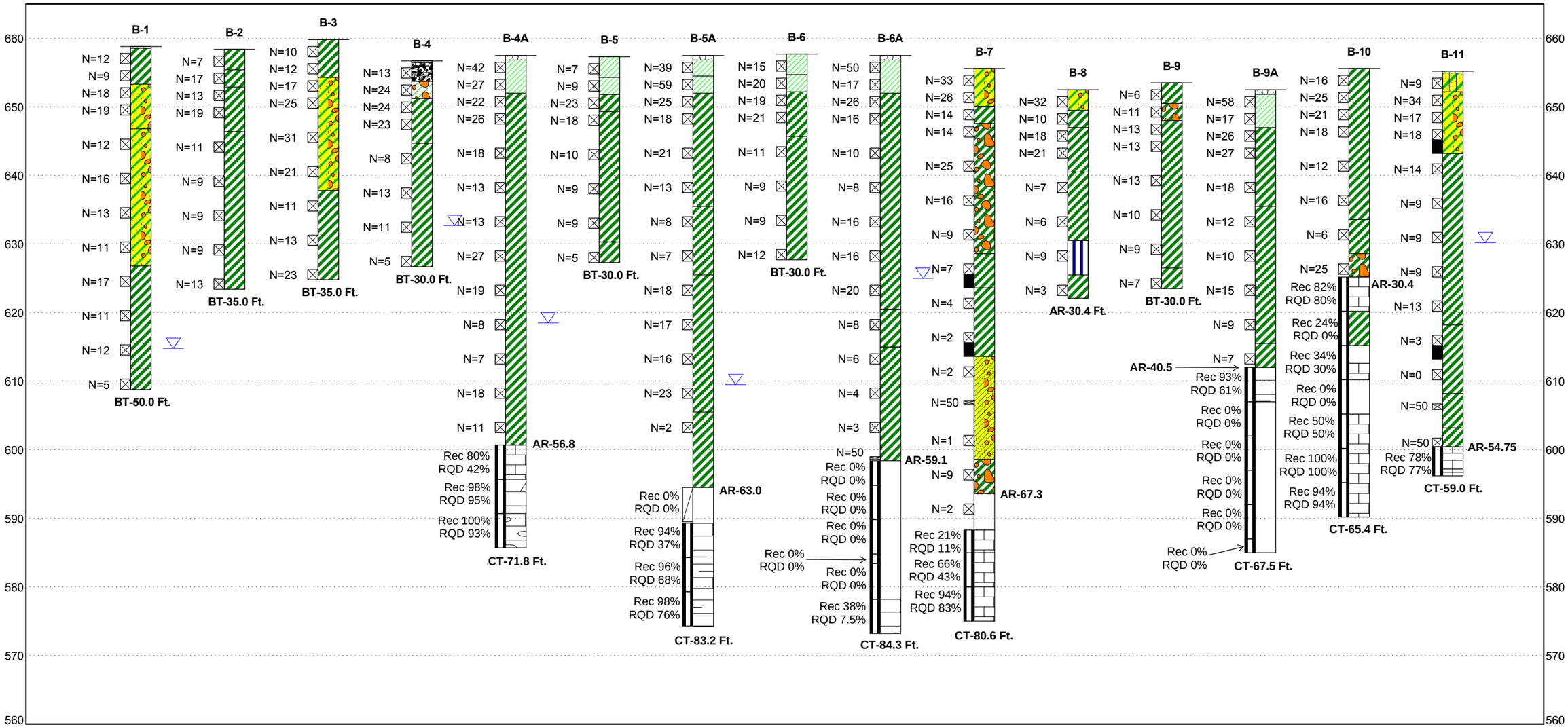
The boring locations were marked in the field by the surveyor and surface elevations were provided by the surveyor. The borings were drilled with a rotary drill rig, using hollow-stem augers to advance the boreholes. Samples of the soil encountered in the borings were obtained using the split-barrel sampling procedures.

In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration test value (SPT N-value). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller’s interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

Samples obtained in the field were sealed and returned to the laboratory for classification and testing. All borings were backfilled after drilling operations were completed with soil cuttings.



THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART FENCE E2165009.DUPONT PUMPING STATION AND TANK.GPJ TERRACON2012.GDT 10/4/16

Explanation

B-1 — Borehole Number
Moisture Content — %w
LL PL — Liquid and Plastic Limits
Sampling (See General Notes)
Borehole Lithology
AR
BT — Borehole Termination Type

Water Level Reading at time of drilling.
Water Level Reading after drilling.

Topsoil
Fat Clay
Clayey Sand with Gravel
GeoEng Fill (made ground)
Clayey Gravel
Lean Clay
Limestone
Dolomitic Limestone or Limy Dolomite
Cherty Limestone 1
Argillaceous or Shaly Limestone

NOTES:

See Exhibit A-2 for orientation of soil profile.
See General Notes in Appendix C for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project Manager: G. Malouf	Project No.: E2165009
Drawn by: GFM	Scale: 1" = 15' vertical
Approved by: JPK	File Name: E2165009.A-4
Date: 10/4/2016	

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN
PH. 423-499-6111 FAX. 423-499-8099

SUBSURFACE PROFILE

DUPONT PUMPING STATION AND TANK
1615 MEMPHIS DRIVE
CHATTANOOGA, TENNESSEE

EXHIBIT

A-4

BORING LOG NO. B-1

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 658.8 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	658.5	**TOPSOIL**										
		FAT CLAY (CH), brown, stiff, trace angular rock fragments, trace roots, organic odor		X	3-5-7 N=12			3 (HP)		27	57-28-29	89
				X	3-3-6 N=9			2.5 (HP)		24		
5.5	653.5	**CLAYEY SAND WITH GRAVEL (SC)**, brown, medium dense, with angular rock fragments	5	X	7-7-11 N=18					10		
				X	6-9-10 N=19					8		
12.0	647	**CLAYEY SAND WITH GRAVEL (SC)**, reddish-brown, loose to medium dense, with angular rock fragments	10									
			15	X	3-5-7 N=12					20		
			20	X	3-7-9 N=16					19		
			25	X	3-5-8 N=13					22	51-23-28	47
			30	X	3-4-7 N=11					26		
32.0	627	**FAT CLAY (CH)**, reddish-brown, stiff to very stiff, trace angular rock fragments, black mineral staining	35	X	4-8-9 N=17			2.5 (HP)		24		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

Water encountered at 44'

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016 | Boring Completed: 3/10/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-5

BORING LOG NO. B-1

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 658.8 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
FAT CLAY (CH), reddish-brown, stiff to very stiff, trace angular rock fragments, black mineral staining *(continued)*												
		40			3-5-6 N=11			1.0 (HP)				
		45	▽		3-5-7 N=12			1.5 (HP)				
47.0	612											
FAT CLAY (CH), yellowish-brown, medium stiff, trace angular rock fragments												
50.0	609	50			1-2-3 N=5			0.5 (HP)				
Boring Terminated at 50 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 44'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016 | Boring Completed: 3/10/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-5

BORING LOG NO. B-2

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 658.4 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), brown, medium stiff, trace roots				X	3-3-4 N=7			1.0 (HP)				
3.0		655.5											
	FAT CLAY (CH), brown, very stiff, trace roots				X	3-7-10 N=17			3.0 (HP)				
5.5		653	5										
	FAT CLAY (CH), brown, stiff to very stiff, wtih angular rock fragments				X	6-6-7 N=13							
					X	7-9-10 N=19							
			10										
12.0		646.5											
	FAT CLAY (CH), reddish-brown, stiff, trace angular rock fragments				X	2-5-6 N=11			1.0 (HP)				
			15										
					X	3-4-5 N=9			1.25 (HP)				
			20										
					X	3-4-5 N=9			1.75 (HP)				
			25										
					X	2-4-5 N=9			1.25 (HP)				
			30										
					X	3-4-9 N=13			1.5 (HP)				
35.0		623.5	35										
	Boring Terminated at 35 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS
No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016	Boring Completed: 3/10/2016
Drill Rig: All-Terrain Vehicle	Driller: Tri-State
Project No.: E2165009	Exhibit: A-6

BORING LOG NO. B-3

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 659.8 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FAT CLAY (CH), brown, stiff, trace angular rock fragments, trace roots, organic odor										
					2-4-6 N=10			2.25 (HP)		21		
					3-5-7 N=12			2.25 (HP)		24		
5.5	654.5	**CLAYEY SAND WITH GRAVEL (SC)**, brown, medium dense, with angular rock fragments	5		11-5-12 N=17					12		
					10-13-12 N=25					7		
			10									
					8-15-16 N=31					16		
			15									
		- Low recovery in 18.5'-20' sample			8-9-12 N=21					7		
22.0	638		20									
		FAT CLAY (CH), reddish-brown, stiff to very stiff, trace angular rock fragments, black mineral oxidation			4-6-5 N=11			1.25 (HP)		20		
			25									
					3-5-8 N=13			2.75 (HP)		29		
			30									
35.0	625				8-12-11 N=23			3.0 (HP)		22		
			35									
		Boring Terminated at 35 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016 | Boring Completed: 3/10/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-7

BORING LOG NO. B-4

PROJECT: Dupont Pumping Station and Tank

**CLIENT: CDM Smith
Chattanooga, TN**

**SITE: 1615 Memphis Drive
Chattanooga, Tennessee**

LOCATION See Exhibit A-2

Surface Elev.: 656.7 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	**TOPSOIL**	656.5											
3.0	**FILL - FAT CLAY**, brown, asphaltic material, trace angular rock fragments	653.5			X	4-7-6 N=13			2.25 (HP)				
5.5	**CLAYEY GRAVEL (GC)**, brown, very stiff	651	5		X	5-11-13 N=24							
12.0	**FAT CLAY (CH)**, reddish-brown, very stiff, wtih angular rock fragments	644.5			X	6-9-15 N=24			3.5 (HP)				
			10		X	9-10-13 N=23			3.25 (HP)				
27.0	**FAT CLAY (CH)**, reddish-brown, stiff, trace angular rock fragments - Low recovery in 13.5'-15' sample	629.5	15		X	3-3-5 N=8			2.25 (HP)				
			20		X	4-5-8 N=13			2.75 (HP)				
			25	▽	X	3-4-7 N=11			1.75 (HP)				
30.0	**FAT CLAY (CH)**, reddish-brown, medium stiff, trace angular rock fragments - Low recovery in 28.5'-30' sample	626.5	30		X	1-2-3 N=5							

Boring Terminated at 30 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 24'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016	Boring Completed: 3/10/2016
Drill Rig: All-Terrain Vehicle	Driller: Tri-State
Project No.: E2165009	Exhibit: A-8

BORING LOG NO. B-4A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)
0.7	657+/-					
TOPSOIL						
LEAN CLAY (CL), with rock fragments, angular, brown, very stiff, trace roots			X	15-19-23 N=42	4.5 (HP)	20
			X	9-11-16 N=27	4.0 (HP)	8
5.5	652+/-	5				
FAT CLAY (CH), trace rock fragments, angular, reddish-brown, stiff to very stiff			X	16-11-11 N=22	4.5 (HP)	25
			X	12-13-13 N=26	3.5 (HP)	27
		10				
			X	7-6-12 N=18	3.0 (HP)	26
		15				
			X	3-6-7 N=13	2.0 (HP)	22
		20				
			X	4-6-7 N=13	2.5 (HP)	23
		25				
			X	4-10-17 N=27	3.5 (HP)	29
		30				
			X	6-7-12 N=19	4.5 (HP)	17
		35				

RECOVERY (%)	RQD (%)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-56.8' Hollow Stem Auger
56.8'-71.8' NQ2 Wireline Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

Water encountered at 39'

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-9

BORING LOG NO. B-4A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FAT CLAY (CH), trace rock fragments, angular, reddish-brown, stiff to very stiff *(continued)*											
		- medium stiff from approximately 37 to 47 feet	40			3-4-4 N=8			1.5 (HP)		23		
			45			4-3-4 N=7			1.0 (HP)		35		
			50			13-8-10 N=18					17		
			55			4-5-6 N=11					19		
	56.8	***Auger Refusal at 56.8'*** 600.5+/-											
		Begin NQ2 Wireline Rock Core **LIMESTONE**, light gray, highly siliceous, concoidal fracture in silicious zones	60			**RUN 1** Depth: 56.8'-61.8' Run Length: 5.0'	80	42					
	61.8	595.5+/-											
		DOLOMITE, light gray	65			**RUN 2** Depth: 61.8'-66.8' Run Length: 5.0'	98	95					
	66.8	590.5+/-											
		LIMESTONE, light gray	70			**RUN 3** Depth: 66.8'-71.8' Run Length: 5.0'	100	93					
	71.8	585.5+/-											
		Coring Terminated at 71.8 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-56.8' Hollow Stem Auger
56.8'-71.8' NQ2 Wireline Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 39'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-9

BORING LOG NO. B-5

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 657.3 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		LEAN CLAY (CL), brown, medium stiff, organic odor		X	3-3-4 N=7			1.25 (HP)		24	46-21-25	91
3.0	654.5											
		LEAN CLAY (CL), grayish-brown, stiff, trace angular rock fragments, organic odor		X	3-4-5 N=9			1.75 (HP)		19		
5.5	652		5									
		FAT CLAY (CH), reddish-brown, very stiff, with angular rock fragments		X	5-8-15 N=23			2.25 (HP)		17		
8.0	649.5											
		FAT CLAY (CH), reddish-brown, very stiff, trace angular rock fragments		X	9-9-9 N=18			2.25 (HP)		16		
			10									
				X	2-4-6 N=10			1.5 (HP)		21		
			15									
				X	2-4-5 N=9			1.25 (HP)		22		
			20									
				X	2-4-5 N=9			1.25 (HP)		22		
27.0	630.5		25									
		FAT CLAY (CH), reddish-brown, medium stiff, trace angular rock fragments		X	1-2-3 N=5			0.5 (HP)		24		
30.0	627.5		30									
		Boring Terminated at 30 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016 | Boring Completed: 3/10/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-10

BORING LOG NO. B-5A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.7	657+/-	**TOPSOIL**										
		LEAN CLAY (CL), brown, hard, trace roots		X	16-18-21 N=39			4.5 (HP)		16		
3.0	654.5+/-											
		LEAN CLAY (CL), with rock fragments, angular, brown, hard, trace roots		X	19-25-34 N=59			4.5 (HP)		15		
5.5	652+/-		5									
		FAT CLAY (CH), with rock fragments, angular, reddish-brown, stiff to very stiff		X	11-13-12 N=25			4.0 (HP)		15		
				X	5-7-11 N=18			2.5 (HP)		20		
			10									
				X	6-10-11 N=21			3.5 (HP)		15		
			15									
				X	6-7-6 N=13			2.0 (HP)		20		
22.0	635.5+/-		20									
		FAT CLAY (CH), with rock fragments, angular, reddish-brown, medium stiff		X	3-4-4 N=8			1.5 (HP)		19		
			25									
				X	3-3-4 N=7			1.5 (HP)		22		
32.0	625.5+/-		30									
		FAT CLAY (CH), with rock fragments, angular, reddish-brown, very stiff		X	3-7-11 N=18			2.0 (HP)		18		
			35									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-63.0' Hollow Stem Auger
63.0'-83.2' NQ2 Wireline Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

Water encountered at 48'

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-11

BORING LOG NO. B-5A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
FAT CLAY (CH), with rock fragments, angular, reddish-brown, very stiff *(continued)*												
- low recovery in 38.5'-40' sample		40			7-7-10 N=17			2.0 (HP)		22		
- no recovery in 43.5'-45' sample		45	▽		13-9-7 N=16							
- no recovery in 48.5'-50' sample		50			14-11-12 N=23							
52.0	605.5+/-											
FAT CLAY (CH), with rock fragments, angular, reddish-brown, soft		55			1-1-1 N=2					30		
63.0 ***Auger Refusal at 63.0'***	594.5+/-	60										
Begin NQ2 Wireline Rock Core - Core barrel skipped off edge of rock, no sample		65			**RUN 1** Depth: 63.0'-68.0' Run Length: 5.0'	0	0					
68.2	589.5+/-											
LIMESTONE, light gray, concoidal fracture		70			**RUN 2** Depth: 68.2'-73.2' Run Length: 5.0'	94	37					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-63.0' Hollow Stem Auger
63.0'-83.2' NQ2 Wireline Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 48'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-11

BORING LOG NO. B-5A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		LIMESTONE, light gray, concoidal fracture *(continued)*	75			**RUN 3** Depth: 73.2'-78.2' Run Length: 5.0'	96	68					
			80			**RUN 4** Depth: 78.2'-83.2' Run Length: 5.0'	98	76					
	83.2	574.5+/-											
		Coring Terminated at 83.2 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-63.0' Hollow Stem Auger
63.0'-83.2' NQ2 Wireline Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 48'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-11

BORING LOG NO. B-6

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 657.7 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)
		LEAN CLAY (CL), brown, very stiff, trace roots				
3.0	654.5			X	5-6-9 N=15	4.0 (HP)
		LEAN CLAY (CL), brown, very stiff, trace angular rock fragments				
5.5	652		5	X	5-7-13 N=20	3.5 (HP)
		FAT CLAY (CH), reddish-brown, very stiff, trace angular rock fragments, black mineral staining		X	8-9-10 N=19	2.75 (HP)
				X	4-8-13 N=21	3.0 (HP)
12.0	645.5		10			
		FAT CLAY (CH), reddish-brown, stiff, trace angular rock fragments, black mineral staining		X	3-5-6 N=11	2.25 (HP)
			15			
				X	4-4-5 N=9	1.5 (HP)
			20			
				X	4-4-5 N=9	2.25 (HP)
			25			
30.0	627.5			X	2-3-9 N=12	2.0 (HP)
		Boring Terminated at 30 Feet	30			

