GEOTECHNICAL ENGINEERING STUDY

PROPOSED APARTMENTS
10410 OLD PRESTON HIGHWAY
LOUISVILLE, KENTUCKY

ASHER PROJECT NO. 21-077

Prepared For:

Mr. Brent Hackworth
brent@highgates.com

Prepared By:

Asher Engineering, Inc.
1021 South Floyd Street
Louisville, Kentucky 40203

July 13, 2021

Asher Engineering, Inc.
Environmental & Engineering Consulting

July 13, 2021

Mr. Brent Hackworth
brent@highgates.com

Re: Geotechnical Engineering Study
Proposed Apartments
10410 Old Preston Highway
Louisville, Kentucky

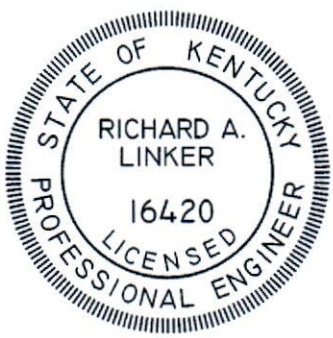
Dear Brent,

Asher Engineering has completed a Geotechnical Engineering Study for the referenced project. This report contains the findings of our subsurface exploration, geotechnical recommendations to aid design of foundations and floor slabs, and construction recommendations with regard to site work, fill placement, and foundation installation and inspection.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance, or if you have any questions regarding this report, please contact our office.

Sincerely,

Richard A. Linker, P. E.



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1.0 PROJECT INFORMATION

The project site is located at 10410 Old Preston Highway, in Louisville, Ky.
The site is an open grass-covered flat rectangular shaped tract with scattered mature trees. A review of historical aerial photographs (Appendix) revealed that the property is previously undeveloped land with some large tilled gardens but no full crop coverage. .

Proposed for construction are 3-story, slab on grade apartment buildings. Asphalt paved parking and access drives will be provided throughout.

2.0 SUBSURFACE EXPLORATION

The subsurface conditions were explored by conducting 9 test pits across the site. The test pits were consistent with about 12 in. topsoil layer underlain by moist, firm, brown silty clay soil down to limestone bedrock. A summary of each test pit is included in the Appendix. The depth to refusal at each test pit is summarized below.

Test Pit	Depth to Refusal, Ft.
1	1.5
2	2.6
3	8 ft. no rock encountered
4	7
5	6.3
6	5.5
7	4.0
8	6.9
9	7.0

No water was noted in the test pits . The limestone bedrock can weather resulting in an irregular surface and elevation differenced over short horizontal distances.

3.0 DESIGN AND CONSTRUCTION RECOMMENDATIONS

The following design and construction recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions.

3.1 Site Development

We recommend an 8 to 12 in. stripping depth be used. Thicker topsoil/rich soil will be encountered in areas that were once tilled gardens, while other areas will have a less thick topsoil layer.

The silty clay soils on site are suitable for support of the new bldgs and roads, and are suitable for use as structural fill.

It is likely that Limestone bedrock will be encountered in utility trenches and bldg pad / footing excavations. The limestone cannot be ripped with an excavator, and will have to be blasted or hoe rammed.

3.2 Shallow Foundations and Floor Slabs

Footings bearing on firm natural soil, or engineered fill placed over firm soil may be proportioned using a net allowable bearing capacity of 3400 psf. Footings can bear on firm natural soil or bedrock. A Site Classification B should be used for seismic design. Wall footings should be at least 16 in. wide and column footings should be at least 24 in. wide to provide an adequate factor of safety for bearing capacity. All exterior footings and footings in unheated areas must bear at least 24 in. below final exterior grade for frost protection. Interior footings can bear at nominal depths below the floor.

Footing excavations that extend to bedrock do not have to be over-excavated to provide a 'cushion' of soil or crushed stone between the bottom of footing and bedrock. Footings can be poured directly on bedrock even if footing elevations in other portions of the bldg encounter clay soil. However, rock will have to be removed such that the entire footing design thickness and footing design depth can be provided.

The building subgrades should be inspected and approved by the geotechnical engineer prior to the placement of grade raise fill or the stone subbase. The slab should be supported on a 4-in. layer of KY Dense Graded Aggregate (DGA) compacted to 98 percent of the standard Proctor (ASTM D-698).

3.4 Below Grade Walls

Below grade walls should be designed to provide drainage to relieve hydrostatic pressure. A clean, free draining granular fill (KY No. 57 stone) should be used to backfill against below grade walls. The backfill zone should be drained using a perforated pipe at the base of the wall. An Equivalent Hydrostatic Pressure (EHP) of 50 pcf may be used to design below grade walls. A unit weight of 130 pcf should be used for the granular backfill.

