SOLID GROUND
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Engineering Innovation; Providing Solutions to Your Challenges.

REVISED REPORT OF GEOTECHNICAL EXPLORATION

University of Kentucky Project No. 2563.0

Cancer Treatment Center / Ambulatory Surgery Center

Lexington, Fayette County, Kentucky

Prepared for: Mr. Raymond Haunsz, Senior Project Manager,
UK Capital Project Management Division

University of Kentucky

Lexington, Kentucky

August 1, 2023

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August 1, 2023

Mr. Raymond Haunsz
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Capital Project Management Division
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Subject: **Report of Geotechnical Exploration**
Cancer Treatment Center / Ambulatory Surgery Center
University of Kentucky Project No. 2563.0
Lexington, Kentucky
Solid Ground Project No: 23-235R

Mr. Haunsz,

Solid Ground Consulting Engineers, PLLC (Solid Ground) is pleased to present our Report of Geotechnical Exploration. This report is for the proposed University of Kentucky Cancer Treatment Center / Ambulatory Surgery Center in Lexington, Kentucky. The geotechnical exploration was conducted in general accordance with the scope of work outlined in Solid Ground proposal 107023 dated April 13, 2023.

This report contains our findings and recommendations for the referenced project detailed above. Once design is completed, it is recommended that Solid Ground review plans and specifications. In addition, it is recommended that Solid Ground be retained to perform observations and special inspections during construction. Solid Ground will not be held responsible for interpretations and field observations made by others.

We appreciate the opportunity to provide our consulting services to you. We look forward to working with you on this and future projects.

Sincerely,
SOLID GROUND CONSULTING ENGINEERS, PLLC

Beck Smith, PE
Senior Engineer
Kentucky License Number 37415

STATE OF KENTUCKY
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LICENSED PROFESSIONAL ENGINEER

Tim McClure
President

1.0 Executive Summary

Solid Ground Consulting Engineers performed a geotechnical exploration in support of the University of Kentucky Cancer Treatment Center / Ambulatory Surgery Center located on South Limestone, Lexington, Fayette County, Kentucky. The approximate coordinates of the site are 38.0296°N, -84.5108°W.

1.1 Summary of Findings

Solid Ground conducted a total of forty-one (41) soil test borings at the site, located at various points of interest within the limits of the proposed treatment center, associated parking garage, utility tunnel, pedestrian bridge, and utility trunk corridor. The borings were drilled along the existing grade.

Soil overburden generally consisted of a layer of topsoil, asphalt paving, concrete paving, and/or gravel underlain by either fill material or natural soils generally described as lean clay, fat clay, silt, sand, and gravel with varying amounts of each to refusal depths. The borings encountered auger refusal at depths ranging from 5.0 to 20.4 feet with most refusing between 10.0 and 15.0 feet.

Sixteen (16) of the borings had rock coring performed at auger refusal elevation encountering slightly to moderately weathered limestone interbedded with dolomite and shale.

2.0 Project Information

2.1 Purpose and Scope of Services

The purpose of this subsurface exploration was to prepare recommendations for design and construction of foundations and concrete slabs for the proposed cancer treatment center, parking garage, utility tunnel, pedestrian bridge, and utility trunk corridor. Our scope of work included the following:

- A desktop review of the site's conditions and historical use.
- Field reconnaissance and site layout for drilling and coring operations.
- Forty-one (41) soil test borings.
- Sixteen (16) borings were cored at auger refusal.

- Laboratory analysis of soil and rock core samples.

- Written geotechnical report discussing the following topics:

    a. Site surface conditions.

    b. Subsurface conditions encountered as well as a discussion of the published geologic conditions at the site.

    c. A summary of field and laboratory testing results including a brief review of our test procedures.

    d. Boring logs and laboratory tests are summarized in the report and included in the appendices.

    e. Specific geotechnical conditions and concerns which may affect the design or construction of the project.

    f. Recommendations for site preparation and construction of compacted fills.

    g. Recommendations for foundation and wall drainage.

    h. Recommendations for temporary excavation shoring.

    i. Recommendations for temporary and permanent cut and fill slopes.

    j. Recommendations for general design and construction criteria for the project foundations.

    k. Recommendations for general design and construction criteria for the project slabs-on-grade.

    l. Recommendations for design and construction of below grade walls and/or retaining walls.

    m. Recommendations for design of flexible and rigid pavements.

    n. Recommendation for seismic site class according to International Building Code which was adopted by the 2018 Kentucky Building Code (KBC).

2.2 Project Description

Project information was provided by THP Limited through a Request for Proposal (RFP) dated April 7, 2023, and by email correspondence. We understand the project will consist of a new cast-in-place parking structure, Cancer Treatment Center and a future Ambulatory Surgery Center. In addition to the structures, a new underground utility tunnel and elevated pedestrian walkway will be constructed and attached to the existing Pavilion A. We understand that the structural design portion of this project has yet to be completed, but preliminary loading and elevation information was provided in the RFP. According to the RFP, the anticipated structural loading information is as follows:

<u>Parking Structure</u>

Interior Columns – 1,300 kips (typical) to 2,100 kips (max column load)
Perimeter Foundation Wall – 1 kip per square foot

<u>Cancer Treatment Center</u>

Interior Columns – 2,181 kips
Exterior Columns – 1,235 kips
Perimeter Foundation Wall – 10 kips per linear foot
Linear Accelerator (Lower-Level Wall) – 45 kips per linear foot

The approximate addition area is depicted below in Figure 1.

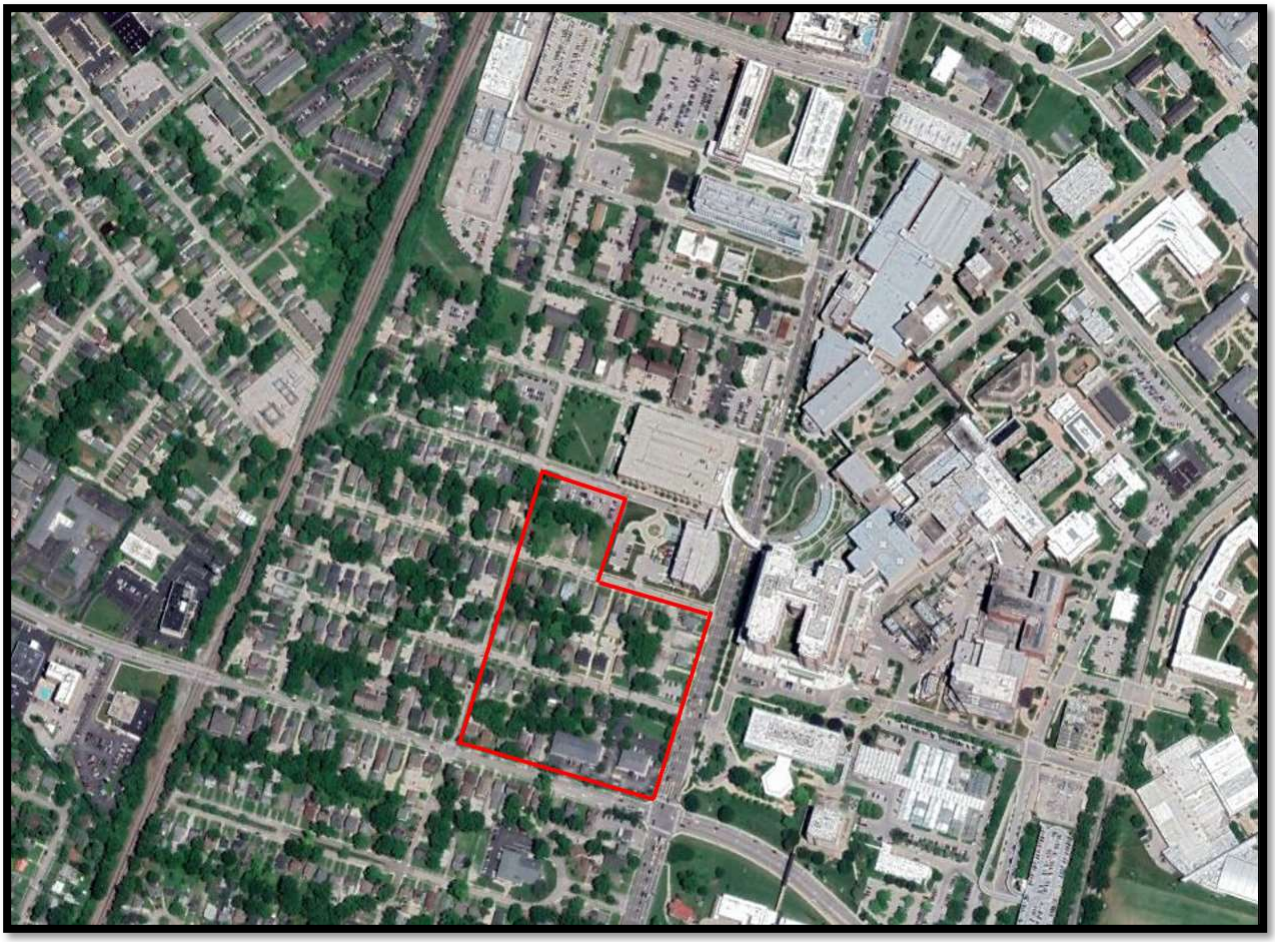


Figure 1: Approximate Site Location

2.3 Site Conditions

Solid Ground personnel visited the site throughout the geotechnical investigation to observe existing conditions, to help interpret the subsurface data, and detect conditions which could influence recommendations.

The site is located just west of South Limestone, Lexington, Fayette County, Kentucky. The property is currently a mixture of occupied structures and recently razed structures. The site is bisected by city streets. Additionally, the site is bounded on the Eastern side by Limestone Avenue (US Highway 27). This boundary (both sides of Limestone) serves as a major underground utility corridor serving both the University of Kentucky and the greater Lexington Metropolitan Area.

2.4 Site Grading and Topography

Currently, the finished floor elevations (FFE) are as follows:

- Parking Structure: 966' (lower-level entry from Conn Terrace) and 977' (upper-level entry from South side of the site)
- Cancer Treatment Center: 973' 8"

The site has approximately 30 feet in elevation variance across the site, running from the South side of the site downward to the North side of the site.

3.0 Subsurface Findings and Encountered Conditions

3.1 Review of Previous Site Development and Historical Information

Based on review of topographic maps provided by the United States Geological Survey (USGS) and historical imagery provided by Google Earth, it appears that the immediate site has remained largely unchanged in the past 25 years. The area served primarily as a residential neighborhood. Figure 2 shows the topographical area. Figures 3-5 show select historical views.

Figure 2: 2019 USGS Topographic Map of Lexington West Quadrangle

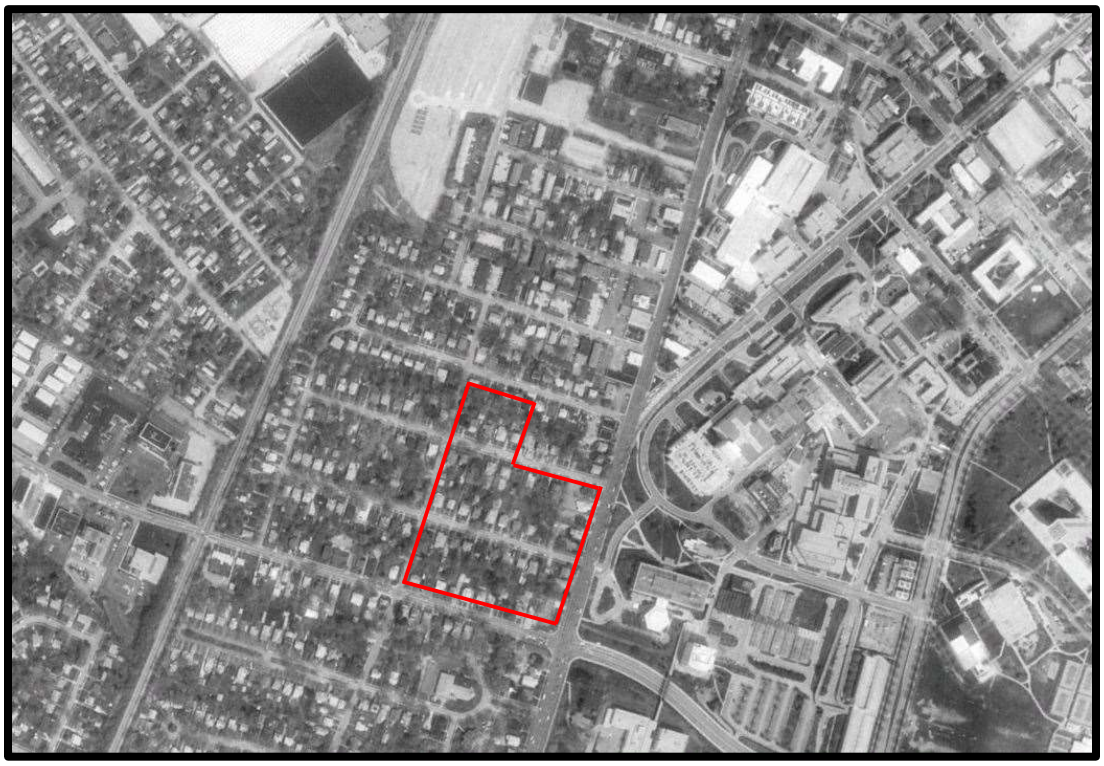


Figure 3: 1993 Google Earth Imagery

Figure 4: 2006 Google Earth Imagery

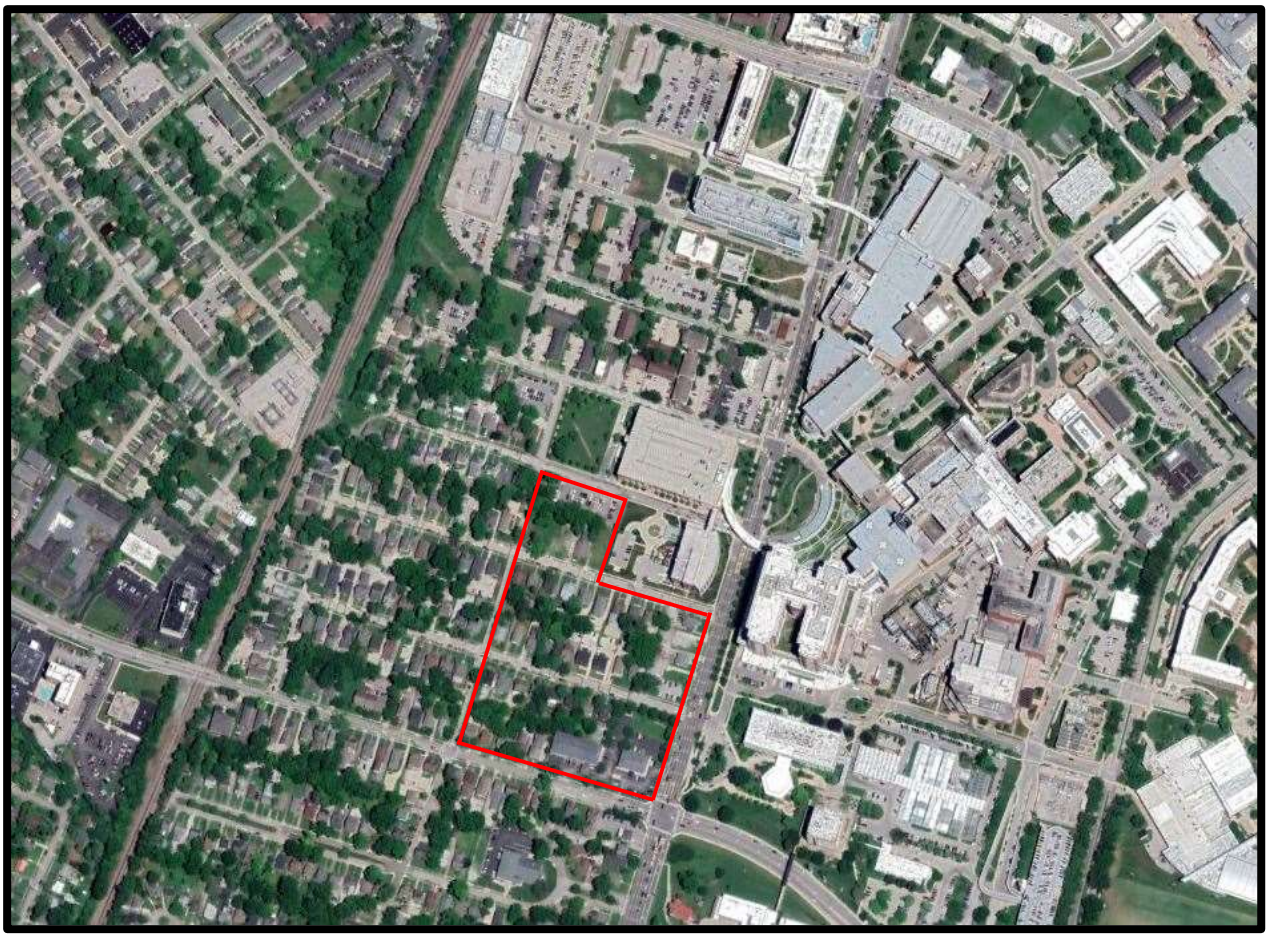
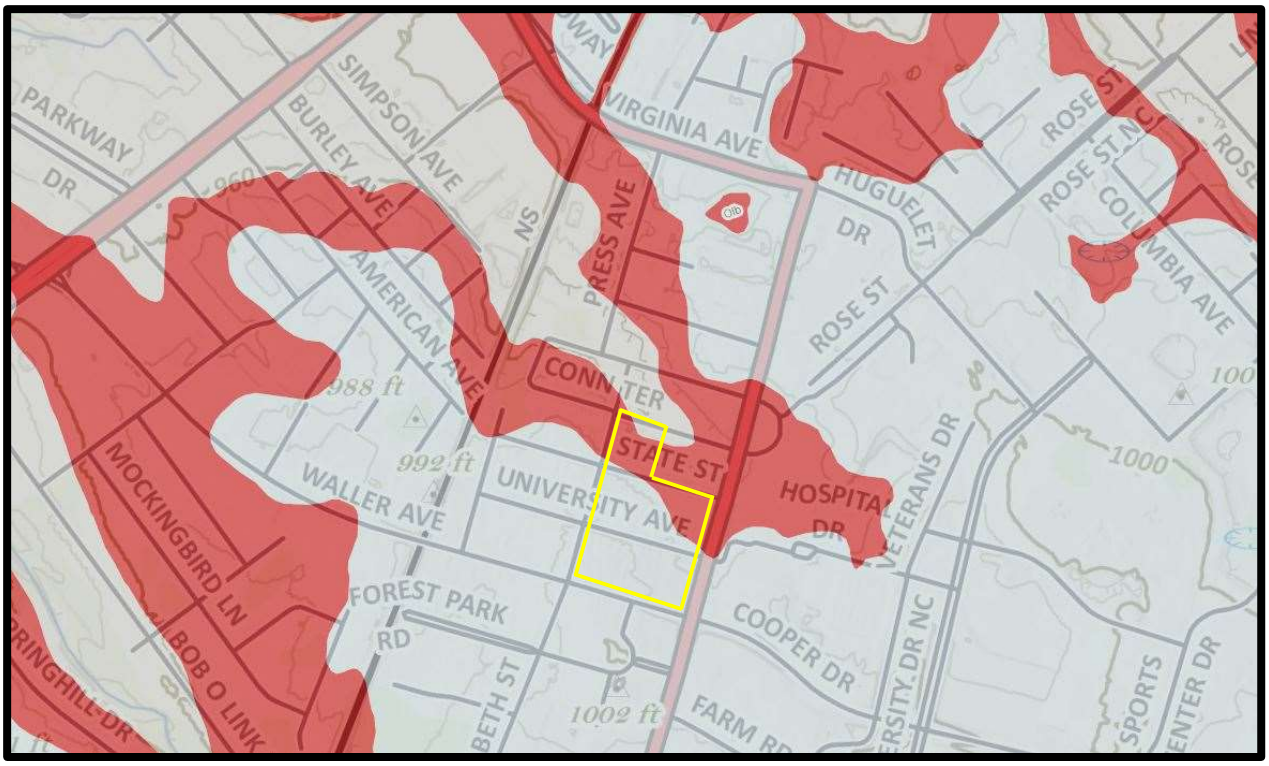


Figure 5: 2021 Google Earth Imagery

3.2 Published Geologic Information

Geologic information was referenced from the Kentucky Geological Survey (KGS), geologic maps of the Lexington West Quadrangle, Fayette County, Kentucky. At the site there is a meeting of bedrock units underlying the site mapped as the Brannon Member and Lower part of Lexington Limestone. Locally, the limestone is described as microgranular and argillaceous, sometimes containing chert nodules interbedded with shale, Lower to Middle Ordovician in age. Figure 6 shows the geological map of the site (approximate site location indicated in yellow) along with details of the map legend.



Ollr
Lower part of Lexington Limestone
This geologic unit is a part of:
Informal Part of Lexington Limestone
(Lower Ordovician - Middle Ordovician)

USGS Unit Info: *GEOLEX (id: Lexington 2452)*

Mapped or described as these unit(s) on the original GQ:

CANE RUN BED
USGS Unit Info: not available
Primary Lithology: Limestone
Description: Limestone, light-gray to light-brownish-gray, microgranular, argillaceous; in part silty; dense limestone nodules and boulders in convolute beds, locally. Chert as nodules and thin beds in upper few feet diagnostic lithologic feature. Top of unit is chert marker bed. Unit interfingers with and grades into lower part of Tanglewood Limestone Member.

Olb
Brannon Member
This geologic unit is a part of:
Member of Upper part of Lexington Limestone
Informal Part of Lexington Limestone
(Lower Ordovician - Middle Ordovician)

USGS Unit Info: *GEOLEX (id: Brannon 605)*

Mapped or described as these unit(s) on the original GQ:

BRANNON MEMBER
USGS Unit Info: *GEOLEX (id: Brannon 605)*
Primary Lithology: Limestone and shale
Description: Limestone and shale: Limestone, light-gray to light-brownish-gray, microgranular, argillaceous; in part silty with thin beds of medium-dark-gray shale; interbeds of clastic limestone locally present; convolute bedding and flow rolls are common in thicker beds, as along New Circle Road at Frankfort Pike, and along railroad cut beneath Virginia Street overpass; chert occurs as thin beds and as nodules; thin beds of swelling bentonite locally occur near base; springs occur at top, but are more common near contact with underlying bioclastic and granular phosphatic limestones. Weathers to a yellowish clayey soil containing abundant porcelaneous chert and siltstone fragments. Unit thins and pinches out northeastward.

Figure 6: KGS Geologic Mapping

The KGS maps for karst potential and for closed depressions were reviewed. The KGS mapping indicates that the underlying rock units are of intense karst potential with mapped sinkholes near the project vicinity (Figure 7). If karst features are encountered during earthwork operations, Solid Ground should be contacted to provide recommendations for the repair.

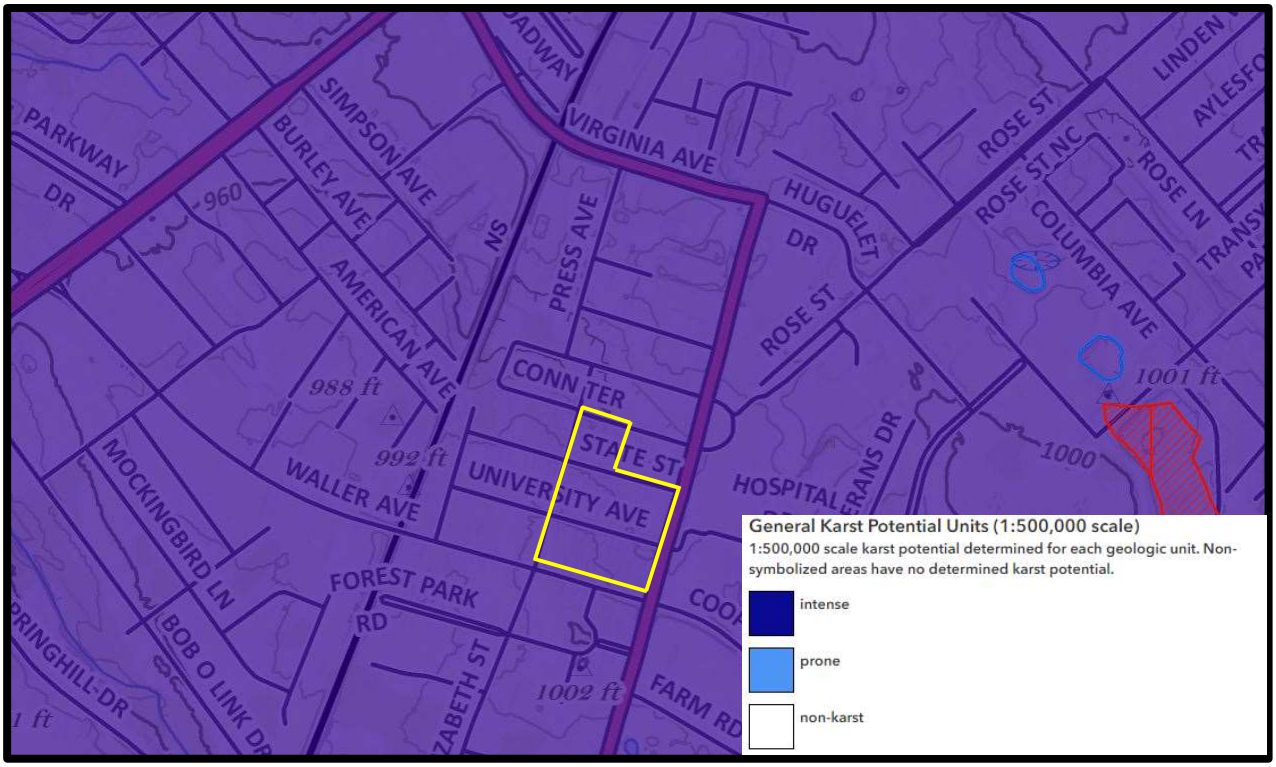


Figure 7: KGS Karst Potential Mapping

3.3 Subsurface Exploration Program

Solid Ground conducted a total of forty-one (41) soil test borings at the site, located at various points of interest around the property. Selected borings had rock coring performed at auger refusal into bedrock. Borings were located as close to the pre-selected foundation elements as site topography and underground utility conditions allowed.

Boring surface elevations were measured in the field by Solid Ground using Carlson GPS Equipment. Therefore, the boring locations and surface elevations should be considered approximate. It should be noted that the subsurface conditions will vary between borings and the representative profile is based upon the borings drilled during the field operations. Boring locations are shown in Figure below.

