Value Engineering Study

US 460
Section 6A
Pond Creek Crossing

Pike County, Kentucky
Item No. 12-263.61

November 2005

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I. INTRODUCTION

A. Study Purpose and History

The purpose of this report is to evaluate possible value engineering options for the crossing of Pond Creek in Section 6A of the US 460 project in Pike County, Kentucky. During Preliminary Design, a bridge was proposed over Pond Creek with an approach to the south side of the hollow. As part of a Value Engineering study in February 1999, a suggestion was made to replace the bridge with a tunnel bored through the mountain to handle the runoff leaving the hollow. In order to provide access for the residents south of the US 460 mainline in the Pond Creek hollow, access roads were proposed both north and south of US 460 with a wagon box culvert used as the connection from one side to the other. This was modeled on a similar situation in West Virginia.

The Project Team made a site visit to the West Virginia site and determined that this solution was desirable for and could be applied to the Pond Creek situation. In February, 2000, Palmer Engineering provided cost estimates and a decision matrix comparing six alternative solutions for crossing Pond Creek and maintaining access (See Appendix A Minutes). From that meeting, Alternative 6 was selected with a tunnel and 30 MPH approaches on each side and a wagon box for crossing under US 460 near the top of the fill.

In December of 2001, after receiving complaints from Pond Creek residents concerning the selected concept, the Cabinet elected to hold a Public Meeting to gauge opinion regarding its desirability (See Appendix B Minutes). Some of the major concerns voiced by residents prior to the Public meeting were the low-water crossing in Draffin and how residents would leave the hollow when the Russell Fork floods; community separation caused by the large fill; and potential flooding caused by the tunnel particularly in the event of blockage.

At the same time, the Cabinet was investigating the use of John Moore Branch as an excess material site for Section 7A. With a road being constructed up the new John Moore Branch site, the Cabinet asked Palmer Engineering to look at the possibility of connecting Pond Creek to John Moore Branch in order to make access to and from the head of the Pond Creek hollow possible during flood events. At that time, there was also the possibility of leaving several homes in the head of John Moore Branch and allowing them to use the connector to Pond Creek as their access during the construction

of the excess material site below them. A replacement bridge in Draffin to connect Pond Creek to US 460 above the potential flood elevation was also studied for presentation at the Public Meeting.

At the April, 2002 Public Meeting (See Appendix C Minutes), options were presented for fill vs. bridge over Pond Creek and a connector route between Pond Creek and John Moore Branch. The Cabinet received a petition from residents of Pond Creek objecting to the concept of the fill separating their community and creating flooding problems for them. There was little support for the connector road between Pond Creek and John Moore Branch. Following the Public Meeting, the Cabinet decided to shift the mainline alignment and utilize a bridge crossing of Pond Creek in lieu of the tunnel and approaches. The mainline shift shortened the bridge and put it in cuts at each end. The grade was also raised to reduce Section 6 earthwork. The connector road was not carried forward in Section 7 and the residents at the head of John Moore Branch were all acquired.

In early 2005, the Cabinet decided to utilize APD funding to replace the low-water crossing at Draffin with a bridge above the 100-year flood level. This project will also correct the difficult turning situation at the US 460/Pond Creek Road intersection and will possibly eliminate a dangerous railroad crossing. At the same time, District 12 Construction staff has raised concerns regarding the constructability of a bridge over Pond Creek with piers as tall as 270 feet, a maximum height of 320 feet, and spans of approximately 300 feet. With launched steel beams and arch and truss alternatives being considered, the need for good access to the site and locations for crane placement will be paramount for the contractor. Long-term maintenance of a bridge of this size in a remote location is also a major concern.

With the money secured for replacing the bridge at Draffin, constructability and maintenance concerns, and with recent changes in stream permitting procedures for excess material sites, District 12 would like to revisit the selection of a bridge at this location. This study considers two mainline alternatives as well as three possible add-ons. The bridge location as currently designed is compared to a fill with a tunnel. Separate add-on prices and impacts are provided for 30 MPH approaches to each side, a connector to John Moore Branch, and a 30 MPH approach to the south with a full connector to the new Draffin bridge site on the north side. With funds secured for the new Draffin bridge, residents may now be more receptive to approach roads that also connect to the new US 460.

B. Location

Pond Creek is located along US 460 approximately 11 miles east of US 23. The crossing of mainline US 460 over Pond Creek occurs approximately 1.5 miles up the Pond Creek hollow south of US 460. Pond Creek drains to the Russell Fork at the mouth of the hollow. An existing low-water crossing connects Pond Creek Road to US 460 in the community of Draffin. Existing Pond Creek Road is a narrow, 12-14 foot wide road with no shoulders and essentially no design speed.

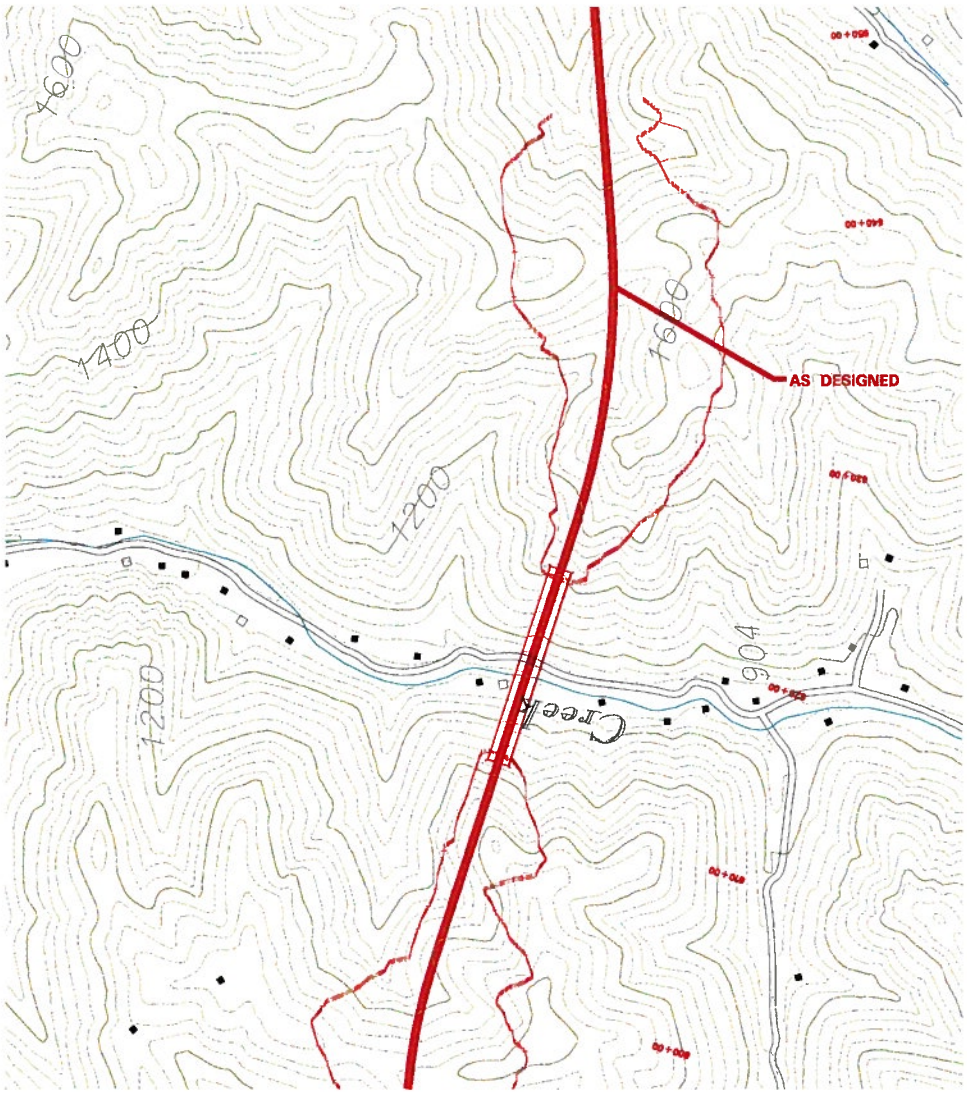
C. Schedule

Currently, Section 6A is not scheduled for a letting. No construction funding is available in the current 6-year Plan. It is anticipated that with recent increases in APD funding for Kentucky and with the continuation of lettings on adjacent sections, that the construction year for Section 6A could be as early as 2008. Right of Way acquisition is well underway and Utility Relocations are not expected to cause major delays in this section. Section 6A is currently estimated to cost approximately $47,000,000 for construction. The Draffin Bridge (12-263.62) is scheduled for a 2007 letting.

II. PROPOSED VALUE ENGINEERING ALTERNATIVES

A. Alternative A (Present Design)

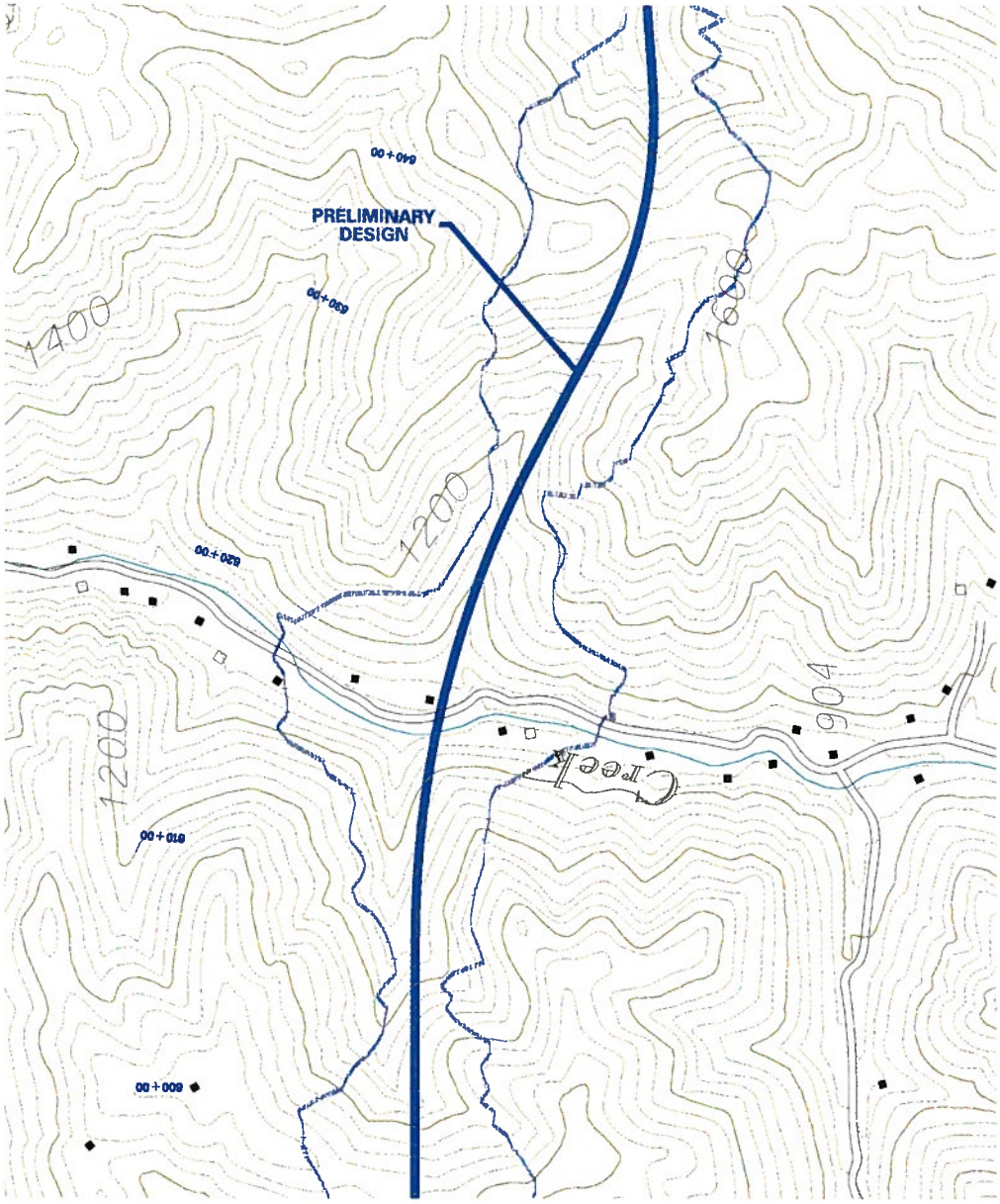
The current mainline design has a bridge 320 feet tall with piers approximately 270 feet tall. The mainline alignment was previously shifted into the hills to shorten the bridge and provide solid rock abutments at each end. Excess material sites are located in the adjacent hollows where the Alternative B alignment falls. Additional excess material sites are being permitted at the beginning of section 6A and 1500 feet south of the new US 460 centerline. No blue-line streams will be impacted with this alternative. Mainline US 460 is designed with a 60 MPH design speed, four-lane depressed median typical, and maximum 6% grades.



Alternative A

B. Alternative B (Preliminary Design)

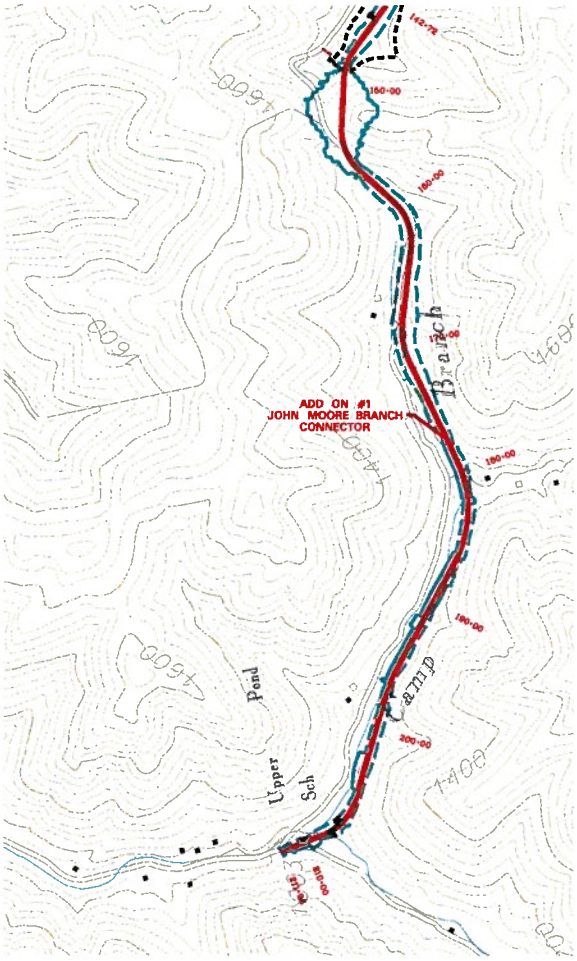
Alternative B is the mainline design developed following the decision to utilize the tunnel instead of a bridge. Costs and impacts for this alternative include the mainline only. The fill height is approximately 260 feet. The tunnel is anticipated to be a 14 foot drilled and shot tunnel that will carry water only. No excess material sites will be required for this alternative since the mainline fill will balance the section. Approximately 1650 feet of blue-line stream will be impacted with this alternative. Mainline US 460 is designed with a 60 MPH design speed, four-lane depressed median typical, and maximum 6% grades.



Alternative B

C. Add-On 1 (Pond Creek to John Moore Branch Connector)

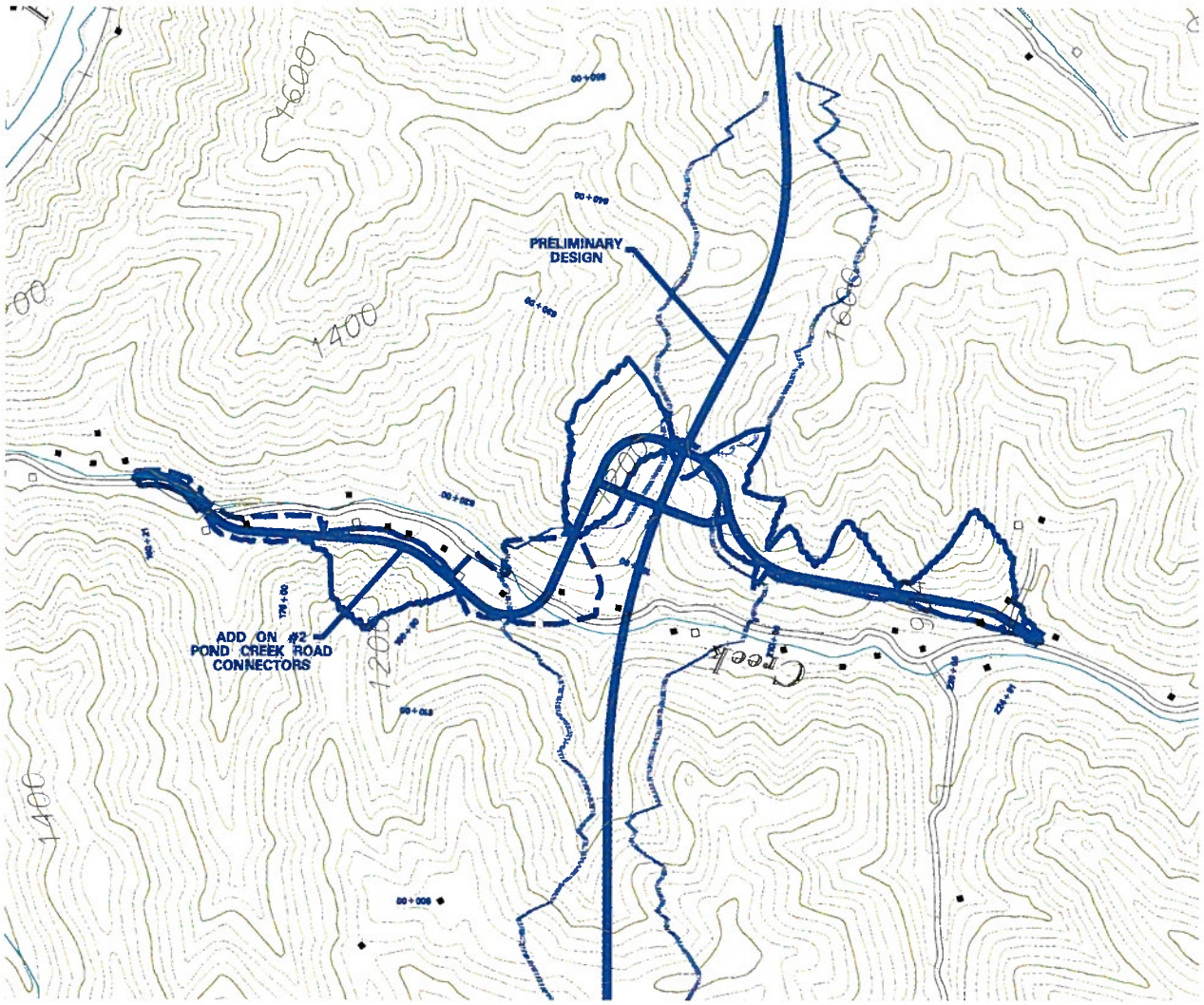
This connector was developed prior to the April 2002 Public Meeting. The concept was to connect the end of asphalt at the head of Pond Creek with the head of the John Moore Branch excess material site. To do this, a cut of approximately 200 foot in depth will be required between the two hollows. Two 12 foot lanes will be provided with four foot shoulders and a design speed of 30 MPH. This add-on can be incorporated with either Alternative A or Alternative B. If added to Alternative A, the advantage would be the use of this access to the hollow for hauling beams or crane equipment to the bridge site. This advantage is diminished greatly by the construction of the new Draffin Bridge from US 460 which will eliminate many of the difficult movements. If added to Alternative B, this add-on will provide access to residents of Pond Creek south of the embankment during construction to avoid passing through construction to get to US 460. If added without Add-On 2 (30 MPH Approaches to Pond Creek) or Add-On 3 (Connector to Draffin Bridge and South), this would become the only access to the head of Pond Creek following construction.



Add-On 1

D. Add-On 2 (30 MPH Approaches to Pond Creek Road)

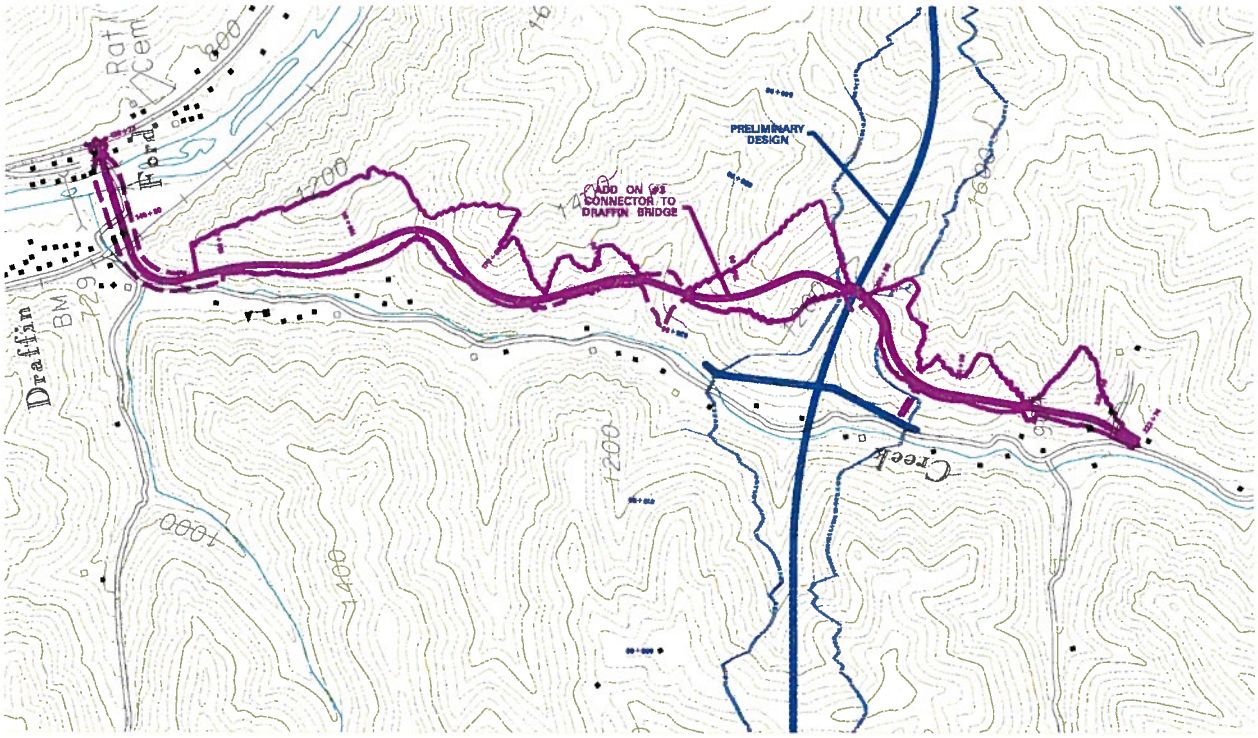
These approaches to Pond Creek Road also include a box culvert under US 460 near the top of the fill so that motorists can pass from one side to the other without making left turns to or from US 460. The design speed for these approaches is 30 MPH with a maximum grade of 10%. Two 12 foot lanes with four foot shoulders would be provided. It is anticipated that this add-on would only be utilized with Alternative B to provide access back and forth from each side of the Pond Creek hollow. 1.6 million cubic yards of excess material would need to be disposed of for this add-on.



Add-On 2

E. Add-On 3 (Connector to Draffin Bridge)

This add-on utilizes the same 30 MPH approach on the south side of the hollow to Pond Creek Road but connects the north side approach all the way to the end of the new Draffin Bridge. The design speed is 30 MPH for these approaches with a maximum grade of 10%. Two 12 foot lanes with four foot shoulders would be provided. It is anticipated that this add-on would only be utilized with Alternative B to provide access back and forth from each side of the Pond Creek hollow. 5.8 million cubic yards of excess material would need to be disposed of for this add-on.



Add-On 3

F. Decision Matrix

For the purposes of making decisions regarding possible alternatives and add-ons, a Decision Matrix was developed to compare costs and impacts. For comparison purposes, stream mitigation costs were estimated both for the mainline and for impacts at excess material sites. Estimates are based on calculations done for other sections of US 460. Additional haul costs for excess material sites are based on $0.50 per cubic yard of excess material. Additional Right of Way and Utility costs are based on experiences on other sections.

Split

	Alternate A US 460 Bridge over Pond Creek (Present Design)	Alternate B Pond Creek Emb. With Tunnel (Preliminary Design)	Add-On 1 Connector to John Moore Branch	Add-On 2 Pond Creek Road Connectors North & South	Add-On 3 Connector to Draffin Bridge (w/Connector South)
Mainline Excavation Cost (1)	$24,400,000	$14,500,000	N/A	N/A	N/A
Mainline Pavement Cost	$2,600,000	$2,100,000	N/A	N/A	N/A
Mainline Bridge or Tunnel Cost	$12,000,000	$1,500,000	N/A	N/A	N/A
John Moore Branch Connector Exc. Cost (1)	N/A	N/A	$1,200,000	N/A	N/A
John Moore Branch Connector Pvmt. Cost	N/A	N/A	$1,000,000	N/A	N/A
John Moore Branch Connector Misc. Costs	N/A	N/A	$1,000,000	N/A	N/A
Pond Creek Rd Connector North Exc. Cost (1)	N/A	N/A	N/A	$4,900,000	N/A
Pond Creek Rd Connector North Pvmt. Cost	N/A	N/A	N/A	$600,000	N/A
Pond Creek Connector North Misc. Costs	N/A	N/A	N/A	$800,000	N/A
Pond Creek Rd Connector South Exc. Cost (1)	N/A	N/A	N/A	$2,800,000	$2,800,000
Pond Creek Rd Connector South Pvmt. Cost	N/A	N/A	N/A	$400,000	$400,000
Pond Creek Connector South Misc. Costs	N/A	N/A	N/A	$500,000	$500,000
Approach Connector with Wagon Box	N/A	N/A	N/A	$1,000,000	$1,000,000
Draffin Bridge Connector Exc. Cost (1)	N/A	N/A	N/A	N/A	$15,200,000
Draffin Bridge Connector Pvmt. Cost	N/A	N/A	N/A	N/A	$800,000
Draffin Bridge Connector Misc. Costs	N/A	N/A	N/A	N/A	$1,300,000
Mainline Bridge Length	1,000	N/A	N/A	N/A	N/A
Mainline Bridge Grade	2%	N/A	N/A	N/A	N/A
Mainline Bridge Superelevation	2%	N/A	N/A	N/A	N/A
Mainline Bridge Height	320'	N/A	N/A	N/A	N/A
Excess Material (CY)	7,600,000	0	100,000	1,600,000	5,800,000
Excess Material Cost ($0.50/CY)	$3,800,000	0	$50,000	$800,000	$2,900,000
Blueline Stream Impacted (Ft)	0	1,650	4,650	0	300
Intermittent & Ephemeral Stream Impacts (2)	14,100	5,300	1,000	3,300	9,850
In-Lieu Fee Stream Mitigation Cost	$3,000,000	$1,600,000	$1,900,000	$500,000	$1,600,000
Right of Way Cost (3) (4)	$0	$500,000	$1,100,000	$3,600,000	$1,100,000
Utilities Cost	$500,000	$500,000	$100,000	$300,000	$200,000
Design/Redesign Cost (6)	$550,000	$300,000	$400,000	$500,000	$600,000
Geotechnical Cost	$0	$0	$150,000	$200,000	$250,000
KTC In-house Forces Cost	$0	$75,000	$150,000	$150,000	$200,000
Total Cost Comparison	$46,850,000	$21,075,000	$7,050,000	$17,050,000	$28,850,000
Residential Relocations (5)	4	6	4	14	4

(1) $3.00/CY
(2) Includes excess material sites
(3) Alternate A money spent - no savings for cost comparison
(4) Alternate B and Pond Creek Connectors cost excludes area already acquired
(5) Additional relocations and R/W may be required for construction access, drainage, erosion control, etc.
(6) Includes survey, roadway design, structure design, environmental, and permitting.

G. Possible Combinations

Although many possible combinations of alternatives and add-ons are possible, the following is a synopsis of the most likely combinations including the advantages and disadvantages of each:

1. **Alternative A** – This is the present design with a comparative cost of **$46,850,000.**

   Advantages
   No design changes required
   Community connection preserved
   Maintenance of local traffic during construction
   No additional residential relocations

   Disadvantages
   Need for excess material sites (7,600,000 CY of waste)
   Long-term bridge maintenance
   Constructability issues for tall piers and long spans
   Intermittent and ephemeral stream impacts in excess material sites
   Longer construction time for bridge

2. **Alternative A with Add-On 1** – This would be the present design with a connector to John Moore Branch and a total comparative cost of **$53,900,000**.

