HYDROLOGY / HYDRAULICS REPORT
TPM 20843
Off
Alpine Heights Road

APN:404-320-43 / E.R.# 04-14-022

PREPARED BY:

MAY ENGINEERING AND SURVEYING
9880 N. Magnolia Ave. #205
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FOR: DEAN R. & LINDA N. ALBERS
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MAY ENGINEERING
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Project Discussion

Project Purpose

The purpose of the project is to subdivide a 23.64 acre parcel into 4 residential lots and a remainder lot. The project is located within the Alpine community plan. The land is designated as Land Use A-70(2) multi-rural for 2 acre lot size. This land use designation is for the purpose of large residential lots such as those proposed by the project.

The project is located off Alpine Heights Road approximately 1.25 miles west of South Grade Road. See the location map following this page.

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WO 6274

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Hydrology Study

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TPM 20843

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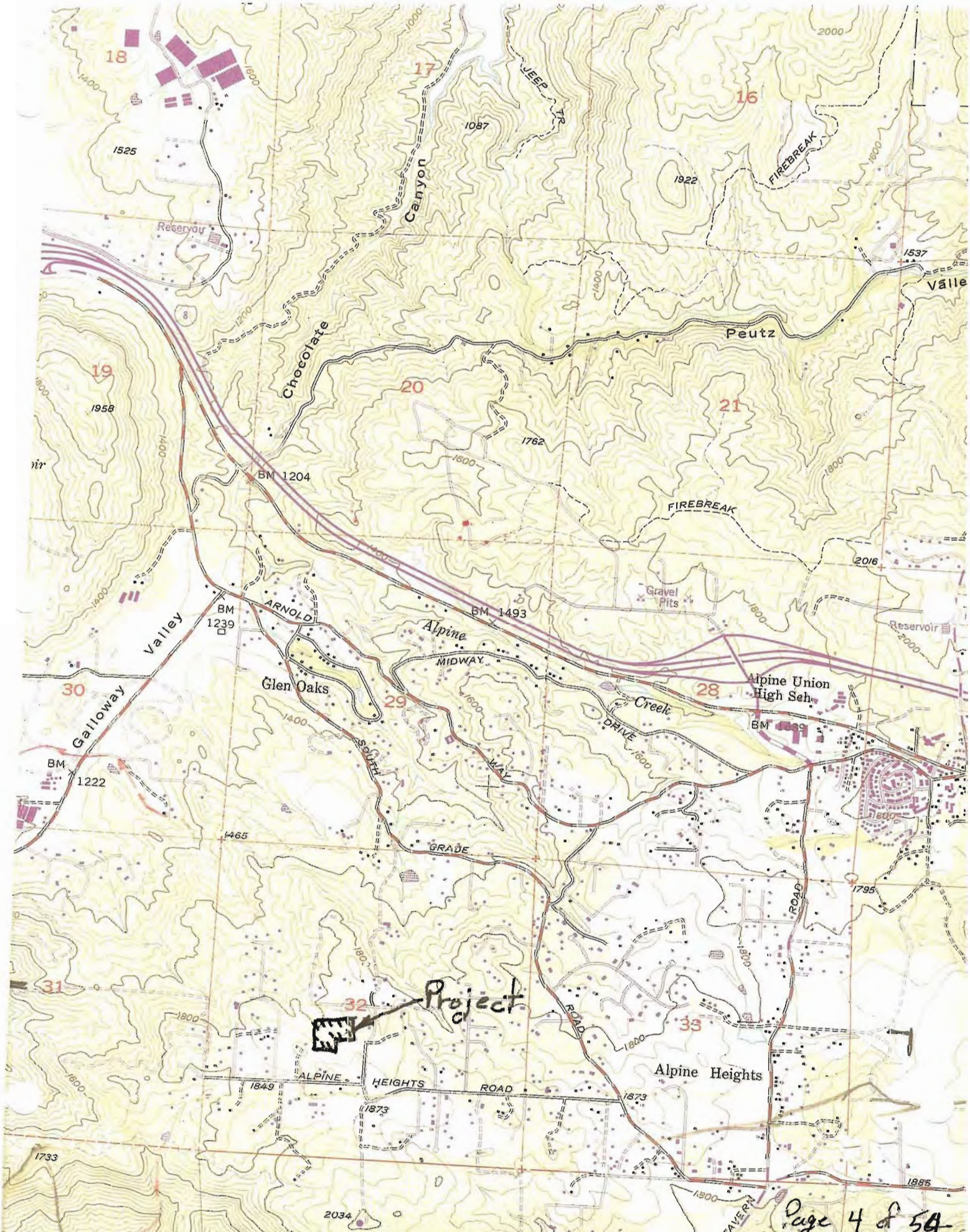

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Gravel Pits
Reservoir
BM 1239
ARNOLD
BM 1493
Alpine
MIDWAY
Valley
Galloway
Glen Oaks
Creek
Alpine Union High Sch.
DRIVE
SOUTH
WAY
BM 1222
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GRADE
1795
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Project
ROAD
Alpine Heights
ALPINE HEIGHTS ROAD
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1873
1873
1733
1885
2034

Description of Watershed

The general area is primarily developed with scattered dwelling units on large acreage lots. Much of the drainage area is confined to the project property and is therefore unlikely to be developed farther. The exception to this is a significant drainage flow that enters the south-west corner of the property from the south. The flow from this area (32.5 acres) crosses the property and is generally unaffected by this development. The lines of inundation were calculated for this drainage as it flows through the property. Calculation details for the lines of inundation are contained in "Appendix A" to this report and are discussed later. These lines of inundation will be shown on the final parcel map.

The drainage flows that originate on the project generally flow to the west and exit the project along the west property line. None of these basins total more than twenty-five acres in size and therefore lines of inundation were not calculated for any of these basins.

Methodology

The hydrology analysis for this project was conducted in accordance with the San Diego County Hydrology Manual dated June 2003. Because of the size of the drainage basin involved, the Rational Method was used as specified on page 3-1 of the Manual. There are no junctions of independent basins as described in Section 3.4 of the Hydrology Manual. Therefore, it was not necessary to use the Modified Rational Method to combine flows.

A density of 0.5 dwelling units per acre was used to determine the "C" runoff value. The reason for this is that the drainage basins contain existing buildings at this density or less. The undeveloped parcels that are within the drainage basins are covered with the same A70(2) land use designation that will limit development to 0.5 dwelling units per acre.

All hydraulic analysis was conducted in accordance with standard engineering practice. The references used for these analyses include King's Handbook of Hydraulics, normographs from the Bureau of Public Roads, the City of San Diego and other commonly accepted sources. The Autocad 2004 Land Development Desktop channel hydraulics calculator was used to determine the hydraulic properties of the natural channel for purposes of travel time calculation.

Summary

Location	Description	Area (acres)	Q (c.f.s) before	Q (c.f.s) after
1	Natural channel originating south of the property and crossing the southerly property line.	3.21	6	6
2	Largest natural channel originating south of the property and crossing the southerly property line.	32.51	66	66
3	Natural channel originating south of the property and crossing the easterly property line near the south property line.	4.78	8	8
4	Small natural channel originating south of the property and crossing the southerly property line at the interior south-east property corner.	1.06	3	3
5	Natural channel originating south of the property and crossing the southerly property line near the exterior south-east property corner.	4.04	8	8
6	Natural channel originating mostly on the property crossing private driveway.	5.74	11	12
7	Natural channel downstream of concentration point 6. Just north of concentration point 8.	9.37	17	19
8	Natural channel downstream of concentration point 5. Just south of concentration point 7.	10.01	18	18
9	Natural channel downstream of concentration points 4, 7 and 8.	23.88	42	44*
10	Largest natural channel downstream of concentration points 13 ad 11.	43.07	82	82
11	Natural channel originating south of the property and crossing the southerly property line. Downstream of concentration point 1.	4.50	8	8
12	Natural channel downstream of concentration point 3.	6.89	12	12
13	Natural channel just upstream of concentration point 10, downstream of concentration point 2.	38.57	73	73

* Flow prior to considering the proposed Detention Basin.

Conclusions

Flood Flow Increases and Detention Basin
The construction this report addresses consists of single family residences which has minimal impact on the drainage flows through the property. The only flows that increased all combine and exit the property at the same location (concentration point 9). Even at this point of maximum impact the increase in flow is only from 42 c.f.s. to 44 c.f.s. which represents less than a 5% increase.

However, in order to reduce the after construction flow off the property to the same or less than existed prior to construction, a detention basin is proposed. The basin will be located at the confluence of the drainage areas that were affected by the proposed project. The basin will be constructed across the drainage swale at the confluence. The basin will have a 30" CMP to provide outlet flows. The pipe was sized so that the before flow (42 c.f.s.) will be equaled as the basin reaches the spillway elevation. The basin dam will have the center 20 feet lower than the abutments (where the dam ties into the natural ground) by 1.5 feet. This will provide a weir type spillway so that any overflow will occur in a controlled manner so as not to damage the dam.

Calculations to determine the size of the detention pond were made following the County DPW procedure and are included in this report. See the section entitled "Detention Basin Calculations".

Limits of Inundation
Lines of inundation were calculated for the larger stream that flows through the north-west corner of the property. Cross-sections were taken from the topography using AutoCad Land Development Desktop. The sections were then exported in HEC-2 format and then input to the US Army Corps of Engineers Hydraulic Engineering Center's "River Analysis System" (HEC-RAS). HEC-RAS is the current version of the Corps' venerable HEC-2 program for water surface profiles. The current version of HEC-RAS is Version 3.1.2 which runs under the Windows operating system.

Appendix A includes the detailed hydraulic output from the program as well as the cross-sections and profile generated by HEC-RAS. A plan view of the lines of inundation generated with AutoCad Land Development Desktop based on the output water surface elevations from HEC-RAS. The lines of inundation will be shown on the final Parcel Map.

HYDROLOGY / HYDRAULICS REPORT

JOB NO. TPM 20843
OWNER: Dean R. & Linda N. Albers

DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the Business and Professions Code, and the design is consistent with current standards.

I understand the check of the project drawings and specifications by the County of San Diego is confined to review and does not relieve me of responsibilities for project design.

May Engineering & Surveying
9880 North Magnolia Ave. #205
Santee, CA 92071

Elliott M. May R.C.E. 18592
My registration expires 6-30-2005

3-24-05
Date

LINES OF INUNDATION APPENDIX
To
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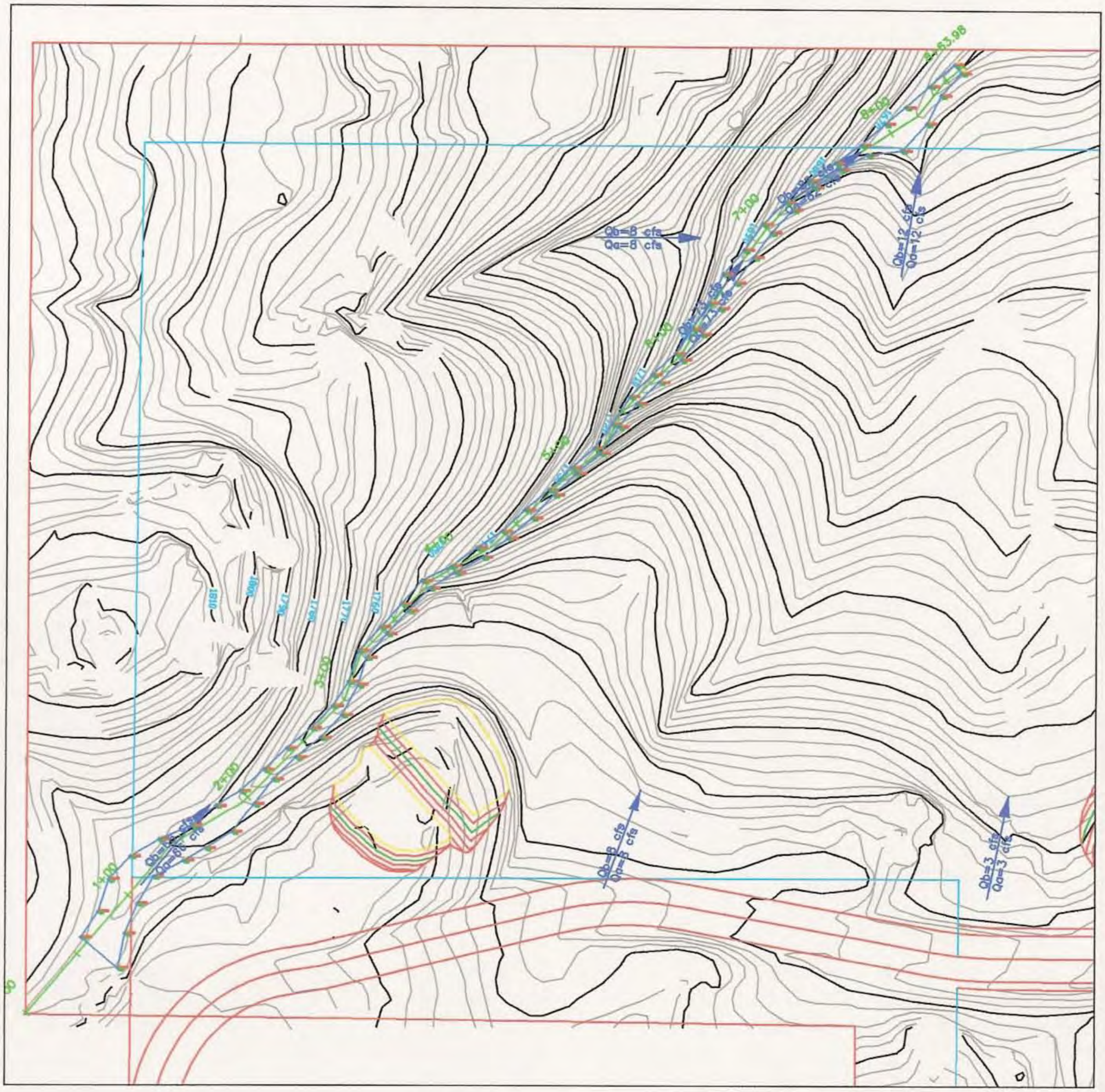
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



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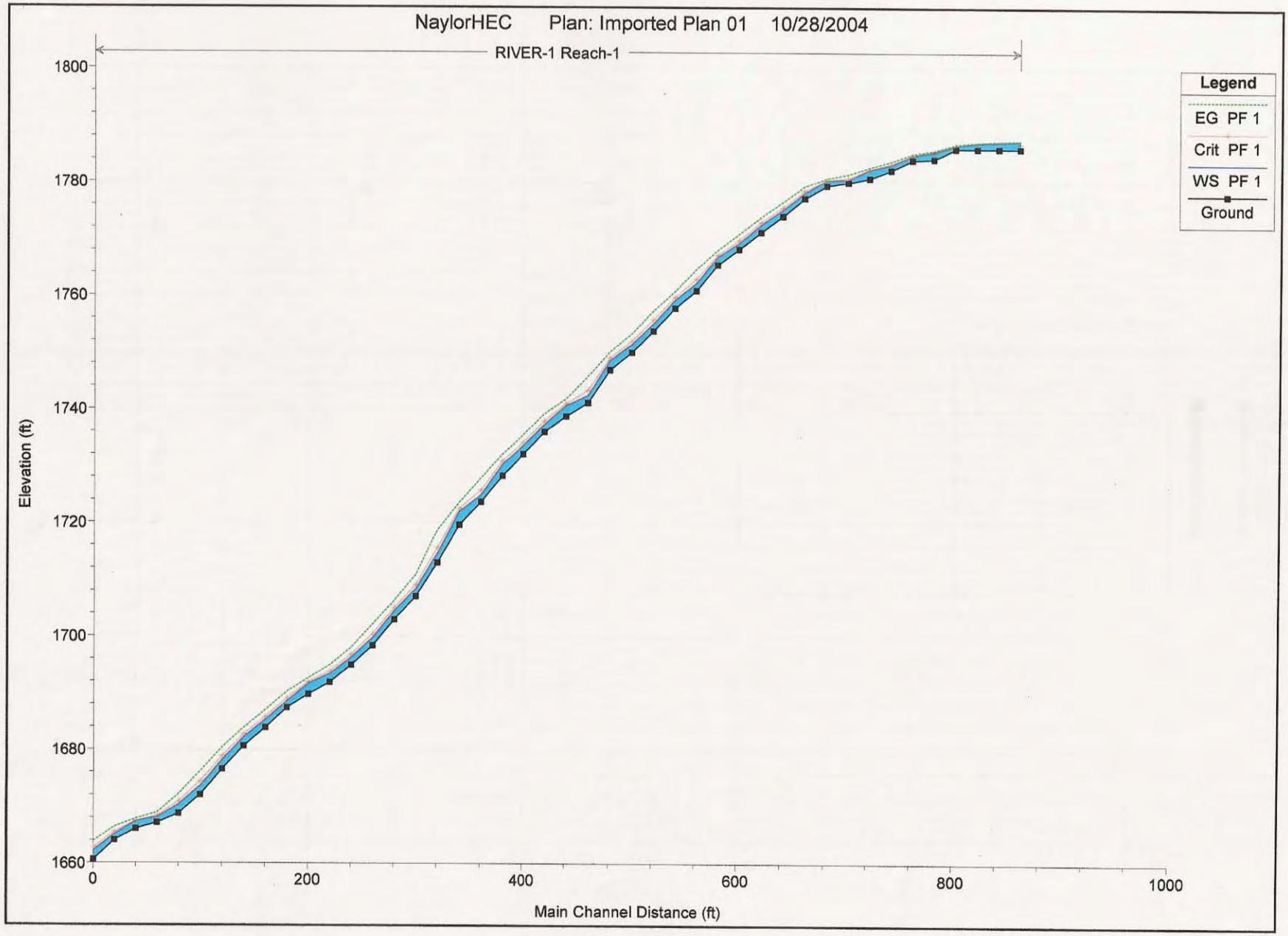
TPM 20843 Albers

