PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I am a registered professional engineer in the State of Florida practicing with **Kisinger Campo & Associates, Inc**. and that I have supervised the preparation and approve the findings, opinions, conclusions, and technical advice hereby reported in:

REPORT: Final Bridge Hydraulics Report: SR 60 Over Peace Creek Drainage Canal West of the CSX Railroad

PROJECT: SR 60 Grade Separation over CSX Railroad

LOCATION: 0.5 miles west of the Duke Energy substation to 0.5 miles east of the CSX railroad crossing, Polk County, FL

FPID: 436559-1-52-01

The following duly authorized engineering business performed the engineering work represented by this document:

Kisinger Campo & Associates, Inc.
201 N. Franklin Street, Suite 400
Tampa, Florida 33602
Telephone: (813) 871-5331
FL Certificate of Authorization No. 02317

This report contains calculations for hydrologic and hydraulic analysis of the new bridge over the Peace Creek Drainage Canal for the above roadway project. The information used to determine hydrologic and hydraulic parameters for the calculations was based on the best information available at the time of the analysis.

I acknowledge that the procedures and references used for this report and its calculations are standard to the practice of civil engineering as applied through professional judgement and experience.

FLORIDA LICENSED PROFESSIONAL ENGINEER:

Ali Tayebnejad, P.E.
Name

PE NUMBER: FL # 42775

SIGNATURE: 7/20/16
Date

ALI REZA TAYEBNEJAD
LICENSE
No 42775
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Final

Bridge Hydraulics Report

SR 60 OVER PEACE CREEK DRAINAGE CANAL WEST OF THE CSX RAILROAD

POLK COUNTY

FINANCIAL PROJECT ID: 436559-1-52-01

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT 1

PREPARED BY:

Kisinger Campo and Associates, Corp.
201 N. Franklin St., Suite 400
Tampa, FL 33602
Florida Certificate of Authorization No. 02317

Engineer of Record:
Ali Tayebnejad
P.E. No. 42775

July 2016

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Executive Summary

The Florida Department of Transportation (FDOT) has proposed this project to grade separate SR 60 over the CSX Railroad located southwest of Lake Parker in Polk County. Due to the proximity to the proposed SR 60 grade separation, it will be necessary to also span the Peace Creek Drainage Canal (PCDC) with new bridges to match the higher proposed profile grade. The hydraulic feasibility of the bridge crossings within this report were analyzed using Hydrologic Engineering Center River Analysis System (HEC-RAS) Version 4.1.0, developed by the U.S. Army Corps of Engineers. The PCDC is a designated FEMA floodway; therefore, a No-rise Certification will be required as a result of the new bridges. All elevations within this report are referenced to the North American Vertical Datum of 1988 (NAVD88).

The existing westbound bridge over the PCDC will be demolished to accommodate this new roadway. The existing eastbound bridge over the PCDC will remain and be rehabilitated for use as a frontage road allowing access to adjacent properties. The new SR 60 east and westbound bridges will be constructed just north of the existing eastbound bridge. The existing SR 60 eastbound bridge (No. 160133) has an overall deck width of 34’-3”, consists of eight 20’-0” spans making the total length 160’, and has a low member elevation of 116.2’. The substructure consists of two spill-through abutments, protected with sand-cement riprap and intermediate bent caps, all supported by 14” square pre-stressed concrete piles that are aligned perpendicular to the flow. It is proposed to widen this bridge to the south to provide sufficient shoulder widths and crash tested barriers. The widened deck width will be 35’-1” and the proposed foundation is 18” square pre-stressed concrete piles. The proposed low member elevation is 116.2’ providing a vertical clearance of 3.9’. The existing abutment protection (sand cement riprap) will be removed and be replaced with rubble riprap with two foot wildlife shelves. The eastbound bridge is parallel to and is located approximately 35’ southwest (downstream) of the westbound bridge.

The existing SR 60 westbound bridge (No. 160145) has an overall deck width of 34’-1”, consists of ten 15’-0” spans making the total length 150’, and has a low member elevation of 116.7’. The substructure consists of two spill-through abutments, protected with sand-cement riprap, and nine intermediate bents supported by 5 in-line piles. The piles were originally 12” square concrete piles but concrete pile jackets have been added to the piles that support the interior seven bents making them 18” square piles. The channel turns directly upstream into the bridge crossing so that flow is aligned perpendicular to the piles.

The proposed westbound bridge begins at Station 3386+89.00 and ends at Station 3388+70.00 (baseline const. SR 60 LT) while the proposed eastbound bridge begins at Station 4386+80.45 and ends at Station 4388+61.45 (baseline const. SR 60 RT). The bridges are to the north of the existing SR 60 eastbound bridge, and they are set on a 20 degree skew to approximately match the alignment of the canal. Three alternatives are considered for the proposed bridges. Alternative 1 is a simple span Florida I-beam configuration with a low member elevation of 119.79’. Alternative 2 is preferred and consists of a two-span Florida I-beam 45 configuration with each span being 90’-6”. The intermediate bent will be supported by 24” square pre-stressed concrete piles which will be aligned perpendicular to flow. The low member elevation for this alternative is 124.04’. Alternative 3 is a four-span pre-stressed Florida Slab Beam (FSB) bridge. This option includes fourteen custom 57” wide, 15” deep FSBs, and has a low member elevation of 126.75’. It was assumed that the intermediate bents will be supported by 24” square pre-stressed concrete piles which will be aligned perpendicular to flow. The FDOT requested that wildlife shelves be provided on each side of the bridges. Based on the floodway and specified wildlife shelves, the proposed bridge length is 181’-0” for all three alternatives. It is proposed that all of the bridge alternatives be supported by vertical spill-through abutments. MSE walls set at the inside edge of the wildlife shelves are proposed to wrap around the bridges.

The analyses addressed in this executive summary are based on Alternative 2 and a widened frontage road bridge. To allow debris to pass without causing damage, the clearance between the design flood stage and the low member of the bridge shall be a minimum of two feet. All of the proposed alternatives provide a minimum of seven feet of vertical clearance above the 50-year design flood stage (112.34’). The proposed wildlife shelves elevation shall be a minimum of 6” above the normal high water line (NHWL) and have a minimum vertical clearance of 5’-0”. The NHWL elevation (109.0’) was established by observing stain lines on the piles of the existing bridges. The wildlife shelf elevation is at 112.5’ under the proposed bridge and transitions to elevation 110.5’ under the frontage road bridge. These wildlife shelf elevations satisfy the vertical clearance requirements of five feet.

The PCDC is not navigable; therefore, the horizontal clearance provided shall be consistent with debris conveyance needs, and structure economics. The wildlife shelves on either side of the floodway also contribute to the horizontal width of the bridges. The wildlife shelves are 10’-0” wide under the proposed bridge and transitions to 2’-0” under the frontage road bridge. The wildlife shelves will be protected by rubble riprap. A flat, uniform surface for the wildlife shelves will be constructed with sand cement riprap and backfilled with soil. The two (horizontal) to one (vertical) slope will extend from the outside edge of the wildlife shelf down to the existing channel and will be protected with rubble riprap

The scour computations were done within HEC-RAS which is based on the procedures outlined in the Federal Highway Administration HEC-18 manual. An average D50 grain size value of 0.25 mm was used for the scour computation. The total estimated scour depth of Alternative 2 for the 100-year (design event) and 500-year (check event) storm events are 7.4’ and 6.5’, respectively. The bridge abutments and wildlife shelves will be protected with FDOT standard bank and shore rubble riprap to avoid any scour issues.

Stormwater runoff from the roadway on the proposed bridge decks will drain to inlets at the bridge approach and then be conveyed to the respective stormwater ponds. Stormwater runoff from the sidewalk on the proposed bridge decks will drain directly into the PCDC through slots in the parapet. Spread is contained within the 10’ outside shoulder. The frontage road bridge (160133) will continue to maintain scuppers and deck runoff will drain directly into the PCDC.

All three of the bridge alternatives and widened frontage road bridge were hydraulically feasible. The cost analysis within the Bridge Development Report (BDR) demonstrates that the FIB 45 superstructure with a substructure founded on 24” square pre-stressed concrete piles (Alternative 2) is the most economical and was therefore chosen as the preferred alternative.

1 Introduction

State Road 60 (SR 60) is one of the most important highways that transverses Central Florida. It extends coast to coast connecting Pinellas, Hillsborough, Polk, Osceola, and Indian River counties and serves as a vital corridor. As a main component of the Strategic Intermodal System (SIS) and a designated hurricane evacuation route, it is an essential transportation facility in Central Florida. SR 60 is functionally classified as an urban principal arterial facility within the project limits and is part of the Florida State Highway System.

The Florida Department of Transportation (FDOT) has proposed this project to grade separate SR 60 over the CSX Railroad located southwest of Lake Parker in Polk County. The project is located in Section 1, Township 30 South, Range 26 East and Section 6, Township 30 South, Range 27 East in Polk County, Florida (Appendix A, Figure A-2) which falls within Southwest Florida Water Management District (SWFWMD) jurisdiction. Nearly 1.2 miles of roadway will be improved along SR 60, starting approximately 0.5 miles west of the Duke Energy substation and ending 0.5 miles east of the railroad crossing. As a result of the grade separation of SR 60, the existing westbound bridge over the PCDC will be replaced with two taller and wider bridge structures that will accommodate both east and westbound traffic. In addition, the existing eastbound bridge over the PCDC will remain and be rehabilitated for use as a frontage road bridge to provide access to adjacent properties (Refer to Appendix H for proposed bridge plans). This bridge hydraulics report addresses the proposed configuration of the crossing over the PCDC including the two new structures (SR 60 eastbound and westbound) and the proposed improvements to the existing eastbound bridge (No. 160133). The PCDC flows north to south before turning southwest to flow under the CSX Railroad and SR 60 crossings. The confluence of the PCDC and Peace Creek is approximately 11 miles downstream from the SR 60 crossing. Refer to Figure 1 to view the project location.

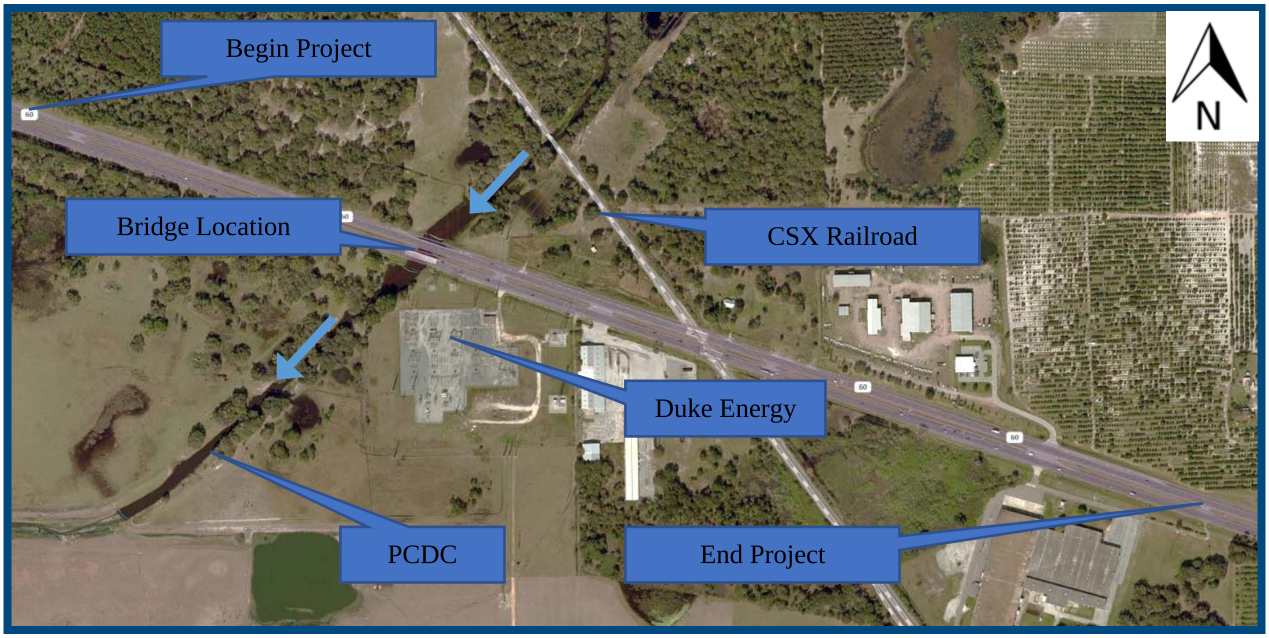


Figure 1: Project Location Map

1.1 Project Datum

All elevations within this report are referenced to the North American Vertical Datum of 1988 (NAVD88). The conversion from NAVD88 to the National Geodetic Vertical Datum of 1929 (NGVD29) is as follows: EL NAVD88 = EL NGVD29 – 0.915’

1.2 Floodplain Requirements

The PCDC is a designated FEMA floodway; therefore, a No-rise Certification will be required for the proposed condition (Appendix M). Refer to Appendix A, Figure A-4 for the FEMA map.

1.3 Existing Flood Stages

Flood Insurance Rate Maps (FIRM) from the Federal Emergency Management Agency (FEMA) indicates that the SR 60 roadway at the PCDC is located within a Floodway Area in Zone AE. The adjacent areas to the roadway are Zone AE, Zone A, and Zone X as shown on Preliminary Community Panel Number 12105C0545H (Appendix A, Figure A-4). Refer to Table 1 to view the descriptions of each FEMA zone type. The base flood elevation at the SR 60 crossing as shown on the FEMA FIRM is approximately 112.0’.

Table 1: FEMA Zone Descriptions

Zone	Description
A	No Base Flood Elevations determined.
AE	Base flood elevations determined.
X	Areas determined to be outside the 0.2% annual chance floodplain.

1.4 Floodplain/Floodway Revision

According to SWFWMD staff, the floodplain and floodway limits within the project area are being revised based on the governing board approved Peace Creek Watershed ICPR model (prepared by Atkins for SWFWMD) and the Peace Creek Floodway HEC-RAS model (prepared by SWFWMD). The Letters of Final Determination were issued in March 2016 and the newly revised FIRMs will become effective in September 2016. The Peace Creek Watershed model and the Peace Creek Floodway HEC-RAS model were used as the newest and best available information in preparing this report. Refer to Appendix J to view the correspondence with SWFWMD and the FEMA reviewer.

1.5 Channel Description

The PCDC was excavated in the early 1900s to drain low-lying lands in Polk County south of the Winter Haven Chain of Lakes. The perennially-flowing PCDC is the main drainage channel within the basin and flows generally westward into the Peace River. The existing SR 60 bridges cross the PCDC approximately 11 miles upstream of the confluence with Peace River. The basin contributing to the PCDC upstream of the crossing is approximately 94.9 square miles (Appendix A, Figure A-5).

The man-made waterway is approximately 200’ wide at the top of bank at the westbound bridge location. The PCDC runs from northeast to southwest and then turns further south directly upstream of the existing SR 60 crossing. It appears that flood flows travel perpendicular to the bridge alignment. The topography of the area is generally flat with elevations ranging from a high of approximately 118’ to a low of approximately 108’ near the SR 60 crossing. The stream bed slope averages approximately six feet per mile. The slightly vegetated/sandy channel bottom is approximately 85’ wide and was observed to have an average water depth of 18 inches (existing water surface elevation = 104.7’) with steady flow at the time of the field inspection (September 22, 2015). The velocity of the stream was estimated to be between 0.5 – 1 ft/sec. Well maintained, grassed channel banks upstream and downstream of the parallel bridge structures were noted. The channel is narrower at the downstream bridge (160133). The FEMA Flood Insurance Rate Map (FIRM) indicates wide floodplains on either side of the crossing. The 100-year flood does not overtop the bridge.

2 Existing Condition

2.1 General Description

Currently, SR 60 services four lanes of travel within the project limits: two eastbound and two westbound. The existing roadway consists of four 12’-0” wide travel lanes with a 40’-0” median and 65 mph posted speed, and it crosses the PCDC via two existing bridges.

2.2 Bridge Number 160133 (Eastbound)

Bridge Number 160133 on SR 60 (eastbound) was built in 1965 over the PCDC. This reinforced concrete slab bridge consists of eight 20’-0” spans making the total length of the bridge 160’. The superstructure is a 14” deck slab with scuppers for deck drainage that varies in thickness at the bent supports to achieve the bridge cross slope. The low member elevation is at 116.2’ (refer to Appendix H, page H-1). It carries raised curbs on each side which support concrete post railings and guardrails. The overall bridge width is 34’-3” with a clear roadway distance of 28’-0”. The substructure consists of two spill-through abutments, protected with sand-cement riprap and intermediate bent caps, all supported by 14” square pre-stressed concrete piles. Each intermediate bent has four piles, including plumb interior piles and battered exterior piles that are aligned parallel to the flow. The eastbound bridge is parallel to the westbound bridge with a separation of approximately 35’. Figure 2 displays the superstructure and substructure of this existing eastbound bridge. Refer to Appendix L to view the existing bridge plans.

Figure 2: Bridge Number 160133, looking at downstream face

Bridge No. 160133 has a sufficiency rating of 79.9 and a Health Index of 84.68 according to the bridge inspection report prepared by ICA Engineering dated 8/26/14 (Appendix I, I-101). This bridge will remain as-is and be rehabilitated for use as a frontage road adjacent to SR 60 that will allow access to the Duke Energy substation and other businesses.

2.3 Bridge Number 160145 (Westbound)

Bridge Number 160145 on SR 60 (westbound) was built in 1951 over the PCDC. Since plans are not available, the description of this bridge is based on inspection reports and field reviews. The bridge consists of ten 15’-0” spans making the total length 150’ and has an overall bridge width of approximately 34’-1”. The superstructure consists of a cast-in-place deck slab with concrete Jersey-type barrier walls. The low member elevation is at 116.7’ NAVD (117.6’ NGVD, refer to Appendix I, page I-27). The substructure consists of two spill-through abutments, protected with sand-cement riprap, and nine intermediate bents supported by 5 in-line piles. The piles were originally 12” square concrete piles but concrete pile jackets have been added to the piles that support the interior seven bents making them 18-inch square piles. Figure 3 displays the superstructure and substructure of this existing bridge. The channel turns directly upstream into the bridge crossing so that flow will be aligned perpendicular to the bridge.

Figure 3: Bridge Number 160045, looking at upstream face

The existing bridge has a Sufficiency Rating of 79.5 and a Health Index of 84.67 based on the latest bridge inspection report dated August 26, 2014 (refer to Appendix I). As part of this project, this bridge will be demolished to accommodate the new SR 60 mainline bridges.

3 Design Criteria

The FDOT includes hydraulic requirements of bridges within the FDOT Drainage Manual (January 2016), Bridge Hydraulics Handbook (July 2012), and within Chapter Two of the Plans Preparation Manual (PPM). A summary of the requirements is included below:

- *Design Frequency*
  SR 60 will be considered a high use or essential facility since it will have a projected 20 year AADT greater than 1500. Therefore, the FDOT Drainage Manual requires a 50 year design frequency (Section 4.3.1).
- *Vertical Clearance*
  To allow debris to pass without causing damage, the clearance between the design flood stage and the low member of the bridge shall be a minimum of two feet (PPM 2.10.1). The design flood stage is the maximum stage that would occur for the 50 year design frequency. The PCDC is not navigable and minimum vertical clearances for navigation do not apply. The incorporated wildlife shelves shall also meet clearance criteria. The shelves shall be a

minimum of 6” above the normal high water line (NHWL) and shall have a minimum vertical clearance of 5’-0”. The NHWL elevation (109.0’) was established by observing stain lines on the piles of the existing bridges.

- *Horizontal Clearance*

The PCDC is not navigable; therefore, the horizontal clearance provided shall be consistent with debris conveyance needs and structure economics. The wildlife shelves on either side of the floodway also contribute to the horizontal width of the bridges. Riprap slopes from the floodway to achieve the required shelf elevation, and the shelves themselves are 10’-0” wide under the proposed bridges.

- *Scour*

Estimate scour depth resulting from the following: channel aggradation, channel degradation, channel migration, contraction scour, and pier scour. Because it is proposed that the abutments be protected with rip-rap, it is not required to calculate abutment scour.

- *Backwater*

Backwater created by the structure shall be consistent with the Flood Insurance Study requirements adopted by the local community in accordance with 23 CFR 650, Subpart A, National Flood Insurance Program, and FEMA guidelines.

- *Berms*

A minimum berm width of 10 feet shall be provided between the top edge of the main channel and the toe of the spill through bridge abutments (Drainage Manual 4.9.1).

4 Potential Site Problems

4.1 Land Use

Land use in the area generally includes large areas of agricultural land. There is a large Duke Energy substation to the southeast of the PCDC and SR 60 (Figure 1).

4.2 Recreational Resources

There are no recreational resources in the area of the existing SR 60 crossing at the PCDC.

4.3 Domestic Water Supply

The water requirements in the vicinity of the project are satisfied through the use of individual private wells.

5 Proposed Condition

5.1 General Description

The proposed reconstruction improvements include a four-lane (interim), expandable to six-lane (ultimate), divided highway with a 23’-6” median, 10’-0” outside shoulders, 10’-2” inside shoulders, 8’-0” sidewalks, and a design speed of 70 mph. In addition to repurposing the existing eastbound bridge, a total of six bridges will be constructed along the project corridor. Paired westbound and eastbound bridges are proposed at the PCDC, Fuel Line, and CSX Railroad locations.

The proposed mainline bridges are on a tangent horizontal alignment. Their roadways are symmetric to each other in a crown configuration with constant 0.02 ft./ft. cross slopes. The resultant width of each bridge is 68’-2½” with a 1” clear spacing between the two. Refer to Appendix H to view the bridge plans.

5.2 Bridge Number 160133 (Eastbound)

Bridge Number 160133 on SR 60 (eastbound) will remain and be rehabilitated for use as a frontage road for access to adjacent properties. It is proposed to widen this bridge to the south to provide sufficient shoulder widths and crash tested barriers. The bridge will continue to be drained by scuppers. The widened deck width will be 35’-1” and the proposed foundation is 18” square pre-stressed concrete piles. The existing abutment protection (sand cement riprap) will be removed and be replaced with FDOT standard bank and shore rubble riprap. The FDOT requested that interim wildlife shelves be provided on each side of the floodway (Appendix J, page J-14). The shelves will be 2’-0” wide at an elevation of 110.5’ which satisfies the vertical design criteria in Section 3. However, the shelves do not meet the required 10’ berm width and will require a variation. The shelves will be protected using rubble riprap. A flat, uniform surface for the wildlife shelves will be constructed with sand cement riprap and backfilled with soil. Refer to Appendix H to view the bridge plans (H-1 to H-4).

5.3 Proposed Bridges

SR 60 is to traverse the PCDC via proposed westbound and eastbound bridges. The proposed westbound bridge begins at Station 3386+89.00 and ends at Station 3388+70.00 (baseline const.

SR 60 LT) while the proposed eastbound bridge begins at Station 4386+80.45 and ends at Station 4388+61.45 (baseline const. SR 60 RT). The bridges are to the north of the existing SR 60 eastbound bridge, and they are set on a 20 degree skew to approximately match the alignment of the canal. Three alternatives are considered for the bridges: a single span FIB 96 superstructure (Alternative 1), a two-span FIB 45 superstructure (Alternative 2), and a four-span Florida Slab Beam (FSB) superstructure (Alternative 3). The FDOT requested that wildlife shelves be provided on each side of the floodway. The shelves will be 10’-0” wide at an elevation of 112.5’ which satisfies the design criteria in Section 3. The shelves will be protected using rubble riprap. A flat, uniform surface for the wildlife shelves will be constructed with sand cement riprap and backfilled with soil. Based on the floodway and specified wildlife shelves, the proposed bridge length is 181’-0” for all three alternatives. It is proposed that all of the bridge alternatives be supported by vertical spill-through abutments. MSE walls set at the edge of the wildlife shelves are proposed to wrap around the bridges.

5.3.1 Alternative 1

The first alternative is a simple span Florida I-beam configuration. FIB 96 beams are the smallest practical beams given the span length. The proposed typical section consists of eight beams spaced at 8’-9”. The low member elevation is at 119.79’. Refer to Appendix H to view the bridge plans (H-5, H-9).

5.3.2 Alternative 2 (Preferred)

Alternative 2 consists of a two-span Florida I-beam 45 configuration. Seven beams spaced at 10’-2½” are employed for each 90’-6” span. The bridge elevation view of Alternative 2 is shown in Figure 4 while the typical section can be seen on page H-10 of Appendix H. The low member elevation is at 124.04’. It was assumed that the intermediate bent will be supported by 24” square pre-stressed concrete piles which will be aligned perpendicular to flow. Based on the BDR, this alternative was chosen as the preferred option. Refer to Appendix H to view the bridge plans (H-6, H-10).

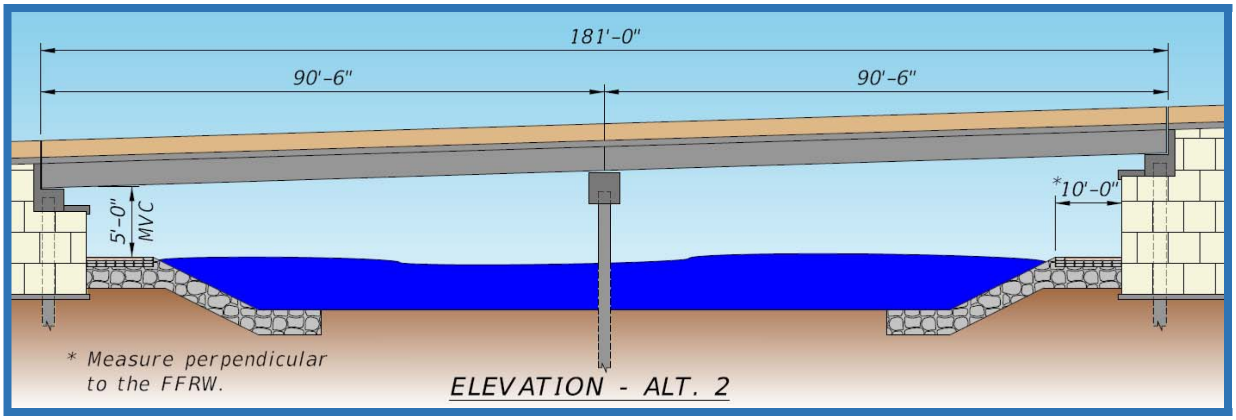


Figure 4: Alternative 2 Elevation view over the PCDC

5.3.3 Alternative 3

The third alternative is a four-span pre-stressed FSB bridge with each span being 45’-3” long. This preliminary design includes fourteen custom 57” wide, 15” deep Florida Slab Beams. The low member elevation is at 126.75’. It was assumed that the intermediate bents will be supported by 24” square pre-stressed concrete piles which will be aligned perpendicular to flow. Refer to Appendix H to view the bridge plans (H-7, H-10).

6 Hydrologic Analysis

The Peace Creek Watershed ICPR model was deemed the best available floodplain information. The model was prepared by Atkins for SWFWMD and is being used to update the FEMA maps for this area (refer to Section 1.4). According to the Justification Report of the Peace Creek Watershed Management Plan prepared by Atkins, it was determined that the five day event captures the lag time associated with this large watershed and more closely resembles predicted stages and flows at gage locations within the main channel. Therefore, peak flow rates and water surface profiles for the five day events from the ICPR model were used to model the existing and proposed condition at the SR 60 bridge crossing. Peak discharge rates from the effective FEMA FIS study (September 28, 2012) were also considered for the hydrologic analysis (Appendix I, page I-34). The peak discharge rates from the FEMA FIS study, reported in Table 2, are similar to the values from the ICPR watershed model. Therefore, it was determined that using the ICPR watershed model for the hydrologic analysis was appropriate. The design storm event for the proposed bridges is the 50 year – 5 day storm.

6.1 Design Flows

The total stream flows for the 25 year – 5 day, 50 year – 5 day, 100 year – 5 day, and 500 year – 5 day storm events were taken at link RC0370A from the Peace Creek Watershed ICPR model (Appendix D, D-3). The link RC0370A connects the node directly upstream (NC0370) and the node directly downstream (NC0380) of the SR 60 crossing. The 25 year – 5 day and 50 year – 5 day storm events were modeled by KCA using the 100 year – 5 day boundary condition (the model was also tested using a different boundary condition which had no effect on the flows and stages at this location). Refer to Table 2 to view the peak flow rates for the corresponding storm events.

Table 2: Design Storm Flow Rates

Storm Event	FEMA FIS Peak Discharges (cfs)	ICPR Watershed Model Peak Discharges (cfs)
25 Year	N/A	1057
50 Year	1356	1223
100 Year	1591	1448
500 Year	2136	1808

6.2 Tailwater

The Peace Creek Watershed ICPR model was used to determine the downstream tailwater (TW) elevation used in the hydraulic analysis. The tailwater values were interpolated from the maximum stage values for downstream nodes NC0380 and NC0385 for the 25 year – 5 day, 50 year – 5 day, 100 year – 5 day, and 500 year – 5 day storm events (Appendix D, D-1). The estimated TW elevations for the respective storms can be seen in Table 3. Refer to Appendix D to view the data used in interpolating the TW values.

Table 3: TW Elevations

Storm Event	Downstream Elev. (ft)
25 Year	111.00
50 Year	111.35
100 Year	111.92
500 Year	112.89

7 Hydraulic Analysis

7.1 Modeling Approach

Hydraulic analysis for the existing and proposed bridges was performed utilizing the HEC-RAS computer program. HEC-RAS was developed by the US Army Corps of Engineers and is used to model the hydraulics of water flow through a channel. Water surface profiles were determined for the 25, 50, 100 and 500 year flood events using a one dimensional HEC-RAS model. The low member calculations for all three alternatives are included in Appendix E beginning on page E-118.

7.2 Existing Condition Model

The existing SR 60 crossing (bridges 160045 and 160133) over the PCDC was modeled within HEC-RAS (Appendix E). The existing bridges were entered separately within the model. Five cross-sections were entered into the model including two upstream and two downstream of the bridge crossing and one cross-section between the east and westbound bridges. Survey data and LIDAR contours were used to define the cross-sections. The survey data, LIDAR contours, and the subsequent elevation data entered into the model are referenced to the NAVD88 datum. The locations of the HEC-RAS existing cross-sections are illustrated in Appendix A, Figure A-6. The contraction and expansion reach lengths were calculated using the methodology explained in Chapter 6 of the HEC-RAS user's manual. The contraction reach must be at least 290' upstream and the expansion reach must be at least 377' downstream of the crossing. The cross-section location calculations can be seen in Appendix E beginning on page E-1. The furthest upstream cross-section (contraction reach), 61397, is located approximately 290' from the upstream face of the westbound bridge. The furthest downstream cross section (expansion reach), 60618, was placed approximately 390’ from the downstream face of the eastbound bridge. Cross-sections 61242 was placed at the upstream toe of the proposed bridge while cross-section 60958 was placed at the downstream toe of the existing eastbound bridge. Cross-section 61045 was placed between the east and westbound bridges to account for the different pile sizes and configurations. The deck width of the west and eastbound bridges was set to 34.1’ and 34.3’, respectively. The contraction and expansion coefficients for cross-sections 61397 and 60618 were set to 0.1 and 0.3, respectively. The contraction and expansion coefficients for cross-sections 61242, 61045 and 60958 (bridge sections) were set to 0.3 and 0.5, respectively. Ineffective flow areas were set on sections 61242, 61045 and 60958 to represent the abutments blocking overbank flows. The manning’s roughness coefficients were calculated using USGS methodology and are .035 for the channel and .100 for the overbanks. Refer to Appendix E to view the manning’s roughness coefficient calculations. The water surface elevation results from the HEC-RAS model for the existing condition are shown in Table 4 of Section 7.3. The water surface upstream of the bridges is 113.11’ during the 100 year storm.

7.3 Proposed Condition Model

The proposed road improvement to SR 60 are described in Section 5.1. The proposed bridges and widened frontage road bridge were modeled within HEC-RAS. The combined width of both proposed bridges measured perpendicular to the SR 60 alignment is 136.5’. The combined width of both proposed bridges measured perpendicular to the PCDC alignment is equal to 145.3’. As a conservative measure, the proposed bridges were entered into the model as one continuous run of bridge using a deck width of 145.3’. The deck width (35.1’) and downstream pier width (18” square) were revised for the frontage road bridge (existing eastbound). The inputs for the frontage road bridge remained the same in the proposed model for all three alternatives. The locations of the cross-sections, the contraction and expansion coefficients, ineffective flow areas, and reach lengths are the same as the existing condition model. The internal geometry of the proposed bridge and frontage road bridge as well as the geometry of interior cross-section 61045 were revised to represent the riprap and wildlife shelf configuration. The manning’s roughness coefficient was changed to .045 within the internal geometry of the bridge to represent the proposed riprap. Refer to Appendix E to view the HEC-RAS report. The water surface elevations for the 25 year, 50 year, 100 year, and 500 year storm events from the HEC-RAS model for Alternative 2 (preferred) are shown in Table 4.

Table 4: Summary of HEC-RAS Results for Existing and Proposed - Alternative 2 (Preferred)

Channel Location	Existing Water Surface Elevations				Proposed Water Surface Elevations				Summary			
	25 Yr	50 Yr	100 Yr	500 Yr	25 Yr	50 Yr	100 Yr	500 Yr	25 Yr	50 Yr	100 Yr	500 Yr
	1057 cfs	1223 cfs	1448 cfs	1808 cfs	1057 cfs	1223 cfs	1448 cfs	1808 cfs	1057 cfs	1223 cfs	1448 cfs	1808 cfs
61397	112.14’	112.53’	113.14’	114.08’	111.98’	112.37’	112.96’	113.89’	-0.16’	-0.16’	-0.18’	-0.19’
61242	112.12’	112.51’	113.11’	114.03’	111.96’	112.34’	112.93’	113.84’	-0.16’	-0.17’	-0.18’	-0.19’
61158 BR US	--	--	--	--	111.96’	112.34’	112.93’	113.84’	--	--	--	--
61158 BR DS	--	--	--	--	111.93’	112.30’	112.89’	113.80’	--	--	--	--
61109 BR US	112.10’	112.49’	113.09’	114.01’	--	--	--	--	--	--	--	--
61109 BR DS	112.09’	112.47’	113.07’	113.99’	--	--	--	--	--	--	--	--
61045	112.05’	112.44’	113.02’	113.93’	111.92’	112.30’	112.88’	113.80’	-0.13’	-0.14’	-0.14’	-0.13’
61026 BR US	112.07’	112.45’	113.04’	113.96’	111.92’	112.29’	112.87’	113.78’	-0.15’	-0.16’	-0.17’	-0.18’
61026 BR DS	111.19’	111.57’	112.16’	113.07’	111.19’	111.56’	112.15’	113.07’	0.00’	-0.01’	-0.01’	0.00’
60958	111.18’	111.56’	112.15’	113.07’	111.18’	111.56’	112.15’	113.07’	0.00’	0.00’	0.00’	0.00’
60618	111.00’	111.35’	111.92’	112.89’	111.00’	111.35’	111.92’	112.89’	0.00’	0.00’	0.00’	0.00’

The upstream stages for the 25, 50, 100, and 500 year events in the proposed condition for Alternative 2 are less than the existing condition. Hydraulic analysis for Alternatives 1 and 3 are included in Appendix E and show lower or equal stages compared to the existing condition. A no-rise certification is included in Appendix M.

8 Scour Analysis

8.1 Scour Analysis Variables and Assumptions

The scour computations were done within HEC-RAS which is based on the procedures outlined in the Federal Highway Administration HEC-18 manual. Refer to Appendix F for scour calculations for Alternative 2.

A D_{50} grain size of 0.17 mm and 0.33 mm was provided by Tierra (Appendix C). An average D_{50} grain size value of 0.25 mm was used for the scour computation. According to the Phase 2 Scour Evaluation Report for Bridge No. 160045, the channel bed has lowered 1.3’ since bridge construction (Appendix I, I-23). The long term scour value was estimated to be two feet as a conservative measure. It is recommended that the bridge abutments and wildlife shelves be protected with FDOT standard bank and shore rubble riprap to prevent any scour issues.

8.2 Scour Computation Results

The scour computations were done within HEC-RAS which is based on HEC-18 procedures. The calculated scour depths were applied to the existing channel bottom of 103.2’. The scour values and elevation is reported in the summary below:

Scour Estimations for the 100-Year Storm Event (Design Event) – Proposed Bridges:

Local Scour..4.2’

Contraction Scour..............................1.2’

Long Term Scour...............................2.0’

Total Estimated Scour Depth..............7.4’

Scour Elevation..................................95.8’

Scour Estimations for the 500-Year Storm Event (Check Event) – Proposed Bridges:

Local Scour..4.3’

Contraction Scour..0.2’

Long Term Scour..2.0’

Total Estimated Scour Depth..6.5’

Scour Elevation..96.7’

Scour Estimations for the 100-Year Storm Event (Design Event) – Existing Eastbound Bridge:

Local Scour..3.2’

Contraction Scour..0.6’

Long Term Scour..2.0’

Total Estimated Scour Depth..5.8’

Scour Elevation..97.4’

Scour Estimations for the 500-Year Storm Event (Check Event) – Existing Eastbound Bridge:

Local Scour..3.3’

Contraction Scour..1.0’

Long Term Scour..2.0’

Total Estimated Scour Depth..6.3’

Scour Elevation..96.9’

9 Deck Drainage

Stormwater runoff from the roadway on the proposed bridge decks will drain to inlets at the bridge approach and then be conveyed to the respective stormwater ponds. Stormwater runoff from the sidewalk on the proposed bridge decks will drain directly into the PCDC through slots in the parapet. Spread is contained within the 10’ outside shoulder. The frontage road bridge will maintain scuppers and deck runoff will drain directly into the PCDC. Refer to Appendix G.

10 Conclusions and Recommendations

The width for the recommended alternative (Alternative 2) east and westbound bridges measured perpendicular to the proposed SR 60 alignment is 68'-2½" with an inch between them making the total width of the crossing 136'-6". The length of both bridges is 181'. The low chord elevation of 124.04' will provide 11.7' of vertical clearance above the design storm (50 year) of 112.34'. The widened frontage road bridge will have a deck width of 35'-1" and the widened deck will be supported by 18" square pre-stressed concrete piles. From this hydraulic analysis, it is shown that the proposed condition will be hydraulically equivalent to the existing condition for the 25, 50, 100, and 500 year storm events. The bridge abutments and wildlife shelves will be protected with FDOT standard bank and shore rubble riprap to prevent any scour issues.

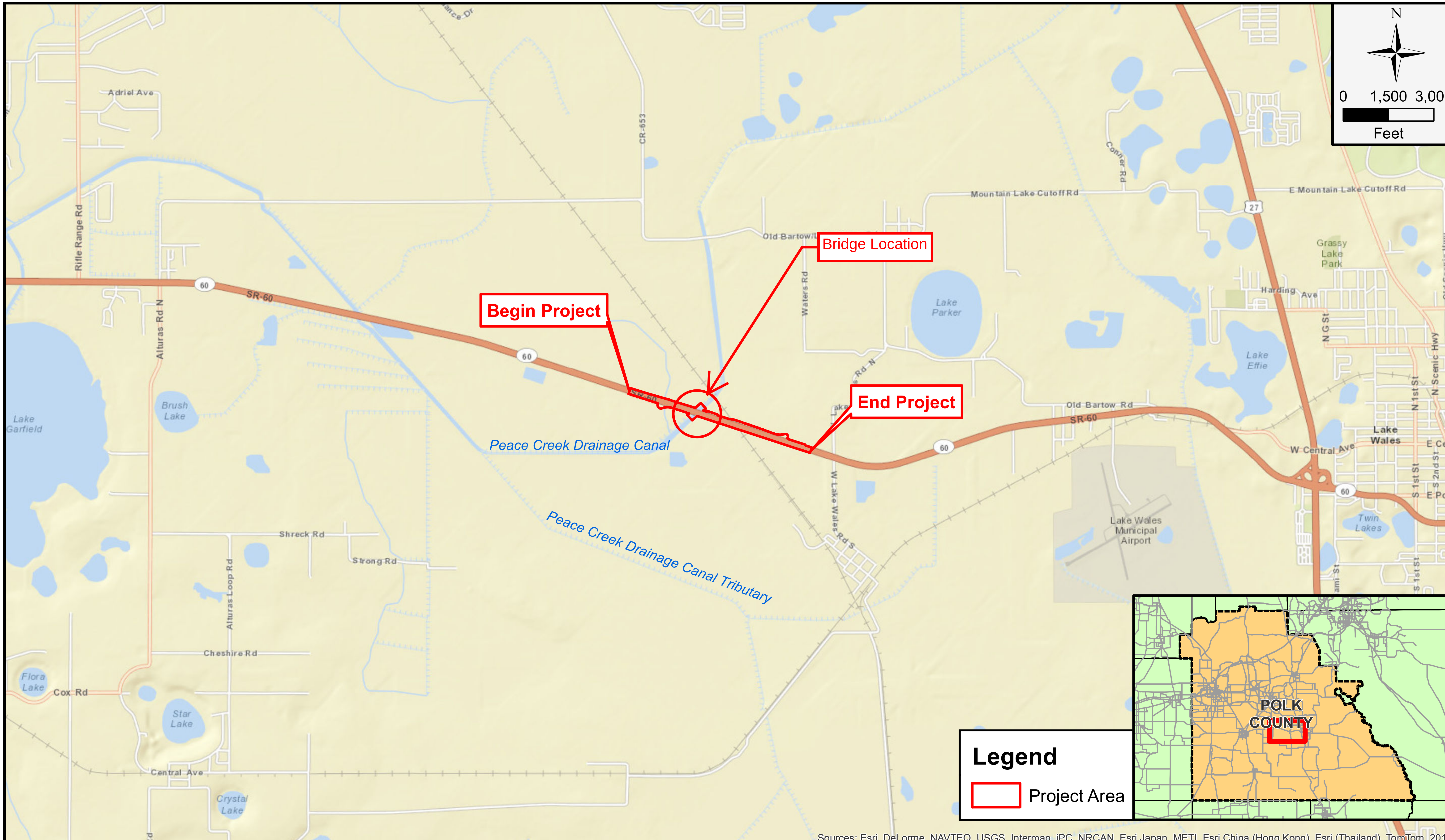
11 Materials and Documentation

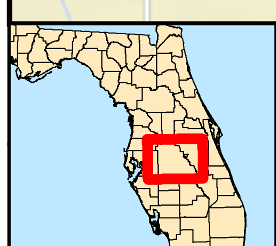
Data used in the Bridge Hydraulic Report was based on the following sources:

- Polk County LIDAR Contour Data
- FEMA FIRM Map, Community Panel No. 12105C0545H (Preliminary March 27, 2015)
- FEMA FIS, Polk County, FL, No. 12105CV001B (Effective September 28, 2012)
- Scour Evaluation Report, Phase 2, Bridge No. 160045, Prepared by URS, 5/29/2012
- Scour Evaluation Report, Phase 2, Bridge No. 160133, Prepared by Kimley-Horn and Associates, INC., 5/31/1996
- Field Review, September 22nd, 2015 (KCA)
- Survey performed by CivilSurv
- Bridge Development Report, SR 60 Grade Separation over CSX Railroad, Polk Co., FL, FPID: 436559-1-52-01, KCA, February 2016
- Peace Creek Watershed ICPR Model (Governing Board Approved), Prepared by Atkins for SWFWMD, March 2013
- Peace Creek Floodway HEC-RAS Model, Prepared by SWFWMD, August 2014
- Grain Size Distribution Report, Tierra
- FDOT Drainage Handbook – Bridge Hydraulics, July 2012
- FDOT Drainage Manual, January 2016
- FDOT Plans Preparation Manual, Volume I, Chapter 2, January 2016

APPENDIX A

Figures





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201 N. Franklin St, Suite 400
Tampa, FL 33602

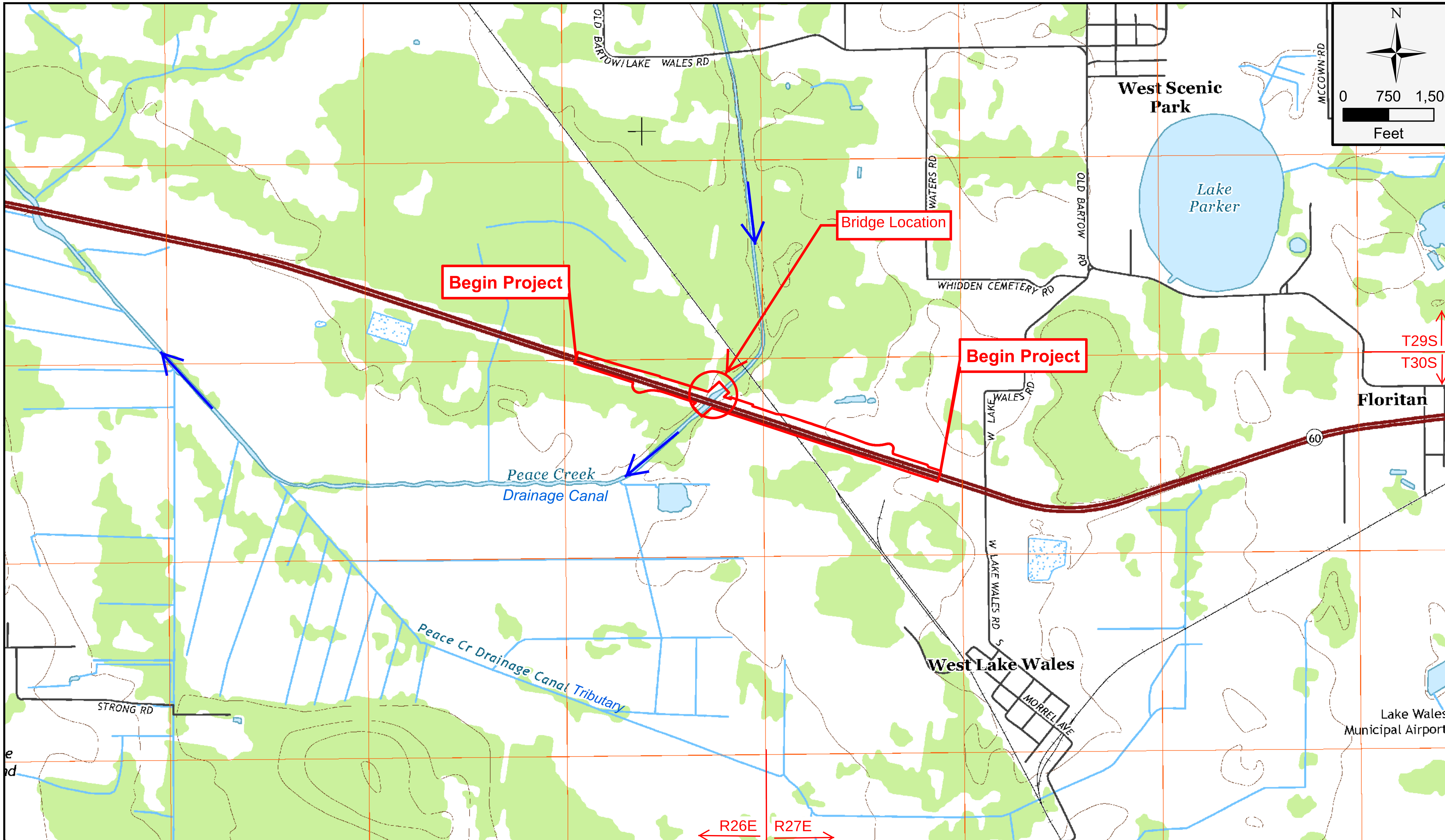
FDOT

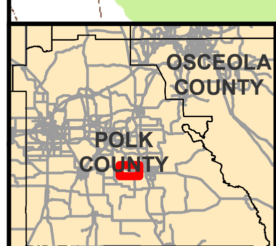
SR 60 over Peace Creek Drainage Canal West of the CSX Railroad
Polk County, Florida
Project Number: 436559-1-52-01

Project Location Map

Figure A-1

Path: H:\LOI_Prop_Present\FDOT\District_1\436559\15201_SR 60_CSX\GIS\Maps\Drainage Design Report Figures\SR 60 CSX - DDR- Project Location.mxd 2/7/2016





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FDOT

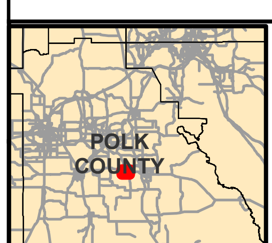
SR 60 over Peace Creek Drainage Canal West of the CSX Railroad
Polk County, Florida
Project Number: 436559-1-52-01

USGS Quadrangle Map

Figure A-2

Legend

13: SAMSULA MUCK
14: SPARR SAND, 0 TO 5 PERCENT SLOPES
15: TAVARES FINE SAND, 0 TO 5 PERCENT SLOPES
16: URBAN LAND
17: SMYRNA AND MYAKKA FINE SANDS
19: FLORIDANA MUCKY FINE SAND, DEPRESSIONAL
21: IMMOKALEE SAND
25: PLACID AND MYAKKA FINE SANDS, DEPRESSIONAL
31: ADAMSVILLE FINE SAND
32: KALIGA MUCK
33: HOLOPAW FINE SAND, DEPRESSIONAL
35: HONTOON MUCK
36: BASINGER MUCKY FINE SAND, DEPRESSIONAL
38: ELECTRA FINE SAND
40: WAUCHULA FINE SAND
42: FELDA FINE SAND
43: OLDSMAR FINE SAND
47: ZOLFO FINE SAND
7: POMONA FINE SAND
83: ARCHBOLD SAND, 0 TO 5 PERCENT SLOPES
87: BASINGER FINE SAND
99: WATER



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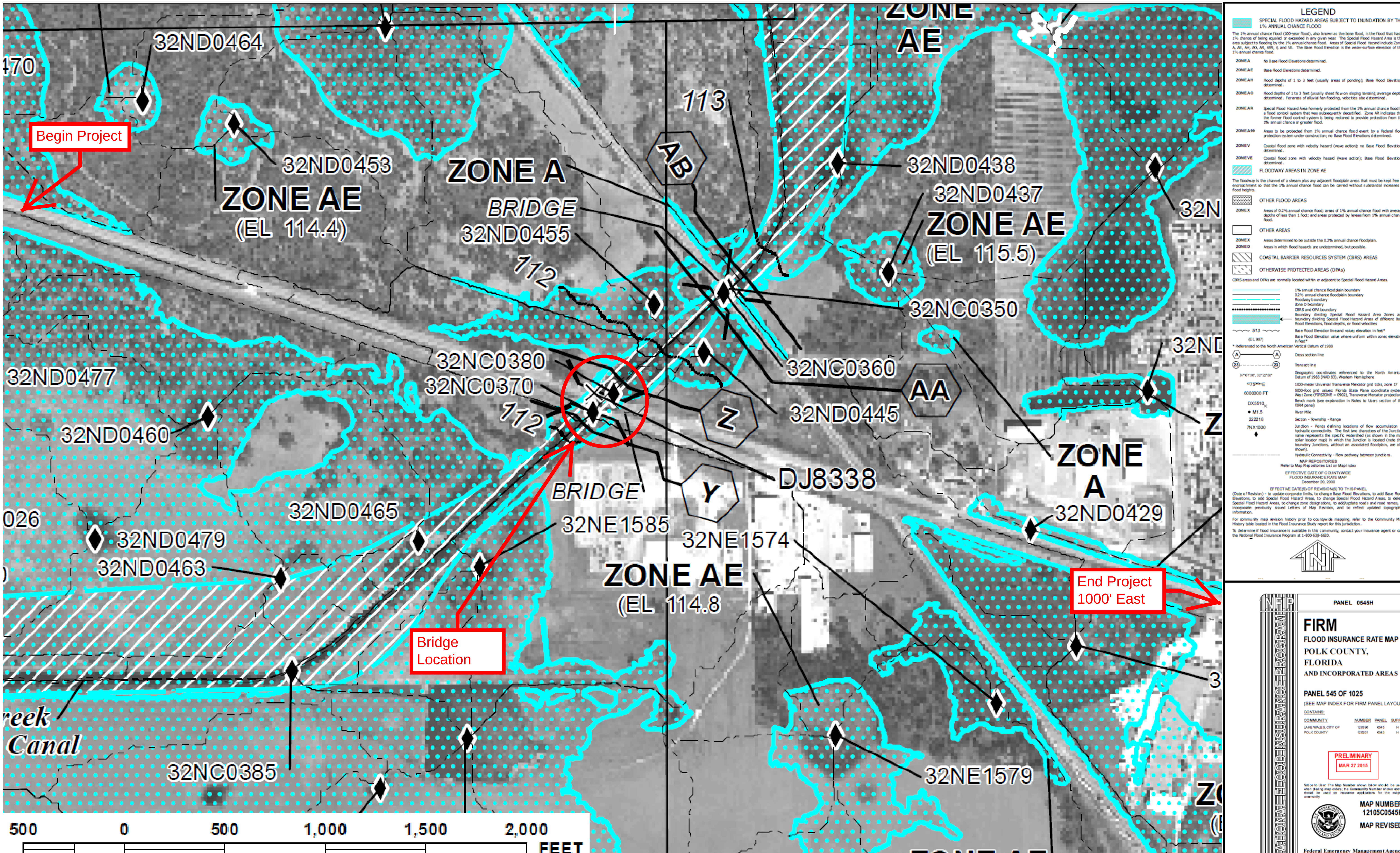
FDOT

SR 60 over Peace Creek Drainage Canal West of the CSX Railroad
Polk County, Florida
Project Number: 436559-1-52-01

NRCS Soils Map

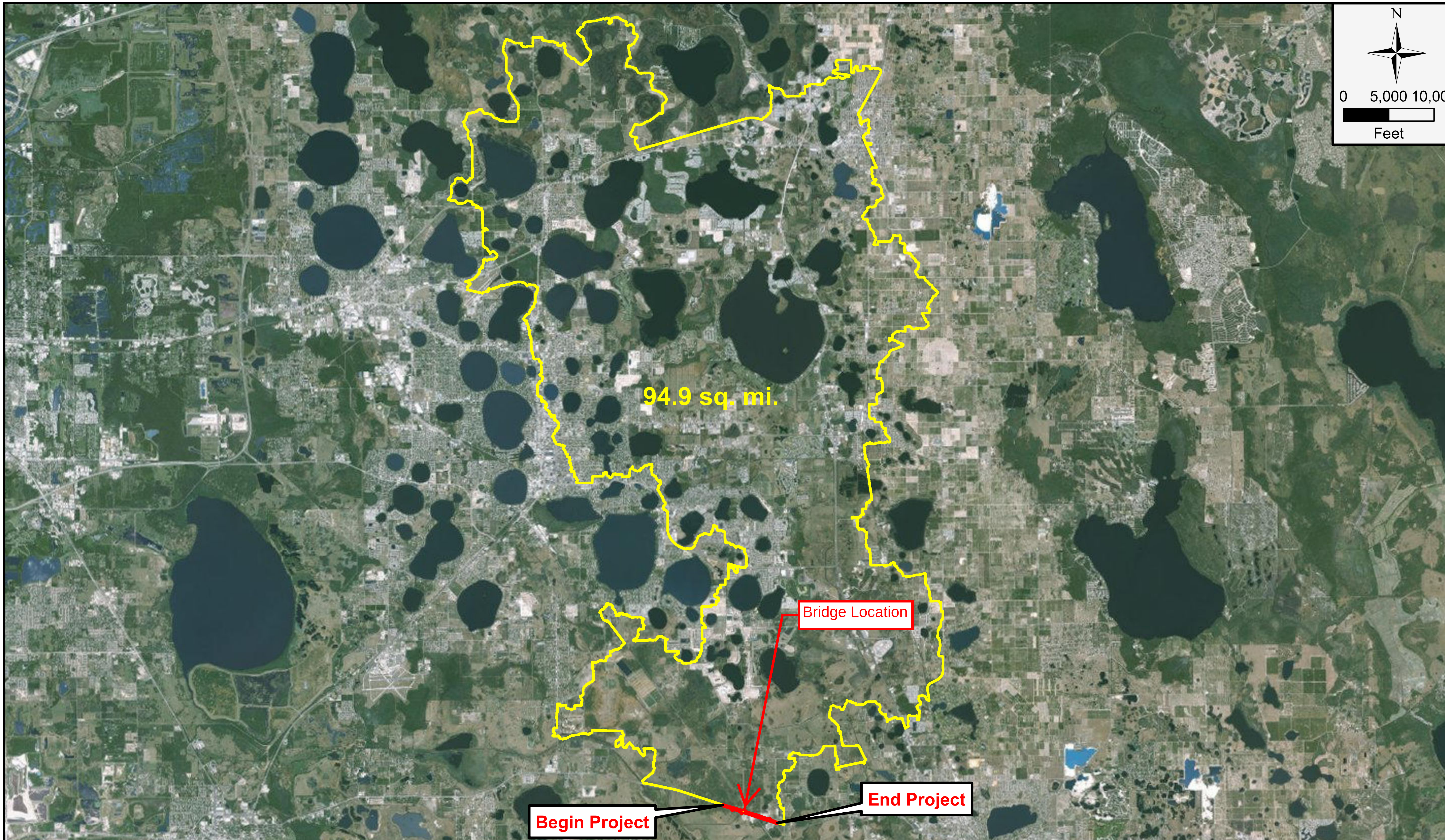
Figure A-3

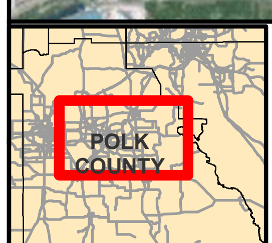
Path: H:\LOI_Prop_Present\FDOT\District_1\43655915201_SR 60_CSX\GIS\Maps\Drainage Design Report Figures\SR 60 CSX - DDR- Soils Map2.mxd 2/7/2016



Scale is approximate

FIGURE A-4: PRELIMINARY FEMA FIRM, MAP NUMBER 12105C0545H





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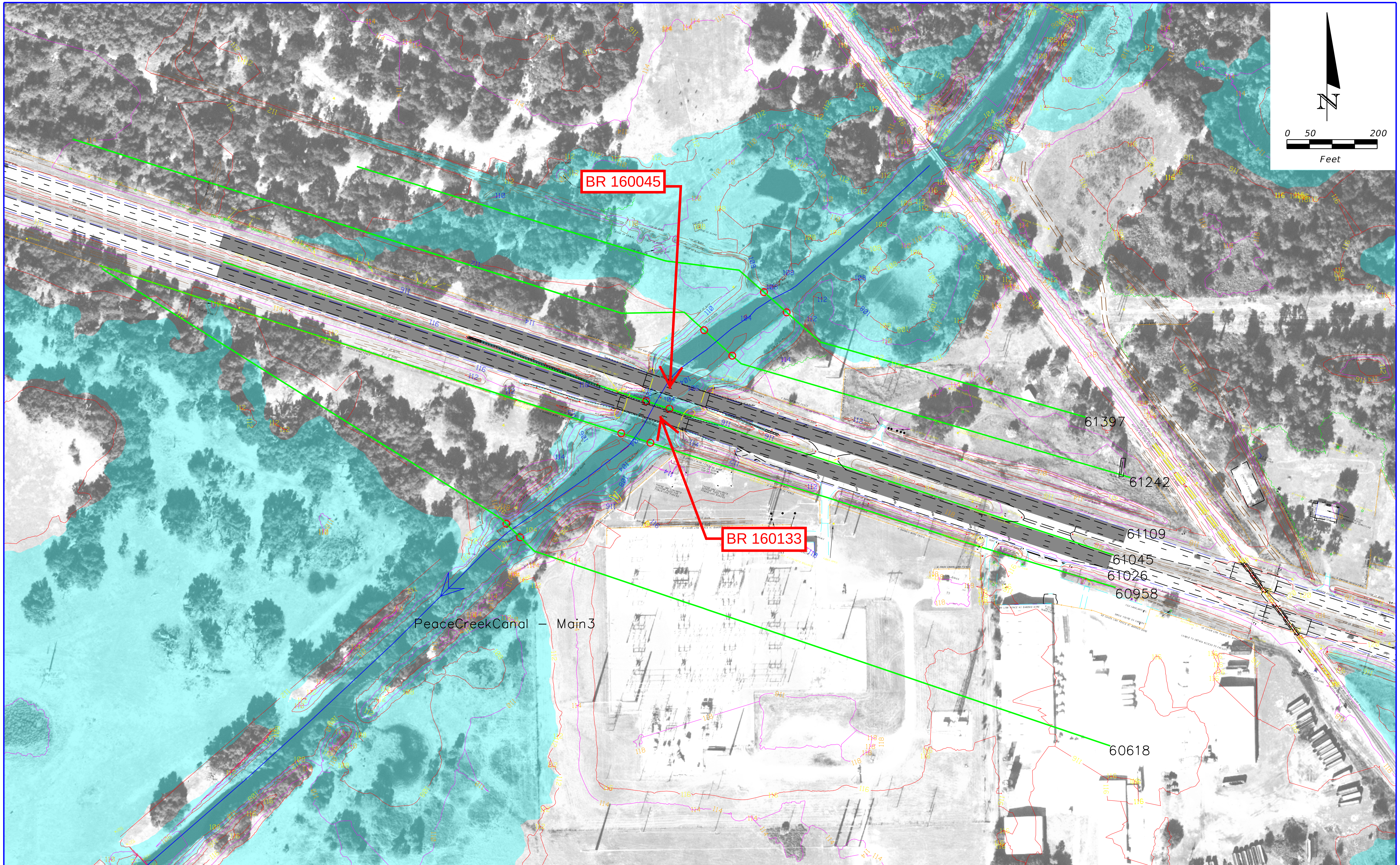
SR 60 over Peace Creek Drainage Canal West of the CSX Railroad Polk County, Florida
Project Number: 436559-1-52-01

Drainage Basin Map

Figure A-5

Path: H:\LOI_Prop_Present\FDOT\District_1\43655915201_SR 60_CSX\GIS\Maps\Drainage Design Report Figures\SR 60 CSX - Drainage Basin Map.mxd 3/18/2016



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

FIGURE A-6: HEC-RAS CROSS-SECTION MAP

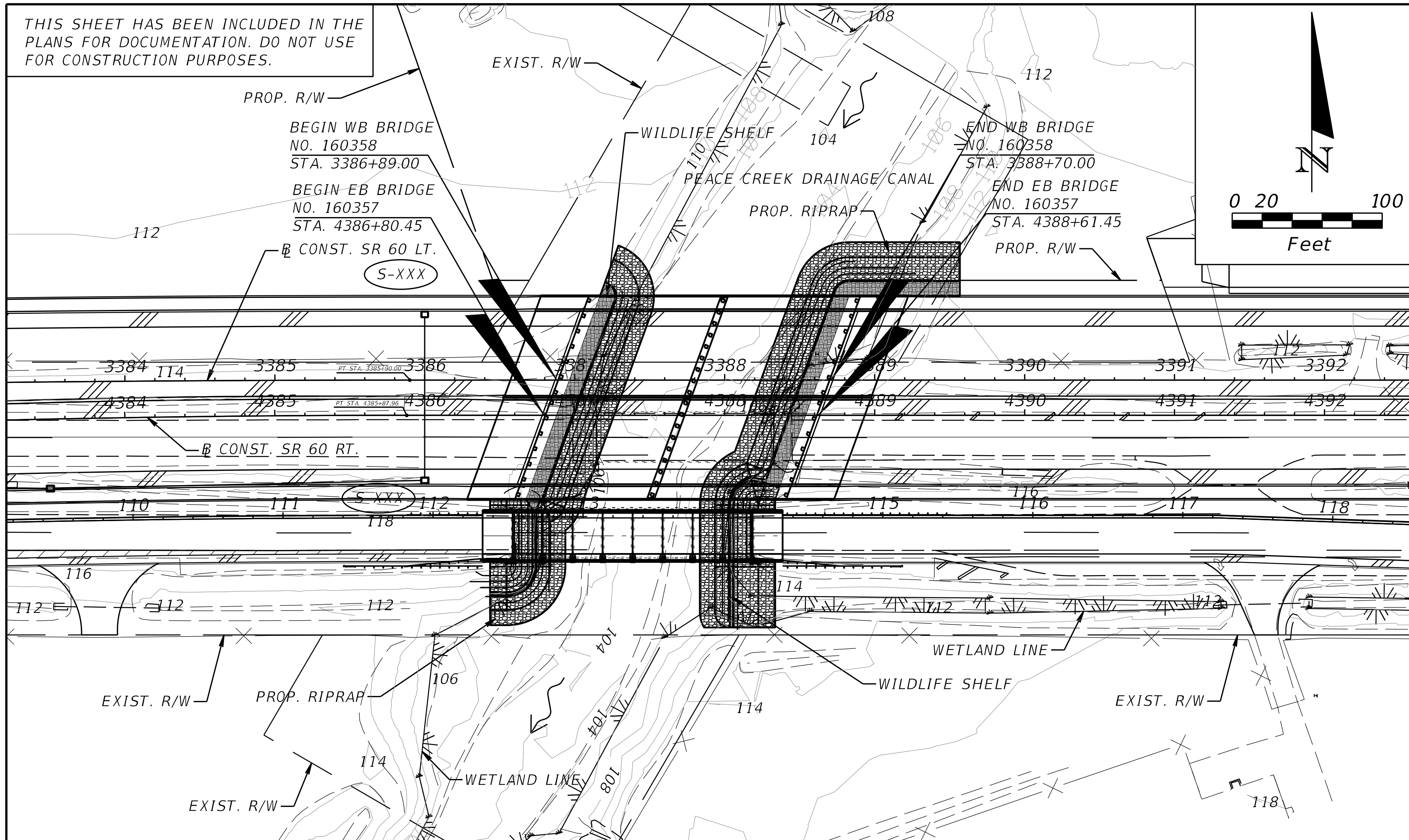
SHEET NO.

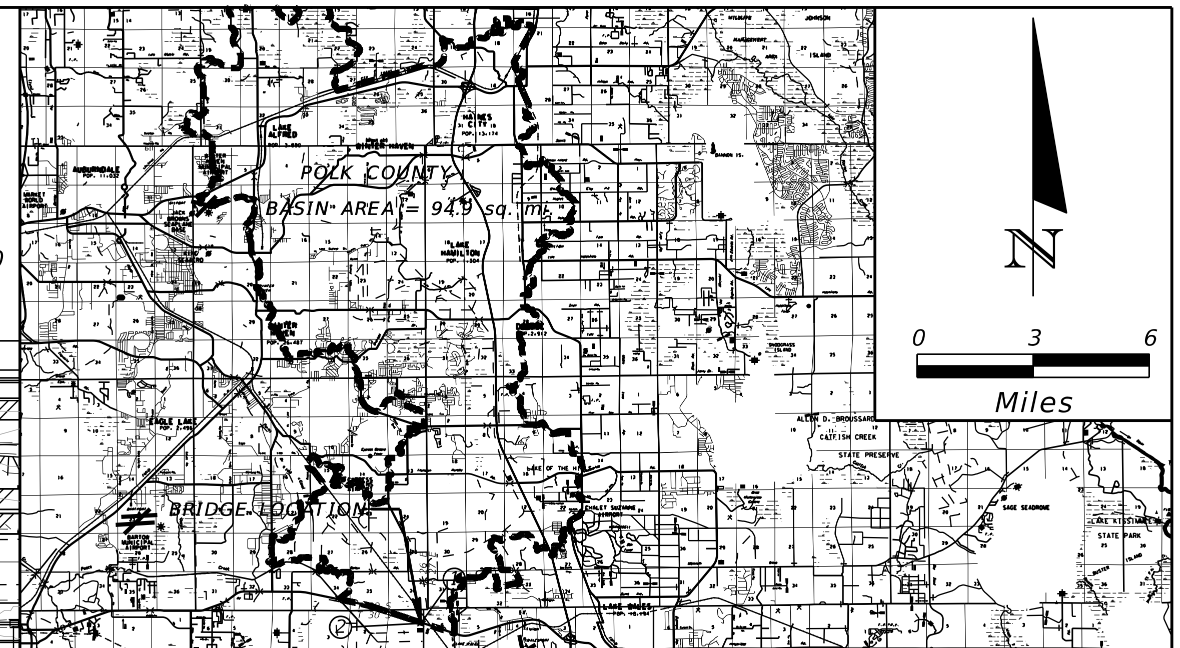
$USER$ $DATE$ $TIME$ $FILE$

APPENDIX B

Bridge Hydraulics Recommendations Sheet

THIS SHEET HAS BEEN INCLUDED IN THE PLANS FOR DOCUMENTATION. DO NOT USE FOR CONSTRUCTION PURPOSES.





	EXISTING STRUCTURES				PROPOSED STRUCT.
(REFERENCE)	SR 60 WB (1)	SR 60 EB (2)	(3)	(4)	SR 60 WB & EB
FOUNDATION	CONC. PILES	CONC. PILES			CONC. PILES
OVERALL LENGTH	150'	160'			181'-0"
SPAN LENGTH	15'-0"	20'-0"			90'-6"
TYPE CONSTRUCTION	CONCRETE	CONCRETE			CONCRETE
AREA OF OPENING@D.F.	836 SF	827 SF			870 SF
BRIDGE WIDTH	34'-1"	34'-3"			136'-6"
ELEV. LOW MEMBER	116.7'	116.2'			124.04'

HYDRAULIC DESIGN DATA

NOTE:
The hydraulic data is shown for informational purposes only to indicate the flood discharges and water surface elevations which may be anticipated in any given year. This data was generated using highly variable factors determined by a study of the watershed. Many judgements and assumptions are required to establish these factors. The resultant hydraulic data is sensitive to changes, particularly antecedent conditions, urbanization, channelization and land use. Users of this data are cautioned against the assumption of precision which cannot be obtained.

TERMS:
Design Flood: Utilized to assure a desired level of hydraulic performance.
Base Flood: Has a 1% chance of being exceeded in any given year (100 year frequency)
Overtopping Flood: Causes flow over the highway, over a watershed divide, or thru emergency relief structures.
Greatest Flood: The most severe that can be predicted where overtopping is not practicable.

WATER SURFACE ELEVATIONS: N.H.W. (Non-Tidal) 109.0' M.H.W. (Tidal) ____
CONTROL (Non-Tidal) ____ M.L.W. (Tidal) ____

FLOOD DATA:	MAX. EVENT OF RECORD	DESIGN FLOOD	BASE FLOOD	☐ OVERTOPPING or ☒ GREATEST FLOOD
STAGE ELEV. NAVD (ft)	UNKNOWN	112.3'	112.9'	113.8'
DISCHARGE (cfs)	UNKNOWN	1223	1448	1808
AVERAGE VELOCITY (f/s)	UNKNOWN	1.4	1.5	1.7
EXCEEDANCE PROB. (%)	UNKNOWN	2.0	1.0	0.2
FREQUENCY (yr.)	UNKNOWN	50 YR	100 YR	500 YR

SCOUR PREDICTIONS FOR PROPOSED STRUCTURE DESCRIBED ABOVE:

PIER INFORMATION			TOTAL SCOUR ELEVATION	
NUMBERS	SIZE AND TYPE	LONG TERM SCOUR ELEV.	WORST CASE < 100 yr. FREQ. (yr.) 100	WORST CASE < 500 yr. FREQ. (yr.) 500
BENT 2	24" SQUARE PRE-STRESSED CONC. PILES	101.2'	95.8'	96.7'

HYDRAULIC RECOMMENDATIONS

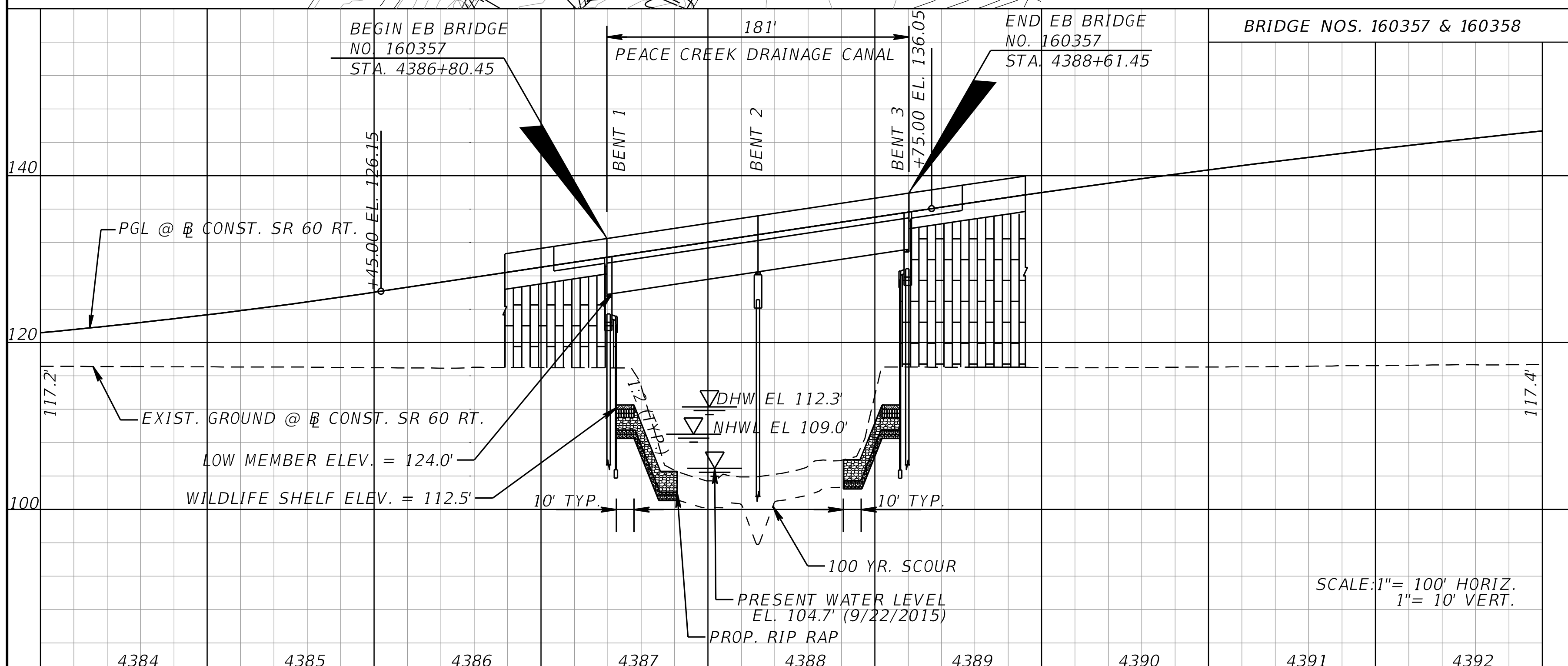
1. BEGIN BRIDGE STATION 4386+80.45 END BRIDGE STATION 4388+61.45 SKEW ANGLE 20°
2. CLEARANCE PROVIDED: NAV: HORIZ. N/A VERT. N/A ABOVE EL. N/A DRIFT: HORIZ. 73'-4" VERT. 11.7' ABOVE EL. 112.3'
3. MINIMUM CLEARANCE: NAV: HORIZ. N/A VERT. N/A ABOVE EL. N/A DRIFT: HORIZ. N/A VERT. 2.0' ABOVE EL. 112.3'
4. ABUTMENTS:

	BEGIN BRIDGE	END BRIDGE
RUBBLE GRADE:	BANK AND SHORE	BANK AND SHORE
SLOPE:	1:2	1:2
BURIED OR NON-BURIED HORIZ. TOE:	BURIED	BURIED
TOE HORIZ. DISTANCE:	10' (MIN.)	10' (MIN.)
LIMIT OF PROTECTION:	36' LT. & RT. (MIN.)	36' LT. & RT. (MIN.)

5. DECK DRAINAGE: SPREAD IS CONTAINED IN SHOULDER. RUNOFF IS CAPTURED BY BW INLETS AT BRIDGE APPROACHES.

REMARKS: ALL ELEVATIONS ARE BASED ON NAVD 88 DATUM

BRIDGE NOS. 160357 & 160358



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REVISIONS			
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Kisinger Campo & Associates Corp.
201 N. Franklin Street, Suite 400
Tampa, Florida 33602
Florida Certificate of Authorization No. 02317
Engineer of Record: Ali Tayebnejad, P.E.
P.E. No.: 42775

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
60	POLK	436559-1-52-01

BRIDGE HYDRAULIC RECOMENDATIONS

SHEET NO. B-1

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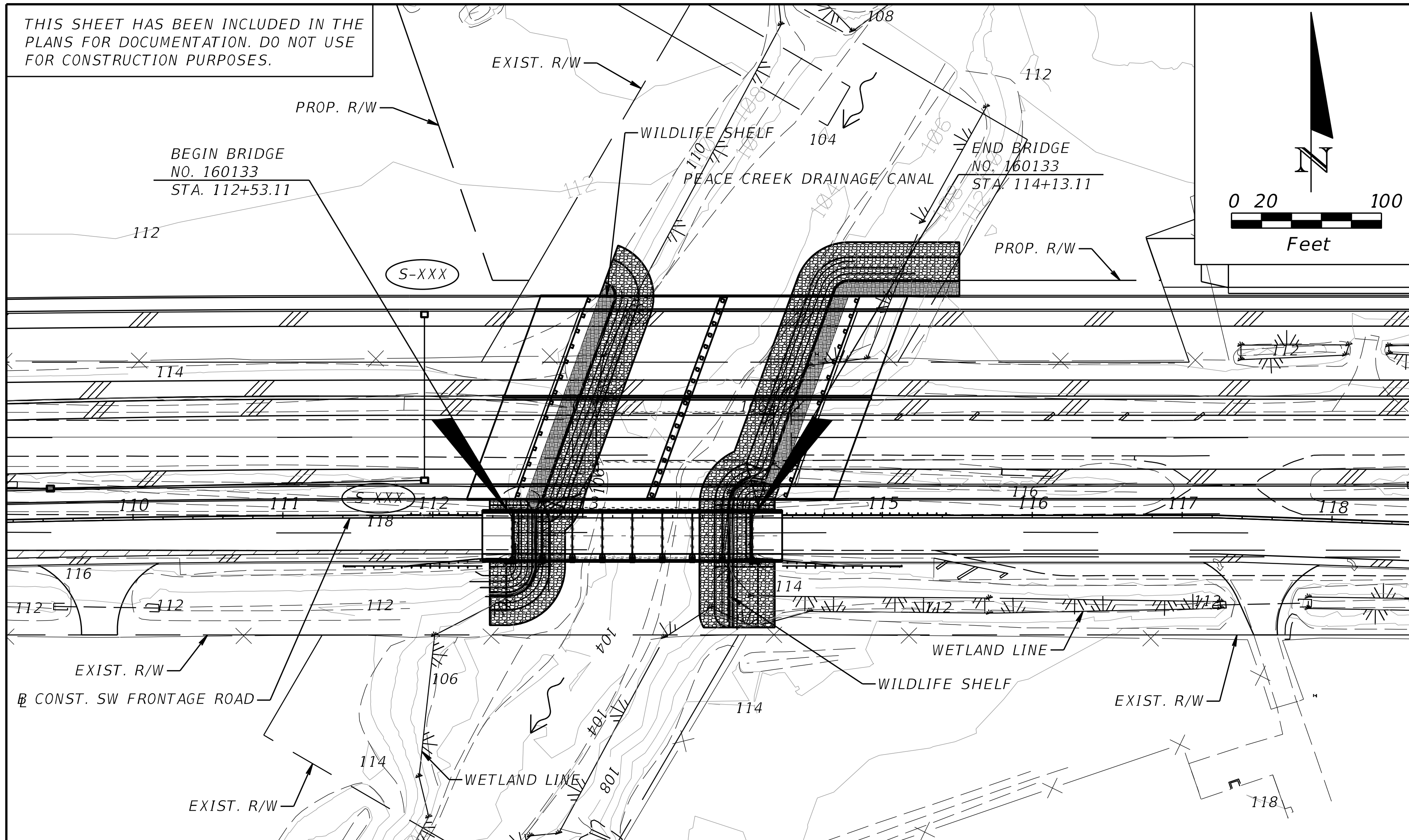
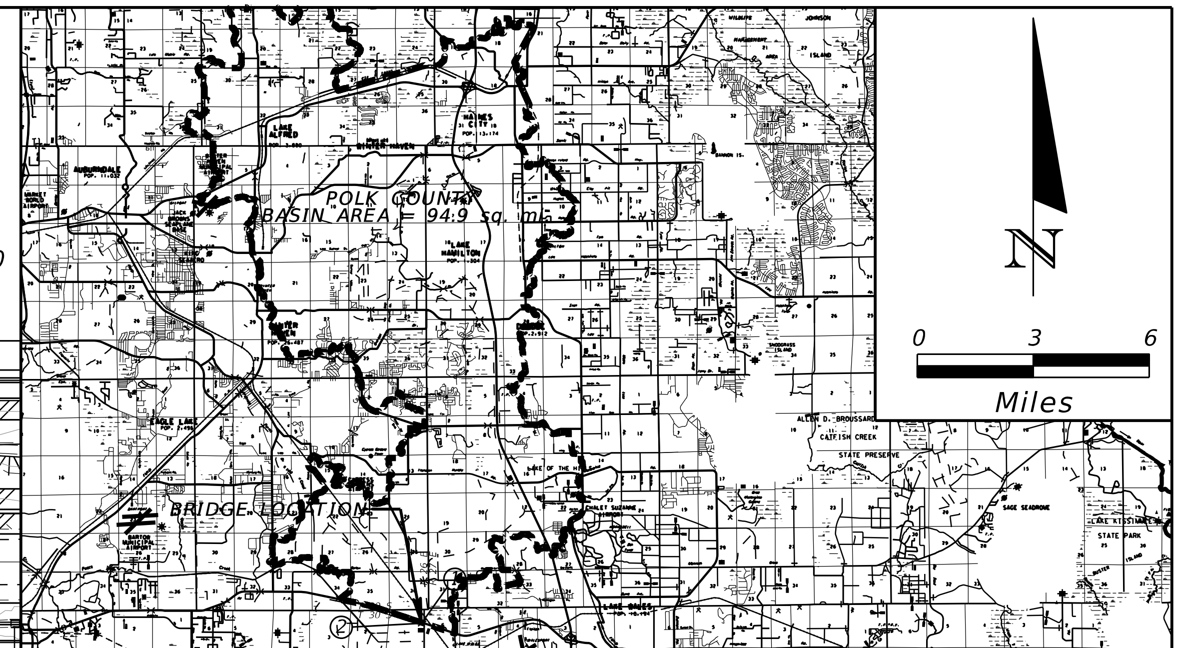




	EXISTING STRUCTURES				PROPOSED STRUCT.
(REFERENCE)	SR 60 WB (1)	SR 60 EB (2)	(3)	(4)	SAME AS (2)
FOUNDATION	CONC. PILES	CONC. PILES-14"			CONC. PILES-18"
OVERALL LENGTH	150'	160'			160'
SPAN LENGTH	15'-0"	20'-0"			20'-0"
TYPE CONSTRUCTION	CONCRETE	CONCRETE			CONCRETE
AREA OF OPENING@D.F.	836 SF	827 SF			827 SF
BRIDGE WIDTH	34'-1"	34'-3"			35'-1"
ELEV. LOW MEMBER	116.7'	116.2'			116.2'

HYDRAULIC DESIGN DATA

NOTE:
The hydraulic data is shown for informational purposes only to indicate the flood discharges and water surface elevations which may be anticipated in any given year. This data was generated using highly variable factors determined by a study of the watershed. Many judgements and assumptions are required to establish these factors. The resultant hydraulic data is sensitive to changes, particularly antecedent conditions, urbanization, channelization and land use. Users of this data are cautioned against the assumption of precision which cannot be obtained.

TERMS:
Design Flood: Utilized to assure a desired level of hydraulic performance.
Base Flood: Has a 1% chance of being exceeded in any given year (100 year frequency)
Overtopping Flood: Causes flow over the highway, over a watershed divide, or thru emergency relief structures.
Greatest Flood: The most severe that can be predicted where overtopping is not practicable.

WATER SURFACE ELEVATIONS: N.H.W. (Non-Tidal) 109.0' M.H.W. (Tidal) ____
CONTROL (Non-Tidal) ____ M.L.W. (Tidal) ____

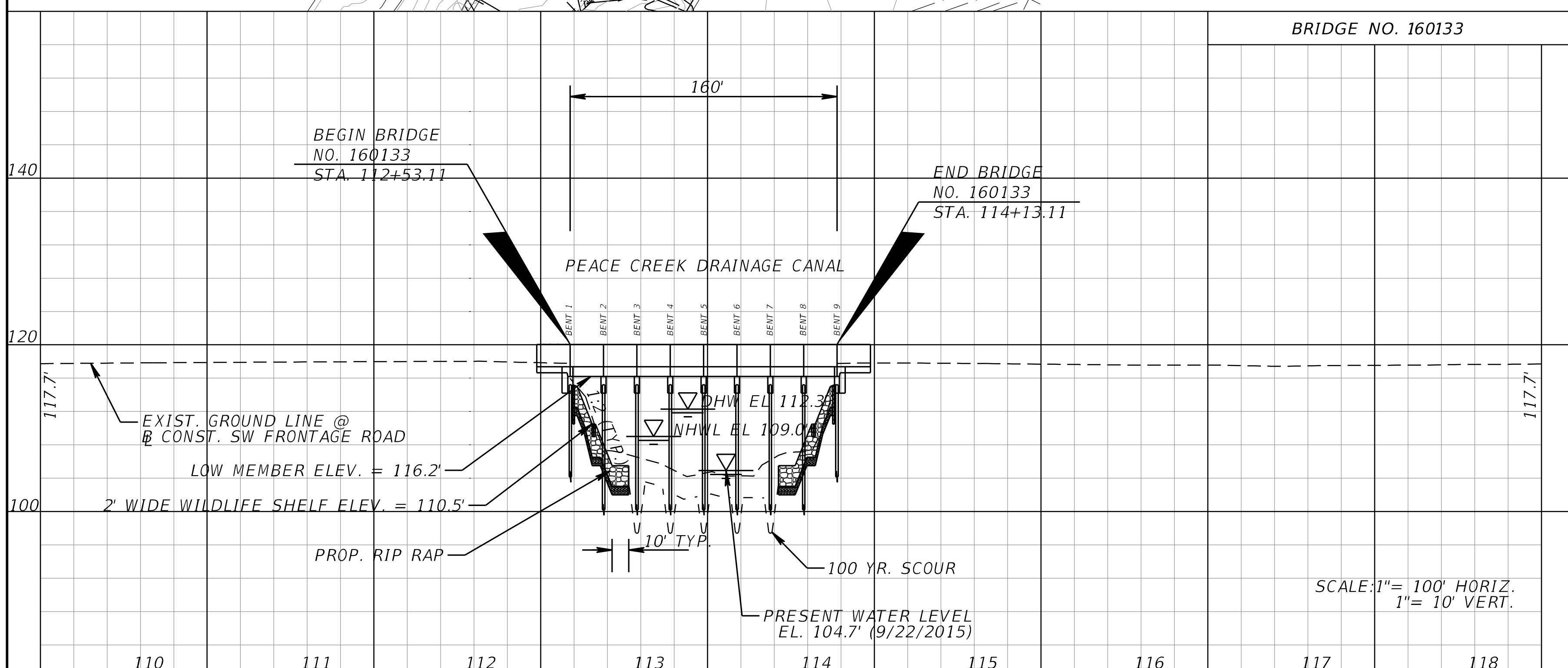
☐ OVERTOPPING or
☒ GREATEST FLOOD

FLOOD DATA:	MAX. EVENT OF RECORD	DESIGN FLOOD	BASE FLOOD	GREATEST FLOOD
STAGE ELEV. NAVD (ft)	UNKNOWN	112.3'	112.9'	113.8'
DISCHARGE (cfs)	UNKNOWN	1223	1448	1808
AVERAGE VELOCITY (f/s)	UNKNOWN	1.6	1.7	1.9
EXCEEDANCE PROB. (%)	UNKNOWN	2.0	1.0	0.2
FREQUENCY (yr.)	UNKNOWN	50 YR	100 YR	500 YR

SCOUR PREDICTIONS FOR PROPOSED STRUCTURE DESCRIBED ABOVE:

PIER INFORMATION NUMBERS	PIER INFORMATION SIZE AND TYPE	LONG TERM SCOUR ELEV.	TOTAL SCOUR ELEVATION WORST CASE < 100 yr. FREQ. (yr.) 100	TOTAL SCOUR ELEVATION WORST CASE < 500 yr. FREQ. (yr.) 500
BENT 3 to 7	18" SQUARE PRE-STRESSED CONC. PILES	101.2'	97.4'	96.9'

BRIDGE NO. 160133



HYDRAULIC RECOMMENDATIONS

1. BEGIN BRIDGE STATION 112+53.11 END BRIDGE STATION 114+53.11 SKEW ANGLE 0°
2. CLEARANCE PROVIDED: NAV: HORIZ. N/A VERT. N/A ABOVE EL. N/A DRIFT: HORIZ. 18'-6" VERT. 3.9' ABOVE EL. 112.3'
3. MINIMUM CLEARANCE: NAV: HORIZ. N/A VERT. N/A ABOVE EL. N/A DRIFT: HORIZ. N/A VERT. 2.0' ABOVE EL. 112.3'
4. ABUTMENTS:

	BEGIN BRIDGE	END BRIDGE
RUBBLE GRADE:	BANK AND SHORE	BANK AND SHORE
SLOPE:	1:2	1:2
BURIED OR NON-BURIED HORIZ. TOE:	BURIED	BURIED
TOE HORIZ. DISTANCE:	10' (MIN.)	10' (MIN.)
LIMIT OF PROTECTION:	34' LT. & RT. (MIN.)	34' LT. & RT. (MIN.)

5. DECK DRAINAGE: SPREAD IS CONTAINED IN SHOULDER. RUNOFF IS DRAINED THROUGH SCUPPERS ON THE BRIDGE DECK.

REMARKS: ALL ELEVATIONS ARE BASED ON NAVD 88 DATUM

NOTICE: THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Kisinger Campo & Associates Corp.
201 N. Franklin Street, Suite 400
Tampa, Florida 33602
Florida Certificate of Authorization No. 02317
Engineer of Record: Ali Tayebnejad, P.E.
P.E. No.: 42775

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
60	POLK	436559-1-52-01

BRIDGE HYDRAULIC RECOMENDATIONS

SHEET NO.
B-2

$USERS $DATES $TIMES $FILES

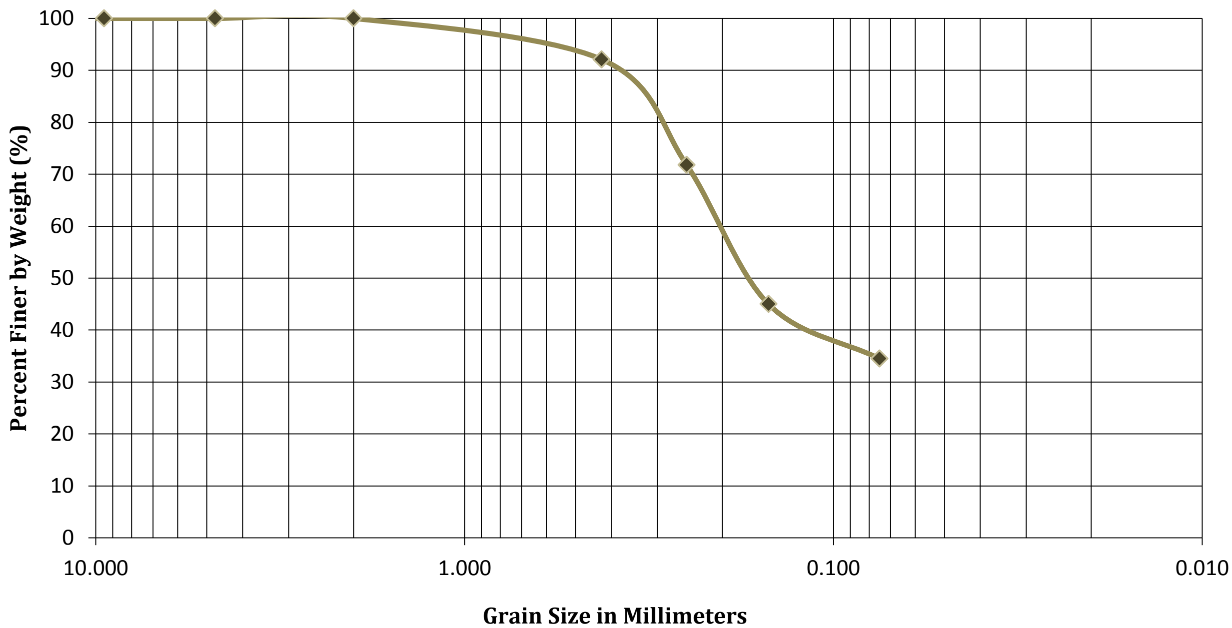
APPENDIX C

Geotechnical Engineering Data

Grain Size Distribution Report
SR 60 Grade Separation over CSX Railroad
Polk County, Florida
FPN: 436559-1-52-01
Tierra Project No.: 6511-15-022

Station	Depth (ft)
Sediment Sample - North Side of Peace Creek	0.5-1.0

Grain Size Distribution Curve



Material Description	Classification	
	USCS	AASHTO
Gray Silty Sand	SM	A-2-4

Sieve Number	Diameter (mm)	Percent Finer by Weight (%)
3/4"	19.000	100
3/8"	9.500	100
4	4.750	100
10	2.000	100
40	0.425	92
60	0.250	72
100	0.150	45
200	0.075	35

Coefficients

D_{10}	N/A	D_{30}	N/A
D_{50}	*0.165*	D_{60}	0.200
D_{85}	0.353	D_{90}	0.402
D_{95}	0.750	D_{80}	0.310
C_U	N/A	C_C	N/A

Grain Size Distribution Report
SR 60 Grade Separation over CSX Railroad
Polk County, Florida
FPN: 436559-1-52-01
Tierra Project No.: 6511-15-022

Station	Depth (ft)
Sediment Sample - South Side of Peace Creek	0.5-1.0

Grain Size Distribution Curve

Material Description	Classification	
	USCS	AASHTO
Brown to Dark Brown Sand	SP	A-3

Sieve Number	Diameter (mm)	Percent Finer by Weight (%)
3/4"	19.000	100
3/8"	9.500	100
4	4.750	100
10	2.000	100
40	0.425	77
60	0.250	19
100	0.150	2
200	0.075	1

Coefficients

D_{10}	0.190	D_{30}	0.276
D_{50}	*0.331*	D_{60}	0.363
D_{85}	0.719	D_{90}	1.011
D_{95}	1.422	D_{80}	0.511
C_U	1.909	C_C	1.101

TIERRA
GEOTECHNICAL • MATERIALS
ENVIRONMENTAL • ENGINEERING

APPENDIX D

Hydrology Calculations

Table D-1: Maximum Stages*

Node	25y5d	50y5d	100y5d	500y5d
NC0380	111.05	111.38	111.94	112.90
NC0385	110.81	111.25	111.84	112.83

*Values are from the Peace Creek Watershed ICPR Model (refer to Appendix D, page D-2)

Table D-2: Maximum Flowrates*

Link	25y5d	50y5d	100y5d	500y5d	Notes
RC0370A	1057.3	1222.87	1448.22	1808.14	From Node C0360 to Node C0370

*Values are from the Peace Creek Watershed ICPR Model (refer to Appendix D, page D-3)

Table D-3: Design Parameters

Storm	25y5d	50y5d	100y5d	500y5d
Flowrate (CFS)	1057	1223	1448	1808
Tailwater (FT)*	111.00	111.35	111.92	112.89

*Tailwater values interopolated using Table D-1: Maximum Stage values and distances below

Distance between nodes NC0380 and NC0385 = 1920'
Distance between XS 60618 and node NC0385 = 1532'

Table D-4: FEMA FIS Parameters*

Storm	10 Year	50 Year	100 Year	500 Year
Flowrate (CFS)	903	1356	1591	2136

*Refer to Appendix I, page I-35.

Node Maximum Conditions Report

Name	Group	Simulation	Max Time Stage hrs	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Time Inflow hrs	Max Inflow cfs	Max Time Outflow hrs	Max Outflow cfs
NC0380	C	PC100y5d	96.42	111.94	109.89	-0.0000	120648	62.05	1312.56	62.09	1311.66
NC0385	C	PC100y5d	96.62	111.84	109.81	-0.0000	377500	60.99	993.14	61.03	985.27
NC0380	C	PC25y5d	96.32	111.05	109.89	0.0004	112419	62.43	1083.26	62.47	1083.22
NC0385	C	PC25y5d	97.43	110.81	109.81	0.0003	321925	61.88	942.89	62.01	939.97
NC0380	C	PC500y5d	96.25	112.90	109.89	0.0003	139605	61.54	1419.43	61.56	1417.75
NC0385	C	PC500y5d	96.32	112.83	109.81	0.0002	396626	60.09	997.95	60.15	980.50
NC0380	C	PC50y5d	96.44	111.38	109.89	0.0004	115426	62.20	1208.00	62.27	1207.11
NC0385	C	PC50y5d	96.83	111.25	109.81	0.0003	365129	61.18	972.42	61.41	967.48

Interconnected Channel and Pond Routing Model (ICPR) ©2002 Streamline Technologies, Inc.

Link Maximum Conditions Report

Name	Group	Simulation	Max Time Flow hrs	Max Flow cfs	Max Delta Q cfs	Max Time US Stage hrs	Max US Stage ft	Max Time DS Stage hrs	Max DS Stage ft
RC0370A	C	PC100y5d	62.24	1448.22	776.120	96.35	111.98	96.42	111.94
RC0370A	C	PC25y5d	62.47	1057.30	69.912	96.29	111.07	96.32	111.05
RC0370A	C	PC500y5d	62.18	1808.14	69.912	96.24	112.94	96.25	112.90
RC0370A	C	PC50y5d	62.34	1222.87	69.912	96.33	111.41	96.44	111.38

APPENDIX E

Hydraulic Calculations

Cross-Section Location

Calculations

KISINGER CAMPO & ASSOCIATES

Job:	SR 60 over CSX Railroad	**Computed By:**	BAF	**Date:**	2/4/2016
Bridge #:	160045	**Checked By:**	TKS	**Date:**	5/13/2016
Water Body:	Peace Creek Canal				

HEC-RAS Cross-Section Location Calculations

Floodplain width directly upstream of bridge, B =	700 ft
Width of bridge opening, b =	120 ft
Bridge skew angle, Θ° =	0 deg
Effective width of bridge opening, W_b = cosΘ*b =	120 ft
Average length of obstruction, L_{obs} = (B - b)/2 =	290 ft
b/B =	0.17

USGS Manning's Determinaion

Manning's in channel

$$n=(n_b+n_1+n_2+n_3+n_4)m \qquad (3)$$

where

n_b = a base value of n for a straight, uniform, smooth channel in natural materials,

n_1 = a correction factor for the effect of surface irregularities,

n_2 = a value for variations in shape and size of the channel cross section,

n_3 = a value for obstructions,

n_4 = a value for vegetation and flow conditions, and

m = a correction factor for meandering of the channel.

n_b =	0.012	Refer to Table 1 tab
n_1 =	0.005	Refer to Table 2 tab
n_2 =	0.005	Refer to Table 2 tab
n_3 =	0.001	Refer to Table 2 tab
n_4 =	0.012	Refer to Table 2 tab
m =	1	Refer to Table 2 tab
n_c =	0.035	

KISINGER CAMPO & ASSOCIATES

Job:	SR 60 over CSX Railroad	**Computed By:**	BAF	**Date:**	2/4/2016
Bridge #:	160045	**Checked By:**	TKS	**Date:**	5/13/2016
Water Body:	Peace Creek Canal				

Manning's for flood plain

$$n=(n_b+n_1+n_2+n_3+n_4)m \qquad (6)$$

where

n_b = a base value of n for the flood plain's natural bare soil surface,
n_1 = a correction factor for the effect of surface irregularities on the flood plain,
n_2 = a value for variations in shape and size of the flood-plain cross section, assumed to equal 0.0,
n_3 = a value for obstructions on the flood plain,
n_4 = a value for vegetation on the flood plain, and
m = a correction factor for sinuosity of the flood plain, equal to 1.0.

n_b =	0.012	Refer to Table 1 tab
n_1 =	0.018	Refer to Table 3 tab
n_2 =	0	Refer to Table 3 tab
n_3 =	0.01	Refer to Table 3 tab
n_4 =	0.06	Refer to Table 3 tab
m =	1	Refer to Table 3 tab
n_{ob} =	0.100	

n_{ob}/n_c = 2.9

Channel Slope Calculation

Upstream channel elevation, US EL = 104.3

Downstream channel elevation, DS EL = 103.4

Distance between elevations, L = 800 ft

Slope = (US EL - DS EL)/L * (5280ft/mi) = 6 ft/mi

Expansion Reach Determination

Expansion Reach, ER = 1.3 Refer to Table 6-1 tab

Cross-section Location Determination

Cross-section 1 location

L_e = ER * L_{obs} = **377 ft** Refer to Figure 6-11 tab

Cross-section 4 location

L_c = L_{obs} = **290 ft** Refer to Figure 6-11 tab

Table 1. Base values of Manning's *n*

[Modified from Aldridge and Garrett, 1973, table 1; —, no data]

Bed material	Median size of bed material (in millimeters)	Base *n* value: Straight uniform channel[1]	Base *n* value: Smooth channel[2]
Sand channels			
Sand[3]	0.2	0.012	—
	.3	.017	—
	.4	.020	—
	.5	.022	—
	.6	.023	—
	.8	.025	—
	1.0	.026	—
Stable channels and flood plains			
Concrete	—	0.012–0.018	0.011
Rock cut	—	—	.025
Firm soil	—	0.025–0.032	.020
Coarse sand	1–2	0.026–0.035	—
Fine gravel	—	—	.024
Gravel	2–64	0.028–0.035	—
Coarse gravel	—	—	.026
Cobble	64–256	0.030–0.050	—
Boulder	>256	0.040–0.070	—

[1] Benson and Dalrymple (1967).

[2] For indicated material; Chow (1959).

[3] Only for upper regime flow where grain roughness is predominant.

Table 2. Adjustment values for factors that affect the roughness of a channel
[Modified from Aldridge and Garrett, 1973, table 2]

Channel conditions		n value adjustment[1]	Example
Degree of irregularity (n_1)	Smooth	0.000	Compares to the smoothest channel attainable in a given bed material.
	Minor	0.001–0.005	Compares to carefully dredged channels in good condition but having slightly eroded or scoured side slopes.
	Moderate	0.006–0.010	Compares to dredged channels having moderate to considerable bed roughness and moderately sloughed or eroded side slopes.
	Severe	0.011–0.020	Badly sloughed or scalloped banks of natural streams; badly eroded or sloughed sides of canals or drainage channels; unshaped, jagged, and irregular surfaces of channels in rock.
Variation in channel cross section (n_2)	Gradual	0.000	Size and shape of channel cross sections change gradually.
	Alternating occasionally	0.001–0.005	Large and small cross sections alternate occasionally, or the main flow occasionally shifts from side to side owing to changes in cross-sectional shape.
	Alternating frequently	0.010–0.015	Large and small cross sections alternate frequently, or the main flow frequently shifts from side to side owing to changes in cross-sectional shape.
Effect of obstruction (n_3)	Negligible	0.000–0.004	A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, that occupy less than 5 percent of the cross-sectional area.
	Minor	0.005–0.015	Obstructions occupy less than 15 percent of the cross-sectional area, and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction. Smaller adjustments are used for curved smooth-surfaced objects than are used for sharp-edged angular objects.
	Appreciable	0.020–0.030	Obstructions occupy from 15 to 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause the effects of several obstructions to be additive, thereby blocking an equivalent part of a cross section.
	Severe	0.040–0.050	Obstructions occupy more than 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause turbulence across most of the cross section.
Amount of vegetation (n_4)	Small	0.002–0.010	Dense growths of flexible turf grass, such as Bermuda, or weeds growing where the average depth of flow is at least two times the height of the vegetation; supple tree seedlings such as willow, cottonwood, arrowweed, or saltcedar growing where the average depth of flow is at least three times the height of the vegetation.
	Medium	0.010–0.025	Turf grass growing where the average depth of flow is from one to two times the height of the vegetation; moderately dense stemmy grass, weeds, or tree seedlings growing where the average depth of flow is from two to three times the height of the vegetation; brushy, moderately dense vegetation, similar to 1- to 2-year-old willow trees in the dormant season, growing along the banks, and no significant vegetation is evident along the channel bottoms where the hydraulic radius exceeds 2 ft.
	Large	0.025–0.050	Turf grass growing where the average depth of flow is about equal to the height of the vegetation; 8- to 10-year-old willow or cottonwood trees intergrown with some weeds and brush (none of the vegetation in foliage) where the hydraulic radius exceeds 2 ft; bushy willows about 1 year old intergrown with some weeds along side slopes (all vegetation in full foliage), and no significant vegetation exists along channel bottoms where the hydraulic radius is greater than 2 ft.
	Very large	0.050–0.100	Turf grass growing where the average depth of flow is less than half the height of the vegetation; bushy willow trees about 1 year old intergrown with weeds along side slopes (all vegetation in full foliage), or dense cattails growing along channel bottom; trees intergrown with weeds and brush (all vegetation in full foliage).
Degree of meandering[2] (m)	Minor	1.00	Ratio of the channel length to valley length is 1.0 to 1.2.
	Appreciable	1.15	Ratio of the channel length to valley length is 1.2 to 1.5.
	Severe	1.30	Ratio of the channel length to valley length is greater than 1.5.

[1] Adjustments for degree of irregularity, variations in cross section, effect of obstructions, and vegetation are added to the base n value (table 1) before multiplying by the adjustment for meander.

[2] Adjustment values apply to flow confined in the channel and do not apply where downvalley flow crosses meanders.

Table 3. Adjustment values for factors that affect roughness of flood plains
[Modified from Aldridge and Garrett, 1973, table 2]

Flood-plain conditions		*n* value adjustment	Example
Degree of irregularity (n_1)	Smooth	0.000	Compares to the smoothest, flattest flood plain attainable in a given bed material.
	Minor	0.001–0.005	Is a flood plain slightly irregular in shape. A few rises and dips or sloughs may be visible on the flood plain.
	Moderate	0.006–0.010	Has more rises and dips. Sloughs and hummocks may occur.
	Severe	0.011–0.020	Flood plain very irregular in shape. Many rises and dips or sloughs are visible. Irregular ground surfaces in pastureland and furrows perpendicular to the flow are also included.
Variation of flood-plain cross section (n_2)		0.0	Not applicable.
Effect of obstructions (n_3)	Negligible	0.000–0.004	Few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, or isolated boulders, occupy less than 5 percent of the cross-sectional area.
	Minor	0.005–0.019	Obstructions occupy less than 15 percent of the cross-sectional area.
	Appreciable	0.020–0.030	Obstructions occupy from 15 to 50 percent of the cross-sectional area.
Amount of vegetation (n_4)	Small	0.001–0.010	Dense growth of flexible turf grass, such as Bermuda, or weeds growing where the average depth of flow is at least two times the height of the vegetation, or supple tree seedlings such as willow, cottonwood, arrowweed, or saltcedar growing where the average depth of flow is at least three times the height of the vegetation.
	Medium	0.011–0.025	Turf grass growing where the average depth of flow is from one to two times the height of the vegetation, or moderately dense stemmy grass, weeds, or tree seedlings growing where the average depth of flow is from two to three times the height of the vegetation; brushy, moderately dense vegetation, similar to 1- to 2-year-old willow trees in the dormant season.
	Large	0.025–0.050	Turf grass growing where the average depth of flow is about equal to the height of the vegetation, or 8- to 10-year-old willow or cottonwood trees intergrown with some weeds and brush (none of the vegetation in foliage) where the hydraulic radius exceeds 2 ft, or mature row crops such as small vegetables, or mature field crops where depth of flow is at least twice the height of the vegetation.
	Very large	0.050–0.100	Turf grass growing where the average depth of flow is less than half the height of the vegetation, or moderate to dense brush, or heavy stand of timber with few down trees and little undergrowth where depth of flow is below branches, or mature field crops where depth of flow is less than the height of the vegetation.
	Extreme	0.100–0.200	Dense bushy willow, mesquite, and saltcedar (all vegetation in full foliage), or heavy stand of timber, few down trees, depth of flow reaching branches.
Degree of meander (m)		1.0	Not applicable.