   Advantages
   Opens up mobility in region
   Community connection preserved
   Maintenance of local traffic during construction
   Ability to bring construction equipment in from both ends

   Disadvantages
   Need for excess material sites (7,700,000 CY of waste)
   Long-term bridge maintenance
   Constructability issues for tall piers and long spans
   Most stream impacts
   Need for additional R/W acquisition
   Total cost
   Blueline stream impacts for connector
   Longer construction time for bridge

3. **Alternative B with Add-On 1** – This would be the drainage tunnel with no approaches and access to the head of Pond Creek from John Moore Branch with a comparative cost of **$28,125,000.**

   Advantages
   Lowest cost
   No long-term maintenance for bridge or wagon box
   No maintenance of local traffic during construction
   Minimal excess material site needs
   Shorter construction time
   Ability to bring in construction equipment from both ends

   Disadvantages
   7.5 miles additional travel distance from head of Pond Creek to Pikeville
   Additional residential relocations on Pond Creek Road
   No community connectivity

4. **Alternative B with Add-On 2** – This would be a return to the preliminary design including a tunnel for drainage and 30 MPH approaches to Pond Creek Road. The comparative cost would be **$38,125,000.**

   Advantages
   Lower cost
   Minimal excess material disposal needs
   Less maintenance for culvert on fill
   Pond Creek access to new US 460

   Disadvantages
   Additional relocations on Pond Creek Road
   Some loss of community connectivity
   Difficult maintenance of traffic during construction

5. **Alternative B with Add-On 3** – This would be a return to the preliminary design including a tunnel for drainage and 30 MPH approaches including the north approach extending to connect to the new Draffin Bridge. The comparative cost would be **$49,925,000.**

   Advantages
   Connection of US 460 to old US 460 with approaches and Draffin Bridge
   Less maintenance for culvert on fill
   Faster construction
   Pond Creek access to new US 460

Disadvantages
Additional relocations on Pond Creek Road
Loss of community connectivity
Need for additional R/W services
Difficult maintenance of traffic during construction
Need for excess material sites (5,800,000 CY of waste)
Stream impacts for excess material sites

6. **Alternative B with Add-Ons 1 & 2** – This would be a return to the preliminary design including a tunnel for drainage and 30 MPH approaches to Pond Creek Road as well as a connector to John Moore Branch. The comparative cost would be **$45,175,000.**

Advantages
Less excess material disposal needs
Less maintenance for culvert on fill
Ability to bring in construction equipment from both ends
More regional mobility
Maintenance of traffic during construction
Faster construction
Pond Creek access to US 460

Disadvantages
Additional relocations on Pond Creek Road and connector
Some loss of community connectivity
Need for additional R/W services

7. **Alternative B with Add-Ons 1 & 3** – This would be a return to the preliminary design including a tunnel for drainage and 30 MPH approaches including the north approach extending to connect to the new Draffin Bridge and a new connector to John Moore Branch. The comparative cost would be **$56,975,000.**

Advantages
Connection of US 460 to old US 460 with approaches and Draffin Bridge
Less maintenance for culvert on fill
Most regional mobility
Ability to bring in construction equipment from both ends
Maintenance of traffic during construction
Faster bridge construction
Pond Creek access to US 460

Disadvantages
Highest cost

Need for excess material sites (5,900,000 CY of waste)
Additional relocations on Pond Creek Road
Some loss of community connectivity
Need for additional R/W services
Difficult maintenance of traffic during construction

III. PUBLIC INVOLVEMENT

In Appendix C, the Public Meeting Summary for the April 2002 Public Meeting describes a petition received from the residents of Pond Creek requesting that the community not be divided by a fill and that a new bridge be constructed over the Russell Fork to allow exits during high flow conditions. The John Moore Branch residents also expressed a desire to not connect the head of Pond Creek to the head of John Moore Branch. They seemed to like the exclusivity of their community. Concerns were also raised about the effects on emergency response times for residents above the fill. The plans at that meeting showed that approximately 20 homes would remain at the head of John Moore Branch and that they would exit through Pond Creek during John Moore Branch construction. Following that meeting, the Cabinet decided that, based on the input of the Public Meeting, a bridge would be constructed over Pond Creek and no connection would be made to John Moore Branch.

With the recent addition of a new, APD funded, bridge over the Russell Fork, and with concerns being raised over the constructability and long-term maintenance of a bridge over Pond Creek, District 12 would like to reconsider this decision. Other factors in the desire to reconsider are that the homes at the head of John Moore Branch have now been purchased so that one of the reasons for public opposition has been eliminated and new requirements for identifying and permitting excess material sites add another dimension to the economic comparisons of these alternatives. If the Cabinet elects to consider revisions to the design to address some of the issues, a new Public Meeting will be necessary to better explain all of the possible issues and get a better feel for the needs and desires of this community.

IV. RECOMMENDATION

In a time where we all need to become more value-driven, this Value Engineering alternative should be seriously considered. With funding scarcer, all significant costs that can be saved need to be examined. In years past, when funding was more plentiful, decisions were reached on this project with less regard to the economic impact and the need to stretch funding. Public input, community values, and environmental impacts were highly valued when compared to construction cost. Recent changes in the way stream impacts are considered combined with the decision to buy all of the homes in the head of John Moore Branch and build a new bridge at Draffin have led us to reconsider the decision to construct a bridge in Pond Creek.

District 12 Preconstruction staff recommends that the Cabinet choose the combination of **Alternative B with Add-On 2** as the preferred alternative for this location. The main reasons for this recommendation are:

- With the new bridge at Draffin, residents below the Pond Creek fill should no longer be concerned with being trapped in the hollow by high waters on the Russell Fork
- Residents in the head of John Moore Branch who previously opposed the fill have since been relocated
- Long-term maintenance costs of a 320 foot high bridge over Pond Creek would be significant
- Improved mobility for the region including direct access for residents from Pond Creek to the new US 460 as well as access for motorists on the old US 460 coming from Belcher to the new US 460 by crossing the new Draffin Bridge and using the new US 460 approaches
- Construction of a bridge creates an unbalanced project which leads to more stream impacts in significant excess material sites
- Total cost savings estimated at $8,725,000 compared to the current design

The District recommends that since previous decisions were based largely on public input, that if this VE alternative is carried forward, an additional Public Meeting be held prior to a final decision to present the possible changes and gauge public opinion.

APPENDIX A

Palmer ENGINEERING
400 Shoppers Drive
P.O. Box 747
Winchester, KY 40392-0747
(859) 744-1218
FAX (859) 744-1266

JOB _____

SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SCALE _____

April 11, 2006
Pike Co, US 460
Value Engr Mtg, D12

Name	Position	Email
Jeff Cowan	Palmer Engr	jcowan@palmernet.com
Charles E. Neeley	KYTC, D12-Traffic	charles.neeley@ky.gov
James D. Wright	KYTC D12 Const.	doug.wright@ky.gov
Mary Westfall-Holbrook	Construction Engr	maryw.holbrook@ky.gov
Samuel Hale	KYTC D12 Bridge Eng	samuel.hale@ky.gov
Jay Watts	KYTC D-10 Const.	
Wes Ratliff	KYTC D-10 Const.	wes.ratliff@ky.gov
Darold Slone	D-12 Operations	darold.slone@ky.gov
Joe Stanley	D-12 Operations	Joe.stanley@ky.go
Keith Damron	KYTC D-12 Planning	keith.damron@ky.gov
Dudley Brown	FHWA	john.brown@fhwa.dot.gov
John M. Johnson	KYTC - D12	
David Lindeman	Palmer Engineering	dlindeman@palmernet.com
Kevin Damron	KYTC D12	kevin.damron@ky.gov
Josh Callihan	KYTC D11	Josh.Callihan@ky.gov
Robert Semones	CO Program Performance	
Phillip Howard	KYTC D11	Phillip.Howard

February 25, 2000

Kevin Damron, P.E.
KY Transportation Cabinet
District 12
Pikeville, KY 41502

RE: Pike County, US 460
From Laurel Branch to KY 80
Item No. 12-263.60
Final Pond Creek Tunnel Meeting Minutes

Dear Kevin:

On Wednesday, December 9, 1999, a meeting was held in the sixth floor conference room in Frankfort to discuss the possibility of constructing a drainage tunnel rather than a bridge for Pond Creek of the reference project. Those in attendance were:

W.H.Phillips	KTC – Central Office Bridge Design
Richard Dutton	KTC – Division of Environmental Analysis
Steve Rice	KTC – Division of Environmental Analysis
Keith Crim	KTC – Division of Environmental Analysis
Kenny Barrett	KTC – Central Office Drainage Design
Earl Wright	KTC – Geotechnical Branch
Richard T. Wilson	KTC – Geotechnical Branch
Danl Hall	KTC – District 12 Construction
Kevin F. Damron	KTC – District 12 TEBM for Preconstruction
Andre Johannes	KTC – Central Office Location Engineer
Doug Lambert	Palmer Engineering
Jim Gallt	Palmer Engineering
David Lindeman	Palmer Engineering

The history of the project and the proposed tunnel design were presented to bring all attendees up to date on this situation. The tunnel as proposed is a 14 foot diameter bore with box culverts on each end where tunneling is not possible. The approach roads on each side of the mainline were designed with a 20 MPH design speed and 10 percent maximum grades. Although no detailed cost estimates had been performed, it was expected that approximately $10,000,000 could be saved in construction cost with the tunnel alternate versus the bridge shown at the Preliminary Line and Grade that is in a fill at each end. The drainage area contributing to the tunnel is 2300 acres (3.6 square miles). The length of channel that would be eliminated is approximately 1800 to 2000 feet. The construction of the tunnel and approaches would add approximately 16-17 additional residence relocations.

The following comments and suggestions were made:

1. The stream quality of Pond Creek is considered "middle of the road" and therefore is not likely to get highly protected status.

2. The Division of Water will likely require 2:1 in-kind mitigation for the portion of the stream displaced by the tunnel and culverts. This would mean approximately 4000 feet of mitigation.

3. The difficulties encountered with mitigating off-site include finding comparable streams to mitigate and obtaining conservation easements from property owners to perform the mitigation on their land.

4. The Division of Bridges and Geotechnical Branch recommend that if a bridge is built that it extend from rock cut to rock cut. This additional length would add approximately $10,000,000 to the bridge alternate as proposed at Preliminary Line and Grade.

5. One possible scenario for mitigation is the funding of sanitary sewer construction for the residents on each end of the tunnel. The possibility of proposing to do this as a demonstration project with partnering between the Transportation Cabinet and the Division of Water should be explored in an effort to find a "win-win" situation for property owners and the regulatory agencies.

6. The Division of Environmental Analysis suggested that baffles be constructed in the tunnel and culvert bottoms in order to trap sediment and provide a channel substrate for migration of stream species. The tunnel and culvert should be upsized by one foot to allow for the reduced flow area.

7. The Division of Bridges and Division of Drainage recommended that a constant circular section be utilized through the inlet and outlet culverts and the tunnel for hydraulic purposes.

8. Jessie Branch, in the next hollow east of Pond Creek, was discussed as a possible mitigation site. The Jessie Branch hollow has been selected for consideration as a designated waste area and as a blue-line stream will likely have it's own mitigation required.

9. The consultant should provide a summary of costs associated with the following three alternates for consideration:

    a. The original bridge design as presented at Preliminary Line and Grade with one approach.
    b. A bridge design from cut to cut with no approach to Pond Creek provided.
    c. The tunnel design with approaches on both sides of the hollow.

10. The consultant should provide quad sheets showing the entire US 460 corridor with all blue-line stream impacts, drainage areas, and descriptions of proposed structures and channel changes for use in discussing the possibility of this becoming a demonstration project.

Attached are the cost comparisons for the above described alternates along with a cost estimate for two new alternates that push the mainline out of the hollows on each side to considerably reduce the cut to cut length of the bridge. These alternates do, however, significantly increase the excavation and waste quantities for this construction section. A description of each alternate with advantages and disadvantages is also included. Although there are considerable savings associated with building the tunnel, no attempt has been made to estimate the costs of providing stream mitigation in other areas of Pike County.

Following the issuance of the draft minutes, the District held a meeting on Thursday, January 20, 2000 to discuss the alternates presented. Minutes of that meeting are attached. In response to the recommendations made in those minutes, a sixth alternate was studied with 30 MPH approaches and the same tunnel and wagon box concept that was used for Alternate 5. A plan view and cost estimate for this new alternate are attached. The alternate description and alternate comparison sheets have also been updated to include this new alternate.

Although Alternate 6 with 30 MPH approaches will add approximately $1.5 million in construction cost and $2.0 million in right of way cost, the District met again on Wednesday, February 23, 2000 and selected Alternate 6 as the preferred alternate. A copy of a letter dated February 24, 2000 with a recommendation to proceed with geotechnical exploration of the tunnel is attached.

In response to comment 4 in the January 25, 2000 minutes, Palmer Engineering looked at the possibility of tying the KY 195 east interchange to the Pond Creek approaches with one right-on/right-off access. Although no cost estimates were performed, the approaches at Pond Creek would have to be built even with the combined interchange. This would mean that the cost of connecting the access points would greatly increase since the connector road would have to pass through the 350 foot deep cut in the saddle.

If you have any questions or need any additional information, please feel free to call.

Sincerely,

David Lindeman, PE & LS
Vice President

cc: all attendees
99-416

Pond Creek Bridge/Tunnel Description of Alternates

Alternate 1 – This is essentially the original Preliminary Line and Grade alternate with the bridge extended to a point where the abutment fills are less than 100 feet in height.

Advantages	Disadvantages
Provides access to Pond Creek	Abutments in fill
Less waste required	
No stream mitigation required	

Alternate 2 – This alternate pushes the bridge from cut to cut on the original alignment but does not provide access.

Advantages	Disadvantages
Abutments in rock	No access to Pond Creek
Less waste material	Highest cost alternate
No stream mitigation required	Vertical sag on bridge

Alternate 3 – In order to shorten a bridge that runs from cut to cut, the horizontal alignment was shifted up the hollow into a sidehill cut on each side of Pond Creek. A similar access was provided as Alternate 1. The vertical profile is the same as Alternates 1 & 2.

Advantages	Disadvantages
Abutments in rock	Most waste material
Fewer relocations	
Better horizontal alignment	
No stream mitigation required	
Provides access to Pond Creek	

Alternate 4 – Using essentially the same alignment as Alternate 3, this alternate raises the vertical grade approximately 60 feet to reduce excavation quantities. No access is provided due to the higher mainline grade.

Advantages	Disadvantages
Abutments in rock	No access to Pond Creek
Fewer relocations	Tallest piers
Better horizontal alignment	
Better vertical alignment	
No stream mitigation required	

Alternate 5 – This is the 20 MPH tunnel alternate. A 14 foot diameter tunnel is proposed through rock with a 14'x14' RCBC connection under each end under fills. It is assumed that a 14' diameter culvert on each end will be similar in cost to the box culvert. Approaches are proposed to traverse the fill slope on each side of the tunnel for Pond Creek Road. A 28' x 14' culvert is proposed at the top of the fill to provide crossing traffic for right-on/right-off movements.

Advantages	Disadvantages
Provides right-on/right-off access to Pond Creek	Stream mitigation required
Less waste material	More residence relocations
Lowest construction cost	Winding approach road
	Potential maintenance concerns
	Possible project delays

Alternate 6 – This is the 30 MPH tunnel alternate. A 14 foot diameter tunnel is proposed through rock with a 14'x14' RCBC connection under each end under fills. It is assumed that a 14' diameter culvert on each end will be similar in cost to the box culvert. Approaches are proposed to traverse the fill slope on each side of the tunnel for Pond Creek Road. A 28' x 14' culvert is proposed at the top of the fill to provide crossing traffic for right-on/right-off movements.

Advantages	Disadvantages
Provides right-on/right-off access to Pond Creek	Stream mitigation required
Less waste material	Most residence relocations
Lower construction cost	Potential maintenance concerns
Better approach speeds	Possible project delays

11/12/05

Pike County US 460
Pond Creek Bridge/Tunnel Comparison of Alternates

	Alternate 1	Alternate 2	Alternate 3	Alternate 4	Alternate 5	Alternate 6
Mainline Construction Cost	$31,780,000	$31,400,000	$41,270,000	$38,040,000	$32,420,000	$32,420,000
Bridge Cost	$20,012,000	$28,210,000	$9,710,000	$12,538,000	$2,550,000	$1,725,000
Approach Construction Cost	$3,030,000	$0	$4,360,000	$0	$5,260,000	$7,050,000
Construction Cost Subtotal	**$54,822,000**	**$59,610,000**	**$55,340,000**	**$50,578,000**	**$40,230,000**	**$41,195,000**
Approximate R/W Cost	$2,000,000	$2,000,000	$1,500,000	$1,500,000	$5,500,000	$7,500,000
Approximate Utility Cost	$300,000	$200,000	$300,000	$200,000	$1,000,000	$1,200,000
Mob., Demob, Eng. & Cont.	$11,060,000	$12,030,000	$11,160,000	$10,200,000	$8,120,000	$8,310,000
Total Alternate Cost	**$68,182,000**	**$73,840,000**	**$68,300,000**	**$62,478,000**	**$54,850,000**	**$58,205,000**
Bridge Information						
Length	1700'	2550'	900'	1100'	None	None
Height	300'	300'	280'	340'	None	None
Maximum Pier Height	260'	280'	275'	290'	None	None
Abutment 1 Fill Height	64'	0'	0'	0'	None	None
Abutment 2 Fill Height	84'	0'	0'	0'	None	None
Likely # of Spans	6	9	4	5	None	None
Longest Span	304'	297'	250'	240'	None	None
Residence Relocations	6	6	4	4	20	28
Waste (CY)	13,291,143	12,516,105	18,105,617	15,036,299	7,722,008	8,500,000

APPENDIX B

February 15, 2002

Mr. John Michael Johnson
Kentucky Department of Transportation
District 12
109 Lorraine Street
Pikeville, KY 41501

RE: Pike County, US 460
Item No. 12-263.00
Meeting on Design and Environmental Issues

Dear Mr. Johnson,

On Thursday, December 20, 2002, a meeting was held at the KTC District 7 office to address design and environmental issues on the US 460 corridor in Pike County. Those in attendance were:

Gary W. Sharpe	KDOT, Central Office, Design
Kevin Damron	KDOT, District 12 – Preconstruction
Johnnie E. Ross	KDOT, District 12 – Environmental
Samuel Hale	KDOT, District 12 – Construction
John M. Johnson	KDOT, District 12 – Design
Jerry Justice	KDOT, District 12 – Right of Way
Ray Polly	KDOT, Central Office – Design
Randall Thomas	KDOT, Central Office – Environmental
Ralph Devine	KDOT, Central Office – Right of Way
Brian Lee	Palmer Engineering
Karl Sawyer	Palmer Engineering
Jeff Cowan	Palmer Engineering
Doug Lambert	Palmer Engineering
David Lindeman	Palmer Engineering

The following issues regarding the US 460 corridor in Pike County were discussed:

FONSI Addendum
The FONSI addendum was reported to be ready for submittal, but did not specifically address the recent FHWA comments. It was agreed that the Addendum would be

submitted, along with the SHPO letters, with the position that the relevant comments had been addressed.

The next section of US 460 scheduled for letting (Section 2) is not affected by the addendum, and could proceed as scheduled for August 2002. Section 3, scheduled for a December 2002 letting, would however be affected and would be dependant on the Addendum's approval.

Upper Prater Cemetery

The cemetery will likely be eligible for the national registry. After studying several alternatives and because it is considered to be a late find, it was agreed to proceed with the present design, and the mitigation would consist of preparing a reference document on the historic context of Eastern Kentucky cemeteries. A memo of agreement will be signed by the SHPO, which should like the document for future reference on other projects.

Three avoidance alternates were analyzed for costs and impacts. The three avoidance alternates and their associated costs are summarized as follows:

Alternate 1 (As designed) - $7,500,000 with no additional right of way needed.

Alternate 2 (Ramp behind the Upper Prater Cemetery) - $9,500,000 plus probably two additional parcels affected and another smaller cemetery that has not been studied affected.

Alternate 3 (Ramp on south side of Kendrick Hollow) - $8,100,000 plus four additional residential relocations.

Alternate 4 (Move interchange to Snake Branch Hollow in Section 3) - $15,000,000 with very little additional right of way.

Jessie Branch Cemetery

The archaeologists were waiting on either next-of-kin permission, or a declaration of abandonment to proceed with study of the cemetery. Johnnie Ross and Lanny Damron were to meet with the next of kin to explain what the archaeologists were going to do, perhaps with the archaeologists at the meeting.

Pond Creek and John Moore Branch

Although the current design for Pond Creek (hollow fill with a constructed tunnel for drainage) was the most economical, opposition from local residents has prompted a look at another design alternate. Their arguments against the proposed design included:

1) With the proposed mainline embankment, there would be no way in or out for the residents of upper Pond Creek when the Russell Fork floods and inundates the existing low water bridge into Pond Creek
2) Several families are located along Pond Creek Road, and would be separated by a longer driving distance once the embankment was in place
3) Those above the proposed embankment were concerned with potential flooding caused by the proposed tunnel

To alleviate these concerns, another alternate was studied. This alternate would shift mainline centerline to the south and bridge both Pond Creek and Pond Creek Road. In conjunction with this change, the construction along John Moore Branch would be altered also. A connection between John Moore Branch and Pond Creek would still be proposed, but the reconstruction along John Moore Branch would be shortened, in order to decrease the number of permanent residential relocations. Although it would be more expensive, this alternate would:

1) keep the Pond Creek community together
2) eliminate the channel change and tunnel on Pond Creek
3) decrease the number of relocations on both Pond Creek and John Moore Branch
4) decrease the channel change on John Moore Branch
5) leave the residents of lower Pond Creek a "way out" when the bridge over Russell Fork is flooded
6) involve less gas line and fewer utility pole relocations

Attached is a decision matrix showing the effect of three combinations of alternates for the Pond Creek and John Moore Branch locations. The following is a description of each alternate:

Alternate A – The Pond Creek embankment as designed with a tunnel for drainage. This alternate for the current design has the entire John Moore Branch waste area in the comparison in order to get the residents at the head of Pond Creek out to the existing US 460 during construction. This scenario would force the John Moore Branch construction to be done before Section 6 construction could begin.

Alternate B – As described previously, a bridge will be constructed over Pond Creek with a shift in mainline alignment to minimize the bridge length. In order to reduce relocations, this alternate only constructs the lower half of the John Moore Branch controlled embankment. In this alternate, the connector to John Moore Branch would be constructed first in order to allow the remaining residents in John Moore Branch above Goose Hollow to get out to US 460 by going through Pond Creek during the construction of the embankment in the lower reaches of John Moore Branch. The cost of the John Moore Branch bridge and embankment construction is included in this alternate since the

connector would not be necessary if the John Moore Branch bridge and embankment is not built. If this alternate is selected and Section 6 is accelerated, the connector from John Moore Branch to Pond Creek should probably be let with Section 6 so that the steel beams for the Pond Creek bridge can be transported from US 460 at Beaver Bottom over the connector road to Pond Creek. Getting beams from the existing US 460 up Pond Creek Road including the railroad crossing is probably not feasible. The typical section of the connector road would likely have to be two nine foot lanes which would be the absolute minimum. Some discussion centered on the possibility of just paving the existing connector road where it is passable on gravel now. The fact that the existing road is less than 10 feet wide probably makes that impractical.

Alternate C – In order to alleviate the concerns of the residents on the north side of the proposed mainline embankment, a third alternate has been shown for comparison that uses the current Pond Creek and John Moore Branch designs, but replaces the low water crossing of Pond Creek Road over the Russell Fork. This alternate could improve a dangerous situation on US 460 but would still leave the Pond Creek community impacted by the separation of the embankment.

Because recent large Pike County projects have been let with excavation bids of less than $2.00 a cubic yard and since waste costs have been included separately, the estimates used for this comparison have used $2.00 a cubic yard so that they will be relatively correct. Final estimates will still use $3.00 a cubic yard to reflect possible future costs. It should also be noted that right of way and utility cost estimates on the decision matrix were based on adjustments from previous estimates.

The attached decision matrix shows that Alternates A and C have lower costs but greater numbers of relocations, more blueline stream impacts, and 12 additional grave relocations. Alternate B has a higher mainline construction cost, additional waste cost, and the additional bridge cost.

It was also discussed that the mine company owner at the head of Pond Creek could be contacted to investigate the development of that property for residential relocations if Alternate B is selected. .

Also attached with these minutes are the comments from the FHWA office.

On Tuesday, February 12th, a follow-up project team meeting was held at the KYTC District 12 office to discuss the potential changes to the proposed alignment for mainline over Pond Creek and John Moore Branch. Those in attendance were:

Kevin Damron	KYTC, District 12 – Design
Keith Damron	KYTC, District 12 – Planning
Danl Hall	KYTC, District 12 – Asst. CDE
Mary Westfall-Holbrook	KYTC, District 12 – Design
John M. Johnson	KYTC, District 12 – Design
Charles E. Neeley	KYTC, District 12 – Traffic
Jay T. White	KYTC, District 12
Greg Preece	KYTC, District 12 – Operations
James D. Wright	KYTC, District 12 – Construction
George Collins	KYTC, District 12 – Construction
Jeff Cowan	Palmer Engineering
David Lindeman	Palmer Engineering

Because of local residents' disapproval with the location and design of proposed US 460 (in the Pond Creek area) and John Moore Branch relocation, and concerns expressed by the FHWA in its environmental review, Alternate B was studied that would address these concerns. Because of the favorable review of the change at that meeting, the change was brought before the project team at this follow-up meeting for review and comment. Those comments included:

1. The change would have a higher total cost (by approximately $12 million).
2. The number of relocations for right of way would be significantly smaller for the change (about 27 fewer).
3. The blueline stream impacts would decrease substantially: from 1500' to 0' for Pond Creek, and 20,760' to 16,930' for John Moore Branch.
4. The community, including many immediate families at Pond Creek, would no longer be split.
5. Because the upper part of Pond Creek Road would no longer be blocked, the start date for construction of Section 6 would no longer be dependent on the completion of John Moore Branch. Section 6 could therefore be let as much as 3 to 4 years sooner, resulting in a savings of financing costs.
6. With the cut-through between Pond Creek and John Moore Branch constructed early, those residents who are not to be relocated on John Moore Branch could use Pond Creek Road for access during the reconstruction of John Moore Branch Road.
7. Design in other locations on the proposed US 460 corridor historically has placed higher priority on environmental issues over cost in determining the final alignment.

As a result of the discussion, the project team decided in favor of alignment change for both mainline at Pond Creek and John Moore Branch. Because the initiative to look at alternates was driven by concerns of the local residents, it was decided to present the

realignments for both at another public meeting. This meeting would be combined with a right of way informational meeting for Stonecoal Fork, and will be scheduled as soon as possible.

Although not directly related to the discussion of the alignment change, the concern of bridge design for overweight coal trucks was mentioned. Because of the frequency of these trucks crossing the new bridges the life-span of the structure could be dramatically shortened. With substantial maintenance and replacement costs to repair the structure, the question of designing the bridges for a higher loading was posed. It was agreed that the bridge design engineers from Palmer Engineering would contact the bridge section at Central Office and discuss using higher weight standards.

If you have any questions about these comments, or have anything you wish to add, please don't hesitate to call.