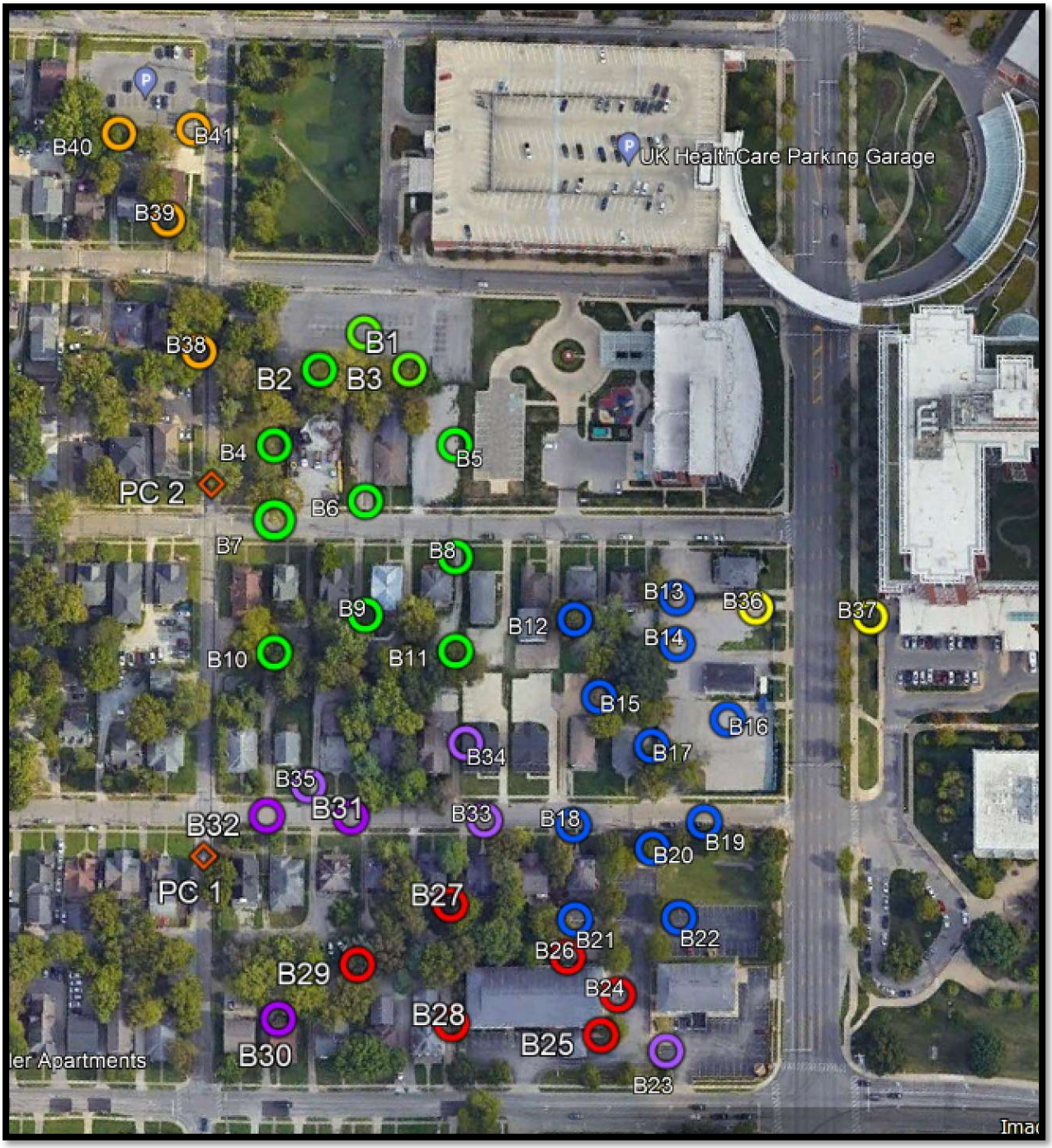


Figure 8: Approximate Boring Locations

3.4 Subsurface Conditions

The soil samples were visually classified by Solid Ground personnel according to the Unified Soil Classification System (USCS, ASTM D2487). A description of each soil layer is as follows:

Surficial Materials – The borings encountered a surficial layer of topsoil (3 to 7 inches). The thicknesses of these materials may vary across the site. The thicknesses presented in this report should be considered approximate. Additionally, several borings were performed within existing city streets and consisted of generally 6 inches of asphalt and 12 inches of underlying crushed stone.

Fill Material - Three of the borings encountered undocumented fill underlying the surficial materials layer described as lean clay (CL) and fat clay (CH) to depths of up to 8.0 feet below existing elevations. The SPT N-values ranged from 3 to 13 blows per foot, with consistencies of soft to stiff.

Natural Soils – The borings encountered natural soils either from below the surficial layer or below the undocumented fill material to auger refusal depths. The natural soils are described as Lean Clay and Fat Clay. The Standard Penetration Test (SPT) N-values ranged from 0 to 50 blows per foot before encountering refusal with consistencies of very soft to hard.

Auger Refusal – The borings encountered auger refusal at depths ranging from 6.1 to 26.5 feet. Auger refusal is defined as rock-like refusal to auger advancement. Coring was performed once auger refusal was encountered at select borings.

Bedrock – Select borings had rock coring performed at auger refusal (see Table 1 – Summary of Borings). Slightly to moderately weathered limestone, sometimes interbedded with shale and dolomite seams were encountered. The bedrock samples had recoveries of 45% to 100% and rock quality designations of 25% to 97%, indicating poor to excellent rock quality.

Detailed descriptions and strength characteristics are included on the rock core logs in Appendix A.

Groundwater – Groundwater was encountered in boring B-27 at 9.5', but not in any other boring. Free groundwater levels fluctuate with seasonal weather conditions and may vary. Therefore, the borings may not be representative of the actual free water levels. To achieve an accurate measurement of free groundwater levels, water wells or piezometers should be installed.

The borings may not be representative of the actual free water levels, especially considering the area's recent demolition efforts. To achieve an accurate measurement of free groundwater levels, water wells or piezometers should be installed.

Solid Ground should be contacted if groundwater is encountered during earthwork operations and/or construction operations. Please note, the groundwater table can fluctuate significantly which could have an impact on the subsurface soils. Table 1 summarizes our findings.

Table 1 – Summary of Borings

Boring Number	Approximate Surface Elevation (ft)*	Auger Refusal Depth (ft) *	Auger Refusal Elevation (ft) *	Total Coring Length (ft)
B-1	967.91	10.5	957.41	--
B-2	972.05	15	957.05	21
B-3	968.31	15.6	952.71	17
B-4	977.3	12.5	964.8	--
B-5	973.96	13	960.96	--
B-6	975.81	11	964.81	19
B-7	978.1	13.6	964.5	--
B-8	977.53	12	965.53	18.5
B-9	982.16	16	966.16	--
B-10	987.83	20.4	967.43	20
B-11	982.52	17	965.52	19.5
B-12	974.56	9.8	964.76	20
B-13	973.67	8.2	965.47	--
B-14	975.12	9.4	966.72	--
B-15	977.12	11.4	965.72	--
B-16	978.02	9.7	968.32	20
B-17	977.8	11.3	966.5	19.5
B-18	981.56	12.7	968.86	20
B-19	978.61	12.4	966.21	20
B-20	982.24	12.5	969.74	20
B-21	986.36	13	973.36	20
B-22	983.49	11.7	971.79	--
B-23	986.2	12	974.2	--
B-24	986.33	12.1	974.23	--
B-25	989.5	15.1	974.4	--
B-26	990.05	13.7	976.35	--

B-27	992.55	11.2	981.35	--
B-28	992.74	11.1	981.64	--
B-29	996.63	5	991.63	20
B-30	998.56	10.3	988.26	--
B-31	986.87	12.5	974.37	--
B-32	989.36	6.9	982.46	--
B-33	984.3	17.5	966.8	--
B-34	984.01	17.8	966.21	--
B-35	988.49	6.1	982.39	--
B-36	975.08	8.6	966.48	22.2
B-37	974.55	11.6	962.95	19
B-38	967.67	17	950.67	--
B-39	970.11	14.5	955.61	--
B-40	963.34	10.9	952.44	--
B-41	960.92	9.4	951.52	--

4.0 Geotechnical Concerns and Construction Considerations

Based on the results of the subsurface exploration and experience with similar projects, we believe the project site is generally suitable for the proposed development. However, some concerns exist with the subsurface conditions as discussed below.

4.1 Topsoil

Based on the information gathered from the soil borings, the site has a surficial layer of topsoil. These thicknesses varied and are representative of conditions encountered at the boring locations only, thickness and aerial extent of the strata may vary across the site. Construction plans should adequately address stripping and the disposal of these materials prior to earthwork operations.

4.2 Construction in Cut/Fill Areas

Cut areas have the potential to be overcut, disturbing the in-situ soils to depths below proposed finished grade. Areas to receive fill are stripped of topsoil and are also sometimes disturbed to depths deeper than intended. Both cut and fill areas should be proof rolled prior to construction. Soft, loose, or wet areas should be identified and remediated in accordance with the recommendations provided in the "5.1 Earthwork" section of this report.

4.3 Underground Utilities

The location of all existing underground utilities within the proposed development area is unknown. Construction plans should include provisions for complete removal of unnecessary utility lines encountered during the site grading. Abandoning utilities in place can be allowed on a case-by-case basis.

4.4 Construction During Wet Conditions

Based on our conversations it is understood the construction of the proposed development could occur during wet conditions. Based on experience with construction during wet conditions, subgrade remediation is often required. Delays of earthwork/foundation operations due to wet conditions should be anticipated.

If construction should continue despite wet conditions to meet scheduling needs remediation may be required. It is recommended that Solid Ground be used to observe construction and conduct special inspections to expedite the remediation recommendations, if necessary.

4.5 Site and Foundation Drainage

Surface and ground water should be controlled during and after construction operations. It is recommended that foundation concrete, or a concrete bearing medium, be placed the same day that foundation excavation is performed.

The final grade should be sloped away from the structure and pavements by a minimum of two percent to promote positive drainage. Roof drains and foundation drains should be installed and should discharge surface runoff away from the structure to provide positive site drainage. Drainage should be designed and constructed without impacting neighboring properties. Drainage design is outside our scope of work.

It is imperative that dewatering be maintained during construction and after development. If positive dewatering methods are not continually applied and maintained, there is potential of decreasing the service life of the structure.

We understand there is a possibility to utilize underground detention storage. The design and implementation of this underground detention should refer to sections 4.8 and especially 4.9 of this report. Any seepage of the underground detention through the soils

could cause potential sinkhole development and other negative impacts associated with Karst. Design of slabs and structural elements over the underground detention should be conducted with care to the reduced structural bearing over the underground detention. Design of underground detention is not included in this report; however, Solid Ground should review all plans and specifications regarding underground detention for conformance with geotechnical recommendations.

4.6 Soil Compaction Equipment

The soil compaction equipment should be selected by the type of fill anticipated for the site. We anticipate utilizing a sheepsfoot roller at this site for the on-site materials and a smooth drum roller for dense graded aggregate fill.

4.7 Soil Plasticity

Some of the subsurface soils were field classified as lean clay, fat clay, and elastic silt. These soils can have high plasticity characteristics and be subject to volume changes with fluctuations in moisture content. The near surface on-site material is not considered highly plastic. Care should still be taken to mitigate subgrade degradation and reduce subgrade remediation. Therefore, we recommend minimal mitigation efforts consisting of the following:

- Improved site drainage to minimize exposure of these soils to moisture fluctuations, especially near building foundations and slab on grade.
- Minimize exposure of these soils to excessive wetting or drying.

4.8 Shallow Rock Excavation

We anticipate rock excavation to occur within the foundation, slab-on-grade, and underground utilities for the parking garage and utility tunnel and the underground utilities for the Cancer Treatment Center. Construction plans should address the method of rock removal and the amount (if any) of rock to be hauled off the site or utilized as fill. In addition, construction plans should adequately address underground utilities as recommended in this report. We do anticipate a much slower process of pneumatic hammer in this geology that should be accounted for by the contractor.

4.9 Development within a Karst Region

Solution activity in areas underlain by limestone generally results from a slow process of dissolving the underlying rock units by surface runoff or rainwater. Sinkholes at the ground surface are caused from either a general raveling failure within the soil unit or by rock collapse. Either phenomenon typically result in depressions at the ground surface, which, if large enough, can be identified on topographic maps. In addition to the natural causes of sinkhole development previously discussed, sinkholes may form as a result from water leaking from subsurface piping and drainage systems such as buried water and sewer pipes, septic lateral fields, and roof drains beneath the building and floor slabs.

As previously stated, the Kentucky Geological Survey rates the site with an intense potential for karst development. It is not possible to remove all risk associated with construction over known sinkholes or in karst areas. Our experience indicates that the limestone formations mapped underlying the site pose a high risk for solution activity and sinkhole formation. The natural rising and lowering of the ground water table and surface water migration downward through the subsurface soils can create the risk of continued soil migration into solution voids in the underlying limestone.

There is potential for sinkholes to be encountered during construction, especially in the drilled shafts and cut areas. Solid Ground should be contacted if a solution feature or other karst feature is encountered during construction. Repair methods of sinkholes and other karst features exist. When sinkholes are encountered, the common practice is to excavate the soil from within the solution feature down to hard bedrock. The two most common methods of remediation are a concrete plug or an inverted filter.

We believe the risk with this development is no greater than for similar developments in the area. To further reduce the risk of unidentified sinkholes at the site would require the implementation of more sophisticated and expensive geotechnical exploration methods including borings or test pits on a tightly spaced grid or geophysical methods.

4.10 Vibration of Construction Equipment

It is recommended that the vibration impact from the construction be considered and addressed. It is highly recommended to contract a third party to perform pre and post construction observations and monitoring of nearby and adjacent structures. Solid Ground can perform this service.

4.11 Stable Excavation Bottoms and Drainage

Dewatering may be required during mass excavation and throughout the construction process. It is recommended that the excavation bottoms consist of competent limestone bedrock. If excavation bottoms become saturated or have standing water, the water should be removed either through pumping or dewatering trenches.

4.12 Temporary Shoring of Excavation

Due to the existing infrastructure located on all sides of the site and the anticipated FFEs, temporary shoring may be required. Construction plans should adequately address this potential. It is strongly recommended that the structural engineer and specialty structural engineer of record or contractor take into consideration and provide a design that accommodates this concern.

The earthwork contractors should be cautioned that vertical and near vertical cuts in granular materials and limestone with dolomite and shale seams, may be prone to raveling and potentially more significant caving failure. The contractor should take appropriate precautions to shore the proposed mass excavation.

Shoring and bracing should be provided in accordance with all applicable local, state, and federal safety regulations, including the current OSHA excavation and trench safety standards. The design and construction of any temporary or permanent shoring or dewatering is the responsibility of the contractor and is beyond the scope of this exploration. Due to the weathered bedrock, it may be recommended to design permanent shoring as soil located behind the walls with potential of active groundwater. Please refer to Section 5.6 for additional dewatering discussion. The constructions plans should address the potential of undermining the existing roadways and hardscapes.

All slopes should be laid back and benched per OSHA 1926 Subpart P requirements. Solid Ground can provide a competent person to evaluate temporary and permanent slopes in the field.

4.13 Design Progress and Discussion

It is recommended to contract Solid Ground as the Geotechnical Engineer of Record to continue to provide services during the design phase and construction phase. We do anticipate anomalies, such as Karst, groundwater, and clay seams to be encountered during construction.

4.14 Mass Rock Excavation

Excavation of the limestone bedrock in confined areas will require ripping tools and pneumatic hammers. The speed and ease of excavation will depend on the type of equipment, the skill of the equipment operators and the geologic structure of the material itself, such as the direction of bedding, planes of weakness, and spacing between discontinuities. We do anticipate a much slower process of pneumatic hammer in this geology that should be accounted for by the contractor.

4.15 Corrosion

Based on past experience corrosion is a concern for parking structures due to chemicals used during roadway treatments during winter. Corrosion should be taken into consideration during design.

The on-site soils are not known to contain water soluble sulfate in concentrations that should react with the structural concrete.

4.16 Groundwater

Groundwater was only encountered in one boring (B-27) during drilling. However, our field exploration was performed during a dry period of weather. There is a possibility that groundwater may be an issue during construction.

Please note, a detailed groundwater study and analysis is beyond the scope of our work. If an underground detention system is planned, it should account for the existing groundwater and the future stormwater due to the increased impervious surface.

4.17 Undocumented Fill

The borings encountered two (2) areas of undocumented fill to depths of approximately 6.0 feet. Undocumented fill is frequently heterogeneous in composition and consistency and can contain pockets of soft, loose, organic, or otherwise deleterious materials. Structures sited on such materials are at risk of damages due to differential settlement under typical loading conditions. It should be noted that the encountered fill could extend to greater depths than encountered in our limited geotechnical study.

If the structure is founded on footings bearing within the uncontrolled fill material, there is a risk that foundation and/or slab settlement may occur. This could potentially cause differential settlement of the footings or cracking in the floor slab of the building.

4.18 Underground Storage Tanks

We understand that there are several underground storage tanks proposed for this project. One is a fuel tank for the facilities generators and the remainder are a series of tanks acting as a reservoir for irrigation. The foundations and retaining walls for these tanks should have foundation/wall drains on the exterior and interior drains that pipe water to the projects storm water system. The floor drains from the fuel tank holding area should be designed to limit potential environmental impacts from fuel.

5.0 Recommendations

The following recommendations are based on information gathered and subsurface conditions encountered during this limited exploration. Solid Ground developed these recommendations under the assumption that our sampling performed on the site accurately portrays conditions that are not immediately visible due to earth, rock, water, or time. Solid Ground cannot be held liable for fill placed or performance of the subgrade without observations to confirm that conditions in the field are consistent with inferences from the samples we obtained.

It is recommended to retain Solid Ground to perform construction materials testing and special inspections for the duration of construction to both maintain speed of construction and overall project costs. If earthwork construction begins during wet weather conditions there is likelihood that the schedule will include prolonged and extensive remediation, or a more robust geotechnical recommendation.

5.1 Earthwork

5.1.1 Site Preparation

- Topsoil and other surficial materials should be stripped to prepare the site for construction.
    - In-place density testing should be performed to check that the previously recommended compaction criteria have been achieved.

- Fill placement should be monitored on a full-time basis by Solid Ground during site grading.
- Fill placement should extend to a minimum of 10 feet beyond the building footprint.

- After stripping and cutting operations, the subgrade should be evaluated by Solid Ground. Possible remediation methods may be required if the subgrade and site soils are exposed to wet weather conditions.
- The building pad may require stabilization prior to new fill placement or for slab-on grade-construction. Solid Ground should be consulted to assist in selecting the method most appropriate for site conditions. These methods may consist of any or combination of the following:
  - Tensar geogrid reinforcement.
  - "Walking" No. 2 stone into the soft subgrade.
  - Application of consolidated No. 57 stone.

5.1.2 Structural Fill Placement

Final grades were not established at the time of this report; however, we anticipate fill placement to be moderate. Backfill materials for structural fill placement may consist of soil or durable crushed stone. The following steps are recommended for fill placement within the building pad. **The onsite soils are expected to meet the requirements for structural fill.**

Structural fill material, if required, is defined as the following:

- Inorganic natural soil with maximum particle sizes of 3 inches.
- Plasticity Index of no greater than 30 percent.
- Solid Ground should observe the material to confirm the soils meet applicable standards for structural fill.
- Other sources of structural fill should be verified by Solid Ground.
  - If other sources of structural fill are anticipated, Solid Ground should collect a bulk sample for Standard Proctor testing.

The following are recommendations for placement of soil structural fill:

- Structural fill should be placed in no greater than 8-inch-thick layers.
- Structural fill should be compacted to at least 98 percent of the soil's maximum dry density as determined by the Standard Proctor Compaction test (ASTM D698).

- The moisture content of the fill material should be maintained within 2 percent (above or below) of its Standard Proctor optimum moisture content depending on the results of the Proctor tests.
- In-place density testing should be performed to check that the previously recommended compaction criteria have been achieved.
- Fill placement should be monitored on a full-time basis by Solid Ground during site grading.
- Fill placement should extend to a minimum of 10 feet beyond the building footprint on a 1:1 (H:V) slope.
- Trench or confined backfill should be placed in no greater than 6-inch-thick layers due to smaller compaction equipment.

Solid Ground should be contacted if any unexpected subsurface conditions are encountered during earthwork construction. It is important that Solid Ground observe earthwork construction.

5.2 Foundations

5.2.1 Foundation Recommendations – Drilled Shafts

Due to the heavy anticipated loads (1,000 kips or greater) and the weathered bedrock, we recommend utilizing a deep foundation system for the parking structure and Cancer Treatment Center, such as drilled shafts (caissons), to bear upon competent bedrock. The deep foundation system can be designed for the anticipated heavy loads and seismic lateral loads and can utilize friction and end bearing on bedrock material. Conventional shallow foundations and/or shallower drilled shafts bearing on weathered bedrock may be considered for areas that aren't as heavily loaded. It should be noted that we recommend neglecting the soil overburden above bedrock from frictional capacity.

Our foundation bearing and friction recommendation is based on the following:

- The compressive strength of the bedrock at selected samples and depths
  - Compressive Strength Results ranged from 10,531 psi to 19,999 psi with the majority over 12,500 psi.
- Rock Mass Rating System
  - Quantified as Fair and Poor-Quality Rock Mass
  - "M" Constant of 0.128 and 0.029

- "S" Constant of 0.00009 and 0.000003

- FHWA friction capacities
- Subsurface conditions encountered consisting of slightly weathered limestone bedrock with some clay seams and interbedded dolomite and shale
- Anticipated loading information
- Information gathered during this exploration and the proposed development

Competent Bedrock Bearing Recommendations

We recommend using a maximum net allowable **competent bedrock** bearing pressure of 85,000 PSF (pounds per square foot) for foundations utilizing drilled shafts. Competent bedrock can be used for end bearing, provided the appropriate net allowable bearing capacity. We highly recommend that each drilled shaft have specific air test holes or coring performed to better determine bedrock capacity elevations for each shaft. Each drilled shaft should have a minimum rock socket depth of 1D (D being the Diameter of the Drilled Shaft). We recommend that a 10-foot test hole or rock core be observed at each shaft once bottom of shaft elevation is achieved.

This allowable bearing pressure assumes that the bearing material for each drilled shaft will be observed and approved by the geotechnical engineer of record. A net allowable skin friction of 3,000 PSF is available for rock socket capacity considerations. **However, the end-bearing should be at least 65 percent of the total design capacity.** Total and differential settlements of foundations bearing on continuous limestone, using the recommended bearing pressure, should be about ½ inch or less. Once the design is finalized, we recommend allowing us to review the plans and specifications.

Table 2 – Generalized Design Parameters for Competent Bedrock

Bedrock Description	Net Allowable Skin Friction, PSF	Net Allowable Uplift Skin Friction, PSF	Net Allowable Bearing Capacity, PSF	Lateral Bearing Capacity, PSF/ft	Minimum Rock Socket Length (ft)
Gray Limestone with Dolomite seams and Shale partings	3,000	1,500	85,000	600	3

General Construction Considerations

Given that drilled shafts are anticipated to bear upon limestone bedrock, the drilled shafts should be placed the same day that they are open or no later than 12 hours after opening. Shafts remaining open longer than 12 hours may be required to be over-excavated 1 additional vertical foot deeper into the bedrock due to the weathered limestone encountered. If the rock socket of the shafts appears to be degraded within the first 12 hours after opening, an additional 1 vertical feet of over-excavation will be required. It is imperative to excavate and place concrete the same day to ensure the bearing is protected from wet weather that could potentially cause degradation of the limestone.

Construction Considerations (Dry Method)

- Clean the foundation bearing area so it is nearly level or suitably benched and is free of ponded water or loose material.
- Provide a minimum drilled shaft diameter of 30 inches for cleaning, bottom preparation, and inspection. If the drilled shaft is less than 36 inches an air test hole can be performed either with an air track rig or by coring to observe the end bearing conditions at each drilled shaft.
- Make provisions for ground water removal from the drilled shaft excavation. Ground water conditions at this site will require the use of special procedures to achieve a satisfactory foundation installation.

- If water is flowing into the drilled shaft at less than 20 gallons per minute, pumps may be used to maintain less than 2 inches of water in the drilled shaft during cleaning and inspection. After approval of the bearing surface, the pumps should be pulled, and concreting commenced immediately.
- If more than 20 gallons per minute are flowing into the drilled hole, the water level should be allowed to stabilize before attempting to place the concrete. For this condition, concrete placement should be accomplished using a tremie pipe or concrete pumping equipment.

- Specify concrete slumps ranging from 4 to 7 inches for the drilled shaft construction.
- Retain Solid Ground to observe foundation excavations after the bottom of the hole is leveled, cleaned of any mud, and dewatered.
- Install a temporary protective steel casing to prevent side wall collapse, prevent excessive mud and water intrusion, and to allow workers to safely clean and inspect the drilled shaft.
- Clean the socket "face" prior to concrete placements. Cleaning will require washing if a mud smear forms on the face of the rock. Solid Ground should approve the rock socket surface prior to concrete placement.
- The protective steel casing may be extracted as the concrete is placed provided a sufficient head of concrete is maintained inside the steel casing to prevent soil or water intrusion into the newly placed concrete.
- Direct the concrete placement into the drilled hole through a centering chute to reduce side flow or segregation.
- Solid Ground recommends a 30 percent concrete overage allowance for seams and cracks in surrounding bedrock.

Construction Considerations (Slurry Method)

- Provide a temporary steel casing to prevent side wall collapse, above the ground water level.
- Prior to drilling, install the temporary steel casing to a minimum depth of 10 feet below the expected ground water level using driving techniques.

- Use a bentonite slurry suspension to support the uncased portion of the drilled shaft.
- Circulate or agitate the bentonite slurry to prevent silt- and sand-sized particles from settling of the suspension prior to concreting.
- Pump or tremie the concrete to the bottom of the driller shaft. If a tremie is used, place a plug in the tremie pipe to reduce exposure of the concrete to water.
- Use a concrete mix with a design slump of 5 to 7 inches for drilled shaft concrete.
- Extract the temporary steel casing as the concrete is placed. Maintain a positive head of concrete above the casing bottom as the casing is extracted.
- The protective steel casing may be extracted as the concrete is placed provided a sufficient head of concrete is maintained inside the steel casing to prevent soil or water intrusion into the newly placed concrete.
- Overfill the drilled shaft with concrete to aid in wasting drilled shaft concrete contaminated by exposure to the slurry solution and suspended sediment. We recommend that project planning include a minimum of 15 percent concrete waste. The actual quantity of contaminated concrete removed from the drilled shaft should be governed by site observations of the geotechnical engineer monitoring the drilled shaft installation.
- Solid Ground recommends a 30 percent concrete overage allowance for seams and cracks in surrounding bedrock.

Rock Excavation

Our borings encountered varying depth to refusal and weathered rock conditions. Our experience with the underlying bedrock formation indicates the rock will be slightly to moderately weathered. Typically, an average depth of rock removal of ½ to 2 shaft diameters should be anticipated to provide a level bottom and rock suitable to achieve the allowable bearing pressure provided our elevations for end bearing are met. In some cases, depth of rock removal may extend to 4 to 5 shaft diameters due to poor quality rock near the bedrock surface.

