Appendix E:

GEOTECHNICAL OVERVIEW

P-001-2014

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M E M O R A N D U M

TO: John Moore, P.E.
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DATE: March 21, 2014

SUBJECT: **Boyle County**
Danville Small Urban Area Study
Mars # 8807407P
12FO C35 D625 07 FH02 0410 C011 E143
Preliminary Geotechnical Assessment

The Division of Planning is conducting a Small Urban Area study for future improvements in Danville, KY. This project is located in Boyle County, KY. There are numerous locations of potential improvements located in the subject area as shown on the supplied project map. Of special note for this portion of the study is the potential widening of KY 34 from the US 127 Bypass to US 150. This abbreviated review will discuss some general geotechnical concerns with the study area.

The approximate coordinates for Danville is:
- 37.645555 degrees North and -84.769722 degrees West.

Previous Geotechnical reports completed in or near this study area are listed in a table in the attachments to this report. These reports can be accessed in the KYTC Geotechnical Branch data base. A review of these reports was made and findings were incorporated into this document.

The site is located in the Danville, Bryantsville, Stanford and Junction City Geologic Quadrangles. The area of interest is located in the Outer Bluegrass Physiographic Region near the interface with the Knobs region. Most of the study area is generally characterized by fairly gentle ground slopes with a range in elevation generally less than 100 feet in broad areas.

There are numerous bedrock formations in this area as depicted on the attached map. The Lexington Limestone Formation with its numerous members (designated Ol on the map) is the predominant formation in this area. The Lexington Limestone formation is generally gray, hard, fine to coarse grained, fossiliferous limestone with some shale partings. The members of the Lexington Limestone Formation are susceptible to developing karst related issues. Numerous mapped sinkholes are present in the study area. Also of note is the Clays Ferry Formation, which is located in the southern portion of the study area. The Clays Ferry Formation is primarily interbedded limestone and shale. The limestone, which is generally 25-50 percent of the unit, is generally medium gray, thin bedded and occasionally fossiliferous. The shale is medium gray and can be very susceptible to weathering. Rock cut slopes in the area require site specific design. Cut slopes can generally range from ½:1 to 2:1 depending on the rock and site conditions.

The study area has numerous mapped faults which are not known to be active. The Lexington

fault system extends into the eastern edge of the study area. Bedrock contours in the area are relatively flat for the majority of the study region. Bedrock dip is measured from 3-5 degrees to the south in the southern portion of the study area and this correlates to the presence of more faulting. Special consideration must be given where bedrock cuts encounter faulted zones.

Mapped soils indicate the presence of alluvium. Artificial fill is mapped in some areas and should be anticipated due to the amount of development in the area. The limestone members weather to moderately and highly plastic clay soils. Generally, overburden in this region is relatively thin. Most borings available in the study area indicate soil depths of less than 20 feet.

Soils in the area are generally suitable for embankment construction. Generally, embankments built from the native soils can be constructed to a height of 30 feet or more with 2H:1V slopes if the foundation is suitable and proper compaction methods are used. 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. Shales can be problematic for construction and may require special methods for placement.

California Bearing Ratio (CBR) values used in pavement design generally range from 2-5 for soils subgrades in the area. The use of rock roadbed is a common practice in the area. Chemical modification of subgrade is sometimes used in the area, however past projects have indicated large cobbles and boulders in the soils which would make chemical modification problematic. Wet areas could require undercutting and/or rock stabilization for embankment construction. It is likely that subgrade under existing pavements could be very wet and might require some type of stabilization if pavements are removed.

