

### DESIGN EXECUTIVE SUMMARY

<b>County:</b>	Todd	<b>Item #:</b>	3-80102.00
<b>Route Number(s):</b>	US 79	<b>State Program #:</b>	1221701D
<b>BMP/EMP:</b>	7.479/7.706	<b>Federal Project #:</b>	STP 079 1007
<b>Type of Work:</b>	Minor Widening	<b>State Project #:</b>	FD52 110 0079 007-000

**Highway Plan Project Description:**  
 Replace and widen bridge to 4 lanes on US-79 at MP 7.613 (Bridge over Elk Fork Creek) (2020CCN)

**EXISTING CONDITIONS**

<b>ADT (current):</b>	3,553 (2019)	<b>Truck Class:</b>	AAA
<b>Existing Functional Classification:</b>	<input type="checkbox"/> Urban <input checked="" type="checkbox"/> Rural Arterial	<b>Terrain:</b>	Rolling
<b>Posted Speed Limit:</b>	mph "or"	<b>Statutory Speed Limit:</b>	<input type="checkbox"/> 35 mph (urban) <input checked="" type="checkbox"/> 55 mph (rural)
<b>Existing Bike Accommodations:</b>	None	<b>Ped:</b>	<input type="checkbox"/> Sidewalk <input type="checkbox"/> Other: ___N/A___

**PROPOSED CONDITIONS**

<b>Design Functional Classification:</b>	<input type="checkbox"/> Urban <input checked="" type="checkbox"/> Rural Arterial	<b>Design ADT ( ): DHV:</b>	<b>Access Control:</b> Min. Spacing: 600' By Permit
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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	<b>30 MPH</b>	Minimum: 55 MPH Selected: 55 MPH	<b>30 MPH</b>	<input checked="" 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.

	EXISTING CONDITIONS	AASHTO Guidance	Recommendation	Exception (≥ 50 mph)	Variance (< 50 mph)
Lane Width, No. of Lanes	11.25', 2 Lanes	12', 2 Lanes	12', 2 Lanes	<input type="checkbox"/>	<input type="checkbox"/>
Shoulder Width (Minimum Usable)	0.5'-1.0' Paved	8'	8' Paved, 2' Earth	<input type="checkbox"/>	<input type="checkbox"/>
Horiz. Curve Radius (Minimum)	Horizontal Tangent	960'	Horizontal Tangent	<input type="checkbox"/>	<input type="checkbox"/>
Max. Superelev. Rate (emax= 8%)	Normal Crown	8%	Normal Crown	<input type="checkbox"/>	<input type="checkbox"/>
Stopping Sight Distance (Minimum)	235'	495'	238'	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Max. Grade (%)	4.13%	5.00%	4.13%	<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	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>

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

## DESIGN EXECUTIVE SUMMARY

**Design Criteria Notes:**

**Environmental Action:**

CE Level 1 ▼

**Completion Date:** 04/02/21

scheduled  actual

**Existing Pavement Depths: Not specified in original plans**

**Include:**

1. Typical Sections, including bridges (on 8.5X11 inch paper)
2. Map showing project location
3. Preliminary line & grade meeting minutes
  - Purpose and Need Statement
  - Project overview and existing conditions
  - Discussion of Alternatives (including preferred and no build) with respective traffic control schemes, utility and right of way impacts, environmental impact, and performance (traffic analysis, safety analysis, etc.)
  - Consideration of Bicycle and pedestrian facilities discussion (**HD-1501**)
  - Cost comparison table of alternatives vs. Highway plan (include D, R, U, & C)
  - Discussion if preferred alternative cost is >115% than the highway plan
  - Discussion of clearzone
  - Discussion of design exceptions and mitigation strategies
  - Discussion of low cost maintenance improvements
  - Additional Comments and action items
4. Water related impact summary

**Submitted by Project Engineer:**

KYTC  Consultant

**Date:**

**Recommended by Project Manager:**

**Date:**

**Tier Level Approval**

Tier 1  Tier 2  Tier 3

**Location Engineer:**

**Date:**

**Roadway Design Branch Manager:**

**Date:**

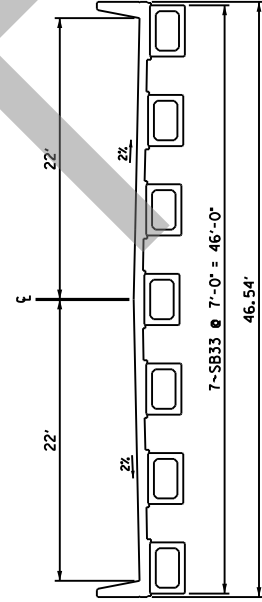
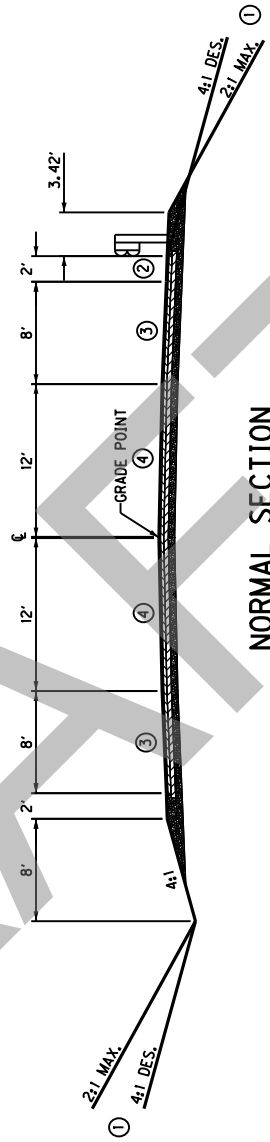
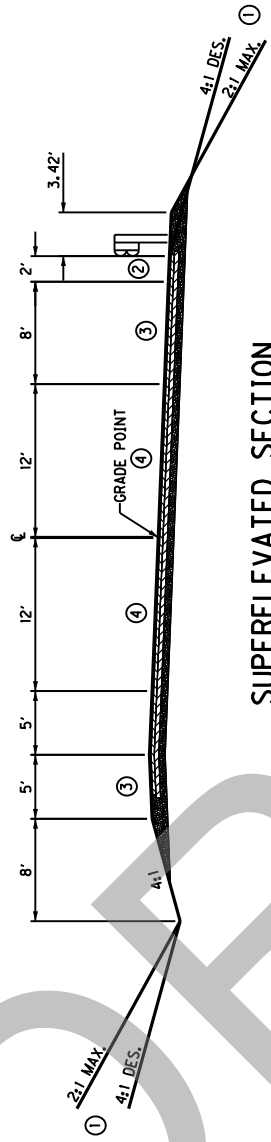
**Geometric Approval**

