ACCESS MANAGEMENT PLAN

U.S. 31W
HARDIN COUNTY
U.S. 31W BYPASS TO N. WILSON ROAD OVERPASS
ITEM NO. 4-154

FOR KENTUCKY TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS

SEPTEMBER 2011

KENTUCKY TRANSPORTATION CABINET

EA Partners, PLC
CIVIL ENGINEERS • LAND SURVEYORS • LANDSCAPE ARCHITECTS

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INTRODUCTION

This Report examines the existing U.S. 31W corridor from the U.S. 31W bypass, north of Elizabethtown, to North Wilson Road Overpass in Radcliff in order to develop a route Access Management Plan.

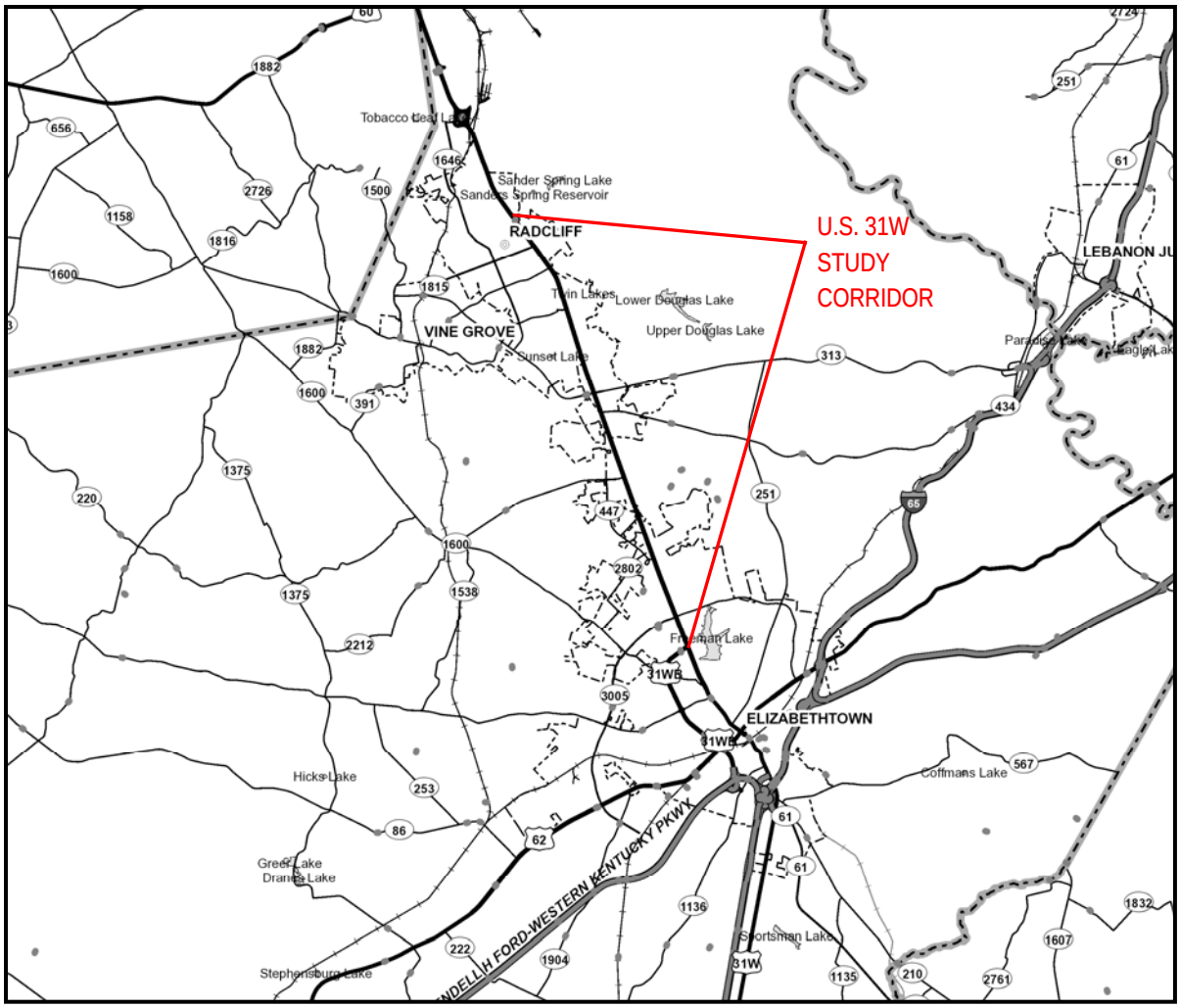


Figure 1: Project Overview

Existing access densities, signal locations, existing crossover locations and public consultation have been used in developing a proposed access management strategy to best meet local conditions and the needs of businesses and residents while maintaining the functionality of this important arterial facility for current and future traffic.

The improvement of the functionality of this corridor to both serve commuting and travelling traffic together with serving the businesses and residences along this route is of high local and strategic importance.

A Memorandum of Agreement has been entered into between the authorities that have influence on the route and its surrounding roads and developments that lie with state and local jurisdictions. Signatories to this memorandum of understanding include Kentucky Transportation Cabinet, Hardin County, the City of Elizabethtown, the City of Radcliff and the Radcliff/Elizabethtown Metropolitan Planning Organization.

EXISTING FACILITY

The existing facility can be categorized into distinct groups based on different criteria. The following tables illustrate the number of access points and named roads off U.S. 31W, for differing characteristics of U.S. 31W in the study area.

Table 1: Categorization by No of Lanes

Typical section ref.	Start Milepoint	End Milepoint	Start and End Description	No. of NB Lanes	NB Turn Lanes	Median	SB Turn Lanes	No. of SB Lanes	Comments
Typ1	18.4	19.2	U.S. 31W Bypass to north of Blue Heron Way and Gray Street	2	1		1	3	NB: 10 access points - 1 side road SB : 11 access points - 1 side road
Typ2	19.2	20.1	North of Blue Heron Way and Gray Street to N. View Av & Routt Drive	3	1	1	1	3	NB: 18 access points- 5 side road SB : 18 access points - 4 side road
Typ3	20.1	20.4	N. View Av & Routt Drive to Veterans Way	2	1	1	1	3	NB: 10 access points- 1 side road SB : 2 access points - 1 side road
Typ4	20.4	27.9	Veterans Way to E. Spring Street	2				2	NB: 127 access points- 25 side road SB : 129 access points - 18 side road
Typ5	27.9	28.4	E. Spring Street to North Wilson Road	2	1		1	2	NB: 20 access points- 4 side road SB : 14 access points - 1 side road

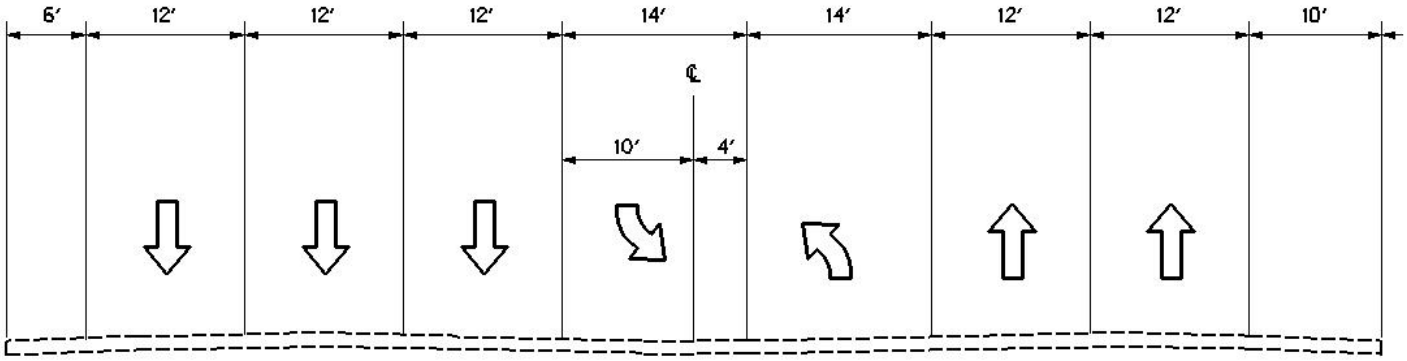
EXISTING ACCESS CONTROL

EXISTING TYPICAL SECTIONS

The existing facility has a number of typical sections from milepoint 18.4 to milepoint 28.4. The following are illustrations of the general typical sections that are present and refer to the 'Typical Section Ref.' Column in Table 1

