


New Ewing Senior Community Center

999 Lower Ferry Road
Ewing Township, Mercer County, New Jersey

Geotechnical Investigation Report July 12, 2024

Prepared for:
Ewing Township
2 Jake Garzio Drive
Ewing, NJ 08628

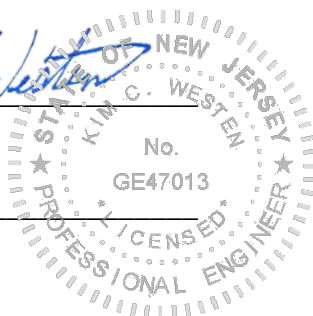
Submitted by:
K. Charles Westen, PE
NJ License No. 47013



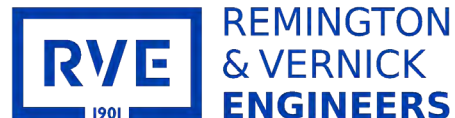
Signature

July 12, 2024

Date



Prepared by:
Remington & Vernick Engineers
2059 Springdale Road
Cherry Hill, New Jersey 08003
Office Phone: (856) 795-9595
RVE Project Number: 1102T089



GEOTECHNICAL INVESTIGATION REPORT

Table of Contents

| <u>Section</u> | <u>Page</u> |
|--|--------------------|
| Introduction | 3 |
| Site & Project Description | 3 |
| Subsurface Investigation | 3 |
| Laboratory Testing | 4 |
| Subsurface Conditions | 4 |
| Discussions & Recommendations | 6 |
| Foundations..... | 10 |
| Floor Slabs | 11 |
| Seismic | 11 |
| Limitations..... | 12 |

Appendices:

Appendix A – Site Location Map/USGS Quadrangle

Appendix B – Soil Boring Location Plan

Appendix C – Soil Boring Logs

Appendix D – Normalized N-Values

Appendix E – Seismic Information

INTRODUCTION

Remington & Vernick Engineers (RVE) has prepared this report which presents the findings, conclusions, and recommendations of a geotechnical investigation conducted for the new Ewing Township Senior Community Center building. The proposed new building is expected to be a single-story structure located at 999 Lower Landing Road, Ewing Township, Mercer County, New Jersey.

The purpose of the geotechnical investigation is to determine the subsurface conditions at the site and to provide recommendations, from a geotechnical engineering viewpoint, for the most suitable type of foundation, site preparation, earthwork operations, and other geotechnical considerations.

SITE & PROJECT DESCRIPTION

The proposed new building will be located roughly within and adjacent to the footprint of the previously demolished senior community center. It is our understanding that the previous community center building was a single-story structure with areas having crawl spaces and a small basement housing a boiler room and mechanical equipment. We further understand the demolition of the community center included removal in its entirety the entire structure including all below grade foundations, walls and floor slabs. Presently the site of the proposed building consists of landscaped areas that surrounded the previous building and un-graded excavation with unconsolidated fill within the original building footprint which will require imported fill to bring the areas to final building subgrade. The general location of the project site is shown on the Site Location Map in Appendix A of this report.

Based on preliminary information, the proposed new building is expected to be a single-story steel frame and curtain wall structure with masonry frost walls and a slab on grade. The building will have a footprint of approximately 58,000 square feet and the maximum anticipated unfactored column and wall loads, as provided by the project structural engineer, are not expected to exceed 200 kips and 4 kips per linear foot, respectively.

At the time of report preparation, the final site grades were not available to us. However, the final site grades are not expected to significantly change from those that presently exist at the site.

SUBSURFACE INVESTIGATION

A Standard Penetration Test (SPT) boring investigation for this project was performed on June 14, 15 and 17, 2024. The investigation consisted of twelve (12) SPT test borings drilled by Boring Brothers, Inc., utilizing the mud rotary method of drilling at locations selected by RVE. The soil borings designated as B-1 through B-12 were drilled to practical sampling spoon refusal or a termination depth of 25 to 27 feet below existing grade at the boring

location. All drilling and soil sampling operations were supervised by RVE, and the field logging of the soil samples was performed by a representative of RVE.

Soil samples were recovered via a two-inch O.D. split-spoon sampler; driven by a hydraulically activated 140-pound hammer, free falling 30 inches (ASTM D 1586). The number of hammer blows required to advance the 24-inch spoon in 6-inch increments (four increments in all) were recorded. The number of blows required to penetrate the middle two increments (6 to 18 inches) is known as the Standard Penetration Resistance (N). Soil samples were obtained continuously in the upper 10 feet and at 5 foot intervals thereafter. Recovered soil samples were visually classified in the field using the *Burmister Soil Identification System* and the *Unified Soil Classification System*. The results of the visual analyses were utilized to prepare the attached Soil Boring Logs located in Appendix C of this report.

The approximate location of the test borings along with other pertinent site information, is shown on the Boring Location Plan, in Appendix B. The soil test boring logs are presented in Appendix C, along with a Glossary of Terms and Definitions.

LABORATORY TESTING

All recovered soil samples were retained by RVE for examination. The field classifications were confirmed or modified as necessary by our geotechnical engineer.

SUBSURFACE CONDITIONS

Published Geologic Data

Published geology indicates that the site soils are discontinuous alluvial materials deposited during the Quaternary period. These materials typically consist of sandy silt, silt and clayey silt with some intermixed gravel. The alluvial material is usually greater than 10 feet in depth where the underlying formations are mostly Triassic shale, argillite, sandstone and diabase bedrock.

The geologic information was obtained from the “Engineering Soil Survey of New Jersey,” Rutgers University, Report No. 12, Mercer County, Engineering Research Bulletin Number 26, March 1954.

Soils Encountered

The site soils are in general agreement with the published geologic data. Beneath a 3-inch layer of topsoil or at grade, fill was encountered in all borings to a depth of 2 to 8 feet below existing grade. Underlying the fill, granular and cohesive alluvial soils were encountered, and were further underlain by decomposed residual bedrock soils, which extended to the

termination depth of the borings. A brief general description is given in the following sections.

Fill Stratum: Beneath a 3-inch layer of topsoil in borings B-3, B-4 and B-11 and at grade in the remaining borings, granular and cohesive fill was encountered to a depth of approximately 2 to 8 feet below existing grade. The granular soils in this stratum can be described as brown, light brown, orangish brown and gray silt and coarse to fine sand with “and” to no medium to fine crushed stone, little to no clay, trace to no cinders and trace to no brick fragments. The cohesive portions of this stratum can be described as brown, light brown, orangish brown and gray clayey silt with some to trace coarse to fine sand and little to trace m-f crushed stone. The relative density of the granular portion of this stratum varies from very loose to dense with normalized Standard Penetration Test (SPT) resistance N_{60} and N_{160} values ranging from 3 to 41 blows per foot (bpf). The relative consistency of the cohesive portions of this stratum varies from firm to hard with normalized SPT resistance N_{60} and N_{160} -values ranging from 7 to 33 bpf.

It should be pointed out that it is sometimes difficult, in the absence of foreign materials within the soil matrix, to differentiate between natural soils and fill or regraded soils, even when classified by experienced engineers. Accordingly, the depth of fill could vary from that indicated on the boring logs.

Alluvial Stratum: Underlying the fill stratum, granular and cohesive alluvial deposits were encountered, and extended to depths of 10 to 20 feet below existing grade. The granular soils in this stratum can be described as varying amounts of mottled orangish brown, brown, reddish brown and gray silt and coarse to fine sand with little to no medium to fine gravel and trace to no clay. The cohesive portions of this stratum can be described as mottled orangish brown, brown, reddish brown and gray clayey silt with little to trace coarse to fine sand and little to trace medium to fine gravel. The relative density of the granular portions of this stratum varies from compact to dense with normalized SPT resistance N_{160} -values ranging from 17 to 38 bpf. The relative consistency of the cohesive portions of this stratum varies from firm to hard with normalized SPT resistance N_{160} -values ranging from 5 to 46 bpf.

Residual Stratum: Underlying the alluvial stratum, decomposed residual bedrock soils were encountered, and extended to the termination depth of each boring. The granular portions of this stratum can be described as varying amounts of reddish brown coarse to fine sand, silt and fine rock fragments with little to trace clay. The cohesive portions of this stratum can be described as reddish-brown clayey silt with little to trace fine rock fragments and little to no fine sand. It should be noted that the rock fragments encountered in this stratum can be described as saprolite, which is to say they are highly friable down to grain sizes as small as silt. The relative density of the granular portions of this stratum varies from compact to very dense with normalized SPT resistance N_{160} -values ranging from 15 to over 50 bpf. The relative

consistency of the cohesive portions of this stratum varies from very stiff to hard with normalized SPT resistance N_{160} -values ranging from 26 to over 50 bpf.

Groundwater

Groundwater was encountered in all borings at depths ranging from 4 to 8 feet below existing grade (approx. elev. 113.3 to 120.0) at the boring locations during time of our drilling operations. A portion of the groundwater encountered at shallower depths in the borings is possibly perched groundwater. It should be noted that this groundwater information represents the conditions encountered at the time of the drilling operations. Groundwater levels generally can fluctuate due to changes in precipitation, infiltration, surface run-off and other hydrogeological factors. Therefore, the groundwater level present at the time of construction may vary from that detected at the time of the drilling operations.

It should also be noted that shallow or perched groundwater might be encountered during excavations for foundation construction, especially if the work commences after a wet weather period. Dewatering of perched water or surface runoff water encountered during construction can be performed using sump pumps.

DISCUSSION & RECOMMENDATIONS

Based on the results of our field investigation, we have carried out evaluations of the existing subsurface soil conditions to determine their engineering properties for the support of the proposed new building, from a geotechnical engineering point of view. The subsurface investigation indicated that the site is underlain by unconsolidated fills over natural cohesive and granular alluvial soils and residual soils that can be utilized to support the proposed structure after the below site preparation and earthwork operation have been completed.

Site Preparation Procedures & Earthwork Operations

The proposed construction area is defined as the area within the proposed addition limits, and a 5-foot and 3-foot wide zone outside the building and pavements, respectively.

1. Clear and strip from the construction area, any existing demolition debris, asphalt pavement, site vegetation or any other deleterious material. Any existing utilities found within the proposed building limits will have to be rerouted outside the building footprint. Any debris, old foundations or abandoned pipes encountered during excavation, will have to be removed completely from the area under the proposed building to a minimum depth of 2 feet below the bottom slab elevation and completely from the area of the foundations. If any pipes are to be left in place, they must be completely filled with cement grout.

2. Excavate the site, where necessary, to proposed subgrade elevations and **remove approximately 4 to 6 feet of unconsolidated soil from the area excavated during the building demolition operation.** Over-excavate any unsuitable material or soils encountered below this elevation in the zone of influence of the foundations. The zone of influence is the volume of soil within lines drawn downward and outward, from the lower edges of a foundation, at a slope of 1.5H:1V. Unsuitable material includes all deleterious material, bricks, debris, rubble, or any other undesirable material designated by the on-site representative of the Geotechnical Engineer. Undesirable natural soils include all soft and loose soils encountered under the bottom of the foundation elevation. Replace the over-excavated material with controlled structural fill as defined herein.
3. After excavation to proposed subgrade and removal of the unconsolidated soil and prior to the placement of any fill, the resulting subgrade should be rigorously proof rolled and compacted with a 10-ton vibratory roller. This should be done during a dry and favorable weather period, and under the technical supervision of a representative of the Geotechnical Engineer. A minimum of 8 overlapping passes is recommended to densify the upper 2 to 4 feet of on-site soils. The vibratory mode should be turned off within 20 feet of existing structures. No heavy equipment should be operated within 5 feet of existing structures. Compaction in the vicinity of existing structures should be accomplished using a mechanical compactor such as a walk behind roller or similar device as approved by the Geotechnical Engineer.
4. Undercut any zones of instability disclosed by the proof rolling, as determined by the on-site representative of the Geotechnical Engineer and replace the undercut material with controlled structural fill as defined herein. As required, raise the ground surface to the proposed subgrade elevation with controlled structural fill. All material used as controlled structural fill material in the building area should comply with the requirements given herein and approved by the on-site representative of the Geotechnical Engineer.
5. All load-bearing fill should be controlled structural fill placed in loose horizontal lifts with a maximum thickness of 8 inches. Controlled structural fill should consist of inorganic, readily compactable, predominantly well-graded granular soils with no more than 12% fines (material passing the No. 200 sieve), and a maximum particle size of 3 inches. The moisture content of the fill materials should be controlled to within 2% of the optimum moisture content, as determined by ASTM D 1557, by wetting, aeration or blending, as necessary. It is recommended that controlled fill within the construction area be compacted to at least 98% and 95% of the maximum dry density, as determined by the Modified Proctor Test (ASTM D 1557), below and above the footing subgrade elevations, respectively. In addition, it is recommended that all fills be stable without significant movement under construction traffic, as judged by the on-site representative of the Geotechnical

Engineer. **Quality control testing of in-place fill densities must be conducted throughout the entire earthwork operation.**

6. Permanent slopes should not be steeper than 2H:1V and provision should be made to protect the surface against erosion by covering the surface with riprap or a suitable vegetative cover.

Excavation

After the site preparation procedures and earthwork operation have been completed, we expect relatively shallow excavations for foundation construction. Deeper excavations may be required for the placement of underground utilities.

