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2801 W. Durango
Phoenix, AZ 85009

US 60/SR202L TI, Phase II

Portions of this project's *Final Drainage Report* (dated February 2005) have been superseded by revised calculations submitted by Bailang Gary Sun of Parsons Brinckerhoff (PB) on May 2, 2005. The revised calculations were sealed by Jeff B. Blau, PE of PB on 4/28/05 and, are, therefore, referred to as the "*4/28/05 Revisions*".

Brief History

The February 2005 *Final Drainage Report* was submitted to the District for review on March 2, 2005. On March 16, 2005, the District responded with 3 comments (see memo from Catherine W. Regester to Shelby Brown, dated March 16, 2005). On May 2, 2005, PB submitted a response to those comments along with revised and additional calculations.

All revised and additional calculations have been inserted into this *Final Drainage Report* with "*4/28/05 Revisions*" noted on each sheet (except for the revised HEC-RAS report (.rpt) files where the notation only appears on the first page of the revised print-out). The superseded data in the February 2005 *Final Drainage Report* has been stamped "SUPERSEDED" but has been left in the report.

A CD containing the revised HEC-1 and HEC-RAS files was also submitted by PB on May 2, 2005. This CD is titled *SRT Phase II, Final Drainage Report* and is dated May 02, 2005. A hard copy print-out of the revised HEC-1 model was not provided by PB. Therefore, the reader should see the CD for the final HEC-1 model used in this design.

A copy of the PB May 2, 2005 transmittal follows this sheet as does the 4/28/05 response memo to the District's review comments of May 16, 2005. A separate notebook containing only the "*4/28/05 Revisions*" has also been prepared and is filed in the Engineering Division Library under the name *US 60 / SR 202L TI – Phase II, Final Drainage Report, 4/28/05 Revisions*.

Prepared by: Catherine W. Regester, FCDMC
June 8, 2005

Parsons Brinckerhoff
1501 W. Fountainhead Parkway, #400
Tempe, Arizona 85282
(480) 966-8295
Fax: 480-966-9234

TRANSMITTAL

DATE	JOB NO.
May 02, 2005	11194P
ATTENTION:	
RE: SR 202L / US 60 System TI, Phase II	
Project No. STP-202-B(008)B	
TRACS No. 202 MA 029 H5686 04C	

TO Curt Slagell
Project Manager
Aztec Engineering
4561 East McDowell Road
Phoenix, Arizona 85008
(602) 659-9301

WE ARE SENDING YOU X Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
2	4/28/05		Responses to FCDMC's Comments Dated March 16, 2005
1	5/02/05		Compact Disc of Final HEC-1 and HEC-RAS Files (April 2005)

THESE ARE TRANSMITTED as checked below:

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REMARKS Let me know if you need additional copies.

COPY TO File, Catherine Regester (FCDMC) - Delivered **SIGNED** Bailang Gary Sun

If enclosures are not as noted, kindly notify us at once

Bailang Gary Sun

L:\PROJECTS\11242 District Minor\Letter - Memos\Trans 102504.doc

Memorandum

177 North Church Avenue, Suite 500
Tucson, Arizona 85701
520-882-6424
Fax: 520-882-8830

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24387
JEFF B. BLAU
DATE SIGNED 4-28-05
ARIZONA U.S.A.

To: Catherine W. Regester, Flood Control District of Maricopa County

From: Jeff Blau, Parsons Brinckerhoff

Date: April 28, 2005

Subject: Response to Review Comments dated March 16, 2005 on the Loop 202/US 60 TI, Phase II – Final Plans and Drainage Report

Thank-you for your review comments. Following are our responses that address your comments.

1. All of the HEC-RAS models *Lateral Weir Rating Curve, Southern Ave System and Hawes Road Channel*, have been revised to reflect the channel and culvert revisions that are in the Final Plans. The revisions resulted in slight changes to the lateral weir rating. The revised lateral weir rating was incorporated into the final HEC-1 model. The revised lateral weir rating resulted in a slight increase in the proposed conditions 100-year peak flows above what was presented in the Final Drainage Report, in the Hawes Channel (increase from 385 to 389 cfs), in the concrete channel along the north side of US 60 (increase from 652 to 654 cfs) and in the Sossoman Channel at the US 60 culvert (1,350 to 1,356 cfs). Table 2 – Summary of 100-Year Peak Flows from the Final Drainage Report has been updated and is included below. Also included in this submittal are the updated digital files of the HEC-RAS models as well as hard copy print outs of the updated HEC-RAS output.

2. The watershed boundary map/HEC-1 schematic that was submitted with the Draft Final Drainage Report at the 60% plan stage has not changed and is valid for the Final HEC-1 model. A digital copy of the watershed boundary map/HEC-1 schematic as well as of the updated final HEC-1 model and output (*NE200255.dat and NE200255.out*) have been included with this submittal.

3. We went to the project site and measured the geometry of the Hawes Channel at the driveway crossing, and computed the normal flow depth using the computer program Flowmaster (v6.1). The slope of the channel at the crossing was determined from the project topography. The flow depth was computed for the Q in the Hawes Channel (221 cfs) at the time of the Q100 at the lateral weir in the Southern Avenue System, as well as for the Q100 in the Hawes Channel (389 cfs). The Flowmaster output shows a flow depth of 2.34 feet and 3.19 feet for 221 cfs and 389 cfs respectively. The driveway low chord is 3.33 feet above the channel bottom. This shows that the driveway will not impact the hydraulics of the basin outfall system design. The Flowmaster output is included with this submittal.

If you should have any questions please contact me at 520-838-3412.

Table 2 – Summary of 100-Year Peak Flows
(Taken from the Final Drainage Report Report dated 2/18/05 and updated with the results of the updated HEC-1 Model NE200255.dat)

Concentration Point	Location	Baseline Conditions (cfs)	Proposed Conditions (cfs)
C31B	Southern Avenue and Hawes Road - Structure at Northwest Corner	1,790	1,148
D31W	Southern Avenue box culvert system - west of Hawes Road	1,058	939
D31S	Hawes Road Channel south of Southern Avenue	732	208
C31S	Hawes Road Channel south of confluence with Southern Avenue system	752	389
C38C	Existing concrete channel along north side of US 60, just downstream of confluence with Hawes Channel	1,503	654
38T39	Existing concrete channel along north side of US 60, just upstream of confluence with Sossoman Channel	633	654
SOSS	Sossoman Channel at US 60 culvert crossing	1,764	1,356

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Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: March 16, 2005

To: Shelby Brown, Permits Branch

From: Catherine W. Regester, Engineering Division, Hydrology/Hydraulics Branch

Subject: Loop 202/60, Phase II – Final Plans and Drainage Report
Permit No. 2004P038

I have reviewed the subject plans and report and have the following comments:

1. The HEC-RAS model for the *Southern Ave System* has been revised since the 95% submittal. The channel invert elevations have been revised (lowered) at several cross sections. Most notably, the invert was lowered by 0.48 ft at cross section 1170. This same section is present in both the *Hawes Road Channel* and the *Lateral Weir Rating Curve* HEC-RAS models. However, per the summary print-outs in the report, there has been no change to the invert elevations in these two models; and, the downstream cross sections in these models show higher invert elevations than the revised elevation at section 1170. The consultant should provide an explanation for the disparity between the models and make any necessary changes to the models and/or design drawings. A digital copy of the final HEC-RAS models should be submitted (on diskette or CD) for inclusion in the final report. A revised hard copy print-out of any modified HEC-RAS models should also be submitted.

2. A watershed boundary map/HEC-1 schematic and digital copy of the HEC-1 model (on diskette or CD) should be submitted for inclusion in the final report as documentation for the final hydrology.

3. My September 28, 2004 comments noted the presence of an existing driveway crossing the Hawes Road Channel downstream of the location where the submitted HEC-RAS models begin. It appears that this driveway may be restricting the flows in the channel. The consultant may want to verify that this driveway is not impacting the hydraulics of their basin outfall system design.

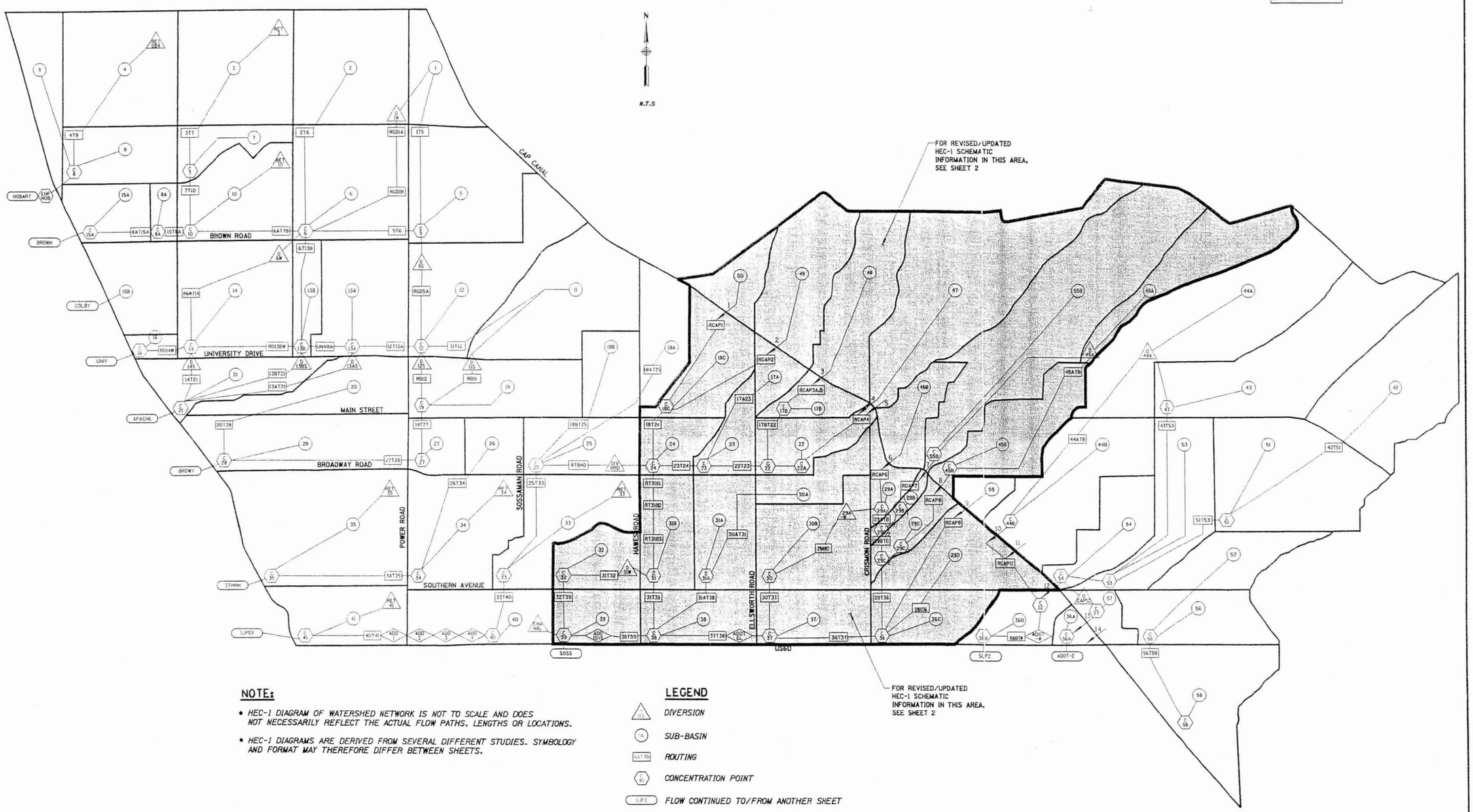
If you have any questions, please feel free to call me at (602) 506-4001.

cc: Bing Zhao
Felicia Terry
Afshin Ahouraiyan
Warren Rosebraugh

2801 West Durango Street Phoenix, Arizona 85009 Phone: 602-506-1501 Fax: 602-506-4601

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

202L MA



NOTE:

- HEC-1 DIAGRAM OF WATERSHED NETWORK IS NOT TO SCALE AND DOES NOT NECESSARILY REFLECT THE ACTUAL FLOW PATHS, LENGTHS OR LOCATIONS.
- HEC-1 DIAGRAMS ARE DERIVED FROM SEVERAL DIFFERENT STUDIES. SYMBOLOGY AND FORMAT MAY THEREFORE DIFFER BETWEEN SHEETS.

LEGEND

- DIVERSION
- SUB-BASIN
- ROUTING
- CONCENTRATION POINT
- FLOW CONTINUED TO/FROM ANOTHER SHEET
- DETENTION BASIN
- CAP OVERCHUTE

	NAME	DATE
DESIGN	ABM	8/02
DRAWN	KJM	8/02
CHECKED	JRM	8/02

DMJM HARRIS — 2777 E. CAMELBACK ROAD, SUITE 200, PHOENIX, AZ. 85016-4302, (602) 337-2777

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

HEC-1 SCHEMATIC
NORTHERN REGION

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: 202L/US60 T.I. PHASE II
SHEET: 1 OF 2
TRACS NO. H 5686 03C

07/31/02 j:\RMSA2\Prod\Exhibit\hec1_1.dgn

F.A.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

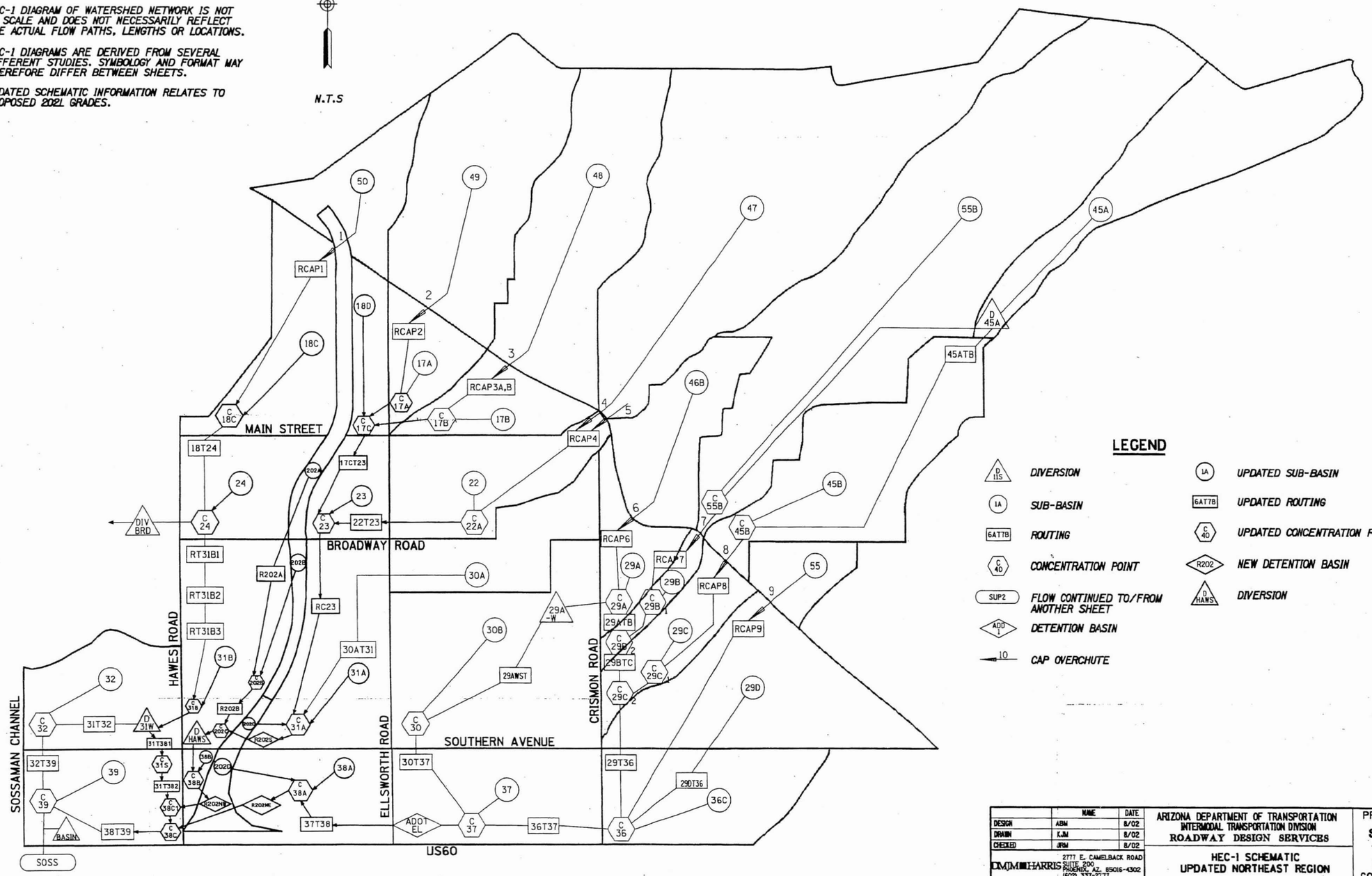
202L MA

NOTE:

- HEC-1 DIAGRAM OF WATERSHED NETWORK IS NOT TO SCALE AND DOES NOT NECESSARILY REFLECT THE ACTUAL FLOW PATHS, LENGTHS OR LOCATIONS.
- HEC-1 DIAGRAMS ARE DERIVED FROM SEVERAL DIFFERENT STUDIES. SYMBOLOGY AND FORMAT MAY THEREFORE DIFFER BETWEEN SHEETS.
- UPDATED SCHEMATIC INFORMATION RELATES TO PROPOSED 202L GRADES.

N

N.T.S



LEGEND

D 11S	DIVERSION	1A	UPDATED SUB-BASIN
1A	SUB-BASIN	6AT7B	UPDATED ROUTING
6AT7B	ROUTING	C 40	UPDATED CONCENTRATION POINT
C 40	CONCENTRATION POINT	R202	NEW DETENTION BASIN
SUP2	FLOW CONTINUED TO/FROM ANOTHER SHEET	D HAWS	DIVERSION
ADD 1	DETENTION BASIN		
10	CAP OVERCHUTE		

	NAME	DATE
DESIGN	ABM	8/02
DRAWN	KJM	8/02
CHECKED	JRM	8/02

HARRIS 2777 E. CAMELBACK ROAD SUITE 200 PHOENIX, AZ. 85016-4302 (602) 337-2777

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

HEC-1 SCHEMATIC
UPDATED NORTHEAST REGION

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: 202L/US60 T.I. PHASE II
SHEET: 2 OF 2

TRACS NO. H 5686 03C

07/31/02 J:\RMSA2\Prod\Exhibit\hec1_3.dgn

Hawes Channel at Driveway Crossing - Q in Hawes Channel at time of Q100 peak at Lateral Weir in Southern Avenue System
Worksheet for Irregular Channel

Project Description	
Worksheet	Hawes Channel at Driveway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.002600 ft/ft
Discharge	221.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	2.34 ft
Elevation Range	0.00 to 3.33
Flow Area	32.5 ft²
Wetted Perimeter	18.85 ft
Top Width	17.31 ft
Actual Depth	2.34 ft
Critical Elevation	2.16 ft
Critical Slope	0.003448 ft/ft
Velocity	6.81 ft/s
Velocity Head	0.72 ft
Specific Energy	3.06 ft
Froude Number	0.88
Flow Type	Subcritical

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+20	0.016

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	3.33
0+06	0.00
0+17	0.00
0+20	3.33

Hawes Channel at Driveway Crossing - Q100
Worksheet for Irregular Channel

Project Description	
Worksheet	Hawes Channel at Driveway
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.002600 ft/ft
Discharge	389.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	3.19 ft
Elevation Range	0.00 to 3.33
Flow Area	48.4 ft^2
Wetted Perimeter	21.92 ft
Top Width	19.82 ft
Actual Depth	3.19 ft
Critical Elevation	3.02 ft
Critical Slope	0.003208 ft/ft
Velocity	8.03 ft/s
Velocity Head	1.00 ft
Specific Energy	4.20 ft
Froude Number	0.91
Flow Type	Subcritical

Roughness Segments

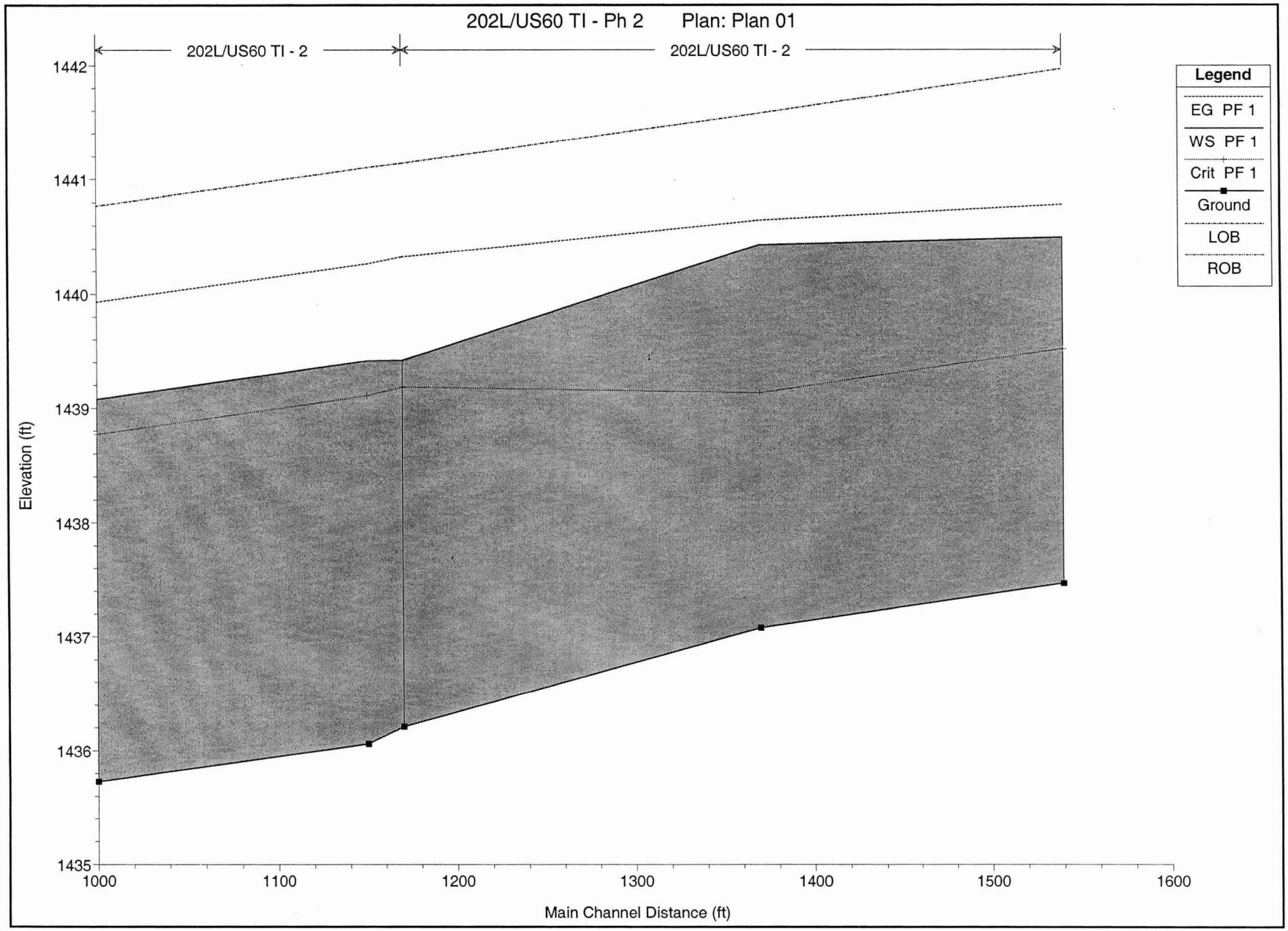
Start Station	End Station	Mannings Coefficient
0+00	0+20	0.016

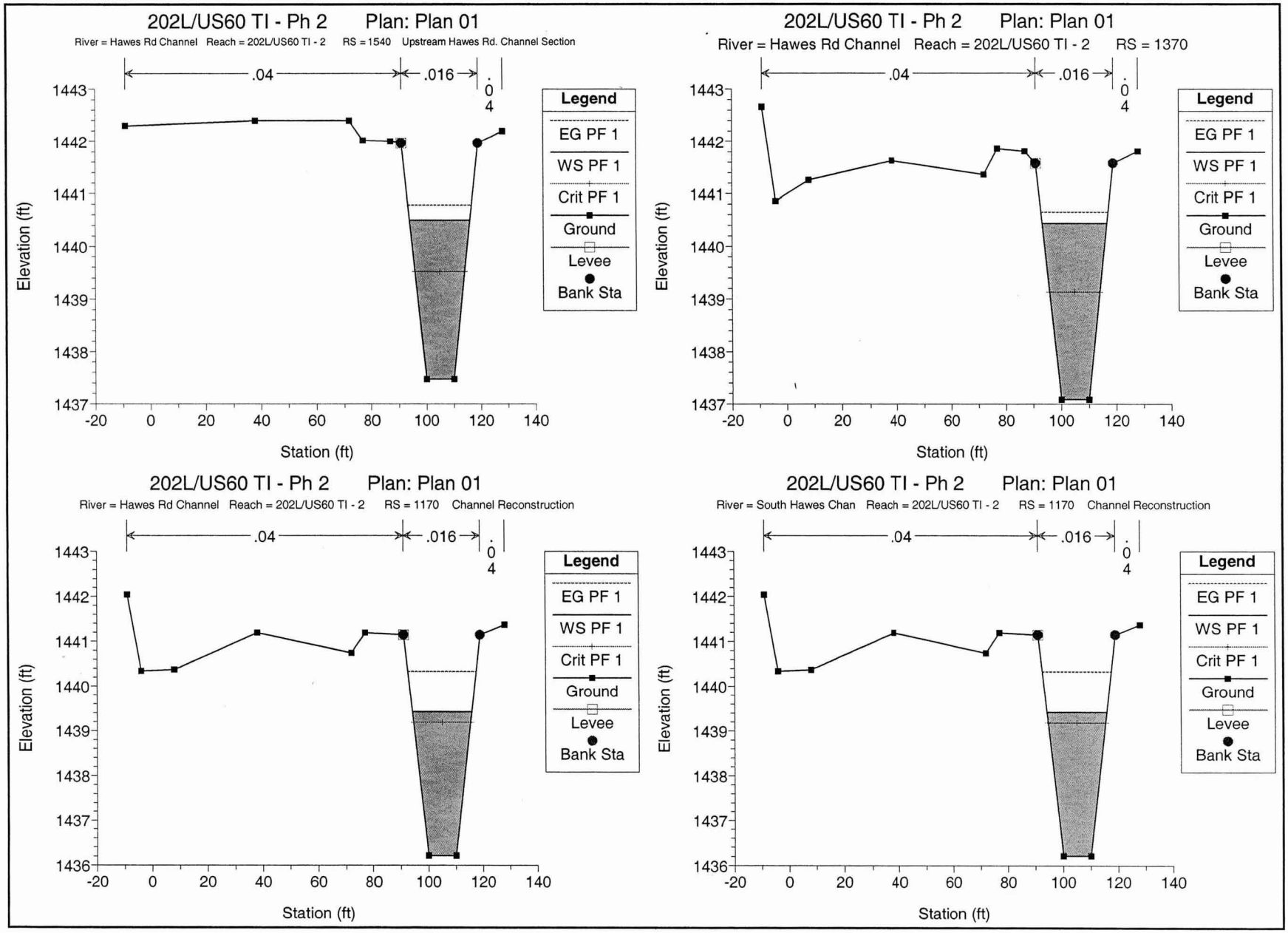
Natural Channel Points

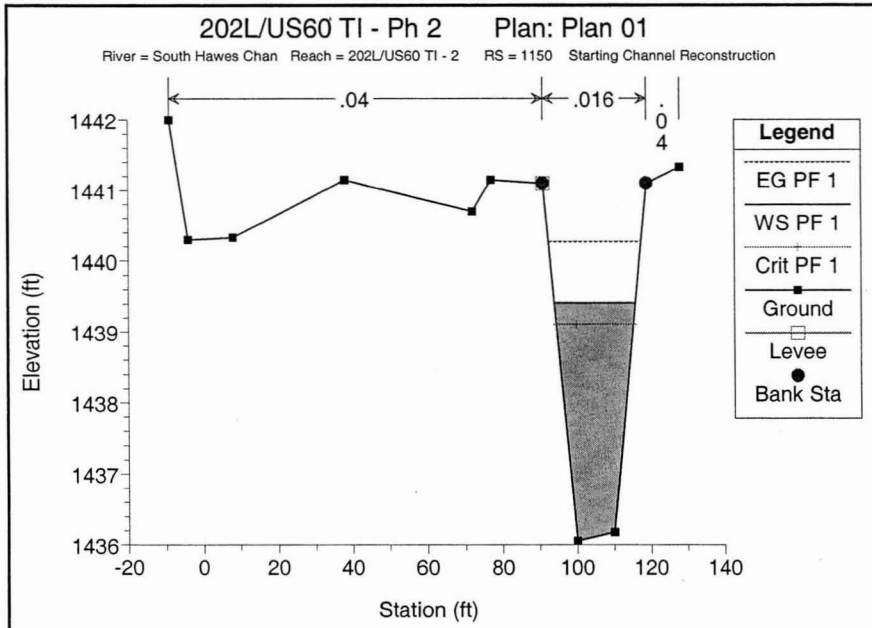
Station (ft)	Elevation (ft)
0+00	3.33
0+06	0.00
0+17	0.00
0+20	3.33

