

DESIGN EXECUTIVE SUMMARY

BALLARD COUNTY

US 60

Item 1-118.0

SECTION A



DESIGN EXECUTIVE SUMMARY

County:	Ballard	Item #:	1-118.00
Route Number(s):	US 60	State Program #:	788463D
BMP/EMP:	11.815 to 14.490	Federal Project #:	
Type of Work:	Reconstrucion	State Project #:	FD04 004 0060 011-014

Highway Plan Project Description: Paducah-Wickliffe Road: Improve US 60 from the east end of the bridge over Humphrey Creek East of LaCenter to 0.4 miles West of Hester Sullivan Lane. (MP 11.815 to 14.490)

EXISTING CONDITIONS

ADT (current):	7187(2017)	Truck Class:	AAA ▼	Trucks: 12.2 %
Existing Functional Classification:	<input type="checkbox"/> Urban <input checked="" type="checkbox"/> Rural Arterial ▼	Terrain:	Rolling ▼	Route is on (check all that apply): <input checked="" type="checkbox"/> NHS <input type="checkbox"/> NN <input type="checkbox"/> Ext Wt <input checked="" type="checkbox"/> None
Posted Speed Limit:	35, 45, 55 mph	<input type="checkbox"/> 35 mph (urban) <input type="checkbox"/> 55 mph (rural)		
Existing Bike Accommodations:	Shared Lane ▼	Ped: <input type="checkbox"/> Sidewalk <input checked="" type="checkbox"/> Other: _____		

PROPOSED CONDITIONS

Design Functional Classification:	<input type="checkbox"/> Urban <input checked="" type="checkbox"/> Rural Arterial ▼	Design ADT (2042): 11,787 1,179 DHV:	Access Control: Min. Spacing: 1200' Partial ▼
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CONTROLLING CRITERIA:	EXISTING CONDITIONS (Estimated based upon existing geometrics.)	AASHTO Guidance (for design speed)	Recommendation	Design Exception (check if needed for Design Speed)
Design Speed	55 mph	Minimum: 50-65 MPH Selected: 55 MPH	55 mph	<input type="checkbox"/>

Note: For any remaining controlling criteria that are less than AASHTO recommended guidance: If recommended design speed is ≥ 50 mph, exceptions are needed; If recommended design speed is < 50 mph, variances are needed.

				Exception (≥ 50 mph)	Variance (< 50 mph)
Lane Width, No. of Lanes	11 ft, 2 lanes	12 ft, 2 lanes	11 ft, 2-Lanes Initial 4 lanes Ultimate	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Shoulder Width (Minimum Usable)	2 ft - 4 ft (2' Paved)	8 ft	8 ft (6 ft Paved)	<input type="checkbox"/>	<input type="checkbox"/>
Horiz. Curve Radius (Minimum)	950 ft	960'	1,800 ft	<input type="checkbox"/>	<input type="checkbox"/>
Max. Superelev. Rate (emax= 8 %)	emax = 7.2%	emax=8%	emax = 6.2%	<input type="checkbox"/>	<input type="checkbox"/>
Stopping Sight Distance (Minimum)	360 ft	495'	503 ft	<input type="checkbox"/>	<input type="checkbox"/>
Max. Grade (%)	5.28%	5.00%	2.60%	<input type="checkbox"/>	<input type="checkbox"/>
Normal Cross Slope (%)	2.00%	2.00%	2.00%	<input type="checkbox"/>	<input type="checkbox"/>
Vert. Clearance (ft.)	N/A	16.5 ft	N/A	<input type="checkbox"/>	<input type="checkbox"/>

OTHER CRITERIA:

				<u>Design Variance</u>
Border Area (urban)	N/A	N/A	N/A	<input type="checkbox"/>
Sidewalk Width, slope	N/A	N/A	N/A	<input type="checkbox"/>
Bike Lane Width, slope	N/A	N/A	N/A	<input type="checkbox"/>
Shared Use Path Width	N/A	N/A	N/A	<input type="checkbox"/>
Other:	N/A	N/A	N/A	<input type="checkbox"/>

DESIGN EXECUTIVE SUMMARY

Design Criteria Notes: This project is being designed as an Initial/Ultimate Design with 2 Lanes initially constructed inside of the right-of-way for 4-lanes using a PBFS Design with 11' lanes that requires a design exception and 8' shoulder (6' Paved).

Environmental Action:

Completion Date: September 2021

scheduled actual

Existing Pavement Depths:

Include:

1. Typical sections, including bridges
2. Map showing project location
3. Project overview and existing conditions
4. Purpose and Need statement
5. Discussion of alternatives (including preferred and no build) with respective traffic control schemes, and environmental, utility and right-of-way impacts.
6. Discussion of Design Exceptions /Variances and mitigation strategies
7. Cost comparison table of alternatives vs. Highway Plan
8. Discussion if preferred alternate cost is >115% than highway plan
9. Discussion of clearzone
10. Consideration for bicycle and pedestrian facilities (see HDM Chapter 1500)
11. Water-related impacts summary

Submitted by Project Engineer:

Keith Damron

KYTC Consultant

Date: 3/2/2021

Recommended by Project Manager:

Date:

Tier Level Approval

Tier 1 Tier 2 Tier 3

Location Engineer:

Date:

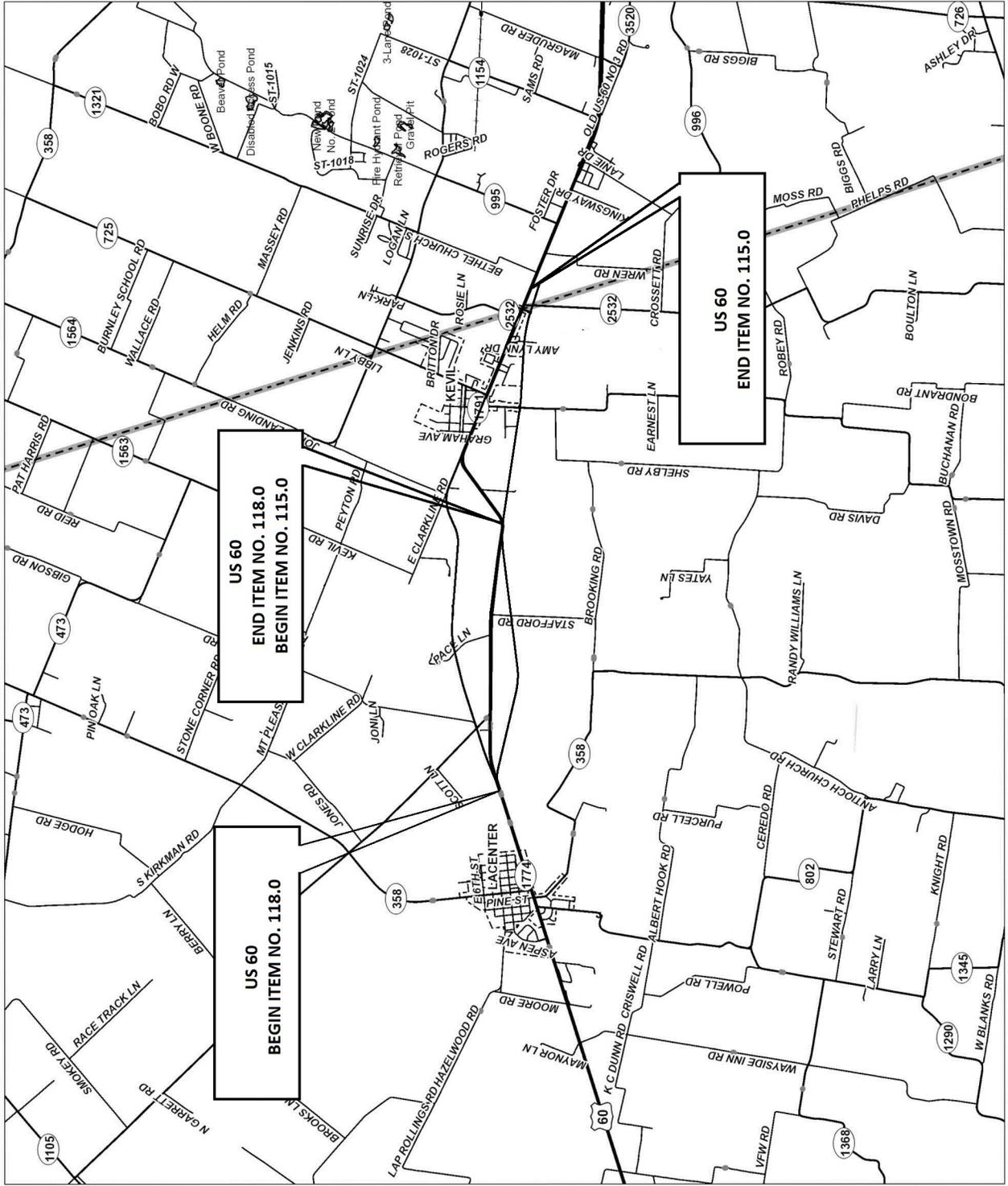
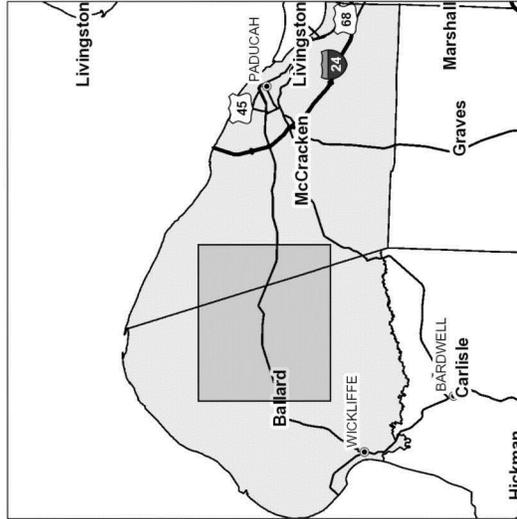
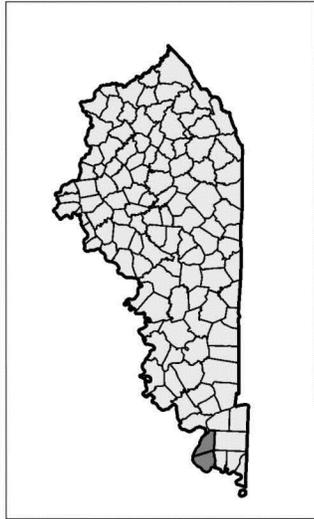
Roadway Design Branch Manager:

Date:

Geometric Approval

Date:

Granted by:



BALLARD COUNTY
MCCRACKEN COUNTY
US 60

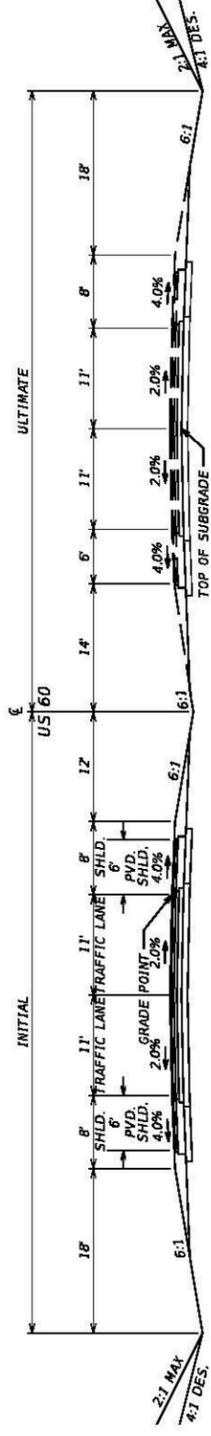
ITEM NO. 118.0 MP 11.815 TO 14.490
 ITEM NO. 115.0 MP 14.490 TO 16.937
 & 0.000 TO 0.385



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TYPICAL SECTIONS US 60

DESIGN SPEED = 55 m.p.h.



DESIGN EXECUTIVE SUMMARY DISCUSSION

Ballard County US 60 (Paducah Road) Item 1-118.00

3. PROJECT OVERVIEW AND EXISTING CONDITIONS

a. Location:

The US 60 Corridor Project is located in Ballard County between LaCenter and the McCracken County line. This section of the proposed US 60 begins near the east end of the bridge over Humphrey Creek east of LaCenter (MP 11.815) and extends east toward Paducah to 0.4 miles West of Hester Sullivan Lane, (MP 14.49). The existing segment of roadway is approximately 2.675 miles in length.

b. Existing Conditions:

US 60 is the only east-west arterial link in Kentucky west of Paducah, leading to the only Ohio River highway bridge crossing for an 80-mile stretch. Listed on the National Highway System and a state-designated truck route, its narrow 11 ft. lanes, limited passing opportunities, closely spaced access points through Kevil, and substandard curves make the route challenging for freight carriers and passenger cars.

US 60 is part of the State Primary System and is Functionally Classified on the Federal System as a Rural Principal Arterial from the project beginning at MP 11.815 to its end at MP 13.615 (at KY 2532). It is a Rural Principal Arterial for its entire length in Ballard County with a rolling terrain.

US 60 provides access to I-24 at Paducah toward the east. It also provides access to I-57 just across the Ohio River from Wickliffe, Kentucky at Cairo, Illinois. It is a primary access to the Paducah-McCracken County Airport located about 6 miles east from the east end of this project

Traffic counts increase through this corridor from near the beginning of the project in the LaCenter area to the end of the project east of Kevil. Recent traffic counts (ADT's) are as follows: 5,795 (2017) from MP 10.83 – 12.62 and 5,835 vpd (2017) from MP 12.62-15.84. Truck % ranges between 10% and 17%. Using the growth factor of 1.64 over 25 years that was used in the last traffic forecast in 2003, and starting with the 2017 count of 7,187 vpd, the design year traffic forecast for this project shows an average ADT of 11,787 (2042). From the 2003 traffic forecast by KYTC, 11 % trucks were forecasted.

