



State of Delaware
Department of Natural Resources and Environmental Control
Delaware Division of Parks and Recreation
89 Kings Highway
Dover, Delaware 19901

ADDENDUM No. ONE

Project Name: Nature Center
White Clay Creek State Park

Contract No.: NAT25805-NATCTR
Date of Issue: Monday, May 4, 2026

Notice No. 1: Attach this addendum to the Project Manual for this project. It modifies and becomes part of the Bidding Documents. Work or material not specifically mentioned herein is to be as described in the main body of the specification and as shown on the drawings.

Bids Due: Tuesday, June 2, 2026 at 1:00 p.m. (via hard copy or email, see below)
DNREC- Division of Parks and Recreation, 89 Kings Hwy, Dover DE 19901

Bid Opening: Tuesday, June 2, 2026 at 1:00 p.m.
To be conducted online via Microsoft Teams
Click [Click here to join the meeting](#).
Or join with audio-only by calling 302-504-8986 and using ID: 491 221 723#

General Information:

1. A mandatory pre-bid meeting was held April 29, 2026. The sign-in sheet is included as part of this Addendum.

Pre-bid Meeting:

1. Brief description of the scope of work: Construction of a new Nature Center Facility in White Clay Creek State Park including sitework, utilities, and facility construction.
2. There are SEVEN alternates for this project.
 - A. Alternate No. 1: Remove shrubs from parking islands (Deduct)
 - B. Alternate No. 2: Add seed mix in stormwater basin in lieu of plugs. (Deduct)
 - C. Alternate No. 3: Remove exterior stainless-steel railings, add galvanized steel railings. (Deduct)
 - D. Alternate No. 4: Remove exterior stainless-steel railings, add anodized aluminum railings. (Deduct)
 - E. Alternate No. 5: Remove green Roof Type R2, add PVC Roof Type R5. (Deduct)
 - F. Alternate No. 6: Remove stone veneer in certain locations, add fiber cement siding. (Deduct)

- G. Alternate No. 7: Remove folding glass storefront between the classroom and the outdoor covered area; add double door and fixed window. (Deduct)
- 3. There are Six Unit Prices for this Project.
 - A. UNIT PRICE No. 1: Excavation CY (Add/Deduct)
 - B. UNIT PRICE No. 2: Tree and Brush Removal EA (Add/Deduct)
 - C. UNIT PRICE No. 3: Asphalt Paving SY (Add/Deduct)
 - D. UNIT PRICE No. 4: Concrete Paving SY (Add/Deduct)
 - E. UNIT PRICE No. 5: Removal of Unsuitable Soils CY (Add/Deduct)
 - F. UNIT PRICE No. 6: Rock Excavation CY (Add/Deduct)
 - 4. There are TWO Contingency Owner's Allowances.
 - A. \$30,000 General Owners Allowance during construction
 - B. \$30,000 General Owner's Allowance for coordination of interpretive infrastructure.
 - 5. Schedule: The project may begin onsite operations after August 24, 2026.
 - 6. Phasing:
 - A. The new parking lot will need to be cleared first to be used as a staging area for the associated bridge project. The Nature Center project can use the existing nature center parking lot as a staging area until the completion of the bridge project. More detail on this will be issued in a future addendum.
 - 7. Work by Others: The septic system and IT system (cabling, devices, WIFI and server) will be installed by others. Installation timing will be coordinated with the awarded contractor.
 - 8. Contract requirements were discussed.
 - A. State of Delaware Prevailing wages ("BUILDING CONSTRUCTION") apply to this Work. A copy of the wage rate has been included in the Technical Manual.
 - B. Ten-percent security bond is required.
 - C. Performance Bond and Labor and Material Payment Bond are required.
 - 01. The forms provided in the Project Manual shall be used. Other forms will not be accepted.
 - D. The hard-copy bid is to be submitted with one original and one copy provided.
 - 01. We are also accepting, and prefer, emailed bids. They must be emailed to shawn.heacock@delaware.gov and kevin.rychlicki@delaware.gov prior to the bid deadline. Note that the state is not responsible if there is any delay in transmission or other error related to email submittals. If an email submittal is sent from the low bidder, the low bidder must provide a hard-copy original to the owner within 2 business days. If the owner requests a hard-copy of any other emailed bids, those bidders must provide a hard-copy original to the owner within 2 business days.
 - E. The number of days to complete the base work as well as alternates shall be listed on the bid form.
 - F. Limits: Confine construction operations to the limits indicated on the drawings.
 - G. Owner Occupancy: The park will remain operation during this project. Work areas shall be secured from the remainder of the park to contain construction activities and prevent public access.
 - H. The surrounding site, buildings, sidewalks, and roadways beyond the work area shall remain accessible to the Owner and general public.

- I. Keep public and private roadways, driveways, and entrances serving the premises and adjacent buildings clear and available to Owner, Owner's employees, general public, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - J. The Owner will not sign for any deliveries at any time. Contractor must be present to accept deliveries.
 - K. A noted area for contractor storage, staging, dumpster placement, and contractor parking shall be within the LOD. Any additional parking or storage areas shall be approved by the owner in writing in advance. Dumpsters shall be covered to prevent windblown debris.
 - L. The Owner is not responsible for theft or vandalism.
 - M. Any damaged or disturbed areas shall be returned to equal or better condition by the contractor.
 - N. Limited water and electric may be available in the work area.
 - O. An office trailer is required.
 - P. The contractor shall designate a superintendent who shall be on-site at all times when work is taking place. This shall include those times when the work is being done only by the subcontractors and not the General Contractor.
 - Q. Grounds must be kept clean at all times. No litter nor cutoffs tossed in holes. Extra care should be taken to protect the natural environment of the park.
 - R. Hours of Operation: Work can be completed 7:00 a.m. to 5:00 p.m. during Monday through Friday. Saturday, Sunday, and after hours work must be coordinated and approved with the Owner's representative in advance.
 - S. The construction crews will not be allowed to use the Owner's telephones or the public restrooms. A portable unit is to be provided and located in an area approved by the Owner.
 - T. Flammable materials shall be kept outside, away from all buildings, in a flammable liquid/material storage box.
 - U. Notify the Owner at least 7 days in advance of proposed operations which may result in elevated levels of noise, vibration, odors, or other disruption to the use of adjacent areas. Obtain the Owner's written permission before proceeding with disruptive operations.
 - V. White Clay Creek State Park is owned by the State and therefore are non-tobacco use areas. Tobacco shall not be used in State managed buildings or on State owned property or in vehicles parked on State managed property.
 - W. Contractor shall ensure no profanity or derogatory language is overheard by the public.
 - X. Contractor is responsible for locating and preventing damage to utilities. Because of the area, private utility location services may be needed in addition to Miss Utility.
 - Y. This project is subject to the requirements of the Build America Buy America Act.
9. Anticipated start date of the work is after August 24, 2026 as coordinated with the awarded contractor upon submission of bonds, contract, and insurances to the State of Delaware and the issuance of a State of Delaware purchase order.
10. Construction progress meetings are typically to be held bi-weekly. The owner can help schedule but contractor should coordinate the agenda, lead discussions, and provide meeting minutes.
11. We will be using Smartsheet to track submittals, RFIs, CORs, and other formal documents. It is an easy to use, web-based software which will be accessible for free and which the owner can provide tutorials on use.
12. The Bid Form was reviewed:
- A. The following requested subcontractors to be listed on the Bid Form were reviewed and accepted by those present: Sitework, Paving, Hardscape, Landscape, Masonry, Doors, Frames, and Hardware, Painting, Concrete, Roofing, Mechanical, Plumbing, Electric, Site

- Utilities, Structural Steel, Cold Formed Metal Framing, Gypsum Wall Board Assemblies, Insulation, Storefront, Ceilings, Epoxy Flooring, HVAC Controls,
- B. Each subcontractor line item is to be identified, even if the work is to be completed by the submitting contractor.
 - C. The General Contractor and subcontractors shall be licensed in the State of Delaware or have applied for a Delaware license prior to the submission of the bid.
 - D. The selected bidder shall be prepared to submit the Affidavit of Craft Training Compliance found in the project manual.
13. All questions shall be e-mailed to Shawn Heacock, shawn.heacock@delaware.gov and Kevin Rychlicki at kevin.rychlicki@delaware.gov. The deadline for questions shall be Friday, May 22, 2026 at 1:00 p.m. The last addendum will be issued no later than Thursday, May 28, 2026.
14. Bids are due Tuesday, June 2, 2026 at 1:00 p.m. Bids received after 1:00 p.m. will not be accepted nor opened. The bids will be opened live online via a Microsoft Teams videoconference at 1:00 p.m. Interested persons may join the videoconference from the cellphone app or an enabled computer by using the [meeting link](#) or using Virtual Meeting ID: 225 679 685 011 59 and Passcode: Jw6AH2X8. Audio and audio-only participation can be accessed by calling 302-504-8986 and using ID: 491 221 723#. There will be no in-person meeting.
15. Attendance of the pre-bid meeting and acquisition of the project manual and drawings (use the link in the ITB: <https://bit.ly/2TVlu2z>) are mandatory for contractors submitting a bid.
16. A list of obtained permits is available in the project manual. Any additional permits pertaining to the project shall be the responsibility of the contractor.
17. Use of drones must be approved in advance. The special use permit should be solicited from Delaware State Parks two weeks prior to the planned use. We encourage the careful use of drones in construction.

Drawing Updates/Notes:

Specifications/Project Manual Updates/Notes:

Questions:

- 1 Question: The project requires both SFRM and IFRM fireproofing methods. Can you define where each system is to be used? The drawings indicate IFRM on 3 columns in the Lower Level and 3 columns on the upper level. Please confirm these are the only locations for IFRM coatings.
 Response: We are planning to adjust the drawings and specifications to clarify this. This will be addressed in Addendum 2.
- 2 Question: LEED certification is mentioned in a couple locations in the specifications. IS LEED applicable to this project?
 Response: Response: LEED is not applicable to this project.
- 3 Question: Please provide the Geotech report for the project
 Response: Attached is the Geotechnical Report and the Supplement to the Report

- 4 Question: Are we correct to assume the structured cabling and security/access control systems are provided by the owner and the GC is required to provide raceways and boxes only? No specs are provided for these systems.
 Response: Confirmed, the GC is required to provide raceways and boxes only.
- 5 Question: Please clarify the insulation subcontractor. Is it building, pipe, etc?
 Response: A new bid form will be issued removing insulation from the subcontractor list in a future addendum.
- 6 Question: Can you combine site work and site utilities on the subcontractor list?
 Response: Leaving these separate allows contractor flexibility to use separate subcontractors. The same subcontractor can be listed for both.
- 7 Question: Is construction fencing noted on the plans?
 Response: Fencing is not noted on the plans. The awarded contractor should place fencing they deem necessary to secure their jobsite and keep the public safe.
- 8 Question: What is the estimated duration of the bridge project?
 Response: 3-4 months. The bridge project will also be able to start operations on August 24, 2026.
- 9 Question: What is the expected completion date of the nature center?
 Response: The project manual notes the State of Delaware's preference that the work will be completed 12 months from the start date. We are relying on the awarded contractor to provide their estimated time to completion in the bid form.
- 10 Question: Is the rear access to Chambers Rock Road large enough for construction vehicles?
 Response: Yes, it is a single lane stone drive that should be fine to accommodate construction vehicles.
- 11 Question: Are there site drawings for the Chambers Rock Road access?
 Response: A park map showing the layout of the stone drive has been attached to this addendum. It is recommended that contractors inspect the drive and connection to Chambers Rock Road for their own verification.

General Notes:

Attachment (Pre-Bid Attendance, Geotechnical Report and the Supplement to the Report, park map section)

End Addendum One



JOHN D. HYNES & ASSOCIATES, INC.

*Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing*

December 19, 2024

Danielle Peters
GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Re: Report of Subsurface Exploration and Geotechnical
Consulting Services
DNREC-White Clay Creek State Park Nature Center
Newark, Delaware
Project No.: JDH-10/24/220

Dear Ms. Peters:

John D. Hynes & Associates, Inc. has completed the authorized subsurface exploration and geotechnical engineering consulting services for the DNREC-White Clay Creek State Park Nature Center project in Newark, Delaware. Our services were performed, generally, in accordance with our proposal dated March 28, 2024.

This report describes the exploration methods employed, exhibits the data obtained, and presents our evaluations and recommendations for the proposed building and site improvements. In summary, we recommend that the new nature center building structural elements be supported by spread footing foundations bearing on firm, natural soils or compacted structural fill. If the recommendations of this report regarding subgrade preparation and construction are followed, a maximum allowable bearing pressure of 2,000 psf should be used to proportion the building foundations.

We appreciate the opportunity to be of service to you. If you have any questions regarding the contents of this report or if we may be of further assistance, please contact our office.

Respectfully,
JOHN D. HYNES & ASSOCIATES, INC.

for: Kelly Childs
Evan H. Cross
Geologist

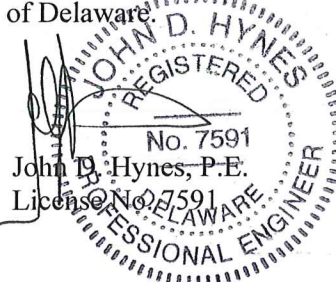
for: Richard D. Rhoads
Richard D. Rhoads, P.G.
Project Geologist

for: Amy Cross
Christian H. Matemu
Geotechnical Staff Engineer

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Delaware.

Expiration Date: 06/30/2026

EHC: CHM: RDR: JDH/kc





**REPORT OF
SUBSURFACE EXPLORATION
AND
GEOTECHNICAL CONSULTING SERVICES**

**DNREC-WHITE CLAY CREEK STATE PARK NATURE CENTER
NEWARK, DELAWARE**

**PREPARED FOR
GWWO ARCHITECTS**

**DECEMBER 19, 2024
PROJECT NO.: JDH-10/24/220**



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PURPOSE AND SCOPE

The subsurface exploration study was performed to evaluate the subsurface conditions with respect to the following:

1. General site and subgrade preparation;
2. Fill and backfill construction;
3. Foundation recommendations, including frost depth, allowable bearing capacity, and estimated foundation settlement;
4. Foundation construction and inspection procedures;
5. Earth pressure requirements for below grade walls;
6. Seismic Site Classification;
7. Floor slab support;
8. Pavement subgrade preparation and pavement cross-section design;
9. Stormwater management structure construction and infiltration test results;
10. Location of groundwater and applicable construction dewatering control procedures; and
11. Other aspects of the design and construction for the proposed structures indicated by the exploration.

An evaluation of the site, with respect to potential construction problems and recommendations dealing with earthwork and inspection during construction, is included. The inspection is considered necessary both to confirm the subsurface conditions and to verify that the soils related construction phases are performed properly.

EXISTING SITE CONDITIONS

As shown on the Project Location Map (Drawing JDH-10/24/220-A) in the Appendix, the project site is located on Creek Road in Newark, Delaware. The project site is located in a cleared and partially wooded area to the west of Creek Road and to the south of the existing White Clay Creek Park Nature Center. The site is bounded by undeveloped wooded property to the west, the existing Nature Center to the north, Creek Road to the east and undeveloped wooded property followed by Hopkins Road to the south. At the time of our exploration, the nature center building site was located on the west side of the existing Nature Center parking lot and in the field adjacent to the parking lot. The proposed parking lot and stormwater management improvements are located in an undeveloped wooded area south of the existing Nature Center facility parking lot. The site is located in a rural area and is generally surrounded by wooded property. Topographically, the site slopes gently upwards to the west.

PROJECT CHARACTERISTICS

The project includes a new Nature Center building, stormwater management improvements, and a new parking lot. The new 8,667 square foot Nature Center building will have 2 stories to be constructed using structural steel and/or timber framing. The first floor will consist of an exhibit room, a mechanical room, storage and bathroom facilities, and the main lobby. The second floor will consist of classrooms, bathroom facilities, a mud room, and an outdoor terrace and covered outdoor area. The building will be constructed with the finished floor of the 2nd story of the building at grade (Elevation El. 123) and the finished floor of the ground level of the building at grade (El 109). The site slopes downward from west (El. 123) to east (El. 109). Based on information provided by the Structural Engineer, we understand that the maximum column loads will be 115 kips and maximum wall loads will be 3 klf.



A paved parking area and stormwater management structure (SWM) are proposed for the project. The parking lot will consist of 58 parking spaces located to the south of the new nature center building. A bio-retention SWM structure is proposed to the east of the new parking lot. The remaining portion of the site will be landscape areas.

Based on the "Schematic Design Site Plan" drawing provided by CDA Engineering Inc., dated October 15, 2024, up to 8 feet of soil will be undercut on the north side of the proposed building to achieve the finished floor elevation of El. 109 for the first floor. Below grade walls are proposed on the north, east, and south sides of the building.

FIELD EXPLORATION AND STUDY

In order to determine the nature of the subsurface conditions at the site, 15 test borings were drilled at the site on November 7 and November 8, 2024 at the approximate locations shown on our Boring Location Plan (Drawing No. JDH-10/24/220-B) in the Appendix. Test borings B-1 through B-5 were drilled at the locations of the proposed building to depths of 20.5 feet below grade. Test borings TP-1 through TP-7 were drilled at the locations of the stormwater management areas to depths of 12 feet below existing grade. Test borings P-1, P-2, and P-3 were drilled to depths of 10 feet in the proposed pavement areas. The borings were drilled using a track-mounted Geoprobe 7822 DT drill rig. A bulk soil sample was collected at test boring location P-3 for California Bearing Ratio (CBR) testing.

Soil sampling and testing were carried out in accordance with ASTM Specification D-1586 for the test borings. A brief description of our field procedures is included in the Appendix. The results of all boring and sampling operations are shown on the boring logs.

Samples of the subsurface soils were examined by our engineering staff and were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM Specification D-2488. The test borings drilled at the stormwater management area were, also, classified in accordance with the United States Department of Agriculture (USDA) classification system. The estimated USCS symbols and USDA descriptions appear on the boring logs (where applicable) and keys to the systems' nomenclature are provided in the Appendix of this report. Also included are reference sheets which define the terms and symbols used on the boring logs and explain the Standard Penetration Test procedures. The Munsell soil color code description is, also, provided for each stratum, for the SWM borings.

We note that the test boring records represent our interpretation of the field data based on visual examination and selected soil classification tests. Indicated interfaces between materials may be gradual.

The field exploration data was supplemented with laboratory testing data. The laboratory at John D. Hynes & Associates, Inc. performed 4 Atterberg Limits (liquid and plastic) tests and 4 Natural Moisture Content tests. The test results are noted on the boring logs in the Appendix. A CBR test was performed on the bulk sample obtained from location P-3. The CBR and Modified Proctor test results are included in the Appendix.

SUBSURFACE CONDITIONS

At the time of our field exploration, approximately 8 to 24 inches of organic bearing soil were encountered at the ground surface at most of the boring locations. Approximately 48 inches of organic bearing soil were encountered at boring P-3. Approximately 3 inches of asphalt and 5 to 6 inches of stone were encountered at the ground surface at boring locations B-2 and B-5. Varying thicknesses of organic bearing soil, asphalt, stone, or other surficial materials may be encountered at other locations on site.



The majority of subsurface soils, visually classified in accordance with the USCS, consisted of interbedded layers of low-silt SAND (SP-SM), Silty SAND (SM), Clayey SILT (ML), Silty CLAY (CL) and Clayey SILT/Silty CLAY (MH/CH) to the boring termination depths. A layer of Organic SILT (OL) was encountered at depths of 10 to 12 feet at boring location TP-5. Decomposed rock was encountered as shallow as 4 feet in the test borings. The granular soil layers were characterized by a Standard Penetration Test (SPT) value (N-values) ranging from 9 to 14 blows per foot indicating an in-place relative density of loose to medium dense. N-values in the cohesive soil layers ranged from 7 blows per foot to 50 blows over 5 inches indicating in-place consistencies of medium stiff to hard. We note that most of the soil samples were micaceous.

Stormwater management area test samples were, also, visually classified in accordance with the USDA classification system. The classifications were Sand, Loamy sand, Silt, Silt loam, and Clay. Refer to the test boring logs in the Appendix for the USDA classification for each strata encountered.

Based on information available on the NRCS Web Soil Survey website, the site is located in an area that is mapped as the Hatboro-Codorus complex, 0 to 3 percent slopes (Hw). The typical profile for Hw soil is described as silt loam from 0 to 44 inches, sandy clay loam from 44 to 55 inches, and stratified gravelly sand to clay from 55 to 80 inches. Groundwater is typically found at depths of 0 to 6 inches.

Groundwater was not encountered at any of the soil test borings to depths of up to 20.5 feet below existing grade. Groundwater elevations may vary at other times during the year depending upon the amount of local precipitation, and the extent of local surface development.