Sincerely,

David Lindeman, P.E. & L.S.
Project Engineer

Cc: all attendees
99-416

Notes for US 460 Waste Site Addendum Project

1. The 106 process will have to be completed on the waste sites. This will not include Native American coordination since this project has already had completed FONSI and is "in the pipeline" as was previously discussed. Native American coordination will be required if there is a discovery of a NA site as we would do anywhere/anytime this occurs on a project.
2. The reevaluation for these projects is already approved but we do not consider the 3 sites to formally be part of the project area until the addendum is approved. We must insure that we do everything necessary to insure that the document may remain a FONSI.
3. When the addendum is submitted, it should contain a description of what will be done to make sure the document stays a FONSI.
4. Consultant must talk to ALL families (no exceptions) and if there is ANY family who is adverse to the waste site project, we must know (as agencies) what would either make it acceptable to them or to make them comfortable with it.
5. Status on the cemeteries needs to be updated. We need to know if we will be taking, infringing, etc. on the Prater cemetery. If we have a 4f issue, then we need to be preserving. There must be no adverse effect/ no use.
6. For relocations, we must be able to relocate them as close to jobs, schools, etc. as possible in decent amount of time and not be rushed.
7. A portion of the new land, as created by the fill, should be dedicated for re-settlement for the families who wish to come back to the area. A well laid out section should be established for settlement if the displaced persons desire to move back. These areas should also be decent, SAFE, and sanitary.
8. Inclusions must be made for the temporary housing and transportation for those people who would be relocating back to the fill area. Inclusions for child care, handicapped, elderly, etc. are considerations as well.
9. If the plan is to use the fill area for industrial, commercial, retail, and residential, then the local ADD's, counties, or cities need a conceptualized plan for this site.
10. There must be a commitment that all revenues from the sites (sales or leases) will come back to KyTC and be used for Title 23 eligible work. Previous occupants must have first choice to be brought back to the fill area with appropriate access. This will be done prior to turning over any land to the county.

	Alternate A - Pond Creek Embankment with Tunnel and Complete John Moore Branch Access Road	Alternate B - US 460 Bridge over Pond Creek with Connector to John Moore Branch and Fill in Bottom Half	Alternate C - Pond Creek Embankment with Tunnel , John Moore Branch, and new Russell Fork Bridge
Mainline Excavation Cost ($2.00/CY)	$24,150,000	$29,900,000	$24,150,000
Mainline Bridge or Tunnel Cost	$1,500,000	$11,500,000	$1,500,000
Russell Fork Bridge and Construction Cost	$0	$0	$3,000,000
John Moore Branch Cost	$8,000,000	$7,700,000	$8,000,000
Mainline Bridge Length	NA	1000'	NA
Mainline Bridge Grade	NA	2%	NA
Mainline Bridge Superelevation	NA	2%	NA
Mainline Bridge Height	NA	320' Max	NA
Section 6 Waste	127,000 CY	5,900,000 CY	127,000 CY
Additional Waste Cost	$0	$2,950,000	$0
Pond Creek Blueline Stream Impacted	1,500'	0'	1,500'
John Moore Branch Blueline Stream Impacted	20,760'	16,930'	20,760'
In-lieu Fee Stream Mitigation Cost	$2,226,000	$1,693,000	$2,226,000
Right of Way Cost	$11,000,000	$5,500,000	$11,500,000
Utilities Cost	$1,000,000	$500,000	$1,200,000
Total Cost Comparison	**$47,876,000**	**$59,743,000**	**$51,576,000**
Pond Creek Relocations	10	4	12
John Moore Branch Relocations	38	17	38
Graves Relocated	16	4	16

APPENDIX C

May 7, 2002

John Michael Johnson
Kentucky Transportation Cabinet
District 12
109 Lorraine Street
Pikeville, Kentucky 41501

RE: Pike County, US 460
Item Nos. 12-263.60 & .70
Public Meeting Summary

Dear Mr. Johnson,

On Monday, April 8th, a public meeting was held at the high school in Elkhorn City. The purpose of the meeting was to review the proposed plan changes for Pond Creek and John Moore Branch Roads on the US 460 project in Pike County. The following is a summary of those comments and the responses to them.

Overview

There were a total of 145 who signed in on the attendance list. A total of 21 comment sheets were received at the meeting, as well as 2 signed petitions. Five additional comments (in the form of email responses to the web site) have been received in the 15 days following the meeting. These have all been tabulated and summarized.

US 460 Bridge over Pond Creek vs. Embankment w/Tunnel

US 460 Bridge over Pond Creek Road – In terms of number of residents responding in favor, this was by far the most supported alternate. A petition with 106 signed names was received indicating their preference that the community not be divided (by a roadway fill), and asking that a bridge for US 460 be built over Pond Creek Road. An additional 7 response sheets signed by 10 other residents were also received expressing support for this alternate, with the following reasons given:

- Don't want the community divided (6 sheets, 3 email responses)
- Slow or impossible response by emergency vehicles by way of John Moore Branch Road, especially in bad weather (1 sheet)
- Russell Fork flooding over the existing bridge is usually of short duration, and not a major problem (2 sheets)
- No reason given (1 sheet, 1 email response)

US 460 Fill over Pond Creek Road – This alternate had far less support in terms of number of residents who responded. A total of 6 response sheets signed by 7 residents was received expressing favor of this alternate, with the following reasons given:

- A new bridge over Russell Fork is needed due to frequent flooding over the bridge makes it impassible. A new intersection between Pond Creek Road and KY 80 is also badly needed. (2 sheets)
- No reason given (4 sheets)

Response – Both alternates provide benefits to the community. The 460 bridge would indeed leave families and multiple property owners access all along the road. The fill, in combination with the new bridge over Russell Fork, would improve access to KY 80 for those below the fill area. It would also decrease the driving distance between upper Pond Creek and Elkhorn City with the new road up and over the hill at John Moore Branch. However, both alternates leave the community with difficulties. Although the 460 bridge over Pond Creek leaves the community intact, it would require longer travel time for residents of lower Pond Creek to travel back over the hill, through John Moore Branch and Elkhorn City to have access during flooding conditions. It would also leave a dangerous intersection at Pond Creek Road and KY 80. The fill alternate would eliminate these two problems, but would of course divide the community.

John Moore Branch Road

Shortened Construction – In terms of negative response, this alternate had the largest number of residents against the proposed change. I fact, of those responding, none of the residents proposed to be left in place wanted to remain if it meant using Pond Creek Road during construction (due to additional travel time, flooding over the existing bridge at Russell Fork, and the dangerous intersection at KY 80). A petition with 22 signatures was presented expressing this reaction. An additional 5 response sheets was also received, signed by 6 residents (5 of whom had also signed the petition), also detailing their reasons for opposing the proposed change:

- Don't want to use Pond Creek Road (on 3 sheets)
- Wants to be bought out (on 1 sheet)
- Don't want to be near the large construction area at the lower end of John Moore Branch (on 2 sheets)
- Don't want to move, but would rather be bought out than use Pond Creek Road (on 1 sheet)
- Wants to know who will be bought out, and who will stay (1 email response)

Response – If all residents were to be bought out as originally proposed, much of the savings in right of way for the US 460 bridge over Pond Creek alternate is lost. This would make the total construction cost for this alternate (already more than the original design) even higher.

Given the responses from both the Pond Creek residents and the John Moore Branch residents, it is clear that neither alternate is supported by a majority of both communities. However, if the US 460 bridge over Pond Creek was combined with an alternative route

during construction for John Moore Branch residents who were not to be relocated (with no new connection between the two), then much of the opposition might be reconciled.

Miscellaneous Comments

Lick Creek Road – Two residents of Lick Creek Road expressed disappointment that the new 460 route would not decrease the travel time to Pikeville.

Response – Although the new route may not decrease the time or distance traveled between Lick Creek and Elkhorn City, it will definitely decrease the time between Elkhorn City and Pikeville.

Beaver Creek Road – One resident of Beaver Creek Road was interested in moving as soon as possible.

Response – Right of way agents are meeting with property owners first where those areas need to be cleared for the earliest construction letting. Keeping property owners informed of their status will be a priority of the agents.

Drilling Damages – One resident of Pond Creek Road stated that damages due to geotech drilling were owed.

Response – Where it is agreed that damages have indeed been done, the property owner will be reimbursed an appropriate amount.

No written responses for the Stone Coal section were received.

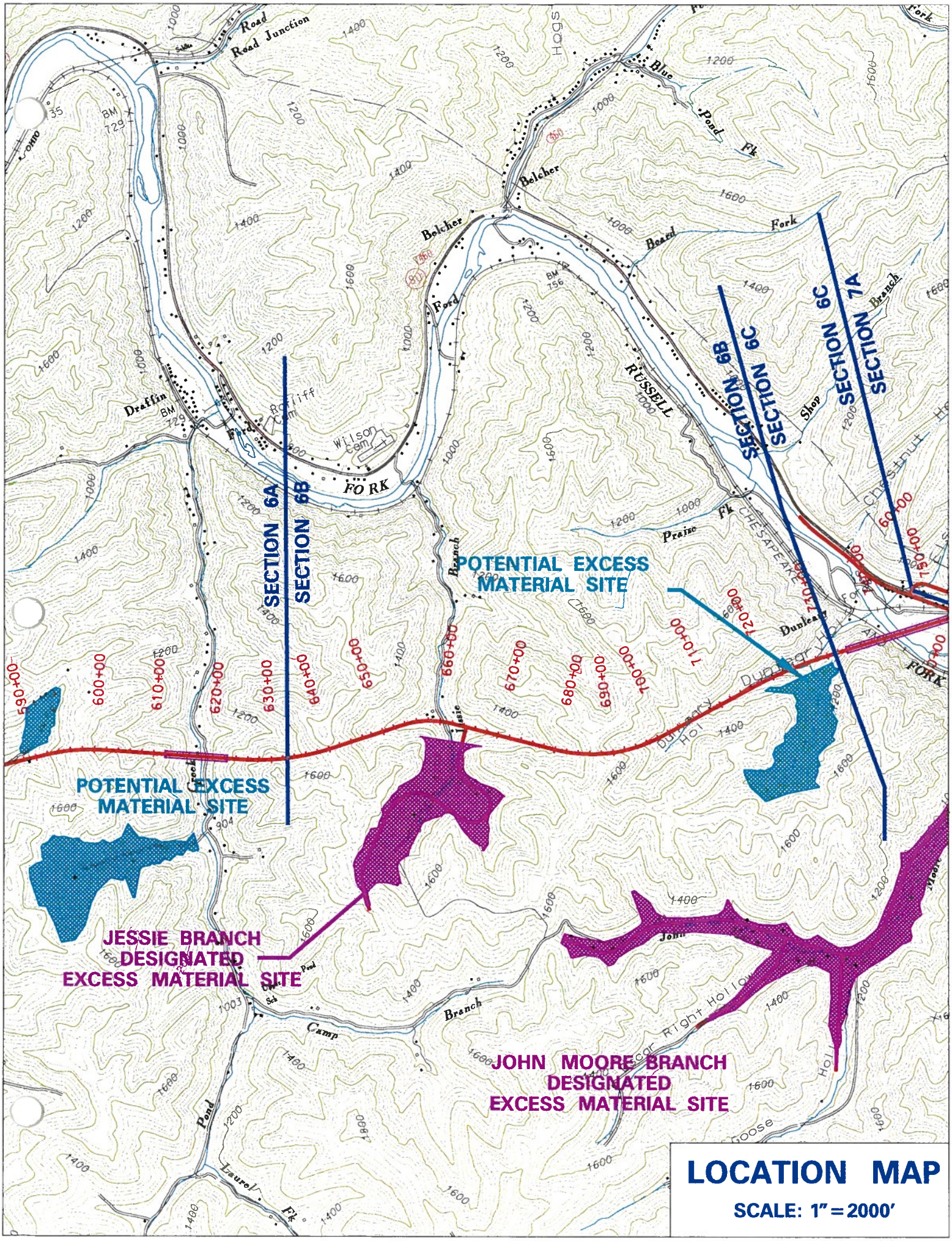
Sincerely,

David Lindeman, PE & LS
Vice President

Cc: Ray Polly
Jonathan Otis (Hall-Harmon)
99-413
99-416

EXHIBIT 1

PROJECT LOCATION MAP



LOCATION MAP

SCALE: 1" = 2000'

EXHIBIT 2

AERIAL PHOTO DISPLAY

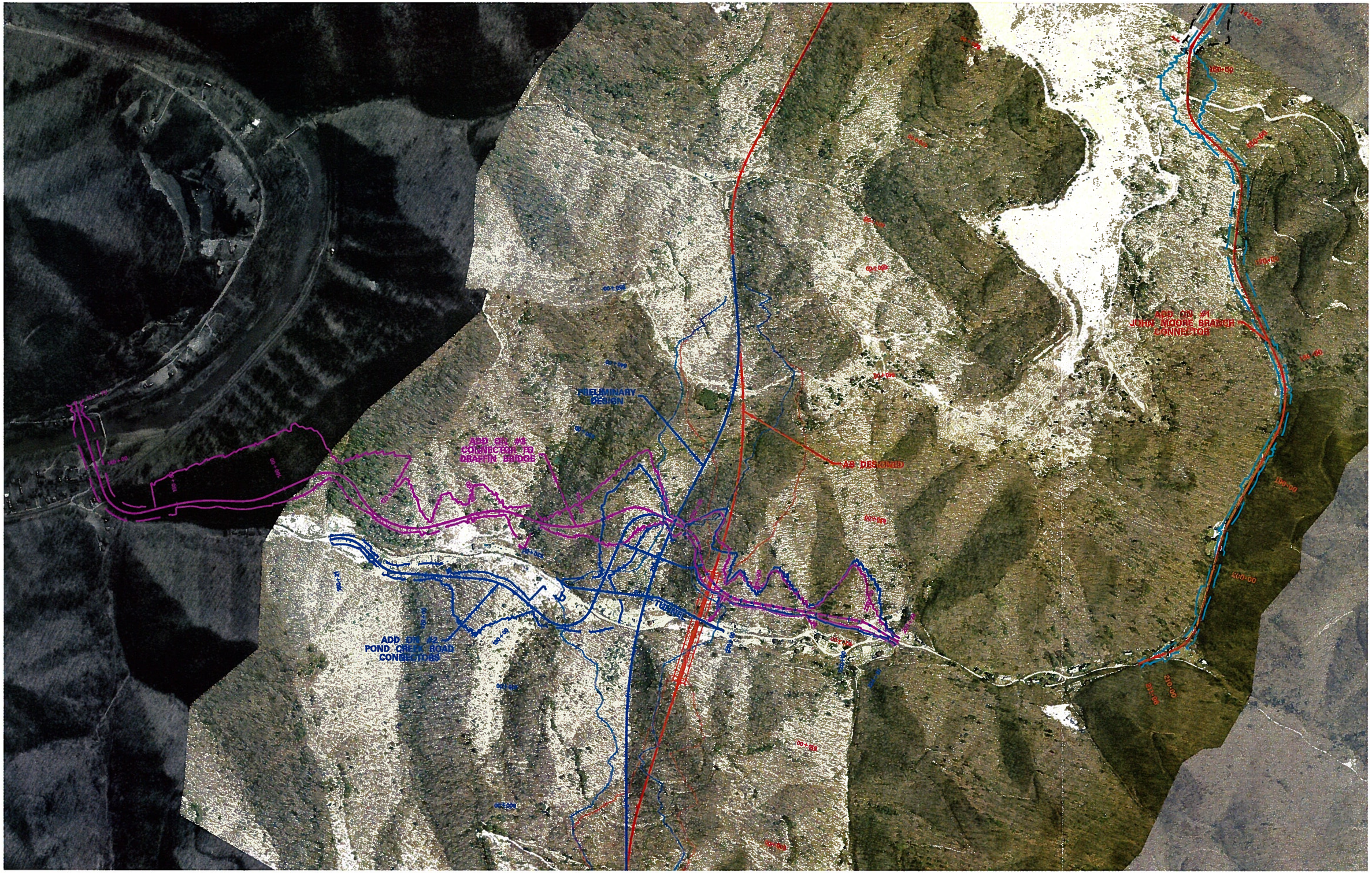
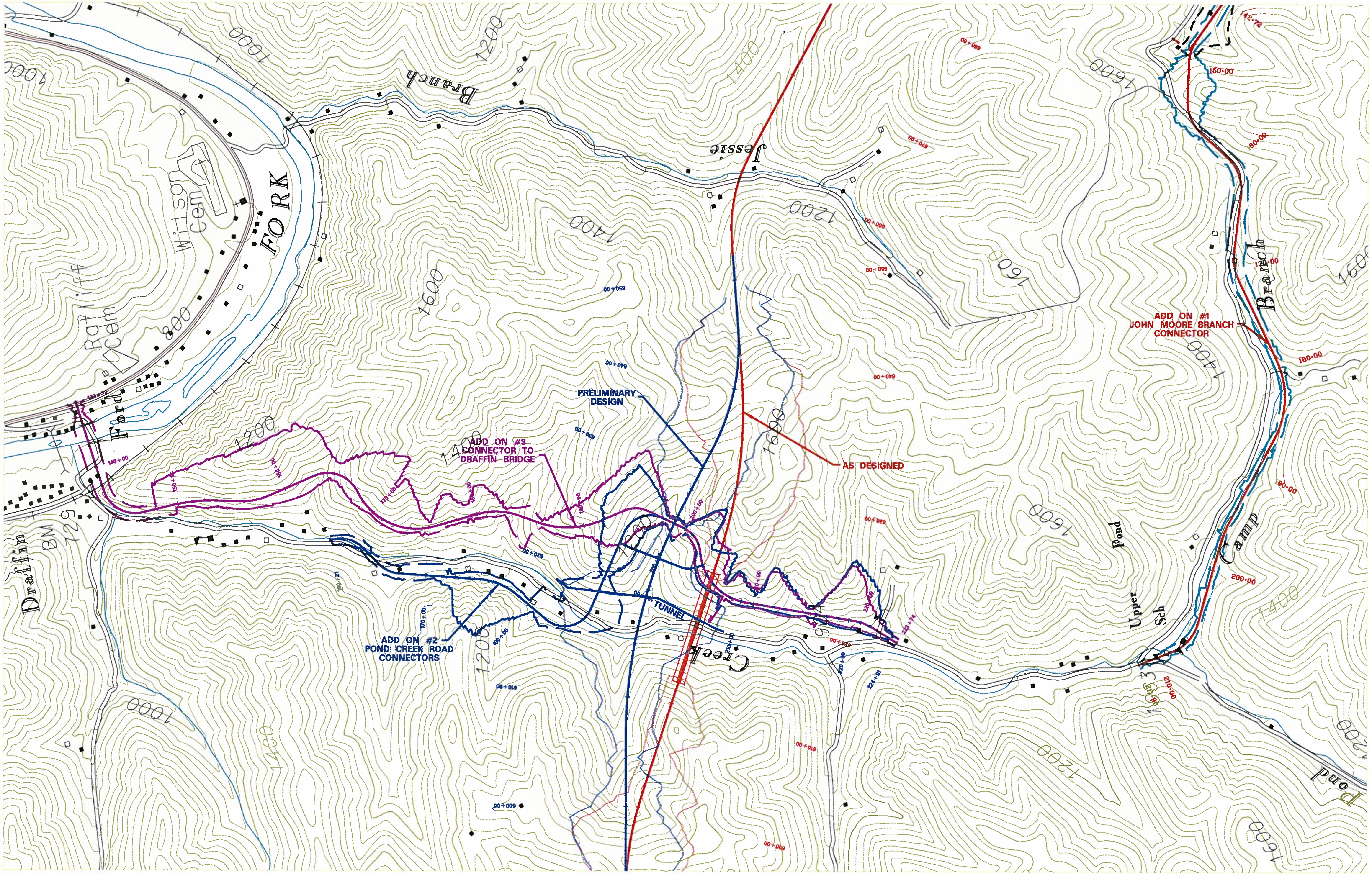

PRELIMINARY DESIGN
ADD ON #3 CONNECTOR TO DRAFFIN BRIDGE
ADD ON #2 POND CREEK ROAD CONNECTORS
TUNNEL
AB DESIGNED
ADD ON #1 JOHN MOORE BRANCH CONNECTOR

EXHIBIT 3

QUAD SHEET DISPLAY

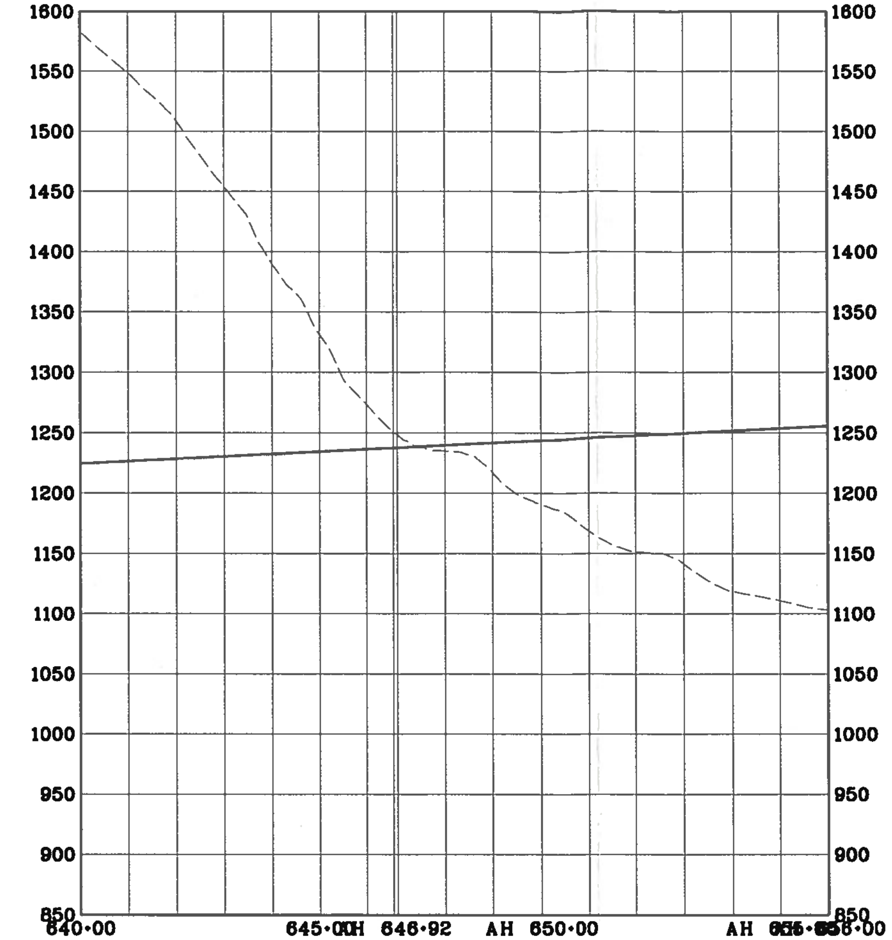


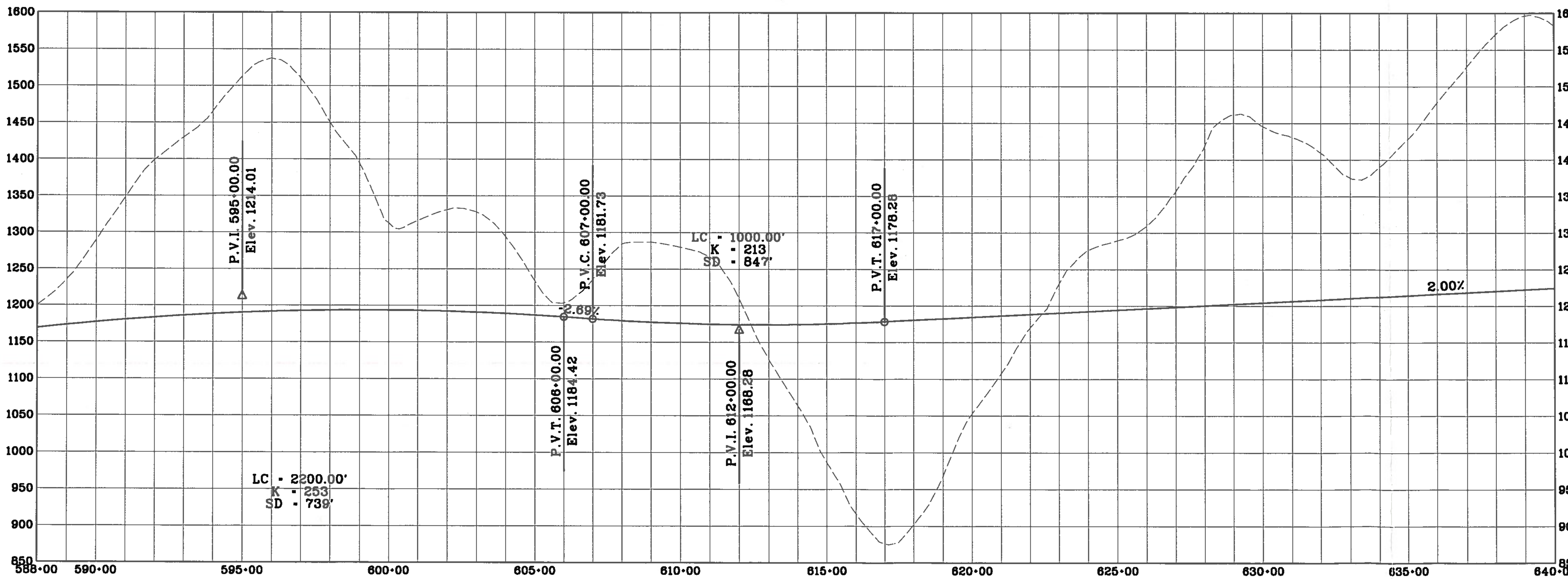
ADD ON #1
JOHN MOORE BRANCH
CONNECTOR
AS DESIGNED
PRELIMINARY
DESIGN
ADD ON #3
CONNECTOR TO
DRAFFIN BRIDGE
ADD ON #2
POND CREEK ROAD
CONNECTORS
TUNNEL
FORK
Wilson
Cem
Ratliff
Cem
Ford
Draffin
BM
729
Jessie
Branch
Creek
Upper
Pond
Sch
Camp
Branch
Pond
140+00
150+00
160+00
180+00
190+00
200+00

EXHIBIT 4

PROFILES

COUNTY OF	ITEM NO.	SHEET NO.
PIKE		





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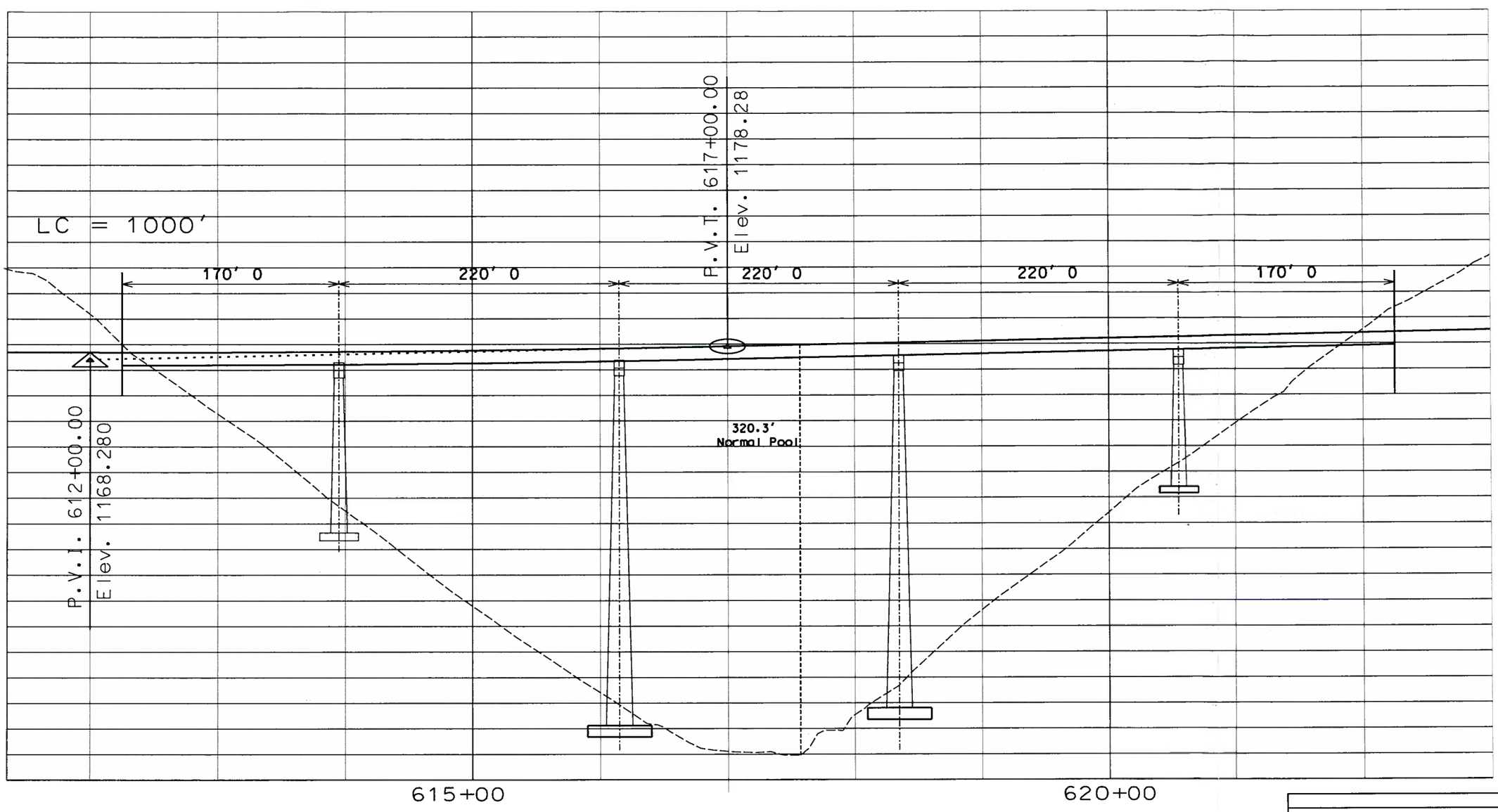
SCALE: 1" = 400'