Lines of Inundation

SIZE	FSCM NO.	DWG NO. TPM20843-L01	REV A
SCALE 1"=100'		SHEET 1 of 1	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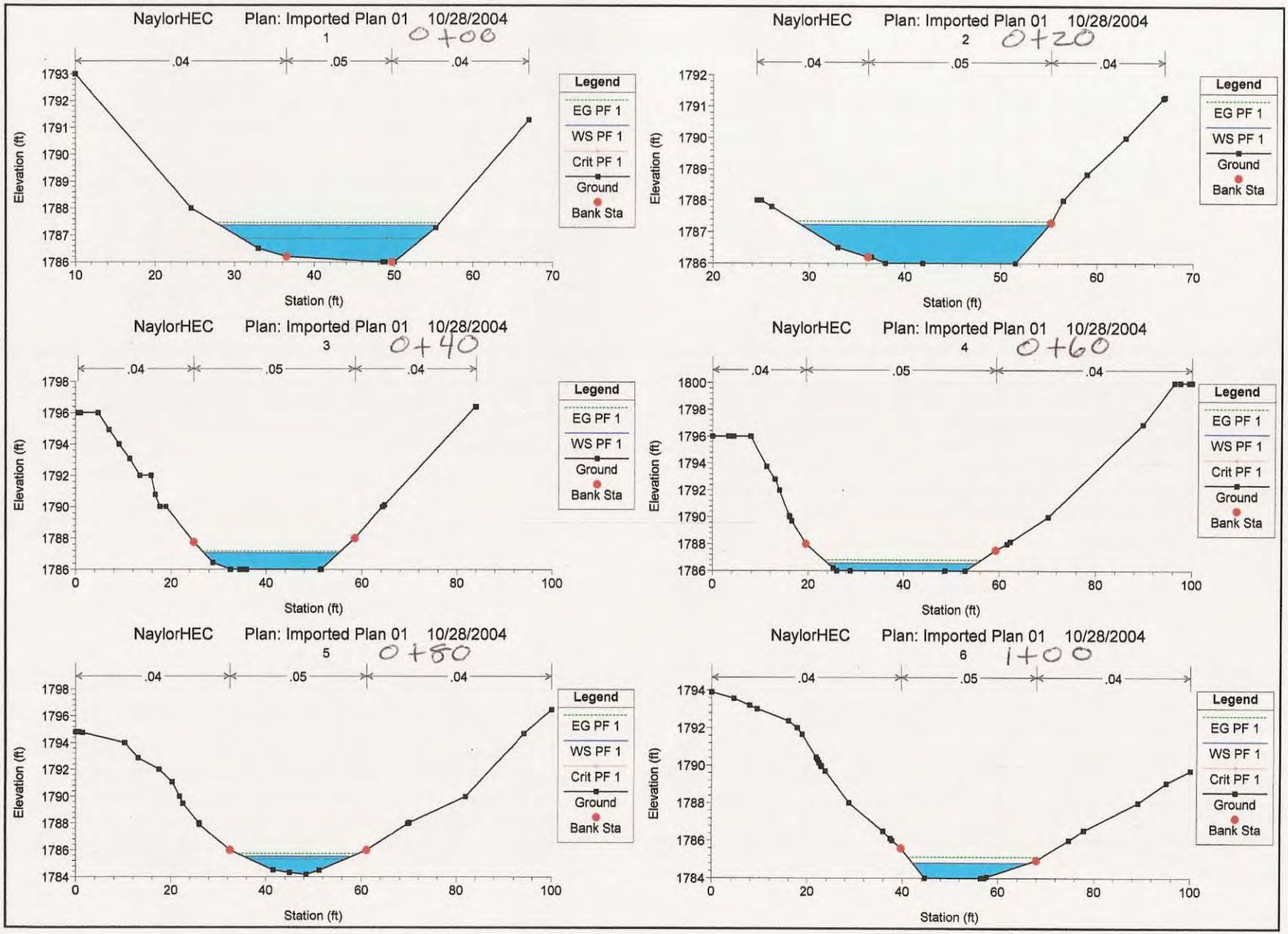
Main Channel Distance (ft)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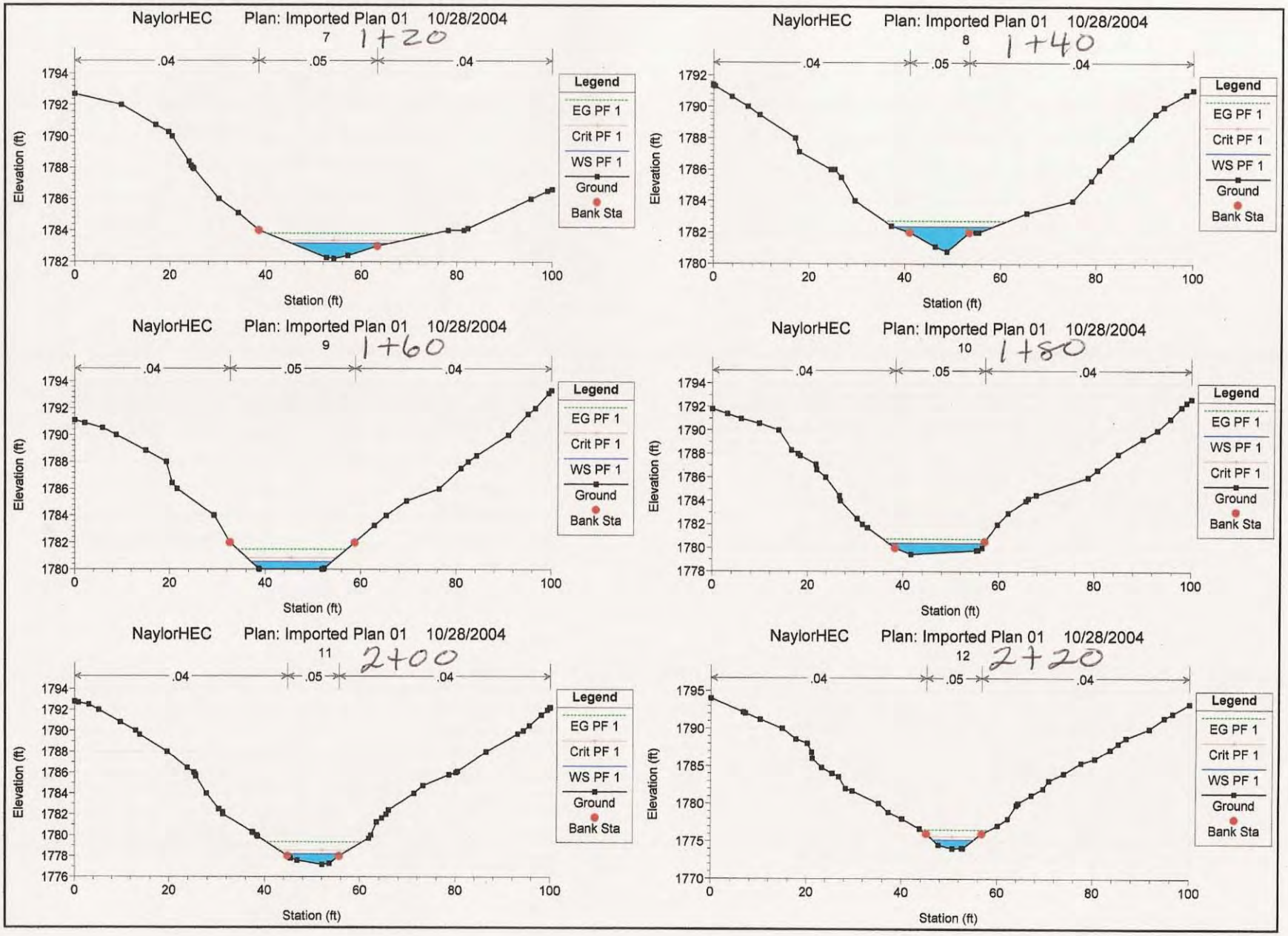
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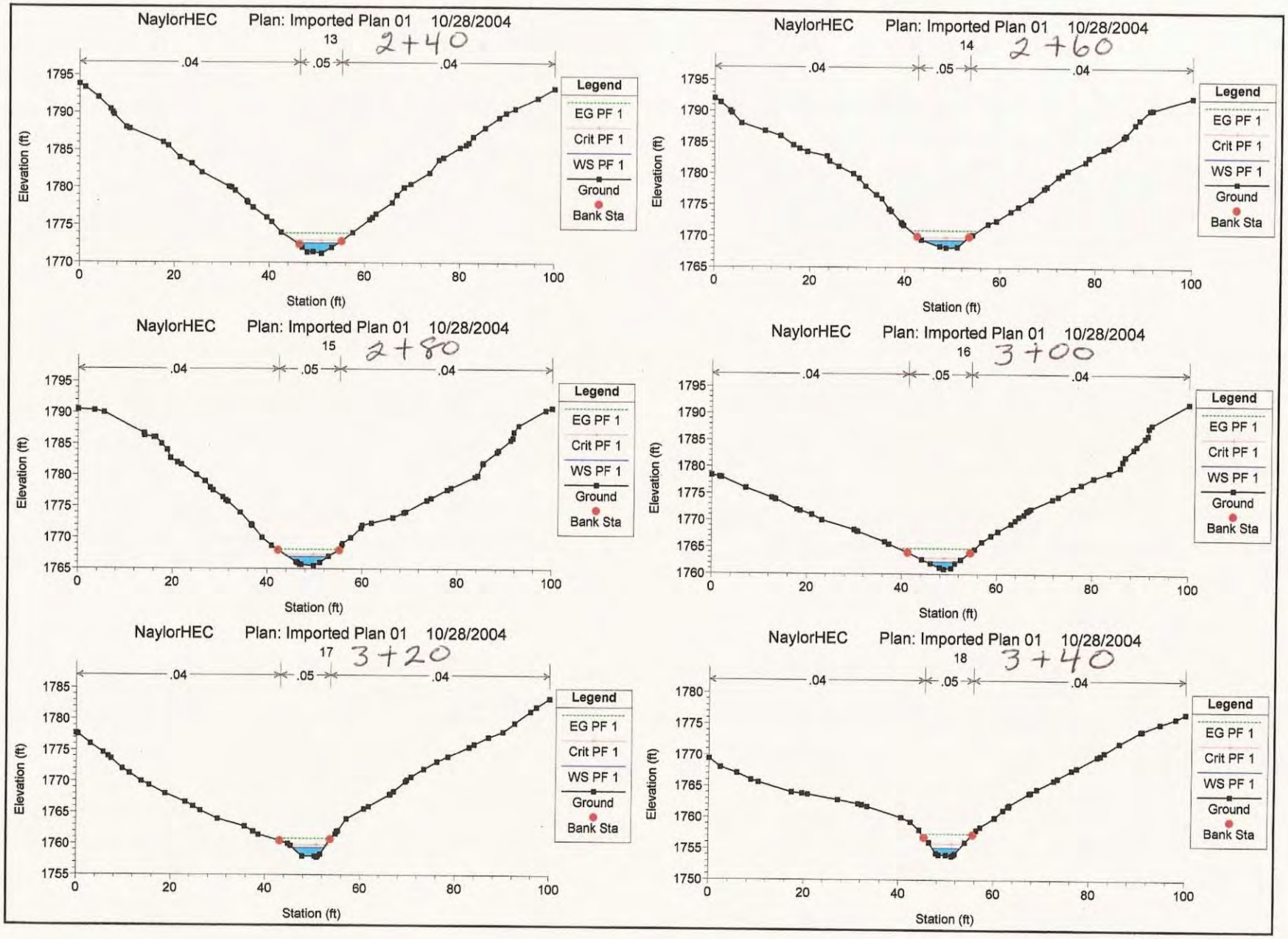
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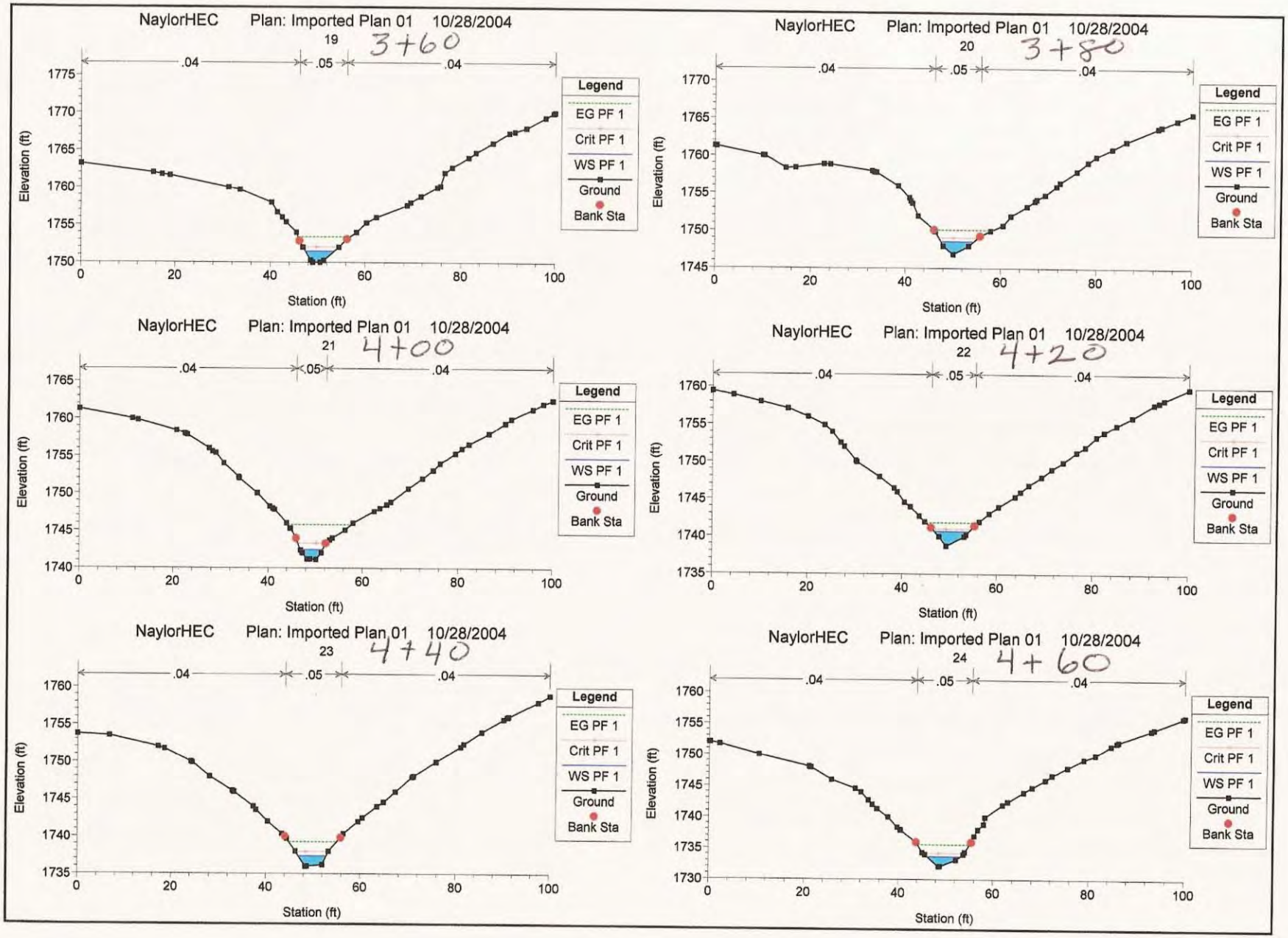
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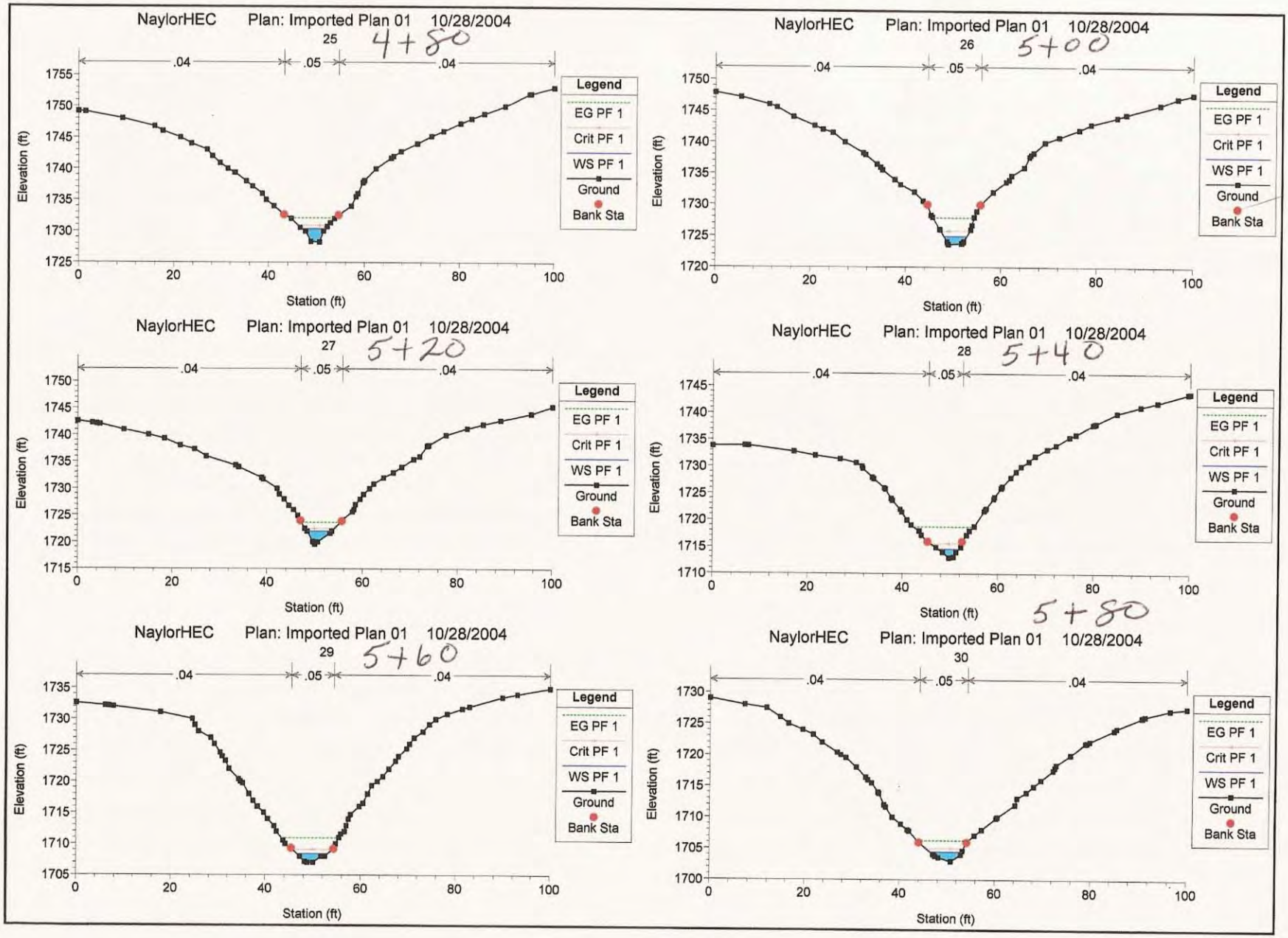
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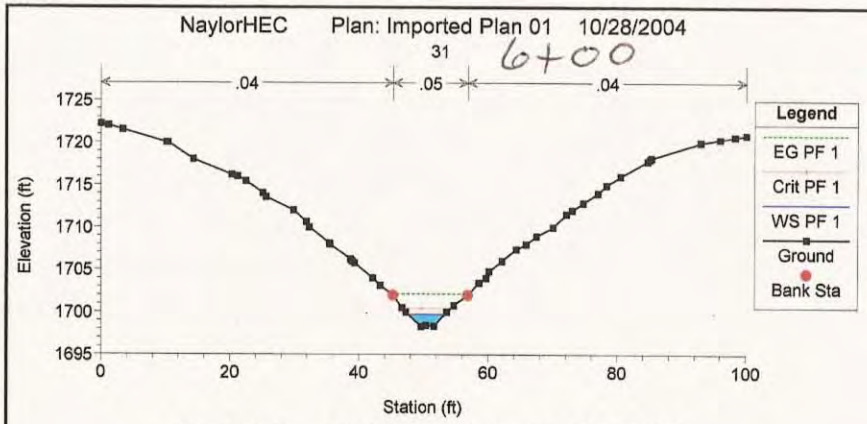
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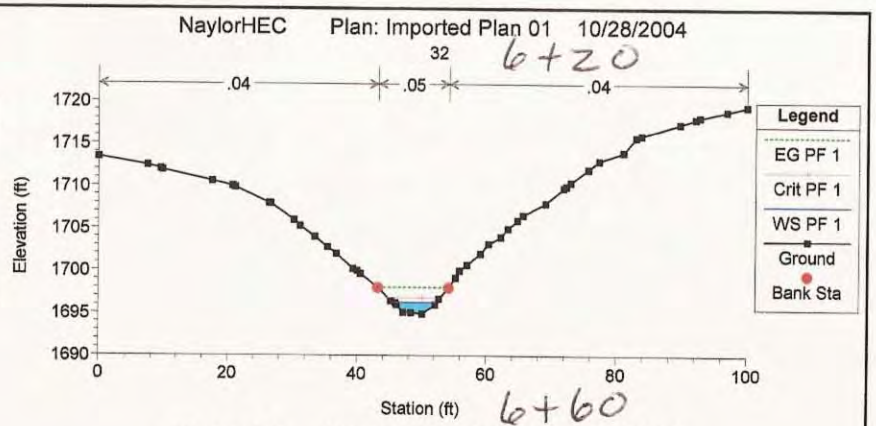
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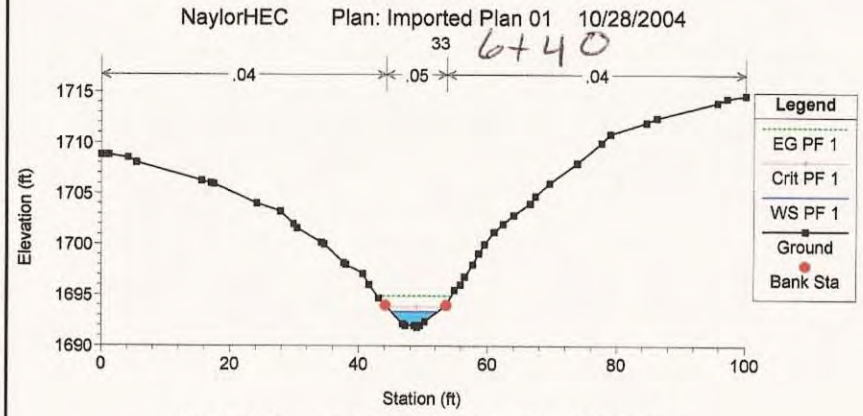
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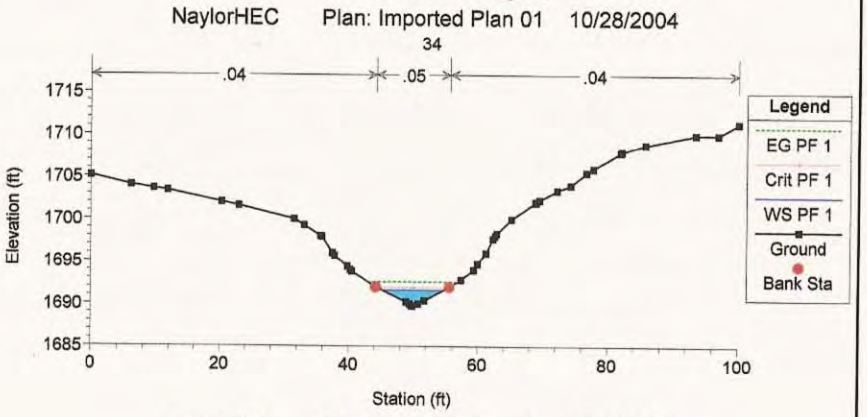
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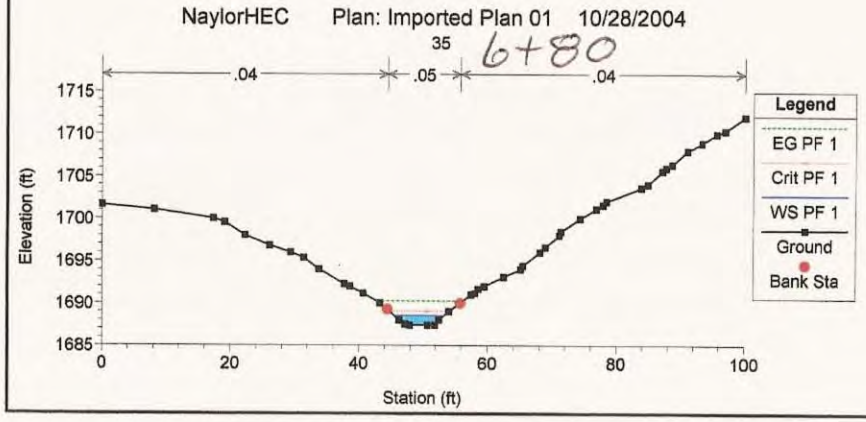
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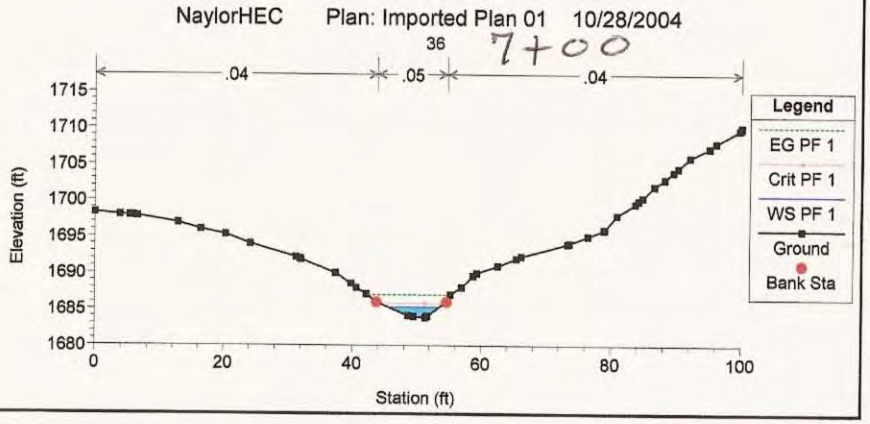
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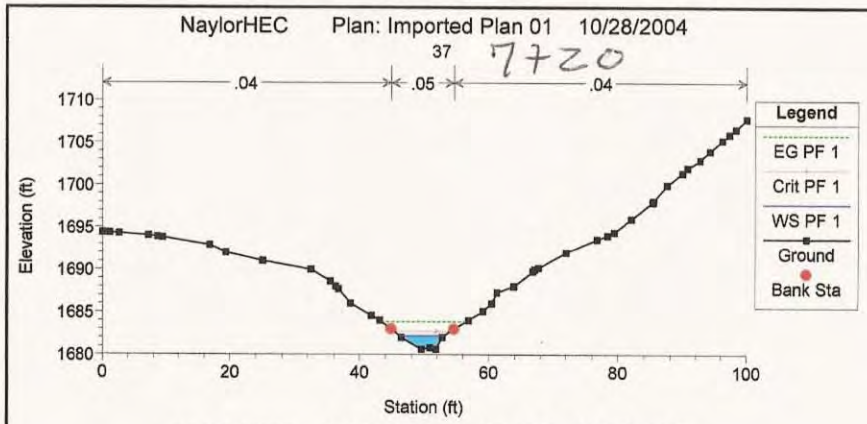
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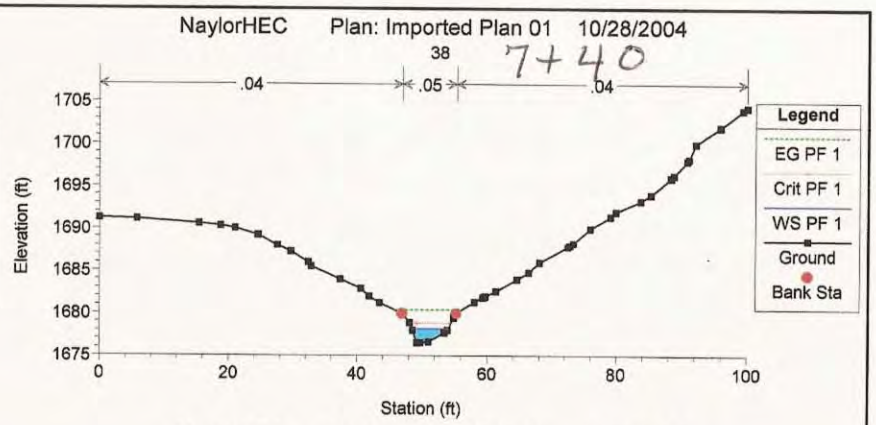
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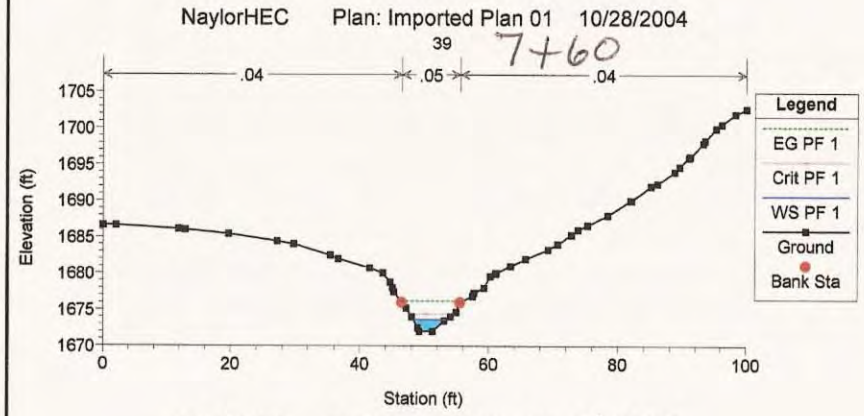
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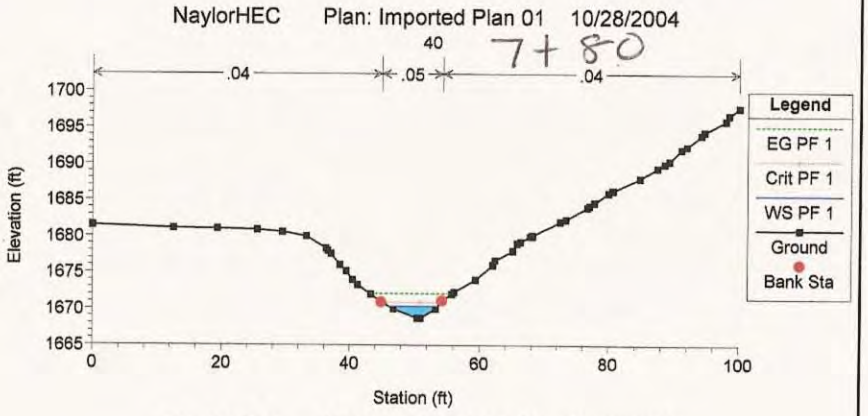
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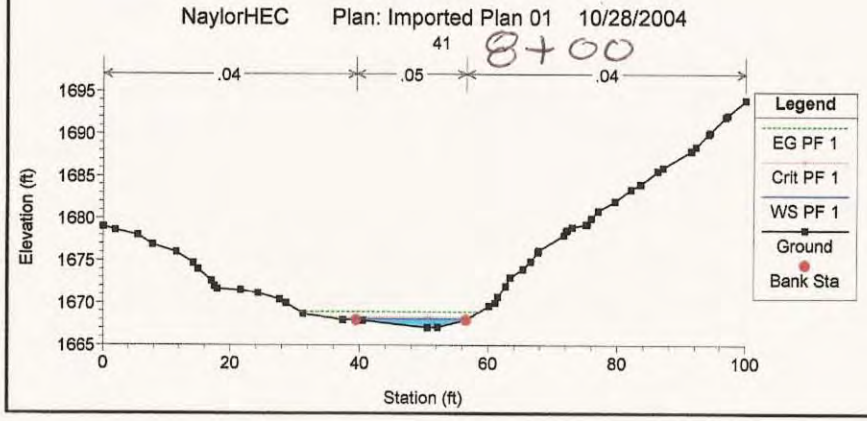
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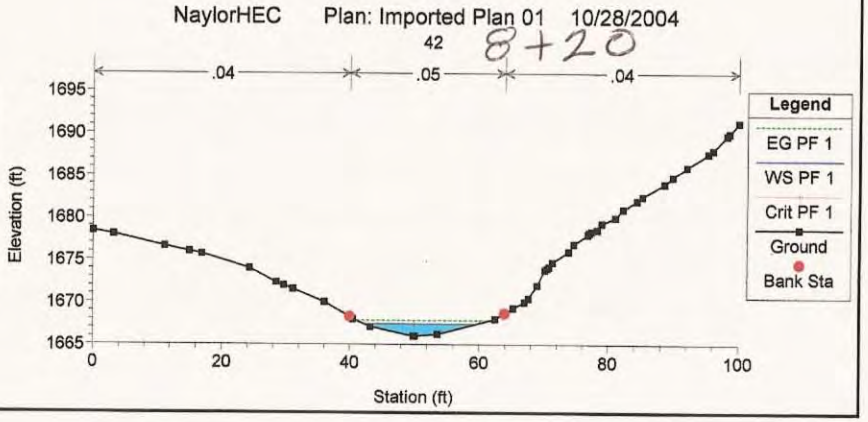
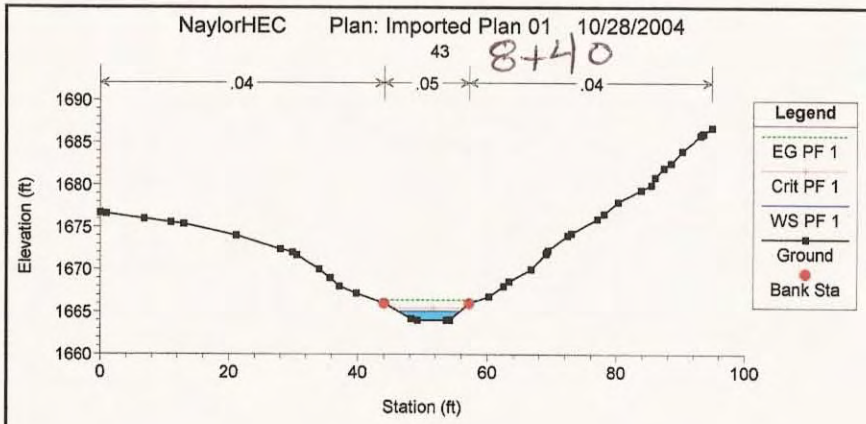
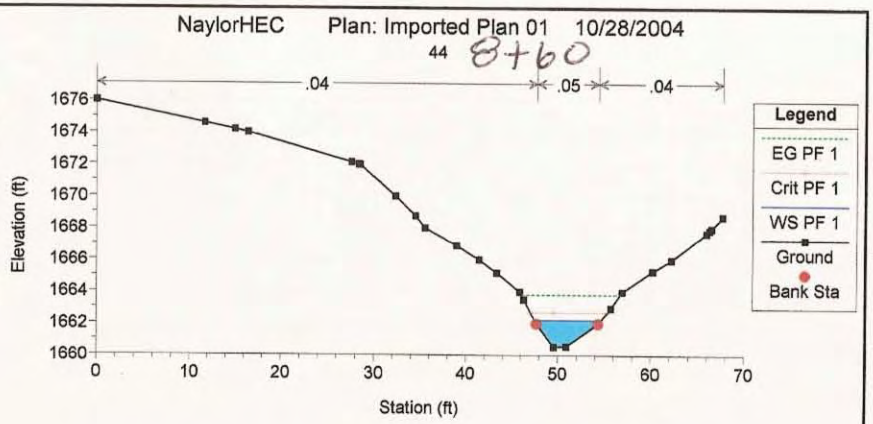
Bank Sta
Elevation (ft)
Station (ft)


NaylorHEC Plan: Imported Plan 01 10/28/2004
42
8+20
.04
.05
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


NaylorHEC Plan: Imported Plan 01 10/28/2004
43
8+40
.04
.05
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta


NaylorHEC Plan: Imported Plan 01 10/28/2004
44
8+60
.04
.05
.04
Elevation (ft)
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

Plan: Imported Pla RIVER-1 Reach-1 RS: 44 Profile: PF 1 0+00

E.G. Elev (ft)	1787.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1787.43	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1786.93	Flow Area (sq ft)	6.27	17.64	4.60
E.G. Slope (ft/ft)	0.005754	Area (sq ft)	6.27	17.64	4.60
Q Total (cfs)	73.00	Flow (cfs)	13.98	48.34	10.68
Top Width (ft)	27.95	Top Width (ft)	8.80	13.16	5.98
Vel Total (ft/s)	2.56	Avg. Vel. (ft/s)	2.23	2.74	2.32
Max Chl Dpth (ft)	1.43	Hydr. Depth (ft)	0.71	1.34	0.77
Conv. Total (cfs)	962.3	Conv. (cfs)	184.4	637.2	140.8
Length Wtd. (ft)	20.00	Wetted Per. (ft)	8.90	13.16	6.16
Min Ch El (ft)	1786.00	Shear (lb/sq ft)	0.25	0.48	0.27
Alpha	1.02	Stream Power (lb/ft s)	0.56	1.32	0.62
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.00	0.18	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.21	0.01

Plan: Imported Pla RIVER-1 Reach-1 RS: 43 Profile: PF 1 0+20

E.G. Elev (ft)	1787.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.040	0.050	
W.S. Elev (ft)	1787.28	Reach Len. (ft)	31.26	20.00	26.26
Crit W.S. (ft)		Flow Area (sq ft)	4.60	21.81	
E.G. Slope (ft/ft)	0.007782	Area (sq ft)	4.60	21.81	
Q Total (cfs)	73.00	Flow (cfs)	10.92	62.08	
Top Width (ft)	26.43	Top Width (ft)	7.38	19.04	
Vel Total (ft/s)	2.76	Avg. Vel. (ft/s)	2.37	2.85	
Max Chl Dpth (ft)	1.28	Hydr. Depth (ft)	0.62	1.15	
Conv. Total (cfs)	827.5	Conv. (cfs)	123.8	703.7	
Length Wtd. (ft)	20.84	Wetted Per. (ft)	7.47	19.27	
Min Ch El (ft)	1786.00	Shear (lb/sq ft)	0.30	0.55	
Alpha	1.01	Stream Power (lb/ft s)	0.71	1.57	
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	0.00	0.17	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.20	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 42 Profile: PF 1 0+40

E.G. Elev (ft)	1787.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.050	
W.S. Elev (ft)	1787.12	Reach Len. (ft)	31.26	20.00	26.26
Crit W.S. (ft)		Flow Area (sq ft)		27.33	
E.G. Slope (ft/ft)	0.008723	Area (sq ft)		27.33	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	28.67	Top Width (ft)		28.67	
Vel Total (ft/s)	2.67	Avg. Vel. (ft/s)		2.67	
Max Chl Dpth (ft)	1.12	Hydr. Depth (ft)		0.95	
Conv. Total (cfs)	781.6	Conv. (cfs)		781.6	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		28.96	
Min Ch El (ft)	1786.00	Shear (lb/sq ft)		0.51	
Alpha	1.00	Stream Power (lb/ft s)		1.37	
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	0.00	0.16	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.19	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 41 Profile: PF 1 0+60

E.G. Elev (ft)	1786.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.		0.050	
W.S. Elev (ft)	1786.59	Reach Len. (ft)	20.01	20.00	25.59
Crit W.S. (ft)	1786.59	Flow Area (sq ft)		17.21	
E.G. Slope (ft/ft)	0.045497	Area (sq ft)		17.21	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	31.27	Top Width (ft)		31.27	
Vel Total (ft/s)	4.24	Avg. Vel. (ft/s)		4.24	
Max Chl Dpth (ft)	0.59	Hydr. Depth (ft)		0.55	
Conv. Total (cfs)	342.2	Conv. (cfs)		342.2	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		31.43	
Min Ch El (ft)	1786.00	Shear (lb/sq ft)		1.56	
Alpha	1.00	Stream Power (lb/ft s)		6.60	
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)	0.00	0.15	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.18	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 40 Profile: PF 1 0+80

E.G. Elev (ft)	1785.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.		0.050	
W.S. Elev (ft)	1785.56	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1785.38	Flow Area (sq ft)		19.01	
E.G. Slope (ft/ft)	0.021799	Area (sq ft)		19.01	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	23.04	Top Width (ft)		23.04	
Vel Total (ft/s)	3.84	Avg. Vel. (ft/s)		3.84	
Max Chl Dpth (ft)	1.39	Hydr. Depth (ft)		0.83	
Conv. Total (cfs)	494.4	Conv. (cfs)		494.4	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		23.23	
Min Ch El (ft)	1784.17	Shear (lb/sq ft)		1.11	
Alpha	1.00	Stream Power (lb/ft s)		4.28	
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	0.00	0.15	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.17	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 39 Profile: PF 1 1+00

E.G. Elev (ft)	1785.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.32	Wt. n-Val.		0.050	
W.S. Elev (ft)	1784.86	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1784.86	Flow Area (sq ft)		15.98	
E.G. Slope (ft/ft)	0.043192	Area (sq ft)		15.98	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	24.95	Top Width (ft)		24.95	
Vel Total (ft/s)	4.57	Avg. Vel. (ft/s)		4.57	
Max Chl Dpth (ft)	0.86	Hydr. Depth (ft)		0.64	
Conv. Total (cfs)	351.3	Conv. (cfs)		351.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		25.12	
Min Ch El (ft)	1784.00	Shear (lb/sq ft)		1.72	
Alpha	1.00	Stream Power (lb/ft s)		7.83	
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)	0.00	0.14	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	0.15	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 38 Profile: PF 1 1+20

E.G. Elev (ft)	1783.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.68	Wt. n-Val.		0.050	0.040
W.S. Elev (ft)	1783.20	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1783.42	Flow Area (sq ft)		10.89	0.30
E.G. Slope (ft/ft)	0.100144	Area (sq ft)		10.89	0.30
Q Total (cfs)	73.00	Flow (cfs)		72.23	0.77
Top Width (ft)	21.28	Top Width (ft)		18.28	3.00
Vel Total (ft/s)	6.52	Avg. Vel. (ft/s)		6.63	2.54
Max Chl Dpth (ft)	1.00	Hydr. Depth (ft)		0.60	0.10
Conv. Total (cfs)	230.7	Conv. (cfs)		228.2	2.4
Length Wtd. (ft)	20.00	Wetted Per. (ft)		18.38	3.01
Min Ch El (ft)	1782.20	Shear (lb/sq ft)		3.70	0.63
Alpha	1.02	Stream Power (lb/ft s)		24.57	1.60
Frctn Loss (ft)	1.26	Cum Volume (acre-ft)	0.00	0.13	0.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.00	0.14	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 37 Profile: PF 1 1+40

E.G. Elev (ft)	1782.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1782.41	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1782.43	Flow Area (sq ft)	0.78	12.90	1.48
E.G. Slope (ft/ft)	0.029992	Area (sq ft)	0.78	12.90	1.48
Q Total (cfs)	73.00	Flow (cfs)	1.72	67.24	4.03
Top Width (ft)	21.53	Top Width (ft)	3.81	12.41	5.31
Vel Total (ft/s)	4.82	Avg. Vel. (ft/s)	2.22	5.21	2.73
Max Chl Dpth (ft)	1.64	Hydr. Depth (ft)	0.20	1.04	0.28
Conv. Total (cfs)	421.5	Conv. (cfs)	10.0	388.3	23.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)	3.84	12.67	5.33
Min Ch El (ft)	1780.77	Shear (lb/sq ft)	0.38	1.91	0.52
Alpha	1.10	Stream Power (lb/ft s)	0.84	9.94	1.42
Frctn Loss (ft)	1.00	Cum Volume (acre-ft)	0.00	0.13	0.00
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.14	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 36 Profile: PF 1 1+60

E.G. Elev (ft)	1781.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.97	Wt. n-Val.		0.050	
W.S. Elev (ft)	1780.61	Reach Len. (ft)	4.52	20.00	35.76
Crit W.S. (ft)	1780.90	Flow Area (sq ft)		9.24	
E.G. Slope (ft/ft)	0.164389	Area (sq ft)		9.24	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	17.20	Top Width (ft)		17.20	
Vel Total (ft/s)	7.90	Avg. Vel. (ft/s)		7.90	
Max Chl Dpth (ft)	0.61	Hydr. Depth (ft)		0.54	
Conv. Total (cfs)	180.0	Conv. (cfs)		180.0	
Length Wtd. (ft)	19.90	Wetted Per. (ft)		17.39	
Min Ch El (ft)	1780.00	Shear (lb/sq ft)		5.45	
Alpha	1.00	Stream Power (lb/ft s)		43.09	
Frctn Loss (ft)	1.18	Cum Volume (acre-ft)	0.00	0.12	0.00
C & E Loss (ft)	0.06	Cum SA (acres)	0.00	0.13	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 35 Profile: PF 1 1+80

E.G. Elev (ft)	1780.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.	0.040	0.050	
W.S. Elev (ft)	1780.46	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1780.46	Flow Area (sq ft)	0.35	14.53	
E.G. Slope (ft/ft)	0.039353	Area (sq ft)	0.35	14.53	
Q Total (cfs)	73.00	Flow (cfs)	0.94	72.06	
Top Width (ft)	20.12	Top Width (ft)	1.54	18.58	
Vel Total (ft/s)	4.91	Avg. Vel. (ft/s)	2.67	4.96	
Max Chl Dpth (ft)	1.01	Hydr. Depth (ft)	0.23	0.78	
Conv. Total (cfs)	368.0	Conv. (cfs)	4.7	363.2	
Length Wtd. (ft)	20.00	Wetted Per. (ft)	1.61	18.84	
Min Ch El (ft)	1779.45	Shear (lb/sq ft)	0.54	1.90	
Alpha	1.01	Stream Power (lb/ft s)	1.43	9.40	
Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.00	0.11	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.12	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 34 Profile: PF 1 2+00

E.G. Elev (ft)	1779.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.20	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1778.24	Reach Len. (ft)	32.33	20.00	7.56
Crit W.S. (ft)	1778.62	Flow Area (sq ft)	0.09	8.20	0.11
E.G. Slope (ft/ft)	0.130497	Area (sq ft)	0.09	8.20	0.11
Q Total (cfs)	73.00	Flow (cfs)	0.30	72.36	0.34
Top Width (ft)	12.49	Top Width (ft)	0.79	10.81	0.88
Vel Total (ft/s)	8.69	Avg. Vel. (ft/s)	3.16	8.82	3.18
Max Chl Dpth (ft)	1.05	Hydr. Depth (ft)	0.12	0.76	0.12
Conv. Total (cfs)	202.1	Conv. (cfs)	0.8	200.3	0.9
Length Wtd. (ft)	20.00	Wetted Per. (ft)	0.83	11.01	0.92
Min Ch El (ft)	1777.19	Shear (lb/sq ft)	0.93	6.07	0.94
Alpha	1.02	Stream Power (lb/ft s)	2.95	53.57	2.99
Frctn Loss (ft)	1.31	Cum Volume (acre-ft)	0.00	0.11	0.00
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.12	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 33 Profile: PF 1 2+20

E.G. Elev (ft)	1776.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.44	Wt. n-Val.		0.050	
W.S. Elev (ft)	1775.27	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1775.72	Flow Area (sq ft)		7.58	
E.G. Slope (ft/ft)	0.140088	Area (sq ft)		7.58	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	8.86	Top Width (ft)		8.86	
Vel Total (ft/s)	9.64	Avg. Vel. (ft/s)		9.64	
Max Chl Dpth (ft)	1.24	Hydr. Depth (ft)		0.86	
Conv. Total (cfs)	195.0	Conv. (cfs)		195.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		9.39	
Min Ch El (ft)	1774.03	Shear (lb/sq ft)		7.05	
Alpha	1.00	Stream Power (lb/ft s)		67.97	
Frctn Loss (ft)	2.70	Cum Volume (acre-ft)	0.00	0.11	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.11	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 32 Profile: PF 1 2+40

E.G. Elev (ft)	1774.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.41	Wt. n-Val.	0.040	0.050	
W.S. Elev (ft)	1772.65	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1773.10	Flow Area (sq ft)	0.07	7.63	
E.G. Slope (ft/ft)	0.124814	Area (sq ft)	0.07	7.63	
Q Total (cfs)	73.00	Flow (cfs)	0.21	72.79	
Top Width (ft)	8.82	Top Width (ft)	0.58	8.24	
Vel Total (ft/s)	9.48	Avg. Vel. (ft/s)	3.02	9.54	
Max Chl Dpth (ft)	1.41	Hydr. Depth (ft)	0.12	0.93	
Conv. Total (cfs)	206.6	Conv. (cfs)	0.6	206.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)	0.63	8.81	
Min Ch El (ft)	1771.24	Shear (lb/sq ft)	0.86	6.75	
Alpha	1.01	Stream Power (lb/ft s)	2.59	64.41	
Frctn Loss (ft)	2.64	Cum Volume (acre-ft)	0.00	0.10	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.11	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 31 Profile: PF 1 2+60

E.G. Elev (ft)	1771.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.64	Wt. n-Val.		0.050	
W.S. Elev (ft)	1769.42	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1769.92	Flow Area (sq ft)		7.10	
E.G. Slope (ft/ft)	0.178878	Area (sq ft)		7.10	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	9.10	Top Width (ft)		9.10	
Vel Total (ft/s)	10.28	Avg. Vel. (ft/s)		10.28	
Max Chl Dpth (ft)	1.19	Hydr. Depth (ft)		0.78	
Conv. Total (cfs)	172.6	Conv. (cfs)		172.6	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		9.60	
Min Ch El (ft)	1768.23	Shear (lb/sq ft)		8.26	
Alpha	1.00	Stream Power (lb/ft s)		84.94	
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	0.00	0.10	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.10	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 30 Profile: PF 1 2+80

