To: **All Vendors Bidding on The College of New Jersey**
Forcina Hall Renovation

From: **Lauren Manning**
Finance & Business Services

Date: **October 15, 2024**

ADDENDUM NO. 1 **ISSUE DATE: October 15, 2024**

REFERENCE: The College of New Jersey
Forcina Hall Renovation
Bid No. AB250001

Date of Original Bidding Documents: October 3, 2024

INTENT: This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents and Prior Addenda if any, as identified above.

VENDOR QUESTIONS:

Question 1: Please provide contact information for the existing Fire Alarm, BMS, Security/Access Control Vendors.

Response: Please contact Honeywell International representatives:

Ed Mogck – ed.mogck@honeywell.com
Mark Ogden – mark.ogden@honeywell.com

Question 2: Please provide a Geotechnical Report.

Response: See attachment.

ATTACHMENTS:

1. Geotechnical Report dated August 13, 2014.
2. Asbestos Abatement Drawings Floors 1,2,3 and 4 (Not in this contract, for reference only)

Milestone Schedule Clarification:

Existing Classrooms 209, 210, 211, 222, 347, and 423(Phase 1) will be available for the GC to start demolition on January 2, 2025. This will allow for the asbestos abatement in these areas to be completed. All other areas in Phase 1 will still be available to start demolition on December 19, 2024.

END OF ADDENDUM NO. 1

August 13, 2014

Mrs. Suzanne Klein
Einhorn Yaffee Prescott
1000 Potomac Street NW
Washington, DC 20007

RE: Geotechnical Engineering Report
TCNJ STEM Building
The College of New Jersey
Ewing, New Jersey
Langan Project No.: 130063101

Dear Mrs. Klein:

This letter report presents the results of Langan Engineering and Environmental Services (Langan's) geotechnical engineering study for the proposed new STEM building, Forum connection building and the Chemistry Addition building at the College of New Jersey in Ewing, New Jersey. The primary purpose of this study was to explore and evaluate the subsurface conditions within the limits of the proposed building footprints in order to provide geotechnical recommendations for foundation design. The scope of work for this project included a field exploration program, classification and laboratory testing of representative soil samples, and a geotechnical engineering evaluation and analysis of the data collected. This work was performed in accordance with our proposal for surveying, geotechnical, and civil engineering services dated 3/7/2013, revised 1/10/2014.

Site Description and Existing Conditions

The site is located at the north end of the TCNJ college campus in Ewing Township, New Jersey (Figure 1). The site is comprised of two separate areas. The site area for which the new "STEM" and "Forum" buildings are proposed is bordered by the 3-story Biology building to the west, the 4-story Forcina Hall building and the 2-story Roscoe L. West Hall building to the east, and Metzger Drive and Ceva Lake to the north. The site is currently occupied by an empty lot, upon which Holman Hall previously stood. The former Holman Hall was demolished, and the caissons were reportedly removed and backfilled with structural fill.

The site area, for which the new Chemistry building addition is proposed, is bordered by the Biology Building to the east, the Chemistry Building to the west, Metzger Drive and Ceva Lake to the north, and the Science Complex walkway and courtyard area to the south. The existing site slopes downward to the north towards Ceva Lake, from elevations EL 122 to EL 108, NAVD 88.

Proposed Construction

The proposed construction will consist of a new 2-story STEM building with a partial basement, a 2-story Forum connection building with no basement level, and a 2-story Chemistry Addition building with a partial basement.

The proposed STEM building will have a footprint area of approximately 31,655 square feet. Based on the current site plan, the first floor of the STEM building is proposed at EL 122.00. One below grade level is anticipated at EL 110.50, which extends approximately 3 to 5 feet below existing site grades, and up to approximately 8 feet below proposed site grades. The proposed Forum connection building will have a footprint area of approximately 3,600 square feet. The first floor of the Forum connection building is proposed at EL 122.00. Overhead bridges are proposed on either side of the Forum building in order to connect the new STEM building with the existing Biology building.

The proposed Chemistry Addition building will have a footprint area of approximately 7,400 square feet. The first floor of the Chemistry Addition building is proposed at EL 121.73. One below grade level is anticipated to be at EL 110.50, which extends approximately 5 to 11 feet below existing site grades.

Construction plans, dated 6 June 2104, for the project were provided by Einhorn Yaffee Prescott (EYP), including structural plans. Based on correspondence with EYP, we anticipate a typical column load of 250 kips with a maximum column load of 350 kips for the STEM and Forum buildings and a maximum of 400 kips for the Chemistry Addition building.

Regional Geology

According to the New Jersey Geological Survey, the site is located within the Newark Rift Basin area which is made up mostly of the Piedmont physiographic province. The region generally consists of Triassic-age sedimentary rocks including siltstone, shale, sandstone and conglomerate. According to the USDA Soil Survey of Mercer County, the northern portion of the site is underlain by Bucks silt loam; the southern portion is underlain by Cut and Fill Land over clayey substratum. The Bucks soil series generally consists of shaly silt loam. The Cut and Fill Land area consists of soil associated with cuts and fills from previous development ranging from silt to gravelly sand overlying clayey substratum soil.

GEOTECHNICAL ENGINEERING FIELD STUDY

Subsurface Exploration

Langan performed a geotechnical field exploration between 8 and 10 July 2014 consisting of 14 borings. Borings LB-1 through LB-9 were located within the limits of the proposed STEM building footprint and were advanced to depths ranging from 17.5 to 25 feet below ground surface (BGS). Boring LB-10 was located within the proposed Forum connector building footprint and was advanced to 18 feet BGS. Boring LB-11 was located near the proposed fire lane located east of the proposed STEM building and was advanced to 10 feet BGS. Boring LB-12 was not performed due to concerns with potentially damaging underground utilities. Borings LB-13 through LB-15 were located within the proposed Chemistry Addition connection building footprint and were advanced to depths ranging from 24 to 24.5 feet BGS. All borings were conducted under the full-time supervision of Langan's field engineer. Upon completion of the borings, the soil samples were brought back to our office for further evaluation and laboratory testing. The boring locations are shown in Figure 2.

<u>Geotechnical Boreholes</u>

Soil borings were completed by Unitech Drilling Co., Inc. using a CME 55 track-carrier drill rig equipped for hollow-stem auger drilling. Soil samples were obtained in conjunction with Standard Penetration Tests (SPT's) using a 2-inch O.D. split spoon sampler in accordance with ASTM D1586. In general, soil samples were collected continuously in the upper 12 feet beginning at ground surface and at 5 feet intervals thereafter until the target boring depths were achieved.

Soil samples were classified in the field and recorded on the boring logs along with penetration resistance, groundwater observations, action of the drill rig and other observations. All borings were backfilled with soil cuttings upon completion. Copies of the boring logs from Langan's subsurface exploration are provided in Appendix A.

<u>Laboratory Testing</u>

Soil classifications were verified by a senior geotechnical engineer and select samples were sent to our subcontracted geotechnical laboratory to determine index and engineering properties of the subsurface soils. Laboratory testing was performed on 14 soil samples at a subcontracted laboratory and included the following:

(14) Water Content [ASTM D2216];
(14) Particle Size Analyses [ASTM D422]; and,
(2) Atterberg Limits Test [ASTM D4318].

The complete laboratory reporting is provided in Appendix B.

Subsurface Conditions

The explored subsurface conditions at the site generally consist of a surficial layer of topsoil over miscellaneous or structural fill material, over a sand stratum underlain by either residual silt and/or decomposed shale rock. Groundwater was encountered in temporary observation wells installed within two borehole locations during this study. A summary of the geotechnical boring data including the soil strata and collected SPT N-values is provided in Figure 3. A full description of each stratum is provided below.

Surficial Materials

The borings were performed within existing landscaped areas including within the former Holman Hall footprint. All borings encountered 2 to 6 inches of topsoil consisting of brown silty sand with trace fine gravel and organic material.

Urban Fill/Controlled Fill

Beneath the surficial layer, a stratum of fill materials was encountered in ten borings. The fill encountered in borings LB-4, LB-7 and LB-9 consisted of engineered, controlled fill materials composed primarily of gray gravelly coarse to fine sand. The fill encountered in the other seven borings; LB-1, LB-2, LB-3, LB-11, LB-13, LB-14, and LB-15; consisted of miscellaneous, urban fill materials composed primarily of sand and gravel with varying amounts of silt, clay and trace amounts of brick fragments, wood, and concrete. The controlled fill layer was approximately 2- to 8-feet thick. The urban fill layer was approximately 8- to 13-feet thick, where penetrated. Within the controlled fill, the SPT N-values varied from 19 blows per foot (bpf) to 32 bpf, with an average value of 24, indicating an in-situ relative density that is medium dense. Within the urban fill, the SPT N-values varied from 3 bpf to refusal with 50 blows over 6 inches of sampler penetration, indicating a highly variable state of in-situ relative density that ranges from very loose to very dense.

Soils laboratory testing was performed on one split-spoon sample representative of the controlled fill material. The natural moisture content was 5.4% and the fines content was 11.3% for the tested specimen. Based on the laboratory testing results and the field observations, the stratum consists of poorly-graded sand with silt and gravel [SP-SM].

Soils laboratory testing was performed on five split-spoon samples from within the urban fill. The natural moisture content ranged from 9.8% to 16.3% and the fines content ranged from 13.9% to 57.6% for the tested specimens. Based on the laboratory testing results and the field observations, the constituents of the stratum range from clayey sand with gravel [SC], silty gravel with sand [GM], and sandy clay [CL]. A summary of the laboratory testing results for samples within this layer is provided in Tables 1A and 1B.

TABLE 1A – LABORATORY TEST RESULTS FOR CONTROLLED FILL

Boring	Sample	Depth (ft)	Water Content (%)	% Gravel	% Sand	% Fines	USCS Description
LB-9	S-2	2-4	5.4	42.7	46.0	11.3	Poorly-graded SAND with silt and gravel [SP-SM]

TABLE 1B – LABORATORY TEST RESULTS FOR MISCELLANEOUS FILL

Boring	Sample	Depth (ft)	Water Content (%)	% Gravel	% Sand	% Fines	USCS Description
LB-2	S-3	4-6	9.8	37.2	37.3	25.4	Clayey SAND with gravel [SC]
LB-3	S-3	4-6	12.9	50.4	35.7	13.9	Silty GRAVEL with sand [GM]
LB-13	S-2	2-4	16.3	8.4	33.9	57.6	Sandy CLAY [CL]
LB-14	S-2	2-4	10.0	20.9	40.6	38.5	Clayey SAND with gravel [SC]
LB-15	S-3	4-6	12.6	26.2	40.7	33.1	Clayey SAND with gravel [SC]

<u>Sand</u>

A stratum of brownish orange and/or reddish brown sand was encountered beneath the fill or surficial layer in all borings except at LB-11 and LB-14. The soil primarily consisted of coarse to fine sand with varying amounts of silt, clay, and gravel. The predominant soil type within this stratum consisted of sand, however thin layers of sandy silt and/or sandy clay were also encountered within the stratum. For the cohesionless soil, SPT N-values ranged from 4 bpf to 49 bpf, indicating variability in the in-situ density from loose to very dense. An average representative N-value of 17 is indicative of a medium-dense state of in-situ density. For the cohesive soil, SPT N-values ranged from 3 bpf to 9 bpf, indicating variability in the in-situ consistency ranging from soft to medium-stiff.

Soils laboratory testing was performed on seven split-spoon sample of this stratum collected during our geotechnical exploration. The natural moisture content ranged from 7.6% to 20.0% and the fines content ranged from 14.9% to 37.1% for the tested cohesionless specimens. The natural moisture content ranged from 13.4% to 20.5% and the fines content ranged from

61.2% to 77.1% for the tested cohesive specimens. Atterberg Limits testing was performed on one of the cohesive samples which resulted in a liquid limit of 32% and a plasticity index of 10%. Based on the laboratory testing results and the field observations the constituents of the stratum range from clayey gravel with sand [GC], silty sand [SM], clayey sand [SC], silty gravel with sand [GM], lean clay with sand [CL], and sandy clay with gravel [CL]. A summary of the laboratory testing results for samples within this layer is provided in Tables 2A and 2B.

TABLE 2A – LABORATORY TEST RESULTS FOR SAND STRATUM (COHESIONLESS)							
Boring	**Sample**	**Depth (ft)**	**Water Content (%)**	**% Gravel**	**% Sand**	**% Fines**	**USCS Description**
LB-4	S-6	10-12	7.6	48.6	36.6	14.9	Clayey GRAVEL with sand [GC]
LB-5	S-4	6-8	10.6	13.1	65.7	21.2	Silty SAND [SM]
LB-6	S-2	2-4	16.2	14.2	68.6	17.2	Clayey SAND [SC]
LB-10	S-6	10-12	20.0	5.2	57.7	37.1	Silty SAND [SM]
LB-13	S-5	8-10	11.7	40.6	37.2	22.1	Silty GRAVEL with sand [GM]

TABLE 2B – LABORATORY TEST RESULTS FOR SAND STRATUM (COHESIVE)								
Boring	**Sample**	**Depth (ft)**	**Water Content (%)**	**Fines Content (%)**	**LL**	**PL**	**PI**	**USCS Description**
LB-8	S-3	4-6	20.5	77.1	32	22	10	Lean CLAY with sand [CL]
LB-10	S-3	4-6	13.4	61.2	n/p	n/p	n/p	Sandy CLAY with gravel [CL]

*n/p indicates that the test was not performed for this sample

<u>Residual Silt</u>

A layer of red-brown residual soil, formed by the in-place chemical weathering of the shale bedrock, was encountered beneath the native soil stratum in five borings located within the limits of the proposed building. The residual soil consisted primarily of silt with some amounts of medium to fine sand. The residual silt was encountered at depths ranging from 12 to 14 feet BGS and was approximately 1 to 5 feet thick. SPT N-values ranged from 30 bpf to 78 bpf, with an average N-value of 46, which is indicative of a hard state of in-situ consistency.

Soils laboratory testing was performed on one representative split-spoon sample of this stratum collected during our geotechnical exploration. The natural moisture content was 21.5% and the fines content was 72.2% for the tested specimen. Atterberg Limits testing indicated that the sample was non-plastic. Based on the laboratory testing results and the field observations, the stratum consists of non-plastic silt with sand [ML]. A summary of the laboratory testing results for samples within this layer is provided in Table 3.

TABLE 3 – LABORATORY TEST RESULTS FOR RESIDUAL SILT								
Boring	**Sample**	**Depth (ft)**	**Water Content (%)**	**Fines Content (%)**	**LL**	**PL**	**PI**	**USCS Description**
LB-6	S-7	14-16	21.5	72.2	NP	NP	NP	SILT with sand [ML]

Weathered Shale

A layer of red-brown decomposed shale rock was encountered beneath the native soil and/or residual shale silt stratum in all borings located within the limits of the proposed building. The decomposed rock was encountered at depths ranging from 13 to 19 feet BGS and continued to the explored depth. This stratum was characterized by consistent sampler refusal, corresponding to a very-dense material.

Soils laboratory testing was not performed on samples collected from within this stratum.

Groundwater

Groundwater was measured in temporary observation wells which were installed during Langan's subsurface exploration in two borings located within the limits of the proposed building. Temporary standpipe piezometers were installed during our study in borings LB-7 and LB-14. The observation wells were left in place overnight during our study to allow groundwater to reach near equilibrium conditions. Groundwater was measured in LB-7 at 13.7 feet BGS and in LB-14 at 11 feet BGS, corresponding to an elevation of EL 103 and EL 105, respectively. Groundwater data from the observation well is summarized in Table 3 below.

TABLE 4 – GROUNDWATER OBSERVATION DATA SUMMARY				
Boring	**Ground Surface Elevation (ft)**	**Date Measured**	**Groundwater Depth (ft)**	**Groundwater Elevation (ft)**
LB-7	117	7/10/14	13.7	103.3
LB-14	116	7/10/14	11.0	105.0

Seasonal and yearly fluctuations in groundwater elevation should be expected with variations in precipitation and other hydrologic factors.

GEOTECHNICAL DESIGN EVALUATION AND DISCUSSION

This section of our report presents our assessment of the subsurface conditions defined by our geotechnical field exploration and laboratory testing. The assessment focuses on a few key concerns regarding site development and the proposed construction.

Foundations

Conventional shallow spread footing foundations were deemed unsuitable due to bearing capacity and settlement concerns beneath the anticipated moderately large column loads, additional loading from fill placement to proposed grades, the presence of miscellaneous fill at anticipated footing subgrade elevations, and sporadic pockets of soft cohesive soil. Several foundation alternatives were considered for the support of the structures, including a mat foundation and deep foundations. An alternative for using shallow spread footings on improved ground was also evaluated.

<u>Conventional Spread Footings</u>

The subsurface conditions encountered during our geotechnical exploration were analyzed to predict settlement magnitudes beneath spread footings based on typical and maximum column loads provided by EYP and on currently proposed grading plans. Settlement estimates were developed for each of the three proposed structures.

Settlement estimates for the proposed STEM and Forum buildings were evaluated based on a typical 250-kip column load and a maximum column load of 350 kips supported by a shallow spread footing sized for an allowable bearing capacity of 4,000 psf. The effects from changes in stress due to cuts and fills were also included in the analyses. Based on these conditions, the anticipated settlements for the proposed STEM building range from 0.43 inches to over 4 inches. Settlement estimates for the proposed Chemistry Addition building were evaluated based on a typical 250-kip column load and a maximum column load of 400 kips supported by a shallow spread footing sized for an allowable bearing capacity of 4,000 psf. Based on these conditions, the anticipated settlements for the proposed building range from 0.38 inches to over 1 inch.

These anticipated settlements for the STEM and Forum buildings are in excess of tolerable maximum and differential values. Therefore, foundation alternatives for these proposed structures must be considered in place of conventional shallow spread footings. Furthermore, while the magnitude of the maximum anticipated settlement for the Chemistry Addition building is at the upper limit, the nature of the bearing materials, especially the presence of deep urban fill, also precludes the use of a shallow foundation system.

Mat Foundation

A limited evaluation of a shallow mat-foundation to support the proposed buildings was performed. Mat foundations are often advantageous when combined with a basement excavation, so that the benefit of the load release from foundation excavation can be applied to reduce the overall settlement of the mat. Settlement analyses were performed for a mat foundation based on installing a 3-foot-thick concrete mat. The loading on the mat foundation for the STEM, Forum, and Chemistry Addition buildings was roughly estimated at 1.2 ksf, 1.6 ksf, and 2.0 ksf, respectively. The magnitude of the anticipated settlement ranged from 0.48 inches to just under 1 inch, which is within acceptable values. If this level of settlement is tolerable for the proposed structure, it is possible to construct the proposed buildings on a mat foundation system; however, the Forum and Chemistry Addition buildings will likely not benefit significantly from a mat foundation due to their smaller footprints.

The total load on the mat foundation was not available; however, based on typical and maximum column loads that were provided, the total load was roughly estimated. Due to the lack of specific structural load information, detailed evaluation of the shallow mat foundation systems is not yet possible. If the required structural information was provided, the use of the shallow mat foundation systems can be evaluated further in order to determine whether these systems would be appropriate to support the proposed structures.

Deep Foundations

Two types of deep-foundation systems were evaluated including drilled shafts and continuous-flight auger (CFA) piles. For deep foundation systems to be effective, they must either bear on the weather rock stratum or within the stratum in the form of a rock socket. Both drilled shafts and CFA piles can provide adequate capacity for supporting the building while maintaining settlement within tolerable limits, however for conditions consisting of soil overlying hard rock, such as the conditions pertaining to the project, CFA piles have the potential for soil mining during installation. Another disadvantage of CFA piles is the uncertainty of the pile-rock interface unless penetration of the rock can be assured. For these reasons, although CFA piles may technically provide the required capacity, CFA piles are not recommended.

Drilled shafts are capable of supporting high column loads typical of mid- to high-rise construction, and can be socketed into rock to provide additional capacity. Drilled shafts can be installed at variable depths through the softer weathered rock mantle and into the underlying sound rock where higher allowable rock socket design parameters can be achieved.

The capacity of drilled shaft foundations that are socketed into bedrock is dependent on the strength of the rock in which the load bearing socket is constructed. The socket design parameters are the allowable end-bearing pressure that is applied to the surface area of the rock socket diameter and the allowable side friction that is applied to the surface area of the length of the rock socket. For a given axial load, larger values of end bearing pressure and side friction result in the need for smaller socket dimensions and vice versa. Conservative rock socket design parameters for end bearing and side friction were used due to the lack of rock core information. These values are presented in the foundation recommendations for drilled shaft foundations in the recommendations section of this report. Overall, the drilled shaft alternative is a viable option to be considered for use at this site.

