KENTUCKY TRANSPORTATION CABINET

Value Engineering Study

Final Report

VE Number: 202303

I-75 Widening, MP 20.2 to MP 28.851 Laurel & Whitley Counties

Item No. 11-14.80

Workshop Dates: 24-28 July 2023 (Virtual Workshop)

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RHA

30 August 2023

Disclaimer

The information contained in this report summarizes the professional opinions of the VE Team members during the Value Engineering Study. These opinions were based on the information provided to the VE Team at the time of the Study. This information may develop further as the project continues, and new data may become available after this report was created. Evaluation on how this new information may affect the value proposals and findings contained in this report must be considered when using its content to judge their feasibility or any decision made about them.

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Table of Contents

Table of Contents (cont.)

Section 5 – Value Engineering Proposals

Table of Contents (cont.)

Section 6 - Appendices

Section

1

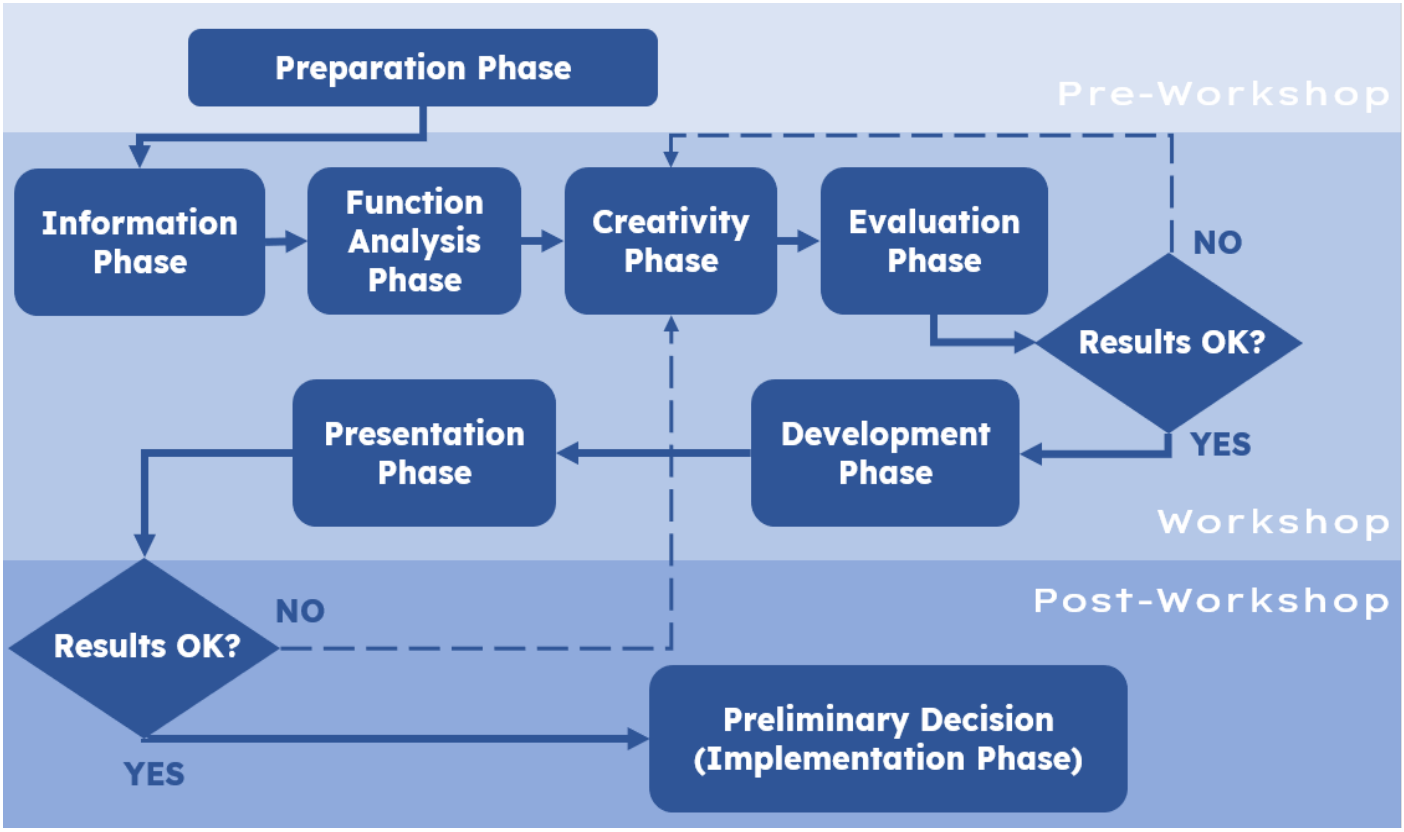
Introduction

Section 1 – Introduction

1.1 Value Methodology

The value methodology (Synonyms: value analysis, value engineering, and value management) is a function-oriented, systematic, team approach to add customer value to a program, facility, system, or service. Improvements like performance, quality, initial and life cycle cost are paramount in the value methodology.

Figure 1-1: The VM Process



The workshop is conducted in accordance with the methodology as established by SAVE International, the value society, and is structured using the Job Plan as outlined on the following pages.

Table 1-1: The VM Job Plan

Value Methodology Stage / Phase	VM Phase Functions Achieved	Objectives of this Phase	Outcomes of this Phase
Phase 1: Preparation Phase	Identify Subject Identify Goals Define Value Organize Effort	• Identify the study project • Identify roles and responsibilities • Define study scope, goals, and objectives • Select team leader • Conduct pre-study meeting • Select value study team members • Identify stakeholders, decision-makers, and technical reviewers • Obtain time commitment • Identify data collection • Select study dates • Determine study logistics, agenda • Collect and distribute data • Perform technology dry-run for a virtual workshop • Send team primer to value study team • Team members to complete Key Issues Memos (KIM)	• Fosters understanding of value study priorities • Defines and manages expectations • Organizes the value study • Offers a thorough review of the project • Tests meeting platform and virtual tools to maximize engagement and collaboration • Primes the team for the value workshop
Phase 2: Information Phase	Analyze Information Transform Information Orient Participants	• Present design concept • Present stakeholders' interests • Review project issues and objectives • Discuss deviation from design standards • Define project performance metrics • Discuss problems the project must solve • identify issues the design may not address • Visit project site / virtual site tour	• It brings all value study team members to a common understanding of the project, including its challenges and constraints • Establishes the benchmark for which to identify alternatives • Gains a real-world perspective of the project and builds the foundation for function analysis
Phase 3: Function Analysis Phase	Define Functions Allocate Resources Allocate Performance Prioritize Functions	• Identify and classify functions • Apply cost and risk relative to performance • Prioritize functions • Select specific functions for study	• Provides a comprehensive understanding by focusing on what the project does rather than what it is • Identifies what the project must do to satisfy needs and objectives • Focuses on functions with the greatest opportunity for project improvements
Phase 4: Creativity Phase	Generate Ideas	• Brainstorm to generate performance-focused ideas for alternative ways to perform functions • Discuss, build on and clarify ideas	• The value team develops a broad array of ideas that provide a wide variety of possible alternative components or methods to improve project value
Phase 5: Evaluation Phase	Evaluate Ideas Select Ideas	• Eliminate obvious "fatal flaw" ideas • Score ideas based on meeting performance criteria, value key and project/study goals	• Prioritizes ideas for development, focusing on those with the highest potential for performance improvement and cost savings • Determine value: performance/cost

Value Methodology Stage / Phase	VM Phase Functions Achieved	Objectives of this Phase	Outcomes of this Phase
		• Discuss conflicting rankings, further clarify ideas and determine final rankings • Discuss ideas with client and decision-makers (midpoint review) • Assign alternatives for the development phase	• Focuses team's effort to develop alternatives that best meet client study objectives
Phase 6: Development Phase	Transform Ideas Develop Information	• Validate and refine idea concepts • Compare to the original design concept • Define implementation considerations • Prepare sketches and calculations • Measure performance • Estimate costs, life-cycle cost benefits/costs	• Provides a side-by-side comparison of baseline and alternative—concepts, initial costs, life-cycle costs, sketches, performance metrics
Phase 7: Presentation Phase	Present Information Propose Change	• Present developed ideas to client, designers, decision-makers, stakeholders • Document feedback • Produce draft report	• Ensures management and other key stakeholders understand the rationale of the value alternatives and design suggestions
Phase 8: Implementation Phase	Implement Change Manage Change Realize Value	• Document process and study findings • Develop and distribute VE study summary report • Review study summary report • Assess alternatives for acceptance • Prepare draft implementation dispositions • Resolve conditionally accepted alternatives • Develop an implementation plan with the project manager • Project manager sign-off on VE implementation plan • Final presentation of study results	• Involves those who will implement and increases the likelihood of implementation • Improves the actual value of the project

1.2 Report Contents

The report provides the outcomes associated with this VE workshop and includes the following sections:

Section 1: Introduction – This section outlines the VE process and explains the content of the report.

Section 2: Project Description – This section outlines the project background, project corridor and project purpose and need.

Section 3: Executive Summary – This section is an overview that includes project background, summary of results, a list of the VE team members and the VE punch list.

Section 4: Summary Information – This section provides an overview in table format of the VE Proposals and Design Comments.

Section 5: VE Proposals and Design Suggestions – This section includes alternatives developed as a workbook during the workshop. Each workbook contains the following information:

- Unique Identifying Number (i.e., Value Engineering Proposal No. 1, 2, 3, 4, etc.)
- Creative Idea Number
- Creative Idea Title
- Function Identification
- VE Proposal Synopsis
- Baseline Concept – brief description
- VE Proposal Description – brief description
- Advantages
- Disadvantages
- Cost Summary
- Sketches/Diagrams (Baseline and Proposed), if applicable
- Discussion & Justification
- Initial Cost Information
- Life-cycle Cost Information, if applicable

Section 6: Appendices

- Appendix A – Study Participants
- Appendix B – Pareto Cost Models
- Appendix C – Function Analysis
- Appendix D - Creative Idea List and Evaluation
- Appendix E – Supporting Data
    - Risk Identification
    - VE Team Observations
    - Agenda

Section

2

Project Description

Section 2 – Project Description

2.1 Purpose & Need

The purpose of the I-75 Widening Project is to address capacity deficiencies and operational issues in the existing corridor and provide increased efficiency and safety for the traveling public.

2.2 Background

The Kentucky Transportation Cabinet (KYTC) is in the design phase of a project to widen I-75 between MP 20.2 and MP 28.851, which includes a series of bridges, overpasses and underpasses, and two major exit interchanges. These include:

- Exit 25 crossing Cumberland Falls Highway (W25)
- Lynn Camp Bridge crossing Lynn Creek
- Keavy Road
- Barton Mill Road (1259)
- W 5th Street Road (727)
- Eatontown Road (3001)
- Corinth Road
- Tidal Wave Road (3000)
- Bacon Creek Road
- Exit 29 crossing W Cumberland Gap Parkway (E25)

I-75 will serve through-traffic and local users including roughly 27% truck usage.

This portion of I-75 is classified as an Arterial Interstate. This project is identified in the 2020 Kentucky Highway Plan as Item No. 11-14.80, Widen I-75 from Two to Three Lanes from (MP 20.2) 0.25 Miles South of Tidal Wave Road (SR3000) to (MP 28.851) the I-75 US 25 E Interchange. The proposed project will address increasing traffic volumes and traffic flow characteristics, thus improving overall corridor performance.

This segment was originally planned to increase from two lanes to four throughout the section with varying pavement structures throughout. At the time of the study, those plans were changed to a one-lane expansion throughout for a total of six lanes. The widening, overlay, and associated rehabilitation of I-75 will mainly be constructed behind a barrier wall with two lanes of traffic being maintained in each direction at all times. The first phase of construction is planned to take place in the existing median while traffic is maintained on the existing pavement. All widening is to occur in the median (widening to the inside only). Once the newly constructed median is complete, traffic will be shifted onto it while the second phase of construction will include braking and seating of the existing driving lanes, where applicable, and construction of all base courses for asphalt pavement overlay and widening. The final surface course for the northbound and southbound driving lanes and shoulders throughout the limits of the project are to be constructed in a third phase.

A lane width of 12 feet will be maintained for all three lanes throughout the entirety of this section. Inside shoulders will maintain a 14-foot width and outside shoulders will maintain a 30-foot clearance. An image of the project section is included below. The scope of the project is highlighted in red.

Figure 2-1: Project Overview

2.3 Value Engineering Study Baseline

A series of plans and drawings were provided to the value team to be used as a baseline concept for study during the value engineering session, however, it was communicated during the in-brief meeting that these plans were no longer current and would serve primarily as a model to inform the conceptual path forward. As such, few specifics were provided aside from the following baseline criteria:

- All lanes to be 12 feet wide
- Inside paved shoulder to have width of 14 feet
- Outside paved shoulder to be 10 feet wide and have a total of 30 feet of clearance
- All widening to be performed into the median (widening to the inside)
- All bridge structures to be replaced and rebuilt
- Traffic patterns at the two major interchanges (Exit 25 & Exit 29) to be redesigned to increase capacity

With these conceptual inputs, the team was able to use the value methodology to both develop value alternatives based on assumed basic level baselines and to develop new concepts without strict baseline comparison.

Section

3

Executive Summary

Section 3 – Executive Summary

3.1 Background

A Value Engineering (VE) study was conducted on the Preliminary Line and Grade documents for the **I-75 Widening, MP 20.2 to MP 28.851** for the Kentucky Transportation Cabinet (KYTC) on July 24-28, 2023, for the project described in Section 2 – Project Description.

3.2 Workshop In-brief Meeting

KYTC and EA (design team) representatives presented the project during the in-brief meeting on Monday, July 24, 2023. The in-brief did not include a site visit.

The workshop objectives were identified at the start of the workshop and were used to focus the VE team's efforts:

- Identify value opportunities (function/resources)
- Review—
  - Bridge construction means and methods
  - Interchange construction strategies
  - Traffic capacity and safety improvements at interchanges

Also identified were the workshop constraints (e.g., standards, policies, resources, commitments made, etc.) that may be difficult, if not impossible, to change:

- All bridges are desired to be reconstructed
- Roadway geometry needs to match connecting segments and maintain KYTC standards

3.3 Performance Criteria

During the Information Phase on Monday, July 24, 2023, the VE team listed the criteria to evaluate the impact of the Value Engineering (VE) Proposals on the project's performance. These criteria were used in the evaluation and development of VE Proposals. The table below presents the list and description of these criteria.

Table 3-1: List of Performance Criteria

ID	Criteria	Description
A	Maintenance of Traffic (MOT)	Allow free-flow traffic movements during construction
B	Safety	Prevent serious injury and fatal crashes
C	Maintainability	Long-term maintenance considerations
D	Mobility	Long-term operations on the Interstate
E	Constructability	Ability to construct complex aspects of the project (Lynn Camp Bridge)

3.4 Observations

In preparation for the value study, the VE team members each developed a list of initial key observations and issues as they reviewed the I-75 Widening project documents. These observations helped the team to focus later phases of the study toward answering or resolving these issues functionally and creatively. The observations are as follows:

- Structure design has a desire for everything new as part of this project (existing assumption)
- 29 Interchange design is unclear (currently planned for rebuild and not redesigned) which may result in complications based on capacity, etc.
    - Eliminating the center pier at Exit 29 would require the structure to be increased and would require the I-75 bridge over US25E to be raised
- Environmental issues may exist at Lynn Camp Bridge and the means of building the substructure for the new bridge will present significant challenges to designing and constructing the bridge
    - Acknowledgement of true environmental impacts for construction of Lynn Camp Bridge (What is significant about Lynn Camp Creek? What are the actual environmental restrictions at this point?)
    - Categorical Exclusion for Lynn Camp Bridge
- Maintenance of Traffic will determine the success of this project scope in terms of resources and function
- North side of Exit 29 bridge runs downhill from North to South which may present challenges to grading I-75. (VE TEAM TO VERIFY) If you were to raise the grade 2ft, what does that do to the south side of the bridge?
- Construction of Lynn Camp Creek (managing traffic, staging, how big is the widening, etc.)
    - Environmental is mainly affected by the foundations and upgrading this will significantly change the basis of the project
- Pavement structure
    - Drainage of the sub-grade
    - Pavement thickness on shoulders
    - Overall construction best practices for this section
    - Construction access/staging for key areas (Lynn Camp Creek)
- Ensuring ramp tie-ins meet current standards is important (tapering, etc.)
- Drainage and the cross-section geometry may create issues

3.5 Workshop Results

Summary workshop results are shown in the table below.

Table 3-2: Summary Workshop Results

Workshop Outcome	Number	Section of Report/Result
Ideas Brainstormed	53	See Creative Idea List and Evaluation (Section 6 – Appendices, Appendix D)
Ideas Developed into Value Engineering VE) Proposals, costed	11	See Section 4 – Summary Information and Section 5 – Value Engineering Proposals
Design Suggestion (DS), developed not costed	2	See Section 4 – Summary Information and Section 5 – Value Engineering Proposals
Design Comments (DC), not developed	18	See Section 4 – Summary Information
All VE Proposals – Cost Avoid (Potentially reduces initial and/or O&M cost without sacrificing function and/or performance)	9	$20,029,000 (Section 5 – Value Engineering Proposals)
All VE Proposals – Cost Add (At a cost add to the project, potentially improves function and/or performance)	2	($19,639,000) (Section 5 – Value Engineering Proposals)

Summary tables of the Value Engineering Proposals and Design Comments are included in Section 4: Summary Information. A description and further discussion of Value Engineering Proposals are also included in Section 5: Value Engineering Proposals.

3.6 Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other "improvement" programs. The objective of this phase is to ensure the entire team agrees upon the purpose of the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing the study. The data supporting Function Analysis can be found in Section 6: Appendices, Appendix C.

The VE team identified the functions using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project. The basic function (the "purpose" of the Purpose and Need) was defined as **Increase Capacity**. A Random Function Identification Worksheet and a Function-Based Mind Map were completed and are included in Appendix C.

3.7 Value Engineering Punchlist

The Value Engineering Punchlist, to be used by the project decision makers in guiding and tracking implementation decisions for each developed proposal, is included on the following pages.

8/11/2023

VALUE ENGINEERING PUNCH LIST

ITEM NO. 11-14.80 **PROJECT COUNTY:** Laurel & Whitley **DATE OF STUDY:** 24-28 July 2023

VE Alternative Number	Description	Location (Item No., Segment, Alternate)	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Life Cycle Cost Savings (Total Present Worth)	FHWA Categories	Remarks
1	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement									
3	Construct the Exit 29 intersection using a two span construction with different pier placement									
12	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes									
15	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane									
17	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge									
19	If there is maximum of 12-15" of clearance, use bridge jacking to increase clearance and avoid the need to totally replace the bridge									
20	Replace only the superstructures on overpasses that do not meet vertical clearance									
24	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab keep the existing bridge structure									
26	Use utility corridor or adjacent properties in conjunction with temporary easements to access creek for construction (with temporary easement for access)									
29	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure									
31	Reuse substructures for Lynn Camp Bridge									
38	Build Lynn Camp Bridge as a single span deck truss with no piers									
53	Build a single span steel girder for Lynn Camp Bridge construction									

3.8 VE Team

Table 3-4: VE Team Participants

Name	Organization	Role in the Value Study	Level of Participation
Jeff Rude, CVS	RHA	Team Leader	Full Time
Natalie Goings, VMA	RHA	Technical Assistant	Full Time
Dale Carpenter	AEI	Structures	Full Time
Will Nolan	QK4	Constructability	Full Time
Jerry Leslie	AEI	Geometrics	Full Time
Katy Stewart	KYTC	QA Branch Manager	Full Time

Figure 3-1: VE Team

Top Row (left to right): Jeff Rude, Dale Carpenter, Katy Stewart

Middle Row (left to right): Will Nolan, Natalie Goings, Jerry Leslie

3.9 Certification

The undersigned Certified Value Specialist (CVS®) facilitator attests that the Value Study documented by this report meets the KYTC Value Standard and that the Value Engineering Study was facilitated in accordance with the SAVE International® Standards of Conduct.

Jeff Rude, CVS
CVS® No. 200704503
Facilitator

Section

4

Summary Information

Section 4 – Summary Information

4.1 Introduction

The VE team brainstormed 53 ideas. To shorten the list, the VE team evaluated the ideas using a simultaneous two-step process (further described in Appendix D). A total of 11 ideas were developed as Value Engineering Proposals with costs, two (2) ideas became Design Suggestions without costs, and 18 ideas were identified as Design Comments. While the team used functions to brainstorm ideas, in order to maximize creative flow, the team elected to brainstorm ideas without function categories using a hybrid model of function based categories combined with component and construction level focus. This allowed the team to better maximize the complexity of the creative ideas but also to allow for connections between different functions and project components.

4.2 Value Engineering Proposals - Summary

The table on the next page summarizes the 11 VE Proposals and two Design Suggestions and their respective cost implications, if any.

It is important to note that costs reflected in positive numbers indicate a cost savings and costs reflected in negative numbers (parentheses) indicate a cost add. It is also important to note that, due to the conceptual nature of the alternatives and the early level of the design metrics, most costs are high-level estimations. As the project design progresses and harder metrics are generated, these costs will need to be refined. The VE team has attempted to maintain a high level of conservatism when making the estimations in this report.

It is important to reiterate that the definition of value is as follows:

$$\text{Value} = \frac{\text{Function Performance}}{\text{Resources}}$$

Understanding Function Performance is key in the evaluation and later recommendation of an idea to become a VE Proposal.

Several of the proposals overlap or represent different ways of approaching the same issue. As a result, the cost avoid/cost add in the summary table is not cumulative.

The following pages list the VE Proposals in table format.

Table 4-1: Summary of Value Engineering Proposals

VE Proposal No.	VE Proposal Title	Evaluation Score	VE PROPOSAL SYNOPSIS					Initial Cost Decrease / (Increase)	O&M Cost Decrease / (Increase)	Total Cost Life Cycle Decrease /(Increase)
			Proposal Synopsis	Reliability	Functionality	O&M	Schedule Impact			
01	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement	4	Widen the existing I-75 overpass instead of constructing a new bridge. Utilzing a Diverging Diamond Interchange to address capacity issues on US 25E while fitting the typical section within the existing piers.	Maintained	Improved	Maintained	Improved	$2,037,000	-	$2,037,000
03	Construct the Exit 29 intersection using a two span construction with different pier placement	4	Utilize a 2 span configuration for the replacement bridge at exit 29 (I75 over US25E)	Maintained	Improved	Improved	Improved	$700,000	-	$700,000
12	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes	5	The existing bridge can be utilized in the widening and reduce the cost of removing the existing bridge and building a wider new bridge.	Maintained	Maintained	Maintained	Improved	$2,070,000	-	$2,070,000
15	At the truck climbing lane, use a 10′ shoulder on the outside and an 8′ shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane	4	Avoidance of rock cut in the area of the truck climbing lane in order to maintain the truck climbing lane beyond the crest as required by federal standards for safety.	Maintained	Maintained	Improved	Improved	$941,000	$43,000	$984,000
17	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge	4	Tidal Wave Road is one of a couple culverts under I-75 within the project area. These culverts, if determined structually sound, should be left in place under current loading design. The design should incorporate no additional fill overtop the culvert, staying within the max fill criteria.	Maintained	Maintained	Maintained	Improved	$926,000	-	$926,000
19	If there is maximum of 12-15″ of clearance, use bridge jacking to increase clearance and avoid the need to totally replace the bridge	DS	In lieu of replacing the structure completely due to vertical clearance, acquire clearance needed by jacking and pouring a new cap.	Maintained	Maintained	Degraded	Improved	N/A	-	N/A
20	Replace only the superstructures on overpasses that do not meet vertical clearance	4	Reuse existing substructure for overpass structures along I-75. This will result in a cost savings and schedule reduction while allowing local access to return quicker.	Maintained	Maintained	Maintained	Improved	$7,223,000	-	$7,223,000
24	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab the existing bridge structure	4	The existing bridge can be utilized in the widen bridge and reduce the cost of removing the existing bridge and building a wider new bridge.	Maintained	Maintained	Maintained	Improved	$2,474,000	-	$2,474,000
26	Use utility corridor or adjacent properties in conjunction with temporary easements to access creek for construction (with temporary easement for access)	DS	Consider access to the creek via private property and utility routes. temporary easements will need to be acquired.	Improved	Improved	Maintained	Degraded	N/A	-	N/A
29	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure	4	Minimize construction phasing by placing both direction of traffic on one side at Lynn Camp Creek bridge allowing the entire substructure and superstructure to be completed in one phase for the second structure.	Improved	Maintained	Improved	Improved	$266,000	$152,000	$418,000

VE Proposal No.	VE Proposal Title	Evaluation Score	VE PROPOSAL SYNOPSIS					Initial Cost Decrease / (Increase)	O&M Cost Decrease / (Increase)	Total Cost Life Cycle Decrease /(Increase)
			Proposal Synopsis	Reliability	Functionality	O&M	Schedule Impact			
31	Reuse substructures for Lynn Camp Bridge	4	Reuse existing substructure at the Lynn Camp Creek bridge. Cost savings and time savings can be realized by using the existing substructures.	Maintained	Maintained	Maintained	Improved	$3,392,000	-	$3,392,000
38	Build Lynn Camp Bridge as a single span deck truss with no piers	4	The option uses a single span deck truss to cross Lynn Camp Creek. The option does not use tall piers that the continuous plate girder bridge	Maintained	Maintained	Maintained	Maintained	($1,616,000)	-	($1,616,000)
53	Build a single span steel girder for Lynn Camp Bridge construction	5	The option uses a single span Plate Girder span to cross Lynn Camp Creek. The option does not use tall piers like the continuous plate girder bridge.	Maintained	Maintained	Maintained	Improved	($18,023,000)	-	($18,023,000)

4.3 Design Comments (No Workbook Prepared)

The following table summarizes all those findings the team identified during the preparation and performance of the VE Study that only comment about recommended corrections or concerns found in the project documents. Items such as errors, omissions, schedule corrections, estimate corrections, or document quality issues are examples of the elements listed in the following table and should be considered self-explanatory and do not require a formal response to accept or reject.

Table 4-2: Design Comments (No Workbook Prepared)

Proposal No.	Design Comment
08	Use special event traffic control planning for the signal system during event times (police involvement, controller timing, etc.) to minimize backup
09	Provide additional traffic signal loops to allow for traffic flushes at key times of special event backup situations
18	Where possible, don't increase fill in order to avoid the need to address buried structures
32	In event of a substructure rebuild, skew the substructure to match the creek and shorten the spans
34	Build access road as close as possible to the project to minimize environmental impact
35	Utilize existing utility or pathways to disturb less trees for construction
36	Minimize creek crossings to minimize impact to the creek during construction
40	Stage construction from near the end of the chosen access point. Then provide a staging area at the base
43	For local road closures (overpass structures) perform the work during non-school times
44	To avoid ponding in sub-grade, ensure that the drainage blanket has a method to drain
45	On the shoulders, remove and refill in cut sections to the bottom of the existing ditch for proper compaction and best drainage
46	For subgrade drainage, ensure that ditch isn't higher than the subgrade
47	Shoulder break must be no more than 8% algebraic difference on the high side of the superelevated section
48	Ensure lifts are following current standard specifications in order to assure proper compaction
49	Carry main line class-4 surface to beyond the rumble strips (4 feet)
50	Ensure that tack is shown on the typical section pavement design
51	Pave as much of mainline surface in eschelon as possible to eliminate at least one longitudinal joint
52	Ensure proper signage is used in case of a divided median

Section

5

Value Engineering Proposals

Section 5 – Value Engineering Proposals

5.1 Introduction

During the Creativity Phase, the VE team brainstormed 53 ideas. Of these, 11 were identified for further development into Value Engineering (VE) Proposals, including cost impacts, and 2 were identified as Design Suggestions where no costs were developed. Several of the proposals overlap or represent different ways of approaching the same issue.

Cost savings are shown as positive costs, while any added costs are noted in parenthesis. Total Life Cycle Costs are the summation of the initial plus O&M costs as estimated by the VE team.

The following pages detail the VE Proposals developed as part of the VE team and include the following information:

- Value Engineering Proposal Number (1, 2, 3, 4, etc.)
- Creative Idea Number
- VE Proposal Title
- Function Identification
- Value Proposal Synopsis
- Baseline Concept
- Value Proposal Description
- Advantages and Disadvantages
- Cost Summary
- Sketches/Diagram (Baseline and Proposed)
- Discussion & Justification
- Cost Information (Initial Cost)
- Cost Information (Operations & Maintenance)

5.2 Cost Estimating for VE Proposals

Because no detailed cost data was provided to the team for the study, the costs used were estimated using the expertise and experience of the value team. The costs were developed by the value team participant who developed the proposal. Where the Value Study Team has offered alternate costs, they are provided for information only, reflective of the short duration of the VE Study and should be evaluated by KYTC. Value Engineering Proposals are provided for their evaluation and implementation exclusively by KYTC.

VALUE PROPOSAL
01
Kentucky Transportation Cabinet
I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement

VALUE PROPOSAL SYNOPSIS:

Widen the existing I-75 overpass instead of constructing a new bridge. Utilzing a Diverging Diamond Interchange to address capacity issues on US 25E while fitting the typical section within the existing piers.

Reliability	Maintained	Functionality	Improved	$ Initial Cost Avoidance (Add)
O&M	Maintained	Schedule Impact	Improved	$2,037,000

BASELINE CONCEPT:

Reconstruct the Exit 29 overpass with a new 3 span bridge and provide dual left turns in eastbound and westbound direction on Us 25E

VALUE PROPOSAL DESCRIPTION:

Build a Double Diveraging Diamond Interchange. Widen the existing overpass to accomdate the I-75 widening.

ADVANTAGES:	DISADVANTAGES:
● Dont need to lengthen spans.	● Drivers may not be familar with configuration
● Reduces number of conflict points	● Complex MOT for US 25E construction
● Eliminates the need for left turn signal phasing	● Existing Pier in the median.
● Reduced intersection delay	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$4,100,000	$0	$4,100,000
VALUE PROPOSAL DESCRIPTION:	$2,063,000	$0	$2,063,000
TOTAL (Baseline less Proposed)	$2,037,000	$0	$2,037,000

AVOID COST

TITLE	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement

DISCUSSION & JUSTIFICATION: (cont.)

