Project Development & Environment Study

SR 60 PD&E Study
From Valrico Road to the Polk County Line

Final
Location Hydraulic Report

WPI Segment No.: 430055-1
Hillsborough County

Prepared for the

Florida Department of Transportation
District Seven

April 2015

Stephanie Pierce

FDOT Project Manager

FINAL LOCATION HYDRAULIC REPORT

State Road (SR) 60
From Valrico Road to the Polk County Line
Project Development and Environment (PD&E) Study
Hillsborough County, Florida

FDOT District 7
FPN: 430055-1-22-01

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EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT) District Seven is conducting a Project Development and Environment (PD&E) Study to evaluate improvement alternatives for State Road 60 (SR 60) from Valrico Road to the Polk County Line in Hillsborough County, Florida. These improvements consist of widening the existing 4 lane roadway to a 6 lane roadway for a project length of approximately 12.3 miles.

SR 60 is a major east-west arterial roadway which has both urban and rural sections. The existing typical section for Segments 1, 2A, 2C and 3 include (4) 12-foot travel lanes, 40-foot median, 5-foot sidewalk on both sides at the beginning of the project and on one side for small segments. Segment 2B also includes (4) 12-foot travel lanes but the median is 36-foot and there is no sidewalk. The proposed typical sections do not include any additional Right of Way along the project. All of the proposed five segments will have six (6) 12-foot lane high speed roadway. Bicycle lane and shoulder has been proposed to be 6.5 ft in width (except Segment 3), a median width of 30 ft (except Segment 3), and a sidewalk width of 5 ft (except Segment 2B). The first three segments (up to the west of Marge Owens Road) will have Curb and Gutter; whereas, the last two segments will have Onsite Conveyance Ditch.

The project is located within the Alafia River Watershed (Turkey Creek, Medard Park Run, Unnamed Branch, and English Creek sub-basins) and the Hillsborough River Watershed (Selfer Canal sub-basin) in the Southwest Florida Water Management District (SWFWMD). The project site is within Township 29 South, Range 21 East and Township 29 South, Range 22 East.

The purpose of this Location Hydraulic Report is to address base floodplain encroachments resulting from the roadway improvements evaluated in the PD&E Study. In accordance with Executive Order 11988 “Floodplain Management”, USDOT Order 5650.2, “Floodplain Management Protection”, and Federal-Aid Policy Guide 23 CFR 650A, floodplains must be protected. The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains and to avoid supporting land use development incompatible with floodplain values.

Floodplain encroachment areas resulting from roadway widening were quantified. It is determined that impacts will occur to the floodplain associated with the proposed roadway throughout all five segments, the extension of cross drains CD-01, CD-02, CD-03, Bridge #100058, CD-07, CD-08, Bridge #100059, CD-13, CD-19, CD-20 and from the bridge widening/replacement at the English Creek (Bridge #100583 & #100584).

The 100-year base flood stage was not (Zone A) available within the project area based on the FEMA flood maps. It was concluded that the project will impact approximately 15.62 ac. of floodplain area based on the most conservative roadway alternative. It was determined that the floodplain encroachment is classified as “minimal”. Minimal encroachments on a floodplain occur when there is a floodplain involvement, but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Please refer to **Section 5.5** for discussion.

In conclusion, the following statement summarizes the results of our findings:

"Replacement drainage structures for this project are limited to hydraulically equivalent structures. The limitations to the hydraulic equivalency being proposed are basically due to restrictions imposed by the geometrics of design, existing development, cost feasibility, or practicability. An alternative encroachment location is not considered in this category since it defeats the project purpose or is economically unfeasible. Since flooding conditions in the project area are inherent in the topography or are a result of other outside contributing sources, and there is no practical alternative to totally eradicate flood impacts or even reduce them in any significant amount, existing flooding will continue, but not be increased. The proposed structure will be hydraulically equivalent to or greater than the existing structure, and backwater surface elevations are not expected to increase. As a result, the project will not affect existing flood heights or floodplain limits. This project will not result in any new or increased adverse environmental impacts. There will be no significant change in the potential for interruption or termination or emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant."

SECTION 1 INTRODUCTION

A Project Development and Environment (PD&E) Study was conducted in accordance with the Florida Department of Transportation requirements for State Road 60 from Valrico Road to the Polk County Line in Hillsborough County, Florida. These improvements consist of widening the existing 4-lane roadway to 6-lanes for a project length of approximately 12.3 miles.

SR 60 is a major east-west arterial roadway and is part of the Florida Strategic Intermodal System (SIS). Within the project limits, SR 60 currently has a 4-lane divided urban typical section from Valrico Road to Dover Road and from Sydney Washer Road to Horton Road. It also has a 4-lane rural typical section from Dover Road to Sydney Washer Road and from Horton Road to the Polk County Line. The existing roadway generally has four 12-foot travel lanes, 4-foot paved outside shoulders, and a 40-foot grassed median. The posted speed varies from 50 mph to 65 mph. The existing right of way is typically 182 feet.

Expected improvements include widening to six lanes as well as intersection improvements and construction of stormwater management facilities and bicycle and pedestrian facilities. A "No-Build" Alternative will also be considered. **The Project Location Map** is shown in **Exhibit 1, Appendix 1** exhibits.

The project is located within both Alafia River Watershed (Turkey Creek, Medard Park Run, Unnamed Branch, and English Creek sub-basins) and Hillsborough River Watershed (Selfer Canal sub-basin). The project site is within Sections 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 and 30 of Township 29 South, Range 21 East; Sections 19, 20, 21, 22, 25, 26, 27, 28, 29 and 30 Township 29 South, Range 22 East. Please refer to **Exhibit 2** for the **Drainage Basin Map**. A reproduction of the **United States Geological Survey (USGS) Quadrangle Maps** for the project vicinity is shown in **Exhibit 3**.

The purpose of this Location Hydraulic Report is to address base floodplain encroachments resulting from the roadway improvements evaluated in the Project Development and Environment (PD&E) study. In accordance with Executive Order 11988 "Floodplain Management", USDOT Order 5650.2, "Floodplain Management Protection", and Federal-Aid Policy Guide 23 CFR 650A, floodplains must be protected. The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains and to avoid supporting land use development incompatible with floodplain values. All exhibits for this report are included in **Appendix 1**. For the ease of review, **Cross Drain Analyses** and **Floodplain Impacts** are included in **Appendix 3** and **Section 4.4**, respectively. Other supporting information and data is included in the remaining appendices. Please note that the vertical datum used for this project is NAVD 88, unless otherwise specified.

SECTION 2 PROJECT DESCRIPTION

FDOT proposes a roadway widening for SR 60 from Valrico Road to the Polk County Line in Hillsborough County, Florida. The project extends for approximately 12.3 miles traversing twenty one (21) cross drains (including two bridge culverts and one bridge). The limits of the project are shown on the **Project Location Map** as shown in **Exhibit 1, Appendix 1**.

The existing typical section for SR 60 within the project limits is a four-lane roadway constructed within a right-of-way that is 182 feet in width. It includes four 12-foot lanes with 4-foot paved shoulders and a 40-foot grassed median. Stormwater runoff is collected in roadside swales or sheet flows to adjacent wetlands. The posted speed varies from 50 mph to 65 mph. The existing roadway and bridge typical sections are provided as shown in **Exhibits 7 and 8 (8-1, 8-2, and 8-3)**, **Appendix 1**.

The proposed roadway is divided into five (5) segments. Segment 1 is from Valrico Rd. to Dover Rd., Segment 2A is from Dover Rd. to West of Sydney Washer Rd., Segment 2B is from West of Sydney Washer Rd. to West of Marge Owens Rd., Segment 2C is from West of Marge Owens Rd. to Turkey Creek Rd., and Segment 3 is from Turkey Creek Rd. to The Polk County Line. Please refer to **Exhibit 1** for project segments and **Section 5.1** for proposed Typical Section improvements discussions.

No formal water quality treatment is currently provided for SR 60, although the current existing ditches do provide some form of treatment. Review of existing permits indicates that SR 60 has been recently milled and resurfaced as well as additional storm drainage systems installed.

SECTION 3 DATA COLLECTION

The design team collected and reviewed data from the following sources:

- FDOT Drainage Manual, July 2013
- FDOT Drainage Handbook – Hydrology, February 2012
- FDOT Drainage Handbook – Culvert Design, January 2004
- FDOT PD&E Manual , Part 2, Chapter 24- Floodplains
- SR 60 – Plans of Proposed State Highway, F.A. Project No. F-033-1 (21), 1961
- SR 60 – Final As-Built Plans, FPID 413395-1-52-01, M.P. 11.456 to M.P. 16.491, 2005
- SR 60 – Final As-Built Plans, FPID 423053-1-52-01, M.P. 16.491 to M.P. 20.284, 2011
- SR 60 – Final As-Built Plans, FPID 413405-1-52-01, M.P. 20.284 to M.P. 23.740, 2008
- Federal Emergency Management Agency (FEMA), Panel Nos. 12057C0405H, 12057C0410H, 12057C0430H, 12057C0415H, 12057C0420H, 12057C0440H and 12057C0445H for Hillsborough County, Florida dated August 28, 2008
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey of Hillsborough County, Florida, 1989
- USDA NRCS Soil Survey Geographic (SSURGO) Database from SWFWMD, 2010
- Land Boundary Information System (LABINS) Quadrangle Maps
- 5-foot contours from Hillsborough County, 2010

- Hillsborough County Property Appraiser's Website (GIS parcel lines), 2013
- FDOT Straight Line Diagrams (SLD's) of Road Inventory for SR 60
- Field Reconnaissance (November 2012)

SECTION 4 EXISTING DRAINAGE CONDITIONS

4.1 Topography & Hydrologic Features

The topography of the project area is not flat and elevations range from a high of 120 feet to a low of 40 feet NAVD 88. Please refer to **USGS Quadrangle Map** and **Exhibit 3** in **Appendix 1**. There are eighteen (18) existing cross drains, one (1) existing bridge, and two (2) existing bridge culverts within the project limits allowing for conveyance of offsite and onsite runoff to the Alafia and Hillsborough rivers. The size and geometry of all cross drains and bridges have been verified from the FDOT SLD's, 1-foot LiDAR contours, SR 60 plans, as well as during field reconnaissance. Please refer to **Table 1** for a summary of existing cross drains and bridges. Please refer to **Appendix 2** for cross drains pictures and review checklists from site reconnaissance.

Table 1 – Summary of Existing Cross Drains and Bridges

Structure Number	FDOT Milepost*	Stations	Description
CD-01	11.868	421+03	Single 24" RCP
CD-02	12.246	441+28	Single 30" RCP
CD-03	14.485	559+02	Single 36" RCP
CD-04 (#100058)	15.058 - 15.064	589+11	31.7' Bridge Culvert Triple 10'X10' Concrete
CD-05	15.434	609+10	Single 4'X3' CBC
CD-06	15.936	635+66	Single 36" RCP
CD-07	16.895	686+49	Single 7'X3' CBC
CD-08	17.106	697+50	Single 8'X5' CBC
CD-09 (#100059)	17.341 - 17.347	709+74	31.7' Bridge Culvert Triple 10'X10' Concrete
CD-10	18.171	754+74	Single 24" RCP
CD-11	18.769	786+01	Single 24" RCP
CD-12	19.005	798+27	Single 24" RCP
CD-13	19.546	826+36	Double 7'X5' CBC
CD-14	20.117	856+80	Double 36" RCP
CD-15	20.292	865+80	Single 24" RCP
CD-16	20.992	902+99	Double 30" RCP
CD-17	21.41	925+31	Double 30" RCP
CD-18	21.840	948+00	Single 36" RCP
CD-19	21.849	960+00	Single 30" RCP
CD-20	22.061	970+00	Single 30" RCP
CD-21 (#100583 & #100584)	23.131 - 23.163	1016+25	165.7' Bridge Over English Creek

4.2 Existing Bridge Study

Both bridge culverts for the Turkey Creek and the Little Alafia River were constructed in 1946. Then they were reconstructed in 1962. The bridge over English Creek was constructed in 1992 (Westbound) and 1993 (Eastbound). Information gathered from the Bridge Inspection Report was used to provide some of the parameters as summarized in **Table 2**.

Table 2 – Existing Bridge Data

	Bridge No. 100058	Bridge No. 100059	Bridge No. 100583	Bridge No. 100584
Year Constructed	1946	1946	1992	1993
Structure Name	SR-60 Over Turkey Creek	Sr 60 - Little Alafia Rvr	SR-60 WB over English CK	SR-60 EB over English CK
Section Number	10 110 000	10 110 000	10 110 000	10 110 000
Mile Post (MP) Marker	15.058	17.341	23.131	23.131
Facility Carried	SR-60	SR-60	SR-60 WB	SR-60 EB
Approximate Location	4.4 Miles West of SR-39	2.1 Miles West of SR-39	3.7 Miles East of CR-39	3.7 Miles East of CR-39
Owner/Maintenance Agency	FDOT	FDOT	FDOT	FDOT
Crossing Waterway/Canal ID	Turkey Creek	Little Alafia River	English Creek	English Creek
Bridge Length	31.7 feet	31.7 feet	165.7 feet	165.7 feet
Number of Traffic Lanes	4	4	2	2
Number of Spans	3	3	5	5
Structure Type	Reinforced Concrete	Reinforced Concrete	Prestressed Concrete	Prestressed Concrete
Pile Type	N/A	N/A	N/A	N/A
Navigable Vertical Clearance	0	0	0	0
Navigable Horizontal Clearance	0	0	0	0
Channel Depth	0.2 feet	1.9 feet	5.2 feet	5.7 feet
Deck Skew	0	0	0	0
Deck Type	N/A	N/A	Concrete Precast Panel	Concrete Precast Panel

Bridge Inspection Reports (BIRs) were prepared by Kisinger Campo & Associates on June 13, 2011 (Bridge No. 100583 & 100584) and June 22, 2011 (Bridge No. 100058 & 100059) for FDOT.

The BIRs mentioned that Deterioration, minor chloride contamination, minor abrasion, minor cracking and/or leaching may have begun in the concrete culverts. There may be moderate to major deterioration, abrasion, extensive cracking and/or leaching and large areas of spalls. Minor to moderate distortion, settlement, or misalignment may have occurred.

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. Concrete Walls show little or no deterioration. 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.

BIRs for the SR-60 WB & EB over English CK Bridges mentioned that repaired areas and/or potholes or impending potholes and/or cracks and/or raveling or rutting exist in decks/slabs. Their combined area is less than 2% of the deck area. Signs of seepage along the joint may be present. Significant debris is in all or part of the joint. Minor spalls in the deck and/or header may be present adjacent to the joint. Pourable Joint Seal shows minimal deterioration. The Railing, Concrete Column, Walls, Abutment, and Cap show little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without affect on strength and/or serviceability. Pile Jacket Bare has little or no deterioration. Scour exists at the structure site but is of little concern to the structural integrity of the bridge. Concrete Approach Slab has minor cracking, spalls may be present but they do not affect the ability of the slab to carry traffic. Settlement may be occurring which increases the traffic impact on the bridge.

For the westbound bridge, the inspectors recommended removing dirt and debris from the Abutment 1 and Abutment 6 expansion joints. Reflectors along the right barrier wall should be installed. Dirt and vegetation along approach slabs at SW NW and NE end posts should be removed. For the eastbound bridge, the inspectors recommended repairing spalled patch with exposed steel in Span 2 Lane 1 at Bent 3. Dirt and debris from the abutment expansion joints should be cleaned. Dirt and vegetation along the east approach slab at the end posts should be removed.

Please refer to **Table 3** for a summary of the performance of the bridge.

Table 3 – Bridge Inspection Report Results

Bridge Number	Existing Waterway	Channel Rating (2011 BIR)	Sufficiency Rating (2011 BIR)
100058	Turkey Creek	7 – Minor Damage	74.7
100059	Little Alafia River	6 – Bank Slumping	74.0
100583	English Creek	7 – Minor Damage	99.60
100584	English Creek	7 – Minor Damage	99.60

4.3 Soils Data & Geotechnical Investigations

The Soil Survey of Hillsborough County, Florida, published by the USDA NRCS (dated 1989) has been reviewed for the project vicinity. USDA SSURGO was also obtained from SWFWMD to create soils map in the project area using GIS ArcMap. SSURGO data was compared to Soil Survey by USDA NRCS and found no deviation. The soil survey map for the project vicinity is illustrated in **Exhibit 4** of **Appendix 1.**

The soils encountered along the project limits are mostly Hydrological Soil Group (HSG) A, C and D. Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission. Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission. According to the Soil Survey, there are twenty (20) different soil types located along the project limits. **Table 4 – USDA NRCS Soil Survey Information** summarizes and lists the soil types and relevant information. The ground water depth varies from 0 – 1' to greater than 6' along the project.

Table 4 – USDA NRCS Soil Survey Information

Soil No.	Hillsborough County	Seasonal High Ground Water		HSG	Soil Classification		
	USDA Soil Name	Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
3	Archbold fine sand	3.5-6.0	Jun-Nov	A	0-4	SP	A-3
					4-80	SP, SP-SM	A-3
4	Arents	2.3	---	B	>6.6	SP	A-3
5	Basinger	+2.0-1.0	Jun-Feb	D	0-7	SP	A-3
					7-28	SP, SP-SM	A-3, A-2-4
					28-42	SP, SP-SM	A-3, A-2-4
					42-80	SP, SP-SM	A-3, A-2-4
5	Holopaw	+2.0-1.0	Jun-Apr	D	0-6	SP, SP-SM	A-3
					6-52	SP, SP-SM	A-3
					52-80	SM, SM-SC	A-2-4
5	Samsula	+2.0-1.0	Jan-Dec	D	0-34	PT	A-3
					34-80	SP-SM, SM, SP	A-3, A-2-4
7	Candler fine sand	> 6.0	---	A	0-6	SP, SP-SM	A-3
					6-72	SP, SP-SM	A-3
					74-80	SP-SM	A-3, A-2-4
9	Candler-Urban land complex	> 6.0	---	A	0-6	SP, SP-SM	A-3
					6-76	SP, SP-SM	A-3
					76-80	SP-SM	A-3, A-2-4
14	Eaton mucky	+2.0-1.0	Jun-Feb	D	0-8	SP-SM	A-3, A-2-4

Soil No.	Hillsborough County	Seasonal High Ground Water		HSG	Soil Classification		
	USDA Soil Name	Depth* (feet)	Duration (months)		Depth (inches)	Unified	AASHTO
	sand				8-22	SM, SP-SM	A-2-4, A-3
					22-80	SC, CL, CH	A-7
16	Felda fine sand	0-1.0	Jul-Mar	B/D	0-22	SP, SP-SM	A-3
					22-38	SM, SM-SC, SC	A-2-4, A-2-6
					38-80	SP, SP-SM	A-3. A-2-4
18	Fort Meade loamy fine sand	> 6.0	---	A	0-26	SM	A-2-4
					26-80	SM	A-2-4
25	Lake fine sand	> 6.0	---	A	60-80	SP-SM	A-3, A-2-4
29	Myakka fine sand	0-1.0	Jun-Nov	B/D	0-20	SP, SP-SM	A-3
					20-30	SM, SP-SM	A-3, A-2-4
					30-80	SP, SP-SM	A-3
30	Myakka	0-1.5	---	D	0-22	SP, SP-SM	A-3
					22-40	SP-SM, SM	A-3, A-2-4
					40-80	SP, SP-SM	A-3
33	Ona fine sand	0-1.0	Jun-Nov	B/D	0-4	SP-SM, SP	A-3
					4-22	SP-SM, SM	A-3, A-2-4
					22-80	SP-SM, SP	A-3
35	Orlando fine sand	> 6.0	---	A	0-20	SP, SP-SM	A-3, A-2-4
					20-80	SP, SP-SM	A-3, A-2-4
43	Quartzipsaments	> 6.6	---	A	>6.6	SP	A-3
46	St. Johns fine sand	0-1.0	Jun-Apr	B/D	0-12	SP, SP-SM	A-3
					12-29	SP, SP-SM	A-3
					29-46	SP-SM, SM	A-3, A-2-4
					46-80	SP, SP-SM	A-3
47	Seffner fine sand	1.5-3.5	Jun-Nov	C	0-13	SP-SM, SP	A-3, A-2-4
					13-21	SP-SM, SP	A-3, A-2-4
					21-80	SP-SM, SP	A-3, A-2-4
51	Haplaquents	0	---	D	>6.6	CH	A-7
52	Smyrna fine sand	0-1.0	Jul-Oct	B/D	0-12	SP, SP-SM	A-3, A-2-4
					12-20	SM, SP-SM	A-3, A-2-4
					20-80	SP, SP-SM	A-3
53	Tavares	3.5-6.0	Jun-Dec	A	0-6	SP, SP-SM	A-3
					6-80	SP, SP-SM	A-3
53	Millhopper	3.5-6.0	Aug-Feb	A	0-57	SP-SM, SM	A-3, A-2-4
					57-80	SM, SM-SC, SC	A-2-4. A-4
61	Zolfo fine sand	2.0-3.5	Jun-Nov	C	0-3	SP-SM	A-3, A-2-4
					3-60	SP-SM, SM	A-3, A-2-4
					60-80	SP-SM, SM	A-3, A-2-4

*Seasonal High Groundwater Table: Depth is referenced below existing grade, except where indicated as "+".

Environmental Characteristics

4.3.1 Land Use Data

The project corridor is a mixture of residential, commercial, reclaimed land and agricultural land uses. Land use on the western end of the project primarily consists of commercial and residential developments, while land use along the central and eastern portions of the alignment consists of agricultural developments and rural residential developments. Please see **Exhibit 5** for **Existing Land Use Map** in **Appendix 1.**

The widening of SR 60 from Valrico Road to the County Line does not alter the existing or future land uses in the area. Future land uses adjacent to the project limits will include residential, agricultural and rural lands.

4.3.2 Cultural Features

A separate Cultural Resource Assessment Survey (CRAS) has been prepared in conjunction with the undertaking of the PD&E study. Information regarding cultural features can be found within the CRAS.

4.3.3 Natural and Biological Features

A separate Wetland Evaluation/Biological Assessment Report (WEBAR) has been prepared in conjunction with the undertaking of the PD&E study. Information regarding natural and biological features can be found within the WEBAR.

4.4 Floodplains/Floodways

According to The Federal Emergency Management Agency (FEMA) the relevant FIRM panel numbers are 12057C0405H, 12057C0410H, 12057C0430H, 12057C0415H, 12057C0420H, 12057C0440H and 12057C0445H for Hillsborough County, Florida dated August 28, 2008. The majority of the project is designated Zone 'X' which means those areas have a 0.2% probability of flooding every year (500-year floodplain). Some parts (mostly streams and waterbodies crossing) are in the zone 'A' which have a 1% probability of flooding every year (100-year floodplain), and where predicted flood water elevations have not been established. Please refer to **Exhibit 6, Appendix 1** for the **FEMA Flood Insurance Rate Maps**.

General comments relating to floodplains include the fact that any development within the 100-year floodplain has the potential for placing citizens and property at risk of flooding and producing changes in floodplain elevations and plan view extent. Development (such as roadways, housing developments, strip malls and other commercial facilities) within floodplains increases the potential for flooding by limiting flood storage capacity and exposing people and property to flood hazards. Development also reduces vegetated buffers that protect water quality and destroys important habitats for fish and wildlife. The area surrounding the proposed roadway widening project has and will continue to experience growth.

Per FDOT, whenever it is determined that the proposed project will involve a regulatory floodway, the District Drainage Engineer, or designee, must work with local agencies and the

Federal Emergency Management Agency (FEMA), as required, to ensure the project is developed consistent with local floodway plans and floodplain management programs. However, this project does not cross any regulatory floodway.

Any floodplain impacts will be mitigated for on offsite flood plain compensation sites, or cut ditch sections on a cup for cup basis. From the available data, an approximate Floodplain Impact Area (FIA) has been calculated (**Table 5**). Within the Project Limits and Right-of-Way, seven (7) FIA segments have been identified (**Figure 1**) which are impacted by 100-year floodplain (Zone A). For Segment 2, only the effective area has been taken beyond which the floodplain elevation is lower than the existing ground elevation.

Length and width are measured using the alignment chain and typical sections respectively. Depth of impact has been calculated from the difference between the floodplain elevation and existing ground elevation or seasonal high water table elevation depending on the type of soil. Although all the floodplains are in Zone A, elevations were estimated from existing permits along SR 60 and contour data collected from Hillsborough County. This analysis data indicate that approximately 15.62 acres of 100-year floodplain are impacted within the project limits. This project has the potential to impact floodplains and their functions in the area.

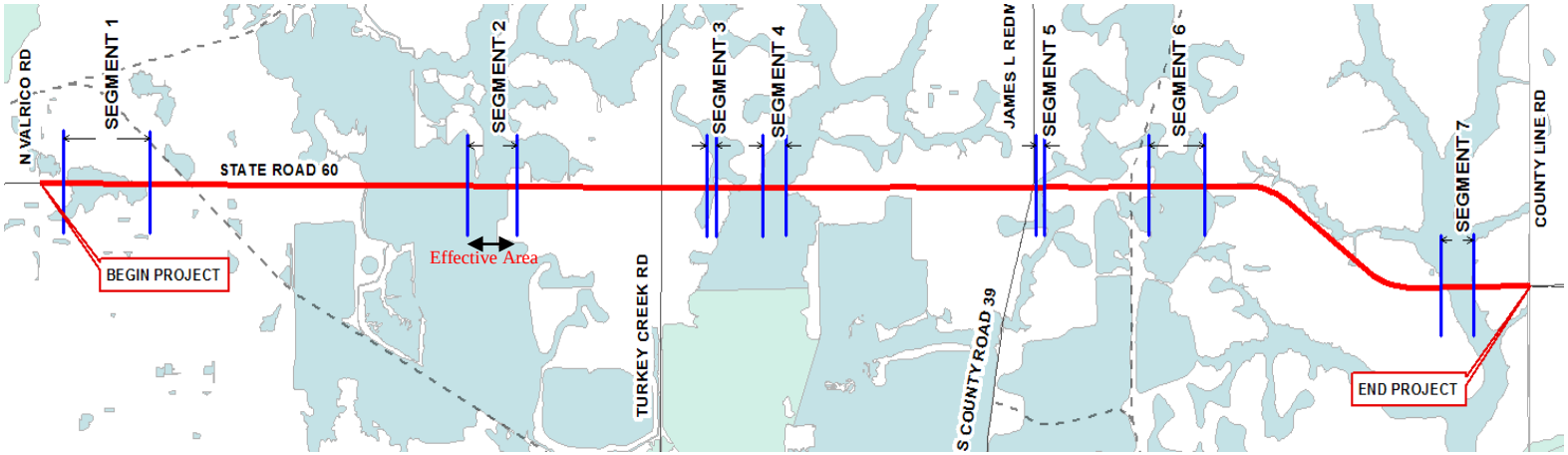


Figure 1 – Segments of Floodplain Impacts Area (FIA)

Table 5 – Summary of Floodplain Impact Areas (FIA)

Floodplain Impact Area (FIA)	From Station	To Station	Length of Impact (ft)	Width of Impact (ft)	Area of Impact (Acre)	Flood Zone	Floodplain Elev.	Existing Ground Elev.	Seasonal High Water Table Elev.	Depth of Impact (ft)	Volume of Impact (Acre-ft)
Segment 1	409+00.00	446+00.00	3700	54	**4.59**	A	38.50	38.00	31.00	0.50	**2.29**
Segment 2	582+00.00	603+00.00	2100	44	**2.12**	A	58.00	56.00	49.00	2.00	**4.24**
Segment 3	684+00.50	688+00.00	400	70	**0.64**	A	72.60	72.00	71.00	0.60	**0.39**
Segment 4	708+00.50	718+00.00	1000	70	**1.61**	A	68.57	64.00	63.50	4.57	**7.34**
Segment 5	825+00.00	828+45.00	345	70	**0.55**	A	105.39	105.00	104.00	0.39	**0.22**
Segment 6	873+00.00	897+00.00	2400	70	**3.86**	A	117.00	116.00	113.70	1.00	**3.86**
Segment 7	1010+00.00	1024+00.00	1400	70	**2.25**	A	74.00	70.00	69.50	4.00	**9.00**
				Total	**15.62**						**27.34**

Note: Existing ground elevation obtained from 1-foot LiDAR Contour (Source: Hillsborough County)

4.5 Flooding History and Maintenance Concerns

In addition to field visit and reconnaissance survey (**Appendix 2**: Review Checklist), FDOT District 7 Maintenance office was contacted to discuss any flooding history and maintenance concerns. One concern they have is with drainage connections from adjoining properties and their effects from a maintenance standpoint. The recent construction project (FPN 42305315201) addressed some of the ditch areas between Turkey Creek and SR 39 but also brought some underlying draining issues to the surface, particularly, between Mud Lake Rd. and Wallace Rd. on the north side of SR 60. Maintenance was called upon to regrade a backslope at 2902 E. SR 60 due to concern of future runoff from the driveway going into their yard instead of the newly constructed ditch. However, with the small amount of rain so far this year they have not seen any issues at this location and will continue to monitor it during the rainy season.

The other location is approximately 900' west of Mud Lake Rd. An approved mitered end was constructed under FPN 42305315201 to connect an adjoining agricultural field to the drainage system. Since the completion of the project 6 months ago, FDOT maintenance have had to clean sediment/silt out of this ditch because of what has come out of the adjoining property's mitered end. It is enough sediment/silt to block the 18" CMP driveway pipe by 75% that runs east to west and hold 12"-16" of water to the east of the driveway.

SECTION 5 PROPOSED CONDITIONS

The existing drainage boundaries and local drainage basins will be maintained in the future condition. Although the project does not outfall to any Outstanding Florida Water (OFW), an area designated as Potable Water Protection Zone 1 adjacent to SR 60 to the south and between SR 39 and the County Line has been identified. Per SWFWMD, no stormwater discharge is allowed in this area to depressions which have direct connections to the Floridian Aquifer. Further coordination with SWFWMD will occur during the design phase to determine the level of impact associated in this area. The FDEP list of impaired water bodies has been reviewed and it has been identified that Turkey Creek (WBID 1578B) and Mustang Ranch Creek (WBID 1592C) are impaired for nutrients. Total Maximum Daily Load calculations will be performed as part of the Preliminary Stormwater Management Facilities Report (PSMFR). In addition, a required pond size per basin will be identified to meet SWFWMD criteria for both open and closed basins. Because of the karstic nature in some areas of the project, shallow ponds will be considered as well as avoidance of any existing wells or contaminated sites.

5.1 Proposed Typical Section Improvements

Typical sections have been proposed with no additional Right of Way. The Project Limits have been divided into five segments where the FDOT will widen the existing four-lane roadway to six (6) 12-foot lane high speed roadway. For Segments 1, 2A, 2B and 2C, bicycle lanes and shoulders on each direction (with the exception of Segment 2B) have been proposed to be 6.5 ft wide, a median width of 30 ft, and a sidewalk width of 5 ft.

The first three segments (up to the west of Marge Owens Road) will have Curb and Gutter system; whereas, the last two segments will have Onsite Conveyance Ditches. A segment-wise detailed typical section dimensions have been shown in Table 6. Moreover, all the proposed typical sections have been shown in **Appendix 1 (Exhibits 8-1 to 8-9).**

Table 6 – Proposed Typical Sections

Segments	Extent	From Station	To Station	Length (ft)	Proposed R/W Width (ft)	Travel Lane Width (ft)	Bicycle Lane & Shoulder Width (ft)	Inside Shoulder Width (ft)	Median Width (ft)	Sidewalk Width (ft)	Curb and Gutter (Type E)	Onsite Conveyance Ditch
1	From Valrico Rd. To Dover Rd.	399+03	506+17	10714	182	(6) 12	(2) 6.5	(2) 6.5	30	(2) 5	Yes	No
2A	From Dover Rd. To West of Sydney Washer Rd.	506+17	559+66	5349	182	(6) 12	(2) 6.5	(2) 6.5	30	(2) 5	Yes	No
2B	From West of Sydney Washer Rd. To West of Marge Owens Rd.	559+66	601+09	4143	135	(6) 12	(2) 6.5	(2) 6.5	30	(2) 6	Yes	No
2C	From West of Marge Owens Rd. To Turkey Creek Rd.	601+09	664+69	6360	182	(6) 12	(2) 6.5	(2) 6.5	30	(2) 5	No	Yes
3	From Turkey Creek Rd. To The Polk County Line	664+69	1048+55	38386	182	(6) 12	(2) 5.0	N/A	40	(2) 5	No	Yes

Note: Parentheses Indicate Total Number

5.2 Longitudinal & Transverse Floodplain Impacts

This project will impact the 100-year floodplain in three (3) different ways;

1. Longitudinal impacts resulting from filling the floodplain areas associated with proposed roadway widening within the Project Limits, isolated wetlands, wetland systems, and depressional areas.
2. Transverse impacts resulting from the extension and replacement of the existing cross drain culverts.
3. Transverse impacts resulting from widening of the bridge.

The longitudinal impacts cannot be avoided since the floodplains associated with the water bodies extend both north and south of SR 60 within the study limits. The floodplain impact area was quantified based on the FEMA 100-year base flood elevation estimated as described in section 4.4 and the existing ground elevation from 1-foot contours from LiDAR. To be conservative, it was assumed that any filling from the proposed roadway outside of the existing roadway was quantified as floodplain impacts.

The transverse impacts resulting from the extension or replacement of the culverts have been analyzed. To minimize upstream impacts, FDOT design criteria for conveyance system (e.g. culvert) allow no significant increase in flood stages at the upstream end of the structures. It was found that no upsizing is required for all the cross drains as the stage difference between proposed and existing did not surpass 0.1 ft. Please refer to **Appendix 3** for cross drains analyses and HY-8 inputs and results. However, during the final design phase of the project, every necessary action should be taken to minimize upstream impacts.

It should be noted that these proposed cross drains were sized and analyzed based on best engineering judgments, assumptions, and limited available data. During the design phase, each cross drain should be analyzed for existing and proposed conditions with more defined data and designed to ensure no conflicts with the proposed roadway and no significant increase in headwater elevation. Also, a more detailed inspection of the cross drains will be necessary to verify their structural integrity and assess the need for complete reconstruction. Based on the cross drains analysis, it is concluded the transverse impacts resulting from the extension of the culverts are minimal.

5.3 Project Classification

The floodplain is located in a low density, non-urbanized area, and the encroachments area is classified as “minimal”. Minimal encroachments on a floodplain occur when there is a floodplain involvement, but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Normally, these minimal efforts to address the impacts will consist of applying the Department’s drainage design standards and following the Water Management District’s procedures to achieve results that will not increase or significantly change the flood elevations and/or limits.

5.4 Risk Evaluation

There is no change in flood "Risk" associated with this project. The encroachments will not have a significant potential for interruption or termination of transportation facilities needed for emergency vehicles or used as an evacuation route. In addition, no significant adverse impacts on natural and beneficial floodplain values are anticipated and no significant impacts to highway users are expected.

5.5 PD&E Manual Requirements with Minimal Encroachment

Chapter 24 Floodplains of the FDOT's PD&E Manual, Part 2, defines four categories of encroachments as they pertain to base floodplain involvement; significant, minimal, none and no involvement, and also lists the report criteria corresponding to these encroachment categories. The FDOT has different requirements based on the category of the encroachment. The proposed SR 60 widening project was determined to have minimal encroachments and as a result the requirements for this category are listed as follows:

1. The history of flooding of the existing facilities and/or measures to minimize any impacts due to the proposed project improvements.

   Some of the ditch areas between Turkey Creek and SR 39 have some underlying draining issues which are being monitored by the Maintenance Office. Moreover, approximately 900' west of Mud Lake Rd., an approved mitered end (connecting adjoining agricultural field to the drainage system) is conveying sediment/silt to the ditch and might block the 18" CMP driveway pipe by 75%.

   Since flooding conditions in the project area are inherent in the topography or are a result of other outside contributing sources, and there is no practical alternative to totally eradicate flood impacts or even reduce them in any significant amount, existing flooding will continue, but not be increased.

2. Determination of whether the encroachment is longitudinal or transverse, and if it is a longitudinal encroachment an evaluation and discussion of practicable avoidance alternatives.

   With the increase in the number of travel lanes proposed, there will be longitudinal and transverse impacts to the floodplain. Longitudinal impacts will be minimized by utilizing the maximum allowable roadway embankment slope.

   The transverse floodplain impacts from the project occur due to the extension or replacement of the existing cross drains and widening of the bridge structures. The impacts at the bridge structures are not analyzed during this study and will need to be addressed during the design phase.

   The existing roadway bisects the floodplain. There are no economically feasible avoidance alternatives.

3. The practicability of avoidance alternatives and/or measures to minimize impacts.

This project will take every effort to minimize the floodplain impacts resulting from the roadway fill. The maximum allowable roadway embankment slope will be used within the floodplain area to minimize the floodplain impacts.

4. Impact of the proposed improvements on emergency services and evacuation.

   The proposed cross drains will perform hydraulically in a manner equal to or greater than the existing condition, and backwater surface elevations are not expected to increase. As a result, there will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or in emergency evacuation routes.

5. Impacts of the proposed improvement on the base flood, likelihood of flood risk, overtopping, location of overtopping, backwater, etc.

   The proposed cross drains will perform hydraulically in a manner equal to or greater than the existing condition, and backwater surface elevations are not expected to increase. As a result, there will be no significant change in flood risk or overtopping.

6. Determination of the impact of the proposed improvements on regulatory floodways, if any, and documentation of coordination with FEMA and local agencies to determine the project's consistency with the regulatory floodway.

   N/A

7. The impacts on natural and beneficial floodplain values, and measures to restore and preserve these values (this information may also be addressed as part of the wetland impact evaluation and recommendations).

   Addressed as part of the wetland impact evaluation.

8. Consistency of the proposed improvements with the local floodplain development plan or the land use elements in the Comprehensive Plan, and the potential impacts of encouraging development within the 100 year base floodplain.

   The project will remain consistent with local floodplain development plans. The project will not support base floodplain development that is incompatible with existing floodplain management programs.

9. A map showing project, location and impacted floodplains. Provide copies of all applicable FIRM maps should be included within the final LHR report appendix.

   *See **Exhibit 6** in **Appendix 1** and **Figure 1.***

10. Results of any and all project risk assessments performed.

    The proposed cross drains will perform hydraulically in a manner equal to or greater than the existing condition, and backwater surface elevations are not expected to increase. As a result, there will be no significant change in flood risk.

SECTION 6 CONCLUSIONS

The modifications to drainage structures included in the project will result in an insignificant change in their capacity to carry floodwater. This change will cause minimal increases in flood heights and flood limits. Replacement drainage structures for this project are limited to hydraulically equivalent structures. The limitations to the hydraulic equivalency being proposed are basically due to restrictions imposed by the geometrics of design, existing development, cost feasibility, or practicability. An alternative encroachment location is not considered in this category since it defeats the project purpose or is economically unfeasible. Since flooding conditions in the project area are inherent in the topography or are a result of other outside contributing sources, and there is no practical alternative to totally eradicate flood impacts or even reduce them in any significant amount, existing flooding will continue, but not be increased. The proposed structure will be hydraulically equivalent to or greater than the existing structure, and backwater surface elevations are not expected to increase. As a result, the project will not affect existing flood heights or floodplain limits. This project will not result in any new or increased adverse environmental impacts. There will be no significant change in the potential for interruption or termination or emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant.

Appendix 1

Exhibits

Exhibit 1 – Project Location Map
Exhibit 2 – Drainage Basin Map
Exhibit 3 – USGS Quadrangle Map
Exhibit 4 – Soils Map
Exhibit 5 – Existing Land Use Map
Exhibit 6– FEMA FIRM Map
Exhibit 7-1 & 7-2 – Existing Typical Sections
Exhibits 8-1 to 8-9 – Proposed Typical Sections

MARTIN LUTHER KING BLVD

S FORBES RD

E ALEXANDER ST

CSX RAILROAD

JAMES L REDMAN PKWY

N VALRICO RD

Valrico Lake

Howell Branch Creek

Little Alafia River

SEGMENT 1

SEGMENT 2A

SEGMENT 2B

SEGMENT 2C

SEGMENT 3

STATE ROAD 60

COUNTY LINE RD

BEGIN PROJECT

LITHIA PINECREST RD

CSX RAILROAD

Turkey Creek

TURKEY CREEK RD

Lake Medard

S COUNTY ROAD 39

END PROJECT

English Creek

HILLSBOROUGH COUNTY

POLK COUNTY

Legend

- Project Limits
- Major Roads
- Streets
- Railroad
- Streams
- Lakes

North

0 2,250 4,500 Feet

0 0.5 1 Miles

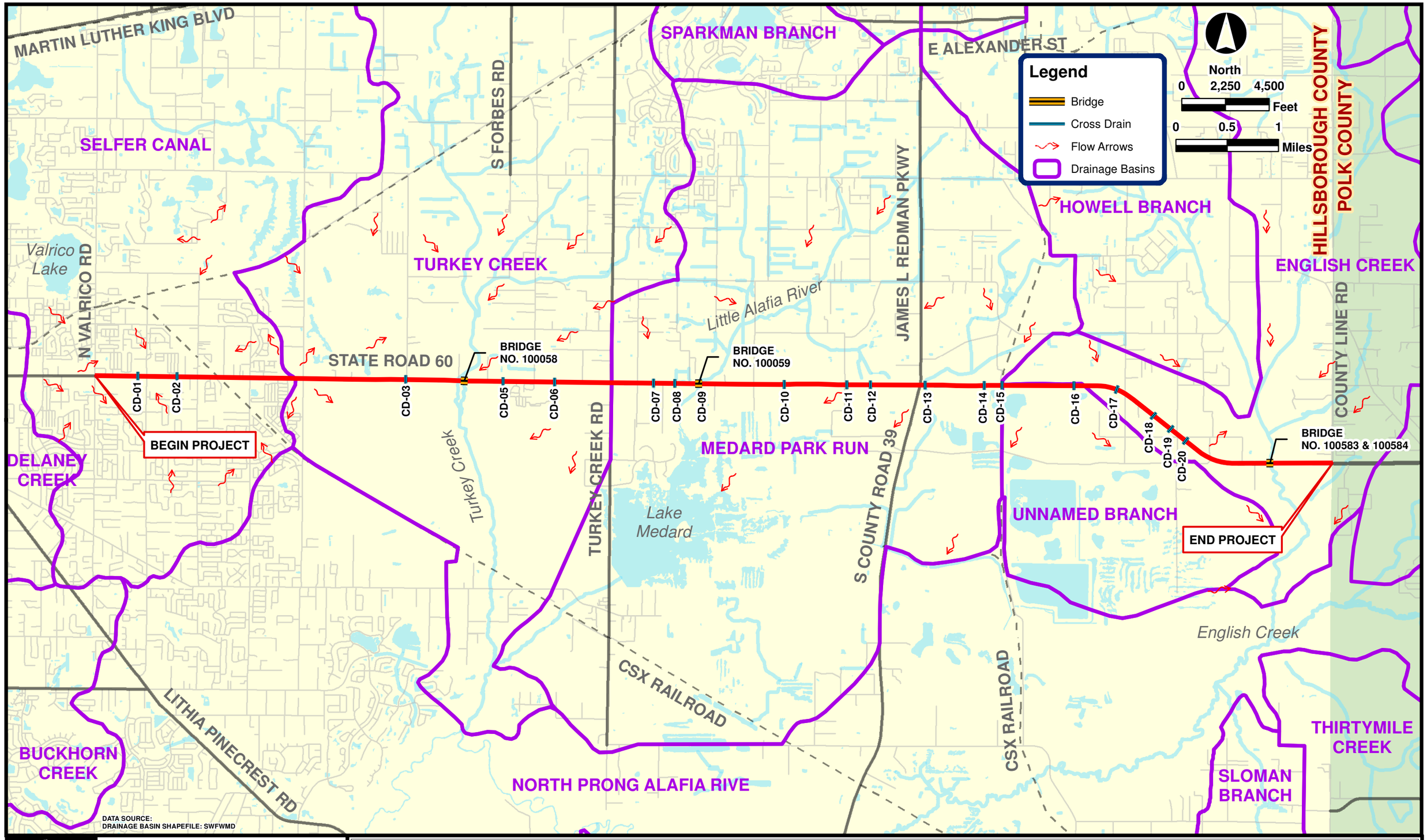
DATA SOURCE:
HILLSBOROUGH COUNTY & POLK COUNTY

FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT 7

SR 60 PD&E Study
from Valrico Road to the Polk County Line
Hillsborough County, Florida
Work Program Item Segment No.: 430055-1

PROJECT LOCATION MAP

EXHIBIT
1



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DISTRICT 7

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Hillsborough County, Florida
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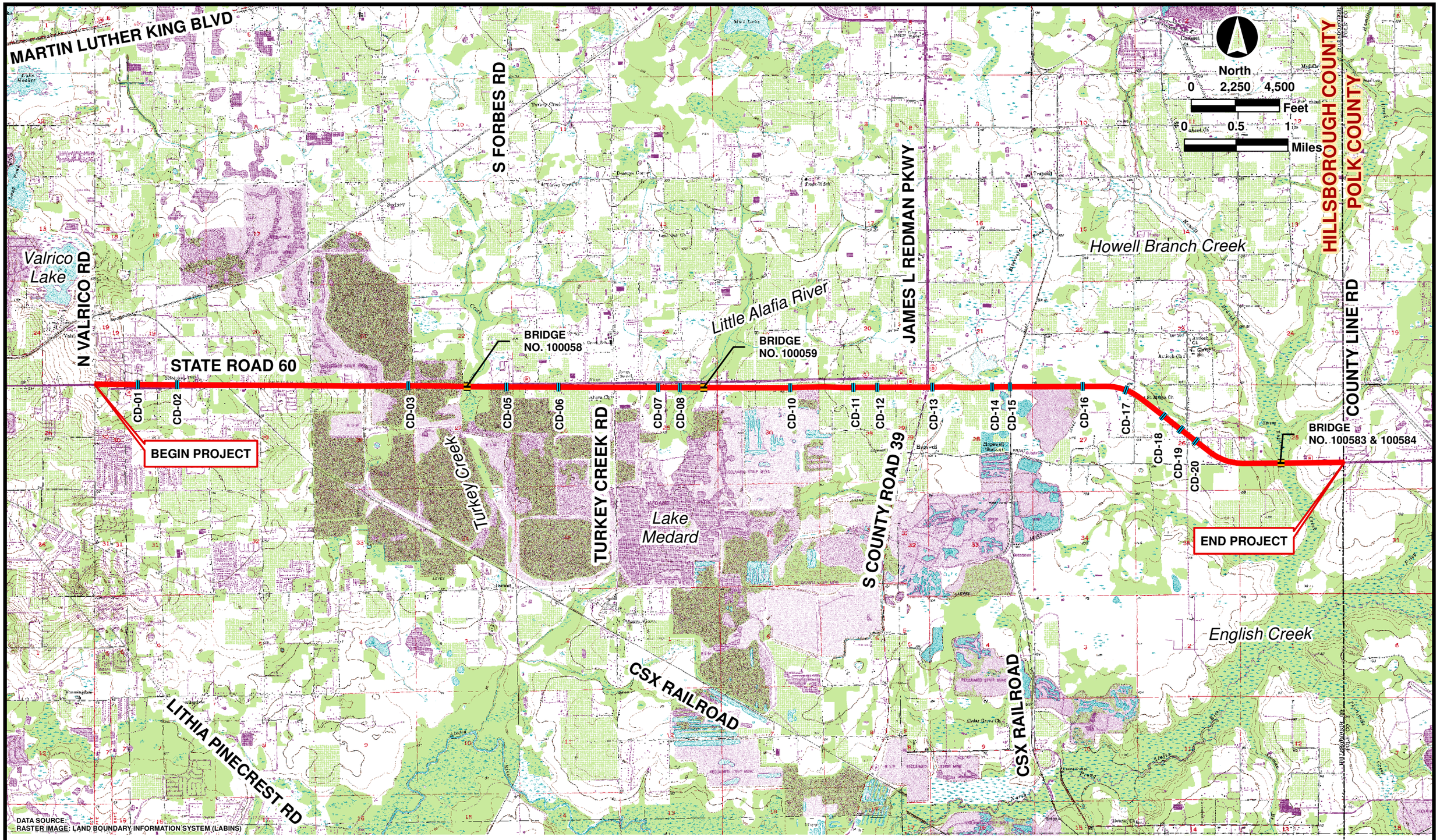
DRAINAGE BASIN MAP

EXHIBIT
2



DATA SOURCE:
RASTER IMAGE: LAND BOUNDARY INFORMATION SYSTEM (LABINS)

FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT 7

SR 60 PD&E Study
from Valrico Road to the Polk County Line
Hillsborough County, Florida
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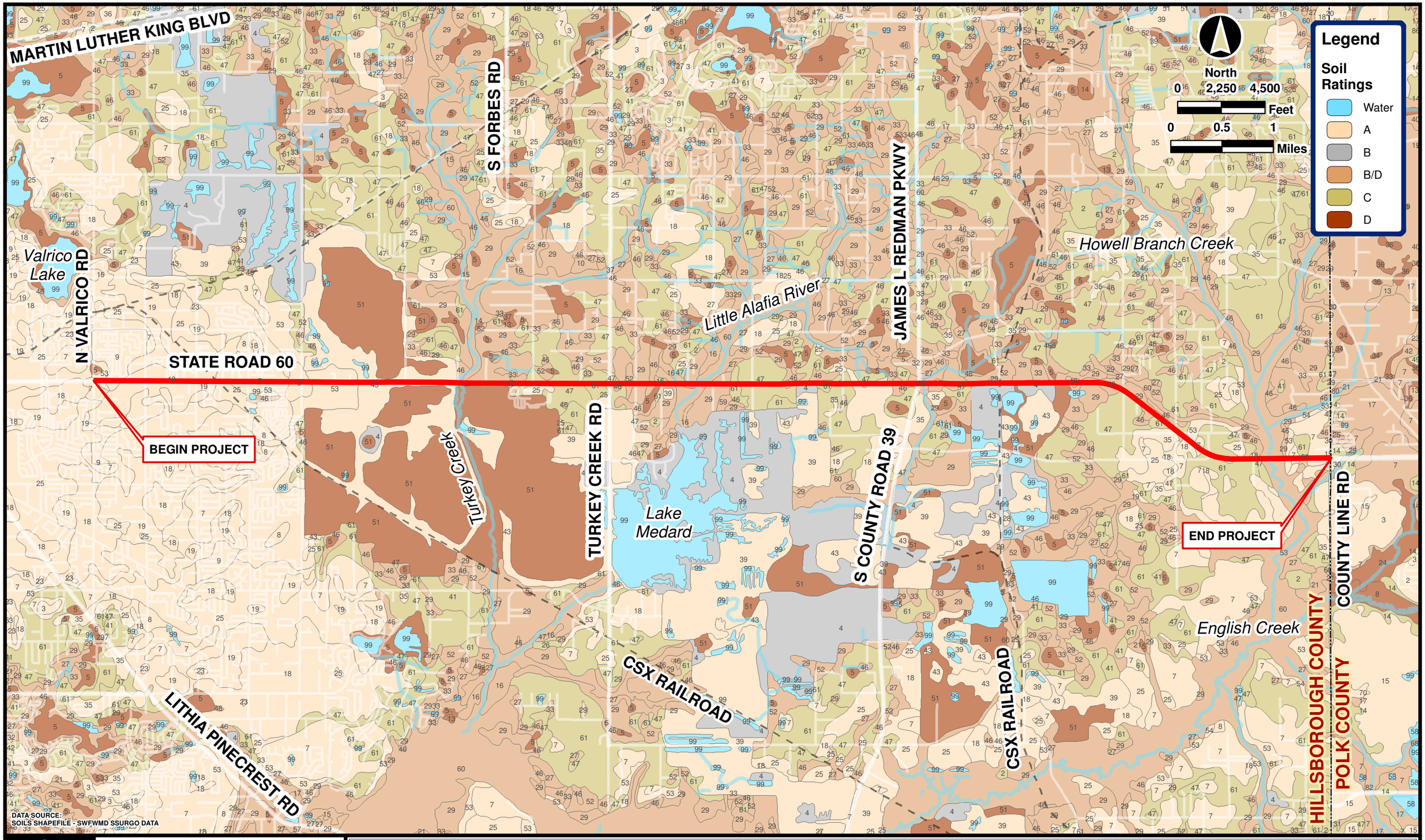
USGS QUADRANGLE MAP

EXHIBIT
3



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DISTRICT 7

SR 60 PD&E Study
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Hillsborough County, Florida
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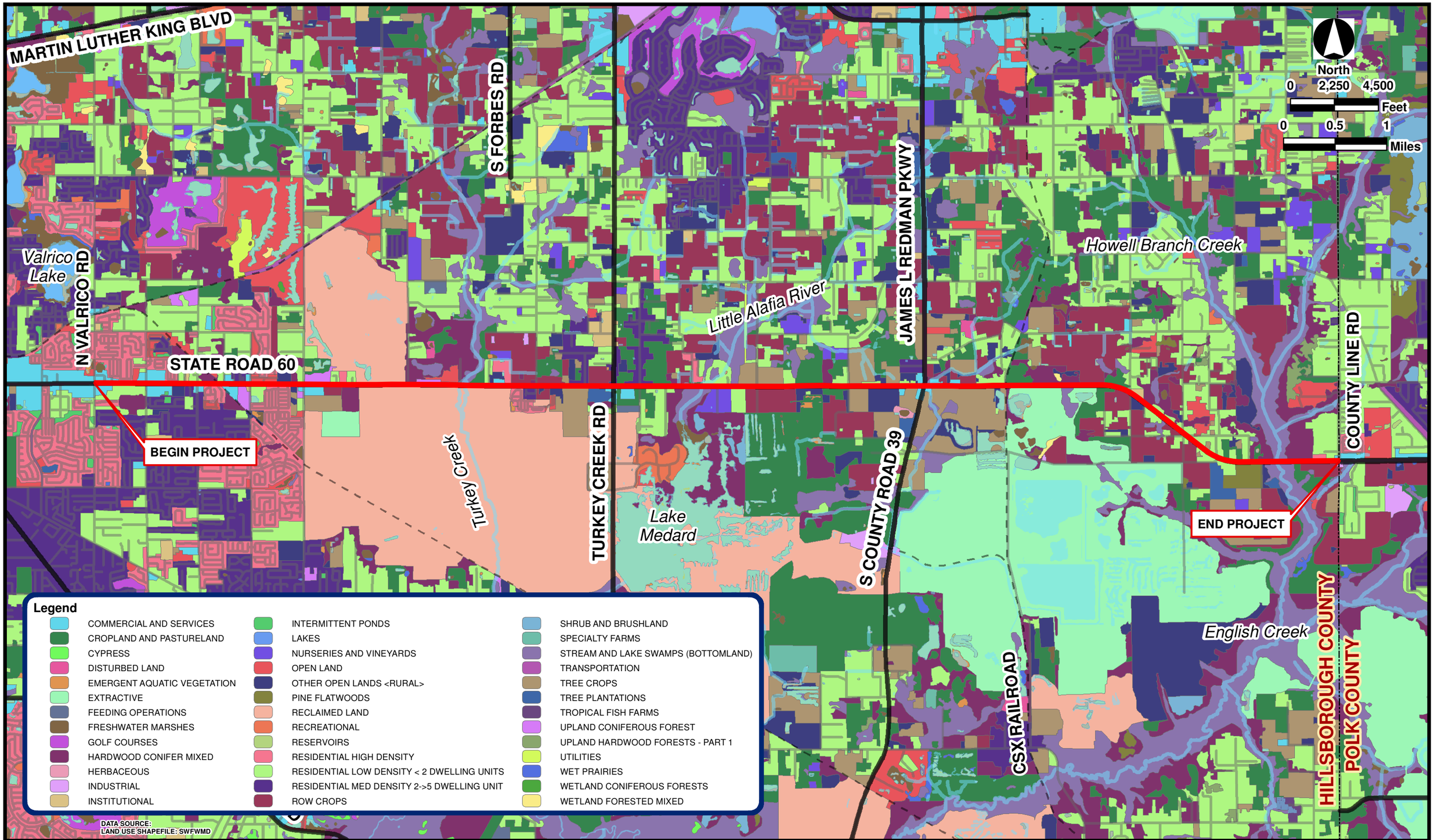
SOILS MAP

EXHIBIT
4



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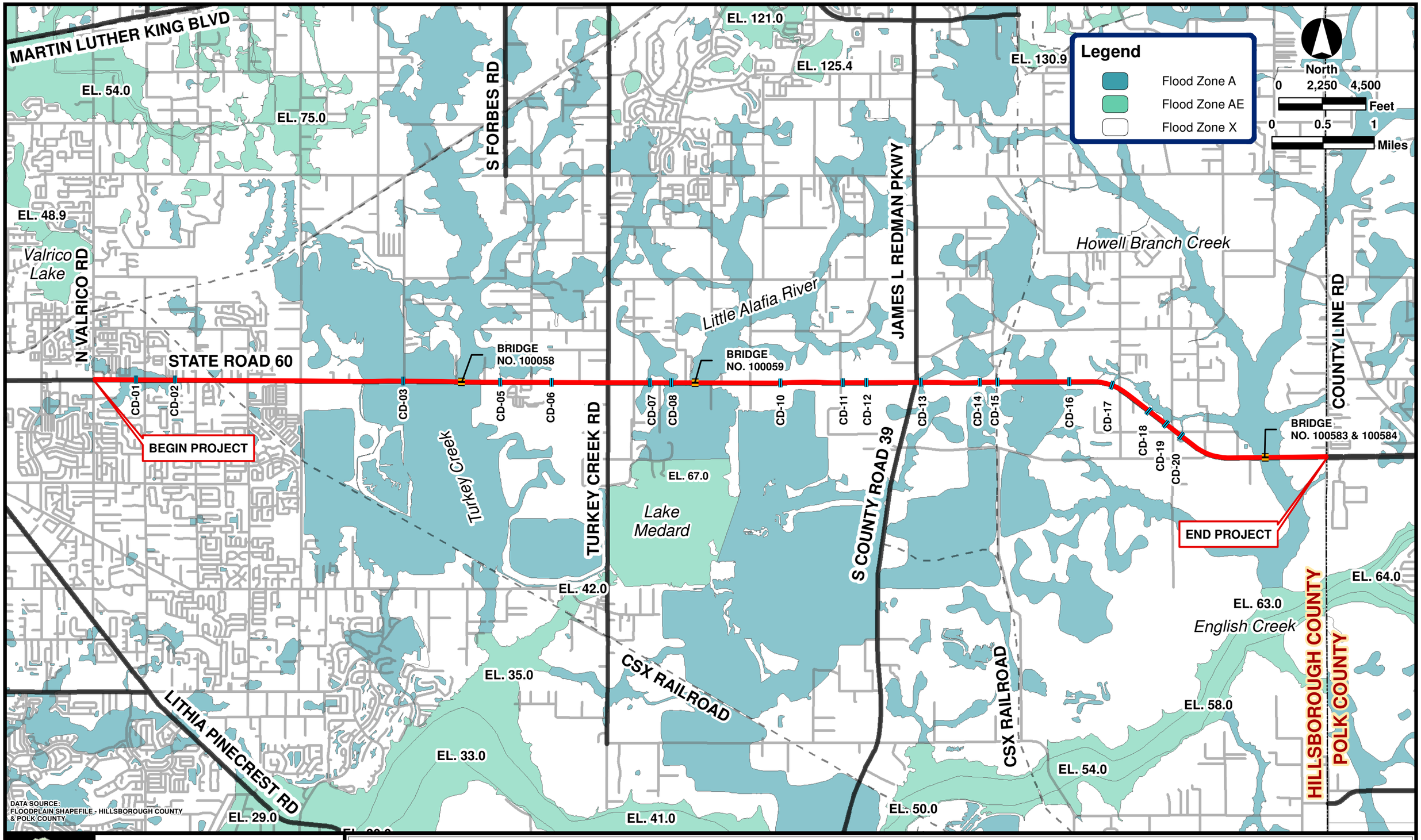
EXISTING LAND USE MAP

EXHIBIT
5



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SR 60 PD&E Study
from Valrico Road to the Polk County Line
Hillsborough County, Florida
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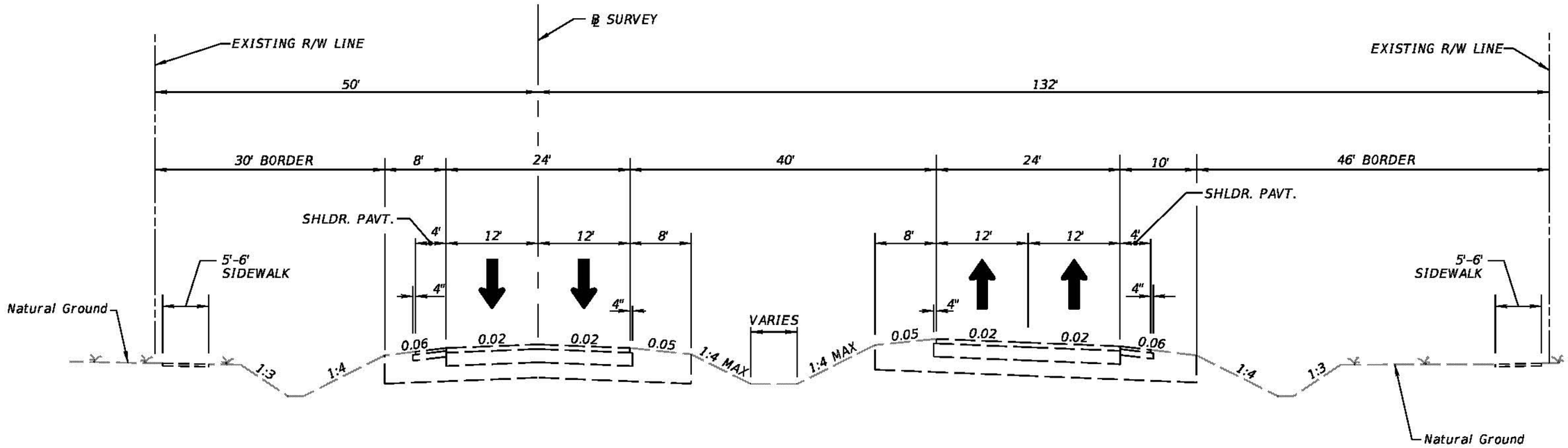
FEMA FIRM MAP

EXHIBIT
6



EXISTING TYPICAL SECTION
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FROM VALRICO ROAD TO THE POLK COUNTY LINE
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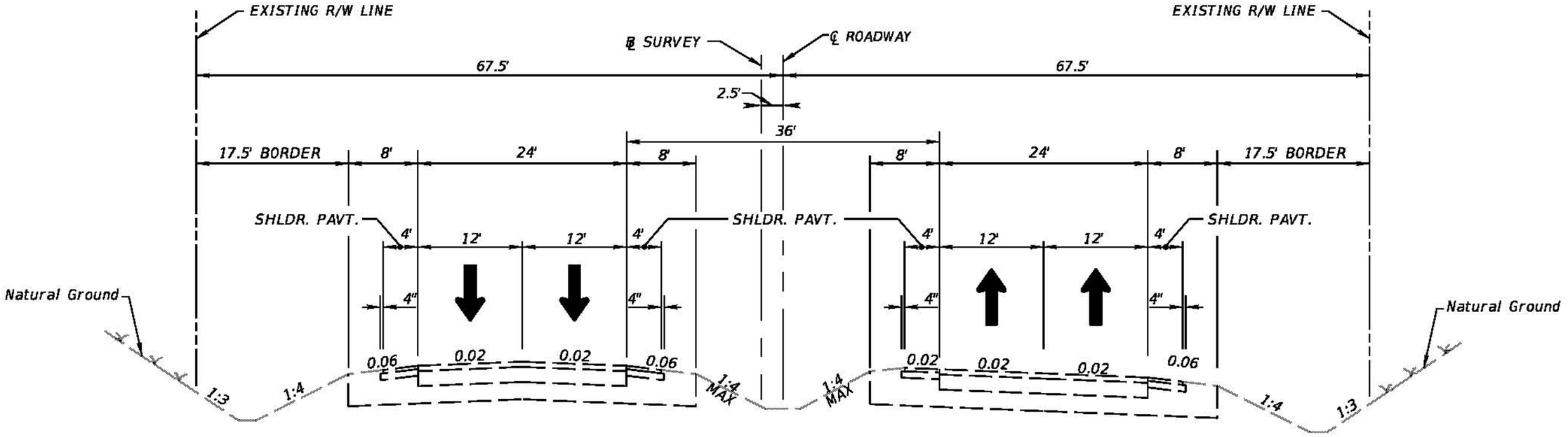
POSTED SPEED = 50-65 MPH



EXISTING TYPICAL SECTION - SEGMENT 2B
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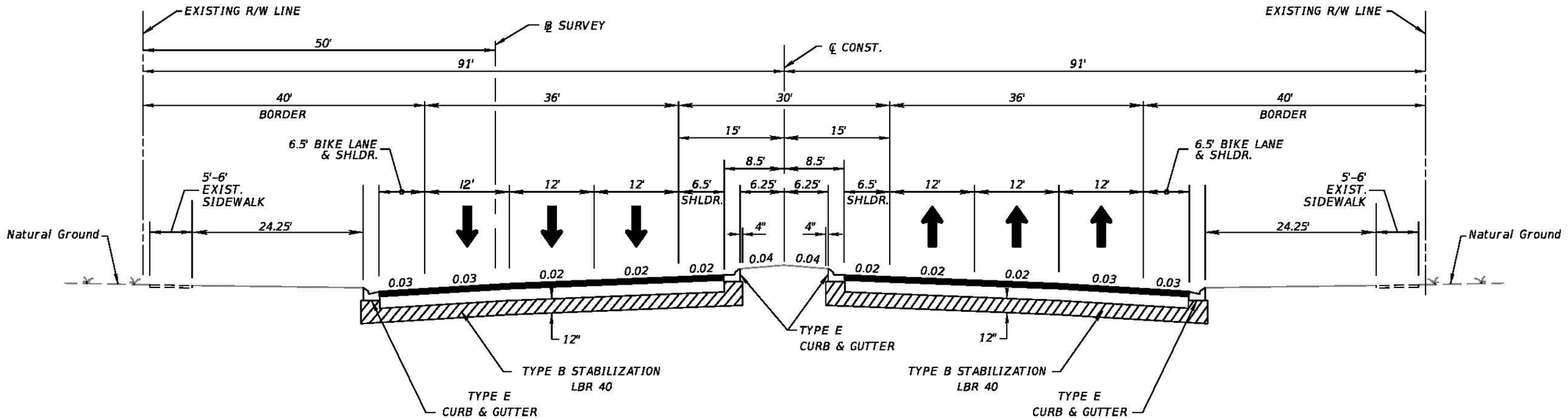
POSTED SPEED = 60 MPH



PROPOSED TYPICAL SECTION - SEGMENT 1
HIGH SPEED URBAN - NEW CONSTRUCTION
SR 60 (HOPEWELL ROAD)
FROM VALRICO ROAD TO DOVER ROAD
DESIGN SPEED = 50 MPH
POSTED SPEED = 50 MPH

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Hillsborough County, Florida
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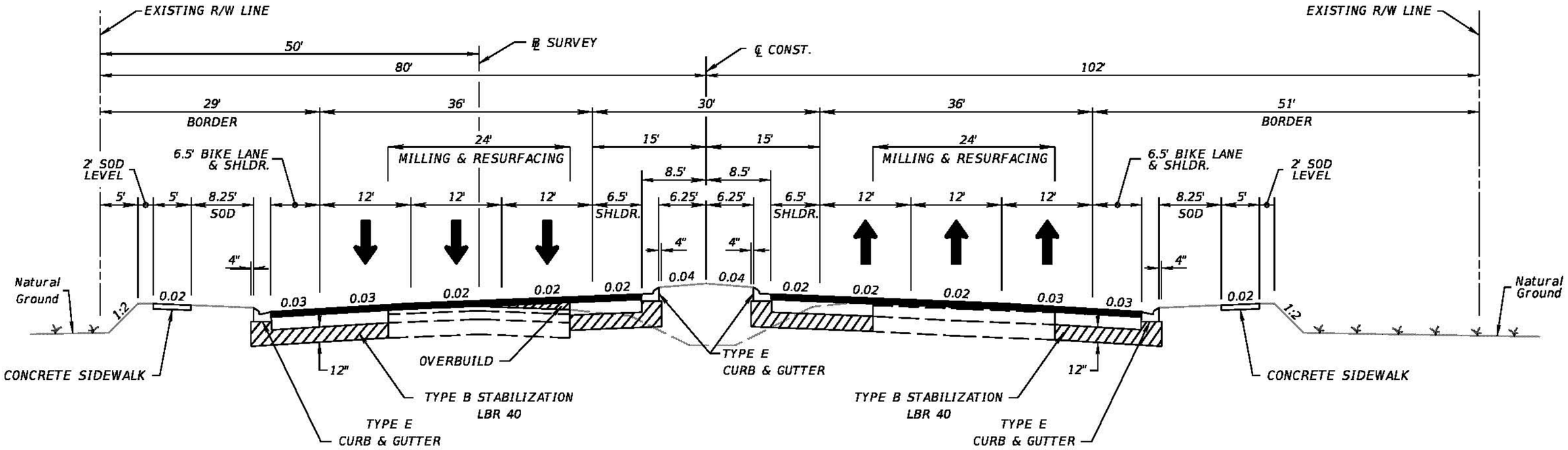
PROPOSED TYPICAL SECTION
(SEGMENT 1- NEW CONSTRUCTION)

EXHIBIT
8-1



PROPOSED TYPICAL SECTION - SEGMENT 1
HIGH SPEED URBAN - PAVEMENT SAVING
SR 60 (HOPEWELL ROAD)
FROM VALRICO ROAD TO DOVER ROAD
DESIGN SPEED = 50 MPH
POSTED SPEED = 50 MPH

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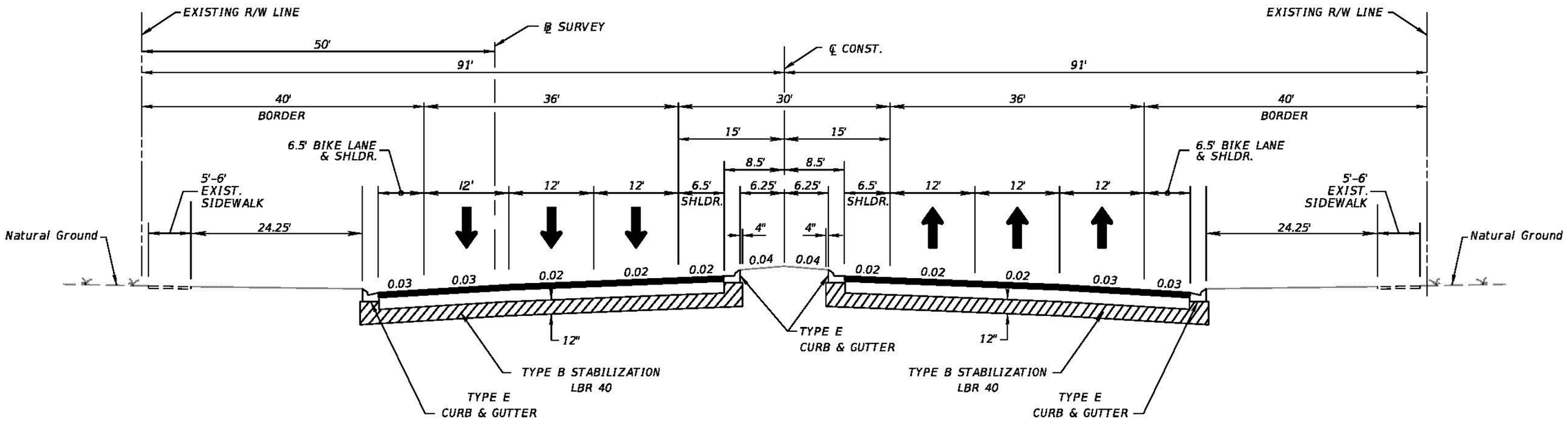
PROPOSED TYPICAL SECTION
(SEGMENT 1- PAVEMENT SAVING)

EXHIBIT
8-2



PROPOSED TYPICAL SECTION - SEGMENT 2A
HIGH SPEED URBAN - NEW CONSTRUCTION
SR 60 (HOPEWELL ROAD)
FROM DOVER ROAD TO WEST OF SYDNEY WASHER ROAD
DESIGN SPEED = 50 MPH
POSTED SPEED = 50 MPH

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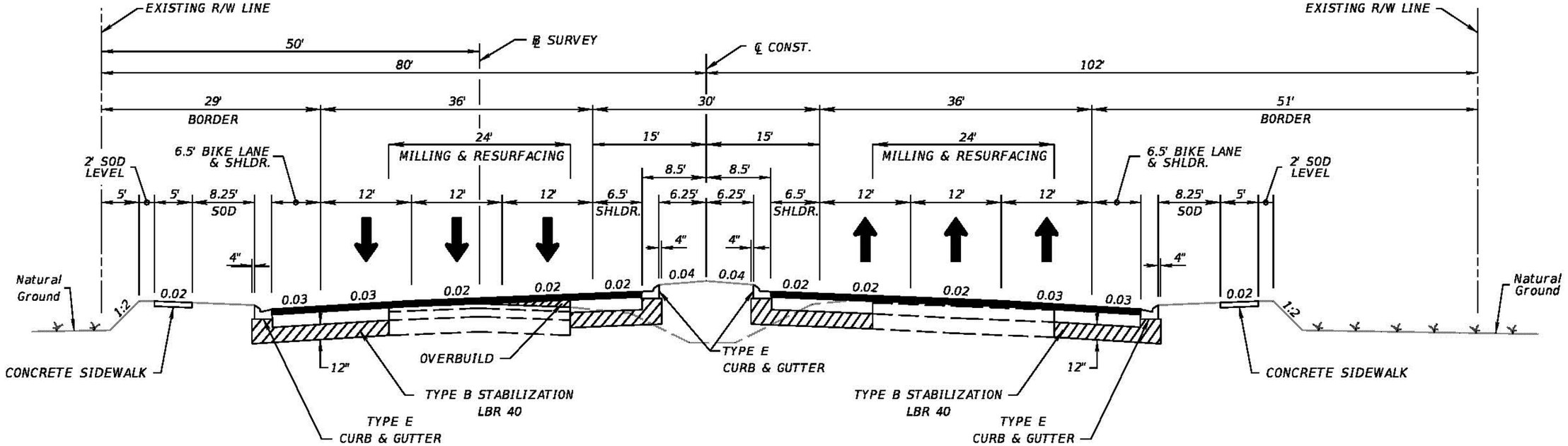
PROPOSED TYPICAL SECTION
(SEGMENT 2A - NEW CONSTRUCTION)

EXHIBIT
8-3



PROPOSED TYPICAL SECTION - SEGMENT 2A
HIGH SPEED URBAN - PAVEMENT SAVING
SR 60 (HOPEWELL ROAD)
FROM DOVER ROAD TO WEST OF SYDNEY WASHER ROAD
DESIGN SPEED = 50 MPH
POSTED SPEED = 50 MPH

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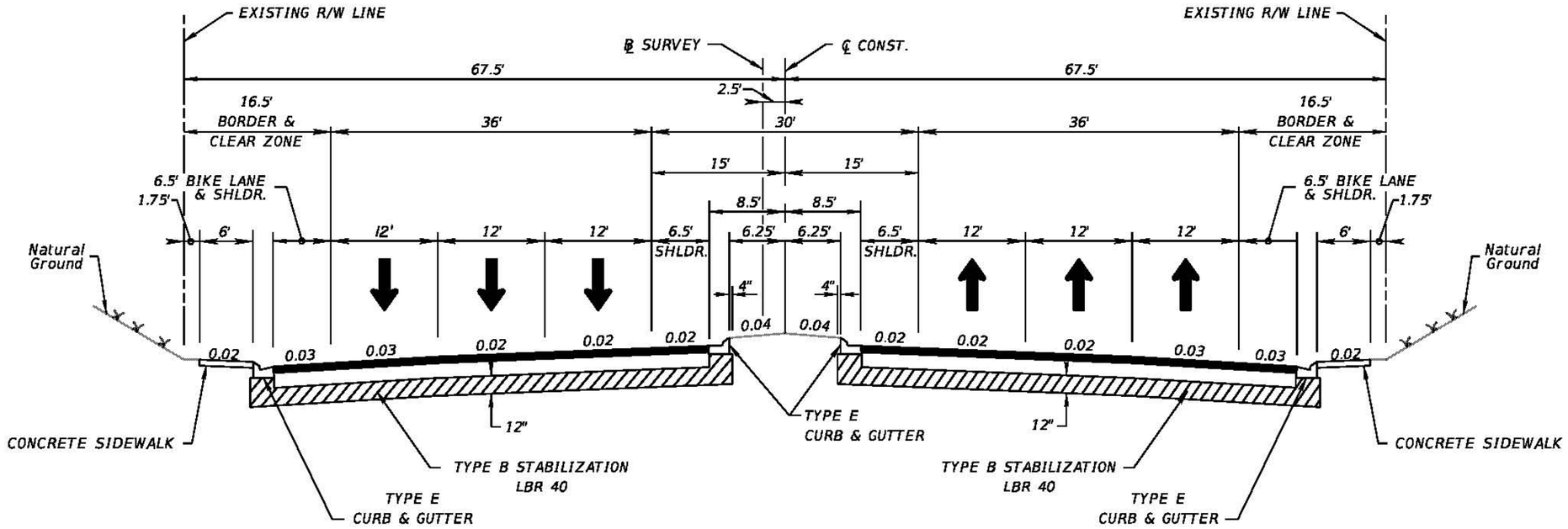
PROPOSED TYPICAL SECTION
(SEGMENT 2A - PAVEMENT SAVING)

EXHIBIT
8-4



PROPOSED TYPICAL SECTION – SEGMENT 2B
HIGH SPEED URBAN – NEW CONSTRUCTION
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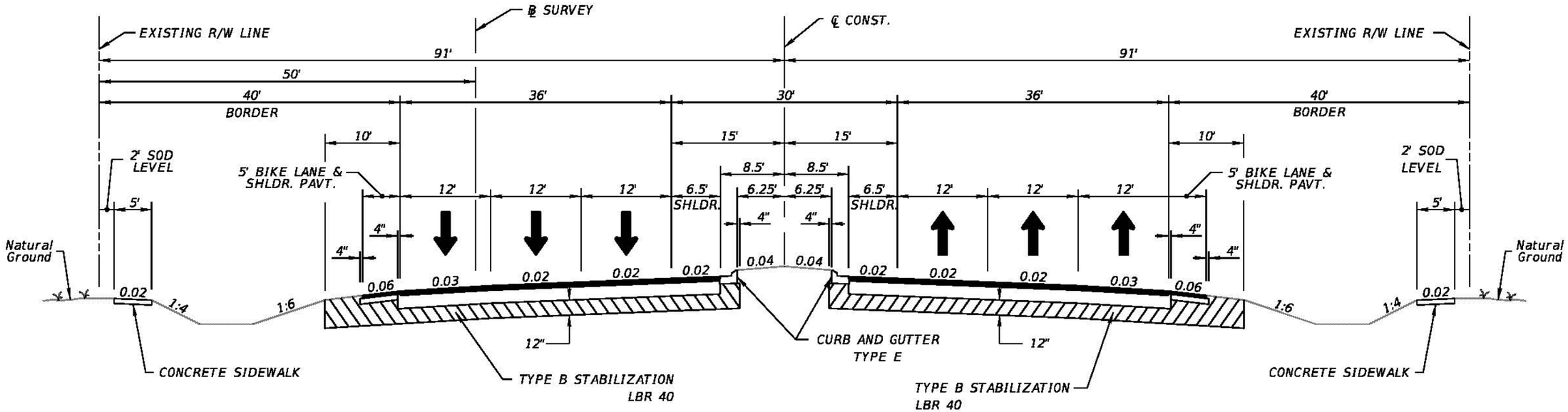

PROPOSED TYPICAL SECTION - SEGMENT 2C
HIGH SPEED SUBURBAN - NEW CONSTRUCTION
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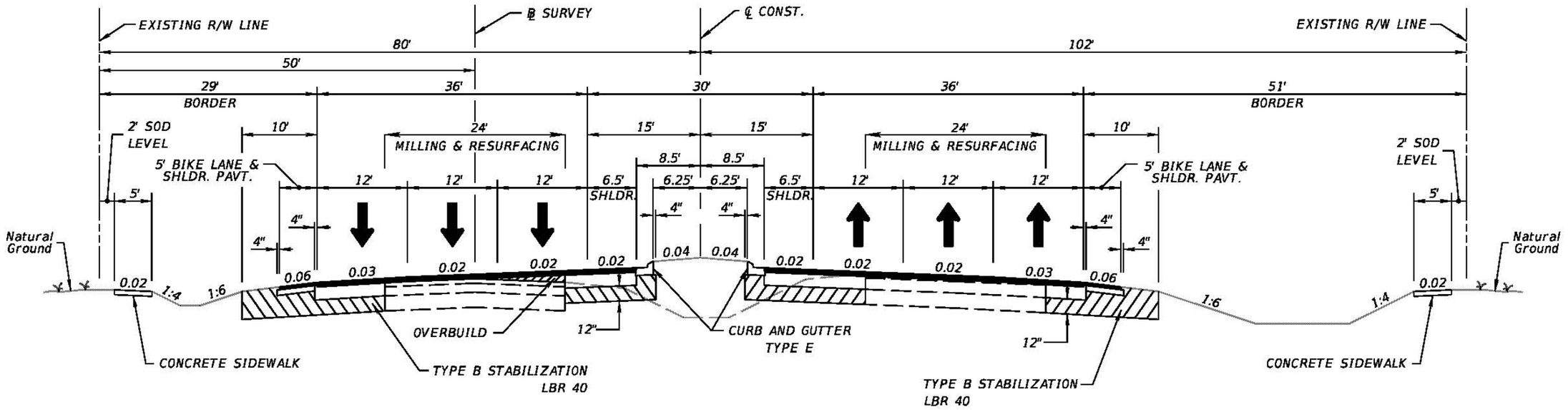
POSTED SPEED = 50 MPH



PROPOSED TYPICAL SECTION - SEGMENT 2C
HIGH SPEED SUBURBAN - PAVEMENT SAVING
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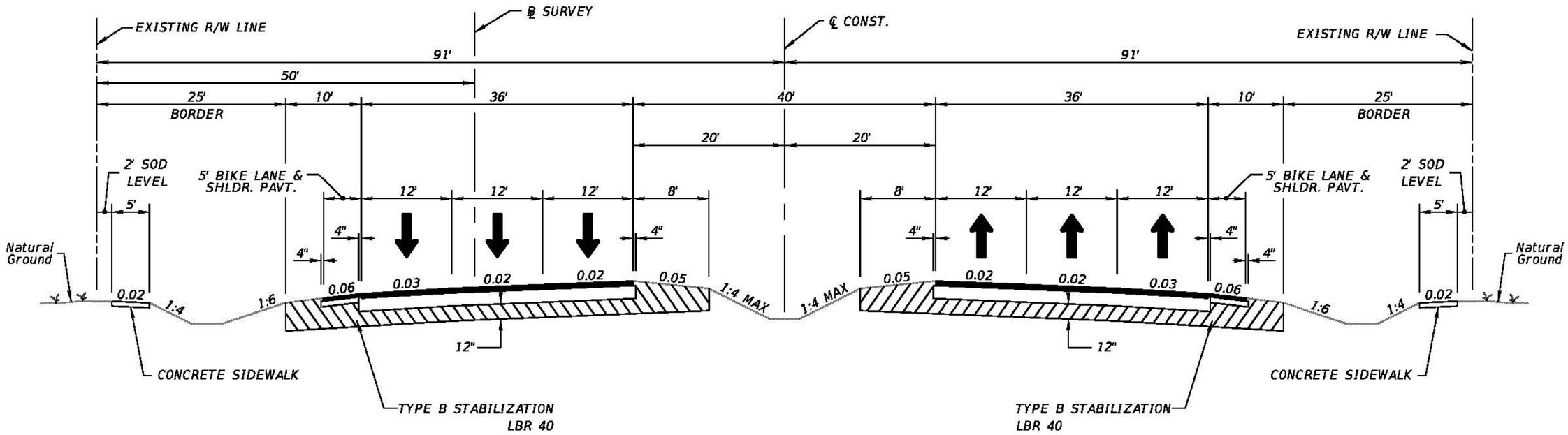
POSTED SPEED = 50 MPH



PROPOSED TYPICAL SECTION – SEGMENT 3
RURAL – NEW CONSTRUCTION
SR 60 (HOPEWELL ROAD)
FROM TURKEY CREEK ROAD TO THE POLK COUNTY LINE
DESIGN SPEED = 70 MPH
POSTED SPEED = 65 MPH

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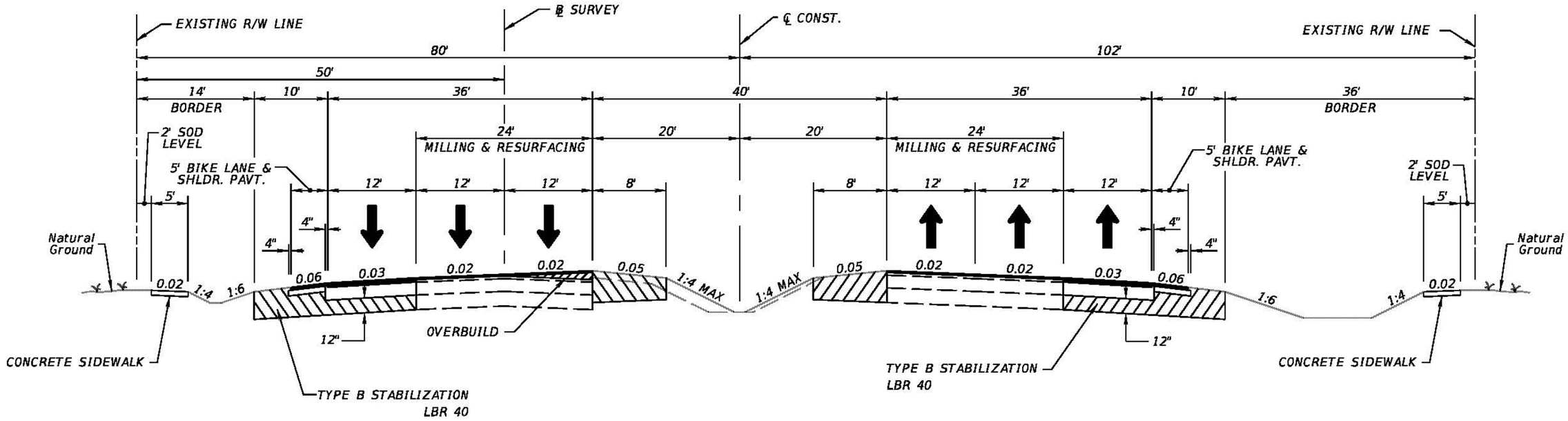
PROPOSED TYPICAL SECTION
(SEGMENT 3 - NEW CONSTRUCTION)