Spread Footings with Ground Improvement

Conventional shallow spread footings are not feasible due to excessive settlements due mainly in part because of loose or soft soil pockets within the foundation subgrade. However, ground improvement measures implemented at column and wall footing areas would reduce footing settlement magnitudes to an acceptable range. The subgrade improvement option involves bypassing the unsuitable materials and transferring the foundation loads into the more competent underlying weathered shale. This bypassing option could be achieved by installing rammed aggregate piers (RAP) which are individual pier elements, typically 30 inches in diameter, that can be drilled or driven to depths ranging from 6 to 30 feet. Once target depths are achieved, a lift of crushed stone aggregate is placed in the open shaft and compacted with a rammer to form a bottom bulb of compacted stone. Subsequent lifts of stone are then placed and compacted into the shaft excavation to form the RAP element. This construction technique results in the combined effect of transferring load to more competent soils while improving the soils around the perimeter of the RAP.

The RAP ground improvement method can be installed exclusively within shallow foundation subgrade areas in order to significantly reduce building settlements and allow for increased bearing capacities which will in-turn allow for smaller-sized foundation elements. This foundation alternative will provide the best cost-saving scenario while sufficiently improving the foundation subgrade and is therefore the recommended option by Langan over deep foundations and a shallow mat.

Slab-on-Grade Support

Because the building structure may potentially be pile supported, two options exist for the lowest level floor slab: pile supported structural slab or slab-on-grade. Considering the academic use of the proposed building, the loading on the lowest-level floor slab will likely be relatively light, on the order of about 100 psf of live load. Therefore, we recommend the floor slab be designed as a slab-on-grade. The slab should bear directly on the native soil, or on compacted structural fill, depending on final finished floor level. We recommend the slab be designed using an average modulus of subgrade reaction (k_{v1}) equal to 115 psi per inch (pci). Note this value is for a 1 foot by 1 foot loaded area, and must be adjusted to account for width of the mat by dividing the value by the width of the mat ($k_b = k_{v1} / b$). The final subgrade at slab level should be proof-rolled following the subgrade preparation recommendations given in the Construction Recommendations section of this report, to provide a smooth, unyielding surface for slab support.

Retaining Walls

Basement Walls

Permanent below-grade walls will be required for the new STEM building and Chemistry Addition building. Below grade walls should be designed to resist earth pressure and surcharge loads. Unrestrained walls (walls that are free to move/rotate) should be designed for active earth pressure and restrained walls (walls that are braced against movement/rotation) should be designed for at-rest earth pressure. Wall backfill should consist of material meeting the requirements for engineered fill in this report. The soil parameters shown in Table 5 should be used for design of below grade walls, assuming that the walls are backfilled with clean, well-graded sand that is imported from off-site.

TABLE 5 – DESIGN PARAMETERS FOR BELOW GRADE WALLS

Parameter	Recommended Value
Wall Backfill:	Medium Dense Clean Sand
Typical Backfill Unit Weight:	130 pcf
Friction Angle:	32 Degrees
Coefficient of Active Earth Pressure: (top of wall free to deflect)	0.31
Coefficient of At-Rest Earth Pressure: (top of wall restrained)	0.47
Allowable Soil Bearing Capacity	4,000 psf
Coefficient of Sliding Friction	0.4

Surcharge loads should also be considered in the design of retaining walls. The walls should be designed for an additional uniform pressure distribution equal to the corresponding coefficient of earth pressure (active or at-rest) times the anticipated surcharge load. The design surcharge load should include anticipated surcharge from construction equipment. Walls must also be designed for surcharge loads from adjacent structures if the walls extend below the area of influence of the adjacent foundations. The zone of influence of neighboring foundations can be estimated as the area below an imaginary 2 to 1 line (vertical to horizontal) extending downward from the base of the adjacent foundations.

The above parameters assume that the walls are fully back-drained to prevent the buildup of hydrostatic pressure discussed below.

Wall Drainage

We recommend that below grade walls be fully drained to prevent the buildup of hydrostatic pressure. Adequate drainage could be provided by a clean, crushed-stone drainage zone or a manufactured drain panel. A perimeter drain at the exterior base of the wall footing should be installed and an outlet connection to the storm sewer system should be provided via a sump pump system.

The stone layer should be at least 12 inches thick and extend to within 2 feet of the ground surface. Drain stone should consist of an open-graded material, such as 3/4-inch crushed stone, wrapped in a geotextile filter fabric (Mirafi 140 N or equivalent) to reduce the migration of fine-grained soils into the drain rock. Four-inch-diameter perforated plastic pipe should be installed (with perforations down) along the base of the walls on a 2-inch-thick bed of drain stone. The pipe should be sloped to drain by gravity to a suitable drainage facility or sump pump. Paving or a 2-foot-thick cap of clayey soil should be placed over the drain rock to inhibit surface water infiltration. Drain pipes should outlet to an appropriate drainage facility.

Alternatively, wall back-drainage can be provided be prefabricated drainage material. The drainage material can be installed on the back (soil) face of the wall and should terminate at a 4-inch-diameter perforated plastic pipe surrounded by at least 6-inches of drain stone as defined above.

Seismicity

According to the International Building Code, New Jersey Edition (NJIBC 2009), Section 1613, and the United States Geological Survey, the following seismic parameters should be used in the building design:

- Site Class = C
- Maximum Considered Earthquake Ground Motions:

  - 0.2 Second Spectral Response Acceleration, %g: S_s = 29.5

  - 1.0 Second Spectral Response Acceleration, %g: S_1 = 6.3

The above ground motions should be adjusted for site class "C" effects using coefficients F_a = 1.2 and F_v = 1.7.

CONSTRUCTION RECOMMENDATIONS

Demolition of Existing Structures and Debris Removal

All existing bollards, pavements, light poles, utilities, etc., will require demolition prior to the start of construction. Any existing utilities within the proposed building footprint and at least 5 feet beyond the footprint limits must be removed. All existing bituminous and concrete pavement and slabs must be removed completely throughout the site to permit proper grading and fill placement as well as to facilitate building construction and utility installation.

Site Preparation

Prior to commencement of excavation, grading, or fill placement, any miscellaneous trash, debris, or other unsuitable materials should be removed from the site. Clearing and grubbing of all trees (including removal of any associated root systems) and vegetation designated for removal should be performed. All debris and trees/vegetation should be properly disposed off-site in accordance with applicable regulations. All clearing activities should be performed in strict accordance with the approved soil erosion and sediment control plan prepared for the project. Topsoil should be stripped from the proposed building footprint and pavement areas, and should be stockpiled and protected from erosion. Topsoil can be re-used in landscape areas.

Existing light fixtures, signs, and their associated foundation elements should be removed completely. Existing asphalt pavement should be completely removed from the site and disposed of per all applicable regulations.

Site Grading and Excavation

Excavations as deep as about 12 feet are anticipated to be necessary to reach proposed subgrade elevations for the lowest level slab. Standard excavation equipment is anticipated to be required to remove the existing fill, and underlying native soils.

The excavation operations should be controlled so that vibrations at the nearest structure do not damage, crack or in any way adversely affect the nearby structure or its occupants/contents. Excavation vibration control can be achieved by limiting the equipment impact energy to that value which would produce non-damaging levels of ground vibration. The peak resultant particle velocity should be the measure of the level of vibration. The peak resultant particle velocity measured at any adjacent structure location should not exceed 1 inch/sec. This is a preliminary vibration control criterion that should be monitored and confirmed based on the behavior of the adjacent structures and of the sensitivity of any equipment they might have. Once the final criteria are established, they should not be exceeded. Monitoring of the vibrations should be performed during excavation work.

Temporary Excavation Support

The new STEM building is proposed to include a partial basement level at the north end of the building footprint with a finished floor elevation (FFE) of EL 110.5 feet. This construction will require excavation depths of up to 6 feet below existing grades. Open-cut slopes or benching should be sufficient for the required excavation for the subgrade preparation procedures. The Contractor, however, may elect to initially grade the site to the first floor FFE of EL 122.0 and subsequently excavate for the basement level foundations. For this case, the excavation depth would be nearly 12 feet and sloped excavation will not be feasible, therefore temporary or permanent excavation support such as cantilevered sheet piling or soldier pile and lagging system would be appropriate options for excavation support.

The Chemistry Addition is also proposed to include a partial basement level with a FFE of EL 110.5 feet. This construction will require an excavation to up to 11 feet below existing side grades and up to 12 feet below proposed grades. Due to the close proximity of the proposed building to the Biology Building to the east and Chemistry Building to the west, sloped excavation will not be feasible and temporary or permanent excavation support will be required. The excavation depth along the northern perimeter of the site to the proposed basement level will be approximately 5 to 6 feet below existing grades. No adjacent buildings exist to the north of the site, therefore sloping or benching of the excavation wall should be sufficient for the excavation.

The need for excavation support and/or underpinning along the eastern and western sides of the Chemistry Addition site also depends on whether the existing buildings in these areas feature below-grade levels. If the existing building foundations rest at an elevation that is below the excavation depth for the proposed building, then no excavation support will be necessary. A thorough review of all available foundation plans of the existing buildings to the east (Biology Building) and west (Chemistry Building) adjacent to the site should be performed. If reliable foundation plans are not available, we recommend performing exploratory test pits, prior to construction, to strategically expose the neighboring building foundations at select locations, so that information regarding these foundations can be obtained and site-specific plans and details can be prepared. These test pits are necessary to investigate foundation type, dimensions and depth, and the material on which these foundations bear and to compare this information against the design documents for these structures. This investigation work should be done in such a manner so as not to damage or cause loss of support to the neighboring structures.

The Earthwork Contractor should be responsible for the design and installation of the temporary excavation support and underpinning systems. Temporary excavation support and underpinning should be designed by a Professional Engineer licensed in the State of New Jersey and retained by the Earthwork Contractor. The construction drawings and associated calculations should be submitted for review by Langan. All applicable municipal and OSHA regulations and requirements should be incorporated into the design of the temporary excavation support and underpinning systems.

Foundations

We recommend that the STEM, Forum, and Chemistry Addition building be founded on shallow spread and strip footings on subgrades improved by rammed aggregate piers. Another viable, yet less cost-effective foundation option is a drilled shaft deep foundation system. At this time, a mat foundation is not recommended, however it could be evaluated further, if necessary. Specific foundation recommendations are provided below.

Drilled Shafts

Both 36-inch-diameter and 48-inch-diameter drilled shafts were evaluated for use. The specifics of the recommended drilled shafts and its capacities are given in Table 6 for structural design. Drilled shafts can be designed for either end-bearing only, rock socket side friction only or a combination of both. Drilled shafts should derive all their capacity from the weather rock and/or underlying competent rock. Shafts designed for end-bearing-only should be in good contact with the weathered rock stratum. Axial capacities were developed using a conservative allowable end-bearing pressure of 9.6 tsf and an allowable side friction/adhesion value of 1.4 tsf.

TABLE 6 – DRILLED SHAFT ALLOWABLE AXIAL CAPACITY

Pile Dia. (in)	Socket Length (ft)	All. Unit Base Res. (tsf)	All. Unit Side Res. (tsf)	Allow. Base Capacity (tons)	Allow. Side Capacity (tons)	Allow. Total Capacity (tons)	Allow. Total Capacity (kips)
36	EBO	9.6	1.4	68	0	68	136
	5			68	66	134	268
	10			68	132	200	400
48	EBO			121	0	121	242
	5			121	88	209	418
	10			121	176	297	594

*EBO stands for "end-bearing only", no rock socket included.

The above values were determined using conservative design values because insufficient rock data was available to warrant higher base and side friction resistances. If drilled shafts are selected for the building construction, a supplemental geotechnical exploration focused on collecting rock data can be implemented. If the results of the exploration justify the use of higher design strengths, the drilled shafts can be assigned increased allowable capacities.

Shallow Spread/Strip Footings and RAPs

In order to minimize building settlements associated with spread footings, the soil subgrade must be improved prior to footing construction. The RAPs ground improvement method will effectively transfer building loads to a more competent bearing stratum while also densifying the soil subgrade laterally around the individual piers. We recommend shallow foundations bear directly on the improved subgrade or on engineered fill placed and compacted in accordance with the recommendations in this report, with the allowable bearing pressures in Table 7.

TABLE 7 – ALLOWABLE BEARING PRESSURE	
Bearing Material	**Allowable Bearing Pressure**
Foundations Bearing on RAP-Improved Soil or Properly Compacted Structural Fill	6 kips/ft^2

The recommended allowable bearing pressure in Table 7 should limit differential settlement to tolerable amounts for footings sized to about 6.5-feet wide (for 250 kips typical column load) to about 8.25-feet wide (for 400 kip max column load). We should be contacted if higher column loads exist or if any heavy or settlement sensitive equipment must be supported, as lower pressures or deep foundations may be required to reduce settlement.

Perimeter strip footings should have a minimum width of 24-inches and interior strip footings should have a minimum width of 18-inches; even if smaller dimensions can be justified using the allowable bearing pressure indicated above. The minimum dimension for isolated footings should be 3 feet by 3 feet. Perimeter foundations and foundations in unheated parts of the building must be at a minimum depth of 3 feet below final grade to reduce the potential for frost heave.

Moderate cuts and fills are anticipated throughout the site to achieve the proposed site grades and building finished floor elevations. For areas that need to be raised, it is anticipated that granular, free-draining structural fill will be used and that proper compaction techniques will be implemented. Ground improvement is not required for properly placed and compacted structural fill. In these areas, the RAPs improvement should be performed prior to filling. Conversely, in areas that require cuts to achieve proposed grades, RAPs improvement should be performed after excavation to target grades in order to minimize material waste.

The final footing subgrade on both structural fill and RAPS-improved soil must be approved by a geotechnical engineer familiar with the design assumptions in this report. Detailed recommendations for subgrade preparation are provided under the Subgrade Preparation section of this report.

Floor Slab

The floor slab of the proposed structures should be constructed as a slab-on-grade. A modulus of subgrade reaction of 120 psi/inch may be used for design. We recommend a drainage layer consisting of a 6-inch-thick layer of 3/4-inch clean stone be placed beneath the floor slab. Construction joints and expansion joints should be incorporated during slab construction to provide crack control. Properly accomplishing the recommended subgrade preparation procedures is required to justify the use of a slab-on-grade.

Prior to floor-slab construction, the subgrade should be proof-rolled with a minimum of at least 2 alternating passes of a loaded tri-axle dump truck with a 12- to 15-cubic-yard carrying capacity. Any areas that exhibit pumping, excessive rutting, bleeding or other signs of wet or soft conditions under the load of the tri-axle should be excavated and replaced with compacted structural fill discussed below.

Subgrade Preparation

After the site clearing and preparation is completed, the following subgrade procedures must be implemented prior to fill placement and construction of footings, slabs and pavements.

Soil Subgrade below Building Pads

1. Remove existing fill layer.
2. Excavate areas to be lowered to achieve proposed grades and construction.
3. Proof-roll the soil subgrade using a minimum of six passes with a smooth-drum roller with a minimum static drum weight of 10 tons, with no vibration, under the direct observation of a geotechnical engineer.
4. Over-excavate areas exhibiting instability under the action of the roller (such as rutting, bleeding, pumping or weaving) as directed by the geotechnical engineer. Replace with compacted structural fill below building pads or pavements, or with compacted general fill in other site areas, as directed by the geotechnical engineer.
5. Place general or structural fill as required to achieve planned final subgrade elevation (see “fill placement and compaction” section below)

Improved Soil Subgrade below Footings

1. Excavate to footing subgrade.
2. Compact the disturbed surface of the subgrade. Use a heavy walk behind pad-foot roller with a minimum 1.5-ton total weight, with no vibration, for column and wall footings.
3. Install rammed aggregate piers (RAPs) within the footing subgrade footprint with a maximum spacing of three times the diameter of the RAP. The edge of the RAPs ground improvement should extend a minimum of 2 feet beyond the footing subgrade footprint. RAPs should be drilled or driven to the weather shale bedrock stratum.
4. Remove any loose stone and soil to create a level subgrade surface.
5. Re-compact the prepared subgrade using a heavy walk behind pad-foot roller with a minimum 1.5-ton total weight, with no vibration, for column and wall footings. Compaction should be performed under the direct observation of a geotechnical engineer.
6. Immediately place reinforcing and construct footing.

Soil Subgrade below Areas to Receive Fill and Pavements

1. Excavate areas to be lowered to achieve proposed grades and construction.
2. In general site areas (outside of the building pad) and in areas of proposed pavement, where fill is required to reach proposed grade, the existing urban fill may remain in place, provided the following procedure is followed:
3. Proof-roll the soil subgrade using a minimum of six passes with a smooth-drum roller with a minimum static drum weight of 10 tons, with no vibration, under the direct observation of a geotechnical engineer.
4. Over-excavate areas exhibiting instability under the action of the roller (such as rutting, bleeding, pumping or weaving) as directed by the geotechnical engineer. Replace with compacted structural fill below building pads or pavements, or with compacted general fill in other site areas, as directed by the geotechnical engineer.
5. Place general fill (in landscaped areas) or structural fill (in pavement areas) as required to achieve planned final grade (see "fill placement and compaction" section below)

The Contractor should be responsible for maintaining all subgrades in their as-approved condition until concrete is placed and the excavations are properly backfilled. Footings and slabs should be constructed as soon as possible following subgrade approval by the geotechnical engineer. Note that the onsite soils are clay and will degrade if exposed to wet weather. If footings cannot be constructed within 48 hours after subgrade approval by the engineer, a 3-inch thick "mud mat" should be placed over the prepared subgrade to protect the subgrade from weather and construction.

Fill Placement and Compaction

Grain size distribution, maximum dry density, and the optimum water content determinations should be made on representative samples of all fill materials proposed by the Contractor. Materials to be used as structural and general fill should be placed in loose lifts not exceeding twelve (12) inches in thickness and compacted using either a 5-ton minimum static-drum-weight vibratory compactor for predominantly granular soils (imported fill) or a 10-ton total weight sheep/pad-foot roller cohesive soils (on-site borrow). Each lift should be compacted to a minimum of 95% of the material's maximum dry density, determined in accordance with ASTM D1557 (Modified Proctor Test).

Smaller compaction equipment and thinner lifts can be used in areas of limited access and maneuverability or where lighter compaction equipment must be used. Backfill for utility trenches should be accomplished to the same criteria using appropriately sized compaction equipment. In non-paved or landscaped areas, the compaction criterion can be reduced to 92% of the material's maximum dry density. Compaction of all fill should be verified by the Langan Geotechnical Engineer as meeting the above criteria through visual inspection and the performance of in-place density tests.

The appropriate water content at the time of compaction should be plus or minus 2 percentage points of optimum as determined by the laboratory compaction tests of proposed fill material. Soil water content may need to be adjusted at the time of construction to achieve satisfactory compaction of the fill. This may require that water be added to soils that are too dry, or that aeration be performed for soils that are too wet.

All fill placement and compaction should be subject to inspection and testing. No fill material should be placed on areas where free water is standing, on frozen subsoil areas, over deleterious materials or on surfaces which have not been approved by a qualified geotechnical engineer. Exposed subgrades and temporary soil stockpiles should be sealed with a smooth-drum roller on a daily basis to enable surface drainage and prevent excessive water infiltration and subsequent subgrade deterioration.

Once building pad and parking lot subgrades have been constructed to grade, the areas should be restricted from construction vehicle traffic in order to prevent deterioration of the subgrades.

Fill Materials and Soil Re-Use

All fill placed at the site should consist of general or structural fill placed in accordance with the requirements herein. General fill is defined as fill in site areas with no site improvements (i.e., fill in landscaped areas). Structural fill is any fill placed beneath footings, slabs, pavements and any other structurally significant areas.

The on-site soils, although mostly sandy, may be sensitive to moisture due to its moderate fines content and pockets of cohesive soil. For these soil types, additional time and effort may be required to adjust the moisture content to within acceptable ranges in order to achieve adequate compaction. The level of effort required could be a significant, time-consuming process. For projects with accelerated schedules, it is advisable to use imported fill material consisting of granular, free-draining soil with less than 15 percent passing the No. 200 sieve and no particles larger than 4-inches in any dimension. Imported fill should be free of all organics, metal, debris, or other deleterious material.

Utilities

Excavation will be required for the installation of proposed utilities and associated structures. All excavations should be properly sloped and/or braced in conformance with applicable OSHA regulations including, but not limited to, temporary shoring, utilizing trench boxes and/or proper benching.

We expect the site utility excavations to be made in the existing fill and/or natural soils. We anticipate the fill and natural soils can be excavated using a conventional excavator having a standard soil excavation bucket. Prior to utility installations, exposed utility trenches should be proof compacted with at least six overlapping coverages of a double-drum walk-behind vibratory compactor such as a Wacker RT 82-SC or equivalent. Any soft or unstable areas identified by the proofrolling should be removed and replaced with approved, compacted fill. Backfill in utility excavations should meet the previously discussed requirements for structural fill, with fill placement and compaction performed as previously discussed.