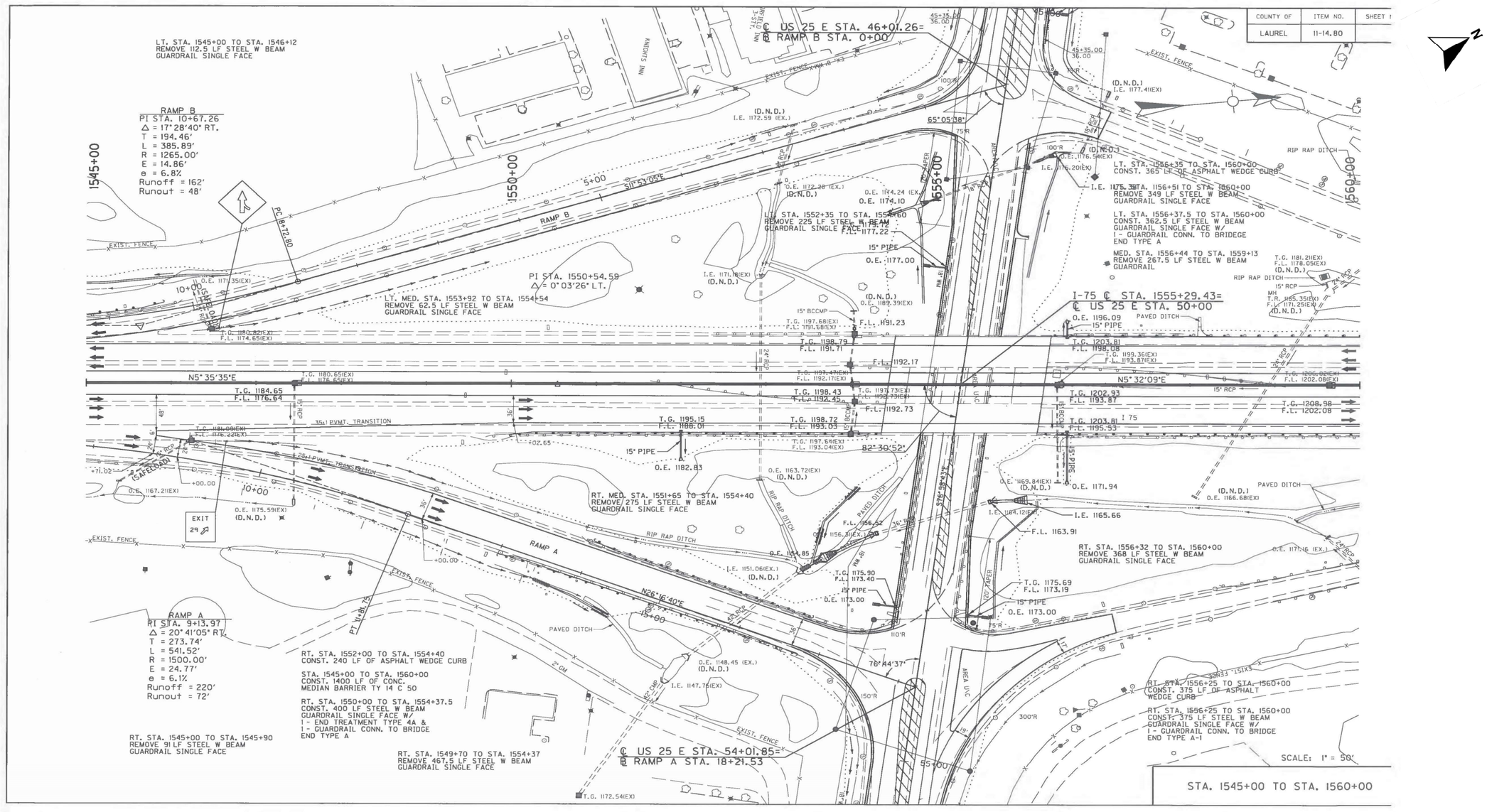
Technical Considerations - The Value Engineering team analyzed the use of a Diverging Diamond Interchange (DDI) at the I-75/US 25E Interchange. Utilizing a DDI allows the use of the existing overpass along with widening the bridge to accommodate the 3 lanes in each direction proposed for I-75; The DDI is an interchange form that allows the two directions of traffic on the crossroad to temporarily divide and cross to the opposite side to gain access to and from the freeway more easily. The primary difference between a DDI and a conventional interchange is the design of directional crossovers on either side of the interchange. This eliminates the need for left-turning vehicles to cross the path of approaching vehicles. By shifting cross street traffic to the left side of the street between the signalized intersections, vehicles on the crossroad making a left turn on to or off of ramps do not conflict with vehicles approaching from other directions.

Risk - A current traffic forecast and turning movements are need to fully analyze the viability of the DDI at this location. Another risk is that the interchange creates an unfamiliar traffic movement with the interchange. There will need to be a robust public education component to the project. Also the Maintenance of Traffic along US 25E is more complex that the baseline.

Cost Consideration - Assumption made for estimate: Asphalt Base is 7.75” thick and the Asphalt Surface is 1.25” thick. The existing structure will be widen 51 feet. The areas pavement outside the existing pavement is the only new pavement.

TITLE	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



TITLE	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement

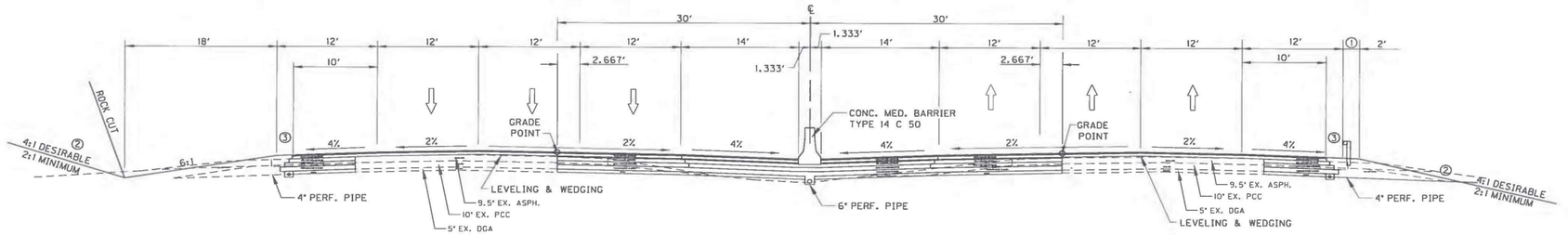
SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT

TYPICAL SECTIONS

I–75 NORTHBOUND & SOUTHBOUND

STA. 1535 + 07.12 – STA. 1566 + 10.17

COUNTY OF	ITEM NO.	SHEET
WHITLEY LAUREL	11-14.80	



NORMAL SECTION

STA. 1535+07.12 TO STA. 1566+10.17

NORTHBOUND/SOUTHBOUND PROPOSED 6" OVERLAY PAVEMENT DESIGN

TRAFFIC LANES

WIDENING

DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	7"
CL4 ASPH BASE 1.5D PG64-22	12½" (6½"+6")

OVERALL

CL4 ASPH BASE 1.0D PG76-22	4½"
CL4 ASPH SURF 0.5A PG76-22	1½"

OUTSIDE SHOULDERS

DGA	FULL-DEPTH
CL3 ASPH BASE 1.0D PG64-22	4½"
CL3 ASPH SURF 0.5D PG64-22	1½"

MEDIAN

DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	7"
CL3 ASPH BASE 1.5D PG64-22	12½" (6½"+6")
CL3 ASPH BASE 1.0D PG64-22	4½"
CL3 ASPH SURF 0.5D PG64-22	1½"

NOTE:
A QUANTITY OF LEVELING AND WEDGING IS PROVIDED FOR THIS PROJECT. THIS QUANTITY SHALL BE USED TO ESTABLISH GRADE, CORRECT THE CROSS SLOPE OF THE PAVEMENT FROM 1.56% TO 2% AND TO MOVE THE EXISTING CROWN.

① SHOULDER SHALL BE WIDENED 2.0 FEET WHERE GUARDRAIL IS TO BE INSTALLED.

② SEE CROSS SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDERS

③ ASPHALT SEAL FOR SHOULDERS FROM OUTSIDE EDGE OF PAVEMENT TO A POINT 2' DOWN THE DITCH OR FILL SLOPE.

NOT TO SCALE

TYPICAL SECTIONS

VALUE PROPOSAL

01

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement

SKETCH/DIAGRAM: VALUE PROPOSAL

VALUE PROPOSAL

01

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement
Assumptions & Calculations	None noted.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Proposed Structure		SF	23,296	$176	$4,100,096	9,282	$176	$1,633,632
US 25E (Assume 8647 SY)								
1.25 Surface						594	$140	$83,160
7.75 Surface						3,685	$94	$346,390
TOTAL					$4,100,000			$2,063,000
							Impact to Initial Cost (Baseline Less Proposed)	**$2,037,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL
03
Kentucky Transportation Cabinet
I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Construct the Exit 29 intersection using a two span construction with different pier placement

VALUE PROPOSAL SYNOPSIS:

Utilize a 2 span configuration for the replacement bridge at exit 29 (I75 over US25E)

Reliability	**Maintained**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Improved**	**Schedule Impact**	**Improved**	**$700,000**

BASELINE CONCEPT:

Currently the bridge over US25E is a four span bridge with piers in the middle of US25E and at each shoulder. KYTC request a new design that removed the center line (that separates the lanes of US25E). the likely method of removing the center pier is with a 3 span configuration with piers to each side of US25E.

VALUE PROPOSAL DESCRIPTION:

Cost savings can be generated by reducing the number of piers from 2 to 1. The beams and other roadwork cost should be similar to the 3 span option.

ADVANTAGES:	DISADVANTAGES:
● Reduced cost	● Leaves pier in the middle of US25E which will necessitate an enhanced roadway intersection design.
● Provide room for future lanes to either side of US25E	●
● Reduce beam erection time	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$4,233,000	$0	$4,233,000
VALUE PROPOSAL DESCRIPTION:	$3,533,000	$0	$3,533,000
TOTAL (Baseline less Proposed)	$700,000	$0	$700,000

AVOID COST

TITLE	Construct the Exit 29 intersection using a two span construction with different pier placement

DISCUSSION & JUSTIFICATION:

The information provided by the project team led the value team to conclude the baseline design for the I-75 over US 25E at exit 29 would be a three-span structure. This stems from the desire of the District to eliminate the center pier for future turning movements. The value team expects that to accomplish this the baseline design will consist of two shoulder piers making this a three-span structure.

The value team proposes instead to construct a two-span structure, leaving the pier in the middle. This allows for more growth to the outside in the future while minimizing cost. By removing the shoulder piers future expansion is not nearly as limited as it would be with the baseline. This configuration more easily allows for additional lanes, sidewalks, etc. that would be limited with shoulder piers.

Utilizing the two-span configuration has advantages of safety over the three-span as well because it reduces potential conflict points. Instead of having 2 piers that are within the clear zone, there is now just one.

The value team believes that the two-span configuration will allow the existing roadway profile above to be more easily maintained than a single span structure while cost savings versus a three-span structure can be easily seen. With less substructure, fewer joints, fewer bearing pads, etc., the project can see less future maintenance with a two-span while maintaining a cheaper cost today.

VALUE PROPOSAL

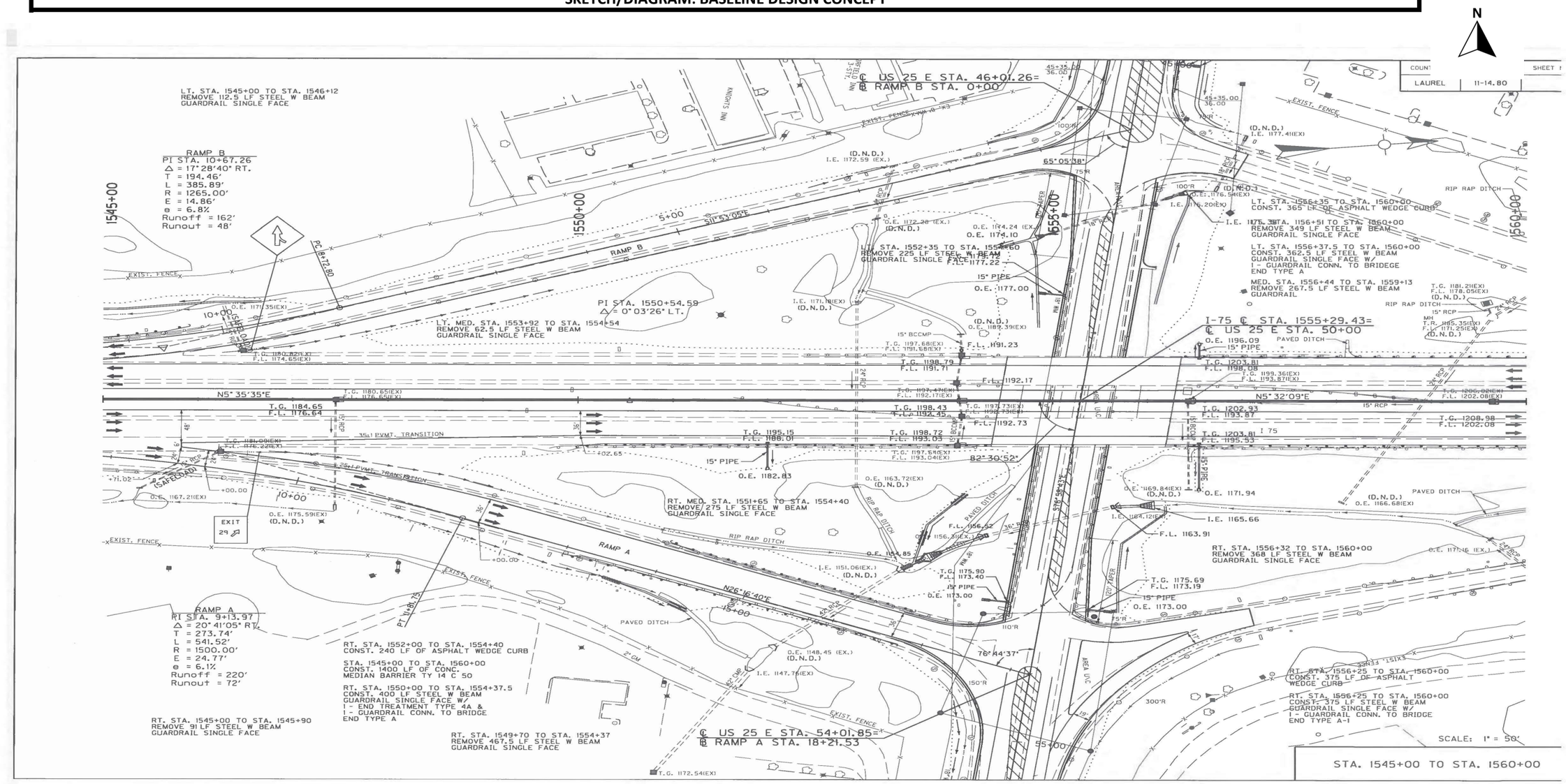
03

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

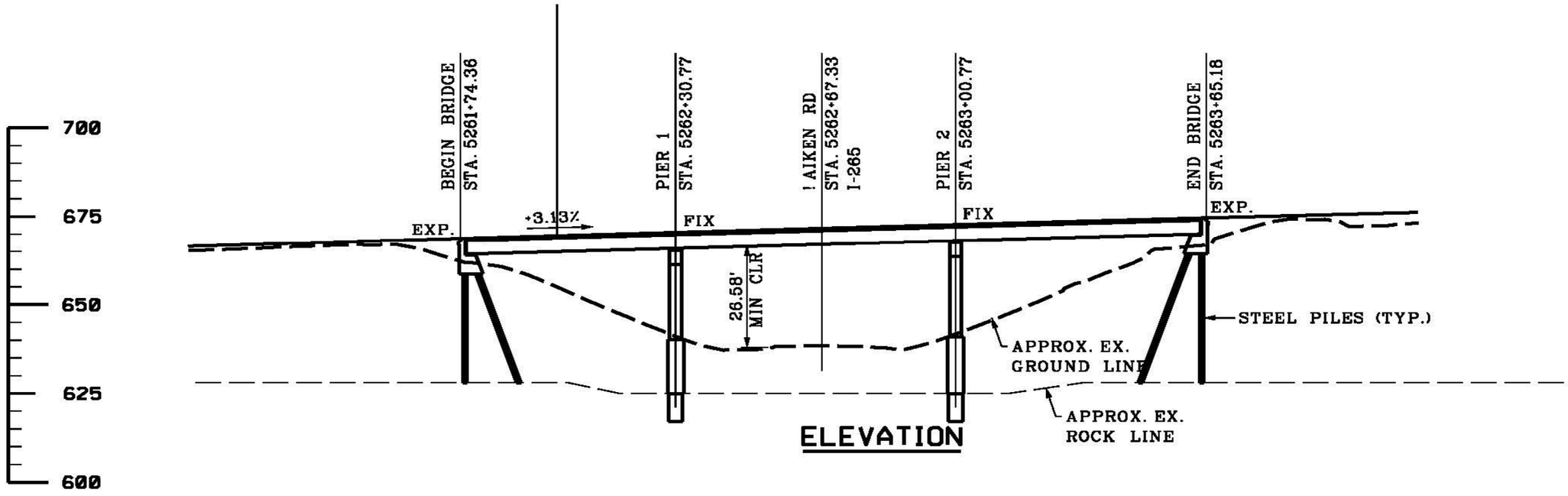
TITLE	Construct the Exit 29 intersection using a two span construction with different pier placement

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



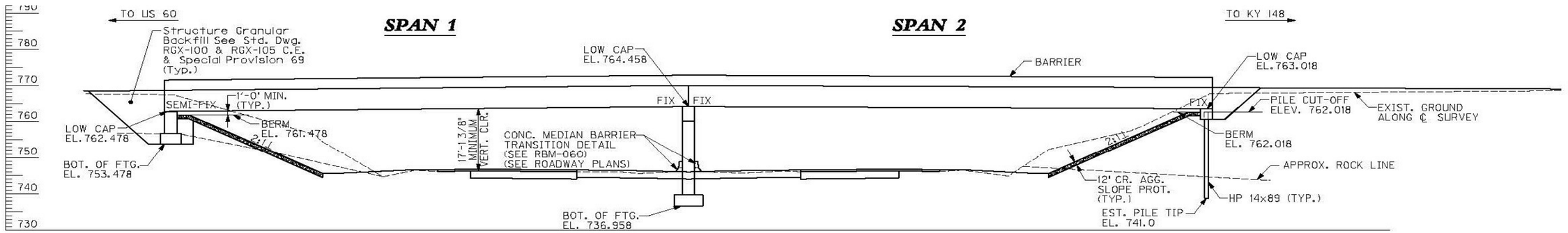
TITLE	Construct the Exit 29 intersection using a two span construction with different pier placement

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



TITLE	Construct the Exit 29 intersection using a two span construction with different pier placement

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

03

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Construct the Exit 29 intersection using a two span construction with different pier placement
Assumptions & Calculations	None noted.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Average Cost Per sf			24,050	$176	$4,232,800	24,050	$176	$4,232,800
One pier						1	($700,000)	($700,000)
TOTAL					$4,233,000			$3,533,000
							Impact to Initial Cost (Baseline Less Proposed)	**$700,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL
12
Kentucky Transportation Cabinet
I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes

VALUE PROPOSAL SYNOPSIS:

The existing bridge can be utilized in the widening and reduce the cost of removing the existing bridge and building a wider new bridge.

Reliability	Maintained	Functionality	Maintained	$ Initial Cost Avoidance (Add)
O&M	Maintained	Schedule Impact	Improved	$2,070,000

BASELINE CONCEPT:

A new bridge (3 span PCI beam) designed to the current specifications would be the constructed at this site. The original bridge will need to be removed.

VALUE PROPOSAL DESCRIPTION:

The existing bridge is a twin continuous RCDG bridge. This bridge style has a history of low on going maintenance cost and has robust load carrying traits (even though designed to HS20). Integrating the existing bridges in the final structure saves considerable construction cost by only constructing a portion in the middle.

ADVANTAGES:	DISADVANTAGES:
● Reduces construction cost	● Older structure may need to be strengthen
● Speeds bridge construction time	●
●	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$4,456,000	$0	$4,456,000
VALUE PROPOSAL DESCRIPTION:	$2,386,000	$0	$2,386,000
TOTAL (Baseline less Proposed)	$2,070,000	$0	$2,070,000

AVOID COST

VALUE PROPOSAL

12

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes

DISCUSSION & JUSTIFICATION:

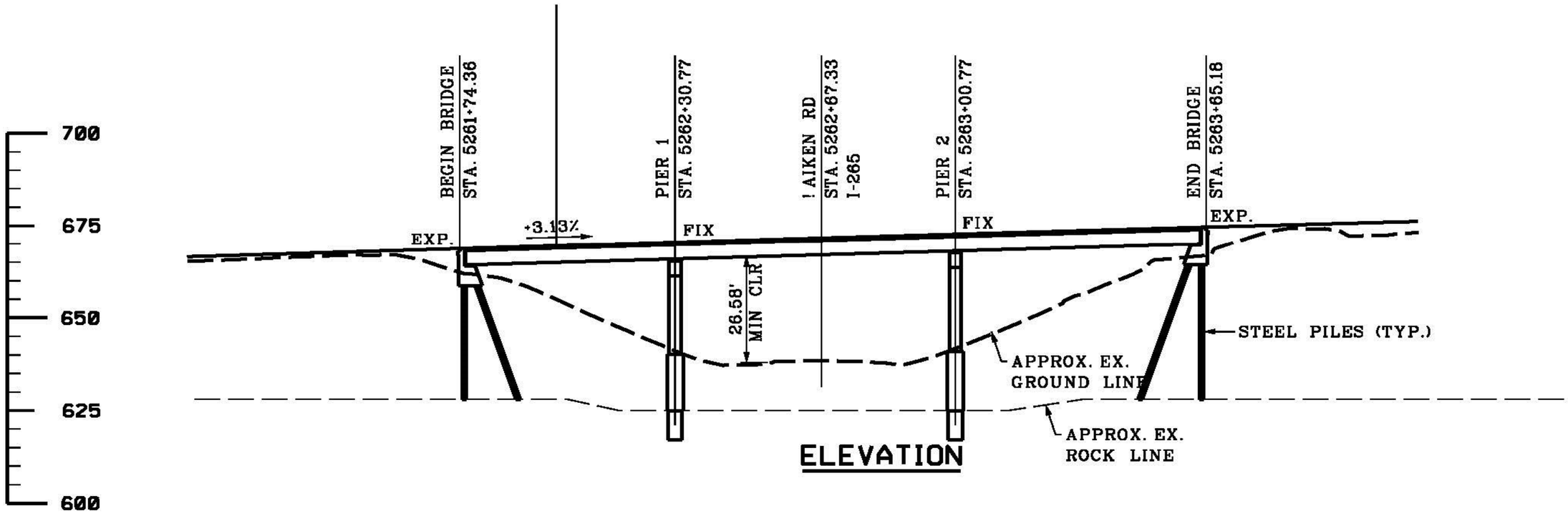
The information provided by the project team led the value team to conclude the baseline design for the exit 25 structure would be to remove and replace with a new structure meeting current design criteria. Based on the information the value team has, we believe current vertical clearances exist for the structure. The existing structure is a twin continuous RCDG bridge which, depending on analysis, appears to be in good condition.

The value team proposes constructing and integrating a new structure between the two existing structures and strengthening the existing structures to obtain the desired load rating. The history of the RCDG bridges have proven them to be low maintenance structures that have weathered the course of time to still thrive as reliable dependable bridges today. With some strengthening of the structure the HS20 design can be brought up to current standards.

By not having to replace these two structures, the bridge at exit 25 can be constructed much more quickly with less traffic shifts, less materials, shorter construction time, less cost, and much less impacts to the traveling public.

TITLE	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes

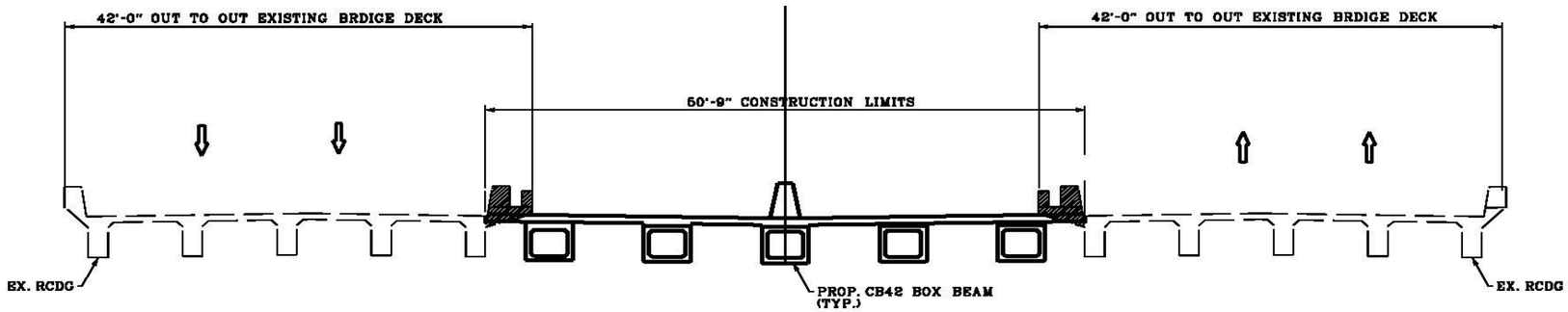
SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



ELEVATION

TITLE	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes

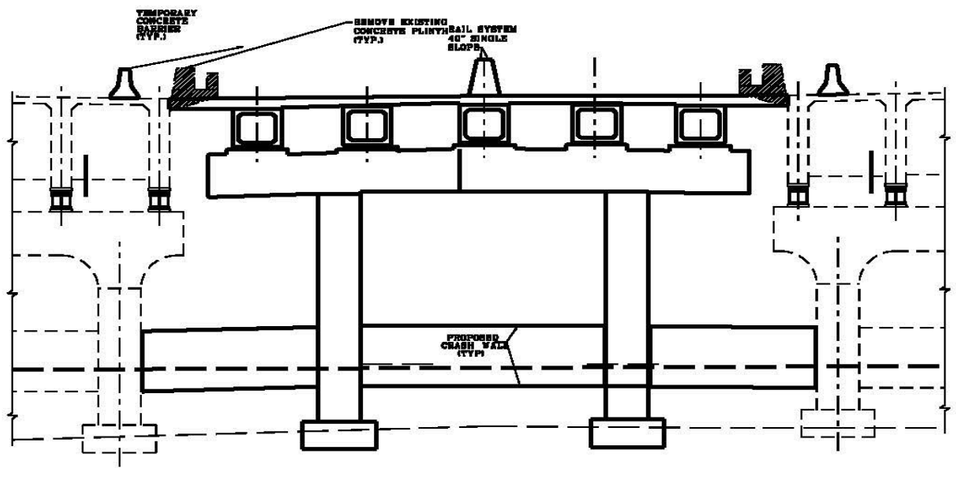
SKETCH/DIAGRAM: VALUE PROPOSAL



SOUTHBOUND REMOVAL AND CONSTRUCTION

NORTHBOUND REMOVAL AND CONSTRUCTION

WIDENING - TYPICAL SECTION



ELEVATION

LEGEND

⇧ INDICATES TRAFFIC DIRECTION

NOTES

1. PHASE 1 MOT SHOWN. PHASE 2 & PHASE 3 MOT WILL BE CARRIED ACROSS THE BRIDGE IN ITS FINAL CONFIGURATION. SEE MOT PLANS.

VALUE PROPOSAL

12

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes
Assumptions & Calculations	None noted.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
New Bridge		SF	24,180	$176	$4,255,680			
Remove Structure		Each	2	$100,000	$200,000			
Widen Bridge						9,300	$176	$1,636,800
Strenghen/Rehab bridge						2	$300,000	$600,000
Rebuild exerior barriers						372	$400	$148,800
TOTAL					$4,456,000			$2,386,000
							Impact to Initial Cost (Baseline Less Proposed)	**$2,070,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL

15

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

VALUE PROPOSAL SYNOPSIS:

Avoidance of rock cut in the area of the truck climbing lane in order to maintain the truck climbing lane beyond the crest as required by federal standards for safety.

Reliability	Maintained	Functionality	Maintained	$ Initial Cost Avoidance (Add)
O&M	Improved	Schedule Impact	Improved	$941,000

BASELINE CONCEPT:

The current configuration would maintain the truck climbing lane to the safe point, but would result in excessive rock cut on the outside shoulder.

VALUE PROPOSAL DESCRIPTION:

The value proposal would allow all federal guidance to be followed for shoulder widths and length of lane while greatly reducing or eliminating the need for rock cut on the outside southbound shoulder.

ADVANTAGES:	DISADVANTAGES:
● Cost Savings	● Shoulder width is not continuous throughout the project
● Construction duration reduction	●
● Safety increase during constrution	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$0	$43,000	$43,000
VALUE PROPOSAL DESCRIPTION:	($941,000)	$0	($941,000)
TOTAL (Baseline less Proposed)	$941,000	$43,000	$984,000

AVOID COST

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

DISCUSSION & JUSTIFICATION:

I-75 southbound near the exit 25 entrance ramp is on an steep grade uphill along the main corridors. Couple that the fact that US 25W crosses under I-75, trucks entering southbound I-75 from exit 25 have a lengthy and steep path to try and get up to speed before entering I-75. Ending the truck climbing lane prior to the crest can leave trucks merging into 70 mph traffic at a less than needed speed causing a severe safety issue. However, this area just south of the exit consists of substantial rock cut. The rock in this cut does not appear to be of good quality and removal of any rock could propagate further into the cut section.

The value team analyzed reduction of shoulder to maintain safety and minimize rock cut. A reduction of the inside shoulder is a better option than reducing the outside shoulder. While keeping the inside shoulder at 14' and reducing the outside shoulder would give the project a more consistent look, most people who need the shoulder for emergencies tend to gravitate to the outside shoulder. We recommend keeping the outside shoulder at 10' and reducing the inside to 10' (minimum required). A slight shift of the alignment prior to the addition of the ramp will allow the transition to occur. By avoiding areas of rock cut and minimizing the depth of cut we can minimize the long-term maintenance of additional cut, both longitudinally and vertically while maintaining operational safety. Reducing the amount of blasting and reducing the overall duration that the entrance ramp is shortened will improve safety during construction.

Reducing the inside shoulder by 4' will allow a reduction in quantity for the CL 3 Asphalt Base and CL3 Asphalt Surface while also allowing the reduction of rock cut. Assumption made for the estimate: average height of cut is 30'. Area of cut goes from Sta 1280+00 to 1320+00. Asphalt Base is 1' thick on inside shoulder. Asphalt Surface is 1.5" thick. A shoulder taper of 280' on both ends of the climbing lane.