Over a 5-year period from March 1, 2014 to March 1, 2019, 35 crashes occurred resulting in 12 injuries and 3 fatalities. Of these 35 collisions, 17 (48.6%) were single vehicles, 10 (28.6%) were rear-end, 5 (14.3%) sideswipe, 2 (5.7%) were angle and 1 (2.9%) opposing left turn collisions. The majority of the single collisions, 16 (45.7%), are within the 3.6-mile rural section that consists of several vertical and horizontal curve deficiencies with 22 (36.6%) of all crashes being within vertical curves with deficiencies and 8 (26.0%) of all crashes being within the one horizontal curves. Wet road conditions contributed to 10 (37.4%) of all the crashes, with 5 (14.3%) wet road collisions being single vehicle collisions and 3 (8.6%) being rear end collisions. Dark conditions contributed to 13 (37.1%) of all the crashes, with 7 (30.0%) being single vehicle collisions. (See the Collision Map.)

This segment of roadway was originally constructed in 1932 with an 18 ft. concrete pavement and then reconstructed in 1944, again with an 18 ft. wide pavement. Over the years, the pavement has widened to 22 ft. This segment of roadway has one horizontal curve that is deficient for super-elevation rate, and 6 vertical curves that do not meet KYTC/AASHTO standards. (See the Crash Map.) The existing roadway is two 11 ft.-lanes with 2 ft.-4 ft. (2 ft. paved) shoulders. This section of US 60 has a truck weight class of AAA.

The posted speed limit is 55 MPH from the beginning of the project (MP 11.815) to the end of the project at Denis Jones Road (Stafford Road.) (MP 13.615). There are no turn lanes in the project area. Access Control for US 60 is by permit.

c. Land Use:

The land use is mostly agricultural with a combination of commercial and residential properties along the section through the Kevil area. There are many entrances through the Kevil community. There are several residential subdivision street approaches along the route in Kevil. The rest of the project route is in Ballard County jurisdiction. There are one state road and two county roads intersecting the existing US 60 along this road corridor. There are no bridges along the project route.

4. PROJECT PURPOSE AND NEED

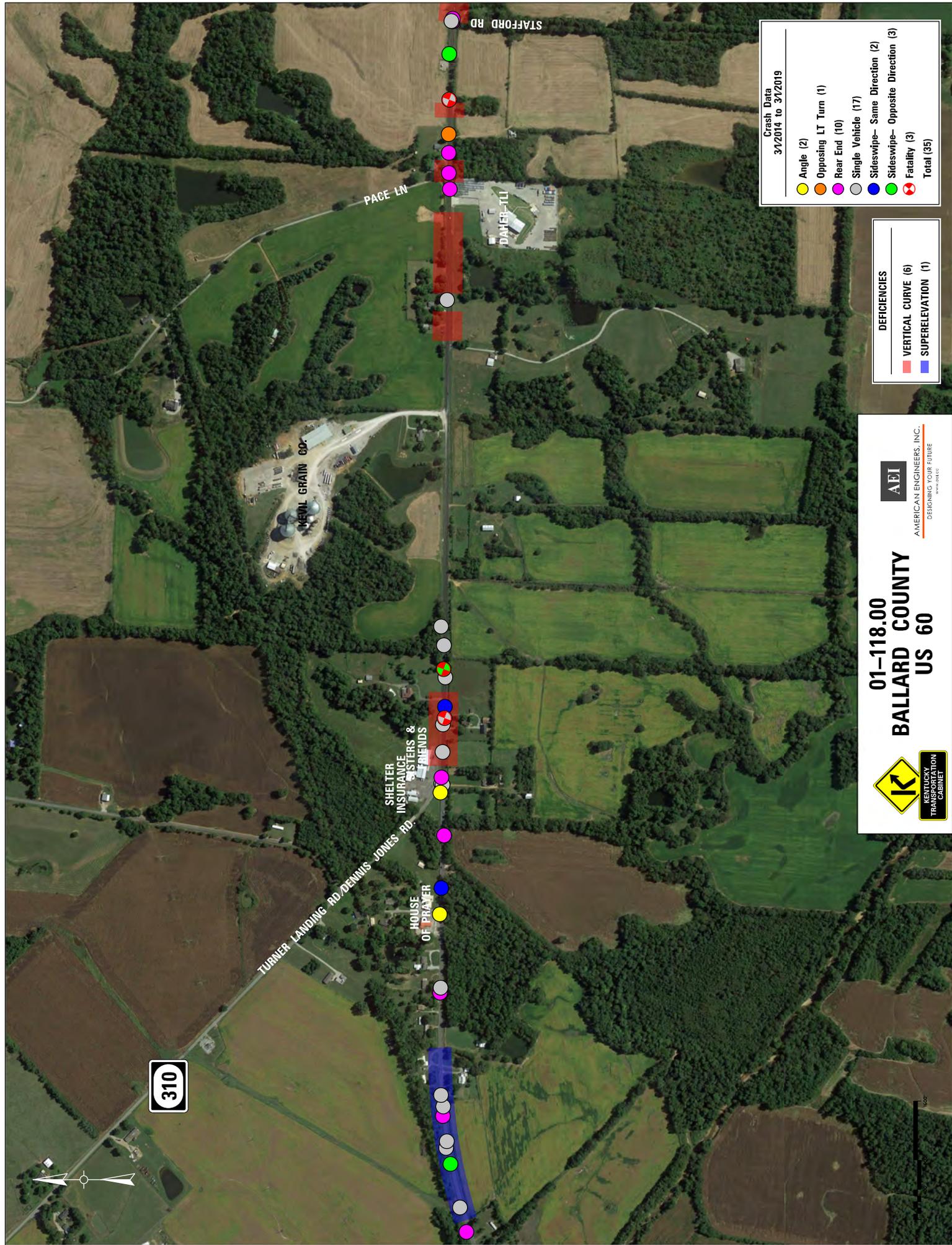
The purpose of the project is to improve mobility and safety for the US 60 corridor in eastern Ballard County. US 60 is the only east-west arterial link in Kentucky west of Paducah, leading to the only Ohio River highway crossing for an 80-mile stretch. Listed on the National Highway System and a state-designated truck route, its narrow lanes, limited passing opportunities, and substandard curves make the route challenging for freight carriers. Further, five years of data show a history of crashes, with three fatalities collisions.

Addressing these project needs should help significantly in meeting the project goals, which are: improve safety; improve US 60 East-West connectivity, improve horizontal & vertical curves, support economic development, and improve traffic flow from LaCenter through Kevil on US 60.