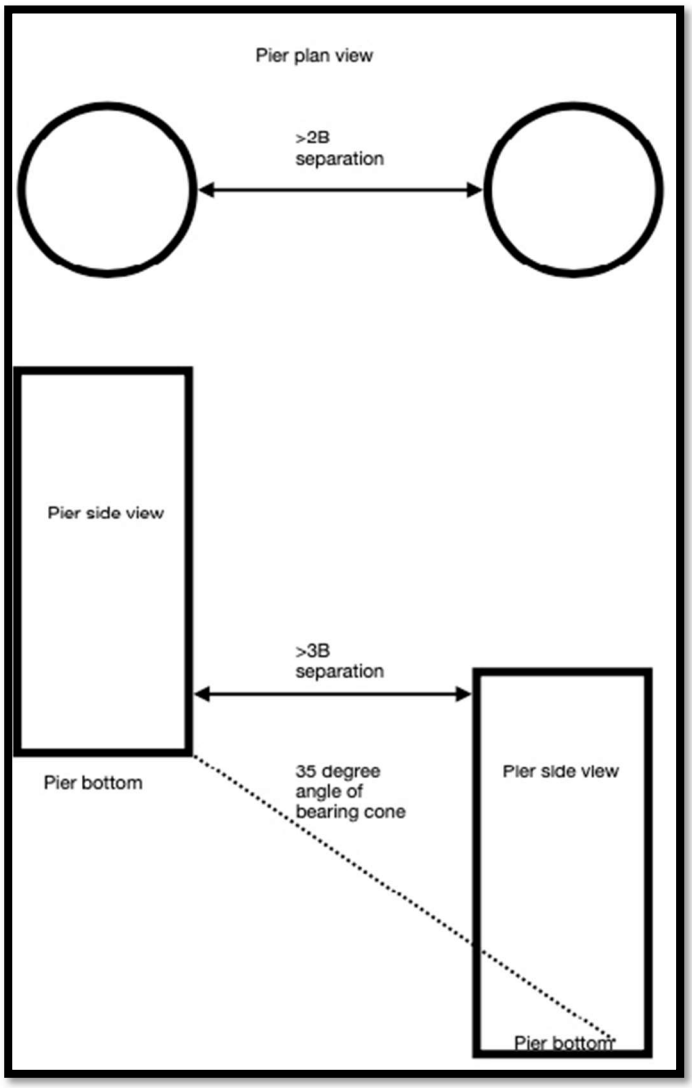
Our experience indicates general drilled shaft construction and delineation of "rock" in the excavation is greatly facilitated if suitable drilling equipment is used. We recommend the use of a drill capable of producing at least 500,000-inch-pounds of torque and 35,000 pounds of

downward force. Additionally, we recommend that rock be defined as material which cannot be penetrated by a heavy-duty earth auger with hardened teeth at a rate in excess of 3 inches per minute. For mass rock removal, the rock cores sampled encountered seams of dolomite, shale, and clay. **We anticipate dampen hoe-ramming efforts and slow down hoe-ramming production. This should be accounted for by the contractor during rock removal.**

Spacing Requirements

Due to the Karst geological setting and fractured bedrock encountered, we recommend a minimum center-to-center pile spacing of 2D pile diameters. This restriction is necessary to limit surface heave, to enhance the bearing efficiency of the individual piles, and to reduce the possibility of damaging previously installed piles. In addition, we recommend no shaft bottoms can intersect a cone of rupture (35-45 degrees from bottom for fractured limestone) of another shaft bottom within 3B. Please refer to the following Diagram.

Diagram 1



Quality Control Requirements

Each drilled shaft should be excavated to appropriate bearing medium as outlined in this section and be inspected by Solid Ground. We recommend that all drilled shaft locations to be pre-drilled using air test or coring methods to remove the need for costly and time-consuming down hole inspections. **We do not recommend downhole inspections**. Solid Ground personnel performing inspections can determine in the field if the shaft is on appropriate bearing material or if the shaft needs to be excavated deeper. As previously stated, we recommend either rock coring or a 1½-inch-diameter, 10 feet long probe holes into the exposed limestone rock at column locations. These probe holes are usually drilled with a pneumatic percussion drill. The geotechnical engineer will evaluate the condition of the bearing material.

We recommend that the drilled shaft construction be observed by Solid Ground. The observation should address the following items:

- Correct plan dimensions
- Plumbness within tolerances
- Materials excavated agree with borings
- Statement of bottom cleanliness
- Construction procedure

Discussion with Design Team for Drilled Shafts

Due to the complexity and heavy loads anticipated for this structure we recommend that the structural engineer provide a detailed foundation loading condition per shaft and re-evaluate recommendations per loading per shaft prior to issuing final plans for submittal. There is a possibility that the re-evaluation could have cost savings to the owner.

L-Pile Parameters for Drilled Shafts

We recommend that an L-Pile analysis be performed to assist the structural engineer in designing the drilled shafts. We offer the following soil and rock parameters for use in this analysis in Table 3.

Table 3 – L-Pile Analysis Parameters

Material	Effective Unit Weight, PCF	Soil Cohesion, PSF	Uniaxial Compressive Strength, PSI
Lean Clay (CL)	110	700	N/A
Silt (ML)	100	500	N/A
Vuggy Limestone	160	N/A	10,000

5.2.2 Foundation Recommendations - Shallow Footings bearing on Bedrock

We understand that due to the relatively shallow bedrock depths and the basements that the structure will utilize, there are potential cost and schedule savings to be had by placing shallow foundations directly on bedrock. The concern with placing foundations directly on top of the weathered bedrock is the available bearing capacity of the bedrock is not a monolith. We are providing two allowable bearing capacities for shallow foundations bearing directly on bedrock. **A 15,000 PSF maximum net allowable bearing pressure can be utilized throughout the project on the weathered bedrock surface. An 85,000 PSF maximum net allowable bearing pressure can be utilized on competent bedrock that has been approved by the Geotechnical Engineer of Record and has 10-foot test holes performed at a rate of 1 per 50 square feet of foundational area.**

A detailed settlement analysis was beyond the scope of this report. Based on the assumed structural loads, the available site grading information, the recommended bearing pressure, knowledge of the site's development, and empirical correlation for the subsurface conditions encountered beneath the proposed structure, we estimate the total and differential settlements of the foundation to be about ½ inch or less.

Once the design is finalized, we recommend allowing Solid Ground the opportunity to review the plans and specifications.

Construction Considerations

The following construction considerations are recommended:

- Continuous footings should be at least 24 inches wide and 12 inches thick.
- **All exterior footing bottoms should be at least 24 inches below the lowest adjacent exterior grade** for protection against frost penetration.
- The foundation bearing area should be cleaned so it is nearly level and is free of ponded water and loose material.
- Dewatering methods will be necessary if the foundation excavation takes place during wet weather.
- Solid Ground should be on site while the foundation construction is performed.

5.2.3 Foundation Recommendations - Shallow Wall Footings (Isolated from Structure)

The in-situ soils are appropriate for support of the lightly loaded wall foundations. The foundation bearing elevation may need to be extended to up to 5 feet below finished grade for sufficient bearing strength and to penetrate the low consistency material and bear upon stiff or better soils.

It is recommended that foundations bear on stiff or better natural soils or engineered fill. **We recommend the use of a maximum net allowable bearing pressure of 1,500 PSF (pounds per square foot) for foundations bearing on these materials.**

A detailed settlement analysis was beyond the scope of this report. Based on the assumed structural loads, the available site grading information, the recommended bearing pressure, knowledge of the site's development, and empirical correlation for the subsurface conditions encountered beneath the proposed structure, we estimate the total settlements of the foundation to be about one inch or less. Differential settlements are estimated to be about ½ inch or less.

Once the design is finalized, we recommend allowing Solid Ground the opportunity to review the plans and specifications.

Construction Considerations

The following construction considerations are recommended:

- **Foundations utilizing soils as bearing should be isolated from the structure to decrease settlement issues.**
- **All foundations should bear on suitable natural soils or a bearing medium such as lean concrete or graded stone (suitable bearing medium).**
- **Some cave is anticipated during the foundation excavations. Construction plans should adequately plan for the additional haul off, as well as the additional quantity of concrete. It is recommended to place concrete soon after excavations are completed to limit the cave in potential. If a cave in does occur, the material should be removed prior to placement of lean concrete. Solid Ground should observe this remediation.**
- Perform Dynamic Cone Penetrometer (DCP) testing every 20 feet in isolated continuous footing locations to confirm recommendations for bearing capacity. It should be anticipated that some of the footing bearing depths may need to be deepened up to 5 feet below finished grade.
- Continuous footings should be at least 24 inches wide and 12 inches thick.
- **All exterior footing bottoms should be at least 24 inches below the lowest adjacent exterior grade** for protection against frost penetration.
- The foundation bearing area should be cleaned so it is nearly level and is free of ponded water and loose material.
- Dewatering methods will be necessary if the foundation excavation takes place during wet weather.
- Solid Ground should be on site while the foundation construction is performed.

5.3 Slab-on-Grade

We assume that there will be two slab-on-grade loading conditions within the Cancer Treatment Center. Some slabs will be utilized for moderate loads of 250 pounds per square foot maximum and others will be utilized for heavy loads of 500 pounds per square foot maximum. The parking garage slabs-on-grade will consist of concrete paving and is discussed in the pavements section of this report. If this assumption is incorrect, Solid Ground should be contacted to modify recommendations.

- If the site soils are exposed to wet weather conditions or continuous construction traffic, the soils have potential to degrade and will lose their strength. This could require a more robust subgrade improvement design.
- Subgrade remediation is anticipated and will likely be required due to construction means and methods.
- It is imperative that dewatering be continuous and construction traffic be controlled to limit damage to the subgrade.
- The means and methods of construction that will be performed by others will heavily dictate the suitability and sustainability of the site conditions and building service life during and after construction.
- The bearing soils for the slabs-on-grade are plastic in nature and can heave if allowed to become inundated with moisture. Perimeter foundations and walls should extend a minimum of 24 inches below the lowest adjacent exterior grade to reduce the possibility of heave.

The following recommendations should be followed:

- Solid Ground should observe the finished subgrade once grading is completed. If excessive pumping and/or rutting is observed remediation may be required. Typical remediation methods consist of undercutting the unsuitable soil and placing recompacted soil or granular material.
- If construction is to take place during wet periods of the year, there is a potential that remediation methods will be required to stabilize the soil subgrade. Solid Ground should be consulted to assist in selecting the method most appropriate for site conditions. These methods may consist of any or combination of the following:
    - Tensar geogrid reinforcement.
    - "Walking" No. 2 stone into the soft subgrade.
    - Application of compacted DGA.
- It is imperative that quality control be performed specifically for the slab-on-grade to ensure that moisture contents, as well as compaction efforts, are within optimum.
- For the moderately loaded slabs-on-grade:
    - It is recommended that the floor slab be constructed with an open graded stone base of a minimum of **8 inches** in thickness.
    - The floor slab should be constructed with a minimum of **5 inches** of reinforced concrete.

- A subgrade modulus, *k,* of 80 pounds per cubic inch (PCI) for design of the floor slab supported by granular material.

- For the heavily loaded slabs-on-grade:
  - It is recommended that the floor slab be constructed with an open graded stone base of a minimum of **10 inches** in thickness.
  - The floor slab should be constructed with a minimum of **7 inches** of reinforced concrete.
  - A subgrade modulus, *k,* of 100 pounds per cubic inch (PCI) for design of the floor slab supported by granular material.
- Control joints should be placed per the most recent ACI standards and guidance.
- The floor slab should be fully ground-supported. This will reduce the possibility of cracking and displacement of the floor slab due to differential settlement.

It is recommended that a proof roll be performed prior to placing stone to serve as the slab working base, and again immediately prior to constructing the slab.

5.4 Seismic Site Classification

As requested, a shear wave velocity analysis was conducted using Refraction Microtremor (ReMi) that provides a simplified subsurface velocity characterization. Using this method, we performed the following:

- Collection of field data using seismic refraction equipment with geophone arrays. With appropriate spacing, the vertical shear waves velocity layers were determined for depths of approximately 100 feet.
- Soil/rock contacts and contrasts between stronger and weaker geologic material layers were interpreted from the collected data.
- Two (2) survey runs were completed at the site within the planned footprints of the proposed Cancer Treatment Center (Line 1) and parking garage (Line 2).
- The below equation was used to calculate the soil/rock shear wave velocity (v_s method) for IBC Site Classification.

$$\overline{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} d_i / v_{si}}$$

d_i = The thickness of any layer between 0 and 100 feet
v_{si} = The shear wave velocity in feet per second

Table 4 shows the average shear wave velocity data obtained during the field survey along each run and Table 5 indicates the IBC 2018 basis for classification.

Table 4 – Survey Results

Run	Soil/Rock Shear Wave Velocity, v_s, (ft/s)
1	3,347
2	3,142
Average	**3,244**

Table 5 – Site Classification Definition

Site Classification	Soil/Rock Profile Name	Soil/Rock Shear Wave Velocity, vs, (ft/s)
A	Hard Rock	$v_s > 5{,}000$
B	Rock	$2{,}500 < v_s < 5{,}000$
C	Very Dense Soil and Soft Rock	$1{,}200 < v_s < 2{,}500$
D	Stiff Soil	$600 < v_s < 1{,}200$
E	Soft Soil	$v_s < 600$

The IBC 2018 guidelines allow for the site seismic classifications to be determined through an average of the shear wave velocities for the upper 100 feet of strata. The average shear wave velocity for this site is 3,244 ft/s which qualifies the site for a Seismic Site Classification of "B". The IBC guidelines state that a Seismic Site Classification B can only be used when the soil thickness cannot exceed 10 feet between the rock surface and the bottom of foundation concrete. **With the understanding the foundations will bear unto limestone bedrock, we recommend a Seismic Site Classification of "B".**

5.5 Below Grade Walls

Based on our understanding of the project, below grade walls will be required for the basement for the Cancer Treatment Center, the parking garage, and the utility tunnel.

Equivalent Fluid Pressures (EFP)

We do not recommend undrained conditions. If undrained conditions are deemed to be designed, we should be contacted to provide additional recommendations. The following table (Table 6) presents EFP for at-rest, passive and active conditions. For the drainage granular backfill, these values assume that a "full" wedge of the material is present behind the wall (Figure 9). The wedge is defined as 2 feet from the base of the wall to a 1:2 (H:V) slope upward.

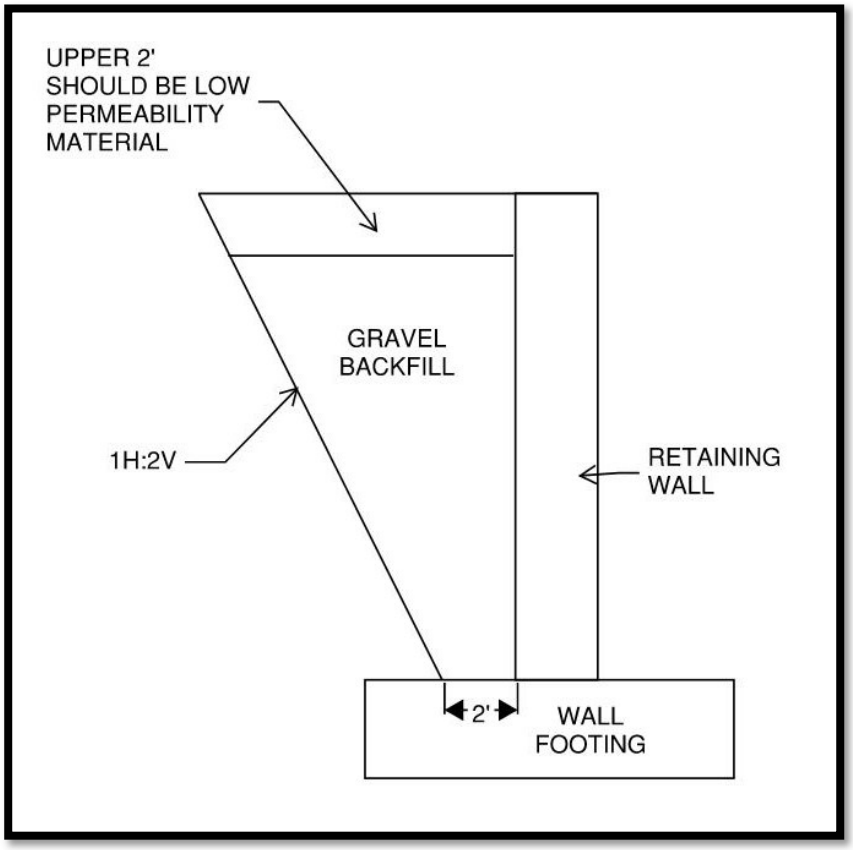


Figure 9: Retaining Wall "Wedge"

Surcharge loads generated by construction equipment and adjacent structures and infrastructure must also be considered in the design, we recommend surcharge loads be applied as a wedge in the design. In addition, a factor of safety should also be included as part of the design. Both the factor of safety and surcharge loads are not accounted for in the scope

of this study. A coefficient of friction between limestone bedrock and concrete of 0.45 can be utilized and a coefficient of friction between clay soil and concrete of 0.30 can be utilized.

We are assuming the majority of the retaining walls are heavily loaded (greater than 1,000 kips) and will be supported by drilled shafts. It is recommended that the below grade wall foundations utilize foundation recommendations as detailed in our report in Section 5.2. However, some of the retaining walls are lightly loaded (less than 5 kips) and will be soil supported. The soil supported retaining walls should bear on stiff or better in-situ clay or engineered fill. **We recommend the use of a maximum net allowable bearing pressure of 1,500 PSF (pounds per square foot) for shallow foundations bearing on stiff or better in-situ clay or engineered fill.**

Table 6 – Equivalent Fluid Pressures

Backfill Material	At Rest (PCF) Drained Condition	Active (PCF) Drained Condition	Passive (PCF) Drained Condition
Anticipated Bedrock sloping towards the wall (Φ = 38 ◦)	50	30	500
Anticipated Well Graded Gravel sloping towards the wall (Φ = 38 ◦)	50	30	600
Anticipated Clay soil sloping towards the wall (Φ = 25 ◦)	70	50	300

Free Drainage Granular Material

A free drainage backfill material should preferably be "GW" as classified by the USCS, so that it will be free draining and exhibit an angle of shear resistance of 38 degrees or more. The material should have less than 3 percent passing the No. 200 sieve and less than 30 percent passing the No. 40 sieve. The No. 40 sieve material should be non-plastic.

Wall drainage systems should consist of a filtered granular backfill (No. 57 size crushed stone) by use of geotextile fabric. The drainage backfill should extend to within 2 feet of the ground surface. Compacted structural fill should be placed over the drainage backfill to prevent direct surface water inflow.

Compaction within five feet of walls should be accomplished by using hand compaction equipment.

Drainage Requirements

To achieve the "drained" condition, an outlet drain at the base of the wall in conjunction with a collector pipe that drains the water away from the structure should be constructed. The drains should be filtered and protected against potential erosion. **We highly recommend drainage behind the wall**. To provide drainage behind the wall, construct a vertical section of crushed stone or gravel approximately 18 inches wide behind the wall with perforated drainpipe located at the foundation level. The granular wall backfill material should be capped with 12 to 24 inches of low plasticity clay to minimize infiltration of surface water runoff behind below grade walls. As with any drainage system, the built-up water will need to be conveyed from behind the wall through a gravity drain or sump pump system.

It should be noted that groundwater dewatering methods will require a more extensive and robust wall to accommodate hydrostatic pressure in conjunction with a permanent drainage system.

If drained conditions cannot be achieved, we should be contacted immediately to provide additional recommendations.

5.6 Pavement Recommendations

5.6.1 General

Based on our experience with similar traffic loading (assumed) and subsurface conditions, the subgrade soils are assumed to have a CBR of 3.0 for the pavement analysis based on SPT correlation. We anticipate that there will be some localized subgrade remediation required to achieve the CBR value of 3.0. American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures (1993) was used for the analysis. The assumptions are listed below for the pavement analysis.

If the following assumptions are incorrect, Solid Ground should be contacted to provide additional recommendations.

- Initial Serviceability of 4.2
- Resilient Modulus of 4,500

- Terminal Serviceability of 2.0
- Reliability of 85%
- Life of 20 years
- Maximum Estimated Equivalent Single Axe Load (ESAL's) of 200,000 for Heavy Duty, with following assumptions:
    - 1 Garbage truck per day
    - 10 Ambulances per day
    - 25 Buses per day
    - 5 Box trucks per day
    - 2 Semi Trailers per day
    - 20 Package Delivery Vehicles per day
    - 2,000 Passenger Cars per day

5.6.2 Flexible Asphalt Pavements

Based on the design assumptions detailed above, we recommend the following asphalt pavement sections in Table 7:

Table 7: Heavy Duty Asphalt Pavement Section

Material	Heavy Duty Thickness (Inches)
Asphalt Surface Course	2.0
Asphalt Base Course	2.0
Compacted Crushed Stone Base	10.0
*1 Layer of Tensar TX150 and Geogrid Filter Fabric	

Indicates typical remediation methods for soft soils identified during proof rolling. Not required if proof rolls indicate stable subgrade conditions.

5.6.3 Rigid Concrete Pavements

Based on the assumptions given in Section 5.6.1, the following concrete pavement sections are recommended in Table 8:

Table 8: Heavy Duty Rigid Reinforced Concrete Pavement

Material	Heavy Duty Thickness (Inches)	Designed Compressive Strength (psi)
Concrete	8.0	4,000
Compacted Crushed Stone Base	10.0	
*1 Layer of Tensar TX150 and Geogrid Filter Fabric		

Indicates typical remediation methods for soft soils identified during proof rolling. Not required if proof rolls indicate stable subgrade conditions.

We recommend the any pad to be used for truck turn around be constructed of reinforced concrete.

5.7 Plan Review

To better assure conformance of the final design documents with the recommendations contained in this report, and to better comply with the building department's requirements, Solid Ground should review the completed project plans prior to construction. The plans should be made available for our review as soon as possible after completion so that we can better assist in keeping your project schedule on track.

We recommend that the following project-specific note be added to the architectural, structural, and civil plans: "The geotechnical aspects of the project, including site grading, utility and foundation excavations, slab on grade construction, placement and compaction of engineered fill, installation of site drainage should be performed in accordance with the recommendations of the *"Revised Geotechnical Report prepared by Solid Ground Consulting Engineers, PLLC, dated August 1, 2023."*

5.8 Construction Monitoring and Observations

Based on experience, in order to obtain the Certificate of Occupancy for this development, you will be required to directly contract a qualified and certified inspection firm to provide special inspection items consisting of observing the following:

- Foundation Construction
- Concrete Placement
- Reinforcement Placement
- Masonry Construction
- Steel Construction

It is advantageous to the owner to contract with Solid Ground to provide construction monitoring and observations for this project. Some of those benefits are as follows:

- As the Geotechnical Engineer of Record (GEoR) for this project, we will provide confirmation that subsurface conditions exposed during construction are substantially the same as those interpolated from our limited subsurface exploration, on which the analysis and design were based.
- The recommendations in this report are based on limited subsurface information. The nature and extent of variation across the site may not become evident until construction. If variations are then exposed, it will be necessary to re-evaluate our recommendations. If subsurface conditions differ from those anticipated, we as the GEoR will provide recommendations if deemed necessary.

6.0 Report Limitations

This report has been prepared for the exclusive use of Mr. Raymond Haunsz for specific application to the project site. Our recommendations have been prepared using generally accepted standards of geotechnical engineering practice in the Commonwealth of Kentucky. No other warranty is expressed or implied.

The recommendations provided are based on the subsurface information and other findings obtained by Solid Ground as well as information provided by you. If there are revisions to the plans for this project or if subsurface conditions detailed in this report are encountered during construction that are different than our exploration, we should be notified immediately to modify the foundation recommendations if deemed necessary. We cannot be held responsible for the impact of those conditions on the project if those impacts are not made known to us.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials. Any statements in this

report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

7.0 Associated Geotechnical Risks

The analytical tools which are used by the geotechnical engineer in this area are generally empirical and must be used in conjunction with professional engineering judgment and experience. Therefore, the recommendations presented in this geotechnical exploration should not be considered risk-free and are not a guarantee that the proposed structure will perform as planned. The engineering recommendations presented in this are based on the information gathered during the subsurface exploration, information provided by you and experience with similar projects.

APPENDICES

APPENDIX A – SOIL BORING LOGS

APPENDIX B – ROCK CORE PHOTOS

APPENDIX C – CROSS SECTIONS

APPENIX D – ROCK CONTOUR MAPS

APPENDIX E – LABORATORY RESULTS

APPENDIX F – SEISMIC REFRACTION SURVEY

Soil Boring: B-1

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.030954 / -84.511656
Location Accuracy: Surveyed	Boring Diameter: 8"	

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 967.91'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Atterberg Limits (LL-PL-PI)	Moisture Content (%)
		Asphalt 0.3								
		Aggregate Base 1.0								
		Soft, brown, moist, **Lean Clay** (CL)	2'							
965				B1-1	2-2-2	4	X	B1-1		29.3
		4.0	4'							
	5	Stiff, brown, slightly moist to moist, **Gravelly Elastic Silt** (MH), trace chert fragments		B1-2	4-6-6	12	X	B1-2	51-38-13	32.7
		6.5	6.5'							
960		Firm, yellowish brown, moist, **Silty Clay** (CH-MH), some chert fragments		B1-3	4-4-5	9	X	B1-3		27.5
		9.0	9'							
	10	Stiff, yellowish brown, moist, **Elastic Silt** (MH)		B1-4	1-10-50	60	X			
955		Auger Refusal at 10.5'								
	15									
950										
	20									
945										
	25									
940										

REMARKS

Water Levels

▽ - ***Free Water was not Encountered***

▼ -

Soil Boring: B-2

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.030961 / -84.512031
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 972.05'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
970		**Gravel** 0.2 Soft, brown, moist, **Lean Clay** with **Gravel** (CL)	2'								
			4'	B2-1	2-2-3	5					
	5	...firm		B2-2	3-3-5	8				B2-2	25.7
965		6.5 Stiff, yellowish brown, moist, **Silty Clay** (CL-ML), some iron inclusions	6.5'	B2-3	5-7-10	17					
		9.0	9'								
	10	Stiff, yellowish brown, moist, **Sandy Silt** (ML), some iron inclusions		B2-4	5-7-11	18				B2-4	38.4
960		14.0	14'								
		Dark gray, Very weathered rock	15'	B2-5	5-50	55/12					
	15	Auger Refusal at 15.0' 15.0 Limestone, moderately to slightly weathered, light to medium grey		B2-R1			86	41			
955											
	20	Vertical Fracture 19.4'-19.9'									
950										RCB2	
	25	Assumed top of 85 KSF bedrock 26.0	25.5'								
945		Dolomtic limestone, fresh to slightly weathered, light to medium grey		B2-R2			95	80			

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-2

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.030961 / -84.512031
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 972.05'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
940	35		Dolomtic limestone, fresh to slightly weathered, light to medium grey 31.0 Limestone, fresh to slightly weathered, medium grey, fossiliferous	30'	B2-R2			95	80			
935			Bottom of Borehole at 36.0'									
930	40											
925	45											
920	50											
915	55											

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-3

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.030819 / -84.511501
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 968.31'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Asphalt 0.4									
		Aggregate Base 1.1									
		Firm, brown, moist, **Lean Clay** (CL)	2'								
965				B3-1	4-4-5	9				B3-1	25.1
		4.0	4'								
	5	Stiff, yellowish brown, **Sandy Silt** (ML), with chert fragments		B3-2	8-7-10	17					
		6.5	6.5'								
960		Firm, yellowish brown, moist **Silt** (ML)		B3-3	4-6-6	12				B3-3	21.8
			8.6'								
		Auger Refusal at 8.6' 8.6		B3-R1			86	74			
	10	Limestone, slightly weathered, medium grey									
955											
		Assumed top of 85 KSF bedrock									
	15	15.6	15.6'								
		Limestone, fresh, light to medium grey,		B3-R2			96	85			
950											
	20										
945											
	25	fossiliferous									
		Bottom of Borehole at 25.6'									
940											

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-4

SOLID GROUND

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.030680 / -84.512171
Location Accuracy: Surveyed		

Rig Type	Diedrich D-50
Tooling	3-1/4" Hollowstem Auger
Surface Elevation	977.30'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
975			**Gravel** 0.3 Firm, brown, moist, **Lean Clay** (CL)	2'						
					B4-1	2-3-3	6	X		
				4.5'						
	5				B4-2	2-2-4	6	X	B4-2	29.1
970				7'						
			...Stiff, trace iron inclusions		B4-3	4-6-6	12	X		
				9.5'						
	10		...some iron inclusions		B4-4	3-4-7	11	X	B4-4	22.4
965										
			Auger Refusal at 12.5'							
	15									
960										
	20									
955										
	25									
950										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-5