RECOVERY (%)	RQD (%)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/25/2016 | Boring Completed: 3/25/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-12

BORING LOG NO. B-6A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.7	657+/-	**TOPSOIL**
		LEAN CLAY (CL), trace rock fragments, angular, brown, very stiff, trace roots
5.5	652+/-	**FAT CLAY (CH)**, trace rock fragments, angular, reddish-brown, stiff to very stiff
37.0	620.5+/-	

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		14-28-22 N=50			4.5 (HP)		16		
		13-9-8 N=17			4.0 (HP)		10		
5		13-15-11 N=26					10		
		5-7-9 N=16			1.25 (HP)		23		
10									
		5-5-5 N=10			2.0 (HP)		24		
15									
		3-3-5 N=8			2.5 (HP)		18		
20									
		5-7-9 N=16			2.5 (HP)		24		
25									
		5-7-9 N=16			2.5 (HP)		31		
30									
		4-13-7 N=20			2.0 (HP)		23		
35									

WATER LEVEL OBSERVATIONS: ▽ at 32.5'

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 32.5'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-13

BORING LOG NO. B-6A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), trace rock fragments, angular, reddish-brown to tan, stiff, black mineral staining											
					3-3-5 N=8			2.25 (HP)		36		
42.5	615+/-	40										
	FAT CLAY (CH), trace rock fragments, angular, reddish-brown to tan, soft to medium stiff, black mineral staining											
					2-3-3 N=6					48		
		45										
	- no recovery in 48.5'-50' sample				6-2-2 N=4							
		50										
	- no recovery in 53.5'-55' sample				1-2-1 N=3							
		55										
59.1	***Auger Refusal at 59.1*** 598.5+/-				50/5"							
	Begin NQ2 Wireline Rock Core - Majority of strata consisted of clay with thin, scattered rock lenses. - 2.25' of LIMESTONE recovered from 59.1'-79.3'	60			**RUN 1** Depth: 59.1'-62.7' Run Length: 3.6'	0	0					
		65			**RUN 2** Depth: 62.7'-67.7' Run Length: 5.0'	0	0					
		70			**RUN 3** Depth: 67.7'-72.7' Run Length: 5.0'	0	0					
					RUN 4 Depth:	0	0					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 32.5'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-13

BORING LOG NO. B-6A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 657.5 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		- Majority of strata consisted of clay with thin, scattered rock lenses. - 2.25' of LIMESTONE recovered from 59.1'-79.3' *(continued)*	75			72.7'-74.1' Run Length: 1.4' **RUN 5** Depth: 74.1'-79.3' Run Length: 5.2'	0	0					
	79.3	578+/-											
		DOLOMITE, light gray	80			**RUN 6** Depth: 79.3'-84.3' Run Length: 5.0'	38	7.5					
	84.3	573+/-											
		- Coring terminated due to core barrel angling off rock pinnacle ***Coring Terminated at 84.3 Feet***											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

Water encountered at 32.5'

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-13

BORING LOG NO. B-7

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 655.6 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		CLAYEY SAND WITH GRAVEL (SC), reddish-brown, medium dense to dense, with angular rock fragments			4-18-15 N=33					19		
					18-12-14 N=26					19		
5.5	650	**FAT CLAY (CH)**, reddish-brown, stiff, trace angular rock fragments	5		7-4-10 N=14			3.5 (HP)		15		
8.0	647.5	**FAT CLAY (CH)**, reddish-brown, stiff to very stiff			5-6-8 N=14			3.0 (HP)		23		
			10		10-12-13 N=25			2.0 (HP)		18		
			15		8-7-9 N=16			3.25 (HP)		22		
			20		3-4-5 N=9			1.75 (HP)		24		
27.0	628.5	**FAT CLAY (CH)**, reddish-brown, medium stiff, with angular rock fragments	25		3-4-3 N=7			1.75 (HP)		25		
32.0	623.5	**FAT CLAY (CH)**, reddish-brown, soft, with angular rock fragments, black mineral staining	30			71		1.25 (HP)	1.46	27		
					2-2-2 N=4			1.75 (HP)		31		
			35									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-67.3' Hollow Stem Auger; 67.3'-80.6' NQ2 Wireline Rock Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/24/2016 | Boring Completed: 3/24/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-14

BORING LOG NO. B-7

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 655.6 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), reddish-brown, soft, with angular rock fragments, black mineral staining *(continued)*										
42.0	613.5			0-1-1 N=2			0.5 (HP)				
		40			92		0.75 (HP)		27		
	SANDY LEAN CLAY WITH GRAVEL (CL), reddish-brown, very soft to soft, trace angular rock fragments			0-1-1 N=2			0.5 (HP)		19	45-23-22	60
		45									
				5/5"			0 (HP)		42		
		50									
57.0	598.5			0-1-0 N=1			0 (HP)		39		
	FAT CLAY (CH), reddish-brown, stiff	55									
62.0	593.5			2-6-3 N=9			1.5 (HP)		22		
	No Recovery	60									
				0-1-1 N=2							
67.3	***Auger Refusal at 67.3'*** 588.5	65									
	Begin NQ2 Wireline Rock Coring at 67.3' **LIMESTONE**, siliceous, light gray, concoidal fractures in siliceous zones			**RUN 1** Depth: 67.3' - 70.6'	21	11					
70.6	585	70									
	LIMESTONE, siliceous, with vugs, light gray, concoidal fracture in siliceous zones			**RUN 2** Depth: 70.6' -	66	43					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-67.3' Hollow Stem Auger; 67.3'-80.6' NQ2 Wireline Rock Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/24/2016 | Boring Completed: 3/24/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-14

BORING LOG NO. B-7

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 655.6 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	75.6	580	75			75.6'							
						RUN 3 Depth: 75.6' - 80.6'	94	83					
	80.6	575	80										

Coring Terminated at 80.6 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0'-67.3' Hollow Stem Auger; 67.3'-80.6' NQ2 Wireline Rock Coring

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/24/2016 | Boring Completed: 3/24/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-14

BORING LOG NO. B-8

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 652.5 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
0.0	652.5	**CLAYEY SAND WITH GRAVEL (SC)**, reddish-brown, medium dense
3.0	649.5	**FAT CLAY (CH)**, reddish-brown, stiff
5.5	647	**FAT CLAY (CH)**, reddish-brown, very stiff, trace angular rock fragments
12.0	640.5	**FAT CLAY (CH)**, reddish-brown, medium stiff, trace angular rock fragments, black mineral staining
22.0	630.5	**ELASTIC SILT (MH)**, reddish-brown, stiff, trace angular rock fragments
27.0	625.5	**FAT CLAY (CH)**, reddish-brown, soft, trace angular rock fragments
30.4	622	***Auger Refusal at 30.4 Feet***

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0									
	X	12-23-9 N=32					19	41-24-17	39
5	X	5-5-5 N=10			0.75 (HP)		23		
	X	7-8-10 N=18			3.0 (HP)		24		
10	X	5-8-13 N=21			2.25 (HP)		18		
	X	2-4-3 N=7			2.0 (HP)		21		
15									
	X	2-2-4 N=6			2.5 (HP)		25		
20									
	X	1-3-6 N=9			1.25 (HP)		35		
25									
	X	2-2-1 N=3			0.5 (HP)		28		
30									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/24/2016 | Boring Completed: 3/24/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-15

BORING LOG NO. B-9

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 653.5 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY TORVANE/HP (tsf)
		FAT CLAY (CH), brown, medium stiff, with angular rock fragments				
3.0	650.5			X	2-3-3 N=6	1.0 (HP)
		FAT CLAY (CH), brown, stiff		X	3-4-7 N=11	1.25 (HP)
5.5	648		5			
		FAT CLAY (CH), reddish-brown, stiff, trace angular rock fragments		X	3-6-7 N=13	1.75 (HP)
				X	3-5-8 N=13	2.25 (HP)
			10			
				X	3-5-8 N=13	3.0 (HP)
			15			
				X	3-4-6 N=10	2.0 (HP)
			20			
		- Low recovery in 23.5'-25' sample		X	5-4-5 N=9	1.25 (HP)
			25			
27.0	626.5					
		FAT CLAY (CH), reddish-brown, medium stiff, trace angular rock fragments, black mineral staining		X	3-3-4 N=7	0.75 (HP)
30.0	623.5		30			
		Boring Terminated at 30 Feet				

RECOVERY (%)	RQD (%)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016 | Boring Completed: 3/10/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-16

BORING LOG NO. B-9A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 652.5 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DESCRIPTION
0.7	652+/-	**TOPSOIL**
		LEAN CLAY (CL), with rock fragments, angular, brown, very stiff
5.5	647+/-	
		FAT CLAY (CH), with rock fragments, angular, reddish-brown, very stiff
17.0	635.5+/-	
		FAT CLAY (CH), trace rock fragments, angular, reddish-brown, stiff to very stiff, black mineral staining
37.0	615.5+/-	

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	X	20-30-28 N=58			4.5 (HP)		6		
	X	17-9-8 N=17			4.5 (HP)		9		
5	X	10-12-14 N=26					17		
	X	10-7-20 N=27			4.5 (HP)		21		
10									
	X	5-7-11 N=18			3.25 (HP)		33		
15									
	X	4-5-7 N=12			2.75 (HP)		32		
20									
	X	2-4-6 N=10			2.5 (HP)		32		
25									
	X	3-6-9 N=15			2.5 (HP)		28		
30									
	X	4-4-5 N=9			1.5 (HP)		28		
35									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-17

BORING LOG NO. B-9A

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Approximate Surface Elev: 652.5 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), trace rock fragments, angular, reddish-brown, medium stiff, black mineral staining											
					7-4-3 N=7			1.5 (HP)		22		
40.5	***Auger Refusal at 40.5***	612+/-										
	Begin NQ2 Wireline Rock Core **DOLOMITE**, light gray	40			**RUN 1** Depth: 40.5' - 45.5' Run Length: 5.0'	93	61					
45.5		607+/-										
	- no recovery	45			**RUN 2** Depth: 45.5' - 50.5' Run Length: 5.0'	0	0					
		50			**RUN 3** Depth: 50.5' - 55.5' Run Length: 5.0'	0	0					
		55			**RUN 4** Depth: 55.5' - 60.5' Run Length: 5.0'	0	0					
		60			**RUN 5** Depth: 60.5' - 65.5' Run Length: 5.0'	0	0					
	- Coring terminated due to core barrel angling off rock pinnacle	65			**RUN 6** Depth: 65.5' - 67.5' Run Length: 2.0'	0	0					
67.5		585+/-										
	Coring Terminated at 67.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations interpolated from topographic drawing.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 9/16/2016 | Boring Completed: 9/16/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-17

BORING LOG NO. B-10

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 655.6 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FAT CLAY (CH), reddish-brown, very stiff, trace angular rock fragments, black mineral staining			3-6-10 N=16			1.0 (HP)				
					8-10-15 N=25			2.25 (HP)				
		- No recovery in 6'-7.5' sample			7-9-12 N=21							
					6-11-7 N=18							
		- No recovery in 13.5'-15' sample			3-5-7 N=12							
					6-8-8 N=16			2.5 (HP)				
22.0	633.5	**FAT CLAY (CH)**, reddish-brown, medium stiff			4-3-3 N=6			1.25 (HP)				
27.0	628.5	**FAT CLAY (CH)**, yellowish-brown, very stiff			8-12-13 N=25			2.75 (HP)				
30.4	625	***Auger Refusal at 30.4'***										
		Begin NQ2 Wireline Rock Coring at 30.4' **LIMESTONE**, with calcite seams, light gray			**RUN 1** Depth: 30.4' - 35.4'	82	80					
35.4	620	**FAT CLAY (CH)**, trace limestone fragments, angular										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/24/2016 | Boring Completed: 3/24/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-18

BORING LOG NO. B-10

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 655.6 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)
		FAT CLAY (CH), trace limestone fragments, angular *(continued)*		**RUN 2** Depth: 35.4' - 40.4'	24	0
40.4	615		40			
		NO RECOVERY		**RUN 3** Depth: 40.4' - 45.4'	34	30
43.0	612.5					
		LIMESTONE, with calcite seams, light gray	45			
45.4	610					
		NO RECOVERY		**RUN 4** Depth: 45.4' - 50.4'	0	0
50.4	605		50			
		LIMESTONE, with calcite seams, light gray		**RUN 5** Depth: 50.4' - 55.4'	50	50
			55	**RUN 6** Depth: 55.4' - 60.4'	100	100
			60	**RUN 7** Depth: 60.4' - 65.4'	94	94
65.4	590		65			
		Coring Terminated at 65.4 Feet				

WATER LEVEL OBSERVATIONS	SAMPLE TYPE	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/24/2016 | Boring Completed: 3/24/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-18

BORING LOG NO. B-11

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 655.2 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.3	655											
TOPSOIL												
SILTY CLAYEY SAND (SC-SM), brown, stiff, trace roots, organic odor				X	2-4-5 N=9					18	24-17-7	42
3.0	652											
CLAYEY SAND WITH GRAVEL (SC), brown, medium dense, with angular rock fragments				X	3-15-19 N=34					9		
		5		X	3-8-9 N=17					18		
				X	4-9-9 N=18					16		
		10		■		33				16		
12.0	643											
FAT CLAY (CH), reddish-brown, stiff, with angular rock fragments				X	3-6-8 N=14			2.25 (HP)		25		
		15										
				X	3-4-5 N=9			1.25 (HP)		19		
		20										
			▽	X	3-5-4 N=9			1.5 (HP)		18		
		25										
				X	3-3-6 N=9			1.5 (HP)		20		
		30										
				X	3-6-7 N=13			2.0 (HP)		20		
		35										
37.0	618											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water encountered at 25'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

Boring Started: 3/10/2016 | Boring Completed: 3/10/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-19

BORING LOG NO. B-11

PROJECT: Dupont Pumping Station and Tank

CLIENT: CDM Smith
Chattanooga, TN

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

LOCATION See Exhibit A-2

Surface Elev.: 655.2 (Ft.)

DEPTH	ELEVATION (Ft.)	Description
		FAT CLAY (CH), reddish-brown, very soft to soft, trace angular rock fragments
		- Low recovery in 43.5'-45' sample
47.0	608	
		FAT CLAY (CH), brown
		- Low recovery in 48.5'-50' sample
52.0	603	
		FAT CLAY (CH), reddish-brown, with angular rock fragments
54.8	600.5	***Auger Refusal at 54.75'***
55.7	599.5	***Begin NQ2 Wireline Rock Coring at 54.75'***
56.7	598.5	**LIMESTONE**, siliceous, with vugs, light gray, concoidal fracture in siliceous zones
58.0	597	**NO RECOVERY**, clay seam
59.0	596	**LIMESTONE**, with calcite seams, light gray
		LIMESTONE, mechanically fractured core, with siliceous zones
		Coring Terminated at 59 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	RECOVERY (%)	RQD (%)	LABORATORY TORVANE/HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
40			0-1-2 N=3			0.25 (HP)		30		
				100		1.25 (HP)		28		
45			0-0-0 N=0			0 (HP)		27		
			2-50/4"					67		
50										
			5-12-50/3"			0 (HP)		42		
55			**RUN 1** Depth: 54.75' - 59.0'	78	77					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.
Elevations provided by client.

