

Appendix D:

GEOTECHNICAL OVERVIEW

MEMORANDUM

TO: John Moore, P.E.
Division of Planning

BY: Bart Asher, P.E., P.L.S.
Geotechnical Branch Manager

DATE: September 29, 2014

SUBJECT: **Jefferson County**
I-265 Programming Study
From I-65 to the New East End Bridge
12FO C35 D625 05 FH02 0410 C056 E143
Mars # 8931407P
Preliminary Geotechnical Assessment

P-009-2014
cc: M. Bullock
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The Division of Planning is conducting a study for future improvements on the subject project. This project is located in Jefferson County, KY on I-265 between I-65 and the New East End Bridge. This abbreviated review will discuss some general geotechnical concerns with the area.

The approximate coordinates this site are:

I-65 at I-265 - 38.115433 degrees North and -85.686636 degrees West.
I-64 at I-265 - 38.223469 degrees North and -85.502647 degrees West.
I-71 at I-265 - 38.320539 degrees North and -85.590478 degrees West.

The site is located in the Brooks, Mount Washington, Jeffersontown, Crestwood and Anchorage Geologic Quadrangles. The project is in the Outer Bluegrass Physiographic Region.

Mapping indicates that the some site soils are comprised of alluvium, terrace deposits and lacustrine deposits. In addition there are numerous areas where it should be anticipated that the soils have been manipulated and consist primarily of artificial, manmade, fills near the surface.

Bedrock in this area is as follows:

Section 1 – Bedrock in the section 1 section is primarily of the Louisville Limestone formation. Louisville limestone is generally a competent limestone that very suitable for use in road construction and generally makes very durable rock cuts. Louisville limestone has some potential for karst related issues. Laurel dolomite, New Albany shale and Beechwood limestone are also present in this section. New Albany shale is known to be a pyritic or black shale which can produce acidic runoff. This may require special treatment if the bedrock is exposed.

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Example of Karst in Louisville Limestone in Rock Cut

Section 2 – The Louisville limestone is also present in section 2. There is an active quarry that mines this material near the interchange of KY 3084 where the current alignment passes over. Of the numerous other formations in this section, a number of them are comprised of non-durable shales. Some of these shales break down and erode badly when exposed to surface runoff. There have been some slope instabilities that have been remediated in this area. Many of these shales would warrant a cut slope design on a 2H:1V slope for new cuts slopes. Of these, the Waldron shale is notable for past construction related issues. This is the same formation encountered in the approaches to and in the tunnels near the end of the project. The shales at the tunnel have numerous construction related constraints imposed on them.



Quarry high wall – flooded pit. Highly erodible and problematic Waldron shale cap.

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Section 3 – Section 3 is primarily in the Louisville Limestone and Laurel dolomite again. Mapping and experience in the area would indicate that Karst problems are more significant in section 3 and can require remediation.

For estimation of right of way for rock cuts in this area it is typical to assume from a 1V:1H to 1.5V:1H for cut slopes. It may be necessary to lay some of the rock cut slopes back on a 2H:1V slope where poor, soil-like, shales are encountered.

Soils in the area are generally suitable for embankment construction. Generally, embankments built from the native soils and durable bedrock can be constructed to a height of 60 feet or more with 2H:1V slopes if the foundation is suitable and proper compaction methods are used. Embankment construction with non-durable shales may require special treatment. Soil cuts over approximately 10 feet often require analyses to design proper slopes. In no case should soil cuts be steeper than 2H:1V. Suitable rock for embankment construction and rock roadbed is readily available in this area of the state. Some of the soils in the area are considered highly erodible. Wet areas, based on vegetation type, were noted in the field visit.

California Bearing Ratio (CBR) values used in pavement design generally range from 2-5 for soils subgrades in the area. Chemical modification of subgrade or the use of rock roadbed is often used in the area. Wet areas could require undercutting and/or rock stabilization for embankment construction. It's very likely that subgrades under any removed pavements will be wet and could require remediation.