5. ALTERNATIVE DISCUSSION

a. Design Criteria:

The design speed for this project varies from 45 on the urban alternate section to 55 MPH rural alternate sections, with rolling terrain. The current speed limit through the project area is posted at 55 MPH from the beginning of the project (MP 11.815) to near Clarkline Road (15.40), 35 MPH from Clarkline Road (MP 15.40) to Gage Road (MP 15.91), 45 MPH from Gage Road (MP 15.91) to near Amy Lynn Drive (MP 16.527), and 55 MPH from Amy Lynn Drive (MP 16.527) to the end of the project at KY 2532—County Line Road (MP 16.937). The 45 MPH section is designed at 55 MPH because the geometrics of the existing road currently meet a 55 MPH design in that area.



Crash Data
3/1/2014 to 3/31/2019

Yellow Circle	Angle (2)
Orange Circle	Opposing LT Turn (1)
Purple Circle	Rear End (10)
Grey Circle	Single Vehicle (17)
Blue Circle	Sideswipe- Same Direction (2)
Green Circle	Sideswipe- Opposite Direction (3)
Red Circle with X	Fatality (3)
Total	(35)

DEFICIENCIES

Red Rectangle	VERTICAL CURVE (6)
Blue Rectangle	SUPERELEVATION (1)



01-118.00
BALLARD COUNTY
US 60



310



100'

Several typical section templates were considered at the beginning of preliminary design, which are the following: 4-lane divided, 5-lane urban through Kevil, Super 2-lane rural, 3-lane urban, 3-lane rural and PBFS (Project Based Flexible Solution) 2-lane rural templates. Lane widths of 11 ft. and 12 ft. were considered with the rural template initially considering 12 ft., 10 ft., 8 ft. and 6 ft. shoulders and the urban template using curb and gutter (C&G) with either a 4 ft. border or a 3 ft. border. The urban area typical sections include a 12 ft. two-way left turn lane (TWLTL) as part of the template. Five templates as follows were chosen to carry forward in Preliminary design:

1. **Rural 4-Lane divided.** This template includes 4-12 ft. lanes, a center 24 ft. median, 8 ft. inside shoulders (6 ft. paved), 12 ft. outside shoulders (10 ft. paved), and 18 ft. ditch foreslope for the clear zones on both sides. This template is for the rural segments and would have 8% max superelevation, 960 ft. min. radius, 5% max grade, and 495 ft. min. sight distance. This could be used for all of Alternative 1--project beginning to project end, Alternate 2-Section A and B, and for Alternative 3 up to the west side of Kevil.
2. **Rural Super 2-Lane.** This template section includes 2-12 ft. lanes, 10 ft. shoulders (8 ft. Paved), and an 18 ft. wide ditch foreslope for the clear zone on both sides. This template is for the rural segments and would have 8% max superelevation, 960 ft. min. radius, 5% max grade, and 495 ft. min. sight distance. This could be used for all of Alternative 1--project beginning to project end, Alternative 2-Sections A and B, and for Alternative 3-up to the west side of Kevil.
3. **PBFS Rural 2-Lane.** This template section includes 2-11 ft. lanes, 6 ft. shoulders (4 ft. Paved), and an 8 ft. wide ditch foreslope for the clear zone on both sides. This template has 8% max superelevation, 960 ft. min. radius, 5% max grade, and 495 ft. min. sight distance. This could be used for all of Alternative 1--project beginning to project end.

The existing super-elevation on US 60 today varies between 4% and 8%. For any new construction areas these max rates will be used; 6% in the 3-lane urban section, and 8% in the rural sections. Details of the design criteria can be found on the cover sheet for each roadway segment.

b. Alternatives:

Alternatives consist of the following three primary alternatives, in addition to the No Build alternative:

- Alternative 1: New Alignment South of Existing US 60—does not go thru Kevil
- Alternative 2: Widening Along Existing US 60 – and extending thru Kevil
- Alternative 3: New Alignment North of Existing US 60 - Along Abandoned Railroad and extending thru Kevil
- No-Build Alternative

No Build Alternative

The No-Build Alternative was considered and determined to be inadequate to address the project purpose, needs and goals causing the single vehicle crash pattern to continue. This alternative results in the continued geometric deficiencies in the vertical and horizontal curvature. Crashes will continue to be a problem. The lack of left turn lanes would continue to cause traffic backups and delays especially during

the morning and afternoon peak traffic hours. The pattern of rear end collisions would continue to exist. Freight movement by trucks would continue to be hampered.

Build Alternatives

Three build alternatives were developed to address the widening of existing US 60 which included addressing horizontal and vertical curve deficiencies and increasing shoulder widths. Alternate 1 is divided into 2 sections—Section A (Item 1-118.0) and Section B (Item 1-115). Alternate 2 is divided into 3 sections—Section A (Item 1-118.0), Section B (Item 1-115) and Section C (Item 1-115). Alternate 3 (Item 1-118) is a stand-alone section, that joins Alternative 2-Section C from the Clarkline Road/US 60 intersection to the east end of the project. All the alternatives span the entire length of the project area. These alternatives for Section A, discussed in further detail below, were designed to minimize Right-of-Way impacts, utility relocations, environmental impacts and overall construction costs. Alternatives were designed to meet AASHTO and KYTC minimum design standards where feasible, but some design exceptions may be needed to minimize project costs. These exceptions are discussed with each alternative below.

There are significant streams and one Zone A tributary in the project corridor. Right of Way impacts vary between alternatives with the largest impact along the existing roadway. The following utilities are located along the project area and would be disturbed by some or all the project alternatives: water lines, gas lines, electric, telephone, and fiber optic lines. The electric and telephone lines are mostly overhead, but they go underground in a few areas. There are sanitary sewer facilities in the Kevil area impacted by Alternative 2C if Alternative 3 were constructed and continued through Kevil. Most of the utilities are within existing R/W of US 60. Also, all three build alternatives will cross over four large gas and crude oil transmission lines: Marathon's 40 in. high pressure petroleum line, Energy Transfer 36 in. high pressure gas and 30 in. crude line, along with Marathon's 26 in. gas line. There is a high cost associated with these four large lines.

Alternative 1

Alternative 1 is a total of 4.85 miles in length and is on the south side of the existing US 60 roadway. This alternative extends through the entire length of the project for both Items 1-115.0 and 1-118.0 and is divided into Section A and Section B. Section A is Project Item No. 1-118.0 with a length of 2.65 miles. This alternative would be new construction in a new corridor and would use a rural template with shoulders. Three cross section templates were considered for this rural alignment; 4-lane, super 2-lane, 2-lane (PBFS-Performance Based Flexible Solution). A primary intent of this alternative is to avoid a Hazmat property (Uranium Cylinder Service Center), a gas pump station and numerous residences and businesses along the existing road.

The primary difference between the three templates is the right-of way needed and the construction cost. All other impacts are similar. For this segment of Alternative 1, 15 parcels totaling 47 acres are impacted by the 2-lane option and PBFS option, and 16 parcels totaling 61 acres are impacted by the 4-lane option. Also, possibly 1 home would need to be relocated. This alternative will potentially impact a small area of wetlands, some forested bat habitat, and bat habitat streams. In addition, it affects a several streams: either perennial, intermittent, or ephemeral.