SOLID GROUND

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.030538 / -84.511427
Location Accuracy: Surveyed		

Rig Type	Diedrich D-50
Tooling	3-1/4" Hollowstem Auger
Surface Elevation	973.96'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: Sample Type	Lab: Sample Number	Lab: Moisture Content (%)
			Gravel 0.3							
			Firm, brown, moist, **Lean Clay** (CL)	2'						
970				4'	B5-1	1-3-4	7	X		
	5				B5-2	2-2-6	8	X	B5-2	33.8
				6.5'						
					B5-3	3-4-5	9	X		
965				9'						
			...Firm, light brown		B5-4	3-6-5	11	X	B5-4	33.2
	10									
960			Auger Refusal at 13.0'							
	15									
955										
	20									
950										
	25									
945										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-6

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.030434 / -84.511808
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 975.81'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Atterberg Limits (LL-PL-PI)	Moisture Content (%)
975		**Topsoil** 0.3										
		Firm, brown, moist, **Lean Clay** (CL)	2'									
				B6-1	2-4-4	8				B6-1	40-27-13	23.9
			4.5'									
970	5	...stiff, trace iron inclusions		B6-2	4-7-7	14						
			7'									
				B6-3	7-9-11	20				B6-3		23
			9.5'									
965	10		11'	B6-4	4-6-10	16						
		Auger Refusal at 11.0' 11.0		B6-R1			74	65				
		Limestone, moderately to slightly weathered, medium grey										
		Clay filled void 12.0'-13.7'										
		Assumed top of 85 KSF bedrock										
960	15											
	20	20.0	20'									
955		Limestone, fresh, medium to dark grey		B6-R2			100	80				
	25											
950												
	30											
945		Bottom of Borehole at 30.0'										

REMARKS

Water Levels

▽ - ***Free Water was not Encountered***

▼ -

Soil Boring: B-7

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.030447 / -84.512270
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 978.10'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Asphalt 0.4							
		Aggregate Base 1.1							
		FILL, soft, light gray, dry **Gravel**	2'	B7-1	2-3-2	5	X		
975			4.5'	B7-2	1-2-1	3	X		
	5	6.0							
		Firm, brown, moist, **Fat Clay** (CH)	7'	B7-3	2-4-6	10	X	B7-3	43
970			9.5'	B7-4	4-6-9	15	X	B7-4	24.1
	10	...stiff							
965									
		Auger Refusal at 13.6'							
	15								
960									
	20								
955									
	25								
950									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-8

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.030177 / -84.511542
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 977.53'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Asphalt 0.3									
		Aggregate Base 0.5	2'								
975		Firm, brown, moist, **Lean Clay** (CL), Trace iron inclusions		B8-1	2-4-5	9				B8-1	27
			4'								
	5			B8-2	3-4-5	9				B8-2	31.3
			6.5'								
970		...Very Stiff, no iron inclusions		B8-3	5-9-13	22					
		9.0	9'								
	10	Firm, brown, moist, **Fat Clay** (CH)		B8-4	4-6-7	13					
		12.0	12'								
965		Limestone, fresh, light to medium grey Auger Refusal at 12.0'		B8-R1			93	60			
	15										
960											
	20	20.5	20.5'								
		Limestone, fresh, light to medium grey		B8-R2			98	89			
955											
	25										
950											
	30										
		Bottom of Borehole at 30.5'									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-9

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.030044 / -84.511950
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 982.16'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
980	0		**Topsoil** 0.3 Firm, brown, moist, **Fat Clay** (CH)	2'						
				4'	B9-1	2-3-4	7	X		
	5			6.5'	B9-2	3-4-4	8	X		
975					B9-3	2-4-6	10	X	B9-3	34.8
				9'						
	10			14'	B9-4	2-4-5	9	X		
970					B9-5	3-3-3	6	X	B9-5	36.6
	15		Auger Refusal at 16.0'							
965										
	20									
960										
	25									
955										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-10

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.029950 / -84.512435
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 987.83'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Gravel 0.2									
985		Stiff, brown, moist, **Lean Clay** (CL)	2'								
				B10-1	6-7-8	15				B10-1	17.9
			4'								
	5	...some iron inclusions		B10-2	5-7-10	17					
			6.5'								
980				B10-3	4-8-13	21				B10-3	31.9
			9'								
	10			B10-4	5-9-10	19					
975			14'								
	15			B10-5	4-5-8	13					
970			19'								
	20	...soft 20.4	20.4'	B10-6	1-1-50	51					
965		Limestone, fresh to slightly weathered, medium grey Auger Refusal at 20.4'		B10-R1			100	78			
	25	Assumed top of 85 KSF bedrock									
960											
	30	30.4	30.4'								
		Limestone, fresh, medium grey		B10-R2			100	86			

REMARKS

Water Levels

▽ - ***Free Water was not Encountered***

▼ -

Soil Boring: B-10

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.029950 / -84.512435
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 987.83'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: % Recovery	Samples: % RQD	Samples: Sample Type	Lab: Sample Number	Lab: Moisture Content (%)
955			Limestone, fresh, medium grey	32'	B10-R2			100	86			
	35		Dolomite Layer at 33.0' to 33.5'									
950												
	40		Bottom of Borehole at 40.4'									
945												
	45											
940												
	50											
935												
	55											
930												
	60											
925												

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-11

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029872 / -84.511681
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 982.52'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Topsoil 0.3									
		Firm, brown, moist, **Lean Clay** (CL)	2.5'								
980				B11-1	2-4-5	9			X		
	5		5'								
		...trace iron inclusions		B11-2	3-6-7	13			X		
			7.5'								
975				B11-3	5-7-10	17			X	B11-3	25.6
	10		10'								
				B11-4	4-7-10	17			X		
970											
	15	15.0	15'								
		Firm, yellowish brown, moist, **Silty Clay** (CL-ML) 17.0		B11-5	3-4-5	9			X	B11-5	33.6
965		Limestone, slightly weathered, medium grey	17'	B11-R1			100	81			
		Auger Refusal at 17.0'									
	20	Dolomite Layer at 18.0' to 18.5'									
		Assumed top of 85 KSF bedrock									
960											
	25	26.5	26.5'								
		Limestone, slightly weathered, medium grey		B11-R2			100	86			
955											

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-11

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029872 / -84.511681
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 982.52'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: % Recovery	Samples: % RQD	Samples: Sample Type	Lab: Sample Number	Lab: Moisture Content (%)
950	35		Limestone, slightly weathered, medium grey Dolomite Layer at 30.0' to 31.0' ...fossiliferous	30'	B11-R2			100	86			
945	40		Bottom of Borehole at 36.5'									
940	45											
935	50											
930	55											
925												

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-12

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029914 / -84.511082
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 974.56'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
			Firm, brown, moist, **Lean Clay** (CL)	2'								
					B12-1	3-4-5	9			X	B12-1	26.1
				4.5'								
970	5		...some iron inclusions		B12-2	5-6-9	15			X		
			7.0	7'								
			Stiff, yellowish brown, moist, **Sandy Silty Clay** (CL-ML), Some iron inclusions		B12-3	5-7-9	16			X	B12-3	26.2
965	10		9.8	9.8'								
			Limestone, slightly weathered, light to medium grey, dolomite seams		B12-R1			100	68			
			Auger Refusal at 9.8'									
			Assumed top of 85 KSF bedrock									
960	15											
955	20		19.8	19.8'								
			Limestone, slightly weathered, light grey, dolomite seams		B12-R2			100	88			
950	25											
945	30		Bottom of Borehole at 29.8'									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-13

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029867 / -84.510678
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 973.67'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Asphalt 0.2							
		Aggregate Base 0.8							
		Soft, dark brown, moist, **Lean Clay** (CL), trace iron inclusions	2'						
970		4.0	4'	B13-1	2-3-3	6	X	B13-1	22.5
	5	Firm to stiff, black, moist, **Fat Clay** (CH), some iron inclusions, and very weathered limestone		B13-2	5-6-6	12	X		
		6.5	6.5'						
965		Hard, light brown, moist, **Sandy Fat Clay** with **Gravel** (CH), trace iron inclusions, some limestone fragments, and very weathered limestone		B13-3	10-15-50	65	X	B13-3	27.5
	10	Auger Refusal at 8.2'							
960									
	15								
955									
	20								
950									
	25								
945									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-14

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029723 / -84.510706
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 975.12'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Atterberg Limits (LL-PL-PI)	Moisture Content (%)
			Gravel 0.2								
			Soft, dark brown, moist, **Lean Clay** (CL)	2'	B14-1	2-2-3	5	X			
970	5		...firm	4.5'	B14-2	3-4-6	10	X	B14-2		27.7
			...with some gravel	7'	B14-3	4-7-50	57	X	B14-3	46-30-16	25.5
965	10		Auger Refusal at 9.4'								
960	15										
955	20										
950	25										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-15

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029627 / -84.511134
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 977.12'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
975		**Gravel** 0.2 Soft, brown, moist, **Fat Clay** (CH), Trace iron inclusions	2'	B15-1	2-3-3	6			
	5		4.5'	B15-2	4-5-9	14		B15-2	24.5
970		...stiff	7'	B15-3	4-6-8	14			
		...no iron inclusions	9.5'	B15-4	15-6-12	18		B15-4	28.4
	10	9.5 Stiff, yellowish brown, moist, **Fat Clay** (CH), Trace iron inclusions and gravel.							
965		Auger Refusal at 11.4'							
	15								
960									
	20								
955									
	25								
950									

REMARKS

Water Levels

▽ - ***Free Water was not Encountered***

▼ -

Soil Boring: B-16

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029443 / -84.510662
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 978.02'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Gravel 0.8									
		Soft, black, moist, **Lean Clay** (CL)	2'								
975				B16-1	1-2-3	5				B16-1	27.3
			4.5'								
	5	...stiff		B16-2	3-4-5	9					
			7'								
970		...with gravel 8.0		B16-3	4-5-10	15				B16-3	30.3
		Soft, yellowish brown, moist, **Fat Clay** (CH) 9.7	9.7'								
	10	Limestone, slightly weathered, light to medium grey Auger Refusal at 9.7'		B16-R1			98	73			
965											
	15										
960											
	20	Assumed top of 85 KSF bedrock 19.7	19.7'								
		Limestone, medium to dark grey		B16-R2			100	94			
955		...Dolomite seam at 19.7' to 23.7'									
	25										
950											
	30	Bottom of Borehole at 29.7'									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-17

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029404 / -84.510948
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 977.80'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
975	0	**Gravel** 0.2 Firm, dark brown, moist, **Lean Clay** (CL)	2'								
				B17-1	3-3-5	8					
			4.5'								
	5			B17-2	3-6-5	11				B17-2	20.9
			7'								
970		...stiff		B17-3	6-7-8	15					
		9.5	9.5'								
	10	Stiff, dark brown, moist, **Fat Clay** (CH)		B17-4	3-7-8	15				B17-4	28.2
			11.3'								
965		Auger Refusal at 11.3' 11.3 Limestone, slightly weathered, light to medium grey Assumed top of 85 KSF bedrock		B17-R1			92	77			
	15										
960											
	20		20.8'								
		Limestone, slightly weathered, medium to dark grey		B17-R2			100	92			
955		...Dolomite seams at 21.0' to 27.0'									
	25										
950											
	30										
		Bottom of Borehole at 30.8'									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-18

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029239 / -84.511331
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 981.56'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
980	0	**Asphalt** 0.6 Aggregate Base 1.2 Firm, brown, moist, **Lean Clay** (CL), some iron inclusisons	2'								
			4'	B18-1	3-3-6	9				B18-1	24.7
	5		6'	B18-2	3-3-4	7					
975		...stiff	9'	B18-3	4-6-7	13				B18-3	32.7
		9.0									
	10	Stiff, brown, moist, **Fat Clay** (CH), some iron inclusisons	12.7'	B18-4	3-4-4	8					
970		Auger Refusal at 12.7' 12.7 Limestone, slightly weathered, light grey		B18-R1			100	72			
	15										
965		Assumed top of 85 KSF bedrock									
	20										
960		22.7	22.7'								
		Limestone, medium grey		B18-R2			98	88			
	25	...Dolomite seam at 24.0' to 24.5'									
955											

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-18

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029239 / -84.511331
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 981.56'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: % Recovery	Samples: % RQD	Samples: Sample Type	Lab: Sample Number	Lab: Moisture Content (%)
950			Limestone, medium grey	30'	B18-R2			98	88			
			Bottom of Borehole at 32.7'									
945	35											
940	40											
935	45											
930	50											
925	55											

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-19

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029103 / -84.510761
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 978.61'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
975	0	**Asphalt** 0.6 Aggregate Base 1.2 Soft, dark grey, moist **Silt** (ML), some iron inclusions, and very weathered limestone 4.0	2'								
			4'	B19-1	1-2-4	6					
970	5	Firm, dark brown, moist, **Elastic Silt** (MH), some iron inclusions 6.5		B19-2	3-3-6	9				B19-2	22.5
			6.5'								
		Stiff, dark brown, moist, **Silty Clay** (CL-ML), some iron inclusions 9.0		B19-3	4-6-9	15					
965	10	Firm, brown, moist, **Fat Clay** (CH), some iron inclusions, and very weathered limestone 12.4	9'	B19-4	3-4-4	8				B19-4	41.2
			12.4'								
		Limestone, slightly weathered, medium grey Auger Refusal at 12.4' ...Quartz deposit at 13.0' Assumed top of 85 KSF bedrock 22.4		B19-R1			100	87			
960	15		22.4'								
955	20	Limestone, slightly weathered, medium grey, fossiliferous ...Dolomite seam at 23.0' to 24.0'		B19-R2			100	97			
950	25										

REMARKS

Water Levels

▽ Water encountered @ 3.5'

▼ -

Soil Boring: B-19

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029103 / -84.510761
Location Accuracy: Surveyed		

Rig Type	Diedrich D-50
Tooling	3-1/4" Hollowstem Auger
Surface Elevation	978.61'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: % Recovery	Samples: % RQD	Samples: Sample Type	Lab: Sample Number	Lab: Moisture Content (%)
			Limestone, slightly weathered, medium grey, fossiliferous	30'	B19-R2			100	97			
945	35		Bottom of Borehole at 32.4'									
940	40											
935	45											
930	50											
925	55											
920												

REMARKS

Water Levels

▽ Water encountered @ 3.5'

▼ -

Soil Boring: B-20

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029055 / -84.511010
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 982.24'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Atterberg Limits (LL-PL-PI)	Moisture Content (%)
980		**Topsoil** 0.3 Soft, dark brown, moist **Silt** (ML), trace iron inclusions	2'									
				B20-1	3-3-3	6						
		4.5	4.5'									
	5	Soft, brown, moist, **Lean Clay** (CL), trace iron inclusions		B20-2	2-1-2	3				B20-2		21.9
975		7.0	7'									
		Firm, brown, moist, **Fat Clay** (CH), trace iron inclusions		B20-3	4-4-7	11						
			9.5'									
	10	...Stiff		B20-4	4-5-7	12				B20-4	50-36-14	29.3
970			12.5'									
		Auger Refusal at 12.5' 12.5 Limestone, slightly weathered, light to medium grey		B20-R 1			45	25				
	15											
965												
	20											
960		22.5	22.5'									
		Limestone, slightly weathered, medium grey		B20-R 2			100	89				
	25	Assumed top of 85 KSF bedrock										
955												

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-20

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029055 / -84.511010
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 982.24'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: % Recovery	Samples: % RQD	Samples: Sample Type	Lab: Sample Number	Lab: Atterberg Limits (LL-PL-PI)	Lab: Moisture Content (%)
950			Limestone, slightly weathered, medium grey	30'	B20-R 2			100	89				
			Bottom of Borehole at 32.5'										
945	35												
940	40												
935	45												
930	50												
925	55												

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-21

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.028903 / -84.511440
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 986.36'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Atterberg Limits (LL-PL-PI)	Moisture Content (%)
985		**Gravel** 0.3 Firm to stiff, brown, moist, **Lean Clay** (CL), trace iron inclusions	2'									
			4'	B21-1	2-4-7	11				B21-1	46-30-16	25.9
980	5		6.5'	B21-2	2-5-7	12						
		6.5 Stiff, brown, moist, **Fat Clay** (CH), some iron inclusions	9'	B21-3	4-6-7	13						
975	10	...light brown 13.0	13'	B21-4	3-6-8	14				B21-4		33.2
		Limestone, slightly weathered, light grey Auger Refusal at 13.0'		B21-R1			100	62				
970	15											
	20	...Dolomite seam at 19.0' 23.0	23'									
965		Limestone, slightly weathered, medium grey Assumed top of 85 KSF bedrock		B21-R2			100	77				
960	25											

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-21

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.028903 / -84.511440
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 986.36'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Samples: Depth of Sample	Samples: Sample Number	Samples: Blow Counts	Samples: Uncorrected N-Value	Samples: % Recovery	Samples: % RQD	Samples: Sample Type	Lab: Sample Number	Lab: Atterberg Limits (LL-PL-PI)	Lab: Moisture Content (%)
955			Limestone, slightly weathered, medium grey	30'	B21-R 2			100	77				
			Bottom of Borehole at 33.0'										
950	35												
945	40												
940	45												
935	50												
930	55												

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-22

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.028813 / -84.511067
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 983.49'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	Sample Type	Lab Sample Number	Lab Moisture Content (%)
980	0	**Asphalt** 0.6								
		Aggregate Base 0.9								
		Stiff, brown, moist, **Lean Clay** (CL), trace iron inclusions	2'							
			4'	B22-ST 1			100			
	5			B22-1	4-5-7	12			B22-1	28.6
		7.0	7'							
975		Stiff, light brown, moist, **Fat Clay** (CH), some iron inclusions		B22-2	4-6-7	13			B22-2	34.7
	10		9.5'							
				B22-3	4-4-5	9				
970		Auger Refusal at 11.7'								
	15									
965										
	20									
960										
	25									
955										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-23

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.028446 / -84.511179
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 986.20'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
985		**Asphalt** 0.6							
		Aggregate Base 0.9							
		Firm, brown, moist, **Fat Clay** (CH), Trace iron inclusions	2'	B23-1	1-3-2	5	X		
			4'						
980	5			B23-2	3-4-4	8	X	B23-2	32.8
			6.5'						
		...Stiff, yellowish brown		B23-3	3-5-7	12	X		
			9'						
975	10			B23-4	2-5-5	10	X	B23-4	27.3
		Auger Refusal at 12.0'							
970	15								
965	20								
960	25								

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-24

SOLID GROUND

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.028644 / -84.511319
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 986.33'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
985			**Asphalt** 0.7							
			Aggregate Base 1.1							
			Stiff, brown, moist, **Fat Clay** (CH), Trace iron inclusions	2'						
				4'	B24-1	3-5-6	11	X	B24-1	24.6
			4.0							
			Limestone fragments and gravel		B24-2	4-5-5	10	X		
980	5		5.5	6.5'						
			Stiff, brown, moist, **Fat Clay** (CH), Trace iron inclusions		B24-3	4-5-8	13	X	B24-3	28.9
				9'						
			...yellowish brown		B24-4	5-5-7	12	X		
975	10									
			Auger Refusal at 12.1'							
970	15									
965	20									
960	25									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-25

SOLID GROUND

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.028500 / -84.511472
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 989.50'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Asphalt 0.6							
		Aggregate base 1.0							
		Stiff, brown, moist, **Lean Clay** (CL)	2'	B25-1	5-6-6	12	X		
985	5		4.5'	B25-2	4-5-7	12	X	B25-2	22.1
		...trace iron inclusions, trace chert fragments	7'	B25-3	4-12-8	20	X		
980	10	...no chert fragments	9.5'	B25-4	5-7-8	15	X	B25-4	32.7
975	15	Auger Refusal at 15.1							
970	20								
965	25								

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-26

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.028826 / -84.511539
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 990.05'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Gravel 0.4							
		Firm, brown, moist, **Lean Clay** (CL), trace iron inclusions	2'						
			4'	B26-1	2-3-4	7	X	B26-1	25.9
985	5	...Stiff		B26-2	3-6-9	15	X		
		6.5	6.5'						
		Stiff, light brown, moist, **Fat Clay** (CH), trace iron inclusions		B26-3	6-7-8	15	X	B26-3	30
			9'						
980	10			B26-4	4-5-8	13	X		
		Auger Refusal at 13.7'							
975	15								
970	20								
965	25								

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-27

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.029090 / -84.511924
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 992.55'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
990	0		Soft, brown, moist, **Lean Clay** (CL)	2'	B27-1	1-2-3	5	X		
	5		...some fractured Limestone, trace iron inclusions	4.5'	B27-2	5-5-3	8	X	B27-2	29.4
			7.0	7'						
985			Soft, yellowish brown, moist, **Fat Clay** (CH), Trace iron inclusions		B27-3	1-1-1	2	X		
	10			9.5'	B27-4	1-3-50	53	X	B27-4	38.8
980			Auger Refusal at 11.2'							
	15									
975										
	20									
970										
	25									
965										

REMARKS

Water Levels

▽ Water encountered @ 9.5'

▼ -

Soil Boring: B-28

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.028643 / -84.512084
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 992.74'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
990	0		Soft, brown, moist, **Lean Clay** (CL)	2'						
				4'	B28-1	2-2-2	4	X	B28-1	25.1
	5		...Firm, trace iron inclusions	6.5'	B28-2	3-5-6	11	X		
985				9'	B28-3	3-8-8	16	X	B28-3	24.4
			9.0							
	10		Firm, brown, saturated, **Fat Clay** (CH), Trace iron inclusions		B28-4	4-4-4	8	X		
980			Auger Refusal at 11.1'							
	15									
975										
	20									
970										
	25									
965										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-29

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.028929 / -84.512323
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 996.63'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
995	0	**Gravel** 0.2 Firm to stiff, light brown, moist, **Lean Clay** (CL), trace iron inclusions	2'								
			4'	B29-1	4-6-10	16				B29-1	32.7
		...trace rock fracgments	5'	B29-2	3-50					B29-2	25.5
990	5	Auger Refusal at 5.0' 5.0 Limestone, slightly weathered, light grey		B29-R1			100	79			
985	10	Assumed top of 85 KSF bedrock									
	15	15.0 Limestone, slightly weathered, light grey	15'	B29-R2			100	79			
980											
975	20										
970	25	Bottom of Borehole at 25.0'									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-30

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/04/2023	Date Completed: 05/04/2023	Lat/Long: 38.028872 / -84.512736
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 998.56'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
995		Firm, brown, moist, **Lean Clay** (CL), Trace iron inclusions	2'						
			4'	B30-1	1-2-3	5			
		4.0							
990	5	Firm, brown, moist, **Fat Clay** (CH), Trace iron inclusions		B30-2	2-3-5	8		B30-2	27.4
			6.5'						
		...yellowish brown		B30-3	3-4-8	12			
			9'						
	10			B30-4	3-50			B30-4	31.2
985		Auger Refusal at 10.3'							
	15								
980									
	20								
975									
	25								
970									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-31

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029430 / -84.512183
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 986.87'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
985	0	**Asphalt** 0.6							
		Aggregate Base 1.2							
		Stiff, brown, moist, **Lean Clay** (CL), trace iron inclusisons	2'						
			4'	B31-1	4-5-7	12	X	B31-1	28.3
	5			B31-2	4-4-7	11	X		
980			6.5'						
			9'	B31-3	2-4-6	10	X	B31-3	31.6
		9.0							
	10	Firm, brown, moist, **Fat Clay** (CH), some iron inclusisons		B31-4	2-3-5	8	X		
975									
		Auger Refusal at 12.5'							
	15								
970									
	20								
965									
	25								
960									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-32

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029529 / -84.512635
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 989.36'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Asphalt 0.5							
		Aggregate Base 1.1	1.5'						
		Firm, brown, moist, **Silty Clay** (CL-ML), some iron inclusions		B32-1	3-3-4	7		B32-1	35.3
985			4'						
	5			B32-2	5-5-6	11		B32-2	29.6
		6.0	6.5'						
		Firm, brown, moist, **Lean Clay** (CL), some iron inclusions		B32-3	50				
980		Auger Refusal at 6.9'							
	10								
975									
	15								
970									
	20								
965									
	25								
960									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-33

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029326 / -84.511712
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 984.30'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Asphalt 0.5								
		Aggregate Base 1.2								
		Stiff, brown, moist, **Lean Clay** (CL), some iron inclusions	2'							
980			4'	B33-ST 1			100			
	5			B33-1	4-8-9	17				
			6.5'							
				B33-2	4-5-8	13			B33-2	32.8
975		9.0	9'							
		Stiff, brown, moist, **Fat Clay** (CH), some iron inclusions		B33-3	3-5-7	12				
	10									
970			14'							
				B33-4	2-3-3	6			B33-4	31.7
	15									
965		Auger Refusal at 17.5'								
	20									
960										
	25									
955										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-34

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029603 / -84.511664
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 984.01'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
980	0	**Gravel** 0.2 Soft, brown, moist, **Lean Clay** (CL)	2'	B34-1	1-2-3	5	X	B34-1	25.5
	5	...Firm	4.5'	B34-2	3-3-6	9	X		
		7.0	7'						
975		Stiff, light brown, moist, **Lean Clay** (CL), Trace iron inclusions		B34-3	3-5-7	12	X	B34-3	36.2
	10		9.5'	B34-4	4-5-8	13	X		
970			14.5'						
	15	...Firm, no iron inclusions		B34-5	4-4-6	10	X		
965		Auger Refusal at 17.8'							
	20								
960									
	25								
955									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-35

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/02/2023	Date Completed: 05/02/2023	Lat/Long: 38.029562 / -84.512377
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 988.49'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	Sample Type	Lab Sample Number	Lab Moisture Content (%)
			Gravel 1.0							
985			Firm, brown, moist, **Lean Clay** (CL), trace iron inclusions	2'	B35-1	3-3-6	9	X	B35-1	32
	5			4'	B35-2	3-4-4	8	X	B35-2	29.5
980			Auger Refusal at 6.1'							
	10									
975										
	15									
970										
	20									
965										
	25									
960										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-36

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/03/2023	Date Completed: 05/03/2023	Lat/Long: 38.029761 / -84.510390
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 975.08'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Concrete 0.4									
		Aggregate Base 1.1									
		Soft, black, moist, **Lean Clay** (CL)	2'								
				B36-1	2-3-4	7					
			4.5'								
970	5			B36-2	3-5-7	12				B36-2	23.1
		7.0	7'								
		Stiff, yellowish brown, moist, **Silty Clay** (CL-ML), With gravel		B36-3	5-5-8	13				B36-3	
			8.6'								
		Auger Refusal at 8.6' 8.6		B36-R1			91	70			
965	10	Limestone, slightly weathered, medium grey									
		Assumed top of 85 KSF bedrock									
960	15	16.1	16.1'								
		Limestone, slightly weathered, light to medium grey		B36-R2			99	82			
		...Dolomite seam at 18.0'									
955	20										
950	25	25.8	25.8'								
		Limestone, slightly weathered, medium grey, fossiliferous		B36-R3			100	87			
945	30										
		Bottom of Borehole at 30.8'									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-37