EXHIBIT
8-8



PROPOSED TYPICAL SECTION - SEGMENT 3

RURAL - PAVEMENT SAVING

SR 60 (HOPEWELL ROAD)

FROM TURKEY CREEK ROAD TO THE POLK COUNTY LINE

DESIGN SPEED = 70 MPH

POSTED SPEED = 65 MPH

FLORIDA DEPARTMENT OF TRANSPORTATION

DISTRICT 7

SR 60 PD&E Study

from Valrico Road to the Polk County Line

Hillsborough County, Florida

Work Program Item Segment No.: 430055-1

PROPOSED TYPICAL SECTION
(SEGMENT 3 - PAVEMENT SAVING)

EXHIBIT
8-9

Appendix 2

Cross Drain Pictures, Review Checklist and FDOT SLD

STR. CD-1 PHOTO 584

STR. CD-2 PHOTO 590

STR. CD-3 PHOTO 593

STR. CD-4 PHOTO 597

STR. CD-5 PHOTO 602

STR. CD-6 PHOTO 608

STR. CD-7 PHOTO 610

STR. CD-8 PHOTO 614

STR. CD-9 PHOTO 622

STR. CD-10 PHOTO 630

STR. CD-11 PHOTO 679

STR. CD-12 PHOTO 675

STR. CD-13 PHOTO 674

STR. CD-14 PHOTO 668

STR. CD-15 PHOTO 662

STR. CD-16 PHOTO 656

STR. CD-17 PHOTO 655

STR. CD-18 PHOTO 650

STR. CD-19 PHOTO 644

STR. CD-20 PHOTO 642

STR. CD-21 PHOTO 638

CROSS/SIDE DRAIN FIELD REVIEW NOTES

FPID: 430055-1-22-01 SR 60
DATE: 04/09/2013 DESCRIPTION
ATTENDEES: Renato Chuw, Mirta Laos, & Kamrul Islam

TABLE 3

STRUCT. NO.	DESCRIPTION			# OF BARRELS	SIZE	MATERIAL	Visible	CULVERT SILTATION	CONDITION OF ENDWALL/CULVERT	SCOUR	SIGNS OF HIGHWATER	CHANNEL DESCRIPTION	ROADWAY ISSUES	PHOTO		
	LOCATION	SIDE	STR. TYPE				% VISIBLE FOR INSPECTION	NOTE USE PROBE TO DETERMINE DEPTH OF SILT	NOTE CRACKING, SPALLING, DETERIORATION	MEASURE DEPTH OF SCOUR HOLE	MEASURE HEIGHT OF WATER STAIN ABOVE CULVERT INVERT	(WET, DRY, VEGETATION, DEBRIS, EROSION, SOIL, ETC.)	NOTE DEPRESSIONS, CRACKING, CURB ISSUES, ETC.	NUMBER	DIRECTION	NOTES
CD-01	11.868 421+03	☐LT ☐RT	☐INLET ☐MH ☒HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☒24" ☐30" ☐36" ☐OTHER	☒RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☒100%	☒NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	584 ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-02	12.246 441+28	☐LT ☐RT	☐INLET ☐MH ☒HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☒30" ☐36" ☐OTHER	☒RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☒NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	590 ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-03	14.485 559+02	☐LT ☐RT	☐INLET ☐MH ☒HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☒36" ☐OTHER	☒RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☒OTHER SILT	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	593 ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-04	15.058 589+11	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☐2 ☒3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☒OTHER 10'x10'	☐RCP ☐CMP ☐SRAP ☒OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☒NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	597 ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	3-10'X10' TURKEY CREEK #100058
CD-05	15.434 609+10	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☒OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☒OTHER 4'x3'	☐RCP ☐CMP ☐SRAP ☐OTHER		☐NO SILT ☒OTHER SILT	☐GOOD CONDITION ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐OTHER	602 ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	4'X4'

CROSS/SIDE DRAIN FIELD REVIEW NOTES

FPID: 430055-1-22-01 SR 60
DATE: 04/09/2013 DESCRIPTION
ATTENDEES: Renato Chuw, Mirta Laos, & Kamrul Islam

TABLE 3

STRUCT. NO.	DESCRIPTION			# OF BARRELS	SIZE	MATERIAL	Visible	CULVERT SILTATION	CONDITION OF ENDWALL/CULVERT	SCOUR	SIGNS OF HIGHWATER	CHANNEL DESCRIPTION	ROADWAY ISSUES	PHOTO		
	LOCATION	SIDE	STR. TYPE				% VISIBLE FOR INSPECTION	NOTE USE PROBE TO DETERMINE DEPTH OF SILT	NOTE CRACKING, SPALLING, DETERIORATION	MEASURE DEPTH OF SCOUR HOLE	MEASURE HEIGHT OF WATER STAIN ABOVE CULVERT INVERT	(WET, DRY, VEGETATION, DEBRIS, EROSION, SOIL, ETC.)	NOTE DEPRESSIONS, CRACKING, CURB ISSUES, ETC.	NUMBER	DIRECTION	NOTES
CD-06	15.936 635+66	□LT □RT	□INLET □MH □HW □MES □EW □OTHER	□1 □2 □3 □4	□15" □18" □24" □30" X36" □OTHER	□RCP □CMP □SRAP □OTHER	□0% □<25% □<50% □<75% □100%	□NO SILT XOTHER SILT	□CORROSION MINOR MAJOR SEVERE □COLLAPSE MINOR MAJOR SEVERE □DEFLECTION MINOR MAJOR SEVERE □LEAKING MINOR MAJOR SEVERE □END DAMAGE MINOR MAJOR SEVERE	□NO SCOUR □VERY LIGHT □LIGHT □MODERATE □SEVERE	□NO HIGHWATER □OTHER	□MAINTENANCE □DESILT ONLY □EROSION □RE-ESTABLISH DITCH L=____ □OTHER	□DEPRESSION □CRACKING □CURB TRANS. □CLEAR ZONE □OTHER	608 ____ ____	□N □S □E □W □N □S □E □W □N □S □E □W	
CD-07	16.895 686+49	□LT □RT	□INLET □MH □HW □MES □EW □OTHER	X1 □2 □3 □4	□15" □18" □24" □30" □36" XOTHER 7'x3'	XRCP □CMP □SRAP □OTHER	□0% □<25% □<50% □<75% □100%	□NO SILT □OTHER	□CORROSION MINOR MAJOR SEVERE □COLLAPSE MINOR MAJOR SEVERE □DEFLECTION MINOR MAJOR SEVERE □LEAKING MINOR MAJOR SEVERE □END DAMAGE MINOR MAJOR SEVERE	□NO SCOUR □VERY LIGHT □LIGHT □MODERATE □SEVERE	□NO HIGHWATER □OTHER	□MAINTENANCE □DESILT ONLY □EROSION □RE-ESTABLISH DITCH L=____ □OTHER	□DEPRESSION □CRACKING □CURB TRANS. □CLEAR ZONE □OTHER	610 ____ ____	□N □S □E □W □N □S □E □W □N □S □E □W	7'X3'
CD-08	17.106 697+50	□LT □RT	□INLET □MH □HW □MES □EW □OTHER	X1 □2 □3 □4	□15" □18" □24" □30" □36" XOTHER 8'x5'	□RCP □CMP □SRAP □OTHER	□0% □<25% □<50% □<75% □100%	□NO SILT XOTHER SILT	□CORROSION MINOR MAJOR SEVERE □COLLAPSE MINOR MAJOR SEVERE □DEFLECTION MINOR MAJOR SEVERE □LEAKING MINOR MAJOR SEVERE □END DAMAGE MINOR MAJOR SEVERE	□NO SCOUR □VERY LIGHT □LIGHT □MODERATE □SEVERE	□NO HIGHWATER □OTHER	□MAINTENANCE □DESILT ONLY □EROSION □RE-ESTABLISH DITCH L=____ □OTHER	□DEPRESSION □CRACKING □CURB TRANS. □CLEAR ZONE □OTHER	614 ____ ____	□N □S □E □W □N □S □E □W □N □S □E □W	8'X5'
CD-09	709+74 17.341	□LT □RT	□INLET □MH □HW □MES □EW □OTHER	□1 □2 X3 □4	□15" □18" □24" □30" □36" XOTHER 10'x10'	XRCP □CMP □SRAP □OTHER	□0% □<25% □<50% □<75% □100%	□NO SILT XOTHER	□CORROSION MINOR MAJOR SEVERE □COLLAPSE MINOR MAJOR SEVERE □DEFLECTION MINOR MAJOR SEVERE □LEAKING MINOR MAJOR SEVERE □END DAMAGE MINOR MAJOR SEVERE	□NO SCOUR □VERY LIGHT □LIGHT □MODERATE □SEVERE	□NO HIGHWATER □OTHER	□MAINTENANCE □DESILT ONLY □EROSION □RE-ESTABLISH DITCH L=____ □OTHER	□DEPRESSION □CRACKING □CURB TRANS. □CLEAR ZONE □OTHER	622 ____ ____	□N □S □E □W □N □S □E □W □N □S □E □W	3-10'X10' LITTLE ALAFIA RVER #100059
CD-10	754+74 18.171	□LT □RT	□INLET □MH □HW □MES □EW □OTHER	X1 □2 □3 □4	□15" □18" X24" □30" □36" □OTHER	□RCP □CMP □SRAP □OTHER		□NO SILT XOTHER SILT	□GOOD CONDITION □VERY LIGHT □LIGHT □MODERATE □SEVERE	□NO SCOUR □VERY LIGHT □LIGHT □MODERATE □SEVERE	□NO HIGHWATER □OTHER	□MAINTENANCE □DESILT ONLY □EROSION □RE-ESTABLISH DITCH L=____ □OTHER	□DEPRESSION □CRACKING □CURB TRANS. □OTHER	630 ____ ____	□N □S □E □W □N □S □E □W □N □S □E □W	

CROSS/SIDE DRAIN FIELD REVIEW NOTES

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STRUCT. NO.	DESCRIPTION			# OF BARRELS	SIZE	MATERIAL	Visible	CULVERT SILTATION	CONDITION OF ENDWALL/CULVERT	SCOUR	SIGNS OF HIGHWATER	CHANNEL DESCRIPTION	ROADWAY ISSUES	PHOTO		
	LOCATION	SIDE	STR. TYPE				% VISIBLE FOR INSPECTION	NOTE USE PROBE TO DETERMINE DEPTH OF SILT	NOTE CRACKING, SPALLING, DETERIORATION	MEASURE DEPTH OF SCOUR HOLE	MEASURE HEIGHT OF WATER STAIN ABOVE CULVERT INVERT	(WET, DRY, VEGETATION, DEBRIS, EROSION, SOIL, ETC.)	NOTE DEPRESSIONS, CRACKING, CURB ISSUES, ETC.	NUMBER	DIRECTION	NOTES
CD-11	18.769 786+01	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☒24" ☐30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☒OTHER SILT	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	679 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-12	19.005 798+27	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☒24" ☐30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☒OTHER SILT	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	675 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-13	19.546 826+36	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☒2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☒OTHER 7'x5'	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	674 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	2-7'X5'
CD-14	20.117 856+80	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☒2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☒36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	668 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-15	20.292 865+80	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☒24" ☐30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER		☐NO SILT ☐OTHER	☐GOOD CONDITION ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐OTHER	662 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	

CROSS/SIDE DRAIN FIELD REVIEW NOTES

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ATTENDEES: Renato Chuw, Mirta Laos, & Kamrul Islam

TABLE 3

STRUCT. NO.	DESCRIPTION			# OF BARRELS	SIZE	MATERIAL	Visible	CULVERT SILTATION	CONDITION OF ENDWALL/CULVERT	SCOUR	SIGNS OF HIGHWATER	CHANNEL DESCRIPTION	ROADWAY ISSUES	PHOTO		
	LOCATION	SIDE	STR. TYPE				% VISIBLE FOR INSPECTION	NOTE USE PROBE TO DETERMINE DEPTH OF SILT	NOTE CRACKING, SPALLING, DETERIORATION	MEASURE DEPTH OF SCOUR HOLE	MEASURE HEIGHT OF WATER STAIN ABOVE CULVERT INVERT	(WET, DRY, VEGETATION, DEBRIS, EROSION, SOIL, ETC.)	NOTE DEPRESSIONS, CRACKING, CURB ISSUES, ETC.	NUMBER	DIRECTION	NOTES
CD-16	20.992 902+99	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☒2 ☐3 ☐4	☐15" ☐18" ☐24" ☒30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☒OTHER SILT	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	656 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-17	21.410 925+31	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☒2 ☐3 ☐4	☐15" ☐18" ☐24" ☒30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☒OTHER SILT	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	655 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-18	21.840 948+00	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☒36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☒OTHER SILT	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	650 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-19	21.849 948+00	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☒30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☒OTHER SILT	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	644 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
CD-20	22.061 970+00	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☒1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☒30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER		☐NO SILT ☐OTHER	☐GOOD CONDITION ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐OTHER	642 ____ ____ ____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	

CROSS/SIDE DRAIN FIELD REVIEW NOTES

TABLE 3

FPID: 430055-1-22-01
DATE: 04/09/2013
ATTENDEES: Renato Chuw, Mirta Laos, & Kamrul Islam

SR 60
DESCRIPTION

STRUCT. NO.	DESCRIPTION			# OF BARRELS	SIZE	MATERIAL	Visible	CULVERT SILTATION	CONDITION OF ENDWALL/CULVERT	SCOUR	SIGNS OF HIGHWATER	CHANNEL DESCRIPTION	ROADWAY ISSUES	PHOTO		
	LOCATION	SIDE	STR. TYPE				% VISIBLE FOR INSPECTION	NOTE USE PROBE TO DETERMINE DEPTH OF SILT	NOTE CRACKING, SPALLING, DETERIORATION	MEASURE DEPTH OF SCOUR HOLE	MEASURE HEIGHT OF WATER STAIN ABOVE CULVERT INVERT	(WET, DRY, VEGETATION, DEBRIS, EROSION, SOIL, ETC.)	NOTE DEPRESSIONS, CRACKING, CURB ISSUES, ETC.	NUMBER	DIRECTION	NOTES
CD-21	23.131 1016+25	☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☒OTHER BRIDGE	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=_____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	638 _____ _____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	Bridge English Creek #100583 & #100584
		☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=_____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	_____ _____ _____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
		☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=_____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	_____ _____ _____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
		☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER	☐0% ☐<25% ☐<50% ☐<75% ☐100%	☐NO SILT ☐OTHER	☐CORROSION MINOR MAJOR SEVERE ☐COLLAPSE MINOR MAJOR SEVERE ☐DEFLECTION MINOR MAJOR SEVERE ☐LEAKING MINOR MAJOR SEVERE ☐END DAMAGE MINOR MAJOR SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=_____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐CLEAR ZONE ☐OTHER	_____ _____ _____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	
		☐LT ☐RT	☐INLET ☐MH ☐HW ☐MES ☐EW ☐OTHER	☐1 ☐2 ☐3 ☐4	☐15" ☐18" ☐24" ☐30" ☐36" ☐OTHER	☐RCP ☐CMP ☐SRAP ☐OTHER		☐NO SILT ☐OTHER	☐GOOD CONDITION ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO SCOUR ☐VERY LIGHT ☐LIGHT ☐MODERATE ☐SEVERE	☐NO HIGHWATER ☐OTHER	☐MAINTENANCE ☐DESILT ONLY ☐EROSION ☐RE-ESTABLISH DITCH L=_____ ☐OTHER	☐DEPRESSION ☐CRACKING ☐CURB TRANS. ☐OTHER	_____ _____ _____	☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W ☐N ☐S ☐E ☐W	

	5 YR INV	SLD REV
DATE	1/27/2010	3/22/2010
BY	MEI/JM-KA	MEI/KA

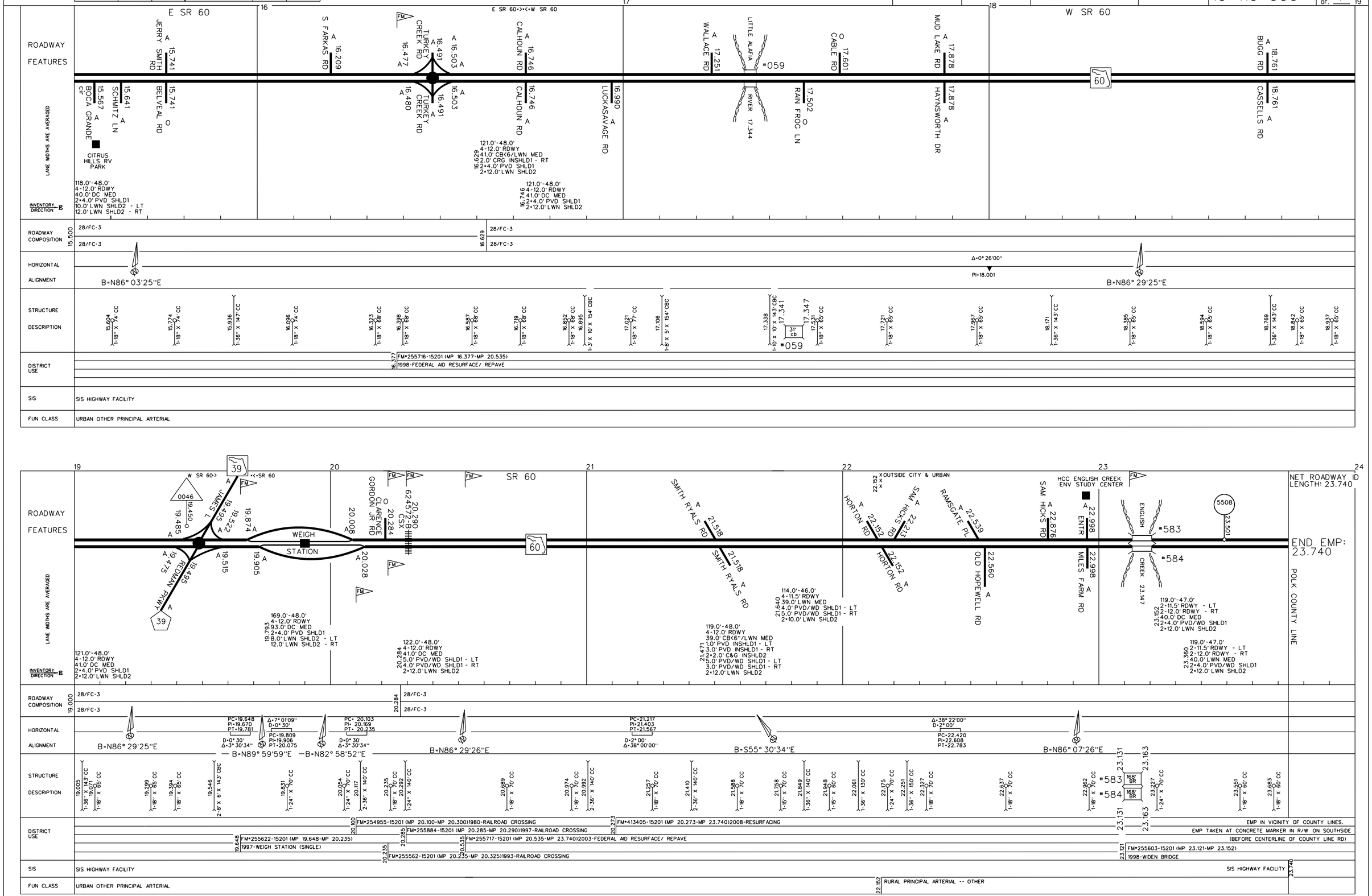
INTERIM REVISIONS

BMP	EMP	INV	SLD REV
19.793	21.471	04/2V2011	06/09/2011
QAR REVISION		QAR TEAM	MEI/KA

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO. / OF.
	SR 60	HILLSBOROUGH	7	10 110 000	4 / 4 19



STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

	5 YR INV	SLD REV
DATE	1/27/2010	3/22/2010
BY	MEI/JM-KA	MEI/KA

INTERIM REVISIONS

BMP	EMP	INV	SLD REV
9.772	11.456	11/16/2010	12/06/2010
CONSTRUCTION		MEI/JM-MCS	MEI/KA
ACCEPTANCE			

INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	SECTION	SHEET NO. / OF.
	SR 60	HILLSBOROUGH	7	10 110 000	3 / 4

10 11 12

ROADWAY FEATURES

E BRANDON BLVD — E BRANDON BLVD ›><‹ E SR 60 — E SR 60

RIDGEWOOD AVE A 10.064 — OAKWOOD AVE A 10.191 — WESTCHESTER OAKS LN A 10.418 — GRACE BIBLE CHURCH — ENTR A 10.477 — WALMART A 10.708 — HOME DEPOT ENTR A 10.864 — N MT CARMEL RD A 10.947 — PIERCE CHRISTIE DR A 10.998 — HUNTER RD A 11.097 — BRANDON BLVD SHOPPES — ENTR A 11.291 — 5349 — 11.300 — N VALRICO RD A 11.456 — JELANE DR A 11.557 — ROLLING HILLS BLVD A 11.631 — N MILLER RD A 11.957 — OAKHIL VILLAGE CIR A 12.180 — OAKHIL VILLAGE CIR A 12.246 — CHURCH ST A 12.322 — N ST CLOUD AVE A 12.456

ENTR A 10.064 NATIVITY CATHOLIC SCHOOL — S OAKWOOD AVE A 10.191 — GLENDALE RD A 10.342 — E BEVERLY BLVD A 10.477 — ENTR A 10.852 LOWE'S — s MT CARMEL RD A 10.947 — MORNINGSIDE DR A 11.128 — ENTR A 11.291 VALRICO SQUARE — S VALRICO RD A 11.456 — S MILLER RD A 11.957 — ENTR A 12.093 SWEETBAY — ENTR A 12.180 THE SHOPPES AT BRANDON FARMS — TEN OAK PL A 12.381 — S ST CLOUD AVE A 12.456

LANE WIDTHS ARE AVERAGED

INVENTORY DIRECTION E

133.0'-92.0' 8-11.5' RDWY 29.0' CX6 MED 2•4.0' PVD SHLD1 2•2.0' C&G SHLD2 — 10.029

121.0'-81.0' 3-11.0' RDWY - LT 4-12.0' RDWY - RT 28.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 2•4.0' PVD SHLD1 2•2.0' C&G SHLD2 — 10.064

133.0'-92.0' 8-11.5' RDWY 29.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 2•4.0' PVD SHLD1 2•2.0' C&G SHLD2 — 10.248

133.0'-92.0' 8-11.5' RDWY 29.0' CX6 MED 2•4.0' PVD SHLD1 2•2.0' C&G SHLD2 — 10.411

133.0'-92.0' 8-11.5' RDWY 29.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 2•4.0' PVD SHLD1 2•2.0' C&G SHLD2 — 10.708

116.0'-84.0' 4-11.5' RDWY - LT 3-12.0' RDWY - RT 29.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 2•4.0' PVD SHLD1 2•2.0' C&G SHLD2 — 11.291

122.0'-60.0' 3-12.0' RDWY - LT 2-12.0' RDWY - RT 28.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 2•5.0' PVD SHLD1 2•12.0' LWN SHLD2 — 11.456

120.0'-48.0' 4-12.0' RDWY 40.0' CB<6/LWN MED 2.0' CRG INSHLD1 - RT 2•4.0' PVD SHLD1 2•12.0' LWN SHLD2 — 11.820

120.0'-48.0' 4-12.0' RDWY 40.0' LWN MED 2•4.0' PVD SHLD1 2•12.0' LWN SHLD2 — 11.687

114.0'-48.0' 4-12.0' RDWY 41.0' LWN MED 4.0' PVD SHLD1 - LT 5.0' PVD SHLD1 - RT 4.0' LWN SHLD2 - LT 12.0' LWN SHLD2 - RT — 11.957

106.0'-48.0' 4-12.0' RDWY 41.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 4.0' PVD SHLD1 - LT 5.0' PVD SHLD1 - RT 2•4.0' LWN SHLD2 — 12.093

119.0'-48.0' 4-12.0' RDWY 41.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 2•4.0' PVD SHLD1 10.0' LWN SHLD2 - LT 12.0' LWN SHLD2 - RT — 12.180

118.0'-48.0' 4-12.0' RDWY 40.0' CB<6/LWN MED 2•2.0' C&G INSHLD1 2•4.0' PVD SHLD1 10.0' LWN SHLD2 - LT 12.0' LWN SHLD2 - RT — 12.334

117.0'-48.0' 4-12.0' RDWY 39.0' DC MED 2•4.0' PVD SHLD1 10.0' LWN SHLD2 - LT 12.0' LWN SHLD2 - RT — 12.456

ROADWAY COMPOSITION — 10.000 — 10.029 — 28/FC-3 / 28/FC-3 — 11.456 — 28/FC-3 / 28/FC-3

HORIZONTAL ALIGNMENT

B=S89° 33'45"E — Δ=2° 27'00" PI=10.091 — B=N89° 16'55"E — Δ=0° 11'04" D=0° 05' PC=10.294 PI=10.315 PT=10.336 — Δ=0° 10'00" PI=10.333 — B=S89° 27'59"E — Δ=0° 50'54" D=0° 02' PC=11.152 PI=11.363 PT=11.634 — Δ=0° 51'00" PI=11.392 — B=S89° 41'07"E — B=N83° 11'25"E

STRUCTURE DESCRIPTION

11.773 CC 54 X 1-18" — 11.868 CC 126 X 1-24" — 11.972 CC 96 X 1-18" — 12.246 CC 126 X 1-36" — 12.322 CC 63 X 1-18" — 12.493 CC 63 X 1-18"

DISTRICT USE

11.344 FM•255702-15201 (MP 11.344-MP 16.317)
2000-FEDERAL AID RESURFACE/ REPAVE
11.332 FM•413395-15201 (MP 11.332-MP 16.551)
2007-RESURFACING

SIS — SIS HIGHWAY FACILITY

FUN CLASS — URBAN OTHER PRINCIPAL ARTERIAL

13 14 15

ROADWAY FEATURES

N MULRENNAN RD A 12.967 — SKYWOOD DR A 12.712 — SHoReWOOD DR A 12.808 — VILLAGE DR A 12.868 — FINCH RD A 12.894 — 6245 CSX 12.665 — VALRICO STATION RD A 12.651 — KNOTTY OAK LN A 12.580

HARDCASTLE PL A 13.098 — 5607 13.063 — STRAWBERRY RIDGE BLVD A 13.235 — TAHO CIR A 13.327 — S DOVER RD A 13.487 — N DOVER RD A 13.477 — OUTSIDE CITY & URBAN — 0012 13.709 — VALRICO HILLS MHP — HANS LN O 13.800 — ENTR A 13.829 — ORCHIDGROVE LN A 13.956

E SR 60 — SYDNEY WASHER RD A 14.500 — INSIDE URBAN, OUTSIDE CITY — TAMPA — 14.502

TURKEY CREEK 15.061 — •058 — MARGE OWENS RD A 15.284 — STARLITE MHP — ENTR A 15.453

LANE WIDTHS ARE AVERAGED

INVENTORY DIRECTION E

117.0'-48.0' 4-12.0' RDWY 39.0' DC MED 2•4.0' PVD SHLD1 10.0' LWN SHLD2 - LT 12.0' LWN SHLD2 - RT — 12.456

115.0'-48.0' 4-12.0' RDWY 37.0' DC MED 2•4.0' PVD INSHLD1 2•4.0' PVD SHLD1 10.0' LWN SHLD2 - LT 12.0' LWN SHLD2 - RT — 14.198

118.0'-48.0' 4-12.0' RDWY 40.0' DC MED 2•4.0' PVD SHLD1 10.0' LWN SHLD2 - LT 12.0' LWN SHLD2 - RT — 15.196

ROADWAY COMPOSITION — 12.500 — 28/FC-3 / 28/FC-3

HORIZONTAL ALIGNMENT

B=N83° 11'25"E — Δ=0° 07'00" PI=13.314 — B=N83° 18'25"E — Δ=2° 46'54" PI=14.189 — Δ=2° 46'54" PI=14.200 — B=N80° 31'31"E — B=N83° 18'25"E — Δ=2° 45'00" PI=14.940 — B=N86° 03'25"E

STRUCTURE DESCRIPTION

12.986 CC 63 X 1-18" — 13.195 CC 63 X 1-18" — 13.649 CC 63 X 1-18" — 13.988 CC 63 X 1-18" — 14.140 CC 63 X 1-18" — 14.387 CC 63 X 1-18" — 14.485 CC 169 X 1-36" — 15.058 CC 54 X 1-18" — 15.064 CC 54 X 1-18" — •058 — 15.238 CC 47 X 1-18" — 15.441 CC 47 X 1-36"

DISTRICT USE

13.377 FM•255771-15201 (MP 13.377-MP 13.577)
1998-TRAFFIC SIGNALS
12.629 FM•255477-15201 (MP 12.500-MP 12.700)1997-RAILROAD CROSSING
FM•255563-15201 (MP 12.629-MP 12.669)
1993-RAILROAD CROSSING

SIS — SIS HIGHWAY FACILITY

FUN CLASS — URBAN OTHER PRINCIPAL ARTERIAL — 13.477 RURAL PRINCIPAL ARTERIAL -- OTHER — 14.502 URBAN OTHER PRINCIPAL ARTERIAL

Appendix 3

Cross Drains Analysis

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 327
(407) 971-8850 - (407) 971-8955 (fax)

Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-1: 1 - 24" RCP (Sta. 421+3.13) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 327
(407) 971-8850 - (407) 971-8955 (fax)

Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-2: 1 - 30" RCP (Sta. 441+27.84) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 4.91 sq.ft.

$Q_{25yr} = A_1V =$ **29 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **35 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **41 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **70 cfs**

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 327
(407) 971-8850 - (407) 971-8955 (fax)

Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-3: 1 - 36" RCP (Sta. 559+02.42) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 7.07 sq.ft.

$Q_{25yr} = A_1V =$ **42 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **51 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **59 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **101 cfs**

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 327
(407) 971-8850 - (407) 971-8955 (fax)

Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-4: 3 - 10' X 10' CBC (Sta. 589+11.37) (Existing)

TURKEY CREEK - 100058

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 300.00 sq.ft.

$Q_{25yr} = A_1V =$ **1800 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **2160 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **2520 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **4284 cfs**

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 327
(407) 971-8850 - (407) 971-8955 (fax)

Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-5: 1 - 4' X 3' CBC (Sta. 609+09.64) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 12.00 sq.ft.

$Q_{25yr} = A_1V =$ **72 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **86 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **101 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **171 cfs**

Inwood Consulting Engineers
3000 Dovera Drive, Suite 200, Oviedo, FL 327
(407) 971-8850 - (407) 971-8955 (fax)

Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-6: 1 - 36" RCP (Sta. 635+66) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 7.07 sq.ft.

$Q_{25yr} = A_1V =$ **42 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **51 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **59 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **101 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-7: 7' X 3' CBC (Sta. 686+48.89) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 21.00 sq.ft.

$Q_{25yr} = A_1V =$ **126 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **151 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **176 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **300 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-8: 1 - 8' X 5' CBC (Sta. 697+49.92) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 40.00 sq.ft.

$Q_{25yr} = A_1V =$ **240 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **288 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **336 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **571 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-9: 3 - 10' X 10' CBC (Sta. 709+73) (Existing)

LITTLE ALAFIA RIVER - 100059

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 300.00 sq.ft.

$Q_{25yr} = A_1V =$		**1800 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$		**2160 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$		**2520 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$		**4284 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-10: 1 - 24" RCP (Sta. 754+74.34) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-11: 1 - 24" RCP (Sta. 786+01.17) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-12: 1 - 24" RCP (Sta. 798+26.94) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-13: 2 - 7' X 5' CBC (Sta. 826+35.91) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 70.00 sq.ft.

$Q_{25yr} = A_1V =$ **420 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **504 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **588 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **1000 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-14: 2 - 36" RCP (Sta. 856+80.48) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 14.14 sq.ft.

$Q_{25yr} = A_1V =$ **85 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **102 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **119 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **202 cfs**

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Made by: MKI **DATE:** June 26, 2013
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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-15: 1 - 24" RCP (Sta. 865+79.50) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 3.14 sq.ft.

$Q_{25yr} = A_1V =$ **19 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **23 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **26 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **45 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-16: 2 - 30" RCP (Sta. 902+98.89) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 9.82 sq.ft.

$Q_{25yr} = A_1V =$ **59 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **71 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **82 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **140 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-17: 2 - 30" RCP (Sta. 925+30.62) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 9.82 sq.ft.

$Q_{25yr} = A_1V =$ **59 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **71 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **82 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **140 cfs**

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Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-18: 1 - 36" RCP (Sta. 948+00.00) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 7.07 sq.ft.

$Q_{25yr} = A_1V =$ **42 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **51 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **59 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **101 cfs**

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Made by: MKI **DATE:** June 26, 2013
Ch'd by: **PROJECT #:** RKK-002-01

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-19: 1 - 30" RCP (Sta. 960+00.00) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 4.91 sq.ft.

$Q_{25yr} = A_1V =$ **29 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **35 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **41 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **70 cfs**

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SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

CD-20: 1 - 30" RCP (Sta. 970+00.00) (Existing)

HYDROLOGIC ANALYSIS

VELOCITY METHOD : $Q = AV$

Q = Peak Runoff for Return Period T (cfs).
A = Existing Culvert Cross Section Area
V = 6 feet per second (maximum)

A_1 = 4.91 sq.ft.

$Q_{25yr} = A_1V =$ **29 cfs**
$Q_{50yr} = 1.2Q_{25yr} =$ **35 cfs**
$Q_{100yr} = 1.4Q_{25yr} =$ **41 cfs**
$Q_{500yr} = 1.7Q_{100yr} =$ **70 cfs**

SR 60 PD&E STUDY (FROM VALRICO RD. TO COUNTY LINE RD.)

TABLE 7 – CROSS DRAIN FLOOD DATA SHEET - EXISTING VS. PROPOSED

Structure Number	Approximate Location	Design Flood (50-yr Storm Event)					Base Flood (100-yr Storm Event)					Overtopping Flood				Greatest Flood (500-yr Storm Event)				
		Existing (A)		Proposed (B)		B-A	Existing (A)		Proposed (B)		B-A	Existing (A)		Proposed (B)		Existing (A)		Proposed (B)		B-A
		Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Stage (ft)
CD-1	Sta. 421+03	23	37.90	23	37.93	0.03	26	38.51	26	38.51	0.00	25.64	38.50	25.47	38.50	45	38.62	45	38.62	0.00
CD-2	Sta. 441+28	35	40.73	35	40.73	0.00	41	41.41	41	41.41	0.00	43.37	41.70	43.37	41.70	70	41.77	70	41.77	0.00
CD-3	Sta. 559+02	51	63.84	51	63.84	0.00	59	64.46	59	64.46	0.00	65.11	65.00	65.11	65.00	101	65.08	101	65.08	0.00
CD-4 (Bridge #100058)	Sta. 589+11	2160	56.55	2160	56.55	0.00	2520	57.10	2520	57.10	0.00	3463.88	59.00	3464.04	59.00	4284	59.57	4284	59.57	0.00
CD-5	Sta. 609+10	86	64.59	86	64.63	0.04	101	65.21	101	65.25	0.04	121.48	66.20	120.41	66.20	171	66.45	171	66.42	-0.03
CD-6	Sta. 635+66	51	82.72	51	82.76	0.04	59	83.31	59	83.36	0.05	67.30	84.00	66.53	84.00	101	84.08	101	84.08	0.00
CD-7	Sta. 686+49	151	74.24	151	74.24	0.00	176	74.85	176	74.85	0.00	232.20	76.60	229.75	76.60	300	76.74	300	76.75	0.01
CD-8	Sta. 697+50	288	67.21	288	67.20	-0.01	336	67.81	336	67.80	-0.01	519.44	71.00	519.46	71.00	571	71.10	519	71.10	0.00
CD-9 (Bridge #100059)	Sta. 709+74	2160	67.32	2160	67.33	0.01	2520	68.12	2520	68.13	0.01	3217.72	70.00	3217.47	70.00	4284	71.29	4284	71.29	0.00
CD-10	Sta. 754+74	23	88.50	23	88.95	0.45	26	89.25	26	89.28	0.03	31.61	90.74	31.43	90.74	45	90.78	45	90.78	0.00
CD-11	Sta. 786+01	23	104.50	23	104.57	0.07	26	105.19	26	105.28	0.09	32.79	107.00	32.30	107.00	45	107.04	45	107.04	0.00
CD-12	Sta. 798+27	23	108.70	23	108.76	0.06	26	109.39	26	109.47	0.08	30.33	110.50	29.93	110.50	45	110.55	45	110.55	0.00
CD-13	Sta. 826+36	504	108.05	504	108.05	0.00	588	108.78	588	108.78	0.00	814.77	111.00	814.73	111.00	1000	111.58	1000	111.58	0.00
CD-14	Sta. 856+80	102	113.97	102	113.97	0.00	119	114.53	119	114.53	0.00	184.87	118.00	184.87	118.00	202	118.05	202	118.05	0.00
CD-15	Sta. 865+80	23	116.61	23	116.65	0.04	26	117.33	26	117.39	0.06	34.90	120.00	34.61	120.00	45	120.07	45	120.07	0.00
CD-16	Sta. 902+99	71	116.75	71	116.80	0.05	82	117.33	82	117.40	0.07	92.99	118.00	91.67	118.00	140	118.10	140	118.10	0.00
CD-17	Sta. 925+31	71	110.00	71	110.02	0.02	82	110.66	82	110.69	0.03	114.73	113.00	113.47	113.00	140	113.07	140	113.07	0.00
CD-18	Sta. 948+00	51	100.12	51	100.16	0.04	59	100.79	59	100.85	0.06	72.49	102.00	71.67	102.00	101	102.18	101	102.16	-0.02
CD-19	Sta. 960+00	35	95.76	35	95.81	0.05	41	96.42	41	96.49	0.07	58.96	99.00	58.16	99.00	70	99.04	70	99.04	0.00
CD-20	Sta. 970+00	35	101.20	35	101.22	0.02	41	101.98	41	102.03	0.05	54.25	104.00	53.50	104.00	70	104.05	70	104.05	0.00

Existing conditions show deficiency. Upsize pipe to prevent base flood in proposed conditions
Upsize pipe to prevent base flood in proposed conditions. Cross drain does not show deficiency in existing conditions.
Maintain same existing conditions inverts to prevent from getting high headwater levels

Cross Drain Upsizing			
Structure Number	Existing Pipe Size	Proposed Pipe Size	
CD-1	Single 24" RCP	Single 24" RCP	same
CD-2	Single 30" RCP	Single 30" RCP	same
CD-3	Single 36" RCP	Single 36" RCP	same
CD-4 (Bridge #100058)	Triple 10'x10' BC	Triple 10'x10' BC	same
CD-5	Single 4'x3' CBC	Single 4'x3' CBC	same
CD-6	Single 36" RCP	Single 36" RCP	same
CD-7	Single 7'X3' CBC	Single 7'X3' CBC	same
CD-8	Single 8'X5' CBC	Single 8'X5' CBC	same
CD-9 (Bridge #100059)	Triple 10'x10' BC	Triple 10'x10' BC	same
CD-10	Single 24" RCP	Single 24" RCP	same
CD-11	Single 24" RCP	Single 24" RCP	same
CD-12	Single 24" RCP	Single 24" RCP	same
CD-13	Double 7'X5' CBC	Double 7'X5' CBC	same
CD-14	Double 36" RCP	Double 36" RCP	same
CD-15	Single 24" RCP	Single 24" RCP	same
CD-16	Double 30" RCP	Double 30" RCP	same
CD-17	Double 30" RCP	Double 30" RCP	same
CD-18	Single 36" RCP	Single 36" RCP	same
CD-19	Single 30" RCP	Single 30" RCP	same
CD-20	Single 30" RCP	Single 30" RCP	same

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 1 - Summary of Culvert Flows at Crossing: EX. CD-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 -EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
37.90	23.00	23.00	0.00	1
38.40	25.20	25.20	0.00	1
38.51	26.00	25.64	0.18	37
38.54	29.60	25.80	3.57	5
38.56	31.80	25.87	5.80	4
38.57	34.00	25.92	7.83	3
38.58	36.20	25.95	10.00	3
38.59	38.40	26.00	12.21	3
38.60	40.60	26.04	14.43	3
38.61	42.80	26.08	16.61	3
38.62	45.00	26.14	18.81	3
38.50	25.64	25.64	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-1

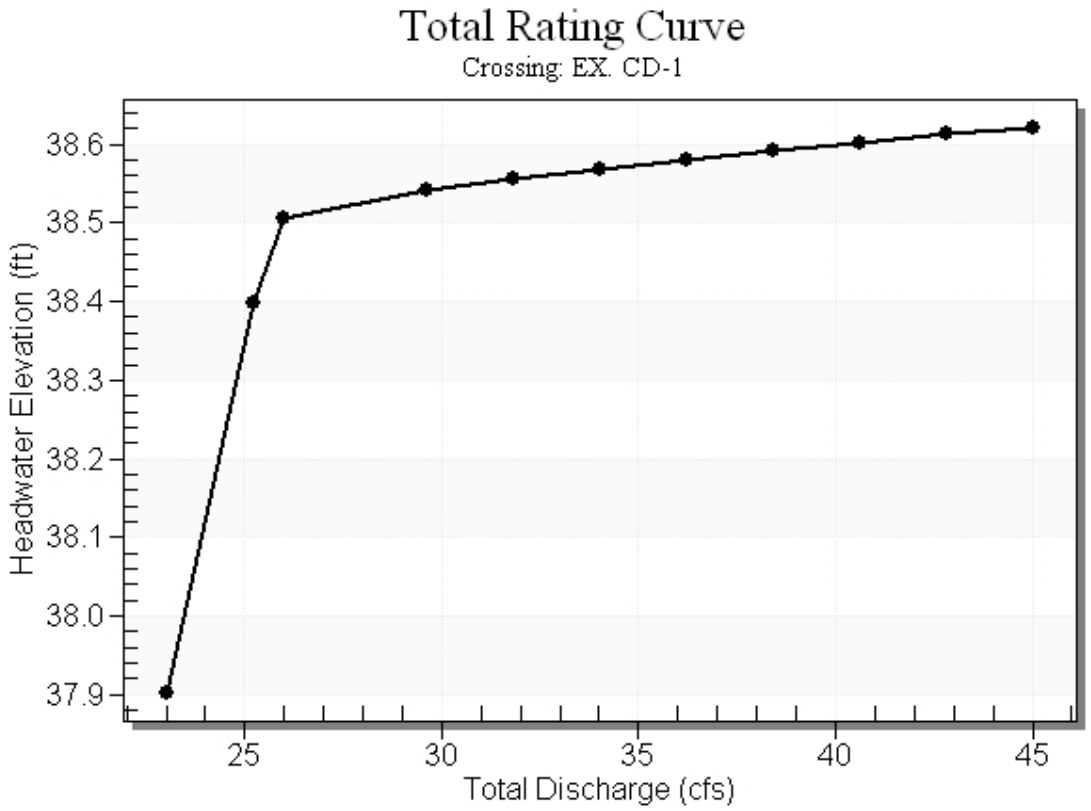


Table 2 - Culvert Summary Table: Culvert 1 -EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	37.90	3.243	4.063	7-M2c	2.000	1.705	1.705	0.310	8.059	0.00
25.20	25.20	38.40	3.624	4.557	7-M2c	2.000	1.767	1.767	0.310	8.582	0.00
26.00	25.64	38.51	3.704	4.666	7-M2c	2.000	1.777	1.777	0.310	8.690	0.00
29.60	25.80	38.54	3.735	4.700	7-M2c	2.000	1.781	1.781	0.310	8.732	0.00
31.80	25.87	38.56	3.747	4.716	7-M2c	2.000	1.783	1.783	0.310	8.748	0.00
34.00	25.92	38.57	3.756	4.728	7-M2c	2.000	1.784	1.784	0.310	8.760	0.00
36.20	25.95	38.58	3.762	4.741	7-M2c	2.000	1.785	1.785	0.310	8.769	0.00
38.40	26.00	38.59	3.771	4.752	7-M2c	2.000	1.786	1.786	0.310	8.781	0.00
40.60	26.04	38.60	3.779	4.762	7-M2c	2.000	1.787	1.787	0.310	8.791	0.00
42.80	26.08	38.61	3.786	4.772	7-M2c	2.000	1.788	1.788	0.310	8.801	0.00
45.00	26.14	38.62	3.797	4.781	7-M2c	2.000	1.789	1.789	0.310	8.816	0.00

****

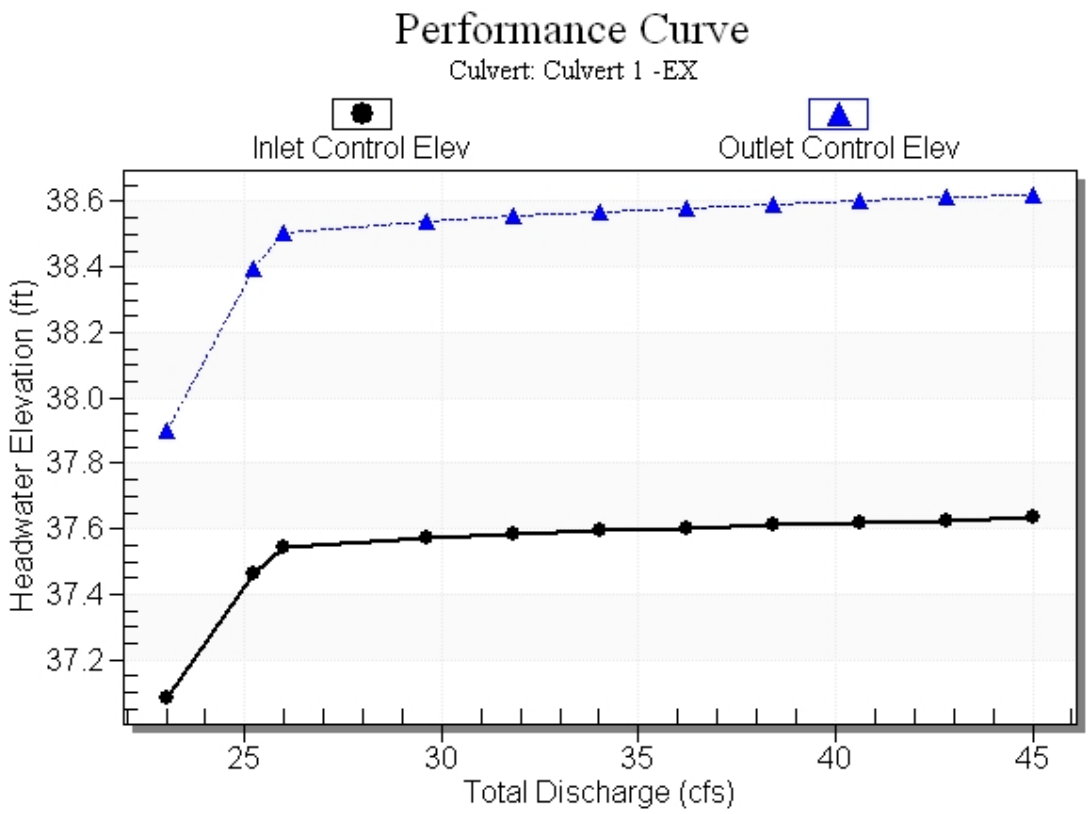
Straight Culvert

Inlet Elevation (invert): 33.84 ft, Outlet Elevation (invert): 33.70 ft

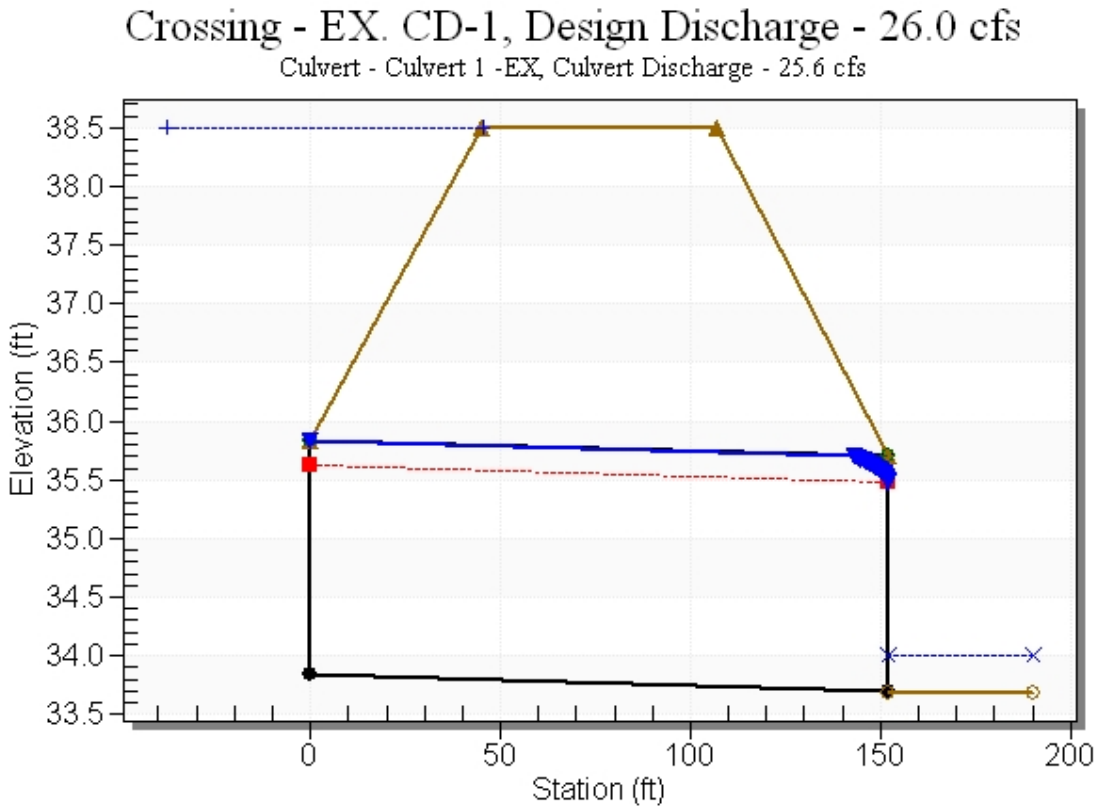
Culvert Length: 152.00 ft, Culvert Slope: 0.0009

****

Culvert Performance Curve Plot: Culvert 1 -EX



Water Surface Profile Plot for Culvert: Culvert 1 -EX



Site Data - Culvert 1 -EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 33.84 ft

Outlet Station: 152.00 ft

Outlet Elevation: 33.70 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1 -EX

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: EX. CD-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	34.00	0.31
25.20	34.00	0.31
26.00	34.00	0.31
29.60	34.00	0.31
31.80	34.00	0.31
34.00	34.00	0.31
36.20	34.00	0.31
38.40	34.00	0.31
40.60	34.00	0.31
42.80	34.00	0.31
45.00	34.00	0.31

Tailwater Channel Data - EX. CD-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 34.00 ft

Roadway Data for Crossing: EX. CD-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 38.50 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 4 - Summary of Culvert Flows at Crossing: PR. CD-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
37.93	23.00	23.00	0.00	1
38.43	25.20	25.20	0.00	1
38.51	26.00	25.52	0.29	25
38.54	29.60	25.67	3.73	5
38.56	31.80	25.73	5.95	4
38.57	34.00	25.78	7.98	3
38.58	36.20	25.82	10.15	3
38.59	38.40	25.87	12.36	3
38.60	40.60	25.92	14.56	3
38.61	42.80	25.94	16.75	3
38.62	45.00	26.00	18.95	3
38.50	25.47	25.47	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-1

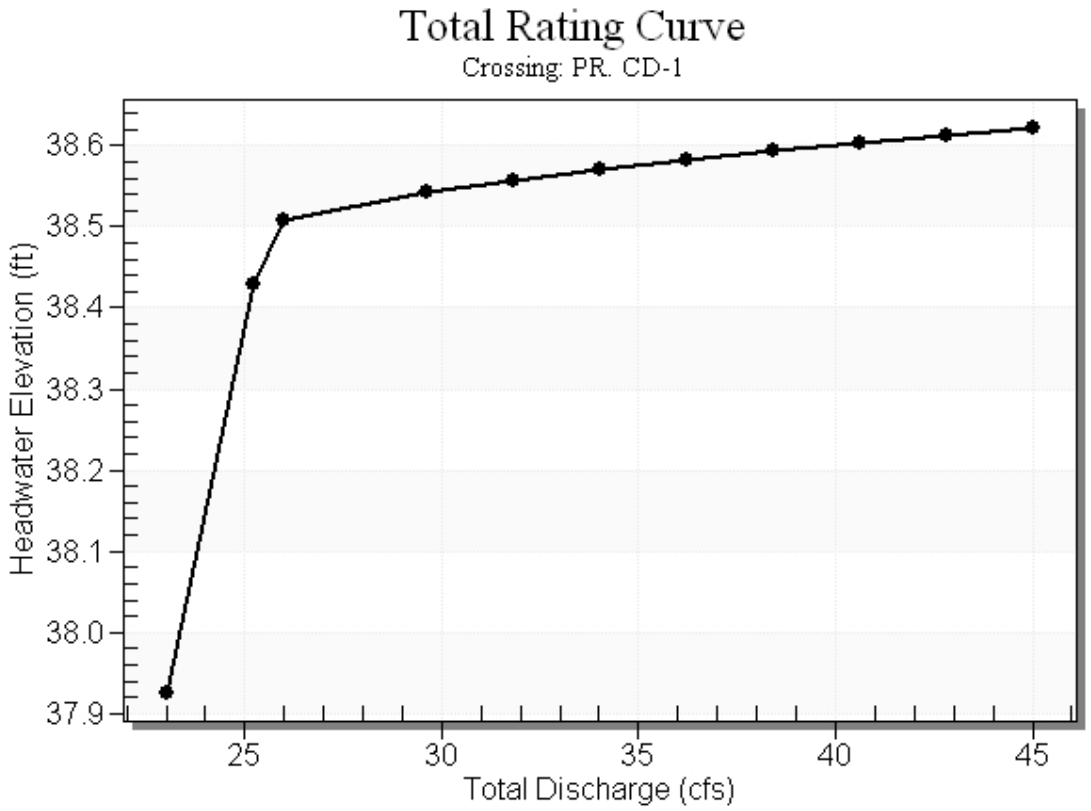


Table 5 - Culvert Summary Table: Culvert 1 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	37.93	3.243	4.086	7-M2c	2.000	1.705	1.705	0.310	8.059	0.00
25.20	25.20	38.43	3.624	4.589	7-M2c	2.000	1.767	1.767	0.310	8.582	0.00
26.00	25.52	38.51	3.683	4.667	7-M2c	2.000	1.775	1.775	0.310	8.661	0.00
29.60	25.67	38.54	3.709	4.702	7-M2c	2.000	1.778	1.778	0.310	8.697	0.00
31.80	25.73	38.56	3.721	4.717	7-M2c	2.000	1.780	1.780	0.310	8.713	0.00
34.00	25.78	38.57	3.729	4.728	7-M2c	2.000	1.781	1.781	0.310	8.724	0.00
36.20	25.82	38.58	3.738	4.740	7-M2c	2.000	1.782	1.782	0.310	8.736	0.00
38.40	25.87	38.59	3.748	4.752	7-M2c	2.000	1.783	1.783	0.310	8.749	0.00
40.60	25.92	38.60	3.755	4.762	7-M2c	2.000	1.784	1.784	0.310	8.759	0.00
42.80	25.94	38.61	3.761	4.774	7-M2c	2.000	1.785	1.785	0.310	8.767	0.00
45.00	26.00	38.62	3.770	4.782	7-M2c	2.000	1.786	1.786	0.310	8.780	0.00

****

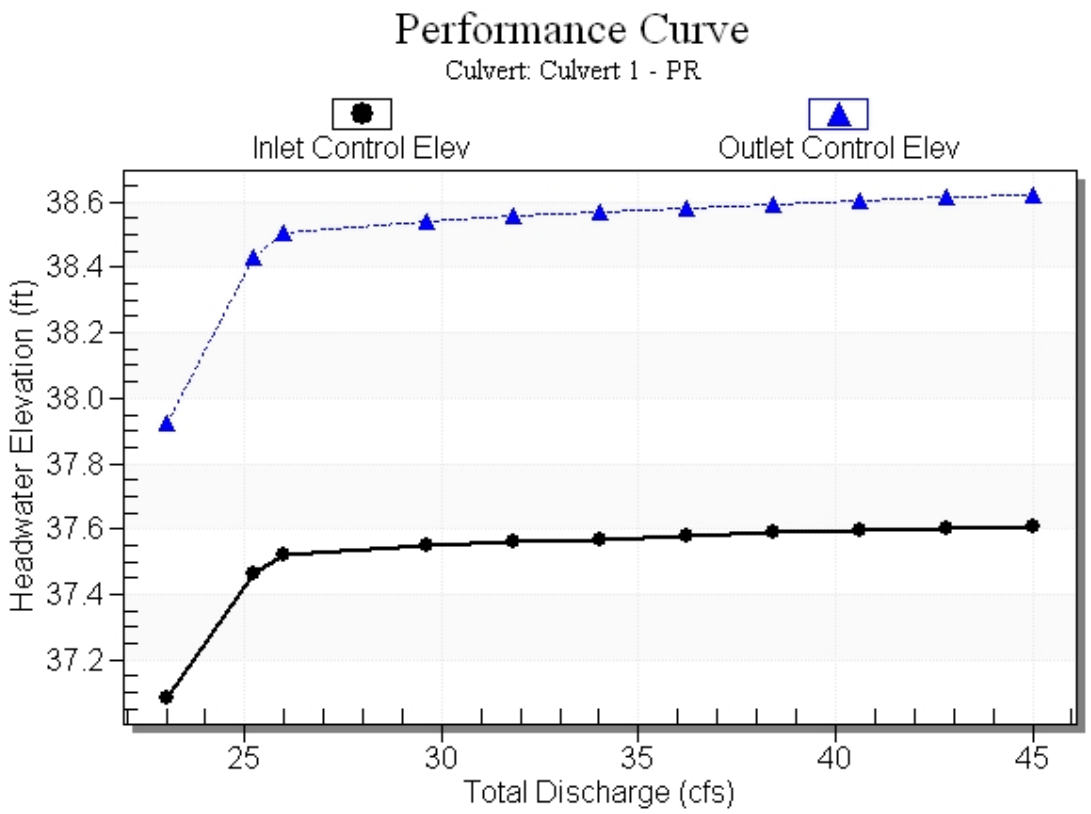
Straight Culvert

Inlet Elevation (invert): 33.84 ft, Outlet Elevation (invert): 33.68 ft

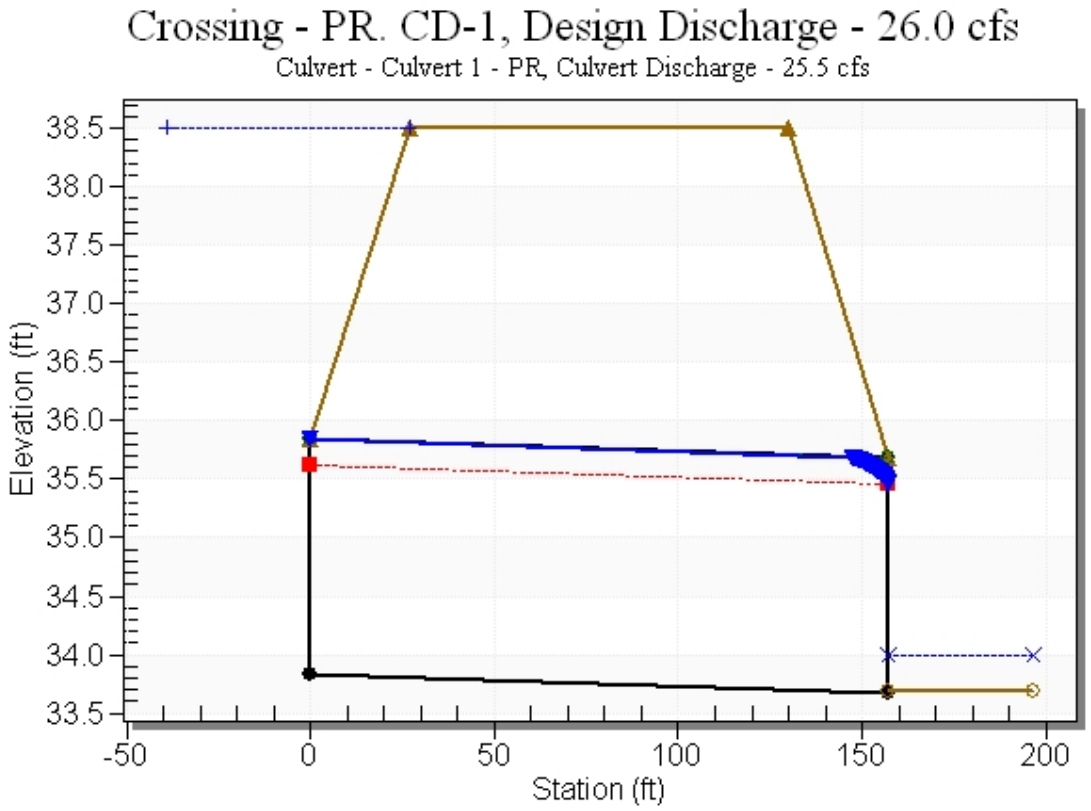
Culvert Length: 157.00 ft, Culvert Slope: 0.0010

****

Culvert Performance Curve Plot: Culvert 1 - PR



Water Surface Profile Plot for Culvert: Culvert 1 - PR



Site Data - Culvert 1 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 33.84 ft

Outlet Station: 157.00 ft

Outlet Elevation: 33.68 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1 - PR

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 6 - Downstream Channel Rating Curve (Crossing: PR. CD-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	34.00	0.31
25.20	34.00	0.31
26.00	34.00	0.31
29.60	34.00	0.31
31.80	34.00	0.31
34.00	34.00	0.31
36.20	34.00	0.31
38.40	34.00	0.31
40.60	34.00	0.31
42.80	34.00	0.31
45.00	34.00	0.31

Tailwater Channel Data - PR. CD-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 34.00 ft

Roadway Data for Crossing: PR. CD-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 38.50 ft

Roadway Surface: Paved

Roadway Top Width: 103.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 7 - Summary of Culvert Flows at Crossing: EX. CD-2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 2 -EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
40.73	35.00	35.00	0.00	1
41.11	38.50	38.50	0.00	1
41.41	41.00	41.00	0.00	1
41.71	45.50	43.46	1.65	33
41.72	49.00	43.55	5.23	5
41.73	52.50	43.63	8.65	4
41.74	56.00	43.69	11.88	3
41.75	59.50	43.75	15.38	3
41.76	63.00	43.80	18.92	3
41.76	66.50	43.85	22.45	3
41.77	70.00	43.90	25.95	3
41.70	43.37	43.37	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-2

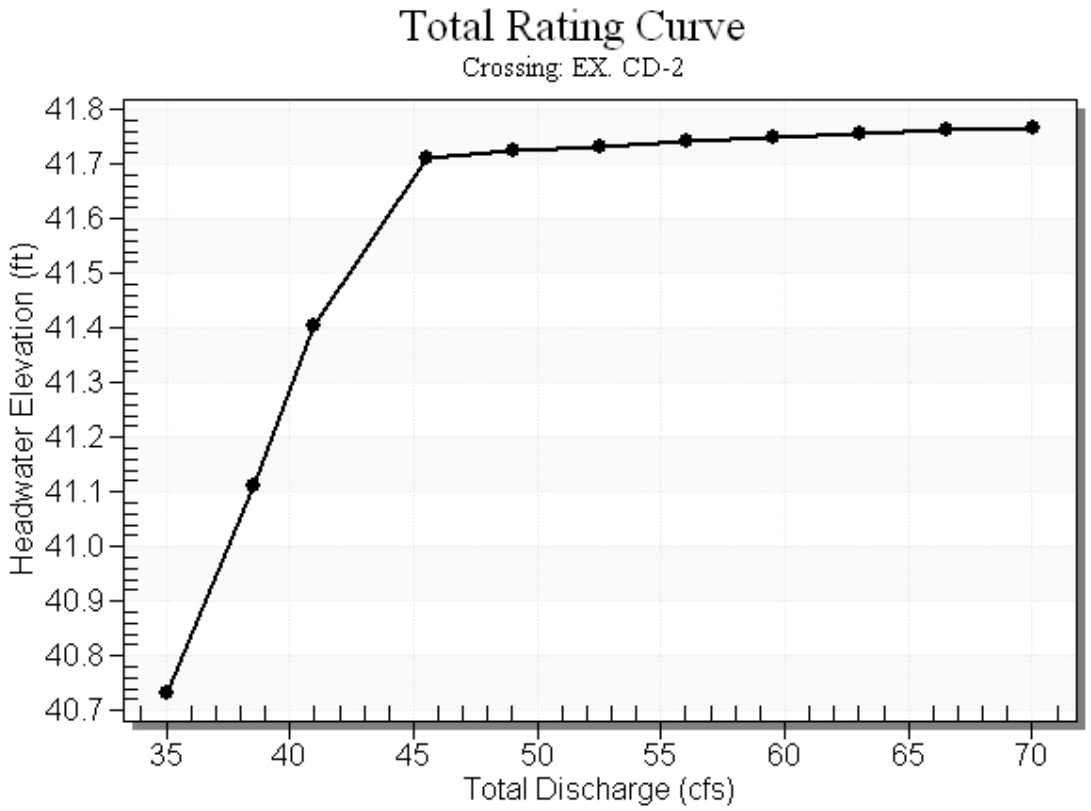


Table 8 - Culvert Summary Table: Culvert 2 -EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
35.00	35.00	40.73	3.473	3.282	7-M2c	2.038	2.007	2.007	1.800	8.286	0.00
38.50	38.50	41.11	3.852	3.546	7-M2c	2.500	2.094	2.094	1.800	8.769	0.00
41.00	41.00	41.41	4.145	3.899	7-M2c	2.500	2.149	2.149	1.800	9.132	0.00
45.50	43.46	41.71	4.451	4.295	7-M2c	2.500	2.198	2.198	1.800	9.506	0.00
49.00	43.55	41.72	4.463	4.310	7-M2c	2.500	2.200	2.200	1.800	9.521	0.00
52.50	43.63	41.73	4.473	4.321	7-M2c	2.500	2.201	2.201	1.800	9.532	0.00
56.00	43.69	41.74	4.481	4.324	7-M2c	2.500	2.202	2.202	1.800	9.542	0.00
59.50	43.75	41.75	4.488	4.340	7-M2c	2.500	2.203	2.203	1.800	9.551	0.00
63.00	43.80	41.76	4.495	4.348	7-M2c	2.500	2.204	2.204	1.800	9.560	0.00
66.50	43.85	41.76	4.502	4.356	7-M2c	2.500	2.205	2.205	1.800	9.568	0.00
70.00	43.90	41.77	4.508	4.363	7-M2c	2.500	2.206	2.206	1.800	9.575	0.00

****

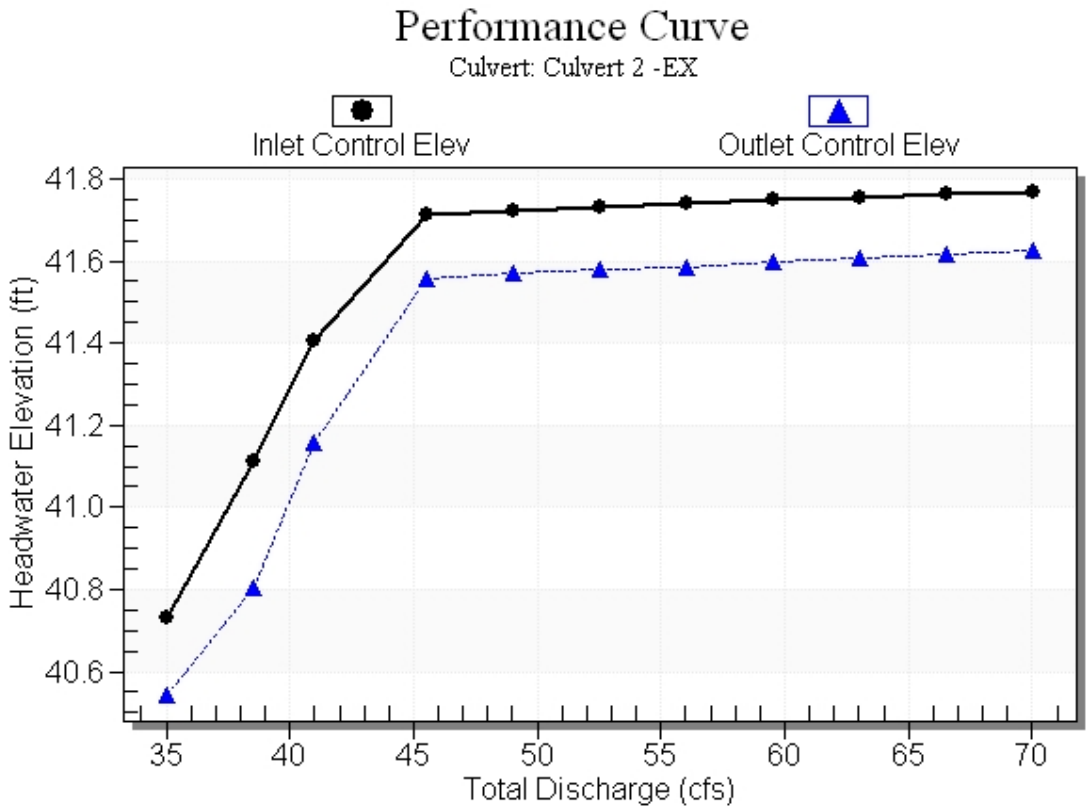
Straight Culvert

Inlet Elevation (invert): 37.26 ft, Outlet Elevation (invert): 36.31 ft

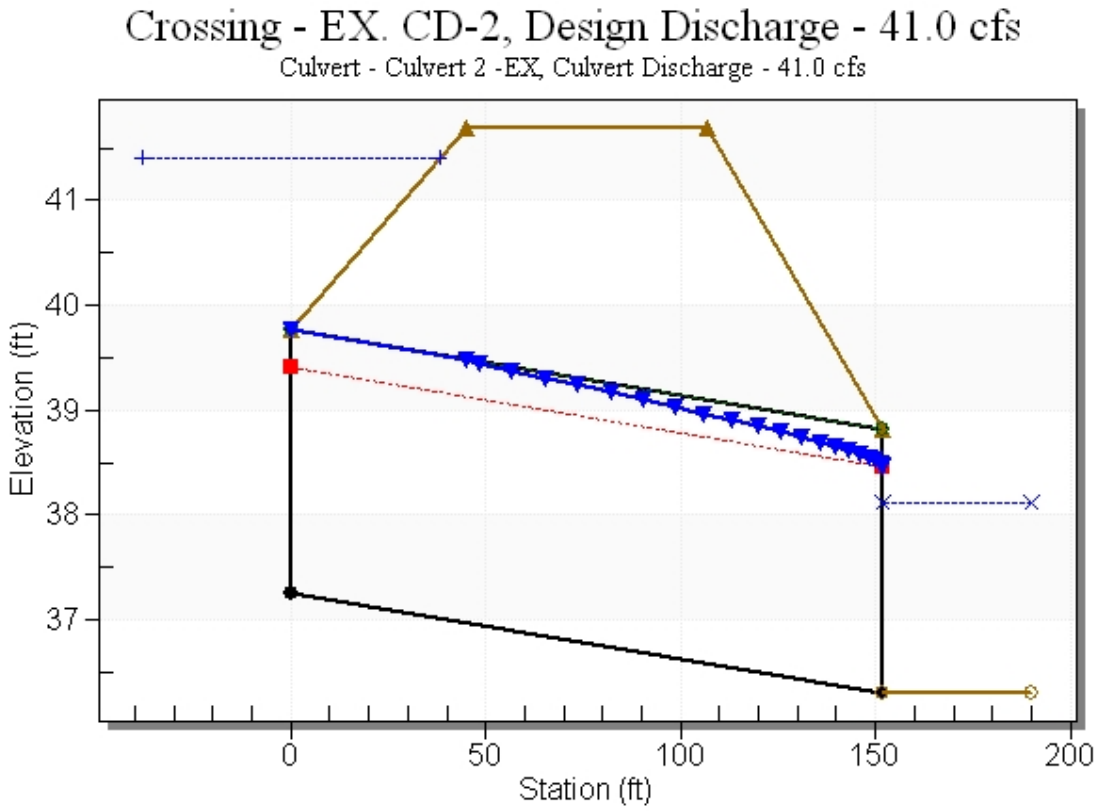
Culvert Length: 152.00 ft, Culvert Slope: 0.0062

****

Culvert Performance Curve Plot: Culvert 2 -EX



Water Surface Profile Plot for Culvert: Culvert 2 -EX



Site Data - Culvert 2 -EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 37.26 ft

Outlet Station: 152.00 ft

Outlet Elevation: 36.31 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2 -EX

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 9 - Downstream Channel Rating Curve (Crossing: EX. CD-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	38.11	1.80
38.50	38.11	1.80
41.00	38.11	1.80
45.50	38.11	1.80
49.00	38.11	1.80
52.50	38.11	1.80
56.00	38.11	1.80
59.50	38.11	1.80
63.00	38.11	1.80
66.50	38.11	1.80
70.00	38.11	1.80

Tailwater Channel Data - EX. CD-2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 38.11 ft

Roadway Data for Crossing: EX. CD-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 41.70 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 10 - Summary of Culvert Flows at Crossing: PR. CD-2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 2 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
40.73	35.00	35.00	0.00	1
41.11	38.50	38.50	0.00	1
41.41	41.00	41.00	0.00	1
41.71	45.50	43.45	1.65	33
41.72	49.00	43.55	5.23	5
41.73	52.50	43.63	8.65	4
41.74	56.00	43.69	11.88	3
41.75	59.50	43.74	15.38	3
41.76	63.00	43.80	18.92	3
41.76	66.50	43.85	22.45	3
41.77	70.00	43.90	25.96	3
41.70	43.37	43.37	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-2

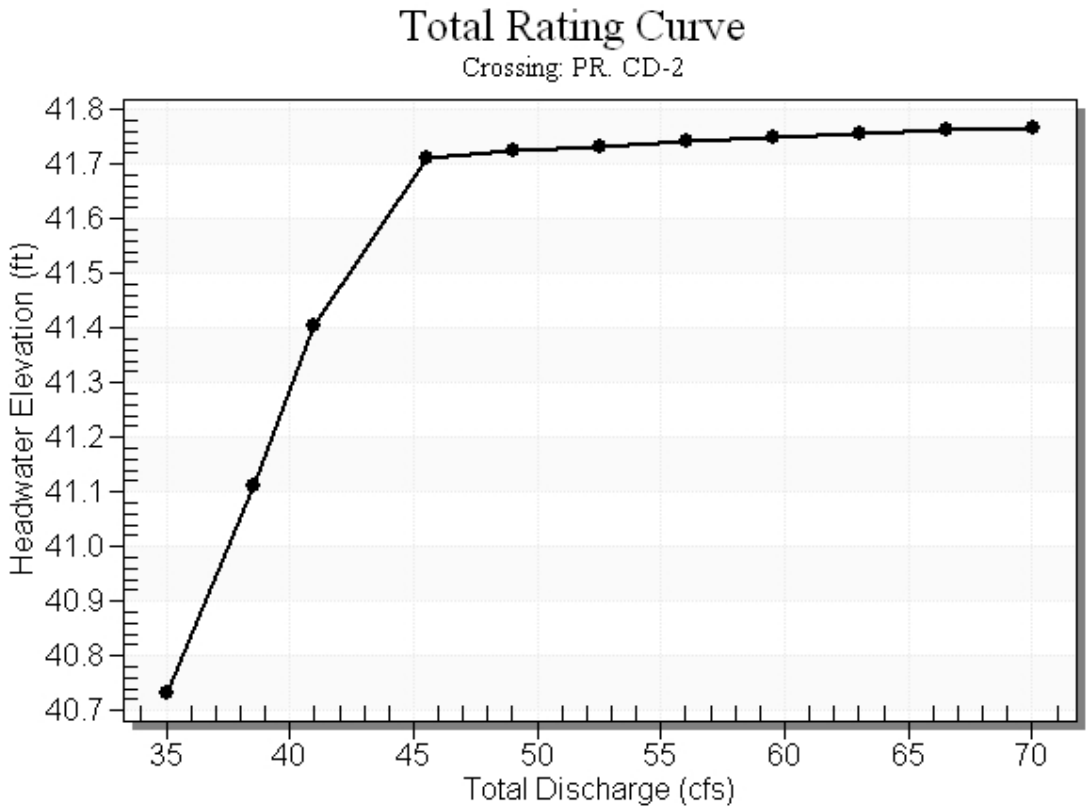


Table 11 - Culvert Summary Table: Culvert 2 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
35.00	35.00	40.73	3.473	3.279	7-M2c	2.084	2.007	2.007	1.800	8.286	0.00
38.50	38.50	41.11	3.852	3.568	7-M2c	2.500	2.094	2.094	1.800	8.769	0.00
41.00	41.00	41.41	4.145	3.955	7-M2c	2.500	2.149	2.149	1.800	9.132	0.00
45.50	43.45	41.71	4.451	4.340	7-M2c	2.500	2.198	2.198	1.800	9.505	0.00
49.00	43.55	41.72	4.463	4.355	7-M2c	2.500	2.200	2.200	1.800	9.521	0.00
52.50	43.63	41.73	4.473	4.366	7-M2c	2.500	2.201	2.201	1.800	9.532	0.00
56.00	43.69	41.74	4.481	4.375	7-M2c	2.500	2.202	2.202	1.800	9.542	0.00
59.50	43.74	41.75	4.488	4.391	7-M2c	2.500	2.203	2.203	1.800	9.551	0.00
63.00	43.80	41.76	4.495	4.393	7-M2c	2.500	2.204	2.204	1.800	9.559	0.00
66.50	43.85	41.76	4.502	4.401	7-M2c	2.500	2.205	2.205	1.800	9.568	0.00
70.00	43.90	41.77	4.508	4.415	7-M2c	2.500	2.206	2.206	1.800	9.575	0.00

****

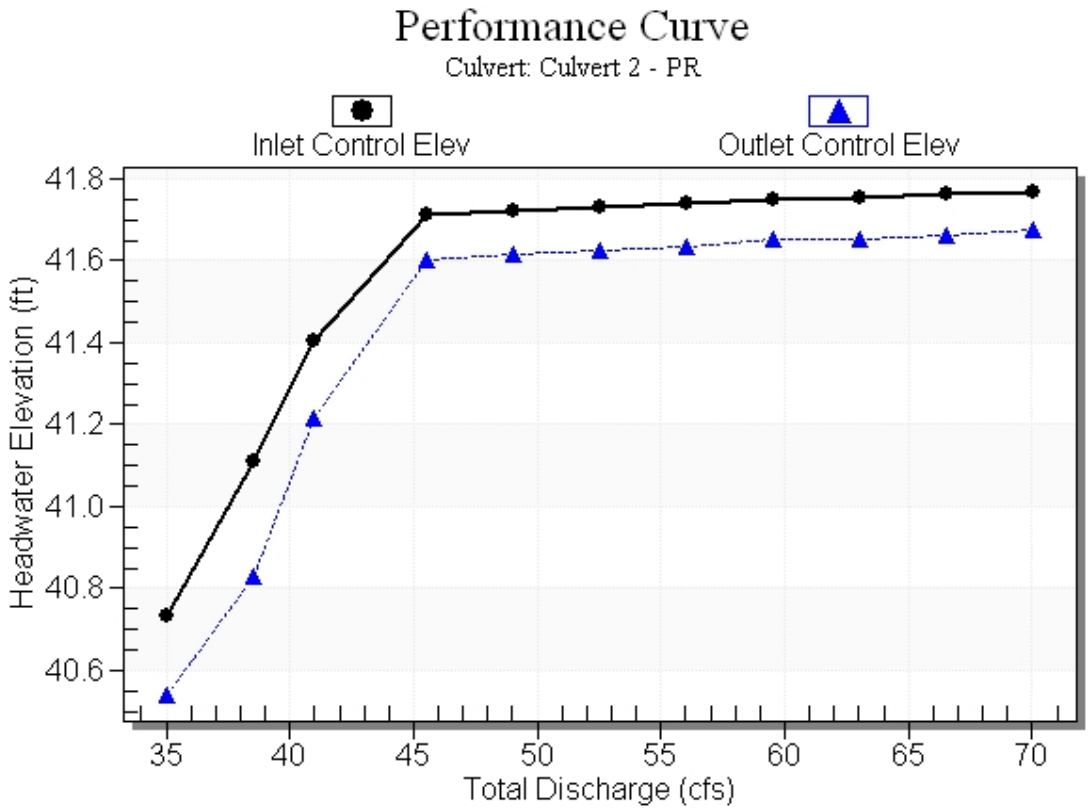
Straight Culvert

Inlet Elevation (invert): 37.26 ft, Outlet Elevation (invert): 36.31 ft

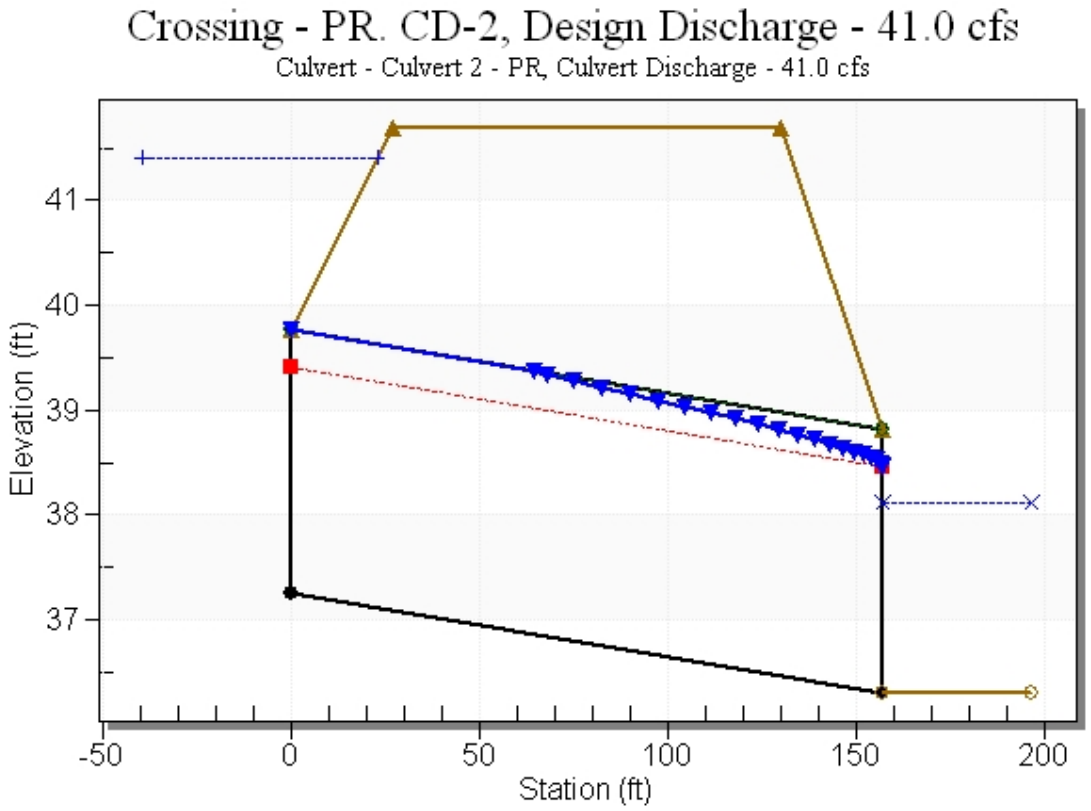
Culvert Length: 157.00 ft, Culvert Slope: 0.0061

****

Culvert Performance Curve Plot: Culvert 2 - PR



Water Surface Profile Plot for Culvert: Culvert 2 - PR



Site Data - Culvert 2 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 37.26 ft

Outlet Station: 157.00 ft

Outlet Elevation: 36.31 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2 - PR

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 12 - Downstream Channel Rating Curve (Crossing: PR. CD-2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	38.11	1.80
38.50	38.11	1.80
41.00	38.11	1.80
45.50	38.11	1.80
49.00	38.11	1.80
52.50	38.11	1.80
56.00	38.11	1.80
59.50	38.11	1.80
63.00	38.11	1.80
66.50	38.11	1.80
70.00	38.11	1.80

Tailwater Channel Data - PR. CD-2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 38.11 ft

Roadway Data for Crossing: PR. CD-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 41.70 ft

Roadway Surface: Paved

Roadway Top Width: 103.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51 cfs

Design Flow: 59 cfs

Maximum Flow: 101 cfs

Table 13 - Summary of Culvert Flows at Crossing: EX. CD-3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 3 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
63.84	51.00	51.00	0.00	1
64.22	56.00	56.00	0.00	1
64.46	59.00	59.00	0.00	1
65.00	66.00	65.14	0.29	67
65.02	71.00	65.35	5.03	5
65.04	76.00	65.50	10.02	4
65.05	81.00	65.62	15.12	4
65.06	86.00	65.72	19.77	3
65.07	91.00	65.81	24.74	3
65.07	96.00	65.90	29.76	3
65.08	101.00	65.99	34.76	3
65.00	65.11	65.11	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-3