Director, Div. of Hwy. Design ▼

**Date:**

**Granted by:**

# 3-80102.00 TYPICAL SECTIONS



SUPERELEVATED SECTION

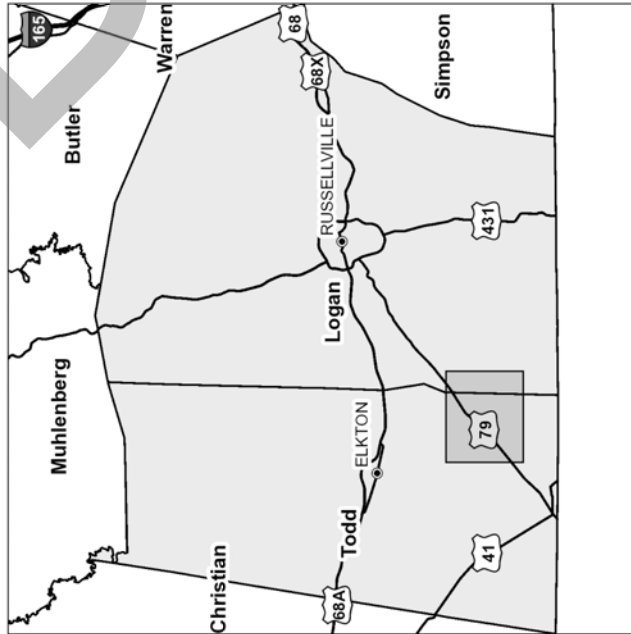
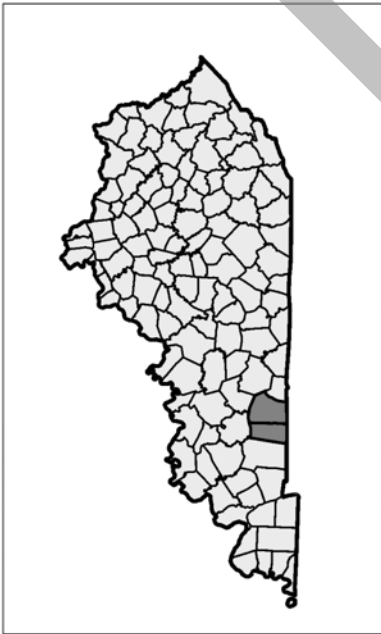
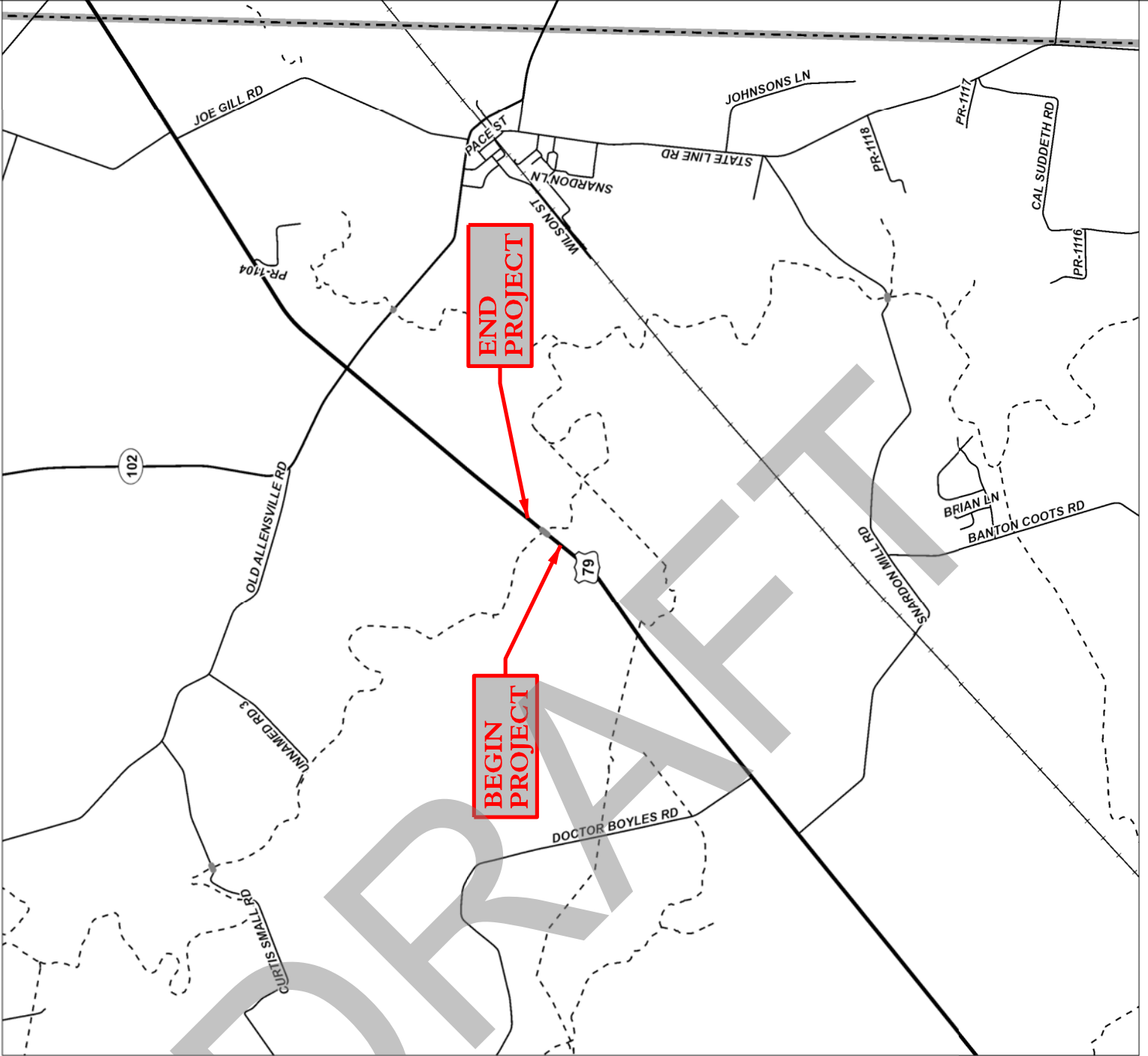
NORMAL SECTION