PRESENT DESIGN MAINLINE (BRIDGE)



DATE: 11/12/2005 11:59:20 AM
USERNAME:
FILE NAME: INCHBASE.DGN
SHEET LOCATION:

REVISION	DATE

DATE: MAY, 2002	CHECKED BY
DESIGNED BY: BNR	
DETAILED BY: BNR	

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY
PIKE

ROUTE	CROSSING
US 460	POND CREEK

PRELIMINARY SPAN LAYOUT

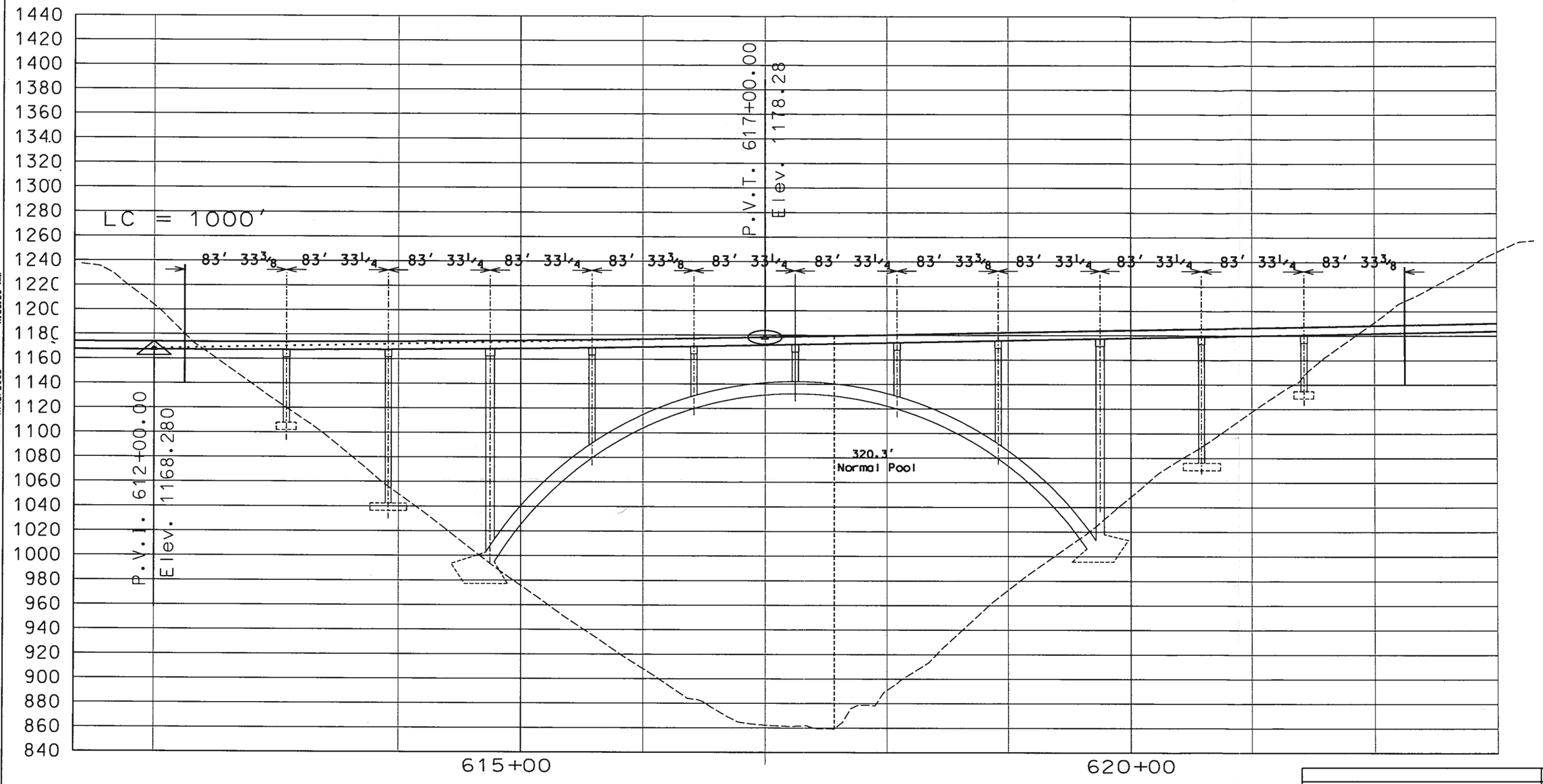
ALTERNATE 1

ITEM NO. 12-263.60

PREPARED BY
PALMER ENGINEERING CO.

SHEET NO.
S000

DRAWING NO.
00000



REVISION	DATE

DATE: MAY, 2002	CHECKED BY
DESIGNED BY: BNR	
DETAILED BY: BNR	

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY
PIKE

ROUTE	CROSSING
US 460	POND CREEK

PRELIMINARY SPAN LAYOUT

ALTERNATE 2

PREPARED BY
PALMER ENGINEERING CO.

SHEET NO. S000
DRAWING NO. 00000

ITEM NO. 12-263.60

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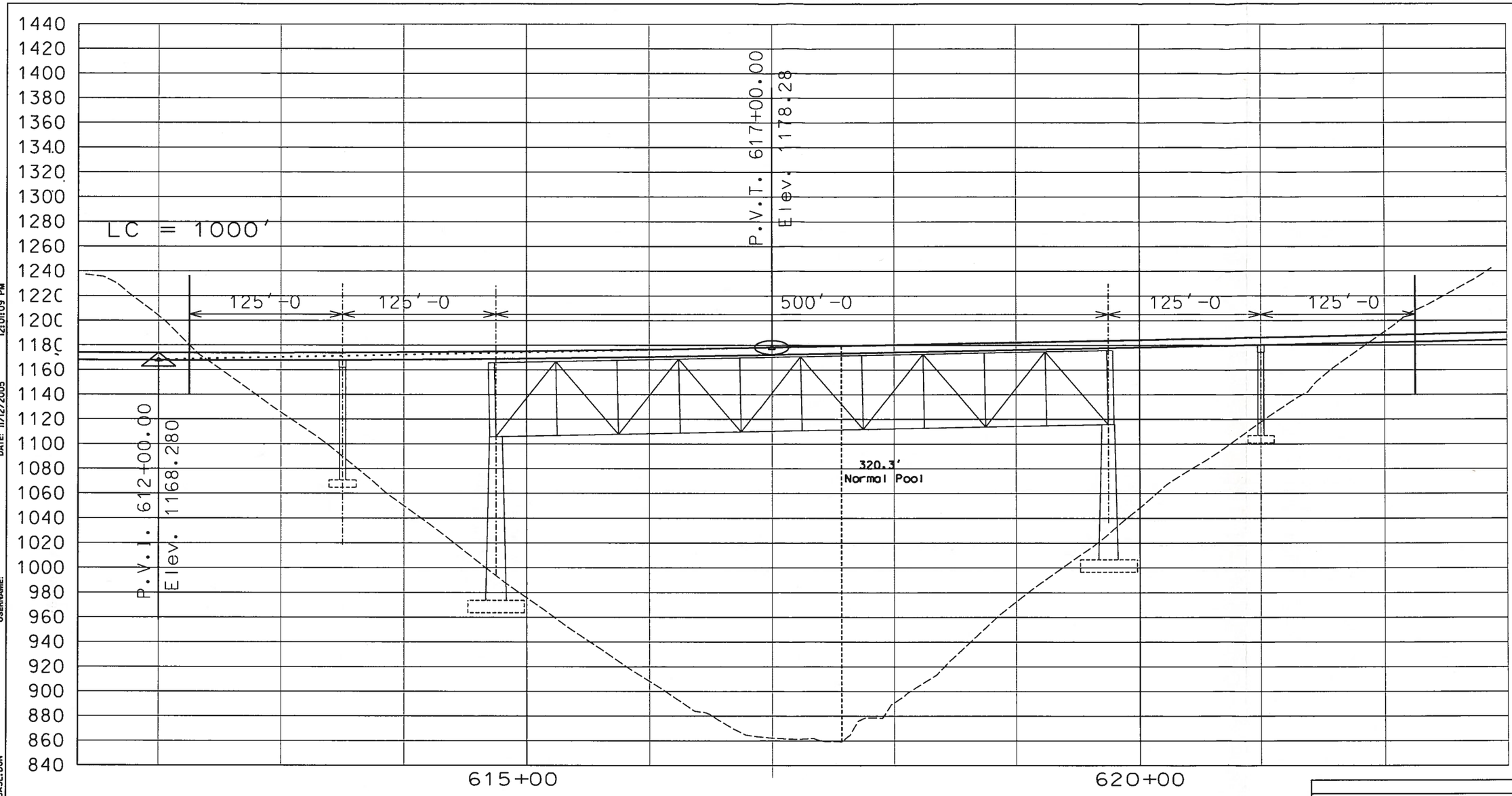
USERNAME:
DATE: 11/12/2005 11:58:59 AM



REVISION	DATE
DATE: MAY, 2002	CHECKED BY
DESIGNED BY: BNR	
DETAILED BY: BNR	

Commonwealth of Kentucky
DEPARTMENT OF HIGHWAYS

COUNTY
PIKE

ROUTE
US 460

CROSSING
POND CREEK

PRELIMINARY SPAN LAYOUT

ALTERNATE 3

PREPARED BY
PALMER ENGINEERING CO.

SHEET NO.
S000

DRAWING NO.
00000

ITEM NO. 12-263.60

SHEET LOCATION:
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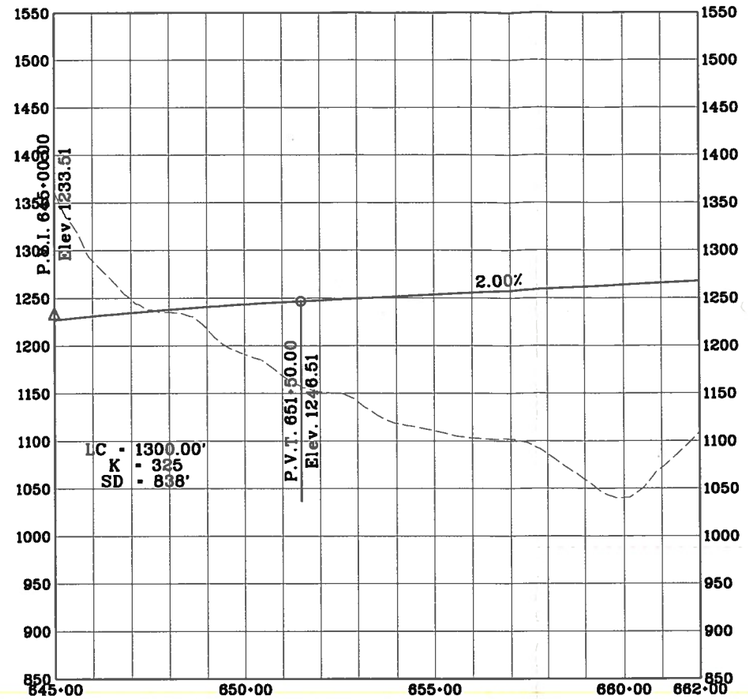
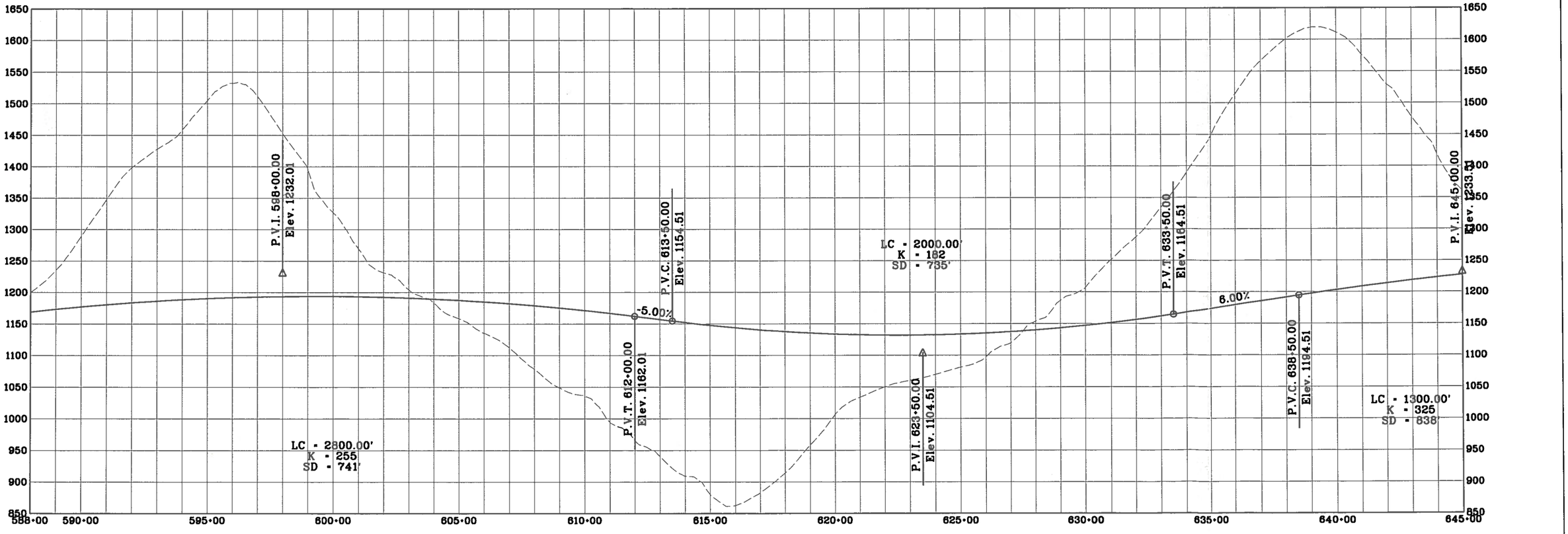
USERNAME:
DATE: 11/12/2005
12:01:09 PM

COUNTY OF	ITEM NO.	SHEET NO.
PIKE		



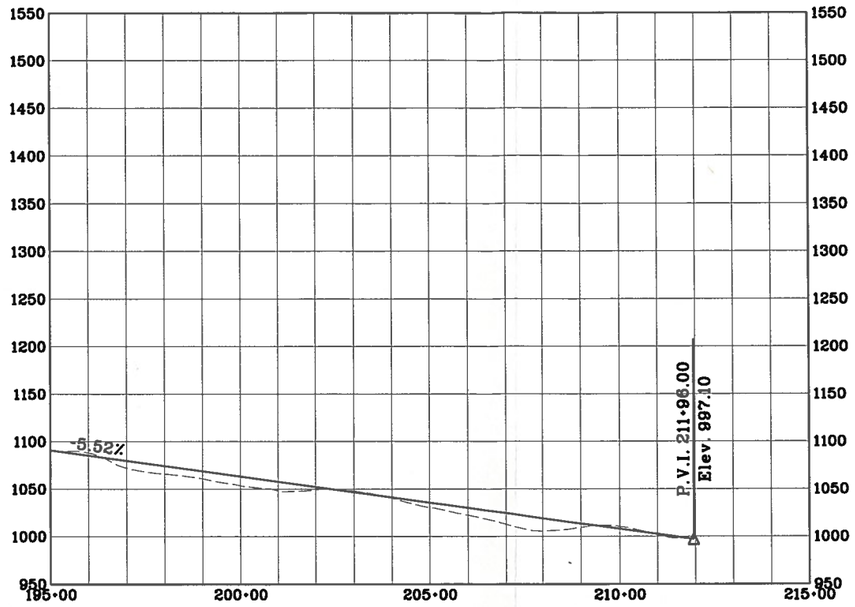


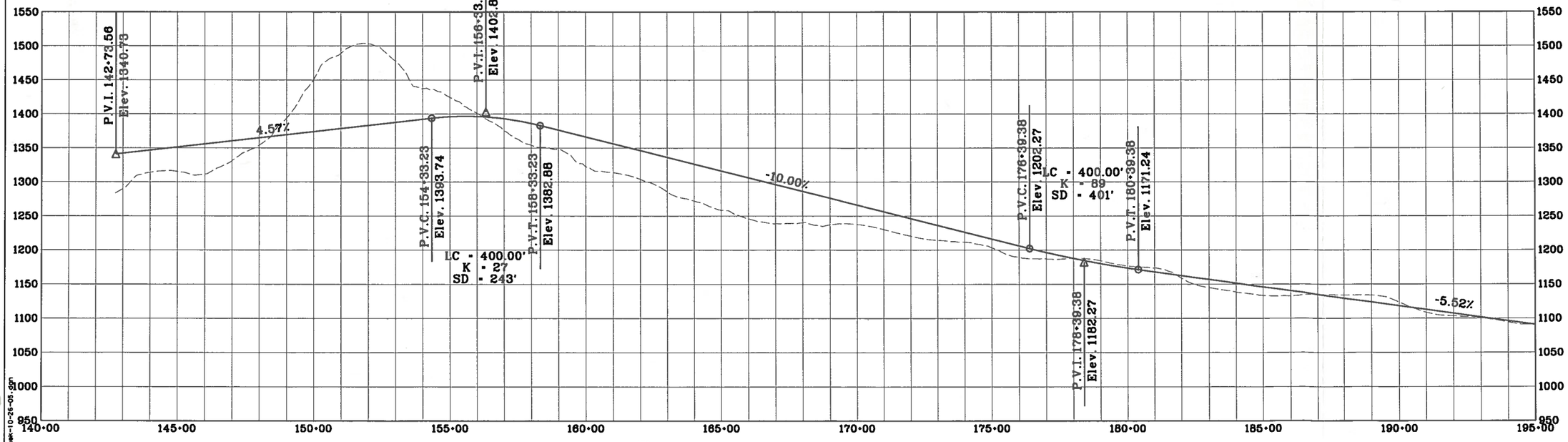
...Pond-Creek-10-26-05.dgn

SCALE: 1" = 400'

PRELIMINARY DESIGN MAINLINE (EMB.)

COUNTY OF	ITEM NO.	SHEET NO.
PIKE		



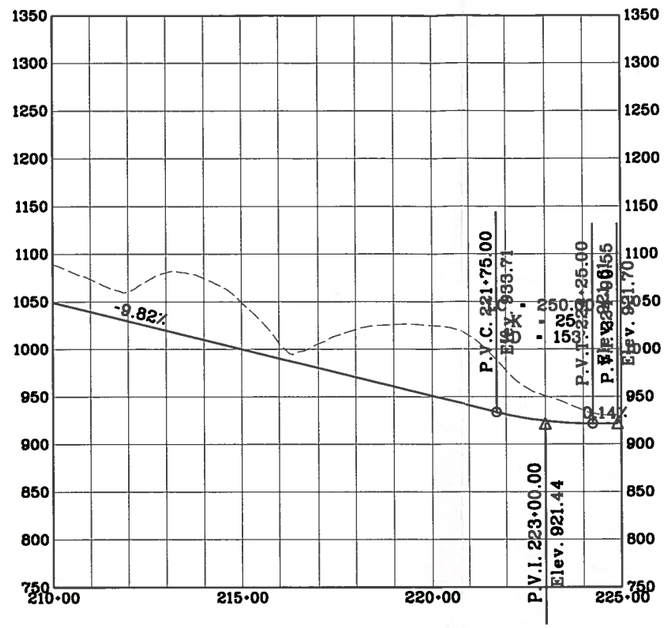


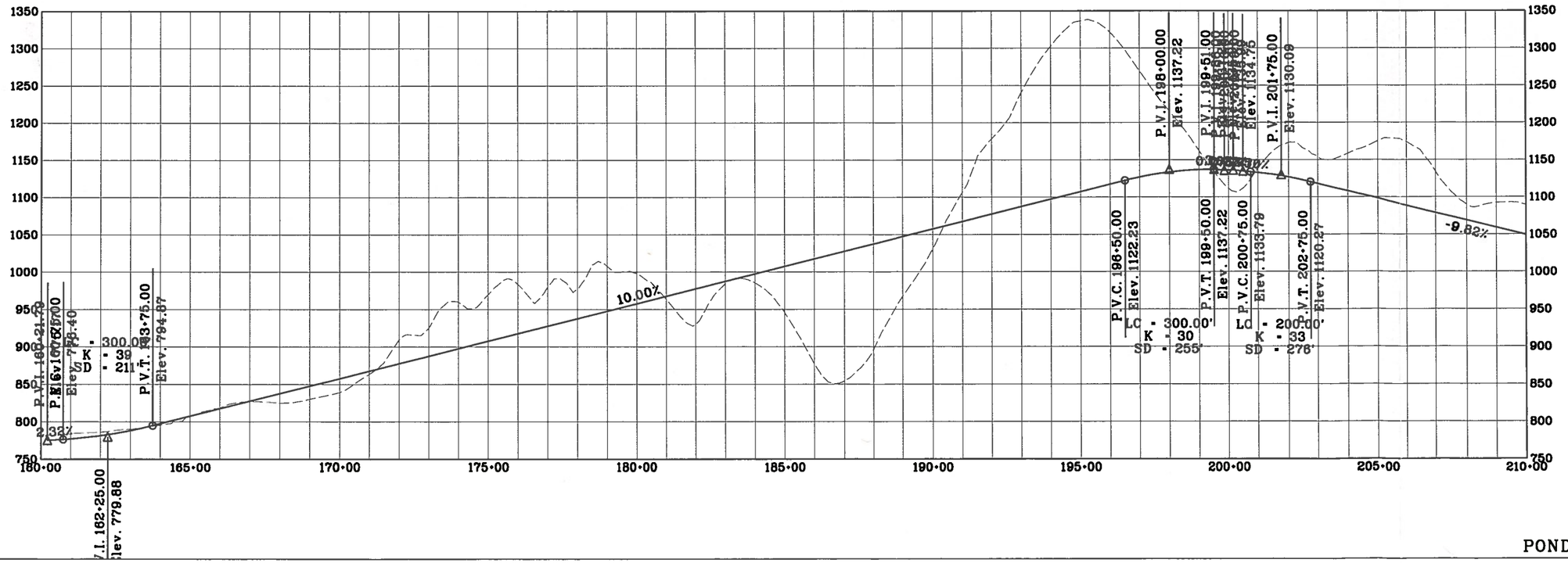
...\pond-creek-10-26-05.dgn

SCALE: 1" = 400'

JOHN MOORE BRANCH CONNECTOR

COUNTY OF	ITEM NO.	SHEET NO.
PIKE		



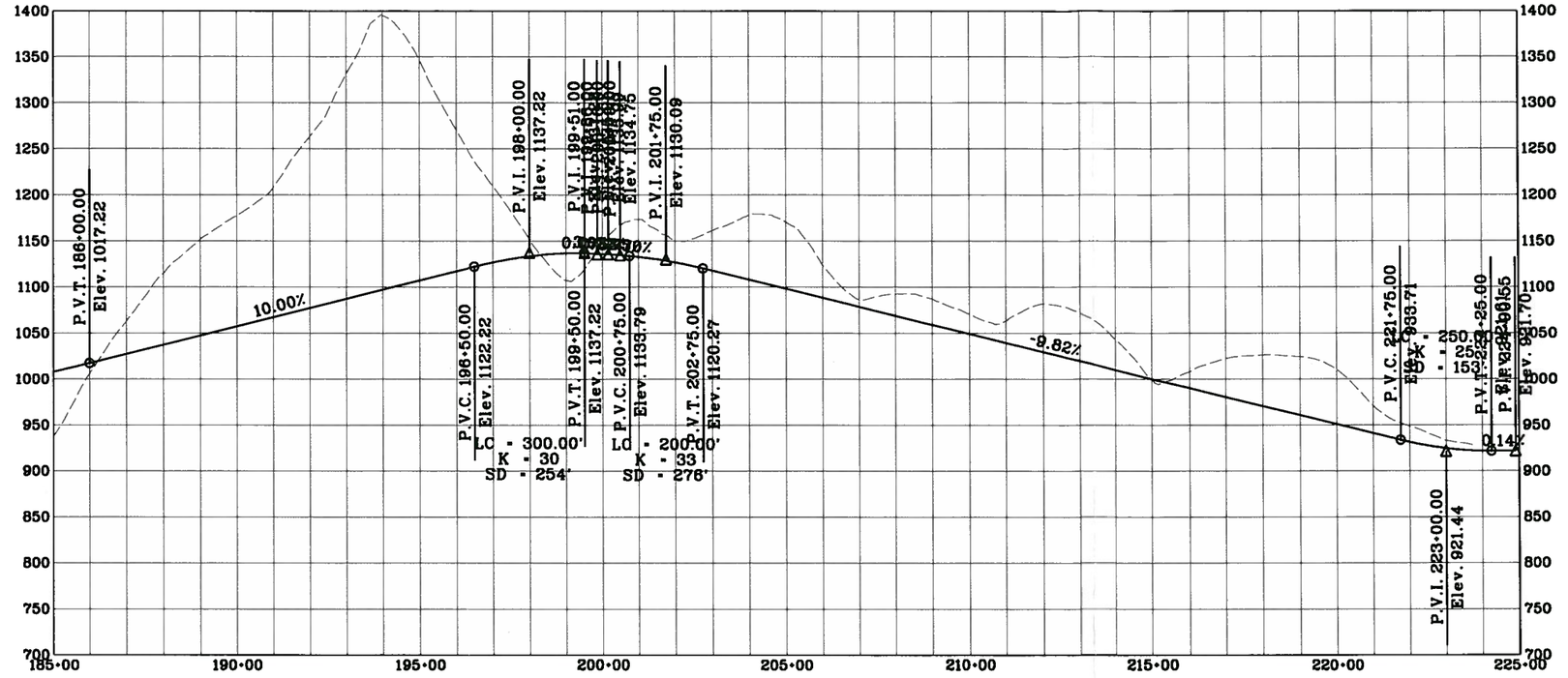


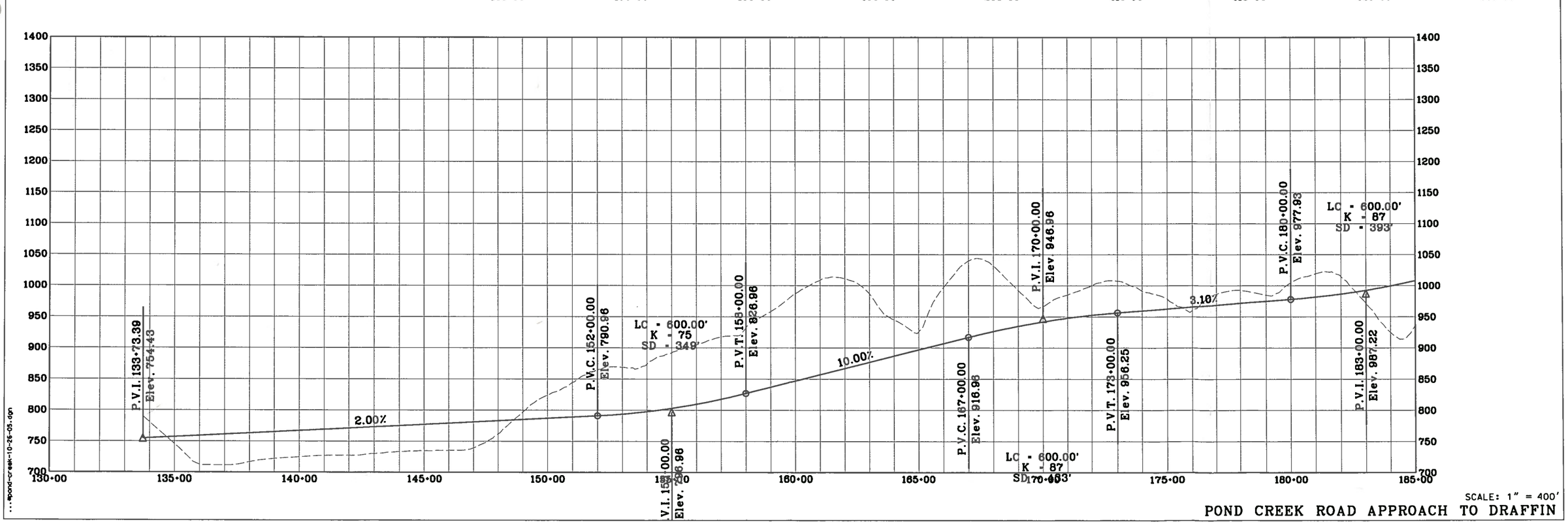
SCALE: 1" = 400'

POND CREEK ROAD APPROACH

...\pond-creek-10-26-05.dgn

COUNTY OF	ITEM NO.	SHEET NO.
PIKE		





...\pond-creek-10-26-05.dgn

SCALE: 1" = 400'

POND CREEK ROAD APPROACH TO DRAFFIN

EXHIBIT 5

PROJECT PHOTOGRAPHS

APPENDIX D

CONTECH®
BRIDGE SOLUTIONS INC.