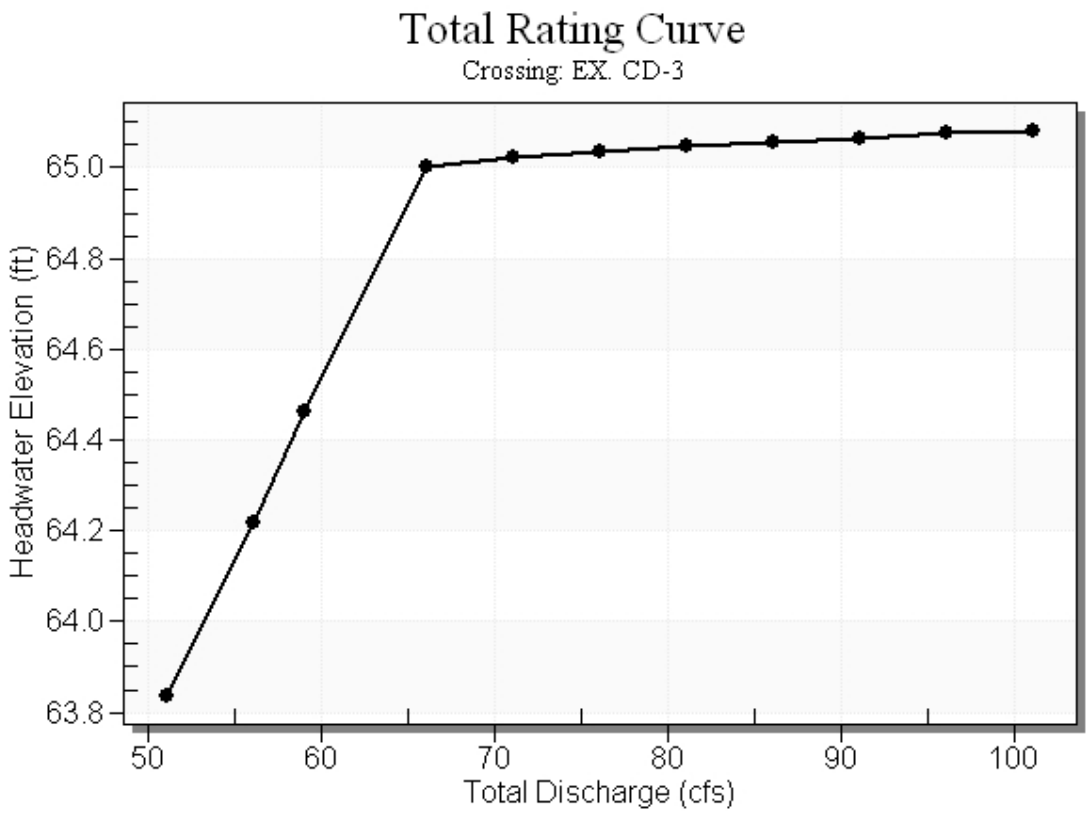


Table 14 - Culvert Summary Table: Culvert 3 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
51.00	51.00	63.84	3.838	2.264	5-S2n	1.611	2.320	1.693	2.000	12.411	0.00
56.00	56.00	64.22	4.216	2.646	5-S2n	1.708	2.424	1.796	2.000	12.689	0.00
59.00	59.00	64.46	4.461	2.888	5-S2n	1.766	2.481	1.858	2.000	12.840	0.00
66.00	65.14	65.00	5.003	3.411	5-S2n	1.885	2.587	1.981	2.000	13.167	0.00
71.00	65.35	65.02	5.023	3.429	5-S2n	1.889	2.590	1.985	2.000	13.180	0.00
76.00	65.50	65.04	5.036	3.442	5-S2n	1.892	2.592	1.988	2.000	13.188	0.00
81.00	65.62	65.05	5.048	3.453	5-S2n	1.894	2.594	1.990	2.000	13.195	0.00
86.00	65.72	65.06	5.057	3.462	5-S2n	1.896	2.596	1.992	2.000	13.201	0.00
91.00	65.81	65.07	5.065	3.469	5-S2n	1.898	2.597	1.994	2.000	13.206	0.00
96.00	65.90	65.07	5.074	3.478	5-S2n	1.900	2.598	1.996	2.000	13.212	0.00
101.00	65.99	65.08	5.083	3.486	5-S2n	1.901	2.600	1.998	2.000	13.217	0.00

****

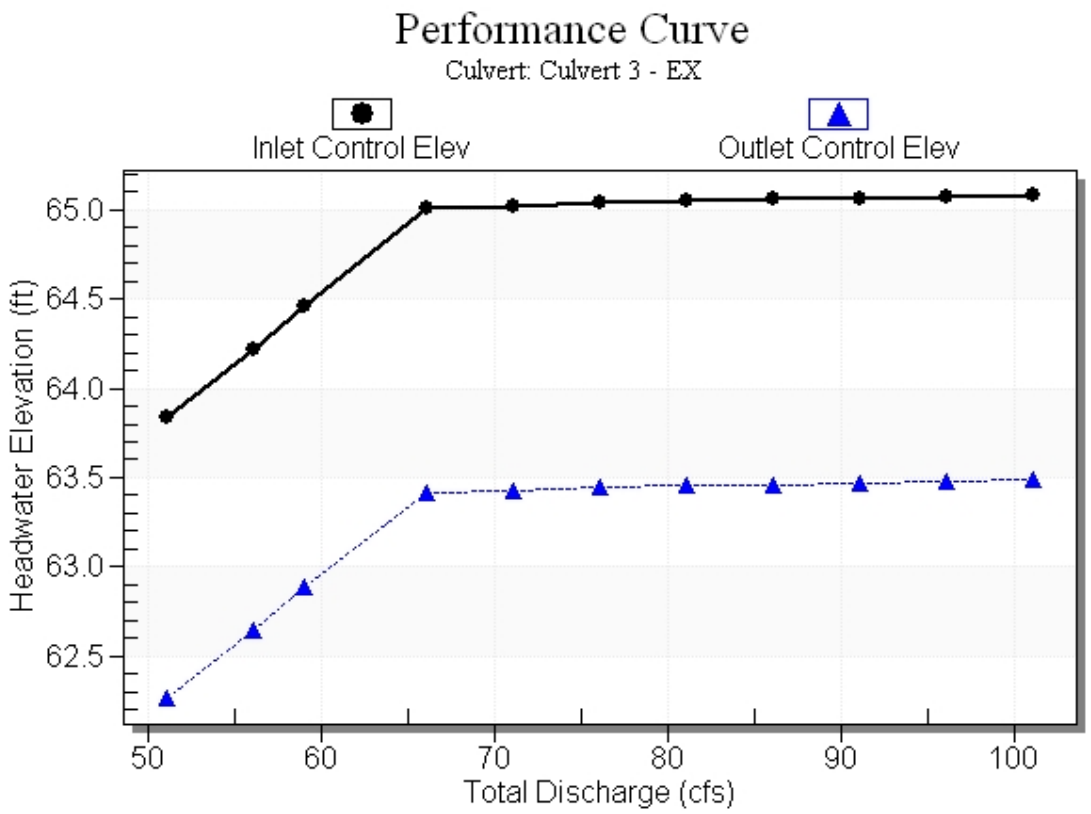
Straight Culvert

Inlet Elevation (invert): 60.00 ft, Outlet Elevation (invert): 58.00 ft

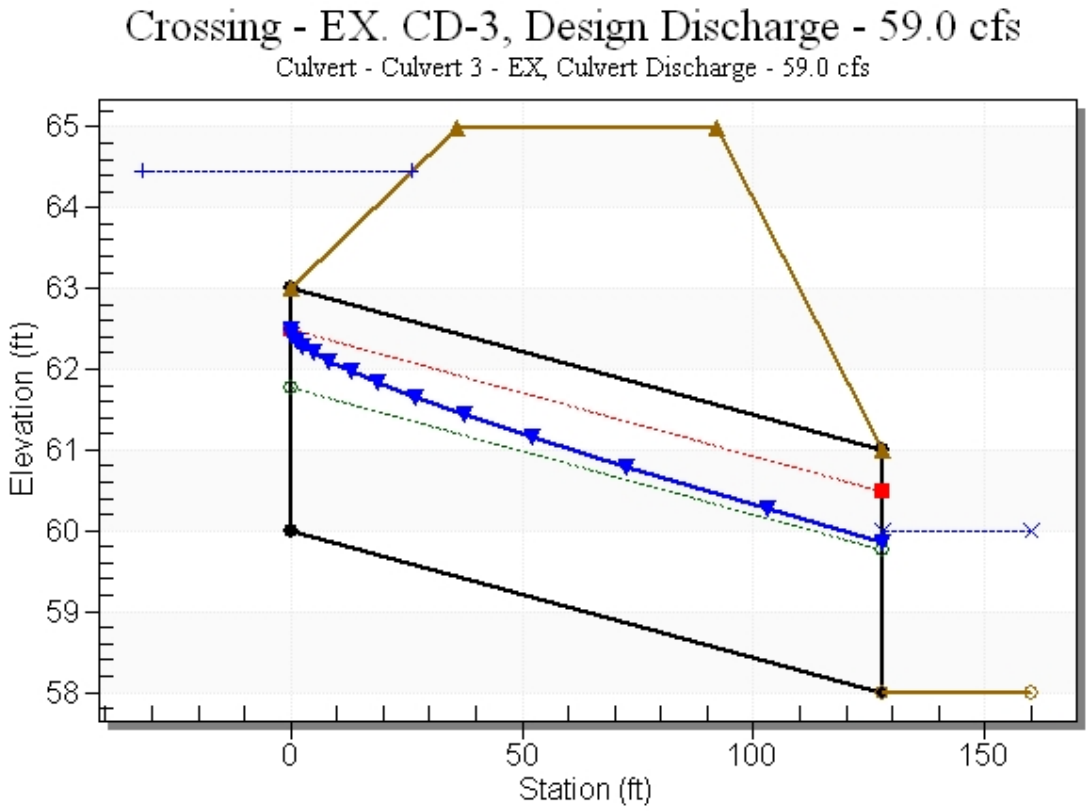
Culvert Length: 128.02 ft, Culvert Slope: 0.0156

****

Culvert Performance Curve Plot: Culvert 3 - EX



Water Surface Profile Plot for Culvert: Culvert 3 - EX



Site Data - Culvert 3 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 60.00 ft

Outlet Station: 128.00 ft

Outlet Elevation: 58.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3 - EX

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 15 - Downstream Channel Rating Curve (Crossing: EX. CD-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	60.00	2.00
56.00	60.00	2.00
59.00	60.00	2.00
66.00	60.00	2.00
71.00	60.00	2.00
76.00	60.00	2.00
81.00	60.00	2.00
86.00	60.00	2.00
91.00	60.00	2.00
96.00	60.00	2.00
101.00	60.00	2.00

Tailwater Channel Data - EX. CD-3

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 60.00 ft

Roadway Data for Crossing: EX. CD-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 65.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51 cfs

Design Flow: 59 cfs

Maximum Flow: 101 cfs

Table 16 - Summary of Culvert Flows at Crossing: PR. CD-3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 3 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
63.84	51.00	51.00	0.00	1
64.22	56.00	56.00	0.00	1
64.46	59.00	59.00	0.00	1
65.00	66.00	65.14	0.30	67
65.02	71.00	65.35	5.04	5
65.04	76.00	65.50	10.03	4
65.05	81.00	65.62	15.12	4
65.06	86.00	65.72	19.77	3
65.07	91.00	65.81	24.74	3
65.07	96.00	65.90	29.76	3
65.08	101.00	65.99	34.76	3
65.00	65.11	65.11	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-3

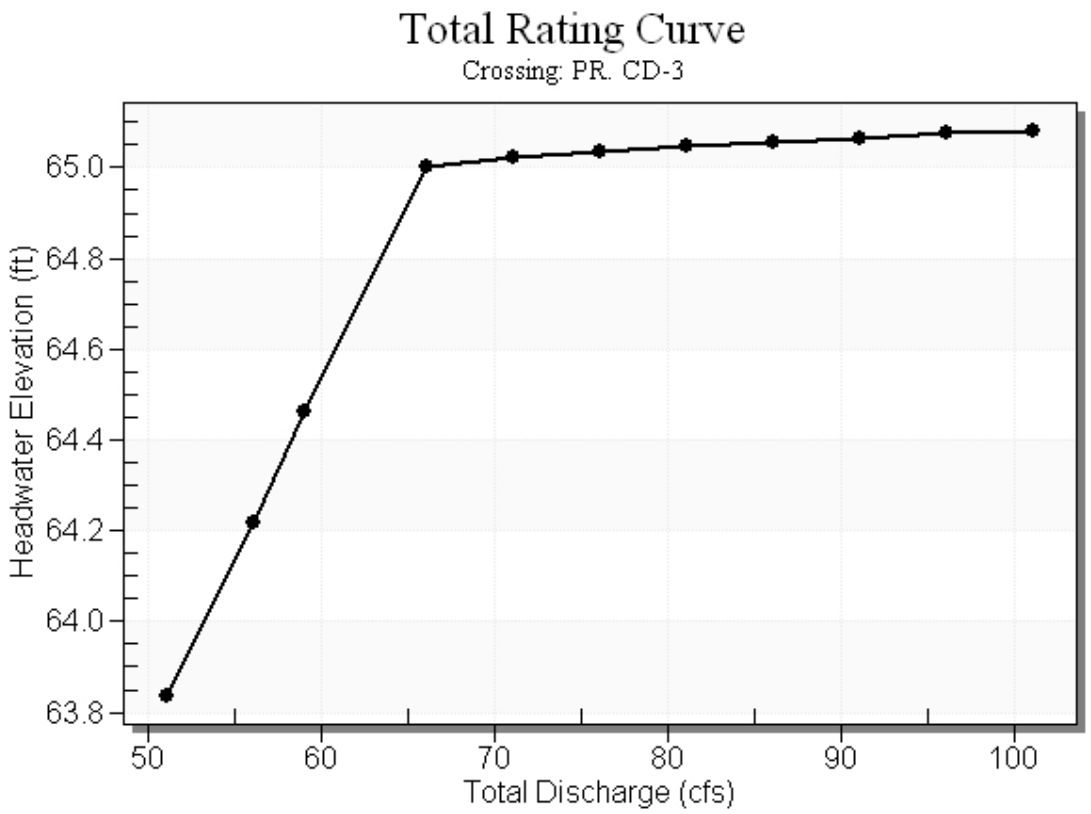


Table 17 - Culvert Summary Table: Culvert 3 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
51.00	51.00	63.84	3.838	2.199	5-S2n	1.613	2.320	1.689	2.000	12.448	0.00
56.00	56.00	64.22	4.216	2.588	5-S2n	1.710	2.424	1.792	2.000	12.727	0.00
59.00	59.00	64.46	4.461	2.834	5-S2n	1.769	2.481	1.854	2.000	12.875	0.00
66.00	65.14	65.00	5.003	3.367	5-S2n	1.888	2.587	1.978	2.000	13.190	0.00
71.00	65.35	65.02	5.023	3.386	5-S2n	1.892	2.590	1.982	2.000	13.202	0.00
76.00	65.50	65.04	5.036	3.399	5-S2n	1.895	2.592	1.985	2.000	13.210	0.00
81.00	65.62	65.05	5.048	3.410	5-S2n	1.897	2.594	1.987	2.000	13.217	0.00
86.00	65.72	65.06	5.057	3.419	5-S2n	1.899	2.596	1.989	2.000	13.223	0.00
91.00	65.81	65.07	5.065	3.427	5-S2n	1.901	2.597	1.991	2.000	13.228	0.00
96.00	65.90	65.07	5.074	3.436	5-S2n	1.902	2.598	1.993	2.000	13.234	0.00
101.00	65.99	65.08	5.083	3.444	5-S2n	1.904	2.600	1.995	2.000	13.239	0.00

****

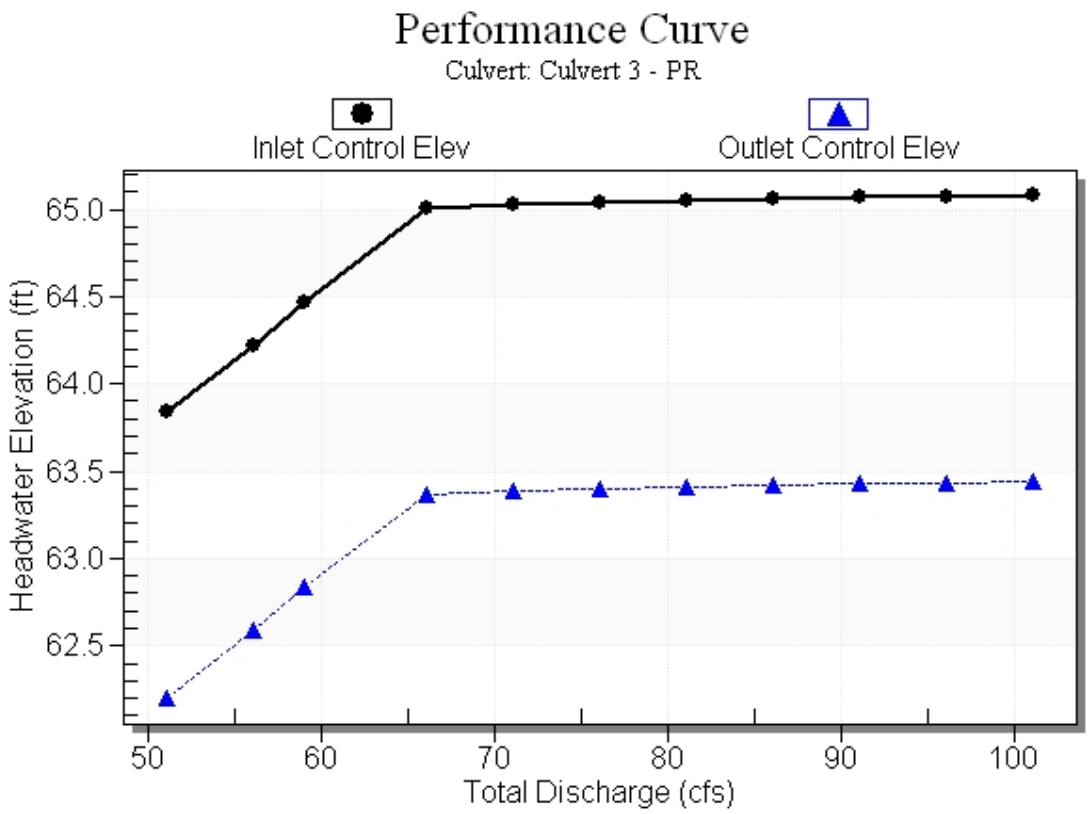
Straight Culvert

Inlet Elevation (invert): 60.00 ft, Outlet Elevation (invert): 57.90 ft

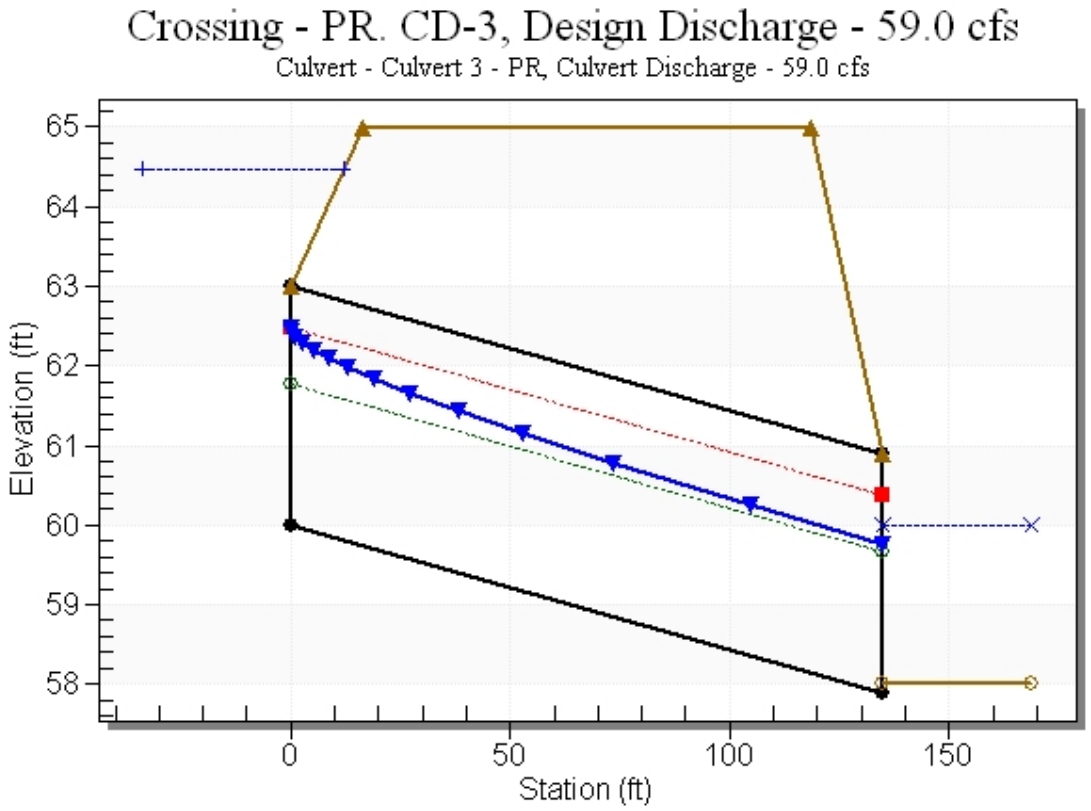
Culvert Length: 135.02 ft, Culvert Slope: 0.0156

****

Culvert Performance Curve Plot: Culvert 3 - PR



Water Surface Profile Plot for Culvert: Culvert 3 - PR



Site Data - Culvert 3 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 60.00 ft

Outlet Station: 135.00 ft

Outlet Elevation: 57.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3 - PR

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 18 - Downstream Channel Rating Curve (Crossing: PR. CD-3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	60.00	2.00
56.00	60.00	2.00
59.00	60.00	2.00
66.00	60.00	2.00
71.00	60.00	2.00
76.00	60.00	2.00
81.00	60.00	2.00
86.00	60.00	2.00
91.00	60.00	2.00
96.00	60.00	2.00
101.00	60.00	2.00

Tailwater Channel Data - PR. CD-3

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 60.00 ft

Roadway Data for Crossing: PR. CD-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 65.00 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 86 cfs

Design Flow: 101 cfs

Maximum Flow: 171 cfs

Table 19 - Summary of Culvert Flows at Crossing: EX. CD-5

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 5 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
64.59	86.00	86.00	0.00	1
64.93	94.50	94.50	0.00	1
65.21	101.00	101.00	0.00	1
65.70	111.50	111.50	0.00	1
66.12	120.00	120.00	0.00	1
66.26	128.50	122.69	5.55	10
66.31	137.00	123.62	13.23	6
66.35	145.50	124.37	20.98	5
66.39	154.00	125.03	28.71	4
66.42	162.50	125.64	36.68	4
66.45	171.00	126.21	44.68	4
66.20	121.48	121.48	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-5

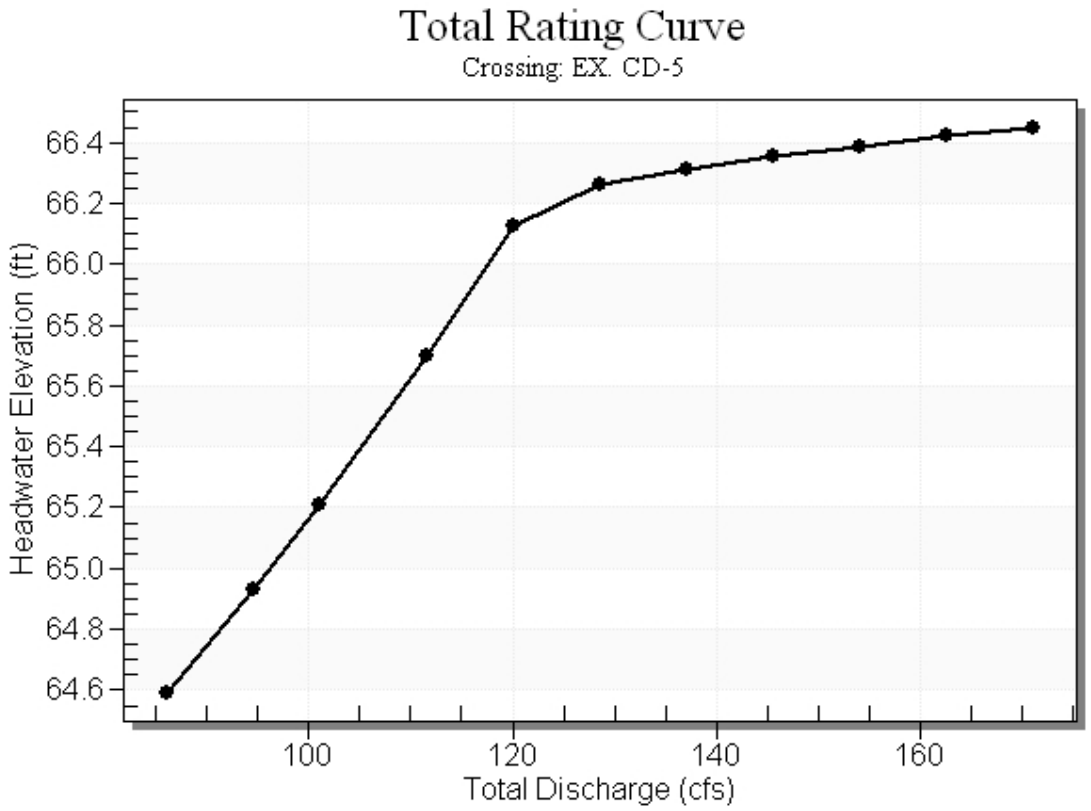


Table 20 - Culvert Summary Table: Culvert 5 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
86.00	86.00	64.59	4.029	4.493	7-M2t	3.000	2.430	2.950	2.900	7.288	0.00
94.50	94.50	64.93	4.386	4.830	7-M2t	3.000	2.588	2.950	2.900	8.008	0.00
101.00	101.00	65.21	4.674	5.109	7-M2t	3.000	2.705	2.950	2.900	8.559	0.00
111.50	111.50	65.70	5.171	5.598	7-M2t	3.000	2.890	2.950	2.900	9.449	0.00
120.00	120.00	66.12	5.603	6.024	6-FFc	3.000	3.000	3.000	2.900	10.000	0.00
128.50	122.69	66.26	5.746	6.163	6-FFc	3.000	3.000	3.000	2.900	10.224	0.00
137.00	123.62	66.31	5.796	6.212	6-FFc	3.000	3.000	3.000	2.900	10.302	0.00
145.50	124.37	66.35	5.837	6.252	6-FFc	3.000	3.000	3.000	2.900	10.364	0.00
154.00	125.03	66.39	5.872	6.287	6-FFc	3.000	3.000	3.000	2.900	10.419	0.00
162.50	125.64	66.42	5.906	6.320	6-FFc	3.000	3.000	3.000	2.900	10.470	0.00
171.00	126.21	66.45	5.937	6.350	6-FFc	3.000	3.000	3.000	2.900	10.517	0.00

****

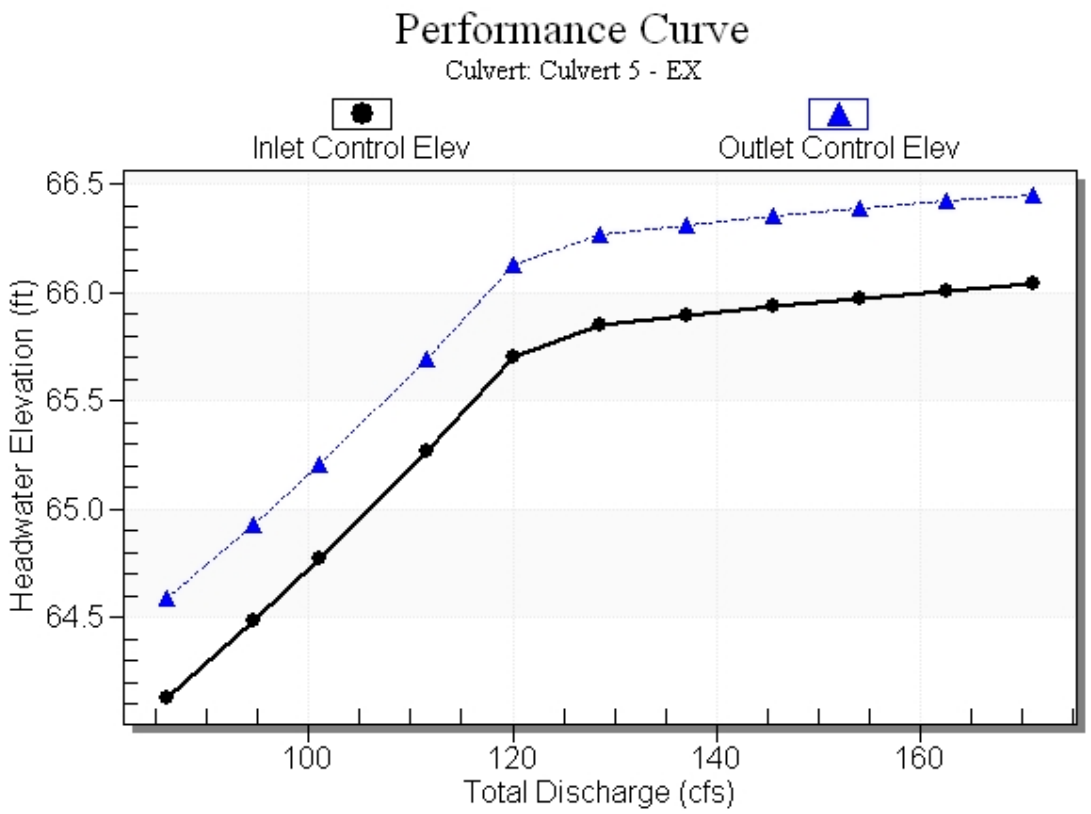
Straight Culvert

Inlet Elevation (invert): 60.10 ft, Outlet Elevation (invert): 60.05 ft

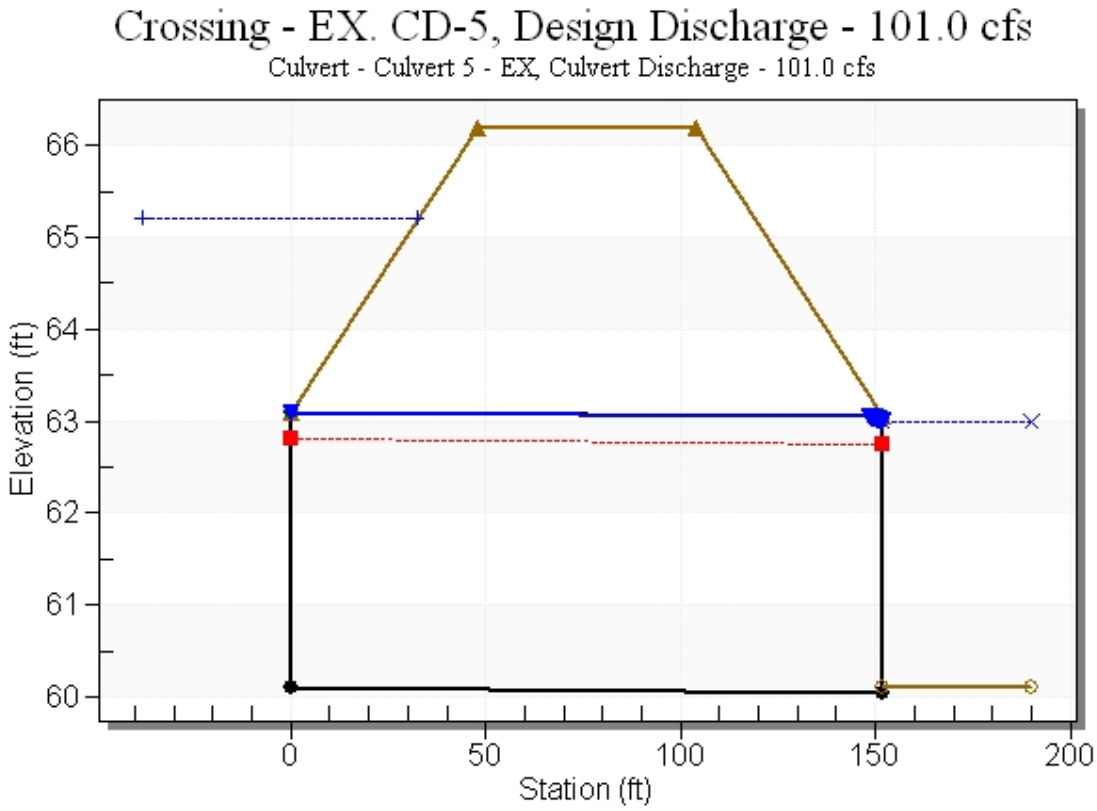
Culvert Length: 152.00 ft, Culvert Slope: 0.0003

****

Culvert Performance Curve Plot: Culvert 5 - EX



Water Surface Profile Plot for Culvert: Culvert 5 - EX



Site Data - Culvert 5 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 60.10 ft

Outlet Station: 152.00 ft

Outlet Elevation: 60.05 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 5 - EX

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: NONE

Table 21 - Downstream Channel Rating Curve (Crossing: EX. CD-5)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
86.00	63.00	2.90
94.50	63.00	2.90
101.00	63.00	2.90
111.50	63.00	2.90
120.00	63.00	2.90
128.50	63.00	2.90
137.00	63.00	2.90
145.50	63.00	2.90
154.00	63.00	2.90
162.50	63.00	2.90
171.00	63.00	2.90

Tailwater Channel Data - EX. CD-5

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 63.00 ft

Roadway Data for Crossing: EX. CD-5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 66.20 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 86 cfs

Design Flow: 101 cfs

Maximum Flow: 171 cfs

Table 22 - Summary of Culvert Flows at Crossing: PR. CD-5

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 5 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
64.63	86.00	86.00	0.00	1
64.97	94.50	94.50	0.00	1
65.25	101.00	101.00	0.00	1
65.74	111.50	111.50	0.00	1
66.18	120.00	120.00	0.00	1
66.26	128.50	121.57	6.64	8
66.30	137.00	122.33	14.35	5
66.34	145.50	122.97	22.38	5
66.37	154.00	123.53	30.22	4
66.40	162.50	124.04	38.29	4
66.42	171.00	124.52	46.37	4
66.20	120.41	120.41	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-5

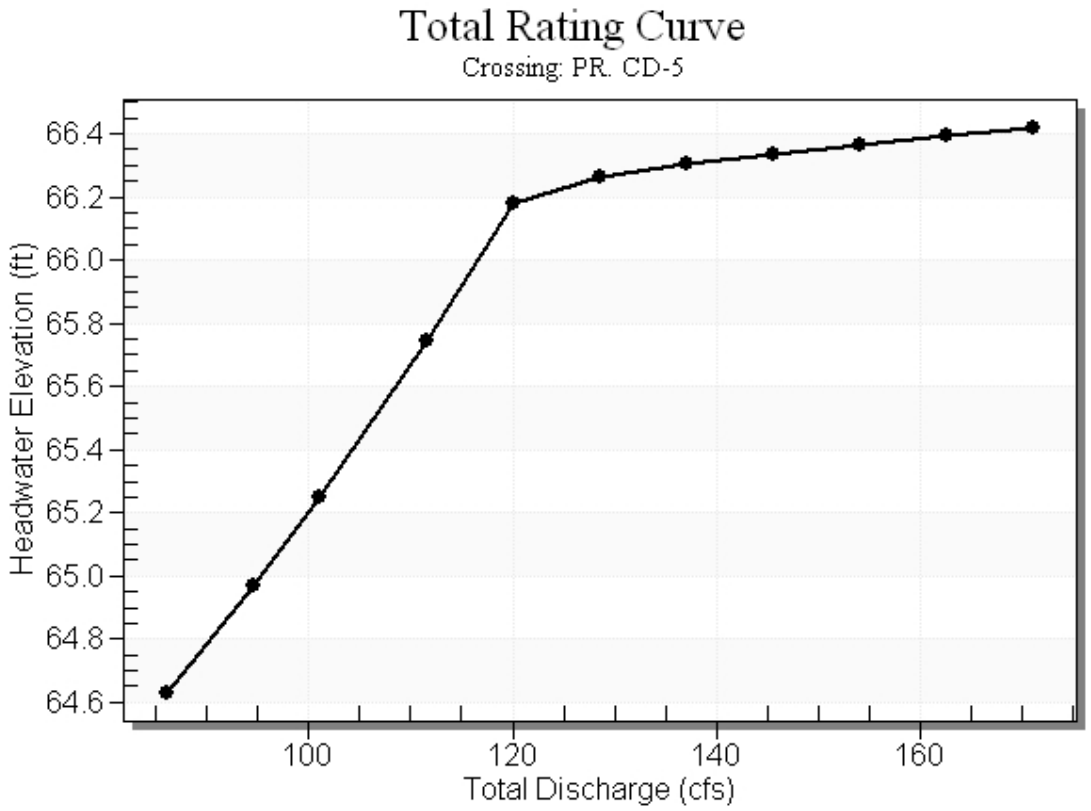


Table 23 - Culvert Summary Table: Culvert 5 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
86.00	86.00	64.63	4.028	4.532	4-FFf	3.000	2.430	3.000	2.900	7.167	0.00
94.50	94.50	64.97	4.385	4.871	4-FFf	3.000	2.588	3.000	2.900	7.875	0.00
101.00	101.00	65.25	4.674	5.151	4-FFf	3.000	2.705	3.000	2.900	8.417	0.00
111.50	111.50	65.74	5.170	5.643	4-FFf	3.000	2.890	3.000	2.900	9.292	0.00
120.00	120.00	66.18	5.603	6.077	4-FFf	3.000	3.000	3.000	2.900	10.000	0.00
128.50	121.57	66.26	5.686	6.161	4-FFf	3.000	3.000	3.000	2.900	10.131	0.00
137.00	122.33	66.30	5.726	6.202	4-FFf	3.000	3.000	3.000	2.900	10.194	0.00
145.50	122.97	66.34	5.761	6.237	4-FFf	3.000	3.000	3.000	2.900	10.248	0.00
154.00	123.53	66.37	5.790	6.267	4-FFf	3.000	3.000	3.000	2.900	10.294	0.00
162.50	124.04	66.40	5.818	6.295	4-FFf	3.000	3.000	3.000	2.900	10.337	0.00
171.00	124.52	66.42	5.844	6.321	4-FFf	3.000	3.000	3.000	2.900	10.377	0.00

****

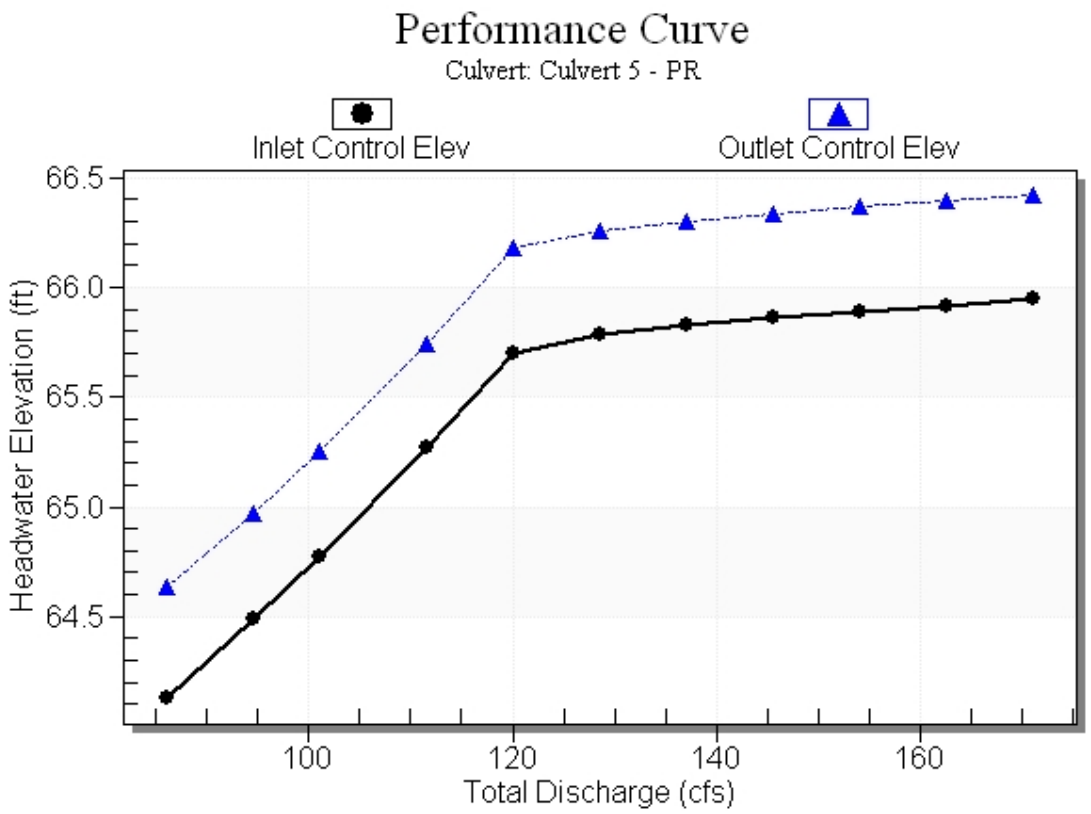
Straight Culvert

Inlet Elevation (invert): 60.10 ft, Outlet Elevation (invert): 60.00 ft

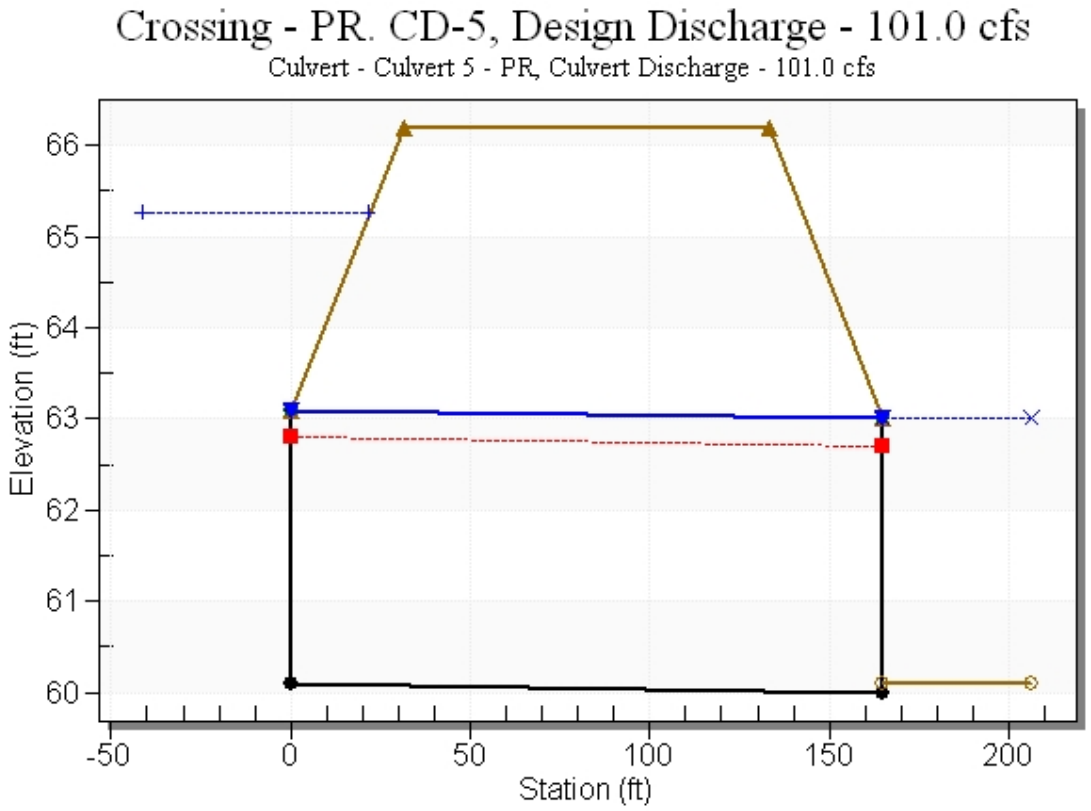
Culvert Length: 165.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: Culvert 5 - PR



Water Surface Profile Plot for Culvert: Culvert 5 - PR



Site Data - Culvert 5 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 60.10 ft

Outlet Station: 165.00 ft

Outlet Elevation: 60.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 5 - PR

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: NONE

Table 24 - Downstream Channel Rating Curve (Crossing: PR. CD-5)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
86.00	63.00	2.90
94.50	63.00	2.90
101.00	63.00	2.90
111.50	63.00	2.90
120.00	63.00	2.90
128.50	63.00	2.90
137.00	63.00	2.90
145.50	63.00	2.90
154.00	63.00	2.90
162.50	63.00	2.90
171.00	63.00	2.90

Tailwater Channel Data - PR. CD-5

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 63.00 ft

Roadway Data for Crossing: PR. CD-5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 66.20 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51 cfs

Design Flow: 59 cfs

Maximum Flow: 101 cfs

Table 25 - Summary of Culvert Flows at Crossing: EX. CD-6

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 6 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
82.72	51.00	51.00	0.00	1
83.08	56.00	56.00	0.00	1
83.31	59.00	59.00	0.00	1
83.89	66.00	66.00	0.00	1
84.02	71.00	67.48	3.07	18
84.03	76.00	67.64	7.75	4
84.04	81.00	67.77	12.88	4
84.05	86.00	67.88	17.51	3
84.06	91.00	67.99	22.48	3
84.07	96.00	68.09	27.52	3
84.08	101.00	68.18	32.54	3
84.00	67.30	67.30	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-6

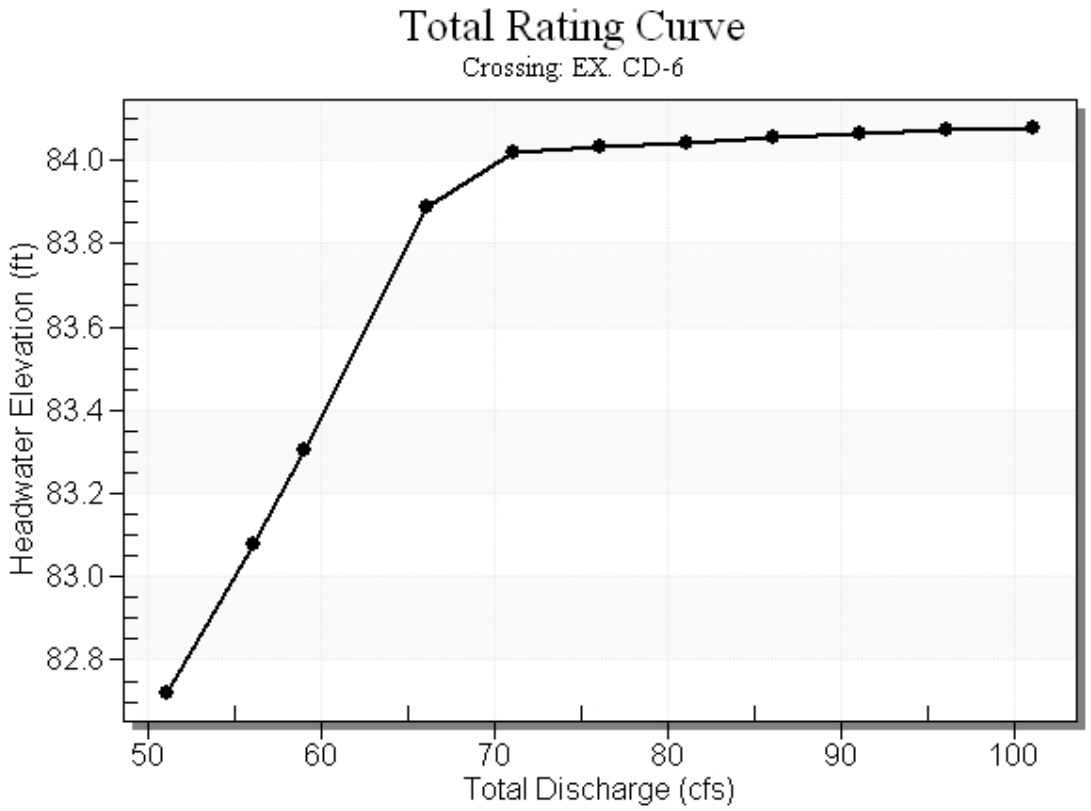


Table 26 - Culvert Summary Table: Culvert 6 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
51.00	51.00	82.72	3.859	4.523	4-FFf	3.000	2.320	3.000	3.000	7.215	0.00
56.00	56.00	83.08	4.237	4.877	4-FFf	3.000	2.424	3.000	3.000	7.922	0.00
59.00	59.00	83.31	4.482	5.106	4-FFf	3.000	2.481	3.000	3.000	8.347	0.00
66.00	66.00	83.89	5.105	5.686	4-FFf	3.000	2.600	3.000	3.000	9.337	0.00
71.00	67.48	84.02	5.245	5.816	4-FFf	3.000	2.622	3.000	3.000	9.547	0.00
76.00	67.64	84.03	5.260	5.831	4-FFf	3.000	2.624	3.000	3.000	9.569	0.00
81.00	67.77	84.04	5.273	5.843	4-FFf	3.000	2.626	3.000	3.000	9.588	0.00
86.00	67.88	84.05	5.284	5.852	4-FFf	3.000	2.628	3.000	3.000	9.603	0.00
91.00	67.99	84.06	5.294	5.862	4-FFf	3.000	2.629	3.000	3.000	9.618	0.00
96.00	68.09	84.07	5.304	5.871	4-FFf	3.000	2.631	3.000	3.000	9.632	0.00
101.00	68.18	84.08	5.312	5.879	4-FFf	3.000	2.632	3.000	3.000	9.645	0.00

****

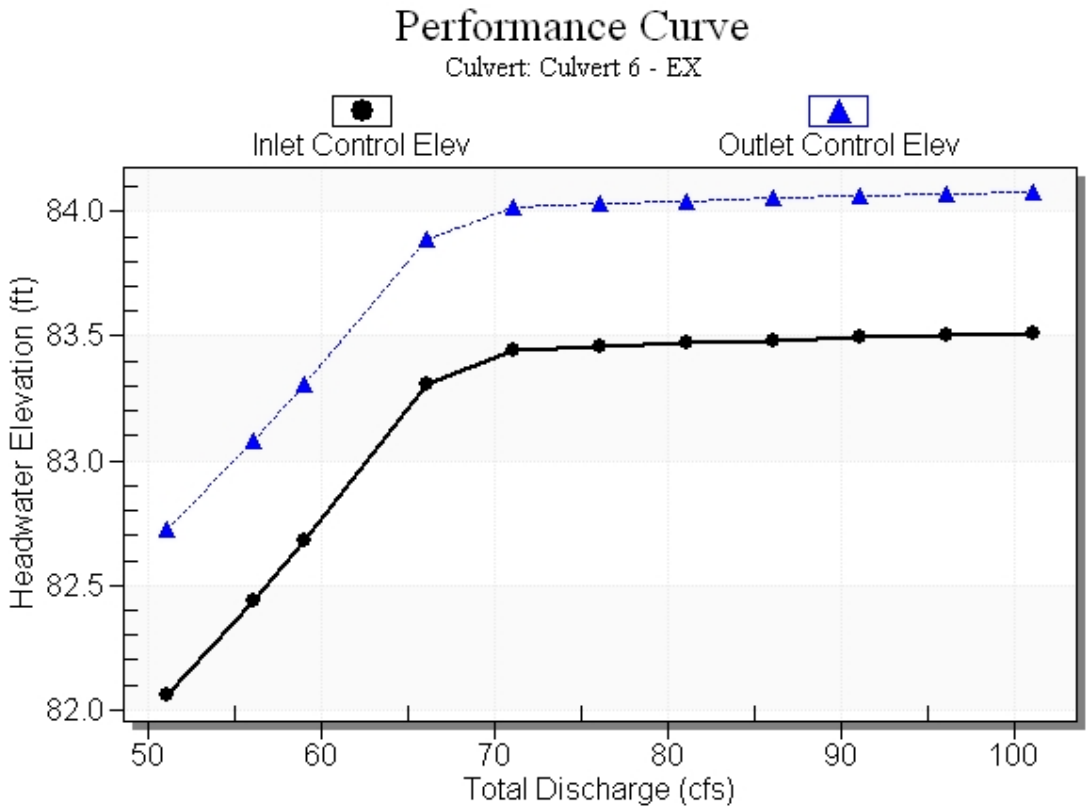
Straight Culvert

Inlet Elevation (invert): 78.20 ft, Outlet Elevation (invert): 78.00 ft

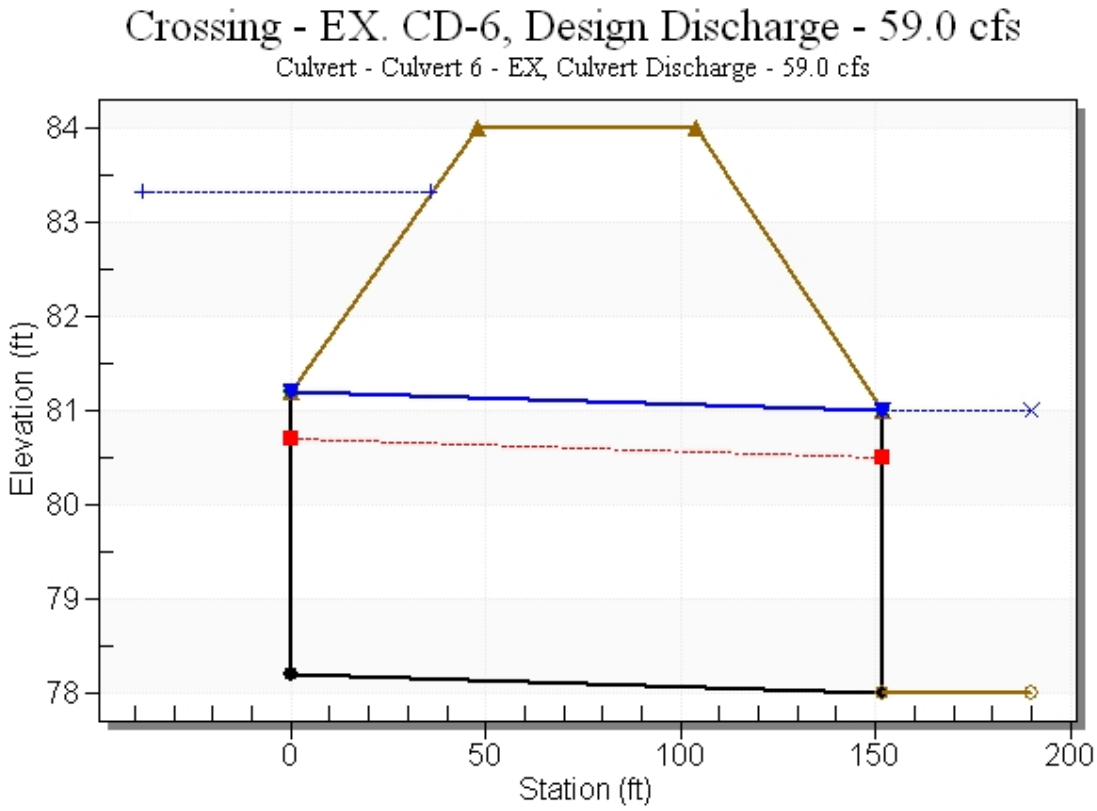
Culvert Length: 152.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 6 - EX



Water Surface Profile Plot for Culvert: Culvert 6 - EX



Site Data - Culvert 6 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 78.20 ft

Outlet Station: 152.00 ft

Outlet Elevation: 78.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 6 - EX

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 27 - Downstream Channel Rating Curve (Crossing: EX. CD-6)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	81.00	3.00
56.00	81.00	3.00
59.00	81.00	3.00
66.00	81.00	3.00
71.00	81.00	3.00
76.00	81.00	3.00
81.00	81.00	3.00
86.00	81.00	3.00
91.00	81.00	3.00
96.00	81.00	3.00
101.00	81.00	3.00

Tailwater Channel Data - EX. CD-6

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 81.00 ft

Roadway Data for Crossing: EX. CD-6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 84.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51 cfs

Design Flow: 59 cfs

Maximum Flow: 101 cfs

Table 28 - Summary of Culvert Flows at Crossing: PR. CD-6

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 6 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
82.76	51.00	51.00	0.00	1
83.13	56.00	56.00	0.00	1
83.36	59.00	59.00	0.00	1
83.95	66.00	66.00	0.00	1
84.02	71.00	66.75	3.78	11
84.03	76.00	66.90	8.55	4
84.04	81.00	67.03	13.66	4
84.05	86.00	67.13	18.30	3
84.06	91.00	67.23	23.27	3
84.07	96.00	67.33	28.30	3
84.08	101.00	67.42	33.31	3
84.00	66.53	66.53	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-6

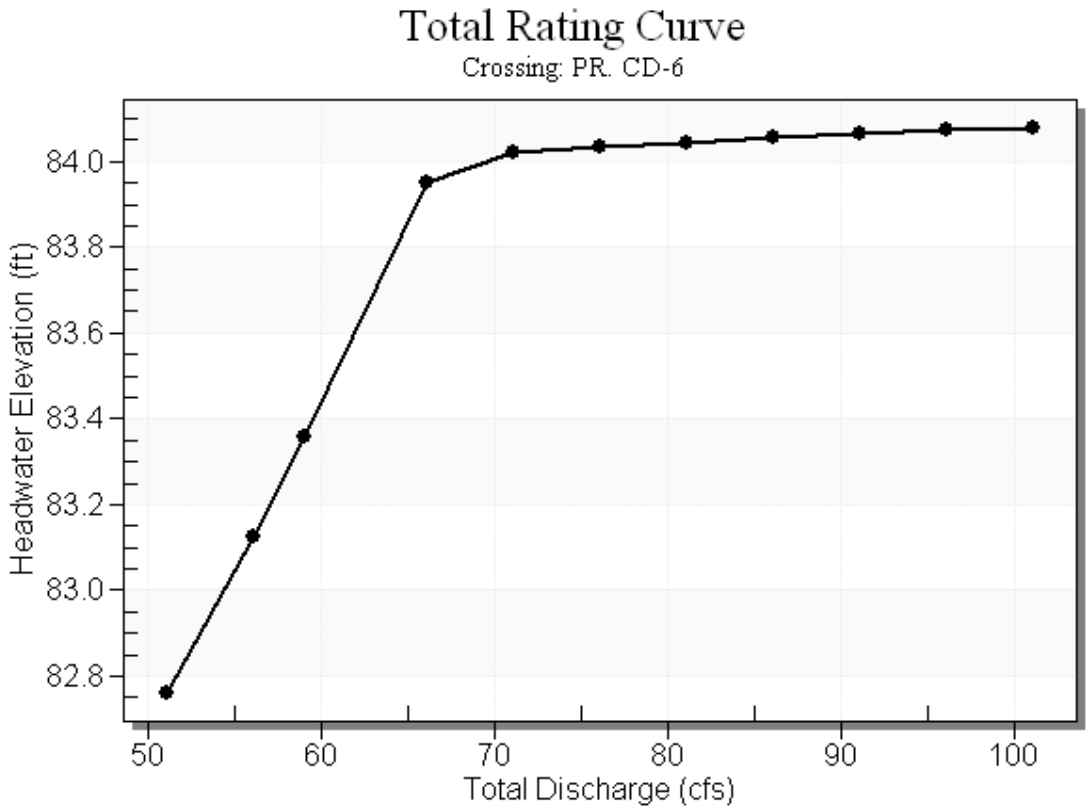


Table 29 - Culvert Summary Table: Culvert 6 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
51.00	51.00	82.76	3.858	4.563	4-FFf	3.000	2.320	3.000	3.000	7.215	0.00
56.00	56.00	83.13	4.237	4.925	4-FFf	3.000	2.424	3.000	3.000	7.922	0.00
59.00	59.00	83.36	4.481	5.159	4-FFf	3.000	2.481	3.000	3.000	8.347	0.00
66.00	66.00	83.95	5.104	5.752	4-FFf	3.000	2.600	3.000	3.000	9.337	0.00
71.00	66.75	84.02	5.174	5.819	4-FFf	3.000	2.611	3.000	3.000	9.442	0.00
76.00	66.90	84.03	5.189	5.833	4-FFf	3.000	2.613	3.000	3.000	9.464	0.00
81.00	67.03	84.04	5.201	5.845	4-FFf	3.000	2.615	3.000	3.000	9.482	0.00
86.00	67.13	84.05	5.211	5.854	4-FFf	3.000	2.617	3.000	3.000	9.497	0.00
91.00	67.23	84.06	5.221	5.863	4-FFf	3.000	2.618	3.000	3.000	9.512	0.00
96.00	67.33	84.07	5.230	5.872	4-FFf	3.000	2.620	3.000	3.000	9.525	0.00
101.00	67.42	84.08	5.239	5.880	4-FFf	3.000	2.621	3.000	3.000	9.538	0.00

****

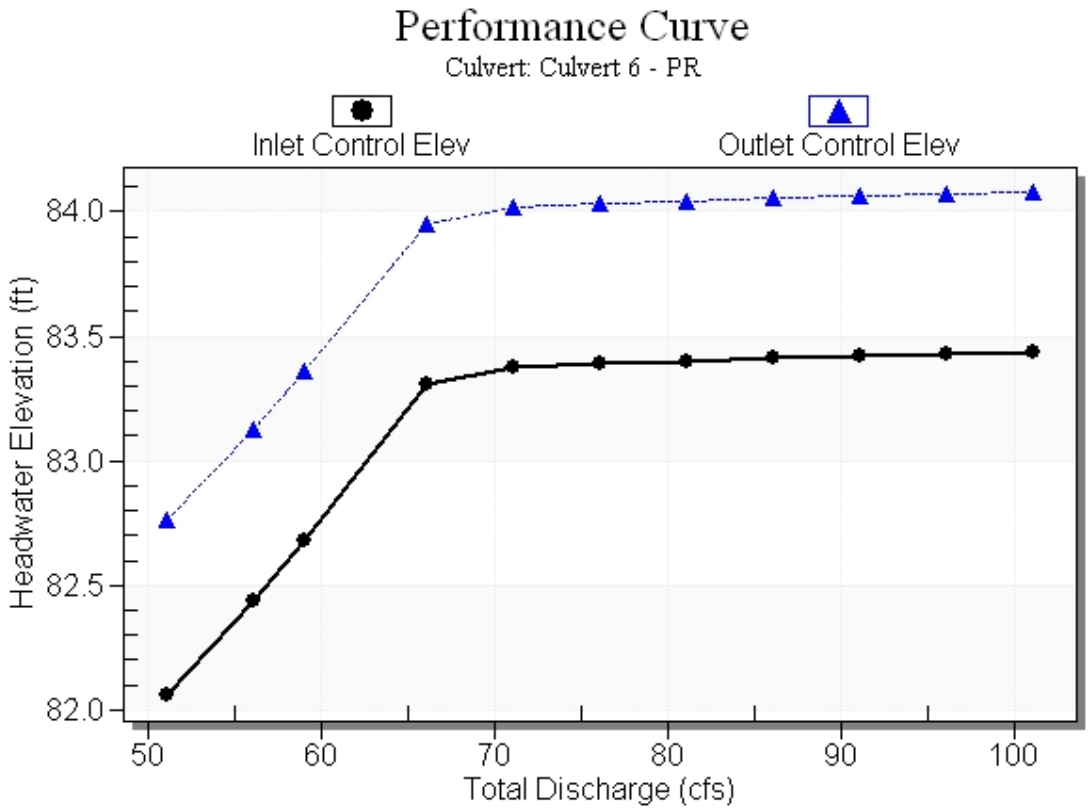
Straight Culvert

Inlet Elevation (invert): 78.20 ft, Outlet Elevation (invert): 77.90 ft

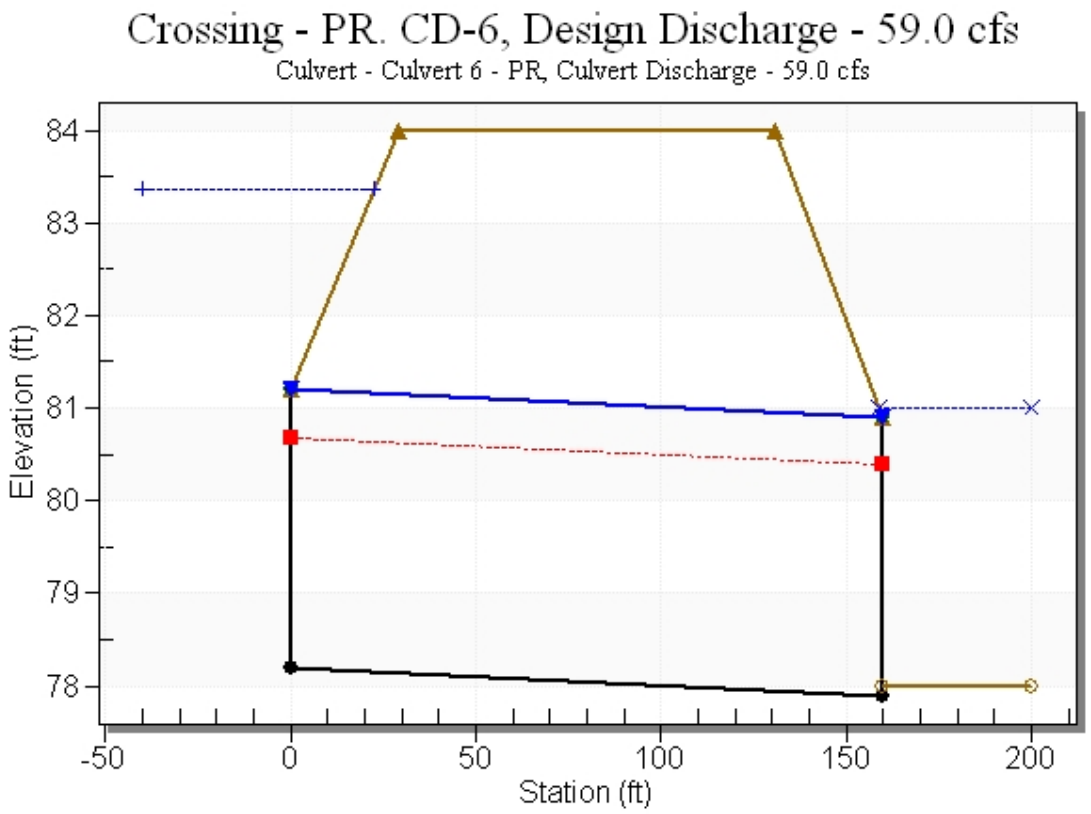
Culvert Length: 160.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Culvert 6 - PR



Water Surface Profile Plot for Culvert: Culvert 6 - PR



Site Data - Culvert 6 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 78.20 ft

Outlet Station: 160.00 ft

Outlet Elevation: 77.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 6 - PR

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 30 - Downstream Channel Rating Curve (Crossing: PR. CD-6)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	81.00	3.00
56.00	81.00	3.00
59.00	81.00	3.00
66.00	81.00	3.00
71.00	81.00	3.00
76.00	81.00	3.00
81.00	81.00	3.00
86.00	81.00	3.00
91.00	81.00	3.00
96.00	81.00	3.00
101.00	81.00	3.00

Tailwater Channel Data - PR. CD-6

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 81.00 ft

Roadway Data for Crossing: PR. CD-6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 84.00 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 151 cfs

Design Flow: 176 cfs

Maximum Flow: 300 cfs

Table 31 - Summary of Culvert Flows at Crossing: EX. CD-7

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 7 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
74.24	151.00	151.00	0.00	1
74.60	165.90	165.90	0.00	1
74.85	176.00	176.00	0.00	1
75.39	195.70	195.70	0.00	1
75.85	210.60	210.60	0.00	1
76.37	225.50	225.50	0.00	1
76.63	240.40	231.07	8.47	18
76.67	255.30	228.66	25.65	5
76.70	270.20	226.12	43.69	5
76.72	285.10	223.47	60.98	4
76.74	300.00	220.84	78.73	4
76.60	232.20	232.20	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-7

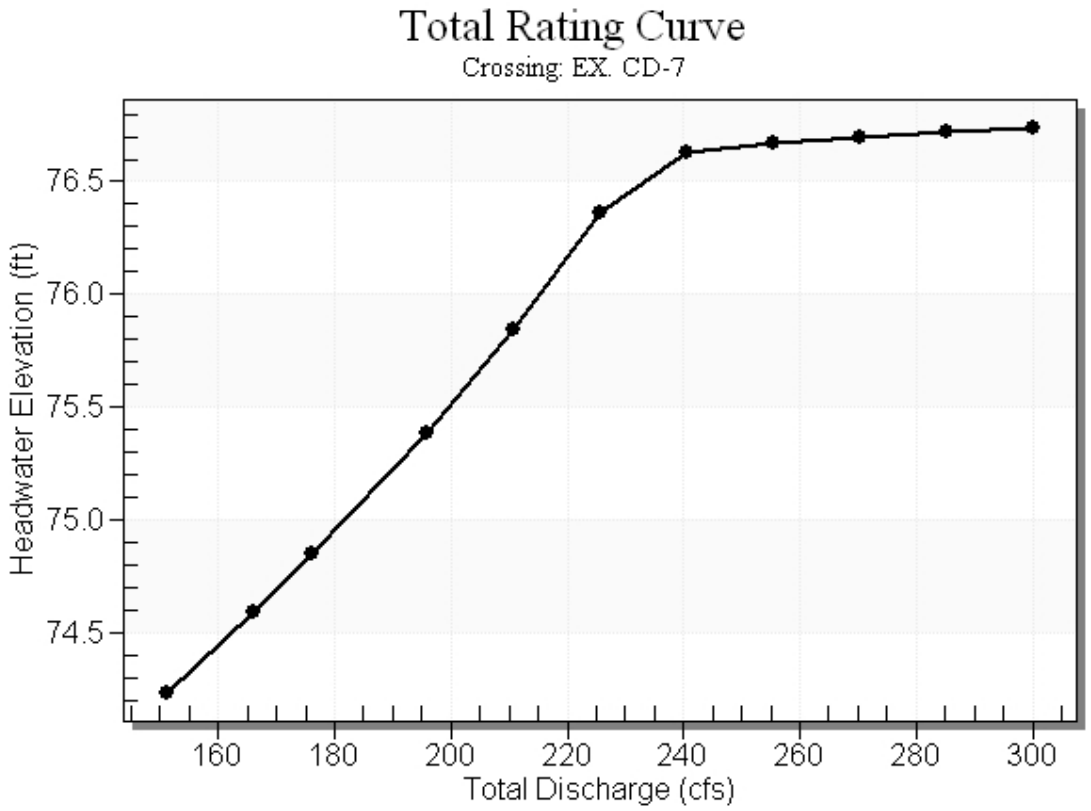


Table 32 - Culvert Summary Table: Culvert 7 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
151.00	151.00	74.24	4.039	3.937	3-M2t	3.000	2.436	2.592	2.572	8.322	0.00
165.90	165.90	74.60	4.397	4.328	7-M2t	3.000	2.593	2.725	2.705	8.698	0.00
176.00	176.00	74.85	4.653	4.629	7-M2t	3.000	2.698	2.811	2.791	8.945	0.00
195.70	195.70	75.39	5.185	5.173	7-M2t	3.000	2.895	2.972	2.952	9.406	0.00
210.60	210.60	75.85	5.619	5.647	4-FFf	3.000	3.000	3.000	3.069	10.029	0.00
225.50	225.50	76.37	6.083	6.166	4-FFf	3.000	3.000	3.000	3.180	10.738	0.00
240.40	231.07	76.63	6.264	6.433	4-FFf	3.000	3.000	3.000	3.289	11.004	0.00
255.30	228.66	76.67	6.185	6.469	4-FFf	3.000	3.000	3.000	3.393	10.889	0.00
270.20	226.12	76.70	6.103	6.497	4-FFf	3.000	3.000	3.000	3.494	10.768	0.00
285.10	223.47	76.72	6.018	6.521	4-FFf	3.000	3.000	3.000	3.592	10.642	0.00
300.00	220.84	76.74	5.935	6.543	4-FFf	3.000	3.000	3.000	3.688	10.516	0.00

****

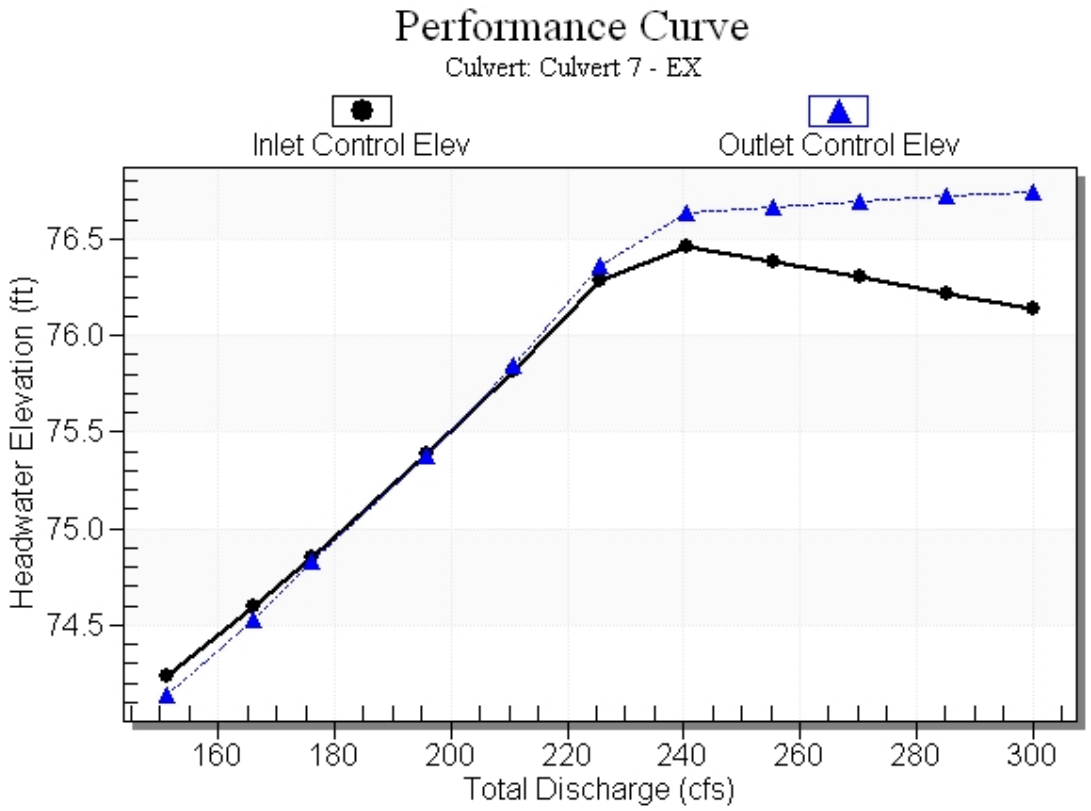
Straight Culvert

Inlet Elevation (invert): 70.20 ft, Outlet Elevation (invert): 69.98 ft

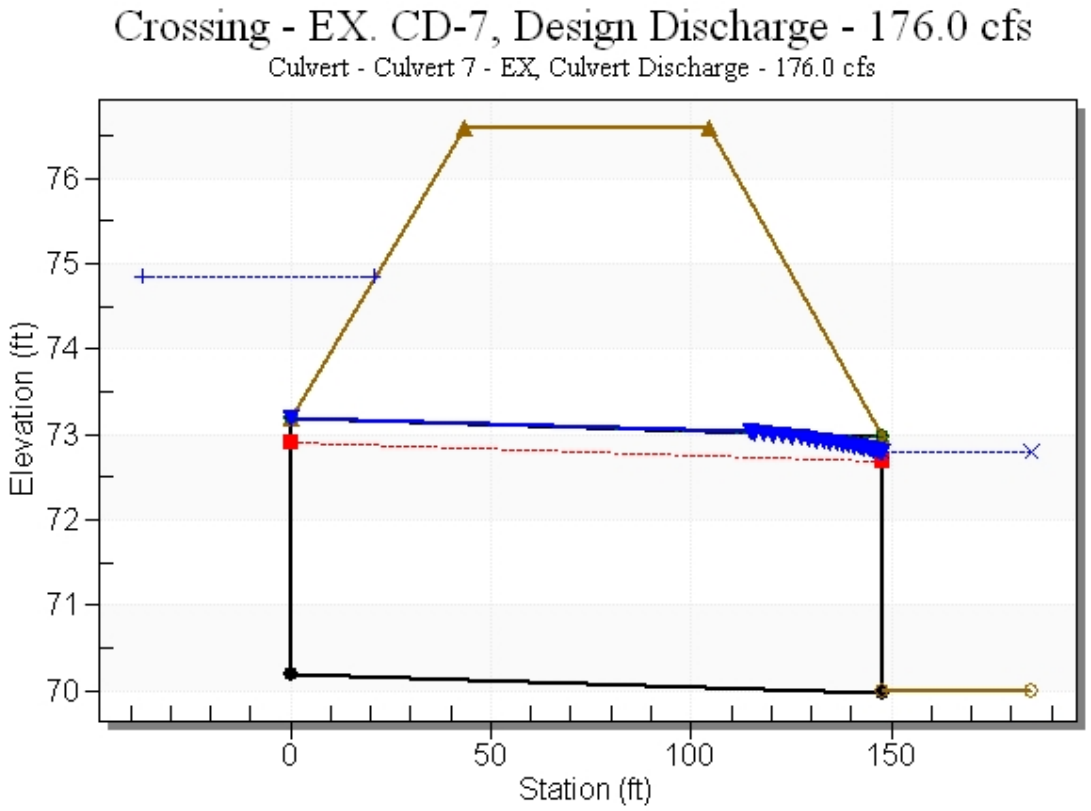
Culvert Length: 148.00 ft, Culvert Slope: 0.0015

****

Culvert Performance Curve Plot: Culvert 7 - EX



Water Surface Profile Plot for Culvert: Culvert 7 - EX



Site Data - Culvert 7 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 70.20 ft

Outlet Station: 148.00 ft

Outlet Elevation: 69.98 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 7 - EX

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: NONE

Table 33 - Downstream Channel Rating Curve (Crossing: EX. CD-7)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
151.00	72.57	2.57	2.66	0.16	0.34
165.90	72.70	2.70	2.73	0.17	0.34
176.00	72.79	2.79	2.78	0.17	0.34
195.70	72.95	2.95	2.87	0.18	0.34
210.60	73.07	3.07	2.93	0.19	0.34
225.50	73.18	3.18	2.99	0.20	0.35
240.40	73.29	3.29	3.04	0.21	0.35
255.30	73.39	3.39	3.09	0.21	0.35
270.20	73.49	3.49	3.14	0.22	0.35
285.10	73.59	3.59	3.19	0.22	0.35
300.00	73.69	3.69	3.24	0.23	0.35

Tailwater Channel Data - EX. CD-7

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 15.00 ft

Side Slope (H:V): 2.75 (_:1)

Channel Slope: 0.0010

Channel Manning's n: 0.0270

Channel Invert Elevation: 70.00 ft

Roadway Data for Crossing: EX. CD-7

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 76.60 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 151 cfs

Design Flow: 176 cfs

Maximum Flow: 300 cfs

Table 34 - Summary of Culvert Flows at Crossing: PR. CD-7

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 7 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
74.24	151.00	151.00	0.00	1
74.59	165.90	165.90	0.00	1
74.85	176.00	176.00	0.00	1
75.41	195.70	195.70	0.00	1
75.92	210.60	210.60	0.00	1
76.45	225.50	225.50	0.00	1
76.64	240.40	228.32	11.44	14
76.67	255.30	225.88	28.62	5
76.70	270.20	223.30	45.85	4
76.72	285.10	220.71	63.75	4
76.75	300.00	218.21	81.41	4
76.60	229.75	229.75	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-7

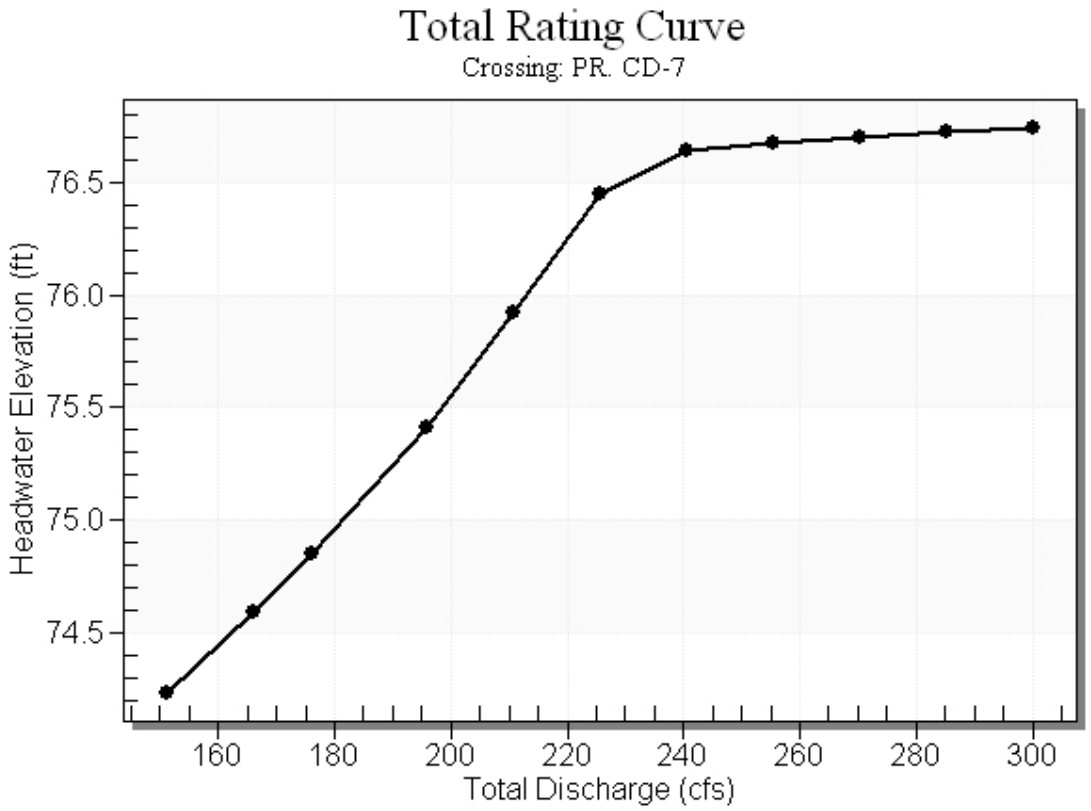


Table 35 - Culvert Summary Table: Culvert 7 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
151.00	151.00	74.24	4.036	3.893	7-M1t	2.441	2.436	2.872	2.572	7.511	0.00
165.90	165.90	74.59	4.395	4.274	4-FFf	2.611	2.593	3.000	2.705	7.900	0.00
176.00	176.00	74.85	4.650	4.583	4-FFf	2.727	2.698	3.000	2.791	8.381	0.00
195.70	195.70	75.41	5.183	5.215	4-FFf	3.000	2.895	3.000	2.952	9.319	0.00
210.60	210.60	75.92	5.617	5.720	4-FFf	3.000	3.000	3.000	3.069	10.029	0.00
225.50	225.50	76.45	6.080	6.250	4-FFf	3.000	3.000	3.000	3.180	10.738	0.00
240.40	228.32	76.64	6.171	6.440	4-FFf	3.000	3.000	3.000	3.289	10.872	0.00
255.30	225.88	76.67	6.093	6.474	4-FFf	3.000	3.000	3.000	3.393	10.756	0.00
270.20	223.30	76.70	6.010	6.500	4-FFf	3.000	3.000	3.000	3.494	10.633	0.00
285.10	220.71	76.72	5.928	6.525	4-FFf	3.000	3.000	3.000	3.592	10.510	0.00
300.00	218.21	76.75	5.850	6.549	4-FFf	3.000	3.000	3.000	3.688	10.391	0.00

