G. GEOTECHNICAL OVERVIEW

M E M O R A N D U M **P-005-2018**

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SUBJECT: Nelson County
Western Bardstown Connectivity Study
Item No. 4-8809.00
EMARS 9278301D
Preliminary Geotechnical Assessment

The Division of Planning is conducting a study for the subject project. The purpose of the planning study is to evaluate connectivity improvements west of Bardstown between KY 332 and the Bluegrass Parkway. This abbreviated review will discuss the general geotechnical concerns within the project area.

The site is located in The Knobs Physiographic Region of Kentucky straddling the Cravens and Bardstown 7.5 Minute Quadrangles. Based on geologic mapping, bedrock within the study area consists of dolomite and limestone separated by three distinct formations (layers) of shale. Bedrock formations in the subject area are depicted on the attached geologic map.

The dolomite and limestone formations (Beechwood Limestone Member of the Sellerburg Limestone, Louisville Limestone, Laurel Dolomite, Brassfield Dolomite and Saluda Dolomite Member of the Drakes Formation) are suitable for most construction requirements including embankment foundation construction and rock roadbed. Rock quarries in the vicinity of Bardstown excavate bedrock from the Louisville Limestone and Laurel Dolomite Formations for concrete aggregate. The dolomite and limestone formations have a potential to be karst. Karst features such as solutioned bedrock and sinkholes are expected to be encountered during construction and may increase planned excavation and require additional rock quantities for mitigation. Multiple sinkholes were identified during a field visit and mapped by the Kentucky Geological Survey (see attached geologic map). Any sinkholes encountered during construction will require an investigation and remediation as outlined under section 215, Treatment of Open Sinkholes, of the standard specifications for road and bridge construction.

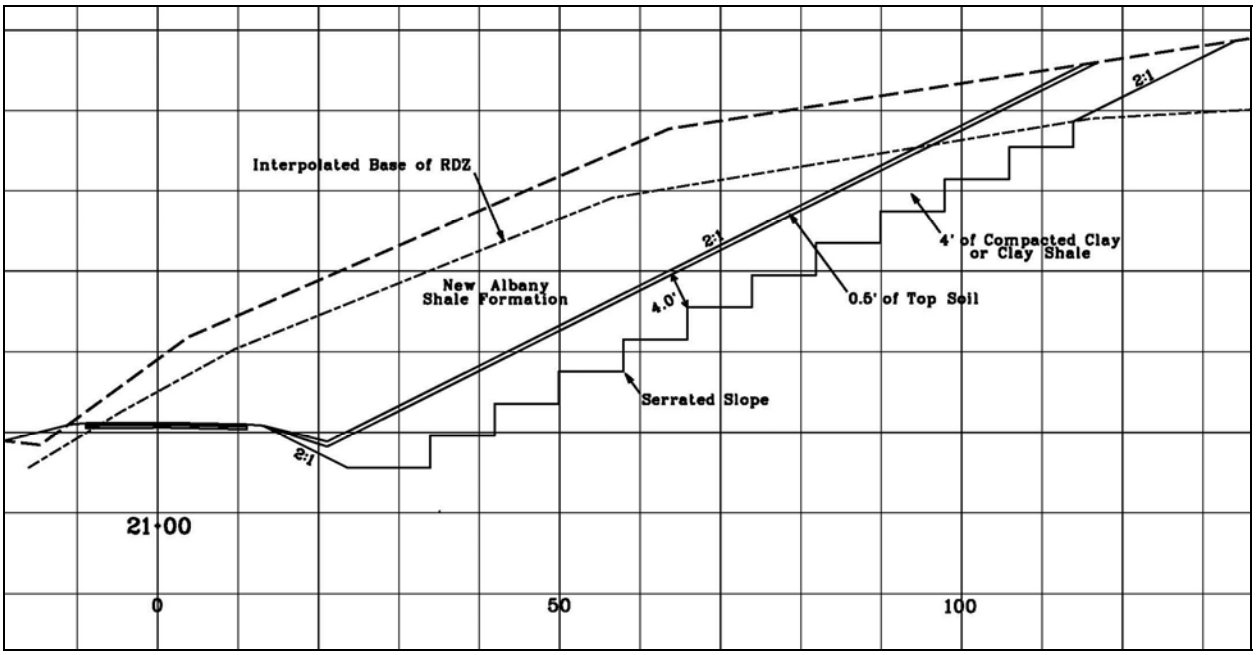
Typical cut slope for dolomite and limestone formations (KY 245 @ MP 6.1-6.2).