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/08/2023	Date Completed: 05/08/2023	Lat/Long: 38.029709 / -84.509869
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 974.55'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	% RQD	Sample Type	Lab Sample Number	Lab Moisture Content (%)
970	5	**Topsoil** 0.4 **FILL**, soft, yellowish brown, moist, **Fat Clay** with **Gravel** (CH)	4'	B37-1	2-2-4	6				B37-1	25
		5.5 **FILL**, dense, gray **Gravel**	6.5'	B37-2	4-3-3	6					
965	10		9'	B37-3	4-8-5	13					
		11.6 Limestone, slightly weathered, light grey Auger Refusal at 11.6'	11.6'	B37-R1			100	86			
960	15	...Dolomite seam at 14.0' 15.4 Limestone, slightly weathered, light to medium grey	15.1'	B37-R2			95	62			
955	20	...Dolomite seam at 19.0' Assumed top of 85 KSF bedrock 20.6	20.6'	B37-R3			100	80			
950	25	Limestone, slightly weathered, medium to dark grey, fossiliferous ...Dolomite seam at 21.0' to 23.0'									
945	30	Bottom of Borehole at 30.6'									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-38

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.031067 / -84.512391
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 967.67'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	Sample Type	Lab Sample Number	Lab Moisture Content (%)
965	0	**Gravel** 0.3 Firm, brown, moist, **Lean Clay** (CL), Trace iron inclusions	2'							
			4'	B38-ST 1			71			
	5			B38-1	3-4-5	9				
			6.5'							
960				B38-2	3-7-7	14			B38-2	41
		9.0	9'							
	10	Stiff, yellowish brown, moist, **Sandy Silt** with **Gravel** (ML)		B38-3	11-13-13	26				
955		14.0	14'							
	15	Soft, yellowish brown, wet, **Silty Clay** (CL-ML)		B38-4	1-WOH-WOH	WOH			B38-4	46
950		Auger Refusal at 17.0'								
	20									
945										
	25									
940										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-39

Solid Ground

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.031527 / -84.512363
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 970.11'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	Sample Type	Lab Sample Number	Lab Moisture Content (%)
		Topsoil 0.4								
		FILL, fill, soft, dark brown, moist, **Fat Clay** (CH), Some rock fragments	2'							
			4'	B39-ST 1			25			
965	5			B39-1	2-1-3	4			B39-1	23.9
			6.5'							
		...yellowish brown		B39-2	3-3-4	7				
		8.0	9'							
		Firm, yellowish brown, moist, **Fat Clay** (CH)		B39-3	4-5-5	10			B39-3	35.4
960	10		14'							
				B39-4	50					
955	15	Auger Refusal at 14.5'								
950	20									
945	25									

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-40

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.031903 / -84.512439
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 963.34'

Elevation (ft)	Depth (Feet)	Graphic Log	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	Sample Type	Lab Sample Number	Lab Moisture Content (%)
			Asphalt 0.6								
			Aggregate Base 1.7	2'							
960			Firm, brown, moist, **Lean Clay** (CL), Trace iron inclusions	4'	B40-ST 1			65			
	5				B40-1	5-6-7	13			B40-1	25.5
				7'							
955					B40-2	4-6-8	14				
			9.5	9.5'							
	10		Stiff, light brown, moist, **Silty Clay** (CL-ML)		B40-3	3-25-50	75			B40-3	26.6
			Auger Refusal at 10.9'								
950											
	15										
945											
	20										
940											
	25										
935											

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

Soil Boring: B-41

Project: UK Cancer Center
Location: 1119 S Limestone, Lexington, KY
Project Number: 23-235

Date Started: 05/01/2023	Date Completed: 05/01/2023	Lat/Long: 38.031849 / -84.512196
Location Accuracy: Surveyed		

Rig Type: Diedrich D-50
Tooling: 3-1/4" Hollowstem Auger
Surface Elevation: 960.92'

Elevation (ft)	Depth (Feet)	Visual Classification and Remarks	Depth of Sample	Sample Number	Blow Counts	Uncorrected N-Value	% Recovery	Sample Type	Lab Sample Number	Lab Moisture Content (%)
960		**Asphalt** 0.4								
		Aggregate Base 1.0								
		Firm, brown, **Lean Clay** (CL), Trace iron inclusions	2'							
			4'	B41-ST 1			75			
	5			B41-1	2-3-4	7			B41-1	25.6
955			6.5'							
				B41-2	4-12-5	17			B41-2	23.7
			9'							
	10			B41-3	50					
950		Auger Refusal at 9.4'								
	15									
945										
	20									
940										
	25									
935										

REMARKS

Water Levels

▽ -

Free Water was not Encountered

▼ -

BORING B-2

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 15.0 – 26.0 FEET

- RECOVERY = 86%
- RQD = 41%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

CORE RUN – 10.0 FEET

RUN 2: 26.0 – 36.0 FEET

- RECOVERY = 95%
- RQD = 80%

BOTTOM OF ROCK IN LOWER LEFT CORNER

BORING B-3

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 8.6 – 15.6 FEET

- RECOVERY = 86%
- RQD = 74%

CORE RUN – 10.0 FEET

RUN 2: 15.6-25.6 FEET

- RECOVERY = 96%
- RQD = 85%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-6

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 9.0 FEET

RUN 1: 11.0 – 20.0 FEET

- RECOVERY = 74%
- RQD = 65%

CORE RUN – 10.0 FEET

RUN 2: 20.0 – 30.0 FEET

- RECOVERY = 100%
- RQD = 80%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-8

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 8 FEET

RUN 1: 12.0 – 20.5 FEET

- RECOVERY = 93%
- RQD = 60%

CORE RUN – 10.0 FEET

RUN 2: 20.5 – 30.5 FEET

- RECOVERY = 98%
- RQD = 89%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-10

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 20.4 – 30.4 FEET

- RECOVERY = 100%
- RQD = 78%

CORE RUN – 10.0 FEET

RUN 2: 30.4 – 40.4 FEET

- RECOVERY = 100%
- RQD = 86%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-11

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 9.5 FEET

RUN 1: 17.0 – 26.5 FEET

- RECOVERY = 100%
- RQD = 81%

CORE RUN – 10.0 FEET

RUN 2: 26.5 – 36.5 FEET

- RECOVERY = 100%
- RQD = 86%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-12

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 4: 9.8 – 19.8 FEET

- RECOVERY = 100%
- RQD = 68%

CORE RUN – 10.0 FEET

RUN 2: 19.8 – 29.8 FEET

- RECOVERY = 100%
- RQD = 88%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-16

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 9.7 – 19.7 FEET

- RECOVERY = 98%
- RQD = 73%

CORE RUN – 10.0 FEET

RUN 2: 19.7 – 29.7 FEET

- RECOVERY = 100%
- RQD = 94%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-17

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 9.5 FEET

RUN 2: 11.3 – 20.8 FEET

- RECOVERY = 92%
- RQD = 77%

CORE RUN – 10.0 FEET

RUN 2: 20.8 – 30.8 FEET

- RECOVERY = 100%
- RQD = 92%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-18

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 12.7 – 22.7 FEET

- RECOVERY = 100%
- RQD = 72%

CORE RUN – 10.0 FEET

RUN 2: 22.7 – 32.7 FEET

- RECOVERY = 98%
- RQD = 88%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-19

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 12.4 – 22.4 FEET

- RECOVERY = 96%
- RQD = 92%

CORE RUN – 10.0 FEET

RUN 2: 22.4 – 32.4 FEET

- RECOVERY = 100%
- RQD = 97%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-20

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 12.5 – 22.5 FEET

- RECOVERY = 45%
- RQD = 25%

CORE RUN – 10.0 FEET

RUN 2: 22.5 – 32.5 FEET

- RECOVERY = 100%
- RQD = 89%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-21

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 13.0 – 23.0 FEET

- RECOVERY = 100%
- RQD = 62%

CORE RUN – 10.0 FEET

RUN 2: 23.0 – 33.0 FEET

- RECOVERY = 100%
- RQD = 77%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-29

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 10.0 FEET

RUN 1: 5.0 – 15.0 FEET

- RECOVERY = 100%
- RQD = 79%

CORE RUN – 10.0 FEET

RUN 2: 15.0 – 25.0 FEET

- RECOVERY = 100%
- RQD = 79%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-36

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 7.5 FEET

RUN 1: 8.6 – 16.1 FEET

- RECOVERY = 91%
- RQD = 70%

CORE RUN – 9.7 FEET

RUN 2: 16.1 – 25.8 FEET

- RECOVERY = 99%
- RQD = 82%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-36

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 5.0 FEET

RUN 3: 25.8 – 30.8 FEET

- RECOVERY = 100%
- RQD = 87%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER

BORING B-37

TOP OF ROCK CORE IN UPPER RIGHT CORNER

CORE RUN – 3.8 FEET

RUN 1: 11.6 – 15.4 FEET

- RECOVERY = 100%
- RQD = 86%

CORE RUN – 5.5 FEET

RUN 2: 15.1 – 20.6 FEET

- RECOVERY = 95%
- RQD = 62%

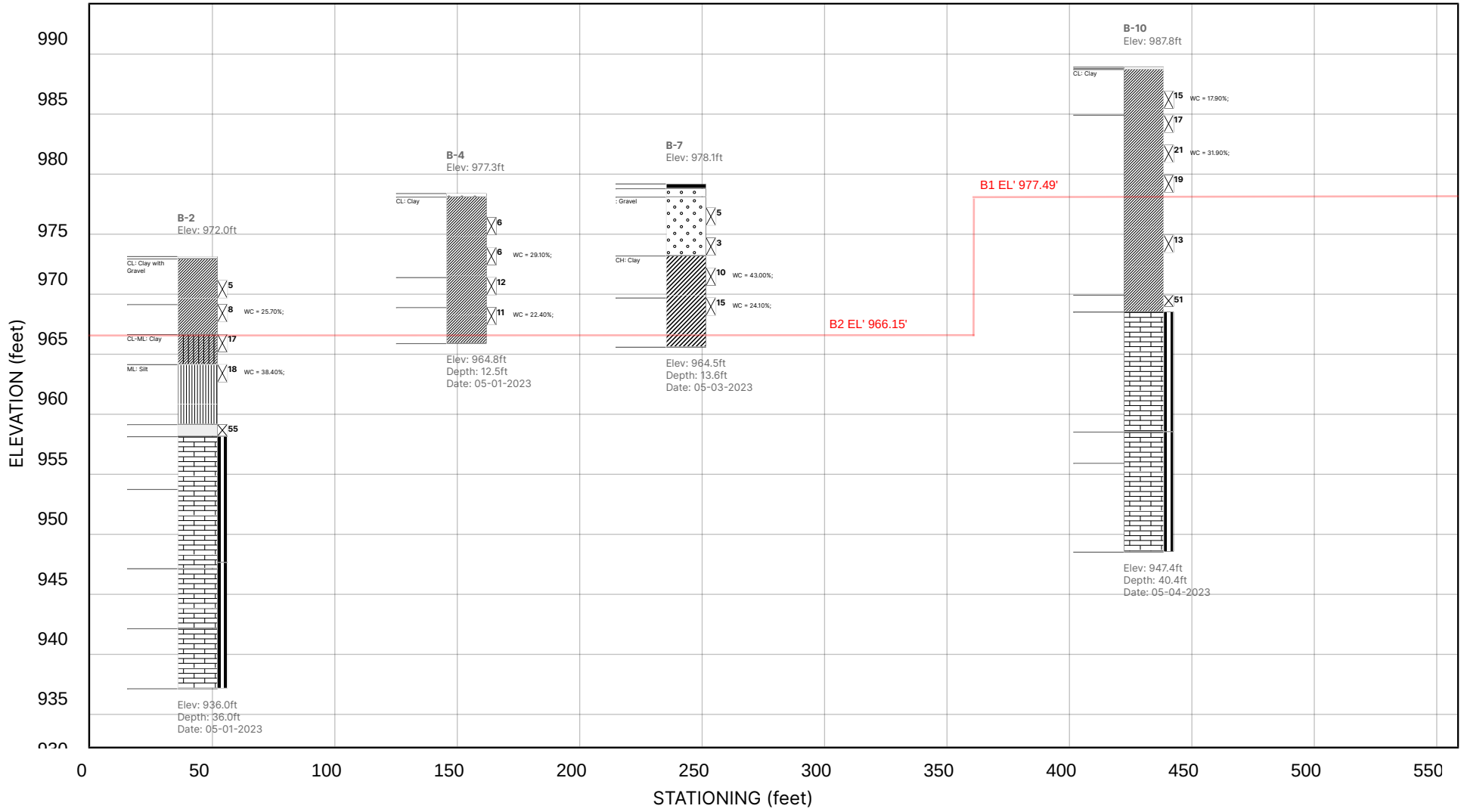
(RUN 1 AND 2 ARE PICTURED IN THE SAME BOX)

CORE RUN – 10.0 FEET

RUN 3: 20.6 – 30.6 FEET

- RECOVERY = 100%
- RQD = 80%

BOTTOM OF ROCK CORE IN LOWER LEFT CORNER



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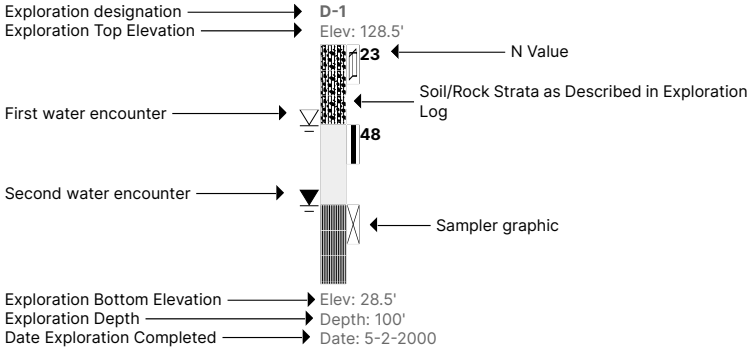

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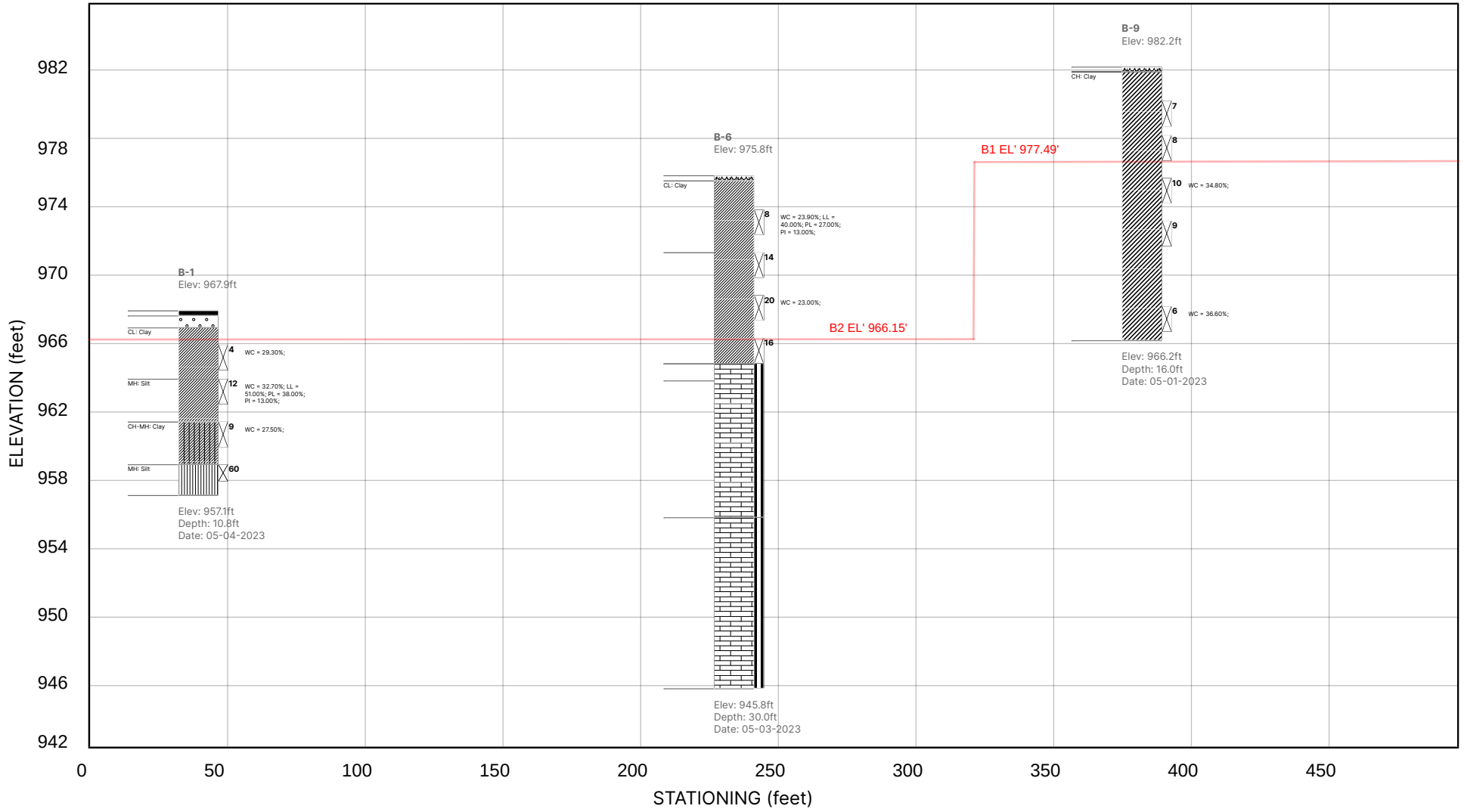
Drawing to be used for illustrative purposes only

UK Cancer Center
38.02962, -84.51079

CROSS SECTIONS REPORT

SOLID GROUND



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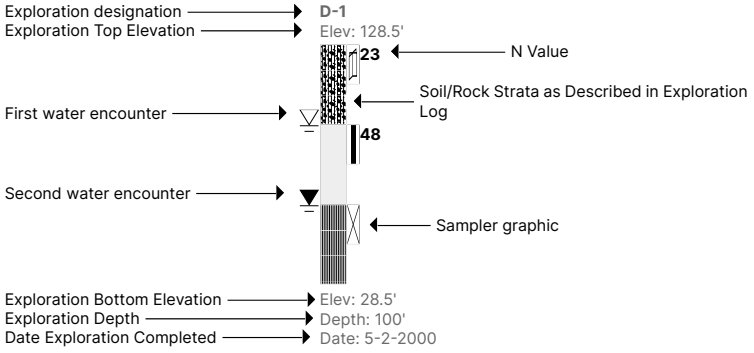

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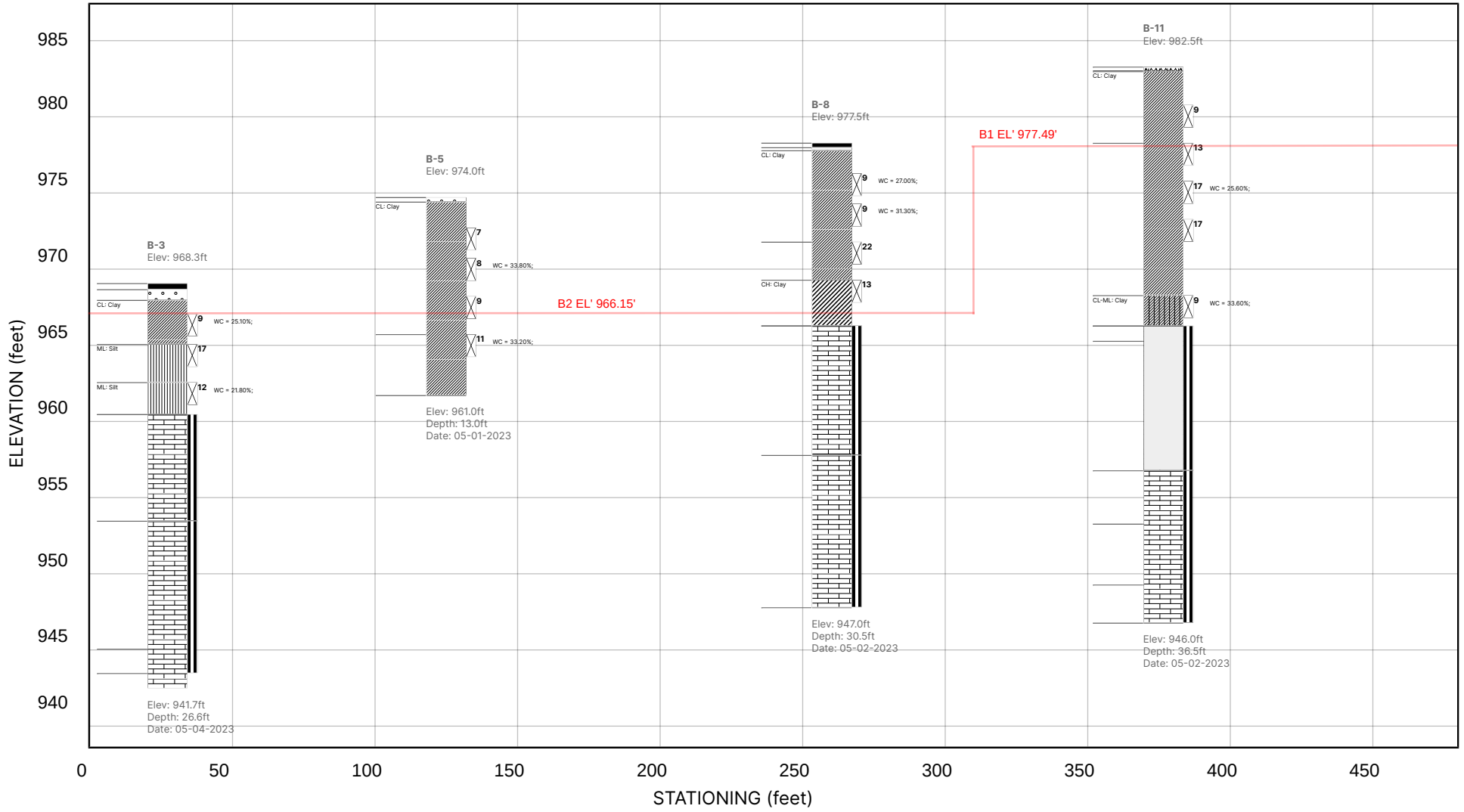
38.02962, -84.51079

CROSS SECTIONS REPORT

SOLID GROUND



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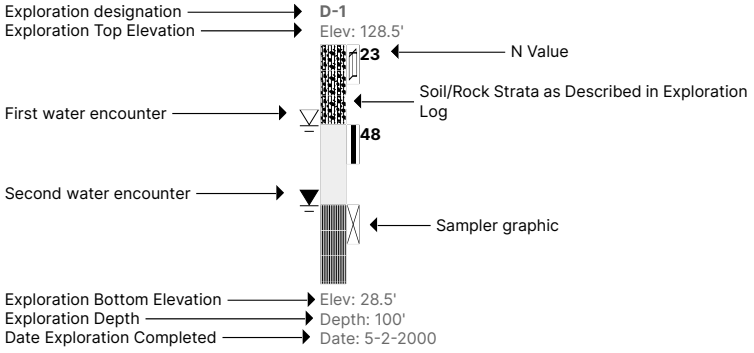

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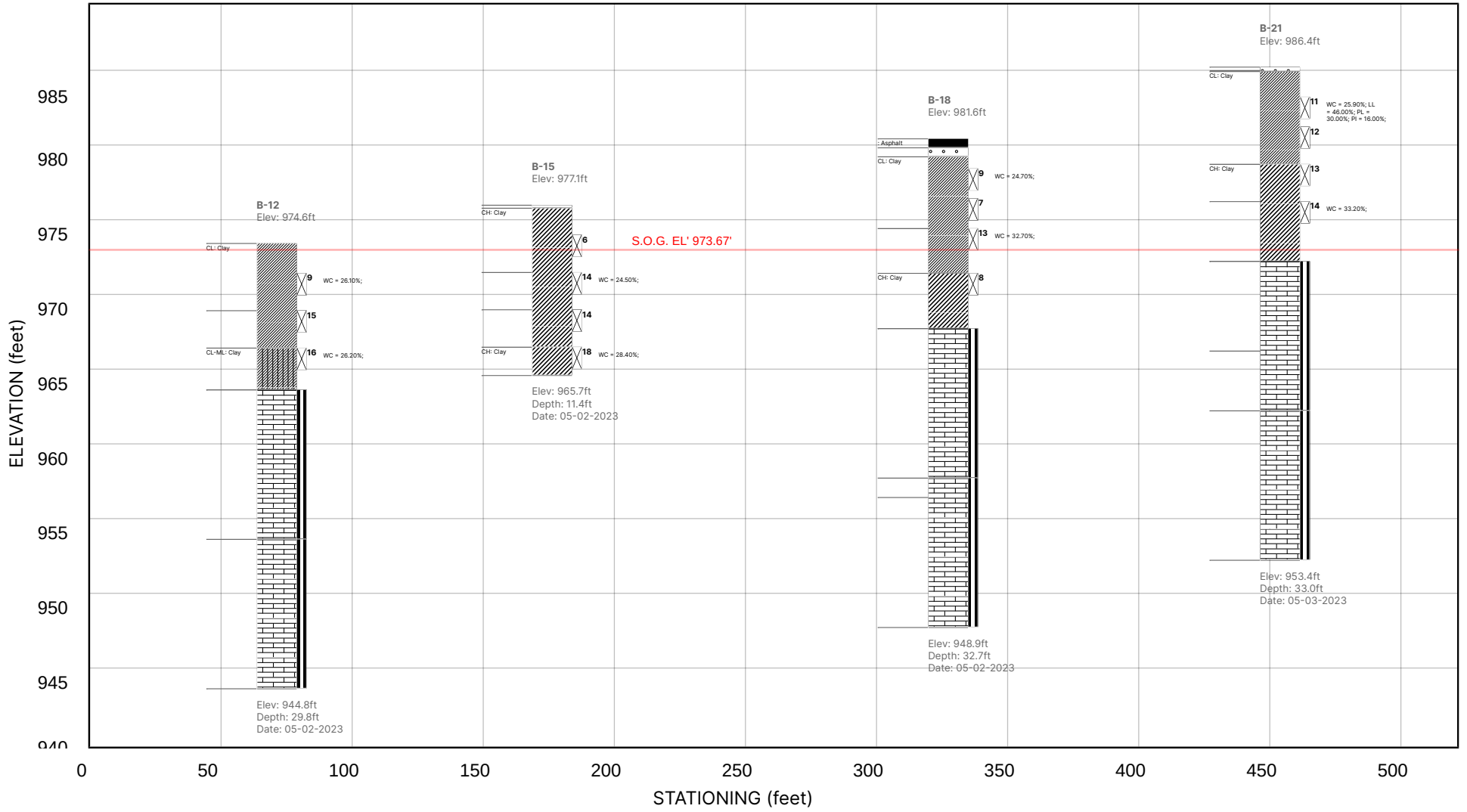
Drawing to be used for illustrative purposes only