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

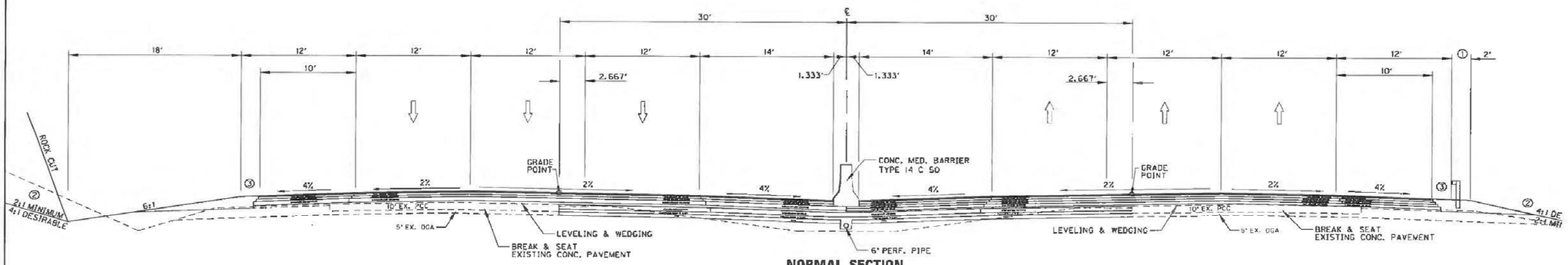
SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT

TYPICAL SECTIONS

I-75 NORTHBOUND & SOUTHBOUND

STA. 1334+18 – STA. 1367+36.19

COUNTY OF	ITEM NO.	SHEET
LAUREL/ WHITLEY	11-14.80	



NORMAL SECTION

SOUTHBOUND PROPOSED 13½" OVERLAY PAVEMENT DESIGN

TRAFFIC LANES

WIDENING

DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	4"
CL4 ASPH BASE 1.5D PG64-22	6"

OVERALL

CL4 ASPH BASE 1.5D PG64-22	5¾"
CL4 ASPH BASE 1.0D PG64-22	3¼"
CL4 ASPH BASE 1.0D PG76-22	3"
CL4 ASPH SURF 0.5A PG76-22	1½"

OUTSIDE SHOULDERS

	FULL-DEPTH
DGA	
CL3 ASPH BASE 1.5D PG64-22	5¾"
CL3 ASPH BASE 1.0D PG64-22	6¼" (3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"

MEDIAN

DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	4"
CL3 ASPH BASE 1.5D PG64-22	11¾" (6"+5¾")
CL3 ASPH BASE 1.0D PG64-22	6¼" (3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"

NORTHBOUND PROPOSED 15" OVERLAY PAVEMENT DESIGN

TRAFFIC LANES

WIDENING

DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	4"
CL4 ASPH BASE 1.5D PG64-22	6"
CL4 ASPH BASE 1.0D PG64-22	10½" (4"+3¼"+3¼")
CL4 ASPH BASE 1.0D PG76-22	3"
CL4 ASPH SURF 0.5A PG76-22	1½"

OVERLAY EXISTING

CL4 ASPH BASE 1.0D PG64-22	10½" (4"+3¼"+3¼")
CL4 ASPH BASE 1.0D PG76-22	3"
CL4 ASPH SURF 0.5A PG76-22	1½"

OUTSIDE SHOULDERS

	FULL-DEPTH
DGA	
CL3 ASPH BASE 1.0D PG64-22	13½" (4"+3¼"+3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"

MEDIAN

DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	4"
CL3 ASPH BASE 1.5D PG64-22	6"
CL3 ASPH BASE 1.0D PG64-22	13½" (4"+3¼"+3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"

NOTE:
A QUANTITY OF LEVELING AND WEDGING IS PROVIDED FOR THIS PROJECT. THIS QUANTITY SHALL BE USED TO ESTABLISH GRADE, CORRECT THE CROSS SLOPE OF THE PAVEMENT FROM 1.56% TO 2% AND TO MOVE THE EXISTING CROWN.

① SHOULDER SHALL BE WIDENED 2.0 FEET WHERE GUARDRAIL IS TO BE INSTALLED.

② SEE CROSS SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDERS

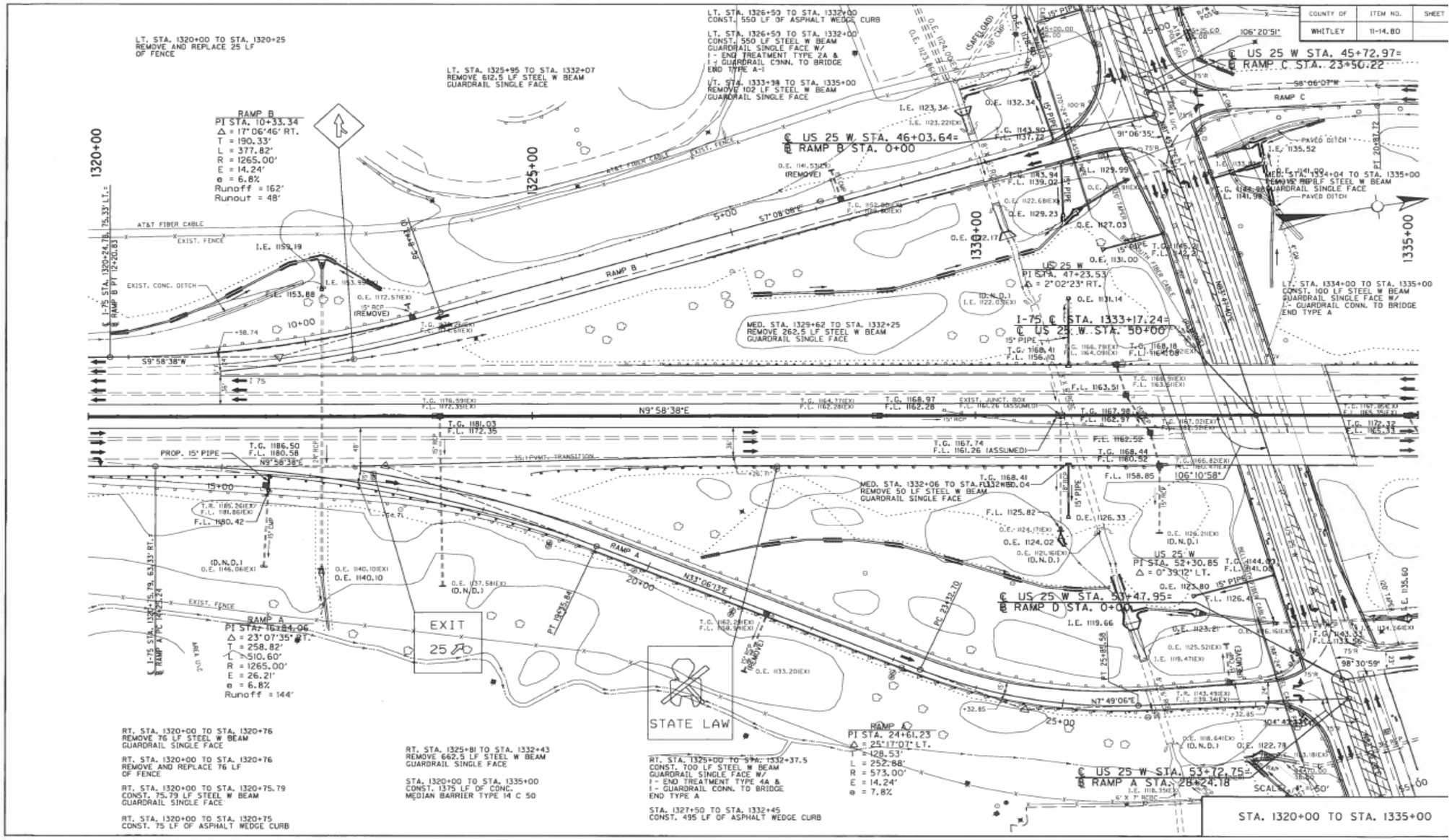
③ ASPHALT SEAL FOR SHOULDERS FROM OUTSIDE EDGE OF PAVEMENT TO A POINT 2' DOWN THE DITCH OR FILL SLOPE.

NOT TO SCALE

TYPICAL SECTIONS

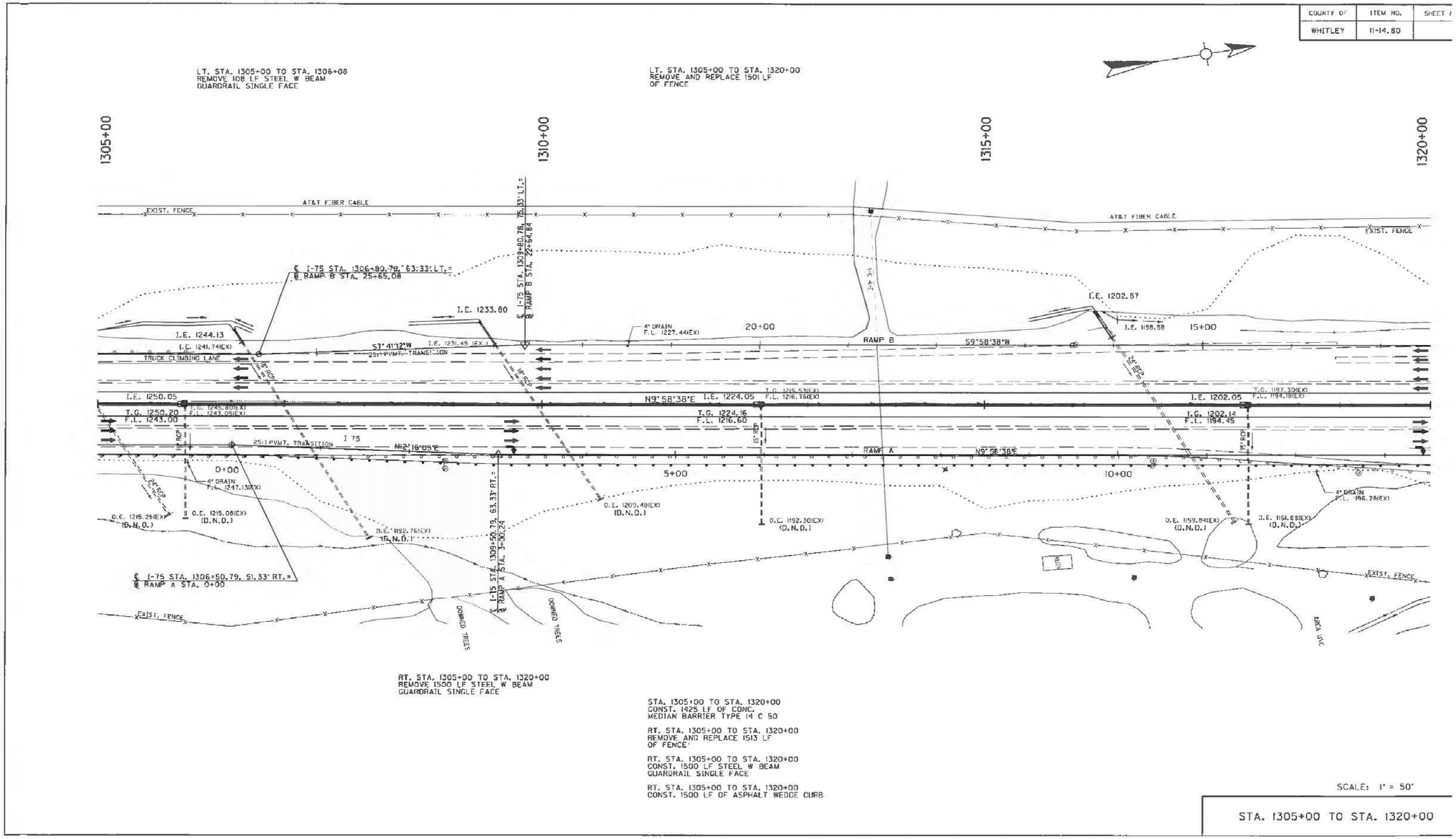
TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



VALUE PROPOSAL

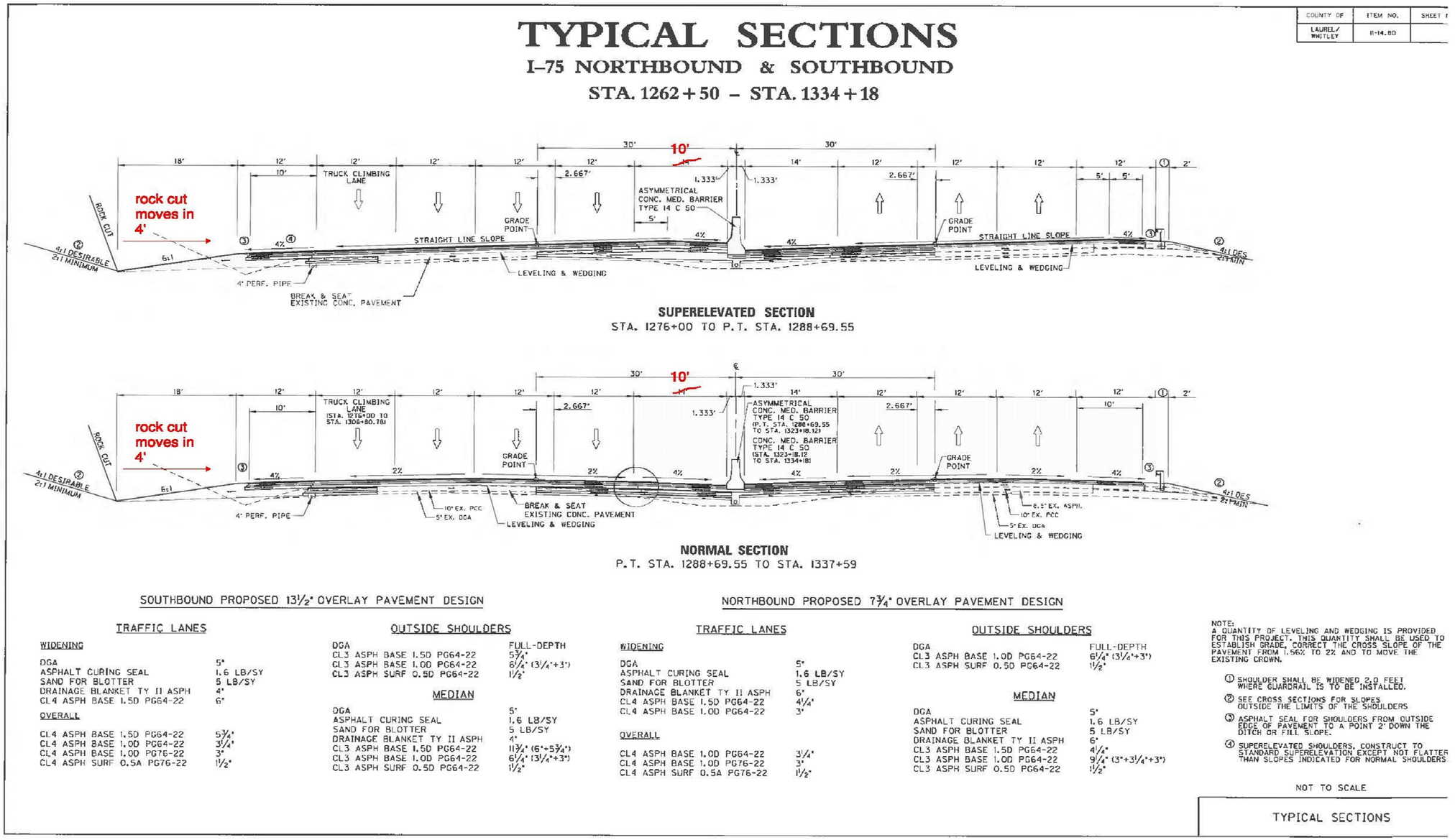
15

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

SKETCH/DIAGRAM: VALUE PROPOSAL



SOUTHBOUND PROPOSED 13½" OVERLAY PAVEMENT DESIGN

TRAFFIC LANES

WIDENING	
DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	4"
CL4 ASPH BASE 1.5D PG64-22	6"
OVERALL	
CL4 ASPH BASE 1.5D PG64-22	5¾"
CL4 ASPH BASE 1.0D PG64-22	3¼"
CL4 ASPH BASE 1.0D PG76-22	3"
CL4 ASPH SURF 0.5A PG76-22	1½"

OUTSIDE SHOULDERS

DGA	FULL-DEPTH
CL3 ASPH BASE 1.5D PG64-22	5¾"
CL3 ASPH BASE 1.0D PG64-22	6¼" (3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"
MEDIAN	
DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	4"
CL3 ASPH BASE 1.5D PG64-22	11¾" (6"+5¾")
CL3 ASPH BASE 1.0D PG64-22	6¼" (3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"

NORTHBOUND PROPOSED 7¾" OVERLAY PAVEMENT DESIGN

TRAFFIC LANES

WIDENING	
DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	6"
CL4 ASPH BASE 1.5D PG64-22	4¼"
CL4 ASPH BASE 1.0D PG64-22	3"
OVERALL	
CL4 ASPH BASE 1.0D PG64-22	3¼"
CL4 ASPH BASE 1.0D PG76-22	3"
CL4 ASPH SURF 0.5A PG76-22	1½"

OUTSIDE SHOULDERS

DGA	FULL-DEPTH
CL3 ASPH BASE 1.0D PG64-22	6¼" (3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"
MEDIAN	
DGA	5"
ASPHALT CURING SEAL	1.6 LB/SY
SAND FOR BLOTTER	5 LB/SY
DRAINAGE BLANKET TY II ASPH	6"
CL3 ASPH BASE 1.5D PG64-22	4¼"
CL3 ASPH BASE 1.0D PG64-22	9¼" (3"+3¼"+3")
CL3 ASPH SURF 0.5D PG64-22	1½"

NOTE:
A QUANTITY OF LEVELING AND WEDGING IS PROVIDED FOR THIS PROJECT. THIS QUANTITY SHALL BE USED TO ESTABLISH GRADE, CORRECT THE CROSS SLOPE OF THE PAVEMENT FROM 1.56% TO 2% AND TO MOVE THE EXISTING CROWN.

① SHOULDER SHALL BE WIDENED 2.0 FEET WHERE GUARDRAIL IS TO BE INSTALLED.

② SEE CROSS SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDERS

③ ASPHALT SEAL FOR SHOULDERS FROM OUTSIDE EDGE OF PAVEMENT TO A POINT 2' DOWN THE DITCH OR FILL SLOPE.

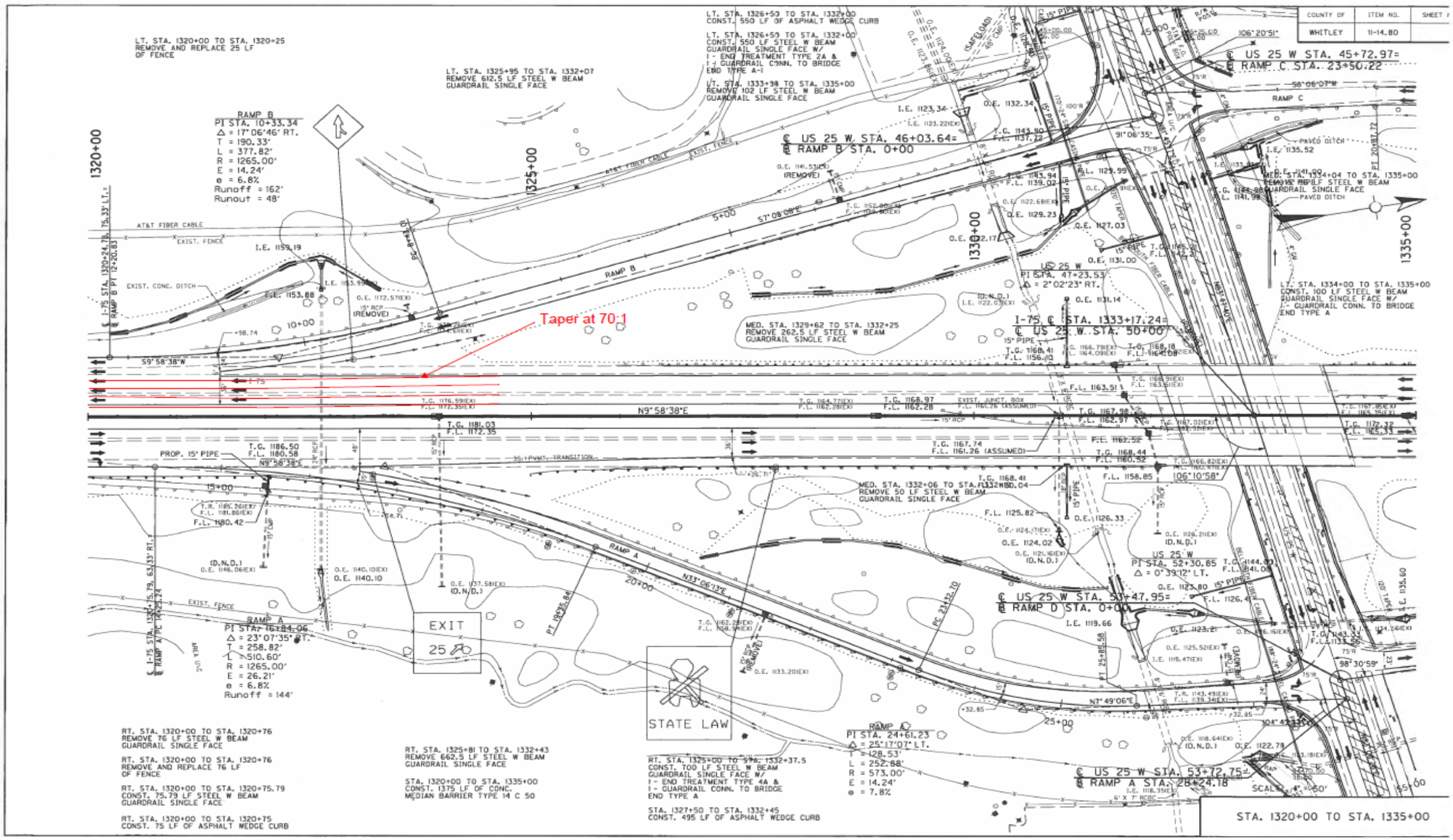
④ SUPERELEVATED SHOULDERS, CONSTRUCT TO STANDARD SUPERELEVATION EXCEPT NOT FLATTER THAN SLOPES INDICATED FOR NORMAL SHOULDERS

NOT TO SCALE

TYPICAL SECTIONS

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

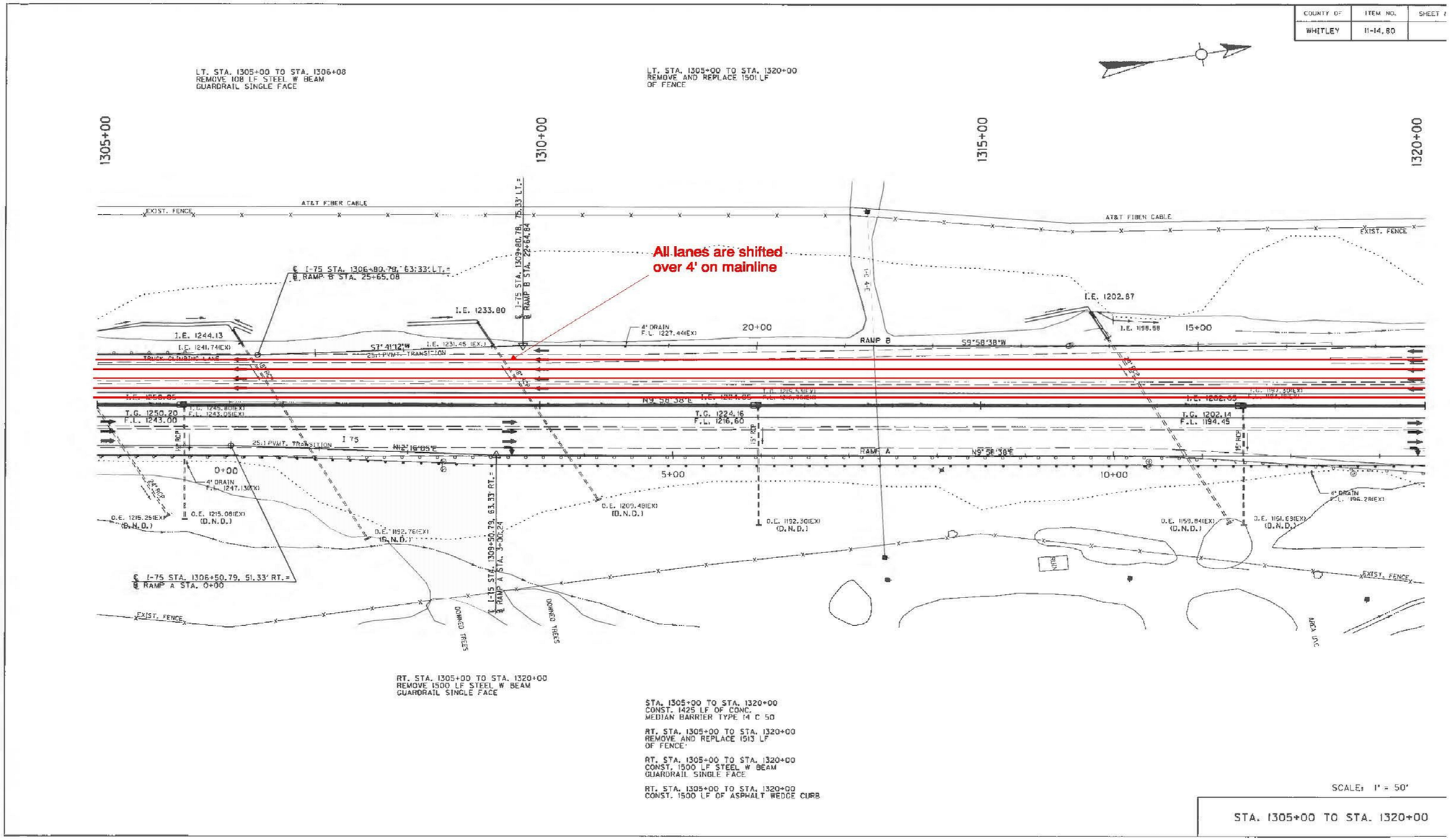
15

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

15

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane
Assumptions & Calculations	None noted.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
CL 3 Asphalt Surface		TON				-147	$140	($20,580)
CL 3 Asphalt Base		TON				-1,174	$94	($110,356)
Roadway Excavation (solid rock)		CY	0	$0	$0	-18,000	$45	($810,000)
TOTAL					$0			($941,000)
							Impact to Initial Cost (Baseline Less Proposed)	**$941,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL

15

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	At the truck climbing lane, use a 10' shoulder on the outside and an 8' shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane

Assumptions				
Interest/Discount Rate(%):	**2.4%**		**Economic Life (yrs):**	50

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Concept**		**Value Proposal**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	CL3 Surface	15	$20,850	$14,609		
2	CL3 Surface	30	$20,850	$10,235		
3	CL3 Surface	45	$20,850	$7,171		
4						
5	Asphalt Mill & Texturing	15	$7,350	$5,150		
6	Asphalt Mill & Texturing	30	$7,350	$3,608		
7	Asphalt Mill & Texturing	45	$7,350	$2,528		
8						
9						
10						
Total Salvage & Replacement Costs			**$84,600**	**$43,301**	**$0**	**$0**

Annual Costs (pres worth calculated over 50 yrs)		**Baseline Concept**		**Value Proposal**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs		**$0**	**$0**	**$0**	**$0**

SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth	**$43,000**	**$0**
RESULTS (Proposed less Baseline)	**AVOID COST of $43,000**	

Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

Assumptions & Calculations: Any assumptions made or support calculations that were developed to support the quantities used in the LCC should be included.

VALUE PROPOSAL

17

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge

VALUE PROPOSAL SYNOPSIS:

Tidal Wave Road is one of a couple culverts under I-75 within the project area. These culverts, if determined structually sound, should be left in place under current loading design. The design should incorporate no additional fill overtop the culvert, staying within the max fill criteria.

Reliability	Maintained	Functionality	Maintained	$ Initial Cost Avoidance (Add)
O&M	Maintained	Schedule Impact	Improved	$926,000

BASELINE CONCEPT:

The baseline concept as explained would bring the existing culverts up to current ratings code. This would require either strengthening or replacement with a new structure.

VALUE PROPOSAL DESCRIPTION:

The value team proposes adding no additional fill beyond the max fill limit with the current culverts remaining in place for continued use.

ADVANTAGES:	DISADVANTAGES:
● construction time shortened	●
● cost savings	●
●	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$1,190,000	$0	$1,190,000
VALUE PROPOSAL DESCRIPTION:	$264,000	$0	$264,000
TOTAL (Baseline less Proposed)	$926,000	$0	$926,000

AVOID COST

TITLE	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge

DISCUSSION & JUSTIFICATION:

The information provided led the project team to believe that strengthening or replacement of the existing culverts would need to take place in order to meet loadings. It was stated that all widening would occur to the inside of the roadway. If outside slopes are left as currently designed, there would be substantial benefit in simply leaving the culverts in place as they are and using them with the current HS20 load specifications.

Assuming the culverts are designed to the max fill height across the entire culvert length, filling the median to this elevation likely will not cause issue. In super elevated sections, however, the road may need to be lowered slightly to account for the additional weight due to the super.

In addition, in lieu of placing an additional 2 lifts of base and surface on the structure, this may need to be milled down. Accounting for a 1"=100' transition of mainline existing pavement, we would need to mill down 7.75" so as not to raise the existing profile at the culvert. This transition would take 1550' approximately to drop down and raise back up.

