GEOTECHNICAL INVESTIGATION

FOR

APARTMENT COMMUNITY

SOUTH PARK ROAD

LOUISVILLE, KENTUCKY

FOR

LDG DEVELOPMENT, LLC

1473 SOUTH FOURTH STREET

LOUISVILLE, KY 40208

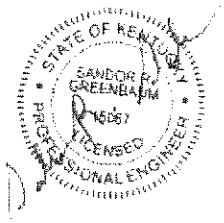
BY

GREENBAUM ASSOCIATES, INC.

994 LONGFIELD AVENUE

LOUISVILLE, KENTUCKY 40215

DECEMBER 26, 2019



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APPENDIX

1.0 Introduction

LDG Development, LLC intends to build a new 312-unit apartment community on a ±18.64-acre tract located at 4011 South Park Road in Louisville, Kentucky. This property consists of two large residential tracts fronting on South Park Road and one parcel fronting on Blue Lick Road. The area is relatively level with the north central portion of the property being overgrown and partially wooded. The new development is to consist of thirteen three-story apartment buildings, a clubhouse, and a pool. A boring location plan is included in the appendix of this report that shows the approximate locations of the borings and the proposed construction. A site location plan is also included in the appendix.

It is our understanding that limestone has been mined from below the property via horizonal mineshafts that extend from the above-ground quarry present on the opposite side of South Park Road. Geotechnical study relating to mining activities below the property was not performed since that is beyond the scope of this investigation. A geophysical survey could be used to determine the presence of mineshafts with rock core borings used to determine the thickness of the overlying bedrock (roof). Such a study could determine the possibility of catastrophic collapse of the mineshaft roof.

No subsidence or erosion feature was observed on the property. Were such a feature present, it could be due to erosion into a karst feature or into a mineshaft.

We were contracted by LDG Development, LLC to carry out a geotechnical investigation directed at determining the foundation support characteristics of the materials upon which these buildings and associated pavement will be supported. Work was coordinated through Ms. Ramona Vasta of LDG Development, LLC.

2.0 General Geology

Soils at this site are shown by the Kentucky Geological Survey to be residuum, the residual product of weathering of the local bedrock. Bedrock is shown to be the New Albany Shale and Beechwood Limestone, undifferentiated. This property is near the contact with the underlying Louisville Limestone, so the bedrock below the eastern portion of the development is probably the Beechwood Limestone and the New Albany Shale may be present below the western portion of the development.

The Kentucky Geological Survey describes the New Albany Shale as:

Shale, silty, olive black to grayish black, weathers pale yellowish brown or very light gray; massive; dense where fresh, fissile in thin brittle chips where weathered. Pyrite abundant as veinlets or spherules that weather to stain outcrops with brown and yellow iron oxides and sulfates. Phosphate nodules as much as 2 inches in diameter in upper 10 feet; calcareous, clayey and sandy in lower part; quartz in dike like geodiferous fracture fillings in upper 10 to 20 feet. Fossils include conodonts, silicified wood, spores, fish remains, worm markings, and linguloid brachiopods.

The Kentucky Geological Survey describes the Beechwood Limestone as:

Limestone, light gray to light greenish gray, weathers moderate yellowish brown to dark yellowish orange; fossil fragmental, with coarse to very coarse fossil fragments and whole fossils in a very fine grained matrix; very thin to thin bedded, locally cross-bedded, stylolitic; weathers to rounded massive slabs on which slightly resistant dull white fossil remains stand out in sharp relief from brownish matrix. Remains of the crinoid commonly called Dolatocrinus are distinctive. Pyrite common at top and base. Basal contact marked by zone of fossil trash. Contact with underlying unit unconformable. Unit commonly poorly exposed owing to solution by recent weathering or cover by terrace deposits of Quaternary age.

3.0 Investigation

Thirty-six borings were carried out across the site by standard penetration procedures to auger refusal. Diedrich D-25 and GeoProbe 66DT track-mounted drill rigs were used to carry out the borings through the use of 2 ¼-inch inside diameter hollow stem augers and an automatic hammer. The boring locations were staked using a nylon tape from existing topography, so boring locations are only as accurate at this method allows.

The standard penetration procedure involves driving a standard 2-inch diameter split spoon in the formation at selected intervals using a 140-pound hammer falling through 30 inches. The blow counts for each 6 inches of drive, to a total of 18 inches, are recorded and the number of blows for the 12 inches after the first 6 inches is a standard measure of the condition of the soil. As the split spoon is removed from the ground, it retrieves a sample of the soil in a disturbed

condition. Nevertheless, this sample is suitable for certain classification tests and is representative of the soils at the depth tested.

Soil samples were returned to the laboratory where a program of testing was carried out. This testing included a grain size analysis, an Atterberg Limits' test and a number of natural moisture determinations.

Grain size determination arrives at a curve of grain size against that fraction of the soil that is finer than that particular grain size. It also allows the determination of the clay fraction, silt fraction, sand fraction, etc. in any particular soil sample. Based on this division of grain sizes, the field soils classifications are refined and the boring logs adjusted. In the case of fine grained soils, the soils are largely silt and clay; thus requiring that the soils be suspended in an aqueous medium and the rate at which the particles drop out is measured in order to arrive at the grain size distribution. Silt and clay grains are so fine that sieve analysis alone will not function in this range. The coarse fraction of this sample is separated from the fine and run through a nest of sieves in order to further detail the grain size distribution in the coarse range. In this case only the sieve analysis portion of the test was performed since little sand and silt was present in the soil samples selected for testing.

The natural moisture determination arrives at the in-situ moisture content of the soil and is useful for correlating the strength of various samples of like texture and in conjunction with the Atterberg limits, gives a strong measure of the strength range the soils are likely to be found in.

4.0 Findings

4.1 Boring Results

This site is covered by 6- to 8-inches of topsoil, for the most part, but one boring found 10 inches of topsoil. Below this soil is moist, soft to very stiff, brown or reddish brown, lean clay, sometimes containing ferromagnesian nodules and sometimes a trace of organics in the top three feet. Deeper soils, below 5- to 6-feet depth, frequently contain chert and/or weathered limestone. Soils are generally very stiff below 5- to 6-feet depth. Auger refusal on apparent bedrock was encountered between 5.5- and 14.8-feet depth.

The soils are softest in the portion of the property that appears as a panhandle extending westward from the main property to Blue Lick Road, This

area is planned for the clubhouse, pool and one apartment building. Elsewhere, shallow soils at the probable foundation bearing level were found to be soft only in borings B-15 and B-33, though there were areas where soils are soft above 2.5 feet depth, possibly the foundation bearing level if these areas are to be filled. However, the vertical extent of these softer soils is limited allowing these soils to be removed and replaced by means of undercut and refill where encountered in foundation bearing surfaces. The more extensive soft soils in borings B-01 through B-05 will limit bearing capacity in this area.

The table below, and continued at the top of the following page, provides a tabulation of N-values as measured by the standard penetration test and corrected for the energy of the automatic hammer. Depth to auger refusal is also provided.

Depth	B-01	B-02	B-03	B-04	B-05	B-06	B-07	B-08	B-09
1 – 2.5 feet	4	5	3	4	5	2	5	7	7
3 – 4.5 feet	7	7	9	7	8	17	27	14	12
6 – 7.5 ft	10	21	17	21	18	17	29	18	29
8.5 – 10 ft	50/2"	8		13	50/2"	50/3"	50/3"		25
Refusal	9.8'	10.3'	8.5'	10.5'	8.6'	9.8'	9.8'	8.0'	11.3'

Depth	B-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17	B-18
1 – 2.5 feet	40	13	10	17	9				7
2 – 3.5 feet						7	18	18	
3 – 4.5 feet	16	36	20	21	12				17
5 – 6.5 feet						9	26	25	
6 – 7.5 feet									16
Refusal	6.6'	8.4'	9.3'	7.2'	8.4'	5.5'	7.7'	7.8'	8.0'

Depth	B-19	B-20	B-21	B-22	B-23	B-24	B-25	B-26	B-27
1 – 2.5 feet	4	5	7	7	4				
2 – 3.5 feet						14	21	23	20
3 – 4.5 feet	20	10	27	18	13				
5 – 6.5 feet						16	27	29	26
6 – 7.5 feet	21	20	17	22	50/4"				
8.5 – 10 feet	5	15	13	22					
Refusal	11.0'	14.8'	10.8'	11.0'	7.5'	7.7'	6.8'	6.9'	8.1'

Depth	B-28	B-29	B-30	B-31	B-32	B-33	B-34	B-35	B-36
1 – 2.5 feet	20	13		13	18	4	7	5	
2 – 3.5 feet			12						21
3 – 4.5 feet	46	31		30	20	8	17	13	
5 – 6.5 feet			9						48
6 – 7.5 feet						23	27	26	
8.5 – 10 feet						14	25		
10 – 11.5 ft.			9						
Refusal	8.0'	7.5'	13.1'	7.8'	6.6'	10.5'	10.3'	8.5'	7.9'

No groundwater was encountered in any of the borings, but water is known to have flooded the mineshafts present below the property.

4.2 Laboratory Results

A sample of soil from shallow depth was tested and classified and was found to be lean clay. The result of this testing is summarized in the table below with more detailed results provided in the appendix of this report. Moisture content is shown graphically on the boring logs.