Groundwater Control

Short-term groundwater elevation measurements collected at the time of our subsurface exploration indicated that the measured groundwater elevation is at EL 105.0 which is approximately 5.5 feet below the anticipated finish floor elevation of the below-grade levels (EL 110.5). Hydrostatic uplift pressures are not anticipated for the lowest-level floor slabs. The installation of a waterproofing system below the slab is not warranted, since the 6 inch-thick stone subbase layer will act as a capillary break. Damp-proofing should be installed on all basement walls prior to placement of drainage fill or the prefabricated drainage board.

Groundwater seepage during periods of wet weather and perched water encountered during excavation work can be controlled using conventional submersible pumps in conjunction with gravel sumps. The pumping, handling, and discharge of all dewatering effluent should be performed in accordance with all applicable regulations and any environmental requirements for the site.

Construction Quality Assurance (CQA) Services

The recommendations in this report should be incorporated into the construction contract documents for foundation construction including but not limited to the foundations and floor slab. Earthwork- and foundation-related technical specifications should be prepared by Langan. The foundation drawings should be reviewed by Langan prior to their release to bidders.

Because of the variable nature of subsurface conditions, field judgments will be required in the implementation of these recommendations during construction. Therefore, it is recommended that Langan provide engineering inspection of the foundation construction and all earthwork operations. Inspection is critical to confirm the assumptions upon which our recommendations are based and to confirm that the foundation system is built in accordance with the recommendations and criteria given in this report. It is essential that all foundation subgrades be field-verified by one of our field geotechnical engineers to assure that adequate bearing is available. Additionally, our field engineer would be able to immediately address unexpected or unusual conditions that may be encountered and provide remedial recommendations. In this manner, prudent and cost-saving decisions can be made in response to the actual field conditions encountered during construction.

LIMITATIONS

The conclusions and recommendations provided in this report are based on subsurface conditions inferred from a limited number of borings, as well as architectural and structural information provided by Einhorn Yaffee Prescott. Recommendations provided are contingent upon one another and no recommendation should be followed independent of the others.

This report has been prepared to assist the owner, architect and structural engineer in the design process and is only applicable to the envisioned project discussed herein. Any proposed changes in structures or their locations should be brought to our attention so that we can determine whether such changes affect our recommendations. Langan cannot assume responsibility for use of this report for any areas beyond the limits of this study or for any projects not specifically discussed herein.

Information on subsurface strata and groundwater levels shown on the logs represents conditions encountered only at the locations indicated and at the time of investigation. If different conditions are encountered during construction, they should immediately be brought to our attention for evaluation as they may affect our recommendations.

Environmental issues (such as potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate study.

CLOSING

Thank you for the opportunity to work with you on this project. If you have any questions regarding the content of this report or need additional information, please call us. Otherwise we trust that our work and this report meet with your approval.

Sincerely,
Langan Engineering and Environmental Services, Inc.

Conrad Cho
Senior Staff Engineer

John J. McElroy Jr., PhD, P.E.
Senior Associate/Vice President

Enclosure(s): Figure 1 – Site Location Map
Figure 2 – Boring Location Plan
Figure 3 – Geotechnical Data Summary
Appendix A – Boring Logs
Appendix B – Soils Laboratory Data

cc: Christian Roche – Langan

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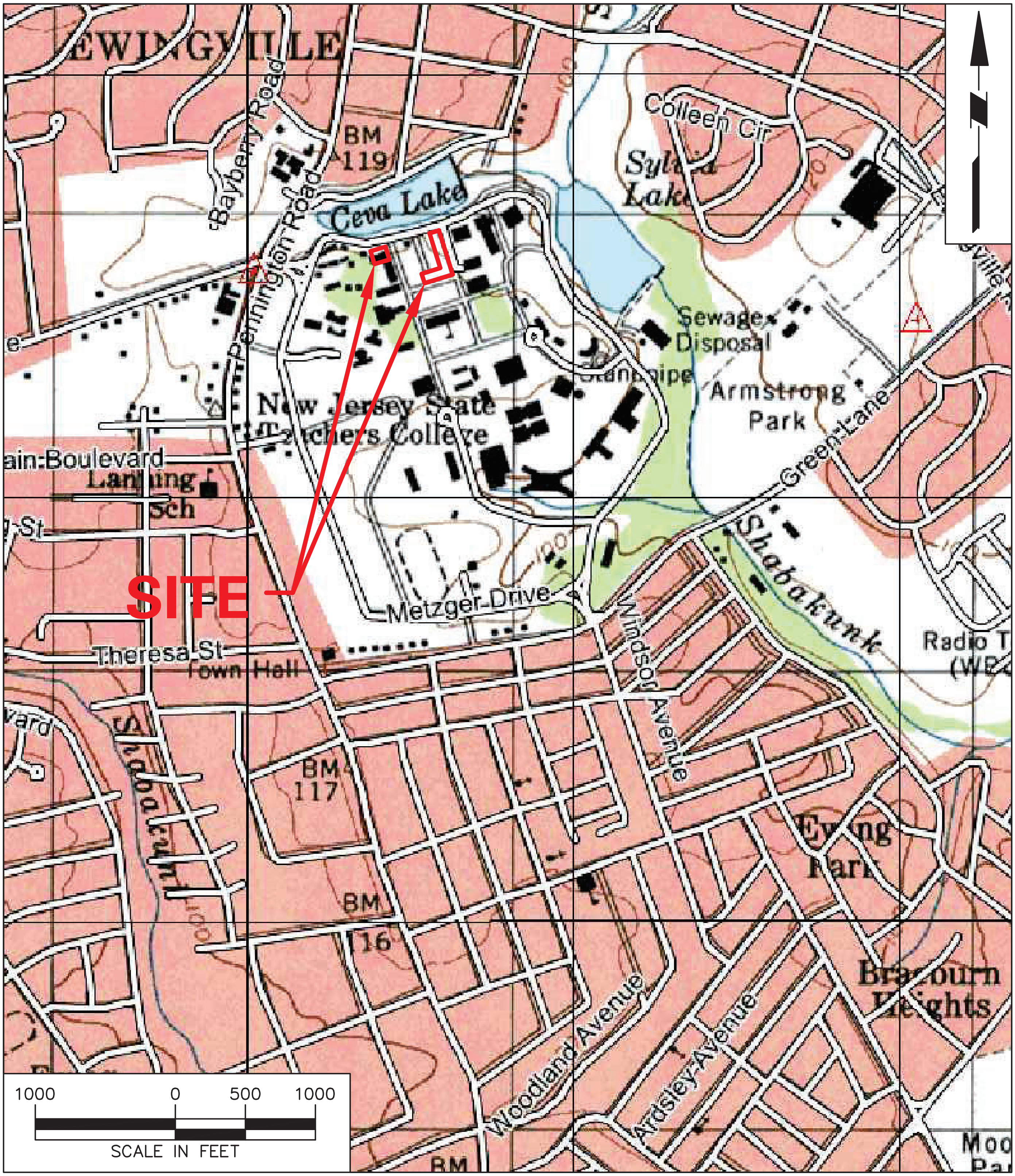
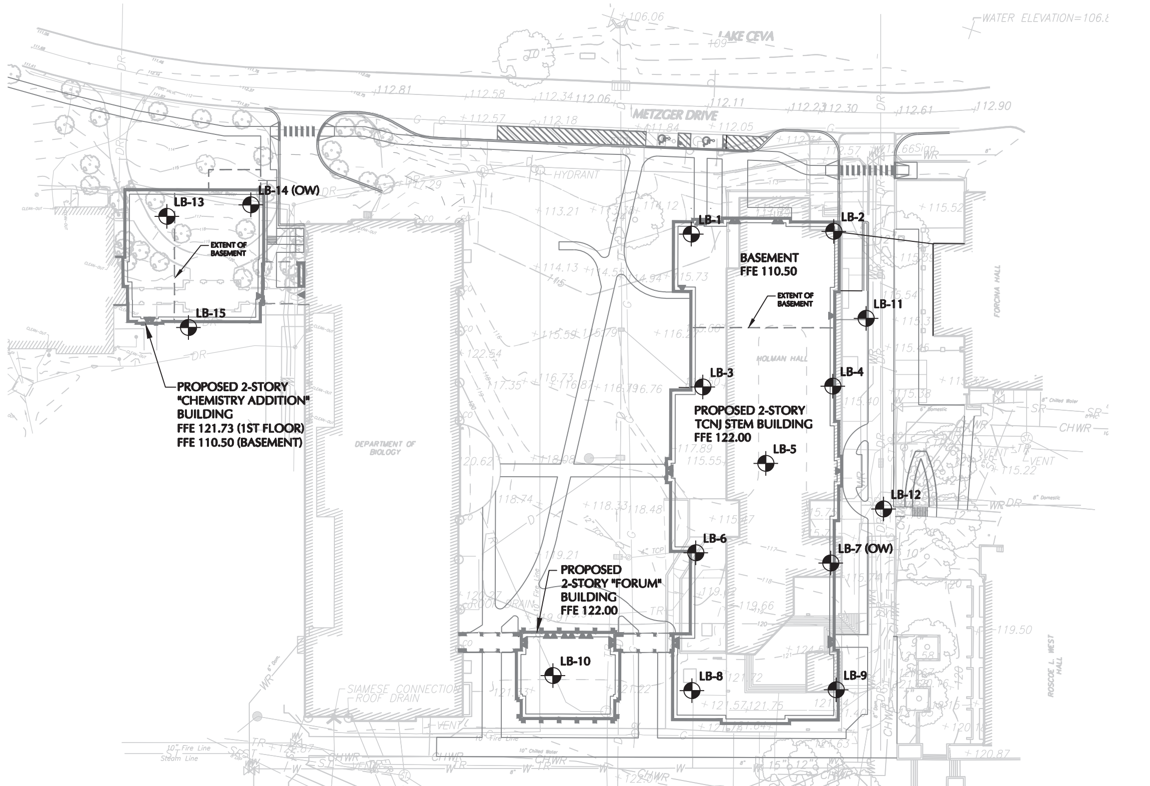
FIGURES



SOURCE: US DEPARTMENT OF THE INTERIOR SURVEY, NEW JERSEY GEOLOGIC SURVEY, LAKEWOOD QUADRANGLE, 2014

LANGAN 989 Lenox Drive, Suite 124 Lawrenceville, NJ 08648 T: 609.282.8000 F: 609.282.8001 www.langan.com Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400	Project TCNJ STEM BUILDING EWING TOWNSHIP MERCER COUNTY NEW JERSEY	Drawing Title SITE LOCATION MAP	Project No. 130063101 Date 23 JULY 2014 Scale 1"=1000' Drawn By JP / Checked By JJM Submission Date	Figure 1

Filename: \\langan.com\data\TR\data1\130063101\Cadd Data - 130063101\SheetFiles\Figures\site location map.dwg Date: 7/31/2014 Time: 15:28 User: jplotkin Style Table: Langan.stb Layout: ANSIA-BP



LEGEND:

LB-1 BORING LOCATION PERFORMED BY LANGAN BETWEEN 8-10 JULY 2014.

NOTES:

1. THIS DRAWING IS PART OF LANGAN'S GEOTECHNICAL ENGINEERING REPORT (PROJECT NO. 130063101) DATED 7 AUGUST 2014 AND SHOULD BE USED IN CONJUNCTION WITH THAT REPORT ONLY.
2. EXISTING ELEVATIONS TAKEN FROM FIELD SURVEY PERFORMED BY LANGAN ON 28 MARCH 2014.
3. SITE INFORMATION TAKEN FROM DRAWING NUMBER CS-101 "SITE PLAN" PREPARED BY LANGAN DATED 6 JUNE 2014.
4. LB-12 OMITTED DUE TO UTILITY CONFLICTS.

60 0 20 40 60

SCALE IN FEET

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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan Engineering and Environmental Services, Inc.
Langan CT, Inc.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

TCNJ
STEM BUILDING AND CHEMISTRY ADDITION

EWING TOWNSHIP

MERCER COUNTY NEW JERSEY

Drawing Title

BORING LOCATION PLAN

Project No.		Figure
130063101		2
Date		
8/7/2014		
Scale		
1"=30'		
Drawn By	Checked By	
JP	JJM	

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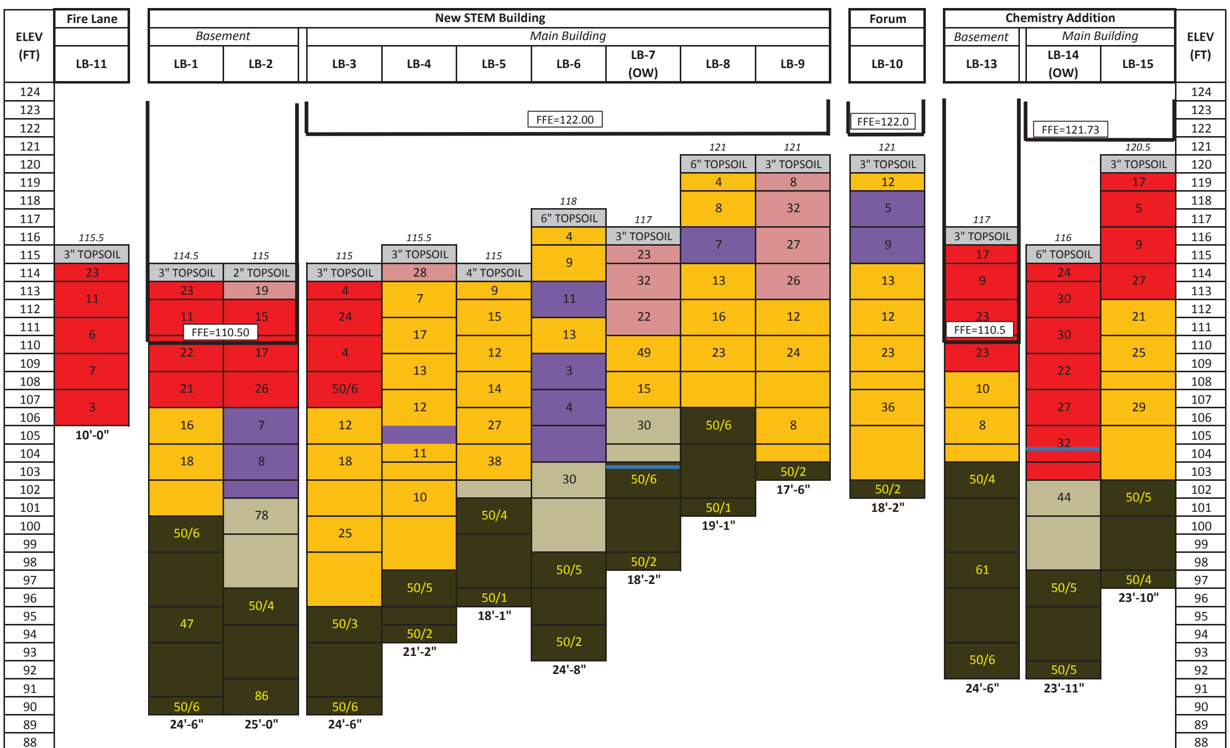
FIGURE 3
GEOTECHNICAL DATA SUMMARY
STEM BUILDING
THE COLLEGE OF NEW JERSEY - EWING, NEW JERSEY
130063101



	N-Value Summary		
	MIN	MAX	AVG
Structural Fill	*8*	*32*	*24*
Urban Fill	*3*	*Refusal*	*20*
Cohesionless soil	*4*	*49*	*17*
Cohesive soil	*3*	*9*	*7*
Silt (Residual Shale)	*30*	*78*	*46*
Weathered rock	*47*	*Refusal*	*Refusal*

Groundwater elevation

APPENDIX A
Boring Logs

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Log of Boring **LB-1** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101	
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 114.5	
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/8/14	Date Finished: 7/8/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 24.5 ft	Rock Depth
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft)	Water Level (ft.): First ▽; Completion ▼; 24 HR. ▼	
Casing Hammer; Weight (lbs); Drop (in)		Drilling Foreman: Jay Blemings	
Sampler: 2" OD Split Spoon		Inspecting Engineer: Eric Rundstrom	
Sampler Hammer: Automatic; Weight (lbs): 140; Drop (in): 30			

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+114.5		0						
+114.3	3" TOPSOIL (c-f SAND, trace silt) (dry)							Begin drilling at 8:37 AM
	Gray/white fine GRAVEL (dry) [FILL]		S-1	SS	6	2, 8, 15, 9	23	
	Gray/white fine GRAVEL (dry) [FILL]	2	S-2	SS	1	7, 6, 5, 6	11	Low recovery, gravel in tip
+110.5	Black c-f SAND, trace silt, trace organics [FILL]	4	S-3	SS	6	5, 9, 13, 18	22	Moderate drilling to 4'
	Dark brown c-f SAND, some silt (moist) [FILL]	6	S-4	SS	1	14, 13, 8, 10	21	
+106.5	Yellow/orange/red c-f SAND, trace silt (moist)	8	S-5	SS	12	8, 7, 9, 9	16	Moderate to stiff drilling to 8'
	Orange red c-f SAND, some silt, trace fine gravel (moist)	10	S-6	SS	22	8, 8, 10, 11	18	
		12						
+100.5	Red brown friable SHALE FRAGMENTS (dry) [WEATHERED SHALE]	14	S-7	SS	14	14, 38, 50/6"	50/6"	Smooth drilling to 14'
		16						
		18						Stiff drilling to 19'
	Red brown friable SHALE FRAGMENTS with white inclusions (quartz), silt, trace clay (dry) [WEATHERED SHALE]	20	S-8	SS	18	10, 18, 29, 30	47	
		22						
+90.0	Red brown friable SHALE FRAGMENTS with white quartz, silt, some c-f and, trace fine gravel (dry) [WEATHERED SHALE]	24	S-9	SS	6	50/6"	50/6"	Stop drilling at 9:30 AM
	End of boring at 24'-6"	26						Backfilled borehole with soil cuttings.
		28						
		30						

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Log of Boring **LB-2** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101	
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 115	
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/10/14	Date Finished: 7/10/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 25 ft	Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft):	Water Level (ft.): First ▽ 3; Completion ▼; 24 HR. ▼	
Casing Hammer:	Weight (lbs): ; Drop (in):	Drilling Foreman: Jay Blemings	
Sampler: 2" OD Split Spoon		Inspecting Engineer: Eric Rundstrom	
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+115.0		0						
+114.8	2" TOPSOIL							Begin drilling at 10:43 AM
	Gray gravelly c-f SAND (moist) [FILL]		S-1	SS	14	8 12 7 9	19	
	Gray gravelly c-f SAND (wet) [FILL]	2	S-2	SS	8	8 8 7 6	15	Spoon wet
+112.0	Red brown c-f SAND, some clay (wet) [FILL]	4						Smooth drilling to 4'
	Red brown c-f gravelly c-f SAND, some clay (moist) [FILL]		S-3	SS	15	8 6 11 11	17	w%=9.8% -200=25.4%
+109.0	Light brown gravelly SAND, trace RCA (moist) [FILL]	6	S-4	SS	6	9 14 12 6	26	Cuttings wet
+107.0	Light brown red m-f sandy SILT, some fine gravel shale fragments (moist)	8	S-5	SS	13	6 4 3 5	7	Choppy/moderate drilling to 8'
	Red brown m-f sandy SILT some fine gravel shale fragments (moist)	10	S-6	SS	12	5 4 4 4	8	
		12						Moderate drilling to 13'
	No recovery	14	S-7	SS	NR	28 37 41 42	78	No recovery, soil trap in good condition
		16						
+97.0	Red brown friable SHALE FRAGMENTS: SILT, some fine sand, trace clay, saprolitic with white/gray inclusions (dry) [WEATHERED SHALE]	18	S-8	SS	8	26 50/4"	50/4"	Moderate to stiff drilling to 18'
		20						
		22						Stiff drilling to 23'
	Red brown friable SHALE FRAGMENTS: SILT, some fine sand, trace clay, saprolitic with white gray inclusions (dry) [WEATHERED SHALE]	24	S-9	SS	20	22 42 44 37	86	
+90.0	End of boring at 25'-0"							Stop drilling at 11:28 AM
		26						Backfilled borehole with soil cuttings.
		28						
		30						

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Log of Boring **LB-3**

Project: TCNJ STEM Building	Project No.: 130063101
Location: Holman Hall, Metzger Drive, Ewing, NJ	Elevation and Datum: Approx. 115
Drilling Company: Uni-Tech Drilling Company, Inc.	Date Started: 7/8/14 — Date Finished: 7/8/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig	Completion Depth: 24.5 ft — Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit	Number of Samples: Disturbed 9 — Undisturbed 0 — Core 0
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger — Casing Depth (ft):	Water Level (ft.): First ▽ — Completion ▼ — 24 HR. ▼
Casing Hammer: — Weight (lbs): — Drop (in):	Drilling Foreman: Jay Blemings
Sampler: 2" OD Split Spoon	Inspecting Engineer: Eric Rundstrom
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+115.0		0						Begin drilling at 9:40 AM
+114.8	3" TOPSOIL							
	Black/brown fine SAND, some silt, trace organics (dry)	0–2	S-1	SS	10	1, 2, 2, 1	4	
	Light brown/white c-f sandy GRAVEL, trace silt, trace wood (dry) [FILL]	2–4	S-2	SS	12	8, 15, 9, 7	24	
	Black/gray GRAVEL, some c-f sand, some silt (dry) [GM] [FILL]	4–6	S-3	SS	10	8, 2, 2, 2	4	Choppy drilling to 4' w%=12.9% -200=13.9%
	No recovery	6–7	S-4	SS	NR	1, 50/6"	50/6"	
+107.0	Brown orange silty m-f SAND, some fine gravel (moist)	8–10	S-5	SS	8	5, 6, 6, 9	12	Very choppy drilling to 8'
+105.0	Brown orange c-f SAND, some fine gravel, trace silt (dry to moist)	10–12	S-6	SS	17	10, 9, 9, 11	18	
+101.0	Red brown c-f SAND, some silt (moist)	14–16	S-7	SS	12	13, 14, 11, 36	25	Moderate drilling to 14'
+96.0	Red brown SHALE FRAGMENTS with trace white inclusions, c-f SAND, trace fine gravel (dry) [WEATHERED SHALE]	19–19.8	S-8	SS	4	29, 50/3"	50/3"	Moderate drilling to 19'
+90.5	No recovery	24–24.5	S-9	SS	NR	50/6"	50/6"	Stiff drilling to 24' Stop drilling at 10:27 AM
	End of boring at 24'-6"							Backfill borehole with soil cuttings.