VALUE PROPOSAL

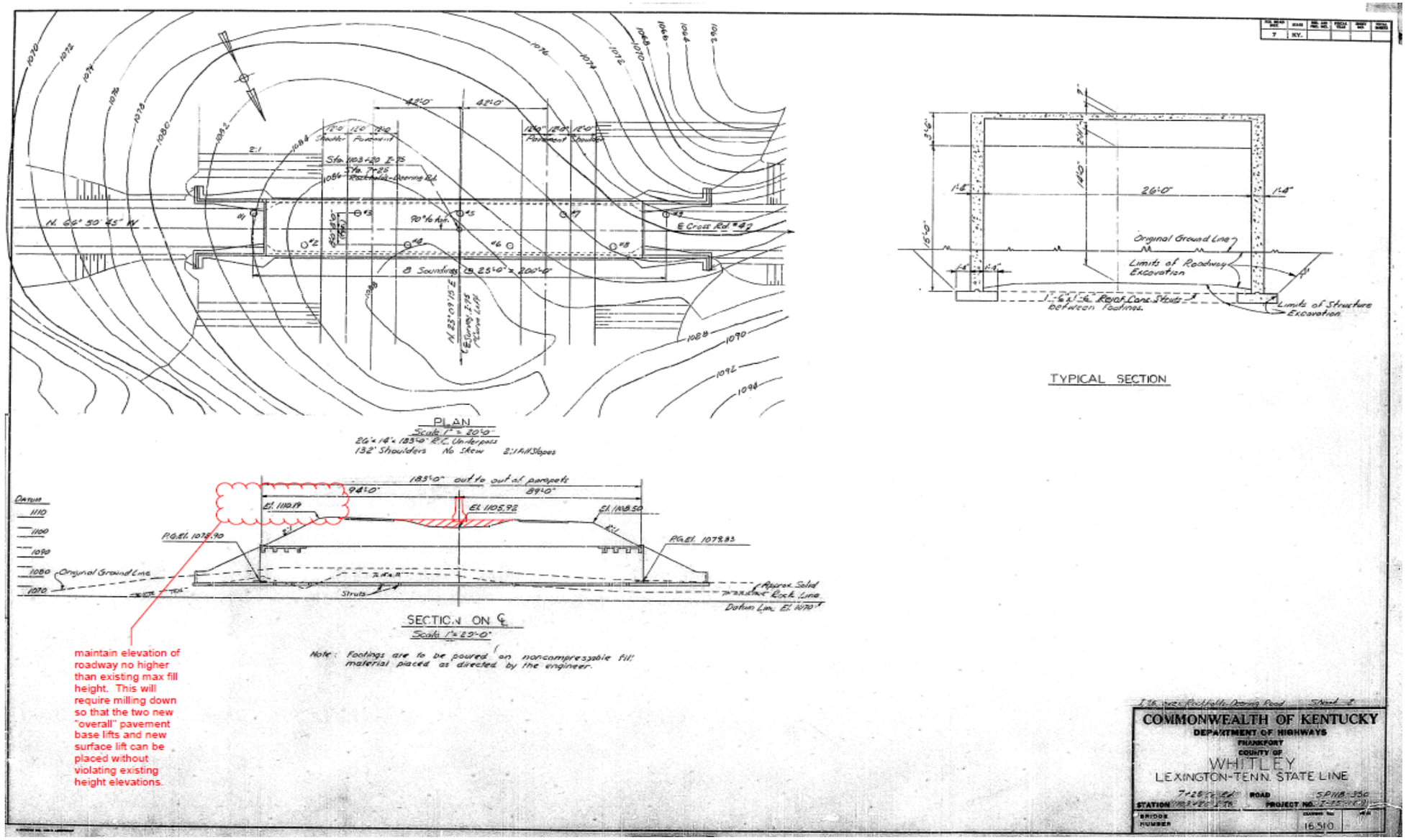
17

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

17

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge
Assumptions & Calculations	Based on current culvert replacement prices, 250/sf was used. replacing the culvert with the exact same size barrel as today.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Culvert Replacement		SF	4,758	$250	$1,189,500			
Asphalt Mill & Texture		TON				5,872	$45	$264,240
TOTAL					$1,190,000			$264,000
							Impact to Initial Cost (Baseline Less Proposed)	**$926,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL

19

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	If there is maximum of 12-15" of clearance, use bridge jacking to increase clearance and avoid the need to totally replace the bridge
ASSOCIATED IDEAS	20: For existing overpass structures, provide vertical clearance by jacking the structure and adding to the cap; protect piers rather than providing horizontal structures

VALUE PROPOSAL SYNOPSIS:

In lieu of replacing the structure completely due to vertical clearance, acquire clearance needed by jacking and pouring a new cap.

Reliability	**Maintained**	**Functionality**	**Maintained**	**$ Initial Cost Avoidance (Add)**
O&M	**Degraded**	**Schedule Impact**	**Improved**	**$0**

BASELINE CONCEPT:

The baseline concept would upgrade the current structures to acquire vertical clearance and push piers on the outside shoulder to beyond the clearzone. This will result in a completely new structure at the location.

VALUE PROPOSAL DESCRIPTION:

Jack and Support the bridge while forming and new cap for the superstructure to rest. Protect shoulder piers with guardrail or barrier wall.

ADVANTAGES:	DISADVANTAGES:
● Expedited construction	● Not a new structure
● Cost savings	●
● Lower impact to local traffic on overpass	●
● Can be completed during summer when school is out	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
			NO CHANGE

VALUE PROPOSAL

19

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	If there is maximum of 12-15" of clearance, use bridge jacking to increase clearance and avoid the need to totally replace the bridge

DISCUSSION & JUSTIFICATION:

It was explained by the project team that the project intended to have 30' clearzones on the outside and meet the 17' vertical clearances for the bridges over shoulders. Based on the information we have, it appears that the clearances today are more along the line of 16'-6" +/- over the shoulder. If we can raise the existing structure through jacking, and pour a new cap underneath, we believe we can meet the vertical clearances. This will still leave the outside shoulder piers at their current location. However, these piers pose no safety concerns to the traveling public because of the guardrail in front.

If it is deemed feasible to jack the structure and pour a new cap, the horizontal clearances of the overpass piers can be safely met with addition of MASH compliant guardrail as today.

While Jacking and Supporting a structure is not cheap, the value team believes it warrants further investigation. School traffic crosses these structures. While one structure could likely be closed and detoured, it would be desirable to not close these structures while school is in session. This would mean the existing structures would need to be demolished and built back in a 3 month span. This will take at least 2 construction seasons and be a costly endeavor.

VALUE PROPOSAL
20
Kentucky Transportation Cabinet
I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Replace only the superstructures on overpasses that do not meet vertical clearance
ASSOCIATED IDEAS	22: For existing overpass structures, replace the super structure only for vertical clearance

VALUE PROPOSAL SYNOPSIS:

Reuse existing substructure for overpass structures along I-75. This will result in a cost savings and schedule reduction while allowing local access to return quicker.

Reliability	**Maintained**	**Functionality**	**Maintained**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Improved**	**$7,223,000**

BASELINE CONCEPT:

The existing bridges over I75 will need to be replaced in order to provide horizontal clearance per KYTC request.

VALUE PROPOSAL DESCRIPTION:

Provide vertical clearance where current overhead bridges have less than required clearance (17'-0"). Retrofit existing piers for new superstructure.

ADVANTAGES:	DISADVANTAGES:
● Saves construction cost	● Does not provide 30" clear zone horizontal clearance
●	●
●	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$9,167,000	$0	$9,167,000
VALUE PROPOSAL DESCRIPTION:	$1,944,000	$0	$1,944,000
TOTAL (Baseline less Proposed)	$7,223,000	$0	$7,223,000

AVOID COST

TITLE	Replace only the superstructures on overpasses that do not meet vertical clearance

DISCUSSION & JUSTIFICATION:

The information presented by the project team stated that all the overpass structures along I-75 would be replaced with completely new structures to achieve vertical clearance and horizontal clear zone clearance. The majority of the clearance issues appear to be due to the arches currently over the shoulder area. When we widen, these arches will directly impact the widened shoulder and lane. The value team believes we can achieve vertical clearance with simply replacing the superstructure to eliminate the arches. As it is understood, the project team intends to replace all 3 structures. However, based of the information we have, the clearance over the shoulders should be 17.6', 18.2' and 16.9'. Depending on the depth of the current overlay, it would appear that 1 if not 2 of the structures will have adequate depth. These structures will not need to be modified at all given the information provided.

In addition to a cost savings, salvaging the substructure can allow the contractor to shorten construction duration. These roadways are utilized by local traffic including school traffic. We will have less impacts on school bus routes if we can shorten the construction duration to allow for a superstructure replacement only.

While the desire to obtain a 30’ clear zone with no piers is achievable, it comes with a price. The current piers, while inside the 30’ clear zone, are protected by guardrail. The safety to the traveling public is not compromised anymore than it would be as we approach any of the bridges on I-75. These bridge ends are within the same 30’ and are protected with guardrail just like the piers of the overpasses are today.

While the new structures would provide for more clear zone and vertical clearance, the value team believes the cost and schedule savings of the superstructure replacements are a better alternative. If it is determined that the existing vertical clearance is not what is in the plans, milling several inches to obtain this clearance would be a greater cost savings than replacing the entire structure.

VALUE PROPOSAL

20

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Replace only the superstructures on overpasses that do not meet vertical clearance
Assumptions & Calculations	Price used per square feet of replacement = 350/sf Price used per square feet of superstructure replacement = 250/sf

DESIGN ELEMENT	Mark-up	BASELINE CONCEPT				VALUE PROPOSAL		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Eaton School Bridge		SF	10,757	$350	$3,764,950	0		
Barton Mill Bridge		SF	7,776	$350	$2,721,600	7,776	$250	$1,944,000
KY 312 Bridge		SF	7,657	$350	$2,679,950	0		
TOTAL					$9,167,000			$1,944,000
							Impact to Initial Cost (Baseline Less Proposed)	**$7,223,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL

24

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab the existing bridge structure

VALUE PROPOSAL SYNOPSIS:

The existing bridge can be utilized in the widen bridge and reduce the cost of removing the existing bridge and building a wider new bridge.

Reliability	Maintained	Functionality	Maintained	$ Initial Cost Avoidance (Add)
O&M	Maintained	Schedule Impact	Improved	$2,474,000

BASELINE CONCEPT:

A new bridge (3span PCI beam) designed to the current specifications would be the constructed at this site. The orginial bridge will need to be removed.

VALUE PROPOSAL DESCRIPTION:

The existing bridge is a twin continuous RCDG bridge. This bridge style has a history of low on going maintenance cost and has robust load carrying traits (eventhough designed to HS20). Intergrating the existing bridges in the final structure saves considerable construction cost by only contructing a widen portion to the middle.

ADVANTAGES:	DISADVANTAGES:
● Reduces construction cost	●
●	●
●	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$4,929,000	$0	$4,929,000
VALUE PROPOSAL DESCRIPTION:	$2,455,000	$0	$2,455,000
TOTAL (Baseline less Proposed)	$2,474,000	$0	$2,474,000

AVOID COST

TITLE	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab the existing bridge structure

DISCUSSION & JUSTIFICATION:

The information provided by the project team led the value team to conclude the baseline design for the KY 727 structure would be to remove and replace with a new structure meeting current design criteria. Based on the information the value team has, we believe current vertical clearances are sufficient for the structure. The existing structure is a twin continuous RCDG bridge which, depending on analysis, appears to be in good condition.

The value team proposes constructing and integrating a new structure between the two existing structures and strengthening the existing structures to obtain the desired load rating. The history of the RCDG bridges have proven them to be low maintenance structures that have weathered the course of time to still thrive as reliable dependable bridges today. With some strengthening of the structure the HS20 design can be brought up to current standards.

By not having to replace these two structures, the bridge at KY 727 can be constructed much more quickly with less traffic shifts, less materials, shorter construction time, less cost, and much less impacts to the traveling public.

VALUE PROPOSAL

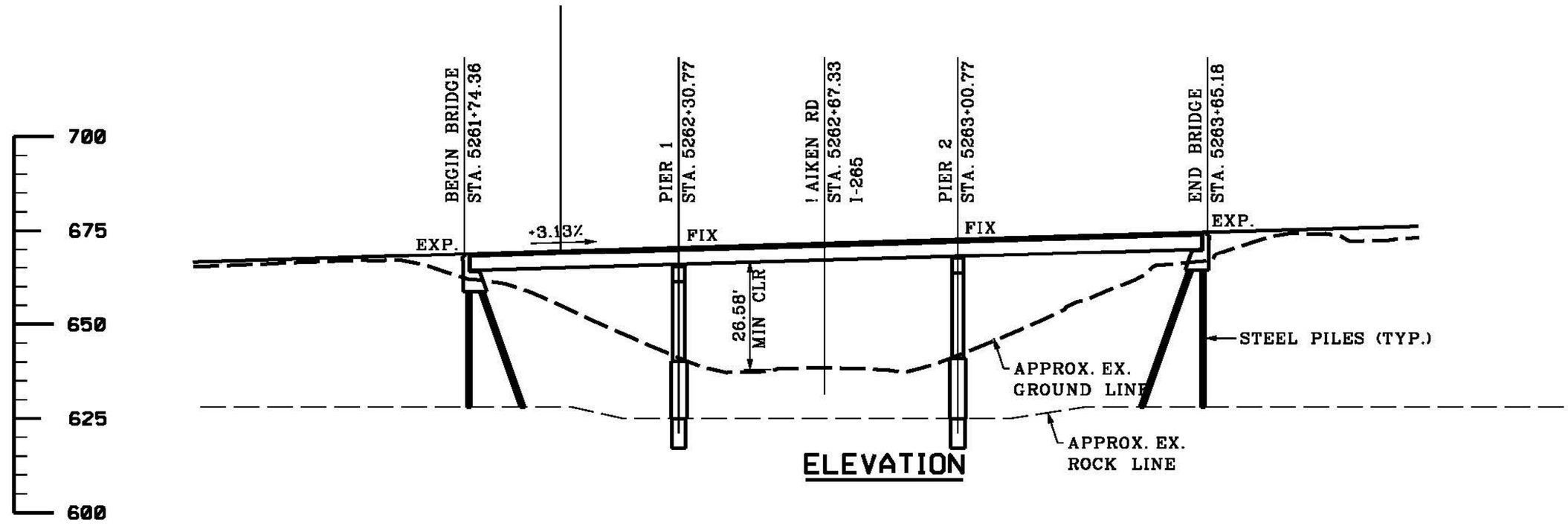
24

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

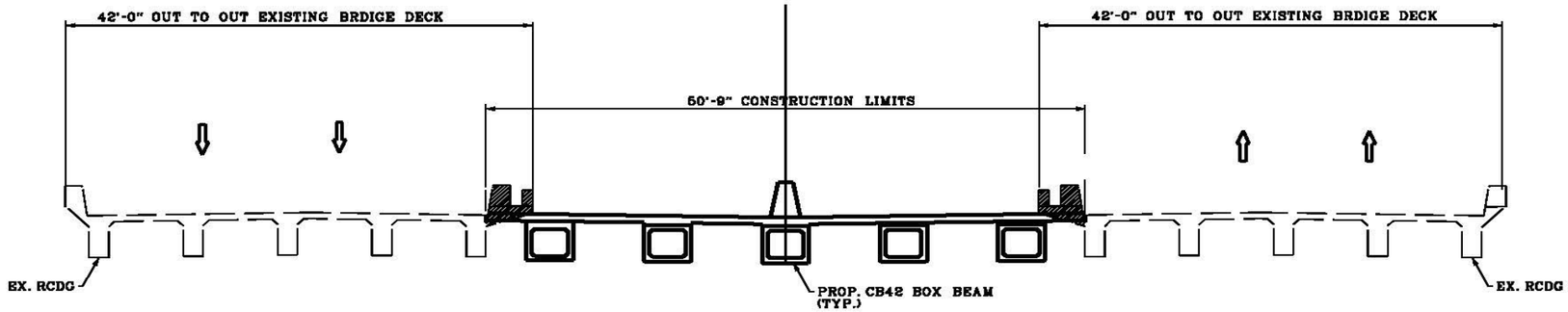
TITLE	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab the existing bridge structure

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



TITLE	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab the existing bridge structure

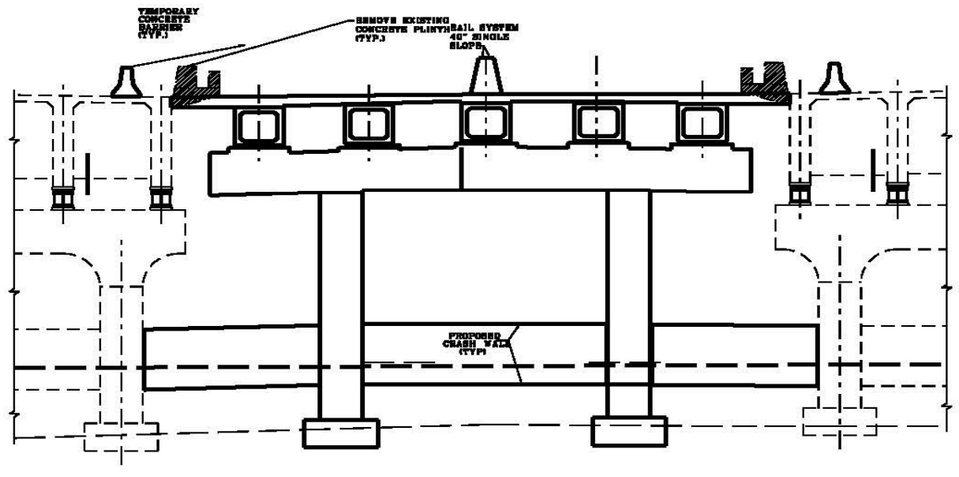
SKETCH/DIAGRAM: VALUE PROPOSAL



SOUTHBOUND REMOVAL AND CONSTRUCTION

NORTHBOUND REMOVAL AND CONSTRUCTION

WIDENING - TYPICAL SECTION



ELEVATION

LEGEND

⇧ INDICATES TRAFFIC DIRECTION

NOTES

1. PHASE 1 MOT SHOWN. PHASE 2 & PHASE 3 MOT WILL BE CARRIED ACROSS THE BRIDGE IN ITS FINAL CONFIGURATION. SEE MOT PLANS.

VALUE PROPOSAL

24

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab the existing bridge structure
Assumptions & Calculations	None noted.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
New Bridge		SF	26,871	$176	$4,729,296			
Remove Existing Bridges		Each	2	$100,000	$200,000			
Widen Existing Bridge						10,542	$176	$1,855,339
Strengthen/Rehab Existing Bridges						2	$300,000	$600,000
TOTAL					$4,929,000			$2,455,000
							Impact to Initial Cost (Baseline Less Proposed)	**$2,474,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL
26
Kentucky Transportation Cabinet
I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Use utility corridor or adjacent properties in conjunction with temporary easements to access creek for construction (with temporary easement for access)
ASSOCIATED IDEAS	27: Use nearby property off Texas Avenue to access creek for construction (with temporary easement for access) 28: Use Beach Street as access to creek for construction (with temporary easement for access)

VALUE PROPOSAL SYNOPSIS:

Consider access to the creek via private property and utility routes. temporary easements will need to be acquired.

Reliability	**Improved**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Degraded**	**$0**

BASELINE CONCEPT:

Since no right of way or access routes are shown on the plans, we believe the basline concept would be for the contractor to access the project via existing right of way near the bridge.

VALUE PROPOSAL DESCRIPTION:

Purchase temp easements to gain access via either Texas Ave, Beach Street, or KOA campground.

ADVANTAGES:	**DISADVANTAGES:**
● Clear path for constructability	● Requires Right of Way process
● Minimize Environmental concerns	●
● Safer access for construction	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
			NO CHANGE

VALUE PROPOSAL

26

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Use utility corridor or adjacent properties in conjunction with temporary easements to access creek for construction (with temporary easement for access)

DISCUSSION & JUSTIFICATION:

Access for the construction of the Lynn Camp Creek Bridge is not readily available. The I-75 is approximately 90 feet from the creek bottom with rock cuts being on both sides. Trying to determine which route is the easiest to get construction equipment down will not be easy if the project team intends to give access off I-75. This venture will be costly to construct as well as hazardous for the traveling public with materials and personnel accessing the project off I-75.

The value team recommends utilizing a combination of existing utility easement and private property to gain safer access. Based on the aerial photography, there appears to be three possible solutions. The value team suggests evaluating which option will draw the contractor in the closest to the bridge site, using minimal environmental disturbance, while keeping the grade of the access road as low as possible.

These alternatives are highlighted in the proposed sketch tab.

VALUE PROPOSAL

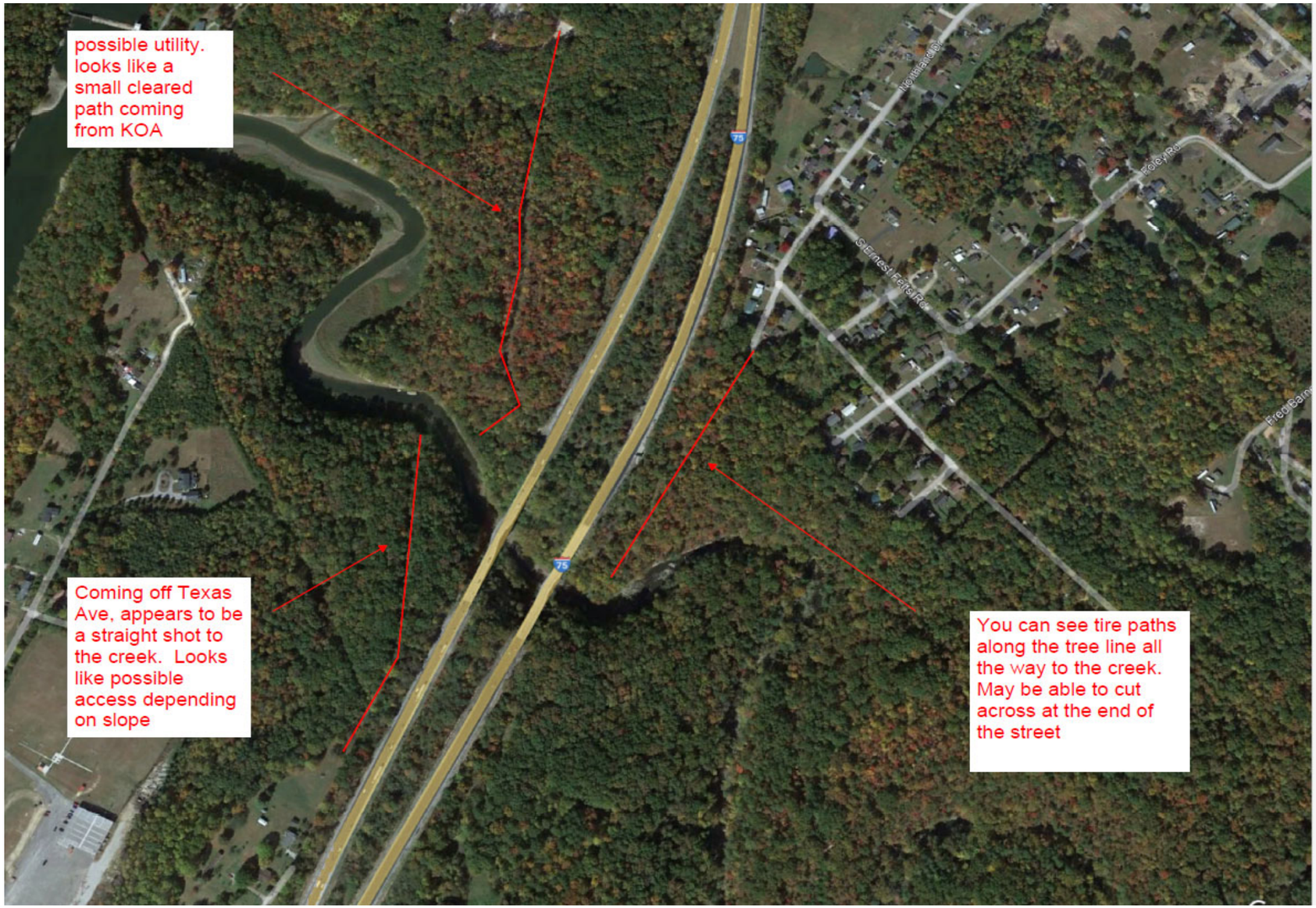
26

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Use utility corridor or adjacent properties in conjunction with temporary easements to access creek for construction (with temporary easement for access)

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

29

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

VALUE PROPOSAL SYNOPSIS:

Minimize construction phasing by placing both direction of traffic on one side at Lynn Camp Creek bridge allowing the entire substructure and superstructure to be completed in one phase for the second structure.

Reliability	**Improved**	**Functionality**	**Maintained**	**$ Initial Cost Avoidance (Add)**
O&M	**Improved**	**Schedule Impact**	**Improved**	**$266,000**

BASELINE CONCEPT:

Existing superstructure and substructure will be replaced for both bridges in 2 phases each. The initial phase pushes traffic to the outside, builds the new structure to the inside, shifts traffic onto the new structure, removes the old structure and replaces with the new.

VALUE PROPOSAL DESCRIPTION:

The contractor would focus on one structure first. However, once the new structure is complete, both directions will be maintained on the new structure (2 lanes each direction) while the second structure is done at one time.

ADVANTAGES:	DISADVANTAGES:
● shortened duration of project (approx. 6 months)	● additional asphalt for cross overs
● elimination of construction joint in superstructure of second bridge	●
● Armored edges and joint material on second bridge will be 1 piece not 2	●
● Easier constructability	●
● Safer construction access for second bridge	●
● Better Staging for second bridge	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$4,426,000	$220,000	$4,646,000
VALUE PROPOSAL DESCRIPTION:	$4,160,000	$68,000	$4,228,000
TOTAL (Baseline less Proposed)	$266,000	$152,000	$418,000

AVOID COST

TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

DISCUSSION & JUSTIFICATION:

Construction of the piers for the widening will take a considerable amount of time each. With the contractor forming and pouring about 20' at a time, we are estimating approximately 6 months each side for the substructure. By building one direction in 2 phases, we allow for complete demolition of the other bridge. The limiting factor for a vertical pour is the height. The contractor would be able to form and pour all the substructure for each lift as opposed to splitting it up. This could in turn lead to a different pier design on the second structure since the existing bridge will be completely removed first.

By building the structure as one unit instead of phasing, you can eliminate the longitudinal construction joint in the pier, the longitudinal construction joint in the deck, the phased placement of armored edges and joint material. All this can be done while not impacting the traveling public at all. 2 lanes can be maintained on the new structure built in phase 1 and 2.

The contractor will be able to stage material for the second bridge in the closed portion of interstate, receive beams safer, minimize any crane pads needed below (would only need one pad per pier instead of two). There is little doubt that the Lynn Camp Creek bridge will be the critical path for the project. By eliminating the 2 phase from the second bridge we immediately save 6 months off the construction.

While crossovers do cost money, the logical locations for cross overs can exist in the areas just north and south of the bifurcated areas, allowing the majority of temporary pavement needed to actually line up with permanent pavement.

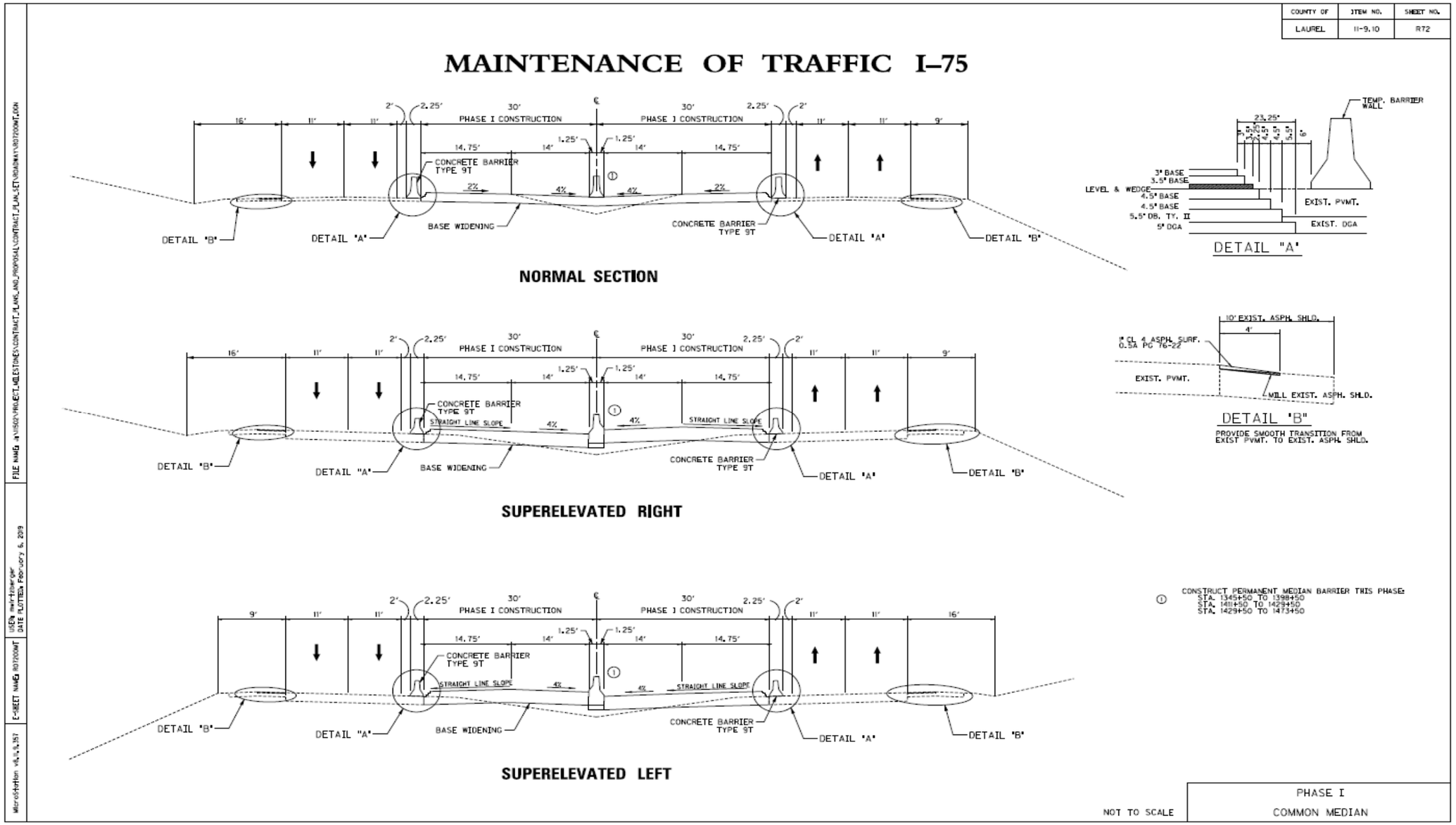
The cost to construct these cross overs is minimal when compared with time savings and joint elimination which is one of the main locations where we see bridges begin to deteriorate.

The cost estimate reflects a price change in concrete class A and concrete class AA. While the typical section of the bridge doesn't change, by reducing the phasing the contractor no longer needs the pump truck for those two phases. They also no longer need the bidwell and deck pour crew for two phases, just one. The production rate of the crew can increase because the contractor can form twice as much as they normally would during phased construction (due to vertical limitations).