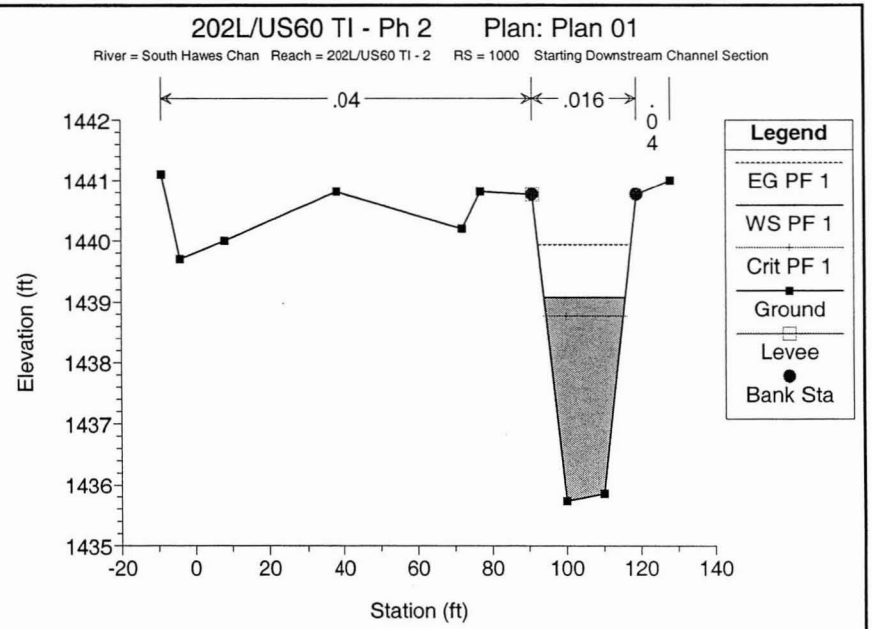
HEC-RAS Plan: Plan 01 Profile: PF 1

River	Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
South Hawes Chan	202L/US60 TI - 2	1170	389.00	1436.21	1439.42	1439.19	1440.33	0.002392	7.64	50.94	21.73	0.88
South Hawes Chan	202L/US60 TI - 2	1150	389.00	1436.06	1439.41	1439.11	1440.27	0.002187	7.40	52.55	21.90	0.84
South Hawes Chan	202L/US60 TI - 2	1000	389.00	1435.73	1439.08	1438.77	1439.93	0.002201	7.42	52.42	21.88	0.85
Hawes Rd Channel	202L/US60 TI - 2	1540	208.00	1437.47	1440.50	1439.52	1440.78	0.000807	4.28	48.61	22.11	0.51
Hawes Rd Channel	202L/US60 TI - 2	1370	208.00	1437.08	1440.43	1439.13	1440.65	0.000545	3.71	56.00	23.41	0.42
Hawes Rd Channel	202L/US60 TI - 2	1170	389.00	1436.21	1439.42	1439.19	1440.33	0.002392	7.64	50.94	21.73	0.88


202L/US60 TI - Ph 2 Plan: Plan 01
202L/US60 TI - 2
202L/US60 TI - 2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (ft)
1442
1441
1440
1439
1438
1437
1436
1435
1000
1100
1200
1300
1400
1500
1600
Main Channel Distance (ft)


202L/US60 TI - Ph 2 Plan: Plan 01
River = Hawes Rd Channel Reach = 202L/US60 TI - 2 RS = 1540 Upstream Hawes Rd. Channel Section
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 01
River = Hawes Rd Channel Reach = 202L/US60 TI - 2 RS = 1370
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 01
River = Hawes Rd Channel Reach = 202L/US60 TI - 2 RS = 1170 Channel Reconstruction
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 01
River = South Hawes Chan Reach = 202L/US60 TI - 2 RS = 1170 Channel Reconstruction
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta


202L/US60 TI - Ph 2 Plan: Plan 01
River = South Hawes Chan Reach = 202L/US60 TI - 2 RS = 1150 Starting Channel Reconstruction
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta


202L/US60 TI - Ph 2 Plan: Plan 01
River = South Hawes Chan Reach = 202L/US60 TI - 2 RS = 1000 Starting Downstream Channel Section
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

PROJECT DATA
Project Title: 202L/US60 TI - Ph 2
Project File : WSP100HC.prj
Run Date and Time: 4/26/2005 10:13:52 AM

Project in English units

Project Description:
202L/US60 Traffic Interchange - Phase 2
This model is to determine the
channel hydraulics for the 100-year peak flow in the Hawes Road Channel.

PLAN DATA

Plan Title: Plan 01
Plan File : 1:\11194\Phase2\HEC-RAS\V301\WSP100HC.p01

Geometry Title: 202L/US60 TI - Phase 2 FP
Geometry File : 1:\11194\Phase2\HEC-RAS\V301\WSP100HC.g02

Flow Title : 202L/US60 TI - Phase 2 FP
Flow File : 1:\11194\Phase2\HEC-RAS\V301\WSP100HC.f02

Plan Summary Information:
Number of: Cross Sections = 32 Mulitple Openings = 0
Culverts = 2 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 202L/US60 TI - Phase 2 FP
Flow File : 1:\11194\Phase2\HEC-RAS\V301\WSP100HC.f02

Flow Data (cfs)

River	Reach	RS	PF 1
Hawes Rd Channel	202L/US60 TI -	21540	208
Hawes Rd Channel	202L/US60 TI -	21170	389
Southern Ave Sys	202L/US60 TI -	23490	712
Southern Ave Sys	202L/US60 TI -	21897	694
Southern Ave Sys	202L/US60 TI -	21877	653
Southern Ave Sys	202L/US60 TI -	21857	607
Southern Ave Sys	202L/US60 TI -	21837	556
Southern Ave Sys	202L/US60 TI -	21817	500
Southern Ave Sys	202L/US60 TI -	21797	439
Southern Ave Sys	202L/US60 TI -	21777	374
Southern Ave Sys	202L/US60 TI -	21762	322
Southern Ave Sys	202L/US60 TI -	21744	256
Southern Ave Sys	202L/US60 TI -	21706	214
Southern Ave Sys	202L/US60 TI -	21170	389

South Hawes Chan202L/US60 TI - 21170	389
South Hawes Chan202L/US60 TI - 21000	389

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Hawes Rd Channel	202L/US60 TI - 2	PF 1	Normal S = .0022	
Southern Ave Sys	202L/US60 TI - 2	PF 1	Normal S = 1E-11	
South Hawes Chan	202L/US60 TI - 2	PF 1		Normal S = .0022

GEOMETRY DATA

Geometry Title: 202L/US60 TI - Phase 2 FP
Geometry File : 1:\11194\Phase2\HEC-RAS\V301\WSP100HC.g02

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Hawes Rd Channel	202L/US60 TI - 2		Confluence
Southern Ave Sys	202L/US60 TI - 2		Confluence
South Hawes Chan	202L/US60 TI - 2	Confluence	

JUNCTION INFORMATION

Name: Confluence
Description: Junction of Southern Ave Syst. w/ Hawes Rd Channel
Energy computation Method

Length across Junction River	Reach		Tributary River	Reach	Length	Angle
Hawes Rd Channel	202L/US60 TI - 2	to	South Hawes Chan	202L/US60 TI - 2	0	
Southern Ave Sys	202L/US60 TI - 2	to	South Hawes Chan	202L/US60 TI - 2	0	

CROSS SECTION RIVER: Hawes Rd Channel
REACH: 202L/US60 TI - 2 RS: 1540

INPUT
Description: Upstream Hawes Rd. Channel Section
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.3	38	1442.4	72	1442.4	77	1442.02	87	1442
91	1441.97	100	1437.47	110	1437.47	119	1441.97	128	1442.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	170	170	170	.1	.3

Left Levee Station= 91 Elevation= 1441.97

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1440.78	Element			
Vel Head (ft)	0.28	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.50	Reach Len. (ft)	170.00	170.00	170.00
Crit W.S. (ft)	1439.52	Flow Area (sq ft)		48.61	
E.G. Slope (ft/ft)	0.000807	Area (sq ft)		48.61	
Q Total (cfs)	208.00	Flow (cfs)		208.00	
Top Width (ft)	22.11	Top Width (ft)		22.11	
Vel Total (ft/s)	4.28	Avg. Vel. (ft/s)		4.28	
Max Chl Dpth (ft)	3.03	Hydr. Depth (ft)		2.20	
Conv. Total (cfs)	7321.4	Conv. (cfs)		7321.4	
Length Wtd. (ft)	170.00	Wetted Per. (ft)		23.54	
Min Ch El (ft)	1437.47	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.45	
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)		0.45	
C & E Loss (ft)	0.02	Cum SA (acres)		0.19	

CROSS SECTION RIVER: Hawes Rd Channel
REACH: 202L/US60 TI - 2 RS: 1370

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.66	-4	1440.86	8	1441.26	38	1441.63	72	1441.36
77	1441.86	87	1441.81	91	1441.58	100	1437.08	110	1437.08
119	1441.58	128	1441.81						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	200	200	200	.1	.3

Left Levee Station= 91 Elevation= 1441.58

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.21	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.43	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1439.13	Flow Area (sq ft)		56.00	
E.G. Slope (ft/ft)	0.000545	Area (sq ft)		56.00	
Q Total (cfs)	208.00	Flow (cfs)		208.00	
Top Width (ft)	23.41	Top Width (ft)		23.41	
Vel Total (ft/s)	3.71	Avg. Vel. (ft/s)		3.71	
Max Chl Dpth (ft)	3.35	Hydr. Depth (ft)		2.39	
Conv. Total (cfs)	8906.4	Conv. (cfs)		8906.4	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		24.99	
Min Ch El (ft)	1437.08	Shear (lb/sq ft)		0.08	
Alpha	1.00	Stream Power (lb/ft s)		0.28	
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)		0.25	
C & E Loss (ft)	0.07	Cum SA (acres)		0.10	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Hawes Rd Channel
REACH: 202L/US60 TI - 2 RS: 1170

INPUT
Description: Channel Reconstruction
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.04	-4	1440.34	8	1440.37	38	1441.19	72	1440.74
77	1441.19	91	1441.14	100	1436.21	110	1436.21	119	1441.14
128	1441.37								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	20	20	20	.1	.3

Left Levee Station= 91 Elevation= 1441.14

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.91	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.42	Reach Len. (ft)	0.00	0.00	0.00
Crit W.S. (ft)	1439.19	Flow Area (sq ft)		50.94	
E.G. Slope (ft/ft)	0.002392	Area (sq ft)		50.94	
Q Total (cfs)	389.00	Flow (cfs)		389.00	
Top Width (ft)	21.73	Top Width (ft)		21.73	
Vel Total (ft/s)	7.64	Avg. Vel. (ft/s)		7.64	
Max Chl Dpth (ft)	3.21	Hydr. Depth (ft)		2.34	
Conv. Total (cfs)	7954.2	Conv. (cfs)		7954.2	
Length Wtd. (ft)	0.00	Wetted Per. (ft)		23.37	
Min Ch El (ft)	1436.21	Shear (lb/sq ft)		0.33	
Alpha	1.00	Stream Power (lb/ft s)		2.49	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)			
C & E Loss (ft)	0.00	Cum SA (acres)			

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 3490

INPUT
Description: Southern Avenue Detention Basin
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
25	1457.58	45	1457.34	100	1445.6	225	1444.5	350	1445.6
390	1457.34	405	1457.58						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
25	.04	45	.025	390	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45	390	125	125	125	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1453.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.025	
W.S. Elev (ft)	1453.27	Reach Len. (ft)	125.00	125.00	125.00

Crit W.S. (ft)	1445.68	Flow Area (sq ft)		2293.30	
E.G. Slope (ft/ft)	0.000002	Area (sq ft)		2293.30	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	312.07	Top Width (ft)		312.07	
Vel Total (ft/s)	0.31	Avg. Vel. (ft/s)		0.31	
Max Chl Dpth (ft)	8.77	Hydr. Depth (ft)		7.35	
Conv. Total (cfs)	513107.3	Conv. (cfs)		513107.3	
Length Wtd. (ft)	125.00	Wetted Per. (ft)		313.99	
Min Ch El (ft)	1444.50	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.01	6.71	0.04
C & E Loss (ft)	0.12	Cum SA (acres)	0.03	1.44	0.14

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 3365

INPUT
Description: End RCB Culvert
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
88	1454.24	99.9	1451.33	100	1444	110	1444	110.1	1451.33
160	1454.11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
88	.04	99.9	.015	110.1	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
99.9	110.1	983.8	983.8	983.8	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1453.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.21	Wt. n-Val.	0.040	0.015	0.040
W.S. Elev (ft)	1451.95	Reach Len. (ft)	983.80	983.80	983.80
Crit W.S. (ft)	1449.37	Flow Area (sq ft)	0.77	80.31	3.39
E.G. Slope (ft/ft)	0.001646	Area (sq ft)	0.77	80.31	3.39
Q Total (cfs)	712.00	Flow (cfs)	0.52	709.15	2.33
Top Width (ft)	23.75	Top Width (ft)	2.51	10.20	11.04
Vel Total (ft/s)	8.43	Avg. Vel. (ft/s)	0.67	8.83	0.69
Max Chl Dpth (ft)	7.94	Hydr. Depth (ft)	0.31	7.87	0.31
Conv. Total (cfs)	17547.3	Conv. (cfs)	12.8	17477.1	57.4
Length Wtd. (ft)	983.80	Wetted Per. (ft)	2.59	24.66	11.06
Min Ch El (ft)	1444.00	Shear (lb/sq ft)	0.03	0.33	0.03
Alpha	1.09	Stream Power (lb/ft s)	0.02	2.96	0.02
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	3.30	0.04
C & E Loss (ft)		Cum SA (acres)	0.03	0.98	0.12

CULVERT RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 3000

INPUT
Description: Southern Avenue Detention Basin Outlet
Distance from Upstream XS = 41
Deck/Roadway Width = 900
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1454.6		700	1454.6	

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
88	1454.24	99.9	1451.33	100	1444	110	1444	110.1	1451.33
160	1454.11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
88	.04	99.9	.015	110.1	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
99.9	110.1	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1450.4		200	1450.4	

Downstream Bridge Cross Section Data
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
     88 1447.09     99.9 1446.85     100 1437.85     110 1437.85   110.1 1446.85
    147 1450.46     168 1448.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      88     .04    99.9    .015   110.1     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          99.9   110.1             .1       .3

Upstream Embankment side slope              =      10 horiz. to 1.0 vertical
Downstream Embankment side slope            =      12 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1          Box       6      10
FHWA Chart # 9 - flared wingwalls and Inlet top edge bevel
FHWA Scale # 1 - Wingwall flared 45 deg.; inlet top edge bevel=0.43D
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                  0   983.8       .013                   .2               .2
Upstream   Elevation =  1444
           Centerline Station =  105
Downstream Elevation =  1437.85
           Centerline Station =  105

CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 2381

INPUT
Description: End Channel Transition, Begin RCB
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      88 1447.09     99.9 1446.85     100 1437.85     110 1437.85   110.1 1446.85
    147 1450.46     168 1448.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      88     .04    99.9    .015   110.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          99.9   110.1            120.3   120.3   120.3             .1       .3

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1446.23    Element                   Left OB   Channel   Right OB
  Vel Head (ft)               3.92    Wt. n-Val.                          0.015
  W.S. Elev (ft)           1442.31    Reach Len. (ft)           120.30    120.30     120.30
  Crit W.S. (ft)           1443.23    Flow Area (sq ft)                    44.81
  E.G. Slope (ft/ft)      0.008150    Area (sq ft)                         44.81
  Q Total (cfs)             712.00    Flow (cfs)                          712.00
  Top Width (ft)             10.10    Top Width (ft)                       10.10
  Vel Total (ft/s)           15.89    Avg. Vel. (ft/s)                     15.89
  Max Chl Dpth (ft)           4.46    Hydr. Depth (ft)                      4.44
  Conv. Total (cfs)         7886.9    Conv. (cfs)                         7886.9
  Length Wtd. (ft)          120.30    Wetted Per. (ft)                     18.92
  Min Ch El (ft)           1437.85    Shear (lb/sq ft)                      1.21
  Alpha                       1.00    Stream Power (lb/ft s)               19.15
  Frctn Loss (ft)                     Cum Volume (acre-ft)                  1.89
  C & E Loss (ft)                     Cum SA (acres)                        0.75


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 2261

INPUT
Description: Begin Channel Transition
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      68 1442.97      76 1444.97      88 1444.73     100 1437.73    116 1438.05
  127.36 1444.73     145 1449.96     170 1447.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      68     .04     88    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           88  127.36               60      60      60             .1       .3
Left Levee      Station=      88      Elevation= 1444.73

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1444.74    Element                   Left OB   Channel   Right OB
```

Vel Head (ft)	4.78	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.96	Reach Len. (ft)	60.00	60.00	60.00
Crit W.S. (ft)	1441.35	Flow Area (sq ft)		40.58	
E.G. Slope (ft/ft)	0.017927	Area (sq ft)		40.58	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	23.09	Top Width (ft)		23.09	
Vel Total (ft/s)	17.54	Avg. Vel. (ft/s)		17.54	
Max Chl Dpth (ft)	2.23	Hydr. Depth (ft)		1.76	
Conv. Total (cfs)	5317.7	Conv. (cfs)		5317.7	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		24.21	
Min Ch El (ft)	1437.73	Shear (lb/sq ft)		1.88	
Alpha	1.00	Stream Power (lb/ft s)		32.91	
Frctn Loss (ft)	1.40	Cum Volume (acre-ft)		1.77	
C & E Loss (ft)	0.09	Cum SA (acres)		0.70	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 2201

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
68	1441.91	76	1443.91	88	1443.67	100	1437.67	116	1437.99
127.36	1443.67	145	1448.1	160	1446.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
68	.04	88	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88	127.36	101	101	101	.1	.3

Left Levee Station= 88 Elevation= 1443.67

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1443.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.28	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.19	Reach Len. (ft)	101.00	101.00	101.00
Crit W.S. (ft)	1441.22	Flow Area (sq ft)		48.99	
E.G. Slope (ft/ft)	0.010828	Area (sq ft)		48.99	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	25.45	Top Width (ft)		25.45	
Vel Total (ft/s)	14.53	Avg. Vel. (ft/s)		14.53	
Max Chl Dpth (ft)	2.52	Hydr. Depth (ft)		1.93	
Conv. Total (cfs)	6842.5	Conv. (cfs)		6842.5	
Length Wtd. (ft)	101.00	Wetted Per. (ft)		26.56	
Min Ch El (ft)	1437.67	Shear (lb/sq ft)		1.25	
Alpha	1.00	Stream Power (lb/ft s)		18.12	
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)		1.71	
C & E Loss (ft)	0.45	Cum SA (acres)		0.67	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 2100

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
68	1441.81	76	1443.81	88	1443.57	100	1437.57	116	1437.89
127.36	1443.57	145	1448	160	1446				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
68	.04	88	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88	127.36	153	153	153	.1	.3

Left Levee Station= 88 Elevation= 1443.57

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1442.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.		0.016	

W.S. Elev (ft)	1441.83	Reach Len. (ft)	153.00	153.00	153.00
Crit W.S. (ft)	1441.12	Flow Area (sq ft)		99.40	
E.G. Slope (ft/ft)	0.001443	Area (sq ft)		99.40	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	32.42	Top Width (ft)		32.42	
Vel Total (ft/s)	7.16	Avg. Vel. (ft/s)		7.16	
Max Chl Dpth (ft)	4.26	Hydr. Depth (ft)		3.07	
Conv. Total (cfs)	18743.5	Conv. (cfs)		18743.5	
Length Wtd. (ft)	153.00	Wetted Per. (ft)		34.36	
Min Ch El (ft)	1437.57	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		1.87	
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)		1.54	
C & E Loss (ft)	0.05	Cum SA (acres)		0.60	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1947

INPUT
Description: End Side Weir
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1443.58	88	1443.41	100	1437.41	116	1437.73	127.36	1443.41
145	1445.77	170	1444.77						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	38	38	38	.1	.3

Left Levee Station= 88 Elevation= 1443.42

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1442.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.98	Reach Len. (ft)	38.00	38.00	38.00
Crit W.S. (ft)	1440.98	Flow Area (sq ft)		77.82	
E.G. Slope (ft/ft)	0.002875	Area (sq ft)		77.82	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	29.63	Top Width (ft)		29.63	
Vel Total (ft/s)	9.15	Avg. Vel. (ft/s)		9.15	
Max Chl Dpth (ft)	3.57	Hydr. Depth (ft)		2.63	
Conv. Total (cfs)	13278.8	Conv. (cfs)		13278.8	
Length Wtd. (ft)	38.00	Wetted Per. (ft)		31.25	
Min Ch El (ft)	1437.41	Shear (lb/sq ft)		0.45	
Alpha	1.00	Stream Power (lb/ft s)		4.09	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)		1.23	
C & E Loss (ft)	0.18	Cum SA (acres)		0.49	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1909

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.78	100	1437.38	116	1437.7	127.36	1443.38	145	1445.74
170	1444.74								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	12	12	12	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.96	Element	Left OB	Channel	Right OB

Vel Head (ft)	2.48	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.48	Reach Len. (ft)	12.00	12.00	12.00
Crit W.S. (ft)	1440.23	Flow Area (sq ft)		56.36	
E.G. Slope (ft/ft)	0.012155	Area (sq ft)		56.36	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	40.59	Top Width (ft)		40.59	
Vel Total (ft/s)	12.63	Avg. Vel. (ft/s)		12.63	
Max Chl Dpth (ft)	2.10	Hydr. Depth (ft)		1.39	
Conv. Total (cfs)	6458.0	Conv. (cfs)		6458.0	
Length Wtd. (ft)	12.00	Wetted Per. (ft)		41.12	
Min Ch El (ft)	1437.38	Shear (lb/sq ft)		1.04	
Alpha	1.00	Stream Power (lb/ft s)		13.14	
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)		1.17	
C & E Loss (ft)	0.12	Cum SA (acres)		0.46	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1897

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.77	100	1437.37	116	1437.69	127.36	1443.37	145	1445.73
170	1444.73								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.25	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.50	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1440.18	Flow Area (sq ft)		57.63	
E.G. Slope (ft/ft)	0.010853	Area (sq ft)		57.63	
Q Total (cfs)	694.00	Flow (cfs)		694.00	
Top Width (ft)	40.96	Top Width (ft)		40.96	
Vel Total (ft/s)	12.04	Avg. Vel. (ft/s)		12.04	
Max Chl Dpth (ft)	2.13	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	6661.8	Conv. (cfs)		6661.8	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		41.50	
Min Ch El (ft)	1437.37	Shear (lb/sq ft)		0.94	
Alpha	1.00	Stream Power (lb/ft s)		11.33	
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)		1.15	
C & E Loss (ft)	0.07	Cum SA (acres)		0.45	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1877

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.75	100	1437.35	116	1437.67	127.36	1443.35	145	1445.71
170	1444.71								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.98	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.49	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1440.08	Flow Area (sq ft)		57.78	
E.G. Slope (ft/ft)	0.009540	Area (sq ft)		57.78	
Q Total (cfs)	653.00	Flow (cfs)		653.00	
Top Width (ft)	41.01	Top Width (ft)		41.01	
Vel Total (ft/s)	11.30	Avg. Vel. (ft/s)		11.30	
Max Chl Dpth (ft)	2.14	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	6685.7	Conv. (cfs)		6685.7	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		41.55	

Min Ch El (ft)	1437.35	Shear (lb/sq ft)	0.83
Alpha	1.00	Stream Power (lb/ft s)	9.36
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	1.13
C & E Loss (ft)	0.08	Cum SA (acres)	0.43

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1857

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.73	100	1437.33	116	1437.65	127.36	1443.33	145	1445.69
170	1444.69								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1441.18	Element			
Vel Head (ft)	0.44	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.73	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1439.97	Flow Area (sq ft)		113.50	
E.G. Slope (ft/ft)	0.001032	Area (sq ft)		113.50	
Q Total (cfs)	607.00	Flow (cfs)		607.00	
Top Width (ft)	45.37	Top Width (ft)		45.37	
Vel Total (ft/s)	5.35	Avg. Vel. (ft/s)		5.35	
Max Chl Dpth (ft)	3.40	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	18892.2	Conv. (cfs)		18892.2	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		47.30	
Min Ch El (ft)	1437.33	Shear (lb/sq ft)		0.15	
Alpha	1.00	Stream Power (lb/ft s)		0.83	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		1.09	
C & E Loss (ft)	0.03	Cum SA (acres)		0.41	

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1837

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.71	100	1437.31	116	1437.63	127.36	1443.31	145	1445.67
170	1444.67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1441.13	Element			
Vel Head (ft)	0.35	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.78	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1439.84	Flow Area (sq ft)		116.36	
E.G. Slope (ft/ft)	0.000802	Area (sq ft)		116.36	
Q Total (cfs)	556.00	Flow (cfs)		556.00	
Top Width (ft)	45.49	Top Width (ft)		45.49	
Vel Total (ft/s)	4.78	Avg. Vel. (ft/s)		4.78	
Max Chl Dpth (ft)	3.47	Hydr. Depth (ft)		2.56	
Conv. Total (cfs)	19635.7	Conv. (cfs)		19635.7	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		47.50	
Min Ch El (ft)	1437.31	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.59	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		1.03	
C & E Loss (ft)	0.02	Cum SA (acres)		0.39	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1817

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
     76 1439.69     100 1437.29     116 1437.61  127.36 1443.29     145 1445.65
    170 1444.65

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      76     .04      76    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            76  127.36               20      20      20            .1       .3
Left Levee      Station=    76.8      Elevation= 1443.38

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1441.09    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.27    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.82    Reach Len. (ft)             20.00     20.00      20.00
  Crit W.S. (ft)           1439.70    Flow Area (sq ft)                     119.13
  E.G. Slope (ft/ft)      0.000603    Area (sq ft)                          119.13
  Q Total (cfs)             500.00    Flow (cfs)                            500.00
  Top Width (ft)             45.62    Top Width (ft)                         45.62
  Vel Total (ft/s)            4.20    Avg. Vel. (ft/s)                        4.20
  Max Chl Dpth (ft)           3.53    Hydr. Depth (ft)                        2.61
  Conv. Total (cfs)        20366.0    Conv. (cfs)                          20366.0
  Length Wtd. (ft)           20.00    Wetted Per. (ft)                       47.70
  Min Ch El (ft)           1437.29    Shear (lb/sq ft)                        0.09
  Alpha                       1.00    Stream Power (lb/ft s)                  0.39
  Frctn Loss (ft)             0.01    Cum Volume (acre-ft)                    0.98
  C & E Loss (ft)             0.02    Cum SA (acres)                          0.37


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1797

INPUT
Description: Side Weir
Station Elevation Data     num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      76 1439.67     100 1437.27     116 1437.59  127.36 1443.27     145 1445.63
    170 1444.63

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      76     .04      76    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            76  127.36               20      20      20            .1       .3
Left Levee      Station=    76.8      Elevation= 1443.38

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1441.06    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.20    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.86    Reach Len. (ft)             20.00     20.00      20.00
  Crit W.S. (ft)           1439.54    Flow Area (sq ft)                     121.77
  E.G. Slope (ft/ft)      0.000434    Area (sq ft)                          121.77
  Q Total (cfs)             439.00    Flow (cfs)                            439.00
  Top Width (ft)             45.73    Top Width (ft)                         45.73
  Vel Total (ft/s)            3.61    Avg. Vel. (ft/s)                        3.61
  Max Chl Dpth (ft)           3.59    Hydr. Depth (ft)                        2.66
  Conv. Total (cfs)        21069.1    Conv. (cfs)                          21069.1
  Length Wtd. (ft)           20.00    Wetted Per. (ft)                       47.89
  Min Ch El (ft)           1437.27    Shear (lb/sq ft)                        0.07
  Alpha                       1.00    Stream Power (lb/ft s)                  0.25
  Frctn Loss (ft)             0.01    Cum Volume (acre-ft)                    0.92
  C & E Loss (ft)             0.02    Cum SA (acres)                          0.35


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1777

INPUT
Description: Side Weir
Station Elevation Data     num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      76 1439.65     100 1437.25     116 1437.57  127.36 1443.25     145 1445.61
    170 1444.61

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      76     .04      76    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            76  127.36               15      15      15            .1       .3
Left Levee      Station=    76.8      Elevation= 1443.38

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1441.03    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.14    Wt. n-Val.                            0.016
```

