LE Gregg
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Geotechnical Engineers and Geologists

Geotechnical Engineering
Exploration

Project:
Fleming County Public Library Pavilion
Flemingsburg, Kentucky

Prepared for:
Fleming County Library Board of Trustees
Mary Rushing, Director

March 22, 2021

Providing Geotechnical Engineering ● Forensic ●Geologic ● Special Inspection ● Materials Testing Services

Geotechnical, Environmental
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Since 1957

March 22, 2021

Mary Rushing, Director
Fleming County Public Library Board of Trustees
202 Bypass Boulevard
Flemingsburg, KY 41041

RE: Report of Geotechnical Exploration
Fleming County Public Library Pavilion
Flemingsburg, Kentucky
L.E. Gregg Project Number: 2021006

Ms. Rushing,

L.E. Gregg Associates is pleased to present our report for the geotechnical exploration performed at the above referenced site. The attached report presents a review of the project information provided to us, a description of the site and subsurface conditions encountered, as well as any foundation and earthwork recommendations for the proposed project. This field exploration for this study was performed on February 27th, 2021.

Unless prior arrangements are made, any remaining soil samples will be discarded shortly after the issue date of this report. Rock cores will be retained for a period of 12 months and then discarded.

We appreciate the opportunity to assist you on this project. If we can be of further service on this or other projects, please contact us.

Respectfully,

L.E. GREGG ASSOCIATES

Steve Mortimer

Steven Mortimer, P.E.
Senior Engineer

Jason Ainslie

Jason Ainslie, P.E.
President

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1.0 INTRODUCTION

1.1 PURPOSE OF EXPLORATION

The purpose of this exploration was to determine the general subsurface conditions existing at the project site through a program of controlled drilling, sampling, and testing; and to evaluate these findings with respect to the foundation concept, design, and currently accepted engineering practices. The purpose and scope of services were based upon the RFP from Pearson & Peters Architects, PLC dated January 31, 2021 and outlined in L.E. Gregg proposal P21-007, dated February 4, 2021. More specifically, the objectives are:

1. Determine depths to and elevations of the underlying bedrock surface beneath the proposed structures and the general geologic conditions existing at the site.

2. Determine existing surface and subsurface water conditions at the site and their relation to design, construction, and service of the proposed project.

3. Make general recommendations concerning foundation type, design, and construction based on the encountered conditions.

2.0 PROJECT INFORMATION

2.1 BACKGROUND INFORMATION

Project information was provided in a request for proposal to L.E. Gregg Associates from Pearson & Peters Architects, PLC on behalf of the Fleming County Public Library. The proposed project is for the construction of a single-story structure composed of a slab on grade with load bearing CMU walls, upper-level steel posts, and wood truss roof construction. The main level of the structure will have a finished floor elevation (FFE) of 889 ft. The lower-level section at the south end of the structure will have an FFE of 881 ft.

2.2 SITE SURFACE CONDITIONS

The proposed project site is located to the east of the existing Fleming County Public Library located at 202 Bypass Boulevard in Flemingsburg, Kentucky. The site is bordered to the north by Bypass Boulevard, to the east by Frazier Street, to the south by KY-11, and to the west by the existing library structure. At the time of drilling, the ground surface was partially snow covered. The ground surface generally slopes down to the south to a detention area.

2.3 SITE GEOLOGY

Geologic information was referenced from Geologic map of the Elizaville quadrangle, Fleming and Mason Counties, Kentucky, 1971. Materials underlying the site are of Upper Ordovician Age and are classified as the Bull Fork Formation. The Bull Fork Formation is composed of limestone and shale which are interbedded. The limestone content increases from about 50 percent in highest beds preserved to about 60 to 70 percent at base of unit. The limestone is generally medium light gray to bluish gray, weathers yellowish brown; fine to coarse grained, and thin to thick bedded. The dominant limestone type is mostly thin bedded and tabular and consists of whole fossils and fossil fragments in a fine-grained matrix. Less common types include coarse-grained, well-sorted, fossil-fragmental limestone and fine-grained, well-sorted, sparsely fossiliferous limestone. Most limestone in lowermost 10 to 15 ft. is fine grained and argillaceous. The shale is gray, weathers dusky yellow; fissile, calcareous; occurs as partings and sets up to about 1 ft. thick. The unit is richly fossiliferous; fossils include common to abundant brachiopods, bryozoans, crinoid columnals, corals, trilobites, pelecypods, and gastropods. Small shallow sinkholes are common in areas underlain by this formation, especially by its lower part.

The karst potential at the site is classified as low risk. No sinkholes are shown on the site or it's near vicinity. No faults are shown on the site or in the near vicinity. Faults are common geologic structures across the Commonwealth of Kentucky and have been mapped in many counties. These faults represent seismic activity that has occurred several million years ago at the latest and there has been no activity along these faults in recorded history. Seismic risk associated with these faults is considered to be very low.

2.4 LABORATORY TESTING

The recovered soil samples were transported to L.E. Gregg's laboratory. Natural moisture content determinations (ASTM D2216), Atterberg limits (ASTM D4318), sieve analysis (ASTM D422), California Bearing Ratio (ASTM D1883), Standard Proctor Test (ASTM D698), and visual/USCS classifications (ASTM D2487/88) were conducted in general accordance with the American Society of Testing and Materials (ASTM) practices and standards.

3.0 EXPLORATION FINDINGS

3.1 SUBSURFACE CONDITIONS

General

Field testing procedures were performed in general accordance with ASTM practices, procedures, and standards. The borings were advanced using 4 in. solid flight augers. Samples were recovered in the undisturbed material below the tip of the auger using the standard drive sample technique in accordance with ASTM D 1586. A 2 in. O.D. (outside diameter) by 1 ⅜ in. I.D. (inside diameter) split-spoon sampler was driven a total of 18 in. with the number of blows of a 140 lb. hammer falling 30 in. recorded for each 6 in. of penetration. The sum of the blows for the final 12 in. of penetration is referred to as the Standard Penetration Test (SPT) result, also known as the N-value, or blow count, which is recorded in blows per foot (bpf). Split spoon samples were generally recovered at 0.0, 1.5, 4.0, 6.5, 9.0 ft., and at 5.0 ft. intervals thereafter. These intervals may be adjusted in the field if gravel, boulders, shot rock, asphalt, or concrete surfaces are encountered. The boreholes were backfilled immediately with auger cuttings and/or granular material for safety considerations.

Soil Conditions

The geotechnical exploration consisted of four (4) soil test borings labeled, B-1 thru B-4. Three (3) borings were placed within the footprint of the proposed structure and one (1) was placed in the proposed parking area. Boring locations were located and staked in the field by L.E. Gregg Associates. The approximate boring locations are shown on the boring layout in Appendix C.

The following subsurface descriptions are of a generalized nature in order to highlight the subsurface stratification features and material characteristics at the boring locations. The boring logs included in Appendix B of this report should be reviewed for specific information at each boring location. Information on actual subsurface conditions exists only at the specific boring locations and is relevant only to the time period that this exploration was performed. Variations may occur and should be expected at the site. All measurements listed below are approximate.

The subsurface conditions are separated between the two proposed structures are described as follows:

Topsoil was encountered in all of the borings from the surface to depths of 3 to 4 in.

Undocumented Fill materials were encountered in all of the borings from below the topsoil layer to refusal depths ranging from 6.0 to 11.5 ft. The fill consisted of lean to fat clay materials with rock fragments and gravel. The fill material was generally brown, dark brown, orange, gray, and/or green, firm to hard, and slightly moist to moist. Standard Penetration Test (SPT) "N"-values ranged from 6 to 31 bpf and natural moisture contents ranged from 17.9 to 28.6 percent.

The results for the soil test borings are summarized in Table 1.

Table 1 – Summary of Drilling Depths

Boring	*Elevation (ft.)	Refusal Depth (ft.)	Refusal Elevation (ft.)
B-1	889	9.5	879.5
B-2	885	6.9	878.1
B-3	883	6.0	877.0
B-4	883	11.5	871.5

Elevations are based off of site plan/grading plan provided with the RFP and are approximate.

Rock Conditions

Refusal was encountered in all borings at depths ranging from 6.0 to 11.5 ft. Weathered rock was generally encountered before refusal. Refusal generally indicates materials that cannot be penetrated with typical soil drilling methods. Therefore, refusal can indicate one or more of the following: coarse gravel, boulders, shot rock fill, buried concrete, weathered rock, thin rock seams, or the upper surface of sound, continuous bedrock. Core drilling is then required to determine the characteristics and soundness of the refusal materials. The refusal materials were cored according to ASTM D 2113, which utilizes a diamond studded bit fastened to the end of a hollow double tube core barrel. The assembly is lowered to refusal depth and the boring is flooded with water to control overheating and to bring the cuttings to the surface. As the drill is rotated at high speeds, the core bit advances into the refusal material and core samples are retained within the inner core barrel. These samples are removed after core runs of up to ten feet and placed in boxes for storage. The core samples were taken back to the laboratory where they were classified as to type of rock, percent recovery, and rock quality designation by an L.E. Gregg geologist or engineer. The percent core recovery (REC) is a ratio of the recovered sample length versus the total length attempted and is expressed as a percentage. The REC is used to assess the continuity of the refusal material. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the portions that are greater than or equal to 4 inches, and dividing by the total length attempted. This is also expressed as a percentage and is used to assess the quality of the refusal material.

A ten (10) ft. section of rock core was obtained from boring B-3 from 6.0 to 16.0 ft. The core indicated limestone interbedded with clay which was medium to coarse grained, gray to dark gray, and fossiliferous. The core had REC's of 13 and 92% and RQD's of 0 and 10% which indicates incompetent to continuous bedrock of very poor quality.

Water Conditions

Water was not encountered in the borings at the time of drilling. Surface water should flow towards installed drainage structures. Groundwater refers to any water that percolates through the soil and can refer to isolated or perched water pockets or water that occurs below the "water table", which is a zone that remains saturated and water-bearing. The groundwater levels encountered during drilling may fluctuate significantly over time due to weather influences and should not be considered a true static groundwater level.

3.2 SEISMIC SITE CLASSIFICATION

The Kentucky Building Code (current edition), Chapter 20 of ASCE 7-10, and the ASCE 7 Hazard Tool were reviewed to determine the Seismic Site Classification for the site based on the following coordinates, 38.416359°N, 83.75047°W. Based on review of geologic data, previous experience with similar projects, and the subsurface conditions encountered, a **Seismic Site Class "C"** is recommended for soil bearing foundations.

Furthermore, using a Site Classification of **C**, we recommend the use of spectral response acceleration coefficients as follows:

0.2 second period: $\mathbf{S_S}$ = 0.194g and Soil Factor = 1.2
1.0 second period: $\mathbf{S_1}$ = 0.084g and Soil Factor = 1.7

The design spectral response acceleration factors are as follows:

S_{DS} = 0.155

S_{D1} = 0.095

4.0 GEOTECHNICAL RECOMMENDATIONS

4.1 GEOTECHNICAL CONSIDERATIONS

General

Based on the provided information, the subsurface conditions encountered and past experience with similar projects, the site is suitable for the proposed development provided the following considerations are addressed. These considerations are briefly summarized below.