Table 6-1 Ranges of Expansion Ratios

		nob / nc = 1	nob / nc = 2	nob / nc = 4
b/B = 0.10	S = 1 ft/mile	1.4 – 3.6	1.3 – 3.0	1.2 – 2.1
	5 ft/mile	1.0 – 2.5	0.8 – 2.0	0.8 – 2.0
	10 ft/mile	1.0 – 2.2	0.8 – 2.0	0.8 – 2.0
b/B = 0.25	S = 1 ft/mile	1.6 – 3.0	1.4 – 2.5	1.2 – 2.0
	5 ft/mile	1.5 – 2.5	1.3 – 2.0	1.3 – 2.0
	10 ft/mile	1.5 – 2.0	1.3 – 2.0	1.3 – 2.0
b/B = 0.50	S = 1 ft/mile	1.4 – 2.6	1.3 – 1.9	1.2 – 1.4
	5 ft/mile	1.3 – 2.1	1.2 – 1.6	1.0 – 1.4
	10 ft/mile	1.3 – 2.0	1.2 – 1.5	1.0 – 1.4

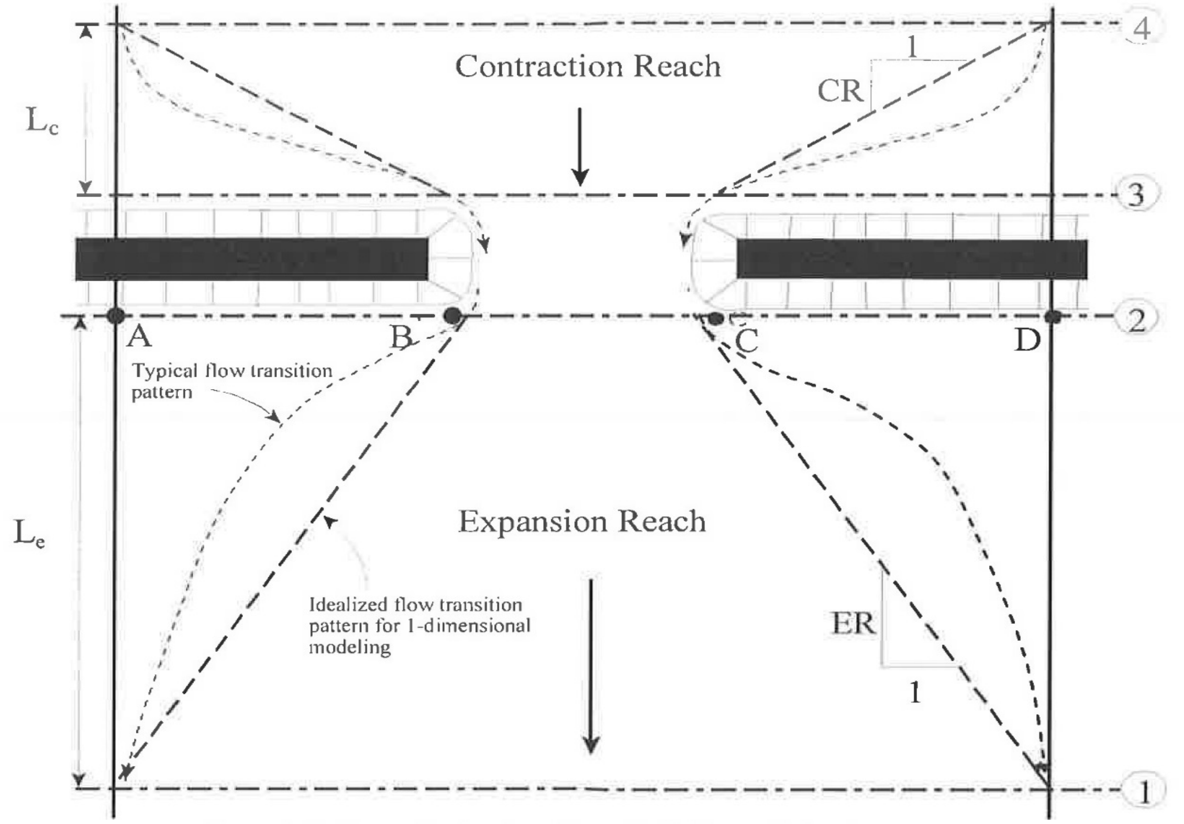


Figure 6-11 Cross Section Locations at a Bridge or Culvert

HEC-RAS

Existing Condition

SR 60 over PCDC.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X      X  XXXXXX    XXXX        XXXX       XX      XXXX
X      X  X        X    X       X   X     X  X    X
X      X  X        X            X   X    X    X   X
XXXXXXX   XXXX     X       XXX  XXXX     XXXXXX    XXXX
X      X  X        X            X  X     X    X        X
X      X  X        X    X       X   X    X    X        X
X      X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: SR 60 over PCDC
Project File : SR 60 over PCDC.prj
Run Date and Time: 5/6/2016 3:02:45 PM

Project in English units

Project Description:
CRS Info=<SpatialReference> <CoordinateSystem Code="3517"
Unit="US_survey_Foot" /> <Registration OffsetX="0" OffsetY="0" OffsetZ="0"
ScaleX="1" ScaleY="1" ScaleZ="1" /></SpatialReference>

PLAN DATA

Plan Title: Existing
Plan File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.p03

Geometry Title: Existing
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g04

Flow Title   : Flow Data
Flow File   : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Plan Summary Information:

```
Number of:  Cross Sections =    5    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    2    Lateral Structures =    0
```

Computational Information

```
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001
```

Computation Options
Critical depth computed only where necessary

SR 60 over PCDC.rep

Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow Data
Flow File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Flow Data (cfs)

River	Reach	RS	25 Year	50 Year	100 Year	500 Year
PeaceCreekCanal	Main3	61397	1057	1223	1448	1808

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
PeaceCreekCanal	Main3	25 Year		Known WS = 111
PeaceCreekCanal	Main3	50 Year		Known WS = 111.35
PeaceCreekCanal	Main3	100 Year		Known WS = 111.92
PeaceCreekCanal	Main3	500 Year		Known WS = 112.89

GEOMETRY DATA

Geometry Title: Existing
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g04

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61397

INPUT
Description:
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	33.22	115	52.93	114.33	78.28	114.27	102.48	114.89
119.95	114.94	191.95	113.92	215.3	114.04	290.03	114	334.6	113.44
347.36	113.67	383.17	112.9	403.15	112.83	419.46	111.95	434.81	112.03
457.95	111.44	479.62	112.11	503.08	111.54	521.01	111.5	531.9	110.86
603.74	111.76	615.49	112.38	639.19	112.78	657.26	111.99	678.74	108.87
700.91	106.92	708.93	105.56	731.55	104.34	763.75	104.31	776.31	105.25
785.25	106.76	821.24	106.55	829.63	106.8	839.8	108.57	877.59	109.31
926.02	109.11	972.4	109.86	1017.79	110.27	1054.63	110.48	1088.12	110.38
1163.67	110.59	1188.42	110.73	1264.32	110.75	1284.24	111.87	1335.61	111.07
1362.69	111.17	1396	110.9	1416.92	111.05	1436.67	111.47	1436.74	111.47
1445.37	111.53	1475	111.86	1497.5	111.94	1563.93	112.63	1569.18	112.57

```
 1572.88  112.55 1588.13  112.79 1604.36  112.59 1648.04  112.68 1680.92  113.01
 1684.42     113 1686.87     113 1689.22  113.01    1696  113.06 1699.55   113.2
    1750   114.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  708.93    .035  776.31      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        708.93  776.31           174.52  154.66  112.86              .1       .3

CROSS SECTION


RIVER: PeaceCreekCanal
REACH: Main3              RS: 61242

INPUT
Description:
Station Elevation Data    num=      61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  114.14   17.14  114.28   25.96  114.08   39.42  114.06    79.9  114.28
    98.8  114.21  182.65  114.09  296.36  114.33  388.83  114.23  450.19  114.03
  463.95  113.84  478.14  113.86  558.86  113.32  585.36  113.37  604.87  112.84
  675.26  113.13  687.97  113.31  776.97  113.19  837.07  113.91  876.36  108.08
  897.12  106.66  923.74  104.57  928.11  103.44   936.7  103.19  945.08  104.49
  990.06  105.13  997.78  104.95 1007.71   105.3 1015.93  106.22 1044.06  112.52
  1049.2   112.3 1077.69  112.18 1111.31  112.25 1142.55  112.61 1215.86  112.94
 1303.97  112.73 1332.42  112.63 1415.43  112.21 1472.49  112.34  1502.9  112.35
 1532.03  112.22  1609.1  112.03 1637.09   111.8 1711.93  111.52 1774.91  111.56
 1813.59  112.22 1867.26  112.11 1919.19  111.95 2004.59  112.02 2012.37  111.99
 2111.51  112.38 2137.72  111.69 2137.77  111.69 2146.04  110.58    2154  110.75
 2161.14  111.43 2199.22  112.18 2213.87  112.36 2303.03   113.3  2408.7   113.8
 2484.83   114.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  923.74    .035 1007.71      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        923.74 1007.71           166.15  197.18   223.3              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  837.07   117.6       F
 1085.83 2484.83   117.6       F

BRIDGE


RIVER: PeaceCreekCanal
REACH: Main3              RS: 61109

INPUT
Description:
Distance from Upstream XS =     127
Deck/Roadway Width        =    34.1
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      10
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
  -33.12  119.38           -6.17  119.38          425.93  118.05
```

533.21	117.7		879.7	117.59	102	879.7	117.59	116.7
1029.7	117.58	116.7	1029.7	117.58	102	1327.45	117.66	
2500	117.7							

Upstream Bridge Cross Section Data
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	114.14	17.14	114.28	25.96	114.08	39.42	114.06	79.9	114.28
98.8	114.21	182.65	114.09	296.36	114.33	388.83	114.23	450.19	114.03
463.95	113.84	478.14	113.86	558.86	113.32	585.36	113.37	604.87	112.84
675.26	113.13	687.97	113.31	776.97	113.19	837.07	113.91	876.36	108.08
897.12	106.66	923.74	104.57	928.11	103.44	936.7	103.19	945.08	104.49
990.06	105.13	997.78	104.95	1007.71	105.3	1015.93	106.22	1044.06	112.52
1049.2	112.3	1077.69	112.18	1111.31	112.25	1142.55	112.61	1215.86	112.94
1303.97	112.73	1332.42	112.63	1415.43	112.21	1472.49	112.34	1502.9	112.35
1532.03	112.22	1609.1	112.03	1637.09	111.8	1711.93	111.52	1774.91	111.56
1813.59	112.22	1867.26	112.11	1919.19	111.95	2004.59	112.02	2012.37	111.99
2111.51	112.38	2137.72	111.69	2137.77	111.69	2146.04	110.58	2154	110.75
2161.14	111.43	2199.22	112.18	2213.87	112.36	2303.03	113.3	2408.7	113.8
2484.83	113.8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	837.07	.035	1044.06	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
923.74	1007.71	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	837.07	117.6	F
1085.83	2484.83	117.6	F

Downstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	119.2		89.18	119.21		114.99	119.12	
283.06	118.61		582.8	117.68		983.3	117.58	102
983.3	117.58	116.7	1133.3	117.59	116.7	1133.3	117.59	102
1201.64	117.62		2500	117.7				

Downstream Bridge Cross Section Data
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	1001.16	107.2	1022.38	106.7
1034.85	105.07	1036.71	104.2	1063.62	104.78	1084.55	104.04	1088.94	104.95
1095.74	106.78	1128.52	108.47	1132.2	109.27	1143.99	115.11	1154.43	117.48
1204.33	117.66	1237.16	117.28	1361.41	116.88	1403.2	117.16	1413.99	116.76
1455.83	117.09	1532.76	116.81	1553.28	117	1587.19	116.56	1603.44	116.97
1659.81	116.47	1781.72	116.36	1808.86	116.81	1823.56	116.28	1858.25	116.54
1911.33	115.88	1954.57	116.28	2025.01	116.42	2074.5	116.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	974.93	.035	1154.43	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
1034.85	1088.94	.3	.5

Ineffective Flow num= 2

```
   Sta L   Sta R    Elev  Permanent
       0  974.93   117.6       F
 1154.43  2074.5   117.6       F

Upstream Embankment side slope             =       3 horiz. to 1.0 vertical
Downstream Embankment side slope           =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
   879.7   115.7   880.7   115.7   906.7   102.7
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
   983.3   115.7   984.3   115.7  1010.3   102.7

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  1002.7   102.7  1028.7   115.7  1029.7   115.7
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  1106.3   102.7  1132.3   115.7  1133.3   115.7

Number of Piers =  9

Pier Data
Pier Station     Upstream=   894.7    Downstream=   998.3
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
        1    102        1  114.9      1.8  114.9      1.8  116.7
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
        1    102        1  114.9      1.8  114.9      1.8  116.7

Pier Data
Pier Station     Upstream=   909.7    Downstream=  1013.3
Upstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
      1.5    102      1.5  113.4        1  113.4        1  114.9      1.8  114.9
      1.8  116.7
Downstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
      1.5    102      1.5  113.4        1  113.4        1  114.9      1.8  114.9
      1.8  116.7

Pier Data
Pier Station     Upstream=   924.7    Downstream=  1028.3
Upstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
      1.5    102      1.5  113.4        1  113.4        1  114.9      1.8  114.9
      1.8  116.7
Downstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
      1.5    102      1.5  113.4        1  113.4        1  114.9      1.8  114.9
```

```
     1.8   116.7

Pier Data
Pier Station     Upstream=   939.7    Downstream=  1043.3
Upstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7
Downstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7

Pier Data
Pier Station     Upstream=   954.7    Downstream=  1058.3
Upstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7
Downstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7

Pier Data
Pier Station     Upstream=   969.7    Downstream=  1073.3
Upstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7
Downstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7

Pier Data
Pier Station     Upstream=   984.7    Downstream=  1088.3
Upstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7
Downstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7

Pier Data
Pier Station     Upstream=   999.7    Downstream=  1103.3
Upstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7
Downstream     num=       6
    Width   Elev    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   113.4       1   113.4       1   114.9     1.8   114.9
     1.8   116.7

Pier Data
Pier Station     Upstream=  1014.7    Downstream=  1118.3
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
```

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1	102	1	114.9	1.8	114.9	1.8	116.7

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1	102	1	114.9	1.8	114.9	1.8	116.7

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
Yarnell KVal = 1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61045

INPUT
Description:
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	984.48	116.99	1001.16	107.2
1022.38	106.7	1034.85	105.07	1036.71	104.2	1063.62	104.78	1084.55	104.04
1088.94	104.95	1095.74	106.78	1128.52	108.47	1132.2	109.27	1143.99	115.11
1154.43	117.48	1204.33	117.66	1237.16	117.28	1361.41	116.88	1403.2	117.16
1413.99	116.76	1455.83	117.09	1532.76	116.81	1553.28	117	1587.19	116.56
1603.44	116.97	1659.81	116.47	1781.72	116.36	1808.86	116.81	1823.56	116.28
1858.25	116.54	1911.33	115.88	1954.57	116.28	2025.01	116.42	2074.5	116.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1034.85	.035	1088.94	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1034.85	1088.94	99.55	87.28	85.32	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

BRIDGE

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61026

INPUT
Description:
Distance from Upstream XS = 3
Deck/Roadway Width = 34.3
Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-8.75	119.38		88.3	119.06		304.6	118.39	
701.62	117.6		986.8	117.6	102	986.8	117.6	116.2
1146.8	117.58	116.2	1146.8	117.58	102	1169.81	117.65	
1321.27	117.67		2400	117.8				

Upstream Bridge Cross Section Data
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	1003.9	107.1	1022.38	106.7
1034.85	105.07	1036.71	104.2	1063.62	104.78	1084.55	104.04	1088.94	104.95
1095.74	106.78	1132.62	108.58	1154.43	117.48	1204.33	117.66	1237.16	117.28
1361.41	116.88	1403.2	117.16	1413.99	116.76	1455.83	117.09	1532.76	116.81
1553.28	117	1587.19	116.56	1603.44	116.97	1659.81	116.47	1781.72	116.36
1808.86	116.81	1823.56	116.28	1858.25	116.54	1911.33	115.88	1954.57	116.28
2025.01	116.42	2074.5	116.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	974.93	.035	1154.43	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
1022.38	1095.74	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

Downstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	119.38		44.21	119.38		155.28	118.98	
249.57	118.74		479.88	118.02		1012.8	117.59	102
1012.8	117.59	116.2	1172.8	117.58	116.2	1172.8	117.58	102
2400	117.6							

Downstream Bridge Cross Section Data
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	113.72	29.45	113.69	44.85	113.08	68.37	113.27	70.38	112.51
109.9	112.84	119	114.72	140.95	115.57	202.04	115.6	223.9	116.11
233.59	115.59	318.11	116.61	327.66	115.5	348.56	115.28	421.88	115.68
581.61	115.13	584.23	115.64	630.99	114.87	662.73	117.11	695.63	116.42
702.73	115.14	728.24	115.28	829.35	114.6	846.82	114.76	993.73	115.17
1032.5	105.85	1040.96	105.71	1077.82	104.99	1107.59	104.01	1134.25	104.01
1145.58	104.97	1152.16	105.39	1197.54	114.96	1293.89	113.43	1326.32	113.03
1406.14	112.95	1423.17	113.37	1494.26	112.73	1531.07	113.03	1629.88	113.11
1764.95	112.16	1819.06	112.04	1899.42	112.13	1915.49	112.33	1995.79	112.02
2016.93	112.04	2031.85	112.04	2053.97	111.78	2055.23	111.74	2065.93	111.73
2075.35	110.93	2079.31	110.76	2081.23	110.73	2090.42	110.03	2098.45	110.38
2107.52	111.17	2121.72	111.63	2134.8	111.89	2152.95	112.08	2176.79	112.17

```
 2195.19  112.15  2259.6  112.42 2273.08  112.59 2292.67  112.76 2298.18  112.76
 2330.65  113.04 2351.66  113.16 2358.42  113.16

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  993.73    .035 1197.54      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
       1077.82 1145.58             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0 1006.53   117.6       F
 1293.89 2358.42   117.6       F

Upstream Embankment side slope              =       3 horiz. to 1.0 vertical
Downstream Embankment side slope            =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
   986.8   115.2   987.8   115.2  1013.8   102.2
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  1012.8   115.2  1013.8   115.2  1039.8   102.2

Abutment Data
Upstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  1119.8   102.2  1145.8   115.2  1146.8   115.2
Downstream     num=       3
     Sta    Elev     Sta    Elev     Sta    Elev
  1145.8   102.2  1171.8   115.2  1172.8   115.2

Number of Piers =  7

Pier Data
Pier Station     Upstream=  1006.8    Downstream=  1032.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2       2   114.2       2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2       2   114.2       2   116.2

Pier Data
Pier Station     Upstream=  1026.8    Downstream=  1052.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2       2   114.2       2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2       2   114.2       2   116.2

Pier Data
```

```
Pier Station     Upstream=  1046.8    Downstream=  1072.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2

Pier Data
Pier Station     Upstream=  1066.8    Downstream=  1092.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2

Pier Data
Pier Station     Upstream=  1086.8    Downstream=  1112.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2

Pier Data
Pier Station     Upstream=  1106.8    Downstream=  1132.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2

Pier Data
Pier Station     Upstream=  1126.8    Downstream=  1152.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2       2   116.2

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       Yarnell                KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line
```

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CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 60958

INPUT
Description:
Station Elevation Data num= 72

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	113.72	29.45	113.69	44.85	113.08	68.37	113.27	70.38	112.51
109.9	112.84	119	114.72	140.95	115.57	202.04	115.6	223.9	116.11
233.59	115.59	318.11	116.61	327.66	115.5	348.56	115.28	421.88	115.68
581.61	115.13	584.23	115.64	630.99	114.87	662.73	117.11	695.63	116.42
702.73	115.14	728.24	115.28	829.35	114.6	846.82	114.76	1006.53	113.3
1016.53	112.71	1043.73	109.3	1050.59	107.76	1077.82	104.99	1107.59	104.01
1134.25	104.01	1145.58	104.97	1160.32	105.06	1171.58	106.01	1202.8	106.31
1216.56	107.34	1239.48	110.57	1293.89	113.43	1326.32	113.03	1406.14	112.95
1423.17	113.37	1494.26	112.73	1531.07	113.03	1629.88	113.11	1764.95	112.16
1819.06	112.04	1899.42	112.13	1915.49	112.33	1995.79	112.02	2016.93	112.04
2031.85	112.04	2053.97	111.78	2055.23	111.74	2065.93	111.73	2075.35	110.93
2079.31	110.76	2081.23	110.73	2090.42	110.03	2098.45	110.38	2107.52	111.17
2121.72	111.63	2134.8	111.89	2152.95	112.08	2176.79	112.17	2195.19	112.15
2259.6	112.42	2273.08	112.59	2292.67	112.76	2298.18	112.76	2330.65	113.04
2351.66	113.16	2358.42	113.16						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1077.82	.035	1160.32	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1077.82	1160.32	327.91	339.69	379.75	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1006.53	117.6	F
1293.89	2358.42	117.6	F

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 60618

INPUT
Description:
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	24.56	115	58.18	115.28	99.55	115.38	106.95	115.21
137.67	116	425.61	116	460.65	117	537.14	117.51	634.83	117.72
696.72	117.73	805.21	117.89	836.04	117.65	885.25	117.81	940.84	117.18
952.19	117.37	978.87	117.1	978.97	117.44	1133.64	117	1203.02	116
1248.93	114	1274.05	113.42	1283.52	114.12	1283.68	113.56	1302.83	115
1321.03	115.79	1327.05	114.5	1352.89	109.94	1365.14	108.34	1386.97	105.99
1388.62	104.77	1391.53	104.03	1406.14	104.12	1427.18	103.44	1431.24	104.67
1440.15	105.35	1456.72	110.02	1462.79	108.93	1467.38	110.29	1490.27	112.5
1539.06	112.03	1575.45	112.18	1653.05	112.26	1688.06	112.05	1840	112.06
1950.29	111.48	2061.49	111.73	2115.81	111.56	2162.53	111.2	2268.98	111.99
2358.62	111.98	2387.73	112.14	2395.69	112.25	2408.87	112.38	2447.86	112.52
2471.35	112.8	2489.65	112.98						

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Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1388.62	.035	1431.24	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1388.62	1431.24	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:PeaceCreekCanal

Reach	River Sta.	n1	n2	n3
Main3	61397	.1	.035	.1
Main3	61242	.1	.035	.1
Main3	61109	Bridge		
Main3	61045	.1	.035	.1
Main3	61026	Bridge		
Main3	60958	.1	.035	.1
Main3	60618	.1	.035	.1

SUMMARY OF REACH LENGTHS

River: PeaceCreekCanal

Reach	River Sta.	Left	Channel	Right
Main3	61397	174.52	154.66	112.86
Main3	61242	166.15	197.18	223.3
Main3	61109	Bridge		
Main3	61045	99.55	87.28	85.32
Main3	61026	Bridge		
Main3	60958	327.91	339.69	379.75
Main3	60618	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: PeaceCreekCanal

Reach	River Sta.	Contr.	Expan.
Main3	61397	.1	.3
Main3	61242	.3	.5
Main3	61109	Bridge	
Main3	61045	.3	.5
Main3	61026	Bridge	
Main3	60958	.3	.5
Main3	60618	.1	.3

HEC-RAS Plan: Existing River: PeaceCreekCanal Reach: Main3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	61397	25 Year	1057.00	104.31	112.14		112.16	0.000076	1.42	2187.56	1057.27	0.09
Main3	61397	50 Year	1223.00	104.31	112.53		112.56	0.000075	1.46	2621.12	1125.79	0.09
Main3	61397	100 Year	1448.00	104.31	113.14		113.16	0.000070	1.48	3380.35	1325.98	0.09
Main3	61397	500 Year	1808.00	104.31	114.08		114.09	0.000056	1.42	4692.96	1567.83	0.08
Main3	61242	25 Year	1057.00	103.19	112.12	106.26	112.15	0.000077	1.43	1089.81	683.63	0.09
Main3	61242	50 Year	1223.00	103.19	112.51	106.43	112.54	0.000086	1.56	1177.07	1158.88	0.10
Main3	61242	100 Year	1448.00	103.19	113.11	106.64	113.15	0.000094	1.71	1321.22	1516.84	0.10
Main3	61242	500 Year	1808.00	103.19	114.03	106.95	114.08	0.000099	1.88	1549.52	2018.78	0.11
Main3	61109 BR U	25 Year	1057.00	103.19	112.10	106.32	112.13	0.000191	1.33	788.54	121.11	0.09
Main3	61109 BR U	50 Year	1223.00	103.19	112.49	106.49	112.53	0.000221	1.45	835.97	122.67	0.09
Main3	61109 BR U	100 Year	1448.00	103.19	113.09	106.70	113.13	0.000251	1.58	909.78	125.05	0.10
Main3	61109 BR U	500 Year	1808.00	103.19	114.01	107.00	114.06	0.000293	1.74	1028.98	132.24	0.10
Main3	61109 BR D	25 Year	1057.00	104.04	112.09	106.88	112.12	0.000262	1.62	705.08	121.04	0.10
Main3	61109 BR D	50 Year	1223.00	104.04	112.47	107.24	112.51	0.000297	1.75	752.22	122.59	0.11
Main3	61109 BR D	100 Year	1448.00	104.04	113.07	107.51	113.11	0.000330	1.89	825.76	124.96	0.11
Main3	61109 BR D	500 Year	1808.00	104.04	113.99	107.88	114.04	0.000374	2.04	944.55	132.15	0.12
Main3	61045	25 Year	1057.00	104.04	112.05	106.70	112.11	0.000160	2.07	822.64	144.93	0.13
Main3	61045	50 Year	1223.00	104.04	112.44	106.96	112.50	0.000179	2.26	878.17	146.35	0.14
Main3	61045	100 Year	1448.00	104.04	113.02	107.35	113.10	0.000193	2.46	964.81	148.54	0.15
Main3	61045	500 Year	1808.00	104.04	113.93	107.78	114.02	0.000208	2.73	1101.56	151.93	0.16
Main3	61026 BR U	25 Year	1057.00	104.04	112.07	106.78	112.10	0.000187	1.45	774.68	137.30	0.09
Main3	61026 BR U	50 Year	1223.00	104.04	112.45	107.05	112.48	0.000211	1.56	827.47	138.83	0.10
Main3	61026 BR U	100 Year	1448.00	104.04	113.04	107.37	113.08	0.000230	1.68	910.12	141.19	0.10
Main3	61026 BR U	500 Year	1808.00	104.04	113.96	107.74	114.00	0.000252	1.82	1041.16	144.85	0.11
Main3	61026 BR D	25 Year	1057.00	104.01	111.19	106.23	111.22	0.000180	1.47	778.18	133.79	0.10
Main3	61026 BR D	50 Year	1223.00	104.01	111.57	106.38	111.60	0.000204	1.60	829.20	135.30	0.10
Main3	61026 BR D	100 Year	1448.00	104.01	112.16	106.57	112.20	0.000224	1.73	909.42	137.65	0.11
Main3	61026 BR D	500 Year	1808.00	104.01	113.07	106.85	113.12	0.000247	1.89	1037.47	141.33	0.11
Main3	60958	25 Year	1057.00	104.01	111.18	106.16	111.22	0.000108	1.58	1055.38	258.03	0.11
Main3	60958	50 Year	1223.00	104.01	111.56	106.37	111.60	0.000119	1.72	1141.44	284.37	0.11
Main3	60958	100 Year	1448.00	104.01	112.15	106.59	112.19	0.000126	1.86	1282.21	586.32	0.12
Main3	60958	500 Year	1808.00	104.01	113.07	106.91	113.12	0.000130	2.04	1522.32	1222.50	0.12

HEC-RAS Plan: Existing River: PeaceCreekCanal Reach: Main3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	60618	25 Year	1057.00	103.44	111.00	106.59	111.13	0.000383	3.04	545.99	127.85	0.20
Main3	60618	50 Year	1223.00	103.44	111.35	106.87	111.50	0.000428	3.32	594.70	173.14	0.22
Main3	60618	100 Year	1448.00	103.44	111.92	107.19	112.08	0.000441	3.54	798.92	535.52	0.22
Main3	60618	500 Year	1808.00	103.44	112.89	107.69	113.02	0.000356	3.44	1762.93	1144.33	0.20

Plan: Existing PeaceCreekCanal Main3 RS: 61109 Profile: 25 Year

E.G. US. (ft)	112.15	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.12	E.G. Elev (ft)	112.13	112.12
Q Total (cfs)	1057.00	W.S. Elev (ft)	112.10	112.09
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.32	106.88
Q Weir (cfs)		Max Chl Dpth (ft)	8.91	8.05
Weir Sta Lft (ft)		Vel Total (ft/s)	1.34	1.50
Weir Sta Rgt (ft)		Flow Area (sq ft)	788.54	705.08
Weir Submerg		Froude # Chl	0.09	0.10
Weir Max Depth (ft)		Specif Force (cu ft)	2841.81	2327.55
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.51	5.83
Min El Prs (ft)	116.70	W.P. Total (ft)	240.73	229.77
Delta EG (ft)	0.04	Conv. Total (cfs)	76406.6	65362.8
Delta WS (ft)	0.06	Top Width (ft)	121.11	121.04
BR Open Area (sq ft)	1304.86	Frctn Loss (ft)	0.01	0.01
BR Open Vel (ft/s)	1.50	C & E Loss (ft)	0.00	0.01
Coef of Q		Shear Total (lb/sq ft)	0.04	0.05
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Existing PeaceCreekCanal Main3 RS: 61109 Profile: 50 Year

E.G. US. (ft)	112.54	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.51	E.G. Elev (ft)	112.53	112.51
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.49	112.47
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	106.49	107.24
Q Weir (cfs)		Max Chl Dpth (ft)	9.30	8.43
Weir Sta Lft (ft)		Vel Total (ft/s)	1.46	1.63
Weir Sta Rgt (ft)		Flow Area (sq ft)	835.97	752.22
Weir Submerg		Froude # Chl	0.09	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3169.50	2622.11
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.82	6.14
Min El Prs (ft)	116.70	W.P. Total (ft)	249.47	238.47
Delta EG (ft)	0.04	Conv. Total (cfs)	82254.4	70944.1
Delta WS (ft)	0.07	Top Width (ft)	122.67	122.59
BR Open Area (sq ft)	1304.86	Frctn Loss (ft)	0.01	0.01
BR Open Vel (ft/s)	1.63	C & E Loss (ft)	0.00	0.01
Coef of Q		Shear Total (lb/sq ft)	0.05	0.06
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Existing PeaceCreekCanal Main3 RS: 61109 Profile: 100 Year

E.G. US. (ft)	113.15	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.11	E.G. Elev (ft)	113.13	113.11
Q Total (cfs)	1448.00	W.S. Elev (ft)	113.09	113.07
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	106.70	107.51
Q Weir (cfs)		Max Chl Dpth (ft)	9.90	9.03
Weir Sta Lft (ft)		Vel Total (ft/s)	1.59	1.75
Weir Sta Rgt (ft)		Flow Area (sq ft)	909.78	825.76
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3705.63	3107.94
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	7.28	6.61
Min El Prs (ft)	116.70	W.P. Total (ft)	262.86	251.82
Delta EG (ft)	0.05	Conv. Total (cfs)	91441.1	79763.8
Delta WS (ft)	0.08	Top Width (ft)	125.05	124.96
BR Open Area (sq ft)	1304.86	Frctn Loss (ft)	0.01	0.01
BR Open Vel (ft/s)	1.75	C & E Loss (ft)	0.00	0.01

Plan: Existing   PeaceCreekCanal   Main3 RS: 61109   Profile: 100 Year (Continued)

Coef of Q		Shear Total (lb/sq ft)	0.05	0.07
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Existing   PeaceCreekCanal   Main3 RS: 61109   Profile: 500 Year

E.G. US. (ft)	114.08	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	114.03	E.G. Elev (ft)	114.06	114.04
Q Total (cfs)	1808.00	W.S. Elev (ft)	114.01	113.99
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.00	107.88
Q Weir (cfs)		Max Chl Dpth (ft)	10.82	9.95
Weir Sta Lft (ft)		Vel Total (ft/s)	1.76	1.91
Weir Sta Rgt (ft)		Flow Area (sq ft)	1028.98	944.55
Weir Submerg		Froude # Chl	0.10	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	4626.51	3950.87
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	7.78	7.15
Min El Prs (ft)	116.70	W.P. Total (ft)	287.09	276.01
Delta EG (ft)	0.05	Conv. Total (cfs)	105644.3	93443.6
Delta WS (ft)	0.10	Top Width (ft)	132.24	132.15
BR Open Area (sq ft)	1304.86	Frctn Loss (ft)	0.01	0.01
BR Open Vel (ft/s)	1.91	C & E Loss (ft)	0.00	0.01
Coef of Q		Shear Total (lb/sq ft)	0.07	0.08
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Existing   PeaceCreekCanal   Main3 RS: 61026   Profile: 25 Year

E.G. US. (ft)	112.11	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.05	E.G. Elev (ft)	112.10	111.22
Q Total (cfs)	1057.00	W.S. Elev (ft)	112.07	111.19
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.78	106.23
Q Weir (cfs)		Max Chl Dpth (ft)	8.03	7.18
Weir Sta Lft (ft)		Vel Total (ft/s)	1.36	1.36
Weir Sta Rgt (ft)		Flow Area (sq ft)	774.68	778.18
Weir Submerg		Froude # Chl	0.09	0.10
Weir Max Depth (ft)		Specif Force (cu ft)	2484.17	2480.26
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.64	5.82
Min El Prs (ft)	116.20	W.P. Total (ft)	224.15	223.57
Delta EG (ft)	0.89	Conv. Total (cfs)	77206.0	78746.8
Delta WS (ft)	0.87	Top Width (ft)	137.30	133.79
BR Open Area (sq ft)	1364.71	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.36	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.04	0.04
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

Plan: Existing   PeaceCreekCanal   Main3 RS: 61026   Profile: 50 Year

E.G. US. (ft)	112.50	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.44	E.G. Elev (ft)	112.48	111.60
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.45	111.57
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	107.05	106.38
Q Weir (cfs)		Max Chl Dpth (ft)	8.41	7.56
Weir Sta Lft (ft)		Vel Total (ft/s)	1.48	1.47
Weir Sta Rgt (ft)		Flow Area (sq ft)	827.47	829.20
Weir Submerg		Froude # Chl	0.10	0.10
Weir Max Depth (ft)		Specif Force (cu ft)	2801.81	2796.57
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.96	6.13
Min El Prs (ft)	116.20	W.P. Total (ft)	231.22	230.57

Plan: Existing   PeaceCreekCanal   Main3 RS: 61026   Profile: 50 Year (Continued)

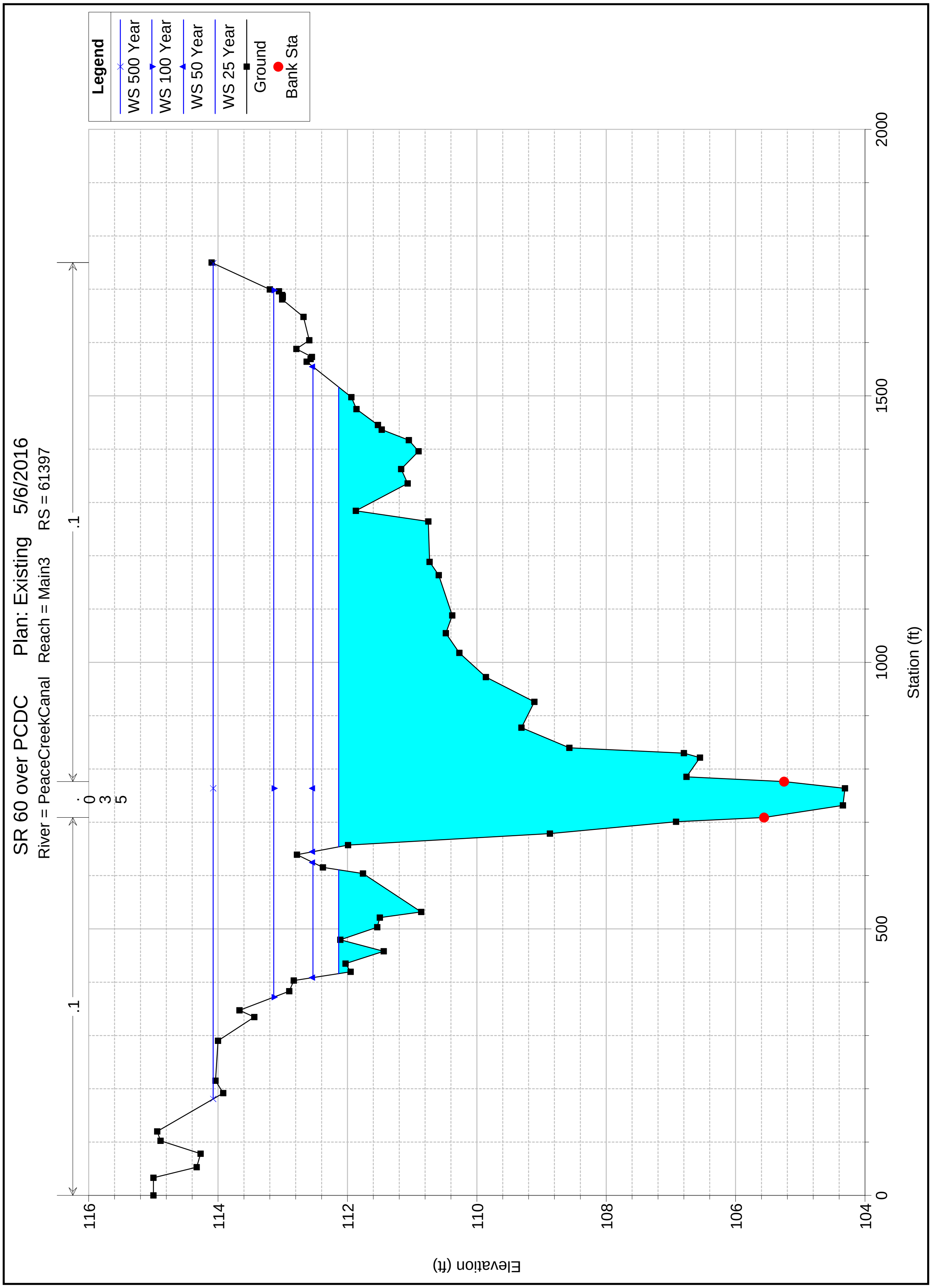
Delta EG (ft)	0.90	Conv. Total (cfs)	84268.8	85695.1
Delta WS (ft)	0.87	Top Width (ft)	138.83	135.30
BR Open Area (sq ft)	1364.71	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.48	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.05	0.05
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

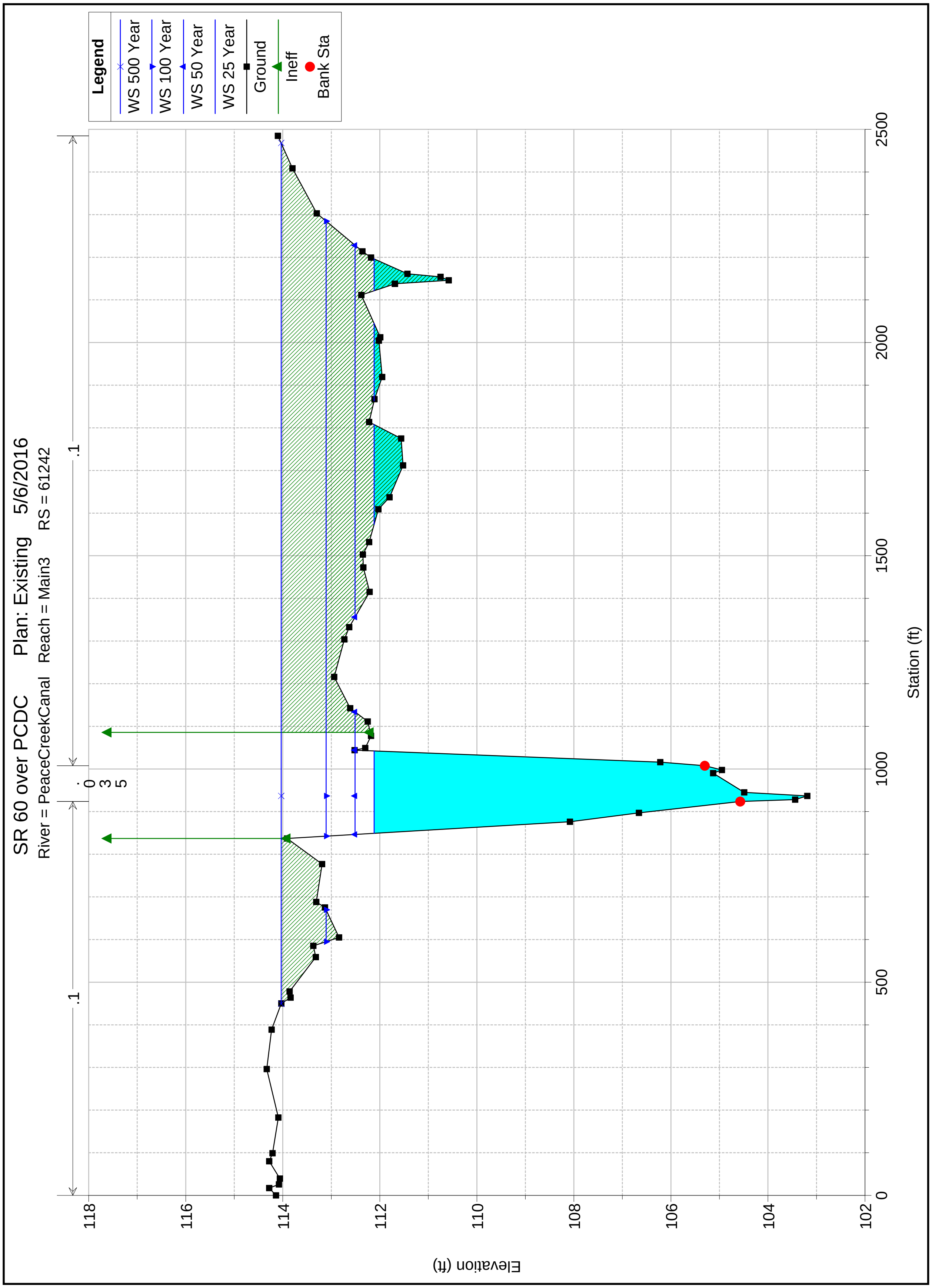
Plan: Existing   PeaceCreekCanal   Main3 RS: 61026   Profile: 100 Year

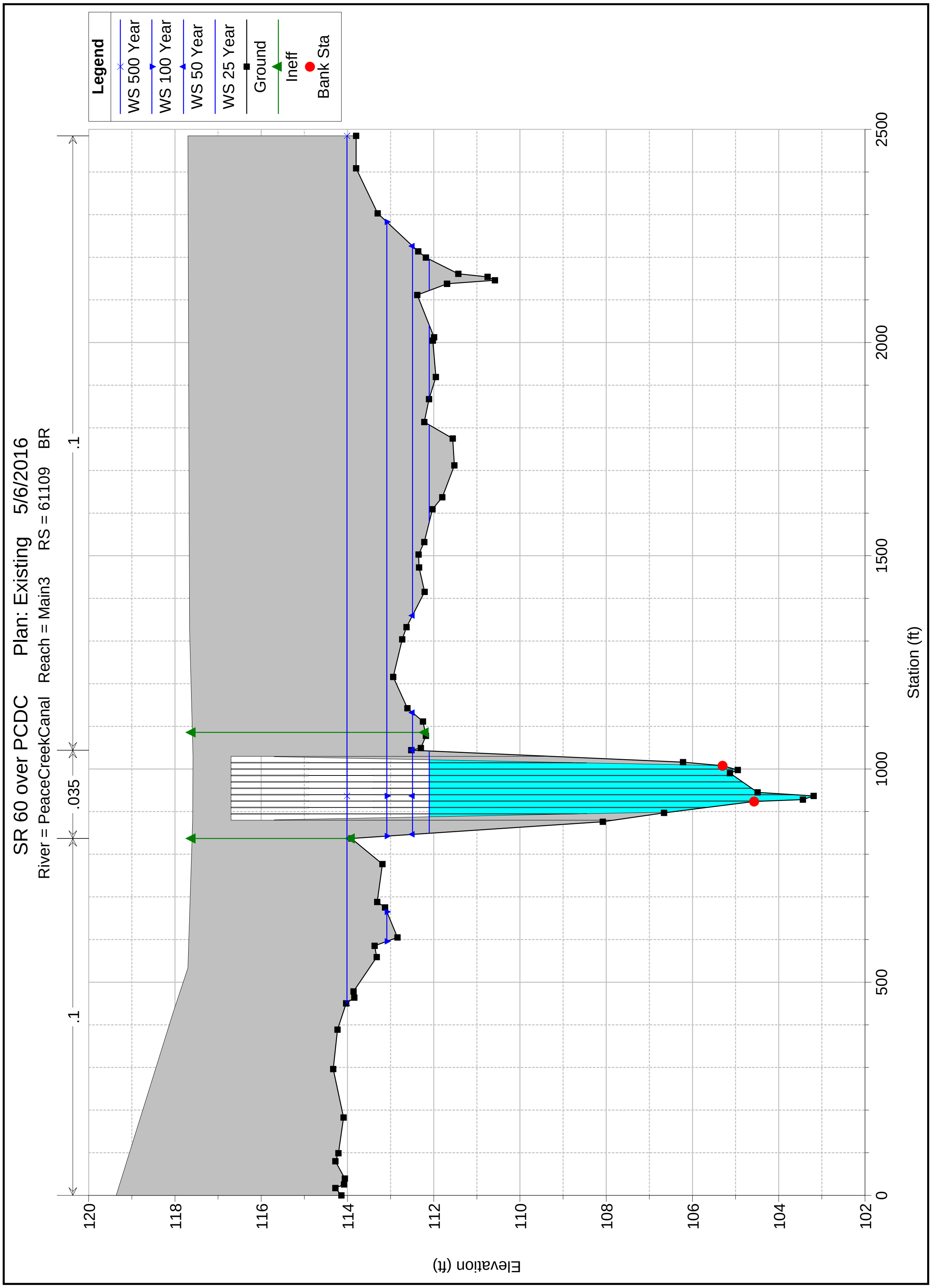
E.G. US. (ft)	113.10	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.02	E.G. Elev (ft)	113.08	112.20
Q Total (cfs)	1448.00	W.S. Elev (ft)	113.04	112.16
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	107.37	106.57
Q Weir (cfs)		Max Chl Dpth (ft)	9.00	8.15
Weir Sta Lft (ft)		Vel Total (ft/s)	1.59	1.59
Weir Sta Rgt (ft)		Flow Area (sq ft)	910.12	909.42
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3330.02	3323.22
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.45	6.61
Min El Prs (ft)	116.20	W.P. Total (ft)	242.12	241.43
Delta EG (ft)	0.91	Conv. Total (cfs)	95562.7	96813.8
Delta WS (ft)	0.88	Top Width (ft)	141.19	137.65
BR Open Area (sq ft)	1364.71	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.59	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.05	0.05
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

Plan: Existing   PeaceCreekCanal   Main3 RS: 61026   Profile: 500 Year

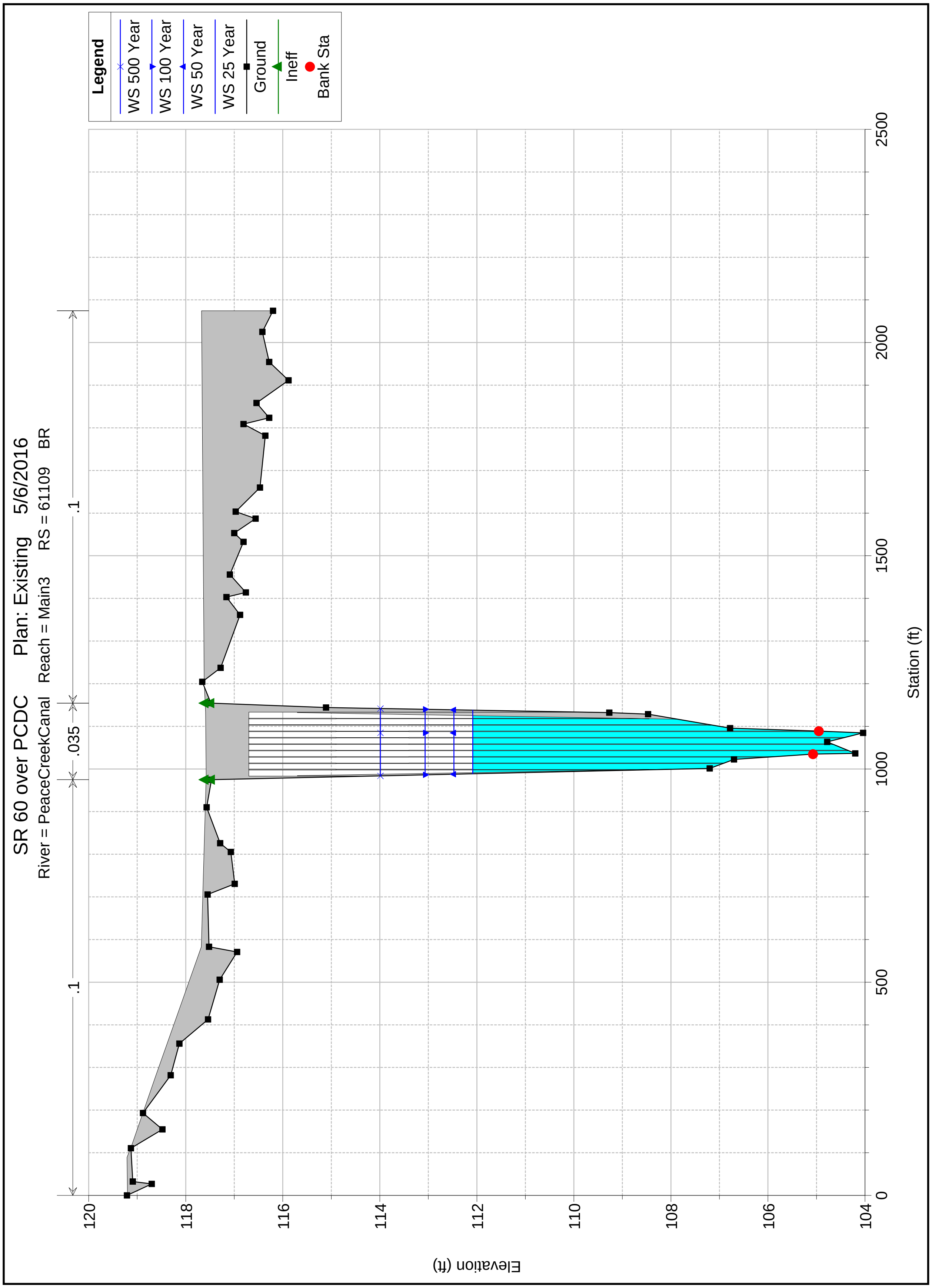
E.G. US. (ft)	114.02	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.93	E.G. Elev (ft)	114.00	113.12
Q Total (cfs)	1808.00	W.S. Elev (ft)	113.96	113.07
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.74	106.85
Q Weir (cfs)		Max Chl Dpth (ft)	9.92	9.06
Weir Sta Lft (ft)		Vel Total (ft/s)	1.74	1.74
Weir Sta Rgt (ft)		Flow Area (sq ft)	1041.16	1037.47
Weir Submerg		Froude # Chl	0.11	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	4249.62	4243.13
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	7.19	7.34
Min El Prs (ft)	116.20	W.P. Total (ft)	259.05	258.39
Delta EG (ft)	0.91	Conv. Total (cfs)	113990.6	115000.5
Delta WS (ft)	0.87	Top Width (ft)	144.85	141.33
BR Open Area (sq ft)	1364.71	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.74	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.06	0.06
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

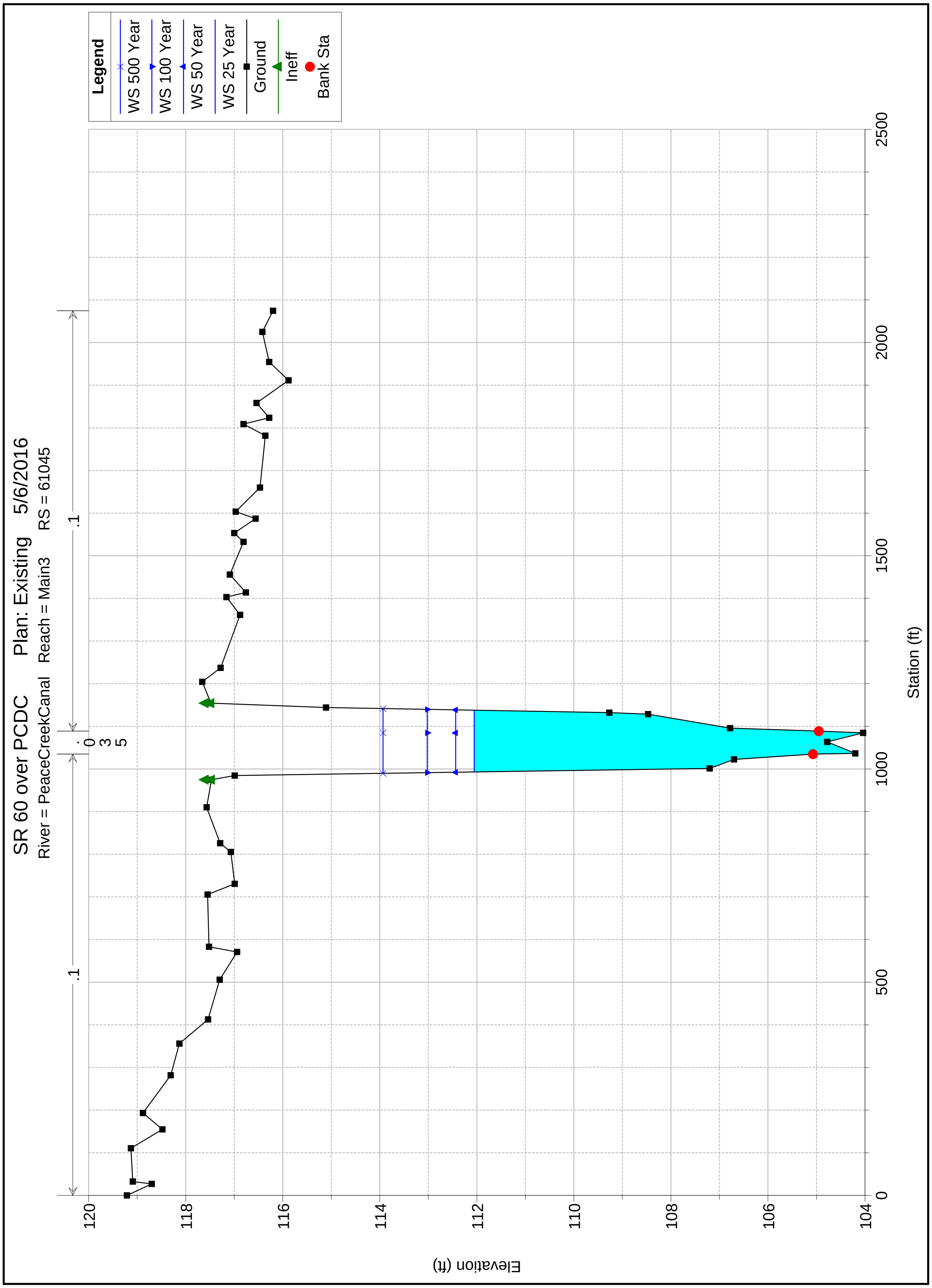

SR 60 over PCDC Plan: Existing 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61397
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
116
114
112
110
108
106
104
0
500
1000
1500
2000

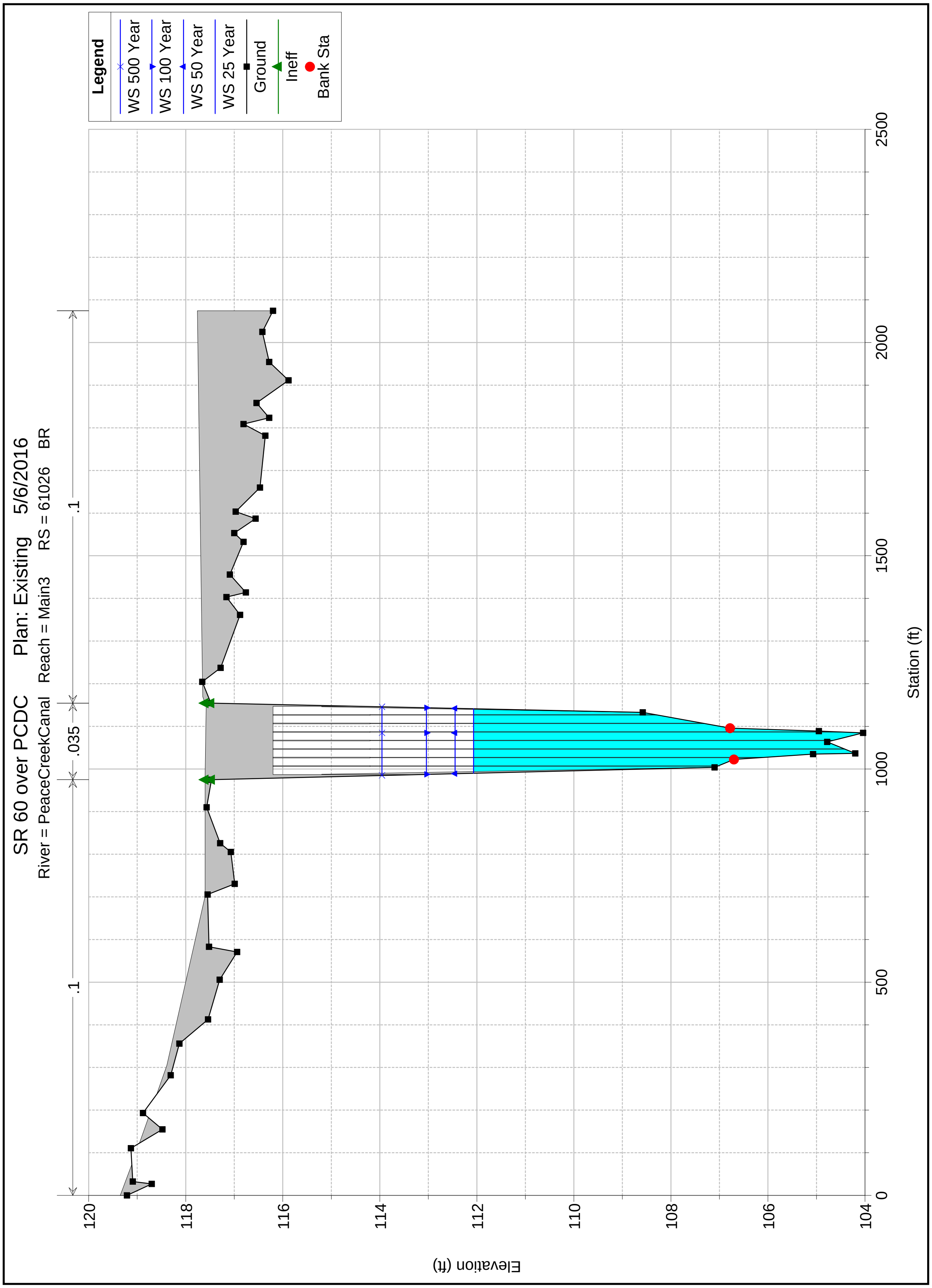

SR 60 over PCDC Plan: Existing 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61242
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
.1
.1
.035

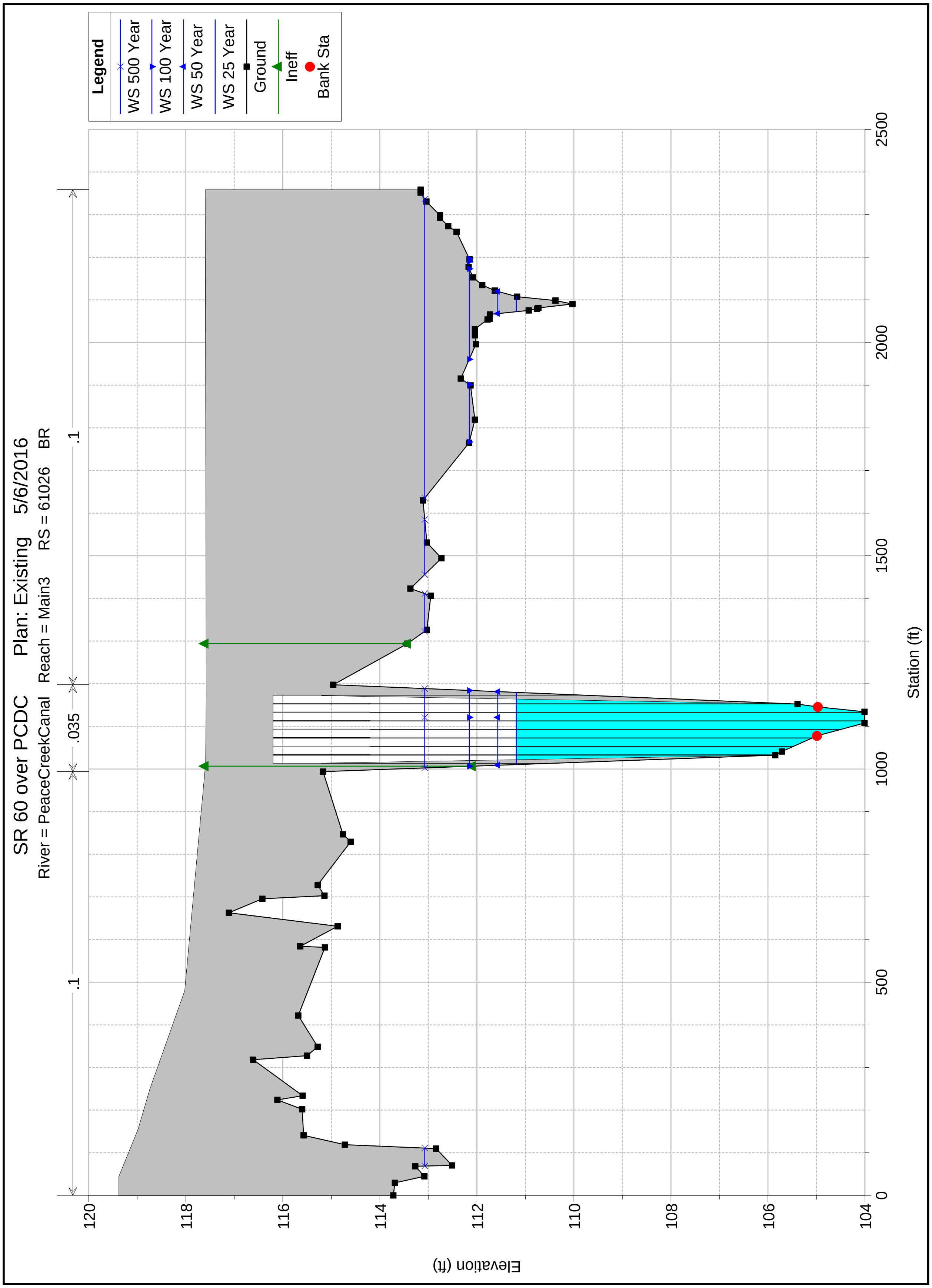


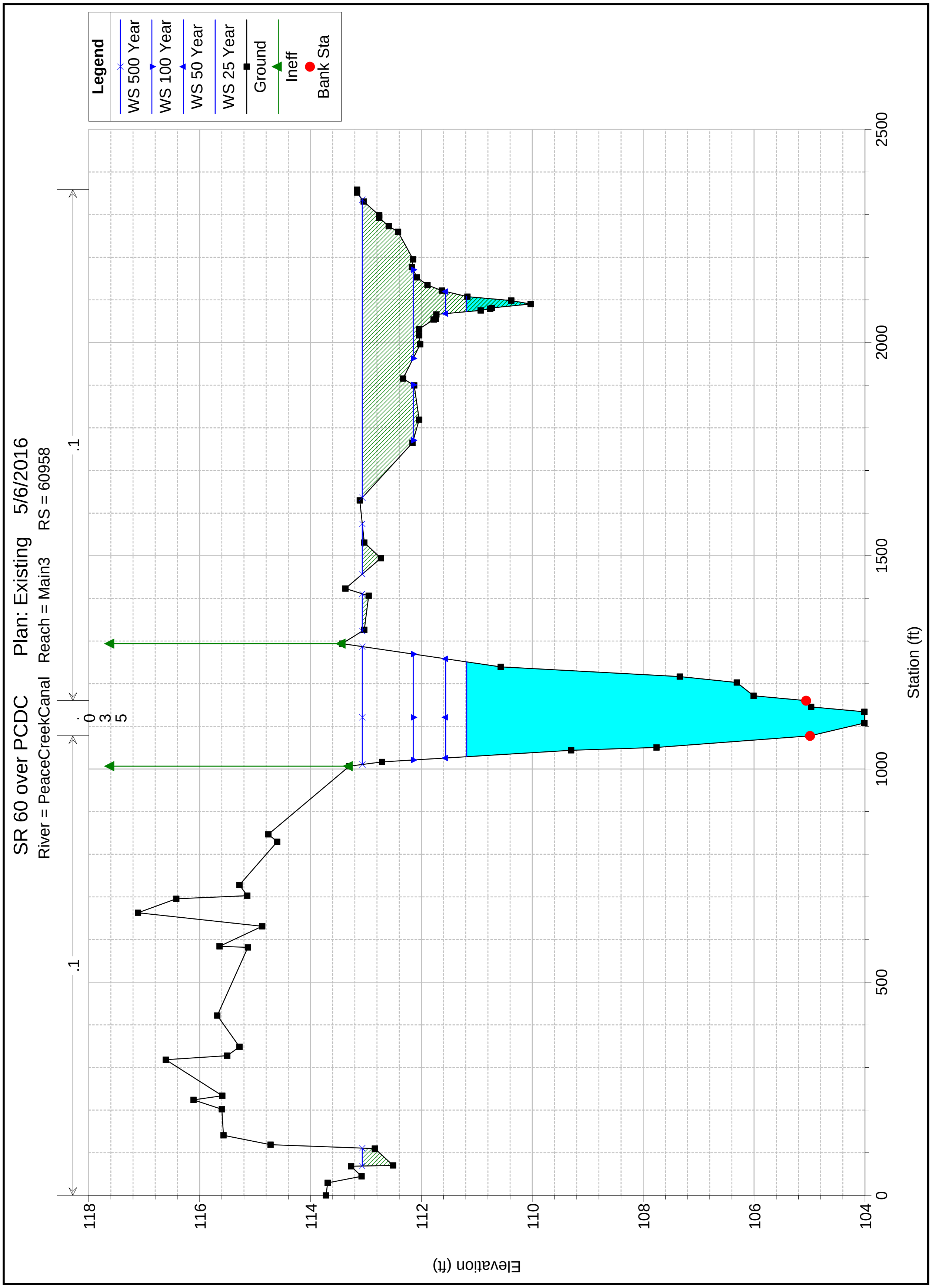
SR 60 over PCDC   Plan: Existing   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 61109   BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
102
0
500
1000
1500
2000
2500

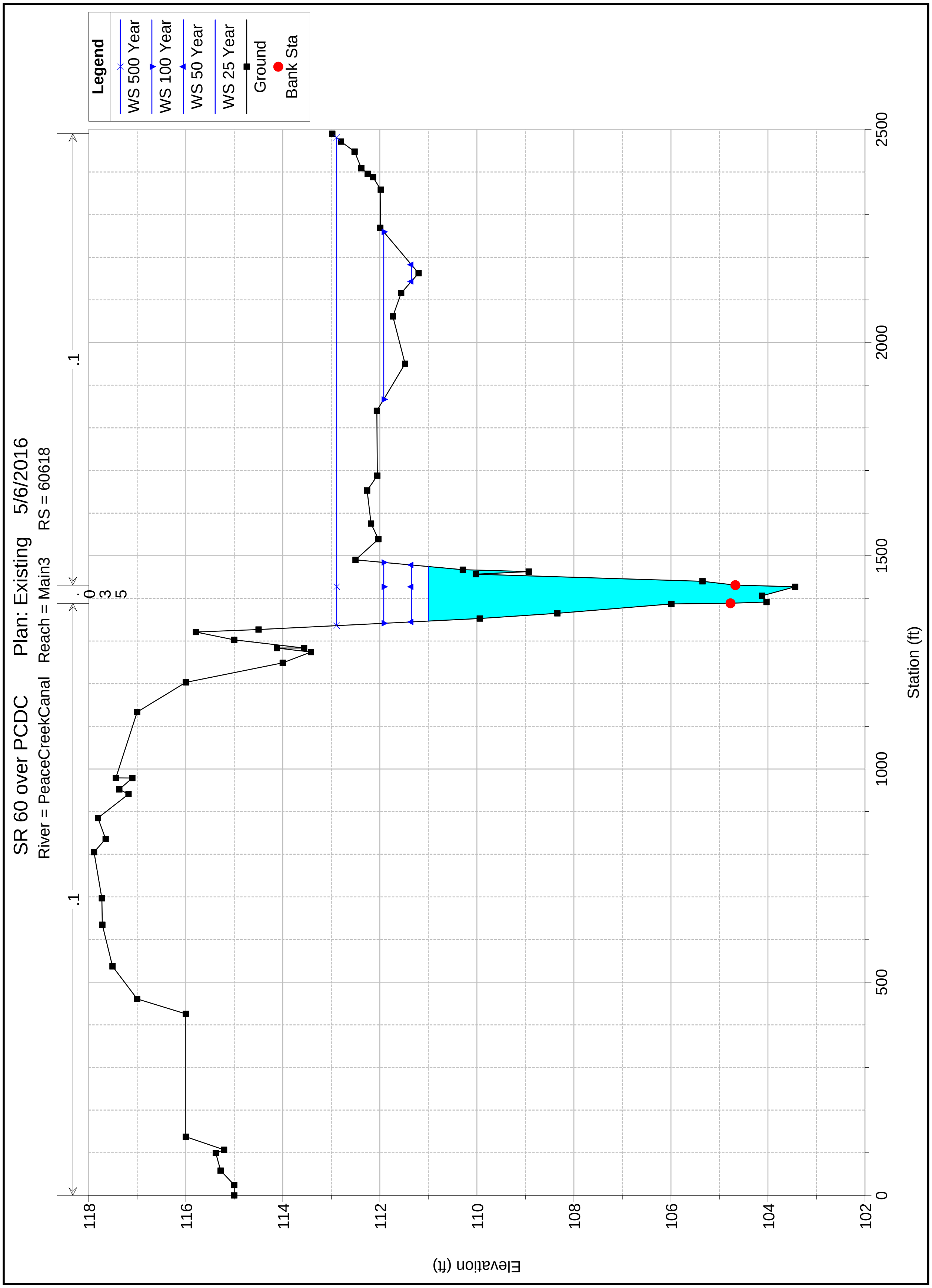

SR 60 over PCDC Plan: Existing 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61109 BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500

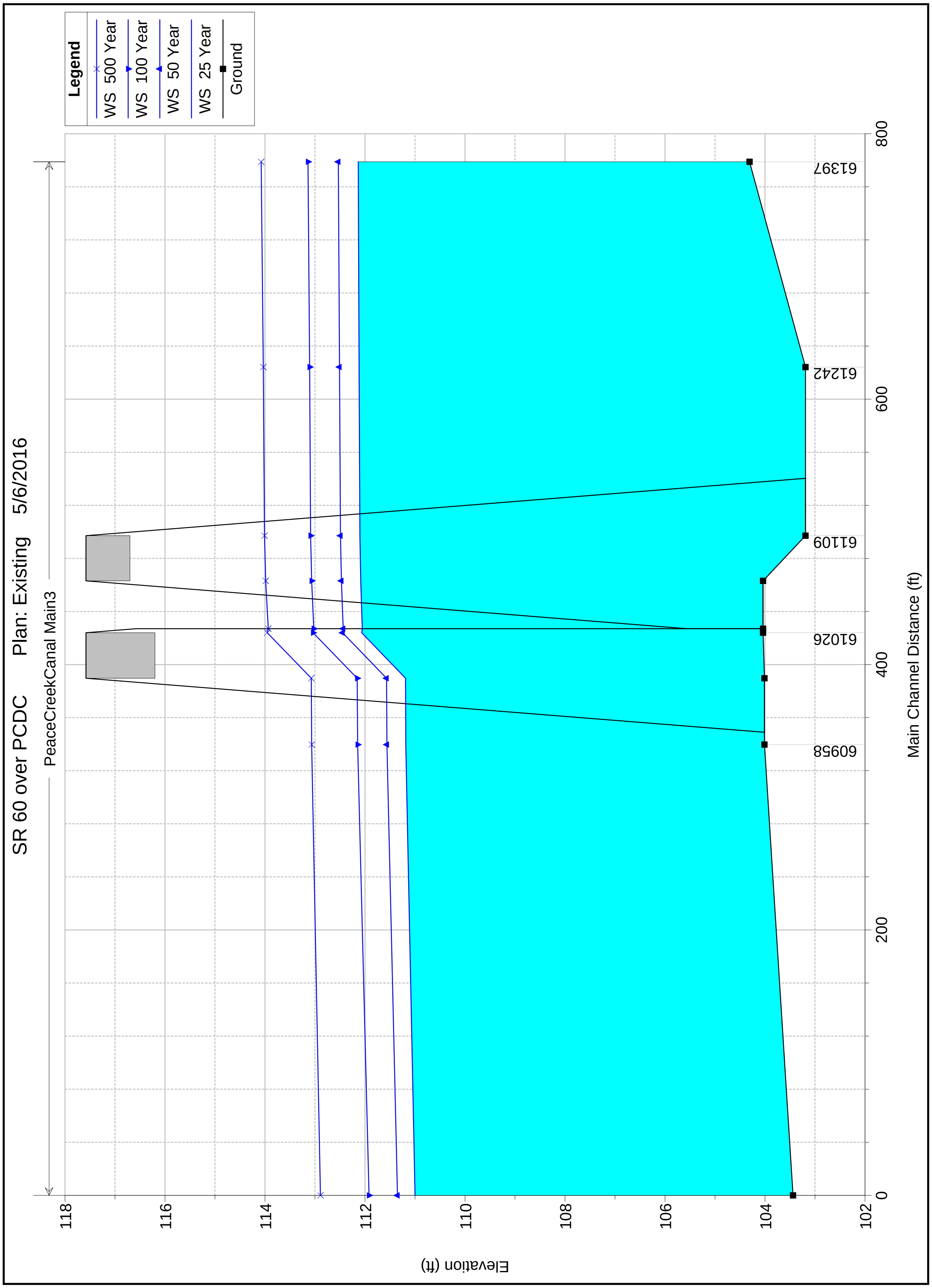

SR 60 over PCDC Plan: Existing 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61045
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC Plan: Existing 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61026 BR
.1
.035
.1
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC Plan: Existing 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61026 BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Existing   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 60958
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
.1
.035
.1
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC Plan: Existing 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 60618
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
.1
.1
.035
Station (ft)
Elevation (ft)
0
500
1000
1500
2000
2500
102
104
106
108
110
112
114
116
118


SR 60 over PCDC Plan: Existing 5/6/2016
PeaceCreekCanal Main3
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
61397
61242
61109
61026
60958
Main Channel Distance (ft)
Elevation (ft)

HEC-RAS

Proposed Condition - Alternative 1

SR 60 over PCDC.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX      XX      XXXX
X     X  X       X    X        X   X    X  X    X
X     X  X       X             X   X   X    X   X
XXXXXXX  XXXX    X       XXX   XXXX    XXXXXX    XXXX
X     X  X       X             X  X    X    X        X
X     X  X       X    X        X   X   X    X        X
X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
```

PROJECT DATA
Project Title: SR 60 over PCDC
Project File : SR 60 over PCDC.prj
Run Date and Time: 5/6/2016 3:39:33 PM

Project in English units

Project Description:
CRS Info=<SpatialReference> <CoordinateSystem Code="3517"
Unit="US_survey_Foot" /> <Registration OffsetX="0" OffsetY="0" OffsetZ="0"
ScaleX="1" ScaleY="1" ScaleZ="1" /></SpatialReference>

PLAN DATA

Plan Title: Proposed - Alt 1
Plan File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.p01

Geometry Title: Proposed - Alt 1
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g01

Flow Title   : Flow Data
Flow File   : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Plan Summary Information:

Number of:	Cross Sections	= 5		Multiple Openings	=	0
	Culverts	= 0		Inline Structures	=	0
	Bridges	= 2		Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations   = 20
Maximum difference tolerance   = 0.33
Flow tolerance factor   = 0.001

Computation Options
Critical depth computed only where necessary

SR 60 over PCDC.rep

Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow Data
Flow File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Flow Data (cfs)

River	Reach	RS	25 Year	50 Year	100 Year	500 Year
PeaceCreekCanal	Main3	61397	1057	1223	1448	1808

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
PeaceCreekCanal	Main3	25 Year		Known WS = 111
PeaceCreekCanal	Main3	50 Year		Known WS = 111.35
PeaceCreekCanal	Main3	100 Year		Known WS = 111.92
PeaceCreekCanal	Main3	500 Year		Known WS = 112.89

GEOMETRY DATA

Geometry Title: Proposed - Alt 1
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g01

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61397

INPUT
Description:
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	33.22	115	52.93	114.33	78.28	114.27	102.48	114.89
119.95	114.94	191.95	113.92	215.3	114.04	290.03	114	334.6	113.44
347.36	113.67	383.17	112.9	403.15	112.83	419.46	111.95	434.81	112.03
457.95	111.44	479.62	112.11	503.08	111.54	521.01	111.5	531.9	110.86
603.74	111.76	615.49	112.38	639.19	112.78	657.26	111.99	678.74	108.87
700.91	106.92	708.93	105.56	731.55	104.34	763.75	104.31	776.31	105.25
785.25	106.76	821.24	106.55	829.63	106.8	839.8	108.57	877.59	109.31
926.02	109.11	972.4	109.86	1017.79	110.27	1054.63	110.48	1088.12	110.38
1163.67	110.59	1188.42	110.73	1264.32	110.75	1284.24	111.87	1335.61	111.07
1362.69	111.17	1396	110.9	1416.92	111.05	1436.67	111.47	1436.74	111.47
1445.37	111.53	1475	111.86	1497.5	111.94	1563.93	112.63	1569.18	112.57

1572.88	112.55	1588.13	112.79	1604.36	112.59	1648.04	112.68	1680.92	113.01
1684.42	113	1686.87	113	1689.22	113.01	1696	113.06	1699.55	113.2
1750	114.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	708.93	.035	776.31	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
708.93	776.31	174.52	154.66	112.86	.1	.3

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61242

INPUT
Description:
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	114.14	17.14	114.28	25.96	114.08	39.42	114.06	79.9	114.28
98.8	114.21	182.65	114.09	296.36	114.33	388.83	114.23	450.19	114.03
463.95	113.84	478.14	113.86	558.86	113.32	585.36	113.37	604.87	112.84
675.26	113.13	687.97	113.31	776.97	113.19	837.07	113.91	876.36	108.08
897.12	106.66	923.74	104.57	928.11	103.44	936.7	103.19	945.08	104.49
990.06	105.13	997.78	104.95	1007.71	105.3	1015.93	106.22	1044.06	112.52
1049.2	112.3	1077.69	112.18	1111.31	112.25	1142.55	112.61	1215.86	112.94
1303.97	112.73	1332.42	112.63	1415.43	112.21	1472.49	112.34	1502.9	112.35
1532.03	112.22	1609.1	112.03	1637.09	111.8	1711.93	111.52	1774.91	111.56
1813.59	112.22	1867.26	112.11	1919.19	111.95	2004.59	112.02	2012.37	111.99
2111.51	112.38	2137.72	111.69	2137.77	111.69	2146.04	110.58	2154	110.75
2161.14	111.43	2199.22	112.18	2213.87	112.36	2303.03	113.3	2408.7	113.8
2484.83	114.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	923.74	.035	1007.71	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
923.74	1007.71	166.15	197.18	223.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	837.07	117.6	F
1085.83	2484.83	117.6	F

BRIDGE

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61158

INPUT
Description:
Distance from Upstream XS = 24
Deck/Roadway Width = 145.3
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 19

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	152.8		100	151.8		200	150.6	

SR 60 over PCDC.rep

300	149.2		400	147.5		500	145.5	
600	143.3		700	140.9		800	138.2	
898	135.22	102	898	135.22	125.22	1062	129.79	119.79
1062	129.79	102	1200	126.15		1300	123.55	
1400	121.3		1500	119.7		1600	118.6	
2500	117.7							

Upstream Bridge Cross Section Data
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	123	898	122.62	902	122.45	902	112.5	912	112.5
923.74	106.63	930.24	103.38	936.7	103.19	945.08	104.49	990.06	105.13
997.78	104.95	1007.71	105.3	1015.93	106.22	1035.99	106.5	1048	112.5
1058	112.5	1058	117.02	1062	117.19	2484.83	117.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	898	.045	1062	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
912	1048	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	837.07	117.6	F
1085.83	2484.83	117.6	F

Downstream Deck/Roadway Coordinates
num= 20

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	153.1		66.21	152.8		166.21	151.8	
266.21	150.6		366.21	149.2		466.21	147.5	
566.21	145.5		666.21	143.3		766.21	140.9	
866.21	138.2		967	135.22	102	967	135.22	125.22
1131	129.79	119.79	1131	129.79	102	1266.21	126.15	
1366.21	123.55		1466.21	121.3		1566.21	119.7	
1666.21	118.6		2500	117.7				

Downstream Bridge Cross Section Data
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	123	971	122.45	971	112.5	981	112.5	991.4	107.31
1001.4	107.2	1022.38	106.7	1034.85	105.07	1036.71	104.2	1063.62	104.78
1084.55	104.04	1088.94	104.95	1096.64	106.78	1106.64	107.35	1117	112.5
1127	112.5	1127	117.02	1131	117.19	2074.5	116.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	971	.045	1131	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
981	1117	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =

SR 60 over PCDC.rep

Spillway height used in design =
Weir crest shape = Broad Crested

Number of Abutments = 2

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
898	122.62	902	122.45	902	112.5	912	112.5	937	100

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
967	122.62	971	122.45	971	112.5	981	112.5	1006	100

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1023	100	1048	112.5	1058	112.5	1058	117.02	1062	117.19

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1092	100	1117	112.5	1127	112.5	1127	117.02	1131	117.19

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61045

INPUT
Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	984.48	116.99	999.3	110.5
1001.3	110.5	1010.3	106	1034.85	105.07	1036.71	104.2	1063.62	104.78
1084.55	104.04	1088.94	104.95	1095.74	106.78	1116.5	107	1127.5	112.5
1137.5	112.5	1143.99	115.11	1154.43	117.48	1204.33	117.66	1237.16	117.28
1361.41	116.88	1403.2	117.16	1413.99	116.76	1455.83	117.09	1532.76	116.81
1553.28	117	1587.19	116.56	1603.44	116.97	1659.81	116.47	1781.72	116.36
1808.86	116.81	1823.56	116.28	1858.25	116.54	1911.33	115.88	1954.57	116.28
2025.01	116.42	2074.5	116.2						

Manning's n Values num= 3

SR 60 over PCDC.rep

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	974.93	.045	1154.43	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
974.93	1154.43	99.55	87.28	85.32	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

BRIDGE

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61026

INPUT
Description:
Distance from Upstream XS = 3
Deck/Roadway Width = 35.1
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-8.75	119.38		88.3	119.06		304.6	118.39	
701.62	117.6		986.8	117.6	102	986.8	117.6	116.2
1146.8	117.58	116.2	1146.8	117.58	102	1169.81	117.65	
1321.27	117.67		2400	117.8				

Upstream Bridge Cross Section Data
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	986.8	115.2	989.8	115
998.8	110.5	1000.8	110.5	1007.7	107.1	1017.7	106.83	1022.38	106.7
1034.85	105.07	1036.71	104.2	1063.62	104.78	1084.55	104.04	1088.94	104.95
1095.74	106.78	1118.7	107.96	1128.7	108.47	1132.8	110.5	1134.8	110.5
1143.8	115	1146.8	115.2	1154.43	117.48	1204.33	117.66	1237.16	117.28
1361.41	116.88	1403.2	117.16	1413.99	116.76	1455.83	117.09	1532.76	116.81
1553.28	117	1587.19	116.56	1603.44	116.97	1659.81	116.47	1781.72	116.36
1808.86	116.81	1823.56	116.28	1858.25	116.54	1911.33	115.88	1954.57	116.28
2025.01	116.42	2074.5	116.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	986.8	.045	1146.8	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
1022.38	1088.94	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

Downstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	119.38		44.21	119.38		155.28	118.98	
249.57	118.74		479.88	118.02		1012.8	117.59	102

```
  1012.8  117.59   116.2  1172.8  117.58   116.2  1172.8  117.58     102
    2400   117.6

Downstream Bridge Cross Section Data
Station Elevation Data    num=      21
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   117.5     991   117.5  1012.8   115.2  1015.8     115  1024.8   110.5
  1026.8   110.5 1035.54  106.13 1045.54  105.98 1051.69  105.89 1077.82  104.99
 1107.59  104.01 1134.25  104.01  1137.8  104.27  1147.8     105  1158.8   110.5
 1160.32   110.5  1160.8   110.5  1169.8     115  1172.8   115.2    1188   117.5
 2358.42   117.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  1012.8    .045  1172.8      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
       1077.82  1147.8             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0 1006.53   117.6       F
 1293.89 2358.42   117.6       F

Upstream Embankment side slope            =       3 horiz. to 1.0 vertical
Downstream Embankment side slope          =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins       =
Energy head used in spillway design       =
Spillway height used in design            =
Weir crest shape                          = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   986.8   115.2   989.8     115   998.8   110.5  1000.8   110.5  1016.8   102.5
Downstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  1012.8   115.2  1015.8     115  1024.8   110.5  1026.8   110.5  1042.8   102.5

Abutment Data
Upstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  1116.8   102.5  1132.8   110.5  1134.8   110.5  1143.8     115  1146.8   115.2
Downstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  1142.8   102.5  1158.8   110.5  1160.8   110.5  1169.8     115  1172.8   115.2

Number of Piers =  7

Pier Data
Pier Station     Upstream=  1006.8    Downstream=  1032.8
Upstream     num=       4
    Width    Elev    Width    Elev    Width    Elev    Width    Elev
   1.167     102   1.167   114.2       2   114.2       2   116.2
Downstream     num=       4
    Width    Elev    Width    Elev    Width    Elev    Width    Elev
     1.5     102     1.5   114.2       3   114.2       3   116.2

Pier Data
```

```
Pier Station     Upstream=  1026.8    Downstream=  1052.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1046.8    Downstream=  1072.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1066.8    Downstream=  1092.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1086.8    Downstream=  1112.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1106.8    Downstream=  1132.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1126.8    Downstream=  1152.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum              Cd   =       2
       Yarnell               KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer
```

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High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 60958

INPUT
Description:
Station Elevation Data num= 72

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	113.72	29.45	113.69	44.85	113.08	68.37	113.27	70.38	112.51
109.9	112.84	119	114.72	140.95	115.57	202.04	115.6	223.9	116.11
233.59	115.59	318.11	116.61	327.66	115.5	348.56	115.28	421.88	115.68
581.61	115.13	584.23	115.64	630.99	114.87	662.73	117.11	695.63	116.42
702.73	115.14	728.24	115.28	829.35	114.6	846.82	114.76	1006.53	113.3
1016.53	112.71	1043.73	109.3	1050.59	107.76	1077.82	104.99	1107.59	104.01
1134.25	104.01	1145.58	104.97	1160.32	105.06	1171.58	106.01	1202.8	106.31
1216.56	107.34	1239.48	110.57	1293.89	113.43	1326.32	113.03	1406.14	112.95
1423.17	113.37	1494.26	112.73	1531.07	113.03	1629.88	113.11	1764.95	112.16
1819.06	112.04	1899.42	112.13	1915.49	112.33	1995.79	112.02	2016.93	112.04
2031.85	112.04	2053.97	111.78	2055.23	111.74	2065.93	111.73	2075.35	110.93
2079.31	110.76	2081.23	110.73	2090.42	110.03	2098.45	110.38	2107.52	111.17
2121.72	111.63	2134.8	111.89	2152.95	112.08	2176.79	112.17	2195.19	112.15
2259.6	112.42	2273.08	112.59	2292.67	112.76	2298.18	112.76	2330.65	113.04
2351.66	113.16	2358.42	113.16						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1077.82	.035	1160.32	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1077.82	1160.32	327.91	339.69	379.75	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1006.53	117.6	F
1293.89	2358.42	117.6	F

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 60618

INPUT
Description:
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	24.56	115	58.18	115.28	99.55	115.38	106.95	115.21
137.67	116	425.61	116	460.65	117	537.14	117.51	634.83	117.72
696.72	117.73	805.21	117.89	836.04	117.65	885.25	117.81	940.84	117.18
952.19	117.37	978.87	117.1	978.97	117.44	1133.64	117	1203.02	116

1248.93	114	1274.05	113.42	1283.52	114.12	1283.68	113.56	1302.83	115
1321.03	115.79	1327.05	114.5	1352.89	109.94	1365.14	108.34	1386.97	105.99
1388.62	104.77	1391.53	104.03	1406.14	104.12	1427.18	103.44	1431.24	104.67
1440.15	105.35	1456.72	110.02	1462.79	108.93	1467.38	110.29	1490.27	112.5
1539.06	112.03	1575.45	112.18	1653.05	112.26	1688.06	112.05	1840	112.06
1950.29	111.48	2061.49	111.73	2115.81	111.56	2162.53	111.2	2268.98	111.99
2358.62	111.98	2387.73	112.14	2395.69	112.25	2408.87	112.38	2447.86	112.52
2471.35	112.8	2489.65	112.98						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1388.62	.035	1431.24	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1388.62	1431.24	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:PeaceCreekCanal

Reach	River Sta.	n1	n2	n3
Main3	61397	.1	.035	.1
Main3	61242	.1	.035	.1
Main3	61158	Bridge		
Main3	61045	.1	.045	.1
Main3	61026	Bridge		
Main3	60958	.1	.035	.1
Main3	60618	.1	.035	.1

SUMMARY OF REACH LENGTHS

River: PeaceCreekCanal

Reach	River Sta.	Left	Channel	Right
Main3	61397	174.52	154.66	112.86
Main3	61242	166.15	197.18	223.3
Main3	61158	Bridge		
Main3	61045	99.55	87.28	85.32
Main3	61026	Bridge		
Main3	60958	327.91	339.69	379.75
Main3	60618	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: PeaceCreekCanal

Reach	River Sta.	Contr.	Expan.
Main3	61397	.1	.3
Main3	61242	.3	.5
Main3	61158	Bridge	

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Main3	**61045**		**.3**	**.5**
Main3	**61026**	**Bridge**		
Main3	**60958**		**.3**	**.5**
Main3	**60618**		**.1**	**.3**

HEC-RAS Plan: Proposed - Alt 1 River: PeaceCreekCanal Reach: Main3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	61397	25 Year	1057.00	104.31	111.98		112.00	0.000087	1.49	2020.97	1009.85	0.10
Main3	61397	50 Year	1223.00	104.31	112.36		112.38	0.000086	1.54	2428.35	1092.36	0.10
Main3	61397	100 Year	1448.00	104.31	112.95		112.98	0.000081	1.56	3135.86	1294.59	0.10
Main3	61397	500 Year	1808.00	104.31	113.88		113.90	0.000063	1.48	4402.95	1438.37	0.09
Main3	61242	25 Year	1057.00	103.19	111.96	106.26	111.99	0.000083	1.46	1059.03	444.47	0.09
Main3	61242	50 Year	1223.00	103.19	112.34	106.43	112.37	0.000093	1.60	1136.03	1038.79	0.10
Main3	61242	100 Year	1448.00	103.19	112.92	106.64	112.96	0.000102	1.76	1275.93	1433.05	0.11
Main3	61242	500 Year	1808.00	103.19	113.84	106.95	113.88	0.000107	1.93	1500.51	1929.57	0.11
Main3	61158 BR U	25 Year	1057.00	103.19	111.96	106.42	111.98	0.000133	1.27	833.39	133.83	0.09
Main3	61158 BR U	50 Year	1223.00	103.19	112.34	106.60	112.36	0.000149	1.38	884.23	135.34	0.10
Main3	61158 BR U	100 Year	1448.00	103.19	112.92	106.78	112.96	0.000157	1.50	972.18	156.00	0.10
Main3	61158 BR U	500 Year	1808.00	103.19	113.84	107.06	113.88	0.000162	1.65	1115.08	156.00	0.10
Main3	61158 BR D	25 Year	1057.00	104.04	111.93	106.69	111.96	0.000173	1.38	768.21	133.71	0.10
Main3	61158 BR D	50 Year	1223.00	104.04	112.30	106.99	112.34	0.000191	1.49	818.59	135.21	0.11
Main3	61158 BR D	100 Year	1448.00	104.04	112.89	107.33	112.93	0.000198	1.61	904.12	156.00	0.11
Main3	61158 BR D	500 Year	1808.00	104.04	113.80	107.60	113.85	0.000198	1.76	1043.29	156.00	0.11
Main3	61045	25 Year	1057.00	104.04	111.92	106.56	111.95	0.000168	1.38	768.63	130.30	0.10
Main3	61045	50 Year	1223.00	104.04	112.30	106.74	112.33	0.000186	1.50	817.66	131.91	0.11
Main3	61045	100 Year	1448.00	104.04	112.88	107.07	112.92	0.000215	1.61	899.18	144.59	0.11
Main3	61045	500 Year	1808.00	104.04	113.80	107.36	113.84	0.000219	1.75	1033.52	148.96	0.12
Main3	61026 BR U	25 Year	1057.00	104.04	111.92	106.78	111.95	0.000354	1.50	728.77	133.51	0.10
Main3	61026 BR U	50 Year	1223.00	104.04	112.29	107.04	112.33	0.000397	1.62	778.86	135.00	0.10
Main3	61026 BR U	100 Year	1448.00	104.04	112.87	107.41	112.92	0.000431	1.73	858.12	137.33	0.11
Main3	61026 BR U	500 Year	1808.00	104.04	113.78	107.77	113.84	0.000469	1.87	984.75	140.97	0.11
Main3	61026 BR D	25 Year	1057.00	104.01	111.19	106.34	111.23	0.000340	1.58	722.23	128.27	0.11
Main3	61026 BR D	50 Year	1223.00	104.01	111.56	106.50	111.61	0.000385	1.72	770.41	129.76	0.11
Main3	61026 BR D	100 Year	1448.00	104.01	112.15	106.70	112.20	0.000422	1.85	847.03	132.10	0.12
Main3	61026 BR D	500 Year	1808.00	104.01	113.07	107.00	113.12	0.000464	2.03	969.97	135.77	0.12
Main3	60958	25 Year	1057.00	104.01	111.18	106.16	111.22	0.000108	1.58	1055.38	258.03	0.11
Main3	60958	50 Year	1223.00	104.01	111.56	106.37	111.60	0.000119	1.72	1141.44	284.37	0.11
Main3	60958	100 Year	1448.00	104.01	112.15	106.59	112.19	0.000126	1.86	1282.21	586.32	0.12
Main3	60958	500 Year	1808.00	104.01	113.07	106.91	113.12	0.000130	2.04	1522.32	1222.50	0.12

HEC-RAS Plan: Proposed - Alt 1 River: PeaceCreekCanal Reach: Main3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	60618	25 Year	1057.00	103.44	111.00	106.59	111.13	0.000383	3.04	545.99	127.85	0.20
Main3	60618	50 Year	1223.00	103.44	111.35	106.87	111.50	0.000428	3.32	594.70	173.14	0.22
Main3	60618	100 Year	1448.00	103.44	111.92	107.19	112.08	0.000441	3.54	798.92	535.52	0.22
Main3	60618	500 Year	1808.00	103.44	112.89	107.69	113.02	0.000356	3.44	1762.93	1144.33	0.20

Plan: Proposed - Alt 1   PeaceCreekCanal   Main3 RS: 61158   Profile: 25 Year

E.G. US. (ft)	111.99	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	111.96	E.G. Elev (ft)	111.98	111.96
Q Total (cfs)	1057.00	W.S. Elev (ft)	111.96	111.93
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.42	106.69
Q Weir (cfs)		Max Chl Dpth (ft)	8.77	7.89
Weir Sta Lft (ft)		Vel Total (ft/s)	1.27	1.38
Weir Sta Rgt (ft)		Flow Area (sq ft)	833.39	768.21
Weir Submerg		Froude # Chl	0.09	0.10
Weir Max Depth (ft)		Specif Force (cu ft)	2864.47	2478.55
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.23	5.75
Min El Prs (ft)	125.22	W.P. Total (ft)	137.31	136.52
Delta EG (ft)	0.03	Conv. Total (cfs)	91564.1	80249.7
Delta WS (ft)	0.03	Top Width (ft)	133.83	133.71
BR Open Area (sq ft)	2427.39	Frctn Loss (ft)	0.02	0.00
BR Open Vel (ft/s)	1.38	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.05	0.06
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 1   PeaceCreekCanal   Main3 RS: 61158   Profile: 50 Year

E.G. US. (ft)	112.37	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.34	E.G. Elev (ft)	112.36	112.34
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.34	112.30
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	106.60	106.99
Q Weir (cfs)		Max Chl Dpth (ft)	9.15	8.26
Weir Sta Lft (ft)		Vel Total (ft/s)	1.38	1.49
Weir Sta Rgt (ft)		Flow Area (sq ft)	884.23	818.59
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3199.76	2787.36
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.53	6.05
Min El Prs (ft)	125.22	W.P. Total (ft)	139.00	138.20
Delta EG (ft)	0.04	Conv. Total (cfs)	100240.9	88486.3
Delta WS (ft)	0.04	Top Width (ft)	135.34	135.21
BR Open Area (sq ft)	2427.39	Frctn Loss (ft)	0.02	0.01
BR Open Vel (ft/s)	1.49	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.06	0.07
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 1   PeaceCreekCanal   Main3 RS: 61158   Profile: 100 Year

E.G. US. (ft)	112.96	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.92	E.G. Elev (ft)	112.96	112.93
Q Total (cfs)	1448.00	W.S. Elev (ft)	112.92	112.89
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	106.78	107.33
Q Weir (cfs)		Max Chl Dpth (ft)	9.73	8.85
Weir Sta Lft (ft)		Vel Total (ft/s)	1.49	1.60
Weir Sta Rgt (ft)		Flow Area (sq ft)	972.18	904.12
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3757.19	3305.08
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.23	5.95
Min El Prs (ft)	125.22	W.P. Total (ft)	160.58	155.54
Delta EG (ft)	0.04	Conv. Total (cfs)	115460.6	102901.7
Delta WS (ft)	0.04	Top Width (ft)	156.00	156.00
BR Open Area (sq ft)	2427.39	Frctn Loss (ft)	0.03	0.01
BR Open Vel (ft/s)	1.60	C & E Loss (ft)	0.00	0.00

Plan: Proposed - Alt 1 PeaceCreekCanal Main3 RS: 61158 Profile: 100 Year (Continued)

Coef of Q		Shear Total (lb/sq ft)	0.06	0.07
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 1 PeaceCreekCanal Main3 RS: 61158 Profile: 500 Year

E.G. US. (ft)	113.88	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.84	E.G. Elev (ft)	113.88	113.85
Q Total (cfs)	1808.00	W.S. Elev (ft)	113.84	113.80
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.06	107.60
Q Weir (cfs)		Max Chl Dpth (ft)	10.65	9.76
Weir Sta Lft (ft)		Vel Total (ft/s)	1.62	1.73
Weir Sta Rgt (ft)		Flow Area (sq ft)	1115.08	1043.29
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	4737.99	4222.10
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	7.15	6.86
Min El Prs (ft)	125.22	W.P. Total (ft)	162.41	156.46
Delta EG (ft)	0.04	Conv. Total (cfs)	142192.6	128409.2
Delta WS (ft)	0.04	Top Width (ft)	156.00	156.00
BR Open Area (sq ft)	2427.39	Frctn Loss (ft)	0.03	0.01
BR Open Vel (ft/s)	1.73	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.07	0.08
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 1 PeaceCreekCanal Main3 RS: 61026 Profile: 25 Year

E.G. US. (ft)	111.95	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	111.92	E.G. Elev (ft)	111.95	111.23
Q Total (cfs)	1057.00	W.S. Elev (ft)	111.92	111.19
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.78	106.34
Q Weir (cfs)		Max Chl Dpth (ft)	7.88	7.18
Weir Sta Lft (ft)		Vel Total (ft/s)	1.45	1.46
Weir Sta Rgt (ft)		Flow Area (sq ft)	728.77	722.23
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	2307.99	2300.32
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.46	5.63
Min El Prs (ft)	116.20	W.P. Total (ft)	216.88	210.25
Delta EG (ft)	0.74	Conv. Total (cfs)	56214.3	57294.7
Delta WS (ft)	0.74	Top Width (ft)	133.51	128.27
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.46	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.07	0.07
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 1 PeaceCreekCanal Main3 RS: 61026 Profile: 50 Year

E.G. US. (ft)	112.33	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.30	E.G. Elev (ft)	112.33	111.61
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.29	111.56
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	107.04	106.50
Q Weir (cfs)		Max Chl Dpth (ft)	8.25	7.55
Weir Sta Lft (ft)		Vel Total (ft/s)	1.57	1.59
Weir Sta Rgt (ft)		Flow Area (sq ft)	778.86	770.41
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	2601.25	2591.46
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.77	5.94
Min El Prs (ft)	116.20	W.P. Total (ft)	223.78	217.15

Plan: Proposed - Alt 1 PeaceCreekCanal Main3 RS: 61026 Profile: 50 Year (Continued)

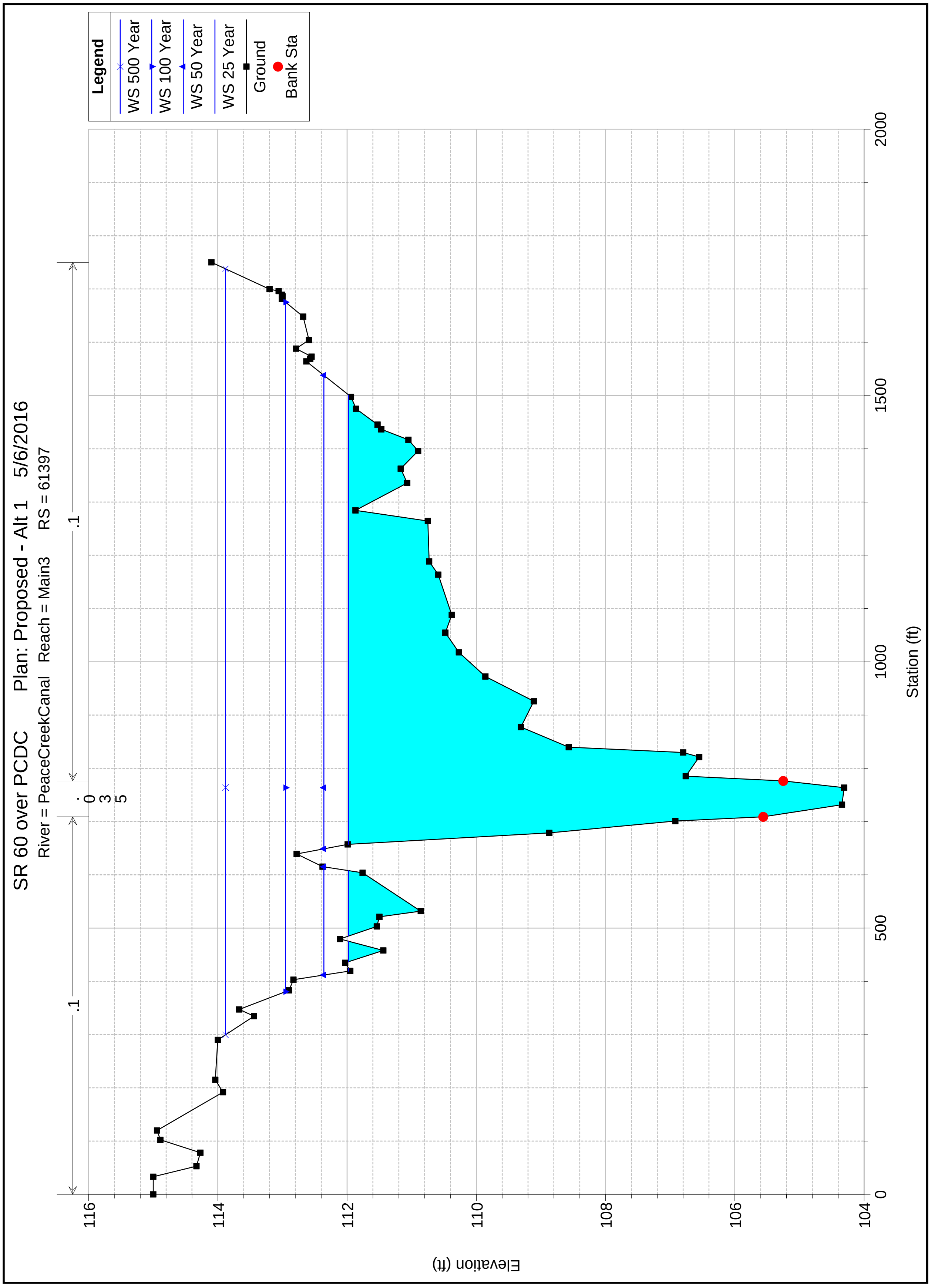
Delta EG (ft)	0.73	Conv. Total (cfs)	61377.4	62338.7
Delta WS (ft)	0.74	Top Width (ft)	135.00	129.76
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.59	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.09	0.09
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

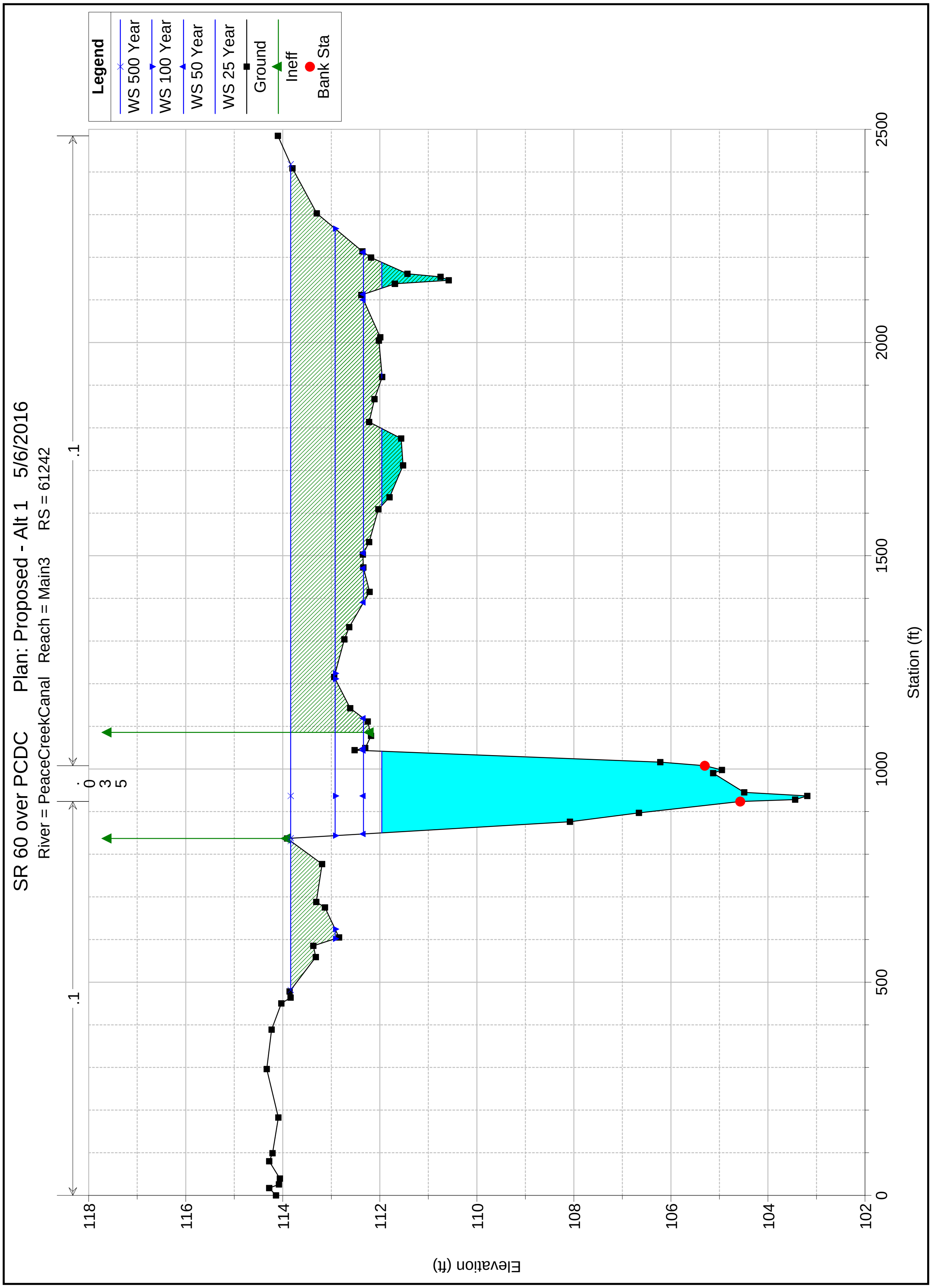
Plan: Proposed - Alt 1 PeaceCreekCanal Main3 RS: 61026 Profile: 100 Year

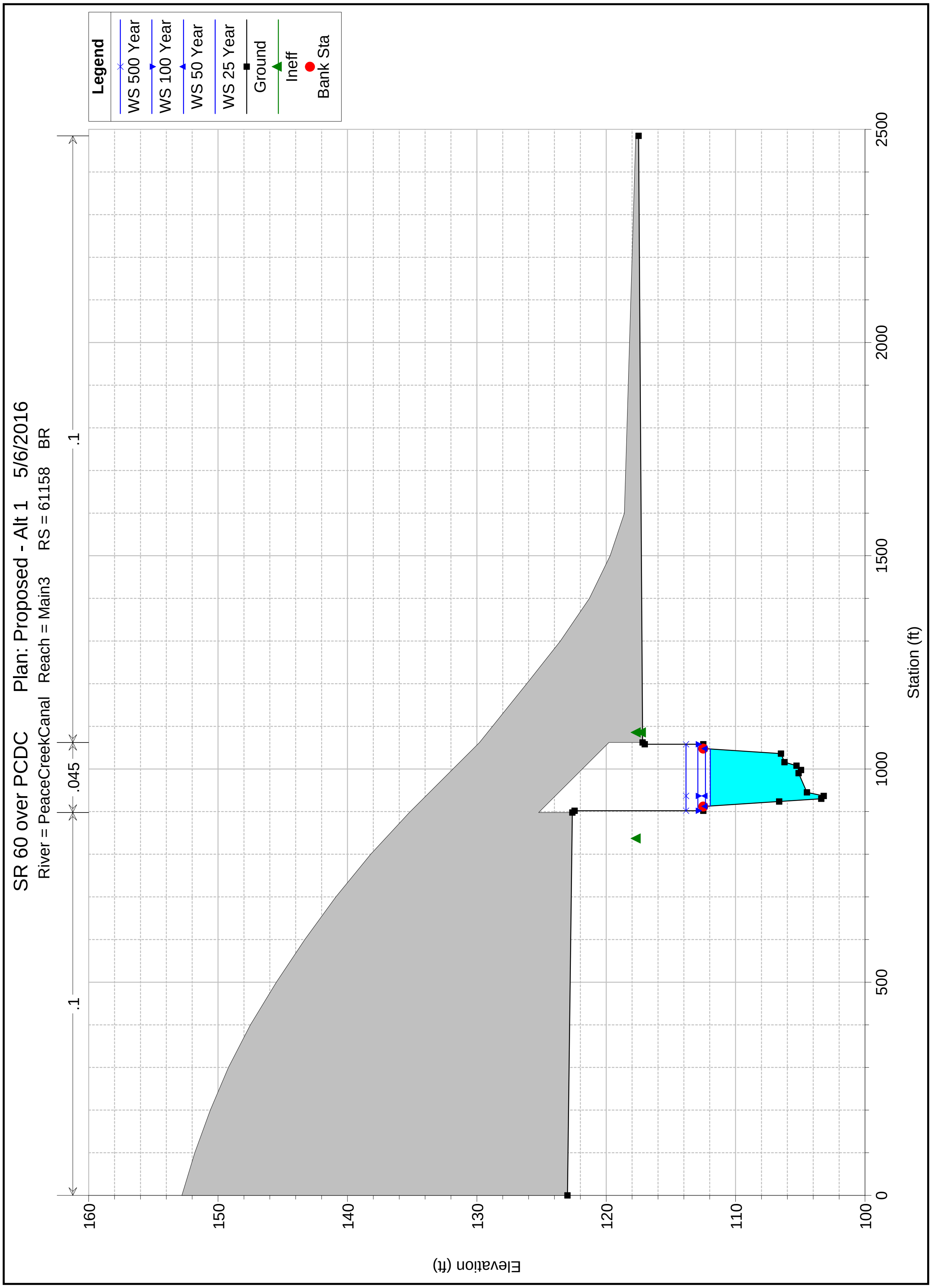
E.G. US. (ft)	112.92	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.88	E.G. Elev (ft)	112.92	112.20
Q Total (cfs)	1448.00	W.S. Elev (ft)	112.87	112.15
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	107.41	106.70
Q Weir (cfs)		Max Chl Dpth (ft)	8.83	8.14
Weir Sta Lft (ft)		Vel Total (ft/s)	1.69	1.71
Weir Sta Rgt (ft)		Flow Area (sq ft)	858.12	847.03
Weir Submerg		Froude # Chl	0.11	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	3093.83	3081.53
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.25	6.41
Min El Prs (ft)	116.20	W.P. Total (ft)	234.53	227.96
Delta EG (ft)	0.73	Conv. Total (cfs)	69731.0	70507.6
Delta WS (ft)	0.73	Top Width (ft)	137.33	132.10
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.71	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.10	0.10
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

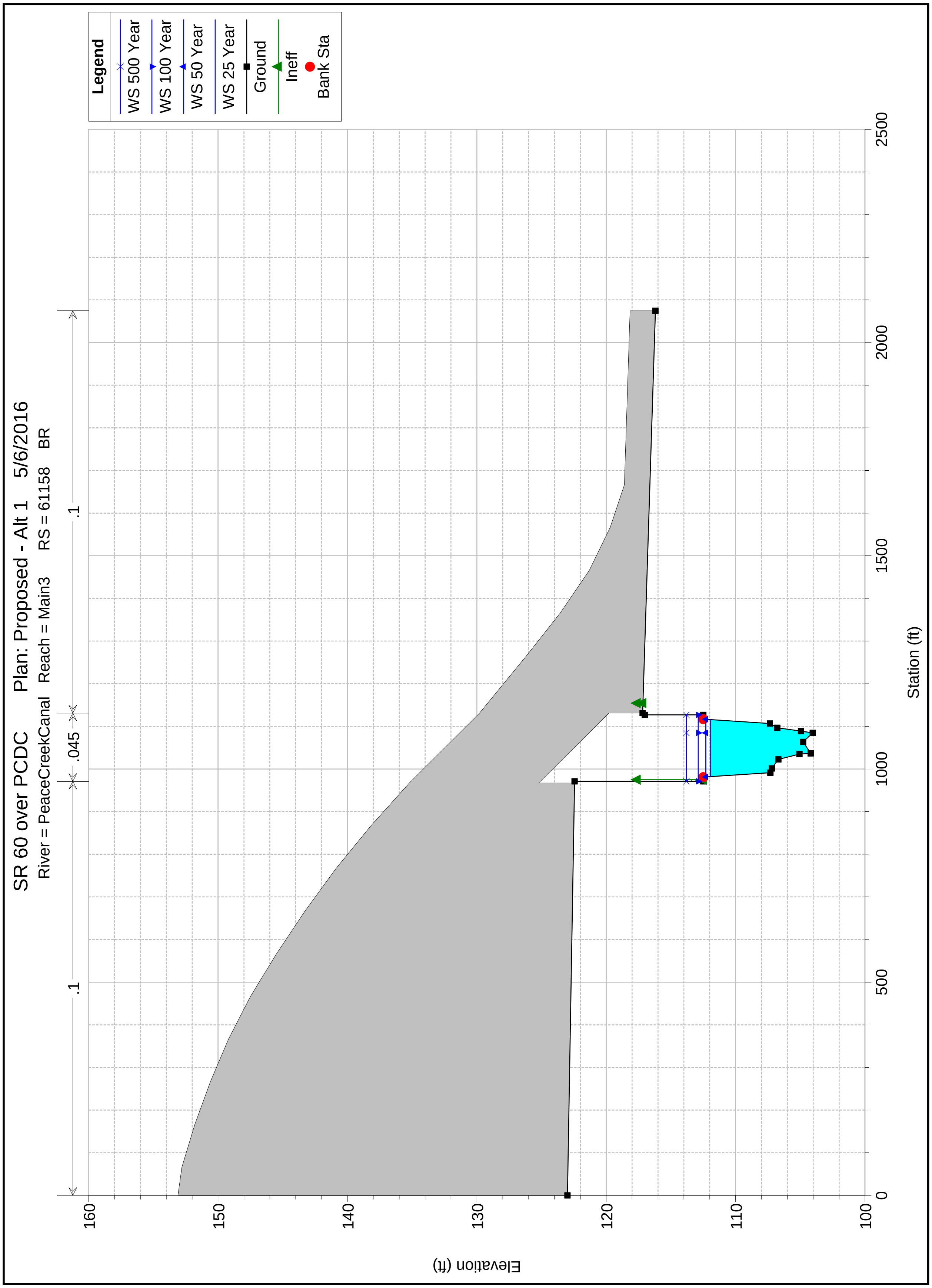
Plan: Proposed - Alt 1 PeaceCreekCanal Main3 RS: 61026 Profile: 500 Year

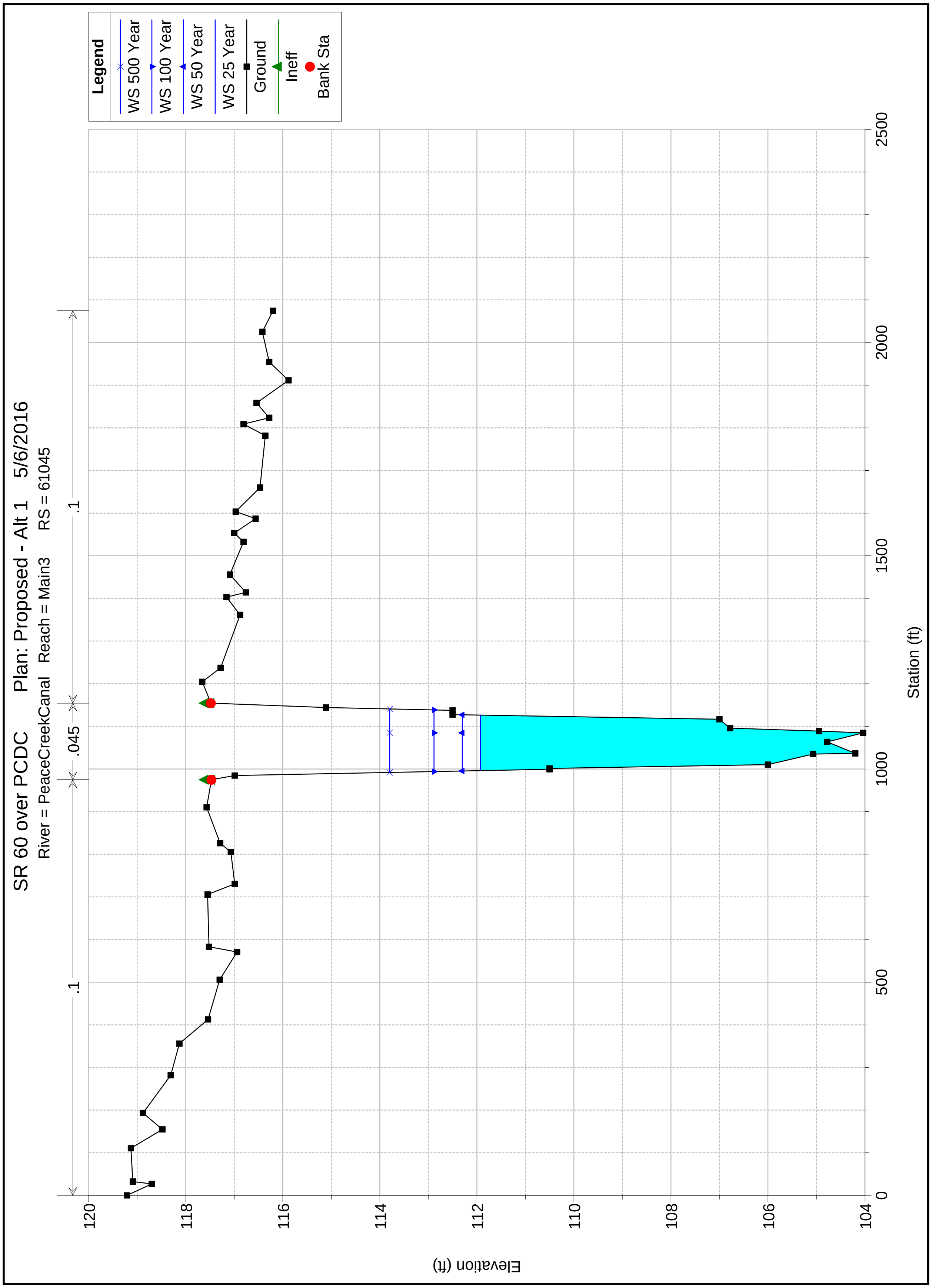
E.G. US. (ft)	113.84	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.80	E.G. Elev (ft)	113.84	113.12
Q Total (cfs)	1808.00	W.S. Elev (ft)	113.78	113.07
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.77	107.00
Q Weir (cfs)		Max Chl Dpth (ft)	9.74	9.06
Weir Sta Lft (ft)		Vel Total (ft/s)	1.84	1.86
Weir Sta Rgt (ft)		Flow Area (sq ft)	984.75	969.97
Weir Submerg		Froude # Chl	0.11	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	3959.33	3943.44
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.99	7.14
Min El Prs (ft)	116.20	W.P. Total (ft)	251.34	244.92
Delta EG (ft)	0.73	Conv. Total (cfs)	83488.3	83944.8
Delta WS (ft)	0.73	Top Width (ft)	140.97	135.77
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.86	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.11	0.11
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00


SR 60 over PCDC Plan: Proposed - Alt 1 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61397
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
.1
.035
.1
116
114
112
110
108
106
104
0
500
1000
1500
2000

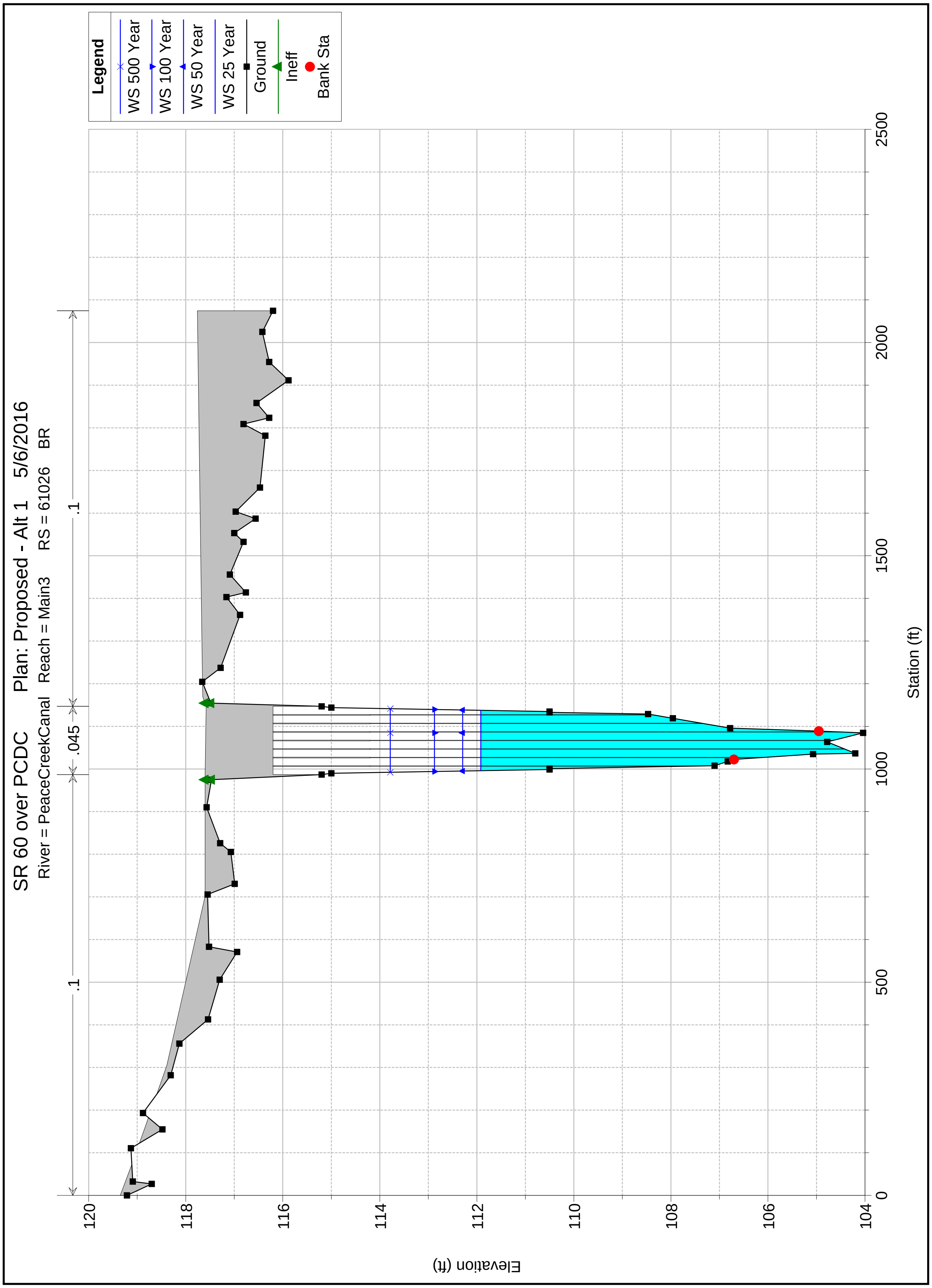

SR 60 over PCDC Plan: Proposed - Alt 1 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61242
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
118
116
114
112
110
108
106
104
102
0
500
1000
1500
2000
2500

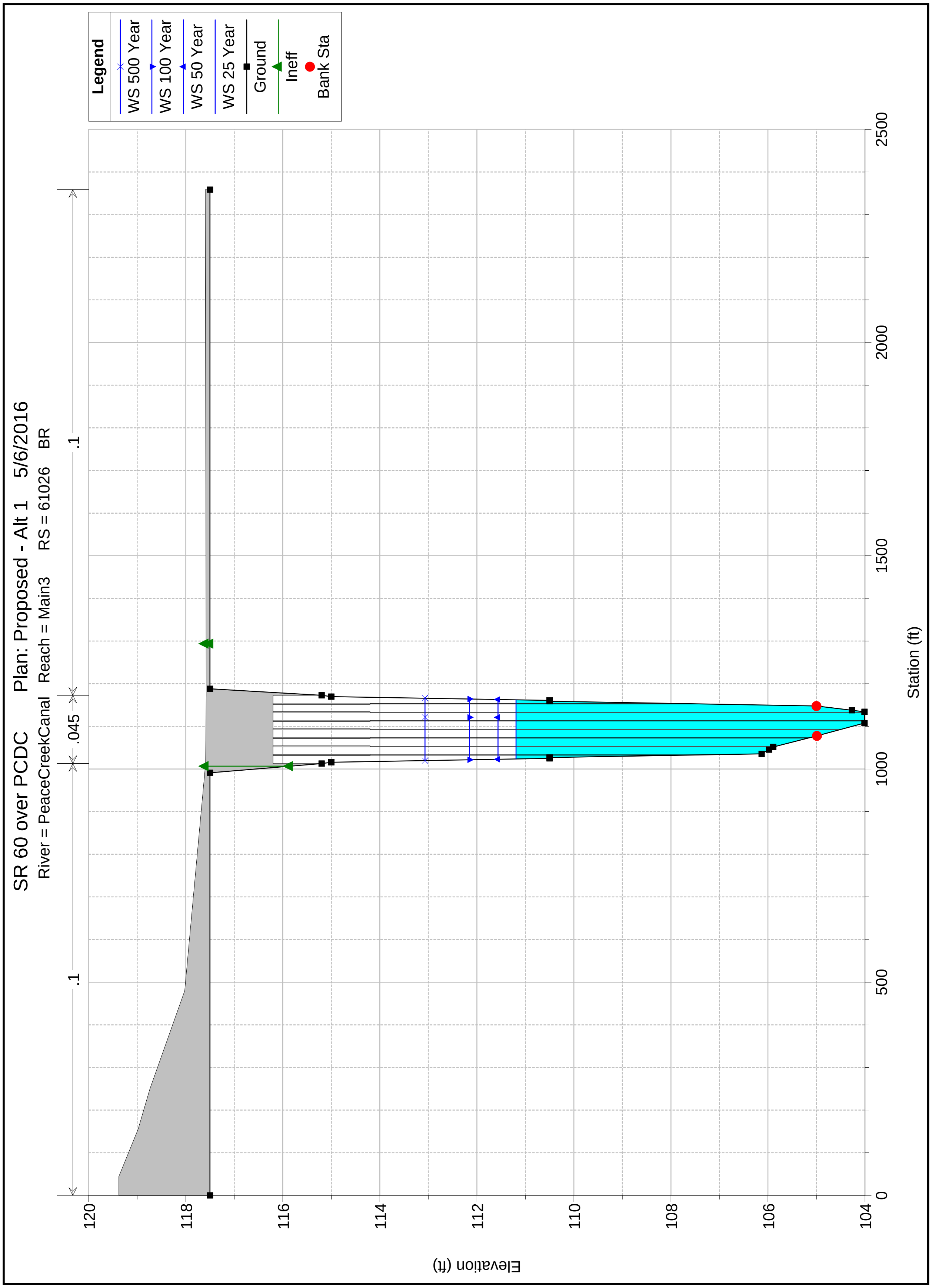

SR 60 over PCDC Plan: Proposed - Alt 1 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61158 BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
160
150
140
130
120
110
100
0
500
1000
1500
2000
2500

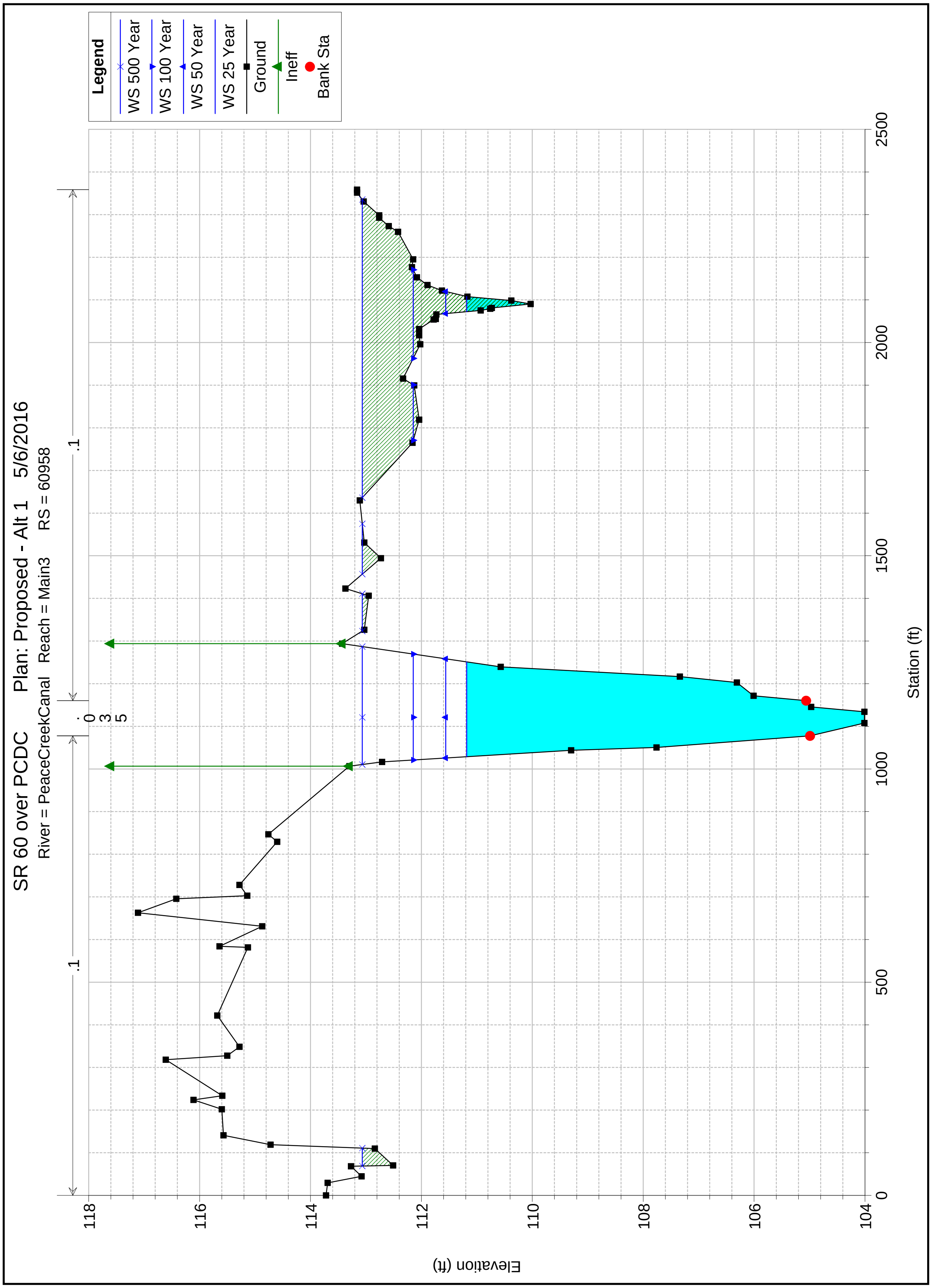

SR 60 over PCDC   Plan: Proposed - Alt 1   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 61158   BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
160
150
140
130
120
110
100
0
500
1000
1500
2000
2500

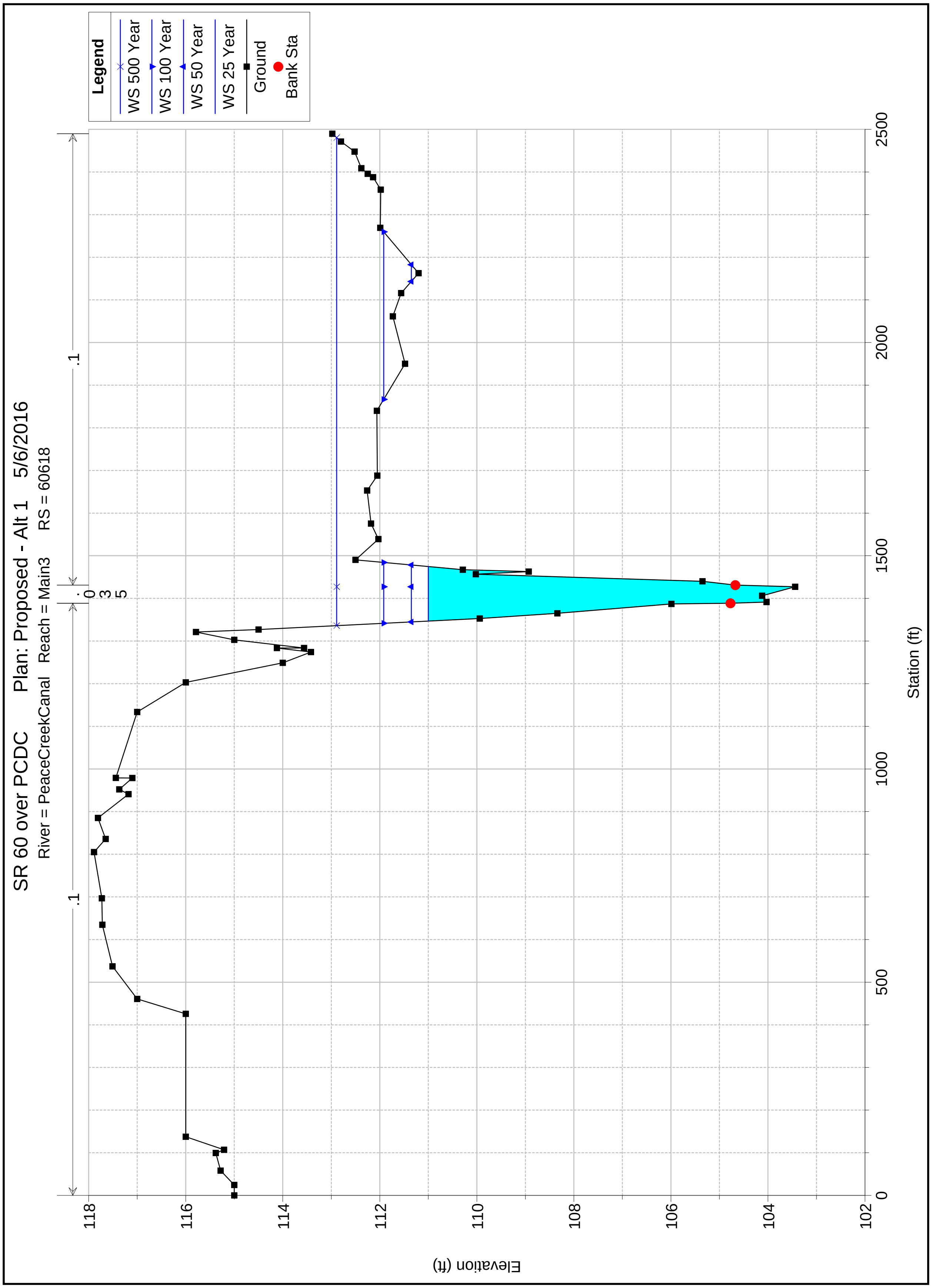


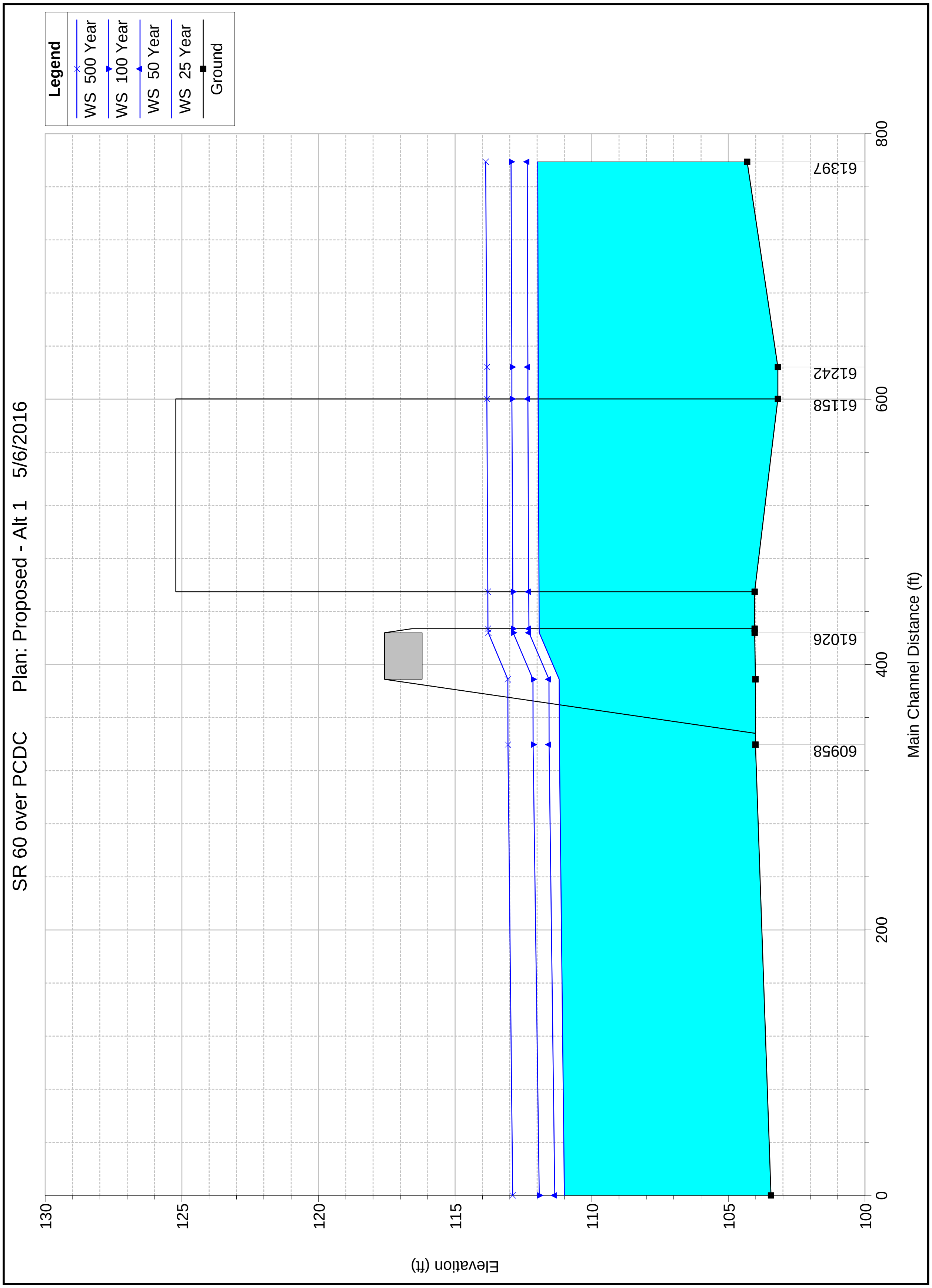
SR 60 over PCDC Plan: Proposed - Alt 1 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61045
.1
.045
.1
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 1   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 61026   BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 1   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 61026   BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 1   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 60958
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
.1
.035
.1
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC Plan: Proposed - Alt 1 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 60618
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
.1
.1
.035
Elevation (ft)
Station (ft)
118
116
114
112
110
108
106
104
102
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 1   5/6/2016
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
61397
61242
61158
61026
60958
Main Channel Distance (ft)
Elevation (ft)
0
200
400
600
800
100
105
110
115
120
125
130

HEC-RAS

Proposed Condition - Alternative 2

SR 60 over PCDC.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX   XXXX        XXXX      XX     XXXX
X     X  X       X    X       X   X    X  X   X
X     X  X       X            X   X   X    X  X
XXXXXXX  XXXX    X      XXX   XXXX    XXXXXX   XXXX
X     X  X       X            X  X    X    X       X
X     X  X       X    X       X   X   X    X       X
X     X  XXXXXX   XXXX        X    X  X    X  XXXXX
```

