

**SUBSURFACE INVESTIGATION &
GEOTECHNICAL RECOMMENDATIONS**

**PROPOSED APARTMENTS
LEBANON, OHIO
ALT & WITZIG ENGINEERING PROJECT No.: 25CN0187**

**PREPARED FOR:
NEW HOUSING OHIO, INC.
LEBANON, OHIO**

**PREPARED BY:
ALT & WITZIG ENGINEERING, INC.
GEOTECHNICAL DIVISION
WEST CHESTER, OHIO**

JULY 23, 2025



Alt & Witzig Engineering, Inc.

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July 23, 2025

New Housing Ohio, Inc.
1160 E. Main Street
Lebanon, Ohio 45036
Attention: Mr. Dale White

Report of Subsurface Investigation and Geotechnical Recommendations

RE: Proposed Apartments
830 Franklin Road
Lebanon, Ohio
Alt & Witzig Engineering Project No.: 25CN0187

Dear Mr. White:

In compliance with your request, Alt & Witzig Engineering, Inc. has completed a subsurface investigation for the above-mentioned site. The Statement of Objectives, Scope of Work, and results of our investigation are presented in the following report. It is our pleasure to transmit a pdf copy of our findings.

The results of our test borings and laboratory tests completed to date are presented in the appendix of the report. The recommendations for the project are presented in the "Geotechnical Analyses and Recommendations" section of the report. If you have any questions or comments regarding this matter, please contact us at your convenience.

Respectfully Submitted,

ALT & WITZIG ENGINEERING, INC.

Tom Orwig
Project Manager

Dustin M. Horn, P.E.
Project Engineer



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EXECUTIVE SUMMARY

Alt & Witzig Engineering, Inc. has performed a subsurface investigation and geotechnical analysis for the design and construction of the apartments located in Lebanon, Ohio, in conformance with the scope and limitations of the proposal dated June 9, 2025, (*Alt & Witzig Engineering Proposal 2506CN008*). This investigation was performed for New Housing Ohio, Inc.. Authorization to perform this investigation was in the form of an Alt & Witzig Engineering proposal accepted by Mr. Dale White of New Housing Ohio, Inc. and an executed agreement.

In compliance with your request, Alt & Witzig Engineering completed a total of 11 soil borings at the above referenced site for the proposed single-story apartment buildings. The purpose of this investigation was to explore the subsurface conditions at the above referenced site to determine the various soil profile components, the engineering characteristics of the subsurface materials, and to provide geotechnical recommendations and parameters for the design and construction of the new single-story apartment buildings. The following conditions and concerns are relevant for this project.

- Similar soil conditions were encountered across the site. All borings encountered between 2 and 9 inches of topsoil with most being between 6 and 8-inches in thickness. Beneath the surface coverings, native brown to dark brown clay with varying amounts of silt, sand and gravel were encountered between 6 and 8.5-feet below the existing surface with exception to boring B10 which was performed on the existing stockpile. Underlying the native clay soils, brown and gray residual clay was encountered in borings B2, B3, B5, B9, and B11 at 6-feet. Borings B1, B4, B6, B7, and B8 either encountered weathered shale with limestone seams or auger refusal (assumed to be on the highly weathered shale strata) between 6 and 8.5-feet. All borings, except for B10, either terminated in the weathered shale strata or refused on the weathered shale strata.
- Boring B10 was performed on the existing stockpile on site. B10 encountered existing fill consisting of dark brown silty sandy clay with gravel to a depth of 10-feet where brown and gray silty sandy clay with gravel was encountered to the termination depth of 15-feet.
- Spread footings and continuous wall footings can be used to support the new apartment buildings. A net allowable bearing pressure of 3,000-psf can be used for design of conventional spread footings and continuous wall footings. The above recommended bearing pressure assumes the footings will be founded on stiff to very stiff soils or new structural fill. Any soft soils encountered in the footing excavation should be undercut and replaced with lean concrete.
- Portions of the utilities are expected to extend into the bedrock. The earth-moving equipment used to excavate this hard material must be of sufficient size and power and should have a rock bucket and/or ripper bar to remove the rock. The bedrock material becomes more competent and harder with increasing depths below grade. Seepage from the soil/rock interface as well as between bedding planes of the bedrock may occur into the excavations and could require a sump pump to keep excavations free of water. For removal of the bedrock to the anticipated depths, it is recommended that a minimum 100,000-lb excavation equipment with a ripper bar and/or a hoe ram be utilized for excavation.

1.0 INTRODUCTION

1.1 Purpose

The purpose of this investigation was to explore the subsurface conditions at the above referenced site to determine the various soil profile components, the engineering characteristics of the subsurface materials, and to provide geotechnical recommendations and parameters for the design engineer and construction of the new single-story apartment buildings.

1.2 Statement of Objectives

In compliance with the recent request, a total of 11-soil borings were completed at the above referenced site for the proposed development to be constructed in Lebanon, Ohio.

This project included:

- A review of geological maps of the area and review of geologic and related literature
- A reconnaissance of the immediate site and subsurface exploration
- Field and laboratory testing
- Engineering analysis and evaluation of the materials

1.3 Incorporations by Reference

The subsurface investigation was conducted in accordance with guidelines set forth in the scope of services and applicable industry standards. This investigation was performed for New Housing Ohio, Inc.. The proposed statement of objectives and scope of work were outlined in the form of Alt & Witzig Engineering Proposal Number 2506CN008 duly authorized by Mr. Dale White of New Housing Ohio, Inc.

1.4 Report Reliance

This report is solely for the use of New Housing Ohio, Inc. and any reliance of this report by third parties shall be at such party's sole risk and may not contain sufficient information for purposes of other parties for other uses. This report shall only be presented in full and may not be used to support any other objectives than those set out in the scope of work, except where written approval and consent are provided by New Housing Ohio, Inc. and Alt & Witzig Engineering.

2.0 BACKGROUND INFORMATION

2.1 Site Location

The site of the proposed development is located at 830 Franklin Road in Lebanon, Ohio. The property currently consists of a vacant greenspace with a wooded area on the northeast side of the site. A creek is located on the very northeast end of the property in the wooded area. The location of the site is shown in Figure 1 below.