BRIDGE SECTION

**NOTES:**

- ① SEE CROSS SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDER.
- ② 2' SHOULDER SHALL BE PAVED WHERE GUARDRAIL WILL BE INSTALLED.
- ③ PAVED SHOULDERS SHALL BE CONSTRUCTED AT A 4% CROSS SLOPE.
- ④ CONSTRUCT FIRST 3'-5' OF SLOPE BEHIND GUARDRAIL WITH A 4% SLOPE EXCEPT WHERE GUARDRAIL END TREATMENTS WILL BE INSTALLED. HERE CONSTRUCT A 10% CROSS SLOPE.
- ⑤ CSB SHOULDERS SHALL BE CONSTRUCTED WITH A 4% CROSS SLOPE.
- ⑥ 2% TYPICAL PAVEMENT CROSS SLOPE.  
⑦ MAX=8.0%.
- ⑧ CONSTRUCT ENTRANCE SHOULDERS WITH AN 8% CROSS SLOPE.





**3-80102.00  
TODD CO.  
US 79 (0.227 MILES)  
MP 7.479 TO MP 7.706**

## **Project Overview**

This project consists of a bridge replacement on US 79 over Elk Fork Creek approximately three miles south of the Todd/Logan Co. line. US 79 is a rural major arterial for the area that is on the National Highway System with a significant percentage (19%) of truck traffic that connects Russellville, KY and Clarksville, TN. The segment of US 79 that this bridge is located has an approximate traffic count of 3,553 ADT (2019). The existing bridge is located in a horizontal tangent with rolling topography and has roadway lane widths of 11.25' and a total pavement width of 23.5', which results in approximately 6" paved shoulders. The existing four span bridge is 23.8' wide between the inside of each curb. It is striped with approximately 9.75' lanes and 2' shoulders.

## **Purpose and Need**

US 79 in this area serves as a major arterial between Russellville, KY and Clarksville, TN and is designated as a National Highway System Route. US 79 also provides industrial and commuter traffic access to I-24 in north Tennessee. The segment of US 79 between the KY/TN state line and Russellville, KY has been identified in the highway plan for widening to better accommodate the 19% truck traffic that currently exists on this roadway. This project will consist of a bridge replacement over the Elk Fork Creek in Todd County at mile point 7.613. While this bridge has a structural rating of 63.3 and is not structurally deficient the narrow lanes on the bridge deck, coupled with heavy truck traffic creates potential risks of collision. This bridge also has a pier located in the edge of the stream on the outside of a curve in the creek that regularly creates large log jams. The proposed bridge will be designed to remove this pier to eliminate the collection of debris resulting in decreased maintenance funds that will be required at this location. The purpose of this project is to ensure the flow of traffic across Elk Fork Creek while also providing connection for residents and industry between Russellville and Clarksville.

## **Discussion of Alternatives**

- **No-Build Alternate – Maintain Current Structure**
  - This alternate is to leave the current structure in place, do no removal or reconstruction of the structure. This will be to maintain the bridge until it becomes structurally deficient, posing risks as the weight limit to cross may require trucks to detour. This alternate is not entirely feasible, despite the structure not being structurally deficient, as it does not address the needs of the project. The current structure is too narrow for the current high volume of truck traffic that travels this corridor.
- **Proposed Structure**
  - One notable situation at this location is a recurring log jam that occurs on the northern bank of the creek where one of the existing piers is located. Structures design has laid out a 2 span bridge and has placed the proposed pier on the southern edge of the stream which will hopefully eliminate the log jam that currently exists at this structure. The proposed structure will consist of 33" deep spread box beams in a two span configuration with a 90' and a 65' span and 30 degree skew abutments. The proposed structure was used in two different geometric alignments that will be discussed in more detail in the following section.

- **Alternate 1**

- Geometric Layout (See Exhibit 1)
  - Alternate 1 centerline is offset 13.38' from the existing centerline and uses four 3,270' radius curves to tie back into the existing roadway. These curves require a 4% superelevation rate. The length for this alternate is controlled by the required length to transition from full super to normal crown. This alternate has a total length of 1530' and will require the extension of an existing 2.5' X 3' box culvert.
- Utilities
  - Alternate 1 will require the involvement of three utility companies (electric, telephone and water). The required relocations are minor with no foreseen extraordinary circumstances.
- Environmental
  - The environmental document has been consulted out and is under contract with Haworth Meyer Boleyn. The preliminary work has begun with no red flags at this point.
- Right of Way
  - Alternate 1 consists of four right of way parcels. The Right of Way Division does not expect any major issues.
- Construction/Maintenance of Traffic (See Exhibit 3 & 4)
  - The maintenance of traffic concept will consist of a two phase concept. Phase 1 construction will require the installation of a temporary traffic signal so that traffic can be reduced to one way traffic. Due to the existing bridge superstructure and the point at which it can be demolished to allow for the proposed construction will only leave 11' between the temporary barrier face and the existing curb. After Phase 1 construction is complete and traffic has been shifted to the proposed bridge two way traffic can resume and the temporary traffic signal can be removed.

