



December 27, 2018

Mr. Brian Wacker
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Subject: Geotechnical Survey Report
Proposed Dobson Lane Subdivision
8000 Dobson Lane
Louisville, Kentucky 40291
ECS Project No. 61-1909

Dear Mr. Wacker:

A new residential subdivision is proposed for construction in Louisville, Jefferson County, Kentucky. The site is located at the south end of Dobson Lane, approximately $\frac{3}{4}$ mile south of Brentlinger Lane. The approximate site location is shown on the attached Site Vicinity Map. The property generally consisted of a wooded valley along Big Run Creek that generally flowed from north to south across the eastern portion of the property. The higher, flatter, western portion of the property included several existing buildings and lawn areas. Provided drawings and Google Earth data indicated that existing surface elevations ranged from approximately ~EL 540 to ~EL 550 along Big Run Creek, to ~EL 670 in the north portion of the hill on the west side of the property, and to ~EL 580 in the south portion of the west valley hillside.

The "Preliminary Plan Dobson Lane Subdivision" (Plan) prepared by Mindel Scott, dated 10/19/2018 identified existing 20-30% slopes and >30% slopes on the property. A reduced copy of this drawing is attached. Some 20-30% slopes and >30% slopes shown on the plan could be disturbed by planned home construction and sanitary/storm sewer construction along the west side of the valley. The current Metro Louisville Land Development Code (LDC) 4.7.5 includes requirements for land disturbing activities on slopes greater than 20%. Item B.3 of 4.7.5 states "Land disturbing activities on slopes greater than 20% and less than 30% shall be required to prepare a geotechnical survey report if the staff of the USDA Natural Resources Conservation Service (NRCS) determines such a study is warranted, given the site's soil and geologic characteristics. A geotechnical survey report shall be submitted for land disturbing activities on slopes greater than 30%.

We understand that at present the NRCS is not making the determination of the need for a geotechnical survey report. Accordingly, ECS Southeast, LLP (ECS) was retained to conduct a geotechnical survey report of the site and to determine if additional exploration/testing/analysis would be required to adequately address slope stability concerns. Our evaluation consisted of the following tasks:

- Review the provided Plan
- Review USGS Geologic Quadrangle Map information
- Review USDA NRCS Soil Survey information
- Conduct a visual reconnaissance of selected slope areas
- Evaluate the reviewed information and prepare a report of our findings and recommendations



USGS Geologic Quadrangle Map Review

The "Geologic Maps of the Jeffersontown and Mt. Washington Quadrangles" published by the U. S. Geological Survey and shown on the Kentucky Geologic Map Information Service website indicated that the sloping areas subject to disturbance by the proposed construction along the west side of the Big Run Creek valley are underlain by the following formations:

- Above ~EL 630-650 Laurel Dolomite
- Below ~EL 630-650 Osgood and Brassfield Formation
- Below ~EL 600-610 Drakes Formation

Slope stability problems have been associated with the Osgood Formation due to its tendency to lose strength when exposed. Waldron Shale was mapped in the far northwest portion of the property that is outside the area of concern for slope stability. The mapped extents of the bedrock formations are shown on Figure 1.

Laurel Dolomite

Primary Lithology: Dolomite and shale.
Reported Thickness: 40' – 55'
Karst Potential: Medium.

In the upper 1/3 to 1/2 of unit dolomite is very fine grained, compact, and in even beds generally from just under 1 foot to nearly 2 feet in thickness, largely unfossiliferous. Lower part of unit is fine grained, thick to very thick bedded, porous, massive weathering dolomite which is slightly limy and sparsely fossiliferous. Commonly known as the oil producing "Blue sand" elsewhere in Kentucky. Both types are medium light gray, light olive gray, or greenish gray where fresh, but many outcrops and even roadcuts weather yellowish gray or grayish orange. Shale is pale olive, weathering to greenish gray chips or to yellowish gray or grayish yellow clay; dolomitic; occurs as 2 to 3 foot thick bed 5 to 8 feet above base of formation.

Osgood Formation

Primary Lithology: Shale and dolomite.
Reported Thickness: 12' – 18'
Karst Potential: Non-karst.