Undocumented Fill

Undocumented fill materials consisting of lean to fat clay with rock fragments and gravel were encountered during the field exploration. In reviewing historical aerials, it appears that a large grading operation was in process for the properties along Bypass Boulevard and Frazier Street in the winter of 2004. The natural materials at the site were likely disturbed during this time. Further fill operations likely took place during the construction of the existing library in 2007-2008. It should be understood that undocumented fills can contain deleterious materials which may decay over time, causing subsidence at the surface. Undocumented fills can also contain zones of less compact materials which have the potential to settle under their own weight or under new loading which can present settlement issues from erratic differential settling of the fill. This settlement is dependent upon several factors such as fill thickness, degree of compaction (if any), fill contents, and age of the fill mass.

The sampling completed during the field exploration would tend to indicate that the fill was placed with some compactive effort; however, no documentation for the placement of this material was made available. If isolated problem areas are discovered and remediated during construction, the risks associated with the existing fill could be minimal; however, the full makeup of the materials across the entire site is unknown. The risks discussed are inherent to undocumented fill and should be fully understood and accepted should the client and design team choose to keep the materials in place.

High Plasticity Clays

Fill materials consisting of fat (CH) clay materials were found during the exploration. Fat clays are known for their high plasticity characteristics and can be subject to high volume changes with fluctuations in moisture content and are also known to have strength loss with increases in moisture content. The active zone for expansive clays in the region begins at the bearing elevation and can extend to refusal depths. With some exceptions, due to the weather patterns in the central Kentucky region, shrinking and swelling of bearing soils are not generally as severe as other regions since long periods of excessive wet or dry weather patterns typically do not occur. However, if foundation construction and/or site grading take place in the dryer summer and fall months, significant drying of the subgrade could occur after construction is complete in wetter months and become re-saturated causing heave. Conversely, moisture loss can contribute to settlement of soil supported foundations and/or slabs. If moisture fluctuations are not controlled, shrink and swell could continue throughout the life of a structure causing structural issues, increased stress, and/or advanced deterioration.

Silty and/or Sandy Clays

Fill materials consisting of silty and/or sandy clays were encountered at the site. These materials can be sensitive to changing moisture conditions and can degrade under repetitive loading and unloading. Heavy equipment traffic during construction can cause these materials to break down. Care will need to be taken to limit heavy construction traffic across the building pad and the contractor will need to consider changing moisture conditions during construction. The owner and contractor should consider seasonal weather patterns for construction scheduling.

Shallow Bedrock

Auger refusal was encountered in all borings at depths ranging from 6 to 11.5 ft. The rock core obtained indicated limestone of very poor quality. If rock removal will be required to achieve bearing elevations, ripping may be possible to an extent; however, massive removal will likely require a pneumatic ram.

Karst Potential

Karst potential in the location of the site is classified as low risk. It should be noted that sinkholes are common in this region and that caverns can extend laterally and may be unobserved from the ground surface. It should also be noted that the rock formations underlying the site are known for horizontal and vertical solution cavities that may go unnoticed for long periods of time. There is a potential for karst features such as solution channels, rock pinnacles, or sinkholes to be encountered during construction.

Excavation Sloping and/or Benching

All excavation work must be performed in accordance with OSHA and local building code requirements. The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

Utility Trench Backfill

All trench excavations should be completed with sufficient working space to permit construction as well as proper backfill placement and compaction. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 in. of lean clay fill in order to reduce the infiltration and conveyance of surface water through the trench backfill.

Ground Water or Free Water

Groundwater water was not encountered during the field exploration. The groundwater table is expected to fall near or below the bedrock level. Groundwater levels may fluctuate significantly over time due to weather influences. The available geological information and past experience with similar projects indicates that it is possible that during construction ground water could be encountered. Ground water and/or free water encroaching upon construction excavations should be removed by placing a sump near the source of seepage and then pumping from the sump. Should heavy seepage or ponding of water occur, then L.E. Gregg should be contacted.

Site Drainage

Positive site drainage and adequate subgrade drainage are critical for performance of the proposed foundations. During construction, large quantities of water should not be allowed to accumulate on the site.

4.2 FOUNDATIONS

Based on the proposed FFE's of 889 and 881 for the main floor and lower level, the main level will require ~1 to 6 ft. of fill and the lower level will require ~4 ft. of cut. Preliminary plans were not available at the time of this report; therefore, we have assumed that all the foundations will be connected and the lower-level foundations will step down in elevation. As previously mentioned, undocumented fill materials consisting of lean to fat clays were encountered across the site. It is likely that this fill was placed between 2004 and 2008 during the development of the surrounding properties and the construction of the library. The materials at the locations sampled appeared to have been placed with some compactive effort, which should minimize settlement risks; however, with no documentation as to the compaction of the materials during fill placement, there is an inherent risk of settlement.

If the owner is willing to accept some minimal risk, the existing fill materials may be kept in place. The site should be thoroughly proof rolled before any fill operations begin and any areas that display rutting or pumping should be removed and replaced. Typical spread foundations may be designed for a maximum allowable bearing pressure of **2,000 psf.** This should be verified in the field during construction and isolated undercutting may be required.

If the owner is not willing to accept the minimal risk the undocumented fill presents, then the existing fill materials should be undercut and replaced as engineered fill.

Design Considerations

We recommend that continuous footings be a minimum of 24 inches wide and isolated spread footings be a minimum of 24 inches by 24 inches. The minimum thickness of both continuous and spread footings should be 12 inches. The foundations should be placed a minimum of 24 in. below grade as required by the Kentucky Building Code.

Construction Considerations

All vegetation, topsoil, unsuitable fill soil (if required), loose rock fragments greater than 6 inches, construction debris, water, and other debris should be removed from the proposed construction areas before concrete placement. Any trench excavations should have adequate shoring and/or benching per OSHA requirements. The foundation support and/or foundation side walls should be protected from freezing weather, severe drying, and water ponding. Positive drainage should be provided to direct surface runoff away from excavations. The foundation elements should not be formed so that concrete completely fills the opened excavations.

4.3 SLAB SUPPORT

Slab on grade areas should be thoroughly proofrolled and any areas showing deflections or pumping should be removed and replaced with engineered fill. Slabs should be designed using a modulus of subgrade reaction, k, of 150 psi/in. We typically recommend that the floor slab should be fully ground supported and not structurally connected to any walls or foundations in order to reduce the possibility of cracking and displacement of the floor slab due to any differential settlement between it and the foundation. If the design requires a turn down slab or areas where the slab is tied to perimeter walls, differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The potential for differential settlement should be accounted for through use of sufficient control joints, appropriate reinforcing, or other means. Areas that may encounter higher point loading such as freezers, lab equipment, etc… should be designed with greater reinforcement. We recommend that a vapor barrier and a minimum of 4 inches of crushed stone be placed beneath the slab to act as a moisture block. The crushed stone or gravel should be kept moist, but not wet, immediately prior to slab concrete placement to minimize curling of the slab due to differential curing conditions between the top and bottom of the slab. These measures should help equalize loading and moisture conditions under the slab. Isolation joints should be provided between the slab and any columns or footing supported walls. Interior construction joints using dowels could be used to reduce any sharp vertical displacements.

4.4 SITE PREPARATION AND GRADING

All vegetation, topsoil, unsuitable fill soil (if required), loose rock fragments greater than 6 in., construction debris, and other debris should be removed from the proposed construction areas. After completion of stripping operations, we recommend that the subgrade be proofrolled with a fully-loaded, tandem-axle dump truck or other pneumatic-tired construction equipment of similar weight. The geotechnical engineer or their representative should observe proofrolling. Areas judged to perform unsatisfactorily should be undercut and replaced with structural soil fill or remediated at the geotechnical engineer's recommendation.

4.5 FILL PLACEMENT

Material considered suitable for use as structural fill should be clean soil free of organics, trash, or other deleterious materials, and contain no rock fragments greater than 6 in. in any one dimension. Preferably, structural soil fill material should have a standard Proctor maximum dry density of 90 pounds per cubic foot (pcf) or greater and a plasticity index (PI) of 25 percent or less. All material to be used as structural fill should be tested by the geotechnical engineer to confirm that it meets the project requirements before being placed.

Structural fill should be placed in loose, horizontal lifts not exceeding 8 in. thick. Each lift should be compacted per Table 2 below and within the range of minus (-) 2 percent to plus (+) 2 percent of the optimum moisture content. Each lift should be tested by geotechnical personnel to confirm that the contractors' method is capable of achieving the project requirements before placing any subsequent lifts. Any areas which have become soft or frozen should be removed before additional structural fill is placed. One in place density test should be performed a minimum of every 5,000 ft^2 for each 8 in. lift. Adequate surface drainage should be provided during all site grading and fill placement operations.

Please note that compaction efforts can be difficult to achieve using conventional construction methods during wet weather.

Table 2 – Fill Placement (ASTM D 698)

Location	Maximum Dry Density (%)
Footings and Floor Slabs	98.0
Pavement Areas	95.0
Landscape Areas	85.0

4.6 DRAINAGE

To reduce the potential for undercut and construction induced sinkholes, water should not be allowed to collect in the foundation excavations, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, subsurface water, or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of structures and beneath floor slabs. The grades should be sloped away from structures and surface drainage should be collected and discharged such that water infiltration is not permitted.

4.7 KARST REGION CONSTRUCTION RECOMMENDATIONS

The underlying rock units are classified as low karst risk. Close attention should be given during the construction process to identify possible karst features or surface movement. Adequate drainage to minimize water infiltration into the subsurface during and after construction should be provided to lessen the risk of damage due to karst activity during construction. Any significant solution features or dropouts encountered during construction will require remediation and will need to be evaluated on a case-by-case basis. Sinkholes could be repaired by excavating the material to find the throat; then lining the excavation with a filter fabric, and backfilling with crushed aggregate, however, L.E. Gregg should be contacted to provide specific recommendations for remediation of any encountered karst features.

4.8 BELOW GRADE WALLS

The following parameters are recommended for below grade wall design and construction:

<u>Soil Backfill</u>

- Plasticity Index of the backfill material should be less than 25;
- Provide temporary bracing if the walls cannot accommodate construction phase stresses;
- Provide adequate drainage at the rear of the wall;
- Table 3 presents Equivalent Fluid Pressures (EFP), and Earth Pressure coefficients for active, at rest and passive conditions;

Table 3 – Soil Backfill

Condition	EFP (pcf)	Coefficients
Active	38	Ka = 0.36
At Rest	56	Ko = 0.53
Passive	291	Kp = 2.77

- The data presented in Table 3 are based on the following assumptions:
  - The backfill "on-site" material is classified as "CL" by the USCS;
  - Backfill material exhibits an angle of shear resistance of 28 degrees or greater;

  - Backfill material possibly exhibits a maximum dry density of 105.0 pcf or greater;
  - Retaining wall analysis assumes a level backfill slope;
  - Retaining wall analysis assumes that the wall will be designed as a vertical wall with respect to the retained soil;
  - Retaining wall analysis assumes the wall will be designed as a smooth wall with no friction.

<u>Granular Backfill</u>

- Provide temporary bracing if the wall cannot accommodate construction phase stresses;
- Table 4 presents conditions possibly exhibited by the backfill, earth pressure design parameters for Equivalent Fluid Pressures (EFP), and Earth Pressure coefficients;

Table 4 – Granular Backfill

Condition	EFP (pcf)	Coefficients
Active	30.0	Ka = 0.25
At Rest	50.0	Ko = 0.38

- The data presented in Table 4 is based on the following assumptions:
  - Retaining wall analysis assumes a level slope backfill;
  - Retaining wall analysis assumes that the wall will be designed as a vertical wall with respect to the retained granular backfill;
  - Retaining wall analysis assumes the wall will be designed as a smooth wall with no friction;
  - The backfill material is classified as "GW" or "GP" by the USCS (No. 57 stone is preferred);
  - Backfill material exhibits an angle of shear resistance of 38 degrees or greater.