Water level data from nearby DGS Well ID Ca55-204 is included in the Appendix for reference. The DGS well is screened from 19 feet to 25 feet below grade and penetrates the Columbia Aquifer. Water levels at the DGS well fluctuate approximately 3 to 4 feet during the year. In consideration of this information, and based on subsurface conditions, it is our opinion that the seasonal high water table (SHWT) at the project site is estimated to be approximately 3 to 4 feet higher than conditions at the time the "SWM" soil borings were drilled. We note that subsurface conditions at the DGS well site may vary from conditions at the project location.

LOCAL GEOLOGY

The site is located in the Atlantic Coastal Plain Physiographic Region. The Atlantic Coastal Plain is characterized by interbedded layers of unconsolidated sands, silts, clays and gravels. Based on information provided on the Delaware Geologic Society (DGS) Web Data Viewer, the site is mapped as the Wissahickon Formation (Cowf). The Wissahickon Formation is described as "Interlayered psammitic and pelitic gneiss with amphibolite. Psammitic gneiss is a medium- to fine-grained biotite-plagioclase-quartz gneiss with or without small garnets. Contacts with pelitic gneiss are gradational. Pelitic gneiss is medium- to coarse-grained garnet-sillimanite-biotite-plagioclase-quartz gneiss. Unit has a streaked or flasered appearance owing to the segregation of garnet-sillimanite-biotite stringers that surround lenses of quartz and feldspar. Throughout, layers of fine to medium-grained amphibolite composed of plagioclase and hornblende, several inches to 30 feet thick or as large massive bodies, are in sharp contact with the psammitic and pelitic gneisses. An attempt has been made to show some of the amphibolites mappable at the scale of the map. Granitic pegmatite is ubiquitous and occurs at all scales. Pyroxene bearing quartzite with garnet occurs locally near the contact with the Wilmington Complex. An ultramafic lens composed of cumulus layers of serpentized peridotite, metapyroxenite, and metagabbro occurs near Hoopes Reservoir. The ultramafic lens may be correlative with the Baltimore Mafic Complex".



RECOMMENDATIONS

The following recommendations and considerations are based on our understanding of the proposed construction, the data obtained from the exploration, and our previous experience with similar subsurface conditions and projects. If there are any significant changes to the project characteristics, such as revised structural loadings differing significantly from those noted above, structure geometry, structure location, elevations, etc., we request that this office be advised so the recommendations of this report can be re-evaluated.

A. Site Preparation

Prior to the construction of foundations, ground slabs, pavements, or the placement of fill in any structural areas, all existing organic materials, frozen or wet soils, excessively soft or loose soils, old foundations, rubble, abandoned utilities, ground slabs, pavement debris, miscellaneous debris, and other deleterious materials should be removed and wasted. The existing organic bearing soil should be stripped and can be stockpiled for reuse in landscape areas. If perched surface water is encountered during any grading or excavation process, Hynes & Associates should be consulted for additional recommendations regarding the stabilization of the bases of the excavations and backfilling.

After the stripping operations have been completed, the exposed subgrade soils should be inspected. The inspector should verify that organic matter has been removed from structural subgrade areas. The inspector should require the exposed subgrade materials be proofrolled utilizing a heavily-loaded dump truck or other pneumatic tired vehicle of similar size and weight. The purpose of proofrolling would be to provide surficial densification and to locate any isolated areas of soft, loose or existing fill soils requiring undercutting. Proofrolling is not advised in wet areas which may deteriorate under repeated vehicular loading. Wet areas should be drained and allowed to dry prior to proofrolling. Precipitation may result in standing water (perched water) at low areas. If the water is allowed to pond, the natural soils may deteriorate and overexcavation or subgrade improvements may be necessary at those areas. The Geotechnical Engineer should be consulted to evaluate poor subgrade conditions during construction.

Care should be exercised during the grading operations at the site. Shallow SM, ML, MH/CH, and CL materials were identified at the boring locations. These materials are moderately (SM) to highly (ML, MH/CH, CL) sensitive to changes in moisture conditions and should therefore be protected. With the exception of the single granular soil layer encountered beneath the asphalt and subbase stone at boring location B-5, the shallow soils at the site are cohesive SILTs and CLAYs and are highly sensitive to changes in moisture conditions. The contractor should be very careful to protect the subgrade by draining the site properly. The contractor should keep the site graded to direct water off of structural subgrade during the stripping and filling operation. If earthwork is performed in the presence of moisture, the traffic of heavy equipment, including heavy compaction equipment, may create pumping and a general deterioration of the subgrade soils. Construction traffic should be minimized at structural subgrade areas. If subgrade problems arise, the Geotechnical Engineer should be consulted for an evaluation of the conditions. Other subgrade stabilization methods may, also, be required. Overexcavated areas resulting from the removal of organic matter, old foundations, rubble, abandoned utilities, or otherwise unacceptable materials should be backfilled with properly compacted materials in accordance with the procedures discussed in the following section.

B. Fill Selection, Placement and Compaction

It is recommended that all materials to be used as structural fill be inspected, tested and approved by the Geotechnical Engineer prior to use. The native SM, ML and CL soils may be re-used for structural fill if it does not contain organics. Acceptable borrow material should include GW, SM, SW, ML and CL classified



in accordance with the USCS. SP material may be used as backfill for drainage material (e.g. above French Drains) Furthermore, the material to be utilized as structural fill should have a Plasticity Index (PI) less than 20. Hynes & Associates does not recommend reusing the native MH/CH for structural fill.

The importation of high quality, granular material should be allowed, and acceptable unit rates for importation and placement should be established. Sand, gravel or sand/gravel mixtures would be appropriate for wet weather placement. Otherwise, the materials noted above will be acceptable for use as structural fill. Native or imported SM, ML, and CL soils will be sensitive to alteration in moisture content and will become unworkable during and following periods of precipitation. For this reason, if earthwork is attempted in late autumn, winter or early spring, the above mentioned high quality imported granular material should be limited to those soils better than SM. SM, ML and CL materials become unworkable at moisture contents greater than 3 percentage points above optimum. The contractor would have to dry these materials or set them aside for use in landscaping areas.

Structural fill should be placed in lifts which are 8 inches or less in loose thickness and should be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557). Adjustments to the natural moisture content of the soils may be required in order to obtain specified compaction levels. Should utility construction be performed after earthwork, the Contractor should be responsible for achieving 95 percent compaction in all trench backfill. These guidelines should be set for all structural fill at the site including, but not limited to building, ground slab and pavement fills.

For the proofrolling and fill compaction operations, fill limits should be extended at least 10 feet beyond the structure exterior walls, exterior columns, pavement and slab boundaries. A sufficient number of in-place density tests should be performed by an engineering technician to verify that the proper degree of compaction is being obtained in all fill soils.

C. Structure Foundations

As discussed in the "Project Characteristics" Section, the project includes a new Nature Center building. We understand that the new Nature Center building will measure approximately 6,700 sf in plan dimensions and will be 2 stories constructed using structural steel and/or timber framing. The building will be constructed into a hillside with the finished floor of the 2nd story on the west side of the building at grade (Elevation El. 123) and the finished floor of the ground level on the eastern side of the building at grade (El 109). Based on the information provided by GWWO Architects, the building will be supported on wall and column footings. Based on structural load data provided by Structural Engineer, the maximum column load will be 115 kips and the maximum wall load will be 3 klf.

Considering current and proposed grade levels, the in-situ soil conditions and the proposed structural loadings, we recommend that the building structural elements be supported on spread footing foundations bearing on firm, natural soils or controlled, structural fill. Footings supporting structural elements for the building columns and walls may be proportioned based on a maximum allowable soil bearing pressure of 2,000 psf bearing. If our recommendations are followed, we estimate a total settlement of 1 inch or less. We estimate differential settlement to be ½ inch or less.

Some locations may be encountered where less than the required bearing is available. At those locations, compaction in the footing excavations may be necessary or minor overexcavation may yield greater soil support. For this reason, the inspection of the footing excavations by the Geotechnical Engineer is advised. Minimum dimensions of 30 inches for square footings, and 24 inches for continuous or rectangular footings should be used in foundation design to minimize the possibility of a local shear failure. All foundation



excavations should be inspected by the Geotechnical Engineer or his approved representative prior to the placement of concrete. The purpose of the inspection would be to verify that the exposed bearing materials are acceptable for the design soil bearing pressure and that loose, wet, frozen or compressible soils are not present.

Where continuous wall footings may need to be raised in elevation in a direction away from and perpendicular to other footings, footings may be gradually changed or lowered to the desired elevation using step construction procedures with a 2H:1V, or more gentle, slope. In addition, discrete column, pier or wall footings bearing at a higher elevation than lower footings should be located at a distance apart which is equal to or greater than the difference in the elevations of the footings.

In Newark, exterior footings and footings in unheated areas should be located at a depth of at least 32 inches to bottom of footing below the outside final grade to provide adequate frost cover protection. We recommend bearing the footings at 36 inches or more below final grade. If the building is to be constructed during the winter months or if the building will be subjected to freezing temperatures after footing construction, then all footings should be adequately protected during freezing periods.

Soils exposed at the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition, such as disturbance from rain or frost. Surface runoff should be drained away from the excavations and not be allowed to pond. Foundation excavations should be adequately protected from rainfall or freezing conditions.

D. Retaining Walls and Below Grade Walls

We propose recommendations for retaining walls and for basement walls. Basement walls shall be drained. Retaining walls may be drained or undrained.

Retaining walls will not restrict the lateral movement of the earth backfill, and therefore the full internal resistance of the soil will be mobilized. For this case, an active lateral earth pressure condition will apply for design. For basement walls, where the building walls restrict the lateral movement of the soil backfill, the full internal resistance of the soil will not be mobilized, and an at-rest lateral earth pressure condition will apply for design. For the above cases, we recommend the following design soil parameters:

SELECT BACKFILL – Behind unbalanced walls

Unified Soil Classification: Silty SAND (SM) or better

Angle of internal friction (ϕ) = 30°

Bulk (wet) density = 120 pcf

Retaining Walls:

Coefficient of Active Earth Pressure (K_a) = 0.33

Equivalent Fluid Pressure (EFP) = 40 pcf

Basement Walls:

Coefficient of At-Rest Earth Pressure (K_o) = 0.5

Equivalent Fluid Pressure (EFP) = 60 pcf



Unbalanced walls should be backfilled with non-plastic soils of Unified Classification Silty SAND (SM) or better. The design parameters are based on: 1) adequate drainage of backfill to prevent the accumulation of free water against the wall or within the backfill; 2) exterior granular backfill capped with a 12 inch thick layer of impervious soil; and 3) surcharge loadings from vehicles and other sources must be added to the stated earth pressure. Heavy compaction equipment must not be operated immediately adjacent to the wall.

Surcharge loads at the surface should be multiplied by 0.5 and superimposed on the recommended lateral loading. We recommend a friction factor of 0.4 to resist sliding at the base of walls which are founded on firm, natural soil.

E. Floor Slab Support

Ground supported slabs may be supported on firm, natural soils or on a layer of controlled, structural fill. The subgrade should be prepared in accordance with the procedures described in Sections A and B of this report. It is, also, recommended that a 4 to 6 inch clean, granular, leveling and load-distributing material such as washed gravel, or screened crushed stone, be used beneath the floor slabs. This material will require acquisition from off-site sources. Prior to placing the leveling and load distributing material, the slab subgrade should be free of standing water or mud. An acceptable moisture barrier should, also, be provided for the building slab. These procedures will help to prevent capillary rise and damp floor slab conditions. For native soil or fill material placed and compacted according to the procedures outlined in this report, we recommend using a value of modulus of subgrade reaction of 150 pounds per cubic inch.

F. Pavement Subgrade Preparation and Pavement Cross-Section Design

The project includes a parking lot with 58 parking spaces to be located to the south of the proposed Nature Center building. Test borings P-1, P-2, and P-3 were drilled in the proposed pavement areas to depths of 10 feet below the ground surface. Approximately 16 to 48 inches of organic soil layers were encountered at the test borings. We note that approximately 4 feet of organic bearing soil was encountered at the ground surface at test boring location P-3. The organic bearing soils shall be removed before the placement of pavement area fill and pavement layers. Below the surficial organic bearing soil, the borings identified Clayey SILT (ML) in the upper 10 feet of the subgrade. We encountered CL and MH/CH at shallow depths in other test borings.

During the exploration phase of this project, a bulk soil sample was excavated at boring location P-3 for California Bearing Ratio (CBR) testing. The CBR test result was a CBR of 3. The CBR and Modified Proctor test procedures are described in the "Investigative Procedures" section of this report, and the test results are included in the Appendix. The CBR test was performed on a Clayey SILT (ML) material.

All pavement subgrade areas should be inspected and proofrolled in accordance with Section A and B of this report. The pavement subgrade soils will consist of materials having the classifications ML in accordance with the USCS. The top 12 inches of the natural subgrades at pavement areas should be compacted to 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) prior to fill or stone placement. Areas that contain "topsoil," and organic matter should be undercut. Refer to Sections A and B for recommendations for subgrade preparation and fill construction related to areas that have organics, rubble or demolition debris at the pavement subgrade.



The following recommendations are provided for on-site pavements assuming an improved subgrade (top 12 inches compacted to 95 percent of the Modified Proctor maximum dry density), organic soils have been removed from pavement subgrade areas, approved subgrade soil types and the indicated traffic usage:

RESTRICTED AUTOMOBILE PAVEMENT AREAS

Asphalt Surface Course (Delaware Superpave 9.5 mm)	1.5 inches
Asphalt Concrete Base Course (Delaware Superpave 19 mm)	2.5 inches
Graded Aggregate Subbase (Delaware Type CR-1 or GAB Subbase)	6.0 inches

PAVEMENTS FOR BUS PARKING/DROP OFF AREA, DRIVEWAY FOR TRUCKS AND FIRE LANES

Asphalt Surface Course (Delaware Superpave 9.5 mm)	1.5 inches
Asphalt Concrete Base Course (Delaware Superpave 19 mm)	3.5 inches
Graded Aggregate Subbase (Delaware Type CR-6 or GAB Subbase)	9.0 inches

The pavement materials and construction should be in accordance with the Delaware Department of Transportation (DelDOT), State Highway Administration, Standard Specifications for Construction and Materials latest edition, and this report. The aggregate subbase should be compacted to a minimum 95 percent of the Modified Proctor (ASTM D-1557) maximum dry density. All pavement subgrade areas should be inspected, proofrolled and tested by the Geotechnical Engineer.

The pavement subgrade and pavement layers should be graded such that surface water is carried off the pavement areas and away from building areas. The surface water should not be allowed to pond. Runoff onto adjacent properties should be controlled property.

Hynes & Associates recommends that rigid pavement be designed and installed for use at trash container storage and pick-up locations. These "dumpster pad" locations receive extreme wheel loads during emptying and placement. Also, hydraulic oils usually accumulate at these areas causing a breakdown in asphalt pavement mixtures.

G. Seismic Site Classification

Hynes & Associates is providing below, the seismic site classification in accordance with the International Building Code (IBC) 2018. The code stipulates that we evaluate the strength of soil to a depth of 100 feet below grade. We used the soil properties indicated in the test boring B-1 which was drilled to a depth of 20.5 feet, and our experience locally. In consideration of the test boring data and our experience locally, it is our opinion that the average properties of the soils in the upper 100 feet of the local subsurface stratigraphy meet Site Classification "D" criteria. We note that we did not drill deep enough to encounter rock. It is possible that the site is a Class C site. Additional exploration would be required to verify another site classification.



We recommend using the following spectral design coefficients for seismic design for the DNREC-White Clay Creek State Park Nature Center project in Newark, Delaware:

Seismic Design Coefficients for Newark, Delaware	
F_a	1.6
F_v	2.4
S_s	0.182
S_1	0.047
S_{DS}	0.195
S_{D1}	0.075

These values were obtained and calculated in accordance with the IBC 2018 and ASCE 7. These are site specific design values and are based on a Site Classification of D.

H. Infiltration Testing

Infiltration tests were performed at boring locations TP-1 through TP-7. The infiltration tests were performed at depths ranging from 5 to 7 feet below the ground surface. The testing was completed at the approximate depths that were specified by CDA Engineering, Inc. Standard falling head infiltration tests were completed at each location. The testing was completed in general accordance with DNREC regulations (ASTM-D 5126). Tests performed at 5 or 6 feet below the ground surface were completed in test pits using 12 inch diameter rings. Tests performed at 7 feet below the ground surface were completed using 4 inch diameter cased boreholes. A hand auger was used to advance a boring to the test depth. The test locations, depth to groundwater, infiltration test depth, and last test increment infiltration rates are summarized in the table below.

Table 1: Summary of Infiltration Test Results

Test Location	Surface Elevation	Depth to Groundwater (ft.)	Infiltration Test Depth (ft.)	Approximate Infiltration Test Elevation (ft.)	K_m (in./hr.) (Infiltration Rate)
TP-1	105.5	NE	6.0	99.5	4.0
TP-2	107.0	NE	6.0	101.0	0.0
TP-3	108.5	NE	7.0	101.5	0.0
TP-4	109.0	NE	6.0	103.0	0.0
TP-5	112.0	NE	7.0	105.0	0.0
TP-6	114.0	NE	7.0	107.0	0.0
TP-7	104.5	NE	5.0	99.5	2.0

NE = Not Encountered (greater than 12 feet)



We note that redoximorphic features can indicate seasonal high groundwater, "perched water", or a restrictive soil layer. Redoximorphic features were not observed in the stormwater borings. Water levels at the DGS well fluctuate approximately 3 to 4 feet during the year. In consideration of this information, and based on subsurface conditions at the site, it is our opinion that the seasonal high water table (SHWT) at the project site is estimated to be 3 to 4 feet higher than the conditions at the time the stormwater "TP" soil borings were drilled. We note that subsurface conditions at the DGS well site may vary from conditions at the project location.

Refer to the "Infiltration Data Table" and "Single Ring Infiltration" test procedures in the Appendix for additional information regarding the infiltration tests. Elevations were on site plans prepared by CDA Engineering.

Based on the location of the proposed SWM structures, subsurface conditions at each of the test locations were utilized in our design evaluation. In consideration of the measured infiltration rates, we recommend design infiltration rates as summarized in Table 2. The DNREC required safety factor of 2.5 was applied to the recommended infiltration rate for falling head tests that were completed in 4 inch cased boreholes (TP-3, TP-5, and TP-6). A safety factor of 2 was applied to the recommended infiltration rate for falling head tests that were completed in 12 inch rings at the other 4 test locations.

Table 2: Recommended Design Infiltration Rates

Test Location	Recommended Infiltration Rate (in./hr.)	Approximate Elevation Range
TP-1	2.0	96.5 to 99.5
TP-2	NR	101.0 to 104.0
TP-3	NR	101.5 to 104.5
TP-4	NR	103.0 to 106.0
TP-5	NR	105.0 to 108.0
TP-6	NR	107.0 to 110.0
TP-7	1.0	96.5 to 99.5

Note: NR — Not Recommended

Based on observed soil conditions at the test locations, it is our opinion that the recommended design rates are valid as summarized in Table 2. We note that soil conditions were found to be variable across the infiltration testing locations. We note that soil conditions and infiltration rates may vary between the test locations, and may, also, vary with depth.

I. Groundwater and Drainage

Groundwater was not encountered at any of the boring locations to depths of up to 20.5 feet below existing grade. Considering the proposed construction, the contractor will likely not experience construction problems relating to the groundwater in foundation excavations. The Contractor should be prepared to dewater the lowest excavations in the event of the infiltration of precipitation. The contractor should be prepared to dewater for deep utility line excavations. If required, acceptable measures for dewatering should be implemented. These methods may include well point systems, sumping and pumping, etc. Efforts should be made to keep exposed subgrade areas dry during construction, primarily, because the soils will be susceptible



to deterioration and loss of strength in the presence of moisture. Adequate drainage should be provided at the site to minimize any increase in moisture content of the foundation and pavement subgrade soils. All pavements and site grades should be sloped away from the buildings to prevent ponding of water around them. The final site drainage should, also, be designed such that run-off onto adjacent properties is controlled properly.

ADDITIONAL SERVICES RECOMMENDED

Additional engineering, testing and consulting services recommended for this project are summarized below.

A. Site Preparation and Proofrolling Monitoring

The Geotechnical Engineer or experienced soils inspector should inspect the site after it has been stripped and excavated. The inspector should determine if any undercutting or in-place densification is necessary to prepare a subgrade for fill placement, or slab and pavement support. The inspector should verify that organic soils, organic matter, tree stumps, and demolition debris have been removed from all structural subgrade areas prior to filling operations.

B. Fill Placement and Compaction Monitoring

The Geotechnical Engineer or experienced soils inspector should witness all fill operations and take sufficient in-place density tests to verify that the specified degree of fill compaction is achieved. The inspector should observe and approve borrow materials used and should determine if their existing moisture contents are acceptable.