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30. N-Value axis: 10 20 30 40.

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Log of Boring **LB-4** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101	
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 115.5	
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/10/14	Date Finished: 7/10/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 21.2 ft	Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft):	Water Level (ft.): First ▽; Completion ▼; 24 HR. ▼	
Casing Hammer:	Weight (lbs): ; Drop (in):	Drilling Foreman: Jay Blemings	
Sampler: 2" OD Split Spoon		Inspecting Engineer: Eric Rundstrom	
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30		

Elev. (ft)	Sample Description	Depth (ft)	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+115.5		0						
+115.3	3" TOPSOIL							Begin boring at 8:50 AM
	Gray gravelly c-f SAND (dry) [FILL]	0–2	S-1	SS	12	3 / 15 / 13 / 8	28	
+113.3	3" Gray gravelly c-f SAND (dry) [FILL]							
	Red orange/brown gravelly c-f SAND, trace silt (dry)	2–4	S-2	SS	16	4 / 3 / 4 / 5	7	
	Red orange/brown silty c-f SAND, some fine gravel (dry)	4–6	S-3	SS	15	8 / 8 / 9 / 7	17	Smooth drilling to 4'
	Red brown c-f SAND, some fine gravel, some silt (dry)	6–8	S-4	SS	17	7 / 8 / 5 / 8	13	
	Red brown c-f SAND, some fine gravel, trace silt (dry)	8–10	S-5	SS	13	5 / 6 / 6 / 9	12	Moderate drilling to 8'
+106.0	Red brown SILT, trace fine sand (dry)							
+105.0	Red/brown c-f sandy c-f GRAVEL, some clay (moist)	10–12	S-6	SS	12	9 / 6 / 5 / 4	11	w%=7.6% -200=14.9%
	No recovery	13–15	S-7	SS	NR	7 / 6 / 4 / 5	10	Moderate drilling to 13'
+97.5	Light brownish gray GRAVEL ROCK FRAGMENTS, some c-f SAND	18	S-8	SS	3	50/5"	50/5"	Moderate to stiff drilling to 18'
+94.3	Red brown friable SHALE FRAGMENTS: SILT, some fine sand (dry) [WEATHERED SHALE]	21	S-9	SS	2	50/2"	50/2"	Auger refusal at 21' Stop drilling at 10:00 AM
	End of boring at 21'-2"							Backfilled borehole with soil cuttings.

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Log of Boring **LB-5** Sheet 1 of 1

Project: TCNJ STEM Building	Project No.: 130063101
Location: Holman Hall, Metzger Drive, Ewing, NJ	Elevation and Datum: Approx. 115
Drilling Company: Uni-Tech Drilling Company, Inc.	Date Started: 7/10/14 — Date Finished: 7/10/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig	Completion Depth: 18.1 ft — Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit	Number of Samples — Disturbed: 8 — Undisturbed: 0 — Core: 0
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger — Casing Depth (ft):	Water Level (ft.) — First: ▽ — Completion: ▼ — 24 HR.: ▼
Casing Hammer: — Weight (lbs): — Drop (in):	Drilling Foreman: Jay Blemings
Sampler: 2" OD Split Spoon	Inspecting Engineer: Eric Rundstrom
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+115.0		0						Begin drilling at 7:55 AM
+114.7	4" TOPSOIL							
	Light brown gravelly c-f SAND, some silt (dry)		S-1	SS	17	1, 4, 5, 8	9	
+113.0	Light brown c-f sandy SILT, trace fine gravel (dry)	2	S-2	SS	14	6, 7, 8, 8	15	
+111.0	Light brown c-f SAND, some silt, trace fine gravel (dry)	4	S-3	SS	19	5, 6, 6, 8	12	Smooth drilling to 4'
	Light brown to brown c-f SAND, some silt, some c-f gravel (dry) [SM]	6	S-4	SS	19	7, 6, 8, 11	14	w%=10.6% -200=21.2%
+107.0	Orange/red brown c-f sandy SILT, some fine gravel (dry)	8	S-5	SS	16	8, 13, 14, 21	27	Moderate drilling to 8'
+105.0	Orange/red brown silty c-f SAND, some fine gravel, trace silt (dry)	10	S-6	SS	19	18, 19, 19, 27	38	
+103.5	Red brown SILT, trace clay (dry)	12						
+102.0								
+101.7	4" seam white/gray GRAVEL		S-7	SS	6	33, 50/4"	50/4"	Moderate to stiff drilling to 13'
	Red brown friable SHALE FRAGMENTS: SILT, trace clay (dry) [WEATHERED SHALE]	14						
		16						
+96.9	Red brown friable SHALE FRAGMENTS: SILT, with white gravel (dry) [SHALE] [WEATHERED SHALE]	18	S-8	SS	1	50/1"	50/1"	Stiff drilling to 18', auger refusal Stop drilling at 8:45 AM
	End of boring at 18'-1"							Backfilled borehole with soil cuttings.
		20						
		22						
		24						
		26						
		28						
		30						

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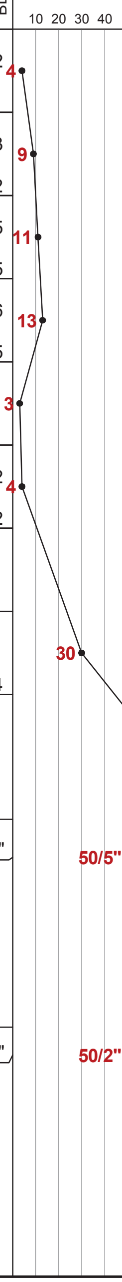
Log of Boring **LB-6** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101	
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 118	
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/8/14	Date Finished: 7/8/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 24.7 ft	Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft):	Water Level (ft.): First ▽; Completion ▼; 24 HR. ▼	
Casing Hammer:	Weight (lbs): ; Drop (in):	Drilling Foreman: Jay Blemings	
Sampler: 2" OD Split Spoon			
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30	Inspecting Engineer: Eric Rundstrom	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+118.0		0						
+117.5	6" TOPSOIL							Begin drilling at 10:48 AM
	Gray to brown c-f SAND, trace fine gravel, trace silt (dry)		S-1	SS	14	1 2 2 1	4	
+116.0	Brown c-f SAND, some clay, some fine gravel (dry) [SC]	2	S-2	SS	12	1 3 6 12	9	w%=16.2% -200=17.2%
+114.0	Light to dark brown c-f sandy SILT, some fine gravel, (moist)	4	S-3	SS	12	5 5 6 5	11	Smooth drilling to 4'
+112.0	Brown orange m-f SAND, some silt, trace fine gravel (moist)	6	S-4	SS	14	6 6 7 5	13	Cobble stuck in auger
+110.0	Brown orange c-f sandy CLAY, some fine gravel (moist)	8	S-5	SS	10	2 1 2 1	3	Smooth drilling to 8'
	Brown red/orange c-f sandy CLAY, some fine gravel, trace mica (moist)	10	S-6	SS	9	2 2 2 2	4	
		12						
+104.0	Red brown SILT, some fine sand, trace mica (dry) [ML]	14	S-7	SS	17	5 11 19 14	30	Moderate drilling to 14' w%=21.5% -200=72.2% Non-plastic
		16						
		18						
+99.0	Red brown friable SHALE FRAGMENTS: SILT, some fine sand, trace clay, trace mica (dry) [WEATHERED SHALE]		S-8	SS	7	29 50/5"	50/5"	Moderate drilling to 19'
		20						
		22						
		24						
+93.3	Red brown friable SHALE FRAGMENTS: SILT, trace clay (dry) [WEATHERED SHALE]		S-9	SS	5	43 50/2"	50/2"	Stiff drilling to 24' Stop drilling at 11:31 PM
	End of boring at 24'-8"							Backfilled borehole with soil cuttings.
		26						
		28						
		30						



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Log of Boring **LB-7** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101	
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 117	
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/9/14	Date Finished: 7/9/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 18.2 ft	Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft):	Water Level (ft.): First ▽ 12; Completion ▼; 24 HR. ▼ 13.7	
Casing Hammer:	Weight (lbs): ; Drop (in):	Drilling Foreman: Jay Blemings	
Sampler: 2" OD Split Spoon		Inspecting Engineer: Eric Rundstrom	
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+117.0		0						
+116.8	3" black/red TOPSOIL							Begin drilling at 2:00 PM
	Red brown silty SAND (dry) [FILL]		S-1	SS	18	3 / 10	23	
	Gray gravelly SAND (dry) [FILL]		S-2			13 / 11		
	Gray gravelly SAND (dry) [FILL]	2	S-3	SS	15	10 / 15 / 17 / 17	32	
	Gray gravelly SAND (wet) [FILL]	4	S-4	SS	15	6 / 9 / 13 / 11	22	Smooth drilling to 4'
+112.0	Red brown c-f SAND, some fine gravel, trace silt (dry)	6	S-5	SS	14	8 / 12 / 37 / 17	49	
	Red brown/orange c-f SAND, some fine gravel (moist)	8	S-6	SS	20	6 / 7 / 8 / 12	15	Moderate drilling to 8'
	Red brown/orange c-f SAND, some silt, trace fine gravel, trace mica (moist)							
+107.0	Red brown SILT, some fine sand, trace mica (dry to moist)	10	S-7	SS	15	12 / 16 / 14 / 17	30	
	▽	12						Cuttings wet
+104.0	▼		S-8	SS	9	12 / 50/6"	50/6"	Smooth drilling to 13'
	Red brown friable SHALE FRAGMENTS: fine sandy SILT, trace mica (moist) [WEATHERED SHALE]	14						
		16						
+98.8	Red brown friable SHALE FRAGMENTS: fine sandy SILT (dry) [WEATHERED SHALE]	18	S-9	SS	2	50/2"	50/2"	Very stiff drilling to 18' Auger refusal at 18' Install temporary observation well to 18' BGS.
	End of boring at 18'-2"	20						7/10/2014: Water table at 13.72' BGS Removed temporary observation well and backfilled borehole with soil cuttings.
		22						
		24						
		26						
		28						
		30						

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Log of Boring **LB-8** Sheet 1 of 1

Project: TCNJ STEM Building	Project No.: 130063101
Location: Holman Hall, Metzger Drive, Ewing, NJ	Elevation and Datum: Approx. 121
Drilling Company: Uni-Tech Drilling Company, Inc.	Date Started: 7/8/14 — Date Finished: 7/8/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig	Completion Depth: 19.1 ft — Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit	Number of Samples: Disturbed 8 — Undisturbed 0 — Core 0
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger — Casing Depth (ft):	Water Level (ft.): First ▽ — Completion ▼ — 24 HR. ▼
Casing Hammer: — Weight (lbs): — Drop (in):	Drilling Foreman: Jay Blemings
Sampler: 2" OD Split Spoon	Inspecting Engineer: Eric Rundstrom
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Elev. (ft)	Sample Description	Depth Scale
+121.0 to +120.5	6" TOPSOIL	0
+120.5 to +119.0	Brown c-f SAND, trace fine gravel, trace silt (moist)	0.5–2
+119.0 to +117.0	Brown orange silty m-f SAND, trace clay (moist)	2–4
+117.0 to +115.0	Brown orange CLAY, some fine sand, trace fine gravel (moist) [CL]	4–6
+115.0 to +113.0	Orange m-f SAND, some clay, trace fine gravel (moist)	6–8
+113.0 to +107.0	Red orange-brown, c-f SAND, some fine gravel, some silt (moist) Brown/red orange gravelly c-f SAND, trace silt (dry to moist)	8–14
+107.0 to +101.9	Brown orange c-f SAND, some fine gravel, trace silt (moist) [WEATHERED SHALE]	14–19
+101.9	Red/brown SILT (dry) [WEATHERED SHALE] End of boring at 19'-1"	19–19.1

Sample Data

Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)
S-1	SS	16	1, 2, 2, 1	4
S-2	SS	15	3, 5, 3, 3	8
S-3	SS	16	2, 3, 4, 5	7
S-4	SS	24	7, 7, 6, 6	13
S-5	SS	21	10, 7, 9, 21	16
S-6	SS	18	9, 11, 12, 14	23
S-7	SS	3	50/6"	50/6"
S-8	SS	1	50/1"	50/1"

Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)

- Begin drilling at 12:37 PM
- Smooth drilling to 4'
- w%=20.5%, -200=77.1%, LL=32, PI=10
- Smooth drilling to 8'
- Choppy drilling at 12'-6"
- Very stiff drilling to 14'
- Stiff drilling at 16'
- Choppy drilling to 18'
- Auger refusal at 19'
- Stop drilling at 1:28 PM
- Backfilled borehole with soil cuttings.

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Log of Boring **LB-9** Sheet 1 of 1

Project: TCNJ STEM Building	Project No.: 130063101
Location: Holman Hall, Metzger Drive, Ewing, NJ	Elevation and Datum: Approx. 121
Drilling Company: Uni-Tech Drilling Company, Inc.	Date Started: 7/8/14 — Date Finished: 7/8/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig	Completion Depth: 17.5 ft — Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit	Number of Samples: Disturbed 8 — Undisturbed 0 — Core 0
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger — Casing Depth (ft):	Water Level (ft.): First ▽ — Completion ▼ — 24 HR. ▼
Casing Hammer: — Weight (lbs): — Drop (in):	Drilling Foreman: Jay Blemings
Sampler: 2" OD Split Spoon	
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	Inspecting Engineer: Eric Rundstrom

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+121.0								
+120.8	3" TOPSOIL	0	S-1	SS	12	3, 4, 4, 4	8	Begin drilling at 1:40 PM
	Gray gravelly c-f SAND, trace silt (moist) [FILL]							
	Gray c-f gravelly c-f SAND, trace silt (moist) [FILL] [SP-SM]	2	S-2	SS	15	11, 19, 13, 20	32	w%=5.4% -200=11.3%
	Gray gravelly c-f SAND (dry) [FILL]	4	S-3	SS	16	8, 15, 12, 15	27	Moderate drilling to 4'
	Gray gravelly c-f SAND (moist) [FILL]	6	S-4	SS	13	11, 11, 15, 7	26	
+113.0	Orange brown c-f SAND, trace silt (moist)	8	S-5	SS	10	4, 6, 6, 6	12	Moderate drilling to 8'
+111.0	Orange brown/dark gray gravelly c-f SAND, trace silt (moist)	10	S-6	SS	13	9, 11, 13, 10	24	Spoon wet
		12						
	Dark brown c-f SAND, some fine gravel, trace silt (moist)	14	S-7	SS	10	4, 4, 4, 8	8	Smooth drilling to 14'
		16						Auger refusal at 16'
+104.0								
+103.5	Red brown friable SHALE FRAGMENTS: SILT, trace clay (dry) [WEATHERED SHALE]		S-8	SS	2	50/2"	50/2"	Spoon wet Stop drilling at 2:30 PM
	End of boring at 17'-6"	18						Backfilled borehole with soil cuttings.
		20						
		22						
		24						
		26						
		28						
		30						

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Log of Boring **LB-10** Sheet 1 of 1

Project			Project No.		
TCNJ STEM Building			130063101		
Location			Elevation and Datum		
Holman Hall, Metzger Drive, Ewing, NJ			Approx. 121		
Drilling Company			Date Started: 7/9/14		Date Finished: 7/9/14
Uni-Tech Drilling Company, Inc.					
Drilling Equipment			Completion Depth: 18.2 ft		Rock Depth:
CME-55 Track Carrier Auger Drill Rig					
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit			Number of Samples	Disturbed: 8 / Undisturbed: 0	Core: 0
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger		Casing Depth (ft):	Water Level (ft.)	First: ▽ / Completion: ▼	24 HR.: ▼
Casing Hammer	Weight (lbs):	Drop (in):	Drilling Foreman: Jay Blemings		
Sampler: 2" OD Split Spoon			Inspecting Engineer: Eric Rundstrom		
Sampler Hammer: Automatic	Weight (lbs): 140	Drop (in): 30			

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+121.0 to +120.8	3" TOPSOIL	0	S-1	SS	18	4, 6, 6, 7	12	Begin drilling at 9:30 AM
+120.8 to +120.0	Brown c-f SAND, trace fine gravel, trace silt (dry)							Choppy drilling
+120.0 to +119.5	6" seam of GRAVEL							
+119.5 to +119.0	Brown c-f SAND, trace fine gravel, trace silt (dry)	2						
+119.0 to +115.0	Light brown CLAY, some m-f sand, some fine gravel (dry)		S-2	SS	17	7, 2, 3, 4	5	
	Light brown CLAY, some m-f sand, some c-f gravel, trace roots/organics (moist) [CL]	4	S-3	SS	9	3, 4, 5, 7	9	Smooth drilling to 4' w%=13.4% -200=61.2%
+115.0 to +111.0	Brown gravelly c-f SAND, trace silt (moist)	6	S-4	SS	15	8, 6, 7, 7	13	
	Light orange/red brown c-f SAND, some fine gravel (moist)	8	S-5	SS	17	4, 5, 7, 10	12	Smooth drilling to 8'
+111.0 to +108.0	Orange/red brown m-f silty SAND, trace fine gravel, (moist) [SM]	10	S-6	SS	20	7, 9, 14, 20	23	w%=20.0% -200=37.1%
+108.0 to +103.0	Light brown/red/gray c-f SAND, some gravel, trace silt (dry)	12–14	S-7	SS	8	7, 12, 24, 30	36	Smooth drilling to 13'
		16						
+103.0 to +102.8	Red brown friable SHALE FRAGMENTS: SILT (dry to moist) [WEATHERED SHALE]	18	S-8	SS	2	50/2"	50/2"	Moderate to stiff drilling to 18' Approximate depth of bedrock Auger refusal at 18'-0" Spoon refusal Stop drilling at 10:10 AM Backfilled borehole with soil cuttings.
	End of boring at 18'-2"	20–30						

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Log of Boring **LB-11** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101			
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 115.5			
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/10/14		Date Finished: 7/10/14	
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 10 ft		Rock Depth:	
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples	Disturbed: 5	Undisturbed: 0	Core: 0
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft):	Water Level (ft.)	First: ▽	Completion: ▼	24 HR.: ▼
Casing Hammer:	Weight (lbs): / Drop (in):	Drilling Foreman: Jay Blemings			
Sampler: 2" OD Split Spoon		Inspecting Engineer: Eric Rundstrom			
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30				

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+115.5		0						Begin drilling at 10:10 AM
+115.3	3" TOPSOIL							
	Gray c-f SAND, some gravel (dry) [FILL]	0–2	S-1	SS	11	3, 12, 11, 12	23	
	3" gray c-f SAND, some fine gravel (dry) [FILL]							
+112.5	Red brown c-f SAND, some fine gravel rock fragments (dry) [FILL]	2–4	S-2	SS	10	9, 6, 5, 5	11	
+111.5	Gravel (brick and crushed concrete) [FILL]	4–6	S-3	SS	4	5, 3, 3, 3	6	Smooth drilling to 4' Brick in tip (low recovery)
+109.5	Brown/red silty c-f SAND, some gravel, trace brick (moist) [FILL]	6–8	S-4	SS	18	5, 3, 4, 4	7	
	Brown/black/red silty c-f SAND, some fine gravel, trace brick (moist) [FILL]	8–10	S-5	SS	15	3, 1, 2, 3	3	Smooth drilling to 8'
+105.5	End of boring at 10'-0"	10						Stop drilling at 10:24 AM Backfilled borehole with soil cuttings.