Section A is a new alignment located south of the existing US 60 with a new proposed roadway length of 2.65 miles. KY 310 will be extended to the proposed US 60 and serve as a west end connector. There will be a connector on the east end tying to the existing roadway going west. It does not impact the pond, or the barn previously evaluated for historic significance. It crosses 4 blue line streams, plus a tributary of

Humphrey Creek in a floodplain Zone A area. It avoids the gas pump station and stays off the hazmat property. Section A will cross over 4 large gas and crude oil transmission lines. The 4-lane section template will have a right of Way near the edge of the pond at Sta 162+00. It crosses 3 blue line streams. It avoids the gas pump station and stays off the hazmat property.

Alternative 2

Alternative 2 is a total of 5.355 miles in length and would follow the existing US 60 roadway alignment. This alternative extends through the entire length of the project for both Items 1-115.0 and 1-118.0 and is divided into Section A, Section B and Section. Section A is Project Item No. 1-118.0 with a length of 2.675 miles. This alternative would reconstruct US 60 along the existing corridor and would use a rural template with shoulders up to just west of the city of Kevil. It would then use an urban template with curb & gutter and a center two-way left turn lane (TWLTL) to the end of the project. Two cross section templates were considered for the 2 rural sections: 4-lane and Super 2-lane. Three cross section templates were considered for the urban section through Kevil: 5-lane Urban with Curb & Gutter, 3-lane Urban Curb & Gutter, 3-lane Rural. The 3 horizontal curves with deficiencies, and 15 vertical curves with deficiencies along the route would be improved with either template.

The primary difference other than cost between the templates is the right of way needed that would include more impacts to residences and businesses as well as the gas pump station that would be impacted for the 4-lane template. For Alternative 2, 43 parcels totaling 19 acres are impacted by the 3-lane Urban Curb & Gutter, along with 2 homes would need to be relocated, 1 sheds and barns would also need to be relocated. There are 49 parcels totaling 44 acres are impacted by the 5-lane Urban with Curb & Gutter, along with 4 homes would need to be relocated, 2 commercial businesses relocated, 1 sheds and barns would also need to be relocated. One church is included as the relocations for the 4-lane option with this alternative. This Alternative will potentially impact a small area of wetlands, some forested bat habitat, and bat habitat streams. In addition, it affects a several streams: either perennial, intermittent, or ephemeral. This alternate cross two blue line streams.

The MOT for Alternative 2 will be more complicated than for the other two alternates. It will require temporary widening along portions of the corridor in order to maintain 2-10 ft. lanes and a 3 ft. buffer between the work zone and edge of traffic. One or two spots may also require a temporary diversion.

There is existing concrete pavement under the existing US 60 asphalt pavement at an unknown depth. Four options were considered for how to handle the underlying pavement. They are as follows: Existing concrete to remain at no additional cost, break and seat the existing concrete costing an additional \$1.50 million, remove the existing concrete costing an additional \$1.76 million, or use geogrid at an additional cost of \$0.95 million. It was decided to leave the existing concrete in place if Alternative 2 becomes the preferred alternative.

Section A follows the existing US 60 alignment with a length of 2.675 miles. It does not impact the pond, or the barn previously evaluated for historic significance as it widens to the best fit along the roadway to minimize impacts. Partial control of access through this section A will require the use of frontage roads. Turning Landing Road and Pace Lane Approach will be slightly realigned in order to eliminate the skew at the current intersection.

This alternate will avoid the Daher-TLI parcel and will cross over the 4 large gas and crude oil transmission lines. The Super 2 template allows for widening of an existing shoulder on each side while the travel lanes

are located on the existing lanes that might help reduce the impacts to the large gas lines by not going outside of the existing 60 ft. encasement around each of the Energy Transfer lines. The two-lane option may allow for missing the gas pump station, but the 4-lane option will impact it. Section A will impact overhead electric/phone utilities, underground fiber optic lines, 2 gas service lines and water lines that will have to be dealt with.

Section B & Section C under Item 1-115.0 is a continuation of Section A.

Alternative 3

Alternate 3 is 3.5 miles in length with a new alignment north of the existing US 60 along the abandoned Illinois Central railroad and would tie to Alternate 2, Section C thru Kevil, a part of the Item No. 1-115.0 project. This alternative begins near the Humphrey Creek Bridge on existing US 60 and then follows along the abandoned railroad corridor for a total of 3.50 miles to Clarkline Road and following Clarkline Road to the intersection with existing US 60. If Alternate 3 were constructed, it would then follow along the Alternate 2C from Item 1-115.0 through the city of Kevil. This alternative would be new construction in a new corridor and would use a rural template with shoulders until it meets and joins Alternative 2, Section C, on the west side of Kevil. Two cross section templates were considered for this rural alignment: super 2-lane, and 4-lane.

The primary difference other than cost between the two rural template is the right of way needed that would include more impacts to residences and businesses as well as the gas pump station that would be impacted. For Alternative 3, 38 property parcels totaling 57 acres are impacted by the 2-lane option, and 42 parcels totaling 81 acres are impacted by the 4-lane option. Also, 1 home would need to be relocated for the 3 lane and 4 homes would be relocated for the 4-lane. This alternative will potentially impact a small area of wetlands, some forested bat habitat, and bat habitat streams. In addition, it affects a several streams: either perennial, intermittent, or ephemeral. This alternate cross seven blue line streams. It crosses 5 blue line streams.

Alternative 3 will avoid both the hazmat site and the gas pump station. Both the 2-lane and 4-lane rural templates avoid the Kevil Grain facility. Two horizontal curves with radii = 2000 ft. would be needed to avoid the church and cemetery along Oak Grove Church Lane and at the end of the alignment to tie into Clarkline Road. These alignment stays south of the tree line along the old rail line.

The urban segment Alternate 2 Section C would then need to be followed in Item No. 1-115.0 through Kevil.

c. Interactive Highway Safety Design Module (IHSDM)

A safety analysis was run using the Interactive Highway Safety Design Module (IHSDM) version 13.1 for the subject project areas of both Item No. 1-118.0 and Item No. 1-115.0. The safety was investigated for each alternative compared to the predicted existing condition collisions. Note, the existing conditions discussed above present the actual crash history and patterns of crashes along the road. The IHSDM analysis allows to use the geometrics of each alignment to compare predicted crashes and therefore the crash reduction of each alternative for a 20-year time period. The IHSDM software anticipated that the existing US 60 Corridor will have 1271 collisions occurring over the next 20 years. In comparison, Alternative 1, super 2-lane, has the greatest collision reduction of all alternatives showing that 650

collisions (621 less) will occur over the next 20 years with the construction of this alternative. It is followed closely by Alternative 1, PBFS with 6 ft. shoulders, at 657 collisions, and by Alternative 1, PBFS with 4 ft. shoulders, at 677 collisions. While the 4-lane divided highway was not analyzed in the IHSDM model, because it is a divided highway with partial control of access, it would have even less predicted crashes than the 2-lane. Other alternatives were also not modeled in the IHSDM analysis.