C. Footing Excavation Inspections

The Geotechnical Engineer should inspect all foundation excavations for the structures. He should verify that the design bearing pressures are available and that no loose or soft areas exist beneath the bearing surfaces of the foundation excavations.

D. Pavement System Inspection

Pavement subgrade soils should be inspected prior to the placement of pavement materials to verify that proper compaction has been achieved and that project specifications are being followed. A sufficient number of in place density tests should be performed to assure that the specified degree of compaction is achieved for the subgrade, the fill layers and the subbase stone layer.

REMARKS

This report has been prepared solely and exclusively for GWWO Architects. to provide guidance to design professionals in developing facilities plans for the proposed DNREC-White Clay State Park Nature Center project located in Newark, Delaware. It has not been developed to meet the needs of others, and application of this report for other than its intended purpose could result in substantial difficulties. The Consulting Engineer cannot be held accountable for any problems which occur due to the application of this report to other than its intended purpose. This report in its entirety should be attached to the project specifications.

These analyses and recommendations are, of necessity, based on the concepts made available to us at the time of the writing of this report, and on-site conditions, surface and subsurface that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to



the areal extent of the site and to depth, are representative of conditions across the site. It is, also, recommended that we be given the opportunity to review all plans for the project in order to comment on the interaction of soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices.



APPENDIX

1. Investigative Procedures
2. Project Location Map
3. Boring Location Plan
4. Boring Logs
5. California Bearing Ratio (CBR) Test Results
6. Modified Proctor Test Results
7. Earth Pressure Requirements for Below Grade Walls (Drained)
8. Earth Pressure Requirements for Below Grade Walls (Undrained)
9. Infiltration Test Results
10. Infiltration Test Procedures
11. DGS Well Ca55-204 Data
12. Unified Soil Classification Sheet
13. Field Classification Sheet
14. USDA Soil Classification System Sheet
15. Important Information Sheet



INVESTIGATIVE PROCEDURES

SOIL TEST BORINGS

Soil drilling and sampling operations were performed in accordance with ASTM Specification D-1586. The borings were advanced by mechanically turning continuous hollow stem auger flights into the ground. At regular intervals, samples were obtained with a standard 1.4 inch I.D., 2.0 inch O.D. splitspoon sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the "Standard Penetration Resistance". The penetration resistance, when properly evaluated, is an index to the soil's strength, density and behavior under applied loads. The soil descriptions and penetration resistances for each boring are presented on the Test Boring Records in the Appendix.

HAND AUGER SOIL TEST BORINGS

Test borings were performed using a hand auger. The auger is manually advanced by rotating the shaft of the auger. The auger is withdrawn at short intervals for inspection of soils collected in the auger head. Soil samples are taken when soil conditions are noted to change. The soil descriptions for each boring are presented on the boring logs in the Appendix.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigation, jar samples obtained during drilling operations are examined in our laboratory and visually classified by the geotechnical engineer in accordance with ASTM Specification D-2488. The soils are classified according to the Unified Classification System (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior.

ATTERBERG LIMITS TEST

Portions from representative soil samples obtained during drilling operations were selected for Atterberg Limits tests. The Atterberg Limits are indicative of the soil's plasticity characteristics. The liquid limit is the moisture content at which the soil will flow as a heavy viscous fluid and is determined in accordance with ASTM Specification D-4318. The plastic limit is the moisture content at which the soil begins to lose its plasticity and is determined in accordance with ASTM Specification D-4318.

NATURAL MOISTURE

Portions from representative soil samples obtained during drilling operations were selected for Natural Moisture Content tests. The Natural Moisture Content Test determines the water content of soils by drying into an oven with a standard drying temperature of 110 °C. The loss of mass drying the sample, determines the water content into the soil. The water content of the sample is calculated in percentage. The water content of soils (natural moisture) is determined in accordance with ASTM Specification D-2216.



INVESTIGATIVE PROCEDURES (CONTINUED)

CALIFORNIA BEARING RATIO

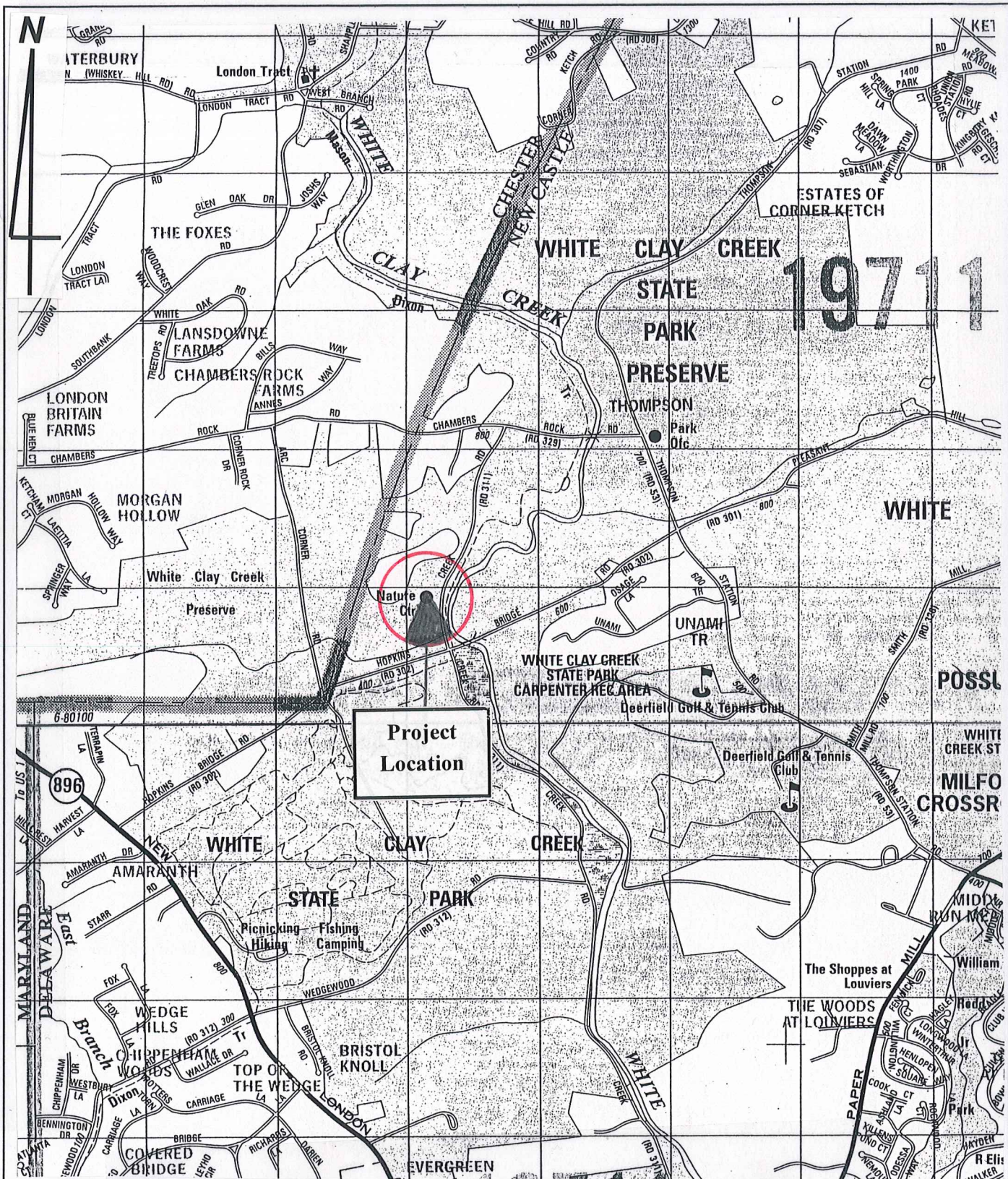
The results of the compaction testing described above were utilized in compacting samples for the laboratory California Bearing Ratio tests. The California Bearing Ratio, abbreviated as CBR, is a punching shear test. It provides data that are a semi-empirical index of the strength and deflection characteristics of a soil that has been correlated with pavement performance. This correlation has resulted in the establishment of design curves for pavement thickness.

The test is performed on a 6-inch diameter, 5-inch thick, disc of compacted soil which is confined in a steel cylinder. The specimens are first tested immediately after compaction and then soaked for four (4) days to simulate a saturated pavement subgrade.

A 1.95-inch diameter piston is forced into the soil at a standard rate and the resistance of the piston penetration is measured. The CBR is the ratio expressed as a percentage of the load at 1.0-inch piston penetration compared to the load required to produce the same penetration in a standard crushed stone.

MODIFIED PROCTOR

A bulk sample was obtained from the pavement area test boring. A MODIFIED Proctor compaction test (ASTM D 1557) was performed on this soil to determine its compaction characteristics, including its maximum dry density and optimum moisture content.



JOHN D. HYNES & ASSOCIATES, INC.

32185 Beaver Run Drive • Salisbury, Maryland 21804

410-546-6462 / Fax: 410-548-5346

Date: November 19, 2024

Scale: 1 in. = 2,000 ft.

Drawn: ADC Map

DWG. No.

JDH-10/24/220-A

Project Location Map
DNREC – White Clay Creek State Park Nature Center
Newark, Delaware



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LOG OF BORING B-1

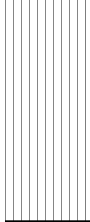
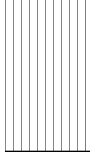
(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 20.5 feet

Depth in Feet	Surf. Elev. 118.5	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	118.5	Brownish gray, wet, stiff, silty CLAY, with trace sand		CL	1	4-5-7	Scale 1" ~ 4.5 feet
2	116.5				2	3-5-7	Approximately 18 inches of organic bearing soil was encountered at the ground surface.
4	114.5	Brown, wet, medium stiff, clayey SILT, with trace sand		ML	3	4-5-5	Groundwater was not encountered during drilling operations.
6	112.5				4	4-5-6	Laboratory Test Results
8	110.5	Brown, wet, stiff, clayey SILT (trace decomposed rock, trace micaceous)		ML	5	4-5-5	Sample No. 2 From 3 to 4.5 feet
10	108.5				6	9-13-20	Atterberg Limits Liquid Limit = 30 Plasticity Index = 8 Natural Moisture = 19.6%
12	106.5	Brown, wet, medium stiff, clayey SILT (trace decomposed rock, rock fragments, micaceous)		ML			
14	104.5						
16	102.5	Gray, wet, hard, clayey SILT (trace decomposed rock, micaceous)		ML			
18	100.5						
20	98.5	Boring terminated at 20.5 feet.					
22	96.5						
24	94.5						
26	92.5						
28	90.5						
30							



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LOG OF BORING B-2

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 20.5 feet

Depth in Feet	Surf. Elev. 114.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	114	Asphalt and stone			1	1-3-4	Scale 1" ~ 4.5 feet
2	112	Brown, wet, medium stiff, clayey SILT		ML	2	3-4-6	Approximately 3 inches of asphalt and 5 inches of stone were encountered at the ground surface.
4	110			ML	3	2-3-5	Groundwater was not encountered during drilling operations.
6	108			ML	4	2-4-6	Laboratory Test Results
8	106	Brown, wet, medium stiff, clayey SILT (decomposed rock, micaceous)		ML	5	3-5-9	Sample No. 2 From 3 to 4.5 feet
10	104			CL	6	10-29-50/5"	Natural Moisture = 23.5%
12	102	Brownish gray, wet, stiff, silty CLAY (trace decomposed rock, micaceous)		ML			Sample No. 5 From 14 to 15.5 feet
14	100			CL			Atterberg Limits
16	98			ML			Liquid Limit = 36
18	96	Brown, wet, hard, clayey SILT, with trace sand (decomposed rock, micaceous, rock fragments)		ML			Plasticity Index = 13
20	94			ML			Natural Moisture = 18.8%
22	92	Boring terminated at 20.5 feet.					
24	90						
26	88						
28	86						
30							



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LOG OF BORING B-3

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 20.5 feet

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Depth in Feet	Surf. Elev. 112.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	112	Brown, wet, stiff, clayey SILT, with trace sand		ML	1	4-6-8	Scale 1" ~ 4.5 feet
2	110	Brown, wet, stiff, clayey SILT, with trace sand (trace micaceous)		ML	2	4-5-6	Approximately 18 inches of organic bearing soil was encountered at the ground surface.
4	108			ML	3	4-5-7	Groundwater was not encountered during drilling operations.
6	106			ML	4	2-4-5	Laboratory Test Results
8	104	Gray, wet, medium stiff, clayey SILT, with trace silt		MH	5	5-8-10	Sample No. 4 From 9 to 10.5 feet
10	102			ML	6	3-12-27	Atterberg Limits Liquid Limit = 51 Plasticity Index = 22 Natural Moisture = 33.9%
12	100	Brown, wet, very stiff, clayey SILT, with some weathered rock (trace decomposed rock, trace micaceous)		ML			
14	98			ML			
16	96			ML			
18	94	Brown to orange-brown, wet, hard, clayey SILT (decomposed rock, rock fragments, micaceous)		ML			
20	92			ML			
22	90	Boring terminated at 20.5 feet.					
24	88						
26	86						
28	84						
30							



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LOG OF BORING B-4

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 20.5 feet

Depth in Feet	Surf. Elev. 116.5	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	116.5	Brown, wet, stiff, clayey SILT, with trace sand		ML	1	3-5-6	Scale 1" ~ 4.5 feet
2	114.5				2	6-7-8	Approximately 10 inches of organic bearing soil was encountered at the ground surface.
4	112.5						Groundwater was not encountered during drilling operations.
6	110.5	Brown, wet, medium stiff, clayey SILT, with trace sand (trace micaceous)		ML	3	3-4-5	Laboratory Test Results
8	108.5				4	3-5-5	Sample No. 3 From 6 to 7.5 feet
10	106.5						Atterberg Limits
12	104.5	Brownish gray, wet, stiff, clayey SILT (trace decomposed rock, micaceous)		ML	5	4-6-8	Liquid Limit = 29 Plasticity Index = 3 Natural Moisture = 26.1%
14	102.5						
16	100.5						
18	98.5	Dark brown, wet, very stiff, clayey SILT, with trace organic silt (trace decomposed rock, micaceous)		ML	6	5-7-10	
20	96.5						
		Boring terminated at 20.5 feet.					
22	94.5						
24	92.5						
26	90.5						
28	88.5						
30							



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LOG OF BORING B-5

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 20.5 feet

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Depth in Feet	Surf. Elev. 114.5	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	114.5	Asphalt and stone			1	3-4-5	Scale 1" ~ 4.5 feet
2	112.5	Brown, wet, loose, fine to coarse SAND, with little silt		SM			Approximately 3 inches of asphalt and 6 inches of stone were encountered at the ground surface.
4	110.5	Brownish gray, wet, medium stiff, clayey SILT (trace micaceous)		ML	2	5-7-8	Groundwater was not encountered during drilling operations.
6	108.5	Brown, wet, medium stiff, clayey SILT		ML	3	3-4-5	Laboratory Test Results
8	106.5	Orange-brown to gray, wet, stiff, clayey SILT, with trace sand (decomposed rock, micaceous)			4	3-4-7	Sample No. 3 From 6 to 7.5 feet Natural Moisture = 25.3%
10	104.5						
12	102.5						
14	100.5			ML	5	3-5-7	
16	98.5						
18	96.5						
20	94.5	Orange-brown, wet, hard, clayey SILT and weathered rock (rock fragments, micaceous)		ML	6	10-17-29	
22	92.5	Boring terminated at 20.5 feet.					
24	90.5						
26	88.5						
28	86.5						
30							



**HYNES
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LOG OF BORING P-1

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Date Completed: : November 8, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 10 feet

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Depth in Feet	Surf. Elev. 115.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	115	Brown, wet, medium stiff, clayey SILT		ML	1	3-3-4-5	Scale 1" ~ 4.5 feet
2	113	Brown, wet, very stiff, clayey SILT		ML	2	3-6-8-10	Approximately 16 inches of organic bearing soil was encountered at the ground surface.
4	111				3	3-6-8-11	Groundwater was not encountered during drilling operations.
6	109	Brown, wet, stiff, clayey SILT, with trace sand (trace decomposed rock, micaceous)		ML	4	3-5-7-7	Laboratory Test Results
8	107				5	3-4-6-6	Sample No. 2 From 2 to 4 feet Natural Moisture = 20.1%
10	105	Boring terminated at 10 feet.					
12	103						
14	101						
16	99						
18	97						
20	95						
22	93						
24	91						
26	89						
28	87						
30							



**HYNES
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LOG OF BORING P-2

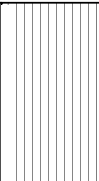
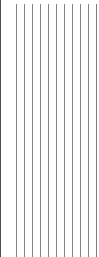
(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 10 feet

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Depth in Feet	Surf. Elev. 112.5	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	112.5	Brown, wet, medium stiff, clayey SILT, with trace sand		ML	1	4-4-5-5	Scale 1" ~ 4.5 feet
2	110.5				2	3-4-4-5	Approximately 20 inches of organic bearing soil was encountered at the ground surface.
4	108.5	Brown, wet, medium stiff to very stiff, clayey SILT, with trace sand (trace micaceous)		ML	3	3-5-7-9	Groundwater was not encountered during drilling operations.
6	106.5				4	3-4-5-5	
8	104.5				5	4-4-5-6	
10	102.5	Boring terminated at 10 feet.					
12	100.5						
14	98.5						
16	96.5						
18	94.5						
20	92.5						
22	90.5						
24	88.5						
26	86.5						
28	84.5						
30							



**HYNES
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LOG OF BORING P-3

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Date Completed: : November 8, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 10 feet

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Depth in Feet	Surf. Elev. 101.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	101	Brown, wet, stiff, clayey SILT		ML	1	3-4-5-6	Scale 1" ~ 4.5 feet
2	99	Dark brown, wet, stiff, clayey SILT, with trace organic silt		ML	2	3-5-7-8	Approximately 48 inches of organic bearing soil was encountered at the ground surface.
4	97	Brown, wet, very stiff, clayey SILT, with trace sand		ML	3	4-6-8-11	Groundwater was not encountered during drilling operations.
6	95	Brown, wet, stiff, clayey SILT (trace micaceous)		ML	4	3-5-6-8	Laboratory Test Results
8	93	Brown, wet, very stiff, clayey SILT (decomposed rock, micaceous)		ML	5	4-6-8-10	Sample No. 3 From 4 to 6 feet Natural Moisture = 15.6%
10	91	Boring terminated at 10 feet.					
12	89						
14	87						
16	85						
18	83						
20	81						
22	79						
24	77						
26	75						
28	73						
30							



**HYNES
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LOG OF BORING TP-1

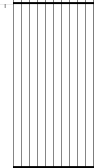
(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Date Completed: : November 8, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 12 feet

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Depth in Feet	Surf. Elev. 105.5	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	105.5	Brown, wet, stiff, silty CLAY, with trace sand (10YR 5/3, Silt)		CL	1	2-4-5-7	Scale 1" ~ 4.5 feet
2	103.5	Brown, wet, stiff, clayey SILT (10YR 5/3, Silt, trace micaceous)		ML	2	3-6-7-7	Approximately 18 inches of organic bearing soil was encountered at the ground surface.
4	101.5	Brown, wet, stiff, clayey SILT, with some sand (10YR 5/3, Silt loam, trace decomposed rock, trace micaceous)		ML	3	4-5-7-8	
6	99.5	Brown, wet, stiff to very stiff, clayey SILT (10YR 5/3, Silt, micaceous, trace weathered rock)		ML	4	5-6-5-6	Groundwater was not encountered during drilling operations.
8	97.5				5	5-7-9-11	
10	95.5				Brown, wet, very stiff, SILT, with some sand, trace clay ((10YR 5/3, Silt loam, decomposed rock, micaceous)		
12	93.5	Boring terminated at 12 feet.					
14	91.5						
16	89.5						
18	87.5						
20	85.5						
22	83.5						
24	81.5						
26	79.5						
28	77.5						
30							



**HYNES
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LOG OF BORING TP-2

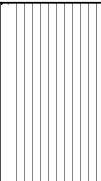
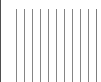
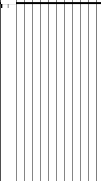
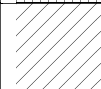
(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Date Completed: : November 8, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 12 feet