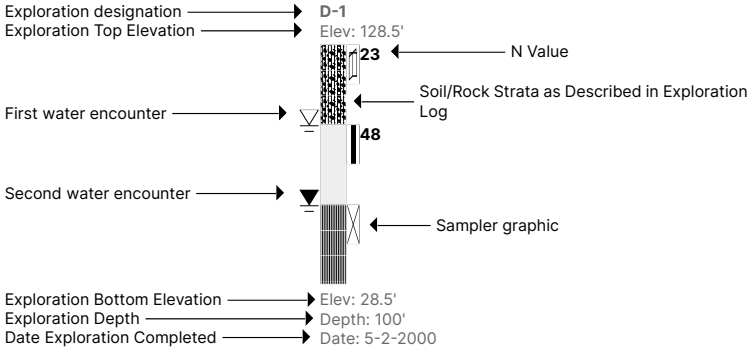
UK Cancer Center
38.02962, -84.51079

CROSS SECTIONS REPORT

SOLID GROUND



EXPLORATION LOG LEGEND

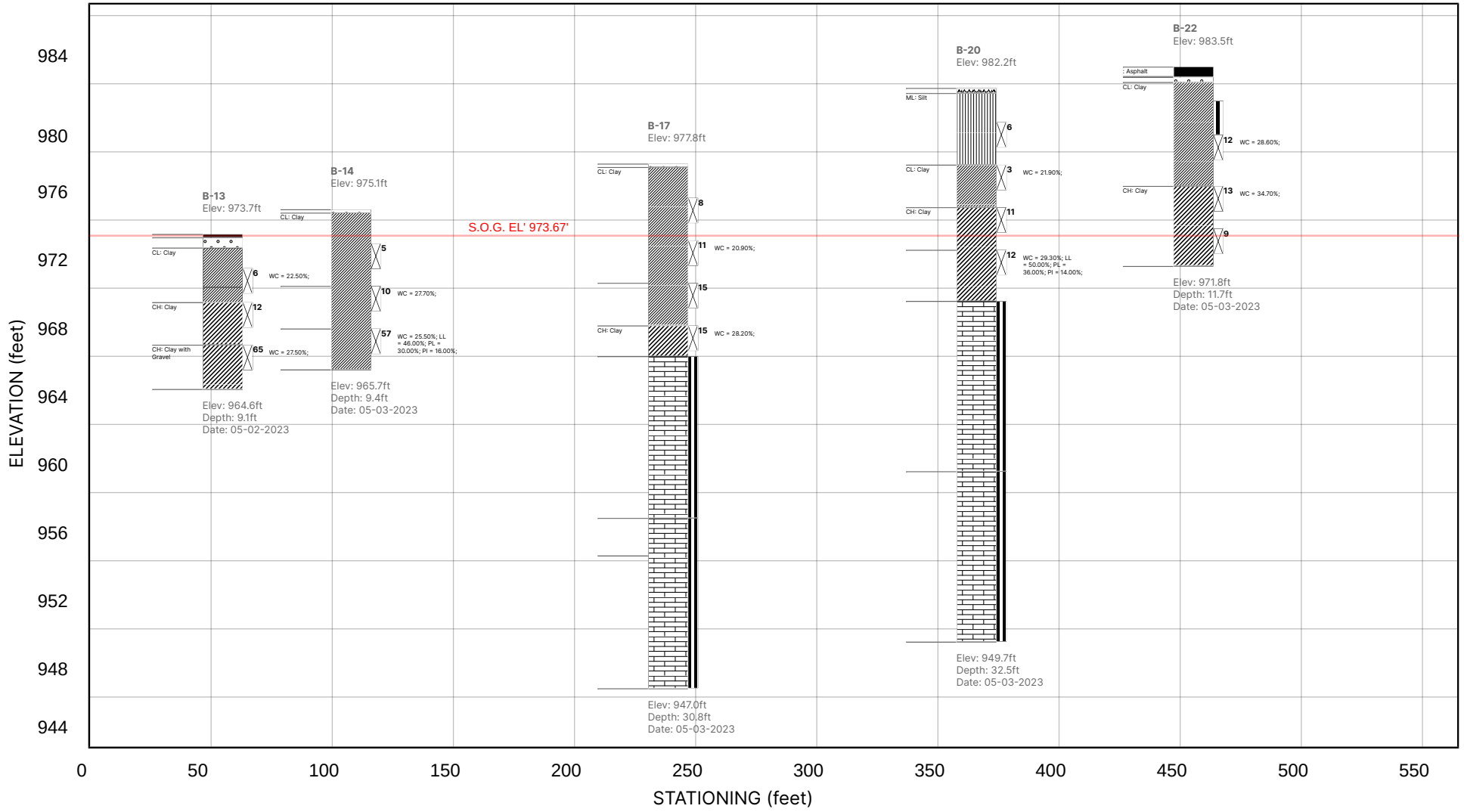


Drawing is Not to Scale (NTS)
Drawing to be used for illustrative purposes only

UK Cancer Center
38.02962, -84.51079

CROSS SECTIONS REPORT

SOLID GROUND



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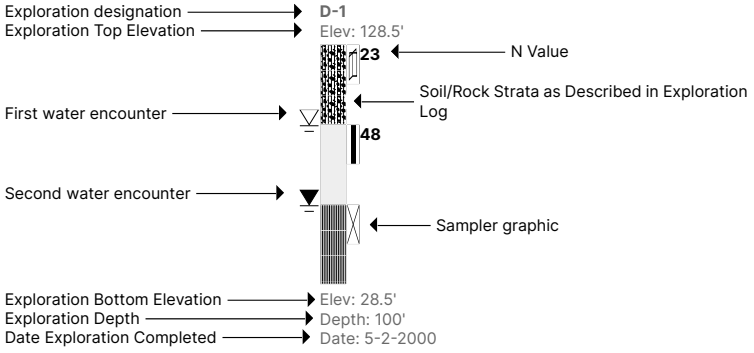

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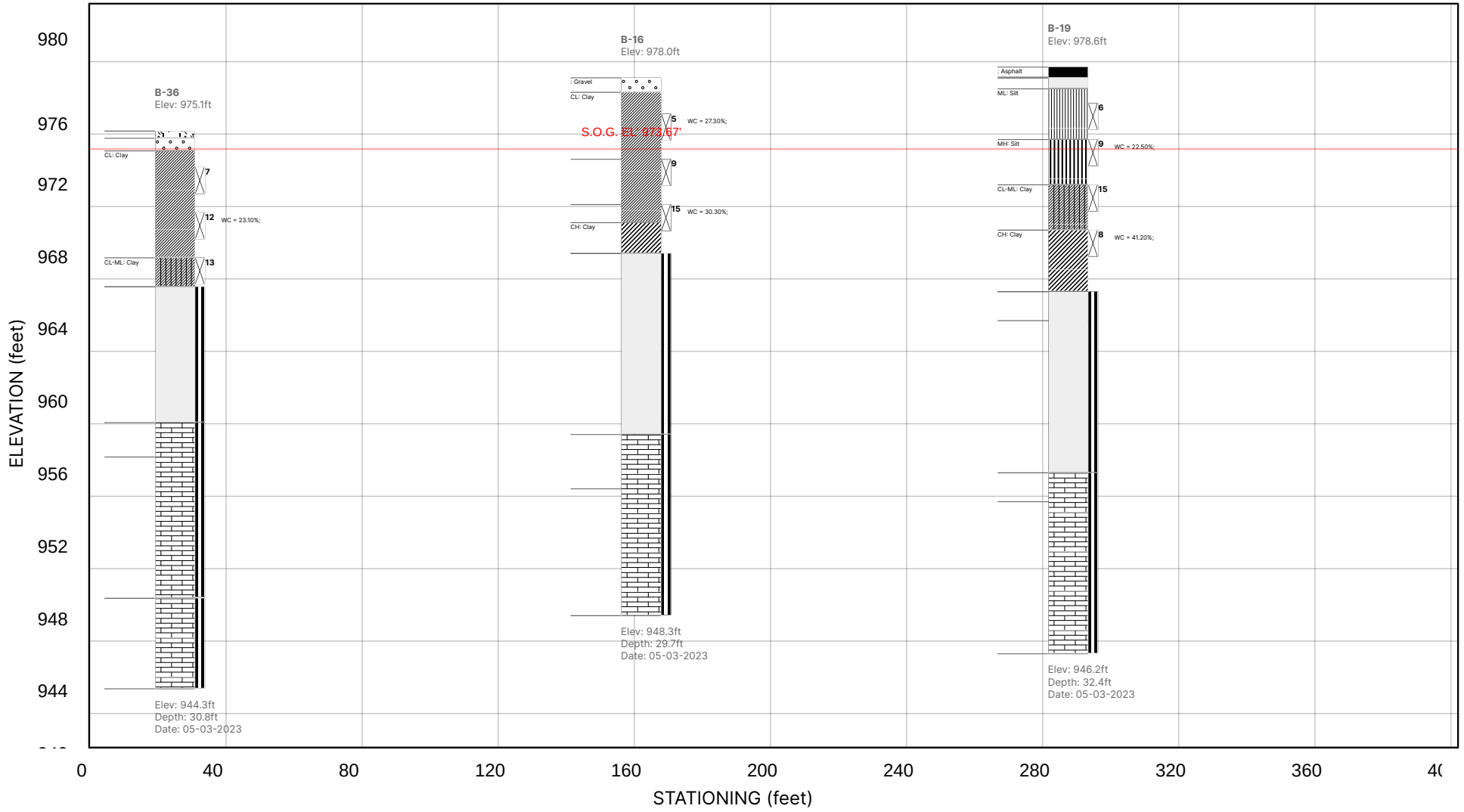
Drawing to be used for illustrative purposes only

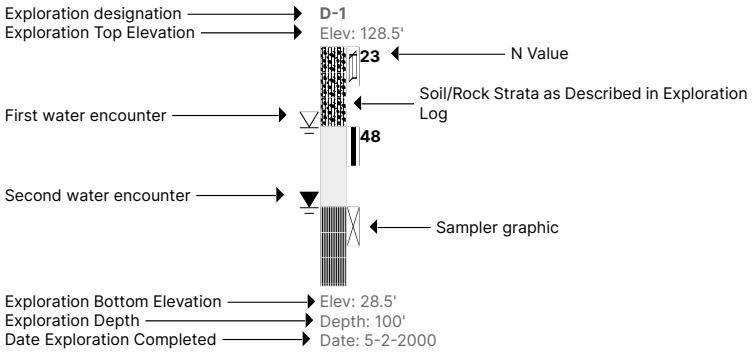
UK Cancer Center
38.02962, -84.51079

CROSS SECTIONS REPORT

SOLID GROUND



EXPLORATION LOG LEGEND

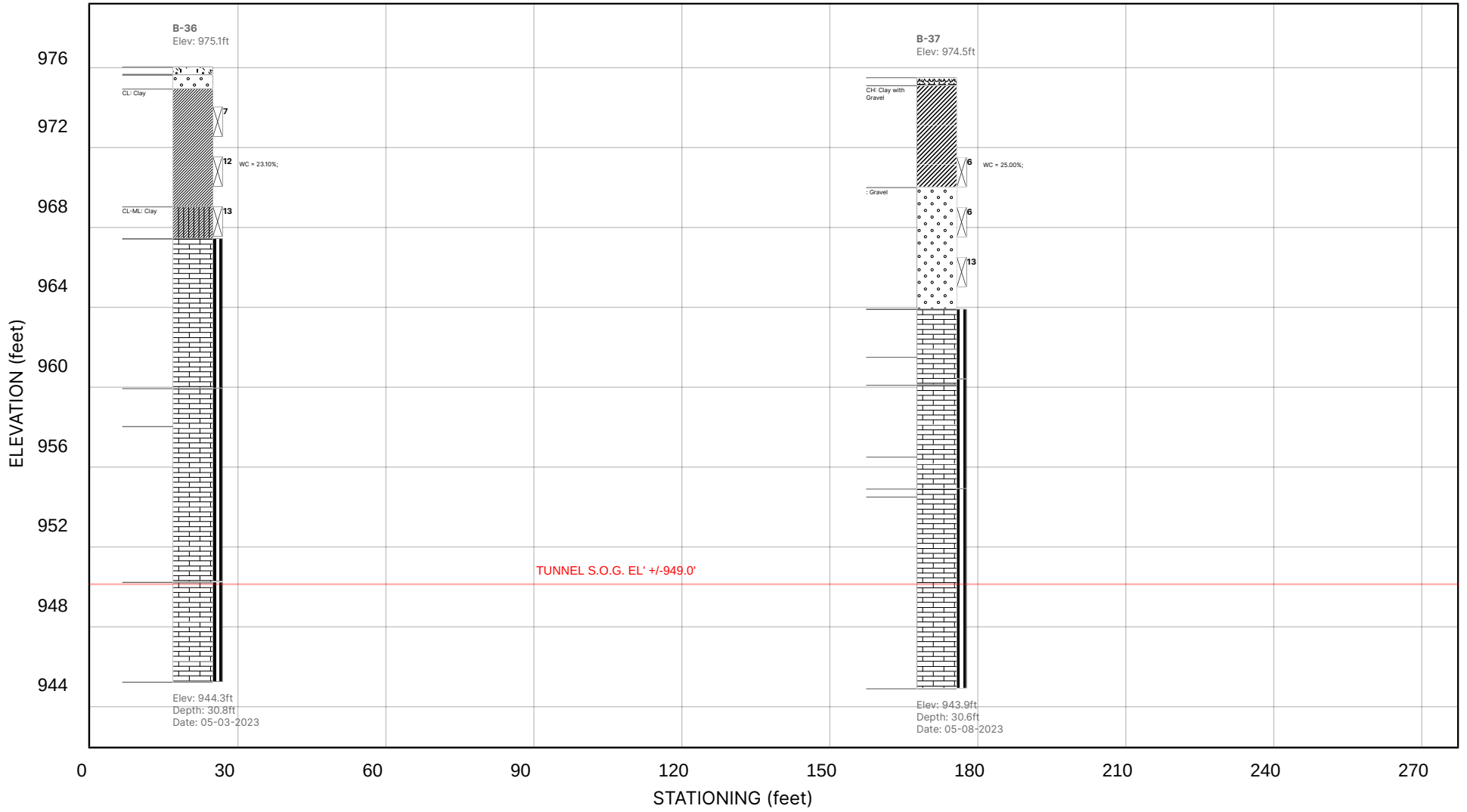


Drawing is Not to Scale (NTS)
Drawing to be used for illustrative purposes only

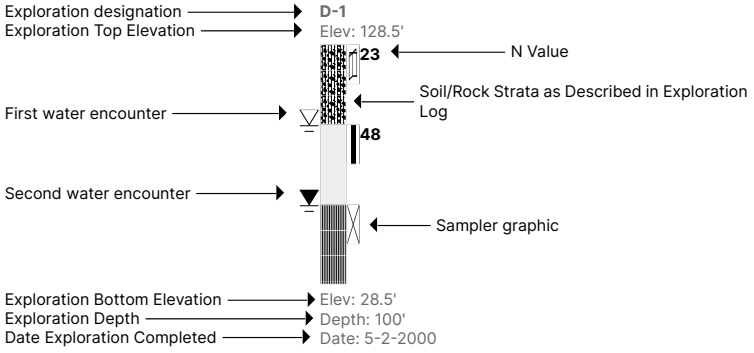
UK Cancer Center
38.02962, -84.51079

CROSS SECTIONS REPORT

SOLID GROUND



EXPLORATION LOG LEGEND

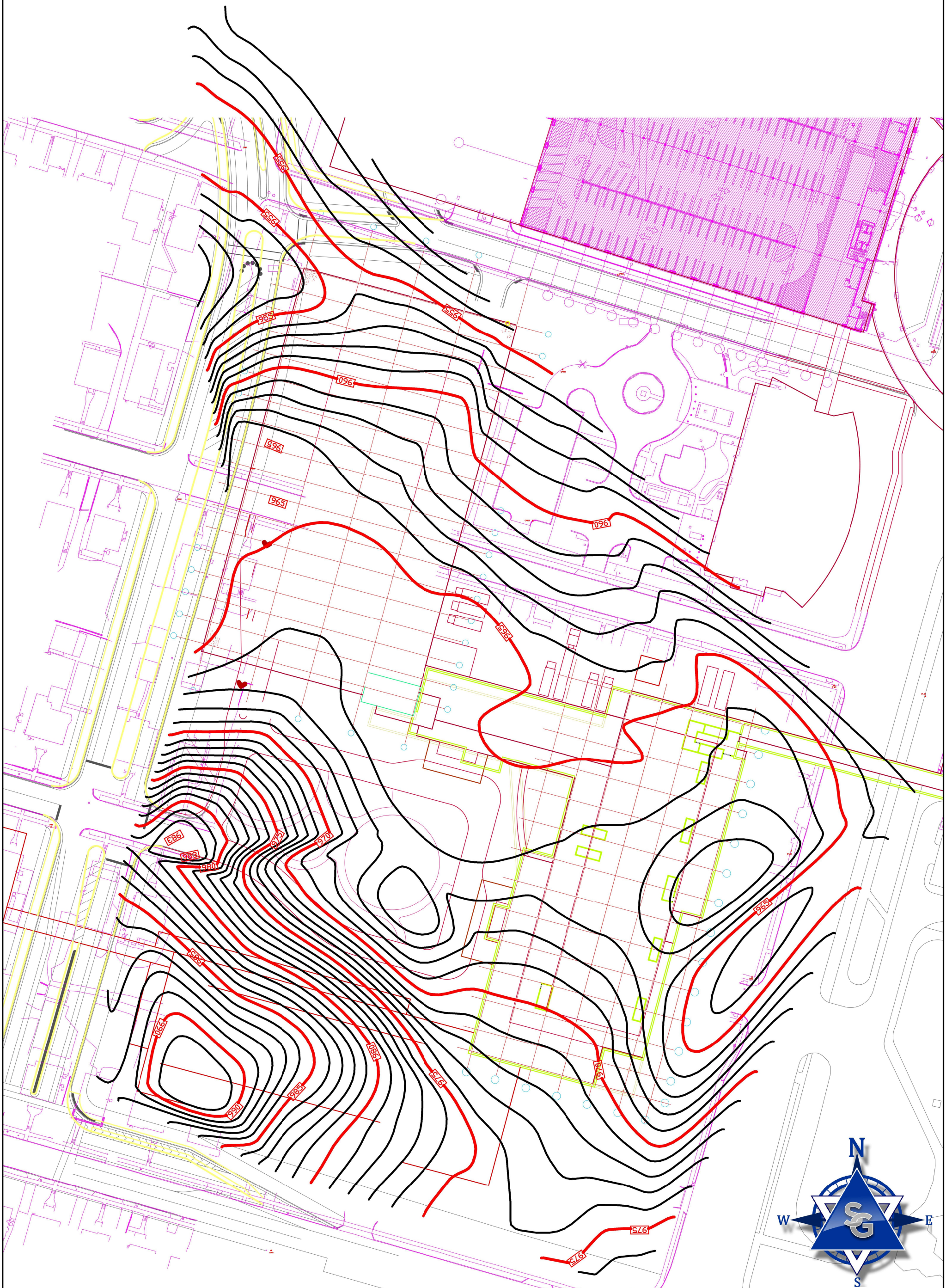


Drawing is Not to Scale (NTS)
Drawing to be used for illustrative purposes only

UK Cancer Center
38.02962, -84.51079

CROSS SECTIONS REPORT

SOLID GROUND



DRAWING: 1 OF 2

REVISIONS
NO.: DATE:

SCALE: N.T.S.
DATE: 08/01/23
PROJECT NO: 23-235
DRAWN BY: JCR
CHECKED BY: MBS

Bedrock Surface Map

UK Cancer Center

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DRAWING: 2 OF 2

REVISIONS
NO.:
DATE:

SCALE: N.T.S.
DATE: 08/01/23
PROJECT NO: 23-235
DRAWN BY: JCR
CHECKED BY: MBS

Compentent (85KSF) Rock Map

UK Cancer Center

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Distribution:

Report:

REPORT OF ATTERBERG LIMIT TESTING - ASTM D4318

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B1 4.0-5.5

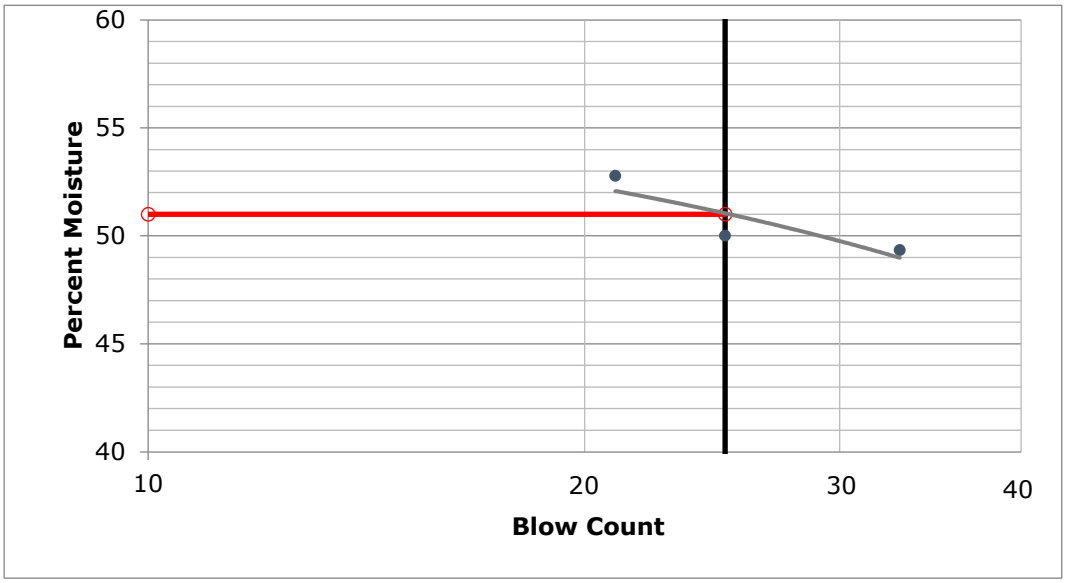
Soil Description: Gravely elastic silt | Prep. Method: Dry

Date Sample Received: 5/12/2023 | Date Tested: 6/7/2023

LIQUID LIMIT

Run Number	1	2	3	4	5	6
Tare Number	133	22	108			
Tare + Wet Soil	23.3	24.7	24.4			
Tare + Dry Soil	20.0	21.0	20.6			
Weight of Water	3.3	3.7	3.8			
Weight of Tare	13.4	13.5	13.4			
Weight of Dry Soil	6.6	7.5	7.2			
Water Content	50.0	49.3	52.8			
Number of Blows	25	33	21			

Liquid limit test was performed using manual device and metal grooving tool



LL 51

PL 38

PI 13

SYMBOL FROM PLASTICITY CHART

MH

Minus #200

52.98

USCS

GRAVELY ELASTIC SILT

PLASTIC LIMIT

Run Number	1	2	3	4	5	Natural Moisture
Tare Number	122	25				
Tare + Wet Soil	18.9	18.1				
Tare + Dry Soil	17.5	16.8				
Weight of Water	1.4	1.3				
Weight of Tare	13.8	13.4				
Weight of Dry Soil	3.7	3.4				
Water Content	37.8	38.2				
Plastic Limit	38.0					

Plastic limt test specimens were hand rolled

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report of Percent Passing No. 200 Sieve
ASTM D1140

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B1 4.0-5.5

Soil Description: Gravely elastic Silt | Method A or B: B

Date Sample Received: 5/12/2023 | Date Tested: 6/6/2023

Boring/Sample No.	B1					
Depth (From-To)	4.0-5.5					

#200 DATA						
Tare Number	Lg. RP					
Wet Soil + Tare, g	731.8					
Dry Soil + Tare, g	537.9					
Wt. of Tare	431.5					
Wt. of Dry Soil, g	106.4					
Soak Time, hours	24					

% MOISTURE DATA						
Tare Number	25	42				
Wet Soil + Tare, g	73.0	66.3				
Dry Soil + Tare, g	57.8	53.9				
Wt of Water	15.2	12.4				
Wt of Tare	13.7	13.8				
Wt. of Dry Soil, g	44.1	40.1				
% Moisture	34.5	30.9				

CALCULATIONS						
Dry Wt. Before, g	226.3					
Dry Wt. After, g	106.4					
% Retained	47.0					
% Passing	53.0					

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report:

REPORT OF ATTERBERG LIMIT TESTING - ASTM D4318

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B6 2.0-3.5

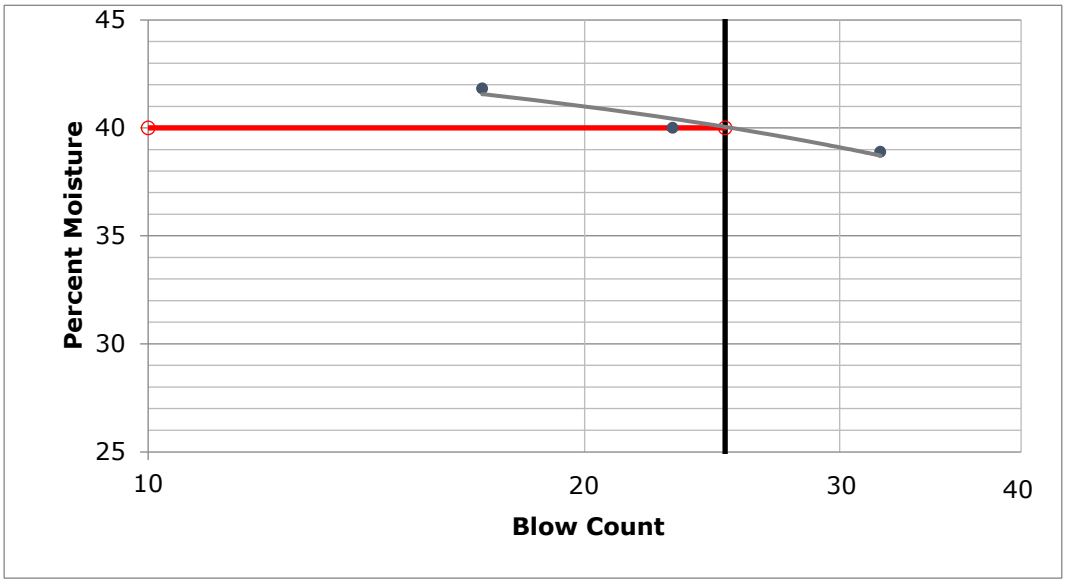
Soil Description: Silt | Prep. Method: Dry

Date Sample Received: 5/12/2023 | Date Tested: 6/7/2023

LIQUID LIMIT

Run Number	1	2	3	4	5	6
Tare Number	47	142	12			
Tare + Wet Soil	21.6	21.0	23.3			
Tare + Dry Soil	19.3	18.9	20.5			
Weight of Water	2.3	2.1	2.8			
Weight of Tare	13.8	13.5	13.5			
Weight of Dry Soil	5.5	5.4	7.0			
Water Content	41.8	38.9	40.0			
Number of Blows	17	32	23			

Liquid limit test was performed using manual device and metal grooving tool



LL: 40

PL: 27

PI: 13

SYMBOL FROM PLASTICITY CHART: ML

Minus #200: 88.22

USCS: SILT

PLASTIC LIMIT

Run Number	1	2	3	4	5	Natural Moisture
Tare Number	112	39				
Tare + Wet Soil	18.4	18.9				
Tare + Dry Soil	17.4	17.8				
Weight of Water	1.0	1.1				
Weight of Tare	13.6	13.8				
Weight of Dry Soil	3.8	4.0				
Water Content	26.3	27.5				
Plastic Limit	26.9					

Plastic limt test specimens were hand rolled

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report of Percent Passing No. 200 Sieve
ASTM D1140

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B6 2.0-3.5

Soil Description: Silt | Method A or B: B

Date Sample Received: 5/12/2023 | Date Tested: 6/6/2023

Boring/Sample No.	B6					
Depth (From-To)	2.0-3.5					

#200 DATA						
Tare Number	Lg. RP					
Wet Soil + Tare, g	787.8					
Dry Soil + Tare, g	467.1					
Wt. of Tare	433.4					
Wt. of Dry Soil, g	33.7					
Soak Time, hours	24					