PROJECT DATA
Project Title: SR 60 over PCDC
Project File : SR 60 over PCDC.prj
Run Date and Time: 5/6/2016 4:34:10 PM

Project in English units

Project Description:
CRS Info=<SpatialReference> <CoordinateSystem Code="3517"
Unit="US_survey_Foot" /> <Registration OffsetX="0" OffsetY="0" OffsetZ="0"
ScaleX="1" ScaleY="1" ScaleZ="1" /></SpatialReference>

PLAN DATA

Plan Title: Proposed - Alt 2
Plan File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.p02

Geometry Title: Proposed - Alt 2
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g02

Flow Title : Flow Data
Flow File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Plan Summary Information:

Number of:	Cross Sections =	5	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	2	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.33
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary

SR 60 over PCDC.rep

Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow Data
Flow File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Flow Data (cfs)

River	Reach	RS	25 Year	50 Year	100 Year	500 Year
PeaceCreekCanal	Main3	61397	1057	1223	1448	1808

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
PeaceCreekCanal	Main3	25 Year		Known WS = 111
PeaceCreekCanal	Main3	50 Year		Known WS = 111.35
PeaceCreekCanal	Main3	100 Year		Known WS = 111.92
PeaceCreekCanal	Main3	500 Year		Known WS = 112.89

GEOMETRY DATA

Geometry Title: Proposed - Alt 2
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g02

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61397

INPUT
Description:
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	33.22	115	52.93	114.33	78.28	114.27	102.48	114.89
119.95	114.94	191.95	113.92	215.3	114.04	290.03	114	334.6	113.44
347.36	113.67	383.17	112.9	403.15	112.83	419.46	111.95	434.81	112.03
457.95	111.44	479.62	112.11	503.08	111.54	521.01	111.5	531.9	110.86
603.74	111.76	615.49	112.38	639.19	112.78	657.26	111.99	678.74	108.87
700.91	106.92	708.93	105.56	731.55	104.34	763.75	104.31	776.31	105.25
785.25	106.76	821.24	106.55	829.63	106.8	839.8	108.57	877.59	109.31
926.02	109.11	972.4	109.86	1017.79	110.27	1054.63	110.48	1088.12	110.38
1163.67	110.59	1188.42	110.73	1264.32	110.75	1284.24	111.87	1335.61	111.07
1362.69	111.17	1396	110.9	1416.92	111.05	1436.67	111.47	1436.74	111.47

```
 1445.37  111.53    1475  111.86  1497.5  111.94 1563.93  112.63 1569.18  112.57
 1572.88  112.55 1588.13  112.79 1604.36  112.59 1648.04  112.68 1680.92  113.01
 1684.42     113 1686.87     113 1689.22  113.01    1696  113.06 1699.55   113.2
    1750   114.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  708.93    .035  776.31      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        708.93  776.31           174.52  154.66  112.86              .1       .3

CROSS SECTION


RIVER: PeaceCreekCanal
REACH: Main3              RS: 61242

INPUT
Description:
Station Elevation Data    num=      61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  114.14   17.14  114.28   25.96  114.08   39.42  114.06    79.9  114.28
    98.8  114.21  182.65  114.09  296.36  114.33  388.83  114.23  450.19  114.03
  463.95  113.84  478.14  113.86  558.86  113.32  585.36  113.37  604.87  112.84
  675.26  113.13  687.97  113.31  776.97  113.19  837.07  113.91  876.36  108.08
  897.12  106.66  923.74  104.57  928.11  103.44   936.7  103.19  945.08  104.49
  990.06  105.13  997.78  104.95 1007.71   105.3 1015.93  106.22 1044.06  112.52
  1049.2   112.3 1077.69  112.18 1111.31  112.25 1142.55  112.61 1215.86  112.94
 1303.97  112.73 1332.42  112.63 1415.43  112.21 1472.49  112.34  1502.9  112.35
 1532.03  112.22  1609.1  112.03 1637.09   111.8 1711.93  111.52 1774.91  111.56
 1813.59  112.22 1867.26  112.11 1919.19  111.95 2004.59  112.02 2012.37  111.99
 2111.51  112.38 2137.72  111.69 2137.77  111.69 2146.04  110.58    2154  110.75
 2161.14  111.43 2199.22  112.18 2213.87  112.36 2303.03   113.3  2408.7   113.8
 2484.83   114.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  923.74    .035 1007.71      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        923.74 1007.71           166.15  197.18   223.3              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  837.07   117.6       F
 1085.83 2484.83   117.6       F

BRIDGE


RIVER: PeaceCreekCanal
REACH: Main3              RS: 61158

INPUT
Description:
Distance from Upstream XS =      24
Deck/Roadway Width        =   145.3
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      19
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
```

0	152.8		100	151.8		200	150.6	
300	149.2		400	147.5		500	145.5	
600	143.3		700	140.9		800	138.2	
898	135.22	102	898	135.22	129.47	1062	129.79	124.04
1062	129.79	102	1200	126.15		1300	123.55	
1400	121.3		1500	119.7		1600	118.6	
2500	117.7							

Upstream Bridge Cross Section Data

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	123	898	122.62	902	122.45	902	112.5	912	112.5
923.74	106.63	930.24	103.38	936.7	103.19	945.08	104.49	990.06	105.13
997.78	104.95	1007.71	105.3	1015.93	106.22	1035.99	106.5	1048	112.5
1058	112.5	1058	117.02	1062	117.19	2484.83	117.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	898	.045	1062	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
912	1048	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	837.07	117.6	F
1085.83	2484.83	117.6	F

Downstream Deck/Roadway Coordinates

num= 20

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	153.1		66.21	152.8		166.21	151.8	
266.21	150.6		366.21	149.2		466.21	147.5	
566.21	145.5		666.21	143.3		766.21	140.9	
866.21	138.2		967	135.22	102	967	135.22	129.47
1131	129.79	124.04	1131	129.79	102	1266.21	126.15	
1366.21	123.55		1466.21	121.3		1566.21	119.7	
1666.21	118.6		2500	117.7				

Downstream Bridge Cross Section Data

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	123	971	122.45	971	112.5	981	112.5	991.4	107.31
1001.4	107.2	1022.38	106.7	1034.85	105.07	1036.71	104.2	1063.62	104.78
1084.55	104.04	1088.94	104.95	1096.64	106.78	1106.64	107.35	1117	112.5
1127	112.5	1127	117.02	1131	117.19	2074.5	116.2		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	971	.045	1131	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
981	1117	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =

SR 60 over PCDC.rep

Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Abutments = 2

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
898	122.62	902	122.45	902	112.5	912	112.5	937	100

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
967	122.62	971	122.45	971	112.5	981	112.5	1006	100

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1023	100	1048	112.5	1058	112.5	1058	117.02	1062	117.19

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1092	100	1117	112.5	1127	112.5	1127	117.02	1131	117.19

Number of Piers = 1

Pier Data
Pier Station Upstream= 980 Downstream= 1049
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	122.8	4.5	122.8	4.5	126.8

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	122.8	4.5	122.8	4.5	126.8

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
Yarnell KVal = 1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61045

INPUT
Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	984.48	116.99	999.3	110.5
1001.3	110.5	1010.3	106	1034.85	105.07	1036.71	104.2	1063.62	104.78
1084.55	104.04	1088.94	104.95	1095.74	106.78	1116.5	107	1127.5	112.5
1137.5	112.5	1143.99	115.11	1154.43	117.48	1204.33	117.66	1237.16	117.28
1361.41	116.88	1403.2	117.16	1413.99	116.76	1455.83	117.09	1532.76	116.81
1553.28	117	1587.19	116.56	1603.44	116.97	1659.81	116.47	1781.72	116.36
1808.86	116.81	1823.56	116.28	1858.25	116.54	1911.33	115.88	1954.57	116.28
2025.01	116.42	2074.5	116.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	974.93	.045	1154.43	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
974.93	1154.43	99.55	87.28	85.32	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

BRIDGE

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61026

INPUT
Description:
Distance from Upstream XS = 3
Deck/Roadway Width = 35.1
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-8.75	119.38		88.3	119.06		304.6	118.39	
701.62	117.6		986.8	117.6	102	986.8	117.6	116.2
1146.8	117.58	116.2	1146.8	117.58	102	1169.81	117.65	
1321.27	117.67		2400	117.8				

Upstream Bridge Cross Section Data
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	986.8	115.2	989.8	115
998.8	110.5	1000.8	110.5	1007.7	107.1	1017.7	106.83	1022.38	106.7
1034.85	105.07	1036.71	104.2	1063.62	104.78	1084.55	104.04	1088.94	104.95
1095.74	106.78	1118.7	107.96	1128.7	108.47	1132.8	110.5	1134.8	110.5
1143.8	115	1146.8	115.2	1154.43	117.48	1204.33	117.66	1237.16	117.28
1361.41	116.88	1403.2	117.16	1413.99	116.76	1455.83	117.09	1532.76	116.81
1553.28	117	1587.19	116.56	1603.44	116.97	1659.81	116.47	1781.72	116.36
1808.86	116.81	1823.56	116.28	1858.25	116.54	1911.33	115.88	1954.57	116.28
2025.01	116.42	2074.5	116.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	986.8	.045	1146.8	.1

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Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff Contr.	Expan.
1022.38	1088.94	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

Downstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	119.38		44.21	119.38		155.28	118.98	
249.57	118.74		479.88	118.02		1012.8	117.59	102
1012.8	117.59	116.2	1172.8	117.58	116.2	1172.8	117.58	102
2400	117.6							

Downstream Bridge Cross Section Data
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	117.5	991	117.5	1012.8	115.2	1015.8	115	1024.8	110.5
1026.8	110.5	1035.54	106.13	1045.54	105.98	1051.69	105.89	1077.82	104.99
1107.59	104.01	1134.25	104.01	1137.8	104.27	1147.8	105	1158.8	110.5
1160.32	110.5	1160.8	110.5	1169.8	115	1172.8	115.2	1188	117.5
2358.42	117.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1012.8	.045	1172.8	.1

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Coeff Contr.	Expan.
1077.82	1147.8	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1006.53	117.6	F
1293.89	2358.42	117.6	F

Upstream Embankment side slope = 3 horiz. to 1.0 vertical
Downstream Embankment side slope = 3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Abutments = 2

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
986.8	115.2	989.8	115	998.8	110.5	1000.8	110.5	1016.8	102.5

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1012.8	115.2	1015.8	115	1024.8	110.5	1026.8	110.5	1042.8	102.5

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1116.8	102.5	1132.8	110.5	1134.8	110.5	1143.8	115	1146.8	115.2

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1142.8	102.5	1158.8	110.5	1160.8	110.5	1169.8	115	1172.8	115.2

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```
Number of Piers =  7

Pier Data
Pier Station     Upstream=  1006.8    Downstream=  1032.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1026.8    Downstream=  1052.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1046.8    Downstream=  1072.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1066.8    Downstream=  1092.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1086.8    Downstream=  1112.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1106.8    Downstream=  1132.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167     102   1.167   114.2        2   114.2        2   116.2
Downstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5     102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station     Upstream=  1126.8    Downstream=  1152.8
Upstream     num=       4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
```

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1.167	102	1.167	114.2	2	114.2	2	116.2

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.5	102	1.5	114.2	3	114.2	3	116.2

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
Yarnell KVal = 1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 60958

INPUT
Description:
Station Elevation Data num= 72

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	113.72	29.45	113.69	44.85	113.08	68.37	113.27	70.38	112.51
109.9	112.84	119	114.72	140.95	115.57	202.04	115.6	223.9	116.11
233.59	115.59	318.11	116.61	327.66	115.5	348.56	115.28	421.88	115.68
581.61	115.13	584.23	115.64	630.99	114.87	662.73	117.11	695.63	116.42
702.73	115.14	728.24	115.28	829.35	114.6	846.82	114.76	1006.53	113.3
1016.53	112.71	1043.73	109.3	1050.59	107.76	1077.82	104.99	1107.59	104.01
1134.25	104.01	1145.58	104.97	1160.32	105.06	1171.58	106.01	1202.8	106.31
1216.56	107.34	1239.48	110.57	1293.89	113.43	1326.32	113.03	1406.14	112.95
1423.17	113.37	1494.26	112.73	1531.07	113.03	1629.88	113.11	1764.95	112.16
1819.06	112.04	1899.42	112.13	1915.49	112.33	1995.79	112.02	2016.93	112.04
2031.85	112.04	2053.97	111.78	2055.23	111.74	2065.93	111.73	2075.35	110.93
2079.31	110.76	2081.23	110.73	2090.42	110.03	2098.45	110.38	2107.52	111.17
2121.72	111.63	2134.8	111.89	2152.95	112.08	2176.79	112.17	2195.19	112.15
2259.6	112.42	2273.08	112.59	2292.67	112.76	2298.18	112.76	2330.65	113.04
2351.66	113.16	2358.42	113.16						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1077.82	.035	1160.32	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1077.82	1160.32	327.91	339.69	379.75	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1006.53	117.6	F
1293.89	2358.42	117.6	F

CROSS SECTION

SR 60 over PCDC.rep

RIVER: PeaceCreekCanal
REACH: Main3 RS: 60618

INPUT
Description:
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	24.56	115	58.18	115.28	99.55	115.38	106.95	115.21
137.67	116	425.61	116	460.65	117	537.14	117.51	634.83	117.72
696.72	117.73	805.21	117.89	836.04	117.65	885.25	117.81	940.84	117.18
952.19	117.37	978.87	117.1	978.97	117.44	1133.64	117	1203.02	116
1248.93	114	1274.05	113.42	1283.52	114.12	1283.68	113.56	1302.83	115
1321.03	115.79	1327.05	114.5	1352.89	109.94	1365.14	108.34	1386.97	105.99
1388.62	104.77	1391.53	104.03	1406.14	104.12	1427.18	103.44	1431.24	104.67
1440.15	105.35	1456.72	110.02	1462.79	108.93	1467.38	110.29	1490.27	112.5
1539.06	112.03	1575.45	112.18	1653.05	112.26	1688.06	112.05	1840	112.06
1950.29	111.48	2061.49	111.73	2115.81	111.56	2162.53	111.2	2268.98	111.99
2358.62	111.98	2387.73	112.14	2395.69	112.25	2408.87	112.38	2447.86	112.52
2471.35	112.8	2489.65	112.98						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1388.62	.035	1431.24	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1388.62	1431.24	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:PeaceCreekCanal

Reach	River Sta.	n1	n2	n3
Main3	61397	.1	.035	.1
Main3	61242	.1	.035	.1
Main3	61158	Bridge		
Main3	61045	.1	.045	.1
Main3	61026	Bridge		
Main3	60958	.1	.035	.1
Main3	60618	.1	.035	.1

SUMMARY OF REACH LENGTHS

River: PeaceCreekCanal

Reach	River Sta.	Left	Channel	Right
Main3	61397	174.52	154.66	112.86
Main3	61242	166.15	197.18	223.3
Main3	61158	Bridge		
Main3	61045	99.55	87.28	85.32
Main3	61026	Bridge		
Main3	60958	327.91	339.69	379.75
Main3	60618	0	0	0

SR 60 over PCDC.rep

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: PeaceCreekCanal

Reach	River Sta.		Contr.	Expan.
Main3	61397		.1	.3
Main3	61242		.3	.5
Main3	61158	Bridge		
Main3	61045		.3	.5
Main3	61026	Bridge		
Main3	60958		.3	.5
Main3	60618		.1	.3

HEC-RAS Plan: Proposed - Alt 2 River: PeaceCreekCanal Reach: Main3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	61397	25 Year	1057.00	104.31	111.98		112.00	0.000086	1.49	2026.17	1012.15	0.10
Main3	61397	50 Year	1223.00	104.31	112.37		112.39	0.000085	1.53	2434.65	1093.27	0.10
Main3	61397	100 Year	1448.00	104.31	112.96		112.98	0.000080	1.56	3144.16	1295.52	0.10
Main3	61397	500 Year	1808.00	104.31	113.89		113.91	0.000062	1.48	4413.12	1439.33	0.09
Main3	61242	25 Year	1057.00	103.19	111.96	106.26	111.99	0.000083	1.46	1060.01	453.84	0.09
Main3	61242	50 Year	1223.00	103.19	112.34	106.43	112.38	0.000092	1.60	1137.37	1050.39	0.10
Main3	61242	100 Year	1448.00	103.19	112.93	106.64	112.97	0.000101	1.76	1277.48	1439.62	0.11
Main3	61242	500 Year	1808.00	103.19	113.84	106.95	113.89	0.000107	1.93	1502.28	1935.75	0.11
Main3	61158 BR U	25 Year	1057.00	103.19	111.96	106.46	111.99	0.000157	1.29	820.04	131.85	0.09
Main3	61158 BR U	50 Year	1223.00	103.19	112.34	106.62	112.37	0.000176	1.41	870.20	133.36	0.10
Main3	61158 BR U	100 Year	1448.00	103.19	112.93	106.81	112.96	0.000188	1.52	957.17	154.00	0.10
Main3	61158 BR U	500 Year	1808.00	103.19	113.84	107.09	113.89	0.000196	1.67	1098.34	154.00	0.10
Main3	61158 BR D	25 Year	1057.00	104.04	111.93	106.76	111.96	0.000209	1.40	753.26	131.71	0.10
Main3	61158 BR D	50 Year	1223.00	104.04	112.30	107.06	112.34	0.000231	1.52	802.87	133.21	0.11
Main3	61158 BR D	100 Year	1448.00	104.04	112.89	107.37	112.93	0.000241	1.64	887.23	154.00	0.11
Main3	61158 BR D	500 Year	1808.00	104.04	113.80	107.65	113.85	0.000245	1.79	1024.59	154.00	0.12
Main3	61045	25 Year	1057.00	104.04	111.92	106.56	111.95	0.000168	1.38	768.63	130.30	0.10
Main3	61045	50 Year	1223.00	104.04	112.30	106.74	112.33	0.000186	1.50	817.66	131.91	0.11
Main3	61045	100 Year	1448.00	104.04	112.88	107.07	112.92	0.000215	1.61	899.18	144.59	0.11
Main3	61045	500 Year	1808.00	104.04	113.80	107.36	113.84	0.000219	1.75	1033.52	148.96	0.12
Main3	61026 BR U	25 Year	1057.00	104.04	111.92	106.78	111.95	0.000354	1.50	728.77	133.51	0.10
Main3	61026 BR U	50 Year	1223.00	104.04	112.29	107.04	112.33	0.000397	1.62	778.86	135.00	0.10
Main3	61026 BR U	100 Year	1448.00	104.04	112.87	107.41	112.92	0.000431	1.73	858.12	137.33	0.11
Main3	61026 BR U	500 Year	1808.00	104.04	113.78	107.77	113.84	0.000469	1.87	984.75	140.97	0.11
Main3	61026 BR D	25 Year	1057.00	104.01	111.19	106.34	111.23	0.000340	1.58	722.23	128.27	0.11
Main3	61026 BR D	50 Year	1223.00	104.01	111.56	106.50	111.61	0.000385	1.72	770.41	129.76	0.11
Main3	61026 BR D	100 Year	1448.00	104.01	112.15	106.70	112.20	0.000422	1.85	847.03	132.10	0.12
Main3	61026 BR D	500 Year	1808.00	104.01	113.07	107.00	113.12	0.000464	2.03	969.97	135.77	0.12
Main3	60958	25 Year	1057.00	104.01	111.18	106.16	111.22	0.000108	1.58	1055.38	258.03	0.11
Main3	60958	50 Year	1223.00	104.01	111.56	106.37	111.60	0.000119	1.72	1141.44	284.37	0.11
Main3	60958	100 Year	1448.00	104.01	112.15	106.59	112.19	0.000126	1.86	1282.21	586.32	0.12
Main3	60958	500 Year	1808.00	104.01	113.07	106.91	113.12	0.000130	2.04	1522.32	1222.50	0.12

HEC-RAS Plan: Proposed - Alt 2 River: PeaceCreekCanal Reach: Main3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	60618	25 Year	1057.00	103.44	111.00	106.59	111.13	0.000383	3.04	545.99	127.85	0.20
Main3	60618	50 Year	1223.00	103.44	111.35	106.87	111.50	0.000428	3.32	594.70	173.14	0.22
Main3	60618	100 Year	1448.00	103.44	111.92	107.19	112.08	0.000441	3.54	798.92	535.52	0.22
Main3	60618	500 Year	1808.00	103.44	112.89	107.69	113.02	0.000356	3.44	1762.93	1144.33	0.20

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61158 Profile: 25 Year

E.G. US. (ft)	111.99	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	111.96	E.G. Elev (ft)	111.99	111.96
Q Total (cfs)	1057.00	W.S. Elev (ft)	111.96	111.93
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.46	106.76
Q Weir (cfs)		Max Chl Dpth (ft)	8.77	7.89
Weir Sta Lft (ft)		Vel Total (ft/s)	1.29	1.40
Weir Sta Rgt (ft)		Flow Area (sq ft)	820.04	753.26
Weir Submerg		Froude # Chl	0.09	0.10
Weir Max Depth (ft)		Specif Force (cu ft)	2820.27	2423.62
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.22	5.72
Min El Prs (ft)	129.47	W.P. Total (ft)	149.28	149.45
Delta EG (ft)	0.04	Conv. Total (cfs)	84302.8	73118.3
Delta WS (ft)	0.04	Top Width (ft)	131.85	131.71
BR Open Area (sq ft)	3069.92	Frctn Loss (ft)	0.03	0.01
BR Open Vel (ft/s)	1.40	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.05	0.07
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61158 Profile: 50 Year

E.G. US. (ft)	112.38	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.34	E.G. Elev (ft)	112.37	112.34
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.34	112.30
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	106.62	107.06
Q Weir (cfs)		Max Chl Dpth (ft)	9.15	8.26
Weir Sta Lft (ft)		Vel Total (ft/s)	1.41	1.52
Weir Sta Rgt (ft)		Flow Area (sq ft)	870.20	802.87
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3151.00	2726.80
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.53	6.03
Min El Prs (ft)	129.47	W.P. Total (ft)	151.73	151.88
Delta EG (ft)	0.04	Conv. Total (cfs)	92067.0	80449.5
Delta WS (ft)	0.04	Top Width (ft)	133.36	133.21
BR Open Area (sq ft)	3069.92	Frctn Loss (ft)	0.03	0.01
BR Open Vel (ft/s)	1.52	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.06	0.08
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61158 Profile: 100 Year

E.G. US. (ft)	112.97	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.93	E.G. Elev (ft)	112.96	112.93
Q Total (cfs)	1448.00	W.S. Elev (ft)	112.93	112.89
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	106.81	107.37
Q Weir (cfs)		Max Chl Dpth (ft)	9.74	8.85
Weir Sta Lft (ft)		Vel Total (ft/s)	1.51	1.63
Weir Sta Rgt (ft)		Flow Area (sq ft)	957.17	887.23
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3700.66	3235.30
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.22	5.91
Min El Prs (ft)	129.47	W.P. Total (ft)	174.47	170.38
Delta EG (ft)	0.05	Conv. Total (cfs)	105594.8	93190.5
Delta WS (ft)	0.04	Top Width (ft)	154.00	154.00
BR Open Area (sq ft)	3069.92	Frctn Loss (ft)	0.03	0.01
BR Open Vel (ft/s)	1.63	C & E Loss (ft)	0.00	0.00

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61158 Profile: 100 Year (Continued)

Coef of Q		Shear Total (lb/sq ft)	0.06	0.08
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61158 Profile: 500 Year

E.G. US. (ft)	113.89	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.84	E.G. Elev (ft)	113.89	113.85
Q Total (cfs)	1808.00	W.S. Elev (ft)	113.84	113.80
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.09	107.65
Q Weir (cfs)		Max Chl Dpth (ft)	10.65	9.76
Weir Sta Lft (ft)		Vel Total (ft/s)	1.65	1.76
Weir Sta Rgt (ft)		Flow Area (sq ft)	1098.34	1024.59
Weir Submerg		Froude # Chl	0.10	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	4667.81	4136.45
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	7.13	6.83
Min El Prs (ft)	129.47	W.P. Total (ft)	178.13	173.13
Delta EG (ft)	0.05	Conv. Total (cfs)	129136.9	115543.3
Delta WS (ft)	0.05	Top Width (ft)	154.00	154.00
BR Open Area (sq ft)	3069.92	Frctn Loss (ft)	0.03	0.01
BR Open Vel (ft/s)	1.76	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.08	0.09
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61026 Profile: 25 Year

E.G. US. (ft)	111.95	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	111.92	E.G. Elev (ft)	111.95	111.23
Q Total (cfs)	1057.00	W.S. Elev (ft)	111.92	111.19
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.78	106.34
Q Weir (cfs)		Max Chl Dpth (ft)	7.88	7.18
Weir Sta Lft (ft)		Vel Total (ft/s)	1.45	1.46
Weir Sta Rgt (ft)		Flow Area (sq ft)	728.77	722.23
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	2307.99	2300.32
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.46	5.63
Min El Prs (ft)	116.20	W.P. Total (ft)	216.88	210.25
Delta EG (ft)	0.74	Conv. Total (cfs)	56214.3	57294.7
Delta WS (ft)	0.74	Top Width (ft)	133.51	128.27
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.46	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.07	0.07
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61026 Profile: 50 Year

E.G. US. (ft)	112.33	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.30	E.G. Elev (ft)	112.33	111.61
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.29	111.56
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	107.04	106.50
Q Weir (cfs)		Max Chl Dpth (ft)	8.25	7.55
Weir Sta Lft (ft)		Vel Total (ft/s)	1.57	1.59
Weir Sta Rgt (ft)		Flow Area (sq ft)	778.86	770.41
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	2601.25	2591.46
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.77	5.94
Min El Prs (ft)	116.20	W.P. Total (ft)	223.78	217.15

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61026   Profile: 50 Year (Continued)

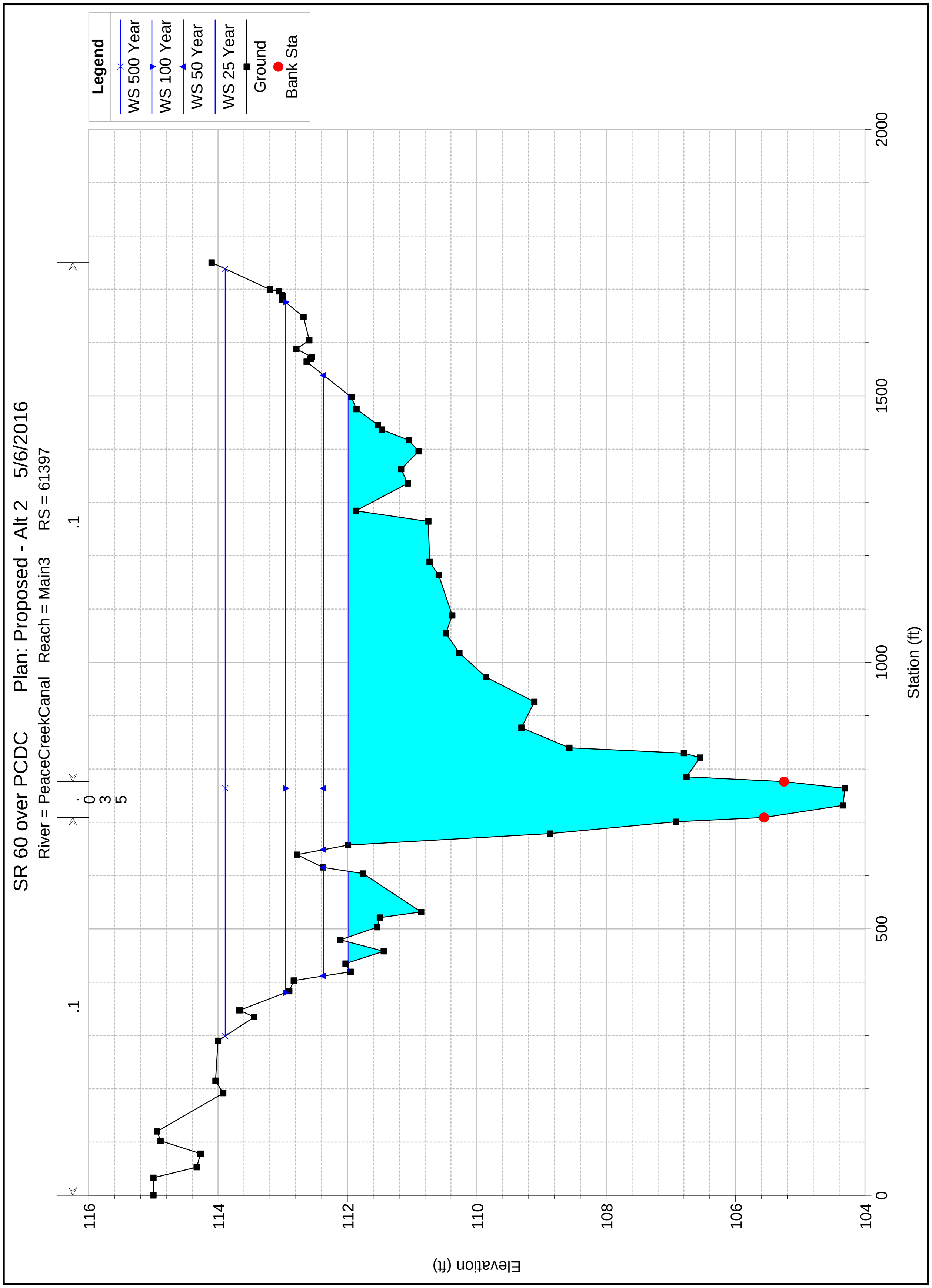
Delta EG (ft)	0.73	Conv. Total (cfs)	61377.4	62338.7
Delta WS (ft)	0.74	Top Width (ft)	135.00	129.76
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.59	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.09	0.09
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

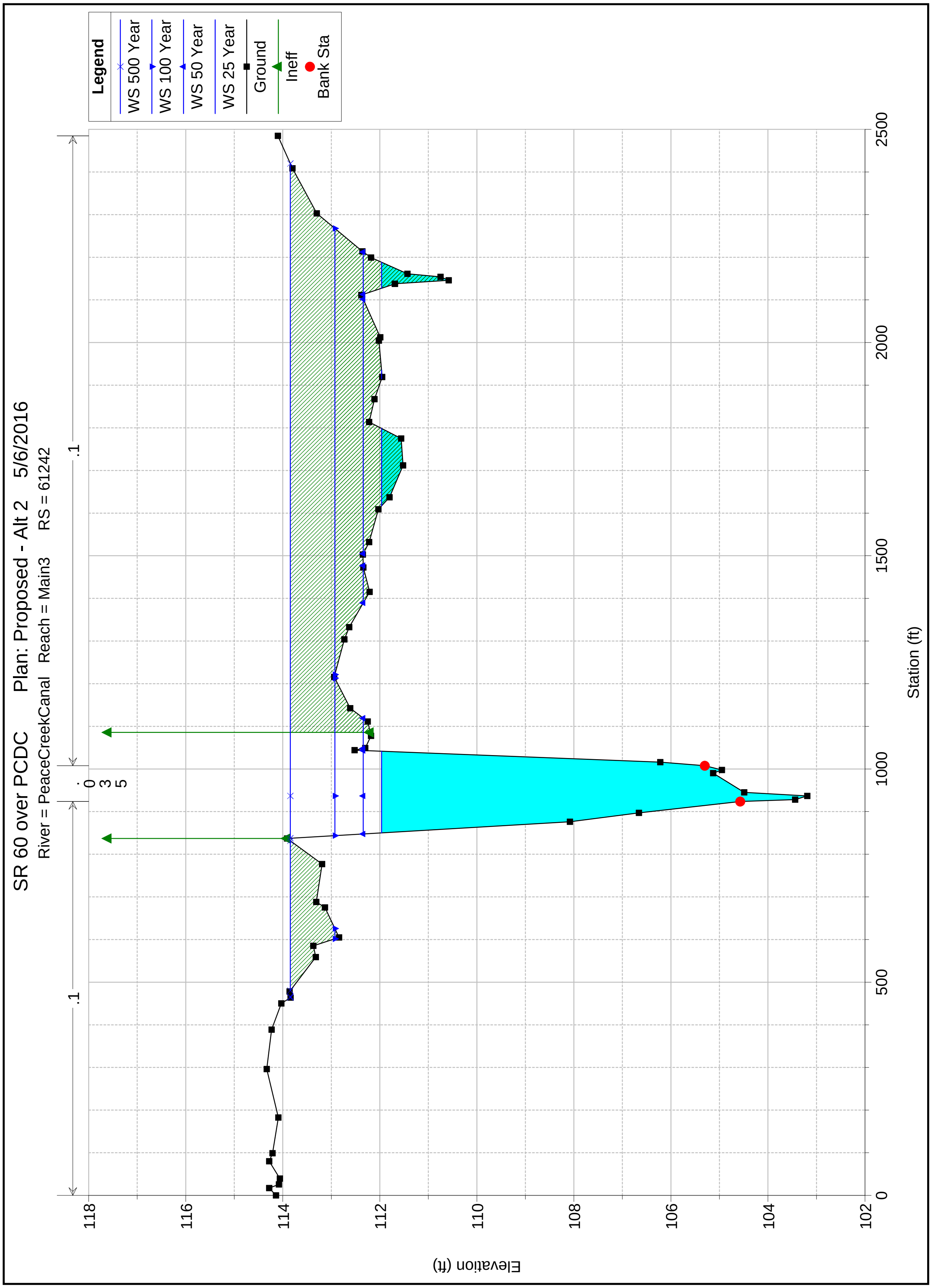
Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61026   Profile: 100 Year

E.G. US. (ft)	112.92	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.88	E.G. Elev (ft)	112.92	112.20
Q Total (cfs)	1448.00	W.S. Elev (ft)	112.87	112.15
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	107.41	106.70
Q Weir (cfs)		Max Chl Dpth (ft)	8.83	8.14
Weir Sta Lft (ft)		Vel Total (ft/s)	1.69	1.71
Weir Sta Rgt (ft)		Flow Area (sq ft)	858.12	847.03
Weir Submerg		Froude # Chl	0.11	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	3093.83	3081.53
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.25	6.41
Min El Prs (ft)	116.20	W.P. Total (ft)	234.53	227.96
Delta EG (ft)	0.73	Conv. Total (cfs)	69731.0	70507.6
Delta WS (ft)	0.73	Top Width (ft)	137.33	132.10
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.71	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.10	0.10
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

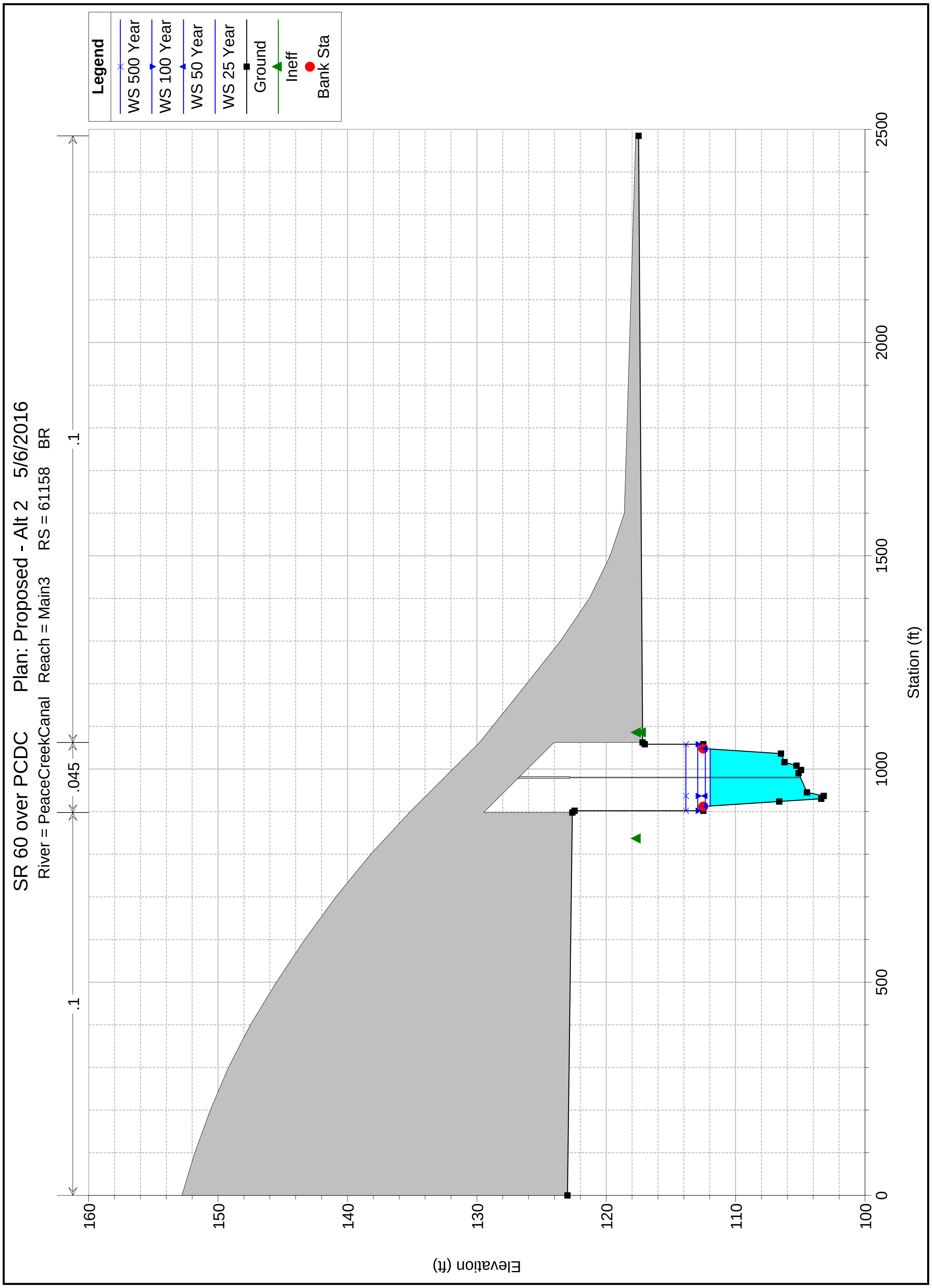
Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61026   Profile: 500 Year

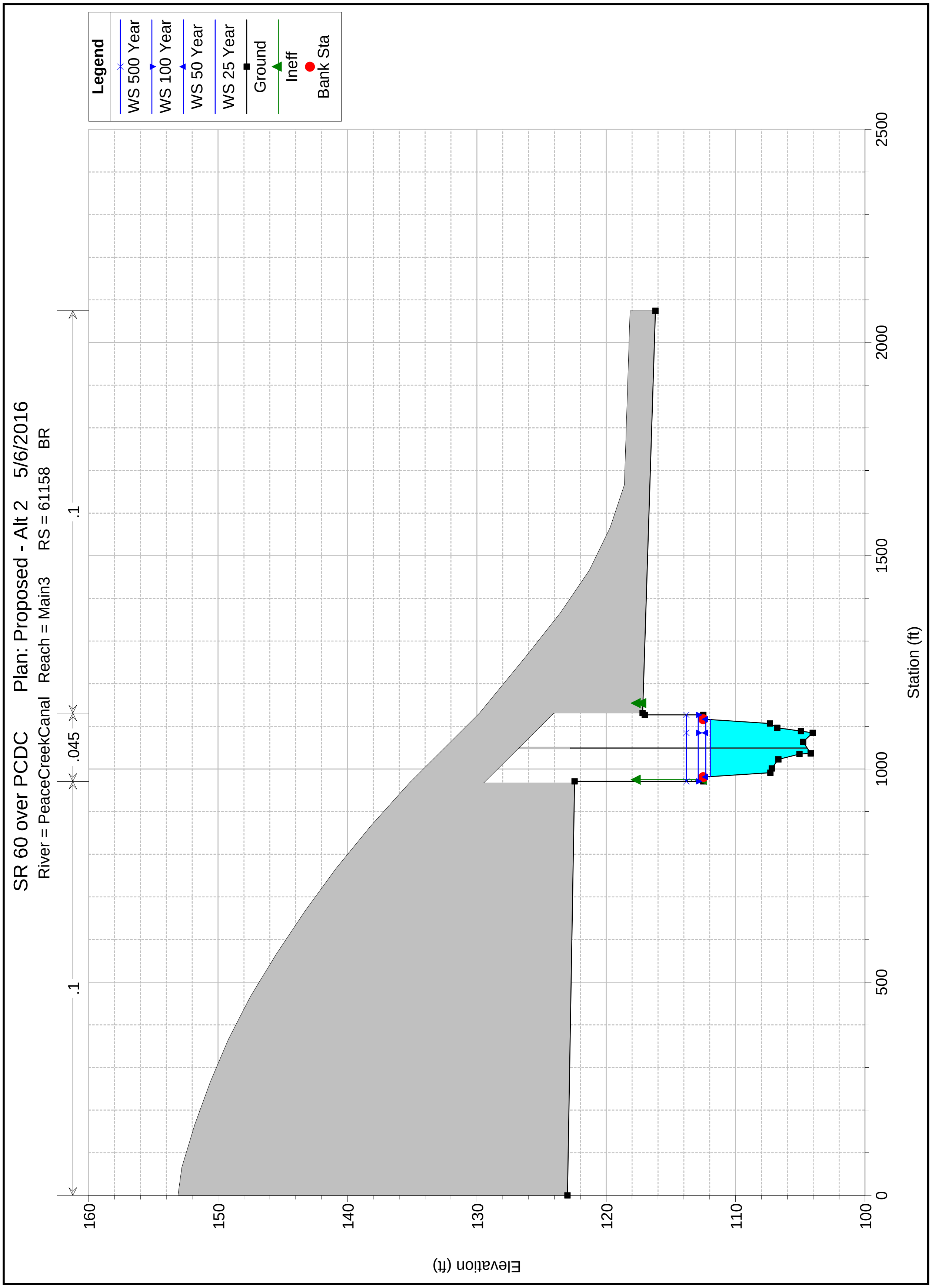
E.G. US. (ft)	113.84	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.80	E.G. Elev (ft)	113.84	113.12
Q Total (cfs)	1808.00	W.S. Elev (ft)	113.78	113.07
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.77	107.00
Q Weir (cfs)		Max Chl Dpth (ft)	9.74	9.06
Weir Sta Lft (ft)		Vel Total (ft/s)	1.84	1.86
Weir Sta Rgt (ft)		Flow Area (sq ft)	984.75	969.97
Weir Submerg		Froude # Chl	0.11	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	3959.33	3943.44
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.99	7.14
Min El Prs (ft)	116.20	W.P. Total (ft)	251.34	244.92
Delta EG (ft)	0.73	Conv. Total (cfs)	83488.3	83944.8
Delta WS (ft)	0.73	Top Width (ft)	140.97	135.77
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.86	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.11	0.11
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

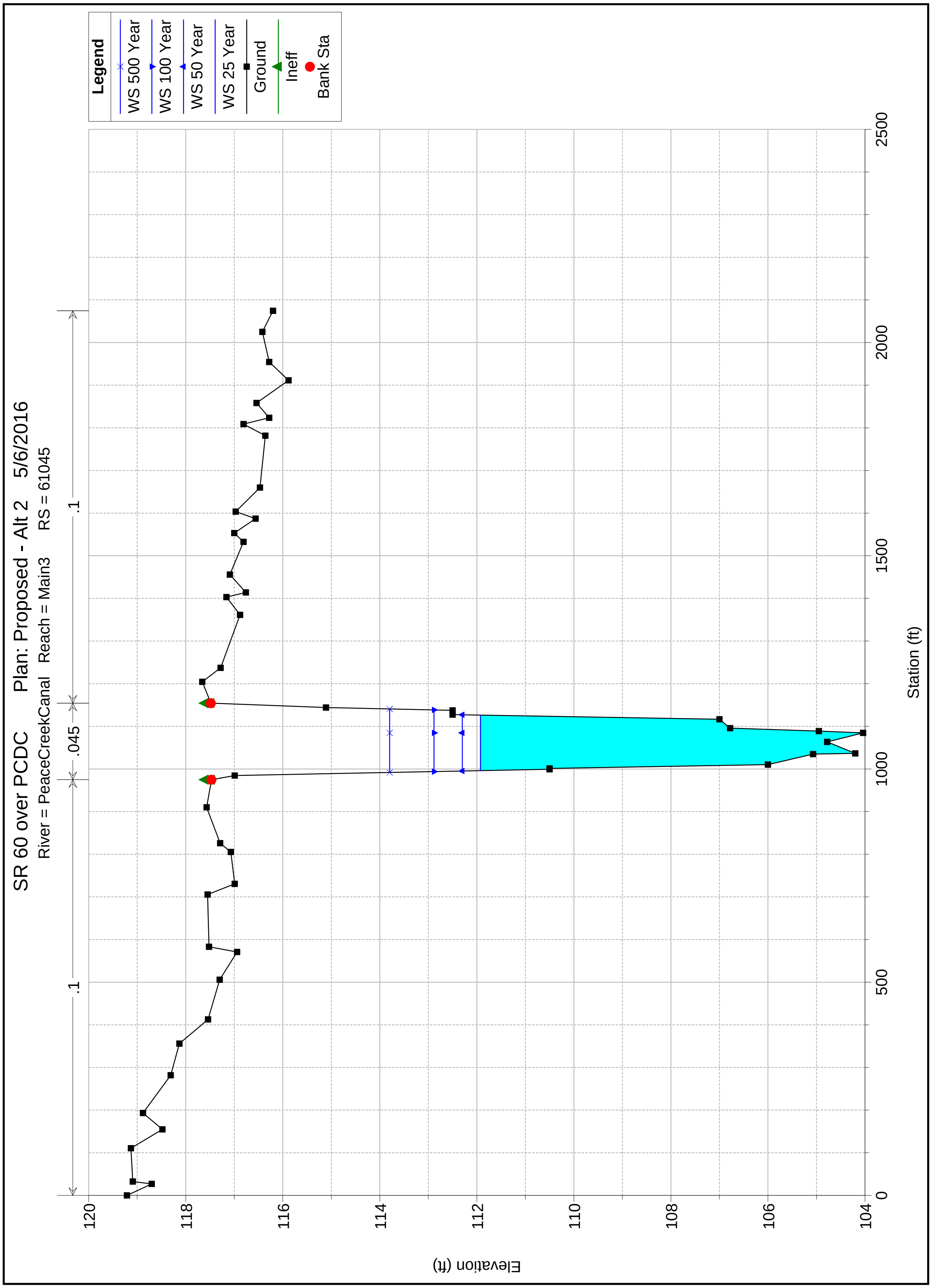

SR 60 over PCDC Plan: Proposed - Alt 2 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61397
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
116
114
112
110
108
106
104
0
500
1000
1500
2000

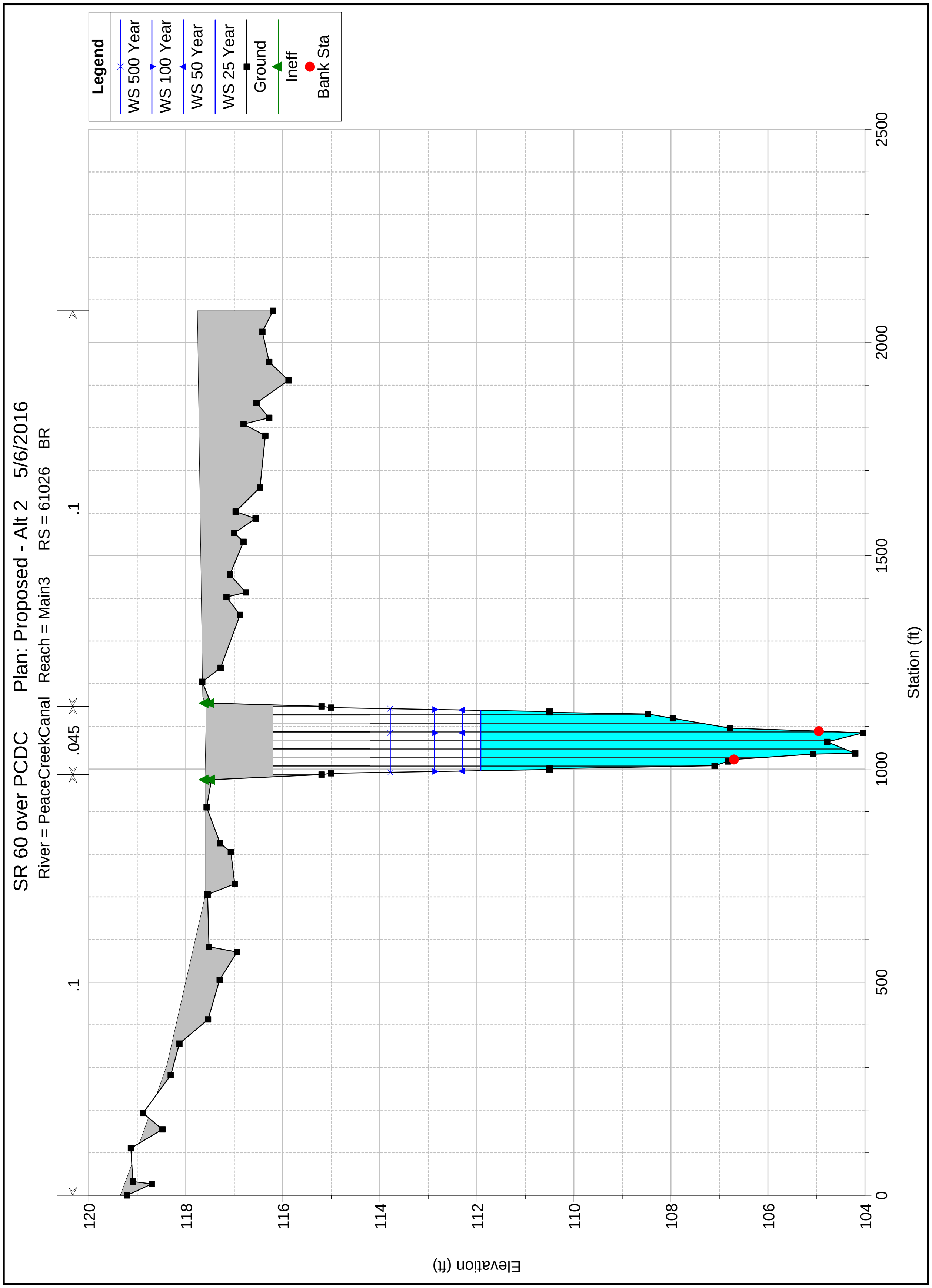


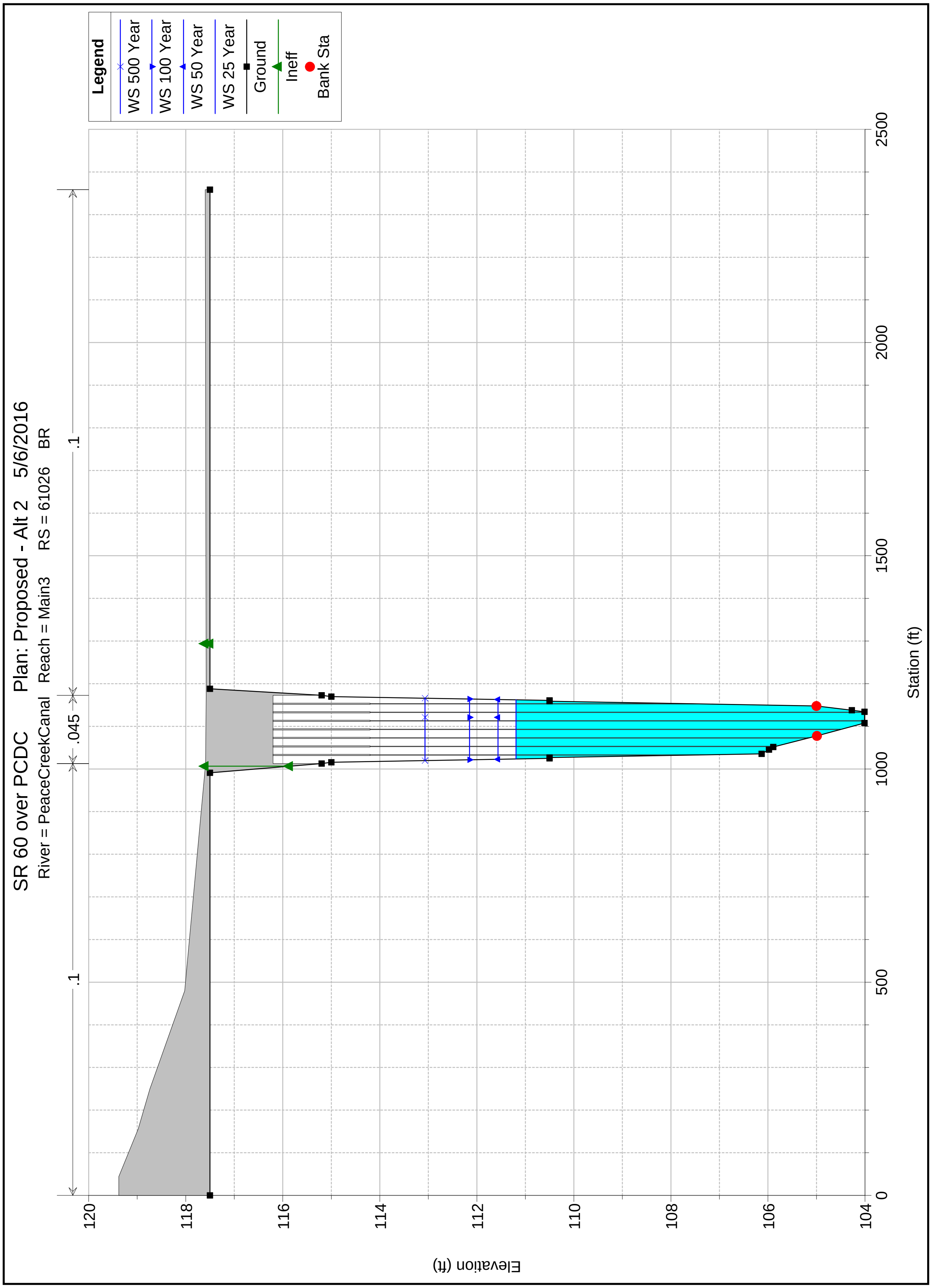
SR 60 over PCDC Plan: Proposed - Alt 2 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61242
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
.1
.035
.1
118
116
114
112
110
108
106
104
102
0
500
1000
1500
2000
2500

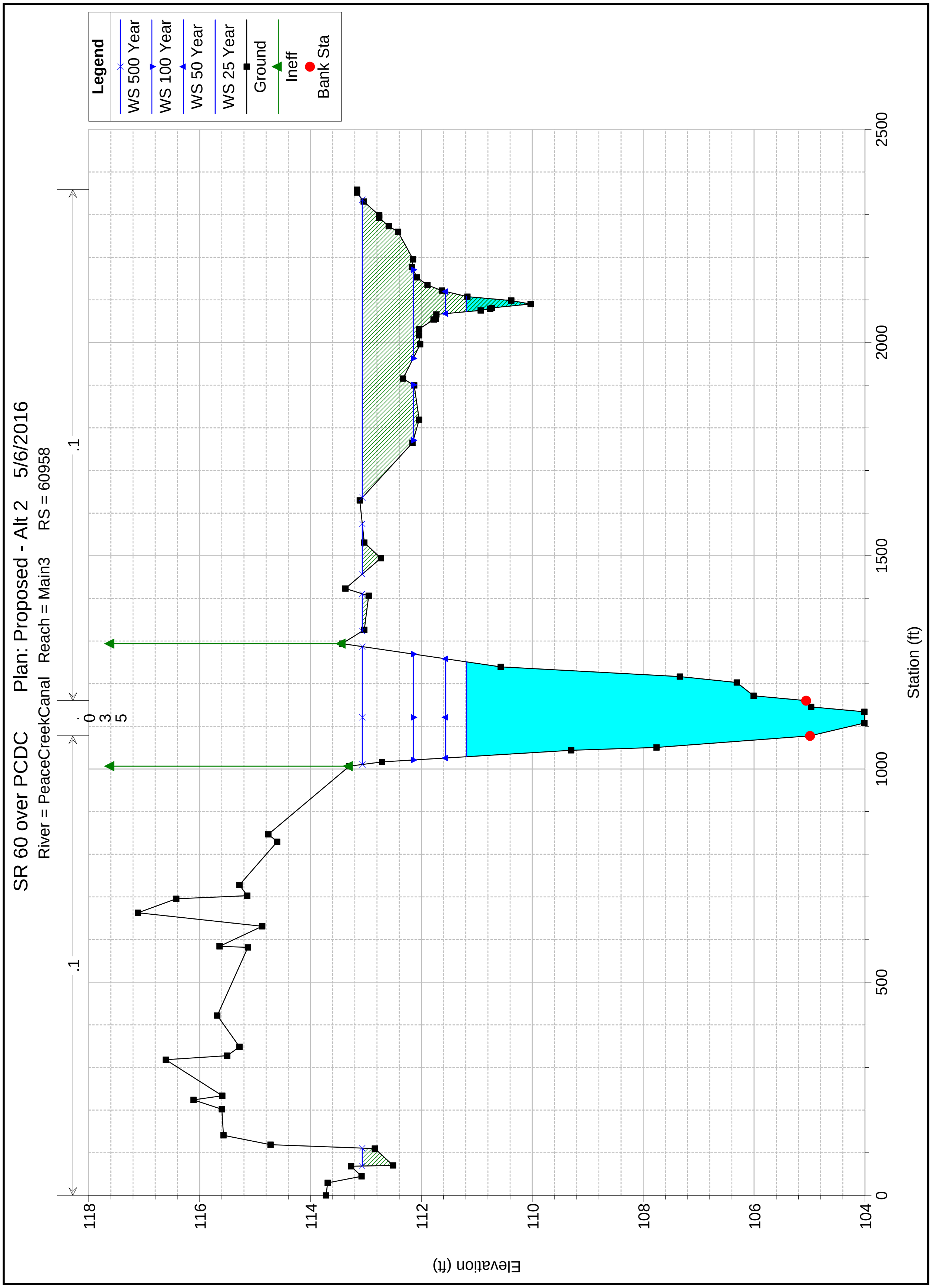

SR 60 over PCDC Plan: Proposed - Alt 2 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61158 BR
.1
.045
.1
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
160
150
140
130
120
110
100
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 2   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 61158   BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
0
500
1000
1500
2000
2500
100
110
120
130
140
150
160

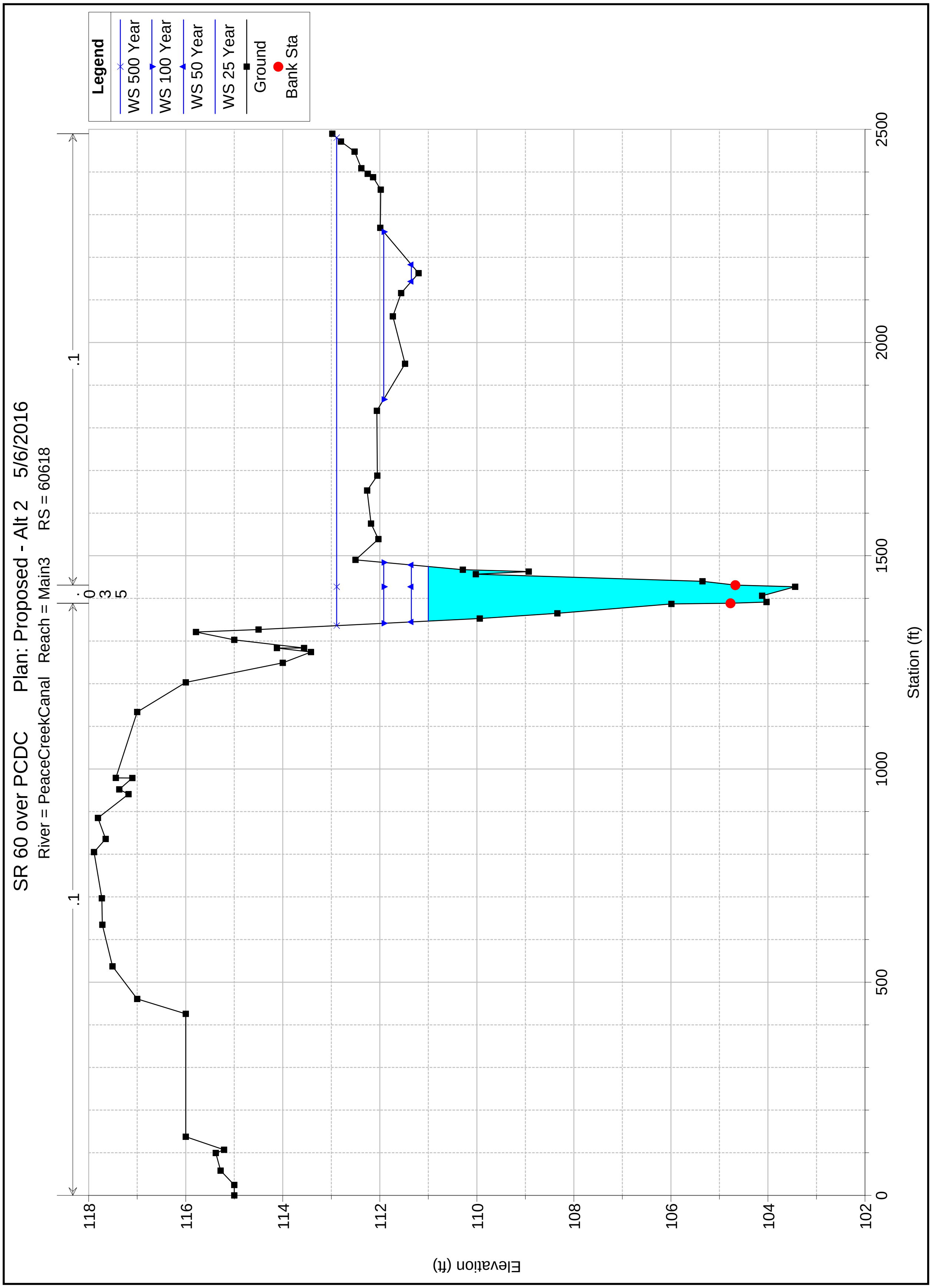

SR 60 over PCDC Plan: Proposed - Alt 2 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61045
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Station (ft)
Elevation (ft)
0
500
1000
1500
2000
2500
104
106
108
110
112
114
116
118
120

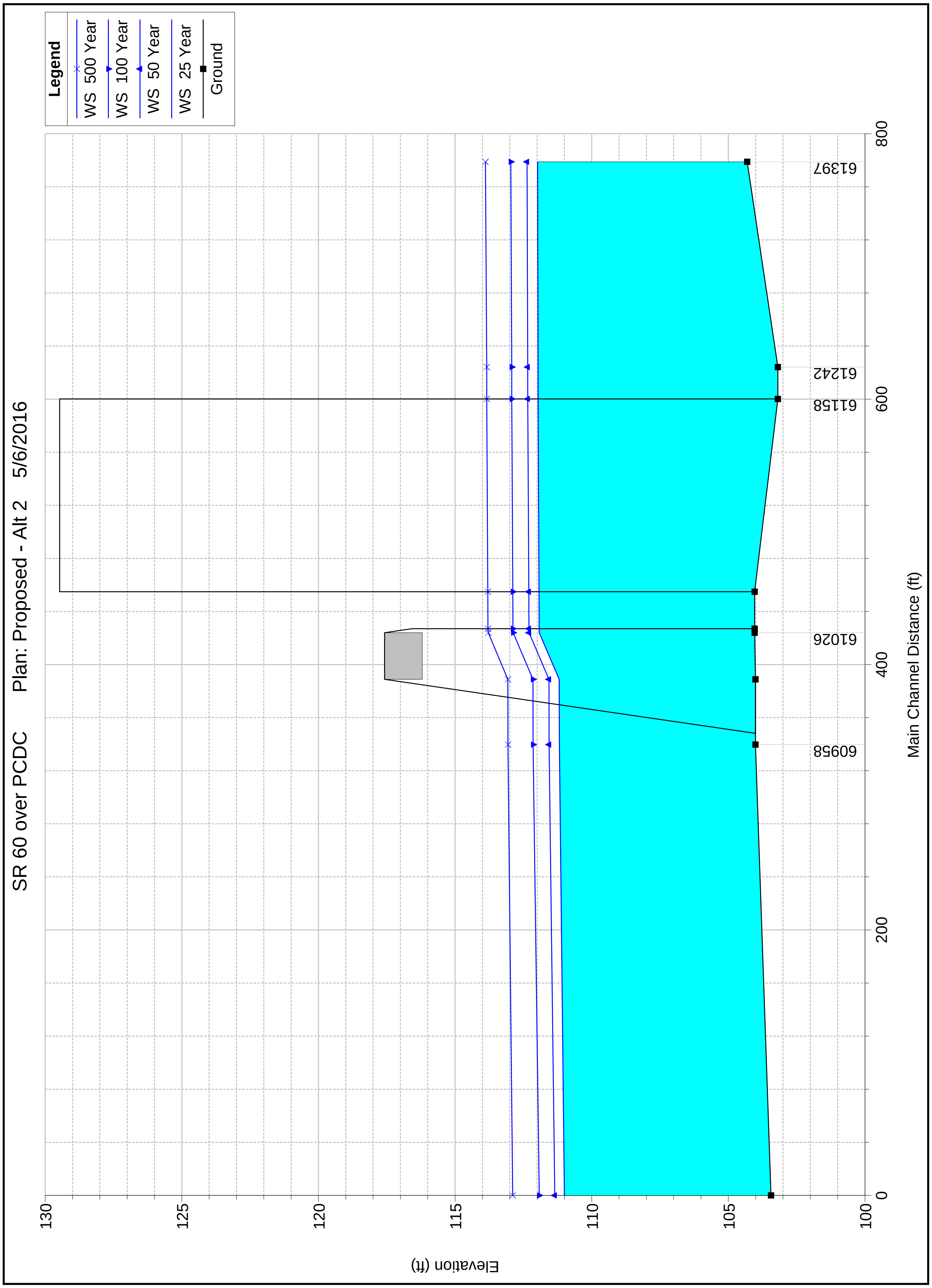

SR 60 over PCDC Plan: Proposed - Alt 2 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61026 BR
.1
.045
.1
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC Plan: Proposed - Alt 2 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61026 BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500



SR 60 over PCDC   Plan: Proposed - Alt 2   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 60958
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
.1
.1
.035
0
500
1000
1500
2000
2500
104
106
108
110
112
114
116
118


SR 60 over PCDC Plan: Proposed - Alt 2 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 60618
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
118
116
114
112
110
108
106
104
102
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 2   5/6/2016
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Elevation (ft)
Main Channel Distance (ft)
60958
61026
61158
61242
61397

HEC-RAS

Proposed Condition - Alternative 3

SR 60 over PCDC.rep

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX   XXXX        XXXX       XX      XXXX
X     X  X       X    X       X   X     X  X    X
X     X  X       X            X   X    X    X   X
XXXXXXX  XXXX    X       XXX  XXXX     XXXXXX    XXXX
X     X  X       X            X  X     X    X        X
X     X  X       X    X       X   X    X    X        X
X     X  XXXXXX   XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: SR 60 over PCDC
Project File : SR 60 over PCDC.prj
Run Date and Time: 5/6/2016 4:32:57 PM

Project in English units

Project Description:
CRS Info=<SpatialReference> <CoordinateSystem Code="3517"
Unit="US_survey_Foot" /> <Registration OffsetX="0" OffsetY="0" OffsetZ="0"
ScaleX="1" ScaleY="1" ScaleZ="1" /></SpatialReference>

PLAN DATA

Plan Title: Proposed - Alt 3
Plan File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.p04

Geometry Title: Proposed - Alt 3
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g03

Flow Title   : Flow Data
Flow File   : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Plan Summary Information:

Number of:	Cross Sections =	5	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	2	Lateral Structures =	0

Computational Information
- Water surface calculation tolerance = 0.01
- Critical depth calculation tolerance = 0.01
- Maximum number of iterations = 20
- Maximum difference tolerance = 0.33
- Flow tolerance factor = 0.001

Computation Options
- Critical depth computed only where necessary

SR 60 over PCDC.rep

Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow Data
Flow File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.f01

Flow Data (cfs)

River	Reach	RS	25 Year	50 Year	100 Year	500 Year
PeaceCreekCanal	Main3	61397	1057	1223	1448	1808

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
PeaceCreekCanal	Main3	25 Year		Known WS = 111
PeaceCreekCanal	Main3	50 Year		Known WS = 111.35
PeaceCreekCanal	Main3	100 Year		Known WS = 111.92
PeaceCreekCanal	Main3	500 Year		Known WS = 112.89

GEOMETRY DATA

Geometry Title: Proposed - Alt 3
Geometry File : M:\43655915201_PM_SR60_CSX (FD)\5_DRAINAGE\HEC-RAS\SR 60 over PCDC.g03

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61397

INPUT
Description:
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	33.22	115	52.93	114.33	78.28	114.27	102.48	114.89
119.95	114.94	191.95	113.92	215.3	114.04	290.03	114	334.6	113.44
347.36	113.67	383.17	112.9	403.15	112.83	419.46	111.95	434.81	112.03
457.95	111.44	479.62	112.11	503.08	111.54	521.01	111.5	531.9	110.86
603.74	111.76	615.49	112.38	639.19	112.78	657.26	111.99	678.74	108.87
700.91	106.92	708.93	105.56	731.55	104.34	763.75	104.31	776.31	105.25
785.25	106.76	821.24	106.55	829.63	106.8	839.8	108.57	877.59	109.31
926.02	109.11	972.4	109.86	1017.79	110.27	1054.63	110.48	1088.12	110.38
1163.67	110.59	1188.42	110.73	1264.32	110.75	1284.24	111.87	1335.61	111.07
1362.69	111.17	1396	110.9	1416.92	111.05	1436.67	111.47	1436.74	111.47

```
 1445.37  111.53    1475  111.86  1497.5  111.94 1563.93  112.63 1569.18  112.57
 1572.88  112.55 1588.13  112.79 1604.36  112.59 1648.04  112.68 1680.92  113.01
 1684.42     113 1686.87     113 1689.22  113.01    1696  113.06 1699.55   113.2
    1750   114.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  708.93    .035  776.31      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        708.93  776.31           174.52  154.66  112.86              .1       .3

CROSS SECTION


RIVER: PeaceCreekCanal
REACH: Main3              RS: 61242

INPUT
Description:
Station Elevation Data    num=      61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  114.14   17.14  114.28   25.96  114.08   39.42  114.06    79.9  114.28
    98.8  114.21  182.65  114.09  296.36  114.33  388.83  114.23  450.19  114.03
  463.95  113.84  478.14  113.86  558.86  113.32  585.36  113.37  604.87  112.84
  675.26  113.13  687.97  113.31  776.97  113.19  837.07  113.91  876.36  108.08
  897.12  106.66  923.74  104.57  928.11  103.44   936.7  103.19  945.08  104.49
  990.06  105.13  997.78  104.95 1007.71   105.3 1015.93  106.22 1044.06  112.52
  1049.2   112.3 1077.69  112.18 1111.31  112.25 1142.55  112.61 1215.86  112.94
 1303.97  112.73 1332.42  112.63 1415.43  112.21 1472.49  112.34  1502.9  112.35
 1532.03  112.22  1609.1  112.03 1637.09   111.8 1711.93  111.52 1774.91  111.56
 1813.59  112.22 1867.26  112.11 1919.19  111.95 2004.59  112.02 2012.37  111.99
 2111.51  112.38 2137.72  111.69 2137.77  111.69 2146.04  110.58    2154  110.75
 2161.14  111.43 2199.22  112.18 2213.87  112.36 2303.03   113.3  2408.7   113.8
 2484.83   114.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1  923.74    .035 1007.71      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        923.74 1007.71           166.15  197.18   223.3              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  837.07   117.6       F
 1085.83 2484.83   117.6       F

BRIDGE


RIVER: PeaceCreekCanal
REACH: Main3              RS: 61158

INPUT
Description:
Distance from Upstream XS =       24
Deck/Roadway Width        =    145.3
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=      19
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
```

SR 60 over PCDC.rep

```
        0   152.8            100   151.8            200   150.6
      300   149.2            400   147.5            500   145.5
      600   143.3            700   140.9            800   138.2
      898  135.22     102    898  135.22  132.18   1062  129.79  126.75
     1062  129.79     102   1200  126.15           1300  123.55
     1400   121.3           1500   119.7           1600   118.6
     2500   117.7

Upstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta     Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0      123      898  122.62      902  122.45      902   112.5      912   112.5
  923.74   106.63   930.24  103.38    936.7  103.19   945.08  104.49   990.06  105.13
  997.78   104.95  1007.71   105.3  1015.93  106.22  1035.99   106.5     1048   112.5
    1058    112.5     1058  117.02     1062  117.19  2484.83   117.5

Manning's n Values        num=       3
     Sta    n Val      Sta   n Val      Sta   n Val
       0       .1      898    .045     1062      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
           912    1048             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  837.07   117.6       F
 1085.83 2484.83   117.6       F

Downstream  Deck/Roadway Coordinates
    num=      20
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   153.1           66.21   152.8          166.21   151.8
  266.21   150.6          366.21   149.2          466.21   147.5
  566.21   145.5          666.21   143.3          766.21   140.9
  866.21   138.2             967  135.22     102     967  135.22  132.18
    1131  129.79  126.75    1131  129.79     102 1266.21  126.15
 1366.21  123.55         1466.21   121.3         1566.21   119.7
 1666.21   118.6            2500   117.7

Downstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta     Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0      123      971  122.45      971   112.5      981   112.5    991.4  107.31
  1001.4    107.2  1022.38   106.7  1034.85  105.07  1036.71   104.2  1063.62  104.78
 1084.55   104.04  1088.94  104.95  1096.64  106.78  1106.64  107.35     1117   112.5
    1127    112.5     1127  117.02     1131  117.19   2074.5   116.2

Manning's n Values        num=       3
     Sta    n Val      Sta   n Val      Sta   n Val
       0       .1      971    .045     1131      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
           981    1117             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  974.93   117.6       F
 1154.43  2074.5   117.6       F

Upstream Embankment side slope             =       0 horiz. to 1.0 vertical
Downstream Embankment side slope           =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
```

SR 60 over PCDC.rep

Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Abutments = 2

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
898	122.62	902	122.45	902	112.5	912	112.5	937	100

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
967	122.62	971	122.45	971	112.5	981	112.5	1006	100

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1023	100	1048	112.5	1058	112.5	1058	117.02	1062	117.19

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1092	100	1117	112.5	1127	112.5	1127	117.02	1131	117.19

Number of Piers = 3

Pier Data
Pier Station Upstream= 937.5 Downstream= 1006.5
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	125.9	5	125.9	5	130.9

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	125.9	5	125.9	5	130.9

Pier Data
Pier Station Upstream= 980 Downstream= 1049
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	124.5	5	124.5	5	129.5

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	124.5	5	124.5	5	129.5

Pier Data
Pier Station Upstream= 1022.5 Downstream= 1091.5
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	123.1	5	123.1	5	128.1

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
2	90	2	123.1	5	123.1	5	128.1

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
Yarnell KVal = 1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

SR 60 over PCDC.rep

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61045

INPUT
Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	984.48	116.99	999.3	110.5
1001.3	110.5	1010.3	106	1034.85	105.07	1036.71	104.2	1063.62	104.78
1084.55	104.04	1088.94	104.95	1095.74	106.78	1116.5	107	1127.5	112.5
1137.5	112.5	1143.99	115.11	1154.43	117.48	1204.33	117.66	1237.16	117.28
1361.41	116.88	1403.2	117.16	1413.99	116.76	1455.83	117.09	1532.76	116.81
1553.28	117	1587.19	116.56	1603.44	116.97	1659.81	116.47	1781.72	116.36
1808.86	116.81	1823.56	116.28	1858.25	116.54	1911.33	115.88	1954.57	116.28
2025.01	116.42	2074.5	116.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	974.93	.045	1154.43	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
974.93	1154.43	99.55	87.28	85.32	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

BRIDGE

RIVER: PeaceCreekCanal
REACH: Main3 RS: 61026

INPUT
Description:
Distance from Upstream XS = 3
Deck/Roadway Width = 35.1
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-8.75	119.38		88.3	119.06		304.6	118.39	
701.62	117.6		986.8	117.6	102	986.8	117.6	116.2
1146.8	117.58	116.2	1146.8	117.58	102	1169.81	117.65	
1321.27	117.67		2400	117.8				

Upstream Bridge Cross Section Data

SR 60 over PCDC.rep

Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	119.21	26.89	118.7	32.6	119.09	110.55	119.13	154.84	118.48
193.01	118.88	281.74	118.31	355.99	118.13	412.82	117.54	505.85	117.3
570.72	116.94	583.11	117.52	705.71	117.55	730.71	116.99	805.23	117.07
825.95	117.29	910.22	117.57	974.93	117.47	986.8	115.2	989.8	115
998.8	110.5	1000.8	110.5	1007.7	107.1	1017.7	106.83	1022.38	106.7
1034.85	105.07	1036.71	104.2	1063.62	104.78	1084.55	104.04	1088.94	104.95
1095.74	106.78	1118.7	107.96	1128.7	108.47	1132.8	110.5	1134.8	110.5
1143.8	115	1146.8	115.2	1154.43	117.48	1204.33	117.66	1237.16	117.28
1361.41	116.88	1403.2	117.16	1413.99	116.76	1455.83	117.09	1532.76	116.81
1553.28	117	1587.19	116.56	1603.44	116.97	1659.81	116.47	1781.72	116.36
1808.86	116.81	1823.56	116.28	1858.25	116.54	1911.33	115.88	1954.57	116.28
2025.01	116.42	2074.5	116.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	986.8	.045	1146.8	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
1022.38	1088.94	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	974.93	117.6	F
1154.43	2074.5	117.6	F

Downstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	119.38		44.21	119.38		155.28	118.98	
249.57	118.74		479.88	118.02		1012.8	117.59	102
1012.8	117.59	116.2	1172.8	117.58	116.2	1172.8	117.58	102
2400	117.6							

Downstream Bridge Cross Section Data
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	117.5	991	117.5	1012.8	115.2	1015.8	115	1024.8	110.5
1026.8	110.5	1035.54	106.13	1045.54	105.98	1051.69	105.89	1077.82	104.99
1107.59	104.01	1134.25	104.01	1137.8	104.27	1147.8	105	1158.8	110.5
1160.32	110.5	1160.8	110.5	1169.8	115	1172.8	115.2	1188	117.5
2358.42	117.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1012.8	.045	1172.8	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
1077.82	1147.8	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1006.53	117.6	F
1293.89	2358.42	117.6	F

Upstream Embankment side slope = 3 horiz. to 1.0 vertical
Downstream Embankment side slope = 3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

SR 60 over PCDC.rep

Number of Abutments = 2

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
986.8	115.2	989.8	115	998.8	110.5	1000.8	110.5	1016.8	102.5

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1012.8	115.2	1015.8	115	1024.8	110.5	1026.8	110.5	1042.8	102.5

Abutment Data
Upstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1116.8	102.5	1132.8	110.5	1134.8	110.5	1143.8	115	1146.8	115.2

Downstream num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1142.8	102.5	1158.8	110.5	1160.8	110.5	1169.8	115	1172.8	115.2

Number of Piers = 7

Pier Data
Pier Station Upstream= 1006.8 Downstream= 1032.8
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.167	102	1.167	114.2	2	114.2	2	116.2

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.5	102	1.5	114.2	3	114.2	3	116.2

Pier Data
Pier Station Upstream= 1026.8 Downstream= 1052.8
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.167	102	1.167	114.2	2	114.2	2	116.2

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.5	102	1.5	114.2	3	114.2	3	116.2

Pier Data
Pier Station Upstream= 1046.8 Downstream= 1072.8
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.167	102	1.167	114.2	2	114.2	2	116.2

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.5	102	1.5	114.2	3	114.2	3	116.2

Pier Data
Pier Station Upstream= 1066.8 Downstream= 1092.8
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.167	102	1.167	114.2	2	114.2	2	116.2

Downstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev
1.5	102	1.5	114.2	3	114.2	3	116.2

Pier Data
Pier Station Upstream= 1086.8 Downstream= 1112.8
Upstream num= 4

Width	Elev	Width	Elev	Width	Elev	Width	Elev

```
   1.167      102   1.167   114.2        2   114.2        2   116.2
Downstream      num=        4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5      102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station      Upstream=  1106.8    Downstream=  1132.8
Upstream      num=        4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167      102   1.167   114.2        2   114.2        2   116.2
Downstream      num=        4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5      102     1.5   114.2        3   114.2        3   116.2

Pier Data
Pier Station      Upstream=  1126.8    Downstream=  1152.8
Upstream      num=        4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
   1.167      102   1.167   114.2        2   114.2        2   116.2
Downstream      num=        4
    Width   Elev    Width   Elev    Width   Elev    Width   Elev
     1.5      102     1.5   114.2        3   114.2        3   116.2

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       Yarnell                KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: PeaceCreekCanal
REACH: Main3              RS: 60958