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Depth in Feet	Surf. Elev. 107.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	107	Brown, wet, medium stiff to stiff, clayey SILT, with trace sand (10YR 5/3, Silt)		ML	1	2-3-4-4	Scale 1" ~ 4.5 feet Approximately 16 inches of organic bearing soil was encountered at the ground surface. Groundwater was not encountered during drilling operations.
2	105				2	3-5-7-8	
4	103	Brown, wet, very stiff, clayey SILT, with trace sand (10YR 5/3, Silt)		ML	3	3-5-7-9	
6	101	Brown, wet, vstiff to very stiff, clayey SILT, with little sand (10YR 5/3, Silt loam, trace decomposed rock, trace micaceous)		ML	4	4-7-7-8	
8	99				5	5-7-9-10	
10	97	Gray, wet, medium stiff, silty CLAY (10YR 6/2, Clay, trace micaceous)		CL	6	3-4-4-6	
12	95	Boring terminated at 12 feet.					
14	93						
16	91						
18	89						
20	87						
22	85						
24	83						
26	81						
28	79						
30							



**HYNES
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ASSOCIATES**

LOG OF BORING TP-3

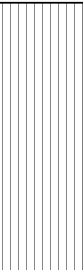
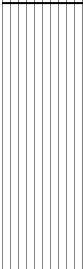
(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Date Completed: : November 8, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 12 feet

Depth in Feet	Surf. Elev. 108.5	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	108.5	Brown, wet, medium stiff to stiff, clayey SILT, with trace sand (10YR 5/3, Silt)		ML	1	3-4-5-5	Scale 1" ~ 4.5 feet Approximately 12 inches of organic bearing soil was encountered at the ground surface. Groundwater was not encountered during drilling operations.
2	106.5				2	3-4-5-6	
4	104.5				3	3-5-6-7	
6	102.5	Grayish brown, wet, very stiff, clayey SILT, with trace sand (10YR 5/3-6/2, Silt loam, trace decomposed rock, rock fragments, micaceous)		ML	4	4-8-10-12	
8	100.5				5	5-7-11-13	
10	98.5				6	6-8-10-12	
12	96.5	Boring terminated at 12 feet.					
14	94.5						
16	92.5						
18	90.5						
20	88.5						
22	86.5						
24	84.5						
26	82.5						
28	80.5						
30							



**HYNES
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ASSOCIATES**

LOG OF BORING TP-4

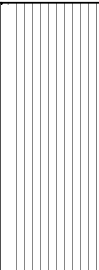
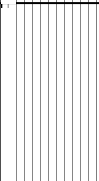
(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Date Completed: : November 8, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 12 feet

Depth in Feet	Surf. Elev. 109.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	109	Brown, wet, medium stiff to stiff, clayey SILT, with little sand (10YR 5/3, Silt loam, micaceous)		ML	1	3-4-4-5	Scale 1" ~ 4.5 feet Approximately 14 inches of organic bearing soil was encountered at the ground surface. Groundwater was not encountered during drilling operations.
2	107				2	3-5-5-6	
4	105				3	4-5-6-7	
6	103	Brown, wet, medium stiff, clayey SILT, with little sand (10YR 5/3, Silt loam, trace decomposed rock)		ML	4	3-3-4-5	
8	101				5	2-3-4-4	
10	99	Gray, wet, stiff, silty CLAY (10YR 6/2, Clay, trace micaceous)		CL	6	2-4-6-8	
12	97	Boring terminated at 12 feet.					
14	95						
16	93						
18	91						
20	89						
22	87						
24	85						
26	83						
28	81						
30							



**HYNES
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LOG OF BORING TP-5

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 12 feet

Depth in Feet		Surf. Elev. 112.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	112	Brown, wet, medium stiff to stiff, clayey SILT, with trace sand (10YR 5/3, Silt) Brown to orange-brown, wet, stiff, clayey SILT (10YR 5/3-6/8, Silt, trace decomposed rock, micaceous) Brown, wet, very stiff, clayey SILT, with trace sand, trace organic silt (10YR 5/3, Silt, trace decomposed rock, micaceous) Dark brown, wet, medium stiff, organic SILT, with trace peat (10YR 5/3, Peat) ML ML ML OL 1 2 3 4 5 6 2-3-5-5 2-4-5-8 4-5-6-9 3-5-6-6 4-5-8-9 3-3-4-4 Scale 1" ~ 4.5 feet Approximately 8 inches of organic bearing soil was encountered at the ground surface. Groundwater was not encountered during drilling operations.						
2	110							
4	108							
6	106							
8	104							
10	102							
12	100	Boring terminated at 12 feet.						
14	98							
16	96							
18	94							
20	92							
22	90							
24	88							
26	86							
28	84							
30								



**HYNES
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LOG OF BORING TP-6

(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

Project No.: JDH-10/24/220

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 12 feet

Depth in Feet	Surf. Elev. 114.0	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	114	Brown, wet, medium stiff, clayey SILT, with trace sand (10YR 5/3, Silt)		MH/CH	1	2-3-4-5	Scale 1" ~ 4.5 feet
2	112	Brown, wet, stiff, clayey SILT, with trace sand (10YR 5/3, Silt, trace micaceous)		ML	2	4-5-6-7	Approximately 18 inches of organic bearing soil was encountered at the ground surface.
4	110			ML	3	3-5-5-7	Groundwater was not encountered during drilling operations.
6	108			ML	4	4-5-6-6	
8	106	Brown, wet, stiff, clayey SILT, with some sand, (10YR 5/3, Silt loam, trace micaceous, trace decomposed rock)		ML	5	3-6-6-8	
10	104	Brownish gray, wet, stiff, silty CLAY, with trace sand, trace micaceous (10YR 5/3-6/2, Clay)		CL	6	4-4-6-6	
12	102	Boring terminated at 12 feet.					
14	100						
16	98						
18	96						
20	94						
22	92						
24	90						
26	88						
28	86						
30							



**HYNES
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LOG OF BORING TP-7

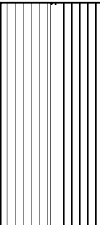
(Page 1 of 1)

GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

DNREC-White Clay Crk. State Park Nature Ctr.

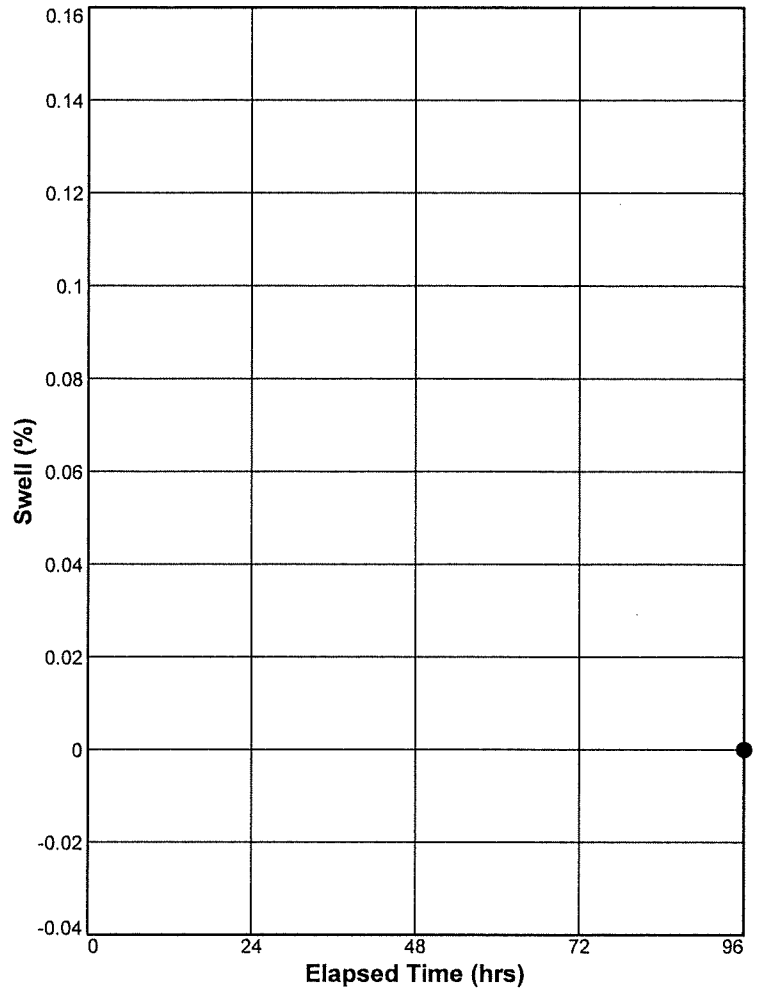
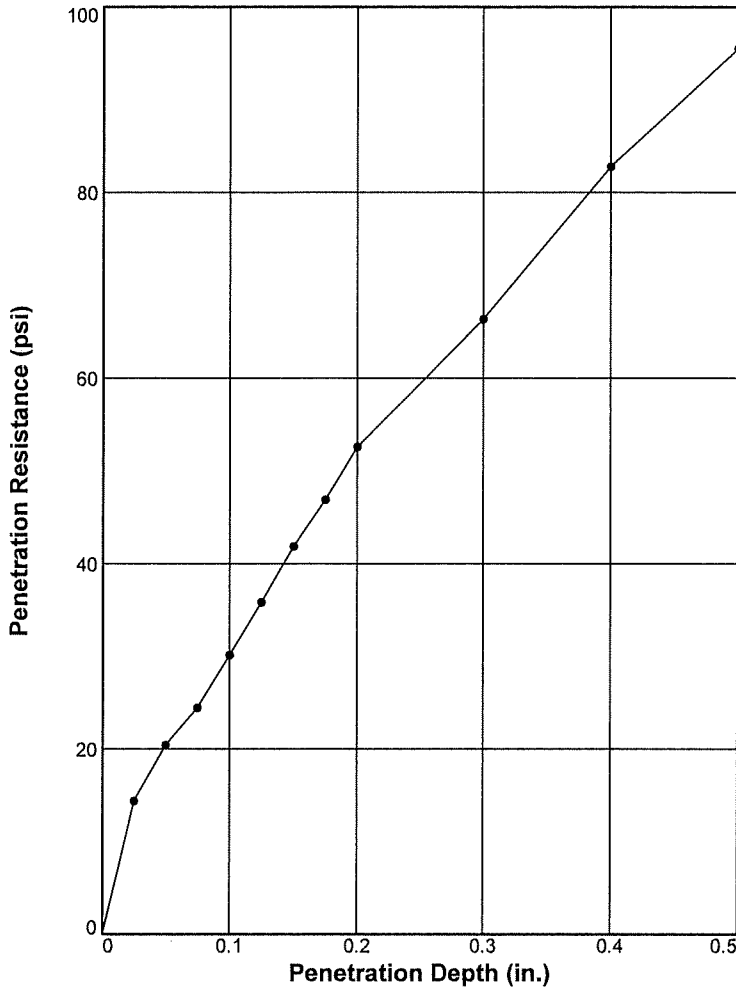
Project No.: JDH-10/24/220

Date Completed: : November 7, 2024
Logged By: : E. Cross
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 12 feet

Depth in Feet	Surf. Elev. 104.5	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blow count	REMARKS
0	104.5	Brown, wet, medium stiff to stiff, clayey SILT, with trace sand (10YR 5/3, Silt)		ML-MH	1	3-4-5-5	Scale 1" ~ 4.5 feet Approximately 24 inches of organic bearing soil was encountered at the ground surface. Groundwater was not encountered during drilling operations.
2	102.5				2	3-5-6-7	
4	100.5				3	5-7-9-11	
6	98.5	Brown, wet, very stiff to stiff, clayey SILT (10YR 5/3, Silt, micaceous, trace weathered rock)	ML	4	3-5-6-8		
8	96.5	Brown, wet, stiff to hard, SILT, with some sand (10YR 5/3, Silt loam, decomposed rock, micaceous)		ML	5	4-6-6-8	
10	94.5		6		9-8-19-20		
12	92.5	Boring terminated at 12 feet.					
14	90.5						
16	88.5						
18	86.5						
20	84.5						
22	82.5						
24	80.5						
26	78.5						
28	76.5						
30							

BEARING RATIO TEST REPORT

AASHTO T 193-10



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	102.8	97.4	23.6	102.8	97.4	24.1	3.0	3.5	0.000	15	0
2 ▲											
3 ■											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown Clayey SILT, with trace sand (ML)							ML	105.5	17.6		

Project No: JDH-10/24/220

Project: DNREC - White Clay Creek

Location: P-3

Sample Number: 16802

Date Sampled: 11-08-2024

Date Received: 11-08-2024

Test Remarks:

BEARING RATIO TEST REPORT
John D. Hynes & Associates, Inc.

Figure _____

Tested By: KAZ _____

BEARING RATIO TESTING RESULTS (AASHTO T 193-10)

Date Sampled: 11-08-2024 **Date Received:** 11-08-2024
Project No.: JDH-10/24/220
Project: DNREC - White Clay Creek
Location: P-3
Sample Number: 16802
Material Description: Brown Clayey SILT, with trace sand (ML)
USCS Classification: ML
Liquid Limit: **Plasticity Index:**

Test Description:
Maximum Dry Density, pcf : 105.5 **Optimum Moisture Content, %:** 17.6
Testing Remarks:

Sample 1 (56 Blows; Surcharge: 15 lbs.)

Water Content

Wt. Wet Soil+Tare, gms. 976.4 Wt. Soil+Tare, gms. 871.3 Wt. Tare, gms. 426.1 **Moisture, % 23.6**

Unit Weight

Wt. Mold+Soil, lbs. 26.780 Wt. Mold, lbs. 17.426 Ht. Soil, in. 4.5 **Density, pcf 102.8**

Swell Data

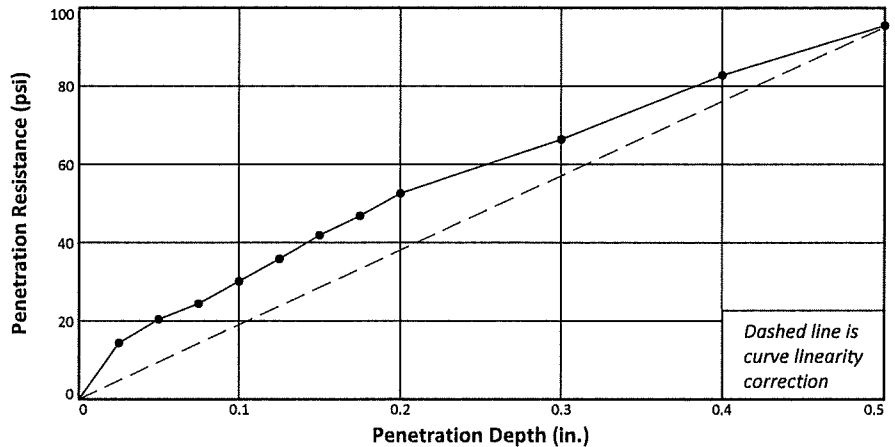
Elapsed Time, hrs.	Dial Reading in. x 1,000	Swell %
0	.3258	0.0
96	.325	0.0

Final Water Content

	Wt. Wet Soil+Tare, gms.	Dry Soil+Tare	Tare	Moisture, %
1)	971.5	870.5	451.9	24.1

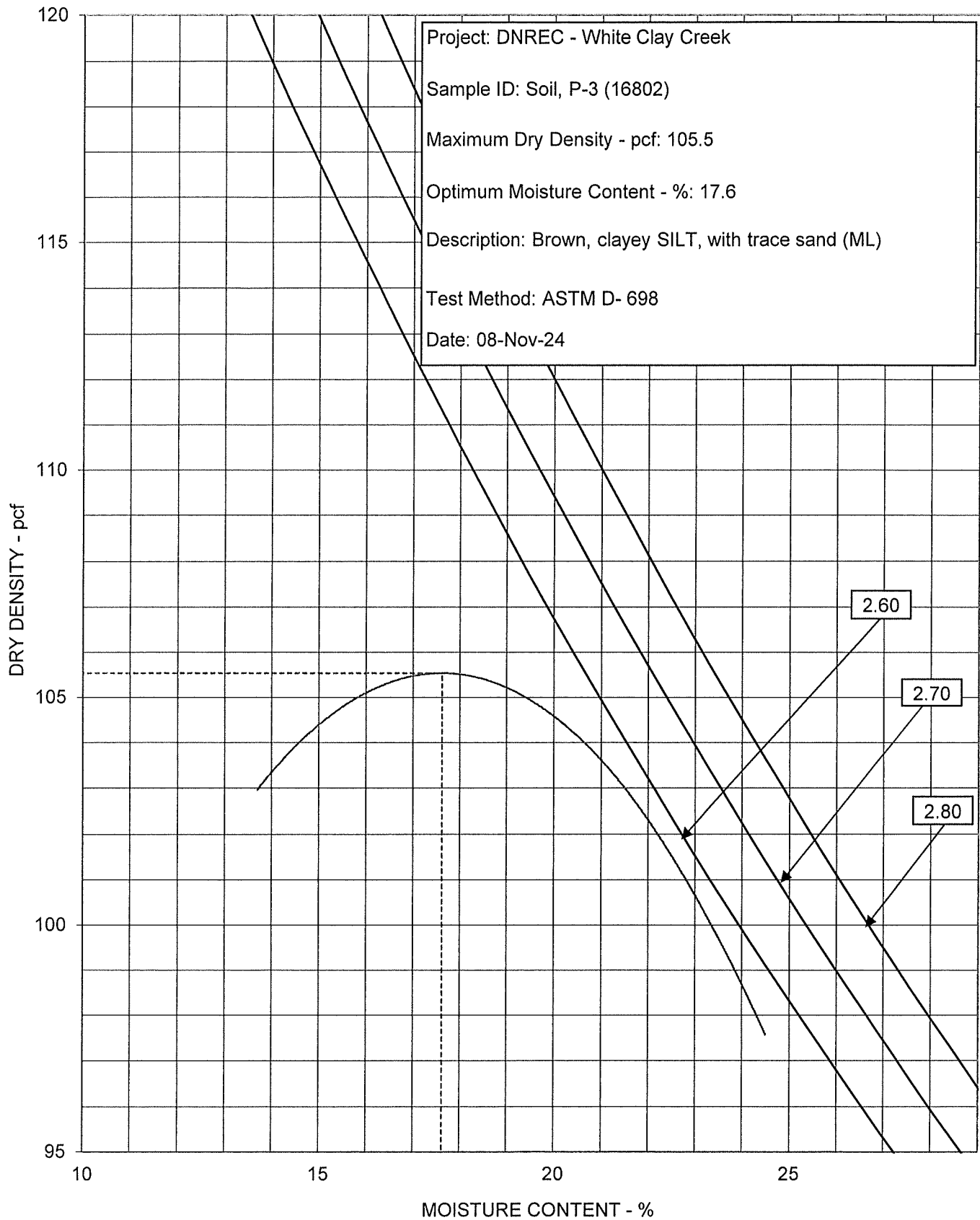
Penetration Test Data

Pen. in.	Dial Reading	Stress psi	CBR %
0.0	0	0.0	
0.025	43	14.4	
0.05	61	20.4	
0.075	73	24.5	
0.1	90	30.1	3.0
0.125	107	35.8	
0.15	125	41.9	
0.175	140	46.9	
0.2	157	52.6	3.5
0.3	198	66.3	
0.4	247	82.7	
0.5	285	95.5	

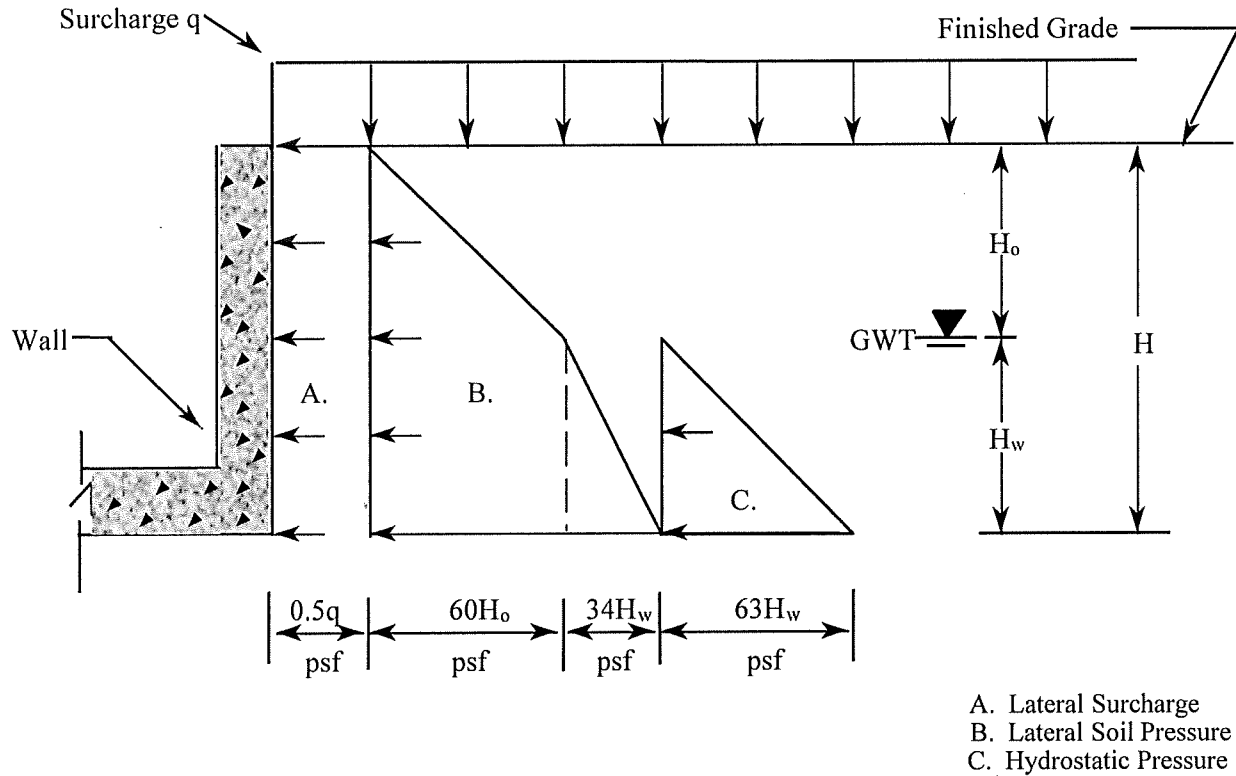




John D. Hynes & Associates



EARTH PRESSURE REQUIREMENTS FOR BELOW GRADE WALLS (UNDRAINED)



1. Pressure diagram assumes undrained soil conditions.
2. Pressure diagram assumes at rest soil pressures on cantilevered walls or walls with one support level.
3. For backfill, use non-plastic SP or better quality material (ASTM D-2487).
4. Compact backfill in maximum 8-inch loose lifts to 92 to 95 percent maximum dry density (ASTM D-1557).
5. Use only light-duty hand operated compaction equipment within 10 feet of walls.
6. For surcharge q , consider the greater of the maximum expected construction equipment live loads or permanent structure dead and live loads.
7. For temporary retaining walls used for excavation support, use $2/3$ of the above values for lateral surcharge and soil pressures. This reflects the active soil pressure condition.