% MOISTURE DATA						
Tare Number	206	116				
Wet Soil + Tare, g	69.0	73.3				
Dry Soil + Tare, g	57.8	62.6				
Wt of Water	11.2	10.7				
Wt of Tare	14.4	13.8				
Wt. of Dry Soil, g	43.4	48.8				
% Moisture	25.8	21.9				

CALCULATIONS						
Dry Wt. Before, g	286.1					
Dry Wt. After, g	33.7					
% Retained	11.8					
% Passing	88.2					

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report:

REPORT OF ATTERBERG LIMIT TESTING - ASTM D4318

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B14 7.0-8.3

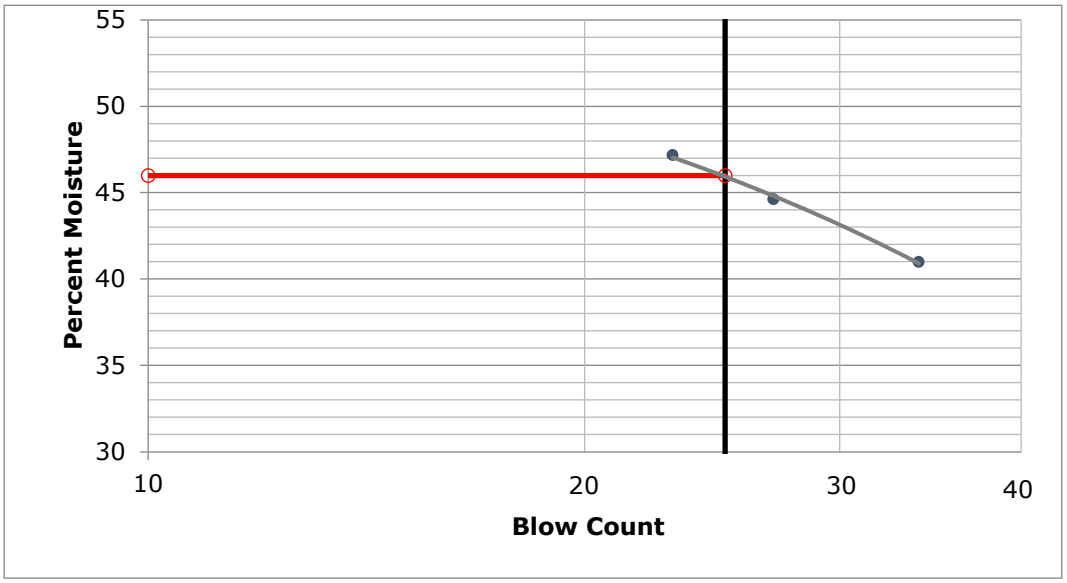
Soil Description: Sandy silt with gravel | Prep. Method: Dry

Date Sample Received: 5/12/2023 | Date Tested: 6/7/2023

LIQUID LIMIT

Run Number	1	2	3	4	5	6
Tare Number	233	15	112			
Tare + Wet Soil	22.4	22.9	21.4			
Tare + Dry Soil	19.9	20.0	18.9			
Weight of Water	2.5	2.9	2.5			
Weight of Tare	13.8	13.5	13.6			
Weight of Dry Soil	6.1	6.5	5.3			
Water Content	41.0	44.6	47.2			
Number of Blows	34	27	23			

Liquid limit test was performed using manual device and metal grooving tool



LL 46

PL 30

PI 16

SYMBOL FROM PLASTICITY CHART

ML

Minus #200

64.78

USCS

SANDY SILT WITH GRAVEL

PLASTIC LIMIT

Run Number	1	2	3	4	5	Natural Moisture
Tare Number	39	47				
Tare + Wet Soil	17.8	18.8				
Tare + Dry Soil	16.9	17.6				
Weight of Water	0.9	1.2				
Weight of Tare	13.8	13.8				
Weight of Dry Soil	3.1	3.8				
Water Content	29.0	31.6				
Plastic Limit	30.3					

Plastic limt test specimens were hand rolled

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report of Percent Passing No. 200 Sieve
ASTM D1140

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B14 7.0-8.3

Soil Description: Sandy silt with gravel | Method A or B: B

Date Sample Received: 5/12/2023 | Date Tested: 6/6/2023

Boring/Sample No.	B14					
Depth (From-To)	7.0-8.3					

#200 DATA						
Tare Number	RP					
Wet Soil + Tare, g	507.1					
Dry Soil + Tare, g	265.9					
Wt. of Tare	171.8					
Wt. of Dry Soil, g	94.1					
Soak Time, hours	24					

% MOISTURE DATA						
Tare Number	211	201				
Wet Soil + Tare, g	71.1	65.6				
Dry Soil + Tare, g	59.6	55.2				
Wt of Water	11.5	10.4				
Wt of Tare	14.5	14.4				
Wt. of Dry Soil, g	45.1	40.8				
% Moisture	25.5	25.5				

CALCULATIONS						
Dry Wt. Before, g	267.2					
Dry Wt. After, g	94.1					
% Retained	35.2					
% Passing	64.8					

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report:

REPORT OF ATTERBERG LIMIT TESTING - ASTM D4318

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B20 9.5-11.0

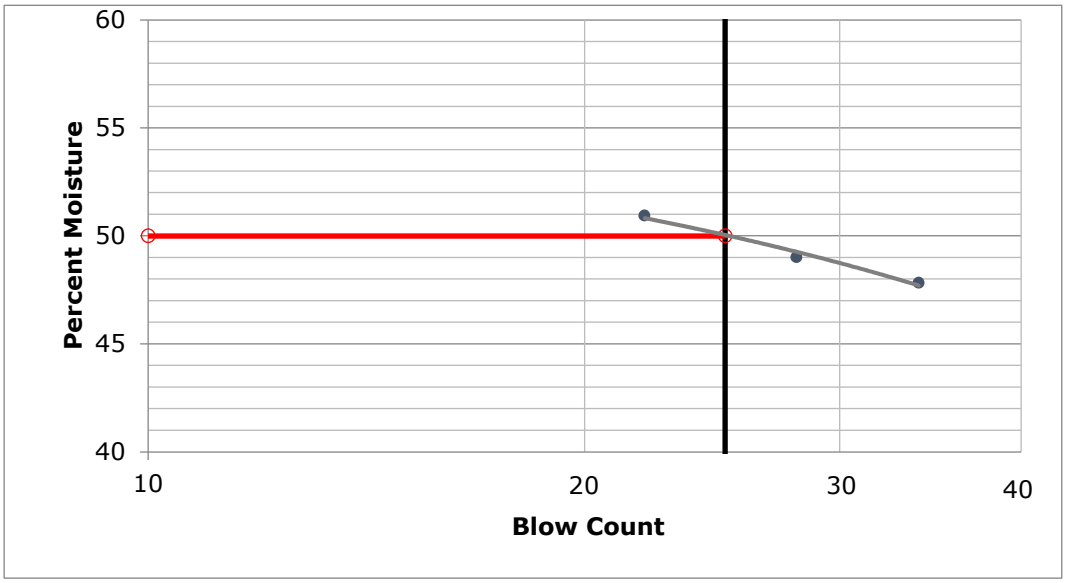
Soil Description: Gravely elastic silt | Prep. Method: dry

Date Sample Received: 5/12/2023 | Date Tested: 6/11/2023

LIQUID LIMIT

Run Number	1	2	3	4	5	6
Tare Number	233	55	10			
Tare + Wet Soil	21.4	20.7	21.4			
Tare + Dry Soil	18.9	18.5	18.7			
Weight of Water	2.5	2.2	2.7			
Weight of Tare	13.8	13.9	13.4			
Weight of Dry Soil	5.1	4.6	5.3			
Water Content	49.0	47.8	50.9			
Number of Blows	28	34	22			

Liquid limit test was performed using manual device and metal grooving tool



LL 50

PL 36

PI 14

SYMBOL FROM PLASTICITY CHART

MH

Minus #200

62.88

USCS

GRAVELY ELASTIC SILT

PLASTIC LIMIT

Run Number	1	2	3	4	5	Natural Moisture
Tare Number	30	26				
Tare + Wet Soil	18.4	19.1				
Tare + Dry Soil	17.1	17.7				
Weight of Water	1.3	1.4				
Weight of Tare	13.5	13.8				
Weight of Dry Soil	3.6	3.9				
Water Content	36.1	35.9				
Plastic Limit	36.0					

Plastic limt test specimens were hand rolled

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report of Percent Passing No. 200 Sieve
ASTM D1140

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B20 9.5-11.0

Soil Description: Gravely elastic silt | Method A or B: B

Date Sample Received: 5/12/2023 | Date Tested: 6/11/2023

Boring/Sample No.	B20					
Depth (From-To)	9.5-11.0					

#200 DATA						
Tare Number	RP					
Wet Soil + Tare, g	472.0					
Dry Soil + Tare, g	258.6					
Wt. of Tare	172.7					
Wt. of Dry Soil, g	85.9					
Soak Time, hours	24					

% MOISTURE DATA						
Tare Number	119	45				
Wet Soil + Tare, g	90.3	88.1				
Dry Soil + Tare, g	72.5	71.6				
Wt of Water	17.8	16.5				
Wt of Tare	13.8	13.4				
Wt. of Dry Soil, g	58.7	58.2				
% Moisture	30.3	28.4				

CALCULATIONS						
Dry Wt. Before, g	231.4					
Dry Wt. After, g	85.9					
% Retained	37.1					
% Passing	62.9					

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report:

REPORT OF ATTERBERG LIMIT TESTING - ASTM D4318

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B21 2.0-3.5

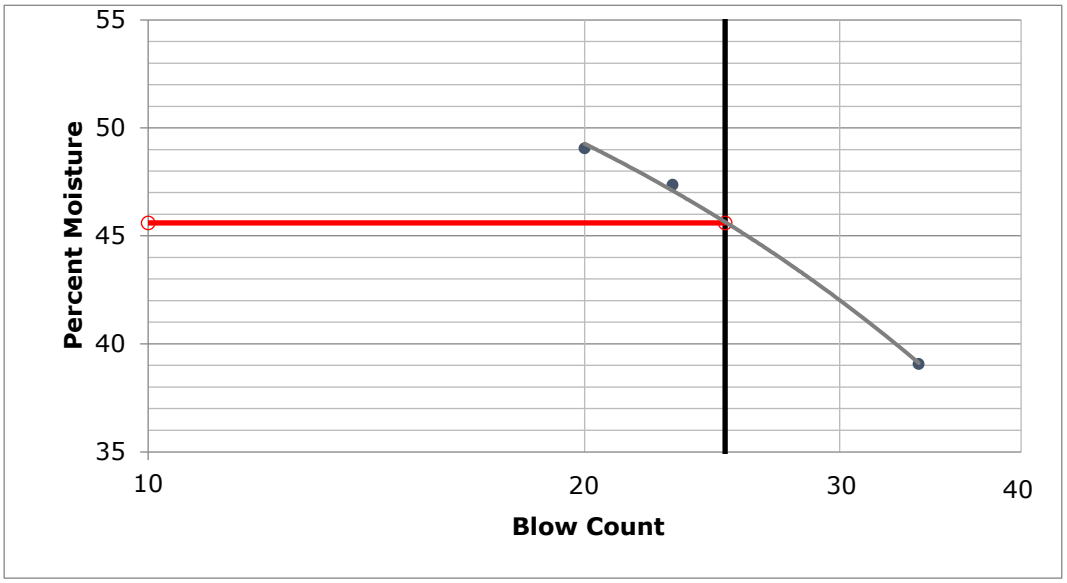
Soil Description: Silt with gravel | Prep. Method: Dry

Date Sample Received: 5/12/2023 | Date Tested: 6/11/2023

LIQUID LIMIT

Run Number	1	2	3	4	5	6
Tare Number	34	119	2			
Tare + Wet Soil	22.3	25.0	21.7			
Tare + Dry Soil	19.8	21.4	19.1			
Weight of Water	2.5	3.6	2.6			
Weight of Tare	13.4	13.8	13.8			
Weight of Dry Soil	6.4	7.6	5.3			
Water Content	39.1	47.4	49.1			
Number of Blows	34	23	20			

Liquid limit test was performed using manual device and metal grooving tool



LL: 46

PL: 30

PI: 16

SYMBOL FROM PLASTICITY CHART: ML

Minus #200: 74.36

USCS: SILT WITH GRAVEL

PLASTIC LIMIT

Run Number	1	2	3	4	5	Natural Moisture
Tare Number	56	108				
Tare + Wet Soil	19.2	19.4				
Tare + Dry Soil	17.9	18.0				
Weight of Water	1.3	1.4				
Weight of Tare	13.5	13.4				
Weight of Dry Soil	4.4	4.6				
Water Content	29.5	30.4				
Plastic Limit	30.0					

Plastic limt test specimens were hand rolled

Tested by: BK | Entered by: BK | Checked by:

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Distribution:

Report of Percent Passing No. 200 Sieve
ASTM D1140

Project Name: UK Cancer Center | Project #: 23-235

Sample #: | Depth: B21 2.0-3.5

Soil Description: Silt with gravel | Method A or B: B

Date Sample Received: 5/12/2023 | Date Tested: 6/11/2023

Boring/Sample No.	B21					
Depth (From-To)	2.0-3.5					

#200 DATA						
Tare Number	RP					
Wet Soil + Tare, g	570.5					
Dry Soil + Tare, g	252.5					
Wt. of Tare	171.2					
Wt. of Dry Soil, g	81.3					
Soak Time, hours	24					

% MOISTURE DATA						
Tare Number	15	33				
Wet Soil + Tare, g	67.7	65.7				
Dry Soil + Tare, g	56.6	54.9				
Wt of Water	11.1	10.8				
Wt of Tare	13.8	13.3				
Wt. of Dry Soil, g	42.8	41.6				
% Moisture	25.9	26.0				

CALCULATIONS						
Dry Wt. Before, g	317.0					
Dry Wt. After, g	81.3					
% Retained	25.6					
% Passing	74.4					

Tested by: BK | Entered by: BK | Checked by:

Natural Moisture Content Determination (ASTM D2216)

Project Name: UK Cancer Center Date:

Project Number: 23-256 Page: 4

Boring Number	Sample Depth	Can ID Number	Can Weight	Wet Weight + Can	Moisture %
B1	2.0-3.5	128	13.8	65.0	29.3
		126	13.7	70.2	27.5
	6.5-8.0	205	14.5	66.8	37.3
		27	13.7	65.4	31.2
B2	4.0-5.5	233	13.8	66.2	25.7
		202	14.3	65.5	26.1
	9.0-10.5	209	14.4	70.7	37.3
		200	14.5	69.2	39.5
B3	2.0-3.5	203	14.4	65.8	25.7
		207	14.3	80.8	24.5
	6.5-8.0	112	13.6	81.1	21.8
		145	13.4	73.5	21.7
B4	4.5-6.0	15	13.5	63.0	31.6
		24	13.5	69.4	26.5
	9.5-11.0	131	13.6	77.5	22.4
		46	13.5	70.4	22.4
B5	4.0-5.5	240	13.4	70.3	33.6
		50	13.7	75.8	34.1
	9.0-10.5	57	13.9	72.2	35.0
		36	13.8	70.2	31.5
B6	2.0-3.5	206	14.4	69.0	25.8
		116	13.8	73.3	21.9
	7.0-8.5	133	13.4	69.2	24.0
		51	13.8	73.3	21.9
B7	7.0-8.5	129	13.8	68.6	41.6
		147	13.5	73.7	44.4
	9.5-11.0	54	13.4	93.0	22.3
		134	13.4	66.3	26.0
B8	2.0-3.5	28	13.8	73.0	26.5
		3	13.4	76.8	27.6
	4.0-5.5	14	13.8	74.6	30.8
		210	14.3	67.3	31.8
B9	6.5-8.0	188	13.5	69.2	35.2
		48	13.4	65.3	34.5
	14.0-15.5	22	13.4	81.9	26.9
		19	13.8	66.9	46.3
B10	2.0-3.5	49	13.4	75	16.9
		208	14.3	71.9	19.0
	6.5-8.0	32	13.6	64.9	31.5
		132	13.8	79.1	32.2
B11	7.5-9.0	18	13.8	73.1	25.1

		41	13.4	67.6	26.0
	15.0-16.5	47	13.8	77.3	34.8
		10	13.4	75.4	32.5
B12	2.0-3.5	44	13.9	78.9	26.7
		20	13.5	73.6	25.5
	7.0-8.5	254	13.8	81.9	26.6
		16	13.8	81.2	25.7
B13	2.0-3.5	3	13.4	71.5	21.8
		6	13.7	65.1	23.3
	6.5-8.0	100	13.9	67.4	30.2
		40	13.7	72.1	24.8
B14	4.5-6.0	204	14.7	80.7	26.2
		38	13.7	69.5	29.2
	7.0-8.3	211	14.5	71.1	25.5
		201	14.4	65.6	25.5
B15	4.5-6.0	4	13.8	85.8	25.9
		122	13.8	65.6	23.0
	9.5-11.0	42	13.6	71.4	24.6
		142	13.5	83.4	32.1
B16	2.0-3.5	21	13.8	73.6	29.7
		9	13.7	81.9	24.9
	7.0-8.5	29	13.8	67.6	29.6
		2	13.8	62.5	30.9
B17	4.5-6.0	35	13.4	65	21.4
		201	21.5	74.6	20.4
	9.5-11.0	200	21.7	77.2	26.4
		203	21.6	73.2	30.0
B18	2.0-3.5	55	13.9	72.1	24.9
		43	13.5	73.5	24.5
	6.0-8.5	139	13.6	67.5	32.8
		113	13.6	66.4	32.7
B19	4.0-5.5	38	13.5	77.8	22.5
		58	13.8	68.9	22.4
	9.0-10.5	37	13.3	77.4	45.0
		17	13.6	68.8	37.3
B20	4.5-6.0	12	13.5	78.1	21.7
		8	13.5	73.2	22.1
	9.5-11.0	119	13.8	90.3	30.3
		45	13.4	88.1	28.4
B21	2.0-3.5	15	13.8	67.7	25.9
		33	13.3	65.7	26.0
	9.0-10.5	52	13.6	67.7	33.6
		301	19.3	72.3	32.8
B22	4.0-5.5	302	19.3	72.3	32.8
		303	20.5	93.9	24.4
	7.0-8.5	304	23.8	99.7	34.6
		305	20	83.1	34.8

B23	4.0-5.5	306	19.2	79.2	34.5
		307	18.9	99.8	31.1
	9.0-10.5	308	20.8	110	28.2
		309	19.5	76	26.4
B24	2.0-3.5	310	19.3	81.3	22.8
		311	19.6	79.9	26.4
	6.5-8.0	312	19.7	102.3	27.5
		313	18.4	104.6	30.4
B25	4.5-6.0	-	20.2	105.7	21.8
		-	19.8	97.2	22.5
	9.5-11.0	-	18.1	94.8	33.4
		-	22.2	91.2	31.9
B26	2.0-3.5	-	19.2	91	25.3
		-	18.5	95	26.4
	6.5-8.0	-	21	85.9	27.0
		-	20.4	95.4	33.0
B27	4.5-6.0	26	13.8	63.6	26.1
		56	13.4	77.8	32.8
	9.5-10.9	114	13.9	84.7	31.4
		11	13.9	80.4	46.2
B28	2.0-3.5	60	13.7	74.4	24.9
		315	21.5	72.6	25.2
	6.5-8.0	316	21.6	81.9	24.3
		34	13.4	78.4	24.5
B29	2.0-3.5	25	13.4	81.6	33.7
		317	21.5	82.9	31.8
	4.0-4.6	108	13.4	79.2	24.6
		39	13.8	65.9	26.5
B30	4.0-5.5	24	13.8	75.9	27.5
		13	13.8	83	27.2
	9.0-9.8	5	13.5	65	32.1
		53	13.4	71	30.3
B31	2.0-3.5	48	13.5	67.8	29.3
		31	13.5	86.3	27.3
	6.5-8.0	30	13.5	68.5	32.9
		7	13.5	75.2	30.4
B32	1.5-3.0	128	13.8	62.7	32.2
		11	13.9	64.6	38.5
	4.0-5.5	39	13.8	71	31.8
		30	13.5	64.2	27.4
B33	6.5-8.0	26	13.8	71.2	37.3
		25	13.4	62.9	28.2
	14.0-15.5	7	13.5	65.4	34.8
		25	13.8	70.4	28.6
B34	2.0-3.5	142	13.5	70.3	25.7
		122	13.8	70.1	25.4
	7.0-8.5	12	13.5	83.3	36.3

		38	13.6	92.4	36.1
B35	2.0-3.5	211	14.5	64.8	29.6
		42	13.7	75.8	34.4
	4.0-5.5	10	13.4	65.8	30.3
		55	13.9	85.8	28.6
B36	4.5-6.0	37	13.3	83.3	22.8
		108	13.4	75.3	23.3
	7.0-8.5	34	13.4	86.3	28.8
		52	13.6	80.9	30.2
B37	4.0-5.5	56	13.4	77	27.2
		4	13.8	66.6	22.8
B38	6.5-8.0	5	13.5	67.1	41.1
		15	13.5	67.5	41.0
	14.0-15.5	24	13.7	80.9	47.0
		43	13.5	82.6	44.9
B39	4.0-5.5	3	13.4	93.5	24.8
		33	13.4	87.1	23.0
	9.0-10.5	44	13.9	75.8	35.2
		15	13.9	75.8	35.7
B40	4.0-5.5	254	13.8	78.2	25.0
		204	14.7	78.8	25.9
	9.5-10.5	47	13.8	74.5	29.4
		22	13.5	64.1	23.7
B41	4.0-5.5	32	13.6	69.7	25.8
		131	13.6	74.3	25.4
	6.5-8.0	133	13.4	78.9	23.6
		3	13.4	69.9	23.9
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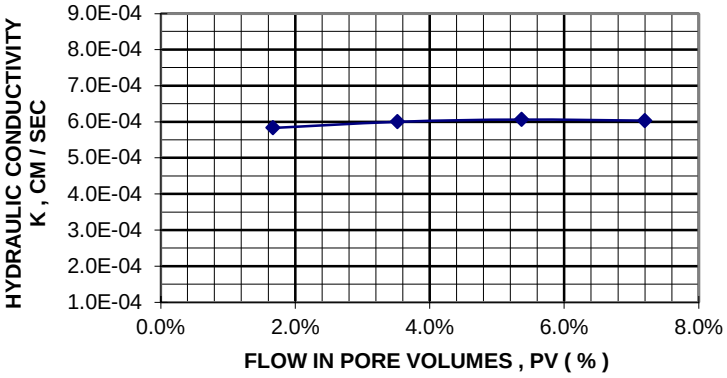
Form No. TR-2310LEX-D5084
Revision No. : 0.5
Revision Date: 09/16/21

HYDRAULIC CONDUCTIVITY OF SOIL

ASTM D 5084 Method C

S&ME - Lexington 2020 Liberty Road Lexington, KY 40505

JOB NAME : *Solid Ground: UK Cancer*			
JOB NO. : *3783-16-006* **SAMPLE DATE:** *05/04/23*	**REPORT DATE:** *05/12/23*	**REVIEWED BY :**	J. Folsom
DEPTH / ELEV. : *2.0 - 4.0*		**SAMPLE TYPE:**	*Intact*
SAMPLE LOCATION: *B33*		**DIAMETER , INCHES :**	*2.86*
SOIL DESCRIPTION : *FAT CLAY (visual-manual), brown*		**LENGTH , INCHES :**	*3.53*
		SPECIFIC GRAVITY, G_s :	*2.65*



HYDRAULIC CONDUCTIVITY, k *

6.0E-04 **CM / SEC @ 20 °C**

SPECIMEN PROPERTIES

INITIAL			
MOISTURE CONTENT	W_o	*23.7*	%
DRY BULK DENSITY	γ_{dryo}	*95.3*	pcf
SATURATION	S_o	*85.6*	%
VOID RATIO	e_o	*0.735*	

AFTER CONSOLIDATION			
MOISTURE CONTENT	W_c	*26.7*	%
DRY BULK DENSITY	γ_{dryc}	*97.0*	pcf
SATURATION	S_c	*100.0*	%
VOID RATIO	e_c	*0.706*	

PERMEATION			
FINAL BACK PRESSURE	u_o	*65.0*	psi
EFFECTIVE CONSOLIDATION PRESSURE	σ_3'	*2.0*	psi
MAXIMUM HYDRAULIC GRADIENT	i_{max}	*5.2*	
MINIMUM HYDRAULIC GRADIENT	i_{min}	*1.9*	
QUANTITY OF FLOW	Q	*10.9*	cm^3
TOTAL PORE VOLUME OF FLOW	PV	*7.2*	%

TEST CONDITIONS

PERMEANT DESCRIPTION : *Water* @ 23 °C

METHOD: *C - Falling Head, Rising Tailwater*

References / Comments / Deviations:

*Applicability of test method is limited to soils of Hydraulic Conductivity of 4.0E-04 and slower. Hydraulic Conductivity is the reported rate or faster.