Open excavations are feasible provided there is enough room so that the stability of any existing structures or utilities are not affected. Existing structures or utilities may be considered not affected by the open cut excavation if a line projected downward from the bottom edge of the existing footings at a slope of 1.5H:1V does not intersect the excavation slope. Any section of existing structure foundations affected by the excavation should be underpinned. Temporary side slopes of open cut excavations should not be steeper than 2H:1V.

If any existing structures will be affected by an open cut excavation, we recommend that the affected structures be underpinned. Alternatively, temporary sheeting and shoring may be used to support the sides of the excavation. If temporary shoring is utilized, the soil parameters presented in the table below may be used for the design of the shoring. All excavations should be in compliance with “Excavating and Trenching Operations” manual (latest revision), issued by the US Department of Labor, OSHA 2226 and local requirements.

Temporary Shoring Design Parameters

| | |
|---|------|
| Unit Weight of Soil (pcf) | 120 |
| Angle of Internal Friction (ϕ) | 30° |
| Coefficient of Active Earth Pressure (K_a) | 0.33 |
| Coefficient of Earth Pressure At-rest (K_o) | 0.50 |
| Coefficient of Passive Earth Pressure (K_p) | 3.0* |

* A suitable factor of safety should be applied to K_p .

The lateral load information presented in this report should be used only as a guideline by the contractor, and it should be a requirement for the excavation contractor to prepare a proposed sheeting design certified by a licensed professional engineer prior to construction. The excavation contractor should be responsible for the design, installation, and maintenance of all sheeting and shoring.

Regardless of the excavation option chosen, excavated soils should not be stockpiled adjacent to the sides of the excavations to avoid the imposition of additional loads, unless these loads are considered in the design of the temporary shoring or side slopes. Additionally, the effect of excavation machinery should be included in the stability of the open cut slopes, as well as the temporary shoring design.

A portion of the on-site soils are sensitive to moisture and are subject to disturbance and deterioration due to weather, moisture intrusion, and construction traffic, etc. It is recommended that excavation equipment operating from the existing ground surface be utilized to complete the proposed excavations.

If soil subgrades within the excavation are to be left open for a prolonged period, a working mat should be used to protect the foundation subgrade. A working mat may consist of a layer of ¾-inch quarry processed crushed stone, dense graded aggregate, a two-inch lean concrete “mud mat,” or other approved material, which will serve to prevent subgrade softening if the subgrade is exposed for prolonged periods.

Backfill

A portion of the on-site soil contains a high percentage of fine-grained material and are sensitive to moisture which may make them difficult to compact. Therefore, these soils are not suitable for use as controlled structural fill. However, they can be used as non-structural fill to raise grades outside of the building envelope and in any paved areas provided, they can be placed at a moisture content which would permit compaction to the required densities. The clean granular portions of the existing on-site soils, if encountered, can be reused as backfill after approval by the Geotechnical Engineer. Soils with organic or other deleterious materials should be discarded. The moisture content of the soil must be within 2% of the optimum value for proper compaction. Therefore, some adjustment of the moisture content may be necessary prior to use as fill material. Imported fill materials required to complete backfilling of the excavations, should consist of uncontaminated, relatively well-graded granular soils as defined in Item 5 of the Site Preparation & Earthwork Operations portion of this report.

The unconsolidated soils removed from the excavations for the demolition and removal of the existing community building shall be backfilled with controlled structural fill as defined in this report. It is expected that approximately 4 to 6 feet of backfill will be required to fill the excavated area up to the building subgrade elevations. The backfill shall be compacted to at least 98% and 95% of the maximum dry density, as determined by the Modified Proctor Test (ASTM D 1557), below and above the footing subgrade elevations, respectively.

Backfilling against the foundations and for utility trenches, or other structural uses, should be accomplished using controlled structural fill, as defined in this report, compacted to 95% of the maximum dry density as determined by the Modified Proctor Test, ASTM D 1557.

Compaction of the backfill within 5 feet of any existing structures should be carried out with relatively light equipment such as a jumping jack, a walk behind roller, or similar device as approved by the on-site representative of the Geotechnical Engineer. The backfill should be placed in 8-inch lifts and compacted to at least 95% and 90% of maximum dry density, as determined by the ASTM D-1557 test procedure, in structural areas and in paved or landscaped areas, respectively.

Dewatering

Groundwater and possible perched groundwater were encountered in all borings at a depth of 4 to 8 feet below existing grade at the time of our drilling operation. Therefore, continuous dewatering operations should not be required on this site for excavations shallower than 8 feet below existing grade. Minor seepage may be encountered in relatively shallow excavations from 4 to 6 feet due to perched water conditions. Dewatering of perched water, run-off water, or any water encountered during construction can be performed using sump pumps and screened sumps.

If groundwater encountered in excavations deeper than 8 feet cannot be controlled by sump pumps, more elaborate dewatering methods such as deep wells or well points may be required. Dewatering with more elaborate dewatering methods will require a dewatering specification. Dewatering specifications should be of the performance type requiring that the contractor maintains the groundwater level at least 2 feet below the prevailing bottom of the excavation. The dewatering should be continuous during construction operations and until backfill has been placed and compacted to at least 2 feet above natural groundwater level.

Foundations

After site preparation operations have been satisfactorily completed, as recommended herein, the densified on-site natural soils and/or structural fill may be utilized to support the proposed structure using a shallow foundation system. Continuous wall footings and isolated column footings may be used. For design purposes a maximum net allowable bearing pressure of 4,000 pounds per square foot (psf) can be used. With the use of the recommended allowable bearing capacity, a satisfactory factor of safety will be provided against a shear failure and total and differential settlement will be within tolerable limits.

Wall and column footing widths should not be less than 2 and 3 feet, respectively. Exterior footings should be founded at a minimum depth of 3 feet beneath the exterior finished grades for frost protection. Interior footings in heated areas of the building can be founded at any convenient depth provided that the bottom of the floor slab and top of the concrete footings are separated by a minimum 6-inch thick layer of clean structural fill or granular base material.

The footing subgrades should be thoroughly compacted prior to the placement of the concrete utilizing a mechanical compactor such as a jumping jack, walk-behind roller, or similar device as approved by the on-site representative of the Geotechnical Engineer. A portion of the on-site soil contains a relatively high silt and clay content and are very sensitive to moisture. We, therefore, recommend that footing concrete be placed as soon as the excavation is opened and approved. If, however, the excavation is to be left open for a prolonged period, a work mat should be used to protect the foundation subgrade. A work mat may consist of 6 inches of compacted dense grade aggregate or 2 inches of lean concrete.

Prior to the placement of concrete, the foundation subgrade must be inspected by a qualified representative of the Geotechnical Engineer in order to confirm the soil bearing capacity. The contractor should exercise extreme caution not to disturb the subgrade soils. Should the subgrade be disturbed, the loosened soil should be compacted in-place or excavated down to firm soil. Any water which accumulates in the excavation bottom, should be removed promptly.

Floor Slabs

Proposed reinforced concrete floor slabs can be uniformly supported on the densified natural soil or controlled structural fill after site preparation procedures have been successfully completed as discussed herein. The slabs should be structurally independent of walls and footings. Large floor areas should be provided with joints at frequent intervals as determined by the structural engineer. A minimum of 4 inches of $\frac{3}{4}$ -inch clean crushed stone or a 12-inch thick layer (minimum) of well-graded sand and gravel with not more than 5% non-plastic fines is recommended below the slab to assure uniform bearing conditions and to act as a capillary break. A vapor barrier should be placed between the slab and base course, as directed by the Architect, to minimize moisture migration to the surface. All structural fill supporting the floor slab should be compacted to 95% of the maximum dry density (ASTM D 1557).

Concrete slabs placed on the subgrade, prepared as described herein, can be designed using a modulus of subgrade reaction of 200 pounds per cubic inch (pci).

Seismic Zone

According to the New Jersey Edition of the 2021 International Building Code, Section 1613.3.2 referencing ASCE 7, Chapter 20, the project site can be categorized as Site Class "D" for seismic design purposes (see Appendix F). This classification is based on soil properties obtained from the borings.

LIMITATIONS

The conclusions and recommendations contained in this report are based upon the subsurface data obtained during this investigation and on details stated in this report. It is understood that the number of borings made are consistent with good engineering practice, but actual conditions encountered may differ significantly from those projected in this report. Should conditions arise which differ from those described in this report, **RVE** should be notified immediately and provided with all information regarding differing subsurface conditions.

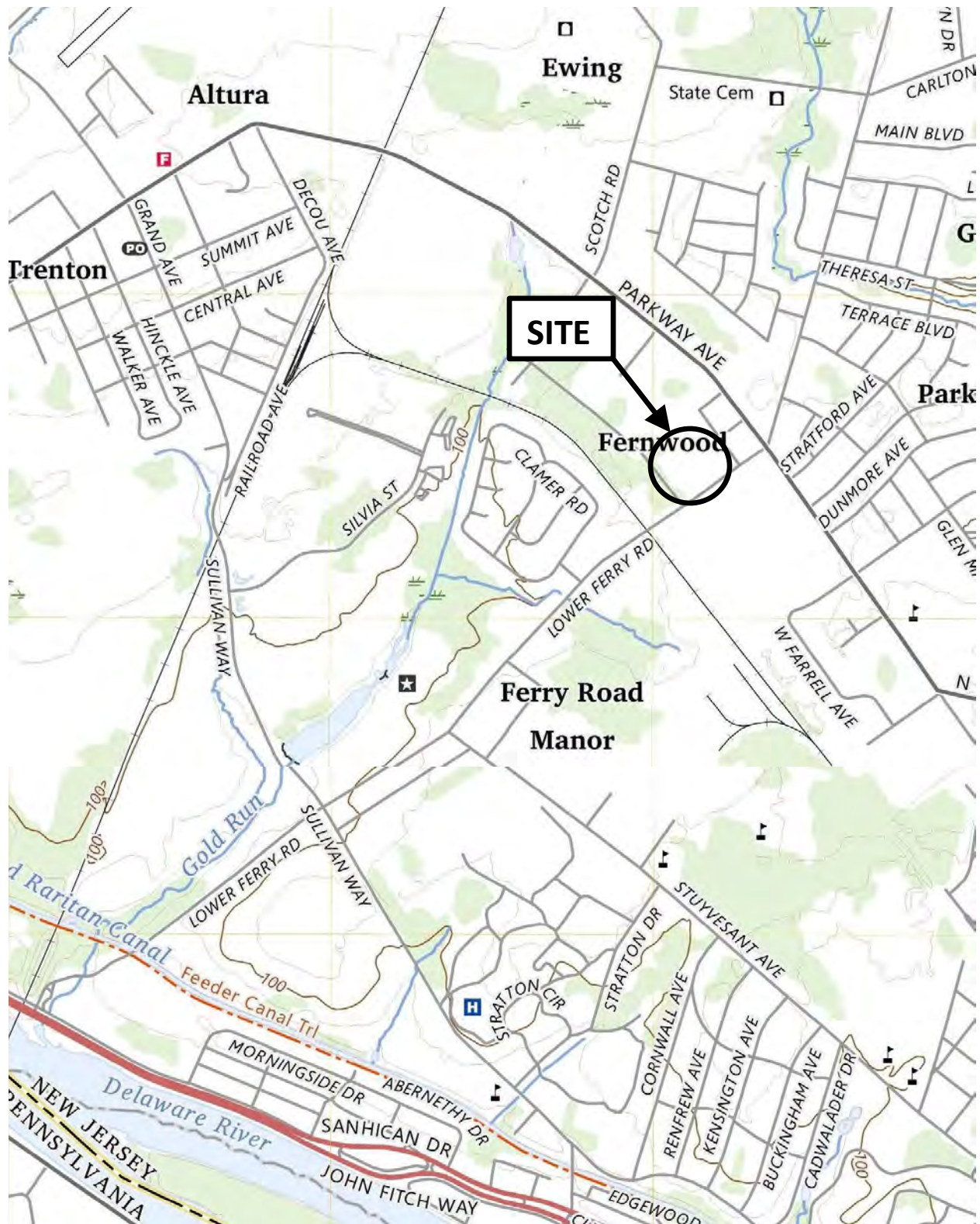
Our recommendations are based upon the assumption that the services of a qualified Geotechnical Engineer will be retained during construction for the observation of all critical earthwork operations and foundation installation. **RVE** cannot minimize, or provide recommended solutions for, any problems resulting from construction or differing soil conditions unless our services include full-time construction inspection to determine that the work performed is in compliance with **RVE's** recommendations, and to ensure the work is carried out in the owner's best interests.

Environmental considerations and contaminants, such as petroleum products, hazardous waste, radioactivity, irritants, pollutants, radon or other dangerous substances and conditions were not the subject of this study. Their presence and/or absence are not implied, inferred or suggested by this report or results of this study.

This report is intended for use with regard to the specific project discussed herein, and any changes in the design of the structure or location, however slight, should be brought to our attention so that we may determine how they may affect our conclusions. We are responsible for the conclusions and opinions contained in this report based on the data relating only to the specific project and location discussed herein.