E.G. Elev (ft)	1768.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.25	Wt. n-Val.		0.050	
W.S. Elev (ft)	1766.99	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1767.39	Flow Area (sq ft)		8.15	
E.G. Slope (ft/ft)	0.106443	Area (sq ft)		8.15	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	8.50	Top Width (ft)		8.50	
Vel Total (ft/s)	8.96	Avg. Vel. (ft/s)		8.96	
Max Chl Dpth (ft)	1.49	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	223.8	Conv. (cfs)		223.8	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		9.17	
Min Ch El (ft)	1765.50	Shear (lb/sq ft)		5.90	
Alpha	1.00	Stream Power (lb/ft s)		52.91	
Frctn Loss (ft)	2.71	Cum Volume (acre-ft)	0.00	0.10	0.00
C & E Loss (ft)	0.12	Cum SA (acres)	0.00	0.10	0.00

3+00

Plan: Imported Pla RIVER-1 Reach-1 RS: 29 Profile: PF 1

E.G. Elev (ft)	1764.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.53	Wt. n-Val.		0.050	
W.S. Elev (ft)	1762.37	Reach Len. (ft)	41.43	20.00	2.56
Crit W.S. (ft)	1763.09	Flow Area (sq ft)		5.71	
E.G. Slope (ft/ft)	0.268198	Area (sq ft)		5.71	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.76	Top Width (ft)		6.76	
Vel Total (ft/s)	12.78	Avg. Vel. (ft/s)		12.78	
Max Chl Dpth (ft)	1.44	Hydr. Depth (ft)		0.85	
Conv. Total (cfs)	141.0	Conv. (cfs)		141.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.55	
Min Ch El (ft)	1760.93	Shear (lb/sq ft)		12.66	
Alpha	1.00	Stream Power (lb/ft s)		161.82	
Frctn Loss (ft)	3.21	Cum Volume (acre-ft)	0.00	0.09	0.00
C & E Loss (ft)	0.13	Cum SA (acres)	0.00	0.10	0.00

3+20

Plan: Imported Pla RIVER-1 Reach-1 RS: 28 Profile: PF 1

E.G. Elev (ft)	1761.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.60	Wt. n-Val.		0.050	
W.S. Elev (ft)	1759.40	Reach Len. (ft)	4.41	20.00	41.25
Crit W.S. (ft)	1759.91	Flow Area (sq ft)		7.19	
E.G. Slope (ft/ft)	0.131139	Area (sq ft)		7.19	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.73	Top Width (ft)		6.73	
Vel Total (ft/s)	10.15	Avg. Vel. (ft/s)		10.15	
Max Chl Dpth (ft)	1.56	Hydr. Depth (ft)		1.07	
Conv. Total (cfs)	201.6	Conv. (cfs)		201.6	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.86	
Min Ch El (ft)	1757.84	Shear (lb/sq ft)		7.50	
Alpha	1.00	Stream Power (lb/ft s)		76.07	
Frctn Loss (ft)	3.63	Cum Volume (acre-ft)	0.00	0.09	0.00
C & E Loss (ft)	0.28	Cum SA (acres)	0.00	0.09	0.00

3+40

Plan: Imported Pla RIVER-1 Reach-1 RS: 27 Profile: PF 1

E.G. Elev (ft)	1757.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.38	Wt. n-Val.		0.050	
W.S. Elev (ft)	1755.23	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1755.94	Flow Area (sq ft)		5.90	
E.G. Slope (ft/ft)	0.217274	Area (sq ft)		5.90	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	5.99	Top Width (ft)		5.99	
Vel Total (ft/s)	12.37	Avg. Vel. (ft/s)		12.37	
Max Chl Dpth (ft)	1.43	Hydr. Depth (ft)		0.99	
Conv. Total (cfs)	156.6	Conv. (cfs)		156.6	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.99	
Min Ch El (ft)	1753.80	Shear (lb/sq ft)		11.45	
Alpha	1.00	Stream Power (lb/ft s)		141.63	
Frctn Loss (ft)	3.32	Cum Volume (acre-ft)	0.00	0.09	0.00
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.09	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 26 Profile: PF 1 3+60

E.G. Elev (ft)	1753.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.03	Wt. n-Val.		0.050	
W.S. Elev (ft)	1751.54	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1752.17	Flow Area (sq ft)		6.38	
E.G. Slope (ft/ft)	0.177621	Area (sq ft)		6.38	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.30	Top Width (ft)		6.30	
Vel Total (ft/s)	11.45	Avg. Vel. (ft/s)		11.45	
Max Chl Dpth (ft)	1.54	Hydr. Depth (ft)		1.01	
Conv. Total (cfs)	173.2	Conv. (cfs)		173.2	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.30	
Min Ch El (ft)	1750.00	Shear (lb/sq ft)		9.69	
Alpha	1.00	Stream Power (lb/ft s)		110.89	
Frctn Loss (ft)	3.92	Cum Volume (acre-ft)	0.00	0.08	0.00
C & E Loss (ft)	0.10	Cum SA (acres)	0.00	0.09	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 25 Profile: PF 1 3+80

E.G. Elev (ft)	1750.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.63	Wt. n-Val.		0.050	
W.S. Elev (ft)	1748.67	Reach Len. (ft)	21.08	20.00	18.91
Crit W.S. (ft)	1749.19	Flow Area (sq ft)		7.11	
E.G. Slope (ft/ft)	0.140431	Area (sq ft)		7.11	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	7.11	Top Width (ft)		7.11	
Vel Total (ft/s)	10.26	Avg. Vel. (ft/s)		10.26	
Max Chl Dpth (ft)	1.77	Hydr. Depth (ft)		1.00	
Conv. Total (cfs)	194.8	Conv. (cfs)		194.8	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.05	
Min Ch El (ft)	1746.90	Shear (lb/sq ft)		7.75	
Alpha	1.00	Stream Power (lb/ft s)		79.55	
Frctn Loss (ft)	3.15	Cum Volume (acre-ft)	0.00	0.08	0.00
C & E Loss (ft)	0.12	Cum SA (acres)	0.00	0.08	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 24 Profile: PF 1 4+00

E.G. Elev (ft)	1746.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.46	Wt. n-Val.		0.050	
W.S. Elev (ft)	1742.54	Reach Len. (ft)	4.57	20.00	35.21
Crit W.S. (ft)	1743.47	Flow Area (sq ft)		4.89	
E.G. Slope (ft/ft)	0.331878	Area (sq ft)		4.89	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	4.87	Top Width (ft)		4.87	
Vel Total (ft/s)	14.93	Avg. Vel. (ft/s)		14.93	
Max Chl Dpth (ft)	1.42	Hydr. Depth (ft)		1.00	
Conv. Total (cfs)	126.7	Conv. (cfs)		126.7	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.00	
Min Ch El (ft)	1741.12	Shear (lb/sq ft)		16.88	
Alpha	1.00	Stream Power (lb/ft s)		252.08	
Frctn Loss (ft)	4.12	Cum Volume (acre-ft)	0.00	0.08	0.00
C & E Loss (ft)	0.18	Cum SA (acres)	0.00	0.08	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 23 Profile: PF 1 4+20

E.G. Elev (ft)	1742.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.27	Wt. n-Val.		0.050	
W.S. Elev (ft)	1740.75	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1741.14	Flow Area (sq ft)		8.08	
E.G. Slope (ft/ft)	0.099548	Area (sq ft)		8.08	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	7.38	Top Width (ft)		7.38	
Vel Total (ft/s)	9.04	Avg. Vel. (ft/s)		9.04	
Max Chl Dpth (ft)	2.01	Hydr. Depth (ft)		1.09	
Conv. Total (cfs)	231.4	Conv. (cfs)		231.4	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.54	
Min Ch El (ft)	1738.74	Shear (lb/sq ft)		5.88	
Alpha	1.00	Stream Power (lb/ft s)		53.12	
Frctn Loss (ft)	3.32	Cum Volume (acre-ft)	0.00	0.07	0.00
C & E Loss (ft)	0.66	Cum SA (acres)	0.00	0.08	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 22 Profile: PF 1 4+40

E.G. Elev (ft)	1739.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.97	Wt. n-Val.		0.050	
W.S. Elev (ft)	1737.44	Reach Len. (ft)	31.48	20.00	8.26
Crit W.S. (ft)	1738.06	Flow Area (sq ft)		6.48	
E.G. Slope (ft/ft)	0.166137	Area (sq ft)		6.48	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.02	Top Width (ft)		6.02	
Vel Total (ft/s)	11.26	Avg. Vel. (ft/s)		11.26	
Max Chl Dpth (ft)	1.46	Hydr. Depth (ft)		1.08	
Conv. Total (cfs)	179.1	Conv. (cfs)		179.1	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.23	
Min Ch El (ft)	1735.98	Shear (lb/sq ft)		9.30	
Alpha	1.00	Stream Power (lb/ft s)		104.69	
Frctn Loss (ft)	2.53	Cum Volume (acre-ft)	0.00	0.07	0.00
C & E Loss (ft)	0.07	Cum SA (acres)	0.00	0.08	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 21 Profile: PF 1 4+60

E.G. Elev (ft)	1735.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.05	Wt. n-Val.		0.050	
W.S. Elev (ft)	1733.71	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1734.32	Flow Area (sq ft)		6.35	
E.G. Slope (ft/ft)	0.200551	Area (sq ft)		6.35	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	7.11	Top Width (ft)		7.11	
Vel Total (ft/s)	11.50	Avg. Vel. (ft/s)		11.50	
Max Chl Dpth (ft)	1.63	Hydr. Depth (ft)		0.89	
Conv. Total (cfs)	163.0	Conv. (cfs)		163.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.90	
Min Ch El (ft)	1732.08	Shear (lb/sq ft)		10.06	
Alpha	1.00	Stream Power (lb/ft s)		115.68	
Frctn Loss (ft)	3.64	Cum Volume (acre-ft)	0.00	0.07	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.07	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 20 Profile: PF 1 4+80

E.G. Elev (ft)	1732.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.81	Wt. n-Val.		0.050	
W.S. Elev (ft)	1730.47	Reach Len. (ft)	21.75	20.00	18.24
Crit W.S. (ft)	1731.06	Flow Area (sq ft)		6.77	
E.G. Slope (ft/ft)	0.147435	Area (sq ft)		6.77	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	5.06	Top Width (ft)		5.06	
Vel Total (ft/s)	10.79	Avg. Vel. (ft/s)		10.79	
Max Chl Dpth (ft)	2.22	Hydr. Depth (ft)		1.34	
Conv. Total (cfs)	190.1	Conv. (cfs)		190.1	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.36	
Min Ch El (ft)	1728.25	Shear (lb/sq ft)		8.46	
Alpha	1.00	Stream Power (lb/ft s)		91.24	
Frctn Loss (ft)	3.42	Cum Volume (acre-ft)	0.00	0.07	0.00
C & E Loss (ft)	0.07	Cum SA (acres)	0.00	0.07	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 19 Profile: PF 1 5+00

E.G. Elev (ft)	1728.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.10	Wt. n-Val.		0.050	
W.S. Elev (ft)	1725.03	Reach Len. (ft)	14.51	20.00	25.43
Crit W.S. (ft)	1725.90	Flow Area (sq ft)		5.17	
E.G. Slope (ft/ft)	0.289570	Area (sq ft)		5.17	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	4.96	Top Width (ft)		4.96	
Vel Total (ft/s)	14.13	Avg. Vel. (ft/s)		14.13	
Max Chl Dpth (ft)	1.36	Hydr. Depth (ft)		1.04	
Conv. Total (cfs)	135.7	Conv. (cfs)		135.7	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.22	
Min Ch El (ft)	1723.67	Shear (lb/sq ft)		15.01	
Alpha	1.00	Stream Power (lb/ft s)		212.07	
Frctn Loss (ft)	4.02	Cum Volume (acre-ft)	0.00	0.06	0.00
C & E Loss (ft)	0.13	Cum SA (acres)	0.00	0.07	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 18 Profile: PF 1 5+20

E.G. Elev (ft)	1723.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.74	Wt. n-Val.		0.050	
W.S. Elev (ft)	1722.09	Reach Len. (ft)	31.57	20.00	8.47
Crit W.S. (ft)	1722.65	Flow Area (sq ft)		6.90	
E.G. Slope (ft/ft)	0.139685	Area (sq ft)		6.90	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	5.31	Top Width (ft)		5.31	
Vel Total (ft/s)	10.57	Avg. Vel. (ft/s)		10.57	
Max Chl Dpth (ft)	2.49	Hydr. Depth (ft)		1.30	
Conv. Total (cfs)	195.3	Conv. (cfs)		195.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.43	
Min Ch El (ft)	1719.60	Shear (lb/sq ft)		8.10	
Alpha	1.00	Stream Power (lb/ft s)		85.64	
Frctn Loss (ft)	3.89	Cum Volume (acre-ft)	0.00	0.06	0.00
C & E Loss (ft)	0.41	Cum SA (acres)	0.00	0.06	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 17 Profile: PF 1 5+40

E.G. Elev (ft)	1718.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.24	Wt. n-Val.		0.050	
W.S. Elev (ft)	1714.69	Reach Len. (ft)	31.49	20.00	8.24
Crit W.S. (ft)	1715.71	Flow Area (sq ft)		4.42	
E.G. Slope (ft/ft)	0.462651	Area (sq ft)		4.42	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	4.63	Top Width (ft)		4.63	
Vel Total (ft/s)	16.52	Avg. Vel. (ft/s)		16.52	
Max Chl Dpth (ft)	1.72	Hydr. Depth (ft)		0.95	
Conv. Total (cfs)	107.3	Conv. (cfs)		107.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		5.98	
Min Ch El (ft)	1712.97	Shear (lb/sq ft)		21.35	
Alpha	1.00	Stream Power (lb/ft s)		352.76	
Frctn Loss (ft)	4.65	Cum Volume (acre-ft)	0.00	0.06	0.00
C & E Loss (ft)	0.25	Cum SA (acres)	0.00	0.06	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 16 Profile: PF 1 5+60

E.G. Elev (ft)	1711.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.74	Wt. n-Val.		0.050	
W.S. Elev (ft)	1708.44	Reach Len. (ft)	5.54	20.00	34.13
Crit W.S. (ft)	1709.19	Flow Area (sq ft)		5.49	
E.G. Slope (ft/ft)	0.295305	Area (sq ft)		5.49	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.49	Top Width (ft)		6.49	
Vel Total (ft/s)	13.29	Avg. Vel. (ft/s)		13.29	
Max Chl Dpth (ft)	1.44	Hydr. Depth (ft)		0.85	
Conv. Total (cfs)	134.3	Conv. (cfs)		134.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.36	
Min Ch El (ft)	1707.00	Shear (lb/sq ft)		13.76	
Alpha	1.00	Stream Power (lb/ft s)		182.76	
Frctn Loss (ft)	7.30	Cum Volume (acre-ft)	0.00	0.06	0.00
C & E Loss (ft)	0.45	Cum SA (acres)	0.00	0.06	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 15 Profile: PF 1 5+80

E.G. Elev (ft)	1706.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.95	Wt. n-Val.		0.050	
W.S. Elev (ft)	1704.51	Reach Len. (ft)	14.55	20.00	25.39
Crit W.S. (ft)	1705.11	Flow Area (sq ft)		6.52	
E.G. Slope (ft/ft)	0.176370	Area (sq ft)		6.52	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.81	Top Width (ft)		6.81	
Vel Total (ft/s)	11.19	Avg. Vel. (ft/s)		11.19	
Max Chl Dpth (ft)	1.57	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	173.8	Conv. (cfs)		173.8	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.68	
Min Ch El (ft)	1702.94	Shear (lb/sq ft)		9.35	
Alpha	1.00	Stream Power (lb/ft s)		104.67	
Frctn Loss (ft)	4.49	Cum Volume (acre-ft)	0.00	0.05	0.00
C & E Loss (ft)	0.24	Cum SA (acres)	0.00	0.06	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 14 Profile: PF 1 6+00

E.G. Elev (ft)	1702.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.54	Wt. n-Val.		0.050	
W.S. Elev (ft)	1699.80	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1700.55	Flow Area (sq ft)		5.71	
E.G. Slope (ft/ft)	0.236968	Area (sq ft)		5.71	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	5.84	Top Width (ft)		5.84	
Vel Total (ft/s)	12.78	Avg. Vel. (ft/s)		12.78	
Max Chl Dpth (ft)	1.50	Hydr. Depth (ft)		0.98	
Conv. Total (cfs)	150.0	Conv. (cfs)		150.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.88	
Min Ch El (ft)	1698.30	Shear (lb/sq ft)		12.28	
Alpha	1.00	Stream Power (lb/ft s)		156.91	
Frctn Loss (ft)	4.07	Cum Volume (acre-ft)	0.00	0.05	0.00
C & E Loss (ft)	0.06	Cum SA (acres)	0.00	0.05	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 13 Profile: PF 1 6+20

E.G. Elev (ft)	1698.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.85	Wt. n-Val.		0.050	
W.S. Elev (ft)	1696.35	Reach Len. (ft)	33.55	20.00	6.67
Crit W.S. (ft)	1696.92	Flow Area (sq ft)		6.68	
E.G. Slope (ft/ft)	0.165313	Area (sq ft)		6.68	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.88	Top Width (ft)		6.88	
Vel Total (ft/s)	10.92	Avg. Vel. (ft/s)		10.92	
Max Chl Dpth (ft)	1.43	Hydr. Depth (ft)		0.97	
Conv. Total (cfs)	179.5	Conv. (cfs)		179.5	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.78	
Min Ch El (ft)	1694.92	Shear (lb/sq ft)		8.87	
Alpha	1.00	Stream Power (lb/ft s)		96.90	
Frctn Loss (ft)	3.93	Cum Volume (acre-ft)	0.00	0.05	0.00
C & E Loss (ft)	0.20	Cum SA (acres)	0.00	0.05	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 12 Profile: PF 1 6+40

E.G. Elev (ft)	1695.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.62	Wt. n-Val.		0.050	
W.S. Elev (ft)	1693.44	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1693.95	Flow Area (sq ft)		7.15	
E.G. Slope (ft/ft)	0.144078	Area (sq ft)		7.15	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	7.48	Top Width (ft)		7.48	
Vel Total (ft/s)	10.21	Avg. Vel. (ft/s)		10.21	
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	192.3	Conv. (cfs)		192.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.30	
Min Ch El (ft)	1691.83	Shear (lb/sq ft)		7.75	
Alpha	1.00	Stream Power (lb/ft s)		79.10	
Frctn Loss (ft)	3.08	Cum Volume (acre-ft)	0.00	0.04	0.00
C & E Loss (ft)	0.07	Cum SA (acres)	0.00	0.05	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 11 Profile: PF 1 6+60

E.G. Elev (ft)	1692.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.05	Wt. n-Val.		0.050	
W.S. Elev (ft)	1691.71	Reach Len. (ft)	16.10	20.00	23.89
Crit W.S. (ft)	1692.02	Flow Area (sq ft)		9.99	
E.G. Slope (ft/ft)	0.084502	Area (sq ft)		9.99	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	10.03	Top Width (ft)		10.03	
Vel Total (ft/s)	8.21	Avg. Vel. (ft/s)		8.21	
Max Chl Dpth (ft)	1.97	Hydr. Depth (ft)		1.00	
Conv. Total (cfs)	282.1	Conv. (cfs)		282.1	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		10.79	
Min Ch El (ft)	1689.74	Shear (lb/sq ft)		4.88	
Alpha	1.00	Stream Power (lb/ft s)		40.07	
Frctn Loss (ft)	2.13	Cum Volume (acre-ft)	0.00	0.04	0.00
C & E Loss (ft)	0.17	Cum SA (acres)	0.00	0.04	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 10 Profile: PF 1 6+80

E.G. Elev (ft)	1690.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.80	Wt. n-Val.		0.050	
W.S. Elev (ft)	1688.61	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1689.17	Flow Area (sq ft)		7.61	
E.G. Slope (ft/ft)	0.160168	Area (sq ft)		7.61	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	8.09	Top Width (ft)		8.09	
Vel Total (ft/s)	10.77	Avg. Vel. (ft/s)		10.77	
Max Chl Dpth (ft)	1.23	Hydr. Depth (ft)		0.94	
Conv. Total (cfs)	204.9	Conv. (cfs)		204.9	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.83	
Min Ch El (ft)	1687.38	Shear (lb/sq ft)		8.62	
Alpha	1.00	Stream Power (lb/ft s)		92.82	
Frctn Loss (ft)	2.27	Cum Volume (acre-ft)	0.00	0.04	0.00
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.04	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 9 Profile: PF 1 7+00

E.G. Elev (ft)	1687.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.82	Wt. n-Val.		0.050	
W.S. Elev (ft)	1685.34	Reach Len. (ft)	12.62	20.00	27.39
Crit W.S. (ft)	1685.92	Flow Area (sq ft)		7.58	
E.G. Slope (ft/ft)	0.165462	Area (sq ft)		7.58	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	8.26	Top Width (ft)		8.26	
Vel Total (ft/s)	10.81	Avg. Vel. (ft/s)		10.81	
Max Chl Dpth (ft)	1.49	Hydr. Depth (ft)		0.92	
Conv. Total (cfs)	201.6	Conv. (cfs)		201.6	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.96	
Min Ch El (ft)	1683.85	Shear (lb/sq ft)		8.74	
Alpha	1.00	Stream Power (lb/ft s)		94.50	
Frctn Loss (ft)	3.26	Cum Volume (acre-ft)	0.00	0.03	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	0.04	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 8 Profile: PF 1 7+20

E.G. Elev (ft)	1684.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.76	Wt. n-Val.		0.050	
W.S. Elev (ft)	1682.28	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1682.85	Flow Area (sq ft)		7.70	
E.G. Slope (ft/ft)	0.146322	Area (sq ft)		7.70	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	7.29	Top Width (ft)		7.29	
Vel Total (ft/s)	10.65	Avg. Vel. (ft/s)		10.65	
Max Chl Dpth (ft)	1.68	Hydr. Depth (ft)		1.06	
Conv. Total (cfs)	214.4	Conv. (cfs)		214.4	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.50	
Min Ch El (ft)	1680.60	Shear (lb/sq ft)		8.28	
Alpha	1.00	Stream Power (lb/ft s)		88.17	
Frctn Loss (ft)	3.11	Cum Volume (acre-ft)	0.00	0.03	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.03	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 7 Profile: PF 1 7+40

E.G. Elev (ft)	1680.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.36	Wt. n-Val.		0.050	
W.S. Elev (ft)	1678.28	Reach Len. (ft)	11.29	20.00	28.59
Crit W.S. (ft)	1679.00	Flow Area (sq ft)		6.66	
E.G. Slope (ft/ft)	0.193643	Area (sq ft)		6.66	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	5.67	Top Width (ft)		5.67	
Vel Total (ft/s)	12.32	Avg. Vel. (ft/s)		12.32	
Max Chl Dpth (ft)	1.77	Hydr. Depth (ft)		1.17	
Conv. Total (cfs)	186.3	Conv. (cfs)		186.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.28	
Min Ch El (ft)	1676.51	Shear (lb/sq ft)		11.05	
Alpha	1.00	Stream Power (lb/ft s)		136.12	
Frctn Loss (ft)	3.35	Cum Volume (acre-ft)	0.00	0.03	0.00
C & E Loss (ft)	0.06	Cum SA (acres)	0.00	0.03	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 6 Profile: PF 1 7+60

E.G. Elev (ft)	1676.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.70	Wt. n-Val.		0.050	
W.S. Elev (ft)	1673.71	Reach Len. (ft)	20.23	20.00	19.77
Crit W.S. (ft)	1674.53	Flow Area (sq ft)		6.22	
E.G. Slope (ft/ft)	0.226503	Area (sq ft)		6.22	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	5.35	Top Width (ft)		5.35	
Vel Total (ft/s)	13.18	Avg. Vel. (ft/s)		13.18	
Max Chl Dpth (ft)	1.71	Hydr. Depth (ft)		1.16	
Conv. Total (cfs)	172.3	Conv. (cfs)		172.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.91	
Min Ch El (ft)	1672.00	Shear (lb/sq ft)		12.73	
Alpha	1.00	Stream Power (lb/ft s)		167.78	
Frctn Loss (ft)	4.18	Cum Volume (acre-ft)	0.00	0.02	0.00
C & E Loss (ft)	0.03	Cum SA (acres)	0.00	0.03	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 5 Profile: PF 1 7+80

E.G. Elev (ft)	1672.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.90	Wt. n-Val.		0.050	
W.S. Elev (ft)	1670.41	Reach Len. (ft)	17.04	20.00	22.95
Crit W.S. (ft)	1670.99	Flow Area (sq ft)		7.42	
E.G. Slope (ft/ft)	0.166198	Area (sq ft)		7.42	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	7.66	Top Width (ft)		7.66	
Vel Total (ft/s)	11.06	Avg. Vel. (ft/s)		11.06	
Max Chl Dpth (ft)	1.72	Hydr. Depth (ft)		0.97	
Conv. Total (cfs)	201.1	Conv. (cfs)		201.1	
Length Wtd. (ft)	19.98	Wetted Per. (ft)		8.50	
Min Ch El (ft)	1668.69	Shear (lb/sq ft)		9.05	
Alpha	1.00	Stream Power (lb/ft s)		100.04	
Frctn Loss (ft)	3.86	Cum Volume (acre-ft)	0.00	0.02	0.00
C & E Loss (ft)	0.24	Cum SA (acres)	0.00	0.02	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 4 Profile: PF 1 8+00

E.G. Elev (ft)	1669.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.93	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1668.12	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1668.41	Flow Area (sq ft)	0.31	10.44	0.02
E.G. Slope (ft/ft)	0.133016	Area (sq ft)	0.31	10.44	0.02
Q Total (cfs)	82.00	Flow (cfs)	0.90	81.07	0.03
Top Width (ft)	20.49	Top Width (ft)	3.14	17.08	0.27
Vel Total (ft/s)	7.62	Avg. Vel. (ft/s)	2.90	7.77	1.94
Max Chl Dpth (ft)	1.04	Hydr. Depth (ft)	0.10	0.61	0.06
Conv. Total (cfs)	224.8	Conv. (cfs)	2.5	222.3	0.1
Length Wtd. (ft)	20.00	Wetted Per. (ft)	3.15	17.20	0.29
Min Ch El (ft)	1667.08	Shear (lb/sq ft)	0.82	5.04	0.45
Alpha	1.03	Stream Power (lb/ft s)	2.38	39.13	0.87
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	0.00	0.02	0.00
C & E Loss (ft)	0.29	Cum SA (acres)	0.00	0.02	0.00

Plan: Imported Pla RIVER-1 Reach-1 RS: 3 Profile: PF 1 8+20

E.G. Elev (ft)	1667.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.		0.050	
W.S. Elev (ft)	1667.47	Reach Len. (ft)	37.19	20.00	4.17
Crit W.S. (ft)	1667.47	Flow Area (sq ft)		15.35	
E.G. Slope (ft/ft)	0.039999	Area (sq ft)		15.35	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	17.72	Top Width (ft)		17.72	
Vel Total (ft/s)	5.34	Avg. Vel. (ft/s)		5.34	
Max Chl Dpth (ft)	1.47	Hydr. Depth (ft)		0.87	
Conv. Total (cfs)	410.0	Conv. (cfs)		410.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		18.00	
Min Ch El (ft)	1666.00	Shear (lb/sq ft)		2.13	
Alpha	1.00	Stream Power (lb/ft s)		11.38	
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	0.00	0.01	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.01	0.00

8+40

Plan: Imported Pla RIVER-1 Reach-1 RS: 2 Profile: PF 1

E.G. Elev (ft)	1666.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.37	Wt. n-Val.		0.050	
W.S. Elev (ft)	1665.14	Reach Len. (ft)	20.00	20.00	20.62
Crit W.S. (ft)	1665.57	Flow Area (sq ft)		8.73	
E.G. Slope (ft/ft)	0.126712	Area (sq ft)		8.73	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	9.88	Top Width (ft)		9.88	
Vel Total (ft/s)	9.39	Avg. Vel. (ft/s)		9.39	
Max Chl Dpth (ft)	1.14	Hydr. Depth (ft)		0.88	
Conv. Total (cfs)	230.4	Conv. (cfs)		230.4	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		10.44	
Min Ch El (ft)	1664.00	Shear (lb/sq ft)		6.62	
Alpha	1.00	Stream Power (lb/ft s)		62.14	
Frctn Loss (ft)	1.31	Cum Volume (acre-ft)	0.00	0.00	0.00
C & E Loss (ft)	0.09	Cum SA (acres)	0.00	0.00	0.00

8+60

Plan: Imported Pla RIVER-1 Reach-1 RS: 1 Profile: PF 1

E.G. Elev (ft)	1664.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.72	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1662.30	Reach Len. (ft)			
Crit W.S. (ft)	1662.83	Flow Area (sq ft)	0.04	7.75	0.06
E.G. Slope (ft/ft)	0.118727	Area (sq ft)	0.04	7.75	0.06
Q Total (cfs)	82.00	Flow (cfs)	0.11	81.69	0.20
Top Width (ft)	7.33	Top Width (ft)	0.27	6.63	0.42
Vel Total (ft/s)	10.44	Avg. Vel. (ft/s)	2.78	10.54	3.15
Max Chl Dpth (ft)	1.76	Hydr. Depth (ft)	0.15	1.17	0.15
Conv. Total (cfs)	238.0	Conv. (cfs)	0.3	237.1	0.6
Length Wtd. (ft)		Wetted Per. (ft)	0.41	7.42	0.52
Min Ch El (ft)	1660.54	Shear (lb/sq ft)	0.75	7.74	0.90
Alpha	1.02	Stream Power (lb/ft s)	2.08	81.55	2.85
Frctn Loss (ft)	2.45	Cum Volume (acre-ft)			
C & E Loss (ft)	0.03	Cum SA (acres)			

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                    HEC-RAS Version 3.1.2 April 2004
                      U.S. Army Corp of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California

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

PROJECT DATA
Project Title: NaylorHEC
Project File : Naylor.prj
Run Date and Time: 11/30/2004 2:46:45 PM

Project in English units

Project Description:
******* Autodesk, Inc. HEC-2 Input Data file ********
****
Minimum Data Input **********

****

PLAN DATA

Plan Title: Imported Plan 01
Plan File : h:\Naylor.p01

Geometry Title: Imported Geom 01
Geometry File : h:\Naylor.g01

Flow Title : Imported Flow 01
Flow File : h:\Naylor.f01

Plan Summary Information:

Number of:	Cross Sections =	44	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

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

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Imported Flow 01
Flow File : h:\Naylor.f01

Flow Data (cfs)

River	Reach	RS	PF 1
RIVER-1	Reach-1	44	73
RIVER-1	Reach-1	11	82

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	PF 1	Critical	Critical

GEOMETRY DATA

Geometry Title: Imported Geom 01
Geometry File : h:\Naylor.g01

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 44

INPUT
Description: 1
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
10	1793	24.51	1788	33.02	1786.5	36.54	1786.2	48.54	1786
48.85	1786	49.7	1786	50	1786	55.27	1787.29	67.02	1791.3

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
10	.04	36.54	.05	49.7	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
36.54	49.7	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1787.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.	0.040	0.050	

0.040				
W.S. Elev (ft)	1787.43	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1786.93	Flow Area (sq ft)	6.27	17.64
4.60				
E.G. Slope (ft/ft)	0.005754	Area (sq ft)	6.27	17.64
4.60				
Q Total (cfs)	73.00	Flow (cfs)	13.98	48.34
10.68				
Top Width (ft)	27.95	Top Width (ft)	8.80	13.16
5.98				
Vel Total (ft/s)	2.56	Avg. Vel. (ft/s)	2.23	2.74
2.32				
Max Chl Dpth (ft)	1.43	Hydr. Depth (ft)	0.71	1.34
0.77				
Conv. Total (cfs)	962.3	Conv. (cfs)	184.4	637.2
140.8				
Length Wtd. (ft)	20.00	Wetted Per. (ft)	8.90	13.16
6.16				
Min Ch El (ft)	1786.00	Shear (lb/sq ft)	0.25	0.48
0.27				
Alpha	1.02	Stream Power (lb/ft s)	0.56	1.32
0.62				
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	0.00	0.18
0.00				
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.21
0.01				

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 43

INPUT
Description: 2
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
24.51	1788	24.93	1788	26.02	1787.8	33.02	1786.5	36.2	1786.2
36.54	1786.2	37.99	1786	41.85	1786	51.54	1786	55.27	1787.29
56.52	1788	58.95	1788.84	63.02	1790	66.88	1791.26	67.01	1791.28
67.02	1791.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
24.51	.04	36.2	.05	55.27	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
36.2	55.27	31.26	20	26.26	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1787.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.12	Wt. n-Val.	0.040	0.050
W.S. Elev (ft)	1787.28	Reach Len. (ft)	31.26	20.00
26.26				
Crit W.S. (ft)		Flow Area (sq ft)	4.60	21.81

E.G. Slope (ft/ft)	0.007782	Area (sq ft)	4.60	21.81
Q Total (cfs)	73.00	Flow (cfs)	10.92	62.08
Top Width (ft)	26.43	Top Width (ft)	7.38	19.04
Vel Total (ft/s)	2.76	Avg. Vel. (ft/s)	2.37	2.85
Max Chl Dpth (ft)	1.28	Hydr. Depth (ft)	0.62	1.15
Conv. Total (cfs)	827.5	Conv. (cfs)	123.8	703.7
Length Wtd. (ft)	20.84	Wetted Per. (ft)	7.47	19.27
Min Ch El (ft)	1786.00	Shear (lb/sq ft)	0.30	0.55
Alpha	1.01	Stream Power (lb/ft s)	0.71	1.57
Frctn Loss (ft) 0.00	0.17	Cum Volume (acre-ft)	0.00	0.17
C & E Loss (ft) 0.00	0.00	Cum SA (acres)	0.01	0.20