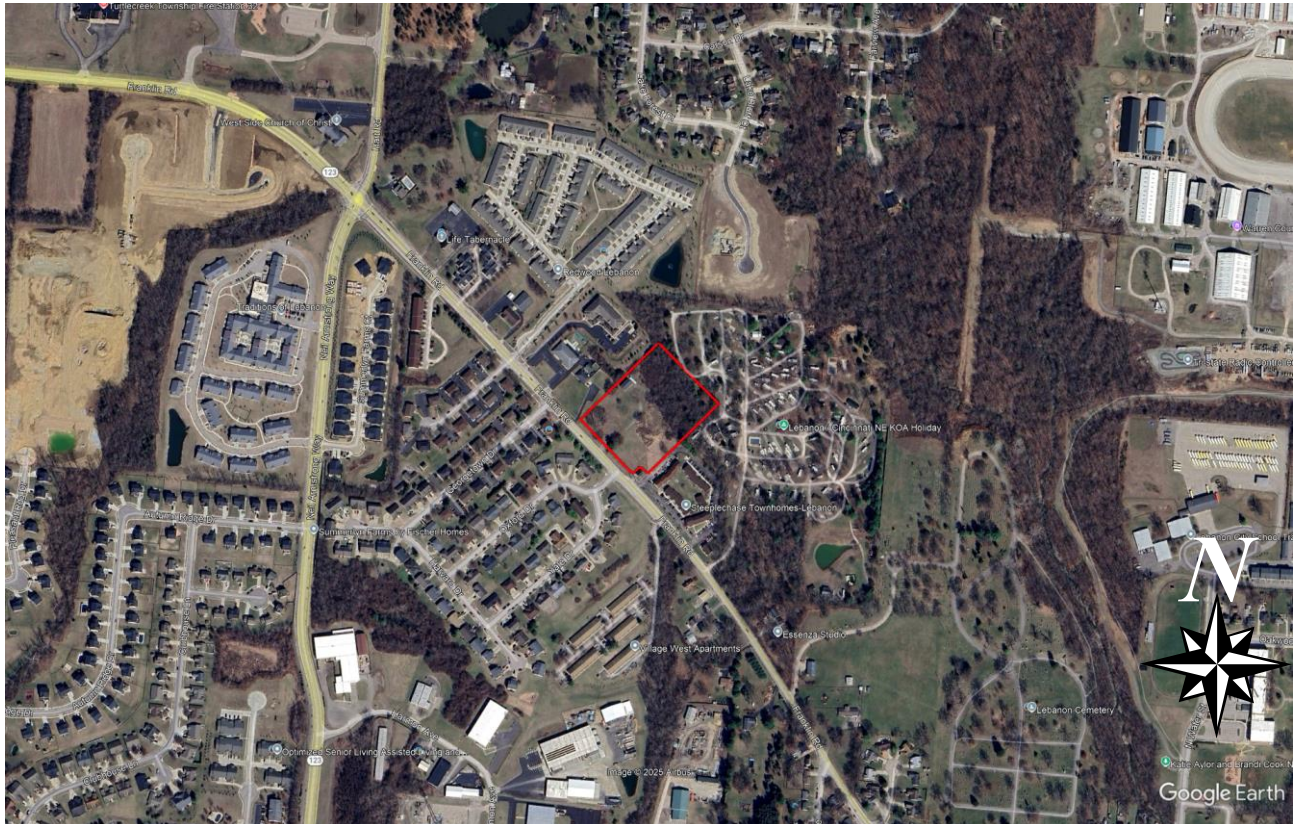


Figure 1: 2025 Google Aerial - Site Location

2.2 Site Description

Based on historic aerals, a stockpile was placed on the property in early 2021. A single-family residence with a pool was located on the west side of the property just east of Franklin Road. The residence and pool were removed some time between late 2021 and early 2023. A picture of the stockpile and previous residence can be seen outlined in blue in a 2021 Google Earth aerial shown in Figure 2.

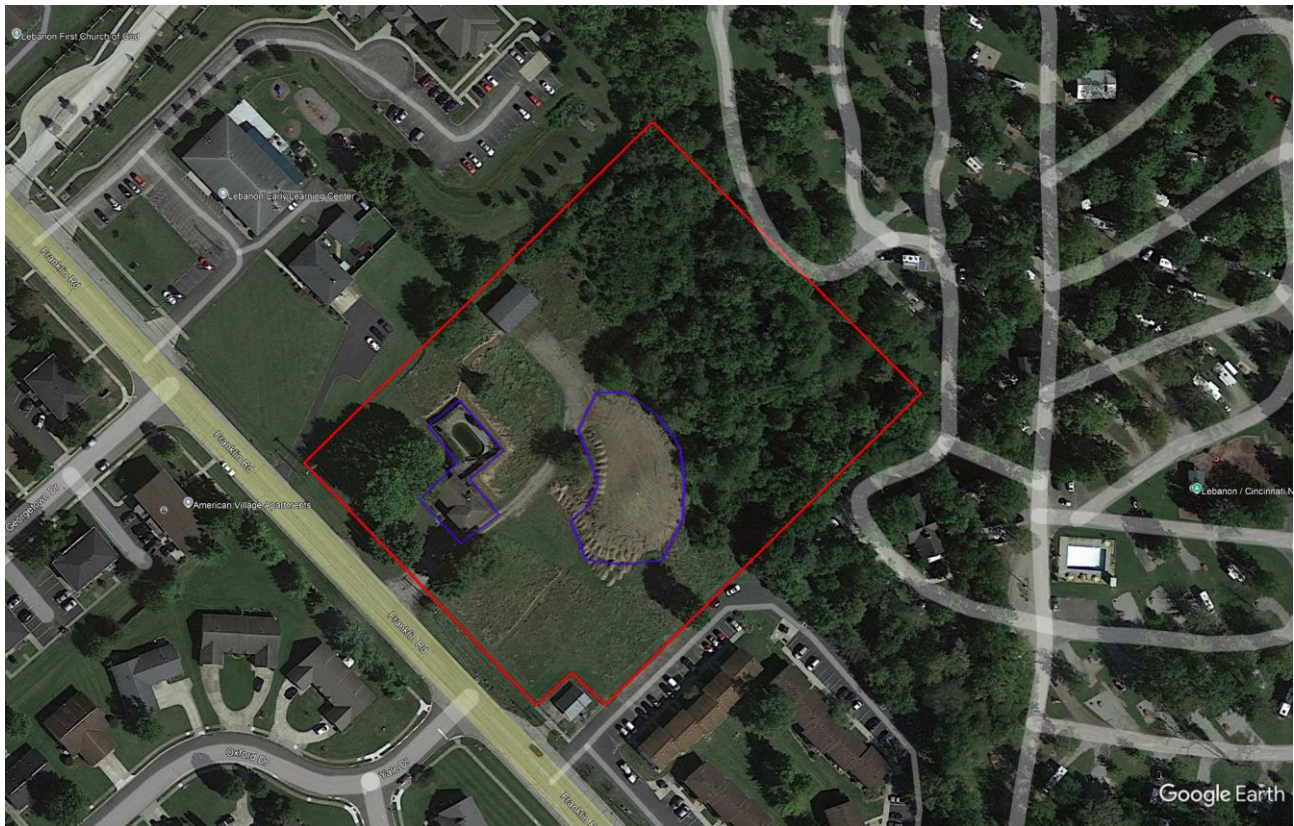


Figure 2: September 2021 Google Earth Image of Stockpile and Previous Residence

3.0 WORK PERFORMED

3.1 Boring Locations

Alt & Witzig Engineering staked the locations of the borings for the proposed apartments using the provided project plans and available information from Google Earth. The borings can be referenced on the *Boring Location Plan* located in the appendix of this report and in Figure 3.