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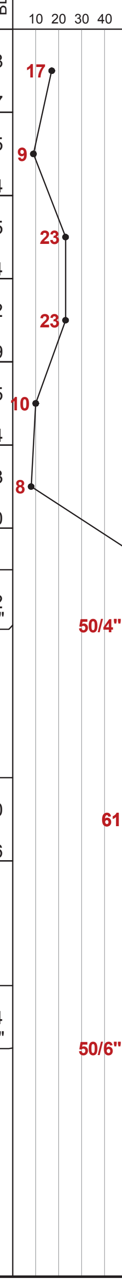
Log of Boring **LB-13** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101	
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 117	
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/9/14	Date Finished: 7/9/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 24.5 ft	Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft):	Water Level (ft.): First ▽; Completion ▼; 24 HR. ▼	
Casing Hammer:	Weight (lbs): ; Drop (in):	Drilling Foreman: Jay Blemings	
Sampler: 2" OD Split Spoon		Inspecting Engineer: Eric Rundstrom	
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+117.0 / +116.8	3" TOPSOIL	0						Begin drilling at 12:39 PM
	Brown c-f sandy CLAY, trace fine gravel (dry) [FILL]		S-1	SS	10	3, 8, 9, 7	17	
	Red brown c-f sandy CLAY, trace fine gravel (dry) [CL] [FILL]	2	S-2	SS	12	7, 5, 4, 4	9	w%=16.3% -200=57.6%
	Brown/gray c-f SAND, some fine gravel (dry) [FILL]	4	S-3	SS	9	4, 5, 18, 24	23	Light to moderate drilling to 4'
	Brown gray c-f SAND, some fine gravel, trace silt, trace wood (dry) [FILL]	6	S-4	SS	13	16, 12, 11, 9	23	
+109.0	Red brown/gray c-f sandy c-f GRAVEL, some silt (moist) [GM]	8	S-5	SS	17	6, 5, 5, 4	10	Moderate drilling to 8' w%=11.7% -200=22.1%
+107.0	Brown orange/gray c-f SAND, some silt, trace fine gravel (moist)	10	S-6	SS	13	3, 3, 5, 10	8	
+104.0	Red brown friable SHALE FRAGMENTS: SILT (dry) [WEATHERED SHALE]	12	S-7	SS	20	7, 22, 50/4"	50/4"	Moderate drilling to 13'
		14						
		16						
	Red brown friable SHALE FRAGMENTS: SILT, trace fine sand (dry) [WEATHERED SHALE]	18	S-8	SS	16	20, 30, 31, 36	61	Moderate to stiff drilling to 18'
		20						
		22						
	Red brown friable SHALE FRAGMENTS: SILT, trace clay (dry) [WEATHERED SHALE]		S-9	SS	13	11, 34, 50/6"	50/6"	Stiff drilling to 23'
+92.5	End of boring at 24'-6"	24						Stop drilling at 1:30 PM
		26						Backfilled borehole with soil cuttings.
		28						
		30						



LANGAN

Log of Boring **LB-14** Sheet 1 of 1

Project: TCNJ STEM Building		Project No.: 130063101	
Location: Holman Hall, Metzger Drive, Ewing, NJ		Elevation and Datum: Approx. 116	
Drilling Company: Uni-Tech Drilling Company, Inc.		Date Started: 7/9/14	Date Finished: 7/9/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig		Completion Depth: 23.9 ft	Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit		Number of Samples: Disturbed 9; Undisturbed 0; Core 0	
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger	Casing Depth (ft):	Water Level (ft.): First ▽; Completion ▼; 24 HR. ▼ 11	
Casing Hammer:	Weight (lbs): ; Drop (in):	Drilling Foreman: Jay Blemings	
Sampler: 2" OD Split Spoon		Inspecting Engineer: Eric Rundstrom	
Sampler Hammer: Automatic	Weight (lbs): 140; Drop (in): 30		

Elev. (ft)	Sample Description	Depth (ft)	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+116.0 / +115.5	6" TOPSOIL	0						Begin drilling at 10:25 AM
	Brown clayey c-f SAND, some gravel (dry) [FILL]	0–2	S-1	SS	10	4, 10, 14, 15	24	
	Brown c-f SAND, some fine gravel, trace organics/roots (dry) [SC] [FILL]	2–4	S-2	SS	10	8, 12, 18, 10	30	w%=10.0% -200=38.5%
	Light brown/gray c-f SAND, some fine gravel [FILL]	4–6	S-3	SS	7	9, 13, 17, 39	30	Moderate drilling to 4'
	Light brown/gray c-f SAND, some fine gravel (dry) [FILL]	6–8	S-4	SS	12	38, 12, 10, 14	22	
+108.0	Gray gravelly red c-f SAND, trace silt (dry) [FILL]	8–10	S-5	SS	13	18, 15, 12, 5	27	Moderate to stiff drilling to 8'
+106.0	Orange/red brown gravelly c-f SAND (dry) [FILL]	10–12	S-6	SS	19	19, 16, 16, 23	32	Choppy drilling
+103.0	Red brown SILT, some m-f SAND (dry)	13–15	S-7	SS	14	20, 21, 23, 26	44	Moderate to stiff drilling to 13'
+98.0	Red brown friable SHALE FRAGMENTS: SILT, with white inclusions (dry) [WEATHERED SHALE]	18–19	S-8	SS	6	44, 50/5"	50/5"	Moderate to stiff drilling to 18'
+92.1	Red brown friable SHALE FRAGMENTS: SILT (dry) [WEATHERED SHALE]	23–24	S-9	SS	8	27, 50/5"	50/5"	Stiff drilling to 23'
	End of boring at 23'-11"	24						Stop drilling at 11:34 PM Prep auger to install temporary observation well to 22'-11" BGS 7/10/2014: Water table at 11.01' BGS Removed temporary observation well and backfilled borehole with soil cuttings.

LANGAN

Log of Boring **LB-15** Sheet 1 of 1

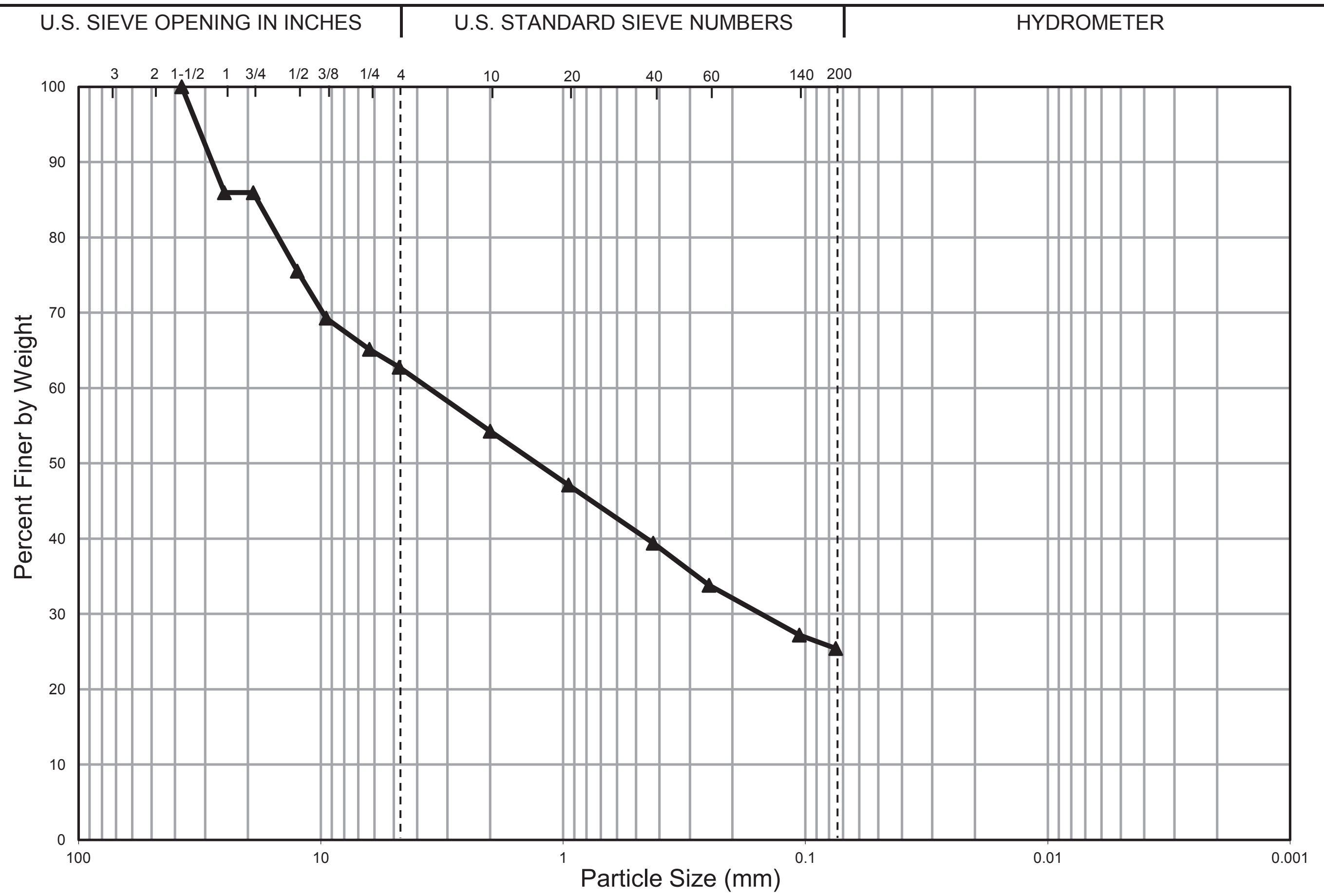
Project: TCNJ STEM Building	Project No.: 130063101
Location: Holman Hall, Metzger Drive, Ewing, NJ	Elevation and Datum: Approx. 120.5
Drilling Company: Uni-Tech Drilling Company, Inc.	Date Started: 7/9/14 — Date Finished: 7/9/14
Drilling Equipment: CME-55 Track Carrier Auger Drill Rig	Completion Depth: 23.8 ft — Rock Depth:
Size and Type of Bit: 4 1/4" I.D. Hollow-Stem Auger Claw Bit	Number of Samples: Disturbed 9 — Undisturbed 0 — Core 0
Casing Diameter (in): 4 1/4" I.D. Hollow-Stem Auger — Casing Depth (ft):	Water Level (ft.): First ▽ — Completion ▼ — 24 HR. ▼
Casing Hammer: — Weight (lbs): — Drop (in):	Drilling Foreman: Jay Blemings
Sampler: 2" OD Split Spoon	Inspecting Engineer: Eric Rundstrom
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Elev. (ft)	Depth Scale	Sample Description	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+120.5	0							Begin drilling at 8:08 AM
+120.3		3" TOPSOIL						
	0–2	Brown c-f SAND, some fine gravel, trace trash (foam) (dry) [FILL]	S-1	SS	17	3, 10, 7, 7	17	
	2–4	Brown c-f SAND, some fine gravel, trace brick, trace organics (dry) [FILL]	S-2	SS	11	5, 3, 2, 3	5	
	4–6	Brown clayey c-f SAND, some fine gravel, trace organics, trace brick (dry to moist) [FILL]	S-3	SS	16	3, 3, 6, 17	9	Light to moderate drilling to 4' w%=12.6% -200=33.1%
	6–8	Brown c-f SAND, some fine gravel, some silt, trace brick (dry) [FILL]	S-4	SS	18	15, 17, 10, 8	27	
+112.5	8–10	Light brown/red c-f SAND, some fine gravel, trace silt (dry)	S-5	SS	13	9, 12, 9, 14	21	Moderate drilling to 8'
	10–12	Light brown m-f SAND, some light gray gravel (dry)	S-6	SS	16	9, 11, 14, 12	25	
	13–15	Light brown m-f SAND, some light gray gravel (dry)	S-7	SS	4	14, 14, 13, 12	27	Moderate to stiff drilling to 13' Low recovery, quartz gravel in tip
	16–18							Choppy drilling Stiff drilling to 18'
+102.5	18–19.4	Red brown friable SHALE FRAGMENTS: c-f SAND, some silt (dry) [WEATHERED SHALE]	S-8	SS	8	16, 24, 50/5"	50/5"	
	21–22							Stiff drilling from 21'-22'
	23–23.8	Red brown friable SHALE FRAGMENTS: SILT, some white inclusions [WEATHERED SHALE]	S-9	SS	12	41, 50/4"	50/4"	Stiff drilling to 23' Stop drilling at 9:00 AM
+96.7	23.8	End of boring at 23'-10"						Backfilled borehole with cuttings.

APPENDIX B
Soil Laboratory Results

LANGAN

PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	37.2		37.3			25.4

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	100.0
1"	85.9
3/4"	85.9
1/2"	75.5
3/8"	69.3
1/4"	65.1
No. 4	62.8
No. 10	54.3
No. 20	47.1
No. 40	39.4
No. 60	33.8
No. 140	27.2
No. 200	25.4

	▲
Stratum	
Boring	LB-2
Sample	S-3
Depth (ft)	4.0 - 6.0
C_u	
C_c	
w (%)	9.8
LL	
PL	
PI	
USCS	SC (visual)

	Color	USCS Group Name
▲	Reddish brown	Clayey sand with gravel (visual)

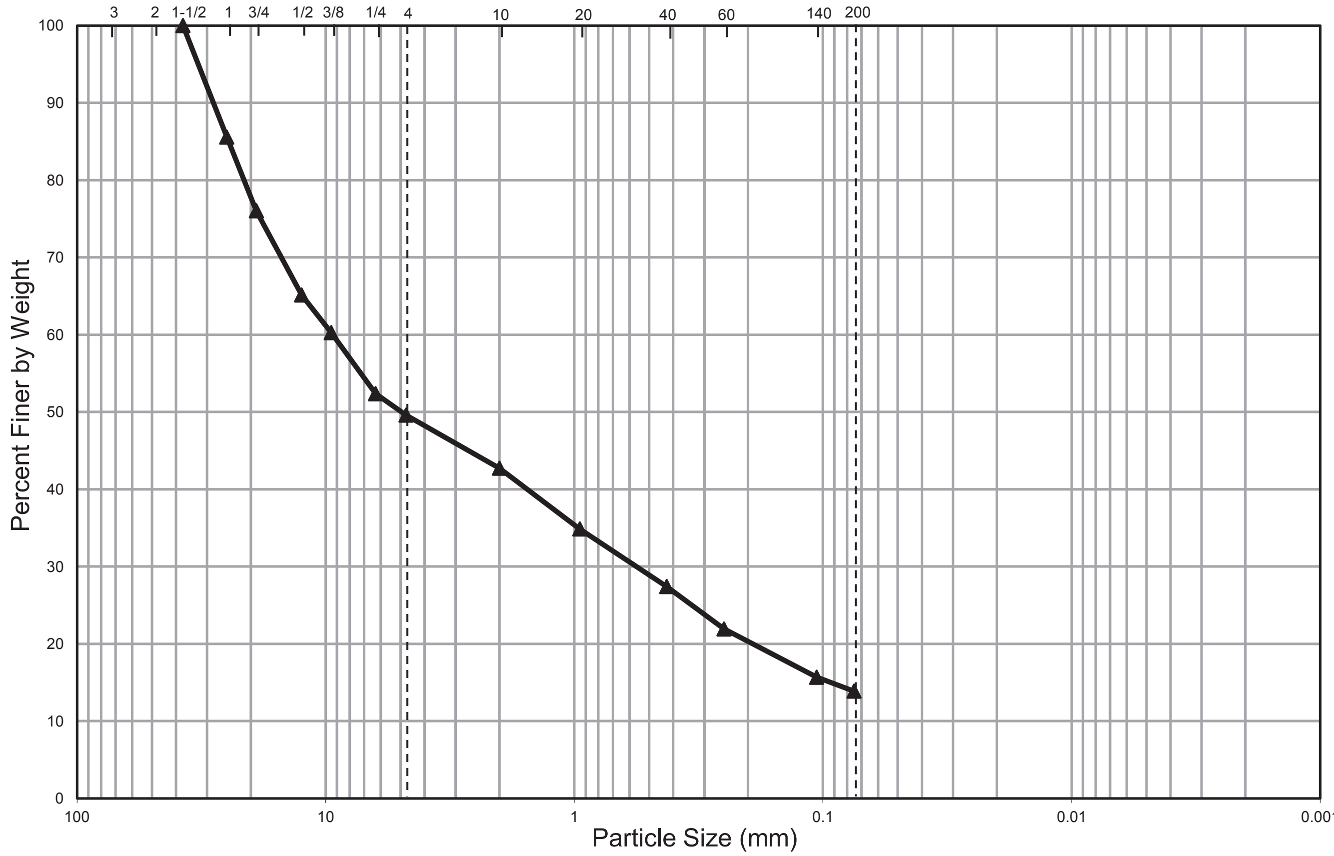
GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/29/2014

PARTICLE SIZE ANALYSIS OF SOILS

U.S. SIEVE OPENING IN INCHES	U.S. STANDARD SIEVE NUMBERS	HYDROMETER



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	50.4		35.7			13.9

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	100.0
1"	85.6
3/4"	76.0
1/2"	65.1
3/8"	60.3
1/4"	52.4
No. 4	49.6
No. 10	42.7
No. 20	34.9
No. 40	27.4
No. 60	21.9
No. 140	15.7
No. 200	13.9

	▲
Stratum	
Boring	LB-3
Sample	S-3
Depth (ft)	4.0 - 6.0
C_u	
C_c	
w (%)	12.9
LL	
PL	
PI	
USCS	GM (visual)

	Color	USCS Group Name
▲	Brown	Silty gravel with sand (visual)

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/29/2014

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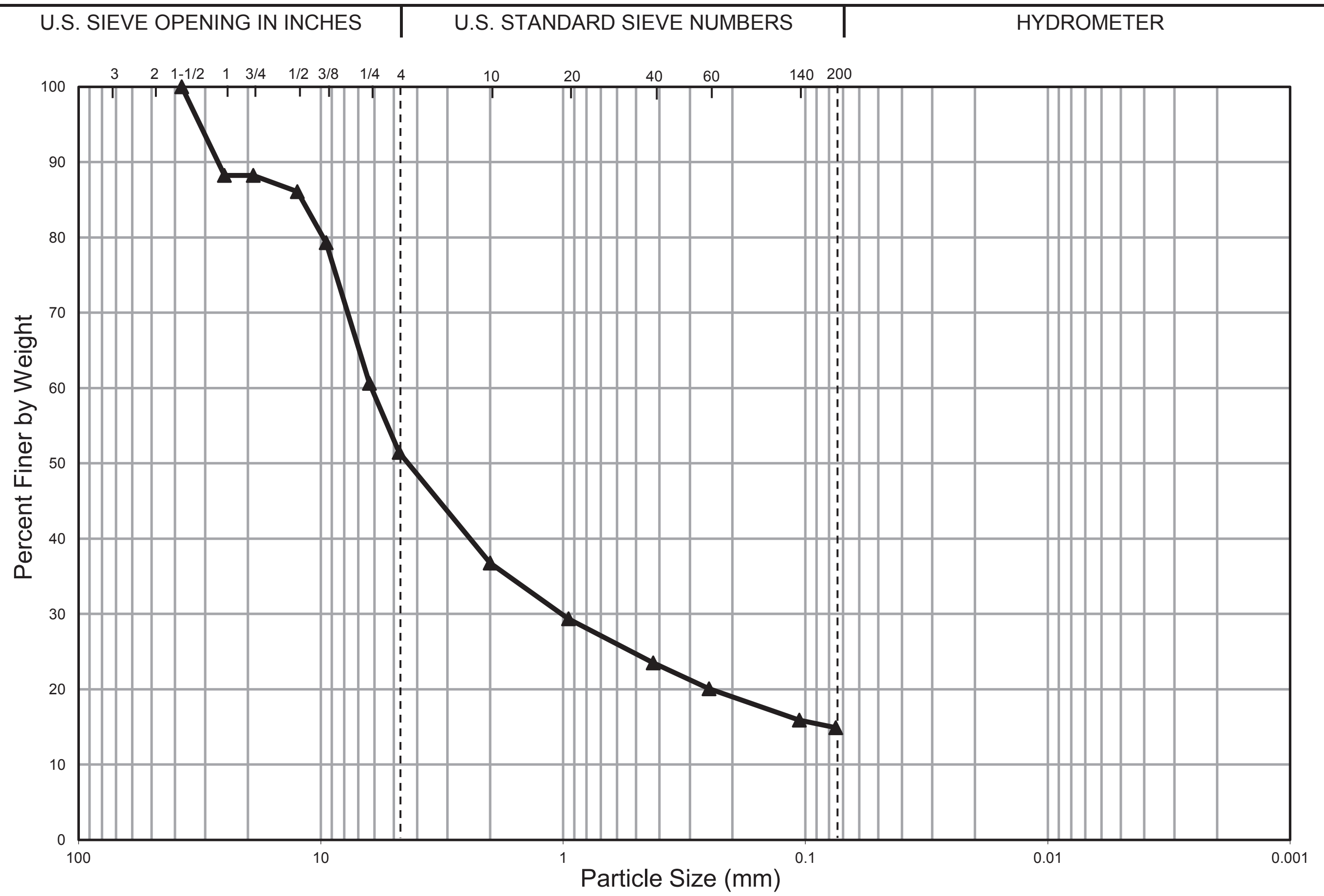
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	48.6		36.6			14.9