Foundations for bridges in this area would typically be founded on shallow foundations (spread footings on bedrock) or deep foundations (steel H-piles driven to bedrock or drilled shafts socketed into bedrock). Culverts and walls are typically supported on shallow (either yielding or non-yielding) foundations on soil or bedrock. Where acid producing shales are encountered, special design and construction considerations will be required for structures. This can include restrictions on backfill and the use of special concretes.

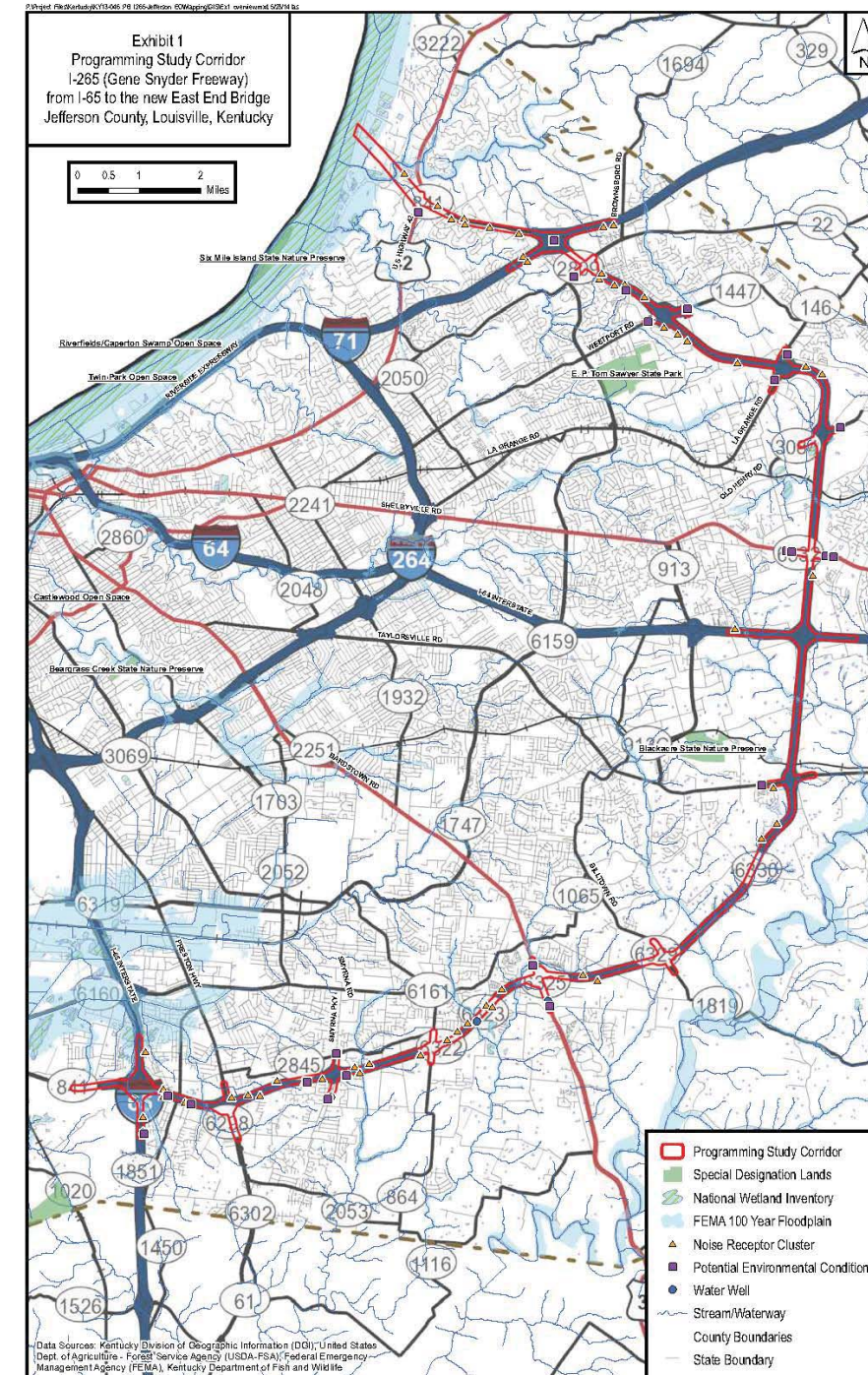
Previously completed Geotechnical Investigations within the vicinity of the study area are located in the appendix. The reports are located on the KYTC Geotechnical Branch Database which can be accessed through the KYTC Division of Structural Designs home page (Click on Geotech and Search KYTC Completed Projects).

