4/5 BASINS ALONG CAP CANAL
CONTRACT FCD 98-31

DRAINAGE REPORT

Prepared for:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Registered Professional Engineer (Civil)
BRIAN J. FRY
3.7.00
ARIZONA, U.S.A.

Prepared by:

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

March 7, 2000

4/5 BASINS ALONG CAP CANAL
CONTRACT FCD 98-31

DRAINAGE REPORT

PCN. 4420330

CONTRACT NUMBERS:
1999C053 (Basins 2&4)
1999C054 (Basins 1&3)
1999C055 (Basin 5)

Prepared For:

Flood Control District of Maricopa County

Registered Professional Engineer (Civil)
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March 7, 2000

4/5 Basins Along CAP Canal
Drainage Report

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1. Stage-Storage Relationship
2. HY8 for Principal Outlets
3. HEC-1 Subbasin map from SE Mesa ADMP
4. HEC-1 Summary output
5. Baffle Chute Spillway Design Calculations
6. HY8 Output for Basin 4 inlet culverts
7. Sloping Drop Structure Calculations
8. StormPlus Output (93rd Street Storm Drain)
9. StormPlus Table of Station conversions from plans
10. HEC-RAS Output (Parkwood Ranch channel - 2 runs)
11. Vertical Drop Structure Calculations
12. Quantity Calculations
13. Structural Calculations
14. Project Survey Report
15. CD Containing:
    - HEC-1 Input File
    - HEC-RAS Project Files
    - HY8 Project Files
    - Microstation Design Files
    - Storm Plus Project Files
    - Special Provisions & Bid Schedule

4/5 Basins Along CAP Canal
Drainage Report

I. INTRODUCTION

This Drainage Report is prepared for the Flood Control District of Maricopa County as part of the design of 5 detention basins along the Central Arizona Project (CAP) canal in east Mesa, Arizona. The detention basins are being constructed as part of the implementation of the *East Mesa Area Drainage Master Plan*, completed in July, 1998. The purpose of the basins is to attenuate peak discharges flowing over the CAP canal in pipe overchutes to mitigate downstream flooding caused by the overchute flows. This report presents the drainage design calculations in support of the design. The detention basin design is presented in 3 separate sets of bid documents, Basins 2 and 4 will be constructed as one project, Basins 1 and 3 as one project, and the Parkwood Ranch Basin (Basin 5) as one project. This will allow the FCDMC flexibility in implementing the basin construction. The five basin locations are shown on **Figure 1**.

Coincident with completion of the construction plans, W.M. Grace Development Co., representing the owner of a parcel containing a portion of the Basin 2 outlet storm drain at Apache Boulevard requested design changes to realign the storm drain around the perimeter of the property. W.M. Grace retained Dibble and Associates to make the requested design changes and plan revisions. The changes were made after the project had been bid by the FCDMC. The design changes from the W.M. Grace contract have been incorporated into this report.

II. DESIGN CRITERIA

The *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology*, January 1, 1995, (Hydrology Manual), and *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics*, January 28, 1996, (Hydraulics Manual), are used as the basis for drainage design.

A. Hydrology

Hydrology for the 4/5 Detention Basins along the CAP Canals is presented in the *East Mesa Area Drainage Master Plan, Recommended Design Report*, July 1998. The East Mesa ADMP hydrology

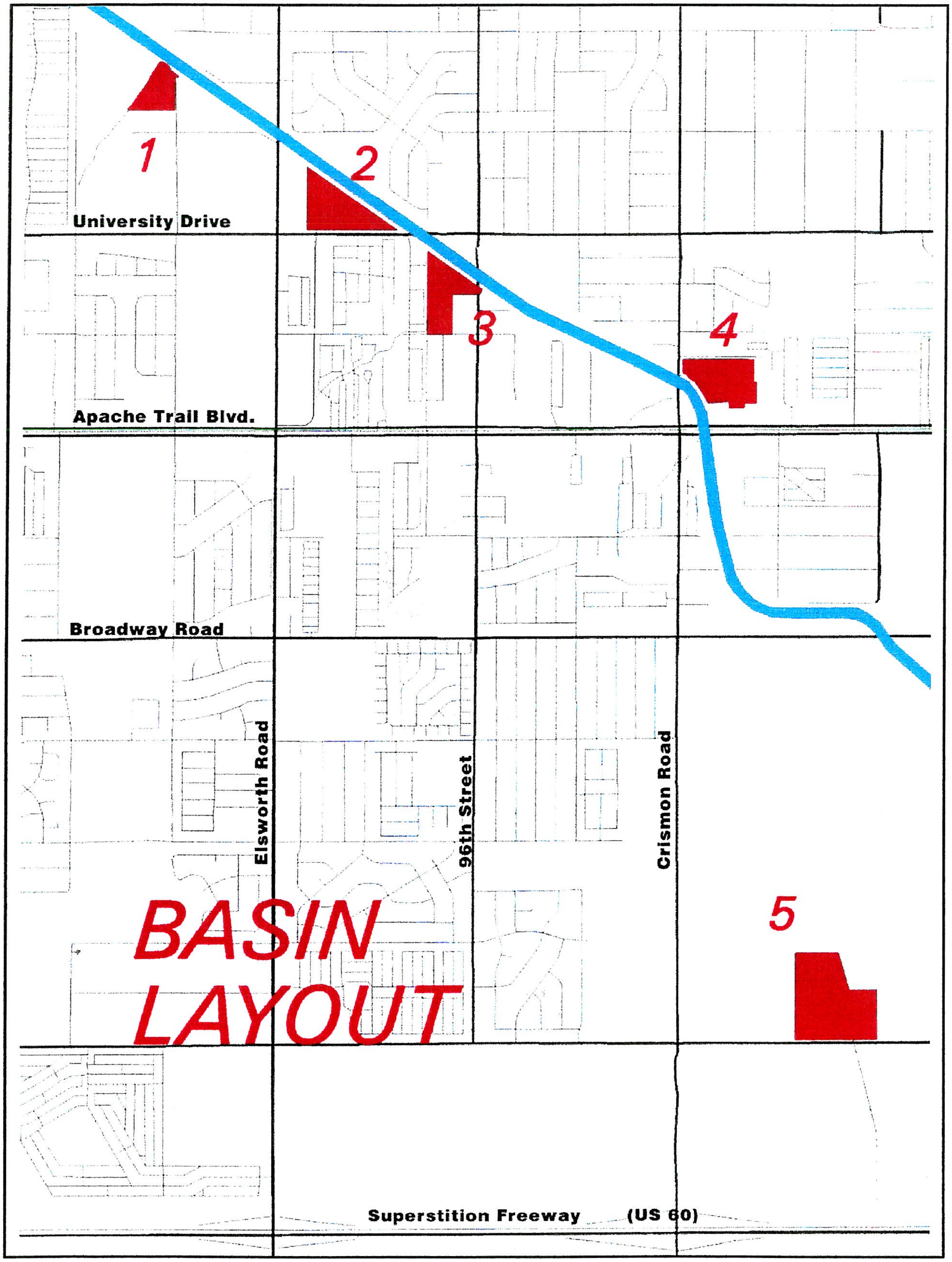


Figure 1 - Basin Locations

is refined as part of this project by inputting the final design stage-storage-discharge relationship for the basins to ensure that the basins will function as set forth in the ADMP. The basins are designed for 100-year, 24-hour runoff with no overtopping under fully developed watershed conditions.

B. Storm Drains

Storm drains have been sized for the 100 year flows leaving the basins using a manning's n value of 0.013. The minimum pipe size used is 24 inch with a minimum cover of 2 ft. Maximum spacing of manholes is 300 ft. for pipes up to 30 in. diameter, 400 ft. for pipes larger than 30 in. and smaller than 48 in., and 500 ft. for pipes 48 in. and larger.

Storm drain profiles are typically designed with pipe crowns matching. The minimum pipe slope is 0.001 feet/feet. The hydraulic grade line is a minimum of 0.5 ft. below manhole rims and inlet structures.

Minimum flowing full velocities of 5 ft/s are maintained where possible. However, a minimum velocity of 2 ft/s must be maintained when flow is one half of the design discharge.

C. Open Channels

Open channels are designed for the 100-year flows.

Channel Section - The maximum side slope is 2:1 for concrete channels and 4:1 for earth channels. A minimum bottom width of 4 feet is required, however, an eight foot bottom width is provided where feasible. The design channel lining depth is the normal flow depth plus freeboard. Required freeboard is 0.25 times the sum of depth plus velocity head with a minimum of 1 foot for sub-critical flow and 2 feet for super-critical flow conditions. Additional freeboard is provided around bends equal to the flow superelevation around the bend.

Manning's n - The following Manning's n values are used in development of the channel design: n=0.015 for concrete, n=0.025 for earth, and n=0.040 for riprap.

Froude Number - Froude numbers for channel design are to be less than or equal to 0.86 for subcritical flow. Drop structures are provided when necessary to flatten the grade to achieve sub-critical flow conditions. Super-critical flow is allowed in special circumstances, such as where right-of-way is limited. Super-critical flow channels, when used, are to have Froude numbers greater than 1.13 and less than 2.0.

Longitudinal Slope - Extremely flat slopes are avoided for constructibility reasons. Specific slope criteria are not provided because slopes will generally be dictated by the Froude number criteria. Slopes are set as steeply as possible within the limitations of the channel material maximum allowable velocity and the limitation on Froude number.

Drop Structures and Channel Profile - When the natural ground slope is steeper than the maximum allowable longitudinal channel slope, drop structures are provided. The size and spacing of drops are established based on a minimum drop height of 3 feet, and a maximum drop height of 6 feet.

Side Drainage - Surface runoff entering the channel from the side should be directed to enter the channel at planned locations with side spillways. This will prevent rill erosion for earth channels and undermining at the concrete-soil interface for concrete channels.

Auxiliary Drainage Facilities - Where the top of channel projects above the adjacent existing ground (fill situations), a parallel channel or swale should be used to convey runoff to a planned channel inflow point. Additional right of way may be required in these areas. The parallel auxiliary drainage channel should generally be a vee-shaped swale.

Maintenance Access Road - The channel cross-section allows for a 16-foot wide maintenance road on each side of the channel. Where the channel is adjacent to a public street, the street serves as one of the maintenance roads. New maintenance roads should have a 2% cross slope. At specified locations, the maintenance road should be dipped to allow side drainage to enter the main channel. A 6-inch thick ABC surface is provided on the maintenance road.

D. Detention Basins

Side Slopes - Side slopes are varied around the basin to provide an aesthetically pleasing appearance Side slopes will normally vary from 4:1 to 8:1, but may be much flatter in some areas.

Basin Longitudinal Slope - Minimum slopes of 0.5% are used for grass or earth low-flow channels or swales. A minimum slope of 0.2% and a maximum slope of 0.5% is used for concrete low-flow channels.

Basin Cross Slope - A 1% minimum cross slope is used for sheet flow runoff surfaces. Surfaces are graded to drain toward the low-flow channel or outlet pipe.

Maintenance Access Road - A 16-foot wide maintenance access road is provided around the basin. The maintenance road will include a 6-inch thick ABC surface. Provision should be made for maintenance access to the basin floor by providing one or more access ramps.

Principal Outlet Pipe - Principal outlet pipes consist of a concrete pipe or box culvert, designed to operate under inlet or pipe control. The minimum allowable outlet pipe size is 24-inches. The outlet pipe invert is typically set 12 inches below the basin floor to facilitate complete draining of the basin and to prevent soggy areas near the outlet.

Basin Overtopping - Basins are typically designed to limit the 100-year water surface at or below the natural ground elevation around the basin. As a result, freeboard and emergency spillways are not required. Basin 4 is an exception and is designed with an embankment and spillway as described later in the report. The basin grading is designed to ensure that overtopping flows will be directed along the historic flow path.

Safety Features - An ADOT wire "game fence" is provided around the perimeter of Basins 1, 2, and 4 to discourage unauthorized motorized vehicles from entering the basins while not preventing pedestrian access. A chain link fence is required around the Basin 3 perimeter to protect the environmental mitigation plantings during the 5 year establishment period. Gates will be provided for maintenance access. All inflow and outflow pipes will be equipped with access barrier grates. The grates shall have adequate open area to limit design flow velocities through the grate to 3 feet per second (ft/s) or less with a plugging factor of 50% applied to the clear opening area. A maximum clear opening of 4 inches is allowed between grate bars.

E. Box Culverts

Design Flow - Culverts constructed with channels shall be designed to the same 100-year design discharge as used for the channel.

III. HYDROLOGY

A. Stage-Storage-Discharge Relationship

The stage-storage relationship for each basin is established using a surface modeling software package. The basin grading is input into a three-dimensional surface model by establishing design elevations at key points and along breaklines established at tops and toes of slopes and other abrupt changes in grade. Cumulative storage volume is input into the HEC-1 model at even foot elevation increments throughout the range of storage within the basin.

The stage-discharge relationship for each basin is established using the Federal Highway Administration (FHWA) HY-8 computer program. The HY-8 program computes a stage-discharge rating curve for the basin outlet culvert pipe over a range of discharges accounting for inlet control, outlet control, or tailwater control. The stage-discharge relationship is input into the HEC-1 model for the hydrologic routing computation.

With the stage-storage-discharge relationship established, the HEC-1 model performs a hydrologic routing of the inflow hydrograph through the basin. The model computes the maximum water surface elevation of ponding, the volume of runoff stored, and the peak discharge from the basin outlet. The peak discharge from the basin outlet is used to size the downstream channel or pipe.

The stage-storage-discharge relationship for each basin is contained in the **Appendix**. The HEC-1 sub-basin map from the East Mesa ADMP and the HEC-1 summary output are also contained in the

Appendix.

B. Design Discharges

The design discharges for each of the hydraulic elements is established by the HEC-1 hydrology model. The drainage area tributary to Basins 2 and 5 have been refined in the HEC-1 hydrology model since completion of the East Mesa ADMP. The model was revised in the vicinity of Basin 2 to more precisely identify peak flow rates at additional points of concentration needed for the downstream drainage structure sizing. The model was revised for Basin 5 to reflect changes resulting from construction of the Parkwood Ranch subdivision. The revised subbasin boundary maps are shown on **Figures 2** and **3**. The resulting peak discharges used for the basin design are summarized in **Table 1** along with other pertinent basin design parameters.

Table 1 - Basin Design Parameters

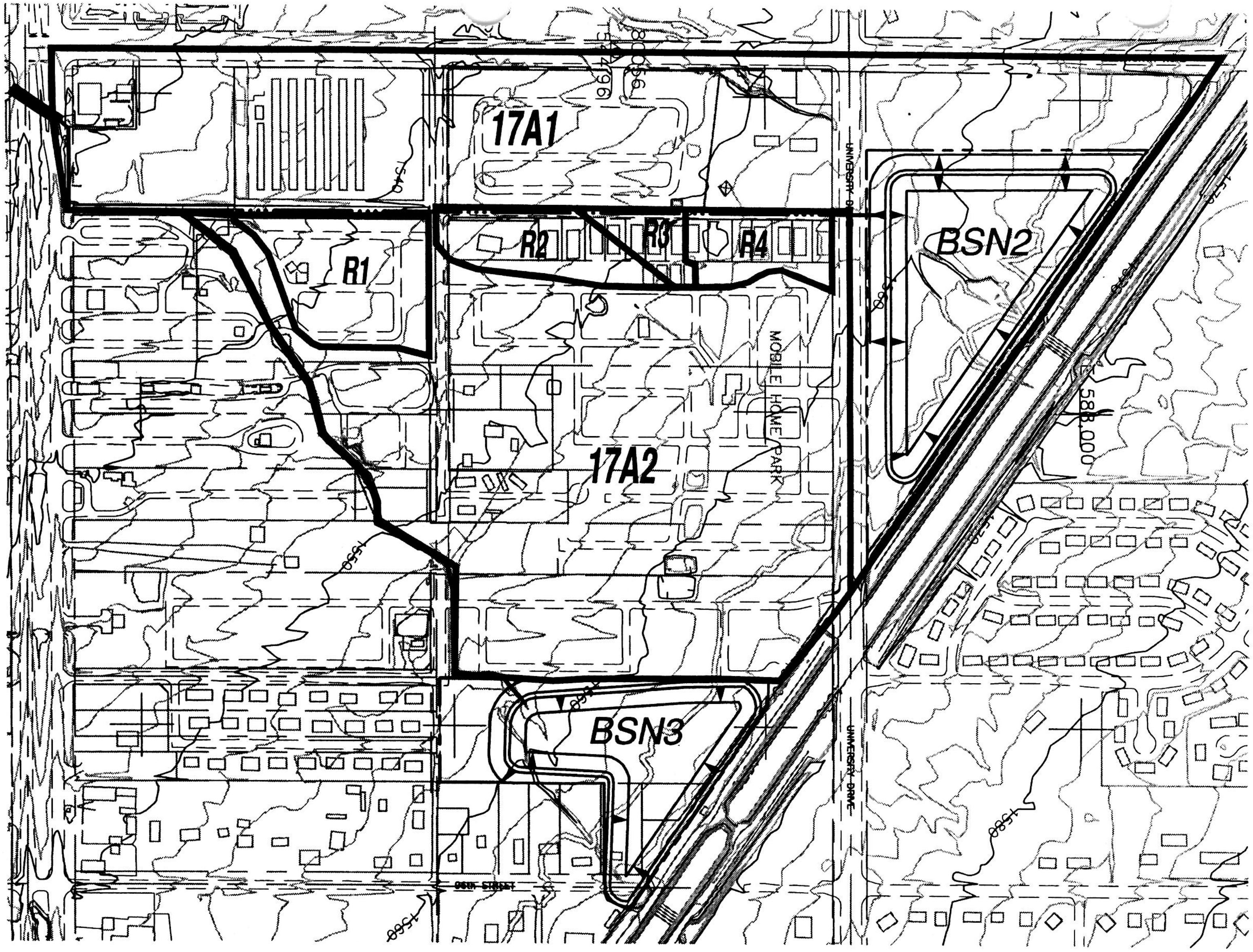
Basin No.	1	2	3	4a	4b	4c	5
Basin Inlet - Design Peak Inflow (cfs)	262	530	476	137	87	322	684
Basin Volume - Design Volume (af) - *ADMS Volume* (af)*	21 *10*	29 *19*	21 *19*		24 *26*		34 *87*
Principal Outlet - Outlet Structure Size - Design Peak Outflow (cfs) - *ADMS Peak Outflow* (cfs)*	24" 33 *29*	30" 52 *38*	30" 48 *57*		2-30" 119 *54*		10'x3' 362 *267*

* - ADMS Volume & Peak Outflow are for comparison purposes only.

The peak discharge entering Basin 4 is 546 cfs. The total inflow is divided between three inlet locations around the basin perimeter. The total inflow is divided among the three inlet locations by applying the ratio of the total drainage area reaching each inlet location to the total peak discharge.

C. ADWR Safety of Dams

The CAP detention basins are designed to be exempt from ADWR jurisdiction for safety of dams.



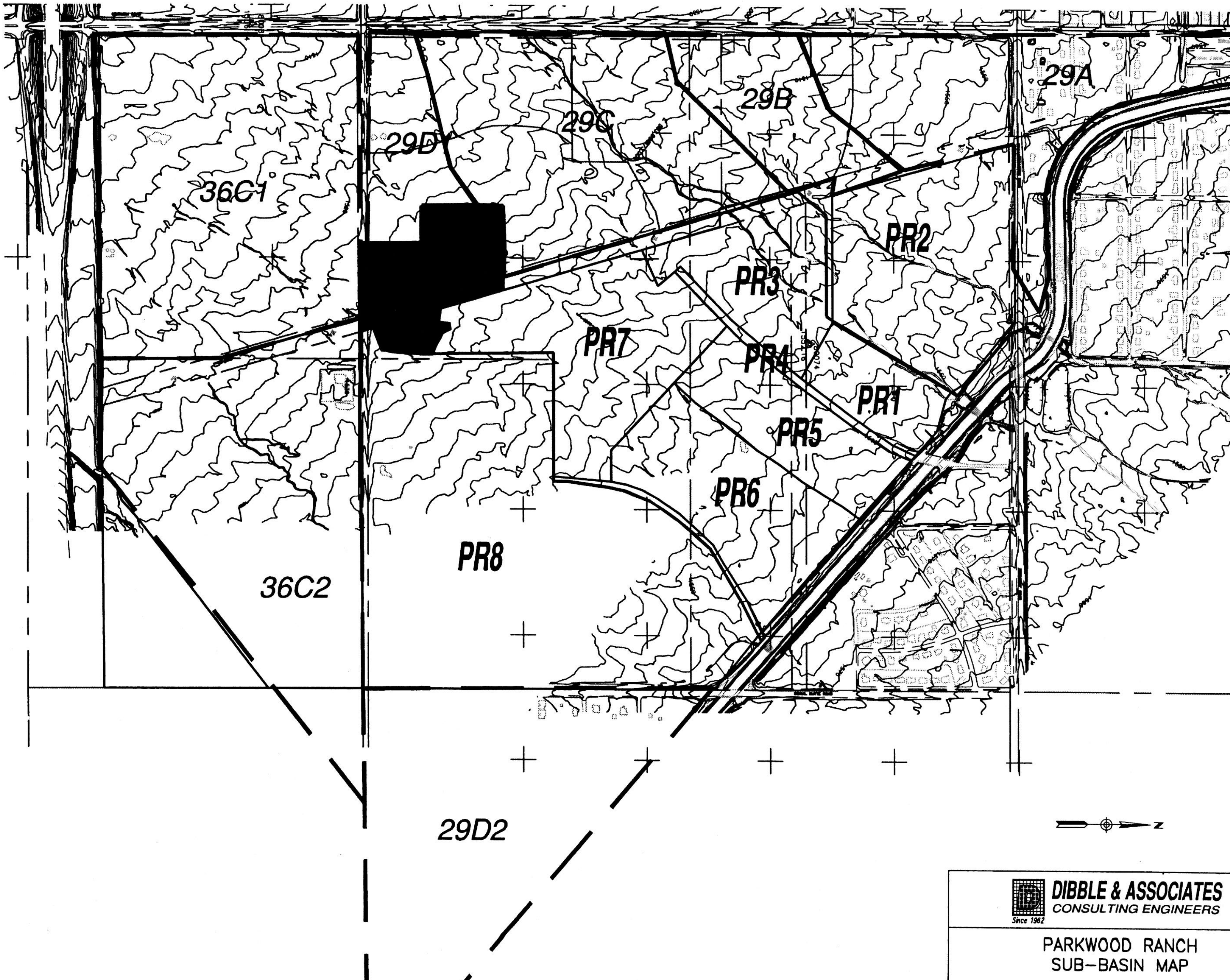
LEGEND

R1 RATIONAL METHOD SUB-BASIN

17A1 MODIFIED HEC-1 SUB-BASIN

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

BASIN2 OUTFALL
SUB-BASIN MAP



DIBBLE & ASSOCIATES
CONSULTING ENGINEERS
Since 1962

PARKWOOD RANCH
SUB-BASIN MAP

DR. D.C.F.	SCALE: 1:1000	DATE: 4-99	SHEET 1 OF 1

Basins 1, 2, 3, and 5 are designed with the maximum water surface at or below the existing ground elevation at the basin perimeter. This was done to avoid hazards associated with earth fill embankments used to impound water, particularly in a high hazard area with residential development immediately downstream from the basins. Basin 4 has an embankment and spillway adjacent to the upstream side of the CAP canal. This is necessary to allow the basin to drain by gravity into the CAP overchute pipes. The storage volume for Basin 4 is 24 acre-feet which is well within the 50 acre-foot jurisdictional limit for dams less than 25 feet in height. As a result, there are no ADWR jurisdictional dams within the project. ADWR has no jurisdiction and therefore requires no review of the design.

D. Freeboard

Since there are no fill embankments included in the design to store water above the natural ground elevation, there is no freeboard or emergency spillway requirement for Basins 1, 2, 3, & 5. Basin 4 is provided with 3 feet of total freeboard from the spillway crest to the top of embankment.

IV. HYDRAULICS

A. Inlet Spillways

The inlet spillways for surface flows entering the basins are typically USBR baffle chute spillways (Basin IX) designed in accordance with guidelines contained in the U.S. Bureau of Reclamation Engineering Monograph No. 25, *Hydraulic Design of Stilling Basins and Energy Dissipators*, by A.J. Peterka. The design calculations are contained in the **Appendix**.

Two inlets to Basin 4 and one inlet to Basin 5 are box culverts designed using the HY8 computer program and design guidance contained in Federal Highway Administration HDS 5, *Hydraulic Design of Highway Culverts*. The HY8 output is contained in the **Appendix**. A raised sill with baffle blocks is included at the outlets of the Basin 4 culverts to dissipate energy. The Basin 5 inlet box culvert acts as an enclosed sloping drop spillway designed to contain the hydraulic jump within the box. The box outlet is recessed below the finished grade of the basin to ensure adequate tailwater to force the jump to occur within the box. The hydraulic jump calculations are contained in the **Appendix**.

One inlet to Basin 5 is an open channel inlet lined with shotcrete.

B. Principal Outlet

The principal outlets for Basins 1, 3, 4, and 5 are culverts designed using the HY8 computer program and design guidance contained in Federal Highway Administration HDS 5, *Hydraulic Design of Highway Culverts*. The HY8 output is contained in the **Appendix**. The principal outlet for Basin 2 is a storm drain pipe and is described in Section D.

C. Emergency Spillway

Emergency spillways are not required for basins having design water surface elevations at or below the existing natural ground. The Basin 4 Emergency spillway is sized for the un-attenuated 100-year peak basin inflow. The spillway is 75 feet in length and consists of a concrete apron along the top of the embankment and a gabion mattress on the downstream side for erosion protection. The spillway crest is 3 feet below the top of embankment and is designed for a 2 foot depth of flow under design conditions. As a point of clarification, the basin is designed to contain the full 100-year runoff with no runoff flowing over the spillway. The spillway design event referenced in this section is the un-attenuated 100-year peak discharge, ignoring any attenuation from the basin.

D. 93rd Street Storm Drain (Basin 2 Outlet)

The storm drain outlet pipe in 93rd Street at Basin 2 is designed using the CivilSoft Storm Plus computer program. Storm Plus computes and plots uniform and nonuniform steady flow water surface profiles and pressure gradients in open channels or closed conduits with irregular or regular sections. The flow in a system may alternate between super critical, subcritical or pressure flow in any sequence. The system is analyzed from the outlet west of Ellsworth Road continuously upstream to the Detention Basin 2 outlet. The Storm Plus output is contained in the **Appendix**. The design plans stationing for the Basin 2 outlet increases in the downstream direction. Storm Plus requires the stationing to increase in the upstream direction. A table showing the station conversion from the plans to the StormPlus run is included with the computer output.

E. Parkwood Ranch Outlet Channel

The Parkwood Ranch outlet channel is an earth channel with 2 drop structures to allow a stable design longitudinal slope. The channel is analyzed using the U.S. Army Corps of Engineers HEC-RAS water surface profile computer program. The channel is analyzed under two conditions- A natural earth n-value of 0.20 is used for the newly constructed condition with no vegetation to be conservative for velocity. A higher n-value of 0.025 is used as the normal design roughness for freeboard calculations. Output from both HEC-RAS runs is contained in the **Appendix**. The drop structures are vertical concrete drops with downstream hydraulic jump basins. The design calculations for the drop structures are contained in the **Appendix**.

V. CALCULATIONS

Quantity Calculations are contained in the **Appendix**. Linear and "each" type quantities are summarized on the Quantity Summary Sheet in the plans. Basin excavation quantities are computed using Eagle Point surface modeling software. The Eagle Point Summary output is presented in the **Appendix** showing total quantities of cut and fill for each basin.

Structural Calculations are also contained in the **Appendix**.

VI. PROJECT SURVEY REPORT

The project survey report is contained in the **Appendix**.

VII. BIBLIOGRAPHY

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Tobar, Daniel L., P.E., *Final Drainage Report For Sunrise at Parkwood Ranch*, July 22, 1998, Revised October 12, 1998, Revised November 16, 1998.

APPENDIX

1. Stage-Storage Relationship

User Name: JMikkelsen
Project: CAP Basins 1-4
Slice Volume Results

Date: 12-21-99
Time: 10:11:02
Page: 1

Slice Volume Results

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Original Surface Model: BASIN1 Site
Final Surface Model: Constant Elevation: 1562.00

Cut Compaction Factor: 0.000000
Fill Compaction Factor: 0.000000

Elevation Interval	Cut Area (ft^2)	Cut Volume (CY)	Fill Area (ft^2)	Fill Volume (CY)	**Cumulative Fill**	
					(CY)	**(ac-ft)**
1553.00 - 1554.00	0.00	0.00	44.82	1.66	**1.66**	**0.00**
1554.00 - 1555.00	0.00	0.00	7523.28	278.64	**280.30**	**0.17**
1555.00 - 1556.00	0.00	0.00	25893.41	959.02	**1239.32**	**0.77**
1556.00 - 1557.00	0.00	0.00	52695.52	1951.69	**3191.00**	**1.98**
1557.00 - 1558.00	0.00	0.00	96941.32	3590.42	**6781.42**	**4.20**
1558.00 - 1559.00	0.00	0.00	156334.02	5790.15	**12571.57**	**7.79**
1559.00 - 1560.00	0.00	0.00	187463.62	6943.10	**19514.67**	**12.10**
1560.00 - 1561.00	0.00	0.00	196838.84	7290.33	**26804.99**	**16.61**
1561.00 - 1562.00	0.00	0.00	199998.16	7407.34	**34212.33**	**21.21**

User Name: JMikkelsen
Project: CAP Basins 1-4
Slice Volume Results

Date: 12-22-99
Time: 16:03:36
Page: 1

Slice Volume Results

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Original Surface Model: BASIN2 Site
Final Surface Model: Constant Elevation: 1558.00

Cut Compaction Factor: 0.000000
Fill Compaction Factor: 0.000000

Elevation Interval	Cut Area (ft^2)	Cut Volume (CY)	Fill Area (ft^2)	Fill Volume (CY)	**Cumulative Fill (CY)**	**Cumulative Fill (ac-ft)**
1550.00 - 1551.00	0.00	0.00	647.99	24.00	**24.00**	**0.01**
1551.00 - 1552.00	0.00	0.00	17729.42	656.65	**680.64**	**0.42**
1552.00 - 1553.00	0.00	0.00	57319.33	2122.94	**2803.58**	**1.74**
1553.00 - 1554.00	0.00	0.00	115477.07	4276.93	**7080.51**	**4.39**
1554.00 - 1555.00	0.00	0.00	202797.20	7511.01	**14591.52**	**9.04**
1555.00 - 1556.00	0.00	0.00	266753.22	9879.75	**24471.27**	**15.17**
1556.00 - 1557.00	0.00	0.00	289456.73	10720.62	**35191.89**	**21.81**
1557.00 - 1558.00	0.00	0.00	300792.54	11140.46	**46332.35**	**28.72**

User Name: JMikkelsen
Project: CAP Basins 1-4
Slice Volume Results

Date: 12-22-99
Time: 10:33:56
Page: 1

Slice Volume Results

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Original Surface Model: BASIN3 Site
Final Surface Model: Constant Elevation: 1561

Cut Compaction Factor: 0.000000
Fill Compaction Factor: 0.000000

Elevation Interval	Cut Area (ft^2)	Cut Volume (CY)	Fill Area (ft^2)	Fill Volume (CY)	**Cumulative Fill**	
					(CY)	**(ac-ft)**
1553.00 - 1554.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
1554.00 - 1555.00	0.00	0.00	445.13	16.49	**16.49**	**0.01**
1555.00 - 1556.00	0.00	0.00	24255.08	898.34	**914.82**	**0.57**
1556.00 - 1557.00	0.00	0.00	110280.88	4084.48	**4999.30**	**3.10**
1557.00 - 1558.00	0.00	0.00	144789.34	5362.57	**10361.87**	**6.42**
1558.00 - 1559.00	0.00	0.00	178943.68	6627.54	**16989.41**	**10.53**
1559.00 - 1560.00	0.00	0.00	219399.02	8125.89	**25115.30**	**15.57**
1560.00 - 1561.00	0.00	0.00	256595.52	9503.54	**34618.84**	**21.46**

ˇUser Name: JMikkelsen
Project: CAP Basins 1-4
Slice Volume Results

Date: 12-22-99
Time: 10:36:41
Page: 1

Slice Volume Results

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Original Surface Model: Basin4 Site
Final Surface Model: Constant Elevation: 1575.

Cut Compaction Factor: 0.000000
Fill Compaction Factor: 0.000000

Elevation Interval	Cut Area (ft^2)	Cut Volume (CY)	Fill Area (ft^2)	Fill Volume (CY)	**Cumulative Fill (CY)**	**Cumulative Fill (ac-ft)**
1568.00 - 1569.00	0.00	0.00	0.00	0.00	**0.00**	**0.00**
1569.00 - 1570.00	0.00	0.00	4368.63	161.80	**161.80**	**0.10**
1570.00 - 1571.00	0.00	0.00	47970.45	1776.68	**1938.48**	**1.20**
1571.00 - 1572.00	0.00	0.00	149240.75	5527.44	**7465.92**	**4.63**
1572.00 - 1573.00	0.00	0.00	252578.60	9354.76	**16820.68**	**10.43**
1573.00 - 1574.00	0.00	0.00	288093.83	10670.14	**27490.82**	**17.04**
1574.00 - 1575.00	0.00	0.00	300148.22	11116.60	**38607.43**	**23.93**

ˇUser Name: JMikkelsen
Project: Parkwood Ranch Basin (CAP 5)
Slice Volume Results

Date: 12-22-99
Time: 10:39:19
Page: 1

Slice Volume Results

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Original Surface Model: Basin 5 Water
Final Surface Model: Constant Elevation: 1525

Cut Compaction Factor: 0.000000
Fill Compaction Factor: 0.000000

Elevation Interval	Cut Area (ft^2)	Cut Volume (CY)	Fill Area (ft^2)	Fill Volume (CY)	**Cumulative Fill (CY)**	**Cumulative Fill (ac-ft)**
1518.00 - 1519.00	0.00	0.00	2859.94	105.92	**105.92**	**0.07**
1519.00 - 1520.00	0.00	0.00	29692.27	1099.71	**1205.64**	**0.75**
1520.00 - 1521.00	0.00	0.00	103697.89	3840.66	**5046.30**	**3.13**
1521.00 - 1522.00	0.00	0.00	244244.46	9046.09	**14092.39**	**8.73**
1522.00 - 1523.00	0.00	0.00	315362.02	11680.07	**25772.47**	**15.97**
1523.00 - 1524.00	0.00	0.00	385033.52	14260.50	**40032.97**	**24.81**
1524.00 - 1525.00	0.00	0.00	414039.68	15334.80	**55367.77**	**34.32**

2. HY8 for Principal Outlets

CURRENT DATE: 08-09-1999
CURRENT TIME: 10:27:23

FILE DATE: 08-09-1999
FILE NAME: BASIN1

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	51.87	46.41	474.71	1 RCP	2.00	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: BASIN1 DATE: 08-09-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
51.87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
52.82	4.0	4.0	0.0	0.0	0.0	0.0	0.0	0.00	1
53.29	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.00	1
53.67	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
54.05	16.0	16.0	0.0	0.0	0.0	0.0	0.0	0.00	1
54.49	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.00	1
55.03	24.0	24.0	0.0	0.0	0.0	0.0	0.0	0.00	1
55.97	28.0	28.0	0.0	0.0	0.0	0.0	0.0	0.00	1
57.06	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.00	1
59.03	36.0	33.0	0.0	0.0	0.0	0.0	0.0	2.75	9
59.06	40.0	33.0	0.0	0.0	0.0	0.0	0.0	6.64	9
59.00	33.0	33.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: BASIN1 DATE: 08-09-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
51.87	0.000	0.00	0.00	0.00
52.82	0.000	4.00	0.00	0.00
53.29	0.000	8.00	0.00	0.00
53.67	0.000	12.00	0.00	0.00
54.05	0.000	16.00	0.00	0.00
54.49	0.000	20.00	0.00	0.00
55.03	0.000	24.00	0.00	0.00
55.97	0.000	28.00	0.00	0.00
57.06	0.000	30.00	0.00	0.00
59.03	-0.008	36.00	0.23	0.64
59.06	-0.001	40.00	0.31	0.77

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 08-09-1999 FILE DATE: 08-09-1999
CURRENT TIME: 10:27:23 FILE NAME: BASIN1

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	51.87	0.00	-5.46	0-NF	0.00	0.00	0.00	-0.05	0.00	0.00
4.00	52.82	0.95	-3.96	1-S2n	0.52	0.69	0.39	0.61	9.09	0.76
8.00	53.29	1.42	-3.34	1-S2n	0.75	1.01	0.75	0.87	7.47	0.92
12.00	53.67	1.80	-2.44	1-S2n	0.95	1.24	0.84	1.06	9.58	1.02
16.00	54.05	2.18	-1.25	1-S2n	1.13	1.44	1.04	1.21	9.71	1.10
20.00	54.49	2.62	0.24	1-S2n	1.31	1.60	1.20	1.34	10.11	1.16
24.00	55.03	3.16	2.01	5-S2n	1.51	1.72	1.42	1.46	10.03	1.22
28.00	55.97	3.78	4.10	5-S2n	1.79	1.84	1.79	1.57	9.43	1.27
30.00	57.06	4.13	5.19	2-M2c	2.00	1.90	1.90	1.61	9.81	1.29
33.01	59.03	4.68	7.16	2-M2c	2.00	1.99	1.99	1.75	10.54	1.35
33.05	59.05	4.69	7.18	2-M2c	2.00	1.99	1.99	1.83	10.55	1.39

El. inlet face invert 51.87 ft El. outlet invert 46.41 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** EMBANKMENT TOE **************

UPSTREAM STATION	0.00 ft
UPSTREAM ELEVATION	52.00 ft
UPSTREAM EMBANKMENT SLOPE (X:1)	6.00
DOWMSTREAM STATION	490.00 ft
DOWNSTREAM ELEVATION	46.36 ft
DOWNSTREAM EMBANKMENT SLOPE (X:1)	2.00

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	GROOVED END IN HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 08-09-1999
CURRENT TIME: 10:27:23

FILE DATE: 08-09-1999
FILE NAME: BASIN1

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	4.00 ft
SIDE SLOPE H/V (X:1)	6.0
CHANNEL SLOPE V/H (ft/ft)	0.001
MANNING'S n (.01-0.1)	0.025
CHANNEL INVERT ELEVATION	46.36 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	46.41 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	46.36	0.000	0.00	0.00	0.00
4.00	47.02	0.166	0.66	0.76	0.02
8.00	47.28	0.169	0.92	0.92	0.03
12.00	47.47	0.171	1.10	1.02	0.03
16.00	47.62	0.173	1.26	1.10	0.04
20.00	47.75	0.174	1.39	1.16	0.04
24.00	47.87	0.175	1.51	1.22	0.05
28.00	47.97	0.176	1.61	1.27	0.05
30.00	48.02	0.177	1.66	1.29	0.05
36.00	48.16	0.178	1.80	1.35	0.06
40.00	48.24	0.179	1.88	1.39	0.06

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	16.00 ft
CREST LENGTH	200.00 ft
OVERTOPPING CREST ELEVATION	59.00 ft

CURRENT DATE: 01-03-2000
CURRENT TIME: 09:19:56

FILE DATE: 01-03-2000
FILE NAME: BASIN3

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

C U L V NO.	SITE DATA INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	53.96	52.50	491.81	1 RCP	2.50	2.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: BASIN3 DATE: 01-03-2000

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
53.96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
55.32	8.0	8.0	0.0	0.0	0.0	0.0	0.0	0.00	1
55.96	16.0	16.0	0.0	0.0	0.0	0.0	0.0	0.00	1
56.57	24.0	24.0	0.0	0.0	0.0	0.0	0.0	0.00	1
57.74	32.0	32.0	0.0	0.0	0.0	0.0	0.0	0.00	1
60.03	40.0	40.0	0.0	0.0	0.0	0.0	0.0	0.00	1
61.19	48.0	44.1	0.0	0.0	0.0	0.0	0.0	3.57	6
61.40	56.0	44.7	0.0	0.0	0.0	0.0	0.0	10.94	4
61.48	60.0	45.0	0.0	0.0	0.0	0.0	0.0	14.53	3
61.71	72.0	45.8	0.0	0.0	0.0	0.0	0.0	26.06	4
61.83	80.0	46.2	0.0	0.0	0.0	0.0	0.0	33.43	3
61.00	43.5	43.5	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: BASIN3 DATE: 01-03-2000

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
53.96	0.000	0.00	0.00	0.00
55.32	0.000	8.00	0.00	0.00
55.96	0.000	16.00	0.00	0.00
56.57	0.000	24.00	0.00	0.00
57.74	0.000	32.00	0.00	0.00
60.03	0.000	40.00	0.00	0.00
61.19	-0.005	48.00	0.30	0.63
61.40	-0.005	56.00	0.35	0.63
61.48	-0.007	60.00	0.49	0.82
61.71	-0.010	72.00	0.16	0.22
61.83	-0.005	80.00	0.38	0.47

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 01-03-2000
CURRENT TIME: 09:19:56

FILE DATE: 01-03-2000
FILE NAME: BASIN3

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.50 (ft) BY 2.50 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	53.96	0.00	-1.46	0-NF	0.00	0.00	0.00	-0.07	0.00	0.00
8.00	55.32	1.29	1.36	2-M2c	0.98	0.93	0.93	0.09	4.77	3.96
16.00	55.96	1.93	2.00	2-M2c	1.48	1.35	1.35	0.18	5.94	5.17
24.00	56.57	2.46	2.61	2-M2c	2.02	1.66	1.66	0.24	6.93	6.03
32.00	57.74	3.04	3.78	2-M2c	2.50	1.92	1.92	0.30	7.93	6.71
40.00	60.03	3.76	6.07	2-M2c	2.50	2.11	2.11	0.36	9.07	7.29
44.14	61.17	4.19	7.21	2-M2c	2.50	2.20	2.20	0.41	9.67	7.79
44.70	61.40	4.25	7.44	2-M2c	2.50	2.21	2.21	0.45	9.75	8.24
44.98	61.48	4.28	7.52	2-M2c	2.50	2.22	2.22	0.47	9.79	8.44
45.77	61.71	4.37	7.75	2-M2c	2.50	2.23	2.23	0.53	9.90	9.02
46.19	61.83	4.42	7.87	2-M2c	2.50	2.24	2.24	0.57	9.95	9.36

El. inlet face invert 53.96 ft El. outlet invert 52.50 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	53.96 ft
OUTLET STATION	491.81 ft
OUTLET ELEVATION	52.50 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0030
CULVERT LENGTH ALONG SLOPE	491.81 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	GROOVED END IN HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 01-03-2000
CURRENT TIME: 09:19:56

FILE DATE: 01-03-2000
FILE NAME: BASIN3

TAILWATER

******* REGULAR CHANNEL CROSS SECTION ****************

BOTTOM WIDTH	12.00 ft
SIDE SLOPE H/V (X:1)	2.0
CHANNEL SLOPE V/H (ft/ft)	0.019
MANNING'S n (.01-0.1)	0.015
CHANNEL INVERT ELEVATION	52.43 ft
CULVERT NO.1 OUTLET INVERT ELEVATION	52.50 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
0.00	52.43	0.000	0.00	0.00	0.00
8.00	52.59	1.727	0.16	3.96	0.19
16.00	52.68	1.832	0.25	5.17	0.29
24.00	52.74	1.892	0.31	6.03	0.37
32.00	52.80	1.933	0.37	6.71	0.44
40.00	52.86	1.965	0.43	7.29	0.50
48.00	52.91	1.990	0.48	7.79	0.56
56.00	52.95	2.011	0.52	8.24	0.61
60.00	52.97	2.020	0.54	8.44	0.63
72.00	53.03	2.043	0.60	9.02	0.70
80.00	53.07	2.056	0.64	9.36	0.75

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	16.00 ft
CREST LENGTH	16.00 ft
OVERTOPPING CREST ELEVATION	61.00 ft