- **Alternate 2**

- Geometric Layout (See Exhibit 2)
  - Alternate 2 matches the existing centerline and maintains the horizontal tangent. The length for this alternate is controlled by the 15:1 shoulder taper for the Type 4A guardrail end treatments and has a total length of 1200'. The reduced length results in approximately \$200,000 in construction cost savings and an additional \$46,500 in right of way and utility cost savings for a total of \$246,500.
- Utilities
  - Alternate 2 will require the involvement of two utility companies (electric and telephone). The required relocations are minor with no foreseen extraordinary circumstances.

- Environmental
  - See alternate 1 discussion.
- Right of Way
  - Alternate 2 consists of three right of way parcels. The Right of Way Division does not expect any major issues.
- Construction/Maintenance of Traffic (See Exhibit 3 & 5)
  - Alternate 2 will have the same Phase 1 MOT layout as Alternate 1, however the major difference between the two is that Alternate 2 will require one way traffic with a temporary signal throughout the construction of the project.

### **Detours**

- Given the narrow lane width that will be able to be provided during Phase 1 construction it was brought up that detours will need to be considered for wide loads and certain farm equipment. The best route for through traffic traveling from Guthrie to Russellville would be to take KY 181 north to Elkton and then travel east on US 68 to Russellville. This results in an additional 7 miles when compared to traveling US 79 from Guthrie to Russellville.
- For local traffic that might be required to detour they would have to use KY 102 & KY 848 traveling through Allensville which would result in a maximum detour of 19 miles.

### **Bicycle and Pedestrian Facilities**

- Currently the facility does not have any bicycle or pedestrian only features such as: bike lanes, sidewalks, or shared use paths. There is not any significant bicycle or pedestrian traffic to require the addition of bicycle and pedestrian facilities at this time.

### **Clear Zone Discussion**

- The project team recognizes that the AASHTO Roadside Design guide recommends a clear zone width of 20-22ft for slopes that are 6:1 or flatter, and 24-30ft for slopes that are 5:1 or 4:1. The project team also recognizes the impacts of such slopes can have on acquiring property, impacting streams or other habitat, impacting utilities, or other such constraints budgetary or otherwise. In order to be considerate of all of these factors, the project team chose a typical with an appropriate clear zone width that also allows a minimal footprint. The recommended typical sections allow for a minimum of 10' of width for clear zone accommodated by the shoulders for the fully widened sections, and between 2-10' minimum elsewhere. This widening project only concerns the bridge and the approach work required to tie in the widening via tapers and other means. Due to the length of the project, the majority of the clear zone will be limited to the shoulder width as guardrail will be used as a barrier to protect the bridge ends from collisions as well as vehicles from going off the roadway near the bridge. Since the grade difference between the top of roadway and bottom of the stream are significant, guardrail is required for protection of both the bridge and side slopes and will therefore be the controlling object for clear zone. At locations where there is not any guardrail, the clear zone will vary depending on the constructed and or existing slopes and shoulder width.

**Preferred Alternative**

- After the evaluation of both alternatives it was decided by the project team that **Alternate 2** would be carried forward for final design. The two major factors that played into the decision was the fact that Alternate 2 does not introduce unnecessary curvature to an existing horizontal tangent and would be safer and that it can be tied to the existing roadway sooner which reduces the project footprint and cost. Alternate 2 is also has the least impact on utilities and right of way. The one negative for Alternate 2 is the fact that a temporary traffic signal with one way traffic will be required for a longer timeframe than Alternate 1. However, the project team felt that an accelerated schedule could be required to minimize this impact to the community and over the life of the project the safety benefits of Alternate 2 outweighed the decreased traffic delay of Alternate 1.

**Cost Analysis**

- Project included in the 2020 Highway Plan  
 3-80102.00 Replace and Widen Bridge to 4 Lanes on US-79 at MP 7.613 (Bridge over Elk Fork Creek)

			SYP	PL&G	(Preferred) PL&G
			Estimate	Alternate 1 Estimate	Alternate 2 Estimate
SPP	D	2021	\$ 375,000	\$ 375,000	\$ 375,000
SPP	R	2022	\$ 600,000	\$ 80,000	\$ 63,500
SPP	U	2022	\$ 300,000	\$ 140,000	\$ 110,000
SPP	C	2023	<u>\$ 2,500,000</u>	<u>\$ 3,000,000</u>	<u>\$ 2,800,000</u>
Total			\$ 3,775,000	\$ 3,595,000	<b>\$3,348,500</b>

**Note: This project has recently been selected for a BUILD Grant and must be let for construction by September 2022**

**Design Exceptions**

- The existing vertical curve just north of the bridge has approximately 235' of stopping sight distance which correlates to a 30 MPH design speed. However, after review of the crash data in the vicinity of this bridge there have been 2 crashes over the past five years and this vertical curve does not appear to be causing a safety issue. In order to comply with a 55 MPH design speed significant grade changes would be required. Given the project scope and lack of crashes the project team decided to match existing grade.

**Low Cost Maintenance Improvements**

- Scope of this project is to replace and widen the bridge. There are no low cost maintenance improvements that would be able to the scope of the project.



**Water Related Impacts Summary**

<b>County</b>	Todd	<b>Route No.</b>	US 79	<b>Item No.</b>	03-80102.00
<b>Date</b>	1-28-2021	<b>Program #</b>	1221701D		
<b>Federal Project No.</b>	STP 079 1007				
<b>State Project No.</b>	FD52 110 0079 007-000				
<b>Location Engineer</b>	Wendy Southworth				

**Section 1: Impact Checklist**

The impacts for all alternates are similar with the variation being the type of bridge and number of piers.