Site specific Geotechnical investigations are critical in this region for design. Proper cut slope design and embankment construction control are crucial for project success.

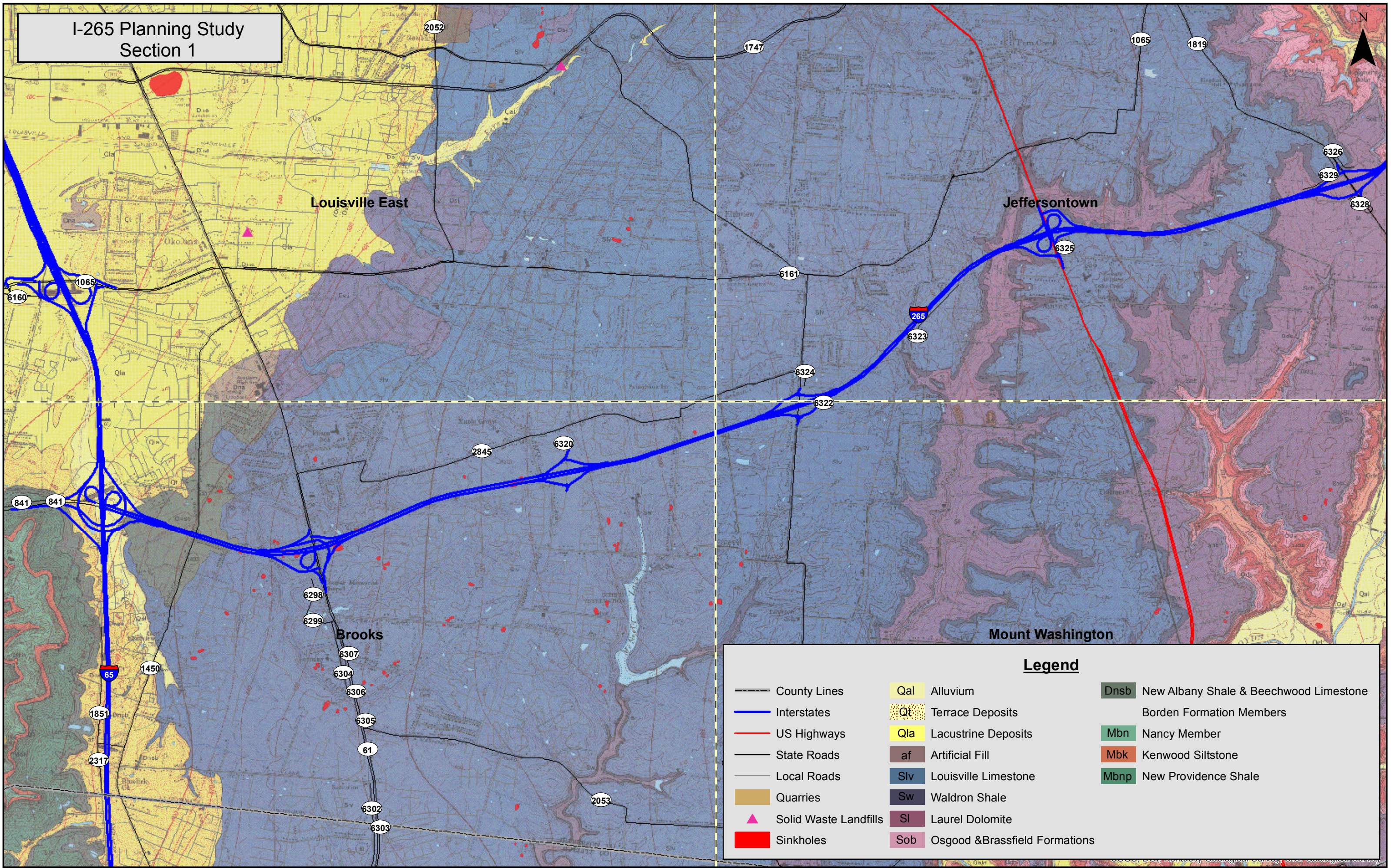
Please feel free to contact this office for additional information.