INPUT
Description:
Station Elevation Data    num=      72
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0   113.72    29.45   113.69    44.85   113.08    68.37   113.27    70.38   112.51
   109.9   112.84      119   114.72   140.95   115.57   202.04    115.6    223.9   116.11
  233.59   115.59   318.11   116.61   327.66    115.5   348.56   115.28   421.88   115.68
  581.61   115.13   584.23   115.64   630.99   114.87   662.73   117.11   695.63   116.42
  702.73   115.14   728.24   115.28   829.35    114.6   846.82   114.76  1006.53    113.3
 1016.53   112.71  1043.73    109.3  1050.59   107.76  1077.82   104.99  1107.59   104.01
 1134.25   104.01  1145.58   104.97  1160.32   105.06  1171.58   106.01   1202.8   106.31
 1216.56   107.34  1239.48   110.57  1293.89   113.43  1326.32   113.03  1406.14   112.95
 1423.17   113.37  1494.26   112.73  1531.07   113.03  1629.88   113.11  1764.95   112.16
 1819.06   112.04  1899.42   112.13  1915.49   112.33  1995.79   112.02  2016.93   112.04
```

2031.85	112.04	2053.97	111.78	2055.23	111.74	2065.93	111.73	2075.35	110.93
2079.31	110.76	2081.23	110.73	2090.42	110.03	2098.45	110.38	2107.52	111.17
2121.72	111.63	2134.8	111.89	2152.95	112.08	2176.79	112.17	2195.19	112.15
2259.6	112.42	2273.08	112.59	2292.67	112.76	2298.18	112.76	2330.65	113.04
2351.66	113.16	2358.42	113.16						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1077.82	.035	1160.32	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1077.82	1160.32	327.91	339.69	379.75	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	1006.53	117.6	F
1293.89	2358.42	117.6	F

CROSS SECTION

RIVER: PeaceCreekCanal
REACH: Main3 RS: 60618

INPUT
Description:
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	115	24.56	115	58.18	115.28	99.55	115.38	106.95	115.21
137.67	116	425.61	116	460.65	117	537.14	117.51	634.83	117.72
696.72	117.73	805.21	117.89	836.04	117.65	885.25	117.81	940.84	117.18
952.19	117.37	978.87	117.1	978.97	117.44	1133.64	117	1203.02	116
1248.93	114	1274.05	113.42	1283.52	114.12	1283.68	113.56	1302.83	115
1321.03	115.79	1327.05	114.5	1352.89	109.94	1365.14	108.34	1386.97	105.99
1388.62	104.77	1391.53	104.03	1406.14	104.12	1427.18	103.44	1431.24	104.67
1440.15	105.35	1456.72	110.02	1462.79	108.93	1467.38	110.29	1490.27	112.5
1539.06	112.03	1575.45	112.18	1653.05	112.26	1688.06	112.05	1840	112.06
1950.29	111.48	2061.49	111.73	2115.81	111.56	2162.53	111.2	2268.98	111.99
2358.62	111.98	2387.73	112.14	2395.69	112.25	2408.87	112.38	2447.86	112.52
2471.35	112.8	2489.65	112.98						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	1388.62	.035	1431.24	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1388.62	1431.24	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:PeaceCreekCanal

Reach	River Sta.	n1	n2	n3
Main3	61397	.1	.035	.1
Main3	61242	.1	.035	.1
Main3	61158	Bridge		
Main3	61045	.1	.045	.1
Main3	61026	Bridge		
Main3	60958	.1	.035	.1

Main3	60618	.1	.035	.1

SUMMARY OF REACH LENGTHS

River: PeaceCreekCanal

Reach	River Sta.	Left	Channel	Right
Main3	61397	174.52	154.66	112.86
Main3	61242	166.15	197.18	223.3
Main3	61158	Bridge		
Main3	61045	99.55	87.28	85.32
Main3	61026	Bridge		
Main3	60958	327.91	339.69	379.75
Main3	60618	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: PeaceCreekCanal

Reach	River Sta.	Contr.	Expan.
Main3	61397	.1	.3
Main3	61242	.3	.5
Main3	61158	Bridge	
Main3	61045	.3	.5
Main3	61026	Bridge	
Main3	60958	.3	.5
Main3	60618	.1	.3

HEC-RAS Plan: Proposed - Alt 3 River: PeaceCreekCanal Reach: Main3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	61397	25 Year	1057.00	104.31	111.99		112.01	0.000086	1.49	2036.24	1016.57	0.10
Main3	61397	50 Year	1223.00	104.31	112.38		112.40	0.000085	1.53	2447.13	1095.05	0.10
Main3	61397	100 Year	1448.00	104.31	112.97		113.00	0.000079	1.56	3160.75	1297.39	0.09
Main3	61397	500 Year	1808.00	104.31	113.90		113.92	0.000062	1.47	4433.49	1441.24	0.09
Main3	61242	25 Year	1057.00	103.19	111.97	106.26	112.00	0.000082	1.46	1061.91	471.91	0.09
Main3	61242	50 Year	1223.00	103.19	112.35	106.43	112.39	0.000092	1.59	1140.03	1086.18	0.10
Main3	61242	100 Year	1448.00	103.19	112.94	106.64	112.98	0.000101	1.75	1280.59	1452.73	0.11
Main3	61242	500 Year	1808.00	103.19	113.86	106.95	113.91	0.000106	1.93	1505.82	1953.95	0.11
Main3	61158 BR U	25 Year	1057.00	103.20	111.97	106.51	112.00	0.000216	1.33	792.55	127.88	0.09
Main3	61158 BR U	50 Year	1223.00	103.20	112.35	106.67	112.38	0.000244	1.45	841.37	129.40	0.10
Main3	61158 BR U	100 Year	1448.00	103.20	112.94	106.86	112.98	0.000263	1.58	926.38	150.00	0.10
Main3	61158 BR U	500 Year	1808.00	103.20	113.85	107.15	113.90	0.000280	1.73	1064.07	150.00	0.11
Main3	61158 BR D	25 Year	1057.00	104.04	111.93	106.79	111.96	0.000270	1.45	730.78	127.71	0.11
Main3	61158 BR D	50 Year	1223.00	104.04	112.30	107.08	112.34	0.000301	1.57	778.88	129.21	0.11
Main3	61158 BR D	100 Year	1448.00	104.04	112.89	107.39	112.93	0.000320	1.69	860.90	150.00	0.12
Main3	61158 BR D	500 Year	1808.00	104.04	113.80	107.67	113.85	0.000332	1.84	994.58	150.00	0.12
Main3	61045	25 Year	1057.00	104.04	111.92	106.56	111.95	0.000168	1.38	768.63	130.30	0.10
Main3	61045	50 Year	1223.00	104.04	112.30	106.74	112.33	0.000186	1.50	817.66	131.91	0.11
Main3	61045	100 Year	1448.00	104.04	112.88	107.07	112.92	0.000215	1.61	899.18	144.59	0.11
Main3	61045	500 Year	1808.00	104.04	113.80	107.36	113.84	0.000219	1.75	1033.52	148.96	0.12
Main3	61026 BR U	25 Year	1057.00	104.04	111.92	106.78	111.95	0.000354	1.50	728.77	133.51	0.10
Main3	61026 BR U	50 Year	1223.00	104.04	112.29	107.04	112.33	0.000397	1.62	778.86	135.00	0.10
Main3	61026 BR U	100 Year	1448.00	104.04	112.87	107.41	112.92	0.000431	1.73	858.12	137.33	0.11
Main3	61026 BR U	500 Year	1808.00	104.04	113.78	107.77	113.84	0.000469	1.87	984.75	140.97	0.11
Main3	61026 BR D	25 Year	1057.00	104.01	111.19	106.34	111.23	0.000340	1.58	722.23	128.27	0.11
Main3	61026 BR D	50 Year	1223.00	104.01	111.56	106.50	111.61	0.000385	1.72	770.41	129.76	0.11
Main3	61026 BR D	100 Year	1448.00	104.01	112.15	106.70	112.20	0.000422	1.85	847.03	132.10	0.12
Main3	61026 BR D	500 Year	1808.00	104.01	113.07	107.00	113.12	0.000464	2.03	969.97	135.77	0.12
Main3	60958	25 Year	1057.00	104.01	111.18	106.16	111.22	0.000108	1.58	1055.38	258.03	0.11
Main3	60958	50 Year	1223.00	104.01	111.56	106.37	111.60	0.000119	1.72	1141.44	284.37	0.11
Main3	60958	100 Year	1448.00	104.01	112.15	106.59	112.19	0.000126	1.86	1282.21	586.32	0.12
Main3	60958	500 Year	1808.00	104.01	113.07	106.91	113.12	0.000130	2.04	1522.32	1222.50	0.12

HEC-RAS Plan: Proposed - Alt 3 River: PeaceCreekCanal Reach: Main3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main3	60618	25 Year	1057.00	103.44	111.00	106.59	111.13	0.000383	3.04	545.99	127.85	0.20
Main3	60618	50 Year	1223.00	103.44	111.35	106.87	111.50	0.000428	3.32	594.70	173.14	0.22
Main3	60618	100 Year	1448.00	103.44	111.92	107.19	112.08	0.000441	3.54	798.92	535.52	0.22
Main3	60618	500 Year	1808.00	103.44	112.89	107.69	113.02	0.000356	3.44	1762.93	1144.33	0.20

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61158 Profile: 25 Year

E.G. US. (ft)	112.00	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	111.97	E.G. Elev (ft)	112.00	111.96
Q Total (cfs)	1057.00	W.S. Elev (ft)	111.97	111.93
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.51	106.79
Q Weir (cfs)		Max Chl Dpth (ft)	8.77	7.89
Weir Sta Lft (ft)		Vel Total (ft/s)	1.33	1.45
Weir Sta Rgt (ft)		Flow Area (sq ft)	792.55	730.78
Weir Submerg		Froude # Chl	0.09	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	2721.86	2360.68
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.20	5.72
Min El Prs (ft)	132.18	W.P. Total (ft)	173.91	167.84
Delta EG (ft)	0.05	Conv. Total (cfs)	71936.2	64343.2
Delta WS (ft)	0.05	Top Width (ft)	127.88	127.71
BR Open Area (sq ft)	3381.56	Frctn Loss (ft)	0.03	0.01
BR Open Vel (ft/s)	1.45	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.06	0.07
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61158 Profile: 50 Year

E.G. US. (ft)	112.39	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.35	E.G. Elev (ft)	112.38	112.34
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.35	112.30
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	106.67	107.08
Q Weir (cfs)		Max Chl Dpth (ft)	9.15	8.26
Weir Sta Lft (ft)		Vel Total (ft/s)	1.45	1.57
Weir Sta Rgt (ft)		Flow Area (sq ft)	841.37	778.88
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	3043.34	2655.45
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.50	6.03
Min El Prs (ft)	132.18	W.P. Total (ft)	177.88	171.76
Delta EG (ft)	0.05	Conv. Total (cfs)	78284.4	70460.6
Delta WS (ft)	0.05	Top Width (ft)	129.40	129.21
BR Open Area (sq ft)	3381.56	Frctn Loss (ft)	0.04	0.01
BR Open Vel (ft/s)	1.57	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.07	0.09
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61158 Profile: 100 Year

E.G. US. (ft)	112.98	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.94	E.G. Elev (ft)	112.98	112.93
Q Total (cfs)	1448.00	W.S. Elev (ft)	112.94	112.89
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	106.86	107.39
Q Weir (cfs)		Max Chl Dpth (ft)	9.74	8.85
Weir Sta Lft (ft)		Vel Total (ft/s)	1.56	1.68
Weir Sta Rgt (ft)		Flow Area (sq ft)	926.38	860.90
Weir Submerg		Froude # Chl	0.10	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	3577.05	3149.72
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	6.18	5.89
Min El Prs (ft)	132.18	W.P. Total (ft)	202.95	192.60
Delta EG (ft)	0.06	Conv. Total (cfs)	89232.5	80993.1
Delta WS (ft)	0.06	Top Width (ft)	150.00	150.00
BR Open Area (sq ft)	3381.56	Frctn Loss (ft)	0.04	0.01
BR Open Vel (ft/s)	1.68	C & E Loss (ft)	0.00	0.00

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61158 Profile: 100 Year (Continued)

Coef of Q		Shear Total (lb/sq ft)	0.08	0.09
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61158 Profile: 500 Year

E.G. US. (ft)	113.91	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.86	E.G. Elev (ft)	113.90	113.85
Q Total (cfs)	1808.00	W.S. Elev (ft)	113.85	113.80
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.15	107.67
Q Weir (cfs)		Max Chl Dpth (ft)	10.66	9.76
Weir Sta Lft (ft)		Vel Total (ft/s)	1.70	1.82
Weir Sta Rgt (ft)		Flow Area (sq ft)	1064.07	994.58
Weir Submerg		Froude # Chl	0.11	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	4516.24	4025.69
Min El Weir Flow (ft)	118.17	Hydr Depth (ft)	7.09	6.81
Min El Prs (ft)	132.18	W.P. Total (ft)	210.29	199.01
Delta EG (ft)	0.06	Conv. Total (cfs)	108058.9	99257.3
Delta WS (ft)	0.06	Top Width (ft)	150.00	150.00
BR Open Area (sq ft)	3381.56	Frctn Loss (ft)	0.04	0.01
BR Open Vel (ft/s)	1.82	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	0.09	0.10
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61026 Profile: 25 Year

E.G. US. (ft)	111.95	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	111.92	E.G. Elev (ft)	111.95	111.23
Q Total (cfs)	1057.00	W.S. Elev (ft)	111.92	111.19
Q Bridge (cfs)	1057.00	Crit W.S. (ft)	106.78	106.34
Q Weir (cfs)		Max Chl Dpth (ft)	7.88	7.18
Weir Sta Lft (ft)		Vel Total (ft/s)	1.45	1.46
Weir Sta Rgt (ft)		Flow Area (sq ft)	728.77	722.23
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	2307.99	2300.32
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.46	5.63
Min El Prs (ft)	116.20	W.P. Total (ft)	216.88	210.25
Delta EG (ft)	0.74	Conv. Total (cfs)	56214.3	57294.7
Delta WS (ft)	0.74	Top Width (ft)	133.51	128.27
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.46	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.07	0.07
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61026 Profile: 50 Year

E.G. US. (ft)	112.33	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.30	E.G. Elev (ft)	112.33	111.61
Q Total (cfs)	1223.00	W.S. Elev (ft)	112.29	111.56
Q Bridge (cfs)	1223.00	Crit W.S. (ft)	107.04	106.50
Q Weir (cfs)		Max Chl Dpth (ft)	8.25	7.55
Weir Sta Lft (ft)		Vel Total (ft/s)	1.57	1.59
Weir Sta Rgt (ft)		Flow Area (sq ft)	778.86	770.41
Weir Submerg		Froude # Chl	0.10	0.11
Weir Max Depth (ft)		Specif Force (cu ft)	2601.25	2591.46
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	5.77	5.94
Min El Prs (ft)	116.20	W.P. Total (ft)	223.78	217.15

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61026 Profile: 50 Year (Continued)

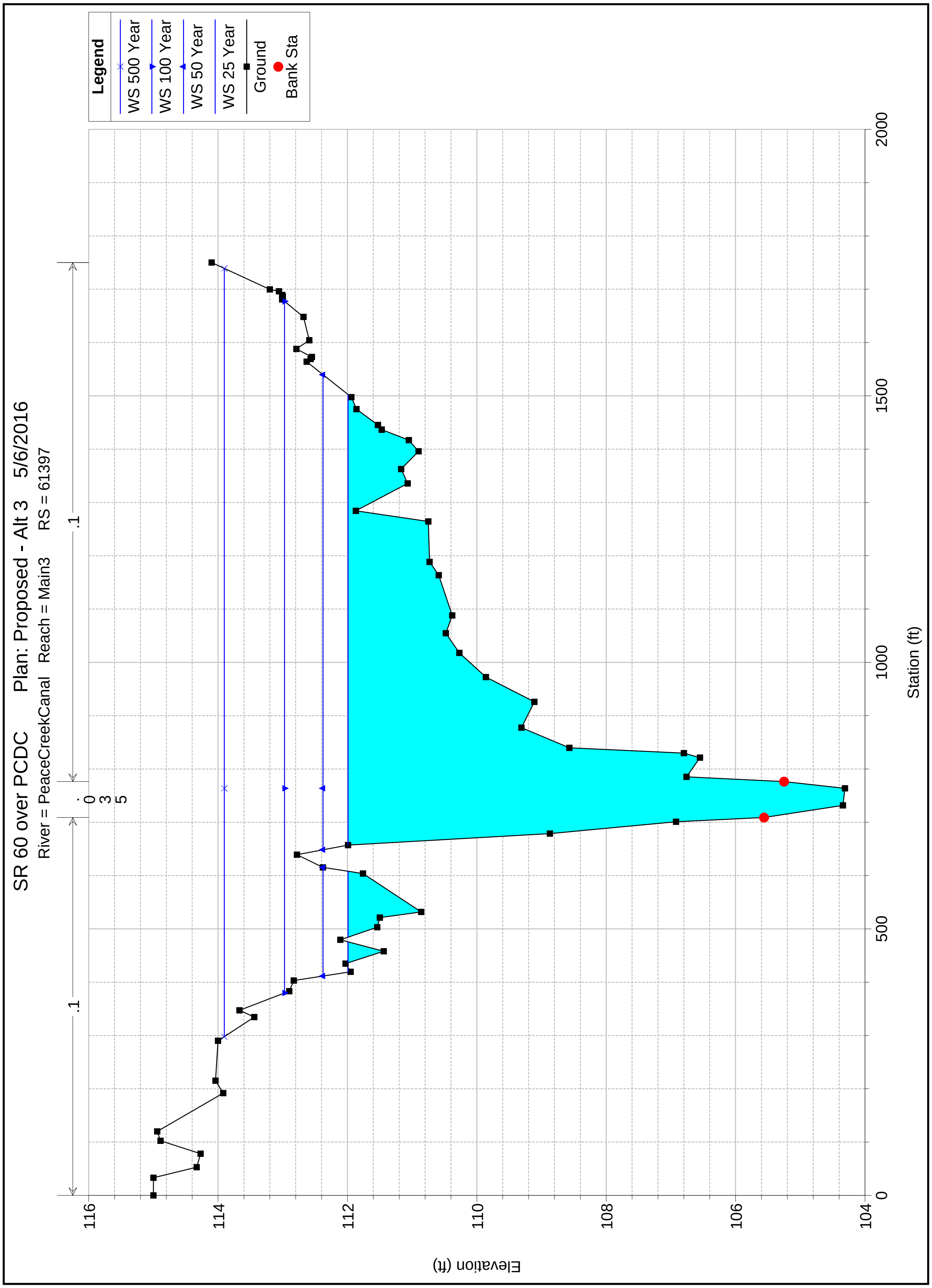
Delta EG (ft)	0.73	Conv. Total (cfs)	61377.4	62338.7
Delta WS (ft)	0.74	Top Width (ft)	135.00	129.76
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.59	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.09	0.09
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61026 Profile: 100 Year

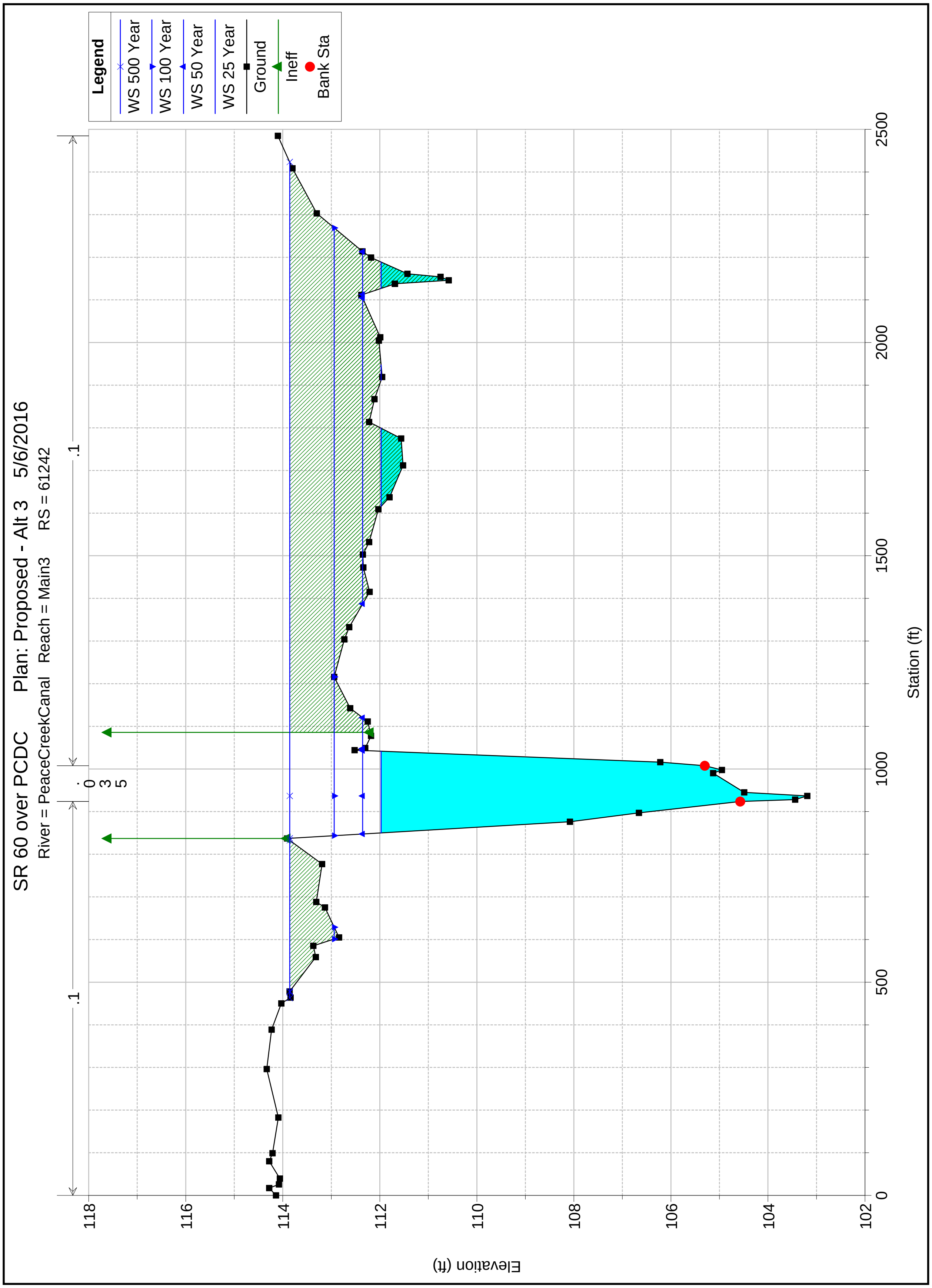
E.G. US. (ft)	112.92	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	112.88	E.G. Elev (ft)	112.92	112.20
Q Total (cfs)	1448.00	W.S. Elev (ft)	112.87	112.15
Q Bridge (cfs)	1448.00	Crit W.S. (ft)	107.41	106.70
Q Weir (cfs)		Max Chl Dpth (ft)	8.83	8.14
Weir Sta Lft (ft)		Vel Total (ft/s)	1.69	1.71
Weir Sta Rgt (ft)		Flow Area (sq ft)	858.12	847.03
Weir Submerg		Froude # Chl	0.11	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	3093.83	3081.53
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.25	6.41
Min El Prs (ft)	116.20	W.P. Total (ft)	234.53	227.96
Delta EG (ft)	0.73	Conv. Total (cfs)	69731.0	70507.6
Delta WS (ft)	0.73	Top Width (ft)	137.33	132.10
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.71	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.10	0.10
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

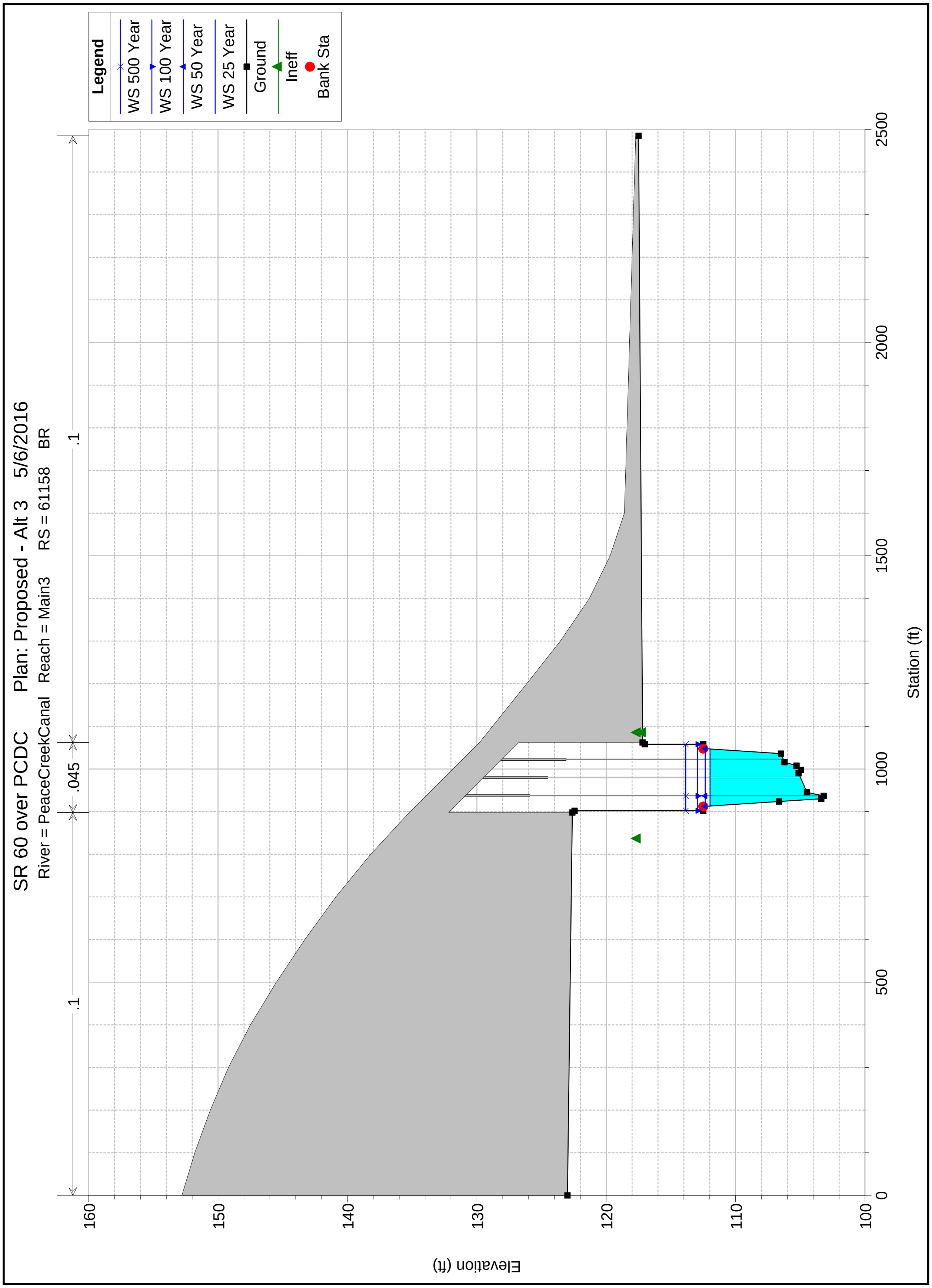
Plan: Proposed - Alt 3 PeaceCreekCanal Main3 RS: 61026 Profile: 500 Year

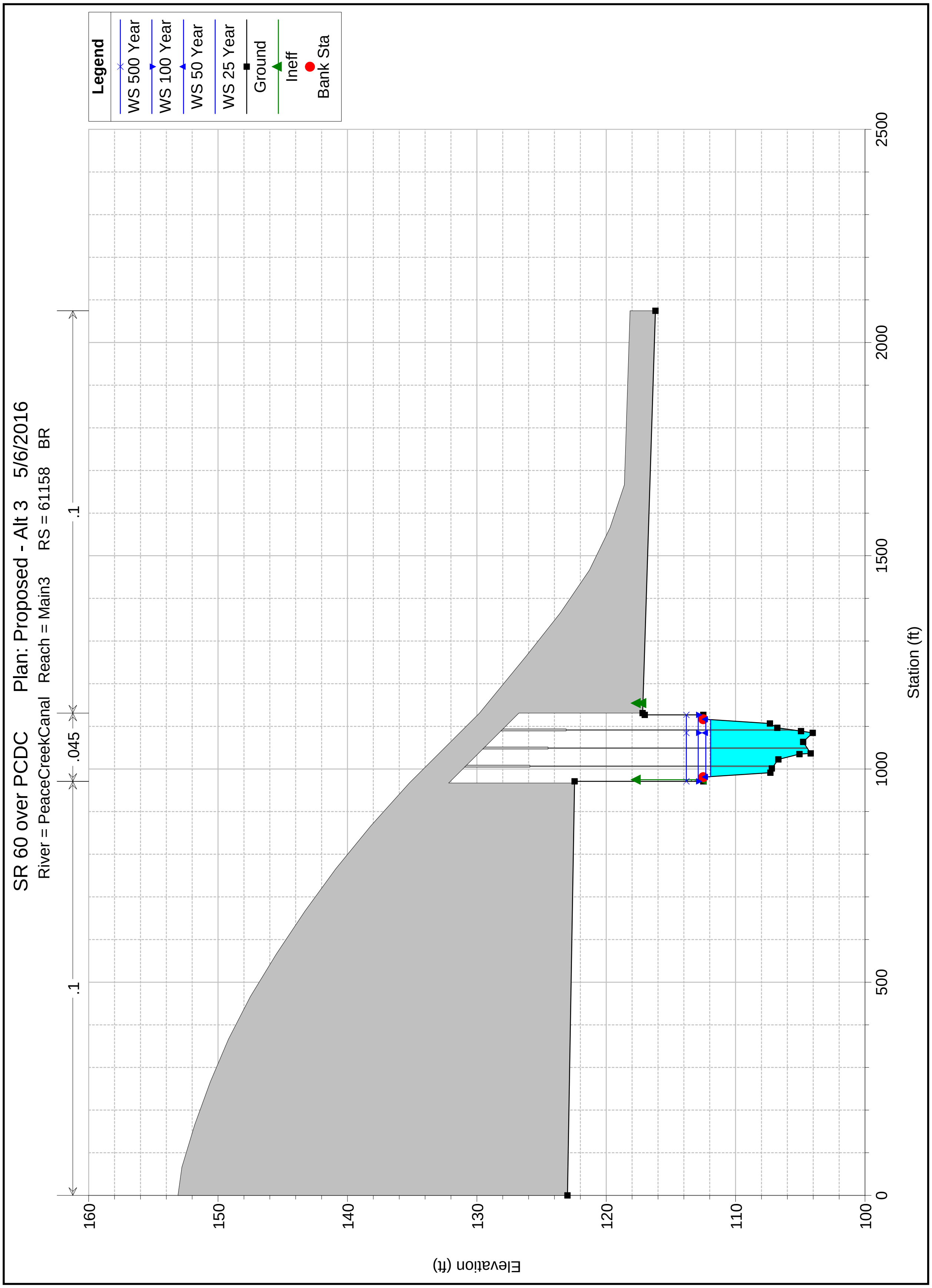
E.G. US. (ft)	113.84	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	113.80	E.G. Elev (ft)	113.84	113.12
Q Total (cfs)	1808.00	W.S. Elev (ft)	113.78	113.07
Q Bridge (cfs)	1808.00	Crit W.S. (ft)	107.77	107.00
Q Weir (cfs)		Max Chl Dpth (ft)	9.74	9.06
Weir Sta Lft (ft)		Vel Total (ft/s)	1.84	1.86
Weir Sta Rgt (ft)		Flow Area (sq ft)	984.75	969.97
Weir Submerg		Froude # Chl	0.11	0.12
Weir Max Depth (ft)		Specif Force (cu ft)	3959.33	3943.44
Min El Weir Flow (ft)	117.59	Hydr Depth (ft)	6.99	7.14
Min El Prs (ft)	116.20	W.P. Total (ft)	251.34	244.92
Delta EG (ft)	0.73	Conv. Total (cfs)	83488.3	83944.8
Delta WS (ft)	0.73	Top Width (ft)	140.97	135.77
BR Open Area (sq ft)	1329.03	Frctn Loss (ft)		
BR Open Vel (ft/s)	1.86	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.11	0.11
Br Sel Method	Momentum	Power Total (lb/ft s)	0.00	0.00

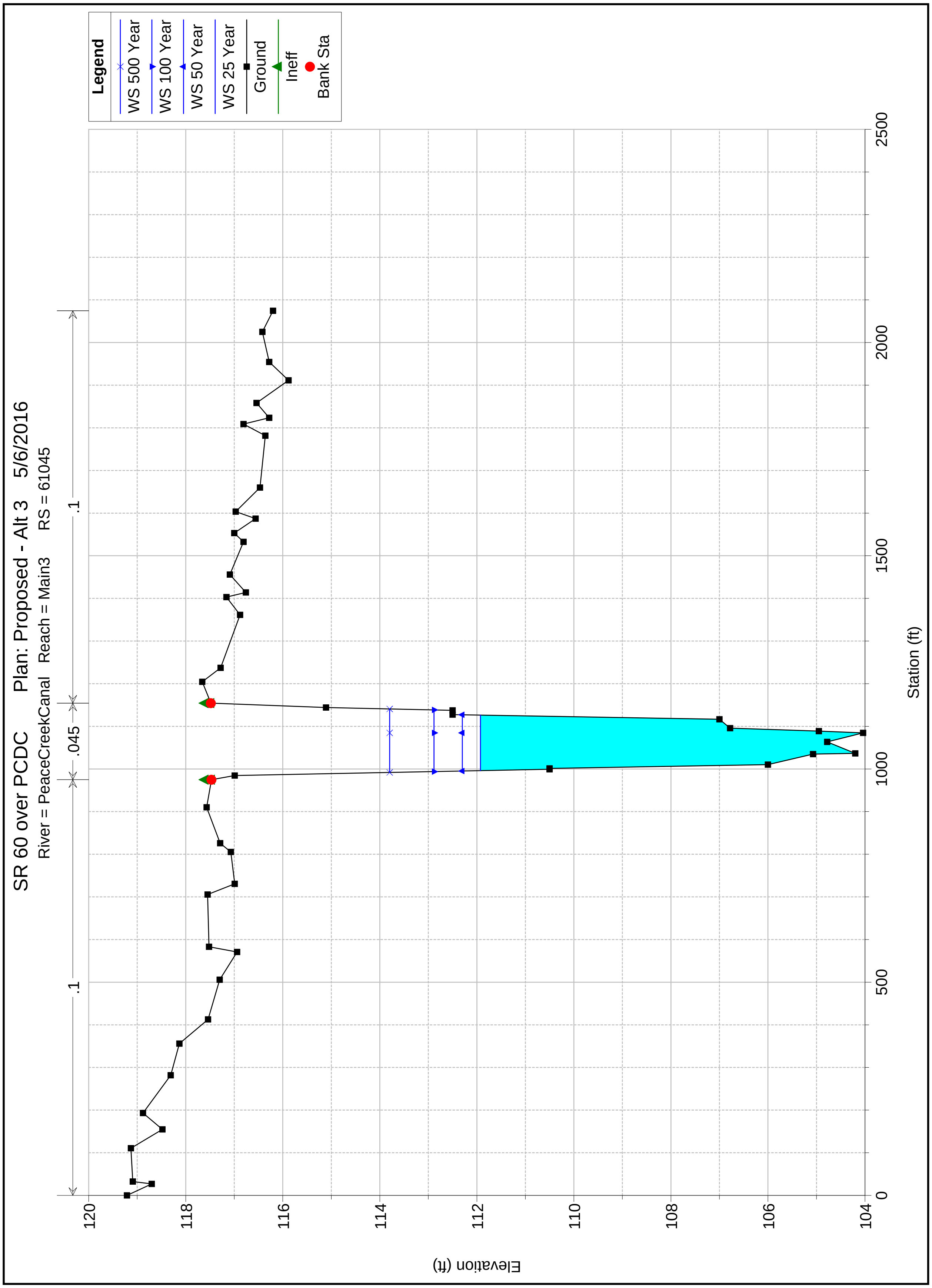


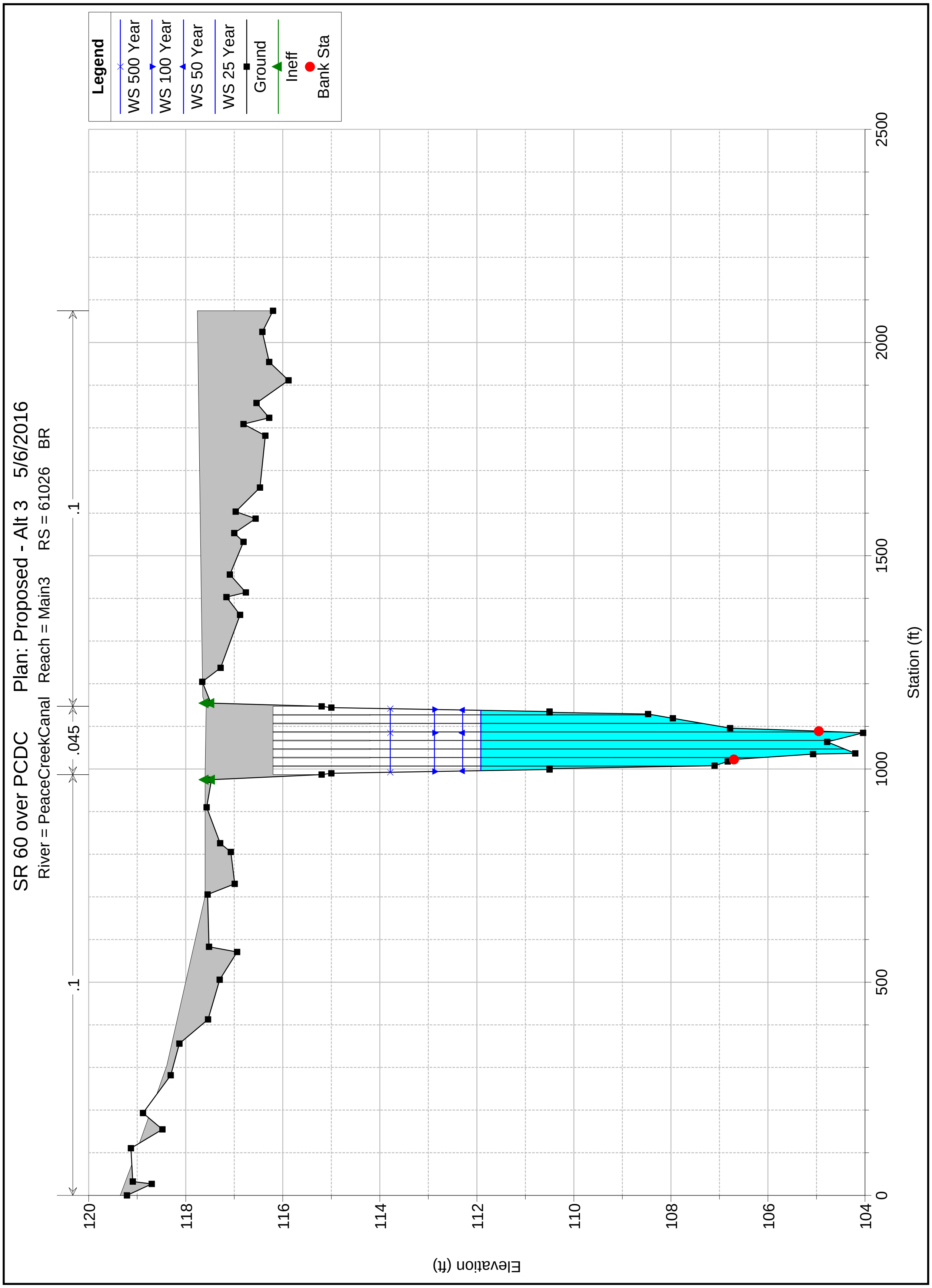
SR 60 over PCDC Plan: Proposed - Alt 3 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61397
.1
.035
.1
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
Elevation (ft)
Station (ft)
104
106
108
110
112
114
116
0
500
1000
1500
2000


SR 60 over PCDC Plan: Proposed - Alt 3 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61242
.1
.035
.1
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
118
116
114
112
110
108
106
104
102
0
500
1000
1500
2000
2500

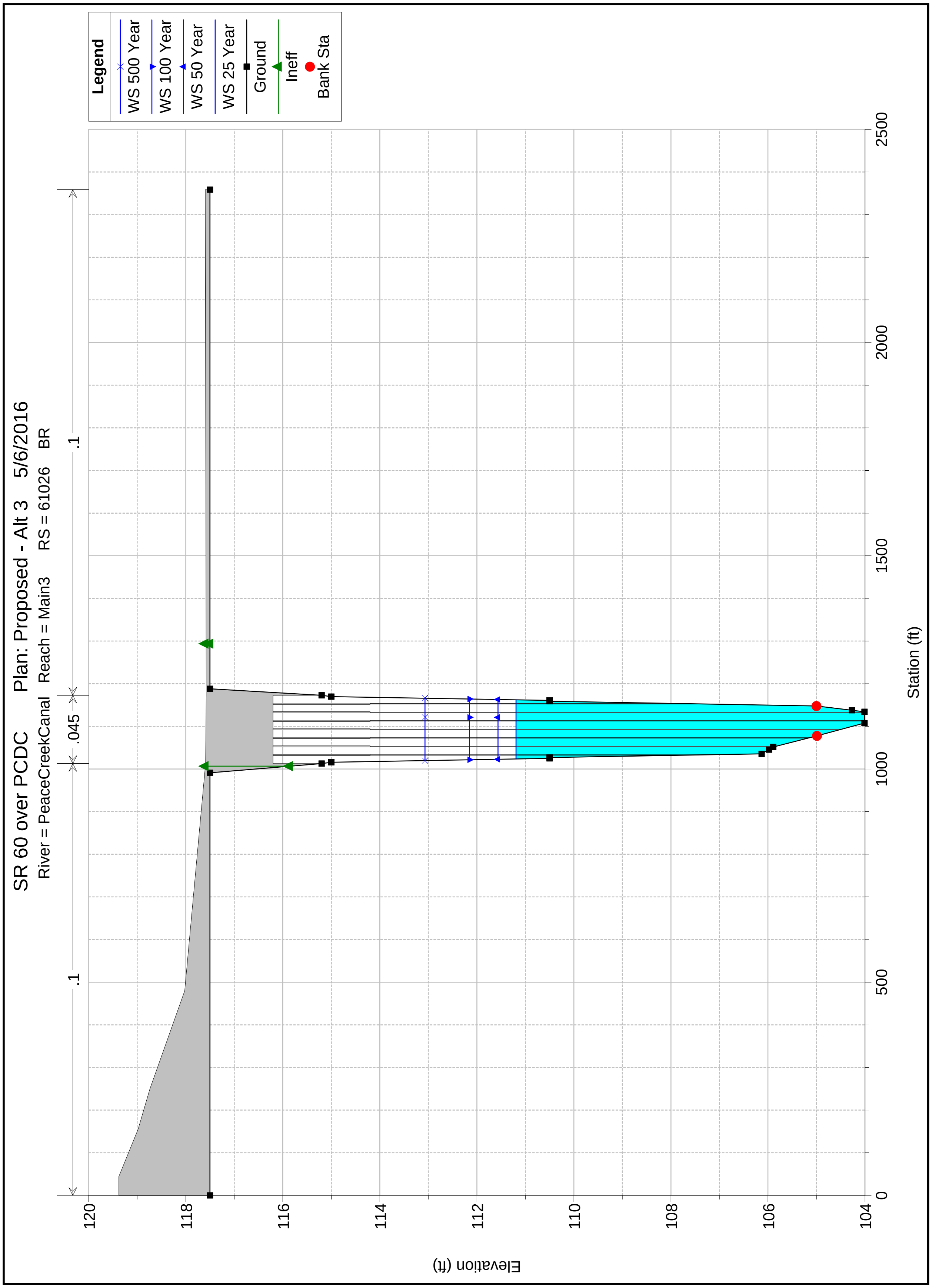

SR 60 over PCDC   Plan: Proposed - Alt 3   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 61158   BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
100
110
120
130
140
150
160
0
500
1000
1500
2000
2500

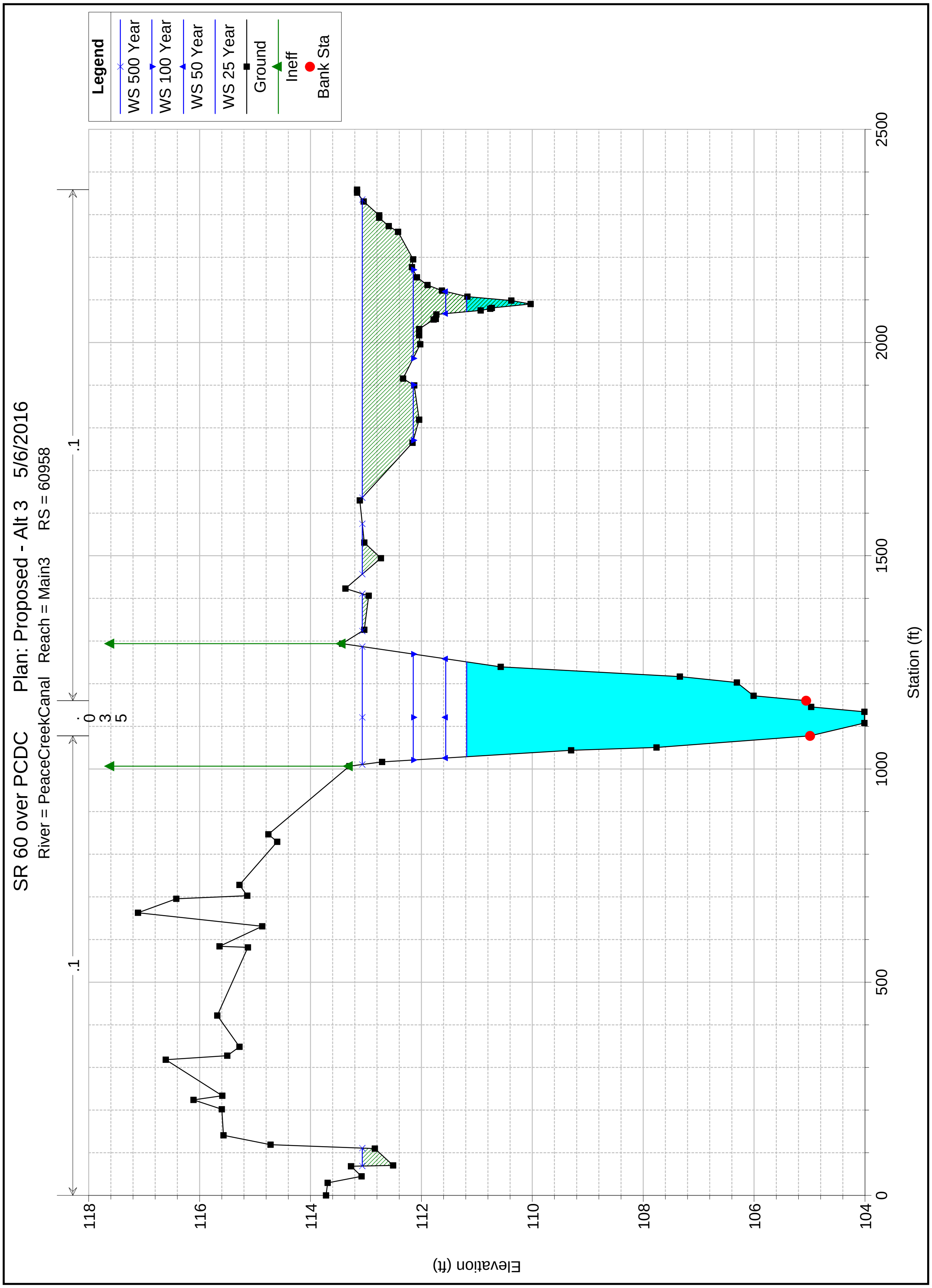

SR 60 over PCDC Plan: Proposed - Alt 3 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61158 BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
160
150
140
130
120
110
100
0
500
1000
1500
2000
2500

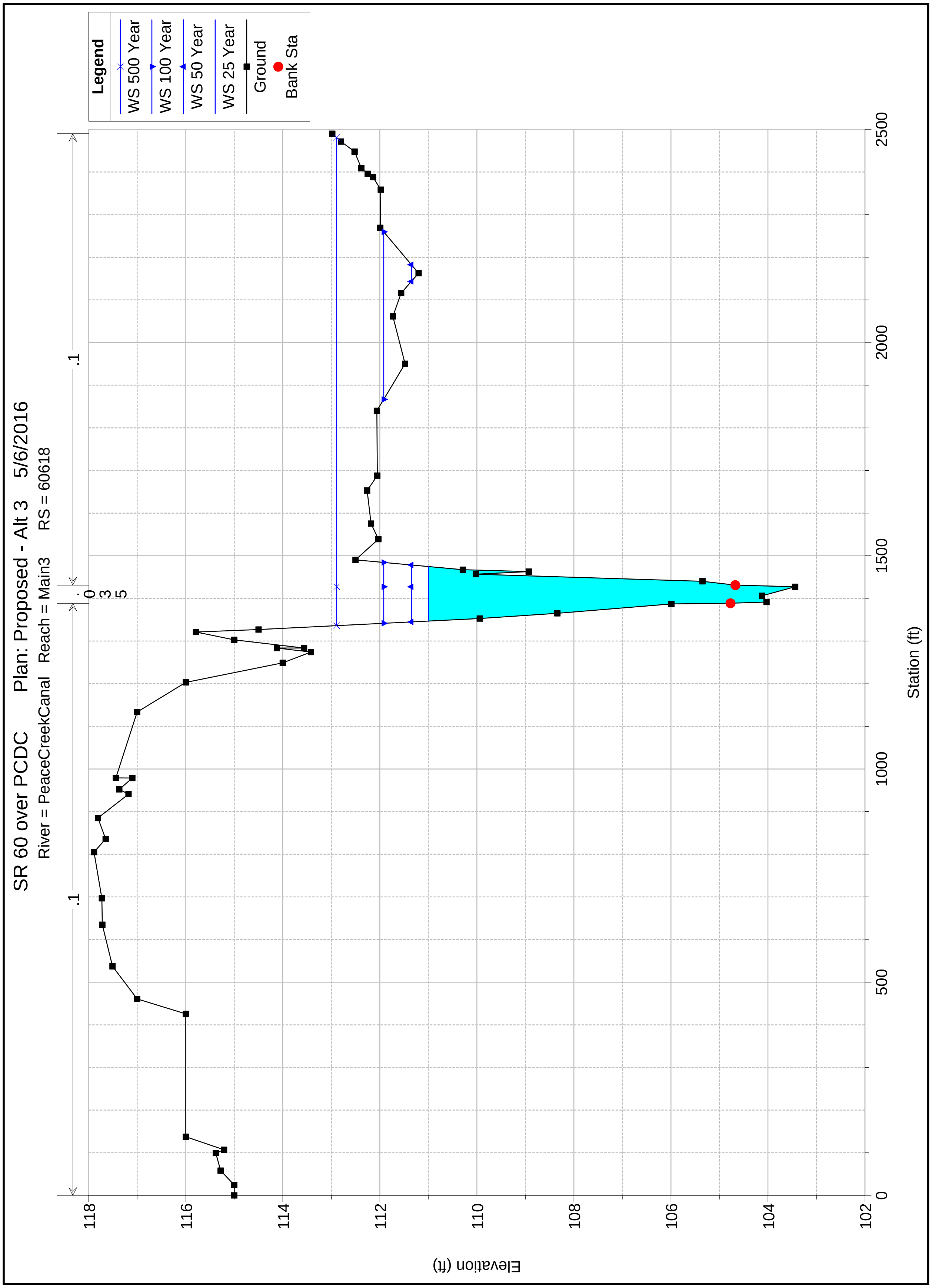

SR 60 over PCDC Plan: Proposed - Alt 3 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61045
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500

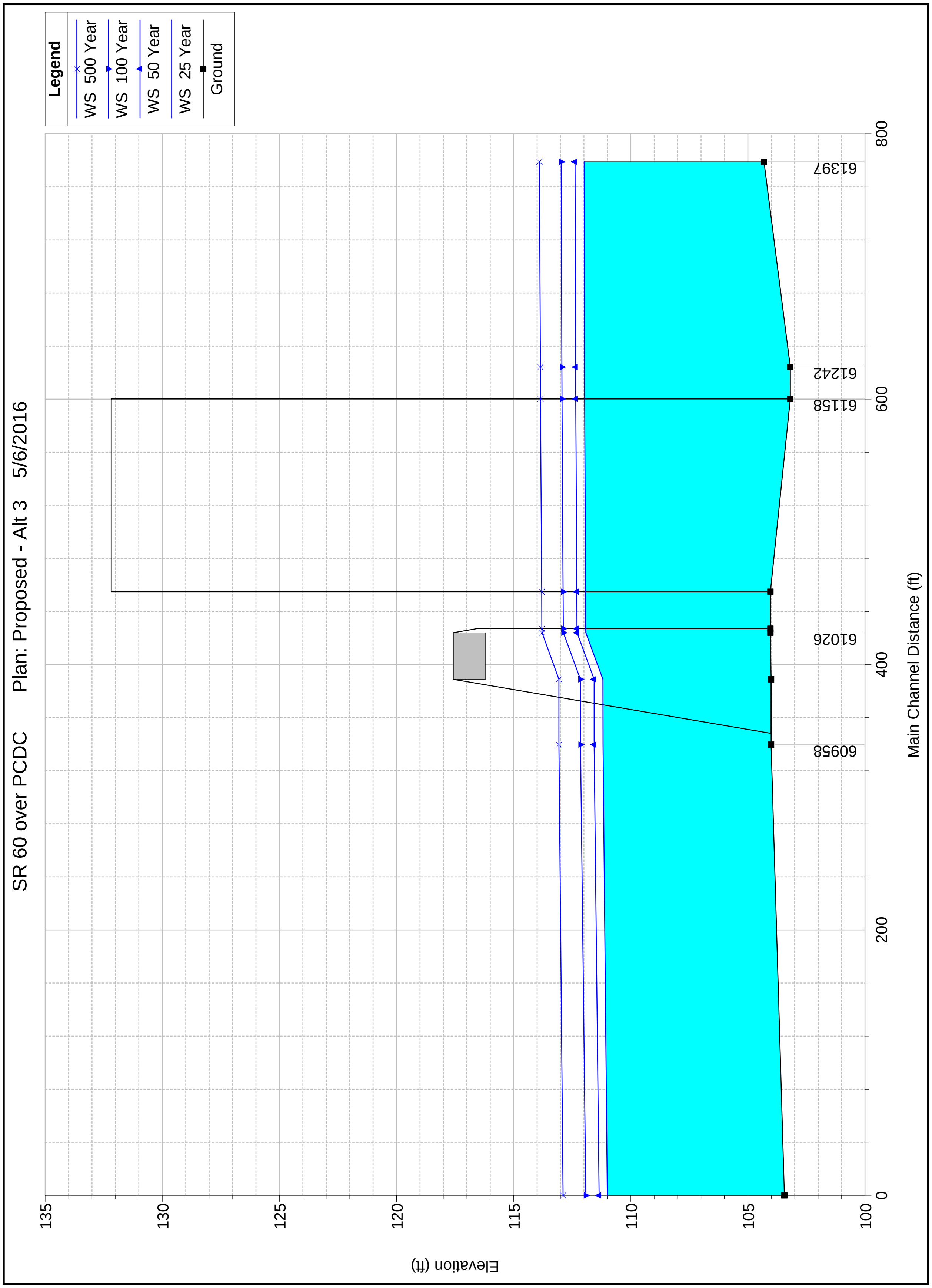


SR 60 over PCDC Plan: Proposed - Alt 3 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 61026 BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
120
118
116
114
112
110
108
106
104
Station (ft)
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 3   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 61026   BR
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.045
.1
Elevation (ft)
Station (ft)
120
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC   Plan: Proposed - Alt 3   5/6/2016
River = PeaceCreekCanal   Reach = Main3   RS = 60958
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Ineff
Bank Sta
.1
.035
.1
Elevation (ft)
Station (ft)
118
116
114
112
110
108
106
104
0
500
1000
1500
2000
2500


SR 60 over PCDC Plan: Proposed - Alt 3 5/6/2016
River = PeaceCreekCanal Reach = Main3 RS = 60618
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
Bank Sta
.1
.1
.035
Elevation (ft)
Station (ft)
118
116
114
112
110
108
106
104
102
0
500
1000
1500
2000
2500


SR 60 over PCDC Plan: Proposed - Alt 3 5/6/2016
Legend
WS 500 Year
WS 100 Year
WS 50 Year
WS 25 Year
Ground
61397
61242
61158
61026
60958
Main Channel Distance (ft)
Elevation (ft)
0
200
400
600
800
100
105
110
115
120
125
130
135

Low Member

Calculations

KISINGER CAMPO & ASSOCIATES

FLORIDA DEPARTMENT OF TRANSPORTATION
SR60 GRADE SEPARATION OVER CSX RAILROAD
POLK COUNTY

DESIGNED BY: TAC 02/04/16
CHECKED BY: CEL 02/16

Peace Creek Alternative 1 -Low Member Elevation Estimate single span

Low member at eastbound bridge, front of bent cap 1 and centerline of exterior beam.

Vertical Alignment

Location	Station	Elevation		
PC	4388+75.00	136.05	Grade 1 =	0.03
PI	4400+80.00	172.20	Grade 2 =	-0.03
PT	4412+85.00	136.05	Δ Grade =	-0.06
			Length (ft.) =	2410.00

Superstructure Geometry

Cross Slope	-0.02
Deck (in.)	8.50
Build-up (in.)	2.00
Beam (in.)	96.00

End Bent 1 (Right Side) - CL Exterior Beam

Location	Station	PGL FGE	Offset	FGE	Super. Depth	Low Member
End Bent 1	4386+64.34	129.73	53.02	128.67	8.88	119.79

KISINGER CAMPO & ASSOCIATES

FLORIDA DEPARTMENT OF TRANSPORTATION
SR60 GRADE SEPARATION OVER CSX RAILROAD
POLK COUNTY

DESIGNED BY: TAC 02/04/16
CHECKED BY: CEL 02|16

Peace Creek Alternative 2 - Low Member Elevation Estimate two span

Low member at eastbound bridge, front of bent cap 1 and centerline of exterior beam.

Vertical Alignment

Location	Station	Elevation		
			Grade 1 =	0.03
PC	4388+75.00	136.05	Grade 2 =	-0.03
PI	4400+80.00	172.20	Δ Grade =	-0.06
PT	4412+85.00	136.05	Length (ft.) =	2410.00

Superstructure Geometry

Cross Slope	-0.02
Deck (in.)	8.50
Build-up (in.)	2.00
Beam (in.)	45.00

End Bent 1 (Right Side) - CL Exterior Beam

Location	Station	PGL FGE	Offset	FGE	Super. Depth	Low Member
End Bent 1	4386+64.34	129.73	53.02	128.67	4.63	124.04

KISINGER CAMPO & ASSOCIATES

FLORIDA DEPARTMENT OF TRANSPORTATION
SR60 GRADE SEPARATION OVER CSX RAILROAD
POLK COUNTY

DESIGNED BY: TAC 02/04/16
CHECKED BY: CEL 02/16

Peace Creek Alternative 3 - Low Member Elevation Estimate

4-span flat slab

Low member at eastbound bridge, front of bent cap 1 and outside edge of exterior FSB.

Vertical Alignment

Location	Station	Elevation	Grade 1 =	0.03
PC	4388+75.00	136.05	Grade 2 =	-0.03
PI	4400+80.00	172.20	Δ Grade =	-0.06
PT	4412+85.00	136.05	Length (ft.) =	2410.00

Superstructure Geometry

Cross Slope	-0.02
Deck (in.)	21.50

End Bent 1 (Right Side) - Outer Edge of Beam

Location	Station	PGL FGE	Offset	FGE	Super. Depth	Low Member
End Bent 1	4386+62.53	129.68	56.54	128.55	1.79	126.75

Geometry Design

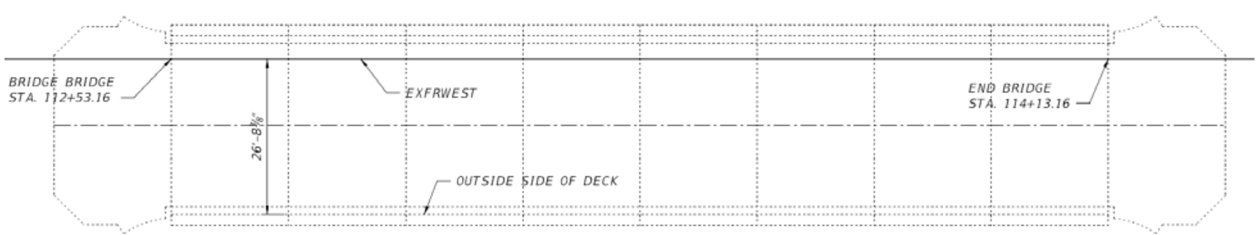
Frontage Road –Existing Low Member

The low member elevation of the existing bridge is estimated.

The existing alignment along eastbound SR 60 (proposed Frontage Road) is presented as profile "EXFRWEST." See the following Geopak output for the profile elevations.

The begin and end bridge locations are shown in the figure below. The outside edge of the deck slab is approximately 26.70 ft. from the baseline. The deck slopes at a rate of 3/16 in. per ft. and the deck slab thickness is 14 in.

Low member elevation = 117.77 ft. – (3/16 in./ft.)*(26.70 ft.) – 14 in.
= 116.19 ft.



APPENDIX F

Scour Calculations

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	1.59	8.34	2.29
	Approach Velocity (ft/s):	0.18	1.56	0.23
	Br Average Depth (ft):	0.43	7.08	0.43
	BR Opening Flow (cfs):	1.06	1445.88	1.06
	BR Top WD (ft):	10.00	134.00	10.00
	Grain Size D50 (mm):	0.25	0.25	0.25
	Approach Flow (cfs):	94.08	877.57	476.35
	Approach Top WD (ft):	328.54	67.38	899.60
	K1 Coefficient:	0.640	0.640	0.640
Results				
	Scour Depth Ys (ft):	0.00	1.16	0.00
	Critical Velocity (ft/s):	1.13	1.49	1.20
	Equation:	Clear	Live	Clear

Pier Scour

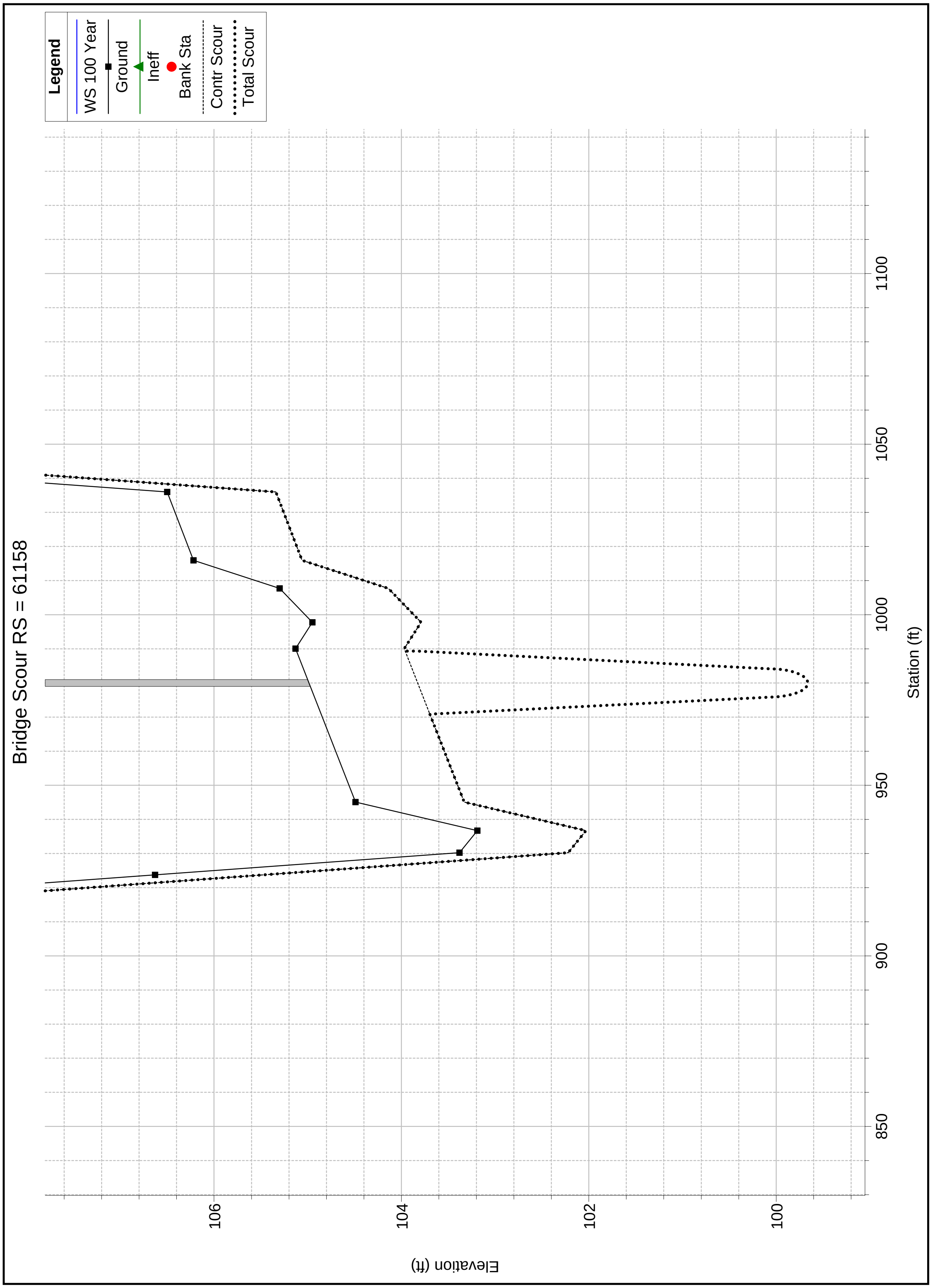
All piers have the same scour depth

Input Data		
	Pier Shape:	Square nose
	Pier Width (ft):	2.00
	Grain Size D50 (mm):	0.25000
	Depth Upstream (ft):	9.67
	Velocity Upstream (ft/s):	1.94
	Projected Width (ft):	2.00
	Pier shape Coeff:	1.30
Results		
	Scour Depth Ys (ft):	4.17
	Froude #:	0.11
	Equation:	Froehlich's equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel: 5.33


Bridge Scour RS = 61158
Legend
WS 100 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
106
104
102
100
Station (ft)
850
900
950
1000
1050
1100

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	2.09	9.27	3.05
	Approach Velocity (ft/s):	0.19	1.48	0.25
	Br Average Depth (ft):	1.34	8.00	1.34
	BR Opening Flow (cfs):	6.95	1794.11	6.95
	BR Top WD (ft):	10.00	134.00	10.00
	Grain Size D50 (mm):	0.25	0.25	0.25
	Approach Flow (cfs):	164.15	922.11	721.74
	Approach Top WD (ft):	410.08	67.38	961.87
	K1 Coefficient:	0.640	0.640	0.640
Results				
	Scour Depth Ys (ft):	0.00	0.23	0.00
	Critical Velocity (ft/s):	1.19	1.52	1.26
	Equation:	Clear	Clear	Clear

Pier Scour

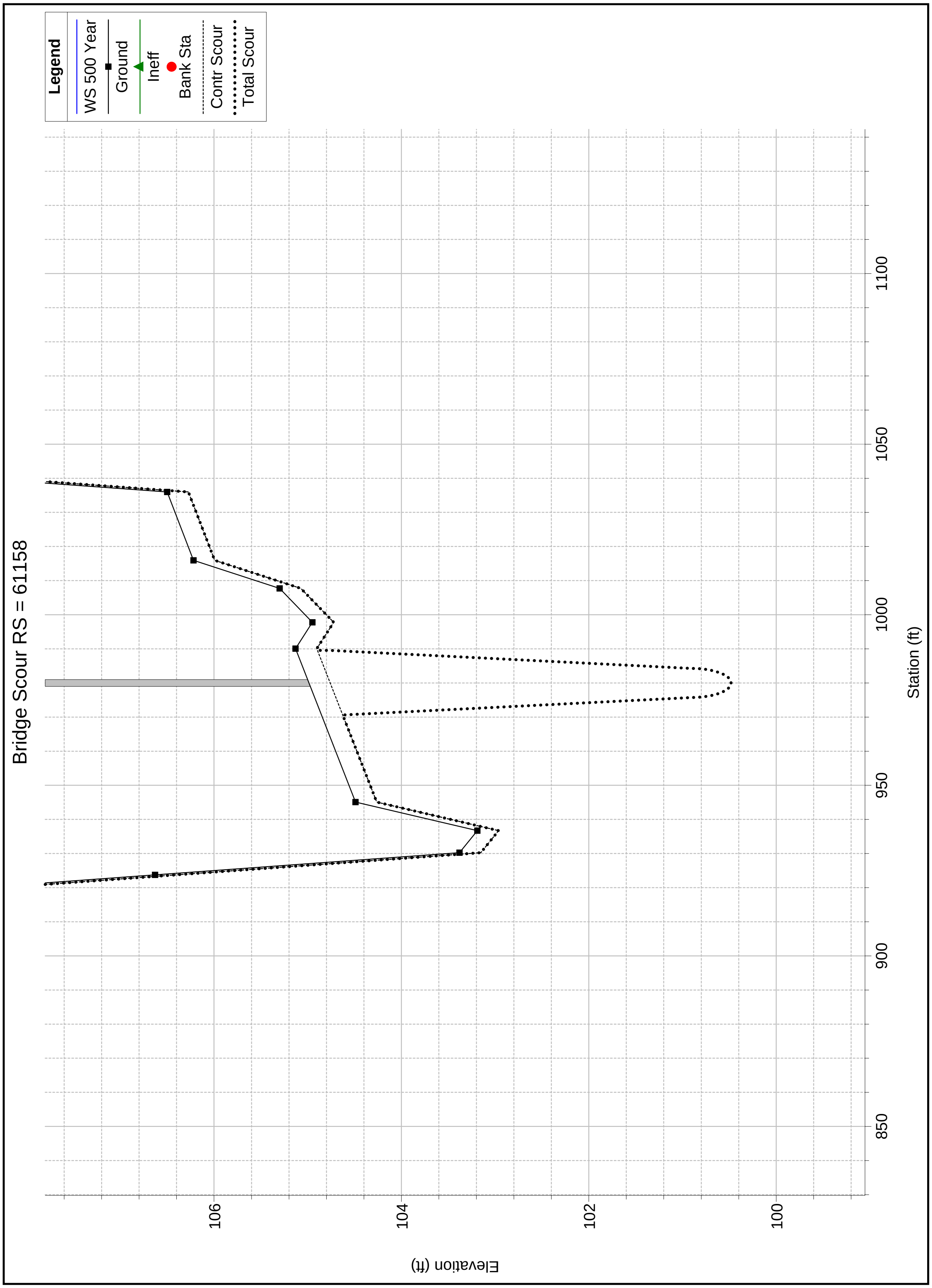
All piers have the same scour depth

Input Data		
	Pier Shape:	Square nose
	Pier Width (ft):	2.00
	Grain Size D50 (mm):	0.25000
	Depth Upstream (ft):	10.59
	Velocity Upstream (ft/s):	2.11
	Projected Width (ft):	2.00
	Pier shape Coeff:	1.30
Results		
	Scour Depth Ys (ft):	4.28
	Froude #:	0.11
	Equation:	Froehlich's equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel: 4.51


Bridge Scour RS = 61158
Legend
WS 500 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
Station (ft)
106
104
102
100
850
900
950
1000
1050
1100

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	1.59	8.34	2.29
	Approach Velocity (ft/s):	0.18	1.56	0.23
	Br Average Depth (ft):	4.42	8.16	4.83
	BR Opening Flow (cfs):	192.32	874.32	381.36
	BR Top WD (ft):	27.16	61.89	48.27
	Grain Size D50 (mm):	0.25	0.25	0.25
	Approach Flow (cfs):	94.08	877.57	476.35
	Approach Top WD (ft):	328.54	67.38	899.60
	K1 Coefficient:	0.640	0.640	0.640
Results				
	Scour Depth Ys (ft):	0.34	0.62	0.40
	Critical Velocity (ft/s):	1.13	1.49	1.20
	Equation:	Clear	Live	Clear

Pier Scour

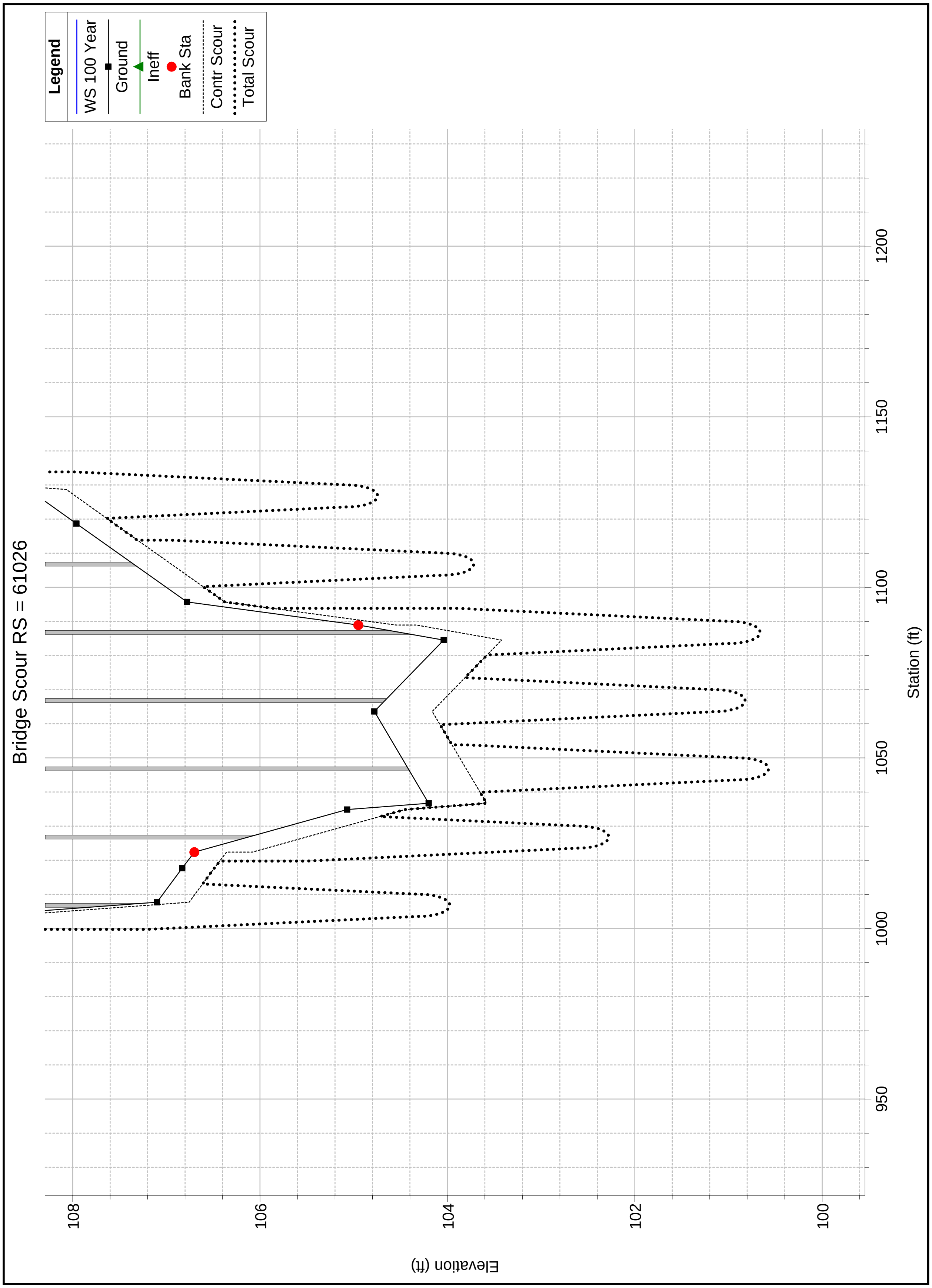
All piers have the same scour depth

Input Data		
	Pier Shape:	Square nose
	Pier Width (ft):	1.17
	Grain Size D50 (mm):	0.25000
	Depth Upstream (ft):	8.68
	Velocity Upstream (ft/s):	1.83
	Projected Width (ft):	2.00
	Pier shape Coeff:	1.30
Results		
	Scour Depth Ys (ft):	3.23
	Froude #:	0.11
	Equation:	Froehlich's equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Left Bank:	3.57
Channel:	3.84
Right Bank:	3.63


Bridge Scour RS = 61026
Legend
WS 100 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Station (ft)
Elevation (ft)
950
1000
1050
1100
1150
1200
108
106
104
102
100

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	2.09	9.27	3.05
	Approach Velocity (ft/s):	0.19	1.48	0.25
	Br Average Depth (ft):	5.02	9.07	5.55
	BR Opening Flow (cfs):	257.21	1047.52	503.27
	BR Top WD (ft):	28.98	61.89	50.09
	Grain Size D50 (mm):	0.25	0.25	0.25
	Approach Flow (cfs):	164.15	922.11	721.74
	Approach Top WD (ft):	410.08	67.38	961.87
	K1 Coefficient:	0.640	0.640	0.640
Results				
	Scour Depth Ys (ft):	0.76	0.99	0.88
	Critical Velocity (ft/s):	1.19	1.52	1.26
	Equation:	Clear	Clear	Clear

Pier Scour

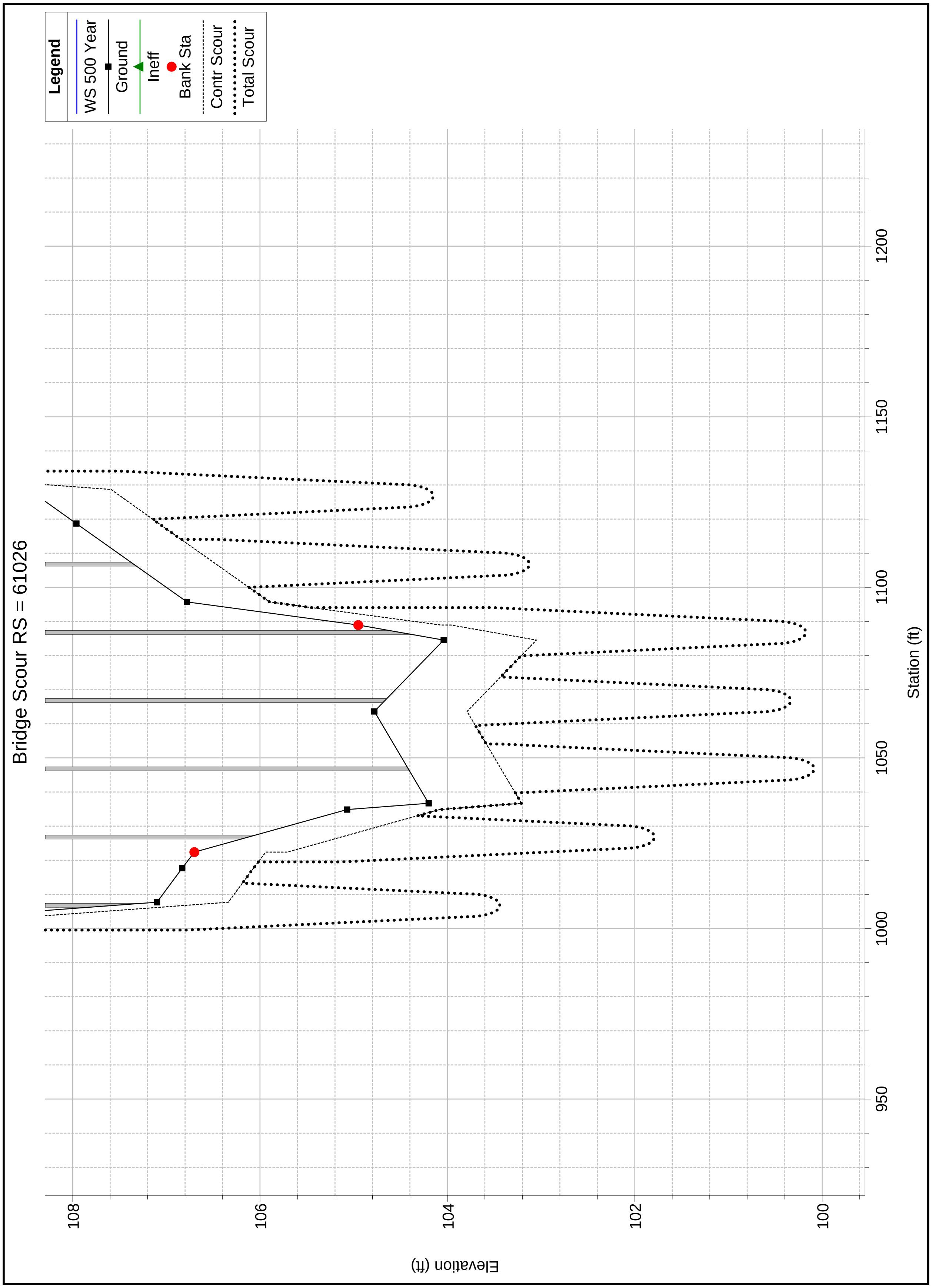
All piers have the same scour depth

Input Data		
	Pier Shape:	Square nose
	Pier Width (ft):	1.17
	Grain Size D50 (mm):	0.25000
	Depth Upstream (ft):	9.60
	Velocity Upstream (ft/s):	1.99
	Projected Width (ft):	2.00
	Pier shape Coeff:	1.30
Results		
	Scour Depth Ys (ft):	3.34
	Froude #:	0.11
	Equation:	Froehlich's equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Left Bank:	4.10
Channel:	4.33
Right Bank:	4.22


Bridge Scour RS = 61026
Legend
WS 500 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
108
106
104
102
100
Station (ft)
950
1000
1050
1100
1150
1200

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61397   Profile: 100 Year

E.G. Elev (ft)	112.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035	0.100
W.S. Elev (ft)	112.96	Reach Len. (ft)	174.52	154.66	112.86
Crit W.S. (ft)		Flow Area (sq ft)	520.86	561.96	2061.34
E.G. Slope (ft/ft)	0.000080	Area (sq ft)	520.86	561.96	2061.34
Q Total (cfs)	1448.00	Flow (cfs)	94.08	877.57	476.35
Top Width (ft)	1295.52	Top Width (ft)	328.54	67.38	899.60
Vel Total (ft/s)	0.46	Avg. Vel. (ft/s)	0.18	1.56	0.23
Max Chl Dpth (ft)	8.65	Hydr. Depth (ft)	1.59	8.34	2.29
Conv. Total (cfs)	161785.5	Conv. (cfs)	10511.7	98051.4	53222.5
Length Wtd. (ft)	148.85	Wetted Per. (ft)	329.08	67.45	899.96
Min Ch El (ft)	104.31	Shear (lb/sq ft)	0.01	0.04	0.01
Alpha	7.06	Stream Power (lb/ft s)	1750.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	3.81	11.23	8.44
C & E Loss (ft)	0.00	Cum SA (acres)	1.42	1.49	7.35

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61397   Profile: 500 Year

E.G. Elev (ft)	113.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.035	0.100
W.S. Elev (ft)	113.89	Reach Len. (ft)	174.52	154.66	112.86
Crit W.S. (ft)		Flow Area (sq ft)	857.46	624.58	2931.08
E.G. Slope (ft/ft)	0.000062	Area (sq ft)	857.46	624.58	2931.08
Q Total (cfs)	1808.00	Flow (cfs)	164.15	922.11	721.74
Top Width (ft)	1439.33	Top Width (ft)	410.08	67.38	961.87
Vel Total (ft/s)	0.41	Avg. Vel. (ft/s)	0.19	1.48	0.25
Max Chl Dpth (ft)	9.58	Hydr. Depth (ft)	2.09	9.27	3.05
Conv. Total (cfs)	229266.6	Conv. (cfs)	20815.5	116930.2	91521.0
Length Wtd. (ft)	147.41	Wetted Per. (ft)	410.62	67.45	962.23
Min Ch El (ft)	104.31	Shear (lb/sq ft)	0.01	0.04	0.01
Alpha	6.79	Stream Power (lb/ft s)	1750.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	5.67	12.61	18.54
C & E Loss (ft)	0.00	Cum SA (acres)	2.60	1.50	13.19

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61158   BR U   Profile: 100 Year

E.G. Elev (ft)	112.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.045	0.045	0.045
W.S. Elev (ft)	112.93	Reach Len. (ft)	145.30	145.30	145.30
Crit W.S. (ft)	106.81	Flow Area (sq ft)	4.26	948.65	4.26
E.G. Slope (ft/ft)	0.000188	Area (sq ft)	4.26	948.65	4.26
Q Total (cfs)	1448.00	Flow (cfs)	1.06	1445.88	1.06
Top Width (ft)	154.00	Top Width (ft)	10.00	134.00	10.00
Vel Total (ft/s)	1.51	Avg. Vel. (ft/s)	0.25	1.52	0.25
Max Chl Dpth (ft)	9.74	Hydr. Depth (ft)	0.43	7.08	0.43
Conv. Total (cfs)	105594.8	Conv. (cfs)	77.5	105439.9	77.5
Length Wtd. (ft)	145.30	Wetted Per. (ft)	10.43	153.62	10.43
Min Ch El (ft)	103.19	Shear (lb/sq ft)	0.00	0.07	0.00
Alpha	1.01	Stream Power (lb/ft s)	2484.83	0.00	0.00
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	1.87	8.53	4.10
C & E Loss (ft)	0.00	Cum SA (acres)	0.52	1.17	4.22

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61158 BR U Profile: 500 Year

E.G. Elev (ft)	113.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.045	0.045	0.045
W.S. Elev (ft)	113.84	Reach Len. (ft)	145.30	145.30	145.30
Crit W.S. (ft)	107.09	Flow Area (sq ft)	13.43	1071.48	13.43
E.G. Slope (ft/ft)	0.000196	Area (sq ft)	13.43	1071.48	13.43
Q Total (cfs)	1808.00	Flow (cfs)	6.95	1794.11	6.95
Top Width (ft)	154.00	Top Width (ft)	10.00	134.00	10.00
Vel Total (ft/s)	1.65	Avg. Vel. (ft/s)	0.52	1.67	0.52
Max Chl Dpth (ft)	10.65	Hydr. Depth (ft)	1.34	8.00	1.34
Conv. Total (cfs)	129136.9	Conv. (cfs)	496.1	128144.7	496.1
Length Wtd. (ft)	145.30	Wetted Per. (ft)	11.34	155.45	11.34
Min Ch El (ft)	103.19	Shear (lb/sq ft)	0.01	0.08	0.01
Alpha	1.03	Stream Power (lb/ft s)	2484.83	0.00	0.00
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	2.46	9.61	11.17
C & E Loss (ft)	0.00	Cum SA (acres)	0.77	1.17	9.72

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61026 BR U Profile: 100 Year

E.G. Elev (ft)	112.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.045	0.045	0.045
W.S. Elev (ft)	112.87	Reach Len. (ft)	35.10	35.10	35.10
Crit W.S. (ft)	107.41	Flow Area (sq ft)	119.96	504.95	233.21
E.G. Slope (ft/ft)	0.000431	Area (sq ft)	119.96	504.95	233.21
Q Total (cfs)	1448.00	Flow (cfs)	192.32	874.32	381.36
Top Width (ft)	137.33	Top Width (ft)	27.16	61.89	48.27
Vel Total (ft/s)	1.69	Avg. Vel. (ft/s)	1.60	1.73	1.64
Max Chl Dpth (ft)	8.83	Hydr. Depth (ft)	4.42	8.16	4.83
Conv. Total (cfs)	69731.0	Conv. (cfs)	9261.6	42104.4	18365.0
Length Wtd. (ft)	35.10	Wetted Per. (ft)	39.05	125.83	69.65
Min Ch El (ft)	104.04	Shear (lb/sq ft)	0.08	0.11	0.09
Alpha	1.00	Stream Power (lb/ft s)	2074.50	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	1.86	4.86	4.08
C & E Loss (ft)		Cum SA (acres)	0.48	0.62	4.18

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61026 BR U Profile: 500 Year

E.G. Elev (ft)	113.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.045	0.045	0.045
W.S. Elev (ft)	113.78	Reach Len. (ft)	35.10	35.10	35.10
Crit W.S. (ft)	107.77	Flow Area (sq ft)	145.51	561.27	277.97
E.G. Slope (ft/ft)	0.000469	Area (sq ft)	145.51	561.27	277.97
Q Total (cfs)	1808.00	Flow (cfs)	257.21	1047.52	503.27
Top Width (ft)	140.97	Top Width (ft)	28.98	61.89	50.09
Vel Total (ft/s)	1.84	Avg. Vel. (ft/s)	1.77	1.87	1.81
Max Chl Dpth (ft)	9.74	Hydr. Depth (ft)	5.02	9.07	5.55
Conv. Total (cfs)	83488.3	Conv. (cfs)	11877.2	48371.5	23239.6
Length Wtd. (ft)	35.10	Wetted Per. (ft)	42.90	133.12	75.32
Min Ch El (ft)	104.04	Shear (lb/sq ft)	0.10	0.12	0.11
Alpha	1.00	Stream Power (lb/ft s)	2074.50	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	2.41	5.44	11.11
C & E Loss (ft)		Cum SA (acres)	0.73	0.62	9.68

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61242 Profile: 100 Year

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
1	LOB	502.24	669.66	0.00	1.05	24.24	0.00	0.04	0.00	0.00	0.00
2	LOB	669.66	837.07							0.00	0.00
3	LOB	837.07	923.74	166.50	389.15	80.53	11.50	4.86	0.43	0.03	0.01
4	Chan	923.74	926.14	36.63	20.79	2.48	2.53	8.67	1.76	0.05	0.09
5	Chan	926.14	928.54	41.19	22.26	2.46	2.84	9.28	1.85	0.06	0.11
6	Chan	928.54	930.94	43.86	22.87	2.40	3.03	9.53	1.92	0.06	0.12
7	Chan	930.94	933.34	44.40	23.04	2.40	3.07	9.60	1.93	0.06	0.12
8	Chan	933.34	935.74	44.94	23.21	2.40	3.10	9.67	1.94	0.06	0.12
9	Chan	935.74	938.13	44.66	23.19	2.42	3.08	9.66	1.93	0.06	0.12
10	Chan	938.13	940.53	41.97	22.38	2.43	2.90	9.33	1.88	0.06	0.11
11	Chan	940.53	942.93	39.22	21.49	2.43	2.71	8.96	1.83	0.06	0.10
12	Chan	942.93	945.33	36.58	20.60	2.42	2.53	8.59	1.78	0.05	0.10
13	Chan	945.33	947.73	35.64	20.19	2.40	2.46	8.42	1.76	0.05	0.09
14	Chan	947.73	950.13	35.39	20.11	2.40	2.44	8.38	1.76	0.05	0.09
15	Chan	950.13	952.53	35.15	20.03	2.40	2.43	8.35	1.76	0.05	0.09
16	Chan	952.53	954.93	34.91	19.95	2.40	2.41	8.31	1.75	0.05	0.09
17	Chan	954.93	957.33	34.68	19.86	2.40	2.39	8.28	1.75	0.05	0.09
18	Chan	957.33	959.73	34.44	19.78	2.40	2.38	8.25	1.74	0.05	0.09
19	Chan	959.73	962.13	34.20	19.70	2.40	2.36	8.21	1.74	0.05	0.09
20	Chan	962.13	964.53	33.96	19.62	2.40	2.35	8.18	1.73	0.05	0.09
21	Chan	964.53	966.92	33.73	19.54	2.40	2.33	8.14	1.73	0.05	0.09
22	Chan	966.92	969.32	33.49	19.45	2.40	2.31	8.11	1.72	0.05	0.09
23	Chan	969.32	971.72	33.26	19.37	2.40	2.30	8.07	1.72	0.05	0.09
24	Chan	971.72	974.12	33.02	19.29	2.40	2.28	8.04	1.71	0.05	0.09
25	Chan	974.12	976.52	32.79	19.21	2.40	2.26	8.01	1.71	0.05	0.09
26	Chan	976.52	978.92	32.56	19.13	2.40	2.25	7.97	1.70	0.05	0.09
27	Chan	978.92	981.32	32.33	19.04	2.40	2.23	7.94	1.70	0.05	0.09
28	Chan	981.32	983.72	32.09	18.96	2.40	2.22	7.90	1.69	0.05	0.08
29	Chan	983.72	986.12	31.86	18.88	2.40	2.20	7.87	1.69	0.05	0.08
30	Chan	986.12	988.52	31.63	18.80	2.40	2.18	7.84	1.68	0.05	0.08
31	Chan	988.52	990.92	31.44	18.73	2.40	2.17	7.81	1.68	0.05	0.08
32	Chan	990.92	993.32	31.69	18.82	2.40	2.19	7.84	1.68	0.05	0.08
33	Chan	993.32	995.71	32.07	18.95	2.40	2.21	7.90	1.69	0.05	0.08
34	Chan	995.71	998.11	32.44	19.09	2.40	2.24	7.96	1.70	0.05	0.09
35	Chan	998.11	1000.51	32.21	19.01	2.40	2.22	7.92	1.69	0.05	0.09
36	Chan	1000.51	1002.91	31.64	18.80	2.40	2.19	7.84	1.68	0.05	0.08

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61242   Profile: 100 Year (Continued)

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
37	Chan	1002.91	1005.31	31.07	18.60	2.40	2.15	7.75	1.67	0.05	0.08
38	Chan	1005.31	1007.71	30.51	18.40	2.40	2.11	7.67	1.66	0.05	0.08
39	ROB	1007.71	1085.83	49.85	187.19	78.87	3.44	2.40	0.27	0.02	0.00
40	ROB	1085.83	1365.63	0.00	72.35	271.27	0.00	0.27	0.00	0.00	0.00
41	ROB	1365.63	1645.43	0.00	202.62	279.80	0.00	0.72	0.00	0.00	0.00
42	ROB	1645.43	1925.23	0.00	306.04	279.81	0.00	1.09	0.00	0.01	0.00

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61242   Profile: 500 Year

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
1	LOB	334.83	502.24	0.00	1.57	24.29	0.00	0.06	0.00	0.00	0.00
2	LOB	502.24	669.66	0.00	102.89	167.42	0.00	0.61	0.00	0.00	0.00
3	LOB	669.66	837.07	0.00	82.62	161.86	0.00	0.51	0.00	0.00	0.00
4	LOB	837.07	923.74	218.73	465.36	86.78	12.10	5.40	0.47	0.04	0.02
5	Chan	923.74	926.14	44.41	22.99	2.48	2.46	9.58	1.93	0.06	0.12
6	Chan	926.14	928.54	49.41	24.46	2.46	2.73	10.20	2.02	0.07	0.13
7	Chan	928.54	930.94	52.41	25.07	2.40	2.90	10.45	2.09	0.07	0.15
8	Chan	930.94	933.34	52.99	25.24	2.40	2.93	10.52	2.10	0.07	0.15
9	Chan	933.34	935.74	53.58	25.41	2.40	2.96	10.59	2.11	0.07	0.15
10	Chan	935.74	938.13	53.26	25.39	2.42	2.95	10.58	2.10	0.07	0.15
11	Chan	938.13	940.53	50.31	24.58	2.43	2.78	10.24	2.05	0.07	0.14
12	Chan	940.53	942.93	47.30	23.69	2.43	2.62	9.87	2.00	0.06	0.13
13	Chan	942.93	945.33	44.42	22.80	2.42	2.46	9.50	1.95	0.06	0.12
14	Chan	945.33	947.73	43.41	22.39	2.40	2.40	9.33	1.94	0.06	0.12
15	Chan	947.73	950.13	43.15	22.31	2.40	2.39	9.30	1.93	0.06	0.12
16	Chan	950.13	952.53	42.88	22.23	2.40	2.37	9.26	1.93	0.06	0.12
17	Chan	952.53	954.93	42.62	22.14	2.40	2.36	9.23	1.92	0.06	0.12
18	Chan	954.93	957.33	42.36	22.06	2.40	2.34	9.20	1.92	0.06	0.12
19	Chan	957.33	959.73	42.10	21.98	2.40	2.33	9.16	1.92	0.06	0.12
20	Chan	959.73	962.13	41.83	21.90	2.40	2.31	9.13	1.91	0.06	0.12
21	Chan	962.13	964.53	41.57	21.82	2.40	2.30	9.09	1.91	0.06	0.12
22	Chan	964.53	966.92	41.31	21.74	2.40	2.29	9.06	1.90	0.06	0.11
23	Chan	966.92	969.32	41.06	21.65	2.40	2.27	9.03	1.90	0.06	0.11
24	Chan	969.32	971.72	40.80	21.57	2.40	2.26	8.99	1.89	0.06	0.11
25	Chan	971.72	974.12	40.54	21.49	2.40	2.24	8.96	1.89	0.06	0.11
26	Chan	974.12	976.52	40.28	21.41	2.40	2.23	8.92	1.88	0.06	0.11

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61242   Profile: 500 Year (Continued)

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
27	Chan	976.52	978.92	40.02	21.33	2.40	2.21	8.89	1.88	0.06	0.11
28	Chan	978.92	981.32	39.77	21.24	2.40	2.20	8.85	1.87	0.06	0.11
29	Chan	981.32	983.72	39.51	21.16	2.40	2.19	8.82	1.87	0.06	0.11
30	Chan	983.72	986.12	39.26	21.08	2.40	2.17	8.79	1.86	0.06	0.11
31	Chan	986.12	988.52	39.01	21.00	2.40	2.16	8.75	1.86	0.06	0.11
32	Chan	988.52	990.92	38.79	20.93	2.40	2.15	8.72	1.85	0.06	0.11
33	Chan	990.92	993.32	39.07	21.02	2.40	2.16	8.76	1.86	0.06	0.11
34	Chan	993.32	995.71	39.48	21.15	2.40	2.18	8.82	1.87	0.06	0.11
35	Chan	995.71	998.11	39.89	21.29	2.40	2.21	8.87	1.87	0.06	0.11
36	Chan	998.11	1000.51	39.64	21.21	2.40	2.19	8.84	1.87	0.06	0.11
37	Chan	1000.51	1002.91	39.01	21.00	2.40	2.16	8.75	1.86	0.06	0.11
38	Chan	1002.91	1005.31	38.38	20.80	2.40	2.12	8.67	1.85	0.06	0.11
39	Chan	1005.31	1007.71	37.76	20.60	2.40	2.09	8.59	1.83	0.06	0.10
40	ROB	1007.71	1085.83	87.67	258.80	78.87	4.85	3.31	0.34	0.02	0.01
41	ROB	1085.83	1365.63	0.00	328.79	279.80	0.00	1.18	0.00	0.01	0.00
42	ROB	1365.63	1645.43	0.00	459.11	279.80	0.00	1.64	0.00	0.01	0.00
43	ROB	1645.43	1925.23	0.00	562.53	279.81	0.00	2.01	0.00	0.01	0.00

Plan: Proposed - Alt 2   PeaceCreekCanal   Main3 RS: 61045   Profile: 100 Year

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
1	Chan	990.32	995.44	0.11	0.55	1.73	0.01	0.35	0.20	0.00	0.00
2	Chan	995.44	1000.57	5.38	8.96	5.48	0.37	1.75	0.60	0.02	0.01
3	Chan	1000.57	1005.70	15.43	17.06	5.65	1.07	3.33	0.90	0.04	0.04
4	Chan	1005.70	1010.83	39.45	30.01	5.67	2.72	5.85	1.31	0.07	0.09
5	Chan	1010.83	1015.96	56.82	35.90	5.13	3.92	7.00	1.58	0.09	0.15
6	Chan	1015.96	1021.09	59.48	36.89	5.13	4.11	7.19	1.61	0.10	0.16
7	Chan	1021.09	1026.22	62.18	37.89	5.13	4.29	7.39	1.64	0.10	0.16
8	Chan	1026.22	1031.34	64.92	38.89	5.13	4.48	7.58	1.67	0.10	0.17
9	Chan	1031.34	1036.47	67.86	40.45	5.30	4.69	7.89	1.68	0.10	0.17
10	Chan	1036.47	1041.60	80.32	44.26	5.15	5.55	8.63	1.81	0.12	0.21
11	Chan	1041.60	1046.73	78.90	43.70	5.13	5.45	8.52	1.81	0.11	0.21
12	Chan	1046.73	1051.86	77.20	43.14	5.13	5.33	8.41	1.79	0.11	0.20
13	Chan	1051.86	1056.99	75.52	42.57	5.13	5.22	8.30	1.77	0.11	0.20
14	Chan	1056.99	1062.12	73.85	42.00	5.13	5.10	8.19	1.76	0.11	0.19
15	Chan	1062.12	1067.24	73.27	41.81	5.13	5.06	8.15	1.75	0.11	0.19

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61045 Profile: 100 Year (Continued)

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
16	Chan	1067.24	1072.37	75.81	42.67	5.13	5.24	8.32	1.78	0.11	0.20
17	Chan	1072.37	1077.50	78.58	43.60	5.13	5.43	8.50	1.80	0.11	0.21
18	Chan	1077.50	1082.63	81.40	44.53	5.13	5.62	8.68	1.83	0.12	0.21
19	Chan	1082.63	1087.76	79.74	44.21	5.20	5.51	8.62	1.80	0.11	0.21
20	Chan	1087.76	1092.89	63.17	38.73	5.29	4.36	7.55	1.63	0.10	0.16
21	Chan	1092.89	1098.02	47.21	32.36	5.23	3.26	6.31	1.46	0.08	0.12
22	Chan	1098.02	1103.14	44.60	31.03	5.13	3.08	6.05	1.44	0.08	0.12
23	Chan	1103.14	1108.27	43.93	30.75	5.13	3.03	6.00	1.43	0.08	0.11
24	Chan	1108.27	1113.40	43.27	30.47	5.13	2.99	5.94	1.42	0.08	0.11
25	Chan	1113.40	1118.53	39.06	29.19	5.37	2.70	5.69	1.34	0.07	0.10
26	Chan	1118.53	1123.66	17.30	18.39	5.73	1.19	3.58	0.94	0.04	0.04
27	Chan	1123.66	1128.79	2.46	5.65	5.58	0.17	1.10	0.44	0.01	0.01
28	Chan	1128.79	1133.92	0.45	1.96	5.13	0.03	0.38	0.23	0.01	0.00
29	Chan	1133.92	1139.04	0.32	1.55	4.61	0.02	0.34	0.21	0.00	0.00

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61045 Profile: 500 Year

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
1	Chan	990.32	995.44	1.06	2.96	4.01	0.06	0.80	0.36	0.01	0.00
2	Chan	995.44	1000.57	11.07	13.66	5.48	0.61	2.66	0.81	0.03	0.03
3	Chan	1000.57	1005.70	23.58	21.75	5.65	1.30	4.24	1.08	0.05	0.06
4	Chan	1005.70	1010.83	51.22	34.71	5.67	2.83	6.77	1.48	0.08	0.12
5	Chan	1010.83	1015.96	71.07	40.59	5.13	3.93	7.91	1.75	0.11	0.19
6	Chan	1015.96	1021.09	74.00	41.59	5.13	4.09	8.11	1.78	0.11	0.20
7	Chan	1021.09	1026.22	76.98	42.58	5.13	4.26	8.30	1.81	0.11	0.21
8	Chan	1026.22	1031.34	80.01	43.58	5.13	4.43	8.50	1.84	0.12	0.21
9	Chan	1031.34	1036.47	83.05	45.14	5.30	4.59	8.80	1.84	0.12	0.21
10	Chan	1036.47	1041.60	96.83	48.95	5.15	5.36	9.54	1.98	0.13	0.26
11	Chan	1041.60	1046.73	95.31	48.40	5.13	5.27	9.44	1.97	0.13	0.25
12	Chan	1046.73	1051.86	93.46	47.83	5.13	5.17	9.33	1.95	0.13	0.25
13	Chan	1051.86	1056.99	91.62	47.26	5.13	5.07	9.22	1.94	0.13	0.24
14	Chan	1056.99	1062.12	89.80	46.70	5.13	4.97	9.11	1.92	0.12	0.24
15	Chan	1062.12	1067.24	89.16	46.50	5.13	4.93	9.07	1.92	0.12	0.24
16	Chan	1067.24	1072.37	91.94	47.37	5.13	5.09	9.24	1.94	0.13	0.25
17	Chan	1072.37	1077.50	94.96	48.30	5.13	5.25	9.42	1.97	0.13	0.25
18	Chan	1077.50	1082.63	98.03	49.23	5.13	5.42	9.60	1.99	0.13	0.26

Plan: Proposed - Alt 2 PeaceCreekCanal Main3 RS: 61045 Profile: 500 Year (Continued)

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	Power
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft s)
19	Chan	1082.63	1087.76	96.15	48.91	5.20	5.32	9.54	1.97	0.13	0.25
20	Chan	1087.76	1092.89	77.90	43.42	5.29	4.31	8.47	1.79	0.11	0.20
21	Chan	1092.89	1098.02	60.30	37.06	5.23	3.33	7.23	1.63	0.10	0.16
22	Chan	1098.02	1103.14	57.48	35.73	5.13	3.18	6.97	1.61	0.10	0.15
23	Chan	1103.14	1108.27	56.73	35.45	5.13	3.14	6.91	1.60	0.09	0.15
24	Chan	1108.27	1113.40	55.99	35.17	5.13	3.10	6.86	1.59	0.09	0.15
25	Chan	1113.40	1118.53	51.04	33.88	5.37	2.82	6.61	1.51	0.09	0.13
26	Chan	1118.53	1123.66	25.76	23.08	5.73	1.42	4.50	1.12	0.06	0.06
27	Chan	1123.66	1128.79	6.88	10.34	5.58	0.38	2.02	0.67	0.03	0.02
28	Chan	1128.79	1133.92	3.49	6.65	5.13	0.19	1.30	0.52	0.02	0.01
29	Chan	1133.92	1139.04	3.03	6.17	5.25	0.17	1.20	0.49	0.02	0.01
30	Chan	1139.04	1144.17	0.12	0.57	1.81	0.01	0.34	0.20	0.00	0.00

APPENDIX G

Deck Drainage

SR 60
FDOT DISTRICT 1

SPREAD CALCULATIONS

Designer: BAF
Date: 2/10/2016
Checker: TKS
Date: 5/13/16

T = Width of Gutter Flow = ((Qt*n)/(0.56*Sx^(5/3)*S^0.5))^0.375
where: n = 0.016 and T in feet

Q = CIA
Where C = 0.95 (pavement) or C=0.2 (grass), I =4 in/hr, A in acres and Q in cfs
Qt = Q + Qp cfs (Total Flow = Actual Flow + Previous Bypass Flow)
Qb = Qt - Qint (Flow Bypass = Total Flow - Intercepted Flow)

Structure	Inlet Type	Station	Side	Location	Total Area (acres)	Imperv. Area (acres)	Perv. Area (acres)	Composite C	Overland Runoff Q (cfs)	Previous By-Pass Qp (cfs)	Total Flow Qt (cfs)	Cross Slope Sx (ft/ft)	Long Slope S %	Spread T (ft)	Allowable Spread (ft)	Intercepted Flow Qint (cfs)	Bypass Flow Qb (cfs)	Bypass to Inlet No.
S-XXX	BW	2386+00.00	LT	SR 60	0.47	0.47	0.00	0.95	1.79	0.00	1.79	0.02	3.00	7.33	10.00	1.79	0.00	TERMINAL
S-XXX	BW	2386+00.00	RT	SR 60	0.47	0.47	0.00	0.95	1.79	0.00	1.79	0.02	3.00	7.33	10.00	1.79	0.00	TERMINAL

SR 60
FDOT DISTRICT 1

BHR SCUPPER SPREAD CALCULATIONS

Frontage Road Bridge

Designer: BAF
Date: 5/18/2016
Checker: TKS
Date: 5/18/2016

Spread per Scupper (BR #160133)		
Bridge Length (8 spans @ 20')	160	ft
Scupper Spacing	10	ft
Number of Scuppers	16	
Proposed Bridge Width	35.08	ft
Drainage Area per Scupper	0.0081	ac
Deck Cross Slope	1.6	%
Rainfall Intensity	4	in/hr
Rational Coefficient	0.95	
Discharge ($\mathbf{Q_o}$)	0.0306	cfs
Orifice discharge coefficient ($\mathbf{C_o}$)	0.6	
Scupper Diameter	4	in
Scupper Cross Section Area ($\mathbf{A_o}$)	0.0873	ft^2
Head from Orifice Equation ($\mathbf{H_o}$)	0.0053	ft
Calculated Spread	0.33	ft
Allowable Spread (Shoulder)	10.00	ft

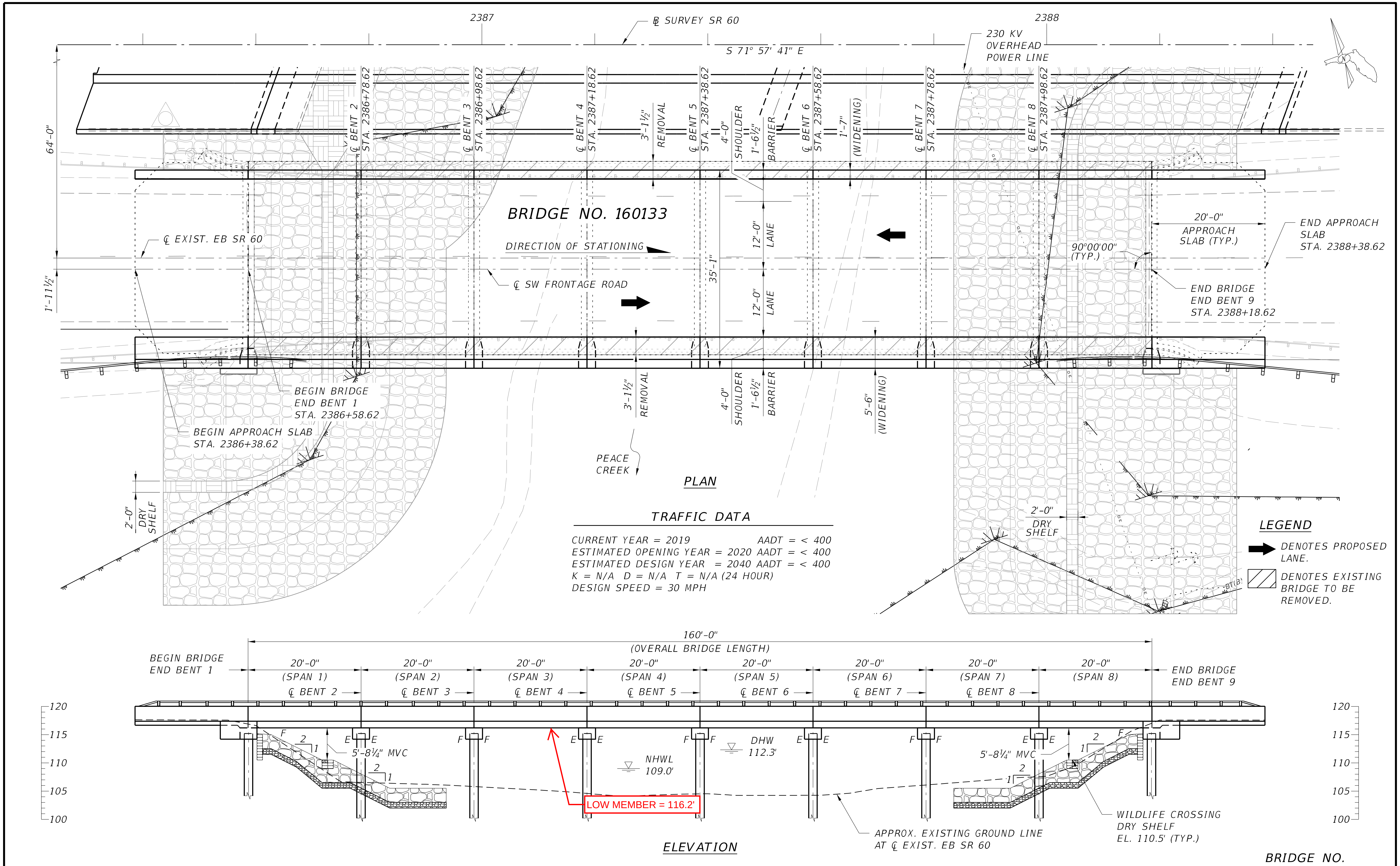
Orifice discharge: $Q_o = C_o A_o \sqrt{2gH_o}$

Solve for head: $H_o = \dfrac{\left[\dfrac{Q_o}{C_o A_o}\right]^2}{2g}$

The profile grade of the frontage road is 0.0%; therefore, spread was evaluated with the orifice equation and solving for head above the scupper. The scuppers are 4 inch diameter and spaced every 10 ft except at the begin and end of the bridge.

APPENDIX H

Proposed Bridge Plans



REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Kisinger Campo & Associates Corp.
201 N. Franklin Street
Suite 400
Tampa, FL 33602
Florida C.O.A. No. 02317
Carlos E. Layrisse, PE No. 72383

DRAWN BY: JBH 01-16
CHECKED BY: TAC 05-16
DESIGNED BY: TAC 01-16
CHECKED BY: SKB 01-16

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

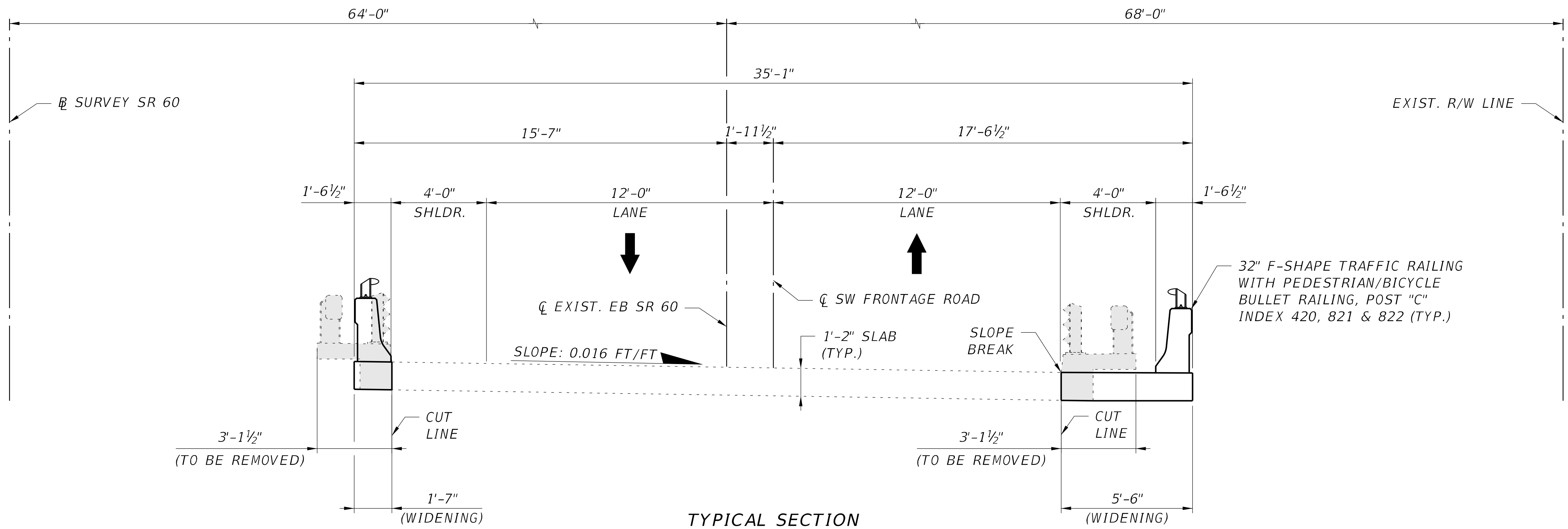
SHEET TITLE: PLAN AND ELEVATION (1 OF 2) ALTERNATIVE 2

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD FRONTAGE RD OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-1

SHEET NO. B1-1

tcaldwell 5/31/2016 3:03:59 PM M:\43655915201\struct\B1\B1PlanElev01.dgn



TYPICAL SECTION

(ALTERNATIVE 2)

NOTE:

ALTERNATIVE 1 NOT SHOWN, LEAVE EXISTING BRIDGE AS-IS.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Kisinger Campo & Associates Corp.
201 N. Franklin Street
Suite 400
Tampa, FL 33602
Florida C.O.A. No. 02317
Carlos E. Layrisse, PE No. 72383

DRAWN BY:	TAC 04-16
CHECKED BY:	CEL 05-16
DESIGNED BY:	TAC 04-16
CHECKED BY:	CEL 04-16

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

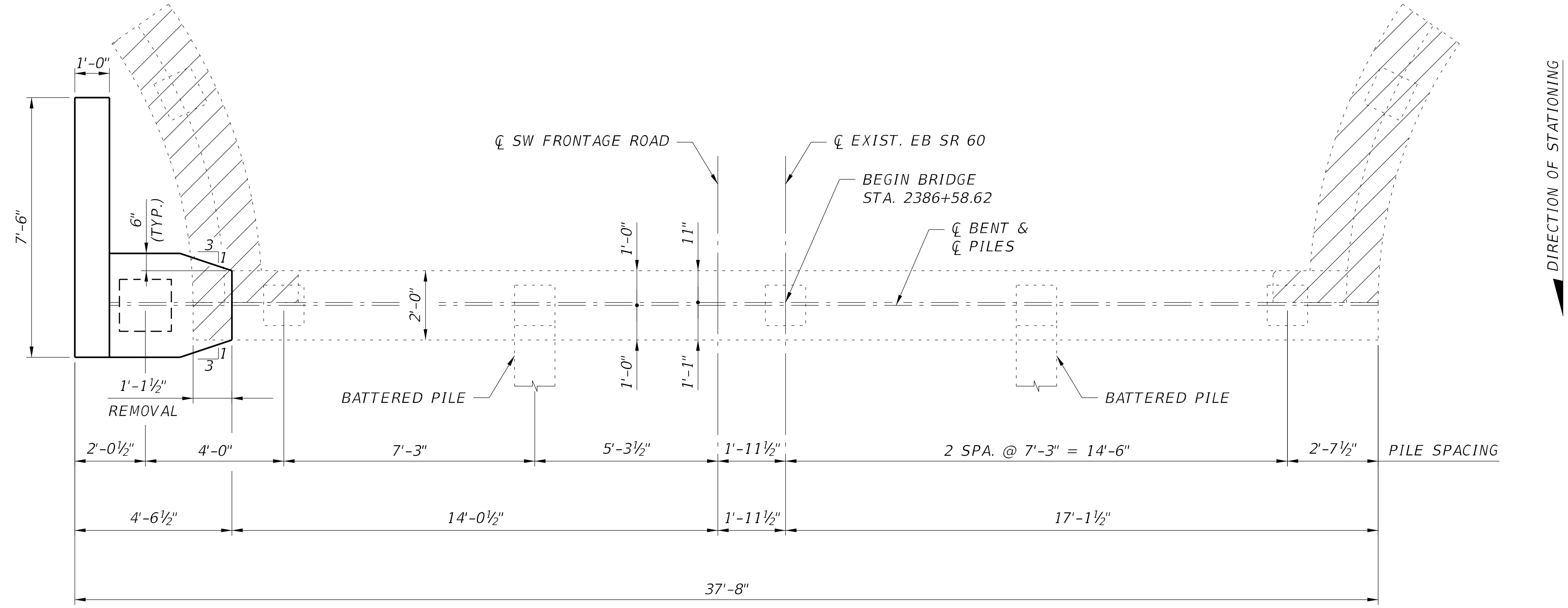
SHEET TITLE: TYPICAL SECTION

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD FRONTAGE RD OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-2

SHEET NO. B1-3

NOTICE: THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

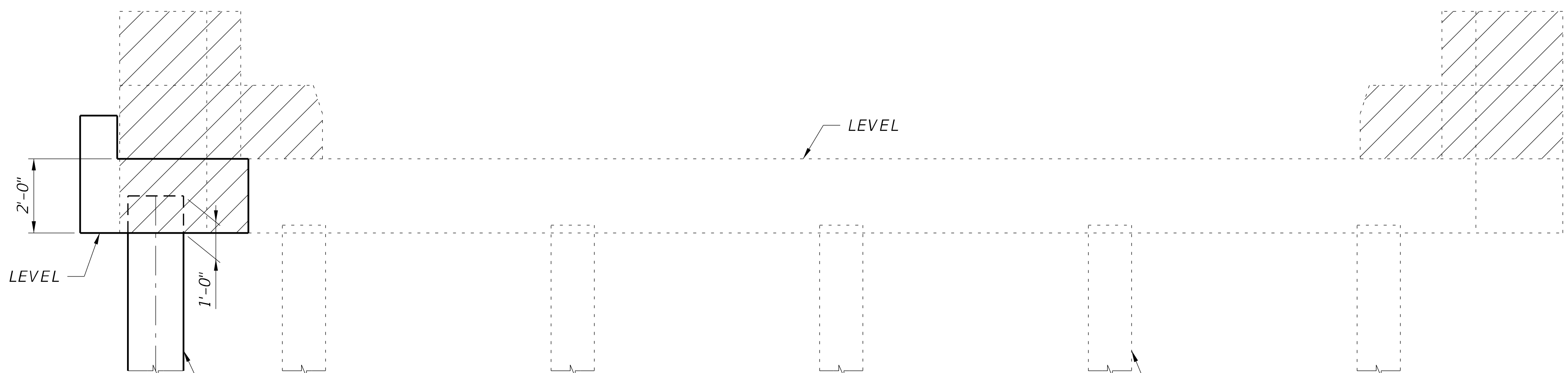


PLAN

(END BENT 1 SHOWN,
END BENT 9 SIMILAR)

LEGEND

EXISTING TO BE REMOVED



ELEVATION

(END BENT 1 SHOWN,
END BENT 9 SIMILAR)

NOTE:

PILE OPTION A SHOWN, PILE OPTION B (HP 14X89 STEEL PILE) SIMILAR.

BRIDGE NO.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Kisinger Campo & Associates Corp.
201 N. Franklin Street
Suite 400
Tampa, FL 33602
Florida C.O.A. No. 02317
Carlos E. Layrisse, PE No. 72383

DRAWN BY: TAC 01-16
CHECKED BY: CEL 05-16
DESIGNED BY: TAC 01-16
CHECKED BY: SKB 01-16

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE:
END BENT (1 OF 2)
ALTERNATIVE 2

PROJECT NAME:
SR 60 GRADE SEPARATION OVER CSX RAILROAD
FRONTAGE RD OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-3

SHEET NO. B1-5

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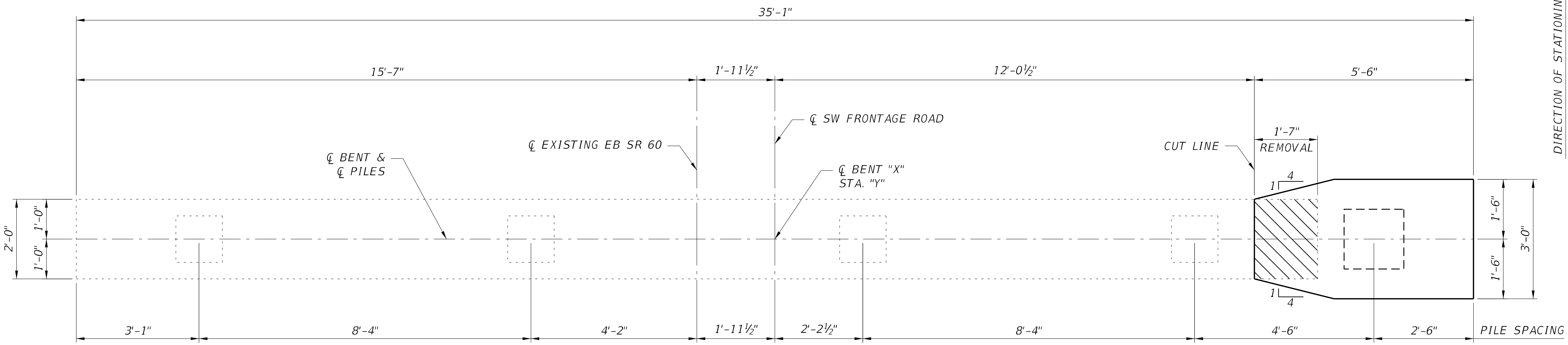
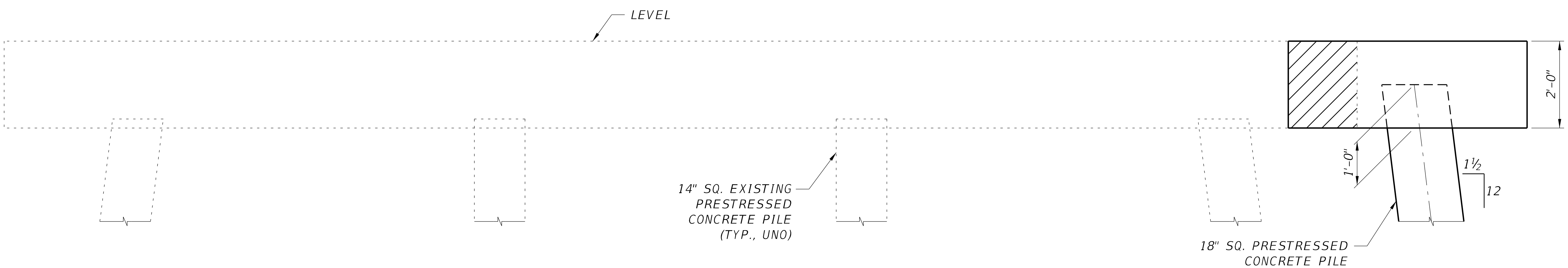


PLAN

"X"	"Y"
2	2386+78.62
3	2386+98.62
4	2387+18.62
5	2387+38.62
6	2387+58.62
7	2387+78.62
8	2387+98.62

LEGEND

EXISTING TO BE REMOVED



ELEVATION

NOTE:
PILE OPTION A SHOWN, PILE OPTION B (HP 14X89 STEEL PILE) SIMILAR.

BRIDGE NO.

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REVISIONS

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Florida C.O.A. No. 02317
Carlos E. Layrisse, PE No. 72383

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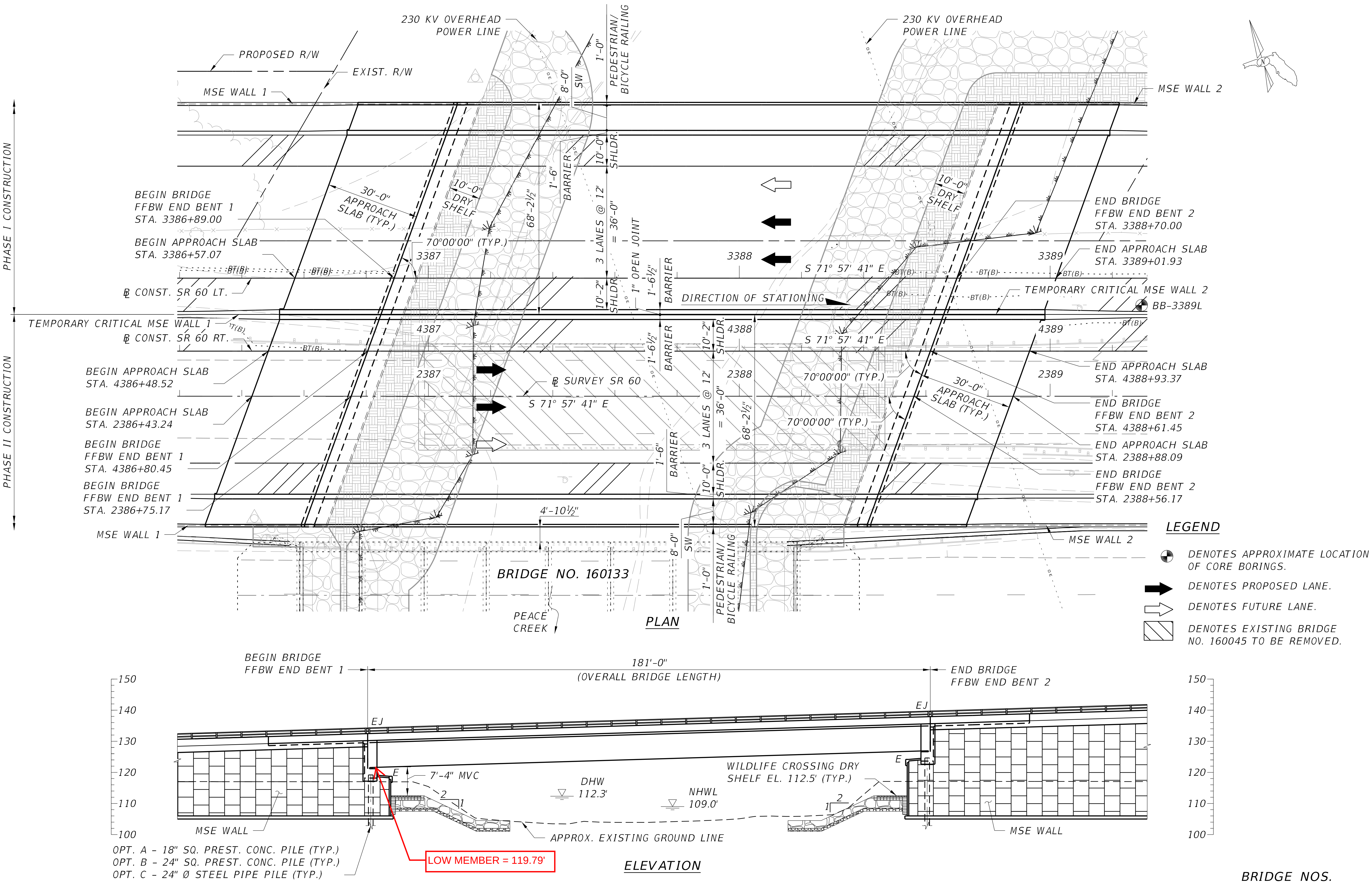
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE:
INTERMEDIATE BENT (1 OF 2)
ALTERNATIVE 2

PROJECT NAME:
SR 60 GRADE SEPARATION OVER CSX RAILROAD
FRONTAGE RD OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-4
SHEET NO. B1-7



BRIDGE NOS.

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DESIGNED BY: TAC 11-15
CHECKED BY: SKB 12-15

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

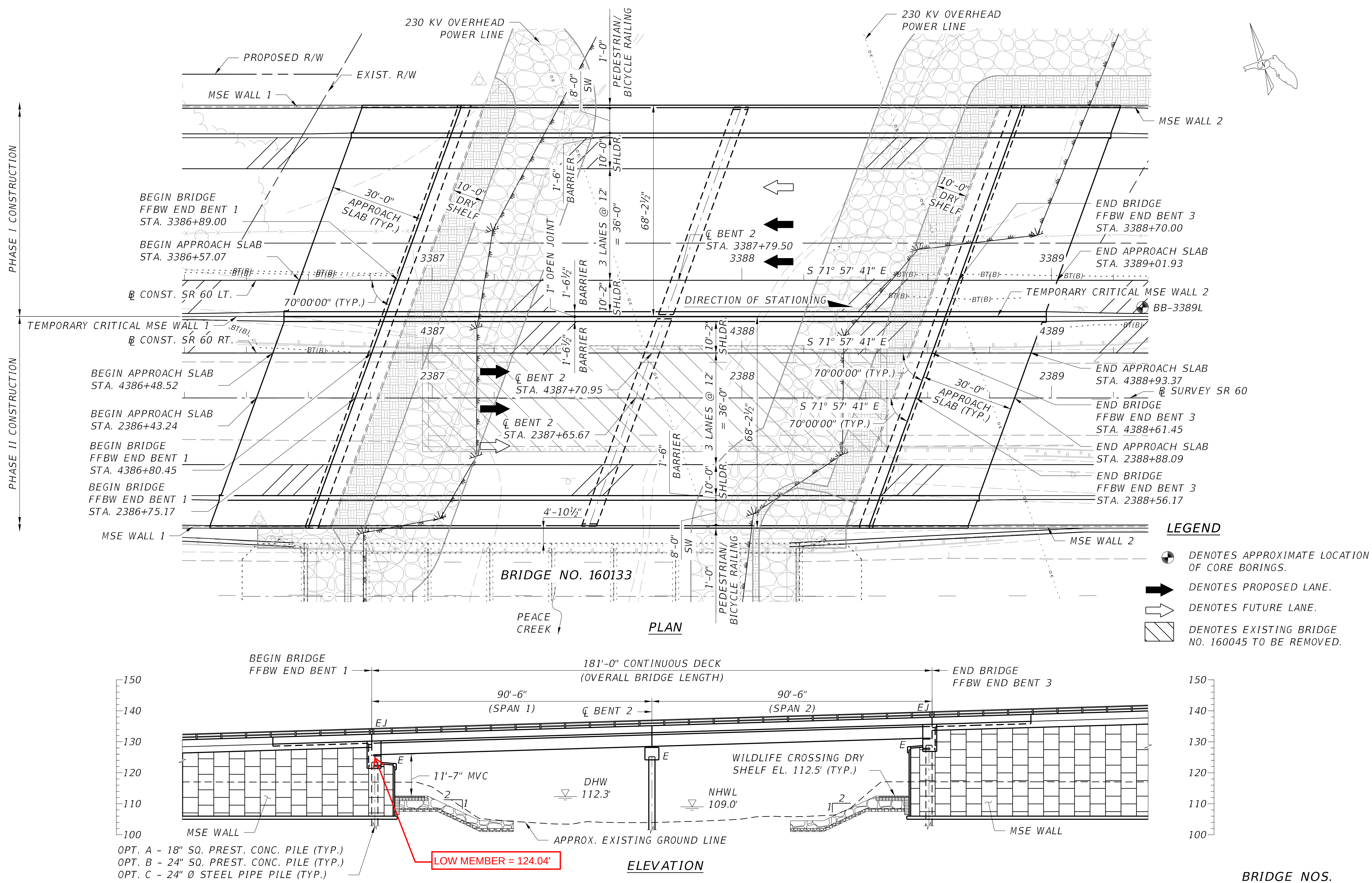
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE:
PLAN AND ELEVATION (1 OF 4)
ALTERNATIVE 1

PROJECT NAME:
SR 60 GRADE SEPARATION OVER CSX RAILROAD
MAINLINE OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-5

SHEET NO. B2-1



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DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE: PLAN AND ELEVATION (2 OF 4) ALTERNATIVE 2

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD MAINLINE OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-6

SHEET NO. B2-2

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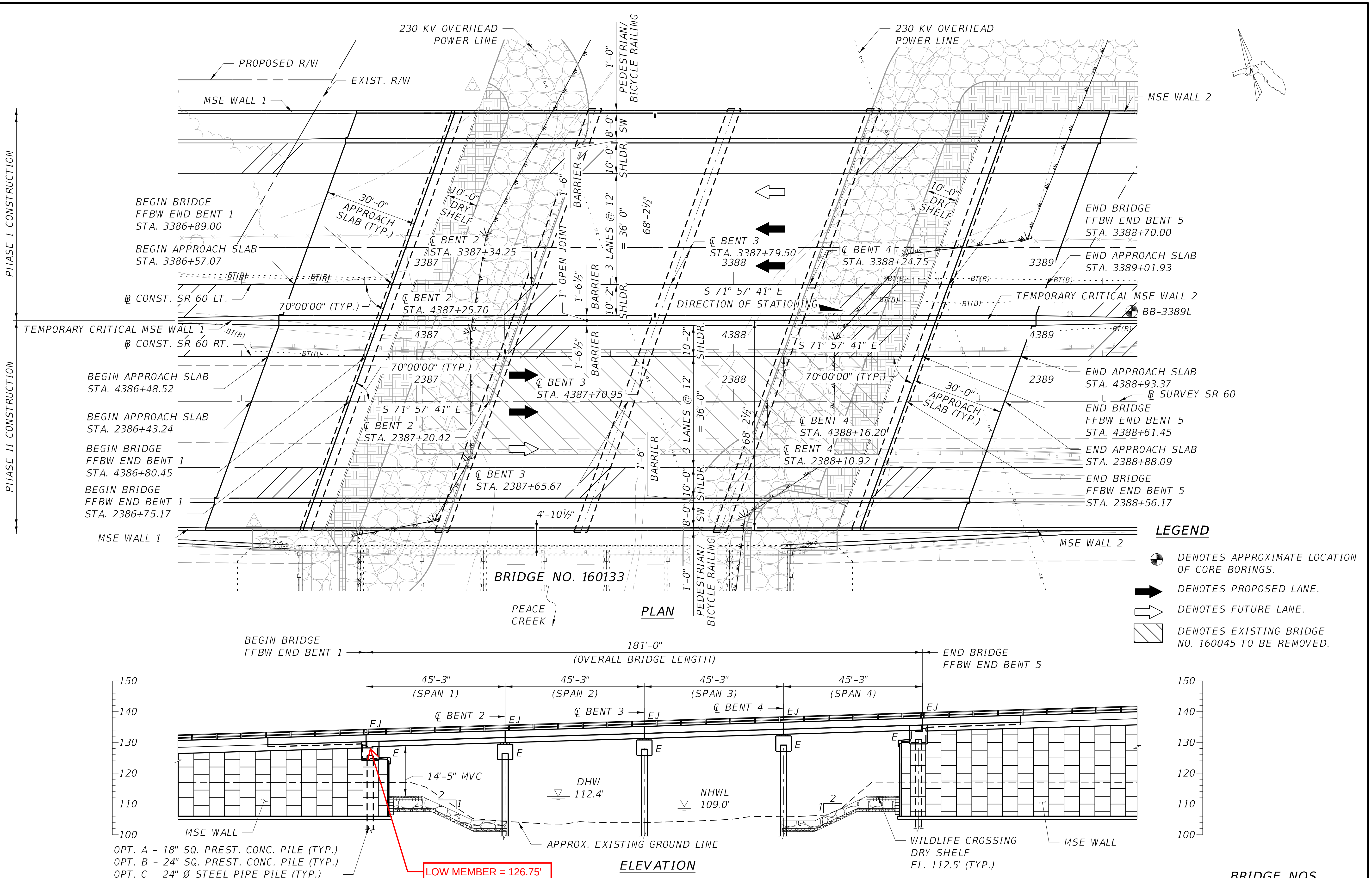

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE: PLAN AND ELEVATION (3 OF 4)
ALTERNATIVE 3

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD
MAINLINE OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-7

SHEET NO. B2-3

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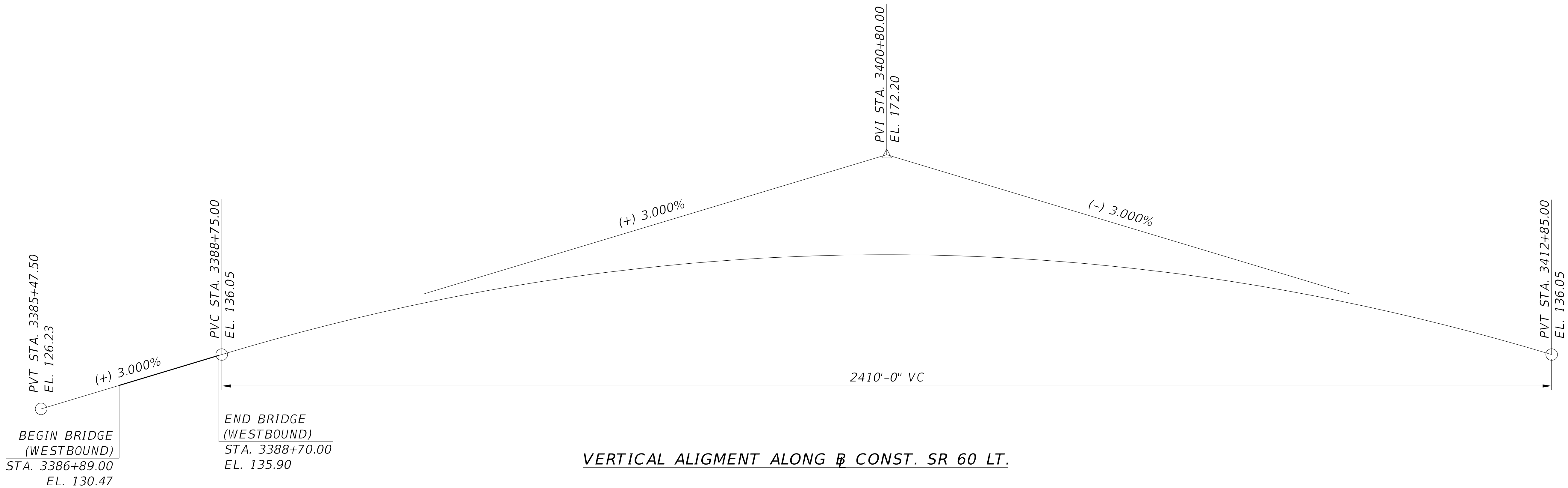
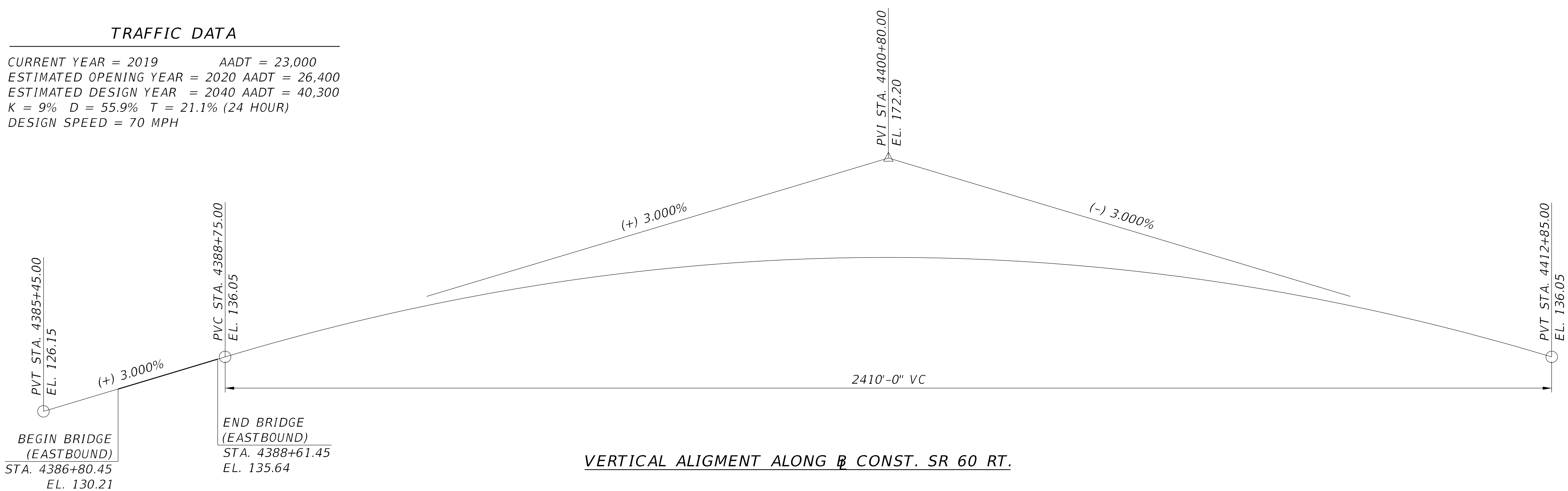


VERTICAL ALIGMENT ALONG ℄ CONST. SR 60 LT.

TRAFFIC DATA

CURRENT YEAR = 2019 AADT = 23,000
ESTIMATED OPENING YEAR = 2020 AADT = 26,400
ESTIMATED DESIGN YEAR = 2040 AADT = 40,300
K = 9% D = 55.9% T = 21.1% (24 HOUR)
DESIGN SPEED = 70 MPH



VERTICAL ALIGMENT ALONG ℄ CONST. SR 60 RT.

BRIDGE NOS.

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

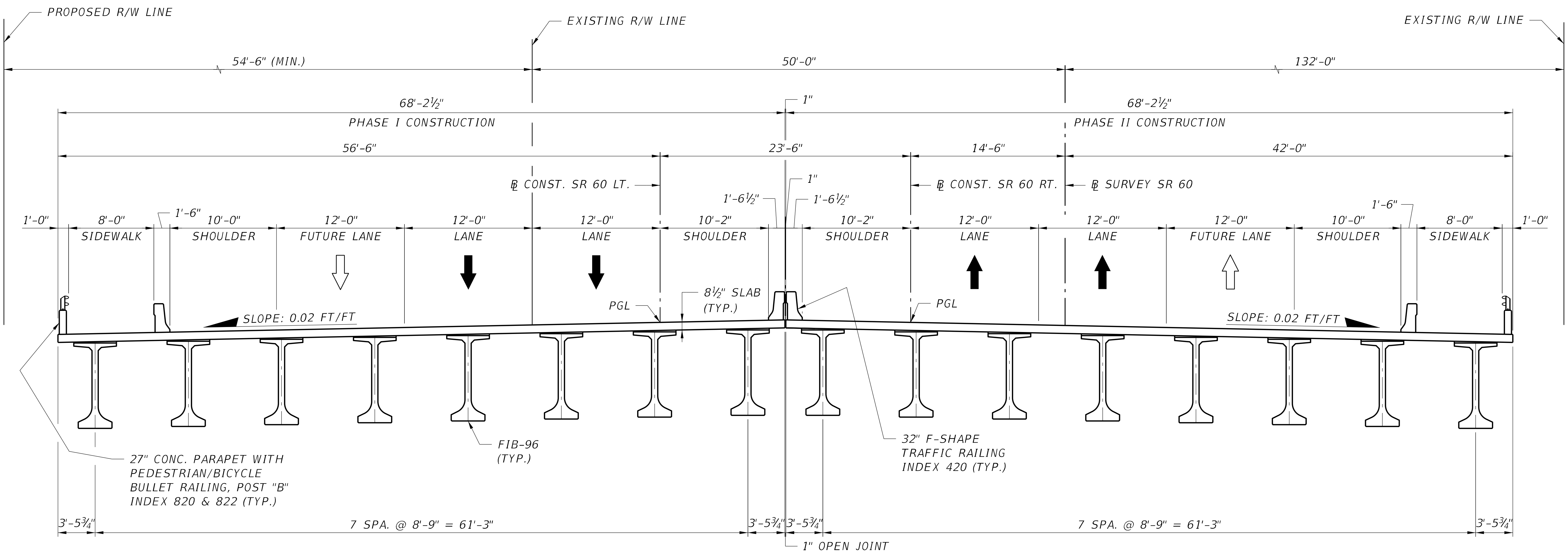
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE: PLAN AND ELEVATION (4 OF 4)

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD MAINLINE OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-8

SHEET NO. B2-4



TYPICAL SECTION
ALTERNATIVE 1

BRIDGE NOS.

REVISIONS					
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE: TYPICAL SECTION (1 OF 2)

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD MAINLINE OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-9

SHEET NO. B2-6

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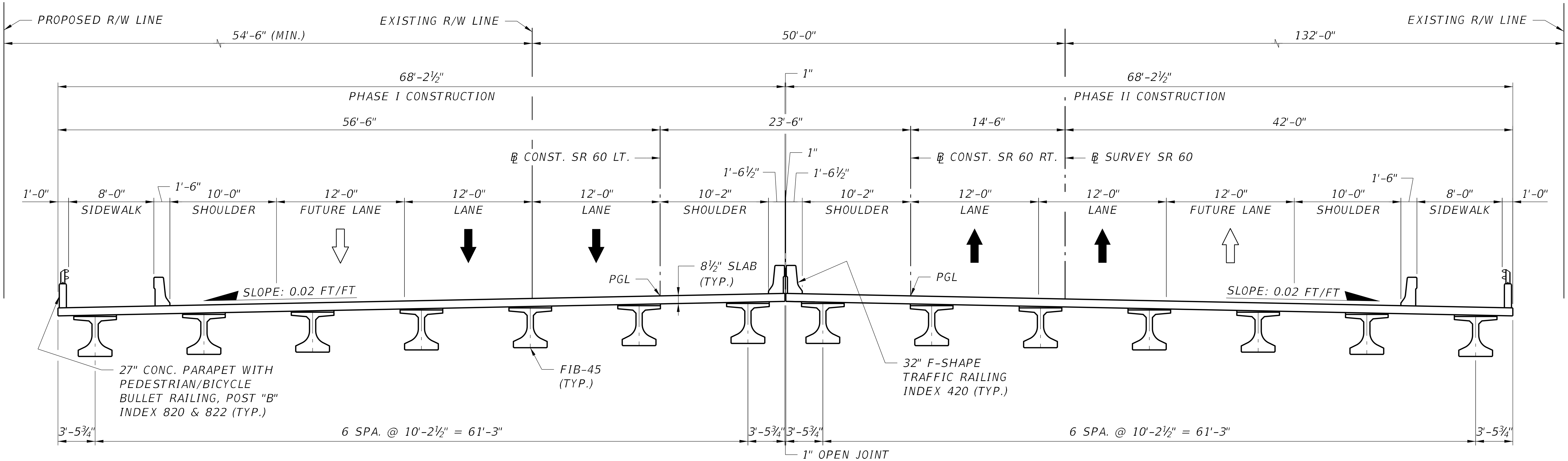
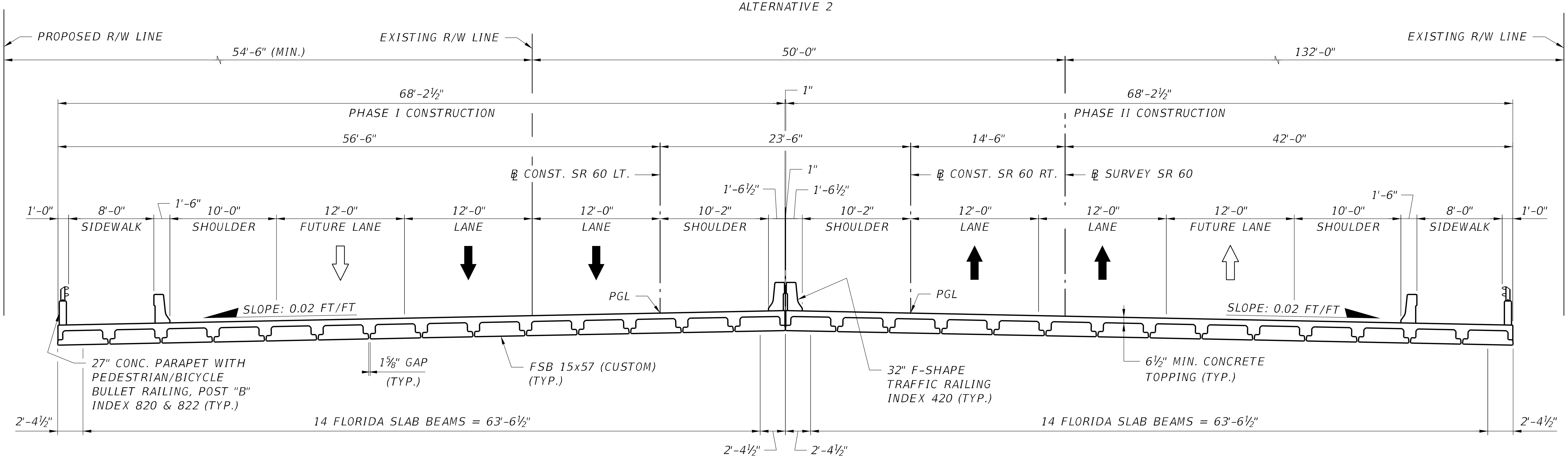


TYPICAL SECTION
ALTERNATIVE 2



TYPICAL SECTION
ALTERNATIVE 3

BRIDGE NOS.

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

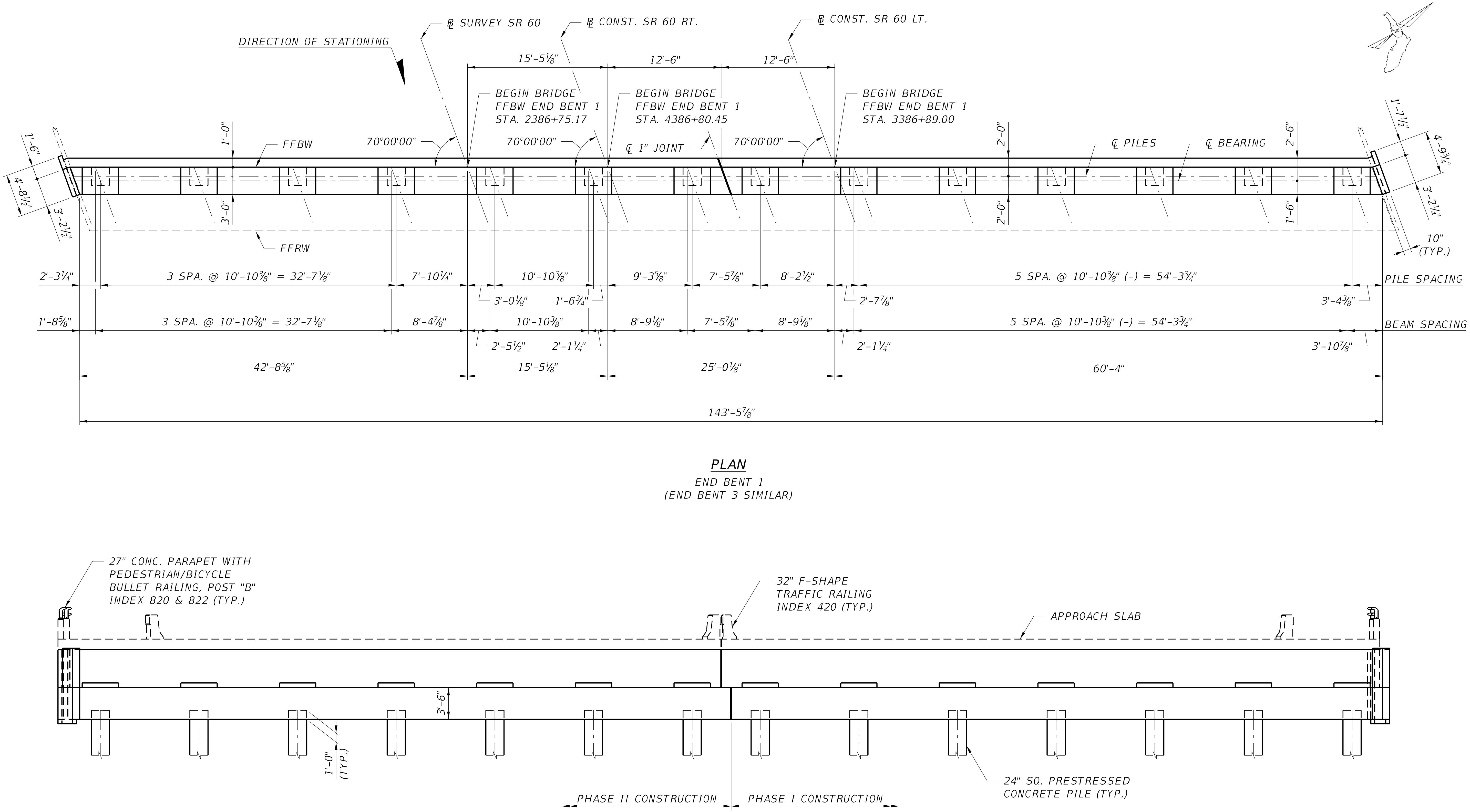
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE: TYPICAL SECTION (2 OF 2)

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD MAINLINE OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-10

SHEET NO. B2-7



PLAN
END BENT 1
(END BENT 3 SIMILAR)

ELEVATION
END BENT 1
(END BENT 3 SIMILAR)

NOTE:
RECOMMENDED ALTERNATIVE SHOWN.
FOR LAYOUT OF OTHER ALTERNATIVES AND PILE OPTIONS, SEE BDR REPORT.

BRIDGE NOS.

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

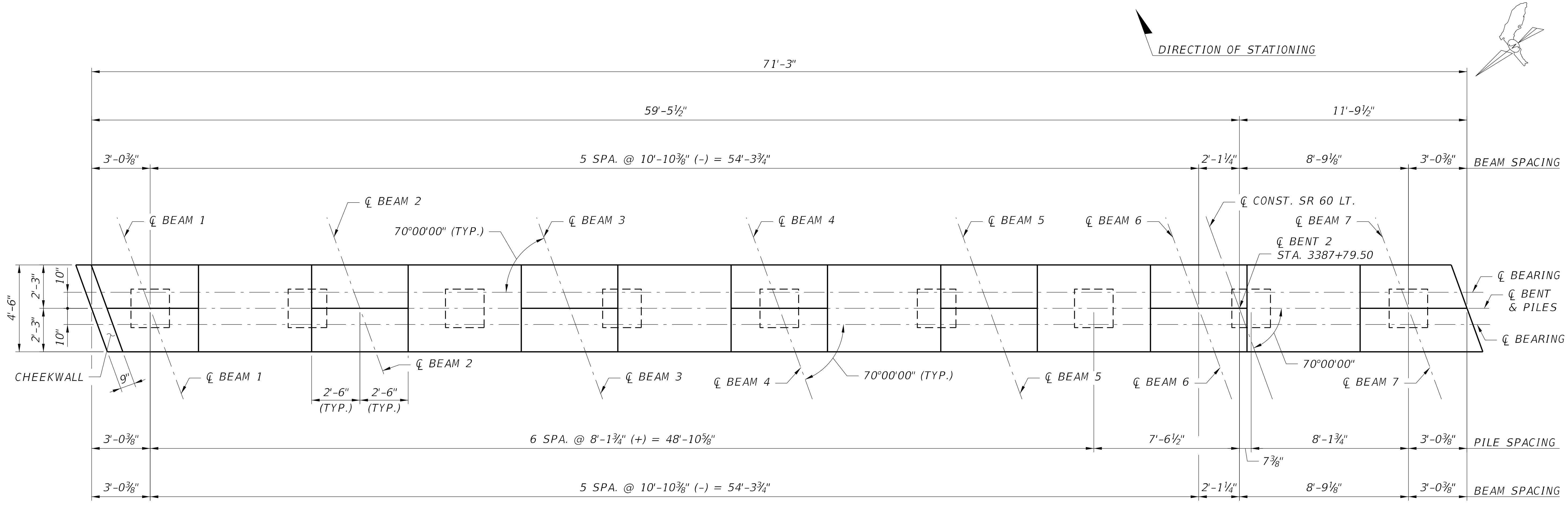
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE: END BENT ALTERNATIVE 2

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD MAINLINE OVER PEACE CREEK DRAINAGE CANAL

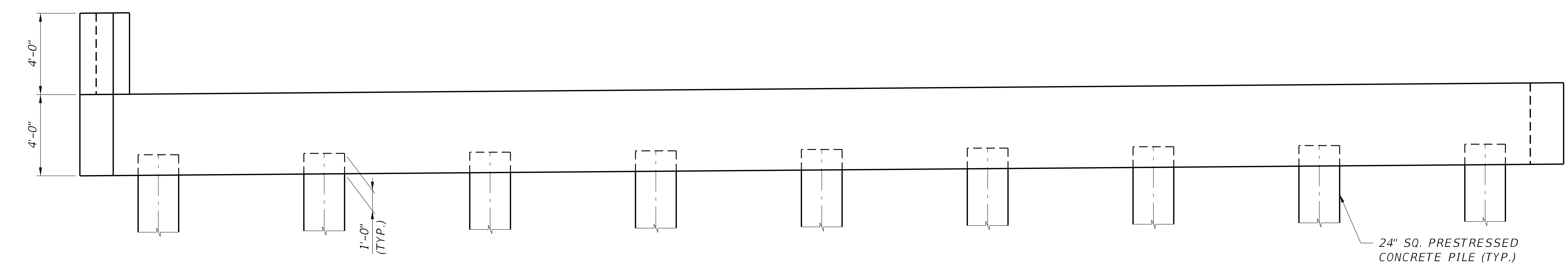
REF. DWG. NO. H-11

SHEET NO. B2-8



PLAN

INTERMEDIATE BENT 2 - PILE OPTION B
(WESTBOUND SHOWN, EASTBOUND SIMILAR)



ELEVATION

INTERMEDIATE BENT 2 - PILE OPTION B
(WESTBOUND SHOWN, EASTBOUND SIMILAR)

BRIDGE NOS.

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	POLK	436559-1-52-01

SHEET TITLE: INTERMEDIATE BENT (2 OF 4)
ALTERNATIVE 2

PROJECT NAME: SR 60 GRADE SEPARATION OVER CSX RAILROAD
MAINLINE OVER PEACE CREEK DRAINAGE CANAL

REF. DWG. NO. H-12

SHEET NO. B2-10

APPENDIX I

Bridge Inspection Reports

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection Report with PDF attachment(s)

BY:	ICA	STRUCTURE NAME:	SR-60 WB OVER PEACE CK RELI
OWNER:	1 State Highway Agency	YEAR BUILT:	1951
MAINTAINED BY:	1 State Highway Agency	SECTION NO.:	16 110 000
STRUCTURE TYPE:	1 Reinforced Concrete - 01 Slab	MP:	25.276
LOCATION:	4.1 MI WEST OF US-27	ROUTE:	00060
SERVICE TYPE ON:	1 Highway	FACILITY CARRIED:	SR-60 WB
SERV TYPE UND:	9 Relief for waterway	FEATURE INTERSECTED:	PEACE CREEK RELIEF

☐ FUNCTIONALLY OBSOLETE ☐ STRUCTURALLY DEFICIENT

TYPE OF INSPECTION: Regular NBI

DATE FIELD INSPECTION WAS PERFORMED: ABOVE WATER: 08/26/2014 UNDERWATER: 8/29/2014

SUFFICIENCY RATING: 79.5
HEALTH INDEX: 84.67

This report contains information relating to the physical security of a structure and depictions of the structure. This information is confidential and exempt from public inspection pursuant to sections 119.071(3)(a) and 119.071(3)(b), Florida Statutes. Only the cover page of this report may be inspected and copied.

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection Report with PDF attachment(s)

BY:	ICA	STRUCTURE NAME:	SR-60 WB OVER PEACE CK RELIEF
OWNER:	1 State Highway Agency	YEAR BUILT:	1951
MAINTAINED BY:	1 State Highway Agency	SECTION NO.:	16 110 000
STRUCTURE TYPE:	1 Reinforced Concrete - 01 Slab	MP:	25.276
LOCATION:	4.1 MI WEST OF US-27	ROUTE:	00060
SERVICE TYPE ON:	1 Highway	FACILITY CARRIED:	SR-60 WB
SERV TYPE UND:	9 Relief for waterway	FEATURE INTERSECTED:	PEACE CREEK RELIEF

- [ ] THIS BRIDGE CONTAINS FRACTURE CRITICAL COMPONENTS
- [X] THIS BRIDGE IS SCOUR CRITICAL
- [ ] THIS REPORT IDENTIFIES DEFICIENCIES WHICH REQUIRE PROMPT CORRECTIVE ACTION
- [ ] FUNCTIONALLY OBSOLETE
- [ ] STRUCTURALLY DEFICIENT

TYPE OF INSPECTION: Regular NBI

DATE FIELD INSPECTION WAS PERFORMED: ABOVE WATER: 08/26/2014 UNDERWATER: 8/29/2014

SMART FLAGS: OVERALL NBI RATINGS:

SMART FLAGS				
360 Settlement SmFlag: Settlement stable	DECK:	7 Good	CHANNEL:	7 Minor Damage
	SUPERSTRUCTURE:	7 Good	CULVERT:	N N/A (NBI)
	SUBSTRUCTURE:	7 Good	SUFF. RATING:	79.5
	PERF. RATING:	Good	HEALTH INDEX:	84.67

FIELD PERSONNEL / TITLE / NUMBER	INITIALS
Coon, Elliott - Team Leader (CBI #00530) (lead)	________
Ryan, William - Team Leader (CBI #00497)	________
Hitch, Victoria - CBI (#00414) (lead)	________
Hoogland, Keith - Bridge Inspector (CBI #00341)	________
Payne, Timothy - Diver-Inspector	________
Davis, Christopher - Diver-Inspector	________

REVIEWING BRIDGE INSPECTION SUPERVISOR:

St. Clair, Clayton - Bridge Inspector (CBI #00374) ________

CONFIRMING REGISTERED PROFESSIONAL ENGINEER:

Perez, Jorge - Professional Engineer (PE#42690)
ICA Engineering
1907 N. U.S. HWY 301, Suite 160C
Certificate of Authorization #26988
Tampa, FL 33619

SIGNATURE: ____

DATE: ____

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All Elements

UNIT: 0 DECKS

ELEMENT/ENV: 39/3 Unp Conc Slab/AC Ovl 5146 sf. ELEM CATEGORY: Decks/Slabs

CONDITION STATE (5)	DESCRIPTION	QUANTITY
2	Repaired areas and/or potholes or impending pot holes and/or raveling or rutting exist. Their combined area is more than 2% but less than 10% of the total deck area.	5146 sf.

ELEMENT INSPECTION NOTES:

CS2: There is a moderate accumulation of dirt, debris and vegetation in the shoulders and scuppers. Refer to Photo 1. P3WO

The deck underside has numerous longitudinal and transverse cracks up to 1/64in. wide in isolated locations throughout in all spans.

The concrete slab in Span 1 is up to 3.7in. lower over Abutment 1 due to past settlement of Abutment 1 during December 2008. Refer to Element 215 R/Conc Abutment for related comments.

Span 6 has a 14in. long x 1/8in. wide diagonal crack on the north outside face 2 ft. from Bent 7.

There are intermittent transverse cracks up to 1/4in. wide in the asphalt surface over the abutment and intermediate bent joints.

PREVIOUS WORK ORDER RECOMMENDATION:
Remove dirt and debris and unclog scuppers in shoulders. 302sf. 8MH - Repaired but recurring. Repeat.

ELEMENT/ENV: 302/3 Compressn Joint Seal 377 lf. ELEM CATEGORY: Joints

CONDITION STATE (3)	DESCRIPTION	QUANTITY
1	The element shows minimal deterioration. Adhesion is sound with no signs of leakage. There are no cohesion cracks. The adjacent deck and/or header is sound. If joint is armored, there are no signs of anchorage looseness.	377 lf.

ELEMENT INSPECTION NOTES:

NOTE: The compression seals are covered with an asphalt overlay.

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All Elements

UNIT: 0 DECKS

ELEMENT/ENV: 331/3 Conc Bridge Railing 302 lf. ELEM CATEGORY: Railing

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.	254 lf.
2	Minor cracks, surface scaling or spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.	48 lf.

ELEMENT INSPECTION NOTES:

NOTE: Due to past settlement of the abutments a string line and level was used along the top of the bridge railing and the following measurements were noted at each corner of the structure. No changes from the 2012 measurements. Refer to Photo 2. MONITOR.

LOCATION:	2009	2010	2012	2014
Northwest:	4-1/2in.	2-1/2in.	2-1/2in.	2-1/2in.
Southwest:	3-1/4in.	2-3/4in.	2-3/4in.	2-3/4in.
Southeast:	3/8in.	3/8in.	3/8in.	3/8in.
Northeast:	1in.	1in.	1in.	1in.

CS2: The barriers have scrape markes up to 20ft. x 2in. x 1/2in. intermittently throughout - NEW.

There is a 2ft. high x 8in. x 2in. spall with no exposed steel in the top inside face of the left barrier of Span 6, over Bent 6.

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All Elements

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV: 205/3 R/Conc Column 45 ea. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without affect on strength and/or serviceability.	45 ea.

ELEMENT INSPECTION NOTES:

The following was noted by the underwater team:

NOTE: The intermediate bents of this bridge are founded on the timber piles from the previous bridge. The intermediate bents have the following configuration: five timber piles which were cut off at the groundline are capped with a reinforced concrete footing. Five reinforced concrete columns extend up from the footings to support the bent cap. The timber piles below the footings are centered under the concrete columns according to plans and are inspected under Element 206 Timber Column. The concrete columns at Bents 3 through 9 had fiberglass jackets installed in 1984.

ELEMENT/ENV: 206/3 Timber Column 5 ea. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
2	Decay, insect/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist but none is sufficiently advanced to affect strength or serviceability of the element.	5 ea.

ELEMENT INSPECTION NOTES:

NOTE: The quantity was updated to reflect only currently exposed piles.

CS2: Piles 3-2 (NEW), 4-1 (NEW) and 5-1 (NEW) are exposed up to 6in. with a soft outer 1/8in. surface. Refer to the Special Underwater Bridge Inspection Report dated 07/29/2014 for a detailed history from 2008 - INCREASE.

CORRECTIVE ACTION TAKEN:
Piles 4-2 through 4-5 are no longer exposed.

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All Elements

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV: 215/3 R/Conc Abutment 76 lf. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without affect on strength and/or serviceability.	38 lf.
2	Minor cracks, spalls and scaling may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.	38 lf.

ELEMENT INSPECTION NOTES:

CS2: Abutment 1 cap has past settlement up to 3.7in. which has been stabilized by repairs. Refer to the Post Repair Inspection Report dated 12/31/2008 for the history.

Abutment 1 cap is rotated up to 0.5in. in 12in. toward to the west on the north side and up to 7/16in. in 12 in. toward to the west on the south side. There have been no change since the repairs were made in 2008. Refer to Photo 3. MONITOR

ELEMENT/ENV: 220/3 R/C Sub Pile Cap/Ftg 6 ea. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
2	Minor cracks, spalls and scaling may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.	6 ea.

ELEMENT INSPECTION NOTES:

The following was noted by the underwater team:

CS2: The footings have scale up to 5/8in. deep.

The footings can be felt through the silt/mud build-up or are intermittently exposed on Bents 3, 4, 5, 6 and 7 – INCREASE.

Footings 3 through 6 have reoccurring undermining, see Element 290 Channel for chart.

All Elements

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV: 234/3 R/Conc Cap 331 lf. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without affect on strength and/or serviceability.	329 lf.
3	Some delaminations, moderate cracks, spalls and/or scaling may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.	2 lf.

ELEMENT INSPECTION NOTES:

CS1: There is minor to moderate seepage staining on the caps throughout.

Minor vegetation is growing at both ends of the caps and at various areas under the structure. Refer to Photo 4.

CS3: Bent 10 cap has two minor lack of cover spalls up to 3in. diameter x 1in. deep with exposed zinc coated rebar at the south end. Refer to Photo 4.

ELEMENT/ENV: 298/3 Pile Jacket Bare 35 ea. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	There is little or no deterioration. Surface defects only are in evidence.	35 ea.

ELEMENT INSPECTION NOTES:

NOTE: All concrete piles in Bents 3 through 9 have fiberglass jackets that extend from the footings to within 1ft. of the bent caps.

ELEMENT/ENV: 396/3 Other Abut Slope Pro 2110 sf. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	There is little or no deterioration. Surface defects only are in evidence. Random open joints may exist.	2062 sf.

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All Elements

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV: 396/3 Other Abut Slope Pro 2110 sf. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
2	There may be minor deterioration, random open joints, cracking and weathering. Mortar in joints may show minor deterioration.	48 sf.

ELEMENT INSPECTION NOTES:

NOTE: The slope protection at both abutments consists of riprap bags covered with concrete slurry and areas of asphalt.

CS2: The northwest slope has an area of erosion 8ft. x 6ft. with misplaced riprap bags and missing areas of slurry overpour, which can be penetrated up to 25in. back under - NEW. Refer to Photo 5. P3WO

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All Elements

UNIT: 0 CHANNEL

ELEMENT/ENV: 290/3 Channel **1 ea.** **ELEM CATEGORY:** Channel

CONDITION STATE (4)	DESCRIPTION	QUANTITY
2	Bank protection is in need of minor repairs, bank may be beginning to slump, minor stream bed movement may be evident or debris may be present.	1 ea.

ELEMENT INSPECTION NOTES:

NOTE: This structure is scour critical. Refer to Table 1 in the addendum, for the 100ft. offset measurements.

CS2: The channel has dirt islands beginning to form intermittently through out the channel - NEW.

The following was noted by the underwater team:

CS2: Footings 3, 4, 5 and 6 are undermined up to 6in. high and the timber piling are exposed - INCREASE.

On several inspections the bottom edge of the footings could be felt through silt bottom material.

CORRECTIVE ACTION TAKEN:
The turbidity barrier along the north side is no longer present.
Divers remove the majority of the vegetation around the piles and the footings.

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All Elements

UNIT: 0 SMART FLAG

ELEMENT/ENV: 360/3 Settlement SmFlag 1 ea. ELEM CATEGORY: Smart Flags

CONDITION STATE (3)	DESCRIPTION	QUANTITY
1	Some of the bridge supporting elements are showing signs of visible settlement or rotation but due to earlier repairs as indicated by other signs, the settlement appears to have stabilized.	1 ea.

ELEMENT INSPECTION NOTES:

NOTE: This element was added in the 12/19/2008 report for the settlement at Abutment 1, pursuant to Elements 206 Timber Column and 215, R/Conc Abutment.

All Elements

UNIT: 0 MISCELLANEOUS

ELEMENT/ENV: 321/3 R/Conc Approach Slab 2 ea. **ELEM CATEGORY:** Other Elements

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The slab has not settled and shows no sign of deterioration other than superficial surface cracks.	2 ea.

ELEMENT INSPECTION NOTES:

NOTE: The concrete approach slabs are covered with asphalt.

CORRECTIVE ACTION TAKEN:
The asphalt spill out and a light accumulation of dirt in the shoulders has been removed.

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Smart Flag Summary

UNIT: 0 SMART FLAG

ELEMENT/ENV: 360/3 Settlement SmFlag 1 ea. ELEM CATEGORY:Smart Flags

CONDITION STATE (3)	DESCRIPTION	QUANTITY
1	Some of the bridge supporting elements are showing signs of visible settlement or rotation but due to earlier repairs as indicated by other signs, the settlement appears to have stabilized.	1

ELEMENT INSPECTION NOTES:

NOTE: This element was added in the 12/19/2008 report for the settlement at Abutment 1, pursuant to Elements 206 Timber Column and 215, R/Conc Abutment.

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Inspector Recommendations

UNIT: 0 DECKS

ELEMENT/ENV:39/3 Unp Conc Slab/AC Ovl ELEM CATEGORY: Decks/Slabs

CONDITION STATE (5)		Priority
2	**5146 sf.**	3

WORK ORDER RECOMMENDATION:

Remove the dirt and debris, and unclog scuppers in shoulders.

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Inspector Recommendations

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV:234/3 R/Conc Cap ELEM CATEGORY: Substructure

CONDITION STATE (4)		Priority
1	**329 lf.**	3

WORK ORDER RECOMMENDATION:
Remove vegetation from south end of Bent 10 cap.

ELEMENT/ENV:396/3 Other Abut Slope Pro ELEM CATEGORY: Substructure

CONDITION STATE (4)		Priority
2	**48 sf.**	3

WORK ORDER RECOMMENDATION:
REP an area of erosion/missplaced bags 8ft. x 6ft. x 25in. in the NW slope protection.

Structure Notes

TRAFFIC RESTRICTIONS: This structure is not posted. According to the load rating dated 01/02/2009, posting is not required.

Structure was inventoried west to east.

This structure is scour critical. Refer to Table 1 in the addendum, for the 100ft. offset measurements.

The asphalt thickness is 4-1/2in.

INSPECTION NOTES: ZGMF 8/26/2014

Sufficiency Rating Calculation Accepted by knicaec-P at 2014-09-11 09:31:52

LOAD CAPACITY EVALUATION:
The load rating dated 01/02/2009 applies to the current condition of this bridge.

Divers inspected five 12in. concrete piles on Bents 3 through 7, three timber piles, jackets, smart flag, submerged footings and channel.

NON-STRUCTURAL ITEMS:

REFLECTORS:
The barriers do not have reflectors mounted to them - NEW. Refer to Photo 6. REPAIR

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Photo 1 - Element 39/3 Unp Conc Slab/AC Ovl

Dirt, debris and vegetation in shoulders and suppers (left shoulder shown). Typical.

WORK ORDER RECOMMENDATION:
P3WO: Remove the dirt and debris, and unclog scuppers in shoulders.

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Photo 2 - Element 331/3 Conc Bridge Railing

String line and level showing elevation difference at west end of the left barrier. Typical.

WORK ORDER RECOMMENDATION:
Monitor.

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Photo 3 - Element 215/3 R/Conc Abutment

Abutment 1 north end, previous rotation toward the west.

WORK ORDER RECOMMENDATION:
Monitor.

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Photo 4 - Element 234/3 R/Conc Cap

Spall with exposed steel south end of Bent 10 cap, and vegetation growing from cap. Typical.

WORK ORDER RECOMMENDATION:
None.

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FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection Report with PDF attachment(s)

Photo 5 - Element 396/3 Other Abutment Slope Pro

Northwest slope area of erosion, with misplaced riprap bags and missing areas of slurry overpour, which can be penetrated.

WORK ORDER RECOMMENDATION:
P3WO: Repair an area of erosion/missplaced bags 8ft. x 6ft. x 25in. in the northwest slope protection.

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Photo 6 - Inspection Notes

Left bridge rail missing reflectors. Typical.

REPAIR RECOMMENDATION:
Install reflectors to both bridge rails.

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SCOUR EVALUATION REPORT PHASE 2

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT 1
DISTRICTWIDE SCOUR EVALUATIONS
FAP NO.: N/A; FPID: 427341-1-72-01 (STATE BRIDGE)

WILFREDO ACEVEDO-DIAZ, P.E. PROJECT MANAGER

BRIDGE NUMBER:	160045
OWNER:	FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE NAME:	STATE ROAD 60(WESTBOUND) OVER PEACE CREEK RELIEF
LOCATION:	4.1 MILES WEST OF US-27
COUNTY:	POLK

SCOUR VULNERABILITY

SCOUR MODE:	☒ Riverine ☐ Tidal	☐ Both	
SCOUR CRITICAL:		☐ Yes	☒ No
SCOUR RATING:	Scour Susceptible:	☒ Yes	☐ No
	Low Risk:	☐ Yes	☒ No
	Foundations:	☐ Known	☒ Unknown
		Previous	Current
CIDR RATING:	17 (113) Scour Critical	U	

RECOMMENDATION: THE BRIDGE IS RATED SCOUR SUSCEPTIBLE (MEDIUM PRIORITY). A PHASE 3 ANALYSIS IS RECOMMENDED BASED ON THE POST-SCOUR EMBEDMENT DEPTH. CONTINUED MEASUREMENT OF THE BED CROSS-SECTION IS RECOMMENDED AS PART OF THE SCHEDULED BRIDGE INSPECTION PROGRAM.

☒PHASE 1	☒PHASE 2	☐ PHASE 3	☐PHASE 4
QUALITATIVE EVALUATION/ ASSESSMENT	HYDRAULIC/HYDROLOGIC ASSESSMENT	STRUCTURAL/GEOTECHNICAL ASSESSMENT	PLAN OF ACTION
DATE: *04/30/1995* ADDENDUM: *12/01/2011*	DATE: *05/29/2012*	DATE: _____	DATE: _____

CHECKED BY: *ELIZABETH GEURINK, P.E.*

BACK CHECKED BY: *ROBERT JOHNSON, P.E.*

CORRECTED BY: *ELIZABETH GEURINK, P.E.*

APPROVED BY: *ROBERT JOHNSON, P.E.*

URS
7650 W. Courtney Campbell Causeway
Tampa, Florida 33607-1462
(813) 286-1711

ENGINEER OF RECORD: *Elizabeth R. Geurink*

SIGNATURE 5/29/2012 **PE. NUMBER** 51941

1.0 SUMMARY OF FINDINGS

Bridge Number 160045 (west bound) on State Road 60 in Polk County was built in 1951 over the Peace Creek Relief drainage canal. A parallel bridge structure, Bridge Number 160133, is located 35 feet downstream and carries eastbound traffic. The multi-span bridge is 151 feet in length with a deck width of 37 feet and is supported by two protected spill-through abutments and nine interior bents which are not fully aligned with the flow. The 1950 plans and subsequent bridge inspection sketches indicate that each interior is comprised of five in-line 12-inch square concrete columns mounted on a 2' x 2' spread footer foundation at or below the mudline and supported by five in-line timber piles of 12-inch diameter and unknown length and embedment. Pile jackets added during subsequent bridge repair increase the effective diameter of the columns to 18-inch square. The 2011 Phase 1 Addendum reported a vertically and horizontally unstable channel bed and estimated minimum pile embedment depths for the bridge of 15.7 feet based on adjusted geotechnical method estimates of original embedment. Undermining of the footer and exposure of timber piles (3 to 10 inches) at Bents 3 and 4 was noted during the 2008 underwater bridge inspection. This finding led to a Scour Vulnerability Rating of Scour Susceptible (Medium Priority) and a recommendation to proceed to a Phase 2 Scour Evaluation.

The perenially-flowing Peace Creek Relief drainage canal flows generally westward into the Peace River but follows a mildly meandering path directing flow southward through this structure (refer to Location Map). Normal flows are skewed approximately 20° to the pier alignment and flood flows are skewed approximately 30° to the pier alignment. The 2009 Bridge Inspection Report described settlement issues at the right abutment (Bent 1) with an unsuccessful repair attempt. Footings at interior bents 3, 4 and 5 are reported to be undermined with timber piles exposed from scour.

The man-made waterway is approximately 200 feet wide at the top of bank at the bridge location with both abutments protected by grouted sand-cement riprap. The sandy channel bottom is approximately 85 feet wide, un-vegetated and was observed to be wet but not flowing at the time of field inspection (February 27, 2012). Well maintained, grassed channel banks upstream and downstream of the parallel bridge structures were noted. The downstream bridge (160133) channel is narrower than the upstream bridge channel. The bridge itself does not encroach upon the channel, but the FEMA Flood Insurance Rate Map (FIRM) indicates wide floodplains on either side of the bridge. The 100-year flood is not anticipated to overtop the bridge.

2.0 HYDROLOGIC/HYDRAULIC SIMULATION

HEC-RAS (version 4.1.0), the U.S. Army Corps of Engineers water surface profile computation model, was utilized for one-dimensional steady flow simulation of the 100- and 500-year events. The 100-year and 500-year discharges applied in the HEC-RAS model were obtained from the 2003 FEMA Flood Insurance Study for Polk County. The cited drainage area upstream of the bridge is 94.9 square miles. Supporting data for hydrologic discharges and flood stages are provided in Appendix A.

The hydraulic simulation included two steady state flood profiles comprised of the calculated 100-year and 500-year return frequency flood flows. Downstream model boundary conditions include a defined energy slope of 0.001 ft/ft under normal depth conditions using the slope-conveyance method. Published flood profile stages at the bridge, 112.5 and 114.0 feet-NGVD, correspond reasonably well with modeled flood stages.

Channel and bridge geometry were derived from several sources, including 1950 design plans, Bridge Inspection sketches, 2009 Bridge Inspection bed cross-section measurements, field review conducted by URS staff February 27, 2012, SWFWMD digital terrain models and aerial photography. Mannings n-values derived from 2012 field review range from 0.03 for the main channel to 0.05 for the overbank. Parallel Bridges 160045 (westbound) and 160133 (eastbound) were simulated as one bridge length (95 feet total), with the pier configuration and bridge opening of Bridge 160045 (the upstream face) controlling hydraulic flow through the bridge.

Hydraulic modeling provided flow rates, water surface elevations, channel top widths, average and distributed velocities, and hydraulic depths used in calculating both the contraction and local scour at the bridge structure. Hydraulic modeling input and output are provided in Appendix B. Table 1 summarizes hydraulic modeling results.

Table 1 - Summary of Predicted Hydraulic Conditions for the 100- and 500-year Flood Events

	100-Year Event	500-Year Event
Maximum Discharge, Q_{max} (cfs)	1,591	2,136
Average Velocity, V_{ave} (fps)	2.1	2.4
Water Surface Elevation (ft-NGVD)	112.9	114.0

3.0 SCOUR ANALYSIS

The scour analysis and related computations were performed using HEC-18 (FHWA, 2001) for the contraction and general scour conditions and for abutment scour prediction. The Florida Department of Transportation (FDOT) Bridge Scour Manual equations were used to predict local scour for the 100- and 500-year flood frequency events.

Long Term

Long-term scour is divided into two categories: channel migration (lateral movement) and aggradation/degradation (vertical bed movement). Examination of bridge profile measurements from 1975 to 2009, presented in the 2011 Phase 1 Scour Evaluation Addendum, indicate some lateral movement of the channel and an estimated net bed lowering of 1.3 feet since bridge construction. No additional long-term degradation/aggradation is anticipated.

Contraction Scour

The HEC-18 methodology for computing scour was used to compute both the 100-year and 500-year contraction scour. This involved determining flow rates, average channel depth, top width and velocity at cross-sections at the bridge and approximately one bridge length upstream of the bridge. Tierra Inc. provided the median sediment diameter, D_{50}, of 0.23 mm which was used to determine critical sediment transport velocity for all scour computations. Calculations predicted clear-water scour conditions for both events. Contraction scour computations are provided in Appendix C.

Local Pier Scour

Calculation of local pier scour followed the methodologies outlined in the FDOT Bridge Scour Manual and its associated FDOT Scour Calculator program for complex pier configurations. Local scour for both the 100-year and 500-year flood events was developed for two representative bents; Bent 4 – the location of highest local pier velocity but with a fully exposed pile cap/spread footer (Case 1), and Bent 8 – a pier with high local velocity and a partially-buried pile cap/spread footer (Case 2) after general scour had been applied. The interior bents are comprised of five 18-inch square concrete columns on a 2' x 2' spread footer base with a single row of timber piles beneath. Circular timber piles are 12" in diameter. Complex piers were assumed to be skewed to the flood flow by 30°. The Case 2 scour condition at Bent 8 proved to be the worst-case scour condition. Local scour computations are provided in Appendix C.

Abutment Scour

Local scour prediction for abutments was not performed because of intact scour protection countermeasures and low velocities (< 1.0 fps) adjacent to abutments.

Total Scour

Table 2 presents a summary of total scour results for the 100- and 500-year flood events

Table 2 - Summary of Scour Calculations						
	100-Year Event			500-Year Event		
	*Bent 1	Bent 8	*Bent 11	*Bent 1	Bent 8	*Bent 11
Long-Term Degradation (ft)	---	0.0	---	---	0.0	---
Contraction Scour (ft)	---	2.1	---	---	3.3	---
Local Scour: Pier/Abutment (ft)	---	5.2	---	---	3.7	---
Current Embedment (ft)	---	15.7	---	---	15.7	---
Total Scour (ft)	---	7.3	---	---	7.0	---
Resultant Embedment (ft)	---	8.4	---	---	8.7	---
* Bents 1 (Right) and 11 (Left) looking downstream are abutments protected by grouted sand-cement riprap. Original embedment estimates for end bents were not provided as part of the 2011 pile embedment evaluation.						

4.0 RECOMMENDATIONS

A Phase 3 Geotechnical and structural stability analysis is recommended for this bridge due to post-scour embedment depth less than 50% of original estimated embedment depth and post-scour structural stability reliance on timber piles of unknown condition. The bridge is considered Medium Priority because of undermined spread footer foundations at Bents 3 and 4 and reported settling issues at protected abutments. Suitable countermeasures may need to be designed and installed, pending the outcome of the Phase 3 Analysis. Continued measurement of the bed cross-section is recommended as part of the scheduled bridge inspection program.

5.0 MATERIALS AND DOCUMENTATION

The following data was used in this evaluation

- 1995 Phase 1 Scour Evaluation Report
- 2011 Phase 1 Addendum
- 2009 FDOT Bridge Inspection Report
- 02/27/2012 field review photographs and site visit
- 2012 Grain Size Data Sheet (D_{50}) from Tierra Inc.
- FEMA Flood Insurance Rate Map and Flood Insurance Study, Polk County, Florida, November 19, 2003
- SWFWMD Digital Elevation Model for Polk County, Florida – vertical datum NAVD 1988
- FDOT Bridge Scour Manual, May 2005
- FHWA HEC-18, Fourth Edition, May 2001
- 1950 original design plans
- 1979 bridge repair plans (pile jacket design)

The following data was unavailable for evaluation:

- As-built plans

- Pile driving logs
- Bridge and channel survey

APPENDIX A – HYDROLOGY

APPENDIX B – HYDRAULIC MODEL INPUT/OUTPUT

APPENDIX C – SCOUR CALCULATIONS

APPENDIX D – FIELD REVIEW PHOTOGRAPHS

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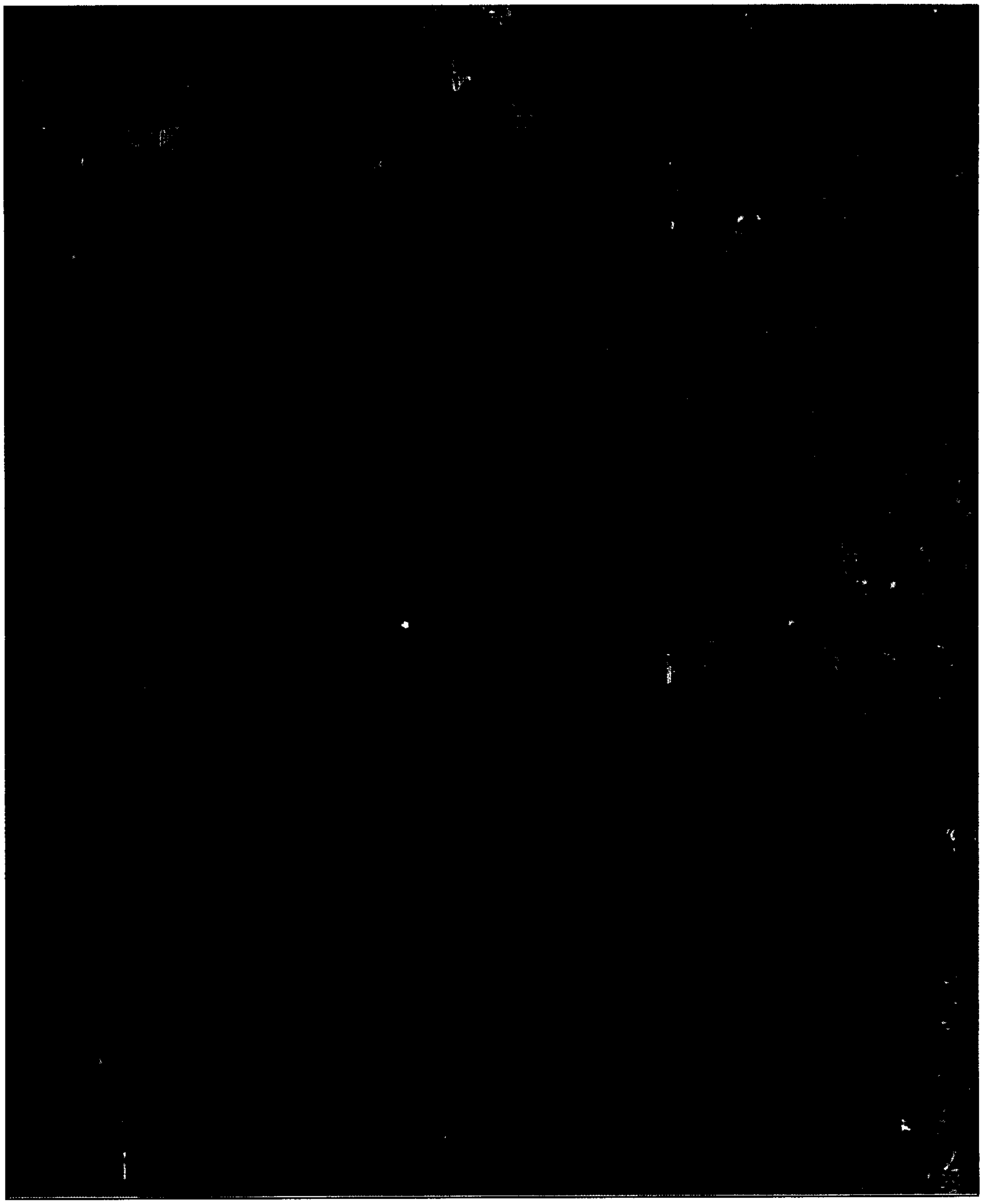
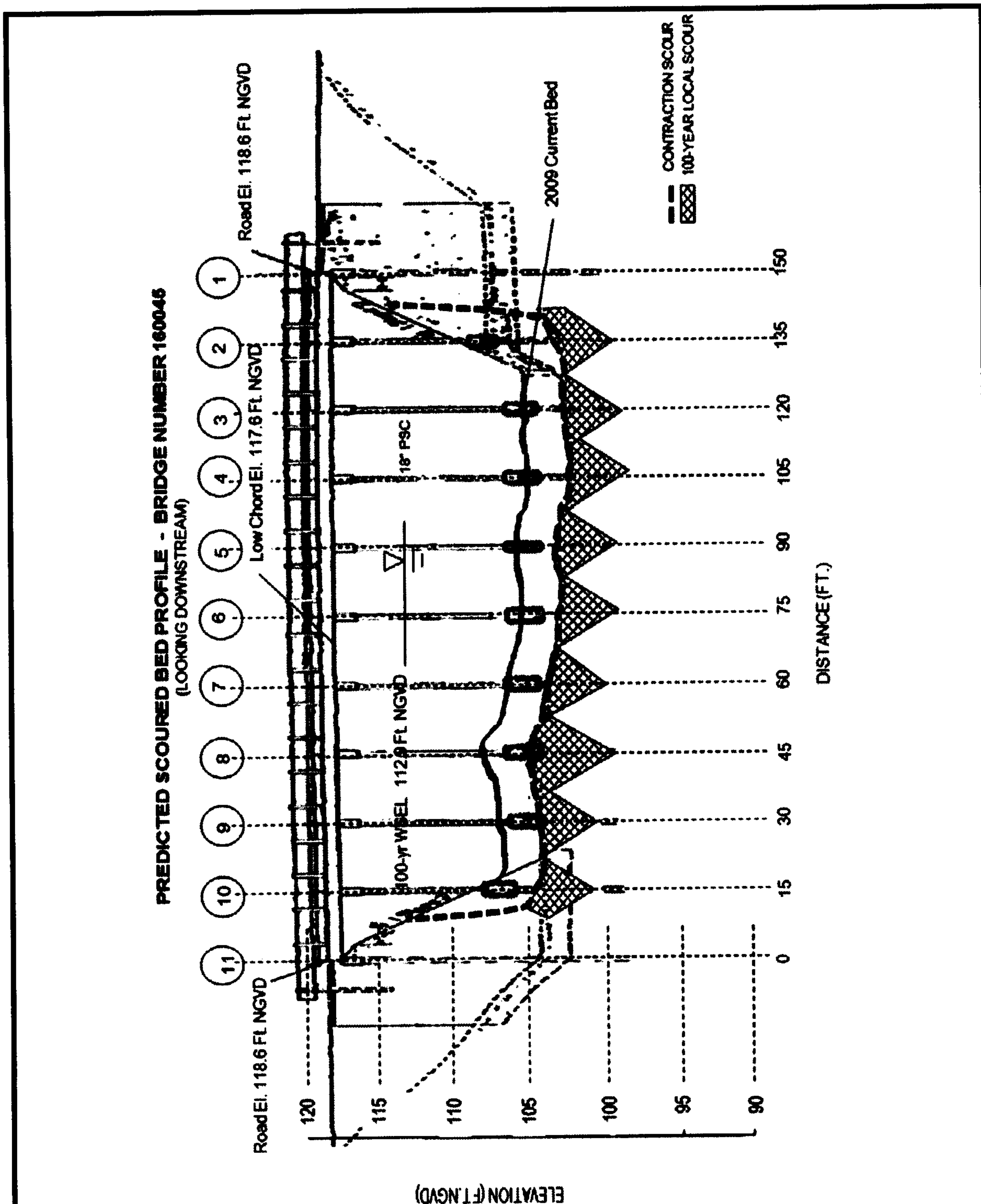


0 0.5 1 2 Miles

Legend

○ Bridge Location

Bridge No. 160045 Location Map



URS 7650 W. Courtney Campbell Causeway Tampa, Florida 33607-1462	BRIDGE NUMBER 160045 STATE ROAD 60 (WB) OVER PEACE CREEK RELIEF POLK COUNTY	**PREDICTED SCOURED BED PROFILE** APPROXIMATE SCALE: HORIZONTAL SCALE: 1" = 30 ft VERTICAL SCALE: 1" = 10 ft

SCOUR EVALUATION – PHASE 2 - FIELD / OFFICE REVIEW REPORT

Bridge Number: *160045*	County: *POLK*	Route: *STATE ROAD 60 (WESTBOUND)*	Over: *Peace Creek Relief*

1. SCOUR VULNERABILITY RATING (PER FHWA)

A. Scour Critical	☐ Yes	☒ No	
Scour Susceptible	☐ High	☒ Medium	☐ Low
Low Risk	☐ High	☐ Medium	☐ Low
Foundation	☐ Known	☒ Unknown	
B. Method of Analysis:	☐ Simplified	☒ Detailed	

C. Reasons for Phase 2 Rating:

- Post-scour embedment <50% computed original minimum embedment depth
- Undermined footing/pile cap at Bents 3 and 4
- Bed material is erodible
- Lack of countermeasures at piers and settling at abutments

2. RECOMMENDATIONS (See Preceding Narrative)

A. Countermeasures:

☐ Riprap

☐ Scour Monitor

☒ Inspection — Continued measurement of the bed cross-section is recommended as part of the scheduled bridge inspection program and after major storm events.

☐ Other

B. Phase 3 Analysis: ☒ Required ☐ Not Required at this time

SCOUR EVALUATION – PHASE 2 - FIELD / OFFICE REVIEW REPORT

3. SUMMARY OF RESULTS

	100 – YEAR FLOOD EVENT (Looking Downstream)				500 – YEAR FLOOD EVENT (Looking Downstream)				OVERTOPPING EVENT ** (Looking Downstream)			
	**Left Abut. (ft)	*Main Channel Pier (ft)	*Flood-plain Pier (ft)	**Right Abut. (ft)	**Left Abut. (ft)	*Main Channel Pier (ft)	*Flood-plain Pier (ft)	**Right Abut. (ft)	Left Abut. (ft)	Main Channel Pier (ft)	Flood-plain Pier (ft)	Right Abut. (ft)
a. Reported Design / Constructed Embedment: 1		17.0				17.0						
b. Current Remaining Embedment: 2		15.7				15.7						
c. Maximum Total Scour: 3		7.3				7.0						
d. Estimated Embedment Remaining After Scour:		8.4				8.7						

e. Sources for above table:

1. *2011 Pile Embedment Estimate Report*
2. *2011 Phase 1 Scour Evaluation Addendum*
3. *FDOT and FHWA HEC-18 methodologies applied for scour calculations*

* *Worst Case Main Channel Pier:* **(8)** *Worst Case Floodplain Pier:* **(N/A)**

** *Embedment estimates were not provided for the right abutment (Bent 1) and left abutment (Bent 11). Abutment scour was not evaluated due to abutment protection and low velocities.*

4. EVALUATION OF METHODS

Method of Analysis:

a. ☐ Simplified

Do results of analysis provide reasonable prediction of scour depths for this structure? [1) or 2)]

1) ☐ Yes — Does the predicted scour suggest instability of the structure, based on existing knowledge of the bridge/bridge culvert?

☐ Yes **RESULT:** Phase 3 is recommended.
☐ No **RESULT:** No further action is required.

2) ☐ No — **RESULT:** Perform a Detailed Analysis.

b. ☒ Detailed

Does the predicted scour suggest instability of the structure, based on existing knowledge of the bridge/bridge culvert? [1) or 2)]

1) ☒ Yes — **RESULT:** Phase 3 is recommended.

2) ☐ No — **RESULT:** No further action is required.

Notes:

5. FLOOD HISTORY

a. Drainage Area: ☒ Applicable (**94.9**) Square Miles source: FEMA FIS Table 4
( ) Acres
☐ Not applicable due to upstream structure control (see summary)

b. Debris Potential: ☐ High ☐ Medium ☒ Low

c. Scour Mode: ☒ Riverine
☐ Tidal
☐ Tidal and Riverine

d. Flow:

Q_{100} = (**1,591**) cfs	Riverine	Method: ☐ Gage Analysis ☐ Regression Analysis: ☐ Rational Method ☒ Other: **See Note (1)**
	Tidal	Method: ☐ HEC 18 Modified Procedure ☐ Historic Data ☐ HEC 18 Procedure ☐ Other:
$Q_{OVERTOPPING}$ = (**N/A**) cfs	Riverine	Method: ☐ Gage Analysis ☐ Iterative WSPRO runs ☐ Other:
	Tidal	Method: ☐ HEC 18 Modified Procedure ☐ Historic Data ☐ HEC 18 Procedure ☐ Other:
Q_{500} = (**2,136**) cfs	Riverine	Method: ☐ Gage Analysis ☐ Regression Analysis: ☐ Rational Method ☒ Other: **See Note (1)**
	Tidal	Method: ☐ HEC 18 Modified Procedure ☐ Historic Data ☐ HEC 18 Procedure ☐ Other:

e. Notes: *(1) FEMA FIS Table 4 - see Appendix A*

SCOUR EVALUATION – PHASE 2 - FIELD / OFFICE REVIEW REPORT

6. CHANNEL STABILITY CONSIDERATIONS

a. Natural Channel Aggradation Expected Over Remaining Life of Structure = (0) *feet*

b. Natural Channel Degradation Expected Over Remaining Life of Structure = (0) *feet*

c. Channel Migration Anticipated During Life of Structure = ☐ Yes ☒ No — Left: ( ) *feet* Right: ( ) *feet*

d. Armoring Potential ☐ Yes ☒ No ☐ Possible

e. Depth to Armoring for Q = ( ) cfs ( ) *feet*

Notes:

7. ESTIMATED SCOUR

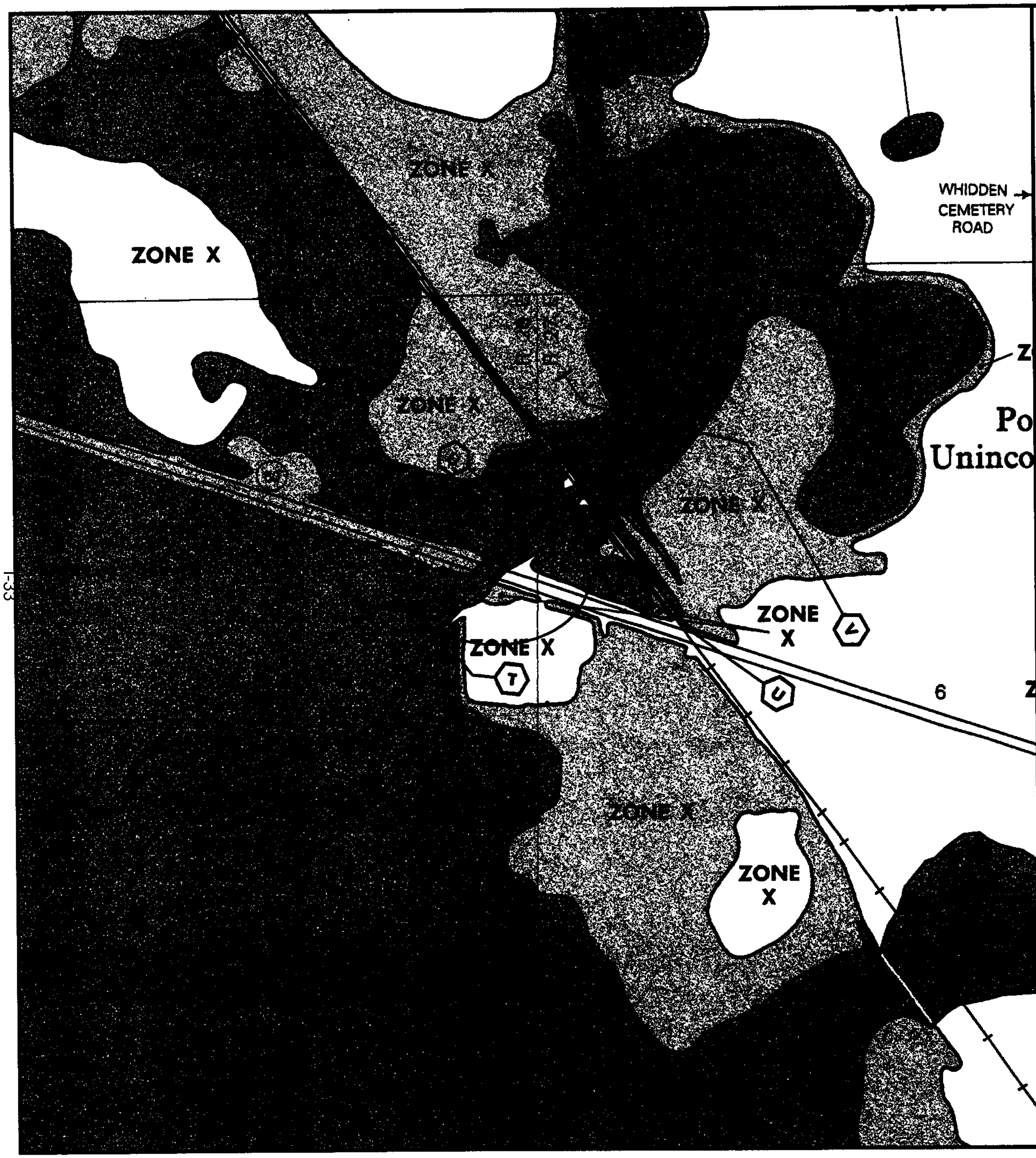
7. ESTIMATED SCOUR		100 – YEAR EVENT	500- YEAR EVENT	OVERTOPPING EVENT
a. Worst Case Flood Event:	Discharge	(1,591) *cfs*	(2,136) *cfs*	( ) *cfs*
b. Contraction Scour: (Looking Downstream)	Left Overbank Main Channel Right Overbank	( ) *ft* (2.1) *ft* ( ) *ft*	( ) *ft* (3.3) *ft* ( ) *ft*	( ) *ft* ( ) *ft* ( ) *ft*
c. Maximum Pier Scour: Main Channel Pier No.: (8) Floodplain Pier No.: ( )	Maximum Velocity Froude Number Main Channel Floodplain	(1.65) fps (0.10) (5.2) *ft* ( ) *ft*	(1.9) fps (0.11) (3.7) *ft* ( ) *ft*	( ) fps ( ) *ft* ( ) *ft* ( ) *ft*
d. Abutment Scour: (Looking Downstream) (x) Abutments Protected	Max Velocity at Abutments Left Abutment Right Abutment	(0.0) fps (---) *ft* (---) *ft*	(0.0) fps (---) *ft* (---) *ft*	( ) fps ( ) *ft* ( ) *ft*
e. Theoretical Total Scour: (Looking Downstream) 6b + 7b + (7c or 7d)	**Left Abutment Main Channel Pier Floodplain Pier Right Abutment**	**(0.0) ft (7.3) *ft* ( ) *ft* (0.0) *ft***	**(0.0) ft (7.0) *ft* ( ) *ft* (0.0) *ft***	**( ) ft ( ) *ft* ( ) *ft* ( ) *ft***
		See Table 2 in Section 3.0 for Summary of Results.		

f. Notes:

1. *Pier Scour maximum velocity was obtained from RS 465 (HEC-RAS) at upstream toe of abutment*
2. *Abutments are protected by sand-cement riprap, therefore no abutment scour was computed*
3.

APPENDIX A

HYDROLOGY



APPROXIMATE SCALE

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
POLK COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 545 OF 1025

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LAKE WALES, CITY OF	[illegible]	0545	G
POLK COUNTY	120261	0545	G

Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.

MAP NUMBER
12105C0545G

MAP REVISED:
NOVEMBER 19, 2003

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

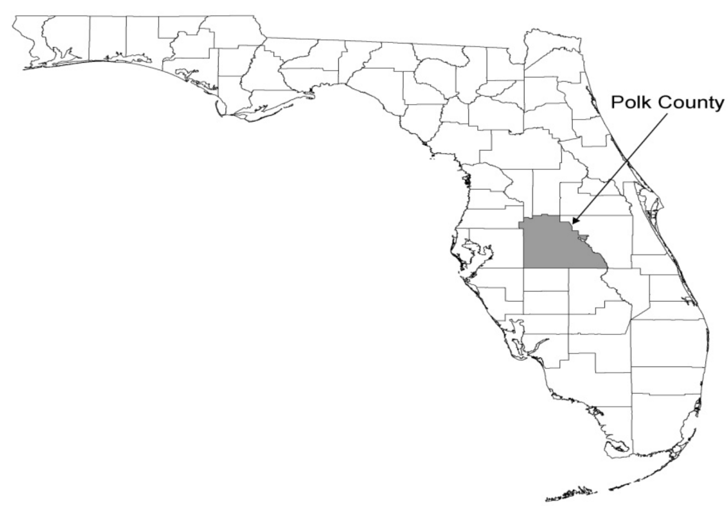
FLOOD INSURANCE STUDY

VOLUME 1 OF 2

POLK COUNTY, FLORIDA

AND INCORPORATED AREAS

Community Name	Community Number
AUBURNDALE, CITY OF	120262
BARTOW, CITY OF	120263
DAVENPORT, CITY OF	120410
DUNDEE, TOWN OF	120409
EAGLE LAKE, CITY OF	120385
FORT MEADE, CITY OF	120264
FROSTPROOF, CITY OF	120265
HAINES CITY, CITY OF	120266
HILLCREST HEIGHTS, TOWN OF	120666
LAKE ALFRED, CITY OF	120667
LAKE HAMILTON, TOWN OF	120414
LAKE WALES, CITY OF	120390
LAKELAND, CITY OF	120267
MULBERRY, CITY OF	120268
POLK CITY, TOWN OF	120665
POLK COUNTY (UNINCORPORATED AREAS)	120261
THE VILLAGE OF HIGHLAND PARK, CITY OF	120386
WINTER HAVEN, CITY OF	120271



EFFECTIVE: September 28, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
12105CV001B

TABLE 4 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
LAKE PARKER TRIBUTARY	3.5	120	165	195	275
LAKE ROSALIE TRIBUTARY					
Below confluence of North Fork Lake Rosalie Tributary	6.5	292	658	713	1,180
Above confluence of North Fork Lake Rosalie Tributary	2.5	227	513	524	835
MUD LAKE DRAIN					
At cross-section A	1.89	44	69	84	111
NORTH FORK LAKE ROSALIE TRIBUTARY	4.0	65	145	189	346
NORTH PRONG ALAFIA RIVER					
At county boundary	64.4	4,140	7,320	8,980	13,500
Above confluence of Poley Creek	39.0	2,170	4,000	4,950	8,050
PEACE CREEK DRAINAGE CANAL					
At confluence with Peace River	215.2	2,262	3,138	3,547	4,427
At confluence of Gaskin Branch	207	2,304	3,321	3,841	4,456
At confluence of Wahneta Farms Canal	197.2	2,299	3,331	3,854	5,263
At State Route 655	149.4	1,696	2,554	2,995	4,136
At State Route 60 (west bridge)	141.0	1,429	2,134	2,494	3,397
At confluence of Peace Creek Drainage Canal Tributary 2	94.9	903	1,356	1,591	2,136
At State Route 60 (east bridge)	94.9	903	1,356	1,591	2,136
At confluence of Lake Myrtle outfall	89.4	850	1,202	1,371	1,768
At divergence of Peace Creek Drainage Canal Tributary 2	80.2	690	960	1,136	1,436
At State Route 540	70.9	504	728	887	1,098

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Peace Creek Drainage Canal								
A	0	1,846	9,490	0.6	99.8	99.8	100.8	1.0
B	2,080	1,157	6,263	1.1	99.9	99.9	100.9	1.0
C	3,759	847	4,379	1.5	100.1	100.1	101.1	1.0
D	5,883	686	3,163	2.0	100.5	100.5	101.5	1.0
E	8,801	626	2,723	2.6	102.0	102.0	102.8	0.8
F	10,554	118	934	4.1	103.1	103.1	103.9	0.8
G	10,783	150	833	4.3	103.4	103.4	104.3	0.9
H	11,283	690	5,099	1.7	104.0	104.0	104.8	0.8
I	14,743	345	2,206	3.1	104.6	104.6	105.5	0.9
J	25,972	2,482	14,605	0.5	105.9	105.9	106.8	0.9
K	31,396	400	806	5.4	107.0	107.0	107.9	0.9
L	32,316	460	2,898	2.4	107.8	107.8	108.7	0.9
M	35,231	200	1,373	3.6	108.8	108.8	109.6	0.8
N	35,541	240	1,138	3.5	109.2	109.2	109.8	0.6
O	38,566	310	1,701	3.3	110.3	110.3	111.1	0.8
P	41,881	153	1,170	3.0	111.3	111.3	112.3	1.0
Q	42,150	200	1,581	3.3	111.6	111.6	112.5	0.9
R	49,569	1,700	10,670	0.4	112.2	112.2	113.2	1.0
S	52,639	1,211	9,864	0.4	112.2	112.2	113.2	1.0
T	60,229	350	1,565	1.4	112.3	112.3	113.3	1.0
U	61,247	245	1,129	1.7	112.6	112.6	113.5	0.9
V	62,020	155	506	3.1	113.1	113.1	113.8	0.7
W	67,243	61	438	3.2	115.2	115.2	115.8	0.6
X	73,844	65	492	2.6	116.9	116.9	117.4	0.5
Y	77,324	120	572	2.1	118.2	118.2	118.5	0.3
Z	83,724	615	1,101	1.8	119.5	119.5	120.1	0.6

[1]Feet above confluence with Peace River

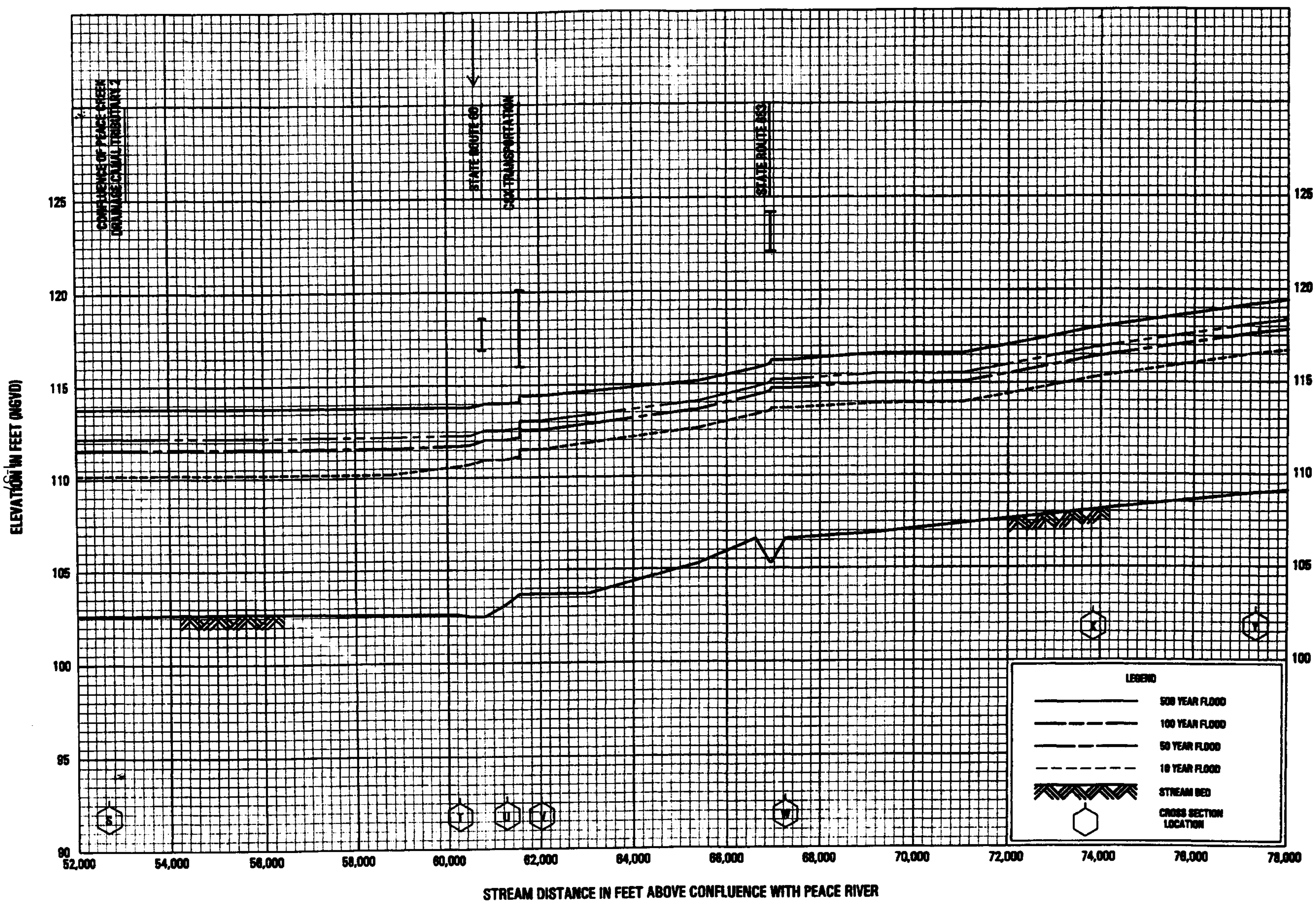
FEDERAL EMERGENCY MANAGEMENT AGENCY

POLK COUNTY, FL AND INCORPORATED AREAS

FLOODWAY DATA

PEACE CREEK DRAINAGE CANAL

TABLE 7



FLOOD PROFILES

PEACE CREEK DRAINAGE CANAL

FEDERAL EMERGENCY MANAGEMENT AGENCY

POLK COUNTY, FL

AND INCORPORATED AREAS

39P

APPENDIX B

HYDRAULIC MODEL INPUT/OUTPUT

