SUBSURFACE INVESTIGATION & FOUNDATION RECOMMENDATIONS

RESIDENTIAL DEVELOPMENT
LEXINGTON, KENTUCKY

Prepared for:

HILLS COMMUNITIES
CINCINNATI, OHIO

Prepared by:

ALT & WITZIG ENGINEERING, INC.
CINCINNATI, OHIO

OCTOBER 3, 2006 **PROJECT NO. 06CN0342**

Alt & Witzig Engineering, Inc.
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October 3, 2006

Hills Communities
4901 Hunt Road
Suite 300
Cincinnati, Ohio 45242
ATTN: Mr. Rodney Crice

RE: Preliminary Subsurface Investigation
& Site Evaluation
Residential Development
Kearny Hill
Lexington, Kentucky
Alt & Witzig Project No.: 06CN0342

Gentleman:

In compliance with your request, we have conducted a preliminary subsurface investigation and evaluation for the above referenced project. It is our pleasure to transmit herewith four (4) copies of our report.

The results of our investigation and evaluation are discussed in detail in the Foundation Discussion and Recommendations Section of this report. Parameters have been given that can be used in the preliminary design of the project.

Often, because of design and construction details that occur on a project, questions arise concerning the soil conditions. If we can give further service in these matters, please contact us at your convenience.

Respectfully submitted,

ALT & WITZIG ENGINEERING, INC.

Robert Smith, P.E.
Project Engineer

Patrick A. Knoll, P.E.

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EXECUTIVE SUMMARY

The purpose of this subsurface investigation was to determine the various soils profile components, the engineering characteristics of the foundation materials and to provide criteria for use by the design engineers and architects in preparing the foundation design for the proposed residential development.

It is anticipated that this site will be developed into a multi-family housing community with numerous two (2) to three (3) story buildings of a combination of wood and/or metal stud frame and masonry construction. The size and configuration of the site and approximate location of the soil borings are shown on the enclosed boring location plan.

Our recommendations are based upon eighteen (18) soil borings drilled as shown on the boring location plan. Boring B-15 does not exist due to a numbering error in the field. Upon completion of the borings, laboratory tests were performed on the samples to determine their general classification and engineering characteristics.

Our test borings indicate that medium stiff to stiff clays and silty clays are the predominate soils across the site. However, isolated areas of fill were encountered at borings B-2, B-3, B-7, B-13, and B-16 to a depth of three (3) to five (5) feet. Some of this fill might have been placed during the operation of the farm that once occupied the site. Other areas, such as the fill encountered at B-2 and B-3, has likely been placed with the current earthwork activities. It should be noted that other areas of fill, not identified by our borings, could be encountered across the site due to the recent construction activities and the previous farm that once occupied the site.

Portions of the soils are highly plastic clays that are susceptible to shrink/swell and exist across isolated areas of the site. It is critical to the performance of the proposed structures and

pavement that proper quality control and testing be performed on this site and procedures as outlined in the following report are followed.

Auger refusal on apparent bedrock was encountered across the site to a depth of four (4) to thirteen (13) feet below grade with exception to boring B-8. Boring B-8 did not encounter rock to a depth of sixteen (16) feet below grade. The bedrock across the site will consist of limestone with clay to weathered shale seams and layers. It is anticipated that the limestone and hardness of the bedrock will increase rapidly with excavations.

Continuous wall footings are generally most feasible when soil conditions allow these footings to be placed at a shallow depth below grade. Net allowable soil bearing pressures of 3000 and 2400 psf are recommended to design conventional spread footings and continuous wall footings, respectively. This assumes that the footings will be placed upon medium stiff natural soils or compacted fill material. Once the grading plan is completed, a review of the building placement and foundation requirements should be performed. Footings excavated in the highly plastic clays should be over excavated eighteen (18) inches below the frost depth of twenty-four (24) inches (total excavation of 42 inches). Additional recommendations for construction on the expansive soils is included in this report.

This Executive Summary provides a summation of the concerns and recommendations of the Subsurface Investigation conducted at the proposed residential development The following final report describes the expanded discussion of our conclusions and recommendations.

SUBSURFACE INVESTIGATION

AND

FOUNDATION RECOMMENDATIONS

INTRODUCTION

General

This report presents the results of a subsurface investigation for the new residential development to be constructed in Lexington, Kentucky. This investigation was conducted for Hills Communities of Cincinnati, Ohio.

Authorization to perform this investigation was in the form of an accepted proposal and notice to proceed from Mr. Rodney Crice of Hills Communities from Alt & Witzig Engineering, Inc.

The scope of this investigation included a review of geological maps of the area and a review of geologic and related literature; a reconnaissance of the immediate site; subsurface exploration; field and laboratory testing; and engineering analysis and evaluation of the materials.

The purpose of this subsurface investigation was to determine the various soils profile components, the engineering characteristics of the subsurface materials, and to provide criteria for use by the architects and design engineers for design and construction of the new residential development.

SITE DESCRIPTION

Site Location

The site of the new residential development is located in Lexington, Kentucky. The site is located at the Kearney Hill Subdivision on the west side of Georgetown Road (U.S. 25) just south of the I-75 to I-64 interchange. Specifically, the site includes two parcels located on the north and south sides of Kearney Ridge Blvd., currently under construction. A site location map has been provided in the appendix of this report.