The median cross over is assuming leveling and wedge at 3" average depths to obtain super elevations. Assuming a 50 median width, and a length of 2000' at 26' width, that equates to $88,000 per crossover.

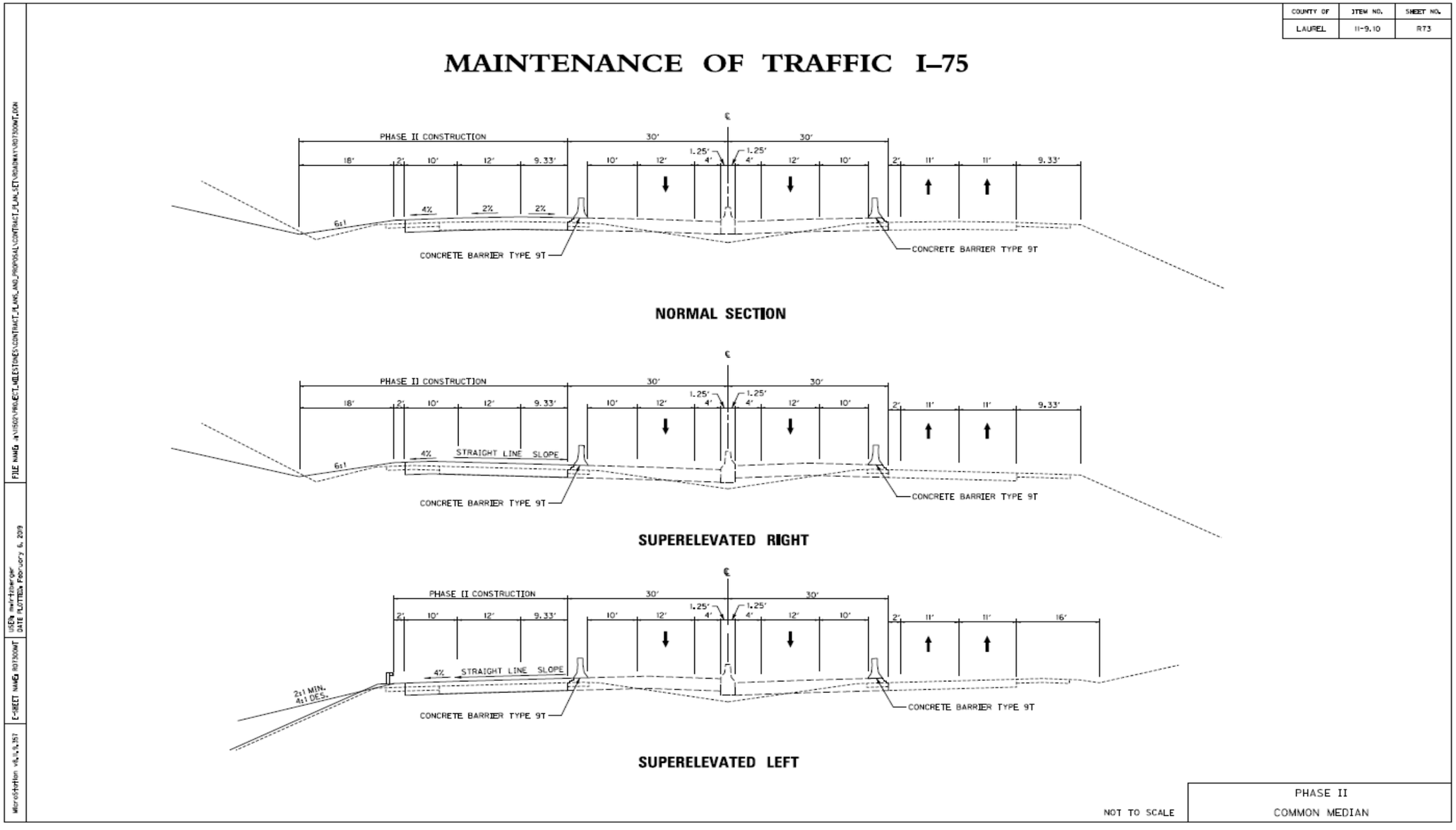
TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT

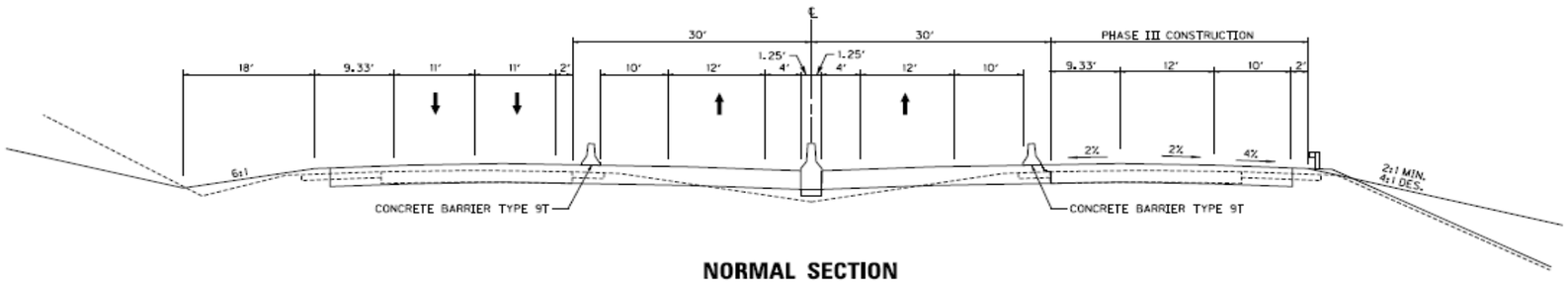


TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

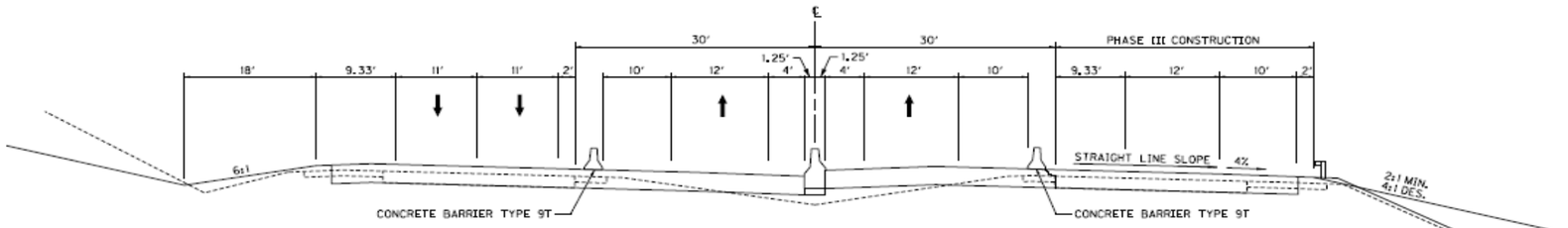
SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT

COUNTY OF	ITEM NO.	SHEET NO.
LAUREL	11-9.10	RT4

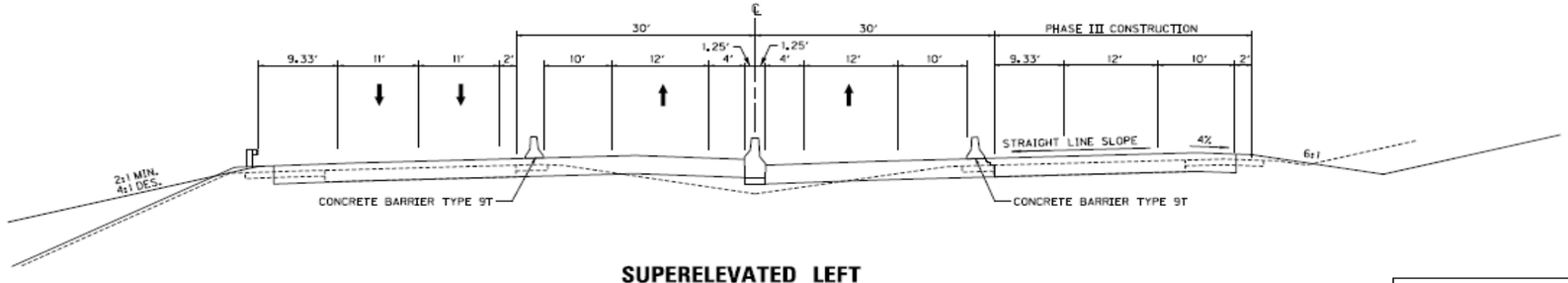
MAINTENANCE OF TRAFFIC I–75



NORMAL SECTION



SUPERELEVATED RIGHT



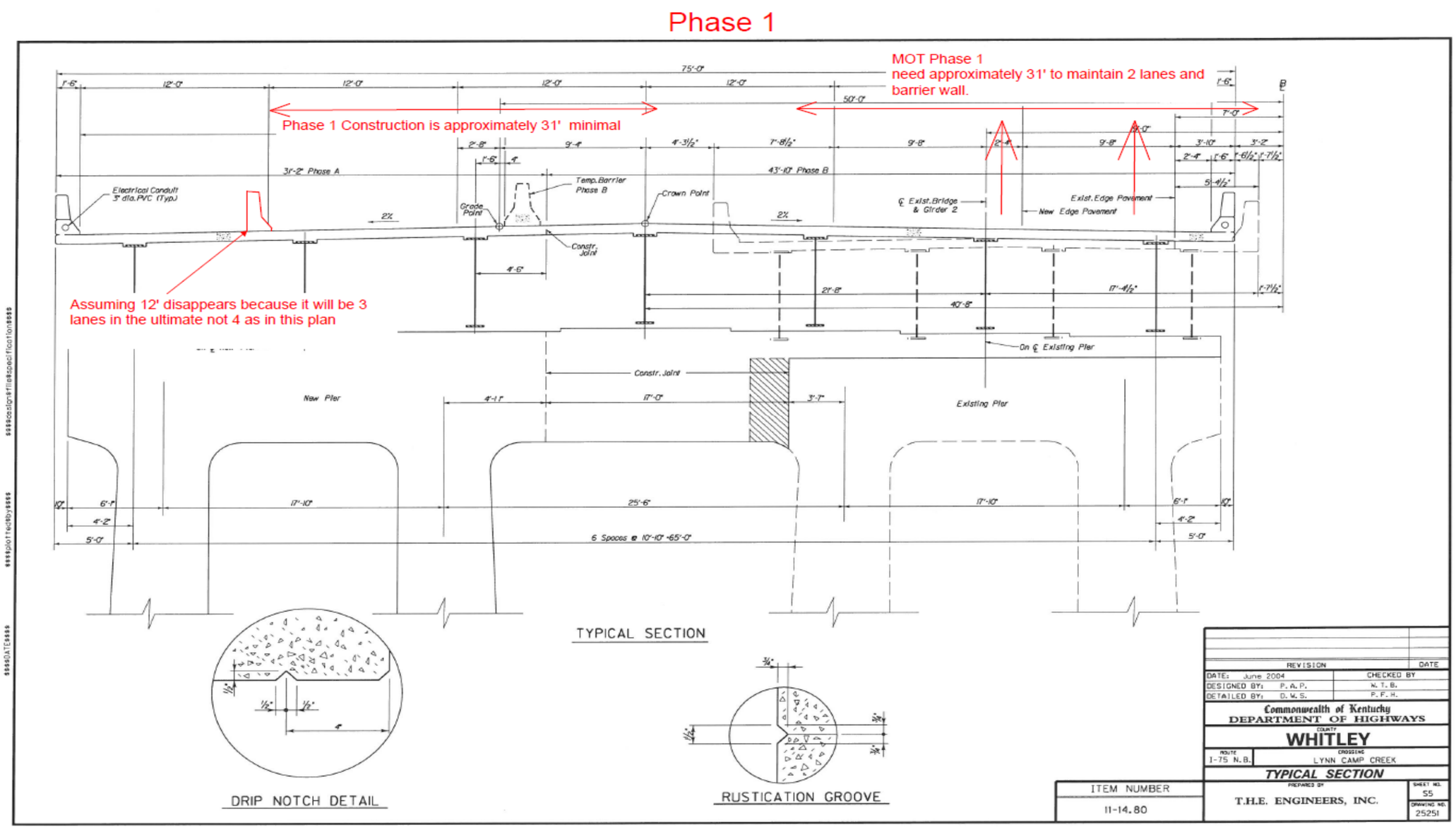
SUPERELEVATED LEFT

NOT TO SCALE

PHASE III
COMMON MEDIAN

TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

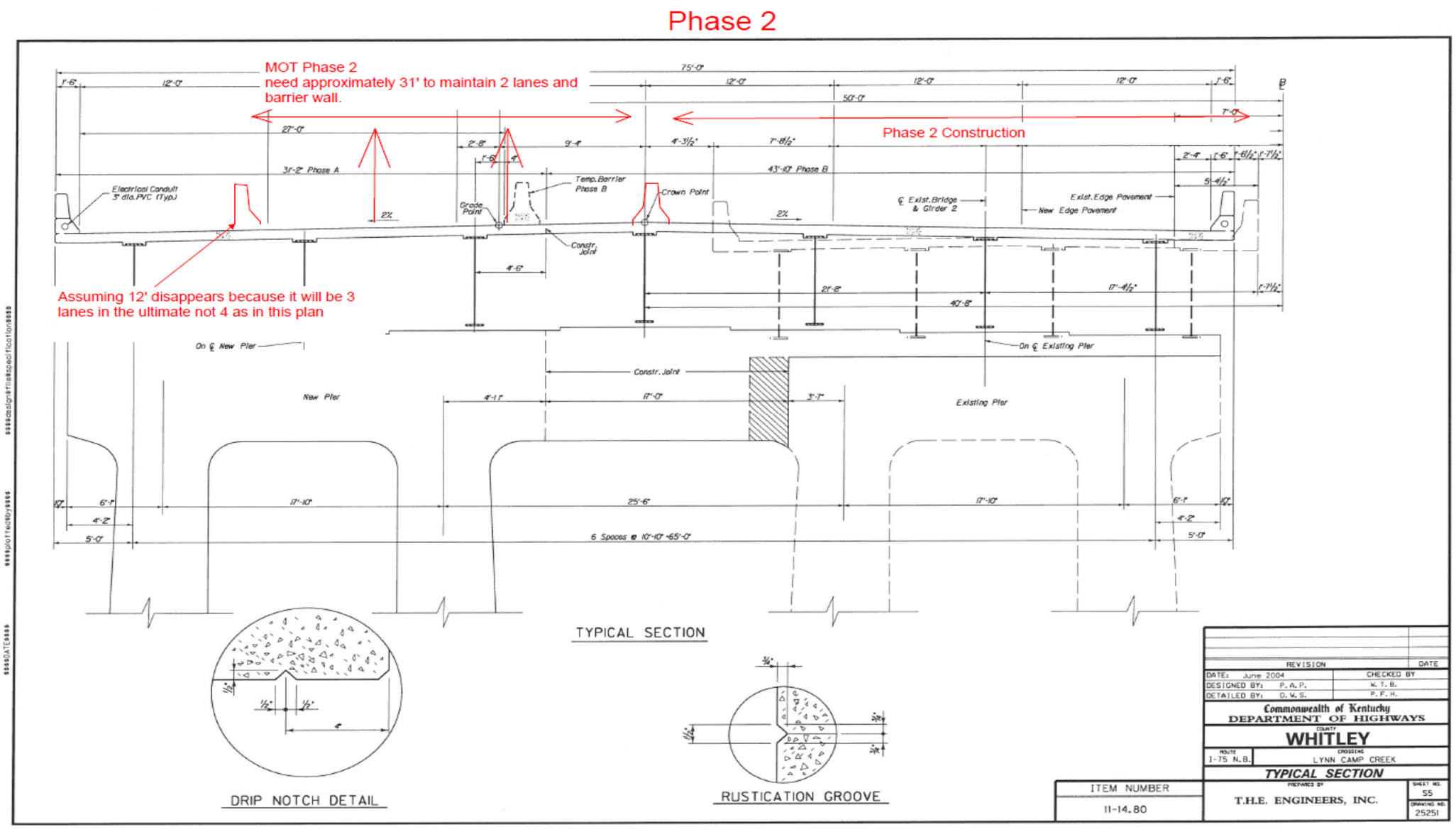
29

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

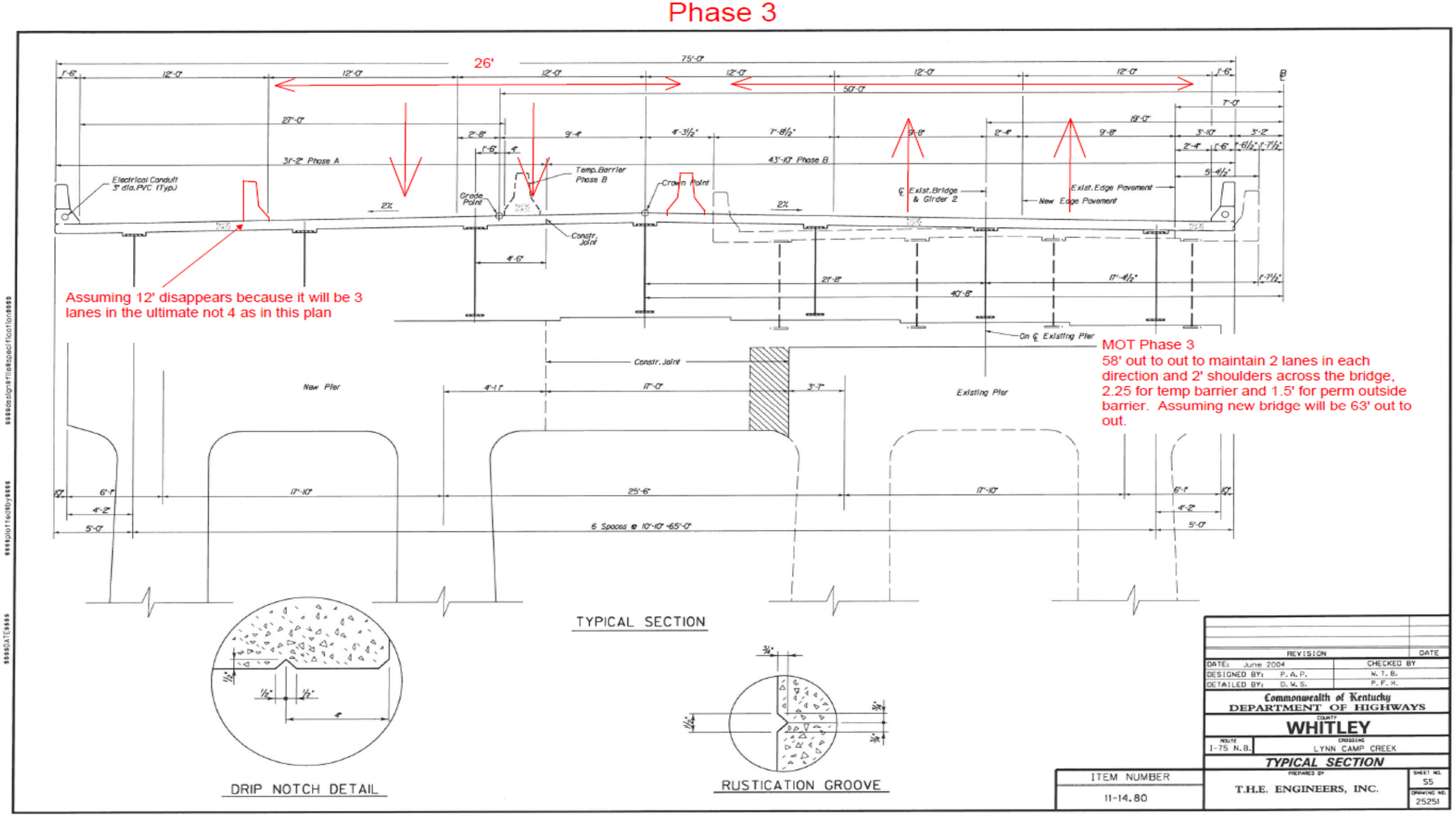
29

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

29

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure
Assumptions & Calculations	Median Crossovers will utililze permanent base but will require approximatley 3 inches of level & wedge. Bridge typicals stay the same. The complete substructure is replaced. Further detail of assumptions show in justifcation sheet 2

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Median Crossover		EACH	0	$0	$0	2	$88,000	$176,000
Concrete Class A		CY	1,292	$1,200	$1,550,400	1,292	$1,080	$1,395,360
Concrete Class AA		CY	1,438	$2,000	$2,876,000	1,438	$1,800	$2,588,400
TOTAL					$4,426,000			$4,160,000
							Impact to Initial Cost (Baseline Less Proposed)	**$266,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL

29

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure

Assumptions				
Interest/Discount Rate(%):	**2.4%**		**Economic Life (yrs):**	50

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Concept**		**Value Proposal**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Joint Replacement	20	$176,000	$109,525	$0	$0
2	Joint Replacement	40	$176,000	$68,158	$176,000	$68,158
3	Joint Replacement	60	$176,000	$42,415	$0	$0
4						
5						
6						
7						
8						
9						
10						
Total Salvage & Replacement Costs			**$528,000**	**$220,097**	**$176,000**	**$68,158**

Annual Costs (pres worth calculated over 50 yrs)		**Baseline Concept**		**Value Proposal**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs		**$0**	**$0**	**$0**	**$0**

SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth	**$220,000**	**$68,000**
RESULTS (Proposed less Baseline)	**AVOID COST of $152,000**	

Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

Assumptions & Calculations: Any assumptions made or support calculations that were developed to support the quantities used in the LCC should be included.

VALUE PROPOSAL

31

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Reuse substructures for Lynn Camp Bridge

VALUE PROPOSAL SYNOPSIS:

Reuse existing substructure at the Lynn Camp Creek bridge. Cost savings and time savings can be realized by using the existing substructures.

Reliability	Maintained	Functionality	Maintained	$ Initial Cost Avoidance (Add)
O&M	Maintained	Schedule Impact	Improved	$3,392,000

BASELINE CONCEPT:

The existing structures would be replaced with completely new structures.

VALUE PROPOSAL DESCRIPTION:

Widen and reuse existing substructure at Lynn Camp Creek to reduce schedule and reduce cost.

ADVANTAGES:	DISADVANTAGES:
● Cost savings	● Not a new structure
● Easier constructability	● May need to repair (epoxy inject)
● Shorter construction	● May need to strengthen
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$19,526,000	$0	$19,526,000
VALUE PROPOSAL DESCRIPTION:	$16,134,000	$0	$16,134,000
TOTAL (Baseline less Proposed)	$3,392,000	$0	$3,392,000

AVOID COST

VALUE PROPOSAL

31

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Reuse substructures for Lynn Camp Bridge

DISCUSSION & JUSTIFICATION:

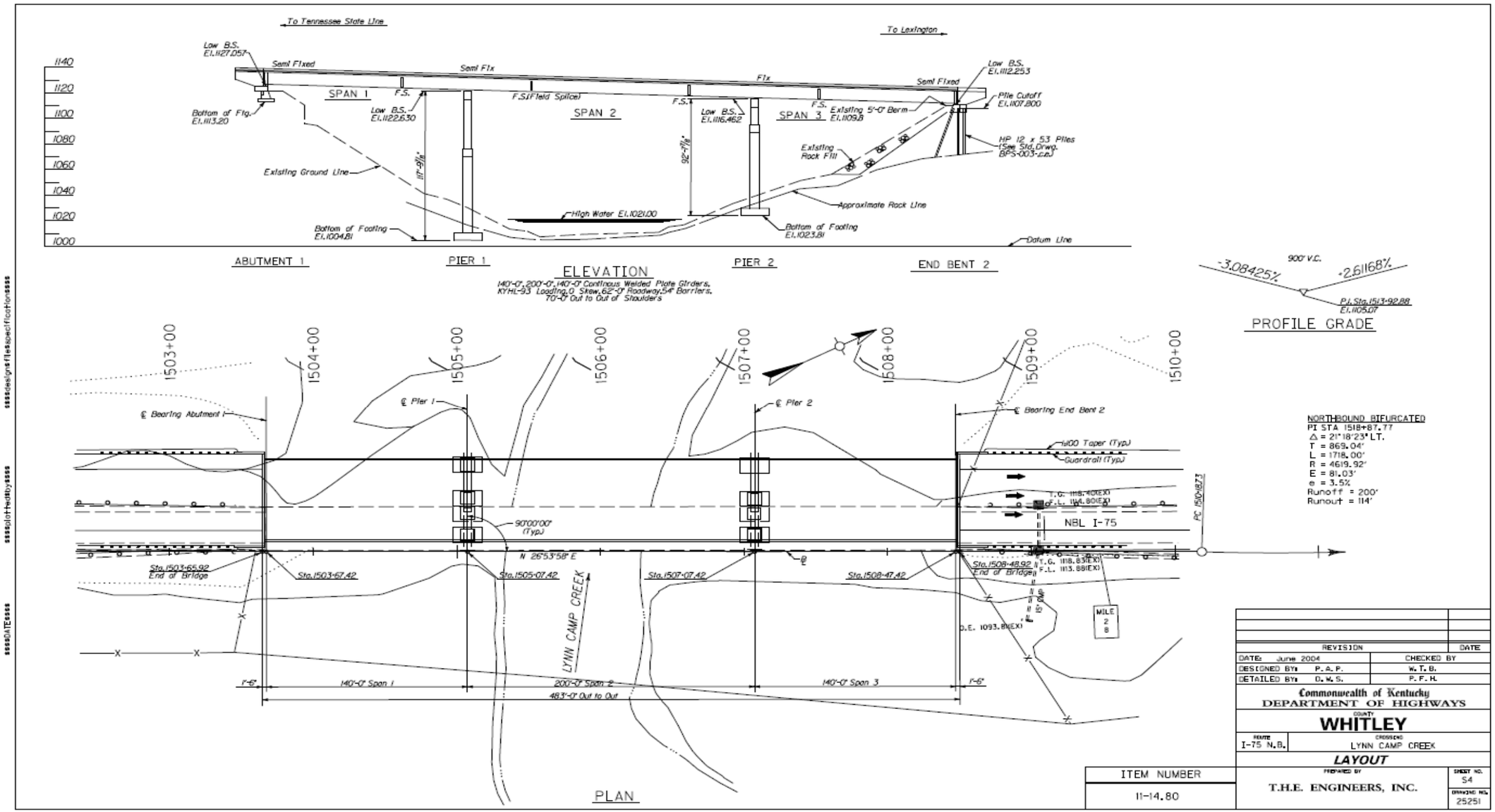
The information provided by the project team stated that all the structures were to be to replaced under the current design. The value team assumed this to mean the Lynn Camp Creek structure would be completely replaced as well. It is the value team's belief that substantial cost savings and schedule savings can be realized by reusing the existing substructure.

The existing structure is approximately 90' high from Lynn Camp Creek. Access and staging of equipment to construct each phase of these piers is a challenge. By reusing the existing substructure it's possible to eliminate crane placements, creek crossings, etc. that are associated with that phase.

Based on the information available to the value team, the substructure appears to be reusable. Further investigation would be needed to determine if any repair may need to be done, but this cost is minimal compared to removing and replacing these structures.