Soil Sample	Grain Size Distribution			Atterberg Limits			Soil Classification	
	Percent Sand	Percent Silt	Percent Clay	Liquid Limit	Plastic Limit	Plasticity Index	Unified	AASHTO
B-24 @ 2' – 3.5'	10	45	45	37	19	18	CL	A-6

4.3 Historic Aerial Photographs

Aerial photographs, available on Google Earth, dating back to 1993 are available. The portion of the property that is overgrown was relatively clear through 2006, at which point it was allowed to become overgrown. There was a house or barn on the east side of the property near its north-south center through 2017, but that structure is not present in the most recement image.

4.4 Seismicity

By the 2018 edition of the Kentucky/2015 International Building Code, this is a Very Dense Soil and Soft Rock Profile, Site Class C. The Spectral Response Acceleration Coefficients, for this area, as provided by U.S.G.S., FEMA Design Parameters are:

$S_S = 0.204$ g	$S_{MS} = 0.245$ g	$S_{DS} = 0.164$ g
$S_1 = 0.106$ g	$S_{M1} = 0.180$ g	$S_{D1} = 0.120$ g

5.0 Recommendations

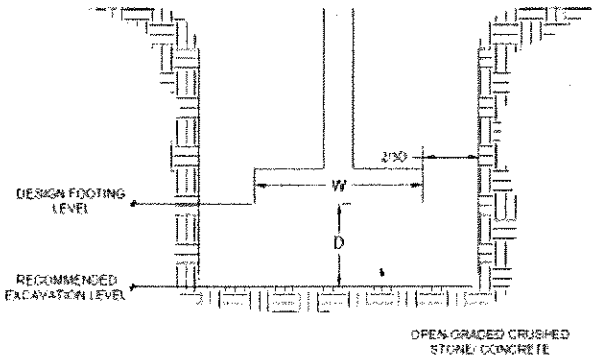
5.1 Foundations

Soil conditions vary across the site, so foundations for these buildings are discussed in two subsections to cover these varying soil conditions.

5.1.1 Panhandle with frontage on Blue Lick Road (Boring B-01 to B-05)

The proposed buildings in this area may be supported on spread footings bearing on shallow soil or structural fill placed in accordance with section 5.3 of this report. These foundations may be designed based on an allowable net bearing capacity of up to 2,000 pounds per square foot.

Undercut and refill below foundations should be under the direction of a Geotechnical Engineer and should be refilled with Kentucky Number 57 stone in a manner as illustrated in the diagram below. Depth of undercut, D, should be 2 feet unless the Geotechnical Engineer determines that greater depth of undercut is necessary.



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Soil bearing foundations exposed to weather must bear at least 30 inches below finished grade in order to insulate the bearing strata from freezing. Interior foundations protected from freezing are exempt from this requirement. Continuous footings must be at least 16 inches wide and isolated footings must be at least 24 inches wide.

Settlement of foundations designed based on the above criteria should be below that which is considered acceptable for this type of construction; that is total settlement should be less than one inch and differential settlement should be less than three quarters of an inch.

For shallow foundations, friction along the base of the footing can be used to resist lateral forces. A friction coefficient of 0.35 may be used, which assumes that the footing concrete is placed directly against the natural cut faces. The coefficient of friction value recommended is an ultimate value and a minimum factor of safety of 1.5 must be applied when determining the allowable sliding resistance.

5.1.2 Main Body of Property

Theses proposed apartment buildings may be supported on spread footings bearing on shallow soil or structural fill placed in accordance with section 5.3 of this report. These foundations may be designed based on an allowable net bearing capacity of up to 2,500 pounds per square foot.

Once foundation bearing surfaces are exposed, an engineer or senior engineering technician from this office should be present to view all bearing surfaces to determine the presence of soft soils. Where soft soils are encountered, undercut will need to extend to firm material or to a level determined to be acceptable by the geotechnical engineer and should be refilled with either lean concrete (fc' = 2,000 psi) or open-graded stone such as Number 57 stone.

Where the building was present on the east side of the property, any foundations that remain must be removed entirely to a level at least two feet below foundation bearing surfaces. Any basements or cellars must be filled with engineered fill as discussed in section 5.3 of this report. If the basement slab is below the foundation bearing level, it may be left in place if perforated with two-inch or larger perforations on four-foot centers.

Soil bearing foundations exposed to weather must bear at least 30 inches below finished grade in order to insulate the bearing strata from freezing. Interior foundations protected from freezing are exempt from this requirement. Continuous

footings must be at least 16 inches wide and isolated footings must be at least 24 inches wide.

Settlement of foundations designed based on the above criteria should be below that which is considered acceptable for this type of construction; that is total settlement should be less than one inch and differential settlement should be less than three quarters of an inch. Settlement of rock bearing foundations will be negligible.

For shallow foundations, friction along the base of the footing can be used to resist lateral forces. A friction coefficient of 0.35 may be used, which assumes that the footing concrete is placed directly against the natural cut faces. The coefficient of friction value recommended is an ultimate value and a minimum factor of safety of 1.5 must be applied when determining the allowable sliding resistance.

5.2 Slab-On-Grade

Prior to placement of the fill in the slab area, the subgrade must be proofrolled and carefully examined by a geotechnical engineer for areas of soft or loose soil. If soft or loose soils are encountered, they must be undercut and refilled in accordance with instructions given by the geotechnical engineer's on-site representative. Undercut and refill in soft areas consists of excavating to a depth up to two feet below subgrade elevation and refill should be with "Surge Rock", 6-inch minus or Number 3 stone. Large rock should not be used in areas where trenching will be required to install piping or conduit.

Some of the soils at this site are relatively silty, so if construction is to take place other than during mid-June to mid-September, shallow soils are likely to be soft. Undercut and refill can be kept to a minimum if construction vehicles traveling over the building pad is kept to a minimum, perhaps delineating areas where construction traffic is acceptable and areas where it is not. Control of construction traffic can prove difficult but has been found to work in some cases.

A slab-on-grade that is structurally separated from the walls, columns and foundations is preferable, though thickened slab may be used. Separation of slab-on-grade from foundations will minimize the stress caused by possible differential settlement between the slabs and the foundations and between adjacent slabs. A vapor barrier must be incorporated into the design and at least four inches of Dense Graded Aggregate (DGA) should underlie the slab. The floor slab may be designed based on a Modulus of Subgrade Reaction of 75 pounds per cubic inch

in the area of borings B-01 through B-06 and 100 pounds per cubic inch over the rest of the site.

5.3 Site Preparation and Earthwork

Prior to fill placement all vegetation and topsoil (soil containing more than 4 percent organic content) must be removed from below the area to be filled. Where trees or bushes have been present, the entire rootball should be removed and the resulting excavation should be refilled with soil compacted as described in this section of the report. Then, prior to placement of fill, the exposed subgrade should be proofrolled by a fully loaded tri-axle truck to delineate any yielding or rutting areas that may require treatment such as undercut and refill or drying.

All fill should be placed in lifts not exceeding 8 inches in uncompacted thickness and must be compacted to at least 98 percent of the soils maximum dry density as determined by the Standard Proctor (ASTM D-698). Soil moisture content should be within 2 percent of optimum as determined from the Standard Proctor.

Soil from any off-site borrow sources should be tested and approved by this office prior to being used on the site. Satisfactory borrow materials are those falling in one of the following classifications: GC, SM, SC, ML, or CL. Soil types MH, CH and OH soils and peat are unsatisfactory borrow materials.

The site should be maintained in a well-drained condition both during and after construction. Site grading should provide for drainage of surface run-off away from proposed buildings and pavement.

The placement of compacted fill should be carried out by an experienced excavator with the proper materials. The excavator must be prepared to adapt his procedures, equipment and materials to the type of project, to weather conditions, and the structural requirements of the engineer. Methods and materials used in summer may not be applicable in winter; soil used in proposed fill may require wetting or drying for proper placement and compaction. Conditions may also vary during the course of a project or in different areas of this site. These needs should be addressed in the project drawings and specifications.

During freezing conditions, the fill must **not** be frozen when delivered to the site. It also must not be allowed to freeze during or after compaction. Since the ability to work the soil while keeping it from freezing depends in part on the soil type, the specifications should require the contractor to submit a sample of his proposed fill before construction starts, for laboratory testing. If the soil engineer

determines that it is not suitable, it should be rejected. In general, silty sand, clayey sand, and cohesive/semi-cohesive soils should not be used as fill under freezing conditions. All frozen soil of any type should be rejected for use as compacted fill.

It is important that compacted fill be protected from freezing after it is placed. The excavator should be required to submit a plan for protecting the soil. The plan should include details on the type and amount of material (straw, blankets, extra loose fill, topsoil, etc.) proposed for use as frost protection. The need to protect the soil from freezing is ongoing throughout construction and applies both before **and** after concrete is placed, until backfilling for final frost protection is completed. Foundations placed on frozen soil can experience heaving and significant settlement, rotation, or other movement as the soil thaws. Such movement can also occur if the soil is allowed to freeze **after** the concrete is placed and then allowed to thaw. The higher the percentage of fines (clay and silt) in the fill, the more critical is the need for protection from freezing.