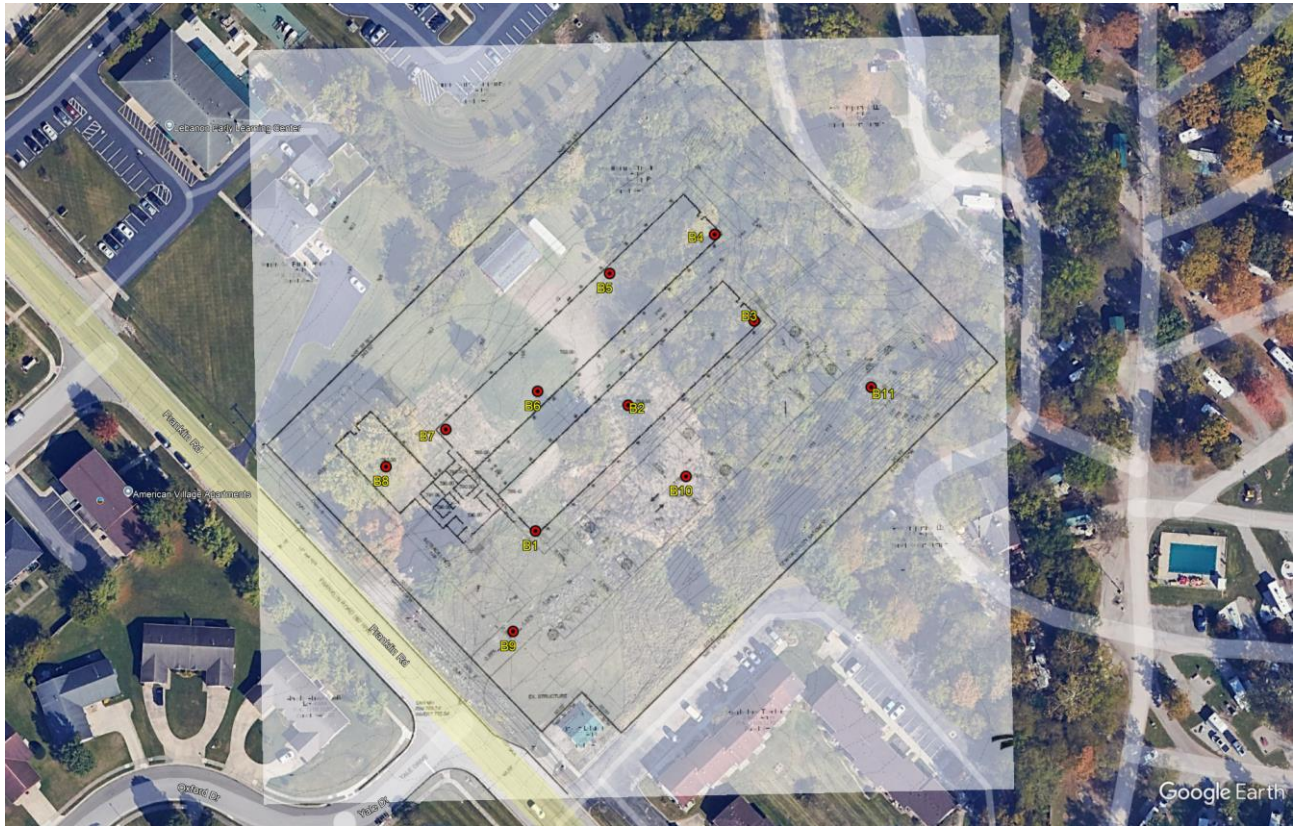


Figure 3: Boring Locations for New Apartment Buildings

3.2 Soil Sampling

The field investigation included a reconnaissance of the project site and drilling 11-borings. The soil borings were performed with a Geoprobe 7822DT. Representative samples were obtained employing split- spoon sampling procedures in accordance with ASTM D1586. During the sampling procedure, Standard Penetration Tests were performed at regular intervals to obtain the Standard Penetration Test value of the soil. The Standard Penetration Test value is defined as the number of blows a 140-pound hammer, falling 30 inches, is required to advance the split-spoon sampler 1 foot into the soil. The results of the Standard Penetration Tests indicate the relative density and comparative consistency of the soil profile components.

3.2.2 Laboratory Analyses for Soil Samples

A supplementary laboratory investigation was conducted to ascertain additional pertinent engineering characteristics of the subsurface materials necessary in analyzing the behavior of the proposed structure. All phases of the laboratory investigation were conducted in accordance with applicable ASTM Specifications. The laboratory-testing program also included:

- ASTM D 2488 - Visual Soil Classification
- ASTM D 5226 - Moisture Content Testing

Samples of the cohesive soil from the split-spoon-sampling device were frequently tested in unconfined compression by use of a calibrated spring testing machine. In addition, a calibrated soil penetrometer was used as an aid in determining the strength of the soil. The values of the unconfined compressive strength as determined on soil samples from the split-spoon should be considered approximate values since the split-spoon sampling techniques provide a representative but somewhat disturbed soil sample.

3.3 Groundwater Elevation

Initial depths to groundwater were estimated based on where water was observed on the sampling rods. Upon completion of drilling activities, the depth to water was measured using a 100-foot tape measure with a weighted end. The depths presented on the Boring Logs are accurate only for the day on which they were recorded. The exact location of the water table shall be anticipated to fluctuate depending upon normal seasonal variations in preparation and surface runoff.

3.4 Ground Surface Elevation

Ground surface elevations were not obtained at the time of drilling operations. It is suggested that the borings be field located by the surveyor/site engineer and shown on the proposed site layout and grading plan. All depths referred to in this report are referenced from the existing ground surface.

4.0 INVESTIGATION RESULTS

The types of subsurface materials encountered have been visually classified and are described in detail on the *Boring Logs*. The results of the field penetration tests, strength tests, water level observations and laboratory water contents are presented on the *Boring Logs* in numerical form. Representative samples of the soils encountered in the field were placed in sample jars and are now stored in the Alt & Witzig laboratory for further analysis if desired. Unless notified to the contrary, all samples will be disposed of after 30-days.

4.1 Subsurface Conditions

Similar soil conditions were encountered across the site. All borings encountered between 2 and 9 inches of topsoil with most being between 6 and 8-inches in thickness. Beneath the surface coverings, native brown to dark brown clay with varying amounts of silt, sand and gravel were encountered between 6 and 8.5-feet below the existing surface with exception to boring B10 which was performed on the existing stockpile. Underlying the native clay soils, brown and gray residual clay was encountered in borings B2, B3, B5, B9, and B11 at 6-feet. Borings B1, B4, B6, B7, and B8 either encountered weathered shale with limestone seams or direct push refusal (assumed to be on the highly weathered shale strata) between 6 and 8.5-feet. All borings, except for B10, either terminated in the weathered shale strata or refused on the weathered shale strata.

Boring B10 was performed on the existing stockpile on site. B10 encountered existing fill consisting of dark brown silty sandy clay with gravel to a depth of 10-feet where brown and gray silty sandy clay with gravel was encountered to the termination depth of 15-feet. The following table provides the depth to bedrock at each boring location:

Boring	Bedrock Depth/Direct Push Refusal (ft)
B1	8.0
B2	8.0
B3	8.0
B4	8.0
B5	8.0
B6	6.0
B7	8.0
B8	6.0
B9	8.0
B10	--
B11	8.5

4.2 Water Observations

Groundwater was not encountered during drilling operations. Groundwater observations were taken over a short observation period. It generally takes several days to weeks of observation to accurately

estimate the elevation of the water table. The exact level of the water table should be expected to fluctuate based on seasonal variation and is expected near the interface of the soil and bedrock.