4.9 LATERAL EARTH PRESSURES

The Kentucky Building Code (KBC), current edition, Table 1806.2, provides guidelines for allowable lateral pressure for use in foundation design. The following table summarizes the allowable lateral pressures.

Table 5 – Presumptive Load-Bearing Values (KBC/IBC Table 1806.2)

Type of Material	Vertical Foundation Pressure (psf)	Lateral Bearing Pressure (psf/ft below natural grade)	Lateral Sliding Resistance	
			Coefficient of friction[a]	Cohesion (psf)[b]
Crystalline bedrock	12,000	1,200	0.70	-
Sedimentary and foliated rock	4,000	400	0.35	-
Sandy gravel and/or gravel (GW and GP)	3,000	200	0.35	-
Sand, silty sand, clayey sand, silty gravel, and clayey gravel (SW, SP, SM, SC, GM, and GC)	2,000	150	0.25	-
Clay, sandy clay, silty clay, clayey silt, silt, and sandy silt (CL, ML, MH, and CH)	1,500	100	-	130

a. Coefficient to be multiplied by the dead load
b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2

The values for lateral bearing pressure located above in Table 6, may be adjusted when considering load combinations, including wind or earthquake loads as permitted by Section 1605.3.2 of the KYBC.

4.10 SLOPE RECOMMENDATIONS

Cut Slopes

Permanent cut slopes are typically recommended to be no steeper than 2H:1V. If steeper slopes are required, they will depend on existing conditions and will need to be reviewed on a case-by-case basis. The upper two (2) ft. of all cut slopes should be graded to 2:1 in order to reduce the potential for sloughing and erosion. Temporary cut slopes may be constructed for retaining walls, below grade walls, etc. and should follow OSHA excavation standards.

Fill Slopes

Permanent fill slopes should be no steeper that 2H:1V. Steeper slopes may be feasible if reinforcement is used in the design/construction. The fill material should be placed and compacted in horizontal lifts according to the project specifications and plans. The slope should be constructed by overbuilding the slope face and then cutting it back to the design grade. Fill slopes should not be constructed or extended horizontally by placing fill on an existing slope face and/or compacted by track walking.

4.11 CONSTRUCTION NEAR SLOPES

Construction of structures on or near slopes should comply with section 1808.7 of the Kentucky Building Code. Buildings constructed near a descending slope shall be set back from the slope a sufficient distance to provide lateral and vertical support for the foundation without detrimental settlement. If the slope is 3H:1V or shallower, the setback (Q) shall be the smaller of 1/3 the height (H) of the slope or 40 ft. The minimum distance for Q shall be 5 ft. If the slope is steeper than 1H:1V, Q shall be measured from an imaginary plane 45° to the horizontal projected upward from the toe of the slope. The setback distance can be decreased below 5 ft. through the use of retaining walls or deep foundations.

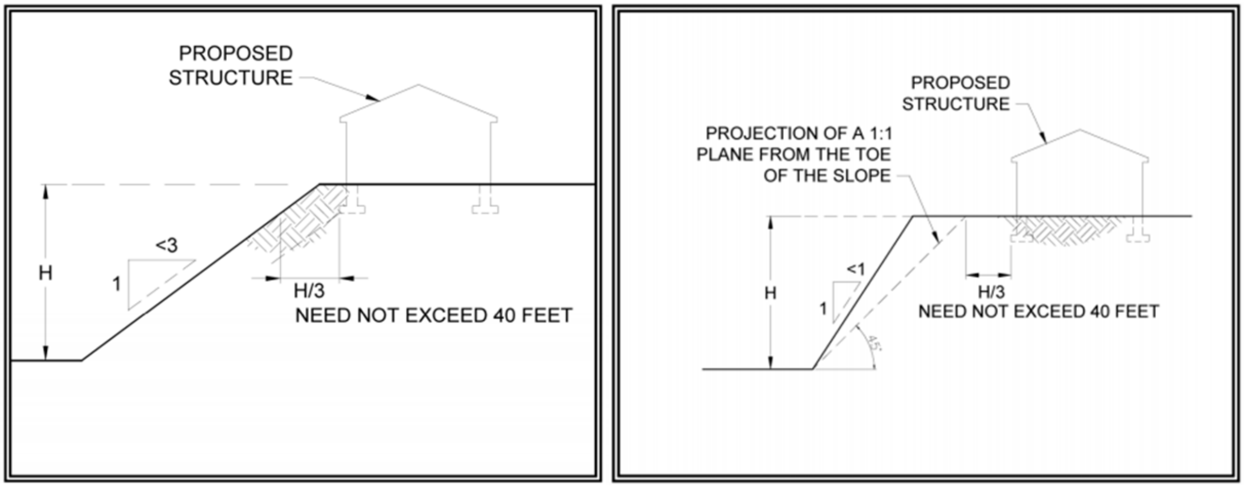


Figure 2: Construction Near Descending Slopes

4.12 PAVEMENT DESIGN

General

A bulk sample was obtained for California Bearing Ratio (CBR) Testing and was found to have a value of 1.3, which is less than optimal for design. We would recommend a stabilization method to increase the CBR value to at least 3.0. Stabilization could consist of mechanical methods or chemical methods. Mechanical methods include undercutting poor materials and backfilling with higher strength clays or granular materials or using granular layers reinforced with geogrid/geofabric. Chemical methods include the addition of hydrated lime or Portland cement to the existing subgrade. Both are effective in strengthening poor performing soils, reduce fatigue, and extend pavement life. Portland cement has been shown to be most suitable for more granular, coarse grained subgrades and hydrated lime is more suitable for fine grained soils with high clay content.

Pavement design assumptions in Table 6 were used in developing the pavement sections shown below.

Table 6 – Pavement Design Assumptions

Design Life	**20 years**
Reliability	95%
Subgrade Resilient Modulus	4,000 psi (CBR=3)
Drainage Coefficient	1.0
Growth Potential	2 %
Standard Deviation	0.45
Initial Serviceability (Asphalt, Concrete)	4.2, 4.0
Terminal Serviceability	2.0
Asphalt Wearing Surface, layer coefficient	0.44
Asphalt Base Surface, layer coefficient	0.40
Dense Graded Aggregate Base, layer coefficient	0.14

The traffic loading is currently unknown; therefore, we have provided the following minimum light and heavy duty flexible designs listed below. The light duty deign will provide approximately 30,000 ESAL's and the heavy duty design will provide approximately 75,000 ESAL's. The light duty design should only be used in areas that will receive passenger car loading only. L.E. Gregg should be contacted if the required ESAL values for the traffic loading differs from that listed above.

Table 7 –Flexible Pavement Design

Component	Light Duty Thickness (in.)	Heavy Duty Thickness (in.)
Surface Course	1.5	1.5
Asphalt Base Course	2.0	3.0
Base Material (DGA)	8.0	8.0

Rigid Pavement

If heavy duty rigid pavements are required for areas such as loading docks and/or dumpster pads we would recommend a 6 inch concrete section with a 6 inch DGA base.

Prior to placing the crushed stone base for the rigid pavement, the area should be proofrolled and observed by L.E. Gregg. It is recommended that the concrete pads be large enough to accommodate the entire length of a truck while loading or unloading. In addition, it is recommended that a thickened curb be constructed around the perimeter of the pads to reduce the potential for damage typically associated with overstressing of the pad edges.

Reinforcement for the rigid pavements should consist of a wire mesh or fiber-reinforced concrete. If wire mesh is utilized, the mesh should be located in the middle third of the rigid pavement. It is recommended that control joints be placed at 15 ft. intervals each way in the apron and pad areas. These control joints should be filled with a fuel resistant seal to prevent intrusion of liquids into the subgrade.

5.0 BASIS FOR RECOMMENDATIONS

VARIATIONS

Since any general foundation or subsurface exploration can examine and report only that information which is obtained from the borings and samples taken there from, and since uniformity of subsurface conditions does not always exist, the following is recommended. If, during construction, any latent soil, bedrock, or water conditions are encountered that were not observed in the borings, contact L.E. Gregg so that the site may be inspected to identify any necessary modifications in the design or construction of the foundation.

OTHER INTERPRETATIONS

The conclusions and recommendations submitted in this report apply to the proposed project only. They are not applicable to on-site, subsequent construction, adjacent or nearby projects. In the event that conclusions or recommendations based on this report and relating to any other projects are made by others, such conclusions and recommendations are not the responsibility of L. E. Gregg Associates. The recommendations provided are based in part on project information provided to L.E. Gregg and only apply to the specific project and site discussed in this report. If the project information section in this report contains incorrect information or if additional information is available, the correct or additional information should be conveyed to L.E. Gregg for review.

It is recommended that this complete report be provided to the various design team members, the contractors, and the project owner. Potential contractors should be informed of this report in the "instructions to bidders" section of the bid documents. The report should not be included or referenced in the actual contract documents.

STANDARD OF CARE

The services provided by L. E. Gregg Associates for this exploration have been performed in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances.

Important Information about Your

Geotechnical Engineering Report

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

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

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

KEY TO SYMBOLS AND DESCRIPTIONS

⁘	**GW**	**Well graded gravels, little or no fines**
⁘	**GP**	**Poorly graded gravels, little or no fines**
⁘	**GM**	**Silty gravels, sand and silt mixtures**
⁘	**GC**	**Clayey gravels, sand and clay mixtures**
⁙	**SW**	**Well graded sand, little or no fines**
⁙	**SP**	**Poorly graded sand, little or no fines**
▥	**SM**	**Silty sands, sand and silt mixtures**
▧	**SC**	**Clayey sands, sand and clay mixtures**
▥	**ML**	**Inorganic silts and very fine sands, rock flour, silty or clayey fine sands silts and with slight plasticity**
▨	**CL**	**Inorganic clays with low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays**
≋	**OL**	**Organic silts and organic silty clay of low plasticity**
▥	**MH**	**Inorganic silts, micaceous or diatomaceous fine sandy or silt soils, elastic silts**
▨	**CH**	**Inorganic clays of high plasticity, fat clays**
≋	**OH**	**Organic clays of medium to high plasticity, organic silts**
✓	**Topsoil**	**Usually top few inches of soil deposits and contains considerable amounts of organic matter**
◪	**Asphalt**	**Usually a black solid or semisolid mixture of bitumens mostly used in paving**
▩	**Fill**	**Soils that have been transported by man to their present location**
▦	**Limestone**	**Sedimentary rock consisting of predominantly of calcium carbonate**
⁙	**Sandstone**	**Sedimentary rock consisting of sand with some cementitious material**
▤	**Siltstone**	**Fine grained rock of consolidated silt**
▤	**Shale**	**Fine grained sedimentary rock consisting of compacted clay, silt, or mud**
⁘	**Coal**	**Natural black graphite like material formed from fossilized plants**
▦	**Limestone interbedded with Shale**	**Predominantly limestone interbedded with shale layers**
▤	**Weathered**	**Weathered rock**

CONSISTANCY AND RELATIVE DENSITY CORRELATED WITH STANDARD PENETRATION TEST (SPT)

SILT AND CLAY		**SAND AND GRAVEL**	
Relative Density	**Blows Per Foot (BPF)**	**Relative Density**	**Blows Per Foot (BPF)**
Very Soft	0 to 1	Very Loose	0 to 4
Soft	2 to 4	Loose	5 to 10
Firm	5 to 8	Firm	11 to 20
Stiff	9 to 15	Very Firm	21 to 30
Very Stiff	16 to 30	Dense	31 to 50