W.S. Elev (ft)	1440.89	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)	1439.34	Flow Area (sq ft)		124.26	
E.G. Slope (ft/ft)	0.000296	Area (sq ft)		124.26	
Q Total (cfs)	374.00	Flow (cfs)		374.00	
Top Width (ft)	45.84	Top Width (ft)		45.84	
Vel Total (ft/s)	3.01	Avg. Vel. (ft/s)		3.01	
Max Chl Dpth (ft)	3.64	Hydr. Depth (ft)		2.71	
Conv. Total (cfs)	21736.5	Conv. (cfs)		21736.5	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		48.06	
Min Ch El (ft)	1437.25	Shear (lb/sq ft)		0.05	
Alpha	1.00	Stream Power (lb/ft s)		0.14	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.87	
C & E Loss (ft)	0.01	Cum SA (acres)		0.33	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1762

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.63	100	1437.23	116	1437.55	127.36	1443.23	145	1445.59
170	1444.59								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	18	18	18	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.92	Reach Len. (ft)	18.00	18.00	18.00
Crit W.S. (ft)	1439.16	Flow Area (sq ft)		126.29	
E.G. Slope (ft/ft)	0.000209	Area (sq ft)		126.29	
Q Total (cfs)	322.00	Flow (cfs)		322.00	
Top Width (ft)	45.93	Top Width (ft)		45.93	
Vel Total (ft/s)	2.55	Avg. Vel. (ft/s)		2.55	
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)		2.75	
Conv. Total (cfs)	22289.4	Conv. (cfs)		22289.4	
Length Wtd. (ft)	18.00	Wetted Per. (ft)		48.21	
Min Ch El (ft)	1437.23	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.09	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.82	
C & E Loss (ft)	0.01	Cum SA (acres)		0.31	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1744

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.61	100	1437.21	116	1437.53	127.36	1443.21	145	1445.57
170	1444.57								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	38	38	38	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.94	Reach Len. (ft)	38.00	38.00	38.00
Crit W.S. (ft)	1438.93	Flow Area (sq ft)		128.34	
E.G. Slope (ft/ft)	0.000126	Area (sq ft)		128.34	
Q Total (cfs)	256.00	Flow (cfs)		256.00	
Top Width (ft)	46.02	Top Width (ft)		46.02	
Vel Total (ft/s)	1.99	Avg. Vel. (ft/s)		1.99	
Max Chl Dpth (ft)	3.73	Hydr. Depth (ft)		2.79	
Conv. Total (cfs)	22848.1	Conv. (cfs)		22848.1	
Length Wtd. (ft)	38.00	Wetted Per. (ft)		48.35	
Min Ch El (ft)	1437.21	Shear (lb/sq ft)		0.02	
Alpha	1.00	Stream Power (lb/ft s)		0.04	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		0.77	
C & E Loss (ft)	0.00	Cum SA (acres)		0.29	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1706

INPUT
Description: Begin Side Weir
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1443.41	88	1443.17	100	1437.17	116	1437.49	127.36	1443.17
145	1445.53	170	1444.53						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	6	6	6	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.89	Reach Len. (ft)	6.00	6.00	6.00
Crit W.S. (ft)	1438.97	Flow Area (sq ft)		82.22	
E.G. Slope (ft/ft)	0.000222	Area (sq ft)		82.22	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	30.22	Top Width (ft)		30.22	
Vel Total (ft/s)	2.60	Avg. Vel. (ft/s)		2.60	
Max Chl Dpth (ft)	3.72	Hydr. Depth (ft)		2.72	
Conv. Total (cfs)	14353.5	Conv. (cfs)		14353.5	
Length Wtd. (ft)	6.00	Wetted Per. (ft)		31.90	
Min Ch El (ft)	1437.17	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.09	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.68	
C & E Loss (ft)	0.00	Cum SA (acres)		0.26	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1700

INPUT
Description: End Transistion
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
68	1441.41	76	1443.41	88	1443.17	100	1437.17	116	1437.49
127.36	1443.17	145	1445.53	170	1444.53				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
68	.04	88	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88	127.36	30.3	30.3	30.3	.1	.3

Left Levee Station= 88 Elevation= 1443.17

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.88	Reach Len. (ft)	30.30	30.30	30.30
Crit W.S. (ft)	1438.98	Flow Area (sq ft)		82.17	
E.G. Slope (ft/ft)	0.000223	Area (sq ft)		82.17	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	30.22	Top Width (ft)		30.22	
Vel Total (ft/s)	2.60	Avg. Vel. (ft/s)		2.60	
Max Chl Dpth (ft)	3.71	Hydr. Depth (ft)		2.72	
Conv. Total (cfs)	14340.8	Conv. (cfs)		14340.8	
Length Wtd. (ft)	30.30	Wetted Per. (ft)		31.90	
Min Ch El (ft)	1437.17	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.09	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		0.67	
C & E Loss (ft)	0.01	Cum SA (acres)		0.25	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1670

INPUT
Description: PT of Curve, Begin Transistion
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
66	1439.31	78	1442.38	90	1442.14	100	1437.14	110	1437.34
119.6	1442.14	145	1445.5	170	1444.5				

```
Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
      66     .04       90    .016    119.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            90   119.6              124   129.8     145            .1        .3
Left Levee      Station=      90      Elevation= 1442.14

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1440.97    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.20    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.78    Reach Len. (ft)            124.00     129.80     145.00
  Crit W.S. (ft)           1439.33    Flow Area (sq ft)                      60.38
  E.G. Slope (ft/ft)      0.000469    Area (sq ft)                           60.38
  Q Total (cfs)             214.00    Flow (cfs)                            214.00
  Top Width (ft)             24.14    Top Width (ft)                         24.14
  Vel Total (ft/s)            3.54    Avg. Vel. (ft/s)                        3.54
  Max Chl Dpth (ft)           3.64    Hydr. Depth (ft)                        2.50
  Conv. Total (cfs)         9880.3    Conv. (cfs)                           9880.3
  Length Wtd. (ft)           129.80   Wetted Per. (ft)                       25.81
  Min Ch El (ft)           1437.14    Shear (lb/sq ft)                        0.07
  Alpha                       1.00    Stream Power (lb/ft s)                  0.24
  Frctn Loss (ft)             0.06    Cum Volume (acre-ft)                    0.62
  C & E Loss (ft)             0.00    Cum SA (acres)                          0.24


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1540

INPUT
Description: PC of Curve
Station Elevation Data    num=       7
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
      70 1440.03      78 1442.03      90 1442.01     100 1437.01     110 1437.21
   119.6 1442.01     168 1442.15

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
      70     .04       90    .016    119.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            90   119.6            106.9   106.9   106.9            .1        .3
Left Levee      Station=      90      Elevation= 1442.01

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1440.91    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.18    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.73    Reach Len. (ft)            106.90     106.90     106.90
  Crit W.S. (ft)           1439.20    Flow Area (sq ft)                      62.37
  E.G. Slope (ft/ft)      0.000429    Area (sq ft)                           62.37
  Q Total (cfs)             214.00    Flow (cfs)                            214.00
  Top Width (ft)             24.47    Top Width (ft)                         24.47
  Vel Total (ft/s)            3.43    Avg. Vel. (ft/s)                        3.43
  Max Chl Dpth (ft)           3.72    Hydr. Depth (ft)                        2.55
  Conv. Total (cfs)        10331.0    Conv. (cfs)                          10331.0
  Length Wtd. (ft)           106.90   Wetted Per. (ft)                       26.18
  Min Ch El (ft)           1437.01    Shear (lb/sq ft)                        0.06
  Alpha                       1.00    Stream Power (lb/ft s)                  0.22
  Frctn Loss (ft)             0.04    Cum Volume (acre-ft)                    0.44
  C & E Loss (ft)             0.00    Cum SA (acres)                          0.16


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1433

INPUT
Description: PT of Curve
Station Elevation Data    num=       7
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
      70 1440.29      78 1442.14      90  1441.9     100  1436.9     110  1437.1
   119.6  1441.9     168 1441.92

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
      70     .04       90    .016    119.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            90   119.6               88    72.8      45            .1        .3
Left Levee      Station=      90      Elevation=  1441.9

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1440.86    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.17    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.69    Reach Len. (ft)             88.00     72.80      45.00
  Crit W.S. (ft)           1439.08    Flow Area (sq ft)                      64.16
```

E.G. Slope (ft/ft)	0.000397	Area (sq ft)	64.16
Q Total (cfs)	214.00	Flow (cfs)	214.00
Top Width (ft)	24.76	Top Width (ft)	24.76
Vel Total (ft/s)	3.34	Avg. Vel. (ft/s)	3.34
Max Chl Dpth (ft)	3.79	Hydr. Depth (ft)	2.59
Conv. Total (cfs)	10742.1	Conv. (cfs)	10742.1
Length Wtd. (ft)	72.80	Wetted Per. (ft)	26.51
Min Ch El (ft)	1436.90	Shear (lb/sq ft)	0.06
Alpha	1.00	Stream Power (lb/ft s)	0.20
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.28
C & E Loss (ft)	0.00	Cum SA (acres)	0.10

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1360

INPUT
Description: End of Transition
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
60	1442.02	90	1441.82	100	1436.83	110	1437.03	119.6	1441.82
132	1442.06								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
60	.04	90	.013	119.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
90	119.6	45.3	45.3	45.3	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.013	
W.S. Elev (ft)	1440.67	Reach Len. (ft)	45.30	45.30	45.30
Crit W.S. (ft)		Flow Area (sq ft)		65.46	
E.G. Slope (ft/ft)	0.000248	Area (sq ft)		65.46	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	24.99	Top Width (ft)		24.99	
Vel Total (ft/s)	3.27	Avg. Vel. (ft/s)		3.27	
Max Chl Dpth (ft)	3.84	Hydr. Depth (ft)		2.62	
Conv. Total (cfs)	13585.0	Conv. (cfs)		13585.0	
Length Wtd. (ft)	45.30	Wetted Per. (ft)		26.76	
Min Ch El (ft)	1436.83	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.12	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.17	
C & E Loss (ft)	0.05	Cum SA (acres)		0.06	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1315

INPUT
Description: Culvert Upstream Section
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1441.3	95	1441.57	99.9	1441.78	100	1436.78	110	1436.78
110.1	1441.78	115	1441.6	230.001	1442				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	99.9	.013	110.1	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
99.9	110.1	78	78	78	.1	.3

Left Levee Station= 95 Elevation= 1441.57

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.62	Wt. n-Val.		0.013	
W.S. Elev (ft)	1440.15	Reach Len. (ft)	78.00	78.00	78.00
Crit W.S. (ft)	1439.19	Flow Area (sq ft)		33.94	
E.G. Slope (ft/ft)	0.001187	Area (sq ft)		33.94	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	10.13	Top Width (ft)		10.13	
Vel Total (ft/s)	6.31	Avg. Vel. (ft/s)		6.31	
Max Chl Dpth (ft)	3.37	Hydr. Depth (ft)		3.35	
Conv. Total (cfs)	6212.7	Conv. (cfs)		6212.7	
Length Wtd. (ft)	78.00	Wetted Per. (ft)		16.74	
Min Ch El (ft)	1436.78	Shear (lb/sq ft)		0.15	
Alpha	1.00	Stream Power (lb/ft s)		0.95	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.12	
C & E Loss (ft)		Cum SA (acres)		0.04	

```
CULVERT                    RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1270

INPUT
Description: Hawes Road Crossing
Distance from Upstream XS =      12
Deck/Roadway Width        =      46
Weir Coefficient          =     2.6
Bridge Deck/Roadway Skew  =      45
Upstream  Deck/Roadway Coordinates
    num=       5
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  1441.3              50  1441.5             105    1442
     160  1441.8             230    1442

Upstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1441.3      95 1441.57    99.9 1441.78     100 1436.78     110 1436.78
   110.1 1441.78     115  1441.6 230.001    1442

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04    99.9    .013   110.1     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          99.9   110.1            .1       .3
Left Levee      Station=      95      Elevation= 1441.57

Downstream  Deck/Roadway Coordinates
    num=       5
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  1441.3              50  1441.5             105    1442
     160  1441.7             230    1442

Downstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1441.3      95  1441.5    99.9 1441.71     100 1436.71     110 1436.71
   110.1 1441.71     115  1441.6 230.001    1442

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04    99.9    .015   110.1     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          99.9   110.1            .1       .3
Left Levee      Station=      95      Elevation=  1441.5

Upstream Embankment side slope              =      50 horiz. to 1.0 vertical
Downstream Embankment side slope            =      50 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =  1441.5
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1          Box       4      10
FHWA Chart # 9 - flared wingwalls and Inlet top edge bevel
FHWA Scale # 2 - Wingwall flared 18 to 33.7 deg.; inlet top edge bevel=0.083D
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                  0      78       .013                   .2               .1
Upstream   Elevation =  1436.78
           Centerline Station =  105
Downstream Elevation =  1436.71
           Centerline Station =  105

CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1237

INPUT
Description: Culvert Downstream Section
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1441.3      95  1441.5    99.9 1441.71     100 1436.71     110 1436.71
   110.1 1441.71     115  1441.6 230.001    1442

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04    99.9    .015   110.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          99.9   110.1             67.3    67.3    67.3              .1       .3
Left Levee      Station=      95      Elevation=  1441.5
```

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.77	Wt. n-Val.		0.015	
W.S. Elev (ft)	1439.73	Reach Len. (ft)	67.30	67.30	67.30
Crit W.S. (ft)	1439.13	Flow Area (sq ft)		30.34	
E.G. Slope (ft/ft)	0.002165	Area (sq ft)		30.34	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	10.12	Top Width (ft)		10.12	
Vel Total (ft/s)	7.05	Avg. Vel. (ft/s)		7.05	
Max Chl Dpth (ft)	3.02	Hydr. Depth (ft)		3.00	
Conv. Total (cfs)	4598.9	Conv. (cfs)		4598.9	
Length Wtd. (ft)	67.30	Wetted Per. (ft)		16.03	
Min Ch El (ft)	1436.71	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		1.80	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		0.06	
C & E Loss (ft)	0.01	Cum SA (acres)		0.02	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1170

INPUT
Description: Channel Reconstruction
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.04	-4	1440.34	8	1440.37	38	1441.19	72	1440.74
77	1441.19	91	1441.14	100	1436.21	110	1436.21	119	1441.14
128	1441.37								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	20	20	20	.1	.3

Left Levee Station= 91 Elevation= 1441.14

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.90	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.43	Reach Len. (ft)	0.00	0.00	0.00
Crit W.S. (ft)	1439.19	Flow Area (sq ft)		51.11	
E.G. Slope (ft/ft)	0.002370	Area (sq ft)		51.11	
Q Total (cfs)	389.00	Flow (cfs)		389.00	
Top Width (ft)	21.75	Top Width (ft)		21.75	
Vel Total (ft/s)	7.61	Avg. Vel. (ft/s)		7.61	
Max Chl Dpth (ft)	3.22	Hydr. Depth (ft)		2.35	
Conv. Total (cfs)	7990.5	Conv. (cfs)		7990.5	
Length Wtd. (ft)	0.00	Wetted Per. (ft)		23.40	
Min Ch El (ft)	1436.21	Shear (lb/sq ft)		0.32	
Alpha	1.00	Stream Power (lb/ft s)		2.46	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)			
C & E Loss (ft)	0.00	Cum SA (acres)			

CROSS SECTION RIVER: South Hawes Chan
REACH: 202L/US60 TI - 2 RS: 1170

INPUT
Description: Channel Reconstruction
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.04	-4	1440.34	8	1440.37	38	1441.19	72	1440.74
77	1441.19	91	1441.14	100	1436.21	110	1436.21	119	1441.14
128	1441.37								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	20	20	20	.1	.3

Left Levee Station= 91 Elevation= 1441.14

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.90	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.43	Reach Len. (ft)	0.00	0.00	0.00
Crit W.S. (ft)	1439.19	Flow Area (sq ft)		51.11	
E.G. Slope (ft/ft)	0.002370	Area (sq ft)		51.11	
Q Total (cfs)	389.00	Flow (cfs)		389.00	
Top Width (ft)	21.75	Top Width (ft)		21.75	
Vel Total (ft/s)	7.61	Avg. Vel. (ft/s)		7.61	

Max Chl Dpth (ft)	3.22	Hydr. Depth (ft)	2.35
Conv. Total (cfs)	7990.5	Conv. (cfs)	7990.5
Length Wtd. (ft)	0.00	Wetted Per. (ft)	23.40
Min Ch El (ft)	1436.21	Shear (lb/sq ft)	0.32
Alpha	1.00	Stream Power (lb/ft s)	2.46
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	
C & E Loss (ft)	0.00	Cum SA (acres)	

CROSS SECTION RIVER: South Hawes Chan
REACH: 202L/US60 TI - 2 RS: 1150

INPUT
Description: Starting Channel Reconstruction
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442	-4	1440.3	8	1440.33	38	1441.15	72	1440.7
77	1441.15	91	1441.1	100	1436.06	110	1436.18	119	1441.1
128	1441.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	150	150	150	.1	.3

Left Levee Station= 91 Elevation= 1441.1

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.85	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.41	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)	1439.11	Flow Area (sq ft)		52.55	
E.G. Slope (ft/ft)	0.002187	Area (sq ft)		52.55	
Q Total (cfs)	389.00	Flow (cfs)		389.00	
Top Width (ft)	21.90	Top Width (ft)		21.90	
Vel Total (ft/s)	7.40	Avg. Vel. (ft/s)		7.40	
Max Chl Dpth (ft)	3.35	Hydr. Depth (ft)		2.40	
Conv. Total (cfs)	8319.1	Conv. (cfs)		8319.1	
Length Wtd. (ft)	150.00	Wetted Per. (ft)		23.61	
Min Ch El (ft)	1436.06	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		2.25	
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)		0.18	
C & E Loss (ft)	0.00	Cum SA (acres)		0.08	

CROSS SECTION RIVER: South Hawes Chan
REACH: 202L/US60 TI - 2 RS: 1000

INPUT
Description: Starting Downstream Channel Section
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1441.1	-4	1439.7	8	1440	38	1440.82	72	1440.2
77	1440.82	91	1440.77	100	1435.73	110	1435.85	119	1440.77
128	1441								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	0	0	0	.1	.3

Left Levee Station= 91 Elevation= 1440.77

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1439.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.86	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.08	Reach Len. (ft)			
Crit W.S. (ft)	1438.77	Flow Area (sq ft)		52.42	
E.G. Slope (ft/ft)	0.002201	Area (sq ft)		52.42	
Q Total (cfs)	389.00	Flow (cfs)		389.00	
Top Width (ft)	21.88	Top Width (ft)		21.88	
Vel Total (ft/s)	7.42	Avg. Vel. (ft/s)		7.42	
Max Chl Dpth (ft)	3.35	Hydr. Depth (ft)		2.40	
Conv. Total (cfs)	8290.8	Conv. (cfs)		8290.8	
Length Wtd. (ft)		Wetted Per. (ft)		23.58	
Min Ch El (ft)	1435.73	Shear (lb/sq ft)		0.31	
Alpha	1.00	Stream Power (lb/ft s)		2.27	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Hawes Rd Channel

Reach	River Sta.	n1	n2	n3
202L/US60 TI - 2	1540	.04	.016	.04
202L/US60 TI - 2	1370	.04	.016	.04
202L/US60 TI - 2	1170	.04	.016	.04

River:Southern Ave Sys

Reach	River Sta.	n1	n2	n3
202L/US60 TI - 2	3490	.04	.025	.04
202L/US60 TI - 2	3365	.04	.015	.04
202L/US60 TI - 2	3000	Culvert		
202L/US60 TI - 2	2381	.04	.015	.04
202L/US60 TI - 2	2261	.04	.016	.04
202L/US60 TI - 2	2201	.04	.016	.04
202L/US60 TI - 2	2100	.04	.016	.04
202L/US60 TI - 2	1947	.04	.016	.04
202L/US60 TI - 2	1909	.04	.016	.04
202L/US60 TI - 2	1897	.04	.016	.04
202L/US60 TI - 2	1877	.04	.016	.04
202L/US60 TI - 2	1857	.04	.016	.04
202L/US60 TI - 2	1837	.04	.016	.04
202L/US60 TI - 2	1817	.04	.016	.04
202L/US60 TI - 2	1797	.04	.016	.04
202L/US60 TI - 2	1777	.04	.016	.04
202L/US60 TI - 2	1762	.04	.016	.04
202L/US60 TI - 2	1744	.04	.016	.04
202L/US60 TI - 2	1706	.04	.016	.04
202L/US60 TI - 2	1700	.04	.016	.04
202L/US60 TI - 2	1670	.04	.016	.04
202L/US60 TI - 2	1540	.04	.016	.04
202L/US60 TI - 2	1433	.04	.016	.04
202L/US60 TI - 2	1360	.04	.013	.04
202L/US60 TI - 2	1315	.04	.013	.04
202L/US60 TI - 2	1270	Culvert		
202L/US60 TI - 2	1237	.04	.015	.04
202L/US60 TI - 2	1170	.04	.016	.04

River:South Hawes Chan

Reach	River Sta.	n1	n2	n3
202L/US60 TI - 2	1170	.04	.016	.04
202L/US60 TI - 2	1150	.04	.016	.04
202L/US60 TI - 2	1000	.04	.016	.04

SUMMARY OF REACH LENGTHS

River: Hawes Rd Channel

Reach	River Sta.	Left	Channel	Right
202L/US60 TI - 2	1540	170	170	170
202L/US60 TI - 2	1370	200	200	200
202L/US60 TI - 2	1170	20	20	20

River: Southern Ave Sys

Reach	River Sta.	Left	Channel	Right
202L/US60 TI - 2	3490	125	125	125
202L/US60 TI - 2	3365	983.8	983.8	983.8
202L/US60 TI - 2	3000	Culvert		
202L/US60 TI - 2	2381	120.3	120.3	120.3
202L/US60 TI - 2	2261	60	60	60
202L/US60 TI - 2	2201	101	101	101
202L/US60 TI - 2	2100	153	153	153
202L/US60 TI - 2	1947	38	38	38
202L/US60 TI - 2	1909	12	12	12
202L/US60 TI - 2	1897	20	20	20
202L/US60 TI - 2	1877	20	20	20
202L/US60 TI - 2	1857	20	20	20
202L/US60 TI - 2	1837	20	20	20
202L/US60 TI - 2	1817	20	20	20
202L/US60 TI - 2	1797	20	20	20
202L/US60 TI - 2	1777	15	15	15
202L/US60 TI - 2	1762	18	18	18
202L/US60 TI - 2	1744	38	38	38
202L/US60 TI - 2	1706	6	6	6
202L/US60 TI - 2	1700	30.3	30.3	30.3

202L/US60 TI - 2	1670	124	129.8	145
202L/US60 TI - 2	1540	106.9	106.9	106.9
202L/US60 TI - 2	1433	88	72.8	45
202L/US60 TI - 2	1360	45.3	45.3	45.3
202L/US60 TI - 2	1315	78	78	78
202L/US60 TI - 2	1270	Culvert		
202L/US60 TI - 2	1237	67.3	67.3	67.3
202L/US60 TI - 2	1170	20	20	20

River: South Hawes Chan

Reach	River Sta.	Left	Channel	Right
202L/US60 TI - 2	1170	20	20	20
202L/US60 TI - 2	1150	150	150	150
202L/US60 TI - 2	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Hawes Rd Channel

Reach	River Sta.	Contr.	Expan.
202L/US60 TI - 2	1540	.1	.3
202L/US60 TI - 2	1370	.1	.3
202L/US60 TI - 2	1170	.1	.3

River: Southern Ave Sys

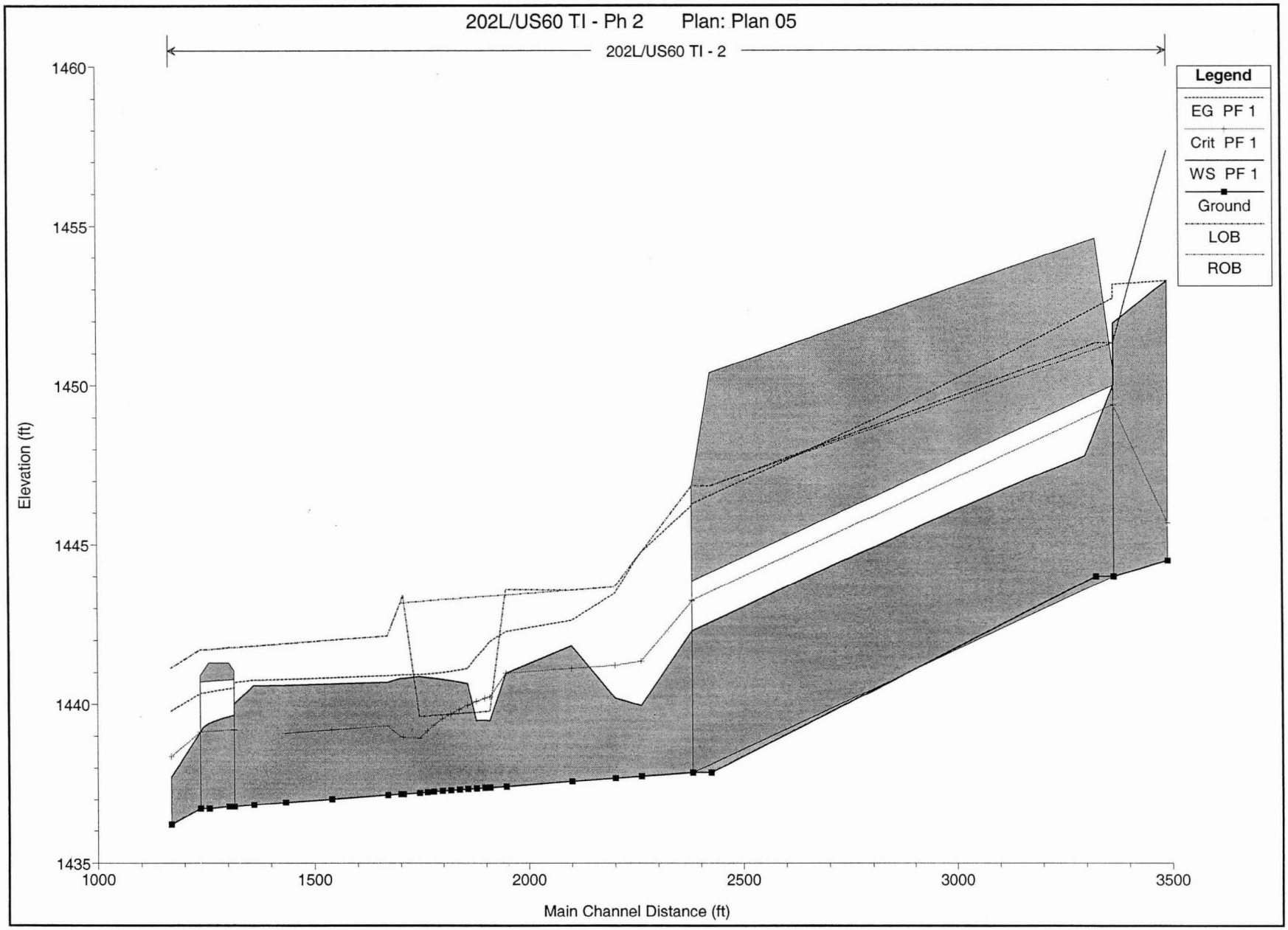
Reach	River Sta.	Contr.	Expan.
202L/US60 TI - 2	3490	.1	.3
202L/US60 TI - 2	3365	.1	.3
202L/US60 TI - 2	3000	Culvert	
202L/US60 TI - 2	2381	.1	.3
202L/US60 TI - 2	2261	.1	.3
202L/US60 TI - 2	2201	.1	.3
202L/US60 TI - 2	2100	.1	.3
202L/US60 TI - 2	1947	.1	.3
202L/US60 TI - 2	1909	.1	.3
202L/US60 TI - 2	1897	.1	.3
202L/US60 TI - 2	1877	.1	.3
202L/US60 TI - 2	1857	.1	.3
202L/US60 TI - 2	1837	.1	.3
202L/US60 TI - 2	1817	.1	.3
202L/US60 TI - 2	1797	.1	.3
202L/US60 TI - 2	1777	.1	.3
202L/US60 TI - 2	1762	.1	.3
202L/US60 TI - 2	1744	.1	.3
202L/US60 TI - 2	1706	.1	.3
202L/US60 TI - 2	1700	.1	.3
202L/US60 TI - 2	1670	.1	.3
202L/US60 TI - 2	1540	.1	.3
202L/US60 TI - 2	1433	.1	.3
202L/US60 TI - 2	1360	.1	.3
202L/US60 TI - 2	1315	.1	.3
202L/US60 TI - 2	1270	Culvert	
202L/US60 TI - 2	1237	.1	.3
202L/US60 TI - 2	1170	.1	.3