Typical Section Reference 1—between milepoints 18.4 to 19.2

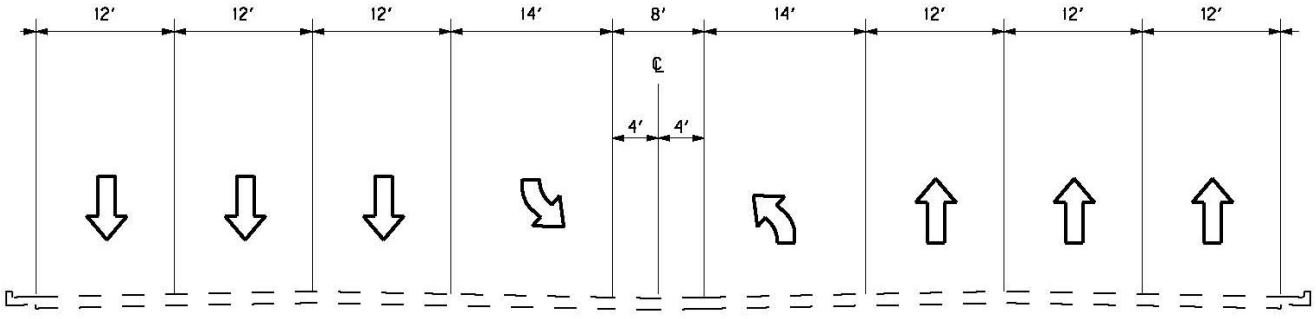
This typical section is present between the U.S. 31W Bypass intersection and the side roads Blue Heron Way/Gray Street.



Development along this segment consists of light commercial with frontage access to U.S. 31W.

Typical Section Reference 2—between milepoints 19.2 to 20.1

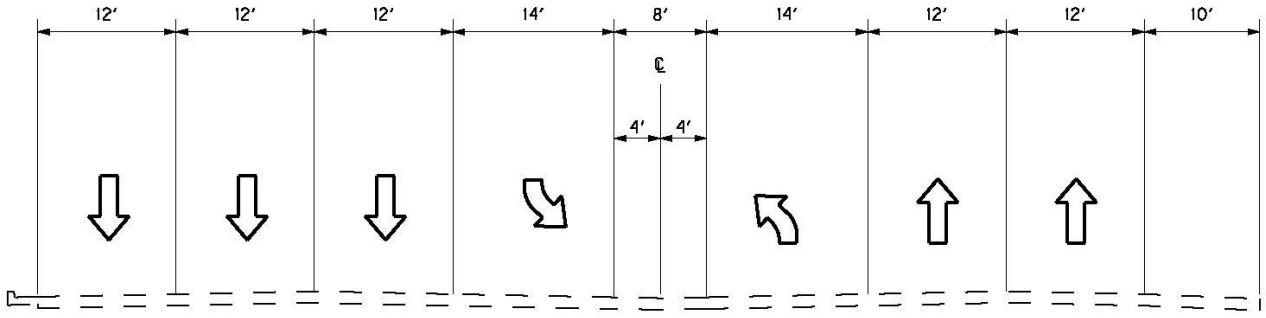
This typical section is present between the side roads Blue Heron Way/Gray Street and N. View Ave./Routt Drive. Additional left and right turn lanes are present on Northbound U.S. 31W at the intersection with Ring Road (KY 3005).



Development along this segment consists of light commercial with frontage onto U.S. 31W; dense retail (Towne Mall, Lowes, Wal-Mart, Starlite Center, Kroger, and K-Mart) served by access roads from U.S. 31W with large parking provision; and restaurants served mainly from distributors within the heavy retail developments.

Typical Section Reference 3—between milepoints 20.1 to 20.4

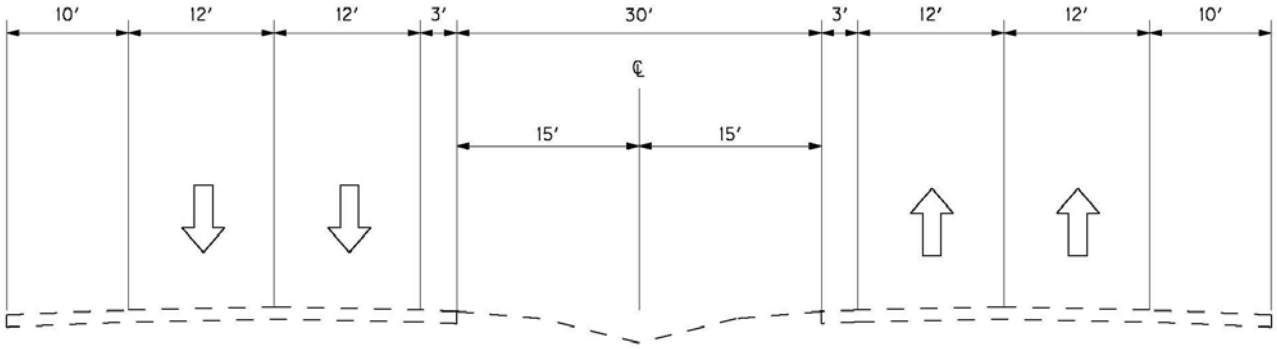
This typical section is present between the side roads N. View Ave/Routt Drive to Veterans Way and transitions from the flush median with turn lanes to a divided typical section with median crossings.



Development along this segment consists of light commercial with frontage onto U.S. 31W; retail on the west of U.S. 31W (Old Navy, Goody's, Michaels & Best Buy) served by access roads from U.S. 31W with parking provision; and restaurants served from distributors within the retail development.

Typical Section Reference 4—between milepoints 20.4 to 27.9

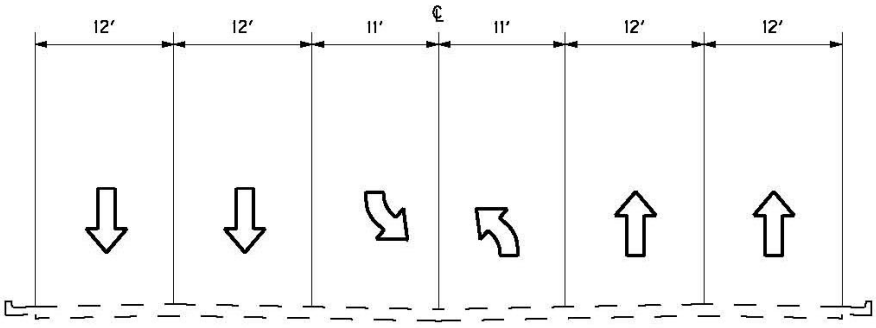
This typical section is present between Veterans Way and E. Spring Street.



Development along this segment consists of intermittent light commercial with some retail and restaurants with frontage onto U.S. 31W. This segment has residential locations with having access via local roads off U.S. 31W with a small number having direct access from U.S. 31W . Radcliff Middle School is located at milepoint 26.6.

Typical Section Reference 5—between milepoints 27.9 to 28.4

This section is present between E. Spring Street to North Wilson Road.



Development along this segment consists of light commercial and retail (Wal-Mart) with frontage access to U.S.31W.

POSTED SPEED LIMITS

The table below details the location of the existing posted speed limits.

start	end	Start and End Description	Speed Limit
18.4	20.9	US 31 Bypass to Chase Way	45 mph
20.9	26.0	Chase Way to Blackjack Road	55 mph
26.0	27.2	Blackjack Road to KY 144 W. Vine Street	50 mph
27.2	28.4	KY 144 W. Vine Street to North Wilson Road Overpass	45 mph

EXISTING SIGNAL CONTROLLED INTERSECTIONS

Milepoint Location	Start and End Description	NB Right Turn Lane	NB through Lanes	NB Left Turn Lanes	SB Left turn Lanes	SB Through Lanes	SB Right Turn Lane
18.4	US 31W Bypass	-	2	1	1	2	1
19.5	Ring Road W (KY 3005)	1	3	2	2	3	1
19.7	Towne Mall	1	3	1	2	3	1
19.8	Starlite Center	1	3	1	1	3	-
19.9	Towne Drive	-	3	1	1	3	1
20.2	Childers Court/Old Navy	-	2	2	1	3	-
20.4	Veterans Way		2	1	1	2	1
20.8	KY 447	-	2	1	1	2	-
21.1	Hutcherson Road/Pine Valley Place	1	2	1	1	2	-
21.6	W.A. Jenkins Road (KY 2802)/Teresa Road	-	2	1	-	2	1
22.6	KY 220	-	2	1	-	2	-
24.0	Medical Center Drive/KY 434 (Battle Training Road)	-	2	1	1	2	-
24.4	Joe Prather Highway (KY 313)	1	2	1	2	2	1
25.3	Centenial Avenue	-	2	-	1	2	-
26.0	Blackjack Road	-	2	1	1	2	-
27.2	KY 144 (W. Vine Street)	-	2	1	-	2	1
27.7	W. Lincoln Trail Blvd (KY 1815)	-	2	1	1	2	1
27.9	E. Spring Street	-	2	1	1	2	-
28.2	Elm Road/Walmart Way	1	2	1	1	2	-

PLANNED HIGHWAY PROJECTS

The attached Exhibit 1 shows the current BRAC designated highway projects in the vicinity of this study. Additional projects on the study corridor include:

- Hardin County Johnson Road and U.S. 31W — Item No. 4-154 (Complete)

The planned improvements of Elizabethtown to Radcliff connector and Bullion Boulevard connector will relieve some of the U.S. 31W traffic. A high residual traffic level is expected to remain on U.S. 31W Dixie Highway as it will remain the commercial center of Elizabethtown and Radcliff.