Notes:

WATER LEVEL OBSERVATIONS

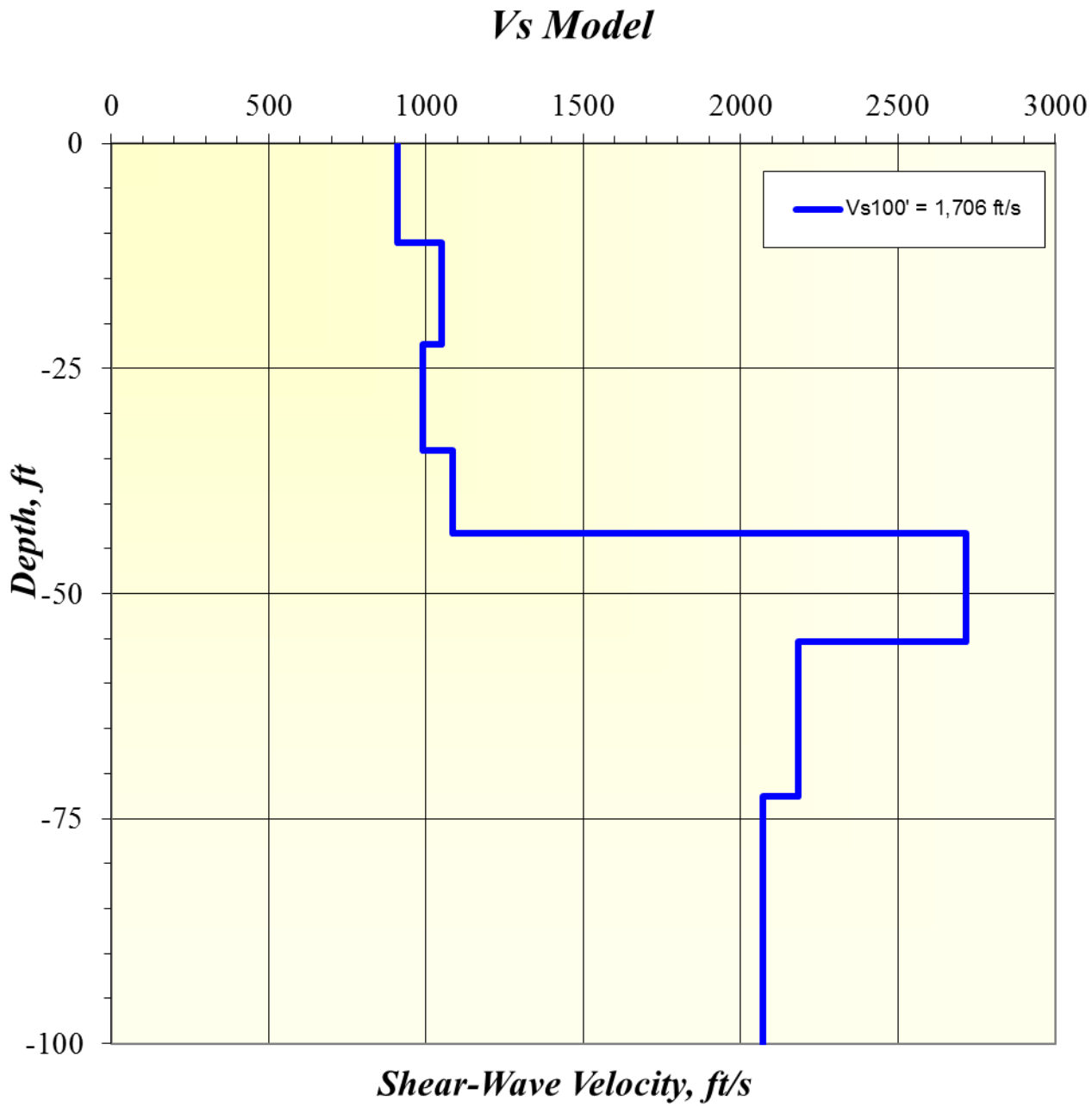
▽ *Water encountered at 25'*

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

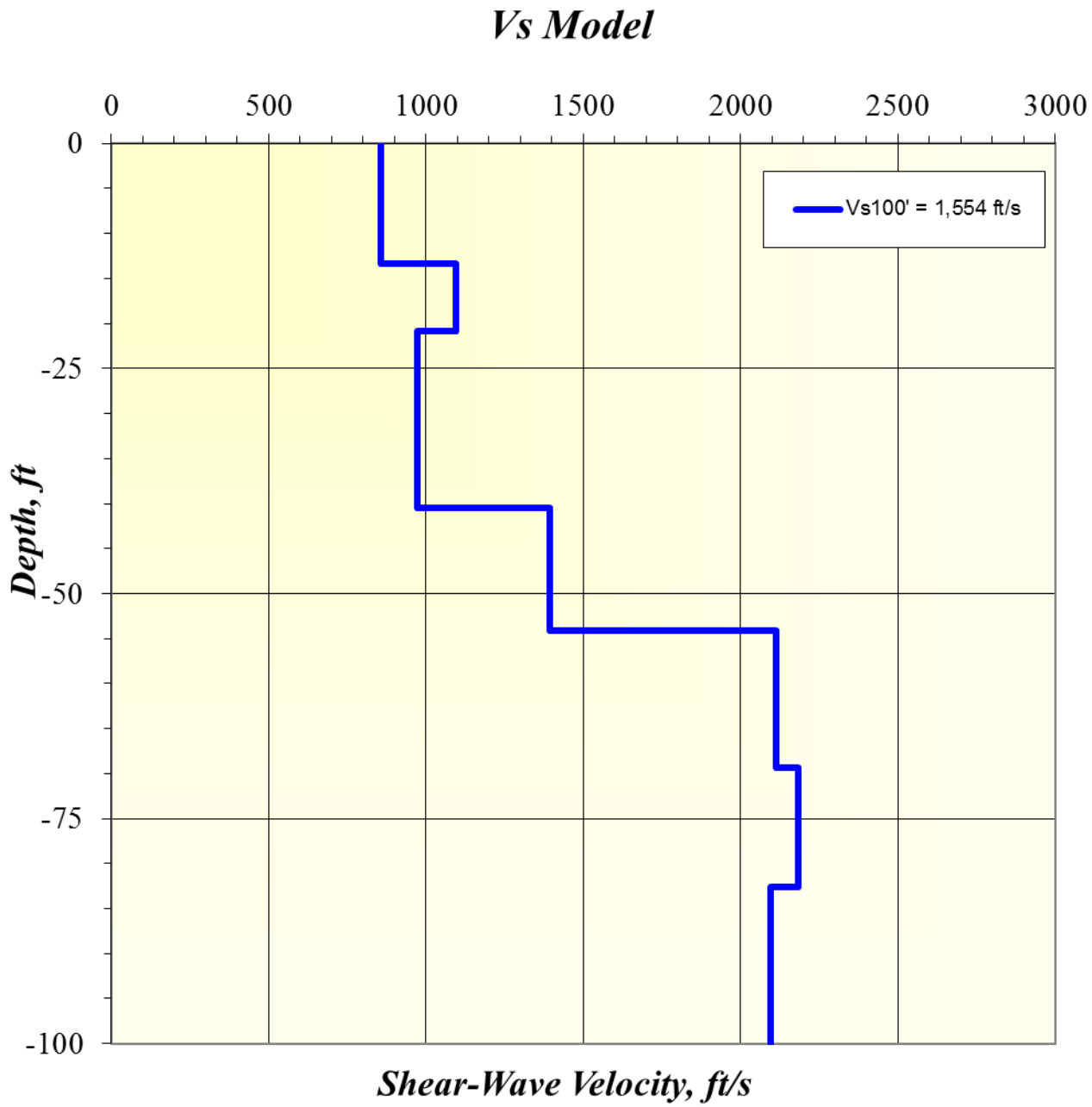
Boring Started: 3/10/2016 | Boring Completed: 3/10/2016

Drill Rig: All-Terrain Vehicle | Driller: Tri-State

Project No.: E2165009 | Exhibit: A-19



Project Manager: GFM Drawn by: GFM Checked by: DLH Approved by: DLH	Project No. E2165009 Scale: Shown File Name: E2165009 Date: 10/14/2016	Terracon Consulting Engineers & Scientists 51 Lost Mound Drive, Suite 135 Chattanooga, Tennessee 37406 PH. (423) 499-6111 FAX. (423) 499-8099	SHEAR WAVE VELOCITY PROFILE A-A' DuPont Pumping Station and Tank 1615 Memphis Drive Chattanooga, Tennessee	FIG No. A-20



Project Manager: GFM Drawn by: GFM Checked by: DLH Approved by: DLH	Project No. E2165009 Scale: Shown File Name: E2165009 Date: 10/14/2016	Terracon Consulting Engineers & Scientists 51 Lost Mound Drive, Suite 135 Chattanooga, Tennessee 37406 PH. (423) 499-6111 FAX. (423) 499-8099	SHEAR WAVE VELOCITY PROFILE B-B' DuPont Pumping Station and Tank 1615 Memphis Drive Chattanooga, Tennessee	FIG No. A-21

APPENDIX B
SUPPORTING INFORMATION

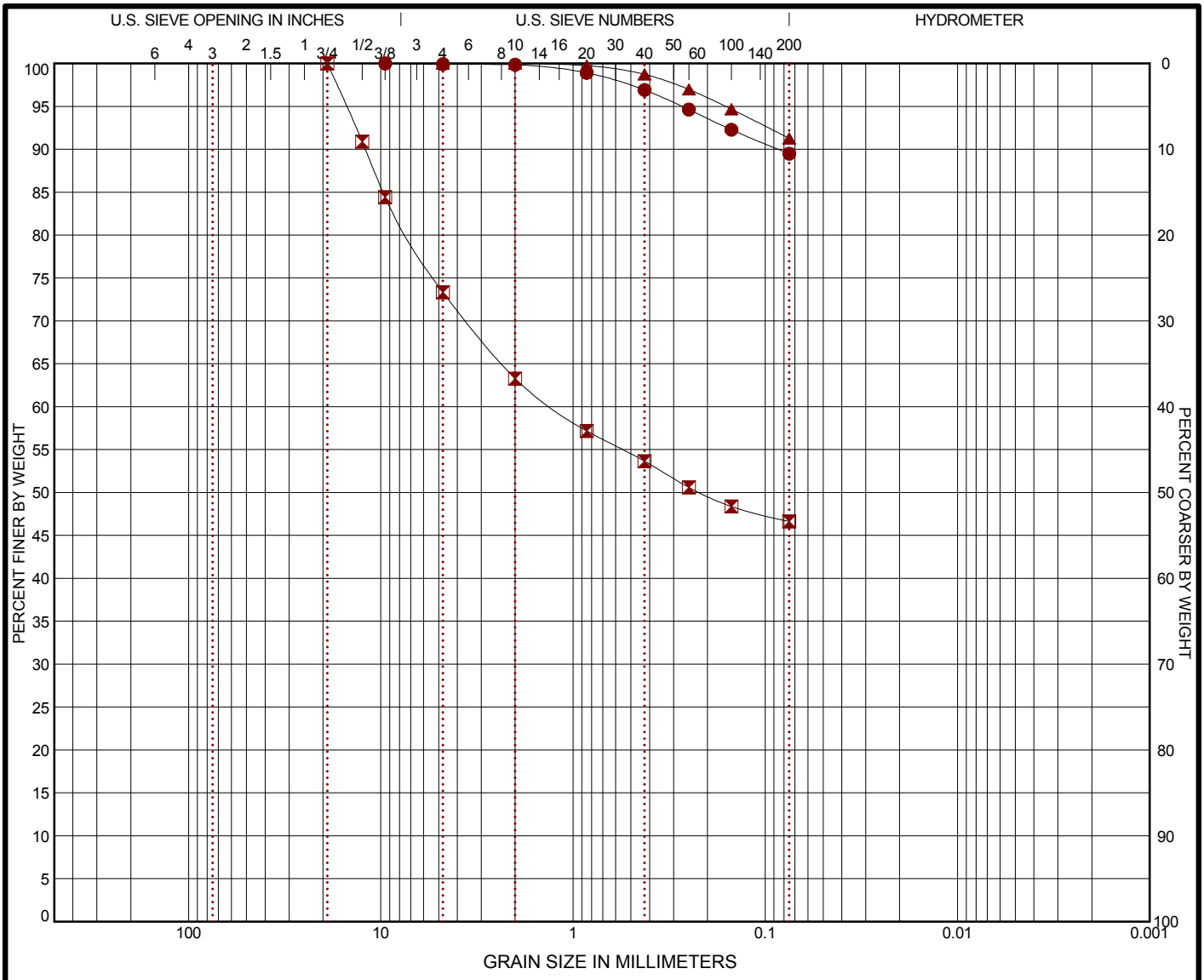
Laboratory Testing

The soil and samples were delivered to the laboratory for testing. The project engineer reviewed the boring logs developed in the field and assigned laboratory testing on select samples to provide the data necessary for the anticipated designs. Laboratory testing was accomplished to determine index properties, such as moisture content, Atterberg limits, and grain size distribution analysis. Additionally unconfined compression strength testing and consolidation testing were performed on relatively undisturbed Shelby tube samples collected at the site. In some cases, variations to procedural standards are applied as a result of local practice or professional judgment.

Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is attached to this report.

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**B-1**	**1 - 2.5**	**0.0**	**0.1**	**10.4**		**89.5**		**CH**
⊠	**B-1**	**23.5 - 25**	**0.0**	**26.7**	**26.7**		**46.6**		**SC**
▲	**B-5**	**1 - 2.5**	**0.0**	**0.0**	**8.7**		**91.3**		**CL**

	GRAIN SIZE		
	●	⊠	▲
D_{60}		**1.263**	
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

SIEVE (size)	PERCENT FINER ●	PERCENT FINER ⊠	PERCENT FINER ▲
1 1/2"			
1"			
3/4"		**100.0**	
1/2"		**90.87**	
3/8"	**100.0**	**84.41**	
#4	**99.91**	**73.33**	**100.0**
#10	**99.85**	**63.28**	**99.99**
#20	**98.9**	**57.18**	**99.74**
#40	**96.91**	**53.66**	**98.73**
#60	**94.63**	**50.6**	**96.97**
#100	**92.27**	**48.37**	**94.66**
#200	**89.49**	**46.62**	**91.27**

SOIL DESCRIPTION
- ● FAT CLAY (CH)
- ⊠ CLAYEY SAND with GRAVEL (SC)
- ▲ LEAN CLAY (CL)

REMARKS
- ●
- ⊠
- ▲

PROJECT: Dupont Pumping Station and Tank

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

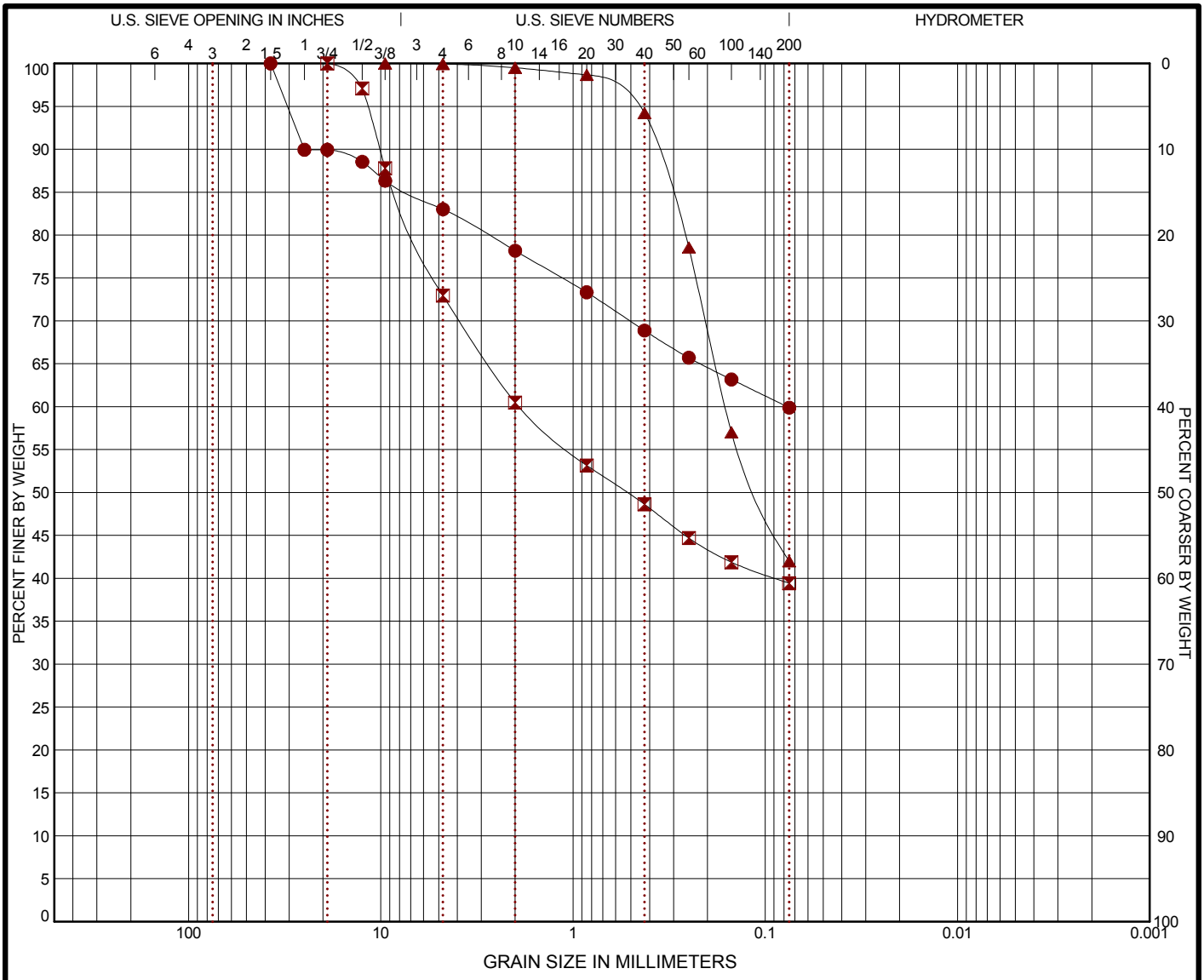
PROJECT NUMBER: E2165009

CLIENT: CDM Smith
Chattanooga, TN

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**B-7**	**43.5 - 45**	**0.0**	**17.0**	**23.1**		**59.9**		**CL**
⊠	**B-8**	**1 - 2.5**	**0.0**	**27.1**	**33.5**		**39.4**		**SC**
▲	**B-11**	**1 - 2.5**	**0.0**	**0.1**	**57.9**		**42.0**		**SC-SM**

	GRAIN SIZE		
	●	⊠	▲
D_{60}	**0.077**	**1.894**	**0.161**
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

SIEVE (size)	PERCENT FINER ●	PERCENT FINER ⊠	PERCENT FINER ▲
1 1/2"	100.0		
1"	89.94		
3/4"	89.94	100.0	
1/2"	88.54	97.09	
3/8"	86.33	87.77	100.0
#4	83.0	72.95	99.94
#10	78.18	60.46	99.5
#20	73.33	53.16	98.66
#40	68.88	48.62	94.22
#60	65.71	44.7	78.56
#100	63.17	41.88	57.01
#200	59.89	39.44	42.01

SOIL DESCRIPTION

● SANDY LEAN CLAY with GRAVEL (CL)