- Attachments:**
Proposed corridor map
GQ Site Maps
List of previous projects

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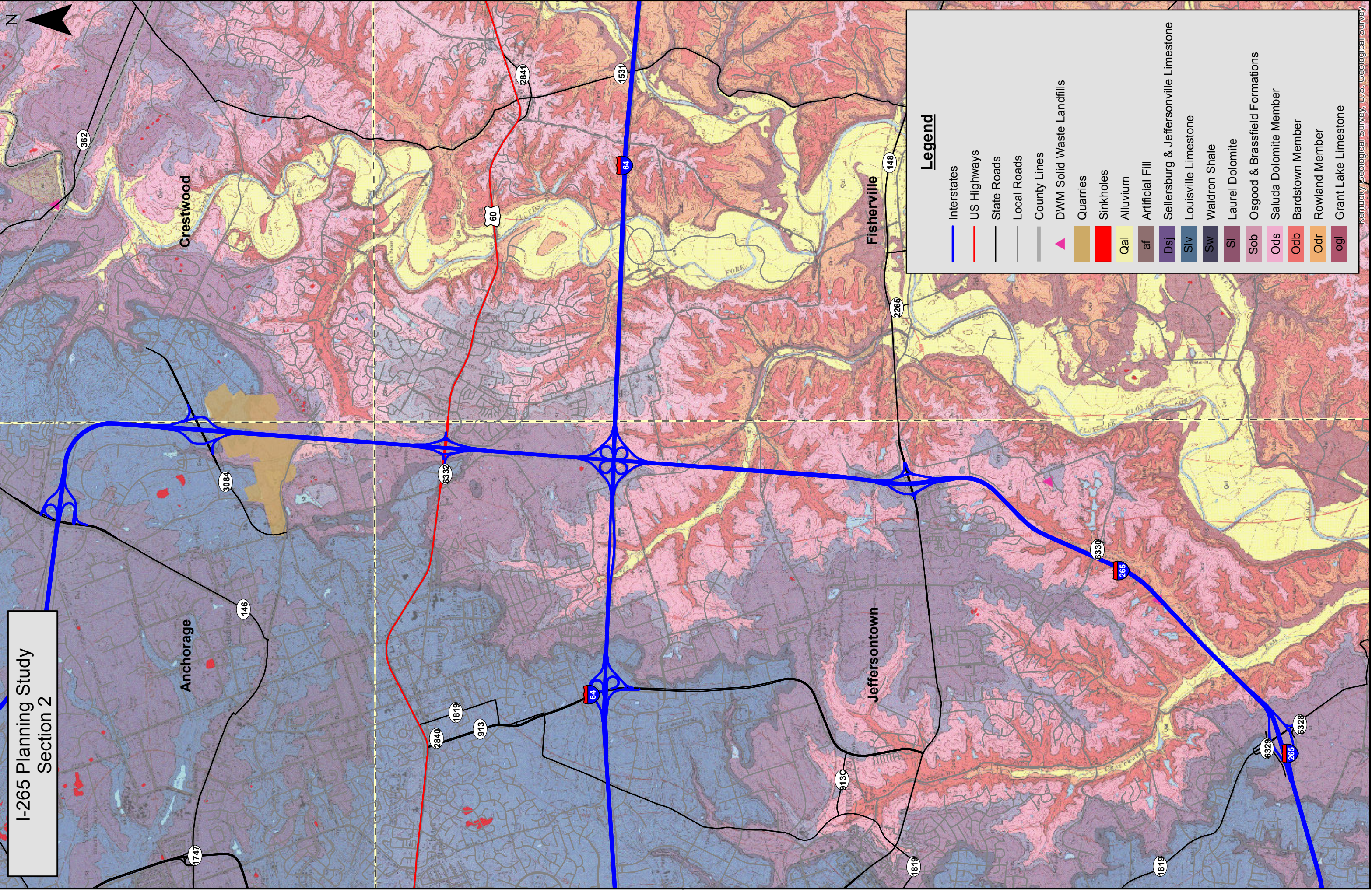
I-265 Planning Study
Section 1