Appendix A

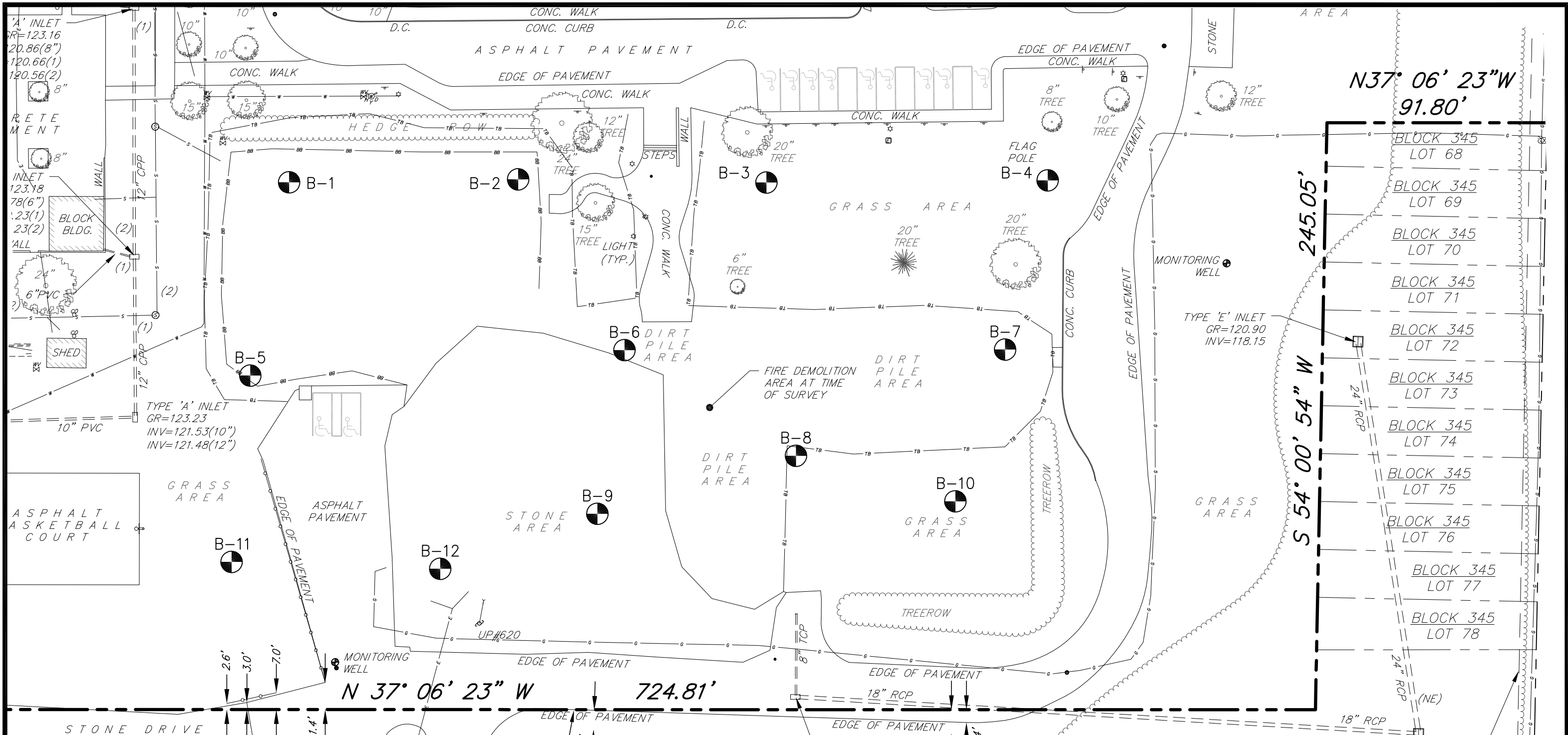
Site Location Map/USGS Quadrangle



**Site Location Map/USGS Quadrangle
New Ewing Senior Community Center
Ewing Township, Mercer County, New Jersey**

Appendix B

Soil Boring Location Plan



| NO. | REVISION | DATE | BY | CHK. BY |
|-----|----------|------|----|---------|
| | | | | |

BORING LOCATION PLAN
NEW EWING SENIOR COMMUNITY CENTER
 EWING, MERCER COUNTY, NEW JERSEY

REMINGTON & VERNICK ENGINEERS GA 277045
 2059 SPRINGDALE ROAD, CHERRY HILL, NJ 08002
 (856) 795-9595, FAX (856) 795-1882, WEB SITE ADDRESS: WWW.RVE.COM

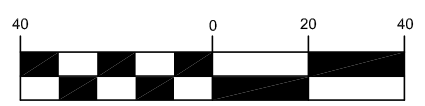
| SCALE | DATE | DRAWN BY | DSGN. BY | CHK'D. BY | DWG. NO. | SHEET NO. |
|--------|--------|----------|----------|-----------|----------|-----------|
| 1"=40' | 7/2024 | C.O.G. | K.C.W. | K.C.W. | | 1 OF 1 |

DWG FILE PATH/NAME

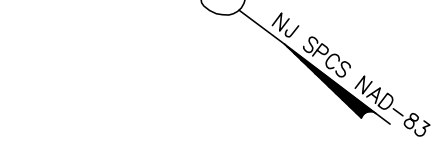
LEGEND

B-1 DENOTES NUMBER AND APPROXIMATE LOCATION OF TEST BORINGS

GRAPHIC SCALE



(IN FEET)
 1 inch = 40 ft.



Appendix C

Soil Test Boring Logs

MODIFIED METHOD
FOR
IDENTIFICATION OF SOILS
AFTER
DR. D. M. BURMISTER

| Soil Component | Descriptive Terms As Written on Log | Range of Proportions |
|--|---|---|
| PRINCIPAL COMPONENT (All Letters Capitalized) | - | 35% or more |
| MINOR COMPONENTS (First Letter Capitalized) | and (a.) some (s.) little (l.) trace (tr.) | 35% to 50% 20% to 35% 10% to 20% 1% to 10% |

Coarse Grained Soils-Gradation of Components

| | | |
|------------------|----|-------------------------------|
| Coarse to fine | cf | All sizes |
| Coarse to medium | cm | Less than 10% fine |
| Medium to fine | mf | Less than 10% coarse |
| Coarse | c | Less than 10% medium & fine |
| Medium | m | Less than 10% coarse & fine |
| Fine | f | Less than 10% coarse & medium |

| Component | Symbol | Sieve Range |
|-----------|--------|---------------|
| Boulders | | 9" and larger |
| Cobbles | | 3" to 9" |
| Gravel | G | |
| Coarse | | ¾" to 3" |
| Fine | | #4 to ¾" |
| Sand | S | |
| Coarse | | #4 to #10 |
| Medium | | #10 to #40 |
| Fine | | #40 to #200 |

Fine Grained Soils-Plasticity of Components

| Component | Symbol | Overall Plasticity | Plasticity Index |
|-------------|--------|--------------------|------------------|
| SILT | S | Non-Plastic | 0 |
| CLAYEY SILT | CyS | Slight | 1 to 5 |
| SILT & CLAY | S & C | Low | 5 to 10 |
| CLAY & SILT | C & S | Medium | 10 to 20 |
| SILTY CLAY | SyC | High | 20 to 40 |
| CLAY | C | Very High | . over 40 |

UNIFIED SOIL CLASSIFICATION SYSTEM. (ASTM D-2487)

| 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: GW, GP, SW, SP GM, GC, SM, SC Borderline cases requiring dual symbols ^b Less than 5 per cent More than 12 per cent 5 to 12 per cent | $C_u = \frac{D_{60}}{D_{10}}$ 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 | | 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 | |
| | | | | u | | | Atterberg limits below "A" line with P.I. Greater than 7 | | |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures | | | | | |
| | 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, little or no fines | | $C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 | | | |
| | | | SP | Poorly graded sands, gravelly sands, little or no fines | | | Not meeting all gradation requirements for SW | | |
| | | Sands with fines (Appreciable amount of fines) | SM ^a | d | | | Silty sands, sand-silt mixtures | Atterberg limits above "A" line or P.I. Less than 4 | Limits plotting in hatched zone with P.I. Between 4 and 7 are <i>borderline</i> cases requiring use of dual symbols |
| | | | | u | | | | Atterberg limits above "A" line with P.I. Greater than 7 | |
| | | | SC | Clayey sands, sand-clay mixtures | | | | | |
| Fine-grained soils (More than half material is smaller than No. 200 sieve) | Silt 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 | <div style="text-align: center;"> </div> | | | | | |
| | | 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 | | | | | | |
| | Silt 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 | | | | | | |
| | | Pt | Peat and other highly organic soils | | | | | | |

^aDivision of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.
^bBorderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

Appendix D

Normalized N-Values

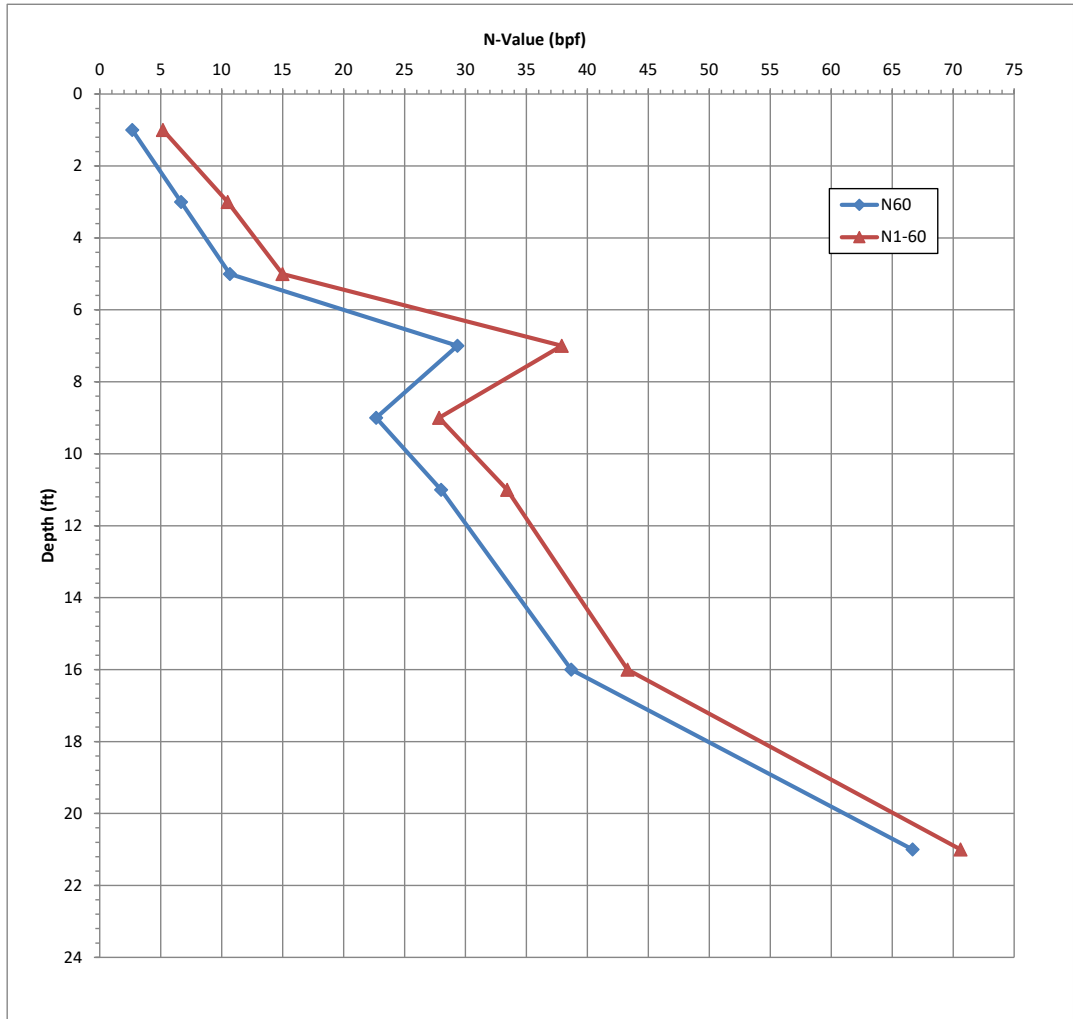
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
 999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-1 |
| Elevation, ft | 122.5 |
| Groundwater Depth, ft | 8 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | | | |
|---------------|-----------------------------|--------|---------------------------------------|
| Formulas used | $N_{60} = N(E/.6)$ | CN < 2 | Only valid for $\sigma' \geq 0.5$ ksf |
| | $\sigma' = \sigma_t - u$ | | |
| | $CN = .77 \log(40/\sigma')$ | | |
| | $N_{160} = N_{60} * CN$ | | |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 121.5 | 2 | 3 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 5 |
| 2 | 2 - 4 | 3 | 119.5 | 5 | 7 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 11 |
| 3 | 4 - 6 | 5 | 117.5 | 8 | 11 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 15 |
| 4 | 6 - 8 | 7 | 115.5 | 22 | 29 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 38 |
| 5 | 8 - 10 | 9 | 113.5 | 17 | 23 | 120 | 1.08 | 0.06 | 1.02 | 1.23 | 28 |
| 6 | 10 - 12 | 11 | 111.5 | 21 | 28 | 120 | 1.32 | 0.19 | 1.13 | 1.19 | 33 |
| 7 | 15 - 17 | 16 | 106.5 | 29 | 39 | 120 | 1.92 | 0.51 | 1.41 | 1.12 | 43 |
| 8 | 20 - 22 | 21 | 101.5 | 50 | 67 | 120 | 2.52 | 0.83 | 1.69 | 1.06 | 71 |