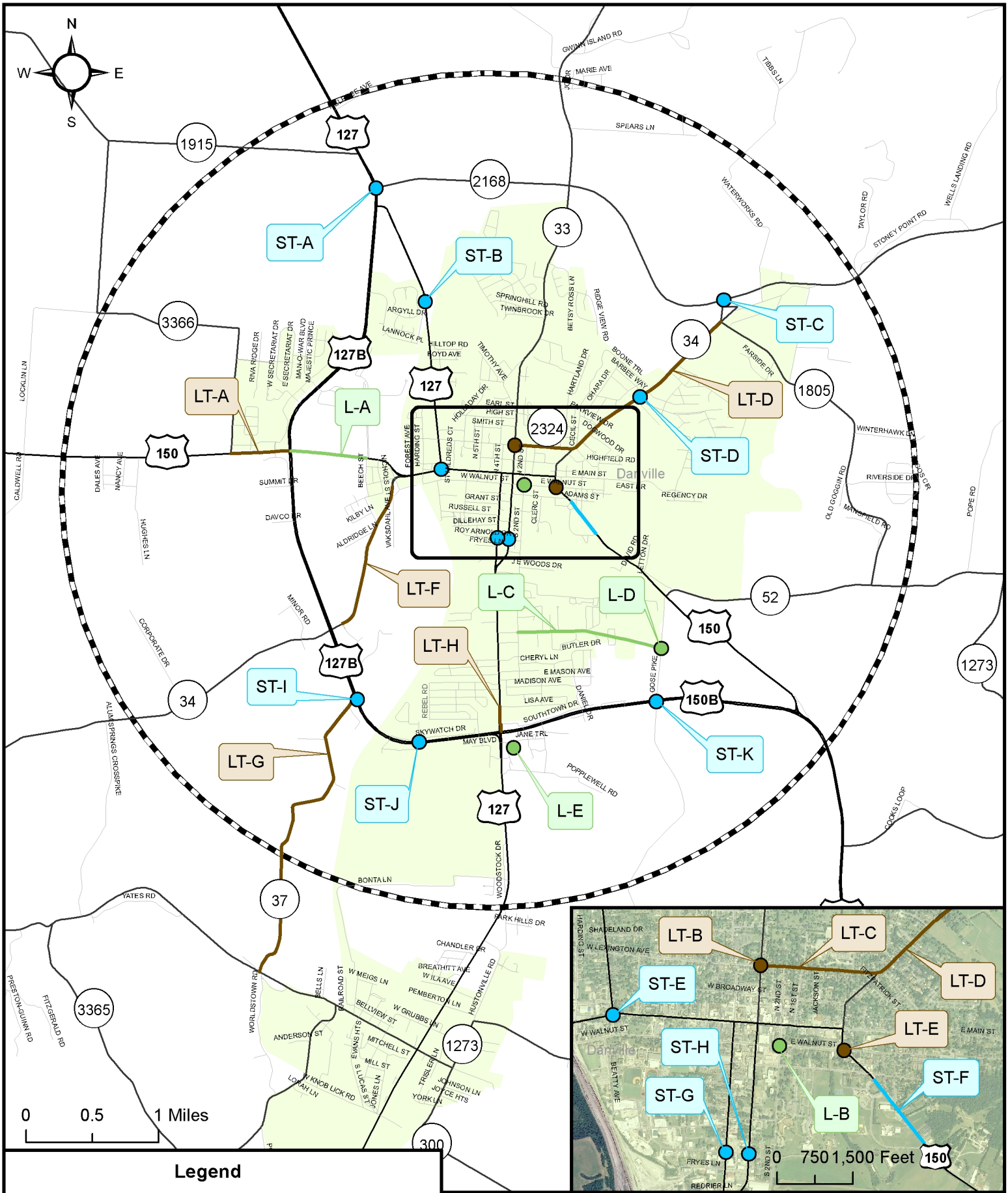
A site review was made for the potential KY 34 widening from the US 127 Bypass to US 150 (LT-F). Some wet and ponded areas (including some cattails in some ditches) were encountered, numerous potential Karst features were in the area and some gabion baskets were seen in the creek (indicating some bank erosion). Mapping indicates the presence of Karst in the area. No mapped faults are located in the direct area indicated for potential improvement.

A site review was also made for the proposed 10 foot multi-use path on the North side of US 150 (L-A). No geotechnical issues were visually observable.

Site specific Geotechnical investigations are critical in this region for design.

Please feel free to contact this office for additional information.

Attachments:
Sudy Area map
List of Improvement Projects
GQ Area Map
List of previous Geotechnical Studies in or near area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0 750 1,500 Feet
Legend
Local (L)
Long Term (LT)
Short Term (ST)
Danville
Local Road
KY and US Road
KENTUCKY TRANSPORTATION CABINET
PARSONS BRINCKERHOFF
Danville Small Urban Area Study
Project Map
02/17/2014