Legend		
	County Lines	
	Interstates	
	US Highways	
	State Roads	
	Local Roads	
	Quarries	
	Solid Waste Landfills	
	Sinkholes	
	Qal Alluvium	
	Qt Terrace Deposits	
	Qla Lacustrine Deposits	
	af Artificial Fill	
	Slv Louisville Limestone	
	Sw Waldron Shale	
	Sl Laurel Dolomite	
	Sob Osgood & Brassfield Formations	
	Dnsb New Albany Shale & Beechwood Limestone	
	Borden Formation Members	
	Mbn Nancy Member	
	Mbk Kenwood Siltstone	
	Mbnp New Providence Shale	

0 3,000 6,000 12,000 Feet

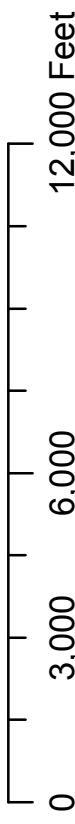
I-265 Planning Study
Section 2



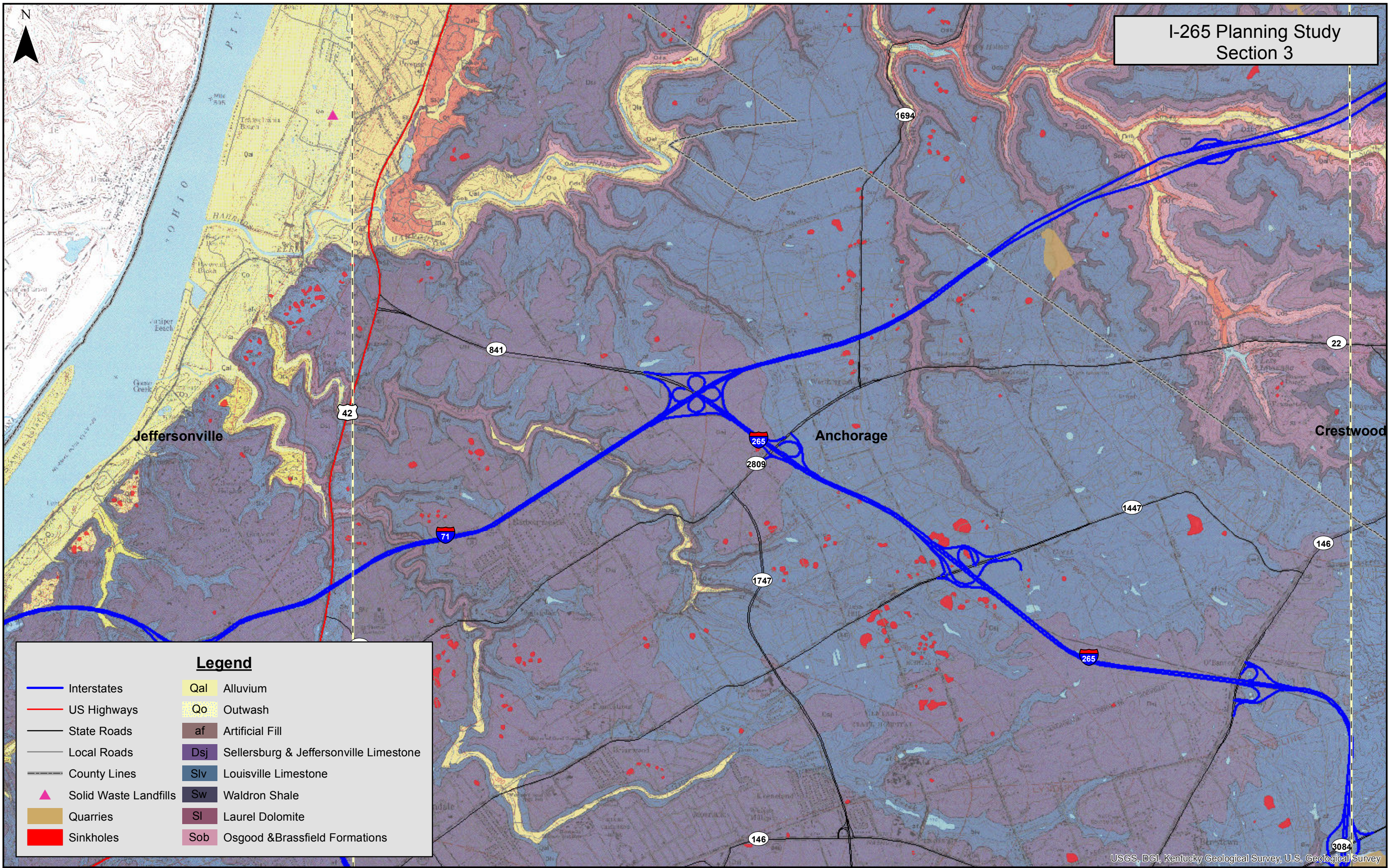
Legend

- Interstates
- US Highways
- State Roads
- Local Roads
- County Lines
- DWM Solid Waste Landfills
- Quarries
- Sinkholes
- Alluvium
- Artificial Fill
- Sellersburg & Jeffersonville Limestone
- Louisville Limestone
- Waldron Shale
- Laurel Dolomite
- Osgood & Brassfield Formations
- Saluda Dolomite Member
- Bardstown Member
- Rowland Member
- Grant Lake Limestone

▲	Quarries	af
■	Sinkholes	Dsj
■	Qal	Slv
■	Artificial Fill	Sw
■	Sellersburg & Jeffersonville Limestone	Sl
■	Louisville Limestone	Sob
■	Waldron Shale	Ods
■	Laurel Dolomite	Odb
■	Osgood & Brassfield Formations	Odr
■	Saluda Dolomite Member	ogl
■	Bardstown Member	
■	Rowland Member	
■	Grant Lake Limestone	



I-265 Planning Study
Section 3



Legend

- | | |
|-----------------------|--|
| Interstates | Qal Alluvium |
| US Highways | Qo Outwash |
| State Roads | af Artificial Fill |
| Local Roads | Dsj Sellersburg & Jeffersonville Limestone |
| County Lines | Slv Louisville Limestone |
| Solid Waste Landfills | Sw Waldron Shale |
| Quarries | Sl Laurel Dolomite |
| Sinkholes | Sob Osgood & Brassfield Formations |