Shale is greenish gray, silty, poorly fissile, dolomitic. Weathers to gray flakes or to yellowish gray or grayish yellow clay. Dolomite is yellowish gray with reddish or orange mottling (probably a weathered color), fine grained; occurs at base of unit; resembles lowest dolomite bed of the Laurel Dolomite. Outcrop areas of the shale are excellent sites for farm ponds. Although unit is not resistant to weathering, it is exposed in numerous road cuts and in tributaries of Floyds Fork. Buildings and roads located on the Osgood Formation are subject to foundation failure. Springs are common at the top of the Osgood Formation but are generally small.

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Brassfield Formation

Primary Lithology: Limestone.

Total Reported Thickness: 0' – 7'

Karst Potential: Non-karst.

Limestone of three types, each generally two feet or less thick, any of which may be missing at a given locality. At top is an orange yellow, medium grained, fossil fragmental limestone; in middle is a medium to dark gray, fine grained, unfossiliferous limestone; at base is a light olive gray, coarse grained, highly fossiliferous limestone. Exposures mostly limited to stream channels and a few road cuts. Mapped with Osgood Formation.

Drakes Formation (3 Members: Saluda Dolomite Member, Bardstown Member, Rowland Member)

Total Reported Thickness: 114' – 140'

Karst Potential: Low.

Saluda Dolomite Member

Primary Lithology: Dolomite, minor limestone and shale.

Total Reported Thickness: 37 – 45'

Dolomite, light greenish to yellowish gray, weathers same or grayish orange to brown; commonly weathers to smooth massive surfaces, which in an overhang may develop honeycomb texture, or on gentle slopes may weather to platy beds less than 0.1 foot thick. Dolomite is calcitic, clayey; clay content increases toward base with corresponding decrease in resistance of unit to weathering; basal one third to one fourth of unit weathers to irregular blocky prisms. Abundant planar laminae, rarely exposed mud cracks, and low amplitude ripple marks present. Limestone, dense, medium to greenish gray, fine grained, laminated, forms marker bed commonly 5 to 10 feet above base, generally less than 0.5 foot thick; generally unfossiliferous. Shale, greenish gray, calcareous, occurs as discontinuous thin bed at top of unit and as local partings above and below limestone bed. Member thickest in northeastern part of area, where sinks are common on upland exposures. Residuum thickest on ridge tops where common range in thickness is from 3 to 7 feet. Springs are common at the base.

Bardstown Member

Primary Lithology: Limestone, mudstone, and shale.

Total Reported Thickness: 32 – 40'

Limestone is olive gray to brownish gray, weathers light gray; abundant to common broken and whole fossils, chiefly brachiopods, in a burrowed lime mud matrix; bedding irregular and rubbly; interbedded with shale. Shale is calcareous, mainly olive gray, weathers yellowish gray; in beds commonly 0.1 to 0.7 foot thick. Shale in basal part of unit is carbonaceous, olive gray to olive black to dusky yellowish brown. Mudstone, common near top of unit, is calcareous, clayey, light olive gray, weathers grayish yellow to yellowish gray; fossiliferous. Contact with underlying unit conformable, placed at base of lowest beds containing abundant fossils; on grassy slopes, contact determined by line of shallow sinkholes in dense thicker limestone beds of underlying unit. Springs are common at the base.

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Rowland Member

Primary Lithology: Limestone, mudstone and shale.

Total Reported Thickness: 45' – 55'

Limestone is dominantly greenish gray to light olive gray and olive gray with common dusky yellowish green splotches; weathers light gray to yellowish gray; grain size in clay to silt range except for rare to common fine to medium fossil fragments and sparse whole fossils; beds persistent, even, 0.2 to 2.0 feet thick; fracture subconchoidal to uneven; some beds dolomitic. Near base of unit limestone is medium dark gray, weathers medium brownish gray; partly dolomitic, partly shaly with shale interbeds; in southernmost exposures basal limestone beds are thinly laminated, contain chert. Mudstone, calcareous, similar in color and grain size to dominant limestone type with which it is locally interbedded. Shale interbeds in basal limestone are carbonaceous, calcareous, brownish to dark gray; elsewhere shale is medium dark gray to olive gray, interbedded and intergraded with dominant limestone type and mudstone. Springs are common at the base and less common in the dense limestone just above the base.