CURRENT DATE: 09-27-1999
CURRENT TIME: 09:15:25

FILE DATE: 09-27-1999
FILE NAME: BASIN4

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

C U L V NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	67.75	67.61	72.40	2 RCP	2.50	2.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: BASIN4 DATE: 09-27-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
67.75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
68.95	12.5	12.5	0.0	0.0	0.0	0.0	0.0	0.00	1
69.51	25.0	25.0	0.0	0.0	0.0	0.0	0.0	0.00	1
69.98	37.5	37.5	0.0	0.0	0.0	0.0	0.0	0.00	1
70.44	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.00	1
70.51	53.0	53.0	0.0	0.0	0.0	0.0	0.0	0.00	1
71.48	75.0	75.0	0.0	0.0	0.0	0.0	0.0	0.00	1
72.15	87.5	87.5	0.0	0.0	0.0	0.0	0.0	0.00	1
72.92	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.00	1
73.71	112.5	112.5	0.0	0.0	0.0	0.0	0.0	0.00	1
74.56	125.0	125.0	0.0	0.0	0.0	0.0	0.0	0.00	1
75.00	131.0	131.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: BASIN4 DATE: 09-27-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
67.75	0.000	0.00	0.00	0.00
68.95	0.000	12.50	0.00	0.00
69.51	0.000	25.00	0.00	0.00
69.98	0.000	37.50	0.00	0.00
70.44	0.000	50.00	0.00	0.00
70.51	0.000	53.00	0.00	0.00
71.48	0.000	75.00	0.00	0.00
72.15	0.000	87.50	0.00	0.00
72.92	0.000	100.00	0.00	0.00
73.71	0.000	112.50	0.00	0.00
74.56	0.000	125.00	0.00	0.00

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-27-1999 FILE DATE: 09-27-1999
CURRENT TIME: 09:15:25 FILE NAME: BASIN4

PERFORMANCE CURVE FOR CULVERT 1 - 2(2.50 (ft) BY 2.50 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	67.75	0.00	-0.03	0-NF	0.00	0.00	0.00	0.11	0.00	0.00
12.50	68.95	1.12	1.20	2-M2c	0.97	0.82	0.82	0.36	4.44	0.00
25.00	69.51	1.68	1.76	2-M2c	1.46	1.18	1.18	0.60	5.47	0.00
37.50	69.98	2.12	2.23	2-M2c	1.98	1.47	1.47	0.86	6.27	0.00
50.00	70.44	2.53	2.69	2-M2c	2.50	1.70	1.70	1.09	7.04	0.00
53.00	70.51	2.63	2.76	2-M2c	2.50	1.75	1.75	1.15	7.20	0.00
75.00	71.48	3.52	3.73	2-M2c	2.50	2.06	2.06	1.59	8.69	0.00
87.50	72.15	4.15	4.40	2-M2c	2.50	2.19	2.19	1.84	9.62	0.00
100.00	72.92	4.87	5.17	2-M2c	2.50	2.32	2.32	2.08	10.57	0.00
112.50	73.71	5.67	5.96	2-M2c	2.50	2.46	2.46	2.21	11.57	0.00
125.00	74.56	6.55	6.81	6-FFc	2.50	2.50	2.50	2.33	12.73	0.00

El. inlet face invert 67.75 ft El. outlet invert 67.61 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	67.75 ft
OUTLET STATION	72.40 ft
OUTLET ELEVATION	67.61 ft
NUMBER OF BARRELS	2
SLOPE (V/H)	0.0019
CULVERT LENGTH ALONG SLOPE	72.40 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	GROOVED END IN HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 09-27-1999 FILE DATE: 09-27-1999
CURRENT TIME: 09:15:25 FILE NAME: BASIN4

TAILWATER

TAILWATER RATING CURVE

FLOW (cfs)	W.S.E.(ft)	DEPTH (ft)
0	67.72	0.11
13	67.97	0.36
25	68.21	0.60
38	68.47	0.86
50	68.70	1.09
53	68.76	1.15
75	69.20	1.59
88	69.45	1.84
100	69.69	2.08
113	69.82	2.21
125	69.94	2.33

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	16.00 ft
CREST LENGTH	76.00 ft
OVERTOPPING CREST ELEVATION	75.00 ft

CURRENT DATE: 09-23-1999
CURRENT TIME: 09:46:17

FILE DATE: 09-23-1999
FILE NAME: BASIN5

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

CULV NO.	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	18.00	16.46	215.51	1 RCB	10.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: BASIN5 DATE: 09-23-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
20.99	150.0	150.0	0.0	0.0	0.0	0.0	0.0	0.00	1
21.45	180.0	180.0	0.0	0.0	0.0	0.0	0.0	0.00	1
21.94	210.0	210.0	0.0	0.0	0.0	0.0	0.0	0.00	1
22.45	240.0	240.0	0.0	0.0	0.0	0.0	0.0	0.00	1
23.01	270.0	270.0	0.0	0.0	0.0	0.0	0.0	0.00	1
23.63	300.0	300.0	0.0	0.0	0.0	0.0	0.0	0.00	1
24.30	330.0	330.0	0.0	0.0	0.0	0.0	0.0	0.00	1
25.03	360.0	360.0	0.0	0.0	0.0	0.0	0.0	0.00	1
25.42	375.0	375.0	0.0	0.0	0.0	0.0	0.0	0.00	1
26.68	420.0	420.0	0.0	0.0	0.0	0.0	0.0	0.00	1
26.68	450.0	420.0	0.0	0.0	0.0	0.0	0.0	657.53	4
25.00	448.7	448.7	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: BASIN5 DATE: 09-23-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
20.99	0.000	150.00	0.00	0.00
21.45	0.000	180.00	0.00	0.00
21.94	0.000	210.00	0.00	0.00
22.45	0.000	240.00	0.00	0.00
23.01	0.000	270.00	0.00	0.00
23.63	0.000	300.00	0.00	0.00
24.30	0.000	330.00	0.00	0.00
25.03	0.000	360.00	0.00	0.00
25.42	0.000	375.00	0.00	0.00
26.68	0.000	420.00	0.00	0.00
26.68	0.000	450.00	-627.53	-139.45

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

PERFORMANCE CURVE FOR CULVERT 1 - 1(10.00 (ft) BY 3.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
150.00	20.99	2.99	1.67	1-S2n	1.36	1.92	1.32	2.43	11.40	2.40
180.00	21.45	3.45	2.22	1-S2n	1.54	2.16	1.58	2.67	11.37	2.53
210.00	21.94	3.94	2.83	1-S2n	1.71	2.40	1.77	2.89	11.88	2.64
240.00	22.45	4.45	3.49	4-FFt	1.87	2.62	1.87	3.09	12.85	2.74
270.00	23.01	5.01	4.20	4-FFt	2.02	2.84	2.02	3.28	13.35	2.83
300.00	23.63	5.63	4.95	4-FFt	2.17	3.00	2.17	3.46	13.80	2.91
330.00	24.30	6.30	5.75	4-FFt	2.32	3.00	2.32	3.63	14.22	2.98
360.00	25.03	7.03	6.60	4-FFt	2.46	3.00	2.46	3.78	14.61	3.06
375.00	25.42	7.42	7.04	4-FFt	2.53	3.00	2.53	3.86	14.80	3.09
420.00	26.68	8.68	8.46	4-FFt	3.00	3.00	2.53	4.08	16.57	3.19
420.00	26.68	8.68	8.60	4-FFt	3.00	3.00	2.53	4.22	16.57	3.25

El. inlet face invert 18.00 ft El. outlet invert 16.46 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	18.00 ft
OUTLET STATION	215.50 ft
OUTLET ELEVATION	16.46 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0071
CULVERT LENGTH ALONG SLOPE	215.51 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	BOX
BARREL SPAN	10.00 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	1:1 BEVEL (45 DEG. FLARE)
INLET DEPRESSION	NONE

```
*************************************************************************************
************************          TAILWATER          *******************************
*************************************************************************************

******* REGULAR CHANNEL CROSS SECTION ****************
        BOTTOM WIDTH                                  16.00 ft
        SIDE SLOPE  H/V (X:1)                          4.0
        CHANNEL SLOPE V/H (ft/ft)                      0.001
        MANNING'S n (.01-0.1)                          0.020
        CHANNEL INVERT ELEVATION                      16.46 ft
        CULVERT NO.1 OUTLET INVERT ELEVATION          16.46 ft

******* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL
```

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
150.00	18.89	0.271	2.43	2.40	0.08
180.00	19.13	0.272	2.67	2.53	0.08
210.00	19.35	0.273	2.89	2.64	0.09
240.00	19.55	0.274	3.09	2.74	0.10
270.00	19.74	0.275	3.28	2.83	0.10
300.00	19.92	0.276	3.46	2.91	0.11
330.00	20.09	0.276	3.63	2.98	0.11
360.00	20.24	0.277	3.78	3.06	0.12
375.00	20.32	0.277	3.86	3.09	0.12
420.00	20.54	0.278	4.08	3.19	0.13
450.00	20.68	0.279	4.22	3.25	0.13

```
*************************************************************************************
************************  ROADWAY OVERTOPPING DATA  *********************************
*************************************************************************************

     ROADWAY SURFACE                                  PAVED
     EMBANKMENT TOP WIDTH                             16.00 ft
     CREST LENGTH                                    100.00 ft
     OVERTOPPING CREST ELEVATION                      25.00 ft

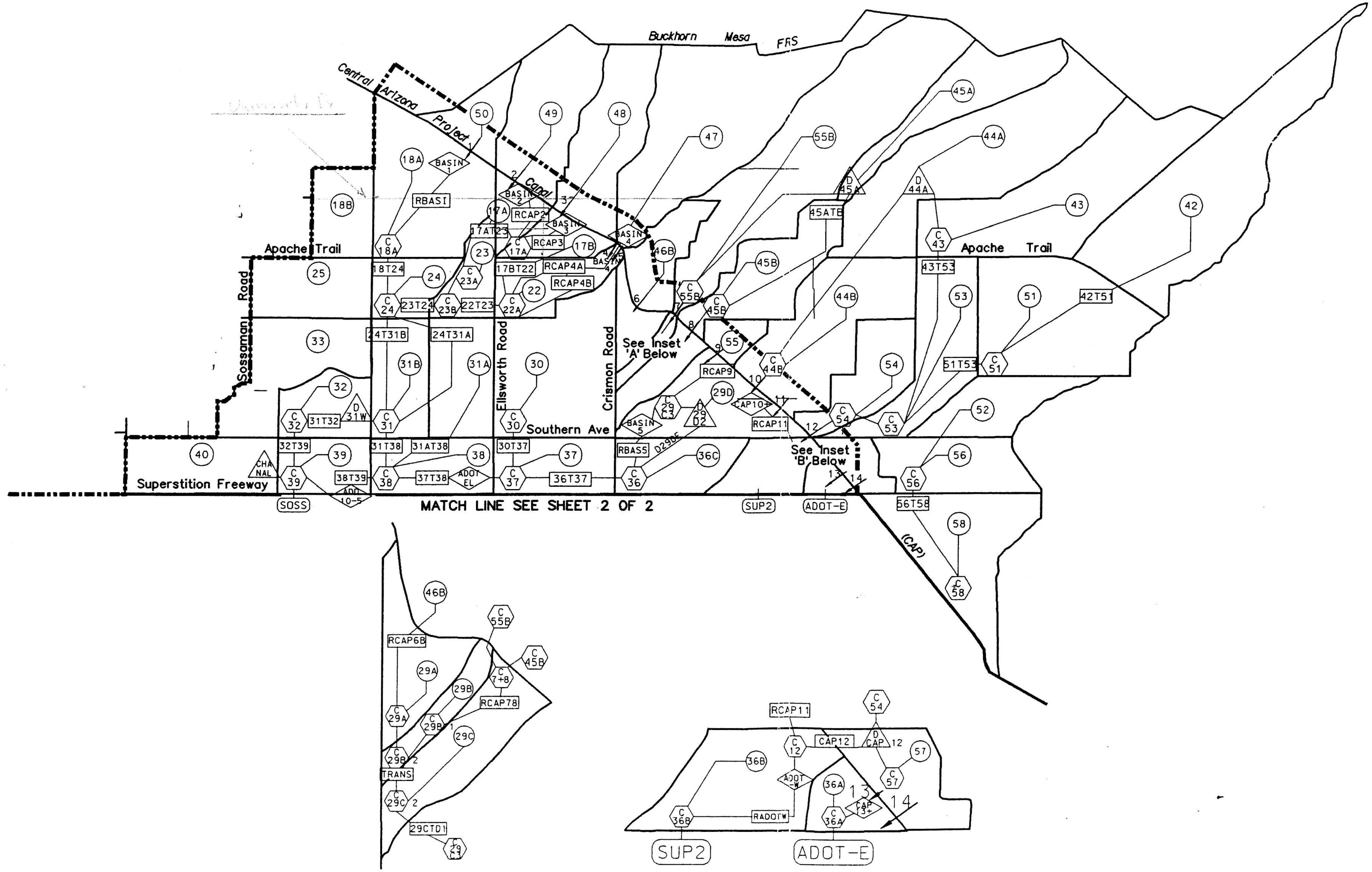
*************************************************************************************
```

3. HEC-1 Subbasin map from SE Mesa ADMP

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Southeast Mesa Area Drainage Master Plan

F.C.D. CONTRACT NO. 95-32



INSET 'A'

INSET 'B'

NOTE:
SCHEMATIC BASED UPON INFORMATION PROVIDED BY THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

STUDY BOUNDARY	
SUB-BASIN BOUNDARY	
DIVERT HYDROGRAPH	DT TRW
SUB-BASIN RUNOFF	90A
ROUTE HYDROGRAPH	6AT7B
COMBINE HYDROGRAPH	CP 90A
OUTFLOW FROM STUDY AREA	CAP5
DETENTION BASIN	ADOT -W
CAP OVERCHUTE	5

N

2500 0' 2500 5000

SCALE: 1" - 5000'

DIBBLE & ASSOCIATES CONSULTING ENGINEERS

Since 1962

Hoskin Engineering Consultants

HEC-1 SCHEMATIC NORTH OF SUPERSTITION FREEWAY

SHEET 1 OF 2

4. HEC-1 Summary output

```
1***************************************             ***************************************
 *                                     *             *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *             *   U.S. ARMY CORPS OF ENGINEERS      *
 *              JUL   1997              *             *   HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *             *         609 SECOND STREET           *
 *                                     *             *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   28SEP99  TIME  11:05:44  *             *         (916) 756-1104              *
 *                                     *             *                                     *
***************************************             ***************************************



                    X     X  XXXXXXX   XXXXX         X
                    X     X  X        X     X       XX
                    X     X  X        X              X
                    XXXXXXX  XXXX     X      XXXXX   X
                    X     X  X        X              X
                    X     X  X        X     X        X
                    X     X  XXXXXXX   XXXXX        XXX



THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                     HEC-1 INPUT                                        PAGE  1

      LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

         1          ID   90% DESIGN FILE FOR DETENTION BASINS 1 THROUGH 5
         2          ID       FILE REVISED SEP., 1999 BY DIBBLE & ASSOCIATES - DCF
         3          ID
         4          ID   EAST MESA AREA DRAINAGE MASTER PLAN
         5          ID   AREA NORTH OF SUPERSTITION FREEWAY
         6          ID
         7          ID   FINAL REVISIONS MAY. 1998 - D&A
         8          ID
         9          ID   REVISED BY VALERIE SWICK, OCTOBER-NOVEMBER 1996
        10          ID   TO INCORPORATE THE SUPERSTITION STRUCTURES AND COMBINE MODELS
        11          ID
        12          ID   REVISED BY DAVID DEGERNESS, NOVEMBER 1997 INCORPORATING DIBBLE SUPPLIED
        13          ID   DETENTION BASINS AND CHANNEL ROUTINGS DOWNSTREAM OF THE CAP
        14          ID
        15          ID   FILE NORTHPL1.H1I now is named NDIBF.DAT
        16          ID    BASED ON GENERAL PLAN FOR FUTURE MESA LAND USE (1997)
        17          ID
        18          ID   THIS MODEL REPRESENTS THE FUTURE CONDITION OF THE WATERSHED (BASED ON 1997
        19          ID     MAG FUTURE LAND USE FOR THE MESA AREA)
        20          ID   TOTAL DRAINAGE AREA IS APPROXIMATELY 17 SQ. MI.
```

```
          ID
          ID   100-YEAR 24-HOUR FREQUENCY
          ID
          ID
          ID   METHODOLOGY
          ID   THE US CORPS OF ENGINEERS FLOOD HYDROLOGY MODEL HEC-1 DATED JUL.1997 VER 4.1
          ID   SCS TYPE II RAINFALL DISTRIBUTION
          ID   S-GRAPH HYDROGRAPH
          ID   GREEN AND AMPT INFILTRATION EQUATION USED FOR CALCULATING LOSSES
          ID   NORMAL DEPTH STORAGE CHANNEL ROUTING
          ID   APPROXIMATE DIRECTION, LOCATION, AND LENGTH OF THE WASHES HAVE BEEN
          ID   EVALUATED BASED ON FIELD INVESTIGATION, USGS MAPS, LANDIS AERIAL SURVEYS
          ID   DATED 1994
          ID   THE NOAA TECHNICAL MEMORANDUM NOAA ATLAS 2 DEPTH AREA RATIOS
          ID
          ID   INITIAL STUDY PERFORMED BY LISA C. YOUNG
          ID   REVIEWED BY VALERIE A. SWICK
          ID   HYDROLOGY BRANCH ENGINEERING DIVISION, FLOOD CONTROL
          ID   DISTRICT OF MARICOPA COUNTY, DECEMBER - JULY 1995.
          ID
          ID   ASSUMED VELOCITY OF 1 FT/SEC FOR SHEET FLOW, 2 FT/SEC FOR WASH/NATURAL
          ID   CHANNEL, 3 FT/SEC FOR ROAD AND GRASS CHANNEL, 10 FT/SEC FOR CONCRETE CHANNEL
          ID
          ID   DIVERSIONS FOR EACH BASIN ARE TO ACCOUNT FOR RETENTION DUE TO DEVELOPMENT.
          ID   VOLUMES (AC-FT) WERE OBTAINED FROM RUNNING THE FUTURE CONDITIONS MODEL WITH
          ID   THE 100 YR 2 HR STORM. ADJUSTMENTS WERE MADE FOR EACH SUBBASIN DEPENDING ON
          ID   THE AMOUNT OF CURRENT DEVELOPMENT, WHICH IN MOST CASES DOES NOT RETAIN THE
          ID   100 YR 2 HR STORM EVENT. THE FUTURE VOLUME WAS REDUCED BY 20% TO ALLOW FOR
          ID   SMALL AREAS IN THE SUBBASIN THAT DO NOT FLOW INTO THE RETENTION BASINS.
          ID
          ID   DDM MCUHP2 MESA AREA DRAINAGE MASTER PLAN
          *DIAGRAM
          IT       5  1APR97            500
          IO       5
          IN      15
1                                      HEC-1 INPUT                                              PAGE  2

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          JD    3.60    0.01
          PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
          PC    .110    .115    .120    .126    .135    .142    .150    .158    .166    .175
          PC    .184    .195    .208    .224    .243    .266    .318    .479    .678    .716
          PC    .743    .764    .781    .795    .808    .818    .828    .837    .844    .851
          PC    .858    .865    .871    .877    .883    .889    .895    .900    .905    .910
          PC    .915    .919    .923    .927    .931    .935    .939    .943    .947    .951
          PC    .954    .957    .960    .963    .966    .969    .972    .975    .978    .981
          PC    .984    .987    .990    .993    .996    .999   1.000
          JD    3.58       1
          JD    3.49       5
          JD    3.38    10.0
          JD    3.24    30.0
          JD    3.10    60.0
          JD    3.05    90.0
          *
```

```
 72          KK      42
 73          KM   BASIN 42
 74          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 75          KM    L=       3.1  Lca=       1.5   S=   60.9  Kn= .046  LAG=  55.2
 76          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 77          BA    1.75
 78          LG     .24      .25    5.00      .31   31.00
 79          UI    107.     107.    219.     392.    505.    582.    656.    758.    877.   1143.
 80          UI   1368.    1145.    967.     854.    736.    640.    544.    461.    335.    208.
 81          UI    183.     175.    117.     107.     83.     33.     33.     33.     33.     33.
 82          UI     33.      33.      0.       0.      0.      0.      0.      0.      0.      0.
 83          UI      0.       0.      0.       0.      0.      0.      0.      0.      0.      0.
             *

 84          KK     D42
 85          KM    RETAIN 100 YEAR 2 HOUR, (42% for FUTURE DEVELOPMENT)
 86          DT     D42       54
 87          DI       0    10000
 88          DQ       0    10000
             *

 89          KK   42T51
 90          RS      10     FLOW      -1
 91          RC    0.08    0.055    0.08    7000   0.011
 92          RX       0      600     700     710     720     730     830    1630
 93          RY      10        5       3       0       0       3       5      10
             *

 94          KK      51
 95          KM   BASIN 51
 96          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 97          KM    L=       1.5  Lca=        .8   S=   54.4  Kn= .042  LAG=  29.4
 98          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 99          BA    1.24
100          LG     .21      .25    4.60      .41   47.00
101          UI    142.     372.    690.     888.   1187.   1735.   1362.   1051.    796.    556.
1                                    HEC-1 INPUT                                                PAGE  3

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

102          UI    284.     215.    142.      58.     44.     44.     44.      0.      0.      0.
103          UI      0.       0.      0.       0.      0.      0.      0.      0.      0.      0.
             *

104          KK     D51
105          KM    RETAIN 100 YEAR 2 HOUR, (50% FOR FUTURE DEVELOPMENT)
106          DT     D51       50
107          DI       0    10000
108          DQ       0    10000
             *

109          KK     C51
110          KM   COMBINE FLOWS FROM 42 AND 51
111          HC       2
             *

112          KK   51T53
113          KM    ROUTE 51 TO 53 VIA SHEET FLOW TO THE SOUTHWEST
```

```
114            RS        9    FLOW      -1
115            RC     0.08   0.055    0.08    8000    0.01
116            RX        0     100     200     210     220     230     330     430
117            RY        7       6       5       0       0       5       6       7
               *

118            KK      44A
119            KM    BASIN 44A
120            KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
121            KM     L=       2.8  Lca=       1.4    S=   54.5  Kn= .052  LAG=  58.2
122            KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
123            BA     1.59
124            LG      .24     .25    4.50     .42   30.00
125            UI      92.     92.    160.    329.    417.    484.    543.    616.    707.    858.
126            UI    1118.   1130.    927.    803.    716.    619.    541.    465.    394.    289.
127            UI     184.    160.    151.    113.     92.     92.     30.     28.     28.     28.
128            UI      28.     28.     28.     28.      0.      0.      0.      0.      0.      0.
129            UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

130            KK     D44A
131            KM     RETAIN 100 YEAR 2 HOUR, (50% FOR FUTURE DEVELOPMENT)
132            DT     D44A      48
133            DI        0   10000
134            DQ        0   10000
               *

135            KK   DIV44A
136            KM    DIVERT 80% OF THE LOW FLOWS WEST AND SOUTH TO 44B, 70% OF HIGH FLOWS
137            DT     D44A
138            DI        0     500    1000    3000
139            DQ        0     400     750    2100
               *
1                                      HEC-1 INPUT                                      PAGE  4

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

140            KK       43
141            KM    BASIN 43
142            KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
143            KM     L=       1.9  Lca=        .9    S=   58.2  Kn= .041  LAG=  33.9
144            KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
145            BA     1.42
146            LG      .19     .25    4.70     .40   49.00
147            UI     142.    284.    610.    790.    981.   1325.   1738.   1348.   1081.    850.
148            UI     659.    402.    244.    196.    142.     59.     43.     43.     43.     43.
149            UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
150            UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

151            KK      D43
152            KM     RETAIN 100 YEAR 2 HOUR, (53% FOR FUTURE DEVELOPMENT
153            DT      D43      62
154            DI        0   10000
155            DQ        0   10000
               *
```

```
156              KK      C43
157              KM      COMBINE 43 WITH DIVERTED FLOWS FROM 45A
158              HC        2
                 *

159              KK    43T53
160              KM     ROUTED BY SHEET FLOW  AND FLOW IN STREETS
161              RS       12     FLOW      -1
162              RC     0.08    0.055    0.08    11250    0.009
163              RX        0      200     300      310      315      325      335      535
164              RY        6        3       2        0        0        2        3        6
                 *

165              KK       53
166              KM    BASIN 53
167              KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
168              KM     L=       1.9  Lca=        .9   S=    63.5  Kn= .046  LAG=  37.4
169              KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
170              BA      .78
171              LG      .23      .25    5.20      .31   36.00
172              UI      71.     116.    278.     367.    443.    547.    777.    836.    639.    527.
173              UI     422.     338.    228.     124.    116.     71.     57.     22.     22.     22.
174              UI      22.      22.      0.       0.      0.      0.      0.      0.      0.      0.
175              UI       0.       0.      0.       0.      0.      0.      0.      0.      0.      0.
                 *

176              KK      D53
177              KM     RETAIN 100 YEAR 2 HOUR, (45% FOR FUTURE DEVELOPMENT)
178              DT      D53       27
179              DI        0    10000
180              DQ        0    10000
                 *
1                                          HEC-1 INPUT                                          PAGE  5

LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


181              KK      C53
182              KM      COMBINE 53, 43 AND 51
183              HC        3
                 *

184              KK       54
185              KM    BASIN 54
186              KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
187              KM     L=       1.5  Lca=        .8   S=    42.8  Kn= .059  LAG=  44.0
188              KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
189              BA      .49
190              LG      .25      .25    5.40      .27   31.00
191              UI      37.      37.    128.     171.    208.    242.    291.    389.    470.    372.
192              UI     311.     262.    217.     181.    129.     77.     63.     53.     37.     29.
193              UI      11.      11.     11.      11.     11.     11.      0.      0.      0.      0.
194              UI       0.       0.      0.       0.      0.      0.      0.      0.      0.      0.
                 *

195              KK      D54
196              KM     RETAIN 100 YEAR 2 HOUR, (31% FOR FUTURE DEVELOPMENT)
197              DT      D54       11
```

```
 198          DI       0   10000
 199          DQ       0   10000
              *

 200          KK     C54
 201          KM   COMBINE 53 AND 54
 202          HC       2
              *

 203          KK  DCAP12
 204          KM   FLOWS SPLIT AT CAP AND SOUTHERN AVE, RATING CURVES BASED ON THREE 5X7 CBCs
 205          KM   PART OF THE FLOW GOES SOUTH ACROSS SOUTHERN TO CAP 13 +14
 206          DT   SOUTH
 207          DI       0     450    1000    2500
 208          DQ       0       0     275    1025
              *

 209          KK   CAP12
 210          RS       1    FLOW      -1
 211          SV       0   0.238    2.72   13.37   36.82   36.82
 212          SE  1563.6    1564    1566    1568    1570    1571
 213          SQ       0      30     188     574    1098    1200
              *
              * ********SEQUENCE CHANGED BY HOSKIN ENGINEERING**********
              * D44A TO C36B ADDED IN HERE***********

 214          KK   DR44A
 215          KM   RETRIEVE DIVERTED FLOWS FROM 44A
 216          DR    D44A
              *
1                                       HEC-1 INPUT                                        PAGE  6

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 217          KK   44ATB
 218          KM   ROUTE 44A TO 44B, STREET AND SHEET FLOW THROUGH NEIGHBORHOODS
 219          KM   NO CURB AND GUTTER
 220          RS      15    FLOW      -1
 221          RC   0.055   0.045   0.055    9000   0.008
 222          RX       0     500    1010  1012.5  1022.5  1027.5  1532.5  2037.5
 223          RY       6     5.5       3       0       0       3     5.5       6
              *

 224          KK     44B
 225          KM   BASIN 44B
 226          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 227          KM    L=       1.1  Lca=       .9    S=    64.8  Kn= .056  LAG=  35.8
 228          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 229          BA    1.06
 230          LG     .23     .19    6.60     .17   39.00
 231          UI     99.    179.    407.    533.    650.    826.   1200.   1060.    835.    673.
 232          UI    536.    402.    223.    168.    122.     99.     31.     30.     30.     30.
 233          UI     30.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 234          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 235          KK    D44B
```

```
[illegible]         KM    RETAIN 100 YEAR 2 HOUR, (27% FOR FUTURE D[illegible]PMENT)
 237         DT    D44B       24
 238         DI       0    10000
 239         DQ       0    10000
             *

 240         KK    C44B
 241         KM   COMBINE 44A WITH 44B
 242         HC       2
             *

 243         KK  CAP10+
 244         KM   COMBINED CAP 10 AND 11, SAME CONTRIBUTING AREA AND HYDRAULICALLY CONNECTED
 245         KM   STORAGE AND DISCHARGES WERE ADDED AT THE APPROPRIATE ELEVATIONS
 246         RS       1     FLOW      -1
 247         SV       0     0.43   3.397  11.626   66.53
 248         SE  1562.4     1564    1566    1568    1570
 249         SQ       0      180     736    1684    2754
             *

 250         KK  RCAP11
 251         KM   ROUTE FLOWS FROM CAP OVERCHUTE #10 AND 11 TO ADOT WEST BASIN
 252         RK    2400  0.0003   0.013             TRAP      20       3
             *

 253         KK     C12
 254         KM   COMBINE ROUTED FLOWS FROM CAP #10 AND 11 WITH CAP #12
 255         HC       2
             *
1                                      HEC-1 INPUT                                        PAGE  7

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 256         KK  ADOT-W
 257         KM   WEST ADOT DETENTION BASIN 4189, WEST OF CAP AND NORTH OF SUPERSTITION FREEWAY
 258         KM   FROM EASTERN MARICOPA COUNTY AREA DRAINAGE MASTER STUDY, FCD OF MARICOPA
 259         KM         COUNTY
 260         KM         AND SUPERSTITION FREEWAY COMPREHENSIVE OFFSITE DRAINAGE PLAN,
 261         KM              A-N WEST, INC., FEBRUARY, 1987.
 262         RS       1     ELEV      36
 263         SV       0    12.35    63.5   210.3   367.5   535.1  667.85  713.55
 264         SE      36       38      40      44      48      52      55      56
 265         SL    36.0    28.27      .6      .5
 266         SS      55      200     2.6     1.5
             *

 267         KK  RADOTW
 268         KM   ROUTE FLOWS IN CONCRETE CHANNEL TO CULVERTS UNDER SUPERSTITION FREEWAY
 269         RS    1.75     FLOW      -1
 270         RC    .035    0.012    .035    4500   .0033
 271         RX       0      500    1000    1012    1020    1032    1532    2032
 272         RY      13     12.5      12       0       0      12    12.5      13
             *

 273         KK     36B
 274         KM   BASIN 36B
 275         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
```

```
 276          KM    L=      1.0  Lca=       .5   S=   45.0  Kn= .087  LAG=  46.7
 277          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 278          BA     .32
 279          LG     .17      .15    7.30     .17   22.00
 280          UI     23.      23.     70.    100.    121.    141.    167.    205.    282.    260.
 281          UI    210.     181.    151.    128.    106.     76.     46.     39.     34.     23.
 282          UI     21.       7.      7.      7.      7.      7.      7.      0.      0.      0.
 283          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 284          KK    D36B
 285          KM    RETAIN 100 YEAR 2 HOUR, (80% FOR FUTURE DEVELOPMENT)
 286          DT    D36B      20
 287          DI       0   10000
 288          DQ       0   10000
              *

 289          KK    C36B
 290          KM   COMBINE FLOWS FROM ADOT BASIN W WITH SUB36
 291          HC       2
 292          ZW     A=ADOT WEST BASIN  B=AT SUPERSTITION  C=FLOW  E=5MIN F=100YR
              *

 293          KK  RSOUTH
 294          KM   RETRIEVE FLOWS CROSSING SOUTHERN AT CAP
 295          DR   SOUTH
              *
1                                          HEC-1 INPUT                                              PAGE  8

     LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 296          KK      57
 297          KM   BASIN 57
 298          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 299          KM    L=       .3  Lca=       .1   S=   35.7  Kn= .090  LAG=  19.2
 300          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 301          BA     .18
 302          LG     .15      .23    5.40     .27   58.00
 303          UI     40.     140.    213.    353.    271.    179.     92.     46.     22.     10.
 304          UI     10.       0.      0.      0.      0.      0.      0.      0.      0.      0.
 305          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 306          KK     D57
 307          KM    RETAIN 100 YEAR 2 HOUR, (93% FOR FUTURE DEVELOPMENT)
 308          DT     D42      15
 309          DI       0   10000
 310          DQ       0   10000
              *

 311          KK     C57
 312          KM   COMBINE FLOWS CROSSING SOUTHERN AT CAP WITH THOSE OF SUBBASIN 57
 313          HC       2
              *

 314          KK  CAP13+
 315          KM    CAP OVERCHUTES 13 AND 14 WERE COMBINED SINCE THY HAVE COMMON DRAINAGE
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```
              KM     STORAGE AND DISCHARGES WERE ADDED AT SPE[illegible] ELEVATIONS
 317          RS        1     FLOW       -1
 318          SV        0    1.198    2.601    5.746
 319          SE     1564     1567     1568     1570
 320          SQ        0      180      500     1143
              *

 321          KK      36A
 322          KM    BASIN 36A
 323          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 324          KM     L=         .3  Lca=        .2   S=    44.1  Kn= .100  LAG=  23.7
 325          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 326          BA      .10
 327          LG      .16      .24     6.00      .27    28.00
 328          UI      14.      50.      78.     109.     164.     121.      87.      59.      28.      18.
 329          UI      10.       4.       4.       4.       0.       0.       0.       0.       0.       0.
 330          UI       0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
              *
              * KK   D36A
              * KM   RETAIN 100 YEAR 2 HOUR, (36A IS A DETENTION BASIN, THEREFORE THE RETENTION
              * KM   REQUIREMENT WAS TAKEN OUT
              * DT   D36A        5
              * DI      0    10000
              * DQ      0    10000
              *
```

1   HEC-1 INPUT   PAGE 9

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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 331          KK     C36A
 332          KM    COMBINE FLOWS FROM CAP OVERCHUTES INTO ADOT EAST DETENTION BASIN
 333          HC        2
              *

 334          KK   ADOT-E
 335          KM    EAST ADOT DETENTION BASIN 4105, WEST OF CAP AND NORTH OF SUPERSTITION
 336          KM    FROM EASTERN MARICOPA COUNTY AREA DRAINAGE MASTER STUDY, FCD OF MARICOPA
 337          KM         COUNTY
 338          KM         AND SUPERSTITION FREEWAY COMPREHENSIVE OFFSITE DRAINAGE PLAN,
 339          KM             A-N WEST, INC., FEBRUARY, 1987.
 340          RS        1     ELEV    49.5
 341          SV        0      300     340
 342          SE     49.5       60      61
 343          SL     49.5    28.27      .6       .5
 344          SS       60      200     2.6      1.5
 345          ZW     A=ADOT EAST BASIN B=AT SUPERSTITION  C=FLOW  E=5MIN F=100YR
              *

 346          KK       52
 347          KM    BASIN 52
 348          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 349          KM     L=        1.6  Lca=        .7   S=    54.9  Kn= .041  LAG=  29.7
 350          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 351          BA      .43
 352          LG      .20      .19     6.60      .18    45.00
 353          UI      49.     126.     235.     303.     402.     594.     479.     370.     280.     201.
 354          UI     104.      79.      49.      25.      15.      15.      15.       0.       0.       0.
```

```
355          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

356          KK     D52
357          KM    RETAIN 100 YEAR 2 HOUR  (68% FOR FUTURE DEVELOPMENT)
358          DT     D52      26
359          DI       0   10000
360          DQ       0   10000
             *

361          KK      56
362          KM    BASIN 56
363          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
364          KM    L=        .9  Lca=       .5   S=   57.9  Kn= .036  LAG=  18.2
365          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
366          BA     .55
367          LG     .18     .15    7.30     .14   54.00
368          UI    139.    473.    735.   1156.    794.    505.    215.    121.     41.     31.
369          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
370          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
1
                                   HEC-1 INPUT                                          PAGE 10

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

371          KK     D56
372          KM    RETAIN 100 YEAR 2 HOUR (48% FOR FUTURE DEVELOPMENT)
373          DT     D56      25
374          DI       0   10000
375          DQ       0   10000
             *

376          KK     C56
377          KM     COMBINE 52 AND 56 BEHIND THE STOCK POND
378          KM     ASSUMING STOCK POND IS EFFECTIVE, DIVERTS FLOWS SOUTH ACROSS SUPERSTITION
379          KM     STORAGE ROUTING WAS NOT PERFORMED, CHANNEL/PIPE CROSSING
380          HC       2
             *

381          KK    56T58
382          KM    ROUTE VIA SHEET FLOW AND NATURAL WASH TO A POINT JUST NORTH OF CAP 1A
383          RS       5    FLOW      -1
384          RC    0.08   0.055    0.08    4500    0.01
385          RX       0     200     300     310     320     330     430     530
386          RY       6       4       3       0       0       3       4       6
             *

387          KK      58
388          KM    BASIN 58
389          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
390          KM    L=       1.1  Lca=       .5   S=   50.4  Kn= .083  LAG=  46.0
391          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
392          BA     .95
393          LG     .12     .24    5.60     .29   56.00
394          UI     70.     70.    219.    308.    373.    433.    516.    644.    877.    764.
395          UI    623.    536.    446.    373.    308.    213.    123.    116.     90.     70.
396          UI     49.     21.     21.     21.     21.     21.     21.      0.      0.      0.
```

```
                 UI      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *

   398           KK     D58
   399           KM    RETAIN 100 YEAR 2 HOUR (87% FOR FUTURE DEVELOPMENT)
   400           DT     D58      73
   401           DI       0   10000
   402           DQ       0   10000
                 *

   403           KK     C58
   404           KM   COMBINE 58 WITH 56
   405           KM   NO DATA AVAILABLE ON CAP OVERCHUTE SIZING
   406           HC       2
                 *

   407           KK   CLEAR
   408           KM   **********FOLLOWING COMBINE TO CLEAR HYDROGRAPHS ONLY*******
   409           KM   **********NOTE THAT THESE HYDROGRAPHS DO NOT PHYSICALLY COMBINE
   410           KM   **********AT THIS LOCATION. ***********************************
   411           HC       3
                 *
```



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LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   412           KK     46B
   413           KM   BASIN 46B
   414           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
   415           KM    L=       1.4  Lca=       .7   S=    42.9  Kn= .073  LAG=  51.1
   416           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
   417           BA     .36
   418           LG     .21     .24    4.00     .56   51.00
   419           UI     24.     24.     59.     95.    118.    135.    156.    182.    232.    298.
   420           UI    262.    217.    189.    161.    138.    117.     94.     61.     42.     39.
   421           UI     31.     24.     21.      7.      7.      7.      7.      7.      7.      7.
   422           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
   423           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *

   424           KK    D46B
   425           KM    RETAIN 100 YEAR 2 HOUR, (16% FOR FUTURE DEVELOPMENT)
   426           DT     D46       5
   427           DI       0   10000
   428           DQ       0   10000
                 *

   429           KK    CAP6
   430           RS       1    FLOW      -1
   431           SV       0   0.236   1.627   8.021
   432           SE  1556.2    1558    1560    1562
   433           SQ       0      52     180     350
                 *

   434           KK  RCAP6B
   435           KM   CHANNEL PARAMETERS TAKEN FROM PLANS BY AMERICAN ENGINEERING
   436           KM   FOR THE SUPERSTITION SKYLINE HIGH SCHOOL.
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 437          KM   FLOW IS ROUTED ALONG THE TRANSMISSION LINE CORRIDOR
 438          KM   ROUTE CONCENTRATION POINT CAP#6 TO SUBBASIN 29A.
 439          RS      2    FLOW      -1
 440          RC   .013    .013    .013    1800    .002
 441          RX      0      39      40    45.5    53.5      59      60      99
 442          RY    6.5     5.5     5.5       0       0     6.5     6.5     6.5
              *

 443          KK    29A
 444          KM   BASIN 29A
 445          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 446          KM    L=       .9  Lca=       .4   S=   41.2  Kn= .107  LAG=  49.5
 447          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 448          BA    .18
 449          LG    .21     .24    4.00     .58   29.00
 450          UI    12.     12.     33.     51.     63.     72.     84.     99.    131.    157.
 451          UI   127.    107.     93.     78.     66.     56.     40.     24.     21.     19.
 452          UI    12.     12.      5.      4.      4.      4.      4.      4.      4.      0.
 453          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 454          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
1
                                        HEC-1 INPUT                                          PAGE 12

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 455          KK    D29A
 456          KM    RETAIN 100 YEAR 2 HOUR, (73% FOR FUTURE DEVELOPMENT)
 457          DT    D29A       9
 458          DI       0   10000
 459          DQ       0   10000
              *

 460          KK    C29A
 461          HC       2
              *

 462          KK    29B
 463          KM   BASIN 29B
 464          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 465          KM    L=       .8  Lca=       .5   S=   52.6  Kn= .092  LAG=  42.2
 466          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 467          BA    .08
 468          LG    .18     .25    4.00     .66   17.00
 469          UI     6.      7.     23.     31.     36.     43.     53.     74.     75.     59.
 470          UI    50.     41.     34.     27.     16.     11.     10.      6.      6.      2.
 471          UI     2.      2.      2.      2.      2.      0.      0.      0.      0.      0.
 472          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 473          KK    D29B
 474          KM    RETAIN 100 YEAR 2 HOUR, (98% FOR FUTURE DEVELOPMENT)
 475          DT    D29B       5
 476          DI       0   10000
 477          DQ       0   10000
              *

 478          KK    C29B
```

```
 479           KM   COMBINE FLOWS FROM CAP #7 OVERCHUTE AND SUBBASIN 29B
 480           HC       2
               *

 481           KK   TRANS
 482           KM   REACH PR-3 AND PR-2
 483           KM   ROUTE FLOW ALONG THE TRANSMISSION CORRIDOR
 484           KM   FROM SUBBASIN 29B TO THE PARKWOOD RANCH BASIN.
 485           RS       1    FLOW      -1
 486           RC    .045   .0416    .045    2500   .0050
 487           RX       0      10      21      51      91     121     131     137
 488           RY     5.8     4.8     4.8       0       0     4.8     4.8     5.8
               *

 489           KK     29C
 490           KM   BASIN 29C
 491           KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 492           KM     L=      .9  Lca=       .5   S=   58.8  Kn= .074  LAG=  34.7
 493           KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 494           BA     .23
 495           LG     .24     .25    5.70     .27   32.00
 496           UI     23.     43.     95.    124.    153.    199.    280.    226.    180.    143.
1                                          HEC-1 INPUT                                          PAGE 13

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 497           UI    113.     77.     41.     36.     23.     15.      7.      7.      7.      7.
 498           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 499           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

 500           KK     D29C
 501           KM     RETAIN 100 YEAR 2 HOUR, (98% FOR FUTURE DEVELOPMENT)
 502           DT     D29      17
 503           DI       0   10000
 504           DQ       0   10000
               *

 505           KK     29D
 506           KM    BASIN 29D
 507           KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 508           KM     L=     1.2  Lca=       .9   S=   40.7  Kn= .066  LAG=  47.8
 509           KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 510           BA     .21
 511           LG     .21     .25    4.90     .35   43.00
 512           UI     46.     46.    133.    196.    239.    275.    325.    390.    532.    552.
 513           UI    439.    375.    319.    270.    225.    177.    111.     80.     75.     51.
 514           UI     46.     26.     14.     14.     14.     14.     14.     14.      0.      0.
 515           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

 516           KK     D29D
 517           KM     RETAIN 100 YEAR 2 HOUR, (53% FOR FUTURE DEVELOPMENT)
 518           KM     RETENTION REVISED FOR PARKWOOD RANCH BASIN DESIGN
 519           DT     D29D      9
 520           DI       0   10000
 521           DQ       0   10000
               *
```

```
 522          KK    CP29D
 523          HC        3
              *

 524          KK     45A
 525          KM    BASIN 45A
 526          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 527          KM     L=       2.0  Lca=       1.0    S=    70.4  Kn= .079  LAG=   66.1
 528          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 529          BA      .62
 530          LG      .21      .25    4.00     .60   19.00
 531          UI      31.      31.     31.    101.    126.    150.    171.    187.    210.    238.
 532          UI     273.     346.    409.    353.    303.    269.    243.    213.    190.    166.
 533          UI     149.     120.     89.     56.     54.     52.     42.     31.     31.     22.
 534          UI      10.      10.     10.     10.     10.     10.     10.     10.     10.      0.
 535          UI       0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
 536          UI       0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
1                                      HEC-1 INPUT                                              PAGE 14

  LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 537          KK    D45A
 538          KM    RETAIN 100 YEAR 2 HOUR, (66% FOR FUTURE DEVELOPMENT)
 539          DT    D29A       24
 540          DI       0    10000
 541          DQ       0    10000
              *

 542          KK    D45A
 543          KM    DIVERT 75% OF THE FLOW SOUTH,THE REMAINDER ALONG UNIVERSITY TO NEXT SUBBASIN
 544          KM    CHANNEL ALONG UNIVERSITY, SOME SHEET FLOW IS DIVERTED
 545          DT    45ATB
 546          DI       0     5000
 547          DQ       0     4750
              *

 548          KK     55B
 549          KM    BASIN 55B
 550          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 551          KM     L=       3.5  Lca=       1.8    S=    48.6  Kn= .058  LAG=   79.5
 552          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 553          BA     1.86
 554          LG      .23      .25    4.10     .57   31.00
 555          UI      79.      79.     79.    141.    269.    319.    374.    413.    451.    490.
 556          UI     542.     600.    670.    821.    973.    999.    852.    753.    682.    628.
 557          UI     569.     510.    465.    413.    376.    325.    252.    192.    139.    136.
 558          UI     129.     124.     79.     79.     79.     54.     24.     24.     24.     24.
 559          UI      24.      24.     24.     24.     24.     24.     24.      0.      0.      0.
 560          UI       0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 561          KK    D55B
 562          KM    RETAIN 100 YEAR 2 HOUR, (73% FUTURE DEVELOPMENT)
 563          DT    D55B       92
 564          DI       0    10000
```

```
565           DQ       0   10000
              *

566           KK     C55B
567           KM    COMBINE 55B WITH DIVERTED FLOWS FROM 45A
568           HC       2
              *

569           KK     CAP7
570           KM    ROUTE THROUGH CAP#7
571           RS       1    FLOW      -1
572           SV       0   0.167   0.309   0.539   24.52   85.75
573           SE  1560.5    1563 1564.27    1566    1568    1570
574           SQ       0       0     225     460     756    1017
              *
1                                     HEC-1 INPUT                                   PAGE 15

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


575           KK    RD45A
576           KM    RETURN DIVERTED FLOWS FROM 45A
577           DR    45ATB
              *

578           KK    45ATB
579           KM    ROUTE REMAINDER OF FLOWS TO 45B
580           KM    STREET FLOW AND SHEET FLOW, NO DEFINED CHANNEL
581           RS      17    FLOW      -1
582           RC   0.055   0.035   0.055   10000   0.001
583           RX       0     500    1010  1012.5  1022.5  1027.5  1532.5  2037.5
584           RY       6     5.5       5       0       0       5     5.5       6
              *

585           KK      45B
586           KM    BASIN 45B
587           KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
588           KM     L=      1.9  Lca=        .9    S=   45.0  Kn= .052  LAG=  45.2
589           KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
590           BA     .66
591           LG     .22     .25    6.00     .22   50.00
592           UI     49.     49.    159.    219.    266.    309.    368.    482.    614.    516.
593           UI    425.    363.    302.    252.    202.    124.     86.     80.     53.     49.
594           UI     22.     15.     15.     15.     15.     15.      0.      0.      0.      0.
595           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

596           KK     D45B
597           KM     RETAIN 100 YEAR 2 HOUR, (42% FOR FUTURE DEVELOPMENT)
598           DT     D45B      24
599           DI       0   10000
600           DQ       0   10000
              *

601           KK     C45B
602           KM    COMBINE FLOWS FROM 45A AND 45B
603           HC       2
              *
```

```
 604          KK    CAP8
 605          KM   ROUTE THROUGH CAP OVERCHUTE #8
 606          RS        1     FLOW       -1
 607          SV        0    1.449    9.494    43.04
 608          SE   1562.1     1564     1566     1568
 609          SQ        0      120      436      935
              *

 610          KK    C7+8
 611          KM   COMBINE FLOW FROM OVERCHUTES #7 & #8
 612          KM   ROUTE FLOW FROM HERE THROUGH PARKWOOD RANCH
 613          HC        2
              *
1
                                    HEC-1 INPUT                                       PAGE 16

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 614          KK   R78-1
 615          KM   ROUTE FLOWS FROM CAP OVERCHUTES #7 & #8 TO PR1 SUB-BASIN
 616          RS        3     FLOW       -1
 617          RC     .035     .035     .035     1960     .007
 618          RX        0        8       40       48       68       79      108      116
 619          RY        6        4        2        0        0        2        4        6
              *

 620          KK  SUBPR1
 621          KM   NEW PARKWOOD RANCH SUB BASIN
 622          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 623          KM    L=        .3  Lca=        .1   S=   32.0  Kn= .050  LAG=   9.8
 624          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 625          BA      .02
 626          LG      .25      .25     4.70      .46    30.00
 627          UI      19.      61.      52.      17.       4.       0.       0.       0.       0.       0.
 628          UI       0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
              *

 629          KK  RETPR1
 630          KM   DIVERT FLOWS TO ACCOUNT FOR ON-SITE RETENTION
 631          DT   DIPR1     3.88
 632          DI        0    10000
 633          DQ        0    10000
              *

 634          KK   CPPR1
 635          KM   COMBINE FLOWS AFTER PR1
 636          HC        2
              *

 637          KK  RPR1-2
 638          KM   ROUTE FLOWS FROM SUB-BASIN PR1 TO SUB-BASIN PR2
 639          RS        2     FLOW       -1
 640          RC     .035     .035     .035     1960     .007
 641          RX        0        8       40       48       68       79      108      116
 642          RY        6        4        2        0        0        2        4        6
              *
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 643           KK   SUBPR2
 644           KM    KM NEW PARKWOOD RANCH SUB BASIN
 645           KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 646           KM     L=        .5  Lca=        .2   S=   33.3  Kn= .050  LAG=  14.9
 647           KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 648           BA      .08
 649           LG      .15      .25     4.7      .46       30
 650           UI      32.      99.     183.     157.      90.      34.      14.       6.       0.       0.
 651           UI       0.       0.      0.       0.       0.       0.       0.       0.       0.       0.
               *
1
                                         HEC-1 INPUT                                                 PAGE 17

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 652           KK   RETPR2
 653           KM    DIVERT FLOWS TO ACCOUNT FOR ON-SITE RETENTION
 654           DT    DIPR2      5.1
 655           DI        0   10000
 656           DQ        0   10000
               *

 657           KK    CPPR2
 658           KM    COMBINE FLOWS AFTER PR2
 659           HC        2
               *

 660           KK   RPR2-3
 661           KM    ROUTE FLOWS FROM SUB-BASIN PR2 TO SUB-BASIN PR3
 662           RS        2    FLOW      -1
 663           RC     .022     .022     .022     1374     .002
 664           RX        0        6       12       18       28       38       52       56
 665           RY      3.6      2.4      1.2        0        0        2      2.4      3.4
               *

 666           KK   SUBPR5
 667           KM    NEW PARKWOOD RANCH SUB BASIN
 668           KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 669           KM     L=        .4  Lca=        .2   S=   14.3  Kn= .050  LAG=  17.3
 670           KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 671           BA      .04
 672           LG      .25      .25     4.70      .46       30
 673           UI      11.      38.      61.      87.      55.      32.      13.       6.       2.       2.
 674           UI       0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
 675           UI       0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
               *

 676           KK   RETPR5
 677           KM    DIVERT FLOWS TO ACCOUNT FOR ON-SITE RETENTION
 678           DT    DIPR5       .4
 679           DI        0   10000
 680           DQ        0   10000
               *

 681           KK   SUBPR4
 682           KM    NEW PARKWOOD RANCH SUB BASIN
 683           KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 684           KM     L=        .4  Lca=        .2   S=   44.4  Kn= .050  LAG=  14.8
```

```
 685      KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 686      BA     .01
 687      LG     .21      .25     4.70      .46    30.00
 688      UI      4.      13.      23.      20.      11.       4.       2.       1.       0.       0.
 689      UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
          *
```