3.5 Pavements

New pavement areas should be inspected by the geotechnical engineer to determine the suitability of the subgrade and to provide recommendations for stabilization if necessary. Assuming proper subgrade preparation, a California Bearing Ratio (CBR) value of 5 is recommended. This value applies for both undisturbed soil and the stone subbase that is stable under a proofroll, and for soil that is recompacted to at least 95 percent of the standard Proctor maximum dry density.

The following asphalt pavement section is recommended for areas that will be limited to automobiles and light trucks:

Automobile and Light Truck Areas	1.0 in. asphalt concrete surface 2.0 in. asphalt concrete base 4.0 in. KY DGA limestone 4.0 in. 4-Minus or Surge limestone

Areas that may experience heavier loading conditions should be provided with the following pavement section.

Heavy Truck Areas	1.0 in. asphalt concrete surface 3.0 in. asphalt concrete base 4.0 in. KY DGA 6.0 in 4-Minus or Surge limestone

4.0 CONSTRUCTION RECOMMENDATIONS

Variations in subsurface conditions should be expected during construction. It is therefore recommended that the geotechnical engineer be retained by the Owner to review the soils-related phases of the project and to correlate the test data with the soil conditions that are encountered during construction.

4.1 Subgrade Preparation

Prior to construction or the placement of new engineered fill or stone subbase, the exposed subgrade should be evaluated by the project geotechnical engineer. The existing subgrade should be carefully inspected by proofrolling with a loaded dump truck prior to the placement of fill to identify soft areas. Any soft areas identified by the proofroll would be undercut and stabilized with crushed stone. The contractor should exercise discretion when selecting equipment sizes and also control surface water while the subgrade soils are exposed. The severity of this potential problem depends to a great extent on the weather conditions during construction.

4.2 Engineered Fill

Engineered fill should be placed on a prepared subgrade that has been inspected and approved by the project geotechnical engineer. The inspection would include proofrolling of the exposed subgrade with a loaded pan or other suitable rubber-tired piece of equipment. If unsuitable material is disclosed, an appropriate remedial measure would be recommended by the geotechnical engineer at that time. Engineered fill placement and compaction operations should be monitored by the geotechnical engineer or his representative. Field density tests should be performed on each lift as necessary to insure that the specified compaction is being achieved. Soil fill placed in the proposed building area should be compacted to at least 98 percent of the standard Proctor maximum dry density (ASTM D-698). Fill placed in the paved areas should be compacted to 95 percent, and fill placed in green areas to 90 percent.