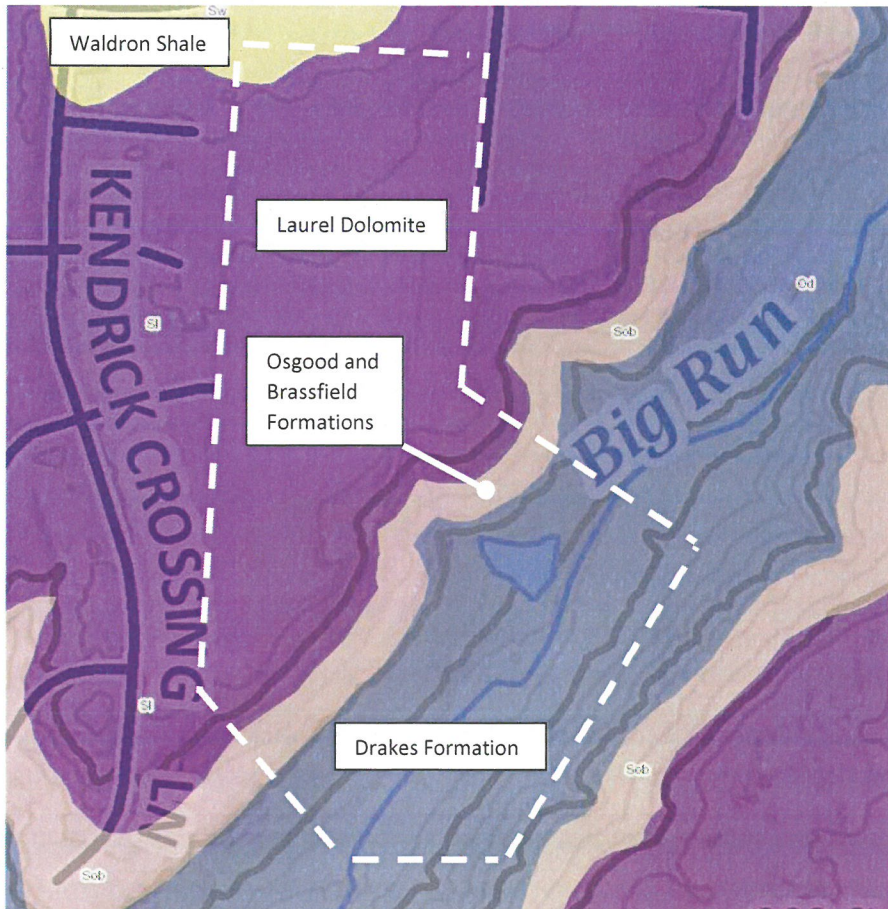


Figure 1: Reported Site Geology

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Soil Conservation Service Soil Survey

The USDA Natural Resources Conservation Service "Web Soil Survey" website indicated the 6 general soil types at the site as shown in Figure 2. Descriptions of these soil types are summarized below.