2300 Hurstbourne Village
Suite 400
Louisville, Kentucky 40299
(502) 493-493-2930
(800) 344-2102
Fax: (502) 493-2931
www.contechbridge.com

May 11, 2006

Mr. John Bargo & Mr. John Brown
Federal Highway Administration – Kentucky Division
330 W Broadway
Frankfort, KY 40601

Project: **High Overfill, KTC District No. 11**
BEBO 26 ft span x 21 ft rise – Vehicular Tunnel

Dear Mr. Bargo & Mr. Brown:

As requested, the following is a BEBO Bridge System ENGINEER'S COST ESTIMATE for the above referenced project. This ESTIMATE is intended for preliminary estimating purposes only and should **not** be interpreted as a final QUOTATION. The information presented is based on the most current data made available to CONTECH Bridge Solutions Inc.

CONTECH Bridge Solutions will fabricate and deliver the following described BEBO Precast Concrete Culvert Sections and appurtenances:

DESCRIPTION OF SUPPLIED MATERIALS:

- 1600 LF. of 26 FT. span x 21FT. rise BEBO Precast Concrete Culvert units
- Joint sealant material
- Masonite shims
- Filter fabric and perforated drain tile
- **Design and shop drawings for foundation and structure**

ESTIMATE - $5,400,000 Delivered (F.O.B.)

HEAVIEST CRANE PICK=20 TONS

The installed cost includes the following: mobilization/demobilization, layout, excavation for footing, concrete footing with rebar, crane, and crew to set bridge, grout, granular backfill for critical back-fill zone, and some surface water diversion or light dewatering is $2,000,000. This cost does not include taxes, permits, fees, heavy dewatering, rip-rap, guard-rail, existing bridge demo, or pavement placement.

Please contact me at 859-421-1233 should you have any questions or need additional information. Thank you for your interest in BEBO Bridge Systems.

Sincerely,

Lance E. Williams, P.E.
Region Manager

CONTECH®
BRIDGE SOLUTIONS INC.

2300 Hurstbourne Village
Suite 400
Louisville, Kentucky 40299
(502) 493-493-2930
(800) 344-2102
Fax: (502) 493-2931
www.contechbridge.com

May 11, 2006

Mr. John Bargo & Mr. John Brown
Federal Highway Administration – Kentucky Division
330 W Broadway
Frankfort, KY 40601

Project: **High Overfill, KTC District No. 11**
CON/SPAN 20 ft span x 7 ft rise – Waterway – 125 sq ft

Dear Mr. Bargo & Mr. Brown:

As requested, the following is a CON/SPAN Bridge System ENGINEER'S COST ESTIMATE for the above referenced project. This ESTIMATE is intended for preliminary estimating purposes only and should **not** be interpreted as a final QUOTATION. The information presented is based on the most current data made available to CONTECH Bridge Solutions Inc.

CONTECH Bridge Solutions will fabricate and deliver the following described CON/SPAN Precast Concrete Culvert Sections and appurtenances:

DESCRIPTION OF SUPPLIED MATERIALS:

- 1600 LF. of 20 FT. span x 7 FT. rise CON/SPAN Precast Concrete Culvert units
- Two (2) precast detached parapet headwalls
- Four (4) precast wingwalls with mounting hardware
- Joint sealant material
- Masonite shims
- Filter fabric and perforated drain tile
- **Design and shop drawings for foundation and structure**

ESTIMATE - $1,600,000 Delivered (F.O.B.)

HEAVIEST CRANE PICK=18 TONS

The installed cost includes the following: mobilization/demobilization, layout, excavation for footing, concrete footing with rebar, crane, and crew to set bridge, grout, granular backfill for critical back-fill zone, and some surface water diversion or light dewatering is $550,000. This cost does not include taxes, permits, fees, heavy dewatering, rip-rap, guard-rail, existing bridge demo, or pavement placement.

Please contact me at 859-421-1233 should you have any questions or need additional information. Thank you for your interest in CON/SPAN Bridges.

Sincerely,

Lance E. Williams, P.E.
Region Manager

CONTECH®
BRIDGE SOLUTIONS INC.

2300 Hurstbourne Village
Suite 400
Louisville, Kentucky 40299
(502) 493-493-2930
(800) 344-2102
Fax: (502) 493-2931
www.contechbridge.com

May 11, 2006

Mr. John Bargo & Mr. John Brown
Federal Highway Administration – Kentucky Division
330 W Broadway
Frankfort, KY 40601

Project: **High Overfill, KTC District No. 11**
CON/SPAN 36 ft span x 11 ft rise – Wagon Box

Dear Mr. Bargo & Mr. Brown:

As requested, the following is a CON/SPAN Bridge System ENGINEER'S COST ESTIMATE for the above referenced project. This ESTIMATE is intended for preliminary estimating purposes only and should **not** be interpreted as a final QUOTATION. The information presented is based on the most current data made available to CONTECH Bridge Solutions Inc.

CONTECH Bridge Solutions will fabricate and deliver the following described CON/SPAN Precast Concrete Culvert Sections and appurtenances:

DESCRIPTION OF SUPPLIED MATERIALS:

- 200 LF. of 36 FT. span x 11FT. rise CON/SPAN Precast Concrete Culvert units
- Two (2) precast detached parapet headwalls
- Four (4) precast wingwalls with mounting hardware
- Joint sealant material
- Masonite shims
- Filter fabric and perforated drain tile
- **Design and shop drawings for foundation and structure**

ESTIMATE - $450,000 Delivered (F.O.B.)

HEAVIEST CRANE PICK=26 TONS

The installed cost includes the following: mobilization/demobilization, layout, excavation for footing, concrete footing with rebar, crane, and crew to set bridge, grout, granular backfill for critical back-fill zone, and some surface water diversion or light dewatering is $180,000. This cost does not include taxes, permits, fees, heavy dewatering, rip-rap, guard-rail, existing bridge demo, or pavement placement.

Please contact me at 859-421-1233 should you have any questions or need additional information. Thank you for your interest in CON/SPAN Bridges.

Sincerely,

Lance E. Williams, P.E.
Region Manager

MTJ154

BEBO BRIDGE SYSTEM

BRIDGETEK A CONTECH COMPANY
SPECIAL - (USER DEFINED PRICING)

JOB NAME / FILE NAME :	Kentucky High Overfill	**LEAD :**	Other
JOB LOCATION :	District 11, KY	**FUNDING :**	Public
CONTRACT DATE :	1/1/2005	**MARKET :**	DOT
B/T JOB # :	06-0000-001	**APPLICATION :**	
ENGINEERING JOB # :		**COMPETITION :**	CIP
		SPECIFICATION :	Or Equal

SUMMARY OF PRODUCTS : BEBO 26' Span Special Arch Design, 1,600 L.F.

PROJECT OVERVIEW

STANDARD COST OF PRODUCTS			AMOUNT
Product #1 :	BEBO ARCHES		$ 2,126,741.51
Product #2 :	HEADWALLS		-
Product #3 :	WINGWALLS		-
Product #4 :	OTHER	(Special Fab. Sheet #1)	-
Product #5 :	OTHER	(Special Fab. Sheet #2)	-
Product #6 :	OTHER	Purchased Finished Goods	75,000.00
	TOTAL COST OF PRODUCTS		**2,201,741.51**

PROJECT COSTS	PER TON	PER FOOT	TOTAL
Product Costs:	217.77	1,383.98	2,201,741.51
Freight Costs:	52.82	335.66	534,000.00
Erection Costs:	-	-	-
Royalty Fees:	24.07	152.95	243,321.30
Form Modification :	-	-	-
Engineering Fees :	-	-	-
TOTAL COST OF PROJECT	**294.65**	**1,872.59**	**2,979,062.81**

	TONS	FEET	AMOUNT
TOTALS FOR PROJECT	**10110.37**	**1590.87**	**2,979,062.81**

SELLING PRICES:	PER TON	PER FOOT	TOTAL
30.0% Gross Margin	413.55	2,628.20	**4,181,140.79**
35.0% Gross Margin	448.01	2,847.22	**4,529,569.19**
40.0% Gross Margin	488.74	3,106.06	**4,941,348.20**
45.0% Gross Margin	537.61	3,416.66	**5,435,483.02**
50.0% Gross Margin	597.35	3,796.29	**6,039,425.58**
55.0% Gross Margin	672.02	4,270.83	**6,794,353.78**
43.00%	**516.94**	**QUOTED PRICE (Net of Tax):**	**5,226,426.00**

SPECIAL COSTS

CULVERT ARCHES :	COST / JOB
Engineering Fee :	0.00
Form Modification :	0.00
Crane Rental, Travel (Site Erection) :	0.00

SPECIAL FABRICATION SHEETS :	COST / JOB
Engineering Fee :	0.00
Form Modification :	0.00
Crane Rental, Travel (Site Erection) :	0.00

BREAKDOWN OF QUOTED PRICE

BEBO ARCHES :

Standard Cost :	2,126,741.51
Freight/Permits/Escorts/Trailer :	534,000.00
Engineering Fee :	-
Form Modification :	-
Crane Rental, Travel (Site Erection) :	-
Royalty :	236,109.76
Units Quote Price :	**$5,082,195.23**

HEADWALLS :

Standard Cost :	-
Freight/Permits/Escorts :	-
Royalty :	-
Headwalls Quote Price :	**$0.00**

WINGWALLS :

Standard Cost :	-
Freight/Permits/Escorts :	-
Royalty :	-
Wingwalls Quote Price :	**$0.00**

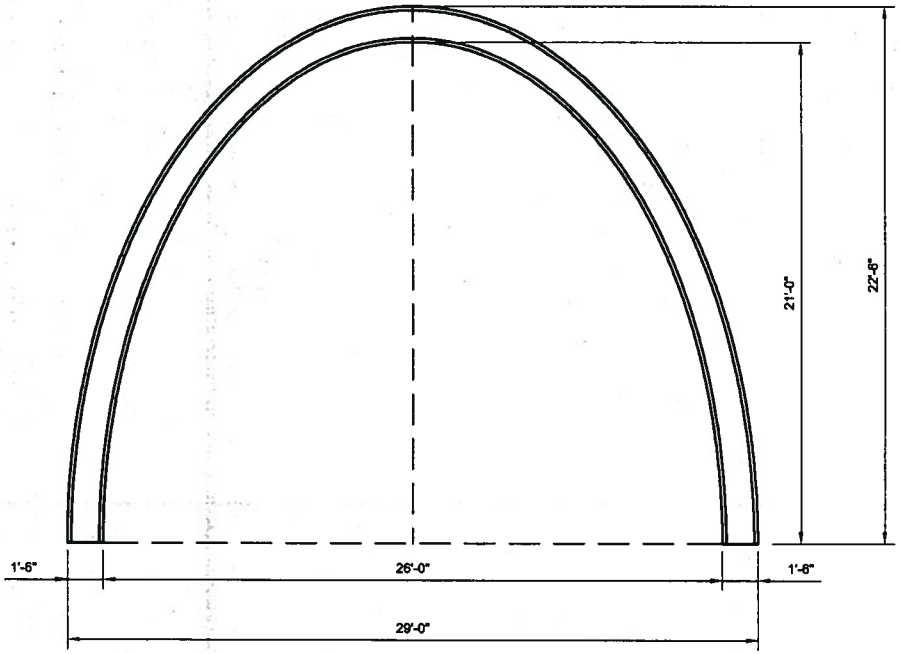
SPECIAL FABRICATION SHEETS :

Standard Cost :	-
Freight/Permits/Escorts/Trailer :	-
Engineering Fee :	-
Form Modification :	-
Crane Rental, Travel (Site Erection) :	-
Royalty :	-
Special Fabrication Quote Price :	**$0.00**

PURCHASED FINISHED GOODS (Product #6) :

Standard Cost :	75,000.00
Royalty :	7,211.54
Purchased Finished Goods Quote Price :	**$144,230.77**

TOTAL :	$5,226,426.00	43.00% MARGIN



circumferential reinforcement: ~ 2 sq in/ft

PRELIMINARY:
NOT FOR CONSTRUCTION

No.	Date	Description	Sheets Revised	By
1				
2				
3				
4				
5				
6				
7				
8				

REVISIONS

Provided Locally by:

CONTECH
KENTUCKY

859-421-1233

CONSPAN® BRIDGE SYSTEMS
A CONTECH Company
3100 Research Blvd. P.O. Box 20266 Dayton, Ohio 45420-0266

Offices	(800) 526-3666	
Dayton, OH	(937) 264-2333	(937) 254-6365 FAX
Charlotte, NC	(704) 548-8439	(704) 548-8688 FAX
Sacramento, CA	(916) 787-8701	(916) 787-8723 FAX
Albany, NY	(518) 371-2671	(518) 371-2672 FAX

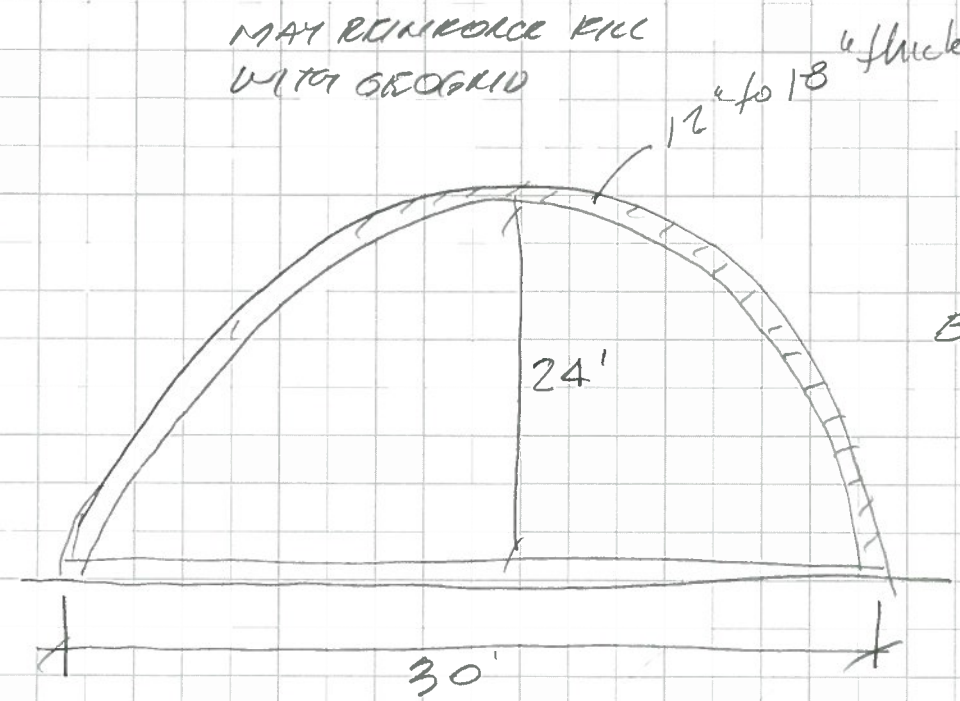
Product:

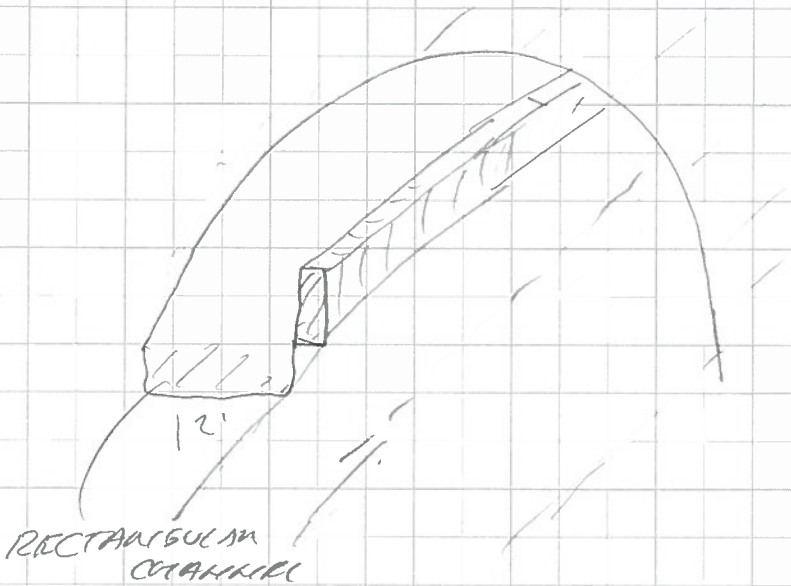
BEBO Arch Systems
CONSPAN® Bridge Systems is a division of CONTECH ARCH TECHNOLOGIES, INC., A DOYTECH COMPANY

CONCRETE ARCH SYSTEMS

Designed: OW	C/S Project No.: XXXXX
Drawn: OW	
Checked: --	Sheet No.: C/S1
Date: 9/5/2006	

BRIDGETEK
BRIDGE TECHNOLOGIES, LLC.
1-800-344-2102

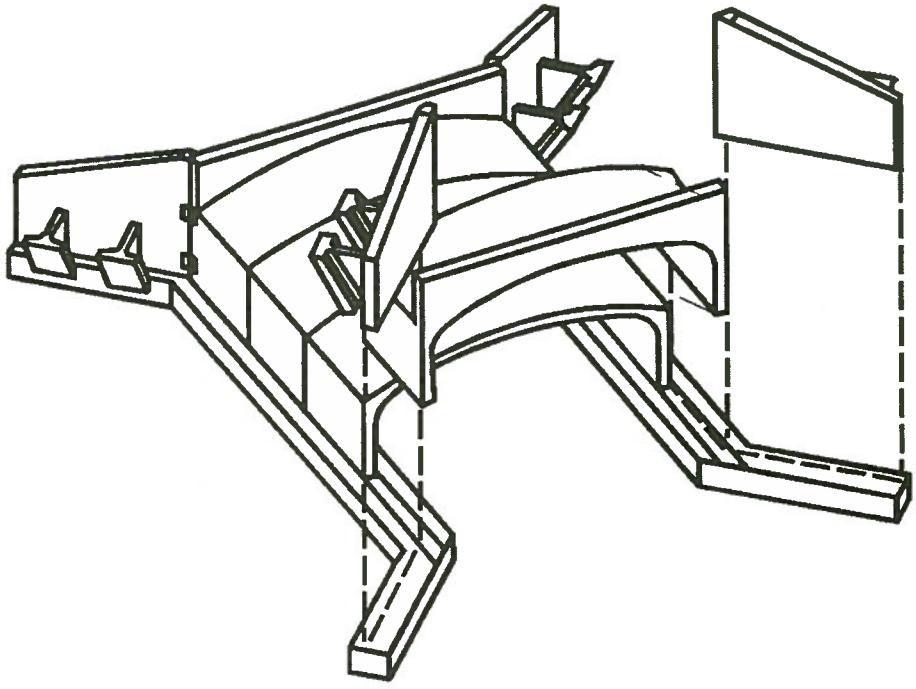




BRIDGETEK®
A CONTECH Company

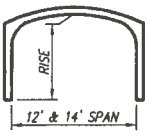
Provider of:

CON SPAN®
BRIDGE SYSTEMS

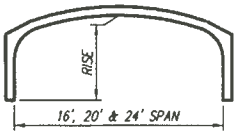


800-344-2102 www.Bridgetek.cc

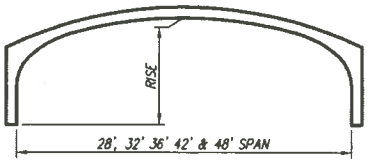
Alabama • Alaska • Arizona • Arkansas • California • Colorado • Delaware • Florida • Georgia • Idaho • Indiana • Iowa • Kansas
Kentucky • Louisiana • Maryland • Minnesota • Mississippi • Montana • Nebraska • Nevada • New Jersey • New Mexico
New York • North Carolina • North Dakota • Ohio • Oklahoma • Oregon • Pennsylvania • South Carolina • South Dakota
Tennessee • Texas • Utah • Virginia • Washington • West Virginia • Wisconsin • Wyoming



SHORT SPAN
8' LAYING LENGTH



INTERMEDIATE SPAN
8' LAYING LENGTH



LONG SPAN
6' LAYING LENGTH
4' LAYING LENGTH (48' Span only)

STANDARD CON/SPAN® BRIDGE UNIT

WATERWAY AREA (FT.²)

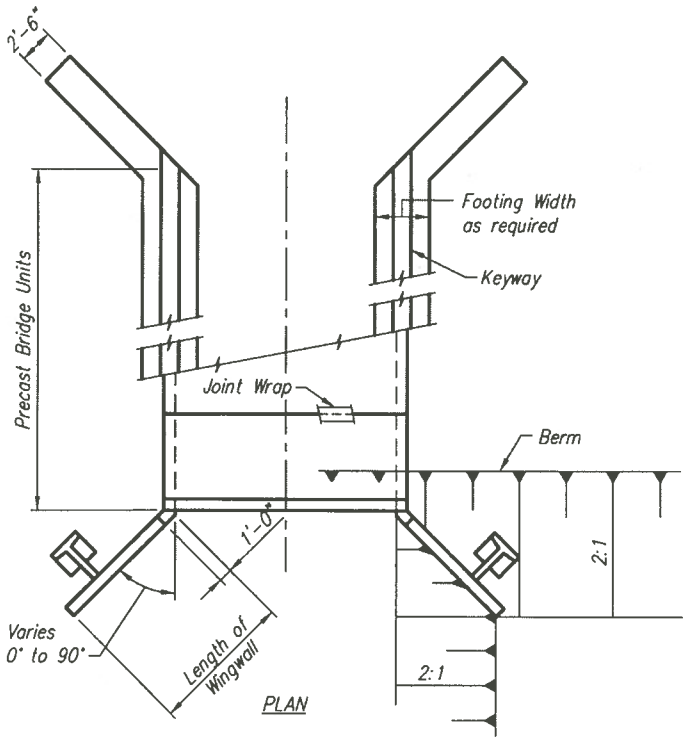
RISE (FT.)	SPAN (FEET)									
	12	14	16	20	24	28	32	36	42	48
3	30	*	*	*	*	*	*	*	*	*
4	42	50	55	65	*	*	*	*	*	*
5	54	64	71	85	95	*	*	*	*	*
6	66	78	87	105	119	139	*	*	*	*
7	78	92	103	125	143	167	184	*	*	*
8	90	106	119	145	167	195	216	232	*	*
9	102	120	135	165	191	223	248	268	*	*
10	114	134	151	185	215	251	280	304	334	*
11	*	*	*	*	239	279	312	340	376	435
12	*	*	*	*	*	*	344	376	418	483
13	*	*	*	*	*	*	*	412	460	531

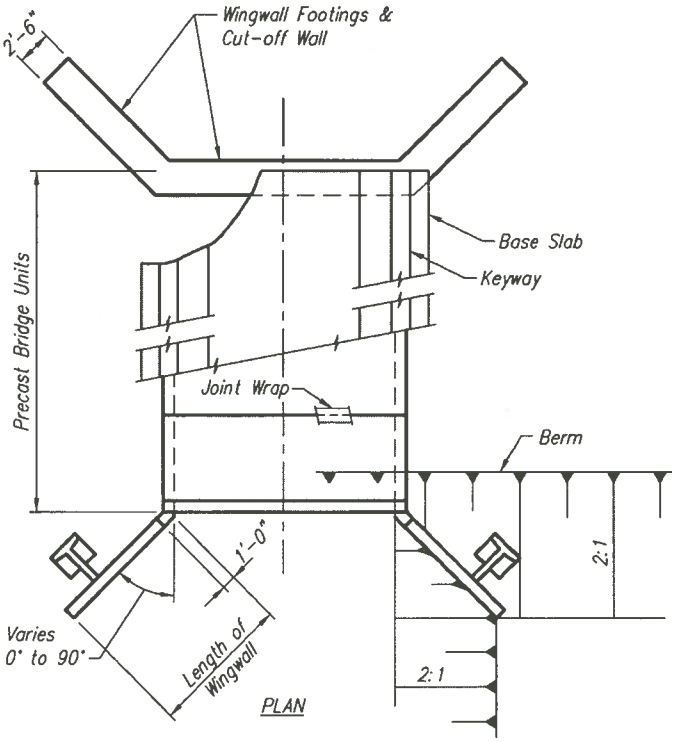
*** Check with local provider for availability.**