The contractor should be required to adjust the moisture content of the soil to within a narrow range near the optimum moisture content (as defined by the applicable Proctor or AASHTO Test). In general, fill should be placed within 2% of optimum moisture. The need for moisture control is more critical as the percentage of fines increases. Naturally occurring cohesive/semi-cohesive soil are often much wetter than the optimum. Placing and attempting to compact such soils to the specified density may be difficult. Even if compacted to the specified density, excessively wet soils may not be suitable as pavement subgrades due to pumping under applied load. This is especially true when wet cohesive/semi-cohesive soil is used as backfill in utility trenches and like situations. Excessively wet soil in thick fill sections may cause post-construction settlement beyond that estimated for fill placed at or near (±2%) the optimum moisture content.

5.4 Earth Pressures

Any retaining walls should be constructed with a drainage blanket of sand or a synthetic drainage material. Synthetic drainage media should be available from suppliers of geotextile. The wall should be drained at its base by a perforated PVC underdrain or weepholes at a spacing of not more than 10 feet. Where a relatively thin drainage blanket is used, the retaining wall should be designed based on a coefficient of active earth pressure (K_a) of 0.36 and a soil unit weight (γ_w) of 130 pounds per cubic foot. This results in an equivalent fluid pressure of 47 pounds per cubic foot. Where granular backfill completely fills the area defined by a plane extending upward from the base of the wall at a 45-degree angle, the retaining wall may be designed based on a coefficient of active earth pressure (K_a)

of 0.27 and a soil unit weight (γ_w) of 130 pounds per cubic foot. This results in an equivalent fluid pressure of 35 pounds per cubic foot.

However, where the wall is restrained from movement, as in the case of building basement walls bearing against the basement slab or building frame, the wall must be designed based on the "at rest" earth pressure. The coefficient of "at rest" earth pressure (K_0) is 0.47 with a soil unit weight (γ_w) of 130 pounds per cubic foot in the case of a thin drainage blanket behind the wall, resulting in an equivalent fluid of 61 pounds per cubic foot unit weight. Where granular backfill completely fills the area defined by a plane extending upward from the base of the wall at a 45 degree angle, the retaining wall may be designed based on a coefficient of "at rest" earth pressure (K_0) of 0.43 and a soil unit weight (γ_w) of 130 pounds per cubic foot. This results in an equivalent fluid pressure of 56 pounds per cubic foot.

The table below summarizes the design earth pressures.

	Active Earth Pressure Coefficient (K_a)	Passive Earth Pressure Coefficient (K_p)	Coefficient of Earth Pressure at Rest (K_0)	Equivalent Fluid Pressure on Cantilever Walls	Equivalent Fluid Pressure on Braced Walls
Fill Material/Local Soils	0.36	2.77	0.47	47 pcf	61 pcf
Granular Backfill	0.27	3.69	0.43	35 pcf	56 pcf

Surcharge above the wall will add additional load. A uniform surcharge must be multiplied by the appropriate coefficient of earth pressure to determine the additional load applied to the wall.

Any retaining wall design must use appropriate factors of safety. It is critical that drainage be provided as mentioned earlier in this section in order to avoid hydrostatic pressure. Hydrostatic pressure would increase pressure against the wall substantially.

5.5 Light- and Heavy-Duty Pavement

Pavement subgrade should be examined and proofrolled as described under "Floor Slabs". If soft areas are encountered, the soft soils will need to be undercut and refilled in accordance with the instructions of the geotechnical engineer's on-site representative. Subgrade stabilization was discussed in section

5.2 for slab-on-grade. The same approach should be taken for pavement subgrade, but the requirement for a stable, non-yielding subgrade is even more important in the case of asphalt pavement.

The soils at this site are very silty, making the soils very sensitive to moisture. It is very likely that extensive undercut and refill or chemical stabilization of the building and pavement subgrades will be required. If earthwork and paving is preformed during the normally dry, warm months of mid-June through mid-September, the need for soil stabilization may be minimized. However, budgeting should take into account the need for either extensive undercut and refill with stone or cement stabilization. These soils are too silty for lime stabilization to be effective.

A pavement analysis was conducted using a life cycle of 20 years and a cumulative 18-kip equivalent single axle load of 20,000 for light traffic loads and 160,000 for moderate traffic loads. Recommendations are provided for both flexible and rigid pavement systems. However, rigid pavement should be used in special truck traffic areas, such as those areas which receive frequent traffic by garbage trucks. The concrete pavement should extend throughout the areas that require extensive turning and maneuvering of garbage trucks or other heavy trucks. Heavily loaded pavement areas that are not designed to accommodate these conditions often experience localized pavement failures, particularly if flexible pavement sections are used.

The minimum recommended thickness for both hot mixed asphalt concrete (HMAC) and reinforced Portland cement concrete (PCC) pavement sections are presented in the table below for the described light, moderate and special traffic condition.

Recommended Pavement Section					
Component	Light		Moderate		Special
	Rigid	Flexible	Rigid	Flexible	Rigid
Reinforced Portland Cement Concrete (PCC)	5 inches		6 inches		7 inches
Hot Mixed Asphalt Concrete (HMAC)		3 inches		4 inches	
Crushed Limestone Base (Dense Graded Aggregate)	4 inches	8 inches	4 inches	8 inches	4 inches
Prepared Subgrade	6 inches	6 inches	6 inches	6 inches	6 inches

The Portland cement concrete should be air-entrained and conform to ASTM C-94 (Standard Specifications for Ready-Mixed Concrete) and have a minimum compressive strength of 4,000 pounds per square inch. Reinforcing should meet the requirements of ACI.

Hot mix asphalt concrete and Dense Graded Aggregate should meet the requirements of the Kentucky Transportation Cabinet. The top inch of asphalt should be a surface mix, the remainder being a base mix.

5.6 Temporary Earth Slopes or Cuts

Temporary earth cuts necessary to construct foundations or utility lines should be no deeper than 4 feet without benching or sloping. Cuts deeper than this should be sloped no steeper than one horizontal to one vertical or should have benches every 2 feet of height equating to this slope. If vertical faces deeper than 4 feet are used, bracing designed for short term loads may be used. Excavations should comply with OSHA regulations.

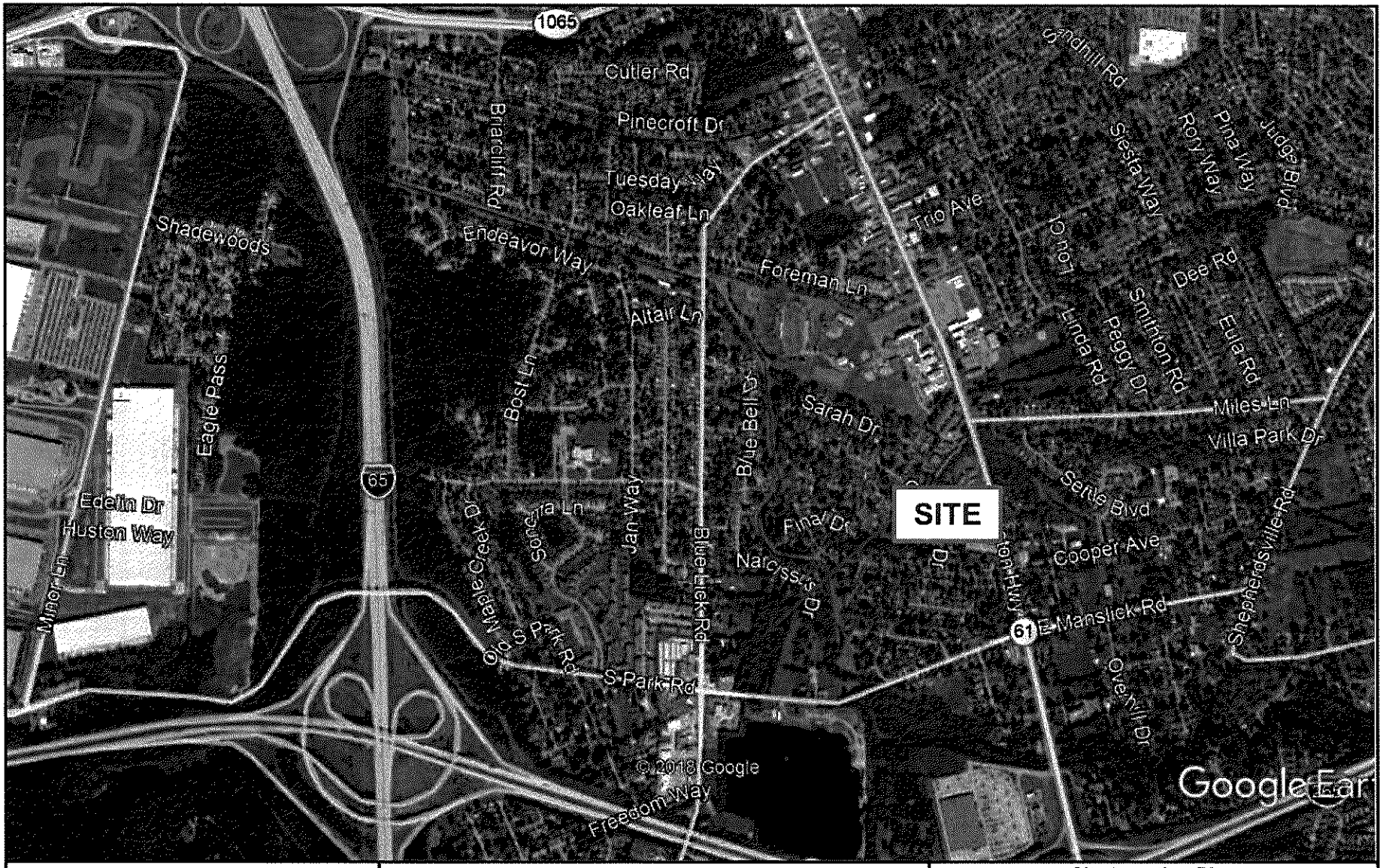
5.7 Limitations

We strongly recommend that bearing surfaces and compaction be monitored by Greenbaum Associates, Inc. Our technicians will be available to further assist you in providing these and other normally specified quality control services. The report is preliminary until such time as these examinations are completed to confirm conditions consistent with those discovered in the investigation.