<u>Report No.</u>	<u>Route</u>	<u>Structure Over</u>	<u>Project Type</u>	<u>Description</u>
S-055-2008	I-265	Ohio River	State Bridge	Phase 1 of the Ohio River Bridges Project; Section 5 - I-265 over the Ohio River Sta 187+40 to 212+50
S-128-2011	I-265		State Bridge	East end approach tying to river bridge KY 841 Station 167+81.96 and ending at KY 841 Station 187+50.96
S-083-2012	KY-841	Harrods Creek	State Bridge	LOUISVILLE BRIDGES SECTION FOUR - EAST END BRIDGE APPROACH DESIGN Bridge over Harrods Creek, Approx. Sta. 143+42.75, Dual 5-span bridges
R-029-2008	I-265		Roadway	LOUISVILLE BRIDGES PROJECT; EAST END BRIDGE COMPONENT. (98KYD) Section 4 Sta 11+33 to 186+50
S-082-2012	KY-841		State Bridge	LOUISVILLE BRIDGES SECTION FOUR - EAST END BRIDGE APPROACH DESIGN. KY 841, Ramp A Flyover Bridge, KY 841 Sta. 100+83.66
S-049-2009	I-265		State Bridge	Ohio River Bridges Project New Wolf Pen Bridge Rd and Temporary Diversion Bridge
R-024-2012	US-42		Roadway	US 42 Add fifth lane for left turns from Harrods Creek Bridge to River Road
R-014-2009	I-265		Roadway	Ohio River Bridges Project Wolf Pen Branch Roadway Report
S-129-2011	I-265		Tunnel	South Bound Tunnel LOUISVILLE BRIDGES SECTION FOUR - EAST END BRIDGE APPROACH DESIGN
S-130-2011	I-265		Tunnel	Pillar Section for Tunnel LOUISVILLE BRIDGES SECTION FOUR - EAST END BRIDGE APPROACH DESIGN
S-131-2011	I-265		Tunnel	Vertical borings for Tunnel LOUISVILLE BRIDGES SECTION FOUR - EAST END BRIDGE APPROACH DESIGN
R-005-1981	I-265		Roadway	Section 9: Sta 1120+00 to Sta 1275+00
R-010-1971	I-265		Roadway	Old Henry Rd over Jefferson Freeway - Bridge Foundation Investigation
S-062-1996	KY-3084	I-265	State Bridge	Old Henry Road over I-265
S-031-1996	I-265	Quarry Lake	State Bridge	Bridge @ Sta. 5+266.070 @ I-265 (Gene Snyder Freeway to Old Henry Rd.) Ramps 5 & 5A
R-009-1971	I-265		Roadway	Jefferson Freeway over Aiken Rd -- Bridge Foundation Investigation
S-076-1979	I-265		Culvert	Culvert @ Sta 1168+90 on KY 841
S-064-1981	I-265	US-60	Ste	Jefferson Freeway (NBL & SBL) @ Station 1122+15.98
R-010-2010	I-265		Roadway	SNYDER FREEWAY RECONSTRUCT I-265/US-60 INTERCHANGE TO ENHANCE CAPACITY AND SAFETY
R-015-2008	I-265		Roadway	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
S-007-2009	I-265		Wall	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF -LOUISVILLE
S-009-2009	I-265		Wall	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
S-032-2008	I-265	I-64	State Bridge	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
S-035-2008	I-265		Culvert	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
S-036-2008	I-265		Culvert	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