- No funding for 4-153 and 4-100 through construction.

ADVERSE INTERSECTION EFFECTS

The positioning of median crossing points can be detrimental to both intersection capacity as well as safety. The exhibit below shows locations either side of the KY 1815 intersection which compromise both capacity and safety.

Label A show where vehicles would be positioned to cross from the southbound left turn lane into either Subway or McDonald's. Southbound left turns must cross the adjacent storage lane of KY 1815. This has a detrimental affect on the overall capacity of this storage lane. The vehicles making this movement may also have to maneuver through stationary left turn traffic that would hinder their visibility of the two oncoming northbound through traffic lanes.

Label B above shows a median opening within the southbound deceleration lane. Vehicles are likely to position themselves relative to the edge of the median and thus be at a point that left turning vehicles would have to pass the stationary vehicle before moving into the left turn lane, thus reducing the left turn lane capacity.

The combination of curb and gutter with a raised median at the signalized intersection and directional median U-turn provisions will prevent these conflicts. Vehicles will use the median U-turn locations into the U.S. 31W traffic lanes and then enter businesses using a right turn.

ADVERSE MEDIAN CROSSING SPACING

Access by permit along this facility has enabled the construction of median crossings at specific business or resident locations. Most of the existing median crossings have no left turn tapers or storage provision. Vehicles making these turning movements have to decelerate in the fast lane of U.S. 31 W and hence encourage erratic driving behavior or sudden lane changes at locations that other drivers may not be anticipating. This decreases safety to drivers using the facility and adversely affects overall capacity.

The illustration above highlights this situation and shows a location where inadequate median spacing is present and shows where a lack of capacity at the median crossings increases the possibility of accidents. This location has two childcare businesses that the median openings serve.

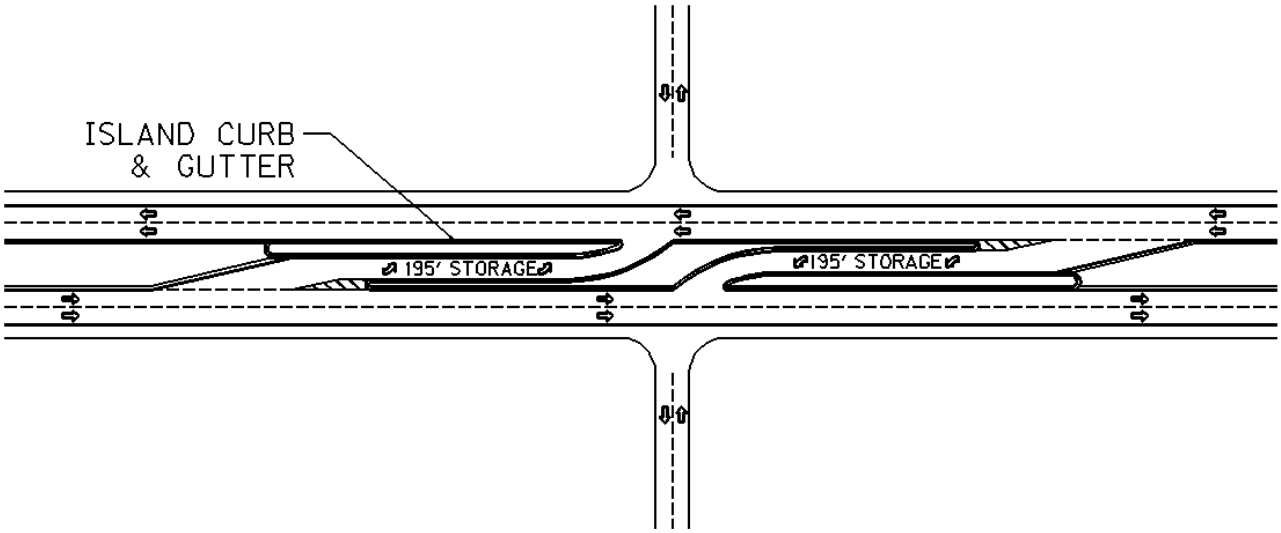
The median openings encourage traffic to turn at erratic spacing and leads to drivers on the through movement to be constantly watching for sudden vehicle movements. The median openings that are present do not have capacity to store turning movements which leads to multiple vehicles using the median openings and present possible obstacles and further uncertainty to the road users of the through movements. Vehicles decelerate within the fast lane before entering the median opening which lead to increased risk of rear end accidents.

There are sections within the study area that have left turn lanes in each direction separated by a flush paved median. Left turning vehicles within these sections are 22 feet from the inside edge of opposing through traffic lane, illustrated in the photograph to the right. When these vehicles turn there is a risk that vehicles in the opposing traffic stream may not have anticipated the movement due to the distance from their driving lane. This could lead to sudden braking or lane changes which in turn could result in rear end collisions or side-swipes.

PROPOSED ACCESS MANAGEMENT TREATMENT

The treatment of roadway medians influences the safety and operational experience of a roadway as well as the access provided to adjacent developments.

Research by Gluck et al. In *NCHRP Report 420: Impacts of Access Management Techniques* documents the safety and operational experience in several states where directional U-turn median openings have replaced conventional median openings. The states reported that closing conventional median openings and replacing them with directional median openings improves safety. Specifically, NCHRP Report 420 indicates that eliminating direct left turns from driveways and replacing them with indirect U-turn maneuvers results in a 20% reduction in accident rate. U-turn crossovers were found to have roughly half the accident rates of roads with two-way left turn lanes. The report states that right turns followed by U-turns can provide comparable, if not shorter, travel times than direct left turns from driveways under heavy volume conditions.



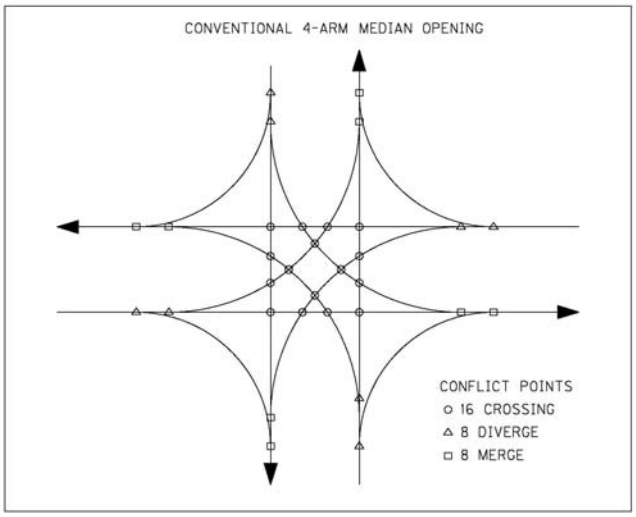
Advantages of Directional U-Turn Median Crossings

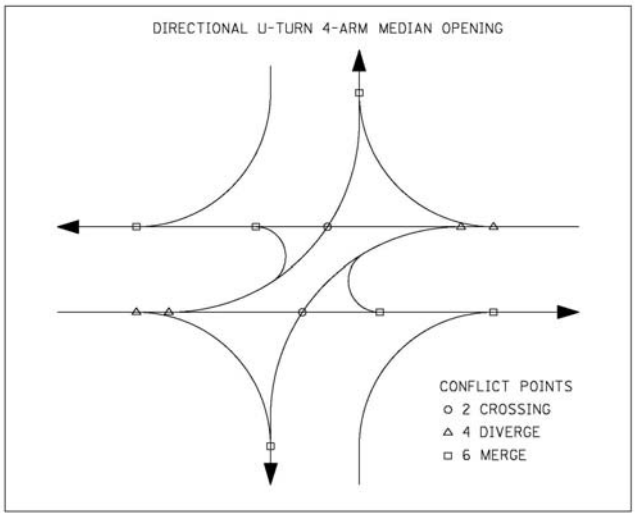
- The presence of left-turn lanes reduces potential for rear-end collisions between left-turn or U-turn vehicles and following through vehicles for both directions of travel on the major road.
- The presence of left-turn lanes mitigates the problem of U-turn vehicles encroaching on adjacent lanes and interfering with through traffic while waiting for a gap in the opposing traffic.
- Vehicles on the major road have direct left-turn access to the minor road.
- Vehicles on the major road in both directions of travel can make U-turn maneuvers.
- Right-turn maneuvers are unaffected by this treatment.
- Delays will be less than at a conventional median opening at a four-leg intersection.
- Since vehicles making a U-turn only need to enter, but not cross, the opposing roadway, a minimum gap of only 4 to 6 sec will be needed.
- There are only 12 conflict points, which is less than at a conventional median opening at a four-leg intersection.
- Accident rates at directional four-leg median openings are lower than at conventional four-leg median openings.