TITLE	Reuse substructures for Lynn Camp Bridge

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



VALUE PROPOSAL

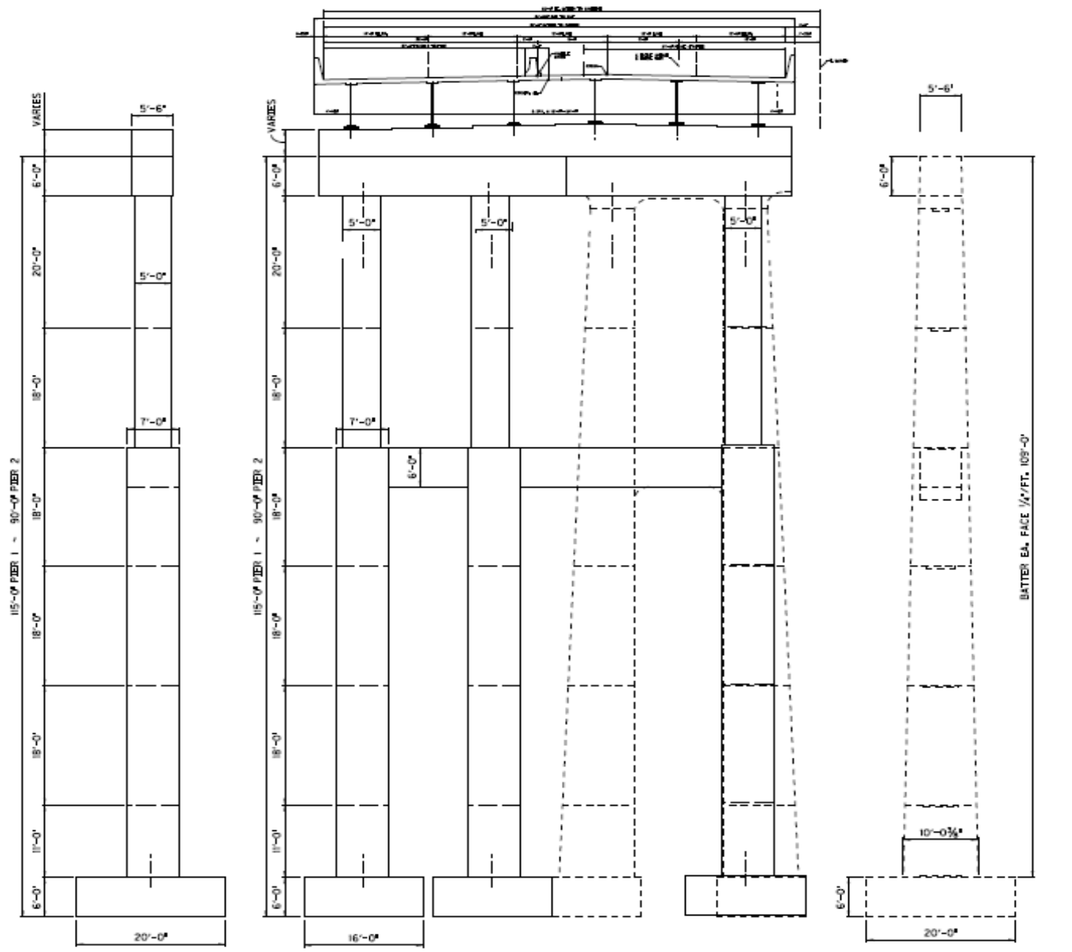
31

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Reuse substructures for Lynn Camp Bridge

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



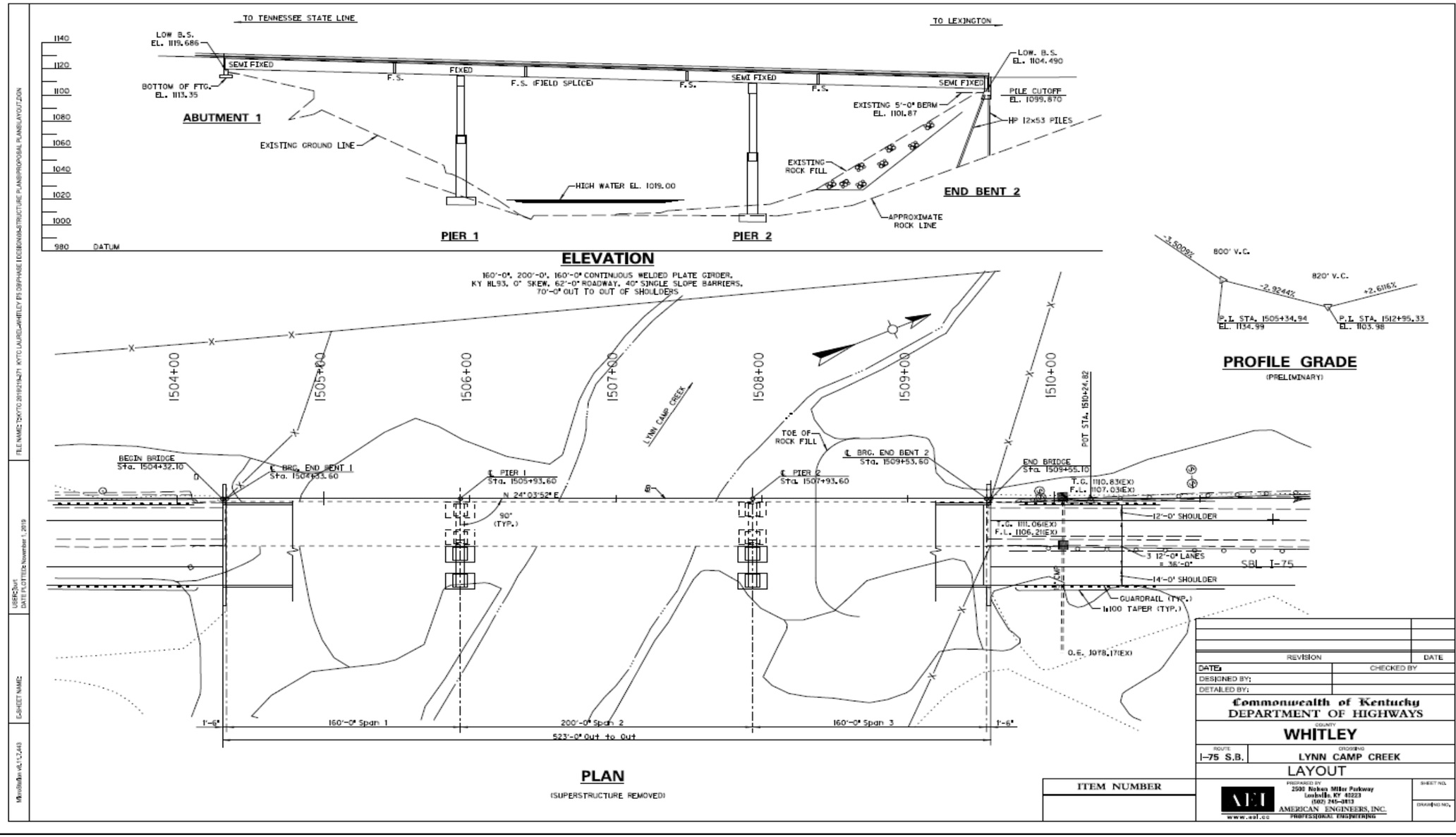
WIDENED END ELEVATION **ELEVATION** **EXISTING END ELEVATION**
(To be removed)

Typical New Bridge Pier

I75 over Lynn Camp Creek

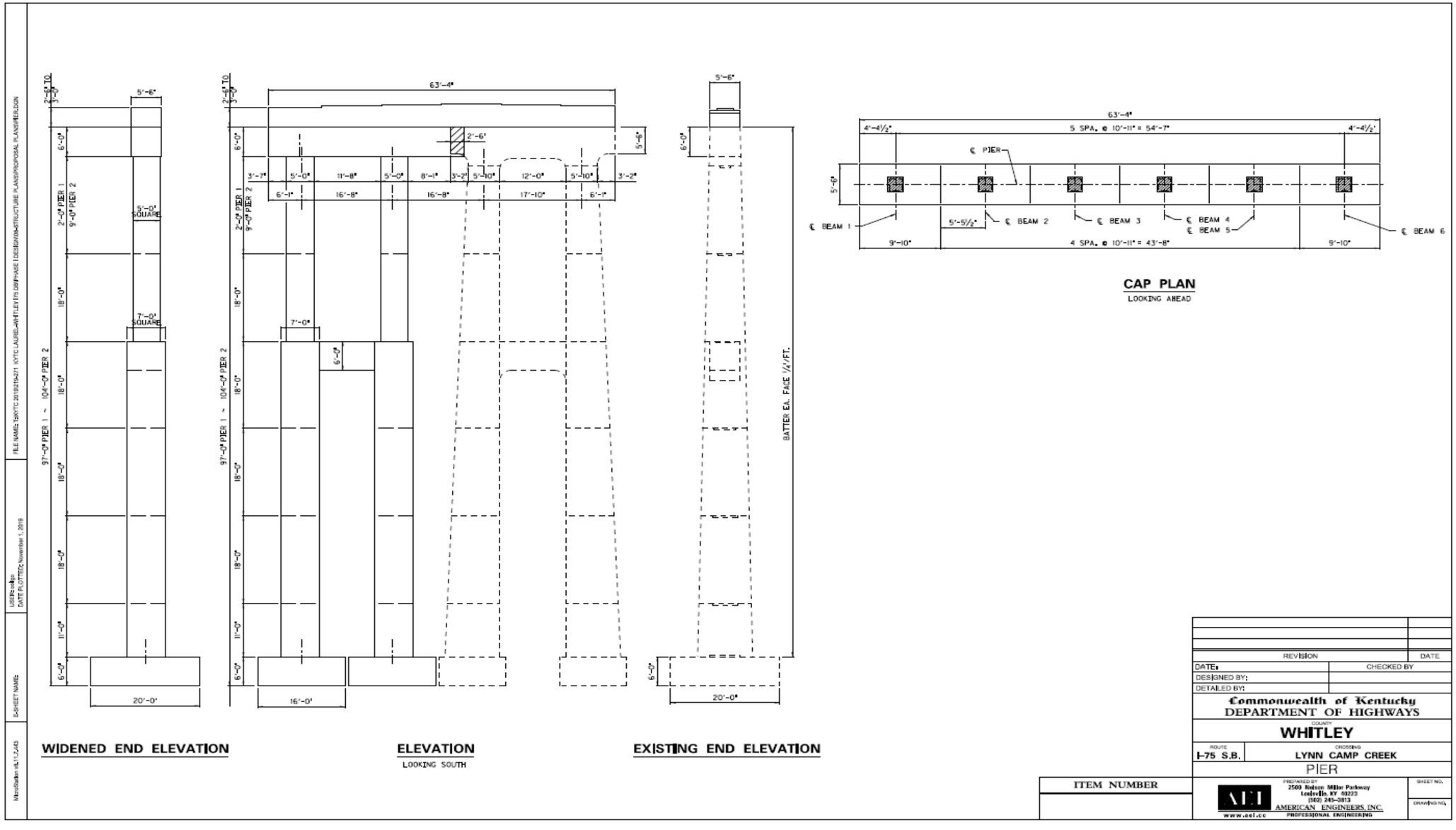
TITLE	Reuse substructures for Lynn Camp Bridge

SKETCH/DIAGRAM: VALUE PROPOSAL



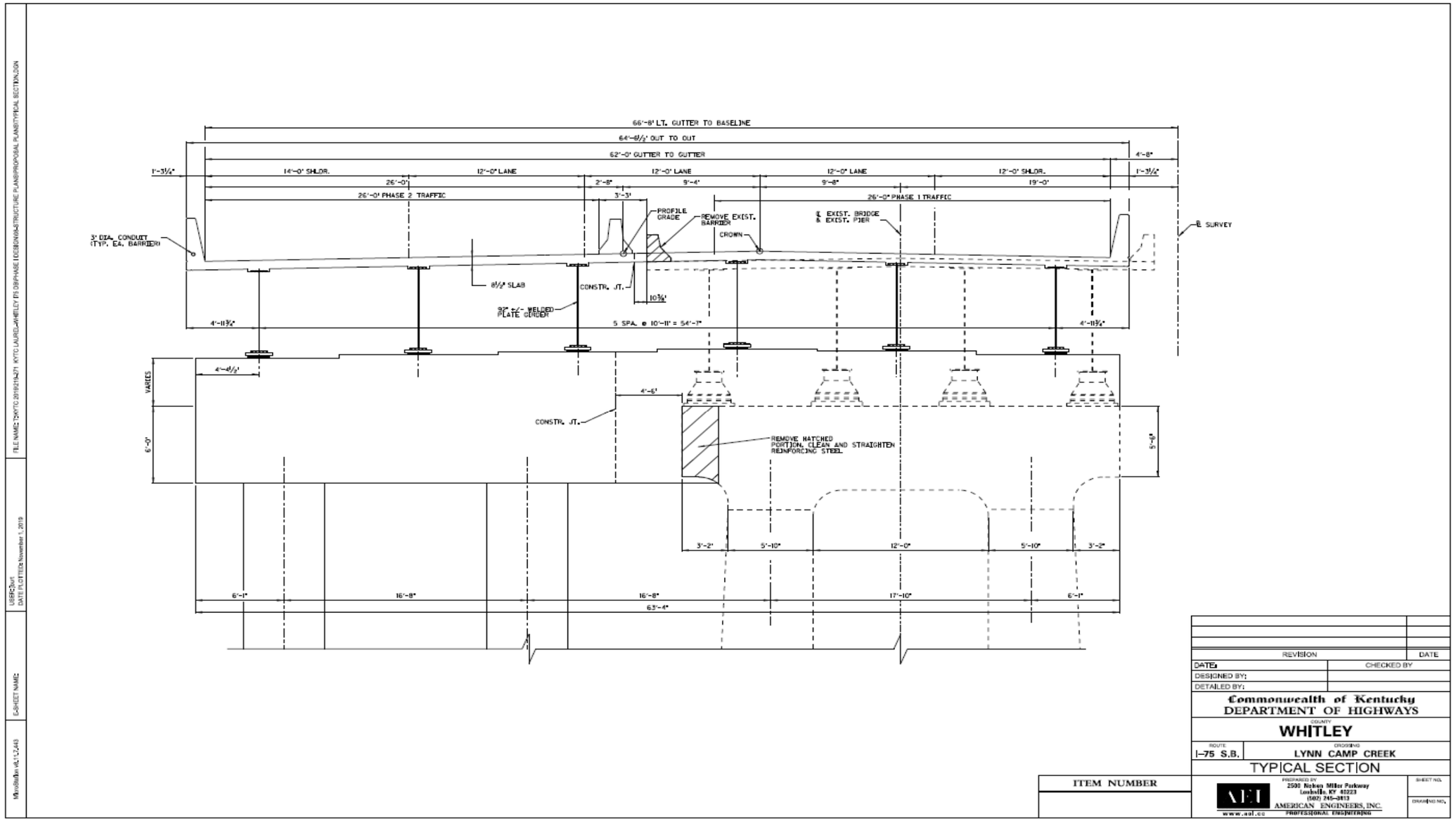
TITLE	Reuse substructures for Lynn Camp Bridge

SKETCH/DIAGRAM: VALUE PROPOSAL



TITLE	Reuse substructures for Lynn Camp Bridge

SKETCH/DIAGRAM: VALUE PROPOSAL



REVISION	DATE
DATE:	CHECKED BY
DESIGNED BY:	
DETAILED BY:	

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY: WHITLEY

ROUTE: I-75 S.B. | CROSSING: LYNN CAMP CREEK

TYPICAL SECTION

ITEM NUMBER

PREPARED BY: 2500 Nolen Miller Parkway, Louisville, KY 40223, (502) 245-3813
AMERICAN ENGINEERS, INC. PROFESSIONAL ENGINEERING
www.aei.cc

SHEET NO.

DRAWING NO.

FILE NAME: I:\KYTC 2019\21427\ KYTC LAUREL-WHITLEY ITS 0\PHASE 1\DESIGN\04-STRUCTURE PLANS\PROPOSAL PLANS\TYPICAL SECTION.DGN
USER: Burt
DATE PLOTTED: November 1, 2019
DGNSHEET NAME:
MicroStation v8.11.9.443

VALUE PROPOSAL

31

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Reuse substructures for Lynn Camp Bridge
Assumptions & Calculations	None noted.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Structural Steel		LBS	########	$4	$8,351,000			
Class AA concrete		CuYds	2,650	$1,100	$2,915,000			
Epoxy Coated Reinforcement		LBS	800,000	$2	$1,408,000			
Class A Concrete		CuYds	4,250	$900	$3,825,000			
Steel reinforcement		LBS	810,000	$2	$1,377,000			
End Bents/Foundation		Each	2	$325,000	$650,000			
Remove Existing Piers		Each	4	$250,000	$1,000,000			
Structural Steel		LBS				########	$4	$8,351,000
Class AA concrete		CuYds				2,650	$1,100	$2,915,000
Epoxy Coated Reinforcement		LBS				800,000	$2	$1,408,000
Class A Concrete		CuYds				2,100	$900	$1,890,000
Steel reinforcement		LBS				600,000	$2	$1,020,000
End Bents/Foundation		Each				2	$275,000	$550,000
TOTAL					$19,526,000			$16,134,000
							Impact to Initial Cost (Baseline Less Proposed)	**$3,392,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE PROPOSAL
38
Kentucky Transportation Cabinet
I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Build Lynn Camp Bridge as a single span deck truss with no piers
ASSOCIATED IDEAS	39: Build Lynn Camp Bridge using deck trusses in lieu of plate girder bridge

VALUE PROPOSAL SYNOPSIS:

The option uses a single span deck truss to cross Lynn Camp Creek. The option does not use tall piers that the continuous plate girder bridge

Reliability	**Maintained**	**Functionality**	**Maintained**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Maintained**	**($1,616,000)**

BASELINE CONCEPT:

A new bridge for NB and SB over Lynn Camp Creek is desired by KYTC. The basic configuration of a new bridge would be a continuous three span (160-200-160) steel Plate Girder bridge with widen new piers in the same location as the existing piers.

VALUE PROPOSAL DESCRIPTION:

Construction of tall piers (90'-100') can be avoided by using a deep deck truss span. The natural slope up from Lynn Camp Creek will meet the bottom of the proposed truss such that shallow abutments or End Bents can be utilized.

ADVANTAGES:	DISADVANTAGES:
● Does not use tall piers	● Construction/crane staging and steel erection time is more complicated than Plate Girder construction
●	
●	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$19,526,000	$0	$19,526,000
VALUE PROPOSAL DESCRIPTION:	$21,142,000	$0	$21,142,000
TOTAL (Baseline less Proposed)	($1,616,000)	$0	($1,616,000)

ADD COST

TITLE	Build Lynn Camp Bridge as a single span deck truss with no piers

DISCUSSION & JUSTIFICATION:

The information provided by the project team led the value team to conclude that the final design of the Lynn Camp Creek bridge will be a continuous three-span steel plate girder bridge. The baseline structure will replace the piers in their current location. However, construction of the new piers poses a constructability concern.

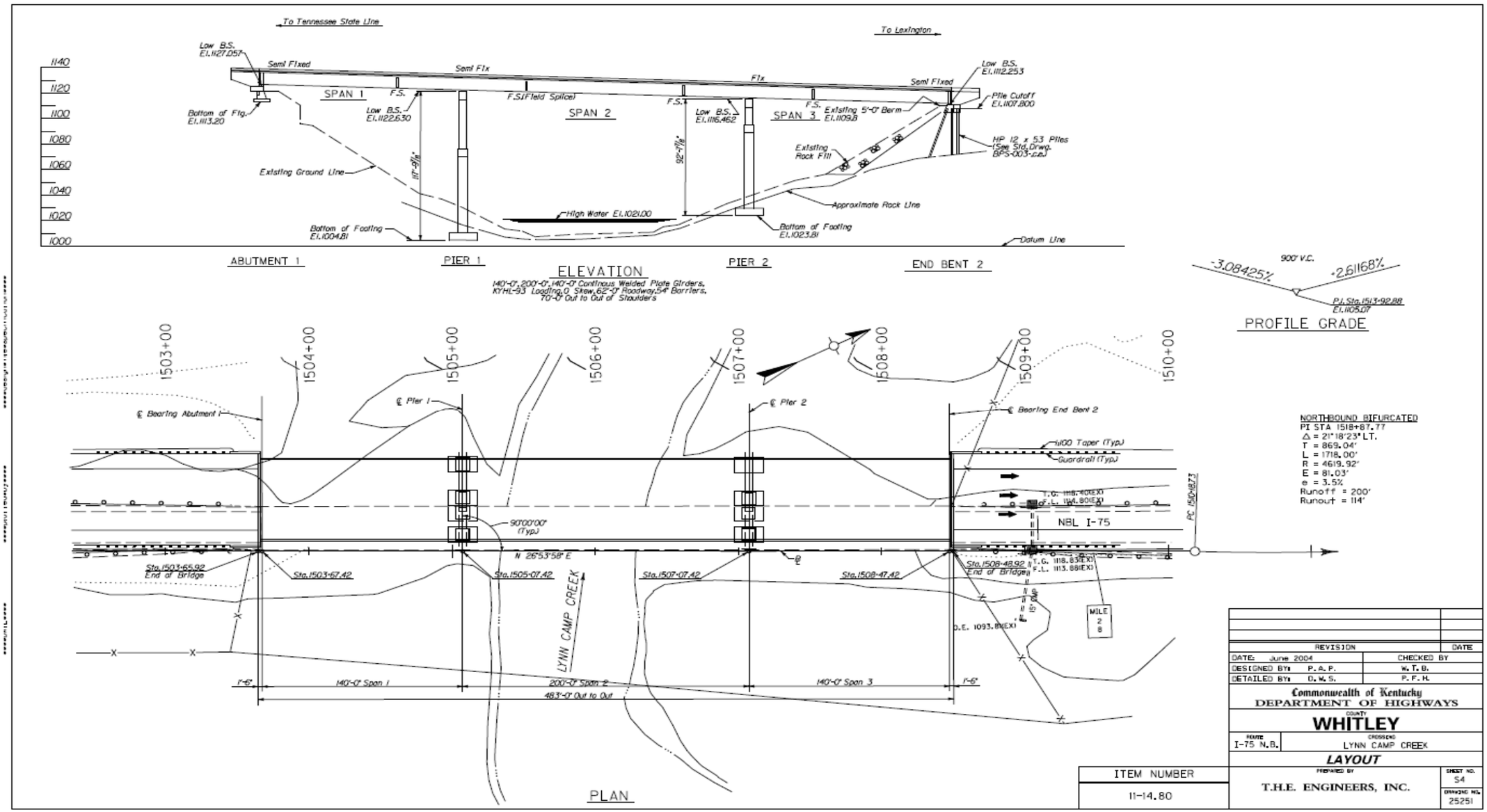
The value team proposes to place a single span deck truss with no piers. This would minimize the need for equipment to be down near the creek such as concrete pumps and concrete trucks.

Access to the creek will still be needed for temporary shoring supports, crane access, etc.

By eliminating the pier construction, the phasing duration for the bridge construction is greatly reduced, however, the complexity of the truss construction would mean that the project time is ultimately expected to remain the same. It is assumed that the Lynn Camp Creek structure will be on the critical path of the project.

TITLE	Build Lynn Camp Bridge as a single span deck truss with no piers

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



VALUE PROPOSAL

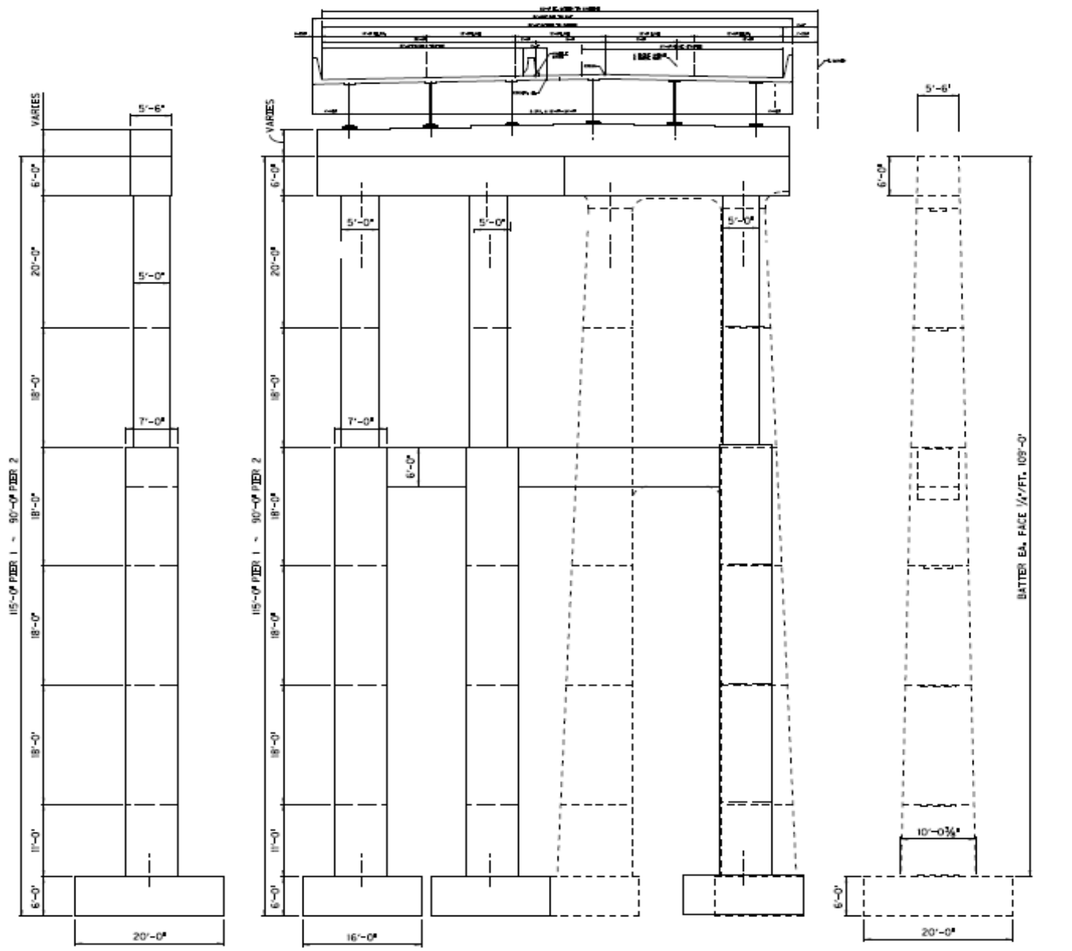
38

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Build Lynn Camp Bridge as a single span deck truss with no piers

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



WIDENED END ELEVATION **ELEVATION** **EXISTING END ELEVATION** (To be removed)

Typical New Bridge Pier

I75 over Lynn Camp Creek

VALUE PROPOSAL

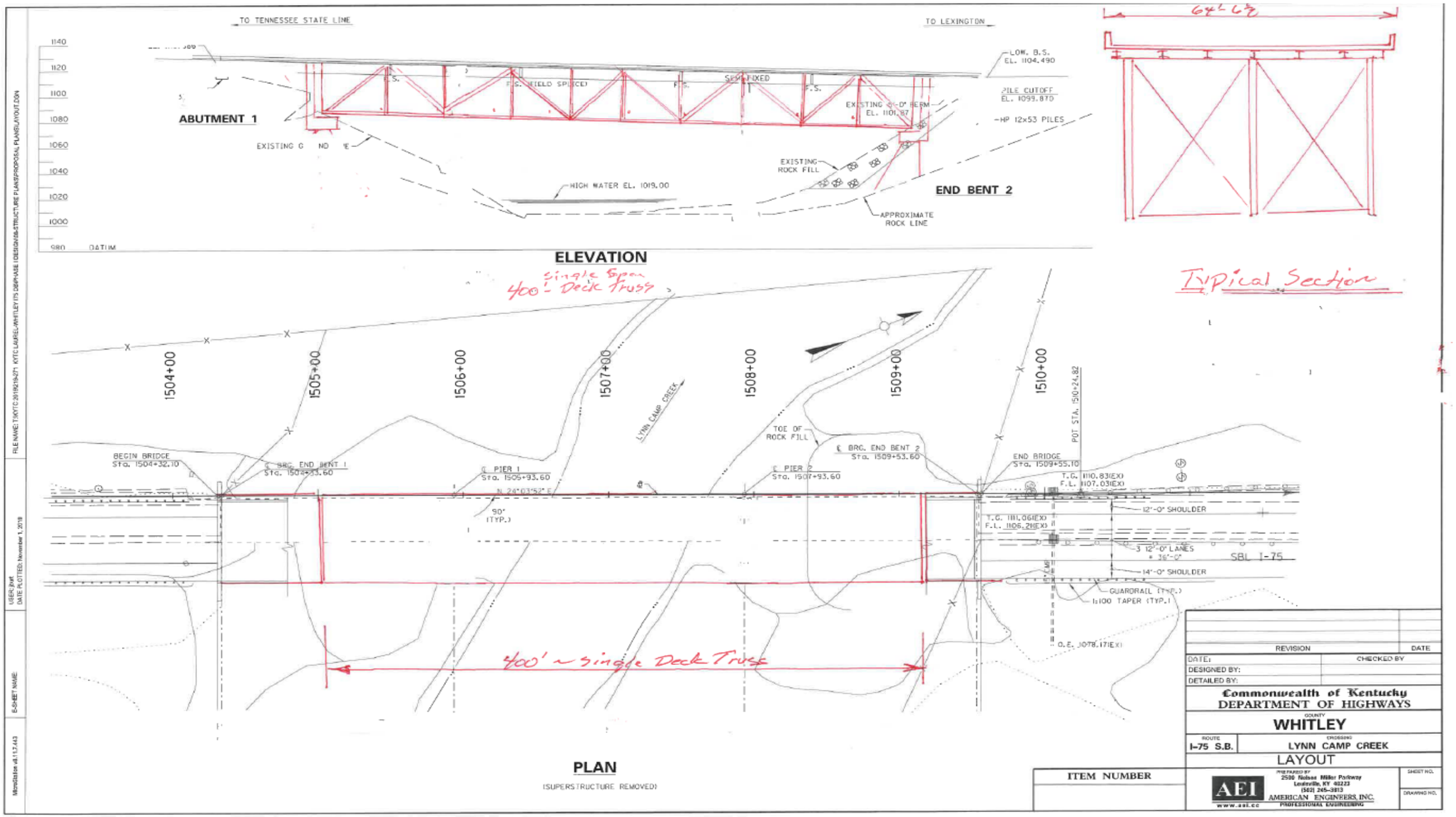
38

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Build Lynn Camp Bridge as a single span deck truss with no piers

SKETCH/DIAGRAM: VALUE PROPOSAL



VALUE PROPOSAL

38

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Build Lynn Camp Bridge as a single span deck truss with no piers
Assumptions & Calculations	None noted.

DESIGN ELEMENT	**Mark-up**	**BASELINE CONCEPT**				**VALUE PROPOSAL**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Structural Steel		LBS	########	$4	$8,351,000			
Class AA concrete		CuYds	2,650	$1,100	$2,915,000			
Epoxy Coated Reinforcement		LBS	800,000	$2	$1,408,000			
Class A Concrete		CuYds	4,250	$900	$3,825,000			
Steel reinforcement		LBS	810,000	$2	$1,377,000			
End Bents/Foundation		Each	2	$325,000	$650,000			
Remove Existing Piers		Each	4	$250,000	$1,000,000			
Structural Steel		LBS				########	$5	$16,200,000
Class AA concrete		CuYds				1,350	$1,100	$1,485,000
Epoxy Coated Reinforcement		LBS				625,000	$2	$1,100,000
Class A Concrete		CuYds				625	$900	$562,500
Steel reinforcement		LBS				120,000	$2	$204,000
MSE Wall		SF				21,200	$75	$1,590,000
TOTAL					$19,526,000			$21,142,000
					Impact to Initial Cost (Baseline Less Proposed)			**($1,616,000)**

Note: Total costs are rounded to the nearest thousand dollars.

ADD COST

VALUE PROPOSAL

53

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Build a single span steel girder for Lynn Camp Bridge construction

VALUE PROPOSAL SYNOPSIS:

The option uses a single span Plate Girder span to cross Lynn Camp Creek. The option does not use tall piers like the continuous plate girder bridge.

Reliability	Maintained	Functionality	Maintained	$ Initial Cost Avoidance (Add)
O&M	Maintained	Schedule Impact	Improved	($18,023,000)

BASELINE CONCEPT:

A new bridge for NB and SB over Lynn Camp Creek is desired by KYTC. The basic configuration of a new bridge would be a continuous three span (160-200-160) steel Plate Girder bridge with widen new piers in the same location as the existing piers.

VALUE PROPOSAL DESCRIPTION:

Construction of tall piers (90'-100') can be avoided by using a single span plate girder bridge. The natural slope up from Lynn Camp Creek will meet the bottom of the proposed bottom of the girders such that shallow abutments or End Bents can be utilized.

ADVANTAGES:	DISADVANTAGES:
● No tall piers are needed	● Extra structural steel
● Reduction in Construction Duration	●
● Easier Constructability	●
●	●
●	●
●	●
●	●

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$19,526,000	$0	$19,526,000
VALUE PROPOSAL DESCRIPTION:	$37,549,000	$0	$37,549,000
TOTAL (Baseline less Proposed)	($18,023,000)	$0	($18,023,000)
			ADD COST

TITLE	Build a single span steel girder for Lynn Camp Bridge construction

DISCUSSION & JUSTIFICATION:

The information provided by the project team led the value team to conclude that the final design of the Lynn Camp Creek bridge will be a continuous three-span steel plate girder bridge. The baseline structure will replace the piers in their current location. However, construction of the new piers pose a constructability concern.