The conclusions and recommendations offered in this report are based on the subsurface conditions encountered in the borings. No warranties can be made regarding the continuity of conditions between or beyond borings. If, during construction, soil conditions are encountered that differ from those indicated in this report, a representative of Greenbaum Associates, Inc. should inspect the site to determining if design modification is required.

This study was directed at specific buildings and associated pavement at this location to be constructed within a reasonably short period after this study. Use for any other location, structures or substantial changes in construction period may invalidate the recommendations. The geotechnical engineer should be consulted relative to any substantial change in these.

This study is directed at mechanical properties of the soils and includes no sampling, testing or evaluation for environmental considerations.



LDG Development, LLC	Greenbaum Associates, Inc.	**Site Location Plan** Apartment Community South Park Road, Louisville, Kentucky Greenbaum Project Number: 19-285G

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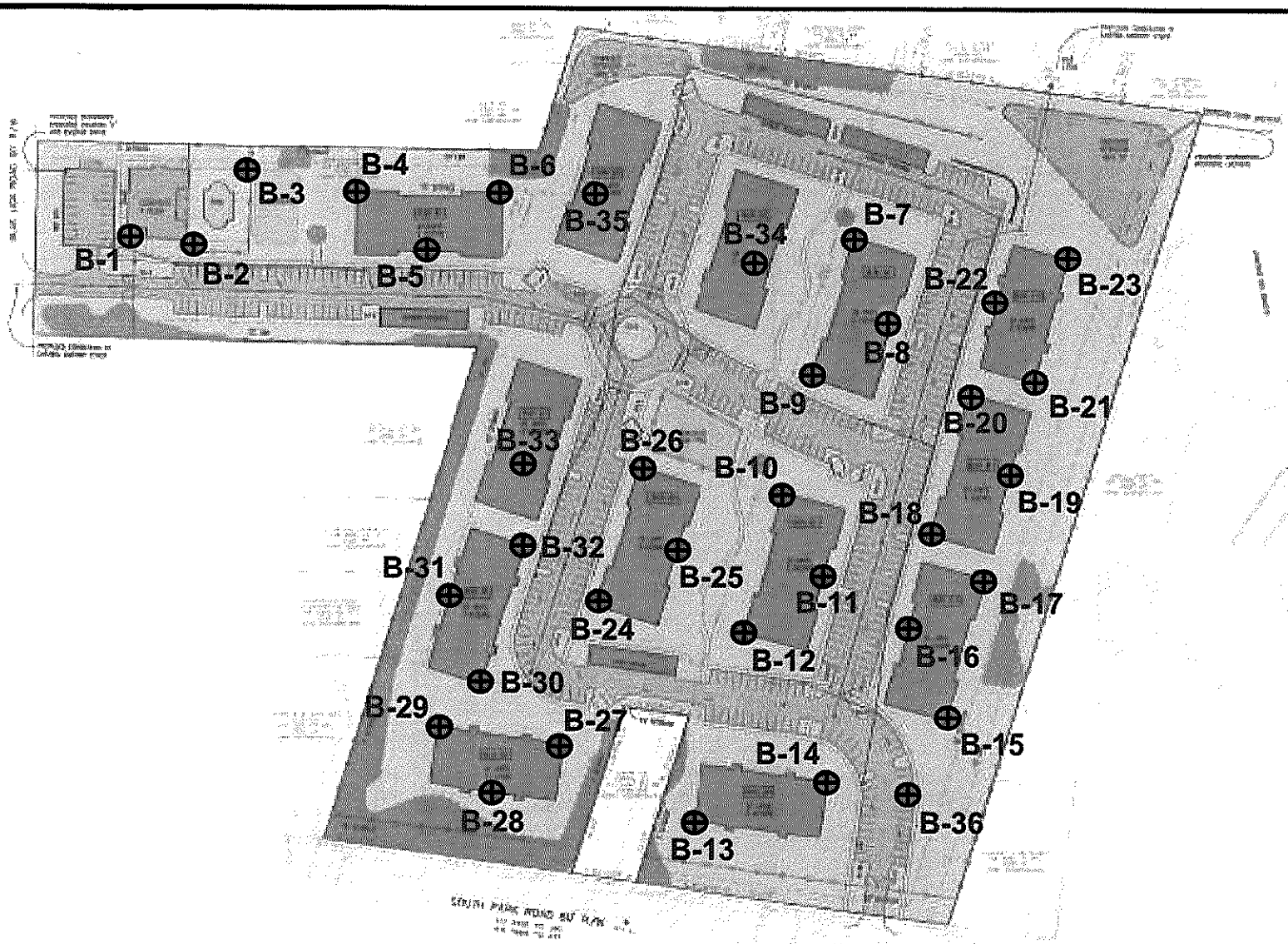

LDG Development, LLC	Greenbaum Associates, Inc.	**Boring Location Plan** Apartment Community South Park Road, Louisville, KY Greenbaum Project Number: 19-285G

SOIL DESCRIPTION TERMINOLOGY

Soils are identified and classified in this report according the the Unified Classification System with the following modifiers:

RELATIVE DENSITY OF GRANULAR SOILS

Description	Blows/Foot
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	50 to 80
Extremely Dense	80+

CONSISTENCY OF COHESIVE SOILS

Description	N-value	q_u (tsf)
Very Soft	0 to 2	0 to 0.25
Soft	3 to 4	0.26 to 0.50
Medium Stiff	5 to 8	0.51 to 1.0
Stiff	9 to 15	1.1 to 2.0
Very Stiff	16 to 30	2.1 to 4.0
Hard	>30	4.1 to 8.0
Very Hard		8.1+

PARTICAL SIZES

Components		Size or Sieve No.
Boulders		over 12 inches
Cobbles		3 to 12 inches
Gravel -	Coarse	$^3/_4$ to 3 inches
	Fine	No. 4 to $^3/_4$ inch
Sand -	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40
Fines (silt and clay)		Finer than No. 200

SOIL MOISTURE

	Descriptive Term
Dry	Dry of Standard Proctor Optimum
Damp	Moist (sand only)
Moist	Near Standard Proctor Optimum
Wet	Wet of Standard Proctor Optimum
Saturated	Free Water in Sample

ROCK DESCRIPTION TERMINOLOGY

The Rock Quality Determination (Deere et. Al., 1969) method of determining rock quality as reported here was obtained by summing up the total length of core recovered in each run, counting only those pieces of core which are four inches (10 cm.) in length or longer and which are hard and sound. The sum is then represented as a percentage over the length of the run. If the core is broken by handling or by the drilling process, the fresh broken pieces are fitted together and counted as one piece provided that they the requisite length of four inches (10 cm.). RQD is reported as a percentage.

RELATIONSHIP BETWEEN RQD AND ROCK QUALITY

RQD (%)	Description of Rock Quality
0 to 25	Very Poor
26 to 50	Poor
51 to 75	Fair
76 to 90	Good
91 to 100	Excellent

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Client: LDG Development, LLC	**HOLE No. B-01**
Project: South Park Road Apartments, Louisville, KY	
Project No.: 19-285G	Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **9.8** Rock: **0** Total Depth: **9.8**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/15/19 - 12/15/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (6 inches)	OL	Ground		
					Moist, Soft, Brown, Lean Clay	CL			
		SPT							3
					Same, Medium Stiff	CL			
5		SPT							5
					Same, Stiff, with Chert	CL			
		SPT							8
		SPT						>>	50/2"
					AUGER REFUSAL @ 9.8 FEET				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-01**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-02

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **10.3** Rock: **0** Total Depth: **10.3**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/15/19 - 12/15/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (10 inches)	OL	Ground		
		SPT			Moist, Medium Stiff, Brown, Lean Clay	CL			4
		SPT							5
5		SPT			Same, Stiff, with Chert	CH			16
		SPT			Same, Medium Stiff	CL			6
10					AUGER REFUSAL @ 10.3 FEET				