4.3 Seismic Parameters

An evaluation of the seismic site class has been performed for this site. The Ohio Building Code indicates that the seismic site class is determined by averaging soil conditions within the top 100 feet with respect to the shear wave velocity. This evaluation is based on data obtained on soil to termination of the borings and knowledge of soils in the area. Based on the field and laboratory tests performed on the encountered subsurface materials to boring termination, this site should be considered a Site Class C in accordance with the current Ohio Building Code.

5.0 GEOTECHNICAL ANALYSES AND RECOMMENDATIONS

5.1 Project Description

The site will consist of multiple single-story apartment structures with associated parking and drives. Details of the new apartments building have not been provided at this time. However, it is assumed the apartments will be moderately loaded with maximum column loads of 75-kips and maximum wall loads of 4-kips per lineal foot. **If loading conditions differ drastically from the above estimated loads, Alt & Witzig Engineering should be contacted to review the recommendations of the report.**

5.2 Mass Earthwork

Proposed grading has not been generated at the time of this report. Prior to placing any fill material, the entire site should be stripped of topsoil. An approximate topsoil thickness of 4 to 6-inches was measured during drilling. Once a grading plan is developed, it should be provided to Alt & Witzig Engineering for review and to provide additional recommendations, if any.

Prior to placing any fill material across the site, the entire site should be stripped of the topsoil surface. A topsoil thickness of 2 to 9-inches was measured during drilling operations with most being between 6 and 8-inches in thickness. After stripping, the exposed subgrade of the fill areas should be proof-roll inspected with approved equipment to determine if any pockets of soft unsuitable materials exist beneath the proposed building and parking areas. The condition of the soils in the upper 2-feet are heavily influenced by the time of the year construction occurs and frequency of inclement events. If construction occurs during the wetter portions of the year, the immediate subgrade is expected to fail the proof-roll inspection. Soft or yielding areas should be removed and replaced with a well-compacted material, chemical stabilization, or disc and aerating soils. The method of stabilization will be determined by the proof-roll and weather conditions at the time of construction.

The soils encountered across the site appear suitable for reuse as structural fill. Although no grading plan was provided, it is anticipated the stockpile where boring B10 was performed will largely be reused for structural fill across the site. Boring B10 indicated the soils in the stockpile are suitable to be reused as structural fill. However, pockets of unsuitable soils may be encountered in other parts of the stockpile. Further evaluation of the stockpile should be performed with test pits prior to reuse as structural fill.

A pool previously occupied the site along with the former residence that was located on the west side of the site. It is assumed that the pool was demolished and backfilled at the time the residence was demolished. Existing fills should be expected from backfill of the pool and can be further evaluated through test pits.

Laboratory tests indicated the shallow soils (upper 7-feet) have moisture conditions between 11% and 29% with most moisture contents being between 11% and 16%. Based on experience with similar soils, optimum moisture content for the shallow soils is anticipated to be in the range of 12% and 16%. Generally, a moisture range of 2% below to 3% above optimum moisture content is desired for these soils to achieve proper compaction.

Therefore, most of the soil appears at or near optimum moisture content. However, pockets of soil will require drying to achieve proper compaction specifications. Areas that require drying can be performed by spreading the soil in a thin loose lift ($8 \pm$ inches) during favorable weather conditions to allow the soil to aerate and dry. Alternatively, if weather conditions and/or construction schedule do not allow for this form of drying, limekiln dust (LKD) can be used to dry the soils. Typically, 3% LKD is sufficient to dry the soil. However, conditions at the time of construction could influence the exact amount required. A representative of Alt & Witzig Engineering should be present to verify proper placement regarding density and moisture content of any earthwork that is performed.

All fills shall be formed from material free of vegetable matter, rubbish, large rock, and other deleterious material. Prior to placement of fill, a sample of the proposed fill material should be submitted to Alt & Witzig Engineering for approval. The fill material should be placed in layers not to exceed the loose thickness mentioned in section 5.2.2 and should be dried as required to secure specified compactions. Each layer should be uniformly compacted by means of suitable equipment of the type required by the materials composing the fill. Under no circumstances should a bulldozer or similar tracked vehicles be used as compacting equipment. Material that has excess water and cannot meet specified compaction limits should be spread and dried to a moisture content that will allow for a moisture content which will permit proper compaction. All fills should be compacted to the specified percent of the maximum density obtained in accordance with ASTM density Test D-698. Should the results of the in-place density tests indicate that the specified compaction limits are not obtained, the areas represented by such tests should be reworked and retested as required until the specified limits are reached.

After remediation of soft/yielding soils identified in the proof-roll inspection, the site should be raised to subgrade elevation. Using approved materials, it is recommended that the minimum dry density as determined in accordance with ASTM D-698 be achieved in the various areas across the site:

AREA	DEGREE OF COMPACTION ASTM D 698	MATERIAL
Roads, Drives, & Parking Areas (including future areas)	98%	*Any
Under Foundations and Footings	98%	*Any
Within 3' of Exterior Side of Walls	**	Granular
Within 4 to 12 inches Below Slab-On-Grade	98%	Granular
Utility Trench Backfill	98%	See Section 5.6

* Except topsoil or soils with a PI >25%.

** Depends on the design of the walls

MAXIMUM LOOSE LIFT THICKNESS (INCHES)		
TYPE OF COMPACTION EQUIPMENT	GRANULAR SOIL (SAND, GRAVEL, ETC.)	COHESIVE SOIL (LEAN CLAY, SILTY CLAY, ETC.)
Hand Operated Vibratory Plate	6	-
Hand Operated "Jumping Jack" in confined spaces	6	4
Walk-Behind Double Drum Vibratory Smoothdrum Roller	8	-
Walk-Behind Double Drum Sheepsfoot Roller	-	6
5 to 20 Ton Vibratory Smoothdrum Roller	8	-
5 to 20 Ton Vibratory or Static Sheepsfoot Roller	-	8
20+ Ton Self-Propelled Vibratory Smoothdrum Roller	12	-
20+ Ton Self-Propelled Vibratory or Static Sheepsfoot Roller	-	12

Bedrock or direct push refusal (anticipated bedrock) was encountered between 6-feet and 8.5-feet in all borings with exception to boring B10 which was drilled on top of the stockpile. Based on the anticipated earthwork required to establish site elevations, Alt & Witzig Engineering does not anticipate rock excavation will be required to establish site elevations across the property. However, rock excavation could be required when excavating for utilities. The grading plan should be provided to Alt & Witzig Engineering for review.

Based on experience, the bedrock in the area is generally rippable within the upper 5-feet. However, the rock generally becomes more competent with increasing depths below grade. For removal of the bedrock, a minimum of 100,000-lb excavation equipment with a ripper bar and/or hoe ram is recommended for bedrock excavation.