JOHN D. HYNES & ASSOCIATES, INC.

32185 Beaver Run Drive • Salisbury, Maryland 21804
410-546-6462 / Fax: 410-548-5346

Date: December 17, 2024

Scale: Not to Scale

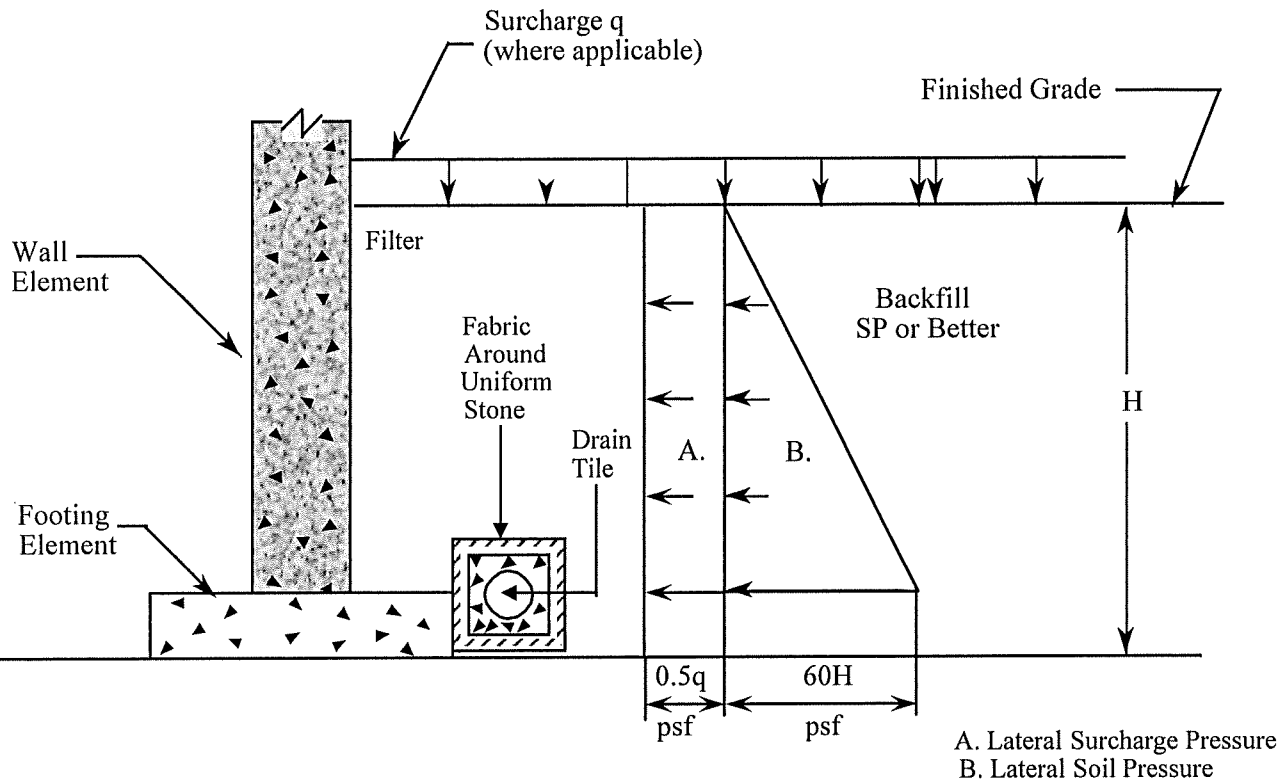
Drawn: Hynes & Assoc.

Earth Pressure Requirements for Retaining Walls (Undrained)
DNREC-White Clay Creek State Park Nature Center
Newark, Delaware

DWG. No.

JDH-10/24/220-C

EARTH PRESSURE REQUIREMENTS FOR BELOW GRADE WALLS (DRAINED)



1. Pressure diagram assumes at rest soil pressures on cantilevered walls or walls with one support level.
2. Pressure diagram includes only loads resulting from backfill and surcharges.
3. This distribution assumes perimeter sub-drainage will be provided; therefore, hydrostatic pressure is not included.
4. For backfill, use SP or better quality material (ASTM D-2487).
5. Compact backfill in maximum 8-inch loose lifts to 92 to 95 percent maximum dry density (ASTM D-1557).
6. Use only light-duty hand operated compaction equipment within 10 feet of walls.
7. For surcharge q , consider the greater of the maximum expected construction equipment live loads or permanent structure dead and live loads.
8. For temporary retaining walls used for excavation support, use $2/3$ of the above values for lateral surcharge and soil pressures. This reflects the active soil pressure condition.



JOHN D. HYNES & ASSOCIATES, INC.

32185 Beaver Run Drive • Salisbury, Maryland 21804

410-546-6462 / Fax: 410-548-5346

Date: December 19, 2024

Scale: Not to Scale

Drawn: Hynes & Assoc.

Earth Pressure Requirements for Below Grade Walls (Drained)
DNREC-White Clay Creek State Park Nature Center
Newark, Delaware

DWG. No.

JDH-10/24/220-D

**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State
Park Nature Center

Date: 12/12/2024

Project No.: JDH-10/24/220

Test Location: TP-1

Weather: Sunny, 35

Test Depth: El. 99.5 ft.

Ring Embedment: 3 in.

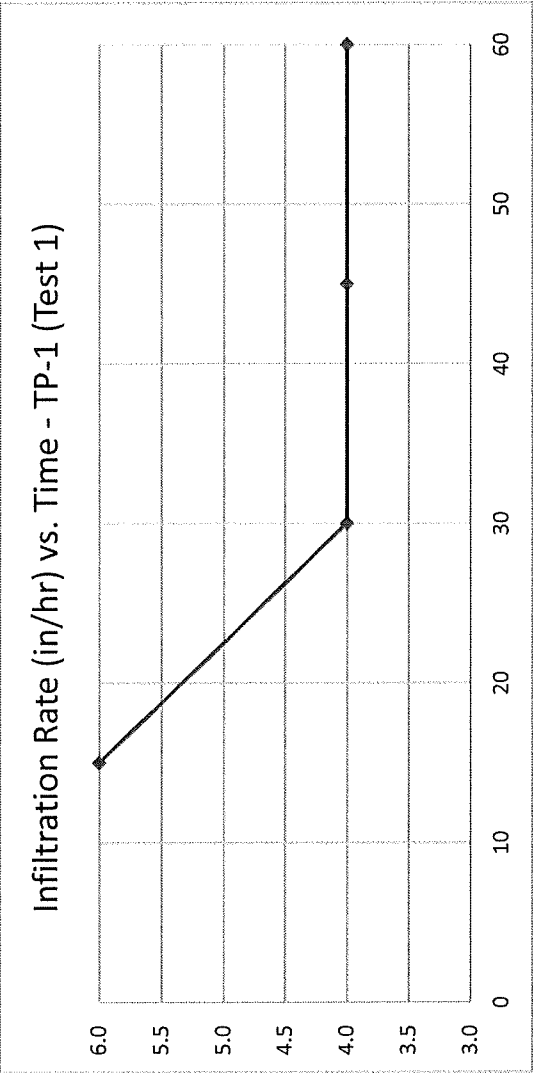
Tester/ Technician Performing Test: E. Cross

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)	
Presoak	0	-	12.00	-	-	
	60	60	4.50	7.50	7.5	
Test 1	0	-	6.00	-	-	
	15	15	4.50	1.50	6.0	
	30	15	3.50	1.00	4.0	
	45	15	2.50	1.00	4.0	
	60	15	1.50	1.00	4.0	
	Test 1		Average Infiltration Rate (in./hr.) :			4.5
			Steady State Infiltration Rate (in./hr.) :			4.0
Test 2	0	-	6.00	-	-	
	15	15	4.50	1.50	6.0	
	30	15	3.50	1.00	4.0	
	45	15	2.50	1.00	4.0	
	60	15	1.50	1.00	4.0	
	Test 2		Average Infiltration Rate (in./hr.) :			4.5
			Steady State Infiltration Rate (in./hr.) :			4.0

DNREC White Clay

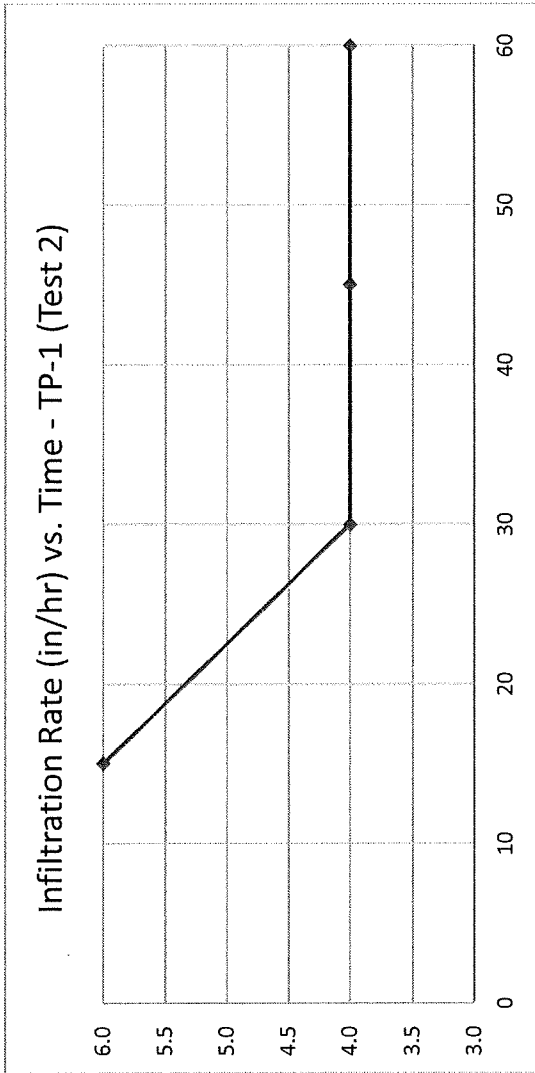
TP-1 Test 1

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	6.0
2	15	30	4.0
3	15	45	4.0
4	15	60	4.0



TP-1 Test 2

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	6.0
2	15	30	4.0
3	15	45	4.0
4	15	60	4.0



**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State Park Nature Center **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-2

Weather: Sunny, 35
Test Depth: El. 101.0 ft.
Ring Embedment: 3 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)
Presoak	0	-	12.00	-	-
	60	20	12.00	0.00	0.0

Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 1		Average Infiltration Rate (in./hr.) :		0.0
			Steady State Infiltration Rate (in./hr.) :		0.0

**Single Ring
Falling Head Infiltration Test
4 Inch Ring**

Project: DNREC White Clay Creek **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-3

Weather: Sunny, 35°

Depth from Top of Casing to Bottom of Boring: 10.0 ft.
Height of Casing Above Ground Surface: 3.0 ft.
Test Depth: 7.0 ft.
Test Elevation: 101.5 ft.
Casing Embedment: 3.0 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate
Presoak	0	-	12.00	-	-
	60	60	12.00	0.00	N/A

Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 1		Average Infiltration Rate (in./hr.) :		
Steady State Infiltration Rate (in./hr.) :			0.0		

**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State Park Nature Center **Date:** 12/12/2024

Test Location: TP-2 **Project No.:** JDH-10/24/220

TP-4

Weather: Sunny, 35
Test Depth: El. 103.0 ft.
Ring Embedment: 3 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)	
Presoak	0	-	12.00	-	-	
	60	20	12.00	0.00	0.0	
Test 1	0	-	6.00	-	-	
	15	15	6.00	0.00	0.0	
	30	15	6.00	0.00	0.0	
	45	15	6.00	0.00	0.0	
	60	15	6.00	0.00	0.0	
	Test 1		Average Infiltration Rate (in./hr.) :			0.0
			Steady State Infiltration Rate (in./hr.) :			0.0

**Single Ring
Falling Head Infiltration Test
4 Inch Ring**

Project: DNREC White Clay Creek **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-5

Weather: Sunny, 35°

Depth from Top of Casing to Bottom of Boring: 10.0 ft.
Height of Casing Above Ground Surface: 3.0 ft.
Test Depth: 7.0 ft.
Test Elevation: 105.0 ft.
Casing Embedment: 3.0 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate
Presoak	0	-	12.00	-	-
	60	60	10.80	1.20	N/A

Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
Test 1		Average Infiltration Rate (in./hr.) :			0.0
		Steady State Infiltration Rate (in./hr.) :			0.0

Test 2	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
Test 2		Average Infiltration Rate (in./hr.) :			0.0
		Steady State Infiltration Rate (in./hr.) :			0.0

**Single Ring
Falling Head Infiltration Test
4 Inch Ring**

Project: DNREC White Clay Creek **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-6

Weather: Sunny, 35°

Depth from Top of Casing to Bottom of Boring: 10.0 ft.
Height of Casing Above Ground Surface: 3.0 ft.
Test Depth: 7.0 ft.
Test Elevation: 107.0 ft.
Casing Embedment: 3.0 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate
Presoak	0	-	12.00	-	-
	60	60	10.80	1.20	N/A

Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 1				Average Infiltration Rate (in./hr.) : 0.0
				Steady State Infiltration Rate (in./hr.) : 0.0	

**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State Park Nature Center
Date: 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-7

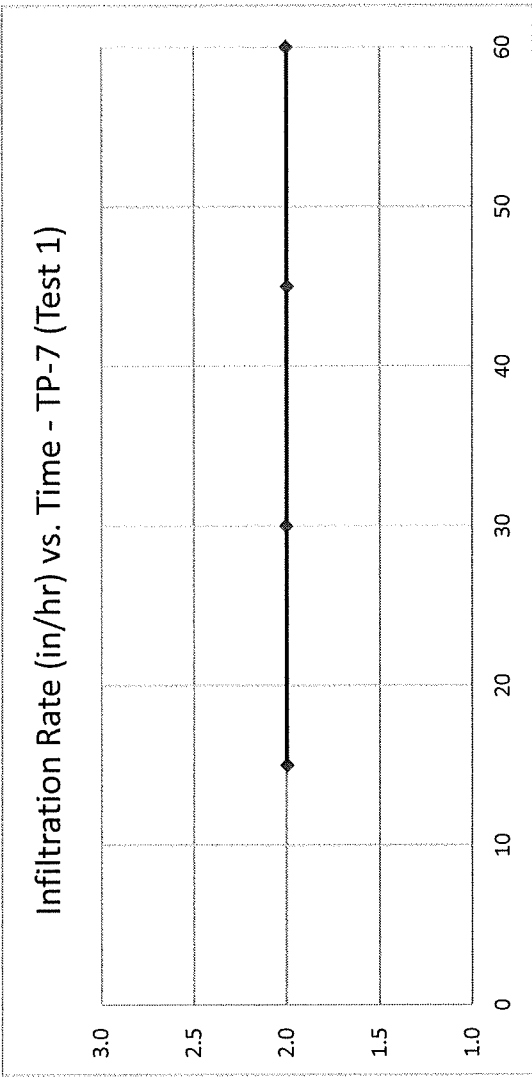
Weather: Sunny, 35
Test Depth: El. 99.5 ft.
Ring Embedment: 3 in.
Tester/ Technician Performing Test: E. Cross

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)
Presoak	0	-	12.00	-	-
	60	60	4.50	7.50	7.5
Test 1	0	-	6.00	-	-
	15	15	5.50	0.50	2.0
	30	15	5.00	0.50	2.0
	45	15	4.50	0.50	2.0
	60	15	4.00	0.50	2.0
	Test 1		Average Infiltration Rate (in./hr.) : 2.0		
			Steady State Infiltration Rate (in./hr.) : 2.0		
Test 2	0	-	6.00	-	-
	15	15	5.50	0.50	2.0
	30	15	5.00	0.50	2.0
	45	15	4.50	0.50	2.0
	60	15	4.00	0.50	2.0
	Test 2		Average Infiltration Rate (in./hr.) : 2.0		
			Steady State Infiltration Rate (in./hr.) : 2.0		

DNREC White Clay

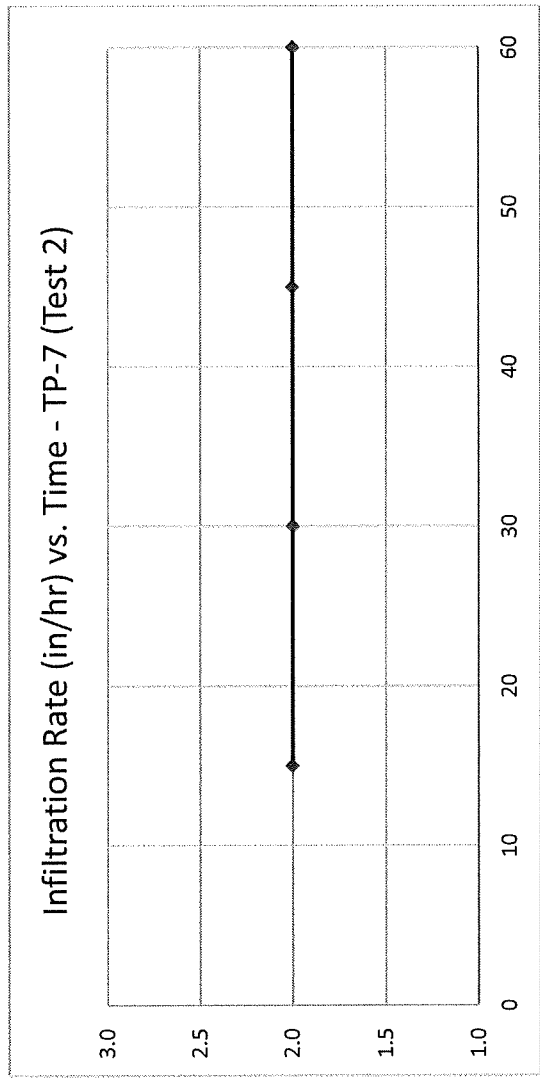
TP-7 Test 1

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	2.0
2	15	30	2.0
3	15	45	2.0
4	15	60	2.0