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-02**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE -0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-03
Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**
Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**
Depth to water immediately: **Dry** Overburden: **8.7** Rock: **0** Total Depth: **8.7**
Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/15/19 - 12/15/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N VALUE
					Topsoil (7 inches)	OL	Ground	
		SPT			Moist, Soft, Brown, Lean Clay with a trace of Organics	CL		2
5		SPT			Moist, Stiff, Brown, Lean Clay	CL		7
		SPT			Same, Very Stiff	CL		13
		SPT			AUGER REFUSAL @ 8.7 FEET			50/2"

STANDARD PENETRATION TEST
● (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-03**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-04

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **10.5** Rock: **0** Total Depth: **10.5**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/15/19 - 12/15/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N VALUE
					Topsoil (6 inches)	OL	Ground	
		SPT			Moist, Soft, Brown, Lean Clay	CL		3
					Same, Medium Stiff	CL		
5		SPT						5
					Same, Very Stiff, with Chert	CL		16
		SPT						
					Same, Stiff	CL		10
10		SPT						
					AUGER REFUSAL @ 10.5 FEET			

STANDARD PENETRATION TEST
● (blows/ft)
PL MC LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-04**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

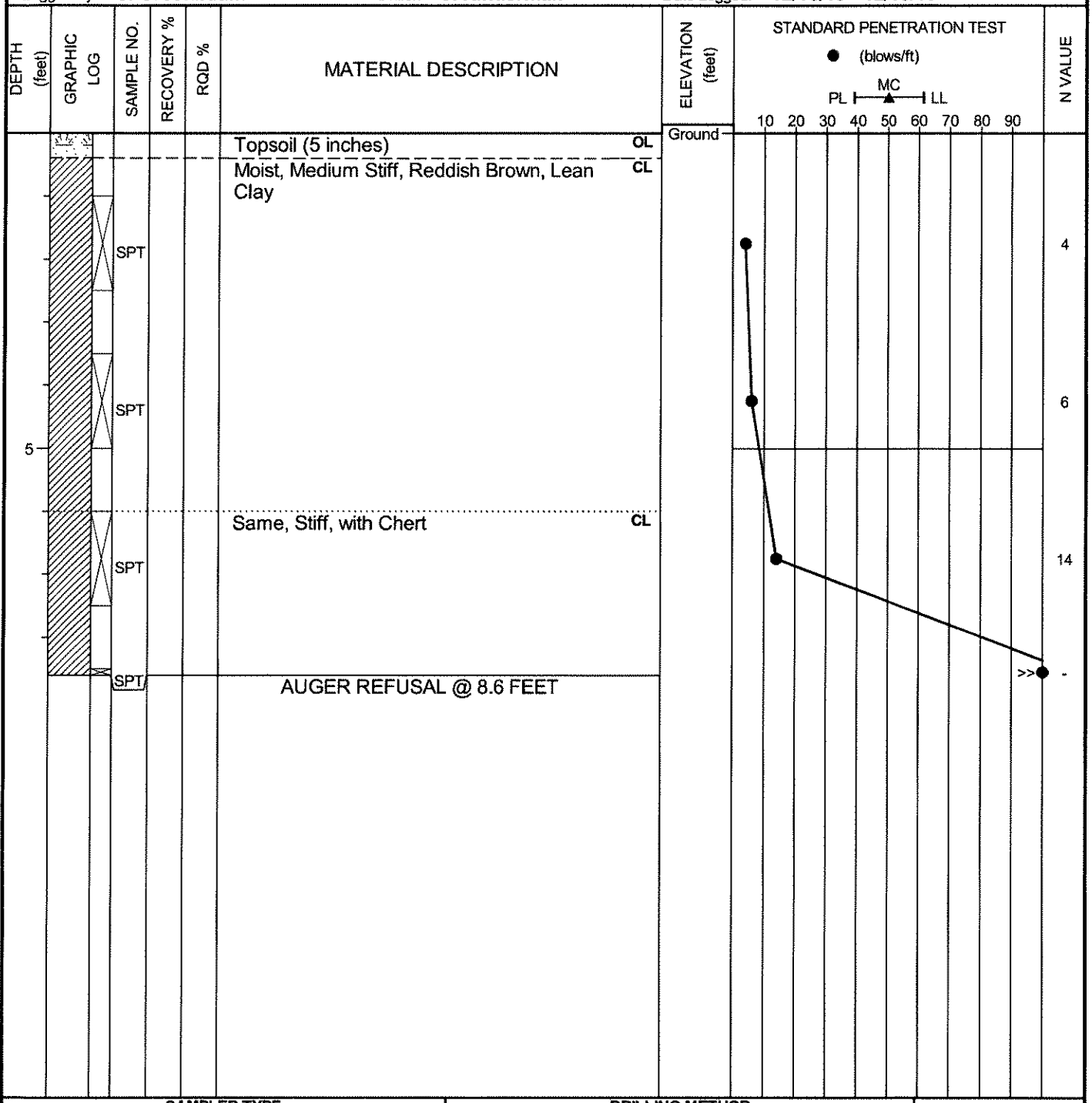
Client: LDG Development, LLC	**HOLE No. B-05**
Project: South Park Road Apartments, Louisville, KY	Sheet 1 of 1
Project No.: 19-285G	

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **8.6** Rock: **0** Total Depth: **8.6**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/15/19 - 12/15/19**



SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-05**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-06

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **9.8** Rock: **0** Total Depth: **9.8**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/15/19 - 12/15/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N VALUE
					Topsoil (6 inches)	OL	Ground	
		SPT			Moist, Soft, Brown, Lean Clay with a trace of Organics	CL		1
		SPT			Moist, Very Stiff, Brown, Lean Clay	CL		13
5		SPT			Same, with Chert	CL		13
		SPT						50/3"
					AUGER REFUSAL @ 9.8 FEET			

STANDARD PENETRATION TEST
● (blows/ft)
PL ▲ MC LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-06**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

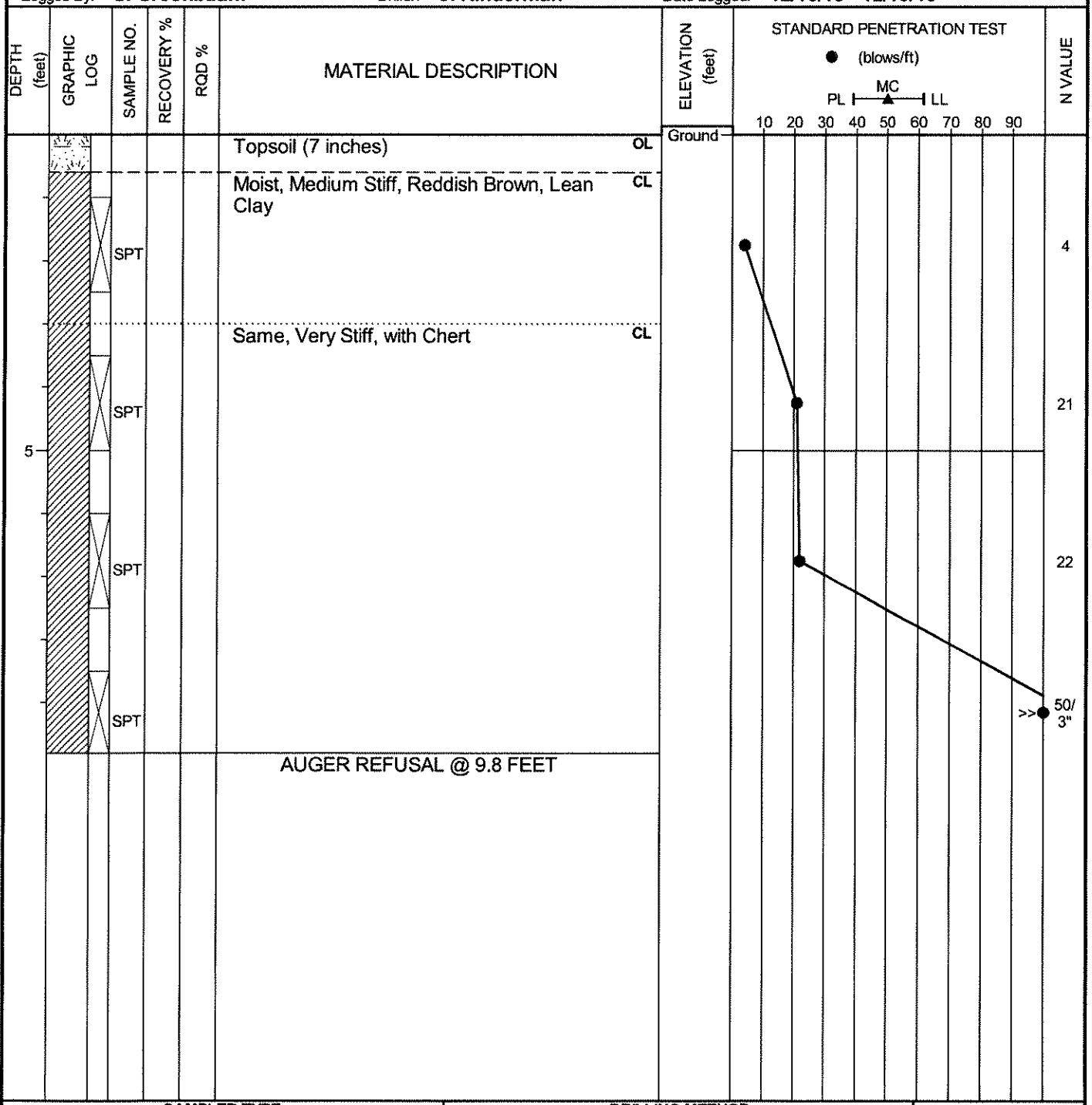
Client: LDG Development, LLC	**HOLE No. B-07**
Project: South Park Road Apartments, Louisville, KY	Sheet 1 of 1
Project No.: 19-285G	