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	100.0
1"	88.2
3/4"	88.2
1/2"	86.1
3/8"	79.3
1/4"	60.6
No. 4	51.4
No. 10	36.8
No. 20	29.4
No. 40	23.5
No. 60	20.1
No. 140	15.9
No. 200	14.9

	▲
Stratum	
Boring	LB-4
Sample	S-6
Depth (ft)	10.0 - 12.0
C_u	
C_c	
w (%)	7.6
LL	
PL	
PI	
USCS	GC (visual)

	Color	USCS Group Name
▲	Reddish brown	Clayey gravel with sand (visual)

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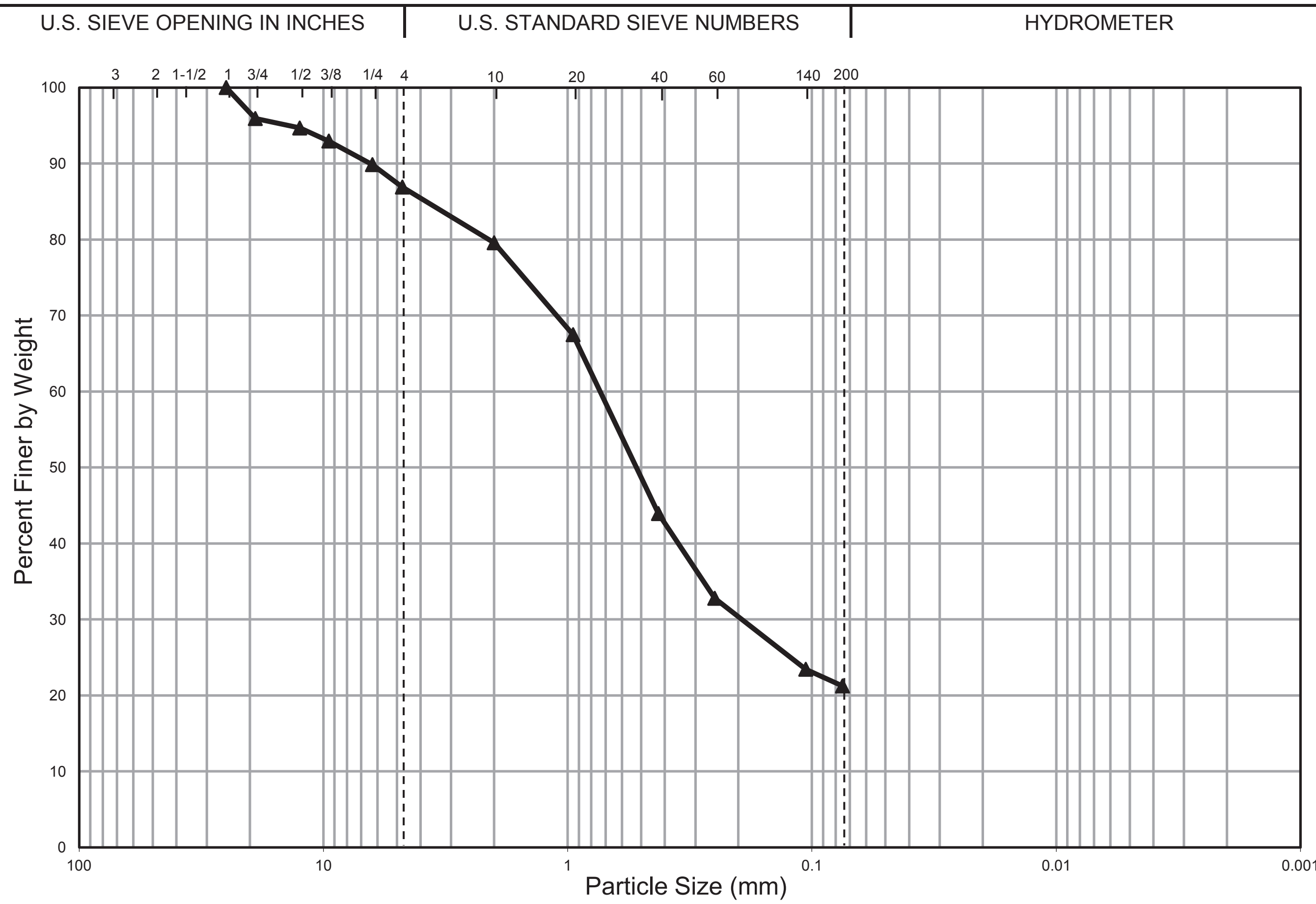
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	13.1		65.7			21.2

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	100.0
3/4"	95.9
1/2"	94.7
3/8"	93.0
1/4"	89.9
No. 4	86.9
No. 10	79.6
No. 20	67.5
No. 40	43.9
No. 60	32.8
No. 140	23.4
No. 200	21.2

	▲
Stratum	
Boring	LB-5
Sample	S-4
Depth (ft)	6.0 - 8.0
C_u	
C_c	
w (%)	10.6
LL	
PL	
PI	
USCS	SM (visual)

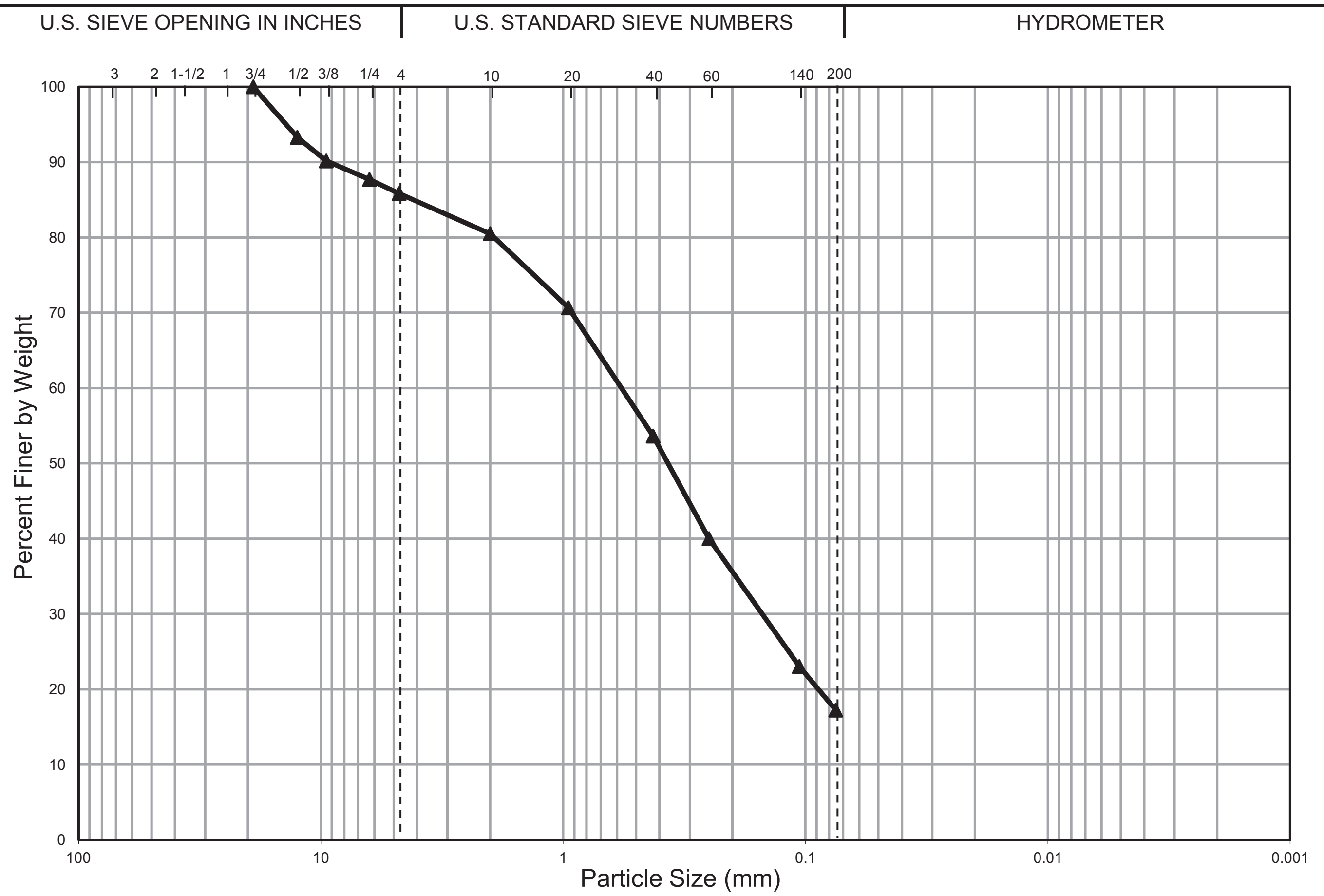
	Color	USCS Group Name
▲	Brown	Silty sand (visual)

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/29/2014

PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	14.2		68.6			17.2

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	93.3
3/8"	90.2
1/4"	87.7
No. 4	85.8
No. 10	80.5
No. 20	70.6
No. 40	53.6
No. 60	40.0
No. 140	23.0
No. 200	17.2

	▲
Stratum	
Boring	LB-6
Sample	S-2
Depth (ft)	2.0 - 4.0
C_u	
C_c	
w (%)	16.2
LL	
PL	
PI	
USCS	SC (visual)

	Color	USCS Group Name
▲	Brown	Clayey sand (visual)

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TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/29/2014

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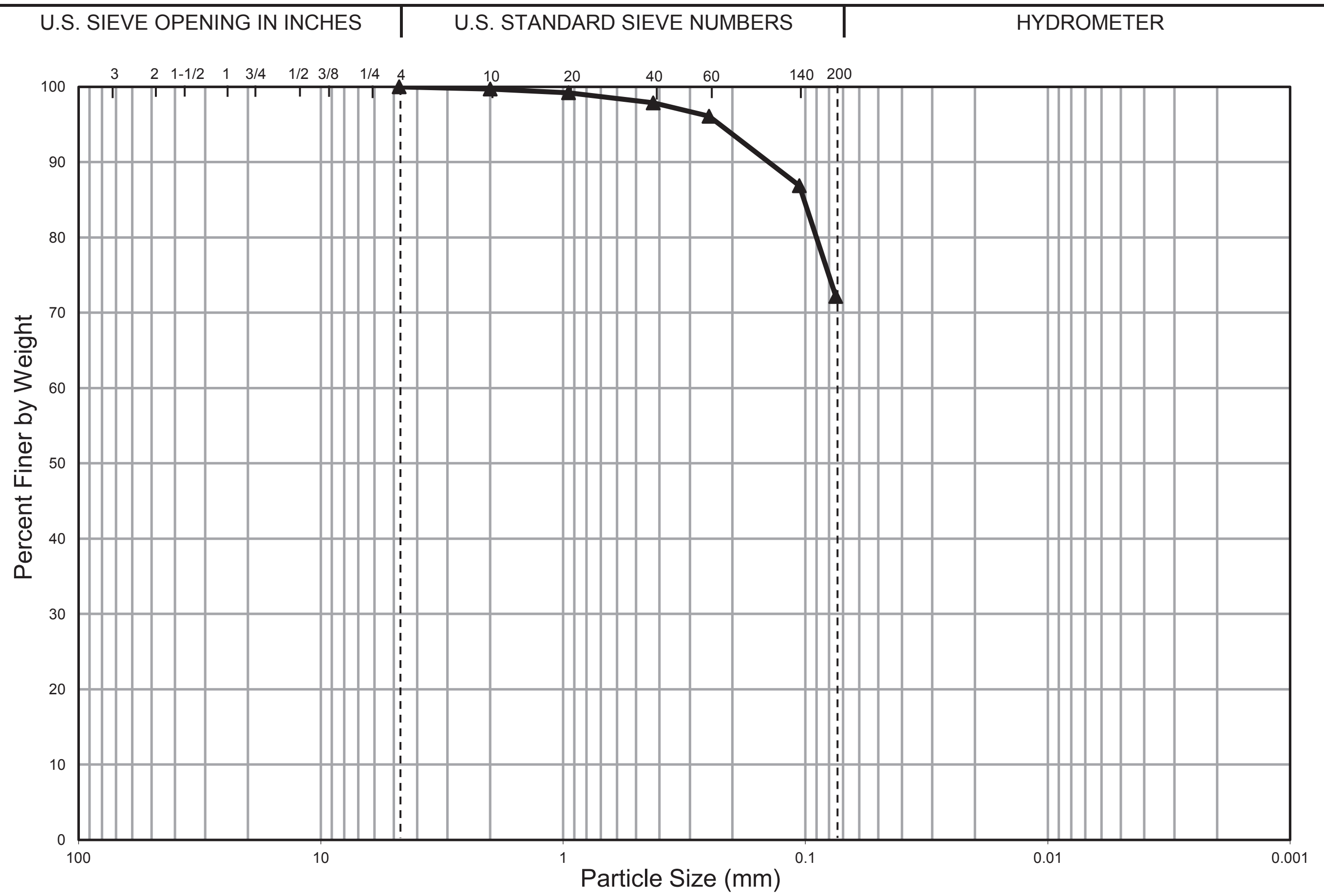
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	0.0		27.8			72.2

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	
1/2"	
3/8"	
1/4"	
No. 4	100.0
No. 10	99.7
No. 20	99.2
No. 40	97.9
No. 60	96.1
No. 140	86.9
No. 200	72.2

	▲
Stratum	
Boring	LB-6
Sample	S-7
Depth (ft)	14.0 - 16.0
C_u	
C_c	
w (%)	21.5
LL	N.P.
PL	N.P.
PI	N.P.
USCS	ML

	Color	USCS Group Name
▲	Reddish brown	Silt with sand

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/29/2014

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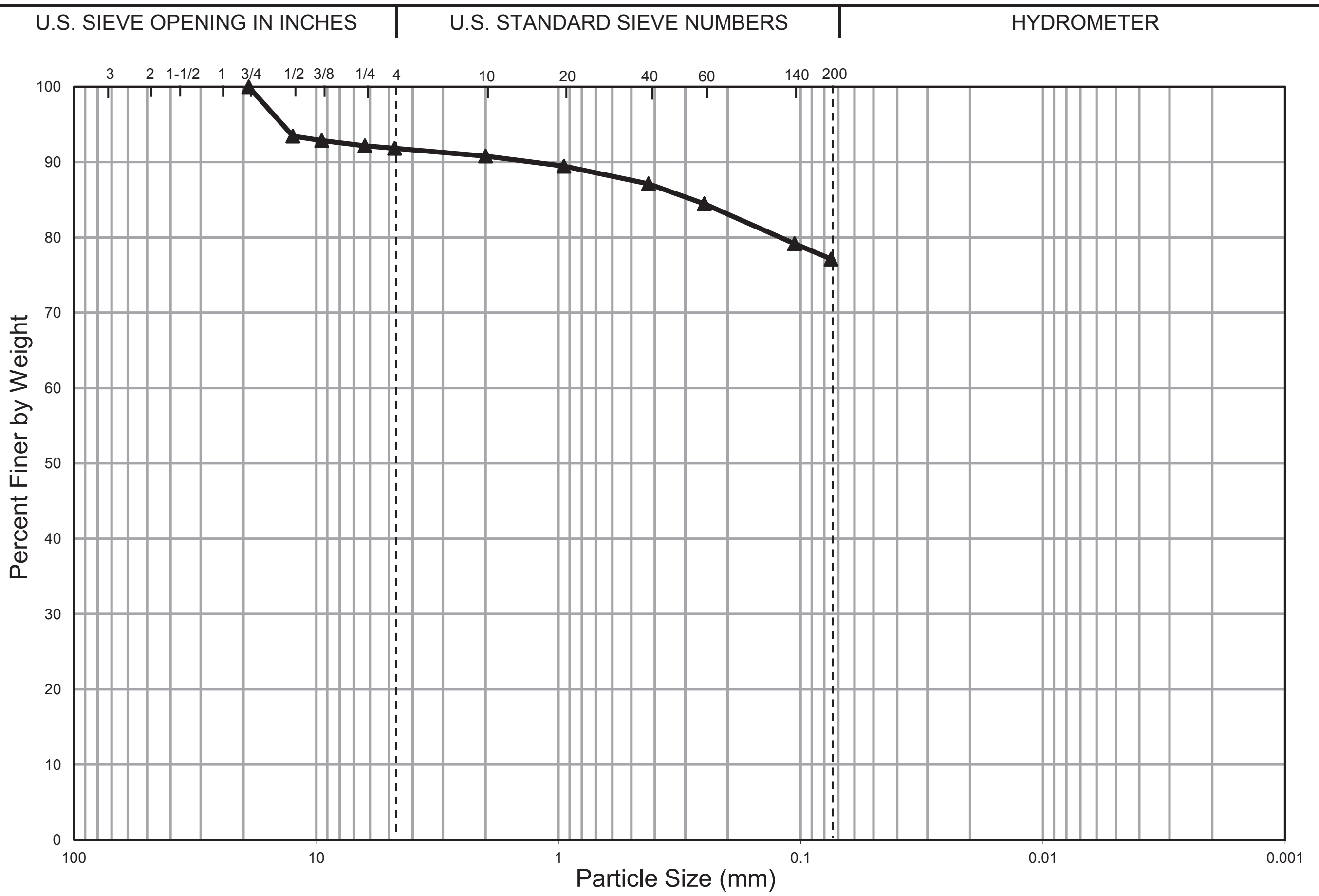
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	8.2		14.7			77.1

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	93.5
3/8"	92.9
1/4"	92.2
No. 4	91.8
No. 10	90.8
No. 20	89.5
No. 40	87.1
No. 60	84.5
No. 140	79.2
No. 200	77.1

	▲
Stratum	
Boring	LB-8
Sample	S-3
Depth (ft)	4.0 - 6.0
C_u	
C_c	
w (%)	20.5
LL	32
PL	22
PI	10
USCS	CL