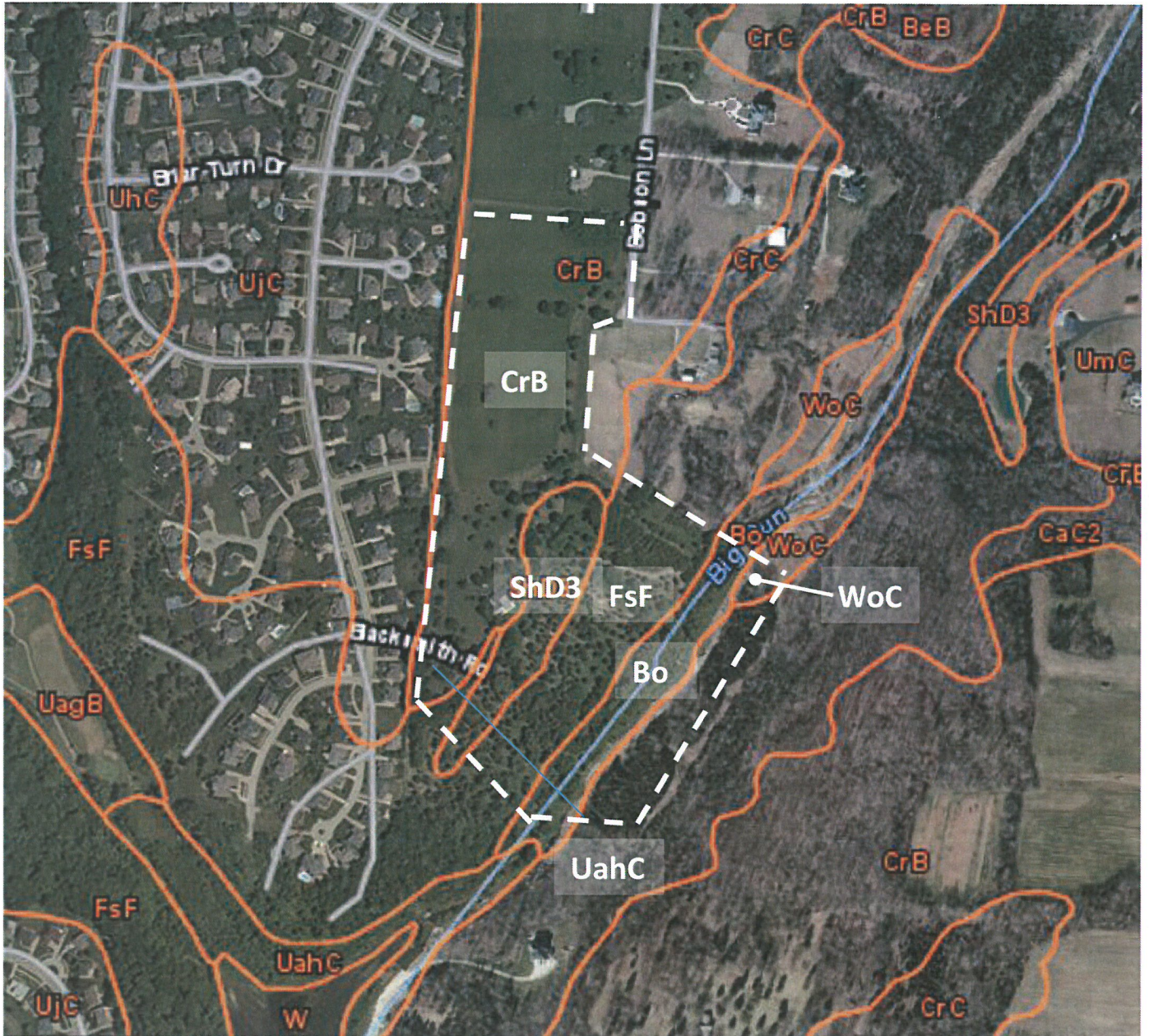


Figure 2: Reported Soil Data

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- Bo Boonewood silt loam, occasionally flooded
Parent material: Mixed fine-silty alluvium over limestone
Typical Profile:
 - 0 to 30 inches: silt loam
 - 30 to 40 inches unweathered bedrock

- CrB Crider silt loam, 2 to 6 percent slopes
Parent material – Fine-silty noncalcareous loess over clayey residuum weathered from limestone
Typical Profile
 - 0 to 9 inches: silt loam
 - 9 to 39 inches: silty clay loam
 - 39 to 79 inches: silty clay

- FsF Faywood-Shrouts-Beasley complex – 25 to 50 percent slopes
Parent material – Clayey residuum weathered from limestone and shale
Typical Profile
 - 0 to 7 inches: silt loam
 - 7 to 29 inches: silty clay
 - 29 to 39 inches: unweathered bedrock

- ShD3 Shrouts silt loam – 12 to 25 percent slopes – severely eroded - very rocky
Parent material – Clayey residuum weathered from calcareous shale and/or siltstone
Typical Profile
 - 0 to 2 inches: silt loam
 - 2 to 35 inches: silty clay
 - 35 to 45 inches: weathered bedrock

- UahC Urban land – Udorthents complex, 0 to 12 percent slopes
Parent material – clayey residuum weathered from limestone
Typical Profile – not described

- WoC Woolpert silt loam, 6 to 12 percent slopes, rarely flooded
Parent material – Clayey colluvium derived from limestone
Typical Profile
 - 0 to 13 inches: silt loam
 - 13 to 101 inches: silty clay loam