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 42

INPUT
Description: 3
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
.48	1796	.78	1796	1.06	1796	4.77	1796	7.02	1794.91
9.13	1794	11.31	1793.08	13.44	1792	15.8	1792	16.69	1790.78
17.68	1790	18.91	1790	24.79	1787.74	28.82	1786.44	32.58	1786
34.49	1786	35.6	1786	35.94	1786	51.31	1786	51.34	1786
51.38	1786	51.48	1786	51.51	1786.01	51.53	1786.02	58.52	1788
64.26	1790	64.32	1790	64.69	1790.13	83.93	1796.41	83.98	1796.42
84.04	1796.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
.48	.04	24.79	.05	58.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
24.79	58.52	31.26	20	26.26	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1787.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.050	
W.S. Elev (ft)	1787.12	Reach Len. (ft)	31.26	20.00	26.26
Crit W.S. (ft)		Flow Area (sq ft)		27.33	
E.G. Slope (ft/ft)	0.008723	Area (sq ft)		27.33	

Q Total (cfs)	73.00	Flow (cfs)			73.00
Top Width (ft)	28.67	Top Width (ft)			28.67
Vel Total (ft/s)	2.67	Avg. Vel. (ft/s)			2.67
Max Chl Dpth (ft)	1.12	Hydr. Depth (ft)			0.95
Conv. Total (cfs)	781.6	Conv. (cfs)			781.6
Length Wtd. (ft)	20.00	Wetted Per. (ft)			28.96
Min Ch El (ft)	1786.00	Shear (lb/sq ft)			0.51
Alpha	1.00	Stream Power (lb/ft s)			1.37
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	0.00		0.16
0.00					
C & E Loss (ft)	0.02	Cum SA (acres)	0.00		0.19
0.00					

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

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 41

INPUT
Description: 4
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1796	3.31	1796	4.38	1796	7.89	1796	11.16	1793.75
12.94	1792.8	13.85	1792	15.95	1790.08	16.07	1790	16.49	1789.7
19.51	1788	25.26	1786.22	25.99	1786	28.86	1786	48.64	1786
52.86	1786	59.25	1787,53	61.59	1788	62.3	1788.15	70.19	1790
89.87	1796.9	96.38	1800	97.59	1800	99.43	1800	100	1800

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	19.51	.05	59.25	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
19.51	59.25	20.01	20	25.59	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1786.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.28	Wt. n-Val.		0.050	
W.S. Elev (ft)	1786.59	Reach Len. (ft)	20.01	20.00	25.59
Crit W.S. (ft)	1786.59	Flow Area (sq ft)		17.21	
E.G. Slope (ft/ft)	0.045497	Area (sq ft)		17.21	

Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	31.27	Top Width (ft)		31.27
Vel Total (ft/s)	4.24	Avg. Vel. (ft/s)		4.24
Max Chl Dpth (ft)	0.59	Hydr. Depth (ft)		0.55
Conv. Total (cfs)	342.2	Conv. (cfs)		342.2
Length Wtd. (ft)	20.00	Wetted Per. (ft)		31.43
Min Ch El (ft)	1786.00	Shear (lb/sq ft)		1.56
Alpha	1.00	Stream Power (lb/ft s)		6.60
Frctn Loss (ft)	0.61	Cum Volume (acre-ft)	0.00	0.15
0.00				
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.18
0.00				

Warning: The energy equation could not be balanced within the specified number of iterations. The
program selected the water surface that had the least amount of error between computed and
assumed values.
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.
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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 40

INPUT
Description: 5
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1794.8	.57	1794.8	1.43	1794.76	10.26	1794	13.05	1792.86
17.48	1792	20.26	1791.07	21.83	1790	22.59	1789.46	25.93	1788
26.06	1787.9	32.46	1786	41.55	1784.51	44.96	1784.31	48.48	1784.17
51.19	1784.5	61.02	1786	69.75	1787.98	69.84	1788	70.06	1788.05
81.91	1790	94.2	1794.7	100	1796.48				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	32.46	.05	61.02	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

32.46 61.02 20 20 20 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1785.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.		0.050	
W.S. Elev (ft)	1785.56	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1785.38	Flow Area (sq ft)		19.01	
E.G. Slope (ft/ft)	0.021799	Area (sq ft)		19.01	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	23.04	Top Width (ft)		23.04	
Vel Total (ft/s)	3.84	Avg. Vel. (ft/s)		3.84	
Max Chl Dpth (ft)	1.39	Hydr. Depth (ft)		0.83	
Conv. Total (cfs)	494.4	Conv. (cfs)		494.4	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		23.23	
Min Ch El (ft)	1784.17	Shear (lb/sq ft)		1.11	
Alpha	1.00	Stream Power (lb/ft s)		4.28	
Frctn Loss (ft)	0.60	Cum Volume (acre-ft)	0.00	0.15	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.17	0.00

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

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 39

INPUT
Description: 6
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1793.9	4.53	1793.56	7.84	1793.2	9.43	1793.01	15.98	1792.36
17.82	1792	18.85	1791.66	21.84	1790.42	22.11	1790.31	22.45	1790.14
22.81	1790	22.97	1789.93	23.76	1789.69	28.81	1788	35.96	1786.49
37.46	1786.1	37.82	1786	39.66	1785.59	44.63	1784	56.39	1784
57.15	1784	57.61	1784.06	67.97	1784.95	74.76	1786	77.89	1786.55
89.16	1788	95	1789.06	100	1789.72				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	39.66	.05	67.97	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
39.66	67.97	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1785.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.32	Wt. n-Val.		0.050
W.S. Elev (ft)	1784.86	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1784.86	Flow Area (sq ft)		15.98
E.G. Slope (ft/ft)	0.043192	Area (sq ft)		15.98
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	24.95	Top Width (ft)		24.95
Vel Total (ft/s)	4.57	Avg. Vel. (ft/s)		4.57
Max Chl Dpth (ft)	0.86	Hydr. Depth (ft)		0.64
Conv. Total (cfs)	351.3	Conv. (cfs)		351.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)		25.12
Min Ch El (ft)	1784.00	Shear (lb/sq ft)		1.72
Alpha	1.00	Stream Power (lb/ft s)		7.83
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)	0.00	0.14
0.00				
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	0.15
0.00				

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 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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 38

INPUT
Description: 7
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	1792.7	9.9	1792	17.08	1790.72	19.81	1790.27	20.5	1790
23.99	1788.4	24.44	1788.14	24.78	1788	24.99	1787.93	30.26	1786
34.33	1785.1	38.59	1784	52.69	1782.26	54.21	1782.2	57.18	1782.39
63.34	1783	78.19	1784	81.49	1784	82.32	1784.12	95.6	1786
99	1786.5	100	1786.61						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	38.59	.05	63.34	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
38.59	63.34	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1783.88	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.68	Wt. n-Val.		0.050
0.040				
W.S. Elev (ft)	1783.20	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1783.42	Flow Area (sq ft)		10.89
0.30				
E.G. Slope (ft/ft)	0.100144	Area (sq ft)		10.89
0.30				
Q Total (cfs)	73.00	Flow (cfs)		72.23
0.77				
Top Width (ft)	21.28	Top Width (ft)		18.28
3.00				
Vel Total (ft/s)	6.52	Avg. Vel. (ft/s)		6.63
2.54				
Max Chl Dpth (ft)	1.00	Hydr. Depth (ft)		0.60
0.10				
Conv. Total (cfs)	230.7	Conv. (cfs)		228.2
2.4				
Length Wtd. (ft)	20.00	Wetted Per. (ft)		18.38
3.01				
Min Ch El (ft)	1782.20	Shear (lb/sq ft)		3.70
0.63				
Alpha	1.02	Stream Power (lb/ft s)		24.57
1.60				
Frctn Loss (ft)	1.26	Cum Volume (acre-ft)	0.00	0.13
0.00				
C & E Loss (ft)	0.04	Cum SA (acres)	0.00	0.14
0.00				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
0.7 or greater than 1.4. This may indicate the need for additional cross sections.
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: Program found supercritical flow starting at this cross section.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 37

INPUT
Description: 8
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1791.4	.34	1791.31	3.79	1790.64	7.1	1790	9.55	1789.47
17.07	1788	17.9	1787.12	24.63	1786	25.43	1786	26.85	1785.5
29.71	1784	37.26	1782.4	41.05	1782	46.34	1781.09	48.74	1780.77
53.46	1782	54.87	1782	55.44	1782	65.47	1783.22	75.04	1784
79	1785.3	80.62	1786	83.17	1786.88	87.29	1788	92.29	1789.57
94.01	1790	98.55	1790.82	100	1791.09				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	41.05	.05	53.46	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
41.05	53.46	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1782.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1782.41	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1782.43	Flow Area (sq ft)	0.78	12.90	1.48
E.G. Slope (ft/ft)	0.029992	Area (sq ft)	0.78	12.90	1.48
Q Total (cfs)	73.00	Flow (cfs)	1.72	67.24	4.03
Top Width (ft)	21.53	Top Width (ft)	3.81	12.41	5.31
Vel Total (ft/s)	4.82	Avg. Vel. (ft/s)	2.22	5.21	2.73
Max Chl Dpth (ft)	1.64	Hydr. Depth (ft)	0.20	1.04	0.28
Conv. Total (cfs)	421.5	Conv. (cfs)	10.0	388.3	23.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)	3.84	12.67	5.33
Min Ch El (ft)	1780.77	Shear (lb/sq ft)	0.38	1.91	0.52
Alpha	1.10	Stream Power (lb/ft s)	0.84	9.94	1.42
Frctn Loss (ft)	1.00	Cum Volume (acre-ft)	0.00	0.13	0.00
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.14	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
0.7 or greater than 1.4. This may indicate the need for additional cross sections.
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: RIVER-1
REACH: Reach-1 RS: 36

INPUT
Description: 9
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1791.1	2.11	1790.89	5.88	1790.52	8.79	1790	15.01	1788.83
19.33	1788	20.5	1786.44	21.58	1786	29.24	1784.02	29.29	1784
29.34	1784	32.61	1782	38.6	1780.05	38.77	1780	51.88	1780
52.15	1780	52.31	1780.07	58.74	1782	62.81	1783.27	65.28	1784
69.51	1785.1	76.36	1786	81.01	1787.52	82.53	1788	84.33	1788.47
90.96	1790	95.13	1791.57	96.69	1792	99.42	1793.12	100	1793.33

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	32.61	.05	58.74	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
32.61	58.74	4.52	20	35.76	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1781.58	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.97	Wt. n-Val.		0.050
W.S. Elev (ft)	1780.61	Reach Len. (ft)	4.52	20.00
35.76				
Crit W.S. (ft)	1780.90	Flow Area (sq ft)		9.24
E.G. Slope (ft/ft)	0.164389	Area (sq ft)		9.24
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	17.20	Top Width (ft)		17.20
Vel Total (ft/s)	7.90	Avg. Vel. (ft/s)		7.90
Max Chl Dpth (ft)	0.61	Hydr. Depth (ft)		0.54
Conv. Total (cfs)	180.0	Conv. (cfs)		180.0
Length Wtd. (ft)	19.90	Wetted Per. (ft)		17.39
Min Ch El (ft)	1780.00	Shear (lb/sq ft)		5.45
Alpha	1.00	Stream Power (lb/ft s)		43.09
Frctn Loss (ft)	1.18	Cum Volume (acre-ft)	0.00	0.12
0.00				
C & E Loss (ft)	0.06	Cum SA (acres)	0.00	0.13
0.00				

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 35

INPUT
Description: 10
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1791.8	3.13	1791.38	5.93	1790.98	9.68	1790.57	13.83	1790
16.53	1788.3	17.91	1788	18.35	1787.83	21.71	1787.09	21.88	1786.64
23.81	1786	26.75	1784.42	26.91	1784	30.43	1782.48	31.57	1782
32.61	1781.7	38.37	1780	41.64	1779.45	55.34	1779.8	55.6	1779.8
56.47	1780	57.04	1780.54	59.72	1782	61.93	1782.96	65.62	1784
66.14	1784.2	67.81	1784.5	78.67	1786	80.66	1786.65	84.97	1788
90.05	1789.3	93.01	1790	95.69	1791.01	97.99	1792	99.03	1792.38
100	1792.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	38.37	.05	57.04	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
38.37	57.04	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1780.83	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.38	Wt. n-Val.	0.040	0.050
W.S. Elev (ft)	1780.46	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1780.46	Flow Area (sq ft)	0.35	14.53
E.G. Slope (ft/ft)	0.039353	Area (sq ft)	0.35	14.53
Q Total (cfs)	73.00	Flow (cfs)	0.94	72.06
Top Width (ft)	20.12	Top Width (ft)	1.54	18.58
Vel Total (ft/s)	4.91	Avg. Vel. (ft/s)	2.67	4.96
Max Chl Dpth (ft)	1.01	Hydr. Depth (ft)	0.23	0.78
Conv. Total (cfs)	368.0	Conv. (cfs)	4.7	363.2
Length Wtd. (ft)	20.00	Wetted Per. (ft)	1.61	18.84
Min Ch El (ft)	1779.45	Shear (lb/sq ft)	0.54	1.90
Alpha	1.01	Stream Power (lb/ft s)	1.43	9.40

Frctn Loss (ft)	0.70	Cum Volume (acre-ft)	0.00	0.11
0.00				
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.12
0.00				

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 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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 34

INPUT
Description: 11
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1792.8	.8	1792.7	3.03	1792.5	5.16	1792	9.73	1790.83
12.92	1790	13.78	1789.63	19.55	1788	23.8	1786.46	25.19	1786
25.51	1785.8	25.58	1785.64	27.81	1784	30.43	1782.5	31.25	1782.21
31.3	1782	37.44	1780.3	37.56	1780.25	38.37	1780	38.57	1779.88
44.79	1778	45.45	1777.76	46.83	1777.59	52.02	1777.19	53.58	1777.28
55.6	1778	61.84	1779.69	62.33	1780	63.48	1781.26	64.53	1781.64
65.47	1782	65.94	1782.41	71.25	1784	73.1	1784.74	78.6	1785.79
80.12	1786	80.46	1786.11	86.5	1788	93.11	1789.71	94.38	1790
95.64	1790.5	98.1	1791.52	99.37	1792	99.83	1792.2	100	1792.26

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.79	.05	55.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.79	55.6	32.33	20	7.56	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1779.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.20	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1778.24	Reach Len. (ft)	32.33	20.00	7.56
Crit W.S. (ft)	1778.62	Flow Area (sq ft)	0.09	8.20	0.11
E.G. Slope (ft/ft)	0.130497	Area (sq ft)	0.09	8.20	0.11
Q Total (cfs)	73.00	Flow (cfs)	0.30	72.36	0.34
Top Width (ft)	12.49	Top Width (ft)	0.79	10.81	

0.88				
Vel Total (ft/s)	8.69	Avg. Vel. (ft/s)	3.16	8.82
3.18				
Max Chl Dpth (ft)	1.05	Hydr. Depth (ft)	0.12	0.76
0.12				
Conv. Total (cfs)	202.1	Conv. (cfs)	0.8	200.3
0.9				
Length Wtd. (ft)	20.00	Wetted Per. (ft)	0.83	11.01
0.92				
Min Ch El (ft)	1777.19	Shear (lb/sq ft)	0.93	6.07
0.94				
Alpha	1.02	Stream Power (lb/ft s)	2.95	53.57
2.99				
Frctn Loss (ft)	1.31	Cum Volume (acre-ft)	0.00	0.11
0.00				
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.12
0.00				

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 33

INPUT
Description: 12
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1794	.01	1794	6.69	1792.18	7.15	1792	10.21	1791.2
14.81	1790	17.71	1788.59	20.13	1788	21.08	1786.82	21.21	1786
23.2	1784.8	25.45	1784	26.89	1783.58	28.31	1782	29.74	1781.67
35.24	1780	37.28	1778.85	40.09	1778	43.74	1776.67	45.17	1776
47.68	1774.5	50.59	1774.03	52.59	1774.08	52.81	1774.05	56.73	1776
60.12	1777.1	62.17	1778	63.99	1779.79	64.33	1780	64.41	1780.08
67.13	1781.1	69.58	1782	70.79	1783.06	73.92	1784	77.54	1785.44
80.47	1786	83.61	1787.19	85.31	1788	86.95	1788.77	91.72	1790
94.8	1791.4	96.53	1792	100	1793.3				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	45.17	.05	56.73	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45.17	56.73	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1776.71	Element	Left OB	Channel
Right OB				

Vel Head (ft)	1.44	Wt. n-Val.			0.050
W.S. Elev (ft)	1775.27	Reach Len. (ft)	20.00		20.00
20.00					
Crit W.S. (ft)	1775.72	Flow Area (sq ft)			7.58
E.G. Slope (ft/ft)	0.140088	Area (sq ft)			7.58
Q Total (cfs)	73.00	Flow (cfs)			73.00
Top Width (ft)	8.86	Top Width (ft)			8.86
Vel Total (ft/s)	9.64	Avg. Vel. (ft/s)			9.64
Max Chl Dpth (ft)	1.24	Hydr. Depth (ft)			0.86
Conv. Total (cfs)	195.0	Conv. (cfs)			195.0
Length Wtd. (ft)	20.00	Wetted Per. (ft)			9.39
Min Ch El (ft)	1774.03	Shear (lb/sq ft)			7.05
Alpha	1.00	Stream Power (lb/ft s)			67.97
Frctn Loss (ft)	2.70	Cum Volume (acre-ft)	0.00		0.11
0.00					
C & E Loss (ft)	0.02	Cum SA (acres)	0.00		0.11
0.00					

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: RIVER-1
REACH: Reach-1 RS: 32

INPUT
Description: 13
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1793.8	1.17	1793.33	4.02	1792	6.65	1790.4	7.06	1790
7.33	1789.7	9.96	1788	10.62	1787.82	17.74	1786	18.75	1785.56
21.19	1784	23.7	1783.19	25.82	1782	31.6	1780.14	31.84	1780.08
32.11	1780	32.89	1779.56	35.34	1778.2	35.55	1778	36.61	1777.35
39.5	1776	40.52	1775.4	42.55	1774	46.42	1772.41	46.99	1772
48.04	1771.4	49.24	1771.46	50.99	1771.24	53.06	1772	55.18	1772.86
57.51	1774	61.07	1775.72	61.67	1776	62.44	1776.49	65.85	1778
66.85	1779	68.36	1780	69.73	1780.5	73.69	1782	75.65	1783.72
76.59	1784	80.04	1785.37	81.35	1785.71	81.88	1786	82.81	1786.82
85.29	1788	88.21	1789.37	89.63	1790	91.63	1790.55	96.55	1792
100	1793.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	46.42	.05	55.18	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
46.42	55.18	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1774.06	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.41	Wt. n-Val.	0.040	0.050
W.S. Elev (ft)	1772.65	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1773.10	Flow Area (sq ft)	0.07	7.63
E.G. Slope (ft/ft)	0.124814	Area (sq ft)	0.07	7.63
Q Total (cfs)	73.00	Flow (cfs)	0.21	72.79
Top Width (ft)	8.82	Top Width (ft)	0.58	8.24
Vel Total (ft/s)	9.48	Avg. Vel. (ft/s)	3.02	9.54
Max Chl Dpth (ft)	1.41	Hydr. Depth (ft)	0.12	0.93
Conv. Total (cfs)	206.6	Conv. (cfs)	0.6	206.0
Length Wtd. (ft)	20.00	Wetted Per. (ft)	0.63	8.81
Min Ch El (ft)	1771.24	Shear (lb/sq ft)	0.86	6.75
Alpha	1.01	Stream Power (lb/ft s)	2.59	64.41
Frctn Loss (ft)	2.64	Cum Volume (acre-ft)	0.00	0.10
0.00				
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.11
0.00				

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: RIVER-1
REACH: Reach-1 RS: 31

INPUT
Description: 14
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1792	1.22	1791.37	3.27	1790	3.56	1789.68	5.57	1788
10.55	1786.8	13.83	1786	16.49	1784.55	17.79	1784	19.42	1783.49
23.53	1782.8	24.04	1782	25.98	1781.13	29.09	1780	30.36	1779.29
31.75	1778	33.98	1776.63	35.13	1776	36.63	1774.33	37.13	1774
39.19	1772.2	39.39	1772	39.73	1771.75	42.58	1770	43.44	1769.46
47.27	1768.4	48.6	1768.23	50.99	1768.29	53.53	1770	54.19	1770.25
57.5	1772	59.25	1772.5	62.3	1774	63.87	1774.76	66.53	1776
69.24	1777.7	69.78	1778	72.21	1779.62	72.99	1780	74.16	1780.62
77.8	1782	78.59	1782.69	81.61	1784	82.64	1784.27	85.81	1786
86.18	1786.3	88.06	1788	88.94	1788.78	91.12	1790.28	91.7	1790.36
100	1792.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	42.58	.05	53.53	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
42.58	53.53	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1771.07	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.64	Wt. n-Val.		0.050
W.S. Elev (ft)	1769.42	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1769.92	Flow Area (sq ft)		7.10
E.G. Slope (ft/ft)	0.178878	Area (sq ft)		7.10
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	9.10	Top Width (ft)		9.10
Vel Total (ft/s)	10.28	Avg. Vel. (ft/s)		10.28
Max Chl Dpth (ft)	1.19	Hydr. Depth (ft)		0.78
Conv. Total (cfs)	172.6	Conv. (cfs)		172.6
Length Wtd. (ft)	20.00	Wetted Per. (ft)		9.60
Min Ch El (ft)	1768.23	Shear (lb/sq ft)		8.26
Alpha	1.00	Stream Power (lb/ft s)		84.94
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	0.00	0.10
0.00				
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.10
0.00				

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: RIVER-1
REACH: Reach-1 RS: 30

INPUT
Description: 15
Station Elevation Data num= 59

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1790.5	3.47	1790.36	5.55	1790	13.96	1786.65	14.05	1786.32
16.06	1786	16.39	1786	17.68	1784.98	18.88	1784	19.57	1782.69
21.01	1782	21.82	1781.68	25.04	1780	26.86	1779.02	27.96	1778
28.56	1777.6	30.71	1776.45	31.33	1776	31.72	1775.75	34.34	1774
36.68	1772.1	36.74	1772	36.87	1771.93	38.94	1770	40.94	1768.7
42.31	1768	46.15	1766.09	46.38	1766	46.86	1765.72	47.21	1765.68

49.8	1765.5	51.1	1766	52.86	1767.01	55.13	1768	55.62	1768.7
55.8	1769	57.55	1770	59.69	1771.51	59.96	1772	61.93	1772.34
66.48	1773.2	68.76	1774	69.22	1774.16	73.61	1776	74.5	1776.33
77.87	1777.7	78.67	1778	83.64	1779.79	84.27	1780	85.3	1781.89
85.38	1782	88.22	1783.75	88.56	1784	91.09	1785.66	91.58	1786
91.79	1787	92.89	1788	98.67	1790.51	100	1790.84		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	42.31	.05	55.13	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
42.31	55.13	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1768.24	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.25	Wt. n-Val.		0.050
W.S. Elev (ft)	1766.99	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1767.39	Flow Area (sq ft)		8.15
E.G. Slope (ft/ft)	0.106443	Area (sq ft)		8.15
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	8.50	Top Width (ft)		8.50
Vel Total (ft/s)	8.96	Avg. Vel. (ft/s)		8.96
Max Chl Dpth (ft)	1.49	Hydr. Depth (ft)		0.96
Conv. Total (cfs)	223.8	Conv. (cfs)		223.8
Length Wtd. (ft)	20.00	Wetted Per. (ft)		9.17
Min Ch El (ft)	1765.50	Shear (lb/sq ft)		5.90
Alpha	1.00	Stream Power (lb/ft s)		52.91
Frctn Loss (ft)	2.71	Cum Volume (acre-ft)	0.00	0.10
0.00				
C & E Loss (ft)	0.12	Cum SA (acres)	0.00	0.10
0.00				

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: RIVER-1
REACH: Reach-1 RS: 29

INPUT
Description: 16
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1778.4	1.68	1778.07	1.99	1778	2.03	1777.99	7.09	1776
12.58	1774.2	13.19	1774	13.48	1773.89	17.85	1772	18.56	1771.78
20.97	1771	23.12	1770	29.93	1768.24	30.5	1768	30.81	1767.87
36.39	1766	37.3	1765.56	41.25	1764	44.21	1762.7	46	1762
47.94	1761.2	48.8	1760.93	50.36	1761.09	51.15	1762	52.37	1762.7
54.44	1764	55.29	1764.64	56.81	1766	58.76	1767.16	60.21	1768
62.97	1769.4	63.84	1770	64.59	1770.65	65.67	1771.06	66.24	1771.71
66.38	1771.8	66.76	1772	67.14	1772.19	71.67	1774	72.88	1774.51
75.91	1776	77.61	1776.75	80.26	1778	83.49	1778.98	85.8	1780
86.27	1781.1	86.76	1782	88.49	1783.4	89.11	1784	90.86	1785.49
91.42	1786	91.64	1787.41	92.22	1788	100	1791.9		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	41.25	.05	54.44	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
41.25	54.44	41.43	20	2.56	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1764.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.53	Wt. n-Val.		0.050	
W.S. Elev (ft)	1762.37	Reach Len. (ft)	41.43	20.00	2.56
Crit W.S. (ft)	1763.09	Flow Area (sq ft)		5.71	
E.G. Slope (ft/ft)	0.268198	Area (sq ft)		5.71	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.76	Top Width (ft)		6.76	
Vel Total (ft/s)	12.78	Avg. Vel. (ft/s)		12.78	
Max Chl Dpth (ft)	1.44	Hydr. Depth (ft)		0.85	
Conv. Total (cfs)	141.0	Conv. (cfs)		141.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.55	
Min Ch El (ft)	1760.93	Shear (lb/sq ft)		12.66	
Alpha	1.00	Stream Power (lb/ft s)		161.82	
Frctn Loss (ft)	3.21	Cum Volume (acre-ft)	0.00	0.09	0.00
C & E Loss (ft)	0.13	Cum SA (acres)	0.00	0.10	0.00

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 28

INPUT
Description: 17
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1777.7	.37	1777.57	2.9	1776	5.69	1774.56	6.73	1774
7.38	1773.6	9.74	1772	11.27	1771.27	13.76	1770	15.44	1769.36
18.86	1768	23.13	1766.66	24.75	1766	26.31	1765.33	29.98	1764
35.75	1762.8	37.52	1762	38.63	1761.47	43.08	1760.49	44.78	1760
45.35	1759.7	47.8	1758	50.47	1758	50.86	1757.84	51.02	1758
51.57	1758.3	53.62	1760.71	54.79	1761.58	55.03	1762	55.29	1762.11
57.07	1764	60.77	1765.6	61.8	1766	66.17	1767.9	66.4	1768
67.08	1768.4	69.54	1770	69.83	1770.28	70.75	1770.74	73.4	1772
76.18	1773.2	78.49	1774	82.86	1775.57	83.89	1776	86.93	1777.14
89.97	1778	92.48	1779.4	95.94	1781.28	97.19	1782	100	1783.37

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	43.08	.05	53.62	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
43.08	53.62	4.41	20	41.25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1761.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.60	Wt. n-Val.		0.050	
W.S. Elev (ft)	1759.40	Reach Len. (ft)	4.41	20.00	41.25
Crit W.S. (ft)	1759.91	Flow Area (sq ft)		7.19	
E.G. Slope (ft/ft)	0.131139	Area (sq ft)		7.19	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.73	Top Width (ft)		6.73	
Vel Total (ft/s)	10.15	Avg. Vel. (ft/s)		10.15	
Max Chl Dpth (ft)	1.56	Hydr. Depth (ft)		1.07	
Conv. Total (cfs)	201.6	Conv. (cfs)		201.6	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.86	
Min Ch El (ft)	1757.84	Shear (lb/sq ft)		7.50	
Alpha	1.00	Stream Power (lb/ft s)		76.07	
Frctn Loss (ft)	3.63	Cum Volume (acre-ft)	0.00	0.09	0.00

C & E Loss (ft)	0.28	Cum SA (acres)	0.00	0.09	0.00

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 27

INPUT
Description: 18
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1769.4	2.39	1768	5.84	1767.07	8.76	1766	10.33	1765.62
17.38	1764	19.57	1763.83	20.73	1763.68	27.08	1762.79	31.37	1762.18
32.24	1762	33.36	1761.74	40.48	1760	42.43	1759.29	44.25	1758
45.32	1756.8	46.34	1756	47.83	1754.26	48.38	1754	49.88	1754
51.1	1753.8	51.48	1754	51.76	1754.21	53.93	1756	55.56	1757.3
56.27	1758	57.13	1758.52	60.14	1759.99	60.18	1760	61.96	1761.23
62.98	1761.8	63.2	1761.82	63.29	1762	67.43	1763.9	67.71	1764
68.99	1764.6	72.58	1766	73.32	1766.32	76.23	1767.6	77.34	1768
81.63	1769.8	82.27	1770	83.05	1770.49	86.24	1772	90.6	1773.9
90.88	1774	94.63	1775.12	97.94	1776	100	1776.74		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	45.32	.05	55.56	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45.32	55.56	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1757.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.38	Wt. n-Val.		0.050	
W.S. Elev (ft)	1755.23	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1755.94	Flow Area (sq ft)		5.90	
E.G. Slope (ft/ft)	0.217274	Area (sq ft)		5.90	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	5.99	Top Width (ft)		5.99	
Vel Total (ft/s)	12.37	Avg. Vel. (ft/s)		12.37	

Max Chl Dpth (ft)	1.43	Hydr. Depth (ft)		0.99
Conv. Total (cfs)	156.6	Conv. (cfs)		156.6
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.99
Min Ch El (ft)	1753.80	Shear (lb/sq ft)		11.45
Alpha	1.00	Stream Power (lb/ft s)		141.63
Frctn Loss (ft)	3.32	Cum Volume (acre-ft)	0.00	0.09
0.00				
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.09
0.00				

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: RIVER-1
REACH: Reach-1 RS: 26

INPUT
Description: 19
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1763.2	15.34	1762	17.25	1761.75	18.89	1761.61	31.23	1760
33.6	1759.7	40.24	1758	41.47	1756.72	42.53	1756	43.38	1755.38
45.52	1754	46.17	1752.89	46.94	1752	48.58	1750.27	49	1750
50.52	1750	51.34	1750.25	54.5	1752	56.22	1753.12	58.24	1754
60.3	1755.3	62.38	1756	68.77	1757.62	69.47	1758	71.62	1758.81
75.11	1760	75.73	1760.19	76.62	1762	78.19	1762.72	81.61	1764
83.16	1764.7	86.78	1766	90.24	1767.31	91.44	1767.5	94	1768
98.03	1769.4	99.71	1770	100	1770.08				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	46.17	.05	56.22	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
46.17	56.22	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1753.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.03	Wt. n-Val.		0.050	
W.S. Elev (ft)	1751.54	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1752.17	Flow Area (sq ft)		6.38	
E.G. Slope (ft/ft)	0.177621	Area (sq ft)		6.38	

Q Total (cfs)	73.00	Flow (cfs)			73.00
Top Width (ft)	6.30	Top Width (ft)			6.30
Vel Total (ft/s)	11.45	Avg. Vel. (ft/s)			11.45
Max Chl Dpth (ft)	1.54	Hydr. Depth (ft)			1.01
Conv. Total (cfs)	173.2	Conv. (cfs)			173.2
Length Wtd. (ft)	20.00	Wetted Per. (ft)			7.30
Min Ch El (ft)	1750.00	Shear (lb/sq ft)			9.69
Alpha	1.00	Stream Power (lb/ft s)			110.89
Frctn Loss (ft)	3.92	Cum Volume (acre-ft)	0.00		0.08
0.00					
C & E Loss (ft)	0.10	Cum SA (acres)	0.00		0.09
0.00					

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: RIVER-1
REACH: Reach-1 RS: 25

INPUT
Description: 20
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1761.3	.37	1761.24	9.99	1760.03	10.38	1760	14.73	1758.34
16.76	1758.4	22.73	1758.89	24.04	1758.86	32.87	1758	33.32	1757.88
33.71	1757.8	38.44	1756	40.82	1754.41	41.13	1754	41.54	1753.69
42.73	1752	46.12	1750.15	46.28	1750	46.37	1749.9	48.04	1748
50.14	1746.9	53.36	1748	55.76	1749.35	57.93	1750	60.51	1750.73
62.15	1752	65.47	1753.27	67.15	1754	67.47	1754.21	69.26	1754.81
71.63	1756	72.36	1756.48	75.93	1758	78.29	1759.21	79.96	1760
83.36	1761	86.28	1762	92.89	1763.81	93.52	1764	96.85	1764.84
100	1765.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	46.12	.05	55.76	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
46.12	55.76	21.08	20	18.91	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1750.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.63	Wt. n-Val.		0.050	
W.S. Elev (ft)	1748.67	Reach Len. (ft)	21.08	20.00	18.91

Crit W.S. (ft)	1749.19	Flow Area (sq ft)		7.11
E.G. Slope (ft/ft)	0.140431	Area (sq ft)		7.11
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	7.11	Top Width (ft)		7.11
Vel Total (ft/s)	10.26	Avg. Vel. (ft/s)		10.26
Max Chl Dpth (ft)	1.77	Hydr. Depth (ft)		1.00
Conv. Total (cfs)	194.8	Conv. (cfs)		194.8
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.05
Min Ch El (ft)	1746.90	Shear (lb/sq ft)		7.75
Alpha	1.00	Stream Power (lb/ft s)		79.55
Frctn Loss (ft)	3.15	Cum Volume (acre-ft)	0.00	0.08
0.00				
C & E Loss (ft)	0.12	Cum SA (acres)	0.00	0.08
0.00				

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: RIVER-1
REACH: Reach-1 RS: 24