****

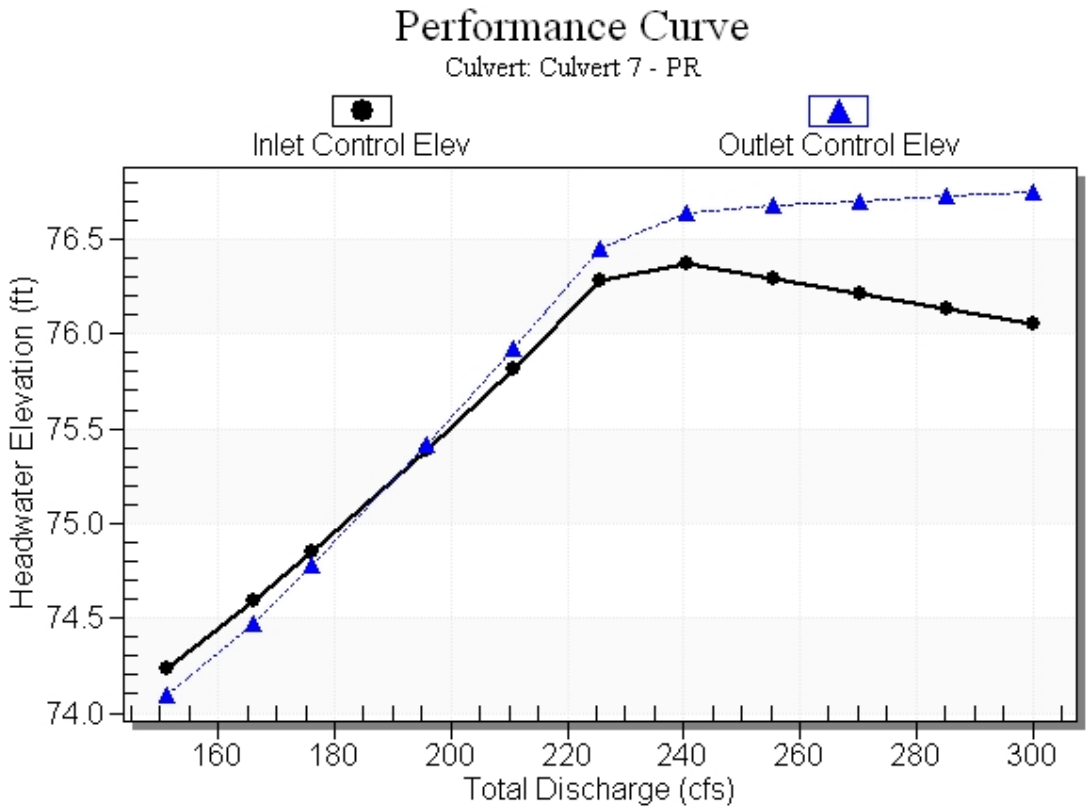
Straight Culvert

Inlet Elevation (invert): 70.20 ft, Outlet Elevation (invert): 69.70 ft

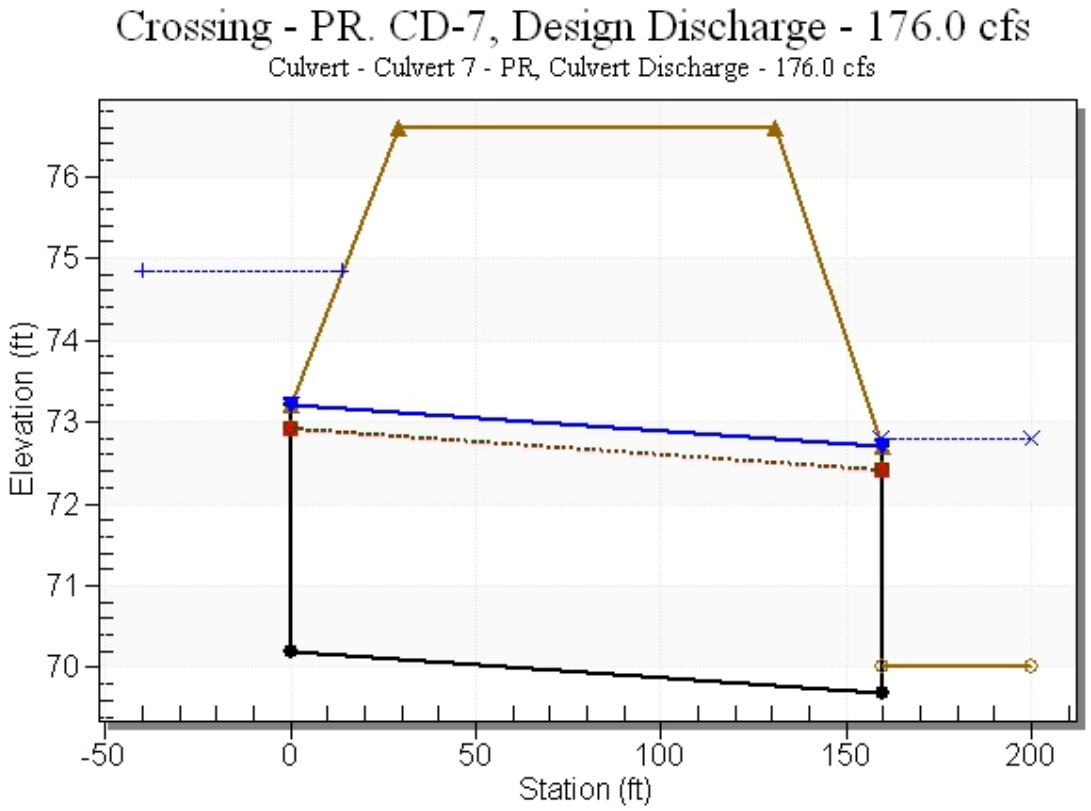
Culvert Length: 160.00 ft, Culvert Slope: 0.0031

****

Culvert Performance Curve Plot: Culvert 7 - PR



Water Surface Profile Plot for Culvert: Culvert 7 - PR



Site Data - Culvert 7 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 70.20 ft

Outlet Station: 160.00 ft

Outlet Elevation: 69.70 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 7 - PR

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: NONE

Table 36 - Downstream Channel Rating Curve (Crossing: PR. CD-7)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
151.00	72.57	2.57	2.66	0.16	0.34
165.90	72.70	2.70	2.73	0.17	0.34
176.00	72.79	2.79	2.78	0.17	0.34
195.70	72.95	2.95	2.87	0.18	0.34
210.60	73.07	3.07	2.93	0.19	0.34
225.50	73.18	3.18	2.99	0.20	0.35
240.40	73.29	3.29	3.04	0.21	0.35
255.30	73.39	3.39	3.09	0.21	0.35
270.20	73.49	3.49	3.14	0.22	0.35
285.10	73.59	3.59	3.19	0.22	0.35
300.00	73.69	3.69	3.24	0.23	0.35

Tailwater Channel Data - PR. CD-7

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 15.00 ft

Side Slope (H:V): 2.75 (_:1)

Channel Slope: 0.0010

Channel Manning's n: 0.0270

Channel Invert Elevation: 70.00 ft

Roadway Data for Crossing: PR. CD-7

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 76.60 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 288 cfs

Design Flow: 336 cfs

Maximum Flow: 571 cfs

Table 37 - Summary of Culvert Flows at Crossing: EX. CD-8

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 8 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
67.21	288.00	288.00	0.00	1
67.57	316.30	316.30	0.00	1
67.81	336.00	336.00	0.00	1
68.36	372.90	372.90	0.00	1
68.82	401.20	401.20	0.00	1
69.30	429.50	429.50	0.00	1
69.81	457.80	457.80	0.00	1
70.34	486.10	486.10	0.00	1
70.90	514.40	514.40	0.00	1
71.06	542.70	522.18	19.36	11
71.10	571.00	524.25	45.51	5
71.00	519.44	519.44	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-8

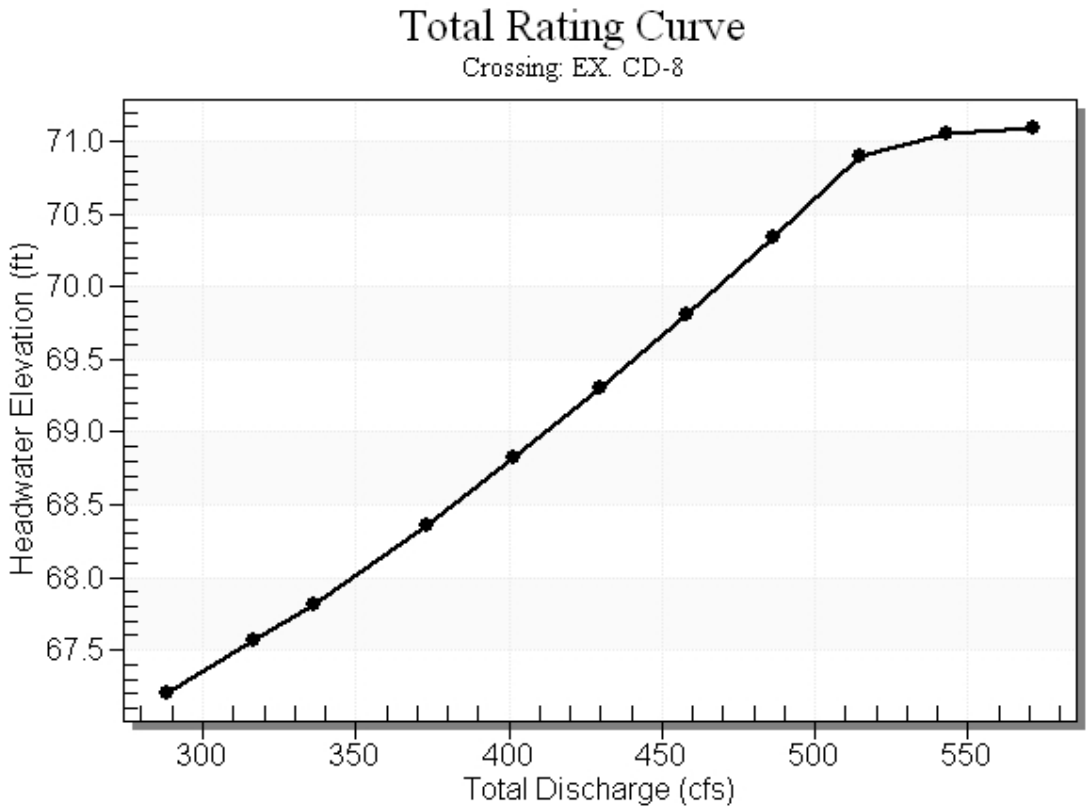


Table 38 - Culvert Summary Table: Culvert 8 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
288.00	288.00	67.21	5.483	5.611	7-M2c	5.000	3.427	3.427	3.000	10.505	0.00
316.30	316.30	67.57	5.894	5.967	7-M2c	5.000	3.648	3.648	3.000	10.838	0.00
336.00	336.00	67.81	6.188	6.209	7-M2c	5.000	3.798	3.798	3.000	11.059	0.00
372.90	372.90	68.36	6.759	6.694	7-M2c	5.000	4.071	4.071	3.000	11.449	0.00
401.20	401.20	68.82	7.218	7.152	7-M2c	5.000	4.275	4.275	3.000	11.732	0.00
429.50	429.50	69.30	7.700	7.609	7-M2c	5.000	4.473	4.473	3.000	12.002	0.00
457.80	457.80	69.81	8.206	8.063	7-M2c	5.000	4.668	4.668	3.000	12.260	0.00
486.10	486.10	70.34	8.738	8.508	7-M2c	5.000	4.858	4.858	3.000	12.507	0.00
514.40	514.40	70.90	9.297	8.948	6-FFc	5.000	5.000	5.000	3.000	12.860	0.00
542.70	522.18	71.06	9.456	9.070	6-FFc	5.000	5.000	5.000	3.000	13.054	0.00
571.00	524.25	71.10	9.499	9.103	6-FFc	5.000	5.000	5.000	3.000	13.106	0.00

****

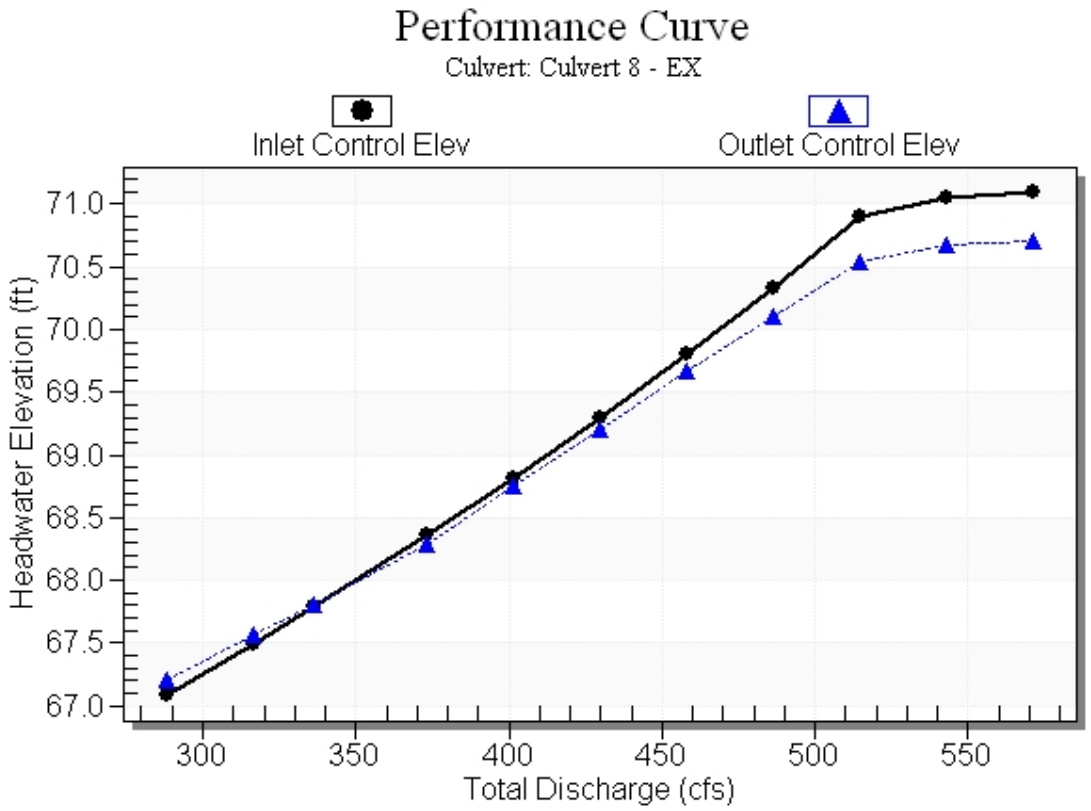
Straight Culvert

Inlet Elevation (invert): 61.60 ft, Outlet Elevation (invert): 61.53 ft

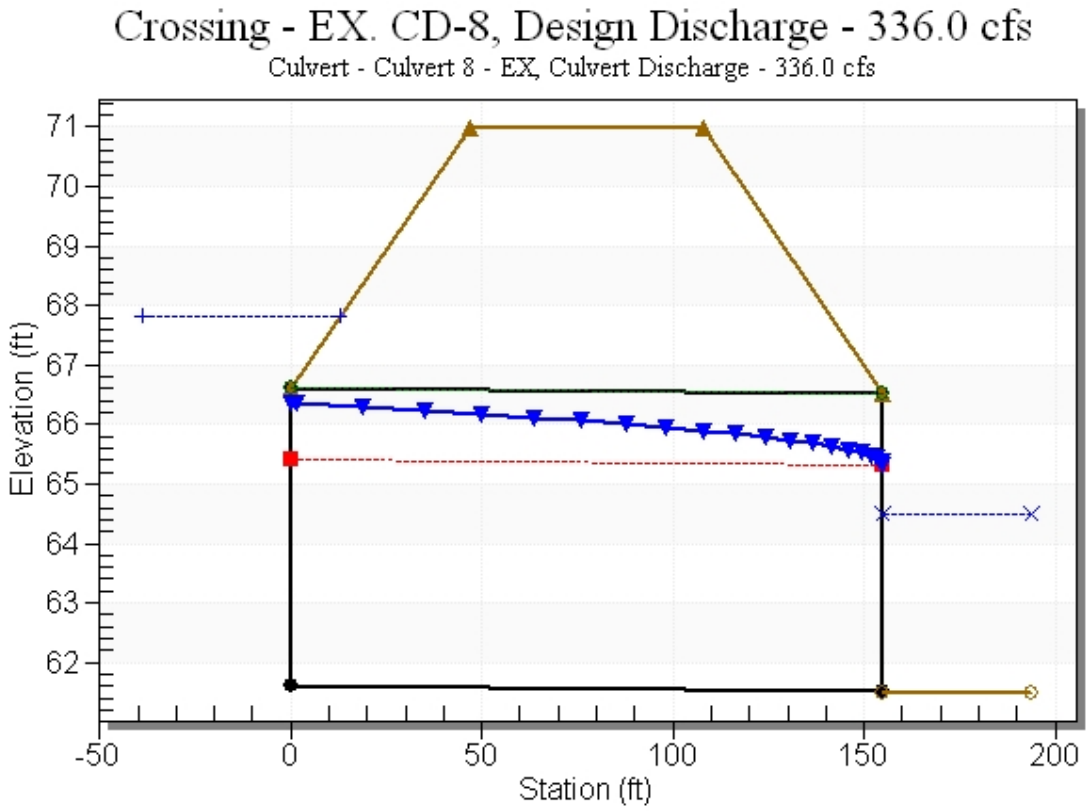
Culvert Length: 155.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: Culvert 8 - EX



Water Surface Profile Plot for Culvert: Culvert 8 - EX



Site Data - Culvert 8 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 61.60 ft

Outlet Station: 155.00 ft

Outlet Elevation: 61.53 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 8 - EX

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: NONE

Table 39 - Downstream Channel Rating Curve (Crossing: EX. CD-8)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
288.00	64.50	3.00
316.30	64.50	3.00
336.00	64.50	3.00
372.90	64.50	3.00
401.20	64.50	3.00
429.50	64.50	3.00
457.80	64.50	3.00
486.10	64.50	3.00
514.40	64.50	3.00
542.70	64.50	3.00
571.00	64.50	3.00

Tailwater Channel Data - EX. CD-8

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 64.50 ft

Roadway Data for Crossing: EX. CD-8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 71.00 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 288 cfs

Design Flow: 336 cfs

Maximum Flow: 571 cfs

Table 40 - Summary of Culvert Flows at Crossing: PR. CD-8

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 8 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
67.20	288.00	288.00	0.00	1
67.55	316.30	316.30	0.00	1
67.80	336.00	336.00	0.00	1
68.36	372.90	372.90	0.00	1
68.82	401.20	401.20	0.00	1
69.30	429.50	429.50	0.00	1
69.81	457.80	457.80	0.00	1
70.34	486.10	486.10	0.00	1
70.90	514.40	514.40	0.00	1
71.06	542.70	522.20	19.33	11
71.10	571.00	524.27	45.49	5
71.00	519.46	519.46	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-8

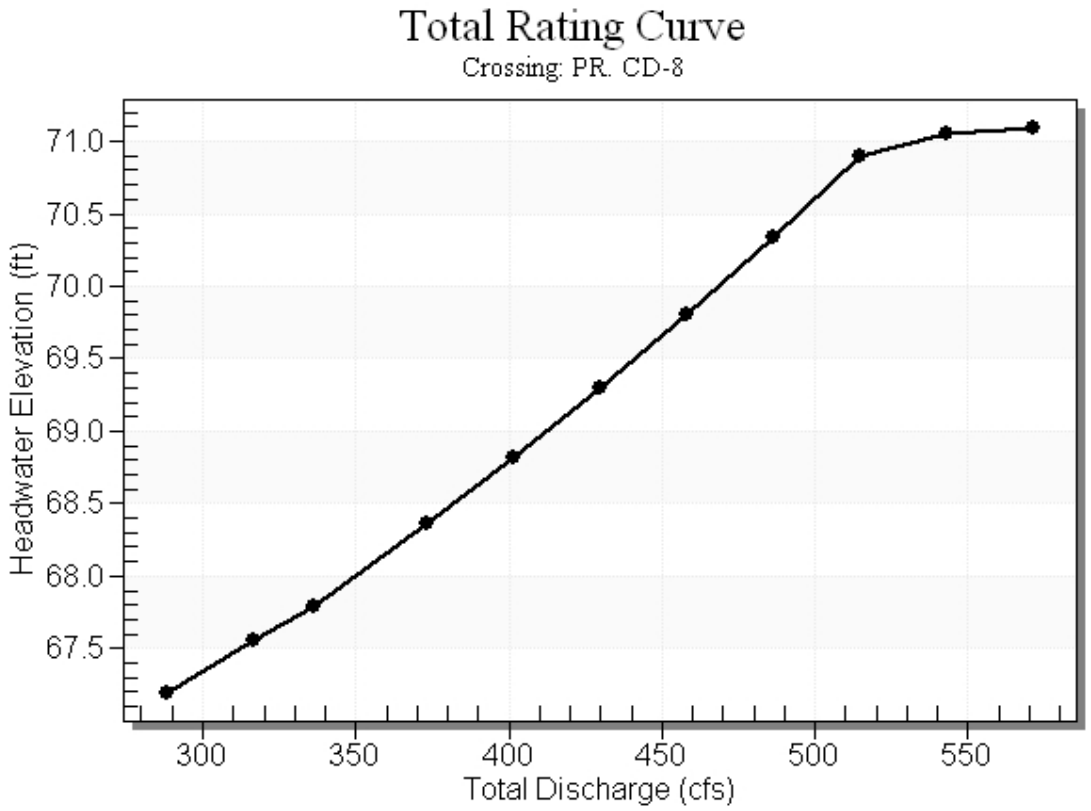


Table 41 - Culvert Summary Table: Culvert 8 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
288.00	288.00	67.20	5.483	5.599	7-M2c	5.000	3.427	3.427	3.000	10.505	0.00
316.30	316.30	67.55	5.894	5.955	7-M2c	5.000	3.648	3.648	3.000	10.838	0.00
336.00	336.00	67.80	6.187	6.197	7-M2c	5.000	3.798	3.798	3.000	11.059	0.00
372.90	372.90	68.36	6.758	6.669	7-M2c	5.000	4.071	4.071	3.000	11.449	0.00
401.20	401.20	68.82	7.218	7.134	7-M2c	5.000	4.275	4.275	3.000	11.732	0.00
429.50	429.50	69.30	7.699	7.597	7-M2c	5.000	4.473	4.473	3.000	12.002	0.00
457.80	457.80	69.81	8.205	8.055	7-M2c	5.000	4.668	4.668	3.000	12.260	0.00
486.10	486.10	70.34	8.737	8.505	7-M2c	5.000	4.858	4.858	3.000	12.507	0.00
514.40	514.40	70.90	9.297	8.948	6-FFc	5.000	5.000	5.000	3.000	12.860	0.00
542.70	522.20	71.06	9.456	9.071	6-FFc	5.000	5.000	5.000	3.000	13.055	0.00
571.00	524.27	71.10	9.499	9.105	6-FFc	5.000	5.000	5.000	3.000	13.107	0.00

****

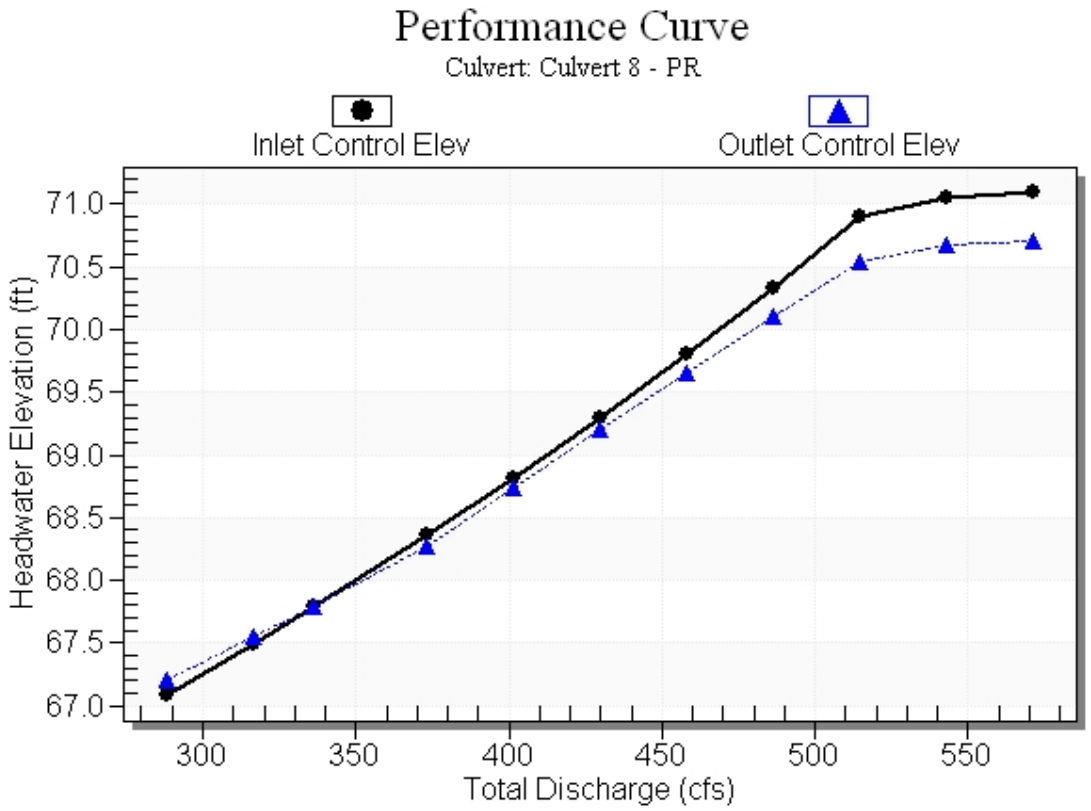
Straight Culvert

Inlet Elevation (invert): 61.60 ft, Outlet Elevation (invert): 61.50 ft

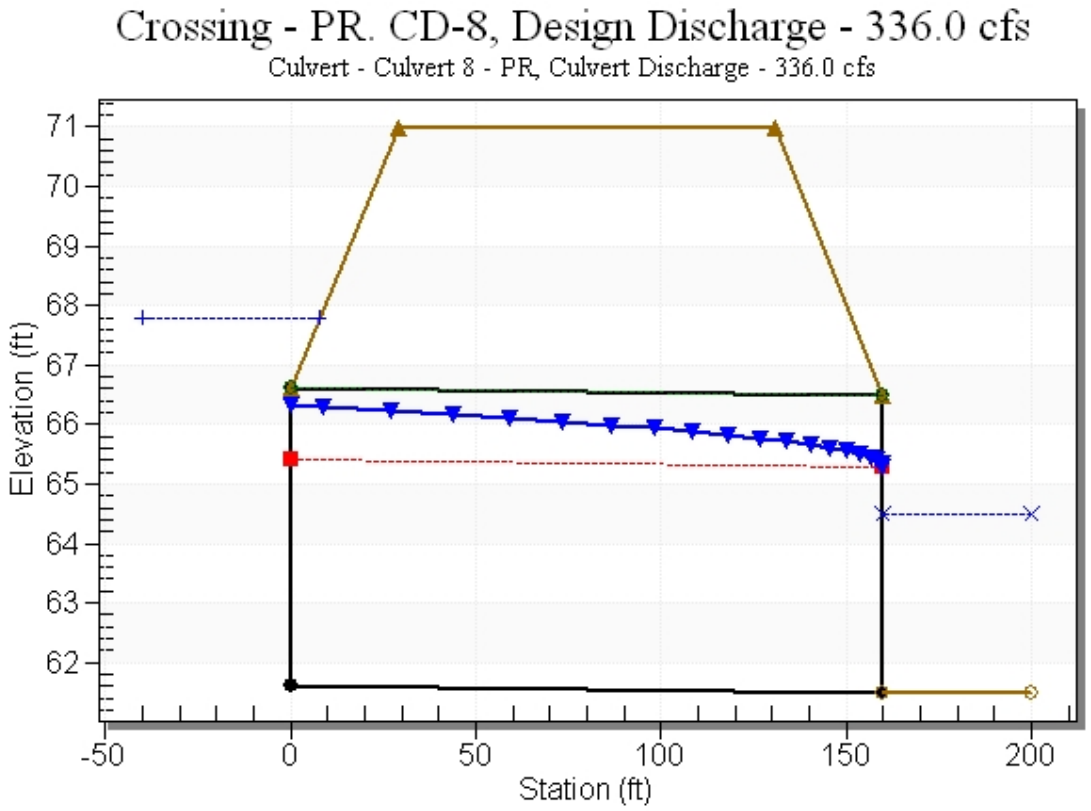
Culvert Length: 160.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: Culvert 8 - PR



Water Surface Profile Plot for Culvert: Culvert 8 - PR



Site Data - Culvert 8 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 61.60 ft

Outlet Station: 160.00 ft

Outlet Elevation: 61.50 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 8 - PR

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: NONE

Table 42 - Downstream Channel Rating Curve (Crossing: PR. CD-8)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
288.00	64.50	3.00
316.30	64.50	3.00
336.00	64.50	3.00
372.90	64.50	3.00
401.20	64.50	3.00
429.50	64.50	3.00
457.80	64.50	3.00
486.10	64.50	3.00
514.40	64.50	3.00
542.70	64.50	3.00
571.00	64.50	3.00

Tailwater Channel Data - PR. CD-8

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 64.50 ft

Roadway Data for Crossing: PR. CD-8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 71.00 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 43 - Summary of Culvert Flows at Crossing: EX. CD-10

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 10 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
88.55	23.00	23.00	0.00	1
89.05	25.20	25.20	0.00	1
89.25	26.00	26.00	0.00	1
90.17	29.60	29.60	0.00	1
90.70	31.80	31.47	0.00	100
90.75	34.00	31.65	2.17	12
90.76	36.20	31.68	4.31	4
90.77	38.40	31.70	6.35	3
90.77	40.60	31.72	8.57	3
90.78	42.80	31.78	10.80	3
90.78	45.00	31.81	13.04	3
90.74	31.61	31.61	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-10

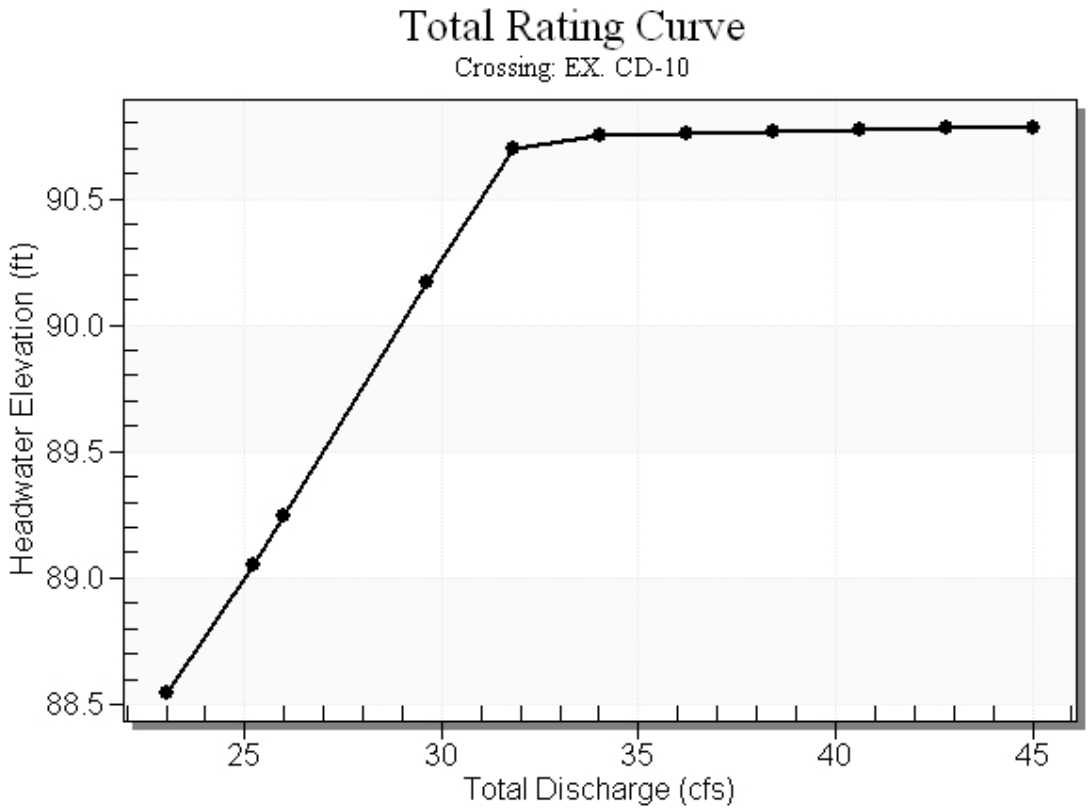


Table 44 - Culvert Summary Table: Culvert 10 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	88.55	3.243	4.049	7-M2c	2.000	1.705	1.705	1.700	8.059	0.00
25.20	25.20	89.05	3.624	4.548	7-M2c	2.000	1.767	1.767	1.700	8.582	0.00
26.00	26.00	89.25	3.771	4.745	7-M2c	2.000	1.786	1.786	1.700	8.781	0.00
29.60	29.60	90.17	4.479	5.666	7-M2c	2.000	1.854	1.854	1.700	9.740	0.00
31.80	31.47	90.70	4.874	6.201	7-M2c	2.000	1.880	1.880	1.700	10.267	0.00
34.00	31.65	90.75	4.914	6.253	7-M2c	2.000	1.882	1.882	1.700	10.322	0.00
36.20	31.68	90.76	4.920	6.261	7-M2c	2.000	1.882	1.882	1.700	10.330	0.00
38.40	31.70	90.77	4.925	6.267	7-M2c	2.000	1.882	1.882	1.700	10.337	0.00
40.60	31.72	90.77	4.929	6.273	7-M2c	2.000	1.883	1.883	1.700	10.343	0.00
42.80	31.78	90.78	4.942	6.278	7-M2c	2.000	1.889	1.889	1.700	10.341	0.00
45.00	31.81	90.78	4.947	6.283	7-M2c	2.000	1.890	1.890	1.700	10.348	0.00

****

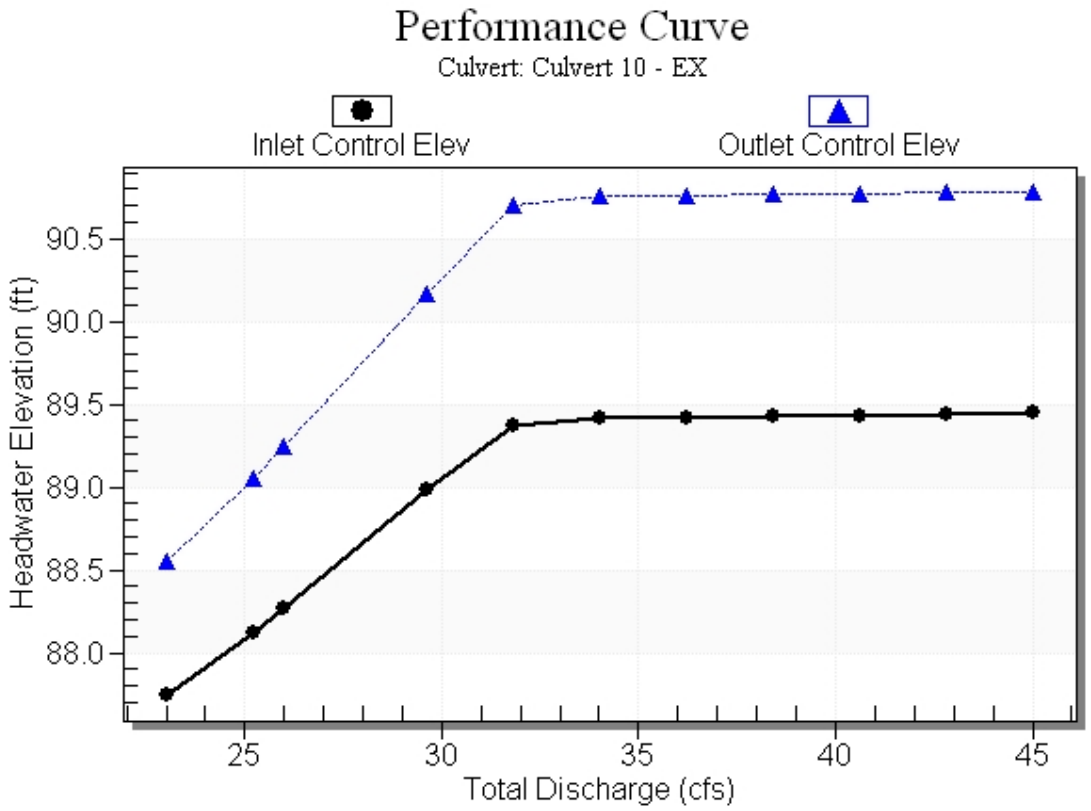
Straight Culvert

Inlet Elevation (invert): 84.50 ft, Outlet Elevation (invert): 84.32 ft

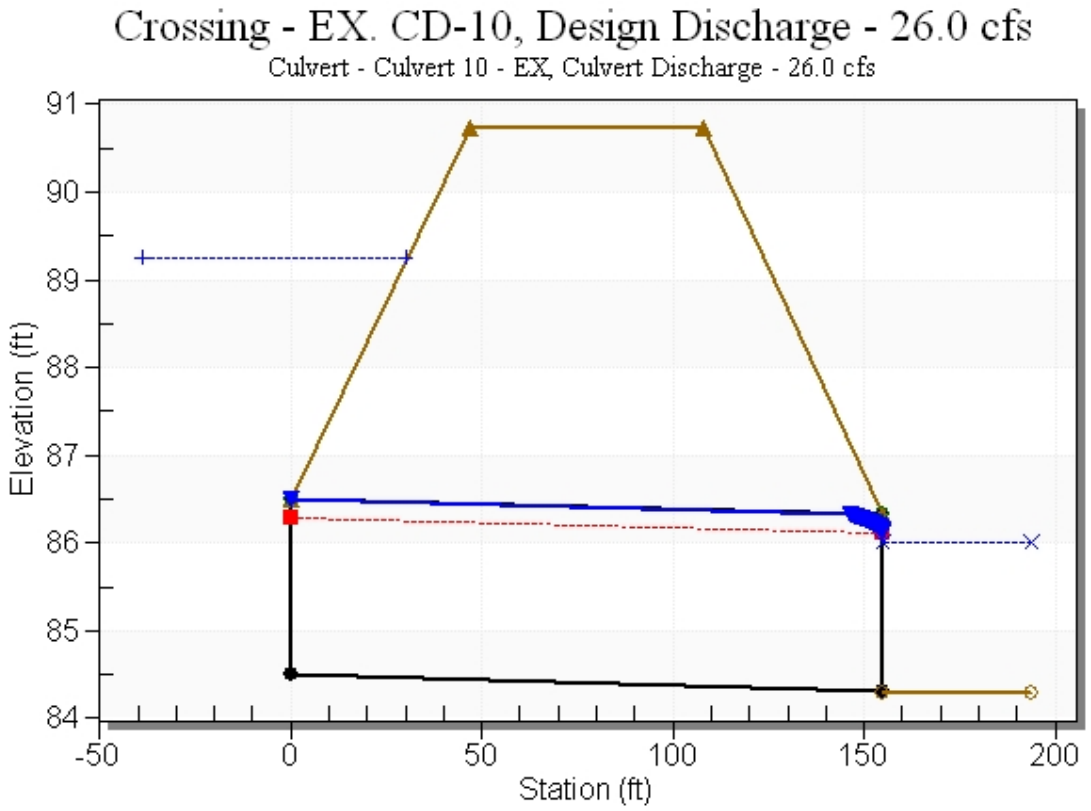
Culvert Length: 155.00 ft, Culvert Slope: 0.0012

****

Culvert Performance Curve Plot: Culvert 10 - EX



Water Surface Profile Plot for Culvert: Culvert 10 - EX



Site Data - Culvert 10 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 84.50 ft

Outlet Station: 155.00 ft

Outlet Elevation: 84.32 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 10 - EX

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 45 - Downstream Channel Rating Curve (Crossing: EX. CD-10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	86.00	1.70
25.20	86.00	1.70
26.00	86.00	1.70
29.60	86.00	1.70
31.80	86.00	1.70
34.00	86.00	1.70
36.20	86.00	1.70
38.40	86.00	1.70
40.60	86.00	1.70
42.80	86.00	1.70
45.00	86.00	1.70

Tailwater Channel Data - EX. CD-10

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 86.00 ft

Roadway Data for Crossing: EX. CD-10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 90.74 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 46 - Summary of Culvert Flows at Crossing: PR. CD-10

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 10 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
88.57	23.00	23.00	0.00	1
89.08	25.20	25.20	0.00	1
89.28	26.00	26.00	0.00	1
90.22	29.60	29.60	0.00	1
90.73	31.80	31.41	0.00	100
90.75	34.00	31.47	2.34	7
90.76	36.20	31.47	4.53	4
90.77	38.40	31.48	6.58	3
90.77	40.60	31.50	8.80	3
90.78	42.80	31.52	11.06	3
90.78	45.00	31.54	13.31	3
90.74	31.43	31.43	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-10

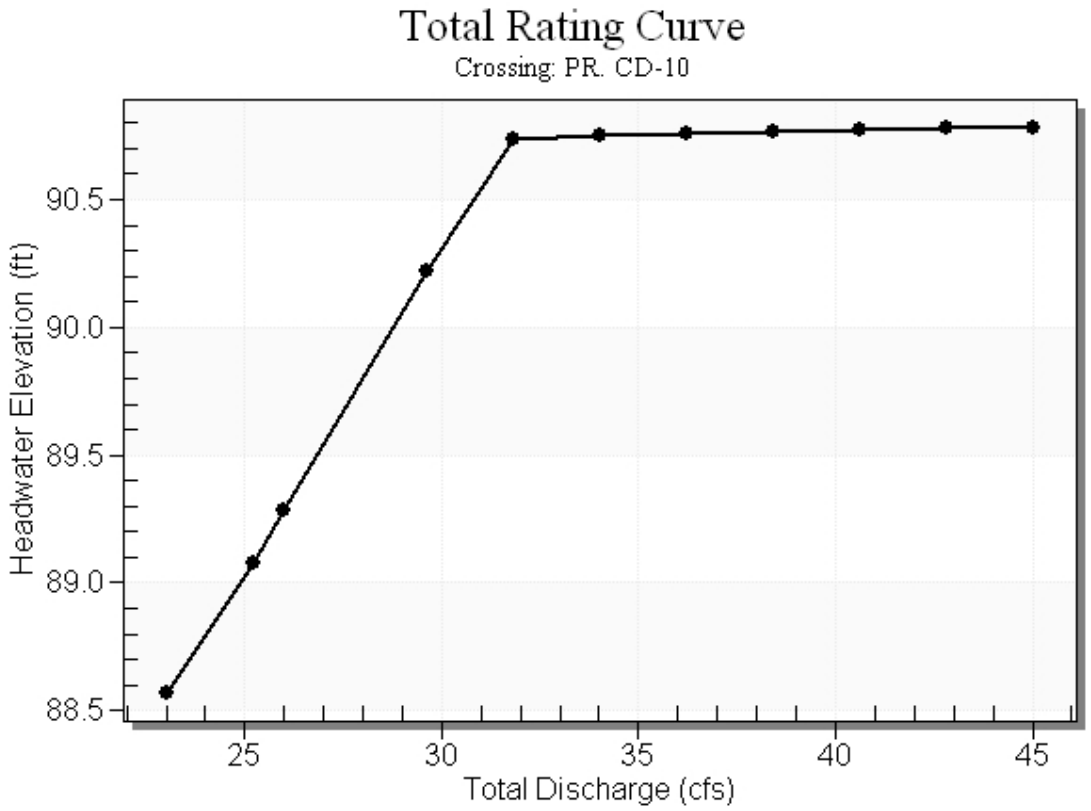


Table 47 - Culvert Summary Table: Culvert 10 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	88.57	3.242	4.072	7-M2c	2.000	1.705	1.705	1.700	8.059	0.00
25.20	25.20	89.08	3.624	4.580	7-M2c	2.000	1.767	1.767	1.700	8.582	0.00
26.00	26.00	89.28	3.771	4.781	7-M2c	2.000	1.786	1.786	1.700	8.781	0.00
29.60	29.60	90.22	4.479	5.718	7-M2c	2.000	1.854	1.854	1.700	9.740	0.00
31.80	31.41	90.73	4.861	6.233	7-M2c	2.000	1.880	1.880	1.700	10.250	0.00
34.00	31.47	90.75	4.873	6.247	7-M2c	2.000	1.880	1.880	1.700	10.267	0.00
36.20	31.47	90.76	4.873	6.262	7-M2c	2.000	1.880	1.880	1.700	10.267	0.00
38.40	31.48	90.77	4.877	6.268	7-M2c	2.000	1.880	1.880	1.700	10.272	0.00
40.60	31.50	90.77	4.882	6.274	7-M2c	2.000	1.881	1.881	1.700	10.278	0.00
42.80	31.52	90.78	4.886	6.279	7-M2c	2.000	1.881	1.881	1.700	10.284	0.00
45.00	31.54	90.78	4.890	6.284	7-M2c	2.000	1.881	1.881	1.700	10.289	0.00

****

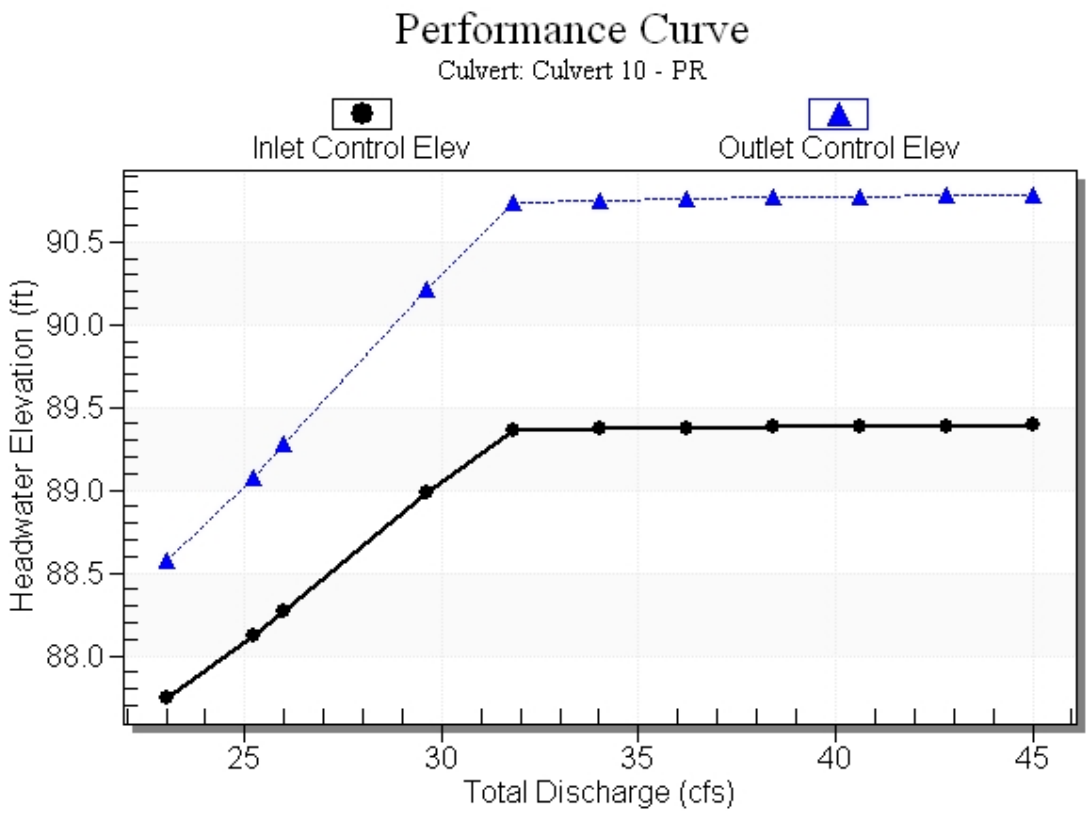
Straight Culvert

Inlet Elevation (invert): 84.50 ft, Outlet Elevation (invert): 84.30 ft

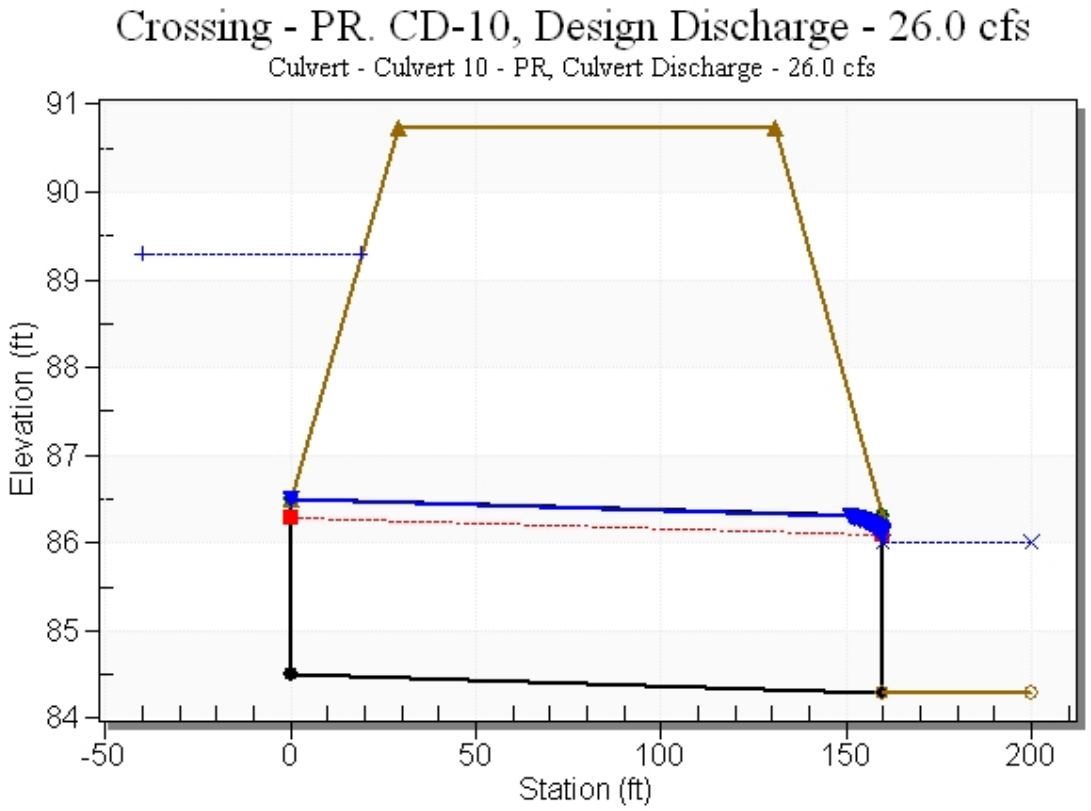
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 10 - PR



Water Surface Profile Plot for Culvert: Culvert 10 - PR



Site Data - Culvert 10 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 84.50 ft

Outlet Station: 160.00 ft

Outlet Elevation: 84.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 10 - PR

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 48 - Downstream Channel Rating Curve (Crossing: PR. CD-10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	86.00	1.70
25.20	86.00	1.70
26.00	86.00	1.70
29.60	86.00	1.70
31.80	86.00	1.70
34.00	86.00	1.70
36.20	86.00	1.70
38.40	86.00	1.70
40.60	86.00	1.70
42.80	86.00	1.70
45.00	86.00	1.70

Tailwater Channel Data - PR. CD-10

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 86.00 ft

Roadway Data for Crossing: PR. CD-10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 90.74 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 49 - Summary of Culvert Flows at Crossing: EX. CD-11

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 11 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
104.50	23.00	23.00	0.00	1
105.00	25.20	25.20	0.00	1
105.19	26.00	26.00	0.00	1
106.10	29.60	29.60	0.00	1
106.71	31.80	31.80	0.00	1
107.01	34.00	32.82	0.97	45
107.02	36.20	32.84	3.03	4
107.02	38.40	32.87	5.36	4
107.03	40.60	32.89	7.42	3
107.04	42.80	32.91	9.64	3
107.04	45.00	32.93	11.89	3
107.00	32.79	32.79	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-11

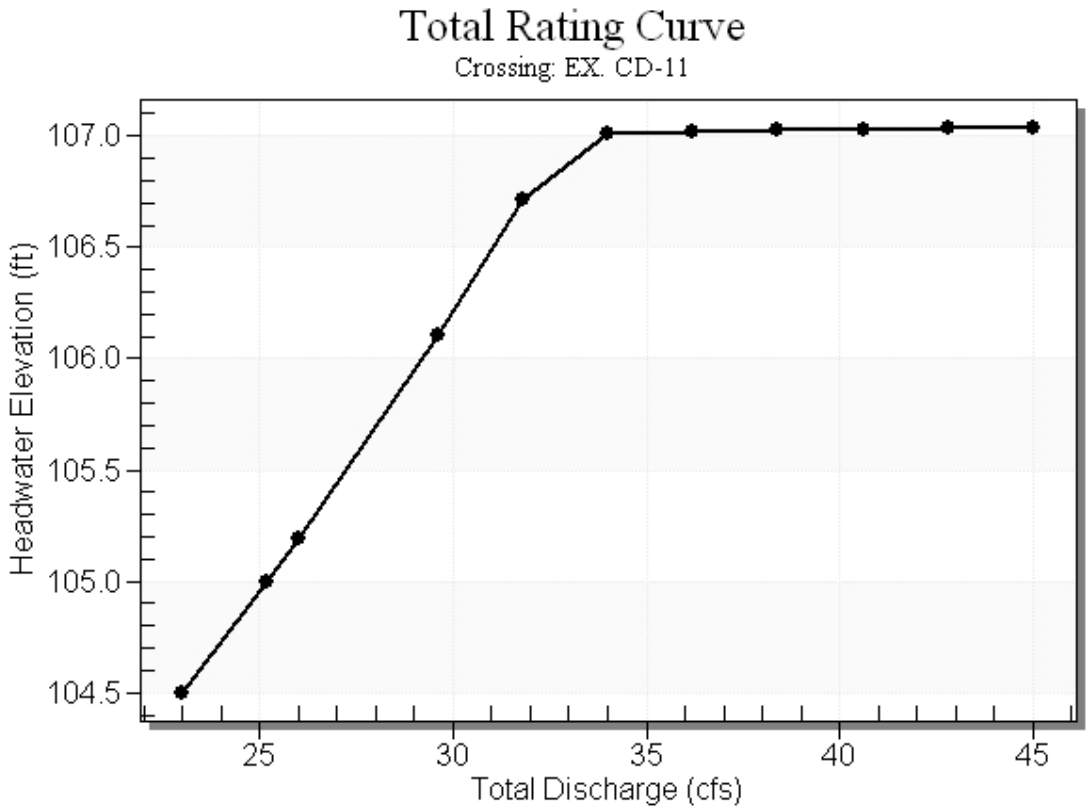


Table 50 - Culvert Summary Table: Culvert 11 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	104.50	3.242	4.002	7-M2c	2.000	1.705	1.705	1.700	8.059	0.00
25.20	25.20	105.00	3.624	4.496	7-M2c	2.000	1.767	1.767	1.700	8.582	0.00
26.00	26.00	105.19	3.771	4.692	7-M2c	2.000	1.786	1.786	1.700	8.781	0.00
29.60	29.60	106.10	4.479	5.602	7-M2c	2.000	1.854	1.854	1.700	9.740	0.00
31.80	31.80	106.71	4.946	6.211	7-M2c	2.000	1.890	1.890	1.700	10.347	0.00
34.00	32.82	107.01	5.170	6.508	7-M2c	2.000	1.903	1.903	1.700	10.636	0.00
36.20	32.84	107.02	5.175	6.516	7-M2c	2.000	1.896	1.896	1.700	10.665	0.00
38.40	32.87	107.02	5.181	6.524	7-M2c	2.000	1.896	1.896	1.700	10.673	0.00
40.60	32.89	107.03	5.185	6.530	7-M2c	2.000	1.896	1.896	1.700	10.679	0.00
42.80	32.91	107.04	5.189	6.535	7-M2c	2.000	1.896	1.896	1.700	10.685	0.00
45.00	32.93	107.04	5.193	6.541	7-M2c	2.000	1.896	1.896	1.700	10.691	0.00

****

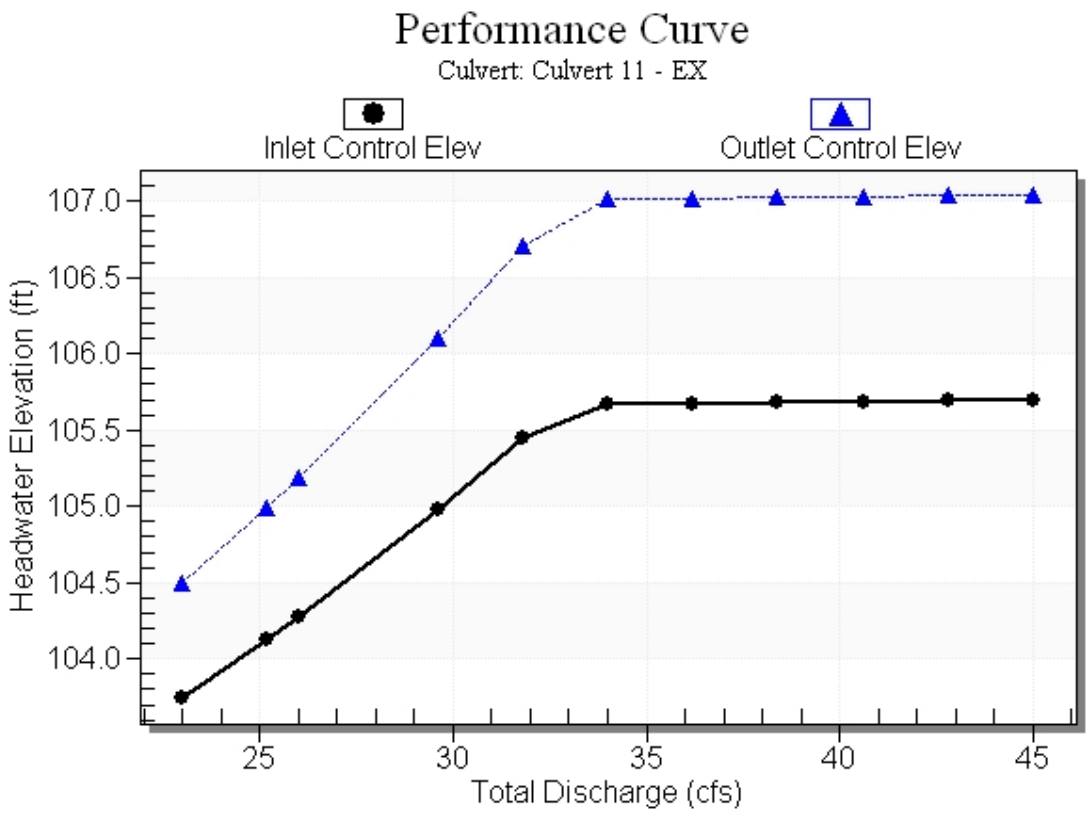
Straight Culvert

Inlet Elevation (invert): 100.50 ft, Outlet Elevation (invert): 100.30 ft

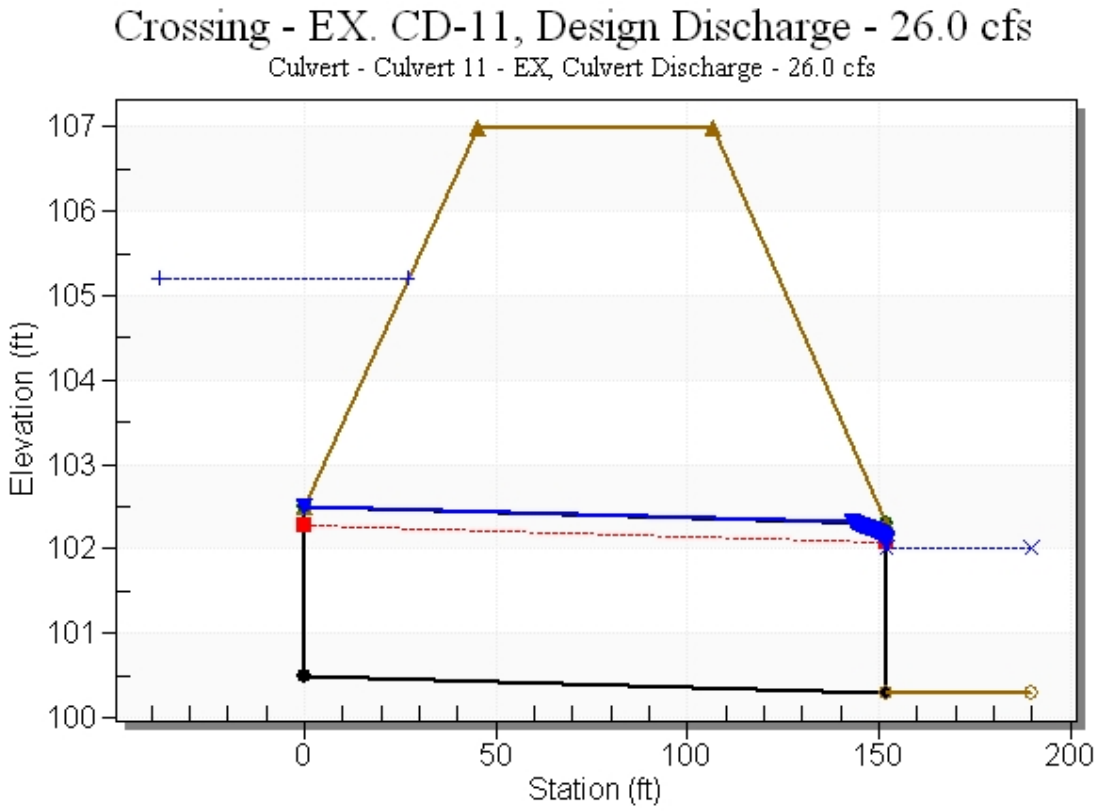
Culvert Length: 152.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 11 - EX



Water Surface Profile Plot for Culvert: Culvert 11 - EX



Site Data - Culvert 11 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.50 ft

Outlet Station: 152.00 ft

Outlet Elevation: 100.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 11 - EX

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 51 - Downstream Channel Rating Curve (Crossing: EX. CD-11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	102.00	1.70
25.20	102.00	1.70
26.00	102.00	1.70
29.60	102.00	1.70
31.80	102.00	1.70
34.00	102.00	1.70
36.20	102.00	1.70
38.40	102.00	1.70
40.60	102.00	1.70
42.80	102.00	1.70
45.00	102.00	1.70

Tailwater Channel Data - EX. CD-11

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 102.00 ft

Roadway Data for Crossing: EX. CD-11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 107.00 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 52 - Summary of Culvert Flows at Crossing: PR. CD-11

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 11 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
104.57	23.00	23.00	0.00	1
105.08	25.20	25.20	0.00	1
105.28	26.00	26.00	0.00	1
106.22	29.60	29.60	0.00	1
106.84	31.80	31.80	0.00	1
107.01	34.00	32.33	1.33	27
107.02	36.20	32.36	3.54	4
107.03	38.40	32.38	5.86	4
107.03	40.60	32.40	7.93	3
107.04	42.80	32.42	10.15	3
107.04	45.00	32.44	12.39	3
107.00	32.30	32.30	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-11

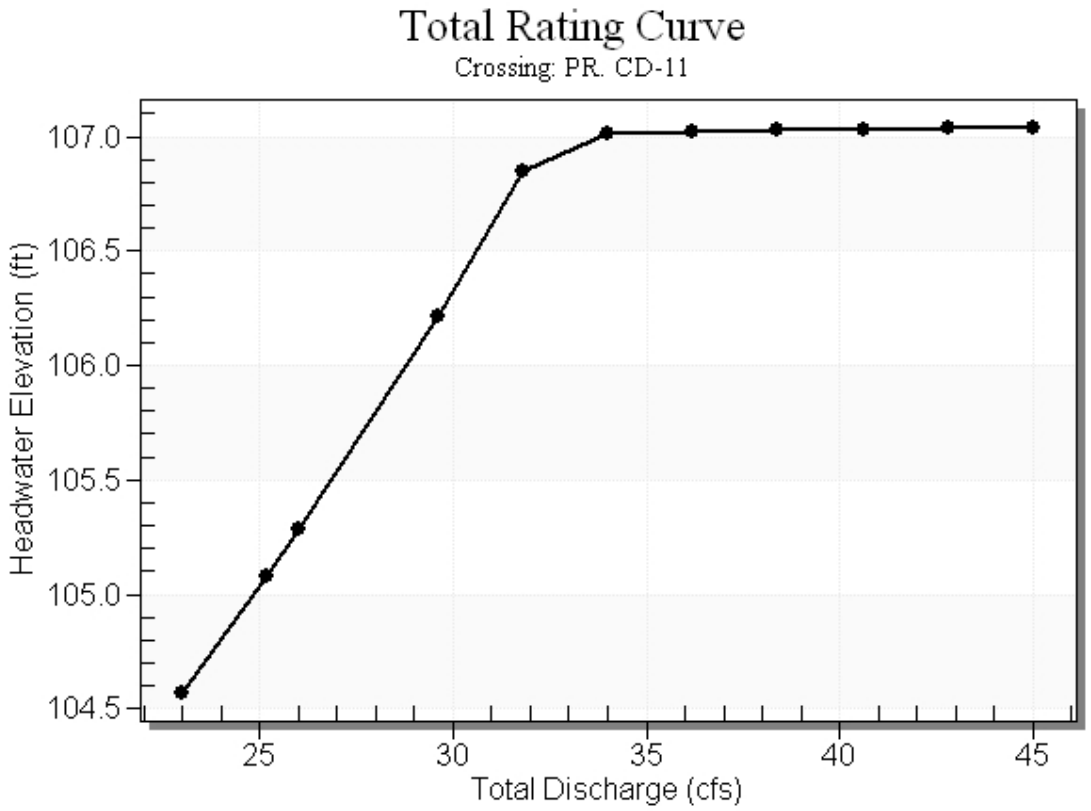


Table 53 - Culvert Summary Table: Culvert 11 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	104.57	3.242	4.072	7-M2c	2.000	1.705	1.705	1.700	8.059	0.00
25.20	25.20	105.08	3.624	4.580	7-M2c	2.000	1.767	1.767	1.700	8.582	0.00
26.00	26.00	105.28	3.771	4.781	7-M2c	2.000	1.786	1.786	1.700	8.781	0.00
29.60	29.60	106.22	4.479	5.718	7-M2c	2.000	1.854	1.854	1.700	9.740	0.00
31.80	31.80	106.84	4.946	6.345	7-M2c	2.000	1.890	1.890	1.700	10.347	0.00
34.00	32.33	107.01	5.062	6.510	7-M2c	2.000	1.891	1.891	1.700	10.516	0.00
36.20	32.36	107.02	5.068	6.518	7-M2c	2.000	1.891	1.891	1.700	10.525	0.00
38.40	32.38	107.03	5.074	6.526	7-M2c	2.000	1.891	1.891	1.700	10.532	0.00
40.60	32.40	107.03	5.078	6.531	7-M2c	2.000	1.891	1.891	1.700	10.538	0.00
42.80	32.42	107.04	5.082	6.537	7-M2c	2.000	1.891	1.891	1.700	10.544	0.00
45.00	32.44	107.04	5.086	6.542	7-M2c	2.000	1.891	1.891	1.700	10.549	0.00

****

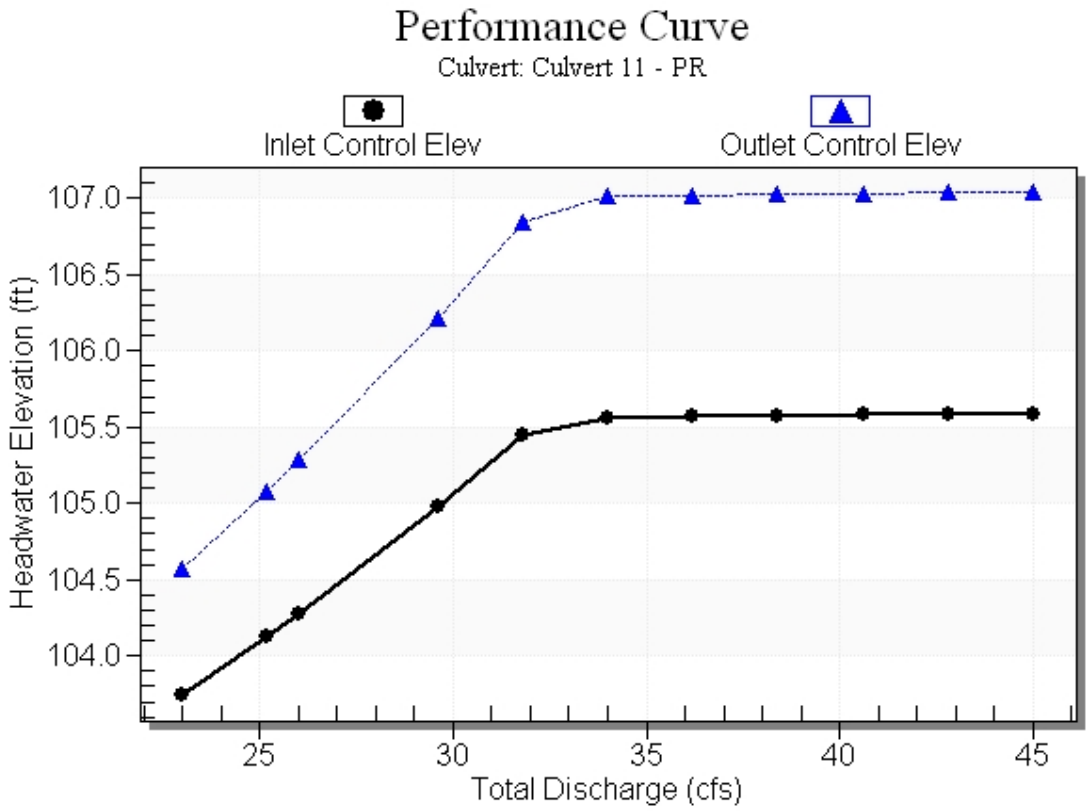
Straight Culvert

Inlet Elevation (invert): 100.50 ft, Outlet Elevation (invert): 100.30 ft

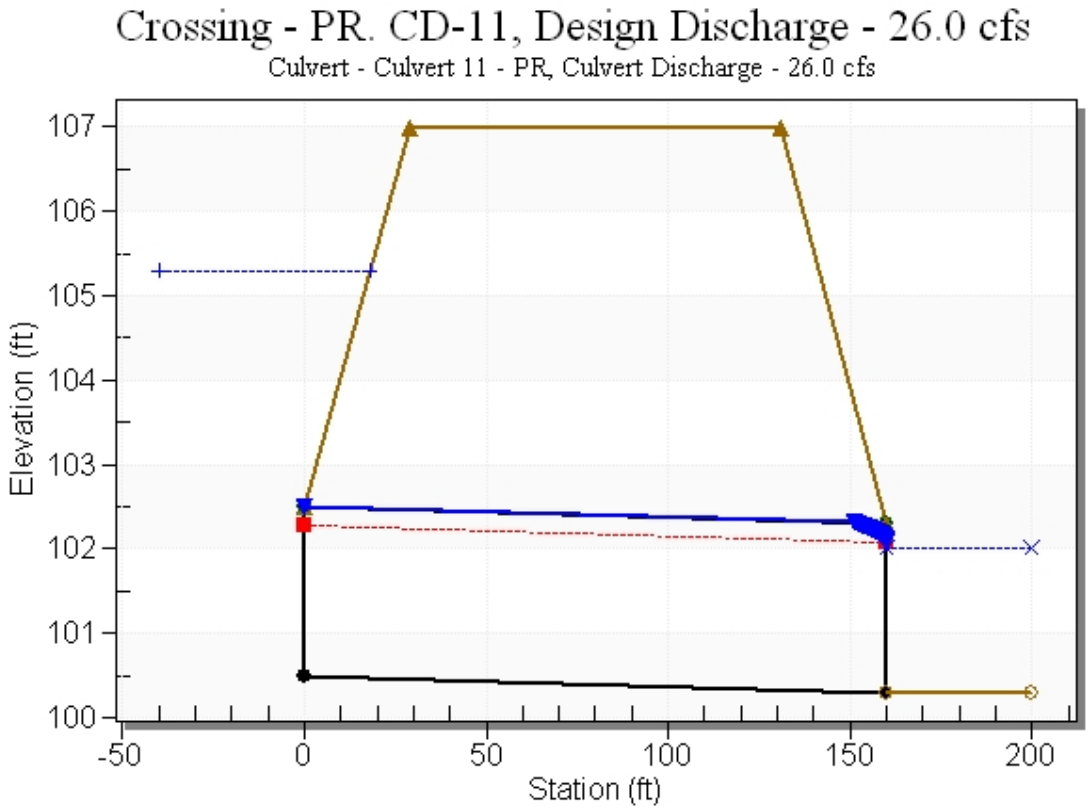
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 11 - PR



Water Surface Profile Plot for Culvert: Culvert 11 - PR



Site Data - Culvert 11 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.50 ft

Outlet Station: 160.00 ft

Outlet Elevation: 100.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 11 - PR

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 54 - Downstream Channel Rating Curve (Crossing: PR. CD-11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	102.00	1.70
25.20	102.00	1.70
26.00	102.00	1.70
29.60	102.00	1.70
31.80	102.00	1.70
34.00	102.00	1.70
36.20	102.00	1.70
38.40	102.00	1.70
40.60	102.00	1.70
42.80	102.00	1.70
45.00	102.00	1.70

Tailwater Channel Data - PR. CD-11

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 102.00 ft

Roadway Data for Crossing: PR. CD-11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 107.00 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 55 - Summary of Culvert Flows at Crossing: EX. CD-12

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 12 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
108.70	23.00	23.00	0.00	1
109.20	25.20	25.20	0.00	1
109.39	26.00	26.00	0.00	1
110.30	29.60	29.60	0.00	1
110.51	31.80	30.35	1.15	33
110.52	34.00	30.38	3.29	4
110.52	36.20	30.42	5.62	4
110.53	38.40	30.44	7.69	3
110.54	40.60	30.46	9.90	3
110.54	42.80	30.48	12.14	3
110.55	45.00	30.49	14.38	3
110.50	30.33	30.33	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-12

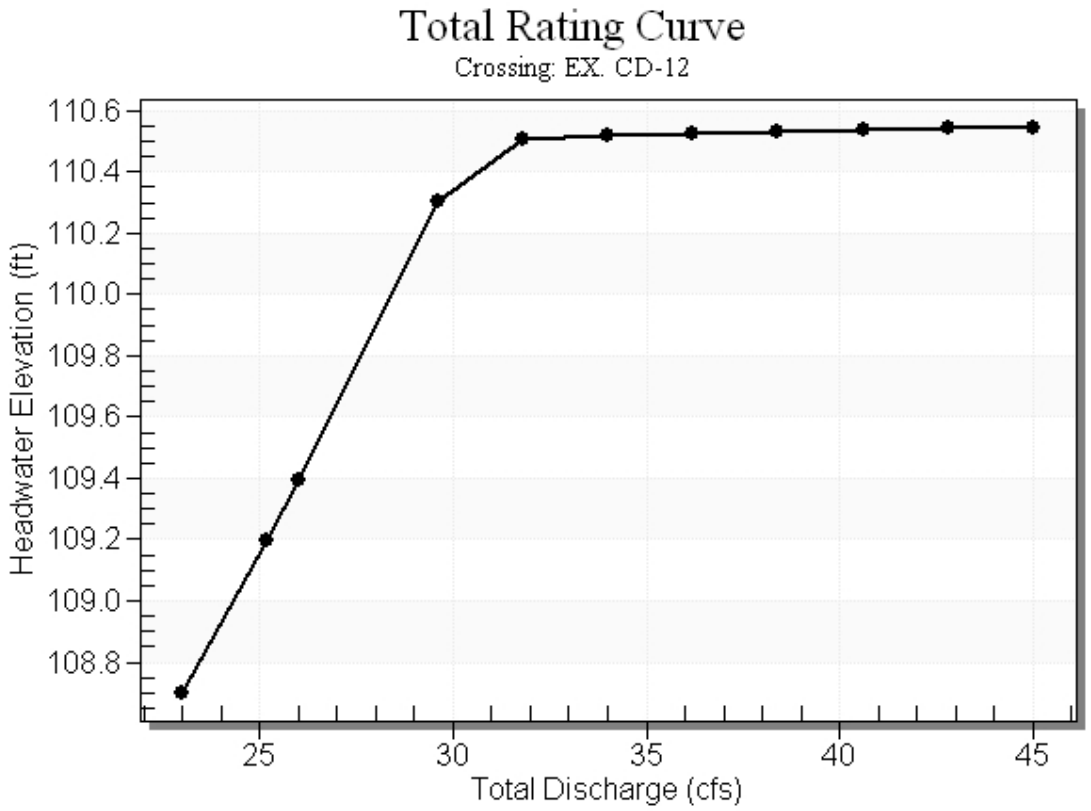


Table 56 - Culvert Summary Table: Culvert 12 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	108.70	3.242	4.002	7-M2c	2.000	1.705	1.705	1.500	8.059	0.00
25.20	25.20	109.20	3.624	4.496	7-M2c	2.000	1.767	1.767	1.500	8.582	0.00
26.00	26.00	109.39	3.771	4.692	7-M2c	2.000	1.786	1.786	1.500	8.781	0.00
29.60	29.60	110.30	4.479	5.602	7-M2c	2.000	1.854	1.854	1.500	9.740	0.00
31.80	30.35	110.51	4.636	5.809	7-M2c	2.000	1.869	1.869	1.500	9.938	0.00
34.00	30.38	110.52	4.642	5.817	7-M2c	2.000	1.870	1.870	1.500	9.946	0.00
36.20	30.42	110.52	4.650	5.825	7-M2c	2.000	1.870	1.870	1.500	9.956	0.00
38.40	30.44	110.53	4.655	5.830	7-M2c	2.000	1.871	1.871	1.500	9.962	0.00
40.60	30.46	110.54	4.659	5.836	7-M2c	2.000	1.871	1.871	1.500	9.968	0.00
42.80	30.48	110.54	4.663	5.841	7-M2c	2.000	1.871	1.871	1.500	9.973	0.00
45.00	30.49	110.55	4.665	5.846	7-M2c	2.000	1.871	1.871	1.500	9.975	0.00

****

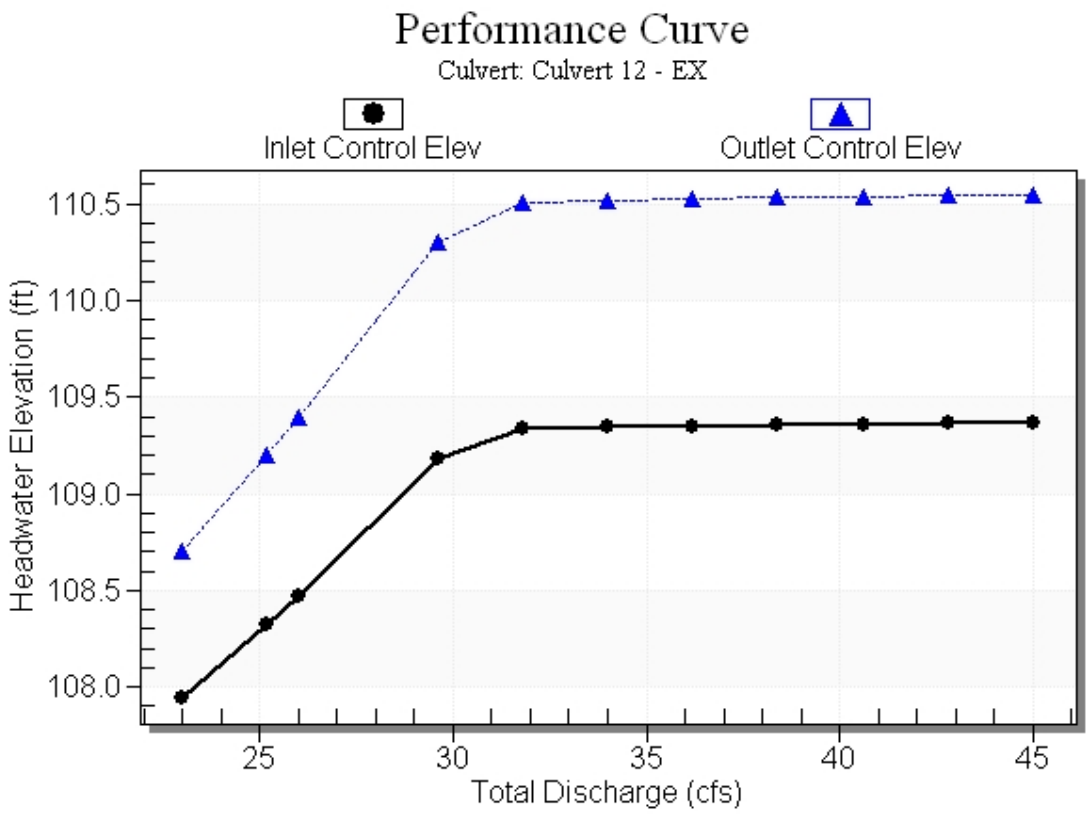
Straight Culvert

Inlet Elevation (invert): 104.70 ft, Outlet Elevation (invert): 104.50 ft

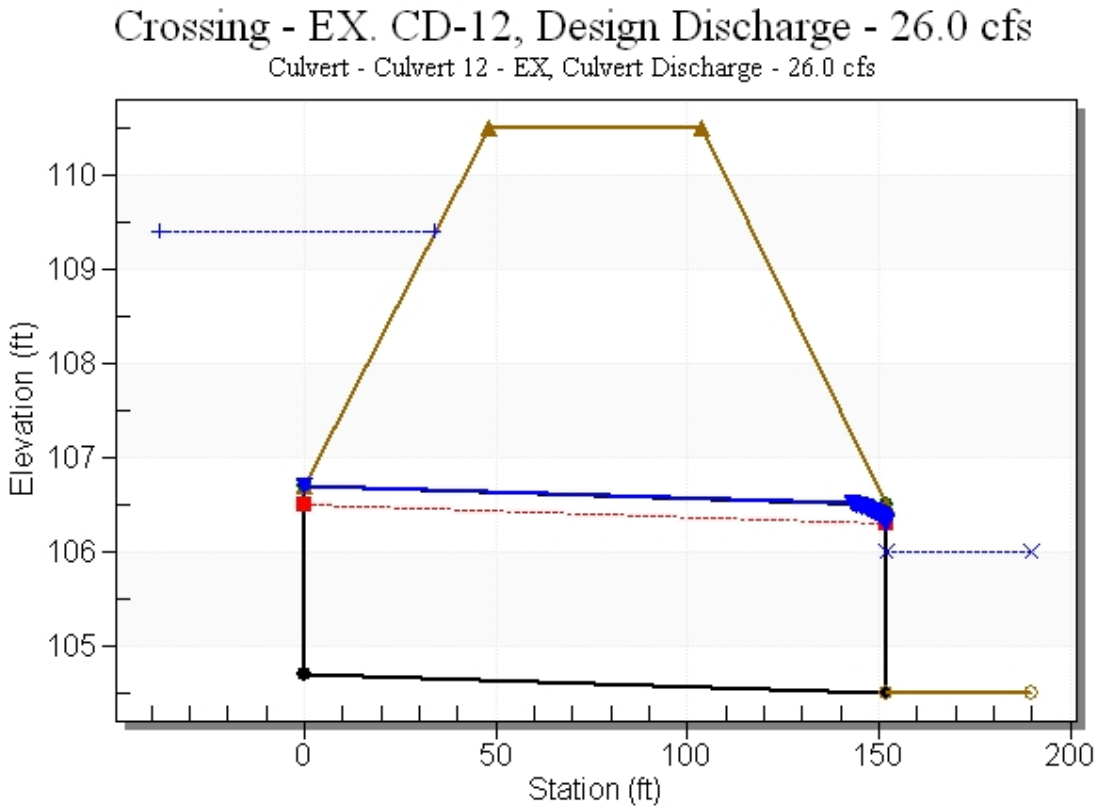
Culvert Length: 152.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 12 - EX



Water Surface Profile Plot for Culvert: Culvert 12 - EX



Site Data - Culvert 12 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 104.70 ft

Outlet Station: 152.00 ft

Outlet Elevation: 104.50 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 12 - EX

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 57 - Downstream Channel Rating Curve (Crossing: EX. CD-12)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	106.00	1.50
25.20	106.00	1.50
26.00	106.00	1.50
29.60	106.00	1.50
31.80	106.00	1.50
34.00	106.00	1.50
36.20	106.00	1.50
38.40	106.00	1.50
40.60	106.00	1.50
42.80	106.00	1.50
45.00	106.00	1.50

Tailwater Channel Data - EX. CD-12

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 106.00 ft

Roadway Data for Crossing: EX. CD-12

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 110.50 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 58 - Summary of Culvert Flows at Crossing: PR. CD-12

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 12 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
108.76	23.00	23.00	0.00	1
109.27	25.20	25.20	0.00	1
109.47	26.00	26.00	0.00	1
110.41	29.60	29.60	0.00	1
110.51	31.80	29.96	1.61	20
110.52	34.00	29.99	3.75	4
110.53	36.20	30.01	6.04	4
110.53	38.40	30.04	8.11	3
110.54	40.60	30.05	10.33	3
110.54	42.80	30.08	12.56	3
110.55	45.00	30.10	14.78	3
110.50	29.93	29.93	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-12

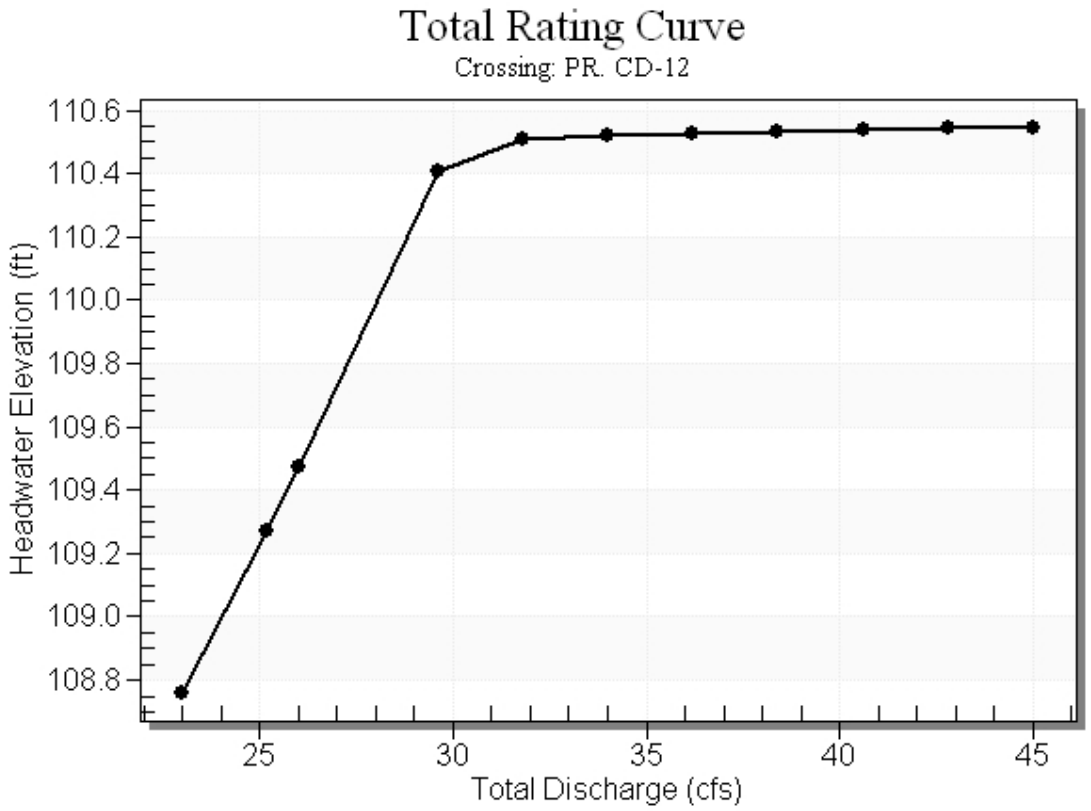


Table 59 - Culvert Summary Table: Culvert 12 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	108.76	3.242	4.062	7-M2c	2.000	1.705	1.705	1.500	8.059	0.00
25.20	25.20	109.27	3.624	4.570	7-M2c	2.000	1.767	1.767	1.500	8.582	0.00
26.00	26.00	109.47	3.771	4.771	7-M2c	2.000	1.786	1.786	1.500	8.781	0.00
29.60	29.60	110.41	4.479	5.708	7-M2c	2.000	1.854	1.854	1.500	9.740	0.00
31.80	29.96	110.51	4.554	5.811	7-M2c	2.000	1.863	1.863	1.500	9.830	0.00
34.00	29.99	110.52	4.560	5.819	7-M2c	2.000	1.863	1.863	1.500	9.838	0.00
36.20	30.01	110.53	4.565	5.826	7-M2c	2.000	1.864	1.864	1.500	9.845	0.00
38.40	30.04	110.53	4.571	5.831	7-M2c	2.000	1.864	1.864	1.500	9.853	0.00
40.60	30.05	110.54	4.573	5.837	7-M2c	2.000	1.864	1.864	1.500	9.856	0.00
42.80	30.08	110.54	4.579	5.842	7-M2c	2.000	1.865	1.865	1.500	9.864	0.00
45.00	30.10	110.55	4.582	5.846	7-M2c	2.000	1.865	1.865	1.500	9.868	0.00