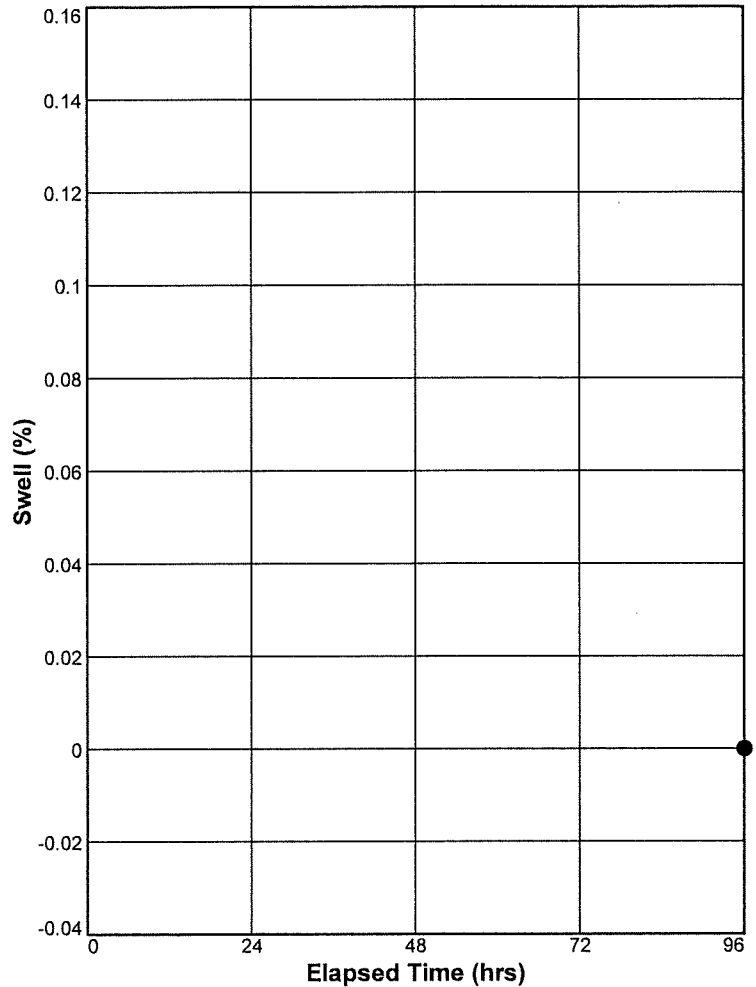
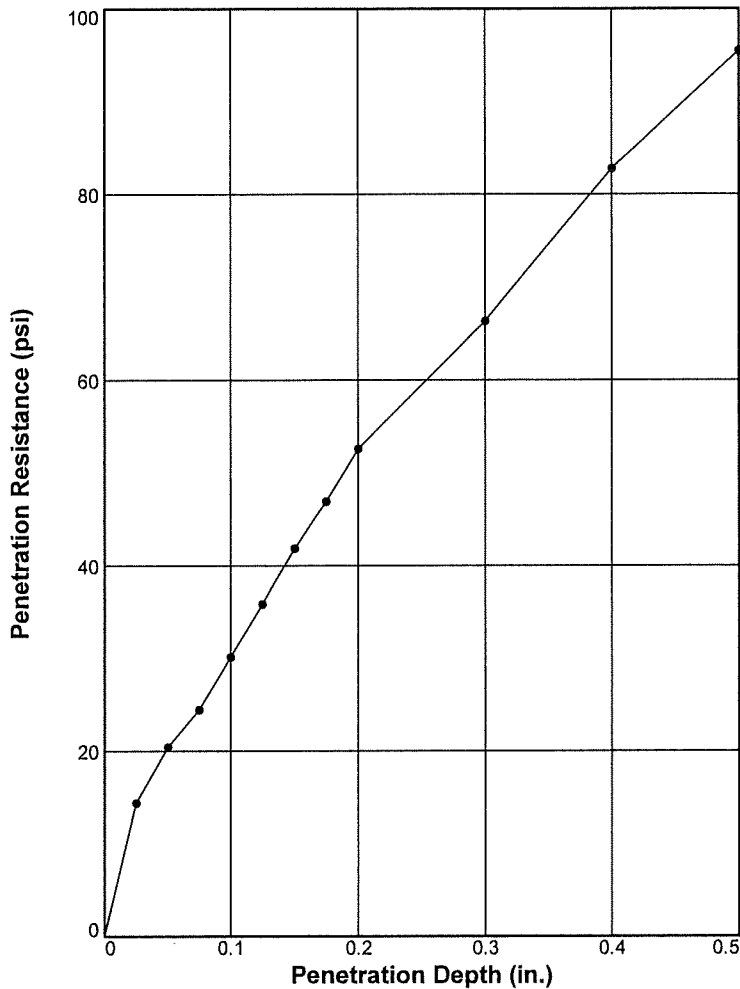
TP-7 Test 2

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	2.0
2	15	30	2.0
3	15	45	2.0
4	15	60	2.0



BEARING RATIO TEST REPORT

AASHTO T 193-10



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	102.8	97.4	23.6	102.8	97.4	24.1	3.0	3.5	0.000	15	0
2 ▲											
3 ■											
Material Description							USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Brown Clayey SILT, with trace sand (ML)							ML	105.5	17.6		

Project No: JDH-10/24/220

Project: DNREC - White Clay Creek

Location: P-3

Sample Number: 16802

Date Sampled: 11-08-2024

Date Received: 11-08-2024

Test Remarks:

BEARING RATIO TEST REPORT

John D. Hynes & Associates, Inc.

Figure _____

Tested By: KAZ _____

BEARING RATIO TESTING RESULTS (AASHTO T 193-10)

Date Sampled: 11-08-2024 **Date Received:** 11-08-2024
Project No.: JDH-10/24/220
Project: DNREC - White Clay Creek
Location: P-3
Sample Number: 16802
Material Description: Brown Clayey SILT, with trace sand (ML)
USCS Classification: ML
Liquid Limit: **Plasticity Index:**

Test Description:
Maximum Dry Density, pcf : 105.5 **Optimum Moisture Content, %:** 17.6
Testing Remarks:

Sample 1 (56 Blows; Surcharge: 15 lbs.)

Water Content

Wt. Wet Soil+Tare, gms. 976.4 Wt. Soil+Tare, gms. 871.3 Wt. Tare, gms. 426.1 **Moisture, % 23.6**

Unit Weight

Wt. Mold+Soil, lbs. 26.780 Wt. Mold, lbs. 17.426 Ht. Soil, in. 4.5 **Density, pcf 102.8**

Swell Data

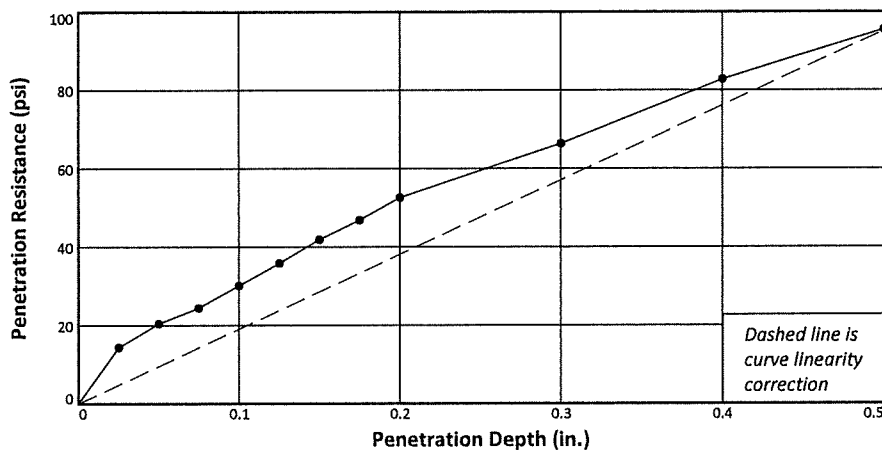
Elapsed Time, hrs.	Dial Reading in. x 1,000	Swell %
0	.3258	0.0
96	.325	0.0

Final Water Content

	Wt. Wet Soil+Tare, gms.	Dry Soil+Tare	Tare	Moisture, %
1)	971.5	870.5	451.9	24.1

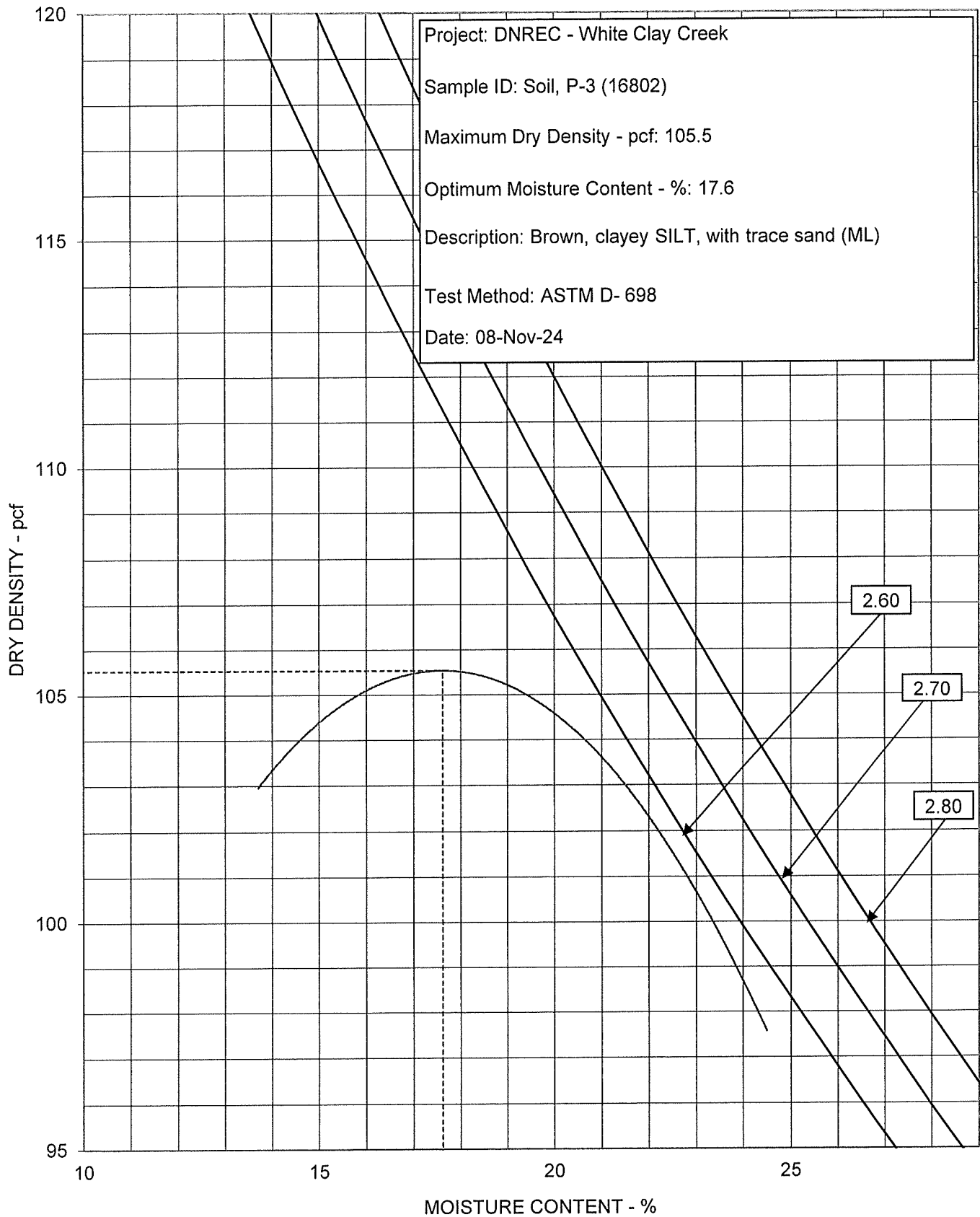
Penetration Test Data

Pen. in.	Dial Reading	Stress psi	CBR %
0.0	0	0.0	
0.025	43	14.4	
0.05	61	20.4	
0.075	73	24.5	
0.1	90	30.1	3.0
0.125	107	35.8	
0.15	125	41.9	
0.175	140	46.9	
0.2	157	52.6	3.5
0.3	198	66.3	
0.4	247	82.7	
0.5	285	95.5	

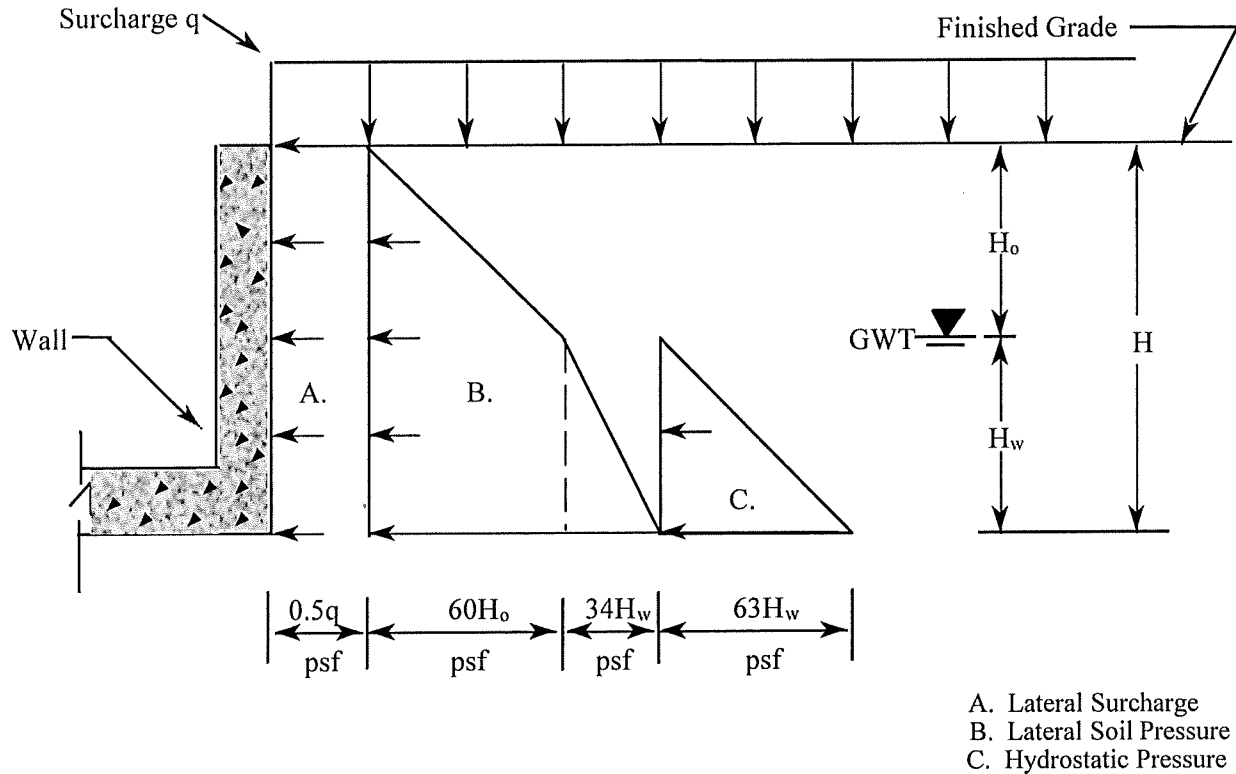




John D. Hynes & Associates



EARTH PRESSURE REQUIREMENTS FOR BELOW GRADE WALLS (UNDRAINED)



1. Pressure diagram assumes undrained soil conditions.
2. Pressure diagram assumes at rest soil pressures on cantilevered walls or walls with one support level.
3. For backfill, use non-plastic SP or better quality material (ASTM D-2487).
4. Compact backfill in maximum 8-inch loose lifts to 92 to 95 percent maximum dry density (ASTM D-1557).
5. Use only light-duty hand operated compaction equipment within 10 feet of walls.
6. For surcharge q , consider the greater of the maximum expected construction equipment live loads or permanent structure dead and live loads.
7. For temporary retaining walls used for excavation support, use $2/3$ of the above values for lateral surcharge and soil pressures. This reflects the active soil pressure condition.



JOHN D. HYNES & ASSOCIATES, INC.

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Date: December 17, 2024

Scale: Not to Scale

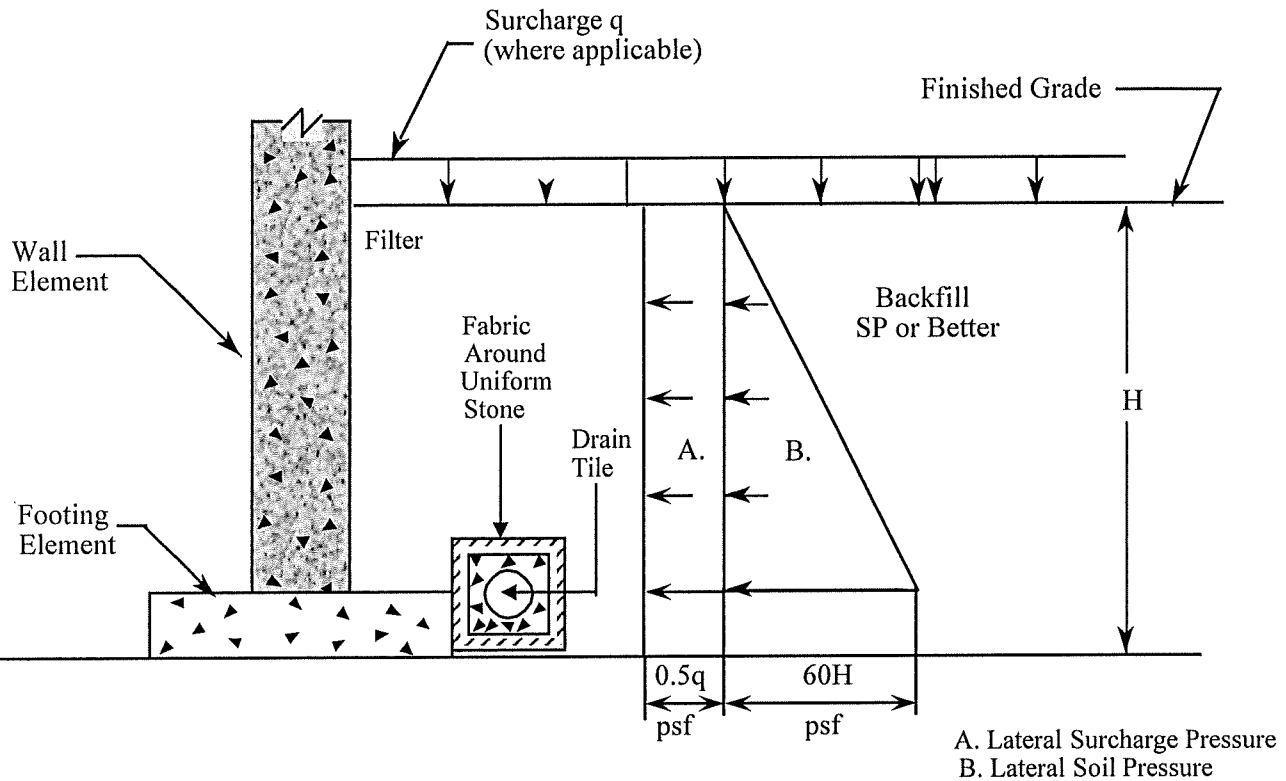
Drawn: Hynes & Assoc.

Earth Pressure Requirements for Retaining Walls (Undrained)
DNREC-White Clay Creek State Park Nature Center
Newark, Delaware

DWG. No.

JDH-10/24/220-C

EARTH PRESSURE REQUIREMENTS FOR BELOW GRADE WALLS (DRAINED)



1. Pressure diagram assumes at rest soil pressures on cantilevered walls or walls with one support level.
2. Pressure diagram includes only loads resulting from backfill and surcharges.
3. This distribution assumes perimeter sub-drainage will be provided; therefore, hydrostatic pressure is not included.
4. For backfill, use SP or better quality material (ASTM D-2487).
5. Compact backfill in maximum 8-inch loose lifts to 92 to 95 percent maximum dry density (ASTM D-1557).
6. Use only light-duty hand operated compaction equipment within 10 feet of walls.
7. For surcharge q , consider the greater of the maximum expected construction equipment live loads or permanent structure dead and live loads.
8. For temporary retaining walls used for excavation support, use $2/3$ of the above values for lateral surcharge and soil pressures. This reflects the active soil pressure condition.



JOHN D. HYNES & ASSOCIATES, INC.

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410-546-6462 / Fax: 410-548-5346

Date: December 19, 2024

Scale: Not to Scale

Drawn: Hynes & Assoc.

Earth Pressure Requirements for Below Grade Walls (Drained)
DNREC-White Clay Creek State Park Nature Center
Newark, Delaware

DWG. No.