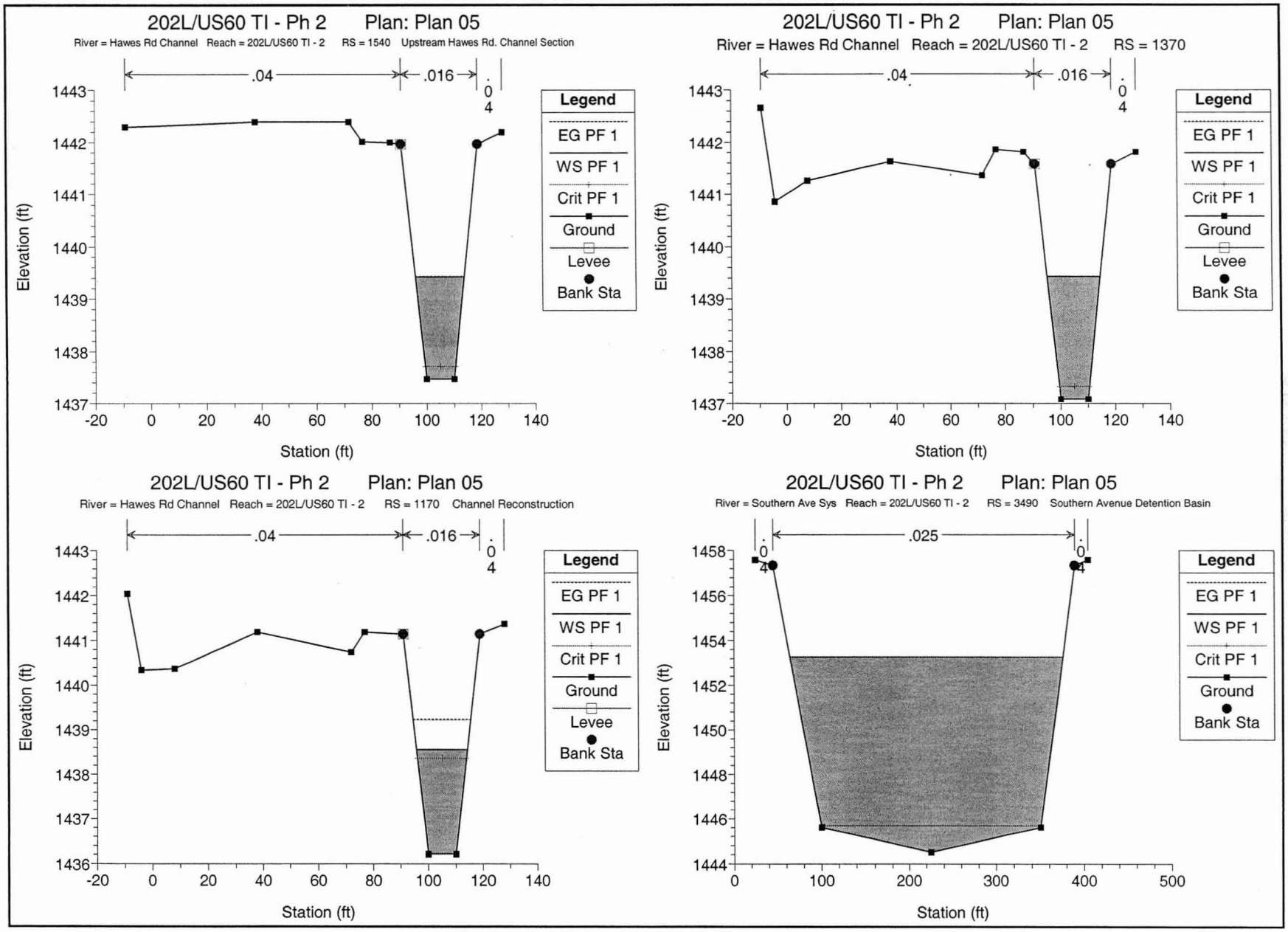
River: South Hawes Chan

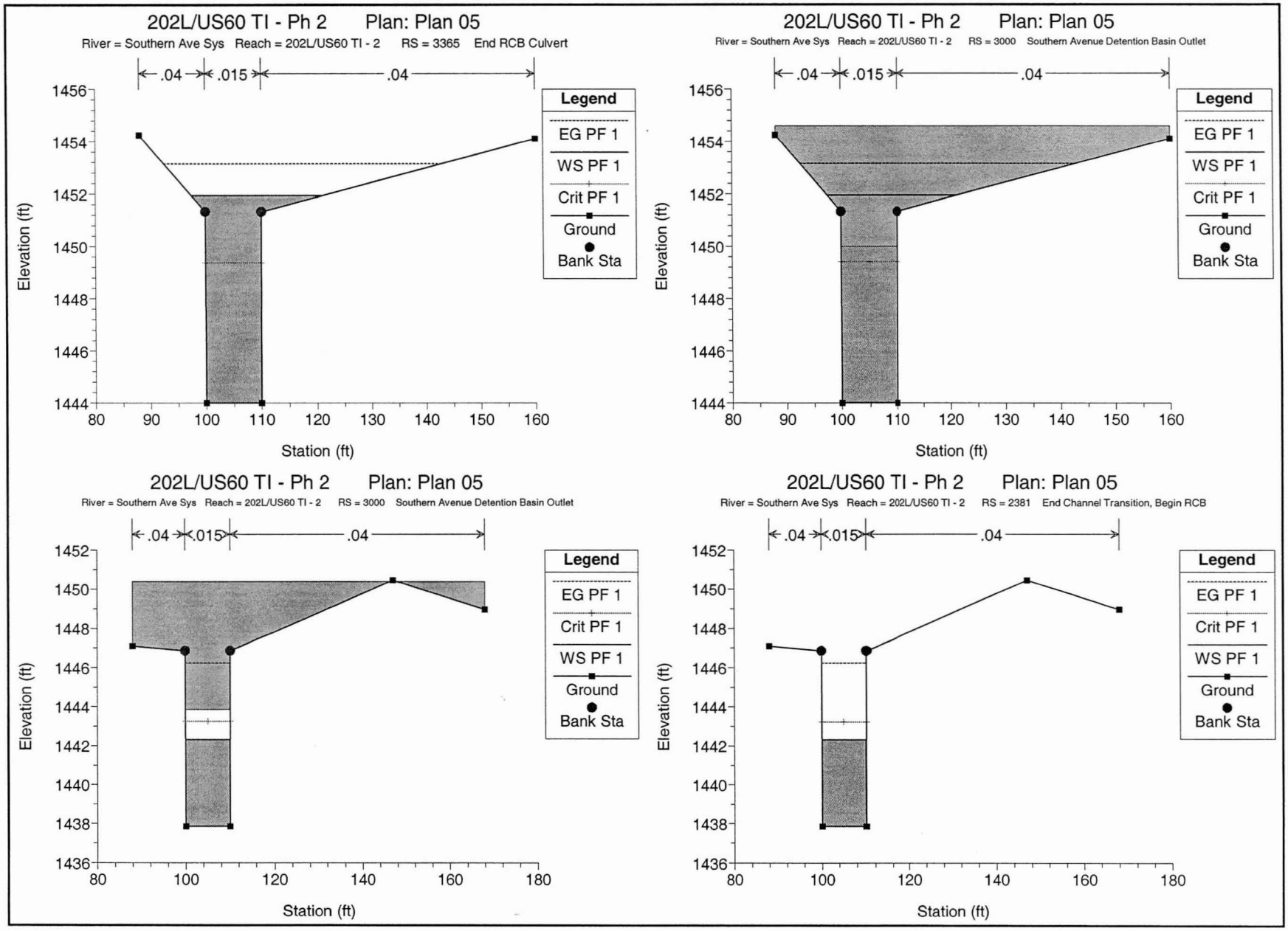
Reach	River Sta.	Contr.	Expan.
202L/US60 TI - 2	1170	.1	.3
202L/US60 TI - 2	1150	.1	.3
202L/US60 TI - 2	1000	.1	.3

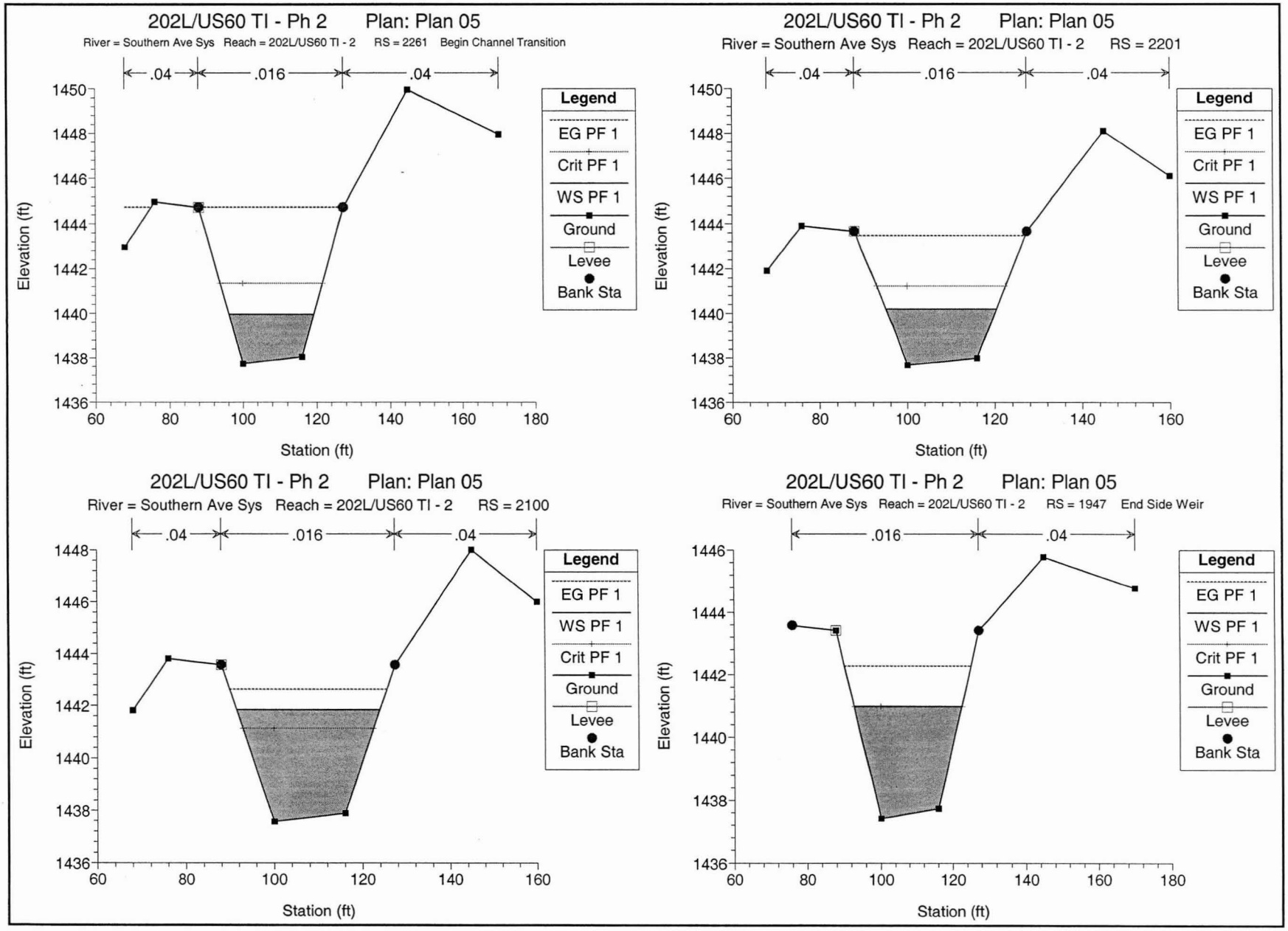
HEC-RAS Plan: Final Plans Profile: PF 1

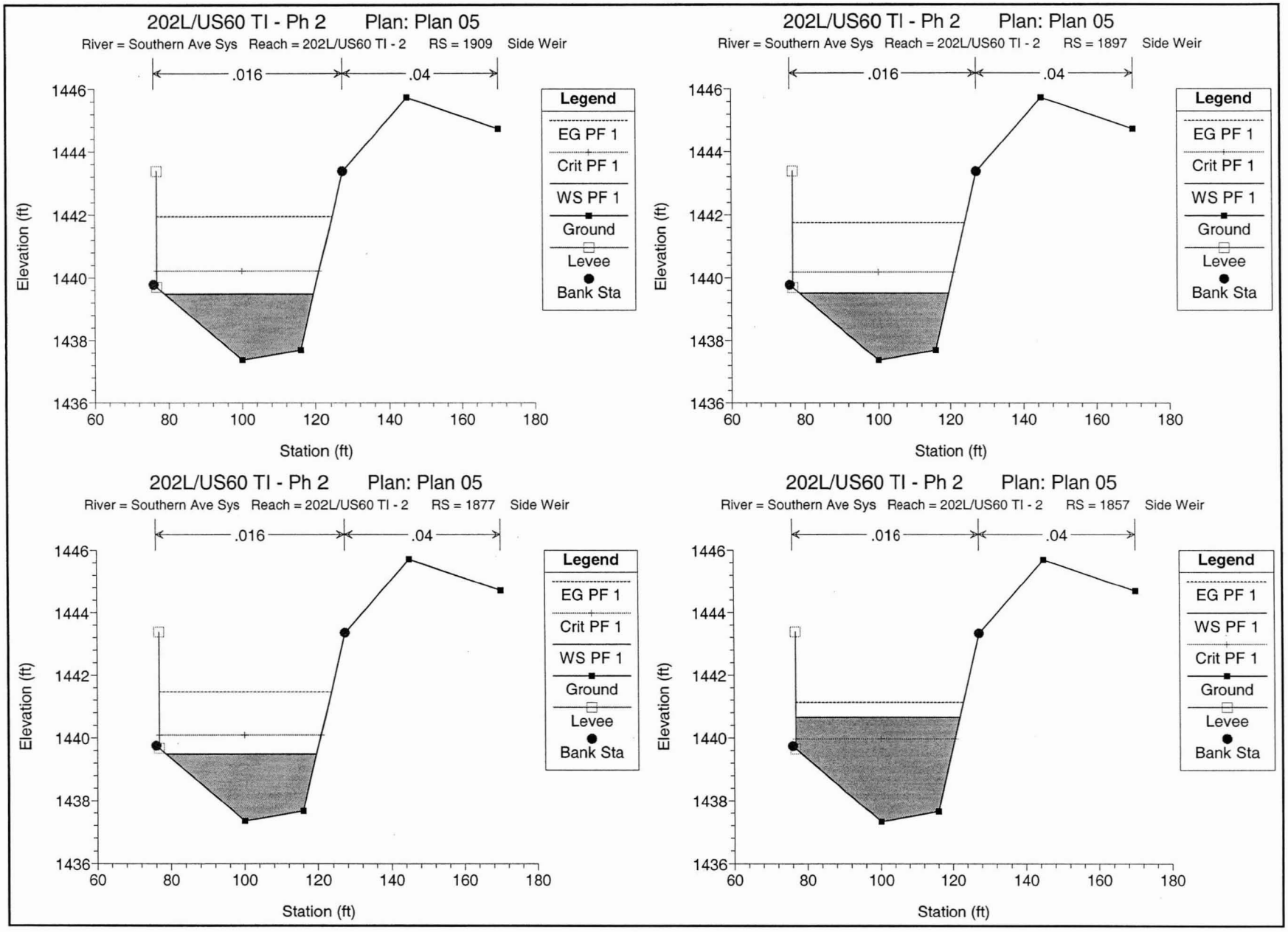
River	Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
South Hawes Chan	202L/US60 TI - 2	1170	221.00	1436.21	1438.56	1438.36	1439.23	0.002495	6.59	33.51	18.57	0.87
South Hawes Chan	202L/US60 TI - 2	1150	221.00	1436.06	1438.55	1438.27	1439.17	0.002200	6.32	34.99	18.79	0.82
South Hawes Chan	202L/US60 TI - 2	1000	221.00	1435.73	1438.22	1437.94	1438.84	0.002201	6.32	34.99	18.78	0.82
Southern Ave Sys	202L/US60 TI - 2	3490	712.00	1444.50	1453.27	1445.68	1453.27	0.000002	0.31	2293.30	312.07	0.02
Southern Ave Sys	202L/US60 TI - 2	3365	712.00	1444.00	1451.95	1449.37	1453.15	0.001646	8.83	84.47	23.75	0.55
Southern Ave Sys	202L/US60 TI - 2	3000	Culvert									
Southern Ave Sys	202L/US60 TI - 2	2381	712.00	1437.85	1442.31	1443.23	1446.23	0.008150	15.89	44.81	10.10	0.55
Southern Ave Sys	202L/US60 TI - 2	2261	712.00	1437.73	1439.96	1441.35	1444.74	0.017927	17.54	40.58	23.09	2.33
Southern Ave Sys	202L/US60 TI - 2	2201	712.00	1437.67	1440.19	1441.22	1443.47	0.010828	14.53	48.99	25.45	1.85
Southern Ave Sys	202L/US60 TI - 2	2100	712.00	1437.57	1441.84	1441.12	1442.63	0.001442	7.16	99.42	32.42	0.72
Southern Ave Sys	202L/US60 TI - 2	1947	712.00	1437.41	1440.98	1440.98	1442.28	0.002875	9.15	77.82	29.63	0.99
Southern Ave Sys	202L/US60 TI - 2	1909	712.00	1437.38	1439.48	1440.23	1441.96	0.012155	12.63	56.36	40.59	1.89
Southern Ave Sys	202L/US60 TI - 2	1897	694.00	1437.37	1439.50	1440.18	1441.76	0.010853	12.04	57.63	40.96	1.79
Southern Ave Sys	202L/US60 TI - 2	1877	653.00	1437.35	1439.49	1440.08	1441.47	0.009540	11.30	57.78	41.01	1.68
Southern Ave Sys	202L/US60 TI - 2	1857	607.00	1437.33	1440.65	1439.97	1441.13	0.001143	5.53	109.83	45.21	0.62
Southern Ave Sys	202L/US60 TI - 2	1837	556.00	1437.31	1440.70	1439.84	1441.08	0.000882	4.93	112.83	45.34	0.55
Southern Ave Sys	202L/US60 TI - 2	1817	500.00	1437.29	1440.74	1439.70	1441.03	0.000660	4.32	115.71	45.47	0.48
Southern Ave Sys	202L/US60 TI - 2	1797	439.00	1437.27	1440.78	1439.54	1441.00	0.000473	3.71	118.45	45.59	0.41
Southern Ave Sys	202L/US60 TI - 2	1777	374.00	1437.25	1440.82	1439.34	1440.97	0.000321	3.09	121.02	45.70	0.33
Southern Ave Sys	202L/US60 TI - 2	1762	322.00	1437.23	1440.85	1439.16	1440.95	0.000226	2.62	123.11	45.79	0.28
Southern Ave Sys	202L/US60 TI - 2	1744	256.00	1437.21	1440.87	1438.93	1440.94	0.000135	2.04	125.21	45.88	0.22
Southern Ave Sys	202L/US60 TI - 2	1706	214.00	1437.17	1440.81	1438.97	1440.93	0.000240	2.67	80.07	29.94	0.29
Southern Ave Sys	202L/US60 TI - 2	1700	214.00	1437.17	1440.81	1438.98	1440.92	0.000240	2.67	80.02	29.93	0.29
Southern Ave Sys	202L/US60 TI - 2	1670	214.00	1437.14	1440.70	1439.33	1440.90	0.000513	3.66	58.44	23.82	0.41
Southern Ave Sys	202L/US60 TI - 2	1540	214.00	1437.01	1440.64	1439.20	1440.84	0.000471	3.55	60.28	24.13	0.40
Southern Ave Sys	202L/US60 TI - 2	1433	214.00	1436.90	1440.60	1439.08	1440.79	0.000437	3.45	61.95	24.40	0.38
Southern Ave Sys	202L/US60 TI - 2	1360	214.00	1436.83	1440.58		1440.76	0.000273	3.39	63.21	24.62	0.37
Southern Ave Sys	202L/US60 TI - 2	1315	214.00	1436.78	1440.01	1439.19	1440.68	0.001337	6.58	32.52	10.13	0.65
Southern Ave Sys	202L/US60 TI - 2	1270	Culvert									
Southern Ave Sys	202L/US60 TI - 2	1237	214.00	1436.71	1439.14	1439.14	1440.33	0.004060	8.78	24.37	10.10	1.00
Southern Ave Sys	202L/US60 TI - 2	1170	221.00	1436.21	1437.71	1438.36	1439.79	0.012575	11.59	19.06	15.47	1.84
Hawes Rd Channel	202L/US60 TI - 2	1540	7.00	1437.47	1439.43	1437.71	1439.43	0.000005	0.26	27.23	17.83	0.04
Hawes Rd Channel	202L/US60 TI - 2	1370	7.00	1437.08	1439.43	1437.32	1439.43	0.000002	0.20	34.49	19.39	0.03
Hawes Rd Channel	202L/US60 TI - 2	1170	221.00	1436.21	1438.56	1438.36	1439.23	0.002495	6.59	33.51	18.57	0.87

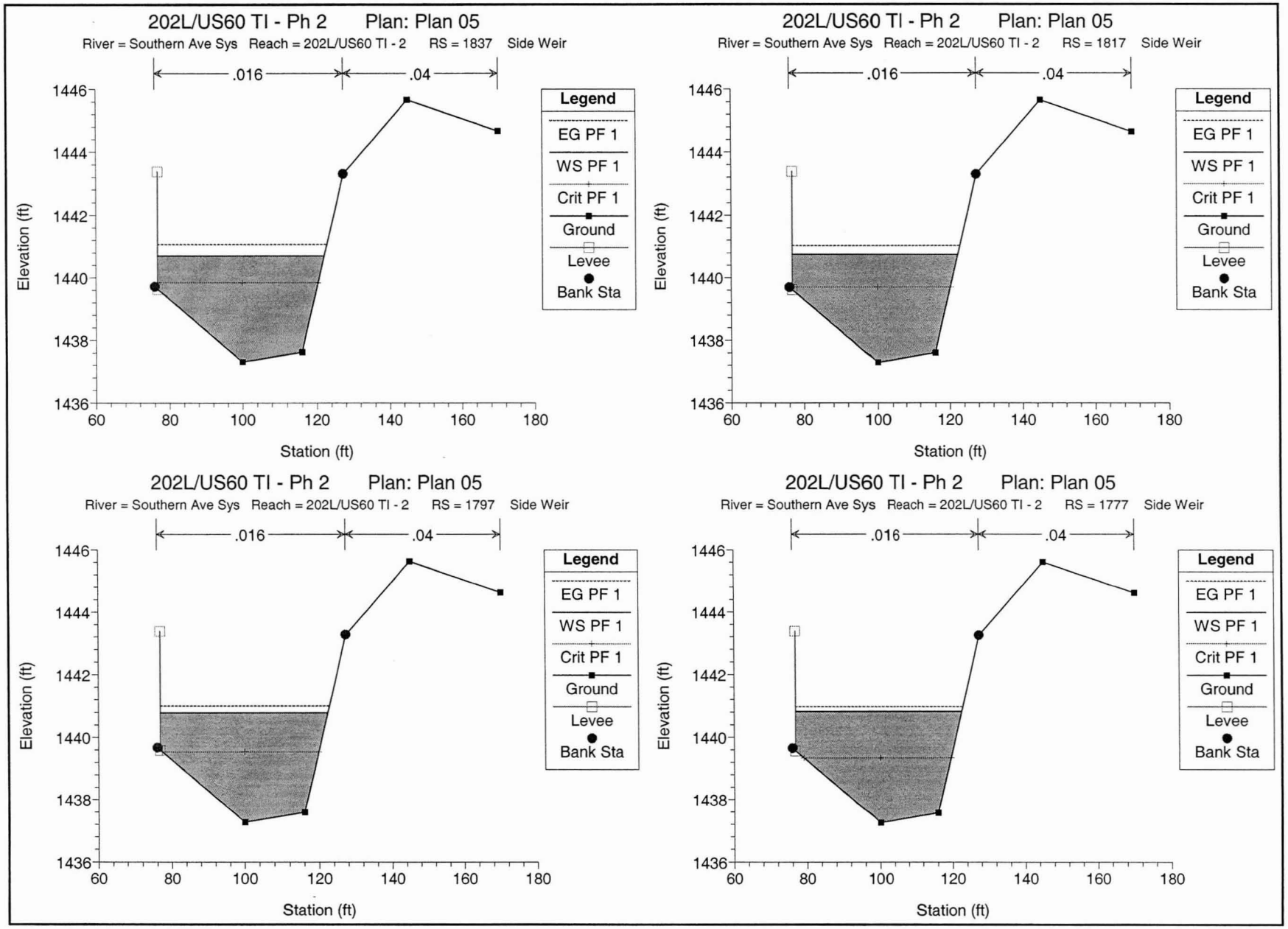

202L/US60 TI - Ph 2 Plan: Plan 05
202L/US60 TI - 2
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
LOB
ROB
Elevation (ft)
1460
1455
1450
1445
1440
1435
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)