Shale spoils are generally unsuitable for reuse as structural fill until properly wetted to a clay-like consistency. This can be performed by spreading the excavated shale in a lift and watering/mixing the shale until a claylike consistency is reached. Mixing dry shale with wet clay to moisture condition the two soil types is not recommended. In addition, large limestone cobble could be removed during bedrock excavation. Limestone cobble greater than 12-inches in width/length and 4-inches in thickness should be either exported from the site, buried in non-structural areas, or crushed and

reduced. Alt & Witzig Engineering should be consulted on all reuse of bedrock on site prior to placement.

5.3 Foundation Recommendations

Based on the proposed construction, anticipated loading, and encountered soil conditions, the buildings can be supported by conventional foundations. The following table provides design parameters for conventional footings:

	Footing Type	
	Continuous Footings	Spread Footings
Net Allowable Bearing Pressure*	3,000-psf	3,000-psf
Minimum Footing Depth	30-inches	30-inches
Minimum Footing Size**	16-inches wide**	24-inches square**
Estimated Maximum Total Settlement	1-inch	1-inch
Estimated Maximum Differential Settlement	½ inch	½ inch
<p>* In utilizing a net allowable bearing pressure, it is only necessary to account for structural loads applied above finished floor elevation.</p> <p>** Minimum footing sizes should comply with actual building loads and conform to local building codes.</p>		

All foundation excavations should be inspected by Alt & Witzig to verify that adequate bearing soils exist in the base of the footings. At the time of footing inspections, Housel Penetration Tests or other approved tests can be performed on these foundation soils. The topsoil encountered on the eastern commercial lot is unsuitable for foundation support and will require undercutting. Any areas of soft or unsuitable soils should be excavated to suitable soils and replaced with lean concrete. Lean concrete is a low strength (1,500-psi 28-day compressive strength) concrete that will transfer foundations loads directly onto the soil in which the lean concrete is placed.

Some amount of existing fill is expected from the demolition/backfill of the previous residence and associated pool on the property. Minor undercuts are expected in the former footprints of the pool and residence. An example of a foundation undercut is shown in Figure 4.

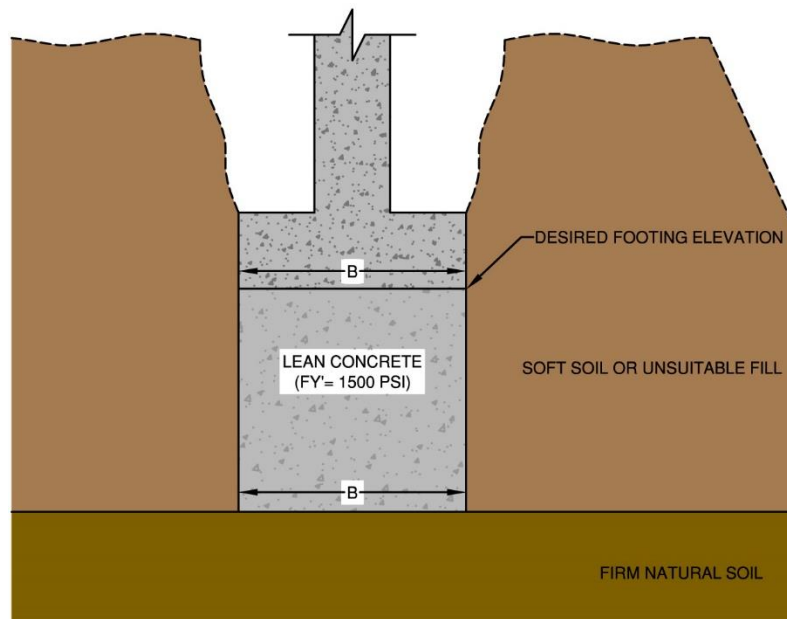


Figure 4: Foundation Undercut Example

5.4 Floor Slab Recommendations

The ground floor for the structures can be constructed as a slab-on-grade supported by natural soils and/or well compacted fill materials. A 4 to 6-inch compacted granular fill should be placed immediately beneath all floor slabs. This granular fill will provide a uniform surface for construction of the floor slab and minimize capillary rise of groundwater through the slab. A vapor barrier should be placed immediately below the floor slab in any areas of the building where floor coverings such as carpet, vinyl tile, ceramic tile, etc. will be placed. Where floor loads due to building structure will be necessary a modulus of sub-grade reaction of 100-pci should be used to dimension the slab thickness.

5.5 Pavement Design Recommendations

As with the floor slab soils, the proposed pavements can be supported by natural soils and/or well compacted fill materials. Final acceptance of the pavement subgrade should be determined with a proofroll inspection. Modifications will be determined at the time of the proof-roll inspection. Based upon laboratory tests and experience with soils having a similar consistency, a design CBR value of 3.0 is recommended for the pavement design.

Paved areas should be designed to prevent water from collecting or ponding immediately beneath the pavement. It is suggested that underdrains be installed in portions of the pavement area to minimize potential saturation of these soils. The soils engineer, owner, and site design engineer should discuss the design and placement of these drains prior to construction. Underdrains should, at a minimum, be placed within 15-feet of all catch basins, in all green space islands, and irrigated areas around the perimeter of the parking lot. For underdrains to be effective, minimum installation depths of 18-inches is suggested. The drains should consist of a 4-inch perforated plastic pipe encased in a clean granular backfill such as a washed No. 57 stone.

Although no specific traffic information was provided, it is anticipated that light-duty pavements will be primarily subjected to several hundred cars per week. It is anticipated that the heavy-duty pavements will be primarily subjected to several hundred cars per week, with an occasional delivery truck, and up to 2 trash truck per week. The following pavement sections were determined based on these assumed traffic conditions, utilizing a 15-year design life and a CBR value of 3.0 and the American Association of State Highway Officials (AASHTO) design method. If actual traffic conditions differ greatly than mentioned above, Alt & Witzig Engineering should be contacted so that appropriate changes in the design can be made.

Proposed Pavement Sections

Traffic Type	Pavement Type	Surface Course	Binder Course	ODOT #304
Light Duty Pavement (Car Parking)	Asphalt	1.5"	2.0"	6.0"
Heavy Duty Pavement (Drive Lanes)	Asphalt	1.5"	3.0"	8.0"

5.6 Utility/Groundwater Considerations

With construction of the new development, placement of numerous underground structures will be required. Temporary slopes on the order of 1H:1V or flatter should be maintained within the clay soils. All excavation slopes should be monitored for changes due to weather conditions and water seepage. Flattening of the slopes should be performed as necessary for safety purposes. Where groundwater infiltration occurs into excavations, the slopes should be flattened to a minimum of 1.5:1 (H:V).

Dry conditions were generally encountered during and at completion of drilling operations. Groundwater observations were taken over a short observation period. It generally takes several days to weeks of observation to accurately estimate the elevation of the water table. The exact level of the water table should be expected to fluctuate based on seasonal variations and is expected near the interface of the soil and bedrock

Utility trenches in roadways, under drives, or within 10-feet of structures should be backfilled with a granular material compacted with a vibratory plate compactor until a point in which a sheepsfoot compactor can safely enter the trench excavation. Once a sheepsfoot can be utilized for compaction, transition from granular backfill to clay backfill can be performed. **Shale bedrock spoils should not be reused as backfill in trench areas.** All trench compaction methods should be reviewed with Alt & Witzig before proceeding. Proper compaction techniques and densities should be followed as recommended in the specifications for compacted fills and backfills section in the appendix.