****

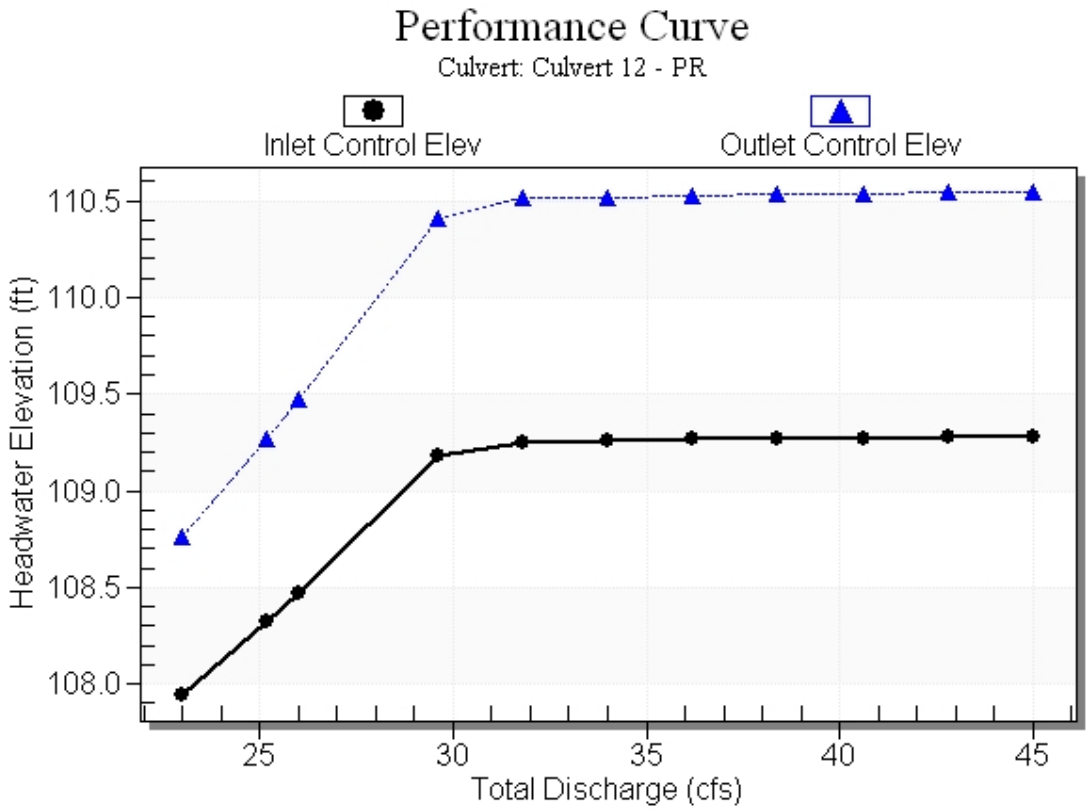
Straight Culvert

Inlet Elevation (invert): 104.70 ft, Outlet Elevation (invert): 104.49 ft

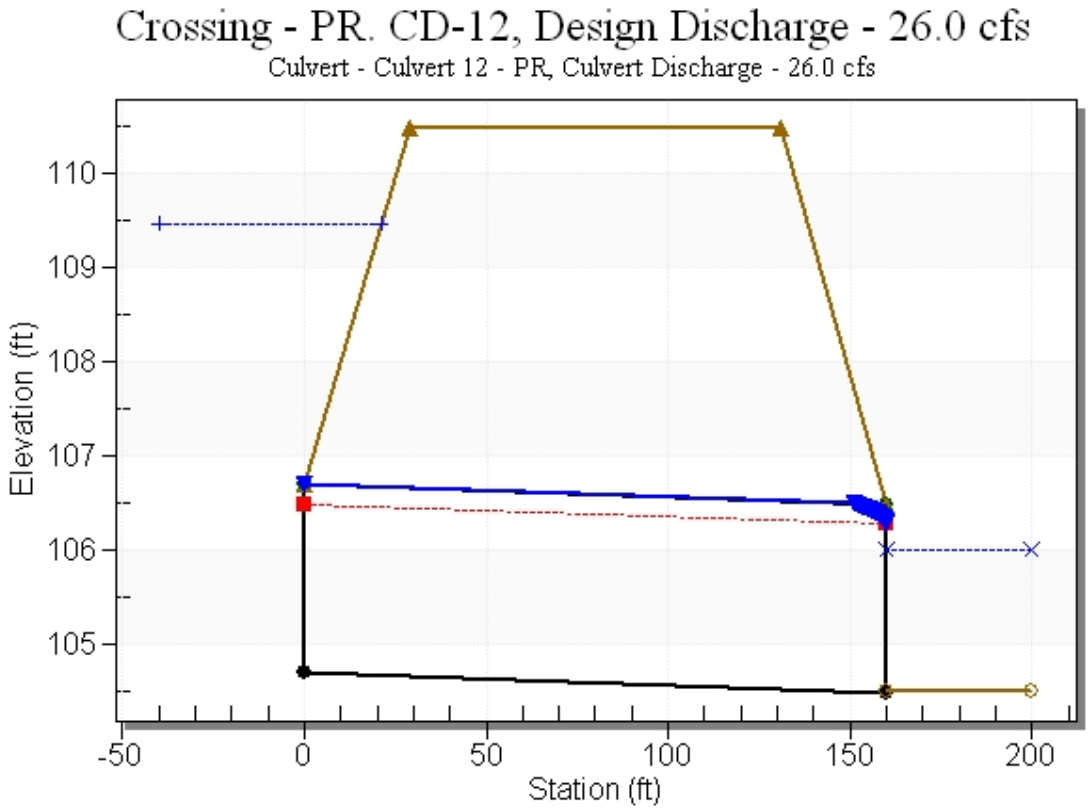
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 12 - PR



Water Surface Profile Plot for Culvert: Culvert 12 - PR



Site Data - Culvert 12 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 104.70 ft

Outlet Station: 160.00 ft

Outlet Elevation: 104.49 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 12 - PR

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 60 - Downstream Channel Rating Curve (Crossing: PR. CD-12)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	106.00	1.50
25.20	106.00	1.50
26.00	106.00	1.50
29.60	106.00	1.50
31.80	106.00	1.50
34.00	106.00	1.50
36.20	106.00	1.50
38.40	106.00	1.50
40.60	106.00	1.50
42.80	106.00	1.50
45.00	106.00	1.50

Tailwater Channel Data - PR. CD-12

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 106.00 ft

Roadway Data for Crossing: PR. CD-12

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 110.50 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 504 cfs

Design Flow: 588 cfs

Maximum Flow: 999.6 cfs

Table 61 - Summary of Culvert Flows at Crossing: EX. CD-13

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 13 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
108.05	504.00	504.00	0.00	1
108.48	553.56	553.56	0.00	1
108.78	588.00	588.00	0.00	1
109.37	652.68	652.68	0.00	1
109.84	702.24	702.24	0.00	1
110.34	751.80	751.80	0.00	1
110.86	801.36	801.36	0.00	1
111.26	850.92	838.49	12.22	8
111.43	900.48	853.58	46.46	5
111.57	950.04	865.78	84.10	5
111.69	999.60	876.37	122.77	4
111.14	827.61	827.61	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-13

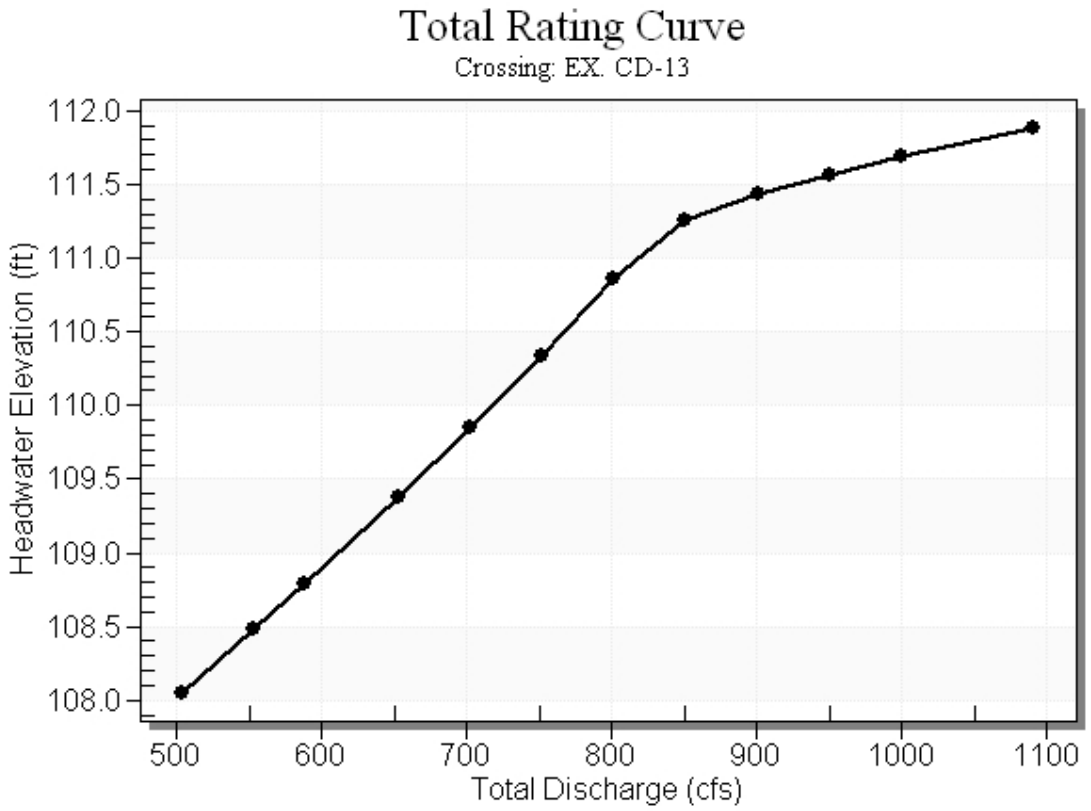


Table 62 - Culvert Summary Table: Culvert 13 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
504.00	504.00	108.05	5.484	4.065	5-S2n	3.084	3.427	3.123	1.000	11.526	0.00
553.56	553.56	108.48	5.911	4.540	5-S2n	3.306	3.648	3.346	1.000	11.818	0.00
588.00	588.00	108.78	6.214	5.481	5-S2n	3.458	3.798	3.498	1.000	12.007	0.00
652.68	652.68	109.37	6.802	6.005	5-S2n	3.742	4.072	3.779	1.000	12.337	0.00
702.24	702.24	109.84	7.275	6.432	5-S2n	3.955	4.275	3.990	1.000	12.571	0.00
751.80	751.80	110.34	7.768	6.880	5-S2n	4.167	4.474	4.199	1.000	12.789	0.00
801.36	801.36	110.86	8.286	7.349	5-S2n	4.377	4.669	4.406	1.000	12.992	0.00
850.92	838.49	111.26	8.690	7.715	5-S2n	4.534	4.812	4.560	1.000	13.134	0.00
900.48	853.58	111.43	8.859	7.914	7-M2c	5.000	4.869	4.869	1.000	12.522	0.00
950.04	865.78	111.57	8.997	8.027	7-M2c	5.000	4.915	4.915	1.000	12.581	0.00
999.60	876.37	111.69	9.118	7.921	7-M2c	5.000	4.955	4.955	1.000	12.632	0.00

****

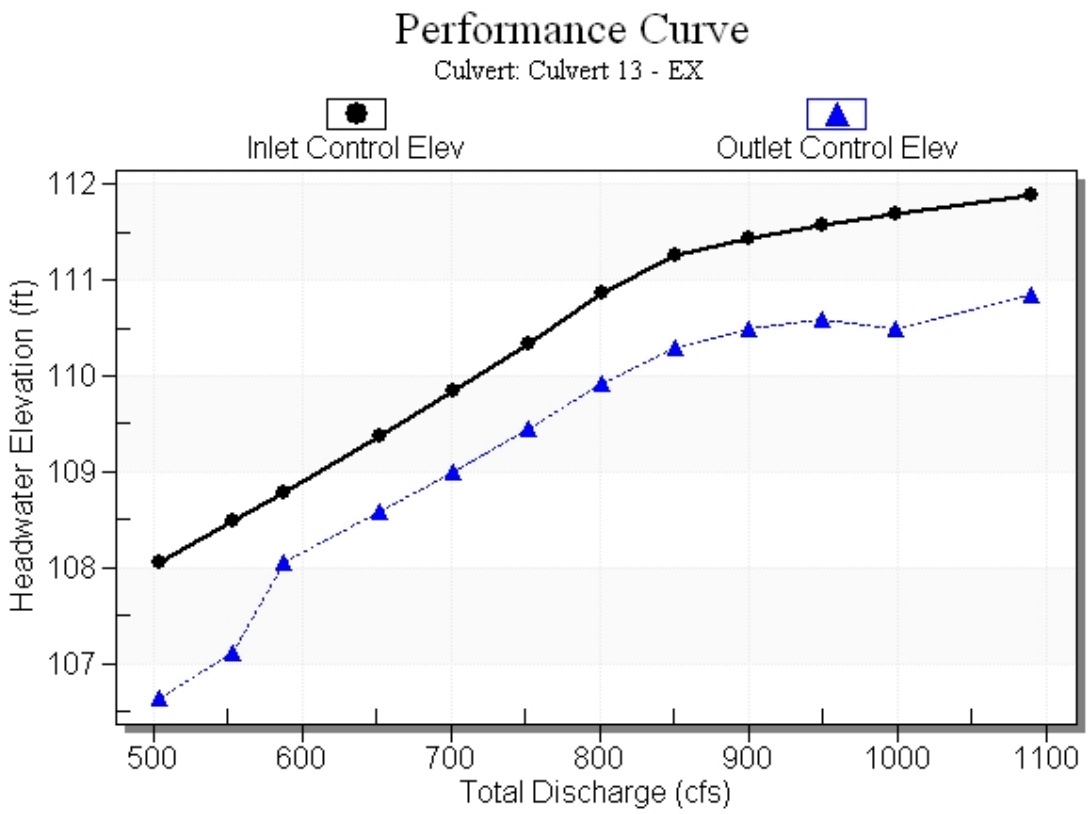
Straight Culvert

Inlet Elevation (invert): 102.57 ft, Outlet Elevation (invert): 101.98 ft

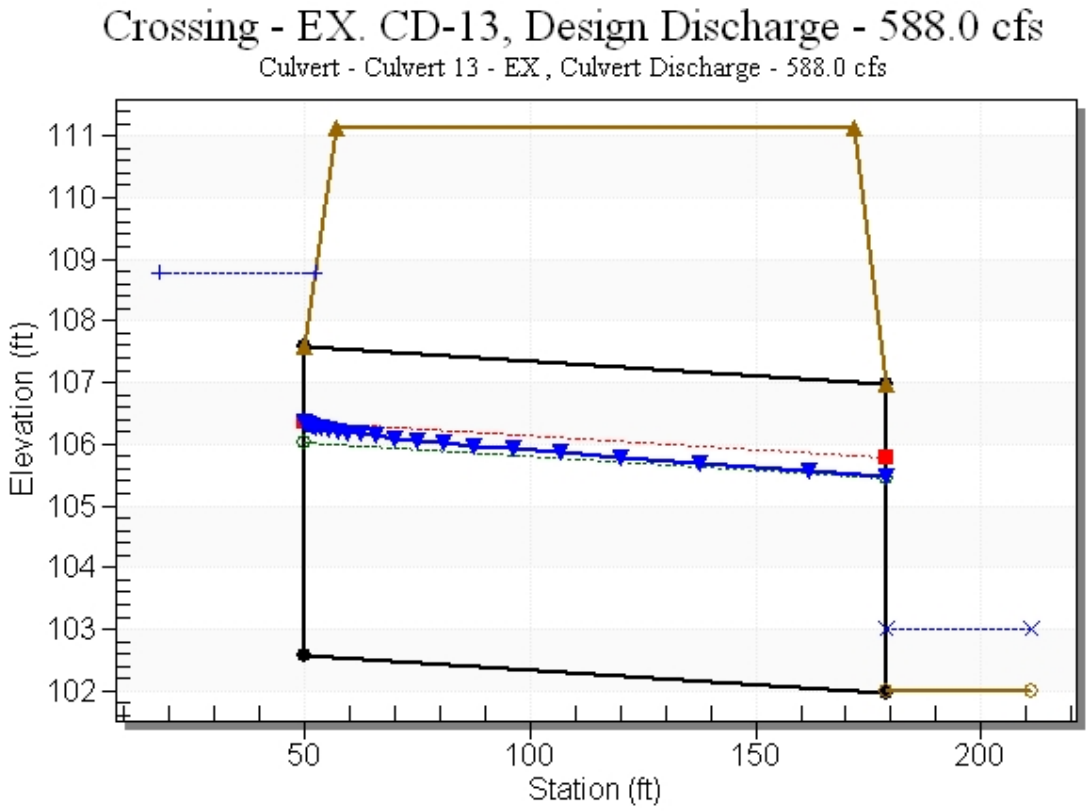
Culvert Length: 129.00 ft, Culvert Slope: 0.0046

****

Culvert Performance Curve Plot: Culvert 13 - EX



Water Surface Profile Plot for Culvert: Culvert 13 - EX



Site Data - Culvert 13 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 50.00 ft

Inlet Elevation: 102.57 ft

Outlet Station: 179.00 ft

Outlet Elevation: 101.98 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 13 - EX

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45º flare) Wingwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: EX. CD-13)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
504.00	103.00	1.00
553.60	103.00	1.00
588.00	103.00	1.00
652.80	103.00	1.00
702.40	103.00	1.00
752.00	103.00	1.00
801.60	103.00	1.00
851.20	103.00	1.00
900.80	103.00	1.00
950.40	103.00	1.00
1000.00	103.00	1.00

Tailwater Channel Data - EX. CD-13

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 103.00 ft

Roadway Data for Crossing: EX. CD-13

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 111.00 ft

Roadway Surface: Paved

Roadway Top Width: 115.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 504 cfs

Design Flow: 588 cfs

Maximum Flow: 999.6 cfs

Table 64 - Summary of Culvert Flows at Crossing: PR. CD-13

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 13 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
108.05	504.00	504.00	0.00	1
108.48	553.56	553.56	0.00	1
108.78	588.00	588.00	0.00	1
109.37	652.68	652.68	0.00	1
109.85	702.24	702.24	0.00	1
110.34	751.80	751.80	0.00	1
110.86	801.36	801.36	0.00	1
111.17	850.92	830.19	20.50	7
111.33	900.48	844.40	55.77	5
111.46	950.04	856.17	93.73	5
111.58	999.60	866.61	132.57	4
111.00	814.73	814.73	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-13

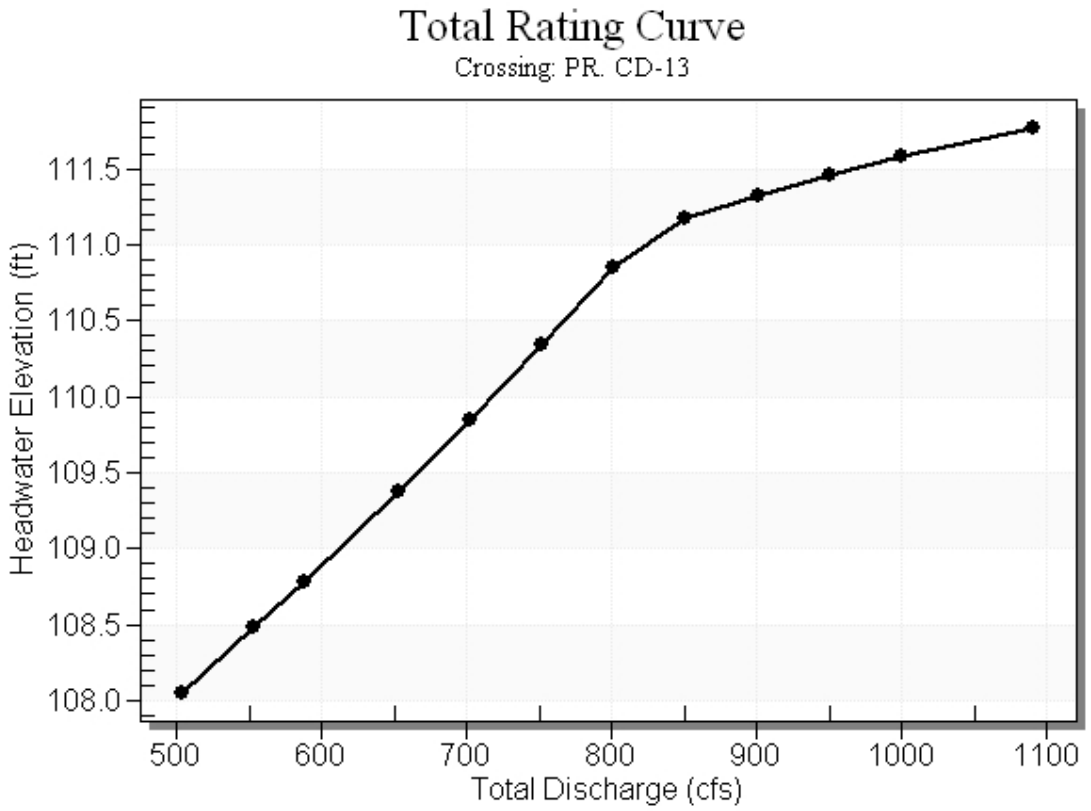


Table 65 - Culvert Summary Table: Culvert 13 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
504.00	504.00	108.05	5.485	0.430	5-S2n	3.129	3.427	3.153	1.090	11.418	0.00
553.56	553.56	108.48	5.911	4.521	5-S2n	3.354	3.648	3.378	1.090	11.704	0.00
588.00	588.00	108.78	6.214	5.469	5-S2n	3.509	3.798	3.533	1.090	11.889	0.00
652.68	652.68	109.37	6.803	6.007	5-S2n	3.797	4.072	3.817	1.090	12.214	0.00
702.24	702.24	109.85	7.275	6.445	5-S2n	4.014	4.275	4.034	1.090	12.435	0.00
751.80	751.80	110.34	7.769	6.905	5-S2n	4.229	4.474	4.247	1.090	12.644	0.00
801.36	801.36	110.86	8.286	7.387	5-S2n	4.443	4.669	4.458	1.090	12.839	0.00
850.92	830.19	111.17	8.599	7.741	7-M2c	5.000	4.780	4.780	1.090	12.406	0.00
900.48	844.40	111.33	8.756	7.884	7-M2c	5.000	4.834	4.834	1.090	12.476	0.00
950.04	856.17	111.46	8.888	7.996	7-M2c	5.000	4.879	4.879	1.090	12.534	0.00
999.60	866.61	111.58	9.007	8.092	7-M2c	5.000	4.919	4.919	1.090	12.585	0.00

****

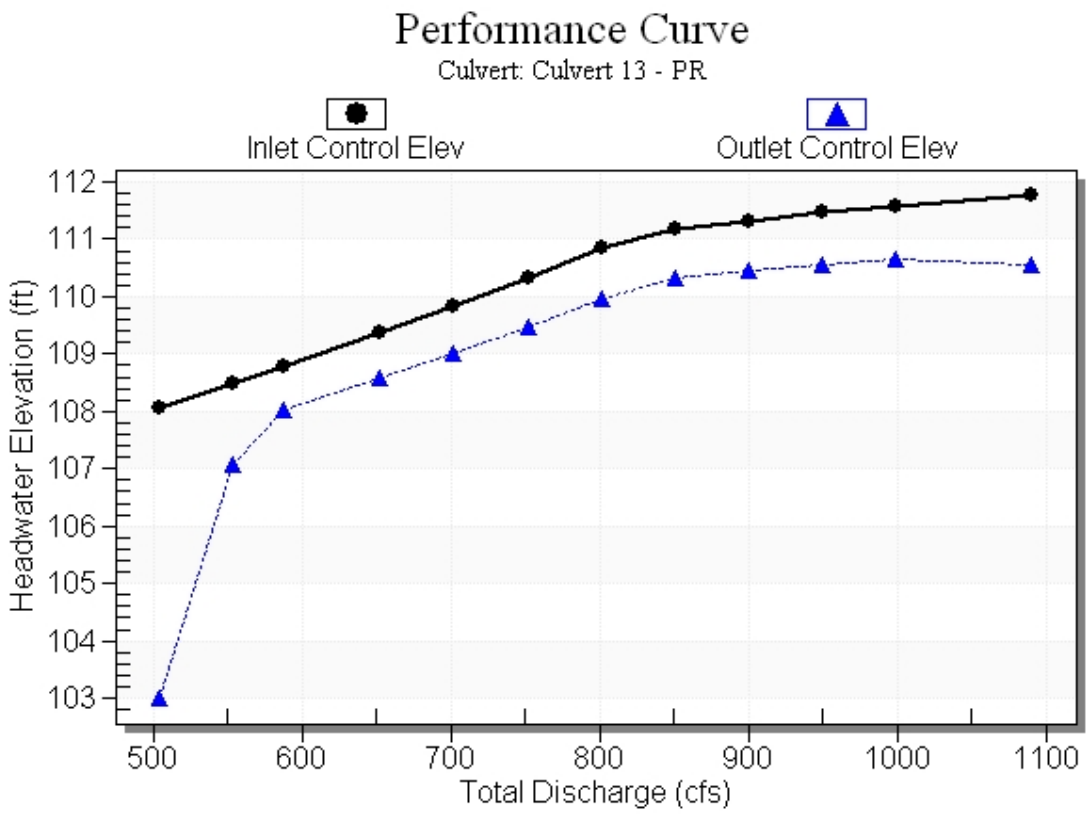
Straight Culvert

Inlet Elevation (invert): 102.57 ft, Outlet Elevation (invert): 101.91 ft

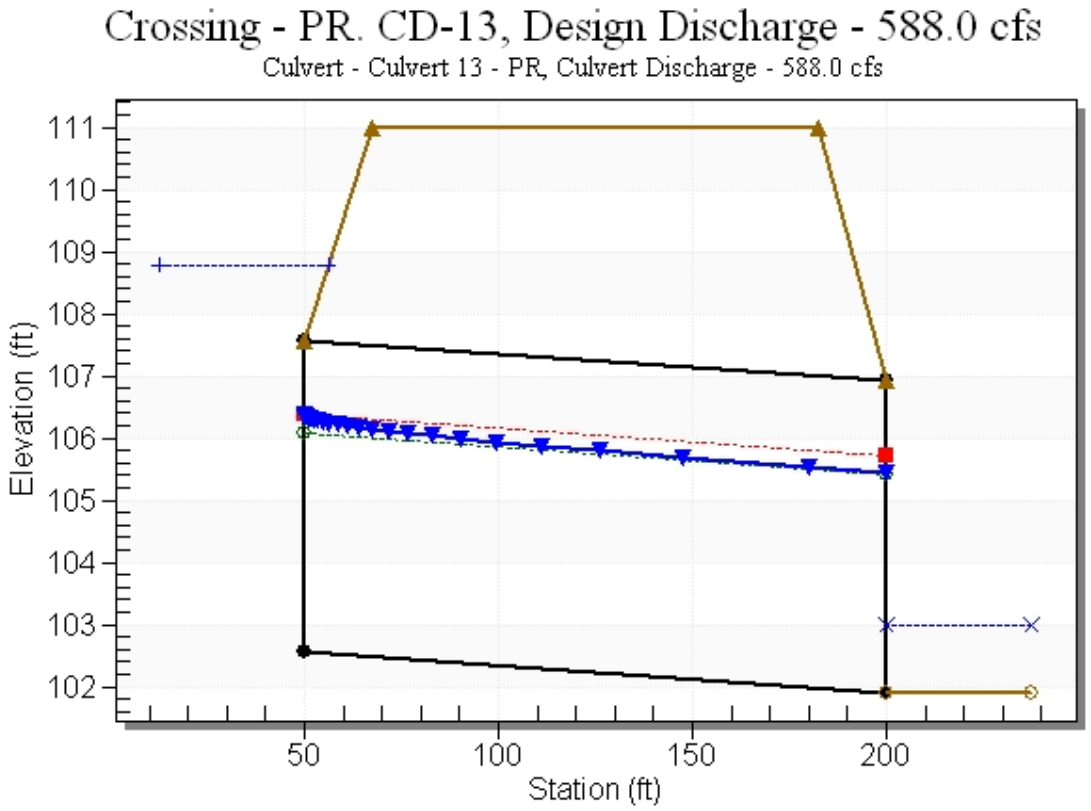
Culvert Length: 150.00 ft, Culvert Slope: 0.0044

****

Culvert Performance Curve Plot: Culvert 13 - PR



Water Surface Profile Plot for Culvert: Culvert 13 - PR



Site Data - Culvert 13 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 50.00 ft

Inlet Elevation: 102.57 ft

Outlet Station: 200.00 ft

Outlet Elevation: 101.91 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 13 - PR

Barrel Shape: Concrete Box

Barrel Span: 7.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel (45º flare) Wingwall

Inlet Depression: NONE

Table 66 - Downstream Channel Rating Curve (Crossing: PR. CD-13)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
504.00	103.00	1.09
553.56	103.00	1.09
588.00	103.00	1.09
652.68	103.00	1.09
702.24	103.00	1.09
751.80	103.00	1.09
801.36	103.00	1.09
850.92	103.00	1.09
900.48	103.00	1.09
950.04	103.00	1.09
999.60	103.00	1.09

Tailwater Channel Data - PR. CD-13

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 103.00 ft

Roadway Data for Crossing: PR. CD-13

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 111.00 ft

Roadway Surface: Paved

Roadway Top Width: 115.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 102 cfs

Design Flow: 119 cfs

Maximum Flow: 202 cfs

Table 67 - Summary of Culvert Flows at Crossing: EX. CD-14

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 14 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
113.97	102.00	102.00	0.00	1
114.24	112.00	112.00	0.00	1
114.53	119.00	119.00	0.00	1
115.11	132.00	132.00	0.00	1
115.59	142.00	142.00	0.00	1
116.11	152.00	152.00	0.00	1
116.66	162.00	162.00	0.00	1
117.23	172.00	172.00	0.00	1
117.82	182.00	182.00	0.00	1
118.03	192.00	185.30	6.19	19
118.05	202.00	185.67	15.83	5
118.00	184.87	184.87	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-14

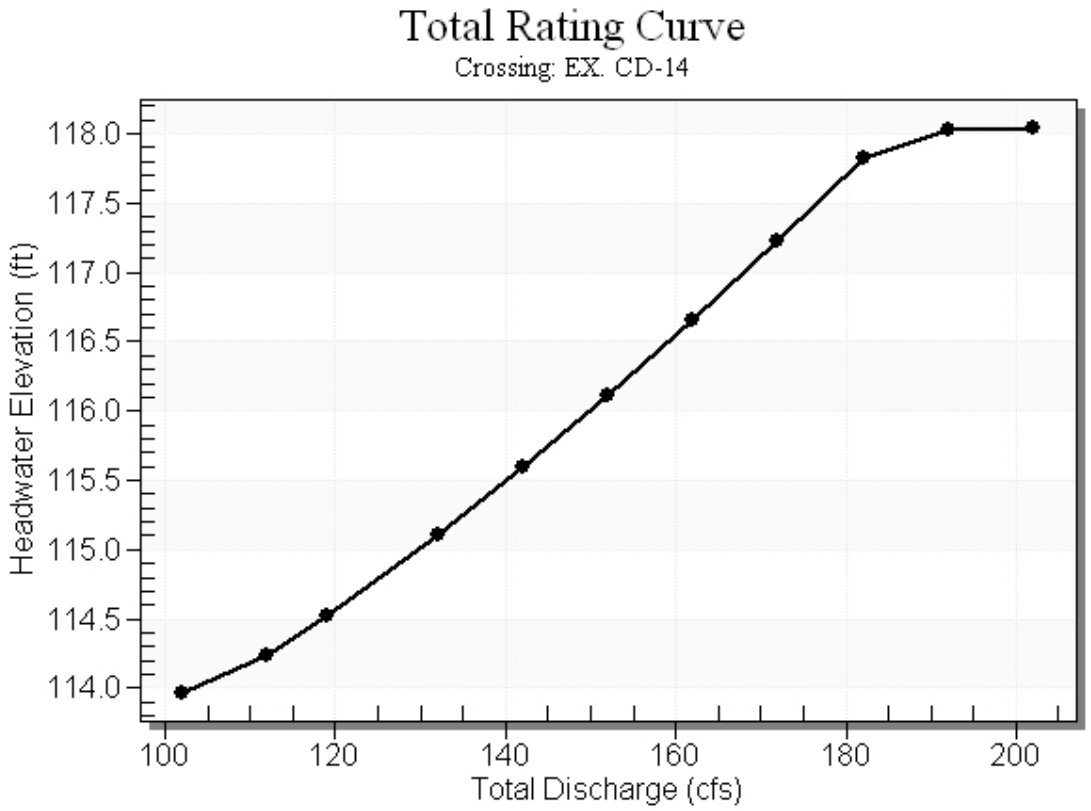


Table 68 - Culvert Summary Table: Culvert 14 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
102.00	102.00	113.97	3.861	3.971	8-H2f	-1.000	2.320	3.000	3.000	7.215	0.00
112.00	112.00	114.24	4.239	4.170	8-H2t	-1.000	2.424	3.000	3.000	8.298	0.00
119.00	119.00	114.53	4.526	4.321	8-H2t	-1.000	2.491	3.000	3.000	8.816	0.00
132.00	132.00	115.11	5.107	4.626	8-H2t	-1.000	2.600	3.000	3.000	9.780	0.00
142.00	142.00	115.59	5.593	4.881	8-H2t	-1.000	2.671	3.000	3.000	10.520	0.00
152.00	152.00	116.11	6.111	5.156	8-H2t	-1.000	2.731	3.000	3.000	11.261	0.00
162.00	162.00	116.66	6.657	5.449	8-H2t	-1.000	2.777	3.000	3.000	12.002	0.00
172.00	172.00	117.23	7.229	5.760	8-H2t	-1.000	2.816	3.000	3.000	12.743	0.00
182.00	182.00	117.82	7.825	6.091	8-H2t	-1.000	2.848	3.000	3.000	13.484	0.00
192.00	185.30	118.03	8.026	6.204	8-H2t	-1.000	2.857	3.000	3.000	13.728	0.00
202.00	185.67	118.05	8.049	6.217	8-H2t	-1.000	2.858	3.000	3.000	13.756	0.00

****

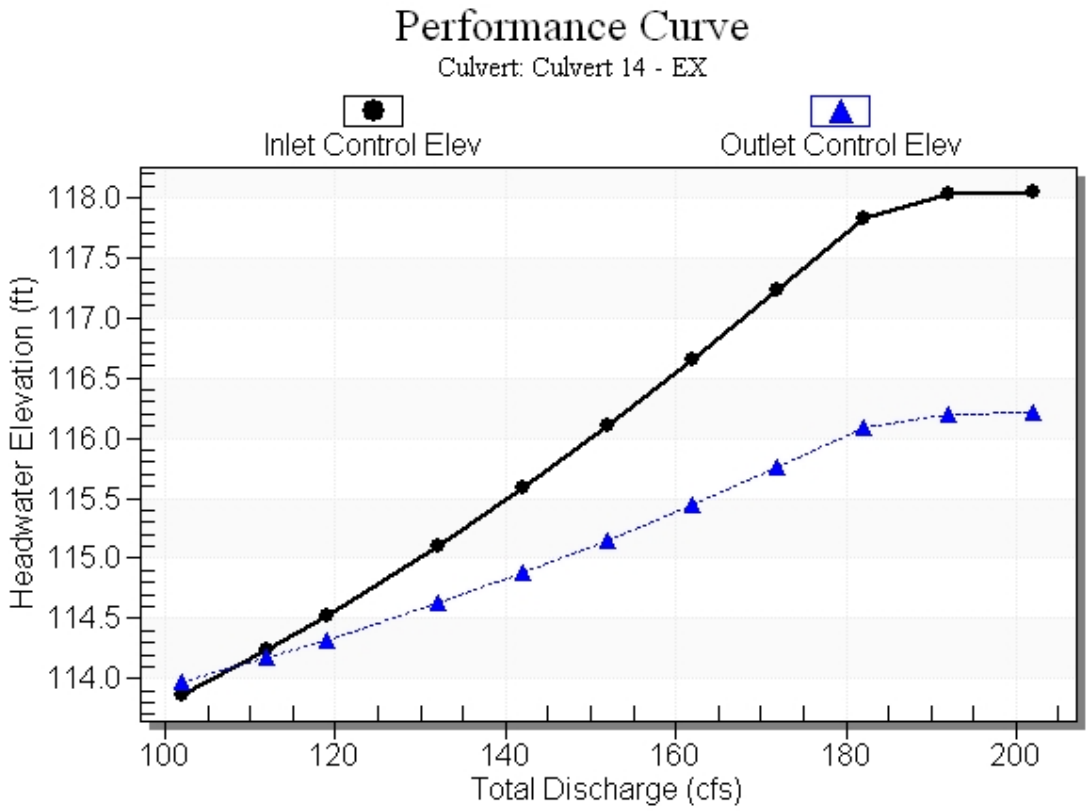
Straight Culvert

Inlet Elevation (invert): 110.00 ft, Outlet Elevation (invert): 110.00 ft

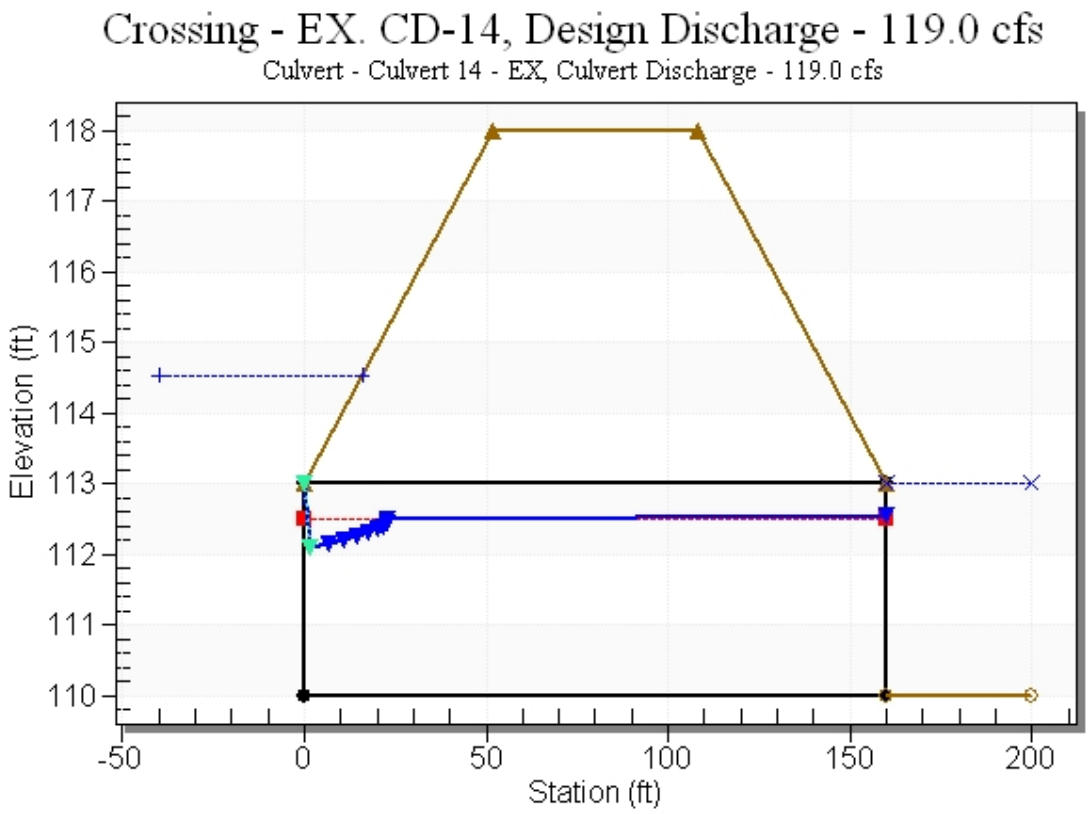
Culvert Length: 160.00 ft, Culvert Slope: 0.0000

****

Culvert Performance Curve Plot: Culvert 14 - EX



Water Surface Profile Plot for Culvert: Culvert 14 - EX



Site Data - Culvert 14 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 110.00 ft

Outlet Station: 160.00 ft

Outlet Elevation: 110.00 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 14 - EX

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 69 - Downstream Channel Rating Curve (Crossing: EX. CD-14)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
102.00	113.00	3.00
112.00	113.00	3.00
119.00	113.00	3.00
132.00	113.00	3.00
142.00	113.00	3.00
152.00	113.00	3.00
162.00	113.00	3.00
172.00	113.00	3.00
182.00	113.00	3.00
192.00	113.00	3.00
202.00	113.00	3.00

Tailwater Channel Data - EX. CD-14

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 113.00 ft

Roadway Data for Crossing: EX. CD-14

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 118.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 102 cfs

Design Flow: 119 cfs

Maximum Flow: 202 cfs

Table 70 - Summary of Culvert Flows at Crossing: PR. CD-14

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 14 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
113.97	102.00	102.00	0.00	1
114.24	112.00	112.00	0.00	1
114.53	119.00	119.00	0.00	1
115.11	132.00	132.00	0.00	1
115.59	142.00	142.00	0.00	1
116.11	152.00	152.00	0.00	1
116.66	162.00	162.00	0.00	1
117.23	172.00	172.00	0.00	1
117.82	182.00	182.00	0.00	1
118.03	192.00	185.30	6.19	19
118.05	202.00	185.67	15.83	5
118.00	184.87	184.87	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-14

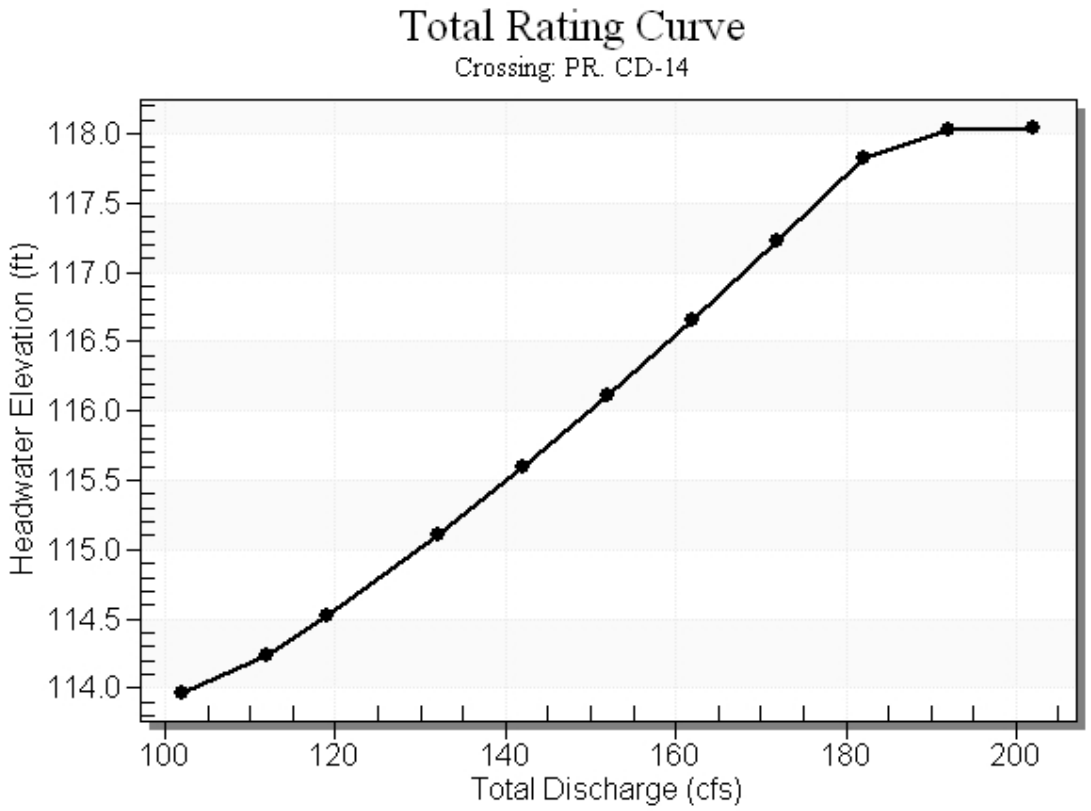


Table 71 - Culvert Summary Table: Culvert 14 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
102.00	102.00	113.97	3.861	3.971	8-H2f	-1.000	2.320	3.000	3.000	7.215	0.00
112.00	112.00	114.24	4.239	4.170	8-H2t	-1.000	2.424	3.000	3.000	8.298	0.00
119.00	119.00	114.53	4.526	4.321	8-H2t	-1.000	2.491	3.000	3.000	8.816	0.00
132.00	132.00	115.11	5.107	4.626	8-H2t	-1.000	2.600	3.000	3.000	9.780	0.00
142.00	142.00	115.59	5.593	4.881	8-H2t	-1.000	2.671	3.000	3.000	10.520	0.00
152.00	152.00	116.11	6.111	5.156	8-H2t	-1.000	2.731	3.000	3.000	11.261	0.00
162.00	162.00	116.66	6.657	5.449	8-H2t	-1.000	2.777	3.000	3.000	12.002	0.00
172.00	172.00	117.23	7.229	5.760	8-H2t	-1.000	2.816	3.000	3.000	12.743	0.00
182.00	182.00	117.82	7.825	6.091	8-H2t	-1.000	2.848	3.000	3.000	13.484	0.00
192.00	185.30	118.03	8.026	6.204	8-H2t	-1.000	2.857	3.000	3.000	13.728	0.00
202.00	185.67	118.05	8.049	6.217	8-H2t	-1.000	2.858	3.000	3.000	13.756	0.00

****

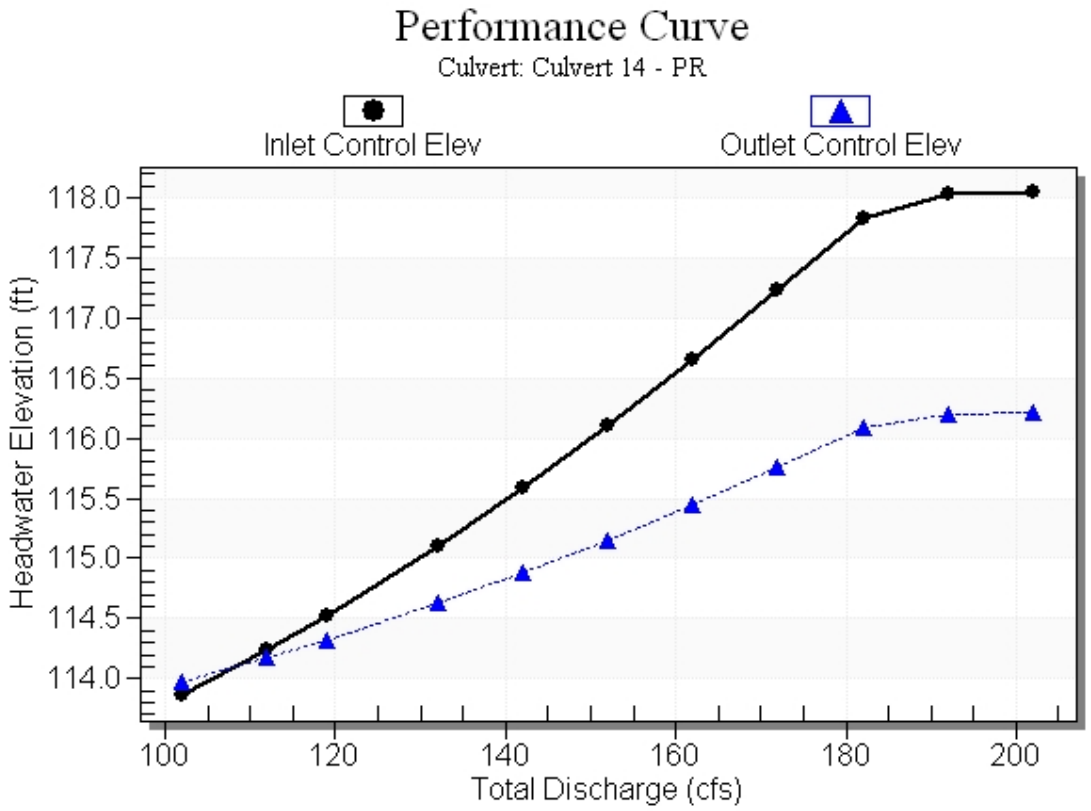
Straight Culvert

Inlet Elevation (invert): 110.00 ft, Outlet Elevation (invert): 110.00 ft

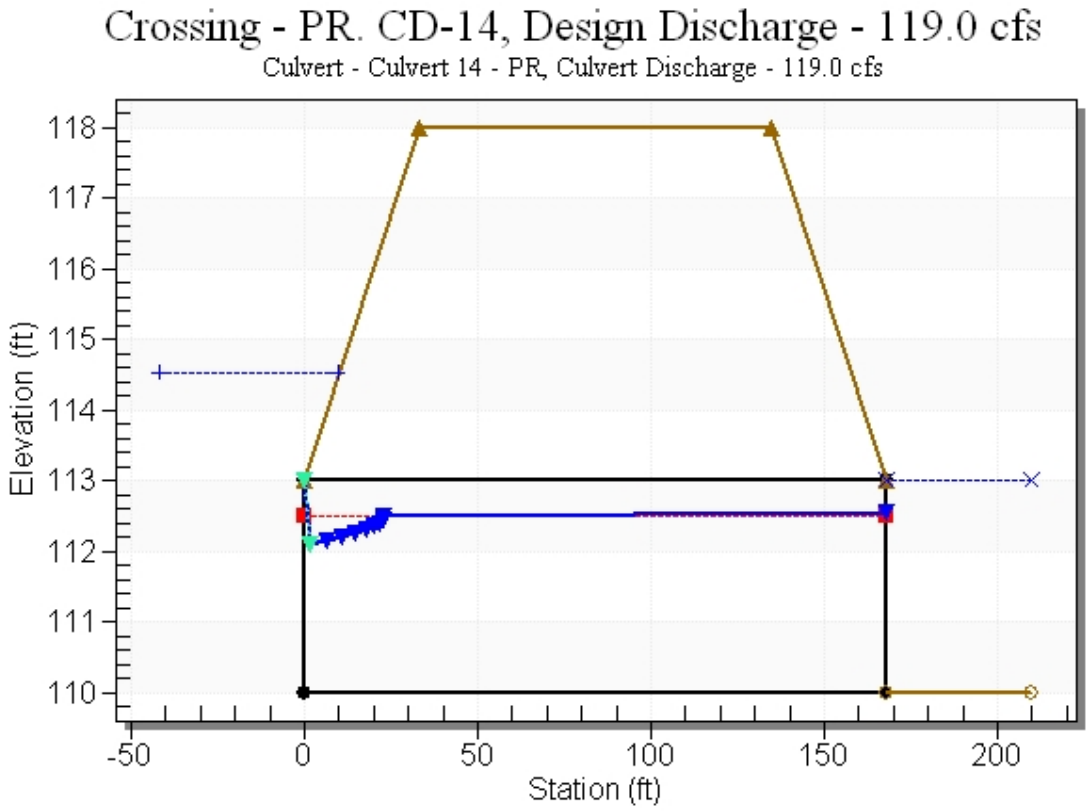
Culvert Length: 168.00 ft, Culvert Slope: 0.0000

****

Culvert Performance Curve Plot: Culvert 14 - PR



Water Surface Profile Plot for Culvert: Culvert 14 - PR



Site Data - Culvert 14 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 110.00 ft

Outlet Station: 168.00 ft

Outlet Elevation: 110.00 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 14 - PR

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 72 - Downstream Channel Rating Curve (Crossing: PR. CD-14)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
102.00	113.00	3.00
112.00	113.00	3.00
119.00	113.00	3.00
132.00	113.00	3.00
142.00	113.00	3.00
152.00	113.00	3.00
162.00	113.00	3.00
172.00	113.00	3.00
182.00	113.00	3.00
192.00	113.00	3.00
202.00	113.00	3.00

Tailwater Channel Data - PR. CD-14

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 113.00 ft

Roadway Data for Crossing: PR. CD-14

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 118.00 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 71 cfs

Design Flow: 82 cfs

Maximum Flow: 140 cfs

Table 73 - Summary of Culvert Flows at Crossing: EX. CD-16

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 16 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
116.75	71.00	71.00	0.00	1
117.11	77.90	77.90	0.00	1
117.33	82.00	82.00	0.00	1
117.92	91.70	91.70	0.00	1
118.02	98.60	93.32	4.54	13
118.04	105.50	93.61	11.54	5
118.05	112.40	93.82	18.19	4
118.07	119.30	94.00	24.49	3
118.08	126.20	94.18	31.31	3
118.09	133.10	94.35	38.22	3
118.10	140.00	94.50	45.11	3
118.00	92.99	92.99	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-16

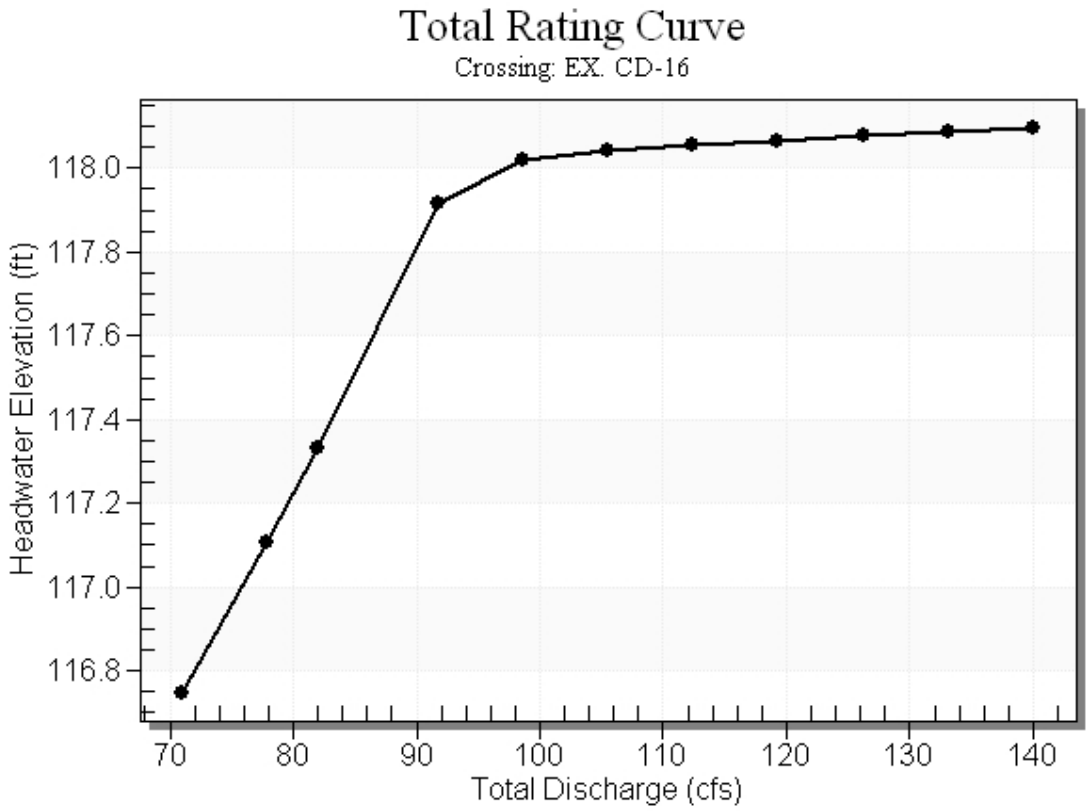


Table 74 - Culvert Summary Table: Culvert 16 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
71.00	71.00	116.75	3.532	6.349	4-FFf	2.500	2.020	2.500	4.600	7.232	0.00
77.90	77.90	117.11	3.910	6.705	4-FFf	2.500	2.104	2.500	4.600	7.935	0.00
82.00	82.00	117.33	4.152	6.933	4-FFf	2.500	2.149	2.500	4.600	8.352	0.00
91.70	91.70	117.92	4.772	7.517	4-FFf	2.500	2.240	2.500	4.600	9.340	0.00
98.60	93.32	118.02	4.882	7.621	4-FFf	2.500	2.252	2.500	4.600	9.506	0.00
105.50	93.61	118.04	4.901	7.640	4-FFf	2.500	2.255	2.500	4.600	9.535	0.00
112.40	93.82	118.05	4.916	7.654	4-FFf	2.500	2.256	2.500	4.600	9.557	0.00
119.30	94.00	118.07	4.928	7.666	4-FFf	2.500	2.258	2.500	4.600	9.575	0.00
126.20	94.18	118.08	4.940	7.677	4-FFf	2.500	2.259	2.500	4.600	9.593	0.00
133.10	94.35	118.09	4.952	7.688	4-FFf	2.500	2.261	2.500	4.600	9.610	0.00
140.00	94.50	118.10	4.963	7.698	4-FFf	2.500	2.262	2.500	4.600	9.626	0.00

****

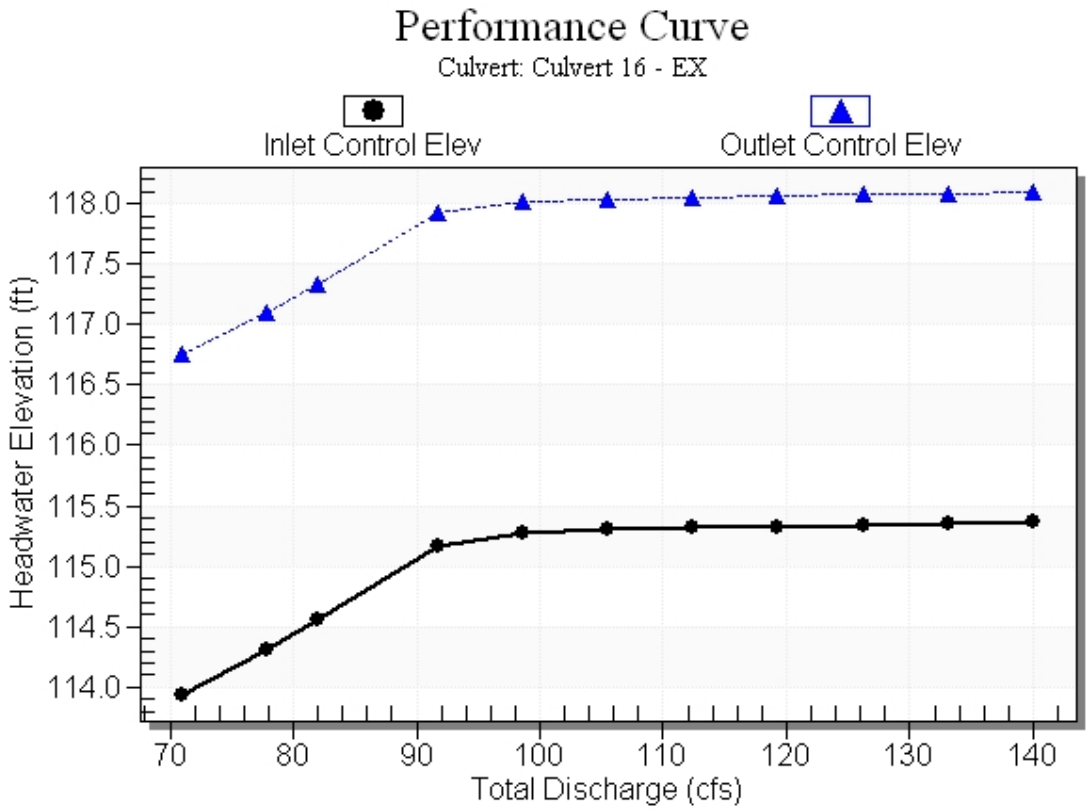
Straight Culvert

Inlet Elevation (invert): 110.40 ft, Outlet Elevation (invert): 110.34 ft

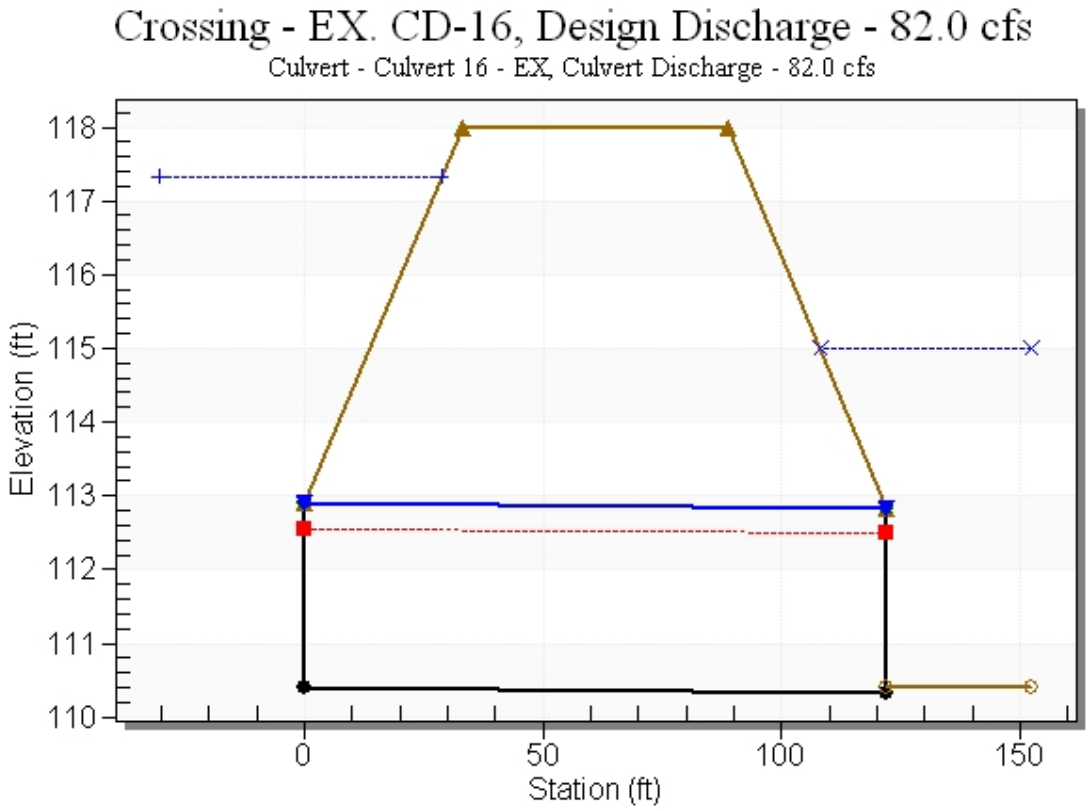
Culvert Length: 122.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: Culvert 16 - EX



Water Surface Profile Plot for Culvert: Culvert 16 - EX



Site Data - Culvert 16 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 110.40 ft

Outlet Station: 122.00 ft

Outlet Elevation: 110.34 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 16 - EX

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 75 - Downstream Channel Rating Curve (Crossing: EX. CD-16)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
71.00	115.00	4.60
77.90	115.00	4.60
82.00	115.00	4.60
91.70	115.00	4.60
98.60	115.00	4.60
105.50	115.00	4.60
112.40	115.00	4.60
119.30	115.00	4.60
126.20	115.00	4.60
133.10	115.00	4.60
140.00	115.00	4.60

Tailwater Channel Data - EX. CD-16

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 115.00 ft

Roadway Data for Crossing: EX. CD-16

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 118.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 71 cfs

Design Flow: 82 cfs

Maximum Flow: 140 cfs

Table 76 - Summary of Culvert Flows at Crossing: PR. CD-16

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 16 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
116.80	71.00	71.00	0.00	1
117.17	77.90	77.90	0.00	1
117.40	82.00	82.00	0.00	1
117.96	91.70	91.11	0.00	70
118.03	98.60	92.05	5.96	9
118.04	105.50	92.31	12.50	4
118.06	112.40	92.53	19.48	4
118.07	119.30	92.70	25.84	3
118.08	126.20	92.87	32.66	3
118.09	133.10	93.04	39.57	3
118.10	140.00	93.19	46.45	3
118.00	91.67	91.67	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-16

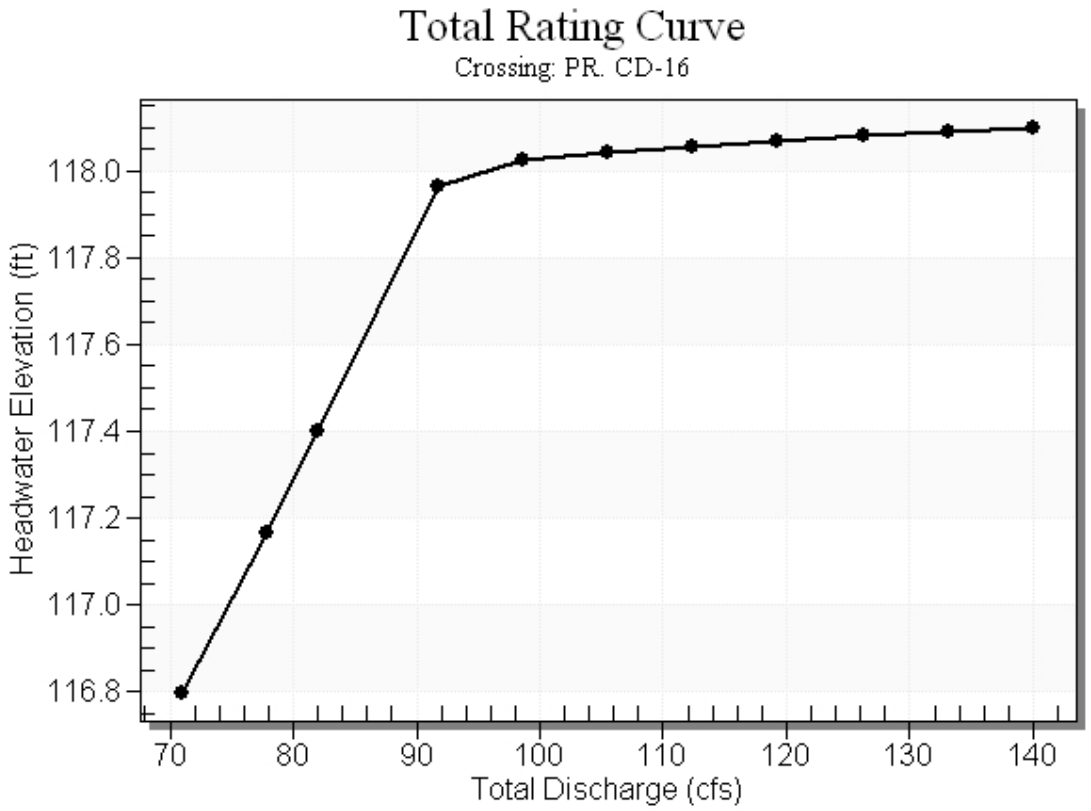


Table 77 - Culvert Summary Table: Culvert 16 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
71.00	71.00	116.80	3.532	6.400	4-FFf	2.500	2.020	2.500	4.600	7.232	0.00
77.90	77.90	117.17	3.911	6.766	4-FFf	2.500	2.104	2.500	4.600	7.935	0.00
82.00	82.00	117.40	4.152	7.000	4-FFf	2.500	2.149	2.500	4.600	8.352	0.00
91.70	91.11	117.96	4.733	7.564	4-FFf	2.500	2.235	2.500	4.600	9.281	0.00
98.60	92.05	118.03	4.796	7.625	4-FFf	2.500	2.242	2.500	4.600	9.376	0.00
105.50	92.31	118.04	4.813	7.642	4-FFf	2.500	2.244	2.500	4.600	9.403	0.00
112.40	92.53	118.06	4.828	7.656	4-FFf	2.500	2.246	2.500	4.600	9.425	0.00
119.30	92.70	118.07	4.840	7.668	4-FFf	2.500	2.248	2.500	4.600	9.443	0.00
126.20	92.87	118.08	4.851	7.679	4-FFf	2.500	2.249	2.500	4.600	9.460	0.00
133.10	93.04	118.09	4.862	7.690	4-FFf	2.500	2.250	2.500	4.600	9.477	0.00
140.00	93.19	118.10	4.873	7.700	4-FFf	2.500	2.251	2.500	4.600	9.492	0.00

****

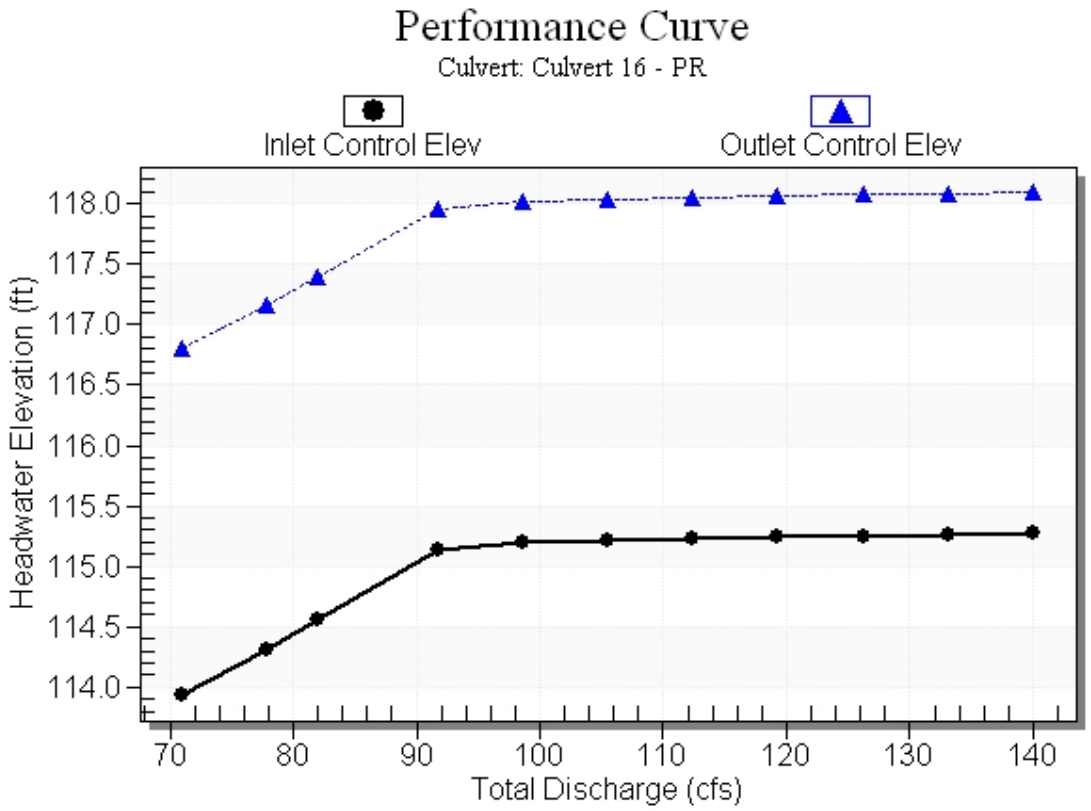
Straight Culvert

Inlet Elevation (invert): 110.40 ft, Outlet Elevation (invert): 110.34 ft

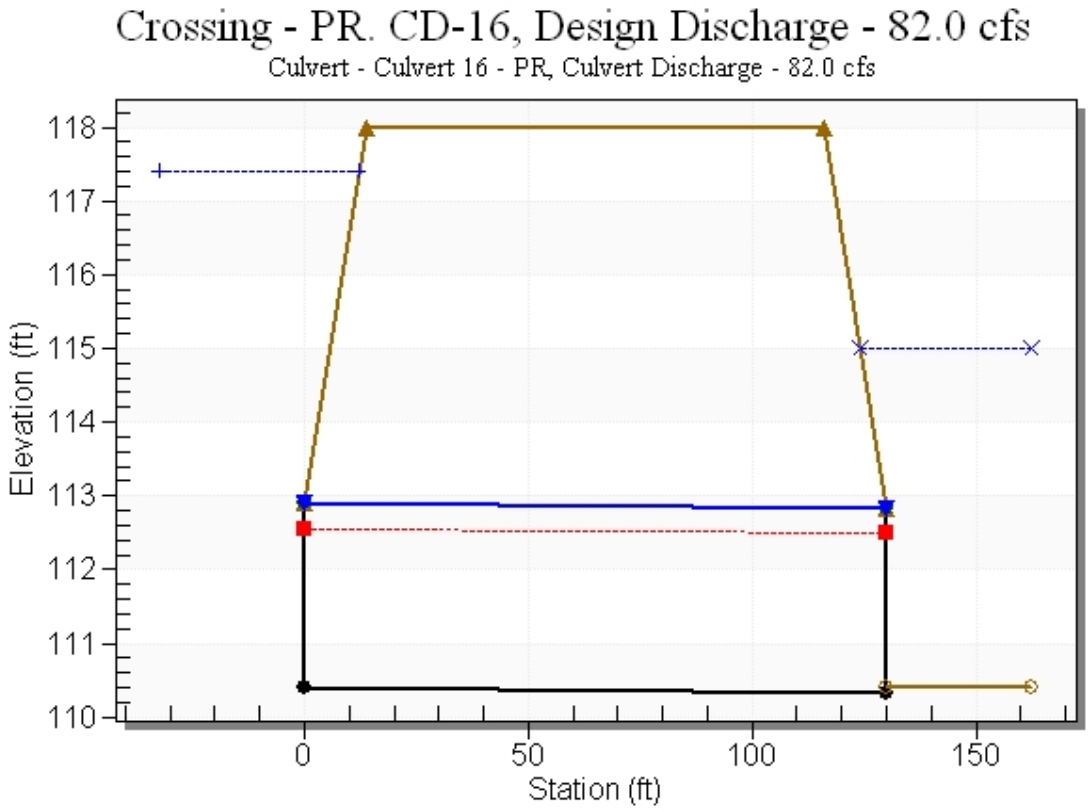
Culvert Length: 130.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: Culvert 16 - PR



Water Surface Profile Plot for Culvert: Culvert 16 - PR



Site Data - Culvert 16 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 110.40 ft

Outlet Station: 130.00 ft

Outlet Elevation: 110.34 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 16 - PR

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 78 - Downstream Channel Rating Curve (Crossing: PR. CD-16)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
71.00	115.00	4.60
77.90	115.00	4.60
82.00	115.00	4.60
91.70	115.00	4.60
98.60	115.00	4.60
105.50	115.00	4.60
112.40	115.00	4.60
119.30	115.00	4.60
126.20	115.00	4.60
133.10	115.00	4.60
140.00	115.00	4.60

Tailwater Channel Data - PR. CD-16

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 115.00 ft

Roadway Data for Crossing: PR. CD-16

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 118.00 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 71 cfs

Design Flow: 82 cfs

Maximum Flow: 140 cfs

Table 79 - Summary of Culvert Flows at Crossing: EX. CD-17

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 17 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
110.00	71.00	71.00	0.00	1
110.41	77.90	77.90	0.00	1
110.66	82.00	82.00	0.00	1
111.29	91.70	91.70	0.00	1
111.77	98.60	98.60	0.00	1
112.28	105.50	105.50	0.00	1
112.82	112.40	112.40	0.00	1
113.02	119.30	114.93	3.79	22
113.04	126.20	115.19	10.65	5
113.05	133.10	115.37	17.33	4
113.07	140.00	115.53	24.22	4
113.00	114.73	114.73	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-17

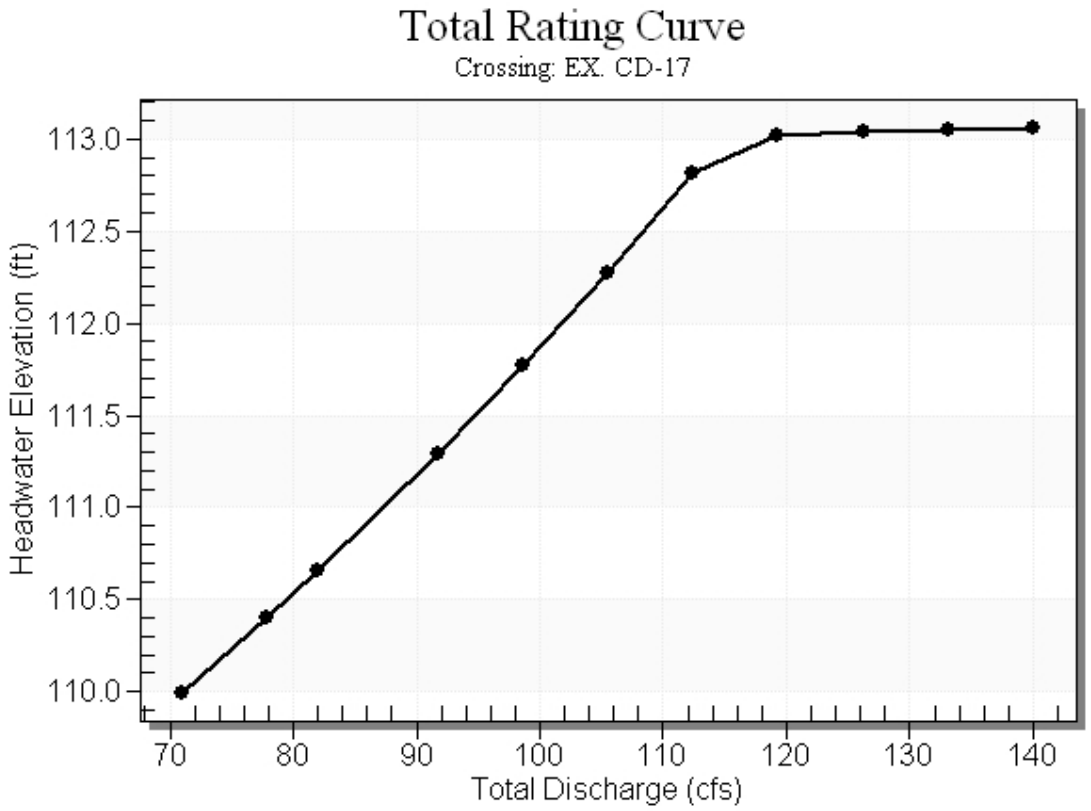


Table 80 - Culvert Summary Table: Culvert 17 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
71.00	71.00	110.00	3.533	3.997	7-M2c	2.500	2.020	2.020	2.000	8.353	0.00
77.90	77.90	110.41	3.911	4.405	7-M2c	2.500	2.104	2.104	2.000	8.833	0.00
82.00	82.00	110.66	4.153	4.657	7-M2c	2.500	2.149	2.149	2.000	9.132	0.00
91.70	91.70	111.29	4.772	5.295	7-M2c	2.500	2.240	2.240	2.000	9.887	0.00
98.60	98.60	111.77	5.250	5.769	7-M2c	2.500	2.291	2.291	2.000	10.462	0.00
105.50	105.50	112.28	5.755	6.276	7-M2c	2.500	2.333	2.333	2.000	11.063	0.00
112.40	112.40	112.82	6.285	6.815	7-M2c	2.500	2.362	2.362	2.000	11.703	0.00
119.30	114.93	113.02	6.485	7.019	7-M2c	2.500	2.378	2.378	2.000	11.921	0.00
126.20	115.19	113.04	6.506	7.037	7-M2c	2.500	2.380	2.380	2.000	11.944	0.00
133.10	115.37	113.05	6.520	7.052	7-M2c	2.500	2.373	2.373	2.000	11.980	0.00
140.00	115.53	113.07	6.532	7.065	7-M2c	2.500	2.373	2.373	2.000	11.996	0.00

****

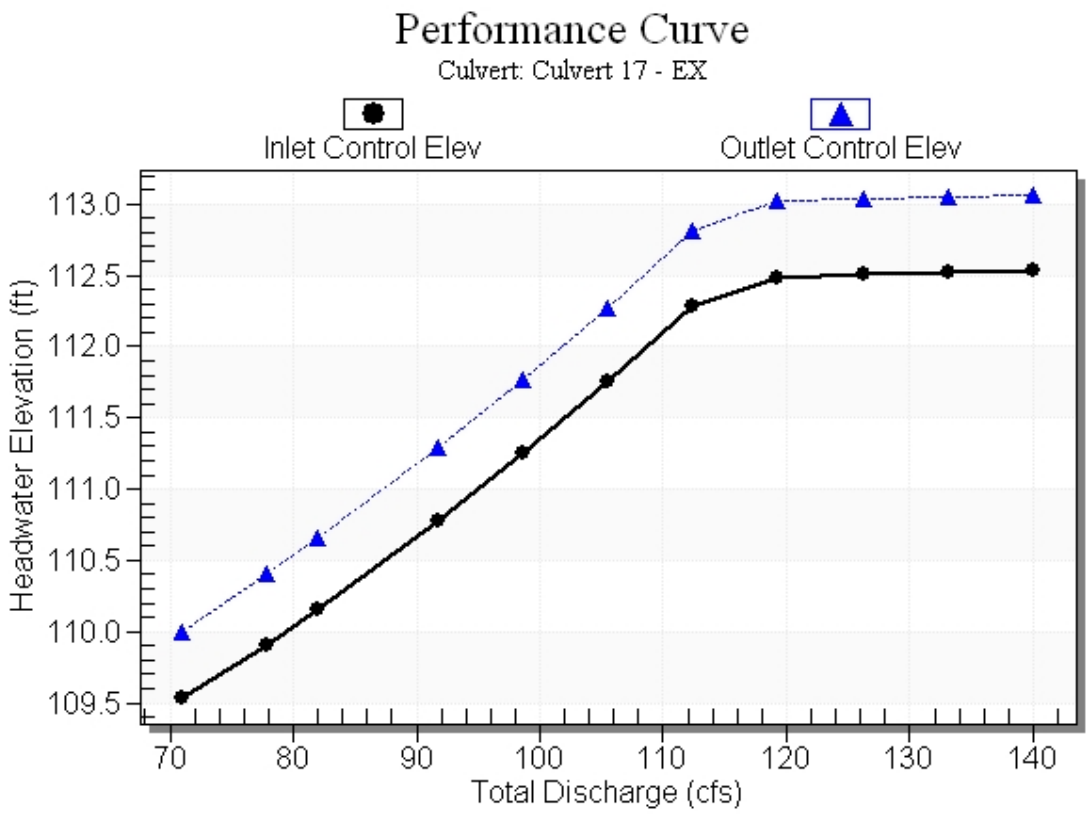
Straight Culvert

Inlet Elevation (invert): 106.00 ft, Outlet Elevation (invert): 105.98 ft

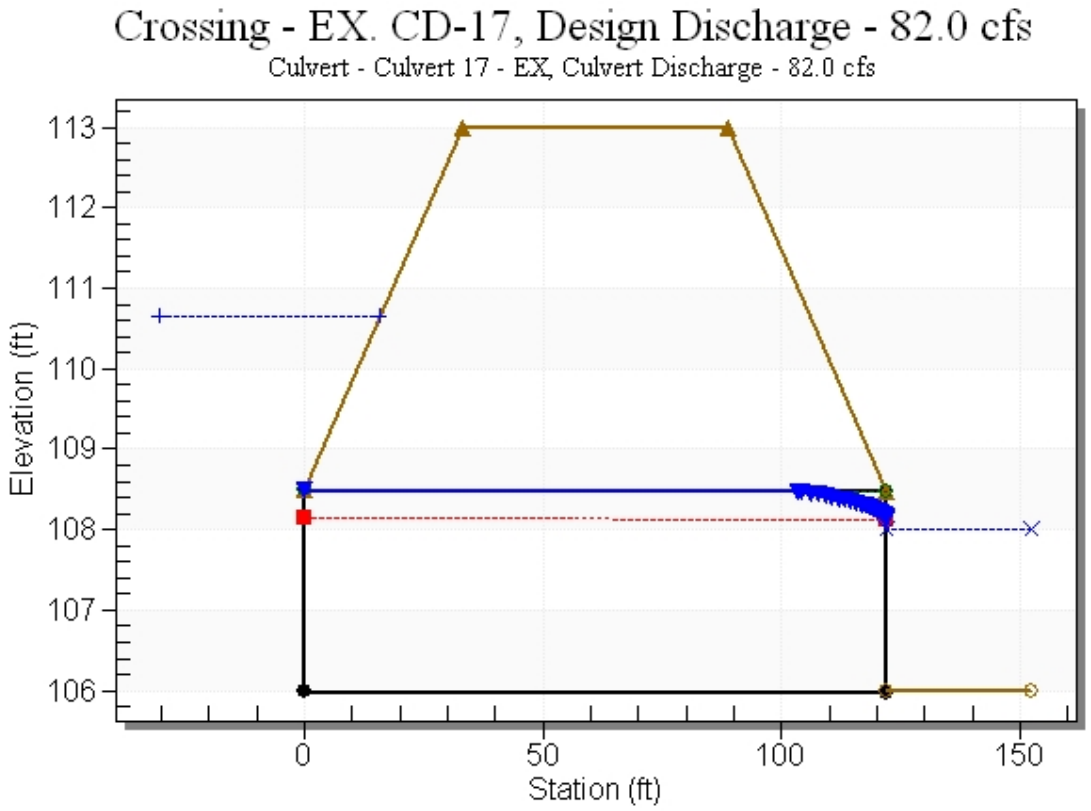
Culvert Length: 122.00 ft, Culvert Slope: 0.0002