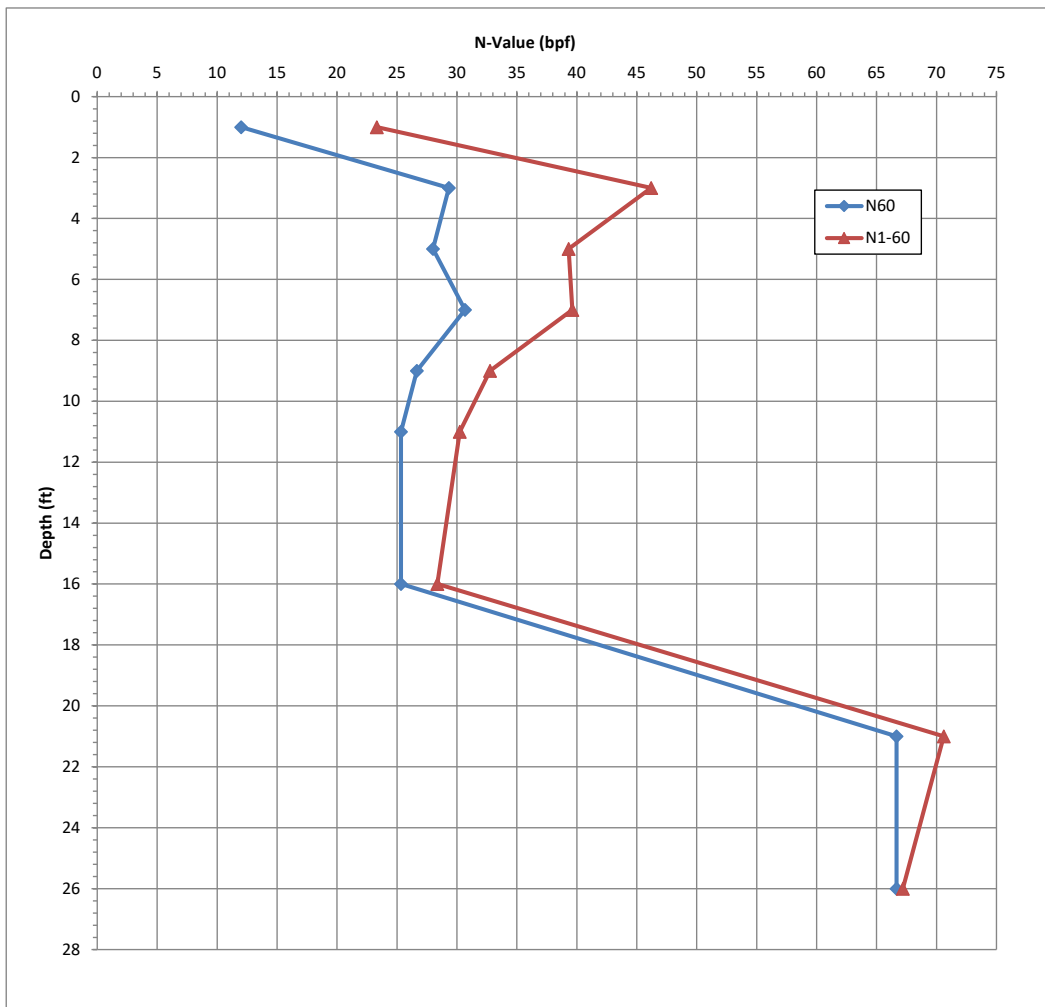
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-2 |
| Elevation, ft | 122.7 |
| Groundwater Depth, ft | 8 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | |
|---------------|--|
| Formulas used | $N_{60} = N(E/.6)$ |
| | $\sigma' = \sigma_t - u$ |
| | $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf |
| | $N_{160} = N_{60} * CN$ |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 121.7 | 9 | 12 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 23 |
| 2 | 2 - 4 | 3 | 119.7 | 22 | 29 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 46 |
| 3 | 4 - 6 | 5 | 117.7 | 21 | 28 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 39 |
| 4 | 6 - 8 | 7 | 115.7 | 23 | 31 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 40 |
| 5 | 8 - 10 | 9 | 113.7 | 20 | 27 | 120 | 1.08 | 0.06 | 1.02 | 1.23 | 33 |
| 6 | 10 - 12 | 11 | 111.7 | 19 | 25 | 120 | 1.32 | 0.19 | 1.13 | 1.19 | 30 |
| 7 | 15 - 17 | 16 | 106.7 | 19 | 25 | 120 | 1.92 | 0.51 | 1.41 | 1.12 | 28 |
| 8 | 20 - 22 | 21 | 101.7 | 50 | 67 | 120 | 2.52 | 0.83 | 1.69 | 1.06 | 71 |
| 9 | 25 - 27 | 26 | 96.7 | 50 | 67 | 120 | 3.12 | 1.16 | 1.96 | 1.01 | 67 |



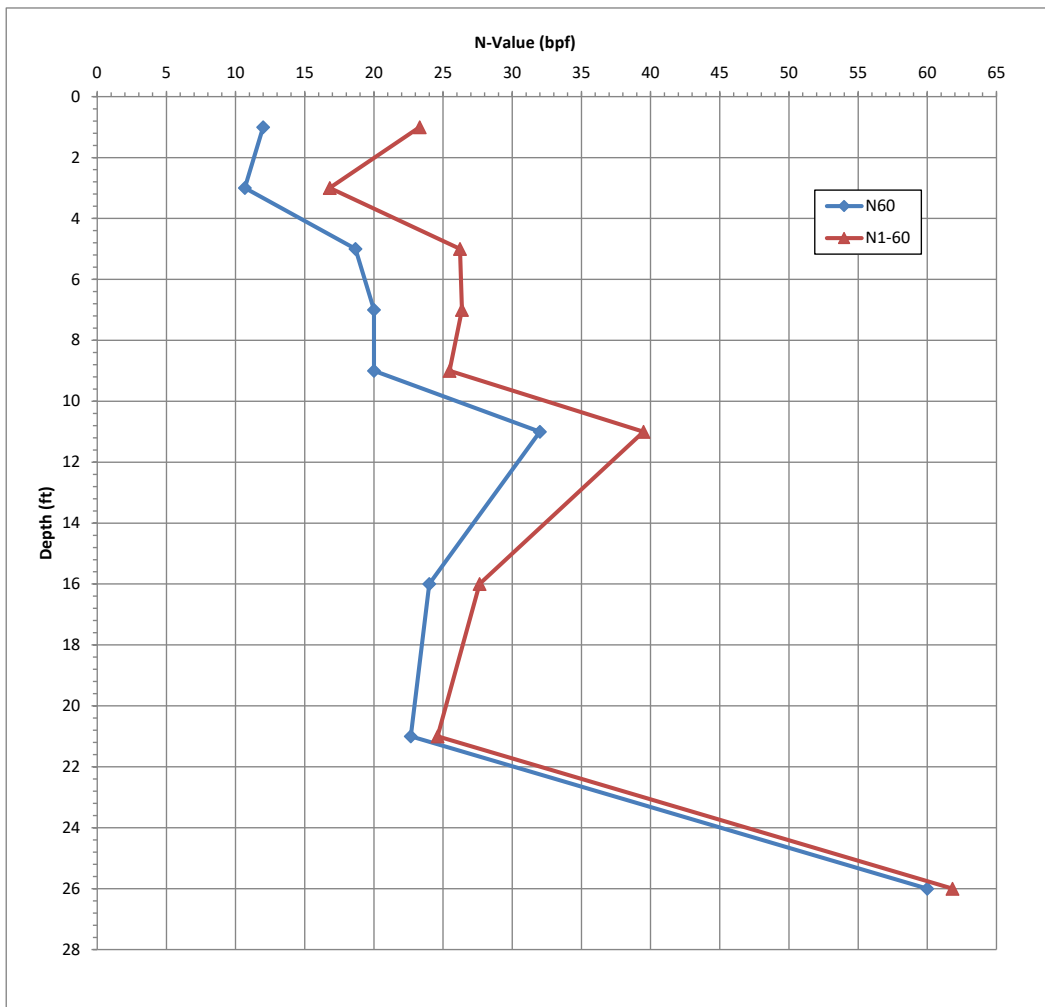
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-3 |
| Elevation, ft | 126.2 |
| Groundwater Depth, ft | 6 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | |
|---------------|--|
| Formulas used | $N_{60} = N(E/.6)$ |
| | $\sigma' = \sigma_t - u$ |
| | $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf |
| | $N_{160} = N_{60} * CN$ |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 125.2 | 9 | 12 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 23 |
| 2 | 2 - 4 | 3 | 123.2 | 8 | 11 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 17 |
| 3 | 4 - 6 | 5 | 121.2 | 14 | 19 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 26 |
| 4 | 6 - 8 | 7 | 119.2 | 15 | 20 | 120 | 0.84 | 0.06 | 0.78 | 1.32 | 26 |
| 5 | 8 - 10 | 9 | 117.2 | 15 | 20 | 120 | 1.08 | 0.19 | 0.89 | 1.27 | 25 |
| 6 | 10 - 12 | 11 | 115.2 | 24 | 32 | 120 | 1.32 | 0.32 | 1.00 | 1.23 | 39 |
| 7 | 15 - 17 | 16 | 110.2 | 18 | 24 | 120 | 1.92 | 0.64 | 1.28 | 1.15 | 28 |
| 8 | 20 - 22 | 21 | 105.2 | 17 | 23 | 120 | 2.52 | 0.96 | 1.56 | 1.09 | 25 |
| 9 | 25 - 27 | 26 | 100.2 | 45 | 60 | 120 | 3.12 | 1.28 | 1.84 | 1.03 | 62 |



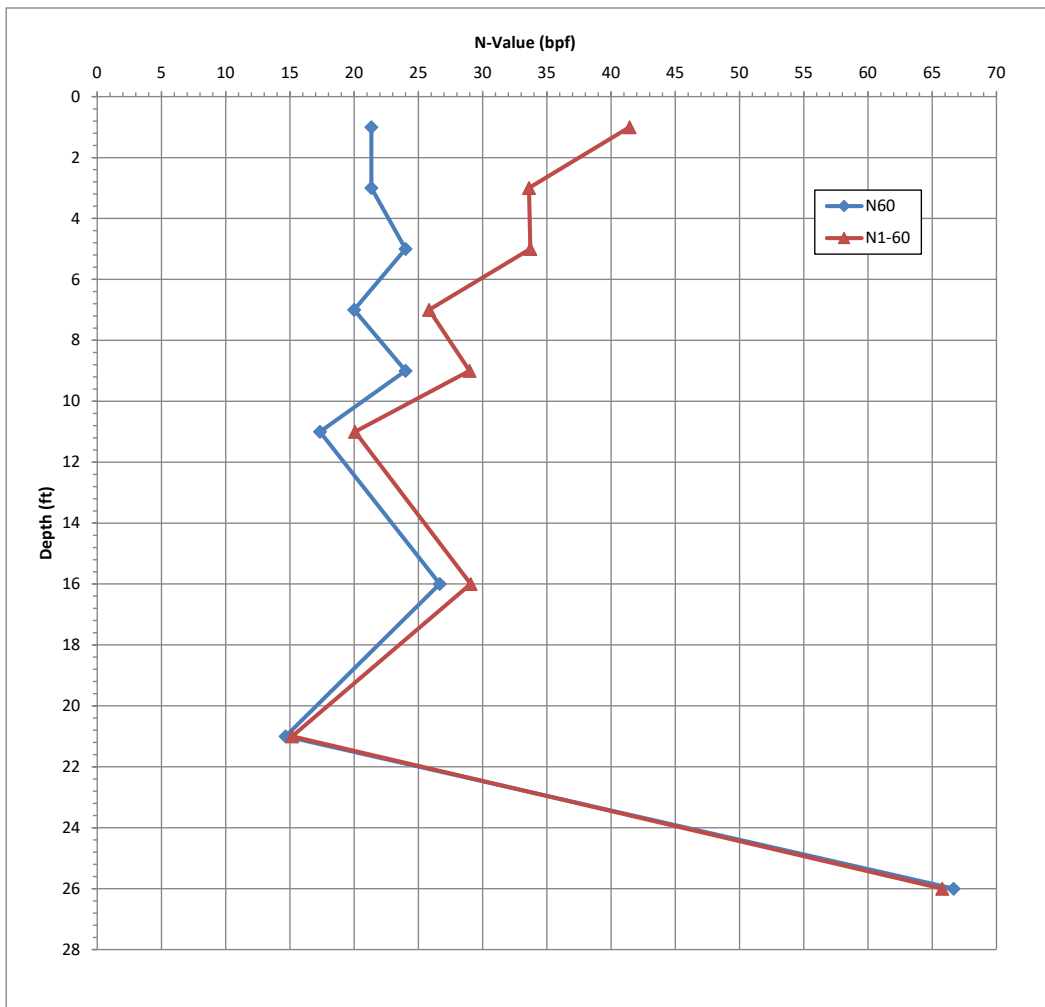
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-4 |
| Elevation, ft | 123.3 |
| Groundwater Depth, ft | 10 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | |
|---------------|--|
| Formulas used | $N_{60} = N(E/.6)$ |
| | $\sigma' = \sigma_t - u$ |
| | $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf |
| | $N_{160} = N_{60} * CN$ |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 122.3 | 16 | 21 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 41 |
| 2 | 2 - 4 | 3 | 120.3 | 16 | 21 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 34 |
| 3 | 4 - 6 | 5 | 118.3 | 18 | 24 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 34 |
| 4 | 6 - 8 | 7 | 116.3 | 15 | 20 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 26 |
| 5 | 8 - 10 | 9 | 114.3 | 18 | 24 | 120 | 1.08 | 0.00 | 1.08 | 1.21 | 29 |
| 6 | 10 - 12 | 11 | 112.3 | 13 | 17 | 120 | 1.32 | 0.06 | 1.26 | 1.16 | 20 |
| 7 | 15 - 17 | 16 | 107.3 | 20 | 27 | 120 | 1.92 | 0.39 | 1.53 | 1.09 | 29 |
| 8 | 20 - 22 | 21 | 102.3 | 11 | 15 | 120 | 2.52 | 0.71 | 1.81 | 1.03 | 15 |
| 9 | 25 - 27 | 26 | 97.3 | 50 | 67 | 120 | 3.12 | 1.03 | 2.09 | 0.99 | 66 |