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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 690      KK   SUBPR3
 691      KM    NEW PARKWOOD RANCH SUB BASIN
 692      KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 693      KM     L=         .4  Lca=        .2   S=    38.9  Kn= .050  LAG=  12.7
 694      KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 695      BA     .05
 696      LG     .25      .25     4.70      .46    30.00
 697      UI     28.      84.     142.      84.      32.      11.       4.       0.       0.       0.
 698      UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
          *

 699      KK   CPPR3A
 700      KM    COMBINE FLOWS AT PR3
 701      HC       3
          *

 702      KK   RETPR3
 703      KM    DIVERT FLOWS TO ACCOUNT FOR ON-SITE RETENTION
 704      DT   DIPR5      6.5
 705      DI       0    10000
 706      DQ       0    10000
          *

 707      KK   CPPR3B
 708      KM    COMBINE FLOWS AFTER PR3
 709      HC       2
          *

 710      KK   R3-BSN
 711      KM    ROUTE FLOWS FROM SUB-BASIN PR3 TO DETENTION BASIN
 712      RS       3     FLOW       -1
 713      RC    .022     .022     .022     1897     .002
 714      RX       0        6       12       18       28       38       52       56
 715      RY     3.6      2.4      1.2        0        0        2      2.4      3.4
          *

 716      KK   SUBPR7
 717      KM    NEW PARKWOOD RANCK SUB BASIN
 718      KM    BASIN SUBPR7
 719      KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 720      KM     L=         .4  Lca=        .3   S=    40.9  Kn= .050  LAG=  15.8
 721      KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 722      BA     .07
 723      LG     .25      .25     4.70      .46    30.00
 724      UI     25.      78.     138.     146.      87.      38.      18.       5.       5.       0.
 725      UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
 726      UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
```

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LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 727           KK  SUBPR6
 728           KM   NEW PARKWOOD RANCK SUB BASIN
 729           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 730           KM    L=       .5  Lca=       .2   S=   36.0  Kn= .050  LAG=  14.3
 731           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 732           BA     .06
 733           LG     .25     .25    4.70     .46   30.00
 734           UI     26.     80.    148.    113.     61.     21.      8.      4.      0.      0.
 735           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

 736           KK  RETPR6
 737           KM   DIVERT FLOWS TO ACCOUNT FOR ON-SITE RETENTION
 738           DT   DIPR6
 739           DI       0   10000
 740           DQ       0   10000
               *

 741           KK      55
 742           KM   BASIN 55
 743           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 744           KM    L=       .5  Lca=       .2   S=   72.3  Kn= .081  LAG=  22.2
 745           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 746           BA     .14
 747           LG     .24     .24    4.60     .40   29.00
 748           UI     21.     85.    128.    192.    243.    167.    116.     63.     35.     20.
 749           UI      7.      7.      7.      0.      0.      0.      0.      0.      0.      0.
 750           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

 751           KK     D55
 752           KM    RETAIN 100 YEAR 2 HOUR, (90% FOR FUTURE DEVELOPMENT)
 753           DT     D55       9
 754           DI       0   10000
 755           DQ       0   10000
               *

 756           KK    CAP9
 757           RS       1    FLOW      -1
 758           SV       0    2.03  10.075  43.569
 759           SE  1562.1    1564    1566    1568
 760           SQ       0     120     436     935
               *

 761           KK  CAP9-6
 762           KM   ROUTE FLOW FROM CAP OVERCHUTE #9 TO CPPR6
 763           KM   CHANNEL SHAPE ASSUMED TO MATCH PHASE 2 DEVELOPMENT <<<<<<<<<VERIFY!!!!!!!
 764           RS       4    FLOW      -1
 765           RC     .25     .25     .25    2245   .0071
 766           RX       0       8      40      48      68      79     108     116
 767           RY       6       4       2       0       0       2       4       6
               *
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 768        KK   CPPR6
 769        KM   COMBINE FLOWS FROM CAP CHANNEL ANT PR6
 770        HC        2
            *

 771        KK   6-BSN
 772        KM   ROUTE FLOW FROM SUB-BASIN PR6 TO BASIN
 773        KM   CHANNEL SHAPE ASSUMED TO MATCH PHASE 2 DEVELOPMENT <<<<<<<<<<VERIFY!!!!!!!
 774        RS        5    FLOW      -1
 775        RC      .25     .25     .25    2821   .0064
 776        RX        0       8      40      48      68      79     108     116
 777        RY        6       4       2       0       0       2       4       6
            *

 778        KK  SUBPR8
 779        KM   NEW PARKWOOD RANCK SUB BASIN
 780        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 781        KM    L=       .8  Lca=       .4   S=   43.0  Kn= .050  LAG=  22.3
 782        KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 783        BA      .23
 784        LG      .25     .25    4.70     .46   30.00
 785        UI      35.    137.    207.    310.    396.    273.    191.    106.     57.     34.
 786        UI      11.     11.     11.      0.      0.      0.      0.      0.      0.      0.
 787        UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            *

 788        KK  RETPR8
 789        KM   DIVERT FLOWS TO ACCOUNT FOR ON-SITE RETENTION
 790        DT   DIPR8       19
 791        DI        0   10000
 792        DQ        0   10000
            *

 793        KK   CPBSN
 794        KM   COMBINE FLOWS AT DETENTION BASIN
 795        HC        4
            *

 796        KK  BASIN5
 797        KO        3
 798        KM        RESERVOIR ROUTING WITH 10 foot by 3 foot CBC OUTFALL
 799        RS        1    STOR      -1
 800        SV        0     .07     .75    3.13    8.72   15.83   24.33   33.79   44.19   54.97
 801        SE     1518    1519    1520    1521    1522    1523    1524    1525    1526    1527
 802        SQ      150     210     240     270     300     330     360     375     420     450
 803        SE   1521.0 1521.94 1522.45 1523.01 1523.63 1524.30 1525.03 1525.42 1526.68 1526.68
            * 30% DESIGN DATA
            * KM      RESERVOIR ROUTING WITH 6 foot by 3 foot CBC OUTFALL
            * RS      1    STOR      -1
            * SV      0      .7    8.27   22.32   30.58   39.34   48.43   58.03   69.13     80.
            * SE   1518    1520    1522    1524    1525    1526    1527    1528    1529     15
            * SQ      0      45      90     135     180     225     270     315     360      3
            * SE   1517 1518.44 1519.31 1520.02 1520.65 1521.23 1522.11 1523.20 1524.48     15
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                * SL1518.5      30     0.6     0.5
                * SS  1528     120     2.5     1.5
                *
```



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 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  804           KK  BSN-36
  805           KM   REACH PR-1
  806           KM    ROUTE OUTFLOW FROM THE BASIN TO THE SUPERSTITION FREEWAY.
  807           RS       4    FLOW      -1
  808           RC   0.025   0.025   0.025    2181  0.0037
  809           RX       0       4      20      36      48      64      80      84
  810           RY     4.9     3.9     3.9       0       0     3.9     3.9     4.9
                *
                *
                * KK D29D2
                * KM PORTIONS OF SUBBASIN 29D THAT ARE EAST AND SOUTH OF THE CHANNEL THROUGH THE
                * KM   PARKWOOD RANCH DEVELOPMENT DRAIN SOUTH TO SOUTHERN AVENUE AND COMBINE WIT
                * KM   FLOW FROM SUBBASIN 36C BEFORE ENTERING THE ADOT CHANNEL.
                * KM   THIS AMOUNT IS APPROXIMATELY TWO-THIRDS OF THE RUNOFF FROM SUBBASIN 29D.
                * KM THEREFORE, ONE-THIRD OF SUBBASIN 29D RUNOFF FLOW TO THE PARKWOOD RANCH BASI
                * DT D29DE   10000
                * DI      0     100     200     500     800
                * DQ      0      66     132     330     528
                *
                *       *****KVM*****
                * OVERTOPPING OF CRISMON ROAD CHANNEL REMOVED TO REFLECT FUTURE CHANNEL
                *

  811           KK    29D2
  812           KM   MODIFIED SUB-BASIN 29D (EAST OF SIGNAL BUTTE RD)
  813           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  814           KM    L=        .4  Lca=        .2   S=   41.9  Kn= .050  LAG=  13.4
  815           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  816           BA     .16
  817           LG     .21     .25    4.70     .46   30.00
  818           UI     81.    242.    430.    284.    127.     50.     12.     12.      0.      0.
  819           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *

  820           KK  RET29D
  821           KM   RETAIN FLOW FOR ON-SITE RETENTION
  822           DT  DI29D2      10
  823           DI       0   10000
  824           DQ       0   10000
                *
                *  FOLLOWING ROUTE ADDED BY HOSKIN ENG.*

  825           KK  29T36C
  826           KM   NATURAL CHANNEL ROUTING
  827           KM    ROUTE FLOW SOUTHWESTERLY FROM SOUTHERN AVENUE TO THE SUPERSTITION FREEWAY.
  828           KM    ROUTING USES NATURAL CHANNELS WHICH ARE COMPRISED OF FOUR CHANNELS, EACH
  829           KM    10 FEET WIDE (TOTAL BOTTOM WIDTH=40 FEET), WITH NEARLY VERTICAL BANK SLOPES.
  830           RS       3    FLOW      -1
  831           RC    .035    .035    .035    3300   .0100
  832           RX       0       2      98     100     140     142     238     240
```

```
833            RY     3.0     2.1     2.0       0       0     2.0     2.1     3.0
               *
1
                                      HEC-1 INPUT                                          PAGE 22

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

834            KK    36C2
835            KM    MODIFIED SUB-BASIN DUE TO PARKWOOD RANCH CHANNEL BISECTING IT.
836            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
837            KM    L=        .6  Lca=        .2   S=   37.5  Kn= .050  LAG=  16.9
838            KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
839            BA     .16
840            LG     .21     .25    4.70    4.60   30.00
841            UI     48.    158.    261.    346.    216.    118.     49.     22.     10.     10.
842            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
843            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

844            KK   D36C2
845            KM    RETAIN 100 YEAR 2 HOUR, (87% FOR FUTURE DEVELOPMENT)
846            DT    D36C    10.6
847            DI       0   10000
848            DQ       0   10000
               *

849            KK     C36
850            KM   COMBINE FLOWS IN CHANNEL ACROSS PARKWOOD RANCH (SUBBASIN 29D) WITH SUBBASIN 3
851            HC       3
               *

852            KK    36C1
853            KM    MODIFIED SUB-BASIN DUE TO PARKWOOD RANCH CHANNEL BISECTING IT.
854            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
855            KM    L=       1.2  Lca=        .6   S=   44.2  Kn= .020  LAG=  12.4
856            KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
857            BA     .18
858            LG     .21     .25    4.65     .47      30
859            UI    266.    780.   1282.    724.    259.     83.     37.      0.      0.      0.
860            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *

861            KK   D36C1
862            KM    RETAIN 100 YEAR 2 HOUR, (FOR FUTURE DEVELOPMENT)
863            DT    D36C    15.9
864            DI       0   10000
865            DQ       0   10000
               *

866            KK    CP36
867            HC       2
               *

868            KK   36T37
869            KM   ROUTE C36 TO C37 VIA ADOT CONCRETE CHANNEL
870            RS    1.76    FLOW      -1
871            RC   0.035   0.013   0.035    5280  0.0033
872            RX       0     500    1000    1012    1020    1032    1532    2032
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```
    3          RY       13     12.5      12        0        0            12.5      13
               *
1                                      HEC-1 INPUT                                          PAGE 23

   LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    874        KK       30
    875        KM    BASIN 30
    876        KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
    877        KM     L=       2.0  Lca=       1.0   S=   40.0  Kn= .050  LAG=  46.5
    878        KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
    879        BA     1.12
    880        LG      .25      .25    4.00      .57    45.00
    881        UI      81.      81.    251.     357.     433.     502.     596.     736.    1009.     917.
    882        UI     743.     639.    534.     450.     373.     265.     157.     137.     116.      81.
    883        UI      70.      25.     25.      25.      25.      25.      25.       0.       0.       0.
    884        UI       0.       0.      0.       0.       0.       0.       0.       0.       0.       0.
               *

    885        KK      D30
    886        KM     RETAIN 100 YEAR 2 HOUR, (25% FOR FUTURE DEVELOPMENT)
    887        DT      D30       21
    888        DI        0    10000
    889        DQ        0    10000
               *

    890        KK    30T37
    891        KM    ROUTE FLOWS FROM S30 TO C37 VIA NATURAL CHANNEL
    892        RS      4.4     FLOW      -1
    893        RC    0.040    0.035   0.040     2640   0.0053
    894        RX        0        2       3        4        7        8       28      528
    895        RY        6        5       5        0        0        4      4.5        5
               *

    896        KK       37
    897        KM    BASIN 37
    898        KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
    899        KM     L=       1.0  Lca=        .5   S=   45.0  Kn= .020  LAG=  10.7
    900        KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
    901        BA      .47
    902        LG      .10      .25    4.00      .67    80.00
    903        UI     378.    1161.   1323.     532.     152.      45.       0.       0.       0.       0.
    904        UI       0.       0.      0.       0.       0.       0.       0.       0.       0.       0.
               *

    905        KK      D37
    906        KM     RETAIN 100 YEAR 2 HOUR, (83% FOR FUTURE DEVELOPMENT)
    907        DT      D37       38
    908        DI        0    10000
    909        DQ        0    10000
               *

    910        KK      C37
    911        KM    COMBINE FLOWS FROM S37, S30, AND C36 AT C37
    912        HC        3
               *
1                                      HEC-1 INPUT                                          PAGE 24
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 913          KK  ADOTEL
 914          KM   ADOT DETENTION BASIN 4313 AT ELLSWORTH RD. AND SUPERSTITION
 915          KM   FROM EASTERN MARICOPA COUNTY AREA DRAINAGE MASTER STUDY, FCD OF MARICOPA
 916          KM         COUNTY
 917          KM         AND SUPERSTITION FREEWAY COMPREHENSIVE OFFSITE DRAINAGE PLAN,
 918          KM              A-N WEST, INC., FEBRUARY, 1987.
 919          RS       1     ELEV      56
 920          SV       0      617     650
 921          SE      56       74      75
 922          SL      56     3.14     0.6     .05
 923          SS      74      200     2.6     1.5
              *

 924          KK   37T38
 925          KM   ROUTE FLOWS FROM C37 TO C38 VIA ADOT CONCRETE CHANNEL
 926          RS    1.76     FLOW      -1
 927          RC   0.035    0.012   0.035    5280  0.0045
 928          RX       0      500    1000    1012    1020    1032    1532    2032
 929          RY      13     12.5      12       0       0      12    12.5      13
              *
              * ******BASIN SITE ROUTING CHANGED      **********

 930          KK      48
 931          KM   BASIN 48
 932          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 933          KM    L=      1.6  Lca=       .8   S=   80.2  Kn= .060  LAG=  41.6
 934          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 935          BA     .77
 936          LG     .27      .25    4.10     .54   22.00
 937          UI     62.      75.    223.    304.    360.    431.    532.    752.    705.    560.
 938          UI    472.     387.    317.    240.    141.    107.     90.     62.     45.     19.
 939          UI     19.      19.     19.     19.      0.      0.      0.      0.      0.      0.
 940          UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

 941          KK      D48
 942          KM    RETAIN 100 YEAR 2 HOUR, (48% FOR FUTURE DEVELOPMENT)
 943          DT     D48       28
 944          DI       0    10000
 945          DQ       0    10000
              *

 946          KK    CAP3
 947          RS       1     FLOW      -1
 948          SV       0    0.934   1.222   4.303   13.13
 949          SE  1564.6   1567.5    1568    1570    1572
 950          SQ       0        0     143     750    1530
              *
              * *******FOLLOWING ADDED FOR ADMP**************
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 951          KK  BASIN3
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```
952          KO        3
953          KM          NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP3
954          KM          WITH 30-INCH OUTFALL    BASIN AE2B (BASIN 3)
955          RS        1    STOR      -1
             * PLANNING LEVEL DESIGN PER PHASE II REPORT
             * SA      0       .5       1     1.8     3.4       4       6       6
             * SE     55       56      57      58      59      60      62      65
             * SL 56.25      4.91     .62      .5
             * SS     62      100     2.5     1.5
             *
             *  30% DESIGN DATA
             * SV      0        0     0.3     1.6     4.1     7.2    10.8    15.7
             * SE   1555     1556   15557    1558    1559    1560    1561    1562
             * SQ      0        6      18      24      30      36      42      48      54
             * SQ    108      205     360     575
             * SE1555.0    1556.1  1557.1  1557.5  1557.9  1558.4  1559.0  1559.6  1560.4  1562
             * SE1562.6    1563.1  1563.6  1564.1
956          SV      .57     3.08    5.78    9.00   12.79   17.07   21.45
957          SE       55       56      57      58      59      60      61
958          SQ        0        8      16      24      32      40      48      56
959          SE     54.0     55.4    56.0    56.7    57.7    58.9    60.2    61.7
             *

960          KK  RCAP3A
961          KM    ROUTE CAP OVERCHUTE #3 TO APACHE TRAIL (ALONG NATURAL CHANNEL)
962          RS        3     FLOW      -1
963          RC     .055     .045    .055    1800    .012
964          RX      100      200     300     305     310     315     415     515
965          RY        7        6       5       0       0       5       6       7
             *

966          KK       49
967          KM    BASIN 49
968          KM      THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
969          KM      L=       1.6  Lca=        .8    S=    73.6  Kn= .060  LAG=   42.6
970          KM      PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
971          BA      .79
972          LG      .27      .25    4.15     .53   23.00
973          UI      62.      68.    220.    296.    354.    420.    509.    709.    747.    583.
974          UI     493.     406.    335.    271.    171.    110.    102.     66.     62.     21.
975          UI      19.      19.     19.     19.     19.      0.      0.      0.      0.      0.
976          UI       0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

977          KK      D49
978          KM      RETAIN 100 YEAR 2 HOUR, (54% FOR FUTURE DEVELOPMENT)
979          DT      D49       27
980          DI        0    10000
981          DQ        0    10000
             *
```

1   HEC-1 INPUT   PAGE 26

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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


982          KK     CAP2
983          RS        1     FLOW      -1
984          SV        0     0.02   0.538   2.545  13.729
```

```
985          SE  1565.1    1566    1568    1570    1572
986          SQ       0      60     340     807    1395
             *
             * *******FOLLOWING ADDED FOR ADMP********

987          KK  BASIN2
988          KO       3
989          KM        NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP2
990          KM        WITH 30-INCH OUTFALL       (EH1B)
991          RS       1    STOR
             *  PLANNING LEVEL DESIGN PER PHASE II.
             * SA      0      .54     1.81     4.10     5.14      6.3      6.3      6.3
             * SE     49      51      52       53       54       55       64       67
             * SL     50     3.14     .62      .5
             * SS   56.5     100      2.5      1.5
             *  30% DESIGN DATA
             * SV      0     0.22     1.17     2.67     5.67    11.35    17.48
             * SE   1550     1551     1552     1553     1554     1555  1556.01
             * SQ      0        7       14       21       28       35       42       49       58       1
             * SQ    225      400      640
             * SE   1549   1550.7   1551.0   1551.4   1552.0   1552.7   1553.7   1554.8   1556.4   1556
             * SE1557.4    1557.9   1558.4
             *  60% DESIGN DATA
             * SV      0     .004      .38     1.46     4.20     9.13    15.42    19.41
             * SE   1550     1551     1552     1553     1554     1555     1556   1556.5
             * SQ      0        7       14       21       28       35       42       49     58.4
             * SQ    221      395      632
             * SE   1549   1550.7   1551.0   1551.3   1552.0   1552.8   1553.8   1553.6   1556.5
             * SE1557.5    1557.8   1558.5
             *
992          SV        0      .05      .62     1.99     4.97    10.20    16.71    20.19    23.76
993          SE       50       51       52       53       54       55       56     56.5       57
994          SQ        0       10       20       30       40       50       58
995          SE       49       50     50.5     52.3     53.4     55.9     58.4
             *

996          KK  RCAP2B
997          KM    REACH C2-1
998          KM    ROUTE FLOW FROM BASIN 2
999          KM      TO CAP BASIN 3 OUTLET CHANNEL (NEAR ELLSWORTH ROAD AND APACHE TRAIL)
1000         RS        1     FLOW       -1
1001         RD     2000    .0112     .013              CIRC        3
             *

1002         KK     17A2
1003         KM    BASIN 17A2
1004         KM      THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1005         KM      L=        .4   Lca=       .2    S=   75.0   Kn= .084   LAG=   21.9
1006         KM      PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1007         BA      .08
1008         LG      .23      .24     4.00      .56    43.00
1                                     HEC-1 INPUT                                           PAGE 27

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1009         UI      12.      50.      74.     113.     138.      94.      65.      33.      19.      11.
1010         UI       4.       4.       4.       0.       0.       0.       0.       0.       0.       0.
1011         UI       0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
```

```
                    *
1012                KK   C17A2
1013                KM   COMBINE FLOWS FROM 17A2 AND BASIN 2
1014                HC
                    *

1015                KK   C17A3
1016                KM   COMBINE FLOWS FROM 17A2 AND BASIN 3
1017                HC
                    *

1018                KK    17A1
1019                KM   BASIN 17A1
1020                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1021                KM    L=         .7  Lca=        .5    S=    60.6  Kn= .084  LAG=  36.9
1022                KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1023                BA     .08
1024                LG     .23      .24     4.00      .56    43.00
1025                UI      7.      12.      29.      38.      46.      58.      83.      84.      65.      53.
1026                UI     42.      33.      21.      13.      11.       7.       5.       2.       2.       2.
1027                UI      2.       2.       0.       0.       0.       0.       0.       0.       0.       0.
1028                UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
                    *

1029                KK  CP17A1
1030                HC
                    *

1031                KK   AT23B
1032                KM   REACH AE-4, AE-5
1033                KM   PART 1 OF 2
1034                KM   ROUTE FROM CONFLUENCE OF CAP BASIN 2 CHANNEL WITH CAP BASIN 3,
1035                KM     WHICH IS 0.06 MILES NORTH OF APACHE TRAIL, TO APACHE TRAIL,
1036                KM     ABOUT 0.1 MILES EAST OF ELLSWORTH ROAD
1037                RS       1     FLOW       -1
1038                RC    .025     .015     .025      570    .0021
1039                RX       0       12       16       24       28       36       40       52
1040                RY       5      4.9      3.9        0        0      3.9      4.9        5
                    *

1041                KK   AT23A
1042                KM   REACH AE-1, AE-2, AE-3
1043                KM   PART 2 OF 2
1044                KM   ROUTE FROM 0.1 MILES EAST OF ELLSWORTH ROAD ON APACHE TRAIL TO
1045                KM     BROADWAY ROAD 0.125 MILES WEST OF 90th STREET (OR 0.625 MILES
1046                KM     WEST OF ELLSWORTH ROAD)
1047                RS       1     FLOW       -1
1048                RC   0.025    0.025    0.025     3820   0.0029
1049                RX       0      2.9      6.9     22.5     37.5     51.5     57.1       60
1050                RY       5      4.9      3.9        0        0      3.9      4.9        5
                    *
```



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1051                KK      23
```

```
1052          KM   BASIN 23
1053          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1054          KM    L=      1.0  Lca=       .3   S=   65.0  Kn= .047  LAG=  20.1
1055          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1056          BA     .28
1057          LG     .22      .25     4.00      .58    42.00
1058          UI     55.     201.     304.     505.     440.     297.     180.      79.      48.      14.
1059          UI     14.      14.       0.       0.       0.       0.       0.       0.       0.       0.
1060          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
              *

1061          KK     D23
1062          KM    RETAIN 100 YEAR 2 HOUR, (49% FOR FUTURE DEVELOPMENT)
1063          DT     D23       10
1064          DI       0    10000
1065          DQ       0    10000
              *

1066          KK    C23A
1067          KM         COMBINE FLOW UPSTREAM OF BROADWAY ROAD, ABOUT 2000 FT. WEST OF ELLSWORTH
1068          HC       2
              *

1069          KK     17B
1070          KM   BASIN 17B
1071          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1072          KM    L=       .8  Lca=       .6   S=   50.0  Kn= .073  LAG=  36.8
1073          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1074          BA     .22
1075          LG     .19      .24     4.00      .56    55.00
1076          UI     20.      35.      81.     107.     129.     162.     233.     232.     179.     146.
1077          UI    117.      92.      57.      35.      30.      20.      13.       6.       6.       6.
1078          UI      6.       0.       0.       0.       0.       0.       0.       0.       0.       0.
1079          UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
              *

1080          KK    D17B
1081          KM    RETAIN 100 YEAR 2 HOUR, (27% FOR FUTURE DEVELOPMENT)
1082          DT    D17B        5
1083          DI       0    10000
1084          DQ       0    10000
              *

1085          KK  17BT22
1086          KM   ROUTE FLOWS FROM SUBBASIN 17B TO C22A VIA LINED CHANNEL
1087          KM    (ROUTED TO THE NORTHEAST CORNER OF ELLSWORTH ROAD AND BROADWAY ROAD)
1088          RS       3     FLOW       -1
1089          RC   0.035    0.015    0.035     2700   0.0114
1090          RX       0        1        3        6       18       21       36       70
1091          RY    6.25     6.10        6        0        0        3     3.25      3.5
              *
1
                                            HEC-1 INPUT                                              PAGE 29

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1092          KK      47
1093          KM   BASIN 47
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1094         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1095         KM    L=      3.0  Lca=      1.5   S=    51.2  Kn= .055  LAG=  66.7
1096         KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1097         BA    1.67
1098         LG     .28     .25    4.00     .55   17.00
1099         UI     85.     85.     85.    265.    337.    402.    456.    500.    559.    633.
1100         UI    721.    921.   1086.    972.    828.    734.    667.    584.    519.    460.
1101         UI    404.    343.    250.    164.    148.    139.    126.     85.     85.     74.
1102         UI     26.     26.     26.     26.     26.     26.     26.     26.     26.      0.
1103         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1104         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

1105         KK     D47
1106         KM    RETAIN 100 YEAR 2 HOUR, (69% FOR FUTURE DEVELOPMENT)
1107         DT     D47      68
1108         DI       0   10000
1109         DQ       0   10000
             *
             * ***************BELOW MODIFIED FOR ADMP**************************
             *

1110         KK  BASIN4
1111         KO       3
1112         KM   ROUTE THROUGH OVERCHUTES 4 AND 5, HYDRAULICALLY CONNECTED
1113         KM   STORAGE AND DISCHARGE WERE ADDED AT APPROPRIATE ELEVATIONS
1114         KM   OUTFLOW THROUGH TWO 30-INCH PIPES.
1115         KM   BASIN4 (BY4B)
1116         RS       1    STOR      -1
             *  PLANNING LEVEL DESIGN PER PHASE II.
             * SA      0    0.64     2.3    5.28    6.88    9.41
             * SE     68      69      70      71      72      76
             * SL 69.75    4.91     .62      .5
             * SS     74     200     2.5     1.5
             *  30% DESIGN DATA
             * SV      0       0     0.7    1.37     4.1     9.0    15.3   22.54      30
             * SE  1568  1569.4    1570    1571    1572    1573    1574    1575    1576
             * SQ      0      13      38      50      53      75      88     100     113       1
             * SQ    185     310     478     683
             * SE  1568  1569.1  1570.2  1570.6  1570.7  1571.6  1572.3  1573.0  1573.8  1575
             * SE1575.3  1575.5  1575.8  1576.0
             *  60% DESIGN DATA
             * SV      0     .01    0.11    1.28    4.77   10.65   17.23   24.16
             * SE  1568  1569.4    1570    1571    1572    1573    1574    1575
             * SQ      0    12.5    37.5      50      53      75    87.5     100   112.5       1
             * SQ    184     309     477     682
             * SE  1568  1569.4  1570.2  1570.6  1570.7  1571.5  1572.2  1573.0  1573.8      15
             * SE1575.3  1575.5  1575.8  1576.0
1117         SV        0     .01    0.31    1.85    5.61   11.12   17.18   23.67
1118         SE     1568    1569    1570    1571    1572    1573    1574    1575
1119         SQ        0    12.5    37.5      50      53      75    87.5     100   112.5     125
1120         SQ      131
1                                        HEC-1 INPUT                                        PAGE 30

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1121         SE  1567.8  1569.0  1570.0  1570.4  1570.5  1571.5  1572.2  1572.9  1573.7  1574.6
1122         SE    1575
```

```
            * NO DIVERSION THROUGH THE OLD CHANNEL FROM OVERCHUTE 5
            *

1123        KK  RCAP4A
1124        KM   REACH C4-4, C4-3, C4-2, + culverts C4C-2 & C4C-3 (CAP BASIN 4 OUTLET CHANNEL)
1125        KM   ROUTE CAP BASIN 4
1126        KM   ROUTE FLOW FROM BASIN 4 TO CULVERT CROSSING (C4C-1) @ 0.25 MILES SOUTH OF APA
1127        KM      TRAIL AND 0.25 MILES WEST OF CRISMON ROAD.
1128        RS       1     FLOW      -1
1129        RC   0.025    0.025   0.025     2210  0.0033
1130        RX       0       10      22       37      45      60      70      80
1131        RY       6        6     3.8        0       0     3.8       6       6
            *

1132        KK  RCAP4B
1133        KM   REACH C4-1 and C4-2 including Culvert C4C-1 (CAP BASIN 4 OUTLET CHANNEL)
1134        KM   ROUTE FLOW FROM CULVERT C4C-1 TO CONFLUENCE WITH BROADWAY CHANNEL AT 98th
1135        KM     STREET, ABOUT 0.3 MILES SOUTH OF APACHE TRAIL.
1136        RS       1     FLOW      -1
1137        RC   0.025    0.025   0.025      300  0.0020
1138        RX       0       10      22       37      45      60      70      80
1139        RY       6        6     3.8        0       0     3.8       6       6
            *

1140        KK  RCAP4C
1141        KM   REACH BY-12 AND BY-13, including culverts BYC-12, BYC-11, and BYC-10.
1142        KM     (THIS ROUTING WITHIN THE BROADWAY CHANNEL.)
1143        KM    ROUTE FLOW FROM 98th STREET TO 0.25 MILES EAST OF ELLSWORTH ROAD.
1144        RS       1     FLOW      -1
1145        RC    .025     .025    .025     2790  0.0021
1146        RX       0        4     9.6       28      48    66.4      72      76
1147        RY       6        6     4.6        0       0     4.6       6       6
            *

1148        KK  RCAP4D
1149        KM   REACH BY-8, BY-9, BY-10, BY-11 plus culverts BYC-10, BYC-9, BYC-8, & BYC-7.
1150        KM     (THIS ROUTING WITHIN THE BROADWAY CHANNEL.)
1151        KM    ROUTE FLOW FROM 0.25 MILES EAST OF ELLSWORTH ROAD TO ELLSWORTH ROAD.
1152        RS       1     FLOW      -1
1153        RC    .025     .015    .025     1360  0.0018
1154        RX       0        6    13.1     22.5      38    47.4      54      60
1155        RY       6        6     4.7        0       0     4.7       6       6
            *

1156        KK      22
1157        KM   BASIN 22
1158        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1159        KM    L=       1.2  Lca=        .3    S=    51.3  Kn= .048  LAG=   22.8
1160        KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1161        BA     .41
1162        LG     .22      .25    4.00      .57   52.00
1163        UI     60.     229.    349.     509.    699.    491.    346.    212.    102.     65.
1164        UI     26.      18.     18.       0.      0.      0.      0.      0.      0.      0.
1                                           HEC-1 INPUT                                   PAGE 31

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1165        UI      0.       0.      0.       0.      0.      0.      0.      0.      0.      0.
```

```
                    *
1166                KK     D22
1167                KM    RETAIN 100 YEAR 2 HOUR, (33% FOR FUTURE DEVELOPMENT)
1168                DT     D22      11
1169                DI       0   10000
1170                DQ       0   10000
                    *

1171                KK    C22A
1172                KM   COMBINE FLOWS FROM CAP OVERCHUTES 4 & 5 AND SUBBASIN 22
1173                KM     THIS IS AT ELLSWORTH ROAD JUST NORTH OF BROADWAY ROAD.
1174                HC       3
                    *

1175                KK   22T23
1176                KM   REACH BY-6, BY-7 plus exist. culvert @ ELLSWORTH ROAD,
1177                KM     and culvert BYC-5.
1178                KM     (THIS ROUTING WITHIN THE BROADWAY CHANNEL.)
1179                KM     ROUTE FLOW FROM ELLSWORTH ROAD (C22A) TO ABOUT 0.5 MILES WEST OF
1180                KM     ELLSWORTH ROAD (C23B), WHICH IS AT THE APACHE CHANNEL.
1181                RS       1    FLOW      -1
1182                RC    .025    .015    .025    2140  0.0018
                    *    This routing based on BY-7 bottom width, depth and slope.
1183                RX       0       6    12.8    22.0      38    47.2      54      60
1184                RY       6       6     4.6       0       0     4.6       6       6
                    *

1185                KK    C23B
1186                KM   COMBINE FLOWS FROM C22A, C17A, AND S23 AT C23B (APACHE CHAN.+ BROADWAY CHAN.)
1187                KM    (THIS COMBINES HYDROGRAPHS C22A AND C23A)
1188                HC       2
                    *

1189                KK   23T24
1190                KM   REACH BY-1, BY-2, BY-3, BY-4 AND BY-5, plus
1191                KM     culverts BYC-1, BYC-2, BYC-3, BYC-4.
1192                KM     (THIS ROUTING WITHIN THE BROADWAY CHANNEL.)
1193                KM     ROUTE FLOW FROM APACHE CHANNEL ABOUT 0.5 MILES WEST OF ELLSWORTH
1194                KM     ROAD (C23B) TO HAWES ROAD (C24).
1195                RS       1    FLOW      -1
1196                RC   0.025   0.015   0.025    3212  0.0017
1197                RX       0       8    16.2      28      43    54.8      63      71
1198                RY     5.9     6.0     5.9       0       0     5.9     6.0     5.9
                    *

1199                KK      50
1200                KM    BASIN 50
1201                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1202                KM    L=        .9  Lca=        .4   S=   81.4  Kn= .079  LAG=  33.8
1203                KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1204                BA     .28
1205                LG     .23     .24    4.00     .55   43.00
1206                UI     27.     55.    118.    153.    190.    259.    335.    259.    208.    163.
1                                             HEC-1 INPUT                                        PAGE 32

LINE                ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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1207          UI    126.     76.     47.     37.     27.     11.      8.      8.      8.      8.
1208          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1209          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

1210          KK     D50
1211          KM    RETAIN 100 YEAR 2 HOUR, (64% FOR FUTURE DEVELOPMENT)
1212          DT     D50      13
1213          DI       0   10000
1214          DQ       0   10000
              *

1215          KK    CAP1
1216          RS       1    FLOW      -1
1217          SV       0   0.091   0.575   3.319  13.256
1218          SE    1566    1568    1570    1572    1574
1219          SQ       5      90     275     470     610
              *

1220          KK  BASIN1
1221          KO       3
1222          KM        NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP1
1223          KM        WITH 24-INCH OUTFALL
1224          RS       1    STOR      -1
              *  PLANNING LEVEL DESIGN PER PHASE II.
              * SA  0.01    1.94    3.10    3.49    3.94    4.40    4.85
              * SE    60      61      62      63      64      65      66
              * SL  60.2    3.14     .62      .5
              * SS    64      50     2.5     1.5
              *
              *  DATA FROM 30% DESIGN
              * SV     0       0    0.03    1.33    3.83     7.1    7.82
              * SE  1559    1560    1561    1562    1563    1564  1564.2
              * SQ     0       5      10      15      20      25      30      34      36
              * SQ    70     135     245
              * SE1559.0  1560.1  1560.6  1561.1  1561.6  1562.3  1563.1  1563.9  1564.2  1564
              * SE  1565  1565.5    1566
              *
1225          SV       0     .17     .78    2.05    4.34    8.16   12.36
1226          SE      53      54      55      56      57      58      59
1227          SQ       0       4      16      28      30      36      40
1228          SE    51.9    52.8    54.1    56.0    57.1    59.0    59.1
              *

1229          KK   RBAS1
1230          KM   ROUTE FLOWS FROM BASIN1 AT THE CAP TO SUBBASIN 18 (APACHE TRAIL AND HAWES RD)
1231          KM    NO IMPROVED CHANNEL
1232          RS      11    FLOW      -1
1233          RC    0.05   0.045    0.05    7000    0.02
1234          RX     100     200     300     301     303     304     404     504
1235          RY       6       5       2       0       0       2       5       6
              *
1                                       HEC-1 INPUT                                        PAGE 33

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1236          KK     18A
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                  KM   BASIN 18A
                  KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  1239            KM    L=      1.0  Lca=        .5    S=   60.6  Kn= .065  LAG=  33.3
  1240            KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  1241            BA    1.01
  1242            LG     .22     .25    4.10     .57   42.00
  1243            UI    102.    211.    446.    577.    719.    992.   1239.    939.    752.    588.
  1244            UI    449.    246.    173.    126.     94.     31.     31.     31.     31.      0.
  1245            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
  1246            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                  *

  1247            KK    D18A
  1248            KM    RETAIN 100 YEAR 2 HOUR, (44% FOR FUTURE DEVELOPMENT)
  1249            DT    D18A      33
  1250            DI       0   10000
  1251            DQ       0   10000
                  *

  1252            KK    C18A
  1253            KM   COMBINE FLOWS FROM CAP OVERCHUTE #1 AND SUBBASIN 18A AT APACHE TRAIL AND
  1254            KM      HAWES ROAD.
  1255            HC       2
                  *

  1256            KK   18T24
  1257            KM   REACH HS-6, HS-7, HS-8
  1258            KM   ROUTE FLOWS FROM SUBBASIN 18A TO SUBBASIN 24.
  1259            RS       1    FLOW      -1
  1260            RC    .025    .015    .025    2730  0.0017
  1261            RX       0       8      16      26      46      58      65      73
  1262            RY     5.0     5.1     5.2       0       0     5.2     5.1     5.0
                  *  THE ABOVE CHANNEL DIMS ARE BASED ON THE NARROWEST DESIGN REACH.
                  *