FLOODPLAIN IMPACTS		
FEMA Study Type	Yes	Community No.
Detailed FEMA Study with delineated floodway*	<input checked="" type="checkbox"/>	21219C0300C
Detailed FEMA Study without delineated floodway**	<input type="checkbox"/>	
Approximate FEMA Study	<input type="checkbox"/>	
No FEMA Study	<input type="checkbox"/>	
<p>* If proposed design impacts the floodway, then it may require initiation of map revision process (CLOMR/LOMR).</p> <p>** If proposed design impacts water surface elevations, then it may require initiation of map revision process (CLOMR/LOMR).</p> <p>Potential impacts to floodplains and/or floodways shall be assessed early in the project. Refer to the Drainage Manual.</p>		

SIGNIFICANT RESOURCE IMPACTS	YES		NO	
Are open sinkholes impacted? If so, how many sinkholes are impacted?	<input type="checkbox"/>		<input checked="" type="checkbox"/>	
Are wetlands impacted? If so, how many total acres are estimated? _____ acres	<input type="checkbox"/>		<input checked="" 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>1. Will at least "1" relocation be over 100' in length? <input type="checkbox"/></p> <p>2. Will at least "1" relocation be over 300' in length? <input type="checkbox"/></p> <p>3. Will at least "1" relocation be over 500' in length? <input type="checkbox"/></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>1. Will at least "1" be over 300' in length? <input type="checkbox"/></p> <p>2. Will at least "1" be over 500' in length? <input type="checkbox"/></p> <p>How many total linear feet are estimated? _____ LF</p>	<input type="checkbox"/>	<input checked="" 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 checked="" type="checkbox"/>	<input 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.

## **Section 2 : Impact Discussion**

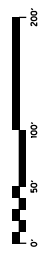
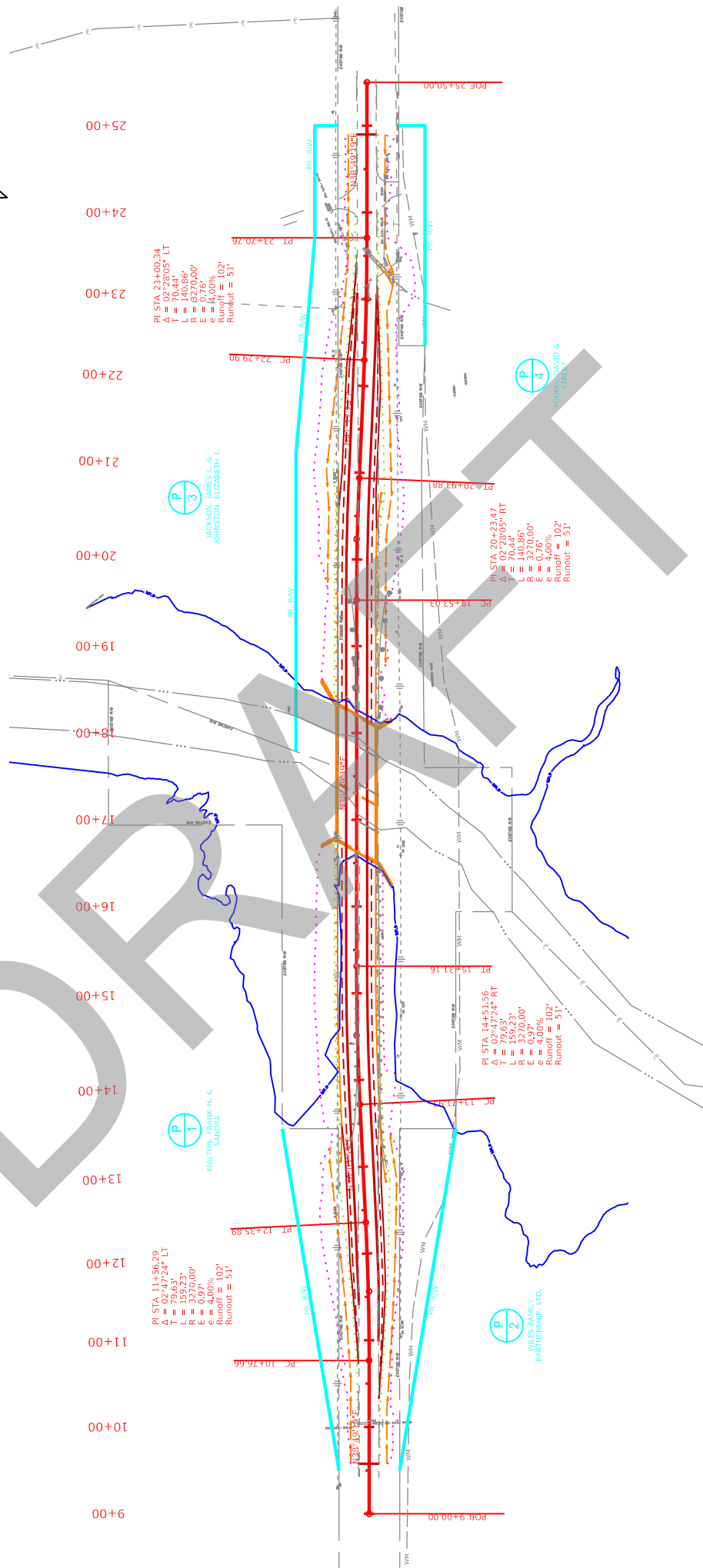
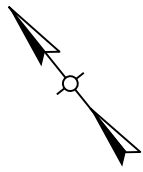
Complete this section for the chosen alternative. Discuss the selected alternate's influence on each of the impacts listed above. Discuss any avoidance, minimization and/or mitigation measures included in the project.

The selected alternate chosen results in less impact on the headwater. The proposed bridge span and pier arrangement was designed to eliminate a reoccurring log jam that currently exists with the existing bridge pier configuration. With the reduction in piers the proposed stream flow will meet all required guidelines. There are minimal ditching and approach work to avoid further impacts to the drainage area and flow paths.