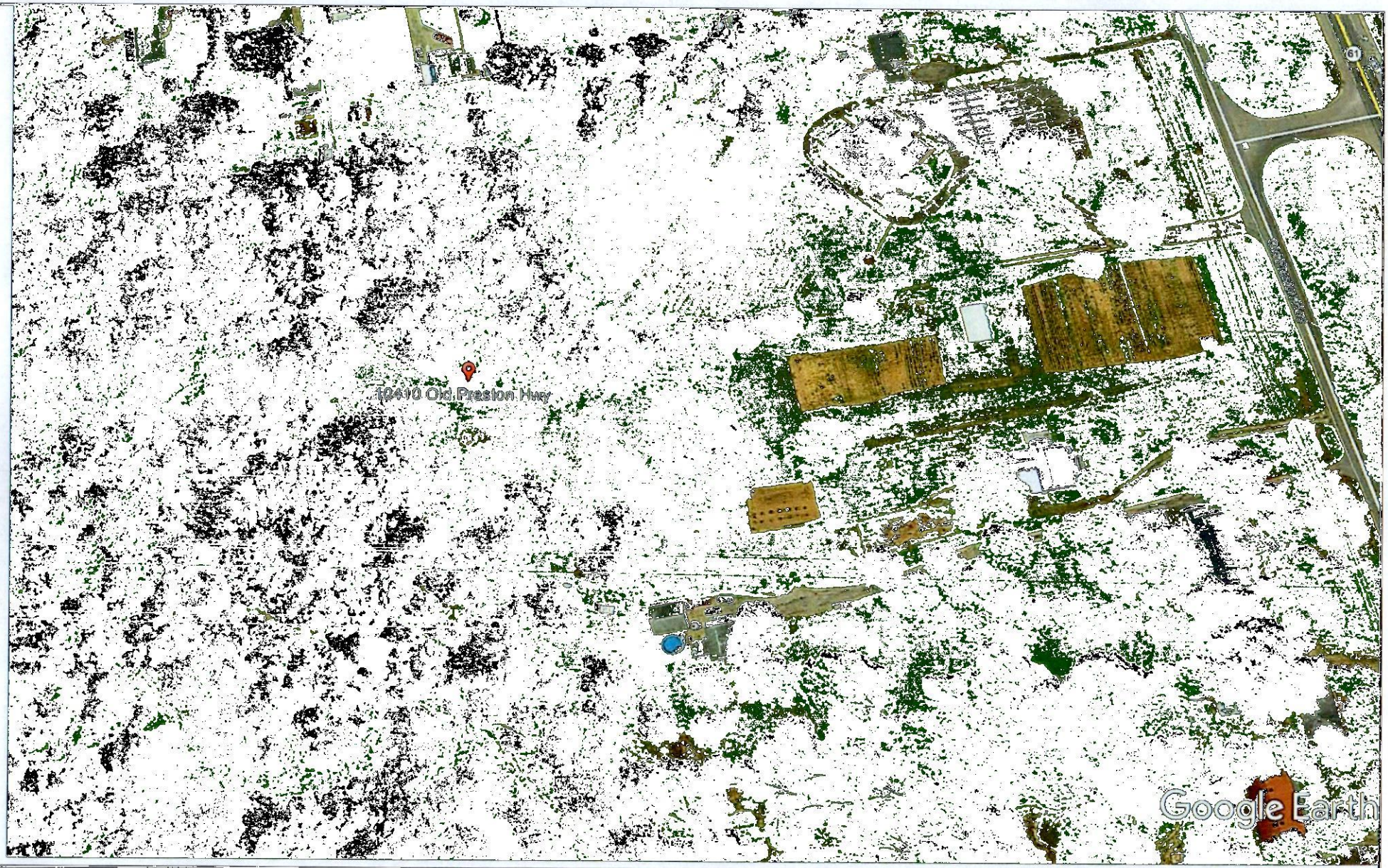
4.3 Foundation Excavations

All foundation excavations should be evaluated by the geotechnical engineer or his representative to insure adequate foundation support. All concrete for foundations should be poured the same day the excavation is made.

Appendix

Historical Aerial Photographs

Summary of Test Pits



High Gates	Proposed Apartments 10410 Old Preston Highway Louisville, Kentucky	Asher Engineering, Inc. Project No.: 21-077 Photo Date June 2020

High Gates	**Proposed Apartments** **10410 Old Preston Highway** **Louisville, Kentucky**	**Asher Engineering, Inc.** **Project No.: 21-077** **Photo Date March 1993**

10410 Old Preston Hwy.
High Gates
21-077

Test Pit #1

0" to 7" Topsoil with roots
7" to 18" Silty Clay; moist; firm; brown; silty
18" Limestone; shelf rock; Possible Karst Activity Near-By
Refusal at 1 ft. 6 in.

Test Pit #2

0" to 4" Topsoil with heavy roots
4" to 31" Silty Clay; moist; firm; brown; silty with trace rock fragments and roots
31" Limestone; Surface Rock Outcrop
Refusal at 2 ft. 7 in.

Test Pit #3

0" to 10" Topsoil with roots to 18"
10" to 36" Silty Clay; moist; firm; brown; silty
36" to 96" Silty Clay; moist; firm; red brown
Terminated at 8 ft.

Test Pit #4

0" to 14" Topsoil with heavy roots
14" to 36" Silty Clay; moist; firm; brown; silty
36" to 84" Silty Clay; moist; firm; red brown with gray
84" Limestone
Refusal at 7 ft.

Test Pit #5

0" to 4" Topsoil (minimal)
4" to 36" Silty Clay; very moist; firm; brown; very silty
36" to 76" Silty Clay; moist; firm; red brown
76" Limestone; Karst Activity Near-By
Refusal at 6 ft. 4 in.

Test Pit #6

0" to 12" Topsoil with roots
12" to 36" Silty Clay; very moist; firm; brown; very silty
36" to 66" Silty Clay; moist; firm; red brown with gray; trace limestone floater at 4 ft.
66" Limestone
Refusal at 5 ft. 6 in.

Test Pit #7

0" to 10" Topsoil with roots
10" to 24" Silty Clay; very moist; firm; brown; silty
24" to 48" Silty Clay; moist; firm; red brown with gray
48" Limestone
Refusal at 4 ft.

Test Pit #8

0" to 10" Topsoil with roots
10" to 30" Silty Clay; dry/moist; firm; tan brown; silty with trace roots
30" to 82" Silty Clay; moist; firm; red brown
82" Limestone
Refusal at 6 ft. 10 in.

Test Pit #9

0" to 12" Topsoil with roots
12" to 84" Silty Clay; moist; firm; red brown; silty
Terminated at 7 ft.