  1263            KK      24
  1264            KM   BASIN 24
  1265            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  1266            KM    L=       .9  Lca=        .5    S=   43.5  Kn= .052  LAG=  27.2
  1267            KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
  1268            BA     .29
  1269            LG     .24     .25    4.00     .58   43.00
  1270            UI     36.    106.    186.    243.    353.    419.    301.    226.    164.     82.
  1271            UI     58.     36.     15.     11.     11.     11.      0.      0.      0.      0.
  1272            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                  *

  1273            KK     D24
  1274            KM    RETAIN 100 YEAR 2 HOUR, (8% FOR FUTURE DEVELOPMENT)
  1275            DT     D24       2
  1276            DI       0   10000
  1277            DQ       0   10000
                  *
1                                     HEC-1 INPUT                                         PAGE 34

  LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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1278      KK     C24
1279      KM   COMBINE FLOWS FROM CONCENTRATION POINTS C18A, C23 AND SUBBASIN 24
1280      KM     (THIS ADDS HYDROGRAPHS 18T24 + 23T24 + SUBBASIN 24.)
1281      HC       3
          *

1282      KK    DC24
1283      KM    THERE IS AN EXISTING INVERTED CROWN STREET ON BROADWAY ROAD WEST OF
1284      KM    HAWES ROAD.  BEFORE THIS ADMP PLAN, SOME RUNOFF WOULD SPLIT HERE.  AFTER
1285      KM    ADMP PLAN IMPLEMENTATION, NO FLOW DIVERSION WILL OCCUR HERE.
1286      KM    THE FOLLOWING FLOW DIVERSION SHOWS THAT 100% OF THE FLOW AT THE INTERSECTION
1287      KM    OF HAWES ROAD AND BROADWAY ROAD WILL CONTINUE SOUTH IN THE HAWES CHANNEL.
1288      DT   DWC24    10000
1289      DI       0      100      200      400      600      800
1290      DQ       0        0        0        0        0        0
1291      ZW    A=BROADWAY  B=AT HAWES  C=FLOW  F=DIVERTED FLOW
          *

1292      KK   RT31B1
1293      KM   THIS ROUTING STEP HAS BEEN BROKEN OUT OF A LARGER SEQUENCE FOR SIMPLICITY
1294      KM   REACH HS-5 plus culvert HSC-4
1295      KM   ROUTE FLOWS FROM HAWES ROAD AND BROADWAY ROAD (C24) TO CORAL BELL AVENUE.
1296      RS       1     FLOW       -1
1297      RC    .025     .015     .025     1312   0.0015
1298      RX       0        8       15       28       68       81       89       97
1299      RY     6.2      6.4      6.5        0        0      6.5      6.4      6.2
          *

1300      KK   RT31B2
1301      KM   THIS ROUTING STEP HAS BEEN BROKEN OUT OF A LARGER SEQUENCE FOR SIMPLICITY
1302      KM   REACH HS-4A AND HS4-B plus culvert HSC-3
1303      KM   ROUTE FLOWS FROM CORAL BELL AVENUE TO EMELITA AVENUE.
1304      RS       1     FLOW       -1
1305      RC    .025     .015     .025     2080   0.0018
1306      RX       0        8     15.9       16       66     66.1       74       82
1307      RY     5.8      5.9      6.1        0        0      6.1      5.9      5.8
          *

1308      KK   RT31B3
1309      KM   THIS ROUTING STEP HAS BEEN BROKEN OUT OF A LARGER SEQUENCE FOR SIMPLICITY
1310      KM   REACH HS-3
1311      KM    THIS REACH IS AN EXISTING CHANNEL FOR THE CRESCENT RUN MOBILE HOME PARK.
1312      KM    The existing channel 5.6 ft deep has no freeboard.  Overbank flows in street
1313      KM    Routing values per channel design plans,
1314      KM    Sheet 2 of 19, City of Mesa Project 97-69.
1315      KM   ROUTE FLOWS FROM EMELITA AVENUE TO SOUTHERN AVENUE (C31) WITHIN SUBBASIN 31B.
1316      RS       1     FLOW       -1
1317      RC    .025     .015     .025     1935   0.0033
1318      RX       0     35.6     41.6       50     66.7     75.1     81.1     92.0
1319      RY     5.4      4.7      5.6        0        0      5.6      7.6      7.7
          *
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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1320      KK     31B
1321      KM   BASIN 31B
```

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                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FO      , BASIN
 1323           KM    L=       1.2  Lca=       .5    S=   29.7  Kn= .049  LAG=  30.8
 1324           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 1325           BA     .47
 1326           LG     .24      .25    4.45      .46   37.00
 1327           UI     52.     125.    240.     309.    399.     601.     544.     416.     321.     243.
 1328           UI    141.      88.     63.      44.     16.      16.      16.      16.       0.       0.
 1329           UI      0.       0.      0.       0.      0.       0.       0.       0.       0.       0.
                *

 1330           KK    D31B
 1331           KM    RETAIN 100 YEAR 2 HOUR, (66% FOR FUTURE DEVELOPMENT)
 1332           DT    D31B       23
 1333           DI       0   10000
 1334           DQ       0   10000
                *

 1335           KK     C31
 1336           KM   COMBINE FLOWS FROM C24 AND SUBBASIN 31B
 1337           HC       2
                *

 1338           KK     D31
 1339           KM   DIVERT FLOWS AT THE SPLITTER BOX AT HAWES AND SOUTHERN TO SOSS. CHANNEL/BASIN
 1340           KM      55% OF THE FLOW TO THE WEST ALONG SOUTHERN AVENUE
 1341           KM      and 45% OF THE FLOW TO THE SOUTH ALONG HAWES ROAD.
 1342           DT    D31W
 1343           DI       0     2137    3000     4000
 1344           DQ       0     1177    1650     2200
                *

 1345           KK  31T381  ROUTED IN TWO STEPS DUE TO CHANNEL DISSIMILARITY.
 1346           KM   REACH HS-2 plus culvert HSC-2
 1347           KM     ROUTE FLOWS FROM SOUTHERN AVENUE (C31) IN THE HAWES CHANNEL.
 1348           KM   REACH HS-2 IS A PROPOSED CHANNEL SOON-TO-BE-CONSTRUCTED.  IT IS 4.5 FEET
 1349           KM     DEEP, WITH FREEBOARD. CHANNEL CROSS-SECTION FROM DESIGN PLANS FOR
 1350           KM     SOUTHERN AVENUE DRAINAGE IMPROVEMENTS.  SHEET 28 OF 43
 1351           KM     CITY OF MESA PROJECT NO. 97-56.1 DESIGN PLANS BY ENTELLUS
 1352           KM     DATED 8/8/97 REV. 12/19/97
 1353           RS       1     FLOW      -1
 1354           RC   0.025   0.015   0.025     1248   .0022
 1355           RX       0      32      37       46      56       65       73       75
 1356           RY       5     7.0     4.5        0       0      4.5      9.0      9.5
                *

 1357           KK  31T382
 1358           KM   REACH HS-1 plus culvert HSC-1
 1359           KM     ROUTE FLOWS TO SUPERSTITION FREEWAY (C38)
 1360           KM     IN THE HAWES CHANNEL.
 1361           RS       1     FLOW      -1
 1362           RC   0.025   0.015   0.025      810   .0017
 1363           RX       0      10      16       26      51       61       77       81
1                                            HEC-1 INPUT                                                PAGE 36

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 1364           RY     5.3     4.8     4.9        0       0      4.9      4.6      3.6
                *
```

```
1365          KK     31A
1366          KM    BASIN 31A
1367          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1368          KM     L=      1.0  Lca=       .5    S=   43.3  Kn= .047  LAG=  25.2
1369          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1370          BA     .53
1371          LG     .24     .25    4.15     .54   47.00
1372          UI     71.    238.    387.    519.    818.    704.    515.    373.    211.    121.
1373          UI     76.     35.     22.     22.     22.      0.      0.      0.      0.      0.
1374          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

1375          KK     D31A
1376          KM     RETAIN 100 YEAR 2 HOUR, (38% FOR FUTURE DEVELOPMENT)
1377          DT     D31A      16
1378          DI        0   10000
1379          DQ        0   10000
              *

1380          KK   31AT38
1381          KM    ROUTE S31A (GLENMAR RD & SOUTHERN AVE) TO C38 (HAWES RD & SUPERSTITION FRWY)
1382          RS        6    FLOW      -1
1383          RC      .04     .03     .04    4200    .012
1384          RX      100     200     300     302     307     309     409     509
1385          RY        4       3       2       0       0       2       3       4
              *

1386          KK      38
1387          KM    BASIN 38
1388          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1389          KM     L=      1.1  Lca=       .8    S=   37.0  Kn= .041  LAG=  28.5
1390          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1391          BA     .47
1392          LG     .18     .25    4.25     .54   56.00
1393          UI     55.    151.    276.    356.    490.    671.    500.    384.    288.    180.
1394          UI     95.     71.     46.     17.     17.     17.     17.      0.      0.      0.
1395          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

1396          KK     D38
1397          KM     RETAIN 100 YEAR 2 HOUR, (38% FOR FUTURE DEVELOPMENT)
1398          DT     D38       15
1399          DI        0   10000
1400          DQ        0   10000
              *

1401          KK     C38
1402          KM    COMBINE FLOWS FROM S38, C37 AND D31A AND B
1403          KM    AT HAWES RD. & SUPERSTITION FWY. (C38).
1404          KM      THIS COMBINES HYDROGRAPHS D38 + 37T38 + 31AT38 + 31T38.
1405          HC        4
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
1406         KK   38T39
1407         KM   ROUTE FLOWS FROM C38 TO C39 VIA ADOT CONCRETE CHANNEL ALONG SUPERSTITION FWY.
1408         RS    1.32    FLOW      -1
1409         RC   0.035   0.012   0.035    3960  0.0066
1410         RX       0     500    1000    1012    1020    1032    1532    2032
1411         RY      13    12.5      12       0       0      12    12.5      13
             *
             * ADOT DETENTION BASINS FROM URS REPORT SEPT 1988

1412         KK   ADD10
1413         KM    BASIN #10 - OFF-LINE DETENTION POND TO ATTENUATE PEAK FLOWS
1414         KM     BUT DO NOT DELAY THE PEAK
1415         DT    DB10
1416         DI     807     879     961    1070    1190    1320
1417         DQ       0      29      61     120     190     270
             *

1418         KK   ADD9
1419         KM   BASIN #9 - OFF-LINE DETENTION POND
1420         DT     DB9
1421         DI     626     660     751     861     987    1128
1422         DQ       0      10      51     110     189     278
             *

1423         KK    ADD8
1424         KM   BASIN #8 - OFF-LINE DETENTION POND
1425         DT     DB8
1426         DI     464     521     627     752     898
1427         DQ       0      21      77     152     248
             *

1428         KK    ADD7
1429         KM   BASIN #7 - OFF-LINE DETENTION POND
1430         DT     DB7
1431         DI     770     810     892     988    1093    1207    1331    1462
1432         DQ       0      10      42      88     143     207     281     362
             *

1433         KK    ADD6
1434         KM   BASIN #6 - OFF-LINE DETENTION POND
1435         DT     DB6
1436         DI     685     703     781     875     978    1092    1215
1437         DQ       0       3      31      75     128     192     265
             *

1438         KK    ADD5
1439         KM   BASIN #5 - OFF-LINE DETENTION POND
1440         DT     DB5
1441         DI    1005    1063    1141    1227    1320    1421    1527
1442         DQ       0      13      41      77     120     171     227
             *
1                                     HEC-1 INPUT                                        PAGE 38

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


1443         KK    D31W
1444         KM   RETRIEVE DIVERTED HYDROGRAPH D31A
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1445           DR    D31W
               *

1446           KK  31WT32
1447           KM   ROUTE FLOWS FROM D31W (HAWES AND SOUTHERN) TO C32 (SOSSAMAN AND SOUTHERN)
1448           KM   PROPOSED CULVERT IS 2-10'x 6'CBC FROM DESIGN PLANS FOR SOUTHERN AVENUE IMP.
1449           KM   CITY OF MESA PROJECT NO. 97-56.1
1450           KM   DESIGN PLANS BY ENTELLUS DATED 8/8/97 REV. 12/19/97
1451           RS    1.76    FLOW      -1
1452           RC    .035    .022    .035    4000   .0027
1453           RX       0    2005    2012    2012    2106    2106    2113    3122
1454           RY     4.5     4.5     3.5       0       0     3.5     4.5     4.5
               *

1455           KK      32
1456           KM   BASIN 32
1457           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1458           KM    L=        .9  Lca=        .5   S=   38.9  Kn= .055  LAG=  29.1
1459           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1460           BA     .38
1461           LG     .23     .25    4.55     .44   27.00
1462           UI     43.    115.    212.    273.    368.    529.    407.    314.    237.    161.
1463           UI     81.     62.     43.     14.     13.     13.     13.      0.      0.      0.
1464           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
               *
               * KK   D32
               * KM  RETAIN 100 YEAR 2 HOUR, (FULLY DEVELOPED - NO RETENTION)
               * DT   D32        0
               * DI     0    10000
               * DQ     0    10000
               *

1465           KK     C32
1466           KM    COMBINE SOSSAMAN CHANNEL FLOWS WITH FLOWS FROM 32
1467           HC       2
               *

1468           KK    32T39
1469           KM   ROUTE FLOWS FROM C32 TO C39 VIA THE SOSSAMAN CHANNEL
1470           RS    0.88    FLOW      -1
1471           RC   0.012   0.012   0.012    2640   0.001
1472           RX       0       5      10      28      38      60      65      70
1473           RY      14      14      14       0       0      14      14      14
               *

1474           KK      39
1475           KM   BASIN 39
1476           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1477           KM    L=        .9  Lca=        .7   S=   38.0  Kn= .060  LAG=  32.4
1478           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1479           BA     .36
1480           LG     .22     .25    4.60     .41   44.00
1                                      HEC-1 INPUT                                        PAGE 39

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1481           UI      37      81     165     213     269     383     437     325     258     200
1482           UI     142      76      61      37      24      11      11      11      11       0
```

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1483            UI      0.      0.      0.      0.      0.              0.      0.      0.      0.
                *

1484            KK       D39
1485            KM      RETAIN 100 YEAR 2 HOUR, (13% FOR FUTURE DEVELOPMENT)
1486            DT       D39       4
1487            DI         0   10000
1488            DQ         0   10000
                *

1489            KK       C39
1490            KM     COMBINE FLOWS FROM C32, C38 AND S39 AT C39
1491            HC         3
                *

1492            KK      SOSS
1493            KM     DIVERT FLOWS IN EXCESS OF 1800 CFS TO SOSSAMAN DET. BASIN
1494            KM     IN REALITY, BACKWATER FROM THE ADOT CROSSING DETERMINES THE AMOUNT OF SPILL
1495            KM     SUPERSTITION FREEWAY
1496            ZW        A=SOSSAMAN DRAIN  B=AT SUPERSTITION  C=FLOW  E=5MIN  F=100YR
1497            DT     BASIN
1498            DI         0    1800    2000   10000
1499            DQ         0       0     200    8200
                *
1500            KM        ******* \/ \/ \/ modifications by Dibble & Associates \/ \/ \/  **********
1501            KM
1502            KM     On 01.13.98 - Revised Hydrology per County '97 Land Use Parameters
1503            KM                 - File Updated by DDMS
1504            KM                 - Retention revised per County '97 Land Use Parameters
1505            KM
1506            KM       2.24.98 - Renamed C17B to be C17A2
1507            KM               - Renamed TEMP to be CLEAR
1508            KM               - Removed 7000 foot route near Detention Basin #1.
1509            KM
1510            KM       4.29.98 - Received this file from Hoskin Engineering as Ph. 2 Final Submit
1511            KM       5.20.98 - Revised file per FCD review comments
1512            KM       5.27.98 - Submitted file to Hoskin Engineering
1513            KM       6.11.98 - Revised channel properties to reflect earth channels
1514            KM       6.12.98 - Submitted file to County (this is a pre-final submittal
1515            KM                 and is SUBJECT TO CHANGE)
1516            KM       7.17.98 - Revised per FCD review comments.  Channel routings revised to
1517            KM                 follow the ADMP Preliminary Design Plans.  More verbal
1518            KM                 descriptions for channel routings added.
1519            KM        07.24.98 Submitted file to County as part of Phase II Final Submittal
1520            KM
1521            KM        08.27.98 Revised file with 30% Basin Design
1522            KM
1523            KM        03.30.99 Revised file with 60% Basin 1 thru 4 Design - JLM
1524            KM
1525            KM        04.23.99 Revised file for Parkwood Ranch Basin.
1526            KM                 this included additional sub-basin delineation and refinement
1527            KM                 of existing basins. - DCF
1528            KM
1                                         HEC-1 INPUT                                        PAGE 40

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1529            KM        07.06.99 Revised file with 90% Basin 2 and Basin 4 Design - JLM
```

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KM
KM       08.09.99 Revised file with 60% Basin 1 and Basin 3 Design Revisions - DCF
KM
KM       09.27.99 Revised file with 90% Basin 5 DEsign - JLM
KM
KM       09.28.99 Revised file with 100% Basin 2 & 4 Design with revisions
KM                to sub-basin 17 for more refinement to design
KM
KM       *******  ^^^^^ modifications by Dibble & Associates ^^^^^   ***************
KM
KM
ZZ
```

```
1
                     SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE          (V)  ROUTING           (--->)  DIVERSION OR PUMP FLOW

 NO.           (.)  CONNECTOR         (<---)  RETURN OF DIVERTED OR PUMPED FLOW

   72                 42
                       .
                       .
   86                  .-------->     D42
   84                D42
                       V
                       V
   89              42T51
                       .
                       .
   94                  .           51
                       .            .
                       .            .
  106                  .            .-------->    D51
  104                  .          D51
                       .            .
                       .            .
  109                C51.............
                       V
                       V
  112              51T53
                       .
                       .
  118                  .          44A
                       .            .
                       .            .
  132                  .            .-------->   D44A
  130                  .         D44A
                       .            .
                       .            .
  137                  .            .-------->   D44A
  135                  .       DIV44A
                       .            .
                       .            .
  140                  .            .          43
                       .            .           .
                       .            .           .
  153                  .            .           .-------->    D43
  151                  .            .         D43
                       .            .           .
                       .            .           .
  156                  .          C43............
                       .            V
                       .            V
  159                  .        43T53
                       .            .
                       .            .
  165                  .            .          53
                       .            .           .
                       .            .           .
  178                  .            .           .-------->    D53
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176         .         .        D53
            .         .          .
            .         .          .
181      C53.....................
            .
            .
184         .         54
            .          .
            .          .
197         .          .------->     D54
195         .       D54
            .          .
            .          .
200      C54............
            .
            .
206         .------->     SOUTH
203   DCAP12
            V
            V
209    CAP12
            .
            .
216         .          .<-------     D44A
214         .      DR44A
            .          V
            .          V
217         .      44ATB
            .          .
            .          .
224         .          .       44B
            .          .         .
            .          .         .
237         .          .         .------->     D44B
235         .          .      D44B
            .          .         .
            .          .         .
240         .       C44B..........
            .          V
            .          V
243         .     CAP10+
            .          V
            .          V
250         .     RCAP11
            .          .
            .          .
253      C12...........
            V
            V
256   ADOT-W
            V
            V
267   RADOTW
            .
            .
273         .        36B
            .          .
            .          .
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286          .           .-------->    D36B
284          .       D36B
             .           .
             .           .
289      C36B............
             .
             .
295          .           .<-------    SOUTH
293          .     RSOUTH
             .           .
             .           .
296          .           .           57
             .           .            .
             .           .            .
308          .           .            .-------->     D42
306          .           .          D57
             .           .            .
             .           .            .
311          .        C57............
             .           V
             .           V
314          .     CAP13+
             .           .
             .           .
321          .           .          36A
             .           .            .
             .           .            .
331          .       C36A............
             .           V
             .           V
334          .     ADOT-E
             .           .
             .           .
346          .           .           52
             .           .            .
             .           .            .
358          .           .            .-------->     D52
356          .           .          D52
             .           .            .
             .           .            .
361          .           .            .          56
             .           .            .           .
             .           .            .           .
373          .           .            .           .-------->     D56
371          .           .            .         D56
             .           .            .           .
             .           .            .           .
376          .           .          C56............
             .           .            V
             .           .            V
381          .           .        56T58
             .           .            .
             .           .            .
387          .           .            .          58
             .           .            .           .
             .           .            .           .
400          .           .            .           .-------->     D58
398          .           .            .         D58
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                   .             .             .            .
                   .             .             .            .
 403               .             .           C58............
                   .             .             .
                   .             .             .
 407          CLEAR.................................
                   .
                   .
 412               .            46B
                   .             .
                   .             .
 426               .             .-------->      D46
 424               .          D46B
                   .             V
                   .             V
 429               .          CAP6
                   .             V
                   .             V
 434               .        RCAP6B
                   .             .
                   .             .
 443               .             .           29A
                   .             .             .
                   .             .             .
 457               .             .             .-------->     D29A
 455               .             .          D29A
                   .             .             .
                   .             .             .
 460               .         C29A...............
                   .             .
                   .             .
 462               .             .           29B
                   .             .             .
                   .             .             .
 475               .             .             .-------->     D29B
 473               .             .          D29B
                   .             .             .
                   .             .             .
 478               .         C29B...............
                   .             V
                   .             V
 481               .         TRANS
                   .             .
                   .             .
 489               .             .           29C
                   .             .             .
                   .             .             .
 502               .             .             .-------->      D29
 500               .             .          D29C
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 505               .             .             .          29D
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 519               .             .             .            .-------->     D29D
 516               .             .             .         D29D
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 522         .         CP29D.....................
             .            .
 524         .            .         45A
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 539         .            .          .------->     D29A
 537         .            .        D45A
             .            .          .
             .            .          .
 545         .            .          .------->    45ATB
 542         .            .        D45A
             .            .          .
             .            .          .
 548         .            .          .         55B
             .            .          .          .
             .            .          .          .
 563         .            .          .          .------->     D55B
 561         .            .          .        D55B
             .            .          .          .
             .            .          .          .
 566         .            .        C55B...........
             .            .          V
             .            .          V
 569         .            .        CAP7
             .            .          .
             .            .          .
 577         .            .          .          .<-------    45ATB
 575         .            .          .       RD45A
             .            .          .          V
             .            .          .          V
 578         .            .          .       45ATB
             .            .          .          .
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 585         .            .          .          .        45B
             .            .          .          .         .
             .            .          .          .         .
 598         .            .          .          .         .------->     D45B
 596         .            .          .          .       D45B
             .            .          .          .         .
             .            .          .          .         .
 601         .            .          .        C45B...........
             .            .          .          V
             .            .          .          V
 604         .            .          .        CAP8
             .            .          .          .
             .            .          .          .
 610         .            .        C7+8...........
             .            .          V
             .            .          V
 614         .            .      R78-1
             .            .          .
             .            .          .
 620         .            .          .      SUBPR1
             .            .          .          .
             .            .          .          .
 631         .            .          .          .------->    DIPR1
 629         .            .          .      RETPR1
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                  .              .              .              .
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 634              .              .         CPPR1...........
                  .              .              V
                  .              .              V
 637              .              .        RPR1-2
                  .              .              .
                  .              .              .
 643              .              .              .          SUBPR2
                  .              .              .              .
                  .              .              .              .
 654              .              .              .              .------->    DIPR2
 652              .              .              .          RETPR2
                  .              .              .              .
                  .              .              .              .
 657              .              .         CPPR2...........
                  .              .              V
                  .              .              V
 660              .              .        RPR2-3
                  .              .              .
                  .              .              .
 666              .              .              .          SUBPR5
                  .              .              .              .
                  .              .              .              .
 678              .              .              .              .------->    DIPR5
 676              .              .              .          RETPR5
                  .              .              .              .
                  .              .              .              .
 681              .              .              .              .          SUBPR4
                  .              .              .              .              .
                  .              .              .              .              .
 690              .              .              .              .              .          SUBPR3
                  .              .              .              .              .              .
                  .              .              .              .              .              .
 699              .              .              .          CPPR3A.......................
                  .              .              .              .
                  .              .              .              .
 704              .              .              .              .------->    DIPR5
 702              .              .              .          RETPR3
                  .              .              .              .
                  .              .              .              .
 707              .              .        CPPR3B...........
                  .              .              V
                  .              .              V
 710              .              .        R3-BSN
                  .              .              .
                  .              .              .
 716              .              .              .          SUBPR7
                  .              .              .              .
                  .              .              .              .
 727              .              .              .              .          SUBPR6
                  .              .              .              .              .
                  .              .              .              .              .
 738              .              .              .              .              .------->    DIPR6
 736              .              .              .              .          RETPR6
                  .              .              .              .              .
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 741              .              .              .              .              .
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753            .           .           .           .           .           .------->     D55
751            .           .           .           .           .         D55
               .           .           .           .           .           V
               .           .           .           .           .           V
756            .           .           .           .           .        CAP9
               .           .           .           .           .           V
               .           .           .           .           .           V
761            .           .           .           .           .      CAP9-6
               .           .           .           .           .           .
               .           .           .           .           .           .
768            .           .           .           .       CPPR6............
               .           .           .           .           V
               .           .           .           .           V
771            .           .           .           .       6-BSN
               .           .           .           .           .
               .           .           .           .           .
778            .           .           .           .           .      SUBPR8
               .           .           .           .           .           .
790            .           .           .           .           .           .------->   DIPR8
788            .           .           .           .           .      RETPR8
               .           .           .           .           .           .
               .           .           .           .           .           .
793            .           .       CPBSN....................................
               .           .           V
               .           .           V
796            .           .      BASIN5
               .           .           V
               .           .           V
804            .           .      BSN-36
               .           .           .
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811            .           .           .        29D2
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822            .           .           .           .------->  DI29D2
820            .           .           .      RET29D
               .           .           .           V
               .           .           .           V
825            .           .           .      29T36C
               .           .           .           .
               .           .           .           .
834            .           .           .           .        36C2
               .           .           .           .           .
               .           .           .           .           .
846            .           .           .           .           .------->     D36C
844            .           .           .           .       D36C2
               .           .           .           .           .
               .           .           .           .           .
849            .           .         C36........................
               .           .           .
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852            .           .           .        36C1
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863            .           .           .           .------->    D36C
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 861           .            .           .         D36C1
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 866           .            .           .             .
               .            .         CP36.............
               .            .             V
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 868           .            .        36T37
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 874           .            .           .            30
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 887           .            .           .             .-------->      D30
 885           .            .           .           D30
               .            .           .             V
               .            .           .             V
 890           .            .           .         30T37
               .            .           .             .
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 896           .            .           .             .           37
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               .            .           .             .            .
 907           .            .           .             .            .-------->     D37
 905           .            .           .             .          D37
               .            .           .             .            .
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 910           .            .          C37.........................
               .            .            V
               .            .            V
 913           .            .       ADOTEL
               .            .            V
               .            .            V
 924           .            .        37T38
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 930           .            .           .            48
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 943           .            .           .             .-------->      D48
 941           .            .           .           D48
               .            .           .             V
               .            .           .             V
 946           .            .           .          CAP3
               .            .           .             V
               .            .           .             V
 951           .            .           .        BASIN3
               .            .           .             V
               .            .           .             V
 960           .            .           .        RCAP3A
               .            .           .             .
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 966           .            .           .             .           49
               .            .           .             .            .
               .            .           .             .            .
 979           .            .           .             .            .-------->     D49
 977           .            .           .             .          D49
               .            .           .             .            V
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 982            .           .           .           .        CAP2
                .           .           .           .           V
                .           .           .           .           V
 987            .           .           .           .      BASIN2
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                .           .           .           .           V
 996            .           .           .           .      RCAP2B
                .           .           .           .           .
                .           .           .           .           .
1002            .           .           .           .           .        17A2
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1012            .           .           .           .       C17A2............
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1015            .           .           .       C17A3............
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1018            .           .           .           .        17A1
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                .           .           .           .           .
1029            .           .           .      CP17A1............
                .           .           .           V
                .           .           .           V
1031            .           .           .       AT23B
                .           .           .           V
                .           .           .           V
1041            .           .           .       AT23A
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1051            .           .           .           .          23
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1063            .           .           .           .           .------->     D23
1061            .           .           .           .         D23
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1066            .           .           .        C23A............
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1069            .           .           .           .         17B
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1082            .           .           .           .           .------->    D17B
1080            .           .           .           .        D17B
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1085            .           .           .           .      17BT22
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1092            .           .           .           .           .          47
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1107            .           .           .           .           .           .------->     D47
1105            .           .           .           .           .         D47
                .           .           .           .           .           V
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1110            .           .           .           .           .      BASIN4
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1123            .           .           .           .           .      RCAP4A
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1132            .           .           .           .           .      RCAP4B
                .           .           .           .           .           V
                .           .           .           .           .           V
1140            .           .           .           .           .      RCAP4C
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                .           .           .           .           .           V
1148            .           .           .           .           .      RCAP4D
                .           .           .           .           .           .
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1156            .           .           .           .           .           .          22
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1168            .           .           .           .           .           .           .-------->    D22
1166            .           .           .           .           .           .         D22
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1171            .           .           .           .        C22A........................
                .           .           .           .           V
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1175            .           .           .           .       22T23
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1185            .           .           .        C23B............
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1189            .           .           .       23T24
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1199            .           .           .           .          50
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1212            .           .           .           .           .-------->    D50
1210            .           .           .           .         D50
                .           .           .           .           V
                .           .           .           .           V
1215            .           .           .           .        CAP1
                .           .           .           .           V
                .           .           .           .           V
1220            .           .           .           .      BASIN1
                .           .           .           .           V
                .           .           .           .           V
1229            .           .           .           .       RBAS1
                .           .           .           .           .
                .           .           .           .           .
1236            .           .           .           .           .         18A
                .           .           .           .           .           .
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1249            .           .           .           .           .           .-------->   D18A
1247            .           .           .           .           .        D18A
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1252            .           .           .           .        C18A............
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1256      .           .           .           .       18T24
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1263      .           .           .           .           .          24
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1275      .           .           .           .           .           .-------->     D24
1273      .           .           .           .           .         D24
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1278      .           .           .         C24........................
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1288      .           .           .           .-------->   DWC24
1282      .           .           .        DC24
          .           .           .           V
          .           .           .           V
1292      .           .           .     RT31B1
          .           .           .           V
          .           .           .           V
1300      .           .           .     RT31B2
          .           .           .           V
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1308      .           .           .     RT31B3
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1320      .           .           .           .         31B
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1332      .           .           .           .           .-------->   D31B
1330      .           .           .           .        D31B
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1335      .           .           .         C31............
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1342      .           .           .           .-------->    D31W
1338      .           .           .         D31
          .           .           .           V
          .           .           .           V
1345      .           .           .      31T381
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1357      .           .           .      31T382
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1365      .           .           .           .         31A
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1377      .           .           .           .           .-------->   D31A
1375      .           .           .           .        D31A
          .           .           .           .           V
          .           .           .           .           V
1380      .           .           .           .      31AT38
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1386      .           .           .           .           .          38
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1398            .            .           .            .           .           .------->     D38
1396            .            .           .            .           .        D38
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1401            .            .        C38.........................................
                .            .           V
                .            .           V
1406            .            .       38T39
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                .            .           .
1415            .            .           .------->     DB10
1412            .            .       ADD10
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                .            .           .
1420            .            .           .------->     DB9
1418            .            .        ADD9
                .            .           .
                .            .           .
1425            .            .           .------->     DB8
1423            .            .        ADD8
                .            .           .
                .            .           .
1430            .            .           .------->     DB7
1428            .            .        ADD7
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                .            .           .
1435            .            .           .------->     DB6
1433            .            .        ADD6
                .            .           .
                .            .           .
1440            .            .           .------->     DB5
1438            .            .        ADD5
                .            .           .
                .            .           .
1445            .            .           .            .<-------     D31W
1443            .            .           .         D31W
                .            .           .            V
                .            .           .            V
1446            .            .           .       31WT32
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1455            .            .           .            .          32
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1465            .            .           .         C32.............
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1468            .            .           .        32T39
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1474            .            .           .            .          39
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1486            .            .           .            .           .------->     D39
1484            .            .           .            .        D39
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1489             .          .        C39.......................
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1497             .          .          .------->   BASIN
1492             .          .        SOSS
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1***************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            JUL   1997                 *
*          VERSION 4.1                  *
*                                       *
*  RUN DATE   28SEP99  TIME  11:05:44   *
*                                       *
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*****************************************
*                                       *
*     U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616          *
*          (916) 756-1104               *
*                                       *
*****************************************
```

```
90% DESIGN FILE FOR DETENTION BASINS 1 THROUGH 5
    FILE REVISED SEP., 1999 BY DIBBLE & ASSOCIATES - DCF

EAST MESA AREA DRAINAGE MASTER PLAN
AREA NORTH OF SUPERSTITION FREEWAY

FINAL REVISIONS MAY. 1998 - D&A

REVISED BY VALERIE SWICK, OCTOBER-NOVEMBER 1996
TO INCORPORATE THE SUPERSTITION STRUCTURES AND COMBINE MODELS

REVISED BY DAVID DEGERNESS, NOVEMBER 1997 INCORPORATING DIBBLE SUPPLIED
DETENTION BASINS AND CHANNEL ROUTINGS DOWNSTREAM OF THE CAP

FILE NORTHPL1.H1I now is named NDIBF.DAT
 BASED ON GENERAL PLAN FOR FUTURE MESA LAND USE (1997)

THIS MODEL REPRESENTS THE FUTURE CONDITION OF THE WATERSHED (BASED ON 1997
  MAG FUTURE LAND USE FOR THE MESA AREA)
TOTAL DRAINAGE AREA IS APPROXIMATELY 17 SQ. MI.

100-YEAR 24-HOUR FREQUENCY


METHODOLOGY
THE US CORPS OF ENGINEERS FLOOD HYDROLOGY MODEL HEC-1 DATED JUL.1997 VER 4.1
SCS TYPE II RAINFALL DISTRIBUTION
S-GRAPH HYDROGRAPH
GREEN AND AMPT INFILTRATION EQUATION USED FOR CALCULATING LOSSES
NORMAL DEPTH STORAGE CHANNEL ROUTING
APPROXIMATE DIRECTION, LOCATION, AND LENGTH OF THE WASHES HAVE BEEN
EVALUATED BASED ON FIELD INVESTIGATION, USGS MAPS, LANDIS AERIAL SURVEYS
DATED 1994
THE NOAA TECHNICAL MEMORANDUM NOAA ATLAS 2 DEPTH AREA RATIOS

INITIAL STUDY PERFORMED BY LISA C. YOUNG
REVIEWED BY VALERIE A. SWICK
HYDROLOGY BRANCH ENGINEERING DIVISION, FLOOD CONTROL
DISTRICT OF MARICOPA COUNTY, DECEMBER - JULY 1995.

ASSUMED VELOCITY OF 1 FT/SEC FOR SHEET FLOW, 2 FT/SEC FOR WASH/NATURAL
CHANNEL, 3 FT/SEC FOR ROAD AND GRASS CHANNEL, 10 FT/SEC FOR CONCRETE CHANNEL

DIVERSIONS FOR EACH BASIN ARE TO ACCOUNT FOR RETENTION DUE TO DEVELOPMENT.
```

VOLUMES (AC-FT) WERE OBTAINED FROM RUNNING [illegible]UTURE CONDITIONS MODEL WITH THE 100 YR 2 HR STORM. ADJUSTMENTS WERE MADE FOR EACH SUBBASIN DEPENDING ON THE AMOUNT OF CURRENT DEVELOPMENT, WHICH IN MOST CASES DOES NOT RETAIN THE 100 YR 2 HR STORM EVENT. THE FUTURE VOLUME WAS REDUCED BY 20% TO ALLOW FOR SMALL AREAS IN THE SUBBASIN THAT DO NOT FLOW INTO THE RETENTION BASINS.

DDM MCUHP2 MESA AREA DRAINAGE MASTER PLAN

```
53 IO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT        HYDROGRAPH TIME DATA
                    NMIN          5  MINUTES IN COMPUTATION INTERVAL
                   IDATE     1APR97  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        500  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE     2APR97  ENDING DATE
                  NDTIME       1735  ENDING TIME
                   ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL     .08 HOURS
                    TOTAL TIME BASE   41.58 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

55 JD        INDEX STORM NO. 1
                    STRM       3.60  PRECIPITATION DEPTH
                    TRDA        .01  TRANSPOSITION DRAINAGE AREA

56 PI          PRECIPITATION PATTERN
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.01	.01	.01	.01	.01	.02	.02	.02	.05	.05
.05	.07	.07	.07	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

66 JD INDEX STORM NO. 2

STRM 3.58 PRECIPITATION DEPTH

TRDA 1.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.05	.05
.05	.07	.07	.07	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

67 JD INDEX STORM NO. 3

STRM 3.49 PRECIPITATION DEPTH

TRDA 5.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

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         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .01      .01      .01      .01
         .01      .01      .01      .01      .01      .02      .02      .02      .05      .05
         .05      .07      .07      .07      .01      .01      .01      .01      .01      .01
         .01      .01      .01      .01      .01      .01      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
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         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
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         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00

68 JD           INDEX STORM NO. 4
                    STRM          3.38  PRECIPITATION DEPTH
                    TRDA         10.00  TRANSPOSITION DRAINAGE AREA

 0 PI             PRECIPITATION PATTERN
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .01      .01      .01      .01
         .01      .01      .01      .01      .01      .02      .02      .02      .05      .05
         .05      .07      .07      .07      .01      .01      .01      .01      .01      .01
         .01      .01      .01      .01      .01      .01      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
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         .00      .00      .00      .00      .00      .00      .00      .00      .00      .00
         .00      .00      .00      .00      .00      .00      .00      .00
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69 JD INDEX STORM NO. 5

STRM	3.24	PRECIPITATION DEPTH
TRDA	30.00	TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.05	.05
.05	.07	.07	.07	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

70 JD INDEX STORM NO. 6

STRM	3.10	PRECIPITATION DEPTH
TRDA	60.00	TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.05	.05
.05	.07	.07	.07	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

71 JD INDEX STORM NO. 7

STRM 3.05 PRECIPITATION DEPTH

TRDA 90.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.01	.01	.01	.01
.01	.01	.01	.01	.01	.02	.02	.02	.05	.05
.05	.07	.07	.07	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00		

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796 KK        *   BASIN5   *
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797 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

RESERVOIR ROUTING WITH 10 foot by 3 foot CBC OUTFALL

HYDROGRAPH ROUTING DATA

799 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

800 SV	STORAGE	.0	.1	.8	3.1	8.7	15.8	24.3	33.8	44.2	55.0
801 SE	ELEVATION	1518.00	1519.00	1520.00	1521.00	1522.00	1523.00	1524.00	1525.00	1526.00	1527.00
802 SQ	DISCHARGE	150.	210.	240.	270.	300.	330.	360.	375.	420.	450.
803 SE	ELEVATION	1521.00	1521.94	1522.45	1523.01	1523.63	1524.30	1525.03	1525.42	1526.68	1526.68

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.07	.75	3.13	8.38	8.72	11.92	15.83	15.92	21.19
OUTFLOW	150.00	150.00	150.00	150.00	210.00	213.53	240.00	269.46	270.00	300.00
ELEVATION	1518.00	1519.00	1520.00	1521.00	1521.94	1522.00	1522.45	1523.00	1523.01	1523.63
STORAGE	24.33	27.17	33.79	34.10	38.16	44.19	51.52	54.97		
OUTFLOW	316.57	330.00	358.77	360.00	375.00	395.71	420.00	420.00		
ELEVATION	1524.00	1524.30	1525.00	1525.03	1525.42	1526.00	1526.68	1527.00		

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN5
TRANSPOSITION AREA .0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 382.	14.67		267.	179.	167.	167.
		(INCHES)	.647	1.736	2.798	2.798
		(AC-FT)	132.	356.	573.	573.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
40.	14.67	19.	4.	3.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR

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+    (FE          (HR)
    1525          14.67                1522.84     1519.21     1518.70     1518.70

                             CUMULATIVE AREA =     3.84 SQ MI


       ***               ***            ***            ***            ***

                              HYDROGRAPH AT STATION    BASIN5
                             TRANSPOSITION AREA      1.0 SQ MI

    PEAK FLOW        TIME                         MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR       41.58-HR
+     (CFS)          (HR)
                               (CFS)
+      378.          14.58                264.         178.         166.          166.
                             (INCHES)     .638        1.728        2.790         2.790
                              (AC-FT)     131.         354.         571.          571.

   PEAK STORAGE      TIME                         MAXIMUM AVERAGE STORAGE
                                          6-HR        24-HR        72-HR       41.58-HR
+   (AC-FT)          (HR)
        39.          14.58                 18.           4.           2.            2.

    PEAK STAGE       TIME                         MAXIMUM AVERAGE STAGE
                                          6-HR        24-HR        72-HR       41.58-HR
+    (FEET)          (HR)
    1525.51          14.58             1522.74     1519.18     1518.68     1518.68

                             CUMULATIVE AREA =     3.84 SQ MI


       ***               ***            ***            ***            ***

                              HYDROGRAPH AT STATION    BASIN5
                             TRANSPOSITION AREA      5.0 SQ MI

    PEAK FLOW        TIME                         MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR       41.58-HR
+     (CFS)          (HR)
                               (CFS)
+      358.          14.58                249.         175.         164.          164.
                             (INCHES)     .602        1.691        2.753         2.753
                              (AC-FT)     123.         346.         564.          564.

   PEAK STORAGE      TIME                         MAXIMUM AVERAGE STORAGE
                                          6-HR        24-HR        72-HR       41.58-HR
+   (AC-FT)          (HR)
        34.          14.58                 15.           3.           2.            2.

    PEAK STAGE       TIME                         MAXIMUM AVERAGE STAGE
                                          6-HR        24-HR        72-HR       41.58-HR
+    (FEET)          (HR)
    1524.99          14.58             1522.28     1519.07     1518.62     1518.62

                             CUMULATIVE AREA =     3.84 SQ MI
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*** *** *** *** ***

HYDROGRAPH AT STATION BASIN5
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 331.	14.50		230.	170.	161.	161.
		(INCHES)	.556	1.646	2.707	2.707
		(AC-FT)	114.	337.	554.	554.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
27.	14.50	12.	3.	2.	1.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE		
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1524.32	14.50	1521.75	1518.94	1518.54	1518.54

CUMULATIVE AREA = 3.84 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN5
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 294.	14.42		206.	164.	158.	158.
		(INCHES)	.499	1.589	2.651	2.651
		(AC-FT)	102.	325.	543.	543.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE		
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
20.	14.42	8.	2.	1.	1.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE		
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1523.50	14.42	1521.08	1518.77	1518.44	1518.44

CUMULATIVE AREA = 3.84 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN5
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

```
+    (CF          (HR)                  6-HR        24-HR       72-HR       -HR
                              (CFS)
+     251.       14.50                  184.        159.        155.        155.
                          (INCHES)      .446        1.535       2.597       2.597
                           (AC-FT)       91.        314.        532.        532.

 PEAK STORAGE    TIME                          MAXIMUM AVERAGE STORAGE
                                        6-HR        24-HR       72-HR    41.58-HR
+   (AC-FT)       (HR)
       13.       14.50                    5.          1.          1.          0.

  PEAK STAGE     TIME                          MAXIMUM AVERAGE STAGE
                                        6-HR        24-HR       72-HR    41.58-HR
+    (FEET)       (HR)
   1522.66       14.50               1520.46     1518.62     1518.36     1518.36

                           CUMULATIVE AREA =      3.84 SQ MI

       ***             ***              ***              ***              ***

                             HYDROGRAPH AT STATION    BASIN5
                           TRANSPOSITION AREA      90.0 SQ MI

  PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR       72-HR    41.58-HR
+    (CFS)        (HR)
                              (CFS)
+     234.       14.58                  177.        157.        154.        154.
                          (INCHES)      .428        1.517       2.579       2.579
                           (AC-FT)       88.        311.        528.        528.

 PEAK STORAGE    TIME                          MAXIMUM AVERAGE STORAGE
                                        6-HR        24-HR       72-HR    41.58-HR
+   (AC-FT)       (HR)
       11.       14.58                    4.          1.          0.          0.