S-056-2008	I-265		State Bridge	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
S-105-2008	I-265		Wall	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
S-106-2008	I-265		Wall	SNYDER FREEWAY RECONSTRUCT 2 RAMPS AT I-265/I-64 INTERCHANGE EAST OF LOUISVILLE
R-014-1971	I-265		Roadway	Jefferson Freeway - From Sta 924+00 to Sta 1920+00 Beulah Church Rd to KY 155
R-016-1971	I-265		Roadway	Jefferson Freeway Section 5 - From Sta 924+00 to Sta 1695+00 (Sta Eq 978+05 Bk = 1562+81 Ah) Beulah Church Rd to KY 155
R-015-1971	I-265		Roadway	Jefferson Freeway - From Sta 480+00 to Sta 924+00 National Turnpike to Beulah Church Road
S-045-1978	CR-1008	I-265	Bridge	Bridge is located at Milepoint 21.5 on I-265
S-035-1979	I-265	Chenoweth Run	State Bridge	Three Span at Jefferson Freeway N.B.
S-046-1978	KY-1819	I-265	State Bridge	Bridge is located over I-265 at Milepoint 19.4
S-017-1978	I-265		Culvert	RCBC @ Station 1884+40 on Jefferson Freeway
S-050-1976	CR-1007	I-265	State Bridge	Bridge on CR 1007H (Seatonville Rd) over I-265 at I-265 MP 18.500
R-009-1972	US-31E		Roadway	Interchange with I-265, From Station 365+00 to Station 460+00
R-023-2008	US-31E		Roadway	IMPROVE I-265/US-31E (BARDSTOWN RD) INTERCHANGE AS RECOMMENDED BY KIPDA'S INTERCHANGE STUDY. North Side and Retaining Wall @ STA 405+61.58 to 413+34.29
R-028-2008	I-265		Roadway	IMPROVE I-265/US-31E (BARDSTOWN RD) INTERCHANGE AS RECOMMENDED BY KIPDA'S INTERCHANGE STUDY. South Side and Retaining Wall @ STA 423+03.83 to 423+92.77
R-034-2011	US-31E		Roadway	US 31E (Bardstown Road) at I-265 Interchange Improvements
S-052-2008	US-31E		Wall	IMPROVE I-265/US-31E (BARDSTOWN RD) INTERCHANGE AS RECOMMENDED BY KIPDA'S INTERCHANGE STUDY. North Side and Retaining Wall @ STA 405+61.58 to 413+34.29
S-068-2008	I-265		Wall	IMPROVE I-265/US-31E (BARDSTOWN RD)
S-069-2008	I-265		Wall	IMPROVE I-265/US-31E (BARDSTOWN RD)
S-048-1978	I-265	US-31E	State Bridge	Bridge is located at Milepoint 4.9 of US-31E at the I-265/US-31E interchange
S-055-1976	I-265		Culvert	Three RC Culverts on Jefferson Freeway (I-265/KY841
S-049-1976	CR-1018	I-265	State Bridge	Bridge on CR 1018H (Johnson School Rd) over I-265 at I-265 MP 16.134
S-042-1976	KY-864	I-265	State Bridge	Bridge over Gene Snyder (Jefferson) Freeway (I-265)
S-048-1976	I-265	KY-864	State Bridge	Bridge on I-265 (Jefferson Freeway) over Beulah Church Rd (KY 864) at MP 15.172
S-052-1976	CR-1007	I-265	State Bridge	Bridge on CR 1007M (Pennsylvania Run Rd) over I-265 at I-265 MP 14.327
S-017-1984	CR-1007	I-265	State Bridge	This report contains two bridges; Pennsylvania Run (CR-1007M) over Gene Snyder (I-265) and second at Gene Snyder over Beulah Church Road (KY-1065)