Sinkhole repair along KY 245@ MP 6.1-6.2.

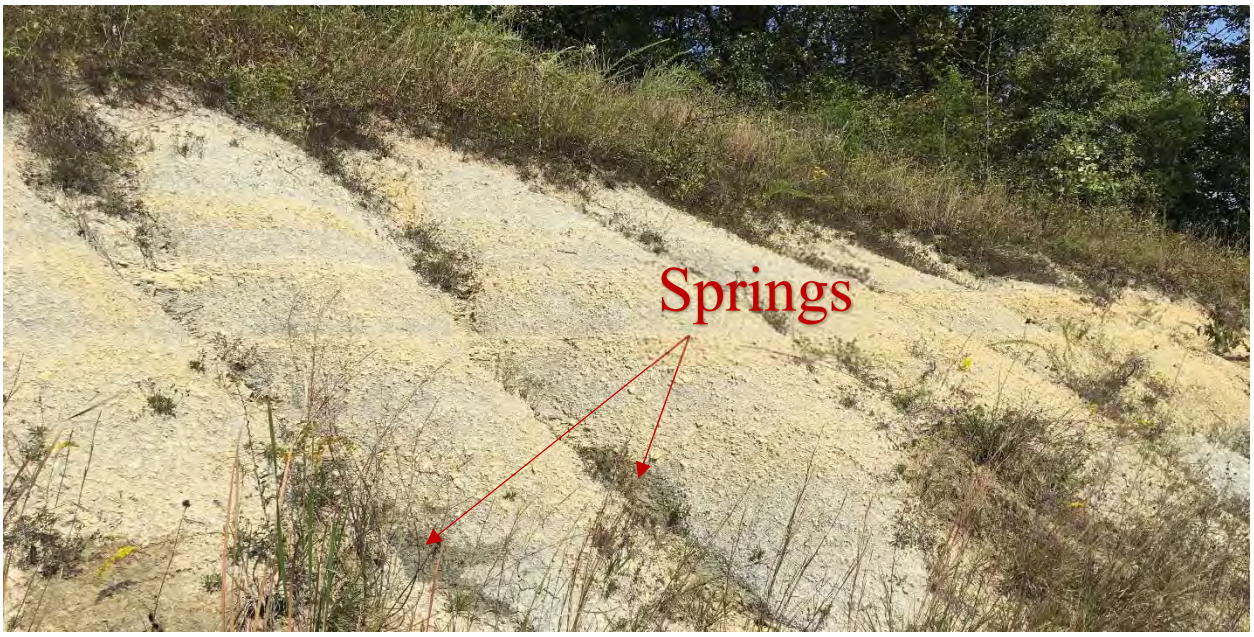
The New Albany Shale will be encountered at the highest elevations along ridge tops and plateaus. The New Albany Shale is black to dark gray, carbonaceous, containing pyrite nodules. A metal-rich, acidic drainage commonly occurs when pyrite from the New Albany Shale Formation is exposed to air and water creating an environmental hazard. Additional efforts are required to

The New Albany Shale Formation exposed in cut slope along KY 733 @ MP 11.9.

mitigate cut slopes and embankments consisting of this pyritic shale. The preferred mitigation is to encapsulate any material exposed from the New Albany Shale Formation with clay or clay shale, and top soil. Special concrete for structures, sign and guardrail posts are required in these locations. Alignments limiting disturbance through this formation is recommended.