INPUT
Description: 21
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1761.3	11.24	1760	12.43	1759.82	20.69	1758.38	22.49	1758
22.61	1757.9	22.97	1757.81	27.51	1756	28.23	1755.57	28.91	1755.39
30.61	1754	33.71	1752.2	33.79	1752.07	33.87	1752	37.6	1750.05
37.68	1750	40.31	1748.26	40.94	1748	41.35	1747.8	43.91	1746
44.68	1745.3	45.95	1744	46.89	1742.39	47.29	1742	48.2	1741.2
48.9	1741.2	50.17	1741.12	51.29	1742	52.22	1743.32	53.05	1743.74
53.6	1744	56.28	1745.07	57.97	1746	62.37	1747.59	63.54	1748
64.95	1748.5	65.79	1748.86	69.44	1750.64	72.41	1752	74.68	1753.11
76.13	1754	79.35	1755.33	80.71	1756	82.19	1756.59	86.47	1758
89.92	1759.4	91.12	1760	95.82	1761.27	98.01	1762	100	1762.49

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	45.95	.05	52.22	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45.95	52.22	4.57	20	35.21	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1746.00	Element	Left OB	Channel

Right OB

Vel Head (ft)	3.46	Wt. n-Val.			0.050
W.S. Elev (ft)	1742.54	Reach Len. (ft)	4.57		20.00
35.21					
Crit W.S. (ft)	1743.47	Flow Area (sq ft)			4.89
E.G. Slope (ft/ft)	0.331878	Area (sq ft)			4.89
Q Total (cfs)	73.00	Flow (cfs)			73.00
Top Width (ft)	4.87	Top Width (ft)			4.87
Vel Total (ft/s)	14.93	Avg. Vel. (ft/s)			14.93
Max Chl Dpth (ft)	1.42	Hydr. Depth (ft)			1.00
Conv. Total (cfs)	126.7	Conv. (cfs)			126.7
Length Wtd. (ft)	20.00	Wetted Per. (ft)			6.00
Min Ch El (ft)	1741.12	Shear (lb/sq ft)			16.88
Alpha	1.00	Stream Power (lb/ft s)			252.08
Frctn Loss (ft)	4.12	Cum Volume (acre-ft)	0.00		0.08
0.00					
C & E Loss (ft)	0.18	Cum SA (acres)	0.00		0.08
0.00					

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 23

INPUT
Description: 22
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1759.4	4.4	1758.86	10.1	1758	15.74	1757.1	20	1756
23.45	1754.9	25.09	1754	26.86	1752.53	27.61	1752	30.06	1750.14
30.26	1750	30.28	1749.99	35.09	1748	38.17	1746.48	38.86	1746
40.46	1744.6	41.75	1744	43.64	1742.76	44.84	1742	46.21	1741.22
47.85	1740	49.34	1738.74	53.1	1740	53.19	1740	53.52	1740.26
55.28	1741.5	56.22	1742	58.33	1743.07	60.28	1744	63.69	1745.36
64.82	1746	66.53	1746.91	69.21	1748	71.33	1749.04	73.77	1750
76.51	1751.3	78.37	1752	80.68	1753.35	82.33	1754	84.95	1754.91
88.23	1756	92.71	1757.72	93.74	1758	94.76	1758.33	100	1759.82

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	46.21	.05	55.28	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
46.21	55.28	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1742.02	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.27	Wt. n-Val.		0.050
W.S. Elev (ft)	1740.75	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1741.14	Flow Area (sq ft)		8.08
E.G. Slope (ft/ft)	0.099548	Area (sq ft)		8.08
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	7.38	Top Width (ft)		7.38
Vel Total (ft/s)	9.04	Avg. Vel. (ft/s)		9.04
Max Chl Dpth (ft)	2.01	Hydr. Depth (ft)		1.09
Conv. Total (cfs)	231.4	Conv. (cfs)		231.4
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.54
Min Ch El (ft)	1738.74	Shear (lb/sq ft)		5.88
Alpha	1.00	Stream Power (lb/ft s)		53.12
Frctn Loss (ft)	3.32	Cum Volume (acre-ft)	0.00	0.07
0.00				
C & E Loss (ft)	0.66	Cum SA (acres)	0.00	0.08
0.00				

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 22

INPUT
Description: 23
Station Elevation Data num= 46

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1753.7	6.73	1753.48	17.16	1752	18.5	1751.72	24.21	1750
24.46	1749.9	28.12	1748	32.9	1746.07	33.06	1746	33.24	1745.95
37.32	1744	37.86	1743.57	40.42	1742	43.41	1740.36	44.04	1740
44.42	1739.7	46.29	1738	48.38	1736.01	48.41	1736	48.42	1735.98
48.45	1736	48.71	1736	51.96	1736.21	53.31	1738	55.85	1739.85
55.89	1740	56.42	1740.34	59.53	1742	60.45	1742.49	63.46	1744
64.83	1744.6	67.26	1746	70.76	1747.93	70.93	1748	71.07	1748.07
75.78	1750	75.85	1750.03	81	1752	81.62	1752.38	85.47	1754
90.11	1755.7	90.81	1755.96	90.95	1756	91.12	1756.07	97.52	1758
100	1758.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.04	.05	55.85	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.04	55.85	31.48	20	8.26	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1739.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.97	Wt. n-Val.		0.050	
W.S. Elev (ft)	1737.44	Reach Len. (ft)	31.48	20.00	8.26
Crit W.S. (ft)	1738.06	Flow Area (sq ft)		6.48	
E.G. Slope (ft/ft)	0.166137	Area (sq ft)		6.48	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.02	Top Width (ft)		6.02	
Vel Total (ft/s)	11.26	Avg. Vel. (ft/s)		11.26	
Max Chl Dpth (ft)	1.46	Hydr. Depth (ft)		1.08	
Conv. Total (cfs)	179.1	Conv. (cfs)		179.1	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.23	
Min Ch El (ft)	1735.98	Shear (lb/sq ft)		9.30	
Alpha	1.00	Stream Power (lb/ft s)		104.69	
Frctn Loss (ft)	2.53	Cum Volume (acre-ft)	0.00	0.07	0.00
C & E Loss (ft)	0.07	Cum SA (acres)	0.00	0.08	0.00

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: RIVER-1
REACH: Reach-1 RS: 21

INPUT
Description: 24
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1752	.2	1752	2.23	1751.68	10.5	1750	21.01	1748.08
21.21	1748	21.28	1748	21.38	1747.96	25.76	1746	30.73	1744.6
31.99	1744	33.58	1742.72	34.4	1742	35.39	1741.33	37.71	1740
39.69	1738.4	40.34	1738	40.47	1737.92	43.74	1736	45.16	1734.31
45.68	1734	48.58	1732.08	48.79	1732.1	52.17	1733.13	53.76	1734
54.04	1734.4	55.39	1736	55.98	1737	56.73	1738	57.95	1738.89
58.24	1740	58.25	1740	58.27	1740.01	61.93	1742	62.97	1742.49
66.31	1744	68.02	1744.82	70.81	1746	72.22	1746.74	75.46	1748
78.87	1749.3	81.28	1750	84.59	1751.5	85.84	1752	86.19	1752.14
92.97	1754	93.56	1754.19	99.66	1756	100	1756.14		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	43.74	.05	55.39	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
43.74	55.39	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1735.76	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.05	Wt. n-Val.		0.050
W.S. Elev (ft)	1733.71	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1734.32	Flow Area (sq ft)		6.35
E.G. Slope (ft/ft)	0.200551	Area (sq ft)		6.35
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	7.11	Top Width (ft)		7.11
Vel Total (ft/s)	11.50	Avg. Vel. (ft/s)		11.50
Max Chl Dpth (ft)	1.63	Hydr. Depth (ft)		0.89
Conv. Total (cfs)	163.0	Conv. (cfs)		163.0
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.90
Min Ch El (ft)	1732.08	Shear (lb/sq ft)		10.06
Alpha	1.00	Stream Power (lb/ft s)		115.68
Frctn Loss (ft)	3.64	Cum Volume (acre-ft)	0.00	0.07
0.00				
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.07
0.00				

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: RIVER-1
REACH: Reach-1 RS: 20

INPUT
Description: 25
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1749.2	1.45	1749.1	9.19	1748	15.96	1746.77	17.69	1746
21.44	1745	23.73	1744	27.01	1743.02	28.18	1742	29.8	1740.92
31.42	1740	32.9	1739.36	35.3	1738	36.65	1737.16	38.64	1736
39.51	1735	41.16	1734	43.25	1732.62	44.75	1732	46.6	1730.61
47.68	1730	48.83	1728.32	50.6	1728.25	51.42	1730	52.18	1730.72
52.83	1731.3	53.67	1732	54.54	1732.54	57.19	1734	58.18	1735.49
58.61	1736	59.65	1737.78	59.87	1738	60.01	1738.13	62.4	1740
65.66	1741.7	66.13	1742	67.74	1742.76	71.2	1744	74.12	1745.23
76.62	1746	80.18	1747.24	82.48	1748	85.13	1748.82	89.42	1750
94.7	1752	94.84	1752	95.06	1752.05	100	1753.02		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	43.25	.05	54.54	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
43.25	54.54	21.75	20	18.24	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1732.27	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.81	Wt. n-Val.		0.050
W.S. Elev (ft)	1730.47	Reach Len. (ft)	21.75	20.00
18.24				
Crit W.S. (ft)	1731.06	Flow Area (sq ft)		6.77
E.G. Slope (ft/ft)	0.147435	Area (sq ft)		6.77
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	5.06	Top Width (ft)		5.06
Vel Total (ft/s)	10.79	Avg. Vel. (ft/s)		10.79
Max Chl Dpth (ft)	2.22	Hydr. Depth (ft)		1.34
Conv. Total (cfs)	190.1	Conv. (cfs)		190.1
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.36
Min Ch El (ft)	1728.25	Shear (lb/sq ft)		8.46
Alpha	1.00	Stream Power (lb/ft s)		91.24
Frctn Loss (ft)	3.42	Cum Volume (acre-ft)	0.00	0.07
0.00				

C & E Loss (ft) 0.07 Cum SA (acres) 0.00 0.07
0.00

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: RIVER-1
REACH: Reach-1 RS: 19

INPUT
Description: 26
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1747.9	5.4	1747.15	11.35	1746	12.98	1745.54	16.49	1744
20.83	1742.6	22.58	1742	24.71	1741.48	27.25	1740	31.14	1738.26
31.59	1738	33.96	1736.48	34.77	1736	35.12	1735.58	37.73	1734
38.9	1733.2	41.78	1732	43.63	1730.58	44.53	1730	45.31	1728.3
45.62	1728	47.11	1726.09	47.22	1726	48.69	1724.07	48.73	1724
48.92	1723.7	49.06	1723.67	51.73	1723.78	51.9	1723.82	52.11	1724
52.24	1724.1	53.64	1726	53.9	1726.73	54.42	1728	54.91	1728.95
55.71	1730	55.73	1730.02	58.32	1732	61.02	1733.64	61.7	1734
62.19	1734.7	64.87	1736	65.93	1737.68	66.26	1738	66.84	1738.32
69.18	1740	72.13	1740.82	76.24	1742	78.71	1742.89	84.25	1744
86.1	1744.5	93.08	1746	96.8	1747.08	100	1747.71		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.53	.05	55.71	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.53	55.71	14.51	20	25.43	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1728.13	Element	Left OB	Channel
Right OB				
Vel Head (ft)	3.10	Wt. n-Val.		0.050
W.S. Elev (ft)	1725.03	Reach Len. (ft)	14.51	20.00
25.43				
Crit W.S. (ft)	1725.90	Flow Area (sq ft)		5.17
E.G. Slope (ft/ft)	0.289570	Area (sq ft)		5.17
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	4.96	Top Width (ft)		4.96
Vel Total (ft/s)	14.13	Avg. Vel. (ft/s)		14.13
Max Chl Dpth (ft)	1.36	Hydr. Depth (ft)		1.04
Conv. Total (cfs)	135.7	Conv. (cfs)		135.7
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.22

Min Ch El (ft)	1723.67	Shear (lb/sq ft)			15.01
Alpha	1.00	Stream Power (lb/ft s)			212.07
Frctn Loss (ft)	4.02	Cum Volume (acre-ft)	0.00	0.06	0.00
C & E Loss (ft)	0.13	Cum SA (acres)	0.00	0.07	0.00

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 18

INPUT
Description: 27
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1742.6	3.05	1742.26	4.01	1742.13	4.72	1742	9.69	1740.95
14.9	1740	18.25	1739.28	21.62	1738	24.58	1737.29	27.09	1736
33.39	1734.3	33.91	1734	34.01	1733.94	38.86	1732	39.18	1731.77
42.06	1730	42.57	1728.93	43.56	1728	44.53	1726.82	45.54	1726
46.43	1724.9	46.98	1724	47.89	1722.54	48.37	1722	49.56	1720.08
49.61	1720	49.95	1719.6	50.54	1720	53.12	1721.63	53.49	1722
55.61	1723.9	55.66	1724	55.76	1724.19	57.83	1725.62	58.1	1726
58.44	1727	59.39	1728	60.14	1728.89	61.37	1730	62.26	1730.85
64.34	1732	66.45	1732.98	68.23	1734	70.77	1735.45	72.04	1736
73.58	1737.9	73.72	1738	73.9	1738.1	77.53	1740	81.95	1741.21
85.29	1742	88.86	1742.78	95.47	1744	100	1745.35		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	46.98	.05	55.61	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
46.98	55.61	31.57	20	8.47	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1723.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.74	Wt. n-Val.		0.050	
W.S. Elev (ft)	1722.09	Reach Len. (ft)	31.57	20.00	8.47
Crit W.S. (ft)	1722.65	Flow Area (sq ft)		6.90	
E.G. Slope (ft/ft)	0.139685	Area (sq ft)		6.90	

Q Total (cfs)	73.00	Flow (cfs)			73.00
Top Width (ft)	5.31	Top Width (ft)			5.31
Vel Total (ft/s)	10.57	Avg. Vel. (ft/s)			10.57
Max Chl Dpth (ft)	2.49	Hydr. Depth (ft)			1.30
Conv. Total (cfs)	195.3	Conv. (cfs)			195.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)			7.43
Min Ch El (ft)	1719.60	Shear (lb/sq ft)			8.10
Alpha	1.00	Stream Power (lb/ft s)			85.64
Frctn Loss (ft)	3.89	Cum Volume (acre-ft)	0.00		0.06
0.00					
C & E Loss (ft)	0.41	Cum SA (acres)	0.00		0.06
0.00					

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 17

INPUT
Description: 28
Station Elevation Data num= 56

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1733.8	6.67	1733.88	7.46	1733.83	17.08	1732.76	21.52	1732
26.77	1731.4	30.21	1730.67	31.43	1730	31.6	1729.68	33.59	1728
33.89	1727.7	36.15	1726	36.32	1725.8	37.58	1724	37.8	1723.68
39.46	1722	39.8	1721.5	40.87	1720	41.74	1719.07	43.43	1718
43.93	1717.2	45.23	1716	46.99	1714.89	48.39	1714	49.71	1712.97
50.68	1713.1	51.22	1714	52.22	1714.95	52.54	1716	53.44	1717.18
54.02	1718	55.04	1718.82	57.07	1721.68	57.38	1722	57.54	1722.16
59.07	1724	59.24	1724.33	60.62	1726	60.82	1726.32	62.64	1728
63.75	1729.1	64.8	1730	66.43	1730.99	67.75	1732	70.26	1733.25
72.07	1734	74.88	1735.54	76.19	1736	79.8	1737.88	80.15	1738
80.4	1738.1	84.8	1740	89.64	1741.27	93.12	1742	99.55	1743.65
100	1743.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	45.23	.05	52.54	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

45.23 52.54 31.49 20 8.24 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1718.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.24	Wt. n-Val.		0.050	8.24
W.S. Elev (ft)	1714.69	Reach Len. (ft)	31.49	20.00	
Crit W.S. (ft)	1715.71	Flow Area (sq ft)		4.42	
E.G. Slope (ft/ft)	0.462651	Area (sq ft)		4.42	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	4.63	Top Width (ft)		4.63	
Vel Total (ft/s)	16.52	Avg. Vel. (ft/s)		16.52	
Max Chl Dpth (ft)	1.72	Hydr. Depth (ft)		0.95	
Conv. Total (cfs)	107.3	Conv. (cfs)		107.3	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		5.98	
Min Ch El (ft)	1712.97	Shear (lb/sq ft)		21.35	
Alpha	1.00	Stream Power (lb/ft s)		352.76	
Frctn Loss (ft)	4.65	Cum Volume (acre-ft)	0.00	0.06	0.00
C & E Loss (ft)	0.25	Cum SA (acres)	0.00	0.06	0.00

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 16

INPUT
Description: 29
Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1732.6	6.1	1732.18	6.84	1732.13	7.77	1732	17.79	1731.06
24.47	1730	24.99	1729.04	25.76	1728	28.38	1726.98	29.17	1726
30.41	1724.6	30.84	1724	31.53	1723.27	32.32	1722	34.32	1720.35
34.71	1720	35.21	1719.7	36.58	1718	37.41	1716.92	38.37	1716

39.64	1715	40.56	1714	41.86	1712.86	42.39	1712	43.75	1710.55
44.23	1710	45.44	1709.29	47.24	1708	48.29	1707.15	48.77	1707.02
49.99	1707	51.66	1708	52.49	1708	54.24	1709.21	54.71	1710
55.39	1711	55.78	1711.58	56.54	1712	56.93	1712.95	57.36	1714
57.8	1714.7	59.64	1716	60.44	1716.51	61.4	1718	62.25	1719.35
63.4	1720	64.6	1720.8	65.89	1722	67.3	1723.26	67.93	1724
69.63	1725.3	70.31	1726	71.28	1727.03	73.12	1728	74.45	1729.18
75.78	1730	78.24	1730.84	81.36	1731.69	82.88	1732	89.72	1733.54
92.93	1734	100	1734.98						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	45.44	.05	54.24	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45.44	54.24	5.54	20	34.13	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1711.18	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.74	Wt. n-Val.		0.050
W.S. Elev (ft)	1708.44	Reach Len. (ft)	5.54	20.00
34.13				
Crit W.S. (ft)	1709.19	Flow Area (sq ft)		5.49
E.G. Slope (ft/ft)	0.295305	Area (sq ft)		5.49
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	6.49	Top Width (ft)		6.49
Vel Total (ft/s)	13.29	Avg. Vel. (ft/s)		13.29
Max Chl Dpth (ft)	1.44	Hydr. Depth (ft)		0.85
Conv. Total (cfs)	134.3	Conv. (cfs)		134.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.36
Min Ch El (ft)	1707.00	Shear (lb/sq ft)		13.76
Alpha	1.00	Stream Power (lb/ft s)		182.76
Frctn Loss (ft)	7.30	Cum Volume (acre-ft)	0.00	0.06
0.00				
C & E Loss (ft)	0.45	Cum SA (acres)	0.00	0.06
0.00				

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: RIVER-1
REACH: Reach-1 RS: 15

INPUT
Description: 30
Station Elevation Data num= 56

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1729	7.22	1728	11.85	1727.45	14.73	1726	16.54	1724.96
19.5	1724	21.69	1723.22	23.55	1722	26.8	1720.37	27.51	1720
28.59	1719.5	30.84	1718	32.84	1716.4	33.25	1716	34.1	1715.49
35.48	1714	35.65	1713.84	36.74	1712	37.07	1711.65	38.46	1710
40.24	1708.9	41.63	1708	41.97	1707.82	44.02	1706	46.98	1704.1
47.15	1704	47.41	1703.79	48.1	1703.57	50.72	1702.94	52.85	1704
53.2	1704.6	54.09	1706	55.75	1707.1	57.25	1708	60.24	1709.91
60.47	1710	60.54	1710.06	64.22	1712	64.66	1713.06	66.6	1714
68.1	1715	69.63	1716	72.2	1717.55	72.51	1718	72.78	1718.41
75.8	1720	78.84	1721.92	79.15	1722	79.75	1722.23	84.85	1724
85.38	1724.3	90.58	1726	90.72	1726.06	91.22	1726.22	96.46	1727.22
100	1727.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.02	.05	54.09	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.02	54.09	14.55	20	25.39	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1706.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.95	Wt. n-Val.		0.050	
W.S. Elev (ft)	1704.51	Reach Len. (ft)	14.55	20.00	25.39
Crit W.S. (ft)	1705.11	Flow Area (sq ft)		6.52	
E.G. Slope (ft/ft)	0.176370	Area (sq ft)		6.52	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.81	Top Width (ft)		6.81	
Vel Total (ft/s)	11.19	Avg. Vel. (ft/s)		11.19	
Max Chl Dpth (ft)	1.57	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	173.8	Conv. (cfs)		173.8	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.68	
Min Ch El (ft)	1702.94	Shear (lb/sq ft)		9.35	
Alpha	1.00	Stream Power (lb/ft s)		104.67	
Frctn Loss (ft)	4.49	Cum Volume (acre-ft)	0.00	0.05	0.00
C & E Loss (ft)	0.24	Cum SA (acres)	0.00	0.06	0.00

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: RIVER-1
REACH: Reach-1 RS: 14

INPUT
Description: 31
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1722.2	1.15	1722.02	1.19	1722	3.35	1721.52	10.14	1720
10.33	1720	14.31	1718	20.3	1716.19	21.17	1716	22.48	1715.45
25.1	1714	25.61	1713.54	29.9	1712	31.83	1710.64	32.32	1710
35.4	1708.1	35.49	1708	38.66	1706.24	38.93	1706	39.32	1705.75
42.15	1704	43.28	1703.11	45.3	1702	46.67	1700.5	47.27	1700
49.65	1698.3	50.47	1698.44	51.68	1698.32	53.63	1700	54.77	1700.77
56.9	1702	58.54	1703.43	59.67	1704	60.11	1704.8	62.06	1706
64.31	1707.4	65.83	1708	67.43	1708.93	70.07	1710	72.1	1711.55
72.96	1712	74.63	1712.89	76.91	1714	78.34	1714.94	80.49	1716
84.68	1717.8	85.05	1718	85.27	1718.17	93.01	1720	96.04	1720.4
98.32	1720.7	100	1720.87						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	45.3	.05	56.9	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
45.3	56.9	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1702.33	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.54	Wt. n-Val.		0.050
W.S. Elev (ft)	1699.80	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1700.55	Flow Area (sq ft)		5.71
E.G. Slope (ft/ft)	0.236968	Area (sq ft)		5.71
Q Total (cfs)	73.00	Flow (cfs)		73.00
Top Width (ft)	5.84	Top Width (ft)		5.84
Vel Total (ft/s)	12.78	Avg. Vel. (ft/s)		12.78
Max Chl Dpth (ft)	1.50	Hydr. Depth (ft)		0.98
Conv. Total (cfs)	150.0	Conv. (cfs)		150.0
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.88
Min Ch El (ft)	1698.30	Shear (lb/sq ft)		12.28

Alpha	1.00	Stream Power (lb/ft s)			156.91
Frctn Loss (ft)	4.07	Cum Volume (acre-ft)	0.00	0.05	0.00
C & E Loss (ft)	0.06	Cum SA (acres)	0.00	0.05	0.00

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: RIVER-1
REACH: Reach-1 RS: 13

INPUT
Description: 32
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1713.4	7.49	1712.42	9.55	1712	9.86	1711.84	17.6	1710.56
20.8	1710	21.23	1709.85	26.44	1708	26.68	1707.93	30.23	1706
31.17	1705.3	33.46	1704	35.44	1702.79	36.77	1702	39.38	1700.24
39.98	1700	40.49	1699.68	43.27	1698	45.2	1696.46	45.87	1696.23
46.07	1696	47.13	1695.11	48.38	1695.06	50.14	1694.92	52.12	1696
52.7	1696.7	54.25	1698	55.31	1699.18	55.89	1700	57.02	1700.71
59.1	1702	60.36	1703.19	62.21	1704	63.32	1705	64.8	1706
65.63	1706.6	69.11	1708	71.88	1709.79	72.27	1710	72.97	1710.44
75.65	1712	77.34	1713	81.02	1714	83.03	1715.77	83.84	1716
89.7	1717.4	92.1	1718	92.72	1718.18	96.9	1718.91	100	1719.46

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	43.27	.05	54.25	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
43.27	54.25	33.55	20	6.67	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1698.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.85	Wt. n-Val.		0.050	
W.S. Elev (ft)	1696.35	Reach Len. (ft)	33.55	20.00	6.67
Crit W.S. (ft)	1696.92	Flow Area (sq ft)		6.68	
E.G. Slope (ft/ft)	0.165313	Area (sq ft)		6.68	
Q Total (cfs)	73.00	Flow (cfs)		73.00	
Top Width (ft)	6.88	Top Width (ft)		6.88	
Vel Total (ft/s)	10.92	Avg. Vel. (ft/s)		10.92	

Max Chl Dpth (ft)	1.43	Hydr. Depth (ft)		0.97
Conv. Total (cfs)	179.5	Conv. (cfs)		179.5
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.78
Min Ch El (ft)	1694.92	Shear (lb/sq ft)		8.87
Alpha	1.00	Stream Power (lb/ft s)		96.90
Frctn Loss (ft)	3.93	Cum Volume (acre-ft)	0.00	0.05
0.00				
C & E Loss (ft)	0.20	Cum SA (acres)	0.00	0.05
0.00				

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: RIVER-1
REACH: Reach-1 RS: 12

INPUT
Description: 33
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1708.8	1.14	1708.79	4.16	1708.5	5.49	1708	15.61	1706.26
17.02	1706	17.5	1705.92	24.1	1704	27.81	1703.22	29.86	1702
30.43	1701.6	34.15	1700.16	34.61	1700	37.6	1698.2	38	1698
40.64	1697.1	41.58	1696	43.12	1694.7	44.17	1694	46.84	1692.16
47.25	1692	48.66	1692	49.07	1691.83	49.49	1692	50.29	1692.39
53.65	1694	54.92	1695.48	55.86	1696	56.49	1696.79	57.72	1698
58.63	1699.1	59.49	1700	60.96	1701.2	62.31	1702	63.96	1702.87
66.52	1704	67.33	1704.73	69.56	1706	73.76	1707.98	73.8	1708
73.81	1708	77.57	1710	78.95	1710.86	84.59	1712	86.17	1712.44
95.71	1714	97.19	1714.4	100	1714.69				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.17	.05	53.65	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.17	53.65	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1695.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.62	Wt. n-Val.		0.050	
W.S. Elev (ft)	1693.44	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1693.95	Flow Area (sq ft)		7.15	

E.G. Slope (ft/ft)	0.144078	Area (sq ft)			7.15
Q Total (cfs)	73.00	Flow (cfs)			73.00
Top Width (ft)	7.48	Top Width (ft)			7.48
Vel Total (ft/s)	10.21	Avg. Vel. (ft/s)			10.21
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)			0.96
Conv. Total (cfs)	192.3	Conv. (cfs)			192.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)			8.30
Min Ch El (ft)	1691.83	Shear (lb/sq ft)			7.75
Alpha	1.00	Stream Power (lb/ft s)			79.10
Frctn Loss (ft)	3.08	Cum Volume (acre-ft)	0.00		0.04
0.00					
C & E Loss (ft)	0.07	Cum SA (acres)	0.00		0.05
0.00					

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: RIVER-1
REACH: Reach-1 RS: 11

INPUT
Description: 34
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1705.1	6.07	1704	9.59	1703.6	11.79	1703.35	20.29	1702
22.95	1701.6	31.5	1700	33.05	1699.3	35.59	1698	35.82	1697.92
37.45	1696	37.78	1695.71	39.73	1694.39	40.14	1694	40.39	1693.86
44.15	1692	48.86	1690.21	49.34	1690	49.7	1689.76	49.9	1689.74
50.8	1690	51.72	1690.37	55.64	1692	57.42	1692.83	59.37	1694
59.94	1694.7	61.22	1696	62.33	1697.71	62.63	1698	62.89	1698.3
65.14	1700	68.83	1701.96	68.9	1702	68.98	1702.04	69.44	1702.25
72.17	1703.4	74.27	1704	76.69	1705.52	77.7	1706	81.95	1707.91
82.13	1708	85.77	1708.85	93.42	1710	96.88	1710	100	1711.37

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.15	.05	55.64	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.15	55.64	16.1	20	23.89	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1692.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.05	Wt. n-Val.		0.050	

W.S. Elev (ft)	1691.71	Reach Len. (ft)	16.10	20.00 23.89
Crit W.S. (ft)	1692.02	Flow Area (sq ft)		9.99
E.G. Slope (ft/ft)	0.084502	Area (sq ft)		9.99
Q Total (cfs)	82.00	Flow (cfs)		82.00
Top Width (ft)	10.03	Top Width (ft)		10.03
Vel Total (ft/s)	8.21	Avg. Vel. (ft/s)		8.21
Max Chl Dpth (ft)	1.97	Hydr. Depth (ft)		1.00
Conv. Total (cfs)	282.1	Conv. (cfs)		282.1
Length Wtd. (ft)	20.00	Wetted Per. (ft)		10.79
Min Ch El (ft)	1689.74	Shear (lb/sq ft)		4.88
Alpha	1.00	Stream Power (lb/ft s)		40.07
Frctn Loss (ft)	2.13	Cum Volume (acre-ft)	0.00	0.04 0.00
C & E Loss (ft)	0.17	Cum SA (acres)	0.00	0.04 0.00

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 10

INPUT
Description: 35
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1701.6	8.12	1701.03	17.33	1700	19.06	1699.53	22.21	1698
26.04	1696.8	29.34	1696	31.42	1695.37	33.77	1694	37.74	1692.27
38.62	1692	40.64	1691.17	43.28	1690	44.39	1689.26	46.28	1688
47.23	1687.5	47.94	1687.39	50.69	1687.38	51.89	1687.39	52.52	1688
54.06	1689	55.8	1690	57.48	1690.98	58.08	1691.17	58.54	1691.66
59.46	1692	62.44	1693.08	65.04	1694	65.42	1694.41	68.06	1696
68.89	1696.6	71.1	1698	71.34	1698.46	74.26	1700	76.8	1701.13
77.82	1701.6	78.36	1702	83.87	1703.63	84.86	1704	87.07	1705.62
87.67	1706	88.59	1706.39	90.99	1708	93.33	1708.96	95.7	1710
96.97	1710.4	99.99	1712	100	1712				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.04	44.39	.05	55.8	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.39	55.8	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1690.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.80	Wt. n-Val.		0.050
W.S. Elev (ft)	1688.61	Reach Len. (ft)	20.00	20.00
20.00				
Crit W.S. (ft)	1689.17	Flow Area (sq ft)		7.61
E.G. Slope (ft/ft)	0.160168	Area (sq ft)		7.61
Q Total (cfs)	82.00	Flow (cfs)		82.00
Top Width (ft)	8.09	Top Width (ft)		8.09
Vel Total (ft/s)	10.77	Avg. Vel. (ft/s)		10.77
Max Chl Dpth (ft)	1.23	Hydr. Depth (ft)		0.94
Conv. Total (cfs)	204.9	Conv. (cfs)		204.9
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.83
Min Ch El (ft)	1687.38	Shear (lb/sq ft)		8.62
Alpha	1.00	Stream Power (lb/ft s)		92.82
Frctn Loss (ft)	2.27	Cum Volume (acre-ft)	0.00	0.04
0.00				
C & E Loss (ft)	0.08	Cum SA (acres)	0.00	0.04
0.00				

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: RIVER-1
REACH: Reach-1 RS: 9

INPUT
Description: 36
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1698.3	3.8	1698	5.36	1697.9	5.79	1697.88	6.44	1697.8
12.82	1696.9	16.37	1696	20.29	1695.31	24.18	1694	31.28	1692.19
31.86	1692	32.05	1691.92	37.37	1690	39.78	1688.55	40.57	1688
42.12	1687.1	43.73	1686	48.56	1684.08	49.47	1684	51.29	1683.85
51.49	1684	51.58	1684	51.68	1684.05	54.64	1686	55.24	1687.01

56.98	1688	58.76	1689.62	59.37	1690	62.52	1690.97	65.44	1692
66.18	1692.3	73.32	1694	73.62	1694.11	76.44	1695.07	78.87	1695.95
78.94	1696	79.04	1696.06	80.91	1698	83.73	1699.58	84.21	1700
84.87	1700.4	86.68	1702	88.21	1702.95	89.56	1704	90.26	1704.5
92.08	1706	95.03	1707.3	96.02	1708	99.7	1709.78	99.94	1710
100	1710.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	43.73	.05	54.64	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
43.73	54.64	12.62	20	27.39	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1687.16	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.82	Wt. n-Val.		0.050
W.S. Elev (ft)	1685.34	Reach Len. (ft)	12.62	20.00
27.39				
Crit W.S. (ft)	1685.92	Flow Area (sq ft)		7.58
E.G. Slope (ft/ft)	0.165462	Area (sq ft)		7.58
Q Total (cfs)	82.00	Flow (cfs)		82.00
Top Width (ft)	8.26	Top Width (ft)		8.26
Vel Total (ft/s)	10.81	Avg. Vel. (ft/s)		10.81
Max Chl Dpth (ft)	1.49	Hydr. Depth (ft)		0.92
Conv. Total (cfs)	201.6	Conv. (cfs)		201.6
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.96
Min Ch El (ft)	1683.85	Shear (lb/sq ft)		8.74
Alpha	1.00	Stream Power (lb/ft s)		94.50
Frctn Loss (ft)	3.26	Cum Volume (acre-ft)	0.00	0.03
0.00				
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	0.04
0.00				

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: RIVER-1
REACH: Reach-1 RS: 8