ROCK PROPERTIES

RELATIVE HARDNESS OF ROCK

Very Soft	Can be scratched by fingernail
Soft	May be broken by fingers
Medium	Corner and edges may be broken by fingers
Moderately Hard	Moderate blow of hammer required to break sample
Hard	Hard blow of hammer required to break sample
Very Hard	Several hard blows of hammer required to break sample

Rock Continuity (REC)		**Rock Quality Designation (RQD)**	
Core Recovery (%)	Description	RQD (%)	Classification
0 – 40	Incompetent	<25	Very Poor
40 – 70	Competent	25 – 50	Poor
70 – 90	Fairly Continuous	50 – 75	Fair
90 – 100	Continuous	75 – 90	Good
		90 – 100	Very Good

Estimated Moisture Condition Relative to Optimum

Dry	Under 5% of Optimum
Slightly Moist	Minus 2% of Optimum
Moist	± 2% of Optimum
Very Moist	Plus 2% of Optimum
Wet	Over 5% of Optimum

Misc. and Soil Sampler Symbols

N	Blows Per Foot (BPF)	■	Undisturbed Sample
% W	Percent Water	◩	Standard Penetration Test (SPT)
RQD	Rock Quality Designation	◐	Boring Location
REC	Rock Core Recovery	▽	Water Table while Drilling
CLA	Classification of Combined Samples	▼	Water Table after Drilling
▯	Rock Core (RC)	⊠	Bulk Sample (BK)

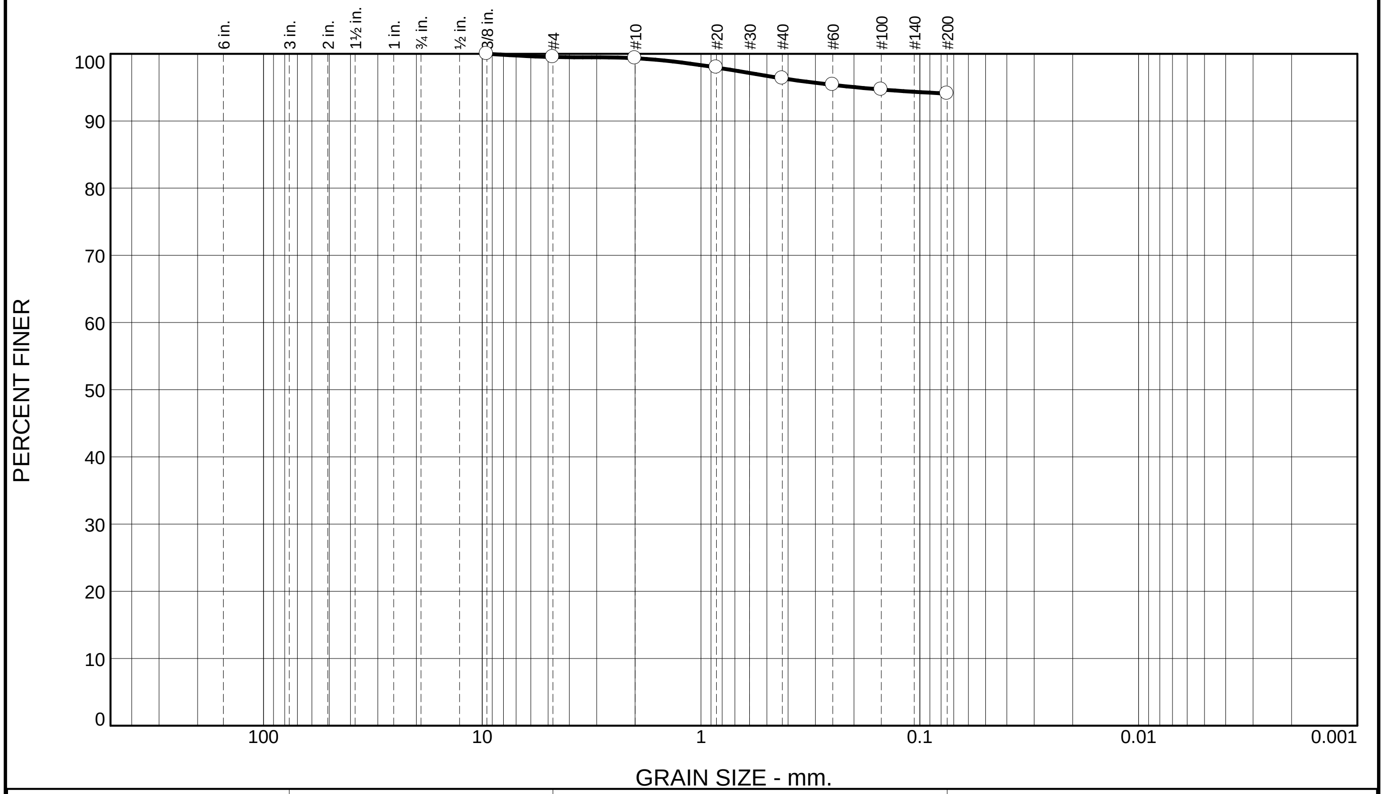
LE Gregg ASSOCIATES

Geotechnical, Environmental & Materials Engineering
Since 1957

APPENDIX A

Summary of Laboratory and Drilling Data

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.2	3.0	2.2	94.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.5		
#10	99.3		
#20	98.0		
#40	96.3		
#60	95.4		
#100	94.7		
#200	94.1		

* (no specification provided)

Material Description

Lean Clay (CL)

Atterberg Limits

PL= 24 LL= 46 PI= 22

Classification

USCS= CL AASHTO= A-7-6(23)

Remarks

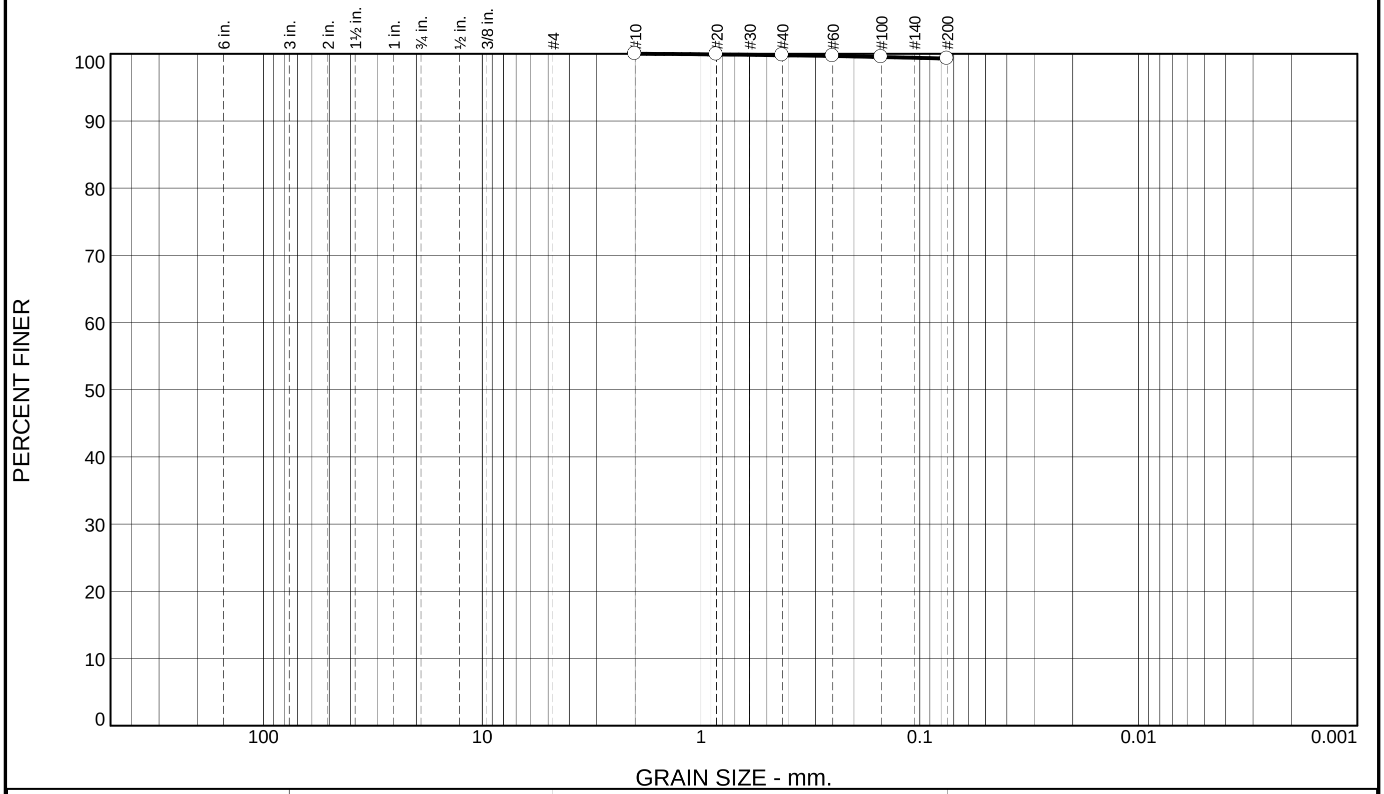
Location: Bulk B4 2-4ft
Sample Number: 21979 **Depth:** 2-4 ft **Date:** 3/3/21

L.E. Gregg Associates, Inc.
2456 Fortune Dr, Ste 155, Lexington, KY 40509
Phone: 859-252-7558

Client: Fleming County Public Library Board of Trustees
Project: Fleming County Public Library Pavilion
Project No: 2021006 **Figure**

Tested By: E. WINEBARGER **Checked By:** S. MORTIMER

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	0.5	99.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.7		
#100	99.5		
#200	99.3		

* (no specification provided)

Material Description

Fat Clay (CH)

Atterberg Limits

PL= 24 LL= 58 PI= 34

Classification

USCS= CH AASHTO= A-7-6(39)

Remarks

Location: B-3

Sample Number: 21982 **Depth:** 1.5-3.0 **Date:** 2/27/21

L.E. Gregg Associates, Inc.
2456 Fortune Dr, Ste 155, Lexington, KY 40509
Phone: 859-252-7558