S-004-2012	I-265		Wall	Sound barrier along the south side of I-265, beginning at Smyrna Pkwy (2100 ft)
S-062-2013	I-265		Wall	DESIGN AND CONSTRUCT A SOUND BARRIER WALL ALONG I-265 SOUTHSIDE FROM APPROX. 500 FEET WEST OF CINDERELLA LANE TO SMYRNA PARKWAY FOR APPRX. 4100 FE
S-046-1976	I-265	Cinderella Lane	State Bridge	Bridge on Jefferson Freeway (I-265) over Cinderella Lane at MP 12.808
R-010-1975	KY-61		Roadway	Interchange with I-265, From Station 260+00 to Station 263+00
R-029-2011	I-265		Roadway	IMPROVE I-265/KY-61 (PRESTON HWY) INTERCHANGE
S-063-2011	I-265		Culvert	IMPROVE I-265/KY-61 (PRESTON HWY) INTERCHANGE
S-035-1974	KY-61	I-265	State Bridge	Preston St Interchange over the Jefferson Freeway
S-036-1974	KY-61	Jefferson Freeway (I-265) & Preston St	State Bridge	Ramp 2 of the I-265 & Preston St Interchange over I-265 and Preston St
S-002-1978	I-265		Culvert	6 Culverts on Jefferson Freeway
S-029-1973	I-265	Blue Lick Road	State Bridge	Twin Bridges over I-265 over Blue Lick Road at MP 10.898
S-045-1975	I-265	Freedom Way	State Bridge	Bridge on I-265 (Jefferson Freeway) over Freedom Way at MP 10.749
S-042-1979	I-265	Ramp 4	State Bridge	Jefferson Freeway over Ramp 4
S-008-1975	I-265	I-65	State Bridge	Structures for Interchange of I-265& I-65, including KY 841, Ramp '6', and South Park Rd
S-043-1979	I-265	I-65	State Bridge	Jefferson Freeway, Ramp 4 over I-65
R-017-1975	I-65		Roadway	I-65 and I-265 Interchange