Location	Issues	Initial List of Improvements		Revised List of Improvement Projects	
		Project #	Improvement Project	Project #	Improvement Project
2nd St / E Walnut St	Incidents with roadside fixed objects	L-1	Clear Zone Improvements	L-B	Extend curb lines on all four corners
Gose Pike / Baughman Ave	High crash intersection (per Emergency Responders)	L-2	Intersection / Safety Improvement	L-D	Add NB left turn lane and restripe. Install W3-1 advance stop sign warning and upgrade double arrow to oversize sign (60x30)
Baughman Ave (Gose Pike to US 127)	Lack of pedestrian amenities	L-3	Safety Improvement	L-C	Add sidewalk along north side of Baughman Ave within the residential portion of the corridor
Walton Ave / Walton Crossing / Jane Trail	Pedestrian amenities needed	L-4	Safety Improvement	L-E	Crosswalk and sidewalk connectivity provided throughout shopping area
Walton Ave / Jane Trail	Pedestrian amenities needed	L-5	Safety Improvement	Combined with L-4 (L-E)	
Study Area	Lighting across the city	n/a	Policy / Procedural	L-F	New lighting FAQ and procedure to gain KYTC approval for install
KY 34 / KY 2168	Education and signage for trucks and visitors	ST-1	Signage	ST-C	Provide adequate signage to detour through, recreational and truck traffic away from downtown
KY 34 / Seminole Trail	Congestion and lack of pedestrians amenities	ST-2	Safety Improvement / Capacity Enhancement	ST-D	Re-align Barbee Way and re-stripe on KY 34 for defined turn lanes. Crosswalks are provided along KY 34
KY 2168 / US 127	Increased traffic volumes results in fewer safe opportunities to makes left turns. Additionally location of a fatal crash	ST-3	Signal Warrant Analysis	ST-A	Conduct a signal warrant analysis to evaluate the need for a traffic signal
US 127 / Argyll Dr	Subdivision access on high speed road with limited sight distance and flooding issues	ST-4	Intersection Improvement	ST-B	Upgrade drainage and provide cleared ditch line for improved sight distance
US 127 (Main St) / Maple Ave	Proximity to downtown, college and mixed traffic with out of town visitors is creating operational issues	ST-5	Intersection Improvement	ST-E	Re-stripe / further delineate westbound approach; add grass median on either side of mid-block crossing on Maple Ave.
KY 34 (KY 2324 to E Main St)	Paint has faded resulting in driver confusion	ST-6	Corridor Improvement	Combined with LT-1 (LT-D)	
KY 52 (US 150) / Admiral Stadium	Special event generator with left turns into the complex that shut down northbound flow on KY 52. Also issues with flooding	ST-7	Lane Markings and Drainage Improvements	ST-F	Refresh lane markings and provide 12 foot ditch on west side of roadway
US 150B / Gose Pike	Issue regarding the frequency of traffic being stopped for Gose Pike traffic	ST-8	Signal Timing	ST-K	Signal operation and timing to coordinate with the Daniel Drive traffic signal
US 127 (S 3rd St) / Fackler St	Two way stop controlled intersection. ROW issues resulting in poor sight distance which is reportedly causing crashes at intersection	ST-9	Re-paving / Lane Markings	ST-H	Re-paving scheduled by KYTC includes removing parking and adding a bicycle lane. Provide stop bars on the pavement of the side streets
US 127 (S 4th St) / Fackler St	Two way stop controlled intersection which is reportedly experiencing many crashes at the intersection	ST-10	Re-paving / Lane Markings	ST-G	Re-paving scheduled by KYTC includes removing parking and adding a bicycle lane. Provide stop bars on the pavement of the side streets
US 127 / Southtown Dr	Congested and high crash section before bypass intersection	ST-11	Access Management Treatments	Combined with LT-5 (LT-H)	
US 127B / Smoky Way	Full access driveway at a two-way stop controlled intersection along a high speed corridor	ST-12	Signal Warrant Analysis / Access Management Treatments	ST-J	Eliminate full access and implement right-in and right-out access for shopping center and restaurants at Fireside Dr. Conduct signal warrant analysis for Smoky Way intersection
US 127B / KY 37	Signalized intersection close to railroad crossing with sight line confusion	ST-13	Intersection Improvement	ST-I	Review / revise traffic signal timing, phasing and signage
US 150 (US 127B to Cunningham Dr)	Multi-use path needed to connect schools to park	ST-14	Safety Improvements	L-A	10 foot multi-use path on north side of US 150
US 150 / KY 3366	High crash area with many rear-end crashes	ST-15	Intersection Improvement	Combined with LT-9 (LT-A)	
US 150 / E Walnut St	Greatly skewed intersection, in which the north and south bound lanes are aligned into an adjacent business at the traffic signal	ST-16	Intersection Reconfiguration	LT-E	Re-align intersection with a roundabout
KY 37 (KY 300 to US 127B)	High crash rate factor on narrow and curvy rural road with truck traffic.	ST-17	Corridor Safety Improvement	LT-G	High friction pavement applications, re-align sharp curve, and add pavement / shoulders near US 127B
KY 34 (KY 2324 to KY 1805)	Multiple access points and lack of sidewalks create high number of conflict points and unsafe connectivity for pedestrians	LT-1	Corridor Improvement	LT-D	Access management treatments where feasible with a median and limiting turns in the less residential portions closer to KY 2168. Re-align intersection with KY 2324 and provide clear route signage for wayfinding. Improve sidewalks to current standards and provide connectivity through corridor where applicable
KY 2324 / KY 34	Intersection with geometric constraints surrounded by historic district	LT-2	Safety and Capacity Improvement	Combined with LT-1 (LT-D)	
KY 2324 / KY 33	Intersection with geometric constraints surrounded by historic district	LT-3	Intersection Reconstruction	LT-B	Re-stripe (11 foot lanes) providing designated left turn lane or right turn lanes. Consider purchasing small piece of ROW from adjacent property owners for a right turn pocket.
KY 2324 (KY 33 to KY 34)	Historic area with much congestion	LT-4	Capacity Improvement	LT-C	Narrowing the lane widths and providing a center two-way left-turn lane or providing additional clear zone area