  PEAK STAGE     TIME                          MAXIMUM AVERAGE STAGE
                                        6-HR        24-HR       72-HR    41.58-HR
+    (FEET)       (HR)
   1522.34       14.58               1520.25     1518.56     1518.32     1518.32

                           CUMULATIVE AREA =      3.84 SQ MI

       ***             ***              ***              ***              ***


                            INTERPOLATED HYDROGRAPH AT    BASIN5

  PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR       72-HR    41.58-HR
+    (CFS)        (HR)
                              (CFS)
+     362.       14.58                  251.        175.        164.        164.
                          (INCHES)      .608        1.697       2.759       2.759
                           (AC-FT)      124.        348.        565.        565.
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CUMULATIVE AREA = 3.84 SQ MI

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951 KK        *   BASIN3   *
              *            *
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952 KO OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP3
WITH 30-INCH OUTFALL   BASIN AE2B (BASIN 3)

HYDROGRAPH ROUTING DATA

955 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	-1.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

956 SV	STORAGE	.6	3.1	5.8	9.0	12.8	17.1	21.5	
957 SE	ELEVATION	55.00	56.00	57.00	58.00	59.00	60.00	61.00	
958 SQ	DISCHARGE	0.	8.	16.	24.	32.	40.	48.	56.
959 SE	ELEVATION	54.00	55.40	56.00	56.70	57.70	58.90	60.20	61.70

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.57	.57	1.57	3.08	4.97	5.78	8.03	9.00	12.41	12.79
OUTFLOW	.00	5.71	8.00	16.00	24.00	26.40	32.00	34.00	40.00	40.62
ELEVATION	54.00	55.00	55.40	56.00	56.70	57.00	57.70	58.00	58.90	59.00

STORAGE	17.07	17.95	21.45	24.52
OUTFLOW	46.77	48.00	52.27	56.00
ELEVATION	60.00	60.20	61.00	61.70

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 6.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN3
TRANSPOSITION AREA .0 SQ MI

PEAK	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 49.	13.58		41.	15.	9.	9.
		(INCHES)	.491	.718	.718	.718
		(AC-FT)	20.	29.	29.	29.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
18.	13.58	13.	4.	3.	3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
60.32	13.58	59.05	55.88	55.09	55.09

CUMULATIVE AREA = .77 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN3
TRANSPOSITION AREA 1.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 48.	13.58		40.	15.	8.	8.
		(INCHES)	.486	.706	.706	.706
		(AC-FT)	20.	29.	29.	29.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
18.	13.58	13.	4.	3.	3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
60.24	13.58	58.97	55.91	55.12	55.12

CUMULATIVE AREA = .77 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN3
TRANSPOSITION AREA 5.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 46.	13.58		38.	14.	8.	8.
		(INCHES)	.459	.657	.657	.657

			6-HR	24-HR	72-HR	41.58-HR
		(AC-FT)	19.	27.	27.	27.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
17.	13.58		12.	4.	3.	3.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
59.87	13.58		58.64	55.72	54.99	54.99

CUMULATIVE AREA = .77 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN3
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 43.	13.58		35.	12.	7.	7.
		(INCHES)	.426	.596	.596	.596
		(AC-FT)	17.	24.	24.	24.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
15.	13.58		10.	3.	2.	2.

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)					
59.41	13.58		58.23	55.56	54.90	54.90

CUMULATIVE AREA = .77 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN3
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 39.	13.58		31.	11.	6.	6.
		(INCHES)	.378	.517	.517	.517
		(AC-FT)	16.	21.	21.	21.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)					
12.	13.58		8.	3.	2.	2.

```
  PEAK              TIME                               MAXIMUM AVERAGE STAGE
                                            6-HR        24-HR        72-HR        [illegible]8-HR
+   (FEET)          (HR)
    58.81          13.58                   57.69        55.76        55.12        55.12

                        CUMULATIVE AREA =        .77 SQ MI

       ***             ***          ***          ***          ***

                         HYDROGRAPH AT STATION    BASIN3
                       TRANSPOSITION AREA      60.0 SQ MI

  PEAK FLOW         TIME                               MAXIMUM AVERAGE FLOW
                                            6-HR        24-HR        72-HR        41.58-HR
+    (CFS)          (HR)
                                (CFS)
+        35.       13.67                    27.           9.           5.           5.
                             (INCHES)       .326         .439         .439         .439
                              (AC-FT)        13.          18.          18.          18.

  PEAK STORAGE      TIME                              MAXIMUM AVERAGE STORAGE
                                            6-HR        24-HR        72-HR        41.58-HR
+   (AC-FT)         (HR)
        10.        13.67                     6.           2.           2.           2.

  PEAK STAGE        TIME                               MAXIMUM AVERAGE STAGE
                                            6-HR        24-HR        72-HR        41.58-HR
+    (FEET)         (HR)
     58.16         13.67                   57.14        55.32        54.80        54.80

                        CUMULATIVE AREA =        .77 SQ MI

       ***             ***          ***          ***          ***

                         HYDROGRAPH AT STATION    BASIN3
                       TRANSPOSITION AREA      90.0 SQ MI

  PEAK FLOW         TIME                               MAXIMUM AVERAGE FLOW
                                            6-HR        24-HR        72-HR        41.58-HR
+    (CFS)          (HR)
                                (CFS)
+        33.       13.67                    25.           9.           5.           5.
                             (INCHES)       .305         .411         .411         .411
                              (AC-FT)        13.          17.          17.          17.

  PEAK STORAGE      TIME                              MAXIMUM AVERAGE STORAGE
                                            6-HR        24-HR        72-HR        41.58-HR
+   (AC-FT)         (HR)
         9.        13.67                     6.           2.           1.           1.

  PEAK STAGE        TIME                               MAXIMUM AVERAGE STAGE
                                            6-HR        24-HR        72-HR        41.58-HR
+    (FEET)         (HR)
     57.92         13.67                   56.94        55.09        54.63        54.63

                        CUMULATIVE AREA =        .77 SQ MI
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INTERPOLATED HYDROGRAPH AT BASIN3

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	41.58-HR
+	(CFS)	(HR)					
			(CFS)				
+	48.	13.58		40.	15.	8.	8.
			(INCHES)	.486	.707	.707	.707
			(AC-FT)	20.	29.	29.	29.

CUMULATIVE AREA = .77 SQ MI

*** ***

987 KK　BASIN2

988 KO　OUTPUT CONTROL VARIABLES

IPRNT	3	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP2
WITH 30-INCH OUTFALL (EH1B)

HYDROGRAPH ROUTING DATA

991 RS　STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	STOR	TYPE OF INITIAL CONDITION
RSVRIC	.00	INITIAL CONDITION
X	.00	WORKING R AND D COEFFICIENT

992 SV	STORAGE	.0	.1	.6	2.0	5.0	10.2	16.7	20.2	23.8
993 SE	ELEVATION	50.00	51.00	52.00	53.00	54.00	55.00	56.00	56.50	57.00
994 SQ	DISCHARGE	0.	10.	20.	30.	40.	50.	58.		
995 SE	ELEVATION	49.00	50.00	50.50	52.30	53.40	55.90	58.40		

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.00	.03	.05	.62	1.03	1.99	3.18	4.97	10.20
OUTFLOW	.00	10.00	20.00	22.78	28.33	30.00	36.36	40.00	42.40	46.40
ELEVATION	49.00	50.00	50.50	51.00	52.00	52.30	53.00	53.40	54.00	55.00

STORAGE	16.06	16.71	20.19	23.76	33.76
OUTFLOW	50.00	50.32	51.92	53.52	58.00
ELEVATION	55.90	56.00	56.50	57.00	58.40

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 10. TO 20.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN2
TRANSPOSITION AREA .0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 52.	13.58		48.	17.	10.	10.
		(INCHES)	.570	.788	.789	.789
		(AC-FT)	24.	33.	33.	33.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
20.	13.58	14.	4.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
56.47	13.58	55.53	51.07	50.19	50.19

CUMULATIVE AREA = .79 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN2
TRANSPOSITION AREA 1.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 52.	13.58		48.	16.	10.	10.
		(INCHES)	.567	.777	.777	.777
		(AC-FT)	24.	33.	33.	33.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
20.	13.58	13.	4.	2.	2.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
56.42	13.58	55.47	51.32	50.38	50.38

CUMULATIVE AREA = .79 SQ MI

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       ***              ***             ***             ***             ***

                    HYDROGRAPH AT STATION   BASIN2
                  TRANSPOSITION AREA      5.0 SQ MI

   PEAK FLOW      TIME                         MAXIMUM AVERAGE FLOW
                                   6-HR        24-HR        72-HR      41.58-HR
+    (CFS)        (HR)
                         (CFS)
+        51.     13.50              47.          15.           9.           9.
                      (INCHES)     .556         .727         .728         .728
                       (AC-FT)      23.          31.          31.          31.

  PEAK STORAGE    TIME                        MAXIMUM AVERAGE STORAGE
                                   6-HR        24-HR        72-HR      41.58-HR
+   (AC-FT)       (HR)
         18.     13.58              12.           3.           2.           2.

   PEAK STAGE     TIME                         MAXIMUM AVERAGE STAGE
                                   6-HR        24-HR        72-HR      41.58-HR
+    (FEET)       (HR)
       56.18     13.58            55.22        50.86        50.07        50.07

                   CUMULATIVE AREA =      .79 SQ MI

       ***              ***             ***             ***             ***

                    HYDROGRAPH AT STATION   BASIN2
                  TRANSPOSITION AREA     10.0 SQ MI

   PEAK FLOW      TIME                         MAXIMUM AVERAGE FLOW
                                   6-HR        24-HR        72-HR      41.58-HR
+    (CFS)        (HR)
                         (CFS)
+        50.     13.50              46.          14.           8.           8.
                      (INCHES)     .539         .665         .666         .666
                       (AC-FT)      23.          28.          28.          28.

  PEAK STORAGE    TIME                        MAXIMUM AVERAGE STORAGE
                                   6-HR        24-HR        72-HR      41.58-HR
+   (AC-FT)       (HR)
         16.     13.50              10.           3.           1.           1.

   PEAK STAGE     TIME                         MAXIMUM AVERAGE STAGE
                                   6-HR        24-HR        72-HR      41.58-HR
+    (FEET)       (HR)
       55.86     13.50            54.86        50.82        50.06        50.06

                   CUMULATIVE AREA =      .79 SQ MI

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                    HYDROGRAPH AT STATION   BASIN2
                  TRANSPOSITION AREA     30.0 SQ MI
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   PEAK FL        TIME                       MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR      41.58-HR
+    (CFS)        (HR)
                            (CFS)
+        48.     13.50                 43.         12.          7.           7.
                          (INCHES)    .506        .587        .588         .588
                           (AC-FT)     21.         25.         25.          25.

  PEAK STORAGE    TIME                      MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR      41.58-HR
+   (AC-FT)       (HR)
         13.     13.50                  7.          2.          1.           1.

   PEAK STAGE     TIME                       MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR      41.58-HR
+    (FEET)       (HR)
       55.44     13.50               54.31       50.40       49.81        49.81

                           CUMULATIVE AREA =      .79 SQ MI


        ***              ***              ***              ***              ***

                             HYDROGRAPH AT STATION    BASIN2
                           TRANSPOSITION AREA      60.0 SQ MI

   PEAK FLOW      TIME                       MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR      41.58-HR
+    (CFS)        (HR)
                            (CFS)
+        47.     13.50                 38.         11.          6.           6.
                          (INCHES)    .450        .508        .509         .509
                           (AC-FT)     19.         21.         21.          21.

  PEAK STORAGE    TIME                      MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR      41.58-HR
+   (AC-FT)       (HR)
         10.     13.50                  5.          1.          1.           1.

   PEAK STAGE     TIME                       MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR      41.58-HR
+    (FEET)       (HR)
       55.03     13.50               53.52       50.14       49.66        49.66

                           CUMULATIVE AREA =      .79 SQ MI


        ***              ***              ***              ***              ***

                             HYDROGRAPH AT STATION    BASIN2
                           TRANSPOSITION AREA      90.0 SQ MI

   PEAK FLOW      TIME                       MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR      41.58-HR
+    (CFS)        (HR)
                            (CFS)
+        46.     13.50                 36.         10.          6.           6.
                          (INCHES)    .422        .479        .480         .480
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                                (AC-FT)      18.          20.          20.          20.

  PEAK STORAGE    TIME                                  MAXIMUM AVERAGE STORAGE
                                             6-HR        24-HR        72-HR      41.58-HR
+  (AC-FT)        (HR)
        9.       13.50                        4.           1.           1.           1.

   PEAK STAGE     TIME                                  MAXIMUM AVERAGE STAGE
                                             6-HR        24-HR        72-HR      41.58-HR
+    (FEET)       (HR)
      54.85      13.50                       53.18       50.08        49.62        49.62

                              CUMULATIVE AREA =        .79 SQ MI

        ***               ***              ***              ***              ***


                              INTERPOLATED HYDROGRAPH AT    BASIN2

   PEAK FLOW      TIME                                  MAXIMUM AVERAGE FLOW
                                             6-HR        24-HR        72-HR      41.58-HR
+    (CFS)        (HR)
                                  (CFS)
+        52.     13.58                        48.          17.          10.          10.
                               (INCHES)      .567         .777         .778         .778
                                (AC-FT)       24.          33.          33.          33.

                              CUMULATIVE AREA =        .79 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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               *            *
1110 KK        *   BASIN4   *
               *            *
               **************

1111 KO               OUTPUT CONTROL VARIABLES
                            IPRNT            3  PRINT CONTROL
                            IPLOT            0  PLOT CONTROL
                            QSCAL           0.  HYDROGRAPH PLOT SCALE
                                ROUTE THROUGH OVERCHUTES 4 AND 5, HYDRAULICALLY CONNECTED
                                STORAGE AND DISCHARGE WERE ADDED AT APPROPRIATE ELEVATIONS
                                OUTFLOW THROUGH TWO 30-INCH PIPES.
                                BASIN4 (BY4B)

                    HYDROGRAPH ROUTING DATA

1116 RS               STORAGE ROUTING
                            NSTPS            1  NUMBER OF SUBREACHES
                             ITYP         STOR  TYPE OF INITIAL CONDITION
                           RSVRIC        -1.00  INITIAL CONDITION
                                X          .00 WORKING R AND D COEFFICIENT
```

1117	SV	STORAGE	.0	.0	.3	1.9	6	11.1	17.2	23.7		
1118	SE	ELEVATION	1568.00	1569.00	1570.00	1571.00	1572.00	1573.00	1574.00	1575.00		
1119	SQ	DISCHARGE	0.	13.	38.	50.	53.	75.	88.	100.	113.	125.
			131.									
1121	SE	ELEVATION	1567.80	1569.00	1570.00	1570.40	1570.50	1571.50	1572.20	1572.90	1573.70	1574.60
			1575.00									

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COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	.00	.01	.31	.93	1.08	1.85	3.73	5.61	6.71
OUTFLOW	.00	2.08	12.50	37.50	50.00	53.00	64.00	75.00	83.93	87.50
ELEVATION	1567.80	1568.00	1569.00	1570.00	1570.40	1570.50	1571.00	1571.50	1572.00	1572.20
STORAGE	10.57	11.12	15.36	17.18	21.07	23.67				
OUTFLOW	100.00	101.56	112.50	116.67	125.00	131.00				
ELEVATION	1572.90	1573.00	1573.70	1574.00	1574.60	1575.00				

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 2. TO 13.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN4
TRANSPOSITION AREA .0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 122.	14.08		80.	22.	13.	13.
		(INCHES)	.444	.493	.493	.493
		(AC-FT)	40.	44.	44.	44.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
20.	14.08	9.	2.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1574.40	14.08	1572.04	1569.07	1568.54	1568.54

CUMULATIVE AREA = 1.67 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN4
TRANSPOSITION AREA 1.0 SQ MI

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

PEAK FLOW	TIME		6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 121.	14.08		78.	22.	13.	13.
		(INCHES)	.434	.483	.483	.483
		(AC-FT)	39.	43.	43.	43.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
19.	14.08	8.	2.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1574.29	14.08	1571.94	1569.04	1568.52	1568.52

CUMULATIVE AREA = 1.67 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN4
TRANSPOSITION AREA 5.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 115.	14.08		70.	20.	11.	11.
		(INCHES)	.389	.435	.435	.435
		(AC-FT)	35.	39.	39.	39.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
16.	14.08	6.	2.	1.	1.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
1573.85	14.08	1571.52	1568.93	1568.46	1568.46

CUMULATIVE AREA = 1.67 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN4
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 106.	14.17		60.	17.	10.	10.
		(INCHES)	.333	.377	.377	.377
		(AC-FT)	30.	34.	34.	34.

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  PEAK STOR[illegible]   TIME                        MAXIMUM AVERAGE STORAGE
                                        6-HR        24-HR        72-HR     41.[illegible]HR
+  (AC-FT)      (HR)
       13.      14.17                     5.           1.           1.           1.

   PEAK STAGE   TIME                        MAXIMUM AVERAGE STAGE
                                        6-HR        24-HR        72-HR     41.58-HR
+   (FEET)      (HR)
   1573.27      14.17                1571.02      1568.79      1568.38      1568.38

                          CUMULATIVE AREA =       1.67 SQ MI


        ***            ***            ***            ***            ***

                            HYDROGRAPH AT STATION    BASIN4
                          TRANSPOSITION AREA      30.0 SQ MI

   PEAK FLOW      TIME                      MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR        72-HR     41.58-HR
+   (CFS)       (HR)
                               (CFS)
+        93.    14.17                    47.          14.           8.           8.
                            (INCHES)    .261         .303         .303         .303
                             (AC-FT)     23.          27.          27.          27.

  PEAK STORAGE   TIME                      MAXIMUM AVERAGE STORAGE
                                        6-HR        24-HR        72-HR     41.58-HR
+  (AC-FT)      (HR)
         8.     14.17                     3.           1.           0.           0.

   PEAK STAGE   TIME                        MAXIMUM AVERAGE STAGE
                                        6-HR        24-HR        72-HR     41.58-HR
+   (FEET)      (HR)
   1572.52      14.17                1570.41      1568.63      1568.28      1568.28

                          CUMULATIVE AREA =       1.67 SQ MI


        ***            ***            ***            ***            ***

                            HYDROGRAPH AT STATION    BASIN4
                          TRANSPOSITION AREA      60.0 SQ MI

   PEAK FLOW      TIME                      MAXIMUM AVERAGE FLOW
                                        6-HR        24-HR        72-HR     41.58-HR
+   (CFS)       (HR)
                               (CFS)
+        79.    14.25                    34.          10.           6.           6.
                            (INCHES)    .190         .228         .228         .228
                             (AC-FT)     17.          20.          20.          20.

  PEAK STORAGE   TIME                      MAXIMUM AVERAGE STORAGE
                                        6-HR        24-HR        72-HR     41.58-HR
+  (AC-FT)      (HR)
         5.     14.25                     1.           0.           0.           0.

   PEAK STAGE   TIME                        MAXIMUM AVERAGE STAGE
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                                          6-HR        24-HR        72-HR       41.58-HR
+    (FEET)       (HR)
   1571.71       14.25                 1569.82      1568.47      1568.19      1568.19

                              CUMULATIVE AREA =     1.67 SQ MI


        ***             ***             ***             ***             ***

                               HYDROGRAPH AT STATION    BASIN4
                             TRANSPOSITION AREA      90.0 SQ MI

    PEAK FLOW        TIME                          MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR       41.58-HR
+     (CFS)         (HR)
                                 (CFS)
+        72.       14.25                    30.           9.           5.           5.
                              (INCHES)    .165         .201         .201         .201
                               (AC-FT)     15.          18.          18.          18.

   PEAK STORAGE      TIME                        MAXIMUM AVERAGE STORAGE
                                          6-HR        24-HR        72-HR       41.58-HR
+    (AC-FT)        (HR)
           3.      14.25                     1.           0.           0.           0.

    PEAK STAGE       TIME                          MAXIMUM AVERAGE STAGE
                                          6-HR        24-HR        72-HR       41.58-HR
+    (FEET)         (HR)
   1571.36       14.25                 1569.62      1568.41      1568.16      1568.16

                              CUMULATIVE AREA =     1.67 SQ MI

        ***             ***             ***             ***             ***


                              INTERPOLATED HYDROGRAPH AT    BASIN4

    PEAK FLOW        TIME                          MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR       41.58-HR
+     (CFS)         (HR)
                                 (CFS)
+       119.       14.08                    75.          21.          12.          12.
                              (INCHES)    .419         .468         .468         .468
                               (AC-FT)     37.          42.          42.          42.

                              CUMULATIVE AREA =     1.67 SQ MI


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


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                 *             *
 1220 KK         *    BASIN1   *
                 *             *
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1221 KO        OUTPUT CONTROL VARIABLES
                     IPRNT          3  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE
                             NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP1
                             WITH 24-INCH OUTFALL

              HYDROGRAPH ROUTING DATA

1224 RS        STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                         X        .00 WORKING R AND D COEFFICIENT

1225 SV          STORAGE       .0        .2        .8       2.0       4.3       8.2      12.4

1226 SE        ELEVATION    53.00     54.00     55.00     56.00     57.00     58.00     59.00

1227 SQ        DISCHARGE       0.        4.       16.       28.       30.       36.       40.

1228 SE        ELEVATION    51.90     52.80     54.10     56.00     57.10     59.00     59.10
                                                         ***

                                      COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

          STORAGE       .00       .00       .00       .17       .23       .78      2.05      4.34      4.72      8.16
          OUTFLOW       .00      4.00      5.85     15.08     16.00     21.68     28.00     29.82     30.00     32.84
        ELEVATION     51.90     52.80     53.00     54.00     54.10     55.00     56.00     57.00     57.10     58.00

          STORAGE     12.36     12.78
          OUTFLOW     36.00     40.00
        ELEVATION     59.00     59.10

    ***            ***            ***            ***            ***

                   HYDROGRAPH AT STATION   BASIN1
                  TRANSPOSITION AREA        .0 SQ MI

   PEAK FLOW      TIME                                MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR         72-HR     41.58-HR
+    (CFS)        (HR)
                            (CFS)
+       33.      13.25                    28.           11.            8.           8.
                          (INCHES)       .946         1.457         1.942        1.942
                           (AC-FT)        14.           22.           29.          29.

  PEAK STORAGE    TIME                               MAXIMUM AVERAGE STORAGE
                                          6-HR        24-HR         72-HR     41.58-HR
+  (AC-FT)        (HR)
         8.      13.25                     4.            1.            1.           1.

   PEAK STAGE     TIME                                MAXIMUM AVERAGE STAGE
                                          6-HR        24-HR         72-HR     41.58-HR
+   (FEET)        (HR)
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      57.96      13.25                    56.69      53.89      53.48       53.48

                          CUMULATIVE AREA =      .28 SQ MI

        ***             ***             ***             ***             ***

                           HYDROGRAPH AT STATION   BASIN1
                         TRANSPOSITION AREA      1.0 SQ MI

     PEAK FLOW       TIME                          MAXIMUM AVERAGE FLOW
                                          6-HR       24-HR      72-HR     41.58-HR
 +    (CFS)          (HR)
                                (CFS)
 +          33.      13.25                28.        11.         8.          8.
                              (INCHES)    .937      1.445      1.930       1.930
                               (AC-FT)    14.        22.        29.         29.

    PEAK STORAGE     TIME                          MAXIMUM AVERAGE STORAGE
                                          6-HR       24-HR      72-HR     41.58-HR
 +   (AC-FT)         (HR)
              8.     13.25                 4.         1.         1.          1.

     PEAK STAGE      TIME                          MAXIMUM AVERAGE STAGE
                                          6-HR       24-HR      72-HR     41.58-HR
 +    (FEET)         (HR)
        57.92        13.25               56.63      53.90      53.49       53.49

                          CUMULATIVE AREA =      .28 SQ MI

        ***             ***             ***             ***             ***

                           HYDROGRAPH AT STATION   BASIN1
                         TRANSPOSITION AREA      5.0 SQ MI

     PEAK FLOW       TIME                          MAXIMUM AVERAGE FLOW
                                          6-HR       24-HR      72-HR     41.58-HR
 +    (CFS)          (HR)
                                (CFS)
 +          32.      13.25                27.        10.         8.          8.
                              (INCHES)    .892      1.391      1.877       1.877
                               (AC-FT)    13.        21.        28.         28.

    PEAK STORAGE     TIME                          MAXIMUM AVERAGE STORAGE
                                          6-HR       24-HR      72-HR     41.58-HR
 +   (AC-FT)         (HR)
              7.     13.25                 4.         1.         1.          1.

     PEAK STAGE      TIME                          MAXIMUM AVERAGE STAGE
                                          6-HR       24-HR      72-HR     41.58-HR
 +    (FEET)         (HR)
        57.76        13.25               56.35      53.76      53.38       53.38

                          CUMULATIVE AREA =      .28 SQ MI

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HYDROGRAPH AT STATION BASIN1
TRANSPOSITION AREA 10.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 31.	13.25		25.	10.	8.	8.
		(INCHES)	.825	1.323	1.809	1.809
		(AC-FT)	12.	20.	27.	27.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
6.	13.25	3.	1.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
57.54	13.25	55.97	53.67	53.34	53.34

CUMULATIVE AREA = .28 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN1
TRANSPOSITION AREA 30.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 31.	13.17		22.	9.	7.	7.
		(INCHES)	.738	1.237	1.722	1.722
		(AC-FT)	11.	18.	26.	26.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
5.	13.17	2.	1.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
57.27	13.17	55.49	53.55	53.28	53.28

CUMULATIVE AREA = .28 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN1
TRANSPOSITION AREA 60.0 SQ MI

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)				

		(CFS)				
+ 30.	13.17		20.	9.	7.	7.
		(INCHES)	.654	1.152	1.638	1.638
		(AC-FT)	10.	17.	24.	24.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
4.	13.17	2.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
57.01	13.17	55.02	53.42	53.18	53.18

CUMULATIVE AREA = .28 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION BASIN1
TRANSPOSITION AREA 90.0 SQ MI

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 30.	13.17		19.	8.	7.	7.
		(INCHES)	.623	1.121	1.607	1.607
		(AC-FT)	9.	17.	24.	24.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (AC-FT)	(HR)				
4.	13.17	1.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	41.58-HR
+ (FEET)	(HR)				
56.86	13.17	54.85	53.38	53.17	53.17

CUMULATIVE AREA = .28 SQ MI

*** *** *** *** ***

INTERPOLATED HYDROGRAPH AT BASIN1

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	41.58-HR
+ (CFS)	(HR)					
		(CFS)				
+ 33.	13.25		28.	11.	8.	8.
		(INCHES)	.939	1.448	1.933	1.933
		(AC-FT)	14.	22.	29.	29.

CUMULATIVE AREA = .28 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	42	1207.	12.67	267.	82.	47.	1.75		
+	DIVERSION TO	D42	872.	12.33	94.	27.	16.	1.75		
+	HYDROGRAPH AT	D42	1207.	12.67	201.	55.	32.	1.75		
+	ROUTED TO	42T51	1057.	13.25	198.	55.	32.	1.75		
+	HYDROGRAPH AT	51	1321.	12.25	220.	71.	41.	1.24		
+	DIVERSION TO	D51	935.	12.00	84.	25.	15.	1.24		
+	HYDROGRAPH AT	D51	1321.	12.25	165.	46.	27.	1.24		
+	2 COMBINED AT	C51	1297.	12.25	354.	99.	57.	2.99		
+	ROUTED TO	51T53	1011.	14.00	349.	99.	57.	2.99		
+	HYDROGRAPH AT	44A	1006.	12.75	231.	71.	41.	1.59		
+	DIVERSION TO	D44A	776.	12.42	83.	24.	14.	1.59		
+	HYDROGRAPH AT	D44A	1006.	12.75	172.	47.	27.	1.59		
+	DIVERSION TO	D44A	754.	12.75	133.	36.	21.	1.59		
+	HYDROGRAPH AT	DIV44A	252.	12.75	39.	10.	6.	1.59		
+	HYDROGRAPH AT	43	1416.	12.33	258.	84.	48.	1.42		
+	DIVERSION TO	D43	1093.	12.08	105.	31.	18.	1.42		
	HYDROGRAPH AT									

+		D43	1416.	12.33	188.	53.	30.	1.42
+	2 COMBINED AT	C43	1395.	12.33	221.	62.	36.	3.01
+	ROUTED TO	43T53	918.	13.58	216.	62.	36.	3.01
+	HYDROGRAPH AT	53	721.	12.42	128.	40.	23.	.78
+	DIVERSION TO	D53	485.	12.08	46.	14.	8.	.78
+	HYDROGRAPH AT	D53	721.	12.42	96.	26.	15.	.78
+	3 COMBINED AT	C53	1755.	13.67	626.	179.	103.	6.78
+	HYDROGRAPH AT	54	405.	12.50	77.	23.	14.	.49
+	DIVERSION TO	D54	174.	12.00	18.	6.	3.	.49
+	HYDROGRAPH AT	D54	405.	12.50	66.	18.	10.	.49
+	2 COMBINED AT	C54	1779.	13.67	682.	194.	112.	7.27
+	DIVERSION TO	SOUTH	665.	13.67	196.	49.	28.	7.27
+	HYDROGRAPH AT	DCAP12	1115.	13.67	486.	145.	84.	7.27
+	ROUTED TO	CAP12	1034.	14.08	485.	145.	84.	7.27
+	HYDROGRAPH AT	DR44A	776.	12.42	83.	24.	14.	1.59
+	ROUTED TO	44ATB	350.	13.25	84.	24.	14.	1.59
+	HYDROGRAPH AT	44B	1104.	12.33	196.	60.	35.	1.06
+	DIVERSION TO	D44B	249.	11.75	38.	12.	7.	1.06
+	HYDROGRAPH AT	D44B	1104.	12.33	179.	48.	28.	1.06
+	2 COMBINED AT	C44B	1303.	12.42	248.	73.	42.	1.06

+	ED TO	CAP10+	1263.	12.50	248.	73.	42.	1.06
+	ROUTED TO	RCAP11	1250.	12.50	248.	73.	42.	1.06
+	2 COMBINED AT	C12	1807.	12.58	707.	213.	123.	8.33
+	ROUTED TO	ADOT-W	392.	15.33	372.	212.	123.	8.33
+	ROUTED TO	RADOTW	392.	15.42	372.	212.	123.	8.33
+	HYDROGRAPH AT	36B	276.	12.58	53.	15.	9.	.32
+	DIVERSION TO	D36B	276.	12.58	38.	10.	6.	.32
+	HYDROGRAPH AT	D36B	190.	12.83	18.	5.	3.	.32
+	2 COMBINED AT	C36B	422.	13.00	381.	215.	125.	8.65
+	HYDROGRAPH AT	RSOUTH	665.	13.67	196.	49.	28.	7.27
+	HYDROGRAPH AT	57	252.	12.08	37.	12.	7.	.18
+	DIVERSION TO	D42	252.	12.08	27.	8.	4.	.18
+	HYDROGRAPH AT	D57	152.	12.33	15.	4.	3.	.18
+	2 COMBINED AT	C57	756.	13.58	237.	60.	35.	.18
+	ROUTED TO	CAP13+	754.	13.67	237.	60.	35.	.18
+	HYDROGRAPH AT	36A	114.	12.17	15.	4.	3.	.10
+	2 COMBINED AT	C36A	756.	13.67	251.	65.	37.	.28
+	ROUTED TO	ADOT-E	246.	14.42	175.	64.	37.	.28
+	HYDROGRAPH AT	52	509.	12.25	84.	26.	15.	.43
	DIVERSION TO							

+		D52	487.	12.17	47.	13.	8.	.43
+	HYDROGRAPH AT	D52	500.	12.33	47.	13.	8.	.43
+	HYDROGRAPH AT	56	822.	12.08	116.	37.	22.	.55
+	DIVERSION TO	D56	536.	11.83	42.	13.	7.	.55
+	HYDROGRAPH AT	D56	822.	12.08	89.	25.	14.	.55
+	2 COMBINED AT	C56	961.	12.33	135.	38.	22.	.98
+	ROUTED TO	56T58	744.	12.67	134.	38.	22.	.98
+	HYDROGRAPH AT	58	849.	12.50	189.	62.	36.	.95
+	DIVERSION TO	D58	849.	12.50	131.	37.	21.	.95
+	HYDROGRAPH AT	D58	613.	12.75	85.	25.	15.	.95
+	2 COMBINED AT	C58	1257.	12.83	211.	62.	36.	1.93
+	3 COMBINED AT	CLEAR	1491.	12.92	686.	320.	186.	10.86
+	HYDROGRAPH AT	46B	272.	12.67	64.	21.	12.	.36
+	DIVERSION TO	D46	13.	9.58	8.	3.	1.	.36
+	HYDROGRAPH AT	D46B	272.	12.67	64.	19.	11.	.36
+	ROUTED TO	CAP6	231.	12.83	64.	19.	11.	.36
+	ROUTED TO	RCAP6B	230.	12.92	64.	19.	11.	.36
+	HYDROGRAPH AT	29A	119.	12.58	25.	8.	4.	.18
+	DIVERSION TO	D29A	119.	12.58	17.	5.	3.	.18
+	HYDROGRAPH AT	D29A	94.	12.83	11.	3.	2.	.18

+	[illegible]BINED AT	C29A	323.	12.83	74.	[illegible]	13.	.54
+	HYDROGRAPH AT	29B	50.	12.50	9.	3.	1.	.08
+	DIVERSION TO	D29B	50.	12.50	9.	3.	1.	.08
+	HYDROGRAPH AT	D29B	0.	22.83	0.	0.	0.	.08
+	2 COMBINED AT	C29B	323.	12.83	74.	22.	13.	.62
+	ROUTED TO	TRANS	287.	13.00	74.	22.	13.	.62
+	HYDROGRAPH AT	29C	223.	12.33	37.	11.	7.	.23
+	DIVERSION TO	D29	223.	12.33	32.	9.	5.	.23
+	HYDROGRAPH AT	D29C	76.	12.83	9.	3.	2.	.23
+	HYDROGRAPH AT	29D	523.	12.58	113.	36.	21.	.21
+	DIVERSION TO	D29D	22.	10.33	14.	5.	3.	.21
+	HYDROGRAPH AT	D29D	523.	12.58	112.	31.	18.	.21
+	3 COMBINED AT	CP29D	705.	12.83	192.	56.	32.	1.06
+	HYDROGRAPH AT	45A	299.	12.92	72.	21.	12.	.62
+	DIVERSION TO	D29A	299.	12.92	45.	12.	7.	.62
+	HYDROGRAPH AT	D45A	251.	13.08	33.	9.	5.	.62
+	DIVERSION TO	45ATB	239.	13.08	31.	9.	5.	.62
+	HYDROGRAPH AT	D45A	13.	13.08	2.	0.	0.	.62
+	HYDROGRAPH AT	55B	881.	13.08	257.	80.	46.	1.86
	DIVERSION TO							

+		D55B	881.	13.08	168.	46.	27.	1.86
+	HYDROGRAPH AT	D55B	671.	13.42	118.	34.	20.	1.86
+	2 COMBINED AT	C55B	674.	13.42	118.	34.	20.	2.48
+	ROUTED TO	CAP7	504.	13.67	118.	34.	20.	2.48
+	HYDROGRAPH AT	RD45A	239.	13.08	31.	9.	5.	.62
+	ROUTED TO	45ATB	149.	14.17	29.	9.	5.	.62
+	HYDROGRAPH AT	45B	593.	12.50	127.	41.	24.	.66
+	DIVERSION TO	D45B	335.	12.08	39.	12.	7.	.66
+	HYDROGRAPH AT	D45B	593.	12.50	104.	29.	17.	.66
+	2 COMBINED AT	C45B	593.	12.50	131.	37.	22.	.66
+	ROUTED TO	CAP8	454.	12.75	130.	37.	22.	.66
+	2 COMBINED AT	C7+8	699.	13.42	237.	70.	40.	3.14
+	ROUTED TO	R78-1	699.	13.50	237.	70.	40.	3.14
+	HYDROGRAPH AT	SUBPR1	27.	12.00	3.	1.	1.	.02
+	DIVERSION TO	DIPR1	27.	12.00	3.	1.	1.	.02
+	HYDROGRAPH AT	RETPR1	0.	.00	0.	0.	0.	.02
+	2 COMBINED AT	CPPR1	699.	13.50	237.	70.	40.	3.16
+	ROUTED TO	RPR1-2	685.	13.67	236.	69.	40.	3.16
+	HYDROGRAPH AT	SUBPR2	102.	12.08	12.	4.	2.	.08
+	DIVERSION TO	DIPR2	102.	12.08	10.	3.	1.	.08

+	HYDROGRAPH AT	RETPR2	35.	12.25	3.	1.	1.	.08
+	2 COMBINED AT	CPPR2	687.	13.67	238.	70.	41.	3.24
+	ROUTED TO	RPR2-3	686.	13.67	237.	70.	41.	3.24
+	HYDROGRAPH AT	SUBPR5	49.	12.08	6.	2.	1.	.04
+	DIVERSION TO	DIPR5	1.	10.00	1.	0.	0.	.04
+	HYDROGRAPH AT	RETPR5	49.	12.08	6.	2.	1.	.04
+	HYDROGRAPH AT	SUBPR4	13.	12.08	1.	0.	0.	.01
+	HYDROGRAPH AT	SUBPR3	65.	12.08	7.	2.	1.	.05
+	3 COMBINED AT	CPPR3A	126.	12.08	14.	4.	2.	.10
+	DIVERSION TO	DIPR5	126.	12.08	13.	3.	2.	.10
+	HYDROGRAPH AT	RETPR3	19.	12.42	3.	1.	1.	.10
+	2 COMBINED AT	CPPR3B	688.	13.67	240.	71.	41.	3.34
+	ROUTED TO	R3-BSN	685.	13.75	239.	71.	41.	3.34
+	HYDROGRAPH AT	SUBPR7	87.	12.08	10.	3.	2.	.07
+	HYDROGRAPH AT	SUBPR6	76.	12.08	9.	3.	2.	.06
+	DIVERSION TO	DIPR6	76.	12.08	9.	3.	2.	.06
+	HYDROGRAPH AT	RETPR6	0.	.00	0.	0.	0.	.06
+	HYDROGRAPH AT	55	161.	12.17	21.	6.	4.	.14
+	DIVERSION TO	D55	161.	12.17	17.	5.	3.	.14
	HYDROGRAPH AT							

+		D55	70.	12.42	6.	2.	1.	.14
	ROUTED TO							
+		CAP9	35.	12.58	6.	2.	1.	.14
	ROUTED TO							
+		CAP9-6	14.	13.67	5.	2.	1.	.14
	2 COMBINED AT							
+		CPPR6	14.	13.67	5.	2.	1.	.20
	ROUTED TO							
+		6-BSN	9.	15.42	5.	2.	1.	.20
	HYDROGRAPH AT							
+		SUBPR8	251.	12.17	33.	10.	6.	.23
	DIVERSION TO							
+		DIPR8	251.	12.17	33.	10.	6.	.23
	HYDROGRAPH AT							
+		RETPR8	3.	17.83	2.	1.	0.	.23
	4 COMBINED AT							
+		CPBSN	684.	13.75	243.	75.	44.	3.84
	ROUTED TO							
+		BASIN5	362.	14.58	251.	175.	164.	3.84
	ROUTED TO							
+		BSN-36	362.	14.67	251.	175.	164.	3.84
	HYDROGRAPH AT							
+		29D2	206.	12.08	23.	7.	4.	.16
	DIVERSION TO							
+		DI29D2	206.	12.08	19.	5.	3.	.16
	HYDROGRAPH AT							
+		RET29D	100.	12.25	7.	2.	1.	.16
	ROUTED TO							
+		29T36C	35.	12.58	7.	2.	1.	.16
	HYDROGRAPH AT							
+		36C2	78.	12.08	13.	5.	3.	.16
	DIVERSION TO							
+		D36C	78.	12.08	13.	5.	3.	.16
	HYDROGRAPH AT							
+		D36C2	0.	.00	0.	0.	0.	.16
	3 COMBINED AT							
+		C36	365.	14.67	256.	177.	165.	4.16
	HYDROGRAPH AT							
+		36C1	577.	12.00	64.	20.	11.	.18

+	DIVERSION TO	D36C	432.	11.83	28.	8.	5.	.18
+	HYDROGRAPH AT	D36C1	577.	12.00	42.	12.	7.	.18
+	2 COMBINED AT	CP36	706.	12.00	295.	188.	171.	4.34
+	ROUTED TO	36T37	622.	12.17	295.	188.	171.	4.34
+	HYDROGRAPH AT	30	857.	12.58	187.	61.	35.	1.12
+	DIVERSION TO	D30	72.	11.33	31.	11.	6.	1.12
+	HYDROGRAPH AT	D30	857.	12.58	181.	50.	29.	1.12
+	ROUTED TO	30T37	829.	12.75	181.	50.	29.	1.12
+	HYDROGRAPH AT	37	752.	12.00	109.	37.	22.	.47
+	DIVERSION TO	D37	684.	11.92	65.	19.	11.	.47
+	HYDROGRAPH AT	D37	709.	12.08	62.	18.	11.	.47
+	3 COMBINED AT	C37	1357.	12.08	516.	251.	207.	5.93
+	ROUTED TO	ADOTEL	145.	41.58	71.	31.	24.	5.93
+	ROUTED TO	37T38	144.	41.58	68.	30.	23.	5.93
+	HYDROGRAPH AT	48	543.	12.50	96.	29.	17.	.77
+	DIVERSION TO	D48	535.	12.42	51.	14.	8.	.77
+	HYDROGRAPH AT	D48	520.	12.58	53.	15.	8.	.77
+	ROUTED TO	CAP3	476.	12.67	53.	15.	8.	.77
+	ROUTED TO	BASIN3	48.	13.58	40.	15.	8.	.77
	ROUTED TO							

+		RCAP3A	48.	13.67	40.	15.	8.	.77
+	HYDROGRAPH AT	49	555.	12.50	100.	30.	17.	.79
+	DIVERSION TO	D49	505.	12.33	49.	14.	8.	.79
+	HYDROGRAPH AT	D49	555.	12.50	60.	17.	10.	.79
+	ROUTED TO	CAP2	530.	12.58	60.	17.	10.	.79
+	ROUTED TO	BASIN2	52.	13.58	48.	17.	10.	.79
+	ROUTED TO	RCAP2B	52.	13.58	48.	17.	10.	.79
+	HYDROGRAPH AT	17A2	92.	12.17	13.	4.	2.	.08
+	2 COMBINED AT	C17A2	91.	12.17	55.	21.	12.	.87
+	2 COMBINED AT	C17A3	103.	13.50	90.	35.	20.	1.64
+	HYDROGRAPH AT	17A1	71.	12.42	13.	4.	2.	.08
+	2 COMBINED AT	CP17A1	149.	12.25	101.	39.	22.	1.72
+	ROUTED TO	AT23B	150.	12.25	101.	39.	22.	1.72
+	ROUTED TO	AT23A	126.	12.42	100.	39.	23.	1.72
+	HYDROGRAPH AT	23	322.	12.08	45.	15.	8.	.28
+	DIVERSION TO	D23	187.	11.92	17.	5.	3.	.28
+	HYDROGRAPH AT	D23	322.	12.08	34.	9.	5.	.28
+	2 COMBINED AT	C23A	406.	12.17	132.	48.	28.	2.00
+	HYDROGRAPH AT	17B	211.	12.42	42.	14.	8.	.22
+	DIVERSION TO	D17B	17.	11.17	7.	3.	1.	.22

+	HYDROGRAPH AT	D17B	211.	12.42	40.	11.	7.	.22
+	ROUTED TO	17BT22	210.	12.42	40.	11.	7.	.22
+	HYDROGRAPH AT	47	802.	12.92	189.	55.	32.	1.67
+	DIVERSION TO	D47	802.	12.92	128.	34.	20.	1.67
+	HYDROGRAPH AT	D47	546.	13.25	75.	21.	12.	1.67
+	ROUTED TO	BASIN4	119.	14.08	75.	21.	12.	1.67
+	ROUTED TO	RCAP4A	118.	14.25	75.	21.	12.	1.67
+	ROUTED TO	RCAP4B	118.	14.25	75.	21.	12.	1.67
+	ROUTED TO	RCAP4C	117.	14.50	74.	21.	12.	1.67
+	ROUTED TO	RCAP4D	117.	14.58	74.	21.	12.	1.67
+	HYDROGRAPH AT	22	477.	12.17	73.	24.	14.	.41
+	DIVERSION TO	D22	71.	11.58	17.	6.	3.	.41
+	HYDROGRAPH AT	D22	477.	12.17	67.	19.	11.	.41
+	3 COMBINED AT	C22A	629.	12.25	169.	50.	29.	2.30
+	ROUTED TO	22T23	624.	12.25	168.	50.	29.	2.30
+	2 COMBINED AT	C23B	1003.	12.25	292.	95.	55.	4.30
+	ROUTED TO	23T24	961.	12.33	291.	95.	55.	4.30
+	HYDROGRAPH AT	50	255.	12.33	45.	15.	8.	.28
+	DIVERSION TO	D50	227.	12.17	23.	7.	4.	.28
	HYDROGRAPH AT							

+		D50	255.	12.33	29.	8.	5.	.28
+	ROUTED TO	CAP1	262.	12.42	29.	11.	8.	.28
+	ROUTED TO	BASIN1	33.	13.25	28.	11.	8.	.28
+	ROUTED TO	RBAS1	33.	13.75	28.	11.	8.	.28
+	HYDROGRAPH AT	18A	922.	12.33	162.	52.	30.	1.01
+	DIVERSION TO	D18A	553.	12.00	55.	17.	10.	1.01
+	HYDROGRAPH AT	D18A	922.	12.33	129.	36.	21.	1.01
+	2 COMBINED AT	C18A	922.	12.33	155.	46.	29.	1.29
+	ROUTED TO	18T24	901.	12.42	153.	46.	29.	1.29
+	HYDROGRAPH AT	24	299.	12.25	48.	15.	9.	.29
+	DIVERSION TO	D24	5.	6.58	4.	1.	1.	.29
+	HYDROGRAPH AT	D24	299.	12.25	48.	14.	8.	.29
+	3 COMBINED AT	C24	2041.	12.33	470.	151.	89.	5.88
+	DIVERSION TO	DWC24	0.	.00	0.	0.	0.	5.88
+	HYDROGRAPH AT	DC24	2041.	12.33	470.	151.	89.	5.88
+	ROUTED TO	RT31B1	2017.	12.33	469.	151.	89.	5.88
+	ROUTED TO	RT31B2	2016.	12.42	468.	151.	89.	5.88
+	ROUTED TO	RT31B3	1963.	12.50	468.	151.	89.	5.88
+	HYDROGRAPH AT	31B	455.	12.33	74.	23.	14.	.47
+	DIVERSION TO	D31B	449.	12.25	41.	12.	7.	.47

+	..GRAPH AT	D31B	453.	12.33	42.	[illegible]	7.	.47
+	2 COMBINED AT	C31	2323.	12.42	502.	160.	95.	6.35
+	DIVERSION TO	D31W	1279.	12.42	277.	88.	52.	6.35
+	HYDROGRAPH AT	D31	1044.	12.42	226.	72.	43.	6.35
+	ROUTED TO	31T381	1038.	12.50	225.	72.	43.	6.35
+	ROUTED TO	31T382	1038.	12.50	225.	72.	43.	6.35
+	HYDROGRAPH AT	31A	585.	12.17	92.	30.	17.	.53
+	DIVERSION TO	D31A	177.	11.75	25.	8.	5.	.53
+	HYDROGRAPH AT	D31A	585.	12.17	79.	22.	13.	.53
+	ROUTED TO	31AT38	539.	12.50	79.	22.	13.	.53
+	HYDROGRAPH AT	38	512.	12.25	89.	30.	17.	.47
+	DIVERSION TO	D38	150.	11.75	23.	8.	4.	.47
+	HYDROGRAPH AT	D38	512.	12.25	79.	22.	13.	.47
+	4 COMBINED AT	C38	1810.	12.50	367.	123.	81.	13.28
+	ROUTED TO	38T39	1809.	12.50	366.	123.	81.	13.28
+	DIVERSION TO	DB10	571.	12.50	37.	9.	5.	13.28
+	HYDROGRAPH AT	ADD10	1238.	12.50	328.	114.	75.	13.28
+	DIVERSION TO	DB9	347.	12.50	31.	8.	4.	13.28
+	HYDROGRAPH AT	ADD9	891.	12.50	298.	106.	71.	13.28
	DIVERSION TO							

+		DB8	243.	12.50	30.	7.	4.	13.28
+	HYDROGRAPH AT	ADD8	647.	12.50	268.	99.	67.	13.28
+	DIVERSION TO	DB7	0.	.00	0.	0.	0.	13.28
+	HYDROGRAPH AT	ADD7	647.	12.50	268.	99.	67.	13.28
+	DIVERSION TO	DB6	0.	.00	0.	0.	0.	13.28
+	HYDROGRAPH AT	ADD6	647.	12.50	268.	99.	67.	13.28
+	DIVERSION TO	DB5	0.	.00	0.	0.	0.	13.28
+	HYDROGRAPH AT	ADD5	647.	12.50	268.	99.	67.	13.28
+	HYDROGRAPH AT	D31W	1279.	12.42	277.	88.	52.	6.35
+	ROUTED TO	31WT32	1102.	12.58	272.	88.	52.	6.35
+	HYDROGRAPH AT	32	359.	12.25	53.	16.	9.	.38
+	2 COMBINED AT	C32	1377.	12.58	336.	111.	66.	.38
+	ROUTED TO	32T39	1352.	12.58	335.	111.	66.	.38
+	HYDROGRAPH AT	39	356.	12.33	61.	20.	11.	.36
+	DIVERSION TO	D39	11.	8.92	6.	2.	1.	.36
+	HYDROGRAPH AT	D39	356.	12.33	61.	18.	10.	.36
+	3 COMBINED AT	C39	1971.	12.58	609.	210.	133.	14.02
+	DIVERSION TO	BASIN	171.	12.58	6.	2.	1.	14.02
+	HYDROGRAPH AT	SOSS	1800.	12.58	603.	208.	132.	14.02

1

5. Baffle Chute Spillway Design Calculations

USBR Baffle Chute Spillway Analysis

Basin 1

* Valid for Rectangular Chute Only

Design Reference

U.S. Bureau of Reclamation Engineering Monograph No. 25
"Hydraulic Design of Stilling Basins and Energy Dissipators", by A.J. Peterka.