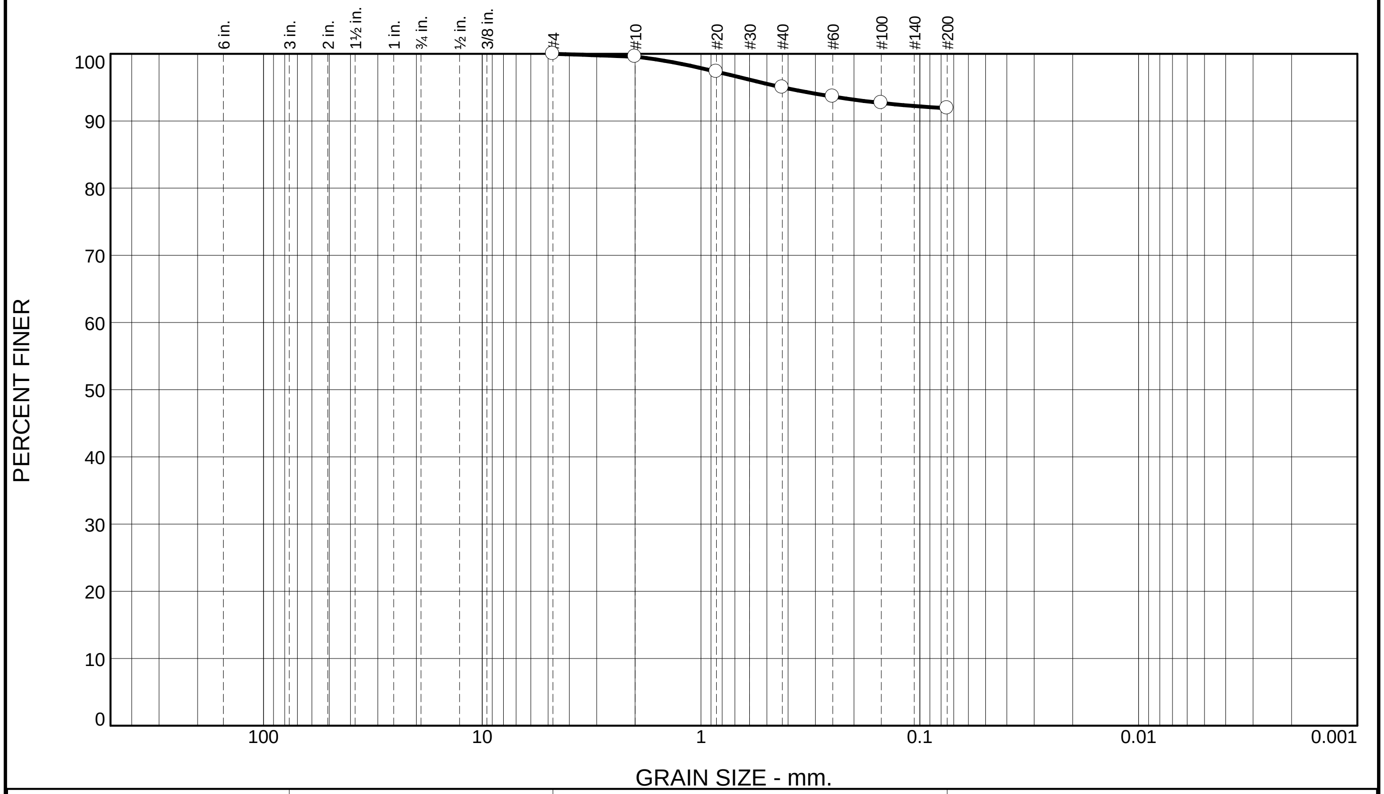
Client: Fleming County Public Library Board of Trustees

Project: Fleming County Public Library Pavilion

Project No: 2021006 **Figure**

Tested By: E. WINEBARGER **Checked By:** S. MORTIMER

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	4.6	3.1	91.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	97.3		
#40	95.0		
#60	93.6		
#100	92.7		
#200	91.9		

* (no specification provided)

Material Description

Lean Clay (CL)

Atterberg Limits

PL= 23 LL= 39 PI= 16

Classification

USCS= CL AASHTO= A-6(16)

Remarks

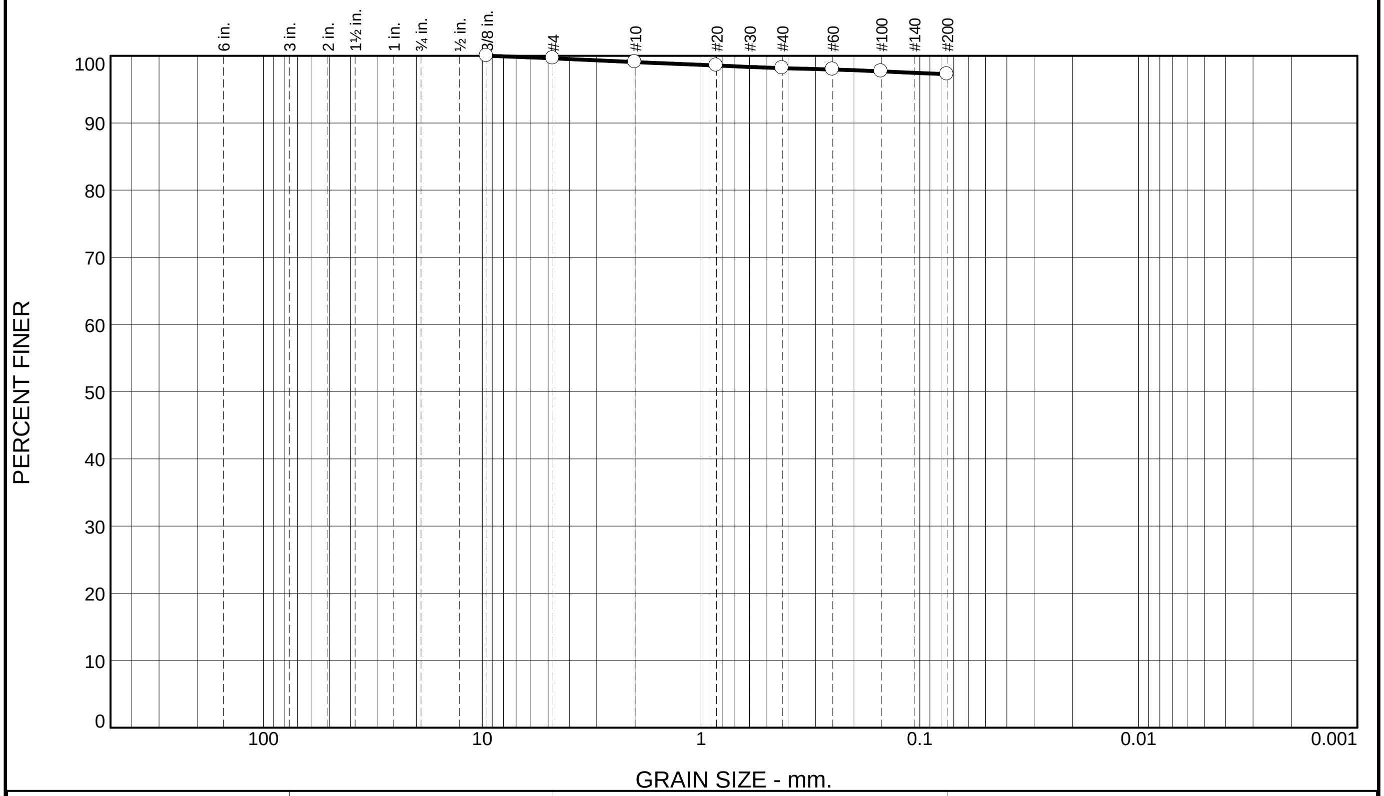
Location: B-2
Sample Number: 21981 **Depth:** 0.0-1.5 **Date:** 2/27/21

L.E. Gregg Associates, Inc.
2456 Fortune Dr, Ste 155, Lexington, KY 40509
Phone: 859-252-7558

Client: Fleming County Public Library Board of Trustees
Project: Fleming County Public Library Pavilion
Project No: 2021006 **Figure**

Tested By: E. WINEBARGER **Checked By:** S, MORTIMER

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.5	0.9	0.9	97.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.6		
#10	99.1		
#20	98.6		
#40	98.2		
#60	98.0		
#100	97.7		
#200	97.3		

* (no specification provided)

Material Description

Lean Clay (CL)

Atterberg Limits

PL= 22 LL= 45 PI= 23

Classification

USCS= CL AASHTO= A-7-6(25)

Remarks

Location: B-1
Sample Number: 21980 **Depth:** 4.0-5.5 **Date:** 3/3/21

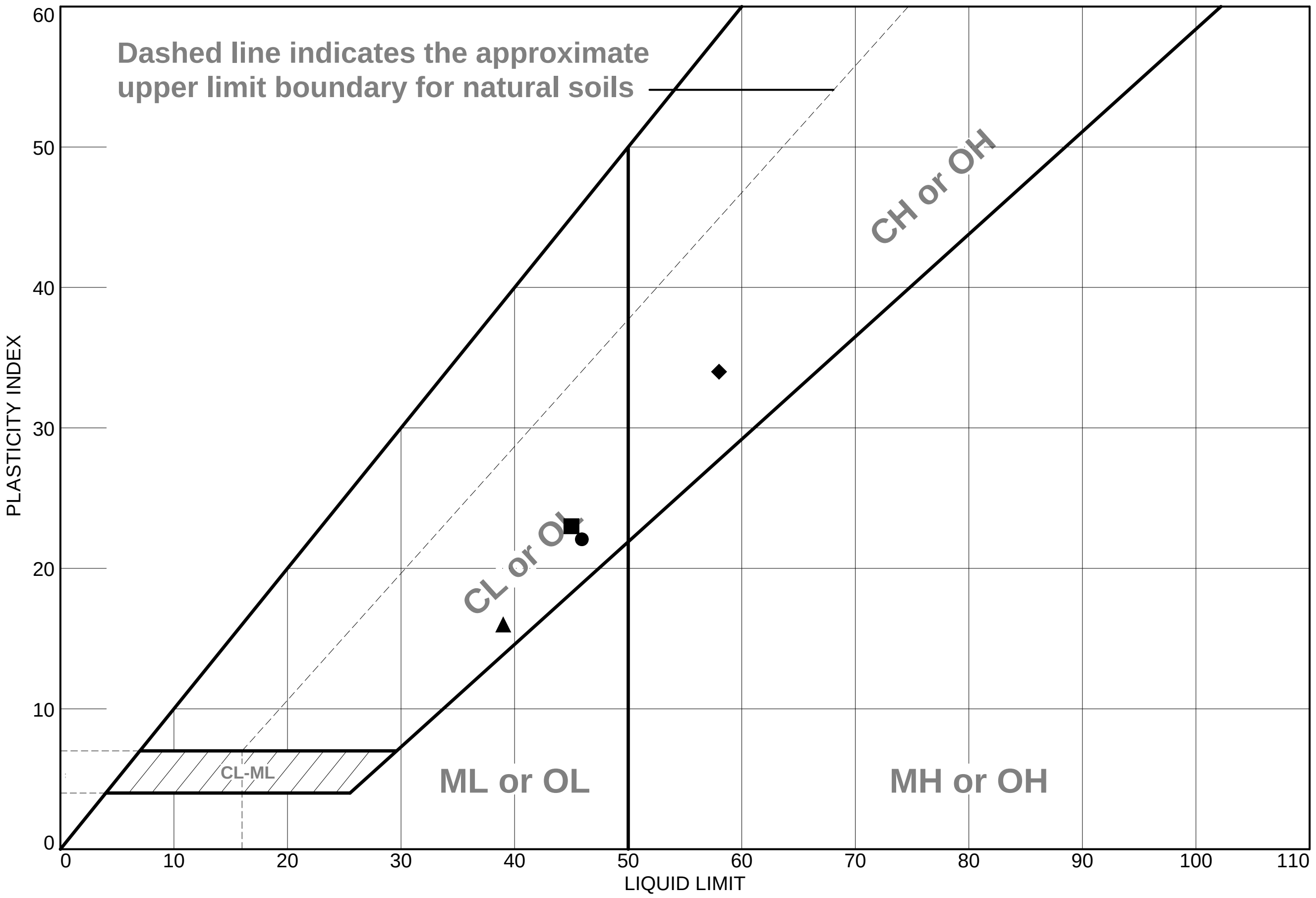
L.E. Gregg Associates, Inc.
2456 Fortune Dr, Ste 155, Lexington, KY 40509
Phone: 859-252-7558

Client: Fleming County Public Library Board of Trustees
Project: Fleming County Public Library Pavilion