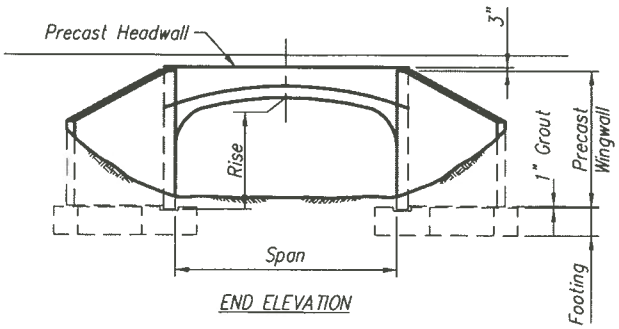
CON/SPAN® BRIDGE SYSTEMS

 5/7/04

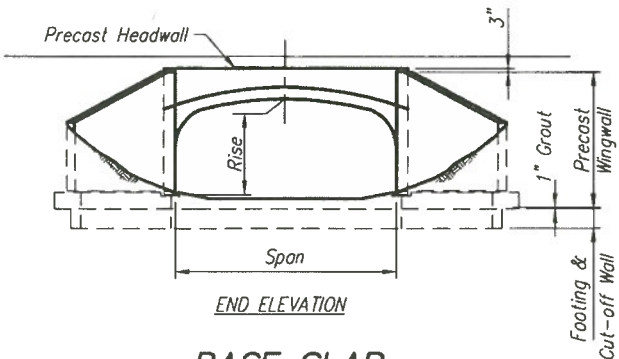
WATERWAY AREA CHART



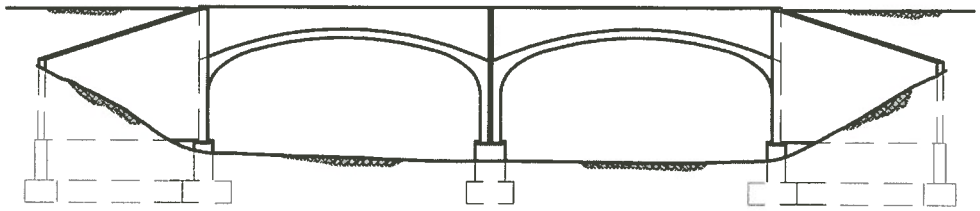




STRIP FOOTING

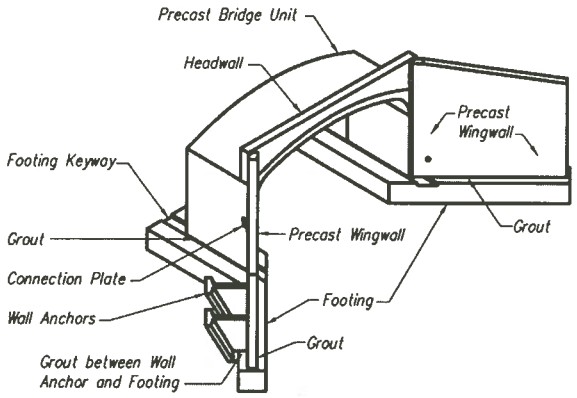


BASE SLAB

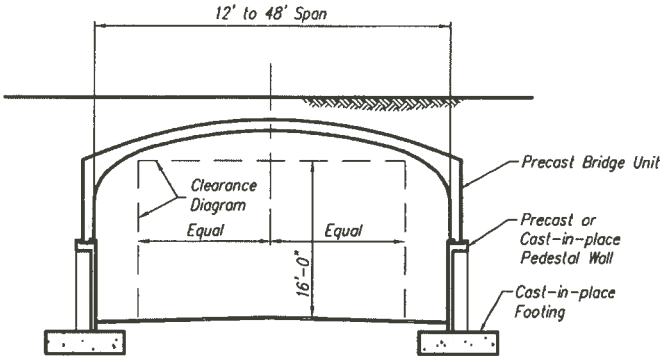


INCREASED WATERWAY OPENING

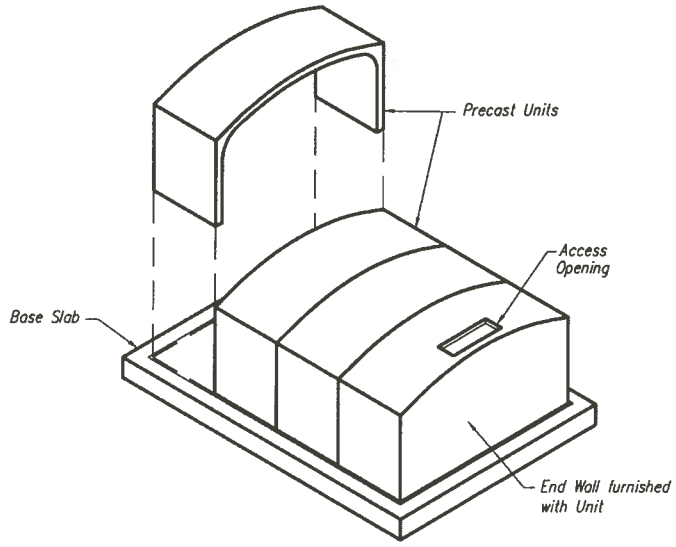
MULTIPLE SPANS AND/OR PEDESTAL WALLS



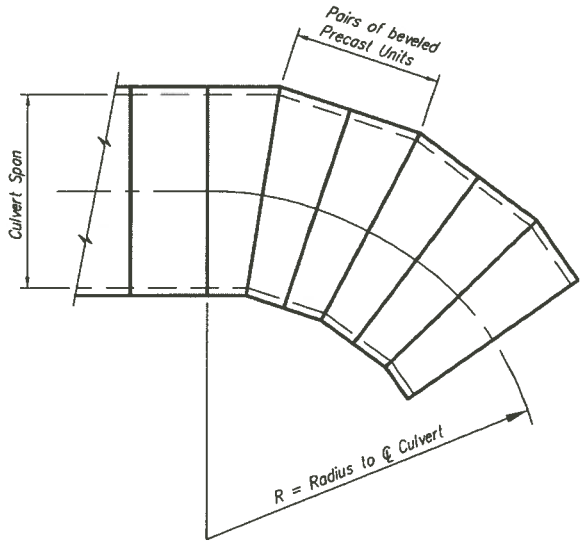
PRECAST WINGWALLS



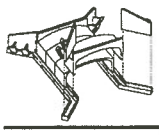
HIGHWAY/ RAILWAY UNDERPASS



UNDERGROUND STORAGE WATER RETENTION



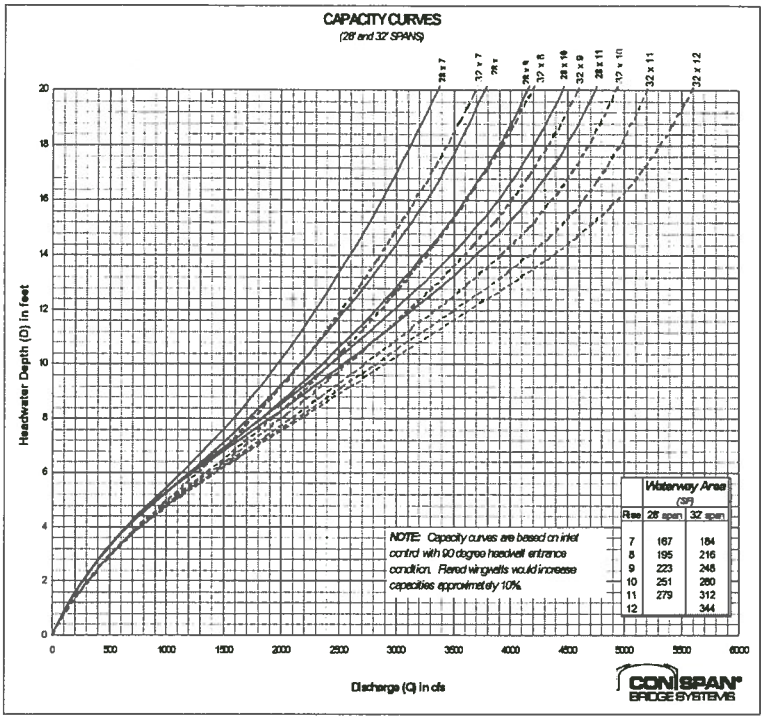
HORIZONTAL CURVE



CON/SPAN® BRIDGE SYSTEMS

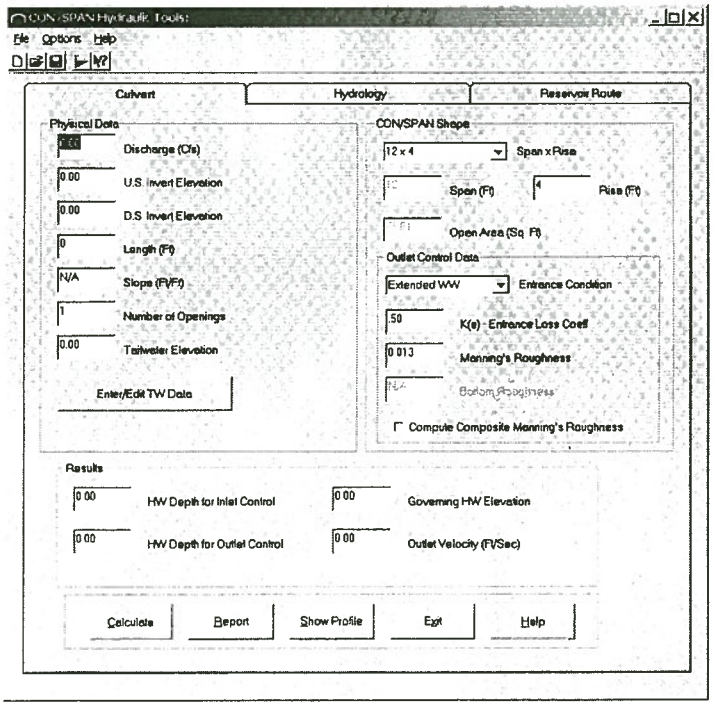
Inlet Control Nomographs

- Based on FHWA HDS-5
- Assumes Inlet Control Design
- Capacities given are conservative
- Charts for all spans and rises are available



Hydraulic Tools by the University of Dayton

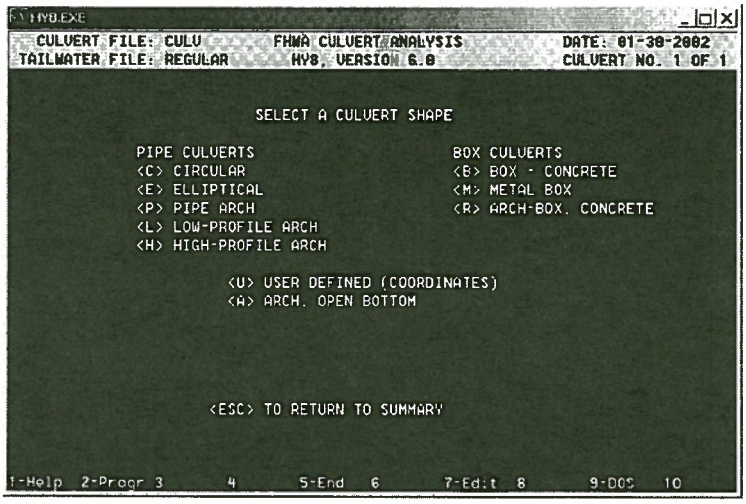
- Simple to use Windows-based program developed by Don Chase, Ph.D., University of Dayton
- Uses FHWA HDS-5 Culvert Hydraulic methods to calculate Inlet and Outlet Control Headwater Depths (Similar methodology as used in FHWA – HY8)
- Uses Direct Step Method to calculate water surface profile through the culvert



CONSPAN® BRIDGE SYSTEMS

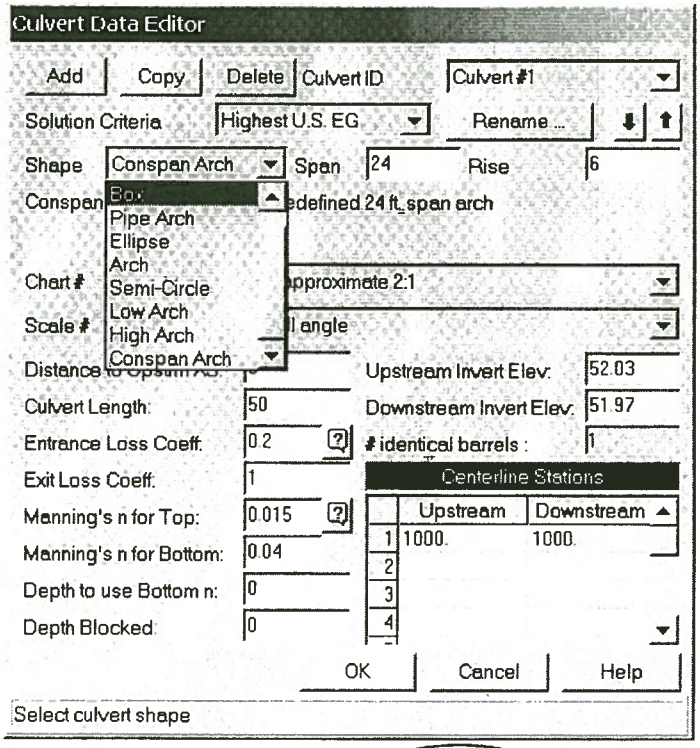
HY-8 Culvert Hydraulic Software

- Developed by Federal Highway Administration (FHWA) to automate HDS-5 culvert design methods
- CON/SPAN® is a standard shape listed under "Arch Box Concrete" on the culvert type selection screen
- Can be downloaded from FHWA Website at: www.fhwa.dot/bridge/hydsoft.htm

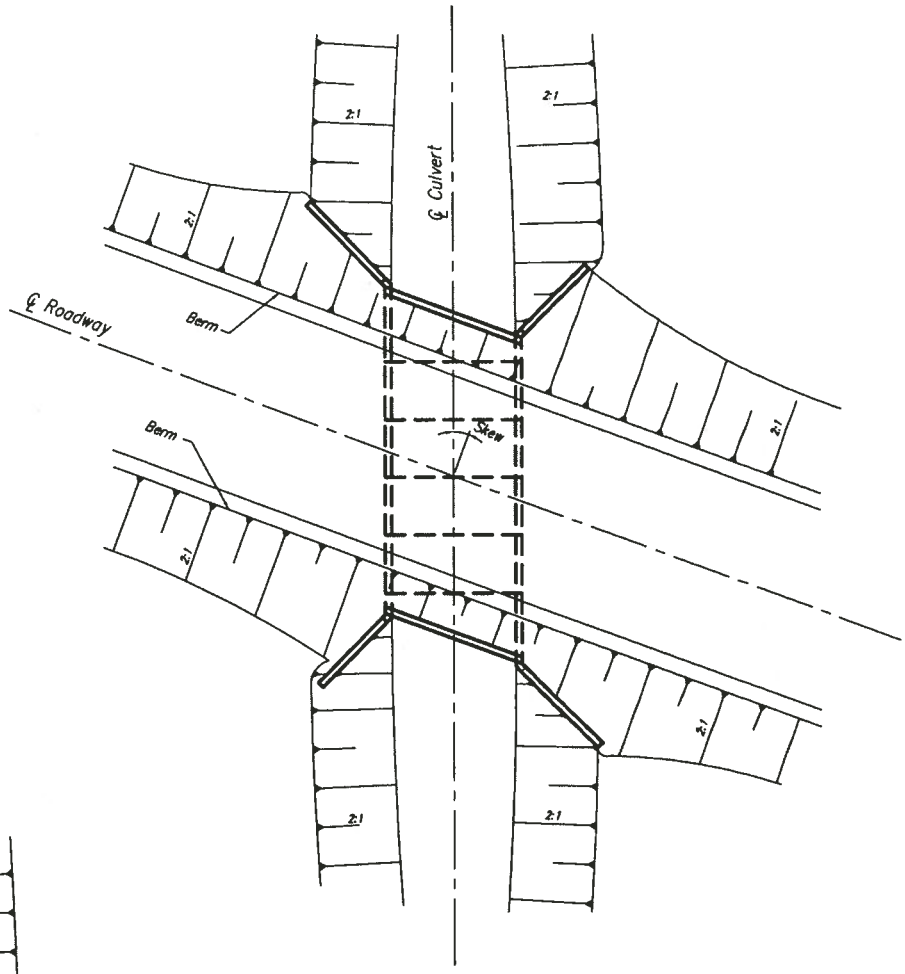


HEC-River Analysis System (RAS) by Corp of Engineers

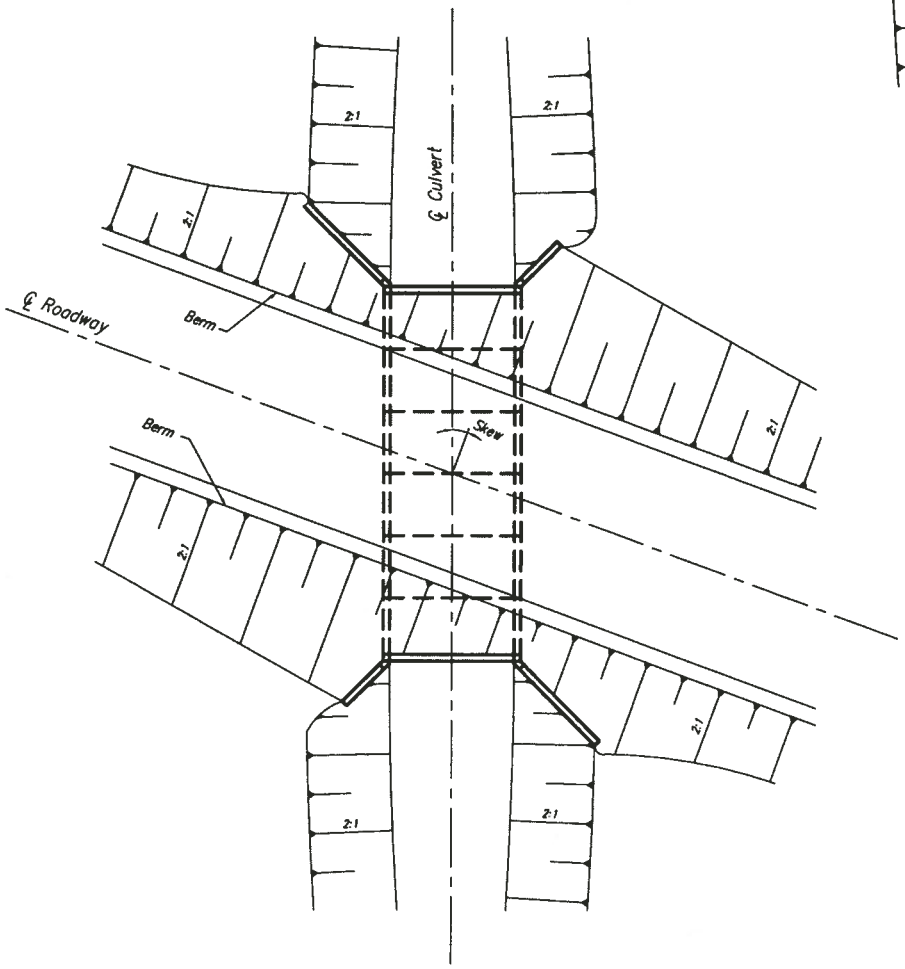
- Software developed by the Army Corp of Engineers that performs steady state water surface profile calculations
- In Version 3.0 CON/SPAN® is a standard culvert shape selection
- Can be downloaded from Corp of Engineers Website at: www.hec.usace.army.mil
- HEC-RAS 3.0 Release Notes state, "We have added a new culvert shape called CONSPAN® culvert. This culvert shape is a pre-fabricated concrete culvert that has a natural bottom"



CON SPAN® BRIDGE SYSTEMS



SKEWED ENDS



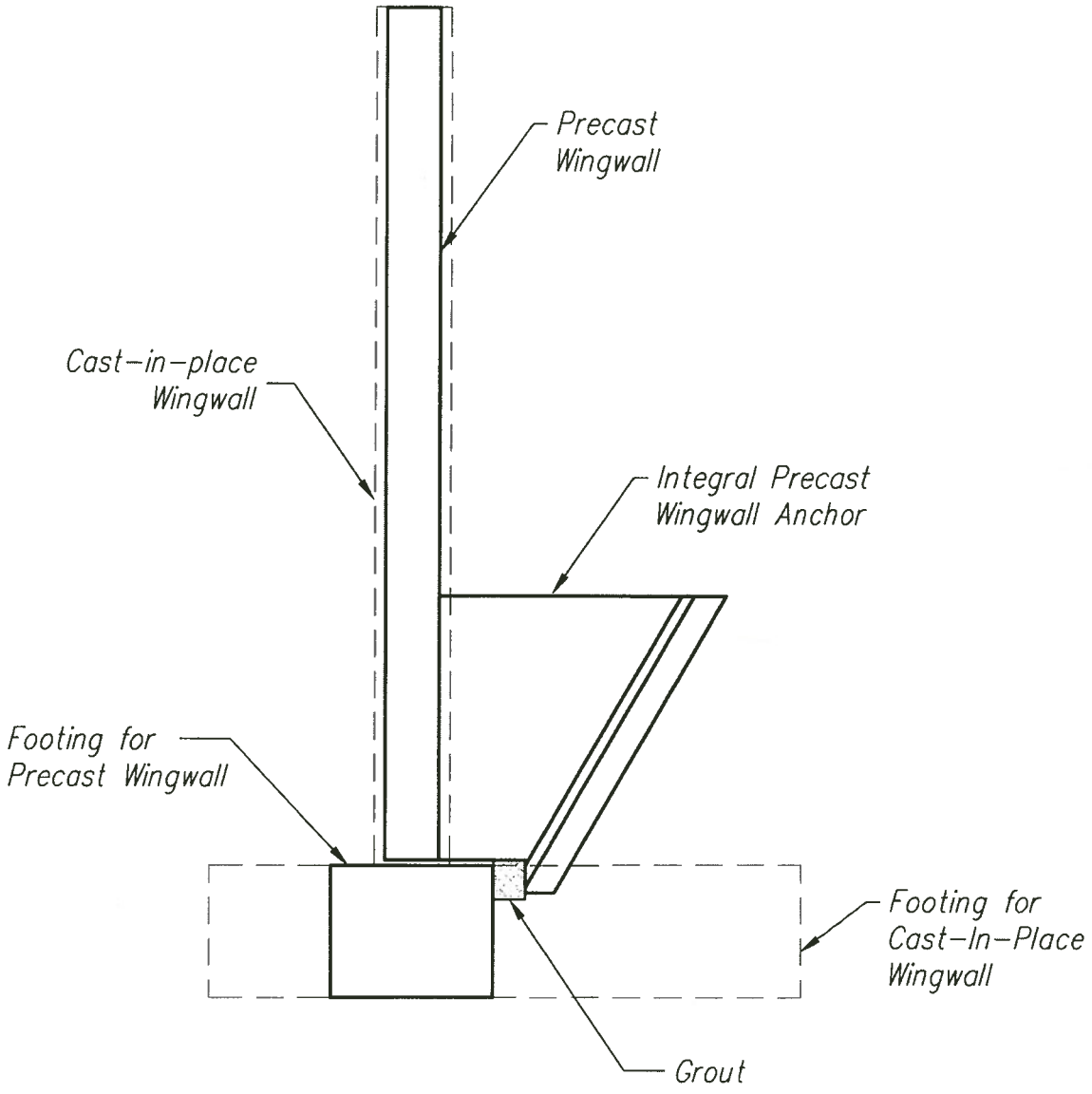
SQUARE ENDS
(PREFERRED)

Square Ends is a preferable end condition for most installations. Details for Precast Units and Headwalls are standard, and Wingwalls are shorter.

CON/SPAN® BRIDGE SYSTEMS

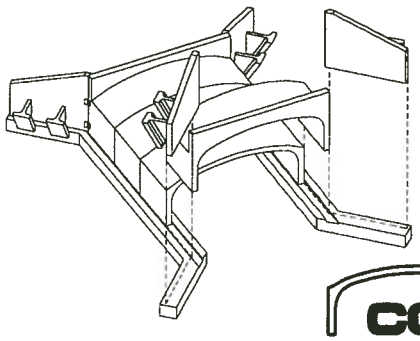
2/3/03

Precast vs. Cast-in-place Wingwall



Significant Economic Advantages are Gained From:

- Narrower Footings
- Thinner Walls
- Reduced Excavation



* All Savings X 4 Wingwalls

CON/SPAN® BRIDGE SYSTEMS

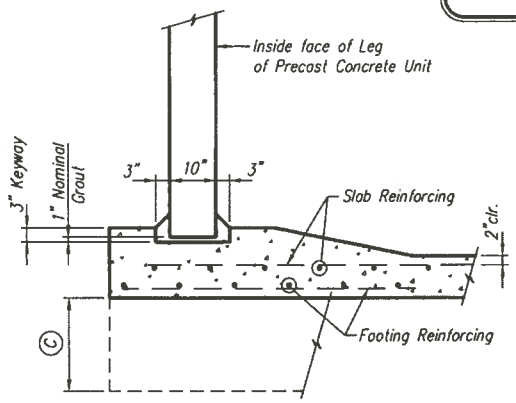
Revised 5/7/04

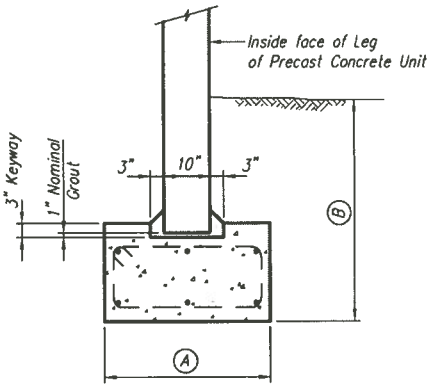
CULVERT FOUNDATION TYPES

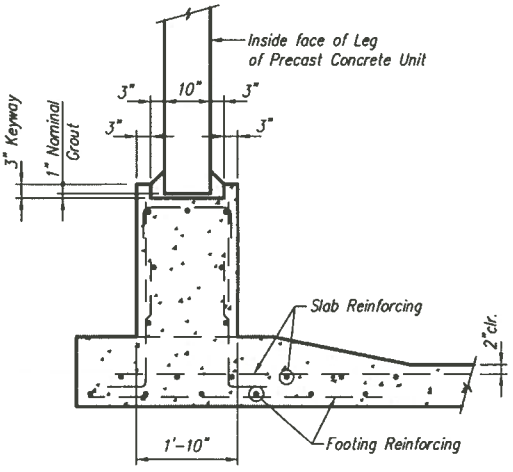
SLAB BOTTOM

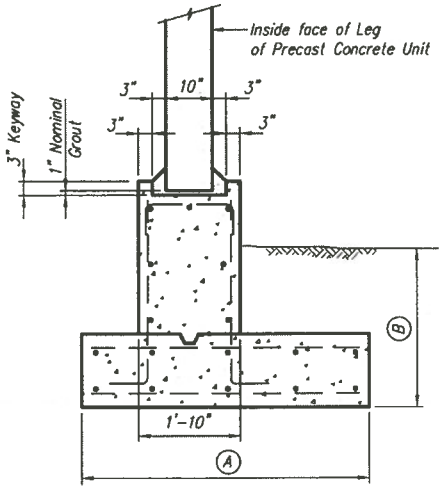
STRIP FOOTING

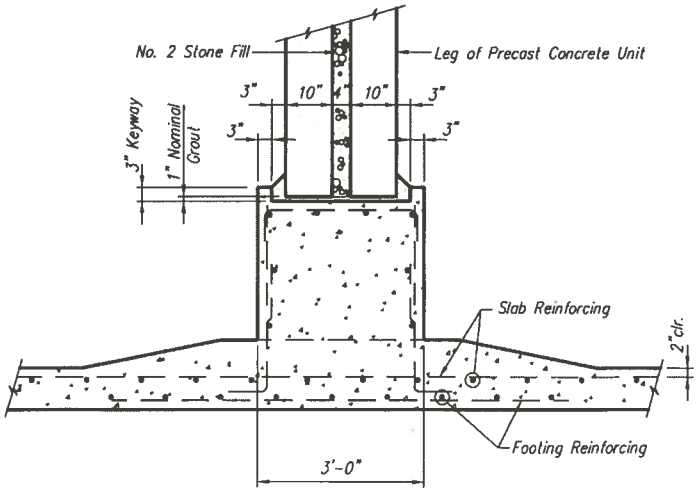
SINGLE SPAN/EXTERIOR LEG DETAILS

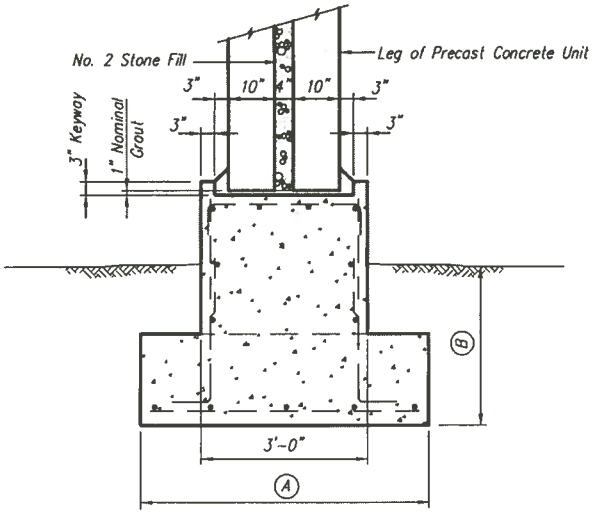










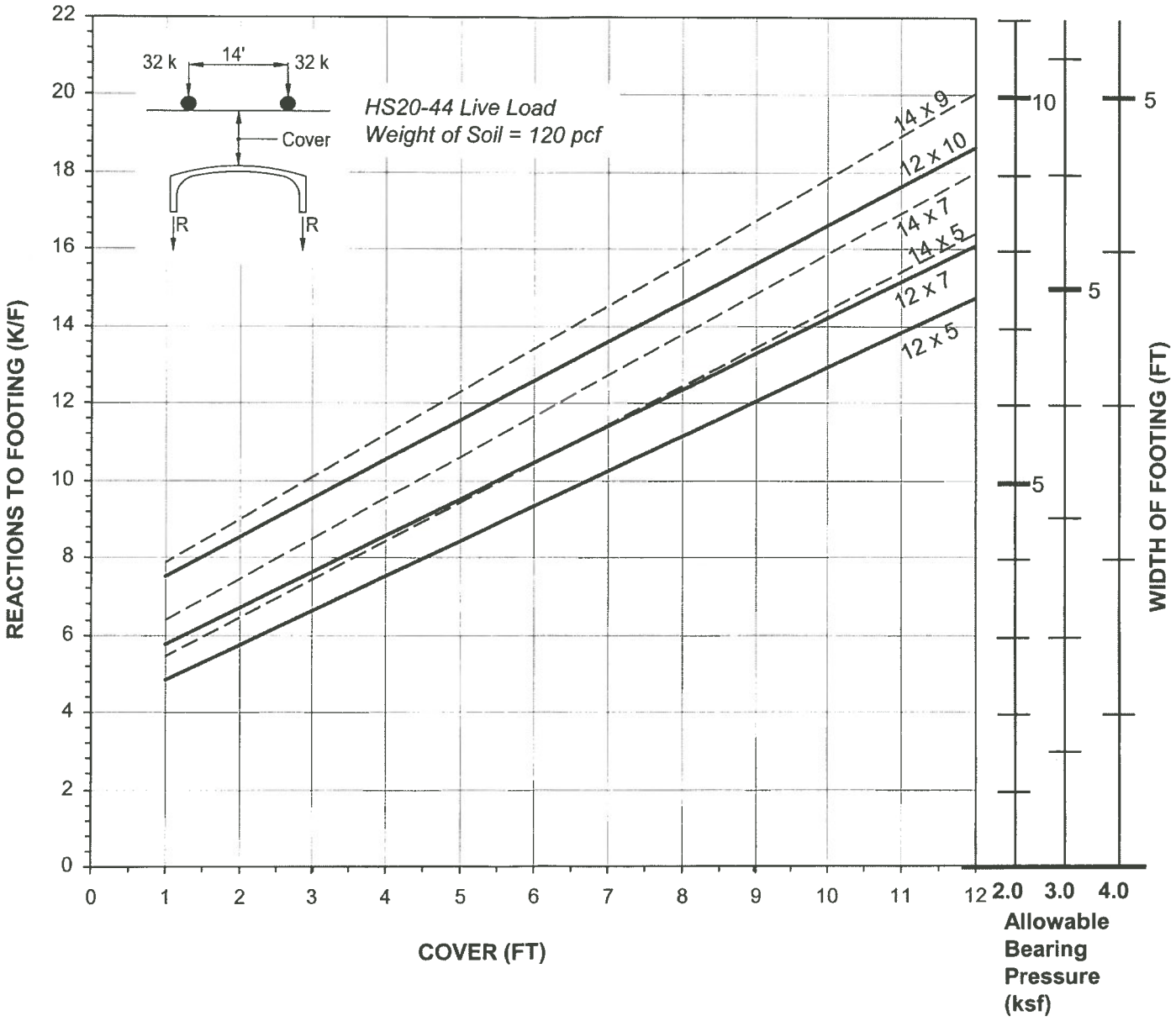


INTERIOR LEGS – MULTIPLE SPAN DETAIL

- (A) Footing width determined by Allowable Soil Bearing.
- (B) Footing depth determined by Scour considerations.
- (C) Provide Cut-Off Wall each end of Slab bottom for scour protection.