5.7 Rock Excavation

With construction of the new development, placement of numerous underground structures will be required. Bedrock was encountered in the borings ranging from 6 to 8.5 feet. Portions of the utilities are expected to extend into the bedrock. The earth-moving equipment used to excavate this hard material must be of sufficient size and power and should have a rock bucket and/or ripper bar to remove the rock. The bedrock material becomes more competent and harder with increasing depths below grade. Seepage from the soil/rock interface as well as between bedding planes of the bedrock may occur into the excavations and could require a sump pump to keep excavations free of water. For removal of the bedrock to the anticipated depths, it is recommended that a minimum 100,000-lb excavation equipment with a ripper bar and/or a hoe ram be utilized for excavation.

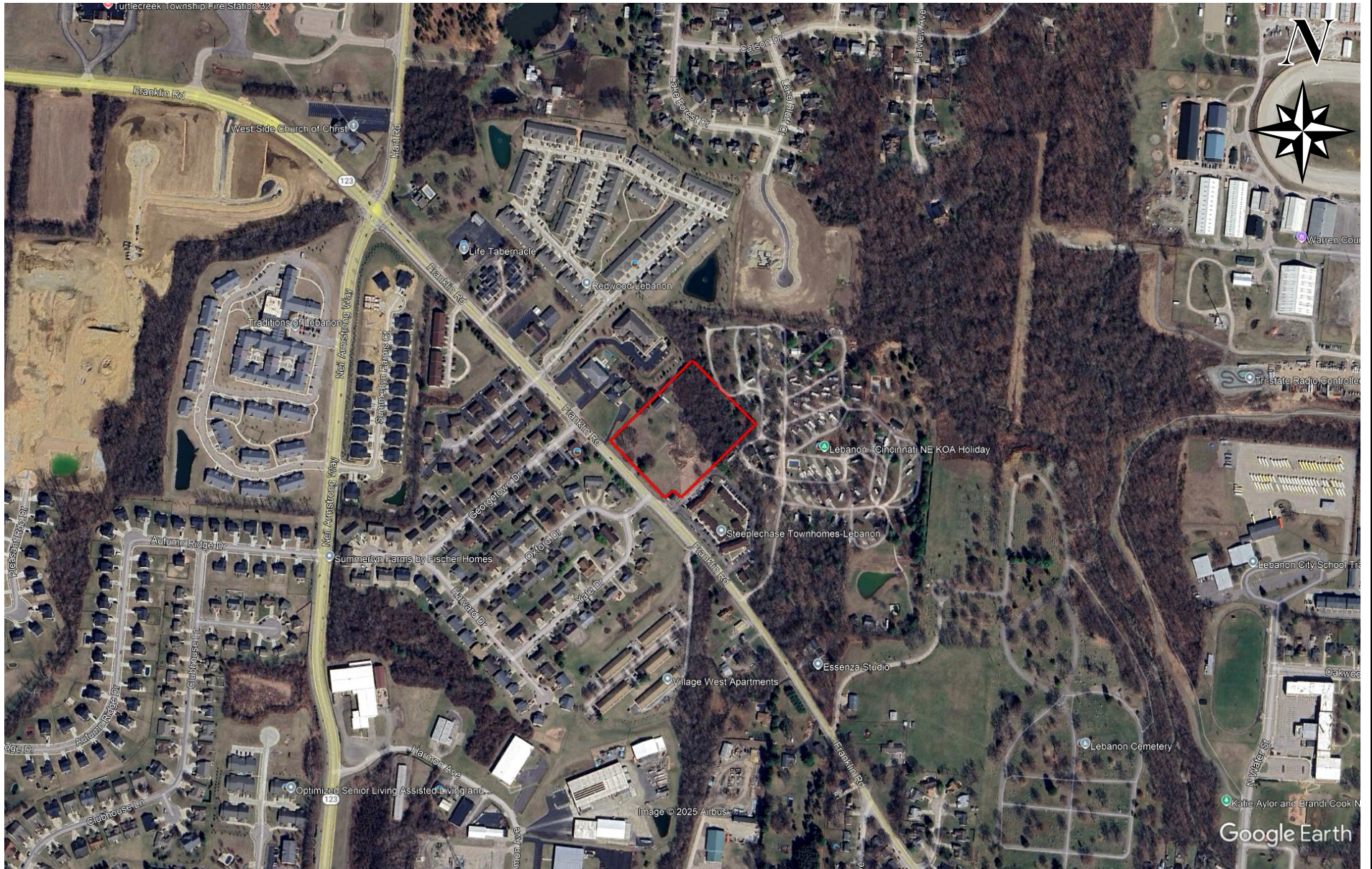
6.0 STATEMENT OF LIMITATIONS

An inherent limitation of any geotechnical engineering study is that conclusions must be drawn on the basis of data collected at a limited number of discrete locations. The geotechnical parameters provided in this report were developed from the information obtained from the test borings that depict subsurface conditions only at these specific locations and on the particular date indicated on the boring logs. Soil conditions at other locations may differ from conditions encountered at these boring locations and groundwater levels shall be expected to vary with time. The nature and extent of variations between the borings may not become evident until the course of construction.

The recommendations submitted are based on the available soil information and assumed design details enumerated in this report. If actual design details differ from those specified in this report, this information should be brought to the attention of Alt & Witzig Engineering, Inc. so that it may be determined if changes in the recommendations herein are required. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of Alt & Witzig Engineering, Inc.

ALT & WITZIG ENGINEERING, INC.