⊠ CLAYEY SAND with GRAVEL (SC)

▲ SILTY, CLAYEY SAND (SC-SM)

REMARKS

●

⊠

▲

PROJECT: Dupont Pumping Station and Tank

SITE: 1615 Memphis Drive
Chattanooga, Tennessee

Terracon
51 Lost Mound Dr Ste 135
Chattanooga, TN

PROJECT NUMBER: E2165009

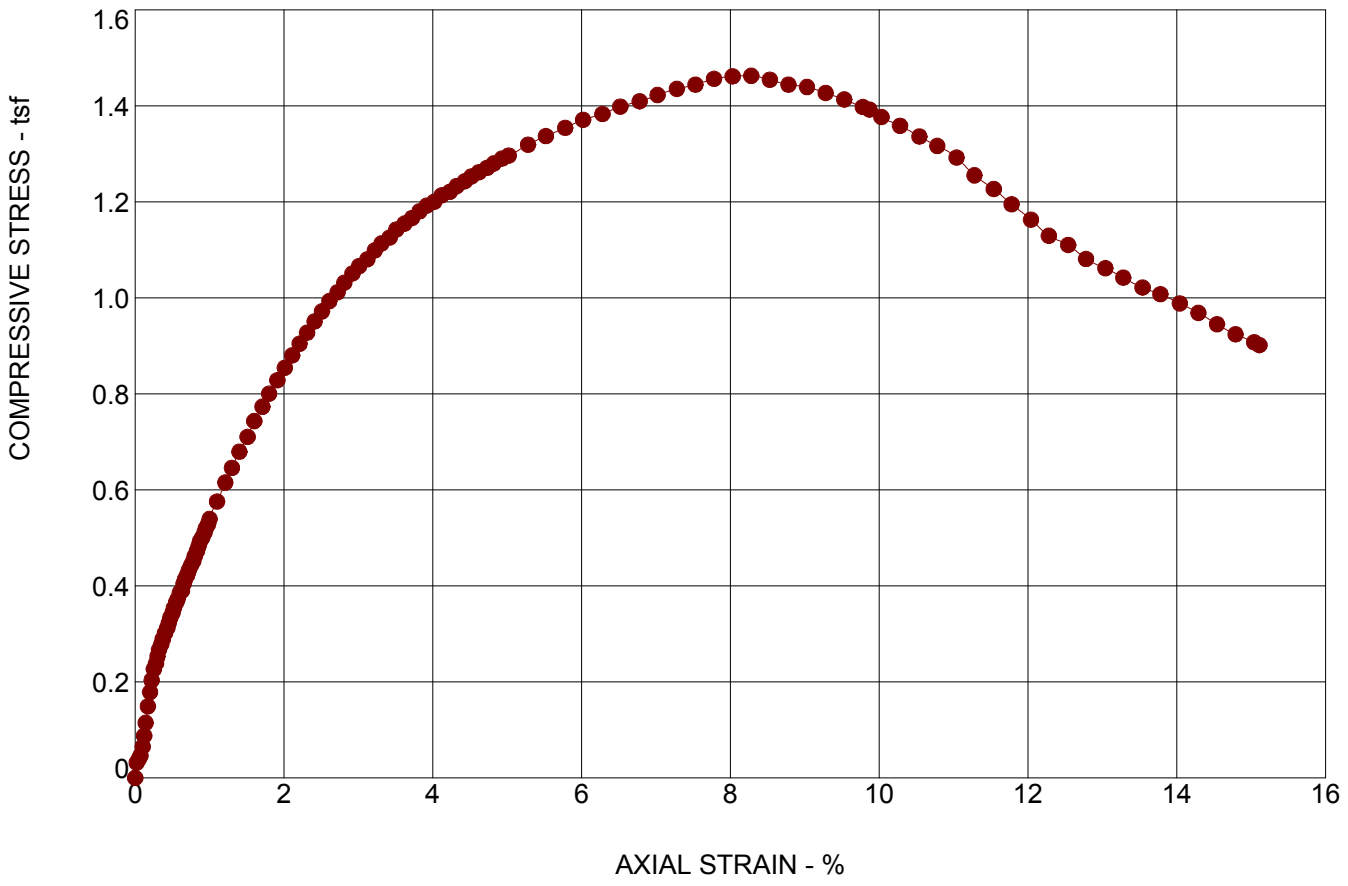
CLIENT: CDM Smith
Chattanooga, TN

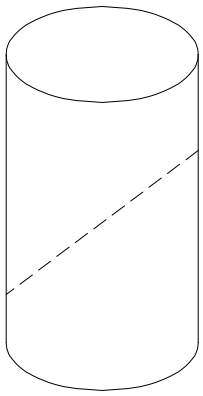
EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 E2165009.DUPONT PUMPING STATION AND TANK.GPJ 35159097 - ATTERBERG ISSUE.GPJ 10/13/16

UNCONFINED COMPRESSION TEST

ASTM D2166



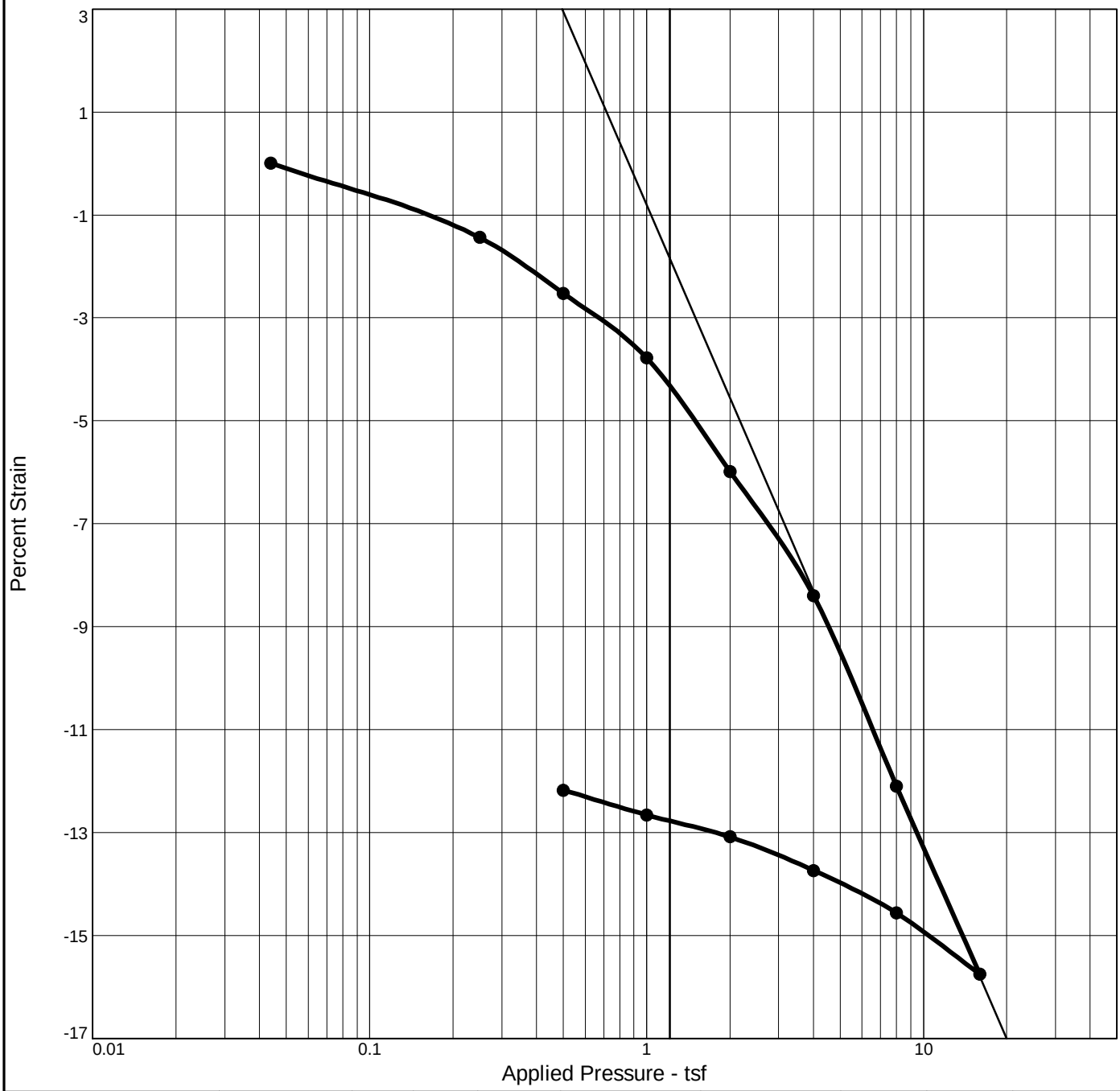
SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	27
	Dry Density:	pcf	96
	Diameter:	in.	2.82
	Height:	in.	5.56
	Height / Diameter Ratio:		1.97
	Calculated Saturation:	%	96.15
	Calculated Void Ratio:		0.75
	Assumed Specific Gravity:		2.7
	Failure Strain:	%	8.28
	Unconfined Compressive Strength	(tsf)	1.46
	Undrained Shear Strength:	(tsf)	0.73
	Strain Rate:	in/min	0.0560
	Remarks:		

Failure Mode: Shear (dashed)

SAMPLE TYPE: Shelby Tube	SAMPLE LOCATION: B-7 @ 30 - 32 feet			
DESCRIPTION:	LL	PL	PI	Percent < #200 Sieve

PROJECT: Dupont Pumping Station and Tank	Terracon 51 Lost Mound Dr Ste 135 Chattanooga, TN	PROJECT NUMBER: E2165009
SITE: 1615 Memphis Drive Chattanooga, Tennessee		CLIENT: CDM Smith Chattanooga, TN
		EXHIBIT: B-4

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
100.0 %	26.0 %	99.0	X	X	2.7	2.08	2.31	0.21	0.03	0.702

MATERIAL DESCRIPTION	USCS	AASHTO
Orange Clay with Gravel	X	X

Project No. E2165009 **Client:** CDM Smith

Project: Dupont Pumping Station and Tank

Source of Sample: B-7 **Depth:** 40.0-42.0 ft **Sample Number:** N/A

Terracon Consultants, Inc.

Chattanooga, TN

Remarks:

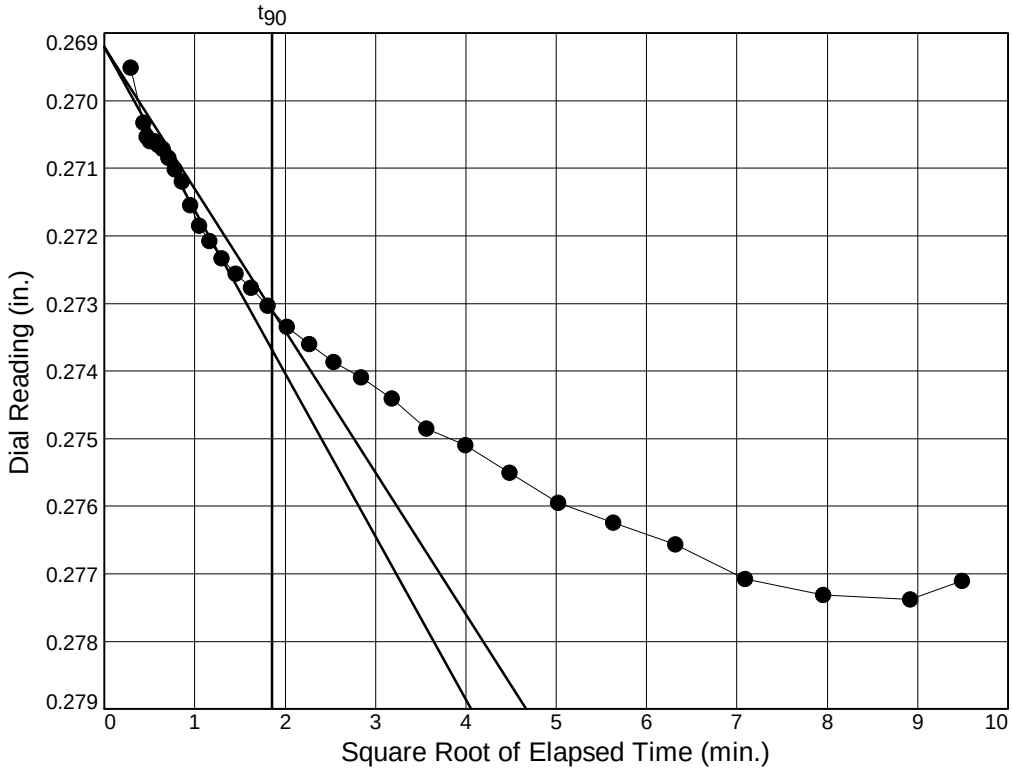
Swell pressure of 88psf.

EXHIBIT: B-5

Dial Reading vs. Time

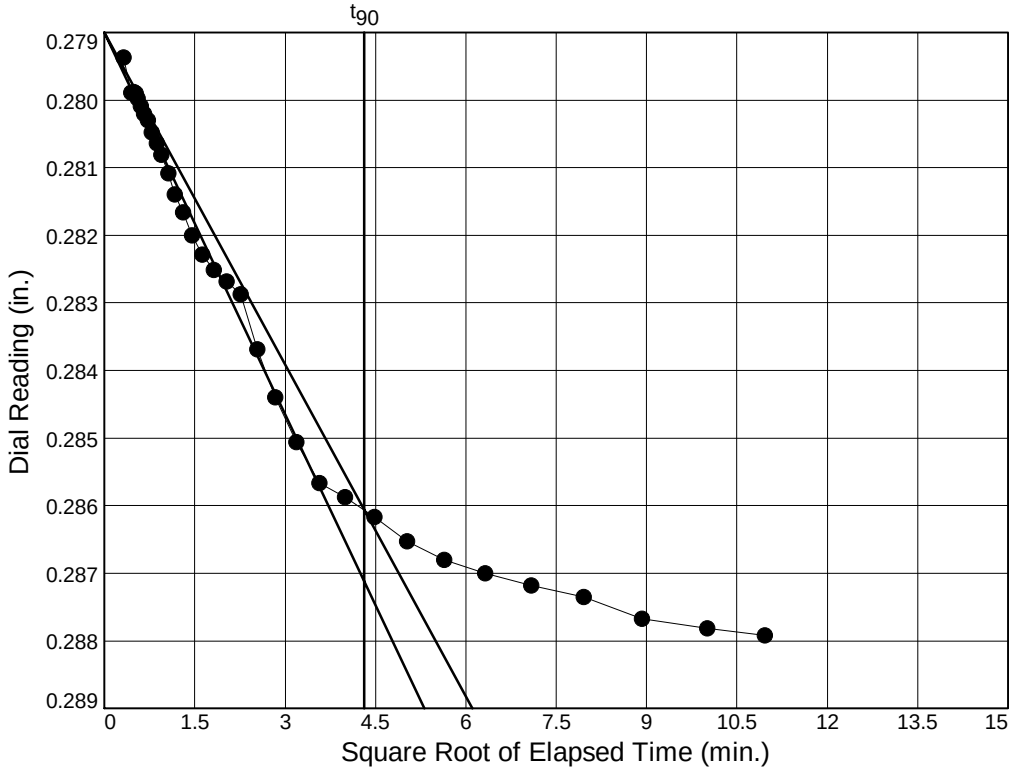
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-7 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 2
Load= 0.25 tsf
D_0 = 0.2692
D_{90} = 0.2731
D_{100} = 0.2735
T_{90} = 3.45 min.

C_v @ T_{90}
0.0065 $cm.^2/sec.$



Load No.= 3
Load= 0.50 tsf
D_0 = 0.2790
D_{90} = 0.2861
D_{100} = 0.2869
T_{90} = 18.61 min.