	Color	USCS Group Name
▲	Brown	Lean clay with sand

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/30/2014

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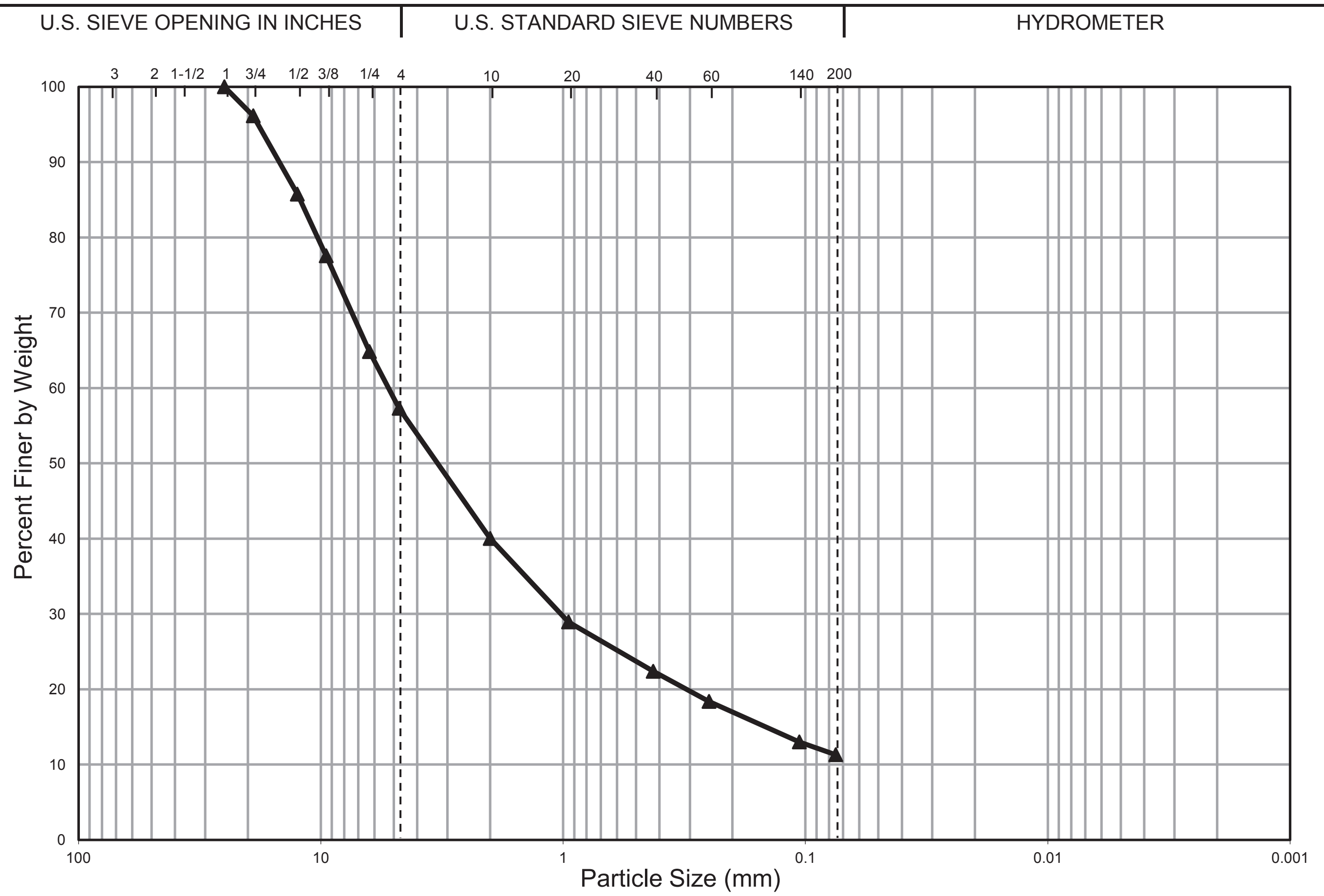
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	42.7		46.0			11.3

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	100.0
3/4"	96.1
1/2"	85.7
3/8"	77.6
1/4"	64.8
No. 4	57.3
No. 10	40.0
No. 20	28.9
No. 40	22.4
No. 60	18.4
No. 140	13.0
No. 200	11.3

	▲
Stratum	
Boring	LB-9
Sample	S-2
Depth (ft)	2.0 - 4.0
C_u	85.5
C_c	3.0
w (%)	5.4
LL	N.P.
PL	N.P.
PI	N.P.
USCS	SP-SM

	Color	USCS Group Name
▲	Greenish gray	Poorly graded sand with silt and gravel

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/29/2014

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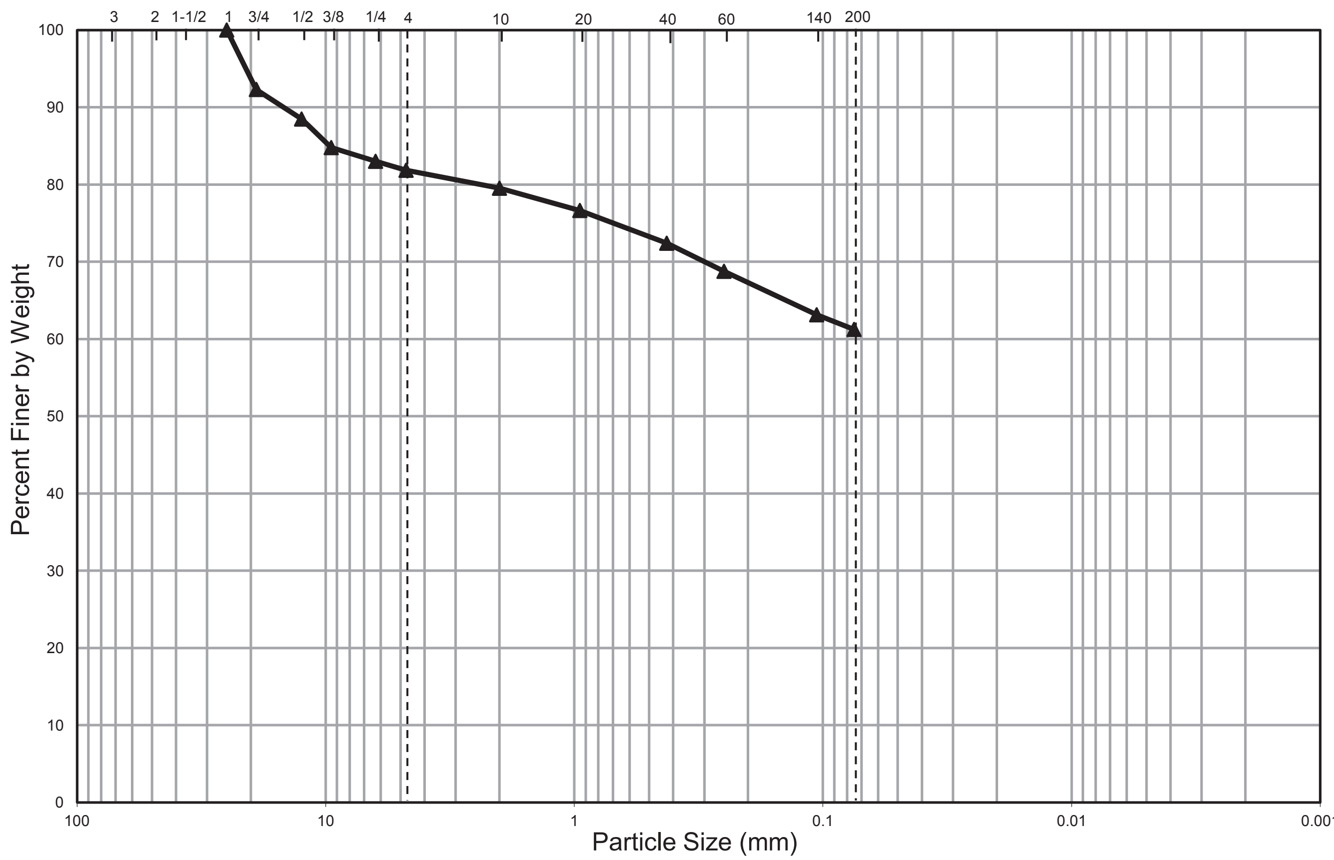
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	18.2		20.6			61.2

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	100.0
3/4"	92.3
1/2"	88.5
3/8"	84.8
1/4"	83.0
No. 4	81.8
No. 10	79.5
No. 20	76.6
No. 40	72.4
No. 60	68.8
No. 140	63.1
No. 200	61.2

	▲
Stratum	
Boring	LB-10
Sample	S-3
Depth (ft)	4.0 - 6.0
C_u	
C_c	
w (%)	13.4
LL	
PL	
PI	
USCS	CL (visual)

	Color	USCS Group Name
▲	Brown	Sandy clay with gravel (visual)

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/28/2014

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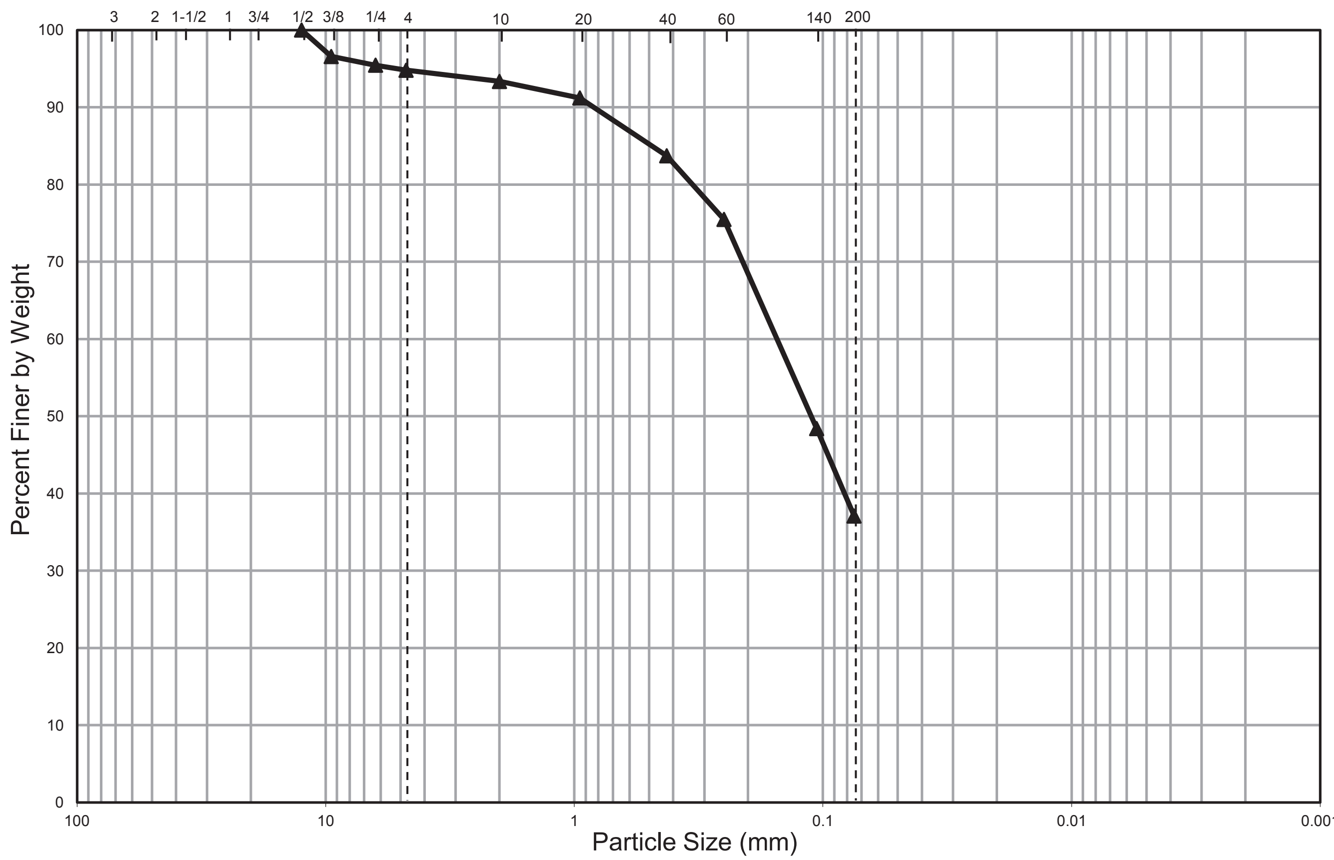
PARTICLE SIZE ANALYSIS OF SOILS

U.S. SIEVE OPENING IN INCHES	U.S. STANDARD SIEVE NUMBERS	HYDROMETER



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	5.2		57.7			37.1

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	
1/2"	100.0
3/8"	96.6
1/4"	95.4
No. 4	94.8
No. 10	93.3
No. 20	91.2
No. 40	83.7
No. 60	75.5
No. 140	48.4
No. 200	37.1

	▲
Stratum	
Boring	LB-10
Sample	S-6
Depth (ft)	10.0 - 12.0
C_u	
C_c	
w (%)	20.0
LL	
PL	
PI	
USCS	SM

	Color	USCS Group Name
▲	Purple brown	Silty sand

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 8/1/2014

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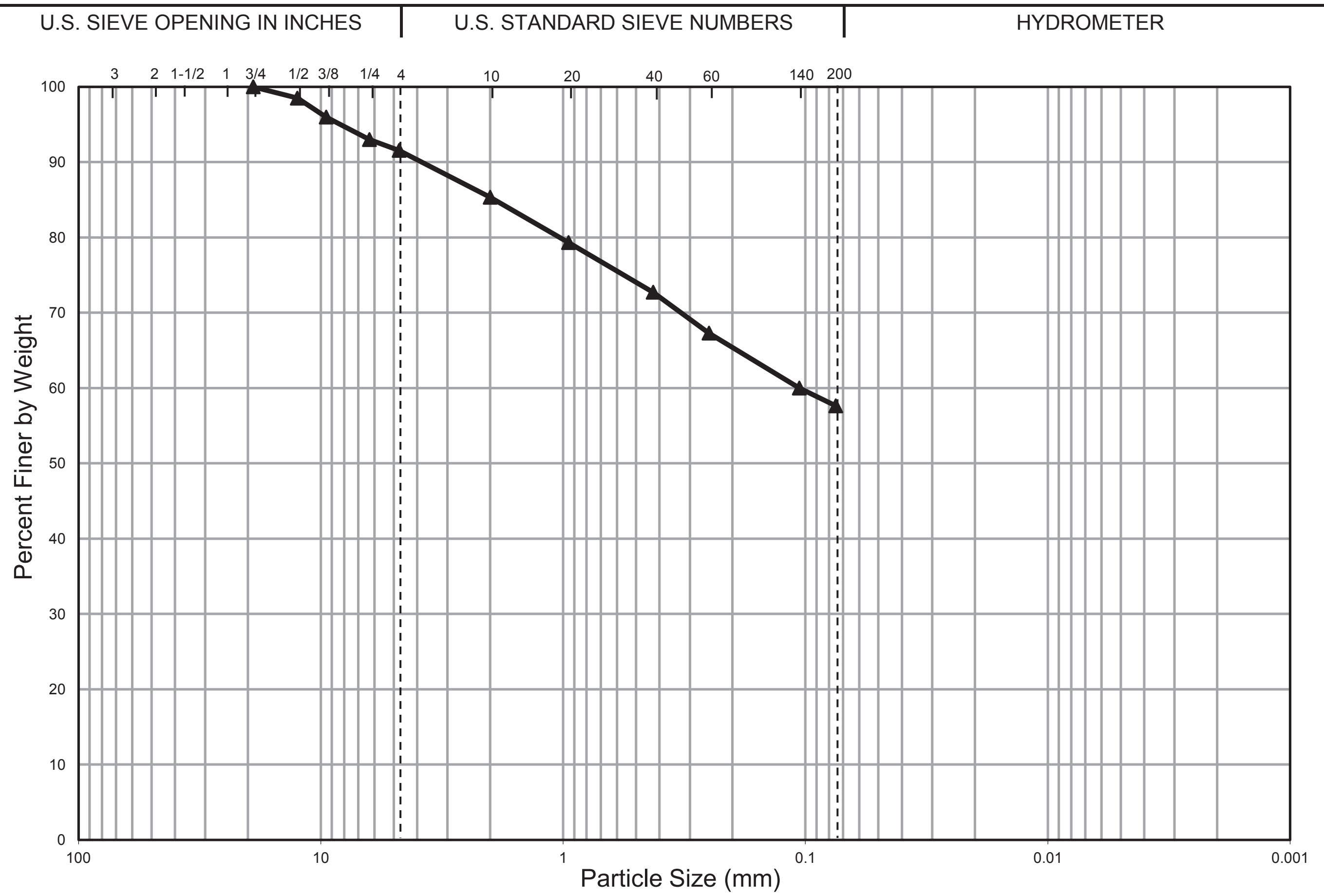
PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	8.4		33.9			57.6

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	98.5
3/8"	96.0
1/4"	93.0
No. 4	91.6
No. 10	85.3
No. 20	79.3
No. 40	72.7
No. 60	67.3
No. 140	60.0
No. 200	57.6

	▲
Stratum	
Boring	LB-13
Sample	S-2
Depth (ft)	2.0 - 4.0
C_u	
C_c	
w (%)	16.3
LL	
PL	
PI	
USCS	CL (visual)

	Color	USCS Group Name
▲	Purple brown	Sandy clay (visual)

GeoStructures

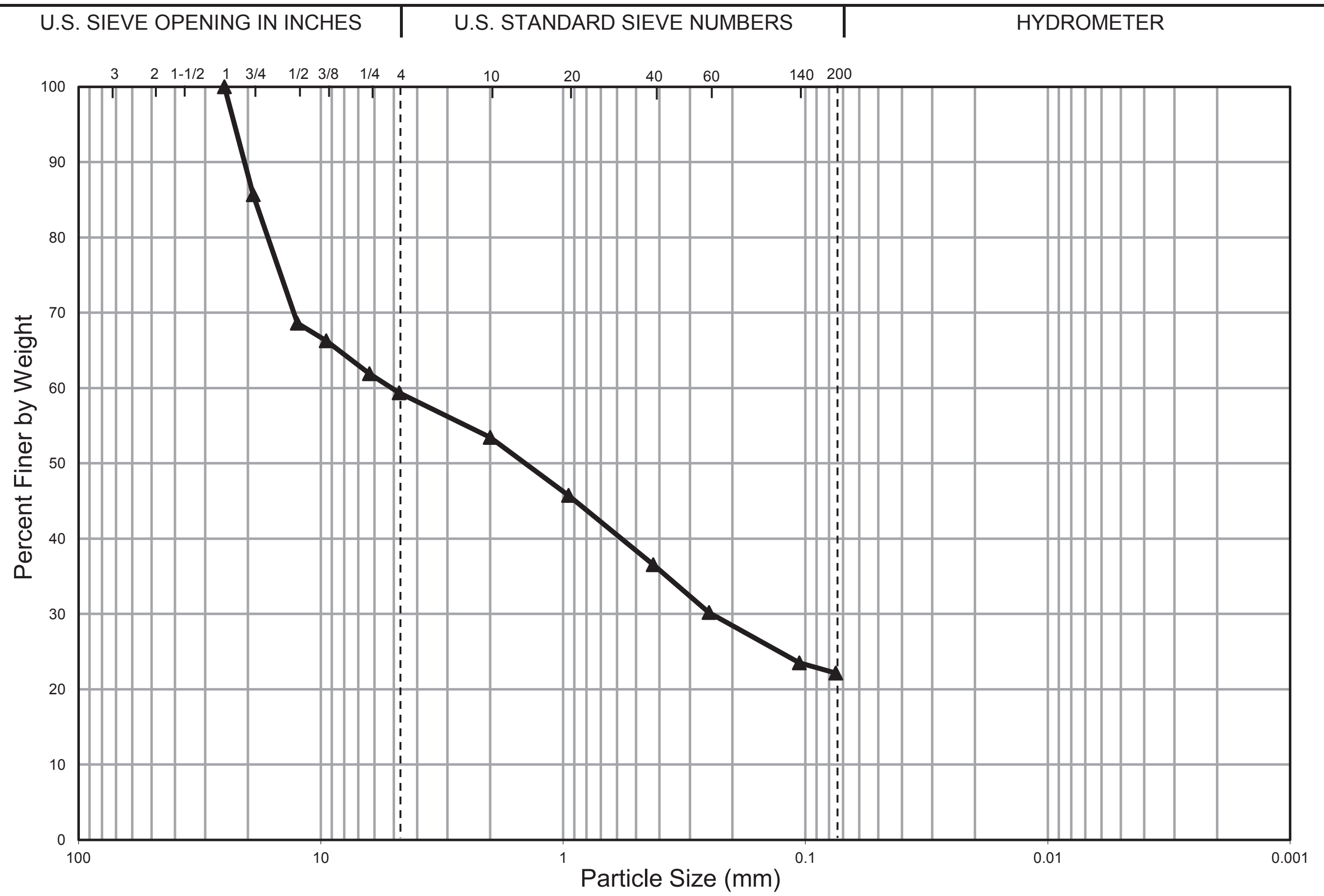
TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103

7/28/2014

Ph. 610.265.1818 1000 W. 9th Avenue, King of Prussia, PA 19406 www.geostructures.net Fax 610.265.1833

PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	40.6		37.2			22.1

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	100.0
3/4"	85.7
1/2"	68.6
3/8"	66.3
1/4"	61.9
No. 4	59.4
No. 10	53.4
No. 20	45.7
No. 40	36.5
No. 60	30.2
No. 140	23.5
No. 200	22.1

	▲
Stratum	
Boring	LB-13
Sample	S-5
Depth (ft)	8.0 - 10.0
C_u	
C_c	
w (%)	11.7
LL	
PL	
PI	
USCS	GM (visual)

	Color	USCS Group Name
▲	Brown	Silty gravel with sand (visual)