Project No: 2021006 **Figure**

Tested By: E. WINEBARGER **Checked By:** S. MORTIMER

LIQUID AND PLASTIC LIMITS TEST REPORT



	Material Description	Sampled	Tested	Technician	LL	PL	PI	%<#40	USCS
●	Lean Clay (CL)	3/3/21	3/3/21	E. WINEBARGER	46	24	22	96.3	CL
■	Lean Clay (CL)	3/3/21	3/3/21	E. WINEBARGER	45	22	23	98.2	CL
▲	Lean Clay (CL)	2/27/21	3/3/21	E. WINEBARGER	39	23	16	95.0	CL
◆	Fat Clay (CH)	2/27/21	3/3/21	E. WINEBARGER	58	24	34	99.8	CH

Project No. 2021006 **Client:** Fleming County Public Library Board of Trustees

Project: Fleming County Public Library Pavilion

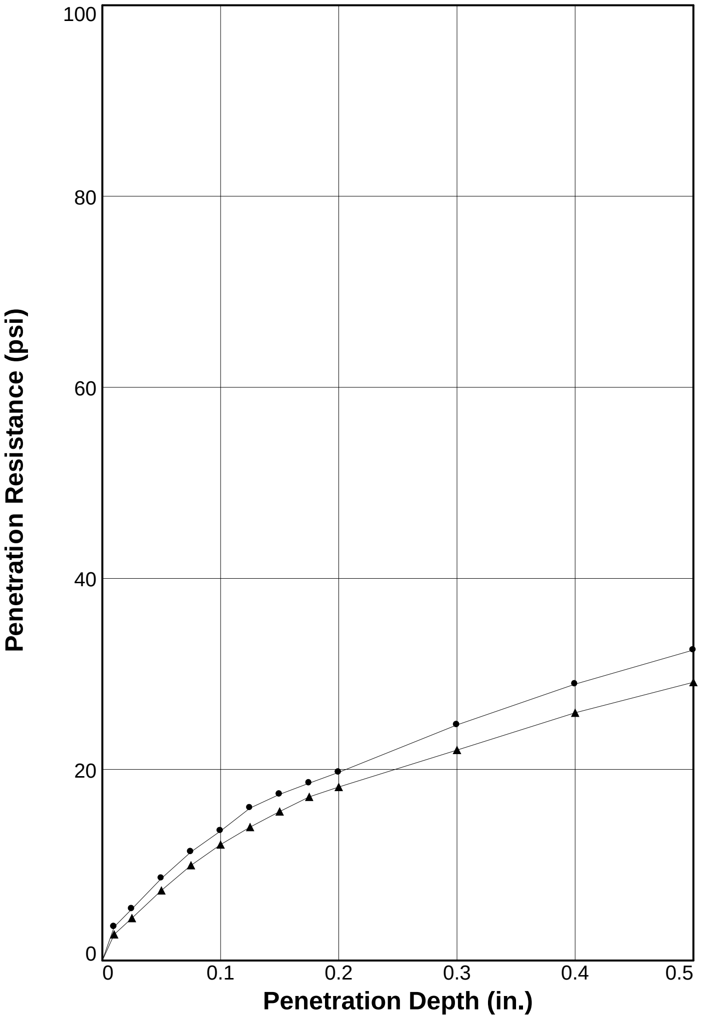
○**Location:** Bulk B4 2-4ft **Depth:** 2-4 ft **Sample Number:** 21979
□**Location:** B-1 **Depth:** 4.0-5.5 **Sample Number:** 21980
△**Location:** B-2 **Depth:** 0.0-1.5 **Sample Number:** 21981
◇**Location:** B-3 **Depth:** 1.5-3.0 **Sample Number:** 21982

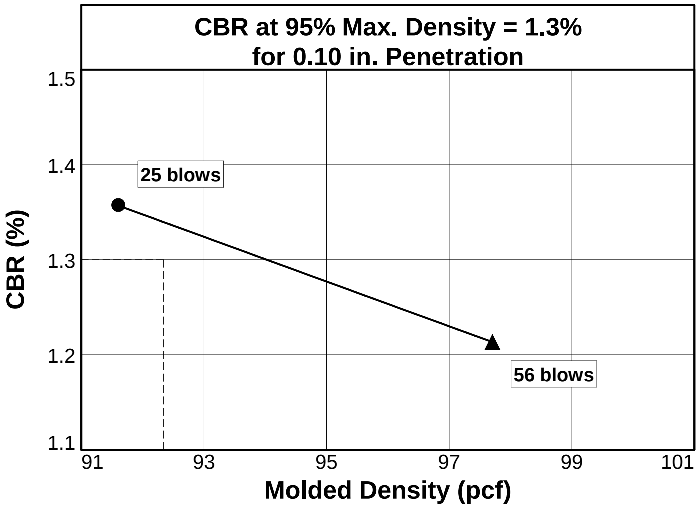
L.E. Gregg Associates, Inc.
2456 Fortune Dr, Ste 155, Lexington, KY 40509
Phone: 859-252-7558

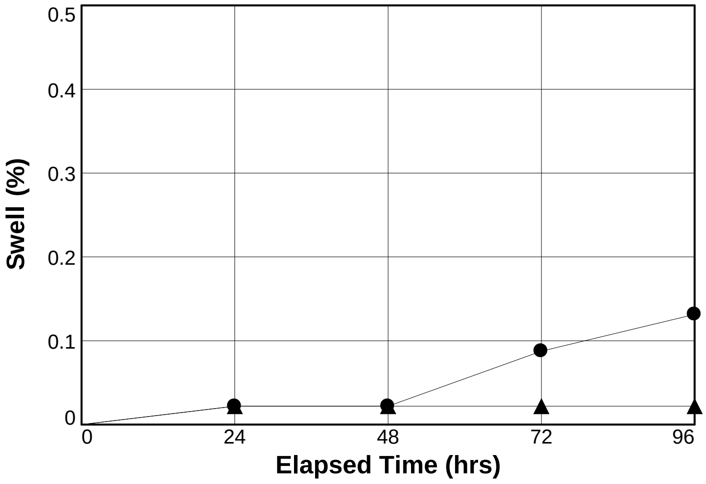
Checked by: S. MORTIMER
Title: SENIOR ENGINEER
Figure

Tested By: E. WINEBARGER **Checked By:** S. MORTIMER

BEARING RATIO TEST REPORT
ASTM D1883-16







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	91.6	94.2	27.6				1.4	1.3	0.000	12.43	0.1
2 △	97.7	100.5	27.6				1.2	1.2	0.000	12.57	0
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Lean Clay (CL)	CL	97.2	22.9	46	22

Project No: 2021006

Project: Fleming County Public Library Pavilion

Location: Bulk B4 2-4ft

Sample Number: 21979 **Depth:** 2-4 ft

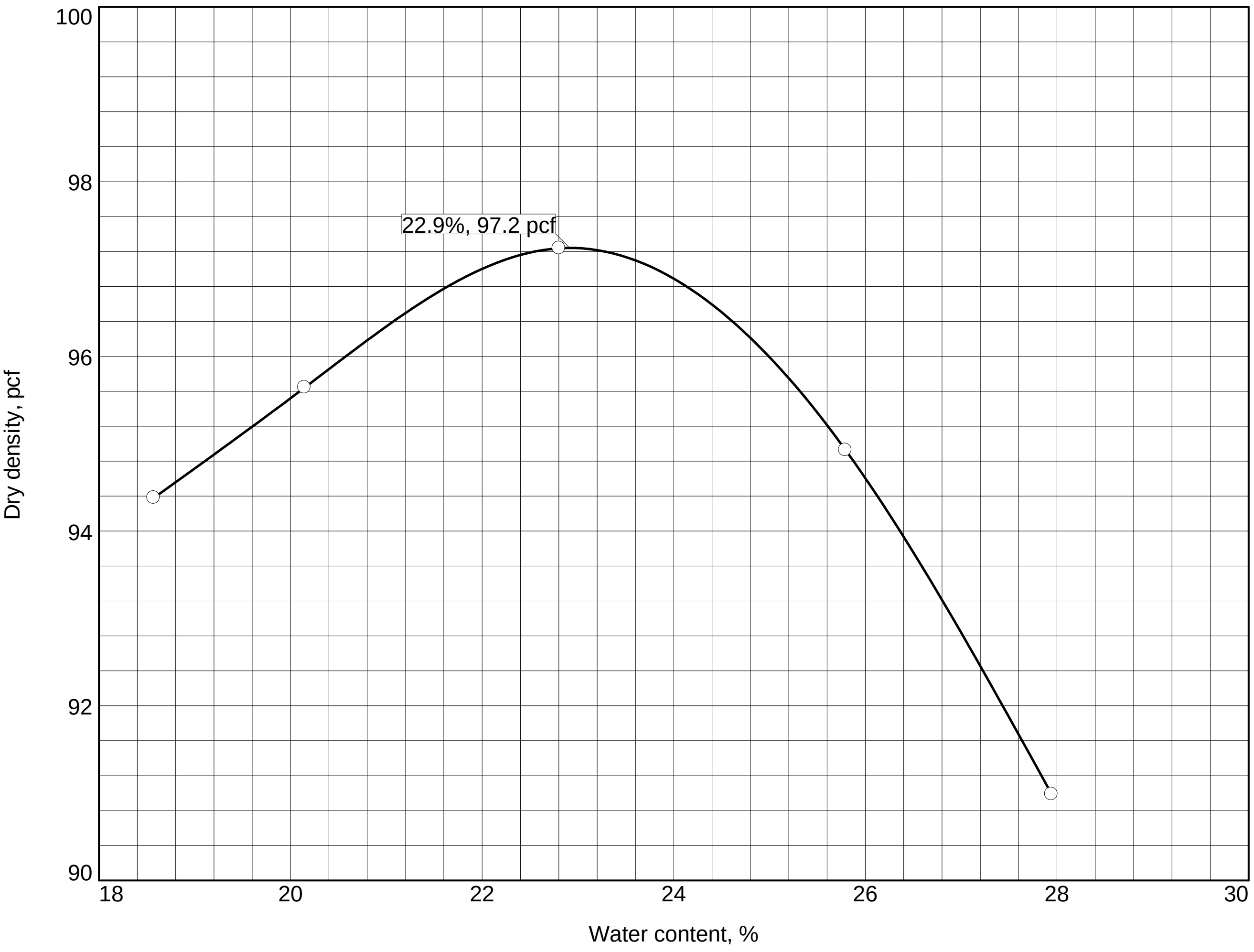
Date: 3/3/21

BEARING RATIO TEST REPORT
L.E. Gregg Associates, Inc.
2456 Fortune Dr, Ste 155, Lexington, KY 40509

Test Description/Remarks:

Figure _______

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
2-4 ft	CL	A-7-6(23)	30.2		46	22	0.0	94.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 97.2 pcf Optimum moisture = 22.9 %	Lean Clay (CL)

Project No. 2021006 **Client:** Fleming County Public Library Board of Trustees

Project: Fleming County Public Library Pavilion

○**Location:** Bulk B4 2-4ft **Sample Number:** 21979

L.E. Gregg Associates, Inc.
2456 Fortune Dr, Ste 155, Lexington, KY 40509
Phone: 859-252-7558

Remarks:

Figure

Tested By: E. Winebarger **Checked By:** M. Cleinmark

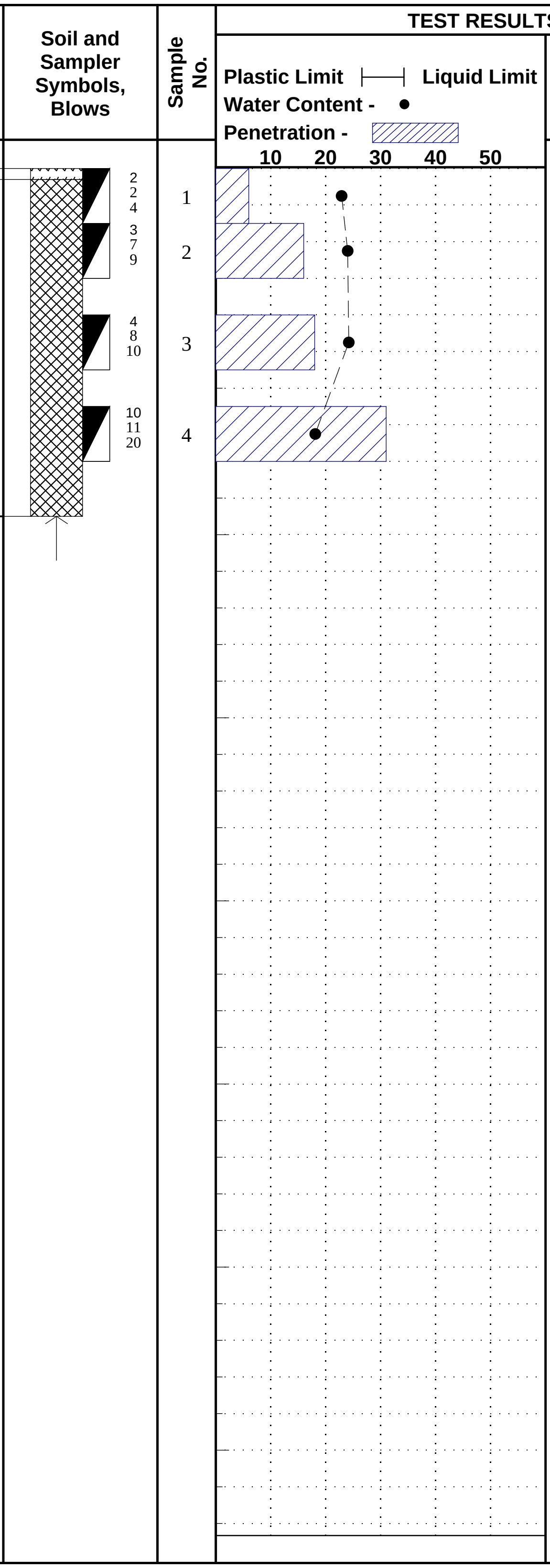
APPENDIX B

Logs of Borings

LE Gregg ASSOCIATES

PROJECT: Fleming County Public Library Pavilion
PROJECT NO.: 2021006
CLIENT: Fleming County Public Library Board of Trustees
DATE: 2/27/21
LOCATION: Fleming Co. Public Library Pavillion
ELEVATION:
DRILLER: Strata Group
LOGGED BY: B. Davenport
DRILLING METHOD: 4" SFA
DEPTH TO WATER> INITIAL: ∇ ______ **AFTER 24 HOURS:** ▼ ______ **CAVING>** C ______

BORING No. B-1



ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	NM	PL	LL	N	Rock Comp. Strength (psi)
	0	Topsoil - 3 in.							
		Fill - Lean to Fat clay with rock fragments and gravel, brown, orange, green, and gray, firm to hard, moist	2 2 4	1	22.9			6	
			3 7 9	2	24.0			16	
	5		4 8 10	3	24.2			18	
			10 11 20	4	18.1			31	
	10	Auger Refusal at 9.5 ft.							
	15								
	20								
	25								
	30								
	35								

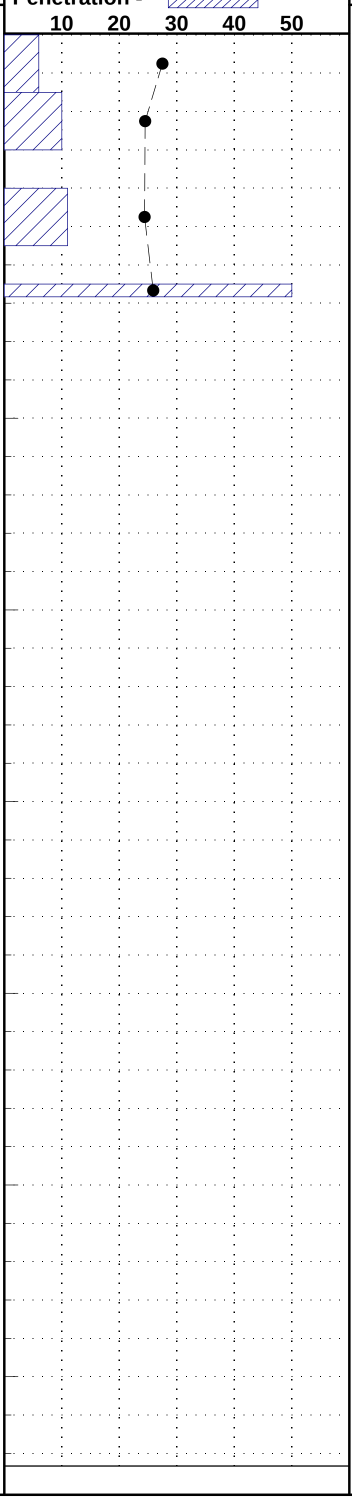
PROJECT: Fleming County Public Library Pavilion
PROJECT NO.: 2021006
CLIENT: Fleming County Public Library Board of Trustees
DATE: 2/27/21
LOCATION: Fleming Co. Public Library Pavillion
ELEVATION:
DRILLER: Strata Group
LOGGED BY: B. Davenport
DRILLING METHOD: 4" SFA
DEPTH TO WATER> INITIAL: ▽
AFTER 24 HOURS: ▼
CAVING> C

BORING No. B-2

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	NM	PL	LL	N	Rock Comp. Strength (psi)
	0	Topsoil - 4 in.							
		Fill - Lean to Fat clay with rock fragments, brown, dark brown, orange, firm to stiff, moist	2 2 4	1	27.5			6	
			3 5 5	2	24.5			10	
	5		3 6 5	3	24.4			11	
			50/5	4	25.9			50+	
		Auger refusal at 6.9 ft.							

TEST RESULTS

Plastic Limit ├─┤ Liquid Limit
Water Content - ●
Penetration - ▨

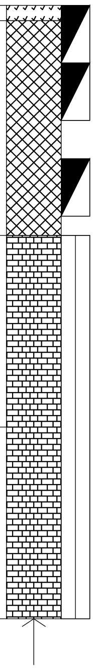


This information pertains only to this boring and should not be interpreted as being indicitive of the site.

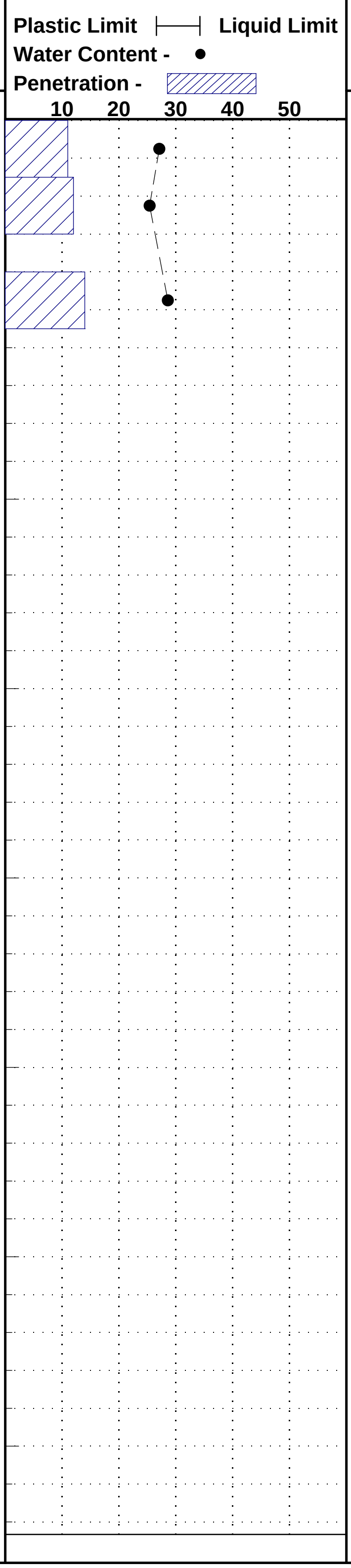
PROJECT: Fleming County Public Library Pavilion
PROJECT NO.: 2021006
CLIENT: Fleming County Public Library Board of Trustees
DATE: 2/27/21
LOCATION: Fleming Co. Public Library Pavillion
ELEVATION:
DRILLER: Strata Group
LOGGED BY: B. Davenport
DRILLING METHOD: 4" SFA
DEPTH TO WATER> INITIAL: ▽ ______ **AFTER 24 HOURS:** ▼ ______ **CAVING>** C ______

BORING No. B-3

ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	NM	PL	LL	N	Rock Comp. Strength (psi)
	0	Topsoil - 4 in.							
		Fill - Lean to Fat clay with rock fragments, brown, gray, green, and orange, stiff, moist	3 4 7	1	27.1			11	
			3 5 7	2	25.4			12	
	5		4 6 8	3	28.6			14	
		Auger refusal at 6.0 ft. Begin Core recovery - Run 1 - 6-11 ft., Limestone, coarse-grained, dark gray, weathers to light gray, interbedded clay, fossiliferous	REC= 13% RQD= 0%						
	10								
		Run 2 - 11-16 ft., Limestone, medium grained, gray, weathers to light gray, interbedded dark gray clay, fossiliferous	REC= 92% RQD= 10%						
	15								
		Core recovery terminated at 16.0 ft.							
	20								
	25								
	30								
	35								