Site Topography and Drainage

The topography of the proposed site is relatively flat with approximately ten (10) to twenty (20) feet of relief across the site. The site drains towards to the existing Georgetown Road.

The site consists of partially stripped areas near the proposed development. Other areas of the site consist of open grass and weed covered fields with sparse trees. The north parcel had a farm house and several associated structures. All structures have been removed from the proposed site. The surrounding property consists of residential developments and houses.

FIELD INVESTIGATIONS

Scope

Field investigations to determine the engineering characteristics of the foundation materials included a reconnaissance of the project site, drilling eighteen (18) soil borings approximately located as shown on the enclosed boring location plan, performing standard penetration tests, and performing unconfined compressive strength tests on the cohesive soils samples retained in the standard split-spoon sampler.

Drilling and Sampling Procedures

The soil borings and rock soundings were performed with a track-mounted drilling rig equipped with a rotary head. Conventional hollow-stem augers were used to advance the holes. Representative samples were obtained employing split-spoon sampling procedures in accordance with ASTM Procedure D-1586.

Field Tests and Measurements

Penetration Tests. During the sampling procedure, standard penetration tests were performed at regular intervals to obtain the standard penetration value of the soil. The standard penetration value is defined as the number of blows a 140-pound hammer, falling 30 inches, is required to advance the split-spoon sampler one (1) foot into the soil. The results of the standard penetration tests indicate the relative density and comparative consistency of the soils, and thereby, provide a basis for estimating the relative strength and compressibility of the soil profile components.

Water Level Measurements. Water level observations were made during and upon completion of the boring operations. These measurements are noted on the boring logs presented herewith. In relatively pervious soils such as sandy soils, the indicated elevations are considered reliable groundwater levels. In relatively impervious soils, the groundwater elevation is difficult and often impossible to accurately determine. The exact location of the water table should be anticipated to fluctuate somewhat depending upon normal seasonal variations in precipitation and surface runoff.

Ground Surface Elevation. Ground surface elevations were not made available at the time of the test borings. All depths and elevations referred to in this report are referenced from the existing ground surface. Due to site conditions difficulty was experienced by our personnel in accurately field staking the proposed boring locations. Locations shown on the boring location plan should be taken as approximate and it is strongly suggested that the borings be field located by the survey/site engineer and shown on the proposed site layout and grading plan. Borings were field staked for this investigation by means of "pacing and taping" methods in accordance with the perspective owner's approval.

LABORATORY INVESTIGATIONS

In addition to the field investigations, a supplemental laboratory investigation was conducted to ascertain additional pertinent engineering characteristics of the foundation materials necessary in analyzing the behavior of foundations used to support the proposed structures.

All phases of the laboratory investigation were conducted in general accordance with applicable ASTM Specifications.

The laboratory-testing program included supplementary visual classification, Water Content tests in accordance with ASTM D2216 and Atterberg Limit tests in accordance with ASTM D4318.

Samples of the cohesive soil from the 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 sampling techniques provide a representative but somewhat disturbed soil sample.

The representative samples of the soils retained for analysis in sample jars will be stored in our laboratory for further analysis, if desired. However, unless notified to the contrary, all samples will be disposed of after three (3) months.

FOUNDATION DISCUSSION AND RECOMMENDATIONS

Preliminary design plans indicate that the new residential development will consist of two (2) to three (3)-story, wood and/or metal stud frame and masonry structures. The approximate size and configuration of the proposed structures is shown on the enclosed boring location plan.

It is anticipated that the buildings will be constructed without basements with the ground floors constructed as slabs-on-grade. The exact finished floor slab elevations were not available at this time. Based on the topography in the proposed building areas, major cuts and fills will be necessary to establish the anticipated subgrade elevations.

It is assumed that all structural loads will be transferred to the soils by a combination of conventional spread footings and continuous wall footings, if possible. Maximum wall loads on the order of one (1) to three (3) kips per lineal foot are anticipated with column loads in the range of thirty (30) kips.

Subsurface Description

Our test borings indicate that medium stiff to stiff clays and silty clays are the predominate soils across the site. However, isolated areas of fill were encountered at borings B-2, B-3, B-7, B-13, and B-16 to a depth of three (3) to five (5) feet. Some of this fill might have been placed during the operation of the farm that once occupied the site. Other areas, such as the fill encountered at B-2 and B-3, has likely been placed with the current earthwork activities. It should be noted that other areas of fill, not identified by our borings, could be encountered across the site due to the recent construction activities and the previous farm that once occupied the site.

Portions of the soils are highly plastic clays that are susceptible to shrink/swell and exist across isolated areas of the site. It is critical to the performance of the proposed structures and

pavement that proper quality control and testing be performed on this site and procedures as outlined in the following report are followed.

Auger refusal on apparent bedrock was encountered across the site to a depth of four (4) to thirteen (13) feet below grade with exception to boring B-8. Boring B-8 did not encounter rock to a depth of sixteen (16) feet below grade. A rock core was not performed and a sample of the bedrock was not obtained, however, it is anticipated that the bedrock across the site will consist of limestone with clay to weathered shale seams and layers. It is anticipated that the limestone and hardness of the bedrock will increase rapidly with excavations.