```
                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California

          X     X  XXXXXX    XXXX         XXXX       XX      XXXX
          X     X  X        X    X        X   X     X  X    X
          X     X  X        X             X   X    X    X   X
          XXXXXXX  XXXX     X        XXX  XXXX     XXXXXX    XXXX
          X     X  X        X             X  X     X    X       X
          X     X  X        X    X        X   X    X    X       X
          X     X  XXXXXX    XXXX         X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: 160045Ph2
Project File : 160045Ph2.prj
Run Date and Time: 3/19/2012 11:25:33 AM

Project in English units

Project Description:
Phase 2 Hydraulic Analysis for Bridge 160045

PLAN DATA

Plan Title: Scour Assessment
Plan File : f:\Projects\FDOT\District1_ScourUnknwnFndtns\Step 6.3 Ph2\Task9_State\160045\Model\160045Ph2.p01

Geometry Title: bridgegeom
Geometry File : f:\Projects\FDOT\District1_ScourUnknwnFndtns\Step 6.3 Ph2\Task9_State\160045\Model\160045Ph2.g01

Flow Title : flow
Flow File : f:\Projects\FDOT\District1_ScourUnknwnFndtns\Step 6.3 Ph2\Task9_State\160045\Model\160045Ph2.f01

Plan Description:
Hydraulic Analysis for Ph2 Scour Assesment

Plan Summary Information:

Number of:	Cross Sections =	4	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

```
Computational Information
    Water surface calculation tolerance =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations        =  20
    Maximum difference tolerance        =  0.3
    Flow tolerance factor               =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow
```

FLOW DATA

Flow Title: flow
Flow File : f:\Projects\FDOT\District1_ScourUnknwnFndtns\Step 6.3 Ph2\Task9_State\160045\Model\160045Ph2.f01

Flow Data (cfs)

	River	Reach	RS	100	500
I-40	Peace Creek	Relil	655	1591	2136

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Peace Creek	Relil	100		Normal S = 0.001
Peace Creek	Relil	500		Normal S = 0.001

GEOMETRY DATA

Geometry Title: bridgegeom
Geometry File : f:\Projects\FDOT\District1_ScourUnknwnFndtns\Step 6.3 Ph2\Task9_State\160045\Model\160045Ph2.g01

CROSS SECTION

RIVER: Peace Creek Reli
REACH: 1 RS: 655

INPUT
Description: Approach
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	115.12	172	115.3	214	107.7	267	106	350	106
391	108.4	447	111	608	111	837	112.8	1065	114.85

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	172	.03	447	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
172	447	70	190	330	.1	.3

CROSS SECTION OUTPUT Profile #100

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	112.95	Wt. n-Val.		0.030	0.035
Vel Head (ft)	0.01	Reach Len. (ft)	70.00	190.00	330.00
W.S. Elev (ft)	112.94	Flow Area (sq ft)		1391.10	551.06
Crit W.S. (ft)		Area (sq ft)		1391.10	551.06
E.G. Slope (ft/ft)	**0.000045**	Flow (cfs)		1399.18	191.82
Q Total (cfs)	1591.00	Top Width (ft)		261.95	405.43
Top Width (ft)	667.38	Avg. Vel. (ft/s)		1.01	0.35
Vel Total (ft/s)	0.82	Hydr. Depth (ft)		5.31	1.36
Max Chl Dpth (ft)	6.94	Conv. (cfs)		209394.5	28706.8
Conv. Total (cfs)	238101.2	Wetted Per. (ft)		262.58	405.43
Length Wtd. (ft)	198.44	Shear (lb/sq ft)		0.01	0.00
Min Ch El (ft)	106.00	Stream Power (lb/ft s)	1065.00	0.00	0.00
Alpha	1.35	Cum Volume (acre-ft)		11.80	2.09
Frctn Loss (ft)	0.01	Cum SA (acres)		2.67	1.54
C & E Loss (ft)	0.00				

I-41

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	114.08	Wt. n-Val.		0.030	0.035
Vel Head (ft)	0.01	Reach Len. (ft)	70.00	190.00	330.00
W.S. Elev (ft)	114.07	Flow Area (sq ft)		1690.11	1079.16
Crit W.S. (ft)		Area (sq ft)		1690.11	1079.16
E.G. Slope (ft/ft)	**0.000035**	Flow (cfs)		1698.10	437.90
Q Total (cfs)	2136.00	Top Width (ft)		268.18	530.89
Top Width (ft)	799.07	Avg. Vel. (ft/s)		1.00	0.41
Vel Total (ft/s)	0.77	Hydr. Depth (ft)		6.30	2.03
Max Chl Dpth (ft)	8.07	Conv. (cfs)		285094.4	73518.6
Conv. Total (cfs)	358612.9	Wetted Per. (ft)		268.91	530.90
Length Wtd. (ft)	204.35	Shear (lb/sq ft)		0.01	0.00
Min Ch El (ft)	106.00	Stream Power (lb/ft s)	1065.00	0.00	0.00
Alpha	1.41	Cum Volume (acre-ft)	0.20	14.90	4.20
Frctn Loss (ft)	0.01	Cum SA (acres)	0.37	2.88	2.40
C & E Loss (ft)	0.00				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Profile #100

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	172.00	185.75	0.00	0.04	0.71	0.00	0.06	0.05	0.00	0.00
2	Chan	185.75	199.50	7.15	18.85	13.97	0.45	1.37	0.38	0.00	0.00
3	Chan	199.50	213.25	40.11	53.06	13.97	2.52	3.86	0.76	0.01	0.01
4	Chan	213.25	227.00	71.63	74.69	13.77	4.50	5.43	0.96	0.02	0.01
5	Chan	227.00	240.75	81.70	80.80	13.76	5.13	5.88	1.01	0.02	0.02
6	Chan	240.75	254.50	92.17	86.86	13.76	5.79	6.32	1.06	0.02	0.02
7	Chan	254.50	268.25	103.10	92.90	13.76	6.48	6.76	1.11	0.02	0.02
8	Chan	268.25	282.00	107.81	95.41	13.75	6.78	6.94	1.13	0.02	0.02
9	Chan	282.00	295.75	107.81	95.41	13.75	6.78	6.94	1.13	0.02	0.02
10	Chan	295.75	309.50	107.81	95.41	13.75	6.78	6.94	1.13	0.02	0.02
11	Chan	309.50	323.25	107.81	95.41	13.75	6.78	6.94	1.13	0.02	0.02
12	Chan	323.25	337.00	107.81	95.41	13.75	6.78	6.94	1.13	0.02	0.02
13	Chan	337.00	350.75	107.77	95.39	13.75	6.77	6.94	1.13	0.02	0.02
14	Chan	350.75	364.50	96.39	89.27	13.77	6.06	6.49	1.08	0.02	0.02
15	Chan	364.50	378.25	77.31	78.20	13.77	4.86	5.69	0.99	0.02	0.02
16	Chan	378.25	392.00	59.96	67.14	13.77	3.77	4.88	0.89	0.01	0.01
17	Chan	392.00	405.75	46.16	57.38	13.76	2.90	4.17	0.80	0.01	0.01
18	Chan	405.75	419.50	35.00	48.60	13.76	2.20	3.53	0.72	0.01	0.01
19	Chan	419.50	433.25	25.12	39.82	13.76	1.58	2.90	0.63	0.01	0.01
20	Chan	433.25	447.00	16.58	31.05	13.76	1.04	2.26	0.53	0.01	0.00
21	ROB	447.00	653.00	156.05	391.41	206.00	9.81	1.90	0.40	0.01	0.00
22	ROB	653.00	859.00	35.77	159.65	199.43	2.25	0.80	0.22	0.00	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