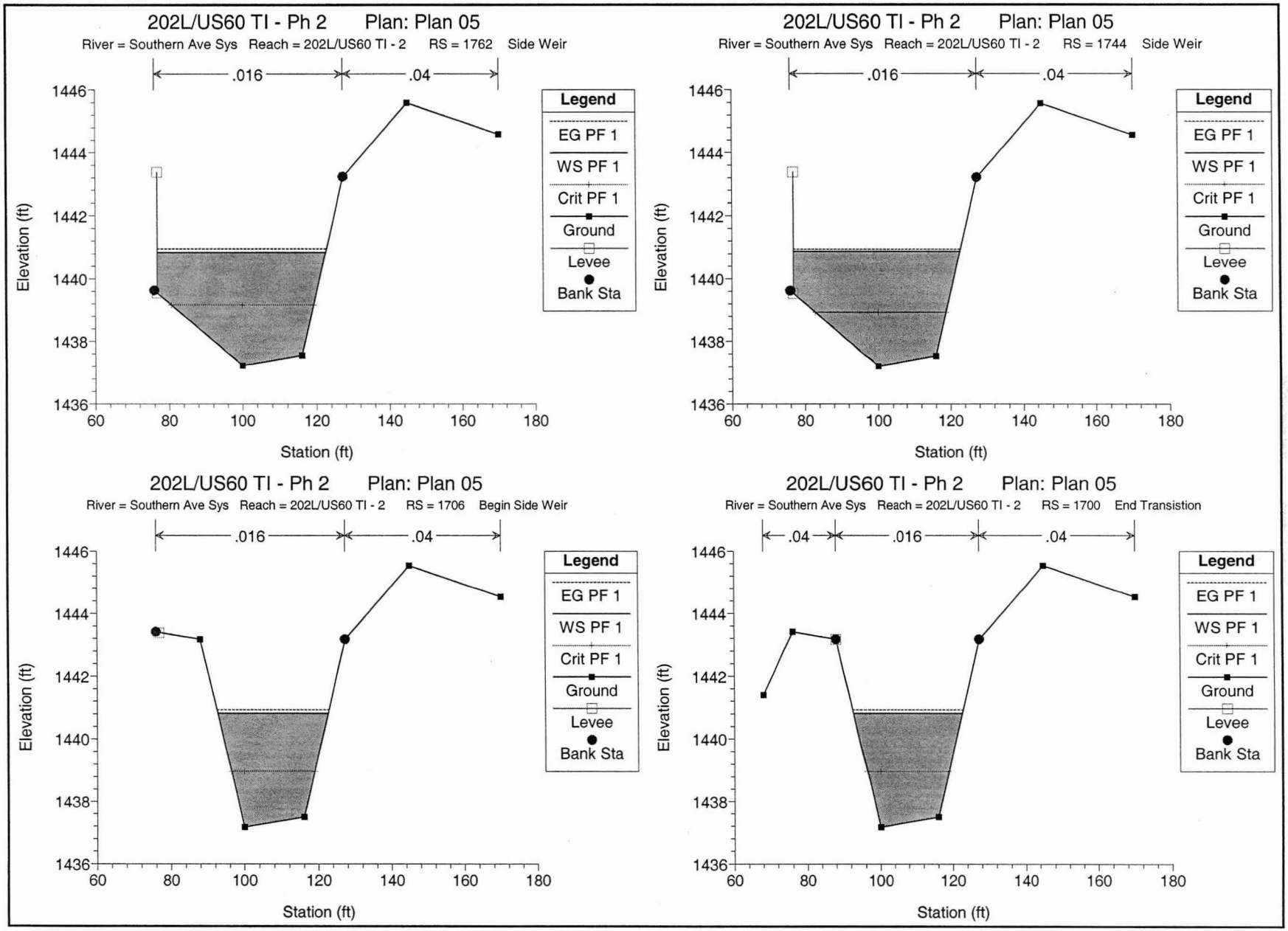

202L/US60 TI - Ph 2 Plan: Plan 05
River = Hawes Rd Channel Reach = 202L/US60 TI - 2 RS = 1540 Upstream Hawes Rd. Channel Section
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Hawes Rd Channel Reach = 202L/US60 TI - 2 RS = 1370
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Hawes Rd Channel Reach = 202L/US60 TI - 2 RS = 1170 Channel Reconstruction
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 3490 Southern Avenue Detention Basin
.04
.025
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

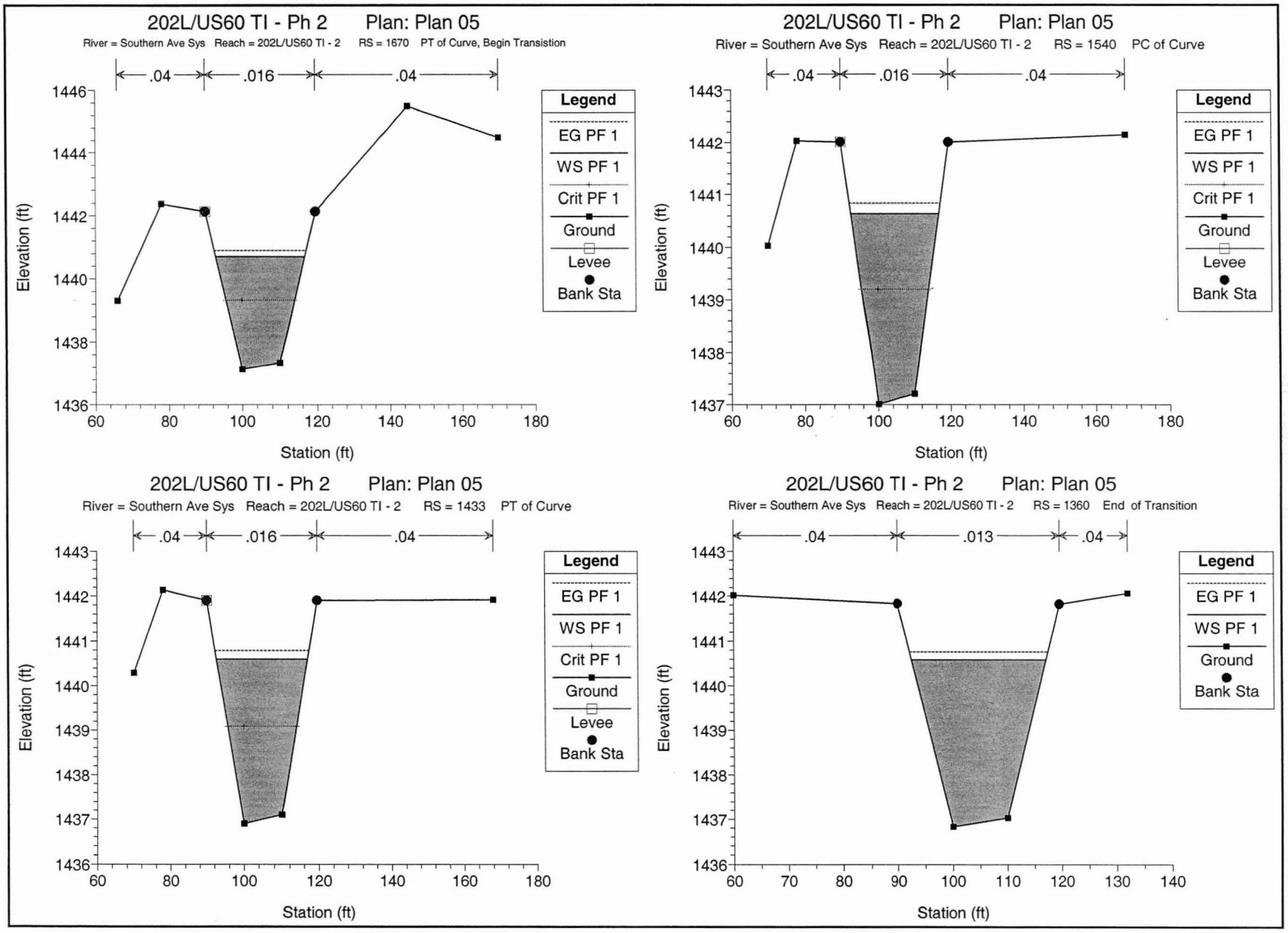

202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 3365 End RCB Culvert
.04
.015
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 3000 Southern Avenue Detention Basin Outlet
.04
.015
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 3000 Southern Avenue Detention Basin Outlet
.04
.015
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 2381 End Channel Transition, Begin RCB
.04
.015
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

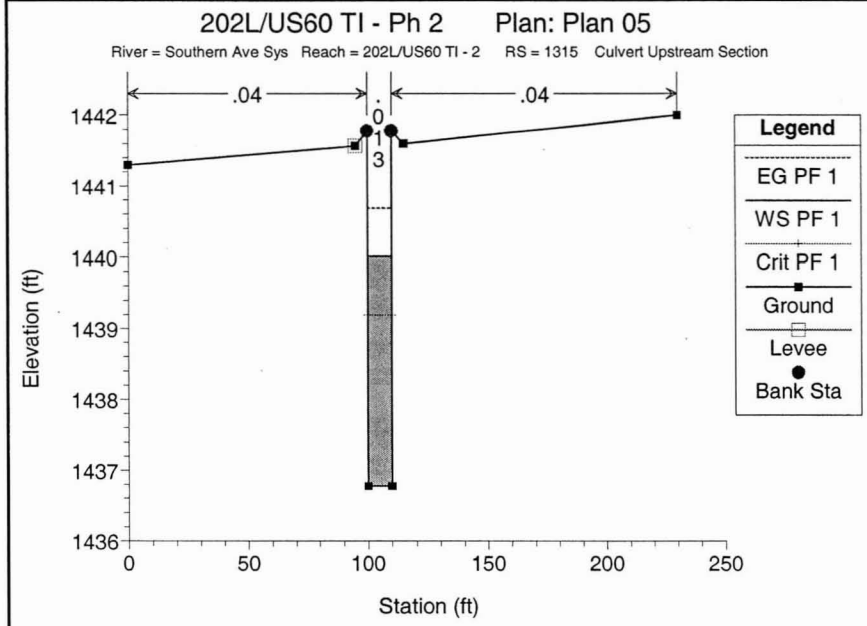

202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 2261 Begin Channel Transition
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 2201
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 2100
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1947 End Side Weir
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta

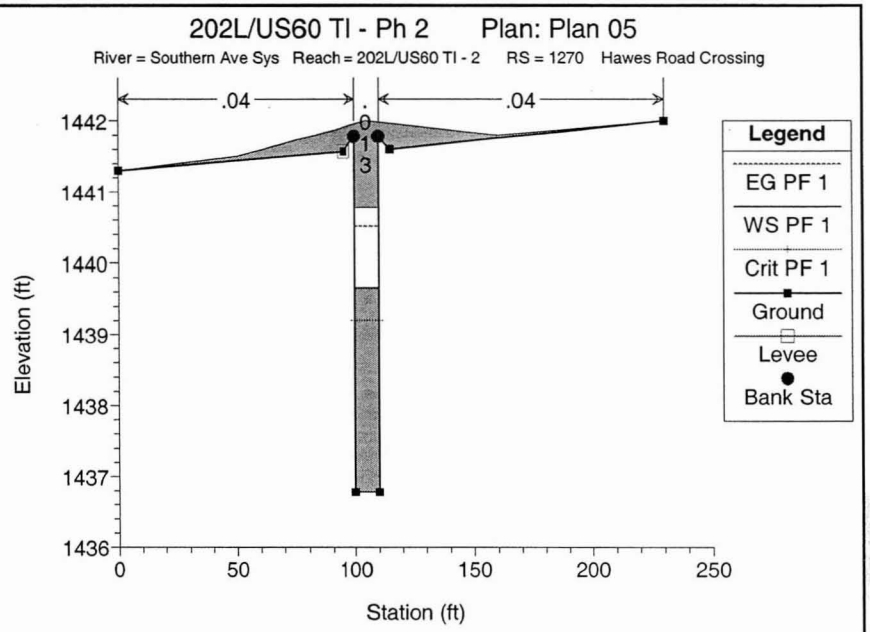

202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1909 Side Weir
.016
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1897 Side Weir
.016
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1877 Side Weir
.016
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1857 Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

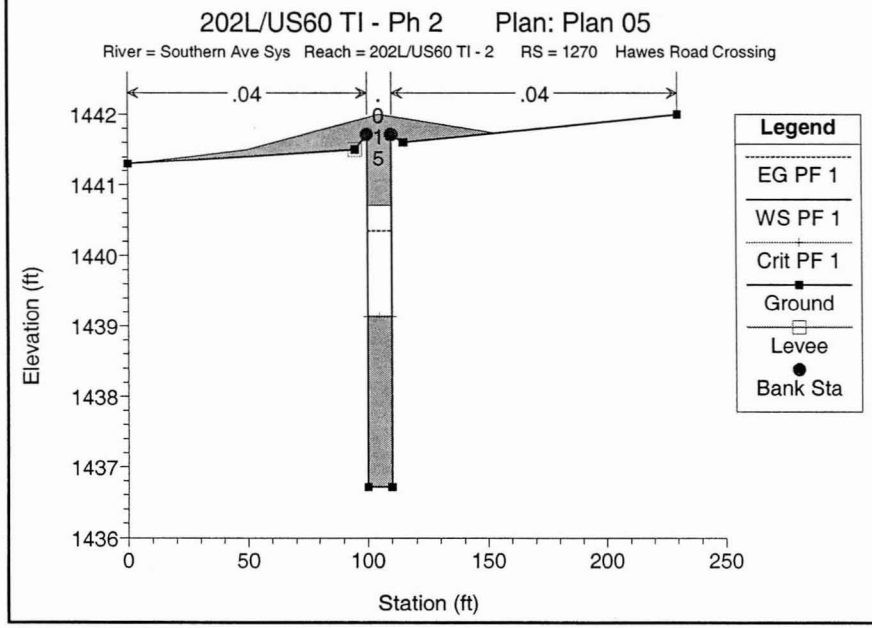

202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1837 Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1817 Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1797 Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1777 Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

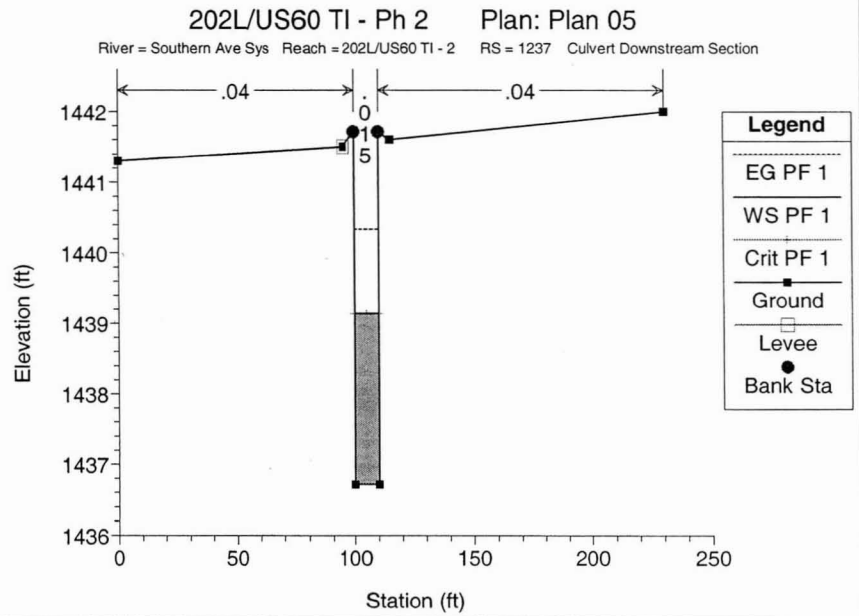

202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1762 Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1744 Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1706 Begin Side Weir
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1700 End Transistion
.04
.016
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)

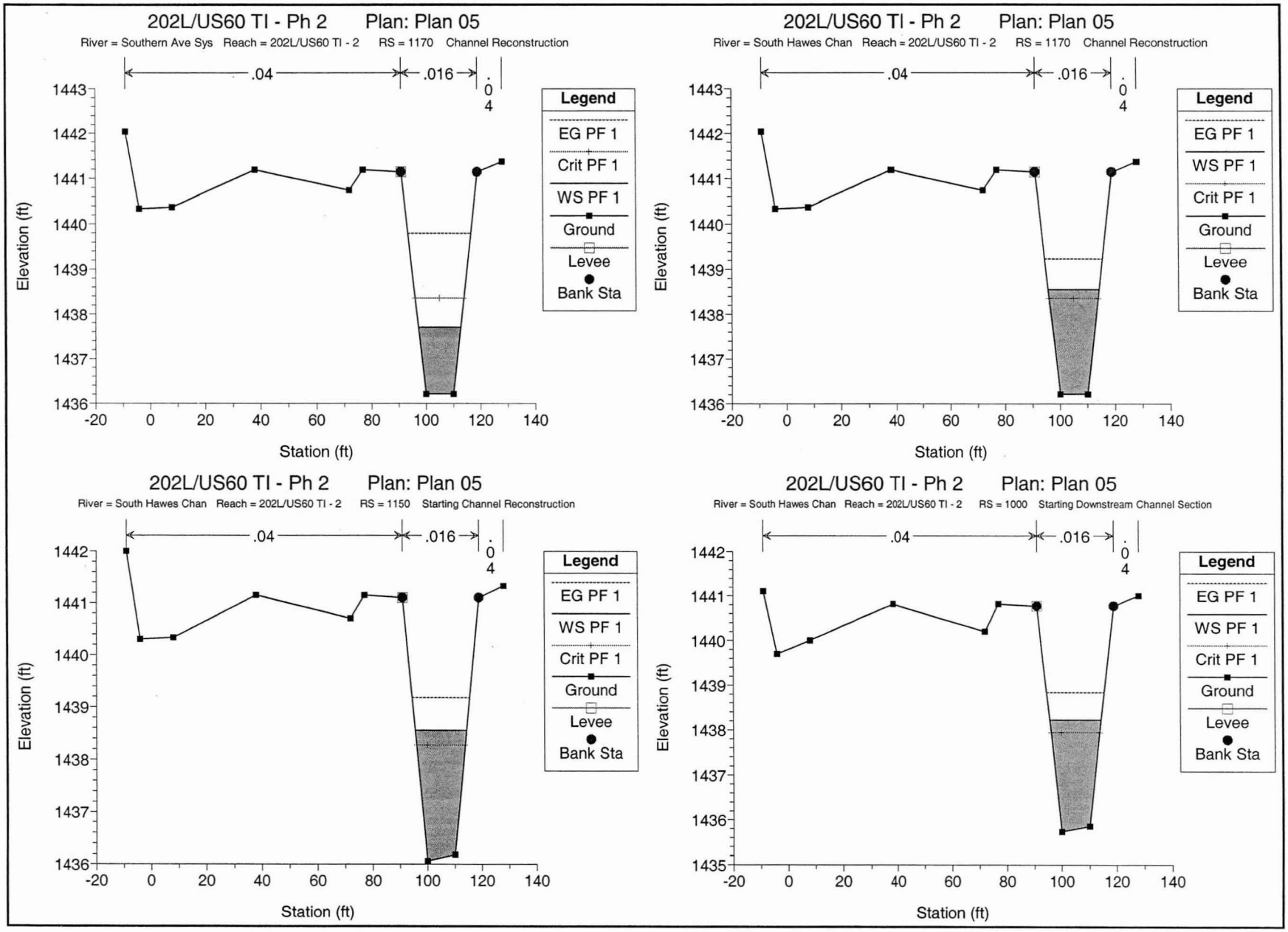

202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1670 PT of Curve, Begin Transistion
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1540 PC of Curve
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1433 PT of Curve
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1360 End of Transition
.04
.013
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta


202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1315 Culvert Upstream Section
.04
.04
.013
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta


202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1270 Hawes Road Crossing
.04
.04
.013
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta


202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1270 Hawes Road Crossing
.04
.04
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta


202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1237 Culvert Downstream Section
.04
.04
.015
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta


202L/US60 TI - Ph 2 Plan: Plan 05
River = Southern Ave Sys Reach = 202L/US60 TI - 2 RS = 1170 Channel Reconstruction
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = South Hawes Chan Reach = 202L/US60 TI - 2 RS = 1170 Channel Reconstruction
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = South Hawes Chan Reach = 202L/US60 TI - 2 RS = 1150 Starting Channel Reconstruction
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
202L/US60 TI - Ph 2 Plan: Plan 05
River = South Hawes Chan Reach = 202L/US60 TI - 2 RS = 1000 Starting Downstream Channel Section
.04
.016
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

PROJECT DATA
Project Title: 202L/US60 TI - Ph 2
Project File : WSP100SC.prj
Run Date and Time: 4/26/2005 9:40:13 AM

Project in English units

Project Description:
202L/US60 Traffic Interchange - Phase 2
This model is to determine the
channel hydraulics for the 100-year peak flow in the Southern Avenue Channel.
The coincident peak flows in the Hawes Road Channel are taken from the
hydrographs generated by the HEC-1 model NE200250.

PLAN DATA

Plan Title: Plan 05
Plan File : 1:\11194\Phase2\HEC-RAS\V301\WSP100SC.p05

Geometry Title: 202L/US60 TI - Phase 2 FP
Geometry File : 1:\11194\Phase2\HEC-RAS\V301\WSP100SC.g02

Flow Title : 202L/US60 TI - Phase 2 FP
Flow File : 1:\11194\Phase2\HEC-RAS\V301\WSP100SC.f02

Plan Summary Information:
Number of: Cross Sections = 32 Mulitple Openings = 0
Culverts = 2 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: 202L/US60 TI - Phase 2 FP
Flow File : 1:\11194\Phase2\HEC-RAS\V301\WSP100SC.f02

Flow Data (cfs)

River	Reach	RS	PF 1
Hawes Rd Channel	202L/US60 TI -	21540	7
Hawes Rd Channel	202L/US60 TI -	21170	221
Southern Ave Sys	202L/US60 TI -	23490	712
Southern Ave Sys	202L/US60 TI -	21897	694
Southern Ave Sys	202L/US60 TI -	21877	653
Southern Ave Sys	202L/US60 TI -	21857	607
Southern Ave Sys	202L/US60 TI -	21837	556
Southern Ave Sys	202L/US60 TI -	21817	500
Southern Ave Sys	202L/US60 TI -	21797	439
Southern Ave Sys	202L/US60 TI -	21777	374
Southern Ave Sys	202L/US60 TI -	21762	322
Southern Ave Sys	202L/US60 TI -	21744	256

Southern Ave Sys202L/US60 TI - 21706	, 214
Southern Ave Sys202L/US60 TI - 21170	221
South Hawes Chan202L/US60 TI - 21170	221
South Hawes Chan202L/US60 TI - 21000	221

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Hawes Rd Channel	202L/US60 TI - 2	PF 1	Normal S = .0022	
Southern Ave Sys	202L/US60 TI - 2	PF 1	Normal S = 1E-11	
South Hawes Chan	202L/US60 TI - 2	PF 1		Normal S = .0022

GEOMETRY DATA

Geometry Title: 202L/US60 TI - Phase 2 FP
Geometry File : 1:\11194\Phase2\HEC-RAS\V301\WSP100SC.g02

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Hawes Rd Channel	202L/US60 TI - 2		Confluence
Southern Ave Sys	202L/US60 TI - 2		Confluence
South Hawes Chan	202L/US60 TI - 2	Confluence	

JUNCTION INFORMATION

Name: Confluence
Description: Junction of Southern Ave Syst. w/ Hawes Rd Channel
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
Hawes Rd Channel	202L/US60 TI - 2 to	South Hawes Chan	202L/US60 TI - 2	0	
Southern Ave Sys	202L/US60 TI - 2 to	South Hawes Chan	202L/US60 TI - 2	0	

CROSS SECTION RIVER: Hawes Rd Channel
REACH: 202L/US60 TI - 2 RS: 1540

INPUT
Description: Upstream Hawes Rd. Channel Section
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.3	38	1442.4	72	1442.4	77	1442.02	87	1442
91	1441.97	100	1437.47	110	1437.47	119	1441.97	128	1442.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	170	170	170	.1	.3

Left Levee Station= 91 Elevation= 1441.97

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1440.84	Element			
Vel Head (ft)	0.20	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.64	Reach Len. (ft)	106.90	106.90	106.90
Crit W.S. (ft)	1439.20	Flow Area (sq ft)		60.28	
E.G. Slope (ft/ft)	0.000471	Area (sq ft)		60.28	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	24.13	Top Width (ft)		24.13	
Vel Total (ft/s)	3.55	Avg. Vel. (ft/s)		3.55	
Max Chl Dpth (ft)	3.63	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	9857.7	Conv. (cfs)		9857.7	
Length Wtd. (ft)	106.90	Wetted Per. (ft)		25.80	
Min Ch El (ft)	1437.01	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.24	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)		0.39	
C & E Loss (ft)	0.00	Cum SA (acres)		0.16	

CROSS SECTION RIVER: Hawes Rd Channel
REACH: 202L/US60 TI - 2 RS: 1370

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.66	-4	1440.86	8	1441.26	38	1441.63	72	1441.36
77	1441.86	87	1441.81	91	1441.58	100	1437.08	110	1437.08
119	1441.58	128	1441.81						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	200	200	200	.1	.3

Left Levee Station= 91 Elevation= 1441.58

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1439.43	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.43	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1437.32	Flow Area (sq ft)		34.49	
E.G. Slope (ft/ft)	0.000002	Area (sq ft)		34.49	
Q Total (cfs)	7.00	Flow (cfs)		7.00	
Top Width (ft)	19.39	Top Width (ft)		19.39	
Vel Total (ft/s)	0.20	Avg. Vel. (ft/s)		0.20	
Max Chl Dpth (ft)	2.35	Hydr. Depth (ft)		1.78	
Conv. Total (cfs)	4531.0	Conv. (cfs)		4531.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		20.50	
Min Ch El (ft)	1437.08	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)		0.16	
C & E Loss (ft)	0.07	Cum SA (acres)		0.09	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Hawes Rd Channel
REACH: 202L/US60 TI - 2 RS: 1170

INPUT
Description: Channel Reconstruction
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.04	-4	1440.34	8	1440.37	38	1441.19	72	1440.74
77	1441.19	91	1441.14	100	1436.21	110	1436.21	119	1441.14
128	1441.37								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91	119	20	20	20	.1	.3

Left Levee Station= 91 Elevation= 1441.14

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1439.23	Element			
Vel Head (ft)	0.68	Wt. n-Val.		0.016	
W.S. Elev (ft)	1438.56	Reach Len. (ft)	0.00	0.00	0.00
Crit W.S. (ft)	1438.36	Flow Area (sq ft)		33.51	
E.G. Slope (ft/ft)	0.002495	Area (sq ft)		33.51	
Q Total (cfs)	221.00	Flow (cfs)		221.00	
Top Width (ft)	18.57	Top Width (ft)		18.57	
Vel Total (ft/s)	6.59	Avg. Vel. (ft/s)		6.59	
Max Chl Dpth (ft)	2.35	Hydr. Depth (ft)		1.80	
Conv. Total (cfs)	4424.7	Conv. (cfs)		4424.7	
Length Wtd. (ft)	0.00	Wetted Per. (ft)		19.77	
Min Ch El (ft)	1436.21	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		1.74	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)			
C & E Loss (ft)	0.00	Cum SA (acres)			

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 3490

INPUT
Description: Southern Avenue Detention Basin
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
25	1457.58	45	1457.34	100	1445.6	225	1444.5	350	1445.6
390	1457.34	405	1457.58						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
25	.04	45	.025	390	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45	390	125	125	125	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1453.27	Element			

Vel Head (ft)	0.00	Wt. n-Val.		0.025	
W.S. Elev (ft)	1453.27	Reach Len. (ft)	125.00	125.00	125.00
Crit W.S. (ft)	1445.68	Flow Area (sq ft)		2293.30	
E.G. Slope (ft/ft)	0.000002	Area (sq ft)		2293.30	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	312.07	Top Width (ft)		312.07	
Vel Total (ft/s)	0.31	Avg. Vel. (ft/s)		0.31	
Max Chl Dpth (ft)	8.77	Hydr. Depth (ft)		7.35	
Conv. Total (cfs)	513107.3	Conv. (cfs)		513107.3	
Length Wtd. (ft)	125.00	Wetted Per. (ft)		313.99	
Min Ch El (ft)	1444.50	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.01	6.64	0.04
C & E Loss (ft)	0.12	Cum SA (acres)	0.03	1.43	0.14

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 3365

INPUT
Description: End RCB Culvert
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
88	1454.24	99.9	1451.33	100	1444	110	1444	110.1	1451.33
160	1454.11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
88	.04	99.9	.015	110.1	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
99.9	110.1	983.8	983.8	983.8	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1453.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.21	Wt. n-Val.	0.040	0.015	0.040
W.S. Elev (ft)	1451.95	Reach Len. (ft)	983.80	983.80	983.80
Crit W.S. (ft)	1449.37	Flow Area (sq ft)	0.77	80.31	3.39
E.G. Slope (ft/ft)	0.001646	Area (sq ft)	0.77	80.31	3.39
Q Total (cfs)	712.00	Flow (cfs)	0.52	709.15	2.33
Top Width (ft)	23.75	Top Width (ft)	2.51	10.20	11.04
Vel Total (ft/s)	8.43	Avg. Vel. (ft/s)	0.67	8.83	0.69
Max Chl Dpth (ft)	7.94	Hydr. Depth (ft)	0.31	7.87	0.31
Conv. Total (cfs)	17547.3	Conv. (cfs)	12.8	17477.1	57.4
Length Wtd. (ft)	983.80	Wetted Per. (ft)	2.59	24.66	11.06
Min Ch El (ft)	1444.00	Shear (lb/sq ft)	0.03	0.33	0.03
Alpha	1.09	Stream Power (lb/ft s)	0.02	2.96	0.02
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	3.24	0.04
C & E Loss (ft)		Cum SA (acres)	0.03	0.97	0.12

CULVERT RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 3000

INPUT
Description: Southern Avenue Detention Basin Outlet
Distance from Upstream XS = 41
Deck/Roadway Width = 900
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1454.6		700	1454.6	

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
88	1454.24	99.9	1451.33	100	1444	110	1444	110.1	1451.33
160	1454.11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
88	.04	99.9	.015	110.1	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
99.9	110.1	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1450.4		200	1450.4	