INPUT
Description: 37
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1694.4	1.15	1694.37	2.61	1694.3	7.24	1694	8.66	1693.88
9.47	1693.8	16.84	1692.89	19.34	1692	25.02	1691.04	32.45	1690
35.43	1688.6	36.23	1688	36.66	1687.69	38.56	1686	41.82	1684.57
43.13	1684	44.86	1683.04	46.44	1682	49.53	1680.61	50.82	1680.78
51.78	1680.6	52.77	1682	54.6	1682.97	56.83	1684	59.11	1685.1
60.47	1686	61.25	1687.31	63.81	1688	63.84	1688.02	63.92	1688.06
66.85	1689.8	67.14	1690	67.66	1690.22	71.91	1692	76.71	1693.57
78.36	1694	79.39	1694.38	82.04	1696	85.27	1697.95	85.34	1698
85.42	1698.1	87.49	1700	89.89	1701.39	90.66	1702	92.73	1702.94
94.32	1704	96.26	1705.27	97.35	1706	98.3	1706.59	100	1707.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.86	.05	54.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.86	54.6	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1684.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.76	Wt. n-Val.		0.050	
W.S. Elev (ft)	1682.28	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1682.85	Flow Area (sq ft)		7.70	
E.G. Slope (ft/ft)	0.146322	Area (sq ft)		7.70	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	7.29	Top Width (ft)		7.29	
Vel Total (ft/s)	10.65	Avg. Vel. (ft/s)		10.65	
Max Chl Dpth (ft)	1.68	Hydr. Depth (ft)		1.06	
Conv. Total (cfs)	214.4	Conv. (cfs)		214.4	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		8.50	
Min Ch El (ft)	1680.60	Shear (lb/sq ft)		8.28	
Alpha	1.00	Stream Power (lb/ft s)		88.17	
Frctn Loss (ft)	3.11	Cum Volume (acre-ft)	0.00	0.03	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.03	0.00

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: RIVER-1

REACH: Reach-1 RS: 7

INPUT
Description: 38
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1691.2	5.75	1691.09	15.42	1690.58	18.72	1690.29	21.01	1690
24.56	1689.2	27.51	1688	29.61	1687.24	32.34	1686	32.83	1685.51
37.4	1684	40.58	1682.89	41.88	1682	43.48	1681.25	46.97	1680
48.15	1678.9	48.54	1678	49.24	1676.51	49.76	1676.55	50.97	1676.62
53.43	1677.7	53.49	1677.79	53.92	1678	54.83	1679.45	55.24	1680
58.01	1681.3	59.3	1681.82	59.52	1681.92	59.7	1682	61.32	1682.59
64.58	1684	66.39	1684.83	68.01	1686	72.41	1687.83	72.71	1688
72.79	1688	73.25	1688.28	75.94	1690	79.09	1691.45	79.92	1692
83.73	1693.3	85.3	1694	88.29	1695.96	88.35	1696	88.4	1696.03
88.74	1696.3	90.77	1698	91.03	1698.25	92.08	1700	95.86	1701.97
95.9	1702	95.94	1702.02	99.36	1704	100	1704.31		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	46.97	.05	55.24	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
46.97	55.24	11.29	20	28.59	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1680.63	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.36	Wt. n-Val.		0.050
W.S. Elev (ft)	1678.28	Reach Len. (ft)	11.29	20.00
28.59				
Crit W.S. (ft)	1679.00	Flow Area (sq ft)		6.66
E.G. Slope (ft/ft)	0.193643	Area (sq ft)		6.66
Q Total (cfs)	82.00	Flow (cfs)		82.00
Top Width (ft)	5.67	Top Width (ft)		5.67
Vel Total (ft/s)	12.32	Avg. Vel. (ft/s)		12.32
Max Chl Dpth (ft)	1.77	Hydr. Depth (ft)		1.17
Conv. Total (cfs)	186.3	Conv. (cfs)		186.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)		7.28
Min Ch El (ft)	1676.51	Shear (lb/sq ft)		11.05
Alpha	1.00	Stream Power (lb/ft s)		136.12
Frctn Loss (ft)	3.35	Cum Volume (acre-ft)	0.00	0.03
0.00				
C & E Loss (ft)	0.06	Cum SA (acres)	0.00	0.03
0.00				

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: RIVER-1
REACH: Reach-1 RS: 6

INPUT
Description: 39
Station Elevation Data num= 56

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1686.6	2.04	1686.6	11.89	1686.11	12.99	1686	19.68	1685.43
27.21	1684.4	29.76	1684	35.33	1682.46	36.58	1682	41.54	1680.73
43.55	1680	44.71	1678.74	45.03	1678	45.27	1677.47	46.48	1676
47.17	1675.2	48.01	1674	48.94	1672.46	49.19	1672	51.25	1672
51.26	1672	51.27	1672	53.07	1673.46	54.08	1674	54.93	1674.63
55.55	1676	57.5	1676.84	57.7	1677.26	59.24	1678	60.23	1679.56
61.04	1679.9	61.2	1680	63.39	1680.98	65.68	1682	69.22	1683.28
70.63	1684	72.79	1685.3	73.76	1686	75.24	1686.62	78.4	1688
81.95	1690	82.02	1690	82.1	1690.03	85.07	1692	86.05	1692.34
88.69	1694	89.45	1694.68	90.95	1695.95	91.05	1696	91.12	1696.12
93.26	1698	93.58	1698.34	95.28	1700	96.17	1700.58	98.27	1702
100	1702.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	46.48	.05	55.55	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
46.48	55.55	20.23	20	19.77	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1676.41	Element	Left OB	Channel
Right OB				
Vel Head (ft)	2.70	Wt. n-Val.		0.050
W.S. Elev (ft)	1673.71	Reach Len. (ft)	20.23	20.00
19.77				
Crit W.S. (ft)	1674.53	Flow Area (sq ft)		6.22
E.G. Slope (ft/ft)	0.226503	Area (sq ft)		6.22
Q Total (cfs)	82.00	Flow (cfs)		82.00
Top Width (ft)	5.35	Top Width (ft)		5.35
Vel Total (ft/s)	13.18	Avg. Vel. (ft/s)		13.18
Max Chl Dpth (ft)	1.71	Hydr. Depth (ft)		1.16
Conv. Total (cfs)	172.3	Conv. (cfs)		172.3
Length Wtd. (ft)	20.00	Wetted Per. (ft)		6.91
Min Ch El (ft)	1672.00	Shear (lb/sq ft)		12.73
Alpha	1.00	Stream Power (lb/ft s)		167.78

Frctn Loss (ft)	4.18	Cum Volume (acre-ft)	0.00	0.02
0.00				
C & E Loss (ft)	0.03	Cum SA (acres)	0.00	0.03
0.00				

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: RIVER-1
REACH: Reach-1 RS: 5

INPUT
Description: 40
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1681.5	12.52	1681.07	19.32	1680.98	25.54	1680.87	29.47	1680.54
33.15	1680	36.3	1678.31	36.56	1678	37.06	1677.61	38.46	1676
39.44	1675.2	40.45	1674	41.23	1673.29	43.27	1672	44.92	1670.94
46.8	1670	50.49	1668.7	50.93	1668.69	53.28	1670	54.25	1671.12
55.74	1672	56.09	1672.28	59.35	1674	62.03	1675.98	62.06	1676
62.4	1676.7	65.14	1678	65.79	1679.01	66.33	1679.25	67.81	1679.98
67.95	1680	68.12	1680.12	72.42	1682	73.32	1682.32	76.7	1684
77.04	1684.2	77.75	1684.64	79.99	1686	80.65	1686.27	84.8	1688
87.48	1689.4	88.54	1690	89.24	1690.39	91.14	1692	91.94	1692.44
94.14	1694	94.66	1694.44	97.94	1696	98.42	1696.73	100	1697.76

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.92	.05	54.25	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.92	54.25	17.04	20	22.95	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1672.31	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.90	Wt. n-Val.		0.050
W.S. Elev (ft)	1670.41	Reach Len. (ft)	17.04	20.00
22.95				
Crit W.S. (ft)	1670.99	Flow Area (sq ft)		7.42
E.G. Slope (ft/ft)	0.166198	Area (sq ft)		7.42
Q Total (cfs)	82.00	Flow (cfs)		82.00
Top Width (ft)	7.66	Top Width (ft)		7.66
Vel Total (ft/s)	11.06	Avg. Vel. (ft/s)		11.06
Max Chl Dpth (ft)	1.72	Hydr. Depth (ft)		0.97
Conv. Total (cfs)	201.1	Conv. (cfs)		201.1

Length Wtd. (ft)	19.98	Wetted Per. (ft)			8.50
Min Ch El (ft)	1668.69	Shear (lb/sq ft)			9.05
Alpha	1.00	Stream Power (lb/ft s)			100.04
Frctn Loss (ft)	3.86	Cum Volume (acre-ft)	0.00		0.02
0.00					
C & E Loss (ft)	0.24	Cum SA (acres)	0.00		0.02
0.00					

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: RIVER-1
REACH: Reach-1 RS: 4

INPUT
Description: 41
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1679	1.9	1678.62	5.47	1678	7.81	1676.87	11.6	1676
14.26	1674.7	15.02	1674	17.08	1672.59	17.58	1672	18	1671.65
21.63	1671.5	24.3	1671.15	27.69	1670.42	28.64	1670	31.3	1668.69
37.36	1668	39.46	1668	40.48	1667.92	50.55	1667.08	52.13	1667.13
56.54	1668	60.14	1669.61	61.1	1670	61.49	1670.69	62.73	1672
63.41	1673	65.38	1674	66.59	1674.89	67.74	1676	67.82	1676.17
71.71	1678	72.02	1678.48	72.28	1678.59	72.99	1678.94	75.1	1679.3
75.3	1679.3	75.88	1680	76.99	1680.86	79.54	1682	82.07	1683.39
83.53	1684	86.13	1685.6	86.95	1686	91.35	1687.97	91.41	1688
92.06	1688.5	94.28	1690	94.47	1690.15	96.9	1692	97.18	1692.19
100	1694								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	39.46	.05	56.54	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
39.46	56.54	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1669.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.93	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1668.12	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	1668.41	Flow Area (sq ft)	0.31	10.44	0.02
E.G. Slope (ft/ft)	0.133016	Area (sq ft)	0.31	10.44	0.02
Q Total (cfs)	82.00	Flow (cfs)	0.90	81.07	

0.03				
Top Width (ft)	20.49	Top Width (ft)	3.14	17.08
0.27				
Vel Total (ft/s)	7.62	Avg. Vel. (ft/s)	2.90	7.77
1.94				
Max Chl Dpth (ft)	1.04	Hydr. Depth (ft)	0.10	0.61
0.06				
Conv. Total (cfs)	224.8	Conv. (cfs)	2.5	222.3
0.1				
Length Wtd. (ft)	20.00	Wetted Per. (ft)	3.15	17.20
0.29				
Min Ch El (ft)	1667.08	Shear (lb/sq ft)	0.82	5.04
0.45				
Alpha	1.03	Stream Power (lb/ft s)	2.38	39.13
0.87				
Frctn Loss (ft)	2.96	Cum Volume (acre-ft)	0.00	0.02
0.00				
C & E Loss (ft)	0.29	Cum SA (acres)	0.00	0.02
0.00				

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: RIVER-1
REACH: Reach-1 RS: 3

INPUT
Description: 42
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1678.4	3.17	1678	11.12	1676.59	14.93	1676	16.86	1675.68
24.3	1674	28.47	1672.33	29.62	1672	31.05	1671.55	36	1670
39.97	1668.3	40.47	1668	43.18	1667.12	49.84	1666	50.09	1666
53.54	1666.2	62.43	1668	63.87	1668.68	65.24	1669.26	67	1670
67.56	1670.4	68.93	1672	70.11	1673.79	70.5	1674	70.75	1674.19
71.3	1674.7	73.82	1676	74.59	1676.88	76.85	1678	76.97	1678.2
77.07	1678.2	77.35	1678.39	78.24	1678.56	78.33	1678.58	78.96	1679.31
81.02	1680	82.22	1681	84.35	1682	85.18	1682.48	88.54	1684
89.78	1684.8	91.99	1686	95.28	1687.61	96	1688	98.17	1689.76
98.52	1690	100	1691.26						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	39.97	.05	63.87	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
39.97	63.87	37.19	20	4.17	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1667.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.		0.050	

W.S. Elev (ft)	1667.47	Reach Len. (ft)	37.19	20.00	4.17
Crit W.S. (ft)	1667.47	Flow Area (sq ft)		15.35	
E.G. Slope (ft/ft)	0.039999	Area (sq ft)		15.35	
Q Total (cfs)	82.00	Flow (cfs)		82.00	
Top Width (ft)	17.72	Top Width (ft)		17.72	
Vel Total (ft/s)	5.34	Avg. Vel. (ft/s)		5.34	
Max Chl Dpth (ft)	1.47	Hydr. Depth (ft)		0.87	
Conv. Total (cfs)	410.0	Conv. (cfs)		410.0	
Length Wtd. (ft)	20.00	Wetted Per. (ft)		18.00	
Min Ch El (ft)	1666.00	Shear (lb/sq ft)		2.13	
Alpha	1.00	Stream Power (lb/ft s)		11.38	
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	0.00	0.01	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.01	0.00

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 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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 2

INPUT
Description: 43
Station Elevation Data num= 42

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1676.7	.93	1676.59	6.82	1676	10.99	1675.58	13	1675.37
21.15	1674	28.01	1672.41	29.9	1672	30.6	1671.69	34.05	1670
35.73	1669	37.17	1668	39.81	1667.18	44.08	1666	48.24	1664.2
49.19	1664	53.68	1664	54.22	1664	54.27	1664.03	57.25	1666
60.26	1666.8	62.46	1668	63.33	1668.57	66.76	1670	69	1671.81
69.17	1672	69.36	1672.29	72.36	1674	72.96	1674.29	76.97	1676
78.07	1676.6	80.27	1678	83.8	1679.39	85.43	1680	86.04	1680.89
87.4	1682	88.5	1682.56	90.25	1684	93.2	1685.85	93.48	1686
93.65	1686.1	94.97	1686.79						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	44.08	.05	57.25	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44.08	57.25	20	20	20.62	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1666.51	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.37	Wt. n-Val.		0.050
W.S. Elev (ft)	1665.14	Reach Len. (ft)	20.00	20.00
20.62				
Crit W.S. (ft)	1665.57	Flow Area (sq ft)		8.73
E.G. Slope (ft/ft)	0.126712	Area (sq ft)		8.73
Q Total (cfs)	82.00	Flow (cfs)		82.00
Top Width (ft)	9.88	Top Width (ft)		9.88
Vel Total (ft/s)	9.39	Avg. Vel. (ft/s)		9.39
Max Chl Dpth (ft)	1.14	Hydr. Depth (ft)		0.88
Conv. Total (cfs)	230.4	Conv. (cfs)		230.4
Length Wtd. (ft)	20.00	Wetted Per. (ft)		10.44
Min Ch El (ft)	1664.00	Shear (lb/sq ft)		6.62
Alpha	1.00	Stream Power (lb/ft s)		62.14
Frctn Loss (ft)	1.31	Cum Volume (acre-ft)	0.00	0.00
0.00				
C & E Loss (ft)	0.09	Cum SA (acres)	0.00	0.00
0.00				

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.

CROSS SECTION

RIVER: RIVER-1
REACH: Reach-1 RS: 1

INPUT
Description: 44
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1676	11.63	1674.58	14.97	1674.18	16.41	1674	27.56	1672.13
28.33	1672	28.46	1671.96	32.3	1670	34.47	1668.74	35.52	1668
38.94	1666.9	41.4	1666	43.36	1665.18	45.87	1664	46.31	1663.5
47.69	1662	49.55	1660.54	50.89	1660.56	54.32	1662	55.68	1662.96
56.91	1664	60.2	1665.3	62.2	1666	65.94	1667.7	66.25	1667.87
66.5	1668	67.69	1668.74						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	47.69	.05	54.32	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
47.69	54.32	9	20	38.41	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1664.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.72	Wt. n-Val.	0.040	0.050	0.040
W.S. Elev (ft)	1662.30	Reach Len. (ft)			
Crit W.S. (ft)	1662.83	Flow Area (sq ft)	0.04	7.75	0.06
E.G. Slope (ft/ft)	0.118727	Area (sq ft)	0.04	7.75	0.06
Q Total (cfs)	82.00	Flow (cfs)	0.11	81.69	0.20
Top Width (ft)	7.33	Top Width (ft)	0.27	6.63	0.42
Vel Total (ft/s)	10.44	Avg. Vel. (ft/s)	2.78	10.54	3.15
Max Chl Dpth (ft)	1.76	Hydr. Depth (ft)	0.15	1.17	0.15
Conv. Total (cfs)	238.0	Conv. (cfs)	0.3	237.1	0.6
Length Wtd. (ft)		Wetted Per. (ft)	0.41	7.42	0.52
Min Ch El (ft)	1660.54	Shear (lb/sq ft)	0.75	7.74	0.90
Alpha	1.02	Stream Power (lb/ft s)	2.08	81.55	2.85
Frctn Loss (ft)	2.45	Cum Volume (acre-ft)			
C & E Loss (ft)	0.03	Cum SA (acres)			

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.

SUMMARY OF MANNING'S N VALUES

River:RIVER-1

Reach	River Sta.	n1	n2	n3

Reach-1	44	.04	.05	.04
Reach-1	43	.04	.05	.04
Reach-1	42	.04	.05	.04
Reach-1	41	.04	.05	.04
Reach-1	40	.04	.05	.04
Reach-1	39	.04	.05	.04
Reach-1	38	.04	.05	.04
Reach-1	37	.04	.05	.04
Reach-1	36	.04	.05	.04
Reach-1	35	.04	.05	.04
Reach-1	34	.04	.05	.04
Reach-1	33	.04	.05	.04
Reach-1	32	.04	.05	.04
Reach-1	31	.04	.05	.04
Reach-1	30	.04	.05	.04
Reach-1	29	.04	.05	.04
Reach-1	28	.04	.05	.04
Reach-1	27	.04	.05	.04
Reach-1	26	.04	.05	.04
Reach-1	25	.04	.05	.04
Reach-1	24	.04	.05	.04
Reach-1	23	.04	.05	.04
Reach-1	22	.04	.05	.04
Reach-1	21	.04	.05	.04
Reach-1	20	.04	.05	.04
Reach-1	19	.04	.05	.04
Reach-1	18	.04	.05	.04
Reach-1	17	.04	.05	.04
Reach-1	16	.04	.05	.04
Reach-1	15	.04	.05	.04
Reach-1	14	.04	.05	.04
Reach-1	13	.04	.05	.04
Reach-1	12	.04	.05	.04
Reach-1	11	.04	.05	.04
Reach-1	10	.04	.05	.04
Reach-1	9	.04	.05	.04
Reach-1	8	.04	.05	.04
Reach-1	7	.04	.05	.04
Reach-1	6	.04	.05	.04
Reach-1	5	.04	.05	.04
Reach-1	4	.04	.05	.04
Reach-1	3	.04	.05	.04
Reach-1	2	.04	.05	.04
Reach-1	1	.04	.05	.04

SUMMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	44	20	20	20
Reach-1	43	31.26	20	26.26
Reach-1	42	31.26	20	26.26
Reach-1	41	20.01	20	25.59
Reach-1	40	20	20	20
Reach-1	39	20	20	20
Reach-1	38	20	20	20
Reach-1	37	20	20	20
Reach-1	36	4.52	20	35.76

Reach-1	35	20	20	20
Reach-1	34	32.33	20	7.56
Reach-1	33	20	20	20
Reach-1	32	20	20	20
Reach-1	31	20	20	20
Reach-1	30	20	20	20
Reach-1	29	41.43	20	2.56
Reach-1	28	4.41	20	41.25
Reach-1	27	20	20	20
Reach-1	26	20	20	20
Reach-1	25	21.08	20	18.91
Reach-1	24	4.57	20	35.21
Reach-1	23	20	20	20
Reach-1	22	31.48	20	8.26
Reach-1	21	20	20	20
Reach-1	20	21.75	20	18.24
Reach-1	19	14.51	20	25.43
Reach-1	18	31.57	20	8.47
Reach-1	17	31.49	20	8.24
Reach-1	16	5.54	20	34.13
Reach-1	15	14.55	20	25.39
Reach-1	14	20	20	20
Reach-1	13	33.55	20	6.67
Reach-1	12	20	20	20
Reach-1	11	16.1	20	23.89
Reach-1	10	20	20	20
Reach-1	9	12.62	20	27.39
Reach-1	8	20	20	20
Reach-1	7	11.29	20	28.59
Reach-1	6	20.23	20	19.77
Reach-1	5	17.04	20	22.95
Reach-1	4	20	20	20
Reach-1	3	37.19	20	4.17
Reach-1	2	20	20	20.62
Reach-1	1	9	20	38.41

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RIVER-1

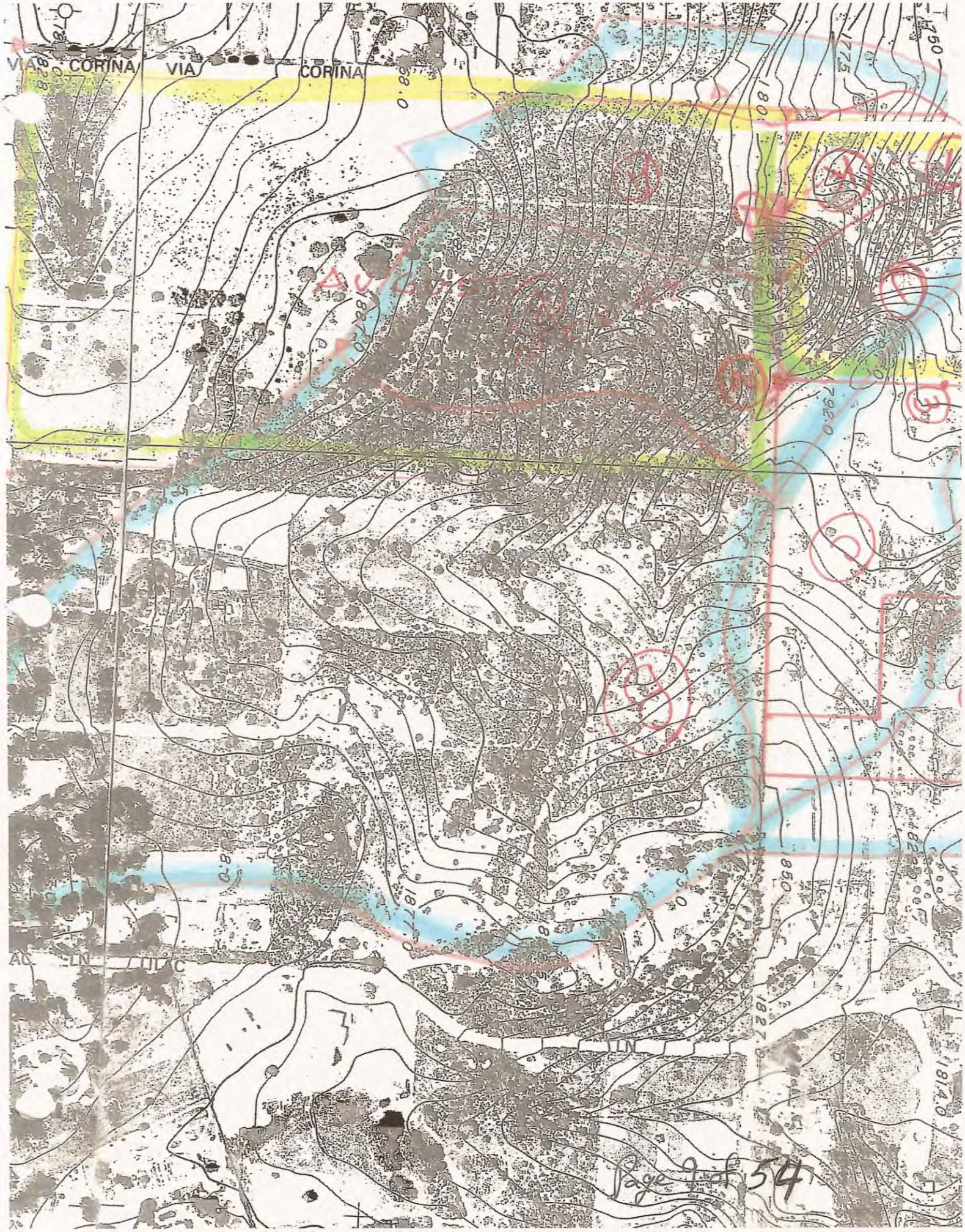
Reach	River Sta.	Contr.	Expan.
Reach-1	44	.1	.3
Reach-1	43	.1	.3
Reach-1	42	.1	.3
Reach-1	41	.1	.3
Reach-1	40	.1	.3
Reach-1	39	.1	.3
Reach-1	38	.1	.3
Reach-1	37	.1	.3
Reach-1	36	.1	.3
Reach-1	35	.1	.3
Reach-1	34	.1	.3
Reach-1	33	.1	.3
Reach-1	32	.1	.3
Reach-1	31	.1	.3
Reach-1	30	.1	.3
Reach-1	29	.1	.3
Reach-1	28	.1	.3
Reach-1	27	.1	.3

Reach-1	26	.1	.3
Reach-1	25	.1	.3
Reach-1	24	.1	.3
Reach-1	23	.1	.3
Reach-1	22	.1	.3
Reach-1	21	.1	.3
Reach-1	20	.1	.3
Reach-1	19	.1	.3
Reach-1	18	.1	.3
Reach-1	17	.1	.3
Reach-1	16	.1	.3
Reach-1	15	.1	.3
Reach-1	14	.1	.3
Reach-1	13	.1	.3
Reach-1	12	.1	.3
Reach-1	11	.1	.3
Reach-1	10	.1	.3
Reach-1	9	.1	.3
Reach-1	8	.1	.3
Reach-1	7	.1	.3
Reach-1	6	.1	.3
Reach-1	5	.1	.3
Reach-1	4	.1	.3
Reach-1	3	.1	.3
Reach-1	2	.1	.3
Reach-1	1	.1	.3

Profile Output Table - Standard Table 1

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/s)	(sq ft)	(ft)	
Reach-1	44	PF 1	73.00	1786.00	1787.43	1786.93	1787.54	0.005754	2.74	28.51	27.95	0.42
Reach-1	43	PF 1	73.00	1786.00	1787.28	1787.40	0.007782	2.85	26.41	26.43	0.47	
Reach-1	42	PF 1	73.00	1786.00	1787.12	1787.23	0.008723	2.67	27.33	28.67	0.48	
Reach-1	41	PF 1	73.00	1786.00	1786.59	1786.59	1786.87	0.045497	4.24	17.21	31.27	1.01
Reach-1	40	PF 1	73.00	1784.17	1785.56	1785.38	1785.79	0.021799	3.84	19.01	23.04	0.74
Reach-1	39	PF 1	73.00	1784.00	1784.86	1784.86	1785.18	0.043192	4.57	15.98	24.95	1.01
Reach-1	38	PF 1	73.00	1782.20	1783.20	1783.42	1783.88	0.100144	6.63	11.19	21.28	1.51
Reach-1	37	PF 1	73.00	1780.77	1782.41	1782.43	1782.80	0.029992	5.21	15.16	21.53	0.90
Reach-1	36	PF 1	73.00	1780.00	1780.61	1780.90	1781.58	0.164389	7.90	9.24	17.20	1.90
Reach-1	35	PF 1	73.00	1779.45	1780.46	1780.46	1780.83	0.039353	4.96	14.88	20.12	0.99
Reach-1	34	PF 1	73.00	1777.19	1778.24	1778.62	1779.44	0.130497	8.82	8.40	12.49	1.79
Reach-1	33	PF 1	73.00	1774.03	1775.27	1775.72	1776.71	0.140088	9.64	7.58	8.86	1.84
Reach-1	32	PF 1	73.00	1771.24	1772.65	1773.10	1774.06	0.124814	9.54	7.70	8.82	1.75

Reach-1	31	PF 1				73.00	1768.23	1769.42	
1769.92	1771.07	0.178878	10.28	7.10	9.10	2.05			
Reach-1	30	PF 1				73.00	1765.50	1766.99	
1767.39	1768.24	0.106443	8.96	8.15	8.50	1.61			
Reach-1	29	PF 1				73.00	1760.93	1762.37	
1763.09	1764.91	0.268198	12.78	5.71	6.76	2.45			
Reach-1	28	PF 1				73.00	1757.84	1759.40	
1759.91	1761.00	0.131139	10.15	7.19	6.73	1.73			
Reach-1	27	PF 1				73.00	1753.80	1755.23	
1755.94	1757.60	0.217274	12.37	5.90	5.99	2.20			
Reach-1	26	PF 1				73.00	1750.00	1751.54	
1752.17	1753.58	0.177621	11.45	6.38	6.30	2.01			
Reach-1	25	PF 1				73.00	1746.90	1748.67	
1749.19	1750.31	0.140431	10.26	7.11	7.11	1.81			
Reach-1	24	PF 1				73.00	1741.12	1742.54	
1743.47	1746.00	0.331878	14.93	4.89	4.87	2.63			
Reach-1	23	PF 1				73.00	1738.74	1740.75	
1741.14	1742.02	0.099548	9.04	8.08	7.38	1.52			
Reach-1	22	PF 1				73.00	1735.98	1737.44	
1738.06	1739.41	0.166137	11.26	6.48	6.02	1.91			
Reach-1	21	PF 1				73.00	1732.08	1733.71	
1734.32	1735.76	0.200551	11.50	6.35	7.11	2.14			
Reach-1	20	PF 1				73.00	1728.25	1730.47	
1731.06	1732.27	0.147435	10.79	6.77	5.06	1.64			
Reach-1	19	PF 1				73.00	1723.67	1725.03	
1725.90	1728.13	0.289570	14.13	5.17	4.96	2.44			
Reach-1	18	PF 1				73.00	1719.60	1722.09	
1722.65	1723.83	0.139685	10.57	6.90	5.31	1.63			
Reach-1	17	PF 1				73.00	1712.97	1714.69	
1715.71	1718.93	0.462651	16.52	4.42	4.63	2.98			
Reach-1	16	PF 1				73.00	1707.00	1708.44	
1709.19	1711.18	0.295305	13.29	5.49	6.49	2.54			
Reach-1	15	PF 1				73.00	1702.94	1704.51	
1705.11	1706.46	0.176370	11.19	6.52	6.81	2.02			
Reach-1	14	PF 1				73.00	1698.30	1699.80	
1700.55	1702.33	0.236968	12.78	5.71	5.84	2.28			
Reach-1	13	PF 1				73.00	1694.92	1696.35	
1696.92	1698.20	0.165313	10.92	6.68	6.88	1.95			
Reach-1	12	PF 1				73.00	1691.83	1693.44	
1693.95	1695.05	0.144078	10.21	7.15	7.48	1.84			
Reach-1	11	PF 1				82.00	1689.74	1691.71	
1692.02	1692.76	0.084502	8.21	9.99	10.03	1.45			
Reach-1	10	PF 1				82.00	1687.38	1688.61	
1689.17	1690.41	0.160168	10.77	7.61	8.09	1.96			
Reach-1	9	PF 1				82.00	1683.85	1685.34	
1685.92	1687.16	0.165462	10.81	7.58	8.26	1.99			
Reach-1	8	PF 1				82.00	1680.60	1682.28	
1682.85	1684.04	0.146322	10.65	7.70	7.29	1.83			
Reach-1	7	PF 1				82.00	1676.51	1678.28	
1679.00	1680.63	0.193643	12.32	6.66	5.67	2.00			
Reach-1	6	PF 1				82.00	1672.00	1673.71	
1674.53	1676.41	0.226503	13.18	6.22	5.35	2.16			
Reach-1	5	PF 1				82.00	1668.69	1670.41	
1670.99	1672.31	0.166198	11.06	7.42	7.66	1.98			
Reach-1	4	PF 1				82.00	1667.08	1668.12	
1668.41	1669.05	0.133016	7.77	10.76	20.49	1.75			
Reach-1	3	PF 1				82.00	1666.00	1667.47	
1667.47	1667.91	0.039999	5.34	15.35	17.72	1.01			
Reach-1	2	PF 1				82.00	1664.00	1665.14	
1665.57	1666.51	0.126712	9.39	8.73	9.88	1.76			
Reach-1	1	PF 1				82.00	1660.54	1662.30	
1662.83	1664.02	0.118727	10.54	7.86	7.33	1.72			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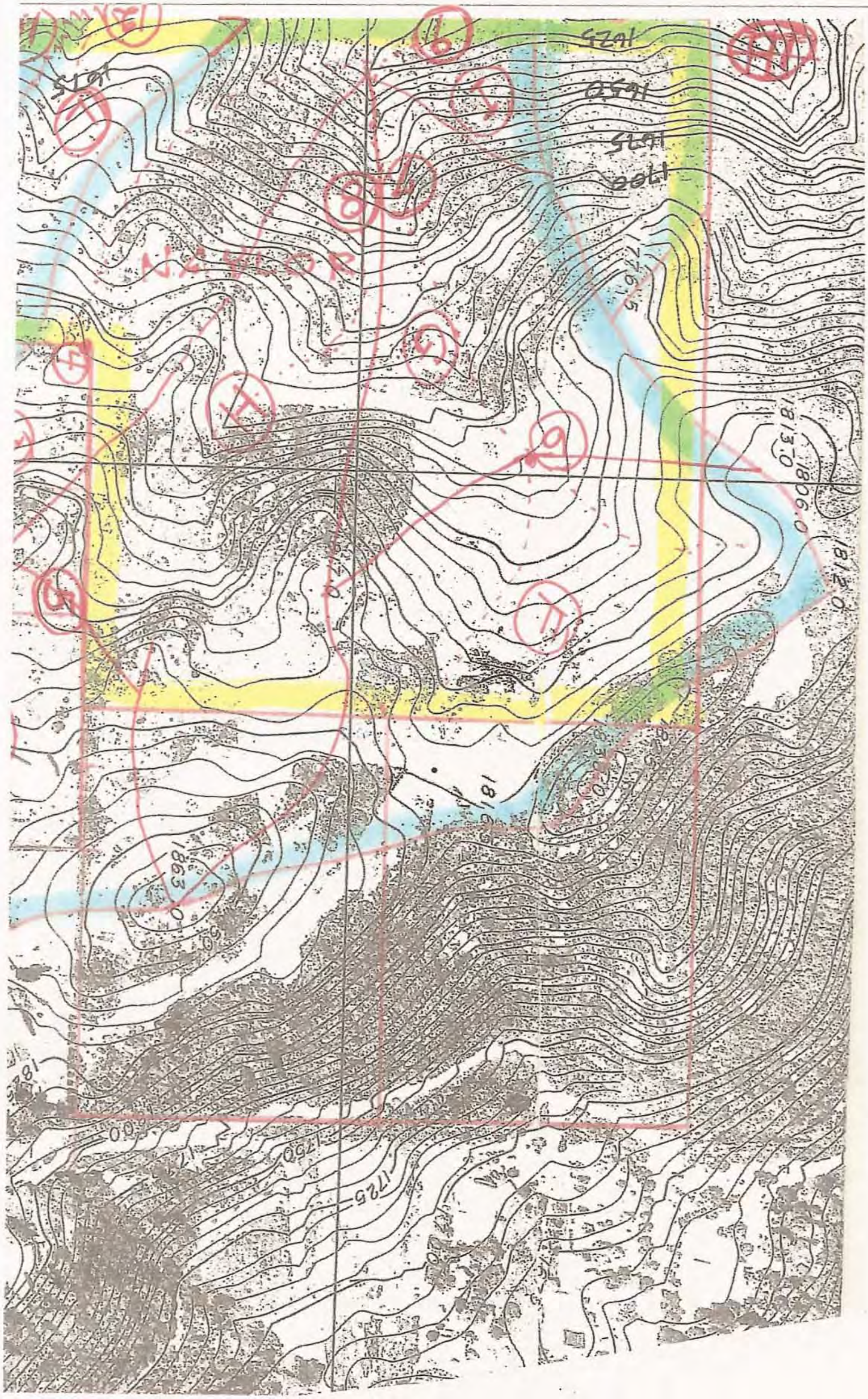
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9880 North Magnolia Ave. #205
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WO 6274