JDH-10/24/220-D

**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State
Park Nature Center **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-1

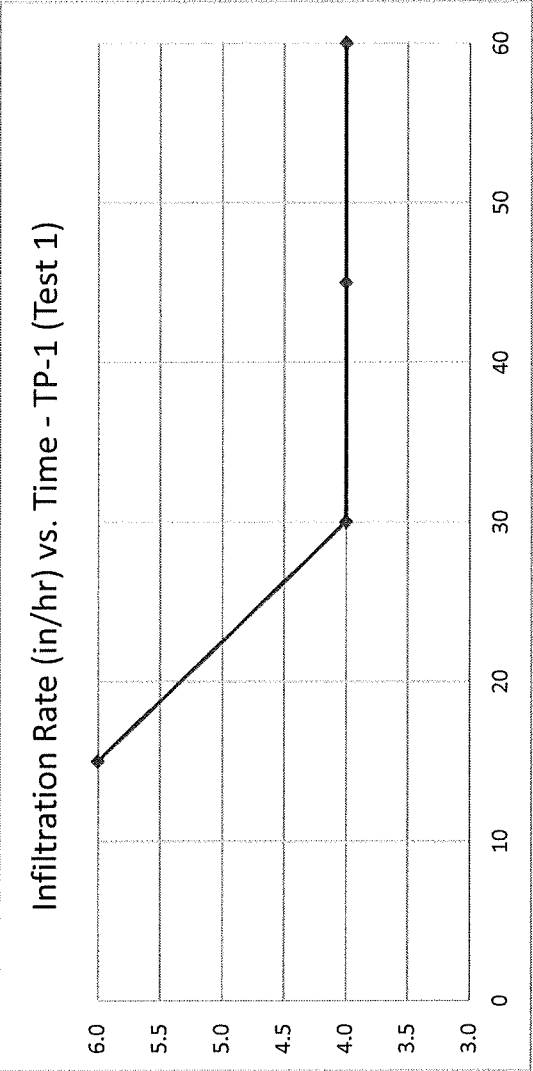
Weather: Sunny, 35
Test Depth: El. 99.5 ft.
Ring Embedment: 3 in.
Tester/ Technician Performing Test: E. Cross

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)	
Presoak	0	-	12.00	-	-	
	60	60	4.50	7.50	7.5	
Test 1	0	-	6.00	-	-	
	15	15	4.50	1.50	6.0	
	30	15	3.50	1.00	4.0	
	45	15	2.50	1.00	4.0	
	60	15	1.50	1.00	4.0	
	Test 1		Average Infiltration Rate (in./hr.) :			4.5
			Steady State Infiltration Rate (in./hr.) :			4.0
Test 2	0	-	6.00	-	-	
	15	15	4.50	1.50	6.0	
	30	15	3.50	1.00	4.0	
	45	15	2.50	1.00	4.0	
	60	15	1.50	1.00	4.0	
	Test 2		Average Infiltration Rate (in./hr.) :			4.5
			Steady State Infiltration Rate (in./hr.) :			4.0

DNREC White Clay

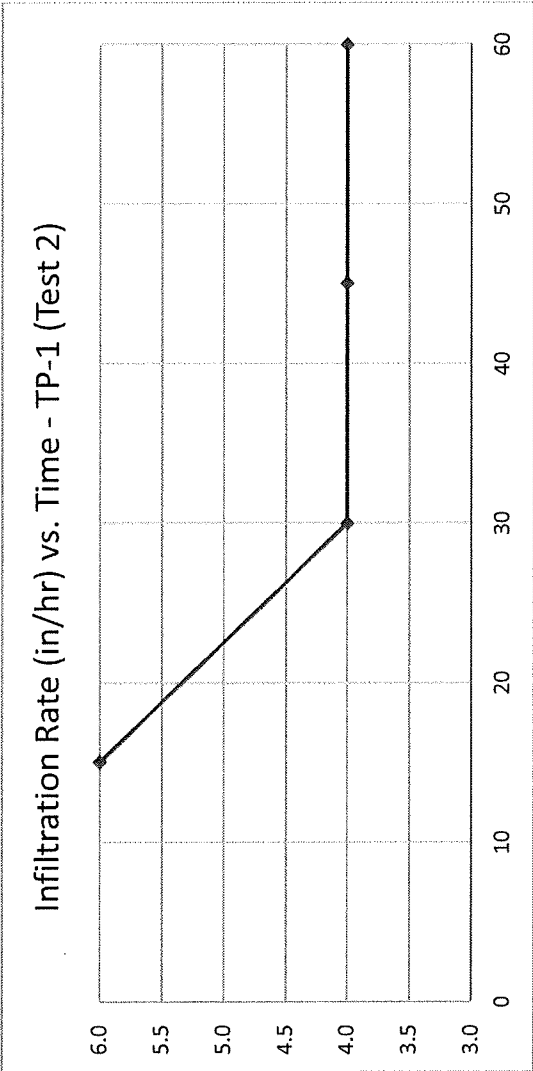
TP-1 Test 1

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	6.0
2	15	30	4.0
3	15	45	4.0
4	15	60	4.0



TP-1 Test 2

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	6.0
2	15	30	4.0
3	15	45	4.0
4	15	60	4.0



**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State
Park Nature Center **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-2

Weather: Sunny, 35
Test Depth: El. 101.0 ft.
Ring Embedment: 3 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)
Presoak	0	-	12.00	-	-
	60	20	12.00	0.00	0.0

Test 1	0	-	6.00	-	-	
	15	15	6.00	0.00	0.0	
	30	15	6.00	0.00	0.0	
	45	15	6.00	0.00	0.0	
	60	15	6.00	0.00	0.0	
	Test 1		Average Infiltration Rate (in./hr.) :			0.0
			Steady State Infiltration Rate (in./hr.) :			0.0

**Single Ring
Falling Head Infiltration Test
4 Inch Ring**

Project: DNREC White Clay Creek **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-3

Weather: Sunny, 35°

Depth from Top of Casing to Bottom of Boring: 10.0 ft.
Height of Casing Above Ground Surface: 3.0 ft.
Test Depth: 7.0 ft.
Test Elevation: 101.5 ft.
Casing Embedment: 3.0 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate
Presoak	0	-	12.00	-	-
	60	60	12.00	0.00	N/A

Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 1		Average Infiltration Rate (in./hr.) :		
Steady State Infiltration Rate (in./hr.) :			0.0		

**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State
Park Nature Center

Date: 12/12/2024

Project No.: JDH-10/24/220

Test Location: TP-4

Weather: Sunny, 35

Test Depth: El. 103.0 ft.

Ring Embedment: 3 in.

Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)
Presoak	0	-	12.00	-	-
	60	20	12.00	0.00	0.0
Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 1		Average Infiltration Rate (in./hr.) :		0.0
			Steady State Infiltration Rate (in./hr.) :		0.0

**Single Ring
Falling Head Infiltration Test
4 Inch Ring**

Project: DNREC White Clay Creek **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-5

Weather: Sunny, 35°

Depth from Top of Casing to Bottom of Boring: 10.0 ft.
Height of Casing Above Ground Surface: 3.0 ft.
Test Depth: 7.0 ft.
Test Elevation: 105.0 ft.
Casing Embedment: 3.0 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate
Presoak	0	-	12.00	-	-
	60	60	10.80	1.20	N/A

Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 1				Average Infiltration Rate (in./hr.) : 0.0
				Steady State Infiltration Rate (in./hr.) : 0.0	

Test 2	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 2				Average Infiltration Rate (in./hr.) : 0.0
				Steady State Infiltration Rate (in./hr.) : 0.0	

**Single Ring
Falling Head Infiltration Test
4 Inch Ring**

Project: DNREC White Clay Creek **Date:** 12/12/2024
Project No.: JDH-10/24/220
Test Location: TP-6

Weather: Sunny, 35°

Depth from Top of Casing to Bottom of Boring: 10.0 ft.
Height of Casing Above Ground Surface: 3.0 ft.
Test Depth: 7.0 ft.
Test Elevation: 107.0 ft.
Casing Embedment: 3.0 in.
Tester/ Technician Performing Test: Evan & Paul

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate
Presoak	0	-	12.00	-	-
	60	60	10.80	1.20	N/A

Test 1	0	-	6.00	-	-
	15	15	6.00	0.00	0.0
	30	15	6.00	0.00	0.0
	45	15	6.00	0.00	0.0
	60	15	6.00	0.00	0.0
	Test 1		Average Infiltration Rate (in./hr.) :		0.0
			Steady State Infiltration Rate (in./hr.) :		0.0

**Single Ring
Falling Head Infiltration Test
12 Inch Ring**

Project: DNREC White Clay Creek State
Park Nature Center

Date: 12/12/2024

Project No.: JDH-10/24/220

Test Location: TP-7

Weather: Sunny, 35

Test Depth: El. 99.5 ft.

Ring Embedment: 3 in.

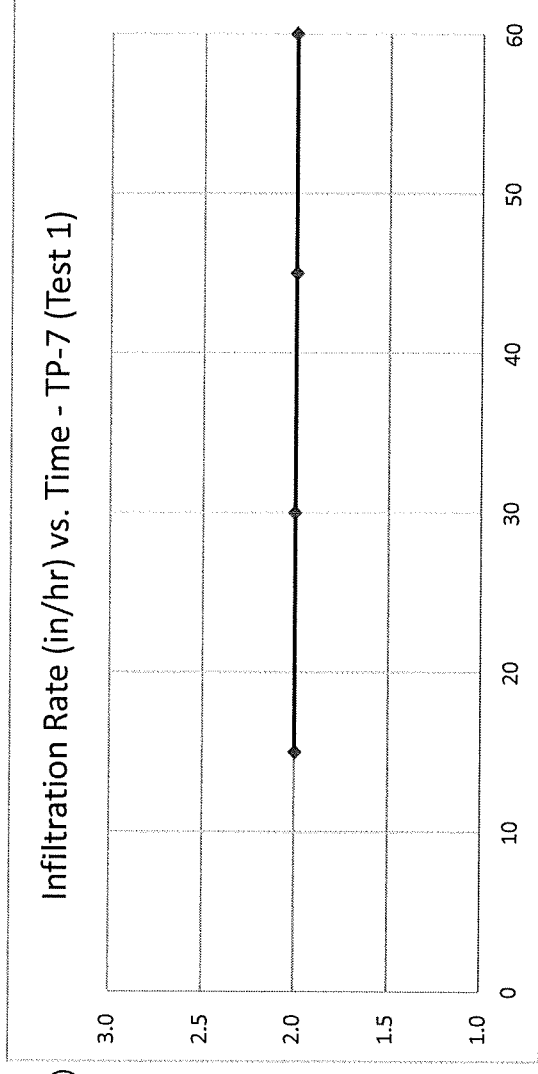
Tester/ Technician Performing Test: E. Cross

	Time (t)	Time Elapsed (min)	Hydraulic Head (h) (in)	Change (Δh) (in)	Incremental Inf. Rate (in/hr)
Presoak	0	-	12.00	-	-
	60	60	4.50	7.50	7.5
Test 1	0	-	6.00	-	-
	15	15	5.50	0.50	2.0
	30	15	5.00	0.50	2.0
	45	15	4.50	0.50	2.0
	60	15	4.00	0.50	2.0
	Test 1		Average Infiltration Rate (in./hr.) : 2.0		
			Steady State Infiltration Rate (in./hr.) : 2.0		
Test 2	0	-	6.00	-	-
	15	15	5.50	0.50	2.0
	30	15	5.00	0.50	2.0
	45	15	4.50	0.50	2.0
	60	15	4.00	0.50	2.0
	Test 2		Average Infiltration Rate (in./hr.) : 2.0		
			Steady State Infiltration Rate (in./hr.) : 2.0		

DNREC White Clay

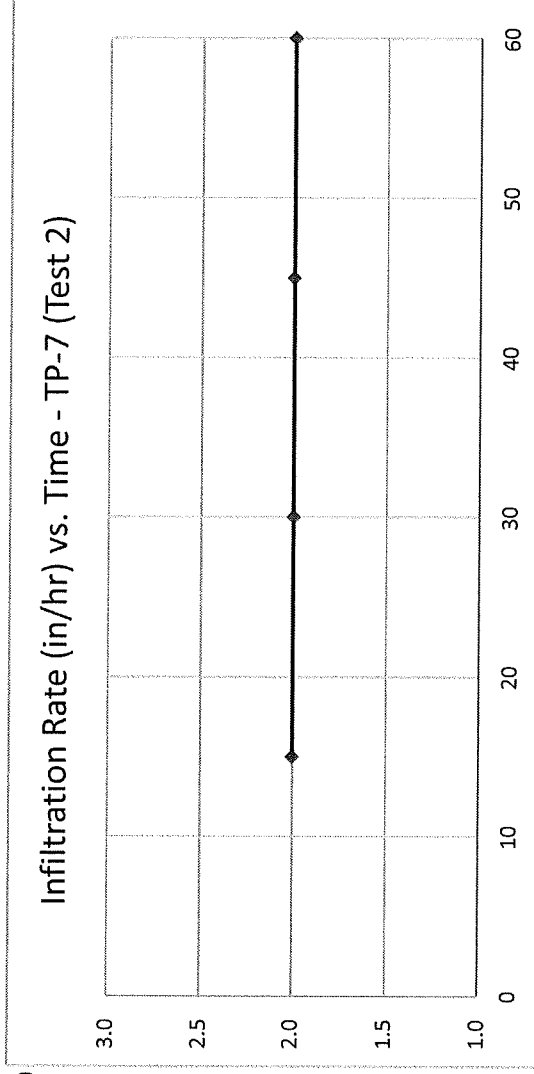
TP-7 Test 1

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	2.0
2	15	30	2.0
3	15	45	2.0
4	15	60	2.0



TP-7 Test 2

Interval #	Interval(min)	Cumulative Time	Rate(in/hr)
1	15	15	2.0
2	15	30	2.0
3	15	45	2.0
4	15	60	2.0



**Falling Head
Single Ring Infiltration Test
(Delaware)
4 inch (cased borehole)**



Tools and Supplies:

- | | |
|---|--|
| ☐ 50 gallons of clean water per test | ☐ Driving Block and Cap |
| ☐ | ☐ Purge Pump, tubing, and buckets |
| ☐ One 4 inch ring per test | ☐ Battery |
| ☐ Well Sand | ☐ Mini Excavator – Rental (pits deeper than 2 feet) |
| ☐ Shovels Flat/Round | ☐ Gator/ATV (as necessary) |
| ☐ Hand Rake | ☐ Hand Auger (with extensions) |
| ☐ Sledge Hammer | ☐ 4 inch thin wall PVC (at least one foot longer than test depth) |

Note: 1 test period equals 1 hour max. or until water empties out of ring, or until infiltration rate equilibrates. Total cumulative time for all tests (after presoak) must be 2 hrs or more. Contact Project manager with questions about testing. **Be prepared to run 2 to 7 tests per location.**

Procedure:

A. Set up ring (permeameter)/Pre-soak

1. Advance a 5-inch diameter soil boring to the specified test depth. Check boring log to ensure that soil at bottom of excavation is soil type to be tested.
2. Cut thin wall PVC to length (approximately 1 to 2' longer than desired test depth).
3. If necessary, use 3-inch auger to clean out bottom of test hole to remove any soils that caved in during PVC placement. Drive PVC casing an additional 2" to ensure that bottom of test hole does not extend beyond the bottom of the PVC pipe.
4. Collect initial test information using water level indicator or tape measure.
5. Determine the total depth to the bottom of the hole from top of pipe and record.
6. Determine riser height above ground and record.
7. Fill ring with approximately 12 inches of water. Be careful not to erode soil at bottom
8. ****Contact project manager after pre-soak with infiltration data.****

B. Run Test (2 to 7 test periods)

1. Readings should be no greater than 15 minutes apart. Reading interval to be based on pre-soak data. See attached data sheet.
2. For each test period, fill ring with 6 inches of water.
3. After pre-soak, run min. of 2 test periods, depending on test data. **Unless the ring runs dry in less than 10 minutes, we should collect 0.5 to 2 hours of data (after pre-soak).** That means you will be running 2 to 7 tests per location. Call project manager after 2nd test period to determine if additional test periods are necessary. **Contact Project Manager after 2 test periods.** Have infiltration data readily available.

**Falling Head
Single Ring Infiltration Test
(Delaware)
4 inch (cased borehole)**



4. Test period can be terminated after 1 hour if four successive readings (water level drops) during a test period vary by $\frac{1}{4}$ inch or less (between the highest and lowest level drops) for rates greater than 2 in/hr., or vary by $\frac{1}{8}$ inch for rates less than 2 in/hr. Note that test periods can run longer than 1 hour. Contact Project Manager if the water level changes don't meet the listed criteria after 1 hour of testing.
5. If ring runs dry in less than 10 minutes, contact project manager.

Example Readings:

Time	Change in Time	Water Level	Level Change
1:00	N/A	6 in	N/A
1:15	15 min	4.75	1.25 (6-4.75)
1:30	15 min	3.625	1.125 (4.75-3.625)
1:45	15 min	2.625	1 (3.625-2.625)
2:00	15 min	1.625	1 (2.625-1.625)

The difference between the greatest Level Change (1.25) and the least Level Change (1.00) is 0.25 ($1.25 - 1.00 = 0.25$). These readings meet the test criteria since the infiltration rate was more than 2 inches per hour, so the test period can be stopped.

Time	Change in Time	Water Level	Level Change
1:00	N/A	6 in	N/A
1:15	15 min	5.625	0.375 (6-5.625)
1:30	15 min	5.375	0.25 (5.625-5.375)
1:45	15 min	5.25	0.125 (5.375-5.25)
2:00	15 min	5.125	0.125 (5.25-5.125)

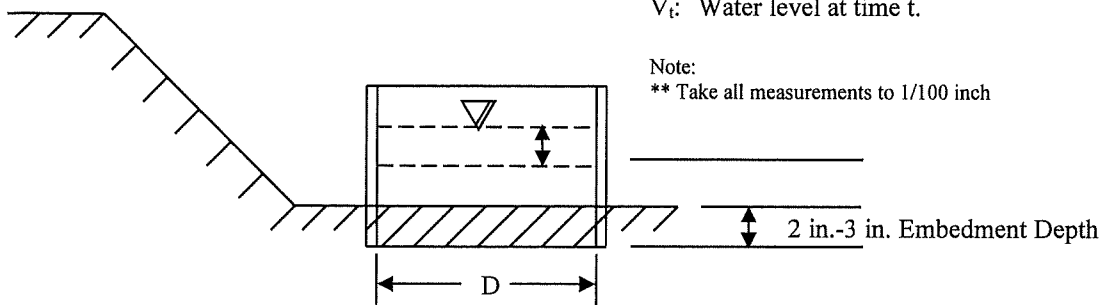
The difference between the greatest Level Change (0.375) and the least Level Change (0.125) is 0.25 ($0.375 - 0.125 = 0.25$). These readings **do not** meet the test criteria since the infiltration rate was less than 2 inches per hour, and the difference was more than $\frac{1}{8}$ inch (0.125), so the test must continue.

**Falling Head
Single Ring Infiltration Test
(Delaware)
4 inch (cased borehole)**



D: Diameter of Ring.
 ∇ : Water level in infiltration Ring or Casing.
 ∇_i : Water level at time $t=0$.
 ∇_t : Water level at time t .

Note:
 ** Take all measurements to 1/100 inch



**Falling Head
Single Ring Infiltration Test
(Delaware)
12 inch**



Tools and Supplies:

- | | |
|--|--|
| ☐ 50 gallons of clean water per test | ☐ Driving Block and Cap |
| ☐ | ☐ Purge Pump, tubing, and buckets |
| ☐ One 12 inch (or 4 inch) ring per test | ☐ Battery |
| ☐ Well Sand | ☐ Mini Excavator – Rental (pits deeper than 2 feet) |
| ☐ Shovels Flat/Round | ☐ Gator/ATV (as necessary) |
| ☐ Hand Rake | ☐ Hand Auger (with extensions) |
| ☐ Sledge Hammer | ☐ 4 inch thin wall PVC (at least one foot longer than test depth) |

Note: 1 test period equals 1 hour max. or until water empties out of ring, or until infiltration rate equilibrates. Total cumulative time for all tests (after presoak) must be 2 hrs or more. Contact Project manager with questions about testing. **Be prepared to run 2 to 7 tests per location.**

Procedure:

- A. Excavate test pit to specified test depth. Test pit should be sloped or benched in accordance with OSHA standards. (For safety two people will be onsite for tests deeper than 4 feet).
- B. Use Flat point shovel or trowel to grade bottom of test pit. Bottom of excavation should be flat but not compacted.
- C. Set up ring (permeameter)/Pre-soak
 1. Set ring at bottom of excavation.
 2. Using driving block drive (ring) approximately 2-3 inches into the ground.
 3. Lightly tamp disturbed soil along inside and outside edges of ring. **Do not compact soil at the bottom of the hole.**
 4. Use hand rake to scarify soils within test ring.
 5. Use ½ water filled ziplock bag or sand filled nylons to prevent scouring. Remove bag after filling.....sand filled nylons do not need to be removed.
 6. Fill ring with approximately 12 inches of water. Be careful not to erode soil at bottom. Use removable shield/deflector as necessary.
 7. Measure using tape measure distance from top of ring to to water surface. You may also use water level indicator device.
 8. Monitor water drop every 15 minutes for 1 hour or until ring runs dry (whichever occurs first).
 9. ****Contact project manager after pre-soak with infiltration data.****
- D. Run Test (2 to 7 test periods)
 1. Readings should be no greater than 15 minutes apart. Reading interval to be based on pre-soak data. See attached data sheet.