Typical cut slope recommendation in the New Albany Shale Formation.



Water from springs flowing from a weathered shale, Osgood Formation, exposure along KY 2737 @ MP 3.7-3.8.

Other difficult shales in the area, which will be encountered, are the Waldron Shale and the shales of the Osgood Formation. These shales have been problematic on past KYTC projects resulting in embankment failures, wet subgrades and flatter than usual cut slopes. These non-durable shales are highly weatherable and can become soft and slick with exposure to water. Often, sliding planes will form along the soil-shale interface for materials with these characteristics and this can lead to potential landslides. These types of shales can also weather quickly and must be accounted for in rock cut designs and footing placements. Springs will likely be present where the Osgood shale and the Waldron shale are present due to their relative impermeability.

Spring box along KY 2737 @ MP 3.7.

Alluvial soils are present, according to the mapping, in the Beech Fork, Buffalo Creek and Cedar Creek basins as well as extending up into the larger tributaries. Alluvial soils are depositional soils that are generally unconsolidated and can sometimes cause issues with road construction.

Structure founded on exposed bedrock on KY 2737 @ MP 1.1.

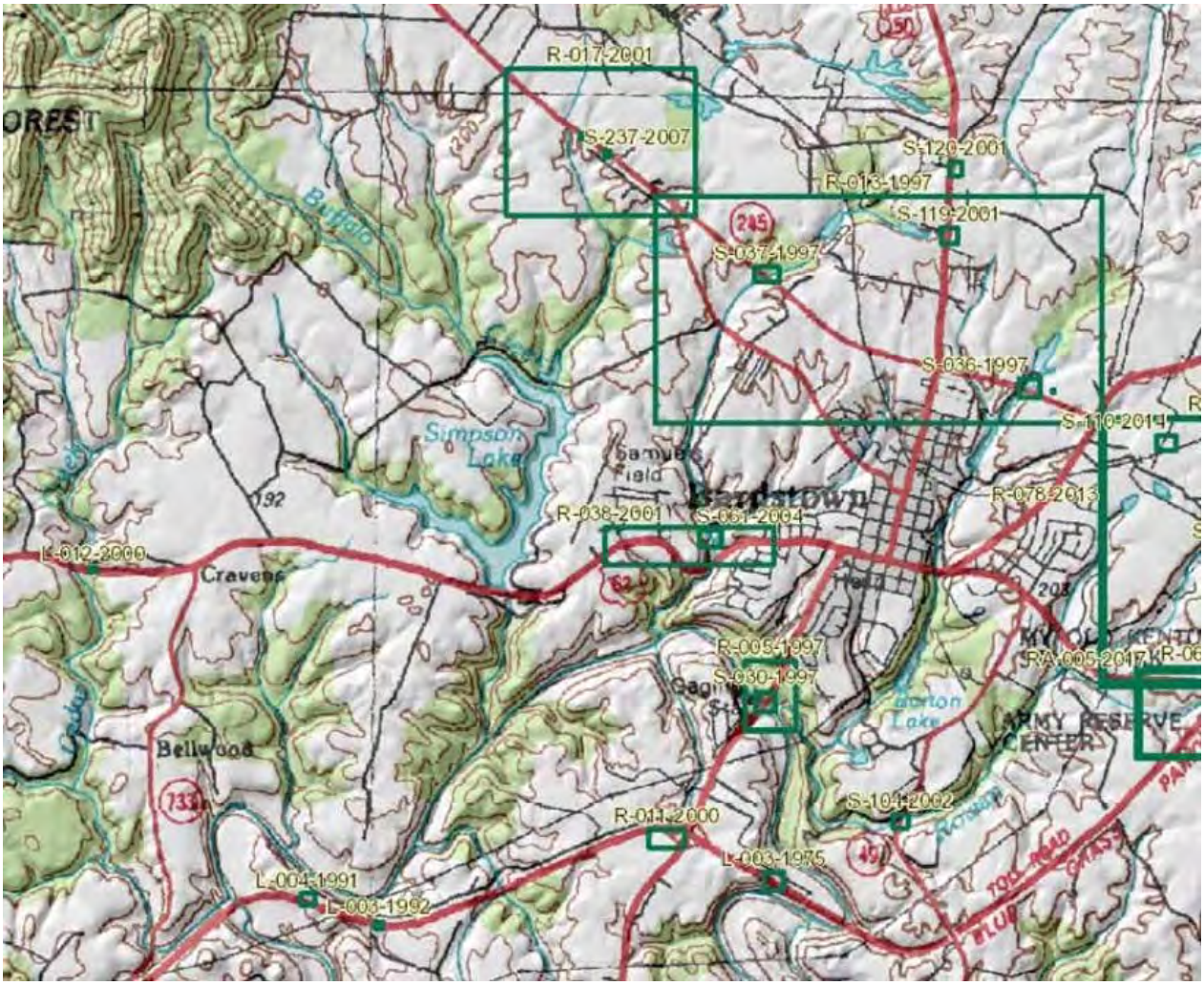
Foundations for bridges in the study area are generally rock bearing (end bearing piles, drilled shafts or spread foundations). Smaller structures such as retaining walls and box culverts may be founded on soil or bedrock. Some measures may be required for foundations constructed in the Waldron Shale and Osgood Formations, where the bedrock is considered erodible.