US 127 (Lisa Ave to US 127B)	Highly congested area with multiple access points. Pedestrian connectivity is limited and in some places there are no facilities	LT-5	Corridor Improvement	LT-H	SB right turn lane from US 127 to US 127B and increase channelized section of the EB right turn lane onto US 127. Access management treatments by limiting full access and installing curb delineators.
US 127 / US 127B	Additional turn lanes and congestion	LT-6	Turn Lanes	Combined with LT-5 (LT-H)	
US 150 / US 127B	High crash area and lack of sidewalks	LT-7	Signal Timing	Combined with LT-9 (LT-A)	
Study Area	No current maps / materials available for routes	LT-8	Planning Study / Wayfinding Maps	L-G	Bicycle Master Plan; map / brochure development
US 150 (KY 3366 to US 127B)	High speed section of US 150 also has a high crash rate factor	LT-9	Corridor Improvement	LT-A	1) Narrowing lane widths and constructing a median. 2) Additional striping for turn lanes at the US 127 B intersection and providing a designated left turn pocket from US 150 onto KY 3366. 3) Perform a signal warrant analysis for the US 150 / KY 3366 intersection
US 127B / US 150B Corridor	Many full access driveways are spread out along the southern part of the Danville Bypass. Most of which are pointed to in stakeholder comments about being difficult to enter the highway through.	LT-10	Access Management / Operational Treatments	Removed from further study as there are individual projects that address problem areas along the corridor.	
KY 34 (US 127B to US 150)	KY 34 widening needed	LT-11	Road Widening	LT-F	Widen the existing KY 34 corridor
Study Area	Additional rail crossing for improved operations	LT-12	Planning Study	LT-I	Study additional feasible rail crossing locations in the City of Danville

N

Danville

Bryantsville

Junction City

Stanford

127
1915
33
2168
3366
127E
150
2324
34
1805
52
150B
37
300
1273

Legend

- US Highways
- State Roads
- Local Roads
- Geologic Faults
- Sinkholes

Qal	Alluvium
Qt	Terrace deposits
Occ	Calloway Creek Limestone
Ocf	Clays Ferry Formation
Og	Garrard Siltstone
Oa	Ashlock Formation
Ol	Lexington Limestone
Ols	Sulphur Well Member
Olb	Brannon Member
Olp	Perryville Limestone
Olt	Tanglewood Limestone
Olgc	Grier and Curdsville Limestone

0 2,250 4,500 9,000 Feet

Geotechnical Reports in or Near Study Area

Report No.	Route	Structure Over		Description
L-002-2006	US-150B		Landslide	Construction Failure on Danville Bypass
S-030-1994	KY-1915		Roadway	From Station 306+00 to 410+66.91
S-081-1980	CR-1102		Roadway	From Station 94+00 to Station 266+50
R-049-1989	US-127B		Roadway	Fourth St Sta's 51+40-134+00; Third St Sta's 114+00.67-154+00; Second St Sta's 0+00-5+0(
S-028-1991	US-127		Roadway	From Sta. 0+00 to 76+50
S-026-1991	US-127		Roadway	Extend New Connector KY 33 to KY 34 NE of Danville
S-030-1991	KY-33		Roadway	Danville Bypass: From Stas 23+00 to 300+00
S-052-1988	CS-1366		Structure	Hustonville - Danville Rd., Culvert @ Sta. 611+05
R-024-1982	US-127		Structure	Hustonville - Danville Rd., Culvert @ Sta. 614+20
S-027-1991	US-127		Structure	Hustonville - Danville Rd., Culvert @ Sta. 622+90
R-047-2008	KY-2168		Structure	Danville - Burgin Rd., Culvert @ Sta. 20+40
S-102-1990	KY-2168	Mocks Branch	Structure	Gentry Lane over Mocks Branch @ Sta. 13+86
R-028-1990	KY-2168		Structure	Culvert at Station 14+97.5
R-011-2002	US-150B	Clark's Run	Structure	Bridge @ Sta. 11+25
S-053-1985	CR-1016		Structure	1.93 km N US 150
R-022-1986	US-127	Spears Creek	Structure	Bridge is located approximately 0.8 miles North of Danville
S-124-2002	US-150B	Clarks Run	Structure	Bridge is located 0.5 miles south of the junction of CR-1102 and KY-34
S-079-1995	KY-33	CNO & TP Railroad	Structure	KY 2168 (US 127 & KY 33 Connector) Bridge over CNO & TP Railroad
S-069-1998	KY-33		Structure	RCBC Extension @ station 369+99; 1/8 mile NE of Gose Pike