The table below is a summary of the IHSDM analysis showing the lowest predicted number of collisions for the various alternatives, the number of design exceptions for each alternative and whether or not the alternative meets the projects goals. Note that Alternatives 1, 2, 2A and the Corridor Spot Improvement Alternatives are the only ones that represent the entire corridor. Alternatives 3, 4 & 5 are each a short spot improvement analyzed to be options to use in place of small segments of the entire corridor alternatives and therefore cannot be compared to the entire corridors as a complete corridor option.

Interactive Highway Safety Design Module Summary

	Exist. US 60	Alt 1- 2-lane	Alt 1- PBFS 6' shld	Alt 1- PBFS 4' shld	Alt 2	Alt 3
Predicted Collisions	1271	650	657	677	N/A	N/A
Crash Reduction	-	621	614	594	N/A	N/A
Design Exceptions	-	0	2	2	N/A	N/A
Meets All Goals	No	Yes	No	No	N/A	N/A

d. Maintenance of Traffic

Maintenance of Traffic (MOT) will be different for Alternate 1 and Alternative 3 compared to Alternate 2. Alternate 1 and Alternate 3 will be constructed away from the existing roadway while traffic will remain on the existing road, with tie-ins being constructed using flag persons and temporary lane closures during working hours only. Alternate 2 would be constructed using some temporary widening and shifting traffic from one side, then the other, maintaining two 10 ft. driving lanes and a 3 ft. buffer between the driving lane and the drop off at the work zone. The shoulder and driving lanes on the portion being widened will be constructed up through the top base course to be used as driving lanes in Phase 2, then final surfacing will be placed in phase 3.

e. Preferred Alternative

The alternative preferred by the Project Team is Alternative 1 with a 4-lane divided highway template that will be designed as an initial 2 lane roadway with right-of-way purchased for the ultimate design of the 4-lane template with the PBFS option of 11 ft. lanes and 8 ft. (6 ft. Paved) shoulders instead of the 6 ft. shoulders discussed above in the design criteria template 5 for the PBFS Rural 2-Lane. This alternative is

preferred because of the following reasons when compared to the other alternatives that meet the project goals:

- It is the only alternate that satisfies all project goals, including improving safety through the improvement of the horizontal and vertical curves.
- It has the greatest potential crash reduction with it being a partial control of access design.
- It impacts the least number of parcels and avoids the major impacts to many homes and businesses along the existing road.
- It avoids the utilities that are located along the existing roadway.
- It has the least environmental impact to wetlands and ponds and environmental justice.
- Construction costs are less than other Alternatives for either the 2-lane or 4-lane section template.
- It is the alternate that is overwhelmingly preferred by 72% (west section) of the public and was recommended as the preferred alternate through a resolution by the Ballard County Fiscal Court.

4. DISCUSSION OF DESIGN EXCEPTIONS AND MITIGATION STRATEGIES

The project teams recommended PFS lane width is 11 ft., requiring that a design exception is requested for the rural route for the preferred alternate 1.

Right-of-Way Summary

	Alternate 1 2 lane	Alternate 1 4 lane	Alternate 2 2 lane	Alternate 2 4 lane	Alternate 3 2 lane	Alternate 3 4 lane
Total Parcels	16	16	43	49	38	42
Commercial Buildings	0	0	0	2	0	0
Residential Buildings	2	2	2	4	1	4
Barns and Sheds	3	3	1	1	0	1
Total Fee Simple R/W	47 acres	61 acres	19 acres	44 acres	57 acres	81 acres

5. COST COMPARISON (PRELIMINARY COST ESTIMATE)

	2018 Highway Plan	Alternate 1 4 lanes	Alternate 1 2 lane	Alternate 1 2 lane PBFS
RIGHT OF WAY	\$ 2,370,000	\$ 3,900,000	\$ 2,050,000	\$ 2,050,000
UTILITIES	\$ 1,900,000	\$ 11,300,000	\$ 11,300,000	\$ 11,300,000
CONSTRUCTION	\$ 0	\$18,500,000	\$ 8,600,000	\$ 7,900,000
TOTAL COST	\$4,270,000	\$33,700,000	\$21,950,000	\$21,250,000
PERCENT HIGHWAY PLAN COST (R and U Phases Only)		253%	223%	223%

Continued Cost Comparison

	Alternate 2 4 Lane (Rural),	Alternate 2 2 Lane (Rural),	Alternate 3 4 Lane (Rural),	Alternate 3 2 Lane (Rural),
RIGHT OF WAY	\$ 8,050,000	\$ 4,400,000	\$ 7,750,000	\$ 5,000,000
UTILITIES	\$11,200,000	\$ 11,200,000	\$ 1,750,000	\$ 1,750,000
CONSTRUCTION	\$20,700,000	\$ 11,800,000	\$24,200,000	\$13,600,000
TOTAL COST	\$39,950,000	\$27,400,000	\$33,700,000	\$23,100,000
PERCENT HIGHWAY PLAN COST (R and U Phases Only)	321%	260%	158%	158%

- Estimates are Preliminary Level Estimates.
- Alternate 3 is only for the rural segment following the old Railroad and does not include reconstructing Alternate 2C listed in Item 1-115.0.

6. DISCUSSION OF PREFERRED ALTERNATE COST >115% THAN HIGHWAY PLAN

No funds are currently programmed in the 2018 Highway Plan for Construction; therefore, Cost comparison is for the Right-of Way and Utility phases only. The preferred Alternate 1 total cost for the R and U phases is \$11,400,000 or 266% of the 2018 Highway Plan R and U phases total of 4,270,000. The largest single impact to the utility cost is 4 large gas and crude oil transmission lines that will be impacted with this project and are estimated to cost \$8,000,000. The right-of-way estimate difference is based on an updated estimate and the fact that the funding shown in the 2018 Highway plan does not include the full cost for the project. However Alternative 1 has the least cost for right-of-way and utilities and is the least cost for construction.

7. DISCUSSION OF CLEAR ZONE

Rural Typical:

Design Criteria (rural): 11,787 ADT (2042), 55 mph Design Speed

8-ft. Shoulder and an 18-ft. 6:1 Fore slope

Recommended Clear-zone: 22 ft. – 24 ft. (From the AASHTO Roadside Design Guide, 4th Edition,)

Proposed Clear zone: 26 ft.

The typical section used in the rural portion shows a graded shoulder width of 8 ft. (6 ft. Paved) from the edge of traveled way and then a cut ditch foreslope of 18 ft. to the ditch bottom. This provides a 26 ft. clear zone which is an improvement compared to the existing roadway that varies in its shoulder width from 2 ft. to 4 ft. from the existing edge of pavement. Because the ditch slope falls within the 26-ft. limits, the ditch slopes shall be smooth and unobstructed within the 26 ft. clear-zone.