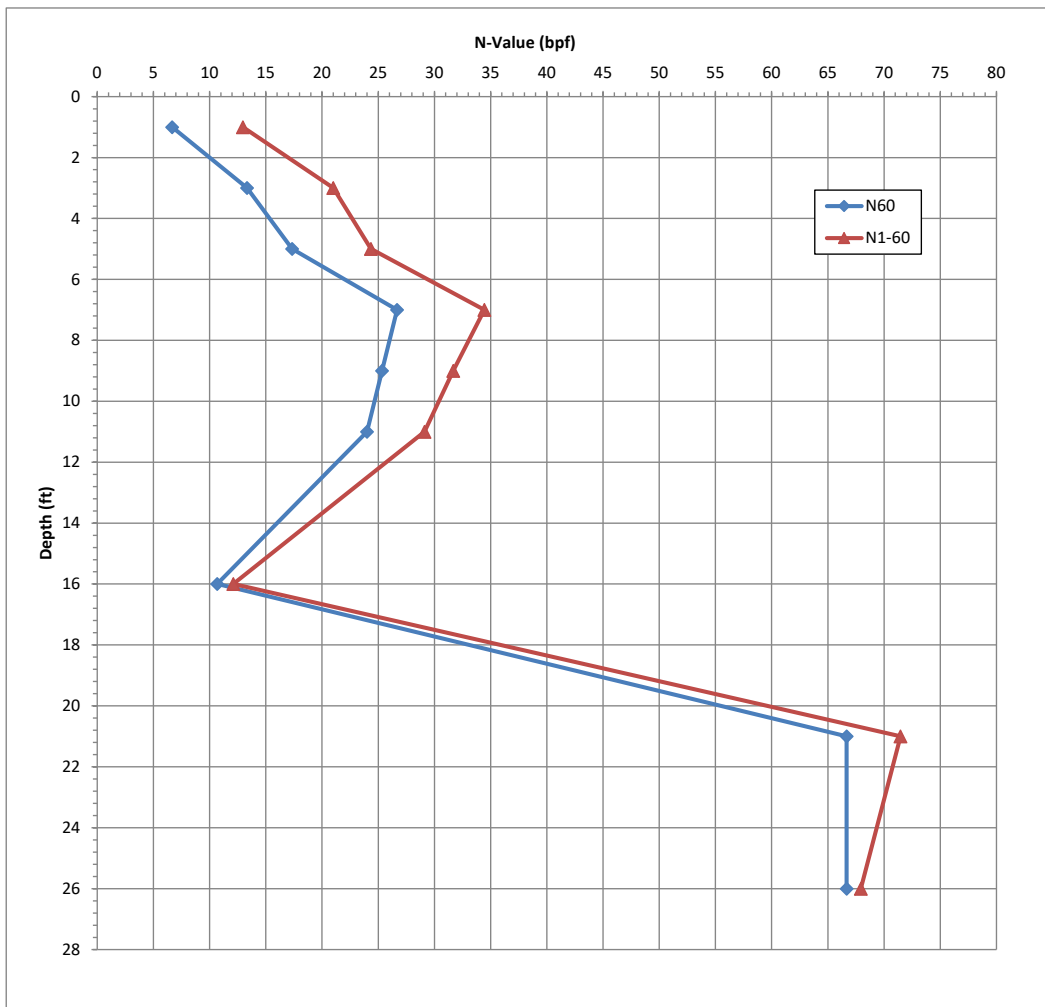
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
 999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-5 |
| Elevation, ft | 123 |
| Groundwater Depth, ft | 7 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | |
|---------------|---|
| Formulas used | $N_{60} = N(E/.6)$ $\sigma' = \sigma_t - u$ $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf $N_{160} = N_{60} * CN$ |
|---------------|---|

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 122 | 5 | 7 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 13 |
| 2 | 2 - 4 | 3 | 120 | 10 | 13 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 21 |
| 3 | 4 - 6 | 5 | 118 | 13 | 17 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 24 |
| 4 | 6 - 8 | 7 | 116 | 20 | 27 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 34 |
| 5 | 8 - 10 | 9 | 114 | 19 | 25 | 120 | 1.08 | 0.13 | 0.95 | 1.25 | 32 |
| 6 | 10 - 12 | 11 | 112 | 18 | 24 | 120 | 1.32 | 0.26 | 1.06 | 1.21 | 29 |
| 7 | 15 - 17 | 16 | 107 | 8 | 11 | 120 | 1.92 | 0.58 | 1.34 | 1.14 | 12 |
| 8 | 20 - 22 | 21 | 102 | 50 | 67 | 120 | 2.52 | 0.90 | 1.62 | 1.07 | 71 |
| 9 | 25 - 27 | 26 | 97 | 50 | 67 | 120 | 3.12 | 1.22 | 1.90 | 1.02 | 68 |



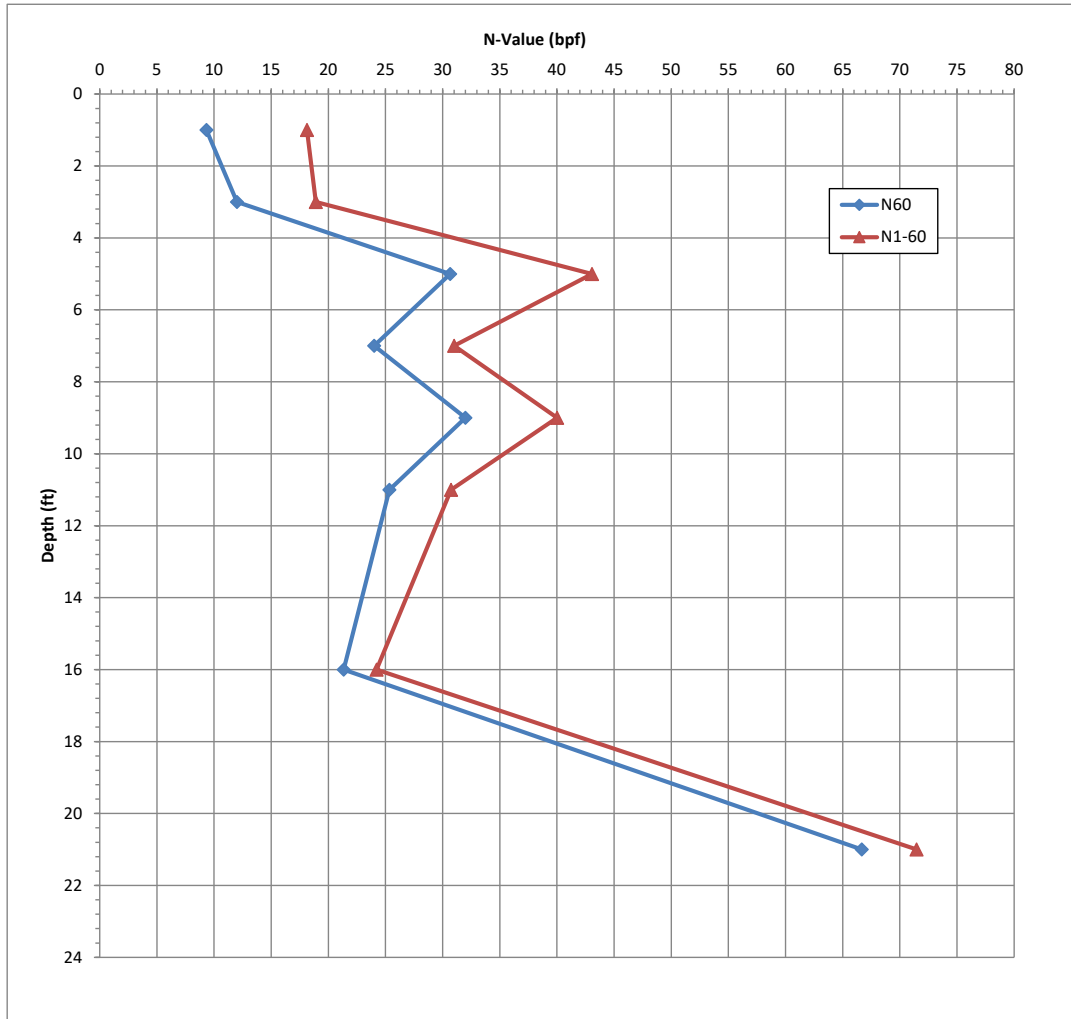
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
 999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-6 |
| Elevation, ft | 123.6 |
| Groundwater Depth, ft | 7 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | | | |
|---------------|-----------------------------|--------|---------------------------------------|
| Formulas used | $N_{60} = N(E/.6)$ | CN < 2 | Only valid for $\sigma' \geq 0.5$ ksf |
| | $\sigma' = \sigma_t - u$ | | |
| | $CN = .77 \log(40/\sigma')$ | | |
| | $N_{160} = N_{60} * CN$ | | |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 122.6 | 7 | 9 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 18 |
| 2 | 2 - 4 | 3 | 120.6 | 9 | 12 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 19 |
| 3 | 4 - 6 | 5 | 118.6 | 23 | 31 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 43 |
| 4 | 6 - 8 | 7 | 116.6 | 18 | 24 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 31 |
| 5 | 8 - 10 | 9 | 114.6 | 24 | 32 | 120 | 1.08 | 0.13 | 0.95 | 1.25 | 40 |
| 6 | 10 - 12 | 11 | 112.6 | 19 | 25 | 120 | 1.32 | 0.26 | 1.06 | 1.21 | 31 |
| 7 | 15 - 17 | 16 | 107.6 | 16 | 21 | 120 | 1.92 | 0.58 | 1.34 | 1.14 | 24 |
| 8 | 20 - 22 | 21 | 102.6 | 50 | 67 | 120 | 2.52 | 0.90 | 1.62 | 1.07 | 71 |