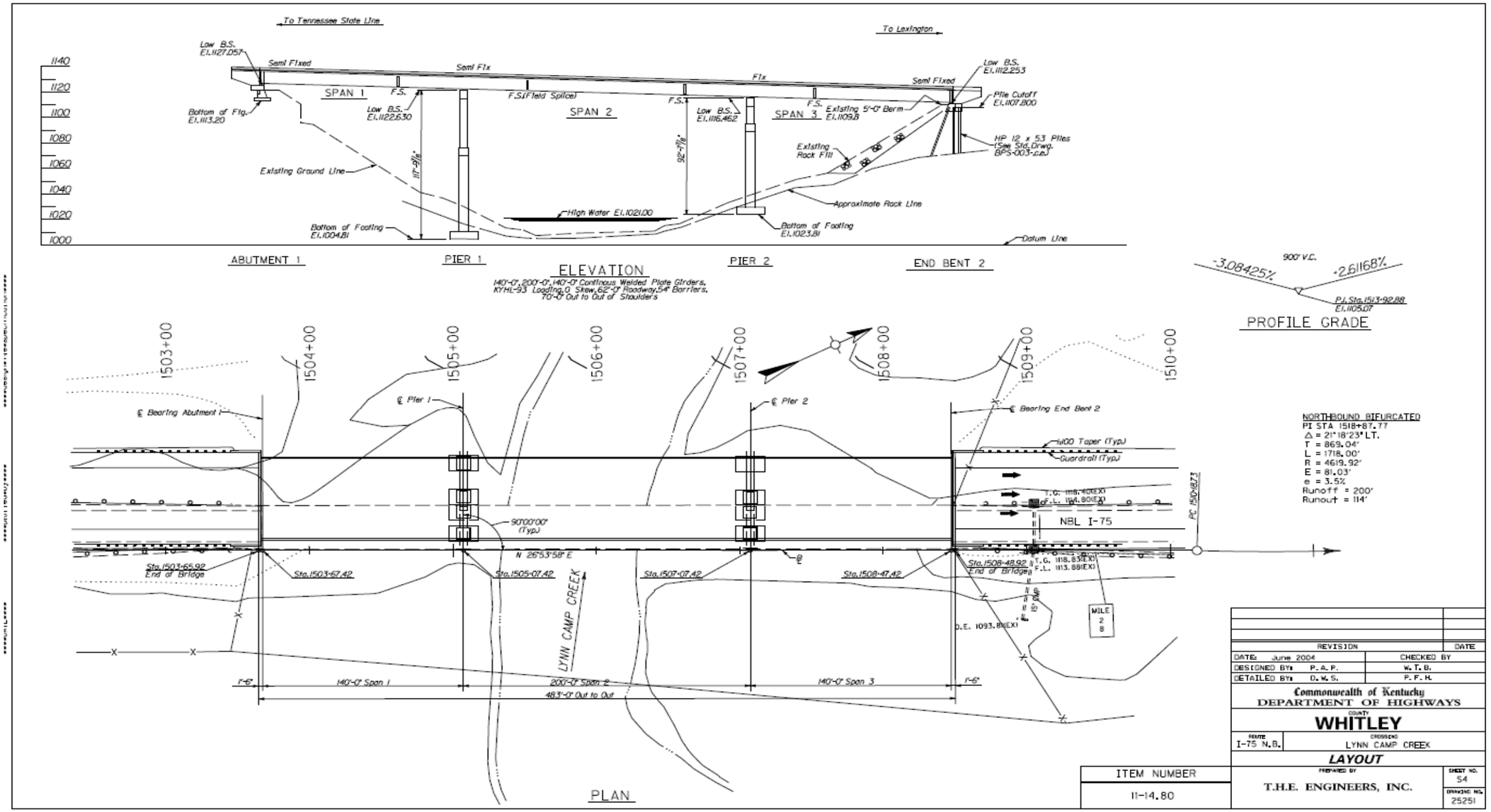
The value team proposes to place a single span plate girder bridge. This would minimize the need for equipment to be down near the creek. Shallow abutments or end bents can be utilized and constructed from the top behind barrier wall. Access walks can be constructed for personnel with materials such as concrete being pumped from the top. Beams can be launched using a gantry instead of requiring large cranes in the creek area.

Access to the creek will still be needed for removal of the existing pier caps, but the access route and crossing will be minimal compared to that needed for the pier construction.

By eliminating the pier construction, the phasing duration for the bridge construction is greatly reduced. It is assumed that the Lynn Camp Creek structure will be on the critical path of the project. Reduction in the duration of this structure will lead to an overall reduction in the project schedule.

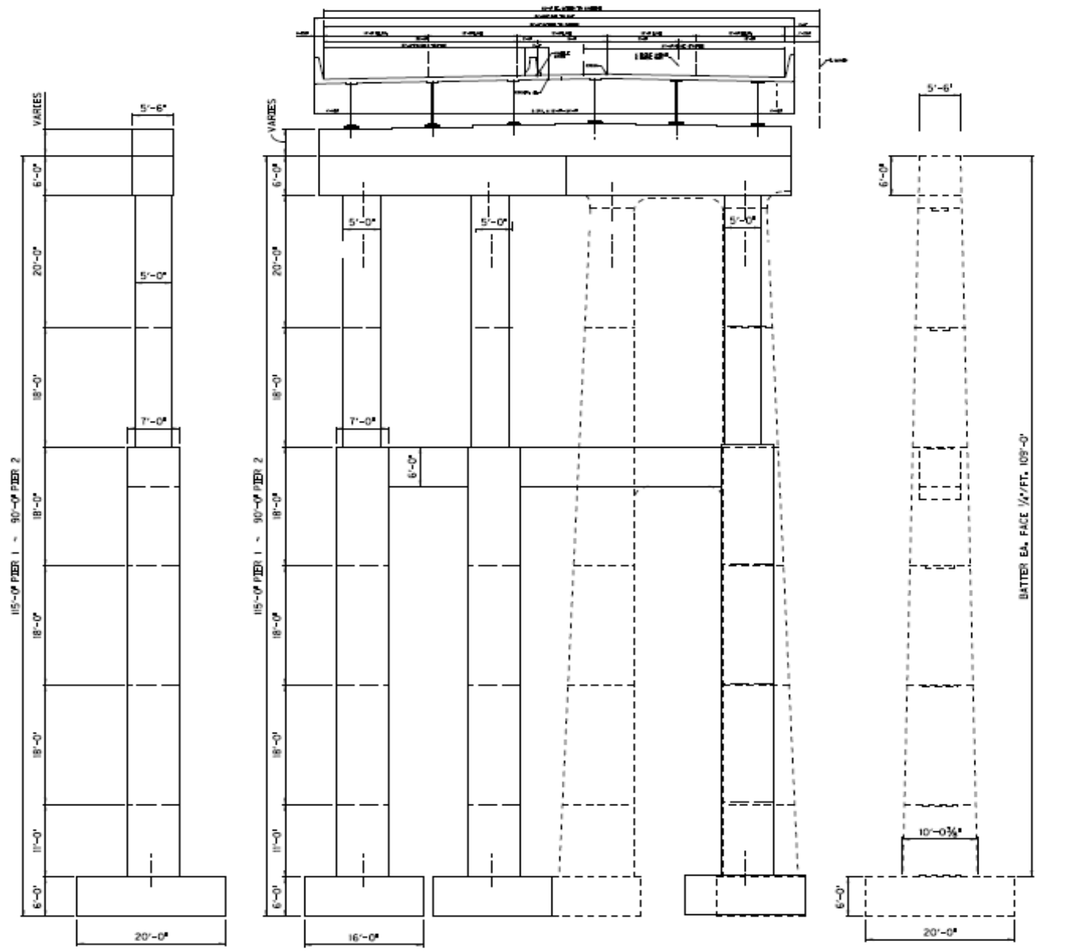
TITLE	Build a single span steel girder for Lynn Camp Bridge construction

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



TITLE	Build a single span steel girder for Lynn Camp Bridge construction

SKETCH/DIAGRAM: BASELINE DESIGN CONCEPT



WIDENED END ELEVATION | **ELEVATION** | **EXISTING END ELEVATION** (To be removed)

Typical New Bridge Pier

I75 over Lynn Camp Creek

VALUE PROPOSAL

53

Kentucky Transportation Cabinet

I-75 Widening (MP 20.2 to MP 28.851)

TITLE	Build a single span steel girder for Lynn Camp Bridge construction
Assumptions & Calculations	None noted.

DESIGN ELEMENT	Mark-up	BASELINE CONCEPT				VALUE PROPOSAL		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Structural Steel		LBS	########	$4	$8,351,000			
Class AA concrete		CuYds	2,650	$1,100	$2,915,000			
Epoxy Coated Reinforcement		LBS	800,000	$2	$1,408,000			
Class A Concrete		CuYds	4,250	$900	$3,825,000			
Steel reinforcement		LBS	810,000	$2	$1,377,000			
End Bents/Foundation		Each	2	$325,000	$650,000			
Remove Existing Piers		Each	4	$250,000	$1,000,000			
Structural Steel		LBS				########	$4	$33,250,000
Class AA concrete		CuYds				1,540	$1,100	$1,694,000
Epoxy Coated Reinforcement		LBS				675,000	$2	$1,188,000
Class A Concrete		CuYds				625	$900	$562,500
Steel reinforcement		LBS				120,000	$2	$204,000
End Bents/Foundation		Each				2	$325,000	$650,000
TOTAL					$19,526,000			$37,549,000
							Impact to Initial Cost (Baseline Less Proposed)	**($18,023,000)**

Note: Total costs are rounded to the nearest thousand dollars.

ADD COST

Section

6

Appendices

Appendix A – Study Participants

A copy of the workshop attendee list is included for reference.

Workshop Attendee List

20	June 1 - 5 (MPR 6/3)											Name	Organization	Position
	24		25		26		27		28					
DR	am	pm	am	pm	am	pm	am	pm	am		OBP			
												VE Team (Full-Time)		
☐	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑	Jeff Rude, CVS	RHA	Team Leader
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑	Natalie Goings, VMA	RHA	Technical Assistant
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑	Dale Carpenter	AEI	Structures
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑	Will Nolan	QK4	Constructability
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑	Jerry Leslie	AEI	Geometrics
☐	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑	Katy Stewart	KYTC	QA Branch Manager
☐	☐	☐	☐	☐	☐	☐	☐	☐	☑		☑	Keith Damron	AEI	Geometrics
												Stakeholders (In-Brief and Out-Brief)		
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐		☐	Tim Layson	KYTC	Director of Highway Design
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	Jason Siwula	KYTC	
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐		☑	Ross Mills	KYTC	
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐		☐	Andre Johannes	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	Brad Frazier	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	Les Haney	EA Partners	
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐		☑	Marc Wirtzberger	EA Partners	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☑	Paul Looney	EA Partners	
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐		☑	Sherri Chappell	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	David Fuson	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	Chris Jones	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	Brad Eldridge	Department of Transportation	

Appendix B – Function Analysis

B.1 Introduction

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other "improvement" programs. The objective of this phase is to ensure the entire team agrees upon the purposes for the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing study.

B.2 Random Function Identification

The VE team identified the functions of the I-71 Widening, MP 20.2 to MP 28.851 Project using active verbs and measurable nouns. This process allowed the team to truly understand the functions associated with the project. A Random Function Identification Worksheet is provided below.

Table B-1: Random Function Identification Worksheet

Identify Functions	
Active Verb	Measurable Noun
Widening/Geometry	
Increase	Capacity
Accommodate	Traffic (Growth)
Optimize	Land-use
Minimize	ROW-take
Match	Geometry
Accommodate	Vehicle
Buffer	Crossover
Minimize	Maintenance
Exit/Interchange	
Improve	Safety
Increase	Capacity
Facilitate	Left-turns
Maintain	Spans
Raise	Grade
Eliminate	Pier
Maintain	Clearances
Limit	Length
Maintain	ROW
Increase	Throughput
Bridges	
Increase	Construction-options
Support	Deck
Span	Creek
Accommodate	Width

Identify Functions	
Active Verb	Measurable Noun
Minimize	Disturbance
Access	Bottom
Access	Edge
Traffic	
Maintain	Traffic
Minimize	Backups
Pavement Structure	
Support	Load
Drain	Water
Collect	Water
Project Delivery Method	
Maximize	Bids
Constructability (Best Practices)	
Manage	Construction

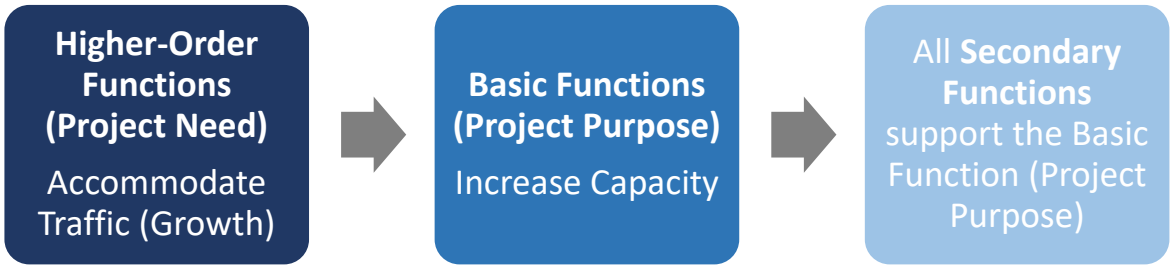
After these were listed and discussed, the functions were classified as described in the following classifications:

- **Higher-Order Function:** The specific goals or needs for which the basic function exists and is outside the scope of the subject under study.
- **Basic Function:** The specific purpose(s) for which a project exists and answers the question, "what must it do?"
- **Secondary Function:** A function that supports the basic function or required secondary functions and results from the specific design approach to achieve the basic function.

Functions were identified and prioritized using the previously identified risks, available cost data, and the VE team's expertise. A function model, or Function Analysis System Technique (FAST) diagram, was not developed for this project. The VE team identified "Increase Capacity" as the basic function of the project.

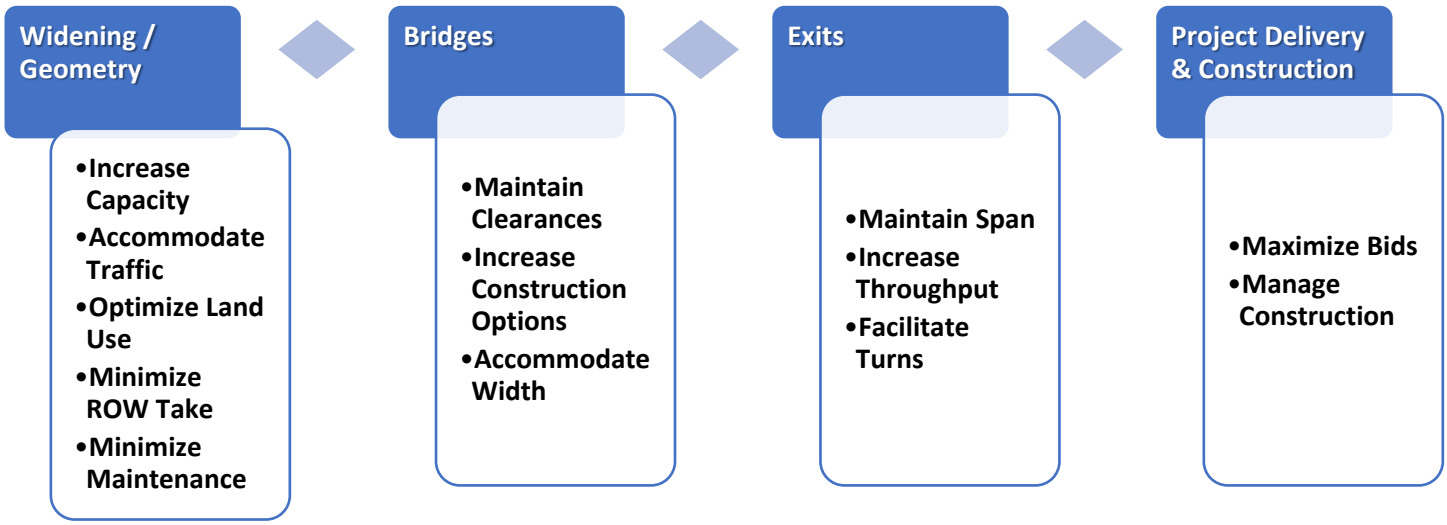
Please note that the Basic and Higher-Order functions relate directly to the project's Purpose and Need as illustrated in Figure B-1.

Figure B-1: Function Analysis and Purpose & Need



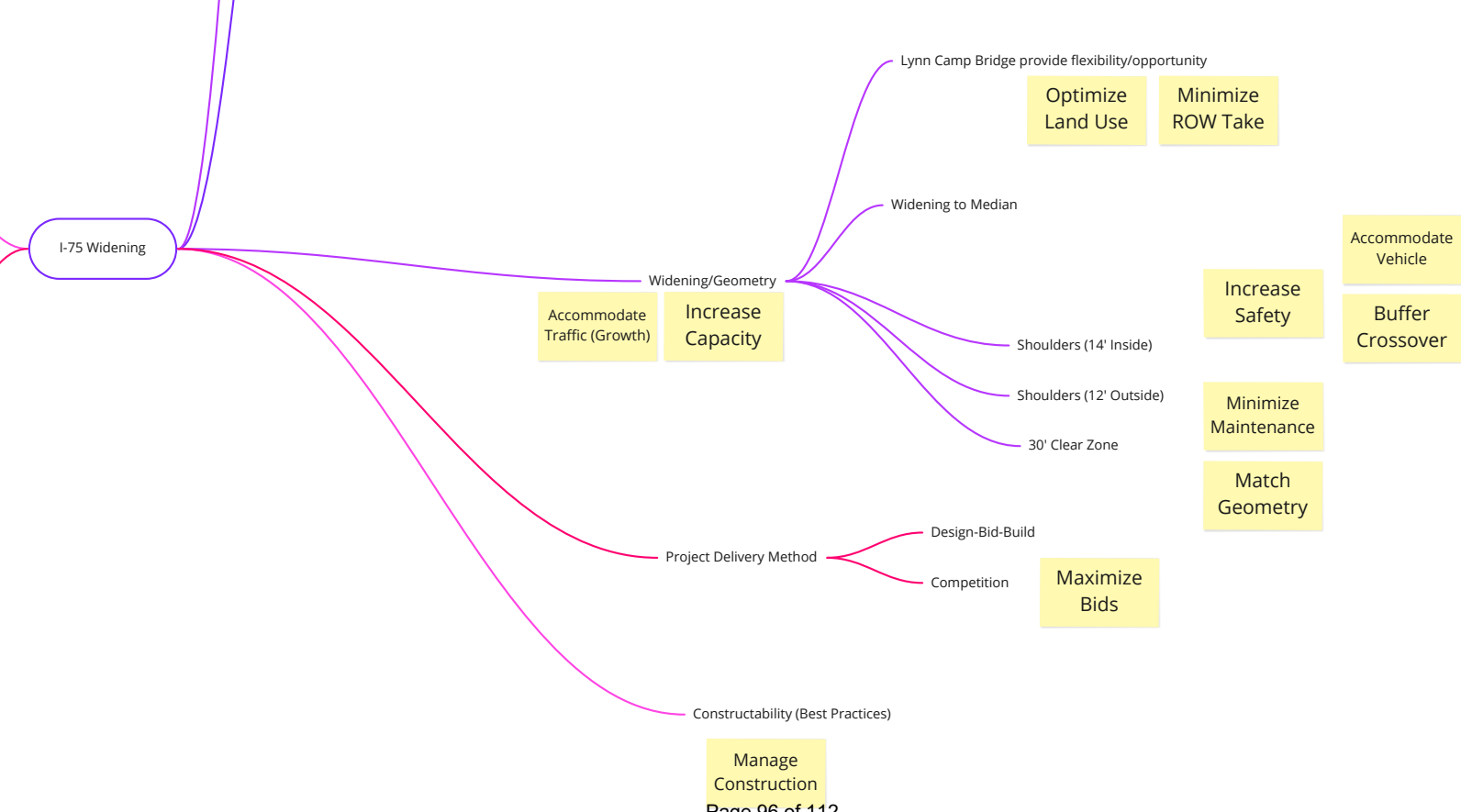
During the mind mapping process, the following functions (brainstormed by project area) emerged as the key functions of the project:

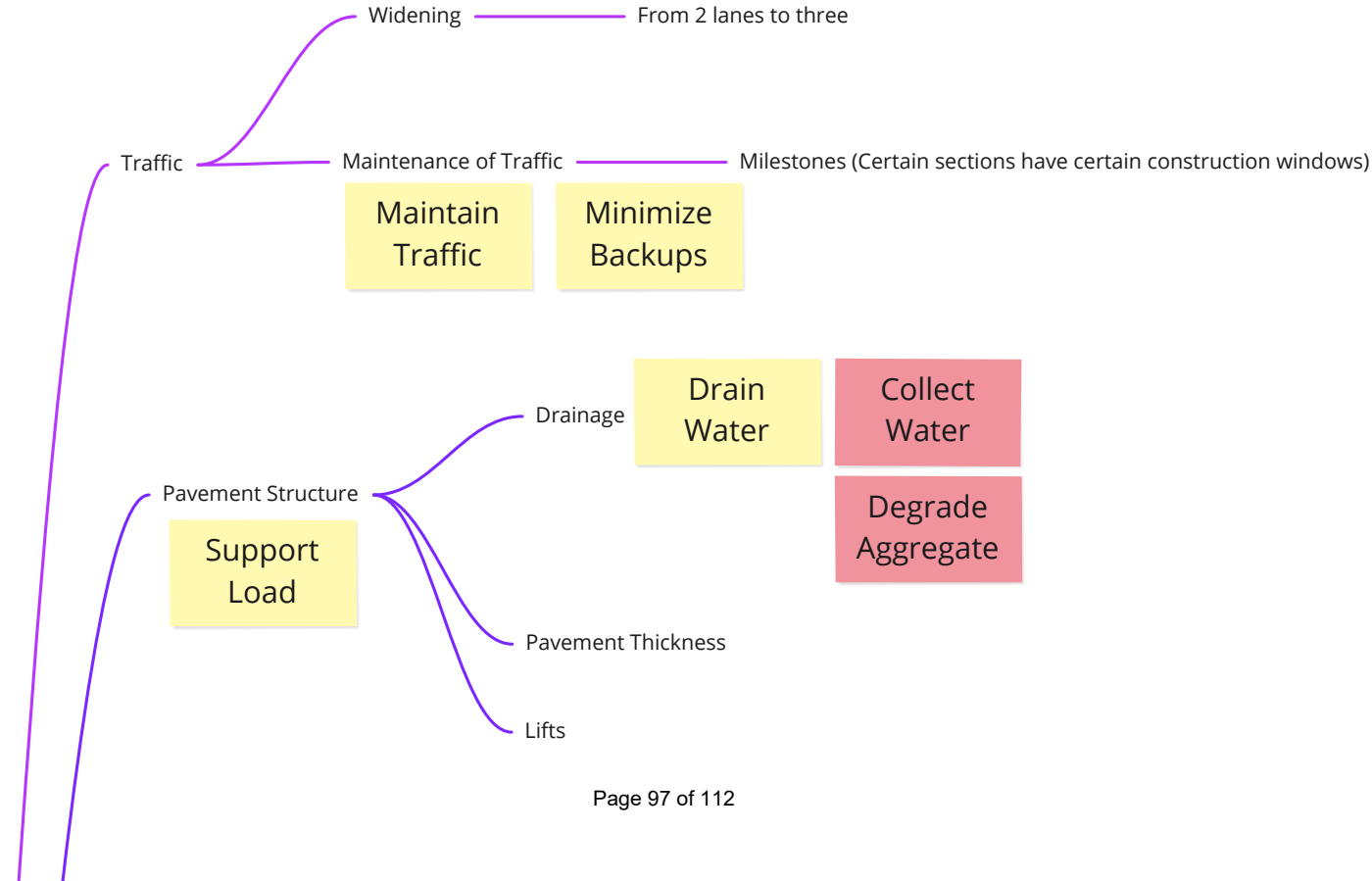
Figure B-2: Key Project Functions

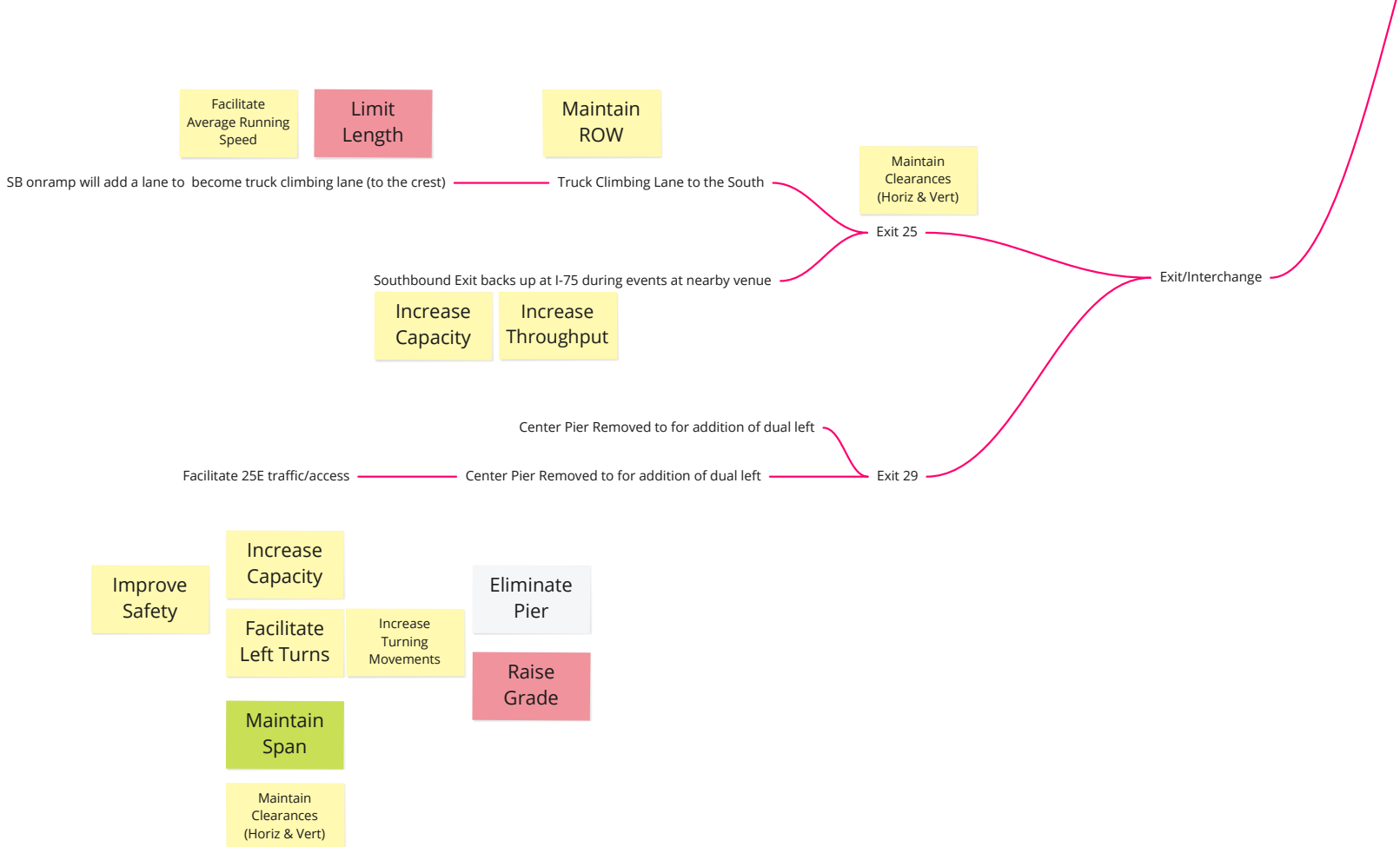


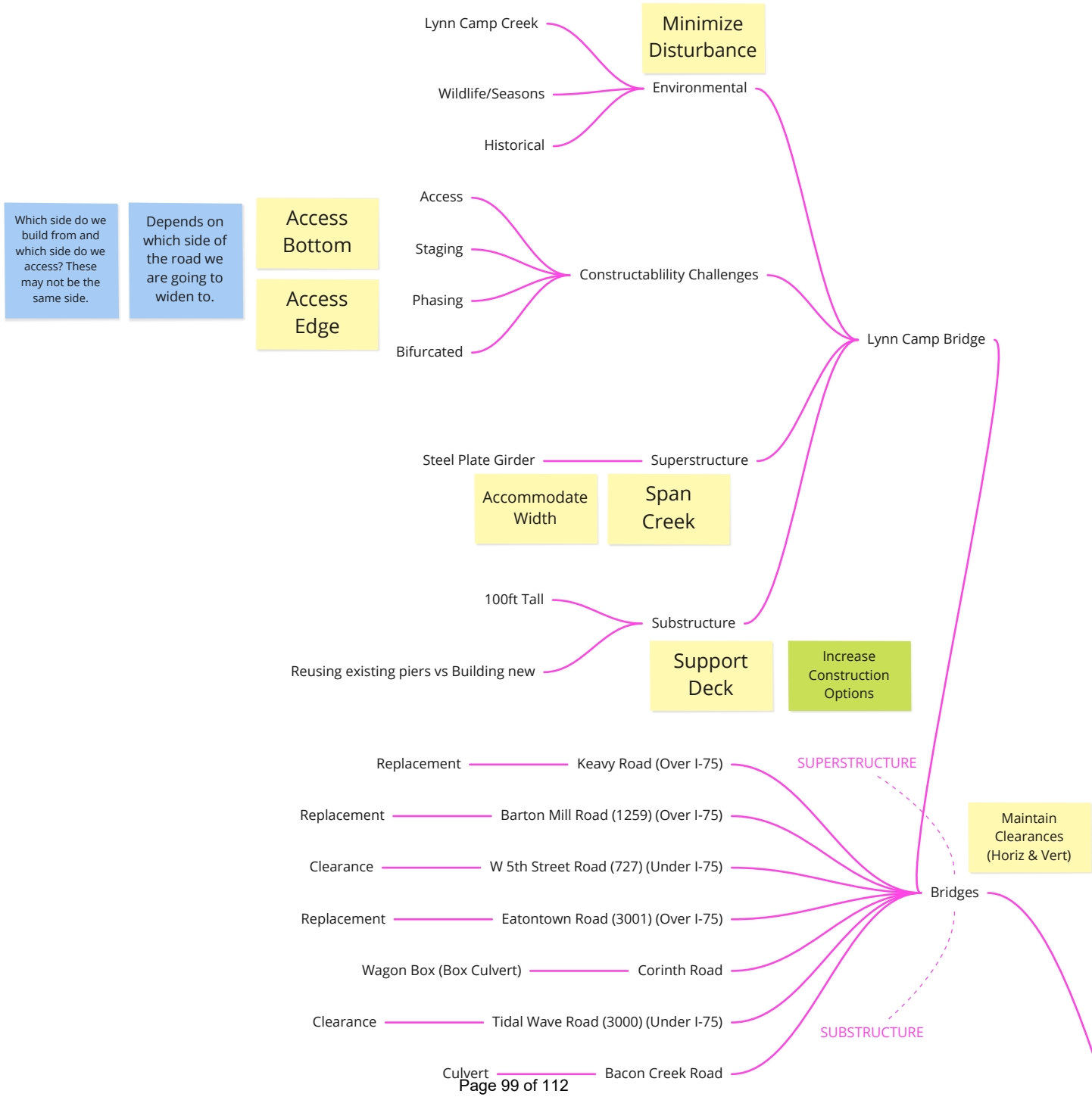
B.3 Mind Map

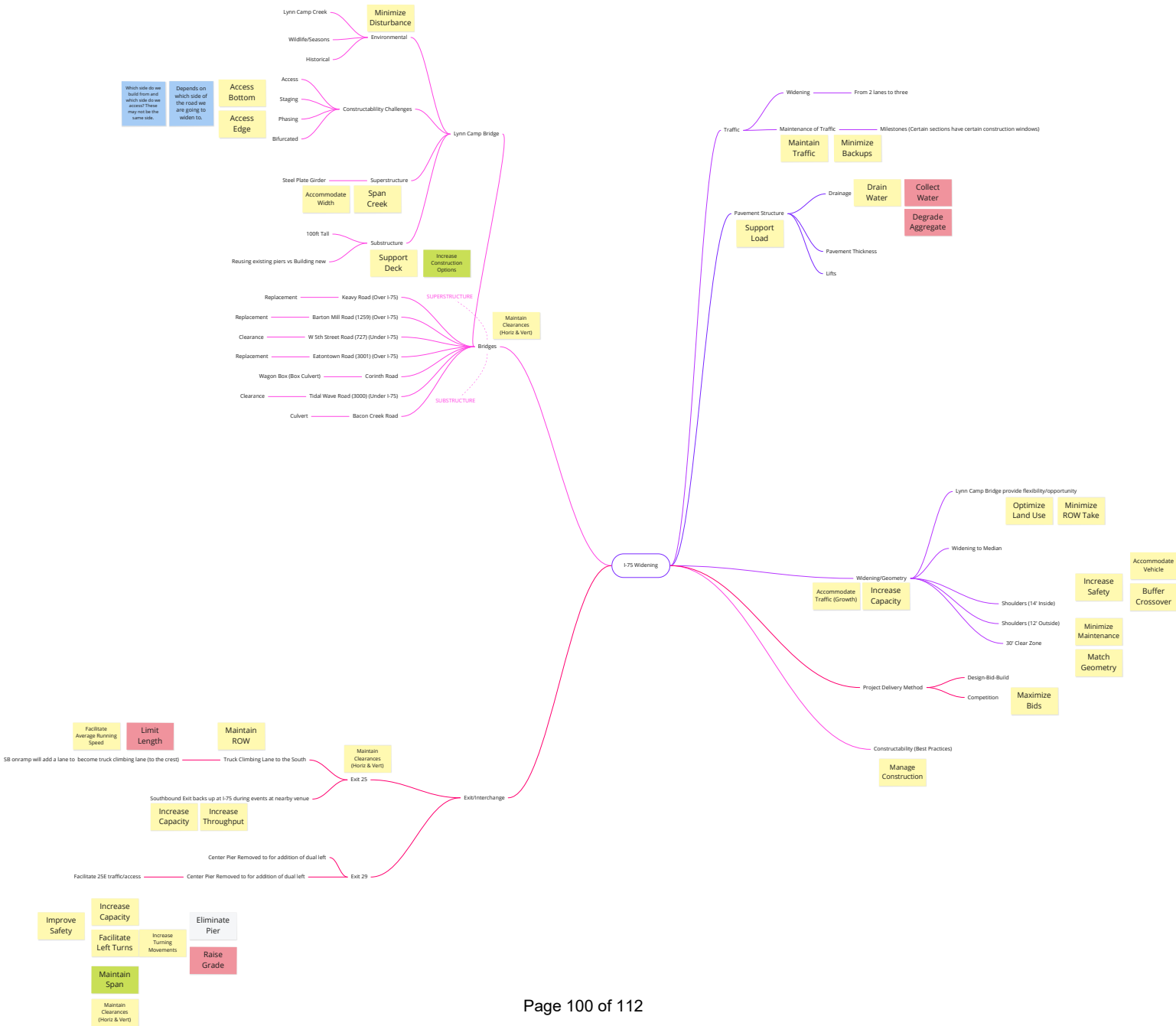
The VE Team utilized a mind mapping process during the Information and Function Analysis phases of the workshop to first identify major project components and key areas of focus for the VE effort, and then to brainstorm functions for each of these areas. The mind map is included, in segments and in full, on the following pages.


I-75 Widening
Widening/Geometry
Lynn Camp Bridge provide flexibility/opportunity
Optimize Land Use
Minimize ROW Take
Widening to Median
Accommodate Traffic (Growth)
Increase Capacity
Shoulders (14' Inside)
Shoulders (12' Outside)
30' Clear Zone
Increase Safety
Accommodate Vehicle
Buffer Crossover
Minimize Maintenance
Match Geometry
Project Delivery Method
Design-Bid-Build
Competition
Maximize Bids
Constructability (Best Practices)
Manage Construction


Widening
From 2 lanes to three
Traffic
Maintenance of Traffic
Milestones (Certain sections have certain construction windows)
Maintain Traffic
Minimize Backups
Drainage
Drain Water
Collect Water
Pavement Structure
Degrade Aggregate
Support Load
Pavement Thickness
Lifts


Facilitate Average Running Speed
Limit Length
Maintain ROW
SB onramp will add a lane to become truck climbing lane (to the crest)
Truck Climbing Lane to the South
Maintain Clearances (Horiz & Vert)
Exit 25
Southbound Exit backs up at I-75 during events at nearby venue
Increase Capacity
Increase Throughput
Exit/Interchange
Center Pier Removed to for addition of dual left
Facilitate 25E traffic/access
Center Pier Removed to for addition of dual left
Exit 29
Improve Safety
Increase Capacity
Facilitate Left Turns
Increase Turning Movements
Eliminate Pier
Raise Grade
Maintain Span
Maintain Clearances (Horiz & Vert)


Lynn Camp Creek
Minimize Disturbance
Wildlife/Seasons
Environmental
Historical
Which side do we build from and which side do we access? These may not be the same side.
Depends on which side of the road we are going to widen to.
Access Bottom
Access
Staging
Constructablility Challenges
Access Edge
Phasing
Bifurcated
Lynn Camp Bridge
Steel Plate Girder
Superstructure
Accommodate Width
Span Creek
100ft Tall
Substructure
Reusing existing piers vs Building new
Support Deck
Increase Construction Options
SUPERSTRUCTURE
Replacement
Keavy Road (Over I-75)
Maintain Clearances (Horiz & Vert)
Replacement
Barton Mill Road (1259) (Over I-75)
Clearance
W 5th Street Road (727) (Under I-75)
Bridges
Replacement
Eatontown Road (3001) (Over I-75)
Wagon Box (Box Culvert)
Corinth Road
SUBSTRUCTURE
Clearance
Tidal Wave Road (3000) (Under I-75)
Culvert
Bacon Creek Road


I-75 Widening
Lynn Camp Bridge
Minimize Disturbance
Environmental
Lynn Camp Creek
Wildlife/Seasons
Historical
Constructability Challenges
Access
Staging
Phasing
Bifurcated
Access Bottom
Access Edge
Which side do we build from and which side do we access? These may not be the same side.
Depends on which side of the road we are going to widen to.
Superstructure
Steel Plate Girder
Accommodate Width
Span Creek
Substructure
100ft Tall
Reusing existing piers vs Building new
Support Deck
Increase Construction Options
Bridges
Maintain Clearances (Horiz & Vert)
SUPERSTRUCTURE
SUBSTRUCTURE
Replacement
Keavy Road (Over I-75)
Barton Mill Road (1259) (Over I-75)
W 5th Street Road (727) (Under I-75)
Eatontown Road (3001) (Over I-75)
Corinth Road
Tidal Wave Road (3000) (Under I-75)
Bacon Creek Road
Clearance
Wagon Box (Box Culvert)
Culvert
Traffic
Widening
From 2 lanes to three
Maintenance of Traffic
Milestones (Certain sections have certain construction windows)
Maintain Traffic
Minimize Backups
Pavement Structure
Support Load
Drainage
Drain Water
Collect Water
Degrade Aggregate
Pavement Thickness
Lifts
Widening/Geometry
Lynn Camp Bridge provide flexibility/opportunity
Optimize Land Use
Minimize ROW Take
Widening to Median
Accommodate Traffic (Growth)
Increase Capacity
Increase Safety
Accommodate Vehicle
Buffer Crossover
Shoulders (14' Inside)
Shoulders (12' Outside)
30' Clear Zone
Minimize Maintenance
Match Geometry
Project Delivery Method
Design-Bid-Build
Competition
Maximize Bids
Constructability (Best Practices)
Manage Construction
Exit/Interchange
Exit 25
Maintain Clearances (Horiz & Vert)
Truck Climbing Lane to the South
SB onramp will add a lane to become truck climbing lane (to the crest)
Facilitate Average Running Speed
Limit Length
Maintain ROW
Southbound Exit backs up at I-75 during events at nearby venue
Increase Capacity
Increase Throughput
Exit 29
Center Pier Removed to for addition of dual left
Facilitate 25E traffic/access
Improve Safety
Increase Capacity
Facilitate Left Turns
Increase Turning Movements
Eliminate Pier
Raise Grade
Maintain Span
Maintain Clearances (Horiz & Vert)

Appendix C – Creative Idea List and Evaluation

C.1 Introduction

The objective of the Creativity Phase is to generate a large number of ideas on alternate ways to perform each function selected for the value engineering study. It uses standard brainstorming techniques, including ideation that is unconstrained by habit, tradition, negative attitudes, assumed restrictions, and specific criteria. No judgment takes place during this phase of the study, though ideas are discussed for clarification purposes.

What makes the Creativity Phase of the Value Methodology successful is for the team not to conceive ways to design a project but to develop ways to perform the functions selected for the study. Past experience is combined and recombined to form new combinations that will perform the desired functions, regardless of what is included in the original project concept, and improve the value of the project compared to what was originally considered attainable.

The list of ideas is shown below and on the following pages.

Table C-1: Creative Idea List

ID	Idea Title
1	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement
2	Construct the Exit 29 intersection using a single span for the brige with spill through slopes on in the Interstate (assumed baseline)
3	Construct the Exit 29 intersection using a two span construction with different pier placement
4	Construct the Exit 29 intersection using a three span bridge with two shoulder piers
5	Rebuild the Exit 29 intersection as a single point urban interchange (SPUI) to facilitate movements and accommodate future growth
6	Increase left turn capacity by building dual left turn lanes at the SB offramp and increasing the left turn lane length (storage capacity)
7	Add two extra lanes on 25E each direction to increase movement and left turn capability for the Exit 29 Intersection
8	Use special event traffic control planning for the signal system during event times (police involvement, controller timing, etc.) to minimize backup
9	Provide additional traffic signal loops to allow for traffic flushes at key times of special event backup situations
10	Change the existing tapered exit to a parallel exit for SB I-75 at Exit 25 The Value Engineering team determined to remove this from consideration because the baseline was already considering a parallel exit for Exit 25.
11	Build a new three-span structure in place for Exit 25 Interchange
12	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes
13	Use an 8′ shoulder on the outside shoulder of the truck climbing lane to allow for a longer truck climbing lane and avoid additional rock cut

ID	Idea Title
14	In order to avoid a rock cut in the truck climbing lane area, allow for a 10-12′ inside shoulder for the length of the onramp
15	At the truck climbing lane, use a 10′ shoulder on the outside and an 8′ shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane
16	For Tidal Wave Road Bridge, upgrade to current standard by replaceing with single span or strengthen existing structure
17	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge
18	Where possible, don't increase fill in order to avoid the need to address buried structures
19	If there is maximum of 12-15″ of clearance, use bridge jacking to increase clearance and avoid the need to totally replace the bridge
20	Replace only the superstructures on overpasses that do not meet vertical clearance
21	For existing overpass structures, provide vertical clearance by jacking the structure and adding to the cap; protect piers rather than providing horizontal structures
22	For existing overpass structures, replace the super structure only for vertical clearance
23	For existing overpass structures, replace the super structure as well as the shoulder piers to provide vertical and horizontal clearance
24	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab keep the existing bridge structure
25	Float a barge up Lynn Creek with a crane to construct from the bottom
26	Use utility corridor or adjacent properties in conjunction with temporary easements to access creek for construction (with temporary easement for access)
27	Use nearby property off Texas Avenue to access creek for construction (with temporary easement for access)
28	Use Beach Street as access to creek for construction (with temporary easement for access)
29	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure
30	Reduce traffic to one lane each direction, to eliminate traffic on one structure and construct in one phase
31	Reuse substructures for Lynn Camp Bridge
32	In event of a substructure rebuild, skew the substructure to match the creek and shorten the spans
33	In the event of a bridge rebuild, rebuild a new isolated single structure between the two existing structures
34	Build access road as close as possible to the project to minimize environmental impact
35	Utilize existing utility or pathways to disturb less trees for construction
36	Minimize creek crossings to minimize impact to the creek during construction
37	Use post tension concrete instead of steel girder for Lynn Camp Bridge span
38	Build Lynn Camp Bridge as a single span deck truss with no piers
39	Build Lynn Camp Bridge using deck trusses in lieu of plate girder bridge
40	Stage construction from near the end of the chosen access point. Then provide a staging area at the base.

ID	Idea Title
41	Temporarily widen roadway to put two lanes of traffic each direction on one side throughout construction area, in order to open up roadway construction (will require shoulder reinforcement)
42	Consider 24 hour construction for key locations to accelerate construction (i.e. interchanges)
43	For local road closures (overpass structures) perform the work during non-school times
44	To avoid ponding in sub-grade, ensure that the drainage blanket has a method to drain
45	On the shoulders, remove and refill in cut sections to the bottom of the existing ditch for proper compaction and best drainage
46	For subgrade drainage, ensure that ditch isn't higher than the subgrade
47	Shoulder break must be no more than 8% algebraic difference on the high side of the superelevated section
48	Ensure lifts are following current standard specifications in order to assure proper compaction
49	Carry main line class-4 surface to beyond the rumble strips (4 feet)
50	Ensure that tack is shown on the typical section pavement design
51	Pave as much of mainline surface in eschelon as possible to eliminate at least one longitudinal joint
52	Ensure proper signage is used in case of a divided median
53	Build a single span steel girder for Lynn Camp Bridge construction

C.2 Evaluation Techniques Used

The VE team members evaluated the ideas using a two-step process. The first step, to shorten the list, identified ideas that scored as follows:

Table C-2: Evaluation Key (Step 1)

Score	Description
5	Great Value (Workbook prepared)
4	Good Value (Workbook prepared)
3	Moderate Value (No workbook prepared)
2	Poor Value (No workbook prepared)
DS	Design Suggestion, More than a DC, requires further explanation
DC	Design Comment, Stand-alone comment that needs no further explanation; a list of these will be given to the design team
ABC	Already Being Considered/Done, Included in the baseline concept
OS	Out of Scope, Not a part of this project
FF	Fatal Flaw, Violates a code or standard

This first step evaluation scored the ideas as appropriate to eliminate them from further evaluation.

The second step scored the remaining ideas using the Value Relationship Key along with the idea's alignment with previously identified project goals, functions, and performance criteria. The prioritization for further development and documentation is as follows:

Table C-3: Rating

Value Relationship Key	*Value =* Function / Resource					
5 Great Value	*F*	*F+*	*F++*	*F++*	*F++*	*F++*
	R--	*R--*	*R*	*R-*	*R--*	*R+*
4 Good Value	*F-*	*F*	*F+*	*F+*	*F+*	
	R--	*R-*	*R*	*R-*	*R+*	
3 Moderate Value	*F--*	*F-*	*F+(*)*	*F++(*)*		
	R--	*R-*	*R++*	*R++*		
2 Poor Value	*F--*	*F-*	*F*	*F*		
	R	*R--*	*R+*	*R++*		
1 Fatal Flaw	*Unacceptable Impacts, violates a code or standard*					

**Is the Function improved to the point that it overcomes the high cost?*

Figure C-1: Value Cue Key (Magnitude of Change)

Value Cue Key – Magnitude of Change	
F++ = Large increase in function	R-- = Large decrease in resources used
F+ = Small increase in function	R- = Small decrease in resources used
F = No impact in function	R = No impact in resources used
F- = Small negative impact in function	R+ = Small increase in resources used
F-- = Large negative impact in function	R++ = Large increase in resources used

C.3 List of Scored Ideas Organized by Function

The list of scored ideas is shown on the following pages. During the Creativity and Evaluation Phases of the workshop, VE team members were actively engaged in the brainstorming and evaluation of ideas. During the Evaluation Phase, some ideas were combined with others and are designated as such by the nomenclature "w/" (with another idea).

Table C-4: "Scored" Creative Idea List

Idea No.	Idea Title	Score*
*Key: **5 = Great Value** (Workbook prepared), **4 = Good Value** (Workbook prepared), **3 = Moderate Value** (No workbook prepared), **2 = Poor Value** (No workbook prepared), **FF = Fatal Flaw**, Violates a code or standard, **DS = Design Suggestion**, More than a DC, requires further explanation, **DC = Design Comment**, Stand-alone comment that needs no further explanation; a list of these will be given to the design team, **ABC = Already Being Considered/Done**, Included in the baseline concept, **OS = Out of Scope**, Not a part of this project		
1	Construct the Exit 29 intersection as a double crossover diamond to maintain the existing bridge and improve movement	4
2	Construct the Exit 29 intersection using a single span for the brige with spill through slopes on in the Interstate (assumed baseline)	3
3	Construct the Exit 29 intersection using a two span construction with different pier placement	4
4	Construct the Exit 29 intersection using a three span bridge with two shoulder piers	2
5	Rebuild the Exit 29 intersection as a single point urban interchange (SPUI) to facilitate movements and accommodate future growth	2
6	Increase left turn capacity by building dual left turn lanes at the SB offramp and increasing the left turn lane length (storage capacity)	ABC
7	Add two extra lanes on 25E each direction to increase movement and left turn capability for the Exit 29 Intersection	ABC
8	Use special event traffic control planning for the signal system during event times (police involvement, controller timing, etc.) to minimize backup	DC
9	Provide additional traffic signal loops to allow for traffic flushes at key times of special event backup situations	DC
10	Change the existing tapered exit to a parallel exit for SB I-75 at Exit 25 The Value Engineering team determined to remove this from consideration because the baseline was already considering a parallel exit for Exit 25.	ABC
11	Build a new three-span structure in place for Exit 25 Interchange	ABC
12	Strengthen and refurbish the Exit 25 bridge and widen to accommodate new lanes	5
13	Use an 8′ shoulder on the outside shoulder of the truck climbing lane to allow for a longer truck climbing lane and avoid additional rock cut	2
14	In order to avoid a rock cut in the truck climbing lane area, allow for a 10-12′ inside shoulder for the length of the onramp	2
15	At the truck climbing lane, use a 10′ shoulder on the outside and an 8′ shoulder on the inside to provide improved pull-off area on the outside shoulder, avoid rock cut, and provide for appropriately shaped truck climbing lane	4
16	For Tidal Wave Road Bridge, upgrade to current standard by replaceing with single span or strengthen existing structure	ABC

Idea No.	Idea Title	Score*
*Key: **5 = Great Value** (Workbook prepared), **4 = Good Value** (Workbook prepared), **3 = Moderate Value** (No workbook prepared), **2 = Poor Value** (No workbook prepared), **FF = Fatal Flaw**, Violates a code or standard, **DS = Design Suggestion**, More than a DC, requires further explanation, **DC = Design Comment**, Stand-alone comment that needs no further explanation; a list of these will be given to the design team, **ABC = Already Being Considered/Done**, Included in the baseline concept, **OS = Out of Scope**, Not a part of this project		
17	Over Tidal Wave Road bridge, avoid increasing total (max) fill while widening in order to avoid the need to rebuild the bridge	4
18	Where possible, don't increase fill in order to avoid the need to address buried structures	DC
19	If there is maximum of 12-15" of clearance, use bridge jacking to increase clearance and avoid the need to totally replace the bridge	DS
20	Replace only the superstructures on overpasses that do not meet vertical clearance	4
21	For existing overpass structures, provide vertical clearance by jacking the structure and adding to the cap; protect piers rather than providing horizontal structures	w/ 19
22	For existing overpass structures, replace the super structure only for vertical clearance	w/ 20
23	For existing overpass structures, replace the super structure as well as the shoulder piers to provide vertical and horizontal clearance	ABC
24	For the bridge over KY727, build additional piers to build a bridge between the existing two bridges, and rehab keep the existing bridge structure	4
25	Float a barge up Lynn Creek with a crane to construct from the bottom	2
26	Use utility corridor or adjacent properties in conjunction with temporary easements to access creek for construction (with temporary easement for access)	DS
27	Use nearby property off Texas Avenue to access creek for construction (with temporary easement for access)	w/ 26
28	Use Beach Street as access to creek for construction (with temporary easement for access)	w/ 26
29	Widen one structure on Lynn Camp Creek Bridge to provide 4 lanes of traffic (2 in each direction) in order to minimize construction phasing on the second structure	4
30	Reduce traffic to one lane each direction, to eliminate traffic on one structure and construct in one phase	2
31	Reuse substructures for Lynn Camp Bridge	4
32	In event of a substructure rebuild, skew the substructure to match the creek and shorten the spans	DC
33	In the event of a bridge rebuild, rebuild a new isolated single structure between the two existing structures	2
34	Build access road as close as possible to the project to minimize environmental impact	DC
35	Utilize existing utility or pathways to disturb less trees for construction	DC
36	Minimize creek crossings to minimize impact to the creek during construction	DC
37	Use post tension concrete instead of steel girder for Lynn Camp Bridge span	2
38	Build Lynn Camp Bridge as a single span deck truss with no piers	4

Idea No.	Idea Title	Score*
*Key: **5 = Great Value** (Workbook prepared), **4 = Good Value** (Workbook prepared), **3 = Moderate Value** (No workbook prepared), **2 = Poor Value** (No workbook prepared), **FF = Fatal Flaw**, Violates a code or standard, **DS = Design Suggestion**, More than a DC, requires further explanation, **DC = Design Comment**, Stand-alone comment that needs no further explanation; a list of these will be given to the design team, **ABC = Already Being Considered/Done**, Included in the baseline concept, **OS = Out of Scope**, Not a part of this project		
39	Build Lynn Camp Bridge using deck trusses in lieu of plate girder bridge	w/ 38
40	Stage construction from near the end of the chosen access point. Then provide a staging area at the base.	DC
41	Temporarily widen roadway to put two lanes of traffic each direction on one side throughout construction area, in order to open up roadway construction (will require shoulder reinforcement)	2
42	Consider 24 hour construction for key locations to accelerate construction (i.e. interchanges)	2
43	For local road closures (overpass structures) perform the work during non-school times	DC
44	To avoid ponding in sub-grade, ensure that the drainage blanket has a method to drain	DC
45	On the shoulders, remove and refill in cut sections to the bottom of the existing ditch for proper compaction and best drainage	DC
46	For subgrade drainage, ensure that ditch isn't higher than the subgrade	DC
47	Shoulder break must be no more than 8% algebraic difference on the high side of the superelevated section	DC
48	Ensure lifts are following current standard specifications in order to assure proper compaction	DC
49	Carry main line class-4 surface to beyond the rumble strips (4 feet)	DC
50	Ensure that tack is shown on the typical section pavement design	DC
51	Pave as much of mainline surface in eschelon as possible to eliminate at least one longitudinal joint	DC
52	Ensure proper signage is used in case of a divided median	DC
53	Build a single span steel girder for Lynn Camp Bridge construction	5

Appendix D – Supporting Data

D.1 Risk Identification

Risk is a measure of future uncertainties in achieving program and/or project performance goals and objectives within defined cost, schedules and performance constraints. Risk can be associated with all aspects of a program/project (e.g., threat, technology maturity, supplier capability, design maturation, performance against plan) as these aspects relate across the project's cost and schedule. Risk addresses the potential variation in the planned approach and its expected outcome. Risks may also represent opportunities within a project that could be exploited to the benefit of the project.

During the preparation for the VE workshop and their initial review of the project documentation, the VE team members identified project risks. The following risks were identified:

- Round pier columns will change pier aesthetics
- Existing Columns need verification that the existing columns have adequate remaining life
- Reusing steel girders may need repair or strengthening. Need field data verifying no existing corrosion/cracks in existing steel girders
- Constructability challenges for the bridge over Lynn Camp Creek
- Future subgrade drainage
- In the areas on the typical where rock cut is shown, the areas under the proposed ditch but above the existing ditch should be removed and refilled. It will result in a change order or issues with compaction if not.

The VE team considered these risks during the Creativity Phase; these have the potential of impacting the project budget, schedule and performance.

D.2 Agenda

A copy of the workshop agenda is included on the following pages for reference.

Value Engineering (VE) Workshop Agenda

Project Name: Kentucky Transportation Cabinet
I-75 Widening, MP 27.943 to 28.851 and MP 20.200 to 27.943
Laurel & Whitley Counties
Item No. 11-14.80

Dates: VE Workshop
July 24-28, 2023 (see detailed times below)

Study Location: Virtual

Day 1: Monday, July 24, 2023, 9:00 AM – 5:00 PM ET

Webex Invitation Link – Day 1: MONDAY LINK FULL MEETING INFO ON NOTES PAGE

Time ET	VE Activity	Participants	Comments
9:00	Welcome & Introductions Brief Overview of Value Engineering Process & VE Agenda Review (CVS Facilitator)	All	
	INFORMATION PHASE		
9:20	Project Overview, Presentation & Virtual Site Tour (KYTC Project Manager, Consultant Design Lead/s)	All	
10:30	Short Break		
10:45	Identify/Review: ▪ Project Goals ▪ VE Study Objectives (Focus of VE Study) ▪ VE Study Constraints ▪ Identify, Define & Rank Performance Attributes	All	
12:00	Conclusion of In-brief meeting / Long Break		
1:00	Discuss Team Observations, Project Risks Review Cost Model, Schedule, Other	VE Team	
	FUNCTION ANALYSIS PHASE		
2:00	Function Identification of Project Elements ▪ Identify/Classify Project Functions ▪ Apply Risks/Resources to Functions ▪ Select Specific Functions for Study	VE Team	
3:00	Short Break		
	CREATIVE PHASE		
3:15	Brainstorm Ideas / Alternatives		
5:00	Adjourn		

Day 2: Tuesday, July 25, 2023, 9:00 AM – 5:00 PM ET

Webex Invitation Link – Day 2: TUESDAY LINK **FULL MEETING INFO ON NOTES PAGE**

Time ET	VE Activity	Participants	Comments
9:00	Check-in	VE Team	
CREATIVE PHASE - continued			
9:05	Brainstorm Ideas / Alternatives	VE Team	
10:30	Short Break		
10:45	Brainstorm Ideas / Alternatives	VE Team	
12:00	Long Break		
EVALUATION PHASE			
1:00	Evaluation of Ideas – Team Assignments for Development	VE Team	
3:00	Short Break		
DEVELOPMENT PHASE			
3:15	Review Workbook Template & Process Flow Develop / Cost Alternatives	VE Team	
5:00	Adjourn		

Day 3: Wednesday, July 26, 2023, 9:00 AM – 5:00 PM ET

Webex Invitation Link – Day 3: WEDNESDAY LINK **FULL MEETING INFO ON NOTES PAGE**

Time ET	VE Study Activity	Participants	Comments
9:00	Check-in	VE Team	
DEVELOPMENT PHASE - continued			
9:05	Develop / Cost Alternatives **continued**	VE Team	
10:45	Develop / Cost Alternatives	VE Team	
11:30	Check-in	VE Team	
12:00	Long Break		
1:00	Develop / Cost Alternatives	VE Team	
4:30	Check-in	VE Team	
5:00	Adjourn		

Day 4: Thursday, July 27, 2023, 9:00 AM – 5:00 PM ET

Webex Invitation Link – Day 4: THURSDAY LINK **FULL MEETING INFO ON NOTES PAGE**

Time ET	VE Study Activity	Participants	Comments
9:00	Check-in	VE Team	
DEVELOPMENT PHASE –			
9:10	Develop / Cost Alternatives - Complete **continued**	VE Team	
11:30	Check-in		
12:00	Long Break		
1:00	Alternatives to Present Peer Review Workbooks Prepare Presentation	VE Team	
4:00	Run-through Presentation	VE Team	
5:00	Adjourn		

Day 5: Friday, July 28, 2023, 8:00 AM – Noon ET

Webex Invitation Link – Day 5: FRIDAY LINK **FULL MEETING INFO ON NOTES PAGE**

Time ET	VE Study Activity	Participants	Comments
8:00	Check-in	VE Team	
DEVELOPMENT PHASE - continued			
8:05	Peer Review Workbooks – Complete Practice Presentation	VE Team	
9:30	Short Break		
9:45	Ready to present	VE Team	
PRESENTATION PHASE			
10:00	Presentation of Key Finding/VE Alternatives to Stakeholders/Decision-makers	All	
11:30	Workshop Close-out	VE Team	
12:00	Adjourn	VE Team	

All: Decision-makers, Design Team, Stakeholders, VE Team (Shaded rows)
VE Team: Subject Matter Experts and others serving as full-time VE Team members

NOTES:

I-75 Widening VE Study
Hosted by Jeff Rude

https://jeffrude-289265.my.webex.com/jeffrude-289265.my/j.php?MTID=m5ddaf819ee7d55a0fd3b2e93c72d9b10

Monday, July 24, 2023 2:00 PM | 9 hours
Occurs every day effective 7/24/2023 until 7/28/2023 from 8:00 AM to 5:00 PM, Eastern Time

Meeting number: 2742 467 7206
Password: xkQmC2RRJ42 (95762277 from phones and video systems)

Join by phone
United States of America Toll +1-650-215-5226
United States of America Toll 2 +1 631 267 4890

Access code: 274 246 77206

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