Should guardrail be required, it will be installed according to KYTC and AASHTO standards.

8. CONSIDERATION FOR BICYCLE AND PEDESTRIAN FACILITIES

Bicycles will be accommodated on this rural project just as they are on most rural highways that have paved shoulders, by using the shoulder concept as discussed in HD 1501.7.2. The preferred alternate typical section has 8 ft. shoulders (6 ft. paved), so that width is considered adequate to accommodate bicycle travel on this route. There are no known state or local plans for bikeway improvements in the project area. Based on response from the project Public Meeting, there is not any public interest requesting pedestrian and bicycle accommodations on this project. There are no design features for safely accommodating pedestrians as part of this project.

9. WATER RELATED IMPACTS SUMMARY

County	Ballard	Route No.	US 60	Item No.	1-118.00
Date	08/22/2019	Program #	C-03060711	FD04 15550 C004 E143	
Federal Project No.					
State Project No.	FD04 15550 C004 E143				
Location Engineer	Chris Kuntz				

Section 1: Impact Checklist

Alternate 1

FLOODPLAIN IMPACTS		
FEMA Study Type	Yes	Community No.
Detailed FEMA Study with delineated floodway*	<input type="checkbox"/>	
Detailed FEMA Study without delineated floodway**	<input type="checkbox"/>	
Approximate FEMA Study	<input checked="" type="checkbox"/>	21007C0104C
No FEMA Study	<input type="checkbox"/>	210268

* If proposed design impacts the floodway, then it may require initiation of map revision process (CLOMR/LOMR).

** If proposed design impacts water surface elevations, then it may require initiation of map revision process (CLOMR/LOMR).

Potential impacts to floodplains and/or floodways shall be assessed early in the project. Refer to the Drainage Manual.

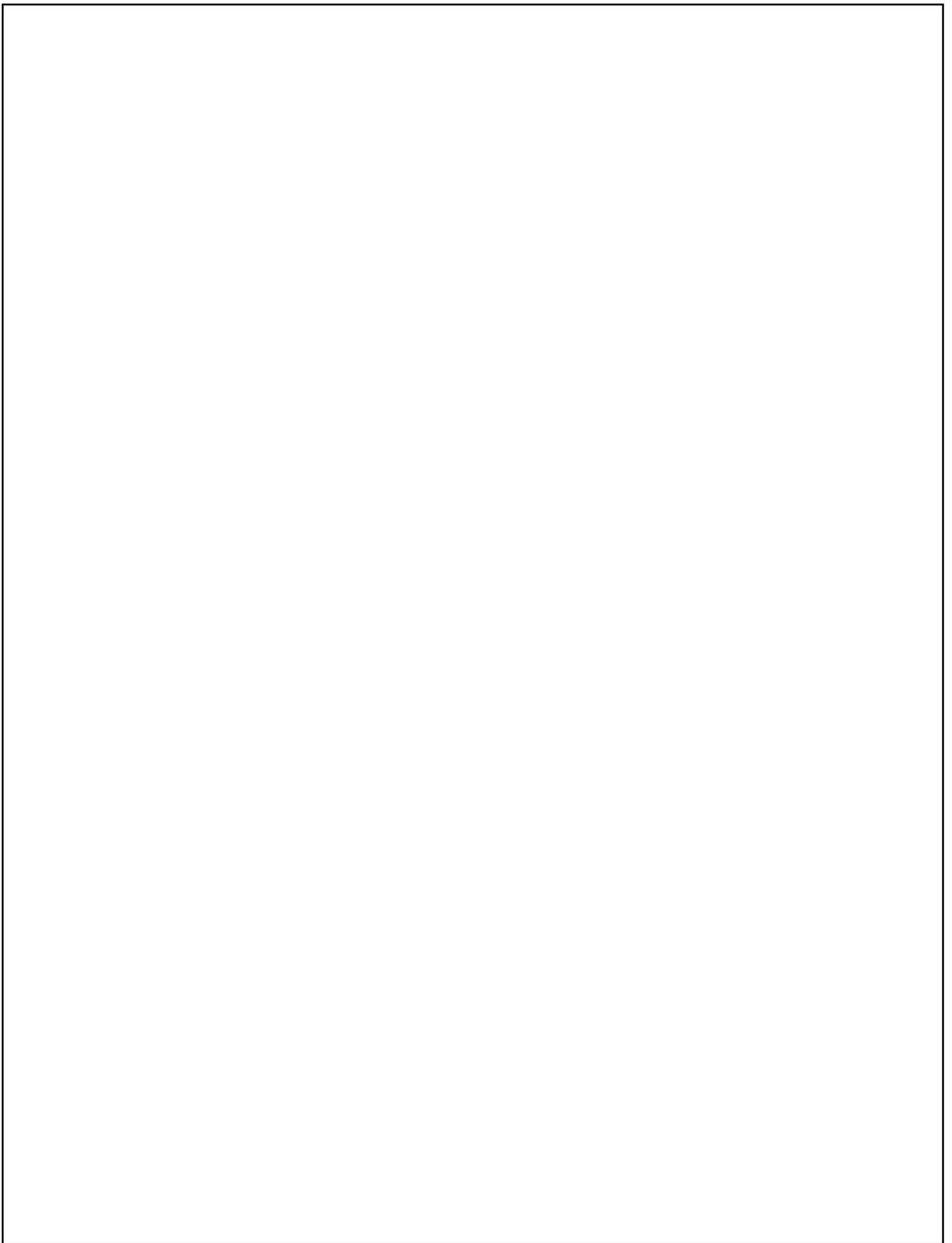
SIGNIFICANT RESOURCE IMPACTS	YES	NO
Are open sinkholes impacted? If so, how many sinkholes are impacted? 4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are wetlands impacted? If so, how many total acres are estimated? 0.14 acres	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are any of the streams in the project area designated "Special Use Waters" (e.g. Wild Rivers, Exceptional Waters, Outstanding State Resource Water, etc.)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Where possible, alignments should be developed that avoid significant resources. When it becomes impossible to avoid a significant resource, the project should be designed to minimize these impacts. Significant resource impacts are discussed in DR 202 of the drainage manual. Wetland impacts and their costs are discussed in DR 500 of the Drainage Manual.

Projects that impact special use waters may require an individual KPDES Erosion Control Permit. Contact the Division of Environmental analysis for more information.