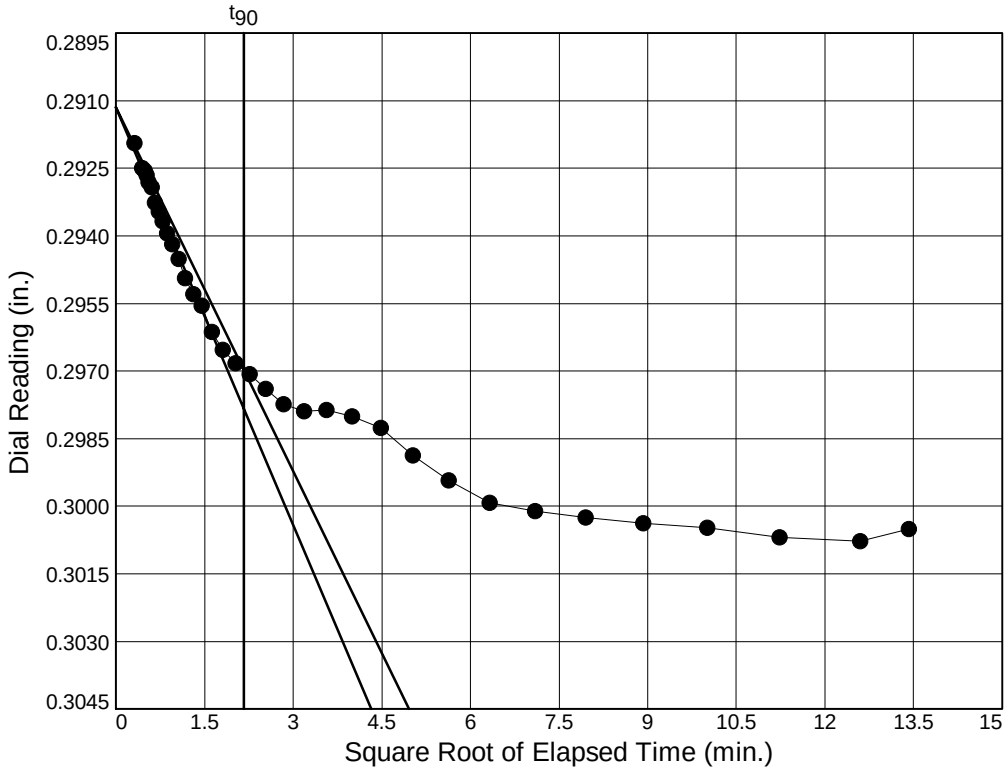
C_v @ T_{90}
0.0012 $cm.^2/sec.$

EXHIBIT: B-5

Dial Reading vs. Time

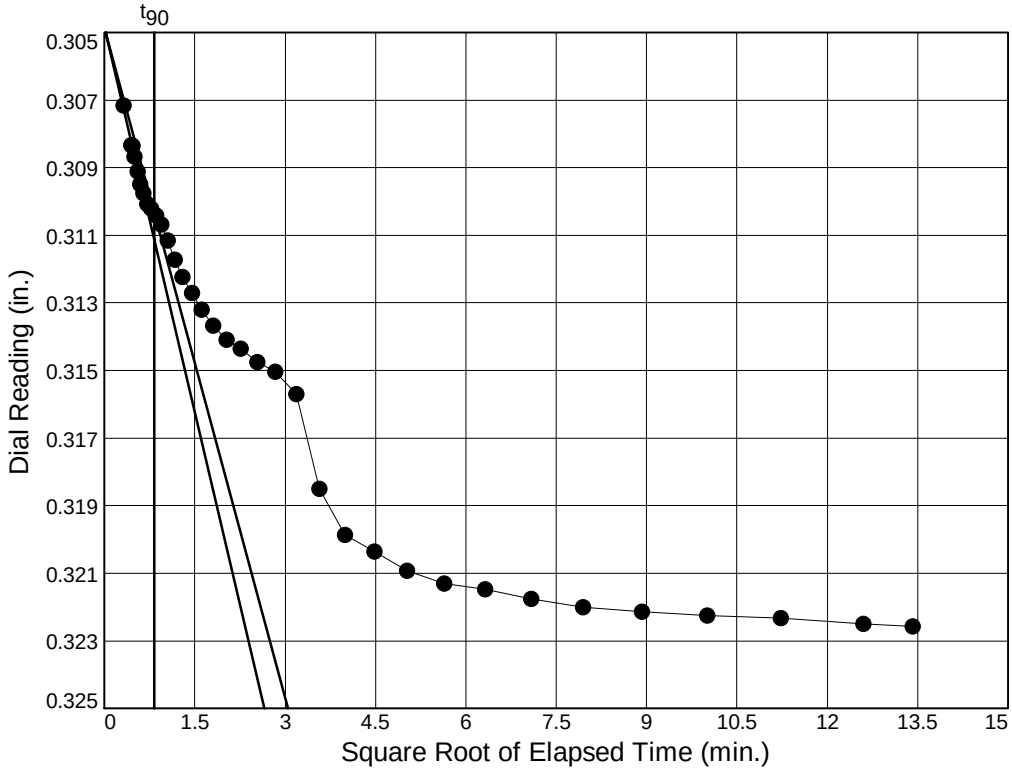
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-7 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 4
Load= 1.00 tsf
D_0 = 0.2911
D_{90} = 0.2970
D_{100} = 0.2976
T_{90} = 4.68 min.

C_v @ T_{90}
0.0046 $cm.^2$/sec.



Load No.= 5
Load= 2.00 tsf
D_0 = 0.3049
D_{90} = 0.3103
D_{100} = 0.3110
T_{90} = 0.69 min.

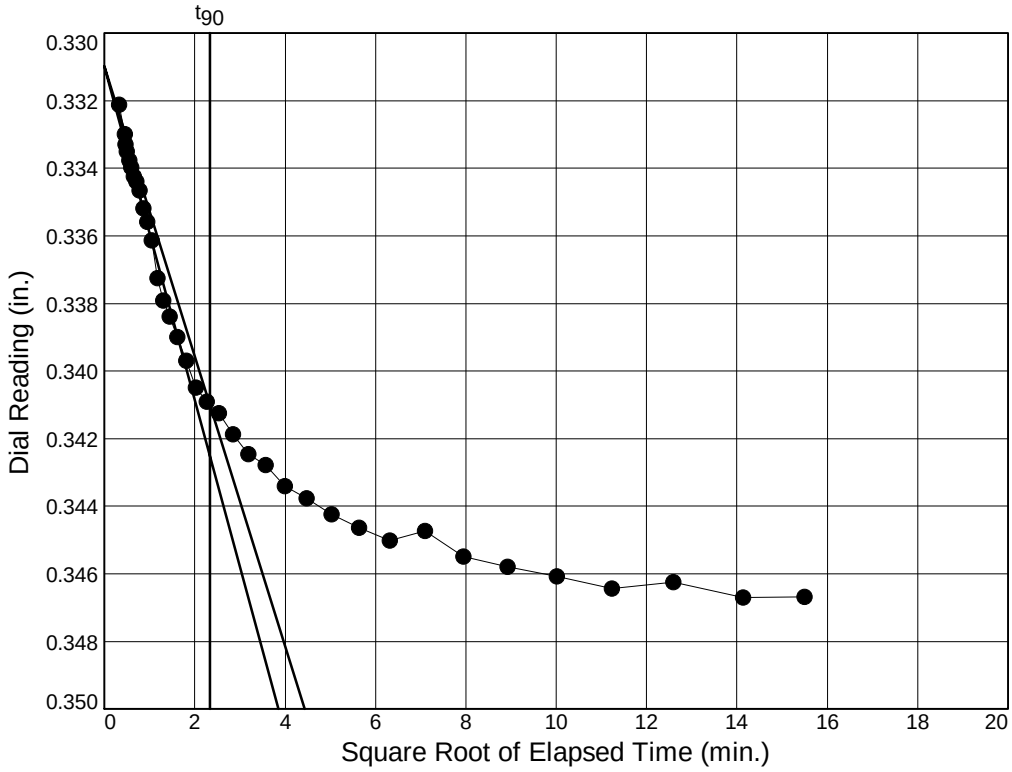
C_v @ T_{90}
0.0300 $cm.^2$/sec.

EXHIBIT: B-5

Dial Reading vs. Time

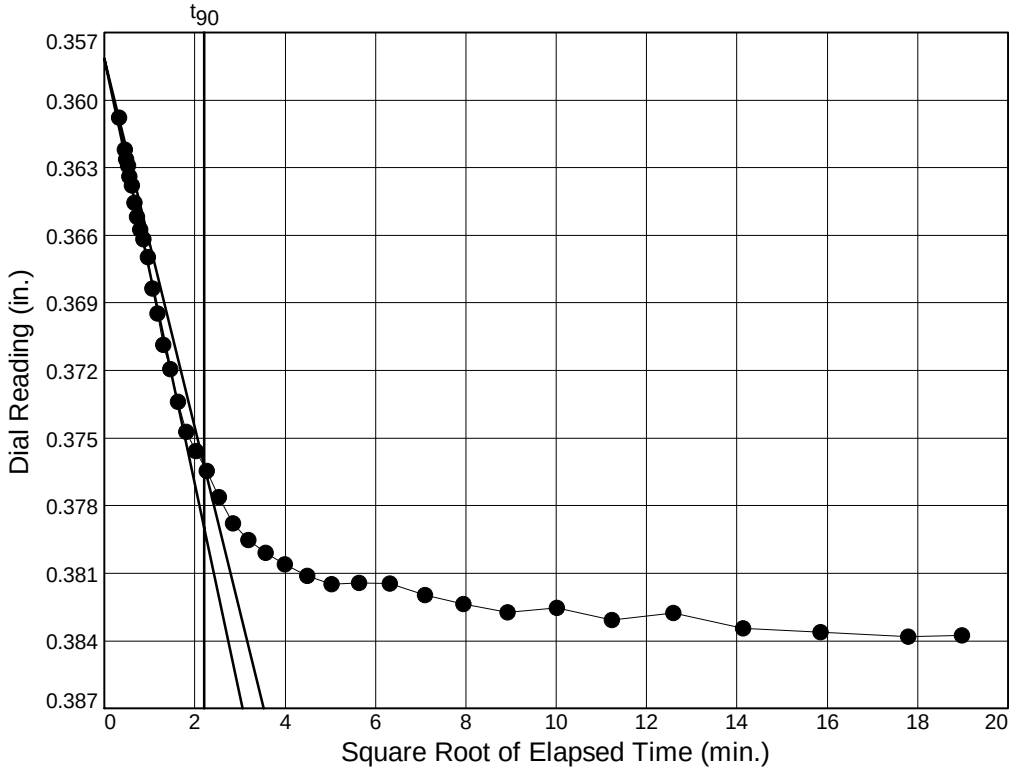
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-7 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 6
Load= 4.00 tsf
D_0 = 0.3310
D_{90} = 0.3410
D_{100} = 0.3421
T_{90} = 5.43 min.

C_v @ T_{90}
0.0036 $cm.^2/sec.$



Load No.= 7
Load= 8.00 tsf
D_0 = 0.3582
D_{90} = 0.3762
D_{100} = 0.3783
T_{90} = 4.88 min.

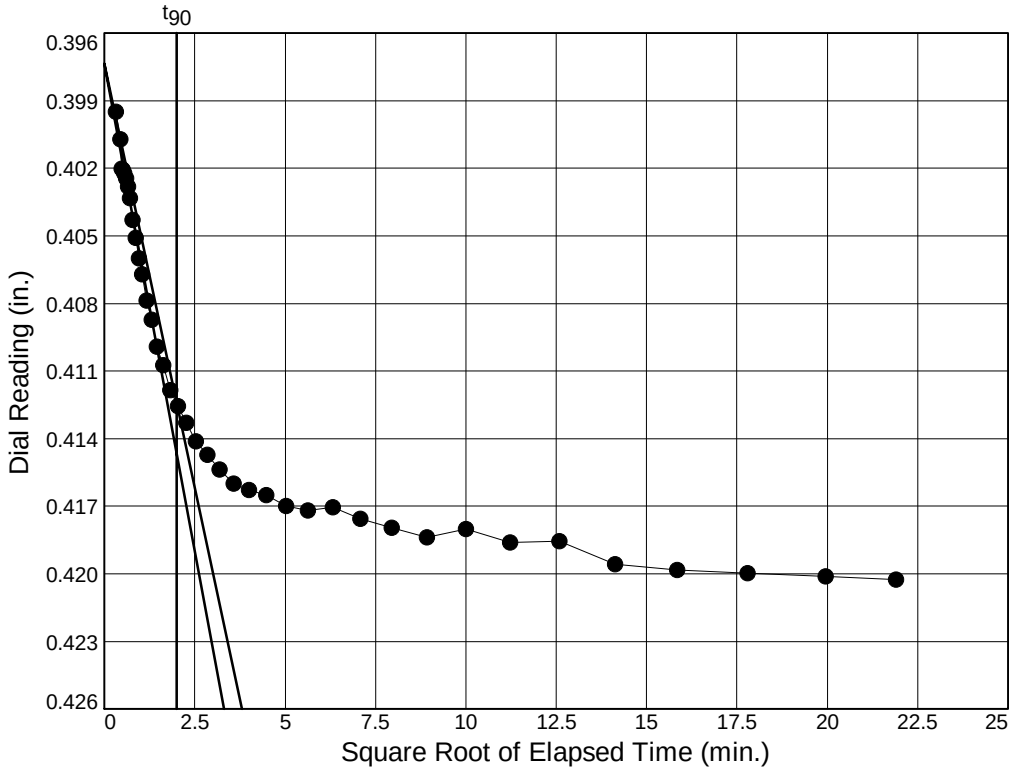
C_v @ T_{90}
0.0038 $cm.^2/sec.$

EXHIBIT: B-5

Dial Reading vs. Time

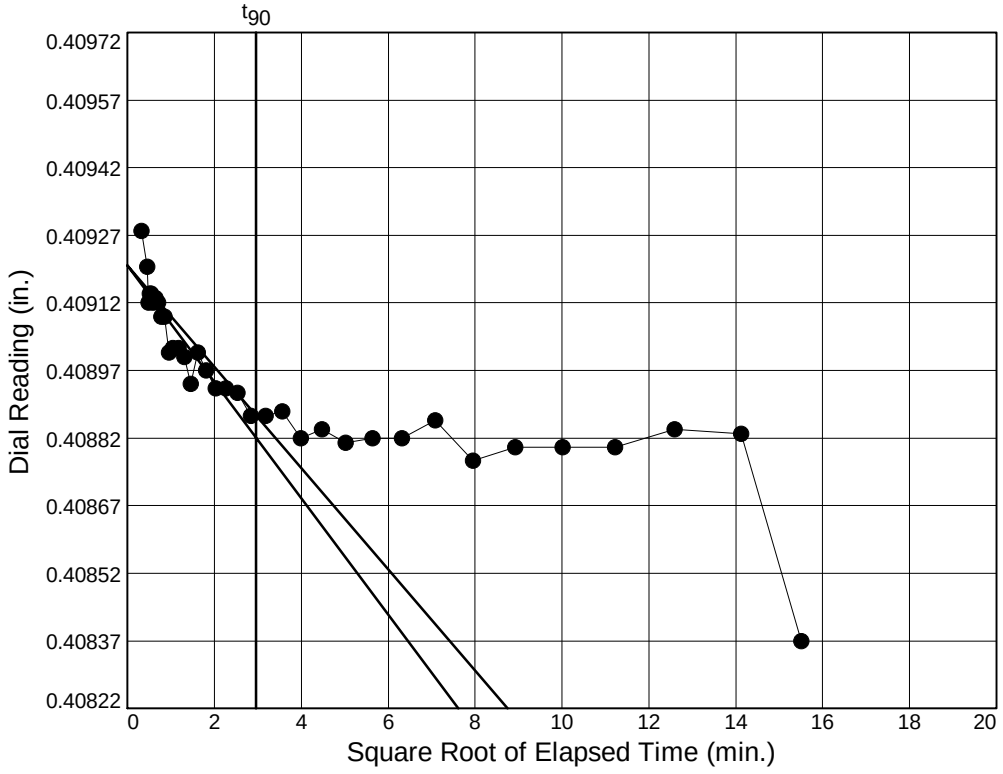
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-7 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 8
Load= 16.00 tsf
D_0 = 0.3974
D_{90} = 0.4125
D_{100} = 0.4142
T_{90} = 4.02 min.

C_v @ T_{90}
0.0042 $cm.^2/sec.$



Load No.= 9
Load= 8.00 tsf
D_0 = 0.4092
D_{90} = 0.4089
D_{100} = 0.4088
T_{90} = 8.77 min.