Input Data

Q	262	cfs
Width	14.000	ft
g	32.20	ft/s^2

Design Data

Unit discharge, q	18.714	cfs					
Recomm. Entrance Velocity, V	3.446	ft/s					
Max Entrance Velocity	8.446	ft/s			**As-Designed**		ft/s
Critical Depth, Dc	2.216	ft					
Baffle Pier Height, H	1.773	to	1.994	ft	**Use**	2.000	ft
Baffle Pier Widths and Spaces	3.000	ft					
Partial Baffle Pier Width	0.667	to	1.333	ft	**Use**	1.000	ft
Dist. Between Baffle Piers	4.000	to	6.000	ft	**Use**	4.000	ft
Height of Chute Training Walls	6.000						
Baffle Pier Top Width	0.400	or	0.75 (min)	ft	**Use**	0.750	ft
Baffle Pier Bottom Width	1.400	ft					

USBR Baffle Chute Spillway Analysis (Basin IX)

Basin 2

* Valid for Rectangular Chute Only

Design Reference

U.S. Bureau of Reclamation Engineering Monograph No. 25
"Hydraulic Design of Stilling Basins and Energy Dissipators", by A.J. Peterka.

Input Data

Q	530	cfs
Width	38.500	ft
g	32.20	ft/s^2

Design Data

Unit discharge, q	13.766 cfs					
Recomm. Entrance Velocity, V	2.625 ft/s					
Max Entrance Velocity	7.625 ft/s			**As-Designed**	7.625	ft/s
Critical Depth, Dc	1.805 ft					
Baffle Pier Height, H	1.444	to	1.625 ft	**Use**	1.500	ft
Baffle Pier Widths and Spaces	2.250 ft					
Partial Baffle Pier Width	0.500	to	1.000 ft	**Use**	0.750	ft
Dist. Between Baffle Piers	3.000	to	6.000 ft	**Use**	4.500	ft
Height of Chute Training Walls	4.500					
Baffle Pier Top Width	0.300	or	0.75 (min) ft	**Use**	0.750	ft
Baffle Pier Bottom Width	1.050 ft					

USBR Baffle Chute Spillway Analysis

Basin 3

* Valid for Rectangular Chute Only

Design Reference

U.S. Bureau of Reclamation Engineering Monograph No. 25
"Hydraulic Design of Stilling Basins and Energy Dissipators", by A.J. Peterka.

Input Data

Q	476	cfs
Width	30.000	ft
g	32.20	ft/s^2

Design Data

Unit discharge, q	15.867 cfs					
Recomm. Entrance Velocity, V	2.994 ft/s					
Max Entrance Velocity	7.994 ft/s			**As-Designed**		ft/s
Critical Depth, Dc	1.985 ft					
Baffle Pier Height, H	1.588	to	1.786 ft	**Use**	1.667	ft
Baffle Pier Widths and Spaces	2.500 ft					
Partial Baffle Pier Width	0.556	to	1.111 ft	**Use**	0.000	ft
Dist. Between Baffle Piers	3.333	to	6.000 ft	**Use**	5.000	ft
Height of Chute Training Walls	5.000					
Baffle Pier Top Width	0.333	or	0.75 (min) ft	**Use**	0.750	ft
Baffle Pier Bottom Width	1.167 ft					

USBR Baffle Chute Spillway Analysis (Basin IX)

Basin 4c

* Valid for Rectangular Chute Only

Design Reference

U.S. Bureau of Reclamation Engineering Monograph No. 25
"Hydraulic Design of Stilling Basins and Energy Dissipators", by A.J. Peterka.

Input Data

Q	322	cfs
Width	22.000	ft
g	32.20	ft/s^2

Design Data

Unit discharge, q	14.636 cfs					
Recomm. Entrance Velocity, V	2.782 ft/s					
Max Entrance Velocity	7.782 ft/s			**As-Designed**	5.040	ft/s
Critical Depth, Dc	1.881 ft					
Baffle Pier Height, H	1.505	to	1.693 ft	**Use**	1.500	ft
Baffle Pier Widths and Spaces	2.250 ft					
Partial Baffle Pier Width	0.500	to	1.000 ft	**Use**	0.875	ft
Dist. Between Baffle Piers	3.000	to	6.000 ft	**Use**	4.000	ft
Height of Chute Training Walls	4.500					
Baffle Pier Top Width	0.300	or	0.75 (min) ft	**Use**	0.750	ft
Baffle Pier Bottom Width	1.050	or	1.00 (min) ft	**Use**	1.050	ft

A WATER RESOURCES TECHNICAL PUBLICATION

ENGINEERING MONOGRAPH No. 25

Hydraulic Design of Stilling Basins and Energy Dissipators

UNITED STATES DEPARTMENT OF THE INTERIOR
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Hydraulic Design of Stilling Basins and Energy Dissipators

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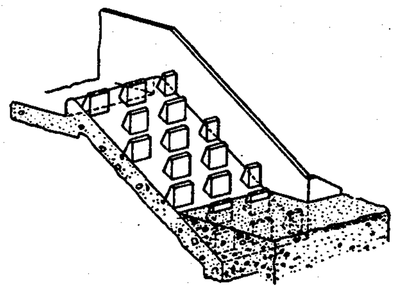
BUREAU OF RECLAMATION

Section 9

Baffled apron for canal or spillway drops (Basin IX)



Baffled aprons or chutes have been in use on irrigation projects for many years. The fact that many of these structures have been built and have performed satisfactorily indicates that they are practical and that in many cases they are an economical answer to the problem of dissipating energy. Baffled chutes are used to dissipate the energy in the flow at a drop and are most often used on canal wasteways or drops. They require no initial tail water to be effective although channel bed scour is not as deep and is less extensive when the tail water forms a pool into which the flow discharges. The multiple rows of baffle piers on the chute prevent excessive acceleration of the flow and provide a reasonable terminal velocity, regardless of the height of drop. Since flow passes over, between, and around the baffle piers, it is not possible to define the flow conditions in the chute in usual terms. The flow appears to slow down at each baffle pier and accelerate after passing the pier, the degree depending on the discharge and the height of the baffle piers. Lower unit discharges result in lower terminal velocities on the chute.

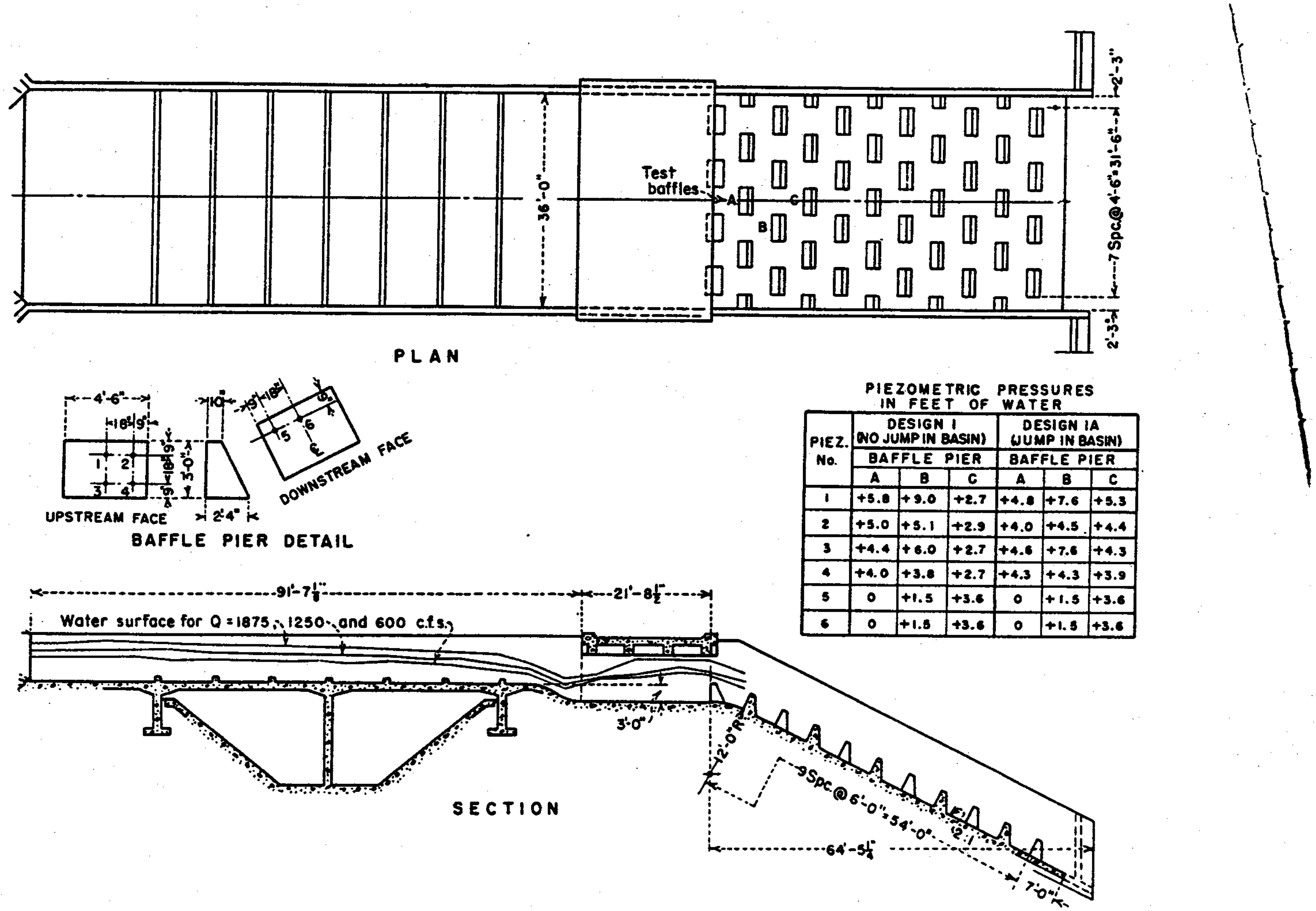
The chute is constructed on an excavated slope, 2:1 or flatter, extending to below the channel bottom. Backfill is placed over one or more rows of baffles to restore the original streambed elevation. When scour or downstream channel degradation occur, successive rows of baffle piers are exposed to prevent excessive acceleration of the flow entering the channel. If degradation does not occur, the scour creates a stilling pool at the downstream end of the chute, stabilizing the scour pattern. If excessive degradation occurs, it may become necessary to extend the chute.

A number of baffled chutes have been constructed and tested in the field. Some of the existing structures were developed from designs obtained from hydraulic model tests made for the particular structure. Other designs for existing structures were obtained by modifying model-tested designs to the extent believed necessary to account for local changes in topography and flow conditions. The generalized design procedures discussed in this section were obtained from test results on several models of baffled chutes and from one model which was modified as necessary to obtain information of value in designing a chute for any installation.

A study of the existing baffled chutes showed that certain features of the design, such as the 2:1 chute slope, had been utilized in each installation. Thus, when a series of tests to generalize the overchute design was begun, these features were considered to be standard and did not need to be evaluated as variables. However, in a concluding series of tests, the baffle pier row spacing was determined for slopes flatter than 2:1.

Development of Baffled Apron Features

Prior to the generalization tests, individual models were constructed to provide a stilling basin upstream from the baffled chute and to develop the baffled chute and stilling basin as a complete unit. Three models that were tested are described in detail in Hydraulic Laboratory Report No. Hyd-359, "Hydraulic Model Studies of the Outlet Control Structure; Culvert Under Dike; and Wash Overchute at Station 938+00—Wellton-Mohawk Division, Gila Project, Arizona." A fourth study, "Hydraulic Model Studies of



PIEZOMETRIC PRESSURES IN FEET OF WATER

Piez. No.	Design I (No jump in basin)			Design IA (Jump in basin)		
	Baffle pier			Baffle pier		
	A	B	C	A	B	C
1	+5.8	+9.0	+2.7	+4.8	+7.6	+5.3
2	+5.0	+5.1	+2.9	+4.0	+4.5	+4.4
3	+4.4	+6.0	+2.7	+4.6	+7.6	+4.3
4	+4.0	+3.8	+2.7	+4.3	+4.3	+3.9
5	0	+1.5	+3.6	0	+1.5	+3.6
6	0	+1.5	+3.6	0	+1.5	+3.6

FIGURE 103.—*Wash overchute, Sta. 938+00, Wellton-Mohawk Canal, Gila project.*

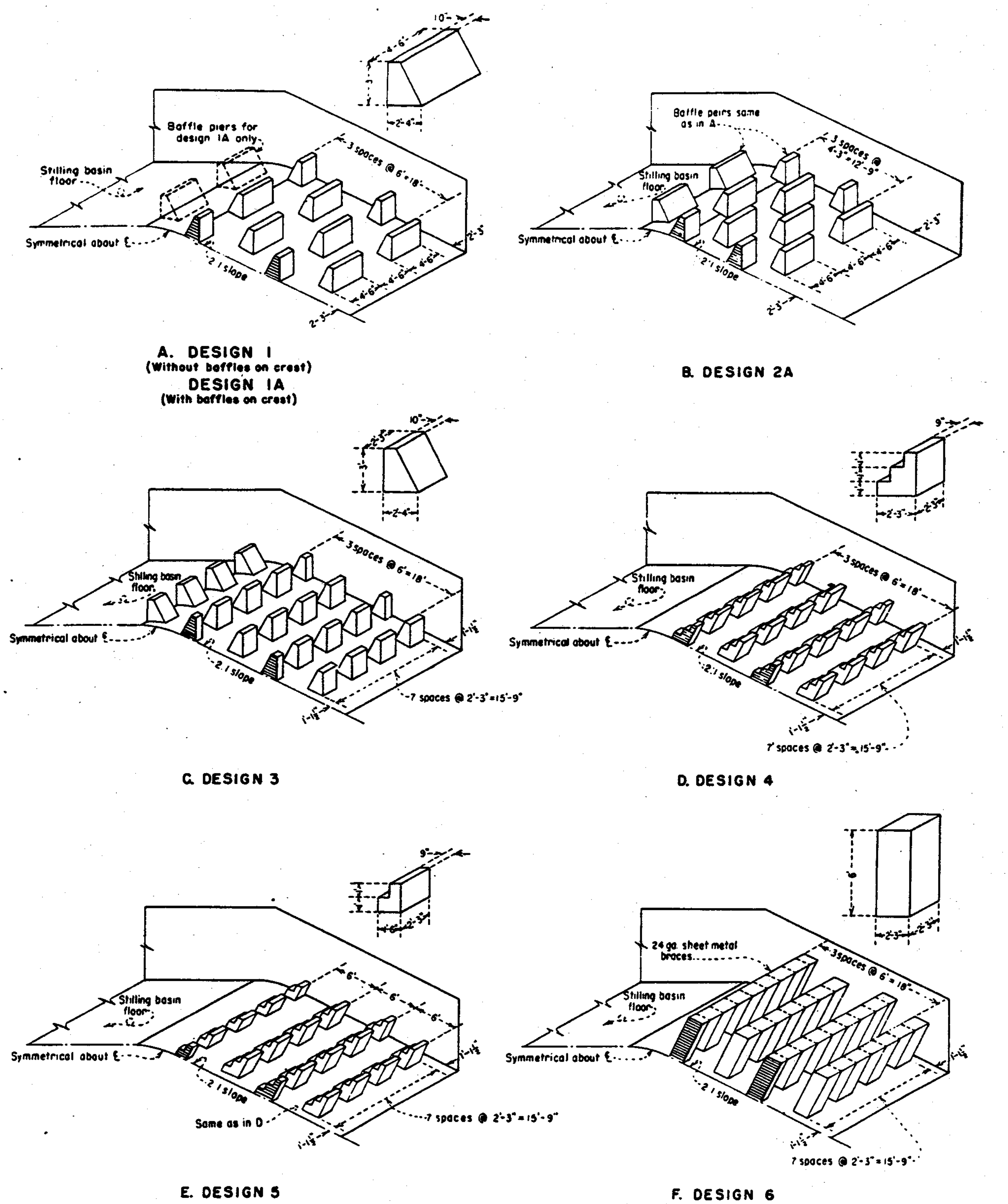


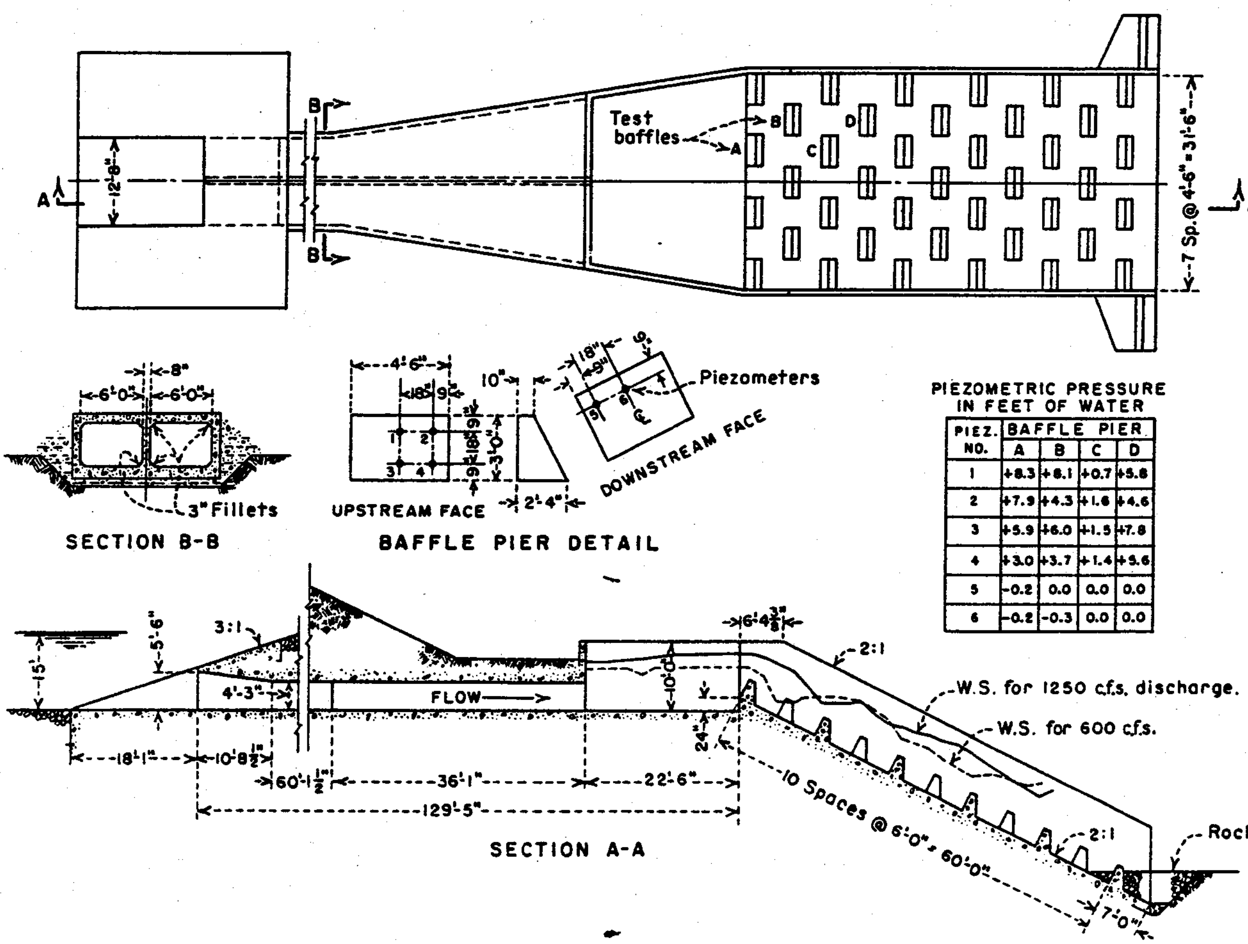
FIGURE 104.—*Wash overchute, Sta. 938+00, Wellton-Mohawk Canal, Gila project, different baffle pier arrangements on 2:1 sloping apron, 1:12 scale model.*

the Check Intake Structure—Potholes East Canal, Columbia River Basin Project, Washington," is the subject of Hydraulic Laboratory Report No. Hyd-411.

A brief summary of the parts of the individual studies which influenced the generalization test procedure is given below.

Wash overchute. The structure shown in Figure 103 was developed from hydraulic model tests on a 1:12 scale model. The design discharge was 1,250 c.f.s. and the chute was 36 feet wide, making the unit discharge about 35 c.f.s. After tests had been made to develop the stilling basin upstream from the chute, six different arrangements of baffle piers on the chute were tested, Figure 104.

For Design 1, the missing row of baffle piers at the top of the chute permitted the flow to continue to accelerate, strike the second row, and jump over the third row of piers. In Design 1A, the top row of baffle piers was in place; the resulting scour depth in the sand bed at the base of the chute was 7 feet, 5 feet less than for Design 1. In Design 2A, the spacing of the rows was reduced from 6 feet to 4 feet 3 inches. This resulted in no apparent difference in the operation of the structure. Scour depth was 7 feet. In Design 3, a greater number of narrow baffle piers was used. These produced a rougher water surface and a scour depth of 8 feet. Stepped face baffle piers were substituted in Design 4. Flow appearance was good and scour depth was 7 feet. For Design 5, the upstream row of baffle piers was reduced to 2 feet in height. Flow appearance was good and scour depth was 5.5 feet. In Design 6, baffle piers 6 feet high and 2 feet square in cross section were used. Flow appearance was poor and scour depth was 9 feet.

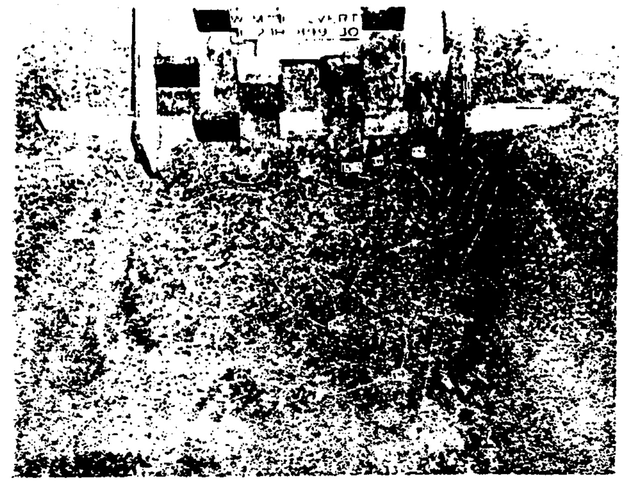


PIEZOMETRIC PRESSURE IN FEET OF WATER

PIEZ. NO.	BAFFLE PIER A	B	C	D
1	+8.3	+8.1	+0.7	+5.8
2	+7.9	+4.3	+1.6	+4.6
3	+5.9	+6.0	+1.5	+7.8
4	+3.0	+3.7	+1.4	+5.6
5	-0.2	0.0	0.0	0.0
6	-0.2	-0.3	0.0	0.0

FIGURE 105.—*Culvert under dike, Gila project.*

Discharge 1,250 c.f.s. Unit discharge is 40 c.f.s. per foot of width.



Scour pattern for flow in photograph at left.

FIGURE 106.—*Model studies for culvert under dike, Gila project. See details in Figure 105.*

Considering all factors, including stilling basin performance, flow appearance, scour depth and extent, and structural problems, it was concluded that the arrangement shown in Figure 103 was most desirable. The piers were 3 feet high and 4 feet 6 inches wide, placed in staggered rows 6 feet apart. Water surface profiles and baffle pier pressures for this arrangement are shown in Figure 103.

Culvert under dike. The culvert structure developed from 1:12 scale hydraulic model tests is shown in Figure 105. The design discharge was 1,250 c.f.s. and the chute width was 31 feet 6 inches, making the unit design discharge approximately 40 c.f.s. After tests had been made to develop the culvert and the stilling basin upstream from the chute, scour tests were made with baffle piers 3, 4, and 5 feet high on the chute. Results of these tests disclosed the depth of scour for the 4- and 5-foot piers to be approximately the same as that obtained for the 3-foot-high piers. Piers 3 feet high provided the best overall performance. The appearance of the design flow and the resulting scour pattern are shown in Figure 106. Water surface profiles and baffle pier pressures for the recommended structure are shown in Figure 105.

Outlet control structure. The outlet control structure stilling basin and baffled chute were developed from 1:24 scale hydraulic model tests on a half model and are shown in Figure 107. The chute width is 140 feet and the design discharge is 7,000 c.f.s., making the unit discharge 50 c.f.s. Tests showed the stilling basin to be adequate for the design flow released through the control notches, Figure 108A. Baffle piers 3 feet high in rows spaced 6 feet apart provided satisfactory flow in the chute. Scour depth was about 5 feet, as shown in Figure 108B.

Check intake structure. A 1:16 scale model was used in this study. Figure 109 shows the developed design which includes the gated control structure, stilling basin, and baffled chute. The chute is 64 feet wide and the discharge is 3,900 c.f.s., making the unit discharge about 61 c.f.s. Baffle piers 4 feet 6 inches high were tested in horizontal rows spaced at intervals of 9 and 6 feet. No differences in the appearance of the flow were apparent for the two spacings, but the scour depth over most of the area was 2 feet less with the larger row spacing. Figure 110 shows the structure in operation and the scour test results.

Figure 111 shows the flow appearance and the resulting scour for a unit discharge of 50 c.f.s. and the 9-foot row spacing. The scour depth is about 1 foot less than for 60 c.f.s. Figure 111 also shows flow conditions for unit discharges of 31 and 16 c.f.s.

Normal versus vertical pier faces. Tests were made to determine the effect of constructing the pier faces vertical rather than normal to the chute, Figure 112. For a unit discharge of 35 c.f.s. there was very little difference in performance between vertical and normal placement. Figure

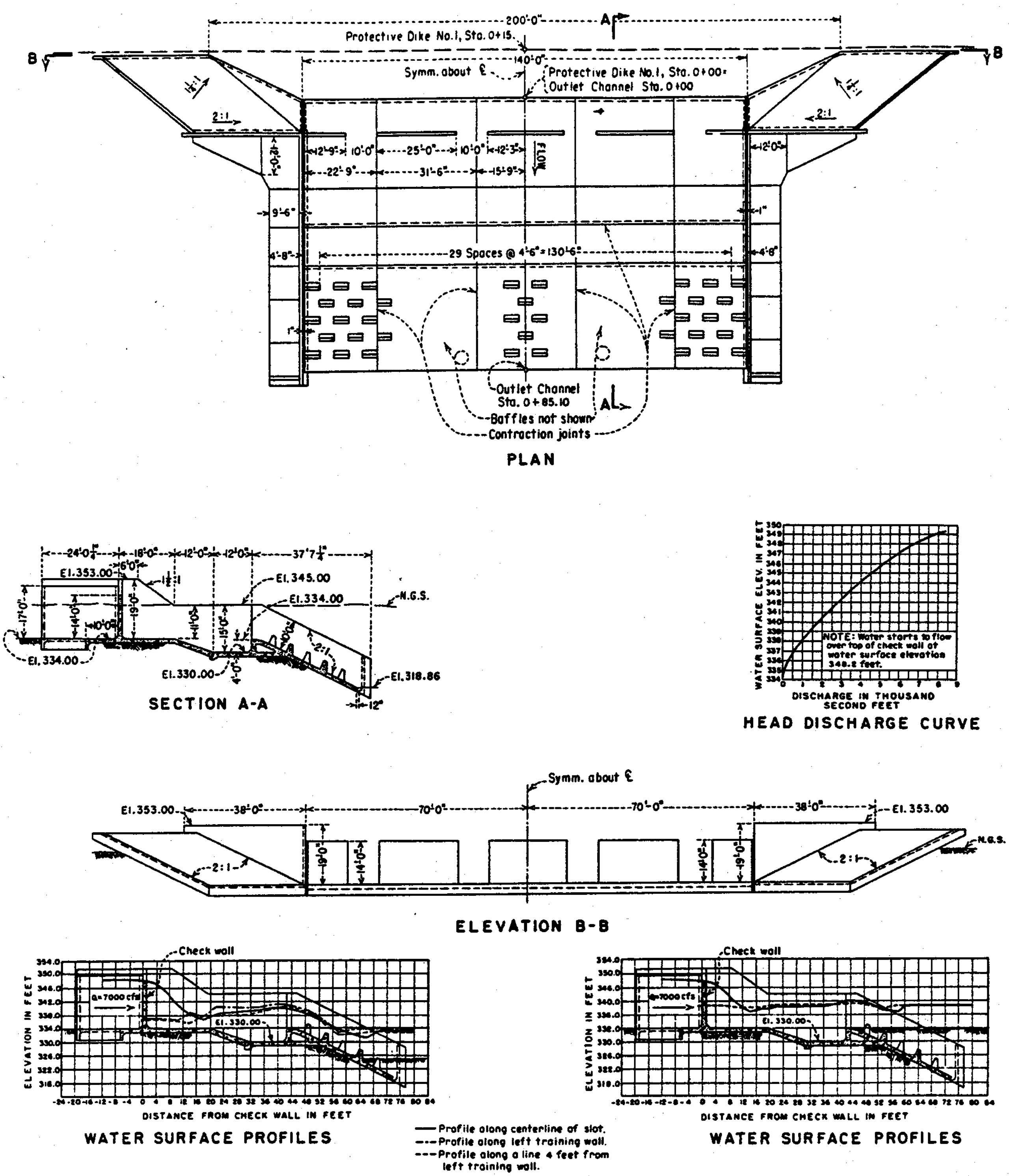
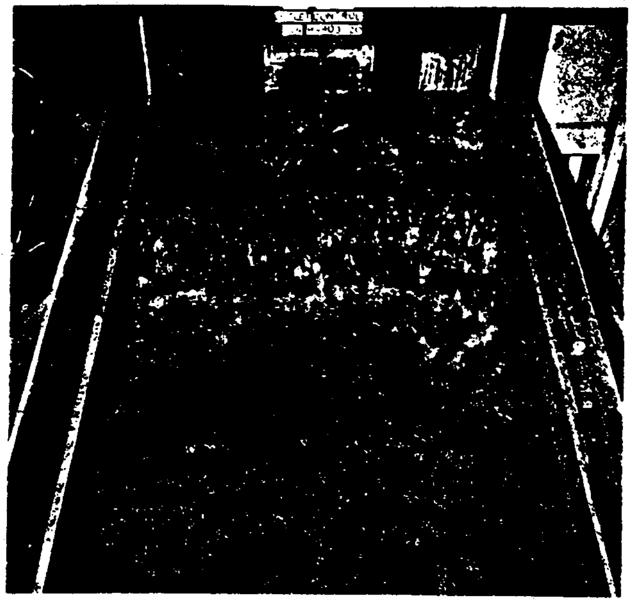
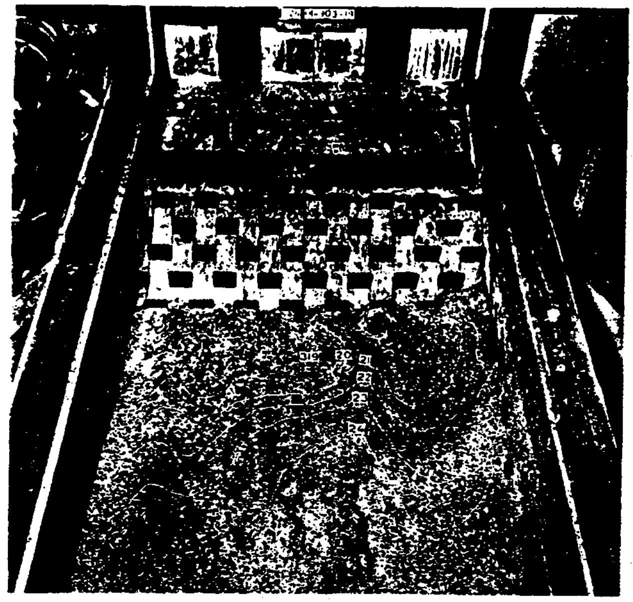


FIGURE 107.—*Outlet control structure, Gila project.*



Discharge 7,000 c.f.s. Unit discharge is 50 c.f.s. per foot of width.



Scour pattern for flow in photograph at left.

FIGURE 108.—*Model of outlet control structure, Gila project. See details in Figure 107.*

112 shows that the splash was about 5 feet lower with vertical face piers as indicated by the darker wetted area in the photographs. Figure 112 shows the scour patterns obtained after ½ hour of model operation. There was slightly less scour in the vicinity of the wing wall when normal pier faces were used. The scour pocket (elevation 906) along the wall of symmetry in the model probably would not have occurred if the full width of the model had been built.

The same scour tendencies were prevalent for a unit discharge of 61 c.f.s., Figure 113. There was less overall erosion with the pier faces normal to the slope although the scour depths were the same.

Generalization Tests

The models. A 1:16 scale model of a 171-foot length of the Potholes East Canal between Stations 1367+69 and 1369+40 was used for the generalization tests. Included were a reach of approach canal, the gate control structure upstream from the baffled apron, the 2:1 sloping apron, and approximately 80 feet of outlet channel. To make the model features as large as possible, only one-half of the structure was built and tested, Figure 114. The wall on the right in the photograph is the wall of symmetry and is on the centerline of the full-sized structure. The gate structure, shown in Figure 109, was made removable so that studies could be made for low as well as high velocities at the top of the baffled chute. A painted splashboard was installed along the wall of symmetry to record the height of splash. The paint on the board absorbed the splash and showed the splash area as a darker color. The channel downstream from the baffled chute was molded in sand having a mean diameter of about 0.5 millimeter. Discharges were measured through calibrated venturi meters and velocities were measured with a pitot tube.

On an entirely different model, a series of tests, scale 1:10 to 1:13.5, was conducted to determine the required baffle pier heights and arrangements for chutes constructed on 3:1 and 4.5:1 (flatter) slopes. Testing was started using the chute and baffle pier arrangement recommended for 2:1 sloping chutes. Each, variable was investigated in turn and it was determined that only the baffle pier row spacing needed modification. In these tests some of the baffle piers were equipped with an impact tube (piezometer) installed in the upstream face of the pier. The tubes, one in each row on the pier nearest the centerline of the chute, were transparent and were extended

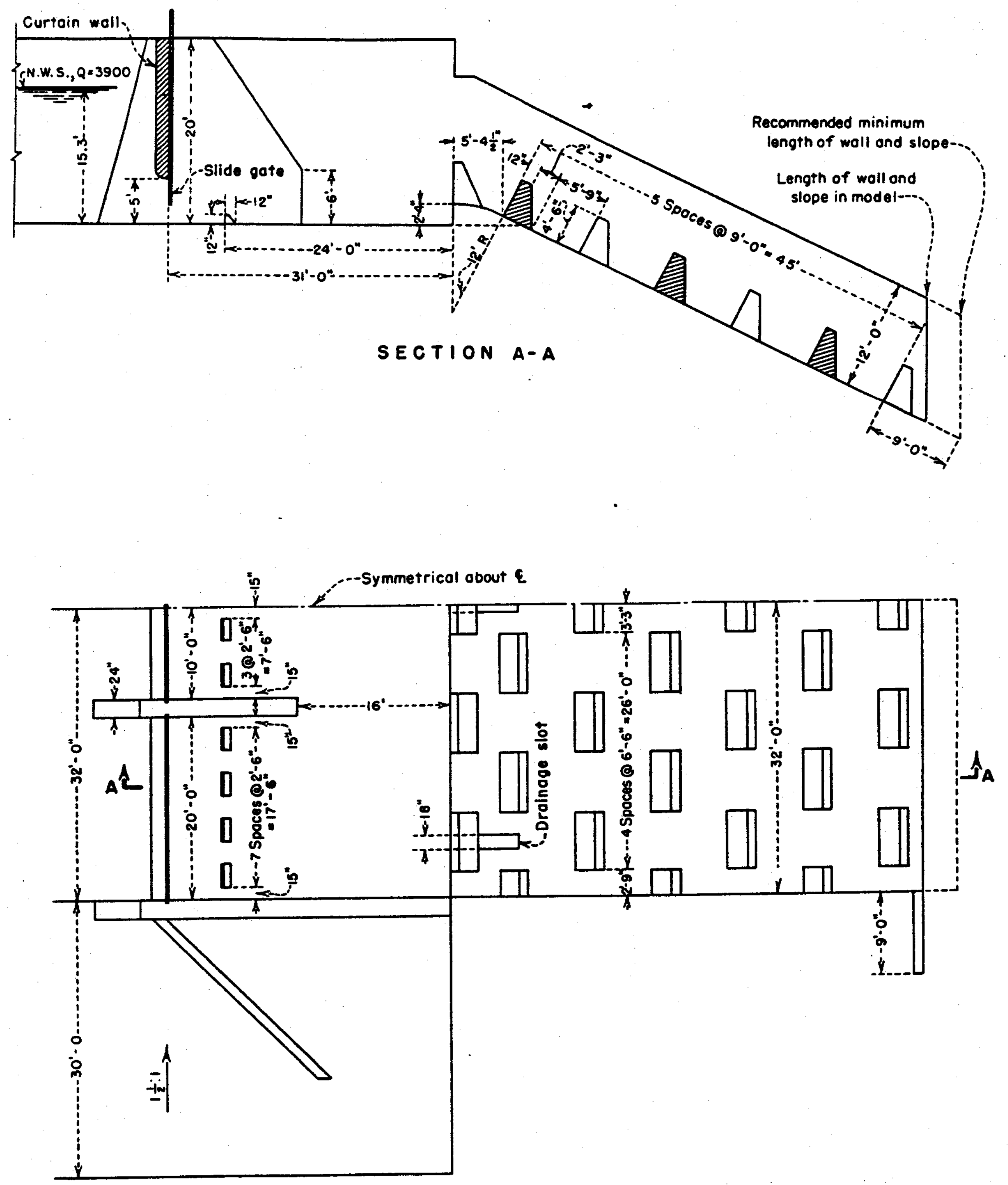
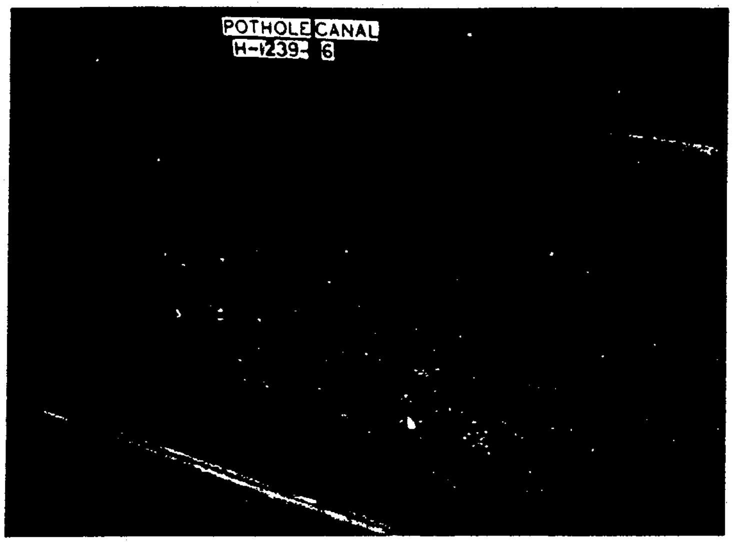
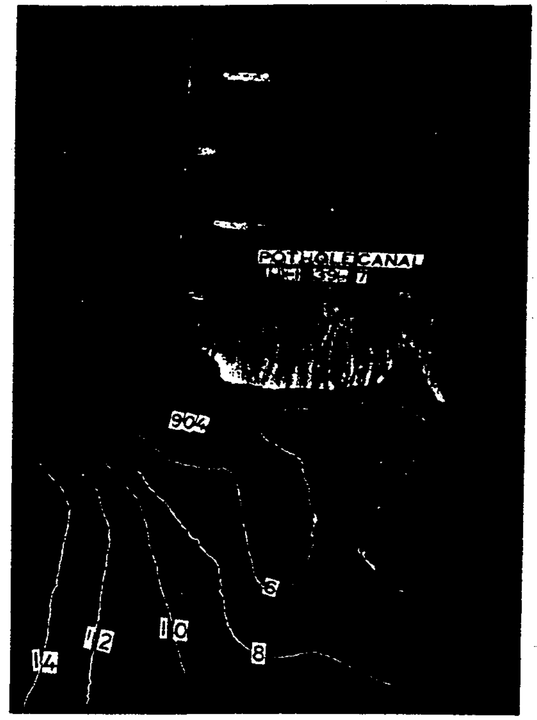


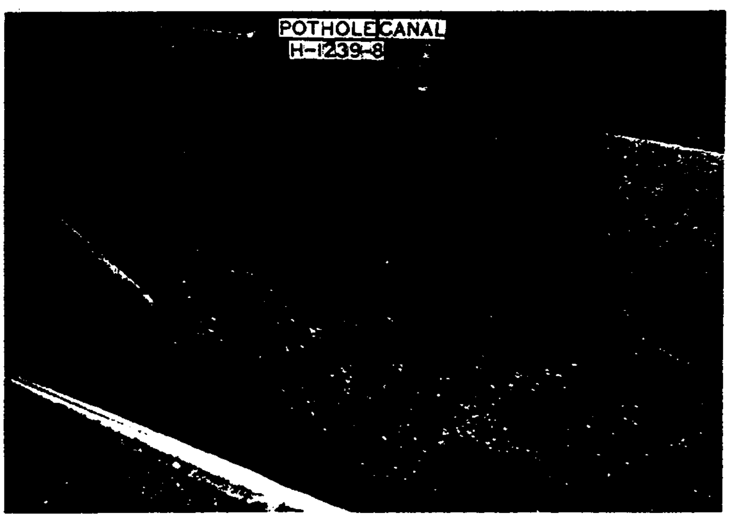
FIGURE 109.—*Check intake structure, Sta. 1369+40, Potholes East Canal, Columbia Basin project, 1:16 scale model.*



Baffle piers 4′6″ high, row spacing 9′0″.