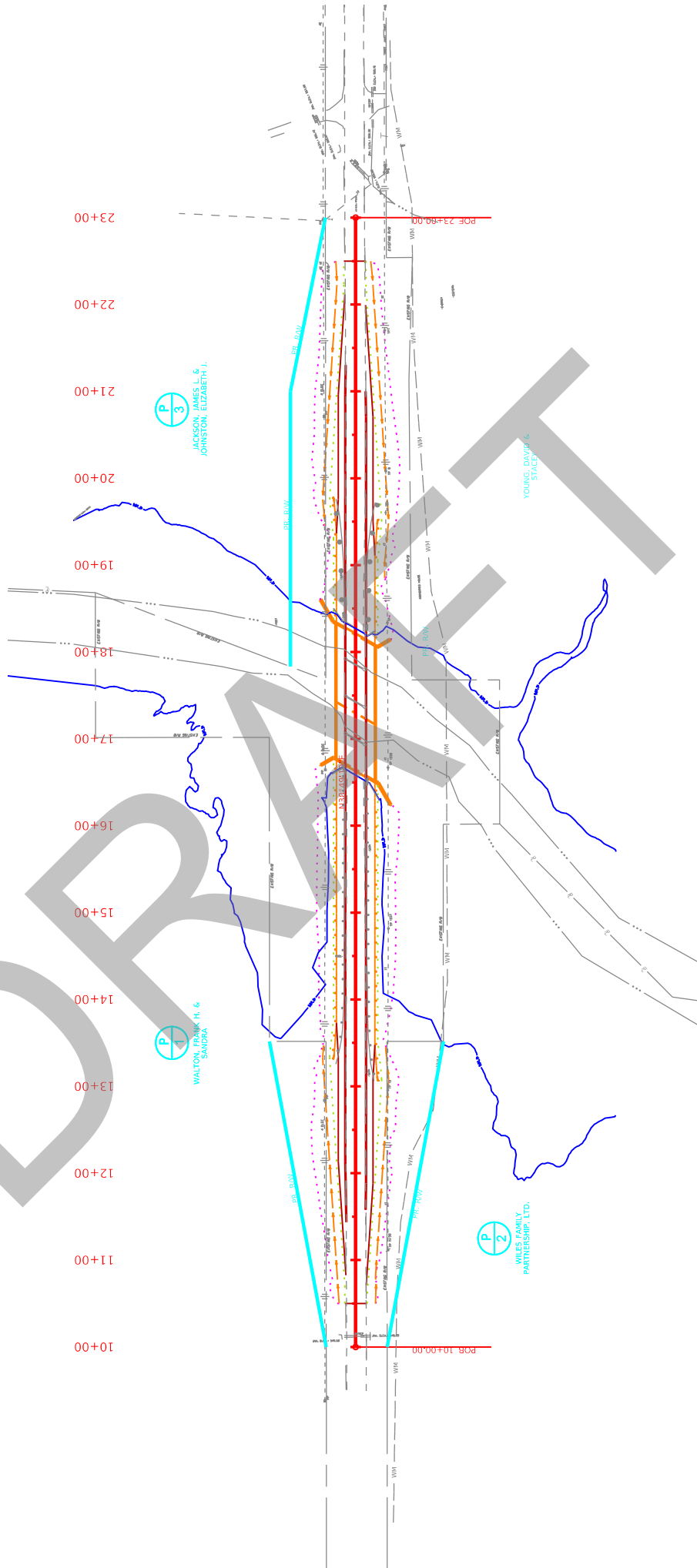
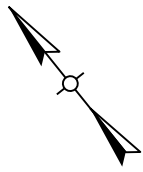
Proper Erosion Control measures will be utilized per KYTC standards and will include BMP items such as silt fence, silt checks, etc. to protect the waters of Elk Fork Creek.

DRAFT

# 3-80102.00, US 79 BRIDGE REPLACEMENT, TODD COUNTY, MP 7.613 ALTERNATE 1



# 3-80102.00, US 79 BRIDGE REPLACEMENT, TODD COUNTY, MP 7.613 ALTERNATE 2



# 3-80102.00 CONSTRUCTION PHASING

## ALTERNATE 1

## ALTERNATE 2

PHASE 1:  
PARTIALLY DEMOLISH EXISTING BRIDGE

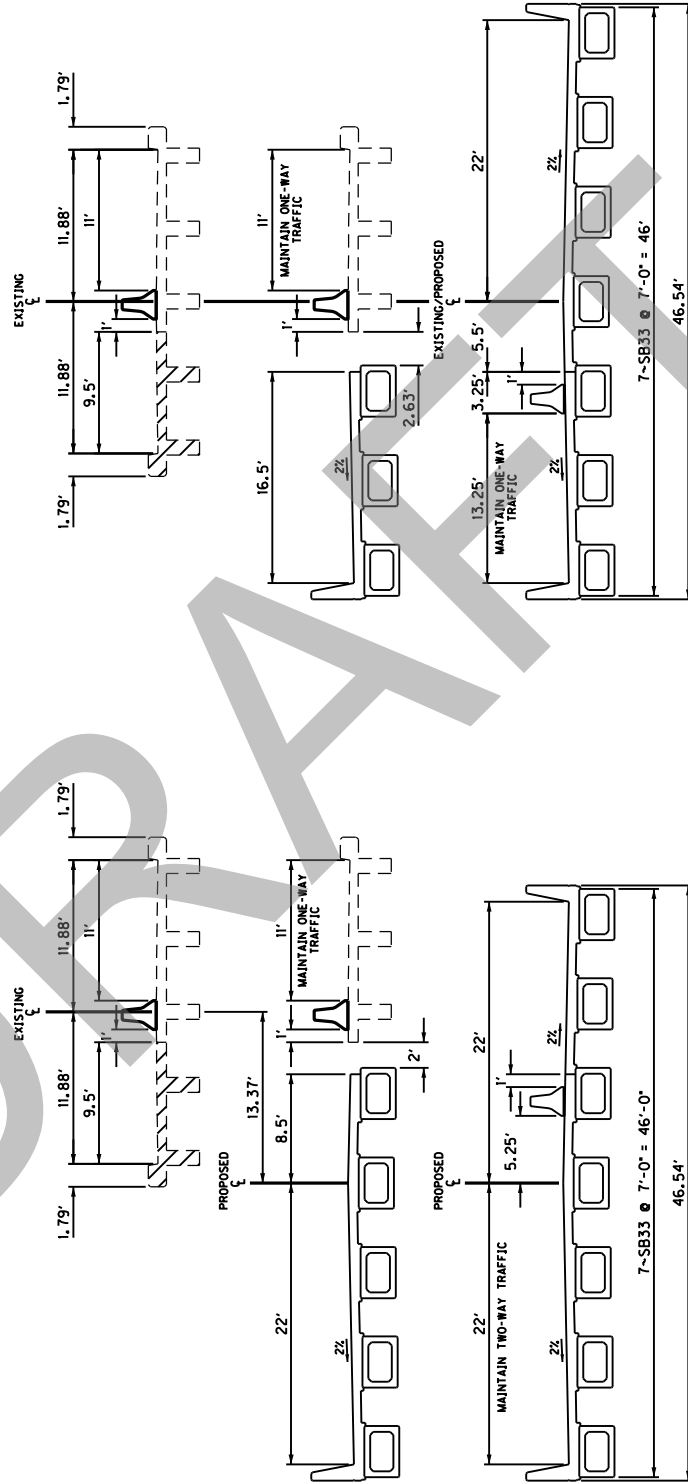
PHASE 1:  
PARTIALLY DEMOLISH EXISTING BRIDGE