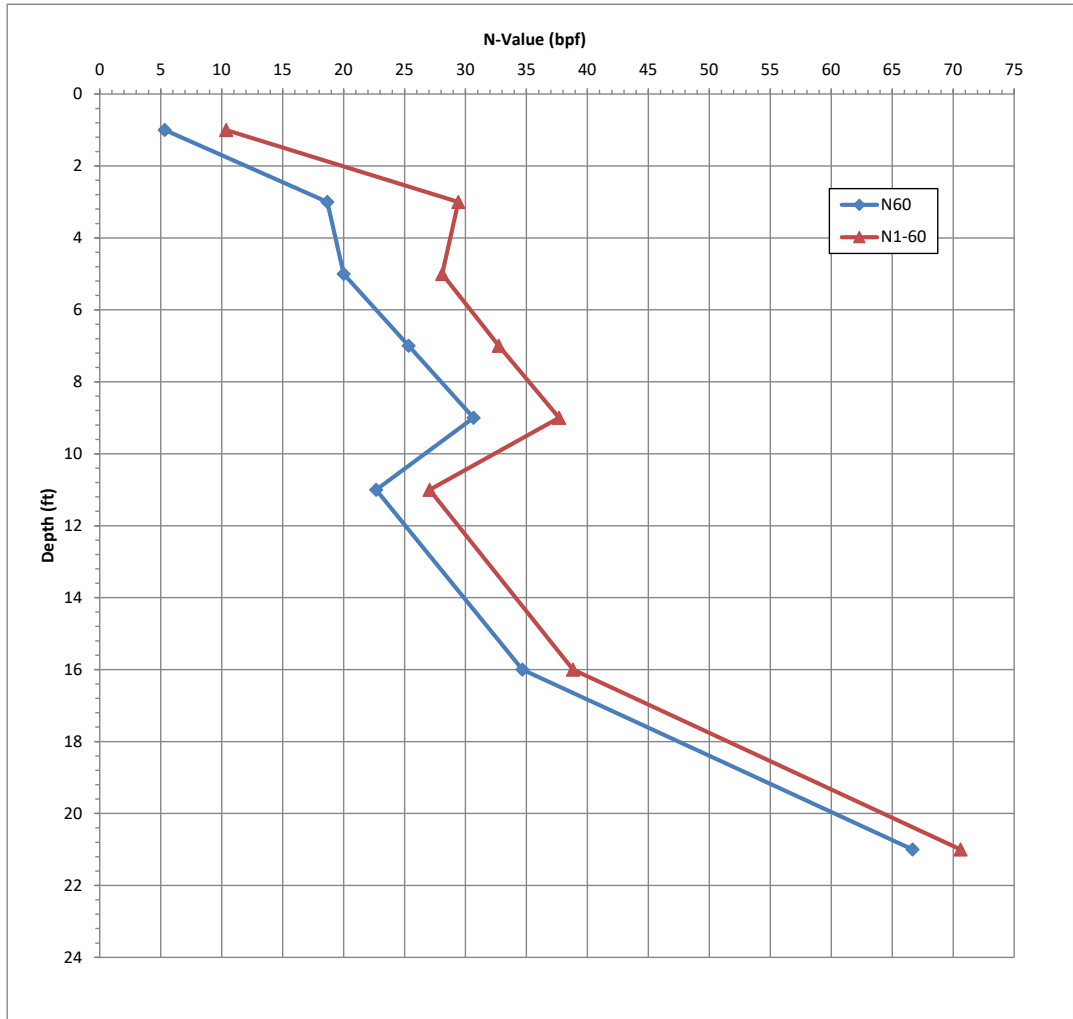
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
 999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-7 |
| Elevation, ft | 122.9 |
| Groundwater Depth, ft | 8 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | | | |
|---------------|-----------------------------|--------|---------------------------------------|
| Formulas used | $N_{60} = N(E/.6)$ | CN < 2 | Only valid for $\sigma' \geq 0.5$ ksf |
| | $\sigma' = \sigma_t - u$ | | |
| | $CN = .77 \log(40/\sigma')$ | | |
| | $N_{160} = N_{60} * CN$ | | |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 121.9 | 4 | 5 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 10 |
| 2 | 2 - 4 | 3 | 119.9 | 14 | 19 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 29 |
| 3 | 4 - 6 | 5 | 117.9 | 15 | 20 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 28 |
| 4 | 6 - 8 | 7 | 115.9 | 19 | 25 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 33 |
| 5 | 8 - 10 | 9 | 113.9 | 23 | 31 | 120 | 1.08 | 0.06 | 1.02 | 1.23 | 38 |
| 6 | 10 - 12 | 11 | 111.9 | 17 | 23 | 120 | 1.32 | 0.19 | 1.13 | 1.19 | 27 |
| 7 | 15 - 17 | 16 | 106.9 | 26 | 35 | 120 | 1.92 | 0.51 | 1.41 | 1.12 | 39 |
| 8 | 20 - 22 | 21 | 101.9 | 50 | 67 | 120 | 2.52 | 0.83 | 1.69 | 1.06 | 71 |



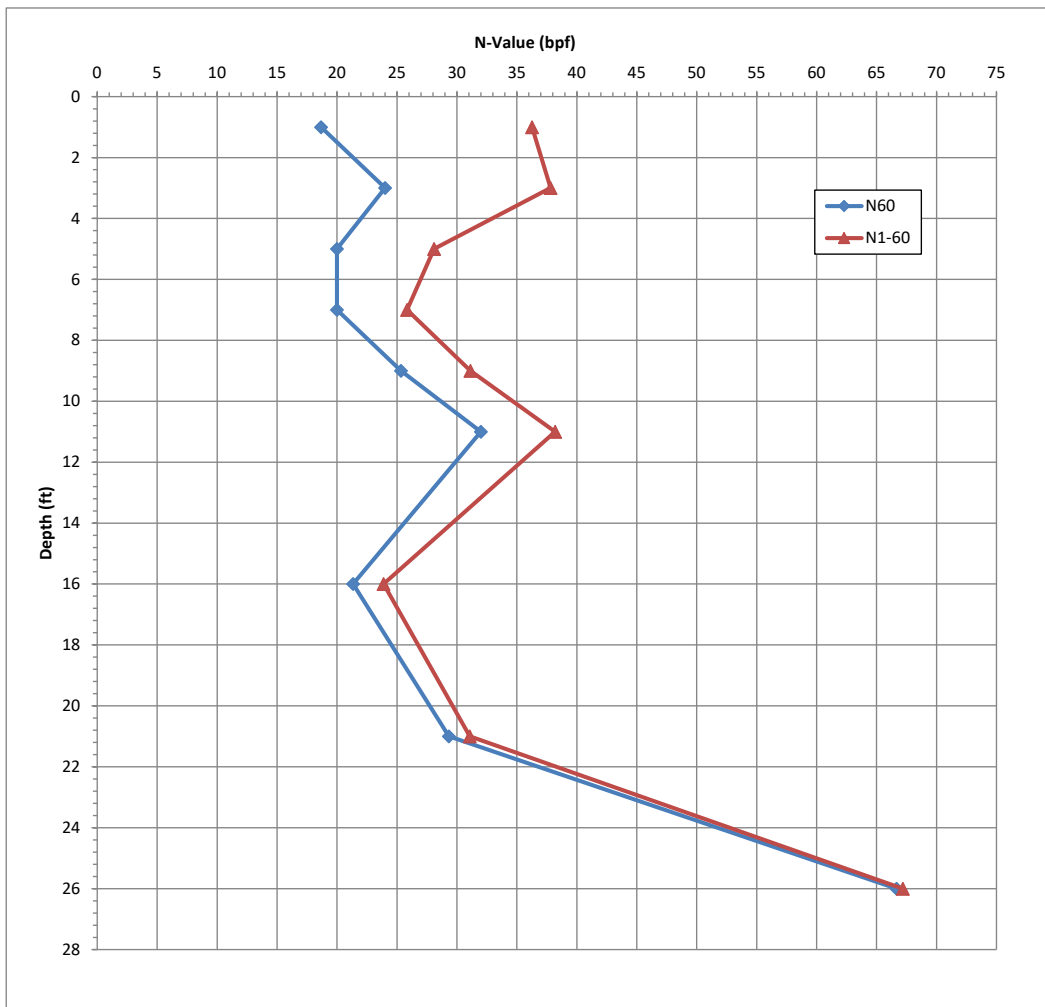
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-8 |
| Elevation, ft | 126.7 |
| Groundwater Depth, ft | 8 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | |
|---------------|--|
| Formulas used | $N_{60} = N(E/.6)$ |
| | $\sigma' = \sigma_t - u$ |
| | $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf |
| | $N_{160} = N_{60} * CN$ |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 125.7 | 14 | 19 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 36 |
| 2 | 2 - 4 | 3 | 123.7 | 18 | 24 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 38 |
| 3 | 4 - 6 | 5 | 121.7 | 15 | 20 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 28 |
| 4 | 6 - 8 | 7 | 119.7 | 15 | 20 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 26 |
| 5 | 8 - 10 | 9 | 117.7 | 19 | 25 | 120 | 1.08 | 0.06 | 1.02 | 1.23 | 31 |
| 6 | 10 - 12 | 11 | 115.7 | 24 | 32 | 120 | 1.32 | 0.19 | 1.13 | 1.19 | 38 |
| 7 | 15 - 17 | 16 | 110.7 | 16 | 21 | 120 | 1.92 | 0.51 | 1.41 | 1.12 | 24 |
| 8 | 20 - 22 | 21 | 105.7 | 22 | 29 | 120 | 2.52 | 0.83 | 1.69 | 1.06 | 31 |
| 9 | 25 - 27 | 26 | 100.7 | 50 | 67 | 120 | 3.12 | 1.16 | 1.96 | 1.01 | 67 |



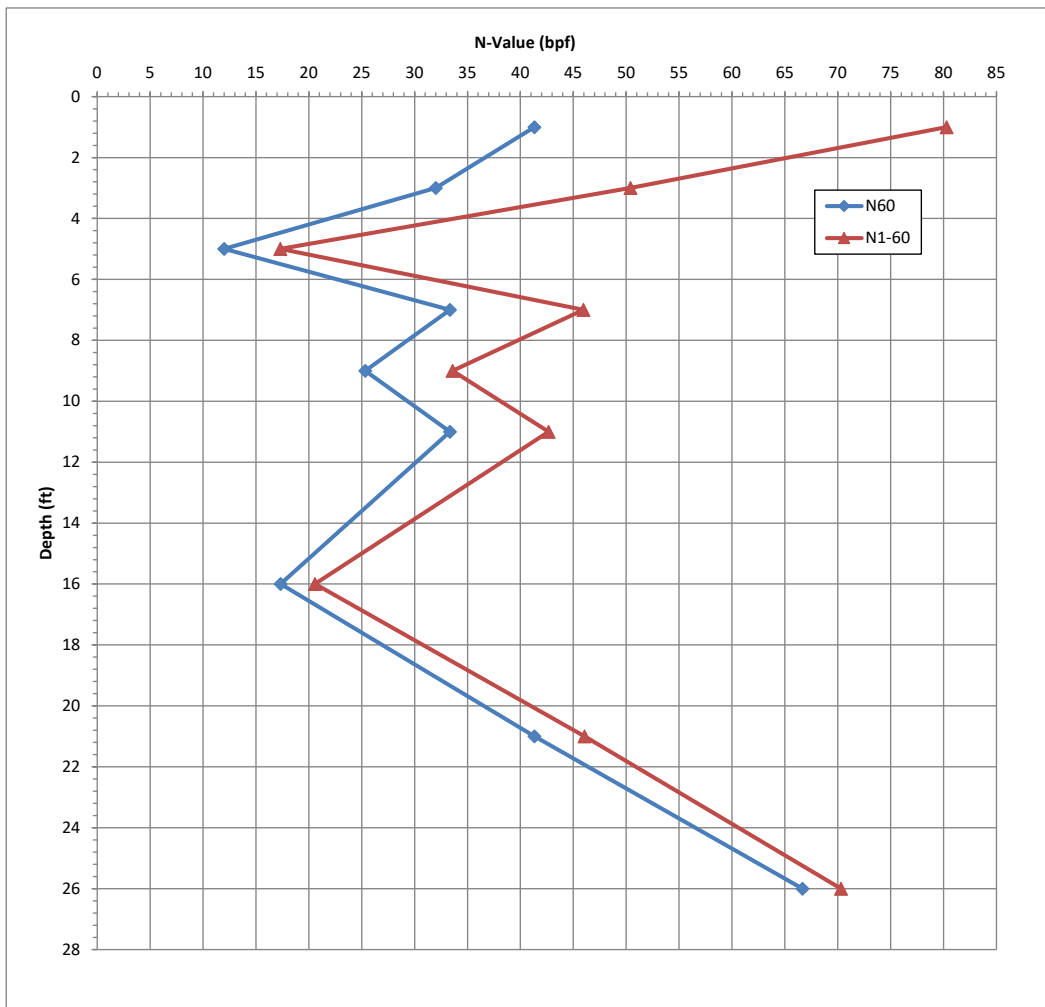
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-9 |
| Elevation, ft | 124.9 |
| Groundwater Depth, ft | 4 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | |
|---------------|--|
| Formulas used | $N_{60} = N(E/.6)$ |
| | $\sigma' = \sigma_t - u$ |
| | $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf |
| | $N_{160} = N_{60} * CN$ |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 123.9 | 31 | 41 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 80 |
| 2 | 2 - 4 | 3 | 121.9 | 24 | 32 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 50 |
| 3 | 4 - 6 | 5 | 119.9 | 9 | 12 | 120 | 0.60 | 0.06 | 0.54 | 1.44 | 17 |
| 4 | 6 - 8 | 7 | 117.9 | 25 | 33 | 120 | 0.84 | 0.19 | 0.65 | 1.38 | 46 |
| 5 | 8 - 10 | 9 | 115.9 | 19 | 25 | 120 | 1.08 | 0.32 | 0.76 | 1.33 | 34 |
| 6 | 10 - 12 | 11 | 113.9 | 25 | 33 | 120 | 1.32 | 0.45 | 0.87 | 1.28 | 43 |
| 7 | 15 - 17 | 16 | 108.9 | 13 | 17 | 120 | 1.92 | 0.77 | 1.15 | 1.19 | 21 |
| 8 | 20 - 22 | 21 | 103.9 | 31 | 41 | 120 | 2.52 | 1.09 | 1.43 | 1.11 | 46 |
| 9 | 25 - 27 | 26 | 98.9 | 50 | 67 | 120 | 3.12 | 1.41 | 1.71 | 1.05 | 70 |