TEST RESULTS

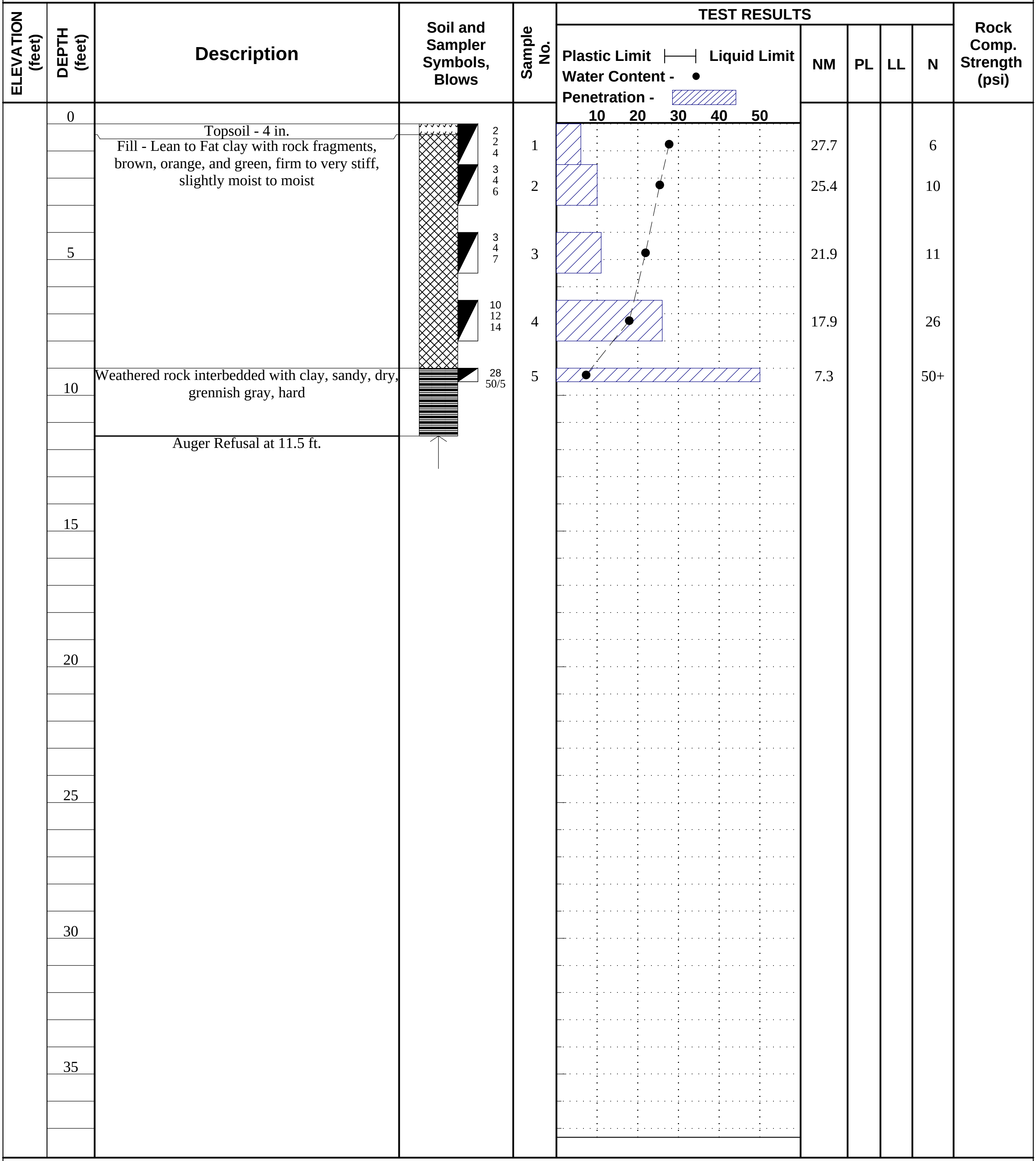


This information pertains only to this boring and should not be interpreted as being indicitive of the site.

PROJECT: Fleming County Public Library Pavilion
PROJECT NO.: 2021006
CLIENT: Fleming County Public Library Board of Trustees
DATE: 2/27/21
LOCATION: Fleming Co. Public Library Pavillion
ELEVATION:
DRILLER: Strata Group
LOGGED BY: B. Davenport
DRILLING METHOD: 4" SFA
DEPTH TO WATER> INITIAL: ▽ ______ **AFTER 24 HOURS:** ▼ ______ **CAVING>** C ______

BORING No. B-4

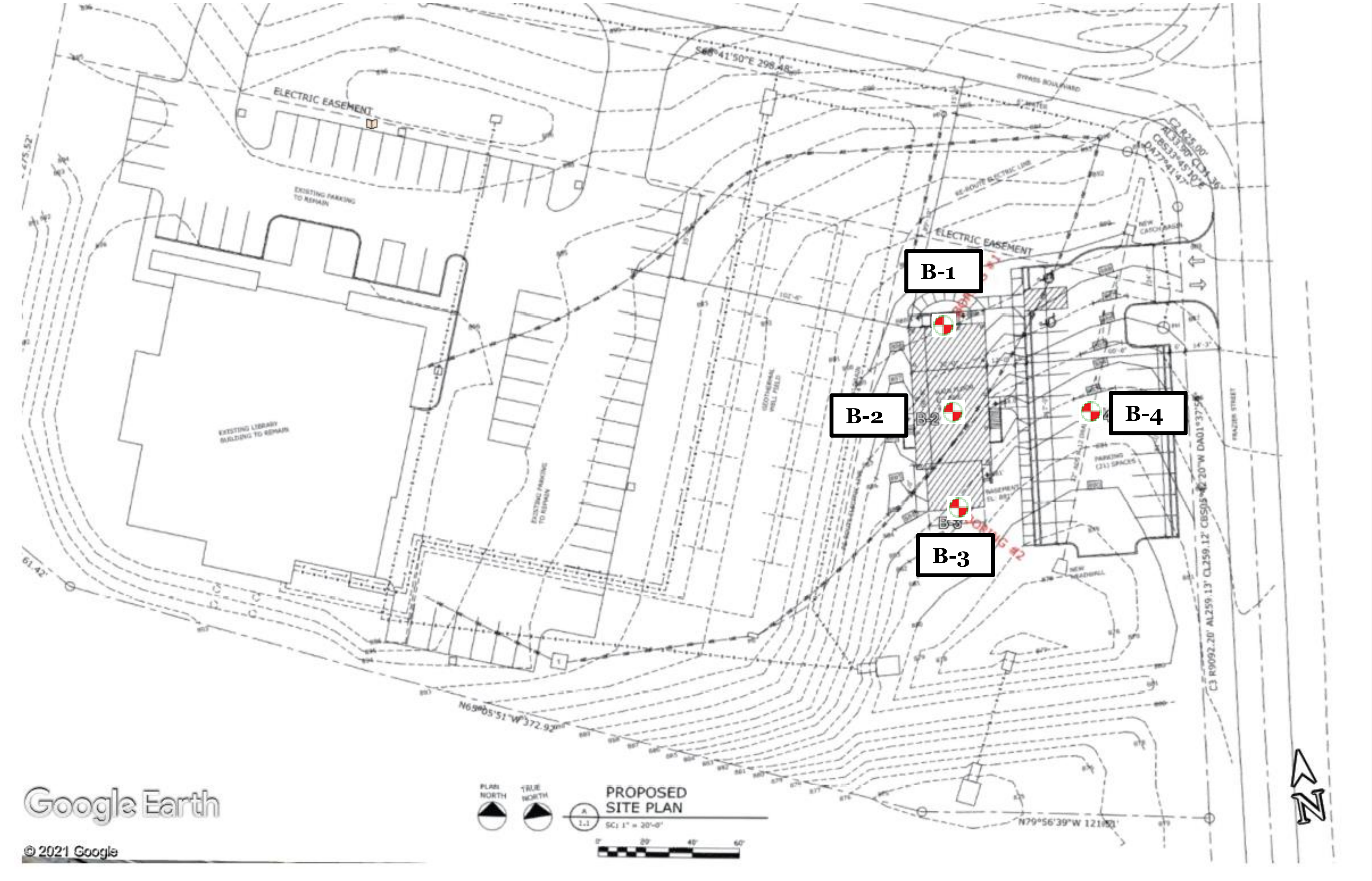
This information pertains only to this boring and should not be interpreted as being indicitive of the site.



ELEVATION (feet)	DEPTH (feet)	Description	Soil and Sampler Symbols, Blows	Sample No.	NM	PL	LL	N	Rock Comp. Strength (psi)
		Topsoil - 4 in.							
		Fill - Lean to Fat clay with rock fragments, brown, orange, and green, firm to very stiff, slightly moist to moist	2 2 4	1	27.7			6	
			3 4 6	2	25.4			10	
			3 4 7	3	21.9			11	
			10 12 14	4	17.9			26	
		Weathered rock interbedded with clay, sandy, dry, grennish gray, hard	28 50/5	5	7.3			50+	
		Auger Refusal at 11.5 ft.							

APPENDIX C

Site Location Map
Drawings



L.E. Gregg Associates, Inc.
2456 Fortune Drive, Suite 155
Lexington, Kentucky 40509

Fleming County Public Library Pavilion
Flemingsburg, KY

Project #2021006	**Boring Layout**

APPENDIX D

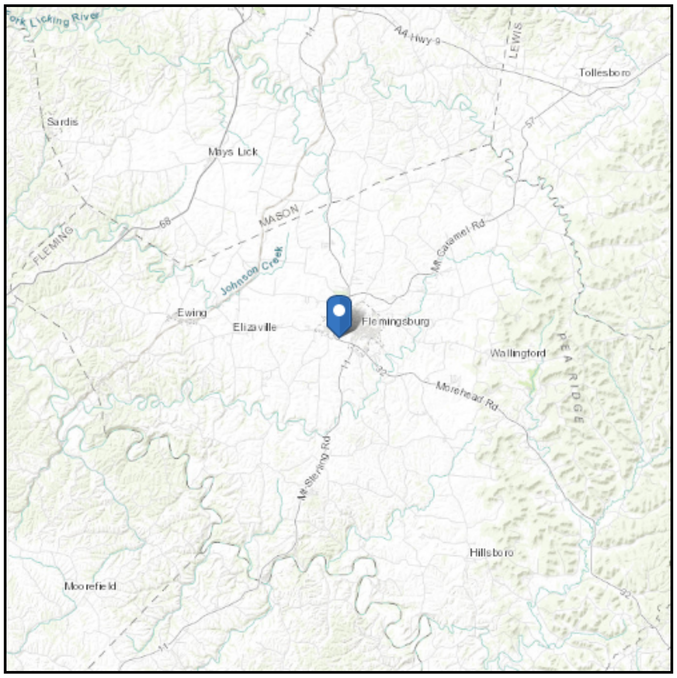
Seismic Design Information

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: I
Soil Class: C - Very Dense Soil and Soft Rock

Elevation: 878.35 ft (NAVD 88)
Latitude: 38.416359
Longitude: -83.75047



AMERICAN SOCIETY OF CIVIL ENGINEERS

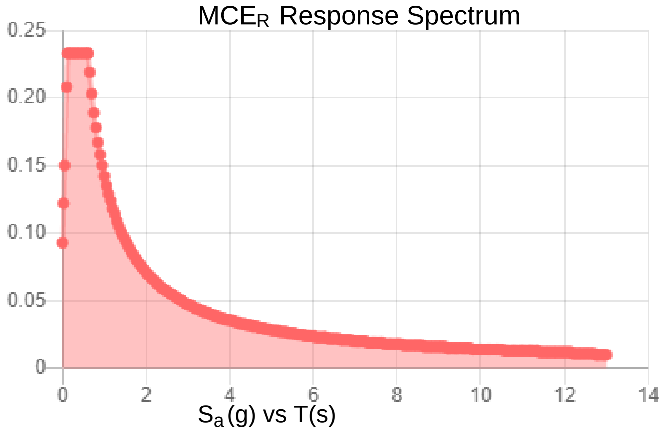
Seismic

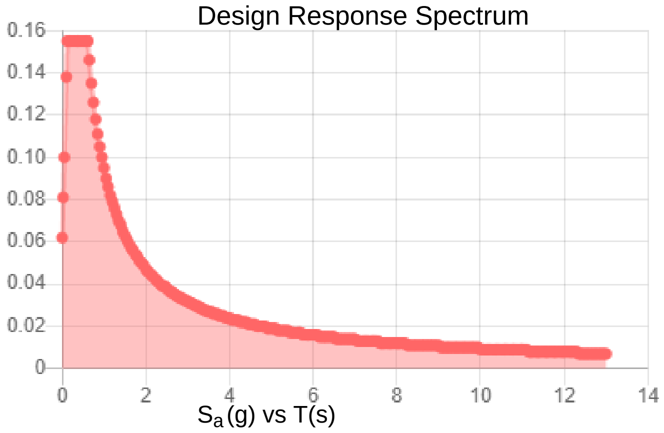
Site Soil Class: C - Very Dense Soil and Soft Rock

Results:

S_S :	0.194	S_{DS} :	0.155
S_1 :	0.084	S_{D1} :	0.095
F_a :	1.2	T_L :	12
F_v :	1.7	PGA :	0.1
S_{MS} :	0.233	PGA_M :	0.12
S_{M1} :	0.142	F_{PGA} :	1.2
		I_e :	1

Seismic Design Category B





Data Accessed: Mon Mar 22 2021

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.