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **9.8** Rock: **0** Total Depth: **9.8**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/13/19 - 12/13/19**



SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-07**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE -0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-08

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **8** Rock: **0** Total Depth: **8.0**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/13/19 - 12/13/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N VALUE
					Topsoil (6 inches) OL	Ground	
		SPT			Moist, Medium Stiff, Brown, Lean Clay with a trace of Organics CL		5
		SPT			Moist, Stiff, Brown, Lean Clay with Chert CL		11
5		SPT			Same, Very Stiff CL		14
					AUGER REFUSAL @ 8.0 FEET		

STANDARD PENETRATION TEST
● (blows/ft)
PL ▲ MC LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-08**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - 1 ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-09
Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**
Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**
Depth to water immediately: **Dry** Overburden: **11.3** Rock: **0** Total Depth: **11.3**
Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/14/19 - 12/14/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N VALUE
					Topsoil (6 inches)	OL	Ground	
		SPT			Moist, Medium Stiff, Brown, Lean Clay with a trace of Organics	CL		5
		SPT			Moist, Stiff, Brown, Lean Clay	CL		9
5		SPT			Moist, Very Stiff, Light Brown, Lean Clay with Ferromagnesian Nodules and Chert	CL		22
		SPT						19
10					AUGER REFUSAL @ 11.3 FEET			

STANDARD PENETRATION TEST
● (blows/ft)
PL ▲ MC LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-09**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - 70NE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-10

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **6.6** Rock: **0** Total Depth: **6.6**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 11/27/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (7 inches)	OL	Ground		
					Moist, Hard, Brown, Lean Clay with Chert	CL			
		SPT							31
					Same, Very Stiff	CL			
5									
		SPT			Same, with Weathered Limestone	CL			12
					AUGER REFUSAL @ 6.6 FEET				

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-10**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-11**
Project: South Park Road Apartments, Louisville, KY	
Project No.: 19-285G	Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **8.4** Rock: **0** Total Depth: **8.4**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 12/30/99**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (6 inches)	OL	Ground		
					Moist, Stiff, Brown, Lean Clay with Ferromagnesian Nodules	CL			
		SPT							10
5					Same, Hard	CL			
		SPT							28
					AUGER REFUSAL @ 8.4 FEET				

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-11**

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-12

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **9.3** Rock: **0** Total Depth: **9.3**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 11/27/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL — MC — LL; 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (7 inches)	OL	Ground		
		SPT			Moist, Stiff, Brown, Lean Clay with Ferromagnesian Nodules	CL			8
5		SPT			Same, Very Stiff	CL			15
					AUGER REFUSAL @ 9.3 FEET				

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-12**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-13**
Project: South Park Road Apartments, Louisville, KY	
Project No.: 19-285G	Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **7.2** Rock: **0** Total Depth: **7.2**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 11/27/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (7 inches)	OL	Ground		
					Moist, Very Stiff, Brown, Lean Clay	CL			
		SPT							13
5		SPT							16
					AUGER REFUSAL @ 7.2 FEET				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-13**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-14

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **8.4** Rock: **0** Total Depth: **8.4**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 11/27/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (7 inches) OL	Ground		
					Moist, Stiff, Brown, Lean Clay CL			
		SPT						7
5		SPT						9
					AUGER REFUSAL @ 8.4 FEET			

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-14**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19-1 ZONE -0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-15**
Project: South Park Road Apartments, Louisville, KY	Sheet 1 of 1
Project No.: 19-285G	

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **5.5** Rock: **0** Total Depth: **5.5**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/14/19 - 12/14/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (7 inches)	OL	Ground		
					Moist, Very Soft, Brown, Lean Clay with a trace of Organics	CL			
		SPT							5
					Moist, Stiff, Brown, Lean Clay with Chert	CL			
		SPT							7
5					AUGER REFUSAL @ 5.5 FEET				

PL — MC — LL

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-15**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-16**
Project: South Park Road Apartments, Louisville, KY	Sheet 1 of 1
Project No.: 19-285G	

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **7.7** Rock: **0** Total Depth: **7.7**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 11/27/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (6 inches)	OL	Ground		
					Moist, Very Stiff, Brown, Lean Clay with Ferromagnesian Nodules	CL			
		SPT							14
5		SPT							20
					Same, with Weathered Limestone	CL			
					AUGER REFUSAL @ 7.7 FEET				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-16**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-17

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**
Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**
Depth to water immediately: **Dry** Overburden: **7.8** Rock: **0** Total Depth: **7.8**
Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 11/27/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (8 inches)	OL	Ground		
					Moist, Very Stiff, Brown, Lean Clay with Ferromagnesian Nodules	CL			
		SPT							14
5		SPT							19
					Same, with Weathered Limestone	CL			
					AUGER REFUSAL @ 7.8 FEET				

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-17**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ' ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-18

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **8** Rock: **0** Total Depth: **8.0**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/12/19 - 12/12/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft)	N VALUE
					Topsoil (7 inches)	OL	Ground		
		SPT			Moist, Medium Stiff, Reddish Brown, Lean Clay	CL			5
		SPT			Same, Very Stiff, with a little Gravel	CL			13
5		SPT			Moist, Very Stiff, Reddish Brown, Fat Clay with a little Gravel	CH			12
					AUGER REFUSAL @ 8.0 FEET				

STANDARD PENETRATION TEST (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-18**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-19**
Project: South Park Road Apartments, Louisville, KY	
Project No.: 19-285G	Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **11** Rock: **0** Total Depth: **11.0**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/12/19 - 12/12/19**

DEPTH (feet)	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N VALUE
				Topsoil (8 inches)	OL	Ground	
	SPT			Moist, Soft, Brown, Lean Clay with a tract of Organics	CL		3
	SPT			Moist, Stiff, Reddish Brown, Fat Clay with Chert	CH		15
5	SPT			Same, Very Stiff	CH		16
	SPT			Same, Medium Stiff	CH		4
10				AUGER REFUSAL @ 11.0 FEET			

STANDARD PENETRATION TEST
● (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-19**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-20

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **14.8** Rock: **0** Total Depth: **14.8**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/12/19 - 12/12/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	N VALUE
		SPT			Topsoil (4 inches) — OL Moist, Medium Stiff, Reddish Brown, Lean Clay — CL	Ground	4
		SPT			Moist, Stiff, Reddish Brown, Fat Clay — CH		8
5		SPT			Same, Very Stiff, with Chert — CH		15
		SPT					13
10					Same, with Gravel (hard drilling) — CH		
					AUGER REFUSAL @ 14.8 FEET		

STANDARD PENETRATION TEST
● (blows/ft)
PL ⊢▲⊣ LL (MC)
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-20**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE -0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-21**
Project: South Park Road Apartments, Louisville, KY	
Project No.: 19-285G	Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **10.8** Rock: **0** Total Depth: **10.8**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/12/19 - 12/12/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft)	N VALUE
					Topsoil (6 inches)	OL	Ground		
		SPT			Moist, Medium Stiff, Reddish Brown, Lean Clay	CL			5
		SPT			Same, Very Stiff, with Chert	CL			21
5		SPT			Moist, Very Stiff, Reddish Brown, Fat Clay with Chert	CH			13
		SPT			Same, Stiff	CH			10
10					AUGER REFUSAL @ 10.8 FEET				

PL — MC — LL

10 20 30 40 50 60 70 80 90

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-21**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE -0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-22

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **11** Rock: **0** Total Depth: **11.0**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/13/19 - 12/13/19**

DEPTH (feet)	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)
				Topsoil (4 inches) OL	Ground
	SPT			Moist, Medium Stiff, Reddish Brown, Lean Clay CL	
	SPT			Same, Very Stiff CL	
5	SPT			Same, with Chert CL	
	SPT				
10				AUGER REFUSAL @ 11.0 FEET	

STANDARD PENETRATION TEST
● (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

N VALUE
5
14
17
17

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-22**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-23**
Project: South Park Road Apartments, Louisville, KY	Sheet 1 of 1
Project No.: 19-285G	

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **7.5** Rock: **0** Total Depth: **7.5**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/13/19 - 12/13/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft)	N VALUE
					Topsoil (5 inches)	OL	Ground		
		SPT			Moist, Soft, Reddish Brown, Lean Clay with a trace of Organics	CL			3
5		SPT			Moist, Stiff, Reddish Brown, Lean Clay with Chert	CL			10
		SPT			Same, Very Stiff	CL		>>	50/4"
					AUGER REFUSAL @ 7.5 FEET				

PL — MC — LL

10 20 30 40 50 60 70 80 90

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-23**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-24