Conventional Foundations

Continuous wall footings are generally most feasible when soil conditions allow these footings to be placed at a shallow depth below grade. Net allowable soil bearing pressures of 3000 and 2400 psf are recommended to design conventional spread footings and continuous wall footings, respectively. This assumes that the footings will be placed upon medium stiff natural soils or compacted fill material. Once the grading plan is completed, a review of the building placement and foundation requirements should be performed.

The recommended bearing pressures are "net allowable soil pressures". In utilizing these net allowable pressures for dimensioning footings, it is necessary to consider only those loads applied above the finished floor elevation. Footings should not be less than eighteen (18) inches wide for walls or twenty-four (24) inches square for columns and must also be in compliance with all local building code requirements.

Differential settlement concerns arise from having a portion of the building being founded on bedrock and the other portion being founded on cohesive soils, especially, cohesive soils that are susceptible to shrink/swell. To minimize the effects of the differential settlement on

footings, footings for the structures should be extended to similar soils or rock. If differences in soil conditions arise across a building, a step in the footing to the differing bearing materials should only occur at areas in the structure where control joints exist. Control joints incorporated in the structures to minimize differential settlement should be determined by the structural engineer. Footings excavated in the highly plastic clays should be over excavated at least eighteen (18) inches below the frost depth of twenty-four (24) inches (total excavation of 42 inches). For footings placed on rock, a net allowable soil bearing pressure of 10,000 psf is recommended to dimension conventional spread footings and continuous wall footings.

All exterior footings must be placed no less than twenty-four (24) inches below finished grade according to Kentucky Building Code requirements for frost protection.

It is recommended that any foundation excavations that show questionable material be inspected by a representative of the soil engineer to assure that adequate bearing soils exist in the base of all footings. Due to the expansive nature of some of the soils all footings should be protected from weather conditions and should be placed as quickly as possible and not allowed to remain open for long periods. If exposed to significant precipitation these wetted soils should be undercut to relatively undisturbed soils as determined by a representative of the soil engineer. Once concrete has been placed, footings should be backfilled as soon as possible to prevent saturation of the soils surrounding and beneath the footings.

In addition, fill exists across the front portion of the site. The fill has been placed in an uncontrolled manner and will not support the proposed structures and will require undercutting to the medium stiff natural soils at a depth of three (3) to five (5) feet below existing grade. Some of these soils may be reusable as a structural fill if dried to within –2 to +2% of optimum moisture content and then compacted in lifts not exceeding eight (8) to twelve (12) inches.

Wherever soft or loose soils are encountered, these footing areas must be undercut. After excavation to an adequate bearing material, the footing areas can then be re-established to the proposed footing elevation by placing lean concrete. If undercut footing areas extend below (4) feet and workers must enter the excavation, cutback slopes or steps of 1H:1V must be performed for workers safety.

Floor Slab Recommendations

The ground floor of the structure can be constructed as a slab-on-grade supported by natural soils and/or compacted fill materials provided that procedures as outlined are followed. In the areas where the existing grade is below the final floor elevation, a well-compacted structural fill will be necessary to raise the site to the desired grade. It is recommended that the floor slabs be constructed using a minimum of twelve (12) inches of moisture conditioned soils. It is recommended that these soils be placed three (3) percent above the optimum moisture content and compacted to 100% of maximum dry density according to ASTM D698. It is critical to the performance of this system that the gravel and subgrade do not become wetted prior placement of the floor slab, walkways, and pavement. It is anticipated that preparation as outlined above will reduce the amount of heave the soils could experience during the lifetime of the structure.

If the highly plastic clays must be used underneath the slab, it is recommended that a minimum of 18 inches of the subgrade soils be lime-stabilized to reduce the risks associated with shrink/swell of the soils.

It is recommended that deep-rooted trees be kept a minimum of ten (10) feet from the proposed structures. This will help eliminate changing moisture conditions in the area and in turn minimize the shrink/swell effects of the highly plastic clays.

Before any fill is placed, it is recommended that the exposed subgrade be proofrolled with equipment approved by the soil engineer. This proofrolling will expose any soft, compressible soil. Soft areas should be undercut to a depth determined at the time of the proofroll inspection and replaced with a well-compacted fill. Test pit excavations across each building area are suggested to evaluate whether the subgrade soils should be lime-treated.

Seismic Requirements

Seismic design consideration based on the information obtained in our subsurface investigation and the 2002 Kentucky Building Code guidelines indicates that the site will be classified with a site class C.

Proposed Parking Areas

The subsurface materials encountered at a shallow depth in our test borings were predominately medium stiff to stiff clays and silty clays. Due to the presence of highly plastic clays, support of the pavement will be more difficult. A design CBR value of 7.0 is suggested for the pavement design if the subgrade soils are lime-stabilized a minimum depth of twelve (12) inches below subgrade elevations. A lime-stabilized subgrade would provide a superior condition for pavement support allowing a longer life for the pavement and a reduced pavement section. Alt & Witzig Engineering, Inc. could design a pavement section if the estimated traffic conditions are provided. It is strongly suggested that the site be lime stabilized.