Profile #500

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	172.00	185.75	0.88	4.35	7.05	0.04	0.63	0.20	0.00	0.00
2	Chan	185.75	199.50	17.46	34.36	13.97	0.82	2.50	0.51	0.01	0.00
3	Chan	199.50	213.25	55.23	68.57	13.97	2.59	4.99	0.81	0.01	0.01
4	Chan	213.25	227.00	88.09	90.20	13.77	4.12	6.56	0.98	0.01	0.01
5	Chan	227.00	240.75	98.31	96.31	13.76	4.60	7.00	1.02	0.02	0.02
6	Chan	240.75	254.50	108.84	102.37	13.76	5.10	7.45	1.06	0.02	0.02
7	Chan	254.50	268.25	119.75	108.41	13.76	5.61	7.88	1.10	0.02	0.02
8	Chan	268.25	282.00	124.44	110.92	13.75	5.83	8.07	1.12	0.02	0.02
9	Chan	282.00	295.75	124.44	110.92	13.75	5.83	8.07	1.12	0.02	0.02
10	Chan	295.75	309.50	124.44	110.92	13.75	5.83	8.07	1.12	0.02	0.02
11	Chan	309.50	323.25	124.44	110.92	13.75	5.83	8.07	1.12	0.02	0.02
12	Chan	323.25	337.00	124.44	110.92	13.75	5.83	8.07	1.12	0.02	0.02
13	Chan	337.00	350.75	124.40	110.90	13.75	5.82	8.07	1.12	0.02	0.02
14	Chan	350.75	364.50	113.05	104.78	13.77	5.29	7.62	1.08	0.02	0.02
15	Chan	364.50	378.25	93.86	93.71	13.77	4.39	6.82	1.00	0.02	0.02

16	Chan	378.25	392.00	76.13	82.65	13.77	3.56	6.01	0.92	0.01	0.01
17	Chan	392.00	405.75	61.77	72.89	13.76	2.89	5.30	0.85	0.01	0.01
18	Chan	405.75	419.50	49.87	64.11	13.76	2.33	4.66	0.78	0.01	0.01
19	Chan	419.50	433.25	39.02	55.33	13.76	1.83	4.02	0.71	0.01	0.01
20	Chan	433.25	447.00	29.26	46.56	13.76	1.37	3.39	0.63	0.01	0.00
21	ROB	447.00	653.00	293.35	623.79	206.00	13.73	3.03	0.47	0.01	0.00
22	ROB	653.00	859.00	135.15	391.83	206.01	6.33	1.90	0.34	0.00	0.00
23	ROB	859.00	1065.00	9.40	63.54	118.89	0.44	0.53	0.15	0.00	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Peace Creek Reli
REACH: 1 RS: 465

INPUT
Description: Upstream Bridge - abutment toe
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-385	116.4	-117	116.2	0	107.7	15	107.4	30	107.1
45	107.7	60	105.8	75	105.2	90	105.5	105	104.6
120	105.2	135	108.6	150	113.06	195	115	537	115.15

I-43

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-385	.035	-117	.03	195	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-117	195	165	165	165	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-385	0	120	F
150	537	120	F

CROSS SECTION OUTPUT Profile #100

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	112.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.		0.030	
W.S. Elev (ft)	112.89	Reach Len. (ft)	35.00	35.00	35.00
Crit W.S. (ft)	107.90	Flow Area (sq ft)		921.36	
E.G. Slope (ft/ft)	0.000109	Area (sq ft)		1106.75	
Q Total (cfs)	1591.00	Flow (cfs)		1591.00	
Top Width (ft)	220.87	Top Width (ft)		220.87	
Vel Total (ft/s)	1.73	Avg. Vel. (ft/s)		1.73	
Max Chl Dpth (ft)	8.29	Hydr. Depth (ft)		6.17	
Conv. Total (cfs)	152635.8	Conv. (cfs)		152635.8	
Length Wtd. (ft)	35.00	Wetted Per. (ft)		150.63	
Min Ch El (ft)	104.60	Shear (lb/sq ft)		0.04	

Alpha	1.00	Stream Power (lb/ft s)	537.00	0.00	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		6.36	
C & E Loss (ft)	0.01	Cum SA (acres)		1.62	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	114.06	Wt. n-Val.		0.030	
Vel Head (ft)	0.06	Reach Len. (ft)	35.00	35.00	35.00
W.S. Elev (ft)	114.00	Flow Area (sq ft)		1088.30	
Crit W.S. (ft)	108.26	Area (sq ft)		1372.07	
E.G. Slope (ft/ft)	0.000113	Flow (cfs)		2136.00	
Q Total (cfs)	2136.00	Top Width (ft)		258.64	
Top Width (ft)	258.64	Avg. Vel. (ft/s)		1.96	
Vel Total (ft/s)	1.96	Hydr. Depth (ft)		7.26	
Max Chl Dpth (ft)	9.40	Conv. (cfs)		200930.1	
Conv. Total (cfs)	200930.1	Wetted Per. (ft)		151.22	
Length Wtd. (ft)	35.00	Shear (lb/sq ft)		0.05	
Min Ch El (ft)	104.60	Stream Power (lb/ft s)	537.00	0.00	0.00
Alpha	1.00	Cum Volume (acre-ft)	0.20	8.22	0.11
Frctn Loss (ft)	0.01	Cum SA (acres)	0.37	1.73	0.39
C & E Loss (ft)	0.01				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	-73.13	-58.50	0.00	6.08	12.97	0.00	0.47	0.00	0.00	0.00
2	Chan	-58.50	-43.88	0.00	21.52	14.66	0.00	1.47	0.00	0.01	0.00
3	Chan	-43.88	-29.25	0.00	37.06	14.66	0.00	2.53	0.00	0.02	0.00
4	Chan	-29.25	-14.63	0.00	52.60	14.66	0.00	3.60	0.00	0.02	0.00
5	Chan	-14.63	0.00	0.00	68.14	14.66	0.00	4.66	0.00	0.03	0.00
6	Chan	0.00	15.00	121.09	80.10	15.00	7.61	5.34	1.51	0.04	0.05
7	Chan	15.00	30.00	132.64	84.60	15.00	8.34	5.64	1.57	0.04	0.06
8	Chan	30.00	45.00	126.76	82.35	15.01	7.97	5.49	1.54	0.04	0.06
9	Chan	45.00	60.00	152.02	92.10	15.12	9.55	6.14	1.65	0.04	0.07
10	Chan	60.00	75.00	208.01	110.85	15.01	13.07	7.39	1.88	0.05	0.09
11	Chan	75.00	90.00	215.18	113.10	15.00	13.53	7.54	1.90	0.05	0.10
12	Chan	90.00	105.00	229.40	117.60	15.03	14.42	7.84	1.95	0.05	0.10
13	Chan	105.00	120.00	236.92	119.85	15.01	14.89	7.99	1.98	0.05	0.11
14	Chan	120.00	135.00	144.23	89.85	15.38	9.07	5.99	1.61	0.04	0.06
15	Chan	135.00	150.00	24.76	30.95	15.05	1.56	2.15	0.80	0.01	0.01

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	-87.75	-73.13	0.00	6.76	13.67	0.00	0.50	0.00	0.00	0.00
2	Chan	-73.13	-58.50	0.00	22.26	14.66	0.00	1.52	0.00	0.01	0.00
3	Chan	-58.50	-43.88	0.00	37.80	14.66	0.00	2.58	0.00	0.02	0.00
4	Chan	-43.88	-29.25	0.00	53.34	14.66	0.00	3.65	0.00	0.03	0.00
5	Chan	-29.25	-14.63	0.00	68.88	14.66	0.00	4.71	0.00	0.03	0.00
6	Chan	-14.63	0.00	0.00	84.42	14.66	0.00	5.77	0.00	0.04	0.00
7	Chan	0.00	15.00	171.03	96.80	15.00	8.01	6.45	1.77	0.05	0.08
8	Chan	15.00	30.00	184.48	101.30	15.00	8.64	6.75	1.82	0.05	0.09
9	Chan	30.00	45.00	177.63	99.05	15.01	8.32	6.60	1.79	0.05	0.08
10	Chan	45.00	60.00	206.73	108.80	15.12	9.68	7.25	1.90	0.05	0.10
11	Chan	60.00	75.00	270.75	127.55	15.01	12.68	8.50	2.12	0.06	0.13
12	Chan	75.00	90.00	278.87	129.80	15.00	13.06	8.65	2.15	0.06	0.13
13	Chan	90.00	105.00	294.85	134.30	15.03	13.80	8.95	2.20	0.06	0.14
14	Chan	105.00	120.00	303.33	136.55	15.01	14.20	9.10	2.22	0.06	0.14
15	Chan	120.00	135.00	197.39	106.55	15.38	9.24	7.10	1.85	0.05	0.09
16	Chan	135.00	150.00	50.94	47.60	15.65	2.38	3.17	1.07	0.02	0.02
17	Chan	150.00	165.00	0.00	9.30	15.01	0.00	0.62	0.00	0.00	0.00
18	Chan	165.00	180.00	0.00	1.02	6.89	0.00	0.15	0.00	0.00	0.00

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Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Peace Creek Reli
REACH: 1 RS: 430

INPUT
Description: BR 160045
Distance from Upstream XS = 35
Deck/Roadway Width = 95
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-15	118.6	117.6	0	118.6	117.6	150	118.6	117.6
165	118.6	117.6						

Upstream Bridge Cross Section Data
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-385	116.4	-117	116.2	0	107.7	15	107.4	30	107.1
45	107.7	60	105.8	75	105.2	90	105.5	105	104.6
120	105.2	135	108.6	150	113.06	195	115	537	115.15

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-385	.035	-117	.03	195	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
-117	195	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-385	0	120	F
150	537	120	F

Downstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-15	118.6	117.6	0	118.6	117.6	150	118.6	117.6
165	118.6	117.6						

Downstream Bridge Cross Section Data
Station Elevation Data num= 14

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Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-330	117.8	0	112.7	66	108.9	100	105.4	104	104.4
115	104.4	119	105.3	123	106.3	127	107.3	131	108.3
135	109.3	250	113.23	390	113.7	530	114.35		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-330	.035	0	.03	250	.045

Bank Sta: Left	Right	Coeff Contr.	Expan.
0	250	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-330	0	120	F
150	530	120	F

Upstream Embankment side slope = 6 horiz. to 1.0 vertical
Downstream Embankment side slope = 6 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Abutments = 2

Abutment Data
Upstream num= 5

```
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     -15   118.6        0   118.6        3     117       15   107.6       22     103
Downstream      num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     -15   118.6        0   118.6        3     117       15   107.6       22     103

Abutment Data
Upstream     num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     128     103      135   107.6      147     117      150   118.6      165   118.6
Downstream      num=      5
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     128     103      135   107.6      147     117      150   118.6      165   118.6

Number of Piers =  9

Pier Data
Pier Station     Upstream=      15     Downstream=      15
Upstream     num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   107.6       1.5  107.61       1.5   117.6
Downstream      num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   107.6       1.5  107.61       1.5   117.6

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Pier Data
Pier Station     Upstream=      30     Downstream=      30
Upstream     num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   106.3       1.5  106.31       1.5   117.6
Downstream      num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   106.3       1.5  106.31       1.5   117.6

Pier Data
Pier Station     Upstream=      45     Downstream=      45
Upstream     num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   106.3       1.5  106.31       1.5   117.6
Downstream      num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   106.3       1.5  106.31       1.5   117.6

Pier Data
Pier Station     Upstream=      60     Downstream=      60
Upstream     num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   106.3       1.5  106.31       1.5   117.6
Downstream      num=      4
    Width    Elev     Width    Elev     Width    Elev     Width    Elev
       2      86        2   106.3       1.5  106.31       1.5   117.6
```

```
Pier Data
Pier Station     Upstream=      75    Downstream=      75
Upstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6
Downstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6

Pier Data
Pier Station     Upstream=      90    Downstream=      90
Upstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6
Downstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6

Pier Data
Pier Station     Upstream=     105    Downstream=     105
Upstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6
Downstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6

Pier Data
Pier Station     Upstream=     120    Downstream=     120
Upstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6
Downstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  106.3      1.5  106.31     1.5   117.6

Pier Data
Pier Station     Upstream=     135    Downstream=     135
Upstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  107.6      1.5  107.61     1.5   117.6
Downstream       num=        4
    Width   Elev     Width   Elev    Width   Elev    Width   Elev
       2      86         2  107.6      1.5  107.61     1.5   117.6

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
```

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Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT Profile #100

E.G. US. (ft)	112.94	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	**112.89**	E.G. Elev (ft)	112.92	112.84
Q Total (cfs)	1591.00	W.S. Elev (ft)	112.85	112.68
Q Bridge (cfs)	**1591.00**	Crit W.S. (ft)	108.03	109.29
Q Weir (cfs)		Max Chl Dpth (ft)	8.21	8.28
Weir Sta Lft (ft)		Vel Total (ft/s)	**2.12**	3.15
Weir Sta Rgt (ft)		Flow Area (sq ft)	750.05	505.77
Weir Submerg		Froude # Chl	**0.15**	0.27
Weir Max Depth (ft)		Specif Force (cu ft)	2621.84	1563.82
Min El Weir Flow (ft)	118.61	Hydr Depth (ft)	**6.25**	4.23
Min El Prs (ft)	118.60	W.P. Total (ft)	239.29	198.47
Delta EG (ft)	0.15	Conv. Total (cfs)	79568.3	46737.5
Delta WS (ft)	0.21	Top Width (ft)	**119.91**	119.48
BR Open Area (sq ft)	1124.24	Frctn Loss (ft)	0.06	0.02
BR Open Vel (ft/s)	3.15	C & E Loss (ft)	0.03	0.02
Coef of Q		Shear Total (lb/sq ft)	0.08	0.18
Br Sel Method	Energy only	Power Total (lb/ft s)	-385.00	-330.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #500

E.G. US. (ft)	114.06	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	**114.00**	E.G. Elev (ft)	114.05	113.96
Q Total (cfs)	2136.00	W.S. Elev (ft)	113.96	113.78
Q Bridge (cfs)	**2136.00**	Crit W.S. (ft)	108.46	109.98
Q Weir (cfs)		Max Chl Dpth (ft)	9.32	9.38
Weir Sta Lft (ft)		Vel Total (ft/s)	**2.42**	3.34
Weir Sta Rgt (ft)		Flow Area (sq ft)	883.90	638.59
Weir Submerg		Froude # Chl	**0.16**	0.26
Weir Max Depth (ft)		Specif Force (cu ft)	3578.39	2258.65
Min El Weir Flow (ft)	118.61	Hydr Depth (ft)	**7.20**	5.22
Min El Prs (ft)	118.60	W.P. Total (ft)	262.72	221.81
Delta EG (ft)	0.15	Conv. Total (cfs)	98297.2	64010.3
Delta WS (ft)	0.22	Top Width (ft)	**122.73**	122.29

BR Open Area (sq ft)	1124.24	Frctn Loss (ft)	0.07	0.02
BR Open Vel (ft/s)	3.34	C & E Loss (ft)	0.02	0.03
Coef of Q		Shear Total (lb/sq ft)	0.10	0.20
Br Sel Method	Energy only	Power Total (lb/ft s)	-385.00	-330.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Peace Creek Reli
REACH: 1 RS: 300

INPUT
Description: Downstream Bridge - abutment toe
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-330	117.8	0	112.7	66	108.9	100	105.4	104	104.4
115	104.4	119	105.3	123	106.3	127	107.3	131	108.3
135	109.3	250	113.23	390	113.7	530	114.35		

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Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-330	.035	0	.03	250	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
0	250	427	300	177	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-330	0	120	F
150	530	120	F

CROSS SECTION OUTPUT Profile #100

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	112.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.030	
W.S. Elev (ft)	112.68	Reach Len. (ft)	427.00	300.00	177.00
Crit W.S. (ft)	109.04	Flow Area (sq ft)		598.77	
E.G. Slope (ft/ft)	0.000457	Area (sq ft)		719.18	
Q Total (cfs)	1591.00	Flow (cfs)		1591.00	
Top Width (ft)	233.62	Top Width (ft)		233.62	
Vel Total (ft/s)	2.66	Avg. Vel. (ft/s)		2.66	
Max Chl Dpth (ft)	8.28	Hydr. Depth (ft)		4.00	
Conv. Total (cfs)	74401.2	Conv. (cfs)		74401.2	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		150.69	
Min Ch El (ft)	104.40	Shear (lb/sq ft)		0.11	

Alpha	1.00	Stream Power (lb/ft s)	530.00	0.00	0.00
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)		3.75	
C & E Loss (ft)	0.05	Cum SA (acres)		1.08	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500

E.G. Elev (ft)	113.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.		0.030	
W.S. Elev (ft)	113.79	Reach Len. (ft)	427.00	300.00	177.00
Crit W.S. (ft)	109.82	Flow Area (sq ft)		764.72	
E.G. Slope (ft/ft)	0.000366	Area (sq ft)	38.28	991.37	46.02
Q Total (cfs)	2136.00	Flow (cfs)		2136.00	
Top Width (ft)	479.30	Top Width (ft)	70.39	250.00	158.91
Vel Total (ft/s)	2.79	Avg. Vel. (ft/s)		2.79	
Max Chl Dpth (ft)	9.39	Hydr. Depth (ft)		5.10	
Conv. Total (cfs)	111696.1	Conv. (cfs)		111696.1	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		151.01	
Min Ch El (ft)	104.40	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)	530.00	0.00	0.00
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	0.19	5.00	0.09
C & E Loss (ft)	0.06	Cum SA (acres)	0.34	1.16	0.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #100

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	0.00	250.00	1591.00	598.77	150.69	100.00	4.00	2.66	0.11	0.30

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

Profile #500

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	0.00	250.00	2136.00	764.72	151.01	100.00	5.10	2.79	0.12	0.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Peace Creek Reli
REACH: 1 RS: 0

INPUT
Description: Expanded XS
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	118.3	250	118.9	283	109.5	288	107.7	292	106.7
296	105.7	300	104.7	319	104.7	323	105.7	327	106.7
331	107.7	385	119.15	560	113.9	735	113.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	250	.03	385	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
250	385	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100

I-52

E.G. Elev (ft)	112.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.		0.030	
W.S. Elev (ft)	112.25	Reach Len. (ft)			
Crit W.S. (ft)	109.12	Flow Area (sq ft)		369.29	
E.G. Slope (ft/ft)	0.001002	Area (sq ft)		369.29	
Q Total (cfs)	1591.00	Flow (cfs)		1591.00	
Top Width (ft)	79.14	Top Width (ft)		79.14	
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)		4.31	
Max Chl Dpth (ft)	7.55	Hydr. Depth (ft)		4.67	
Conv. Total (cfs)	50268.1	Conv. (cfs)		50268.1	
Length Wtd. (ft)		Wetted Per. (ft)		81.06	
Min Ch El (ft)	104.70	Shear (lb/sq ft)		0.28	
Alpha	1.00	Stream Power (lb/ft s)	735.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #500

E.G. Elev (ft)	113.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.33	Wt. n-Val.		0.030	
W.S. Elev (ft)	113.34	Reach Len. (ft)			
Crit W.S. (ft)	109.84	Flow Area (sq ft)		460.08	
E.G. Slope (ft/ft)	0.001001	Area (sq ft)		460.08	
Q Total (cfs)	2136.00	Flow (cfs)		2136.00	
Top Width (ft)	88.08	Top Width (ft)		88.08	
Vel Total (ft/s)	4.64	Avg. Vel. (ft/s)		4.64	

Max Chl Dpth (ft)	8.64	Hydr. Depth (ft)		5.22	
Conv. Total (cfs)	67496.3	Conv. (cfs)		67496.3	
Length Wtd. (ft)		Wetted Per. (ft)		90.26	
Min Ch El (ft)	104.70	Shear (lb/sq ft)		0.32	
Alpha	1.00	Stream Power (lb/ft s)	735.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Profile #100

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	250.00	385.00	1591.00	369.29	81.06	100.00	4.67	4.31	0.28	1.23

Profile #500

	Pos	Left Sta (ft)	Right Sta (ft)	Flow (cfs)	Area (sq ft)	W.P. (ft)	Percent Conv	Hydr Depth(ft)	Velocity (ft/s)	Shear (lb/sq ft)	Power (lb/ft s)
1	Chan	250.00	385.00	2136.00	460.08	90.26	100.00	5.22	4.64	0.32	1.48

I-53

SUMMARY OF MANNING'S N VALUES

River:Peace Creek Reli

Reach	River Sta.	n1	n2	n3
1	655	.035	.03	.035
1	465	.035	.03	.035
1	430	Bridge		
1	300	.035	.03	.045
1	0	.04	.03	.05

SUMMARY OF REACH LENGTHS

River: Peace Creek Reli

Reach	River Sta.	Left	Channel	Right
1	655	70	190	330
1	465	165	165	165
1	430	Bridge		
1	300	427	300	177
1	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Peace Creek Reli

Reach	River Sta.	Contr.	Expan.
1	655	.1	.3
1	465	.3	.5
1	430	Bridge	
1	300	.3	.5
1	0	.1	.3

APPENDIX C

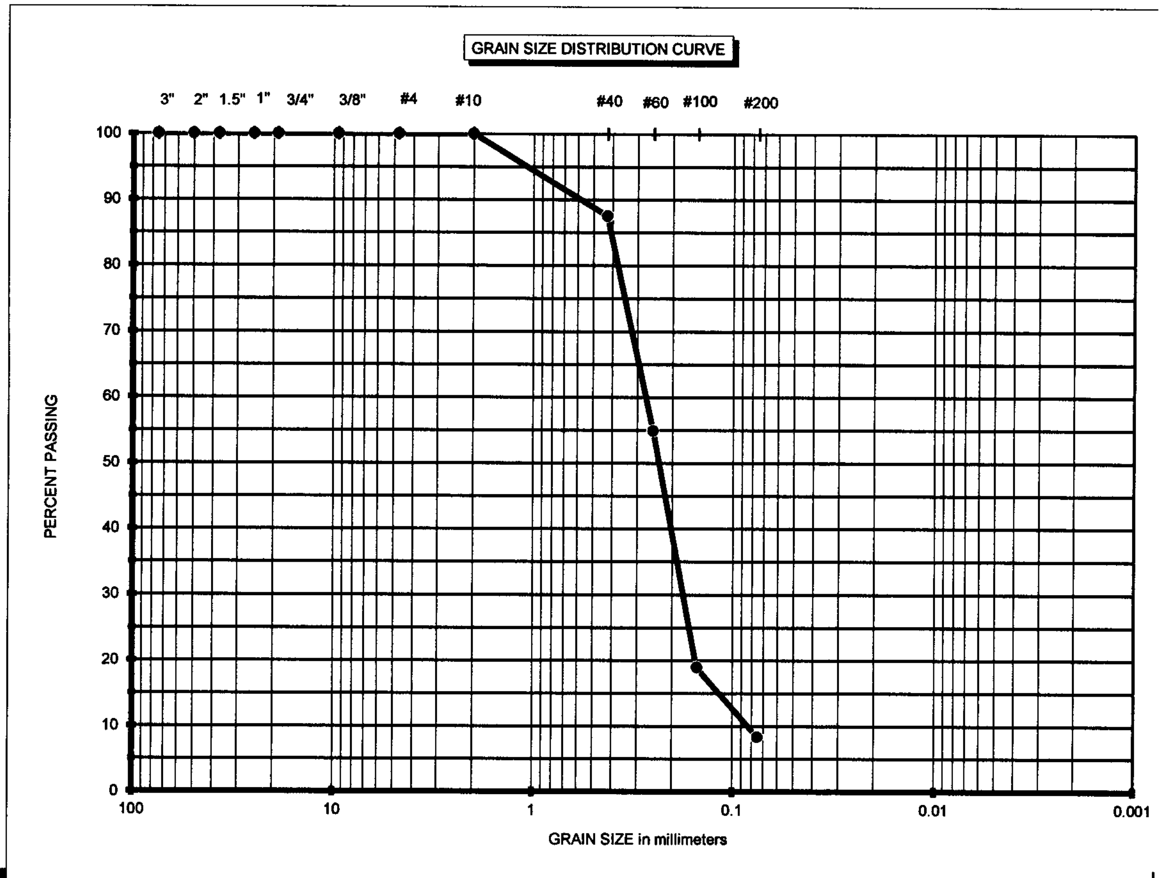
SCOUR CALCULATIONS

[redacted]

GRAIN SIZE DATA SHEET

PROJECT NAME: Phase III Scour Analysis **DATE:** 2/16/2012

PROJECT #: 6511-09-184



ASTM D 2487 Classification of Soil for Engineering Purposes			Coarse Sand	< #4 and > #10	Cu = D60 / D10
Coarse Gravel	< 3" and > 3/4"		Medium Sand	< #10 and > #40	Cc = (D30)^2 / (D10 x D60)
Fine Gravel	< 3/4" and > #4		Fine Sand	< #40 and > #200	

BORING # B - 160045 **OFFSET (ft)** **DEPTH (ft):** 0 - 1.0

SOIL CLASSIFICATION: SP-SM **D50 =** 0.23 mm

LIQUID LIMIT	
PLASTIC LIMIT	
PLASTIC INDEX	

k_1 = Exponent determined below

V_*/ω	k_1	Mode of Bed Material Transport
<0.50	0.59	Mostly contact bed material discharge
0.50 to 2.0	0.64	Some suspended bed material discharge
>2.0	0.69	Mostly suspended bed material discharge

V_* = $(\tau_o/\rho)^{½} = (g y_1 S_1)^{½}$, shear velocity in the upstream section, m/s (ft/s)
ω = Fall velocity of bed material based on the D_{50}, m/s (Figure 5.8)
For fall velocity in English units (ft/s) multiply ω in m/s by 3.28
g = Acceleration of gravity (9.81 m/s^2) (32.2 ft/s^2)
S_1 = Slope of energy grade line of main channel, m/m (ft/ft)

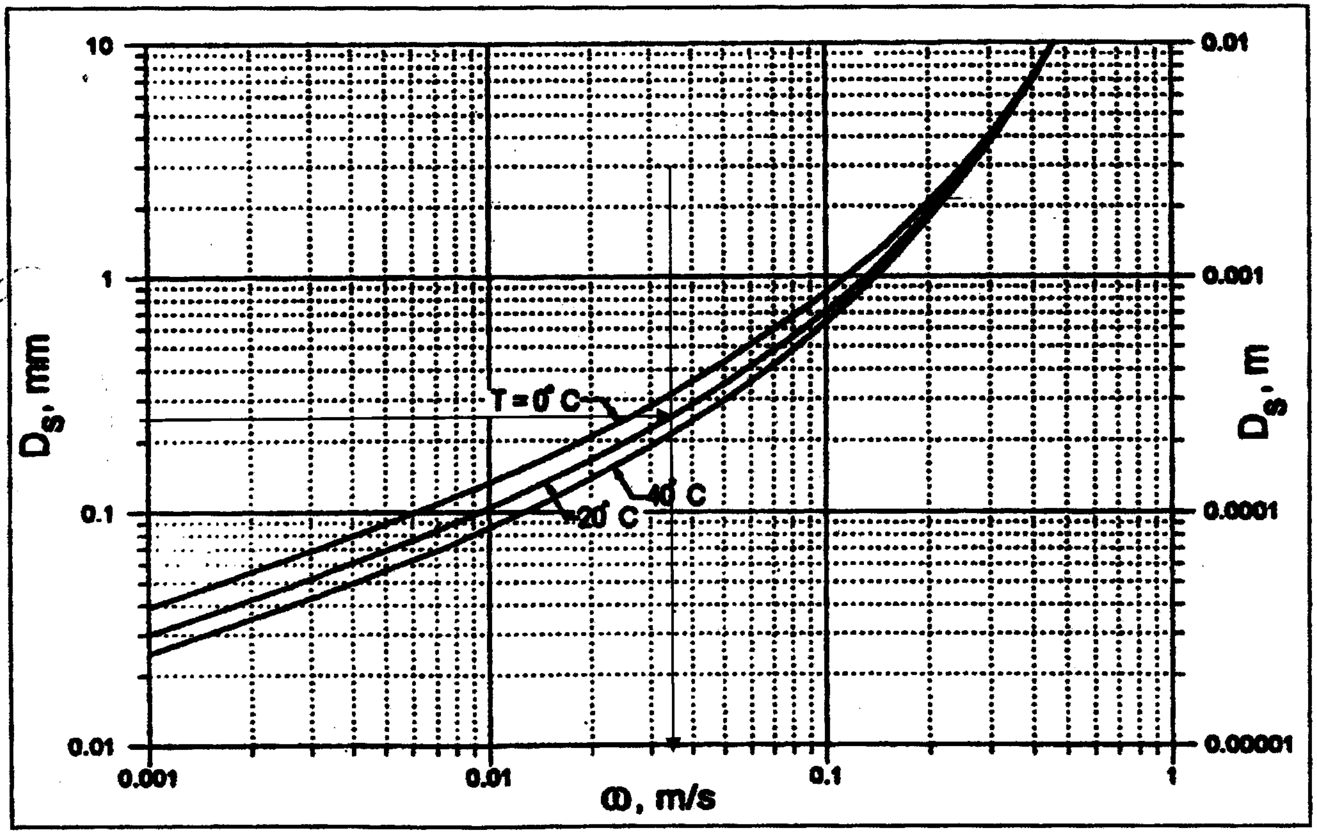


Figure 5.8. Fall velocity of sand-sized particles with specific gravity of 2.65 in metric units.

URS

Job 160045	Project No.	Page ___ of ___	
Description	Computed by ERG	Sheet 1 of 2	Date 3/11/2012
	Checked by	Date	

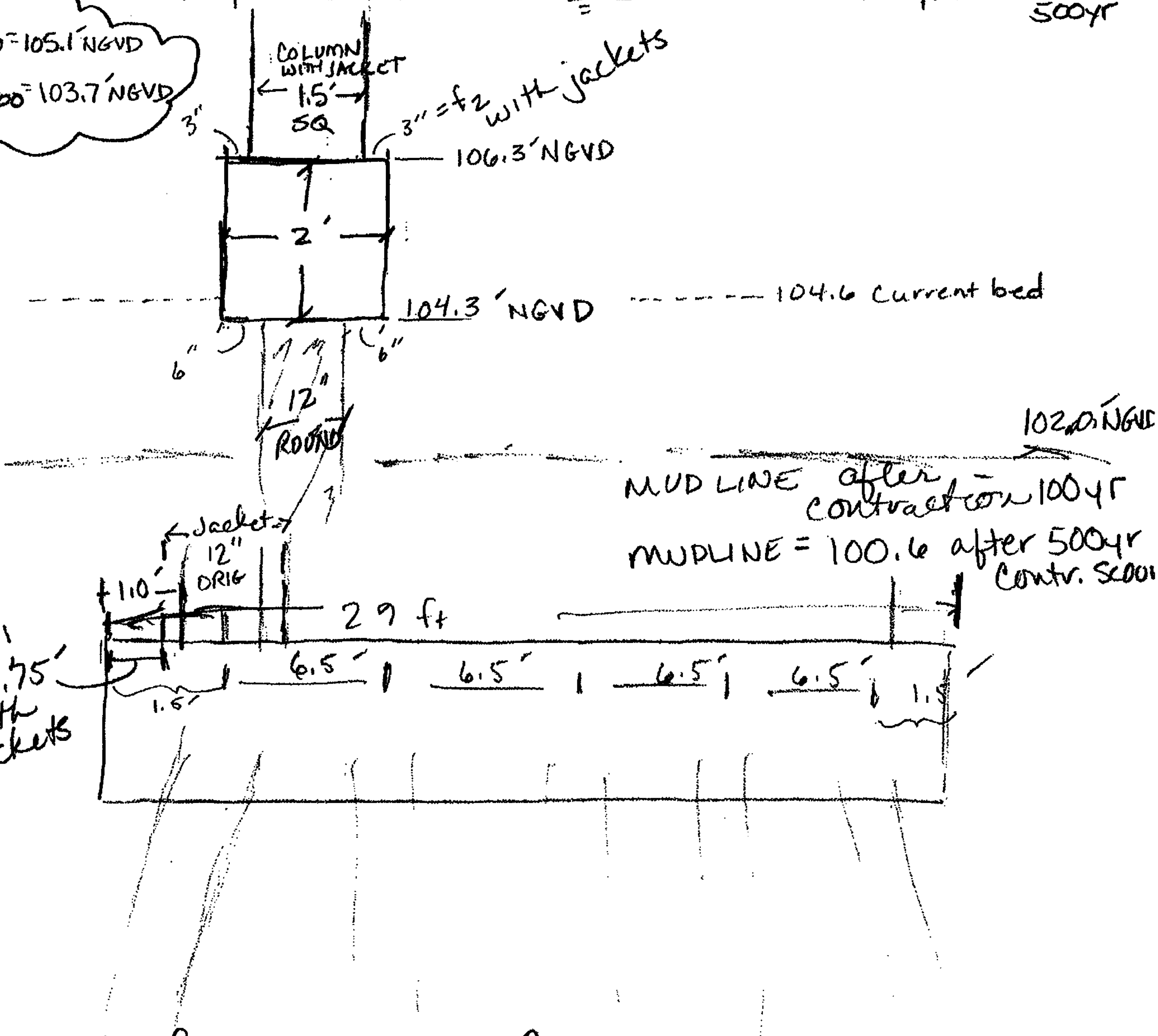
Reference

2.0 ft contraction scour will bRING ALL PILE CAPS TO AT OR ABOVE BED (except Bent 8 - Test Separately)

BENTS 8,9
$V = 1.65_{100y}$
$V = 1.9_{500y}$

scoured bed 100 = 105.1' NGVD
scoured bed 500 = 103.7' NGVD

ANALYZE BENT 4 ∇ 112.9 ft NGVD 100 YR 114 ft 500yr



L for cap = 29 ft
L for Columns = 5 x 1.5' = 7.5'

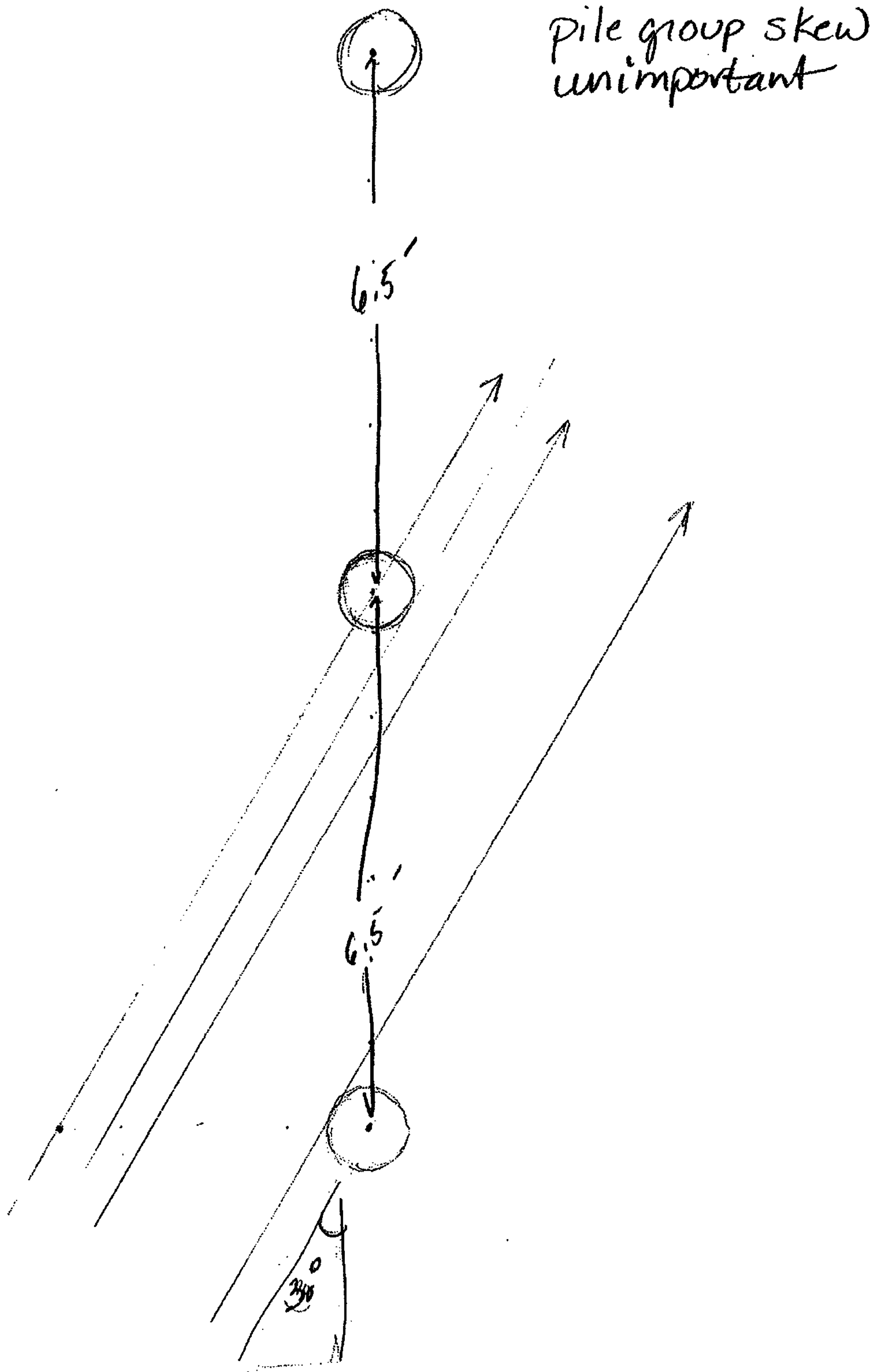
flow skew = 30°

URS

Job 160045	Project No.	Page ___ of ___
		Sheet 2 of 2
Description	Computed by ERG	Date 3/19/2012
	Checked by	Date

Reference

30° Flow angle is such that piles do not overlap in projected width.



Job:	Bridge # 160045	Project No. 12010451.00003			
Description:	Scour Analysis - 100-yr	Computed by: ERG		Date:	3/19/2012
		Revised by:	ERG	Date:	5/29/2012

100-YEAR

Contraction Scour

18-inch square columns - 9 bents in channel

$$\frac{Y_2}{Y_1} = \left(\frac{Q_2}{Q_1}\right)^{6/7}\left(\frac{W_1}{W_2}\right)^{k1}$$

$$Y_s = Y_2 - Y_0$$

$$y_2 = \left[\frac{K_u\, Q^2}{D_m^{2/3}\, W^2}\right]^{3/7}$$

Clear Water

$$Vc = 11.17\, y^{1/6}\, D_{50}^{1/3}$$

Live Bed

INPUT DATA

		Channel	
Y1=	Approach Average Depth (ft)	5.31	xs 655
V1=	Approach Velocity (ft/s)	1.01	xs 655
Y0=	Br Average Depth (ft)	6.25	xs 430
Q2=	Br. Opening flow (cfs)	1591.0	xs 430
W2=water width -pier width =	Br. Top Width (ft)	119.91	xs 430
D50=fine sand=	Grain Size D50 (ft)	0.00075	Tierra
Q1=	Approach Flow (cfs)	1399.2	xs 655
W1=	Approach Top width (ft)	262.0	xs 655
K1=	K1 Coefficient	0.64	HEC-18
V*=	Shear Vel (fps)	0.09	
ω=	Fall velocity (fps)	0.11	HEC-18
S_1=	EGL slope (ft/ft)	0.00005	xs 655
V*/ω =		0.81	

Results

Live Bed Ys = Y2 - Y0 =	Scour Depth Ys (ft)		**N/A**
Vc=	Critical Velocity (ft/s)		1.35
		V<Vc	**Clear-water**
Clear-Water Ys = Y2 - Y0 =	Scour Depth Ys (ft)		**2.1**

Checked by: REJ
Date: 5/29/12

Source: Tierra Inc Grain Size Data Sheet dated 2/16/2012

D50			
mm	cm	in	ft
0.23	0.023	0.00906	0.000754593

3.28 converts Fig 5.8 fall vel to ft/s

Checked by:__REJ______
Date: _____3/19/12_______

100-YEAR

Abutment Scour

Left Abutment ***N/A protected***

$$\frac{Ys}{Ya} = 2.27 K_1 K_2 \left(\frac{L'}{Ya}\right)^{0.43} Fr^{0.61} + 1$$

Froehlich

INPUT DATA

K1= Coefficient for abutment shape	0.55	spill thru
K2= Coefficient for angle of embankment to flow	0.00	degree
L'= Length of abutment projected normal to flow		
Ae= Flow area of the approach cross section obstructed by the embankment		
Fr= Froude number of approach flow upstream of the abutment=ve/(gye)^0.5	#DIV/0!	
Ve= Qe/Ae	#DIV/0!	
Qe= Flow obstructed by the abutment and approach embankment	0.0	
Ya= average depth of flow on the floodplain,ft	#DIV/0!	

Results

Ys= Scour depth, ft	**#DIV/0!**

Checked by: REJ
Date: 3/19/12

100-YEAR		
Abutment Scour	*Right Abutment*	*N/A protected*

$$\frac{Ys}{Ya} = 2.27\,K_1\,K_2\left(\frac{L'}{Ya}\right)^{0.43} Fr^{0.61} + 1$$

Froehlich

INPUT DATA

K1=	Coefficient for abutment shape	0.55	spill-thru	
K2=	Coefficient for angle of embankment to flow	0.00		degree
L'=	Length of abutment projected normal to flow			
Ae=	Flow area of the approach cross section obstructed by the embankment			
Fr=	Froude number of approach flow upstream of the abutment=ve/(gye)^0.5	#DIV/0!		
Ve=	Qe/Ae	#DIV/0!		
Qe=	Flow obstructed by the abutment and approach embankment	0.0		
Ya=	average depth of flow on the floodplain,ft	#DIV/0!		

Results

Ys=	Scour depth, ft	**#DIV/0!**

Checked by:__REJ______
Date: ____3/19/12_______

100-year scour at Bent 4

This Program was Developed for use with Cohesionless Sediment

Complex Pier ▾

English ▾

The local scour is	3.26 (ft)
The structures D* is	2.63 (ft)

Flow and Sediment	
D_{50} (mm)	0.23
Sediment Density (lb/ft^3)	165.41
Water Temp. (F^0)	60
Salinity (ppt)	0
Skew Angle	30
y_o (ft)	10.9
V (ft/s)	1.98

Column Data	
b_{col} (ft)	1.5
l_{col} (ft)	7.5
H_{col} (ft)	4.3
f_1 (ft)	0.75
f_2 (ft)	0.25
Shape	Rectangular

Complex Pier data

Pile Cap Data	
b_{pc} (ft)	2
l_{pc} (ft)	29
T (ft)	2
H_{pc} (ft)	2.3
Shape	Rectangular

Pile Group Data	
n	1
m	5
b (ft)	1
s_n (ft)	0
s_m (ft)	6
Pile	Circular
W_p (ft)	1
W_{pi} (ft)	1

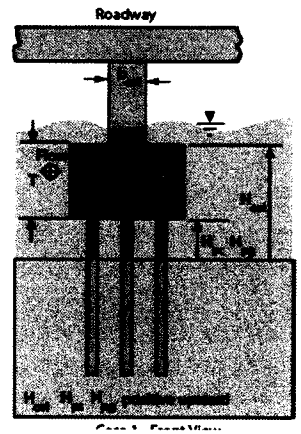
☐ No Column

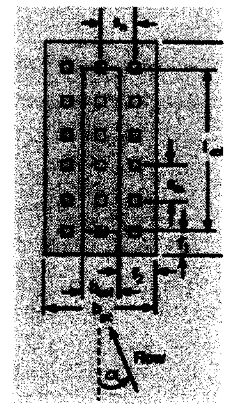
☐ No Pile Cap

☐ No Pile Group

Calculate Case 1 Scour

Reset Defaults





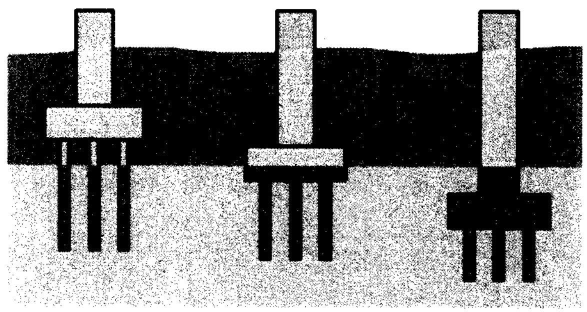
Top View

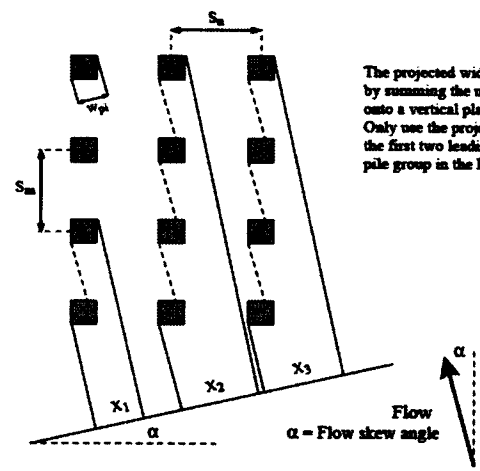
Typical Salinity Values

The average ocean salinity is 35 ppt. This number varies between about 32 and 37 ppt. Rainfall, evaporation, river runoff, and ice formation cause the variations. For example, the Black Sea is so diluted by river runoff, its average salinity is only 16 ppt.

Freshwater salinity is usually less than 0.5 ppt. Water between 0.5 ppt and 17 ppt is called brackish. Estuaries (where fresh river water meets salty ocean water) are examples of brackish waters.

Case 1 Pile Cap Above Bed — Case 2 Partially Buried Pile Cap — Case 3 Buried Pile Cap





The projected width of the pile group, W_p, is obtained by summing the unobstructed projections of the piles onto a vertical plane that is normal to the flow.
Only use the projections for piles in the first two rows and the first two leading edge columns. For the n = 3 x m = 4 pile group in the Figure $W_p = X_1 + X_2 + X_3$.

Critical Velocity and Live Bed Peak Velocity

	y_o (ft)	10.9
	Water density (lb/ft^3)	62.36
	Kinematic Viscosity (ft^2/s)	1.20877E-05
	D_{50} (mm)	0.23
	u_{*c} (ft/s)	0.043
	V_c (ft/s)	1.17
	V_{lp} (ft/s)	11.24
	V/V_c	1.69
	V_{lp}/V_c	9.58

Case 1 Column Calculations

A	Calculate K_s	0.91
B	Calculate K_α	3.37
C	Calculate $y_{1(max)}$ (ft)	10.9
D	Is $H_{col} > y_{1(max)}$	Continue on to step E
E	Calculate the pile cap extention coefficient, K_f	
	f (ft)	0.63
	f/b_{col}	0.42
	K_f	1
F	Calculate D^*_{col} (ft)	
	$h_{col}/(Y_{1(max)})$ (ft)	0.39
	D^*_{col} (ft)	0.5609

Case 1 Pile Cap Calculations

A	Calculate K_s	0.9
B	Calculate K_α	8.12
C	Calculate $y_{2(max)}$ (ft)	10.9
D	Is $H_{pc} > y_{2(max)}$	Continue on to step E
E	Calculate D^*_{pc}	
	$H_{col}/(y_{2(max)})$	0.39
	$H_{pc}/(y_{2(max)})$	0.21
	D^*_{pc} (ft)	1.069

Case 1 Pile Group Calculations

A	Calculate $y_{s(col+pc)}$	
	$D^*_{(col+pc)}$ (ft)	1.63
	$y_o/D^*_{col(max)}$	6.6875
	D^*/D_{50}	2158.81
	$f_1(y_o/D^*)$	0.97
	$f_2(V/V_c)$	0.67
	$f_3(D^*/D_{50})$	0.5379
	$y_{s(col+pc)}$ (ft)	2.2407
B	Calculate and (ft)	
		13.14
		4.54
C	Calculate the shape factor for the pile group, K_s	

s/b	6
$K_{s(pile)}$	1
$K_{s(pile\ group)}$	1
K_s	1
D Calculate W_p (ft)	1
E Calculate the pile spacing coefficient, K_{sp}	1
F Calculate K_m	1
G Calculate (ft)	1
H Calculate K_h	
	4.54
K_h	1
I Calculate D^*_{pg} (ft)	1

Case 1 Complex Pier Scour

A Calculate the overall effective diameter, D^*	2.63
B Calculate $y_{s(col+pc+pg)}$	
$D^*_{(col+pc+pg)}$ (ft)	2.63
y_o/D^*	4.14
D^*/D_{50}	3287.38
$f_1(y_o/D^*)$	0.94
$f_2(D^*/D_{50})$	0.67
$y_{s(col+pc+pg)}$ (ft)	3.26

Case 1 Complex Pier

Critical Velocity and Live Bed Peak Velocity

y_o (ft)	4.8
Water density (lb/ft^3)	62.36
Kinematic viscosity (ft^2/s)	1.20877E-05
D_{50} (mm)	0.2
u_{*c} (ft/s)	0.043
V_c (ft/s)	1.09
V_{lp} (ft/s)	7.46
V/V_c	0.55
V_{lp}/V_c	6.87

Case 1 Column Calculations

A Calculate K_s	No column is present	
B Calculate K_α	No column is present	
C Calculate $y_{1(max)}$ (ft)	No column is present	
D Is $H_{col} > y_{1(max)}$	No column is present	
E Calculate the pile cap extention coefficient, K_f	No column is present	
f (ft)	No column is present	
f/b_{col}	No column is present	
K_f	No column is present	
F Calculate D^*_{col} (ft)	No column is present	
$h_{col}/(Y_{1(max)})$ (ft)	No column is present	
D^*_{col} (ft)		0

Case 1 Pile Cap Calculations

A Calculate K_s	No pile cap is present	
B Calculate K_α	No pile cap is present	
C Calculate $y_{2(max)}$ (ft)	No pile cap is present	
D Is $H_{pc} > y_{2(max)}$	No pile cap is present	
E Calculate D^*_{pc}	No pile cap is present	
$H_{col}/(y_{2(max)})$	No pile cap is present	
$H_{pc}/(y_{2(max)})$	No pile cap is present	
D^*_{pc} (ft)		0

Case 1 Pile Group Calculations

A Calculate $y_{s(col+pc)}$	
$D^*_{(col+pc)}$ (ft)	0.00
$y_o/D^*_{col(max)}$	0
D^*/D_{50}	0.00
$f_1(y_o/D^*)$	0.00
$f_2(V/V_c)$	0
$f_3(D^*/D_{50})$	0
$y_{s(col+pc)}$ (ft)	
B Calculate $\hat{y}_o$ and $\hat{H}_{pg}$ (ft)	
$\hat{y}_o$ (ft)	4.8
$\hat{H}_{pg}$ (ft)	4.8

C Calculate the shape factor for the pile group, K_s	
s/b	6
$K_{s(pile)}$	1.36
$K_{s(pile\ group)}$	1
K_s	1.2
D Calculate W_p (ft)	1
E Calculate the pile spacing coefficient, K_{sp}	1
F Calculate K_m	1.05
G Calculate $\bar{y}_{3max}$ (ft)	1.26
H Calculate K_h	
$\hat{H}pg$ / $\bar{y}_{3max}$	3.81
K_h	1
I Calculate D^*_{pg} (ft)	1.26

Case 1 Complex Pier Scour

A Calculate the overall effective diameter, D^*	1.26
B Calculate $y_{s(col+pc+pg)}$	
$D^*_{(col+pc+pg)}$ (ft)	1.26
y_o/D^*	3.81
D^*/D_{50}	1800
$f_1(y_o/D^*)$	0.94
$f_2(D^*/D_{50})$	0.57
$\mathbf{y_{s(col+pc+pg)}}$ **(ft)**	0.94

Case 1 Complex Pier

100-year scour at Bent 8

This Program was Developed for use with Cohesionless Sediment

Complex Pier

English

The local scour is	5.191 (ft)
The structures D* is	5.726 (ft)

Flow and Sediment	
D_{50} (mm)	0.23
Sediment Density (lb/ft^3)	165.41
Water Temp. (F^o)	60
Salinity (ppt)	0
Skew Angle	30
y_o (ft)	7.8
V (ft/s)	1.65

Column Data	
b_{col} (ft)	1.5
l_{col} (ft)	7.5
H_{col} (ft)	1.2
f_1 (ft)	0.75
f_2 (ft)	0.25
Shape	Rectangular

Complex Pier data

Pile Cap Data	
b_{pc} (ft)	2
l_{pc} (ft)	29
T (ft)	2
H_{pc} (ft)	-0.8
Shape	Rectangular

Pile Group Data	
n	1
m	5
b (ft)	1
s_n (ft)	0
s_m (ft)	6
Pile	Circular
W_p (ft)	1
W_{pi} (ft)	1

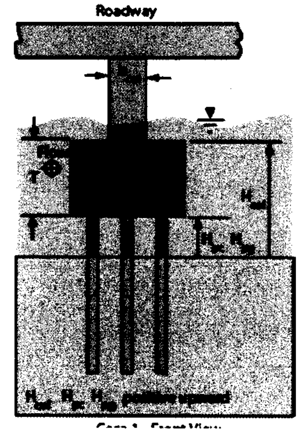
No Column

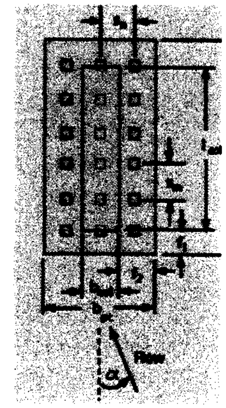
No Pile Cap

No Pile Group

Calculate Case 2 Scour

Reset Defaults





Top View

Typical Salinity Values

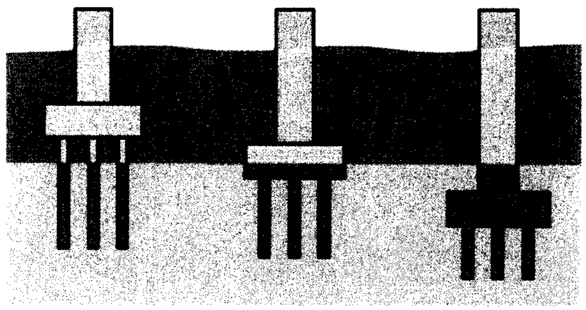
The average ocean salinity is 35 ppt. This number varies between about 32 and 37 ppt. Rainfall, evaporation, river runoff, and ice formation cause the variations. For example, the Black Sea is so diluted by river runoff, its average salinity is only 16 ppt.

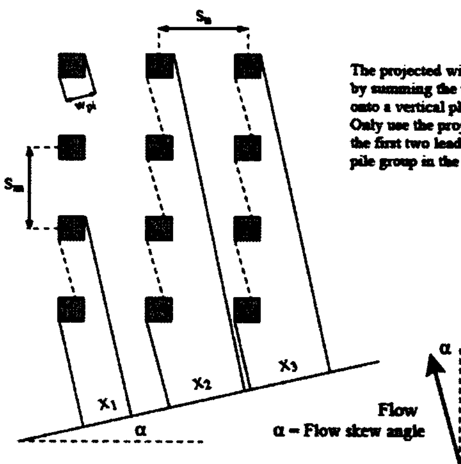
Freshwater salinity is usually less than 0.5 ppt. Water between 0.5 ppt and 17 ppt is called brackish. Estuaries (where fresh river water meets salty ocean water) are examples of brackish waters.

Case 1
Pile Cap Above Bed

Case 2
Partially Buried Pile Cap

Case 3
Buried Pile Cap





The projected width of the pile group, W_p, is obtained by summing the unobstructed projections of the piles onto a vertical plane that is normal to the flow. Only use the projections for piles in the first two rows and the first two leading edge columns. For the n = 3 x m = 4 pile group in the Figure $W_p = X_1 + X_2 + X_3$.

Critical Velocity and Live Bed Peak Velocity

y_o (ft)	4.8
Water density (lb/ft^3)	62.36
Kinematic viscosity (ft^2/s)	1.20877E-05
D_{50} (mm)	0.2
u_{*c} (ft/s)	0.043
V_c (ft/s)	1.09
V_{lp} (ft/s)	7.46
V/V_c	0.55
V_{lp}/V_c	6.87

Case 1 Column Calculations

A	Calculate K_s	No column is present
B	Calculate K_α	No column is present
C	Calculate $y_{1(max)}$ (ft)	No column is present
D	Is $H_{col} > y_{1(max)}$	No column is present
E	Calculate the pile cap extention coefficient, K_f	No column is present
	f (ft)	No column is present
	f/b_{col}	No column is present
	K_f	No column is present
F	Calculate D^*_{col} (ft)	No column is present
	$h_{col}/(Y_{1(max)})$ (ft)	No column is present
	D^*_{col} (ft)	0

Case 1 Pile Cap Calculations

A	Calculate K_s	No pile cap is present
B	Calculate K_α	No pile cap is present
C	Calculate $y_{2(max)}$ (ft)	No pile cap is present
D	Is $H_{pc} > y_{2(max)}$	No pile cap is present
E	Calculate D^*_{pc}	No pile cap is present
	$H_{col}/(y_{2(max)})$	No pile cap is present
	$H_{pc}/(y_{2(max)})$	No pile cap is present
	D^*_{pc} (ft)	0

Case 1 Pile Group Calculations

A	Calculate $y_{s(col+pc)}$	
	$D^*_{(col+pc)}$ (ft)	0.00
	$y_o/D^*_{col(max)}$	0
	D^*/D_{50}	0.00
	$f_1(y_o/D^*)$	0.00
	$f_2(V/V_c)$	0
	$f_3(D^*/D_{50})$	0
	$y_{s(col+pc)}$ (ft)	
B	Calculate $\bar{y}_o$ and $\hat{H}_{pg}$ (ft)	
	$\bar{y}_o$ (ft)	4.8
	$\hat{H}_{pg}$ (ft)	4.8

C	Calculate the shape factor for the pile group, K_s	
	s/b	6
	$K_{s(pile)}$	1.36
	$K_{s(pile\ group)}$	1
	K_s	1.2
D	Calculate W_p (ft)	1
E	Calculate the pile spacing coefficient, K_{sp}	1
F	Calculate K_m	1.05
G	Calculate $\bar{y}_{3max}$ (ft)	1.26
H	Calculate K_h	
	$\hat{H}pg$ / $\bar{y}_{3max}$	3.81
	K_h	1
I	Calculate D^*_{pg} (ft)	1.26

Case 1 Complex Pier Scour

A	Calculate the overall effective diameter, D^*	1.26
B	Calculate $y_{s(col+pc+pg)}$	
	$D^*_{(col+pc+pg)}$ (ft)	1.26
	y_o/D^*	3.81
	D^*/D_{50}	1800
	$f_1(y_o/D^*)$	0.94
	$f_2(D^*/D_{50})$	0.57
	$y_{s(col+pc+pg)}$ (ft)	0.94

Case 1 Complex Pier

Critical Velocity and Live Bed Peak Velocity

y_o (ft)	7.8
Water density (lb/ft^3)	62.36
Kinematic Viscosity (ft^2/s)	1.20877E-05
D_{50} (mm)	0.23
u_{*c} (ft/s)	0.043
V_c (ft/s)	1.14
V_{lp} (ft/s)	9.5
V/V_c	1.45
V_{lp}/V_c	8.36

Case 1 Column Calculations

A Calculate K_s	0.91
B Calculate K_α	3.37
C Calculate $y_{1(max)}$ (ft)	7.8
D Is $H_{col} > y_{1(max)}$	Continue on to step E
E Calculate the pile cap extention coefficient, K_f	
f (ft)	0.62
f/b_{col}	0.41
K_f	1
F Calculate D^*_{col} (ft)	
$h_{col}/(Y_{1(max)})$ (ft)	0.15
D^*_{col} (ft)	1.018
G Calculate $y_{s(col)}$	
y_o/D^*_{col}	7.66
D^*/D_{50}	1348.34
$f_1(y_o/D^*)$	0.98
$f_2(V/V_c)$	0.84
$f_3(D^*/D_{50})$	0.59
$y_{s(col)}$ (ft)	1.5142

Case 2 Pile Cap Calculations

A Calculate K_s	0.9
B Calculate K_α	8.12
C Calculate $y_{2(max)}$ (ft)	7.8
D Calculate $y_{s(pc)(max)}$	
$D^*_{pc(max)}$ (ft)	14.616
$y_o/D^*_{pc(max)}$	0.5337
D^*/D_{50}	19358.9404
$f_1(y_o/D^*)$	0.6515
$f_2(V/V_c)$	0.84
$f_3(D^*/D_{50})$	0.3472
$y_{s(pc)(max)}$ (ft)	9.04
E Set i, $H'_{pc(i)}$, and $Y_{s[col+pc(i)]}$	

i		1
$H'_{pc(i)}$		-0.8
$Y_{s[col+pc(i)]}$		1.5142
F Calculate $D^*_{pc(i+1)}$		
$H_{col}/y_{2(max)}$		0.15
$H'_{pc(i)}/Y_{s(pc)(max)}$		-0.09
$D^*_{pc(i+1)}$ (ft)		3.1875
G Compute $D^*_{[col+pc(i+1)]}$ and $Y_{s[col+pc(i+1)]}$		
$D^*_{[col+pc(i+1)]}$		4.2055
$D^*_{[col+pc(i+1)]}/D_{50}$		5570.1987
$y_o/D^*_{[col+pc(i+1)]}$		1.8547
$f_1(y_o/D^*_{[col+pc(i+1)]})$		0.8566
$f_2(V/V_c)$		0.84
$f_3(D^*_{[col+pc(i+1)]}/D_{50})$		0.4453
$Y_{s[col+pc(i+1)]}$ (ft)		4.249
H Determine if the pile cap was uncovered initially		
$H'_{pc(i)} = H_{pc}$?	Yes	
$H'_{pc(i+1)}$	Stop, Proceed to Step J	
I Check for convergence		
$(Y_{s[col+pc](i+1)}-Y_{s[col+pc](i)})/Y_{s[col+pc](i)}$	NA	
i		1
J Pile cap summary		
D^*_{pc} (ft)		3.1875
Calculate $D^*_{(col+pc)}$ (ft)		4.2055
Calculate $y_{s(col+pc)}$ (ft)		4.249
K Determine if the Pile Group is exposed		Exposed

Case 2 Pile Group Calculations

A Calculate $\overline{H}_{pg}$ and $\overline{y}_0$ (ft)	
$\overline{H}_{pg}$	3.45
$\overline{y}_0$	12.05
B	
Calculate the shape factor for the pile group, K_s	
s/b	6
$K_{s(pile)}$	1
$K_{s(pile\ group)}$	1
K_s	1
C Calculate W_p (ft)	1
D Calculate the pile spacing coefficient, K_{sp}	1
E Calculate K_m	1
F Calculate $\overline{y}_{3max}$ (ft)	1
G Calculate K_h	1
H Calculate D^*_{pg} (ft)	1

Case 2 Complex Pier Scour

A Calculate the overall effective diameter, D^*	5.7260
B Calculate $y_{s(col+pc+pg)}$	
y_o/D^*	1.3622
D^*/D_{50}	7584.1722
$f_1(y_o/D^*)$	0.8116
$f_2(V/V_c)$	0.84
$f_3(D^*/D_{50})$	0.4187
$y_{s(col+pc+pg)}$ (ft)	**5.191**

Case 2 Comp

Iteration 1
0.15
-0.09
3.1875

4.2055
5570.1987
1.8547
0.8566
0.84
0.4453
4.249

Yes
Stop, Proceed to Step J

NA
1

Job:	Bridge # 160045	Project No.	12010451.00003		
Description:	Scour Analysis - 500-yr	Computed by:	ERG	Date:	3/19/2012
		Revised by:	ERG	Date:	5/29/2012

500-YEAR

Contraction Scour

18-inch square columns - 9 bents in channel

$$\frac{Y_2}{Y_1} = \left[\frac{Q_2}{Q_1}\right]^{6/7} \left[\frac{W_1}{W_2}\right]^{k1}$$

$$y_2 = \left[\frac{K_u Q^2}{D_m^{2/3} W^2}\right]^{3/7}$$

$$Y_s = Y_2 - Y_0$$

Clear Water

$$Vc = 11.17\, y^{1/6} D_{50}^{1/3}$$

Live Bed

INPUT DATA

		Channel	
Y1=	Approach Average Depth (ft)	6.30	xs 655
V1=	Approach Velocity (ft/s)	1.00	xs 655
Y0=	Br Average Depth (ft)	7.20	xs 430
Q2=	Br. Opening flow (cfs)	2136.0	xs 430
W2=water width -pier width =	Br. Top Width (ft)	122.73	xs 430
D50=fine sand=	Grain Size D50 (ft)	0.00075	Tierra
Q1=	Approach Flow (cfs)	1698.1	xs 655
W1=	Approach Top width (ft)	268.2	xs 655
K1=	K1 Coefficient	0.59	HEC-18
V*=	Shear Vel (fps)	0.00	
ω=	Fall velocity (fps)	0.11	HEC-18
S_1=	EGL slope (ft/ft)		xs 655
V*/ω =		0.00	

Results

Live Bed Ys = Y2 - Y0 =	Scour Depth Ys (ft)		**N/A**
Vc=	Critical Velocity (ft/s)		1.39
		V<Vc	**Clear-water**
Clear-Water Ys = Y2 - Y0 =	Scour Depth Ys (ft)		**3.3**

Checked by:___REJ____
Date: ___5/29/12_______

Source: Tierra Inc Grain Size Data Sheet dated 2/16/2012

D50			
mm	cm	in	ft
0.23	0.023	0.00906	0.000754593

3.28 converts Fig 5.8 fall vel to ft/s

Checked by:___REJ____
Date: ___3/19/12_______

Job:	Bridge # 160045	Project No.	12010451.00003		
Description:	Scour Analysis - 500-yr	Computed by:	ERG	Date:	3/19/2012
		Revised by:		Date:	

500-YEAR

Abutment Scour

Left Abutment ***N/A protected***

$$\frac{Ys}{Ya} = 2.27\, K_1\, K_2 \left(\frac{L'}{Ya}\right)^{0.43} Fr^{\,0.61} + 1$$

Froehlich

INPUT DATA

K1=	Coefficient for abutment shape	0.55	spill thru
K2=	Coefficient for angle of embankment to flow	0.00	degree
L'=	Length of abutment projected normal to flow		
Ae=	Flow area of the approach cross section obstructed by the embankment		
Fr=	Froude number of approach flow upstream of the abutment=ve/(gye)^0.5	#DIV/0!	
Ve=	Qe/Ae	#DIV/0!	
Qe=	Flow obstructed by the abutment and approach embankment	0.0	
Ya=	average depth of flow on the floodplain,ft	#DIV/0!	

Results

Ys=	Scour depth, ft	**#DIV/0!**

Checked by:___REJ____
Date: ___3/19/12_______

Simple ScourHEC18.xls

500-YEAR

Abutment Scour ***Right Abutment*** ***N/A protected***

$$\frac{Ys}{Ya} = 2.27\,K_1\,K_2\left(\frac{L'}{Ya}\right)^{0.43} Fr^{0.61} + 1$$

Froehlich

INPUT DATA

K1=	Coefficient for abutment shape	0.55	spill-thru
K2=	Coefficient for angle of embankment to flow	0.00	degree
L'=	Length of abutment projected normal to flow		
Ae=	Flow area of the approach cross section obstructed by the embankment		
Fr=	Froude number of approach flow upstream of the abutment=ve/(gye)^0.5	#DIV/0!	
Ve=	Qe/Ae	#DIV/0!	
Qe=	Flow obstructed by the abutment and approach embankment	0.0	
Ya=	average depth of flow on the floodplain,ft	#DIV/0!	

Results

Ys=	Scour depth, ft	**#DIV/0!**

Checked by:___REJ____
Date: ___3/19/12_______

500-year scour at Bent 4

This Program was Developed for use with Cohesionless Sediment

Complex Pier

English

The local scour is	3.04 (ft)
The structures D* is	2.33 (ft)

Flow and Sediment	
D_{50} (mm)	0.23
Sediment Density (lb/ft^3)	165.41
Water Temp. (F^o)	60
Salinity (ppt)	0
Skew Angle	30
y_o (ft)	13.4
V (ft/s)	2.22

Column Data	
b_{col} (ft)	1.5
l_{col} (ft)	7.5
H_{col} (ft)	5.7
f_1 (ft)	0.75
f_2 (ft)	0.25
Shape	Rectangular

Complex Pier data

Pile Cap Data	
b_{pc} (ft)	2
l_{pc} (ft)	29
T (ft)	2
H_{pc} (ft)	3.7
Shape	Rectangular

Pile Group Data	
n	1
m	5
b (ft)	1
s_n (ft)	0
s_m (ft)	6
Pile	Circular
W_p (ft)	1
w_{pi} (ft)	1

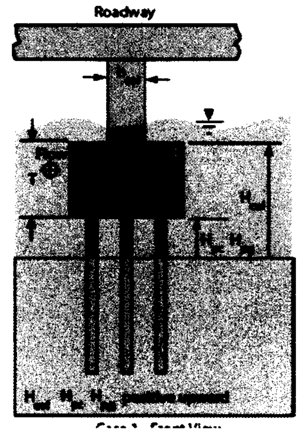
No Column

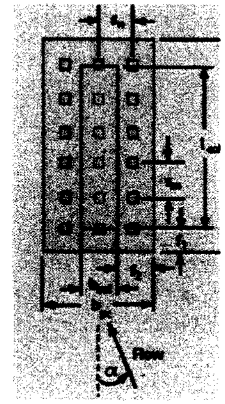
No Pile Cap

No Pile Group

Calculate Case 1 Scour

Reset Defaults

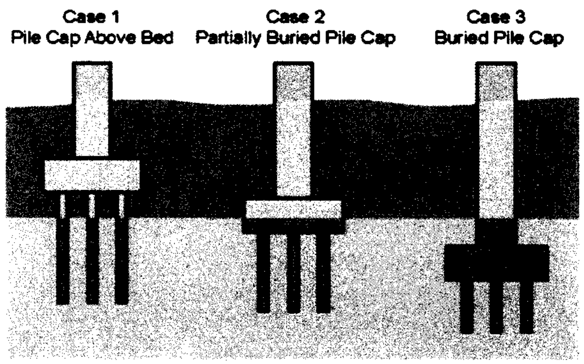


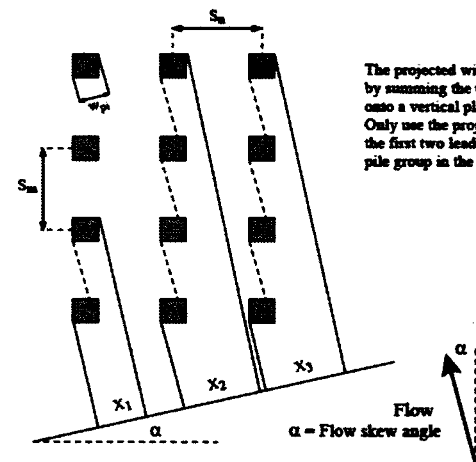

Top View

Typical Salinity Values

The average ocean salinity is 35 ppt. This number varies between about 32 and 37 ppt. Rainfall, evaporation, river runoff, and ice formation cause the variations. For example, the Black Sea is so diluted by river runoff, its average salinity is only 16 ppt.

Freshwater salinity is usually less than 0.5 ppt. Water between 0.5 ppt and 17 ppt is called brackish. Estuaries (where fresh river water meets salty ocean water) are examples of brackish waters.





The projected width of the pile group, W_p, is obtained by summing the unobstructed projections of the piles onto a vertical plane that is normal to the flow.
Only use the projections for piles in the first two rows and the first two leading edge columns. For the n = 3 x m = 4 pile group in the Figure $W_p = X_1 + X_2 + X_3$.

Critical Velocity and Live Bed Peak Velocity

y_o (ft)	13.4
Water density (lb/ft^3)	62.36
Kinematic Viscosity (ft^2/s)	1.20877E-05
D_{50} (mm)	0.23
u_{*c} (ft/s)	0.043
V_c (ft/s)	1.20
V_{lp} (ft/s)	12.46
V/V_c	1.86
V_{lp}/V_c	10.42

Case 1 Column Calculations

A Calculate K_s	0.91
B Calculate K_α	3.37
C Calculate $y_{1(max)}$ (ft)	13.4
D Is $H_{col} > y_{1(max)}$	Continue on to step E
E Calculate the pile cap extention coefficient, K_f	
f (ft)	0.63
f/b_{col}	0.42
K_f	1
F Calculate D^*_{col} (ft)	
$h_{col}/(Y_{1(max)})$ (ft)	0.43
D^*_{col} (ft)	0.5119

Case 1 Pile Cap Calculations

A Calculate K_s	0.9
B Calculate K_α	8.12
C Calculate $y_{2(max)}$ (ft)	13.4
D Is $H_{pc} > y_{2(max)}$	Continue on to step E
E Calculate D^*_{pc}	
$H_{col}/(y_{2(max)})$	0.43
$H_{pc}/(y_{2(max)})$	0.28
D^*_{pc} (ft)	0.8172

Case 1 Pile Group Calculations

A Calculate $y_{s(col+pc)}$	
$D^*_{(col+pc)}$ (ft)	1.33
$y_o/D^*_{col(max)}$	10.082
D^*/D_{50}	1760.40
$f_1(y_o/D^*)$	0.99
$f_2(V/V_c)$	0.55
$f_3(D^*/D_{50})$	0.5601
$y_{s(col+pc)}$ (ft)	1.9322
B Calculate and (ft)	
	15.33
	5.63
C Calculate the shape factor for the pile group, K_s	

	s/b	6
	$K_{s(pile)}$	1
	$K_{s(pile\ group)}$	1
	K_s	1
D	Calculate W_p (ft)	1
E	Calculate the pile spacing coefficient, K_{sp}	1
F	Calculate K_m	1
G	Calculate (ft)	1
H	Calculate K_h	
		5.63
	K_h	1
I	Calculate D^*_{pg} (ft)	1

Case 1 Complex Pier Scour

A	Calculate the overall effective diameter, D^*	2.33
B	Calculate $y_{s(col+pc+pg)}$	
	$D^*_{(col+pc+pg)}$ (ft)	2.33
	y_o/D^*	5.75
	D^*/D_{50}	2911.38
	$f_1(y_o/D^*)$	0.96
	$f_2(D^*/D_{50})$	0.55
	$y_{s(col+pc+pg)}$ (ft)	3.04

Case 1 Complex Pier

Critical Velocity and Live Bed Peak Velocity

y_o (ft)	4.8
Water density (lb/ft^3)	62.36
Kinematic viscosity (ft^2/s)	1.20877E-05
D_{50} (mm)	0.2
u_{*c} (ft/s)	0.043
V_c (ft/s)	1.09
V_{lp} (ft/s)	7.46
V/V_c	0.55
V_{lp}/V_c	6.87

Case 1 Column Calculations

A	Calculate K_s	No column is present	
B	Calculate K_α	No column is present	
C	Calculate $y_{1(max)}$ (ft)	No column is present	
D	Is $H_{col} > y_{1(max)}$	No column is present	
E	Calculate the pile cap extention coefficient, K_f	No column is present	
	f (ft)	No column is present	
	f/b_{col}	No column is present	
	K_f	No column is present	
F	Calculate D^*_{col} (ft)	No column is present	
	$h_{col}/(Y_{1(max)})$ (ft)	No column is present	
	D^*_{col} (ft)		0

Case 1 Pile Cap Calculations

A	Calculate K_s	No pile cap is present	
B	Calculate K_α	No pile cap is present	
C	Calculate $y_{2(max)}$ (ft)	No pile cap is present	
D	Is $H_{pc} > y_{2(max)}$	No pile cap is present	
E	Calculate D^*_{pc}	No pile cap is present	
	$H_{col}/(y_{2(max)})$	No pile cap is present	
	$H_{pc}/(y_{2(max)})$	No pile cap is present	
	D^*_{pc} (ft)		0

Case 1 Pile Group Calculations

A	Calculate $y_{s(col+pc)}$	
	$D^*_{(col+pc)}$ (ft)	0.00
	$y_o/D^*_{col(max)}$	0
	D^*/D_{50}	0.00
	$f_1(y_o/D^*)$	0.00
	$f_2(V/V_c)$	0
	$f_3(D^*/D_{50})$	0
	$y_{s(col+pc)}$ (ft)	
B	Calculate $\bar{y}_o$ and $\hat{H}_{pg}$ (ft)	
	$\bar{y}_o$ (ft)	4.8
	$\hat{H}_{pg}$ (ft)	4.8

C Calculate the shape factor for the pile group, K_s	
s/b	6
$K_{s(pile)}$	1.36
$K_{s(pile\ group)}$	1
K_s	1.2
D Calculate W_p (ft)	1
E Calculate the pile spacing coefficient, K_{sp}	1
F Calculate K_m	1.05
G Calculate $\bar{y}_{3max}$ (ft)	1.26
H Calculate K_h	
$\hat{H}pg$ / $\bar{y}_{3max}$	3.81
K_h	1
I Calculate D^*_{pg} (ft)	1.26

Case 1 Complex Pier Scour

A Calculate the overall effective diameter, D^*	1.26
B Calculate $y_{s(col+pc+pg)}$	
$D^*_{(col+pc+pg)}$ (ft)	1.26
y_o/D^*	3.81
D^*/D_{50}	1800
$f_1(y_o/D^*)$	0.94
$f_2(D^*/D_{50})$	0.57
$y_{s(col+pc+pg)}$ (ft)	0.94

Case 1 Complex Pier

500-year scour at Bent 8

This Program was Developed for use with Cohesionless Sediment

Complex Pier

English

The local scour is	3.73 (ft)
The structures D* is	3.23 (ft)

Flow and Sediment	
D_{50} (mm)	0.23
Sediment Density (lb/ft³)	165.41
Water Temp. (F°)	60
Salinity (ppt)	0
Skew Angle	30
y_o (ft)	9.2
V (ft/s)	1.9

Column Data	
b_{col} (ft)	1.5
l_{col} (ft)	7.5
H_{col} (ft)	2.6
f_1 (ft)	0.75
f_2 (ft)	0.25
Shape	Rectangular

Complex Pier data

Pile Cap Data	
b_{pc} (ft)	2
l_{pc} (ft)	29
T (ft)	2
H_{pc} (ft)	0.6
Shape	Rectangular

Pile Group Data	
n	1
m	5
b (ft)	1
s_n (ft)	0
s_m (ft)	6
Pile	Circular
W_p (ft)	1
w_{pi} (ft)	1

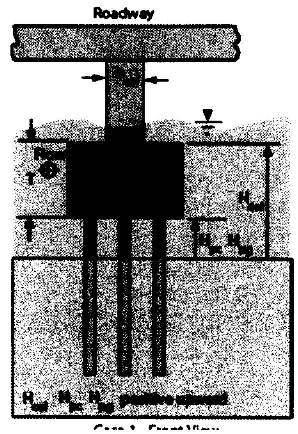
No Column

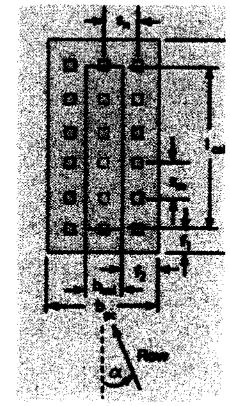
No Pile Cap

No Pile Group

Calculate Case 1 Scour

Reset Defaults



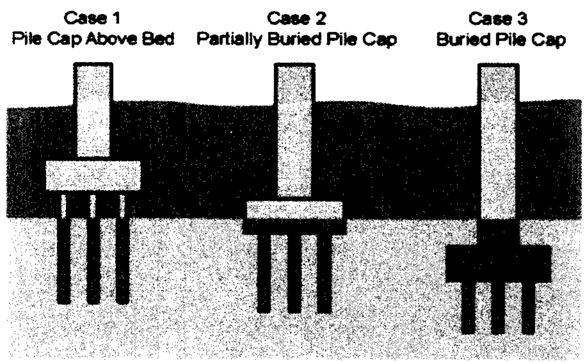


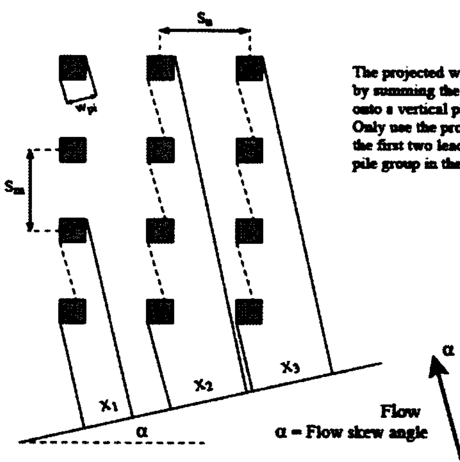
Top View

Typical Salinity Values

The average ocean salinity is 35 ppt. This number varies between about 32 and 37 ppt. Rainfall, evaporation, river runoff, and ice formation cause the variations. For example, the Black Sea is so diluted by river runoff, its average salinity is only 16 ppt.

Freshwater salinity is usually less than 0.5 ppt. Water between 0.5 ppt and 17 ppt is called brackish. Estuaries (where fresh river water meets salty ocean water) are examples of brackish waters.





The projected width of the pile group, W_p, is obtained by summing the unobstructed projections of the piles onto a vertical plane that is normal to the flow. Only use the projections for piles in the first two rows and the first two leading edge columns. For the n = 3 x m = 4 pile group in the Figure $W_p = X_1 + X_2 + X_3$.

Critical Velocity and Live Bed Peak Velocity

y_o (ft)	9.2
Water density (lb/ft^3)	62.36
Kinematic Viscosity (ft^2/s)	1.20877E-05
D_{50} (mm)	0.23
u_{*c} (ft/s)	0.043
V_c (ft/s)	1.15
V_{lp} (ft/s)	10.32
V/V_c	1.65
V_{lp}/V_c	8.94

Case 1 Column Calculations

A Calculate K_s	0.91
B Calculate K_α	3.37
C Calculate $y_{1(max)}$ (ft)	9.2
D Is $H_{col} > y_{1(max)}$	Continue on to step E
E Calculate the pile cap extention coefficient, K_f	
f (ft)	0.63
f/b_{col}	0.42
K_f	1
F Calculate D^*_{col} (ft)	
$h_{col}/(Y_{1(max)})$ (ft)	0.28
D^*_{col} (ft)	0.7569

Case 1 Pile Cap Calculations

A Calculate K_s	0.9
B Calculate K_α	8.12
C Calculate $y_{2(max)}$ (ft)	9.2
D Is $H_{pc} > y_{2(max)}$	Continue on to step E
E Calculate D^*_{pc}	
$H_{col}/(y_{2(max)})$	0.28
$H_{pc}/(y_{2(max)})$	0.07
D^*_{pc} (ft)	1.4713

Case 1 Pile Group Calculations

A Calculate $y_{s(col+pc)}$	
$D^*_{(col+pc)}$ (ft)	2.23
$y_o/D^*_{col(max)}$	4.1289
D^*/D_{50}	2951.26
$f_1(y_o/D^*)$	0.94
$f_2(V/V_c)$	0.7
$f_3(D^*/D_{50})$	0.5054
$y_{s(col+pc)}$ (ft)	2.8156
B Calculate and (ft)	
	12.02
	3.42
C Calculate the shape factor for the pile group, K_s	

s/b	6
$K_{s(pile)}$	1
$K_{s(pile\ group)}$	1
K_s	1
D Calculate W_p (ft)	1
E Calculate the pile spacing coefficient, K_{sp}	1
F Calculate K_m	1
G Calculate (ft)	1
H Calculate K_h	
	3.42
K_h	1
I Calculate D^*_{pg} (ft)	1

Case 1 Complex Pier Scour

A Calculate the overall effective diameter, D^*	3.23
B Calculate $y_{s(col+pc+pg)}$	
$D^*_{(col+pc+pg)}$ (ft)	3.23
y_o/D^*	2.85
D^*/D_{50}	4035.25
$f_1(y_o/D^*)$	0.91
$f_2(D^*/D_{50})$	0.7
$y_{s(col+pc+pg)}$ (ft)	3.73

Case 1 Complex Pier

Critical Velocity and Live Bed Peak Velocity

y_o (ft)	4.8
Water density (lb/ft^3)	62.36
Kinematic viscosity (ft^2/s)	1.20877E-05
D_{50} (mm)	0.2
u_{*c} (ft/s)	0.043
V_c (ft/s)	1.09
V_{lp} (ft/s)	7.46
V/V_c	0.55
V_{lp}/V_c	6.87

Case 1 Column Calculations

A Calculate K_s	No column is present	
B Calculate K_α	No column is present	
C Calculate $y_{1(max)}$ (ft)	No column is present	
D Is $H_{col} > y_{1(max)}$	No column is present	
E Calculate the pile cap extention coefficient, K_f	No column is present	
f (ft)	No column is present	
f/b_{col}	No column is present	
K_f	No column is present	
F Calculate D^*_{col} (ft)	No column is present	
$h_{col}/(Y_{1(max)})$ (ft)	No column is present	
D^*_{col} (ft)		0

Case 1 Pile Cap Calculations

A Calculate K_s	No pile cap is present	
B Calculate K_α	No pile cap is present	
C Calculate $y_{2(max)}$ (ft)	No pile cap is present	
D Is $H_{pc} > y_{2(max)}$	No pile cap is present	
E Calculate D^*_{pc}	No pile cap is present	
$H_{col}/(y_{2(max)})$	No pile cap is present	
$H_{pc}/(y_{2(max)})$	No pile cap is present	
D^*_{pc} (ft)		0

Case 1 Pile Group Calculations

A Calculate $y_{s(col+pc)}$	
$D^*_{(col+pc)}$ (ft)	0.00
$y_o/D^*_{col(max)}$	0
D^*/D_{50}	0.00
$f_1(y_o/D^*)$	0.00
$f_2(V/V_c)$	0
$f_3(D^*/D_{50})$	0
$y_{s(col+pc)}$ (ft)	
B Calculate $\bar{y}_o$ and $\hat{H}_{pg}$ (ft)	
$\bar{y}_o$ (ft)	4.8
$\hat{H}_{pg}$ (ft)	4.8

C Calculate the shape factor for the pile group, K_s	
s/b	6
$K_{s(pile)}$	1.36
$K_{s(pile\ group)}$	1
K_s	1.2
D Calculate W_p (ft)	1
E Calculate the pile spacing coefficient, K_{sp}	1
F Calculate K_m	1.05
G Calculate $\bar{y}_{3max}$ (ft)	1.26
H Calculate K_h	
$\hat{H}pg$ / $\bar{y}_{3max}$	3.81
K_h	1
I Calculate D^*_{pg} (ft)	1.26

Case 1 Complex Pier Scour

A Calculate the overall effective diameter, D^*	1.26
B Calculate $y_{s(col+pc+pg)}$	
$D^*_{(col+pc+pg)}$ (ft)	1.26
y_o/D^*	3.81
D^*/D_{50}	1800
$f_1(y_o/D^*)$	0.94
$f_2(D^*/D_{50})$	0.57
$y_{s(col+pc+pg)}$ (ft)	0.94

Case 1 Complex Pier

APPENDIX D

FIELD REVIEW PHOTOGRAPHS

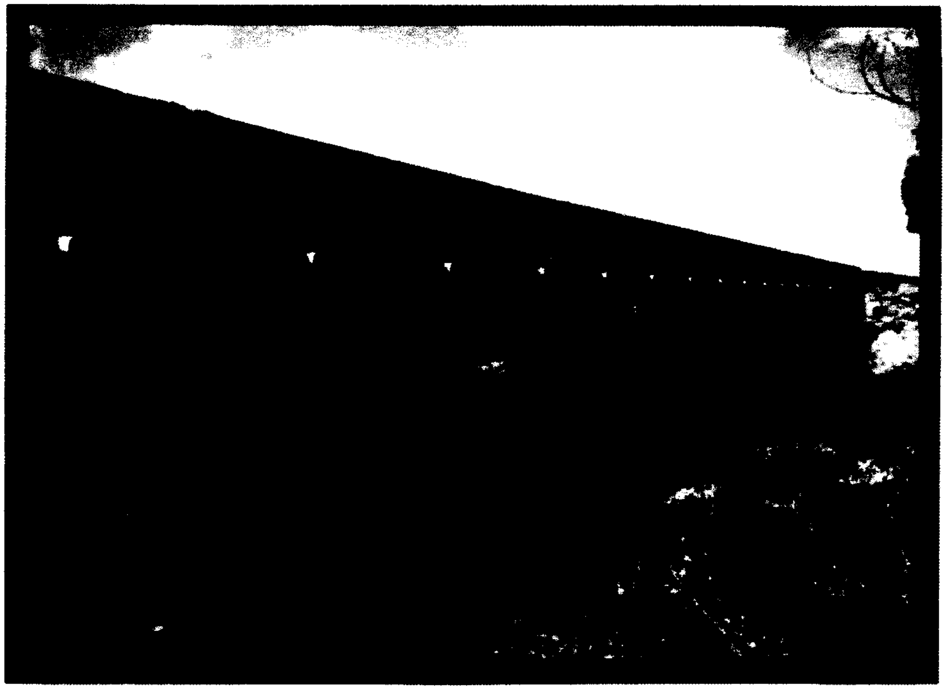


PHOTO 1: *VIEW OF UPSTREAM FACE OF STRUCTURE*

(From 1995 Phase 1 Report)

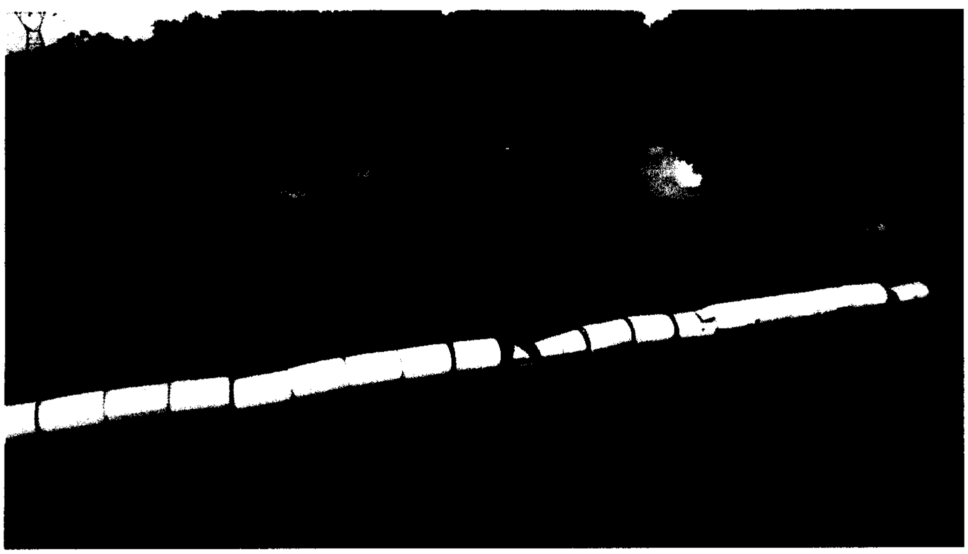


PHOTO 2: *VIEW OF UPSTREAM CHANNEL*
(From 2/27/2012 Site Review)

PHOTO 3: *VIEW OF DOWNSTREAM FACE OF STRUCTURE*

(From 1995 Phase 1 Report)

PHOTO 4: *VIEW OF DOWNSTREAM CHANNEL TAKEN FROM BRIDGE 160133*
(From 2/27/2012 Site Review)

FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection Report with PDF attachment(s)

BY:	ICA Engineering	STRUCTURE NAME:	SR-60 EB OVER PEACE CK RELIE
OWNER:	1 State Highway Agency	YEAR BUILT:	1965
MAINTAINED BY:	1 State Highway Agency	SECTION NO.:	16 110 000
STRUCTURE TYPE:	1 Reinforced Concrete - 01 Slab	MP:	25.268
LOCATION:	4.1 MI W/O US-27	ROUTE:	00060
SERVICE TYPE ON:	1 Highway	FACILITY CARRIED:	SR-60 EB
SERV TYPE UND:	9 Relief for waterway	FEATURE INTERSECTED:	PEACE CREEK RELIEF

[X] FUNCTIONALLY OBSOLETE [ ] STRUCTURALLY DEFICIENT

TYPE OF INSPECTION: Regular NBI

DATE FIELD INSPECTION WAS PERFORMED: ABOVE WATER: 08/26/2014 UNDERWATER: 7/29/2014

SUFFICIENCY RATING: 79.9
HEALTH INDEX: 84.68

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FLORIDA DEPARTMENT OF TRANSPORTATION
BRIDGE MANAGEMENT SYSTEM
Inspection Report with PDF attachment(s)

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STRUCTURE TYPE:	1 Reinforced Concrete - 01 Slab	MP:	25.268
LOCATION:	4.1 MI W/O US-27	ROUTE:	00060
SERVICE TYPE ON:	1 Highway	FACILITY CARRIED:	SR-60 EB
SERV TYPE UND:	9 Relief for waterway	FEATURE INTERSECTED:	PEACE CREEK RELIEF

- [ ] THIS BRIDGE CONTAINS FRACTURE CRITICAL COMPONENTS
- [ ] THIS BRIDGE IS SCOUR CRITICAL
- [ ] THIS REPORT IDENTIFIES DEFICIENCIES WHICH REQUIRE PROMPT CORRECTIVE ACTION
- [X] FUNCTIONALLY OBSOLETE
- [ ] STRUCTURALLY DEFICIENT

TYPE OF INSPECTION: Regular NBI

DATE FIELD INSPECTION WAS PERFORMED: ABOVE WATER: 08/26/2014 UNDERWATER: 7/29/2014

SMART FLAGS:	OVERALL NBI RATINGS:			
None	DECK:	7 Good	CHANNEL:	7 Minor Damage
	SUPERSTRUCTURE:	7 Good	CULVERT:	N N/A (NBI)
	SUBSTRUCTURE:	7 Good	SUFF. RATING:	79.9
	PERF. RATING:	Good	HEALTH INDEX:	84.68

FIELD PERSONNEL / TITLE / NUMBER	INITIALS
Ryan, William - Team Leader (CBI #00497) (lead)	________
Coon, Elliott - Team Leader (CBI #00530)	________
Hitch, Victoria G. - Diver-Inspector (CBI #00414)	________
Hoogland, Keith S. - Diver-Inspector (CBI #341)	________
Payne, Timothy N. - Diver-Inspector	________
Davis, Christopher S. - Diver-Inspector	________

REVIEWING BRIDGE INSPECTION SUPERVISOR:

St. Clair, Clayton - Bridge Inspector (CBI #00374) ________

CONFIRMING REGISTERED PROFESSIONAL ENGINEER:

Perez, Jorge - Professional Engineer (PE#42690)
ICA Engineering
1907 N. U.S. HWY 301, Suite 160C
Certificate of Authorization #26988
Tampa, FL 33619

SIGNATURE: ____

DATE: ____

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All Elements

UNIT: 0 DECKS

ELEMENT/ENV: 38/3 Bare Concrete Slab 5459 sf. ELEM CATEGORY: Decks/Slabs

CONDITION STATE (5)	DESCRIPTION	QUANTITY
2	Repaired areas and/or spalls/delaminations and/or cracks exist in the deck surface or underside. The combined distressed area is more than 2% but less than 10% of the deck area.	5459 sf.

ELEMENT INSPECTION NOTES:

CS2: All spans, except Span 5, have span length x up to 1/32in. wide longitudinal cracks in the deck top near the centerline. These longitudinal cracks are reflected in the deck underside up to 1/64in. wide some with minor efflorescence.

ELEMENT/ENV: 301/3 Pourable Joint Seal 307 lf. ELEM CATEGORY: Joints

CONDITION STATE (3)	DESCRIPTION	QUANTITY
1	The element shows minimal deterioration. Adhesion is sound with no signs of leakage. There are no cohesion cracks. The adjacent deck and/or header is sound.	122 lf.
2	Minor adhesion and/or cohesion failures may be present. Signs of seepage along the joint may be present. Joint may be slightly impacted with debris. Minor spalls in the deck and/or headers may be present adjacent to the joint.	185 lf.

ELEMENT INSPECTION NOTES:

CS2: There is a 1ft. x 4in. x 1/2in. spall with no exposed steel in Lane 1 of Span 1 over Abutment 1, which has been filled with asphalt.

The joint sealant has minor to moderate deterioration and intermittent areas of adhesion loss up to 14in. long with vegetation growth in the shoulder areas - INCREASE. Refer to Photo 1. P3WO

Joint headers 2, 3 and 5 have spalls with no exposed steel up to 33in. x 2in. x 1-1/2in. in the left and right wheel paths - NEW. Refer to Photo 2. P3WO

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All Elements

UNIT: 0 DECKS

ELEMENT/ENV: 331/3 Conc Bridge Railing 321 lf. ELEM CATEGORY: Railing

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.	313 lf.
2	Minor cracks, surface scaling or spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.	4 lf.
3	Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.	4 lf.

ELEMENT INSPECTION NOTES:

CS2: Several posts have delaminated repair patches up to 12in. x 4in. intermittently throughout - NEW.

CS3: Posts 3-1 right, and Posts 3-2 and 8-1 left have spalls with exposed painted steel up to 4in. x 3in. x 3/4in. Refer to Photo 3.

CORRECTIVE ACTION TAKEN:
The scrapes in the right bridge rail in Span 8 have been repaired.

ELEMENT/ENV: 334/3 Metal Rail Coated 321 lf. ELEM CATEGORY: Railing

CONDITION STATE (5)	DESCRIPTION	QUANTITY
1	There is no evidence of active corrosion. Protective coating is sound and functioning as intended to protect the element.	321 lf.

ELEMENT INSPECTION NOTES:

NOTE: This element quantifies the steel guardrail and steel posts mounted to the curbs.

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All Elements

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV: 204/3 P/S Conc Column 28 ea. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
2	Minor cracks, spalls and scaling may be present and there may be exposed reinforcing with no evidence of corrosion. There is no exposure of the prestress system.	28 ea.

ELEMENT INSPECTION NOTES:

CS2: The piles have isolated areas where the grout is delaminated, and some areas where the grout has failed up to 1ft. x 1ft. exposing scale up to 1/4in. deep.

There is a 28in. x 1/64in. vertical crack in the east face of Piles 3-1 and 3-2 starting 4in. above the splice on Pile 3-1 and at the splice on Pile 3-2 from the splice - INCREASE. Refer to Photo 4.

The east face of Pile 4-1 has a 14in. x 1/64in. vertical crack, extending down from a pile splice area, near the southeast corner.

There are vertical cracks up to 20in. x 1/64in. in the north and west faces of Piles 7-1.

There are two vertical cracks up to 34in. x 1/64in. in the west face of Pile 7-3 starting near the bottom of the cap.

Pile 7-3, northwest corner, has a 3ft. x 7in. delaminated repair patch 1ft. above the groundline - NEW.

Pile 7-4 has a spall with no exposed steel up to 14in. x 4in. x 1in. in the southeast corner near the groundline.

There is one vertical crack up to 28in. x 1/64in. in the east face of Pile 8-1 starting at the bottom of the cap.

The piles at Piers 3 and 4 have graffiti which is not visible to the general public - NEW.

ELEMENT/ENV: 215/3 R/Conc Abutment 69 lf. ELEM CATEGORY: Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without affect on strength and/or serviceability.	69 lf.

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All Elements

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV: 234/3 R/Conc Cap **220 lf.** **ELEM CATEGORY:** Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without affect on strength and/or serviceability.	220 lf.

ELEMENT INSPECTION NOTES:

CS1: There is light vegetation growth at the south end of Pier 2 cap - DECREASE.

ELEMENT/ENV: 396/3 Other Abut Slope Pro **2616 sf.** **ELEM CATEGORY:** Substructure

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	There is little or no deterioration. Surface defects only are in evidence. Random open joints may exist.	2606 sf.
3	Moderate to major deterioration and cracking. Major deterioration of joints. Minor settlement may be present.	10 sf.

ELEMENT INSPECTION NOTES:

NOTE: This element quantifies the sand/cement riprap slope protection.

CS1: The radius areas of the riprap bag slope protection at both abutments have moderate to heavy vegetation growth. Refer to Photo 5. P3WO

CS3: The Abutment 1 slope protection has a 5ft. x 3-1/2ft. x 18in. back under area of collapsed bags at the south end. The east slope has a similar condition at the south end - NEW. Refer to Photo 6. P3WO

PREVIOUS WORK ORDER RECOMMENDATION:
Trim or spray moderate to heavy vegetation at both abutments. 40MH - Not repaired. Repeat.

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All Elements

UNIT: 0 CHANNEL

ELEMENT/ENV: 290/3 Channel **1 ea.** **ELEM CATEGORY:** Channel

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The channel is in good condition, channel banks are protected or well vegetated, river control devices and embankment protection are not required or are in good condition.	1 ea.

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All Elements

UNIT: 0 MISCELLANEOUS

ELEMENT/ENV: 321/3 R/Conc Approach Slab 2 ea. **ELEM CATEGORY:** Other Elements

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The slab has not settled and shows no sign of deterioration other than superficial surface cracks.	2 ea.

ELEMENT INSPECTION NOTES:

NOTE: The approach slabs are overlaid with asphalt.

ELEMENT/ENV: 475/3 R/Conc Walls 33 lf. **ELEM CATEGORY:** Other Elements

CONDITION STATE (4)	DESCRIPTION	QUANTITY
1	The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without affect on strength and/or serviceability. Random open joints may exist.	27 lf.
2	Minor cracks and spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion. Open joints may be prevalent.	6 lf.

ELEMENT INSPECTION NOTES:

NOTE: The approach barriers were evaluated under this element.

CS1: There is light to moderate vegetation in the joint between the curb and northeast and northwest wingwalls - INCREASE.

The southwest curb has steel anchors left in place from a previous attachment - NEW.

There is a 6ft. x 4in. x 1/2in. area of minor spalling, with no exposed rebar, on the inboard face of the southwest approach curb.

The northeast approach barrier, north face at Abutment 9 has a 5in. x 2in. x 6in. deep spall with no exposed steel from previous attachment - NEW.

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Inspector Recommendations

UNIT: 0 DECKS

ELEMENT/ENV:301/3 Pourable Joint Seal ELEM CATEGORY: Joints

CONDITION STATE (3)		Priority
2	**8 lf.**	3

WORK ORDER RECOMMENDATION:
Repair spalls with no steel up to 33in. x 2in. x 1.5in. deep in wheel paths of Joints 2, 3 and 5

CONDITION STATE (3)		Priority
2	**15 lf.**	3

WORK ORDER RECOMMENDATION:
Clean out and spot seal areas of cohesion loss up to 14in. long throughout.

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Inspector Recommendations

UNIT: 0 SUBSTRUCTURE

ELEMENT/ENV:396/3 Other Abut Slope Pro ELEM CATEGORY: Substructure

CONDITION STATE (4)		Priority
1	**2616 sf.**	3

WORK ORDER RECOMMENDATION:
Remove heavy vegetation at both abutments.

3	**10 sf.**	3

WORK ORDER RECOMMENDATION:
Stabilize and repair 5ft. x 3.5ft. x 18in. area of collapsed bags at the S end of ABTs 1 and 9 slopes.

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Inspector Recommendations

UNIT: 0 MISCELLANEOUS

ELEMENT/ENV:475/3 R/Conc Walls ELEM CATEGORY: Other Elements

CONDITION STATE (4)		Priority
1	**27 lf.**	3

WORK ORDER RECOMMENDATION:
Seal open joints on SE and SW MSE wall coping caps up to 3.5 in.

Structure Notes

TRAFFIC RESTRICTIONS: This structure is not posted. According to the load rating dated 04/29/09, posting is not required.

Structure was inventoried west to east.

INSPECTION NOTES: HKSV 8/26/2014

Sufficiency Rating Calculation Accepted by knicawr-P at 2014-10-01 10:10:32
Sufficiency Rating Calculation Accepted by knicawr-P at 2014-09-22 16:38:27

LOAD CAPACITY EVALUATION:
The load rating dated 04/29/09 applies to the current condition of this bridge. An engineering review was performed due to installation of steel Tri-Rail on both curbs. The current load rating still applies.

Element 334 Metal Rail Coated was added to this inspection report.

NON-STRUCTURAL ITEMS:

APPROACH GUARDRAIL:

CORRECTIVE ACTION TAKEN:
The broken southwest timber post has been replaced.

APPROACH ROADWAY:

CORRECTIVE ACTION TAKEN:
The approach roadways have been resurfaced.

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Photo 1 - Element 301/3 Pourable Joint Seal

Joint 4 left shoulder cohesion loss and vegetation growth. Typical.

WORK ORDER RECOMMENDATION:
P3WO: Clean out and spot seal areas of cohesion loss up to 14in. long throughout.

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Photo 2 - Element 301/3 Pourable Joint Seal

Joint 2 Lane 2 spalled joint header with no exposed steel. Typical.

WORK ORDER RECOMMENDATION:
P3WO: Repair spalls with no steel up to 33in. x 2in. x 1.5in. deep in wheel paths of Joints 2, 3 and 5

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Photo 3 - Element 331/3 Conc Bridge Railing

Spall with exposed steel in Post 3-1 right. Typical.

WORK ORDER RECOMMENDATION:
None.

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Photo 4 - Element 204/3 P/S Conc Column

Vertical crack on Pile 3-1 east face. Typical.

WORK ORDER RECOMMENDATION:
None.

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Photo 5 - Element 396/3 Other Abutment Slope Pro

Vegetation growth in southwest radius. Typical.

WORK ORDER RECOMMENDATION:
P3WO: Remove heavy vegetation at both abutments.

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Photo 6 - Element 396/3 Other Abutment Slope Pro

Area of collapsed rip-rap bags at south end of Abutment 1 slope. Typical.

WORK ORDER RECOMMENDATION:
P3WO: Stabilize and repair 5ft. x 3.5ft. x 18in. back under area of collapsed bags at the south end of Abutments 1 and 9 slopes.

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SCOUR EVALUATION REPORT - PHASE 2

PREPARED FOR:

FLORIDA DEPARTMENT OF TRANSPORTATION, DISTRICT ONE
DISTRICTWIDE SCOUR EVALUATIONS
WPI NO. 1620028 (STATE BRIDGES)
STATE PROJECT NO. 99901-1524

HAMID B. KASHANI, P.E., PROJECT MANAGER

BRIDGE NUMBER:	***160133***
OWNER:	***FLORIDA DEPARTMENT OF TRANSPORTATION***
BRIDGE NAME:	***NONE***
LOCATION:	***STATE ROAD 60 (EASTBOUND) OVER PEACE CREEK DRAINAGE CANAL***
COUNTY:	***POLK***
SCOUR MODE:	***RIVERINE*** ***SCOUR SUSCEPTIBLE (LOW PRIORITY)***
RECOMMENDATION:	***A PHASE 3 ANALYSIS IS RECOMMENDED BASED ON THE ESTIMATED REMAINING EMBEDMENTS RESULTING FROM THE PREDICTED SCOURED BED CONDITIONS***

THE FOUNDATION SHOULD BE ANALYZED FOR STRUCTURAL STABILITY FOR THE 100-YEAR AND 500-YEAR FLOOD EVENTS

THE COUNTERMEASURES AT ABUTMENT 2 SHOULD BE REPAIRED

BED CROSS-SECTION MEASUREMENTS SHOULD CONTINUE TO BE INCLUDED AS PART OF THE SCHEDULED BRIDGE INSPECTION PROGRAM

FOUNDATION STATUS: (X) Known ( ) Unknown

■ PHASE 1	■ PHASE 2	☐ PHASE 3	☐ PHASE 4
QUALITATIVE EVALUATION / ASSESSMENT	HYDRAULIC / HYDROLOGIC ASSESSMENT	STRUCTURAL / GEOTECHNICAL ASSESSMENT	PLAN OF ACTION
DATE: 5/31/95	DATE: 5/31/96	DATE:_________	DATE:_________

PREPARED BY:	DDB/DRB/JB/LF
CHECKED BY:	DRB
REVIEWED BY:	DON RISSMEYER, P.E.
QA / QC BY:	SAM STEBBINS, P.E.

Kimley-Horn and Associates, Inc.

PROJECT MANAGER:
SAM S. STEBBINS, P.E.

SIGNATURE 11/14/96

48380
P.E. NUMBER

1.0 SUMMARY OF FINDINGS

Bridge Number 160133 on S.R. 60 (eastbound) crosses over the Peace Creek Drainage Canal, just downstream from Bridge Number 160045, and was constructed in Polk County in 1965. The project team visited the site and conducted a field review of the structure and surrounding area in order to assess the scour history and current stability of the waterway.

The Peace Creek Drainage Canal flows through Polk County, draining approximately 97 square miles of agricultural, urban, and natural upland areas, before discharging into the Peace River approximately 10 miles downstream of the structures. Since stream gages do not exist along the waterway in the proximity of the bridge, hydrologic information for the drainage basin was obtained from the Polk County Surface Water Management Plan. WSPRO, a water surface profile computation model was used to analyze the flow through the structures. The model was calibrated to the 100-year water surface elevation provided in the Polk County study. The overtopping event was not analyzed since iterative WSPRO runs determined the discharge at overtopping to be greater than the 500-year flood event discharge. The effect of debris accumulation is considered to be negligible. A potential flood flow angle of attack of 30° is assumed in the scour computations. Since the eastbound and westbound structures are closely spaced, they were hydraulically analyzed as one wide structure; however, the scour analysis was not performed on the westbound structure at this time due to a foundation of unknown embedment. During the Phase 2 field review, a large area of collapsed riprap bags was observed at the southeast side of Abutment 2.

The summary of findings for the 100-year flood event is:

- Contraction scour is estimated to be 3.6 feet;
- Pier scour is estimated to be 5.6 feet;
- Abutment scour was not computed since the abutments are protected and the velocities at the abutments are less than 4 feet per second;
- There is no historical evidence of degradation;
- There appears to be no potential for armoring of the channel bed;
- There is no current or historical evidence of lateral migration at the bridge site;
- Maximum total scour is estimated to be 9.2 feet at the interior bents;
- Estimated remaining embedments range from 5.8 feet to 6.7 feet at Interior Bent 5;
- Estimated remaining embedments at the remaining interior bents range from 9.3 feet to 31 feet.

The maximum total scour for the 500-year flood event is estimated to be 12.6 feet at the interior bents. This would result in estimated remaining embedments ranging from 2.4 feet to 3.3 feet at Interior Bent 5 and from 5.9 feet to 28 feet at the remaining interior bents. A summary of the results for the 100-year and 500-year flood events is presented in Section 3 (page 6) of this report.

2.0 CONCLUSIONS AND RECOMMENDATIONS

A Phase 3 analysis is recommended based on the estimated remaining embedments resulting from the predicted scoured bed conditions. The foundation should be analyzed for structural stability for the 100-year and 500-year flood events. The countermeasures at Abutment 2 should be repaired. Bed cross-section measurements should continue to be included as part of the scheduled bridge inspection program.

As a result of the Phase 2 analysis, the bridge is rated scour susceptible (low priority), reflecting a downgrade from the Phase 1 rating of scour susceptible (medium priority).