Downstream Bridge Cross Section Data

```
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      88 1447.09    99.9 1446.85     100 1437.85     110 1437.85   110.1 1446.85
     147 1450.46     168 1448.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      88     .04    99.9    .015   110.1     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          99.9   110.1            .1       .3

Upstream Embankment side slope              =      10 horiz. to 1.0 vertical
Downstream Embankment side slope            =      12 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1         Box       6      10
FHWA Chart # 9 - flared wingwalls and Inlet top edge bevel
FHWA Scale # 1 - Wingwall flared 45 deg.; inlet top edge bevel=0.43D
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                  0   983.8      .013                .2                .2
Upstream   Elevation =  1444
           Centerline Station =  105
Downstream Elevation =  1437.85
           Centerline Station =  105

CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 2381

INPUT
Description: End Channel Transition, Begin RCB
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      88 1447.09    99.9 1446.85     100 1437.85     110 1437.85   110.1 1446.85
     147 1450.46     168 1448.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      88     .04    99.9    .015   110.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          99.9   110.1            120.3   120.3   120.3             .1       .3

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)          1446.23    Element                  Left OB    Channel   Right OB
  Vel Head (ft)              3.92    Wt. n-Val.                          0.015
  W.S. Elev (ft)          1442.31    Reach Len. (ft)          120.30     120.30     120.30
  Crit W.S. (ft)          1443.23    Flow Area (sq ft)                    44.81
  E.G. Slope (ft/ft)     0.008150    Area (sq ft)                         44.81
  Q Total (cfs)            712.00    Flow (cfs)                          712.00
  Top Width (ft)            10.10    Top Width (ft)                       10.10
  Vel Total (ft/s)          15.89    Avg. Vel. (ft/s)                     15.89
  Max Chl Dpth (ft)          4.46    Hydr. Depth (ft)                      4.44
  Conv. Total (cfs)        7886.9    Conv. (cfs)                         7886.9
  Length Wtd. (ft)         120.30    Wetted Per. (ft)                     18.92
  Min Ch El (ft)          1437.85    Shear (lb/sq ft)                      1.21
  Alpha                      1.00    Stream Power (lb/ft s)               19.15
  Frctn Loss (ft)                    Cum Volume (acre-ft)                  1.82
  C & E Loss (ft)                    Cum SA (acres)                        0.74


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 2261

INPUT
Description: Begin Channel Transition
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      68 1442.97     76 1444.97      88 1444.73     100 1437.73     116 1438.05
  127.36 1444.73    145 1449.96     170 1447.96

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      68     .04     88    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           88  127.36               60      60      60             .1       .3
Left Levee      Station=      88      Elevation= 1444.73

CROSS SECTION OUTPUT    Profile #PF 1
```

E.G. Elev (ft)	1444.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.78	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.96	Reach Len. (ft)	60.00	60.00	60.00
Crit W.S. (ft)	1441.35	Flow Area (sq ft)		40.58	
E.G. Slope (ft/ft)	0.017927	Area (sq ft)		40.58	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	23.09	Top Width (ft)		23.09	
Vel Total (ft/s)	17.54	Avg. Vel. (ft/s)		17.54	
Max Chl Dpth (ft)	2.23	Hydr. Depth (ft)		1.76	
Conv. Total (cfs)	5317.7	Conv. (cfs)		5317.7	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		24.21	
Min Ch El (ft)	1437.73	Shear (lb/sq ft)		1.88	
Alpha	1.00	Stream Power (lb/ft s)		32.91	
Frctn Loss (ft)	1.40	Cum Volume (acre-ft)		1.70	
C & E Loss (ft)	0.09	Cum SA (acres)		0.69	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 2201

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
68	1441.91	76	1443.91	88	1443.67	100	1437.67	116	1437.99
127.36	1443.67	145	1448.1	160	1446.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
68	.04	88	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88	127.36	101	101	101	.1	.3

Left Levee Station= 88 Elevation= 1443.67

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1443.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.28	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.19	Reach Len. (ft)	101.00	101.00	101.00
Crit W.S. (ft)	1441.22	Flow Area (sq ft)		48.99	
E.G. Slope (ft/ft)	0.010828	Area (sq ft)		48.99	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	25.45	Top Width (ft)		25.45	
Vel Total (ft/s)	14.53	Avg. Vel. (ft/s)		14.53	
Max Chl Dpth (ft)	2.52	Hydr. Depth (ft)		1.93	
Conv. Total (cfs)	6842.5	Conv. (cfs)		6842.5	
Length Wtd. (ft)	101.00	Wetted Per. (ft)		26.56	
Min Ch El (ft)	1437.67	Shear (lb/sq ft)		1.25	
Alpha	1.00	Stream Power (lb/ft s)		18.12	
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)		1.64	
C & E Loss (ft)	0.45	Cum SA (acres)		0.66	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 2100

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
68	1441.81	76	1443.81	88	1443.57	100	1437.57	116	1437.89
127.36	1443.57	145	1448	160	1446				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
68	.04	88	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88	127.36	153	153	153	.1	.3

Left Levee Station= 88 Elevation= 1443.57

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1442.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.80	Wt. n-Val.		0.016	
W.S. Elev (ft)	1441.84	Reach Len. (ft)	153.00	153.00	153.00
Crit W.S. (ft)	1441.12	Flow Area (sq ft)		99.42	
E.G. Slope (ft/ft)	0.001442	Area (sq ft)		99.42	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	32.42	Top Width (ft)		32.42	
Vel Total (ft/s)	7.16	Avg. Vel. (ft/s)		7.16	
Max Chl Dpth (ft)	4.26	Hydr. Depth (ft)		3.07	
Conv. Total (cfs)	18748.8	Conv. (cfs)		18748.8	
Length Wtd. (ft)	153.00	Wetted Per. (ft)		34.36	
Min Ch El (ft)	1437.57	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		1.87	
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)		1.47	
C & E Loss (ft)	0.05	Cum SA (acres)		0.59	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1947

INPUT
Description: End Side Weir
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1443.58	88	1443.41	100	1437.41	116	1437.73	127.36	1443.41
145	1445.77	170	1444.77						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	38	38	38	.1	.3

Left Levee Station= 88 Elevation= 1443.42

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1442.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.30	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.98	Reach Len. (ft)	38.00	38.00	38.00
Crit W.S. (ft)	1440.98	Flow Area (sq ft)		77.82	
E.G. Slope (ft/ft)	0.002875	Area (sq ft)		77.82	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	29.63	Top Width (ft)		29.63	
Vel Total (ft/s)	9.15	Avg. Vel. (ft/s)		9.15	
Max Chl Dpth (ft)	3.57	Hydr. Depth (ft)		2.63	
Conv. Total (cfs)	13278.8	Conv. (cfs)		13278.8	
Length Wtd. (ft)	38.00	Wetted Per. (ft)		31.25	
Min Ch El (ft)	1437.41	Shear (lb/sq ft)		0.45	
Alpha	1.00	Stream Power (lb/ft s)		4.09	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)		1.16	
C & E Loss (ft)	0.17	Cum SA (acres)		0.48	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1909

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.78	100	1437.38	116	1437.7	127.36	1443.38	145	1445.74
170	1444.74								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	12	12	12	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.48	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.48	Reach Len. (ft)	12.00	12.00	12.00
Crit W.S. (ft)	1440.23	Flow Area (sq ft)		56.36	
E.G. Slope (ft/ft)	0.012155	Area (sq ft)		56.36	
Q Total (cfs)	712.00	Flow (cfs)		712.00	
Top Width (ft)	40.59	Top Width (ft)		40.59	
Vel Total (ft/s)	12.63	Avg. Vel. (ft/s)		12.63	
Max Chl Dpth (ft)	2.10	Hydr. Depth (ft)		1.39	
Conv. Total (cfs)	6458.0	Conv. (cfs)		6458.0	
Length Wtd. (ft)	12.00	Wetted Per. (ft)		41.12	
Min Ch El (ft)	1437.38	Shear (lb/sq ft)		1.04	
Alpha	1.00	Stream Power (lb/ft s)		13.14	
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)		1.10	
C & E Loss (ft)	0.12	Cum SA (acres)		0.45	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1897

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.77	100	1437.37	116	1437.69	127.36	1443.37	145	1445.73
170	1444.73								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.25	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.50	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1440.18	Flow Area (sq ft)		57.63	
E.G. Slope (ft/ft)	0.010853	Area (sq ft)		57.63	
Q Total (cfs)	694.00	Flow (cfs)		694.00	
Top Width (ft)	40.96	Top Width (ft)		40.96	
Vel Total (ft/s)	12.04	Avg. Vel. (ft/s)		12.04	
Max Chl Dpth (ft)	2.13	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	6661.8	Conv. (cfs)		6661.8	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		41.50	
Min Ch El (ft)	1437.37	Shear (lb/sq ft)		0.94	
Alpha	1.00	Stream Power (lb/ft s)		11.33	
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)		1.09	
C & E Loss (ft)	0.07	Cum SA (acres)		0.44	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1877

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.75	100	1437.35	116	1437.67	127.36	1443.35	145	1445.71
170	1444.71								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1441.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.98	Wt. n-Val.		0.016	
W.S. Elev (ft)	1439.49	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1440.08	Flow Area (sq ft)		57.78	
E.G. Slope (ft/ft)	0.009540	Area (sq ft)		57.78	
Q Total (cfs)	653.00	Flow (cfs)		653.00	
Top Width (ft)	41.01	Top Width (ft)		41.01	
Vel Total (ft/s)	11.30	Avg. Vel. (ft/s)		11.30	
Max Chl Dpth (ft)	2.14	Hydr. Depth (ft)		1.41	

Conv. Total (cfs)	6685.7	Conv. (cfs)	6685.7
Length Wtd. (ft)	20.00	Wetted Per. (ft)	41.55
Min Ch El (ft)	1437.35	Shear (lb/sq ft)	0.83
Alpha	1.00	Stream Power (lb/ft s)	9.36
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	1.06
C & E Loss (ft)	0.08	Cum SA (acres)	0.42

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1857

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.73	100	1437.33	116	1437.65	127.36	1443.33	145	1445.69
170	1444.69								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1441.13	Element		Channel	
Vel Head (ft)	0.47	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.65	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1439.97	Flow Area (sq ft)		109.83	
E.G. Slope (ft/ft)	0.001143	Area (sq ft)		109.83	
Q Total (cfs)	607.00	Flow (cfs)		607.00	
Top Width (ft)	45.21	Top Width (ft)		45.21	
Vel Total (ft/s)	5.53	Avg. Vel. (ft/s)		5.53	
Max Chl Dpth (ft)	3.32	Hydr. Depth (ft)		2.43	
Conv. Total (cfs)	17952.7	Conv. (cfs)		17952.7	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		47.04	
Min Ch El (ft)	1437.33	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		0.92	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		1.02	
C & E Loss (ft)	0.03	Cum SA (acres)		0.40	

Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1837

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.71	100	1437.31	116	1437.63	127.36	1443.31	145	1445.67
170	1444.67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	20	20	20	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1441.08	Element		Channel	
Vel Head (ft)	0.38	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.70	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1439.84	Flow Area (sq ft)		112.83	
E.G. Slope (ft/ft)	0.000882	Area (sq ft)		112.83	
Q Total (cfs)	556.00	Flow (cfs)		556.00	
Top Width (ft)	45.34	Top Width (ft)		45.34	
Vel Total (ft/s)	4.93	Avg. Vel. (ft/s)		4.93	
Max Chl Dpth (ft)	3.39	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	18718.7	Conv. (cfs)		18718.7	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		47.25	
Min Ch El (ft)	1437.31	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.65	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.97	
C & E Loss (ft)	0.03	Cum SA (acres)		0.38	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1817

INPUT
Description: Side Weir

```
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      76 1439.69     100 1437.29     116 1437.61  127.36 1443.29     145 1445.65
     170 1444.65

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      76     .04      76    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            76  127.36              20      20      20            .1        .3
Left Levee      Station=    76.8      Elevation= 1443.38

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1441.03    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.29    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.74    Reach Len. (ft)             20.00     20.00      20.00
  Crit W.S. (ft)           1439.70    Flow Area (sq ft)                     115.71
  E.G. Slope (ft/ft)      0.000660    Area (sq ft)                          115.71
  Q Total (cfs)             500.00    Flow (cfs)                            500.00
  Top Width (ft)             45.47    Top Width (ft)                         45.47
  Vel Total (ft/s)            4.32    Avg. Vel. (ft/s)                        4.32
  Max Chl Dpth (ft)           3.45    Hydr. Depth (ft)                        2.55
  Conv. Total (cfs)        19467.4    Conv. (cfs)                          19467.4
  Length Wtd. (ft)           20.00    Wetted Per. (ft)                       47.46
  Min Ch El (ft)           1437.29    Shear (lb/sq ft)                        0.10
  Alpha                       1.00    Stream Power (lb/ft s)                  0.43
  Frctn Loss (ft)             0.01    Cum Volume (acre-ft)                    0.92
  C & E Loss (ft)             0.02    Cum SA (acres)                          0.36


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1797

INPUT
Description: Side Weir
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      76 1439.67     100 1437.27     116 1437.59  127.36 1443.27     145 1445.63
     170 1444.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      76     .04      76    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            76  127.36              20      20      20            .1        .3
Left Levee      Station=    76.8      Elevation= 1443.38

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1441.00    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.21    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.78    Reach Len. (ft)             20.00     20.00      20.00
  Crit W.S. (ft)           1439.54    Flow Area (sq ft)                     118.45
  E.G. Slope (ft/ft)      0.000473    Area (sq ft)                          118.45
  Q Total (cfs)             439.00    Flow (cfs)                            439.00
  Top Width (ft)             45.59    Top Width (ft)                         45.59
  Vel Total (ft/s)            3.71    Avg. Vel. (ft/s)                        3.71
  Max Chl Dpth (ft)           3.51    Hydr. Depth (ft)                        2.60
  Conv. Total (cfs)        20186.1    Conv. (cfs)                          20186.1
  Length Wtd. (ft)           20.00    Wetted Per. (ft)                       47.65
  Min Ch El (ft)           1437.27    Shear (lb/sq ft)                        0.07
  Alpha                       1.00    Stream Power (lb/ft s)                  0.27
  Frctn Loss (ft)             0.01    Cum Volume (acre-ft)                    0.86
  C & E Loss (ft)             0.02    Cum SA (acres)                          0.34


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1777

INPUT
Description: Side Weir
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      76 1439.65     100 1437.25     116 1437.57  127.36 1443.25     145 1445.61
     170 1444.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      76     .04      76    .016  127.36     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            76  127.36              15      15      15            .1        .3
Left Levee      Station=    76.8      Elevation= 1443.38

CROSS SECTION OUTPUT    Profile #PF 1
```

E.G. Elev (ft)	1440.97	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.82	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)	1439.34	Flow Area (sq ft)		121.02	
E.G. Slope (ft/ft)	0.000321	Area (sq ft)		121.02	
Q Total (cfs)	374.00	Flow (cfs)		374.00	
Top Width (ft)	45.70	Top Width (ft)		45.70	
Vel Total (ft/s)	3.09	Avg. Vel. (ft/s)		3.09	
Max Chl Dpth (ft)	3.57	Hydr. Depth (ft)		2.65	
Conv. Total (cfs)	20866.3	Conv. (cfs)		20866.3	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		47.83	
Min Ch El (ft)	1437.25	Shear (lb/sq ft)		0.05	
Alpha	1.00	Stream Power (lb/ft s)		0.16	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.81	
C & E Loss (ft)	0.01	Cum SA (acres)		0.32	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1762

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.63	100	1437.23	116	1437.55	127.36	1443.23	145	1445.59
170	1444.59								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	18	18	18	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.85	Reach Len. (ft)	18.00	18.00	18.00
Crit W.S. (ft)	1439.16	Flow Area (sq ft)		123.11	
E.G. Slope (ft/ft)	0.000226	Area (sq ft)		123.11	
Q Total (cfs)	322.00	Flow (cfs)		322.00	
Top Width (ft)	45.79	Top Width (ft)		45.79	
Vel Total (ft/s)	2.62	Avg. Vel. (ft/s)		2.62	
Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		2.69	
Conv. Total (cfs)	21426.9	Conv. (cfs)		21426.9	
Length Wtd. (ft)	18.00	Wetted Per. (ft)		47.98	
Min Ch El (ft)	1437.23	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.09	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.77	
C & E Loss (ft)	0.01	Cum SA (acres)		0.30	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1744

INPUT
Description: Side Weir
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1439.61	100	1437.21	116	1437.53	127.36	1443.21	145	1445.57
170	1444.57								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	38	38	38	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.87	Reach Len. (ft)	38.00	38.00	38.00
Crit W.S. (ft)	1438.93	Flow Area (sq ft)		125.21	
E.G. Slope (ft/ft)	0.000135	Area (sq ft)		125.21	
Q Total (cfs)	256.00	Flow (cfs)		256.00	
Top Width (ft)	45.88	Top Width (ft)		45.88	
Vel Total (ft/s)	2.04	Avg. Vel. (ft/s)		2.04	
Max Chl Dpth (ft)	3.66	Hydr. Depth (ft)		2.73	
Conv. Total (cfs)	21993.8	Conv. (cfs)		21993.8	
Length Wtd. (ft)	38.00	Wetted Per. (ft)		48.13	
Min Ch El (ft)	1437.21	Shear (lb/sq ft)		0.02	
Alpha	1.00	Stream Power (lb/ft s)		0.04	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		0.71	
C & E Loss (ft)	0.00	Cum SA (acres)		0.28	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1706

INPUT
Description: Begin Side Weir
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
76	1443.41	88	1443.17	100	1437.17	116	1437.49	127.36	1443.17
145	1445.53	170	1444.53						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
76	.04	76	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	127.36	6	6	6	.1	.3

Left Levee Station= 76.8 Elevation= 1443.38

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1440.93	Element			
Vel Head (ft)	0.11	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.81	Reach Len. (ft)	6.00	6.00	6.00
Crit W.S. (ft)	1438.97	Flow Area (sq ft)		80.07	
E.G. Slope (ft/ft)	0.000240	Area (sq ft)		80.07	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	29.94	Top Width (ft)		29.94	
Vel Total (ft/s)	2.67	Avg. Vel. (ft/s)		2.67	
Max Chl Dpth (ft)	3.64	Hydr. Depth (ft)		2.67	
Conv. Total (cfs)	13824.6	Conv. (cfs)		13824.6	
Length Wtd. (ft)	6.00	Wetted Per. (ft)		31.58	
Min Ch El (ft)	1437.17	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.10	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.62	
C & E Loss (ft)	0.00	Cum SA (acres)		0.25	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1700

INPUT
Description: End Transistion
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
68	1441.41	76	1443.41	88	1443.17	100	1437.17	116	1437.49
127.36	1443.17	145	1445.53	170	1444.53				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
68	.04	88	.016	127.36	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
88	127.36	30.3	30.3	30.3	.1	.3

Left Levee Station= 88 Elevation= 1443.17

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1440.92	Element			
Vel Head (ft)	0.11	Wt. n-Val.		0.016	
W.S. Elev (ft)	1440.81	Reach Len. (ft)	30.30	30.30	30.30
Crit W.S. (ft)	1438.98	Flow Area (sq ft)		80.02	
E.G. Slope (ft/ft)	0.000240	Area (sq ft)		80.02	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	29.93	Top Width (ft)		29.93	
Vel Total (ft/s)	2.67	Avg. Vel. (ft/s)		2.67	
Max Chl Dpth (ft)	3.64	Hydr. Depth (ft)		2.67	
Conv. Total (cfs)	13812.2	Conv. (cfs)		13812.2	
Length Wtd. (ft)	30.30	Wetted Per. (ft)		31.58	
Min Ch El (ft)	1437.17	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.10	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		0.61	
C & E Loss (ft)	0.01	Cum SA (acres)		0.25	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1670

INPUT
Description: PT of Curve, Begin Transistion
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
     66 1439.31      78 1442.38      90 1442.14     100 1437.14     110 1437.34
  119.6 1442.14     145  1445.5     170  1444.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      66     .04      90    .016   119.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            90   119.6              124   129.8     145            .1        .3
Left Levee      Station=      90      Elevation= 1442.14

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1440.90    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.21    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.70    Reach Len. (ft)            124.00     129.80     145.00
  Crit W.S. (ft)           1439.33    Flow Area (sq ft)                      58.44
  E.G. Slope (ft/ft)      0.000513    Area (sq ft)                           58.44
  Q Total (cfs)             214.00    Flow (cfs)                            214.00
  Top Width (ft)             23.82    Top Width (ft)                         23.82
  Vel Total (ft/s)            3.66    Avg. Vel. (ft/s)                        3.66
  Max Chl Dpth (ft)           3.55    Hydr. Depth (ft)                        2.45
  Conv. Total (cfs)          9446.5    Conv. (cfs)                           9446.5
  Length Wtd. (ft)           129.80    Wetted Per. (ft)                       25.45
  Min Ch El (ft)           1437.14    Shear (lb/sq ft)                        0.07
  Alpha                       1.00    Stream Power (lb/ft s)                  0.27
  Frctn Loss (ft)             0.06    Cum Volume (acre-ft)                    0.57
  C & E Loss (ft)             0.00    Cum SA (acres)                          0.23


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1540

INPUT
Description: PC of Curve
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      70 1440.03      78 1442.03      90 1442.01     100 1437.01     110 1437.21
  119.6 1442.01     168 1442.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      70     .04      90    .016   119.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            90   119.6             106.9   106.9   106.9            .1        .3
Left Levee      Station=      90      Elevation= 1442.01

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1440.84    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.20    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1440.64    Reach Len. (ft)            106.90     106.90     106.90
  Crit W.S. (ft)           1439.20    Flow Area (sq ft)                      60.28
  E.G. Slope (ft/ft)      0.000471    Area (sq ft)                           60.28
  Q Total (cfs)             214.00    Flow (cfs)                            214.00
  Top Width (ft)             24.13    Top Width (ft)                         24.13
  Vel Total (ft/s)            3.55    Avg. Vel. (ft/s)                        3.55
  Max Chl Dpth (ft)           3.63    Hydr. Depth (ft)                        2.50
  Conv. Total (cfs)          9857.7    Conv. (cfs)                           9857.7
  Length Wtd. (ft)           106.90    Wetted Per. (ft)                       25.80
  Min Ch El (ft)           1437.01    Shear (lb/sq ft)                        0.07
  Alpha                       1.00    Stream Power (lb/ft s)                  0.24
  Frctn Loss (ft)             0.05    Cum Volume (acre-ft)                    0.39
  C & E Loss (ft)             0.00    Cum SA (acres)                          0.16


CROSS SECTION          RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2   RS: 1433

INPUT
Description: PT of Curve
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      70 1440.29      78 1442.14      90  1441.9     100  1436.9     110  1437.1
  119.6  1441.9     168 1441.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      70     .04      90    .016   119.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            90   119.6              88    72.8     45            .1        .3
Left Levee      Station=      90      Elevation=  1441.9

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1440.79    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.19    Wt. n-Val.                            0.016
```

W.S. Elev (ft)	1440.60	Reach Len. (ft)	88.00	72.80	45.00
Crit W.S. (ft)	1439.08	Flow Area (sq ft)		61.95	
E.G. Slope (ft/ft)	0.000437	Area (sq ft)		61.95	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	24.40	Top Width (ft)		24.40	
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)		3.45	
Max Chl Dpth (ft)	3.70	Hydr. Depth (ft)		2.54	
Conv. Total (cfs)	10235.9	Conv. (cfs)		10235.9	
Length Wtd. (ft)	72.80	Wetted Per. (ft)		26.10	
Min Ch El (ft)	1436.90	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.22	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.24	
C & E Loss (ft)	0.00	Cum SA (acres)		0.10	

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1360

INPUT
Description: End of Transition
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
60	1442.02	90	1441.83	100	1436.83	110	1437.03	119.6	1441.82
132	1442.06								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
60	.04	90	.013	119.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
90	119.6	45.3	45.3	45.3	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1440.76	Element			
Vel Head (ft)	0.18	Wt. n-Val.		0.013	
W.S. Elev (ft)	1440.58	Reach Len. (ft)	45.30	45.30	45.30
Crit W.S. (ft)		Flow Area (sq ft)		63.21	
E.G. Slope (ft/ft)	0.000273	Area (sq ft)		63.21	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	24.62	Top Width (ft)		24.62	
Vel Total (ft/s)	3.39	Avg. Vel. (ft/s)		3.39	
Max Chl Dpth (ft)	3.75	Hydr. Depth (ft)		2.57	
Conv. Total (cfs)	12950.2	Conv. (cfs)		12950.2	
Length Wtd. (ft)	45.30	Wetted Per. (ft)		26.34	
Min Ch El (ft)	1436.83	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.14	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.13	
C & E Loss (ft)	0.05	Cum SA (acres)		0.06	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1315

INPUT
Description: Culvert Upstream Section
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1441.3	95	1441.57	99.9	1441.78	100	1436.78	110	1436.78
110.1	1441.78	115	1441.6	230.001	1442				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	99.9	.013	110.1	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
99.9	110.1	78	78	78	.1	.3

Left Levee Station= 95 Elevation= 1441.57

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1440.68	Element			
Vel Head (ft)	0.67	Wt. n-Val.		0.013	
W.S. Elev (ft)	1440.01	Reach Len. (ft)	78.00	78.00	78.00
Crit W.S. (ft)	1439.19	Flow Area (sq ft)		32.52	
E.G. Slope (ft/ft)	0.001337	Area (sq ft)		32.52	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	10.13	Top Width (ft)		10.13	
Vel Total (ft/s)	6.58	Avg. Vel. (ft/s)		6.58	
Max Chl Dpth (ft)	3.23	Hydr. Depth (ft)		3.21	
Conv. Total (cfs)	5851.7	Conv. (cfs)		5851.7	
Length Wtd. (ft)	78.00	Wetted Per. (ft)		16.46	
Min Ch El (ft)	1436.78	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		1.09	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.08	
C & E Loss (ft)		Cum SA (acres)		0.04	

```
CULVERT                    RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2    RS: 1270

INPUT
Description: Hawes Road Crossing
Distance from Upstream XS =       12
Deck/Roadway Width        =       46
Weir Coefficient          =      2.6
Bridge Deck/Roadway Skew  =       45
Upstream  Deck/Roadway Coordinates
    num=        5
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
       0  1441.3               50  1441.5              105    1442
     160  1441.8              230    1442

Upstream Bridge Cross Section Data
Station Elevation Data    num=        8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0  1441.3       95 1441.57     99.9 1441.78     100 1436.78     110 1436.78
   110.1 1441.78      115  1441.6 230.001    1442

Manning's n Values        num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .04     99.9    .013    110.1     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          99.9   110.1             .1       .3
Left Levee      Station=       95      Elevation= 1441.57

Downstream  Deck/Roadway Coordinates
    num=        5
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
       0  1441.3               50  1441.5              105    1442
     160  1441.7              230    1442

Downstream Bridge Cross Section Data
Station Elevation Data    num=        8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0  1441.3       95  1441.5     99.9 1441.71     100 1436.71     110 1436.71
   110.1 1441.71      115  1441.6 230.001    1442

Manning's n Values        num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .04     99.9    .015    110.1     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          99.9   110.1             .1       .3
Left Levee      Station=       95      Elevation=  1441.5

Upstream Embankment side slope              =      50 horiz. to 1.0 vertical
Downstream Embankment side slope            =      50 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =  1441.5
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box       4      10
FHWA Chart # 9 - flared wingwalls and Inlet top edge bevel
FHWA Scale # 2 - Wingwall flared 18 to 33.7 deg.; inlet top edge bevel=0.083D
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                  0      78       .013                   .2               .1
Upstream   Elevation =  1436.78
           Centerline Station =  105
Downstream Elevation =  1436.71
           Centerline Station =  105

CROSS SECTION              RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2    RS: 1237

INPUT
Description: Culvert Downstream Section
Station Elevation Data    num=        8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0  1441.3       95  1441.5     99.9 1441.71     100 1436.71     110 1436.71
   110.1 1441.71      115  1441.6 230.001    1442