It is suggested that underdrains be installed in the pavement area to minimize potential saturation of these soils. The soil engineer, owner, and site design engineer should discuss the design and placement of these drains prior to construction. For underdrains to be effective, minimum installation depths of eighteen (18) inches is suggested. The drains should consist of a four (4) inch perforated plastic pipe encased in a clean granular backfill such as a washed No. 57

stone. Inverted pavement sections should be avoided if possible to reduce softening or de-stabilization of subgrade conditions.

It is recommended that after stripping has been performed, the exposed subgrade should be proofrolled with approved equipment. This proofrolling will determine if any pockets of soft unsuitable materials exist beneath this exposed subgrade.

On-Site Borrow Material

Most on-site soils, with the exception of the topsoil, can be used as structural fills in the building areas and/or roadway and parking areas. However, due to the plastic nature of some of the natural soils, some limitations exist on the depth and location of placement. It was noted that some of the fill that has been placed on the site may be unusable and will require close observation during removal and placement if it is to be used as a structural fill.

The predominate soil types encountered at a shallow depth are clays and silty clays. The laboratory tests indicated natural moisture contents of the shallow cohesive soils range from % to % at the time of our boring operations. Optimum moisture contents for clays and silty clays are anticipated to be in the range of 16% to 20%. Atterberg Limit Tests performed on the shallow clay soils obtained from boring B-1 and B-10 indicates a plastic limit (PL) of 30% and liquid limit (LL) of 49% to 62% giving a plasticity index (PI) of 19% to 32%. These results indicate that these soils are slightly to very susceptible to shrink/swell with changing moisture conditions. Procedures have been outlined to minimize these effects including use of stone, lime-stabilization, and extension of foundations. Based on our experience, lime-stabilization in the roadway/parking areas and floor slab area would be the most effective method of modifying the clay soils to reduce the effects of changing moisture conditions to tolerable levels for support of the pavement and floor slabs.

CONSTRUCTION CONSIDERATIONS

Site Preparation

It is recommended that excessively organic topsoils and loose materials be stripped from the construction areas and wasted or stockpiled for later use. Our test borings and site reconnaissance indicates that stripping on the order of four (4) to seven (7) inches in most areas should be adequate to remove vegetation and loose soils. It is recommended that an average depth of six (6) inches be used for estimating purposes. However, the exact depth of stripping should be determined by a representative of the soils engineer in the field at the time of the stripping operations. If stripping occurs during periods of frequent precipitation, it is recommended that light-tracked equipment be used.

It is recommended that the exposed subgrade be proofrolled with approved equipment. This proofrolling will determine if any pockets of soft unsuitable materials are encountered. Should soft unsuitable materials be encountered, the material should be removed and replaced with a well-compacted material. It is recommended that a representative of the soil engineer be present for this phase of this project.

After the existing subgrade soils are excavated to design grade, proper control of subgrade compaction and fill, and structural fill replacement should be maintained by a representative of the soils engineer as per the "Recommended Specifications for Compacted Fills and Backfills", presented in the Appendix of this report; thus minimizing volume changes and differential settlements which are detrimental to behavior of shallow foundations, floor slabs and pavements. In addition, modification to the subgrade soils as determined by the owner and soil engineer should be followed.

Depending on the time of year that construction takes place, heavy construction traffic may cause rutting and pumping over the exposed subgrade. Caution should be exercised to direct construction traffic such that the subgrade does not fail due to construction activities.

Groundwater

A low groundwater level is anticipated therefore, little difficulty during excavation and construction of the proposed shallow foundations is expected. However, water could be encountered at the soil rock interface and between shale layers if construction proceeds during the wetter portions of the year (typically November to April). In addition, depending upon the weather conditions during construction, seepage from surface runoff may occur. Since these foundation materials tend to soften when exposed to free water, every effort should be made to keep the excavations dry should groundwater be encountered. A gravity drainage system, sump pumps, or other conventional minor dewatering procedures should be sufficient for this purpose. It is also recommended that all concrete for footings be placed the same day that the individual foundation excavations are made.

Bedrock Considerations

Utility line excavations and other related site activities may encounter bedrock. Rock excavation is expensive and should be carefully considered when final elevations are selected. The nature of the bedrock is such that blasting, ripping, or jack hammering will be necessary for removal.

The elevation to sound rock is not precisely known and the depth shown on the logs should only be used as an approximation. Test pit excavations are recommended to determine the actual depth to sound bedrock and to determine the difficulties that could be experienced with rock excavations. The weathering of rock is a transitional process. The degree of

weathering usually decreases nonuniformly with depth over a given area and a sharp line of demarcation does not exist between weathered and unweathered rock. Additionally, rock shelves, floaters and other features are associated with the topography in this area. Thus, when estimating rock excavation, these features should also be considered.

Utility Excavations

With construction of the new residential development, placement of numerous underground structures will be required. Seepage from the soil/rock interface as well as between bedding planes of the bedrock could occur into the excavations. Minor dewatering might be required in order to maintain dry excavations. Slopes on the order of 1H:1V or flatter should be maintained with these excavations within the cohesive soils with nearly vertical cut slopes possible in the limestone and weathered shale. However, these slope angles should only be considered for temporary excavations. Long term excavations with nearly vertical slopes would be possible in the bedrock if a "catch" area is provided for loose or weathering rock falls. 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. If over-excavation is not desired, a trench box will be necessary to provide for workers safety in these soils.