Soils in the area are generally suitable for embankment construction. Generally embankments built from the native soils and bedrock can be constructed to a height of 60 feet with 2H:1V side slopes if the foundation is suitable and proper compaction methods are used. Soil cuts over approximately 10 feet often require analyses to design proper side slopes. In no case should soil cuts be steeper than 2H:1V. The use of area shales in the construction of embankment can require special construction techniques to ensure adequate long term stability.

California Bearing Ratio (CBR) values used in pavement design for soils subgrades in the area range from 2-5. The use of rock for a roadbed is common in the area. Chemical modification of the subgrade is sometimes used when rock excavation quantities are insufficient.

Low lying areas may be wet and saturated, creating problems during construction. Ponds and springs may be encountered and require remediation efforts.

Below is a list of previously completed Geotechnical Investigations close the study area. The reports can be accessed through the KYTC Geotechnical Branch Database which can be accessed through the KYTC Division of Structural Designs home page (Click on Geotech and Search KYTC Completed Projects).



Extents of nearby completed Geotechnical Investigations.

Geotechnical Roadway Reports:

R-003-1988	R-038-2001
R-005-1997	R-063-2013
R-013-1997	R-078-2013
R-011-2000	RA-005-2017
R-017-2001	

Geotechnical Structure Reports:

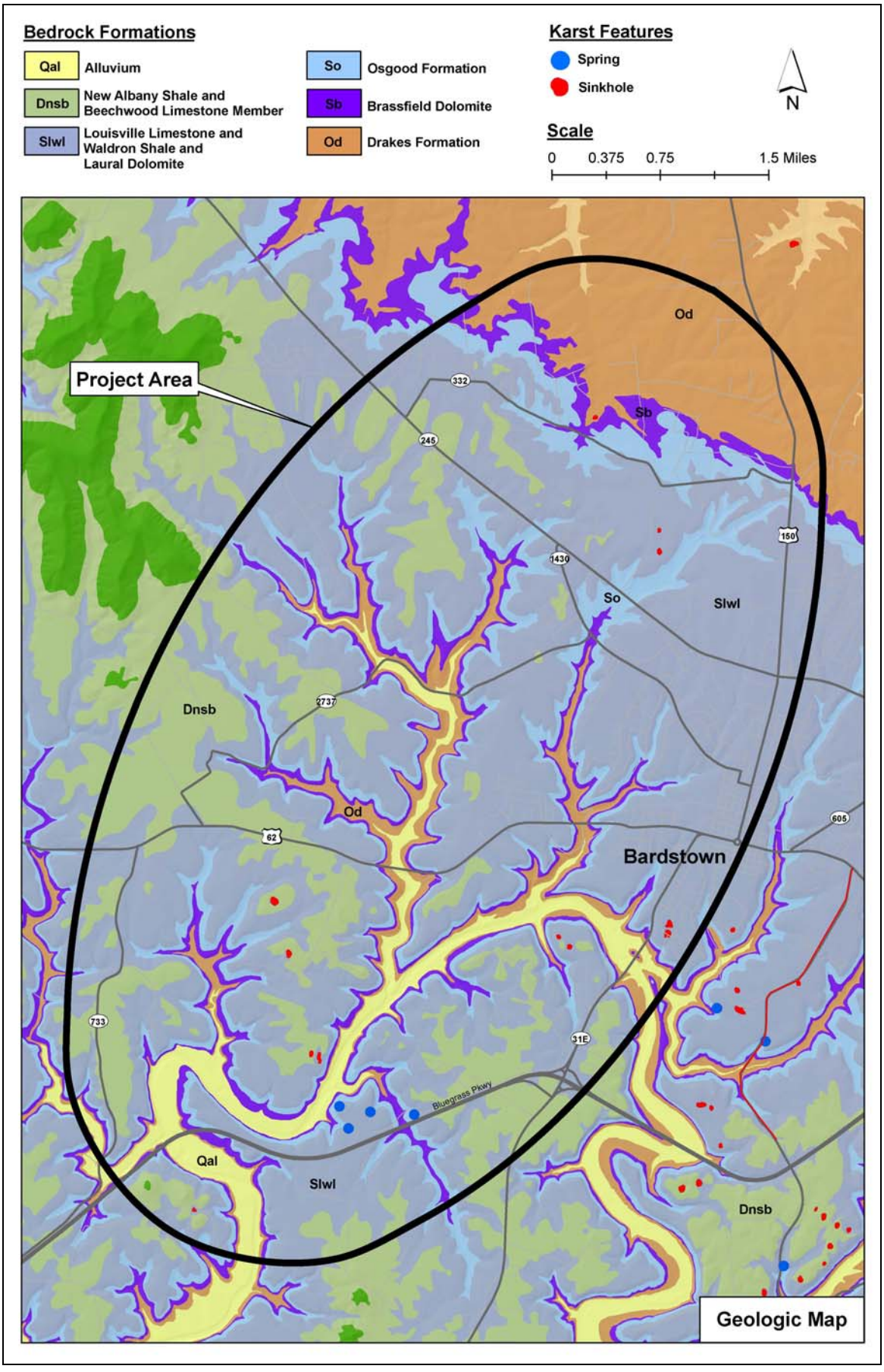
S-047-1986	S-120-2001
S-036-1997	S-104-2002
S-037-1997	S-061-2004
S-119-2001	S-236-2007

Geotechnical Landslide Reports:

L-003-1975
L-004-1991
L-012-2000

Attachments:

Geologic Map


Bedrock Formations
Qal Alluvium
Dnsb New Albany Shale and Beechwood Limestone Member
Slwl Louisville Limestone and Waldron Shale and Laural Dolomite
So Osgood Formation
Sb Brassfield Dolomite
Od Drakes Formation
Karst Features
Spring
Sinkhole
N
Scale
0 0.375 0.75 1.5 Miles
Project Area
Od
Sb
So
Slwl
Dnsb
Od
Bardstown
Qal
Slwl
Dnsb
Bluegrass Pkwy
332
245
150
1430
2737
62
605
733
31E
Geologic Map