Manning's n Values        num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
       0     .04     99.9    .015    110.1     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          99.9   110.1             67.3    67.3    67.3             .1       .3
```

Left Levee Station= 95 Elevation= 1441.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1440.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.20	Wt. n-Val.		0.015	
W.S. Elev (ft)	1439.14	Reach Len. (ft)	67.30	67.30	67.30
Crit W.S. (ft)	1439.14	Flow Area (sq ft)		24.37	
E.G. Slope (ft/ft)	0.004060	Area (sq ft)		24.37	
Q Total (cfs)	214.00	Flow (cfs)		214.00	
Top Width (ft)	10.10	Top Width (ft)		10.10	
Vel Total (ft/s)	8.78	Avg. Vel. (ft/s)		8.78	
Max Chl Dpth (ft)	2.43	Hydr. Depth (ft)		2.41	
Conv. Total (cfs)	3358.4	Conv. (cfs)		3358.4	
Length Wtd. (ft)	67.30	Wetted Per. (ft)		14.85	
Min Ch El (ft)	1436.71	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		3.65	
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)		0.03	
C & E Loss (ft)	0.16	Cum SA (acres)		0.02	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION RIVER: Southern Ave Sys
REACH: 202L/US60 TI - 2 RS: 1170

INPUT
Description: Channel Reconstruction
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.04	-4	1440.34	8	1440.37	38	1441.19	72	1440.74
77	1441.19	91	1441.14	100	1436.21	110	1436.21	119	1441.14
128	1441.37								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9	.04	91	.016	119	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
91 119 20 20 20 .1 .3
Left Levee Station= 91 Elevation= 1441.14

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1439.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.09	Wt. n-Val.		0.016	
W.S. Elev (ft)	1437.71	Reach Len. (ft)	0.00	0.00	0.00
Crit W.S. (ft)	1438.36	Flow Area (sq ft)		19.06	
E.G. Slope (ft/ft)	0.012575	Area (sq ft)		19.06	
Q Total (cfs)	221.00	Flow (cfs)		221.00	
Top Width (ft)	15.47	Top Width (ft)		15.47	
Vel Total (ft/s)	11.59	Avg. Vel. (ft/s)		11.59	
Max Chl Dpth (ft)	1.50	Hydr. Depth (ft)		1.23	
Conv. Total (cfs)	1970.8	Conv. (cfs)		1970.8	
Length Wtd. (ft)	0.00	Wetted Per. (ft)		16.23	
Min Ch El (ft)	1436.21	Shear (lb/sq ft)		0.92	
Alpha	1.00	Stream Power (lb/ft s)		10.69	
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)			
C & E Loss (ft)	0.09	Cum SA (acres)			

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: South Hawes Chan
REACH: 202L/US60 TI - 2 RS: 1170

INPUT
Description: Channel Reconstruction
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9	1442.04	-4	1440.34	8	1440.37	38	1441.19	72	1440.74
77	1441.19	91	1441.14	100	1436.21	110	1436.21	119	1441.14
128	1441.37								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
     -9     .04      91    .016     119     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           91     119               20      20      20            .1        .3
Left Levee      Station=      91      Elevation= 1441.14

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1439.79    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               2.09    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1437.71    Reach Len. (ft)             0.00       0.00       0.00
  Crit W.S. (ft)           1438.36    Flow Area (sq ft)                     19.06
  E.G. Slope (ft/ft)      0.012575    Area (sq ft)                          19.06
  Q Total (cfs)             221.00    Flow (cfs)                           221.00
  Top Width (ft)             15.47    Top Width (ft)                        15.47
  Vel Total (ft/s)           11.59    Avg. Vel. (ft/s)                      11.59
  Max Chl Dpth (ft)           1.50    Hydr. Depth (ft)                       1.23
  Conv. Total (cfs)         1970.8    Conv. (cfs)                          1970.8
  Length Wtd. (ft)            0.00    Wetted Per. (ft)                      16.23
  Min Ch El (ft)           1436.21    Shear (lb/sq ft)                       0.92
  Alpha                       1.00    Stream Power (lb/ft s)                10.69
  Frctn Loss (ft)             0.45    Cum Volume (acre-ft)
  C & E Loss (ft)             0.09    Cum SA (acres)


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less
         than 0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

CROSS SECTION          RIVER: South Hawes Chan
REACH: 202L/US60 TI - 2   RS: 1150

INPUT
Description: Starting Channel Reconstruction
Station Elevation Data     num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      -9    1442      -4  1440.3       8 1440.33      38 1441.15      72  1440.7
      77 1441.15      91  1441.1     100 1436.06     110 1436.18     119  1441.1
     128 1441.33

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      -9     .04      91    .016     119     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           91     119              150     150     150            .1        .3
Left Levee      Station=      91      Elevation=  1441.1

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)           1439.17    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.62    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1438.55    Reach Len. (ft)           150.00     150.00     150.00
  Crit W.S. (ft)           1438.27    Flow Area (sq ft)                     34.99
  E.G. Slope (ft/ft)      0.002200    Area (sq ft)                          34.99
  Q Total (cfs)             221.00    Flow (cfs)                           221.00
  Top Width (ft)             18.79    Top Width (ft)                        18.79
  Vel Total (ft/s)            6.32    Avg. Vel. (ft/s)                       6.32
  Max Chl Dpth (ft)           2.49    Hydr. Depth (ft)                       1.86
  Conv. Total (cfs)         4711.8    Conv. (cfs)                          4711.8
  Length Wtd. (ft)          150.00    Wetted Per. (ft)                      20.04
  Min Ch El (ft)           1436.06    Shear (lb/sq ft)                       0.24
  Alpha                       1.00    Stream Power (lb/ft s)                 1.51
  Frctn Loss (ft)             0.33    Cum Volume (acre-ft)                   0.12
  C & E Loss (ft)             0.00    Cum SA (acres)                         0.06


CROSS SECTION          RIVER: South Hawes Chan
REACH: 202L/US60 TI - 2   RS: 1000

INPUT
Description: Starting Downstream Channel Section
Station Elevation Data     num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      -9  1441.1      -4  1439.7       8    1440      38 1440.82      72  1440.2
      77 1440.82      91 1440.77     100 1435.73     110 1435.85     119 1440.77
     128    1441

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      -9     .04      91    .016     119     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           91     119                0       0       0            .1        .3
Left Levee      Station=      91      Elevation= 1440.77

CROSS SECTION OUTPUT    Profile #PF 1
```

E.G. Elev (ft)	1438.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.62	Wt. n-Val.		0.016	
W.S. Elev (ft)	1438.22	Reach Len. (ft)			
Crit W.S. (ft)	1437.94	Flow Area (sq ft)		34.99	
E.G. Slope (ft/ft)	0.002201	Area (sq ft)		34.99	
Q Total (cfs)	221.00	Flow (cfs)		221.00	
Top Width (ft)	18.78	Top Width (ft)		18.78	
Vel Total (ft/s)	6.32	Avg. Vel. (ft/s)		6.32	
Max Chl Dpth (ft)	2.49	Hydr. Depth (ft)		1.86	
Conv. Total (cfs)	4710.9	Conv. (cfs)		4710.9	
Length Wtd. (ft)		Wetted Per. (ft)		20.04	
Min Ch El (ft)	1435.73	Shear (lb/sq ft)		0.24	
Alpha	1.00	Stream Power (lb/ft s)		1.52	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Hawes Rd Channel

Reach	River Sta.	n1	n2	n3
202L/US60 TI - 2	1540	.04	.016	.04
202L/US60 TI - 2	1370	.04	.016	.04
202L/US60 TI - 2	1170	.04	.016	.04

River:Southern Ave Sys

Reach	River Sta.	n1	n2	n3
202L/US60 TI - 2	3490	.04	.025	.04
202L/US60 TI - 2	3365	.04	.015	.04
202L/US60 TI - 2	3000	Culvert		
202L/US60 TI - 2	2381	.04	.015	.04
202L/US60 TI - 2	2261	.04	.016	.04
202L/US60 TI - 2	2201	.04	.016	.04
202L/US60 TI - 2	2100	.04	.016	.04
202L/US60 TI - 2	1947	.04	.016	.04
202L/US60 TI - 2	1909	.04	.016	.04
202L/US60 TI - 2	1897	.04	.016	.04
202L/US60 TI - 2	1877	.04	.016	.04
202L/US60 TI - 2	1857	.04	.016	.04
202L/US60 TI - 2	1837	.04	.016	.04
202L/US60 TI - 2	1817	.04	.016	.04
202L/US60 TI - 2	1797	.04	.016	.04
202L/US60 TI - 2	1777	.04	.016	.04
202L/US60 TI - 2	1762	.04	.016	.04
202L/US60 TI - 2	1744	.04	.016	.04
202L/US60 TI - 2	1706	.04	.016	.04
202L/US60 TI - 2	1700	.04	.016	.04
202L/US60 TI - 2	1670	.04	.016	.04
202L/US60 TI - 2	1540	.04	.016	.04
202L/US60 TI - 2	1433	.04	.016	.04
202L/US60 TI - 2	1360	.04	.013	.04
202L/US60 TI - 2	1315	.04	.013	.04
202L/US60 TI - 2	1270	Culvert		
202L/US60 TI - 2	1237	.04	.015	.04
202L/US60 TI - 2	1170	.04	.016	.04

River:South Hawes Chan

Reach	River Sta.	n1	n2	n3
202L/US60 TI - 2	1170	.04	.016	.04
202L/US60 TI - 2	1150	.04	.016	.04
202L/US60 TI - 2	1000	.04	.016	.04

SUMMARY OF REACH LENGTHS

River: Hawes Rd Channel

Reach	River Sta.	Left	Channel	Right
202L/US60 TI - 2	1540	170	170	170
202L/US60 TI - 2	1370	200	200	200
202L/US60 TI - 2	1170	20	20	20

River: Southern Ave Sys

Reach	River Sta.	Left	Channel	Right

202L/US60 TI - 2	3490	125	125	125
202L/US60 TI - 2	3365	983.8	983.8	983.8
202L/US60 TI - 2	3000	Culvert		
202L/US60 TI - 2	2381	120.3	120.3	120.3
202L/US60 TI - 2	2261	60	60	60
202L/US60 TI - 2	2201	101	101	101
202L/US60 TI - 2	2100	153	153	153
202L/US60 TI - 2	1947	38	38	38
202L/US60 TI - 2	1909	12	12	12
202L/US60 TI - 2	1897	20	20	20
202L/US60 TI - 2	1877	20	20	20
202L/US60 TI - 2	1857	20	20	20
202L/US60 TI - 2	1837	20	20	20
202L/US60 TI - 2	1817	20	20	20
202L/US60 TI - 2	1797	20	20	20
202L/US60 TI - 2	1777	15	15	15
202L/US60 TI - 2	1762	18	18	18
202L/US60 TI - 2	1744	38	38	38
202L/US60 TI - 2	1706	6	6	6
202L/US60 TI - 2	1700	30.3	30.3	30.3
202L/US60 TI - 2	1670	124	129.8	145
202L/US60 TI - 2	1540	106.9	106.9	106.9
202L/US60 TI - 2	1433	88	72.8	45
202L/US60 TI - 2	1360	45.3	45.3	45.3
202L/US60 TI - 2	1315	78	78	78
202L/US60 TI - 2	1270	Culvert		
202L/US60 TI - 2	1237	67.3	67.3	67.3
202L/US60 TI - 2	1170	20	20	20

River: South Hawes Chan

Reach	River Sta.	Left	Channel	Right
202L/US60 TI - 2	1170	20	20	20
202L/US60 TI - 2	1150	150	150	150
202L/US60 TI - 2	1000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Hawes Rd Channel

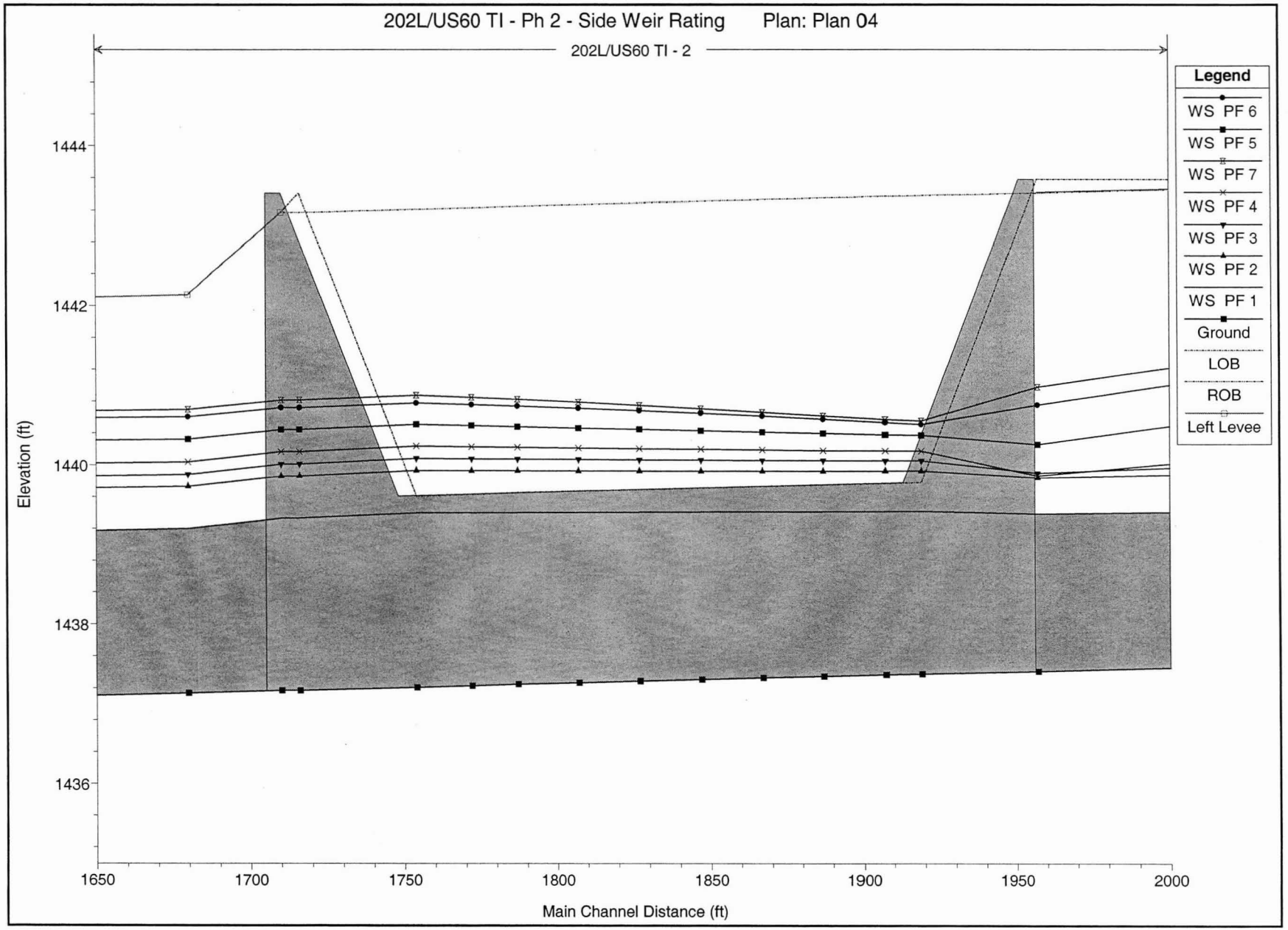
Reach	River Sta.	Contr.	Expan.
202L/US60 TI - 2	1540	.1	.3
202L/US60 TI - 2	1370	.1	.3
202L/US60 TI - 2	1170	.1	.3

River: Southern Ave Sys

Reach	River Sta.	Contr.	Expan.
202L/US60 TI - 2	3490	.1	.3
202L/US60 TI - 2	3365	.1	.3
202L/US60 TI - 2	3000	Culvert	
202L/US60 TI - 2	2381	.1	.3
202L/US60 TI - 2	2261	.1	.3
202L/US60 TI - 2	2201	.1	.3
202L/US60 TI - 2	2100	.1	.3
202L/US60 TI - 2	1947	.1	.3
202L/US60 TI - 2	1909	.1	.3
202L/US60 TI - 2	1897	.1	.3
202L/US60 TI - 2	1877	.1	.3
202L/US60 TI - 2	1857	.1	.3
202L/US60 TI - 2	1837	.1	.3
202L/US60 TI - 2	1817	.1	.3
202L/US60 TI - 2	1797	.1	.3
202L/US60 TI - 2	1777	.1	.3
202L/US60 TI - 2	1762	.1	.3
202L/US60 TI - 2	1744	.1	.3
202L/US60 TI - 2	1706	.1	.3
202L/US60 TI - 2	1700	.1	.3
202L/US60 TI - 2	1670	.1	.3
202L/US60 TI - 2	1540	.1	.3
202L/US60 TI - 2	1433	.1	.3
202L/US60 TI - 2	1360	.1	.3
202L/US60 TI - 2	1315	.1	.3
202L/US60 TI - 2	1270	Culvert	
202L/US60 TI - 2	1237	.1	.3
202L/US60 TI - 2	1170	.1	.3

River: South Hawes Chan

Reach	River Sta.	Contr.	Expan.
202L/US60 TI - 2	1170	.1	.3
202L/US60 TI - 2	1150	.1	.3
202L/US60 TI - 2	1000	.1	.3


202L/US60 TI - Ph 2 - Side Weir Rating
Plan: Plan 04
202L/US60 TI - 2
Legend
WS PF 6
WS PF 5
WS PF 7
WS PF 4
WS PF 3
WS PF 2
WS PF 1
Ground
LOB
ROB
Left Levee
Elevation (ft)
1444
1442
1440
1438
1436
1650
1700
1750
1800
1850
1900
1950
2000
Main Channel Distance (ft)

HEC-RAS Plan: Plan 02

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
South Hawes Chan	202L/US60 TI - 2	1170	PF 1	97.00	1436.21	1437.67		1438.10	0.002636	5.24	18.52	15.34	0.84
South Hawes Chan	202L/US60 TI - 2	1170	PF 2	136.41	1436.21	1437.99		1438.51	0.002572	5.77	23.63	16.51	0.85
South Hawes Chan	202L/US60 TI - 2	1170	PF 3	151.36	1436.21	1438.10		1438.65	0.002554	5.94	25.47	16.91	0.85
South Hawes Chan	202L/US60 TI - 2	1170	PF 4	175.73	1436.21	1438.27		1438.87	0.002530	6.19	28.37	17.53	0.86
South Hawes Chan	202L/US60 TI - 2	1170	PF 5	282.00	1436.21	1438.90		1439.67	0.002449	7.03	40.11	19.82	0.87
South Hawes Chan	202L/US60 TI - 2	1170	PF 6	326.25	1436.21	1439.13		1439.96	0.002410	7.29	44.77	20.66	0.87
South Hawes Chan	202L/US60 TI - 2	1170	PF 7	215.16	1436.21	1438.52		1439.19	0.002499	6.55	32.86	18.44	0.86
South Hawes Chan	202L/US60 TI - 2	1150	PF 1	97.00	1436.06	1437.66	1437.43	1438.04	0.002200	4.93	19.68	15.56	0.77
South Hawes Chan	202L/US60 TI - 2	1150	PF 2	136.41	1436.06	1437.98	1437.73	1438.45	0.002200	5.47	24.93	16.74	0.79
South Hawes Chan	202L/US60 TI - 2	1150	PF 3	151.36	1436.06	1438.10	1437.84	1438.59	0.002200	5.65	26.80	17.14	0.80
South Hawes Chan	202L/US60 TI - 2	1150	PF 4	175.73	1436.06	1438.27	1438.01	1438.81	0.002200	5.90	29.76	17.75	0.80
South Hawes Chan	202L/US60 TI - 2	1150	PF 5	282.00	1436.06	1438.90	1438.61	1439.61	0.002187	6.76	41.71	20.04	0.83
South Hawes Chan	202L/US60 TI - 2	1150	PF 6	326.25	1436.06	1439.12	1438.82	1439.89	0.002186	7.05	46.31	20.85	0.83
South Hawes Chan	202L/US60 TI - 2	1150	PF 7	215.16	1436.06	1438.52	1438.25	1439.13	0.002200	6.27	34.33	18.66	0.81
South Hawes Chan	202L/US60 TI - 2	1000	PF 1	97.00	1435.73	1437.33	1437.10	1437.71	0.002200	4.93	19.68	15.56	0.77
South Hawes Chan	202L/US60 TI - 2	1000	PF 2	136.41	1435.73	1437.65	1437.40	1438.12	0.002203	5.48	24.91	16.73	0.79
South Hawes Chan	202L/US60 TI - 2	1000	PF 3	151.36	1435.73	1437.77	1437.51	1438.26	0.002202	5.65	26.80	17.14	0.80
South Hawes Chan	202L/US60 TI - 2	1000	PF 4	175.73	1435.73	1437.93	1437.67	1438.48	0.002201	5.91	29.76	17.75	0.80
South Hawes Chan	202L/US60 TI - 2	1000	PF 5	282.00	1435.73	1438.56	1438.27	1439.28	0.002200	6.78	41.62	20.02	0.83
South Hawes Chan	202L/US60 TI - 2	1000	PF 6	326.25	1435.73	1438.79	1438.50	1439.56	0.002203	7.07	46.18	20.83	0.84
South Hawes Chan	202L/US60 TI - 2	1000	PF 7	215.16	1435.73	1438.19	1437.91	1438.80	0.002201	6.27	34.33	18.66	0.81
Southern Ave Sys	202L/US60 TI - 2	3490	PF 1	96.00	1444.50	1446.35		1446.35	0.000018	0.29	326.18	256.03	0.05
Southern Ave Sys	202L/US60 TI - 2	3490	PF 2	185.00	1444.50	1447.63		1447.63	0.000007	0.28	660.34	266.39	0.03
Southern Ave Sys	202L/US60 TI - 2	3490	PF 3	248.00	1444.50	1448.41		1448.41	0.000005	0.28	871.13	272.71	0.03
Southern Ave Sys	202L/US60 TI - 2	3490	PF 4	324.00	1444.50	1449.27		1449.27	0.000004	0.29	1108.51	279.67	0.03
Southern Ave Sys	202L/US60 TI - 2	3490	PF 5	480.00	1444.50	1450.84		1450.85	0.000003	0.31	1559.73	292.43	0.02
Southern Ave Sys	202L/US60 TI - 2	3490	PF 6	644.00	1444.50	1452.48		1452.48	0.000002	0.31	2048.68	305.66	0.02
Southern Ave Sys	202L/US60 TI - 2	3490	PF 7	712.00	1444.50	1453.27		1453.27	0.000002	0.31	2293.30	312.07	0.02
Southern Ave Sys	202L/US60 TI - 2	3365	PF 1	96.00	1444.00	1445.91	1445.41	1446.30	0.001655	5.01	19.16	10.05	0.64
Southern Ave Sys	202L/US60 TI - 2	3365	PF 2	185.00	1444.00	1446.96	1446.19	1447.56	0.001711	6.22	29.76	10.08	0.64
Southern Ave Sys	202L/US60 TI - 2	3365	PF 3	248.00	1444.00	1447.61	1446.66	1448.33	0.001768	6.84	36.24	10.10	0.64
Southern Ave Sys	202L/US60 TI - 2	3365	PF 4	324.00	1444.00	1448.31	1447.19	1449.18	0.001840	7.47	43.39	10.12	0.64
Southern Ave Sys	202L/US60 TI - 2	3365	PF 5	480.00	1444.00	1449.62	1448.13	1450.73	0.001985	8.48	56.58	10.15	0.63
Southern Ave Sys	202L/US60 TI - 2	3365	PF 6	644.00	1444.00	1451.10	1449.03	1452.35	0.001932	8.98	71.71	10.19	0.60
Southern Ave Sys	202L/US60 TI - 2	3365	PF 7	712.00	1444.00	1451.95	1449.37	1453.15	0.001646	8.83	84.47	23.75	0.55
Southern Ave Sys	202L/US60 TI - 2	3000		Culvert									
Southern Ave Sys	202L/US60 TI - 2	2381	PF 1	96.00	1437.85	1439.38		1439.99	0.003208	6.25	15.36	10.03	0.89
Southern Ave Sys	202L/US60 TI - 2	2381	PF 2	185.00	1437.85	1440.04	1440.04	1441.14	0.004113	8.42	21.96	10.05	1.00
Southern Ave Sys	202L/US60 TI - 2	2381	PF 3	248.00	1437.85	1440.52	1440.52	1441.85	0.004178	9.28	26.74	10.06	1.00
Southern Ave Sys	202L/US60 TI - 2	2381	PF 4	324.00	1437.85	1441.03	1441.03	1442.63	0.004297	10.14	31.95	10.07	1.00
Southern Ave Sys	202L/US60 TI - 2	2381	PF 5	480.00	1437.85	1441.98	1441.98	1444.06	0.004556	11.56	41.52	10.09	1.00

HEC-RAS Plan: Plan 02 (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Southern Ave Sys	202L/US60 TI - 2	2381	PF 6	644.00	1437.85	1442.88	1442.88	1445.40	0.004806	12.72	50.61	10.11	1.00
Southern Ave Sys	202L/US60 TI - 2	2381	PF 7	712.00	1437.85	1443.23	1443.23	1445.92	0.004910	13.15	54.15	10.12	1.00
Southern Ave Sys	202L/US60 TI - 2	2261	PF 1	96.00	1437.73	1439.55	1438.89	1439.69	0.000709	3.07	31.24	21.66	0.45
Southern Ave Sys	202L/US60 TI - 2	2261	PF 2	185.00	1437.73	1440.10	1439.40	1440.37	0.000978	4.24	43.63	23.53	0.55
Southern Ave Sys	202L/US60 TI - 2	2261	PF 3	248.00	1437.73	1440.32	1439.71	1440.72	0.001244	5.05	49.09	24.31	0.63
Southern Ave Sys	202L/US60 TI - 2	2261	PF 4	324.00	1437.73	1440.63	1440.03	1441.14	0.001398	5.72	56.69	25.36	0.67
Southern Ave Sys	202L/US60 TI - 2	2261	PF 5	480.00	1437.73	1441.29	1440.62	1441.94	0.001424	6.48	74.06	27.60	0.70
Southern Ave Sys	202L/US60 TI - 2	2261	PF 6	644.00	1437.73	1441.84	1441.14	1442.64	0.001485	7.18	89.75	29.48	0.72
Southern Ave Sys	202L/US60 TI - 2	2261	PF 7	712.00	1437.73	1442.04	1441.35	1442.90	0.001507	7.43	95.88	30.18	0.73
Southern Ave Sys	202L/US60 TI - 2	2201	PF 1	96.00	1437.67	1439.52	1438.82	1439.65	0.000645	2.94	32.70	22.74	0.43
Southern Ave Sys	202L/US60 TI - 2	2201	PF 2	185.00	1437.67	1440.06	1439.33	1440.31	0.000904	4.06	45.54	24.90	0.53
Southern Ave Sys	202L/US60 TI - 2	2201	PF 3	248.00	1437.67	1440.27	1439.63	1440.64	0.001166	4.86	51.06	25.77	0.61
Southern Ave Sys	202L/US60 TI - 2	2201	PF 4	324.00	1437.67	1440.58	1439.95	1441.04	0.001306	5.48	59.08	26.99	0.65
Southern Ave Sys	202L/US60 TI - 2	2201	PF 5	480.00	1437.67	1441.25	1440.52	1441.84	0.001292	6.14	78.13	29.67	0.67
Southern Ave Sys	202L/US60 TI - 2	2201	PF 6	644.00	1437.67	1441.82	1441.03	1442.52	0.001317	6.74	95.60	31.94	0.69
Southern Ave Sys	202L/US60 TI - 2	2201	PF 7	712.00	1437.67	1442.03	1441.22	1442.78	0.001325	6.95	102.48	32.79	0.69
Southern Ave Sys	202L/US60 TI - 2	2100	PF 1	96.00	1437.57	1439.46	1438.72	1439.58	0.000591	2.85	33.68	22.91	0.41
Southern Ave Sys	202L/US60 TI - 2	2100	PF 2	185.00	1437.57	1439.97	1439.23	1440.22	0.000884	4.03	45.88	24.95	0.52
Southern Ave Sys	202L/US60 TI - 2	2100	PF 3	248.00	1437.57	1440.13	1439.53	1440.52	0.001232	4.95	50.08	25.62	0.62
Southern Ave Sys	202L/US60 TI - 2	2100	PF 4	324.00	1437.57	1440.40	1439.85	1440.90	0.001448	5.68	56.99	26.67	0.69
Southern Ave Sys	202L/US60 TI - 2	2100	PF 5	480.00	1437.57	1441.07	1440.42	1441.69	0.001407	6.33	75.81	29.36	0.69
Southern Ave Sys	202L/US60 TI - 2	2100	PF 6	644.00	1437.57	1441.63	1440.93	1442.38	0.001424	6.93	92.98	31.61	0.71
Southern Ave Sys	202L/US60 TI - 2	2100	PF 7	712.00	1437.57	1441.83	1441.12	1442.63	0.001442	7.16	99.42	32.42	0.72
Southern Ave Sys	202L/US60 TI - 2	1947	PF 1	96.00	1437.41	1439.39	1438.56	1439.50	0.000498	2.69	35.67	23.26	0.38
Southern Ave Sys	202L/US60 TI - 2	1947	PF 2	185.00	1437.41	1439.84	1439.07	1440.08	0.000841	3.96	46.68	25.08	0.51
Southern Ave Sys	202L/US60 TI - 2	1947	PF 3	248.00	1437.41	1439.90	1439.37	1440.31	0.001379	5.15	48.18	25.32	0.66
Southern Ave Sys	202L/US60 TI - 2	1947	PF 4	324.00	1437.41	1439.87	1439.69	1440.59	0.002483	6.85	47.30	25.18	0.88
Southern Ave Sys	202L/US60 TI - 2	1947	PF 5	480.00	1437.41	1440.26	1440.26	1441.34	0.003095	8.34	57.52	26.75	1.00
Southern Ave Sys	202L/US60 TI - 2	1947	PF 6	644.00	1437.41	1440.75	1440.75	1442.02	0.003022	9.04	71.24	28.73	1.01
Southern Ave Sys	202L/US60 TI - 2	1947	PF 7	712.00	1437.41	1440.98	1440.98	1442.28	0.002875	9.15	77.82	29.63	0.99
Southern Ave Sys	202L/US60 TI - 2	1946		Lat. Weir									
Southern Ave Sys	202L/US60 TI - 2	1909	PF 1	96.00	1437.38	1439.42		1439.47	0.000253	1.79	53.67	39.79	0.27
Southern Ave Sys	202L/US60 TI - 2	1909	PF 2	185.00	1437.38	1439.93		1440.02	0.000353	2.45	75.40	44.45	0.33
Southern Ave Sys	202L/US60 TI - 2	1909	PF 3	248.00	1437.38	1440.05		1440.20	0.000503	3.06	81.16	44.71	0.40
Southern Ave Sys	202L/US60 TI - 2	1909	PF 4	324.00	1437.38	1440.18		1440.39	0.000699	3.74	86.61	44.95	0.47
Southern Ave Sys	202L/US60 TI - 2	1909	PF 5	479.98	1437.38	1440.37		1440.77	0.001129	5.03	95.48	45.34	0.61
Southern Ave Sys	202L/US60 TI - 2	1909	PF 6	642.09	1437.38	1440.51		1441.13	0.001657	6.31	101.71	45.62	0.75
Southern Ave Sys	202L/US60 TI - 2	1909	PF 7	711.75	1437.38	1440.55		1441.29	0.001915	6.86	103.73	45.71	0.80
Southern Ave Sys	202L/US60 TI - 2	1897	PF 1	96.00	1437.37	1439.41		1439.46	0.000249	1.78	53.98	39.88	0.27
Southern Ave Sys	202L/US60 TI - 2	1897	PF 2	184.19	1437.37	1439.93		1440.02	0.000344	2.43	75.82	44.47	0.33