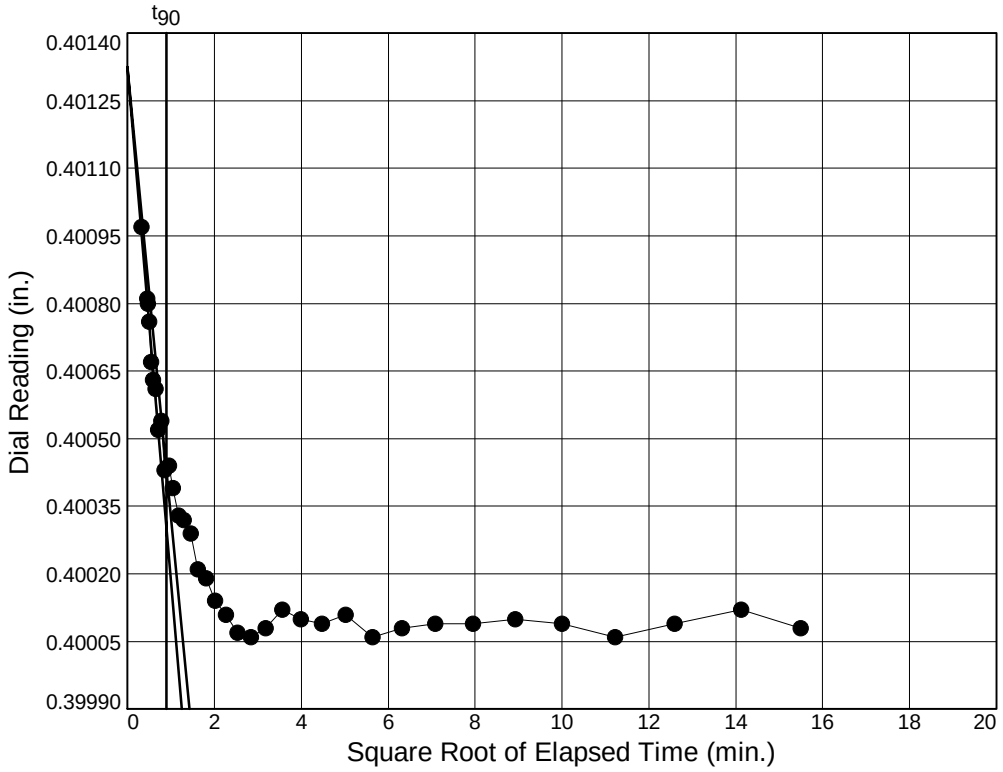
C_v @ T_{90}
0.0019 $cm.^2/sec.$

EXHIBIT: B-5

Dial Reading vs. Time

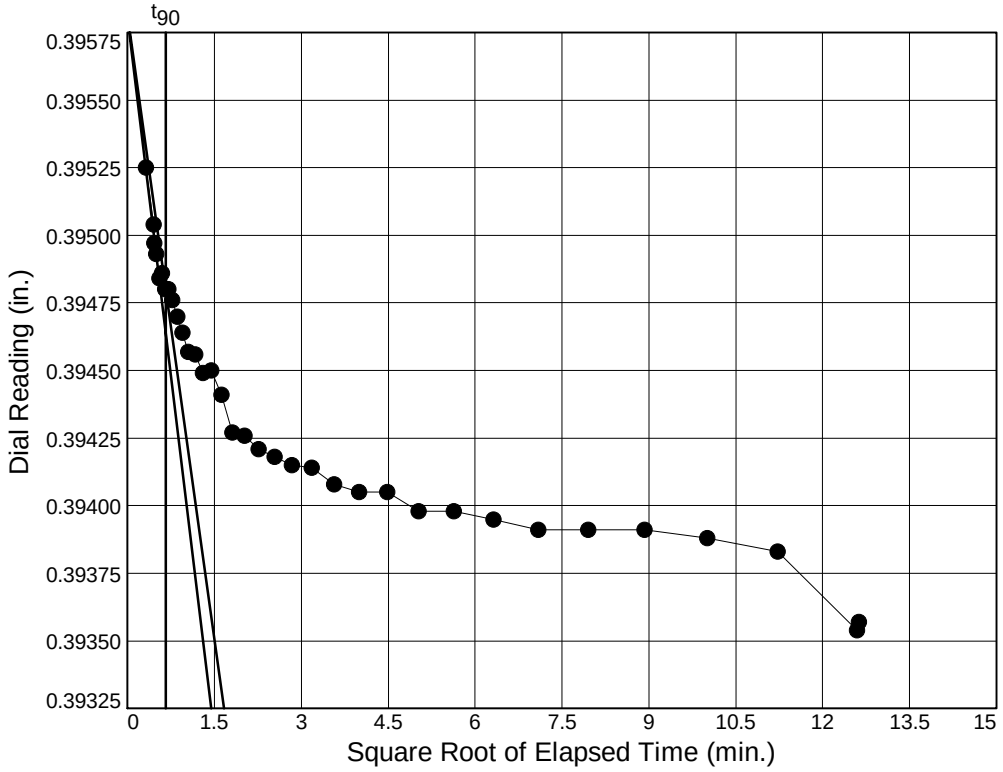
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-7 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 10
Load= 4.00 tsf
D_0 = 0.4013
D_{90} = 0.4004
D_{100} = 0.4003
T_{90} = 0.80 min.

C_v @ T_{90}
0.0210 $cm.^2/sec.$



Load No.= 11
Load= 2.00 tsf
D_0 = 0.3958
D_{90} = 0.3948
D_{100} = 0.3947
T_{90} = 0.43 min.

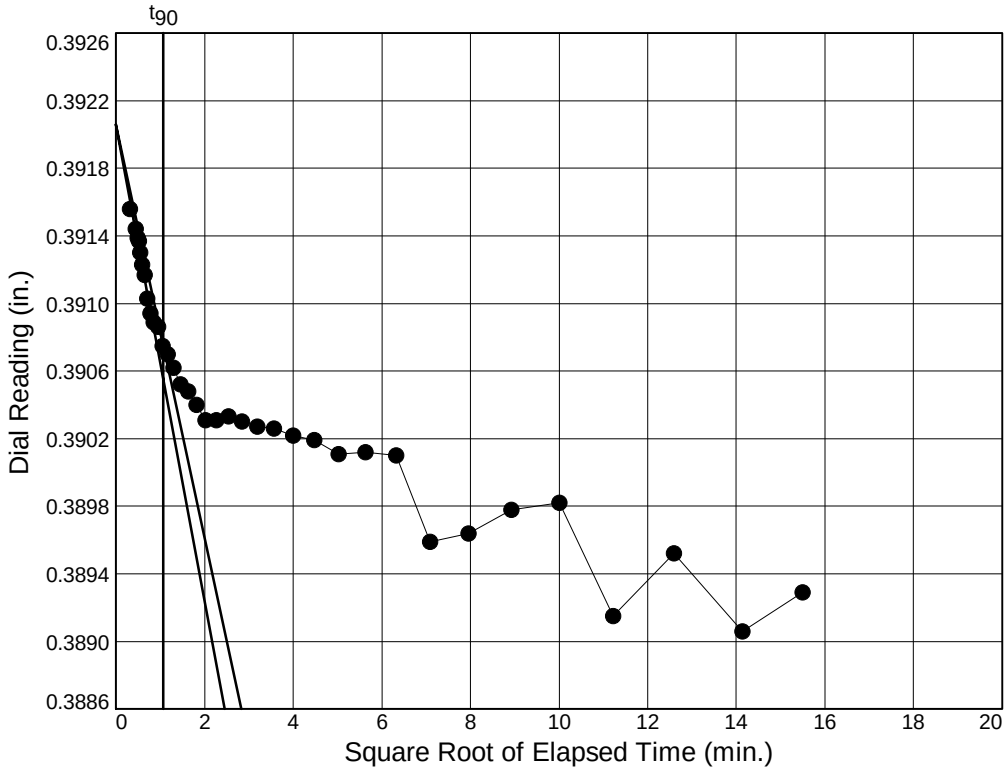
C_v @ T_{90}
0.0396 $cm.^2/sec.$

EXHIBIT: B-5

Dial Reading vs. Time

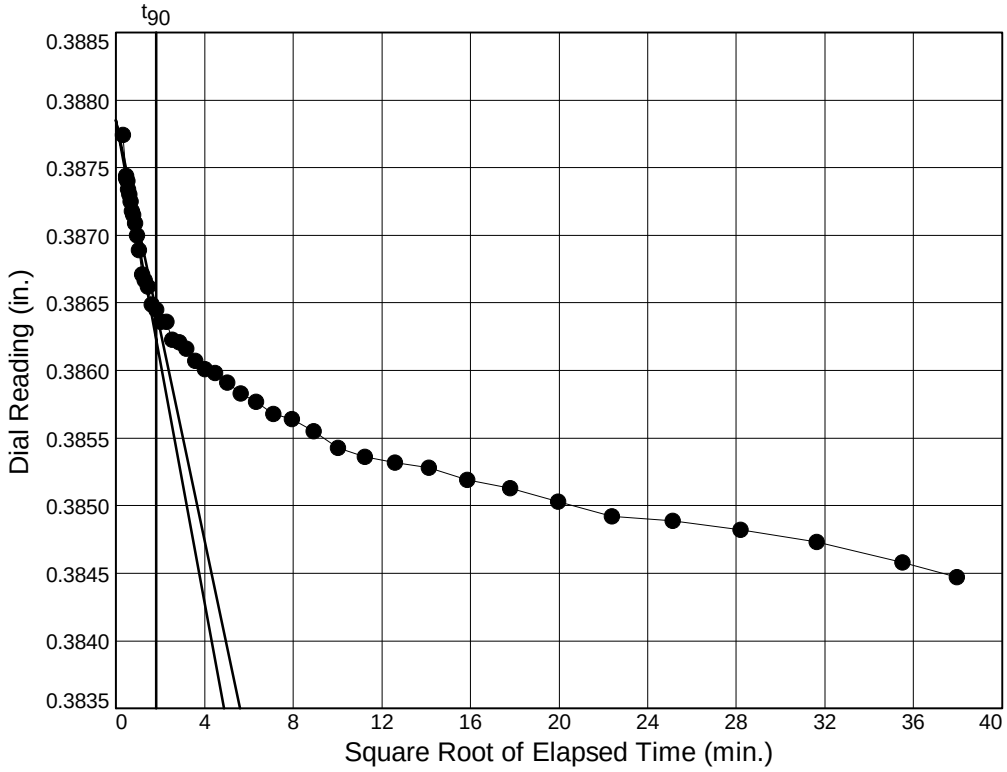
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-7 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 12
Load= 1.00 tsf
D_0 = 0.3921
D_{90} = 0.3907
D_{100} = 0.3906
T_{90} = 1.15 min.

C_v @ T_{90}
0.0150 $cm.^2/sec.$

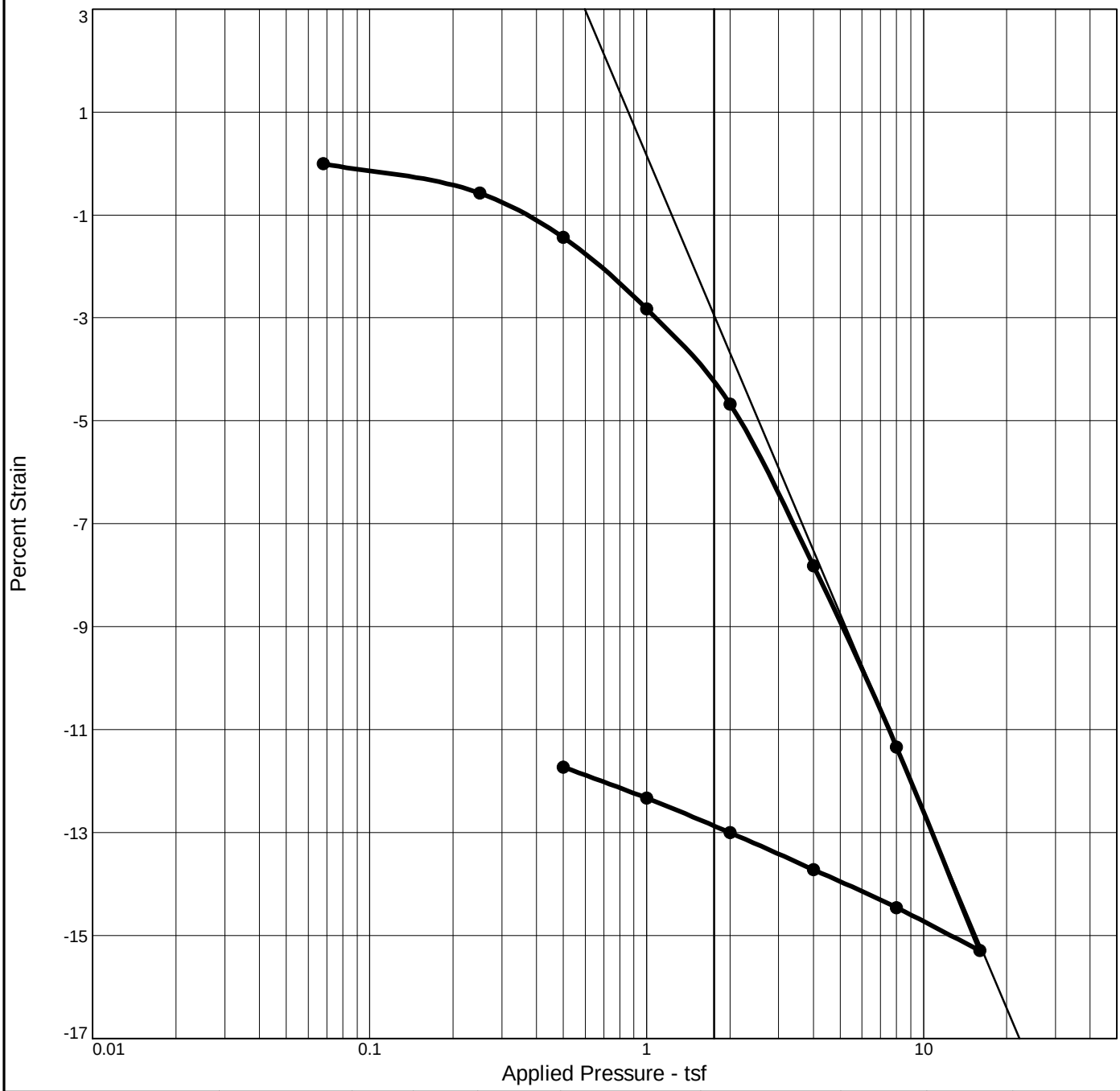


Load No.= 13
Load= 0.50 tsf
D_0 = 0.3879
D_{90} = 0.3865
D_{100} = 0.3863
T_{90} = 3.26 min.

C_v @ T_{90}
0.0054 $cm.^2/sec.$

EXHIBIT: B-5

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
95.3 %	28.2 %	93.7	X	X	2.7	1.97	2.43	0.23	0.04	0.798

MATERIAL DESCRIPTION	USCS	AASHTO
Orange Clay with Gravel	X	X

Project No. E2165009 **Client:** CDM Smith

Project: Dupont Pumping Station and Tank

Source of Sample: B-11 **Depth:** 40.0-42.0 ft **Sample Number:** N/A

Terracon Consultants, Inc.

Chattanooga, TN

Remarks:

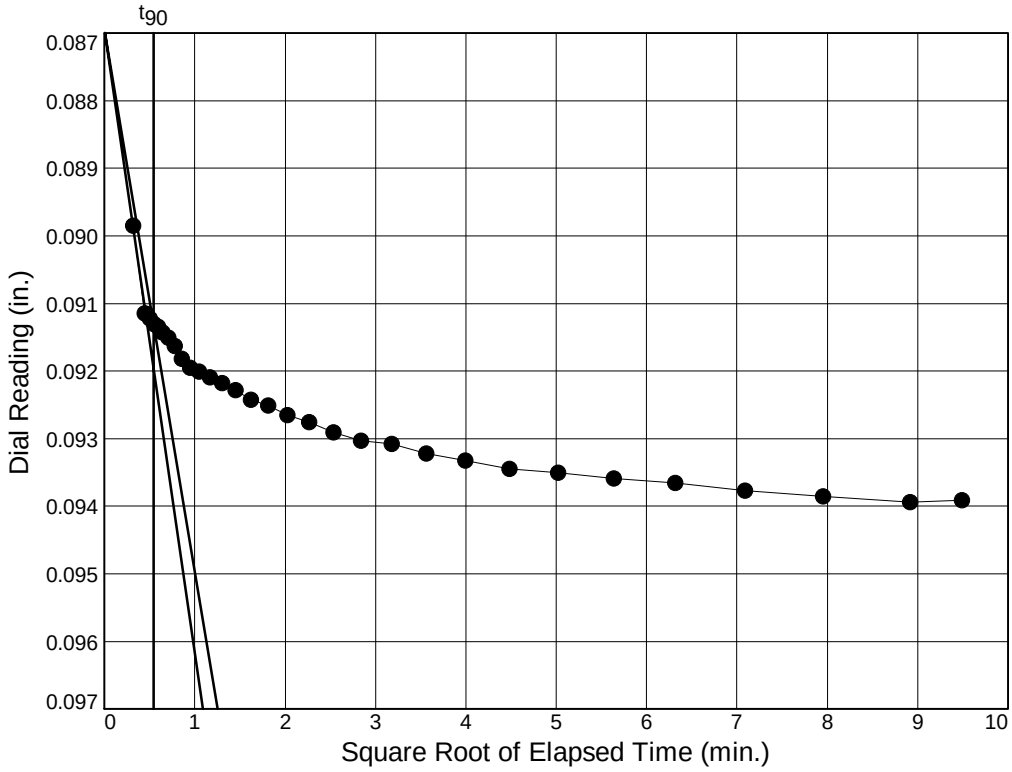
Swell pressure of 136psf.

EXHIBIT: B-6

Dial Reading vs. Time

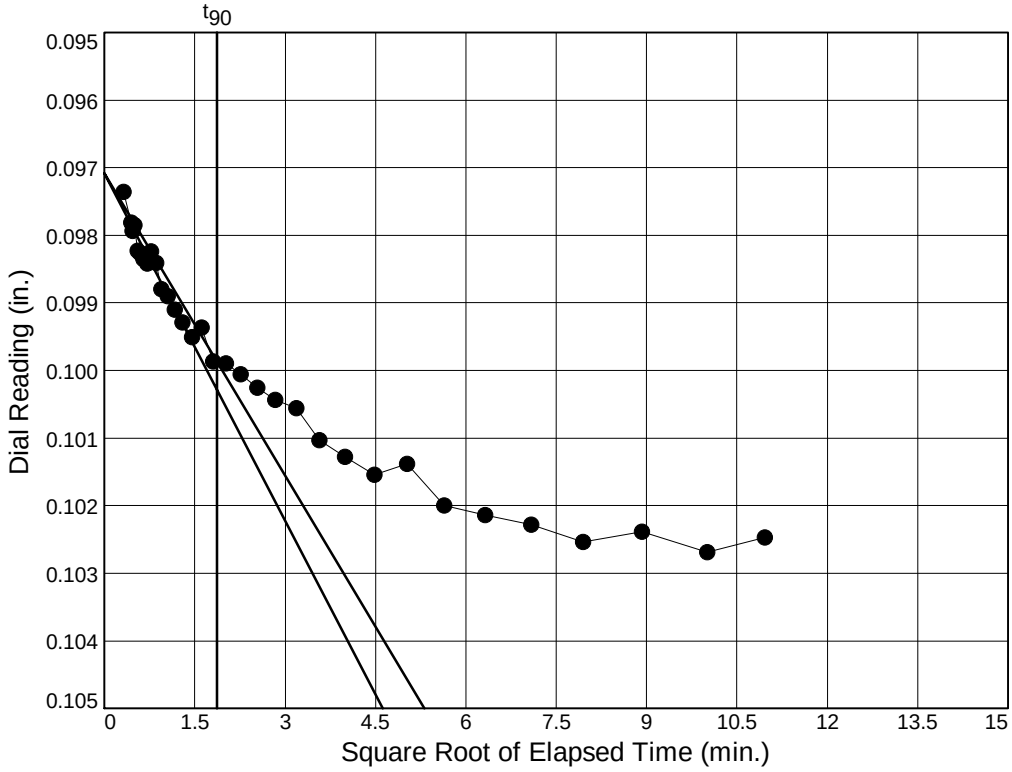
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-11 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 2
Load= 0.25 tsf
D_0 = 0.0870
D_{90} = 0.0913
D_{100} = 0.0918
T_{90} = 0.30 min.