3.0 MATERIALS AND DOCUMENTATION

The following data was used in this evaluation:

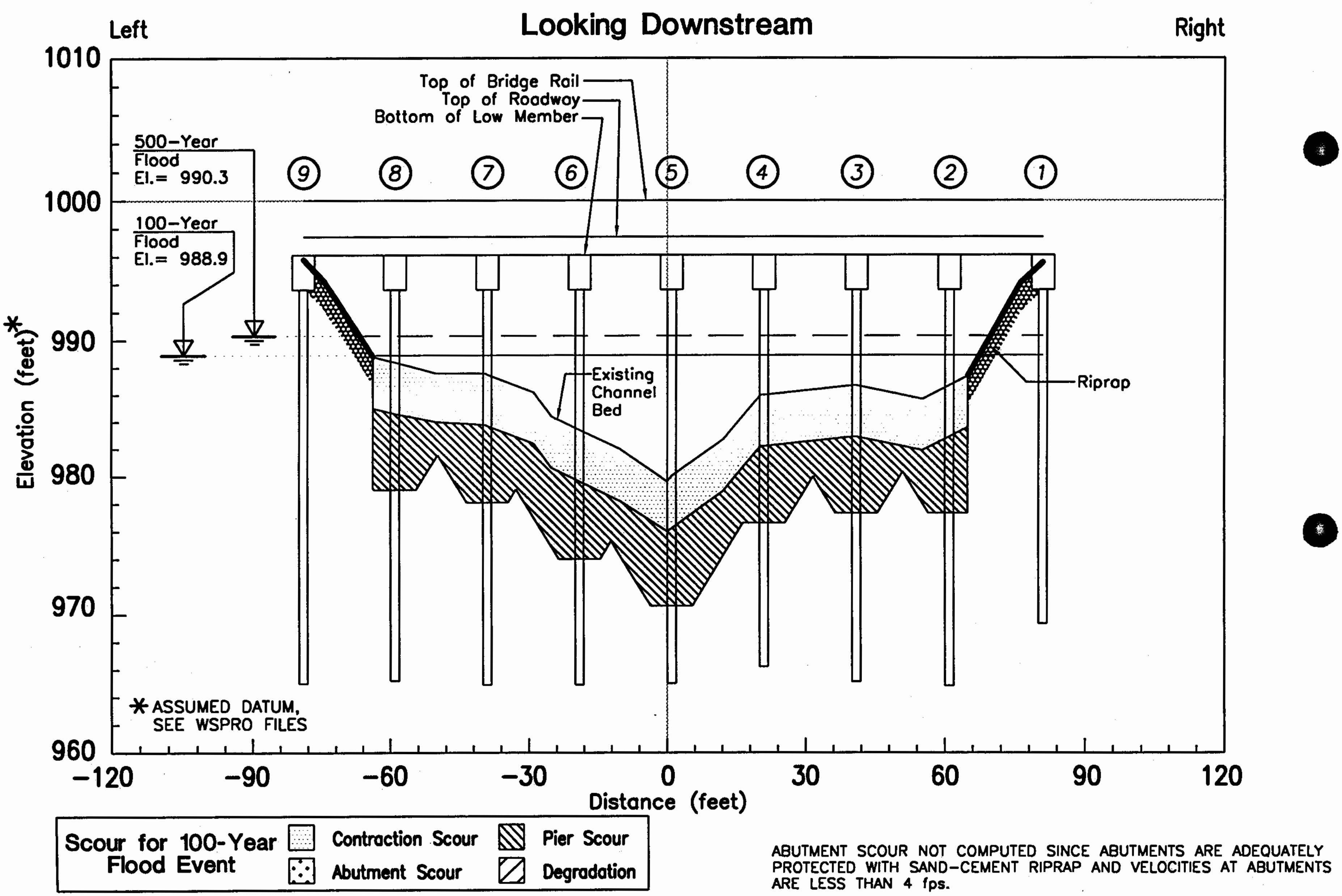
- Phase 1 Scour Evaluation Report.
- 1958 original design plans.
- Field reviews conducted by the project team on May 24, 1995 and June 28, 1996.
- U.S. Geological Survey (USGS) Eloise, Florida Quadrangle.
- FEMA Flood Insurance Rate Map, Polk County, Florida (Unincorporated Areas), November 15, 1989, Panel 550 of 1025.
- 1971 and 1990 aerial photographs.
- 1964 pile driving logs.
- Soil boring data found in 1958 original design plans.
- Survey data furnished by Weidener Surveying & Mapping P.A.
- "Users Manual for WSPRO, A Computer Model for Water-Surface Profile Computations," U.S. Geological Survey, Federal Highway Administration, March 1990.
- "State of Florida Department of Transportation Drainage Manual," Drainage Design Office, Tallahassee, Florida, Volumes 2A and 2B - Procedures, 1987.
- "Evaluating Scour at Bridges," Hydraulic Engineering Circular No. 18, USDOT Federal Highway Administration, Revised April 1993.
- "Stream Stability at Highway Structures," Hydraulic Engineering Circular No. 20, USDOT Federal Highway Administration, February 1991.
- "Stream Stability and Scour at Highway Bridges - Participant Workbook," NHI Course No. 13046, Federal Highway Administration, Publication No. FHWA HI-91-011, Revised April 1993.
- Chow, Ven Te, Ph. D., "Open Channel Hydraulics," (Manning's n), 1959.
- "Polk County Surface Water Management Study," Envisors, Inc., Book 2 of 4, Volume 2 of 2, December, 1987.
- "Instructions and Information Sheet, Phase 1 Qualitative Scour Evaluation, Field/Office Review Report," Florida Department of Transportation.
- "Sediment Engineering," ASCE Manuals and Reports on Engineering Practice - No. 54, 1975.

The following data was researched but not found:

- Stream gage data for stream gages in the vicinity of the structure.

Notice to Users of This Report:
This document, together with the concepts and designs presented herein, as an instrument of service, is intended for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

Predicted Scoured Bed Profile - Bridge Number 160133



ABUTMENT SCOUR NOT COMPUTED SINCE ABUTMENTS ARE ADEQUATELY PROTECTED WITH SAND–CEMENT RIPRAP AND VELOCITIES AT ABUTMENTS ARE LESS THAN 4 fps.

Kimley-Horn and Associates, Inc.

BRIDGE NUMBER 160133

STATE ROAD 60 OVER PEACE CREEK DRAINAGE CANAL, POLK COUNTY

SCALE: 1"=30' H. 1"=10' V.

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

Bridge Number: *160133*	County: *POLK*	Route: *S.R. 60 (EASTBOUND)*	Over: *PEACE CREEK DRAINAGE CANAL*

1. SCOUR VULNERABILITY RATING (PER FHWA)

a. Scour Critical	( ) Yes	(X) No	
Scour Susceptible	( ) High	( ) Medium	(X) Low
Low Risk	( ) High	( ) Medium	( ) Low
Foundation	(X) Known	( ) Unknown	
b. Method of Analysis:	(X) Simplified	( ) Detailed	

c. Reasons for Phase 2 Rating:

As a result of the Phase 2 analysis, the bridge is rated scour susceptible (low priority), reflecting a downgrade of the Phase 1 rating of scour susceptible (medium priority). For the 100-year flood event, a maximum total scour of 9.2 feet has been estimated to occur at the interior bents. This would result in a minimum embedment of 5.8 feet at Interior Bent 5.

2. RECOMMENDATIONS (See Preceding Narrative)

a. Recommended Course of Action:

(X) Countermeasures *The countermeasures at Abutment 2 should be repaired.*

( ) Scour Monitor

(X) Inspection *Bed cross-section measurements should continue to be included as part of the scheduled bridge inspection program.*

(X) Other *The foundation should be analyzed for structural stability for the 100-year and 500-year flood events.*

b. Phase 3 Analysis: (X) Required ( ) Not Required at this time

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

3. SUMMARY OF RESULTS

	100-YEAR FLOOD EVENT				500-YEAR FLOOD EVENT				OVERTOPPING EVENT **			
		Worst Case *				Worst Case *				Worst Case *		
	Left Abut. (ft)	Main Channel Pier (ft)	Flood-plain Pier (ft)	Right Abut. (ft)	Left Abut. (ft)	Main Channel Pier (ft)	Flood-plain Pier (ft)	Right Abut. (ft)	Left Abut. (ft)	Main Channel Pier (ft)	Flood-plain Pier (ft)	Right Abut. (ft)
a. Reported Design / Constructed Embedment: 1	*30.8*	*18.2*	--	*26.3*	*30.8*	*18.2*	--	*26.3*	*30.8*	*18.2*	--	*26.3*
b. Current Remaining Embedment: 2	*30.8*	*15.0*	--	*26.3*	*30.8*	*15.0*	--	*26.3*	*30.8*	*15.0*	--	*26.3*
c. Maximum Total Scour: 3	--	*9.2*	--	--	--	*12.6*	--	--	--	**	--	--
d. Estimated Embedment Remaining After Scour:	--	***5.8***	--	--	--	***2.4***	--	--	--	**	--	--

e. Sources for above table:

1. *1958 Original Design Plans and 1964 Pile Driving Logs*
2. *1995 Survey Data and 1964 Pile Driving Logs*
3. *Section 7 (Page 8 of this Report)*

* *Worst Case Main Channel Pier: (5)* *Worst Case Floodplain Pier: (N/A)*

** *Overtopping event not analyzed since it was determined to be greater than the 500-year flood event*

4. EVALUATION OF METHODS

Method of Analysis:

a. (X) Simplified

Do results of analysis provide reasonable prediction of scour depths for this structure? [1) or 2)]

1) (X) Yes — Does the predicted scour suggest instability of the structure, based on existing knowledge of the bridge/bridge culvert?

(X) Yes **RESULT:** Phase 3 is recommended.

( ) No **RESULT:** No further action is required.

2) ( ) No — **RESULT:** Perform a Detailed Analysis.

b. ( ) Detailed

Does the predicted scour suggest instability of the structure, based on existing knowledge of the bridge/bridge culvert? [1) or 2)]

1) ( ) Yes — **RESULT:** Phase 3 is recommended.

2) ( ) No — **RESULT:** No further action is required.

Notes:

SCOUR EVALUATION - FIELD / OFFICE REVIEW REPORT

5. FLOOD HISTORY

a. Drainage Area: (X) Applicable (*97*) Square Miles

(*61,890*) Acres

( ) Not applicable due to methodology (see summary)

b. Debris Potential: ( ) High ( ) Medium (X) Low

c. Scour Mode: (X) Riverine

( ) Tidal

( ) Tidal and Riverine

d. Flow:

Q_{100} = (*1,350*) cfs	Riverine	Method: ( ) Gage Analysis ( ) Regression Analysis: ( ) Rational Method (X) Other: *Polk County Study*
	Tidal	Method: ( ) Modified HEC 18 Procedure ( ) Historic Data ( ) HEC 18 Procedure ( ) Other:
$Q_{OVERTOPPING}$ = (--) cfs	Riverine	Method: ( ) Gage Analysis (X) Iterative WSPRO runs ** ( ) Other: ** (Greater than 500-yr Q)
	Tidal	Method: ( ) Modified HEC 18 Procedure ( ) Historic Data ( ) HEC 18 Procedure ( ) Other:
Q_{500} = (*2,300*) cfs	Riverine	Method: ( ) Gage Analysis ( ) Regression Analysis: ( ) Rational Method (X) Other: *(See below)*
	Tidal	Method: ( ) Modified HEC 18 Procedure ( ) Historic Data ( ) HEC 18 Procedure ( ) Other:

e. Notes:

Since the eastbound and westbound bridges are closely spaced, they were hydraulically analyzed as one wide structure.

The discharge for the 500-year flood event was estimated as 1.7 times the 100-year flood event discharge.

6. CHANNEL STABILITY CONSIDERATIONS

a. Natural Channel Aggradation Expected Over Remaining Life of Structure =				(--) *feet*
b. Natural Channel Degradation Expected Over Remaining Life of Structure =				(--) *feet*
c. Channel Migration Anticipated During Life of Structure			Left:	(--) *feet*
	( ) Yes	(X) No	Right:	(--) *feet*
d. Armoring Potential	( ) Yes	(X) No	( ) Possible	
e. Depth to Armoring for Q = (--) cfs				(--) *feet*
f. Notes:				

7. ESTIMATED SCOUR

		100-YEAR EVENT	500-YEAR EVENT	OVERTOPPING EVENT
a. Worst Case Flood Event:	Discharge	(*1,350*) cfs	(*2,300*) cfs	(*) cfs
b. Contraction Scour: (Looking Downstream)	Left Overbank	(--) ft	(--) ft	( ) ft
	Main Channel	(*3.6*) ft	(*6.4*) ft	( ) ft
	Right Overbank	(--) ft	(--) ft	( ) ft
c. Maximum Pier Scour:	Maximum Velocity	(*4.18*) fps	(*4.82*) fps	( ) fps
	Froude Number	(*0.27*)	(*0.27*)	( )
Main Channel Pier No.: (5)	Main Channel	(*5.6*) ft	(*6.2*) ft	( ) ft
Floodplain Pier No.: (N/A)	Floodplain	(--) ft	(--) ft	( ) ft
d. Abutment Scour: (Looking Downstream)	Max Velocity at Abutments	(*1.99*) fps	(*2.54*) fps	( ) fps
	Left Abutment	(--) ft	(--) ft	( ) ft
(X) Abutments Protected	Right Abutment	(--) ft	(--) ft	( ) ft
e. Theoretical Total Scour: (Looking Downstream)	**Left Abutment**	**(--) ft**	**(--) ft**	**( ) ft**
	Main Channel Pier	**(9.2) ft**	**(12.6) ft**	**( ) ft**
	Floodplain Pier	**(--) ft**	**(--) ft**	**( ) ft**
6b + 7b + (7c or 7d)	**Right Abutment**	**(--) ft**	**(--) ft**	**( ) ft**
f. Notes:		See Page 6 for Summary of Results.		

**Overtopping event not analyzed since it was determined to be greater than the 500-year flood event.*

ATTACHMENT A

Scour Calculations

SCOUR CALCULATION WORKSHEETS

Bridge Number 160133

INDEX:	DESCRIPTION:	WORKSHEET:	STATUS:
Abutment Scour	Froelich's Equation	2	INCLUDED
Abutment Scour	Hire's Equation	3	N/A
Live-Bed vs. Clear-Water	Laursen's Equation	4	INCLUDED
Contraction Scour - Main Channel	Live-Bed	5a	N/A
Contraction Scour - Main Channel	Clear-Water	5b	INCLUDED
Contraction Scour - Left Floodplain	Clear-Water	6	N/A
Contraction Scour - Right Floodplain	Clear-Water	7	N/A
Pier Scour - Main Channel	CSU Equation	8	N/A
Pier Scour - Left Floodplain	CSU Equation	9	N/A
Pier Scour - Right Floodplain	CSU Equation	10	N/A
Degradation	Historical Data	11	N/A

SCOUR Components	Left Abutment	Left Floodplain	Main Channel	Right Floodplain	Right Abutment
Q100 = 1,350 cfs					
Abutment Scour -Froelich's Equation	N/A				N/A
Abutment Scour -Hire's Equation	N/A				N/A
Contraction Scour	N/A	N/A	3.64	N/A	N/A
Pier Scour		N/A	5.58	N/A	
Degradation	N/A	N/A	0.00	N/A	N/A
Total Scour	N/A	N/A	9.22	N/A	N/A
Q500 = 2,300 cfs					
Abutment Scour -Froelich's Equation	N/A				N/A
Abutment Scour -Hire's Equation	N/A				N/A
Contraction Scour	N/A	N/A	6.41	0.00	N/A
Pier Scour		N/A	6.18	N/A	
Degradation	N/A	N/A	0.00	N/A	N/A
Total Scour	N/A	N/A	12.59	N/A	N/A
Qovertopping = N/A cfs					
Abutment Scour -Froelich's Equation	N/A				N/A
Abutment Scour -Hire's Equation	N/A				N/A
Contraction Scour	N/A	N/A	N/A	N/A	N/A
Pier Scour		N/A	N/A	N/A	
Degradation	N/A	N/A	N/A	N/A	N/A
Total Scour	N/A	N/A	N/A	N/A	N/A
Qother = N/A cfs					
Abutment Scour -Froelich's Equation	N/A				N/A
Abutment Scour -Hire's Equation	N/A				N/A
Contraction Scour	N/A	N/A	N/A	N/A	N/A
Pier Scour		N/A	N/A	N/A	
Degradation	N/A	N/A	N/A	N/A	N/A
Total Scour	N/A	N/A	N/A	N/A	N/A
SCOUR Components	Left Abutment	Left Floodplain	Main Channel	Right Floodplain	Right Abutment

Live-Bed vs. Clear-Water Scour

Bridge Number 160133

The equation to determine Live-bed versus Clear-water Scour is based on a simplified Laursen's equation, which assumes the specific gravity of the bed material is 2.65. The equation is:

$$Vc = 10.95 * y^{(1/6)} * D50^{(1/3)}$$

Enter values:	Q100	Q500
D50* =	0.25 mm 0.00082 ft	0.25 mm 0.00082 ft
From APPRO HP1 subarea for Main Channel only:		
Kmain =	64,168	106,306
Ktotal =	64,969	108,678
Amain =	693 ft^2	938 ft^2
left x ref of main channel =	-77	-77
right x ref of main channel =	98	98
Width (difference) =	175 ft	175 ft
Avg. depth at APPRO**, y =	3.96 ft	5.36 ft
Qtotal =	203 ft	284 ft
Q1 = (Kmain/Ktotal)*Qtotal =	200 ft	278 ft
Avg. Velocity at APPRO**, Vavg. =	0.29 ft/s	0.30 ft/s
Critical velocity, Vc =	1.29 ft/s	1.36 ft/s

Therefore, Clear-water Scour Occurs for the 100-Yr Event
since the actual velocity is greater than the critical velocity

and Clear-water Scour Occurs for the 500-Yr Event
since the actual velocity is greater than the critical velocity

* The D50 is estimated based on field soil observations.
** Avg. Depth and Avg. Velocity is for the APPRO main channel only.

Clear-Water Contraction Scour for Main Channel
Bridge Number 160133

Step 1: Input

D50 = 0.25 mm
Dm = 1.25 * D50 = 0.00103 ft

		Q100	Q500	Qovertop	Qother	Units
Discharge at BRDGE:*	Q2 =	1,350	2,300	N/A	N/A	cfs
* does not include road or other relief overflow						
GO TO HP CARDS FOR BRIDGE:						
from BRDGE:	Kmain =	40,573	69,934	N/A	N/A	
from BRDGE:	Ktotal =	40,629	70,333	N/A	N/A	
from BRDGE:	Amain =	467	647	N/A	N/A	ft^2
from BRDGE:	TOPWmain =	129	129	N/A	N/A	ft
	minus main channel pier widths:	8.2	8.2	N/A	N/A	ft
	Wmain =	121	121	N/A	N/A	ft
Step 2: Determine Scour:	Qmain =	1,348	2,287	N/A	N/A	cfs
	yo =	3.62	5.02	N/A	N/A	ft
	y2 =	7.26	11.42	N/A	N/A	ft
Average Scour Depth of Main Channel =	**ys =**	**3.64**	**6.41**	**N/A**	**N/A**	**ft**
		Q100	Q500	Qovertop	Qother	Units

Page 5b

Pier Scour for Main Channel Piers
Bridge Number 160133

Input:

D50 =	0.25	mm
K1 =	1.0	see chart below
K2 =	2.0	see chart below
K3 =	1.1	see chart below
K4 =	1.0	(K4 = 1.0 for D50 < 0.06 m, see HEC 18 for D50 >= 0.06 m)
Pier width, a =	1.2	ft
Pier Length, L =	4.7	ft
Computed L/a =	4	(maximum L/a = 12)
Flood flow angle of attack =	30	degrees

For K1, CHOOSE:

TYPE OF PIER NOSE	VALUE	
square nose	K1 = 1.1	
round nose	K1 = 1.0	
circular cylinder	K1 = 1.0	
sharp nose	K1 = 0.9	
group of cylinders*	K1 = 1.0	
all pier shapes**	K1 = 1.0	<=== Selected

* K1 = 1.0 for any grouping within a pier, regardless of shape

** K1 = 1.0 if the flood flow angle of attack is greater than 5 degrees, regardless of shape

For K2, CHOOSE:

FLOW ANGLE OF ATTACK	L/A =4	L/A =8	L/A =12	
0	K2 = 1.0	K2 = 1.0	K2 = 1.0	
15	K2 = 1.5	K2 = 2.0	K2 = 2.5	
30	K2 = 2.0	K2 = 2.75	K2 = 3.5	<=== Selected
45	K2 = 2.3	K2 = 3.3	K2 = 4.3	
90	K2 = 2.5	K2 = 3.9	K2 = 5.0	

For K3, CHOOSE:

BED CONDITION	DUNE HEIGHT (H)	VALUE	
Large Dunes	H > 30	K3 = 1.3	
Medium Dunes	30 >H >10	K3 = 1.1 to 1.2	
Small Dunes	10 >H > 2	K3 = 1.1	
Plane bed & antidune flow	N/A	K3 = 1.1	<=== Selected
Clear-water scour	N/A	K3 = 1.1	

Input Variables:

			Q100	Q500	Qovertop	Qother	Units
Discharge at BRDGE:* * does not include road or other relief overflow		Q2 =	1,350	2,300	N/A	N/A	cfs
GO TO HP CARDS FOR BRDGE: from BRDGE:		ax Vel in Main Channel=	4.18	4.82	N/A	N/A	ft/s
from BRDGE:		Area of flow tube =	16.1	23.9	N/A	N/A	ft^2
from BRDGE:		left X ref =	-8.6	-3.4	N/A	N/A	ft
		right X ref =	-6.4	-1.0	N/A	N/A	ft
	(Computed)	Width (difference) =	2.2	2.4	N/A	N/A	ft
	(Computed)	K1 =	1.0	1.0	N/A	N/A	
	(Computed)	K2 =	2.0	2.0	N/A	N/A	
	(Computed)	K3 =	1.1	1.1	N/A	N/A	
	(Computed)	K4 =	1.0	1.0	N/A	N/A	
	(Computed)	y1 =	7.3	10.0	N/A	N/A	ft
	(Computed)	Froude Number =	0.27	0.27	N/A	N/A	
	Total Scour at Main Channel Piers=	**ys =**	**5.58**	**6.18**	**N/A**	**N/A**	**ft**
			Q100	Q500	Qovertop	Qother	Units

ATTACHMENT B

WSPRO Output File

```
*************************************************************************************
*                                        * WSPRO S/N    :                           *
*             WSPRO                      * HMVersion    :  2.00                     *
*                                        * Date         :  6/27/96                  *
*          USGS - FHWA                   * Time         : 13:31:55                  *
*     Water-Surface Profile              * Input file   : 160133.HY7                *
*         Computations                   * Output file: 160133.out                  *
*                                        *                                          *
*                                        *                                          *
*************************************************************************************
```

```
x     x  xxxxx   xxxxxx   xxxxxx   xxxxx
x     x x     x  x     x  x     x x     x
x     x x        x     x  x     x x     x
x     x  xxxxx   xxxxxx   xxxxxx  x     x
x  x  x       x  x        x   x   x     x
x x x x x     x  x        x    x  x     x
 x   x   xxxxx   x        x     x  xxxxx
```

```
::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::
:::                                    :::
:::   Full Microcomputer Implementation :::
:::                 by                  :::
:::         Haestad Methods, Inc.       :::
:::                                    :::
::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

```
WSPRO           FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188              MODEL   FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

              *** RUN DATE & TIME:   6/27/96  13:31

   *
   *          Date printing:
   *          Wednesday, January 3, 1996
   *          4:30 p.m.
   *
   *          SCOUR EVALUATION REPORT
   *
   *          PROJECT NO.: 99901-1524    (STATE BRIDGES)
   *          PROJECT MANAGER: HAMID B. KASHANI, P.E.
   *
   *            DATA FILENAME:  160133.HY7
   *          OUTPUT FILENAME:  160133.OUT
   *
   T1         Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
   T2         Phase 2 Bridge Scour Hydraulic Evaluation        Project #99901-1524
   T3         Prepared By: Kimley-Horn and Assoc., Inc.        State Bridges
   *
   *          ----------------------------------------------------------------------
   *
   *                    Tolerance Tolerance Froude
   *          Elev      for       for       Number    Friction/
   *          Step      Energy    Discharge Test      Conveyance
   *          Inc       Balance   Balance   Value     Code
   *
   *          DELTAY    YTOL      QTOL      FNTEST    INFNOJ
   *          ------    ----      ----      ------    ------
   J1         *         *         *         *         *

J1 RECORD PARAMETERS:
DELTAY = 1.00   YTOL =  .02   QTOL =  .02   FNTEST =  .80   IHFNOJ = -1

   *
   J3         6  5  17  29  30  16  448  13  3
   *          ----------------------------------------------------------------------
   *
   *          Q100 COMPUTED BY:
   *            Polk County Surface Water Management (SWM) Plan for the
   *             Peace Creek Drainage Canal (DAU 5)
   *
   *          Q500 COMPUTED BY:
   *             Assumed 1.7 times greater than Q100
   *
   *          Qovertopping was not analyzed since it was determined to be
   *             greater than Q500
   *
   *          All elevations are referenced to an assumed datum at elevation 1000.
   *             (approximately 877.8 feet above NGVD)
   *
   *          Fema map and study indicate the bridges are in Zone A - Area of
   *             100-year flood; Base flood elevations not determined
   *
   *          100-year water surface elevation near bridge approximately 990.2
   *             (112.4 NGVD) from the Polk County SWM Plan
   *
   *          Q100      Q500
   *          -----     ------
   Q          1350      2300
*** Q-DATA FOR SEC-ID, ISEQ =           1
   *
   *          Given the information available, the model is considered calibrated.
```

```
*          SWM Plan Flood Elev = 990.2    WSPRO BRIDGE Flood Elev = 988.9
*
*         ------------------------------------------------------------------
*
*         Start with Energy Gradient equal to Ground Slope
SK         .0006    .0006
*
*         ==================================================================
*         Downstream Template Section                             (SRD 840)
*         ==================================================================
*                                         ***************
*         Convention for Cross-sections:  Facing Downstream - Left to Right
*                                         ***************
*
*         Note assumed datum elevation of 1000 (subtract 877.8 to get NGVD)
*
*         Survey cross-section (used as template) located 160 feet downstream
*         of downstream face of bridge
*
*         SECID  SRD
*         -----  ---
```

```
WSPRO             FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188               MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation       Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.       State Bridges
           *** RUN DATE & TIME:  6/27/96  13:31

*** START PROCESSING CROSS SECTION - "TEMPD"
  XT   TEMPD       840
  *
  *         From Survey:
  GR        -105 ,994.9     -79 ,987.3    -72.0 , 985.1    -53.0 , 985.1
  GR         -42 ,985.1     -21 ,984.4    -16.0 , 983.7     -6.0 , 983.1
  GR           0 ,982.7       5 ,986.0     21.0 , 985.4     43.0 , 985.1
  GR          56 ,984.7      73 ,985.8     76.0 , 987.4     98.0 , 993.3
  *
  *         ====================================================================
  *          Downstream Section 1000D                                    (SRD 0)
  *         ====================================================================
  *
  *         Cross Sec  Acute
  *         Sec   Ref  Skew      Expansion Contract Valley
  *         ID    ID   Angle     Coeff     Coeff    Slope
  *
  *         SECID SRD  SKEW      EK        CK       VSLOPE
  *         ----- ---  ----      --------- -------- ------

*** FINISH PROCESSING CROSS SECTION - "TEMPD"
*** TEMPLATE CROSS SECTION "TEMPD" SAVED INTERNALLY.
```

```
        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation         Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.         State Bridges
           *** RUN DATE & TIME:  6/27/96  13:31

*** START PROCESSING CROSS SECTION - "1000D"
  XS    1000D        0       *       *        *        .0006
   *
   *          Derived cross-section located 1000 feet downstream of the bridge -
   *            translated from template section
   *
   *          Vertical                                  X coordinate
   *          Shift     Left      Right     Scaling     to be held
   *          Distance  Limit     Limit     Factor      at original
   *
   *          YSHIFT    XLIML     XLIMR     SCALE       XORIG
   *          --------  -----     -----     -------     -----------
  GT          *         *         *         *           *
   *
   *          -------------------------------------------------------------------
   *
   *          Manning's n values based on
   *                    Overbank:   Left:   Pasture/Trees
   *                                Right:  Pasture/Trees
   *                    Channel:    Type:   Major stream; regular section
   *                                Bed Matl:  Sand
   *
   *              Main        Main
   *              TOLB        TORB
   *              -----      -----
  SA              -79         76
  N           .06      .04        .06
   *
   *                    TOLB / TORB  =  Top of Left / Right Bank
   *
   *          ===================================================================
   *           EXIT  Section                                              (SRD 840
   *          ===================================================================
   *
   *          Cross Sec  Acute
   *          Sec   Ref  Skew      Expansion Contract  Valley
   *          ID    ID   Angle     Coeff     Coeff     Slope
   *
   *          SECID SRD  SKEW      EK        CK        VSLOPE
   *          ----- ---  ----      --------- --------  ------

*** FINISH PROCESSING CROSS SECTION - "1000D"
*** CROSS SECTION "1000D" WRITTEN TO DISK, RECORD NO. =  1

--- DATA SUMMARY FOR SECID "1000D" AT SRD =       0.  ERR-CODE =       0

      SKEW      IHFNO     VSLOPE       EK        CK
        .0         0.      .0006       .50       .00

X-Y COORDINATE PAIRS  (NGP =  16):
       X       Y            X       Y            X       Y            X       Y
   -105.0  994.40       -79.0  986.80       -72.0  984.60       -53.0  984.60
    -42.0  984.60       -21.0  983.90       -16.0  983.20        -6.0  982.60
       .0  982.20         5.0  985.50        21.0  984.90        43.0  984.60
     56.0  984.20        73.0  985.30        76.0  986.90        98.0  992.80

 X-Y MAX-MIN POINTS:
```

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
-105.0	994.40	.0	982.20	98.0	992.80	-105.0	994.40

SUBAREA BREAKPOINTS (NSA = 3):
-79. 76.

ROUGHNESS COEFFICIENTS (NSA = 3):
.060 .040 .060

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188              MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation         Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.         State Bridges
           *** RUN DATE & TIME:  6/27/96  13:31

*** START PROCESSING CROSS SECTION - "EXIT "
 XS    EXIT        840  *        *         *        .0006
 *
 *       ----------------------------------------------------------------
 *
 *       Manning's n values based on
 *                Overbank:   Left:   Pasture/Trees
 *                            Right:  Pasture/Trees
 *                Channel:    Type:   Major stream; regular section
 *                            Bed Matl:  Sand
 *
 *           Main       Main
 *           TOLB       TORB
 *           -----      -----
 SA           -79        76
 N       .06       .04        .06
 *
 *       ================================================================
 *        Full Valley Section                                 (SRD 1000)
 *       ================================================================
 *
 *       Cross Sec  Acute
 *       Sec   Ref  Skew     Expansion Contract  Valley
 *       ID    ID   Angle    Coeff     Coeff     Slope
 *
 *       SECID SRD  SKEW     EK        CK        VSLOPE
 *       ----- ---- ----     --------- --------  ------

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " WRITTEN TO DISK, RECORD NO. =  2

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =    840.  ERR-CODE =       0

     SKEW     IHFNO    VSLOPE       EK        CK
      .0         0.     .0006       .50       .00

X-Y COORDINATE PAIRS   (NGP =  16):
       X       Y          X       Y          X       Y          X       Y
   -105.0  994.90     -79.0  987.30     -72.0  985.10     -53.0  985.10
    -42.0  985.10     -21.0  984.40     -16.0  983.70      -6.0  983.10
       .0  982.70       5.0  986.00      21.0  985.40      43.0  985.10
     56.0  984.70      73.0  985.80      76.0  987.40      98.0  993.30

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
   -105.0  994.90         .0  982.70     98.0  993.30    -105.0  994.90

SUBAREA BREAKPOINTS (NSA =  3):
       -79.     76.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .060    .040    .060
```

```
WSPRO           FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188              MODEL   FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation        Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.        State Bridges
           *** RUN DATE & TIME:  6/27/96  13:31

*** START PROCESSING CROSS SECTION - "FULLV"
  XS    FULLV      1000 *        *         *         .0006
  *
  *          -------------------------------------------------------------------
  *
  *          Manning's n values based on
  *                    Overbank:   Left:   Pasture/Trees
  *                                Right:  Pasture/Trees
  *                    Channel:    Type:   Major stream; regular section
  *                                Bed Matl:  Sand
  *
  *              Main        Main
  *              TOLB        TORB
  *              -----       -----
  SA             -79          76
  N          .06      .04        .06
  *
  *          ===================================================================
  *          Downstream Face of Main Channel Bridge Section             (SRD 1000
  *          ===================================================================
  *
  *          Cross Sec  Low      Acute
  *          Sec   Ref  Cord     Skew      Expansion Contract  Discharge
  *          ID    ID   Elev     Angle     Coeff     Coeff     Coeff
  *
  *          SECID SRD  LSEL     SKEW      EK        CK        USERCD
  *          ----- ---- -----    --------- --------  --------  ---------

*** FINISH PROCESSING CROSS SECTION - "FULLV"
*** CROSS SECTION "FULLV" WRITTEN TO DISK, RECORD NO. =  3

--- DATA SUMMARY FOR SECID "FULLV" AT SRD =    1000.  ERR-CODE =       0

     SKEW     IHFNO     VSLOPE       EK        CK
      .0        0.      .0006        .50       .00

X-Y COORDINATE PAIRS   (NGP =   16):
       X      Y             X      Y              X      Y              X      Y
  -105.0  995.00        -79.0  987.40         -72.0  985.20         -53.0  985.20
   -42.0  985.20        -21.0  984.50         -16.0  983.80          -6.0  983.20
      .0  982.80          5.0  986.10          21.0  985.50          43.0  985.20
    56.0  984.80         73.0  985.90          76.0  987.50          98.0  993.40

 X-Y MAX-MIN POINTS:
     XMIN       Y             X    YMIN        XMAX       Y             X     YMAX
  -105.0  995.00           .0  982.80        98.0  993.40        -105.0  995.00

SUBAREA BREAKPOINTS (NSA =  3):
        -79.     76.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .060    .040    .060
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation        Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.        State Bridges
           *** RUN DATE & TIME:  6/27/96  13:31

*** START PROCESSING CROSS SECTION - "BRDGE"
  BR   BRDGE     1000  996.1     *         *         *         *
  *
  GR          -79.1,996.1
  *
  *          From Survey for Main Channel Bridges:
  GR          -79 ,995.8    -75 ,994.2   -63.8 , 988.8   -50.2 , 987.8
  GR          -40 ,987.6    -29 ,986.2   -25.1 , 984.4   -10.2 , 982.0
  GR            0 ,979.8     12 ,982.7    20.3 , 986.0    40.3 , 986.7
  GR           55 ,985.7     65 ,987.4    76.2 , 994.1    80.9 , 995.6
  *
  GR          80.9,996.1    -79.1,996.1
  *          -------------------------------------------------------------------
  *          Manning's n values based on
  *                    Overbank:   Left:   Riprap, smooth
  *                                Right:  Riprap, smooth
  *                    Channel:    Type:   Major stream; regular section
  *                                Bed Matl:  Sand
  *
  *          (Subareas for spill-through abutments)
  *
  *                               (Channel)
  *                    Bottom         ^          Bottom
  *                      of                        of
  *                    Riprap                    Riprap
  *                    -------                   -------
  SA                   -63.8                      65
  N                .037              .04               .037
  *
  *          -------------------------------------------------------------------
  *
  *          Type      Width     Embank-   Embank-
  *          of        of         ment      ment     Wingwall  Wingwall  Radius o
  *          Bridge    Bridge    Side      Eleva-    Angle     Width     Entrance
  *          Opening   Deck      Slope      tion     (degrees) (ft)      Rounding
  *
  *          BRTYPE    BRWDTH    EMBSS     EMBELV    WWAMGL    WWWID     ENTRND
  *          ------    ------    -----     ------    ------    -----     ------
  CD         3         100       1.5       997.4     *         *         *
  *
  *          Piers widths and elevation changes (no adjustment for debris):
  PW 1           979.8,8.2      993.6,8.2      993.6,14.0
  *
  *          -------------------------------------------------------------------
  *            Min       Elev      Max
  *            Elev      Inc.      Elev
  *            for       for       for
  *            Comput.   Comput.   Computations
  *
  *            ELMIN     YINC      ELMAX     FLOWS
  *            -----     ----      -----     -----
  HP 1 BRDGE   988.9       *       988.9

*** FINISH PROCESSING CROSS SECTION - "BRDGE"
*** CROSS SECTION "BRDGE" WRITTEN TO DISK, RECORD NO. =  4

--- DATA SUMMARY FOR SECID "BRDGE" AT SRD =    1000.  ERR-CODE =       0
```

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0006	.50	.00

X-Y COORDINATE PAIRS (NGP = 19):

X	Y	X	Y	X	Y	X	Y
-79.1	996.10	-79.0	995.80	-75.0	994.20	-63.8	988.80
-50.2	987.80	-40.0	987.60	-29.0	986.20	-25.1	984.40
-10.2	982.00	.0	979.80	12.0	982.70	20.3	986.00
40.3	986.70	55.0	985.70	65.0	987.40	76.2	994.10
80.9	995.60	80.9	996.10	-79.1	996.10		

X-Y MAX-MIN POINTS:

XMIN	Y	YMIN		XMAX	Y	X	YMAX
-79.1	996.10	.0	979.80	80.9	995.60	-79.1	996.10

SUBAREA BREAKPOINTS (NSA = 3):
-64. 65.

ROUGHNESS COEFFICIENTS (NSA = 3):
.037 .040 .037

BRIDGE PARAMETERS:

BRTYPE	BRWDTH	LSEL	USERCD	EMBSS	EMBELV	ABSLPL	ABSLPR
3	100.0	996.10	*******	1.50	997.40	*******	*******

PIER DATA: NPW = 3 PPCD = 1.

PELV	PWDTH	PELV	PWDTH	PELV	PWDTH	PELV	PWDTH
979.80	8.2	993.60	8.2	993.60	14.0		

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31
CROSS-SECTION PROPERTIES: ISEQ = 4; SECID = BRDGE; SRD = 1000.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	0.	0.	0.	0.				0.
	2	467.	40573.	129.	131.				5042.
	3	2.	56.	3.	3.				9.
988.90		469.	40629.	132.	134.	1.00	-64.	68.	5009.

HP 1 BRDGE 990.3 * 990.3

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31
CROSS-SECTION PROPERTIES: ISEQ = 4; SECID = BRDGE; SRD = 1000.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	2.	72.	3.	3.				11.
	2	647.	69934.	129.	131.				8229.
	3	7.	327.	5.	6.				48.
990.30		656.	70333.	137.	140.	1.01	-67.	70.	8109.

```
*
*                                                    Q100
HP 2 BRDGE  988.9        *        988.9        1350
```

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31

VELOCITY DISTRIBUTION: ISEQ = 4; SECID = BRDGE; SRD = 1000.

WSEL	LEW	REW	AREA	K	Q	VEL
988.90	-64.0	67.5	468.6	40629.	1350.	2.88

X STA.	-64.0		-19.5		-16.3		-13.6		-11.0		-8.6
A(I)		84.1		17.9		16.9		17.1		16.7	
V(I)		.80		3.77		4.00		3.94		4.03	
X STA.	-8.6		-6.4		-4.4		-2.4		-.6		1.3
A(I)		16.1		16.2		16.3		16.5		16.4	
V(I)		4.18		4.16		4.15		4.08		4.12	
X STA.	1.3		3.2		5.3		7.6		10.0		12.7
A(I)		16.9		16.9		16.7		16.8		17.6	
V(I)		4.00		3.98		4.05		4.01		3.83	
X STA.	12.7		16.6		25.2		39.5		52.2		67.5
A(I)		19.7		27.2		35.5		32.9		33.9	
V(I)		3.43		2.48		1.90		2.05		1.99	

```
*
*                                                Q500
HP 2 BRDGE  990.3        *        990.3          2300
```

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31

VELOCITY DISTRIBUTION: ISEQ = 4; SECID = BRDGE; SRD = 1000.

WSEL	LEW	REW	AREA	K	Q	VEL
990.30	-66.9	69.8	656.4	70333.	2300.	3.50

X STA.	-66.9		-28.0		-22.5		-18.4		-14.9		-11.7
A(I)		97.7		31.0		27.2		25.7		25.1	
V(I)		1.18		3.71		4.23		4.47		4.58	
X STA.	-11.7		-8.7		-6.0		-3.4		-1.0		1.3
A(I)		24.8		24.3		24.1		23.9		23.9	
V(I)		4.63		4.73		4.76		4.82		4.80	
X STA.	1.3		3.7		6.4		9.3		12.5		16.9
A(I)		24.5		24.5		24.7		25.6		28.7	
V(I)		4.69		4.70		4.65		4.50		4.01	
X STA.	16.9		25.1		35.2		46.5		54.8		69.8
A(I)		37.1		39.8		42.4		36.0		45.2	
V(I)		3.10		2.89		2.71		3.19		2.54	

Road Section (SRD 1017)

Road cross-section coded to limit flow to effective area.

Convention used is a 1:1 expansion in effective flow area from upstream of bridge to approach section and a continuation of this effective flow area across the road section (weir flow simulation)

		Top Width of Embank	Surface Matl	Unsubmerged Weir Flow Coeff	Acute Skew Angle
SECID	SRD	EMBWID	IPAVE	USERCF	SKEW

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188               MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation           Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.           State Bridges
           *** RUN DATE & TIME:  6/27/96  13:31

*** START PROCESSING CROSS SECTION - "ROAD "
  XR   ROAD        1017   100        *         *         *
  *
  *         From Survey for Main Channel Bridges:
  GR        -500 ,997.4    -400 ,997.4   -300.0 , 997.2  -200.0 , 997.2
  GR        -100 ,997.2       0 ,997.4    100.0 , 997.5   200.0 , 997.5
  GR         300 ,997.4     400 ,997.3    500.0 , 997.2
  *
  N         .012
  *
  *         ==================================================================
  *          APPRO Section                                          (SRD 1260)
  *         ==================================================================
  *
  *         Cross Sec  Acute
  *         Sec   Ref  Skew     Expansion Contract  Valley
  *         ID    ID   Angle    Coeff     Coeff     Slope
  *
  *         SECID SRD  SKEW     EK        CK        VSLOPE
  *         ----- ---- ----     ------    --------  -------

*** FINISH PROCESSING CROSS SECTION - "ROAD "
*** CROSS SECTION "ROAD " WRITTEN TO DISK, RECORD NO. =  5

--- DATA SUMMARY FOR SECID "ROAD " AT SRD =   1017.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE      EK       CK
      .0        0.     .0006       .50      .00

X-Y COORDINATE PAIRS   (NGP =  11):
       X      Y             X      Y             X      Y             X      Y
   -500.0  997.40      -400.0  997.40      -300.0  997.20      -200.0  997.20
   -100.0  997.20          .0  997.40       100.0  997.50       200.0  997.50
    300.0  997.40       400.0  997.30       500.0  997.20

 X-Y MAX-MIN POINTS:
     XMIN      Y             X    YMIN        XMAX      Y             X    YMAX
   -500.0  997.40      -300.0  997.20       500.0  997.20       100.0  997.50

ROUGHNESS COEFFICIENTS (NSA =  1):
         .012

ROAD GRADE DATA:   IPAVE  RDWID  USERCF
                   *****  100.0 *******

BRIDGE PROJECTION DATA:   XREFLT  XREFRT  FDSTLT  FDSTRT
                         ******* ******* ******* *******
```

```
WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation          Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.          State Bridges
          *** RUN DATE & TIME:  6/27/96  13:31

*** START PROCESSING CROSS SECTION - "APPRO"
  AS    APPRO      1260   *       *         *          .0006
  *
  *        From Survey for Main Channel Bridges:
  GR        -99 ,993.6    -77 ,987.7    -55.0 , 985.7   -37.0 , 986.7
  GR        -30 ,987.7    -28 ,988.1    -21.0 , 987.7   -11.0 , 986.7
  GR         -9 ,984.6      0 ,982.8     16.0 , 982.8    26.0 , 983.9
  GR         41 ,984.7     53 ,985.6     66.0 , 985.3    86.0 , 984.7
  GR         98 ,985.7    104 ,987.7    112.0 , 989.8
  *
  *        -------------------------------------------------------------------
  *
  *        Manning's n values based on
  *                  Overbank:   Left:    Pasture/Trees
  *                              Right:   Pasture/Trees
  *                  Channel:    Type:    Major stream; regular section
  *                              Bed Matl:  Sand
  *
  *              (Main Channel)
  *             Main     ^     Main
  *             TOLB           TORB
  *             -----          -----
  SA             -77            98
  N        .06      .04        .06
  *
  *        -------------------------------------------------------------------
  *          Min      Elev      Max
  *          Elev     Inc.      Elev
  *          for      for       for
  *          Comput.  Comput.   Computations
  *
  *          ELMIN     YINC     ELMAX     FLOWS
  *          -----     ----     -----     -----
  HP 1 APPRO 989.3      *       989.3

*** FINISH PROCESSING CROSS SECTION - "APPRO"
*** CROSS SECTION "APPRO" WRITTEN TO DISK, RECORD NO. =   6

--- DATA SUMMARY FOR SECID "APPRO" AT SRD =   1260.  ERR-CODE =      0

     SKEW     IHFNO     VSLOPE       EK        CK
      .0       0.       .0006       .50       .00

X-Y COORDINATE PAIRS   (NGP =   19):
      X       Y            X       Y            X       Y            X       Y
    -99.0  993.60        -77.0  987.70        -55.0  985.70        -37.0  986.70
    -30.0  987.70        -28.0  988.10        -21.0  987.70        -11.0  986.70
     -9.0  984.60           .0  982.80         16.0  982.80         26.0  983.90
     41.0  984.70         53.0  985.60         66.0  985.30         86.0  984.70
     98.0  985.70        104.0  987.70        112.0  989.80

 X-Y MAX-MIN POINTS:
     XMIN       Y            X     YMIN        XMAX       Y            X     YMAX
    -99.0  993.60           .0  982.80        112.0  989.80        -99.0  993.60

SUBAREA BREAKPOINTS (NSA =   3):
       -77.     98.
```

```
ROUGHNESS COEFFICIENTS (NSA =  3):
         .060     .040     .060

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
```

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31
CROSS-SECTION PROPERTIES: ISEQ = 6; SECID = APPRO; SRD = 1260.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	5.	100.	6.	6.				24.
	2	693.	64168.	175.	177.				7818.
	3	20.	702.	12.	13.				151.
989.30		718.	64969.	193.	195.	1.04	-83.	110.	7714.

HP 1 APPRO 990.7 * 990.7

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31
CROSS-SECTION PROPERTIES: ISEQ = 6; SECID = APPRO; SRD = 1260.

WSEL	SA#	AREA	K	TOPW	WETP	ALPH	LEW	REW	QCR
	1	17.	534.	11.	12.				117.
	2	938.	106306.	175.	177.				12314.
	3	40.	1838.	14.	15.				378.
990.70		994.	108678.	200.	204.	1.06	-88.	112.	12233.

```
*
*                                              Q100
HP 2 APPRO  989.3       *       989.3      1350
```

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31

VELOCITY DISTRIBUTION: ISEQ = 6; SECID = APPRO; SRD = 1260.

WSEL	LEW	REW	AREA	K	Q	VEL
989.30	-83.0	110.1	717.8	64969.	1350.	1.88

X STA.	-83.0		-55.9		-43.4		-5.9		-1.1		2.9
A(I)		58.9		41.0		89.1		27.6		25.8	
V(I)		1.15		1.64		.76		2.45		2.62	
X STA.	2.9		7.0		11.0		15.1		19.3		23.8
A(I)		26.6		26.1		26.7		26.8		26.5	
V(I)		2.54		2.59		2.53		2.51		2.55	
X STA.	23.8		29.2		35.3		41.9		49.9		59.3
A(I)		29.0		30.9		31.5		33.6		35.7	
V(I)		2.33		2.19		2.15		2.01		1.89	
X STA.	59.3		68.1		76.1		83.5		90.9		110.1
A(I)		34.9		33.3		33.0		32.7		48.2	
V(I)		1.94		2.03		2.05		2.07		1.40	

```
*
*                                              Q500
HP 2 APPRO  990.7      *        990.7          2300
```

FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation   Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc.   State Bridges
*** RUN DATE & TIME: 6/27/96 13:31

VELOCITY DISTRIBUTION: ISEQ = 6; SECID = APPRO; SRD = 1260.

WSEL	LEW	REW	AREA	K	Q	VEL
990.70	-88.2	112.0	993.9	108678.	2300.	2.31

X STA.	-88.2		-60.7		-49.7		-36.8		-8.6		-2.6
A(I)		77.9		52.6		55.9		96.4		41.2	
V(I)		1.48		2.19		2.06		1.19		2.79	
X STA.	-2.6		2.4		7.2		12.0		16.8		21.9
A(I)		38.6		37.8		38.0		37.7		38.3	
V(I)		2.98		3.04		3.02		3.05		3.00	
X STA.	21.9		27.7		34.4		41.4		49.7		59.0
A(I)		40.8		43.4		43.3		46.7		48.1	
V(I)		2.82		2.65		2.66		2.46		2.39	
X STA.	59.0		68.0		76.2		84.0		91.9		112.0
A(I)		48.1		46.2		45.2		46.1		71.5	
V(I)		2.39		2.49		2.54		2.50		1.61	

```
*
*         -----------------------------------------------------------------------
*         Notice:
*            This file, together with the concepts and designs presented
*            herein, as an instrument of service, is intended for the specific
*            purpose and client for which it was prepared.  Reuse of and
*            improper reliance on this file without written authorization
*            and adaptation by Kimley-Horn and Associates, Inc. shall be
*            without liability to Kimley-Horn and Associates, Inc.
*         -----------------------------------------------------------------------
*
*         End of WSPRO Input File
*         DDB
*         Created 1/3/96
EX

+++ BEGINNING PROFILE CALCULATIONS --   2
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation        Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.        State Bridges
           *** RUN DATE & TIME:   6/27/96  13:31

 XSID:CODE   SRDL    LEW     AREA    VHD     HF    EGL    CRWS       Q   WSEL
       SRD   FLEN    REW        K   ALPH     HO    ERR     FR#     VEL

1000D:XS   ******    -84.     610.    .08 *****  988.42  985.76   1350.  988.34
       0.  ******     81.   55098.   1.02 ***** *******     .21    2.21

EXIT :XS     840.    -84.     609.    .08    .51  988.92 *******   1350.  988.84
     840.    840.     81.   55002.   1.02    .00    -.01     .21    2.22

FULLV:FV     160.    -84.     610.    .08    .10  989.02 *******   1350.  988.94
    1000.    160.     81.   55150.   1.02    .00     .01     .21    2.21
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APPRO:AS     260.    -82.     680.    .06    .14  989.17 *******   1350.  989.11
    1260.    260.    109.   59671.   1.03    .00     .01     .19    1.98
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA    VHD     HF    EGL    CRWS       Q   WSEL
       SRD   FLEN    REW        K   ALPH     HO    ERR     FR#     VEL

BRDGE:BR     160.    -64.     468.    .17    .13  989.07  986.77   1350.  988.90
    1000.    160.     68.   40586.   1.30    .02     .00     .31    2.88

     TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
       3.   1.   1.   .875    .159  996.10 ****** ****** ******

       XSID:CODE    SRD    FLEN    HF    VHD    EGL     ERR      Q     WSEL
     ROAD :RG     1017.        <<<<<EMBANKMENT IS NOT OVERTOPPED>>>>>

 XSID:CODE   SRDL    LEW     AREA    VHD     HF    EGL    CRWS       Q   WSEL
       SRD   FLEN    REW        K   ALPH     HO    ERR     FR#     VEL

APPRO:AS     160.    -83.     709.    .06    .12  989.31  986.14   1350.  989.26
    1260.    175.    110.   63744.   1.04    .12     .01     .18    1.90

        M(G)   M(K)     KQ   XLKQ   XRKQ   OTEL
        .313   .159  53430.   -41.    90. 989.18

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>
```

FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31

FIRST USER DEFINED TABLE.

XSID:CODE	SRD	Q	AREA	LEW	REW	K	VEL	WSEL
1000D:XS	0.	1350.	610.	-84.	81.	55098.	2.21	988.34
EXIT :XS	840.	1350.	609.	-84.	81.	55002.	2.22	988.84
FULLV:FV	1000.	1350.	610.	-84.	81.	55150.	2.21	988.94
BRDGE:BR	1000.	1350.	468.	-64.	68.	40586.	2.88	988.90
ROAD :RG	1017.	0.*********************************					1.00********	

XSID:CODE	VAVG
ROAD :RG	******
ROAD :RG	******

XSID:CODE	SRD	Q	AREA	LEW	REW	K	VEL	WSEL
APPRO:AS	1260.	1350.	709.	-83.	110.	63744.	1.90	989.26

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188             MODEL   FOR   WATER-SURFACE   PROFILE   COMPUTATIONS

        Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
        Phase 2 Bridge Scour Hydraulic Evaluation       Project #99901-1524
        Prepared By: Kimley-Horn and Assoc., Inc.       State Bridges
           *** RUN DATE & TIME:   6/27/96   13:31

 XSID:CODE   SRDL     LEW      AREA    VHD    HF     EGL     CRWS       Q     WSEL
       SRD   FLEN     REW         K   ALPH    HO     ERR      FR#     VEL

1000D:XS   ******    -89.      856.    .12 *****  989.90   986.34   2300.   989.78
        0. ******     87.    93863.   1.04 ***** *******      .22    2.69

EXIT :XS     840.    -89.      855.    .12   .51  990.40  *******   2300.   990.28
      840.   840.     87.    93743.   1.04   .00     .00      .22    2.69

FULLV:FV     160.    -89.      856.    .12   .10  990.50  *******   2300.   990.38
     1000.   160.     87.    93911.   1.04   .00     .01      .22    2.69
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===140 AT SECID "APPRO":   END OF CROSS SECTION EXTENDED VERTICALLY.
                            WSEL,YLT,YRT =     990.55      993.60      989.80

APPRO:AS     260.    -88.      963.    .09   .14  990.64  *******   2300.   990.55
     1260.   260.    112.   103451.   1.05   .00     .00      .20    2.39
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL     LEW      AREA    VHD    HF     EGL     CRWS       Q     WSEL
       SRD   FLEN     REW         K   ALPH    HO     ERR      FR#     VEL

BRDGE:BR     160.    -67.      660.    .22   .13  990.54   987.71   2300.   990.32
     1000.   160.     70.    70888.   1.14   .02     .00      .30    3.49

    TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
     3.   1.   1.    .935   .131  996.10 ****** ****** ******

   XSID:CODE    SRD    FLEN    HF    VHD     EGL     ERR        Q     WSEL
   ROAD :RG    1017.          <<<<<EMBANKMENT IS NOT OVERTOPPED>>>>>

===140 AT SECID "APPRO":  END OF CROSS SECTION EXTENDED VERTICALLY.
                            WSEL,YLT,YRT =     990.69       993.6       989.8

 XSID:CODE   SRDL     LEW      AREA    VHD    HF     EGL     CRWS       Q     WSEL
       SRD   FLEN     REW         K   ALPH    HO     ERR      FR#     VEL

APPRO:AS     160.    -88.      991.    .09   .12  990.77   986.88   2300.   990.69
     1260.   172.    112.   108189.   1.06   .12     .01      .19    2.32

     M(G)   M(K)      KQ   XLKQ   XRKQ    OTEL
     .313   .173  89248.   -46.    91.  990.61

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>
```

WSPRO FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P060188 MODEL FOR WATER-SURFACE PROFILE COMPUTATIONS

Bridge No. 160133; S.R. 60 over Peace Creek Drainage Canal
Phase 2 Bridge Scour Hydraulic Evaluation Project #99901-1524
Prepared By: Kimley-Horn and Assoc., Inc. State Bridges
*** RUN DATE & TIME: 6/27/96 13:31
FIRST USER DEFINED TABLE.

XSID:CODE	SRD	Q	AREA	LEW	REW	K	VEL	WSEL
1000D:XS	0.	2300.	856.	-89.	87.	93863.	2.69	989.78
EXIT :XS	840.	2300.	855.	-89.	87.	93743.	2.69	990.28
FULLV:FV	1000.	2300.	856.	-89.	87.	93911.	2.69	990.38
BRDGE:BR	1000.	2300.	660.	-67.	70.	70888.	3.49	990.32
ROAD :RG	1017.	0.*********************************					1.00********	

XSID:CODE	VAVG
ROAD :RG	******
ROAD :RG	******

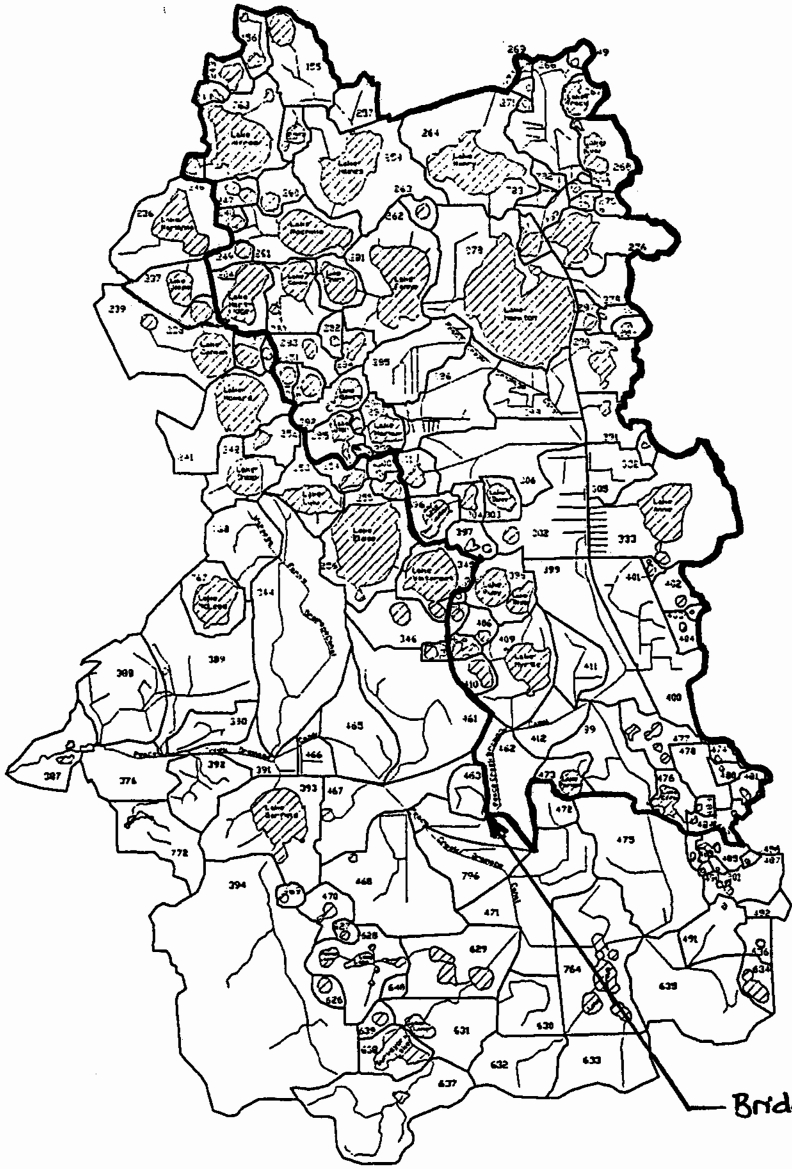
XSID:CODE	SRD	Q	AREA	LEW	REW	K	VEL	WSEL
APPRO:AS	1260.	2300.	991.	-88.	112.	108189.	2.32	990.69

ER

```
  NORMAL  END  OF  WSPRO  EXECUTION.
Stop - Program terminated.
```

ATTACHMENT C

Hydrology



Bridge Location

DRAINAGE ANALYSIS UNIT 5
PEACE CREEK CANAL
SUB-BASIN LOCATIONS

LEGEND

SUB-BASIN BOUNDARIES
512 SUB-BASIN NUMBER
LAKES & STREAMS

SCALE: 1" = 2.5 MI.

2.5 0 2.5

Basin Boundaries to Bridge # 160133

APPENDIX J

Correspondence

Brett French

From: Dawn Turner <Dawn.Turner@swfwmd.state.fl.us>
Sent: Tuesday, October 06, 2015 9:46 AM
To: Brett French
Subject: RE: Floodway analysis
Attachments: Guidance_1a1_SWFWMD_WMPG_Jan2011.pdf

Brett,

The District's Guidelines and Specifications (attached) includes rainfall amounts and a distribution for the 5 day event.

The use of a multi-day event was evaluated by the watershed consultant and the peer review consultant, and found to be reasonable based on the verification data we have for the Peace Creek watershed. This is described in more detail in the report prepared by the peer review consultant.

I was not involved in the development of the effective 2012 FIS. However, I do know that the 2012 FIS is an older version of the FIS that was updated for the east part of Polk County within the South Florida Water Management District's jurisdiction. Originally we were working with FEMA and the SFWMD to produce a county-wide product; but we were not able to complete our portion of the County in time to be included in the 2012 update. The DFIRMs and revised FIS that we are producing will update the area within our District. These products are going through the review and map adoption process now.

We used the ICPR model to obtain the flows that were used in the HEC-RAS model. Of course, I believe our ICPR and HEC-RAS models are the most up-to-date, and therefore most accurate/appropriate. But our maps and FIS are still "Preliminary." I don't know if FEMA can accept them for your no-rise application. But, you will have to check with them. The flows in the revised FIS have been updated to reflect the ICPR model results for the 1 percent annual chance event; in this case, the 100 year-5 day event. We did not produce flow rates for the other storm events for the FIS.

Dawn

____
Dawn Turner, P.E.
Southwest Florida Water Management District
7601 Highway 301 North
Tampa, Florida 33637-6759
(813) 985-7481 or 1-800-836-0797 (Florida only), ext. 4199

From: Brett French [mailto:Brett.French@kisingercampo.com]
Sent: Tuesday, October 06, 2015 7:57 AM
To: Dawn Turner <Dawn.Turner@swfwmd.state.fl.us>
Subject: FW: Floodway analysis

Good morning Dawn,

I am touching base with you about the questions below. Some of them are long winded and are our responsibility to determine the answers to but just wanted to bounce some things off of you to get a better idea of the PCDC model. Please let me know if you have any time to discuss. Thank you.

KISINGER CAMPO & ASSOCIATES

Brett French, EI
Stormwater Engineer

Email: Brett.French@kisingercampo.com
Work: 813.871.5331 ext 4196
201 N. Franklin St., Suite 400, Tampa, FL 33602

From: Brett French
Sent: Monday, October 05, 2015 1:32 PM
To: Dawn Turner <Dawn.Turner@swfwmd.state.fl.us>
Subject: RE: Floodway analysis

Dawn, Below are a few questions we had as it relates to the Peace Creek Watershed model and the Polk County FIS. Thank you.

- We have a version of the FEMA FIS for Polk County, FL dated September, 28th, 2012. At the SR 60 crossing (east bridge), the peak discharge rates reported in the FIS are considerably higher than the flowrates taken from the Watershed Model. For example, the 50 Year flowrate is 1,356 CFS in the FIS while the 50 Year – 1 Day flowrate is 667 CFS for the corresponding link in the model. Alternatively, the flowrate from the 100 year event in the FIS (1,591 CFS) corresponds reasonably well with the flowrate for the 100 year – 5 day event from the model (1,448 CFS).
    - Are you familiar with the methodology used in the FIS to develop these flowrates?
    - In your opinion, what would be the most accurate/appropriate flowrate used for the design storm event (FIS vs. Watershed Model)?

- Within the Justification Report, Section 4.1.3 – Use of a Multi-Day Storm, it is stated that multi-day storms are more suitable for large watersheds where travel time to the outlet exceeds one day. Gage data for the Peace Creek Canal support this statement because peak flows occur up to four days following the initial rainfall event. We were considering modeling the more frequent storm events for longer durations, for example the 25 year – 5 day and 50 year – 5 day storm events.
    - Would you recommend we use the 5 day duration for the design storm event?
    - Do you know of a good resource to find rainfall depths for the frequency/duration events stated above?

KISINGER CAMPO & ASSOCIATES

Brett French, EI
Stormwater Engineer

Email: Brett.French@kisingercampo.com
Work: 813.871.5331 ext 4196
201 N. Franklin St., Suite 400, Tampa, FL 33602

From: Dawn Turner [mailto:Dawn.Turner@swfwmd.state.fl.us]
Sent: Monday, October 05, 2015 8:28 AM
To: Brett French <Brett.French@kisingercampo.com>
Cc: Vogel, Randall <randallvogel@polk-county.net>
Subject: RE: Floodway analysis

Brett,

The floodway analysis entitled PeaceCreekFloodwayAnalysis_2014Aug.zip is located at:

http://ftp.swfwmd.state.fl.us/pub/outgoing/

Please let me know if you have any problems downloading the information.

Dawn

____

Dawn Turner, P.E.
Southwest Florida Water Management District
7601 Highway 301 North
Tampa, Florida 33637-6759
(813) 985-7481 or 1-800-836-0797 (Florida only), ext. 4199

From: Vogel, Randall [mailto:randallvogel@polk-county.net]
Sent: Friday, October 02, 2015 3:52 PM
To: Brett French <Brett.French@kisingercampo.com>
Cc: Dawn Turner <Dawn.Turner@swfwmd.state.fl.us>
Subject: RE: Floodway analysis

Brett, I would talk to Pradeep Chettri. He works for AECOM and is the lead MT-2 reviewer for FEMA Region IV cases. He can be reached at 404.965.9600

Thanks

Randall E. Vogel MPA, CFM
Floodplain Manager
Polk County Board of County Commissioners
330 W. Church St. Drawer GM03
P.O. Box 9005
Bartow, FL 33831-9005

Phone (863) 534-6767
Fax (863) 534-7646

http://www.polk-county.net/boccsite/your-government/floodplain-management/

From: Yuan Li [mailto:Yuan.Li@swfwmd.state.fl.us]
Sent: Friday, October 02, 2015 2:11 PM
To: Dawn Turner; Brett French

Cc: Ali Tayebnejad; Kenneth Yinger; Vogel, Randall; Corcoran, Brian
Subject: RE: Floodway analysis

Thanks Dawn!

From: Dawn Turner
Sent: Friday, October 02, 2015 2:08 PM
To: Yuan Li <Yuan.Li@swfwmd.state.fl.us>; Brett French <Brett.French@kisingercampo.com>
Cc: Ali Tayebnejad <Ali.Tayebnejad@kisingercampo.com>; Kenneth Yinger <Kenneth.Yinger@kisingercampo.com>; Randall Vogel <randallvogel@polk-county.net> (randallvogel@polk-county.net) <randallvogel@polk-county.net>; Corcoran, Brian <BrianCorcoran@polk-county.net>
Subject: RE: Floodway analysis

Yes – that is correct.

We are working with Randall Vogel, Polk County Floodplain Manager; and Brian Corcoran on the review of the Preliminary DFIRMs. They are in the Polk County Land Development Division, and can be reached at (863) 534-6767 and (863) 534-6765 respectively.

The official 90 day appeal period began on August 19, 2015. After the appeal period closes, we will prepare responses to the comments and appeals, and make any necessary revisions to the maps.

We currently anticipate issuing Letters of Final Determination around March 2016. The maps should become effective 6 months later around September 2016.

Please let me know if you need anything else.

Dawn Turner

____

Dawn Turner, P.E.
Southwest Florida Water Management District
7601 Highway 301 North
Tampa, Florida 33637-6759
(813) 985-7481 or 1-800-836-0797 (Florida only), ext. 4199

From: Yuan Li
Sent: Friday, October 02, 2015 1:42 PM
To: Brett French <Brett.French@kisingercampo.com>; Dawn Turner <Dawn.Turner@swfwmd.state.fl.us>
Cc: Ali Tayebnejad <Ali.Tayebnejad@kisingercampo.com>; Kenneth Yinger <Kenneth.Yinger@kisingercampo.com>
Subject: RE: Floodway analysis

Brett,
Thanks for following up with us on Peace Creek Canal floodway study. I'm copying the message to Dawn Turner, who is probably the best person to address your questions about FEMA adoption and Polk County coordination.

Dawn,
My understanding is we are in the middle of appeal time frame of draft Polk County DFIRM, which has our newly developed floodway in it. Am I correct?

Thanks,

Yuan Li, P.E.
Senior Professional Engineer
Engineering & Watershed Management Section
Water Resources Bureau
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899
Main: (352) 796-7211, Ext. 4283
800-423-1476 (Florida only)
Direct: (352) 796-0515, Ext. 4283
Fax: (352) 754-3498
yuan.li@swfwmd.state.fl.us

From: Brett French [mailto:Brett.French@kisingercampo.com]
Sent: Friday, October 02, 2015 1:02 PM
To: Yuan Li <Yuan.Li@swfwmd.state.fl.us>
Cc: Ali Tayebnejad <Ali.Tayebnejad@kisingercampo.com>; Kenneth Yinger <Kenneth.Yinger@kisingercampo.com>
Subject: FW: Floodway analysis

Hi Yuan,

KCA is preparing several BHRs over the Peace Creek Drainage Canal and I wanted to follow up on the e-mail chain below. Do you know the status for FEMA adoption of the Peace Creek floodplain/floodway model? If possible, may we please have the HEC-RAS model for setting floodplain/floodway? Also, Is Polk County involved in FEMA reviews? If yes; Who is your contact at Polk County? Thank you.

KCA
KISINGER CAMPO & ASSOCIATES

Brett French, EI
Stormwater Engineer

Email: Brett.French@kisingercampo.com
Work: 813.871.5331 ext 4196
201 N. Franklin St., Suite 400, Tampa, FL 33602

From: Yuan Li [mailto:Yuan.Li@swfwmd.state.fl.us]
Sent: Thursday, October 16, 2014 4:56 PM
To: Kenneth Yinger <Kenneth.Yinger@kisingercampo.com>
Subject: RE: Floodway analysis

Ken, as discussed please find the latest version of Peace Creek floodway, which is pretty much finalized internally but still subject to FEMA's adoption.
Thanks,
Yuan

Yuan Li, P.E.

Senior Professional Engineer
Engineering & Watershed Management Section
Water Resources Bureau
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899
Main: (352) 796-7211, Ext. 4283
800-423-1476 (Florida only)
Direct: (352) 796-0515, Ext. 4283
Fax: (352) 754-3498
yuan.li@swfwmd.state.fl.us

From: Kenneth Yinger [mailto:Kenneth.Yinger@kisingercampo.com]
Sent: Friday, February 28, 2014 9:24 AM
To: Yuan Li
Subject: RE: Floodway analysis

Thanks alot for the info.

From: Yuan Li [mailto:Yuan.Li@swfwmd.state.fl.us]
Sent: Friday, February 28, 2014 8:41 AM
To: Kenneth Yinger
Subject: RE: Floodway analysis

Ken, attached please find the draft floodway for Peace Creek. Feel free to let me know if you have any questions or concerns.

Thanks,
Yuan

From: Kenneth Yinger [mailto:Kenneth.Yinger@kisingercampo.com]
Sent: Tuesday, February 18, 2014 3:59 PM
To: Yuan Li
Subject: RE: Floodway analysis

That would be great. Attached is pic of the location of our project. Thanks.

From: Yuan Li [mailto:Yuan.Li@swfwmd.state.fl.us]
Sent: Tuesday, February 18, 2014 12:25 PM
To: Kenneth Yinger
Subject: RE: Floodway analysis

Ken,
The model should be completed this month but we may not be able to release it until we get FEMA's approval. However, we could provide GIS file for your review and comments. Do you have a figure showing where your project is located? I may be able to provide a localized draft floodway sometime next week so you could comment on.

Thanks,
Yuan Li, P.E.
Senior Professional Engineer
Engineering & Watershed Management Section
Water Resources Bureau

Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899
Phone: (352) 796-7211, Ext. 4283
800-423-1476 (Florida only)
Fax: (352) 797-5806
yuan.li@swfwmd.state.fl.us

From: Kenneth Yinger [mailto:Kenneth.Yinger@kisingercampo.com]
Sent: Tuesday, February 18, 2014 9:12 AM
To: Yuan Li
Subject: RE: Floodway analysis

Yuan,
How is the floodway model coming along? Just wanted to get an update? Also, will it be possible to get a copy of the model and a GIS shape file of the updated floodway when it is complete?
Thanks,
Kenny Yinger

From: Yuan Li [mailto:Yuan.Li@swfwmd.state.fl.us]
Sent: Thursday, January 16, 2014 1:42 PM
To: Kenneth Yinger
Cc: Harry Downing
Subject: RE: Floodway analysis

Ken,
Harry and I are currently performing verifications of the Peace Creek floodway model, which is in HEC-RAS 4.1, to implement those latest changes and modify certain methodologies in defining flow changes. We may need some further discussions and get approval from FEMA on our end. The model is expected to be completed mid to late February though. You are very welcome to check back with us then.

Thanks,

Yuan Li, P.E.
Senior Professional Engineer
Engineering & Watershed Management Section
Water Resources Bureau
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899
Phone: (352) 796-7211, Ext. 4283
800-423-1476 (Florida only)
Fax: (352) 797-5806
yuan.li@swfwmd.state.fl.us

From: Harry Downing
Sent: Thursday, January 16, 2014 8:39 AM

To: Yuan Li
Subject: FW: Floodway analysis

Yuan,

Can you provide the information requested?

Thanks,

Harry

From: Kenneth Yinger [mailto:Kenneth.Yinger@kisingercampo.com]
Sent: Friday, January 10, 2014 9:22 AM
To: Harry Downing
Subject: Floodway analysis

Harry Downing,
I understand that you are working on the floodway analysis for the Peace Creek. I understand that the Peace Creek model has recently been updated and now you are currently updating the floodway. I'm currently working for FDOT on designing the new Central Polk Parkway. We have three bridge crossings over Peace Creek along the project corridor. I was wondering if you had an idea on the schedule. Also, what software are you using to analyze the floodway?

Thanks,

CONFIDENTIALITY NOTE: This communication may be privileged and confidential. It should not be disseminated to others. If received in error, please immediately reply that you have received this communication in error and then delete it. Thank you.

** Please Note: Florida has a very broad Public Records Law. Most written communications to or from State and Local Officials regarding State or Local business are public records available to the public and media upon request. Your email communications may therefore be subject to public disclosure.
****

Brett French

From: Chettri, Pradeep <pradeep.chettri@aecom.com>
Sent: Monday, October 05, 2015 4:35 PM
To: Brett French
Cc: Ali Tayebnejad
Subject: RE: Peace Creek in Polk County, FL - No Rise

Brett,

Yes, please use the Polk County prelim model as existing conditions, and incorporate the proposed project to evaluate the project impact.

If you have questions, please let me know.

Thanks,

Pradeep Chettri, PE, CFM
AECOM, a member of **Compass PTS JV**
D 1-404-965-7080
pradeep.chettri@aecom.com

From: Brett French [mailto:Brett.French@kisingercampo.com]
Sent: Monday, October 05, 2015 3:52 PM
To: Chettri, Pradeep
Cc: Ali Tayebnejad
Subject: RE: Peace Creek in Polk County, FL - No Rise

Pradeep,

No, we are not anticipating to make a LOMR/CLOMR application to FEMA. We plan on completing a No-rise certification. Thank you.

KCA KISINGER CAMPO & ASSOCIATES

Brett French, EI
Stormwater Engineer
Email: Brett.French@kisingercampo.com
Work: 813.871.5331 ext 4196
201 N. Franklin St., Suite 400, Tampa, FL 33602

From: Chettri, Pradeep [mailto:pradeep.chettri@aecom.com]
Sent: Monday, October 05, 2015 1:54 PM
To: Brett French <Brett.French@kisingercampo.com>

Cc: Ali Tayebnejad <Ali.Tayebnejad@kisingercampo.com>
Subject: RE: Peace Creek in Polk County, FL - No Rise

Brett,

Are you anticipating to make LOMR/CLOMR application to FEMA? Could you clarify?

Thanks,

Pradeep Chettri, PE, CFM
AECOM, a member of **Compass PTS JV**
D 1-404-965-7080
pradeep.chettri@aecom.com

From: Brett French [mailto:Brett.French@kisingercampo.com]
Sent: Monday, October 05, 2015 11:39 AM
To: Chettri, Pradeep
Cc: Ali Tayebnejad
Subject: RE: Peace Creek in Polk County, FL - No Rise

Pradeep,

Kisinger Campo & Associates is preparing several BHRs over Peace Creek/Peace Creek Drainage Canal in Polk County, FL. I was advised by Randall Vogel, the Polk County Floodplain Manager, that you are lead MT-2 reviewer for FEMA Region IV cases. Currently, the FEMA FIRMs for this area are in the process of being revised and updated based on a new Watershed ICPR model and a HEC-RAS floodway model. I was directed by the Southwest Florida Water Management District (SWFWMD) and Polk County to use these most recent models for data acquisition for completing the BHRs and the required documentation for the No-rise certifications. According to SWFWMD, the official 90 day appeal period for the Preliminary DFIRMs began on August 19, 2015. They anticipate issuing Letters of Final Determination around March 2016 with the maps becoming effective 6 months later around September 2016. We will be submitting our No-rise certifications around late January or early February 2016. Do you anticipate any issue with us using the most recent models for preparing the required documentation for the No-rise certifications? Thank you.

KCA
KISINGER CAMPO
& ASSOCIATES

Brett French, EI
Stormwater Engineer

Email: Brett.French@kisingercampo.com
Work: 813.871.5331 ext 4196
201 N. Franklin St., Suite 400, Tampa, FL 33602

From: Chettri, Pradeep [mailto:pradeep.chettri@aecom.com]
Sent: Monday, October 05, 2015 9:52 AM
To: Brett French <Brett.French@kisingercampo.com>
Subject: Peace Creek in Polk County, FL - No Rise

Brett,

I received your message this morning. Please find my contact information below-

Please feel free to call or email with questions.

Pradeep Chettri, PE, CFM
AECOM, a member of **Compass PTS JV**
D 1-404-965-7080
pradeep.chettri@aecom.com

CONFIDENTIALITY NOTE: This communication may be privileged and confidential. It should not be disseminated to others. If received in error, please immediately reply that you have received this communication in error and then delete it. Thank you.

Drainage and Permitting Kickoff Meeting Minutes
SR 60 Grade Separation over CSX Railroad
FPID 436559-1-52-01

February 26, 2016
10:00 AM

The meeting began with an overview of the project which is to grade separate SR 60 over the CSX railroad. Three frontage roads will be provided in the northwest, southwest, and northeast quadrants. Two new frontage road terminals will be provided at each end of the grade separation. Three new bridge pairs on SR 60 are proposed over the Peace Creek Drainage Canal (PCDC), fuel line and frontage road access, and the CSX railroad. The existing eastbound SR 60 bridge over the PCDC will be re-used for the southwest frontage road. Sidewalks in both directions are provided.

The alignment is shifted to the north to allow re-use of the existing eastbound PCDC bridge for the southwest frontage road and to allow traffic control phasing to keep four lanes open on SR 60 during construction and is consistent with the PD&E alignment. Right of way will be acquired on the north side except for the west frontage road terminal, which is on the south side.

I. Design Criteria

For quantity/quality calculations the 25-year 24-hour storm will be used for the pond design. Carl mentioned that lately the water management district has been asking for additional storms be modeled when demonstrating no adverse impact for 100-year floodplain impacts. This will be confirmed at the pre-application meeting. The standard pond freeboard is one foot. Carl confirmed that this is acceptable but if there is any hardship, a reduction could be considered (no less than 0.5' of freeboard) since this is not an area with a history of flooding. Brent pointed out that the net improvement calculations will need to address the change in DCIA since a closed storm sewer will be utilized for the entire project. Brent mentioned that there may be two watershed floodplain model versions available and that we should confirm that we have the latest model.

II. Ponds

The existing borrow pit in Basin 1 was originally proposed to be used as both a pond site and for borrow. Subsequently, discussions were initiated by the property owner and a new pond site has been added directly south of the current borrow pit location, adjacent to the right of way. The plan is to excavate the borrow pit and return it to the property owner and use the new pond for a permanent storm water facility. Brent asked FDA to review the proposed pond location since it would require significant piping back to the outfall. A discussion took place regarding the fencing at the Basin 1 pond. It was decided that the pond fence will not be included in the construction plans but the adjacent property owner would be compensated to install a fence around the back side of the pond as part of the cost to cure.

Photographs were presented that show the dumping that has occurred in the Basin 3 pond site.

The dumping is significant and since this pond site will continue to be isolated from view, it is preferable to include fencing in the proposed design. After reviewing the photographs of the site Carl and Brent both agreed that a variation for pond fencing is needed. Amy will provide an example of a previously used variation.

The pond siting report addendum will include calculations and data regarding the relocated pond site in Basin 1.

III. Regional Idea

For the environmental look around (ELA), the entire region will be considered. With the borrow pit and drainage easement being returned to the adjacent property owner, syphoning the Peace Creek Drainage Canal may no longer be a viable option. The new pond site should be reviewed for opportunities related to this idea. Brent asked FDA to include calculations that show the benefit of nitrogen and phosphorus removal.

IV. Pipes

A roll plot with the conceptual storm sewer layout was provided. The location of the trunkline was discussed. The concept showed the trunkline located in the median within the limits of the MSE wall. It was mentioned that dropping vertically from the inlets and using a thrust block at the bend would result in less pipe. If a vertical drop is utilized it would be preferable to pass the pipe beneath the MSE wall leveling pad inside a steel casing prior to it connecting to the trunkline under the Frontage Road.

Temporary drainage was discussed and with dropping the pipe vertically it would be much simpler. After discussions with temporary retaining wall manufacturer's, it was confirmed that the median trunkline option would also be constructible.

The outfall from Pond 3 to the PCDC will need to be re-established. The type of connection was discussed. It was decided that an open ditch would be preferable due to maintenance but the final decision should be coordinated with utilities so access to their facilities can be accommodated. A water crossing using gravel or culvert should be considered.

The cross drain will be replaced with a class IV pipe due to the depth of fill being added over the pipe. Calculations will be performed to evaluate whether a size increase is needed due to the extra length.

A few side drain pipes need replacement in the ditch that will remain, primarily on the south side of SR 60. It was decided that all side drain pipes will be replaced as the cost is incidental to the project.

V. Environmental

The current status of the environmental reviews for pond siting, JD limits, permitting and mitigation requirements was provided.

No further environmental review is required for the relocated Basin 1 pond; the area was reviewed during previous phases of the pond siting.

Wetland and surface water limits for the mainline, existing pond sites, and the proposed new location were established in the field and were surveyed. These are shown on the Phase I submittal plans.

Permits applications will be prepared and submitted with the Phase II revised plans. An Individual permit from SWFWMD and USACE is expected. Brent noted the USACE SAJ-92 permit may apply. Niki will confirm the project was reviewed in EDTM with the DEMO staff as part of the requirements to applying for this permit. Follow up: Vivienne Cross confirmed this project was not screened through ETDM "since it started out on a fast track." So the USACE SAJ-92 permit is not applicable. Since the PD&E will be producing a state document, FWS will not consult on the project until USACE provides the federal nexus. We have been able to get technical guidance from them so we do not expect any surprises once they are fully involved during permitting.

A pre-application meeting will be scheduled at one of the regularly scheduled SWFWMD monthly meetings (1st Wednesday of the month).

Mitigation requirements for wetlands will be determined during the permit application preparation. Brent has about 9-10 credits of both herbaceous and forested credits from Boran Ranch Mitigation Bank and the Peace River Mitigation Bank.

Wildlife involvement includes mitigating for wood stork suitable foraging habitat. FDA will use the process detailed by Brent for determining the wood stork mitigation. The wetland credits will cover the required wood stork credits.

Other wildlife species with involvement with the project include:

- Gopher tortoises located within the Basin 3 pond site and outfall. These will be permitted for relocation closer to the construction date.

- Surveys for the crested caracara are underway. No caracara have been observed during the survey. The ESBA will be updated after the survey. The survey will be complete at the end of April 2016.

- A survey for Southeastern American kestrels was conducted in the summer of 2015. One nest pole was identified off-site. The nest pole was cut down and replaced with a metal pole by Duke Energy. Kestrels continue to forage in the project area, mainly around Peace Creek Drainage Canal. No new nest locations are known.

- A pair of fox squirrels were observed within the project limits on the southwest quadrant of Peace Creek Drainage Canal. They were in pine trees and foraging on pine cones.

- The dry shelves under the new bridges at the Peace Creek Drainage Canal were discussed. The existing SR 60 eastbound bridge will remain in place for the frontage road. Brent noted that a project in Collier County added a 2-foot-wide dry pathway for wildlife as a retrofit to an existing bridge. FDA will review the potential for a similar retrofit for the SR 60 eastbound bridge so that a complete wildlife pathway is provided.

FWC has issued a concurrence letter. USFWS has indicated they will not consult on the project until the USACE provides the federal nexus during permitting. Niki will forward Brent any available concurrence letters along with the USFWS correspondence.

Drainage and Permitting Kickoff Meeting Agenda
SR 60 Grade Separation over CSX Railroad
FPID 436559-1-52-01

February 26, 2016
10:00 AM

Engineering:

- Criteria
  a. Base clearance / variation
  b. Critical Duration
  c. Freeboard
  d. Impaired Water Bodies

- Ponds
  a. Basin 1 - Change in plan due to property owner request (PSR Addendum)
  b. ELA
  c. Fencing
  d. Re-establish outfall in Basin 3
    i. Pipe vs. ditch
    ii. Update ICPR model
- Regional Idea
- Pipes
  a. Trunkline location
  b. Outfall locations / types
  c. MOT drainage
  d. Cross Drain
  e. Side Drains
    i. Mostly CMP
    ii. All but two are in good condition

Environmental:

- Pond Siting
  a. Evaluate revised Basin 1 pond area
  b. Limited JD staking expected
- Wetland and Surface Water Limits
  a. Mainline and original Basin 1 & 3 SMFs areas have been staked, surveyed
  b. Limits are shown on plans
- Permitting – after Phase II revised
  a. SWFWMD – Individual
  b. USACE – Individual
  c. Pre-application meetings
    i. PD&E held 10/1/14
    ii. Design phase pre-app to be scheduled
- Mitigation Requirements
  a. Wetland impacts
    i. Credits at Peace River MB for forested; Boran Ranch MB for herbaceous
    ii. Total impacts & credit requirements TBD
  b. Wood stork SFH—with wetland mitigation

   c. Gopher tortoise recipient site (down the road)
- No SSL, easements, other special designations
- Wildlife Surveys
   a. SE American kestrel survey completed
   b. Caracara survey underway now—no sightings so far
   c. Gopher tortoises
      i. Present on Basin 3 parcel and outfall
      ii. Resurvey/permitting/relocation necessary ~ six months prior to construction
- Other Wildlife Issues
   a. Fox squirrels and SE American kestrels are within project limits
   b. These are state-listed species; FWC this week issued concurrence letter for ESBA and no mitigation is required for these species
   c. New PCDC bridges have wildlife shelves (see BDR)

Schedule

- BDR and BHR in review
- Phase II Plans – Fall 2016

Action Items

Sign In SHEET

Purpose: **Drainage and Permitting Kickoff Meeting**

Date: **2-26-16**

FPID: **436559-1-52-01**

Project Description: **SR 60 Grade Separation over CSX Railroad**

Name	Company	E-mail Address
Kim Muzyka	FDA	Kmuzyka@fallsdavis.com
CARLTON SPIRIO	FDOT	
Brent Setchell	FDOT	
Nicole Montes	FDOT	nicole.montes@dot.fl.us
Amy Setchell (LATE)	FDOT PM	amy.setchell@dot.state.fl.us
Nia ~~[illegible]~~ Okeen		
Tammy		

APPENDIX K

Comments

Submittal Report

Financial Project:	436559-1-52-01	Submital Type:	BRIDGE HYDRAULIC REPORT
Submittal Phase:	INITIAL	Submital Staff Type:	CONSULTANT
Received Date:	2/17/2016	Response Due Date:	4/18/2016
Grace Period:	0	District:	FIRST
Status:	OPEN	Create Date:	2/17/2016
Create User Id:	RD158SA	Last Update:	2/17/2016
		Last Update User Id:	RD158SA

Description:

Initial Bridge Hydraulic Report - SR 60 over Peace Creek

Assignments:

Name	Assignment	Due Date	Status	Comments
Amir Ayoub	REVIEWER	3/18/2016	ACTIVE	

No	Status	Current Holder	Reference	Categories
79	RESPONSE ACCEPTED			DRAINAGE

Created By	Created On	Version	Delegate For
Amir Ayoub	3/17/2016	1	

BHRS sheet:
a) The bridge numbers are not provided. Please provide.
b) Plan view: Please show the riprap geometry on the side of the bridge. They are not currently shown.

Ken Muzyk	4/18/2016	1	

a) The bridge numbers will be determined after the final BDR submittal.
b) Agree, riprap geometry on the side of the bridge will be shown.

We will be submitting Final BDR in June and will apply for bridge numbers at that time.

Amir Ayoub	4/27/2016	1	

Response Accepted & Comment Closed

Name	Assignment	Due Date	Status	Comments
Amy Setchell	IN-HOUSE PROJECT MANAGER	3/18/2016	ACTIVE	
Andra Diggs	LEAD REVIEWER	3/18/2016	ACTIVE	
Andy Richardson	REVIEWER	3/18/2016	ACTIVE	

No	Status	Current Holder	Reference	Categories
78	RESPONSE ACCEPTED			DRAINAGE

Created By	Created On	Version	Delegate For
Andy Richardson	3/17/2016	1	

BHR, Page 2: The second paragraph states that the animal crossing shelf shall be 6” above the normal high water (EL 109.5’). Please verify whether or not the 6” requirement is a minimum value or a required value. If it is a minimum value, it may not be necessary to excavate in the canal and the square footage of MSE wall required can be reduced.

Ken Muzyk	4/18/2016	1	

For the wildlife shelf, 6” above the normal high water (EL 109.5’) is a minimum value. The wildlife shelf elevation will be raised (elevation TBD) which will reduce the required square footage of MSE wall. Once a revised wildlife elevation is determined, the requirement for canal excavation will be analyzed.

Andy Richardson	4/28/2016	1	

Response Accepted & Comment Closed

Wildlife shelf has been raised to elevation 112.5' under the proposed bridges and a wildlife shelf at elevation 110.5' was added under the Frontage Road Bridge

Name	Assignment	Due Date	Status	Comments
CHARLES SAMUELS	REVIEWER	3/18/2016	ACTIVE	

No	Status	Current Holder	Reference	Categories
1	RESPONSE ACCEPTED		General	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

All review comment responses should specifically address how comments will be resolved and where exactly in the plans or documentation changes have been made. Vague responses will be considered unresponsive and may be rejected.

Ken Muzyk	4/18/2016	1	

Agree.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
2	RESPONSE ACCEPTED		TOC ii	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please add "Project" to Figure 1 for consistency with the figure description.

Ken Muzyk	4/18/2016	1	

Agree, "Project" will be added to Figure 1 for consistency with the figure description.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
3	RESPONSE ACCEPTED		TOC ii	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revise Figurs 2 to "USGS Quadrangle Map" for consistency with the figure description.

Ken Muzyk	4/18/2016	1	

Agree, Figure 2 will be revised to "USGS Quadrangle Map" for consistency with the figure description.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
4	RESPONSE ACCEPTED		TOC ii	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

This map is of Polk County. Please revise the Appendix description to match the figure description of NRCS Soils Map.

Ken Muzyk	4/18/2016	1	

Agree, Figure 3 description on page ii will be revised to match the figure description of NRCS Soils Map in Appendix A.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
5	RESPONSE ACCEPTED		TOC ii	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revise the Figure 4 description to match the figure description. FIGURE FIRM, MAP NUMBER 12105C0545G

Ken Muzyk	4/18/2016	1	

Agree, the Figure 4 description on page ii will be revised to match the figure description in Appendix A.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
6	RESPONSE ACCEPTED		TOC ii	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revise Recommendation to Recommendations.			
Ken Muzyk	4/18/2016	1	
Agree, Recommendation will be revised to Recommendations.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
7	RESPONSE ACCEPTED		TOC ii	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revise all Conditions text to singular to match appendix sheets for consistency.			
Ken Muzyk	4/18/2016	1	
Agree, Conditions text will be revised to singular throughout the report to match appendix sheets for consistency.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
8	RESPONSE ACCEPTED		Exc. Sum. Pg. 1	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please consider adding "The hydraulic feasibility of bridge crossings within this report were analyzed using Hydrologic Engineering Center River Analysis System (HEC-RAS) Version. 4.1.0, developed by the U.S. Army Corps of Engineers" to the first paragraph.			
Ken Muzyk	4/18/2016	1	
Agree, "The hydraulic feasibility of bridge crossings within this report were analyzed using Hydrologic Engineering Center River Analysis System (HEC-RAS) Version. 4.1.0, developed by the U.S. Army Corps of Engineers" will be added to the first paragraph.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
9	RESPONSE ACCEPTED		Exc. Sum. Pg. 2	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please consider adding "The analyses addressed in this executive summary are based on this alternative" to the second sentence.			
Ken Muzyk	4/18/2016	1	
Agree, a statement will be added to the executive summary indicating that the analyses addressed are based on Alternative 2.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
10	RESPONSE ACCEPTED		Exc. Sum. Pg.2	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please add to the second paragraph which alternative this flood stage represents. If you added to the second sentence on page 2, please disregard this comment.			
Ken Muzyk	4/18/2016	1	
We will disregard this comment. Please see the response to comment 9.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
11	RESPONSE ACCEPTED		Exc. Sum. Pg. 3	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please add to the first paragraph which alternative these estimated scour depths represent. If you added to the second sentence on page 2, please disregard this comment.

Ken Muzyk	4/18/2016	1	

We will disregard this comment. Please see the response to comment 9.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
12	RESPONSE ACCEPTED		Pg. 4	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please consider the use PCDC or Peace Creek Drainage Canal for consistency in the report, it use is flipped back and forth.

Ken Muzyk	4/18/2016	1	

Agree, the text "Peace Creek Drainage Canal (PCDC)" will be used once in the beginning of the report and then "PCDC" will be used throughout the rest for consistency.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
13	RESPONSE ACCEPTED		Pg. 5	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please add a north arrow to Figure 1.

Ken Muzyk	4/18/2016	1	

Agree, a north arrow will be added to Figure 1.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
14	RESPONSE ACCEPTED		Pg. 5	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please submit the no-rise documentation as an addendum in the next submittal.

Ken Muzyk	4/18/2016	1	

Agree, the no-rise documentation will be submitted in the next submittal.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
15	RESPONSE ACCEPTED		Pg. 5	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Consider adding the Preliminary March 27, 2015 map to your addendum. It more accurately shows the elevations you are using in your model.

Ken Muzyk	4/18/2016	1	

We will replace Figure 4, the Effective FEMA FIRM Map Number 12105C0545G, with the Preliminary FEMA FIRM Map Number 12105C0545H.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
16	RESPONSE ACCEPTED		Pg. 6	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The last sentence at the top of the page appears to be referencing the Bridge Scour report 100 year event. If this is so it does not correspond to the 100 year event in the report. Please revisit the inconsistency.

Ken Muzyk	4/18/2016	1	

The elevation referenced is the 100 year stage found on the Effective FEMA FIRM, Map Number 12105C0545G. We are replacing the Effective FEMA FIRM Map Number 12105C0545G with the Preliminary FEMA FIRM Map Number 12105C0545H. We will revise the base flood elevation based on FEMA FIRM 12105C0545H and will add text within this section documenting that this value is from the FEMA FIRM. The sentence referencing the Phase 2 Bridge Scour report will be removed.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
17	RESPONSE ACCEPTED		Pg. 8	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The report states "Consequently, two viable..." the BDR indicates three, Maintain Bridge, Widen Bridge, Replace Bridge, please address this. Your report states "This bridge will be....." which bridge? You may want to indicate that "The existing bridge is to remain as is however will be rehabilitated to...."

Ken Muzyk	4/18/2016	1	

We will revise the text to indicate that the existing eastbound bridge/future frontage road bridge will remain and will be widened to the south to replace the bridge railings.

CHARLES SAMUELS	4/25/2016	1	Proposed construction is covered under Section 5.2

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
18	RESPONSE ACCEPTED		Pg. 9	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

This low member elevation of 116.7 does not match the one on Page I-27 of Appendix I.

Ken Muzyk	4/18/2016	1	

The figure on Page I-27, Appendix I reports elevations in NGVD whereas this BHR reports elevations in NAVD. Therefore, the low member elevation of 116.7' (NAVD) is correct. Will include low member elevation in NGVD in parenthesis within the report.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
19	RESPONSE ACCEPTED		Pg. 9	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

These sufficiency ratings and health index do not match the inspection report. These are the rating for Bridge 160133. The report also does not indicate it as functionally obsolete. Please revise the paragraph accordingly.

Ken Muzyk	4/18/2016	1	

Agree, the sufficiency ratings and health index will be revised to match the inspection report. The sentence regarding the structure being "functionally obsolete" will be removed.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
20	RESPONSE ACCEPTED		Pg.10	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please remove the word "minimum" in the Design Frequency. This is not a minimum it is a standard design frequency.			
Ken Muzyk	4/18/2016	1	
Agree, the word "minimum" in the Design Frequency will be removed.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
21	RESPONSE ACCEPTED		Pg. 10	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Vertical clearance and horizontal clearance are defined in the PPM Volume 1, Chapter 2 not the Drainage Manual.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise sentence as follows: "The FDOT includes hydraulic requirements of bridges within the FDOT Drainage Manual (Effective: January 2016) and within Chapter Two of the Plans Preparation Manual (PPM)."			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
22	RESPONSE ACCEPTED		Pg. 13	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please provide a Typical Section along with the elevation for this alternative, since it is the basis of the report.			
Ken Muzyk	4/18/2016	1	
We will not be providing a Typical Section within the body of this report as it is provided within Appendix H. We will provide the appendix and page number for the typical section within the report (H-7, Appendix H).			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
23	RESPONSE ACCEPTED		Pg. 13	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please reference the newest FIS for this location. There is currently one effective September 2, 2012.			
Ken Muzyk	4/18/2016	1	
Agree, we will reference the effective FEMA FIS (September 28th, 2012), however, the discharge values are the same.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
24	RESPONSE ACCEPTED		Pg. 14	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revisit the storm frequency for the FEMA FIS to verify it is a discharge for a 5-Day. The FIS referenced stated that the analysis chose a 4-day storm. Since you are referring to newer models, the preliminary 2015 FIS only indicates a 1 percent which seems to have a much higher discharge. Please address the peak flow determinations with more detail and some additional documentation and possible references in establishing the peak discharges used in this analysis.

Ken Muzyk	4/18/2016	1	

The Preliminary 2015 FIS does not report flowrates at this SR 60 Bridge Crossing (between sections Y and Z) therefore it will not be referenced within this report. The Peace Creek Watershed ICPR model was created by Atkins at the directive of SWFWMD for updating the FEMA FIRMs. This ICPR model was used as the hydrologic analysis within this BHR. The 100 year and 500 year events were run by Atkins using a 120 hour duration (5 days). KCA modeled the 25 year and 50 year events using a 120 hour duration (5 days). According to the Justification Report of the Peace Creek Watershed Management Plan prepared by Atkins, it was determined that the 5 day event captures the lag time associated with this large watershed and more closely resembles predicted stages and flows at gage locations within the main channel. This statement will be included within Section 6. Please refer to page J-1, Appendix J to view correspondence with the SWFWMD project manager for the Peace Creek Watershed Management Plan. Correspondence with the FEMA reviewer, who directed KCA to use the Peace Creek Watershed ICPR model, will also be added to Appendix J.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
25	RESPONSE ACCEPTED		Pg. 16	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revisit the ineffective flow areas for the existing. There seems to be active flow within the limits of the modeled ineffective flow areas.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the limits of ineffective flow areas.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
26	RESPONSE ACCEPTED		Pg. 16	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revise "conditions" to "water surface elevations" in the paragraph above Table 4 as well as the "Conditions" call out in the Table 4 title and heading. Also add ft. after the number so it is not confused as being a cfs. As an alternate "stage" could be used, however, W.S. Elev is used in the HEC-RAS table.

Ken Muzyk	4/18/2016	1	

Agree, we will revise "conditions" to "water surface elevations" in the paragraph, however, Table 4 will be removed per comment 31.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
27	RESPONSE ACCEPTED		Pg. 16	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please include the Bridge sections information for Table 4.

Ken Muzyk	4/18/2016	1	

Table 4 will be removed per comment 31.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
28	RESPONSE ACCEPTED		Pg. 16	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Section 7.3 indicates the HEC-RAS has a deck width of 136.5', the HEC-RAS models have a deck width is 135. Please address this inconsistency.

Ken Muzyk	4/18/2016	1	

Agree, the deck width within the HEC-RAS models will be revised to 136.5'.

The combined deck width and 1" between the proposed bridges measured perpendicular to the SR 60 alignment is 136.5'. The combined deck width and 1" between the proposed bridges measured perpendicular to the PCDC alignment/ flow path is 145.3'. As a conservative measure, the deck width was set to 145.3' within the HEC-RAS model.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
29	RESPONSE ACCEPTED		Pg. 16	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Since the manning's roughness was changed to .045 for the internal geometry due to the riprap, please consider revising your internal geometry to reflect the proposed riprap configuration.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the internal geometry to reflect the proposed riprap configuration.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
30	RESPONSE ACCEPTED		Pg. 17	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

For Table 5 please revise "conditions" to "water surface elevations". Also add ft. after the number so it is not confused as being a cfs.

Ken Muzyk	4/18/2016	1	

Agree, we will revise "conditions" to "water surface elevations" and add a foot indicator after the number for Table 5.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
31	RESPONSE ACCEPTED		Pg. 17	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The Existing Condition is duplicated in Table 4. Consider removing Table 4 and just use the Summary table and call it out in the Section 7.2 reference.

Ken Muzyk	4/18/2016	1	

Agree, we will remove Table 4 and will call out the Summary Table in Section 7.2.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
32	RESPONSE ACCEPTED		Pg. 17	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please include the Bridge sections information for Table 5.

Ken Muzyk	4/18/2016	1	

Agree, we will include the Bridge sections information for Table 5.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
33	RESPONSE ACCEPTED		Pg. 17	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please address the channel bottom elevation somewhere in Section 8.

Ken Muzyk	4/18/2016	1	

Agree, we will address the channel bottom elevation in Section 8.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
34	RESPONSE ACCEPTED		Pg. 17	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please consider a D50 significant number of 0.00 or revise this to 0.248.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the D50 value to 0.25.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
35	RESPONSE ACCEPTED		Pg. 18	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

In the sentence prior to Section 8.2 abutment scour is recommended. Section 4.9.2.3 of the FDOT Drainage Manual (2016) states "Abutment scour estimates are not required when the minimum abutment protection is provided." Section 4.9.3.2.1 states that minimum protection shall consist of one of the following rubble riprap (Bank and Shore), articulated block, or grout-filled articulating mattress. Section 6.4.1 of the Bridge Hydraulics Handbook states that "Notably, neither grouted sand-cement bag abutment protection nor slope paving is considered adequate protection for bridges spanning waterways." The BHRS and Bridge Plans indicate that sand cement is being used for the wildlife shelf. Please address abutment protection and provide calculations indicating that sufficient protection is being provided since the shelf is inundated significantly with the 100 year event.

Ken Muzyk	4/18/2016	1	

We will provide the minimum protection of the abutments and wildlife shelves by using rubble rip rap, therefore, additional analysis will not be required. A smooth surface for the wildlife crossing will be created by backfilling the shelf with soil. The BHRS and Bridge Plans will be revised to reflect this change.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
36	RESPONSE ACCEPTED		Pg.18	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revisit the local scour calculation for the 500 year proposed bridge. Please revise the total scour once the local scour has been derived.

Ken Muzyk	4/18/2016	1	

Local scour is correct. This comment was resolved during discussion with the reviewer.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
37	RESPONSE ACCEPTED		Pg. 19	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Section 9 states all runoff will drain to inlets at the bridge approach. In looking at the BHR the west bound does not show inlets. Also please address how the runoff for the area between the barrier wall and parapet will be handled. If there are no slots in the parapet this runoff will be concentrated at the bridge end.

Ken Muzyk	4/18/2016	1	

Agree, we will address the deck drainage by adding inlets at the approach of the westbound bridge. We will also either provide slots in the parapet (Index 410, sheet 15 of 25) to drain the sidewalk or add another inlet at the approach to collect runoff from the sidewalk.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
38	RESPONSE ACCEPTED		Pg. 19	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Section 10 states a total width of 136’-5” this does not match the bridge plans.

Ken Muzyk	4/18/2016	1	

On pages H-2 through H-4, it can be seen that the eastbound and westbound bridge width is equal to 68'-2 1/2" (68.21') plus there is one inch between the bridges. Therefore, the total bridge width is 136.5'. The total width value will be revised to 136’-6”.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
39	RESPONSE ACCEPTED		Pg. 19	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The last sentence states “It is recommended that the abutments of the proposed bridges be protected with rubble riprap to prevent scour”. Please add a statement about the wildlife crossing. The BHRS appears to indicate sand cement not rubble as the scour protection at that location.

Ken Muzyk	4/18/2016	1	

We will provide the minimum protection of the abutments and wildlife shelves by using rubble rip rap. A smooth surface for the wildlife crossing will be created by backfilling the shelf with soil. The statement in the report and the BHRS will be revised to reflect this change.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
40	RESPONSE ACCEPTED		Pg. 20	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

In Section 11 please consider adding FDOT material and documents.

Ken Muzyk	4/18/2016	1	

Agree, we will add FDOT material and documents in Section 11.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
41	RESPONSE ACCEPTED		Appendix A	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please add the bridge location to all of the figures except Figure 6.

Ken Muzyk	4/18/2016	1	

Agree, we will add the bridge location to all of the figures except Figure 6.

CHARLES SAMUELS	4/25/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
42	RESPONSE ACCEPTED		Appendix A	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revisit the drainage area boundaries for this structure depicted in Figure 5. It appears that there is area south of the bridge that would not be included.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise the drainage area boundaries depicted in Figure 5 to show no drainage area south of SR 60.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
43	RESPONSE ACCEPTED		Appendix B	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revise Recommendation to Recommendations.			
Ken Muzyk	4/18/2016	1	
Agree, Recommendation will be revised to Recommendations.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
44	RESPONSE ACCEPTED		BHR Sheet - Plan	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please depict how the structure will tie to natural ground as required in the PPM, as well as the limits of riprap. It appears that the riprap is abruptly stopping below the parapet.			
Ken Muzyk	4/18/2016	1	
Agree, we will depict how the structure will tie to natural ground and will revise the limits of riprap.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
45	RESPONSE ACCEPTED		BHR Sheet - Profile	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please show the scour configuration as indicated in the Bridge Hydraulics Handbook (2012).			
Ken Muzyk	4/18/2016	1	
Agree, we will show the scour configuration.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
46	RESPONSE ACCEPTED		BHR Sheet - Profile	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please indicate existing ground below bridge with the correct line symbology.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise the existing ground with the correct line symbology.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
47	RESPONSE ACCEPTED		BHR Sheet - Profile	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
The profile grade is not required in the profile portion of the sheet.			
Ken Muzyk	4/18/2016	1	
Agree, we will remove the profile grade callout.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
48	RESPONSE ACCEPTED		BHR Sheet - Profile	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please add the existing ground elevation at both ends as indicated in the Bridge Hydraulics Handbook (2012).			
Ken Muzyk	4/18/2016	1	
Agree, we will add the existing ground elevation at both ends of the bridge.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
49	RESPONSE ACCEPTED		BHR Sheet - Profile	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revise the LOW CHORD to LOW MEMBER as identified in the reference of the structures box.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise LOW CHORD to LOW MEMBER.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
50	RESPONSE ACCEPTED		BHR Sheet	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
In the existing and proposed structures, please place a foot indicator after the appropriate distance. 15-0" should be 15'-0". Please do this for all call outs of this kind.			
Ken Muzyk	4/18/2016	1	
Agree, we will place a foot indicator after the appropriate distance.			
CHARLES SAMUELS	4/25/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
51	RESPONSE ACCEPTED		BHR Sheet	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revisit the foundation in the proposed structure box, the report indicates steel piles please revise accordingly for consistency.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise the foundation in the proposed structure box to be "STEEL PILES".			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

The proposed pile type is now 24" Square Pre-stressed Concrete Piles. We will keep "CONC. PILES" as the foundation type.

No	Status	Current Holder	Reference	Categories
52	RESPONSE ACCEPTED		BHR Sheet	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
The proposed bridge width in the proposed structure box does not match the BDR.			
Ken Muzyk	4/18/2016	1	
It will be revised to 136'-6". Please see response to comment 38.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
53	RESPONSE ACCEPTED		BHR Sheet	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revisit the velocities at the bridge section for all events. These do not seem to agree with the model.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise these velocities to match the average velocities reported at the upstream bridge section within the HEC-RAS model for all events.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
54	RESPONSE ACCEPTED		BHR Sheet	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please add the appropriate pier number under the scour predictions.			
Ken Muzyk	4/18/2016	1	
Agree, we will add the appropriate pier number under the scour predictions.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
55	RESPONSE ACCEPTED		Appendix D Pg. D1	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
This page has a reference to Page D-2 and D-3. The node names do not agree with the referenced pages. D-1 has C0380, D-2 has NC0380. D-1 has C0370A, D-3 has RC0370A. Please revise nodes for consistency here and in the body of the report.			
Ken Muzyk	4/18/2016	1	
Agree, we will add the "N" or the "R" in front of the name of the respective Node or Reach.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
56	RESPONSE ACCEPTED		Appendix E Pg. E-1	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please fill in the Checked By: and Date:			
Ken Muzyk	4/18/2016	1	
Agree, we will fill in the Checked By: and Date: boxes.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
57	RESPONSE ACCEPTED		Appendix E Pg. E-2	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please fill in the Checked By: and Date:			
Ken Muzyk	4/18/2016	1	
Agree, we will fill in the Checked By: and Date: boxes.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
58	RESPONSE ACCEPTED		Appendix E - HEC-RAS	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please reformat report to align headings with parameters.			
Ken Muzyk	4/18/2016	1	
Agree, we will reformat report to align headings with parameters.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
59	RESPONSE ACCEPTED		Appendix E Pg. E-12	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revisit the ineffective flow areas. There seems to be some active flow within this area.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise the ineffective flow areas.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
60	RESPONSE ACCEPTED		Appendix E Pg. E-13	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please revisit the ineffective flow areas on this sheet. There seems to be some active flow within this area.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise the ineffective flow areas.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
61	RESPONSE ACCEPTED		Appendix E Pg. E-14	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
There is a pier width of 1 from 103.54 to 114.9. The inspection report indicates jackets extend all the way to the footing.			
Ken Muzyk	4/18/2016	1	
The piers at Bents 1 and 9 do not have pile jackets and are 12" square piles. The remaining piles will be revised to 18" square piles. Text will be added to the report indicating this.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
62	RESPONSE ACCEPTED		Appendix E Pg. E-14	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
There is a pier width of 1.8 from 114.9 to 116.7. The inspection report indicates the existing piles are 18”.			
Ken Muzyk	4/18/2016	1	
The pier width of 1.8' from elevations 114.9' to 116.7' represents the width of the bent caps.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
63	RESPONSE ACCEPTED		Appendix E Pg. E-18	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
There is a pier width of 2 from 114.2 to 116.2. The inspection report indicates the existing piles are 14”.			
Ken Muzyk	4/18/2016	1	
The pier width of 2' from elevations 114.2 to 116.2' represents the width of the bent caps.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
64	RESPONSE ACCEPTED		Appendix E Pg. E-18	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please add the bridge output tables.			
Ken Muzyk	4/18/2016	1	
Agree, we will add the bridge output tables.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
65	RESPONSE ACCEPTED		Appendix E Pg. E-32	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
Please adjust deck accordingly to correct graphic of downstream bridge. This is addressed by the high chord elevation of 116.63 at station 1967.57. If this high cord is correct then so be the graphic. This is of course relative to all of the alternatives as well since the downstream bridge remains as is in all cases.			
Ken Muzyk	4/18/2016	1	
Agree, we will adjust the deck accordingly to correct the graphic of downstream bridge by removing the high chord elevation of 116.63 at station 1967.57.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

No	Status	Current Holder	Reference	Categories
66	RESPONSE ACCEPTED		Appendix E Pg. E-36	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	
The deck width does not match the bridge plans for this alternative.			
Ken Muzyk	4/18/2016	1	
Agree, we will revise the deck width to be 136.5'. Please refer to the response to comment 38.			
CHARLES SAMUELS	4/27/2016	1	
Response Accepted & Comment Closed			

The combined deck width and 1" between the proposed bridges measured perpendicular to the SR 60 alignment is 136.5'. The combined deck width and 1" between the proposed bridges measured perpendicular to the PCDC alignment/flow path is 145.3'. As a conservative measure, the deck width was set to 145.3' within the HEC-RAS model.