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Visual Reconnaissance of Selected Slope Areas

Based on our review of the Plan, several areas shown to be 20-30% slopes and >30% slopes that may be disturbed were identified. See attached Visual Slope Reconnaissance Plan for the approximate locations. A visual reconnaissance of these areas was conducted on December 26, 2018. Photos of the conditions observed at these areas are shown below. In general, similar conditions were observed in most areas. The portion of the site observed (western hillside between Big Run Creek and east half of southern loop of Dobson Lane) primarily was wooded with numerous small to large trees. Some brush, vines, and other low vegetation also was present. Several rock outcrops and springs were observed along the

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hillside. Isolated indications of minor erosion were observed. No indications of large scale erosion were noted. No visual indications of slope instability were observed. In particular, none of the following were noted: unusual tilting or fallen trees, tension cracks, scarps, displaced soil, or mounds of soil in lower areas.



Area 01



Apparent spring east of Area 01



Area 01a – minor erosion



Area 01a – minor erosion



Area 02



Rock outcrop south of Area 02



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Area 03



Areas 04-05



Area 06



Area 07 – rock outcrop along road



Areas 08 - 09



Area 10



Narrow gully near Area 10



Area 10a



Area 11



Area 12

Based on our review of the above reference information and on our past experience with construction under similar conditions in Jefferson County, our opinion is that the on-site slopes (excluding small, localized erosion features) in the observed areas were stable at the time of our reconnaissance. Slope stability problems have been associated with the Osgood Formation due to its tendency to lose strength when exposed. However, it appears that the Osgood Formation only is present in the areas lower in elevation than the planned lots and only would be disturbed by the planned sewers. The current, on-site slope stability likely is related to the following factors:

- Relatively thin depths of soil in slope areas
- Cohesive (clayey) soil matrix
- Rocky soil texture
- Limestone bedrock in many areas
- Numerous trees and other vegetation

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In our opinion, additional geotechnical analyses including soil/rock test borings/coring, shear strength testing of soils, etc. is not required, so long as the planned subdivision configuration does not involve disturbance significantly greater than what was indicated on the Plan.

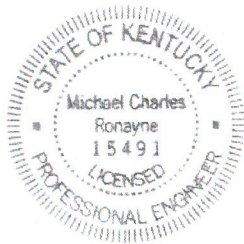
Several measures may be considered to help maintain the stability of the existing and planned slopes during construction of the new subdivision and over the life of the new homes. These measures include:

- Plan grading to minimize changes to existing topography along slopes.
- Minimize disturbance to slopes and vegetation outside new construction areas.
- Avoid significant transverse cuts along or at the toe of existing slopes.
- Avoid significant embankments along or at the crest of existing slopes.
- Maintain the following limits for new embankments without additional geotechnical exploration and analysis:
 - 3:1 (horizontal:vertical) or flatter slopes.
 - Properly strip all vegetation, topsoil, etc. where fill will be placed.
 - Construct embankments with controlled fill compacted to at least 98 percent standard Proctor maximum dry density and within 2 percent of the optimum moisture content.
 - Maximum fill embankment height – 5 feet.
 - Horizontally bench new fill into existing slopes.
- Maintain the following limits for new cuts in soil without additional geotechnical exploration and analysis:
 - 3:1 (horizontal:vertical) or flatter slopes.
 - Maximum cut height – 5 feet.
- Provide adequate erosion and surface water drainage control during construction and over the life of the subdivision.
- Establish permanent vegetative cover as soon as practical.

We appreciate the opportunity to work with you on this project. If you have any questions about this evaluation, or if you need any further assistance, please call us at any time.

Cordially,
ECS Southeast, LLP

Michael C. Ronayne, P.E.
Chief Engineer



Jeremy R. Hudson, P.E.
Senior Project Engineer

Attachments: Site Vicinity Map
Preliminary Plan South English Station Property
Visual Slope Reconnaissance Plan

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Site Vicinity Map
 Proposed Dobson Lane Subdivision
 8000 Dobson Lane
 Louisville, Kentucky 40291
 ECS Project No. 61-1909



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