Disadvantages of Directional U-Turn Median Crossings

- Minor-road vehicles do not have direct left-turn access to the major road.
- U-turn vehicles entering the through lanes may delay full-speed through traffic.
- No direct crossing maneuver on minor road.
- Additional traveled distance will be incurred by vehicles whose drivers desire to make crossing maneuvers on the minor road and left-turn maneuvers from the minor

A traditional four leg median opening has 32 conflict points. The introduction of a directional U-turn median opening reduces the number of conflict points to 12.





NCHRP Report 524 :

An extract of conclusions of the research are as follows:

- Accidents related to U-turn and left-turn maneuvers at unsignalized median openings occur very infrequently. The 103 median openings in urban arterial corridors evaluated in detail in this research experienced an average of 0.41 U-turn plus left-turn accidents per median opening per year. The 12 median openings in rural arterial corridors evaluated in detail in this research experienced an average of 0.20 accidents per median opening per year. Overall, at these median openings, U-turns represent 58 percent of the median opening movements and left turns represent 42 percent of the median opening movements. Based on these limited accident frequencies, there is no basis for safety concerns of U-turns at unsignalized median openings.

- For urban arterial corridors, average median opening accident rates for directional three-leg median openings are about 48 percent lower than the accident rates for conventional three-leg median openings.

- For urban arterial corridors, average median opening accident rates for directional four-leg median openings are about 15 percent lower than for conventional four leg intersections.

- Where a large truck is used as the design vehicle for a median opening and a median width of 70 to 100 ft cannot be provided, consideration should be given to providing a loon.

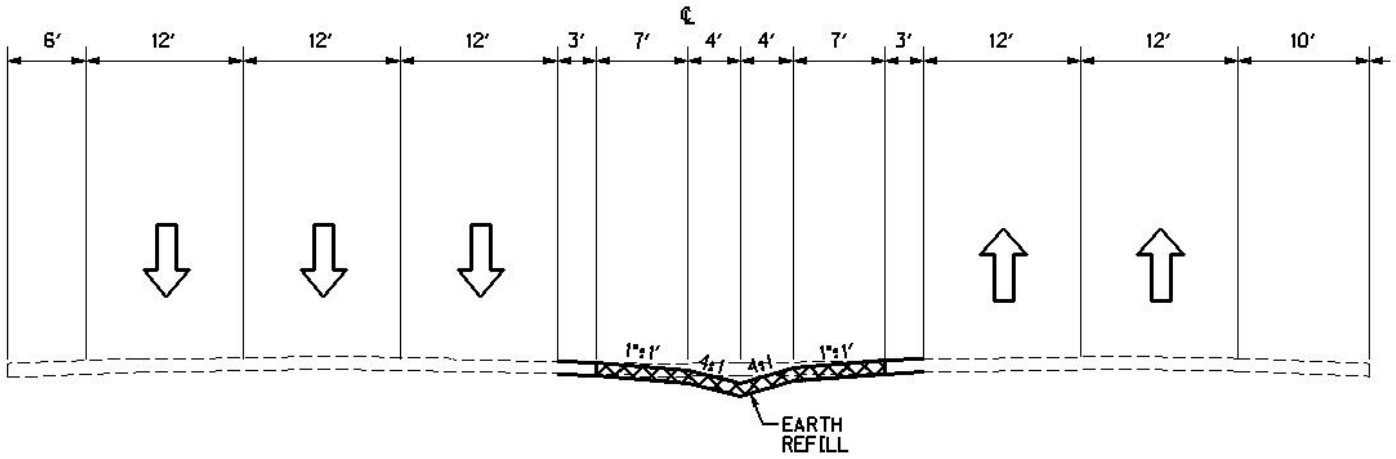
PROPOSED MEDIAN OPENING SPACINGS

Where feasible, minimum signal controlled intersection spacing shall be 2,400 feet. The minimum uncontrolled median directional U-turn spacing of 1,200 feet. An assessment of the conflict point of the existing median openings shows 2,185 conflict points (one-third of median openings estimated served 4-way movement and two-thirds served 3-way movements). The proposed access management provisions show a reduction in conflict points to 622. An estimated 70% reduction in conflict points. In addition, there has been 14,000 feet of flush median replaced with either raised or depressed median.

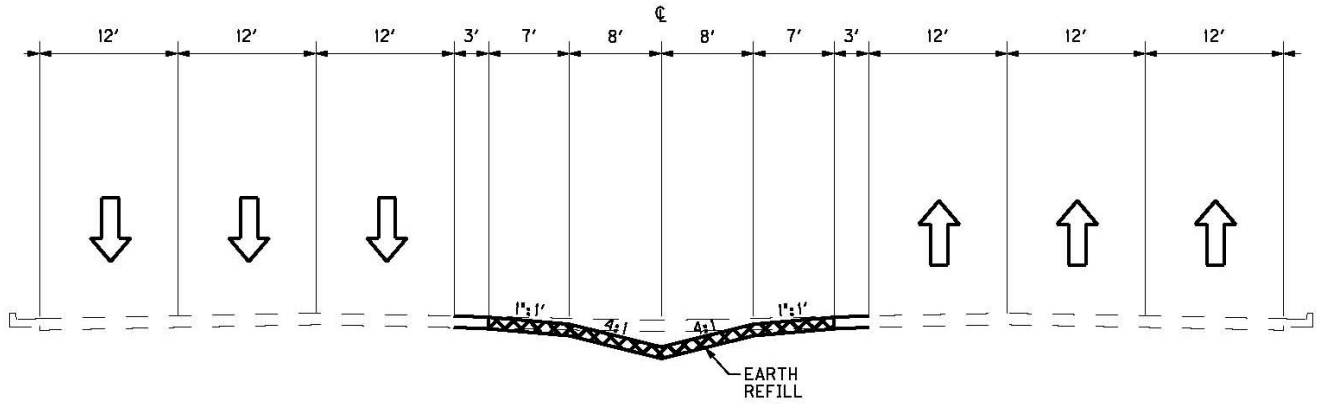
PROPOSED TYPICAL SECTIONS

Typical Section Reference 1—between milepoints 18.4 to 19.2

This typical section will be located between the U.S. 31 W Bypass intersection and the side roads Blue Heron Way/Gray Street. Posted speed limit is 45 mph. Existing signal controlled U.S. 31W Bypass intersection to remain. Northbound and Southbound left turn lanes to be replaced by depressed grassed median. Directional U-turn median crossing to replace the U.S. 31W uncontrolled 4 way intersection at Gray Street/Blue Heron Way.