C_v @ T_{90}
0.0766 cm.^{2}/sec.



Load No.= 3
Load= 0.50 tsf
D_0 = 0.0971
D_{90} = 0.0999
D_{100} = 0.1002
T_{90} = 3.50 min.

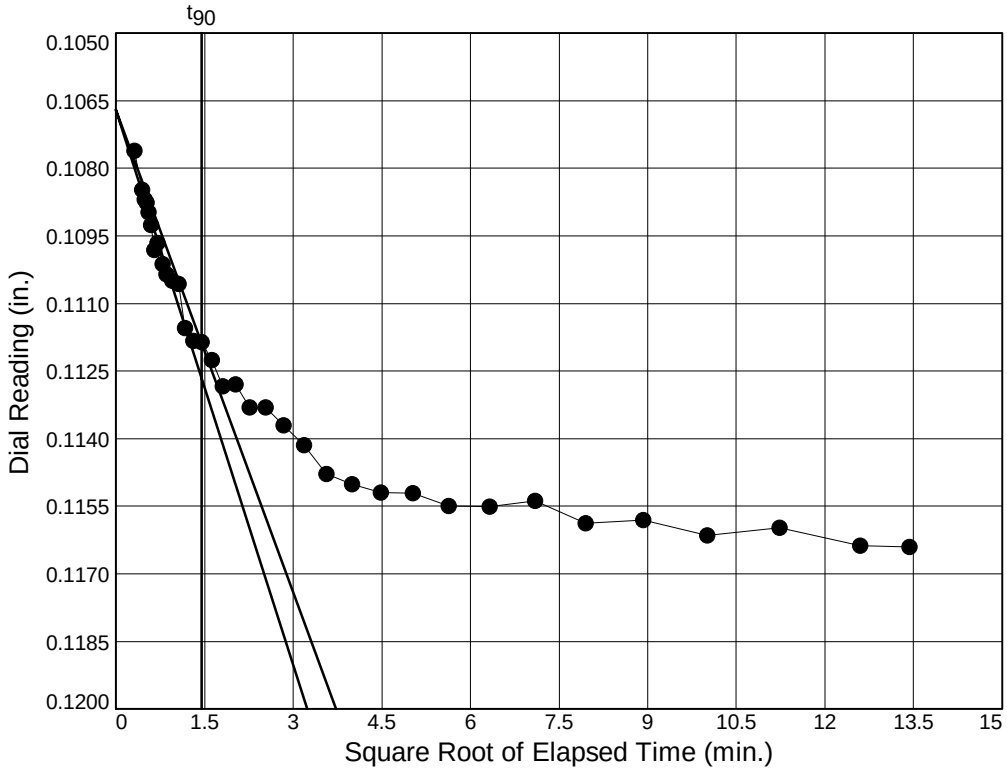
C_v @ T_{90}
0.0064 cm.^{2}/sec.

EXHIBIT: B-6

Dial Reading vs. Time

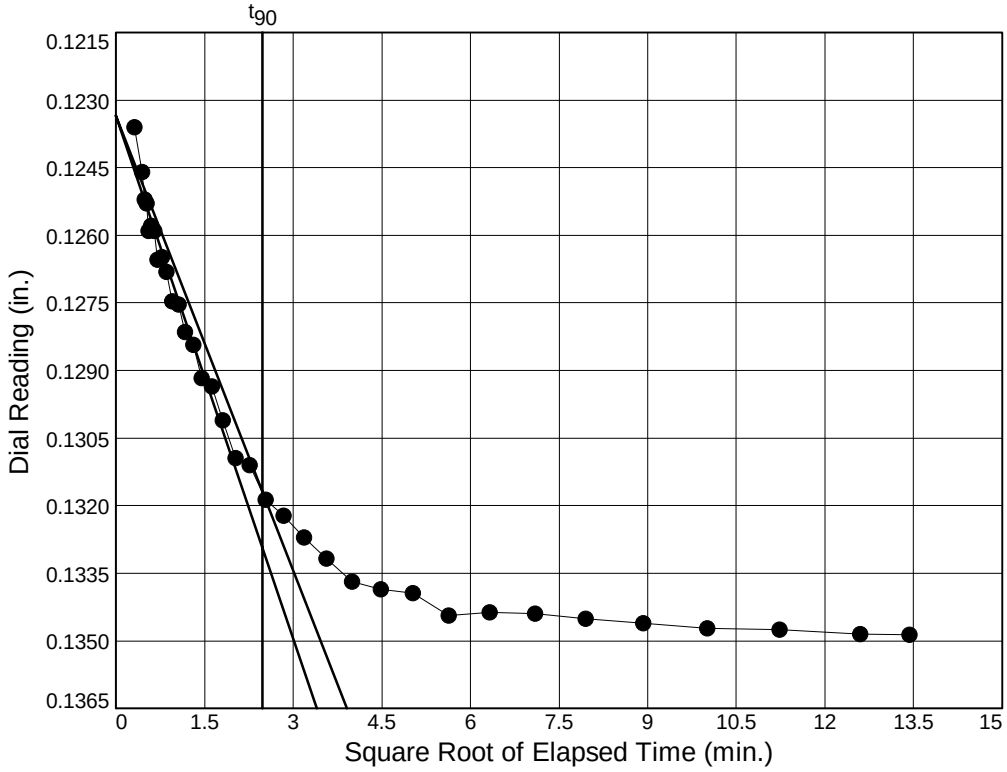
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-11 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 4
Load= 1.00 tsf
D_0 = 0.1067
D_{90} = 0.1119
D_{100} = 0.1124
T_{90} = 2.09 min.

C_v @ T_{90}
0.0105 $cm.^2/sec.$



Load No.= 5
Load= 2.00 tsf
D_0 = 0.1234
D_{90} = 0.1317
D_{100} = 0.1326
T_{90} = 6.15 min.

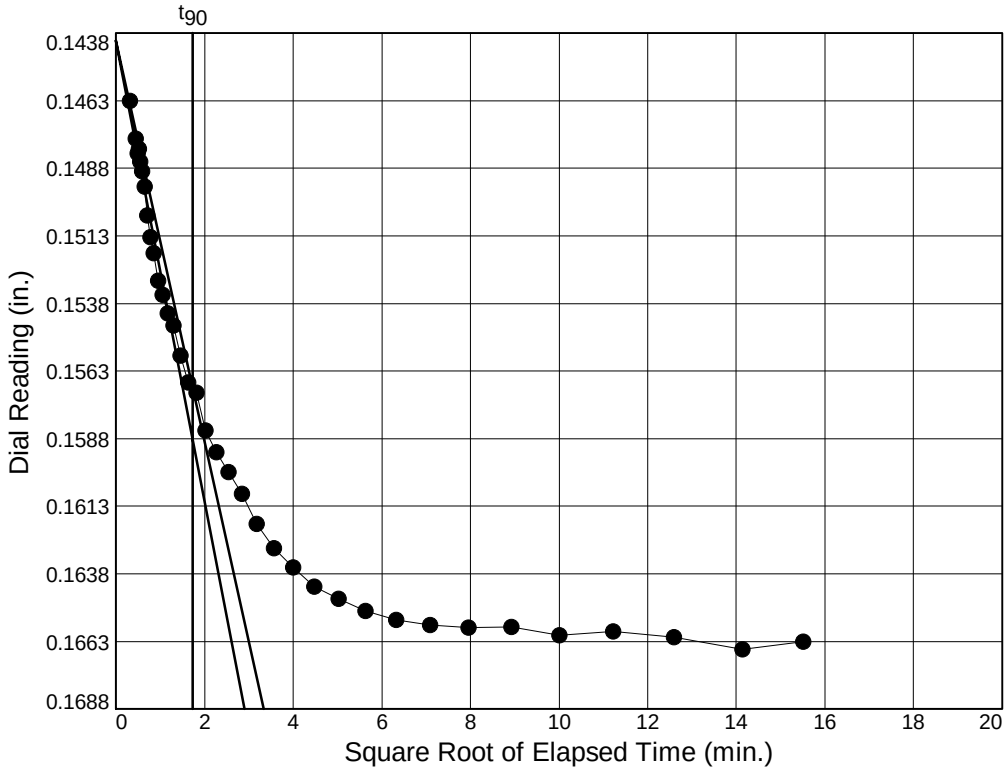
C_v @ T_{90}
0.0034 $cm.^2/sec.$

EXHIBIT: B-6

Dial Reading vs. Time

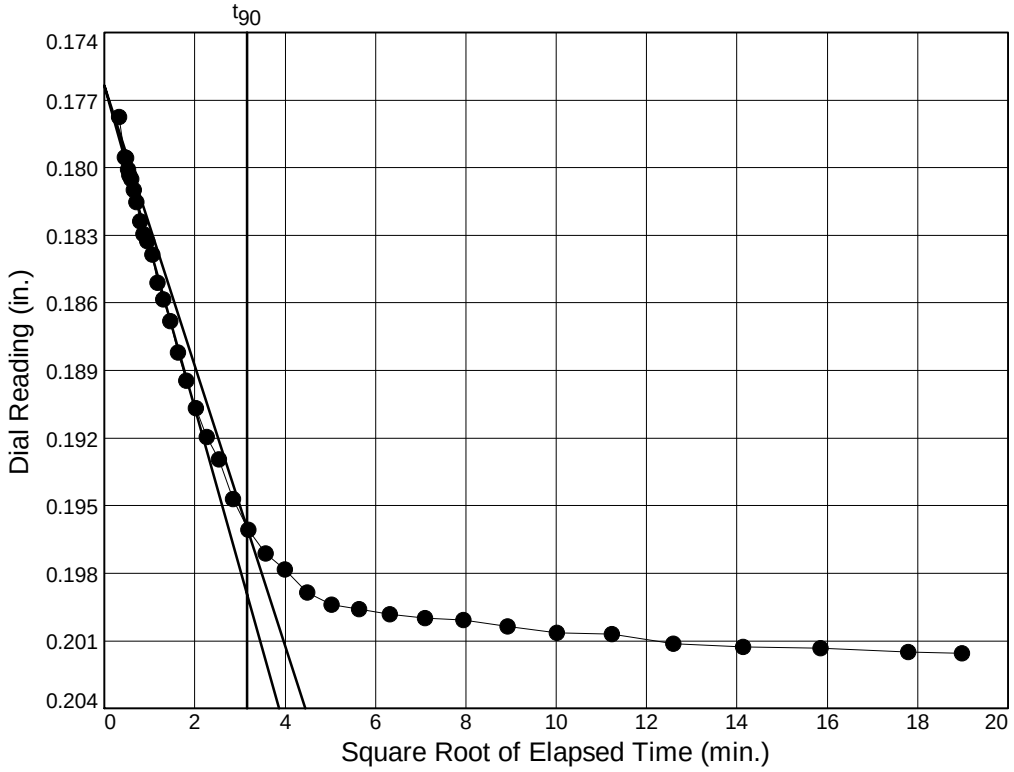
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-11 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 6
Load= 4.00 tsf
D_0 = 0.1441
D_{90} = 0.1569
D_{100} = 0.1584
T_{90} = 3.00 min.

C_v @ T_{90}
0.0067 $cm.^2/sec.$



Load No.= 7
Load= 8.00 tsf
D_0 = 0.1764
D_{90} = 0.1960
D_{100} = 0.1981
T_{90} = 9.94 min.

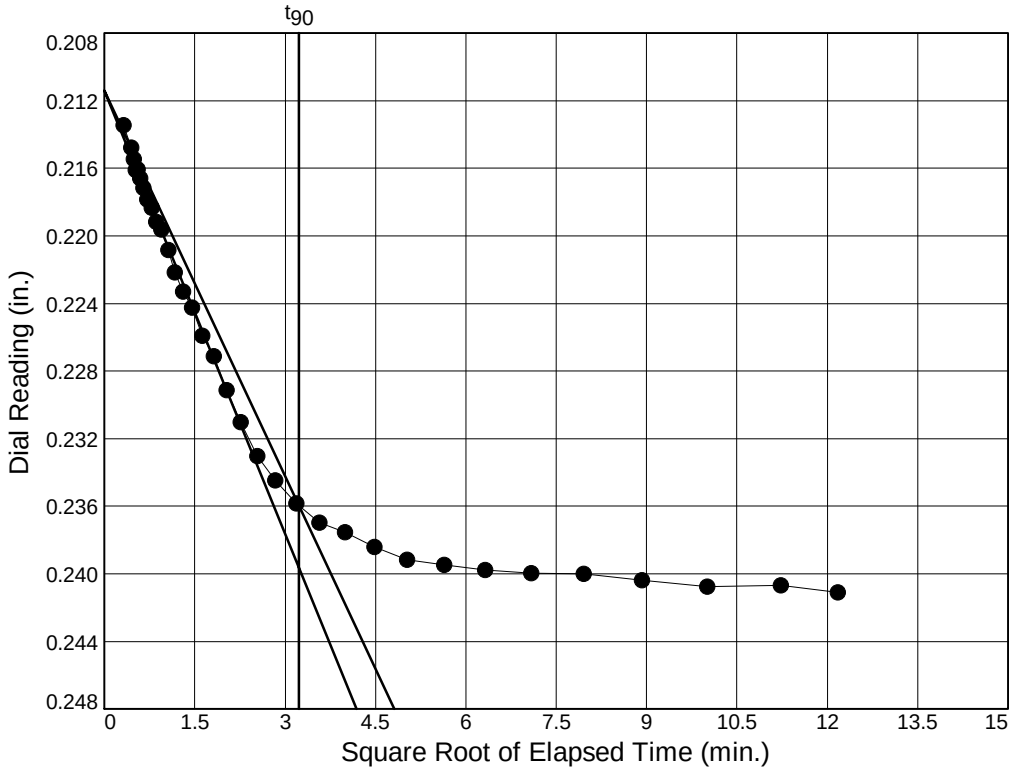
C_v @ T_{90}
0.0019 $cm.^2/sec.$

EXHIBIT: B-6

Dial Reading vs. Time

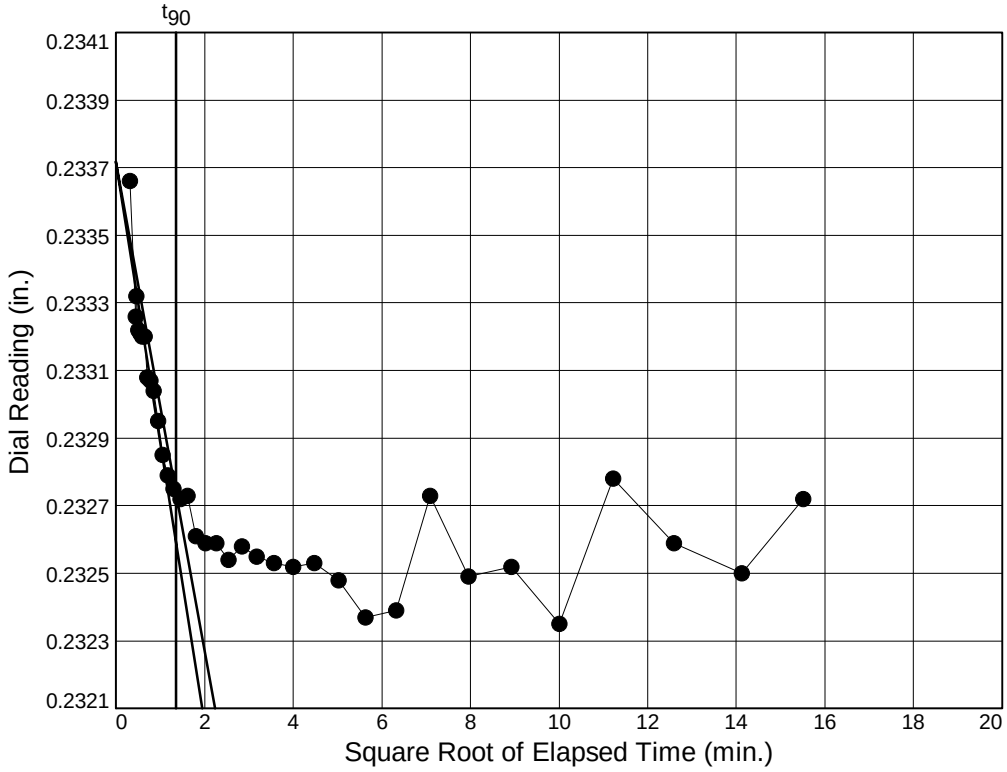
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-11 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 8
Load= 16.00 tsf
D_0 = 0.2114
D_{90} = 0.2360
D_{100} = 0.2387
T_{90} = 10.45 min.

C_v @ T_{90}
0.0016 $cm.^2/sec.$



Load No.= 9
Load= 8.00 tsf
D_0 = 0.2337
D_{90} = 0.2327
D_{100} = 0.2326
T_{90} = 1.84 min.