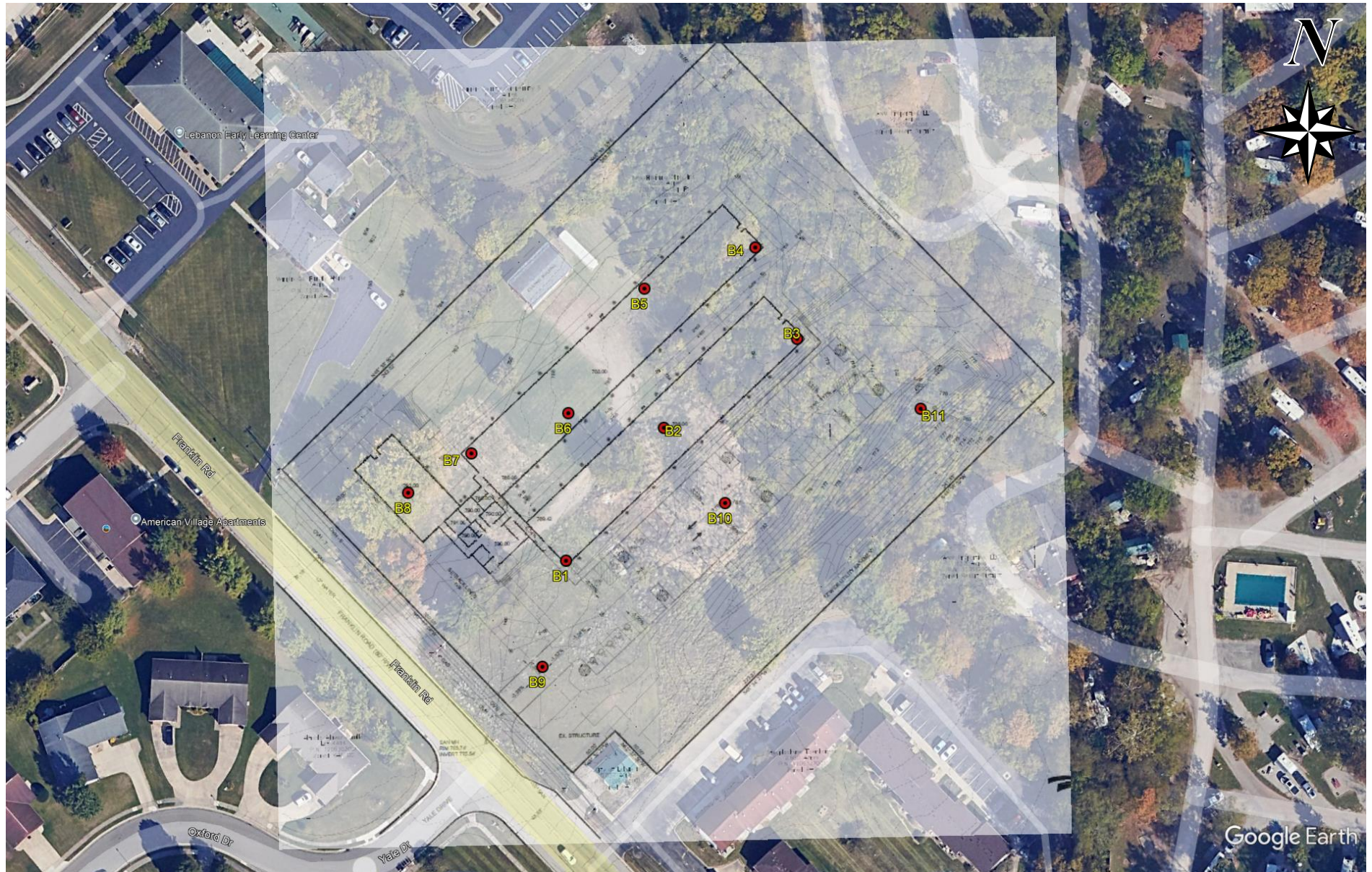
APPENDIX A
Site Location Map
Boring Location Plan
Boring Logs
General Notes



PROJECT: Proposed Apartments
LOCATION: Lebanon, OH
CLIENT: New Housing Ohio (NHO), Inc.
ALT & WITZIG ENGINEERING FILE NO.: 25CN0187

SITE LOCATION PLAN

Alt & Witzig Engineering, Inc.
 6205 Schumacher Park Drive
 West Chester, OH 45069
 TEL (513) 777-9890
www.altwitzig.com



PROJECT: Proposed Apartments
LOCATION: Lebanon, OH
CLIENT: New Housing Ohio (NHO), Inc.
ALT & WITZIG ENGINEERING FILE NO.: 25CN0187

BORING LOCATION PLAN

Alt & Witzig Engineering, Inc.
6205 Schumacher Park Drive
West Chester, OH 45069
TEL (513) 777-9890
www.altwitzig.com



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.

BORING # B01

PROJECT NAME Proposed Apartments

ALT & WITZIG FILE # 25CN0187

PROJECT LOCATION Lebanon, Ohio

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.

Date Completed 6/26/25 Hammer Drop 30 in.

Boring Method HSA Spoon Sampler OD 2 in.

Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pct)	Remarks
	SURFACE ELEVATION											
	TOPSOIL 8"	0.7										
				1	SS			9		4.0	25.2	
	Dark Brown CLAY with Sand	3.5										
				2	SS			9		0.5	29.0	
			5									
	Brown/ Gray Silty CLAY with Sand and Gravel			3	SS			15			17.8	
		7.9										
	Auger Refusal 7.9' End of Boring at 7.9 feet											

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.

BORING # B02

PROJECT NAME Proposed Apartments

ALT & WITZIG FILE # 25CN0187

PROJECT LOCATION Lebanon, Ohio

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.

Date Completed 6/26/25 Hammer Drop 30 in.

Boring Method HSA Spoon Sampler OD 2 in.

Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pct)	Remarks
	TOPSOIL 5"	0.4										
	Dark Brown Silty CLAY	3.5		1	SS			10		3.5	26.4	
	Brown/ Gray CLAY with Sand and Gravel	6.0	5	2	SS			12		4.0	15.5	
	Brown/ Gray Residual CLAY with Limestone Cobble	8.1		3	SS			33		>4.5	16.2	
	Auger Refusal 8.1' End of Boring at 8.1 feet											

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.
 PROJECT NAME Proposed Apartments
 PROJECT LOCATION Lebanon, Ohio

BORING # B03
 ALT & WITZIG FILE # 25CN0187

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.
 Date Completed 6/26/25 Hammer Drop 30 in.
 Boring Method HSA Spoon Sampler OD 2 in.
 Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	SURFACE ELEVATION											
	TOPSOIL 6"	0.5		1	SS			12		>4.5	11.3	
	Brown Silty Sandy CLAY with Gravel		5	2	SS			16		>4.5	11.3	
	Brown/ Gray Residual CLAY with Limestone Cobble	6.0		3	SS			29		>4.5	15.5	
	Auger Refusal 8.1' End of Boring at 8.1 feet	8.1										

Sample Type

SS - Driven Split Spoon
 ST - Pressed Shelby Tube
 CA - Continuous Flight Auger
 RC - Rock Core
 CU - Cuttings
 CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
 ▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
 CFA - Continuous Flight Augers
 DC - Driving Casing
 MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.

BORING # B04

PROJECT NAME Proposed Apartments

ALT & WITZIG FILE # 25CN0187

PROJECT LOCATION Lebanon, Ohio

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.

Date Completed 6/26/25 Hammer Drop 30 in.

Boring Method HSA Spoon Sampler OD 2 in.

Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	SURFACE ELEVATION											
	TOPSOIL 6'	0.5		1	SS			11		>4.5	11.7	
	Brown Silty CLAY with Sand and Gravel	5		2	SS			19		>4.5	14.2	
				3	SS			28		>4.5	15.5	
	Auger Refusal 8.0' End of Boring at 8 feet	8.0										

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT **New Housing Ohio (NHO), Inc.**

BORING # **B05**

PROJECT NAME **Proposed Apartments**

ALT & WITZIG FILE # **25CN0187**

PROJECT LOCATION **Lebanon, Ohio**

DRILLING and SAMPLING INFORMATION

Date Started **6/26/25** Hammer Wt. **140** lbs.

Date Completed **6/26/25** Hammer Drop **30** in.

Boring Method **HSA** Spoon Sampler OD **2** in.