Jacob Folsom	Jacob Folsom	Lab Services Manager	5/18/2023
Technical Responsibility	*Signature*	*Position*	*Date*

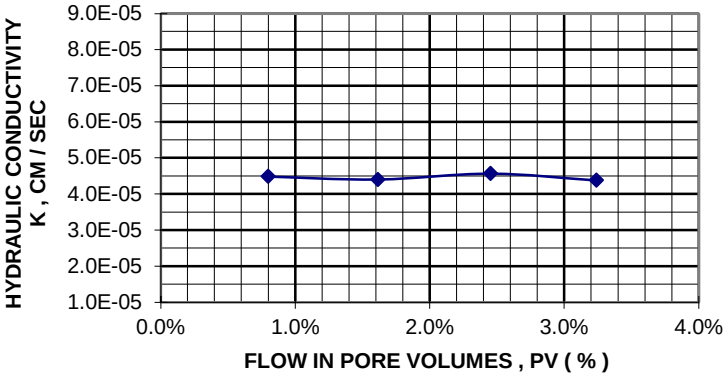
Form No. TR-2310LEX-D5084
Revision No. : 0.5
Revision Date: 09/16/21

HYDRAULIC CONDUCTIVITY OF SOIL

ASTM D 5084 Method C

S&ME - Lexington 2020 Liberty Road Lexington, KY 40505

JOB NAME : *Solid Ground: UK Cancer*			
JOB NO. : *3783-16-006* **SAMPLE DATE:** *05/04/23*	**REPORT DATE:** *05/18/23*	**REVIEWED BY :**	J. Folsom
DEPTH / ELEV. : *2.0 - 4.0*		**SAMPLE TYPE:**	*Intact*
SAMPLE LOCATION: *B38*		**DIAMETER , INCHES :**	*2.83*
SOIL DESCRIPTION : *FAT CLAY(visaul-manual), brown*		**LENGTH , INCHES :**	*3.12*
		SPECIFIC GRAVITY, G_s :	*2.65*



HYDRAULIC CONDUCTIVITY, k

4.5E-05 **CM / SEC @ 20 °C**

SPECIMEN PROPERTIES

INITIAL			
MOISTURE CONTENT	W_o	*23.0*	%
DRY BULK DENSITY	γ_{dryo}	*100.1*	pcf
SATURATION	S_o	*93.6*	%
VOID RATIO	e_o	*0.652*	
AFTER CONSOLIDATION			
MOISTURE CONTENT	W_c	*24.6*	%
DRY BULK DENSITY	γ_{dryc}	*100.3*	pcf
SATURATION	S_c	*100.0*	%
VOID RATIO	e_c	*0.650*	
PERMEATION			
FINAL BACK PRESSURE	u_o	*60.0*	psi
EFFECTIVE CONSOLIDATION PRESSURE	σ_3'	*2.0*	psi
MAXIMUM HYDRAULIC GRADIENT	i_{max}	*6.2*	
MINIMUM HYDRAULIC GRADIENT	i_{min}	*4.7*	
QUANTITY OF FLOW	Q	*4.1*	cm^3
TOTAL PORE VOLUME OF FLOW	PV	*3.2*	%

TEST CONDITIONS

PERMEANT DESCRIPTION : *Water* @ 25 °C

METHOD: *C - Falling Head, Rising Tailwater*

References / Comments / Deviations:

Jacob Folsom	Jacob Folsom	Lab Services Manager	5/18/2023
Technical Responsibility	*Signature*	*Position*	*Date*

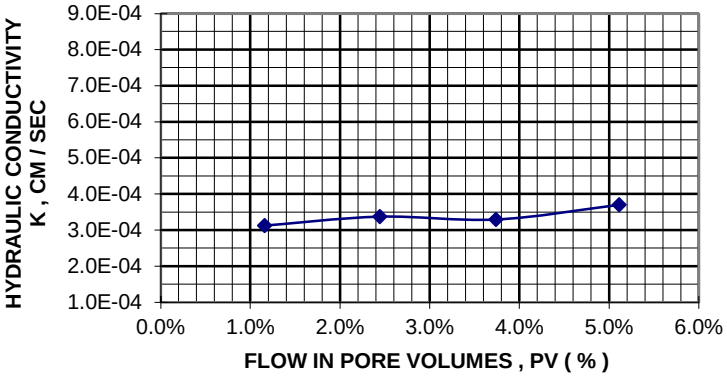
Form No. TR-2310LEX-D5084
Revision No. : 0.5
Revision Date: 09/16/21

HYDRAULIC CONDUCTIVITY OF SOIL

ASTM D 5084 Method C

S&ME - Lexington 2020 Liberty Road Lexington, KY 40505

JOB NAME : *Solid Ground: UK Cancer*			
JOB NO. : *3783-16-006* **SAMPLE DATE:** *05/04/23*	**REPORT DATE:** *05/18/23*	**REVIEWED BY :**	J. Folsom
DEPTH / ELEV. : *2.0 - 4.0*		**SAMPLE TYPE:**	*Intact*
SAMPLE LOCATION: *B40*		**DIAMETER , INCHES :**	*2.85*
SOIL DESCRIPTION : *FAT CLAY (visual-manual), brown*		**LENGTH , INCHES :**	*3.67*
		SPECIFIC GRAVITY, G_s :	*2.75*



HYDRAULIC CONDUCTIVITY, k

3.4E-04 **CM / SEC @ 20 °C**

SPECIMEN PROPERTIES

INITIAL			
MOISTURE CONTENT	W_o	*22.8*	%
DRY BULK DENSITY	γ_{dryo}	*103.5*	pcf
SATURATION	S_o	*95.5*	%
VOID RATIO	e_o	*0.659*	
AFTER CONSOLIDATION			
MOISTURE CONTENT	W_c	*23.5*	%
DRY BULK DENSITY	γ_{dryc}	*104.5*	pcf
SATURATION	S_c	*100.0*	%
VOID RATIO	e_c	*0.643*	
PERMEATION			
FINAL BACK PRESSURE	u_o	*70.0*	psi
EFFECTIVE CONSOLIDATION PRESSURE	σ_3'	*2.0*	psi
MAXIMUM HYDRAULIC GRADIENT	i_{max}	*5.2*	
MINIMUM HYDRAULIC GRADIENT	i_{min}	*2.8*	
QUANTITY OF FLOW	Q	*7.6*	cm^3
TOTAL PORE VOLUME OF FLOW	PV	*5.1*	%

TEST CONDITIONS

PERMEANT DESCRIPTION : *Water* @ 25 °C

METHOD: *C - Falling Head, Rising Tailwater*

References / Comments / Deviations:

Jacob Folsom	*Jacob Folsom*	Lab Services Manager	5/18/2023
Technical Responsibility	*Signature*	*Position*	*Date*

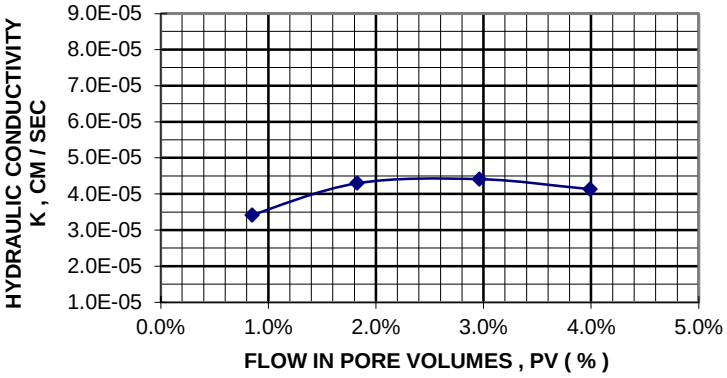
Form No. TR-2310LEX-D5084
Revision No. : 0.5
Revision Date: 09/16/21

HYDRAULIC CONDUCTIVITY OF SOIL

ASTM D 5084 Method C

S&ME - Lexington 2020 Liberty Road Lexington, KY 40505

JOB NAME : *Solid Ground: UK Cancer*			
JOB NO. : *3783-16-006* **SAMPLE DATE:** *05/04/23*	**REPORT DATE:** *05/18/23*	**REVIEWED BY :**	J. Folsom
DEPTH / ELEV. : *2.0 - 4.0*		**SAMPLE TYPE:**	*Intact*
SAMPLE LOCATION: *B41*		**DIAMETER , INCHES :**	*2.83*
SOIL DESCRIPTION : *FAT CLAY (visual-manual), brown*		**LENGTH , INCHES :**	*3.04*
		SPECIFIC GRAVITY, G_s :	*2.65*



HYDRAULIC CONDUCTIVITY, k

4.1E-05 **CM / SEC @ 20 °C**

SPECIMEN PROPERTIES

INITIAL			
MOISTURE CONTENT	W_o	*21.9*	%
DRY BULK DENSITY	γ_{dryo}	*99.6*	pcf
SATURATION	S_o	*88.0*	%
VOID RATIO	e_o	*0.661*	
AFTER CONSOLIDATION			
MOISTURE CONTENT	W_c	*23.8*	%
DRY BULK DENSITY	γ_{dryc}	*101.6*	pcf
SATURATION	S_c	*100.0*	%
VOID RATIO	e_c	*0.628*	
PERMEATION			
FINAL BACK PRESSURE	u_o	*70.0*	psi
EFFECTIVE CONSOLIDATION PRESSURE	σ_3'	*2.0*	psi
MAXIMUM HYDRAULIC GRADIENT	i_{max}	*6.3*	
MINIMUM HYDRAULIC GRADIENT	i_{min}	*4.2*	
QUANTITY OF FLOW	Q	*4.7*	cm^3
TOTAL PORE VOLUME OF FLOW	PV	*4.0*	%

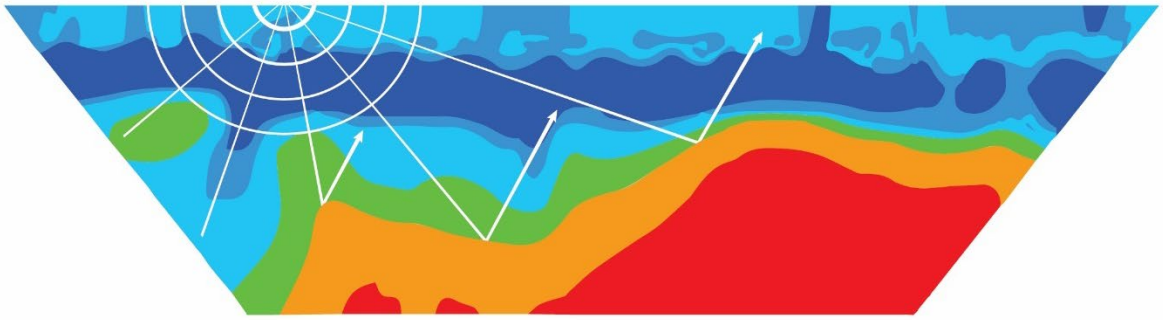
TEST CONDITIONS

PERMEANT DESCRIPTION : *Water* @ 25 °C

METHOD: *C - Falling Head, Rising Tailwater*

References / Comments / Deviations:

Jacob Folsom	Jacob Folsom	Lab Services Manager	5/18/2023
Technical Responsibility	*Signature*	*Position*	*Date*



SHEAR-WAVE VELOCITY TESTING FOR SEISMIC-CLASS DETERMINATION

UNIVERSITY OF KENTUCKY
PROPOSED CANCER TREATMENT CENTER
LEXINGTON, KENTUCKY

Prepared For:

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President
Solid Ground Consulting Engineers
1419 Lexington Rd.
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606-661-9652

June 7, 2023

Prepared by:

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Respectfully submitted:
Thomas B. Brackman
Trent Edwards

Table of Contents

1.0 Introduction

The area under investigation is identified as the proposed UK Cancer Treatment Center and is bounded by State Steet to the north, University Avenue to the south and US Hwy 27 to the east in Lexington, Kentucky. Two refraction microtremor (ReMi) survey lines were conducted in this area. Line 1 was oriented through the approximate center of the proposed cancer center building whereas Line 2 was conducted on the sidewalk along State Street and through the approximate center of the proposed parking structure. A site map showing the approximate location of the survey lines in relation to the rest of the site is included as Figure 1. The intent of this survey was to conduct a shear-wave velocity testing for seismic-class determination for the site.

The information provided herein is a determination of the shear-wave velocity using the Refraction Microtremor (ReMi) method, which can be used in accordance with the International Building Code (IBC) to determine a seismic site classification. It is recommended that a professional engineer be consulted to determine if the site class noted here is acceptable.

2.0 Technical Background

Since its introduction in the late 1990s, use of surface-wave techniques have rapidly increased for two reasons: (1) they provide the shear-wave velocity (Vs) of ground materials, which is one of the most important geotechnical parameters in civil engineering, and (2) they are easier to use than other common seismic approaches (e.g., refraction and reflection).

Elastic moduli are commonly used in geotechnical engineering to describe the behavior of Earth materials under stress, which is ultimately related to such tasks as properly designing earthworks and structural foundations, risk assessment under specific site conditions, and monitoring various types of existing infrastructures for public safety. Among three primary types of modulus: Young's (E), shear (μ), and bulk (κ) moduli—the first two are most commonly used because of what they represent. Young's modulus simply describes the deformation tendency along the axis of stress, whereas the shear modulus describes the tendency of shape deformation (shearing) that, in turn, is related to the viscosity of material. Young's and shear moduli are determined from the parameters of density (ρ), *Vs*, and Poisson's ratio (ó). *Vs* plays the most important role as it is included as squared terms in mathematical expressions. In addition, *Vs*, in reality, changes through a broader range than do density and Poisson's ratio. Therefore, accurate evaluation of *Vs* can be extremely valuable in geotechnical engineering. The shear modulus can be determined fairly accurately once *Vs* is known. Alternatively, Young's modulus requires Poisson's ratio to obtain a comparable accuracy. *Vs* information of ground materials is obtained by processing Rayleigh-type surface waves that are dispersive when travelling through a layered media (i.e., different frequencies travel at different speeds). This dispersion property is determined from a material's *Vs* (by more than 95%), P-wave velocity (*Vp*) (≤ 3%), and density (ρ) (≤2%). By analyzing dispersion properties, we can therefore determine *Vs* fairly accurately by assuming some realistic values for *Vp* and ρ. The accurate evaluation of the dispersion property is most important with any surface-wave method in this sense.

By using a transformation, the surface-wave method converts raw field data in a time-offset (*t-x*) domain into a frequency-slowness velocity (*f-p*) domain. The remaining procedure extracts a

dispersion curve that is used in a subsequent process in search of the one-dimensional (1D) *Vs* profile. An accurate dispersion analysis is obviously an important part of data processing, and this is because shear-wave velocity (*Vs*) information is a good indicator of material stiffness. Surface-wave methods are commonly applied in civil engineering to deal with mechanical aspects of ground materials for example, assessment of load-bearing capacity, ground behavior under continuous and prolonged vibration, and ground amplification and liquefaction potential.

Based on the premise established from empirical studies that the top 30 meters are influenced the most, and also from the fact that the shear-wave velocity (*Vs*) is the best indicator of stiffness, the average *Vs* in the top 30 meters (approximately 100 ft.) (usually denoted as *Vs* 30 m or *Vs* 100 ft.) is used as an important criterion in the design of building structures. In general, a site with a lower *Vs* 30 m (100 ft.) would be subject to greater ground amplification (and suffer more damage from an earthquake).

The National Earthquake Hazard Reduction Program (NEHRP) established by the U.S. Congress in 1977 adopts this criterion and classifies a site into one of several categories (Table 1). The International Building Code (IBC) published the same classification designations in 2000 as one of the parameters that should be accounted for in structural design.

Calculation of the average Vs for a certain depth range can be accomplished in two ways: (1) based on relative thickness-contribution of each layer, and (2) based on the definition of velocity—total distance (Σdi) divided by total travel time (Σti) that is calculated by the summation of thickness (di) divided by velocity (Vsi) of each layer. Both methods can yield significantly different results for the same *Vs* profile as illustrated by using a simple two-layer Vs profile. *Vs* 30 m, as defined in the International Building Code (IBC 2000 and later editions) uses the second method, which tends to put a greater emphasis on the lower *Vs* as shown in the equation below:

Table 1 Site Class Definitions partially reproduced below

Site Class	Soil Profile Name	Average Properties in Top 100 feet (as per 2000 IBC section 1615.1.5) Soil Shear Wave Velocity, V_s	
		Feet/second	Meters/second
A	Hard Rock	$V_s > 5000$	$V_s > 1524$
B	Rock	$2500 < V_s \leq 5000$	$762 < V_s \leq 1524$
C	Very dense soil and soft rock	$1200 < V_s \leq 2500$	$366 < V_s \leq 762$
D	Stiff soil profile	$600 < V_s \leq 1200$	$183 < V_s \leq 366$
E	Soft soil profile	$V_s < 600$	$V_s < 183$

Site Classifications adopted from Table 1615 1.1 Site Class Definitions published in 2000 International Building code, International Code Council, Inc. on page 350.

$$Vs30m = \Sigma di / \Sigma ti = 30 / \Sigma(di/Vsi)\ (m/s)\ (1)$$

2.1 Surface-Wave Seismic Method; Refraction Microtremor (ReMi)

Refraction Microtremor or ReMi is a surface-wave seismic method for measuring in-situ shear-wave (S-wave) velocity profiles. The ReMi method is used to determine shear-wave velocity profiles for International Building Code seismic site classification. The Rayleigh wave method has since been used for delineation of landslides and tunnel assessment, soil compaction control, mapping the subsurface and estimating the strength of subsurface materials. Testing is performed at the surface using the same conventional seismograph and vertical P-wave geophones used for

refraction studies thus the term refraction. The seismic source consists of ambient seismic "noise", or microtremors, which are constantly being generated by cultural and natural noise. Depending on the material properties of the subsurface, ReMi can determine shear-wave velocities down to a minimum of 40 meters (approximately 130 feet) and a maximum of 100 meters (approximately 300 feet) depth. The data acquisition procedure consists of obtaining ten to twenty, thirty-second seismic noise records using conventional seismograph and 4.5 or 10 Hertz (Hz), P-wave geophones. The wavefield transformation of the noise record reveals the shear-wave dispersion curve. The shear-wave dispersion curve is then manually picked from the wavefield transformation and forward modeled to determine the subsurface shear-wave velocity profile (see inset Diagram 1).

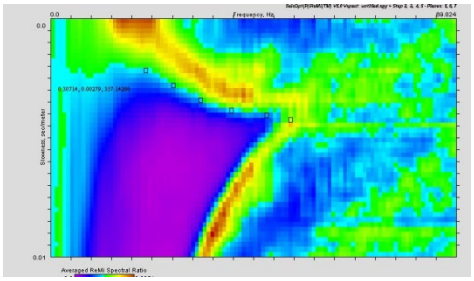


Diagram 1: Schematic diagram of the slowness (p) frequency transformation of the data for picking the dispersion curve.

3.0 Procedures

Two ReMi survey lines were conducted at the UK Cancer Treatment Center site on June 2nd, 2023. Each line was conducted using twenty-four, 10-hertz geophones with 13-foot spacing between geophones for a total line length of 299 feet. The lines were laid out for the survey as shown in Figure 1. Data were collected for 30 second intervals using a Seismic Source DAQ link III, 24-bit Data, 24-Channel Seismic Acquisition Unit equipped with Vibrascope Seismic Software.

Evaluation of the ReMi data for the site was completed using the method described by Louie (2001). The recorded data were exported to the SeisOpt® ReMi™ proprietary software for processing and modeling. SeisOpt® ReMi™ software was used to process and pick dispersion curves (Figure 2). Dispersion curves were forward modeled to construct a shear-wave velocity profile for each line (Figures 3 and 4). Shear-wave velocities obtained from the forward modeling process were then compared to the National Earthquake Hazard Reduction Program (NEHRP) site class as illustrated in Table 1.

4.0 Summary of Findings

The information provided herein is a determination of the shear-wave velocity using the Refraction Microtremor (ReMi) method and can be used in accordance with the International Building Code (IBC) to determine a seismic site classification (Table 1). The Site Class has been determined to be **Class B,** for both areas investigated, based on data provided by the geophysical survey conducted. Note that Class B shall not be used if there is more than 10 feet of soil between the rock surface and bottom of the spread footing or mat foundation shear-wave velocity. Based on evaluation of data from the ReMi survey lines at the site are as follows:

- Line 1: ***Vs*= 3,347.04 ft/sec** with a root mean square (RMS) of 297.09 ft/sec.
- Line 2: ***Vs*= 3,142.37 ft/sec** with a root mean square (RMS) of 107.43 ft/sec.

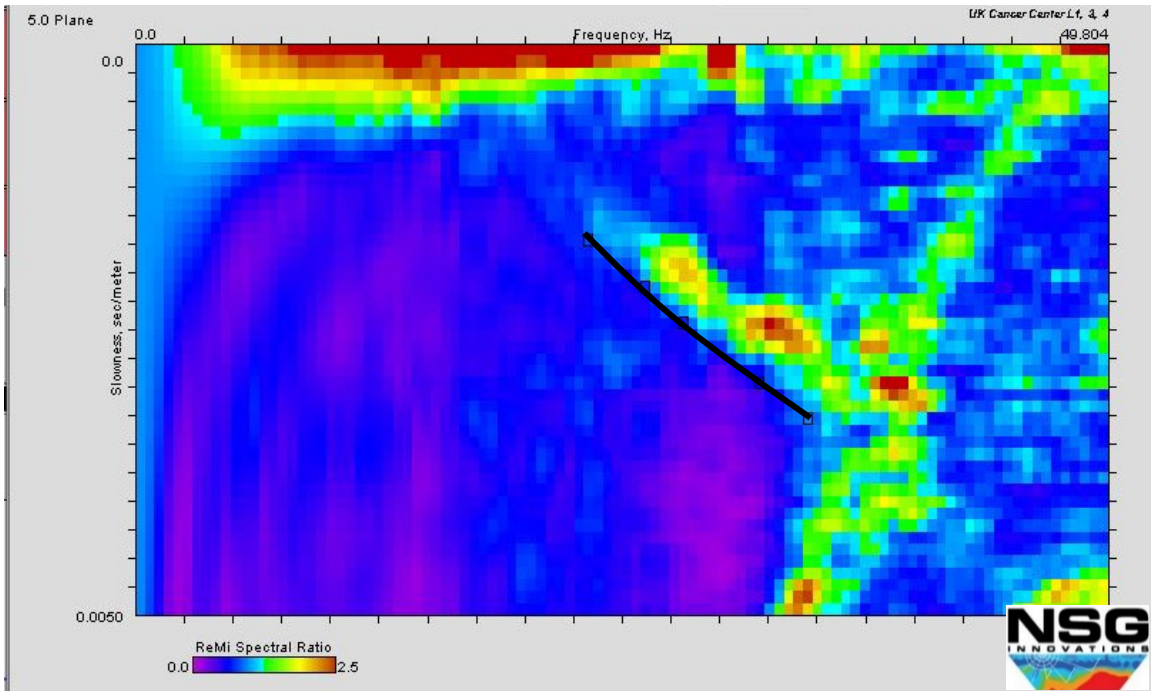
5.0 Limitations

This study included a limited set of geophysical readings across limited portions of the site. The results and interpretations of the geophysical survey performed are considered generally reliable and were conducted in a manner consistent with practitioners in the field of geophysical engineering. The methods used in this investigation are considered reliable. The shear-wave data applies only to this particular site.

Figure 1 Approximate Line Locations

Figure 2 ReMi Dispersion Curves and Picks

Line 1



Line 2

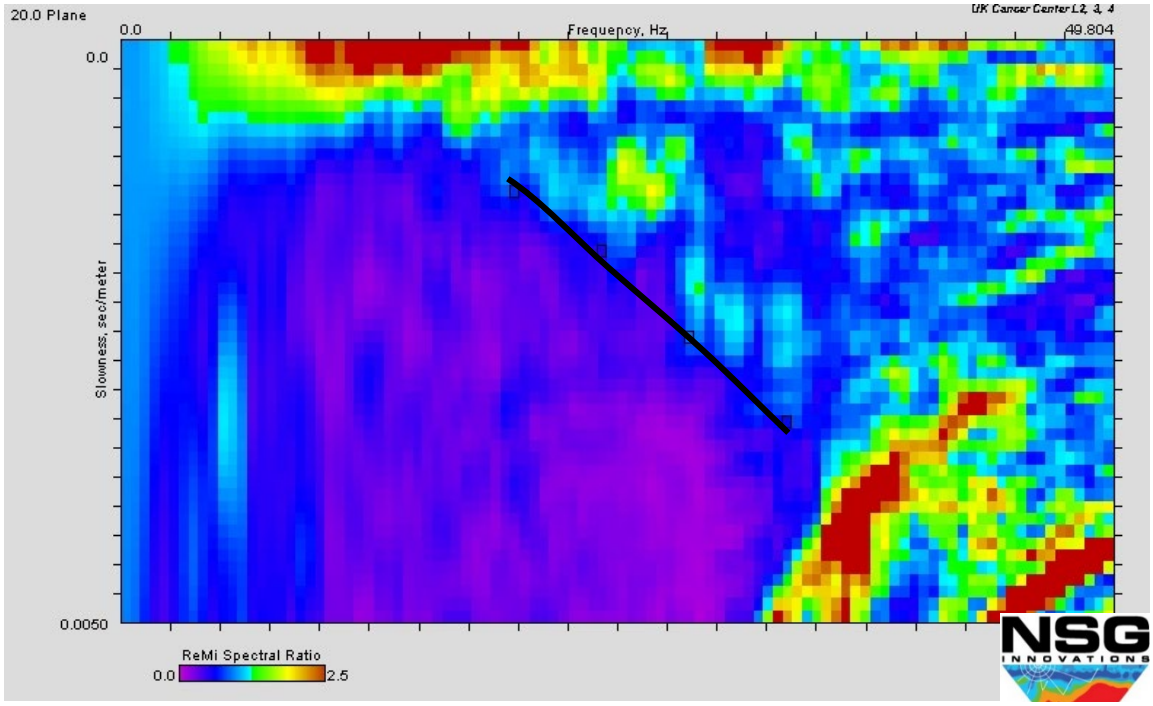


Figure 3 Shear-Wave Velocity Profile-Line 1

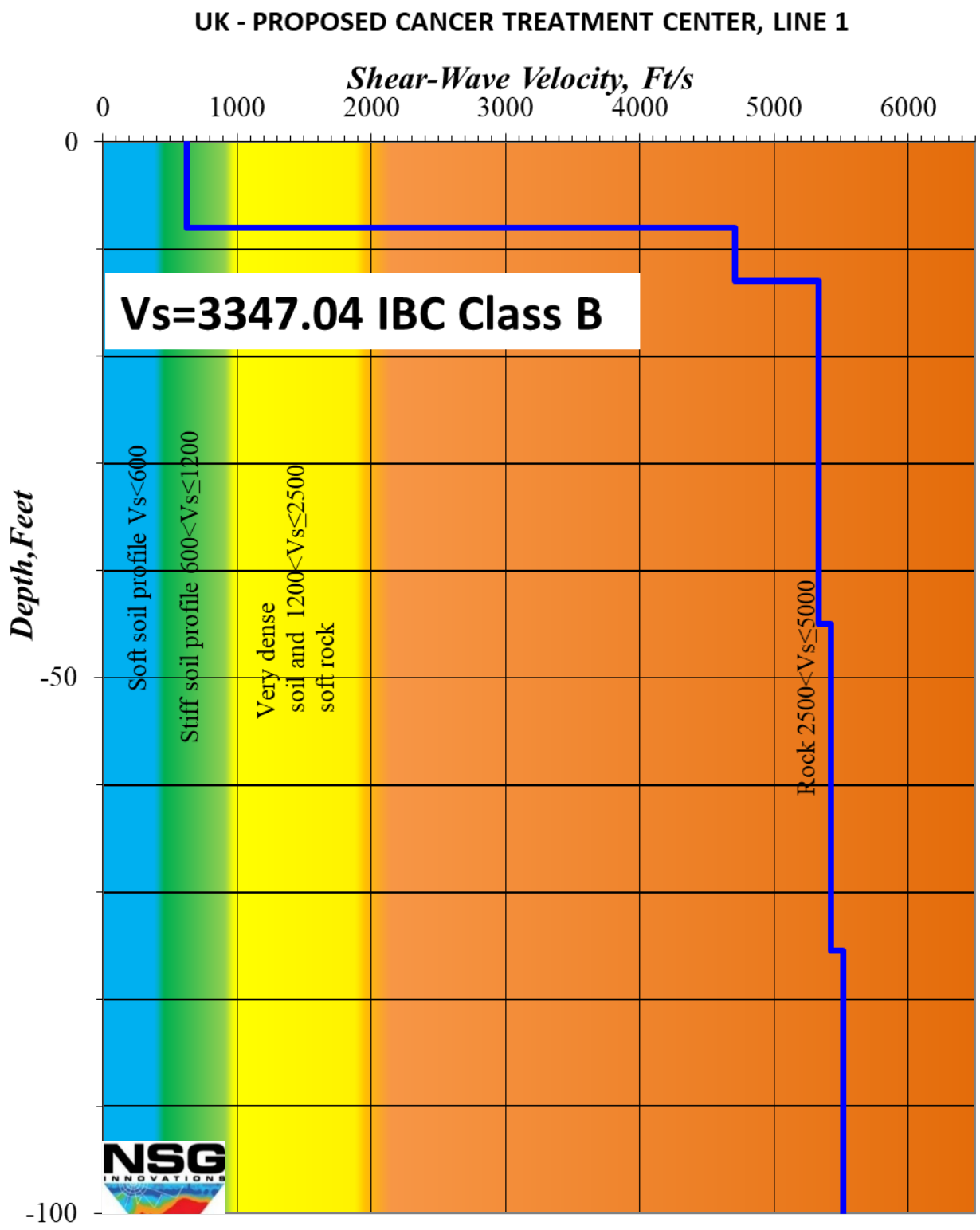


Figure 4 Shear Wave Velocity Profile-Line 2