****

Culvert Performance Curve Plot: Culvert 17 - EX



Water Surface Profile Plot for Culvert: Culvert 17 - EX



Site Data - Culvert 17 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 106.00 ft

Outlet Station: 122.00 ft

Outlet Elevation: 105.98 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 17 - EX

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 81 - Downstream Channel Rating Curve (Crossing: EX. CD-17)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
71.00	108.00	2.00
77.90	108.00	2.00
82.00	108.00	2.00
91.70	108.00	2.00
98.60	108.00	2.00
105.50	108.00	2.00
112.40	108.00	2.00
119.30	108.00	2.00
126.20	108.00	2.00
133.10	108.00	2.00
140.00	108.00	2.00

Tailwater Channel Data - EX. CD-17

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 108.00 ft

Roadway Data for Crossing: EX. CD-17

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 113.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 71 cfs

Design Flow: 82 cfs

Maximum Flow: 140 cfs

Table 82 - Summary of Culvert Flows at Crossing: PR. CD-17

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 17 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
110.02	71.00	71.00	0.00	1
110.44	77.90	77.90	0.00	1
110.69	82.00	82.00	0.00	1
111.35	91.70	91.70	0.00	1
111.84	98.60	98.60	0.00	1
112.36	105.50	105.50	0.00	1
112.91	112.40	112.40	0.00	1
113.02	119.30	113.78	5.07	14
113.04	126.20	113.99	11.91	5
113.05	133.10	114.16	18.57	4
113.07	140.00	114.29	24.91	3
113.00	113.47	113.47	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-17

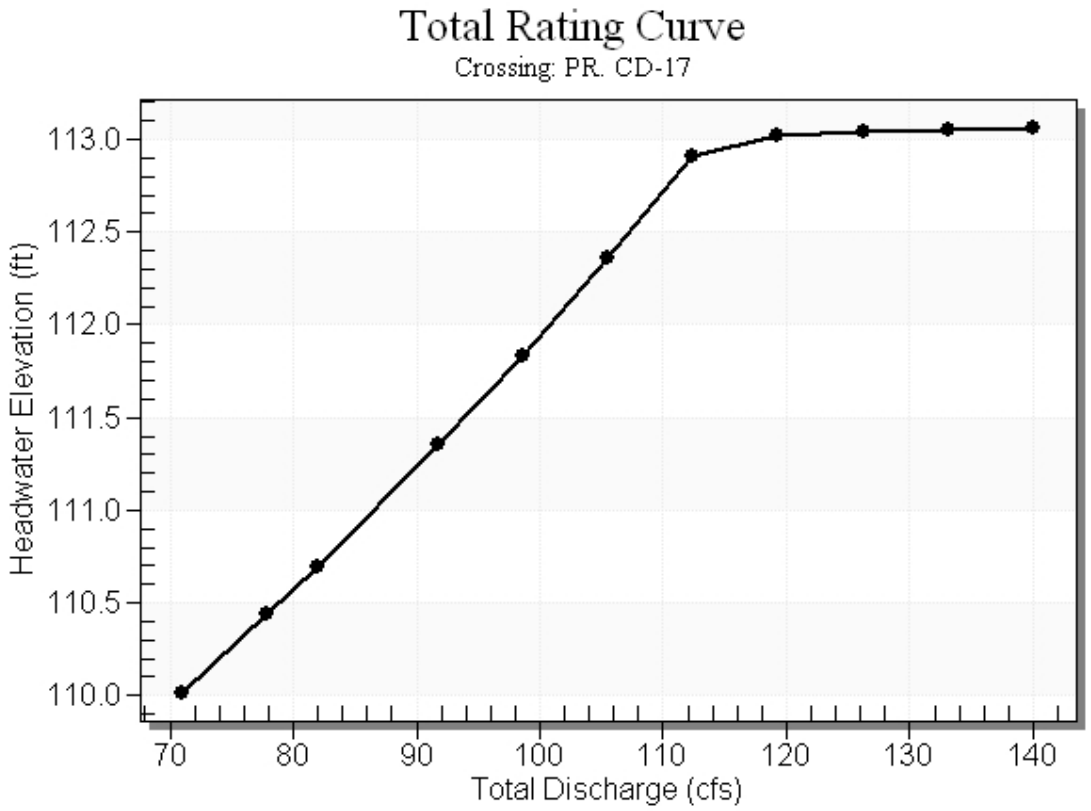


Table 83 - Culvert Summary Table: Culvert 17 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
71.00	71.00	110.02	3.532	4.018	7-M2t	2.500	2.020	2.050	2.000	8.241	0.00
77.90	77.90	110.44	3.911	4.436	7-M2c	2.500	2.104	2.104	2.000	8.833	0.00
82.00	82.00	110.69	4.152	4.694	7-M2c	2.500	2.149	2.149	2.000	9.132	0.00
91.70	91.70	111.35	4.772	5.349	7-M2c	2.500	2.240	2.240	2.000	9.887	0.00
98.60	98.60	111.84	5.250	5.837	7-M2c	2.500	2.291	2.291	2.000	10.462	0.00
105.50	105.50	112.36	5.755	6.358	7-M2c	2.500	2.333	2.333	2.000	11.063	0.00
112.40	112.40	112.91	6.285	6.912	7-M2c	2.500	2.362	2.362	2.000	11.703	0.00
119.30	113.78	113.02	6.393	7.023	7-M2c	2.500	2.374	2.374	2.000	11.813	0.00
126.20	113.99	113.04	6.410	7.041	7-M2c	2.500	2.375	2.375	2.000	11.832	0.00
133.10	114.16	113.05	6.423	7.055	7-M2c	2.500	2.369	2.369	2.000	11.866	0.00
140.00	114.29	113.07	6.434	7.066	7-M2c	2.500	2.369	2.369	2.000	11.880	0.00

****

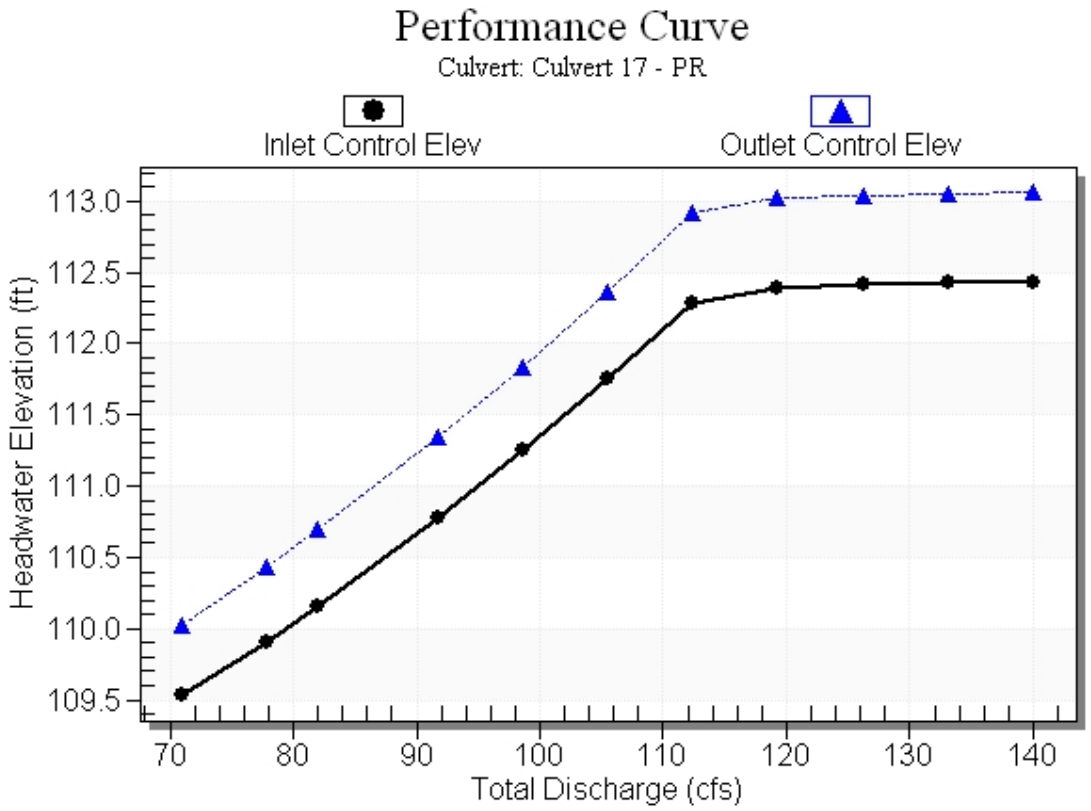
Straight Culvert

Inlet Elevation (invert): 106.00 ft, Outlet Elevation (invert): 105.95 ft

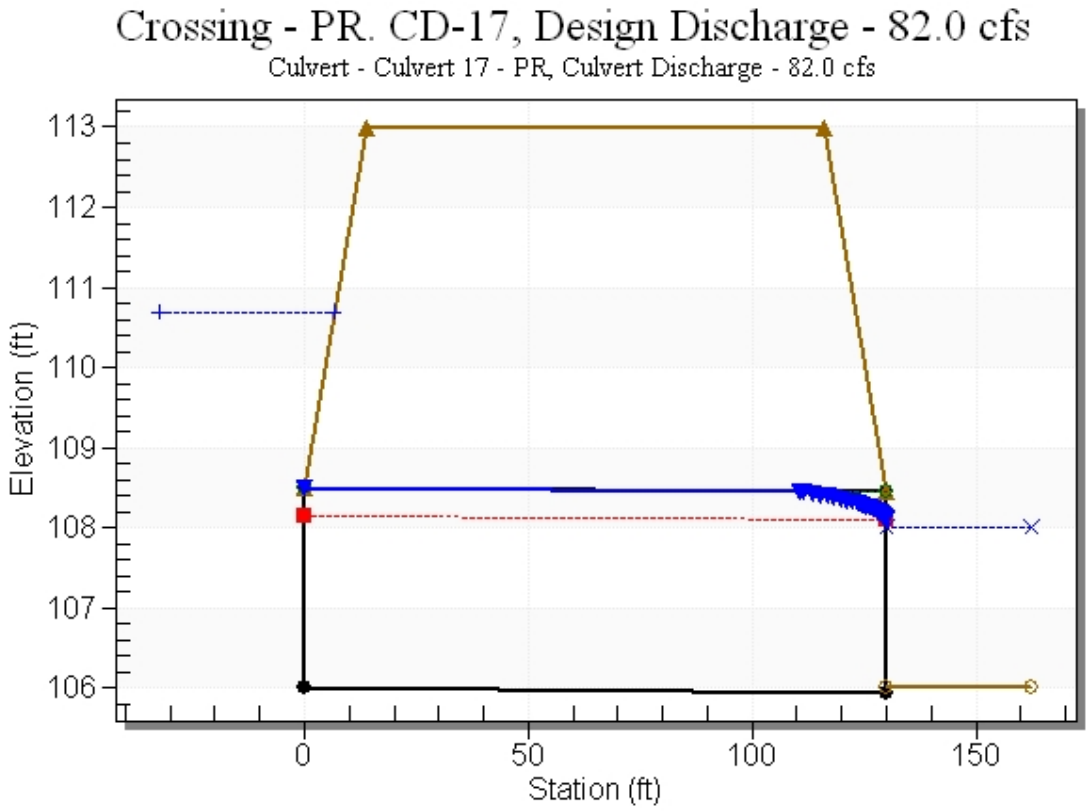
Culvert Length: 130.00 ft, Culvert Slope: 0.0004

****

Culvert Performance Curve Plot: Culvert 17 - PR



Water Surface Profile Plot for Culvert: Culvert 17 - PR



Site Data - Culvert 17 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 106.00 ft

Outlet Station: 130.00 ft

Outlet Elevation: 105.95 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 17 - PR

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 84 - Downstream Channel Rating Curve (Crossing: PR. CD-17)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
71.00	108.00	2.00
77.90	108.00	2.00
82.00	108.00	2.00
91.70	108.00	2.00
98.60	108.00	2.00
105.50	108.00	2.00
112.40	108.00	2.00
119.30	108.00	2.00
126.20	108.00	2.00
133.10	108.00	2.00
140.00	108.00	2.00

Tailwater Channel Data - PR. CD-17

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 108.00 ft

Roadway Data for Crossing: PR. CD-17

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 113.00 ft

Roadway Surface: Paved

Roadway Top Width: 102.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 51 cfs

Design Flow: 59 cfs

Maximum Flow: 101 cfs

Table 85 - Summary of Culvert Flows at Crossing: EX. CD-18

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 18 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
100.12	51.00	51.00	0.00	1
100.52	56.00	56.00	0.00	1
100.79	59.00	59.00	0.00	1
101.39	66.00	66.00	0.00	1
101.86	71.00	71.00	0.00	1
102.04	76.00	72.84	2.94	14
102.08	81.00	73.22	7.65	6
102.11	86.00	73.57	12.15	4
102.13	91.00	73.81	17.02	4
102.16	96.00	74.02	21.86	4
102.18	101.00	74.31	26.67	4
102.00	72.49	72.49	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-18

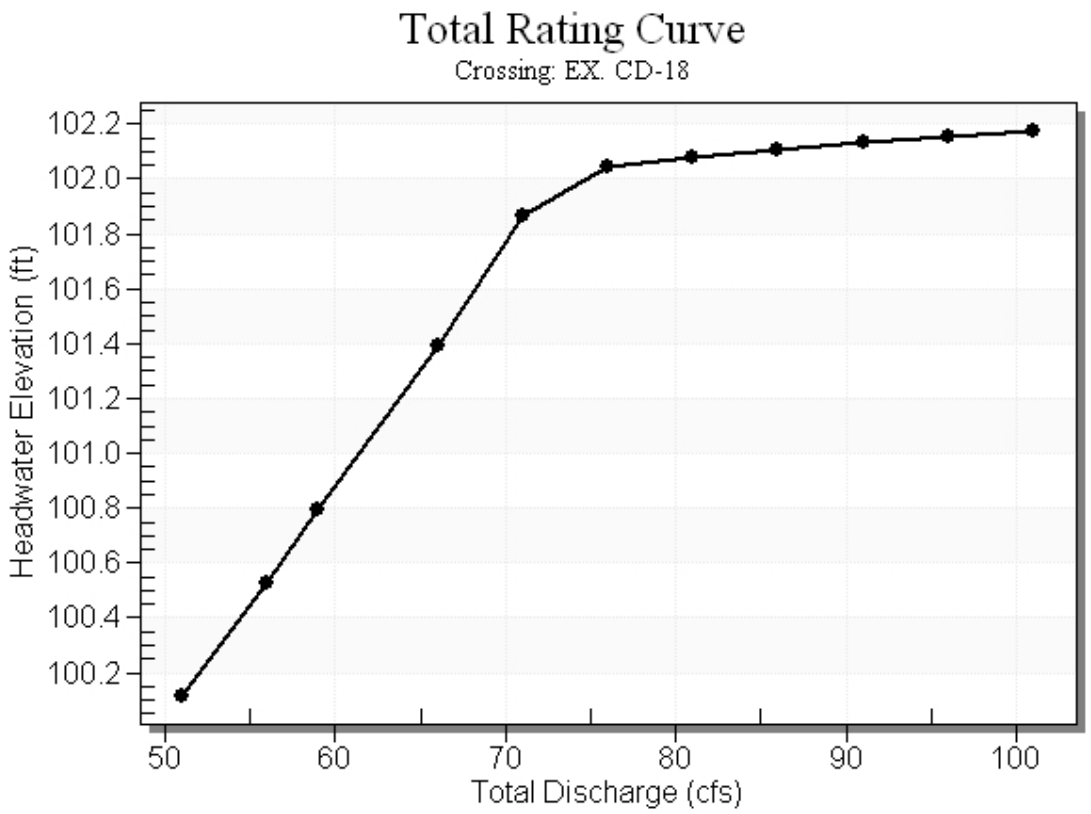


Table 86 - Culvert Summary Table: Culvert 18 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
51.00	51.00	100.12	3.859	4.128	7-M2c	3.000	2.320	2.320	1.100	8.693	0.00
56.00	56.00	100.52	4.238	4.534	7-M2c	3.000	2.424	2.424	1.100	9.151	0.00
59.00	59.00	100.79	4.483	4.803	7-M2c	3.000	2.481	2.481	1.100	9.436	0.00
66.00	66.00	101.39	5.105	5.402	7-M2c	3.000	2.600	2.600	1.100	10.141	0.00
71.00	71.00	101.86	5.591	5.875	7-M2c	3.000	2.671	2.671	1.100	10.682	0.00
76.00	72.84	102.04	5.779	6.051	7-M2c	3.000	2.694	2.694	1.100	10.889	0.00
81.00	73.22	102.08	5.818	6.088	7-M2c	3.000	2.698	2.698	1.100	10.932	0.00
86.00	73.57	102.11	5.854	6.116	7-M2c	3.000	2.703	2.703	1.100	10.973	0.00
91.00	73.81	102.13	5.878	6.145	7-M2c	3.000	2.705	2.705	1.100	10.999	0.00
96.00	74.02	102.16	5.900	6.166	7-M2c	3.000	2.708	2.708	1.100	11.024	0.00
101.00	74.31	102.18	5.930	6.188	7-M2c	3.000	2.711	2.711	1.100	11.057	0.00

****

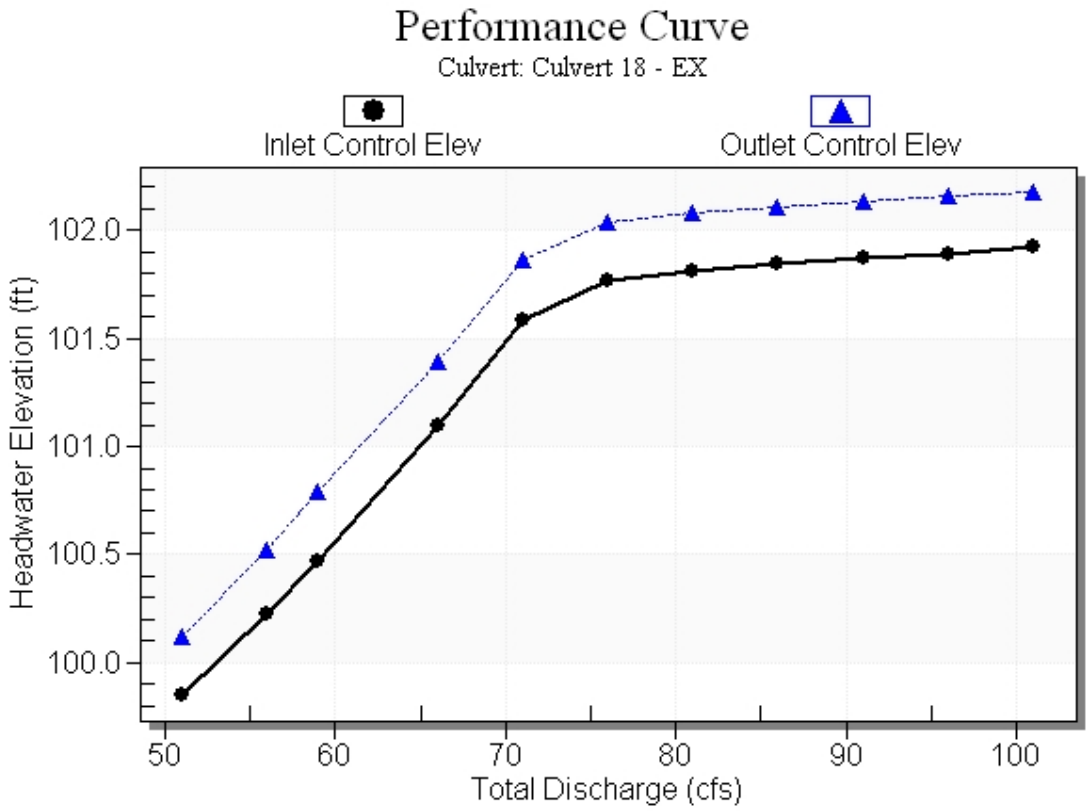
Straight Culvert

Inlet Elevation (invert): 95.99 ft, Outlet Elevation (invert): 95.85 ft

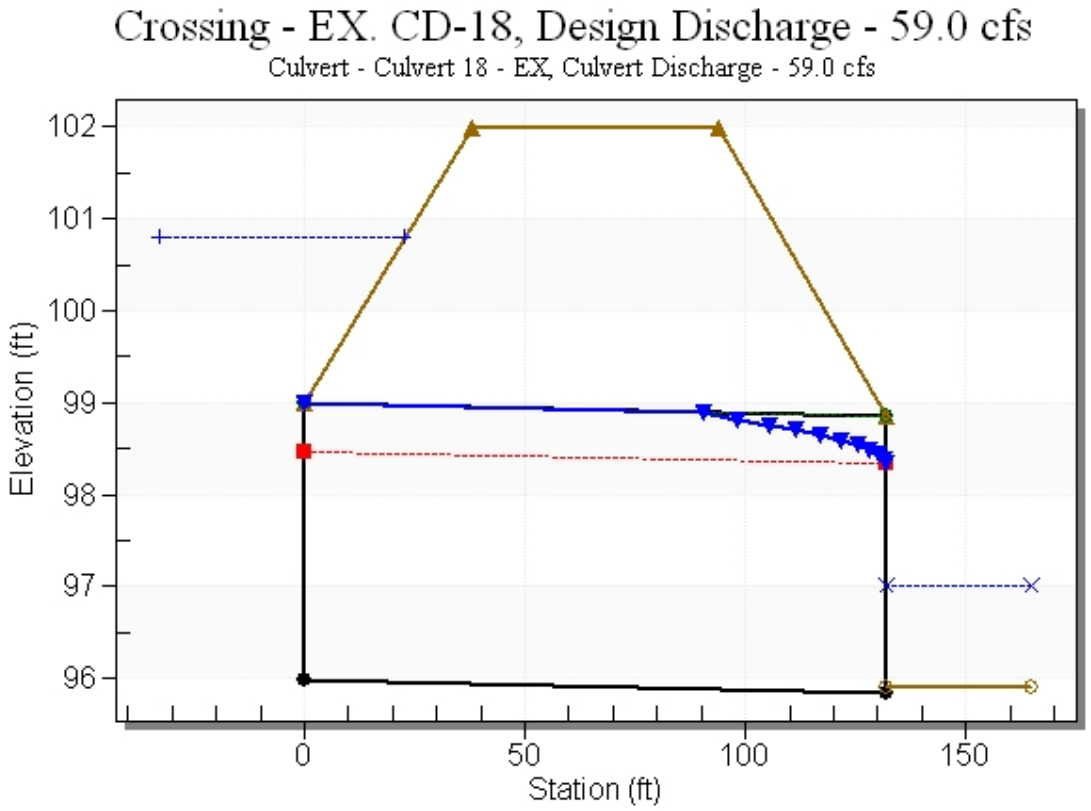
Culvert Length: 132.00 ft, Culvert Slope: 0.0011

****

Culvert Performance Curve Plot: Culvert 18 - EX



Water Surface Profile Plot for Culvert: Culvert 18 - EX



Site Data - Culvert 18 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 95.99 ft

Outlet Station: 132.00 ft

Outlet Elevation: 95.85 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 18 - EX

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 87 - Downstream Channel Rating Curve (Crossing: EX. CD-18)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
51.00	97.00	1.10
56.00	97.00	1.10
59.00	97.00	1.10
66.00	97.00	1.10
71.00	97.00	1.10
76.00	97.00	1.10
81.00	97.00	1.10
86.00	97.00	1.10
91.00	97.00	1.10
96.00	97.00	1.10
101.00	97.00	1.10

Tailwater Channel Data - EX. CD-18

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 97.00 ft

Roadway Data for Crossing: EX. CD-18

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 120.00 ft

Crest Elevation: 102.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 1 - Summary of Culvert Flows at Crossing: EX. CD-19

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 19 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
95.76	35.00	35.00	0.00	1
96.13	38.50	38.50	0.00	1
96.42	41.00	41.00	0.00	1
96.98	45.50	45.50	0.00	1
97.45	49.00	49.00	0.00	1
97.96	52.50	52.50	0.00	1
98.51	56.00	56.00	0.00	1
99.00	59.50	58.97	0.01	89
99.02	63.00	59.07	3.39	5
99.03	66.50	59.13	7.01	4
99.04	70.00	59.18	10.27	3
99.00	58.96	58.96	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-19

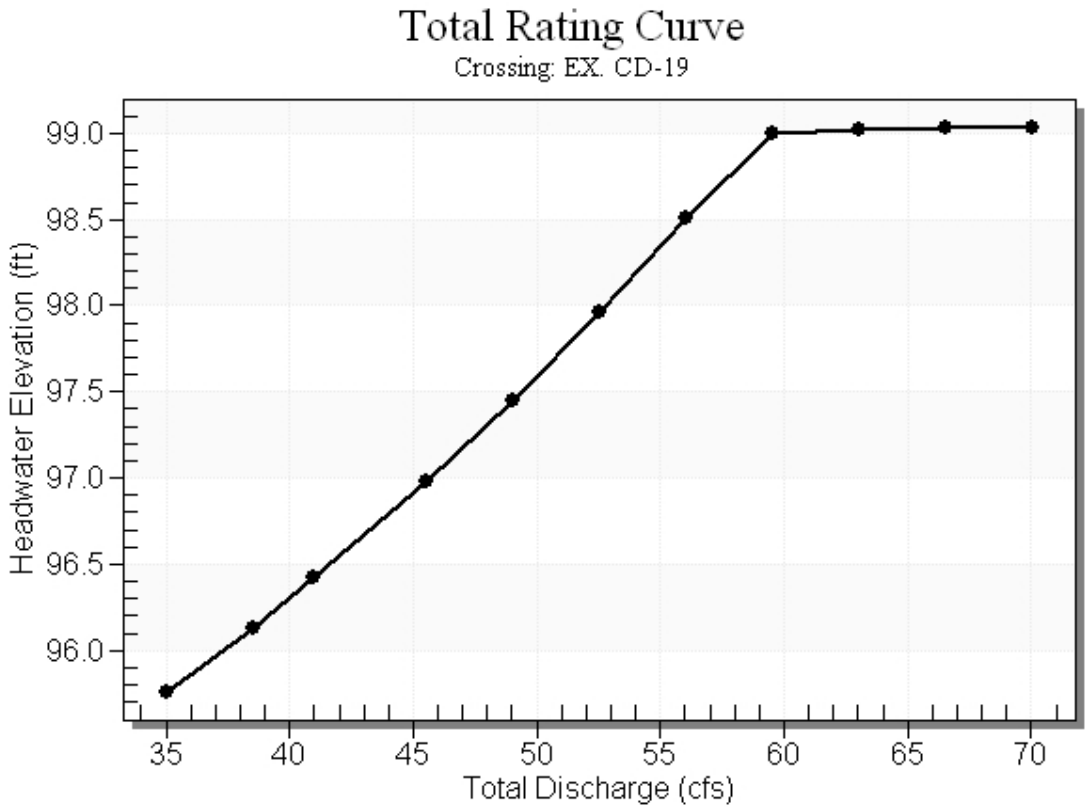


Table 2 - Culvert Summary Table: Culvert 19 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
35.00	35.00	95.76	3.477	4.062	4-FFf	2.500	2.007	2.500	2.700	7.130	0.000
38.50	38.50	96.13	3.856	4.432	4-FFf	2.500	2.094	2.500	2.700	7.843	0.000
41.00	41.00	96.42	4.149	4.717	4-FFf	2.500	2.149	2.500	2.700	8.352	0.000
45.50	45.50	96.98	4.722	5.277	4-FFf	2.500	2.234	2.500	2.700	9.269	0.000
49.00	49.00	97.45	5.204	5.753	4-FFf	2.500	2.287	2.500	2.700	9.982	0.000
52.50	52.50	97.96	5.715	6.264	4-FFf	2.500	2.330	2.500	2.700	10.695	0.000
56.00	56.00	98.51	6.250	6.810	4-FFf	2.500	2.360	2.500	2.700	11.408	0.000
59.50	58.97	99.00	6.723	7.300	4-FFf	2.500	2.391	2.500	2.700	12.013	0.000
63.00	59.07	99.02	6.739	7.318	4-FFf	2.500	2.382	2.500	2.700	12.033	0.000
66.50	59.13	99.03	6.750	7.329	4-FFf	2.500	2.382	2.500	2.700	12.047	0.000
70.00	59.18	99.04	6.758	7.337	4-FFf	2.500	2.392	2.500	2.700	12.056	0.000

****

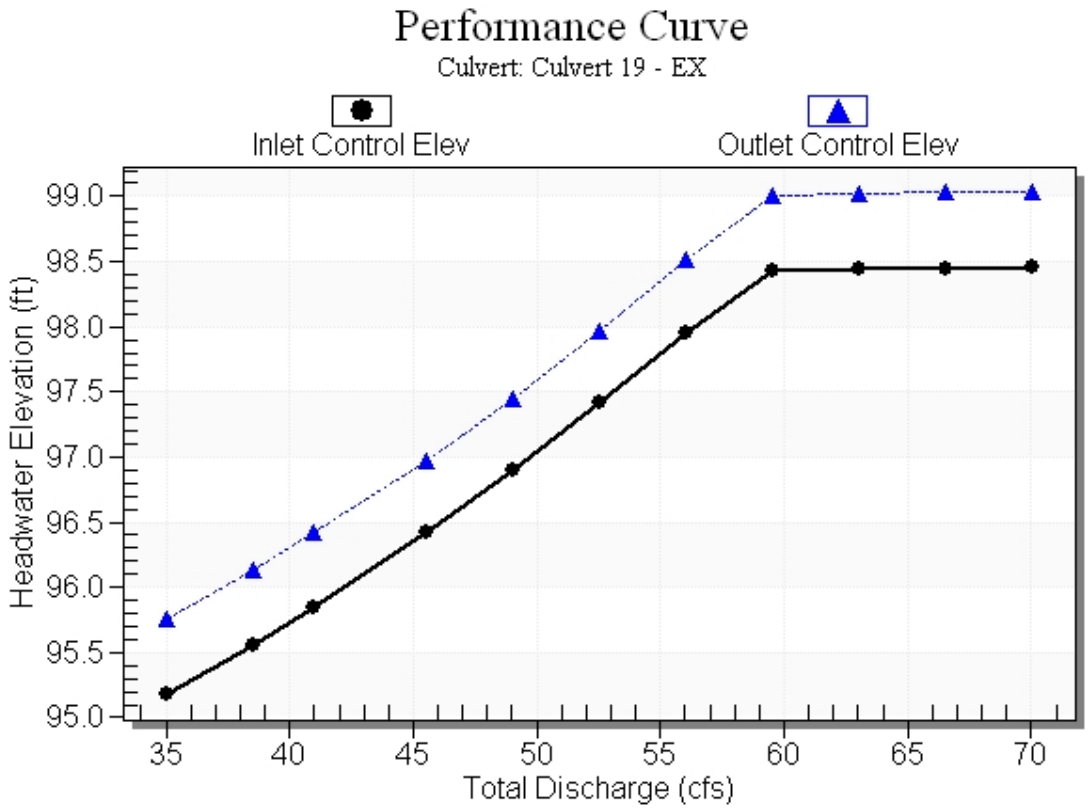
Straight Culvert

Inlet Elevation (invert): 91.70 ft, Outlet Elevation (invert): 91.33 ft

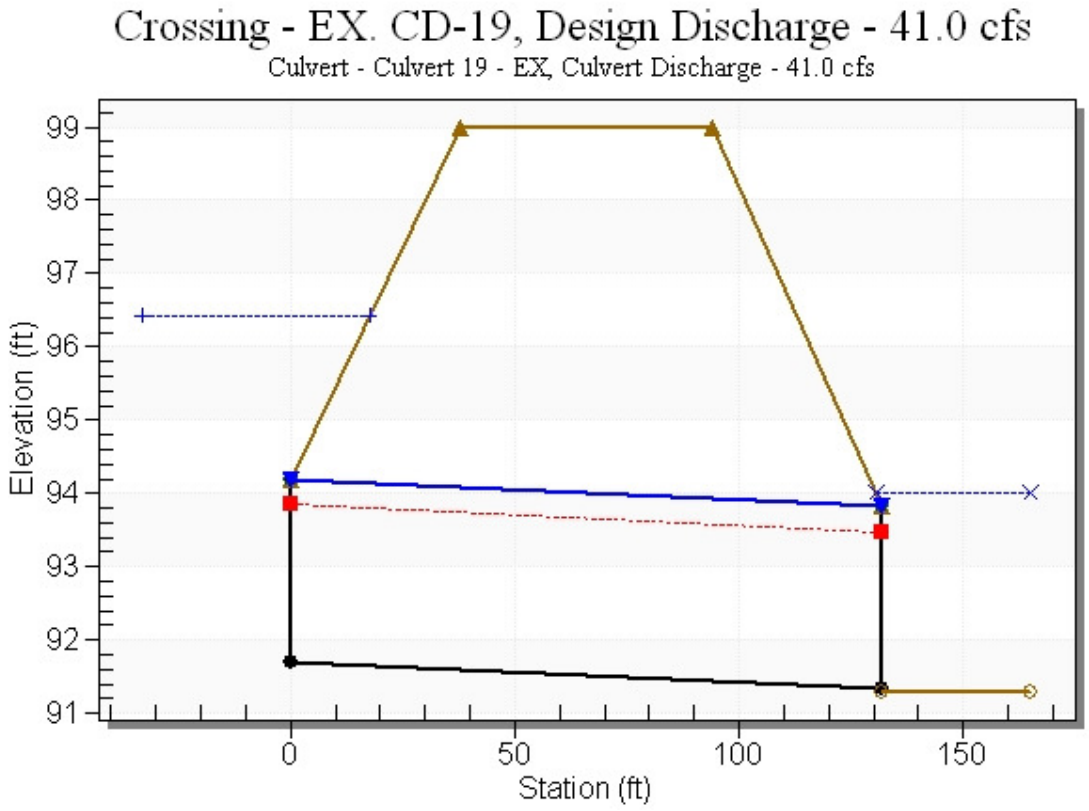
Culvert Length: 132.00 ft, Culvert Slope: 0.0028

****

Culvert Performance Curve Plot: Culvert 19 - EX



Water Surface Profile Plot for Culvert: Culvert 19 - EX



Site Data - Culvert 19 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 91.70 ft

Outlet Station: 132.00 ft

Outlet Elevation: 91.33 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 19 - EX

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: EX. CD-19)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	94.00	2.70
38.50	94.00	2.70
41.00	94.00	2.70
45.50	94.00	2.70
49.00	94.00	2.70
52.50	94.00	2.70
56.00	94.00	2.70
59.50	94.00	2.70
63.00	94.00	2.70
66.50	94.00	2.70
70.00	94.00	2.70

Tailwater Channel Data - EX. CD-19

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 94.00 ft

Roadway Data for Crossing: EX. CD-19

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 99.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 4 - Summary of Culvert Flows at Crossing: PR. CD-19

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 19 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
95.81	35.00	35.00	0.00	1
96.19	38.50	38.50	0.00	1
96.49	41.00	41.00	0.00	1
97.06	45.50	45.50	0.00	1
97.55	49.00	49.00	0.00	1
98.07	52.50	52.50	0.00	1
98.64	56.00	56.00	0.00	1
99.01	59.50	58.19	0.81	50
99.02	63.00	58.28	4.41	5
99.03	66.50	58.34	7.90	4
99.04	70.00	58.38	11.14	3
99.00	58.16	58.16	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-19

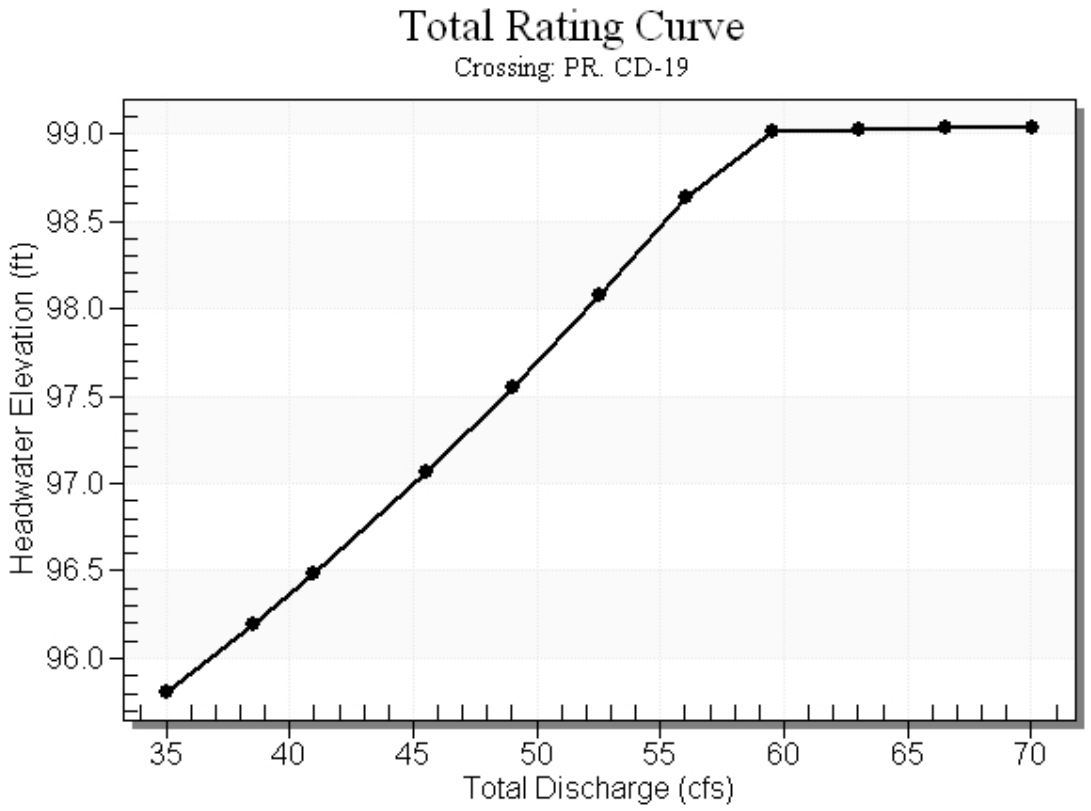


Table 5 - Culvert Summary Table: Culvert 19 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
35.00	35.00	95.81	3.477	4.111	4-FFf	2.500	2.007	2.500	2.700	7.130	0.000
38.50	38.50	96.19	3.856	4.491	4-FFf	2.500	2.094	2.500	2.700	7.843	0.000
41.00	41.00	96.49	4.149	4.785	4-FFf	2.500	2.149	2.500	2.700	8.352	0.000
45.50	45.50	97.06	4.722	5.361	4-FFf	2.500	2.234	2.500	2.700	9.269	0.000
49.00	49.00	97.55	5.204	5.850	4-FFf	2.500	2.287	2.500	2.700	9.982	0.000
52.50	52.50	98.07	5.715	6.375	4-FFf	2.500	2.330	2.500	2.700	10.695	0.000
56.00	56.00	98.64	6.250	6.936	4-FFf	2.500	2.360	2.500	2.700	11.408	0.000
59.50	58.19	99.01	6.598	7.307	4-FFf	2.500	2.376	2.500	2.700	11.855	0.000
63.00	58.28	99.02	6.612	7.321	4-FFf	2.500	2.385	2.500	2.700	11.872	0.000
66.50	58.34	99.03	6.621	7.331	4-FFf	2.500	2.386	2.500	2.700	11.884	0.000
70.00	58.38	99.04	6.628	7.339	4-FFf	2.500	2.378	2.500	2.700	11.893	0.000

****

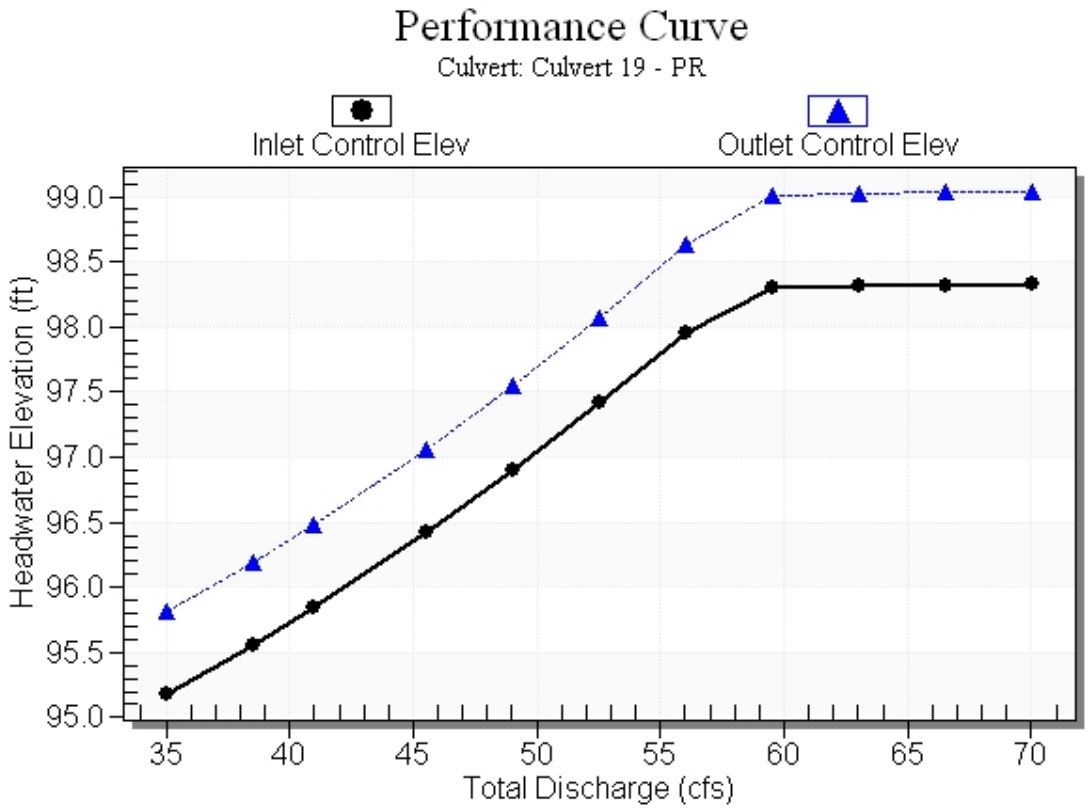
Straight Culvert

Inlet Elevation (invert): 91.70 ft, Outlet Elevation (invert): 91.30 ft

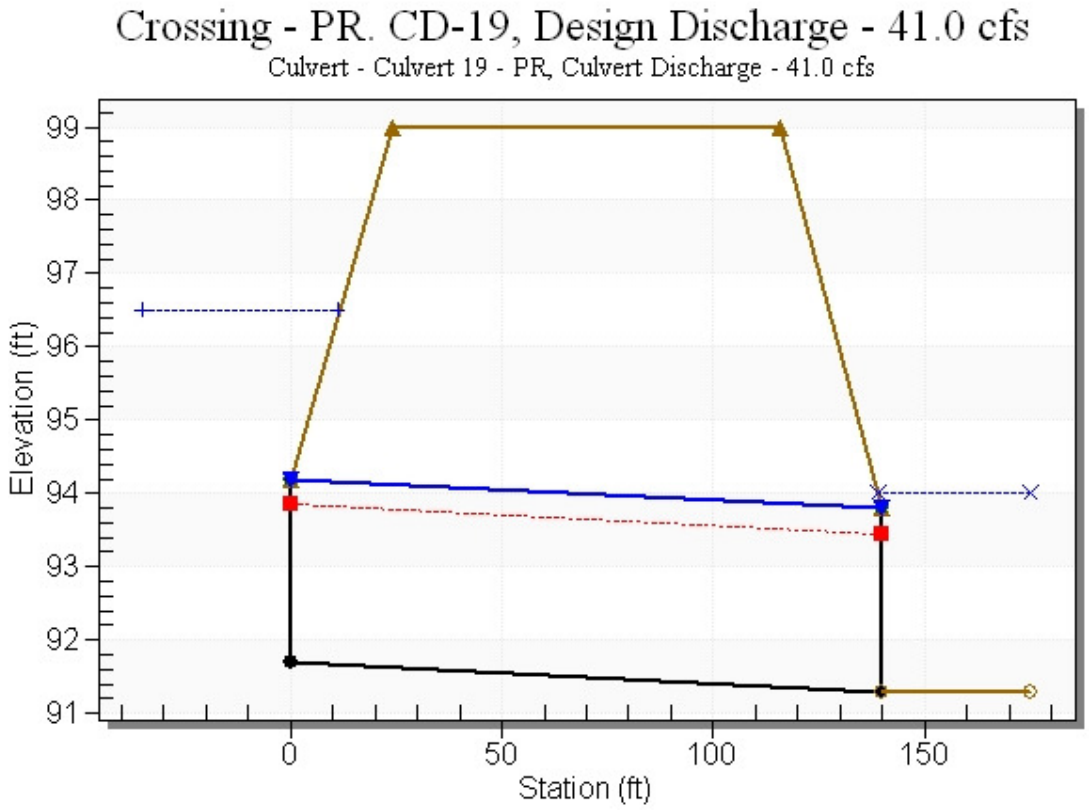
Culvert Length: 140.00 ft, Culvert Slope: 0.0029

****

Culvert Performance Curve Plot: Culvert 19 - PR



Water Surface Profile Plot for Culvert: Culvert 19 - PR



Site Data - Culvert 19 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 91.70 ft

Outlet Station: 140.00 ft

Outlet Elevation: 91.30 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 19 - PR

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 6 - Downstream Channel Rating Curve (Crossing: PR. CD-19)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	94.00	2.70
38.50	94.00	2.70
41.00	94.00	2.70
45.50	94.00	2.70
49.00	94.00	2.70
52.50	94.00	2.70
56.00	94.00	2.70
59.50	94.00	2.70
63.00	94.00	2.70
66.50	94.00	2.70
70.00	94.00	2.70

Tailwater Channel Data - PR. CD-19

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 94.00 ft

Roadway Data for Crossing: PR. CD-19

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 99.00 ft

Roadway Surface: Paved

Roadway Top Width: 92.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 97 - Summary of Culvert Flows at Crossing: EX. CD-20

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 20 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
101.20	35.00	35.00	0.00	1
101.65	38.50	38.50	0.00	1
101.98	41.00	41.00	0.00	1
102.62	45.50	45.50	0.00	1
103.15	49.00	49.00	0.00	1
103.71	52.50	52.50	0.00	1
104.01	56.00	54.30	1.23	39
104.02	59.50	54.38	4.87	5
104.03	63.00	54.42	8.33	4
104.04	66.50	54.46	11.57	3
104.05	70.00	54.51	15.08	3
104.00	54.25	54.25	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-20

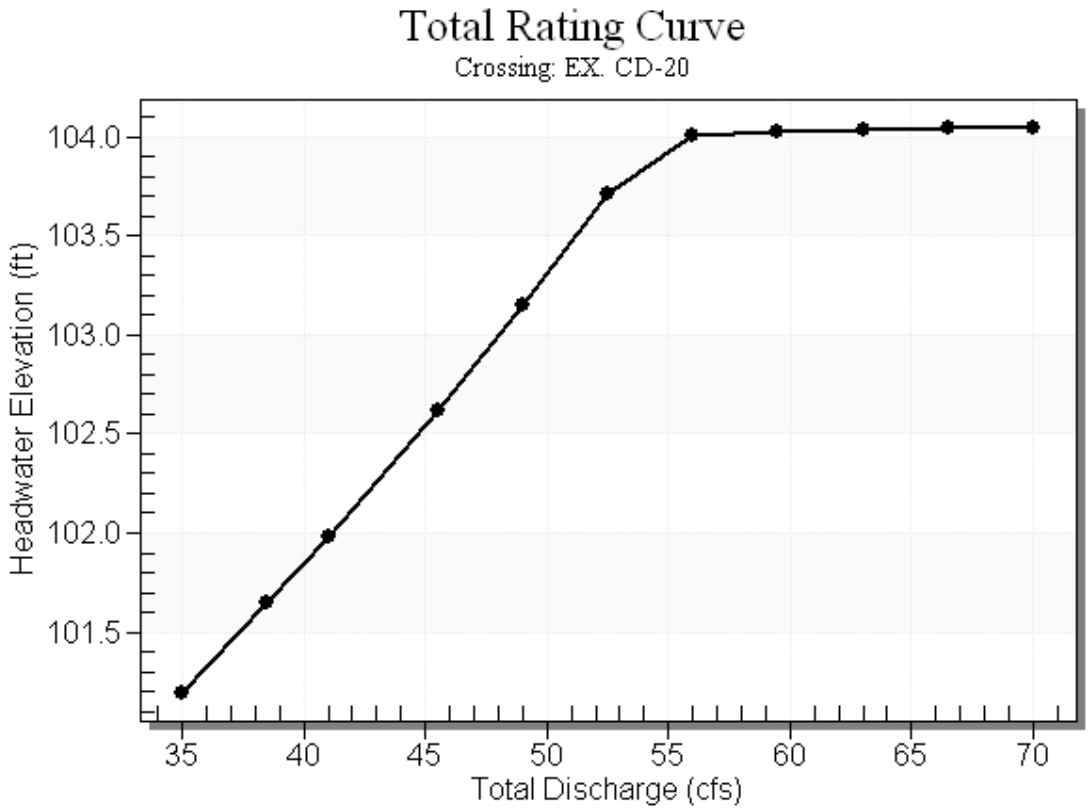


Table 98 - Culvert Summary Table: Culvert 20 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
35.00	35.00	101.20	3.478	3.797	7-M2c	2.500	2.007	2.007	2.000	8.286	0.00
38.50	38.50	101.65	3.857	4.252	7-M2c	2.500	2.094	2.094	2.000	8.769	0.00
41.00	41.00	101.98	4.150	4.581	7-M2c	2.500	2.149	2.149	2.000	9.132	0.00
45.50	45.50	102.62	4.723	5.220	7-M2c	2.500	2.234	2.234	2.000	9.830	0.00
49.00	49.00	103.15	5.205	5.754	7-M2c	2.500	2.287	2.287	2.000	10.411	0.00
52.50	52.50	103.71	5.716	6.308	7-M2c	2.500	2.330	2.330	2.000	11.019	0.00
56.00	54.30	104.01	5.988	6.609	7-M2c	2.500	2.345	2.345	2.000	11.354	0.00
59.50	54.38	104.02	6.001	6.622	7-M2c	2.500	2.346	2.346	2.000	11.368	0.00
63.00	54.42	104.03	6.006	6.631	7-M2c	2.500	2.346	2.346	2.000	11.375	0.00
66.50	54.46	104.04	6.013	6.639	7-M2c	2.500	2.347	2.347	2.000	11.383	0.00
70.00	54.51	104.05	6.020	6.647	7-M2c	2.500	2.347	2.347	2.000	11.392	0.00

****

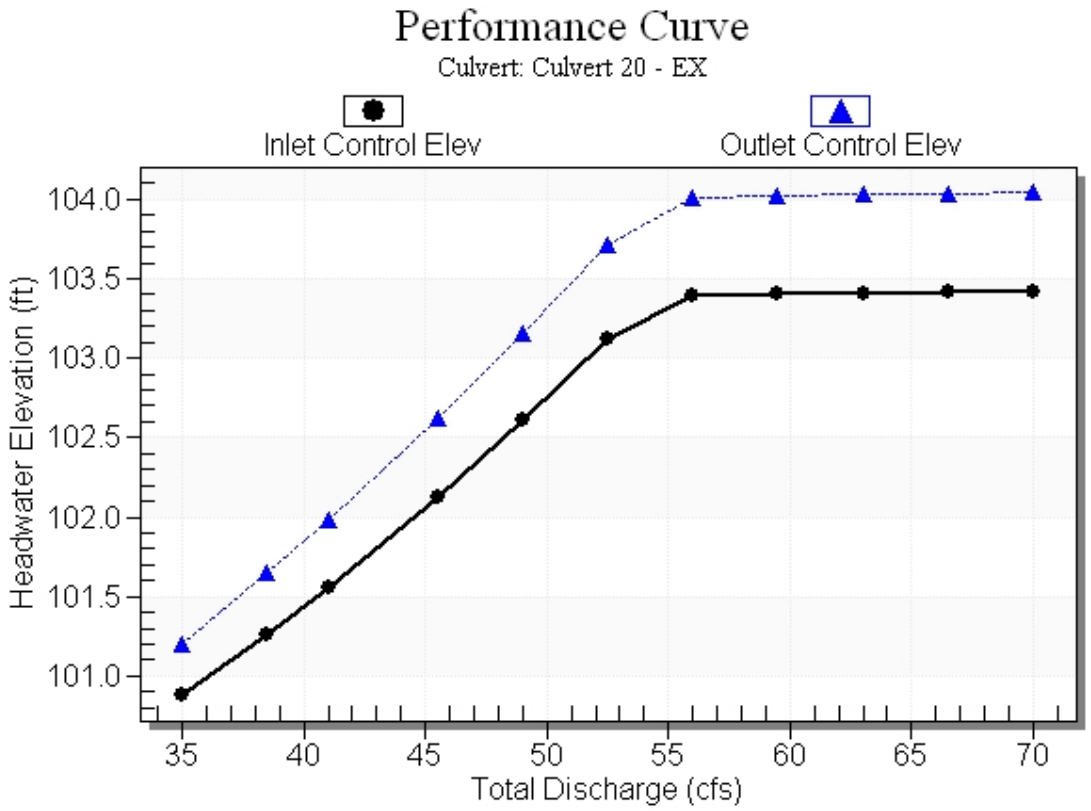
Straight Culvert

Inlet Elevation (invert): 97.40 ft, Outlet Elevation (invert): 97.09 ft

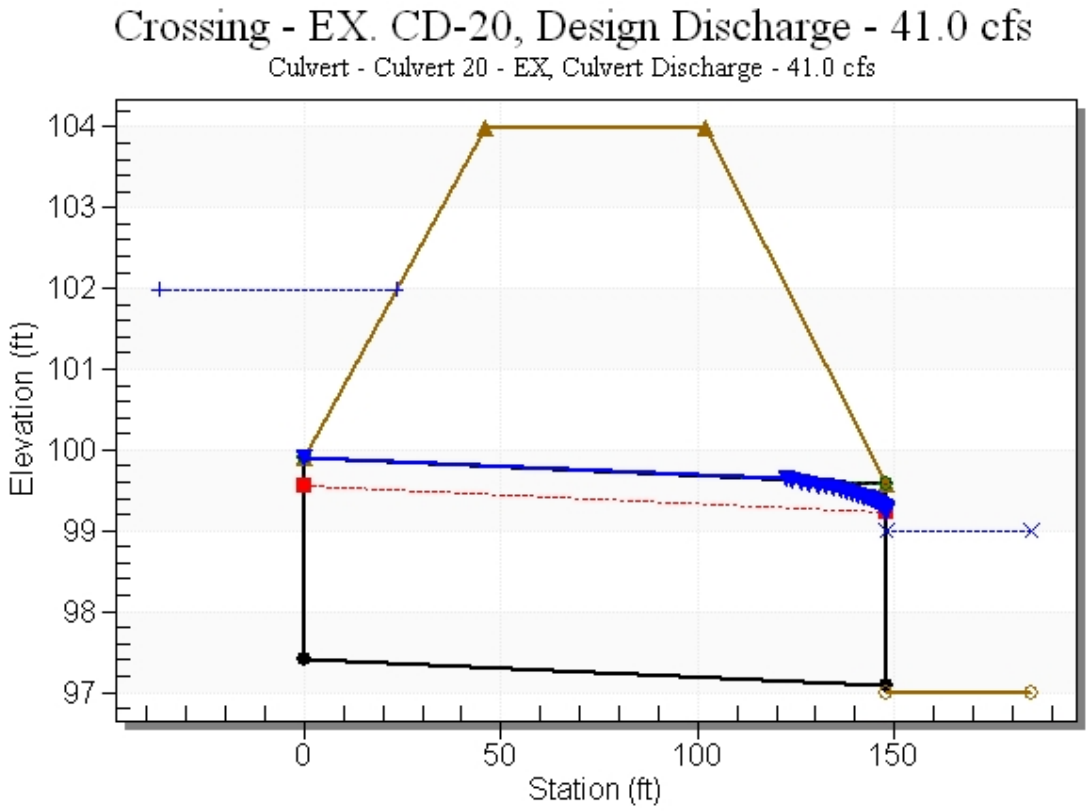
Culvert Length: 148.00 ft, Culvert Slope: 0.0021

****

Culvert Performance Curve Plot: Culvert 20 - EX



Water Surface Profile Plot for Culvert: Culvert 20 - EX



Site Data - Culvert 20 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 97.40 ft

Outlet Station: 148.00 ft

Outlet Elevation: 97.09 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 20 - EX

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 99 - Downstream Channel Rating Curve (Crossing: EX. CD-20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	99.00	2.00
38.50	99.00	2.00
41.00	99.00	2.00
45.50	99.00	2.00
49.00	99.00	2.00
52.50	99.00	2.00
56.00	99.00	2.00
59.50	99.00	2.00
63.00	99.00	2.00
66.50	99.00	2.00
70.00	99.00	2.00

Tailwater Channel Data - EX. CD-20

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 99.00 ft

Roadway Data for Crossing: EX. CD-20

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 104.00 ft

Roadway Surface: Paved

Roadway Top Width: 56.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 35 cfs

Design Flow: 41 cfs

Maximum Flow: 70 cfs

Table 100 - Summary of Culvert Flows at Crossing: PR. CD-20

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 20 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
101.22	35.00	35.00	0.00	1
101.69	38.50	38.50	0.00	1
102.03	41.00	41.00	0.00	1
102.69	45.50	45.50	0.00	1
103.25	49.00	49.00	0.00	1
103.82	52.50	52.50	0.00	1
104.01	56.00	53.59	1.91	25
104.02	59.50	53.63	5.37	4
104.03	63.00	53.69	9.05	4
104.04	66.50	53.76	12.32	3
104.05	70.00	53.80	15.85	3
104.00	53.50	53.50	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-20

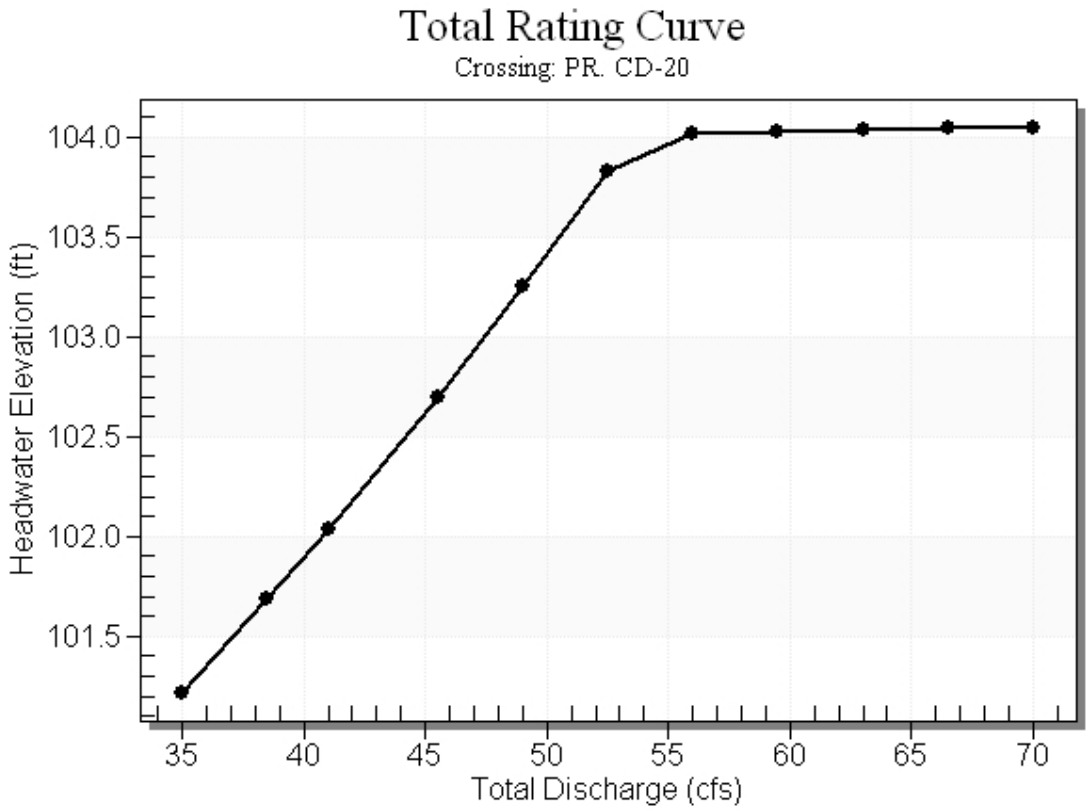


Table 101 - Culvert Summary Table: Culvert 20 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
35.00	35.00	101.22	3.478	3.819	7-M2c	2.500	2.007	2.007	2.000	8.286	0.00
38.50	38.50	101.69	3.857	4.290	7-M2c	2.500	2.094	2.094	2.000	8.769	0.00
41.00	41.00	102.03	4.150	4.632	7-M2c	2.500	2.149	2.149	2.000	9.132	0.00
45.50	45.50	102.69	4.723	5.295	7-M2c	2.500	2.234	2.234	2.000	9.830	0.00
49.00	49.00	103.25	5.205	5.849	7-M2c	2.500	2.287	2.287	2.000	10.411	0.00
52.50	52.50	103.82	5.715	6.425	7-M2c	2.500	2.330	2.330	2.000	11.019	0.00
56.00	53.59	104.01	5.879	6.612	7-M2c	2.500	2.343	2.343	2.000	11.210	0.00
59.50	53.63	104.02	5.886	6.624	7-M2c	2.500	2.344	2.344	2.000	11.218	0.00
63.00	53.69	104.03	5.895	6.634	7-M2c	2.500	2.340	2.340	2.000	11.241	0.00
66.50	53.76	104.04	5.905	6.642	7-M2c	2.500	2.341	2.341	2.000	11.253	0.00
70.00	53.80	104.05	5.911	6.649	7-M2c	2.500	2.341	2.341	2.000	11.261	0.00

****

Straight Culvert

Inlet Elevation (invert): 97.40 ft, Outlet Elevation (invert): 97.04 ft

Culvert Length: 160.00 ft, Culvert Slope: 0.0022

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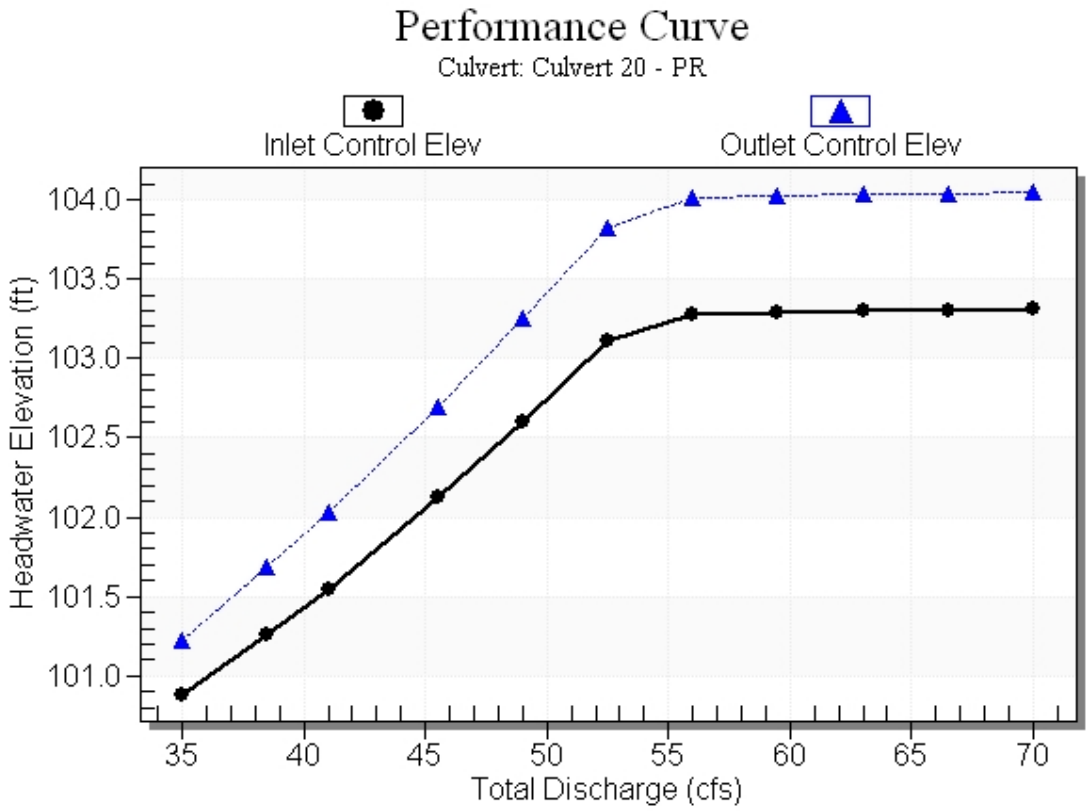
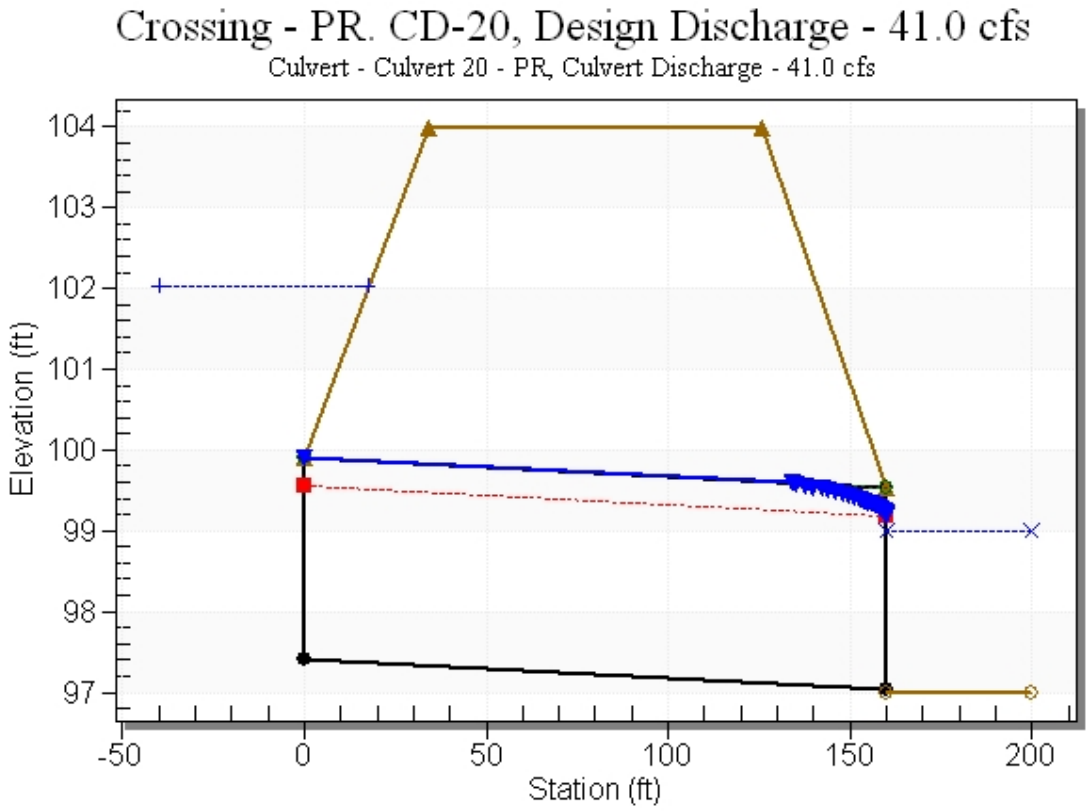
Culvert Performance Curve Plot: Culvert 20 - PR



Water Surface Profile Plot for Culvert: Culvert 20 - PR



Site Data - Culvert 20 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 97.40 ft

Outlet Station: 160.00 ft

Outlet Elevation: 97.04 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 20 - PR

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: NONE

Table 102 - Downstream Channel Rating Curve (Crossing: PR. CD-20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
35.00	99.00	2.00
38.50	99.00	2.00
41.00	99.00	2.00
45.50	99.00	2.00
49.00	99.00	2.00
52.50	99.00	2.00
56.00	99.00	2.00
59.50	99.00	2.00
63.00	99.00	2.00
66.50	99.00	2.00
70.00	99.00	2.00

Tailwater Channel Data - PR. CD-20

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 99.00 ft

Roadway Data for Crossing: PR. CD-20

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 104.00 ft

Roadway Surface: Paved

Roadway Top Width: 92.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2160 cfs

Design Flow: 2520 cfs

Maximum Flow: 4284 cfs

Table 103 - Summary of Culvert Flows at Crossing: EX. CD-4

Headwater Elevation (ft)	Total Discharge (cfs)	Turkey Creek - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
56.55	2160.00	2160.00	0.00	1
56.87	2372.40	2372.40	0.00	1
57.10	2520.00	2520.00	0.00	1
57.58	2797.20	2797.20	0.00	1
57.97	3009.60	3009.60	0.00	1
58.38	3222.00	3222.00	0.00	1
58.90	3434.40	3434.40	0.00	1
59.19	3646.80	3522.26	123.28	7
59.34	3859.20	3566.20	291.28	5
59.46	4071.60	3602.98	467.80	5
59.57	4284.00	3635.46	646.20	4
59.00	3463.88	3463.88	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-4

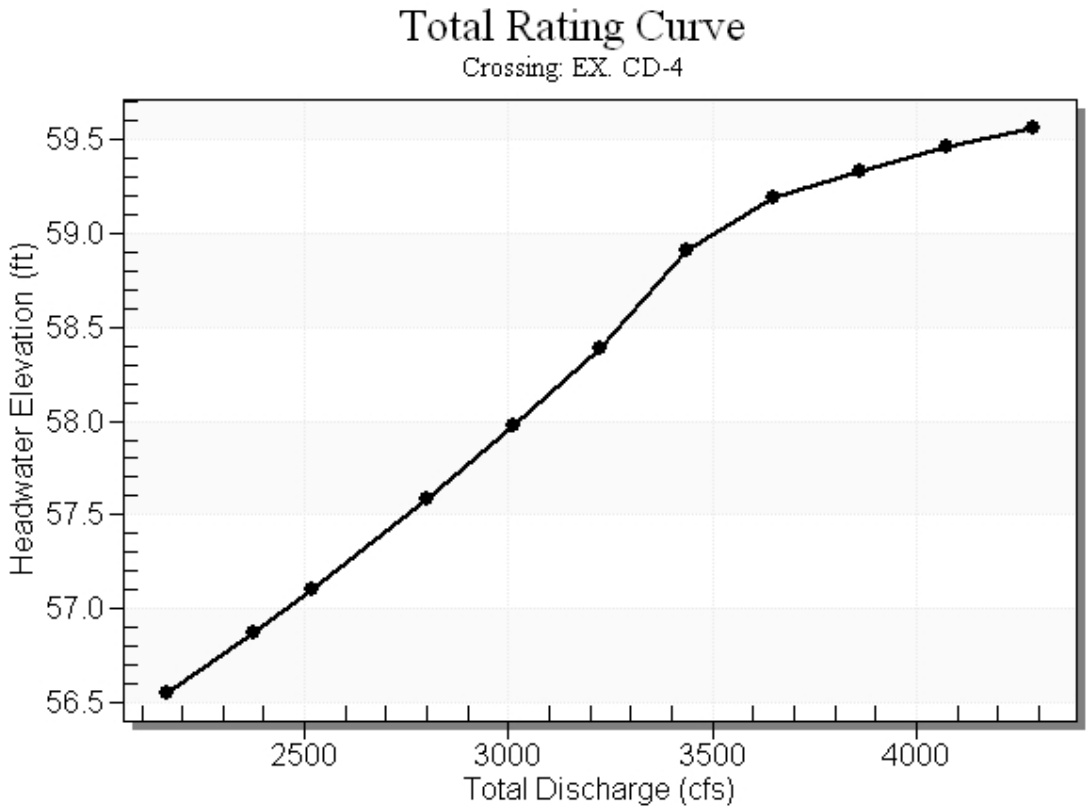


Table 104 - Culvert Summary Table: Turkey Creek - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2160.00	2160.00	56.55	9.206	10.664	3-M2t	10.000	5.440	9.180	9.200	7.843	0.00
2372.40	2372.40	56.87	9.818	10.980	3-M2t	10.000	5.791	9.180	9.200	8.614	0.00
2520.00	2520.00	57.10	10.245	11.214	3-M2t	10.000	6.029	9.180	9.200	9.150	0.00
2797.20	2797.20	57.58	11.054	11.689	3-M2t	10.000	6.463	9.180	9.200	10.157	0.00
3009.60	3009.60	57.97	11.688	12.081	3-M2t	10.000	6.786	9.180	9.200	10.928	0.00
3222.00	3222.00	58.38	12.340	12.495	3-M2t	10.000	7.102	9.180	9.200	11.699	0.00
3434.40	3434.40	58.90	13.014	12.928	3-M2t	10.000	7.411	9.180	9.200	12.471	0.00
3646.80	3522.26	59.19	13.301	13.112	3-M2t	10.000	7.537	9.180	9.200	12.790	0.00
3859.20	3566.20	59.34	13.446	13.205	3-M2t	10.000	7.599	9.180	9.200	12.949	0.00
4071.60	3602.98	59.46	13.568	13.284	3-M2t	10.000	7.651	9.180	9.200	13.083	0.00
4284.00	3635.46	59.57	13.676	13.353	3-M2t	10.000	7.697	9.180	9.200	13.201	0.00

****

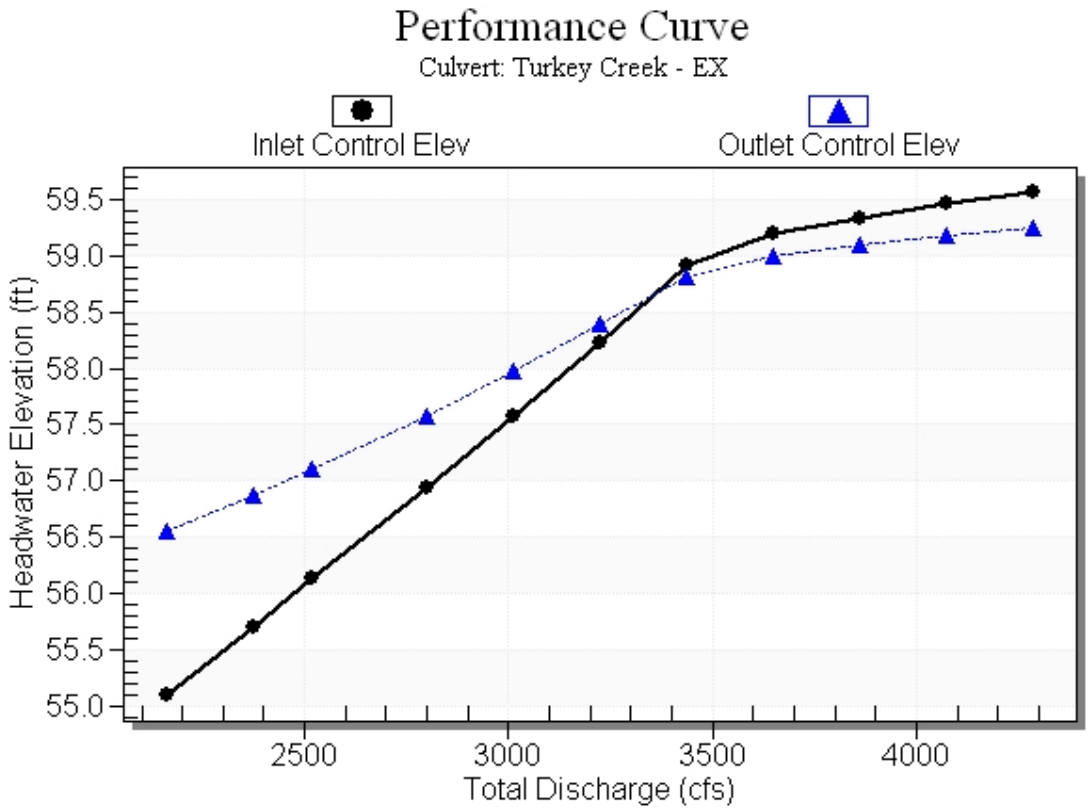
Straight Culvert

Inlet Elevation (invert): 45.89 ft, Outlet Elevation (invert): 45.82 ft

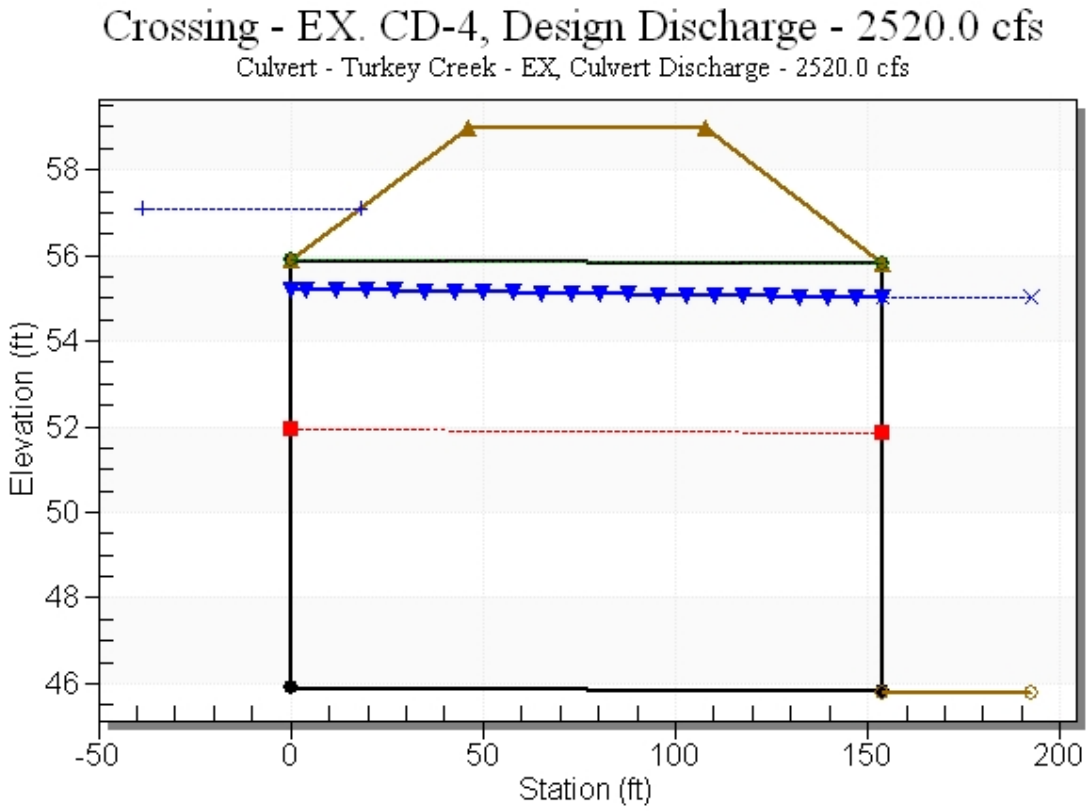
Culvert Length: 154.00 ft, Culvert Slope: 0.0005

****

Culvert Performance Curve Plot: Turkey Creek - EX



Water Surface Profile Plot for Culvert: Turkey Creek - EX



Site Data - Turkey Creek - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 45.89 ft

Outlet Station: 154.00 ft

Outlet Elevation: 45.82 ft

Number of Barrels: 3

Culvert Data Summary - Turkey Creek - EX

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 10.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90°) Headwall

Inlet Depression: NONE

Table 105 - Downstream Channel Rating Curve (Crossing: EX. CD-4)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
2160.00	55.00	9.20
2372.40	55.00	9.20
2520.00	55.00	9.20
2797.20	55.00	9.20
3009.60	55.00	9.20
3222.00	55.00	9.20
3434.40	55.00	9.20
3646.80	55.00	9.20
3859.20	55.00	9.20
4071.60	55.00	9.20
4284.00	55.00	9.20

Tailwater Channel Data - EX. CD-4

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 55.00 ft

Roadway Data for Crossing: EX. CD-4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 59.00 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2160 cfs

Design Flow: 2520 cfs

Maximum Flow: 4284 cfs

Table 106 - Summary of Culvert Flows at Crossing: EX. CD-9

Headwater Elevation (ft)	Total Discharge (cfs)	Alafia River - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
67.32	2160.00	2160.00	0.00	1
67.78	2372.40	2372.40	0.00	1
68.12	2520.00	2520.00	0.00	1
68.80	2797.20	2797.20	0.00	1
69.36	3009.60	3009.60	0.00	1
70.01	3222.00	3221.12	0.46	7
70.37	3434.40	3334.24	99.89	5
70.63	3646.80	3417.34	228.87	4
70.87	3859.20	3490.44	368.43	4
71.09	4071.60	3556.53	514.85	4
71.29	4284.00	3617.71	666.13	4
70.00	3217.72	3217.72	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-9

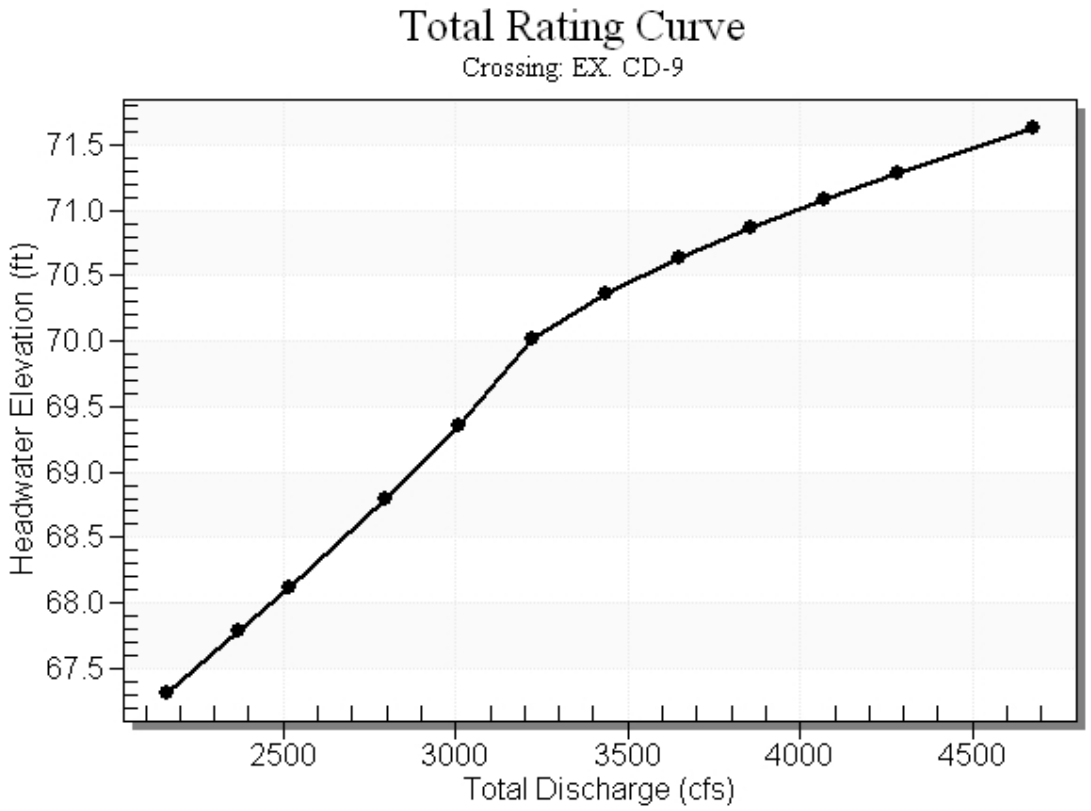


Table 107 - Culvert Summary Table: Alafia River - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2160.00	2160.00	67.32	9.198	9.637	3-M1t	6.615	5.440	7.600	7.500	9.474	0.00
2372.40	2372.40	67.78	9.811	10.101	7-M1t	7.119	5.791	7.600	7.500	10.405	0.00
2520.00	2520.00	68.12	10.237	10.443	7-M1t	7.465	6.029	7.600	7.500	11.053	0.00
2797.20	2797.20	68.80	11.047	11.119	3-M2t	8.110	6.463	7.600	7.500	12.268	0.00
3009.60	3009.60	69.36	11.681	11.658	3-M2t	8.598	6.786	7.600	7.500	13.200	0.00
3222.00	3221.12	70.01	12.330	12.196	3-M2t	9.083	7.101	7.600	7.500	14.128	0.00
3434.40	3334.24	70.37	12.686	12.482	3-M2t	10.000	7.266	7.600	7.500	14.624	0.00
3646.80	3417.34	70.63	12.952	12.689	3-M2t	10.000	7.386	7.600	7.500	14.988	0.00
3859.20	3490.44	70.87	13.189	12.870	3-M2t	10.000	7.491	7.600	7.500	15.309	0.00
4071.60	3556.53	71.09	13.406	13.032	3-M2t	10.000	7.586	7.600	7.500	15.599	0.00
4284.00	3617.71	71.29	13.610	13.181	7-M2c	10.000	7.672	7.672	7.500	15.718	0.00