Driller **OSI** Rig Type **D-50 Track ATV**

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	SURFACE ELEVATION											
	TOPSOIL 8"	0.7										
	Dark Brown CLAY with Silt and Sand	3.5		1	SS			8		2.5	23.6	
	Brown CLAY with Sand and Gravel	6.0	5	2	SS			15		>4.5	12.8	
	Brown/ Gray Residual CLAY with Limestone Cobble	7.9		3	SS			28		>4.5	16.9	
	Auger Refusal 7.9' End of Boring at 7.9 feet											

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.

BORING # B06

PROJECT NAME Proposed Apartments

ALT & WITZIG FILE # 25CN0187

PROJECT LOCATION Lebanon, Ohio

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.

Date Completed 6/26/25 Hammer Drop 30 in.

Boring Method HSA Spoon Sampler OD 2 in.

Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	TOPSOIL 7"	0.6		1	SS			13		>4.5	12.3	
	Brown CLAY with Sand and Gravel	6.0	5	2	SS			14		>4.5	15.2	
	Gray Highly Weathered SHALE with Limestone Seams	7.9		3	SS			43		>4.5	13.9	
	End of Boring at 7.9 feet											

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.
 PROJECT NAME Proposed Apartments
 PROJECT LOCATION Lebanon, Ohio

BORING # B07
 ALT & WITZIG FILE # 25CN0187

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.
 Date Completed 6/26/25 Hammer Drop 30 in.
 Boring Method HSA Spoon Sampler OD 2 in.
 Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	SURFACE ELEVATION											
	TOPSOIL 8"	0.7		1	SS			13		>4.5	11.5	
	Brown Silty CLAY with Sand and Gravel	5		2	SS			14		>4.5	16.3	
				3	SS			26		>4.5	14.3	
	Auger Refusal 8.2' End of Boring at 8.2 feet	8.2										

Sample Type

SS - Driven Split Spoon
 ST - Pressed Shelby Tube
 CA - Continuous Flight Auger
 RC - Rock Core
 CU - Cuttings
 CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
 ▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
 CFA - Continuous Flight Augers
 DC - Driving Casing
 MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.

BORING # B08

PROJECT NAME Proposed Apartments

ALT & WITZIG FILE # 25CN0187

PROJECT LOCATION Lebanon, Ohio

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.

Date Completed 6/26/25 Hammer Drop 30 in.

Boring Method HSA Spoon Sampler OD 2 in.

Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pct)	Remarks
	SURFACE ELEVATION											
	TOPSOIL 8"	0.7		1	SS			14		>4.5	11.3	
	Brown CLAY with Sand and Gravel	6.0	5	2	SS			16		>4.5	12.2	
	Gray Completely Weathered SHALE with Limestone Seams	7.7		3	SS			42			13.5	
	Auger Refusal 7.7' End of Boring at 7.7 feet											

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT New Housing Ohio (NHO), Inc.

BORING # B09

PROJECT NAME Proposed Apartments

ALT & WITZIG FILE # 25CN0187

PROJECT LOCATION Lebanon, Ohio

DRILLING and SAMPLING INFORMATION

Date Started 6/26/25 Hammer Wt. 140 lbs.

Date Completed 6/26/25 Hammer Drop 30 in.

Boring Method HSA Spoon Sampler OD 2 in.

Driller OSI Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	TOPSOIL 9"	0.8										
	Dark Brown CLAY with Sand	3.5		1	SS			9		4.0	24.2	
	Brown CLAY	6.0	5	2	SS			11		>4.5	25.4	
	Brown/ Gray Residual CLAY with Limestone Cobble	8.2		3	SS			34		>4.5	16.5	
	Auger Refusal 8.2' End of Boring at 8.2 feet											

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT **New Housing Ohio (NHO), Inc.**

BORING # **B10**

PROJECT NAME **Proposed Apartments**

ALT & WITZIG FILE # **25CN0187**

PROJECT LOCATION **Lebanon, Ohio**

DRILLING and SAMPLING INFORMATION

Date Started **6/26/25** Hammer Wt. **140** lbs.

Date Completed **6/26/25** Hammer Drop **30** in.

Boring Method **HSA** Spoon Sampler OD **2** in.

Driller **OSI** Rig Type **D-50 Track ATV**

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	SURFACE ELEVATION										
	TOPSOIL 3"	0.3		1	SS		11		>4.5	10.9	
				2	SS		16				
	Dark Brown Silty Sandy CLAY with Gravel (FILL)	5		3	SS		15				
				4	SS		15		2.3	19.0	
		10.0	10								
	Brown Sandy Silty CLAY with Gravel										
		13.5		5	SS		40		>4.5	15.6	
	Brown/ Gray CLAY with Sand and Gravel	15.0	15								
	End of Boring at 15 feet										

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT **New Housing Ohio (NHO), Inc.**

BORING # **B11**

PROJECT NAME **Proposed Apartments**

ALT & WITZIG FILE # **25CN0187**

PROJECT LOCATION **Lebanon, Ohio**

DRILLING and SAMPLING INFORMATION

Date Started **6/26/25** Hammer Wt. **140** lbs.

Date Completed **6/26/25** Hammer Drop **30** in.

Boring Method **HSA** Spoon Sampler OD **2** in.

Driller **OSI** Rig Type **D-50 Track ATV**

TEST DATA

Boring Method		HSA		Spoon Sampler OD		2 in.								
Driller		OSI		Rig Type		D-50 Track ATV								
STRATA ELEV.	SOIL CLASSIFICATION			Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	SURFACE ELEVATION													
	TOPSOIL 2"			0.2		1	SS			10		>4.5	13.6	
	Brown Silty CLAY with Sand and Gravel					2	SS			21		>4.5	15.3	
				6.0	5									
	Brown/ Gray Residual CLAY with Limestone Cobble					3	SS			36		>4.5	17.4	
	Gray Highly Weathered SHALE with Limestone Seams			8.5 8.8		4	SS			50/3			5.7	
	Auger Refusal 8.75' End of Boring at 8.75 feet													

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
⚡ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split-spoon.
- Qu: Unconfined compressive strength, TSF
- Qp: Penetrometer value, unconfined compressive strength, TSF
- Mc: Water content, %
- LL: Liquid limit, %
- PL: Plastic limit, %
- Dd: Natural dry density, PCF
- : Apparent groundwater level at time noted after completion

DRILLING AND SAMPLING SYMBOLS

- SS: Split-spoon - 1 3/8" I.D., 2" O.D., except where noted
- ST: Shelby tube - 3" O.D., except where noted
- AU: Auger sample
- DB: Diamond bit
- CB: Carbide bit
- WS: Washed sample

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>TERM (NON-COHESIVE SOILS)</u>	<u>BLOWS PER FOOT</u>
Very loose	0 - 4
Loose	5 - 10
Firm	11 - 30
Dense	31 - 50
Very Dense	Over 50

<u>TERM (COHESIVE SOILS)</u>	<u>Qu (TSF)</u>
Very soft	0 - 0.25
Soft	0.25 - 0.50
Medium	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.(+)	Coarse Sand	5 mm-0.6 mm	Silt	0.075 mm - 0.005 mm
Cobbles	8 in. - 3 in.	Medium Sand	0.6mm-0.2 mm	Clay	0.005mm(-)
Gravel	3 in. - 5 mm	Fine Sand	0.2mm-0.075 mm		