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Hydrology Study

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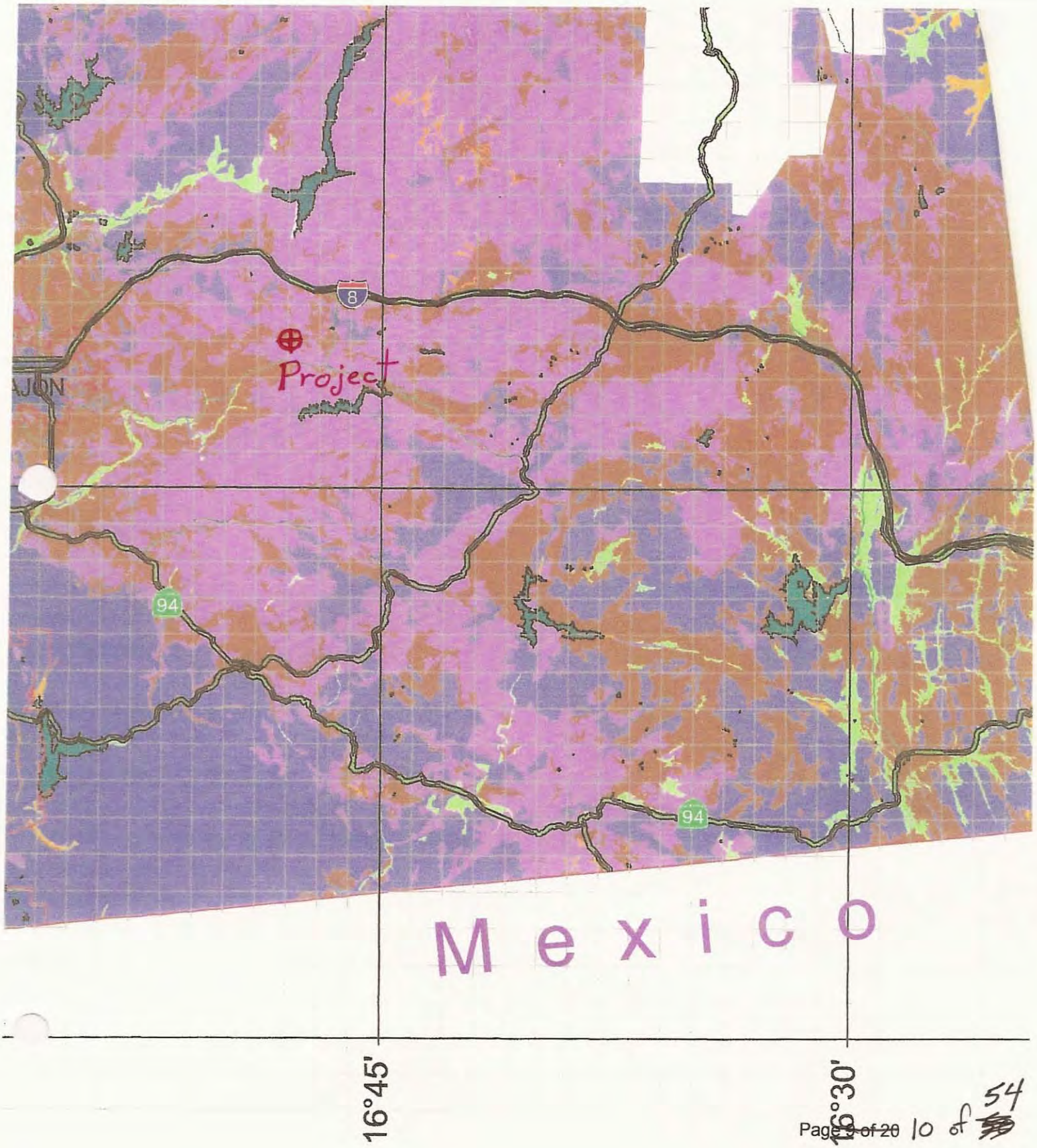
TPM 20843



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WO 6274
Hydrology Study
PDM 20843

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

County of San Diego
Hydrology Manual

9880 North Magnolia Ave. #205
Santee, CA 92071
WO 6274

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

May Engineering & Surveying, Inc.

Hydrology Study

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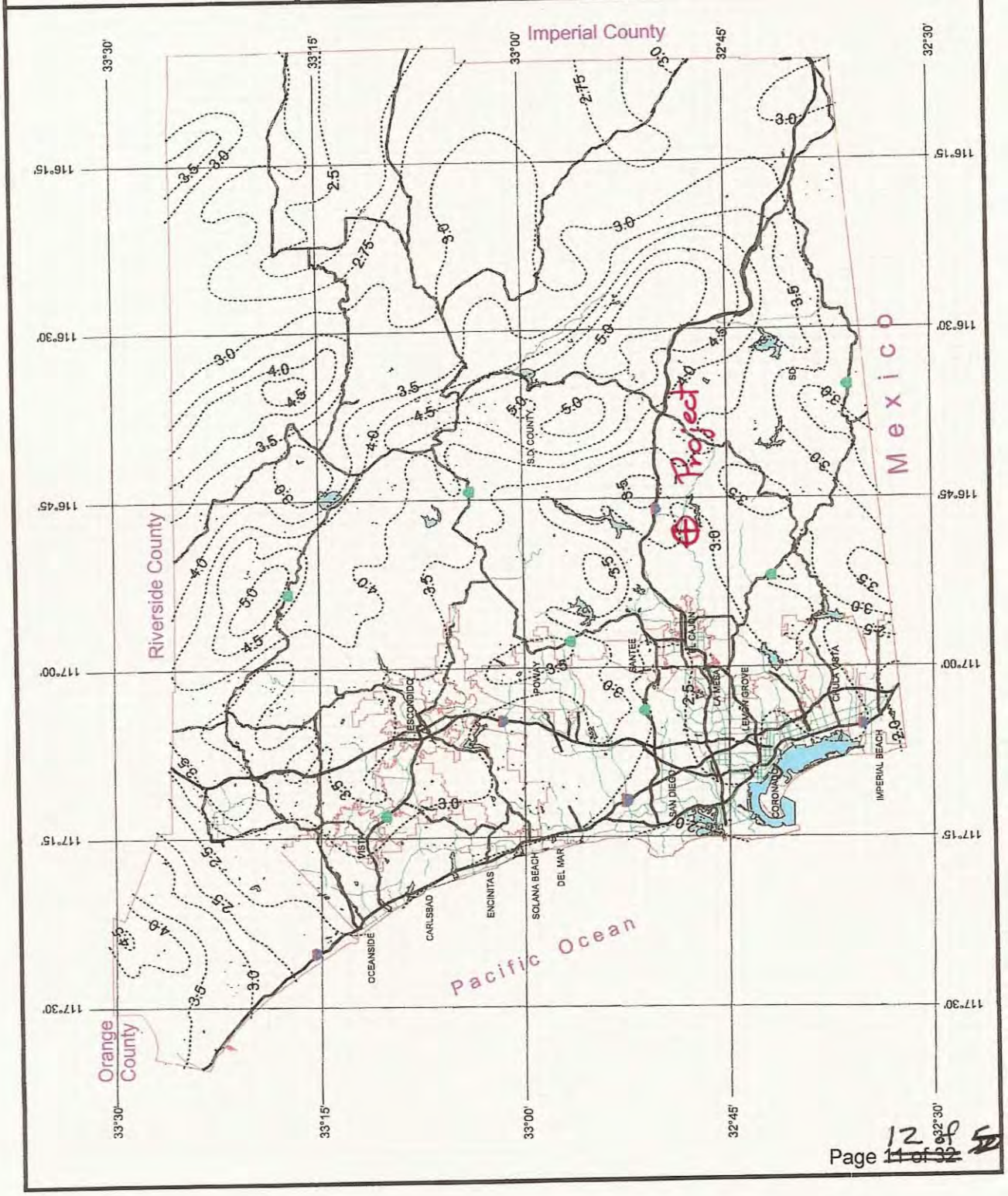
TPM 20843



County of San Diego
Hydrology Manual

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Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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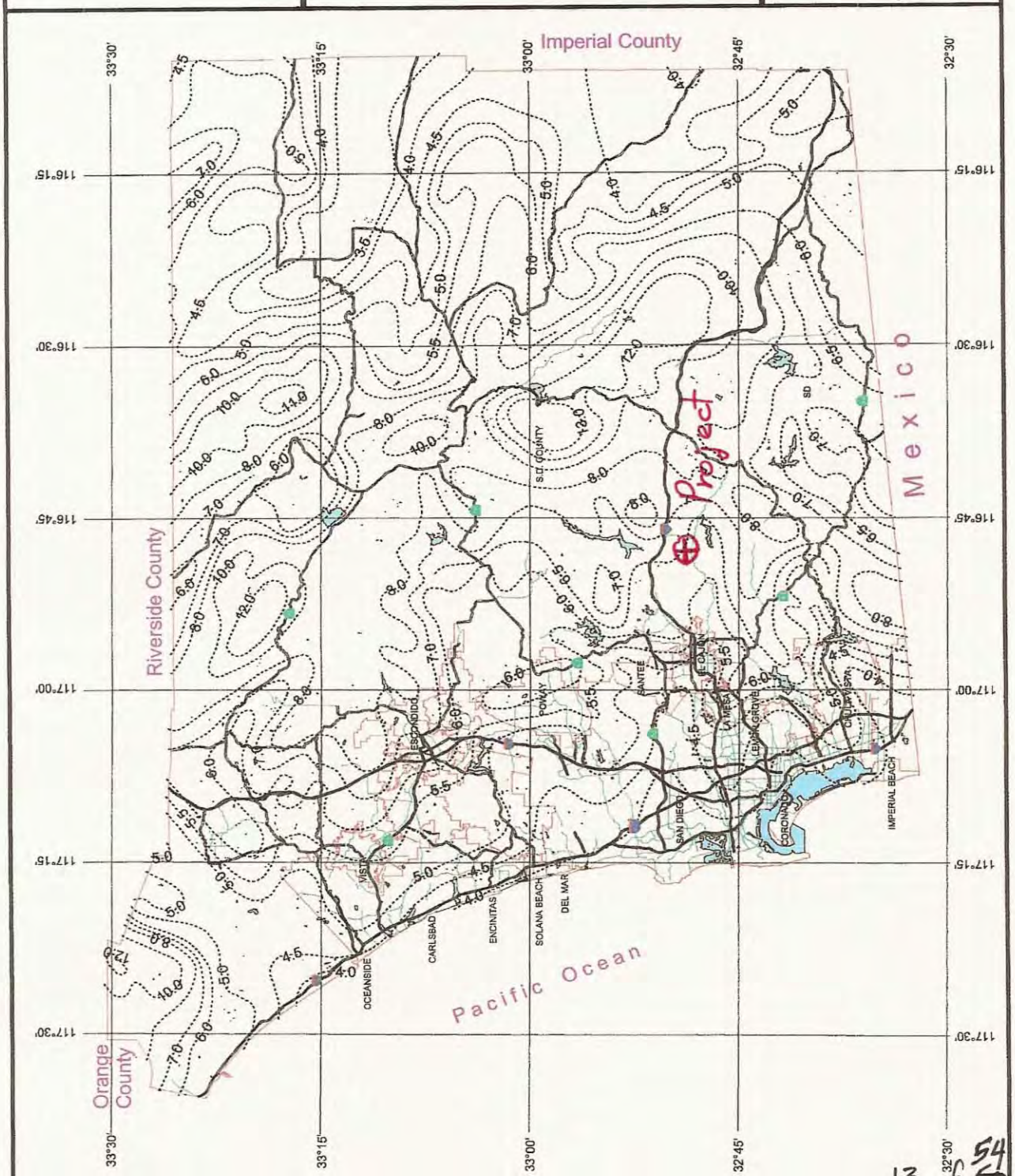

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Hydrology Study

TPM 20843

Area Calculations

Concentration Point	Basin	Area 1	Area 2	Area Avg Sq.In.	Area Sq.Ft.	Area Acres
1	A	3.5	7	3.5	140000	3.21
2	B	35.4	70.8	35.4	1416000	32.51
3	C	5.1	10.4	5.2	208000	4.78
4	D	1.1	2.3	1.15	46000	1.06
5	E	4.4	8.8	4.4	176000	4.04
6	F	6.2	12.5	6.25	250000	5.74
	G	3.9	7.9	3.95	158000	3.63
	H	6.5	13	6.5	260000	5.97
	I	3.7	7.5	3.75	150000	3.44
	J	2.6	13.2	6.6	264000	6.06
	K	1.4	2.8	1.4	56000	1.29
	L	2.2	4.6	2.3	92000	2.11
7	F,G					9.37
8	E,H					10.01
9	D,E,F,G,H,I					23.88
10	A,B,J,K					43.07
11	A,K					4.50
12	C,L					6.89

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Hydrology Calculations

Hydrology Analysis of area(s) = **A**
Concentration Point = **1**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	3.21			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	3.21	0.36	1.16	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	1.16	

High Point	1876
Low Point	1785
100' elevation	1870
Slope after 100'	15.17%

Calculate Tc

Approximate slope for the first 100' of the basin= 6 %
D = distance over which Ti develops = 100 feet (Table 3-2)
Ti = 1.8(1.1-C)(d^0.5)/s^0.33 From Figure 3-3)
Ti = 7.3 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 3 cfs (1/2 expected flow) for travel time calculation.

Q=	3	c.f.s.
BW =	2	feet
Z =	3:01	
s =	15%	
n =	0.050	
Depth =	0.31	feet
Velocity =	4.5	f.p.s.
Basin Length =	700	feet
less Ti distance =	100	feet
Tt distance =	600	feet
Tt distance/Velocity =	133	seconds
=	2.2	minutes
Tc = Ti + Tt =	9.6	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.20	inch/hr
Q=∑(CA) * I	**6**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	3.0000 cfs
Slope	0.1500 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	3.7642 in
Velocity	4.5443 fps
Full Flowrate	55.4287 cfs
Flow area	0.6602 ft2
Flow perimeter	31.9356 in
Hydraulic radius	2.9767 in
Top width	26.5095 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	15.6842 %

Critical Information

Critical depth	4.8317 in
Critical slope	0.0682 ft/ft
Critical velocity	3.4911 fps
Critical area	0.8593 ft2
Critical perimeter	34.1861 in
Critical hydraulic radius	3.6197 in
Critical top width	27.2211 in
Specific energy	0.6346 ft
Minimum energy	0.6040 ft
Froude number	1.4655
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **B**
Concentration Point = **2**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	32.51			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	32.51	0.36	11.70	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	11.70	

High Point	1907
Low Point	1780
100' elevation	1885
Slope after 100'	7.94%

Calculate Tc

Approximate slope for the first 100' of the basin= 22 %
D = distance over which Ti develops = 100 feet (Table 3-2)
Ti = 1.8(1.1-C)(d^0.5)/s^0.33 From Figure 3-3)
Ti = 4.8 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 30 cfs (1/2 expected flow) for travel time calculation.

Q=	30	c.f.s.
BW =	2	feet
Z =	3:01	
s =	8%	
n =	0.050	
Depth =	1.66	feet
Velocity =	7.1	f.p.s.
Basin Length =	1700	feet
less Ti distance =	100	feet
Tt distance =	1600	feet
Tt distance/Velocity =	225	seconds
=	3.8	minutes
Tc = Ti + Tt =	8.5	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.61	inch/hr
Q=∑(CA) * I	**66**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	30.0000 cfs
Slope	0.0800 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	19.9406 in
Velocity	7.0690 fps
Full Flowrate	40.4794 cfs
Flow area	4.2439 ft2
Flow perimeter	66.0386 in
Hydraulic radius	9.2540 in
Top width	37.2938 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	83.0860 %

Critical Information

Critical depth	20.7339 in
Critical slope	0.0706 ft/ft
Critical velocity	6.7404 fps
Critical area	4.4508 ft2
Critical perimeter	67.7109 in
Critical hydraulic radius	9.4654 in
Critical top width	37.8226 in
Specific energy	2.4383 ft
Minimum energy	2.5917 ft
Froude number	1.0665
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **C**
Concentration Point = **3**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	4.78			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	4.78	0.36	1.72	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	1.72	

High Point	1855
Low Point	1771
100' elevation	1850
Slope after 100'	11.20%

Calculate Tc

Approximate slope for the first 100' of the basin= 5 %
D = distance over which Ti develops = 100 feet (Table 3-2)
Ti = 1.8(1.1-C)(d^0.5)/s^0.33 From Figure 3-3)
Ti = 7.8 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 4 cfs (1/2 expected flow) for travel time calculation.

Q=	4	c.f.s.
BW =	2	feet
Z =	3:01	
s =	11%	
n =	0.050	
Depth =	0.41	feet
Velocity =	4.5	f.p.s.
Basin Length =	850	feet
less Ti distance =	100	feet
Tt distance =	750	feet
Tt distance/Velocity =	167	seconds
=	2.8	minutes
Tc = Ti + Tt =	10.6	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.88	inch/hr
Q=∑(CA) * I	**8**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	4.0000 cfs
Slope	0.1100 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	4.9838 in
Velocity	4.5038 fps
Full Flowrate	47.4663 cfs
Flow area	0.8881 ft2
Flow perimeter	34.5068 in
Hydraulic radius	3.7063 in
Top width	27.3225 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	20.7659 %

Critical Information

Critical depth	5.8249 in
Critical slope	0.0674 ft/ft
Critical velocity	3.8118 fps
Critical area	1.0494 ft2
Critical perimeter	36.2800 in
Critical hydraulic radius	4.1651 in
Critical top width	27.8833 in
Specific energy	0.7305 ft
Minimum energy	0.7281 ft
Froude number	1.2713
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **D**
Concentration Point = **4**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	1.06			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	1.06	0.36	0.38	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	0.38	

High Point	1815
Low Point	1760
100' elevation	1800
Slope after 100'	22.00%

Calculate Tc

Approximate slope for the first 100' of the basin= 15 %
D = distance over which Ti develops = 100 feet (Table 3-2)
Ti = 1.8(1.1-C)(d^0.5)/s^0.33 From Figure 3-3)
Ti = 5.4 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 2 cfs (1/2 expected flow) for travel time calculation.

Q=	2	c.f.s.
BW =	2	feet
Z =	3:01	
s =	22%	
n =	0.050	
Depth =	0.22	feet
Velocity =	4.5	f.p.s.
Basin Length =	350	feet
less Ti distance =	100	feet
Tt distance =	250	feet
Tt distance/Velocity =	56	seconds
=	0.9	minutes
Tc = Ti + Tt =	6.3	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	6.79	inch/hr
Q=∑(CA) * I	**3**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	2.0000 cfs
Slope	0.2200 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	2.5874 in
Velocity	4.4769 fps
Full Flowrate	67.1274 cfs
Flow area	0.4467 ft2
Flow perimeter	29.4548 in
Hydraulic radius	2.1840 in
Top width	25.7250 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	10.7810 %

Critical Information

Critical depth	3.7073 in
Critical slope	0.0700 ft/ft
Critical velocity	3.0783 fps
Critical area	0.6497 ft2
Critical perimeter	31.8158 in
Critical hydraulic radius	2.9406 in
Critical top width	26.4716 in
Specific energy	0.5271 ft
Minimum energy	0.4634 ft
Froude number	1.7290
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **E**
Concentration Point = **5**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	4.04			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	4.04	0.36	1.45	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	1.45	

High Point	1861
Low Point	1800
100' elevation	1850
Slope after 100'	9.38%

Calculate Tc

Approximate slope for the first 100' of the basin= 11 %
D = distance over which Ti develops = 100 feet (Table 3-2)
Ti = 1.8(1.1-C)(d^0.5)/s^0.33 From Figure 3-3)
Ti = 6.0 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 4 cfs (1/2 expected flow) for travel time calculation.

Q=	2	c.f.s.
BW =	2	feet
Z =	3:01	
s =	9%	
n =	0.050	
Depth =	0.44	feet
Velocity =	4.2	f.p.s.
Basin Length =	750	feet
less Ti distance =	100	feet
Tt distance =	650	feet
Tt distance/Velocity =	155	seconds
=	2.6	minutes
Tc = Ti + Tt =	8.6	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.58	inch/hr
Q=∑(CA) * I	**8**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	4.0000 cfs
Slope	0.0900 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	5.3127 in
Velocity	4.2071 fps
Full Flowrate	42.9349 cfs
Flow area	0.9508 ft2
Flow perimeter	35.2001 in
Hydraulic radius	3.8895 in
Top width	27.5418 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	22.1361 %

Critical Information

Critical depth	5.8249 in
Critical slope	0.0674 ft/ft
Critical velocity	3.8118 fps
Critical area	1.0494 ft2
Critical perimeter	36.2800 in
Critical hydraulic radius	4.1651 in
Critical top width	27.8833 in
Specific energy	0.7178 ft
Minimum energy	0.7281 ft
Froude number	1.1524
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **F**
Concentration Point = **6**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	5.74			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	5.74	0.36	2.07	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	2.07	

High Point	1863
Low Point	1760
100' elevation	1855
Slope after 100'	13.73%

Calculate Tc

Approximate slope for the first 100' of the basin= 8 %
D = distance over which Ti develops = 100 feet (Table 3-2)
Ti = 1.8(1.1-C)(d^0.5)/s^0.33 From Figure 3-3)
Ti = 6.7 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 6 cfs (1/2 expected flow) for travel time calculation.

Q=	6	c.f.s.
BW =	2	feet
Z =	3:01	
s =	14%	
n =	0.050	
Depth =	0.44	feet
Velocity =	5.6	f.p.s.
Basin Length =	850	feet
less Ti distance =	100	feet
Tt distance =	750	feet
Tt distance/Velocity =	134	seconds
=	2.2	minutes
Tc = Ti + Tt =	8.9	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.45	inch/hr
Q=∑(CA) * I	**11**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	6.0000 cfs
Slope	0.1400 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	5.9767 in
Velocity	5.5617 fps
Full Flowrate	53.5492 cfs
Flow area	1.0788 ft2
Flow perimeter	36.6000 in
Hydraulic radius	4.2445 in
Top width	27.9845 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	24.9029 %

Critical Information

Critical depth	7.5679 in
Critical slope	0.0670 ft/ft
Critical velocity	4.3045 fps
Critical area	1.3939 ft2
Critical perimeter	39.9546 in
Critical hydraulic radius	5.0237 in
Critical top width	29.0453 in
Specific energy	0.9788 ft
Minimum energy	0.9460 ft
Froude number	1.4416
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **F&G**
Concentration Point = **7**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	9.37			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	9.37	0.36	3.37	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	3.37	

High Point	1760	
Low Point	1625	
100' elevation	1760	
Slope after 100'	24.55%	
Calculate Tc		
Point is downstream point	6	
Ti = Tc for point number	6	
Ti =	8.9	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 14 cfs (average of upstream & here) for travel time calculation.

Q=	14	c.f.s.
BW =	2	feet
Z =	3:01	
s =	25%	
n =	0.050	
Depth =	0.71	feet
Velocity =	8.8	f.p.s.
Basin Length =	550	feet
less Ti distance =	0	feet
Tt distance =	550	feet
Tt distance/Velocity =	63	seconds
=	1.0	minutes
Tc = Ti + Tt =	9.9	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.07	inch/hr
Q=∑(CA) * I	**17**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	14.0000 cfs
Slope	0.2500 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	8.5426 in
Velocity	8.7902 fps
Full Flowrate	71.5581 cfs
Flow area	1.5927 ft2
Flow perimeter	42.0094 in
Hydraulic radius	5.4594 in
Top width	29.6951 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	35.5941 %

Critical Information

Critical depth	12.9629 in
Critical slope	0.0681 ft/ft
Critical velocity	5.4914 fps
Critical area	2.5495 ft2
Critical perimeter	51.3282 in
Critical hydraulic radius	7.1524 in
Critical top width	32.6419 in
Specific energy	1.9126 ft
Minimum energy	1.6204 ft
Froude number	1.9317
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **E&H**
Concentration Point = **8**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	10.01			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	10.01	0.36	3.60	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	3.60	

High Point	1800	
Low Point	1625	
100' elevation	1800	
Slope after 100'	20.59%	
Calculate Tc		
Point is downstream point	5	
Ti = Tc for point number	5	
Ti =	8.6	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 13 cfs (average of upstream & here) for travel time calculation.

Q=	14	c.f.s.
BW =	2	feet
Z =	3:01	
s =	21%	
n =	0.050	
Depth =	0.72	feet
Velocity =	8.1	f.p.s.
Basin Length =	850	feet
less Ti distance =	0	feet
Tt distance =	850	feet
Tt distance/Velocity =	105	seconds
=	1.7	minutes
Tc = Ti + Tt =	10.3	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.94	inch/hr
Q=∑(CA) * I	**18**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	13.0000 cfs
Slope	0.2100 ft/ft
Manning's n	0.0500
Height	24.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	8.6146 in
Velocity	8.0869 fps
Full Flowrate	65.5841 cfs
Flow area	1.6075 ft2
Flow perimeter	42.1611 in
Hydraulic radius	5.4905 in
Top width	29.7430 in
Area	5.3333 ft2
Perimeter	74.5964 in
Percent full	35.8940 %

Critical Information

Critical depth	12.3741 in
Critical slope	0.0679 ft/ft
Critical velocity	5.3790 fps
Critical area	2.4168 ft2
Critical perimeter	50.0870 in
Critical hydraulic radius	6.9483 in
Critical top width	32.2494 in
Specific energy	1.7342 ft
Minimum energy	1.5468 ft
Froude number	1.7703
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **D,E,F,G,H&I**
Concentration Point = **9**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	23.88			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	23.88	0.36	8.60	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	8.60	

High Point	1625	
Low Point	1615	
100' elevation	1625	
Slope after 100'	6.67%	
Calculate Tc		
Point is downstream point	8	
Ti = Tc for point number	8	
Ti =	10.3	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 39 cfs (average of upstream & here) for travel time calculation.

Q=	39	c.f.s.
BW =	2	feet
Z =	3:01	
s =	7%	
n =	0.050	
Depth =	2.04	feet
Velocity =	7.1	f.p.s.
Basin Length =	150	feet
less Ti distance =	0	feet
Tt distance =	150	feet
Tt distance/Velocity =	21	seconds
=	0.4	minutes
Tc = Ti + Tt =	10.7	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.85	inch/hr
Q=∑(CA) * I	**42**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	39.0000 cfs
Slope	0.0700 ft/ft
Manning's n	0.0500
Height	36.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	24.4381 in
Velocity	7.1488 fps
Full Flowrate	74.5466 cfs
Flow area	5.4555 ft2
Flow perimeter	75.5201 in
Hydraulic radius	10.4024 in
Top width	40.2921 in
Area	9.0000 ft2
Perimeter	99.8947 in
Percent full	67.8836 %

Critical Information

Critical depth	24.2737 in
Critical slope	0.0716 ft/ft
Critical velocity	7.2095 fps
Critical area	5.4095 ft2
Critical perimeter	75.1734 in
Critical hydraulic radius	10.3623 in
Critical top width	40.1825 in
Specific energy	2.8307 ft
Minimum energy	3.0342 ft
Froude number	0.9887
Flow condition	Subcritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **A,B,J&K**
Concentration Point = **10**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	43.07			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	43.07	0.36	15.51	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	15.51	

High Point	1780
Low Point	1660
100' elevation	1780
Slope after 100'	20.00%
Calculate Tc	
Point is downstream point	2
Ti = Tc for point number	2
Ti =	8.5 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 73 cfs (average of upstream & here) for travel time calculation.

Q=	73	c.f.s.
BW =	2	feet
Z =	3:01	
s =	20%	
n =	0.050	
Depth =	2.17	feet
Velocity =	12.4	f.p.s.
Basin Length =	600	feet
less Ti distance =	0	feet
Tt distance =	600	feet
Tt distance/Velocity =	48	seconds
=	0.8	minutes
Tc = Ti + Tt =	9.3	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.29	inch/hr
Q=∑(CA) * I	**82**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	73.0000 cfs
Slope	0.2000 ft/ft
Manning's n	0.0500
Height	36.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	26.0064 in
Velocity	12.3729 fps
Full Flowrate	126.0068 cfs
Flow area	5.9000 ft2
Flow perimeter	78.8264 in
Hydraulic radius	10.7781 in
Top width	41.3376 in
Area	9.0000 ft2
Perimeter	99.8947 in
Percent full	72.2401 %

Critical Information

Critical depth	35.0282 in
Critical slope	0.0737 ft/ft
Critical velocity	8.4118 fps
Critical area	8.6783 ft2
Critical perimeter	97.8460 in
Critical hydraulic radius	12.7718 in
Critical top width	47.3522 in
Specific energy	4.5463 ft
Minimum energy	4.3785 ft
Froude number	1.6668
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **A&K**
Concentration Point = **11**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	4.5			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	4.5	0.36	1.62	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	1.62	

High Point	1785	
Low Point	1660	
100' elevation	1785	
Slope after 100'	31.25%	
Calculate Tc		
Point is downstream point	1	
Ti = Tc for point number	1	
Ti =	9.6	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 7 cfs (average of upstream & here) for travel time calculation.

Q=	7	c.f.s.
BW =	2	feet
Z =	3:01	
s =	31%	
n =	0.050	
Depth =	0.43	feet
Velocity =	7.7	f.p.s.
Basin Length =	400	feet
less Ti distance =	0	feet
Tt distance =	400	feet
Tt distance/Velocity =	52	seconds
=	0.9	minutes
Tc = Ti + Tt =	10.5	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.91	inch/hr
Q=∑(CA) * I	**8**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	7.0000 cfs
Slope	0.3100 ft/ft
Manning's n	0.0500
Height	36.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	5.1175 in
Velocity	7.6626 fps
Full Flowrate	156.8772 cfs
Flow area	0.9135 ft2
Flow perimeter	34.7885 in
Hydraulic radius	3.7814 in
Top width	27.4116 in
Area	9.0000 ft2
Perimeter	99.8947 in
Percent full	14.2152 %

Critical Information

Critical depth	8.3546 in
Critical slope	0.0670 ft/ft
Critical velocity	4.5045 fps
Critical area	1.5540 ft2
Critical perimeter	41.6130 in
Critical hydraulic radius	5.3776 in
Critical top width	29.5697 in
Specific energy	1.3389 ft
Minimum energy	1.0443 ft
Froude number	2.1362
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **C&L**
Concentration Point = **12**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	6.89			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	6.89	0.36	2.48	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	2.48	

High Point	1771	
Low Point	1655	
100' elevation	1771	
Slope after 100'	29.00%	
Calculate Tc		
Point is downstream point	3	
Ti = Tc for point number	3	
Ti =	10.6	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 10 cfs (average of upstream & here) for travel time calculation.

Q=	10	c.f.s.
BW =	2	feet
Z =	3:01	
s =	29%	
n =	0.050	
Depth =	0.55	feet
Velocity =	8.4	f.p.s.
Basin Length =	400	feet
less Ti distance =	0	feet
Tt distance =	400	feet
Tt distance/Velocity =	48	seconds
=	0.8	minutes
Tc = Ti + Tt =	11.4	minutes

Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.65	inch/hr

Q=∑(CA) * I **12 c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	10.0000 cfs
Slope	0.2900 ft/ft
Manning's n	0.0500
Height	36.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	6.5647 in
Velocity	8.3761 fps
Full Flowrate	151.7323 cfs
Flow area	1.1939 ft2
Flow perimeter	37.8396 in
Hydraulic radius	4.5433 in
Top width	28.3765 in
Area	9.0000 ft2
Perimeter	99.8947 in
Percent full	18.2352 %

Critical Information

Critical depth	10.4862 in
Critical slope	0.0673 ft/ft
Critical velocity	4.9944 fps
Critical area	2.0022 ft2
Critical perimeter	46.1068 in
Critical hydraulic radius	6.2533 in
Critical top width	30.9908 in
Specific energy	1.6374 ft
Minimum energy	1.3108 ft
Froude number	2.0783
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **B&J**
Concentration Point = **13**
Land Use Designation = #17
(Use 0.5 DU/acre)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	38.57			
Area A soil	0	0.27	0.00	
Area B soil	0	0.32	0.00	
Area C soil	38.57	0.36	13.89	
Area D soil	0	0.41	0.00	
Sum C*A		0.36	13.89	

High Point	1780
Low Point	1660
100' elevation	1780
Slope after 100'	20.00%
Calculate Tc	
Point is downstream point	2
Ti = Tc for point number	2
Ti =	8.5 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 70 cfs (average of upstream & here) for travel time calculation.