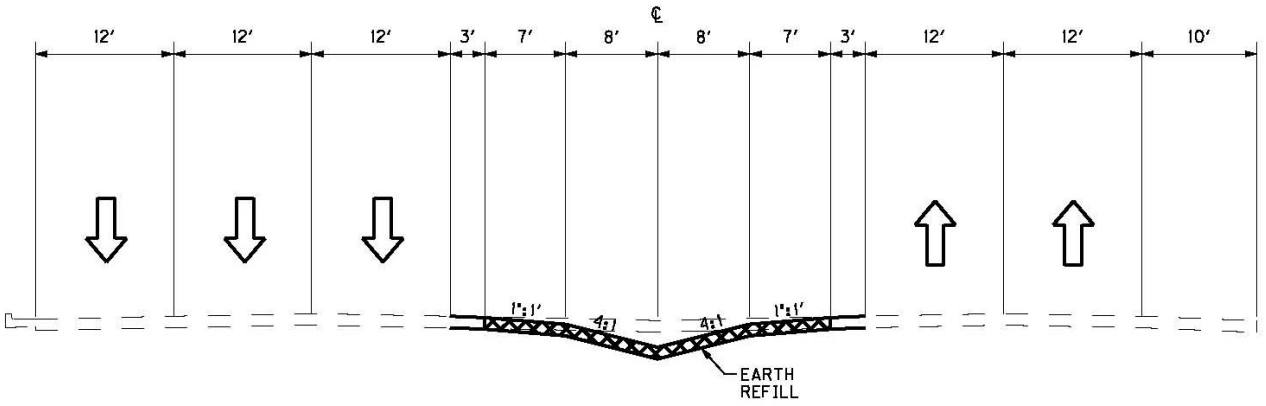


Typical Section Reference 2 - between milepoints 19.2 to 20.1



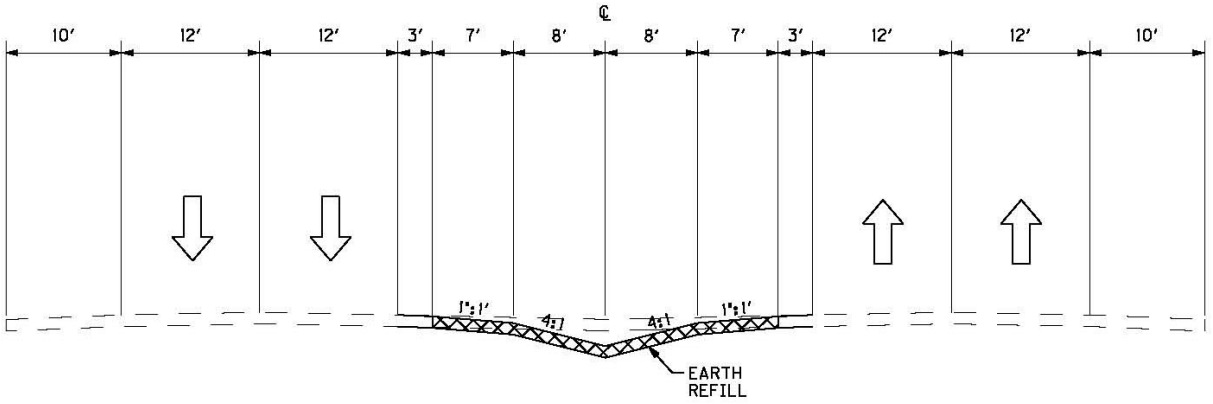
This typical section will be located between the intersection of Blue Heron Way/Gray Street and N. View Avenue/Routt Drive. Additional left and right turn lanes are present on Northbound U.S. 31W at the intersection with Ring Road (KY 3005). Northbound and Southbound left turn lanes to be replaced by depressed grassed median. Existing 4-way signal controlled intersections and associated turn lanes with Ring Road (KY 3005); Towne Mall/Wal-Mart and Towne Drive/Kmart to remain. The latter has a proposed project to realign Starlite Drive with the signalized intersection with Towne Drive. U turn provisions are to be allowed at these intersections, except trucks. The existing signalized intersection of Towne Mall/Starlite center and U.S. 31W is to be removed.

Typical Section Reference 3 - between milepoints 20.1 to 20.4



This typical section will be located between the side roads N. View Avenue/Routt Drive to Veterans Way and transitions from the flush median with turn lanes to a divided typical section with median crossings. Northbound and Southbound left turn lanes to be replaced by grassed median and existing median crossings removed and replaced by a depressed grassed median. Existing 4-way signal controlled intersections and associated turn lanes with Childers Court & Veterans Way are to remain. U-turn provisions are to be allowed at these intersections, except trucks.

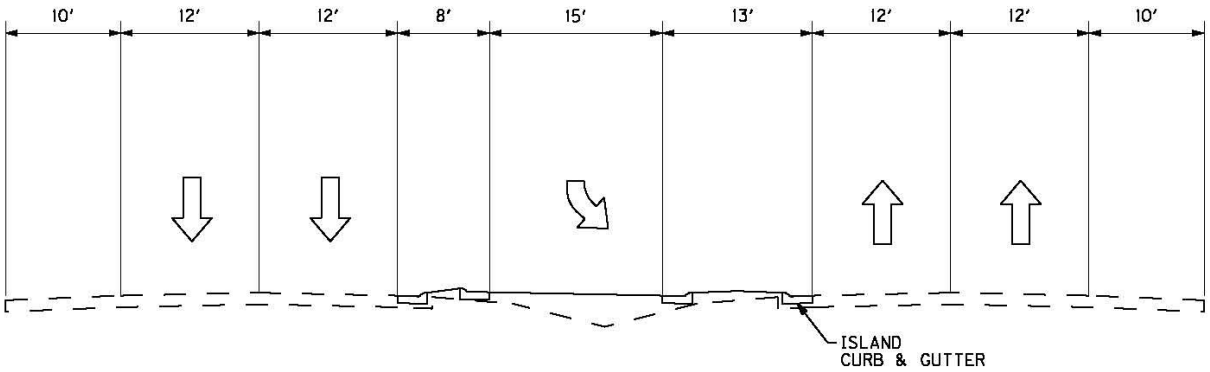
Typical Section Reference 4 - between milepoints 20.4 to 27.9



This typical section will be located between Veterans Way and E. Spring Street. Existing median crossings are to be removed and replaced with a depressed grassed median as shown previously. The existing signal controlled intersections and associated turn lanes with KY 447/Kohl's; Hutcherson Road/Pine Valley Place; W.A. Jenkins Road (KY2802)/Teresa Road; KY220; Medical center Drive/KY 434 (Battle Training Road); Joe Prather Highway (KY 313); Centennial Avenue; Blackjack Road; KY 144 (W. Vine Street) and E. Lincoln Trail Blvd (KY 1815) are to remain. U-turn provisions are to be allowed at these intersections. The existing signal controlled intersection at E. Spring Street is to be removed.

The photo enhancement below shows what a directional median U-turn would look like after construction.

Directional median U-turn provisions, typical section below, are proposed at the following locations:



Milepoint	NB reference point	SB Reference Point
21.4	--	Drexler Circle
22.1	1st Street	Aaron's Rental
22.3	Nr Honda Car Sales	Creekside Auto Sales II
22.9	RSC Equipment Rental	Hardin Co. Bus Garage
23.2	--	--
23.4	--	Longview Drive & Corvins Floor Coverings
23.7	Granite Center	Radcliff Fire Station #2
24.7	--	Will's Auto Parts
25.0	Treasure Chest Mini Storage/ Radcliff Electric Supply	Edwards Auto and Scrap Metal Recycling
25.7	Shelby Avenue	Superior Auto Care
26.3	Smith Street	Southside Plaza
26.6	Lifeline Assembly of God	Radcliff Middle School
27.0	Executive Center	Radcliff Veterinary Clinic
27.5	Corvin's Furniture	College Drive

The following photo exhibit following shows an Access Management Plan recently completed along New Circle Road (KY 4) on the northeast side of Lexington, Kentucky. This shows what the U.S. 31W project might look like after construction.

LOOKING EAST

LOOKING EAST

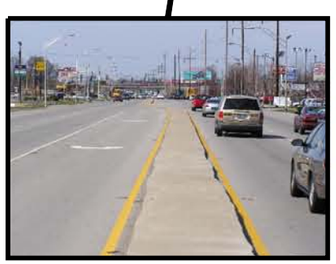
LOOKING EAST

LOOKING WEST

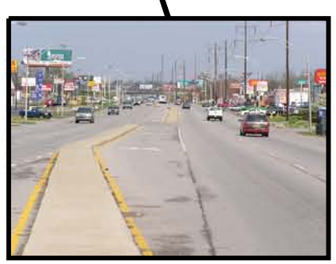
LOOKING WEST

LOOKING EAST

LOOKING WEST



LOOKING WEST



2011 NEW CIRCLE ROAD

NORTH BROADWAY TO BRYAN STATION

POST ACCESS MANAGEMENT PLAN

LEGEND

SCALE: 1" = 300'

EA Partners, PLLC

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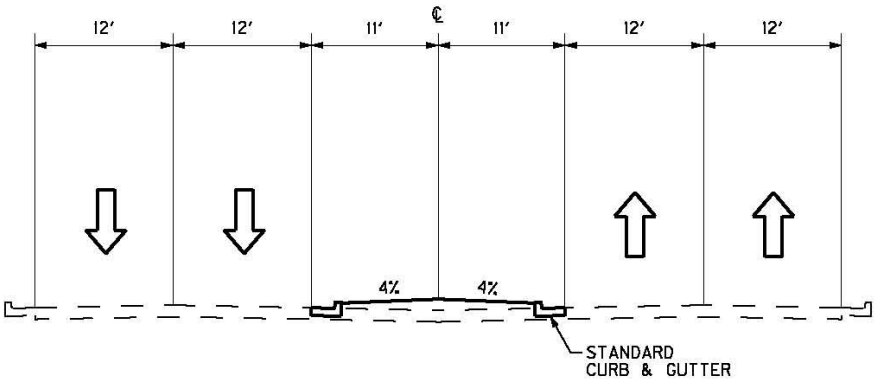
Typical Section Reference 5 - between milepoints 27.9 to 28.4