PHASE 2:  
MAINTAIN ONE-WAY TRAFFIC ON PARTIALLY CONSTRUCTED PROPOSED BRIDGE. CONSTRUCT PHASE 1 OF PROPOSED BRIDGE

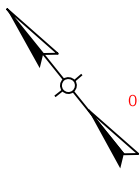
PHASE 2:  
MAINTAIN ONE-WAY TRAFFIC ON PARTIALLY CONSTRUCTED PROPOSED BRIDGE. CONSTRUCT PHASE 1 OF PROPOSED BRIDGE

PHASE 3:  
MAINTAIN TWO-WAY TRAFFIC ON PARTIALLY CONSTRUCTED PROPOSED BRIDGE. COMPLETE REMAINING OF EXISTING BRIDGE AND COMPLETE PROPOSED BRIDGE

PHASE 3:  
MAINTAIN ONE-WAY TRAFFIC ON PARTIALLY CONSTRUCTED PROPOSED BRIDGE. COMPLETE REMAINING OF EXISTING BRIDGE AND COMPLETE PROPOSED BRIDGE

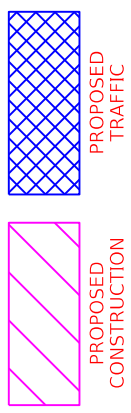
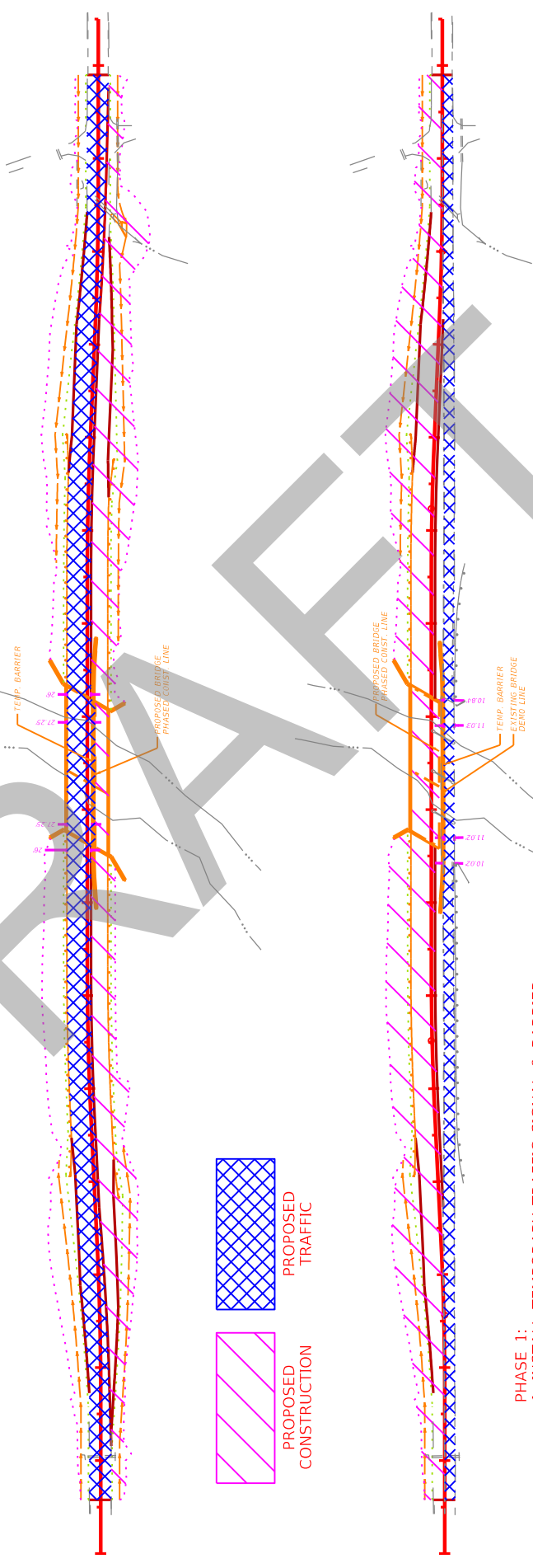