SUMMARY

A subsurface exploration and evaluation of the foundation conditions has been conducted for the proposed residential development being constructed in Lexington, Kentucky.

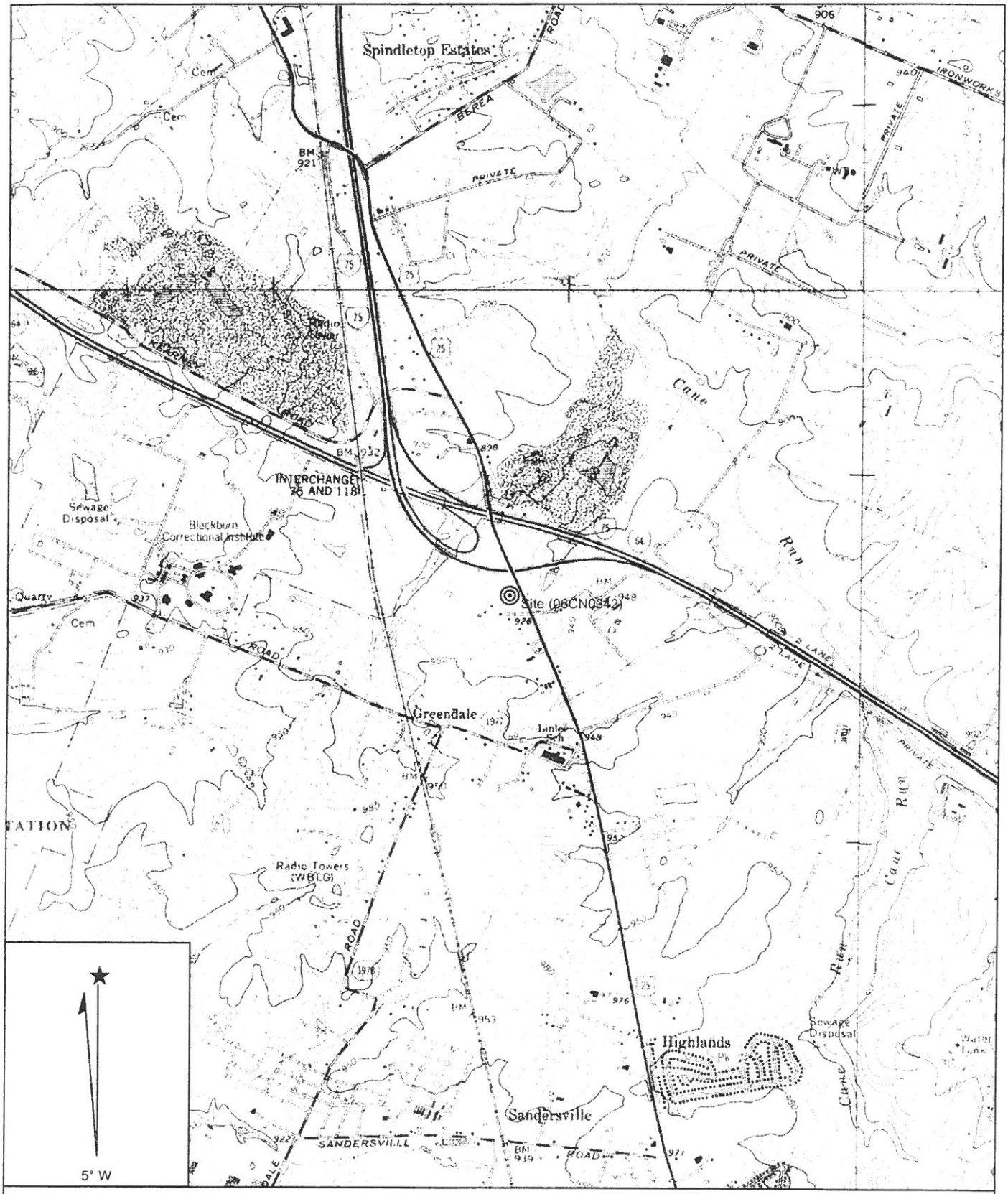
Consideration of foundation design and construction has been discussed. Other potential construction concerns including rock excavation, subgrade soil concerns due to plastic clays, and groundwater have been discussed.

The exploration and analysis of the subsurface conditions reported herein is considered in sufficient detail and scope to form a reasonable basis for evaluating the site for design and construction. The recommendations submitted are based on the available soil information and the preliminary design details furnished by the architects for the proposed structures. As more detailed plans are developed, Alt and Witzig Engineering should be consulted for additional recommendations. The soil engineer and owner should meet to discuss the desired method of constructing the improvements on the plastic clays in order to finalize construction details.

APPENDIX

RECOMMENDED SPECIFICATIONS FOR COMPACTED FILLS AND BACKFILLS

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 the soils engineer for his approval. The fill material should be placed in layers not to exceed eight (8) inches in loose thickness and should be sprinkled with water 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 containing an excess of water so the specified compaction limits cannot be attained should be spread and dried to 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 (100 percent of maximum dry density below the base of footing elevation, floor slab and pavement sections). 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.