CON/SPAN® BRIDGE SYSTEMS

VERTICAL FOOTING REACTIONS
12' & 14' SPANS
(SERVICE LOADS)
HS20-44



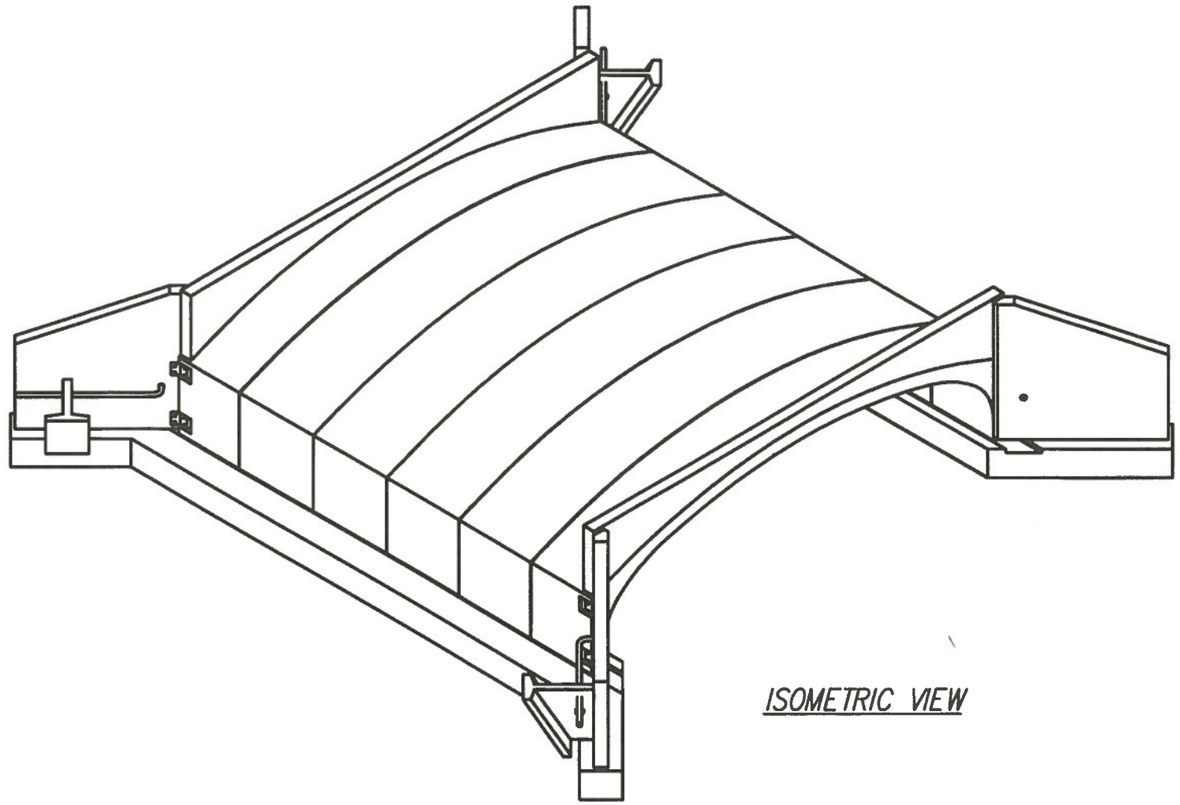
•For complete set of footing reactions see the CON/SPAN® Design Manual

CON/SPAN® BRIDGE SYSTEMS

Revised 5/7/04

COPLAY CREEK BRIDGE

NORTH WHITEHALL TOWNSHIP PENNSYLVANIA



ISOMETRIC VIEW

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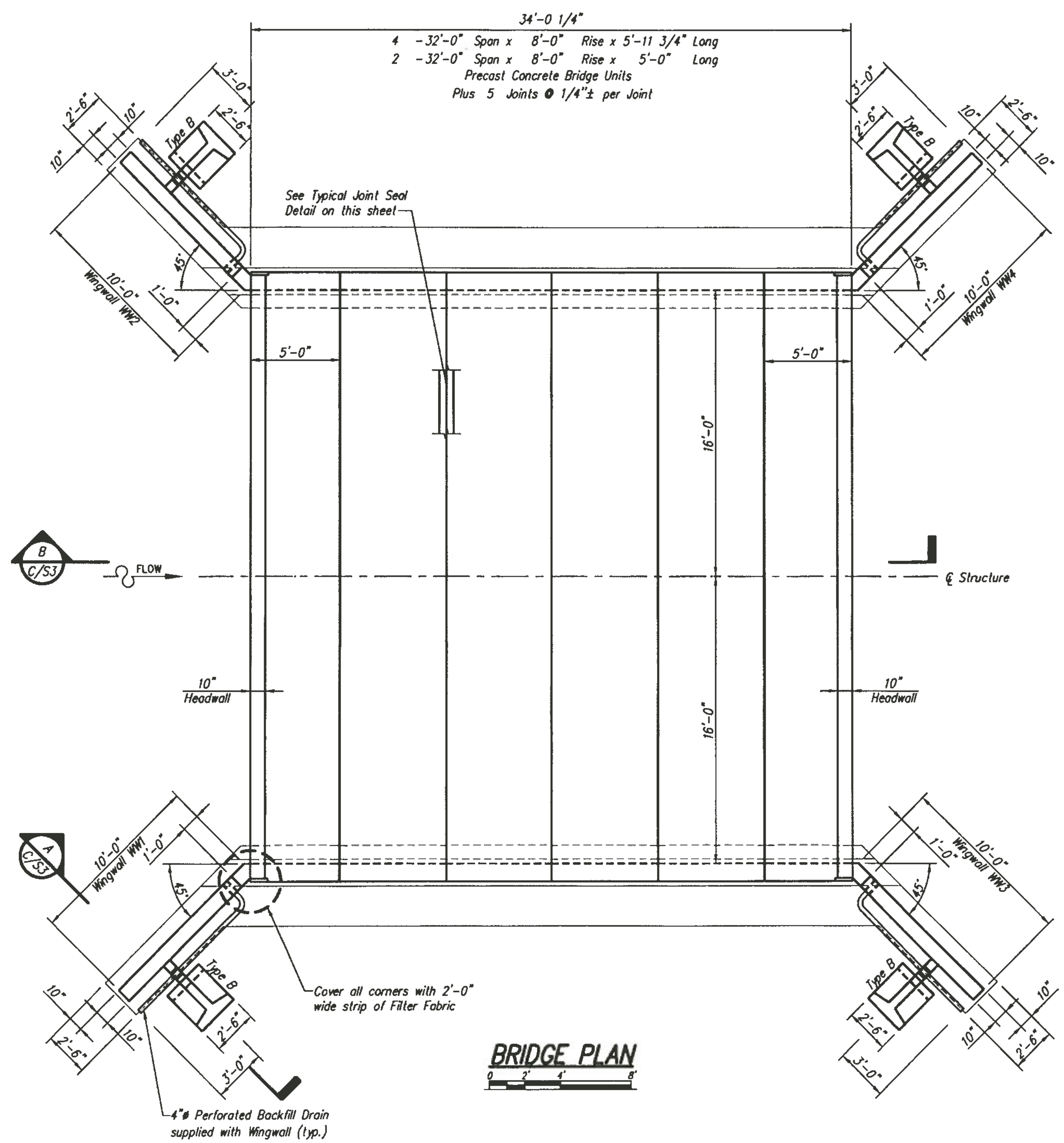
3100 Research Blvd.
P.O. Box 20366
Dayton, Ohio 45420-0366
(937) 254-2233
(800) 526-3999
Fax (937) 254-4385
Email: info@con-span.com

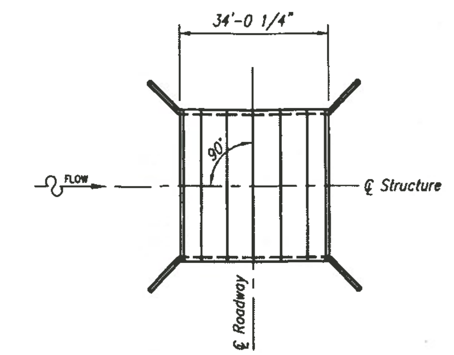
NORTH WHITEHALL TOWNSHIP PENNSYLVANIA

COPLAY CREEK BRIDGE

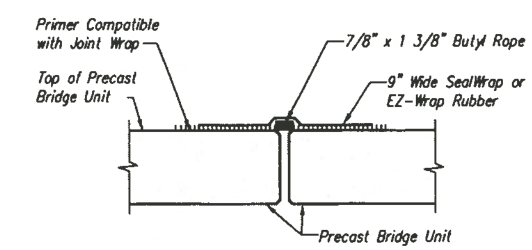
Designed	CAM	C/S Project No. 9808
Drawn	RPU	
Checked	DLW	Sheet No. C/S1
Date	9/27/02	



BRIDGE PLAN



LOCATION PLAN



TYPICAL JOINT SEAL DETAIL

NOTES

GENERAL NOTES:

1. This bridge has been designed for general site conditions. The project engineer shall be responsible for the structure's suitability to the existing site conditions and for the hydraulic evaluation -- including scour and confirmation of soil conditions.
2. Prior to construction, contractor must verify all elevations shown through the engineer.

DESIGN DATA

Design Loading:
Bridge Units: HS20-44
Headwalls: Earth Pressure Only
Wingwalls: Earth Pressure Only
Design Fill Height: 1'-0"
from top of crown to top of pavement.
Design Method: Load factor per AASHTO Specification
Assumed Allowable Soil Bearing: 3000 PSF (Verify)

MATERIALS

Precast units shall be constructed and installed in accordance with CON/SPAN Specifications. Concrete for Footings shall have a minimum compressive strength of 4000 psi. Reinforcing steel for Footings shall conform to ASTM 615, A616 or A617-Grade 60.

No.	Date	Description	By
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REVISIONS

NOTICE
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The CON/SPAN® Arch Culvert and wingwalls are protected by one or more of the following U.S. Patent Numbers 4595314, 4687371, 4797030, 4854775, 4993872.

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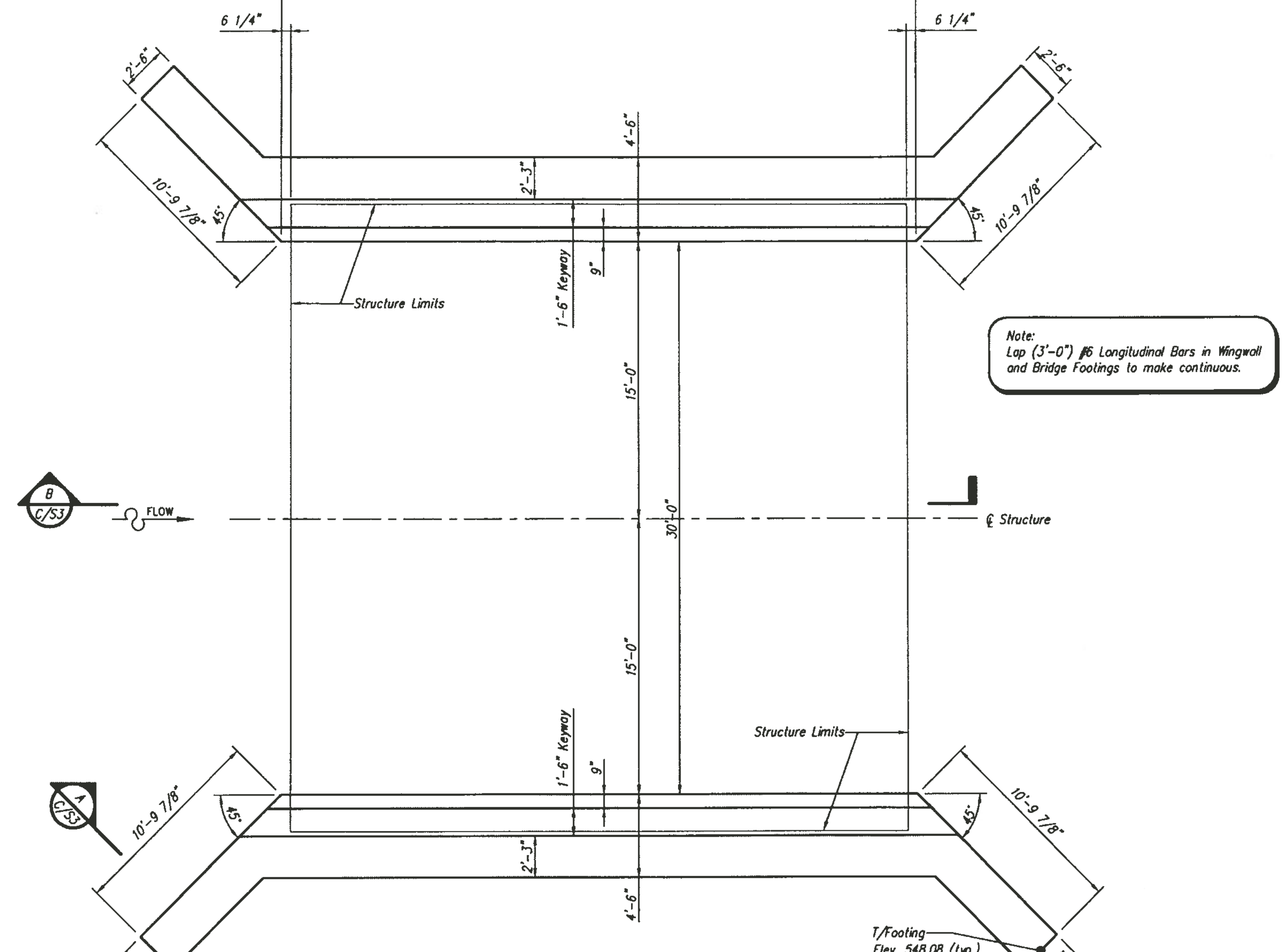
CON/SPAN® BRIDGE SYSTEMS
3100 Research Blvd.
P.O. Box 20266
Dayton, Ohio 45420-0266
(937) 254-2233
(800) 526-3999
Fax (937) 254-8365
Email: info@con-span.com

NORTH WHITEHALL TOWNSHIP PENNSYLVANIA

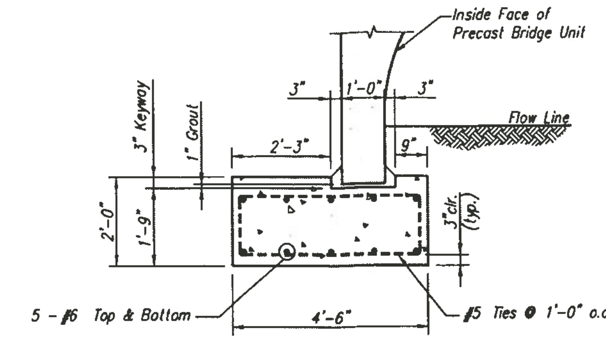
COPLAY CREEK BRIDGE

Designed	CAM	C/S Project No.	9808
Drawn	RPU		
Checked	DLW	Sheet No.	C/S2
Date	9/27/02		

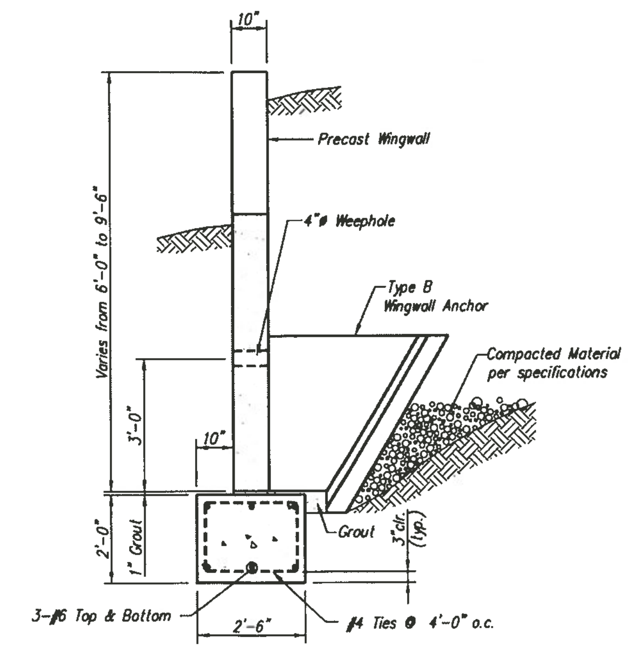


Note: Lap (3'-0") #6 Longitudinal Bars in Wingwall and Bridge Footings to make continuous.

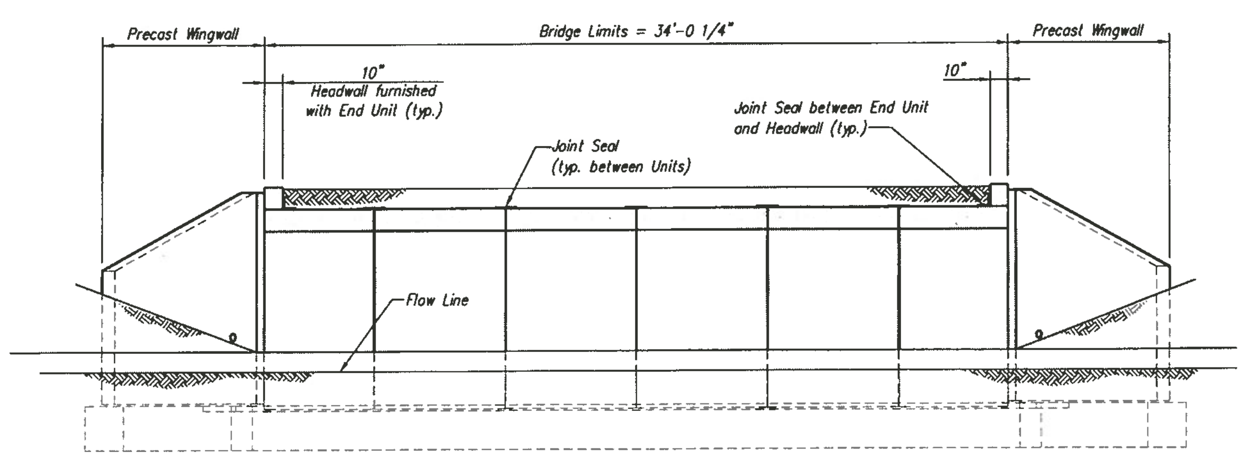
FOUNDATION PLAN



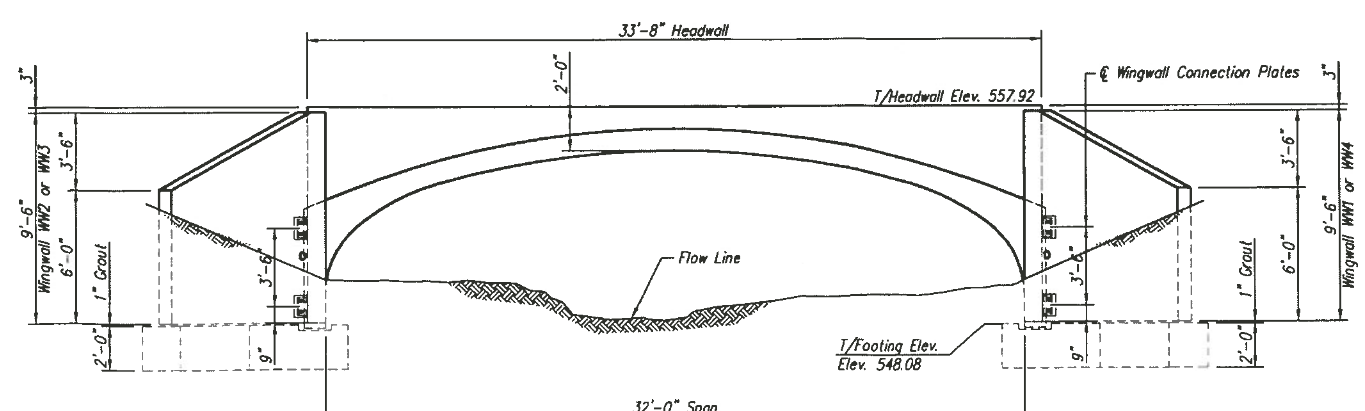
UNIT FOOTING DETAIL



SECTION A C/S2



SECTION B C/S2



TYPICAL END ELEVATION

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NORTH WHITEHALL TOWNSHIP PENNSYLVANIA

COPLAY CREEK BRIDGE

Designed	CAM	C/S Project No.	9808
Drawn	RPU		
Checked	DLW	Sheet No.	C/S3
Date	9/27/02		

SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CON/SPAN® BRIDGE SYSTEMS

1. DESCRIPTION

This work shall consist of constructing a CON/SPAN ® bridge in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or as established by the Engineer. In situations where two or more specifications apply to this work, the most stringent requirements shall govern.

2. TYPES

Precast reinforced concrete CON/SPAN® bridge units manufactured in accordance with this specification shall be designated by span and rise. Precast reinforced concrete CON/SPAN® wingwalls and headwalls manufactured in accordance with this specification shall be designated by length, height, and deflection angle.

3. MATERIALS - CONCRETE

The concrete for the culverts shall be air-entrained when installed in areas subject to freeze-thaw conditions, composed of portland cement, fine and coarse aggregates, admixtures and water. Air-entrained concrete shall contain 6 ± 2 percent air. The air entraining admixture shall conform to AASHTO M154.

3.1 Portland Cement - Shall conform to the requirements of ASTM Specifications C150-Type I, Type II, or Type III cement.

3.2 Coarse Aggregate - Shall consist of stone having a maximum size of 1 inch. Aggregate shall meet requirements for ASTM C33.

3.3 Water Reducing Admixture - The manufacturer may submit for approval by the Engineer, a water-reducing admixture for the purpose of increasing workability and reducing the water requirement for the concrete.

3.4 Calcium Chloride - The addition to the mix of calcium chloride or admixtures containing calcium chloride will not be permitted.

4. MATERIALS - STEEL REINFORCEMENT AND HARDWARE

All reinforcing steel for the culverts shall be fabricated and placed in accordance with the detailed shop drawings submitted by the manufacturer.

4.1 Steel Reinforcement - Reinforcement shall consist of welded wire fabric conforming to ASTM Specification A 185 or A 497, or deformed billet steel bars conforming to ASTM Specification A 615, Grade 60. Longitudinal distribution reinforcement may consists of welded wire fabric or deformed billet-steel bars.

4.2 Hardware:

Bolts and threaded rods for wingwall connections shall conform to ASTM A 307. Nuts shall conform to AASHTO M 292 (ASTM A 194) Grade 2H. All bolts, threaded rods and nuts used in wingwall connections shall be mechanically zinc coated in accordance with ASTM B 695 Class 50.

Structural Steel for wingwall connection plates and plate washers shall conform to AASHTO M 270 (ASTM A 709) Grade 36 and shall be hot dip galvanized as per AASHTO M 111 (ASTM A 123).

Inserts for wingwalls shall be 1" diameter Two-Bolt Preset Wingwall Anchors as manufactured by Dayton/Richmond Concrete Accessories, Miamisburg, Ohio, (800) 745-3700.

Ferrule Loop Inserts shall be F-64 Ferrule Loop Inserts as manufactured by Dayton/Richmond Concrete Accessories, Miamisburg, Ohio, (800) 745-3700.

Hook Bolts used in attached headwall connections shall be ASTM A 307.

Inserts for detached headwall connections shall be AISI Type 304 stainless steel, F-58 Expanded Coil inserts as manufactured by Dayton/Richmond Concrete Accessories, Miamisburg, Ohio, (800) 745-3700. Coil rods and nuts used in headwall connections shall be AISI Type 304 stainless steel. Washers used in headwall connections shall be either AISI Type 304 stainless steel plate washers or AASHTO M 270 (ASTM A 709) Grade 36 plate washers hot dip galvanized as per AASHTO M 111 (ASTM A 153).

Reinforcing bar splices shall be made using the Dowel Bar Splicer System as manufactured by Dayton/Richmond Concrete Accessories, Miamisburg, Ohio, (800) 745-3700, and shall consist of the Dowel Bar Splicer (DB-SAE) and Dowel-In (DI).

5. MANUFACTURE

5.1 Mixture - The aggregates, cement and water shall be proportioned and mixed in a batch mixer to produce a homogeneous concrete meeting the strength requirements of this specification. The proportion of portland cement in the mixture shall not be less than 564 pounds (6 sacks) per cubic yard of concrete.

5.2 Curing - The precast concrete culvert units shall be cured for a sufficient length of time so that the concrete will develop the specified compressive strength in 28 days or less. Any one of the following methods of curing or combinations thereof shall be used:

5.2.1 Steam Curing - The culverts may be low pressure, steam cured by a system that will maintain a moist atmosphere.

5.2.2 Water Curing - The culverts may be water cured by any method that will keep the sections moist.

5.2.3 Membrane Curing - A sealing membrane conforming to the requirements of ASTM Specification C 309 may be applied and shall be left intact until the required concrete compressive strength is attained. The concrete temperature at the time of application shall be within ± 10 degrees F of the atmospheric temperature. All surfaces shall be kept moist prior to the application of the compounds and shall be damp when the compound is applied.

5.3 Forms - the forms used in manufacture shall be sufficiently rigid and accurate to maintain the culvert dimensions within the permissible variations given in Section 7 of these specifications. All casting surfaces shall be of a smooth material.

5.4 Handling - Handling devices or holes shall be permitted in each culvert for the purpose of handling and setting.

5.5 Storage - The precast elements shall be stored in such a manner to prevent cracking or damage. The units shall not be moved until the concrete compressive strength has reached a minimum of 2500 psi, and they shall not be stored in an upright position until the concrete compressive strength is a minimum of 4,000 psi.

6. DESIGN

6.1 The precast element dimension and reinforcement details shall be as prescribed in the plan and the shop drawings provided by the manufacturer, subject to the provisions of Section 7, below. The minimum concrete compressive strength shall be as shown on the shop drawings. The minimum steel yield strength shall be 60,000 psi, unless otherwise noted on the shop drawings.

6.2 The precast elements are designed in accordance with the "Standard Specifications for Highway Bridges" 16th Edition, adopted by the American Association of State Highway and Transportation Officials, 1996, as amended by the 1997, 1998, 1999, and 2000 Interim Revisions. A minimum of one foot of cover above the crown of the bridge units is required in the installed condition. (Unless noted otherwise on the shop drawings and designed accordingly.)