# 3-80102.00, US 79 BRIDGE REPLACEMENT, TODD COUNTY, MP 7.613 ALTERNATE 1 MAINTENANCE OF TRAFFIC CONCEPT

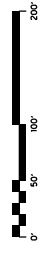


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10+00  
9+00

- PHASE 2:**
1. INSTALL TEMPORARY BARRIER ON PROPOSED BRIDGE AND SHIFT TWO WAY TRAFFIC TO NEWLY CONSTRUCTED ROADWAY
  2. DEMO REMAINING PORTION OF EXISTING BRIDGE
  3. CONSTRUCT EAST SIDE OF PROPOSED PROJECT

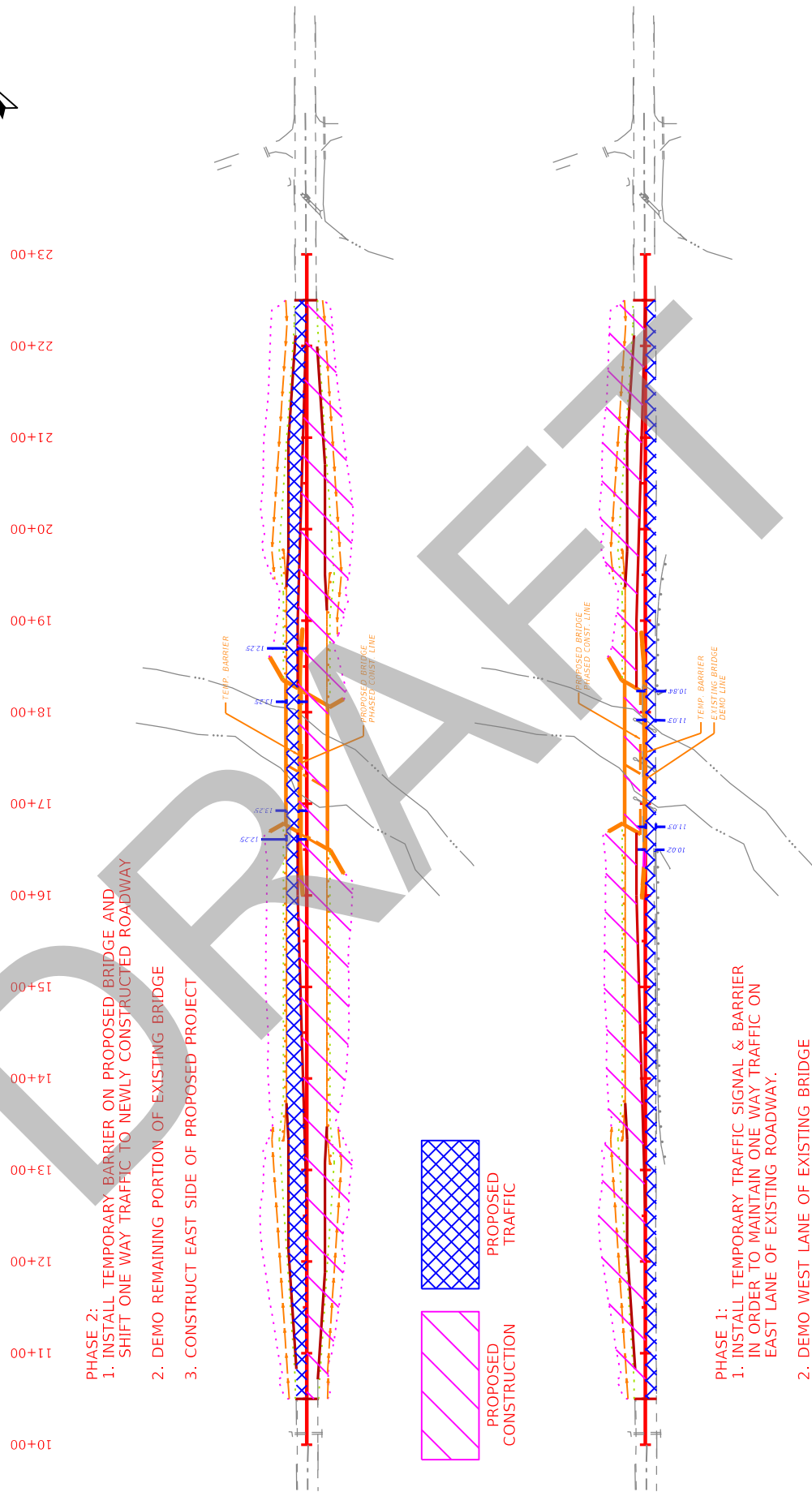
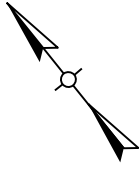


- PHASE 1:**
1. INSTALL TEMPORARY TRAFFIC SIGNAL & BARRIER IN ORDER TO MAINTAIN ONE WAY TRAFFIC ON EAST LANE OF EXISTING ROADWAY.
  2. DEMO WEST LANE OF EXISTING BRIDGE
  3. CONSTRUCT WEST SIDE OF PROPOSED PROJECT

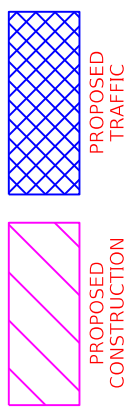


# 3-80102.00, US 79 BRIDGE REPLACEMENT, TODD COUNTY, MP 7.613

## ALTERNATE 2 MAINTENANCE OF TRAFFIC CONCEPT



- PHASE 2:**
1. INSTALL TEMPORARY BARRIER ON PROPOSED BRIDGE AND SHIFT ONE WAY TRAFFIC TO NEWLY CONSTRUCTED ROADWAY
  2. DEMO REMAINING PORTION OF EXISTING BRIDGE
  3. CONSTRUCT EAST SIDE OF PROPOSED PROJECT



- PHASE 1:**
1. INSTALL TEMPORARY TRAFFIC SIGNAL & BARRIER IN ORDER TO MAINTAIN ONE WAY TRAFFIC ON EAST LANE OF EXISTING ROADWAY.
  2. DEMO WEST LANE OF EXISTING BRIDGE
  3. CONSTRUCT WEST SIDE OF PROPOSED PROJECT