No	Status	Current Holder	Reference	Categories
67	RESPONSE ACCEPTED		Appendix E Pg. E-37	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The distance from the beginning to the end of the lower deck upstream (167.71) is different from the distance on the downstream (173.52). These are typically the same, please address.

Ken Muzyk	4/18/2016	1	

Agree, we will adjust the bridge opening geometry so that the upstream and downstream match.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
68	RESPONSE ACCEPTED		Appendix E Pg. E-44	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please add the bridge output tables.

Ken Muzyk	4/18/2016	1	

Agree, we will add the bridge output tables.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
69	RESPONSE ACCEPTED		Appendix E Pg. E-58	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The deck width does not match the bridge plans for this alternative.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the deck width to be 136.5'. Please refer to the response to comment 38.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

The combined deck width and 1" between the proposed bridges measured perpendicular to the SR 60 alignment is 136.5'. The combined deck width and 1" between the proposed bridges measured perpendicular to the PCDC alignment/flow path is 145.3'. As a conservative measure, the deck width was set to 145.3' within the HEC-RAS model.

No	Status	Current Holder	Reference	Categories
70	RESPONSE ACCEPTED		Appendix E Pg. E-59	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The distance from the beginning to the end of the lower deck upstream (167.71) is different from the distance on the downstream (173.52). These are typically the same, please address.

Ken Muzyk	4/18/2016	1	

Agree, we will adjust the bridge opening geometry so that the upstream and downstream match.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
71	RESPONSE ACCEPTED		Appendix E Pg. E-67	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please add the bridge output tables.

Ken Muzyk	4/18/2016	1	

Agree, we will add the bridge output tables.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
72	RESPONSE ACCEPTED		Appendix E Pg. E-81	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The deck width does not match the bridge plans for this alternative.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the deck width to be 136.5'. Please refer to the response to comment 38.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

The combined deck width and 1" between the proposed bridges measured perpendicular to the SR 60 alignment is 136.5'. The combined deck width and 1" between the proposed bridges measured perpendicular to the PCDC alignment/flow path is 145.3'. As a conservative measure, the deck width was set to 145.3' within the HEC-RAS model.

No	Status	Current Holder	Reference	Categories
73	RESPONSE ACCEPTED		Appendix E Pg. E-82	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The distance from the beginning to the end of the lower deck upstream (167.71) is different from the distance on the downstream (173.52). These are typically the same, please address.

Ken Muzyk	4/18/2016	1	

Agree, we will adjust the bridge opening geometry so that the upstream and downstream match.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
74	RESPONSE ACCEPTED		Appendix E Pg. E-90	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please add the bridge output tables.

Ken Muzyk	4/18/2016	1	

Agree, we will add the bridge output tables.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
75	RESPONSE ACCEPTED		Appendix F Pg. F-3	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revise the pier shape to square in order address the worst case pile option given in the BDR of a 24" square prestressed concrete pile which would increase the scour depth.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the pier shape to square in order to address the worst case pile option given in the BDR of a 24" square prestressed concrete pile.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
76	RESPONSE ACCEPTED		Appendix F Pg. F-5	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

Please revise the pier shape to square in order address the worst case pile option given in the BDR of a 24" square prestressed concrete pile which would increase the scour depth.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the pier shape to square in order address the worst case pile option given in the BDR of a 24" square prestressed concrete pile.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

No	Status	Current Holder	Reference	Categories
77	RESPONSE ACCEPTED		Appendix F Pg. F-7	DRAINAGE

Created By	Created On	Version	Delegate For
CHARLES SAMUELS	2/26/2016	1	

The pier shapes for the 100 and 500 year do not match. Please revise for consistency. This will affect the depths in Section 8.2 as well.

Ken Muzyk	4/18/2016	1	

Agree, we will revise the pier shape to match.

CHARLES SAMUELS	4/27/2016	1	

Response Accepted & Comment Closed

Karina Della Sera	LEAD REVIEWER	3/18/2016	ACTIVE	
Ken Muzyk	CONSULTANT PROJECT MANAGER	4/18/2016	ACTIVE	
Kisan Patel	REVIEWER	3/18/2016	ACTIVE	The User has No Comments
Teresa Puckett	LEAD REVIEWER	3/18/2016	ACTIVE	

Submittal Report

Financial Project:	436559-1-52-01	Submital Type:	BRIDGE HYDRAULIC REPORT
Submittal Phase:	FINAL	Submital Staff Type:	CONSULTANT
Received Date:	6/9/2016	Response Due Date:	8/8/2016
Grace Period:	0	District:	FIRST
Status:	OPEN	Create Date:	6/9/2016
Create User Id:	RD158SA	Last Update:	6/9/2016
		Last Update User Id:	RD158SA

Description:

Final Bridge Hydraulic Report

Assignments:

Name	Assignment	Due Date	Status	Comments
Amir Ayoub	REVIEWER	7/8/2016	ACTIVE	1

No	Status	Current Holder	Reference	Categories
1	RESPONSE SUBMITTED	Amir Ayoub		DRAINAGE

Created By	Created On	Version	Delegate For
Amir Ayoub	7/8/2016	1	

on page 3, it is stated "
Stormwater runoff from the sidewalk on the proposed bridge decks will drain directly into the PCDC through slots in the parapet." Has the drainage scheme been approved in the permit?

Created By	Created On	Version	Delegate For
Ken Muzyk	7/15/2016	1	

The environmental resource permit application will be submitted in November 2016 and any comments related to the sidewalk will be addressed at that time.

Name	Assignment	Due Date	Status	Comments
Amy Setchell	IN-HOUSE PROJECT MANAGER	7/8/2016	ACTIVE	0
Andra Diggs	LEAD REVIEWER	7/8/2016	ACTIVE	0
Andy Richardson	REVIEWER	7/8/2016	ACTIVE	0*

JOHN LITTLEFIELD	REVIEWER	7/8/2016	ACTIVE	4

No	Status	Current Holder	Reference	Categories
2	RESPONSE SUBMITTED	JOHN LITTLEFIELD		DRAINAGE

Created By	Created On	Version	Delegate For
JOHN LITTLEFIELD	7/8/2016	1	

In the second paragraph of the introduction, the second sentence refers to Figure 2. The report has a Figure 2 and so does Appendix A. Revise this sentence to clarify that it refers to Figure 2 of Appendix A and not Figure 2 of the report. Verify all other references to figures make this same distinction.

Ken Muzyk	7/15/2016	1	

Agree, we will revise the figure titles in Appendix A to be Figure A-1, Figure A-2, etc. and will revise the text within the report to reflect this change

No	Status	Current Holder	Reference	Categories
3	RESPONSE SUBMITTED	JOHN LITTLEFIELD		DRAINAGE

Created By	Created On	Version	Delegate For
JOHN LITTLEFIELD	7/8/2016	1	

Section 1.4 of the report states that March 2016 was the anticipated issue date for the Letters of Final Determination for the Peace Creek Watershed ICPR model and Peace Creek Floodway HEC-RAS model. The BHR is dated May 2016. Please update the report to show the issue date(s) for these models or the current anticipated issue date (s).

Ken Muzyk	7/15/2016	1	

We will revise the text to be past tense when stating the issue date for the Letters of Final Determination. The revised FEMA FIRMs are still preliminary and the September date for them becoming effective is still valid.

No	Status	Current Holder	Reference	Categories
4	RESPONSE SUBMITTED	JOHN LITTLEFIELD		DRAINAGE

Created By	Created On	Version	Delegate For
JOHN LITTLEFIELD	7/8/2016	1	

Section 5.2 mentions that a variation will be required for the two-foot wide interim wildlife shelves for the existing eastbound bridge that is to remain for local business access. If available, please include meeting minutes or written correspondence within the report to document concurrence from FDOT's staff regarding the interim two-foot wildlife shelves.

Ken Muzyk	7/15/2016	1	

Agree, we will include correspondence with FDOT staff regarding the interim two-foot wildlife shelves.

No	Status	Current Holder	Reference	Categories
5	RESPONSE SUBMITTED	JOHN LITTLEFIELD		DRAINAGE

Created By	Created On	Version	Delegate For
JOHN LITTLEFIELD	7/8/2016	1	

The proposed ten-foot wildlife shelves for the proposed bridges are to be constructed of rubble rip-rap with soil backfill. The soil backfill would washout would be prone to eroding and washing out over time, leaving the wildlife shelf less traversable. It is understood that sand cement and sloped pavement are not considered adequate protection for bridges spanning waterways. Were any alternative materials considered instead of the rubble rip-rap with soil backfill?

Ken Muzyk	7/15/2016	1	

The text within the report will be revised to state that the wildlife shelves will be constructed on top of rubble riprap using sand cement rip rap and then backfilling with soil. The wildlife shelf elevation of 112.5' is above the DHW (50 year = 112.34') therefore the shelves will be dry during smaller and more regular storm events.

Karina Della Sera	LEAD REVIEWER	7/8/2016	ACTIVE	0
Ken Muzyk	CONSULTANT PROJECT MANAGER	8/8/2016	ACTIVE	0
Kisan Patel	REVIEWER	7/8/2016	ACTIVE	0*
Teresa Puckett	LEAD REVIEWER	7/8/2016	ACTIVE	0

APPENDIX L

Existing Bridge Plans (BR 160133)

STATE JOB NO. 16110-3115-11-21

3	FLA	F-033-1(25)	(3)	1

STATE OF FLORIDA
STATE ROAD DEPARTMENT

PLANS OF PROPOSED

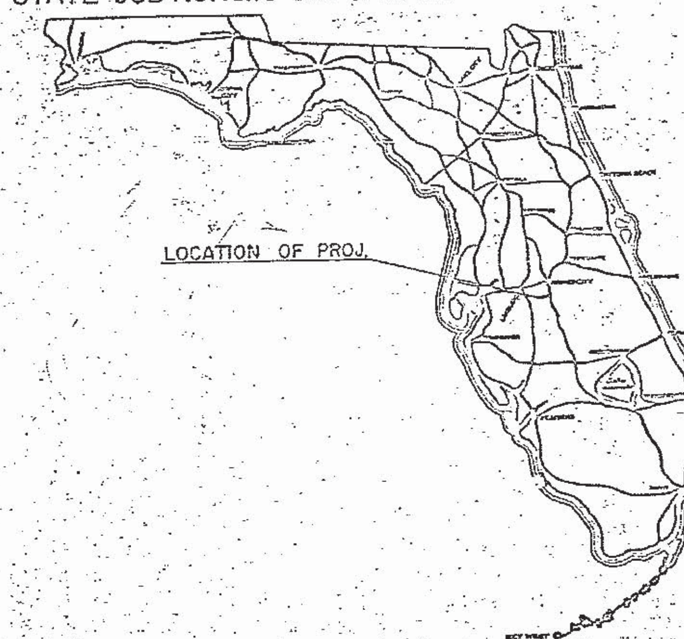
STATE HIGHWAY

F. A. PROJECT NO. F-033-1 (25)
POLK COUNTY
STATE ROAD NO. 60

—160133

INDEX OF SHEETS

FOR INDEX OF BRIDGE SHEETS SEE BRIDGE PLANS

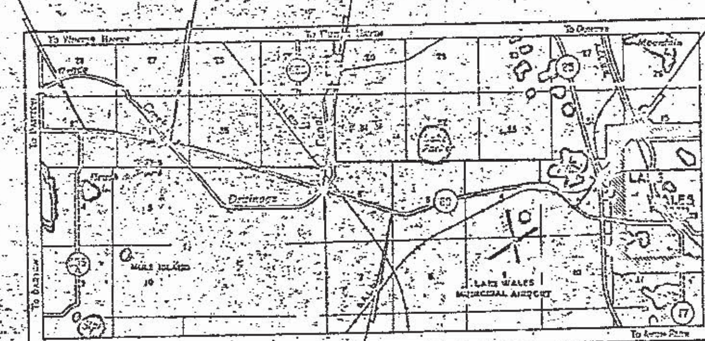


STA. 2208+89.53
BEGIN F.A. PROJ. Nº F-033-1 (25)
BEGIN STATE JOB Nº 16110-3115

STA. 2270+73.00
BEGIN BRIDGE
PROP. 220' BRIDGE
STA. 2272+93.00
END BRIDGE

BEGIN BRIDGE
PROP. 100' BRIDGE
STA. 2333+10.00
END BRIDGE

STA. 2585+92.38
END F.A. PROJ. Nº F-033-1 (25)
END STATE JOB Nº 16110-3115



SCALE 1" = 1 MILE

EQUATION
STA. 2440+52.87 BK.
STA. 2440+57.43 AHD.

FDOT
NOV 8 2007
EDMS SCANNED

BEST AVAILABLE ORIGINAL

BR # 160133

ATTENTION IS DIRECTED TO THE FACT THAT THESE PLANS MAY HAVE BEEN REDUCED IN SIZE BY REPRODUCTION. THIS MUST BE CONSIDERED WHEN OBTAINING SCALED DATA.

CONVENTIONAL SIGNS

COUNTY LINE	TRAVELED WAY
TOWNSHIP LINE	CULVERTS
SECTION LINE	BRIDGES OVER 20 FT. SPAN
UNFENCED PROPERTY	POWER POLE
CITY LINE	TELEPHONE POLE
FENCE LINE	MARSH
RIGHT OF WAY LINE	GROUND ELEV.
BASE OR SURVEY LINE	GRADE ELEV.
RAILROADS	R. R. MILE POST

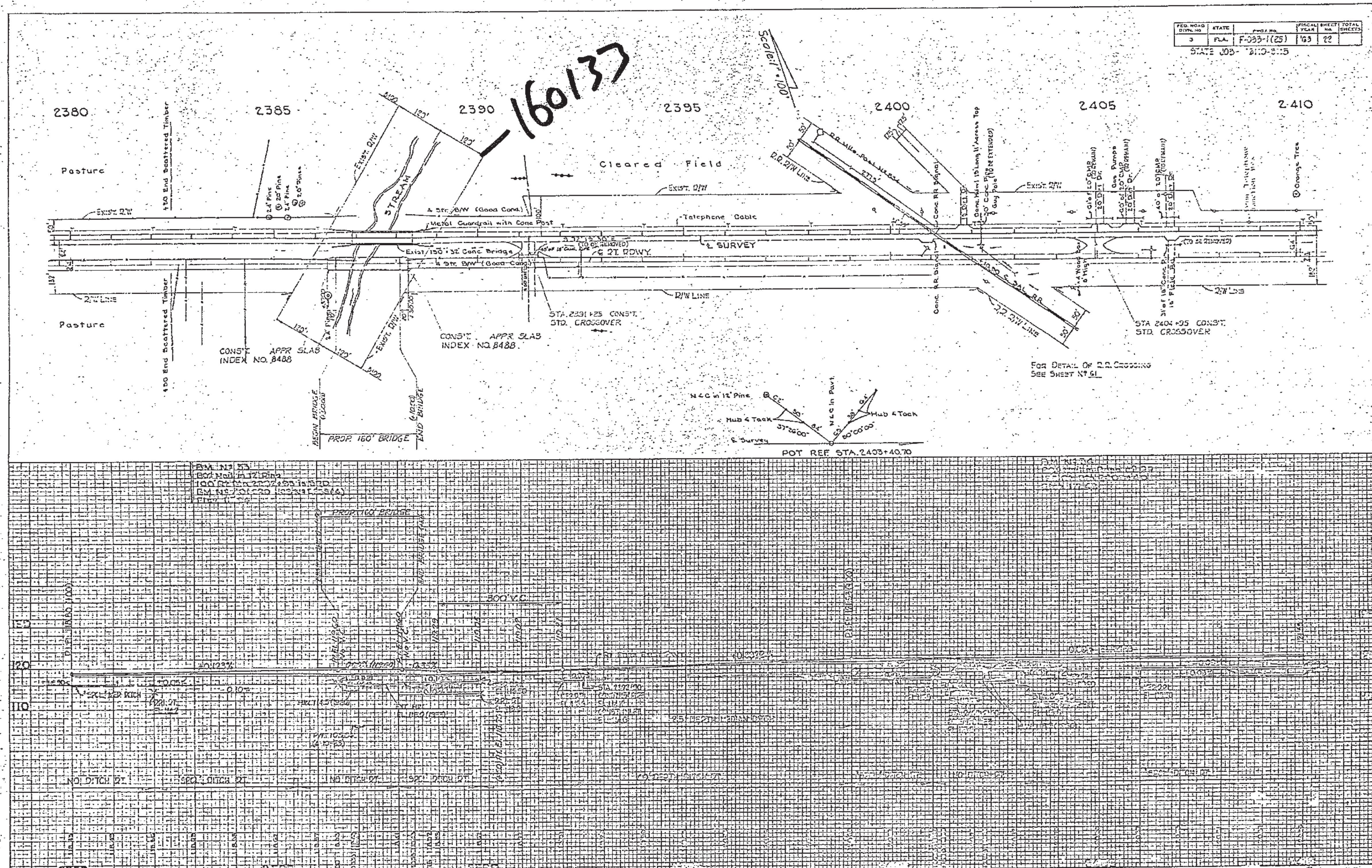
GOVERNING SPECIFICATIONS: STATE OF FLORIDA, STATE ROAD DEPARTMENT, STANDARD SPECIFICATIONS, DATED APRIL 1, 1959 AND SUPPLEMENT Nº 1 THERETO, DATED JULY 1, 1965.
APPROVED BY BUREAU OF PUBLIC ROADS — DATE

LENGTH OF PROJECT		
	LIN. FEET	MILES
ROADWAY	37,328.69	7.069
BRIDGES	380.00	0.072
NET LENGTH OF PROJ.	37,708.69	7.141
EXCEPTIONS	0.00	.000
GROSS LENGTH OF PROJ.	37,708.89	7.141

SUBMITTED BY J. W. Brown
STATE HIGHWAY ENGINEER

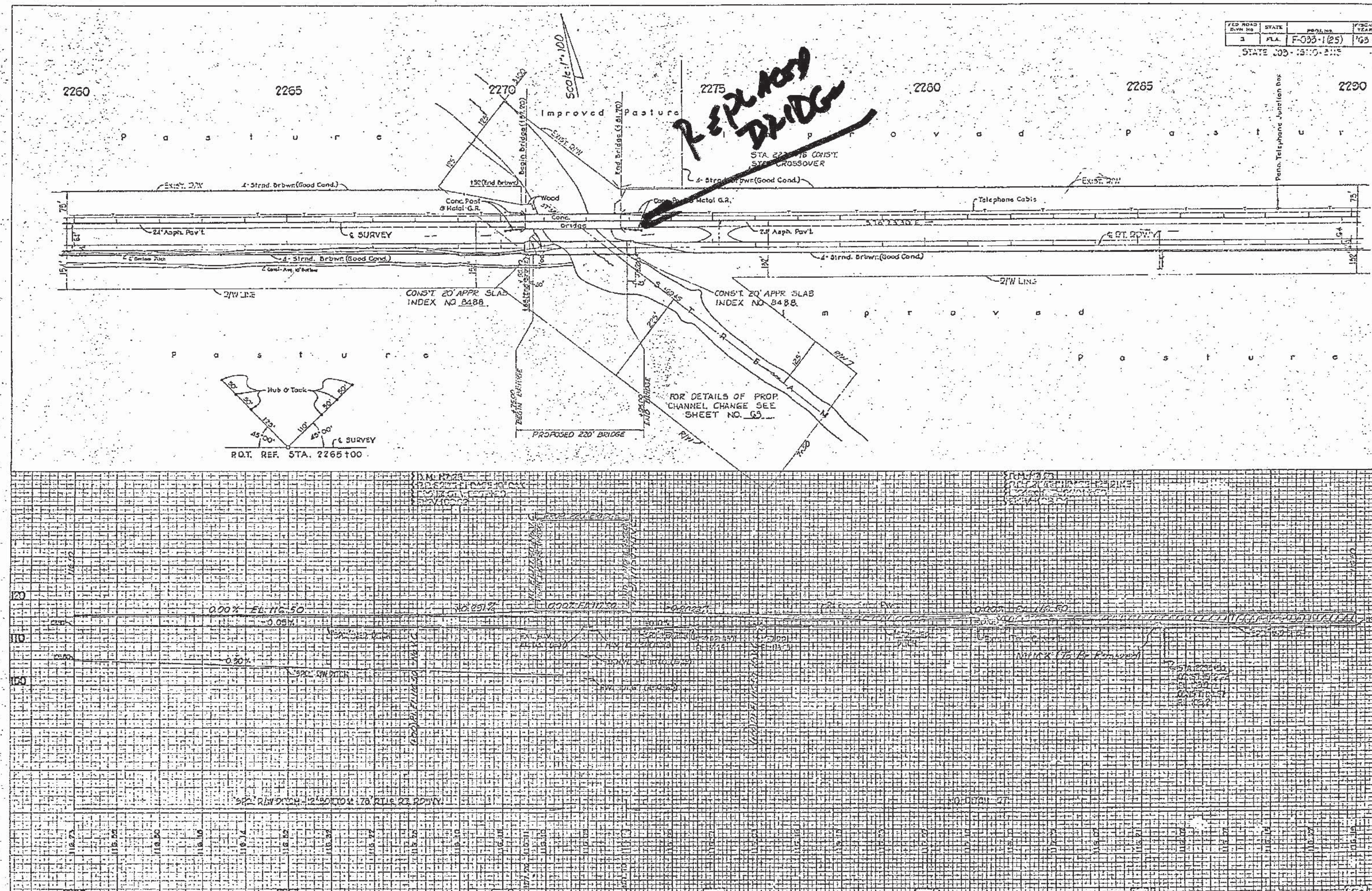
APPROVED DATE
BUREAU OF PUBLIC ROADS

160137



FDOT
NOV 8 2007
EDMS SCANNED

BEST AVAILABLE ORIGINAL

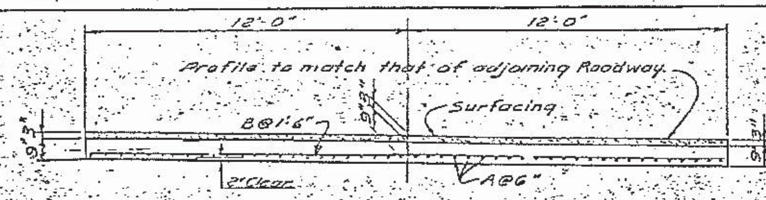


L-3

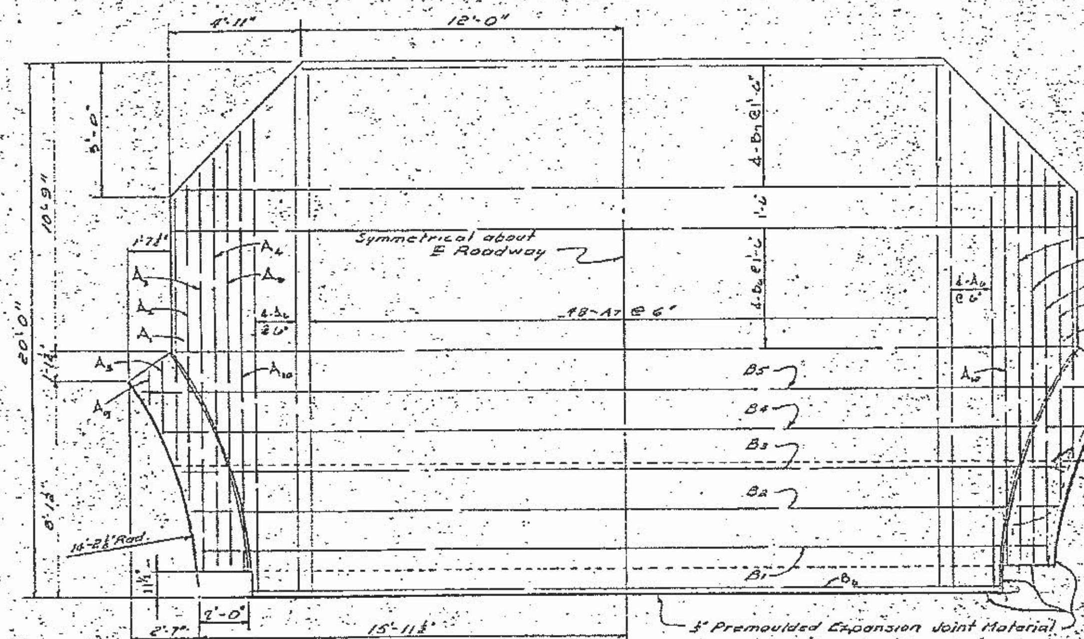
BEST AVAILABLE ORIGINAL

FDOT NOV 8 2007 EDMS SCANNED

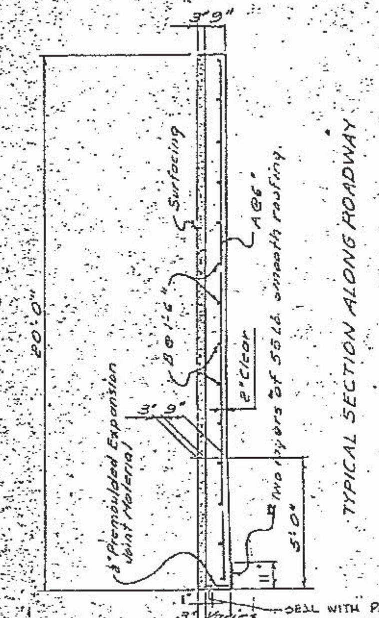
FED. ROAD DIV. No.	STATE	PROJECT NO.	FISCAL YEAR	SHEET NO.
3	FLA.	F033-1(25)	63	197

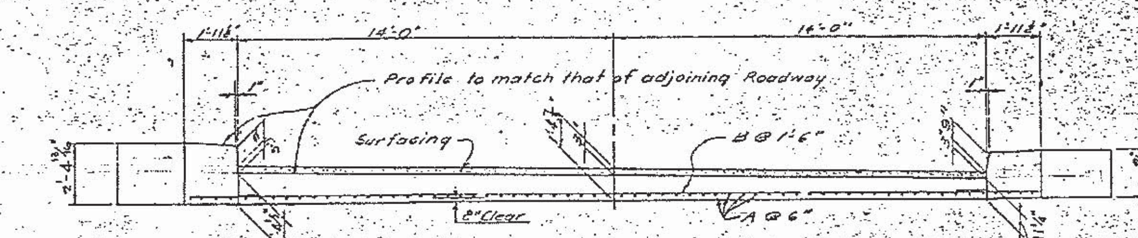


REFLECTED VIEW AT END ADJOINING ROADWAY



PLAN





VIEW AT END ADJOINING BRIDGE

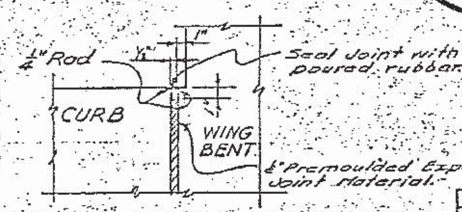
BEST AVAILABLE ORIGINAL

FDOT NOV 8 2007 EDMS SCANNED

BILL OF REINFORCING STEEL			
MARK	SIZE	NO. REQ'D.	LENGTH
A1	5	2	9'-10"
A2	5	2	12'-0"
A3	5	2	14'-5"
A4	5	2	15'-5"
A5	5	2	15'-9"
A6	5	8	①17'-9" To 19'-4"
A7	5	48	13'-8"
B1	4	1	31'-8"
B2	4	1	32'-6"
B3	4	1	33'-2"
B4	4	1	34'-6"
B5	4	1	36'-0"
B6	4	4	33'-6"
B7	4	4	②23'-6" To 32'-6"
B8	4	1	27'-7"
A8	5	2	2'-5"
A9	5	2	11'-3"
A10	5	2	16'-3"

① Varies by: 0.53 (in pairs).
② Varies by: 3.00

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Class A Concrete	Cu.Yd.	21.77
Reinforcing Steel	Lb.	1,618



SECTION A-A

APPROACH SLAB

STATE ROAD DEPARTMENT OF FLORIDA
BRIDGE DIVISION

BRIDGE AT STA. 2271+85
AND BRIDGE AT STA. 2387+30

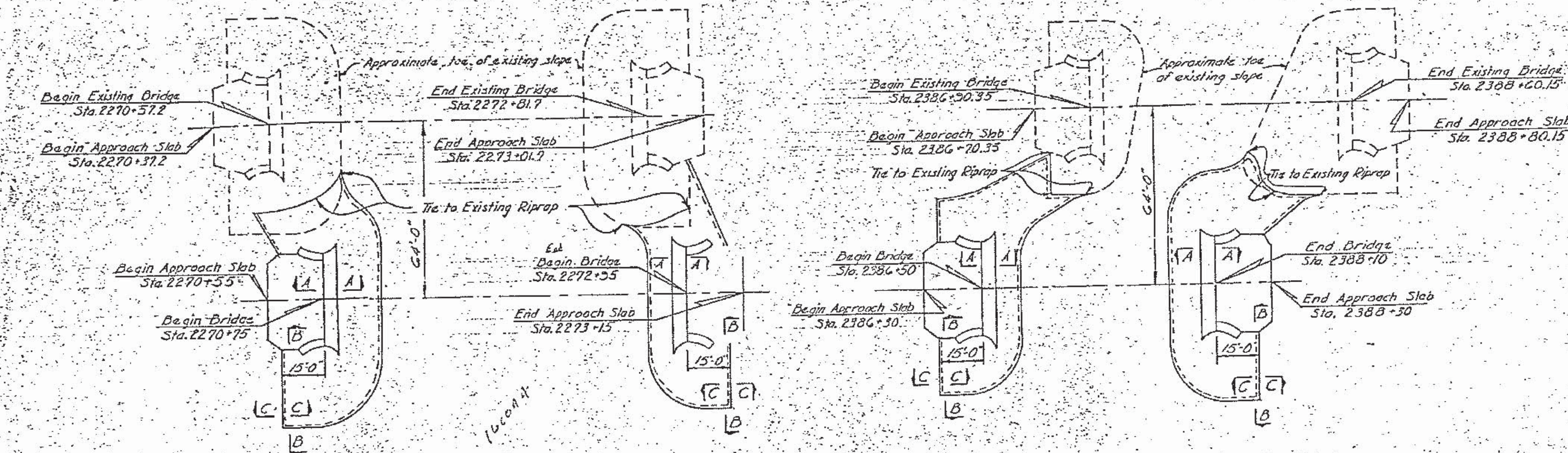
REVISIONS		ROAD NO.	COUNTY	PROJECT NO.
Dates	Descriptions	60	POLK	F-033-1(25)

	Names	Dates
Detailed by	R.C.	5-64
Checked by	L.B.	5-64
Quantities by	R.C.	5-64
Checked by	L.B.	5-64
Traced by	R.C.	5-64

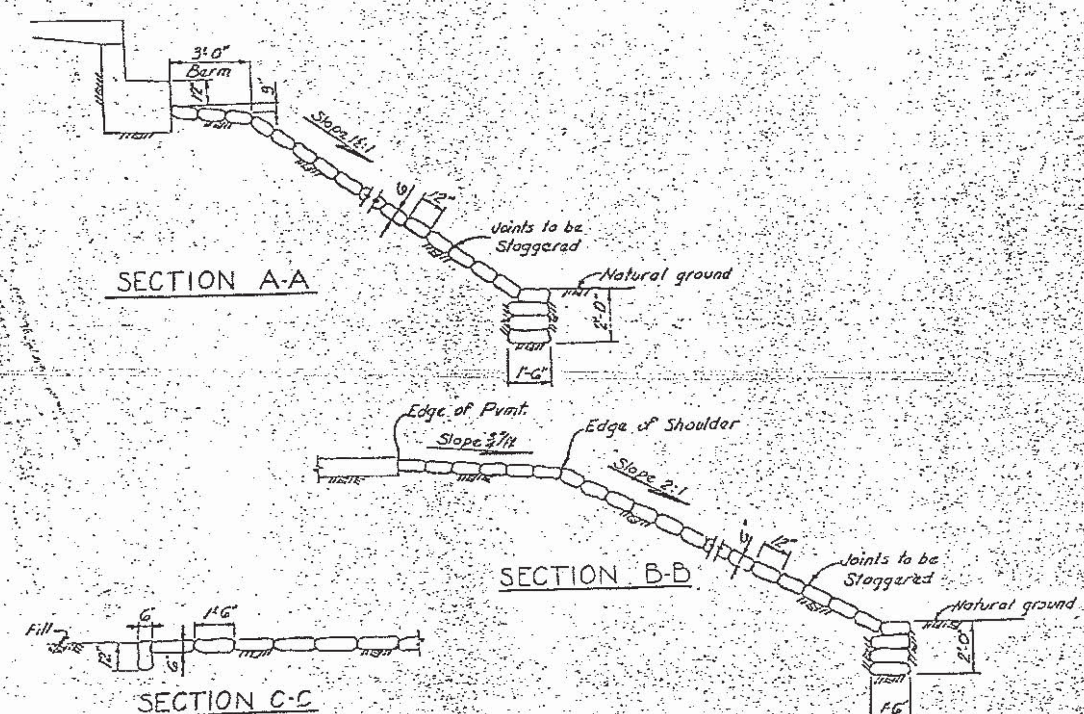
APPROVED BY

Drawing No.	Index No.
1 of 1	8488

FED. ROAD DIV. NO.	STATE	PROJECT NO.	FISCAL YEAR	SHEET NO.
3	FLA.	F-033-1(25)		B-1



PLAN OF RIPRAP



ESTIMATED BRIDGE QUANTITIES

ITEM NO.	ITEM	UNIT	BRIDGE AT STA. 2271+85	BRIDGE AT STA. 2387+30	TOTAL
300-15	Class A Concrete	[illegible]	400.45	295.5	695.95
300-7	Concrete Handrail	Lin.Ft.	440	320	760
310-15	Reinforcing Steel	Lbs.	72,299	53,132	125,431
403-3	Precast Concrete Piling Furnished (14" Prestressed)	Lin.Ft.	2238	[illegible]	3891
403-2	Precast Concrete Piling Driven (14" Prestressed)	Lin.Ft.	2238	1653	5591
403-9	Unloaded Test Piling (14" Prestressed)	Lin.Ft.	90	90	180
403-10	Test Loads (60 Tons) ①	Each	1	1	2
256-1	Riprap (Sand-Cement)	Cu.Yds.	106	120	226

① The number of Test Loads may be increased or decreased as directed by the Engineer.
② Payment for incidental items not specifically covered in the individual bid items shall be included in the Contract Prices for bid items.

INDEX OF BRIDGE SHEETS

SH. No.	TITLE
B-1	Riprap Details & Estimated Bridge Quantities
B-2	Bridge At Sta. 2271+85 Plan & Elevation
B-3	Bridge At Sta. 2387+30 Plan & Elevation
B-4	Precast Concrete Piles, 14" ☐ Prestressed
B-5	Bent Details
B-6	Typical 20 Ft. Span Details
B-7	Concrete Railing
B-8	Design Data Sheet (Bridge at Sta. 2271+85)
B-9	Design Data Sheet (Bridge at Sta. 2387+30)

GENERAL NOTES

Specifications: Designed in accordance with latest edition of the AASHO Standards Specifications for Highway Bridges and Approved Revisions (f'c=3000 p.s.i.) minimum for Class A Concrete. (~~Revised to Conform to~~ 1961 AASHO Standard Specifications for Highway Bridges and Approved Revisions.)
Loading: H20-S16-44
Piles: Design loads for Piles is 30 Tons.

APPROVED FOR GIBBS & HILL, INC.
[signature] CHIEF CIVIL ENGINEER

BRIDGE AT STA. 2271+85
AND
BRIDGE AT STA. 2387+30

BR# 160133

BEST AVAILABLE ORIGINAL

FDOT NOV 8 2007 EDMS SCANNED

GIBBS & HILL, INC.
ENGINEERS - CONSTRUCTORS TAMPA, FLORIDA

STATE ROAD DEPARTMENT OF FLORIDA
BRIDGE DIVISION

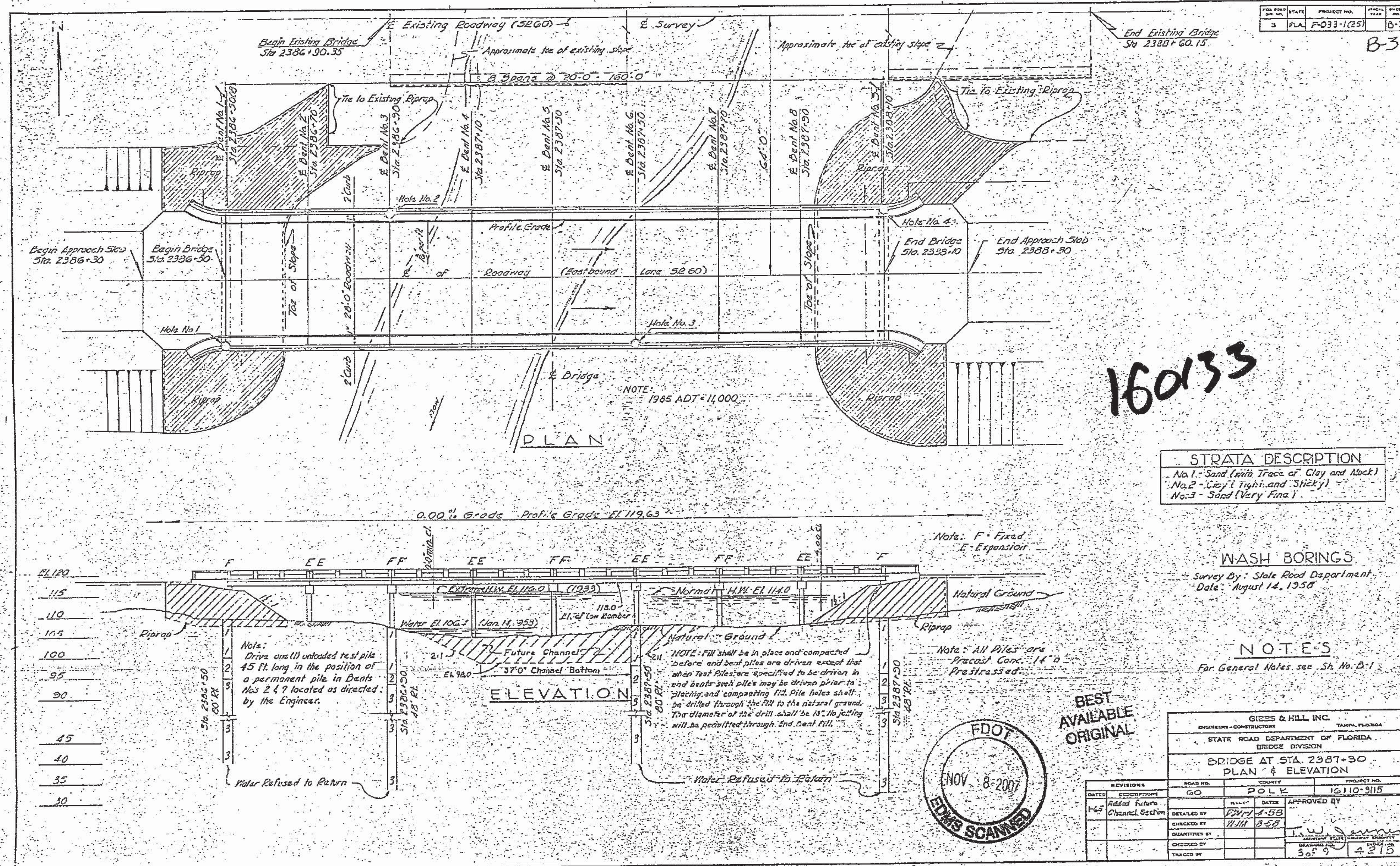
RIPRAP DETAILS
& ESTIMATED BRIDGE QUANTITIES

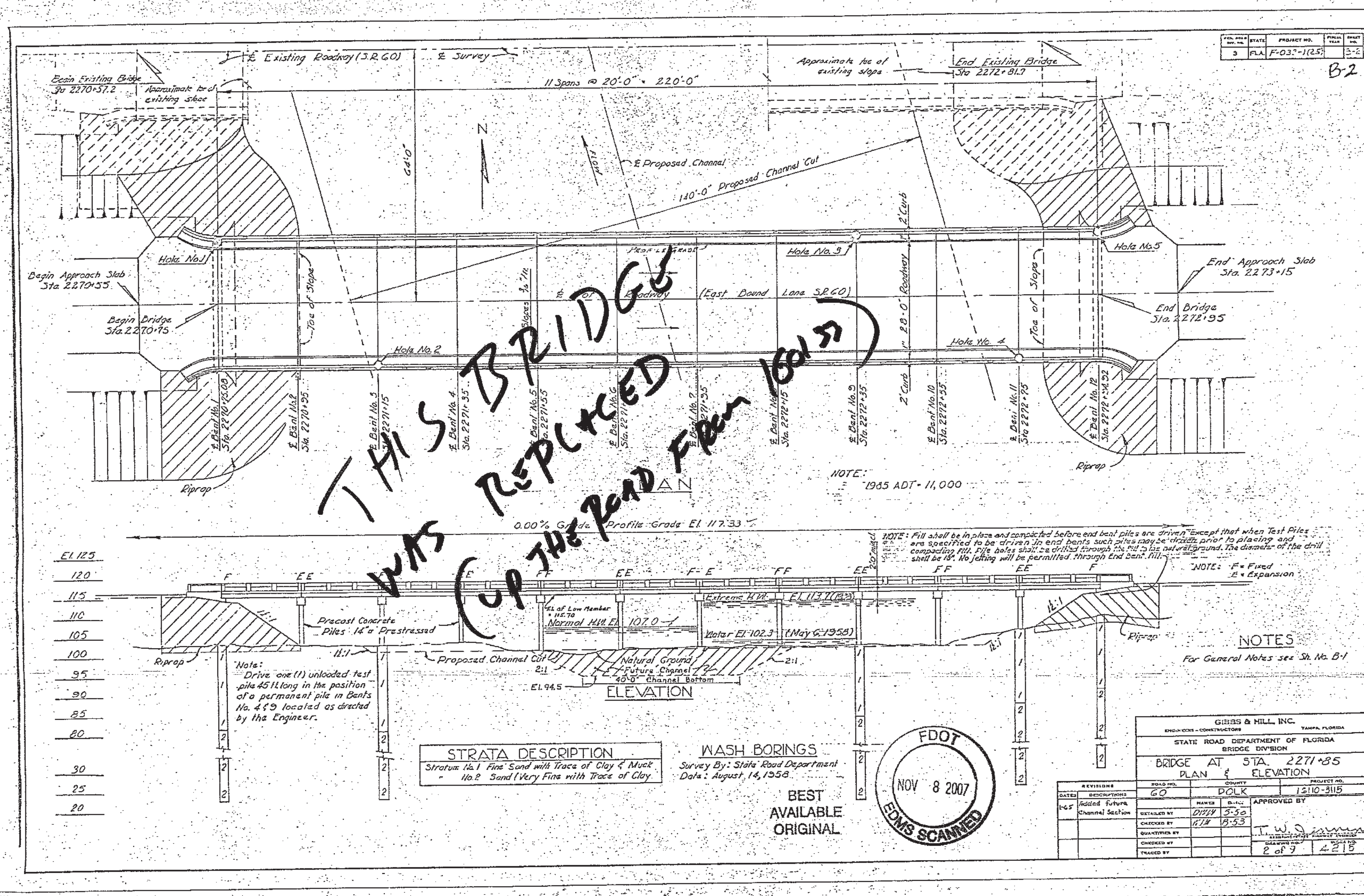
REVISIONS		ROAD NO.	COUNTY	PROJECT NO.
DATES	DESCRIPTIONS	60	POLK	16110-3115

	NAMES	DATES
DETAILED BY	D.T.T.	8-58
CHECKED BY	H.J.H.	8-58
QUANTITIES BY	D.T.T.	8-58
CHECKED BY	H.J.H.	8-58
TRACED BY		

APPROVED BY
T. W. Jennings
ASSISTANT STATE HIGHWAY ENGINEER

DRAWING NO. 1 of 9 | INDEX NO. +215


FED. ROAD DIV. NO. 3 | STATE FLA. | PROJECT NO. F-033-1(25) | SHEET NO. B-3
B-3
℄ Existing Roadway (5260)
℄ Survey
Begin Existing Bridge Sta. 2386+90.35
End Existing Bridge Sta. 2388+60.15
Approximate toe of existing slope
8 Spans @ 20'-0" = 160'-0"
Tie to Existing Riprap
Riprap
Hole No. 1
Hole No. 2
Hole No. 3
Hole No. 4
Begin Approach Slab Sta. 2386+30
Begin Bridge Sta. 2386+50
End Bridge Sta. 2388+10
End Approach Slab Sta. 2388+30
Profile Grade
℄ of Roadway (East bound Lane 5260)
Toe of Slope
28'-0" Roadway
℄ Bridge
NOTE: 1985 ADT = 11,000
PLAN
160133
STRATA DESCRIPTION
No. 1 - Sand (with Trace of Clay and Muck)
No. 2 - Clay (Tight and Sticky)
No. 3 - Sand (Very Fine)
0.00% Grade Profile Grade El. 119.63
Note: F = Fixed E = Expansion
Extreme H.W. El. 116.0 (1933)
Normal H.W. El. 114.0
Water El. 106.1 (Jan. 14, 1959)
Natural Ground
Future Channel
37'-0" Channel Bottom
Note: Drive one (1) unloaded test pile 45 Ft. long in the position of a permanent pile in Bents No's 2 & 9 located as directed by the Engineer.
NOTE: Fill shall be in place and compacted before end bent piles are driven except that when Test Piles are specified to be driven in end bents such piles may be driven prior to placing and compacting fill. Pile holes shall be drilled through the fill to the natural ground. The diameter of the drill shall be 18". No jetting will be permitted through End Bent Fill.
Note: All Piles are Precast Conc. 14" □ Prestressed.
ELEVATION
Water Refused to Return
WASH BORINGS
Survey By: State Road Department
Date: August 14, 1958
NOTES
For General Notes see Sh. No. B-1
BEST AVAILABLE ORIGINAL
FDOT NOV 8 2007 EDMS SCANNED
GIBBS & HILL INC. ENGINEERS - CONSTRUCTORS TAMPA, FLORIDA
STATE ROAD DEPARTMENT OF FLORIDA BRIDGE DIVISION
BRIDGE AT STA. 2387+30 PLAN & ELEVATION
ROAD NO. 60 | COUNTY POLK | PROJECT NO. 16110-3115
REVISIONS: Added Future Channel Section
DETAILED BY | CHECKED BY | QUANTITIES BY | CHECKED BY | TRACED BY
APPROVED BY
DRAWING NO. 3 of 9 | 4215

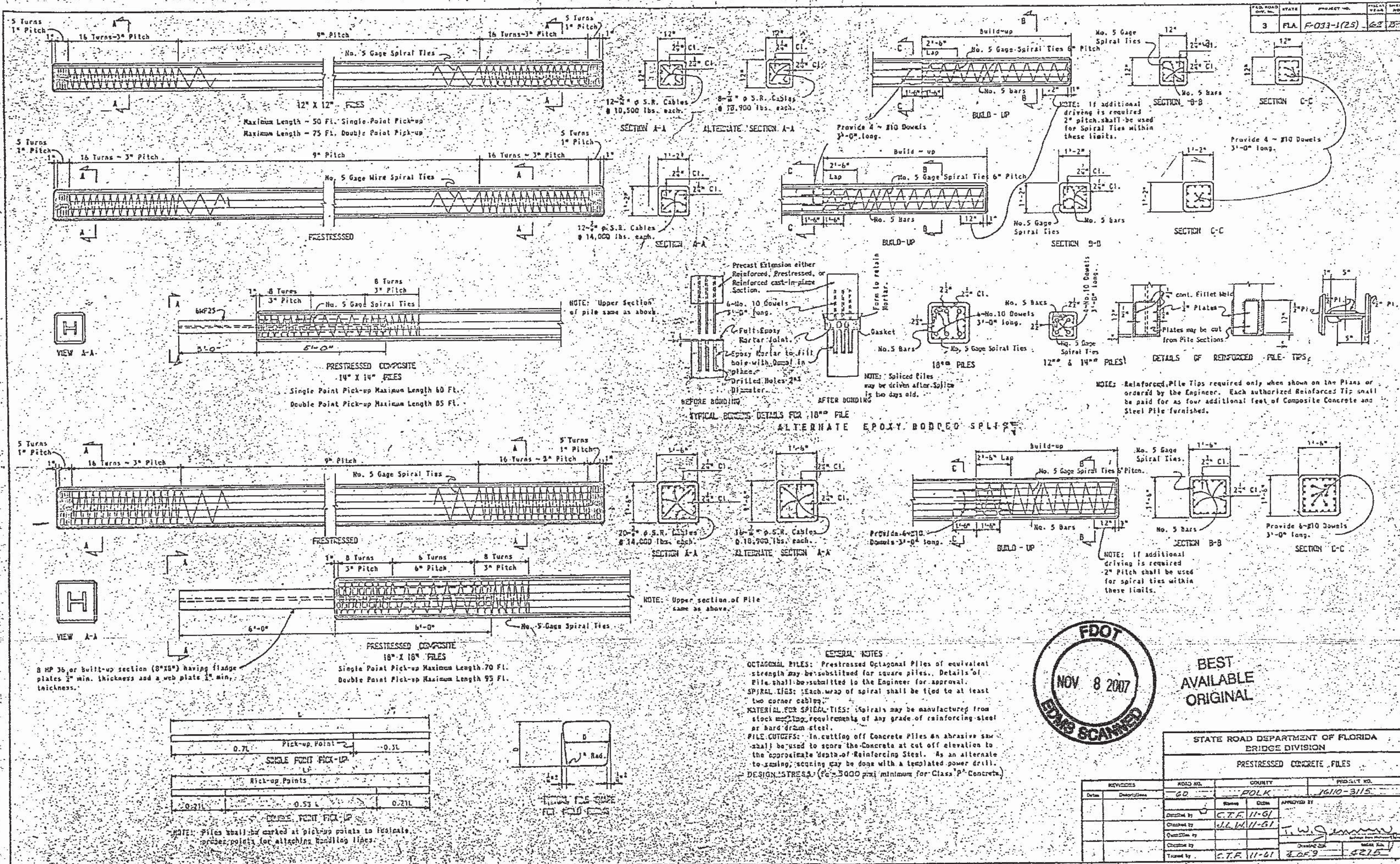


FDOT
NOV 8 2007
EDMS SCANNED

BEST AVAILABLE ORIGINAL

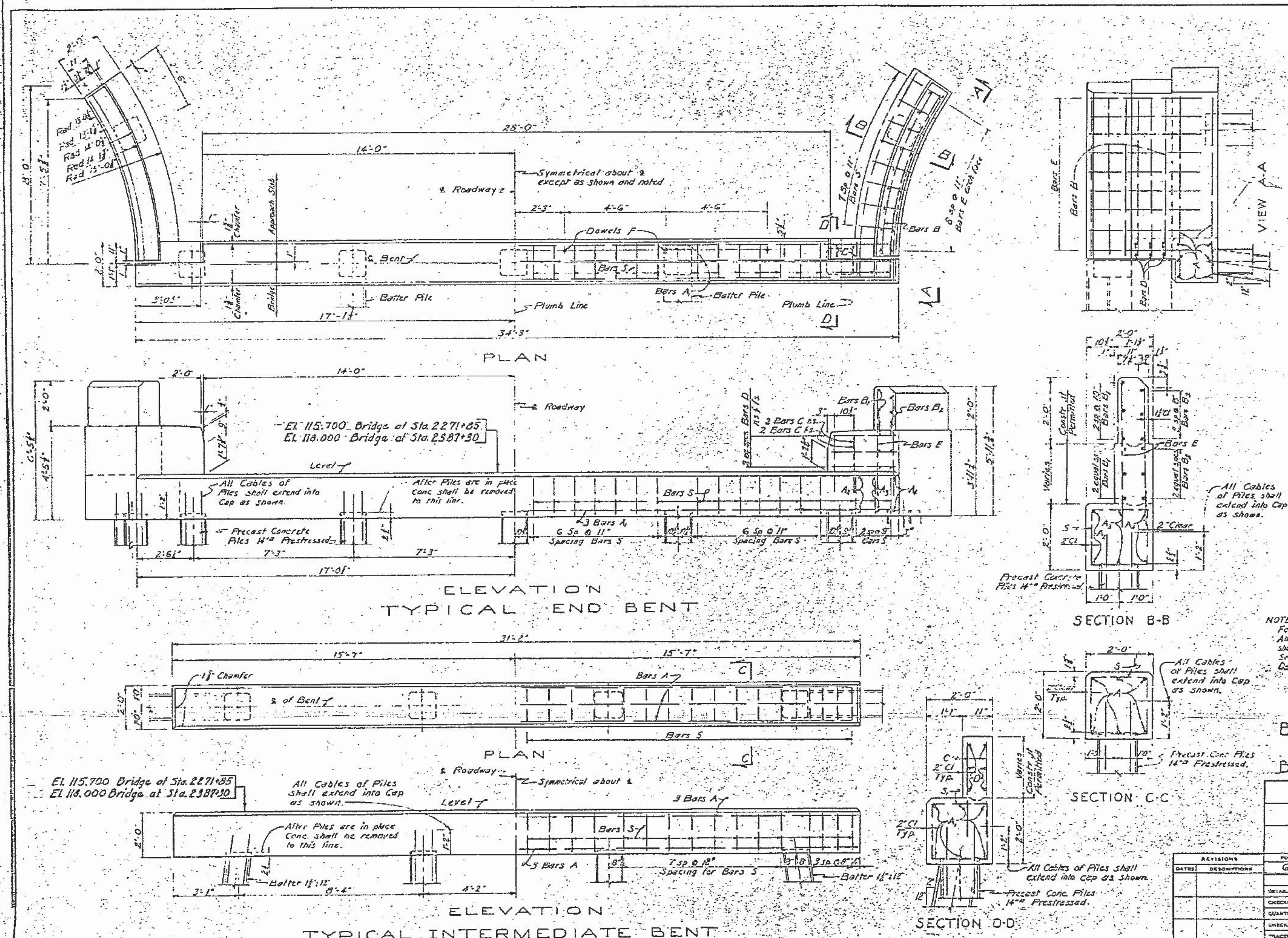
THIS BRIDGE WAS REPLACED (UP THE ROAD FROM 160157)

NOT THE PARALLEL BRIDGE



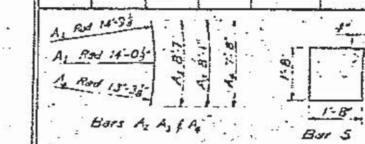
3
FLA
F-033-1(25)
12" X 12" PILES
Maximum Length - 50 Ft. Single Point Pick-up
Maximum Length - 75 Ft. Double Point Pick-up
No. 5 Gage Spiral Ties
SECTION A-A
ALTERNATE SECTION A-A
BUILD-UP
SECTION B-B
SECTION C-C
PRESTRESSED
PRESTRESSED COMPOSITE
14" X 14" PILES
Single Point Pick-up Maximum Length 60 Ft.
Double Point Pick-up Maximum Length 85 Ft.
VIEW A-A
TYPICAL BONDING DETAILS FOR 18" PILE
ALTERNATE EPOXY BONDED SPLICE
18" PILES
12" & 14" PILES
DETAILS OF REINFORCED PILE TIPS
PRESTRESSED COMPOSITE
18" X 18" PILES
Single Point Pick-up Maximum Length 70 Ft.
Double Point Pick-up Maximum Length 95 Ft.
SINGLE POINT PICK-UP
DOUBLE POINT PICK-UP
GENERAL NOTES
OCTAGONAL PILES: Prestressed Octagonal Piles of equivalent strength may be substituted for square piles. Details of Pile shall be submitted to the Engineer for approval.
SPIRAL TIES: Each wrap of spiral shall be tied to at least two corner cabling.
MATERIAL FOR SPIRAL TIES: Spirals may be manufactured from stock meeting requirements of any grade of reinforcing steel or hard drawn steel.
PILE CUTOFFS: In cutting off Concrete Piles an abrasive saw shall be used to score the Concrete at cut off elevation to the approximate depth of Reinforcing Steel. As an alternate to sawing, scoring may be done with a templated power drill.
DESIGN STRESS: (f'c = 5000 psi minimum for Class "P" Concrete.)
FDOT
NOV 8 2007
EDMS SCANNED
BEST AVAILABLE ORIGINAL
STATE ROAD DEPARTMENT OF FLORIDA
BRIDGE DIVISION
PRESTRESSED CONCRETE PILES
ROAD NO. 60
COUNTY POLK
PROJECT NO. 16110-3115
Drawn by C.T.F. 11-61
Checked by J.L.W. 11-61
Traced by C.T.F. 11-61
4 OF 9
6215

FED. ROAD DIV. NO.	STATE	PROJECT NO.	FISCAL YEAR	SHEET NO.
3	FLA.	F-033-1(25)		B-5



BILL OF REINFORCING STEEL

MARK	SIZE	No. REQ.	LENGTH	LOCATION	REMARKS
ONE END BENT					
A_1	8	6	33'-11"	Cap	Straight
A_2	8	4	8'-7"	Wing Wall	See Diag.
A_3	8	4	8'-1"	" "	" "
A_4	8	4	7'-8"	" "	" "
B_1	4	12	8'-0"	" "	Field Bend
B_2	4	12	7'-5"	" "	" "
C	4	8	3'-0"	Curb	Straight
D	4	12	3'-0"	"	"
E	4	36	4'-9"	Wing Wall	"
F	6	6	2'-0"	Cap	"
S	4	50	6'-11"	"	See Diag.
ONE INTERMEDIATE BENT					
A	5	6	30'-10"	Cap	Straight
S	4	32	6'-11"	"	See Diag.



NOTE: All Bar dimensions are out to out

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
ONE END BENT		
Class A Concrete	Cu. Yds.	10.10
Reinforcing Steel	Lbs.	1332
Precast Conc. Piles	Lin. Ft.	*
ONE INTERMEDIATE BENT		
Class A Concrete	Cu. Yds.	4.61
Reinforcing Steel	Lbs.	642
Precast Conc. Piles	Lin. Ft.	*

* See Estimated Bridge Quantities Sh. No. B-1

NOTES:
For General Notes see Sheet B-1.
All exposed edges to be chamfered ¾" unless otherwise shown.
Set Dowels shown on Superstructure Drawing. Set Dowels for Approach Slab.

BRIDGE AT STA. 2271+85 AND BRIDGE AT STA. 2387+30

GIBBS & HILL, INC.
ENGINEERS – CONSTRUCTORS, TAMPA, FLORIDA

STATE ROAD DEPARTMENT OF FLORIDA
BRIDGE DIVISION

BENT DETAILS

ROAD NO.	COUNTY	PROJECT NO.
60	POLK	1610-3115

	NAMES	DATES
DETAILED BY	[illegible]	8-58
CHECKED BY	[illegible]	8-58
QUANTITIES BY	[illegible]	9-58
CHECKED BY	[illegible]	8-58
TRACED BY		

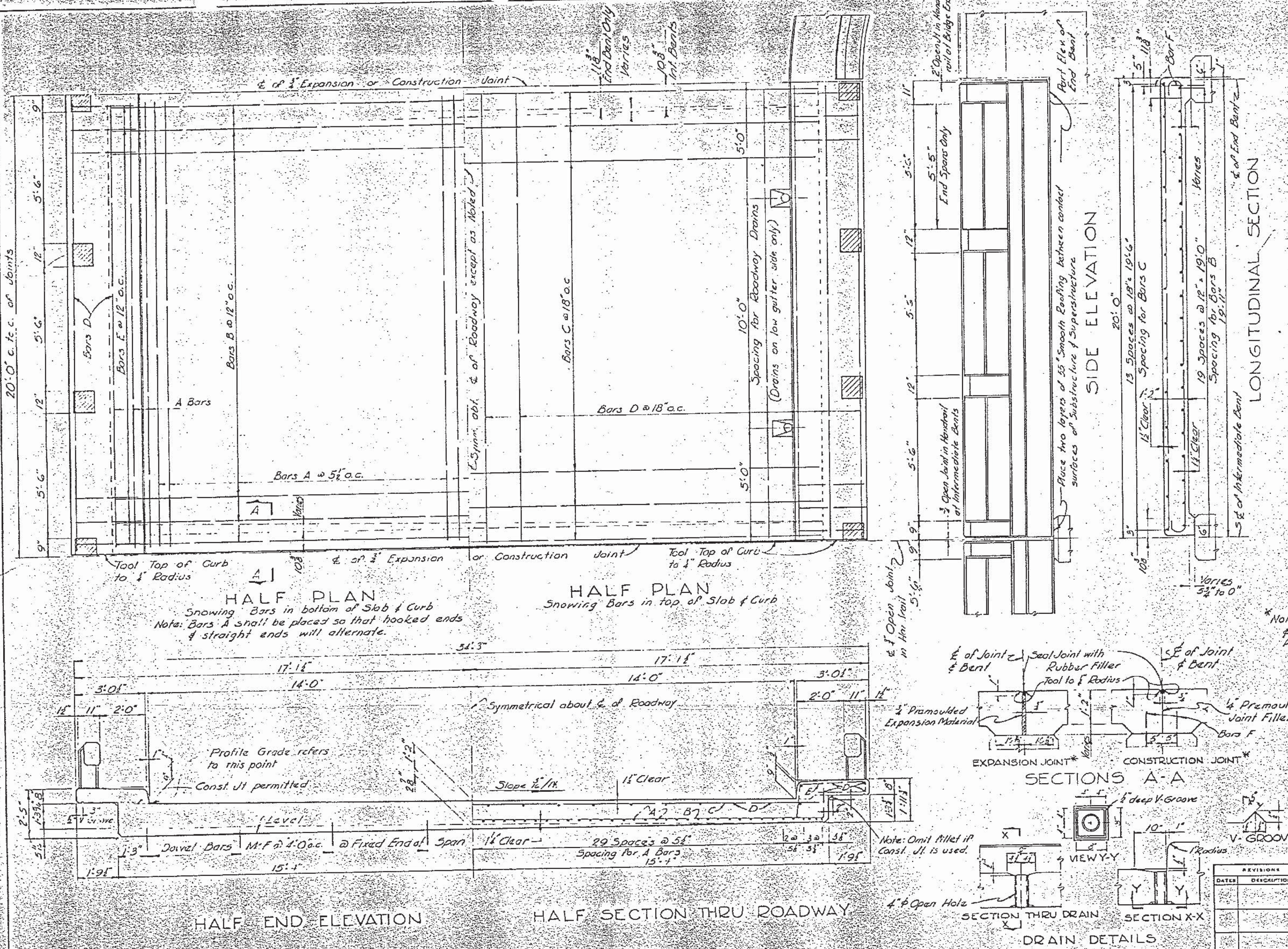
REVISIONS: DATES | DESCRIPTIONS

APPROVED BY: T. W. [illegible]
ASSISTANT STATE HIGHWAY ENGINEER

DRAWING NO. 5 of 9 | INDEX NO. 4215

FDOT NOV 8 2007 EDMS SCANNED
BEST AVAILABLE ORIGINAL

FED. ROAD DIV. NO.	STATE	PROJECT NO.	FISCAL YEAR	SHEET NO.
3	FLA.	F-033-1(25)		B-6



BILL OF REINFORCING STEEL

MARK	SIZE	NO. REQ'D	LENGTH	LOCATION	BENDING
A	8	69	20'-6"	Slab	See Diag.
B	6	20	30'-4"	"	Straight
C	4	14	30'-4"	"	"
D	4	30	19'-8"	Slab & Curb	"
E	5	40	8'-8"	Curb	See Diagram
F	6	8	1'-3"	Bridge Seat	Straight

BENDING DIAGRAMS

BAR A

BAR E

All dimensions are out to out.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A Concrete	Cu. Yd.	30.85
Reinforcing Steel	Lbs.	57.47

NOTES

For General Notes see Sheet No. B-1.
All Exposed Edges & Corners shall be Chamfered ¾" unless otherwise noted.

BEST AVAILABLE ORIGINAL

FDOT NOV 8 2007 EDMS SCANNED

*Note: For Location of Expansion & Construction Joints see Plan & Elevation Sheet.

160132 & 133

BRIDGE AT STA. 2271+85 AND BRIDGE AT STA. 2387+30

GIBBS & HILL, INC.
ENGINEERS - CONSTRUCTORS TAMPA, FLORIDA

STATE ROAD DEPARTMENT OF FLORIDA
BRIDGE DIVISION

TYPICAL 20 Ft. SPAN DETAIL

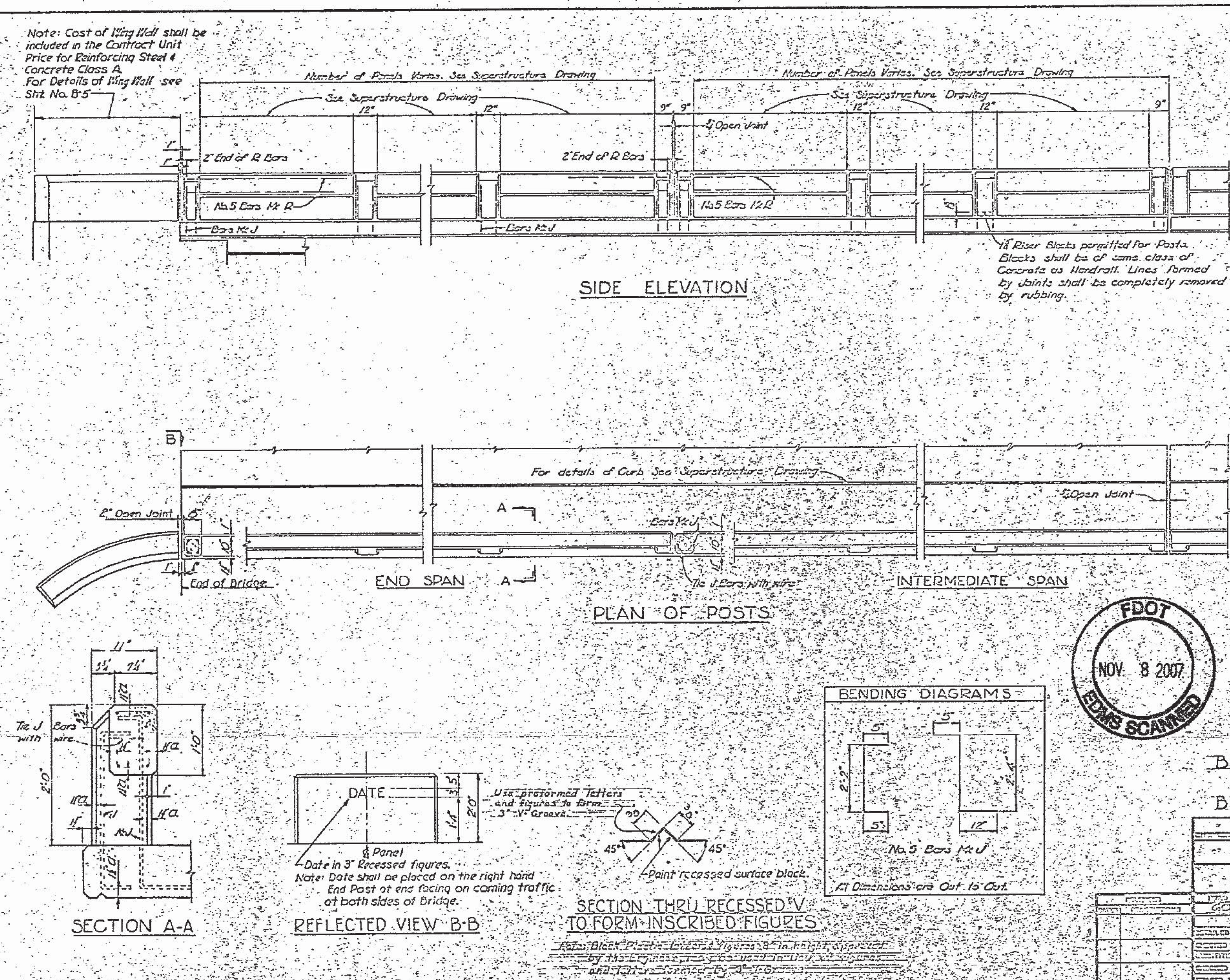
ROAD NO.	COUNTY	PROJECT NO.
60	POLK	16110-3115

REVISIONS DATES	DESCRIPTIONS

	NAMES	DATES
DETAILED BY	DWW	8-57
CHECKED BY	WJM	1-58
QUANTITIES BY	DWW	1-58
CHECKED BY	WJM	8-58
TRACED BY		

APPROVED BY T. W. [signature]
ASSISTANT STATE HIGHWAY ENGINEER

DRAWING NO. 6 of 9 INDEX NO. 42-15



STATE		PROJECT NO.		
3	FLA	F033-1(25)		B-7

GENERAL NOTES

Concrete: Class A Concrete shall be used in Handrail.

Payment: Handrail shall be paid for per linear foot, which shall include all concrete & reinforcing steel. Handrail shall be measured along the centerline of rail with no deductions for open joints.

Markers: Markers recording the elevation shall be placed on top of the wings of end bents. On Bridges longer than 100 feet one marker shall be placed at each end of the Bridge. Markers are to be furnished by the State Road Department & installed by the Contractor. The cost of installing the markers shall be included in the Contract Unit Price for Concrete Handrail.

Chamfer: ¾ chamfer all edges of Handrail & Posts.

FDOT NOV 8 2007 EDMS SCANNED

BEST AVAILABLE ORIGINAL

BRIDGE AT STA 2271+85
AND
BRIDGE AT STA 2387+30

GIBBS & HILL, INC.
ENGINEERS – CONSTRUCTORS — TAMPA, FLORIDA

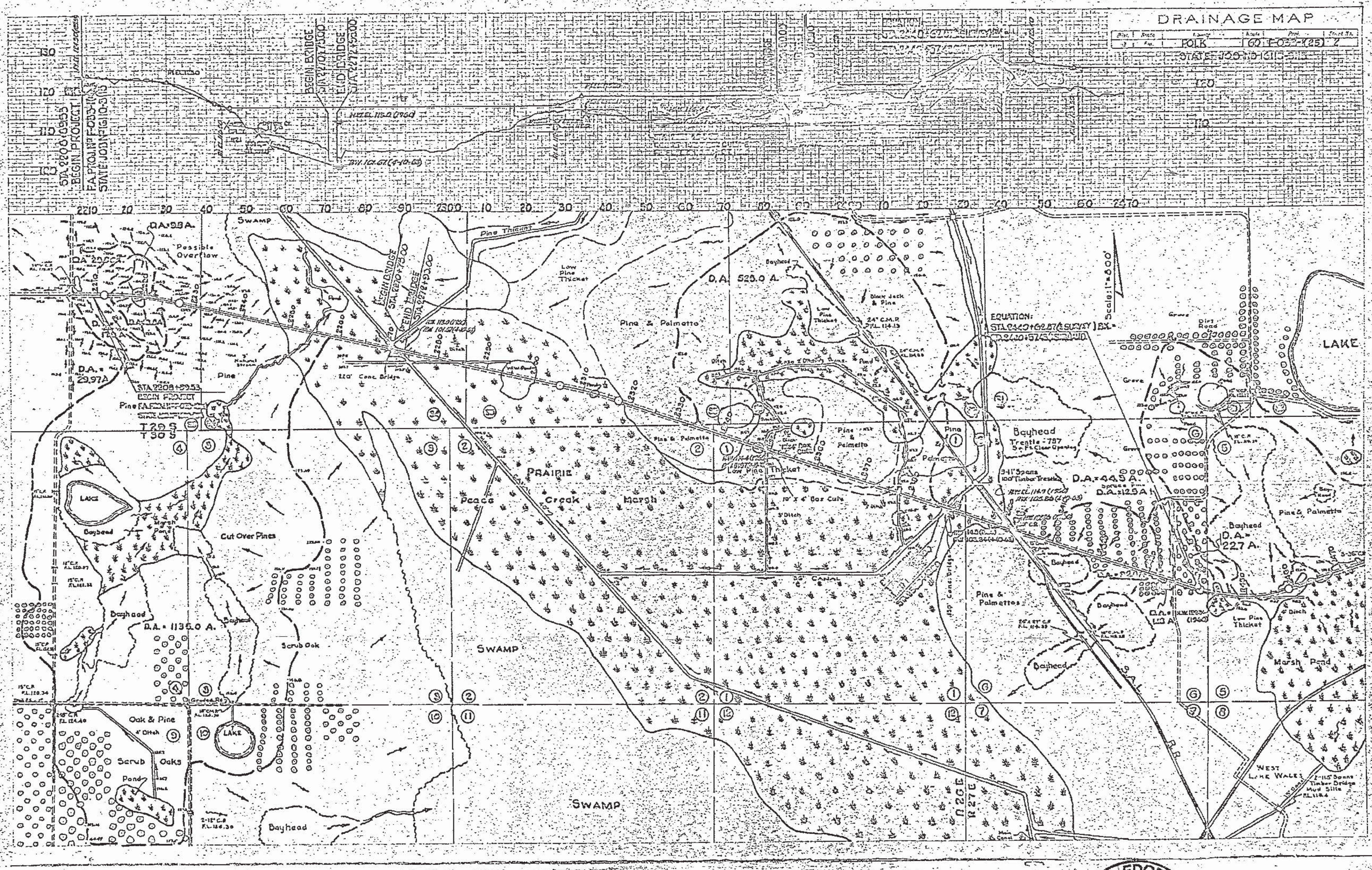
STATE ROAD DEPARTMENT OF FLORIDA
BRIDGE DIVISION

CONCRETE RAILING

ROAD NO.	COUNTY	PROJECT NO.
60	POLK	1010-115

APPROVED BY: T. W. Jennings

SHEET NO. 7 of 9 — 42:5



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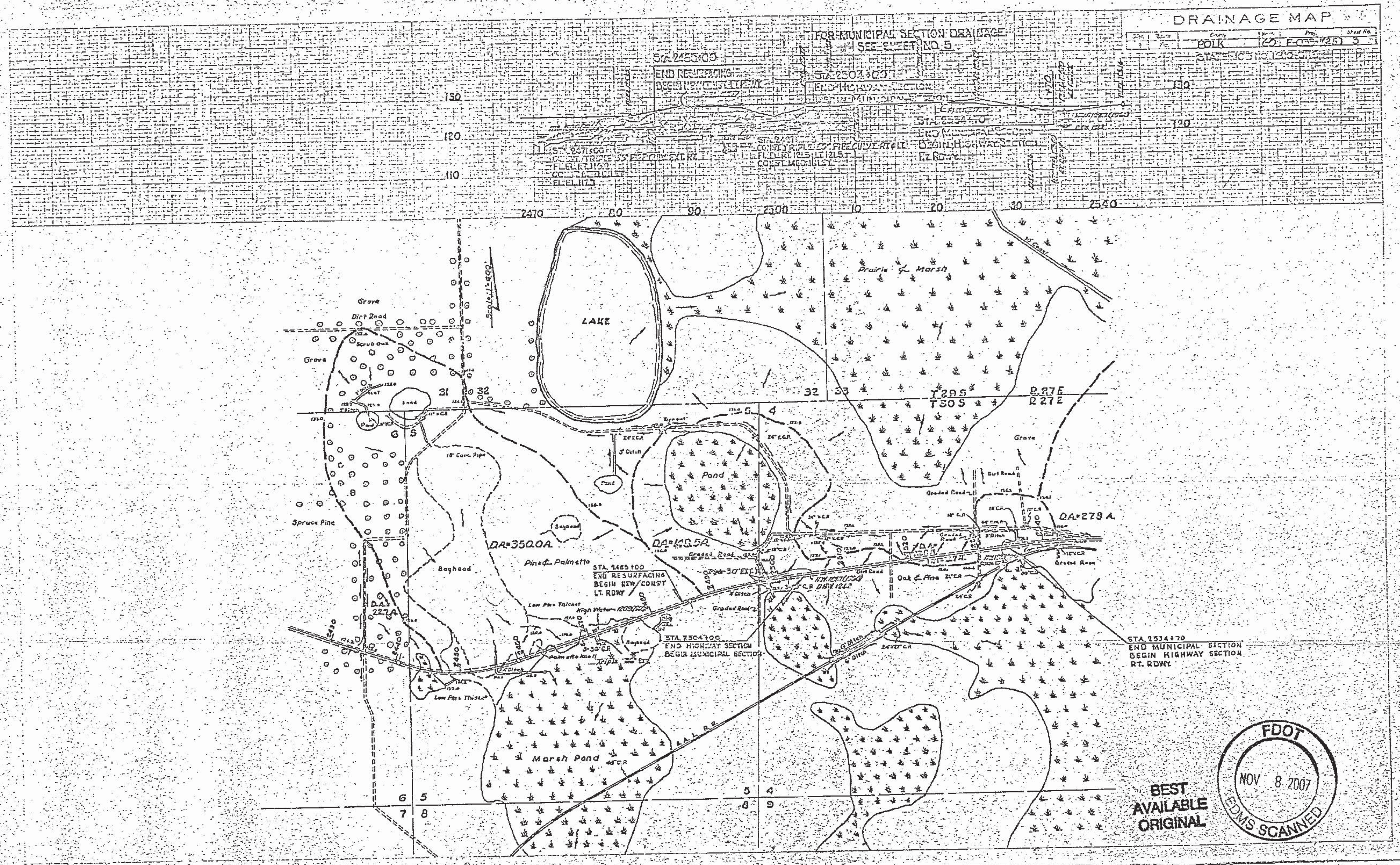
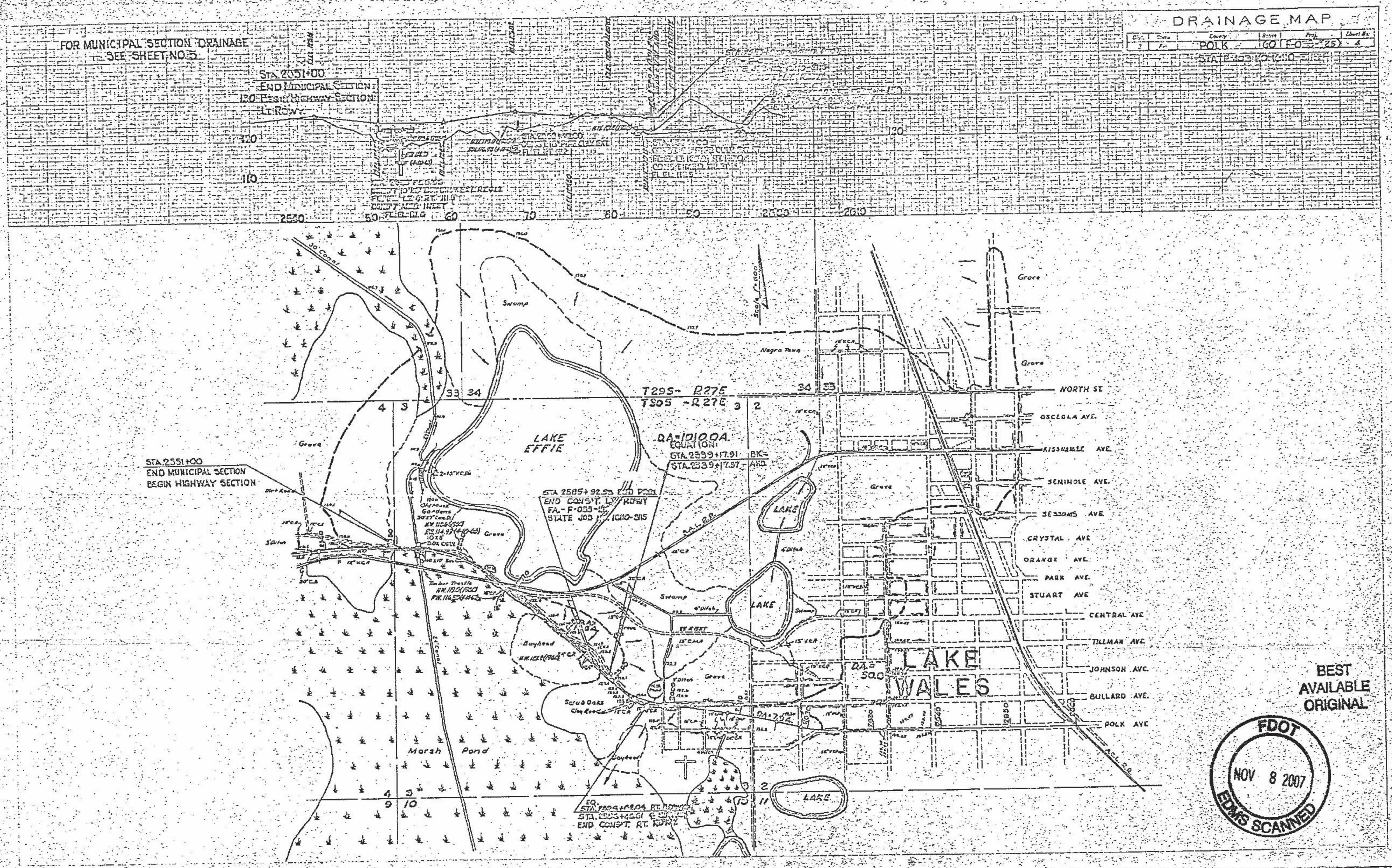
NOV 8 2007
EDMS SCANNED

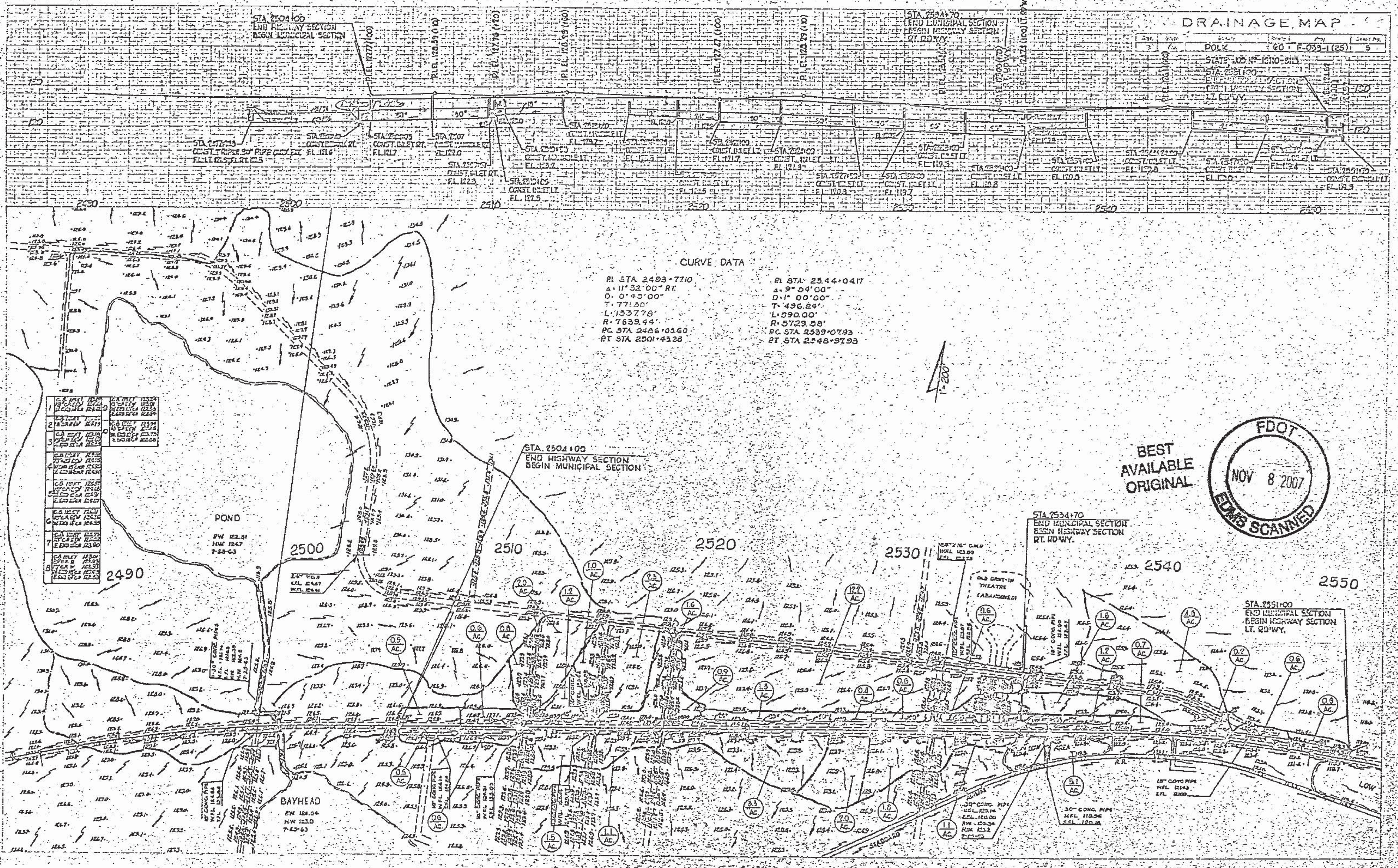
BEST AVAILABLE ORIGINAL

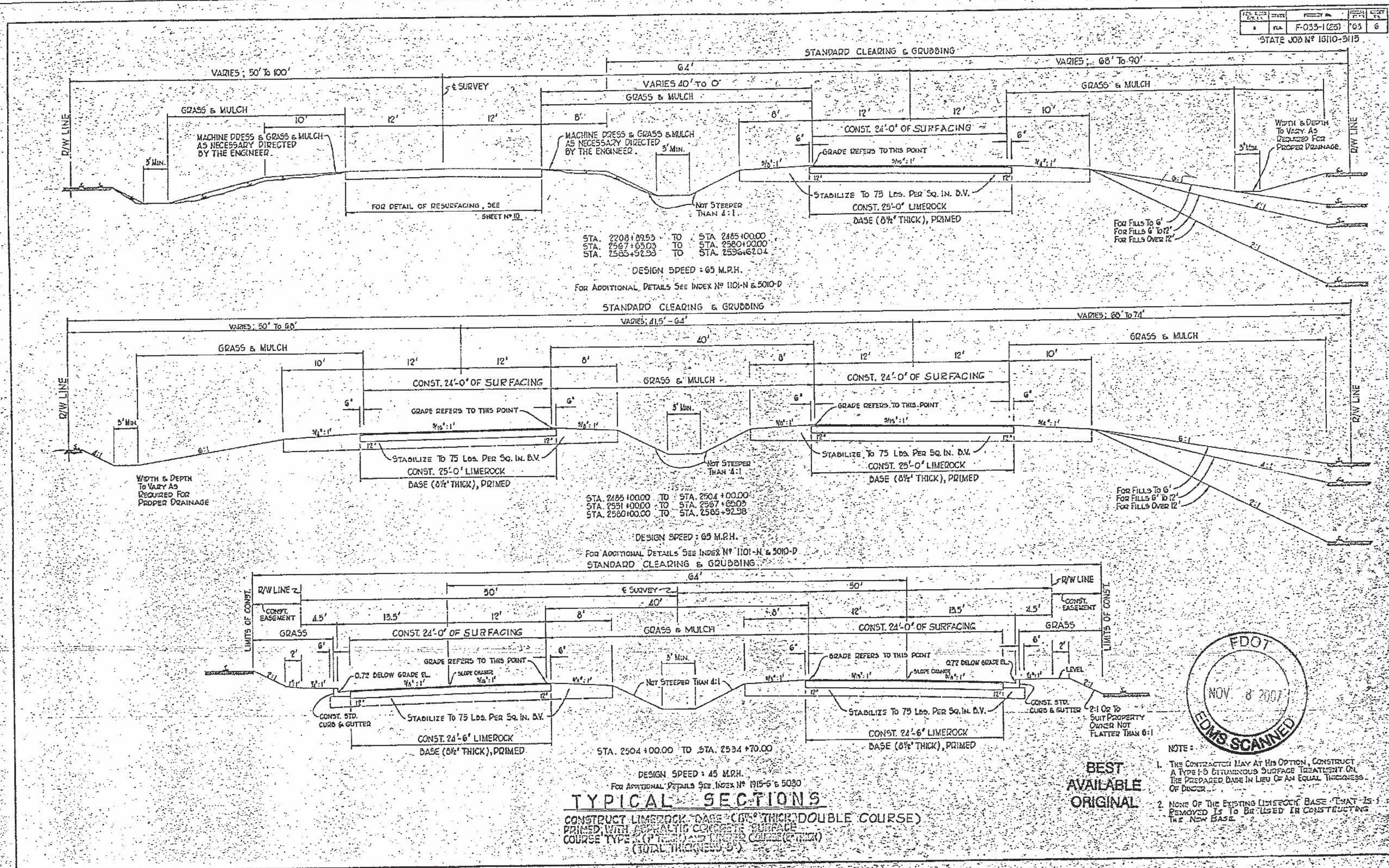


BEST AVAILABLE ORIGINAL
FDOT
NOV 8 2007
EDMS SCANNED



DRAINAGE MAP
POLK
FOR MUNICIPAL SECTION DRAINAGE SEE SHEET NO. 5
STA. 2551+00
END MUNICIPAL SECTION
BEGIN HIGHWAY SECTION
LAKE EFFIE
LAKE WALES
LAKE
Swamp
Grove
Marsh Pond
NORTH ST.
OSCEOLA AVE.
SEMINOLE AVE.
SESSOMS AVE.
CRYSTAL AVE.
ORANGE AVE.
PARK AVE.
STUART AVE.
CENTRAL AVE.
TILLMAN AVE.
JOHNSON AVE.
BULLARD AVE.
POLK AVE.
T29S R27E
T30S R27E
END CONST. LT. RDWY
END CONST. RT. RDWY
BEST AVAILABLE ORIGINAL
FDOT
NOV 8 2007
EDMS SCANNED


DRAINAGE MAP
POLK
STA. 2504+00
END HIGHWAY SECTION
BEGIN MUNICIPAL SECTION
STA. 2534+70
END MUNICIPAL SECTION
BEGIN HIGHWAY SECTION
RT. RD'WY.
STA. 2551+00
END MUNICIPAL SECTION
BEGIN HIGHWAY SECTION
LT. RD'WY.
CURVE DATA
P.I. STA. 2493+7710
Δ = 11° 32' 00" RT.
D = 0° 45' 00"
T = 771.50'
L = 1537.78'
R = 7639.44'
P.C. STA. 2486+0560
P.T. STA. 2501+4338
P.I. STA. 2544+0417
Δ = 9° 54' 00"
D = 1° 00' 00"
T = 496.24'
L = 990.00'
R = 5729.58'
P.C. STA. 2539+0793
P.T. STA. 2548+9793
POND
BAYHEAD
2490
2500
2510
2520
2530
2540
2550
LOW
BEST AVAILABLE ORIGINAL
FDOT
NOV 8 2007
EDMS SCANNED


F-033-1(25) '63 6
STATE JOB Nº 16110-3115
STANDARD CLEARING & GRUBBING
VARIES: 50' To 100'
VARIES: 68' To 90'
VARIES 40' To 0'
GRASS & MULCH
R/W LINE
℄ SURVEY
MACHINE DRESS & GRASS & MULCH AS NECESSARY DIRECTED BY THE ENGINEER
CONST. 24'-0" OF SURFACING
GRADE REFERS TO THIS POINT
STABILIZE To 75 Lbs. Per Sq. In. B.V.
CONST. 25'-0" LIMEROCK BASE (8½" THICK), PRIMED
FOR DETAIL OF RESURFACING, SEE SHEET Nº 10
NOT STEEPER THAN 4:1
WIDTH & DEPTH To VARY AS REQUIRED FOR PROPER DRAINAGE
For Fills To 6'
For Fills 6' To 12'
For Fills Over 12'
STA. 2208+89.53 TO STA. 2485+00.00
STA. 2567+65.03 TO STA. 2580+00.00
STA. 2585+92.98 TO STA. 2596+62.04
DESIGN SPEED: 65 M.P.H.
For Additional Details See Index Nº 1101-N & 5010-D
VARIES: 50' To 68'
VARIES: 41.5' - 64'
VARIES: 66' To 74'
STA. 2485+00.00 TO STA. 2504+00.00
STA. 2591+00.00 TO STA. 2567+65.03
STA. 2580+00.00 TO STA. 2585+92.98
DESIGN SPEED: 65 M.P.H.
For Additional Details See Index Nº 1101-N & 5010-D
STANDARD CLEARING & GRUBBING
LIMITS OF CONST.
CONST. EASEMENT
GRASS
CONST. 24'-0" OF SURFACING
0.72 BELOW GRADE EL.
SLOPE CHANGE
CONST. STD. CURB & GUTTER
CONST. 24'-6" LIMEROCK BASE (8½" THICK), PRIMED
2:1 Or To Suit Property Owner Not Flatter Than 6:1
LEVEL
STA. 2504+00.00 TO STA. 2534+70.00
DESIGN SPEED: 45 M.P.H.
For Additional Details See Index Nº 1915-6 & 5030
TYPICAL SECTIONS
CONSTRUCT LIMEROCK BASE (8½" THICK DOUBLE COURSE)
PRIMED WITH ASPHALTIC CONCRETE SURFACE
COURSE TYPE
NOTE:
1. The Contractor May At His Option, Construct A Type I-S Bituminous Surface Treatment On The Prepared Base In Lieu Of An Equal Thickness Of Binder.
2. None Of The Existing Limerock Base That Is Removed Is To Be Used In Constructing The New Base.
FDOT
NOV 8 2007
EDMS SCANNED
BEST AVAILABLE ORIGINAL

FED. ROAD DIV. No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
[illegible]	FLA.	F-033-1 (25)	63	11

State Job Nº 16110-3115

REVISED 6-8-64

GENERAL STABILIZING NOTES

1. NO STABILIZING WILL BE REQUIRED FOR TURNOUTS TO PRIVATE PROPERTY.
2. STABILIZE ALL CROSSOVERS, TURNOUTS AND INTERSECTIONS TO COUNTY ROADS AND STREETS TO 75 LBS. PER SQ. INCH BEARING VALUE 12" DEEP AND 12" OUTSIDE PAV'T. EDGES. (6" BACK OF CURBS).
3. STABILIZE ALL GRADED CONNECTIONS TO COUNTY ROADS AND STREETS TO 75 LBS. PER SQ. INCH BEARING VALUE. (12" DEEP).

ESTIMATE OF TURNOUTS & SIDE-DRAIN PIPE

	TOTAL
PAVEMENT (R.B.A.C)	1225 SQ.YDS.
18" PIPE	684 LIN. FT.
24" PIPE	50 LIN. FT.

NOTE: TURNOUTS AND SIDE-DRAIN PIPE TO BE CONSTRUCTED AS DIRECTED BY THE ENGINEER IN ACCORDANCE WITH INDEX Nº 1101-N.

SUMMARY OF GUARDRAIL

STATION TO STATION	SIDE	LENGTH	TOTAL
2270+24.50 TO 2270+74.50	RT.	50'	50'
2270+24.50 TO 2270+74.50	LT.	50'	50'
2350+60.75 TO 2351+48.25	RT.	87.5'	87.5'
2385+99.50 TO 2386+49.50	LT.	50'	50'
2385+99.50 TO 2386+49.50	RT.	50'	50'
2553+10.00 TO 2554+10.00	LT.	100'	100'
2553+10.00 TO 2554+10.00	RT.	100'	100'
		TOTALS	487.5'

NOTE: GUARDRAIL STATIONING IS APPROXIMATE. EXACT LOCATIONS TO BE DETERMINED BY THE PROJECT ENGINEER DURING CONSTRUCTION.

SIZE REQUIREMENTS FOR SIDE DRAIN PIPE

STATION	TO	STATION	SIZE
	RT. SIDE		
STA. 2209	TO	STA. 2226	18"
STA. 2226	TO	STA. 2245	24"
STA. 2245	TO	STA. 2255	30"
STA. 2255	TO	STA. 2271	3-48"x35" C.M.P.
STA. 2318	TO	STA. 2504	18"
STA. 2535	TO	STA. 2250	18"
STA. 2588	TO	STA. 2597	24"
			18"
	LT. SIDE		
STA. 2471	TO	STA. 2478	24"
STA. 2478	TO	STA. 2502	18"
STA. 2552	TO	STA. 2554	18"
STA. 2580	TO	STA. 2584	18"
STA. 2584	TO	STA. 2586	24"

SUMMARY OF QUANTITIES

ITEM Nº	ITEM	UNIT	TOTAL
53-1	CLEARING AND GRUBBING	LUMP SUM	1
53-41	PLUGGING WATER WELLS (NON-ARTESIAN)	PER WELL	2
58-1	GRADING	LUMP SUM	1
58-6	BORROW EXCAVATION	CU. YD.	374,600
58-8	SUBSOIL EXCAVATION	CU. YD.	60,111
70-1	STABILIZING	LUMP SUM	1
100-1	LIMEROCK BASE (8½" THICK)	SQ. YD.	143,627
190-2	CONCRETE APPROACH SLABS	EACH	4
200-1	BITUMINOUS MATERIAL (PLANT MIX, AC. 60-70 PENETRATION) (AND TACK COAT)	GALLON	413,155
231-2	SAND-ASPHALT HOT MIX (600 LBS. STABILITY)	TON	135
233-1	TYPE I ASPHALTIC CONCRETE SURFACE COURSE (1" THICK) WITH BINDER COURSE (2" THICK)	SQ. YD.	143,239
233-3	TYPE I ASPHALTIC CONCRETE SURFACE COURSE	TON	6093
300-1A	CLASS A CONCRETE (CULVERTS)	CU. YD.	215.04
300-1B	CLASS A CONCRETE (RAIL ROAD APPROACH SLABS)	CU. YD.	59.22
301-1	CLASS NS CONCRETE (ENDWALLS AND MISCELLANEOUS)	CU. YD.	122.03
310-1A	REINFORCING STEEL (CULVERTS)	POUND	24649
355-1	INLETS	EACH	58
355-2	MANHOLES	EACH	5
380-A	CONCRETE PIPE CULVERT (15" CROSS DRAIN AND STORM SEWER)	LIN. FT.	1783
380-B	CONCRETE PIPE CULVERT (18" CROSS DRAIN AND STORM SEWER)	LIN. FT.	1273
380-C	CONCRETE PIPE CULVERT (24" CROSS DRAIN AND STORM SEWER)	LIN. FT.	1282
380-D	CONCRETE PIPE CULVERT (30" CROSS DRAIN AND STORM SEWER)	LIN. FT.	1084
380-E	CONCRETE PIPE CULVERT (36" CROSS DRAIN AND STORM SEWER)	LIN. FT.	523
380-F	CONCRETE PIPE CULVERT (36" SPECIAL)	LIN. FT.	60
380-25A	SIDE DRAIN PIPE CULVERT (18")	LIN. FT.	653
380-25B	SIDE DRAIN PIPE CULVERT (24")	LIN. FT.	55
430-1	CONCRETE CURB AND GUTTER (STANDARD)	LIN. FT.	7400
430-2	CONCRETE CURB (TYPE "C")	LIN. FT.	5947
451-1	CONCRETE DITCH PAVEMENT (3" THICK)	SQ. YD.	148
405-1	GUARDRAIL	LIN. FT.	487.5
470-1	INSTALLING RIGHT-OF-WAY MARKERS	EACH	111
480-1	GRASSING	SQ. YD.	7,732
480-2	GRASSING AND MULCHING	SQ. YD.	403,254
480-3	MULCH MATERIAL	TON	524
480-4	SEEDING AND FERTILIZING ONLY	SQ. YD.	69,641
481-1	SODDING	SQ. YD.	1,727

ITEM Nº 58-1 INCLUDES 110 S.Y. OF EXISTING CONC. DRIVEWAYS & CONC. ISLANDS TO BE REMOVED AND DISPOSED OF BY THE CONTRACTOR IN AREAS PROVIDED BY HIM.
ITEM Nº 100-1 IF MIAMI OOLITE FORMATION IS USED, GRADE Nº 1 MATERIAL WILL BE REQUIRED.
ITEM Nº 200-1 THE BITUMINOUS MATERIAL FOR OPTIONAL FD SURFACE TREATMENT WILL BE PAID FOR AT THE BID PRICE FOR THIS ITEM REGARDLESS OF WHETHER ASPHALT CEMENT OR EMULSIFIED ASPHALT IS USED.
ITEM Nº 200-1 INCLUDES 50,000 GALS. TOTAL FOR TACK COAT.
ITEM Nº 233-1 THE COVER MATERIAL FOR OPTIONAL FD SURFACE TREATEMENT WILL NOT BE PAID FOR DIRECTLY BUT THE COST WILL BE INCLUDED IN THIS ITEM.
ITEM Nº 233-3 INCLUDES 10 TONS FOR DRIVEWAY ADJUSTMENTS, IF NECESSARY, AS DIRECTED BY THE ENGINEER.
ITEM Nº 301-1 INCLUDES 50 CU.YDS. FOR MISCELLANEOUS CONSTRUCTION, IF NECESSARY, AS DIRECTED BY THE ENGINEER.
ITEM Nº 451-1 INCLUDES 10 SQ.YDS. FOR MISCELLANEOUS CONSTRUCTION, IF NECESSARY, AS DIRECTED BY THE ENGINEER.
ITEM Nº 481-1 THIS IS A CONTINGENT ITEM, TO BE USED, IF NECESSARY, AS DIRECTED BY THE ENGINEER.
ITEM No. 300-1B INCLUDES COST OF NECESSARY REINFORCING STEEL.

FOR BRIDGE QUANTITIES SEE BRIDGE PLANS

FDOT NOV 8 2007 EDMS SCANNED

BEST AVAILABLE ORIGINAL

FED. ROAD DIV. No.	STATE	PROJECT No.	FISCAL YEAR	SHEET No.
3	FLA.	F-033-1(25)	64	12

STATE JOB Nº 16110-3115

SUMMARY OF DRAINAGE STRUCTURES

INDEX Nº	STA. TO STA.	SIDE	TYPE	SIZE	LENGTH	PIPE CONCRETE 15"	PIPE CONCRETE 18"	PIPE CONCRETE 24"	PIPE CONCRETE 30"	PIPE CONCRETE 36"	PIPE "SPCL." 36"	INLETS "E" 0'-4'	INLETS "E" 4'-8'	INLETS "E" 8'-10'	INLETS "C" 4'-6'	INLETS "S" 4'-6'	INLETS "A-2" 4'-6'	INLETS "A-2" 6'-8'	INLETS "A-3" 4'-6'	INLETS "A-3" 6'-8'	MANHOLES A 6'-8'	MANHOLES B 4'-6'	CONCRETE CLASS "A"	CONCRETE CLASS "NS"	REINF. STEEL
5046 & 1454-B	2251+00	℄-RT.	INLET, PIPE & ENDWALL	18"	60'		60'					1												1.92	
5046 & 1454-B	2245+00	℄-RT.	INLET, PIPE & ENDWALL	18"	60'		60'					1												1.92	
5046 & 1454-B	2265+50	℄-RT.	INLET, PIPE & ENDWALL	15"	68'	68'								1										1.55	
5046 & 1454-B	2303+00	℄-RT.	INLET, PIPE & ENDWALL	18"	70'		70'						1											1.92	
5046 & 1454-B	2322+00	℄-RT.	INLET, PIPE & ENDWALL	15"	64'	64'						1												1.55	
5046 & 1454-B	2328+00	℄-RT.	INLET, PIPE & ENDWALL	15"	61'	61'						1												1.55	
5046 & 1101-N & 5013	2351+04.50	℄-RT.	INLET, BOX CULVERT EXT.	10'x4'	76'							1											81.72		10,107
5046 & 1454-B	2392+50	℄-RT.	INLET, PIPE & ENDWALL	15"	65'	65'						1												1.55	
5046 & 1101-N & 200	2402+21.60 TO 2403+00	℄-RT.	INLET, PIPE EXT. & ENDWALL	30"	101' & 4'				105'				1											1.34	
5046 & 1454-B	2412+00	℄-RT.	INLET, PIPE & ENDWALL	15"	63'	63'						1												1.55	
5046 & 1454-B	2422+00	℄-RT.	INLET, PIPE & ENDWALL	15"	57'	57'						1												1.55	
5046 & 1454-B	2428+00	℄-RT.	INLET, PIPE & ENDWALL	15"	62'	62'						1												1.55	
5046 & 1454-B	2441+00	℄-RT.	INLET, PIPE & ENDWALL	15"	74'	74'						1												1.55	
5046 & 1454-B	2452+00	℄-RT.	INLET, PIPE & ENDWALL	15"	73'	73'						1												1.55	
5046 & 1454-B	2463+00	℄-RT.	INLET, PIPE & ENDWALL	15"	75'	75'							1											1.55	
5046 & 1454-B	2471+00	℄-RT.	INLET, PIPE EXT. & ENDWALL	TRIPLE 36"	75', 73', 75'					223'			1											7.50	
5046 & 1454-B	2480+00	℄-RT.	INLET, PIPE & ENDWALL	15"	65'	65'						1												1.55	
5046 & 1454-B	2487+50	℄-RT.	INLET, PIPE & ENDWALL	15"	62'	62'						1												1.55	
5046 & 1454-B & 1101-N	2497+98.5	LT.-RT.	INLET, PIPE EXTS. & ENDWALLS	TRIPLE 30"	39' & 36'				225'				1											10.94	
200	2503+20 TO 2504+05	RT.	ENDWALL & PIPE	30"	75'				75'															1.55	
5046, 1331-B & 2234-D	2504+05	LT.-RT.	INLETS & PIPE	15"	42' & 42'	84'						1					1								
2234-D & 1331-B	2504+05 TO 2507+00	RT.	INLET & PIPE	30"	292'				292'									1							
5046	2507+00	LT.-RT.	INLET & PIPE	15"	33'	33'							1								1				
699-C	2507+00 TO 2509+67	RT.	MANHOLE & PIPE	30"	264'				264'											1					
2234-D & 1331-B	2509+67 TO 2510+06	RT.-LT.	INLET & PIPE	24"	101'			101'											1						
2234-D & 1331-B	2509+67 TO 2510+44	RT.	PIPE & INLET	15"	74'	74'													1						
2234-D & 1331-B	2510+06 TO 2510+55	LT.	INLET & PIPE	18"	47'		47'												1						
2234-D & 1331-B	2510+55 TO 2510+59	LT.	PIPE & INLET	15"	11'	11'																1			
699-C	2510+55 TO 2513+40	LT.	MANHOLE & PIPE	18"	281'		281'															1			
699-C	2513+40 TO 1+07 (ACUFF AVE.)	LT.	MANHOLE & PIPE	15"	61'	61'																			
5046	1+07 (ACUFF AVE.)	LT.	INLET, PIPE & INLET	15"	38'	38'									2										
2234-D & 1331-B	2516+38 TO 2516+59.5	RT.-LT.	INLET & PIPE	15"	91'	91'											1		1						
2234-D & 1331-B	2516+59.5 TO 2519+00	LT.	INLET & PIPE	18"	238'		238'											1							
2234-D & 1331-B	2519+00 TO 2521+00	LT.	INLET & PIPE	24"	197'			197'											1						
5046, 1331-B & 2234-D	2520+80 TO 2521+00	RT.-LT.	INLETS & PIPE	18"	43' & 43'		86'					1								1					
2234-D & 1331-B	2521+00 TO 2524+00	LT.	INLET & PIPE	30"	298'				298'									1							
2234-D & 1331-B	2524+00 TO 2527+50	LT.	INLET & PIPE	30"	348'				348'								1								
5046, 1331-B & 2234-D	2527+50	RT-LT	INLETS & PIPE	15"	42' & 42'	84'						1						1							
2234-D & 1331-B	2527+50 TO 2530+00	LT.	INLET & PIPE	30"	247'				247'										1						
2234-D & 1331-B	2529+77 TO 2530+00	RT.-LT.	INLET & PIPE	15"	93'	93'												1							
2234-D & 1331-B	2530+00 TO 2533+00	LT.	INLET & PIPE	36"	297'					297'															
5046	2533+00	RT.-LT.	INLET & PIPE	15"	45'	45'						1						1							
1331-B & 2234-D	2533+00 TO 2536+00	LT.	INLET & PIPE	36"	297'					297'															
1143-B; 1331-B & 200	2534+60 TO 2534+90	RT.	INLET PIPE & ENDWALL	15"	36'	36'										1								0.73	
1454-B	2536+00	LT.	ENDWALL & PIPE	15"	9'	9'																		1.55	
5046; 1331-B; 2234-D & 1454-B	2536+00	LT.-RT.	INLETS, PIPE & ENDWALL	36"	41' & 65'					106'			1							1				5.11	
	2536+00 (LAT. DITCH)	RT.	PIPE	SPCL. DBL. 30"	30'						60'														
2234-D & 1331-B	2536+00 TO 2539+00	LT.	PIPE & INLET	18"	297'		297'										1								
	1+19.0 TO 1+44.0 (OLD BARTOW RD.)	LT.	PIPE	18"	17'		17'																		
1454-B	1+19.0 TO 1+50.0 (OLD BARTOW RD.)	LT.-RT.	PIPE & ENDWALL	18"	46'		46'																	1.92	
5046	1+19.0 TO 2544+24.80	LT.	INLET & PIPE	24"	33'			33'							1										
2234-D & 1331-B	2544+24.80 TO 2547+90	LT.	INLET & PIPE	24"	363'			363'									1								
5046	2547+90	RT.-LT.	INLET & PIPE	15"	42'	42'						1					1								
2234-D & 1331-B	2547+90 TO 2550+90	LT.	INLET & PIPE	24"	297'			297'									1								
2234-D; 1331-B & 1454-B	2550+90 TO 2551+70	LT.	INLET PIPE & ENDWALL	24"	89'			89'																2.65	
5046 & 8343	2553+66.66	LT.-RT.	INLET, BOX CULVERT EXT.	10'x8'	505' & 365'							1											134.12		14,542
5046 & 1454-B	2560+00	℄-RT.	INLET, PIPE & ENDWALL	15"	61'	61'							1											1.55	
1454-B & 1101-N	2568+20	℄-RT.	PIPE EXT. & ENDWALL	18"	71'		71'																	1.92	
5046 & 1454-B	2576+00	℄-RT.	INLET, PIPE & ENDWALL	15"	76'	76'							1											1.55	
5046 & 1454-B, 1101-N	2584+00	LT.-RT.	INLET, PIPE, PIPE EXT. & ENDWALLS	24"	5', 65', 71', 71'			212'					1											6.46	
5046 & 1454-B	2589+00	℄-RT.	INLET, PIPE & ENDWALL	15"	72'	72'						1												1.55	
5046 & 1454-B	2379+00	℄-RT.	INLET, PIPE & ENDWALL	15"	64'	64'						1												1.55	
	PROJECT TOTAL					1783'	1273'	1292'	1654'	923'	60'	21	10	1	3	1	7	6	6	3	1	2	215.84	72.03	24649

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APPENDIX M

No-Rise Certification

"NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of Florida practicing with **Kisinger Campo & Associates, Inc.**

It is further to certify that the attached technical data supports the fact that the proposed bridge for the SR 60 Grade Separation over CSX Railroad will not impact the 100-year flood elevations, floodway elevations, or floodway widths on the Peace Creek Drainage Canal at published sections (cross-section Z) in the Preliminary FIRM Map 12105C0545H for Polk County dated March 27th, 2015 and will not impact the 100-year flood elevations, floodway elevations, or floodway widths at unpublished cross-sections in the vicinity of the proposed development based on the Peace Creek Watershed Model (Atkins).

Attached are the following documents that support my findings:

Final Bridge Hydraulics Report: SR 60 Over Peace Creek Drainage Canal West of the CSX Railroad, FPID: 436559-1-52-01

FLORIDA LICENSED PROFESSIONAL ENGINEER:

Ali Tayebnejad, P.E.
Name

PE NUMBER: FL # 42775

SIGNATURE: 5/16/2016
Date

ALIREZA TAYEBNEJAD LICENSE No 42775 STATE OF FLORIDA PROFESSIONAL ENGINEER