STREAM CHANNEL IMPACTS	YES	NO		
Will stream relocations (channel changes) be needed? If so, check all that apply: 1. Will at least "1" relocation be over 100' in length? <input type="checkbox"/> 2. Will at least "1" relocation be over 300' in length? <input type="checkbox"/> 3. Will at least "1" relocation be over 500' in length? <input type="checkbox"/> How many total linear feet are estimated? None	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
Will new culverts or culvert extensions be constructed? If so, check all that apply: 1. Will at least "1" be over 300' in length? <input type="checkbox"/> 2. Will at least "1" be over 500' in length? <input type="checkbox"/> How many total linear feet are estimated? 485 LF	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
Will temporary stream crossings be needed?	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
Will excess material sites that require permitting be needed?	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
Will bridges be constructed?	<input type="checkbox"/>		<input checked="" type="checkbox"/>	

On highway projects that involve stream crossings such as bridge and culverts, it is often not feasible to totally avoid stream channel impacts. In these cases, design the project to minimize the impacts. Stream relocations should be avoided if possible. If stream relocations are unavoidable design to project to minimize their impacts. Stream channel impacts are discussed in DR 506, 601-3, 608-2, and 802-3 of the drainage manual.



Alternate 2

FLOODPLAIN IMPACTS		
FEMA Study Type	Yes	Community No.
Detailed FEMA Study with delineated floodway*	<input type="checkbox"/>	
Detailed FEMA Study without delineated floodway**	<input type="checkbox"/>	
Approximate FEMA Study	<input type="checkbox"/>	
No FEMA Study	<input checked="" type="checkbox"/>	210268

* If proposed design impacts the floodway, then it may require initiation of map revision process (CLOMR/LOMR).

** If proposed design impacts water surface elevations, then it may require initiation of map revision process (CLOMR/LOMR).

Potential impacts to floodplains and/or floodways shall be assessed early in the project. Refer to the Drainage Manual.

SIGNIFICANT RESOURCE IMPACTS	YES	NO
Are open sinkholes impacted? If so, how many sinkholes are impacted? 0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are wetlands impacted? If so, how many total acres are estimated? 0.63 acres	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are any of the streams in the project area designated "Special Use Waters" (e.g. Wild Rivers, Exceptional Waters, Outstanding State Resource Water, etc.)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Where possible, alignments should be developed that avoid significant resources. When it becomes impossible to avoid a significant resource, the project should be designed to minimize these impacts. Significant resource impacts are discussed in DR 202 of the drainage manual. Wetland impacts and their costs are discussed in DR 500 of the Drainage Manual.</p> <p>Projects that impact special use waters may require an individual KPDES Erosion Control Permit. Contact the Division of Environmental analysis for more information.</p>		

STREAM CHANNEL IMPACTS		YES	NO
Will stream relocations (channel changes) be needed? If so, check all that apply: 4. Will at least "1" relocation be over 100' in length? <input type="checkbox"/> 5. Will at least "1" relocation be over 300' in length? <input type="checkbox"/> 6. Will at least "1" relocation be over 500' in length? <input type="checkbox"/> How many total linear feet are estimated? none	<input type="checkbox"/>		<input checked="" type="checkbox"/>
Will new culverts or culvert extensions be constructed? If so, check all that apply: 3. Will at least "1" be over 300' in length? <input checked="" type="checkbox"/> 4. Will at least "1" be over 500' in length? <input type="checkbox"/> How many total linear feet are estimated? 560 LF	<input checked="" type="checkbox"/>		<input type="checkbox"/>
Will temporary stream crossings be needed?	<input type="checkbox"/>		<input checked="" type="checkbox"/>
Will excess material sites that require permitting be needed?	<input type="checkbox"/>		<input checked="" type="checkbox"/>
Will bridges be constructed?	<input type="checkbox"/>		<input checked="" type="checkbox"/>

On highway projects that involve stream crossings such as bridge and culverts, it is often not feasible to totally avoid stream channel impacts. In these cases, design the project to minimize the impacts. Stream relocations should be avoided if possible. If stream relocations are unavoidable design to project to minimize their impacts. Stream channel impacts are discussed in DR 506, 601-3, 608-2, and 802-3 of the drainage manual.

Alternate 3

FLOODPLAIN IMPACTS		
FEMA Study Type	Yes	Community No.
Detailed FEMA Study with delineated floodway*	<input type="checkbox"/>	
Detailed FEMA Study without delineated floodway**	<input type="checkbox"/>	
Approximate FEMA Study	<input type="checkbox"/>	
No FEMA Study	<input checked="" type="checkbox"/>	210268

* If proposed design impacts the floodway, then it may require initiation of map revision process (CLOMR/LOMR).

** If proposed design impacts water surface elevations, then it may require initiation of map revision process (CLOMR/LOMR).

Potential impacts to floodplains and/or floodways shall be assessed early in the project. Refer to the Drainage Manual.

SIGNIFICANT RESOURCE IMPACTS	YES	NO
Are open sinkholes impacted? If so, how many sinkholes are impacted? 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are wetlands impacted? If so, how many total acres are estimated? 2.42 acres	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are any of the streams in the project area designated "Special Use Waters" (e.g. Wild Rivers, Exceptional Waters, Outstanding State Resource Water, etc.)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Where possible, alignments should be developed that avoid significant resources. When it becomes impossible to avoid a significant resource, the project should be designed to minimize these impacts. Significant resource impacts are discussed in DR 202 of the drainage manual. Wetland impacts and their costs are discussed in DR 500 of the Drainage Manual.

Projects that impact special use waters may require an individual KPDES Erosion Control Permit. Contact the Division of Environmental analysis for more information.

STREAM CHANNEL IMPACTS	YES		NO	
<p>Will stream relocations (channel changes) be needed?</p> <p>If so, check all that apply:</p> <p>7. Will at least "1" relocation be over 100' in length? <input type="checkbox"/></p> <p>8. Will at least "1" relocation be over 300' in length? <input type="checkbox"/></p> <p>9. Will at least "1" relocation be over 500' in length? <input type="checkbox"/></p> <p>How many total linear feet are estimated? None</p>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
<p>Will new culverts or culvert extensions be constructed?</p> <p>If so, check all that apply:</p> <p>5. Will at least "1" be over 300' in length? <input type="checkbox"/></p> <p>6. Will at least "1" be over 500' in length? <input type="checkbox"/></p> <p>How many total linear feet are estimated? 200 LF</p>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
<p>Will temporary stream crossings be needed?</p>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
<p>Will excess material sites that require permitting be needed?</p>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
<p>Will bridges be constructed?</p>	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
<p>On highway projects that involve stream crossings such as bridge and culverts, it is often not feasible to totally avoid stream channel impacts. In these cases, design the project to minimize the impacts. Stream relocations should be avoided if possible. If stream relocations are unavoidable design to project to minimize their impacts. Stream channel impacts are discussed in DR 506, 601-3, 608-2, and 802-3 of the drainage manual.</p>				

Section 2 : Impact Discussion

Complete this section for the chosen alternative. Discuss the selected alternate's influence on each of the impacts listed above. Discuss any avoidance, minimization and/or mitigation measures included in the project.

Alternative 1 will cross over the Humphries Creek Tributary #2, however, there are no anticipated impacts to affect the floodplain or existing flood elevations. A flood study of this Zone A area will be completed.