NOTE: Bed was at elevation 914 at start of 30-minute test.



Baffle piers 4′6″ high, row spacing 6′0″.

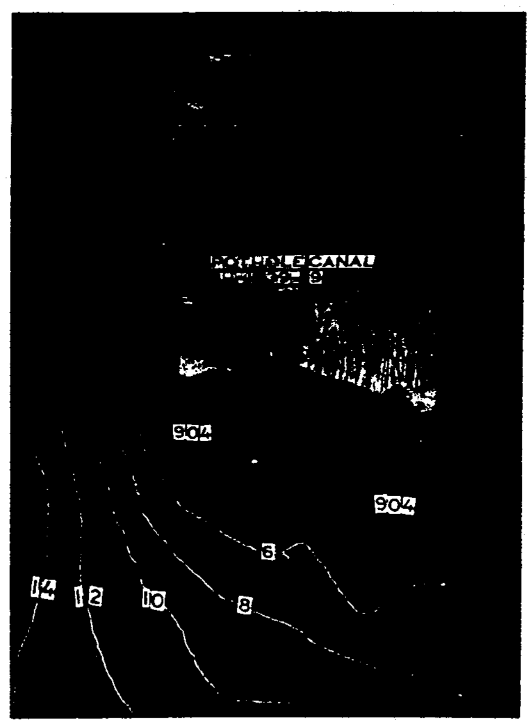
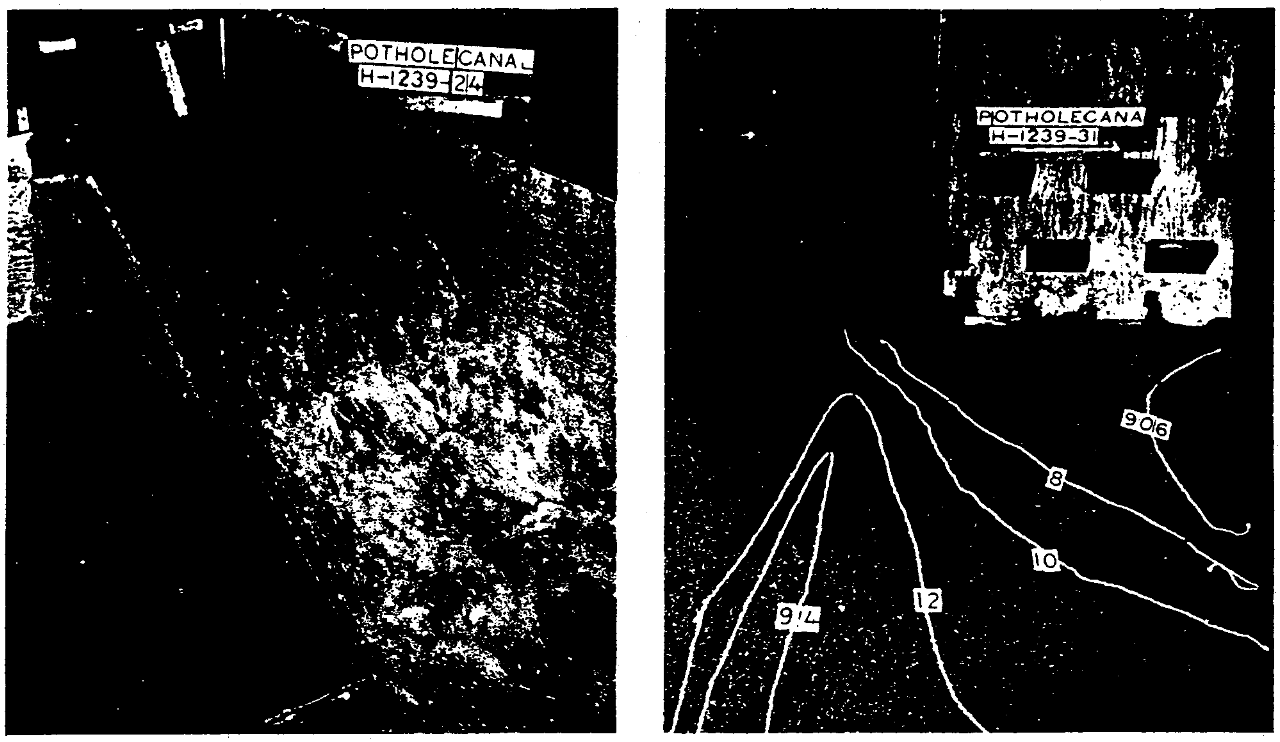
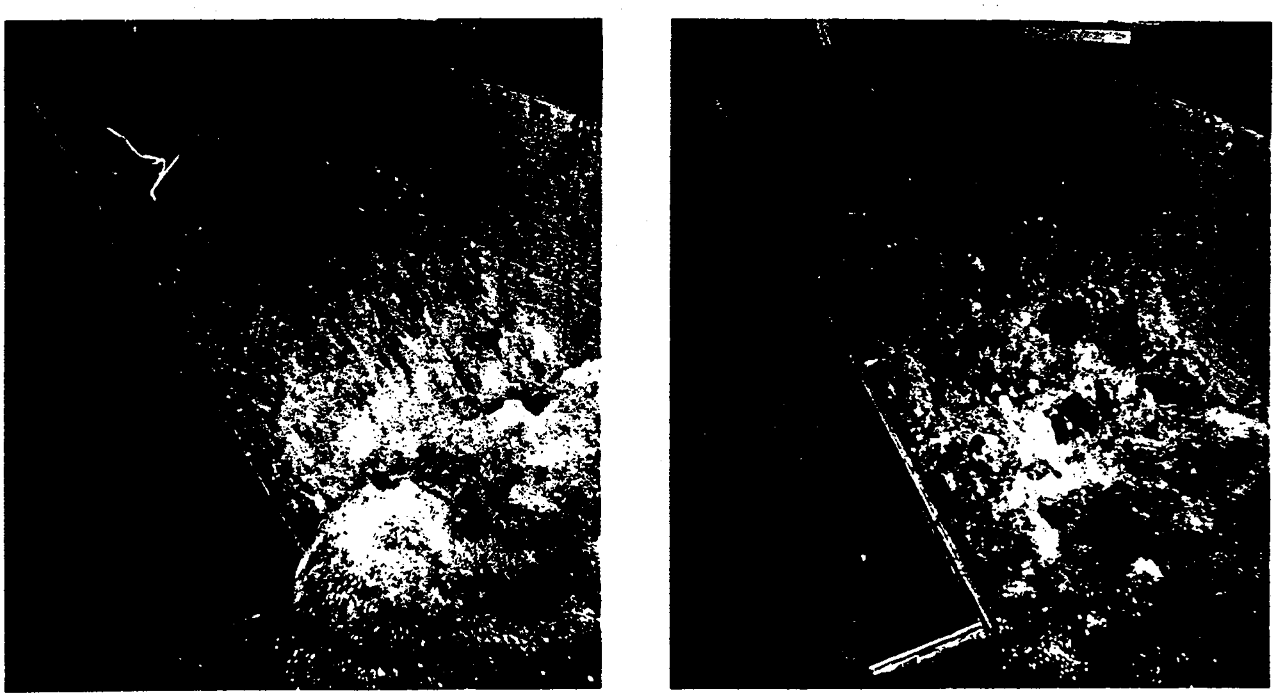


FIGURE 110.—*Model of check intake structure, discharge at 81 c.f.s. per foot of width. See details in Figure 109.*



Flow. Scour.

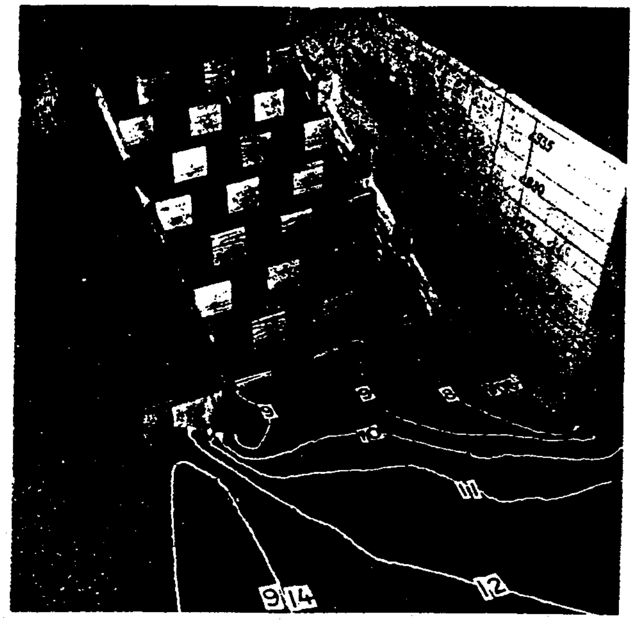
Discharge 3,200 c.f.s.—unit discharge 50 c.f.s. per foot width. Baffle piers 4'6" high, row spacing 9'0".



31 c.f.s. per foot width. 16 c.f.s. per foot width.

FIGURE 111.—*Model of check intake structure, Potholes East Canal, discharges at 50 c.f.s., 31 c.f.s., and 16 c.f.s. per foot of width.*

Flow.



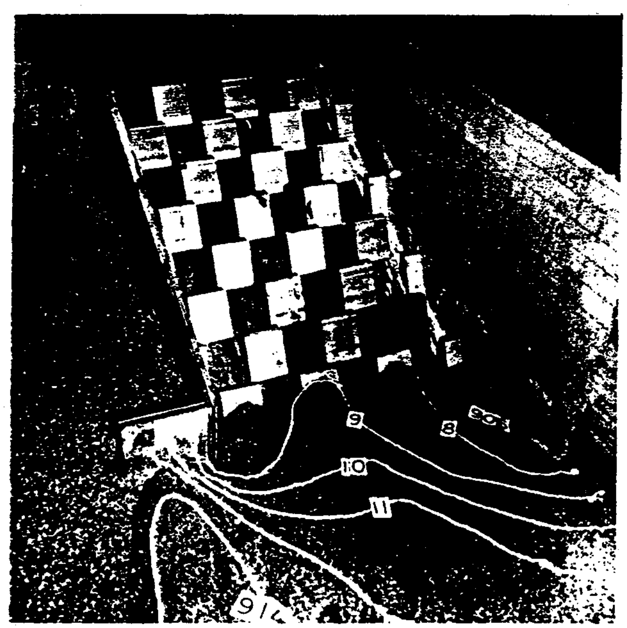
Scour.

Note splash area on wall.

Normal-face piers.

Discharge 35 c.f.s. per foot width.

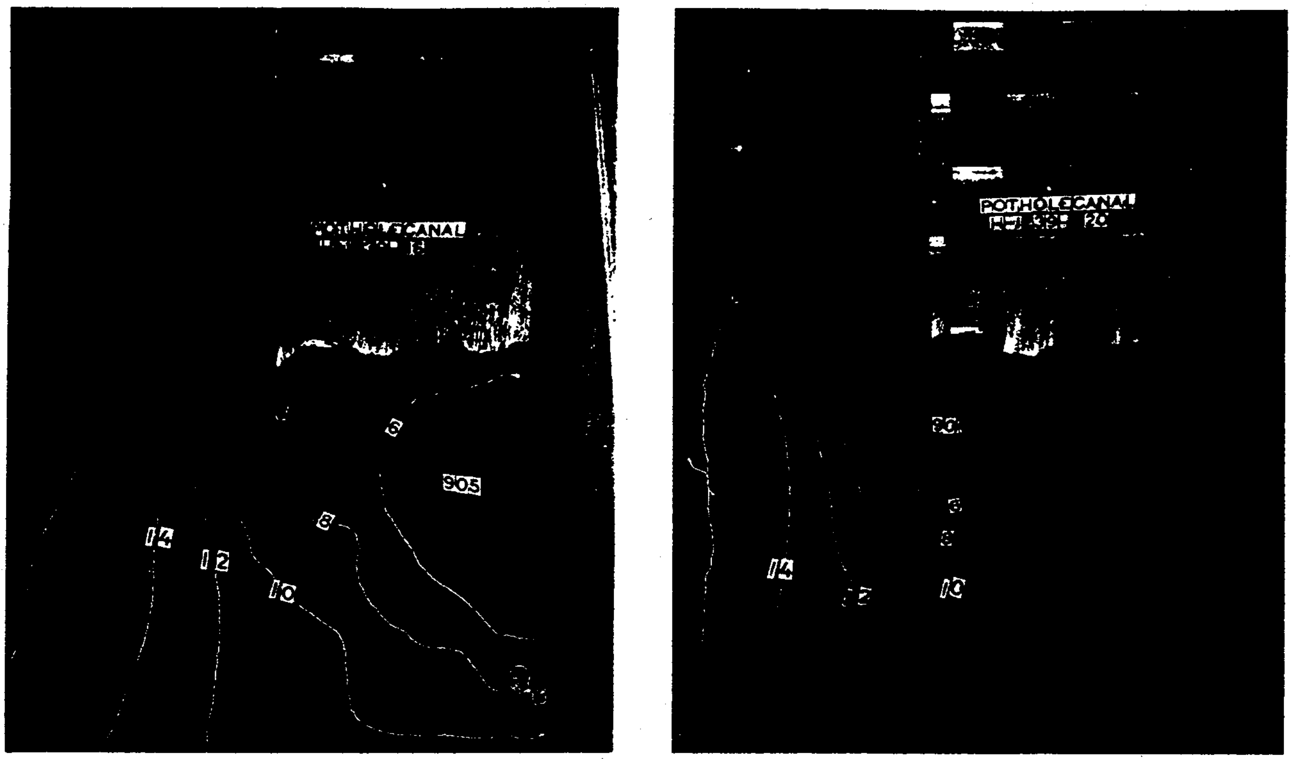
Flow.



Scour.

Vertical-face piers.

FIGURE 112.—*Model of check intake structure, Potholes East Canal, tests of various-shaped baffles.*



Normal-face piers. Vertical-face piers.

NOTE: Bed was at elevation 914 at start of 30-minute test.

Discharge 61 c.f.s. per foot width.

FIGURE 113.—*Model of check intake structure, Potholes East Canal, tests of various-shaped baffles.*

through the pier and bent at right angles to rise above the top of the flowing water surface. The tubes were filled, after the model was operating, with colored water so that the impact pressures on the pier faces could be evaluated visually. These tubes were especially useful in determining the most effective spacing of the baffle pier rows.

Testing procedure. The tests on the 2:1 sloping chute were concerned primarily with the effectiveness of the baffled chute in preventing acceleration of the flow down the chute. This was judged by the appearance or profile of the flow in the chute, the depth and extent of scour in the downstream channel, and by the height of splash shown on the splashboard. For each test, the channel was molded level at the base of the chute at elevation 914 and the model was operated for 30 minutes, after which the erosion in the channel bed was measured. Relative depths were made visible with contour lines of white string. The tailgate in the model was set to provide a tail water depth of 2 feet (elevation 916) in the downstream channel for a discharge of 20 c.f.s. per foot of width of chute. The tailgate setting was not changed for larger discharges; therefore, the tail water depth did not build up as much as it normally would in a field structure. The resulting depths for discharges of 35, 50, and 60 c.f.s. were 2.5, 3.0, and 3.5 feet, respectively. For tests with gate-controlled flow, 15.3 feet of depth was maintained upstream from the gates. For the free flow tests, the gate structure was removed and the normal depth for the particular flow being tested was maintained in the canal. The elevations shown in the drawings and photographs are compatible and apply for a model scale of 1:16.

Four baffle pier heights were included in the original testing program: 3, 4, 5, and 6 feet, measured normal to the 2:1 sloping chute, Figures 115, 116, 117, and 118. Each height was tested

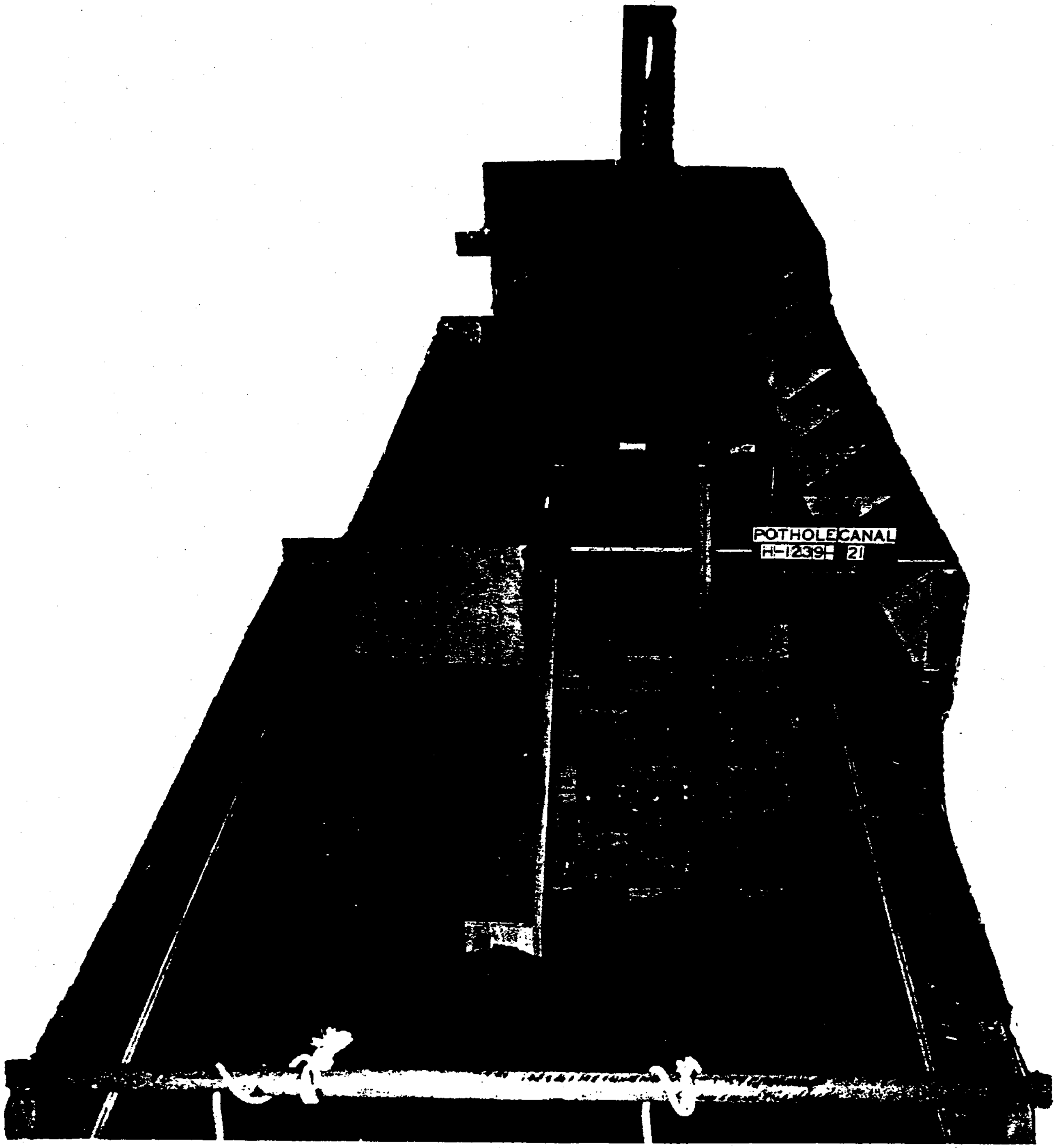


FIGURE 114.—*Model of check intake structure as used in generalization tests.*

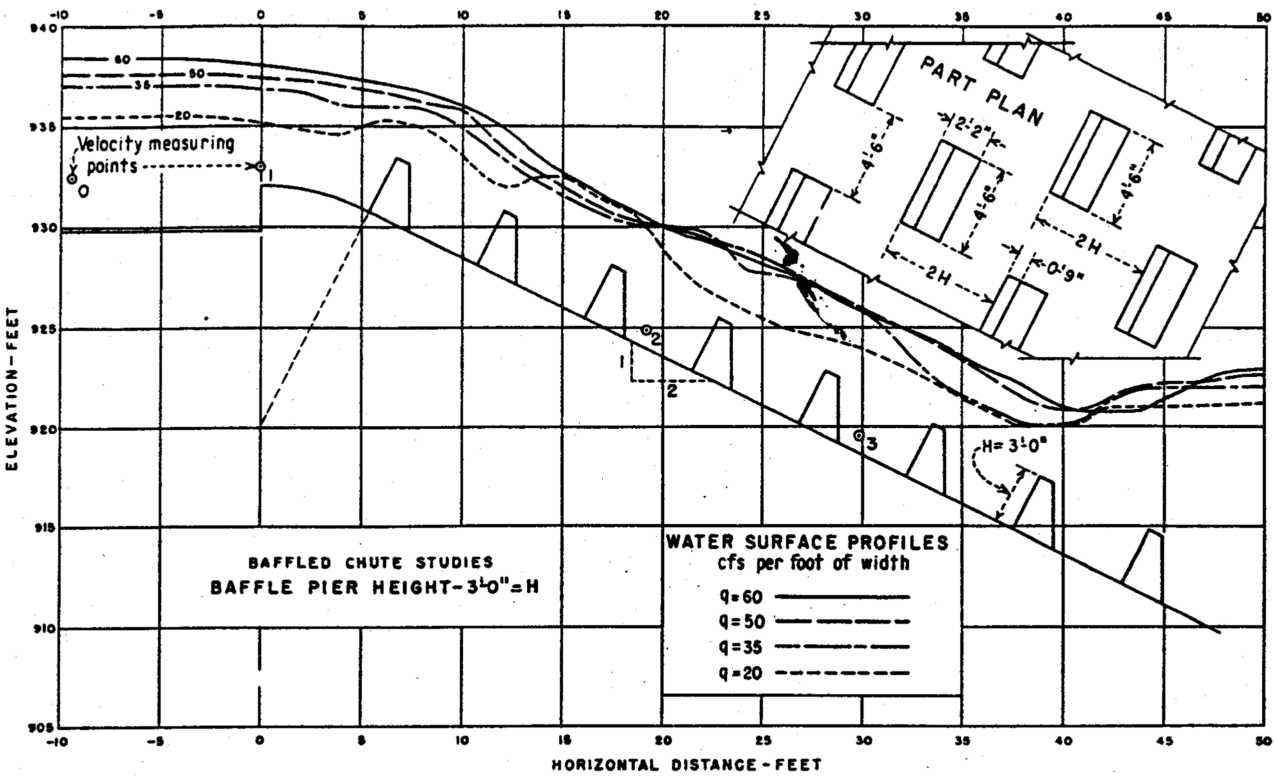


FIGURE 115.—*Baffled chute studies. Baffle pier height, H=3'0''.*

with the spacing between rows fixed at twice the baffle height. The baffle pier widths and spacing within each row were equal to one and one-half times the baffle height. For each baffle pier arrangement, individual tests were made for 20, 35, 50, and 60 c.f.s. per foot of width.

Water surface measurements were made with a point gage and a scale, taking the maximum water surface at each measured point. Since the water surface at any point on the chute varies with respect to time, the profiles obtained are higher than the profiles shown in a photograph of the same test. The measured profiles of Figures 115 to 118 are believed to be more dependable for estimating necessary wall heights than are the photographs in the report, which portray the appearance of the flow at a particular moment.

Velocity measurements were attempted in the locations shown in Figures 115 through 118. At Stations 0 and 1, the flow was smooth and uniform; the data are accurate. On the slope, where turbulence and unsteadiness are characteristic of the flow, only the measurements at Point 3 were considered to be dependable. Even these showed some inconsistencies, but velocity curves for the range of discharges were determined by using general knowledge and judgment to adjust the obviously incorrect measured values. The curves shown in Figure 119 are believed to be reasonably accurate and were found useful in evaluating the height of the baffle piers in terms of general performance. The velocity measurements in other parts of the chute are summarized in the notes of Figure 119.

Test results. For all baffle pier heights and a test discharge of 60 c.f.s. per foot of width, the flow entering the chute had a bottom velocity of about 1.8 feet per second and reached a maximum of 5.5 feet per second at Point 2. At Point 3, the velocity was dependent on the baffle pier height, as shown in Figure 119. The average velocity V=Q/A, at the top of the chute was 7 feet per second. For a unit discharge of 20 c.f.s., the initial bottom velocity was about 1.1 feet per second, reached a maximum of about 4.5 feet per second at Point 2, and was reduced at Point 3. The average velocity at the top of the chute was 3 feet per second. The velocities in themselves

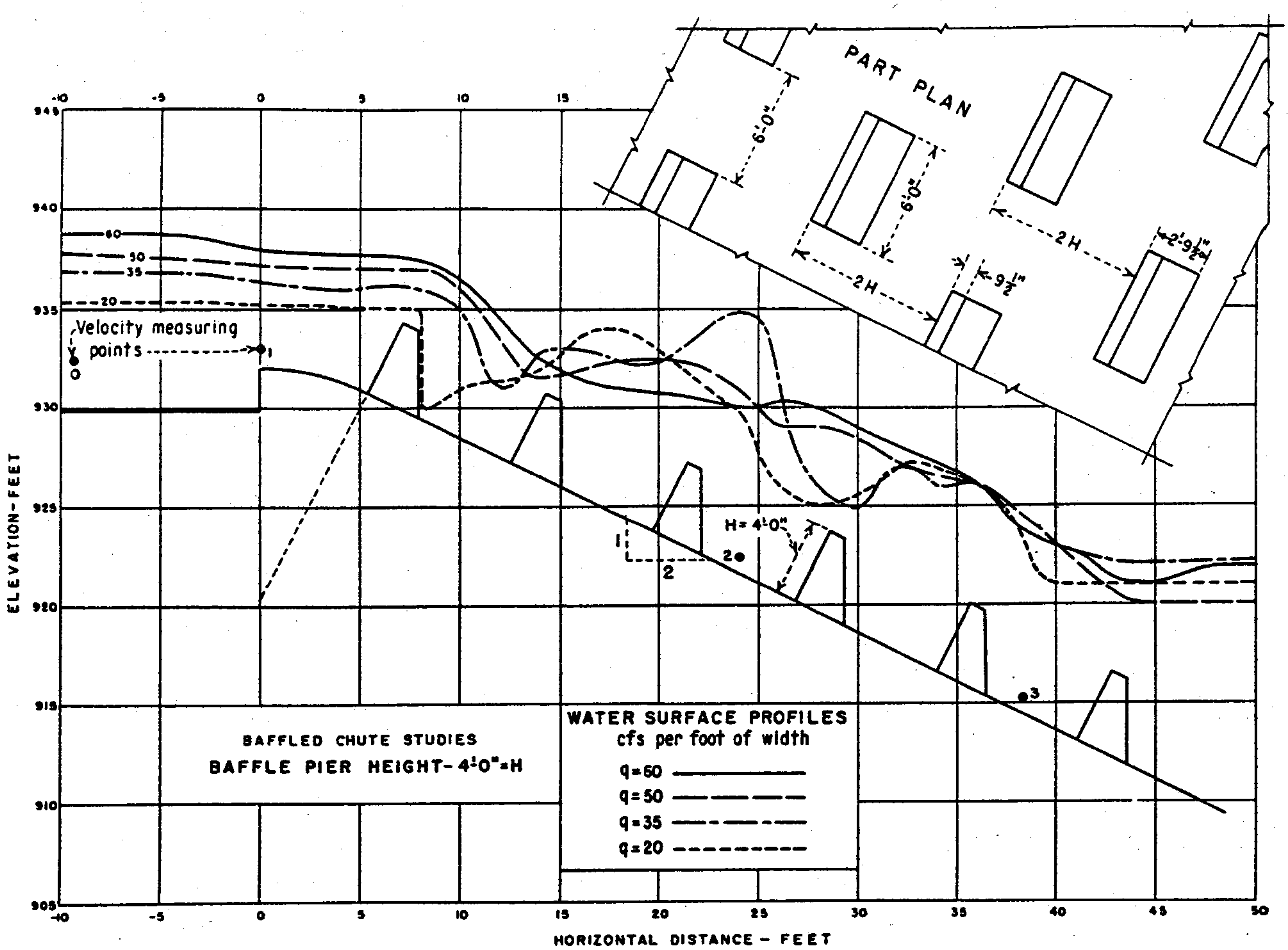


FIGURE 116.—*Baffled chute studies. Baffle pier height, H=4'0".*

are not important in generalizing the design of the baffled chute, but do help the reader to visualize the velocity distribution on the chute. With low baffles and high discharges, the bottom velocity at Point 3, Figure 119, is considerably higher than when higher baffles are used with the same discharge. This is because a larger volume of water passes over the tops of the low baffles and the decelerating effect of the baffles on the entire volume of flow is less, Figure 120.

Although the velocity at Point 3, for 60 c.f.s. per foot and the 6-foot baffles, was considerably less than for the 3-foot baffles, the erosion was more severe. When the 6-foot baffles were used, erosion was to elevation 900, exposing the end of the chute. When the 3-foot baffles were used, erosion was only to elevation 905 and the extent of the erosion was also less. Appearance of the flow on the chute and in the downstream channel for the 5-foot baffles, Figure 121B, was better than for the 6-foot baffles, but the appearance for the 4-foot baffles was still better, Figure 121A. The erosion patterns for the 4- and 5-foot baffles were better than for the 3- or 6-foot baffles. The least splash occurred with the 3- and 4-foot baffles.

The same relative performance was evident for the 50 c.f.s. per foot flow. The 4- and 5-foot baffles produced the best flow appearance and the 5-foot baffles produced the most favorable scour and splash patterns. Figure 121 shows the flow for 50 c.f.s. per foot with the 4- and 5-foot baffles.

At 35 c.f.s. per foot, the flow patterns were all satisfactory in appearance. The most favorable erosion patterns occurred with the 3- and 4-foot baffles, the deepest erosion being to elevation 906. The deepest erosion hole with the 5-foot

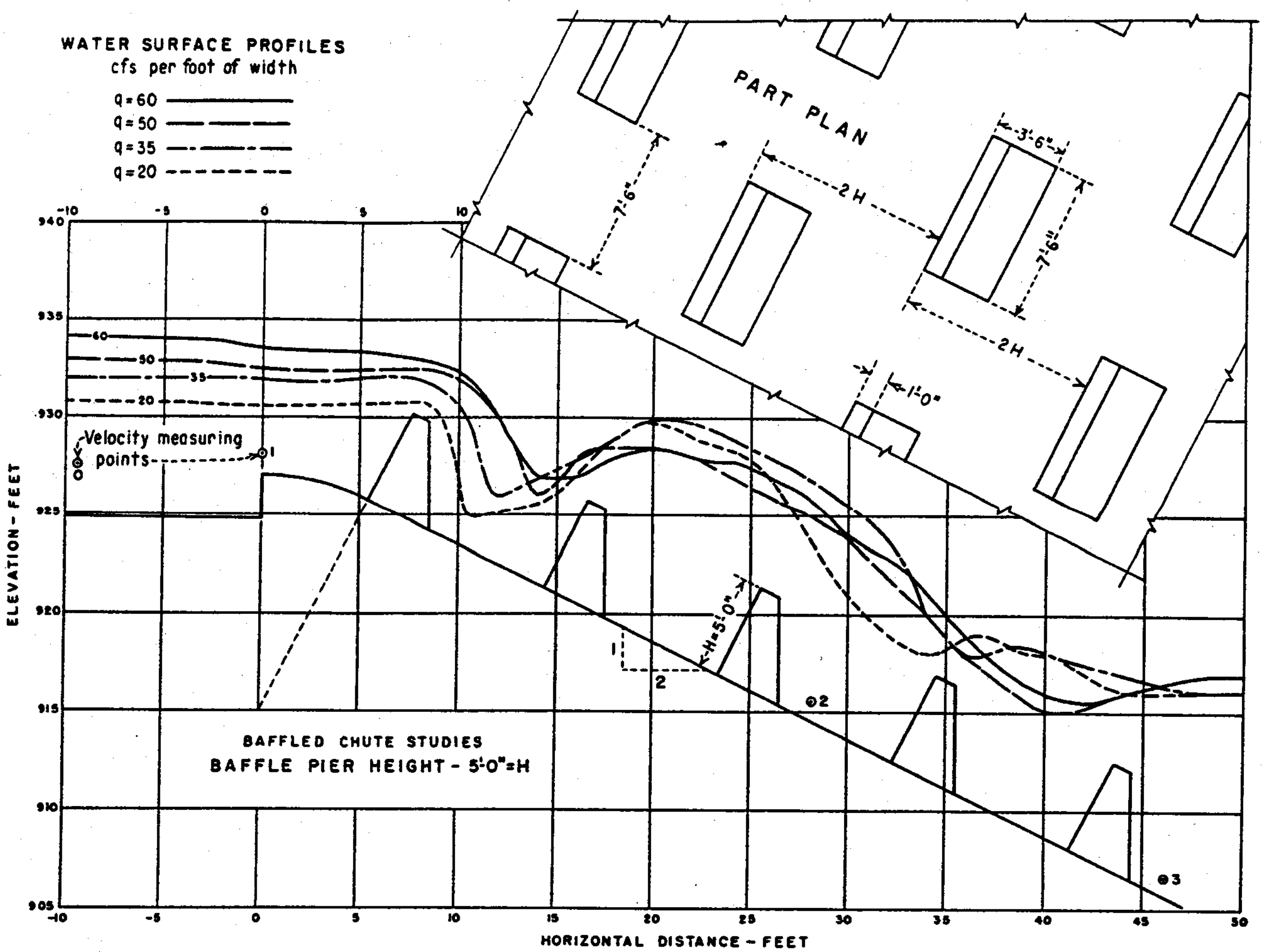


FIGURE 117.—*Baffled chute studies. Baffle pier height, H=5'0''.*

baffles was to elevation 905. Splash was minimum with the 4-foot baffles but was not much greater with the 3-foot baffles. Figure 122A shows the flow pattern and erosion for the 3-foot baffles and 35 c.f.s. per foot of width..

For 20 c.f.s. per foot, flow appearances were all good but the 3-foot baffles showed a slightly better flow pattern. The scour pattern was also most favorable with the 3-foot baffles. The deepest erosion hole was to elevation 908. Erosion with the 4-foot baffles was to elevation 907; with the 5-foot baffles to elevation 905, and with the 6-foot baffles to elevation 906. The 4-foot baffles produced the least erosion near the wing wall at the end of the chute. The splash patterns for 3-, 4-, and 5-foot baffles were almost identical, but the splash for the 6-foot baffles was somewhat greater. Figure 122B shows the flow pattern and erosion for the 3-foot baffles and 20 c.f.s. per foot of width.

After partial analysis of the test data, it was apparent that baffles 2 feet high might provide ample scour protection for a design discharge of 20 c.f.s. per foot of width. Scour tests showed this to be true, although scour depths were about the same as found for the 3-foot-high baffles. For a discharge of 35 c.f.s. per foot, the scour depth exceeded that for the 3-foot baffles and the flow appearance was not good; too much high velocity flow passed over the tops of the piers.

A summary of scour test data is given in Table 21. Listed are the lowest scour-hole elevations (1) at the wing wall visible in the photographs, (2) downstream from chute, and (3) the average of the elevations in (1) and (2). Scour along the wall of symmetry was not con-

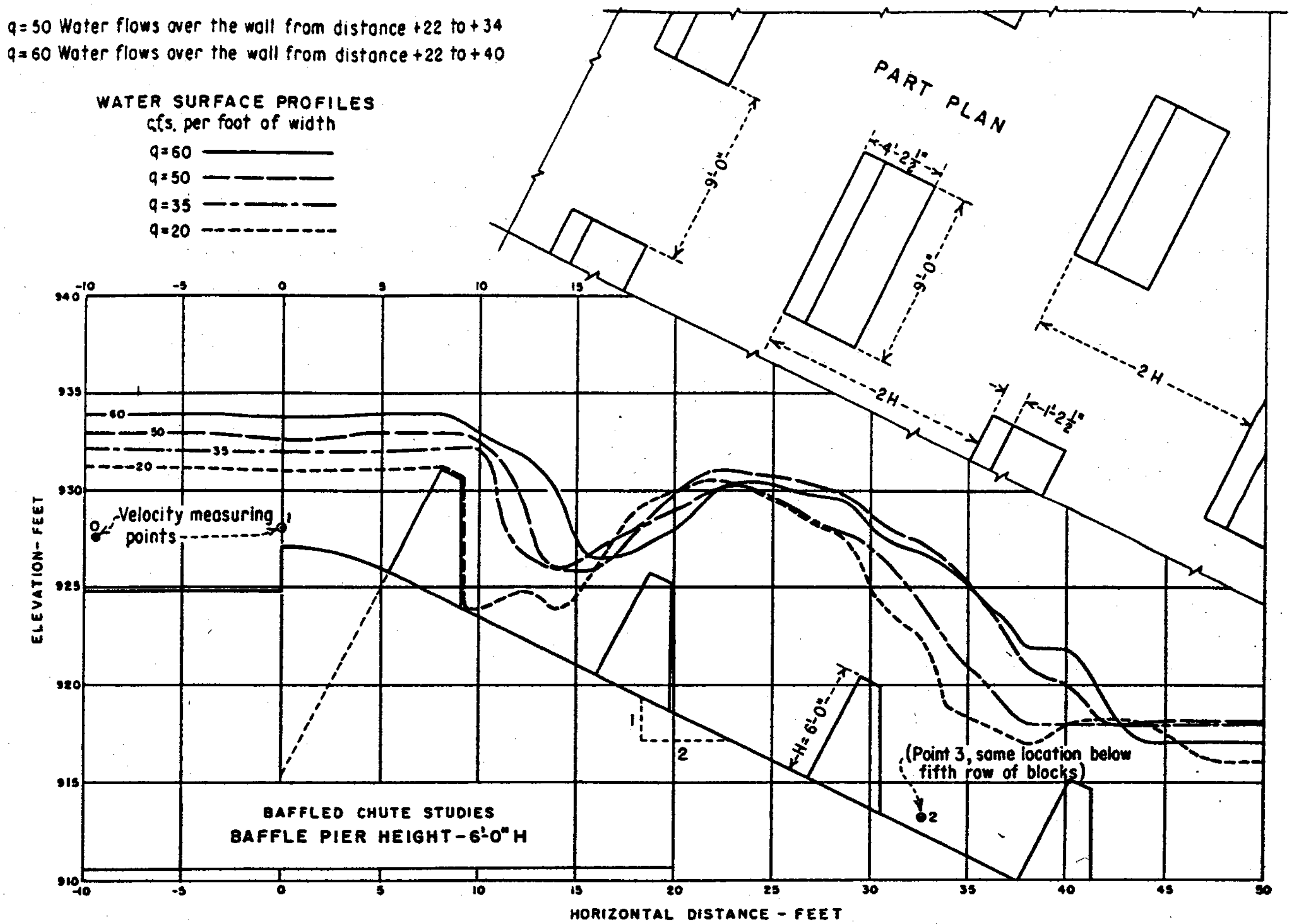


FIGURE 118.—*Baffled chute studies. Baffle pier height, H=6'0''.*

sidered because the adjacent wall affected the scour depth adversely.

Figures 123 and 124 show three groups of curves, A, B, and C, plotted from the data in Table 21, one group, D, plotted from the velocity curves of Figure 119 and one group, E, plotted from the splash tests. In Group A, the scour depth at the wing wall is a minimum for the 2- and 3-foot-high piers for a discharge of 20 c.f.s. At 35 c.f.s., the 3- and 4-foot piers provided the minimum scour depth, and at 60 c.f.s., the 4- and 5-foot piers provided minimum scour depth. In Groups B and C, the depth of scour at the end of the chute and the average of the maximum depths show the same general trend, except that the 3- and 4-foot piers show minimum scour for the maximum design discharge of 60 c.f.s.