HEC-RAS Plan: Plan 02 (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Southern Ave Sys	202L/US60 TI - 2	1897	PF 3	245.07	1437.37	1440.05		1440.19	0.000483	3.00	81.57	44.73	0.39
Southern Ave Sys	202L/US60 TI - 2	1897	PF 4	318.97	1437.37	1440.18		1440.39	0.000666	3.66	87.09	44.97	0.46
Southern Ave Sys	202L/US60 TI - 2	1897	PF 5	468.52	1437.37	1440.38		1440.75	0.001050	4.87	96.22	45.38	0.59
Southern Ave Sys	202L/US60 TI - 2	1897	PF 6	620.94	1437.37	1440.53		1441.10	0.001478	6.01	103.26	45.69	0.70
Southern Ave Sys	202L/US60 TI - 2	1897	PF 7	694.08	1437.37	1440.57		1441.25	0.001755	6.61	104.97	45.76	0.77
Southern Ave Sys	202L/US60 TI - 2	1877	PF 1	96.00	1437.35	1439.41		1439.46	0.000240	1.76	54.69	40.09	0.26
Southern Ave Sys	202L/US60 TI - 2	1877	PF 2	181.30	1437.35	1439.92		1440.01	0.000322	2.36	76.68	44.51	0.32
Southern Ave Sys	202L/US60 TI - 2	1877	PF 3	236.46	1437.35	1440.06		1440.18	0.000433	2.86	82.55	44.77	0.37
Southern Ave Sys	202L/US60 TI - 2	1877	PF 4	304.81	1437.35	1440.18		1440.37	0.000584	3.46	88.22	45.02	0.43
Southern Ave Sys	202L/US60 TI - 2	1877	PF 5	440.89	1437.35	1440.40		1440.71	0.000881	4.50	97.89	45.45	0.54
Southern Ave Sys	202L/US60 TI - 2	1877	PF 6	577.91	1437.35	1440.58		1441.04	0.001177	5.45	106.07	45.81	0.63
Southern Ave Sys	202L/US60 TI - 2	1877	PF 7	652.58	1437.35	1440.62		1441.18	0.001422	6.05	107.94	45.89	0.69
Southern Ave Sys	202L/US60 TI - 2	1857	PF 1	96.00	1437.33	1439.41		1439.46	0.000232	1.73	55.40	40.30	0.26
Southern Ave Sys	202L/US60 TI - 2	1857	PF 2	177.71	1437.33	1439.92		1440.01	0.000298	2.29	77.54	44.55	0.31
Southern Ave Sys	202L/US60 TI - 2	1857	PF 3	226.94	1437.33	1440.06		1440.17	0.000384	2.72	83.53	44.81	0.35
Southern Ave Sys	202L/US60 TI - 2	1857	PF 4	289.22	1437.33	1440.19		1440.35	0.000503	3.23	89.47	45.08	0.40
Southern Ave Sys	202L/US60 TI - 2	1857	PF 5	411.16	1437.33	1440.41		1440.68	0.000726	4.13	99.58	45.53	0.49
Southern Ave Sys	202L/US60 TI - 2	1857	PF 6	533.45	1437.33	1440.61		1440.99	0.000928	4.91	108.73	45.93	0.56
Southern Ave Sys	202L/US60 TI - 2	1857	PF 7	606.50	1437.33	1440.66		1441.13	0.001128	5.47	110.91	46.02	0.62
Southern Ave Sys	202L/US60 TI - 2	1837	PF 1	96.00	1437.31	1439.41		1439.45	0.000224	1.71	56.11	40.52	0.26
Southern Ave Sys	202L/US60 TI - 2	1837	PF 2	173.34	1437.31	1439.92		1440.00	0.000274	2.21	78.40	44.59	0.29
Southern Ave Sys	202L/US60 TI - 2	1837	PF 3	216.44	1437.31	1440.06		1440.16	0.000336	2.56	84.61	44.86	0.33
Southern Ave Sys	202L/US60 TI - 2	1837	PF 4	272.09	1437.31	1440.20		1440.34	0.000426	3.00	90.73	45.13	0.37
Southern Ave Sys	202L/US60 TI - 2	1837	PF 5	379.28	1437.31	1440.43		1440.65	0.000586	3.75	101.26	45.60	0.44
Southern Ave Sys	202L/US60 TI - 2	1837	PF 6	487.04	1437.31	1440.65		1440.95	0.000720	4.38	111.27	46.04	0.50
Southern Ave Sys	202L/US60 TI - 2	1837	PF 7	555.69	1437.31	1440.71		1441.08	0.000872	4.88	113.90	46.15	0.55
Southern Ave Sys	202L/US60 TI - 2	1817	PF 1	96.00	1437.29	1439.40		1439.45	0.000216	1.69	56.83	40.73	0.25
Southern Ave Sys	202L/US60 TI - 2	1817	PF 2	168.06	1437.29	1439.93		1439.99	0.000248	2.12	79.38	44.63	0.28
Southern Ave Sys	202L/US60 TI - 2	1817	PF 3	204.93	1437.29	1440.07		1440.15	0.000289	2.39	85.70	44.91	0.31
Southern Ave Sys	202L/US60 TI - 2	1817	PF 4	253.35	1437.29	1440.21		1440.32	0.000354	2.75	91.98	45.19	0.34
Southern Ave Sys	202L/US60 TI - 2	1817	PF 5	345.20	1437.29	1440.45		1440.62	0.000461	3.35	102.95	45.67	0.39
Southern Ave Sys	202L/US60 TI - 2	1817	PF 6	438.22	1437.29	1440.68		1440.91	0.000545	3.85	113.68	46.14	0.43
Southern Ave Sys	202L/US60 TI - 2	1817	PF 7	500.00	1437.29	1440.75		1441.03	0.000653	4.28	116.78	46.27	0.47
Southern Ave Sys	202L/US60 TI - 2	1797	PF 1	96.00	1437.27	1439.40		1439.45	0.000208	1.67	57.55	40.94	0.25
Southern Ave Sys	202L/US60 TI - 2	1797	PF 2	161.74	1437.27	1439.93		1439.99	0.000221	2.01	80.35	44.67	0.26
Southern Ave Sys	202L/US60 TI - 2	1797	PF 3	192.36	1437.27	1440.07		1440.15	0.000245	2.22	86.78	44.96	0.28
Southern Ave Sys	202L/US60 TI - 2	1797	PF 4	232.98	1437.27	1440.21		1440.31	0.000287	2.50	93.24	45.25	0.31
Southern Ave Sys	202L/US60 TI - 2	1797	PF 5	308.88	1437.27	1440.46		1440.60	0.000351	2.95	104.64	45.75	0.34
Southern Ave Sys	202L/US60 TI - 2	1797	PF 6	386.82	1437.27	1440.71		1440.88	0.000399	3.34	115.98	46.24	0.37
Southern Ave Sys	202L/US60 TI - 2	1797	PF 7	439.37	1437.27	1440.79		1441.00	0.000469	3.68	119.52	46.39	0.40
Southern Ave Sys	202L/US60 TI - 2	1777	PF 1	96.00	1437.25	1439.40		1439.44	0.000201	1.65	58.28	41.15	0.24

HEC-RAS Plan: Plan 02 (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Southern Ave Sys	202L/US60 TI - 2	1777	PF 2	154.26	1437.25	1439.93		1439.98	0.000193	1.90	81.33	44.72	0.25
Southern Ave Sys	202L/US60 TI - 2	1777	PF 3	178.72	1437.25	1440.07		1440.14	0.000203	2.03	87.87	45.01	0.26
Southern Ave Sys	202L/US60 TI - 2	1777	PF 4	210.93	1437.25	1440.22		1440.30	0.000225	2.23	94.50	45.30	0.27
Southern Ave Sys	202L/US60 TI - 2	1777	PF 5	270.26	1437.25	1440.48		1440.58	0.000256	2.54	106.33	45.82	0.29
Southern Ave Sys	202L/US60 TI - 2	1777	PF 6	332.79	1437.25	1440.74		1440.86	0.000279	2.82	118.15	46.33	0.31
Southern Ave Sys	202L/US60 TI - 2	1777	PF 7	373.90	1437.25	1440.82		1440.97	0.000318	3.06	122.11	46.50	0.33
Southern Ave Sys	202L/US60 TI - 2	1762	PF 1	96.00	1437.23	1439.40		1439.44	0.000194	1.63	59.01	41.37	0.24
Southern Ave Sys	202L/US60 TI - 2	1762	PF 2	147.80	1437.23	1439.93		1439.98	0.000171	1.80	82.31	44.76	0.23
Southern Ave Sys	202L/US60 TI - 2	1762	PF 3	167.75	1437.23	1440.08		1440.13	0.000172	1.89	88.96	45.06	0.24
Southern Ave Sys	202L/US60 TI - 2	1762	PF 4	193.21	1437.23	1440.23		1440.29	0.000181	2.02	95.76	45.36	0.24
Southern Ave Sys	202L/US60 TI - 2	1762	PF 5	239.73	1437.23	1440.50		1440.57	0.000192	2.22	107.89	45.89	0.26
Southern Ave Sys	202L/US60 TI - 2	1762	PF 6	290.47	1437.23	1440.76		1440.85	0.000203	2.42	119.97	46.41	0.27
Southern Ave Sys	202L/US60 TI - 2	1762	PF 7	321.68	1437.23	1440.85		1440.95	0.000223	2.59	124.21	46.60	0.28
Southern Ave Sys	202L/US60 TI - 2	1744	PF 1	96.00	1437.21	1439.40		1439.44	0.000188	1.61	59.74	41.58	0.24
Southern Ave Sys	202L/US60 TI - 2	1744	PF 2	139.02	1437.21	1439.93		1439.98	0.000146	1.67	83.29	44.80	0.22
Southern Ave Sys	202L/US60 TI - 2	1744	PF 3	153.72	1437.21	1440.08		1440.13	0.000139	1.71	90.05	45.10	0.21
Southern Ave Sys	202L/US60 TI - 2	1744	PF 4	170.56	1437.21	1440.24		1440.28	0.000136	1.76	97.02	45.41	0.21
Southern Ave Sys	202L/US60 TI - 2	1744	PF 5	201.35	1437.21	1440.51		1440.56	0.000130	1.84	109.45	45.96	0.21
Southern Ave Sys	202L/US60 TI - 2	1744	PF 6	237.66	1437.21	1440.78		1440.84	0.000129	1.95	121.79	46.49	0.21
Southern Ave Sys	202L/US60 TI - 2	1744	PF 7	255.69	1437.21	1440.87		1440.94	0.000134	2.02	126.33	46.69	0.22
Southern Ave Sys	202L/US60 TI - 2	1706	PF 1	96.00	1437.17	1439.33		1439.42	0.000354	2.40	40.08	24.01	0.33
Southern Ave Sys	202L/US60 TI - 2	1706	PF 2	135.41	1437.17	1439.86		1439.96	0.000306	2.54	53.38	26.13	0.31
Southern Ave Sys	202L/US60 TI - 2	1706	PF 3	147.36	1437.17	1440.01		1440.12	0.000294	2.57	57.35	26.73	0.31
Southern Ave Sys	202L/US60 TI - 2	1706	PF 4	159.73	1437.17	1440.17		1440.27	0.000282	2.60	61.54	27.35	0.30
Southern Ave Sys	202L/US60 TI - 2	1706	PF 5	180.00	1437.17	1440.44		1440.55	0.000256	2.60	69.28	28.46	0.29
Southern Ave Sys	202L/US60 TI - 2	1706	PF 6	201.25	1437.17	1440.72		1440.82	0.000235	2.61	77.22	29.55	0.28
Southern Ave Sys	202L/US60 TI - 2	1706	PF 7	214.16	1437.17	1440.81		1440.93	0.000240	2.67	80.07	29.94	0.29
Southern Ave Sys	202L/US60 TI - 2	1700	PF 1	96.00	1437.17	1439.33	1438.32	1439.42	0.000355	2.40	40.01	23.99	0.33
Southern Ave Sys	202L/US60 TI - 2	1700	PF 2	135.41	1437.17	1439.86	1438.56	1439.96	0.000307	2.54	53.31	26.12	0.31
Southern Ave Sys	202L/US60 TI - 2	1700	PF 3	147.36	1437.17	1440.01	1438.63	1440.11	0.000295	2.57	57.29	26.72	0.31
Southern Ave Sys	202L/US60 TI - 2	1700	PF 4	159.73	1437.17	1440.17	1438.70	1440.27	0.000283	2.60	61.48	27.34	0.31
Southern Ave Sys	202L/US60 TI - 2	1700	PF 5	180.00	1437.17	1440.44	1438.80	1440.55	0.000256	2.60	69.22	28.45	0.29
Southern Ave Sys	202L/US60 TI - 2	1700	PF 6	201.25	1437.17	1440.72	1438.91	1440.82	0.000235	2.61	77.17	29.55	0.28
Southern Ave Sys	202L/US60 TI - 2	1700	PF 7	214.16	1437.17	1440.81	1438.97	1440.92	0.000240	2.68	80.02	29.93	0.29
Southern Ave Sys	202L/US60 TI - 2	1670	PF 1	96.00	1437.14	1439.20	1438.53	1439.39	0.000871	3.52	27.29	17.84	0.50
Southern Ave Sys	202L/US60 TI - 2	1670	PF 2	135.41	1437.14	1439.73	1438.83	1439.94	0.000714	3.63	37.34	19.96	0.47
Southern Ave Sys	202L/US60 TI - 2	1670	PF 3	147.36	1437.14	1439.88	1438.91	1440.09	0.000678	3.65	40.41	20.57	0.46
Southern Ave Sys	202L/US60 TI - 2	1670	PF 4	159.73	1437.14	1440.04	1439.00	1440.25	0.000641	3.66	43.69	21.20	0.45
Southern Ave Sys	202L/US60 TI - 2	1670	PF 5	180.00	1437.14	1440.32	1439.12	1440.53	0.000563	3.61	49.89	22.34	0.43
Southern Ave Sys	202L/US60 TI - 2	1670	PF 6	201.25	1437.14	1440.60	1439.26	1440.80	0.000503	3.57	56.30	23.46	0.41
Southern Ave Sys	202L/US60 TI - 2	1670	PF 7	214.16	1437.14	1440.70	1439.32	1440.90	0.000514	3.66	58.44	23.82	0.41

HEC-RAS Plan: Plan 02 (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Southern Ave Sys	202L/US60 TI - 2	1540	PF 1	96.00	1437.01	1439.09	1438.41	1439.28	0.000834	3.47	27.70	17.93	0.49
Southern Ave Sys	202L/US60 TI - 2	1540	PF 2	135.41	1437.01	1439.65	1438.71	1439.84	0.000665	3.54	38.30	20.15	0.45
Southern Ave Sys	202L/US60 TI - 2	1540	PF 3	147.36	1437.01	1439.81	1438.79	1440.00	0.000629	3.55	41.51	20.78	0.44
Southern Ave Sys	202L/US60 TI - 2	1540	PF 4	159.73	1437.01	1439.97	1438.86	1440.16	0.000593	3.56	44.92	21.43	0.43
Southern Ave Sys	202L/US60 TI - 2	1540	PF 5	180.00	1437.01	1440.27	1438.99	1440.46	0.000516	3.50	51.47	22.62	0.41
Southern Ave Sys	202L/US60 TI - 2	1540	PF 6	201.25	1437.01	1440.55	1439.12	1440.74	0.000461	3.46	58.14	23.77	0.39
Southern Ave Sys	202L/US60 TI - 2	1540	PF 7	214.16	1437.01	1440.64	1439.19	1440.84	0.000472	3.55	60.27	24.12	0.40
Southern Ave Sys	202L/US60 TI - 2	1433	PF 1	96.00	1436.90	1439.01	1438.29	1439.19	0.000793	3.40	28.20	18.04	0.48
Southern Ave Sys	202L/US60 TI - 2	1433	PF 2	135.41	1436.90	1439.59	1438.59	1439.77	0.000620	3.45	39.27	20.35	0.44
Southern Ave Sys	202L/US60 TI - 2	1433	PF 3	147.36	1436.90	1439.75	1438.67	1439.93	0.000585	3.46	42.59	20.99	0.43
Southern Ave Sys	202L/US60 TI - 2	1433	PF 4	159.73	1436.90	1439.91	1438.76	1440.10	0.000551	3.46	46.13	21.65	0.42
Southern Ave Sys	202L/US60 TI - 2	1433	PF 5	180.00	1436.90	1440.22	1438.88	1440.40	0.000477	3.40	52.93	22.88	0.39
Southern Ave Sys	202L/US60 TI - 2	1433	PF 6	201.25	1436.90	1440.51	1439.02	1440.69	0.000426	3.36	59.81	24.05	0.38
Southern Ave Sys	202L/US60 TI - 2	1433	PF 7	214.16	1436.90	1440.60	1439.09	1440.79	0.000438	3.46	61.93	24.40	0.38
Southern Ave Sys	202L/US60 TI - 2	1360	PF 1	96.00	1436.83	1438.97		1439.14	0.000497	3.34	28.74	18.17	0.47
Southern Ave Sys	202L/US60 TI - 2	1360	PF 2	135.41	1436.83	1439.56		1439.73	0.000387	3.38	40.07	20.52	0.43
Southern Ave Sys	202L/US60 TI - 2	1360	PF 3	147.36	1436.83	1439.72		1439.90	0.000366	3.39	43.46	21.17	0.42
Southern Ave Sys	202L/US60 TI - 2	1360	PF 4	159.73	1436.83	1439.89		1440.06	0.000344	3.39	47.06	21.84	0.41
Southern Ave Sys	202L/US60 TI - 2	1360	PF 5	180.00	1436.83	1440.20		1440.37	0.000298	3.33	54.03	23.09	0.38
Southern Ave Sys	202L/US60 TI - 2	1360	PF 6	201.25	1436.83	1440.49		1440.66	0.000266	3.30	61.03	24.27	0.37
Southern Ave Sys	202L/US60 TI - 2	1360	PF 7	214.16	1436.83	1440.58		1440.76	0.000273	3.39	63.22	24.63	0.37
Southern Ave Sys	202L/US60 TI - 2	1315	PF 1	96.00	1436.78	1438.70	1438.20	1439.09	0.001219	4.98	19.29	10.08	0.63
Southern Ave Sys	202L/US60 TI - 2	1315	PF 2	135.41	1436.78	1439.18	1438.56	1439.67	0.001261	5.62	24.10	10.10	0.64
Southern Ave Sys	202L/US60 TI - 2	1315	PF 3	147.36	1436.78	1439.31	1438.66	1439.83	0.001274	5.79	25.46	10.10	0.64
Southern Ave Sys	202L/US60 TI - 2	1315	PF 4	159.73	1436.78	1439.45	1438.77	1440.00	0.001286	5.95	26.84	10.11	0.64
Southern Ave Sys	202L/US60 TI - 2	1315	PF 5	180.00	1436.78	1439.74	1438.93	1440.31	0.001217	6.05	29.75	10.12	0.62
Southern Ave Sys	202L/US60 TI - 2	1315	PF 6	201.25	1436.78	1440.00	1439.10	1440.60	0.001200	6.22	32.36	10.13	0.61
Southern Ave Sys	202L/US60 TI - 2	1315	PF 7	214.16	1436.78	1440.01	1439.19	1440.69	0.001337	6.58	32.54	10.13	0.65
Southern Ave Sys	202L/US60 TI - 2	1270		Culvert									
Southern Ave Sys	202L/US60 TI - 2	1237	PF 1	96.00	1436.71	1438.13	1438.13	1438.84	0.004069	6.76	14.20	10.06	1.00
Southern Ave Sys	202L/US60 TI - 2	1237	PF 2	135.41	1436.71	1438.49	1438.49	1439.38	0.004067	7.59	17.85	10.07	1.00
Southern Ave Sys	202L/US60 TI - 2	1237	PF 3	147.36	1436.71	1438.59	1438.59	1439.54	0.004062	7.80	18.90	10.08	1.00
Southern Ave Sys	202L/US60 TI - 2	1237	PF 4	159.73	1436.71	1438.70	1438.70	1439.69	0.004072	8.01	19.94	10.08	1.00
Southern Ave Sys	202L/US60 TI - 2	1237	PF 5	180.00	1436.71	1439.29		1440.04	0.002415	6.96	25.88	10.10	0.77
Southern Ave Sys	202L/US60 TI - 2	1237	PF 6	201.25	1436.71	1439.56		1440.33	0.002253	7.02	28.66	10.11	0.74
Southern Ave Sys	202L/US60 TI - 2	1237	PF 7	214.16	1436.71	1439.13	1439.13	1440.33	0.004118	8.83	24.26	10.10	1.00
Southern Ave Sys	202L/US60 TI - 2	1170	PF 1	96.00	1436.21	1437.98		1438.24	0.001317	4.11	23.36	16.45	0.61
Southern Ave Sys	202L/US60 TI - 2	1170	PF 2	135.41	1436.21	1438.33		1438.66	0.001366	4.62	29.34	17.73	0.63
Southern Ave Sys	202L/US60 TI - 2	1170	PF 3	147.36	1436.21	1438.46		1438.80	0.001287	4.63	31.80	18.23	0.62
Southern Ave Sys	202L/US60 TI - 2	1170	PF 4	159.73	1436.21	1438.71		1439.01	0.001036	4.39	36.35	19.12	0.56
Southern Ave Sys	202L/US60 TI - 2	1170	PF 5	180.00	1436.21	1439.63		1439.80	0.000401	3.23	55.65	22.50	0.36

HEC-RAS Plan: Plan 02 (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Southern Ave Sys	202L/US60 TI - 2	1170	PF 6	201.25	1436.21	1439.93		1440.09	0.000366	3.23	62.34	23.56	0.35
Southern Ave Sys	202L/US60 TI - 2	1170	PF 7	214.16	1436.21	1438.89		1439.34	0.001428	5.36	39.95	19.79	0.66
Hawes Rd Channel	202L/US60 TI - 2	1540	PF 1	1.00	1437.47	1438.14		1438.15	0.000004	0.13	7.65	12.70	0.03
Hawes Rd Channel	202L/US60 TI - 2	1540	PF 2	1.00	1437.47	1438.57		1438.57	0.000001	0.07	13.36	14.38	0.01
Hawes Rd Channel	202L/US60 TI - 2	1540	PF 3	4.00	1437.47	1438.71		1438.71	0.000008	0.26	15.47	14.96	0.04
Hawes Rd Channel	202L/US60 TI - 2	1540	PF 4	16.00	1437.47	1438.93		1438.94	0.000070	0.85	18.89	15.85	0.14
Hawes Rd Channel	202L/US60 TI - 2	1540	PF 5	102.00	1437.47	1439.74		1439.89	0.000575	3.09	32.97	19.07	0.41
Hawes Rd Channel	202L/US60 TI - 2	1540	PF 6	125.00	1437.47	1440.02		1440.18	0.000559	3.25	38.49	20.20	0.41
Hawes Rd Channel	202L/US60 TI - 2	1540	PF 7	1.00	1437.47	1439.26		1439.26	0.000000	0.04	24.25	17.15	0.01
Hawes Rd Channel	202L/US60 TI - 2	1370	PF 1	1.00	1437.08	1438.14		1438.14	0.000001	0.08	12.91	14.26	0.01
Hawes Rd Channel	202L/US60 TI - 2	1370	PF 2	1.00	1437.08	1438.57		1438.57	0.000000	0.05	19.27	15.94	0.01
Hawes Rd Channel	202L/US60 TI - 2	1370	PF 3	4.00	1437.08	1438.71		1438.71	0.000003	0.19	21.61	16.52	0.03
Hawes Rd Channel	202L/US60 TI - 2	1370	PF 4	16.00	1437.08	1438.93		1438.94	0.000030	0.63	25.32	17.40	0.09
Hawes Rd Channel	202L/US60 TI - 2	1370	PF 5	102.00	1437.08	1439.70		1439.80	0.000337	2.56	39.88	20.47	0.32
Hawes Rd Channel	202L/US60 TI - 2	1370	PF 6	125.00	1437.08	1439.98		1440.10	0.000344	2.73	45.81	21.60	0.33
Hawes Rd Channel	202L/US60 TI - 2	1370	PF 7	1.00	1437.08	1439.26		1439.26	0.000000	0.03	31.24	18.71	0.00
Hawes Rd Channel	202L/US60 TI - 2	1170	PF 1	1.00	1436.21	1438.14		1438.14	0.000000	0.04	26.17	17.06	0.01
Hawes Rd Channel	202L/US60 TI - 2	1170	PF 2	1.00	1436.21	1438.57		1438.57	0.000000	0.03	33.69	18.60	0.00
Hawes Rd Channel	202L/US60 TI - 2	1170	PF 3	4.00	1436.21	1438.71		1438.71	0.000001	0.11	36.40	19.13	0.01
Hawes Rd Channel	202L/US60 TI - 2	1170	PF 4	16.00	1436.21	1438.93		1438.93	0.000008	0.39	40.67	19.93	0.05
Hawes Rd Channel	202L/US60 TI - 2	1170	PF 5	102.00	1436.21	1439.70		1439.75	0.000120	1.79	57.05	22.73	0.20
Hawes Rd Channel	202L/US60 TI - 2	1170	PF 6	125.00	1436.21	1439.98		1440.04	0.000134	1.97	63.59	23.76	0.21
Hawes Rd Channel	202L/US60 TI - 2	1170	PF 7	1.00	1436.21	1439.26		1439.26	0.000000	0.02	47.41	21.12	0.00