Name: LEXINGTON WEST
Date: 9/13/2006
Scale: 1 inch equals 2000 feet

Location: 038° 06' 39.9" N 084° 31' 12.2" W
Caption: Site Location Map 06CN0342
Multi-Family Development
Lexington, Kentucky

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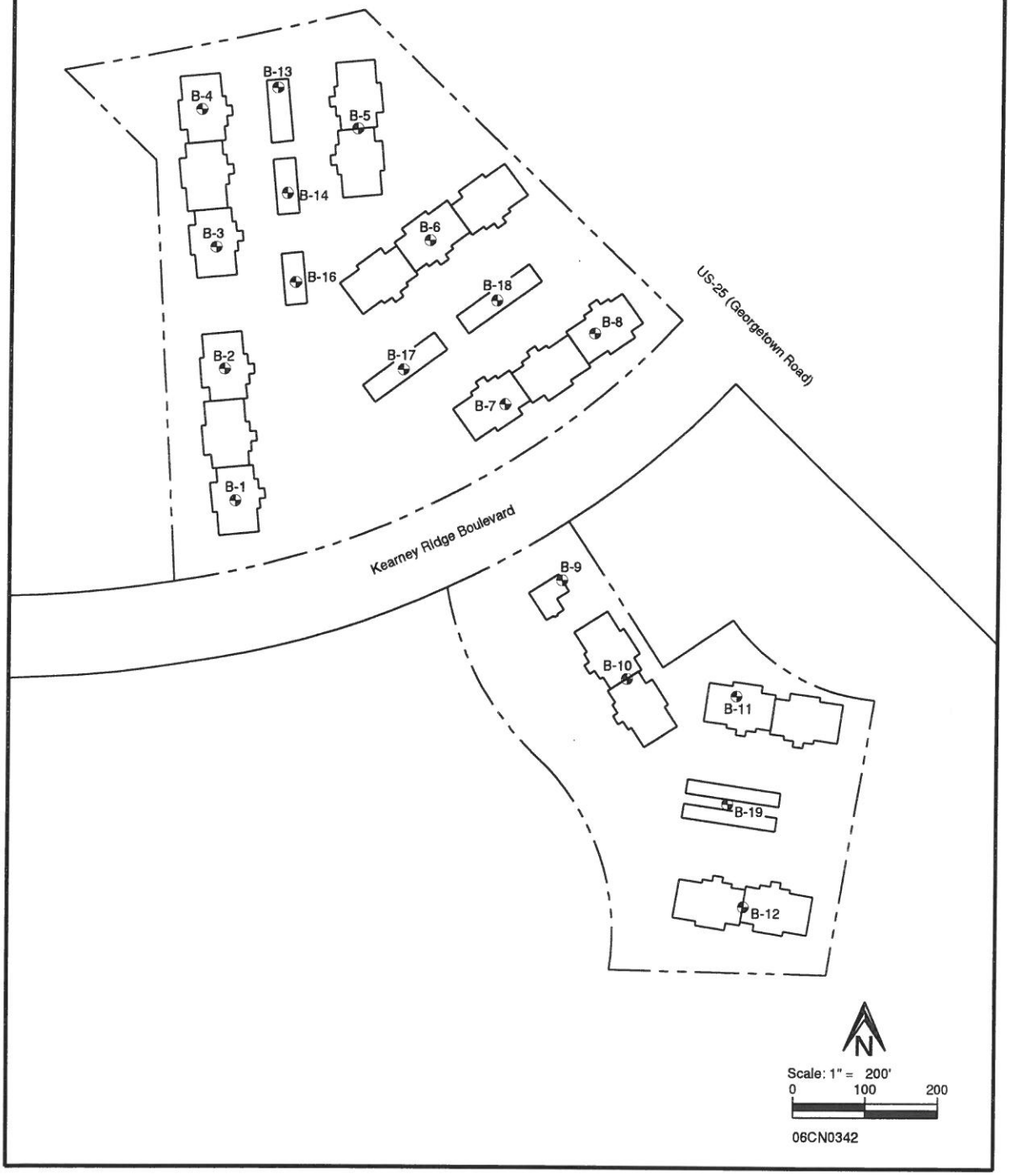
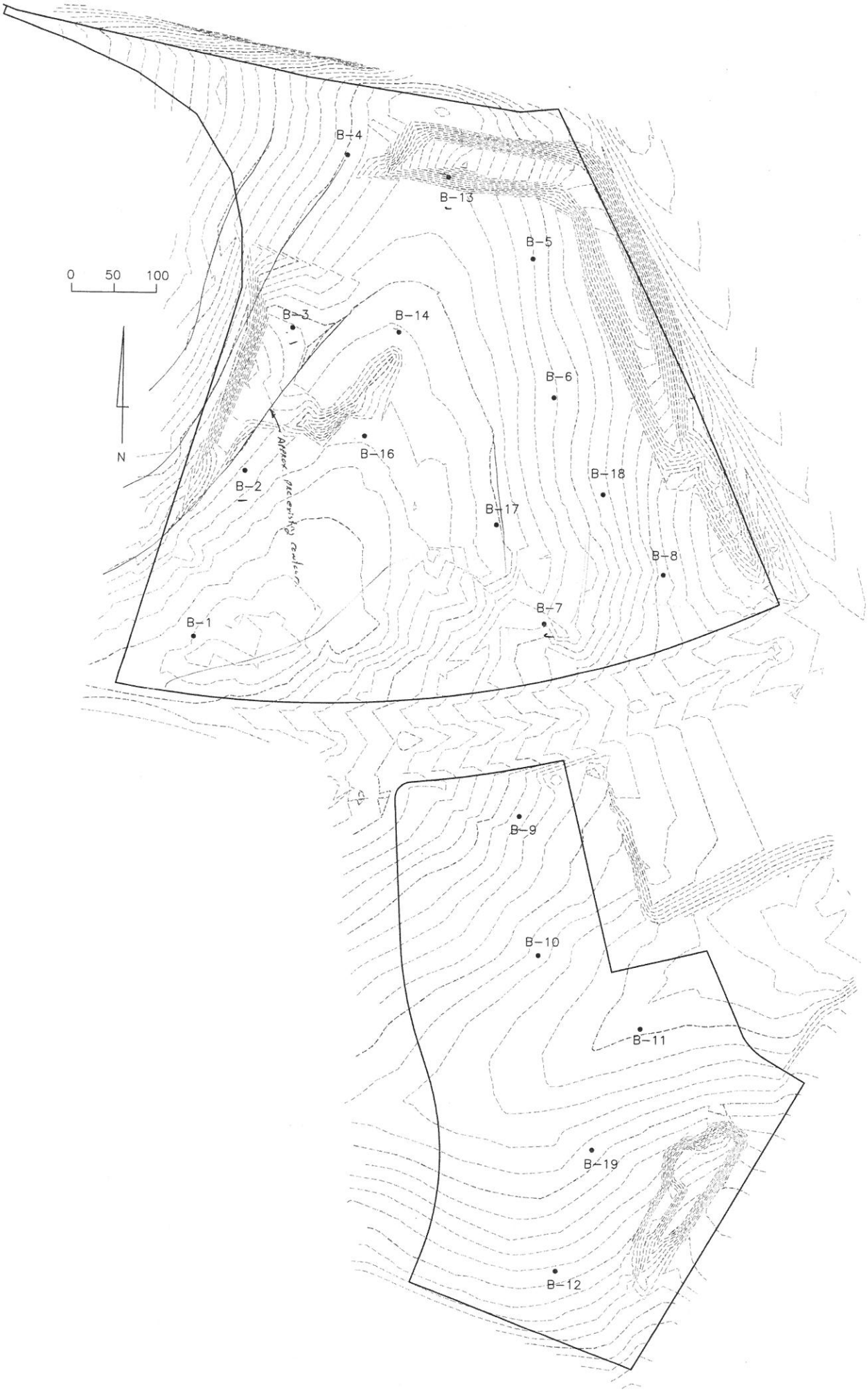
BORING LOCATION PLAN