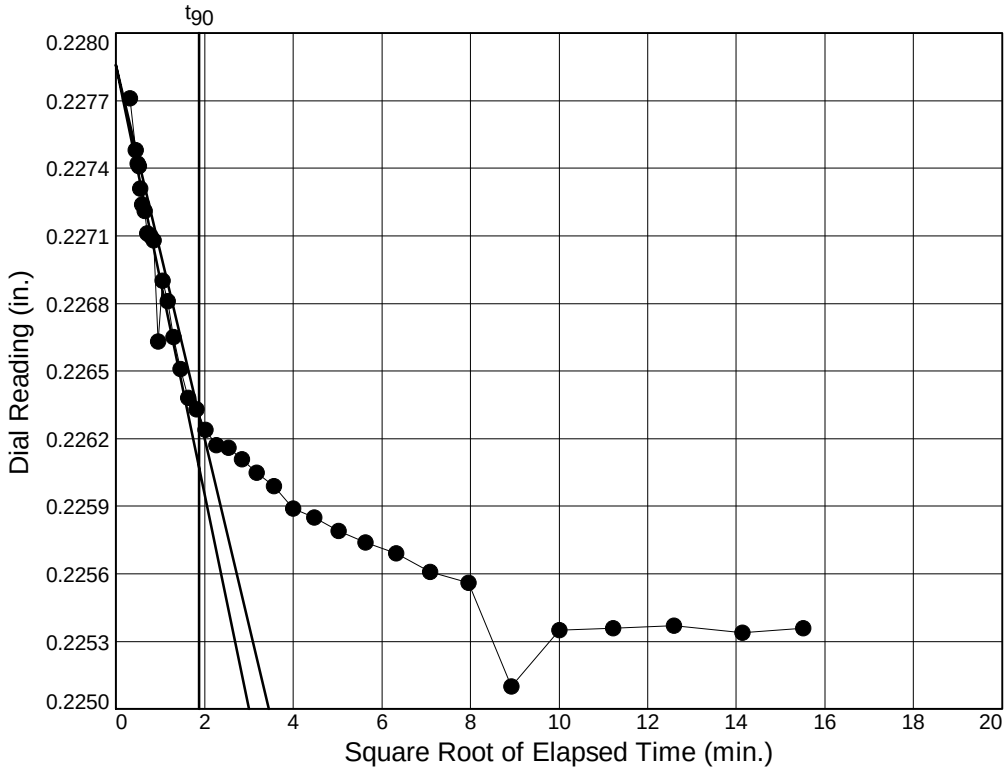
C_v @ T_{90}
0.0090 $cm.^2/sec.$

EXHIBIT: B-6

Dial Reading vs. Time

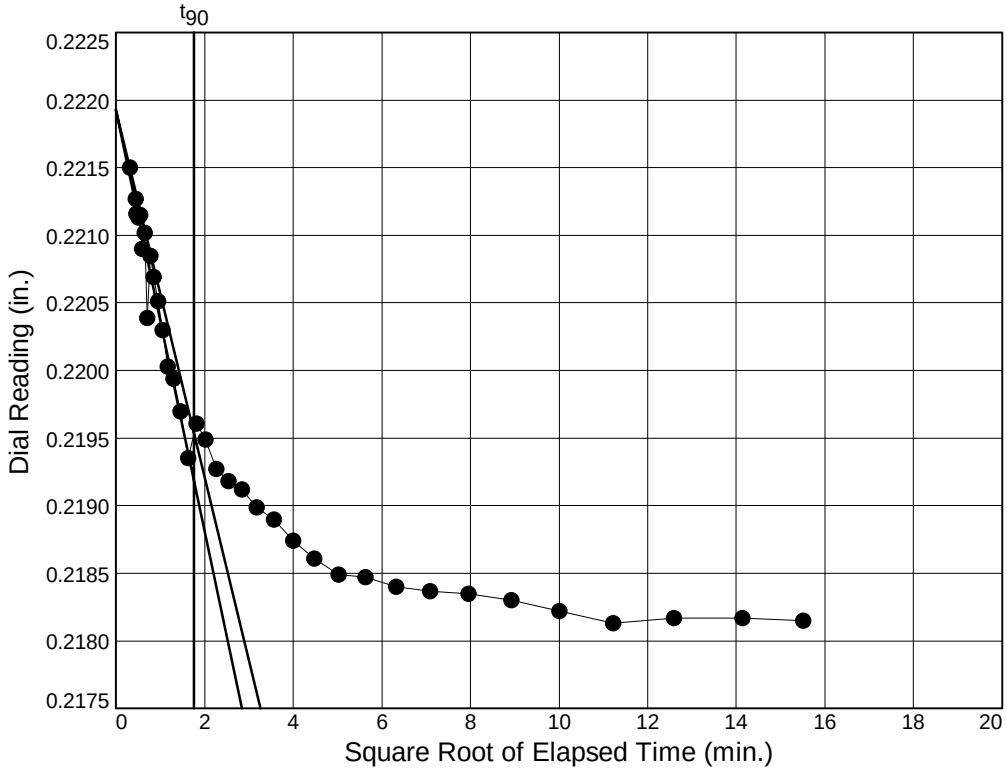
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-11 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 10
Load= 4.00 tsf
D_0 = 0.2279
D_{90} = 0.2263
D_{100} = 0.2261
T_{90} = 3.54 min.

C_v @ T_{90}
0.0048 $cm.^2/sec.$



Load No.= 11
Load= 2.00 tsf
D_0 = 0.2219
D_{90} = 0.2195
D_{100} = 0.2193
T_{90} = 3.10 min.

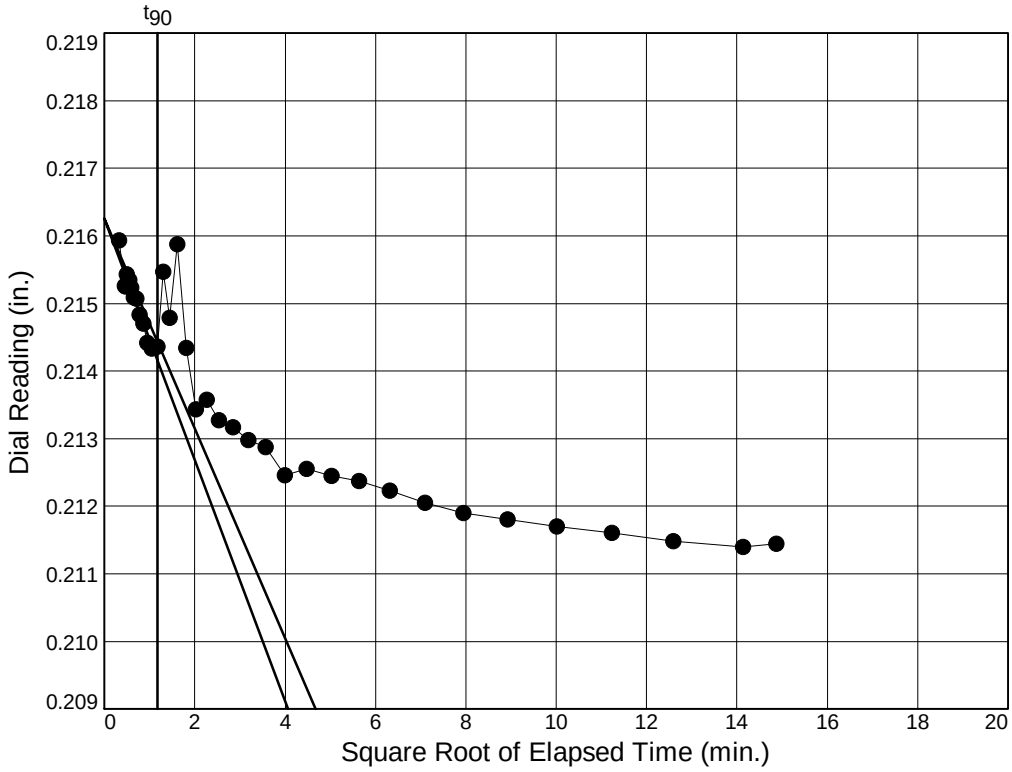
C_v @ T_{90}
0.0055 $cm.^2/sec.$

EXHIBIT: B-6

Dial Reading vs. Time

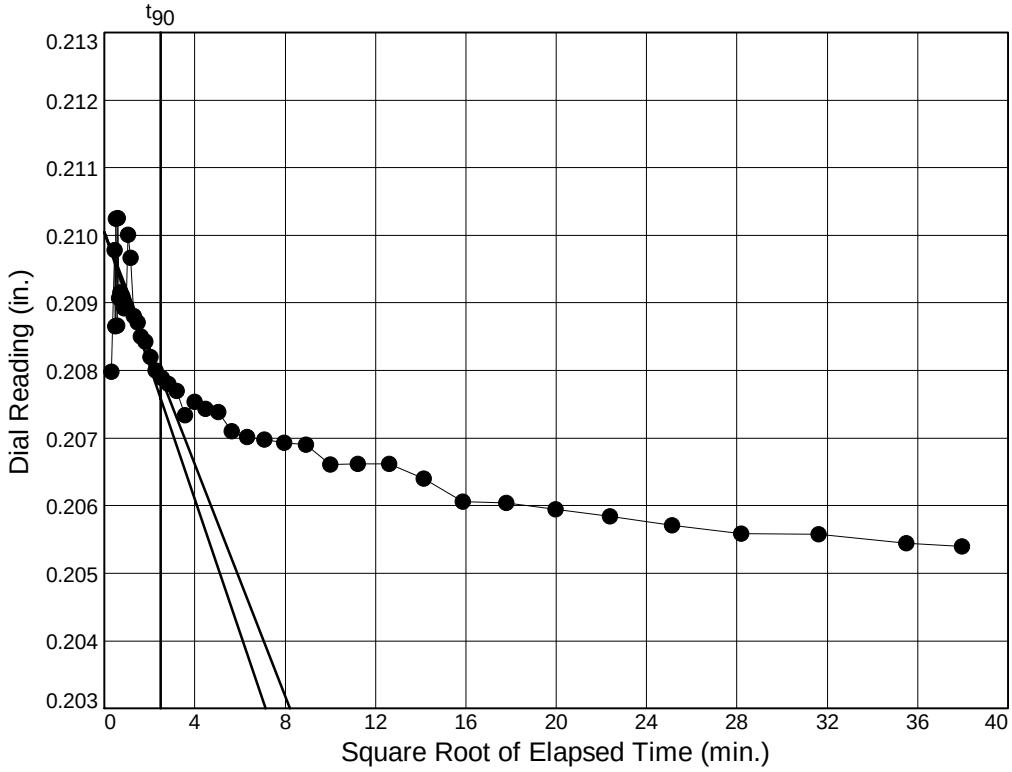
Project No.: E2165009
Project: Dupont Pumping Station and Tank

Source of Sample: B-11 Depth: 40.0-42.0 ft Sample Number: N/A



Load No.= 12
Load= 1.00 tsf
D_0 = 0.2163
D_{90} = 0.2144
D_{100} = 0.2142
T_{90} = 1.39 min.

C_v @ T_{90}
0.0125 $cm.^2/sec.$



Load No.= 13
Load= 0.50 tsf
D_0 = 0.2100
D_{90} = 0.2079
D_{100} = 0.2077
T_{90} = 6.17 min.

C_v @ T_{90}
0.0029 $cm.^2/sec.$

EXHIBIT: B-6

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING


Auger


Split Spoon


Shelby Tube


Macro Core


Ring Sampler


Rock Core


Grab Sample


No Recovery

WATER LEVEL


Water Initially Encountered


Water Level After a Specified Period of Time


Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, tsf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: 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.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

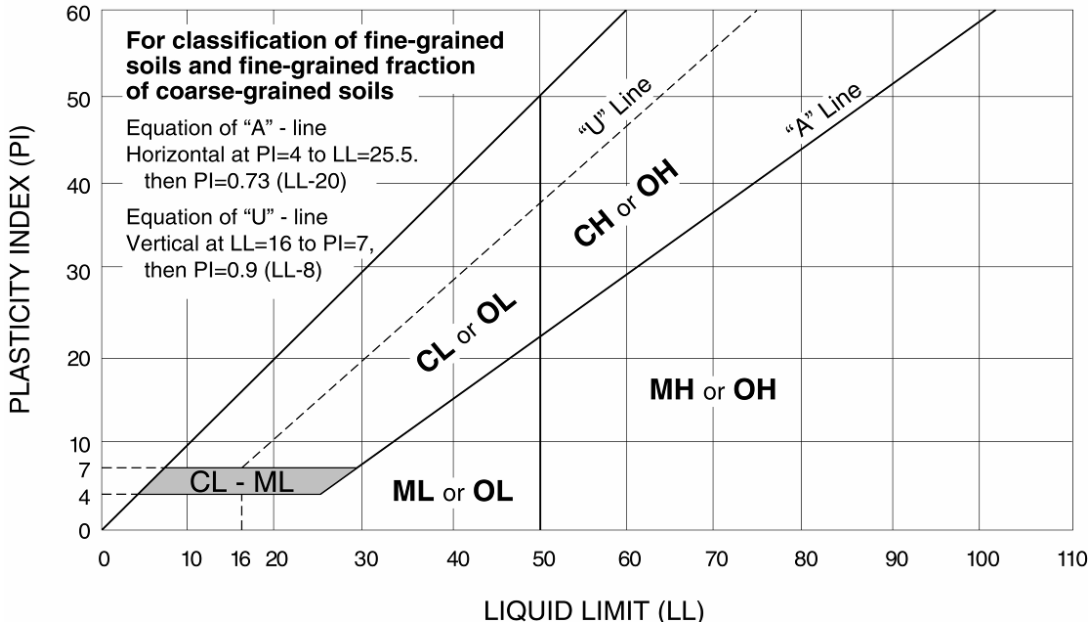
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, PSI (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft (50 – 300 mm)
Moderate	8 in – 2 ft (200 – 600 mm)	**Medium**	1 ft – 3 ft (300 – 900 mm)
Wide	2 ft – 6 ft (600 mm – 2.0 m)	**Thick**	3 ft – 10 ft (900 mm – 3 m)
Very Wide	6 ft – 20 ft (2.0 – 6 m)	**Massive**	> 10 ft (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0 degree angle.

ROCK QUALITY DESIGNATION (RQD*)	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

*The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009 Technical Manual for Design and Construction of Road Tunnels – Civil Elements

EXHIBIT B

Rendering and Description of Planned Landscaping & Screening of Property

GENERAL NOTES:

1. PROPOSED PROCESS MECHANICAL COMPONENTS INCLUDING WET WEATHER PUMP STATION, PIPING, ETC. AS SHOWN ON PRELIMINARY SITE PLAN ARE NOT INCLUDED IN THIS RENDERING. PROPOSED LOCATION WOULD BE IN FRONT OF THE BERM SHOWN.
2. IT IS ANTICIPATED THAT ALL EXISTING OLD-GROWTH TREES ALONG ELM STREET WITHIN THE LIMITS OF CONSTRUCTION WILL BE NEED TO CLEARED TO ACCOMMODATE CONSTRUCTION OF TANK, UNDERGROUND PIPING AND WET WEATHER PUMP STATION. LOCATION AND DENSITY OF NEW TREES PLANNED ALONG FENCE LINE WILL REQUIRE COORDINATION WITH FINAL LOCATION OF PROCESS COMPONENTS.
3. TREES AND LANDSCAPING SHOWN AT BERM ARE SUGGESTIONS ONLY AND DEMONSTRATE FULLY ESTABLISHED LONG TERM GROWTH OF PLANTS. FINAL PLANT SELECTIONS SHALL BE COORDINATED WITH THE LANDSCAPE DESIGNER.
4. THE DISTURBANCE SURROUNDING THE STORAGE TANK WILL BE KEPT TO A MINIMUM SO THAT VEGETATION AND SCREENING SURROUNDING THE TANK SHALL REMAIN. THIS INCLUDES A 30 FOOT BUFFER ALONG THE STREAM. ADDITIONAL VEGETATION WILL ALSO BE PLANTED TO FILL IN AND PROVIDE FOR ADDED SCREENING OF THE STORAGE TANK.

CDM Smith

9/30/16

General Decision Number: TN170146 01/06/2017 TN146

Superseded General Decision Number: TN20160146

State: Tennessee

Construction Type: Heavy
Including Water and Sewer Line Construction

Counties: Hamilton and Sequatchie Counties in Tennessee.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017

ELEC0175-012 06/01/2016

Hamilton County

	Rates	Fringes
ELECTRICIAN	$ 30.56	14.5%+6.65

ELEC0429-008 06/01/2016

Sequatchie County

	Rates	Fringes
Electrician	$ 25.42	12.17

ENGI0917-022 05/01/2015

	Rates	Fringes
Operating Engineers:		
Bulldozer and Crane	$ 26.72	9.90
Forklift	$ 24.53	9.90

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* LABO0846-001 05/01/2016

	Rates	Fringes
LABORER: Common or General	$ 14.90	5.40

SUTN2009-144 12/02/2009

	Rates	Fringes
LABORER: Flagger	$ 8.73	0.00
LABORER: Pipelayer	$ 11.68	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 16.82	0.00
OPERATOR: Loader	$ 13.50	0.00
TRUCK DRIVER: Dump Truck	$ 10.76	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

Iran Divestment Act Compliance Certification

In accordance with Tennessee Code Annotated (TCA) § 12-12-101 *et. seq*., by submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to TCA § 12-12-106.

SIGNATURE: _____

NAME PRINTED: _____

COMPANY: _____

DATE: _____