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **7.6** Rock: **0** Total Depth: **7.6**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)
				Topsoil (7 inches)	OL	Ground
	SPT			Moist, Stiff, Reddish Brown, Lean Clay with Ferromagnesian Nodules	CL	
5	SPT			Same, Very Stiff	CL	
				Same, with Weathered Limestone	CL	
				AUGER REFUSAL @ 7.7 FEET		

STANDARD PENETRATION TEST
● (blows/ft)
PL ▲ MC LL
10 20 30 40 50 60 70 80 90

N VALUE: 11, 12

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-24**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE -0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-25

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **6.8** Rock: **0** Total Depth: **6.8**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (8 inches)	OL	Ground		
					Moist, Very Stiff, Brown, Lean Clay	CL			
		SPT							16
5					Same, with Weathered Limestone	CL			
		SPT							21
					AUGER REFUSAL @ 6.8 FEET				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-25**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - " ZONE " - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-26

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **6.9** Rock: **0** Total Depth: **6.9**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (7 inches)	OL	Ground		
					Moist, Very Stiff, Brown, Lean Clay	CL			
		SPT							18
5									
		SPT			Same, with Ferromagnesian Nodules and Weathered Limestone	CL			22
					AUGER REFUSAL @ 6.9 FEET				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-26**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-27
Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**
Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**
Depth to water immediately: **Dry** Overburden: **8.1** Rock: **0** Total Depth: **8.1**
Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft)	N VALUE
					Topsoil (6 inches) OL	Ground		
					Moist, Very Stiff, Reddish Brown, Lean Clay CL			
		SPT						15
5					Same, with Ferromagnesian Nodules and Weathered Limestone CL			
		SPT						20
					AUGER REFUSAL @ 8.1 FEET			

STANDARD PENETRATION TEST (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-27**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-28**
Project: South Park Road Apartments, Louisville, KY	
Project No.: 19-285G	Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **8** Rock: **0** Total Depth: **8.0**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (6 inches)	OL	Ground		
					Moist, Very Stiff, Reddish Brown, Lean Clay with Ferromagnesian Nodules	CL			
		SPT							15
5					Same, Hard, with Weathered Limestone	CL			
		SPT							35
					AUGER REFUSAL @ 8.0 FEET				

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-28**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-29**
Project: South Park Road Apartments, Louisville, KY	Sheet 1 of 1
Project No.: 19-285G	

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **7.5** Rock: **0** Total Depth: **7.5**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (7 inches)	OL	Ground		
		SPT			Moist, Stiff, Reddish Brown, Lean Clay with Ferromagnesian Nodules	CL			10
5		SPT			Same, Very Stiff, with Weathered Limestone	CL			24
					AUGER REFUSAL @ 7.5 FEET				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-29**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE -0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-30

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **13.1** Rock: **0** Total Depth: **13.1**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft)	N VALUE
					Topsoil (6 inches) OL	Ground		
					Moist, Stiff, Brown, Lean Clay CL			
		SPT						9
5		SPT						7
10		SPT			Same, Brown and Gray Mottled CL			7
					AUGER REFUSAL @ 13.1 FEET			

STANDARD PENETRATION TEST (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-30**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-31

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **7.8** Rock: **0** Total Depth: **7.8**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft)	N VALUE
					Topsoil (6 inches) OL	Ground		
		SPT			Moist, Stiff, Reddish Brown, Lean Clay with Ferromagnesian Nodules CL			10
5		SPT			Same, Hard, with Weathered Limestone CL			23
					AUGER REFUSAL @ 7.8 FEET			

STANDARD PENETRATION TEST
● (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-31**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-32

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **6.6** Rock: **0** Total Depth: **6.6**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/25/19 - 11/25/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft)	N VALUE
					Topsoil (7 inches) OL	Ground		
					Moist, Very Stiff, Reddish Brown, Lean Clay with Ferromagnesian Nodules CL			
		SPT						14
5		SPT						15
					AUGER REFUSAL @ 6.6 FEET			

STANDARD PENETRATION TEST
(blows/ft)
MC
PL — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No.
B-32

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - [illegible] ZONE [illegible] - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-33

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**
Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**
Depth to water immediately: **Dry** Overburden: **10.5** Rock: **0** Total Depth: **10.5**
Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/14/19 - 12/14/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N VALUE
					Topsoil (7 inches)	OL	Ground	
		SPT			Moist, Soft, Brown, Lean Clay with a trace of Organics	CL		3
		SPT			Moist, Medium Stiff, Brown, Lean Clay	CL		6
5		SPT			Same, Very Stiff, with Chert	CL		18
		SPT			Same, Stiff	CL		11
10					AUGER REFUSAL @ 10.5 FEET			

STANDARD PENETRATION TEST
● (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-33**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-34**
Project: South Park Road Apartments, Louisville, KY	Sheet 1 of 1
Project No.: 19-285G	

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **10.3** Rock: **0** Total Depth: **10.3**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/14/19 - 12/14/19**

DEPTH (feet)	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION	ELEVATION (feet)
				Topsoil (8 inches) OL	Ground
	SPT			Moist, Medium Stiff, Brown, Lean Clay with a trace of Organics CL	
	SPT			Moist, Very Stiff, Reddish Brown and Tan Mottled, Lean Clay CL	
5	SPT				
	SPT				
10				AUGER REFUSAL @ 10.3 FEET	

STANDARD PENETRATION TEST
(blows/ft)
MC
PL — LL
10 20 30 40 50 60 70 80 90

N VALUE: 5, 13, 21, 19

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-34**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC
Project: South Park Road Apartments, Louisville, KY
Project No.: 19-285G

HOLE No. B-35

Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **Geoprobe 66DT Track-Mounted Drill** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **8.5** Rock: **0** Total Depth: **8.5**

Logged By: **S. Greenbaum** Driller: **J. Kinderman** Date Logged: **12/15/19 - 12/15/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)
					Topsoil (7 inches)	OL	Ground
		SPT			Moist, Medium Stiff, Brown, Lean Clay with a trace of Organics	CL	
		SPT			Moist, Stiff, Brown and Tan Mottled, Lean Clay	CL	
5		SPT			Same, Very Stiff, with Chert	CL	
					AUGER REFUSAL @ 8.5 FEET		

STANDARD PENETRATION TEST (blows/ft)
PL — MC — LL
10 20 30 40 50 60 70 80 90

N VALUE: 4, 10, 20

SAMPLER TYPE
SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD
HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-35**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

19 - ZONE - 0086

Greenbaum Associates, Inc.
Louisville, KY 40215 (502) 361-8447

Client: LDG Development, LLC	**HOLE No. B-36**
Project: South Park Road Apartments, Louisville, KY	
Project No.: 19-285G	Sheet 1 of 1

Boring Location: **See Boring Location Plan** Surface Elevation: **Ground** Station: **n/a**

Drilling Equipment: **D-25 Track-Mounted Drill w/Auto Hammer** Drilling Method: **2 1/4 Inch ID Hollow Stem Augers**

Depth to water immediately: **Dry** Overburden: **7.9** Rock: **0** Total Depth: **7.9**

Logged By: **S. Greenbaum** Driller: **B. Sumler** Date Logged: **11/27/19 - 11/27/19**

DEPTH (feet)	GRAPHIC LOG	SAMPLE NO.	RECOVERY %	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	STANDARD PENETRATION TEST (blows/ft) PL MC LL 10 20 30 40 50 60 70 80 90	N VALUE
					Topsoil (6 inches)	OL	Ground		
		SPT			Moist, Very Stiff, Brown, Lean Clay with Ferromagnesian Nodules	CL			16
5		SPT			Same, Hard	CL			37
					AUGER REFUSAL @ 7.9 FEET				

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
HQ - Rock Core, 2-1/2"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-36**

LOG WITH WELL AND SPT GRAPH 19-285.GPJ 08-053.GPJ 12/26/19

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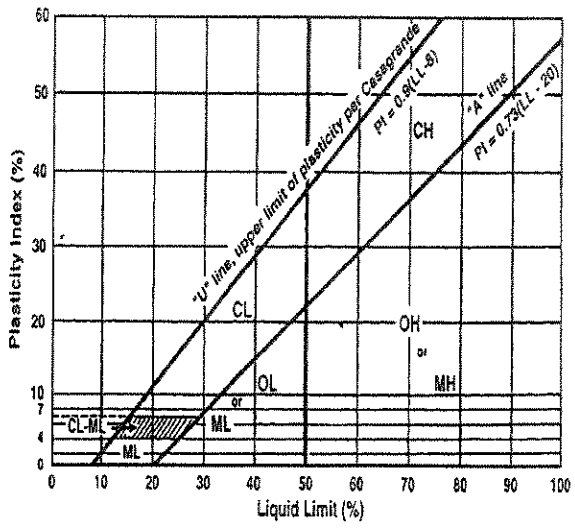
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM D2487 and D2488