****

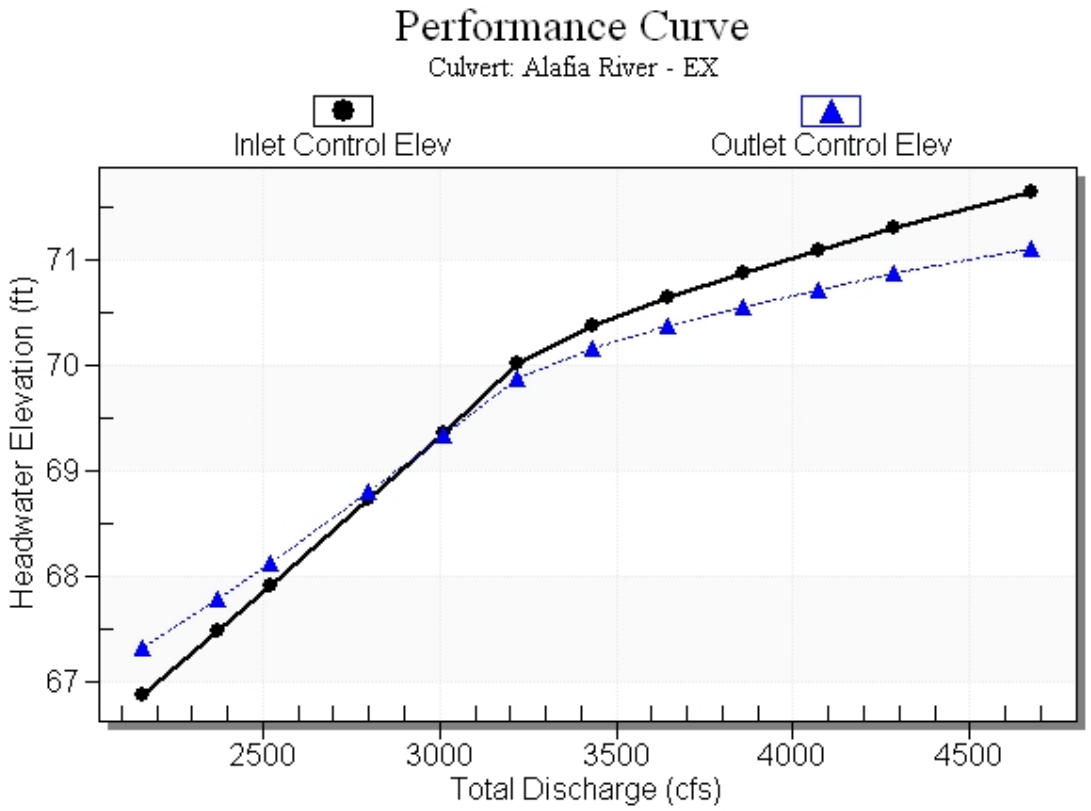
Straight Culvert

Inlet Elevation (invert): 57.68 ft, Outlet Elevation (invert): 57.40 ft

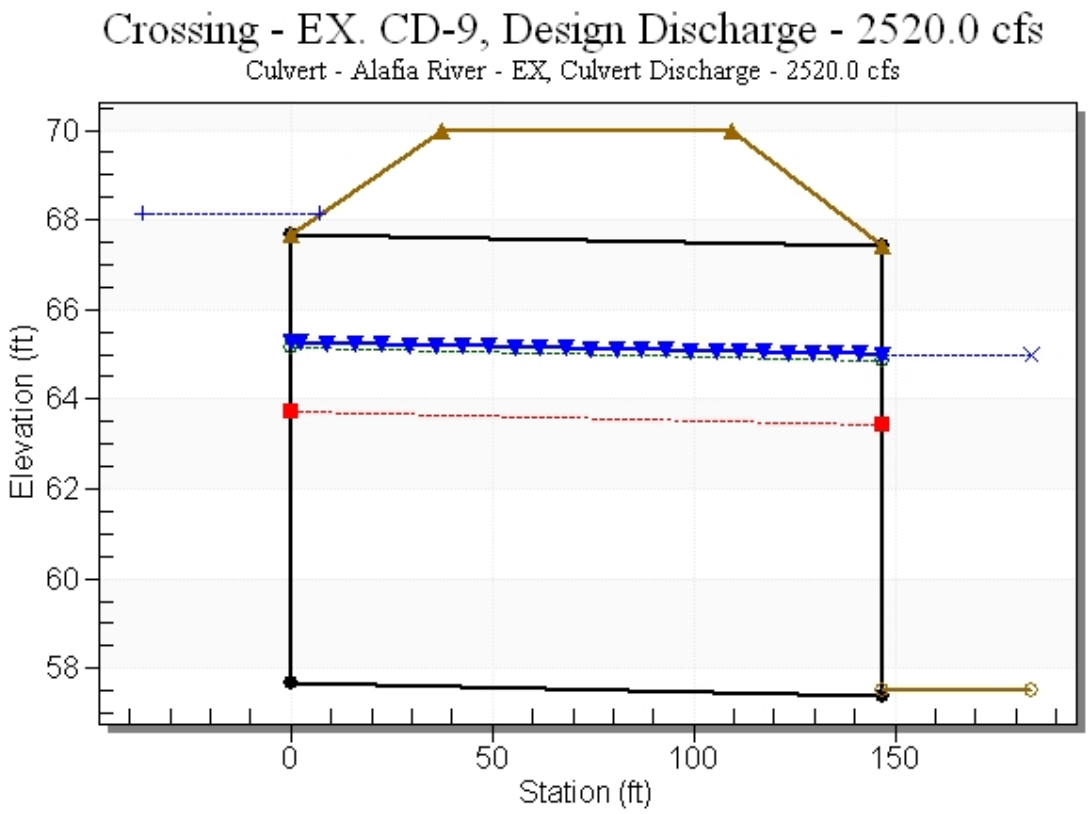
Culvert Length: 147.00 ft, Culvert Slope: 0.0019

****

Culvert Performance Curve Plot: Alafia River - EX



Water Surface Profile Plot for Culvert: Alafia River - EX



Site Data - Alafia River - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 57.68 ft

Outlet Station: 147.00 ft

Outlet Elevation: 57.40 ft

Number of Barrels: 3

Culvert Data Summary - Alafia River - EX

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 10.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90°) Headwall

Inlet Depression: NONE

Table 108 - Downstream Channel Rating Curve (Crossing: EX. CD-9)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
2160.00	65.00	7.50
2372.40	65.00	7.50
2520.00	65.00	7.50
2797.20	65.00	7.50
3009.60	65.00	7.50
3222.00	65.00	7.50
3434.40	65.00	7.50
3646.80	65.00	7.50
3859.20	65.00	7.50
4071.60	65.00	7.50
4284.00	65.00	7.50

Tailwater Channel Data - EX. CD-9

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 65.00 ft

Roadway Data for Crossing: EX. CD-9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 70.00 ft

Roadway Surface: Paved

Roadway Top Width: 72.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2160 cfs

Design Flow: 2520 cfs

Maximum Flow: 4284 cfs

Table 109 - Summary of Culvert Flows at Crossing: PR. CD-4

Headwater Elevation (ft)	Total Discharge (cfs)	Turkey Creek - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
56.55	2160.00	2160.00	0.00	1
56.87	2372.40	2372.40	0.00	1
57.10	2520.00	2520.00	0.00	1
57.58	2797.20	2797.20	0.00	1
57.97	3009.60	3009.60	0.00	1
58.39	3222.00	3222.00	0.00	1
58.90	3434.40	3434.40	0.00	1
59.19	3646.80	3522.39	123.15	7
59.34	3859.20	3566.33	291.14	5
59.46	4071.60	3603.12	467.66	5
59.57	4284.00	3635.60	646.06	4
59.00	3464.04	3464.04	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-4

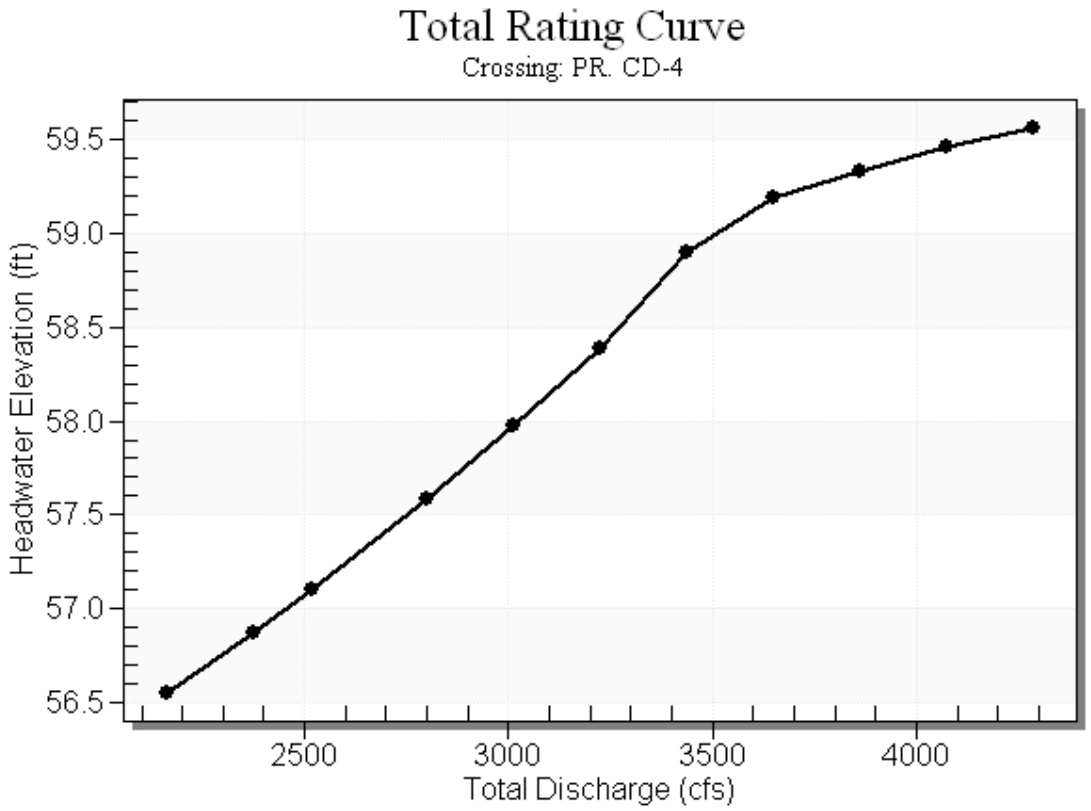


Table 110 - Culvert Summary Table: Turkey Creek - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2160.00	2160.00	56.55	9.205	10.665	3-M2t	10.000	5.440	9.200	9.200	7.826	0.00
2372.40	2372.40	56.87	9.818	10.980	3-M2t	10.000	5.791	9.200	9.200	8.596	0.00
2520.00	2520.00	57.10	10.244	11.215	3-M2t	10.000	6.029	9.200	9.200	9.130	0.00
2797.20	2797.20	57.58	11.054	11.690	3-M2t	10.000	6.463	9.200	9.200	10.135	0.00
3009.60	3009.60	57.97	11.688	12.082	3-M2t	10.000	6.786	9.200	9.200	10.904	0.00
3222.00	3222.00	58.39	12.340	12.495	3-M2t	10.000	7.102	9.200	9.200	11.674	0.00
3434.40	3434.40	58.90	13.014	12.929	3-M2t	10.000	7.411	9.200	9.200	12.443	0.00
3646.80	3522.39	59.19	13.301	13.113	3-M2t	10.000	7.537	9.200	9.200	12.762	0.00
3859.20	3566.33	59.34	13.445	13.206	3-M2t	10.000	7.599	9.200	9.200	12.921	0.00
4071.60	3603.12	59.46	13.568	13.284	3-M2t	10.000	7.652	9.200	9.200	13.055	0.00
4284.00	3635.60	59.57	13.676	13.354	3-M2t	10.000	7.698	9.200	9.200	13.172	0.00

****

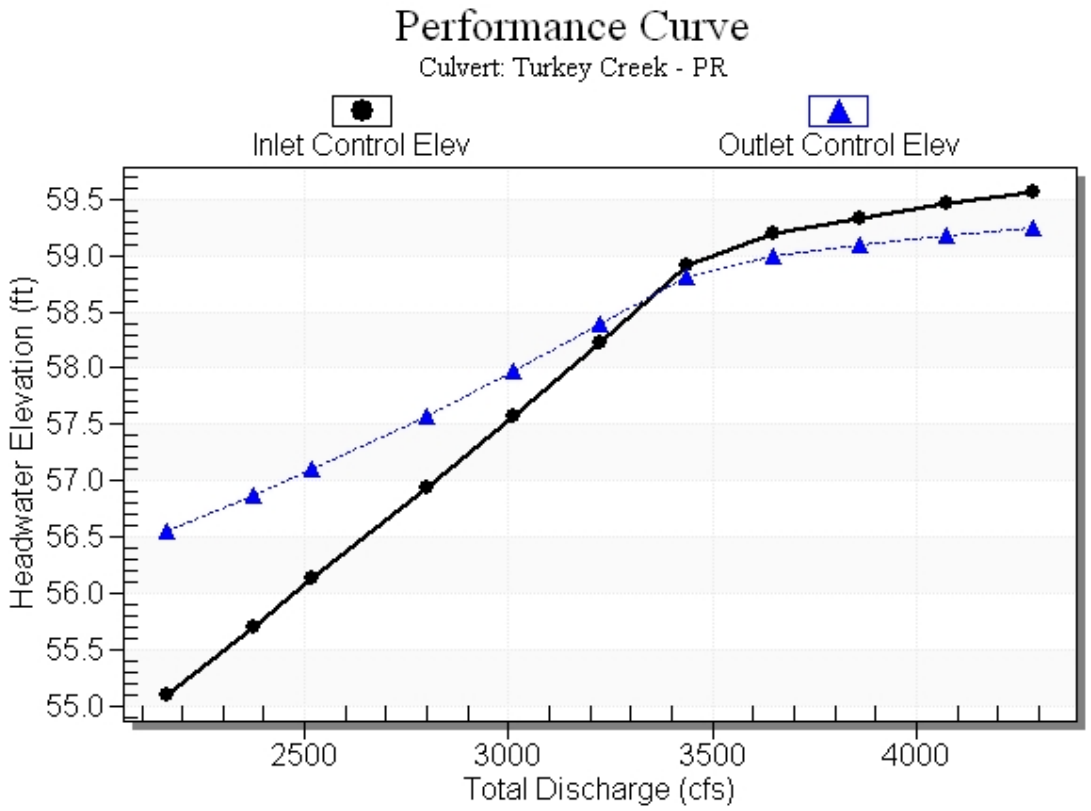
Straight Culvert

Inlet Elevation (invert): 45.89 ft, Outlet Elevation (invert): 45.80 ft

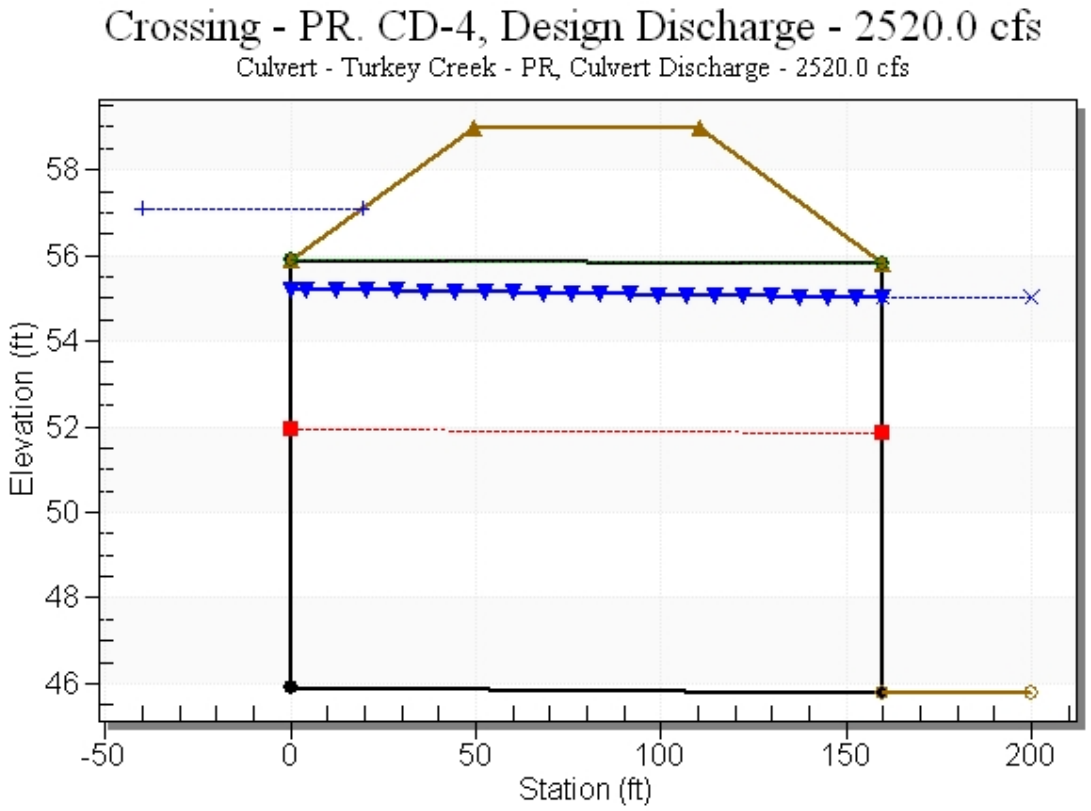
Culvert Length: 160.00 ft, Culvert Slope: 0.0006

****

Culvert Performance Curve Plot: Turkey Creek - PR



Water Surface Profile Plot for Culvert: Turkey Creek - PR



Site Data - Turkey Creek - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 45.89 ft

Outlet Station: 160.00 ft

Outlet Elevation: 45.80 ft

Number of Barrels: 3

Culvert Data Summary - Turkey Creek - PR

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 10.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90°) Headwall

Inlet Depression: NONE

Table 111 - Downstream Channel Rating Curve (Crossing: PR. CD-4)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
2160.00	55.00	9.20
2372.40	55.00	9.20
2520.00	55.00	9.20
2797.20	55.00	9.20
3009.60	55.00	9.20
3222.00	55.00	9.20
3434.40	55.00	9.20
3646.80	55.00	9.20
3859.20	55.00	9.20
4071.60	55.00	9.20
4284.00	55.00	9.20

Tailwater Channel Data - PR. CD-4

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 55.00 ft

Roadway Data for Crossing: PR. CD-4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 500.00 ft

Crest Elevation: 59.00 ft

Roadway Surface: Paved

Roadway Top Width: 61.50 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2160 cfs

Design Flow: 2520 cfs

Maximum Flow: 4284 cfs

Table 112 - Summary of Culvert Flows at Crossing: PR. CD-9

Headwater Elevation (ft)	Total Discharge (cfs)	Alafia River - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
67.33	2160.00	2160.00	0.00	1
67.79	2372.40	2372.40	0.00	1
68.13	2520.00	2520.00	0.00	1
68.81	2797.20	2797.20	0.00	1
69.36	3009.60	3009.60	0.00	1
70.01	3222.00	3221.09	0.51	7
70.37	3434.40	3334.10	100.03	5
70.63	3646.80	3417.19	229.03	4
70.87	3859.20	3490.28	368.59	4
71.09	4071.60	3556.37	515.01	4
71.29	4284.00	3617.55	666.30	4
70.00	3217.47	3217.47	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-9

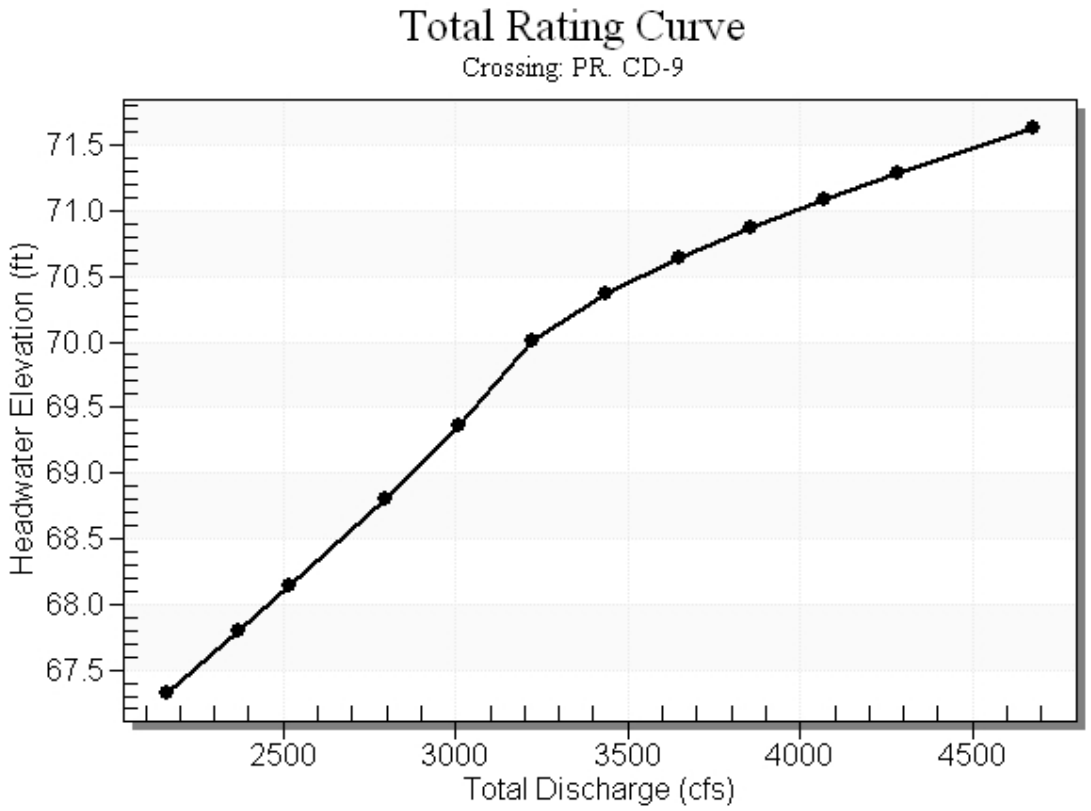


Table 113 - Culvert Summary Table: Alafia River - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2160.00	2160.00	67.33	9.199	9.649	3-M1t	6.837	5.440	7.600	7.500	9.474	0.00
2372.40	2372.40	67.79	9.812	10.112	7-M1t	7.360	5.791	7.600	7.500	10.405	0.00
2520.00	2520.00	68.13	10.238	10.453	3-M2t	7.719	6.029	7.600	7.500	11.053	0.00
2797.20	2797.20	68.81	11.048	11.127	3-M2t	8.389	6.463	7.600	7.500	12.268	0.00
3009.60	3009.60	69.36	11.682	11.661	3-M2t	8.897	6.786	7.600	7.500	13.200	0.00
3222.00	3221.09	70.01	12.331	12.196	3-M2t	10.000	7.101	7.600	7.500	14.128	0.00
3434.40	3334.10	70.37	12.687	12.479	3-M2t	10.000	7.266	7.600	7.500	14.623	0.00
3646.80	3417.19	70.63	12.952	12.686	3-M2t	10.000	7.386	7.600	7.500	14.988	0.00
3859.20	3490.28	70.87	13.189	12.866	3-M2t	10.000	7.491	7.600	7.500	15.308	0.00
4071.60	3556.37	71.09	13.407	13.028	3-M2t	10.000	7.585	7.600	7.500	15.598	0.00
4284.00	3617.55	71.29	13.610	13.177	7-M2c	10.000	7.672	7.672	7.500	15.717	0.00

****

Straight Culvert

Inlet Elevation (invert): 57.68 ft, Outlet Elevation (invert): 57.40 ft

Culvert Length: 160.00 ft, Culvert Slope: 0.0018

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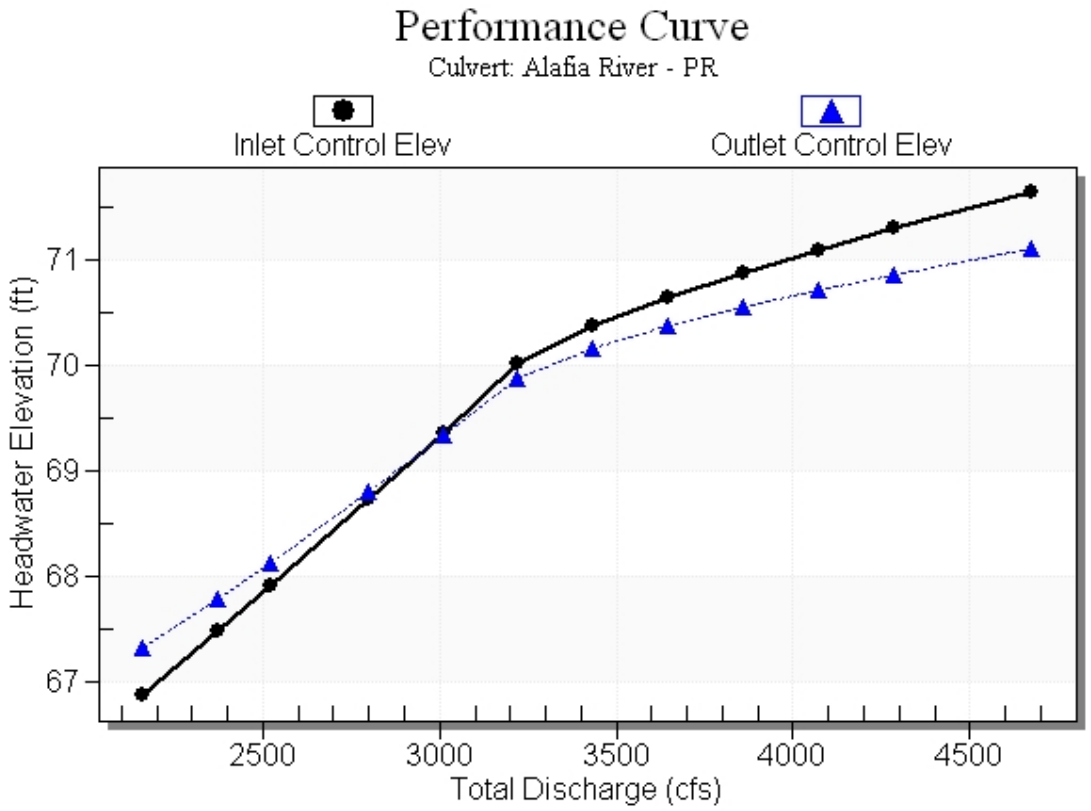
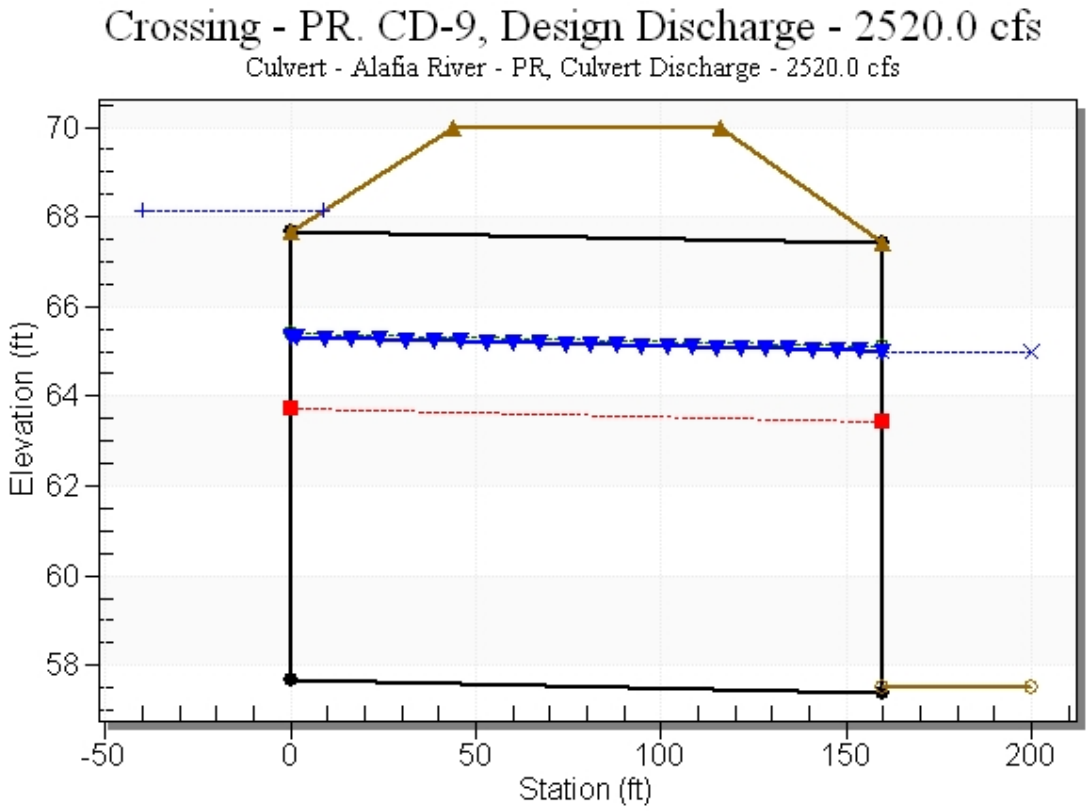
Culvert Performance Curve Plot: Alafia River - PR



Water Surface Profile Plot for Culvert: Alafia River - PR



Site Data - Alafia River - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 57.68 ft

Outlet Station: 160.00 ft

Outlet Elevation: 57.40 ft

Number of Barrels: 3

Culvert Data Summary - Alafia River - PR

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 10.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90°) Headwall

Inlet Depression: NONE

Table 114 - Downstream Channel Rating Curve (Crossing: PR. CD-9)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
2160.00	65.00	7.50
2372.40	65.00	7.50
2520.00	65.00	7.50
2797.20	65.00	7.50
3009.60	65.00	7.50
3222.00	65.00	7.50
3434.40	65.00	7.50
3646.80	65.00	7.50
3859.20	65.00	7.50
4071.60	65.00	7.50
4284.00	65.00	7.50

Tailwater Channel Data - PR. CD-9

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 65.00 ft

Roadway Data for Crossing: PR. CD-9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 150.00 ft

Crest Elevation: 70.00 ft

Roadway Surface: Paved

Roadway Top Width: 72.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 1 - Summary of Culvert Flows at Crossing: EX. CD-15

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 15 - EX Discharge (cfs)	Roadway Discharge (cfs)	Iterations
116.61	23.00	23.00	0.00	1
117.13	25.20	25.20	0.00	1
117.33	26.00	26.00	0.00	1
118.32	29.60	29.60	0.00	1
118.98	31.80	31.80	0.00	1
119.69	34.00	34.00	0.00	1
120.02	36.20	34.94	1.08	33
120.03	38.40	34.99	3.27	5
120.04	40.60	35.03	5.43	4
120.05	42.80	35.06	7.46	3
120.07	45.00	35.09	9.66	3
120.00	34.90	34.90	0.00	Overtopping

Rating Curve Plot for Crossing: EX. CD-15

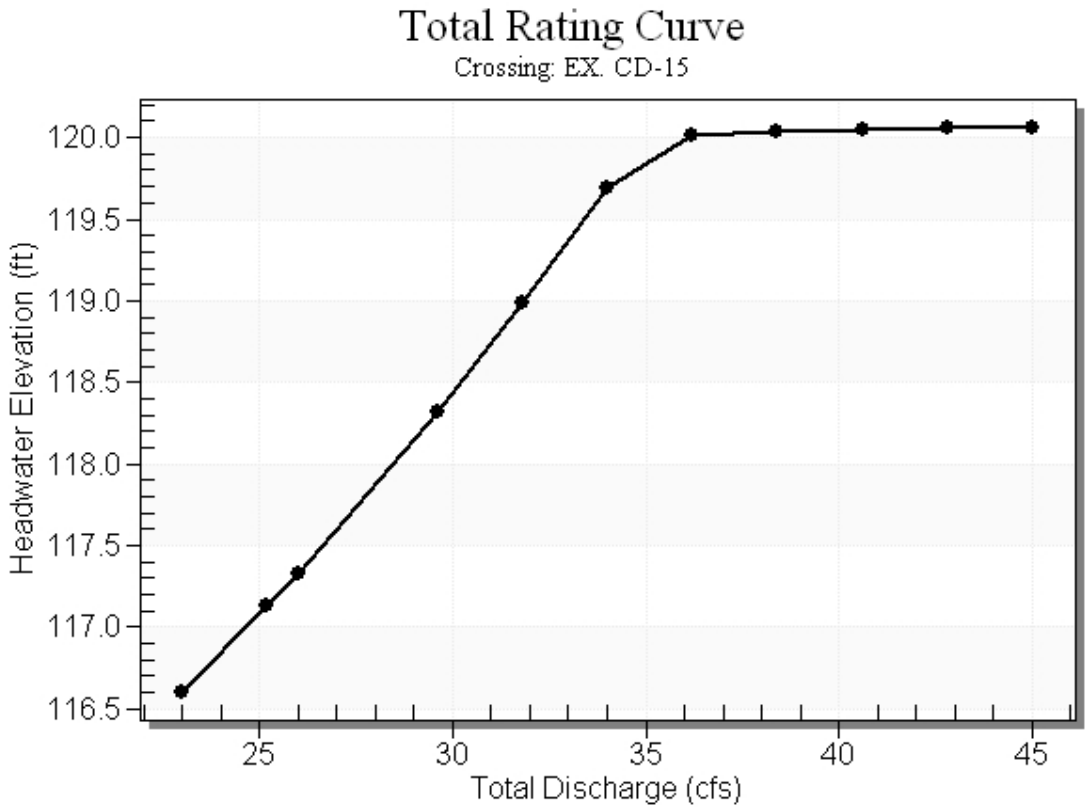


Table 2 - Culvert Summary Table: Culvert 15 - EX

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	116.61	3.452	5.026	4-FFf	2.000	1.705	2.000	2.700	7.321	0.000
25.20	25.20	117.13	3.877	5.548	4-FFf	2.000	1.767	2.000	2.700	8.021	0.000
26.00	26.00	117.33	4.042	5.750	4-FFf	2.000	1.786	2.000	2.700	8.276	0.000
29.60	29.60	118.32	4.856	6.736	4-FFf	2.000	1.854	2.000	2.700	9.422	0.000
31.80	31.80	118.98	5.406	7.401	4-FFf	2.000	1.890	2.000	2.700	10.122	0.000
34.00	34.00	119.69	5.994	8.115	4-FFf	2.000	1.916	2.000	2.700	10.823	0.000
36.20	34.94	120.02	6.271	8.435	4-FFf	2.000	1.847	2.000	2.700	11.123	0.000
38.40	34.99	120.03	6.286	8.452	4-FFf	2.000	1.845	2.000	2.700	11.138	0.000
40.60	35.03	120.04	6.297	8.464	4-FFf	2.000	1.843	2.000	2.700	11.150	0.000
42.80	35.06	120.05	6.306	8.475	4-FFf	2.000	1.842	2.000	2.700	11.160	0.000
45.00	35.09	120.07	6.315	8.485	4-FFf	2.000	1.841	2.000	2.700	11.169	0.000

****

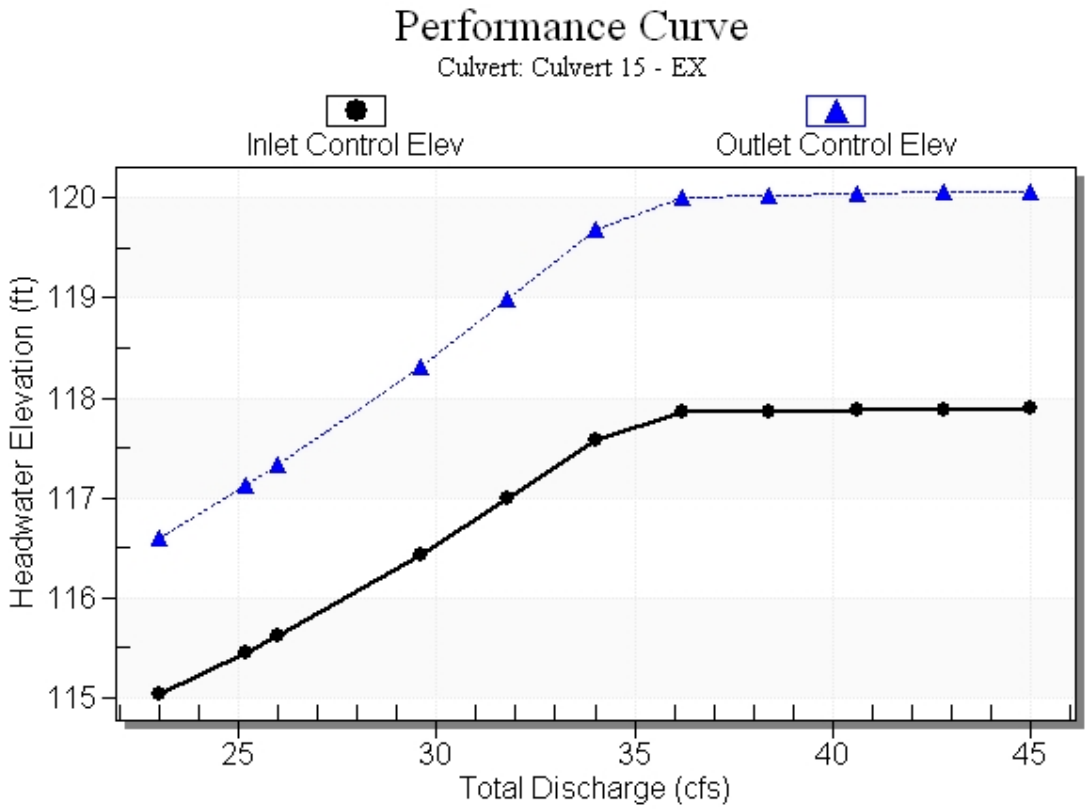
Straight Culvert

Inlet Elevation (invert): 111.58 ft, Outlet Elevation (invert): 111.37 ft

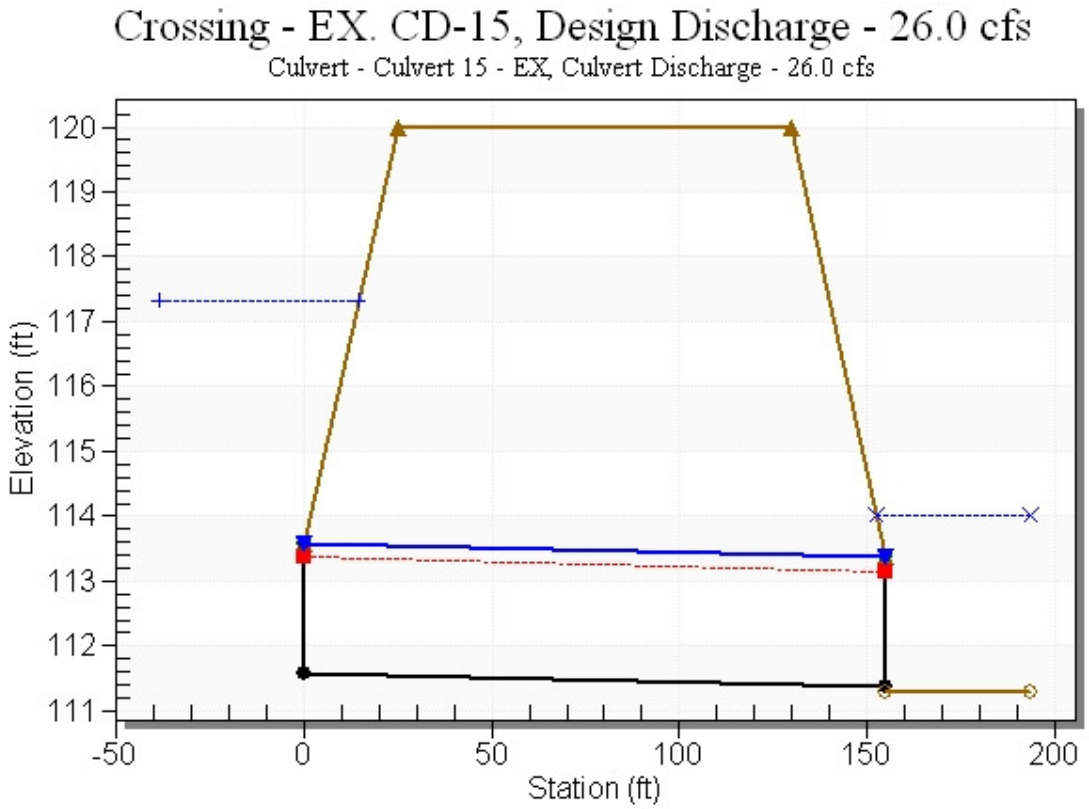
Culvert Length: 155.00 ft, Culvert Slope: 0.0014

****

Culvert Performance Curve Plot: Culvert 15 - EX



Water Surface Profile Plot for Culvert: Culvert 15 - EX



Site Data - Culvert 15 - EX

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 111.58 ft

Outlet Station: 155.00 ft

Outlet Elevation: 111.37 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 15 - EX

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 3 - Downstream Channel Rating Curve (Crossing: EX. CD-15)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	114.00	2.70
25.20	114.00	2.70
26.00	114.00	2.70
29.60	114.00	2.70
31.80	114.00	2.70
34.00	114.00	2.70
36.20	114.00	2.70
38.40	114.00	2.70
40.60	114.00	2.70
42.80	114.00	2.70
45.00	114.00	2.70

Tailwater Channel Data - EX. CD-15

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 114.00 ft

Roadway Data for Crossing: EX. CD-15

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 120.00 ft

Roadway Surface: Paved

Roadway Top Width: 105.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 23 cfs

Design Flow: 26 cfs

Maximum Flow: 45 cfs

Table 4 - Summary of Culvert Flows at Crossing: PR. CD-15

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 15 - PR Discharge (cfs)	Roadway Discharge (cfs)	Iterations
116.65	23.00	23.00	0.00	1
117.18	25.20	25.20	0.00	1
117.39	26.00	26.00	0.00	1
118.39	29.60	29.60	0.00	1
119.07	31.80	31.80	0.00	1
119.79	34.00	34.00	0.00	1
120.02	36.20	34.66	1.28	24
120.03	38.40	34.71	3.56	5
120.05	40.60	34.74	5.72	4
120.06	42.80	34.77	7.76	3
120.07	45.00	34.80	9.96	3
120.00	34.61	34.61	0.00	Overtopping

Rating Curve Plot for Crossing: PR. CD-15

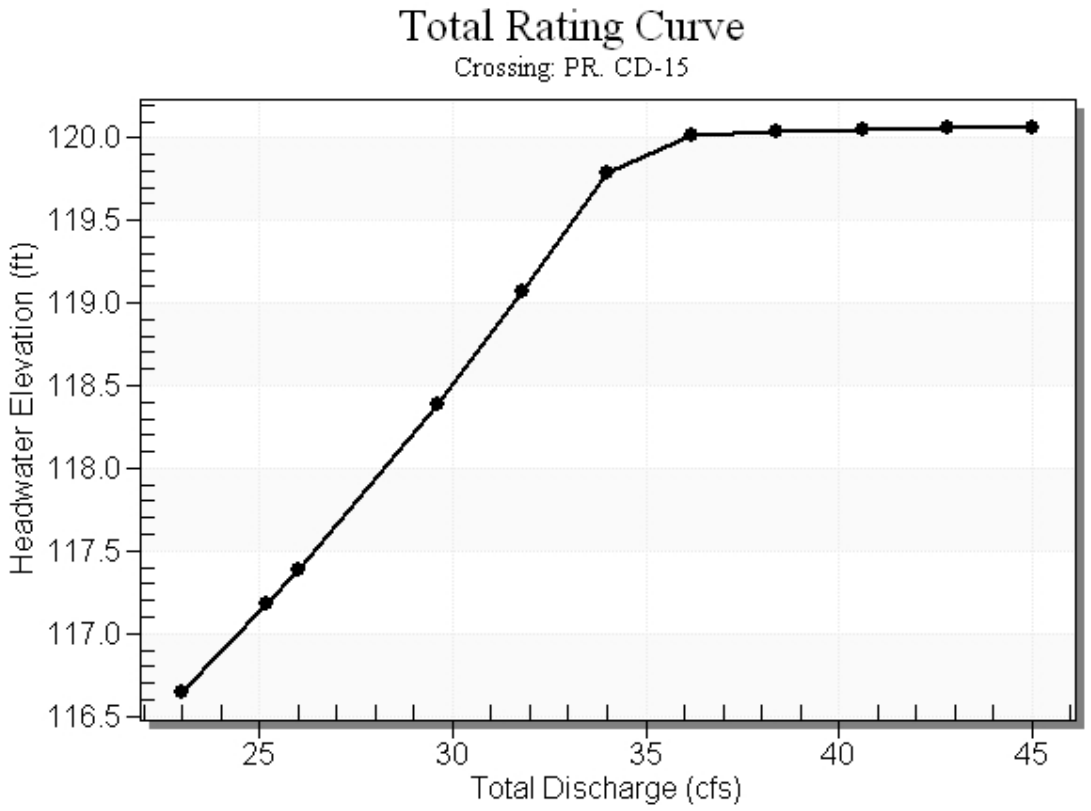


Table 5 - Culvert Summary Table: Culvert 15 - PR

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
23.00	23.00	116.65	3.452	5.070	4-FFf	2.000	1.705	2.000	2.700	7.321	0.000
25.20	25.20	117.18	3.877	5.601	4-FFf	2.000	1.767	2.000	2.700	8.021	0.000
26.00	26.00	117.39	4.042	5.806	4-FFf	2.000	1.786	2.000	2.700	8.276	0.000
29.60	29.60	118.39	4.856	6.809	4-FFf	2.000	1.854	2.000	2.700	9.422	0.000
31.80	31.80	119.07	5.406	7.485	4-FFf	2.000	1.890	2.000	2.700	10.122	0.000
34.00	34.00	119.79	5.994	8.210	4-FFf	2.000	1.916	2.000	2.700	10.823	0.000
36.20	34.66	120.02	6.186	8.437	4-FFf	2.000	1.862	2.000	2.700	11.032	0.000
38.40	34.71	120.03	6.200	8.453	4-FFf	2.000	1.860	2.000	2.700	11.047	0.000
40.60	34.74	120.05	6.211	8.466	4-FFf	2.000	1.858	2.000	2.700	11.059	0.000
42.80	34.77	120.06	6.220	8.476	4-FFf	2.000	1.856	2.000	2.700	11.068	0.000
45.00	34.80	120.07	6.228	8.486	4-FFf	2.000	1.855	2.000	2.700	11.077	0.000

****

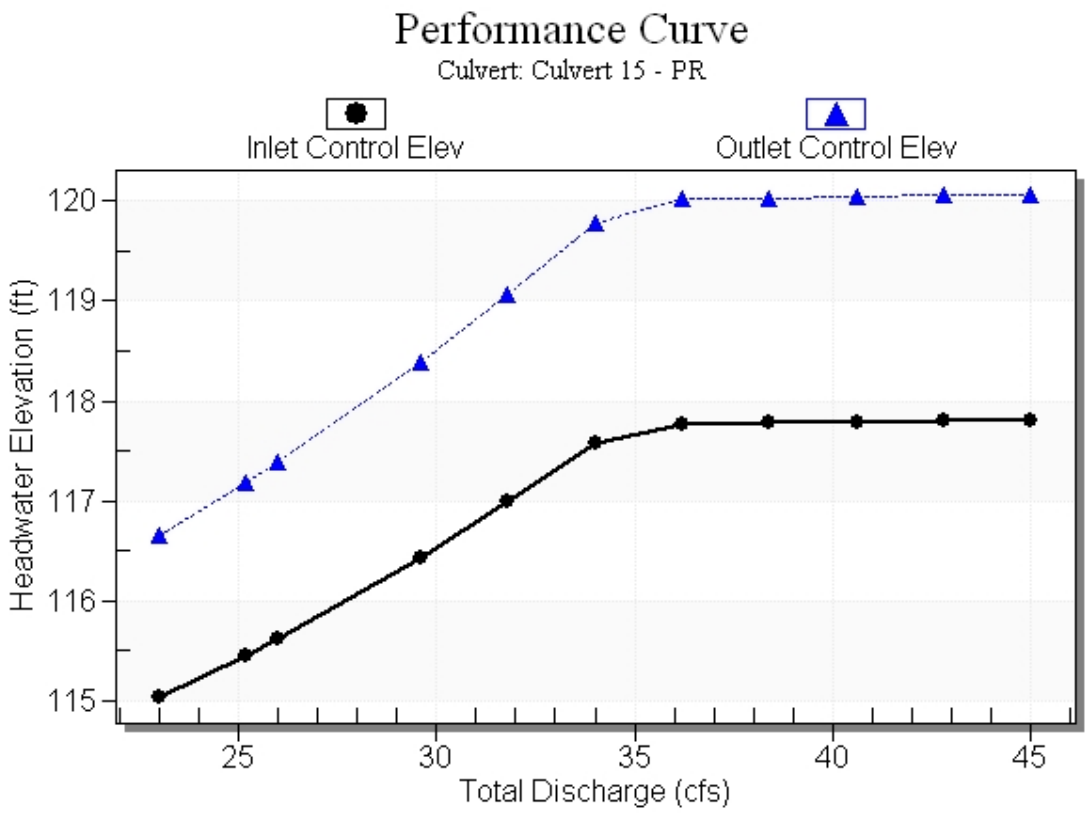
Straight Culvert

Inlet Elevation (invert): 111.58 ft, Outlet Elevation (invert): 111.37 ft

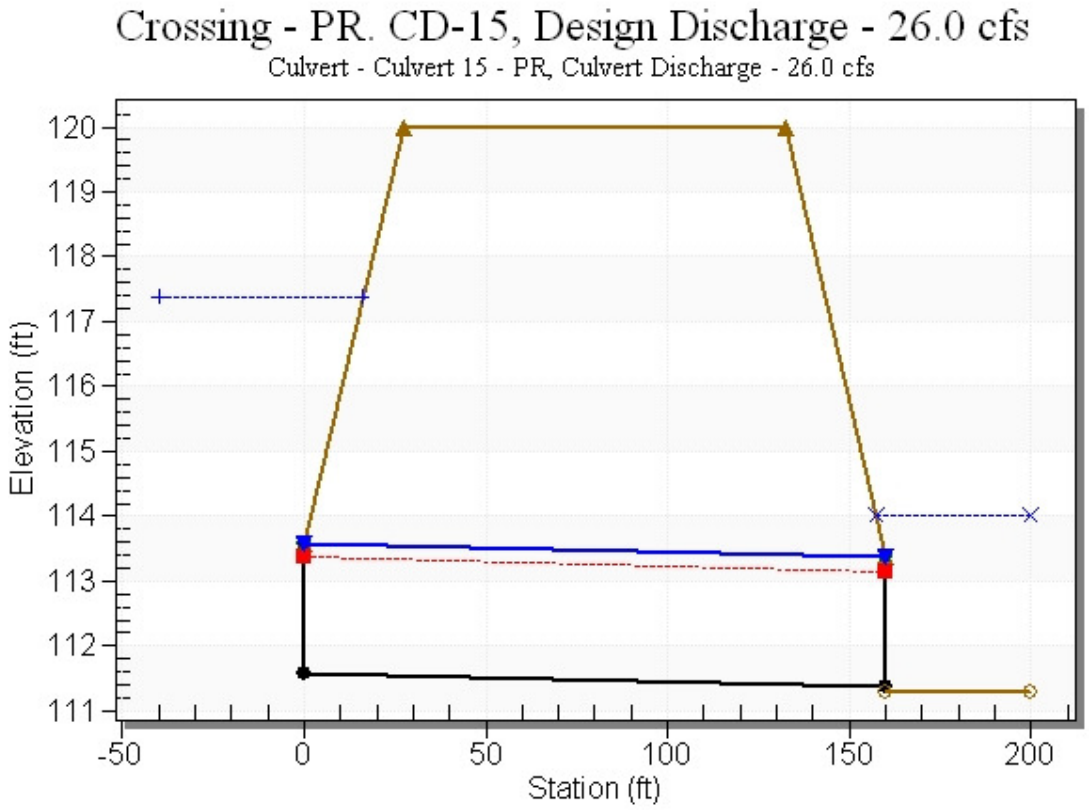
Culvert Length: 160.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: Culvert 15 - PR



Water Surface Profile Plot for Culvert: Culvert 15 - PR



Site Data - Culvert 15 - PR

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 111.58 ft

Outlet Station: 160.00 ft

Outlet Elevation: 111.37 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 15 - PR

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: NONE

Table 6 - Downstream Channel Rating Curve (Crossing: PR. CD-15)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
23.00	114.00	2.70
25.20	114.00	2.70
26.00	114.00	2.70
29.60	114.00	2.70
31.80	114.00	2.70
34.00	114.00	2.70
36.20	114.00	2.70
38.40	114.00	2.70
40.60	114.00	2.70
42.80	114.00	2.70
45.00	114.00	2.70

Tailwater Channel Data - PR. CD-15

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 114.00 ft

Roadway Data for Crossing: PR. CD-15

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 200.00 ft

Crest Elevation: 120.00 ft

Roadway Surface: Paved

Roadway Top Width: 105.00 ft

Appendix 4

Correspondence

MEMORANDUM

101 West Main Street
Suite 240
Lakeland, FL 33815
Phone 863.682.4081
Fax 863.802.3907
www.rkk.com

Date: February 15th, 2013
To: Manny Santos, FDOT PM
Rick Adair, ISD GEC Support
From: Chris Piazza, PE
CC: File
Re: SR 60 from Valrico Road to County Line Road. PD&E Study (FPID: 430055-1-22-01)
Typical Section Memo

Segment 1 (from Valrico Road to Dover Road)

Existing Typical Section (See attached typical)

The existing typical section for this segment is a four lane divided rural section with 2-12' lanes, 4' paved outside shoulders, and 8' inside shoulders in each direction. There exists a 5'-6' sidewalk on both sides at the beginning of the project up to St Cloud Ave, with intermittent sidewalk up t0 Turkey Creek Road. New sidewalk is constructed from Turkey Creek to SR 39. There is no sidewalk on either side of the road from SR 39 to County Line Road. There is an existing open drainage system. There are existing light poles on both sides of the road from Valrico Road to just past Dover Road, from Turkey Creek Road to Calhoun Road and from James L Redman Pkwy to the median truck weigh station. The existing right-of-way width is typically 182'. There are eight existing signalized intersections: Valrico Rd, Miller Rd, St Cloud Ave, Mulrennan Rd, Dover Rd, Turkey Creek Rd, James L. Redman Pkwy, and County Line Rd. There are two existing bridges on this segment that cross English Creek. The existing design speed is 65 mph and the existing posted speed varies from 50-65 mph.

Proposed Typical Section - High Speed Urban - New Construction (See attached typical)

The proposed typical section alternative for this segment is a six lane divided high speed urban section and will consist of a complete reconstruction with the roadway centerline being centered within the existing 182' right-of-way. This section will consist of 3-12' lanes, a 6.5' paved outside shoulder and bike lane, and a 6.5' paved inside shoulder in each direction. A 5' sidewalk will be located on both sides of the roadway along with a 30' median. This section meets current design criteria and does not involve any right-of-way impacts. It is a closed drainage system with Type E curb and gutter provided at the inside and outside shoulders in each direction. The design and posted speed for this section is 50 mph. The approximate construction cost for this typical section is $7.6M per mile.

Proposed Typical Section - High Speed Urban - Pavement Saving (See attached typical)

The proposed typical section alternative for this segment is a six lane divided high speed urban section and will consist of milling and resurfacing the existing roadway, constructing overbuild and widening as needed, and using the existing centerline of the roadway for new construction. The roadway centerline will not be centered within the existing 182' right-of-way. This section will consist of 3-12' lanes, a 6.5' paved outside shoulder and bike lane, and a 6.5' paved inside shoulder in each direction. A 5' sidewalk will be located on both sides of the roadway along with a 30' median. This section meets current design criteria and does not involve any right-of-way impacts. It is a closed drainage system with Type E curb and gutter provided at the inside and outside shoulders in each direction. The design and posted speed for this section is 50 mph. The approximate construction cost for this typical section is $5.7M per mile.

Segment 2 (from Dover Road to Horton Road)

Existing Typical Section (See attached typical)

See Segment 1 description.

Proposed Typical Section - High Speed Suburban - New Construction (See attached typical)

The proposed typical section alternative for this segment is a six lane divided high speed suburban section and will consist of a complete reconstruction with the roadway centerline being centered within the existing 182' right-of-way. This section will consist of 3-12' lanes, a 5' paved outside shoulder and bike lane, and a 6.5' paved inside shoulder in each direction. A 5' sidewalk will be located on both sides of the roadway along with a 30' median. This section meets current design criteria and does not involve any right-of-way impacts. It is an open drainage system with conveyance ditches to offsite ponds. Type E curb and gutter is provided at the inside shoulders in each direction. The design and posted speed for this section is 50 mph. The approximate construction cost for this typical section is $8.2M per mile.

Proposed Typical Section - High Speed Suburban - Pavement Saving (See attached typical)

The proposed typical section alternative for this segment is a six lane divided high speed suburban section and will consist of milling and resurfacing the existing roadway, constructing overbuild and widening as needed, and using the existing centerline of the roadway for new construction. The roadway centerline will not be centered within the existing 182' right-of-way. This section will consist of 3-12' lanes, a 5' paved outside shoulder and bike lane, and a 6.5' paved inside shoulder in each direction. A 5' sidewalk will be located on both sides of the roadway along with a 30' median. This section meets current design criteria and does not involve any right-of-way impacts. It is an open drainage system with conveyance ditches to offsite ponds. Type E curb and gutter is provided at the inside shoulders in each direction. The design and posted speed for this section is 50 mph. The approximate construction cost for this typical section is $6.7M per mile.

Segment 3 (from Horton Road to County Line Road)

Existing Typical Section (See attached typical)

See Segment 1 description.

Proposed Typical Section - Rural - New Construction Alt 1 (See attached typical)

The proposed typical section alternative for this segment is a six lane divided rural section and will consist of a complete reconstruction with the roadway centerline being centered within the proposed 212' right-of-way. This section will consist of 3-12' lanes, a 5' paved outside shoulder and bike lane, and a 8' inside shoulder in each direction. A 5' sidewalk will be located on both sides of the roadway along with a 40' median. This section meets current design criteria but does required 30' additional right-of-way to meet a 40' border requirement on each side. It is an open drainage system with conveyance ditches to offsite ponds. The design speed for this section is 70 mph and the posted speed is 65 mph. The approximate construction cost for this typical section is $10.3M per mile.

Proposed Typical Section - Rural - New Construction Alt 2 (See attached typical)

The proposed typical section alternative for this segment is a six lane divided rural section and will consist of a complete reconstruction with the roadway centerline being centered within the existing 182' right-of-way. This section will consist of 3-12' lanes, a 5' paved outside shoulder and bike lane, and a 8' inside shoulder in each direction. A 5' sidewalk will be located on both sides of the roadway along with a 40' median. This section does not involve any right-of-way impacts but also does not meet current design criteria. A variation to the 40' border width requirement would be needed. It is an open drainage system with conveyance ditches to offsite ponds. The design speed for this section is 70 mph and the posted speed is 65 mph. The approximate construction cost for this typical section is $10.6M per mile.

Proposed Typical Section - Rural - Pavement Saving (See attached typical)

The proposed typical section alternative for this segment is a six lane divided rural section and will consist of milling and resurfacing the existing roadway, constructing overbuild and widening as needed, and using the existing centerline of the roadway for new construction. The roadway centerline will not be centered within the existing 182' right-of-way. This section will consist of 3-12' lanes, a 5' paved outside shoulder and bike lane, and a 8' inside shoulder in each direction. A 5' sidewalk will be located on both sides of the roadway along with a 40' median. This section does not involve any right-of-way impacts but also does not meet current design criteria. A variation to the 40' border width requirement would be needed. It is an open drainage system with conveyance ditches to offsite ponds. The design speed for this section is 70 mph and the posted speed is 65 mph. The approximate construction cost for this typical section is $8.2M per mile.

Team Coordination Meeting # 4

October 17, 2012, 9:30am

Teleconference (888-394-8197: Passcode 564719#)

AGENDA

(bold/italics = completed activities AND normal/regular = ongoing activities)

A. Program Management & Administration

- ✓ ***Notice to Proceed: June 18, 2012***
- ✓ ***Received all Subs Agreement***
- ✓ ***Received signed QA/QC forms or plans from all Subs***
- ✓ ***Updated detail Team Schedule (Attached with data date:10/01/12)***
- ✓ **Draft Work Plan (on ftp site-work in progress)**
- ✓ **Invoicing Procedure Established**

  Invoices for September, 2012. RK&K cutoff dates for 2012 are:
  - September 28th
  - October 26th
  - November 30th
  - December 28th

B. Public Involvement

Public Involvement Plan

- ✓ ***Submitted to FDOT on 07/16/12***
- ✓ ***PIP Signed***

Kick-Off Newsletter

- ✓ ***Submitted 1st Draft to FDOT on 07/26/12***
- ✓ ***Addressed and resubmitted on 08/21/12***
- ✓ ***Rec'd direction from FDOT on 10/08/12 to change date to "October 2102" & name to "Project Newsletter No. 1" instead of "Kick-Off Newsletter"***
- ✓ ***Received further comments on 10/17/12. Revised & resubmitted***

  Awaiting FDOT approval to distribute.

  Alternatives Public Meeting on 04/30/13.

C. Engineering Data Collection / Reports

Survey/ Aerial Photography

- ✓ ***Completed***

Traffic

- ✓ ***Traffic counts completed & submitted to American (Akram Hussein)***

  RK&K Traffic Team met with FDOT on 09/12/12 to discuss traffic forecasting methodology

  American started existing traffic volumes analysis.

  TrafOData held forecasting methodology meeting with FDOT. Started on what they are able to do pending existing traffic volume analysis.

  First Draft Traffic Technical Memo is now due 12/04/12 (originally 10/30/12).

Other Data Collection

- ✓ ***Crash Data – collected prior to Presentation.*** Requested update from FDOT

Transportation Plans - collected some prior to Presentation – Status?
Drainage – Status?
Utilities & Railroads & Weigh Station- Status?
Existing Roadway Characteristics - Status?
Existing Structures Characteristics – American started. 80% complete in pulling together available information. Will be summarizing in spreadsheet. Analysis will follow after.
Geotech - Status?

✓ Base Maps **- *Completed***

D. Environmental Data Collection/Reports

Cultural Resources – Received Draft Research Design & Survey Methodology on 08/15/12. FDOT forwarded to FHWA / SHPO
Wetlands/ T&E – Status?
Wildlife & Habitat – Status?
Farmlands – Status?
Physical Impacts

- Air & Noise – Status?
- Contamination – Status?

E. Schedule/Project Milestones

Milestones	Due Date	Submittal Date
PIP	***07/16/12***	***07/16/12 (Resubmitted 09/07/12)***
Kick-Off Newsletter	***08/07/12***	***07/26/12 (Resubmitted thrice)***
Draft Traffic Tech Memo	**10/30/12**	12/04/12 (Tentative Date)

F. Other

Appendix 5

Existing Permits

S.R. 60

Plans of Proposed State Highway

F.A. Project No. F-033-1 (21), 1961

DRAINAGE MAP

Dist.	State	County	Route	Proj.
3	Fla.	Hillsborough	60	F-033-1

State Job No. 10110-3503

Not in this Contract

BEGIN PROJECT STA. 666+48.5

Sta. 609+00
Const. 4x2 Box Culv. Ext.
F.L. Lt. 60.05
F.L. Rt. 60.10

Sta. 609+00
Const. 4x2 Box Culv. Ext.
F.L. Lt. 59.90
F.L. Rt. 59.85

Sta. 589+00
Conc. Box Culv. Ext.
F.L. Lt. 45.89
F.L. Rt. 45.87
H.W. 56.0

Sta. 635+54
Relay 20' of 36" Pipe
F.L. Lt. 77.90, F.L. Lt. 77.90

Sta. 635+54
Const. 36" Pipe
F.L. Lt. 78.00
F.L. Rt. 78.20

Sta. 635+34
Single 3x2 Conc Box Culv.
to be removed

Sta. 686+50
Const. 7x5 Box
Culvert Ext.
F.L. Lt. 69.98
F.L. Rt. 70.20
H.W. 71.5

DR. AREA = 3.6 Ac.

DR. AREA = 89.1 Ac.

DR. AREA = 161.1 Ac.

DR. AREA = 341.1 Ac.

For Lateral Ditch
See Sheet No.

NOT IN THIS CONTRACT

Scale 1" = 400'

Top Spoil Bank

Phosphate Pits

Ditch 4' W. 12' Bottom

Graded Rd.

Turkey Creek

Swamp

6' Gap

W.W. Draw

5' Original Stream

Pine Flatwoods

Pine Woods

Borrow Pit

Phosphate Pit

High Spoil Bank

Spoil Bank

Note: This area is completely mined 11/13/59

JERRY SMITH RD.

DIRT RD.

TURKEY CREEK RD.

CALHOUN RD.

Cultivated Field

Cleared Field

Drained Pond

6' Bottom Ditch

Spec. Ditch Rt.

Spec. Ditch Lt.

DRAINAGE MAP

5-3

Dist.	State	County	Route	Proj.
3	Fla.	Hillsborough	60	F-033-1(21)

Title Job No. 18110-3505

Sta. 697+50
Const. 6'x6' Conc. Box Culvert Extension
F.L. Lt. 61.53
F.L. Rt. 61.60

Sta. 709+75
Const. Triple 10'x10' Conc. Box Culvert Extension
F.L. Lt. 57.68
F.L. Rt. 57.40

Sta. 753+75
Const. 24" Pipe Ext.
F.L. Lt. 84.32
F.L. Rt. 84.50

Sta. 785+10
18" Pipe to be Plugged

Sta. 786+00
Const. 24" Pipe
F.L. Lt. 100.50
F.L. Rt. 100.30

Sta. 793+25.3
Const. 24" Pipe Ext.
F.L. Lt. 104.50
F.L. Rt. 104.70

Sta. 798+26.3
Const. 24" Pipe (Ext.)
F.L. Lt. 104.50
F.L. Rt. 104.70

WALLACE RD.

MUD LAKE RD.

ARMOUR RD.

Swamp

Swamp

Swamp

Swamp

To Alafia River

Cult. Field

Cultivated Field

Cult. Field

Oak & Pine

Oak & Pine

Phosphate Pits

Phosphate Pits being mined

High Grade Overburden Spoil Bank.

3' Bottom Ditch

6' Bottom Ditch

DR. AREA 12.2 Ac.

DR. AREA 4.7 Ac.

DR. AREA 9.1 Ac.

DR. AREA 15.7 Ac.

DR. AREA 23.7 Ac.

Scale: 1"=400'

DRAINAGE MAP

5-4

Dist.	State	County	Route	Proj.
3	Fla.	Hillsborough	60	F-033-1(21)

State Job No. 10110-3502

Sta. 826+34
Const. 7'x5' Conc. Box Culv.
Culv. Extension
F.L. Lt. 102.57
F.L. Rt. 102.40

Sta. 856+81
Const. Dbl. 30" Pipe
F.L. Lt. 110.00
F.L. Rt. 110.10

Sta. 865+79.50
Const. 24" Pipe Ext.
F.L. Lt. 115.43
F.L. Rt. 114.40

Sta. 865+37
Const. M.H. Type "A"
F.L. 111.40

Sta. 903+00
Const. Dbl. 30" Pipe Ext.
F.L. Lt. 110.34
F.L. Rt. 110.40

Sta. 925+34.9
Const. Dbl. 30" Pipe Extension
F.L. Lt. 105.98
F.L. Rt. 106.00

Sta. 865+00
Const. Endwall
F.L. 111.40

Sta. 865+895
Const. M.H. Type "A"
F.L. 111.53

AREA 1240 Ac.

DR. AREA 23.69 Ac.

DR. AREA 142.08 Ac.

DR. AREA 74.09 Ac.

DR. AREA 79.78 Ac.

Graded Road

Swamp

Cultivated

Bearing Grove

Grove

Thick Oak & Pine

Pine Woods

Dirt Road

Pump House for Irrigation

Dam

Present Road 75' Asph.

Open Phosphate Pit

High Phos. Spoil Dumps

Spoil Dumps

Open Phos. Pit

Low Bulbosewoods

Ditch

Cultivated Fields & Pine Woods

W.W. Pond

SMITH RILEY RD.

Scale: 1" = 400'

DRAINAGE MAP

5-5.

Dist.	State	County	Route	Proj.	S
3	Fla.	Hillsborough	60	F-033-1(21)	

State Job No. 10110-3503

Sta. 960+00
Const. 30" Pipe Ext.
F.L. Lt. 91.53
F.L. Rt. 91.70

Sta. 948+80
Const. 36" Pipe Ext.
F.L. Lt. 96.09
F.L. Rt. 96.30

Sta. 970+00
Const. 30" Pipe Ext.
F.L. Lt. 97.09
F.L. Rt. 97.40

Spec. Ditch Rt.

400' V.C.

350' V.C.

600' V.C.

END PROJECT
STA. 1048+04.59 K=
STA. 1050+54.93 H.

Scale: 1" = 400'

Swamp

2' Ditch

Cultivated Field

DR. AREA 62.44 Ac.

DR. AREA 35.52 Ac.

DR. AREA 10.03 Ac.

DR. AREA 32.84 Ac.

AREA 3.5 SQ. MI.

Trail Road

Pres. Rd. No 79 - 15' Asph.

Rolling Land

Cult. Field

EX. BRIDGE

Sta. 997+51.74

Sta. 978+39.41

S. Hicks Rd.

635+00

647+58

24' Gr. Rd. = SMITH RILEY RD.

24' Gr. Rd. = HORTON RD.

15' Gr. Rd. = MILLS RD.

HILLSBOROUGH COUNTY — POLK COUNTY

Range 22 E
Range 23 E

25 | 30
36 | 31

FED. ROAD DIVN. NO.	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
9	FLA.	F-033-1(21)	'60 14	

STATE JOB Nº 10110-3503

680 685 690 695 700 705

45' Exist. R/W

Exist. R/W

1 Sty. Frm. Res.

1¼" WATER PIPE

SCATTERED PINES

30" Conc. Pipe

1 STY. BLK. RES. & BLK. REST RM.

30" CONC. PIPES

R/W Line ℄

30" C.M.P.

8" HWL

DUE EAST

GARDEN

1¼" Water Pipe

1 STY. C.B. RES.

Prop. Easement.

1460

60'

Exist. R/W

Exist. R/W

Sta. 678+15 Rt.
3.85' of 24" S.D. RCP

Sta. 683+30 Rt.
24.40' of 24" S.D. RCP

Exist. R/W

Exist. R/W

4 STR. BARB W.

7'X3' CONC. BOX CULVERT w/ 12" CONC. HWLS.

18" C.M. PIPE. Extend To be Removed

3/4" WATER PIPE

1 STY. FRM. RES.

1¼" WELL

5' CHICKEN WIRE

1 STY. FRM. RES.

3/4" WATER PIPE

18" CONC. P.

18" CONC. P.

18" CONC. P.

STA. 685+00 Const. Crossover See Sheet Nº 7 & 41

ELEC. 2 STR. BARB W. 36" STOCK FENCE

1 STY. FRM. RES & GARAGE

LOW AREA

SCATTERED PINES

POND

R/W Line ℄

SCATTERED OAKS, PALMETTO & BAY TREES

Exist. R/W

60'

B.C.C. BOX CULVERT

STA. 695+00 Const. Crossover & Conc. Spillway Type I See Sheet Nº 7 & 42

SCATTERED PINES & PALMETTOS

Exist. R/W

60'

CLEARED FIELD

97.25 (2) 2" W.D. HUBS

66.13

119.68

58°-10'

66°-11'

℄

REFERENCE PT. P.O.T. STA. 704+94.15 B.B. SPIKE

106.84

(2) 2" W.D. HUBS

NAIL & CAP IN BASE 12" PINE

80.15

STA. 704+94.15 Const. Intersection See Sheet Nº 43

SCATTERED OAKS & PINES

50'

Exist. R/W

Wallace Rd. Exist. Gravel Dirt Rd.

℄ Exist. R/W

24" C.M.P.

DUE EAST

132'

B. M. No. 57
130' Lt. Sta. 683+31
R.R. Spike in base 15" Aus. Pine
El. 73.10

B.M. No. 58
147' Lt. Sta. 693+83
R.R. Spike in base 18" Gum
El. = 70.73

B.M. No. 59
138' Rt. Sta 703+93
R.R. Spike in Base 8" Pine
El. = 65.38

M.D.R.T. 79.1

-0.8446%

-0.30 % Spec. Ditch Rt.

Type "C"

D.P.I. At. 76.30

D.P.I. Rt. 75.70

Rt. 76.30

79.1

2.42' rade

400' V.C.

12.20 (+6.5) 11.91 11.55 11.24 16.98 16.91 16.77 16.60 16.49 16.43 16.33 (+6.5)

P.I. (6.5) El. 76.51

-0.0424%

-1.203 % Spec. Med. Ditch

Med. D.P.I. 75.30 (2.41)

Med. D.P.I. 72.89 (4.50)

+0.05 %

Sta. 684+00 Const. Inlet Type "C" Fl. 71.90 Const. 18" Pipe Fl. Lt. 71.90, Rt. 71.70

Med. Ditch 2.42' below Prof. Grade

Sta. 686+50 Const. Inlet Type "C" on Top of 7'X3' Conc. Box Culvt. Extension Fl. El. 70.13 Lt. Fl. El. 70.20 Rt.

P.I. (6.90) El. 76.16

-0.8946%

-0.252 % Spec. Med. Ditch

(6.90) 76.24 76.18 76.01 75.91 75.73 75.69 75.41 75.09 74.71 74.31 (6.40)

400' V.C.

Med. D.P.I. 74.01

600' V.C.

12.83 (4.50) 73.41 73.01 72.66 72.34 72.07 71.82 71.62 71.45 71.32 71.22 71.17 71.15 (4.50)

+0.40 %

-0.10 %

Spec. Ditch (Rt.)

Med. D.P.I. 69.30 (4.41)

Med. D.P.I. 70.85 (2.41)

P.I. (4.50) El. 71.15

-0.92 %

Spec. Med. Ditch

+0.05 %

Spec. Med. Ditch

0.00 %

71.15

Med. D.P.I. 68.80 (4.50)

Med. D.P.I. 68.98

Sta. 693+00 Const. Inlet Type "C" Fl. 69.50 Const. 18" Pipe Fl. Lt. 69.50, Rt. 69.30

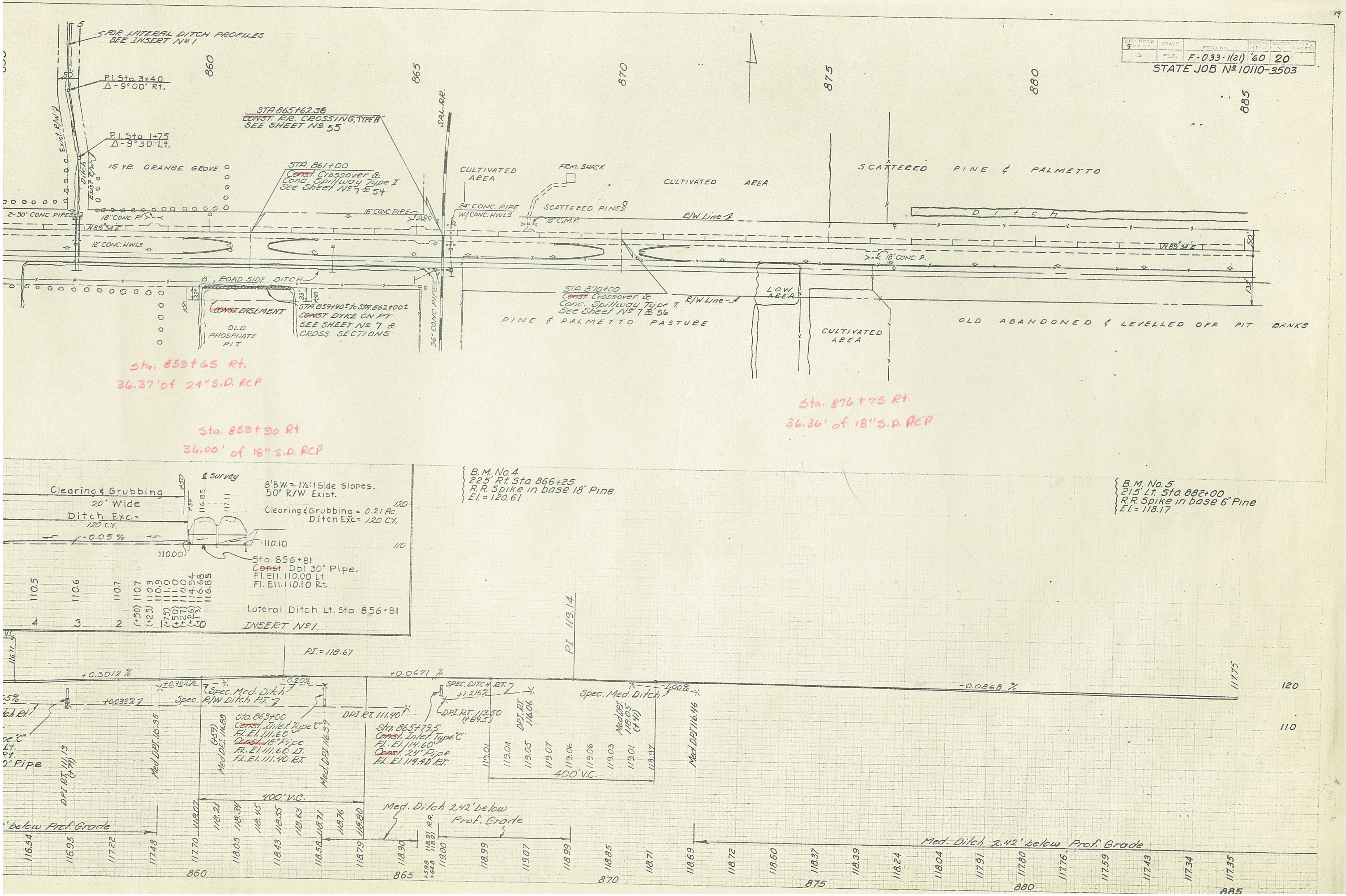
Sta. 697+50 Const. Inlet Type "C" on Top of 8'X6' Conc. Box Culvt. Extension Fl. El. 61.65 Lt. Fl. El. 61.60 Rt.

Sta. 694+60 Rt.
21.35' of 18" S.D. RCP

80.89 80.11 79.49 78.47 77.60 77.08 76.62 76.42 76.24 76.10 76.16 76.07 76.03 75.78 75.37 74.77 74.01 73.09 72.28 71.84 71.21 70.84 70.78 70.82 70.88 70.88 71.02 71.00 70.95 70.85

80

70


19
FED. ROAD DIVN. No. 3
STATE FLA.
PROJ. No. F-033-1(21)
FISCAL YEAR '60
SHEET No. 20
TOTAL SHEETS
STATE JOB Nº 10110-3503
860
865
870
875
880
885
FOR LATERAL DITCH PROFILES SEE INSERT Nº 1
P.I. Sta. 3+40 Δ-9°00' Rt.
P.I. Sta. 1+75 Δ-9°30' Lt.
Exist. R/W
Ditch
Exist. R/W
15 YR. ORANGE GROVE
STA 865+62.38
CONST. R.R. CROSSING, TYPE A
SEE SHEET Nº 55
STA. 861+00
Const. Crossover & Conc. Spillway Type I
See Sheet Nº 7 & 54
SAL. RR.
CULTIVATED AREA
FRM. SHACK
CULTIVATED AREA
SCATTERED PINE & PALMETTO
24" CONC. PIPE W/CONC. HWLS
SCATTERED PINES
18" C.M.P.
R/W Line
D i t c h
2-30" CONC. PIPES
18" CONC. P.
18" CONC. PIPE
N 85°34' E
12" CONC. HWLS
N 89°34' E
18" CONC. P.
50'
8' ROAD SIDE DITCH
33'
150
CONST. EASEMENT
STA. 859+90± to STA. 862+00±
CONST DYKE ON PT
SEE SHEET Nº 7 & CROSS SECTIONS
OLD PHOSPHATE PIT
36" CONC PIPES
STA 870+00
Const. Crossover & Conc. Spillway Type T.
See Sheet Nº 7 & 56
R/W Line
LOW AREA
132'
PINE & PALMETTO PASTURE
CULTIVATED AREA
OLD ABANDONED & LEVELLED OFF PIT BANKS
Sta. 859+65 Rt.
36.37' of 24" S.D. RCP
Sta. 859+90 Rt.
36.00' of 18" S.D. RCP
Sta. 876+75 Rt.
36.36' of 18" S.D. RCP
B.M. No. 4
225' Rt. Sta. 866+25
R.R. Spike in base 18" Pine
El. = 120.61
B.M. No. 5
215' Lt. Sta. 882+00
R.R. Spike in base 6" Pine
El. = 118.17
Clearing & Grubbing 20' Wide
Ditch Exc. = 120 C.Y.
-0.05 %
℄ Survey
8' B.W. - 1½:1 Side Slopes.
50' R/W Exist.
Clearing & Grubbing = 0.21 Ac.
Ditch Exc. = 120 C.Y.
110.00
110.10
Sta. 856+81
Const. Dbl 30" Pipe.
Fl. Ell. 110.00 Lt.
Fl. Ell. 110.10 Rt.
Lateral Ditch Lt. Sta. 856+81
INSERT Nº 1
110.5
110.6
110.7
110.7
110.9
110.9
111.00
111.00
114.94
116.68
116.85
116.85
117.11
4
3
2
(+50)
(+25)
1
(+75)
(+50)
(+27)
(+26)
(+13)
0
120
110
P.I. = 118.67
PI 119.14
+0.3012 %
+0.0671 %
-0.0868 %
117.75
+0.962%
-0.20%
+0.033%
Spec. Med. Ditch
Spec. R/W Ditch P.T.
DPI RT. 111.40
SPEC. DITCH RT.
+1.216%
DPI. RT. 113.50 (+89.5)
DPI. RT. 116.06
Spec. Med. Ditch
-4.00%
Med. DPI. 118.05 (+41)
Med. DPI 116.46
DPI RT. 111.13 (+79)
Med. DPI. 115.35
Med. DPI. 116.88 (+59)
Sta. 863+00
Const. Inlet Type "C"
Fl. El. 111.60
Const. 18" Pipe
Fl. El. 111.60 Lt.
Fl. El. 111.40 Rt.
Med. DPI. 116.39
Sta. 865+79.5
Const. Inlet Type "C"
Fl. El. 114.60
Const. 24" Pipe
Fl. El. 114.40 Rt.
400' V.C.
400' V.C.
118.07
118.21
118.34
118.45
118.55
118.63
118.71
118.76
118.80
119.01
119.04
119.05
119.07
119.06
119.06
119.03
119.01
118.97
Med. Ditch 2.42' below Prof. Grade
Med. Ditch 2.42' below Prof. Grade
R.R. 118.91 118.91
+59.8 +64.8
Med. Ditch 2.42' below Prof. Grade
116.54
116.95
117.22
117.48
117.70
118.05
118.43
118.58
118.79
118.90
119.00
118.99
119.07
118.99
118.85
118.71
118.69
118.72
118.60
118.37
118.39
118.24
118.04
117.91
117.80
117.76
117.59
117.43
117.34
117.35
120
110

S.R. 60

Final As-Built Plans

FPID 413395-1-52-01

M.P. 11.456 to M.P. 16.491

2005

HANDRAIL IS From STA. 420+98 TO STA. 421+09. Bob 10-12-07

1"=40'

+13.81 82.00' LT. +12.82 81.00' LT. +28.81 82.00' LT. +29.81 81.00' LT. +08.12 79.85' LT. +06.97 81.00' LT. +44.58 79.85' LT. +68.94 80.00' LT. +54.58 80.00' LT. +73.66 75.33' LT. +84.52 75.39' LT. +90.06 81.00' LT. +93.81 72.14' LT. +84.86 81.00' LT. +13.81 72.25' LT. +22.47 81.00' LT. +00.26 76.44' LT. +95.70 81.00' LT. +11.33 76.44' LT. +15.89 81.00' LT. +50.23 82.00' LT. +49.24 81.00' LT. +65.23 82.00' LT. +66.24 81.00' LT.

EXIST. R/W
6' Chain Link Fence
5' CONC. SW
BEGIN STEEL HANDRAIL +55.89
END STEEL HANDRAIL +39.85
5' CONC. SW
18" RCP
Bob 10-12-07 TURNOUT DELETED
25'R
25'R
CONST. 48 LF OF 18" PIPE
CONST. RURAL TURNOUT (INDEX 515)
CONST. 16 LF OF 18" PIPE
CONST. 17 LF OF 18" PIPE
S-7
S-8
S-9

82' 34' 32' 13.7' 14.7' 30' 100'

418 S.R. 60 419 420 421 422

EXIST. MES (2) & PIPE (TO BE REMOVED)
℄ SURVEY
S 89°41'10" E
EXIST. PAVED SHLDR. 4' (TYP.)
24" RCP

418 419 420 421 422

Grass Median
℄ CONST. S 89°41'10" E

82' 28' 20' 32' 7.8' 41.8' 100'

EXIST. MES TO BE REPLACED
24" CMP
5' PAVED SHLDR.
24" RCP
END 5' SHLDR. CONSTRUCTION +49.61
Asph.
Dirt Drwy.
18" RCP
EXIST. MES TO BE REPLACED

5' Hog Wire Fence
5' Hog Wire Fence
6' CONC. SW
EXIST. R/W

END 6" THICK SW BEGIN 4" THICK SW +12.36, 99.00' RT.
END 4" THICK SW BEGIN 6" THICK SW +98.56, 99.00' RT.
END 4" THICK SW BEGIN 6" THICK SW +76.83, 99.00' RT.

+17.85 99.00' RT. +02.77 94.89' RT. +13.63 94.83' RT. ℄ DRWY. +04.95 Gravel Drwy.