Georgetown Road Multi-Family
Lexington, Kentucky
Hills Communities




B-4
B-13
B-5
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B-3
B-14
N
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B-16
B-2
B-18
B-17
B-8
B-7
B-1
B-9
B-10
B-11
B-19
B-12

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-19
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-6" Topsoil											
	6"-3.0 Brown Silty Clay		3.0	1	SS			9		2.0	24.8	
		5		2	SS			11		4.0	21.9	
	3.0-13.0 Brown Clay			3	SS			12	4.5	4.5	20.4	
		10		4	SS			13		4.5	21.9	
	Auger Refusal at 13.0 feet		13.0									

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-18
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-6" Topsoil											
	6"-6.5 Brown Peppered Black Clay	5		1	SS	X		11	3.7	4.0	31.5	
				2	SS	X		11	4.1	4.5	26.7	
	6.5-7.3 Brown Silty Clay with Limestone		6.5									
	Auger Refusal at 7.3 feet		7.3	3	SS	X		50/3"				

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-17
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-6" Topsoil											
	6"-5.0 Brown Peppered Black Clay			1	SS	X		10	3.5	3.0	24.3	
		5	5.0									
	Auger Refusal at 5.0 feet			2	SS	X		50/0"		2.0	32.6	

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

GROUNDWATER
▽ At Completion Dry ft.
▼ After hours ft.
○ Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-16
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-5" Topsoil											
	5"-4.7 Brown Clay with Brick Fragments (Fill)			1	SS			11			26.2	
		5	4.7									
	Auger Refusal at 4.7 feet			2	SS			50/2"				

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-14
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-4" Topsoil											
	4"-4.0 Brown and Black Clay			1	SS			11		4.0	27.1	
			4.0									
	4.0-5.2 Brown Clay and Limestone	5	5.2	2	SS			50/2"			20.8	
	Auger Refusal at 5.0 feet											

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-13
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-4" Topsoil											
	4"-4.0 Brown Clay (Fill)			1	SS	X		14		4.5+	27.7	
			4.0									
	4.0-6.0 Brown Peppered Black Clay	5		2	SS	X		11		3.0	24.8	
			6.0									
	Auger Refusal at 6.0 feet											

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-12
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-6.0 Brown Silty Clay	5		1	SS			13		4.5+	19.9	
			6.0	2	SS			17	7.5	4.5+	19.5	
	6.0-8.0 Brown Clay		8.0	3	SS			50/4"		4.0	21.5	
	Auger Refusal at 8.0 feet											