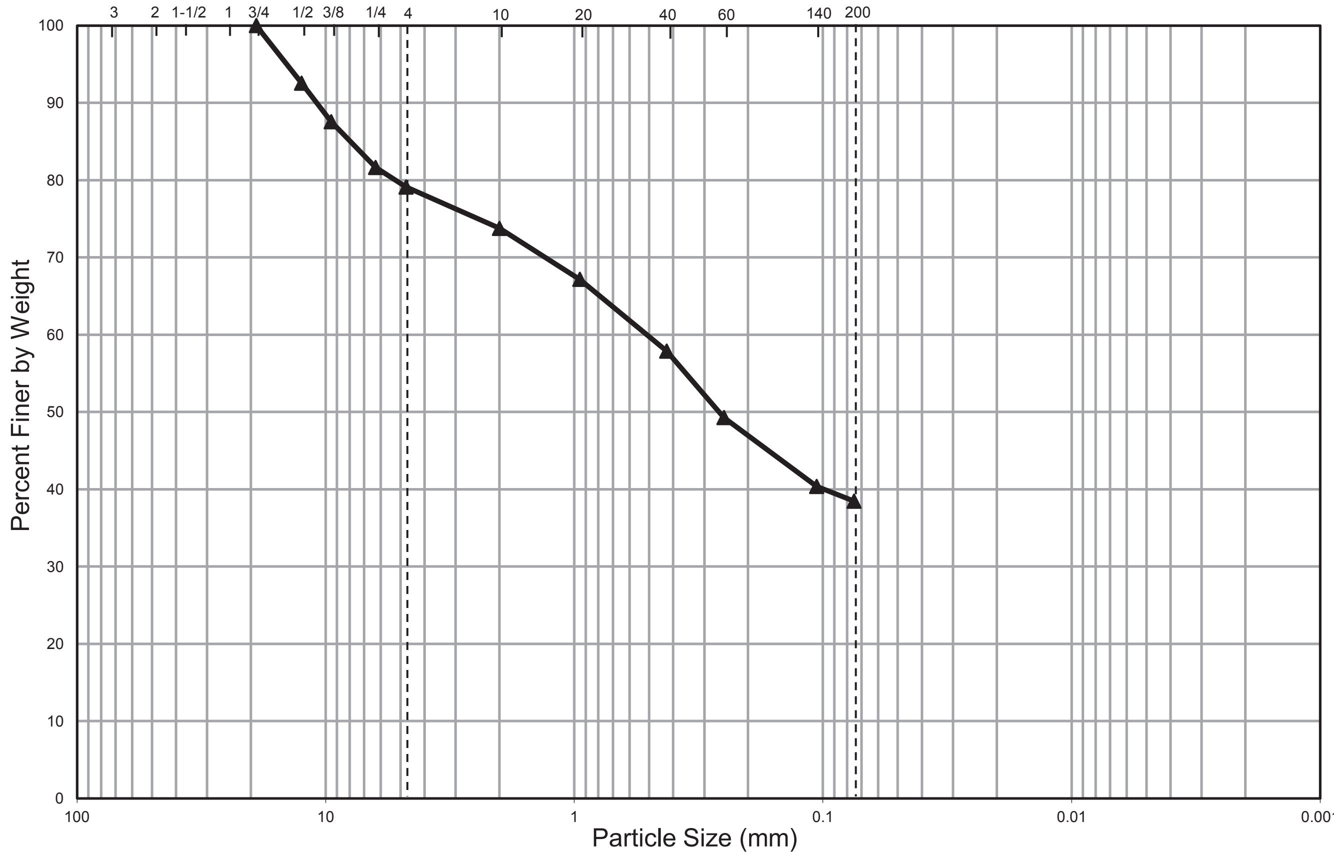
GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/29/2014

Ph. 610.265.1818 1000 W. 9th Avenue, King of Prussia, PA 19406 www.geostructures.net Fax 610.265.1833

PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	20.9		40.6			38.5

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	92.5
3/8"	87.6
1/4"	81.6
No. 4	79.1
No. 10	73.8
No. 20	67.2
No. 40	57.9
No. 60	49.3
No. 140	40.4
No. 200	38.5

	▲
Stratum	
Boring	LB-14
Sample	S-2
Depth (ft)	2.0 - 4.0
C_u	
C_c	
w (%)	10.0
LL	
PL	
PI	
USCS	SC (visual)

	Color	USCS Group Name
▲	Brown	Clayey sand with gravel (visual)

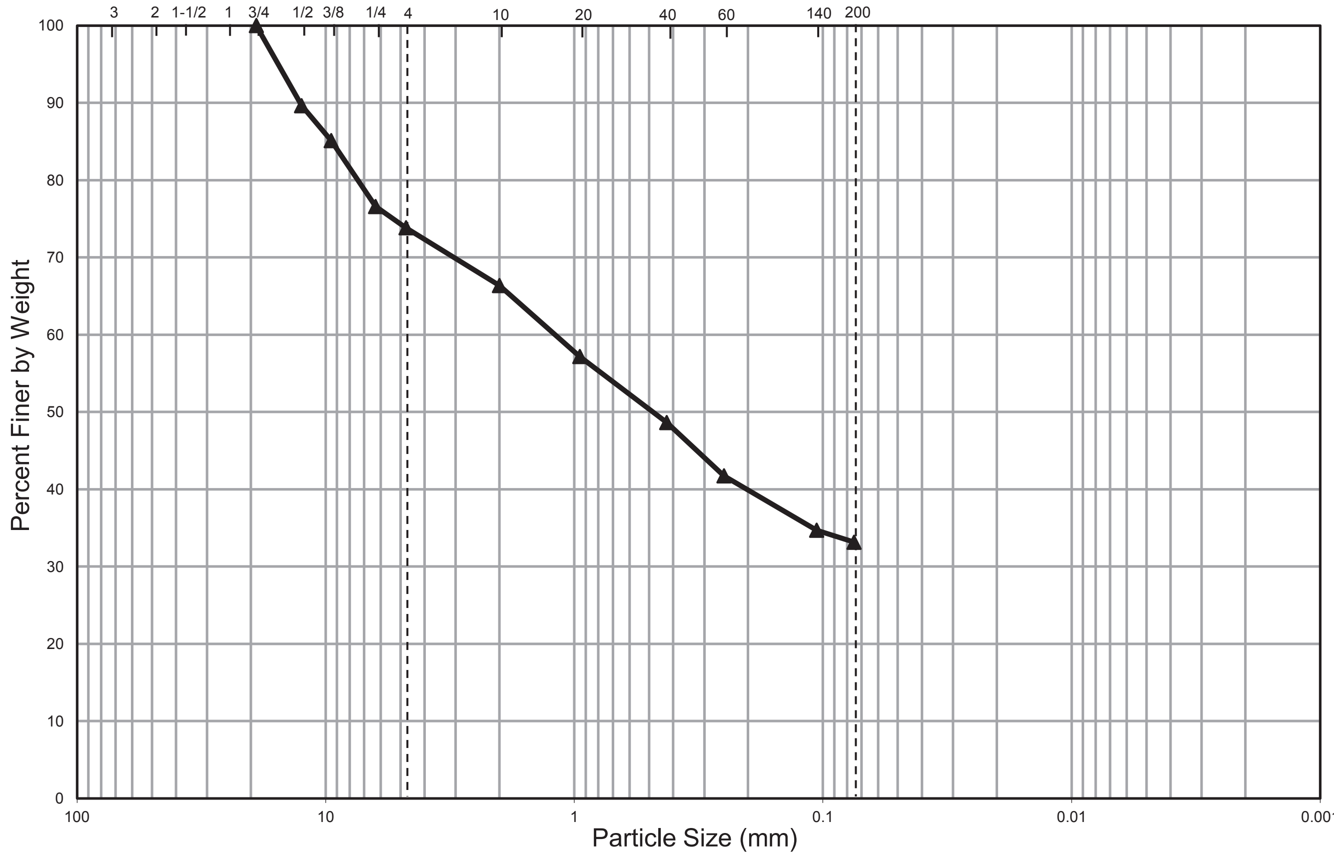
GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103 | 7/28/2014

Ph. 610.265.1818 1000 W. 9th Avenue, King of Prussia, PA 19406 www.geostructures.net Fax 610.265.1833

PARTICLE SIZE ANALYSIS OF SOILS



%	Cobbles	Gravel		Sand			Fines (Silt, Clay)
		Coarse	Fine	Coarse	Medium	Fine	
▲	0.0	26.2		40.7			33.1

Sieve	Percent Finer ▲
3"	
2"	
1-1/2"	
1"	
3/4"	100.0
1/2"	89.6
3/8"	85.1
1/4"	76.6
No. 4	73.8
No. 10	66.4
No. 20	57.2
No. 40	48.6
No. 60	41.7
No. 140	34.7
No. 200	33.1

	▲
Stratum	
Boring	LB-15
Sample	S-3
Depth (ft)	4.0 - 6.0
C_u	
C_c	
w (%)	12.6
LL	
PL	
PI	
USCS	SC (visual)

	Color	USCS Group Name
▲	Brown	Clayey sand with gravel (visual)

GeoStructures

TCNJ STEM Building (Langan Job No.130063101)

GeoStructures Project No.: G14-103

7/28/2014

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APPENDIX B:

FIRE-RATED, TESTED ASSEMBLIES

Asbestos Design Legend

Separation Barrier

3 stage Decon Unit

AFD Exhaust

Phase 1A : 12-2-24 to 12-19-24

Phase 3 : 12-12-25 to 12-31-25

ATLAS Asbestos Design

Project No. 4017200003/ 00002

Date October 10, 2024

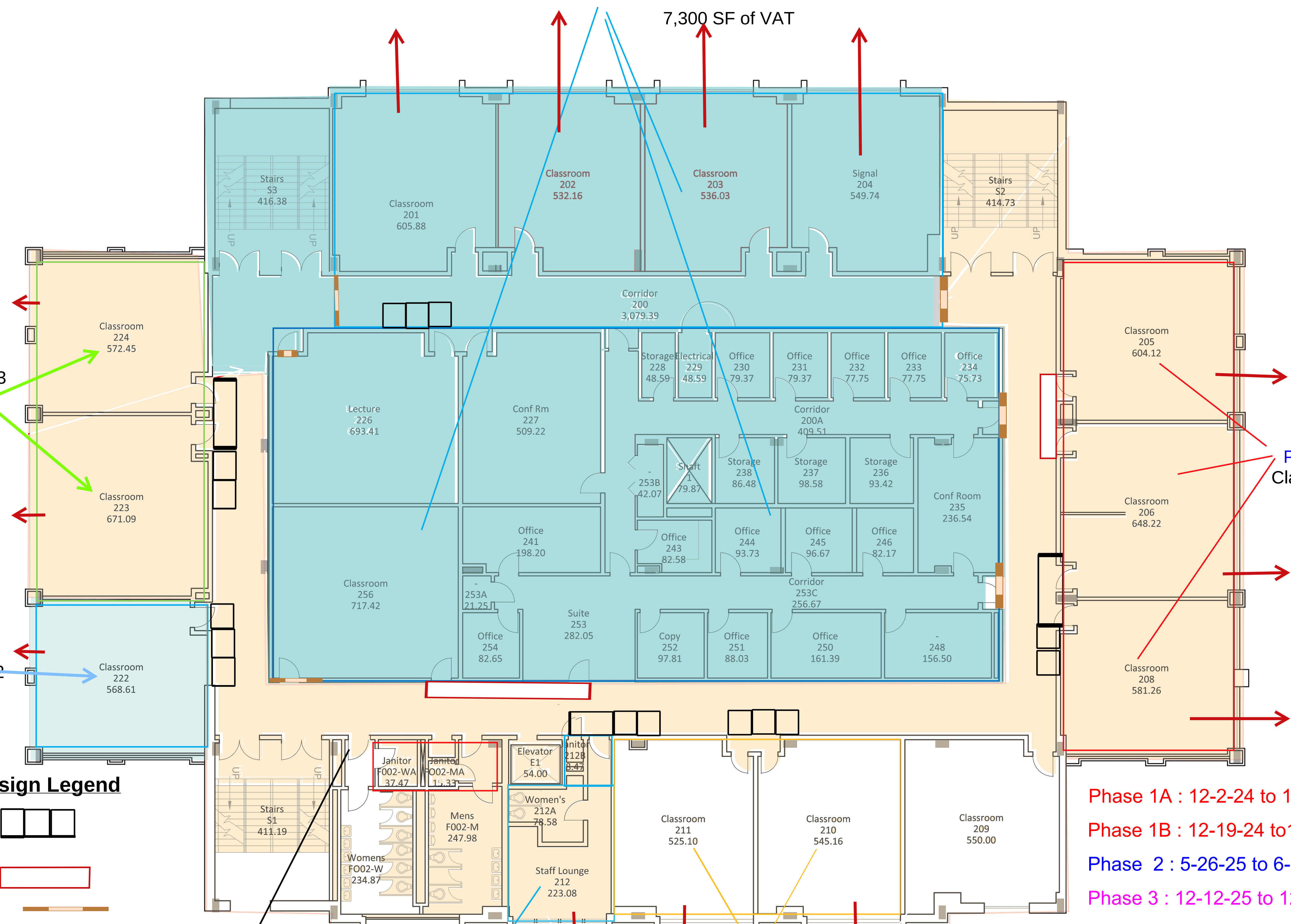
Revised	June 6, 2022
Scale	Not to Scale
Drawn	XX
Approved	XX
Dwg. No.	XXX

Room by Department

Campus Planning

TCNJ THE COLLEGE OF NEW JERSEY

FORCINA HALL
FIRST FLOOR



Phase #1A: ASB-11 Classrooms & Offices 201-204,226-256
7,300 SF of VAT

Phase # 2 ASB-11
Classrooms 224,223
1,243 SF of VAT

Phase # 1B-
ASB-12
Classrooms # 222
569 SF of VAT

Phase # 2 ASB-9
Classrooms 205,206
& 208
1833 SF of VAT

Asbestos Design Legend

3 stage Decon Unit

Plywood Tunnel

Separation Barrier

AFD Exhaust

Phase # 3 ASB-6
Men's & Women's Room
Janitor's Closets
53 SF of VAT(Minor Area)

Phase #1B ASB-7
Staff Lounge&Closet
4 SF of Sink Undercoating
242 SF of VAT

Phase # 1B : ASB-8
Classrooms 210 & 211
1070 SF of VAT

Phase 1A : 12-2-24 to 12-19-24

Phase 1B : 12-19-24 to1-3-25

Phase 2 : 5-26-25 to 6-6-25

Phase 3 : 12-12-25 to 12-31-25

ATLAS Asbestos Design
Project No. 4017200003/ 00002
Date : October 10, 2024

Revised February 21, 2022
Scale Not to Scale
Drawn XX
Approved XX
Dwg. No. XXX

Room by Department
CAMPUS PLANNING

TCNJ THE COLLEGE OF NEW JERSEY

FORCINA HALL SECOND FLOOR

Phase #1B :
ASB-13
Classrooms # 347
575 SF of VAT

Asbestos Design Legend

3 stage Decon Unit

Separation Barrier

AFD Exhaust

Phase 1B :12-19-24 to 1-3-24

Phase 3 : 12-12-25 to 12-31-25

Phase # 3 : ASB-14
Men's & Women's Room Closets & Storage Areas

172 SF of VAT

ATLAS Asbestos Design

Project No. 4017200003/ 00002

Date: October 10, 2024

Revised	Feb 21, 2022
Scale	Not to Scale
Drawn	XX
Approved	XX
Dwg. No.	XXX

Room by Department

Campus Planning

TCNJ THE COLLEGE OF NEW JERSEY

FORCINA HALL THIRD FLOOR

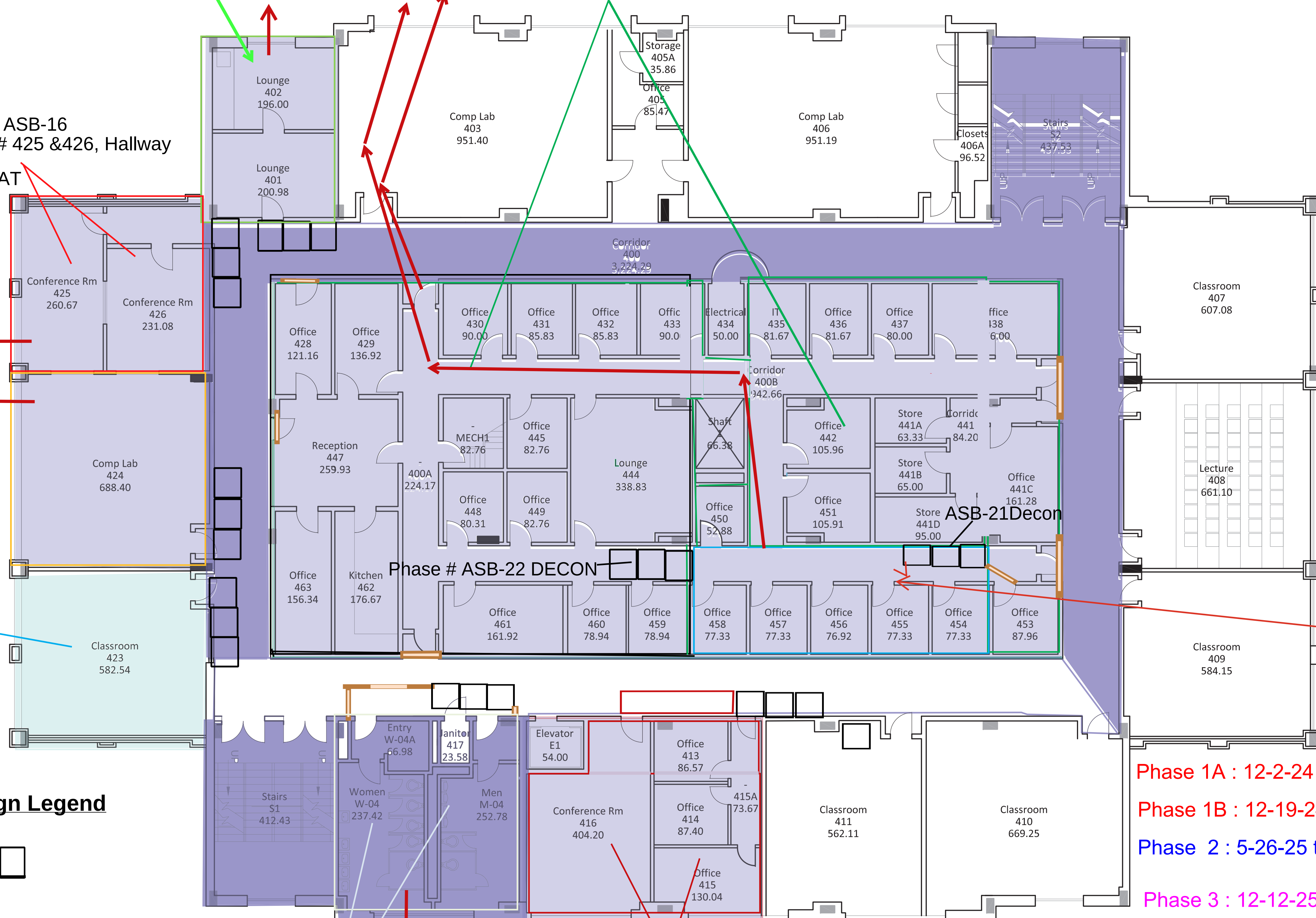
Phase #2:ASB-15
Lounge
397 SF of VAT

Phase # 2 :ASB-21
Lounge, Kitchen, Corridors & Storage Rooms &Offices 428-433,435-453, 459-463
4,597 SF of VAT

Phase # 2: ASB-16
Conference Rooms # 425 &426, Hallway
523 SF of VAT

Phase # 2 : ASB-17
Computer Lab #424
688 SF of VAT

Phase # 1B:
ASB-18
Classroom #423
583 SF of VAT



Phase # 1A :
ASB-22 Corridor &
Offices 454-458
535 SF of VAT

Phase 1A : 12-2-24 to 12-19-24
Phase 1B : 12-19-24 to1-3-25
Phase 2 : 5-26-25 to 6-6-25
Phase 3 : 12-12-25 to 12-31-25

Asbestos Design Legend

3 stage Decon Unit
AFD Exhaust
Separation Barrier
Plywood Tunnel

Phase # 3: ASB-19
Men's & Women's Room Closets & Storage Areas
110 SF of VAT(Minor Area)

Phase # 3 : ASB-20
Conference Room #416 & Offices 413-415,415A
722 SF of VAT

ATLAS Asbestos Design
Project No. 4017200003/ 00002
October 10, 2024

Revised June 3, 2022
Scale Not to Scale
Drawn XX
Approved XX
Dwg. No. XXX

Rooms By Department
Campus Planning
TCNJ THE COLLEGE OF NEW JERSEY

FORCINA HALL
FOURTH FLOOR