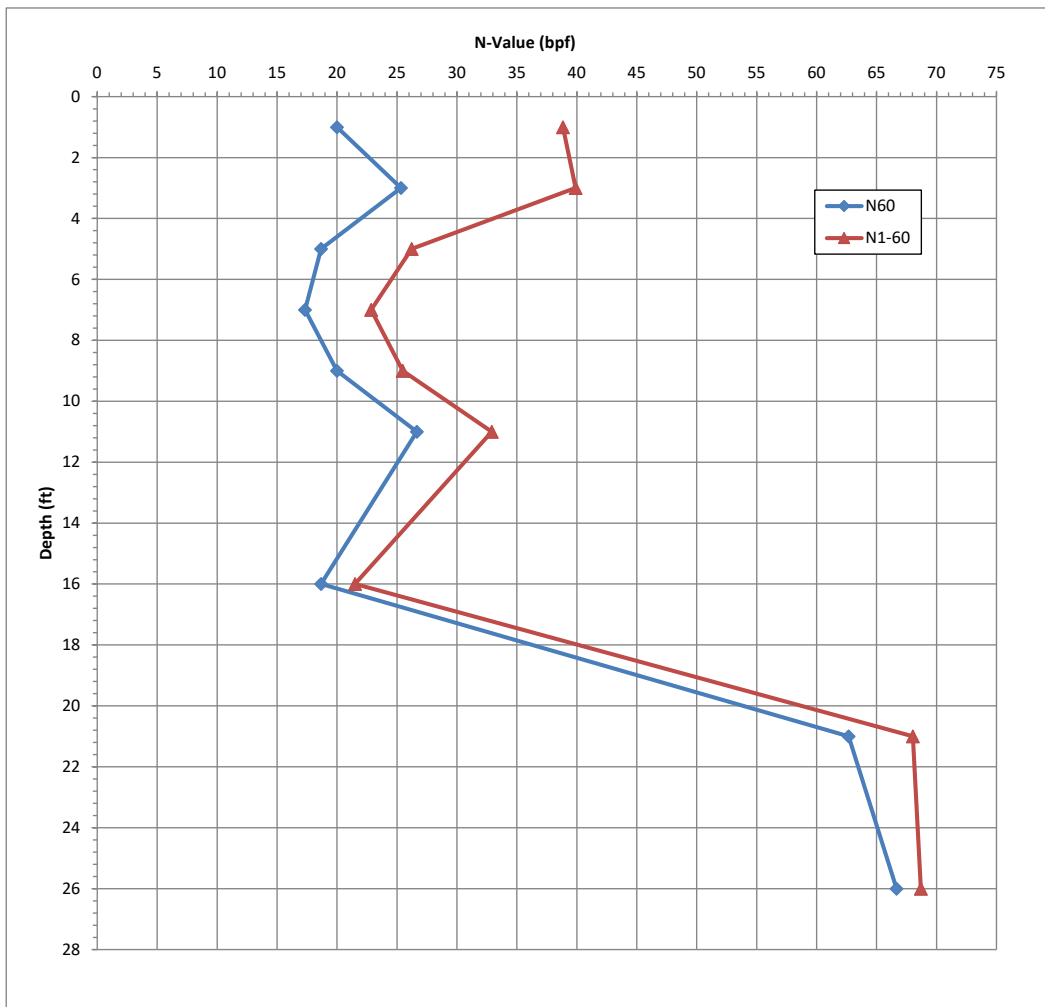
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-10 |
| Elevation, ft | 126.7 |
| Groundwater Depth, ft | 6 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | |
|---------------|--|
| Formulas used | $N_{60} = N(E/.6)$ |
| | $\sigma' = \sigma_t - u$ |
| | $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf |
| | $N_{160} = N_{60} * CN$ |

| Sample Number | Sample Depth | N-value Recorded | | | N_{60} | γ pcf | σ_t ksf | u ksf | σ' ksf | CN | N160 |
|---------------|--------------|------------------|-------|-------|----------|--------------|----------------|---------|---------------|------|------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 125.7 | 15 | 20 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 39 |
| 2 | 2 - 4 | 3 | 123.7 | 19 | 25 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 40 |
| 3 | 4 - 6 | 5 | 121.7 | 14 | 19 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 26 |
| 4 | 6 - 8 | 7 | 119.7 | 13 | 17 | 120 | 0.84 | 0.06 | 0.78 | 1.32 | 23 |
| 5 | 8 - 10 | 9 | 117.7 | 15 | 20 | 120 | 1.08 | 0.19 | 0.89 | 1.27 | 25 |
| 6 | 10 - 12 | 11 | 115.7 | 20 | 27 | 120 | 1.32 | 0.32 | 1.00 | 1.23 | 33 |
| 7 | 15 - 17 | 16 | 110.7 | 14 | 19 | 120 | 1.92 | 0.64 | 1.28 | 1.15 | 21 |
| 8 | 20 - 22 | 21 | 105.7 | 47 | 63 | 120 | 2.52 | 0.96 | 1.56 | 1.09 | 68 |
| 9 | 25 - 27 | 26 | 100.7 | 50 | 67 | 120 | 3.12 | 1.28 | 1.84 | 1.03 | 69 |



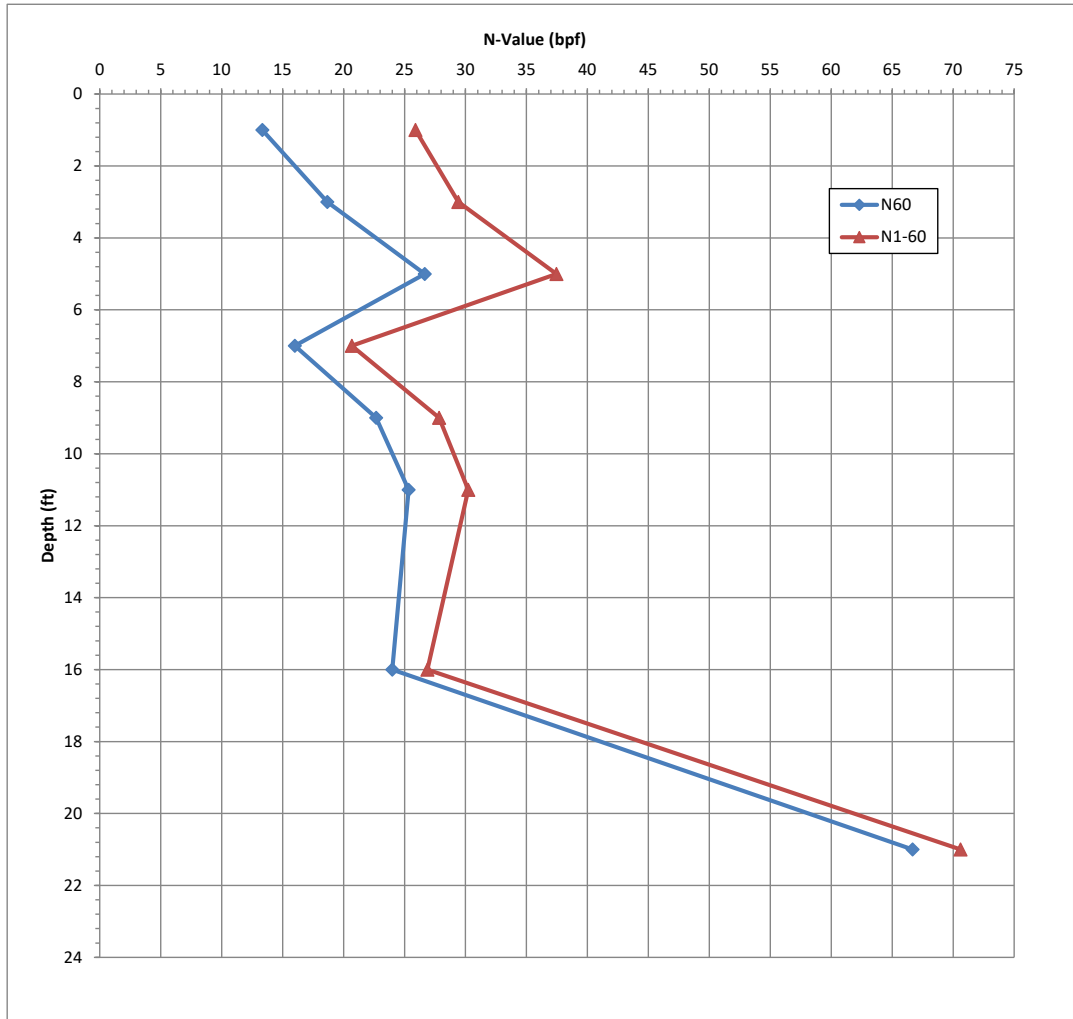
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
 999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-11 |
| Elevation, ft | 125.1 |
| Groundwater Depth, ft | 8 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

| | | | |
|---------------|-----------------------------|--------|---------------------------------------|
| Formulas used | $N_{60} = N(E/.6)$ | CN < 2 | Only valid for $\sigma' \geq 0.5$ ksf |
| | $\sigma' = \sigma_t - u$ | | |
| | $CN = .77 \log(40/\sigma')$ | | |
| | $N_{160} = N_{60} * CN$ | | |

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 124.1 | 10 | 13 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 26 |
| 2 | 2 - 4 | 3 | 122.1 | 14 | 19 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 29 |
| 3 | 4 - 6 | 5 | 120.1 | 20 | 27 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 37 |
| 4 | 6 - 8 | 7 | 118.1 | 12 | 16 | 120 | 0.84 | 0.00 | 0.84 | 1.29 | 21 |
| 5 | 8 - 10 | 9 | 116.1 | 17 | 23 | 120 | 1.08 | 0.06 | 1.02 | 1.23 | 28 |
| 6 | 10 - 12 | 11 | 114.1 | 19 | 25 | 120 | 1.32 | 0.19 | 1.13 | 1.19 | 30 |
| 7 | 15 - 17 | 16 | 109.1 | 18 | 24 | 120 | 1.92 | 0.51 | 1.41 | 1.12 | 27 |
| 8 | 20 - 22 | 21 | 104.1 | 50 | 67 | 120 | 2.52 | 0.83 | 1.69 | 1.06 | 71 |



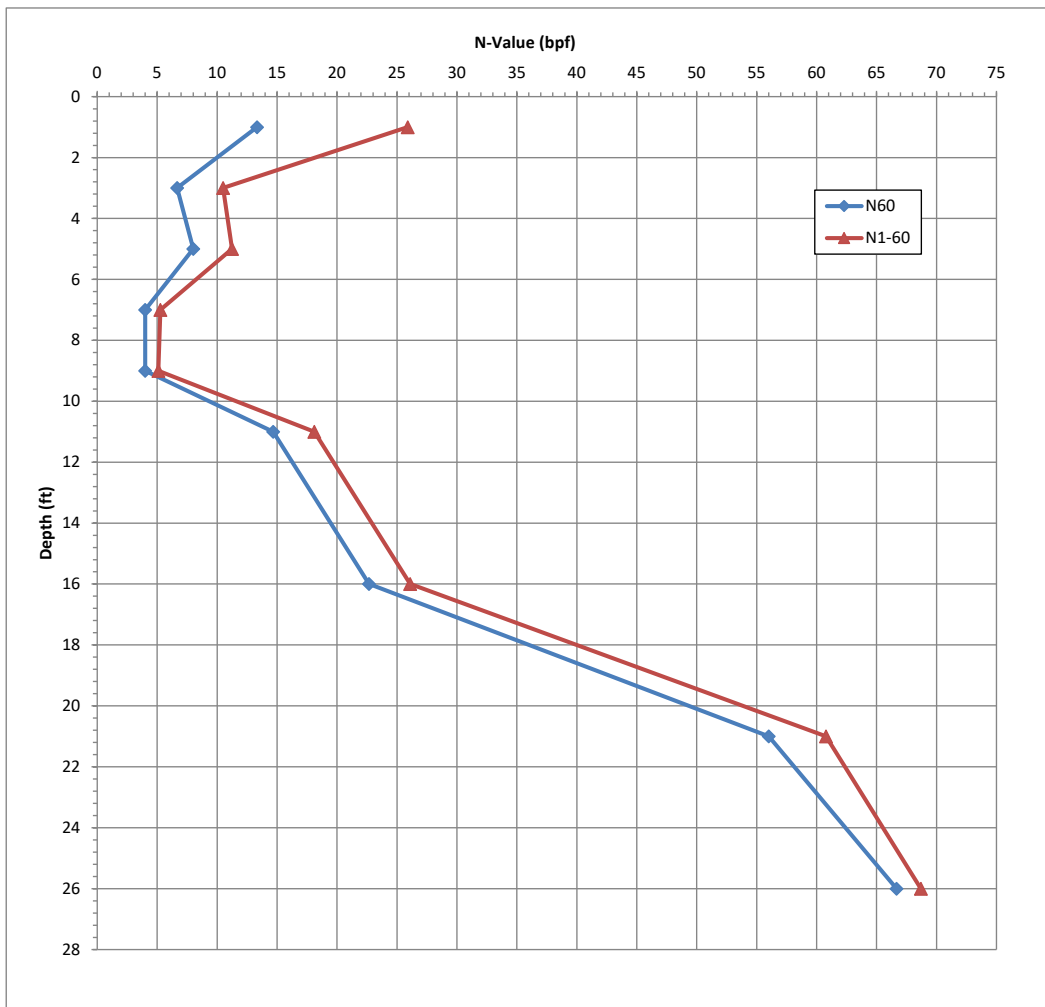
NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
 999 Lower Ferry Road, Ewing Township, New Jersey

| | |
|-----------------------|-----------|
| Boring No. | B-12 |
| Elevation, ft | 125.1 |
| Groundwater Depth, ft | 6 |
| Hammer Type | Automatic |
| Hammer Efficiency, E | 0.8 |