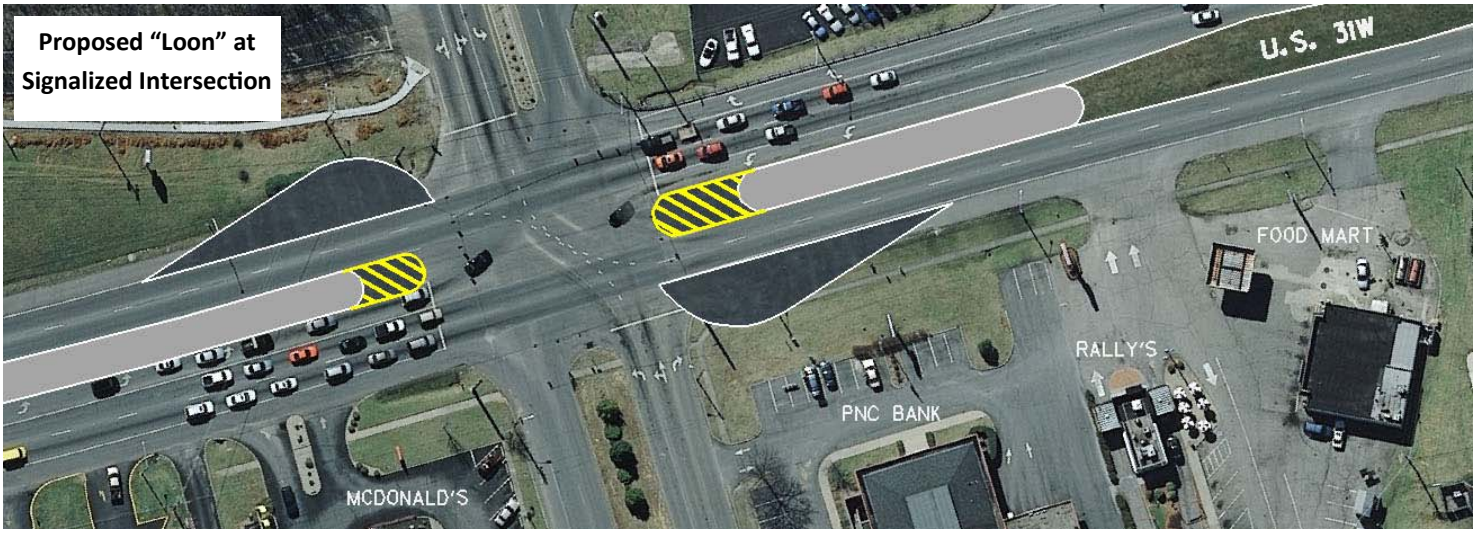
This section is present between E. Spring Street to North Wilson Road.



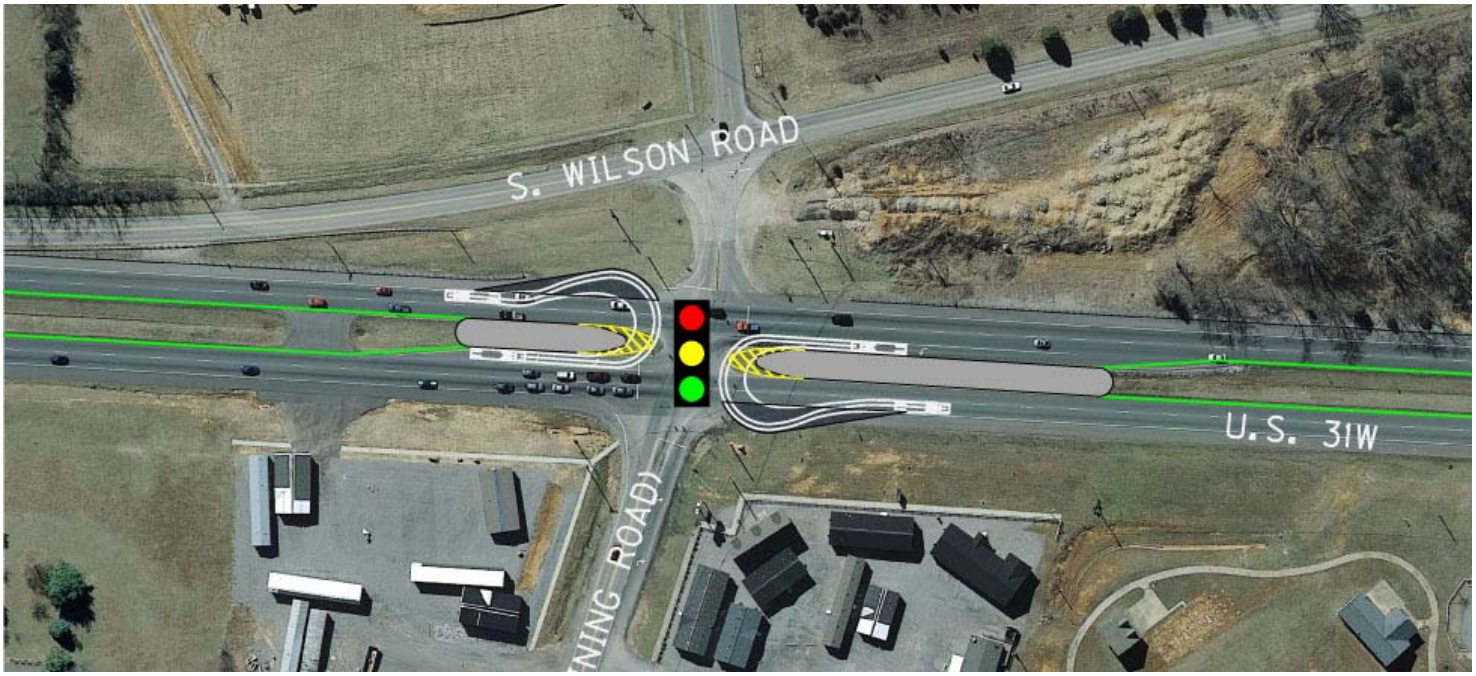
Development along this segment consists of light commercial and retail (Wal-Mart) with frontage access to U.S.31W. Existing flush median to be replaced with raised grassed median. The existing signal controlled intersections and associated turn lanes with Elm Road/Wal-Mart Way to remain.

LARGER COMMERCIAL TRAFFIC AND EMERGENCY SERVICES

No U-turn provision has been made between U.S. 31W Bypass and Veterans Way as there are existing service entrances that can be accessed via the existing signal controlled intersections.



Additional paved areas adjacent to intersections to allow vehicle overuns by larger tractor trailer vehicles have been termed 'Loons'. Loons are to be provided at all signalized intersections at and between KY 447/Kohl's and W. Lincoln Trail Blvd. (KY 1815), illustrated below.



No 'Loons' are proposed at the signalized intersection at Wal-Mart Way.

Woodland Drive, Veterans Way, and Wilson Road shall be used as an alternate truck route for large tractor trailer vehicles that are unable to use the "Loons." There are several crossing streets between U.S. 31W and the above roadways that will accommodate the desired movement. See attached Exhibit 2 for a schematic plan of the alternate truck routes.

The larger "ladder" fire engines can make U-turns at the directional U-turn median opening crossing over the island curbs. Law enforcement vehicles will be able to traverse the grassed median between median openings as standard 6:1 median grades will be used.

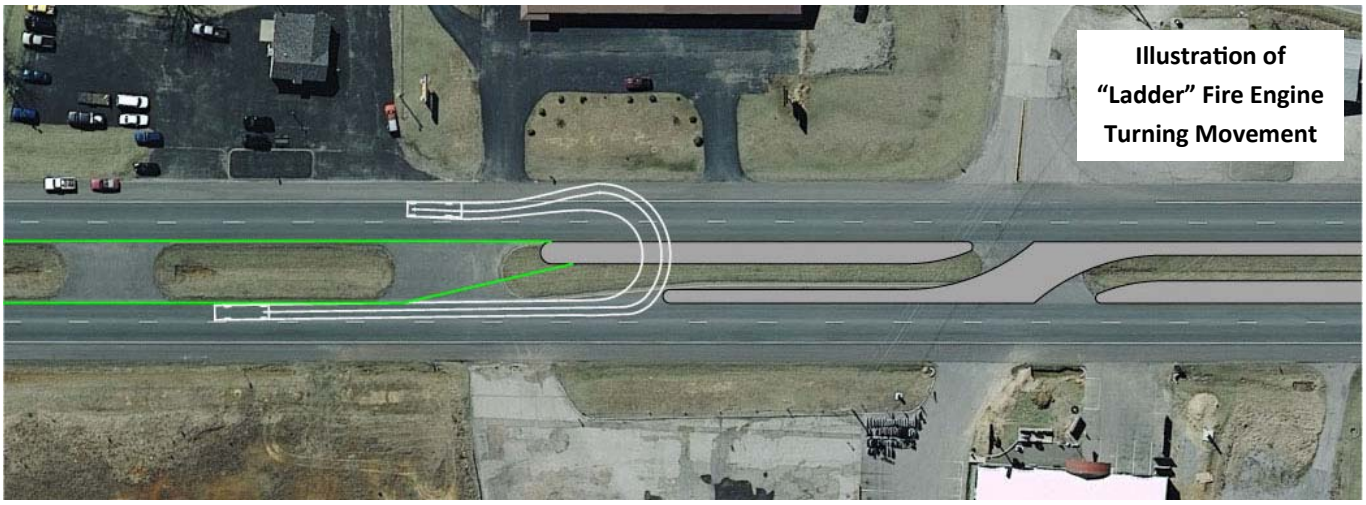


Illustration of "Ladder" Fire Engine Turning Movement

ADDITIONAL PROPOSED IMPROVEMENTS

Northbound U.S. 31W to Wilson Road Ramp to be improved to provide larger radii for right turning traffic from U.S. 31W and an improved merge taper on N. Wilson Road.