6.3 Placement of Reinforcement in Precast Bridge Units - The cover of concrete over the outside circumferential reinforcement shall be 2 inches minimum. The cover of concrete over the inside circumferential reinforcement shall be 1 1/2 inches minimum, unless otherwise noted on the shop drawings. The clear distance of the end circumferential wires shall not be less than one inch nor more than two inches from the ends of each section. Reinforcement shall be assembled utilizing single or multiple layers of welded wire fabric (not to exceed 3 layers), supplemented with a single layer of deformed billet-steel bars, when necessary. Welded wire fabric shall be composed of circumferential and longitudinal wires meeting the spacing requirements of 6.6, below, and shall contain sufficient longitudinal wires extending through the bridge unit to maintain the shape and position of the reinforcement. Longitudinal distribution reinforcement may be welded wire fabric or deformed billet-steel bars and shall meet the spacing requirements of 6.6, below. The ends of the longitudinal distribution reinforcement shall be not more than 3 inches and not less than 1 1/2 inches from the ends of the bridge unit.

6.4 Placement of Reinforcement for Precast Wingwalls and Headwalls - The cover of concrete over the longitudinal and transverse reinforcement shall be 2 inches minimum. The clear distance from the end of each precast element to the end transverse reinforcing steel shall not be less than one inch nor more than two inches. Reinforcement shall be assembled utilizing a single layer of welded wire fabric, or a single layer of deformed billet-steel bars. Welded wire fabric shall be composed of transverse and longitudinal wires meeting the spacing requirements of 6.7, below, and shall contain sufficient longitudinal wires extending through the element to maintain the shape and position of the reinforcement. Longitudinal reinforcement may be welded wire fabric or deformed billet-steel bars and shall meet the spacing requirements of 6.7, below. The ends of the longitudinal reinforcement shall be not more than 3 inches and not less than 1 1/2 inches from the ends of the walls.

6.5 Bending of Reinforcement for Precast Bridge Units - The outside and inside circumferential reinforcing steel for the corners of the bridge shall be bent to such an angle that is approximately equal to the configuration of the bridge's outside corner.

6.6 Laps, Welds, and Spacing for Precast Bridge Units - Tension splices in the circumferential reinforcement shall be made by lapping. Laps may be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of AASHTO 8.30.2 and 8.32.6. For deformed welded wire fabric, the overlap shall meet the requirements of AASHTO 8.30.1 and 8.32.5. The overlap of welded wire fabric shall be measured between the outer most longitudinal wires of each fabric sheet. For deformed billet-steel bars, the overlap shall meet the requirements of AASHTO 8.25. For splices other than tension splices, the overlap shall be a minimum of 12" for welded wire fabric or deformed billet-steel bars. The spacing center to center of the circumferential wires in a wire fabric sheet shall be not less than 2 inches nor more than 4 inches. The spacing center to center of the longitudinal wires shall not be more than 8 inches. The spacing center to center of the longitudinal distribution steel for either line of reinforcing in the top slab shall be not more than 16 inches.

6.7 Laps, Welds, and Spacing for Precast Wingwalls and Headwalls - Splices in the reinforcement shall be made by lapping. Laps may be tack welded together for assembly purposes. For smooth welded wire fabric, the overlap shall meet the requirements of AASHTO 8.30.2 and 8.32.6. For deformed welded wire fabric, the overlap shall meet the requirements of AASHTO 8.30.1 and 8.32.5. For deformed billet-steel bars, the overlap shall meet the requirements of AASHTO 8.25. The spacing center-to-center of the wires in a wire fabric sheet shall be not less than 2 inches nor more than 8 inches.

7. PERMISSIBLE VARIATIONS

7.1 Bridge Units

7.1.1 Internal Dimensions - The internal dimension shall vary not more than 1 % from the design dimensions nor more than 1-1/2 inches whichever is less. The haunch dimensions shall vary not more than 3/4 inch from the design dimension.

7.1.2 Slab and Wall Thickness - The slab and wall thickness shall not be less than that shown in the design by more than 1/4 inch. A thickness more than that required in the design shall not be cause for rejection.

7.1.3 Length of Opposite Surfaces - Variations in laying lengths of two opposite surfaces of the bridge unit shall not be more than 1/2 inch in any section, except where beveled ends for laying of curves are specified by the purchaser.

7.1.4 Length of Section - The underrun in length of a section shall not be more than 1/2 inch in any bridge unit.

7.1.5 Position of Reinforcement - The maximum variation in position of the reinforcement shall be ± 1/2 inch. In no case shall the cover over the reinforcement be less than 1 1/2 inches for the outside circumferential steel or be less than 1 inch for the inside circumferential steel as measured to the external or internal surface of the bridge. These tolerances or cover requirements do not apply to mating surfaces of the joints.

7.1.6 Area of Reinforcement - The areas of steel reinforcement shall be the design steel areas as shown in the manufacturer's shop drawings. Steel areas greater than those required shall not be cause for rejection. The permissible variation in diameter of any reinforcement shall conform to the tolerances prescribed in the ASTM Specification for that type of reinforcement.

7.2 Wingwalls and Headwalls

7.2.1 Wall Thickness - The wall thickness shall not vary from that shown in the design by more than 1/2 inch.

7.2.2 Length/ Height of Wall sections - The length and height of the wall shall not vary from that shown in the design by more than 1/2 inch.

7.2.3 Position of Reinforcement - The maximum variation in the position of the reinforcement shall be ± 1/2 inch. In no case shall the cover over the reinforcement be less than 1 1/2 inches.

7.2.4 Size of Reinforcement - The permissible variation in diameter of any reinforcing shall conform to the tolerances prescribed in the ASTM Specification for that type of reinforcing. Steel area greater than that required shall not be cause for rejection.

8. TESTING AND INSPECTION

8.1 Type of Test Specimen - Concrete compressive strength shall be determined from compression tests made on cylinders or cores. For cylinder testing, a minimum of 4 cylinders shall be taken during each production run. For core testing, one core shall be cut from each of 3 precast elements selected at random from each production group. A production group shall be defined as 15 or fewer bridge units (of a particular size), wingwalls or headwalls in a continuous production run. For each continuous production run, each production group or fraction thereof shall be considered separately for the purpose of testing and acceptance. A production run shall be considered continuous if not interrupted for more than 3 consecutive days.

8.2 Compression Testing - Cylinders shall be made and tested as prescribed by the ASTM C 39 Specification. Cores shall be obtained and tested for compressive strength in accordance with the provisions of the ASTM C497 Specification.

8.3 Acceptability of Cylinder Tests - When the average compressive strength of all cylinders tested is equal to or greater than the design compressive strength, and not more than 10 % of the cylinders tested have a compressive strength less than the design concrete strength, and no cylinder tested has a compressive strength less than 80 % of the design compressive strength, then the lot shall be accepted. When the compressive strength of the cylinders tested does not conform to this acceptance criteria, the acceptability of the lot may be determined as described in section 8.4, below. Failure of any of the 28-day test cylinders to meet 90 percent of the minimum compressive strength requirement can be cause for rejection.

Acceptability of Core Tests - The compressive strength of the concrete in each production group as defined in 8.1 is acceptable when the average core test strength is equal to or greater than the design concrete strength. When the compressive strength of the core tested is less than the design concrete strength, the precast element from which that core was taken may be re-cored. When the compressive strength of the re-core is equal to or greater than the design concrete strength, the compressive strength of the concrete in that production group is acceptable.

8.4.1 When the compressive strength of any recore is less than the design concrete strength, the precast element from which that core was taken shall be rejected. Two precast elements from the remainder of the group shall be selected at random and one core shall be taken from each. If the compressive strength of both cores is equal to or greater than the design concrete strength, the compressive strength of the remainder of that group is acceptable. If the compressive strength of either of the two cores tested is less than the design concrete strength, the remainder of the group shall be rejected or, at the option of the manufacturer, each precast element of the remainder of the group shall be cored and accepted individually, and any of these elements that have cores with less than the design concrete strength shall be rejected.

8.4.2 Plugging Core Holes - The core holes shall be plugged and sealed by the manufacturer in a manner such that the elements will meet all of the test requirements of this specification. Precast elements so sealed shall be considered satisfactory for use.

8.4.3 Test Equipment - Every manufacturer furnishing culverts under this specification shall furnish all facilities and personnel necessary to carryout the test required.

9. JOINTS

The bridge units shall be produced with flat butt ends. The ends of the bridge units shall be such that when the sections are laid together they will make a continuous line of with a smooth interior free of appreciable irregularities, all compatible with the permissible variations in Section 7, above. The joint width shall not exceed 3/4 inches.

10. WORKMANSHIP AND FINISH

The bridge units, wingwalls, and headwalls shall be substantially free of fractures. The ends of the bridge units shall be normal to the walls and centerline of the bridge section, within the limits of the variations given in section 7, above, except where beveled ends are specified. The faces of the wingwalls and headwalls shall be parallel to each other, within the limits of variations given in section 7, above. The surface of the precast elements shall be a smooth steel form or troweled surface. Trapped air pockets causing surface defects shall be considered as part of a smooth, steel form finish.

11. REPAIRS

Precast elements may be repaired, if necessary, because of imperfections in manufacture or handling damage and will be acceptable if, in the opinion of the purchaser, the repairs are sound, properly finished and cured, and the repaired section conforms to the requirements of this specification.

12. INSPECTION

The quality of materials, the process of manufacture, and the finished culverts shall be subject to inspection by the purchaser.

13. REJECTION

The precast elements shall be subject to rejection on account of any of the specification requirements. Individual precast elements may be rejected because of any of the following:

13.1 Fractures or cracks passing through the wall, except for a single end crack that does not exceed one half the thickness of the wall.

13.2 Defects that indicate proportioning, mixing, and molding not in compliance with Section 5 of these specifications.

13.3 Honeycombed or open texture.

13.4 Damaged ends, where such damage would prevent making a satisfactory joint.

14. MARKING

Each bridge unit shall be clearly marked by waterproof paint. The following shall be shown on the inside of the vertical leg of the bridge section:

Bridge Span X Bridge Rise
Date of Manufacture
Name or trademark of the manufacturer

15. CONSTRUCTION REQUIREMENTS

15.1 Footings - The bridge units and wingwalls shall be installed on either precast or cast-in-place concrete footings. The design size and elevation of the footings shall be as determined by the Engineer. A three inch deep keyway shall be formed in the top surface of the bridge footing three inches clear of the inside and outside faces of the bridge units, unless specified otherwise on the plans. No keyway is required in the wingwall footings, unless otherwise specified on the plans. The footings shall be given a smooth float finish and shall reach a compressive strength of 2,000 psi before placement of the bridge and wingwall elements. The completed footing surface shall be constructed in accordance with grades shown on the plans. When tested with a 10 foot straight edge, the surface shall not vary more than 1/4 inch in 10 feet. If a precast concrete footing is used, the contractor shall prepare a 4 inch thick base layer of compacted granular material the full width of the footing prior to placing the precast footing.

15.2 Placement of the Bridge Units, Wingwalls, and Headwalls - The bridge units, wingwalls, and headwalls shall be placed as shown on the Engineer's plan drawings. Special care shall be taken in setting the elements to the true line and grade. The bridge units and wingwalls shall be set on 6" X 6" masonite or steel shims. A minimum of 1/2 inch gap shall be provided between the footing and the bottom of the bridge's vertical legs or the wingwall. The gap shall be filled with cement grout (Portland cement and water or cement mortar composed of one part Portland cement and three parts of sand, by volume, and water.)

15.3 External Protection of Joints - The butt joint made by two adjoining bridge units shall be covered with a 7/8" x 1 3/8" preformed bituminous joint sealant and a minimum of a 9 inch wide joint wrap. The surface shall be free of dirt before applying the joint material. A primer compatible with the joint wrap to be used shall be applied for a minimum width of nine inches on each side of the joint. The external wrap shall be either EZ-WRAP RUBBER by PRESS-SEAL GASKET CORPORATION, SEAL WRAP by MAR MAC MANUFACTURING CO. INC. or approved equal. The joint shall be covered continuously from the bottom of one bridge section leg, across the top of the arch and to the opposite bridge section leg. Any laps that result in the joint wrap shall be a minimum of six inches long with the overlap running downhill.

In addition to the joints between bridge units, the joint between the end bridge unit and the headwall shall also be sealed as described above. If precast wingwalls are used, the joint between the end bridge unit and the wingwall shall be sealed with a 2'-0" strip of filter fabric. Also, if lift holes are formed in the arch units, they shall be primed and covered with a 9" x 9" square of joint wrap.

During the backfilling operation, care shall be taken to keep the joint wrap in its proper location over the joint.

15.4 Backfill - Backfill shall be considered as all replaced excavation and new embankment adjacent to the CON/SPAN® bridge units, wingwalls, and headwalls. The project construction and material specifications which include the specifications for excavation for structures and roadway excavation and embankment construction, shall apply except as modified in this section.

No backfill shall be placed against any structural elements until they have been approved by the Engineer.

Backfill against a waterproofed surface shall be placed carefully to avoid damage to the waterproofing material.

Mechanical tampers or approved compacting equipment shall be used to compact all backfill and embankment immediately adjacent to each side and over the top of each bridge unit until it is covered to a minimum depth of one foot, unless the design fill height is less than 1'-0". The backfill within the Critical Backfill Zone (shown in the diagrams below) shall be placed in lifts of eight inches or less (loose depth). Heavy compaction equipment shall not be operated in this area or over the bridge until it is covered to a depth of one foot, unless the design fill height is less than 1'-0".

Lightweight dozers and graders may be operated over bridge units having one foot of compacted cover, but heavy earth moving equipment (larger than a D-4 Dozer weighing in excess of 12 tons and having track pressures of eight psi or greater) shall require two feet of cover unless the design cover is less than two feet. In no case shall equipment operating in excess of the design load (HS20 or HS25) be permitted over the bridge units unless approved by CON/SPAN®.

Any additional fill and subsequent excavation required to provide this minimum cover shall be made at no additional cost to the project.

As a precaution against introducing unbalanced stresses in the bridge, when placing backfill at no time shall the difference between the heights of fill on opposite sides of the bridge exceed 24".

Backfill in front of wingwalls shall be carried to ground lines shown in the plans.

For fill heights over 12 feet, no backfilling may begin until a backfill compaction testing plan has been coordinated with and approved by CON/SPAN® Bridge Systems. Cost of the backfill compaction testing shall be included in the cost of the precast units. This included cost applies only to projects with fill heights over 12 feet (as measured from top crown of arch to finished grade).

16. QUALITY ASSURANCE

The Precaster shall demonstrate adherence to the standards set forth in the NPCA Quality Control Manual. The Precaster shall meet either Section 16.1 or 16.2.

16.1 Certification: The Precaster shall be certified by the Precast/Prestressed Concrete Institute Plant Certification Program or the National Precast Concrete Association's Plant Certification Program prior to and during production of the products covered by this specification.

16.2 Qualifications, Testing and Inspection

16.2.1 The Precaster shall have been in the business of producing precast concrete products similar to those specified for a minimum of three years. He shall maintain a permanent quality control department or retain an independent testing agency on a continuing basis. The agency shall issue a report, certified by a licensed engineer, detailing the ability of the Precaster to produce quality products consistent with industry standards.

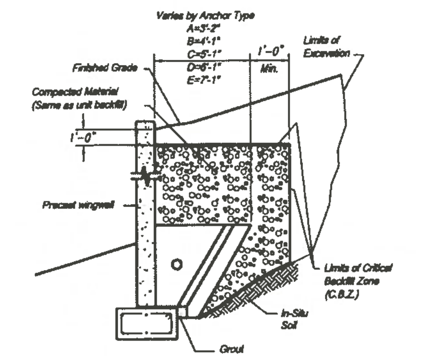
16.2.2 The Precaster shall show that the following tests are performed in accordance with the ASTM standards indicated. Tests shall be performed for each 150 cubic yards of concrete placed, but not less frequently than once per production run, as defined in §8 of these specifications.

16.2.2.1 Air Content: C231 or C173

16.2.2.2 Compressive Strength: C39, C497

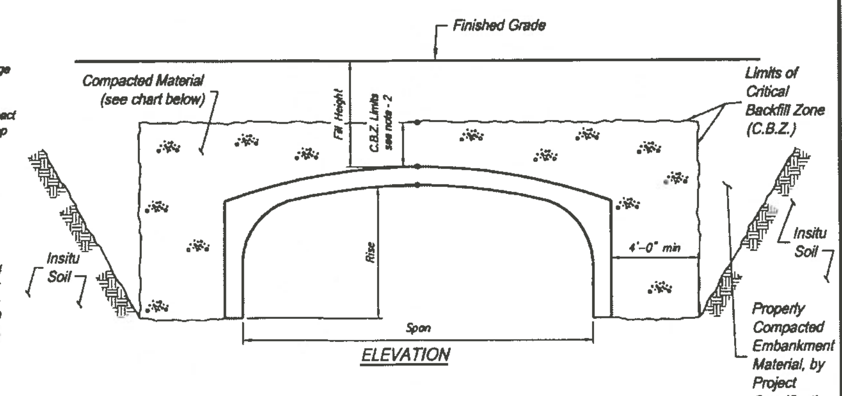
16.2.3 The Precaster shall provide documentation demonstrating compliance with this section to CON/SPAN® Bridge Systems at regular intervals or upon request.

16.2.4 The Owner may place an inspector in the plant when the products covered by this specification are being manufactured.



WINGWALL BACKFILL REQUIREMENTS

BACKFILL DESCRIPTION (AASHTO M 145-91)								
Group Classification	A-1		A-3	A-2				A-4
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7	
Sieve Analysis, Percent Passing (100% Passing 3" Sieve)								
No. 10	50 max.							
No. 40	30 max.	50 max.	51 min.					
No. 200	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.
Characteristics of Fraction Passing No. 40								
Liquid Limit				40 max.	41 min.	40 max.	41 min.	40 max.
Plasticity Index	6 max.		N.P.	10 max.	10 max.	11 min.	11 min.	10 max.
Usual Types of Significant Constituent Materials	Stone Fragments, Gravel & Sand		Fine Sand	Silty or Clayey Gravel and Sand				Silty Soils
General Rating as Subgrade	Excellent to Good							Fair to Poor



ELEVATION

NOTES
1. SEE CON/SPAN® SPECIFICATIONS SECTION 15.4 FOR BACKFILL SPECIFICATIONS.
2. FOR FILL HEIGHTS GREATER THAN 2'-0", C.B.Z. LIMIT SHALL BE 2'-0" ABOVE ARCH CROWN. FOR FILL HEIGHTS LESS THAN 2'-0", THE FINISHED GRADE SHALL BE THE BOUNDARY LINE FOR THE C.B.Z.
3. BACKFILLING OPERATIONS WITHIN THE C.B.Z. SHALL BE PERFORMED IN LIFTS OF 8" OR LESS (LOOSE DEPTH).
4. MAXIMUM DRY DENSITY SHALL BE DETERMINED BY AASHTO T-99 OR OTHER APPROVED METHODS.
5. BACKFILL SHALL BE COMPACTED IN LAYERS UNTIL THE DENSITY IS NOT LESS THAN 95% OF THE MAXIMUM DRY DENSITY.

SPAN	FILL HEIGHT	ACCEPTABLE MATERIAL INSIDE C.B.Z.	ACCEPTABLE MATERIAL OUTSIDE C.B.Z.
≤24'-0"	≥ 12'-0"	A1, A3	**
≤24'-0"	< 12'-0"	A1, A2, A3, A4	**
>24'-0"	ALL	A1, A3	**

** EMBANKMENT MATERIAL PER PROJECT SPECIFICATIONS

BACKFILL REQUIREMENTS

NOTICE
The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by CON/SPAN® Bridge Systems Incorporated. They are intended for use in the design and construction of the project in accordance with CON/SPAN® Bridge Systems Incorporated. Any unauthorized use or reproduction of this information is strictly prohibited. ©CON/SPAN® Bridge Systems Incorporated.

If discrepancies between the supplied information and actual field conditions are encountered as site work progresses, these discrepancies must be reported to CON/SPAN® Bridge Systems Incorporated immediately for re-evaluation of the design. CON/SPAN® Bridge Systems Incorporated accepts no liability for designs based on inaccurate information supplied by others.

The CON/SPAN® Arch Culvert and wingwalls are protected by one or more of the following U.S. Patent Numbers 4595314, 4683751, 4797030, 4854775, 4993872.

No.	Date	Description	By
1			
2			
3			
4			
5			
6			
7			

REVISIONS

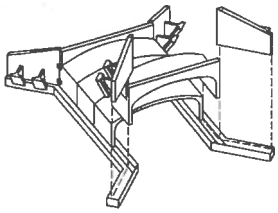
Provided by:
BRIDGETEK
PENNSYLVANIA
1-800-344-2102

CON/SPAN® BRIDGE SYSTEMS
3100 Research Blvd.
P.O. Box 20266
Dayton, Ohio 45420-0266
(937) 254-2233
(800) 526-3999
Fax (937) 254-8365
Email: info@con-span.com

NORTH WHITEHALL TOWNSHIP PENNSYLVANIA

COPLAY CREEK BRIDGE

Designed	CAM	C/S Project No.	9808
Drawn	RPU		
Checked	DLW	Sheet No.	C/S4
Date	9/27/02		



CON/SPAN® BRIDGE SYSTEMS
A CONTECH Company

3100 Research Blvd.
P.O. Box 20266
Dayton, Ohio 45420-0266
937-254-2233
800-526-3999
Fax 937-254-8365
www.con-span.com

General Information

CON/SPAN® has quickly grown to become a widely recognized and utilized system for bridge replacement and new construction. It is also used for a variety of underground storage applications. Since the first prototype was produced in 1983, more than 4,500 projects have been installed in 49 states, Canada, the Caribbean, Central and South America, Japan and Korea.

Innovative new technology developed by CON/SPAN® Bridge Systems has resulted in six U.S. and foreign patents. The precast modular system offers set-in-place construction of small bridges and underground structures through a national network of precast producers. The CON/SPAN® system stands apart from other products through the strength of its distinctive arch action and extensive technical support.

Product Versatility

CON/SPAN®'s versatile system offers a standard span series ranging from 12' to 48', variable heights and lengths determined by the number of units placed end-to-end. The precast units are easily adjusted for curved alignments and can be set side-by-side for multiple span configuration.

Field installation of the system's units, which are delivered to the site and set in place by crane, can be accomplished in a few hours with a minimum of traffic or project interruption. Options include precast headwalls, wingwalls and footings for bridge applications, closed ends for underground containment and slab floor or strip footings that offer preservation of natural stream beds.

The inherent aesthetic values of the arch can be further enhanced with a variety of headwall facings (i.e. stone, brick, patterned concrete) to blend with a site. Frequent users include private developers and state, county and city engineers. The recognized attributes of precast concrete and the arch shape provide economy, durability and assured quality for a broad spectrum of applications: • small bridge construction, • stream enclosures, • railroad overpasses, • airport taxiway overpasses/highway underpasses, • underground containment, bunkers and vaults, • utility protection, • storm water and glycol retention systems, • underground vaults for chemical storage tanks, • wine storage, • golf course and go-kart underpasses and overpasses, • pedestrian walkways, • mine shaft enclosures, • boat passages between lakes.

Continued on reverse.

Manufacturing, Distribution and Engineering Support

A carefully selected network of licensed providers, representing the finest organizations in the concrete industry, supports the design community by providing solutions and technical assistance on the application of the CON/SPAN® system. They are also responsible for the manufacturing of the CONSPAN® modular components and provide installation support. CON/SPAN®'s Dayton, Ohio, based design team, with regional offices in Charlotte, North Carolina; Sacramento, California; and Albany, New York; provides extensive technical support services to the provider network and to project personnel to determine proper applications of the system. CON/SPAN® designers prepare engineering studies and preliminary plans to assist their licensed providers in preparing cost estimates for projects, and their technical support can include automated CADD plan preparation. Engineers design the precast units for proper reinforcing, concrete strengths and handling operations. Readily available software allows a direct hydraulic comparison between CON/SPAN® and other structures. The design team conducts structural analysis of projects with a finite element computer program originally developed for the Federal Highway Administration that has been modified for CON/SPAN® application.

Research and Development

Research and development were started in the early 1980s to apply and extend the enormous effort sponsored by the FHWA to develop a comprehensive procedure to analyze the interaction of a buried structure with its surrounding soil mass. The initial work was with Dr. Katona, the chief researcher for the FHWA project, to create a reliable design procedure to mobilize the recognized strength of an arched span by reacting against integral vertical walls into the surrounding soil. The resulting arch-box shape utilizes this interaction with a broad range of span and height configurations for an economical, durable structure with enormous load carrying capacity.

Several full-scale load tests, conducted in cooperation with state highway departments, have demonstrated CON/SPAN®'s strength and verified the analysis procedures. Dr. Ernest T. Selig, professor of civil engineering at the University of Massachusetts/Amherst, presented his findings on a full-scale load test in Pennsylvania in a report to the Transportation Research Board (Committee A2K04) in January of 1994. Other recent developments include hydraulic model testing headed by Dr. Don Chase at the University of Dayton. In addition, CON/SPAN® has conducted a full-scale load test using fibers in concrete to manufacture composite bridge units. CON/SPAN® has also used fiber-reinforced concrete on headwall and wingwall units in lieu of conventional reinforcing. Research and development continue as an important component of this system.

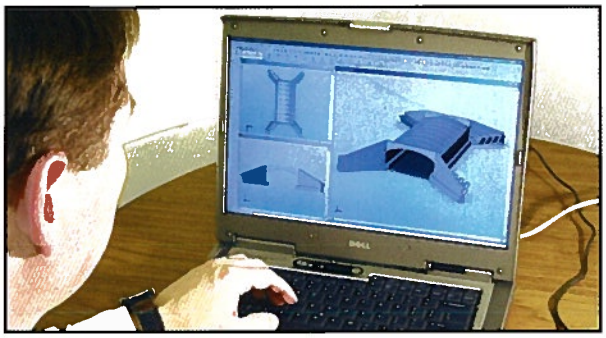
CON SPAN®
BRIDGE SYSTEMS
800/526-3999

The Process

5 Foundation – Strip footings or slab base can be either cast in place or precast.

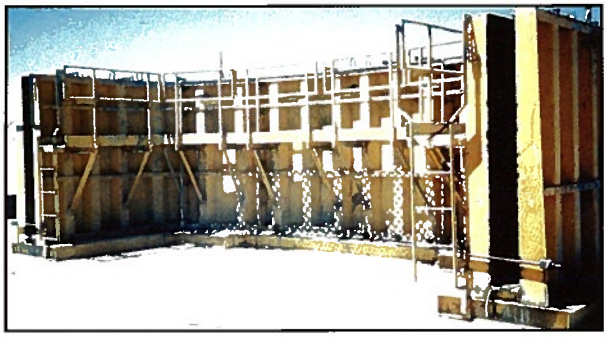
1 Project Consultation – The local CON/SPAN® provider assists you in your structure evaluation.

6 Joint Seal – Commercial joint wrap is applied as a seal between precast units.

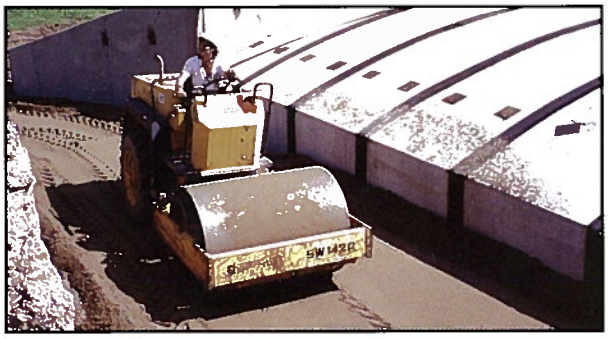


2 Design – State-of-the-art precast unit design procedures utilize advantages of unique shape.

7 Wingwalls & Headwalls – Setting of precast wingwalls and headwalls completes the bridge.



3 Manufacture – Quality is assured through controlled conditions for plant-produced concrete products.



8 Backfill – Structure stiffness and vertical walls of unit allow backfill to be placed rapidly and effectively.

4 Transportation – Entire structure arrives on schedule ready for installation.

9 Finished Bridge – It is economical, durable, quickly installed and looks great.

3100 Research Blvd.
PO Box 20266
Dayton, OH
45420-0266

In the USA
800/526-3999

In Canada
888/793-2724

www.con-span.com

info@con-span.com

Lance E. Williams, P.E.
Region Manager

2300 Hurstbourne Village, Suite 400
Louisville, KY 40299
lwilliams@bridgetek.cc
www.bridgetek.cc

Phone: 502-493-2930
800-344-2102
Fax: 502-493-2931
Mobile: 859-421-1233