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-11
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/25/2006 Hammer Wt. 140 lbs.
Date Completed 9/25/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-12.5 Brown Silty Clay	5		1	SS	X		9		2.0	25.0	
				2	SS	X		20		4.5	21.8	
				3	SS	X		19			21.1	
		10		4	SS	X		12			28.7	
	Auger Refusal at 12.5 feet		12.5									

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-10
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-5" Topsoil											
	5"-3.0 Brown Clay Trace Silt Stone		3.0	1	SS			10	4.3	4.0	22.9	
	3.0-7.5 Brown Peppered Black Clay	5		2	SS			9		3.3	27.0	LL = 62% PL = 30% P± = 32%
	Auger Refusal at 7.5 feet		7.5									

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-9
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-5" Topsoil											
	5"-4.0 Brown Clay	5	4.0	1	SS			12		4.5	22.5	
	4.0-7.0 Brown and Black Silty Clay		7.0	2	SS			12	3.7	3.8	30.9	
	7.0-9.5 Brown Clay and Limestone		9.5	3	SS			13		4.5+	22.0	
	Auger Refusal at 9.5 feet											

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-8
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-5" Topsoil											
	5"-7.0 Brown Silty Clay	5		1	SS			11	4.1	3.0	21.8	
				2	SS			7		2.5	22.6	
			7.0	3	SS			11	4.0	2.8	28.6	
	7.0-16.0 Brown Clay	10		4	SS			12	4.9	3.8	25.8	
		15	16.0	5	SS			50		1.8	22.4	
	Boring Terminated at 16.0 feet											

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

GROUNDWATER
At Completion 13.0 ft.
After hours ft.
Water on Rods 15.0 ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-7
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-4" Topsoil											
	4"-6.0 Brown Clayey Silt with Limestone Fragments (Fill)	5		1	SS			8		4.5+	17.9	
			6.0	2	SS			22		3.5	28.0	
	6.0-8.0 Light Brown Dry Silt and Limestone		8.0	3	SS			50/1"				
	Auger Refusal at 8.0 feet											

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-6
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-5" Topsoil											
	5"-5.0 Brown and Dark Brown Clay			1	SS	X		21		4.5+	22.5	
		5	5.0									
	Auger Refusal at 5.0 feet			2	SS	X		50/1"		4.5+	20.0	

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT	Hills Communities	Boring #	B-5
PROJECT NAME	Multi-Family Development	Alt & Witzig File No.	06CN0342
LOCATION	Lexington, Kentucky		

DRILLING and SAMPLING INFORMATION

Date Started	9/21/2006	Hammer Wt. 140	lbs.
Date Completed	9/21/2006	Hammer Drop 30	in.
Boring Method	HSA	Spoon Sampler OD 2	in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-5" Topsoil											
	5"-6.5 Brown Silty Clay Trace Sand and Gravel	5		1	SS			19		4.5+	18.7	
				2	SS			15		4.5+	22.0	
			6.5									
	Auger Refusal at 6.5 feet											

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-4
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-3.0 Brown Clay Trace Sand		3.0	1	SS	X		15		4.5+	26.2	
	3.0-6.5 Brown Clay	5		2	SS	X		14	5.2	4.5+	23.1	
	Auger Refusal at 6.5 feet		6.5									

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-3
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-3.0 Brown Silty Clay Trace Organics (Fill)	5	3.0	1	SS	X		14		4.5	18.3	
	3.0-7.0 Brown Silty Clay Trace Roots			2	SS	X		13		4.5+	21.3	
	Auger Refusal at 7.0 feet		7.0									

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-2
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-4.0 Brown Silty Clay (Fill)	5	4.0	1	SS	X		14	4.1	4.5+	19.6	
	4.0-5.5 Brown Clay Trace Sand		5.5	2	SS	X		50/1"		3.3	30.8	
	Auger Refusal at 5.5 feet											

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

GROUNDWATER
▽ At Completion Dry ft.
▼ After hours ft.
○ Water on Rods Dry ft.
C - Boring Caved Depth

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

RECORD OF SUBSURFACE EXPLORATION

Alt & Witzig Engineering, Inc.

CLIENT Hills Communities
PROJECT NAME Multi-Family Development
LOCATION Lexington, Kentucky

Boring # B-1
Alt & Witzig File No. 06CN0342

DRILLING and SAMPLING INFORMATION

Date Started 9/21/2006 Hammer Wt. 140 lbs.
Date Completed 9/21/2006 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.

STRATA ELEV.	SOIL CLASSIFICATION / SURFACE ELEVATION	Depth Scale	Strata Depth	Sample No.	Sample Type	Sampler Graphics	Ground Water	Standard Penetration Test, N - Blows/foot	Qu - tsf Unconfined Compressive Strength	Pp - tsf Pocket Penetrometer	Moisture Content %	Remarks
	0.0-5" Topsoil											
	5"-3.0 Brown Clay Trace Sand		3.0	1	SS			15		4.5+	27.2	LL = 49% PL = 30% PI = 19%
	3.0-4.0 Brown Silty Clay with Limestone		4.0									
	Auger Refusal at 4.0 feet	5										

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

GROUNDWATER
At Completion Dry ft.
After hours ft.
Water on Rods Dry ft.
C - Boring Caved Depth

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

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

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

TERM (COHESIVE SOILS)	Qu (TSF)
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		