LESSONS LEARNED FROM JOHNSON ROAD:

- Extend curb out until median is better developed to limit "temptation" to cross at the end of curb.
- Temporary and permanent median signage during construction is important to keep public informed.

OUTCOMES FROM CONSULTATIONS

Consultations with City Council representatives have resulted in the following recommendations and concerns that will need to be considered in the final design:

- City of Elizabethtown indicated a willingness to partner with the state to improve the access to Starlite Plaza.
- City of Elizabethtown suggested directional left access into Routt Drive to provide relief for the signal at Childers Court.
- City of Elizabethtown indicated that the parcel north of Hutcherson Road has been investigated for re-development.
- City of Elizabethtown was concerned about access into Freeman Lake during events (specifically from Gray St), however, with the infrequency of the events (twice a year), it was indicated that the proposed access could be accommodated.
- Hardin County expressed concern regarding access to Forest Drive. Due to a natural gas distributor across from KY 220, it would be difficult and expensive to tie across from KY 220.
- Hardin County expressed concern regarding how the school bus traffic accesses US 31W at the bus garage. Conversations with Transportation officials indicate that the buses currently operate their access as a right in/right out facility.
- Hardin County and City of Radcliff indicated that the KY 313 area is anticipated to be a commercial hub. Project Team may want to consider denoting this as a commercial area.
- Hardin County and City of Radcliff shared that many homes access US 31W via Fairmont Drive. Since this does not fall at a full access median break, residents would have to travel up to Black Jack Road or KY 434 to access US 31W. There is an unscheduled need project to extend Centennial Ave to South Wilson Road.
- City of Radcliff recommended moving the KY 1500 directional left to Southside Plaza since it was a frequent destination for residents of Radcliff.
- City of Radcliff recommended a full access to Radcliff Middle School.

- City of Radcliff requested a summary of the net change in access along the corridor.
- City of Radcliff indicated that city fire trucks have trouble negotiating the U-turn at Johnson Road.
- City of Radcliff expressed significant concern about the additional delay for emergency personnel on emergency runs. The Cabinet committed to actively seeking feedback from communities where this has been implemented.
- City of Radcliff indicated that the ramp would not alleviate the congestion since the back-up at Fort Knox's Wilson Road gate causes the back-up on US 31W. City of Radcliff suggested that congestion is only a problem 2 hours a day in the morning and afternoon.