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria
Coarse-grained soils (More than half of material is *larger* than No. 200 sieve size)	**Gravels** (More than half of coarse fraction larger than No. 4 sieve)	**Clean Gravels** (Little or no fines)	**GW**	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u=D_{60}/D_{10}$ greater than 4 $C_u=(D_{30})^2/(D_{10}\times D_{60})$ between 1 and 3
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW
		Gravels with fines (Appreciable amount of fines)	**GM**[a] d / u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line with P. I. less than 4 — Above "A" line with P. I. between 4 and 7 are *borderline* cases requireing us of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits below "A" line with P. I. greater than 7
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	**Clean Sands** (Little or no fines)	**SW**	Well-graded sands, gravelly sands, little or no fines	$C_u=D_{60}/D_{10}$ greater than 6 $C_u=(D_{30})^2/(D_{10}\times D_{60})$ between 1 and 3
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	**SM**[a] d / u	Silty sands, sand-silt mixtures	Atterberg limits above "A" line or P.I. < 4 — Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requireing use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" lime with P.I. > 7
Fine-grained soils (More than half meterial is smaller than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		**ML**	Inorganic silts and very fine sands, silty or clayey fine sands, or clayey silts with slight plasticity	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic siltyclays of low plasticity	
	Silts and clays (Liquid limit less that 50)		**MH**	Inorganic silts, micaceous or diatomaceous fine sand or silty soils, elastic silts	
			CH	Inorganic slays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity, organic silts	
	Highly organic soils		**Pt**	Peat and other highly organic soils	

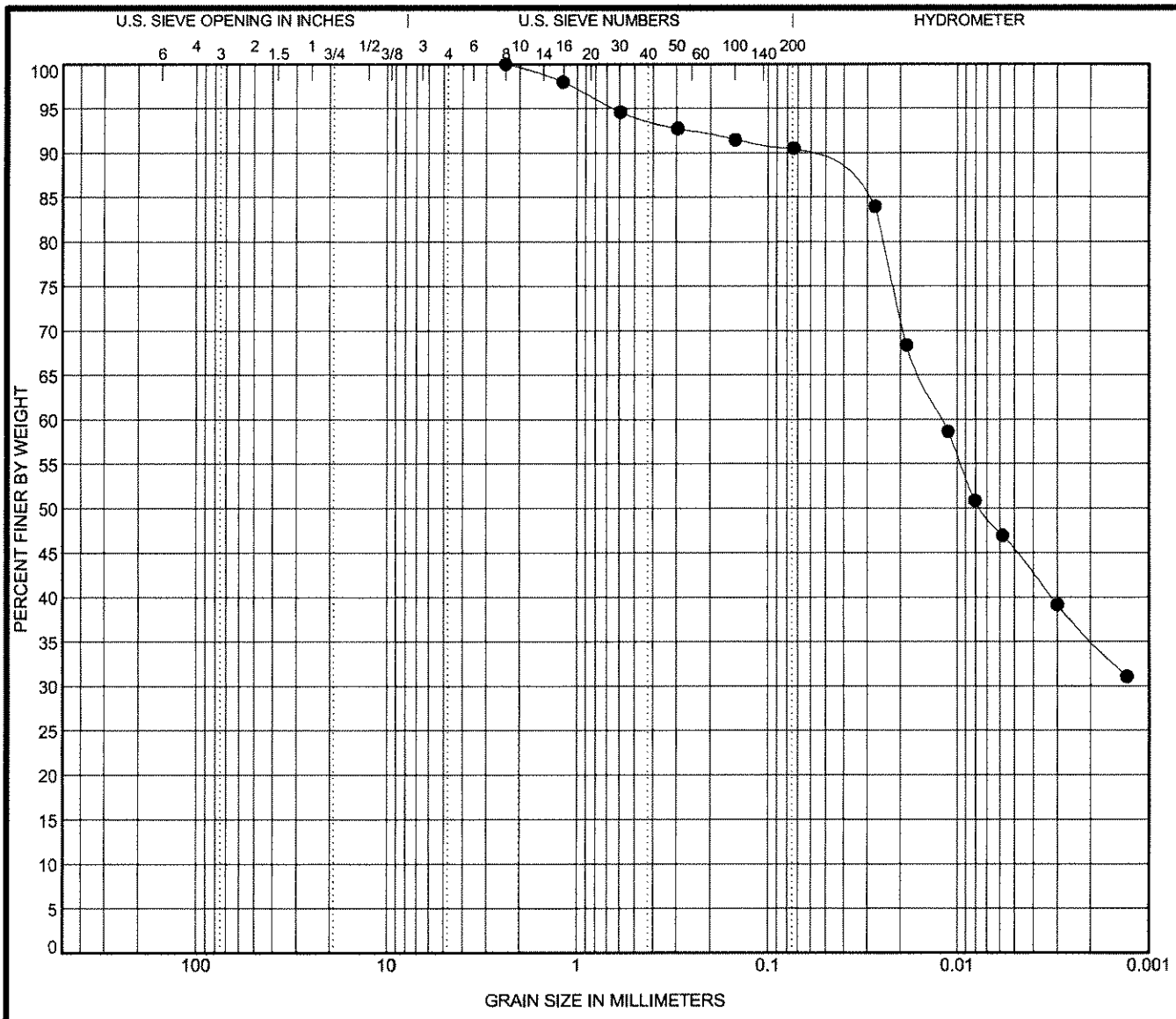
Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller that No. 200 sieve size), coarse-grained soils are classified as follows:
Less than 5 percent — GW, GP, SW, SP
More than 12 percent — GM, GC, SM, SC
5 to 12 percent — *Borderline* cases requireing dual symbols[b]



Plasticity Chart

[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits :suffix d used when L. L. is 28 or less and the P. I. is 6 or les; the suffix u used when L. L. is greater than 28.

[b] Borderline classifications, used for soils possessing characeristics of two groups, are sesignated by combinations of group symbols. For examplı: GW-GC, well-graded gravel-sand misture with clay binder.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-24	2.5	LEAN CLAY(CL)	37	19	18		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-24	2.5	2.38	0.012			0.0	9.5	45.3	45.2

Greenbaum Associates, Inc.
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GRAIN SIZE DISTRIBUTION

Project: South Park Road Apartments,

Location: Louisville, KY

Number: 19-285G

US GRAIN SIZE 19-285.GPJ GREENBAUM.GDT 12/26/19

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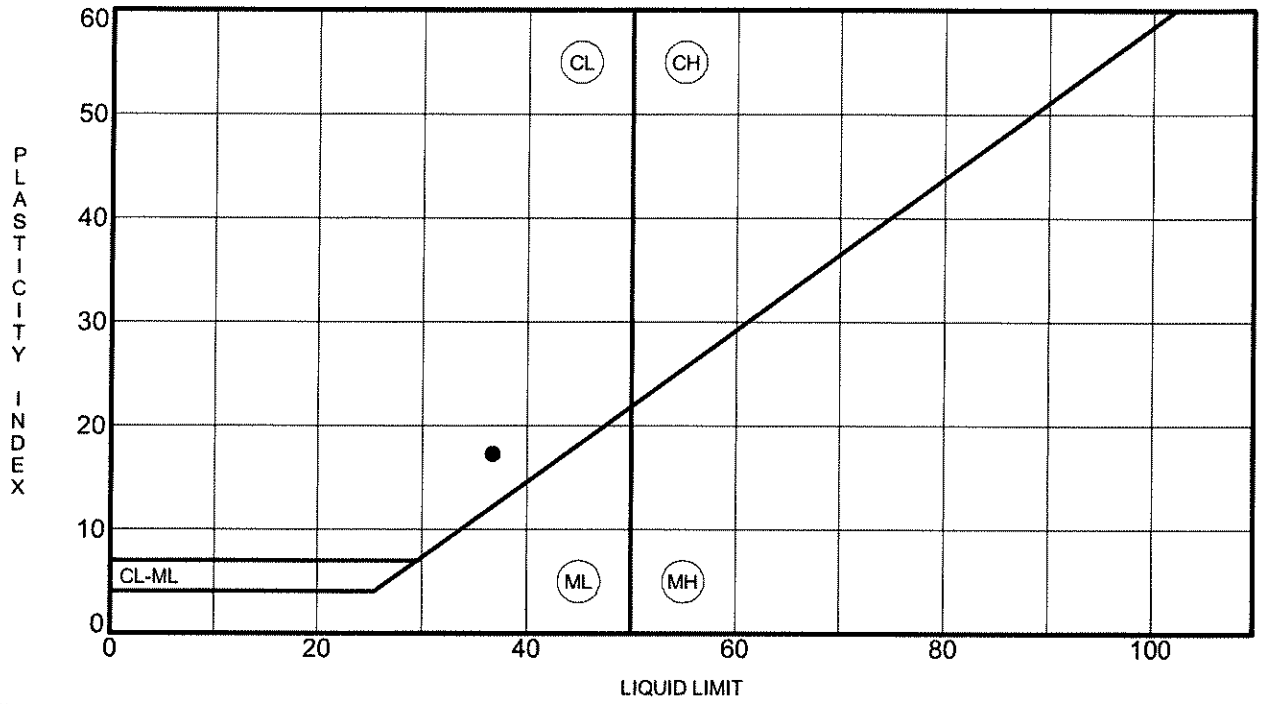

	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-24**	**2.5**	**37**	**19**	**18**	**91**	**LEAN CLAY(CL)**

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ATTERBERG LIMITS' RESULTS

Project: South Park Road Apartments,

Location: Louisville, KY

Number: 19-285G

US ATTERBERG LIMITS 19-285.GPJ GREENBAUM.GDT 12/24/19

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