+21.80 99.00' RT. +22.81 100.00' RT. +38.80 99.00' RT. +37.80 100.00' RT. +72.66 99.00' RT. +73.67 100.00' RT. +89.66 99.00' RT. +88.67 100.00' RT. +35.88 99.00' RT. +36.89 100.00' RT. +52.88 99.00' RT. +51.88 100.00' RT. +03.70 99.00' RT. +04.71 100.00' RT. +20.69 99.00' RT. +19.70 100.00' RT.

Jacobs project # was constructed in substantial compliance with these plans as marked by the Engineer of Record. If changes are made, the changes are indicated by black ink revision and bear the signature of the responsible Engineer.

Bob Rast 10-12-07

LEGEND

LIMITS OF MILLING & RESURFACING

NOTICE: THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 61G15-23.003, F.A.C.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

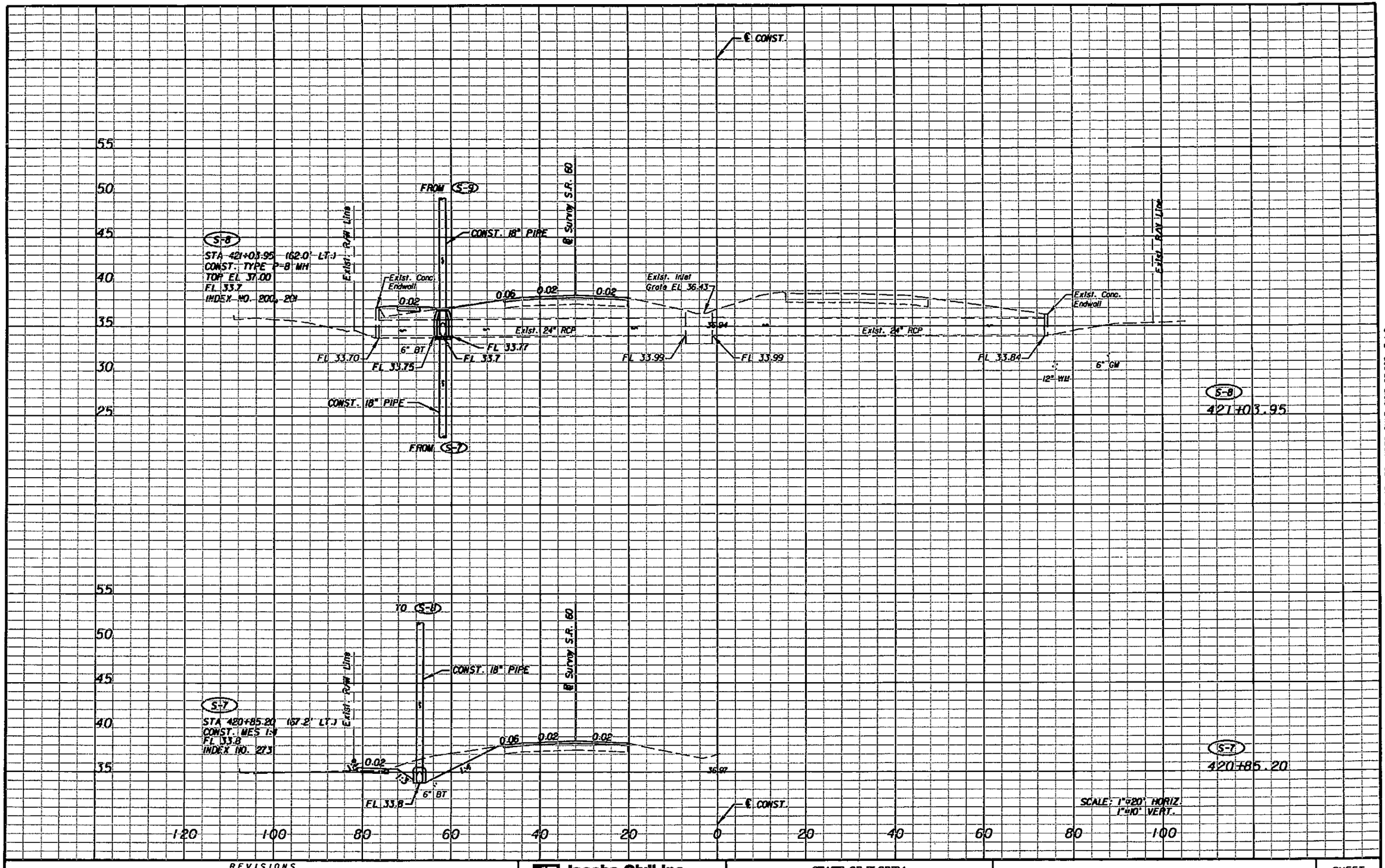
Jacobs Civil Inc.
18302 Highwoods Preserve Parkway
Highwoods Plaza, Suite 200
Tampa, FL. 33647
Tel. (813) 977-3434
CERTIFICATE OF AUTHORIZATION NO. 6512
ENGINEER OF RECORD:
DAVID A. RAST P.E. No. 51486

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413395-1-52-01

PLAN SHEET (9)
STA 417+20 TO STA 422+80

SHEET NO. 31



SCALE: 1"=20' HORIZ.
1"=10' VERT.

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REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Jacobs Civil Inc.
18302 Highwoods Preserve Parkway
Highwoods Plaza, Suite 200
Tampa, FL. 33647
Tel.(813)977-3434
CERTIFICATE OF AUTHORIZATION No. 6572
ENGINEER OF RECORD:
DAWN MARIE RATICAN, P.E. No. 60226

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413395-1-52-01

DRAINAGE STRUCTURES
SR 60 (4)

SHEET NO. 83

EXISTING HEADWALL REMOVED AND S-13 PLACED IN THAT LOCATION AND TIED INTO EXISTING 24" PIPE UNDER CO. TIED INTO EXISTING 18" UNDER DW. PLACED 23' OF 18" RCP TO S-14.

Burk 10-12-07

SW WAS PLACED TO BACK OF R/W AS SHOWN. THESE AREAS WERE DELETED

Burk 10-12-07

"This project was constructed in substantial compliance with these plans as provided by the Engineer of Record. If changes were made, these changes are indicated by black ink revisions to these as-built plans and signature of the responsible Engineer."

Brian M. Burkhart 10-12-07

SIDEWALK SHIFTED TOWARDS ℄ TO AVOID NEED FOR HANDRAIL BY HEAD WALL.

Burk 10-12-07

DID'NT REMOVE AND REPLACE CURB IN THIS LOCATION

S.R. 60

℄ SURVEY

S 89°41'10" E

℄ CONST. S 89°41'10" E

CONST. TYPE E-C & G (REMOVE EXIST. C & G)

CONST. 23 LF OF 18" PIPE

CONST. 9 LF OF 18" PIPE

CONST. 0 LF OF 19"X30" PIPE

END TYPE E C & G +25.60, 7.51' LT.

BEGIN STEEL HANDRAIL +92.31

END STEEL HANDRAIL +29.86

END-HANDRAIL +54.29

BEGIN HANDRAIL +80.21

EXIST. PAVED SHLDR. 4' (TYP.)

EXIST. PAVED SHLDR. 4' (TYP)

EXIST. R/W

5' CONC. SW

6' CONC. SW

4' Chain Link Fence

18" CMP

18" RCP

24" RCP

24" CMP

Grass Median

EXIST. MES TO BE REPLACED

℄ DIRT DRWY. +77.35

℄ DIRT DRWY. +33.33

℄ DIRT DRWY. +11.59

℄ DIRT DRWY. +44.25

GRASSED SHLDR. DRWY. +49.28 NO LONGER IN USE

+61.77 69.30' LT.

+92.13 69.46' LT.

+49.94 81.00' LT.

+29.33 81.00' LT.

+17.93 69.60' LT.

+00.05 76.04' LT.

+89.19 76.04' LT.

+84.23 81.00' LT.

+05.01 81.00' LT.

END 4" THICK SW BEGIN 6" THICK SW +28.53, 81.00' LT.

END 6" THICK SW BEGIN 4" THICK SW +39.57, 81.00' LT.

END 4" THICK SW BEGIN 6" THICK SW +05.56, 81.00' LT.

+02.38 82.00' LT.

+87.38 82.00' LT.

+86.39 81.00' LT.

+03.39 81.00' LT.

END 6" THICK SW BEGIN 4" THICK SW +16.27, 81.00' LT.

+78.50 76.00' LT.

+73.49 81.00' LT.

+89.36 76.00' LT.

+94.36 81.00' LT.

END 4" THICK SW BEGIN 6" THICK SW +40.81, 81.00' LT.

END 6" THICK SW BEGIN 4" THICK SW +58.68, 81.00' LT.

+68.65 99.00' RT.

+33.21 99.00' RT.

+67.66 100.00' RT.

+34.22 100.00' RT.

+56.21 99.00' RT.

+50.21 99.00' RT.

+49.22 100.00' RT.

+80.21 75.00' RT.

+78.29 99.00' RT.

+54.29 75.00' RT.

END 4" THICK SW BEGIN 6" THICK SW +41.54, 99.00' RT.

END 6" THICK SW BEGIN 4" THICK SW +52.00, 99.00' RT.

+28.69 99.00' RT.

+29.70 100.00' RT.

+45.69 99.00' RT.

+44.69 100.00' RT.

440 441 442 443 444 445 448

82' 48' 32' 1.1' 18.6' 28' 100'

LEGEND

LIMITS OF MILLING & RESURFACING

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REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

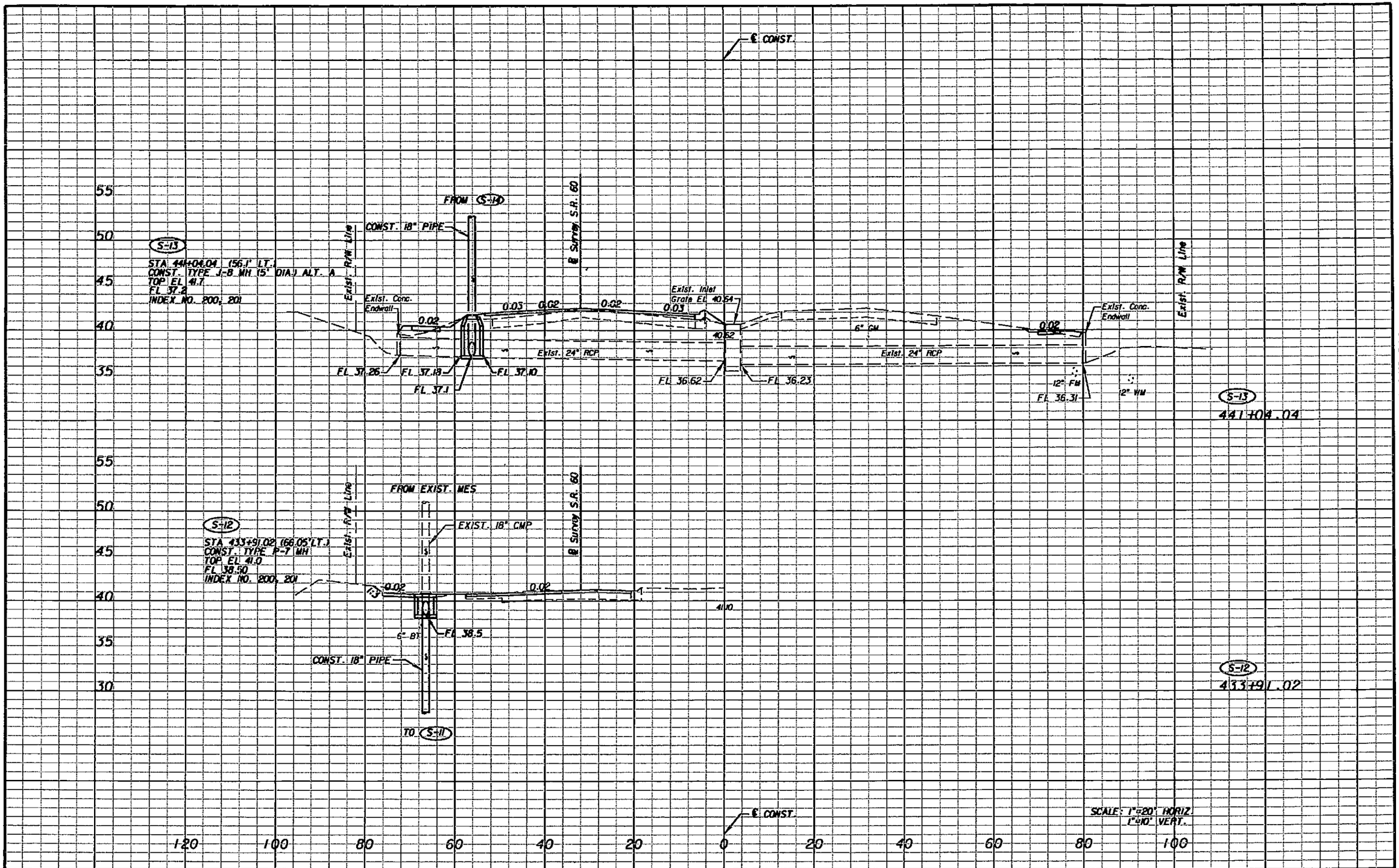
Jacobs Civil Inc.
18302 Highwoods Preserve Parkway
Highwoods Plaza, Suite 200
Tampa, FL. 33647
Tel. (813) 977-3434
CERTIFICATE OF AUTHORIZATION NO. 6572
ENGINEER OF RECORD:
DAVID A. PAST, P.E. No. 51485

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413395-1-52-01

PLAN SHEET (13)
STA 439+60 TO STA 445+20

SHEET NO. 35



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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Jacobs Civil Inc.
18302 Highwoods Preserve Parkway
Highwoods Plaza, Suite 200
Tampa, FL. 33647
Tel. (813) 377-3434
CERTIFICATE OF AUTHORIZATION No. 6572
ENGINEER OF RECORD:
DAWN MARIE RATICAN, P.E. No. 60226

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

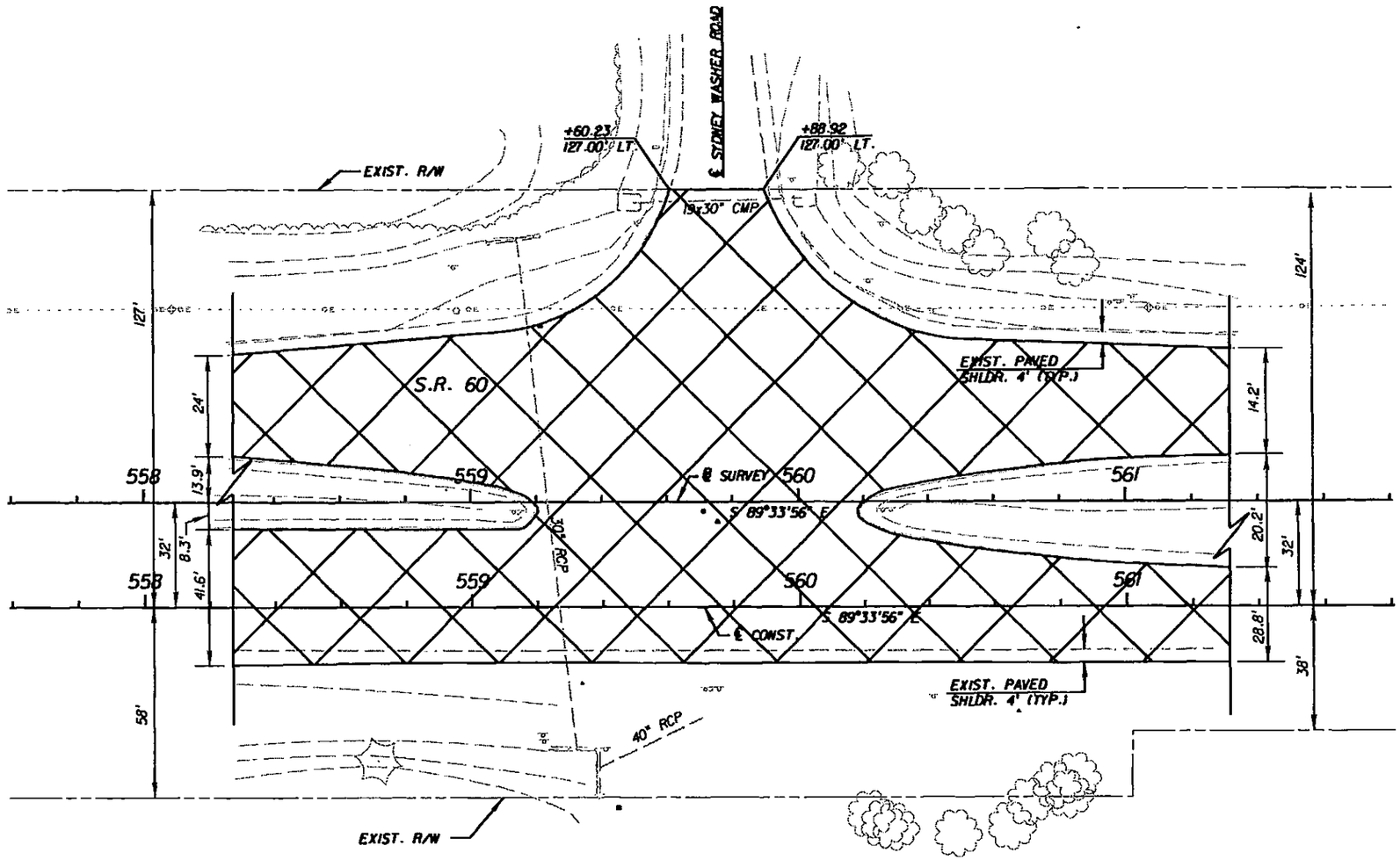
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413395-1-52-01

DRAINAGE STRUCTURES
SR 60 (7)

SHEET NO. 86

BM NO. 60-13
CONC. MONUMENT
45.73' RT.
STA. 569+33.47 ℄ CONST.
ELEV. 62.848'

1"=40'



NOTE:
TRIM EXISTING TREES WITHIN RIGHT OF WAY FROM STA. 560+00.00 TO STA. 567+00.00 LEFT TO PROVIDE CLEAR LINE OF SIGHT.

LEGEND

LIMITS OF MILLING & RESURFACING

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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Jacobs Civil Inc.
18302 Highwoods Preserve Parkway
Highwoods Plaza, Suite 200
Tampa, FL 33647
Tel.(813) 977-3434
CERTIFICATE OF AUTHORIZATION NO. 6512
ENGINEER OF RECORD

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413395-1-52-01

INTERSECTION DETAIL (7)
STA 558+27 TO STA 561+31

SHEET NO. 62

S.R. 60

Final As-Built Plans

FPID 423053-1-52-01

M.P. 16.491 to M.P. 20.284

2011

1" = 50'

N

S.R. 60

LITTLE ALAFIA RIVER

5' CONC. SW

END PAVED SHOULDER
+43.15, 26.00' Lt.

END GUARDRAIL
END ANCHORAGE
TYPE PARALLEL
STA. 710+88.00

END GRAVITY
WALL WITH RAILING
+82.50, 37.50' Lt.

R/W Line

+82.50
37.50' Lt.

+90.00
30.00' Lt.

5' PVC FENCE

TECO Distribution

250290

50.00'

26'

708 709 710 711 712 713 714 715

2' PAVED SHOULDER

SAW CUT

SAW CUT

REMOVE EXISTING GUARDRAIL

END WIDENING
+43.15, 11.12' Lt.

S 89° 48' 45" E

℄ Survey S.R. 60

EXISTING 4' PAVED SHOULDER

LIMITS OF MILLING & RESURFACING

132.00'

LIMITS OF MILLING & RESURFACING

EXISTING 4' PAVED SHOULDER

5' CONC. SW

REMOVE EXISTING GUARDRAIL

STA. 709+75.00 Rt. BEGIN SW BACK SLOPE
TRANSITION FROM 1:4 TO 1:3

RIVER BOTTOM

R/W Line

WIDENING

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

WADETRIM
8745 Henderson Road, Suite 220, Tampa FL 33634
Engineer of Record: David O. Theung, PE No. 44786
Certificate of Authorization No. 3952

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
60	HILLSBOROUGH	423053-1-52-01

PLAN

SHEET NO. 38

krichard 12/5/2010 10:10:07 AM P:\Fdt2050\423053\5201\roadway\planrd09.dgn

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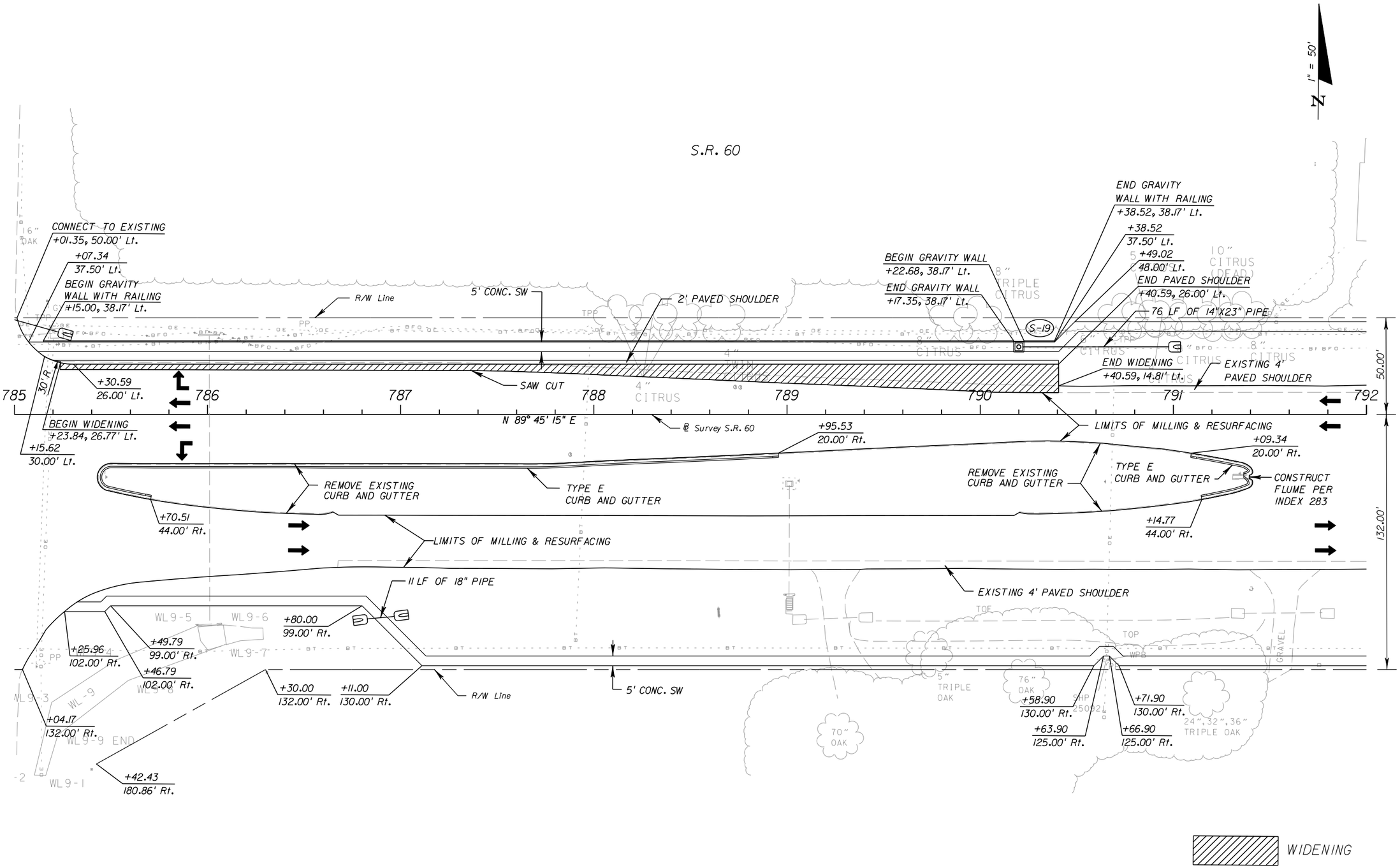

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
	48		

WADETRIM
8745 Henderson Road, Suite 220, Tampa FL 33634
Engineer of Record: David O. Theung, PE No. 44786
Certificate of Authorization No. 3952

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
60	HILLSBOROUGH	423053-1-52-01

PLAN

SHEET NO. 49

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S.R. 60

S.R. 39

C.R. 39

TO BE REMOVED

S-28

12 LF OF 24" PIPE

+21.45
187.45' Lt.

+09.27
187.41' Lt.

SEE PLAN SHEET 61 FOR DETAILS

END PAVEMENT REMOVAL
CONNECT TO EXISTING
+34.93, 128.96' Lt.

END PAVED SHOULDER
+30.97, 129.57' Lt.

CONNECT TO EXISTING
+85.59, 121.16' Lt.

CONNECT TO EXISTING
+16.11, 137.88' Lt.

CONNECT TO EXISTING
+52.95, 135.49' Lt.

BEGIN PAVED SHOULDER
+56.36, 135.27' Lt.

R/W Line

4' PAVED SHOULDER

44 LF OF 24"X38" PIPE

+08.13
76.79' Lt.

+01.34
57.89' Lt.

PT +29.30
95.44' Lt.

SAW CUT

+09.56
85.00' Lt.

SEE SPECIAL DETAIL SHEET FOR SIDEWALK DETAILS

+00.00
85.00' Lt.

+63.34
35.00' Lt.

5' CONC. SW

+49.03
48.75' Lt.

+34.89
48.75' Lt.

+34.14
48.00' Lt.

END 5' CONC. SW
+97.37, 60.93' Lt.

SIDEWALK LANDING. SEE SPECIAL DETAIL SHEET

CONSTRUCT CURB RAMP PER INDEX 304

CR 10

+32.71
39.06' Lt.

+51.92
60.26' Lt.

SIDEWALK LANDING. SEE SPECIAL DETAIL SHEET

+69.78
28.00' Lt.

+73.17
28.00' Lt.

+54.07
28.00' Lt.

+30.68
28.00' Lt.

+71.55
50.00' Lt.

100' R

CONSTRUCT CURB RAMPS PER INDEX 304

3' CONC. SW

6' SHOULDER

+35.73
16.00' Lt.

REMOVE TRAFFIC ISLAND

SAW CUT

PAVE EXISTING ISLAND

+42.02
21.47' Lt.

BEGIN WIDENING
+39.78, 26.33' Lt.

SAW CUT

S-23

820 821 822 PC +30.68 12.00' Lt. 823 824 825 826 827

N 89° 45' 15" E

50.00'

60.00'

26'

4' PAVED SHOULDER

LIMITS OF MILLING & RESURFACING

+81.01
23.68' Rt.

℄ Survey S.R. 60

END WIDENING
+43.07, 22.56' Rt.

BEGIN 4' PAVED SHOULDER
BEGIN PAVEMENT REMOVAL
CONNECT TO EXISTING
+35.73, 12.00' Lt.

REMOVE EXISTING CURB AND GUTTER

8.5' R

SAW CUT

BEGIN WIDENING
+17.74, 27.67' Rt.

+43.05
31.06' Rt.

REMOVE EXISTING CURB AND GUTTER

TYPE E CURB AND GUTTER

BEGIN WIDENING
+76.96, 39.68' Rt.

+77.01
31.18' Rt.

END WIDENING
+06.23, 37.53' Rt.

+40.30
39.10' Rt.

132.00'

90'

160.00'

END WIDENING
+71.90, 90.43' Rt.

PAVE EXISTING ISLAND

+81.31
86.41' Rt.

CONSTUCT CURB RAMPS PER INDEX 304

CONSTUCT CURB RAMP PER INDEX 304

+14.95
86.34' Rt.

CONSTRUCT CURB RAMPS PER INDEX 304

LIMITS OF MILLING & RESURFACING TO BE REMOVED

6' SHOULDER

CONSTUCT CURB RAMP PER INDEX 304

CR 10

+49.15
102.83' Rt.

+90.88
98.35' Rt.

SAW CUT

+01.62
98.12' Rt.

EXISTING 4' PAVED SHOULDER

S-22B

+19.91
103.28' Rt.

SIDEWALK LANDING. SEE SPECIAL DETAIL SHEET

CR 10

PAVE EXISTING ISLAND

5' CONC. SW

+36.25
113.34' Rt.

4' PAVED SHOULDER

+98.94
129.00' Rt.

SIDEWALK LANDING. SEE SPECIAL DETAIL SHEET

+50.34
130.00' Rt.

+38.14
130.00' Rt.

+42.14
126.00' Rt.

+44.32
126.00' Rt.

+47.32
129.00' Rt.

CONSTRUCT CURB RAMP PER INDEX 304

CR 21

+84.53
132.00' Rt.

5' CONC. SW

S-27

+33.67
127.46' Rt.

+54.89
158.00' Rt.

END 5' CONC. SW
+66.60, 158.00' Rt.

18 LF OF 18" PIPE

S-26

R/W Line

+23.68
130.00' Rt.

+31.84
122.39' Rt.

+38.95
200.24' Rt.

9 LF OF 24" PIPE

+62.90
160.00' Rt.

+36.69
158.00' Rt.

+47.69
158.00' Rt.

+40.69
154.00' Rt.

+43.69
154.00' Rt.

+27.88
203.87' Rt.

END PAVED SHOULDER
+56.50, 210.78' Rt.

CONNECT TO EXISTING
+60.35, 211.41' Rt.

CONNECT TO EXISTING
+98.05, 218.47' Rt.

CONNECT TO EXISTING
+33.17, 186.32' Rt.

CONNECT TO EXISTING
+82.05, 198.06' Rt.

SEE PLAN SHEET 62 FOR DETAILS

R/W Line

WIDENING

I" = 50'

N

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REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

WADETRIM
8745 Henderson Road, Suite 220, Tampa FL 33634
Engineer of Record: David O. Theung, PE No. 44786
Certificate of Authorization No. 3952

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
60	HILLSBOROUGH	423053-1-52-01

PLAN

SHEET NO. 54

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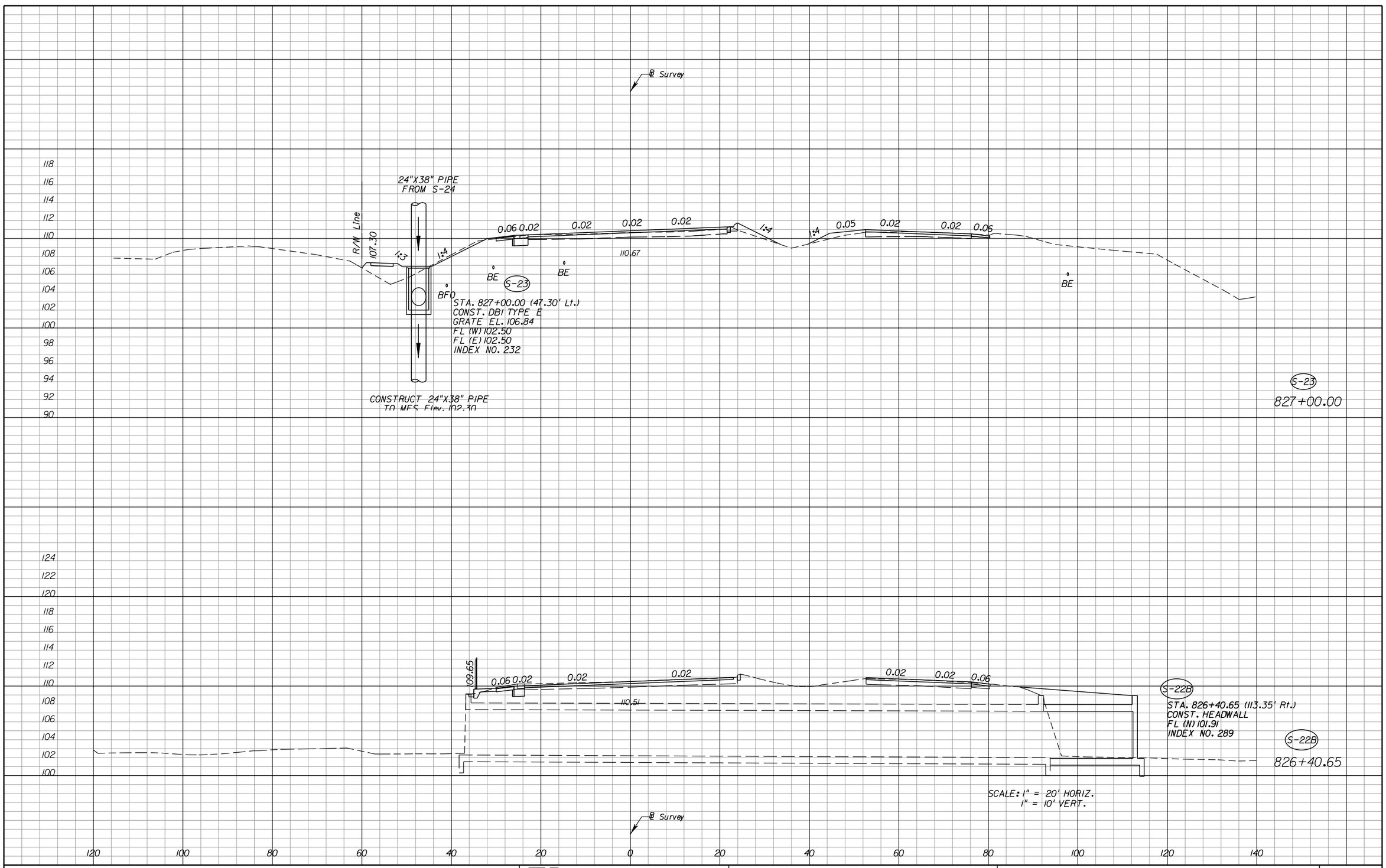

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

WADETRIM
8745 Henderson Road, Suite 220, Tampa FL 33634
Engineer of Record: David O. Theung, PE No. 44786
Certificate of Authorization No. 3952

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
60	HILLSBOROUGH	423053-1-52-01

DRAINAGE STRUCTURES

SHEET NO. 105

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SWFWMD DRAINAGE DOCUMENTATION

State Road 60

from Turkey Creek Road to Clarence Gordon Jr. Road
Section 10110
Hillsborough County (10)
Financial Project ID: 423053-1-52-01

Prepared For:

Florida Department of Transportation
District 7

December 3, 2010

Prepared by:

WADETRIM

8745 Henderson Road
Suite 220, Renaissance 5
Tampa, Florida 33634
Phone: (813) 882-8366
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Certificate No. 3952

Table of Contents

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SECTION 1.0
GENERAL PROJECT INFORMATION

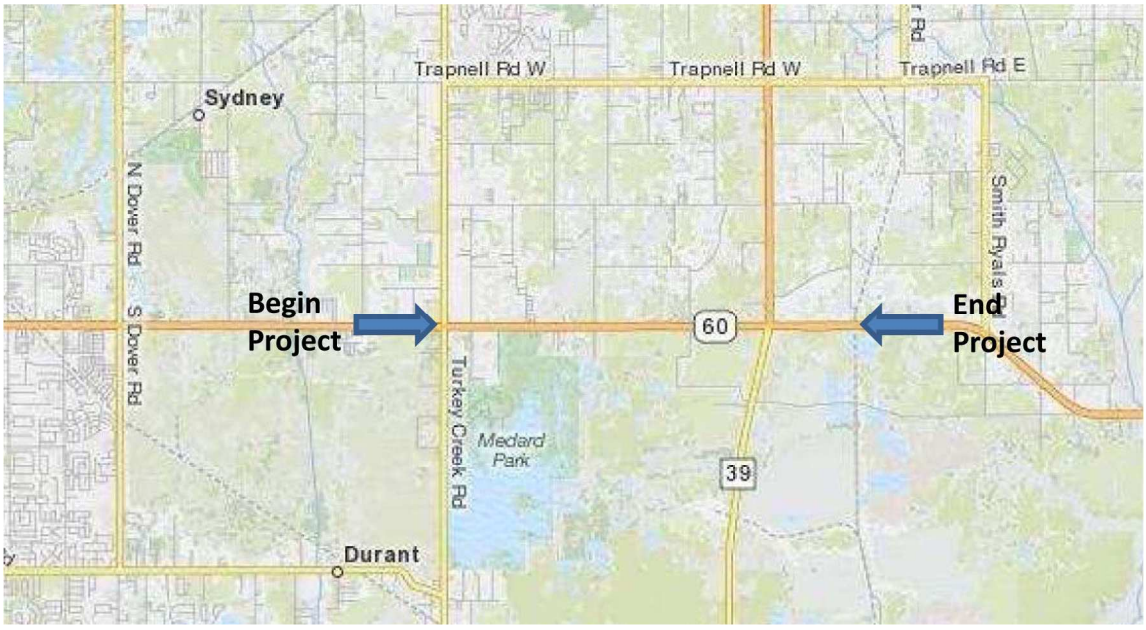
1.1 INTRODUCTION

This drainage design documentation serves to assess and document the Stormwater, Floodplain, and Wetland Impacts along the project corridor. This report will present an analysis and justification of any impacts to these systems and serve as the support documentation for the proposed roadway and sidewalk improvements.

1.2 SITE LOCATION AND DESCRIPTION

The Florida Department of Transportation (Department) has identified and programmed a Resurfacing, Restoration, and Rehabilitation (RRR) project for SR-60 in the current 5-year Work Program. This project is currently scheduled for a June, 2011 letting. The project lies in the eastern portion of unincorporated Hillsborough County, the land use in the project vicinity is a mix of light commercial, farm and ranch land. The limits are from Turkey Creek Road (MP 16.353) to Clarence Gordon Jr. Road (MP 20.273). The project covers approximately 3.920 miles of this east/west route. The project lies within Sections 23, 24, 25 and 26 of Township 29, Range 21 and Sections 19, 20, 21, 28, 29, and 30 of Township 29, Range 22. Refer to Figure 1.2.1, Project Location Map.

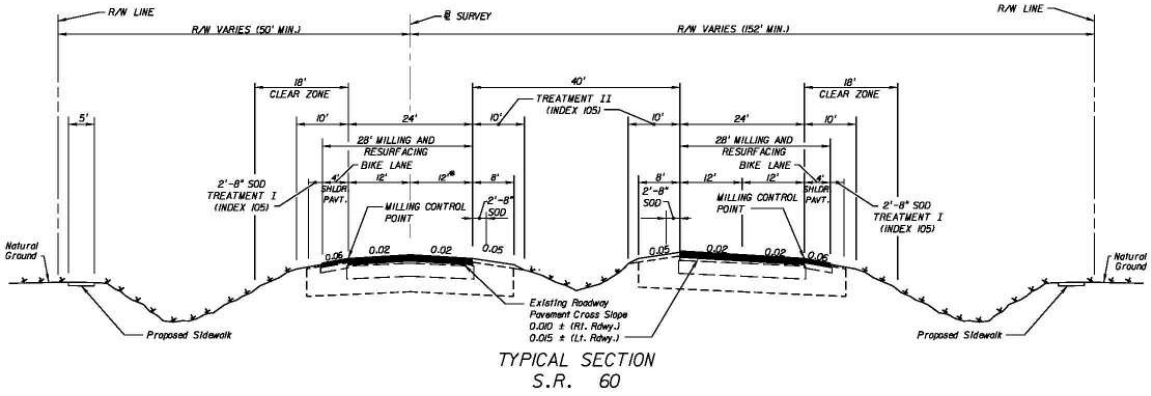
Figure 1.2.1 Project Location Map



The intent of the project is to resurface the existing 4-lane rural highway. Right turn lanes will be extended to meet "L" in the Department's Design Standard Index 301, which is 460 feet, and add a 50 foot taper for a total length of 510 feet. In addition, the right turn lanes will be offset

outward to accommodate a 4-foot bicycle lane located between the turn lane and through lane. A 5-foot pedestrian sidewalk will be added to both sides of the roadway from east Turkey Creek Road to Clarence Gordon Jr. Road on the north side of S.R.60 and from Turkey Creek Road to SR-39 on the south side of the SR-60. Refer to Figure 1.2.2., Proposed Typical Section, for pictorials of the proposed sections.

Figure 1.2.2 – Proposed Typical Section



The project terrain is flat and poorly drained. There are wetlands or other surface waters lying adjacent to the roadway along the project corridor. In general, offsite runoff drains away from the project to the Little Alafia River and/or tributaries. Refer to **Appendix 7**, SWFWMD Aerial and Drainage Maps for further clarification. A cross drain, or multiple cross drains, convey the basin runoff under SR-60 from the north side to the south for several major basins. The size and location of the cross drains within the project limits are summarized below in Table 1.2.1, Summary of Existing Cross Drains.

Table 1.2.1 – Summary of Existing Cross Drains

Structure	Station
7' x 3'	686+50
6' x 8'	697+50
(3) 10' x 10'	709+74
18”	753+75
24”	786+00
24”	798+25
(2) 7' x 5'	826+36
(2) 30”	856+85

1.3 SOIL CHARACTERISTICS

The Hillsborough County Soil Conservation Service (SCS) Soil Survey mappings identifies 10 main soil units within the limits of the project.

The majority of the project corridor is made of Seffner Fine Sand (47). These soils are nearly level to gently sloping and moderately well drained to excessively drained. Detailed soils information and data is included in **Appendix 6**, Soils Report. The table below provides a legend for the Soils Map.

Table 1.3.1 – Soils Map Legend

MAP SYMBOL	SOIL NAME	HYDROLOGIC GROUP
4	Arents Nearly Level	
16	Felda Fine Sand, Occasionally Flooded	B/D
29	Myakka Fine Sand	B/D
33	Ona Fine Sand	B/D
35	Orlando Fine Sand, 0 to 5% slope	A
46	St. Johns Fine Sand	B/D
47	Seffner Fine Sand	C
51	Haplaquents, Clayey	
60	Winder Fine Sand, Frequently Flooded	B/D
61	Zolfo Fine Sand	C

In February of 2010, geotechnical explorations were conducted by Professional Service Industries, Inc (PSI). Nine (9) hand auger borings were done along the corridor, on both sides of the existing roadway. The borings were typically between 30 to 110 feet from the baseline survey of the roadway. The soil characteristics were assessed and compared with the SCS Soil Survey. The laboratory testing results were used as part of the Culvert Service Life Estimator, **Appendix 7.0**, to determine the allowable Optional Pipe parameters.

1.4 FLOOD PLAIN INFORMATION

Per Community Panel Numbers: 12057C0410H and 12057C0430H the project corridor lies within Flood Zones A, No base flood elevations determined, and X, Area determined to be outside of the 500-year floodplain. According to the Hillsborough County SWMM model, the 100-year flood stage elevations along the corridor vary between elevations 66.79 (NAVD) to 105.86 (NAVD) depending on the associated tributary. A copy of both the FEMA maps and the county node diagram, with stage elevations, can be found in **Appendix 5.0**.

1.5 EXISTING DRAINAGE STRUCTURES

In August of 2009, a drainage inventory was done of the existing drainage structures. A recommendation of repairs and/or replacements is listed in the Construction Plans as part of the Summary of Existing Structures Maintenance and Repair.

1.6 EXISTING SIDEDRAINS AND CROSSDRAINS

In August of 2009, a drainage inventory was done of the existing drainage structures. A recommendation of repairs and/or replacements is listed in the Construction Plans as part of the Summary of Existing Structures Maintenance and Repair.

SECTION 2.0
DRAINAGE REFERENCE AND RESOURCE INFORMATION

2.1 INVESTIGATIONS

Initial investigations and data collection were conducted to establish the existing conditions, available information, and historic conditions. The original roadway plans along the corridor were obtained to compare stormwater patterns. Field reviews, contact with FDOT Maintenance, and a pre-application meeting with SWFWMD were all part of the investigation process, the outcomes of which are discussed in the subsections below.

2.1.1 FIELD REVIEWS

Twelve separate field reviews by the design team have been conducted. The summer/fall of 2010 was an extremely active storm season in this region. Water levels and flows were observed during numerous visits to aid in the development of proposed stormwater systems and sidewalk placement.

2.1.2 DISCUSSION WITH FDOT MAINTENANCE

Wade Trim staff spoke with Mr. Harvey Hunt, FDOT Tampa Maintenance Office, regarding stormwater issues and related historic maintenance issues along the corridor. We also reviewed the existing roadway plans prior to the stormwater design. This project was discussed amongst all pertinent staff, and all agreed that the largest drainage issues were pooling water in the medians and the need for roadway cross slope corrections.

2.1.3 SWFWMD COORDINATION

On April 15, 2010, a SWFWMD pre-application meeting for this project was held at the SWFWMD Tampa office. At the time of the meeting the proposed sidewalks on the north sides of the road ran from station 678+00 to station 705+00 and from station 665+00 to station 691+00. At the time, no wetland or floodplain impacts were anticipated and thus the project was to qualify for an Exception.

Per the optional services approved by FDOT on September 28, 2010, a sidewalk will be added on the north side of the road along the length of the corridor, and on the south side of the road, from the beginning of the project to SR-39. Additionally, the box culvert on the southeast corner of the SR-39 intersection will be extended. The additional sidewalk along with the proposed box culvert extension will impact wetland areas and require a SWFWMD Standard General Permit with support stormwater documentation. Refer to **Appendix 1.2**, SWFWMD Coordination for the minutes of the pre-application meeting, and documentation.

2.2 RESOURCES FOR ANALYSIS

The following is a list of resources utilized for the stormwater analysis and design of the stormwater systems for this project:

1. Southwest Florida Water Management District
    a. Staff directives
    b. Environmental Resource Permitting Information Manual (July ’06)
    c. Aerial Contour Maps

2. Florida Department of Transportation
    a. Staff directives
    b. FDOT Drainage Manual (English Units) (March ’10)
    c. FDOT Drainage Handbook Hydrology (January ’04)
    d. FDOT Storm Drain Handbook (January ’08)
    e. FDOT Design Standards (English Units) (2010)
    f. FDOT Drainage Handbook Optional Pipe Material (June ’08)

3. Field Analysis
    a. Aerial Survey and Photography by I. F. Rooks & Associates.
    b. Land Survey by Echezabal and Associates
    c. Jurisdictional Assessment by Wetlands by Earth Resources Consulting Scientists
    d. Geotechnical Assessment by PSI, Professional Service Industries, Inc.

SECTION 3.0
EXISTING DRAINAGE CHARACTERISTICS

3.1 WATERSHED, OFFSITE BASIN AND ROADWAY BASIN DESCRIPTIONS

There are eight (8) culvert crossings along the project corridor. Refer to Drainage Maps in the Construction Plans and SWFWMD Aerials, in **Appendix 7.0** for basin locations. Estimates of the existing 100-year peak stage elevations and floodway elevations within the project corridor were determined from the SWMM model provided by Hillsborough County in **Appendix 5.0**. Where applicable, the data from a previous flood study, FDOT Drainage Connection Permits and SWFWMD ERP Permits were used.

In the existing condition, the majority of the roadway stormwater runoff flows through a series of interconnected shallow ditches to the Little Alafia River or one of its minor tributaries.

There are two segments of the corridor that have interconnected storm sewer structures requiring stormdrain tabulation analysis. The segment on the northeast corner of SR-60 and Turkey Creek Road will be replaced due to the extension of the right turn lane and sidewalk placement. The portion of storm sewer at the intersection of SR-39 and SR-60 will require the relocation of one structure and the addition of one structure but no modification of the existing pipe network.

SECTION 4.0
PROPOSED DRAINAGE DESIGN

4.1 STORMWATER MANAGEMENT DESIGN APPROACH

Proposed and/or modified drainage structures and sidedrains were analyzed for the proposed condition and upsized when necessary. The analysis of these improvements was modeled using the rational method for a FDOT 3-year event in Bentley StormCad V8i.

4.2 DESIGN CRITERIA

The stormwater conveyance design for this project will meet the following criteria:

4.2.1 CONVEYANCE

The existing roadway conveyance system consists mainly of roadside ditches interconnected by sidedrains. The existing system will stay in place for a substantial portion of the project corridor. Only those facilities impacted by the turn lane extensions and/or sidewalk placement, will be replaced by their hydraulic equivalent. Depending on the location, runoff will continue to convey via open ditch or by pipe to the boundary location. The design event for the proposed conveyance system of ditches, pipes, and inlets is the 3-year frequency storm event (General Design) per Section 2.2 of the FDOT Drainage Manual. **Appendix 2.2** contains copies of the Time of Concentration calculations, proposed structure node diagram, catchment structure table and transition element table for verification of system capacity.

4.2.2 TAILWATER AND OUTFALL CONDITIONS

Tailwater elevations for the proposed systems were based on three criteria:

Relative location to cross drain: if the downstream boundary was a cross drain, the inside crown elevation was used at the tailwater elevation.

Top of bank: when the TOB was substantially below the crown of the receiving pipe system.

Receiving structure hydraulic gradeline: If structures were in a series along the right-of-way, the hydraulic gradeline elevation of the receiving structure side drains was used.

4.3 FLOOD PLAIN MITIGATION

The 100 year flood plain encroachment volume is defined as the proposed fill between the estimated seasonal high water elevation (if above ground) or the existing ground, and the proposed 100-year peak stage per Chapter 4, Section 4.4 of the ERP Manual. Generally, 100-year floodplain encroachment will occur where existing roadside ditches within the right-of-way are being filled for the proposed roadway. There are several areas were turn lane extensions and the addition of sidewalk require the filling of low areas. However this impact has been minimized by the use of retaining walls. Remaining impacts have been mitigated for by widening the existing ditches, such that there is no net gain of fill in the floodplain. The following roadway segments experience fill in the floodplain, yet require no floodplain mitigation facilities:

Little Alafia River between stations 698+20 to 721+00
Tributary east of SR-39 between stations 825+50 to 829+50

The Little Alafia River basin will experience a 34 cubic yard reduction in floodplain impacts in the post construction condition and the tributary east of SR-39 will experience a 76 cubic yard reduction. Consequently, no offsite floodplain mitigation will be required for this project. Refer to **Appendix 5.0**, Floodplain Impacts, for roadway cross section with delineated impact areas.

4.4 WETLAND IMPACT MITIGATION

The construction of the sidewalks and extension of the box culvert at station 826+36 will permanently impact 40 wetland and or other surface water areas which combined create an overall 0.653 permanent impact. An environmental narrative and accompanying Impact Summary can be found in **Appendix 3.0**.

4.5 BOX CULVERT EXTENSION

The double 7' x 5' box culvert at station 826+35 will be extended 21 feet to the south. The existing culvert bottom slope will be carried through the extension in order to insure proper flow and minimize loss in the culvert system. Verification that the extension would not have any effect on the upstream water elevations or decrease the culvert capacity was done utilizing HY-8 per FDOT Culvert Design Handbook. As per the Handbook the cross-sectional area of the culverts was examined for a flow of 6 feet per second to establish a 25-year flow regime. The 25-year flow regime was then manipulated to determine the 50-year design flow and 500-year maximum flow regimes. Input data and cross-section analysis for the existing and extended condition are represented in **Figures 4.5.1 through 4.5.4.** As demonstrated by **Figures 4.5.2** and **4.5.4** the extension of the culverts have no apparent adverse effect to the flow capacity.

Figure 4.5.1 – Existing Culvert Input Data

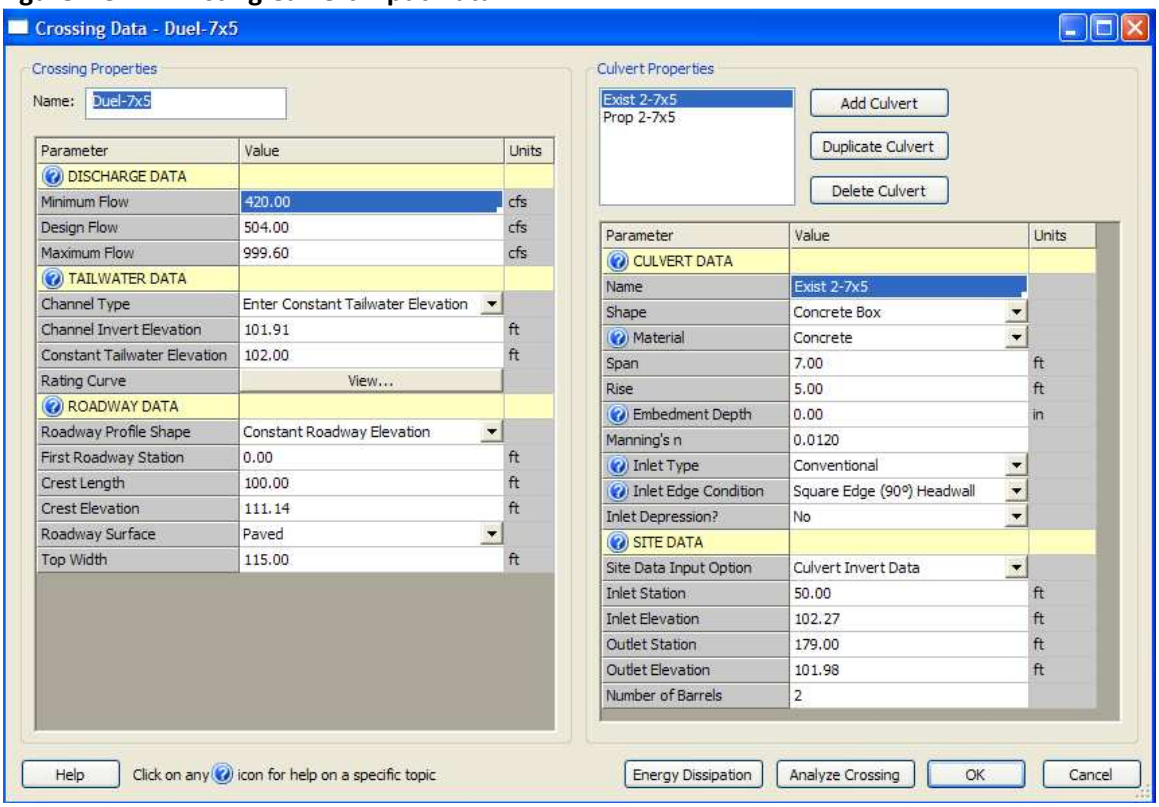


Figure 4.5.2 – Existing Culvert Stage Elevation

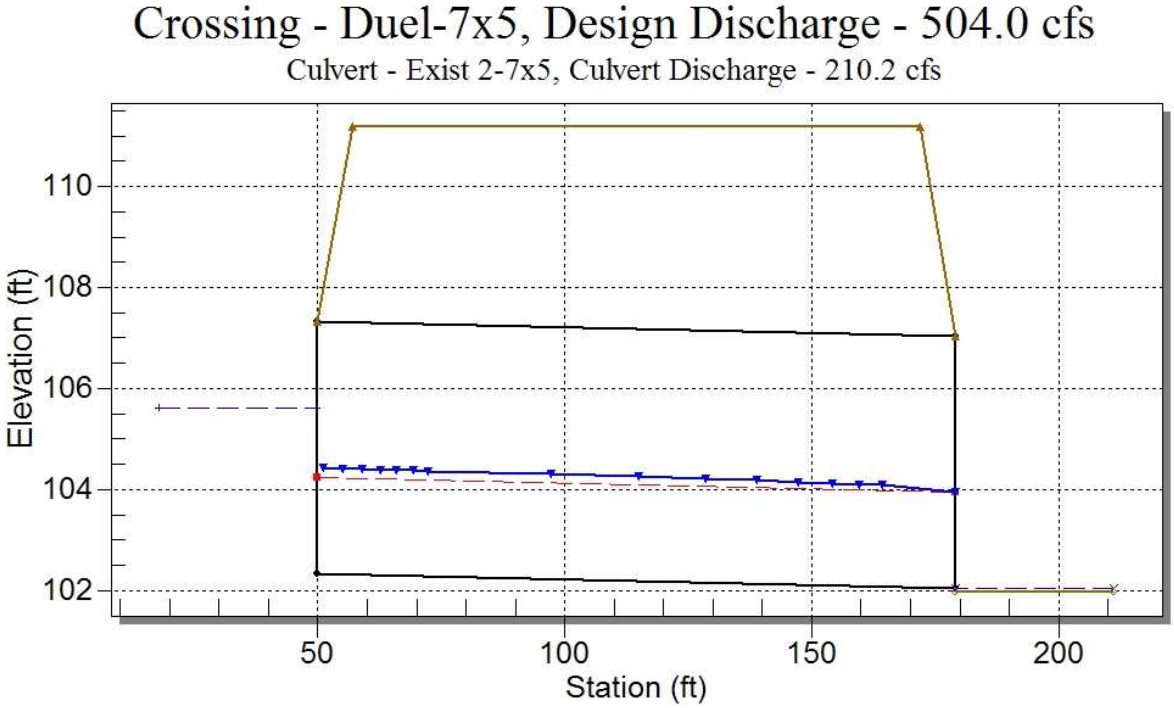


Figure 4.5.3 – Proposed Culvert Input Data

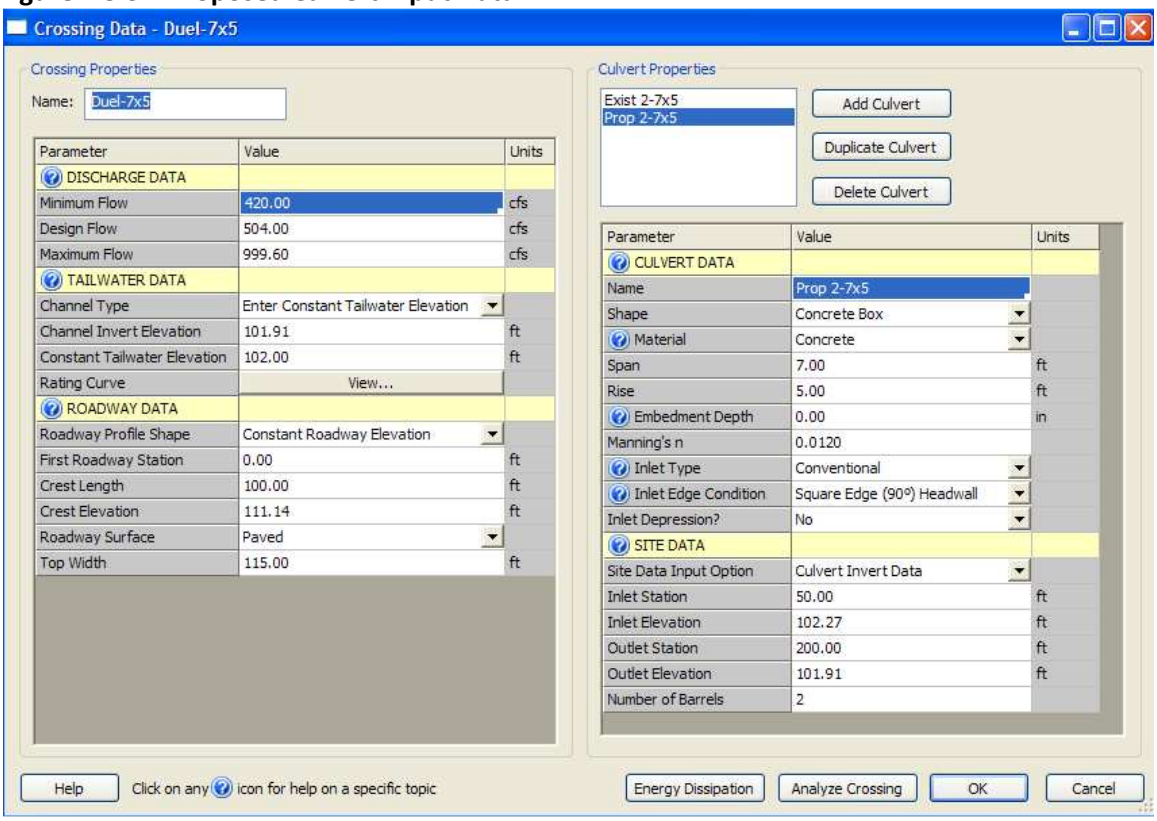
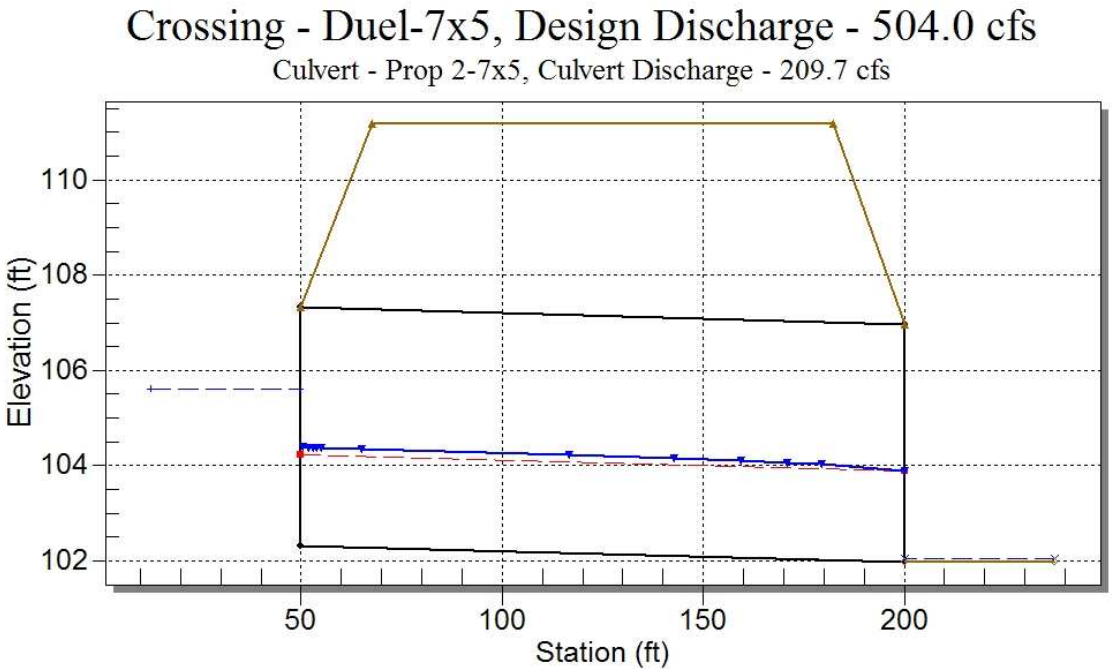


Figure 4.5.4 – Proposed Culvert Stage Elevation



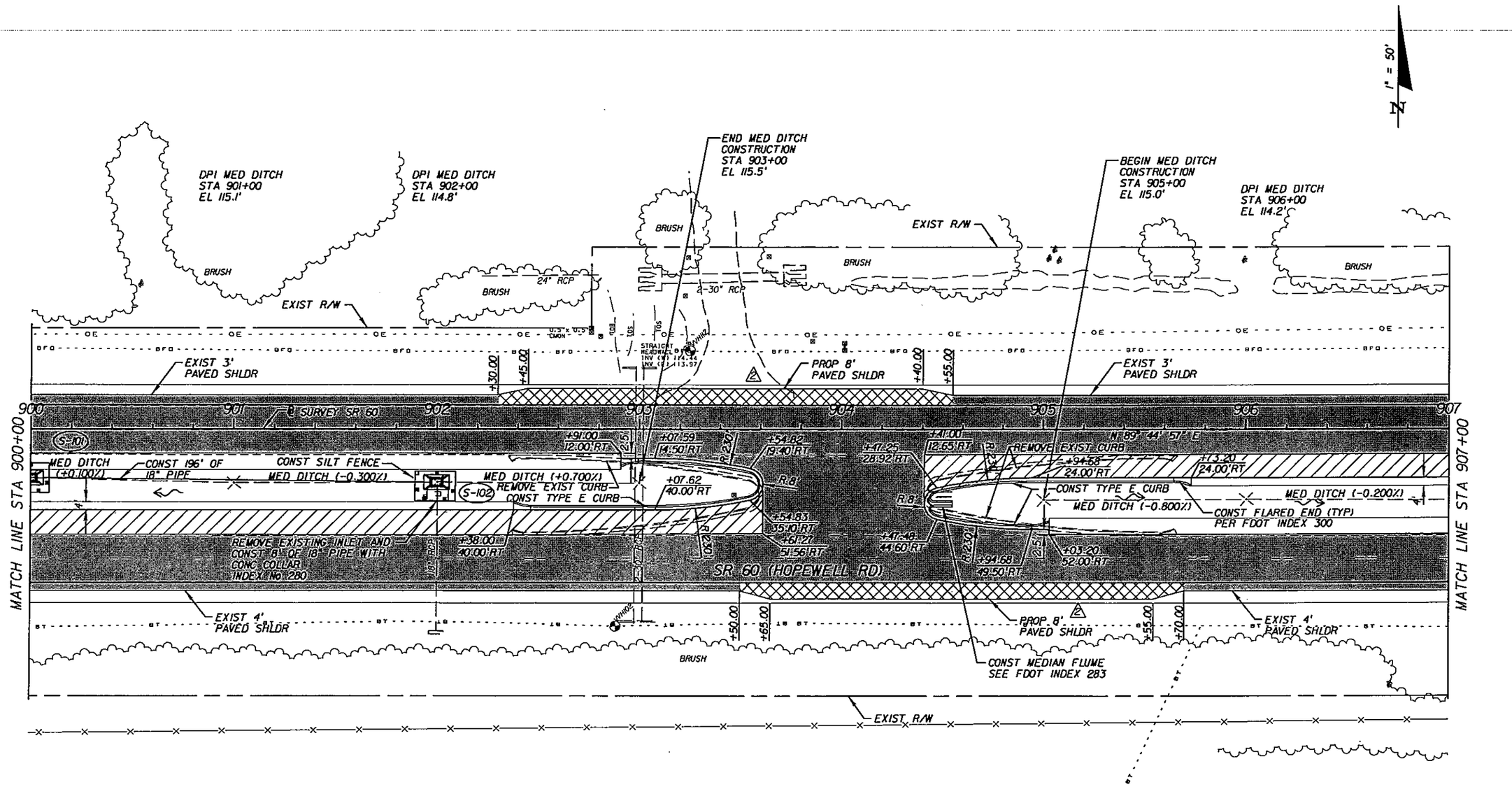
S.R. 60

Final As-Built Plans

FPID 413405-1-52-01

M.P. 20.284 to M.P. 23.740

2008



REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
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Kisinger Campo & Associates Corp.
2203 N. Lois Avenue, Suite 1200
Tampa, Florida 33607
Florida Certificate of Authorization No. 02317
Engineer of Record:Richard Arico
P.E. No.:59674

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413405-1-52-01

PLAN (7)
STA 900+00 TO STA 907+00

SHEET NO. 28

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NOTE
(-) INDICATES TRAVELWAY SLOPES "DOWNWARD" FROM THE SE CONTROL LINE.
(+) INDICATES TRAVELWAY SLOPES "UPWARD" FROM THE SE CONTROL LINE.

CURVE DATA C1
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DELTA = 38° 00' 27" (RT)
D = 2° 00' 00"
T = 986.64
L = 1,900.38
R = 2,864.79
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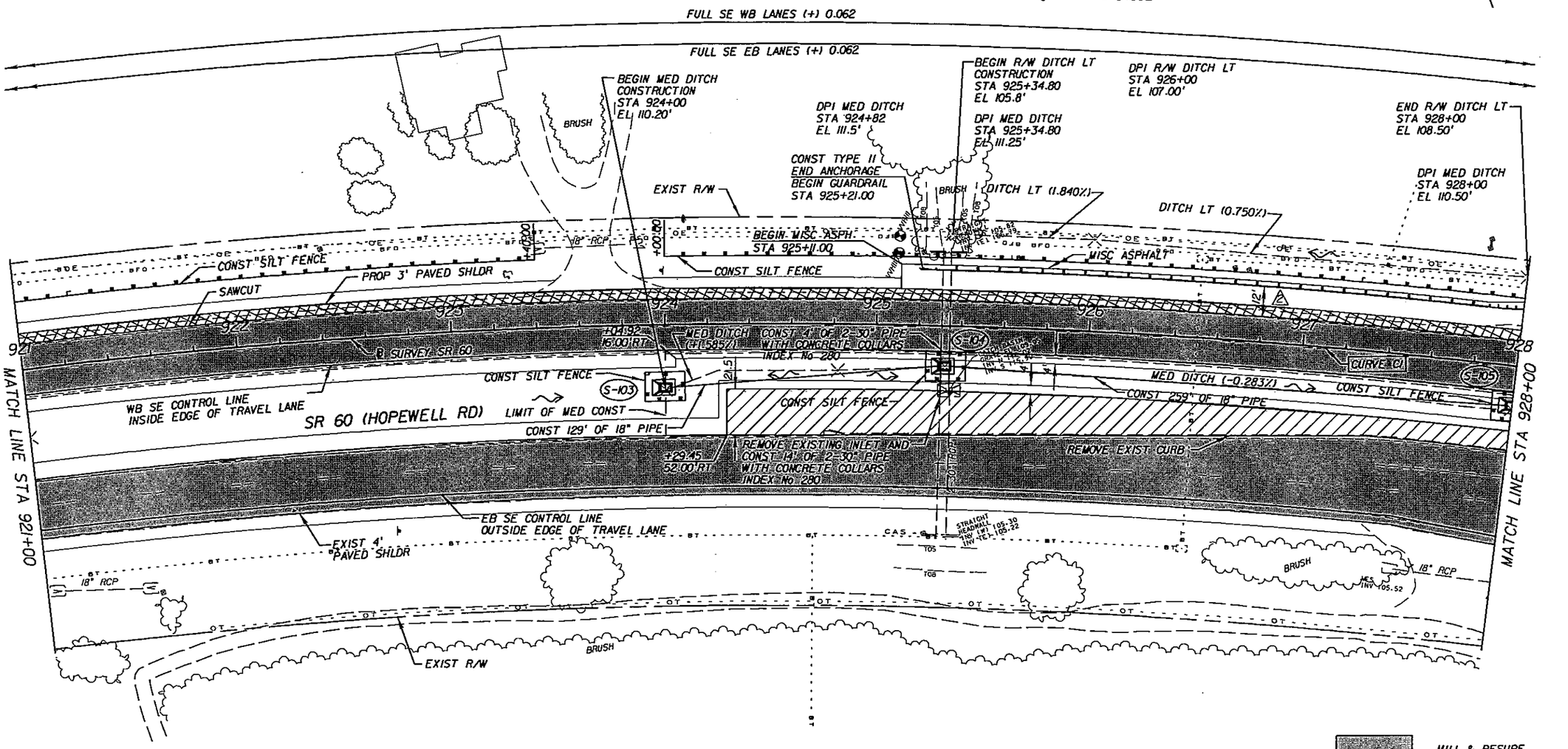
PT STA = 933+84.24
e = 0.062

1" = 50'



MILL & RESURF
WIDENING (TURN LANES)
WIDENING (SHOULDER)
SILT FENCE

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
3/14/08	RA	2 REVISE 14' DIM TO 12'			

Kisinger Campo & Associates Corp.
2203 N. Lois Avenue, Suite 1200
Tampa, Florida 33607
Florida Certificate of Authorization No. 02317
Engineer of Record: Richard Arico
P.E. No.: 59674

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413405-1-52-01

PLAN (10)
STA 921+00 TO STA 928+00

SHEET NO. 31

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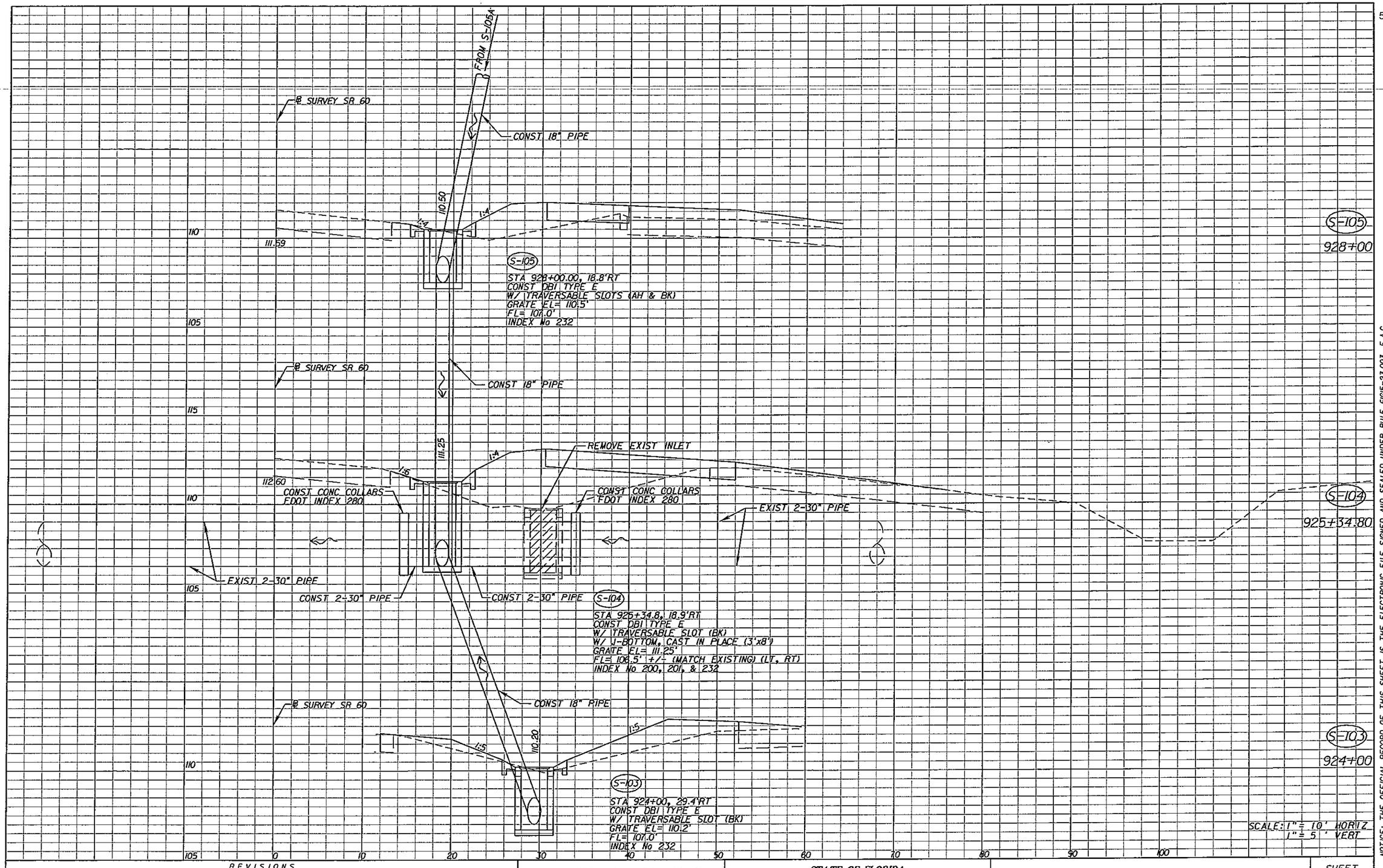

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Kisinger Campo & Associates Corp.
2203 N. Lois Avenue, Suite 1200
Tampa, Florida 33607
Florida Certificate of Authorization No. 02317
Engineer of Record: Tara K.M. Spieler
P.E. No.: 55333

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413405-1-52-01

DRAINAGE STRUCTURE (2)

SHEET NO. 53

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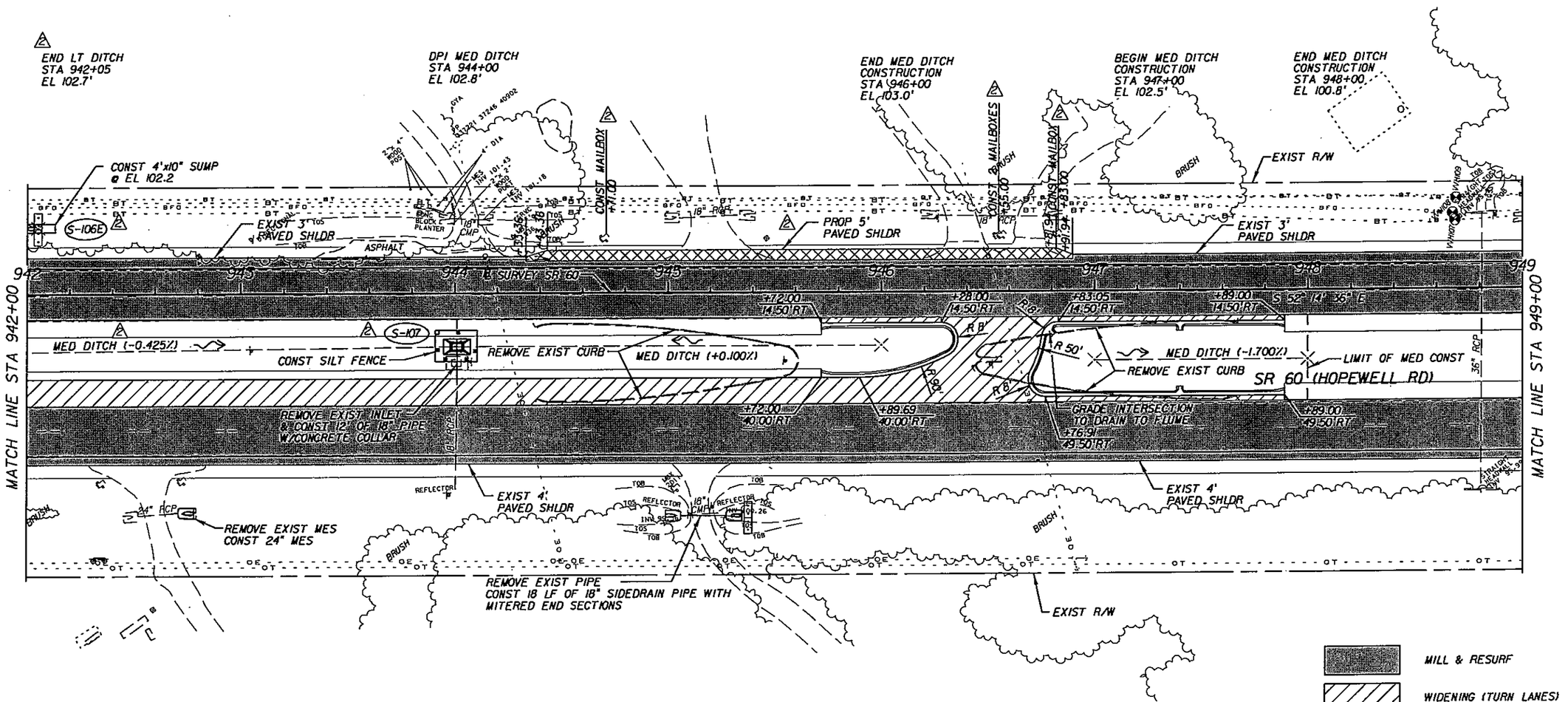
2 S-106E
STA 942+00, 31.0'LT
CONST MITERED END SECTION (1:4)
FL = 102.2
INDEX No 273

2 S-107
STA 944+01, 25.0'RT
CONST DBI TYPE E
W/TRAVERSABLE SLOTS (AH, BK)
GRATE EL = 102.8
FL = 100.8 +/- (MATCH EXIST)
INDEX No 232

1" = 50'



MILL & RESURF
WIDENING (TURN LANES)
WIDENING (SHOULDER)
SILT FENCE
SYNTHETIC BALE

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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION
3/14/08	RA	2 ADD 5' SHLDR LT, MEDIAN OPEN, S-106E, LT DITCH, MAILBOXES- MOVE S-107, & REV MED DITCH.			

Kisinger Campo & Associates Corp.
2203 N. Lois Avenue, Suite 1200
Tampa, Florida 33607
Florida Certificate of Authorization No. 02317
Engineer of Record: Richard Arico
P.E. No.: 59674

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413405-1-52-01

PLAN (13)
STA 942+00 TO STA 949+00

SHEET NO. 34

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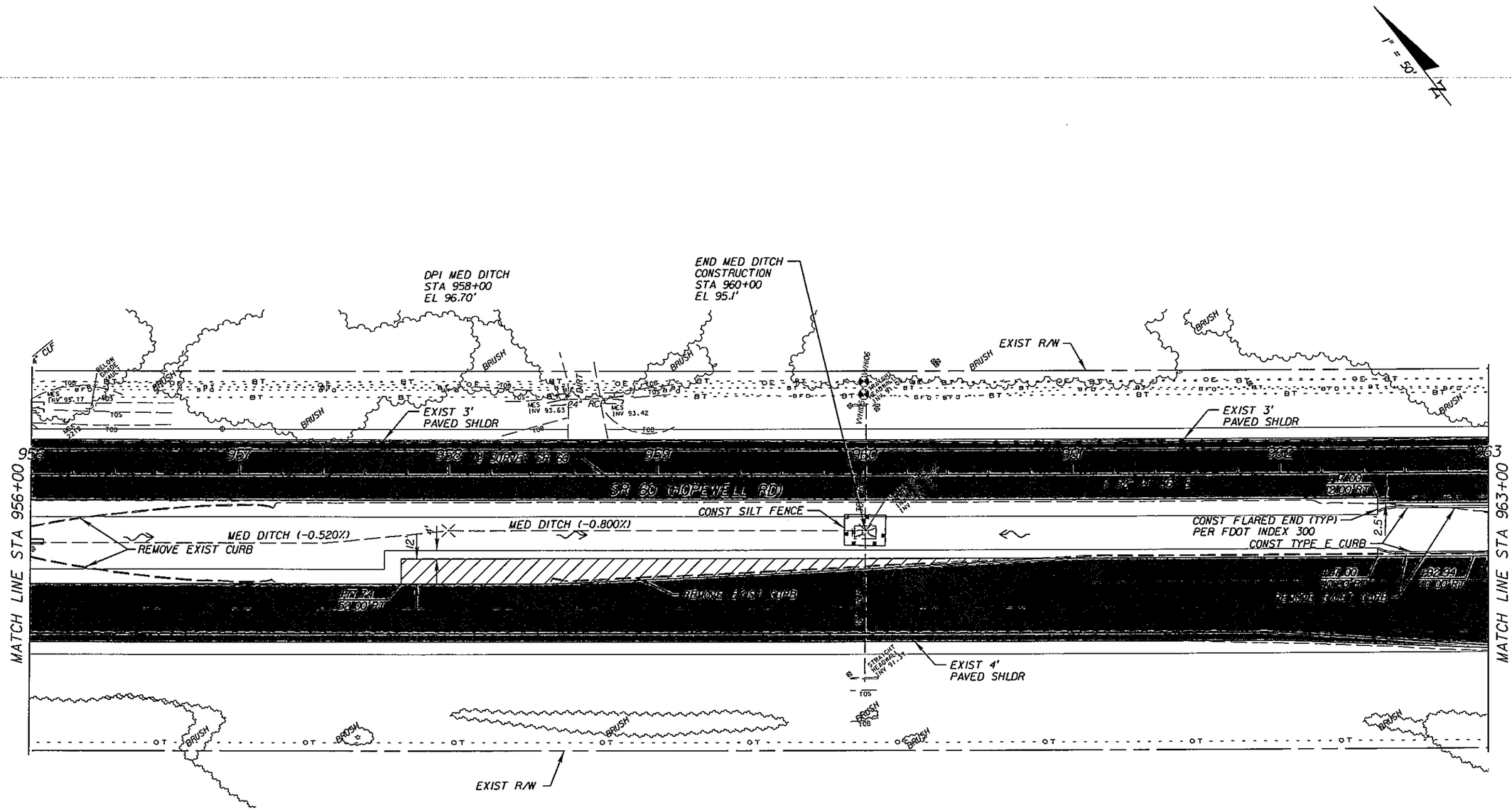

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Kisinger Campo & Associates Corp.
2203 N. Lois Avenue, Suite 1200
Tampa, Florida 33607
Florida Certificate of Authorization No. 02317
Engineer of Record:Richard Arico
P.E. No.:59674

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413405-1-52-01

PLAN (15)
STA 956+00 TO STA 963+00

SHEET NO. 36

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1" = 50'

NOTE
(-) INDICATES TRAVELWAY SLOPES "DOWNWARD" FROM THE SE CONTROL LINE.
(+) INDICATES TRAVELWAY SLOPES "UPWARD" FROM THE SE CONTROL LINE.

* MATCH EXIST OUTSIDE LANE CROSS SLOPE IF OTHER THAN (+) 0.02

SE TRANSITION WB INSIDE LANE FROM EXIST TO (+) 0.02*

+35

+55

+39

SE TRANSITION EB LANES FROM EXIST TO (+) 0.062

DPI MED DITCH STA 972+00 EL 105.0'

END MED DITCH CONSTRUCTION STA 974+00 EL 104.6'

WB SE CONTROL LINE OUTSIDE EDGE OF TRAVEL LANE STA 976+55 TO 999+30

WB SE CONTROL LINE @ SURVEY SR 60 STA 975+35 TO 976+55

EXIST R/W

REMOVE EXIST MES CONST 18" MES

EXIST 3' PAVED SHLDR

BRUSH

18" RCP

MATCH LINE STA 970+00

MATCH LINE STA 977+00

970

972

974

976

977

F.D. 12.00 Rt

CONST SILT FENCE

MED DITCH (+0.967%)

MED DITCH (-0.200%)

SR 60 (HOPEWELL RD)

EB SE CONTROL LINE INSIDE EDGE OF TRAVEL LANE STA 974+39 TO 1001+46

REMOVE EXIST CURB

REMOVE EXIST PAVT AND SOD MEDIAN AREA

REMOVE EXIST CURB

LIMIT OF MED CONST

30" STRAIGHT HEADWALL INV 97.08

EXIST 4' PAVED SHLDR

BEGIN PROP 4' PAVED SHLDR STA 974+39.40

SAWCUT

CONST SILT FENCE

+20.00

+00.00

EXIST R/W

REMOVE EXIST PIPE
CONST 18 LF OF 18" SIDEDRAIN PIPE WITH MITERED END SECTIONS

BM No 97
FDOT BRASS DISK SET ON 4"x4" CONC MONUMENT
STA 970+39, 174'RT
ELEV 99.560'

MILL & RESURF

WIDENING (TURN LANES)

WIDENING (SHOULDER)

SILT FENCE

SYNTHETIC BALE

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ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 60	HILLSBOROUGH	413405-1-52-01

PLAN (17)
STA 970+00 TO STA 977+00

SHEET NO. 38

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