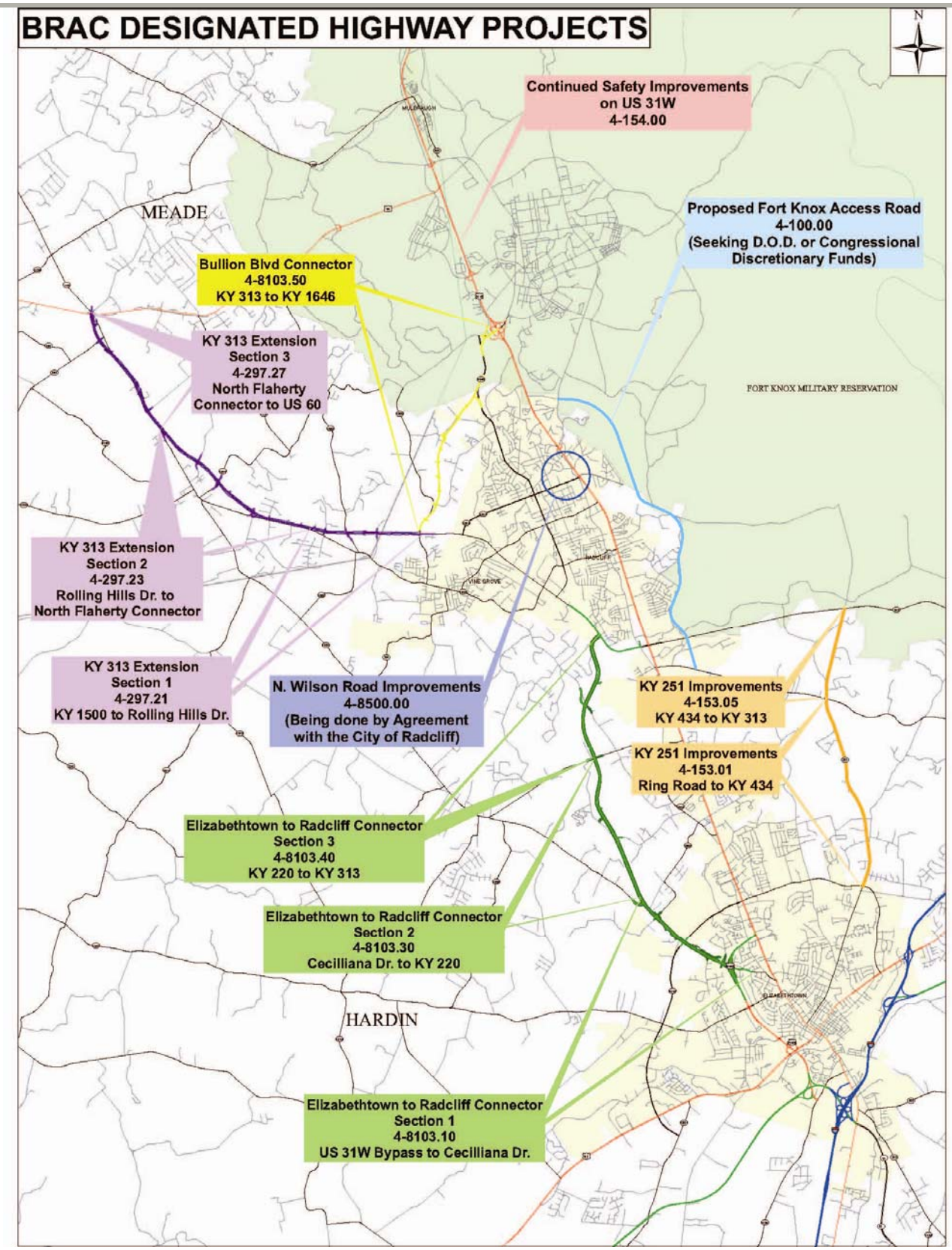


EXHIBIT 1: BRAC DESIGNATED HIGHWAY PROJECTS

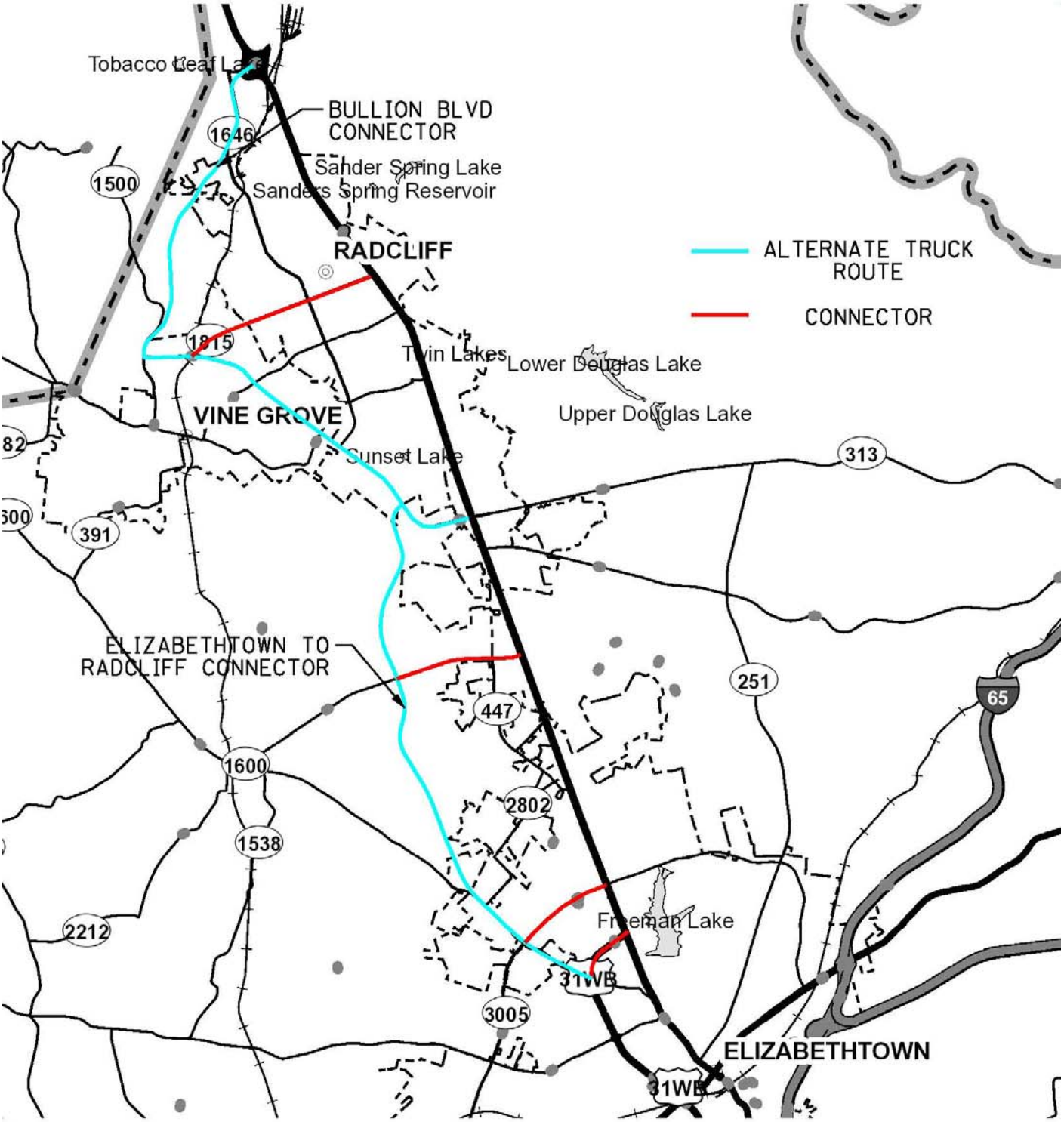


EXHIBIT 2: SCHEMATIC OF ALTERNATE TRUCK ROUTES

US 31-W HARDIN COUNTY
EXHIBIT 3

ACCESS MANAGEMENT PLAN

LEGEND

PROP. PAVEMENT

PROP. CURB & GUTTER

PROP. DEPRESSED MEDIAN

TRAFFIC LIGHT

SCALE: 1" = 600'

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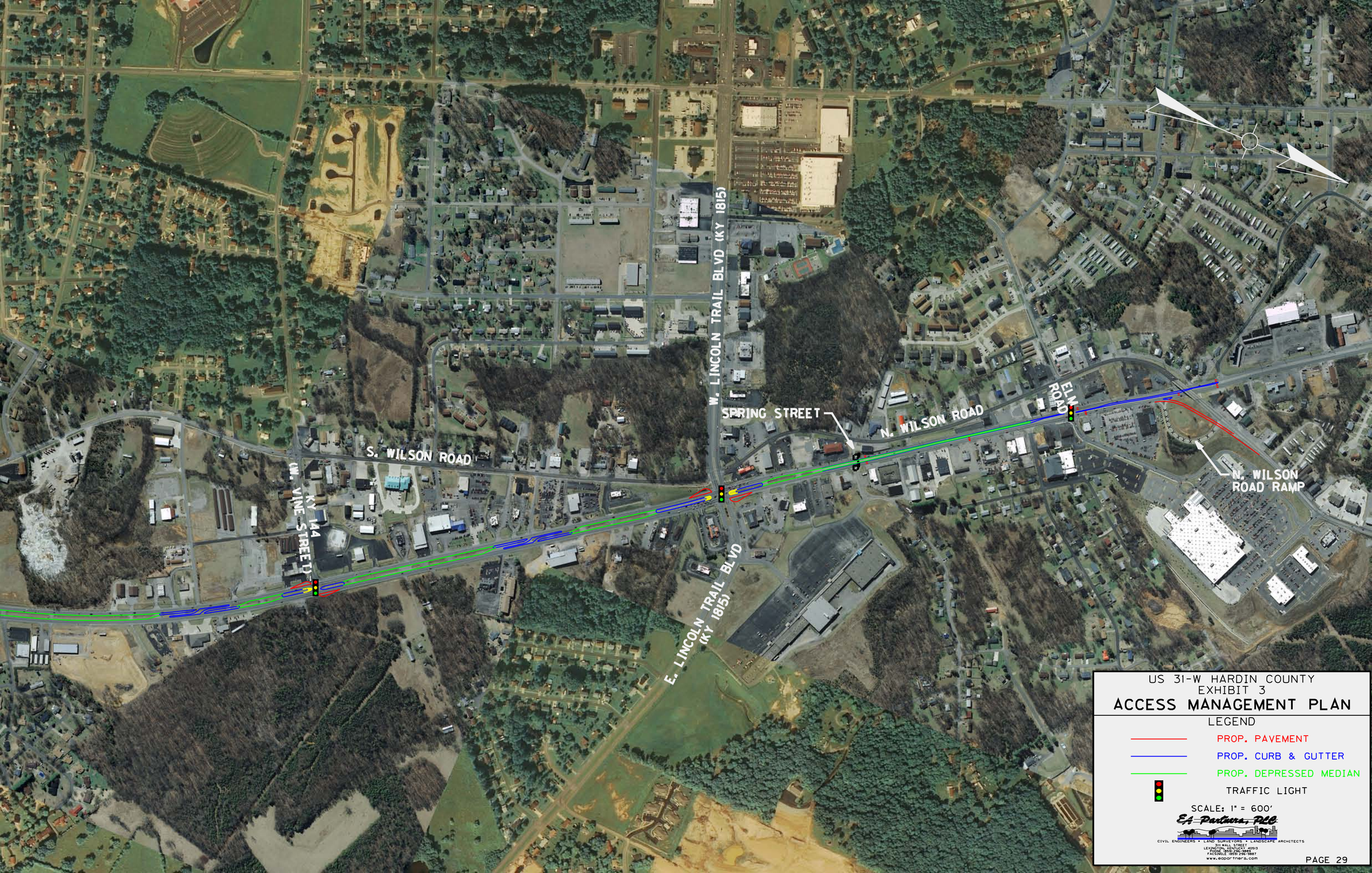

US 31-W HARDIN COUNTY
EXHIBIT 3

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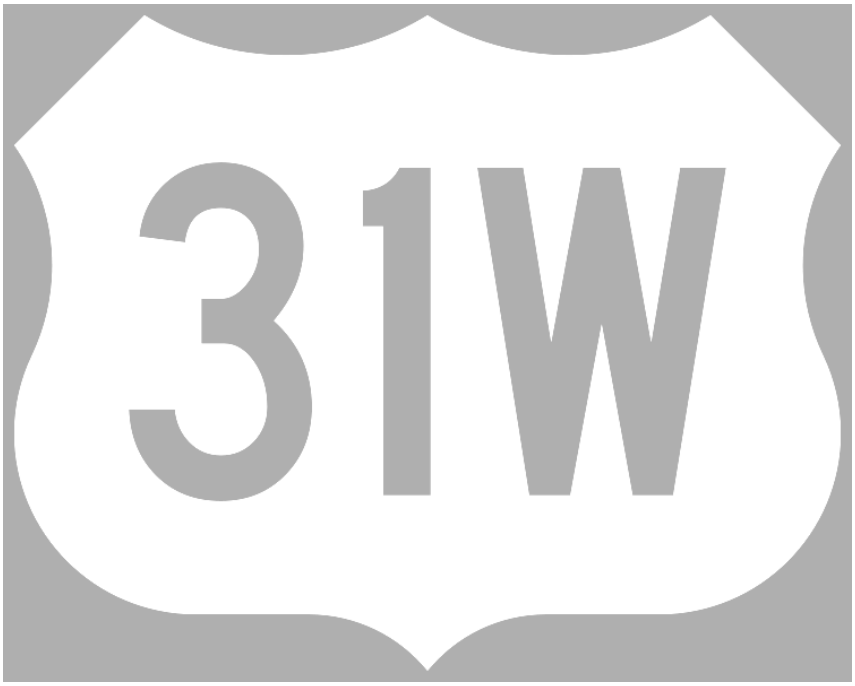
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