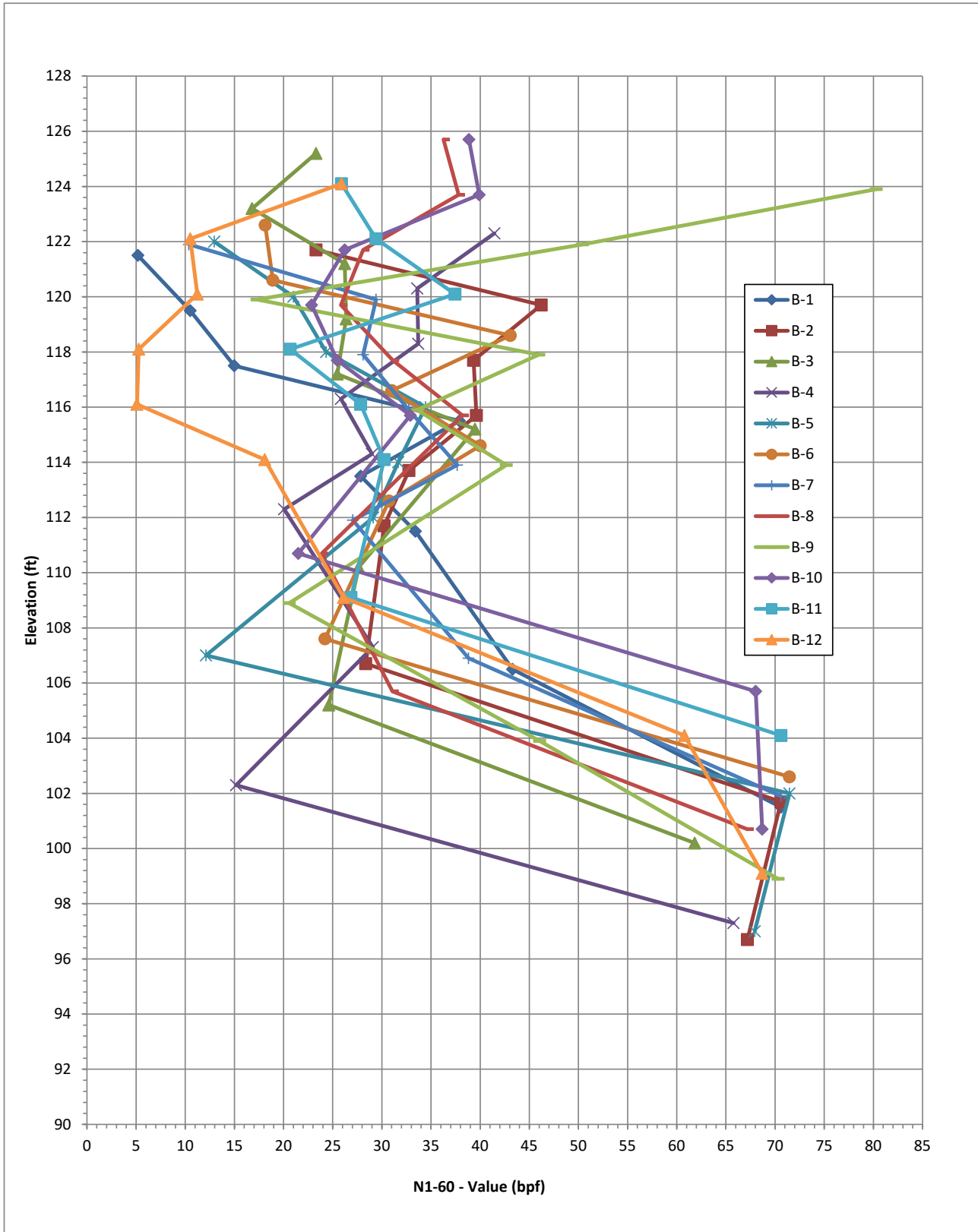
| | |
|---------------|---|
| Formulas used | $N_{60} = N(E/.6)$ $\sigma' = \sigma_t - u$ $CN = .77 \log(40/\sigma')$ $CN < 2$ Only valid for $\sigma' \geq 0.5$ ksf $N_{160} = N_{60} * CN$ |
|---------------|---|

| Sample Number | Sample Depth | N-value Recorded | | | N ₆₀ | γ pcf | σ _t ksf | u ksf | σ' ksf | CN | N ₁₆₀ |
|---------------|--------------|------------------|-------|-------|-----------------|-------|--------------------|-------|--------|------|------------------|
| | | Depth | Elev. | Value | | | | | | | |
| 1 | 0 - 2 | 1 | 124.1 | 10 | 13 | 120 | 0.12 | 0.00 | 0.12 | 1.94 | 26 |
| 2 | 2 - 4 | 3 | 122.1 | 5 | 7 | 120 | 0.36 | 0.00 | 0.36 | 1.58 | 11 |
| 3 | 4 - 6 | 5 | 120.1 | 6 | 8 | 120 | 0.60 | 0.00 | 0.60 | 1.40 | 11 |
| 4 | 6 - 8 | 7 | 118.1 | 3 | 4 | 120 | 0.84 | 0.06 | 0.78 | 1.32 | 5 |
| 5 | 8 - 10 | 9 | 116.1 | 3 | 4 | 120 | 1.08 | 0.19 | 0.89 | 1.27 | 5 |
| 6 | 10 - 12 | 11 | 114.1 | 11 | 15 | 120 | 1.32 | 0.32 | 1.00 | 1.23 | 18 |
| 7 | 15 - 17 | 16 | 109.1 | 17 | 23 | 120 | 1.92 | 0.64 | 1.28 | 1.15 | 26 |
| 8 | 20 - 22 | 21 | 104.1 | 42 | 56 | 120 | 2.52 | 0.96 | 1.56 | 1.09 | 61 |
| 9 | 25 - 27 | 26 | 99.1 | 50 | 67 | 120 | 3.12 | 1.28 | 1.84 | 1.03 | 69 |



NORMALIZED & CORRECTED N-VALUES

New Ewing Senior Community Center
999 Lower Ferry Road, Ewing Township, New Jersey



Appendix E

Seismic Information

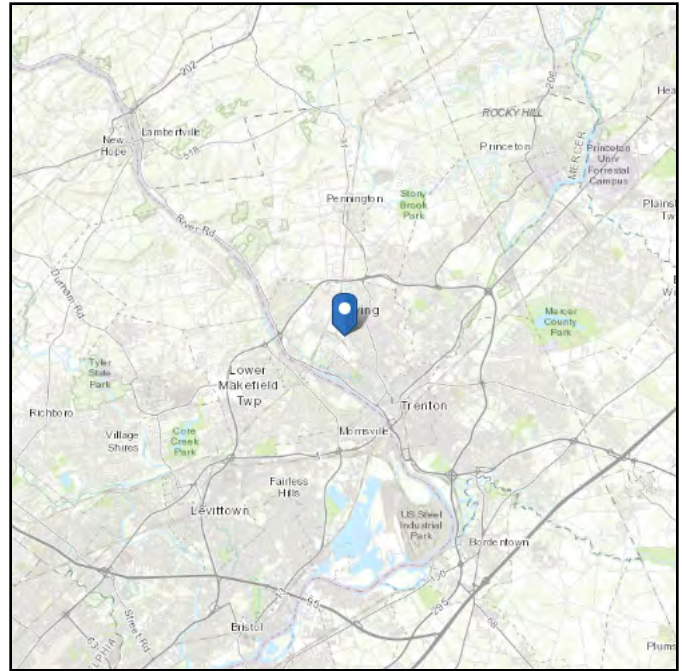
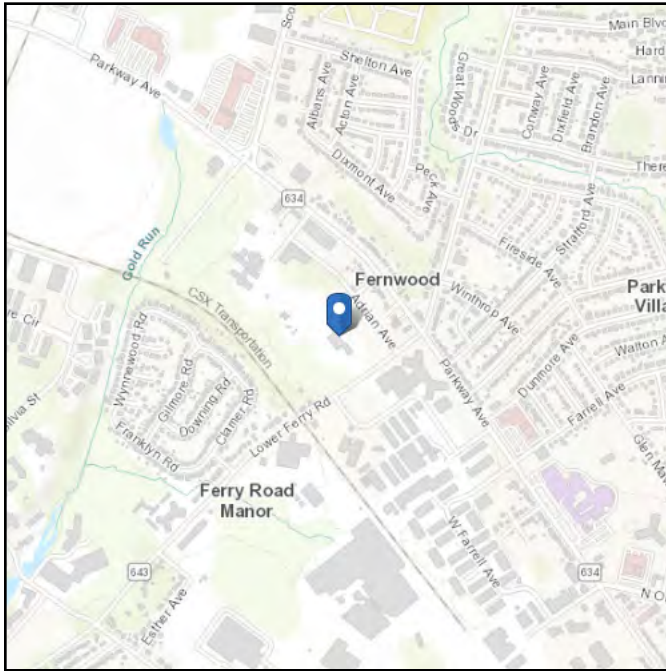


ASCE Hazards Report

Address:
999 Lower Ferry Rd
Ewing, New Jersey
08628

Standard: ASCE/SEI 7-22
Risk Category: III
Soil Class: D - Stiff Soil

Latitude: 40.258948
Longitude: -74.798929
Elevation: 127.14202416696983 ft
(NAVD 88)

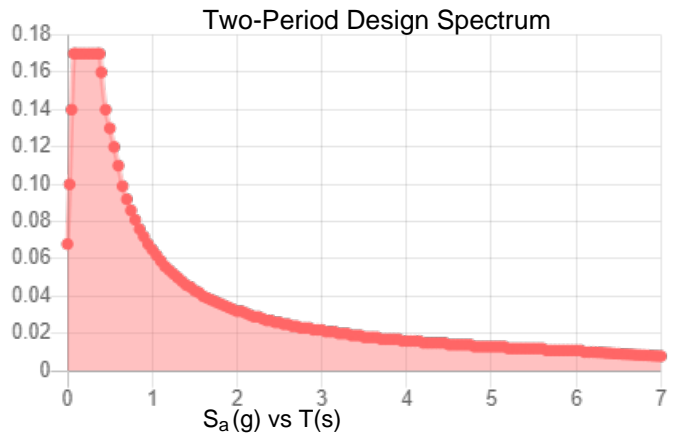
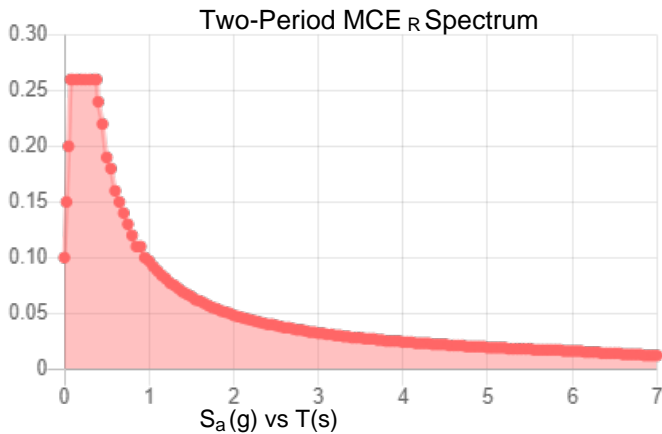
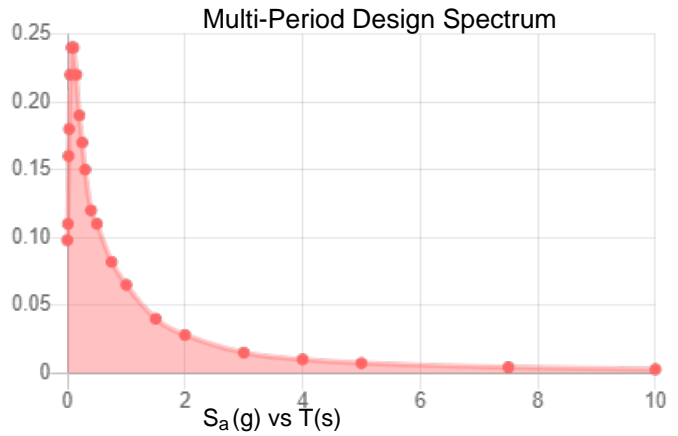
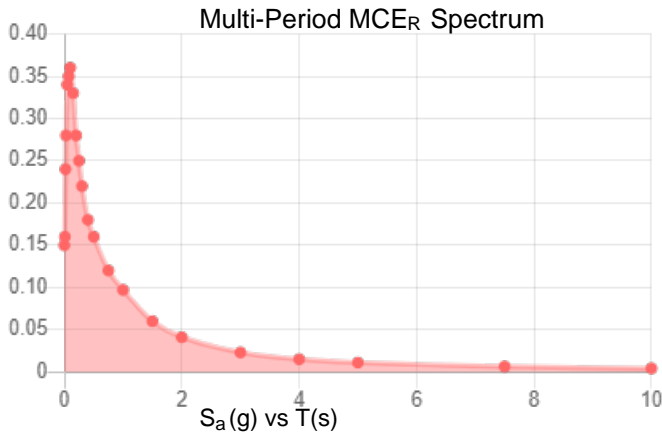


Site Soil Class: D - Stiff Soil

Results:

| | | | |
|--------------------|-------|--------------------|-------|
| PGA _M : | 0.13 | T _L : | 6 |
| S _{MS} : | 0.26 | S _S : | 0.22 |
| S _{M1} : | 0.097 | S ₁ : | 0.046 |
| S _{DS} : | 0.17 | V _{S30} : | 260 |
| S _{D1} : | 0.065 | | |

Seismic Design Category: B



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.



Data Accessed: Fri Jun 28 2024

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE Hazard Tool.