Q=	70	c.f.s.
BW =	2	feet
Z =	3:01	
s =	20%	
n =	0.050	
Depth =	2.11	feet
Velocity =	12.3	f.p.s.
Basin Length =	600	feet
less Ti distance =	0	feet
Tt distance =	600	feet
Tt distance/Velocity =	49	seconds
=	0.8	minutes
Tc = Ti + Tt =	9.3	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.29	inch/hr
Q=∑(CA) * I	**73**	**c.f.s.**

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Channel Calculator

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	70.0000 cfs
Slope	0.2000 ft/ft
Manning's n	0.0500
Height	36.0000 in
Bottom width	24.0000 in
Left slope	3.0000 ft/ft (V/H)
Right slope	3.0000 ft/ft (V/H)

Computed Results:

Depth	25.3506 in
Velocity	12.2534 fps
Full Flowrate	126.0068 cfs
Flow area	5.7127 ft2
Flow perimeter	77.4437 in
Hydraulic radius	10.6223 in
Top width	40.9004 in
Area	9.0000 ft2
Perimeter	99.8947 in
Percent full	70.4182 %

Critical Information

Critical depth	34.1945 in
Critical slope	0.0736 ft/ft
Critical velocity	8.3277 fps
Critical area	8.4057 ft2
Critical perimeter	96.0882 in
Critical hydraulic radius	12.5970 in
Critical top width	46.7963 in
Specific energy	4.4459 ft
Minimum energy	4.2743 ft
Froude number	1.6686
Flow condition	Supercritical

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Hydrology Calculations

Hydrology Analysis of area(s) = **F**
Concentration Point = **6 After Condition**
Land Use Designation = #17
Use 0.5 DU/acre + added 3% impervious (8600 SF added)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	5.74			
Area A soil	0	0.29	0.00	
Area B soil	0	0.34	0.00	
Area C soil	5.74	0.38	2.18	
Area D soil	0	0.43	0.00	
Sum C*A		0.38	2.18	

High Point	1863
Low Point	1760
100' elevation	1855
Slope after 100'	13.73%

Calculate Tc

Approximate slope for the first 100' of the basin= 8 %
D = distance over which Ti develops = 100 feet (Table 3-2)
Ti = 1.8(1.1-C)(d^0.5)/s^0.33 From Figure 3-3)
Ti = 6.5 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 6 cfs (1/2 expected flow) for travel time calculation.

Q=	6	c.f.s.
BW =	2	feet
Z =	3:01	
s =	14%	
n =	0.050	
Depth =	0.44	feet
Velocity =	5.6	f.p.s.
Basin Length =	850	feet
less Ti distance =	100	feet
Tt distance =	750	feet
Tt distance/Velocity =	134	seconds
=	2.2	minutes
Tc = Ti + Tt =	8.7	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.52	inch/hr
Q=∑(CA) * I	**12**	**c.f.s.**

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Hydrology Calculations

Hydrology Analysis of area(s) = **F&G**
Concentration Point = **7 After Condition**
Land Use Designation = #17
Use 0.5 DU/acre + added 7% impervious (30100 SF added)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	9.37			
Area A soil	0	0.32	0.00	
Area B soil	0	0.36	0.00	
Area C soil	9.37	0.40	3.75	
Area D soil	0	0.44	0.00	
Sum C*A		0.40	3.75	

High Point	1760	
Low Point	1625	
100' elevation	1760	
Slope after 100'	24.55%	
Calculate Tc		
Point is downstream point	6	
Ti = Tc for point number	6	
Ti =	8.9	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 14 cfs (average of upstream & here) for travel time calculation.

Q=	14	c.f.s.
BW =	2	feet
Z =	3:01	
s =	25%	
n =	0.050	
Depth =	0.71	feet
Velocity =	8.8	f.p.s.
Basin Length =	550	feet
less Ti distance =	0	feet
Tt distance =	550	feet
Tt distance/Velocity =	63	seconds
=	1.0	minutes
Tc = Ti + Tt =	9.9	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	5.07	inch/hr
Q=∑(CA) * I	**19**	**c.f.s.**

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Hydrology Calculations

Hydrology Analysis of area(s) = **E&H**
Concentration Point = **8 After Condition**
Land Use Designation = #17
Use 0.5 DU/acre + added 1% impervious (4300 SF added)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	10.01			
Area A soil	0	0.28	0.00	
Area B soil	0	0.33	0.00	
Area C soil	10.01	0.37	3.70	
Area D soil	0	0.42	0.00	
Sum C*A		0.37	3.70	

High Point	1800
Low Point	1625
100' elevation	1800
Slope after 100'	20.59%
Calculate Tc	
Point is downstream point	5
Ti = Tc for point number	5
Ti =	8.6 min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 13 cfs (average of upstream & here) for travel time calculation.

Q=	14	c.f.s.
BW =	2	feet
Z =	3:01	
s =	21%	
n =	0.050	
Depth =	0.72	feet
Velocity =	8.1	f.p.s.
Basin Length =	850	feet
less Ti distance =	0	feet
Tt distance =	850	feet
Tt distance/Velocity =	105	seconds
=	1.7	minutes
Tc = Ti + Tt =	10.3	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.94	inch/hr
Q=∑(CA) * I	**18**	**c.f.s.**

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Hydrology Calculations

Hydrology Analysis of area(s) = **D,E,F,G,H&I**
Concentration Point = **9 After Condition**
Land Use Designation = #17
Use 0.5 DU/acre + added 3% impervious (34,400 SF added)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	23.88			
Area A soil	0	0.29	0.00	
Area B soil	0	0.34	0.00	
Area C soil	23.88	0.38	9.07	
Area D soil	0	0.43	0.00	
Sum C*A		0.38	9.07	

High Point	1625	
Low Point	1615	
100' elevation	1625	
Slope after 100'	6.67%	
Calculate Tc		
Point is downstream point	8	
Ti = Tc for point number	8	
Ti =	10.3	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 39 cfs (average of upstream & here) for travel time calculation.

Q=	39	c.f.s.
BW =	2	feet
Z =	3:01	
s =	7%	
n =	0.050	
Depth =	2.04	feet
Velocity =	7.1	f.p.s.
Basin Length =	150	feet
less Ti distance =	0	feet
Tt distance =	150	feet
Tt distance/Velocity =	21	seconds
=	0.4	minutes
Tc = Ti + Tt =	10.7	minutes
Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.85	inch/hr
Q=∑(CA) * I	**44**	**c.f.s.**

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Hydrology Calculations

Hydrology Analysis of area(s) = **C&L**
Concentration Point = **12 After Condidtion**
Land Use Designation = #17
Use 0.5 DU/acre + 3% added impervious (8600 SF added)

Calculate C*A

	Area	C value	C * A	(C values from Table 3-1)
Total Area (acres)	6.89			
Area A soil	0	0.29	0.00	
Area B soil	0	0.34	0.00	
Area C soil	6.89	0.38	2.62	
Area D soil	0	0.43	0.00	
Sum C*A		0.38	2.62	

High Point	1771	
Low Point	1655	
100' elevation	1771	
Slope after 100'	29.00%	
Calculate Tc		
Point is downstream point	3	
Ti = Tc for point number	3	
Ti =	10.6	min.

Tt = Travel time in natural channel
Assume a 2' wide bottom with 3:1 side slopes as average shape of the natural channel.
Assume an average flow rate of 10 cfs (average of upstream & here) for travel time calculation.

Q=	10	c.f.s.
BW =	2	feet
Z =	3:01	
s =	29%	
n =	0.050	
Depth =	0.55	feet
Velocity =	8.4	f.p.s.
Basin Length =	400	feet
less Ti distance =	0	feet
Tt distance =	400	feet
Tt distance/Velocity =	48	seconds
=	0.8	minutes
Tc = Ti + Tt =	11.4	minutes

Selected Frequency =	100	year
6 hr precipitation =	3.0	inch
24 hr precipitation =	6.5	inch
6 hr/24 hr precip =	0.46	0.45 - .65 OK
Adjusted 6 hr =	3.0	inch
I = (7.44*P6)*(D^-0.645) =	4.65	inch/hr

Q=∑(CA) * I **12 c.f.s.**

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Concentration Point Number: **9** **After Condition**

Input Variable (Urban Conditions)

Six hour precipitation amount (inches)	P_6	3
Time of Concentration (min.)	T_c	10.7
Coefficient of runoff	C	0.38
Basin Area (acres)	A	23.88

Computation

Time to Peak

$T_p=2.0T_cK_D/(1+K_p)=1.1072T_c$ — T_p 11.8

Time of hydrograph to begin

$T_B=20-T_p$ — T_B 8.2

Time of hydrograph to end

$T_E=20+1.5T_B$ — T_E 32.2

Peak Flow — Q_p 44 cfs

$Q_p=CIA$

$Itc=7.44P_6/T_c^{0.645}=$ 4.84 in./hr.

Surrounding Flow (Q_s)

Depth of precipitation for 2 hours

$D_{120}=7.44P_6/120^{0.645}$ (2 hr.)

$D_{120}=0.6785P_6=$ 2.0 in.

Depth of precipitation for hydrograph

$D_H=(P_6T_c^{0.355})/5.83=$ 1.2 in.

Surrounding Intensity

$I_s=60(D_{120}-D_H)/(120-2.5T_c)$

$I_s=$ 0.5 in./hr.

$Q_s=CI_sA$ — Q_s 5 cfs

Plot Hydrograph and Surrounding Flow

Outflow / Basin Size (**Natural Conditions**)

Outflow

C= 0.36 T_c= 10.7 min.

$I=7.44P_6/T_c^{0.645}=$ 4.84 in./hr.

$Q_N=CIA=$ 42 cfs

1. Plot on Hydrograph
   a. Draw line from surrounding flow intercept with beginning hydrograph limb to Q_N
2. Estimate volume needed for reservoir = 1669 Cu.Ft.
   a. Determine preliminary reservoir dimensions
   b. Surrounding flow discharges directly through reservoir without detaining any storage
3. Size outlet works
   a. Outlet flow, Q_O less than or equal to Q_N
   b. Stay within the limits of the reservoir

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4. Rout

a. Refine reservoir dimensions and/or outflow facility

Hydrograph

Project Flows		Natural Flows	
Time	Flow	Time	Flow
8.2	5	8.2	5
20	44	20.72479	42
32.2	5	32.2	5

Volume Calc
28165 Cu.Ft.

Volume Calc
26496 Cu.Ft.

Volume Change (Reservoir Volume)
1669 Cu.Ft.

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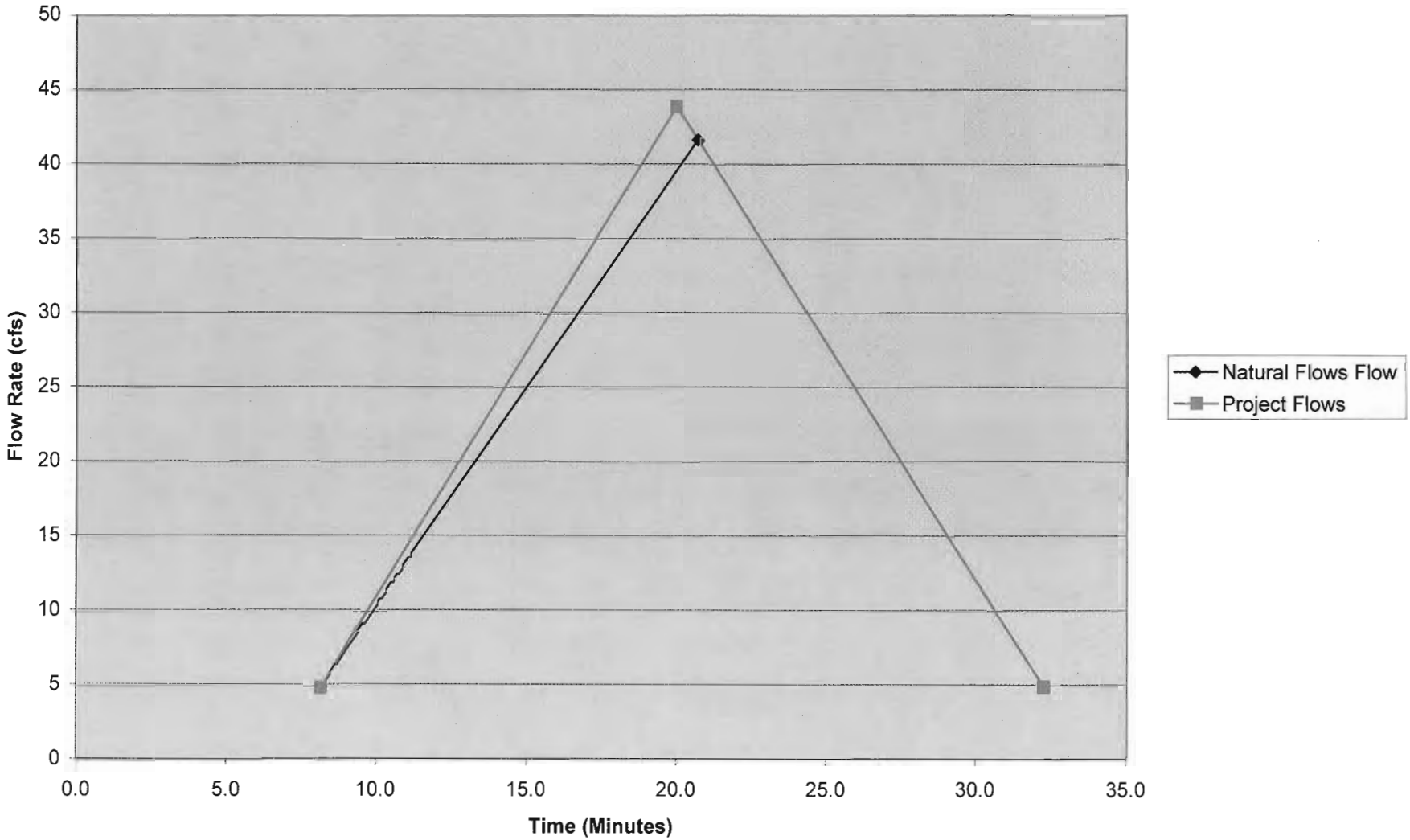
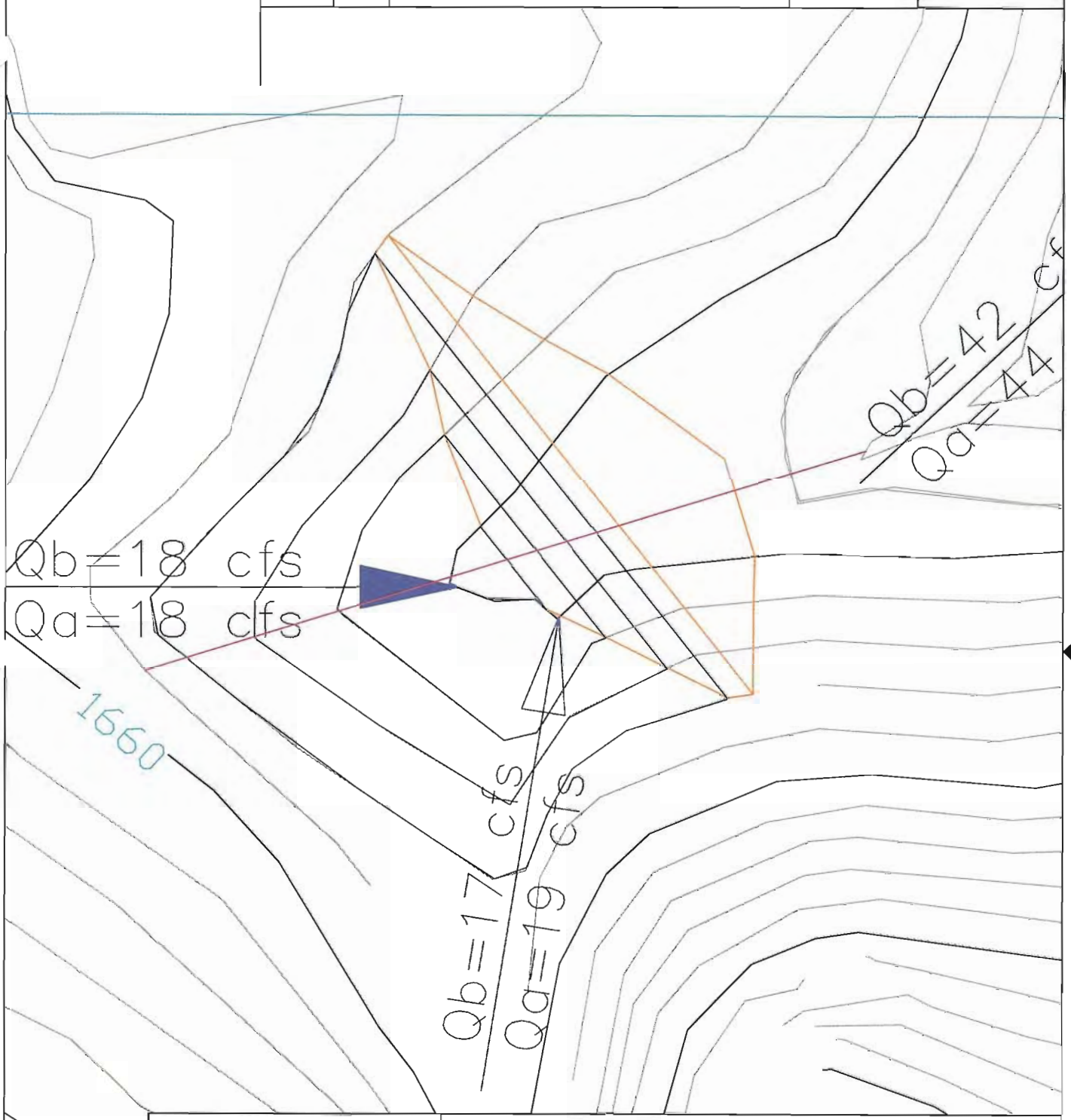
Detention Basin Flows



REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



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Detention Basin

Plan View

SIZE	FSCM NO.	DWG NO.	REV

SCALE 1"=20'

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Detention Basin at Contour 1650
Required Volume 1403 cubic feet

Spillway at elevation 1656

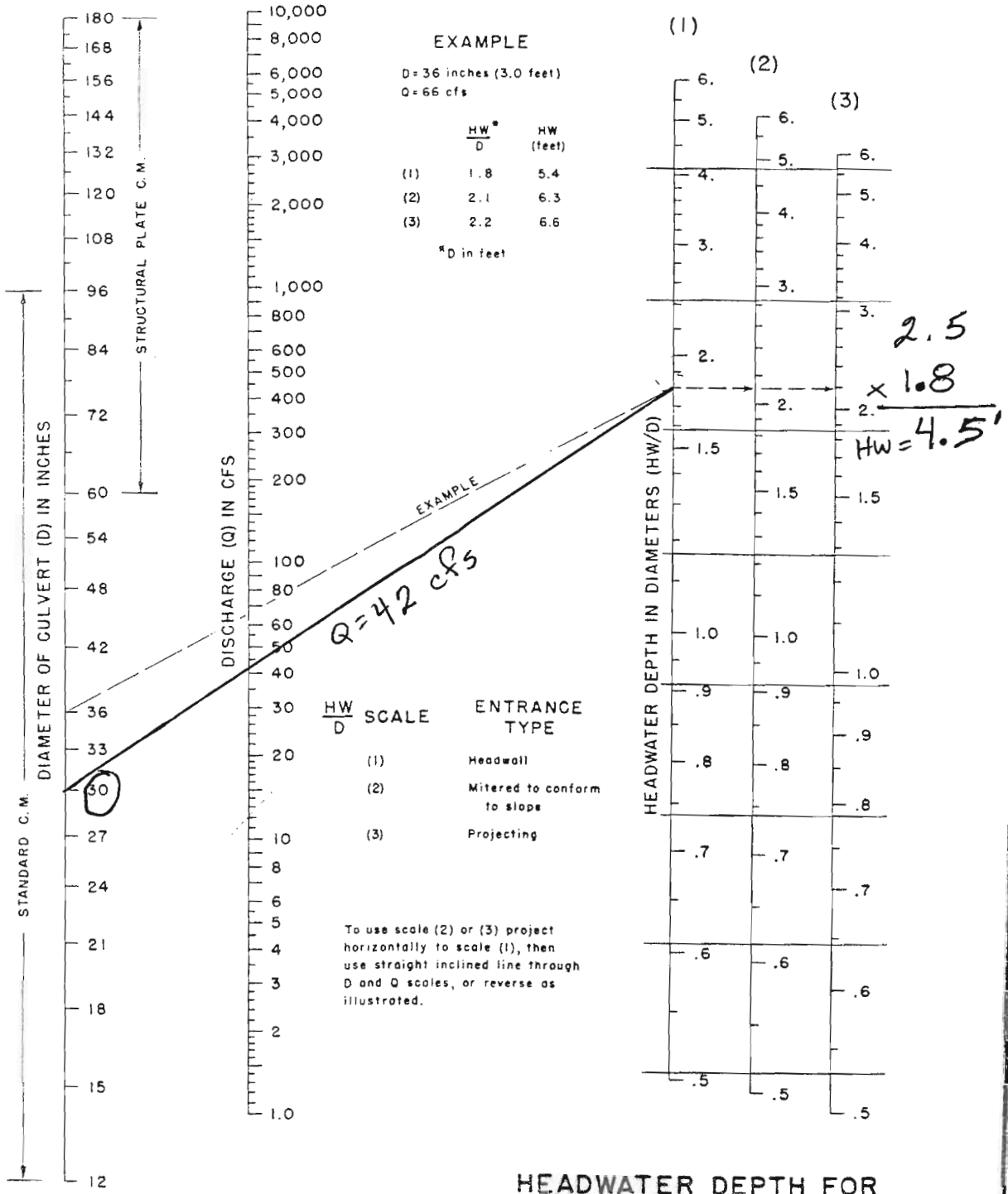
Coutour	Area s.f.	Ave. Area	Elev. Diff.	Volume
1650	67.2			
		452.075	2	904.15
1652	836.95			
		1282.68	2	2565.36
1654	1728.41			
		2477.945	2	4955.89
1656	3227.48			

Total Volume 8425.4 cubic feet

Spillway at elevation 1654

Coutour	Area s.f.	Ave. Area	Elev. Diff.	Volume
1650	67.2			
		452.075	2	904.15
1652	836.95			
		1282.68	2	2565.36
1654	1728.41			
		2477.945	0	0
1656	3227.48			

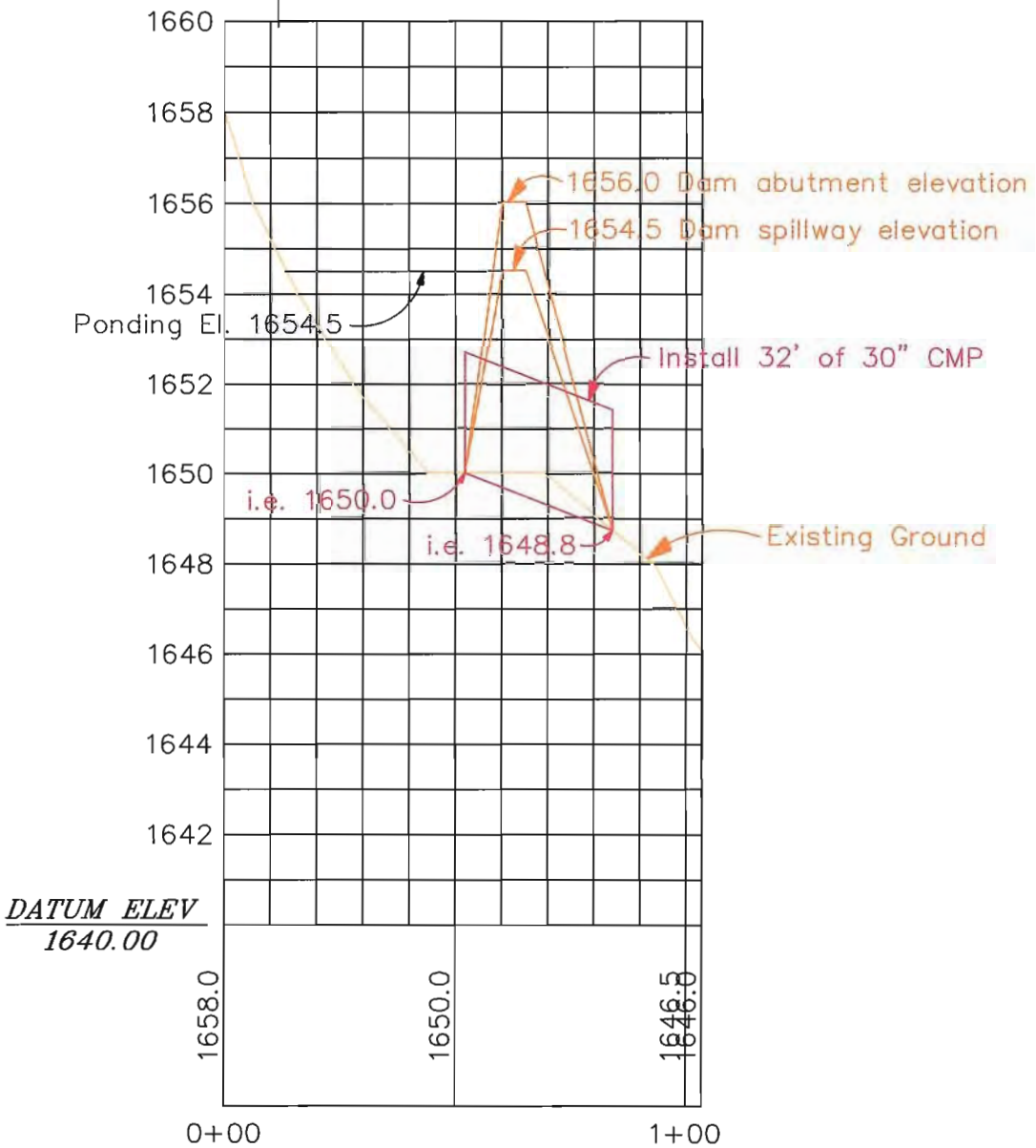
Total Volume 3469.51 cubic feet



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



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Detention Basin Profile

SIZE	FSCM NO.	DWG NO.	REV

SCALE 1"=40'

SHEET 52 of 54

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REVISIONS				
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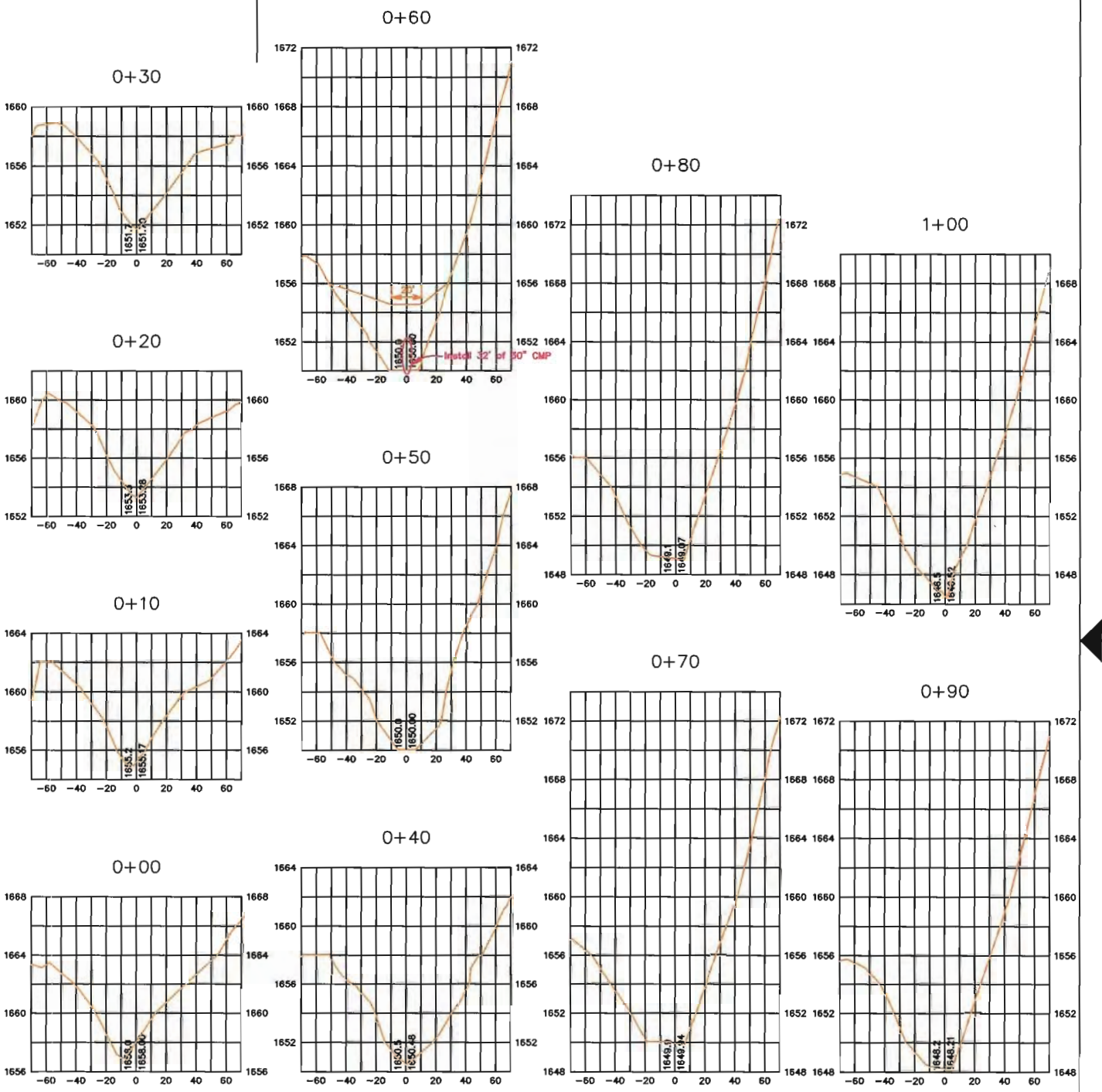

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Detention Basin Cross-Sections

SIZE	FSCM NO.	DWG NO.	REV
SCALE		SHEET 53 of 54	

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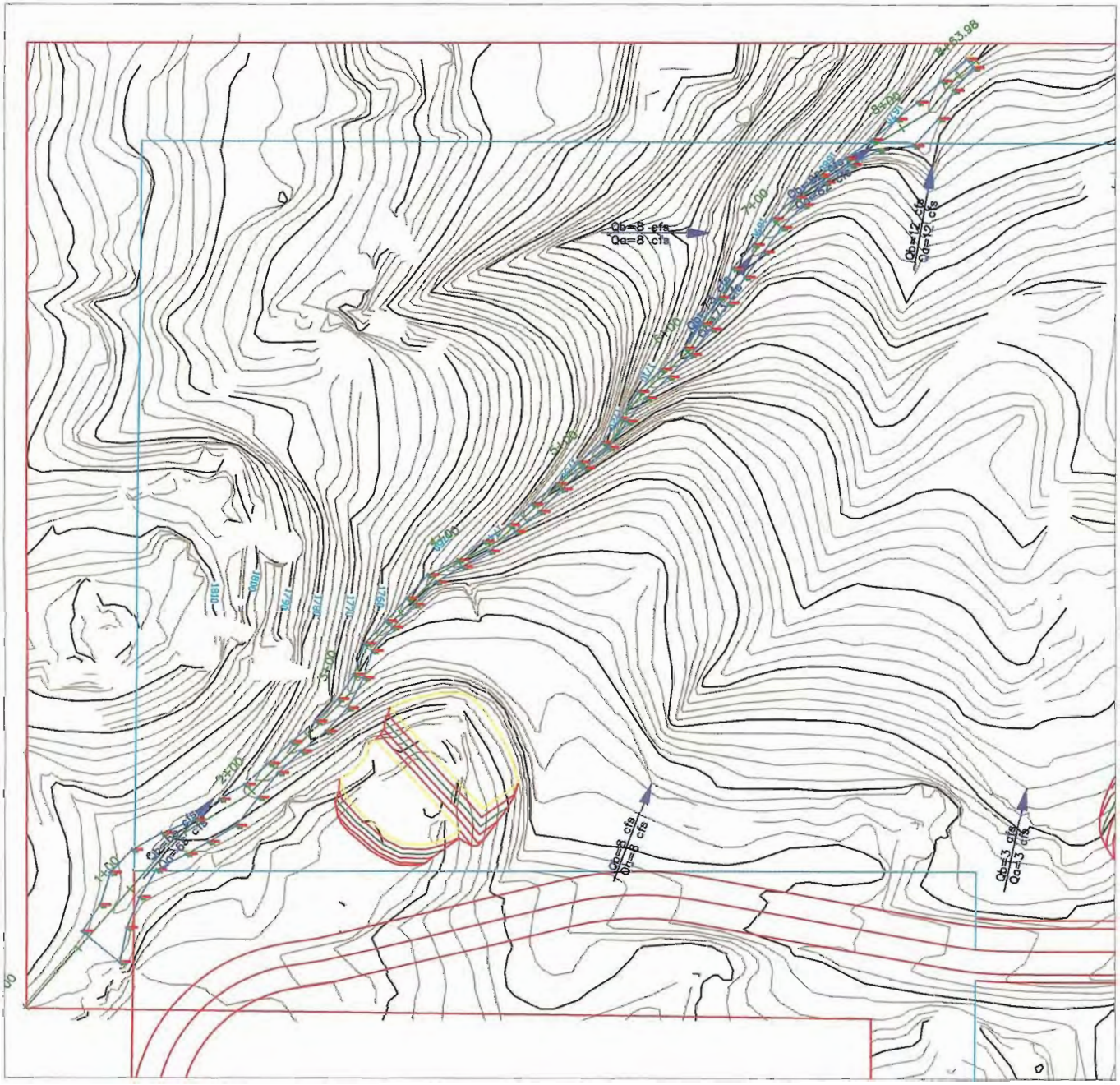
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



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TPM 20843 Albers

Lines of Inundation

SIZE	FSCM NO.	DWG NO.	REV
		TPM20843-LOI	A

SCALE 1"=100'

SHEET ~~1~~ 54 of ~~1~~ 54

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