**Falling Head
Single Ring Infiltration Test
(Delaware)
12 inch**



2. For each test period, fill ring with 6 inches of water.
3. After pre-soak, run min. of 2 test periods, depending on test data. **Unless the ring runs dry in less than 10 minutes, we should collect 1 to 2 hours of data (after pre-soak).** That means you will be running 2 to 12 tests per location. Call project manager after 2nd test period to determine if additional test periods are necessary. **Contact Project Manager after 2 test periods.** Have infiltration data readily available.
4. Test period can be terminated after 1 hour if four successive readings (water level drops) during a test period vary by ¼ inch or less (between the highest and lowest level drops) for rates greater than 2 in/hr., or vary by 1/8 inch for rates less than 2 in/hr. Note that test periods can run longer than 1 hour. Contact Project Manager if the water level changes don't meet the listed criteria after 1 hour of testing.
5. If ring runs dry in less than 10 minutes, contact project manager.

Example Readings:

Time	Change in Time	Water Level	Level Change
1:00	N/A	6 in	N/A
1:15	15 min	4.75	1.25 (6-4.75)
1:30	15 min	3.625	1.125 (4.75-3.625)
1:45	15 min	2.625	1 (3.625-2.625)
2:00	15 min	1.625	1 (2.625-1.625)

The difference between the greatest Level Change (1.25) and the least Level Change (1.00) is 0.25 (1.25 - 1.00 = 0.25). These readings meet the test criteria since the infiltration rate was more than 2 inches per hour, so the test period can be stopped.

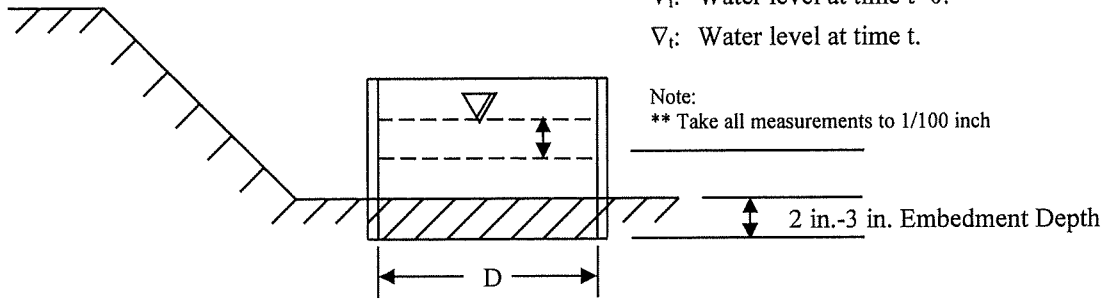
Time	Change in Time	Water Level	Level Change
1:00	N/A	6 in	N/A
1:15	15 min	5.625	0.375 (6-5.625)
1:30	15 min	5.375	0.25 (5.625-5.375)
1:45	15 min	5.25	0.125 (5.375-5.25)
2:00	15 min	5.125	0.125 (5.25-5.125)

The difference between the greatest Level Change (0.375) and the least Level Change (0.125) is 0.25 (0.375 - 0.125 = 0.25). These readings **do not** meet the test criteria since the infiltration rate was less than 2 inches per hour, and the difference was more than 1/8 inch (0.125), so the test must continue.

**Falling Head
Single Ring Infiltration Test
(Delaware)
12 inch**

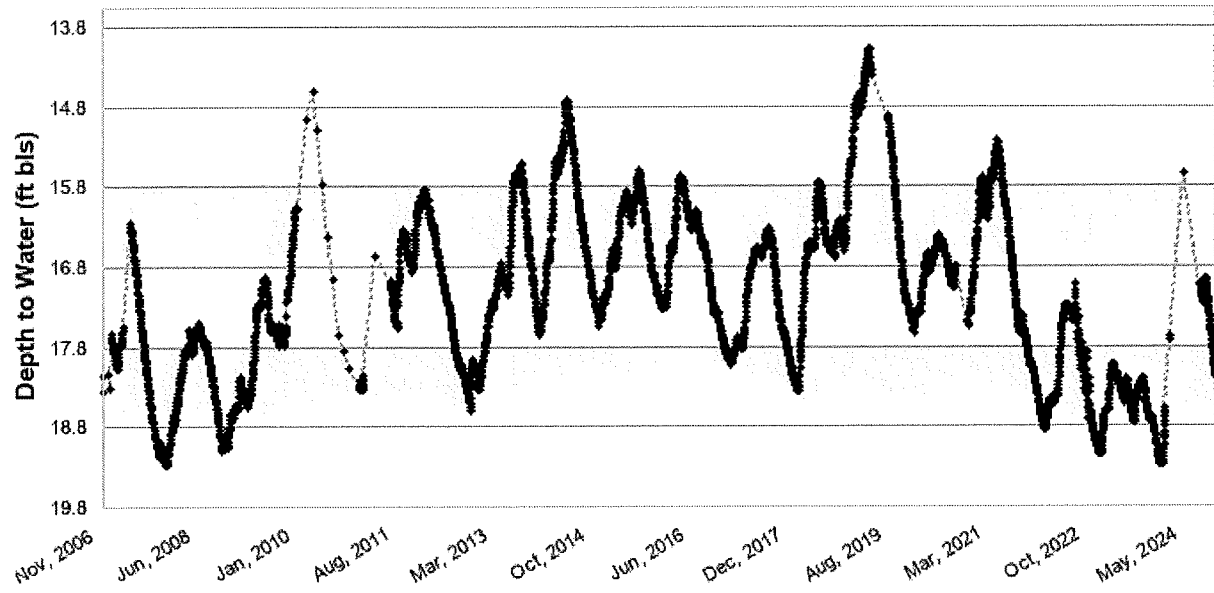


- D: Diameter of Ring.
 H_c : Distance from bottom of Drop Tube to Soil.
 ∇ : Water level in infiltration Ring.
 ∇_i : Water level at time $t=0$.
 ∇_t : Water level at time t .



Delaware Geological Survey

DGS Well ID Ca55-204



Created on: December 15, 2024, 6:37 pm

Ca55-204, Note: DM=Daily Mean Waterlevel; DEST=Estimated DM water level
Water levels reported in feet below land surface datum
Created on 12-14-2024 by Delaware Geological Survey (<http://www.dgs.udel.edu>)
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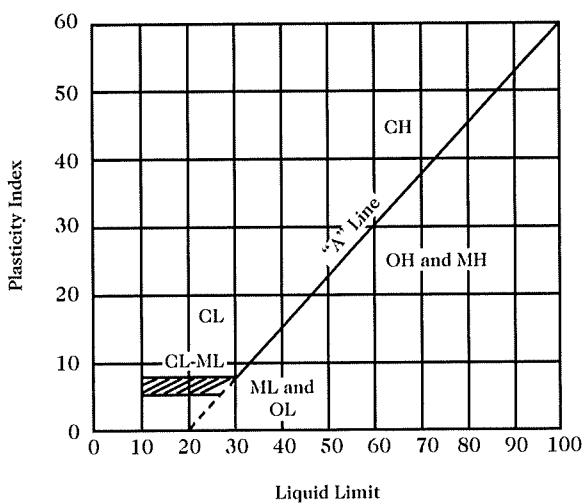
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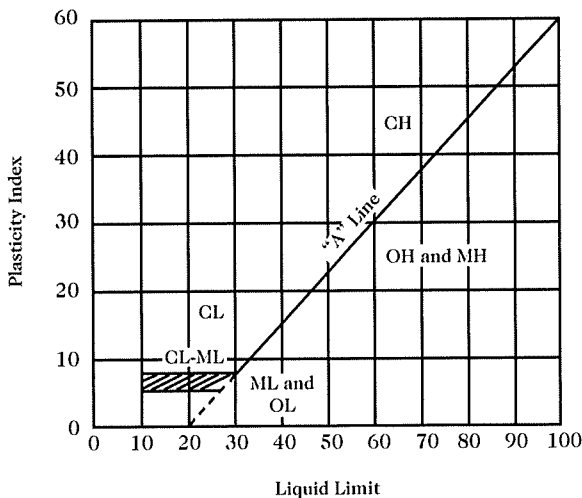


JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria			
Coarse-grained soils (More than half of material is larger than No 200 sieve size)	Gravels (More than half of coarse fraction is larger than No 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No 200 sieve size), coarse grained soils are classified as follows: Less than 5 percent More than 12 percent 5 to 12 percent GW, GP, SW, SP GM, GC, SM, SC <i>Borderline cases requiring dual symbols^a</i>	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		
			GP	Poorly graded gravels, gravel sand mixtures, little or no fines		Not meeting all gradation requirements for GW		
		Gravels with fines (Appreciable amount of fines)	GM ^a	d u		Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are <i>borderline</i> cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7		
	Sands (More than half of coarse fraction is smaller than No 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands,		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	Not meeting all gradation requirements for SW	
			SP	Poorly graded sands, gravelly sands, little or no fines				
		Sands with fines (Appreciable amount of fines)	SM ^a	d u		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are <i>borderline</i> cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7		
	Fine-grained soils (More than half material is smaller than No 200 sieve)	Silts and clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity				
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays				
OL			Organic silts and organic silty clays of low plasticity					
Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts					
		CH	Inorganic clays of high plasticity, fat clays					
		OH	Organic clays of medium to high plasticity, organic silts					
Highly organic soils		Pt	Peat and other highly organic soils					





FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON-COHESIVE SOILS

(Silt, Sand, Gravel and Combinations)

DENSITY

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

PARTICLE SIZE IDENTIFICATION

Boulders	- 8 inch diameter or more
Cobbles	- 3 to 8 inch diameter
Gravel	- Coarse - 1 to 3 inch - Medium - 1/2 to 1 inch - Fine - 4.75 mm to 1/2 inch
Sand	- Coarse - 2.0 mm to 4.75 mm - Medium - 0.425 mm to 2.0 mm - Fine - 0.075 mm to 0.425 mm
Silt	- 0.075 mm to 0.002 mm

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS

(Clay, Silt and Combinations)

CONSISTENCY

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	- 11 to 15 blows/ft.
Very Stiff	- 16 to 30 blows/ft.
Hard	- 31 blows/ft. or more

PLASTICITY

Degree of Plasticity	Plasticity Index
None to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

Classification on logs are made by visual inspection of samples unless a sample has been subjected to laboratory classification testing.

Standard Penetration Test - Driving a 2.0" O.D., 1-3/8" I.D., splitspoon sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test value (N - value) can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.). (ASTM D-1586)

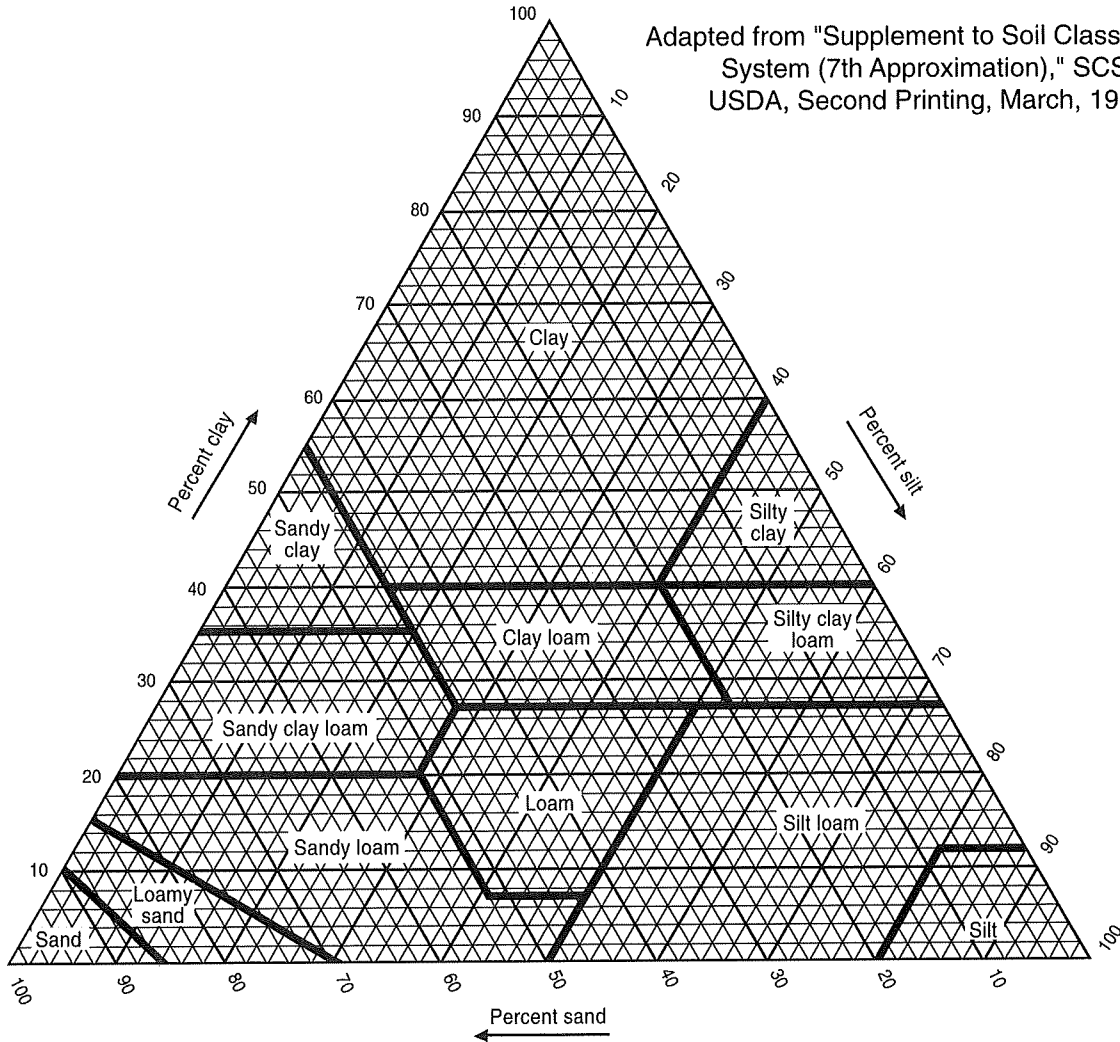
Strata Changes - In the column "Soil Descriptions," on the drill log, the horizontal lines represent strata changes. A solid line (—) represents an actually observed change, a dashed line (----) represents an estimated change.

Groundwater - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the logs.

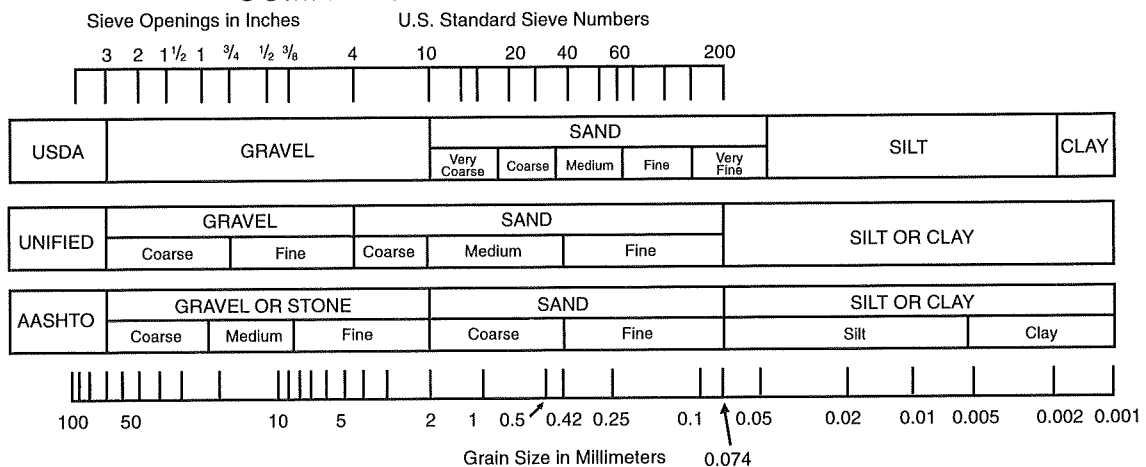


USDA SOIL CLASSIFICATION SYSTEM

Adapted from "Supplement to Soil Classification System (7th Approximation)," SCS, USDA, Second Printing, March, 1967



COMPARISON OF PARTICLE - SIZE SCALES



Soil triangle of the basic soil textural classes. (U.S. Soil Conservation Service.) 288-D-2782.

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

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

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists.*



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**SUPPLEMENT TO REPORT
OF
SUBSURFACE EXPLORATION
AND
GEOTECHNICAL CONSULTING SERVICES**

**DNREC-WHITE CLAY CREEK STATE PARK NATURE CENTER
NEWARK, DELAWARE**

**PREPARED FOR
GWWO ARCHITECTS**

**MARCH 24, 2025
PROJECT NO.: JDH-10/24/220**



JOHN D. HYNES & ASSOCIATES, INC.

*Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing*

March 24, 2025

Danielle Peters
GWWO Architects
800 Wyman Park Drive, Suite 300
Baltimore, Maryland 21211

Re: Supplement to Report of Subsurface Exploration, and Geotechnical Consulting Services
DNREC-White Clay Creek State Park Nature Center
Newark, Delaware
Project No.: JDH-10/24/220

Dear Ms. Peters:

John D. Hynes & Associates, Inc. was provided with new foundation load information for the DNREC-White Clay Creek State Park Nature Center project located in Newark, Delaware. Our services were performed to complete the services for our proposal dated March 28, 2024.

The project includes a new Nature Center building, stormwater management improvements, and a new parking lot. The new 8,667 square feet Nature Center building will have 2 stories to be constructed using structural steel and/or timber framing. The building will be constructed with the finished floor of the 2nd story of the building at grade (Elevation El. 123) and the finished floor of the ground level of the building at grade (El 109). The site slopes downward from west (El. 123) to east (El. 109). Below grade walls are proposed on the north, east, and south sides of the building.

The previous and new foundation loads provided by the Structural Engineer for the proposed building are summarized in the table below.

Foundation Load Component	Previous Value	New Value	Units
Maximum Column Load	115	95	Kip
Maximum Wall Load	3	3.4	Klf

Considering current and proposed grade levels, the in-situ soil conditions and the noted structural loadings, we recommend that the building structural elements be supported on spread footing foundations bearing on firm, natural soils or controlled, structural fill. Footings supporting structural elements for the building columns and walls may be proportioned based on a maximum allowable soil bearing pressure of 2,000 psf bearing. If our recommendations are followed, we estimate a total settlement of 1 inch or less. We estimate differential settlement to be ½ inch or less.

Please refer to the December 19, 2024 Geotechnical Report for our geotechnical engineering recommendations for the DNREC-White Clay Creek State Park Nature Center. The report includes data for the subsurface conditions, and recommendations for site preparation, fill and backfill construction, structures foundations, earth pressure requirements, ground supported slabs, pavement subgrade preparation and pavement cross-section design, stormwater management structure construction, infiltration test results, the handling of groundwater, and seismic site classification.

This report has been prepared solely and exclusively for GWWO Architects to provide guidance to design professionals in developing facilities plans for the proposed DNREC-White Clay State Park Nature Center project



GWWO Architects
March 24, 2025
Page 2

located in Newark, Delaware. It has not been developed to meet the needs of others, and application of this report for other than its intended purpose could result in substantial difficulties. The Consulting Engineer cannot be held accountable for any problems which occur due to the application of this report to other than its intended purpose. This report in its entirety should be attached to the project specifications.

These analyses and recommendations are, of necessity, based on the concepts made available to us at the time of the writing of this report, and on-site conditions, surface and subsurface that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to the areal extent of the site and to depth, are representative of conditions across the site. It is, also, recommended that we be given the opportunity to review all plans for the project in order to comment on the interaction of soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices.

We appreciate the opportunity to be of service to you. If you have any questions regarding this report or if we may be of further assistance, please contact our office.

Respectfully,
JOHN D. HYNES & ASSOCIATES, INC.

Christian H. Matemu, E.I.T.
Geotechnical Staff Engineer

John D. Hynes, P.E.
President

The stamp is circular with the text "JOHN D. HYNES" at the top, "REGISTERED" on the left, "No. 7591" in the center, "DELAWARE" at the bottom, and "PROFESSIONAL ENGINEER" on the right.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Delaware.

John D. Hynes, P.E.
License No. 7591

The stamp is circular with the text "JOHN D. HYNES" at the top, "REGISTERED" on the left, "No. 7591" in the center, "DELAWARE" at the bottom, and "PROFESSIONAL ENGINEER" on the right.

Expiration Date: 06/30/2026

CHM: JDH/kc

ATTENDANCE SHEET

PRE-BID CONFERENCE – CONTRACT #NAT25805-NATCTR

NAME – White Clay Creek State Park – Nature Center

DATE: April 29, 2026 1:00 p.m.

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