If envelope curves were drawn in A, B, and C to determine the height of baffle pier which produces the least scour, the pier heights would vary from 2 feet for 20 c.f.s. in all cases to 3, 4 or 5 feet in the other cases for 60 c.f.s. An envelope curve drawn on the velocity curves to determine the height of pier to produce the lowest velocity on the chute would indicate baffle piers 6 feet high for all discharges. Since 6-foot piers produce maximum scour depth, a compromise must be made. Scour depth is more important than the velocity on the chute, and since the water surface profiles of Figures 115 to 118 favor the lower baffle piers, the most practical height for the baffle piers is indicated by the circles in Figures 123 and 124. The circles have been plotted on each set of curves and represent baffle piers 2 feet high for design discharge 20 c.f.s.; 3 feet high for design discharge 35 c.f.s.; 3.8 feet high for

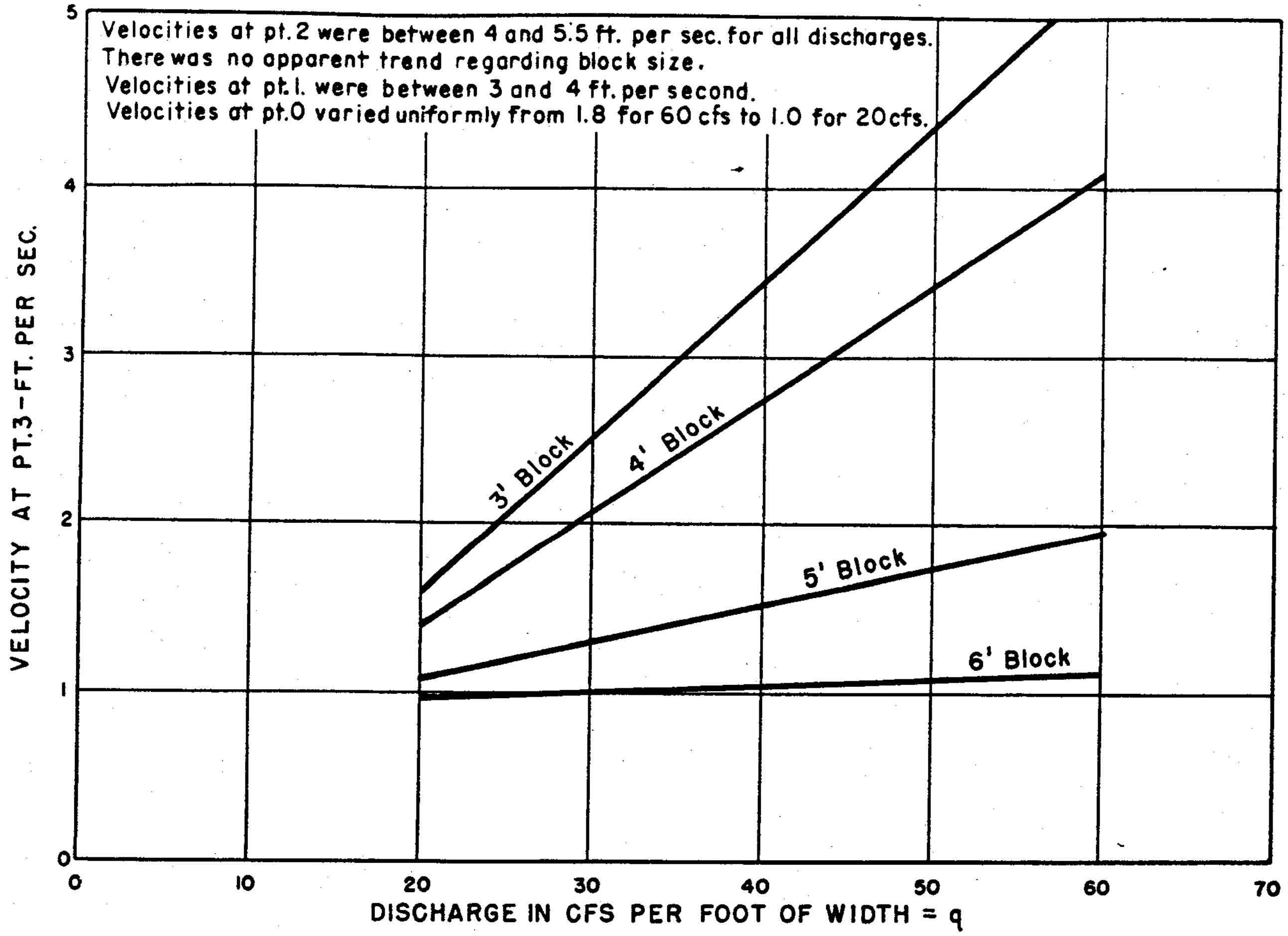
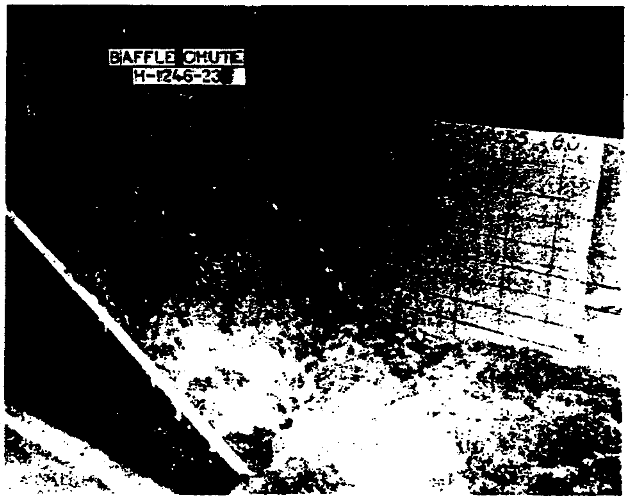
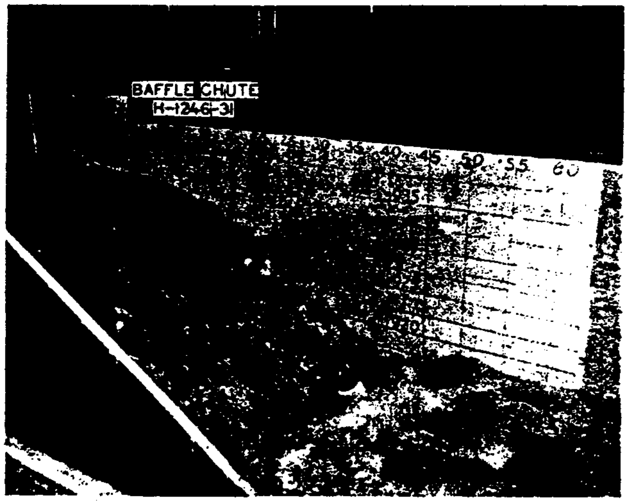


FIGURE 119.—*Baffled chute studies. Velocities at Point 3 on model.*

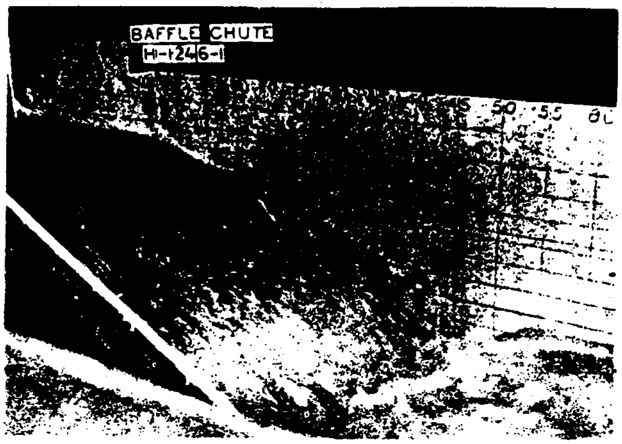


Baffle piers 6'0" high.

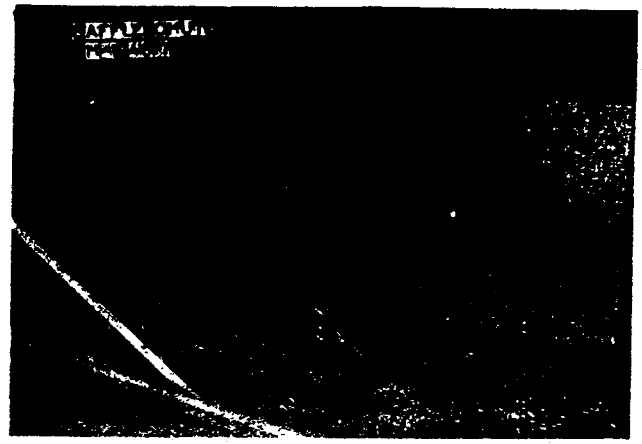


Baffle piers 3'0" high.

FIGURE 120.—*Baffled chute studies—discharge 60 c.f.s. per foot of width.*

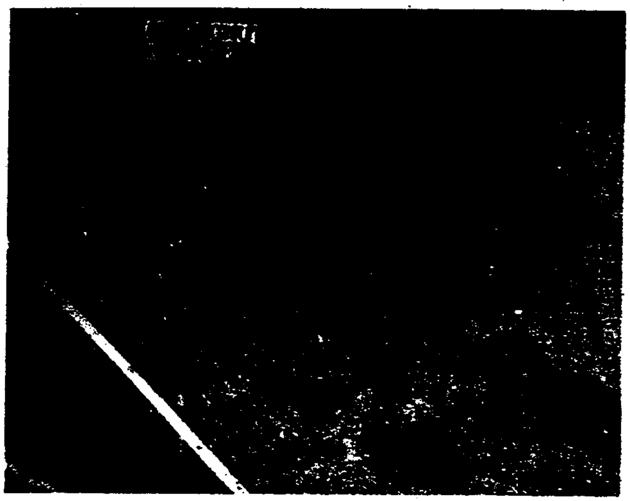


50 c.f.s. per foot of width.

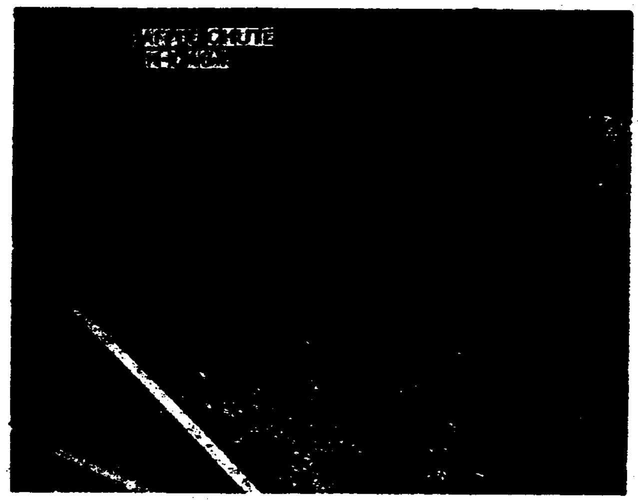


60 c.f.s. per foot of width.

Baffle piers 4′0″ high.



50 c.f.s. per foot of width.



60 c.f.s. per foot of width.

Baffle piers 5′0″ high.

FIGURE 121.—*Baffled chute studies—discharges 50 and 60 c.f.s. per foot of width.*

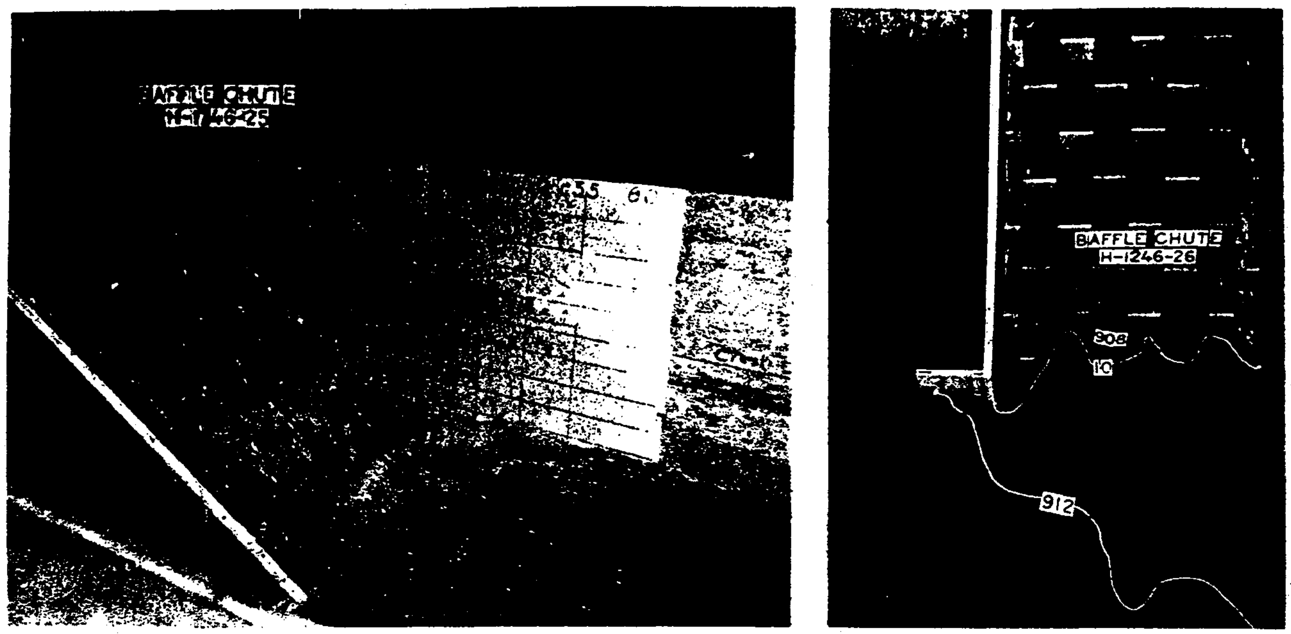
design discharge 50 c.f.s. and 4.3 feet high for design discharge 60 c.f.s.

Piers of this height produce near minimum depths of scour for all design discharges and near minimum velocity on the chute. In addition, they produce near minimum splash for all discharges as shown by Curves E of Figure 124. Finally, an inspection of the photographs made of each test (only a few representative photographs are reproduced in this report) show that the flow appearance is satisfactory for each of the recommended piers.

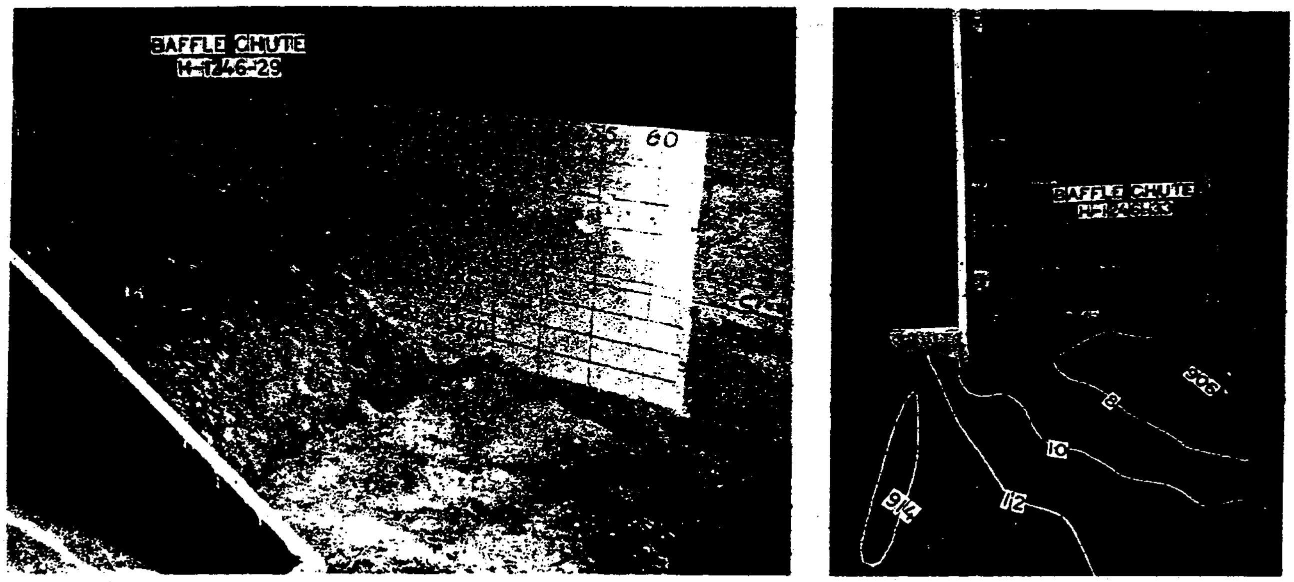
The height of baffle piers shown by the circles in Figures 123 and 124 may be expressed as 0.8 D_c where $D_c=\sqrt[3]{\frac{q^2}{g}}$=critical depth on the chute. Curve B, Figure 125, shows the recommended height of baffle piers.

Generalization of the Hydraulic Design

The general rules for the design of baffled overchutes have been derived from tests on individual models, prototype experiences, and on the verifi-



Discharge 35 c.f.s. per foot of width.



Discharge 20 c.f.s. per foot of width.

NOTE: Bed at elevation 914 at start of 30-minute test.

FIGURE 122.—*Baffled chute studies—baffle piers 3′0″ high.*

cation tests described in detail in this section. Since many of the rules are flexible to a certain degree, an attempt has been made in the following discussion to indicate how rigidly each rule applies.

The rules apply to chute slopes in the range 2:1 (steep) to 4:1 (flat). For slopes flatter than 2:1, the baffle pier row spacing should be modified as discussed on page 175.

Design discharge. The chute should be designed for the full capacity expected to be passed through the structure. The maximum unit discharge may be as high as 60 c.f.s. Generally

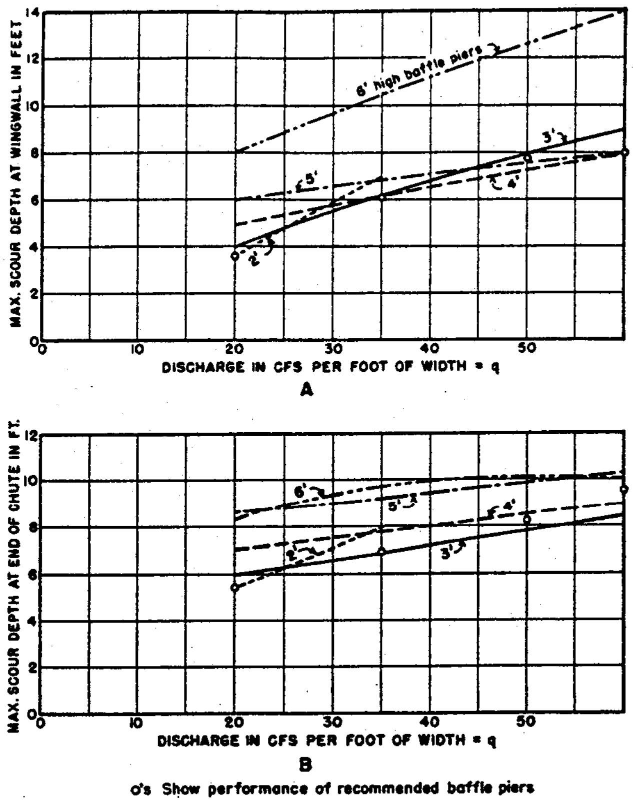


Figure 123.—*Baffled chute studies—scour test results.*

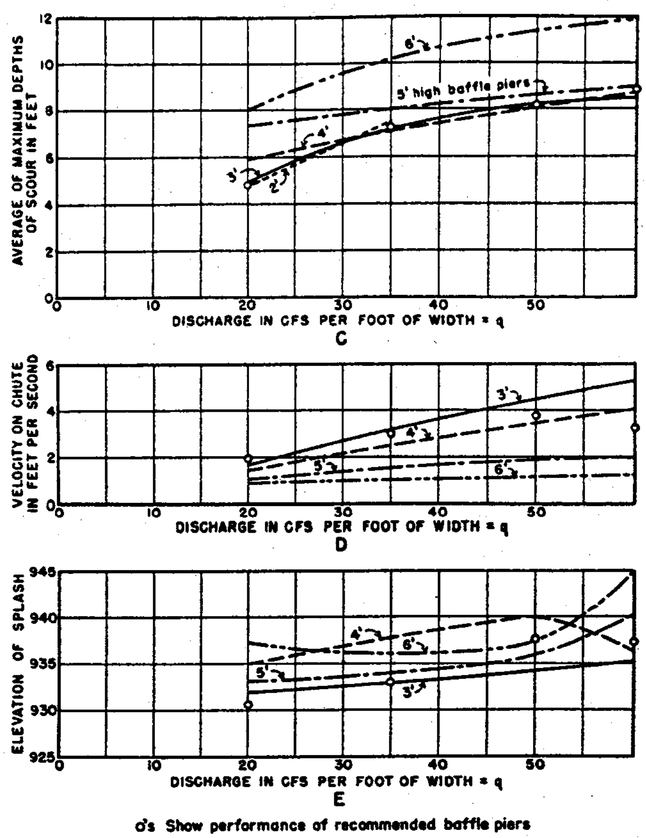


Figure 124.—*Baffled chute studies—scour, velocity, and splash test results.*

Table 21.—*Scour test results*

Baffle pier height ft.	Discharge per foot of width q in c.f.s.	Elevation of deepest erosion		
		(1) At wing-wall	(2) End of chute	Average 1 and 2
2	20	910−	908−	909−
	35	907−	906	906.5
3	20	910	908	909
	35	908	907	907.5
	50	906	906+	906.1
	60	905	906−	905.5
4	20	909	907	908
	35	908	906	907
	50	907	906−	906.5
	60	906	905	905.5
5	20	908	905	906.5
	35	907	905	906
	50	907	904	905.5
	60	906	904	905
6	20	906	906	906
	35	903	904	903.5
	50	902	904	903
	60	900	904	902

speaking, however, unit discharges in the range of 35 c.f.s. provide less severe conditions on the chute and in the downstream channel, and a unit discharge of 20 c.f.s. provides a relatively mild condition.

In installations where downstream degradation is not a problem and an energy dissipating pool can be expected to form at the base of the chute, more acceptable operation for a unit discharge of 60 c.f.s. will occur than will be the case in steeper channels where no energy dissipation occurs. The design maximum unit discharge may be limited by the economics of baffle pier sizes or chute training wall heights. A wider chute with a correspondingly reduced unit discharge may provide a more economical structure.

Reports have been received from the field that baffled aprons designed for a unit discharge of 60 c.f.s. have operated at estimated values up to 120 c.f.s. for short periods without excessive

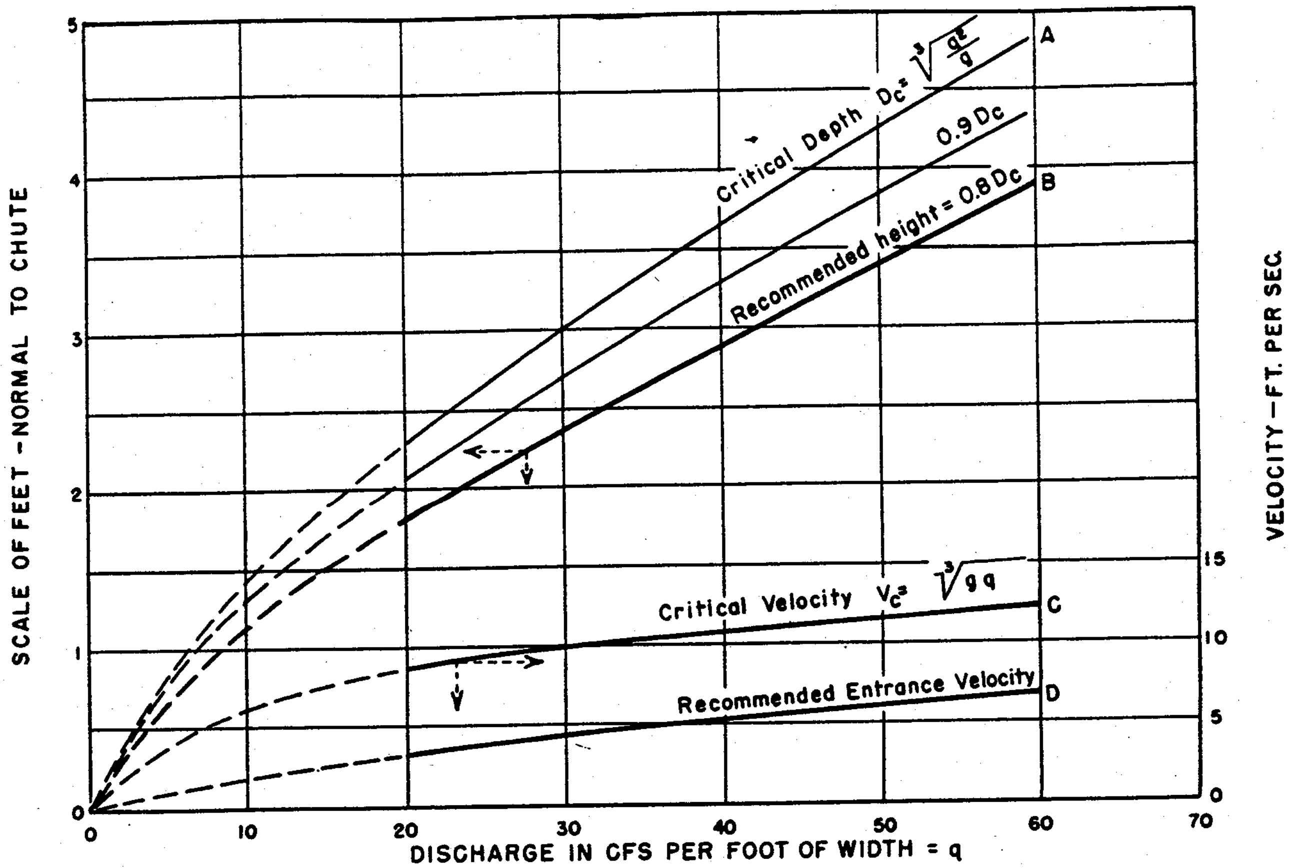


FIGURE 125.—*Baffled chute studies—recommended baffle pier heights and allowable velocities.*

erosion and spillage over the walls. This is mentioned only to indicate that a baffled apron can discharge more than the design flow without immediate disaster; it is not intended to suggest that baffled aprons should be underdesigned as a matter of general practice.

Chute entrance. Flow entering the chute should be well distributed laterally across the width of the chute. The velocity should be well below the critical velocity, preferably the values shown in Curve D of Figure 125. The critical velocity in a rectangular channel is $V_c = \sqrt[3]{gq}$. Velocities near critical or above cause the flow to be thrown vertically into the air after striking the first baffle pier. When the initial velocity is high, the flow has been observed to pass completely over the next row or two of baffle piers in a model. The baffled apron is not a device to reduce the velocity of the incoming flow; rather, it is intended only to prevent excessive acceleration of the flow passing down the chute.

To insure low velocities at the upstream end of the chute, it may be necessary to provide a short energy dissipating pool similar to the ones shown in Figures 103, 105, 107, and 109. A hydraulic jump stilling basin may be suitable if the flow is discharged under a gate as shown in Figure 109. The sequent or conjugate depth in the basin should be maintained to prevent jump sweepout, but the basin length may be considerably less than a conventional hydraulic jump basin, since the primary purpose of this pool is to reduce the average velocity. This is accomplished in the upstream portion of the stilling basin. The downstream third of the basin may therefore be eliminated, since the purpose of this portion of the basin is to complete the jump action and provide a smoother water surface. A basin length of twice the sequent depth will usually provide ample basin length. The end sill of the pool may be used as the crest of the chute, as shown in Figures 103, 105, 107, and 109.

Again, it is very important that proper flow conditions be provided at the entrance to the baffled apron. In fact, satisfactory performance of the entire structure may hinge on whether entrance flow conditions are favorable. If unusual entrance problems are encountered or if any doubt exists, a hydraulic model study is recommended.

Design of chute. The drop section, or chute, is usually constructed on a 2:1 slope. The upstream end of the chute floor should be joined to the horizontal floor by a curve to prevent excessive vertical contraction of the flow. However, the radius should be sufficiently small that the curved surface does not interfere with the placement of the first row of baffles. The upstream face of the first row should be no more than 1 foot (vertically) below the high point of the chute. It is important that the first row of baffles be placed as high on the chute as practicable, since half of the water will not be intercepted until the flow strikes the second row of baffles. To prevent overtopping of the training walls at the second row of baffles, a partial baffle (one-third to two-thirds of the width of a full baffle) should be placed against the training walls in the top or first row. This will place a space of the same width adjacent to the walls in the second row. Alternate rows are then made identical. (Rows 1, 3, 5, 7, etc., are identical; Rows 2, 4, 6, 8, etc., are identical.) Four rows of baffles are necessary to establish the expected flow pattern at the base of the chute.

The height of the training walls on the chute should be three or more times the baffle height, measured normal to the chute floor. Walls of this height will contain the main flow and most of the splash. The greatest tendency to overtop the walls occurs in the vicinity of the second and third rows of baffles, as indicated in the profiles and photographs. If it is important to keep the adjacent area entirely dry, it may be desirable to increase the wall height near the top of the chute.

Several rows of baffle piers are usually constructed below the channel grade and backfill is placed over the piers to restore original bottom topography. To determine the depth below channel grade to which the chute should be constructed, the following methods have been used. When the downstream channel has a control, the slope of a stable channel from the control upstream to the structure should be used to determine the elevation of the end of the chute. Usually, data are not available or sufficient to compute a stable channel grade. In these instances, a slope of 0.0018 is then used. Experience has shown that a slope of 0.015 is much too steep. If a stable downstream control does not exist, the probable stable channel must be determined by estimating the amount of material which will be moved during the maximum design flood.

Baffle pier heights and spacing. Curve A of Figure 125 shows the critical depth in a rectangular channel. The curve was plotted from the equation

$$D_c=\sqrt[3]{\frac{q^2}{g}}$$

Curve B gives values for 0.8 D_c; a curve for 0.9 D_c is also shown. Baffle pier heights for unit design discharges up to 60 c.f.s. may be obtained from Curve B. As indicated by the tests, the baffle pier heights are not critical and the height may be varied by several inches to provide a convenient dimension.

The width of the baffle piers should equal the width of the spaces between baffles in the same horizontal row and may vary between one and one and one-half times the block height—preferred width is one and one-half times the block height. Greater baffle widths may result in too few baffles to break up the flow thoroughly; narrower widths do not intercept enough of the flow at one place and also may result in slots too narrow for easy passage of trash.

As a general rule, the slope distance between rows of baffles (measured face to face on the 2:1 slope) should be twice the baffle height. When baffles less than 3 feet in height are used, the row spacing may be increased but should not exceed 6 feet. Greater spacing with small baffles allows the shallower flows to accelerate excessively before being intercepted by a baffle pier. Alternate rows should be staggered to provide a space below a block and vice versa.

Extensive tests made to determine the baffle pier sizes, spacing, etc., for chutes flatter than 2:1 indicated that the only modification required to produce optimum performance was in the baffle pier row spacing. It was found that a chute on a slope flatter than 2:1 should contain the same number of rows of piers as a 2:1 chute constructed between the identical top and bottom elevations.

In other words, the vertical fall distance between rows should be the same for all chutes, whether on slopes of 2:1 or flatter.

It was also determined that there is a disadvantage in supplying a greater number of rows than specified. Too many rows reduce the efficiency of the stilling action which occurs in the spaces between rows. For example, if a sufficient number of extra rows were added, a smooth floor consisting of the tops of the piers would result, and no energy dissipation could be expected.

The baffles may be constructed with their upstream faces normal to the chute or truly vertical; the difference in performance is hardly measurable in a model. There is a tendency, however, for the vertical faces to produce more splash and less scour than the normal faces, Figure 112. Other dimensions of the blocks are not important except from the structural standpoint. The proportions shown in Figure 115 have been found acceptable for both structural and hydraulic requirements and are recommended for general use. The forces on a baffle pier may be estimated from the baffle pier pressure measurements shown in Figures 103 and 105.

Prototype Performance

Field performance of baffled chutes, designed and constructed according to the suggestions given in this section, has been excellent at most installations. This has been verified by inspection teams working out of design offices and by field personnel responsible for operating the structures. Where deficiencies in performance have been noted, the cause was as obvious as the deficiency and simple remedial measures have resulted in satisfactory performance. The only difficulties reported have been associated with unstable channel banks, lack of riprap, or both. Proper bank protection has resulted in a satisfactory structure in all cases.

Figures 126 through 138 show a variety of installations in the field and indicate construction techniques. Also shown are completed baffled aprons which have operated for several years and structures performing for various fractions of the design flow. Each structure shown has been reported as satisfactory, either at the outset of operation or after bank stabilization had been accomplished. Each structure was built according to the general rules given in this section.

Baffle pier dimensions, spacing and arrangement, wall heights, and other rules for baffled chutes on a 2:1 slope were followed precisely. Table 22 contains data on other structures which have been built following the general rules. Although no reports on the performance of the tabulated aprons have been received, it is believed that they are operating as expected. No adverse comments on their performance have been forthcoming.

TABLE 22.—*Baffled chute structures in use*

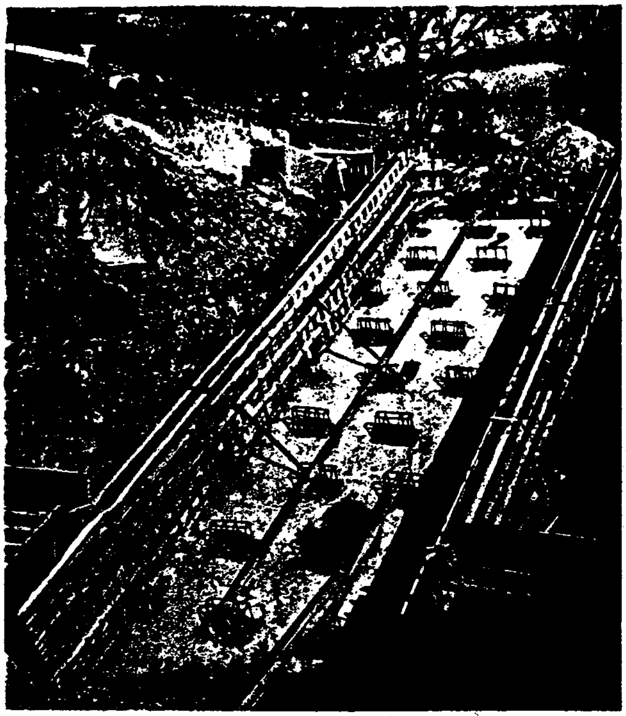
Spec. No.	Drawing No.	Location	Station	Chute width, feet	Design discharge, c.f.s.
		Franklin Canal			
DC-3720	271-D-549	Drain F-1.5-D	0+50	8 Trap	85
DC-3720	271-D-549	Drain F-10. 1-U	1+10	8 Trap	80
DC-3720	271-D-550	Drain F-1. 9-D	1+25	6 Trap	64
DC-3720	271-D-550	Drain F-10. 1-D	2+00	6 Trap	51
DC-3720	271-D-551	Drain F-10. 1	84+68+	18 Rect	625
DC-3891	271-D-648	Drain F-14. 1-D	1+44	10 Trap	100
DC-3891	271-D-649	Drain F-14. 9	5+20	32 Rect	1, 100
DC-3891	271-D-650	Drain F-14. 9-D	23+20	14 Rect	280
DC-3891	271-D-651	Drain F-15. 8	5+00	23 Rect	800
DC-3891	271-D-653	Drain F-23. 5-U	2+80	10 Trap	100
		Courtland Canal			
DC-4501	271-D-1031	Drain C-42. 3-U	2+80	10 Trap	120

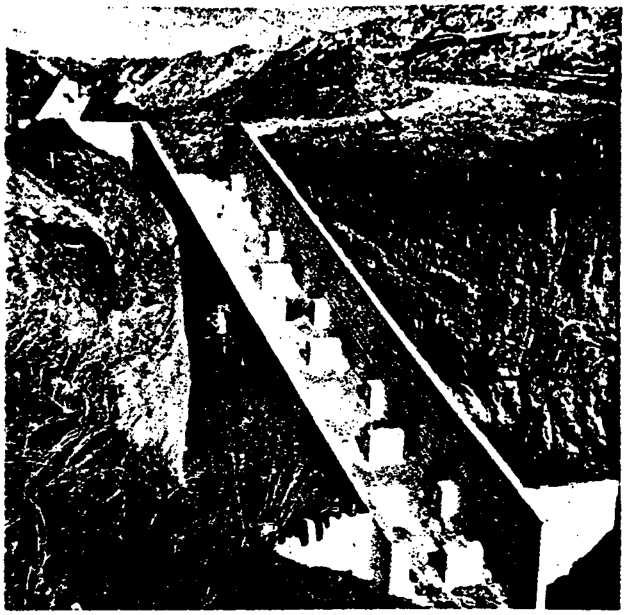
TABLE 22.—*Baffled chute structures in use*—Continued

Spec. No.	Drawing No.	Location	Station	Chute width, feet	Design discharge, c.f.s.
		Courtland West Canal			
DC-4874	271-D-1344	Drain CW-0. 7-D	3+00	10 Rect.	123
DC-4874	271-D-1344	Drain CW-1. 4-U	2+00	6 Rect.	123
DC-4874	271-D-1344	Drain CW-10. 5	8+00	6 Rect.	46
		Sargent Canal			
DC-4681	499-D-263	Airport Wasteway	16+00	11. 5 Rect.	130
DC-4681	499-D-263	Airport Wasteway	36+50	11. 5 Rect.	130
DC-4681	499-D-264	Airport Wasteway	51+20	17 Rect.	300
DC-4681	499-D-264	Airport Wasteway	98+00	17 Rect.	300
DC-4681	499-D-229	Big Oak Drain	11+25	11 Rect.	220
DC-4681	499-D-230	Big Oak Drain	13+00	12. 5 Rect.	150
DC-4681	499-D-248	Drain S-21. 9	4+60	25. 5 Rect.	800
DC-4681	499-D-249	Drain S-22. 6	4+00	19. 5 Rect.	650
DC-4681	499-D-250	Drain S-22. 6-U	0+60	14. 5 Rect.	165
DC-4681	499-D-260	Drain S-38. 0	29+35	15 Rect.	180
		Gila Project			
DC-2688	50-D-2417	Wellton-Mohawk Canal	7+14. 48	84 Rect.	35 c.f.s.
DC-2688	50-D-2432	Wellton-Mohawk Canal	151+39. 25	52 Rect.	per foot of
DC-2688	50-D-2438	Wellton-Mohawk Canal	234+60	36 Rect.	width.
DC-2972	50-D-2668	Mohawk Dike No. 1	0+00	140 Rect.	
DC-2972	50-D-2679	Mohawk Dike No. 1	12+30	25 Rect.	
DC-2972	50-D-2646	Mohawk Canal	1125+95. 74	180 Rect.	
DC-2972	50-D-2654	Mohawk Canal	1406+22. 25	124 Rect.	
DC-2972	50-D-2659	Mohawk Canal	1479+78. 47	46 Rect.	
DC-2972	50-D-2661	Mohawk Canal	1546+90	8 Rect.	35 c.f.s
DC-3683	50-D-2982	Radium Hot Springs	179+84. 91	18 Rect.	per foot
DC-4983	50-D-3359	Wellton-Mohawk Canal	661+16	90 Rect.	of width.
DC-2822	50-D-2446	Wellton-Mohawk Canal	489+21. 71	65 Rect.	
DC-2822	50-D-2453	Wellton-Mohawk Canal	563+50	39 Rect.	
DC-2822	50-D-2456	Wellton-Mohawk Canal	614+21. 71	65 Rect.	
DC-2822	50-D-2459	Wellton-Mohawk Canal	660+00	62 Rect.	
DC-2822	50-D-2470	Wellton-Mohawk Canal	822+17. 17	200 Rect.	
DC-2822	50-D-2473	Wellton-Mohawk Canal	938+00	36 Rect.	
DC-5019	50-D-3366	Texas Hill Floodway	113+00	11 Rect.	200
DC-5019	50-D-3368	Texas Hill Floodway	133+00	28. 5 Rect.	1, 000
		Eden Project			
DC-3558	153-D-152	Means Canal	7+30. 77	18 Rect.	630
		Columbia Basin Project			
DC-4888	222-D-19589	WB5WW1	36+90	18 Rect.	226
DC-4888	222-D-19596	WB5WW1	564+95	7 Rect.	85
DC-4888	222-D-19596	WB5WW1	280+10	7 Rect.	85
DC-4888	222-D-19596	WB5WW1	286+60	11 Rect.	127

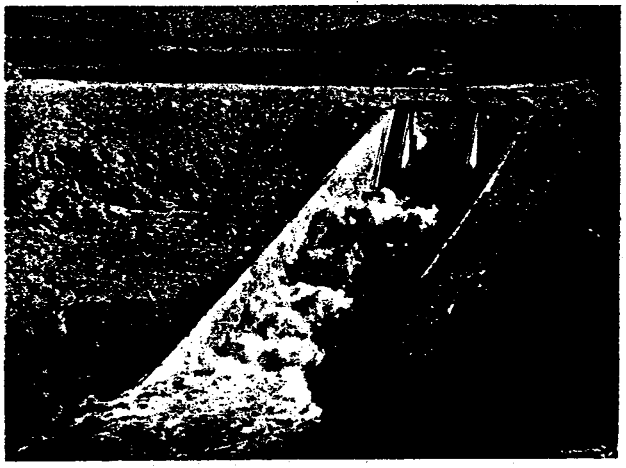
TABLE 22.—*Baffled chute structures in use*—Continued

Spec. No.	Drawing No.	Location	Station	Chute width, feet	Design discharge, c.f.s.
		Columbia Basin Project—Continued			
DC-4888	222-D-19596	WB5WW1	303+10	11 Rect	127
DC-4888	222-D-19596	WB5WW1	329+10	11 Rect	127
DC-4888	222-D-19596	WB5WW1	346+25	11 Rect	127
DC-4888	222-D-19596	WB5WW1	363+10	11 Rect	127
DC-4888	222-D-19596	WB5WW1	396+60	11 Rect	127
DC-4888	222-D-19597	WB5WW1	410+10	14 Rect	172
DC-4888	222-D-19597	WB5WW1	420+60	14 Rect	172
DC-4888	222-D-19597	WB5WW1	432+10	14 Rect	172
DC-4888	222-D-19597	WB5WW1	441+45	14 Rect	172
DC-4888	222-D-19597	WB5WW1	456+75	14 Rect	172
DC-4888	222-D-19597	WB5WW1	465+70	14 Rect	172
DC-4888	222-D-19597	WB5WW1	472+90	14 Rect	172
DC-4888	222-D-19598	WB5WW1	481+85	14 Rect	172
DC-4888	222-D-19598	WB5WW1	489+60	14 Rect	172
DC-4888	222-D-19598	WB5WW1	497+10	14 Rect	172
DC-4888	222-D-19598	WB5WW1	505+10	14 Rect	172
DC-4888	222-D-19598	WB5WW1	513+40	14 Rect	172
DC-4888	222-D-19598	WB5WW1	520+40	14 Rect	172
DC-4888	222-D-19598	WB5WW1	527+60	14 Rect	172
DC-4696	222-D-18763	EL68DWW	321+55.70	14 Rect	146
DC-4696	222-D-18817	EL68DWW	551+07AH	22 Rect	450
DC-4696	222-D-18775	EL81WW	202+02	18 Rect	365
DC-4696	222-D-18776	EL68DWW	Dike No. 1	9 Rect	96
DC-4696	222-D-18776	EL68DWW	Dike No. 4	14 Rect	198
DC-4696	222-D-18776	EL68DWW	Dike No. 5	14 Rect	198
DC-4696	222-D-18776	EL68DWW	Dike No. 6	14 Rect	198
DC-4696	222-D-18776	EL68DWW	Dike No. 7	14 Rect	198
DC-4696	222-D-18776	EL68DWW	Dike No. 9	18 Rect	313
DC-4696	222-D-18776	EL68DWW	Dike No. 10	20 Rect	363
DC-4696	222-D-18776	EL68DWW	Dike No. 11	22 Rect	414
DC-4696	222-D-18776	EL83WW	Dike No. 12	11 Rect	220
DC-4696	222-D-18776	EL83WW	Dike No. 13	11 Rect	220
DC-4696	222-D-18776	EL83WW	Dike No. 14	11 Rect	220
DC-4696	222-D-19601	WB5WW1	531+17.53	14 Rect	172
DC-4696	222-D-19601	WB5WW1	535+80	14 Rect	172
DC-4571	222-D-18422	PE16.4WW	1594+63	22 Rect	770
DC-4749	222-D-19090	Potholes East Canal	1369+11	46.5 Rect	3,900
		Colorado Big Thompson Project			
DC-3657	245-D-6645	St. Vrain Supply	513+86	18 Rect	575
DC-4150	245-D-7137	Boulder Creek Supply	667+78	10 Rect	200
		Solano Project			
DC-4881	413-D-513	Putah South Canal	1099+79	13 Rect	156
DC-4555	413-D-317	Putah South Canal	263+50	6 Rect	48





(Above) Setting forms for baffled chute at Sta. 3+35 of Wasteway 10.7, and (upper right) compacting backfill at Sta. 2+85 of Wasteway 11.1, Culbertson Canal, Missouri River Basin project.



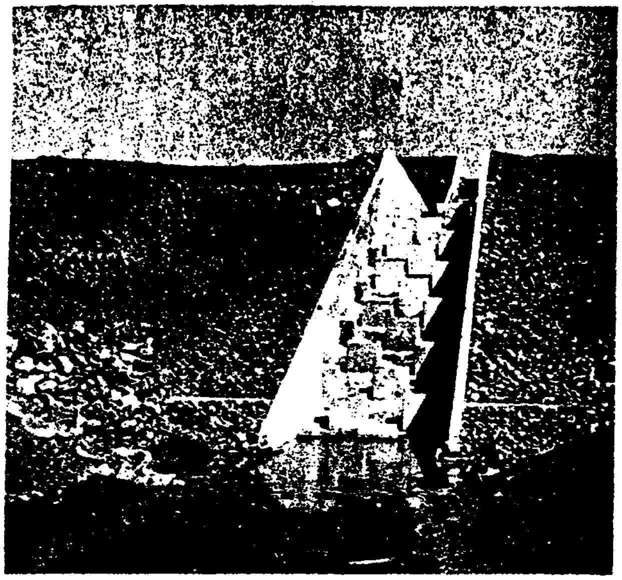
(Lower right). A discharge of 63 c.f.s. flowing into Helena Valley Regulating Reservoir, Missouri River Basin project, from Helena Canal. Soft earth bank is eroded, otherwise, performance is excellent.

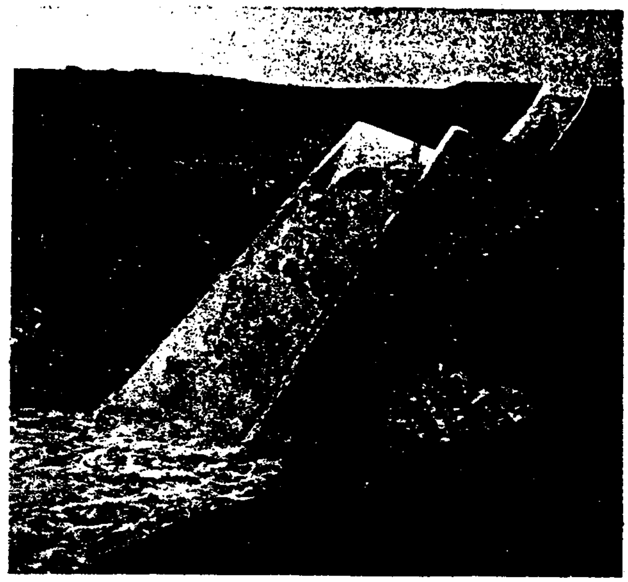
FIGURE 126.—*Construction and performance of baffled chutes.*

Figure 126 shows construction techniques used on two baffled chutes and operation of another at partial capacity. In the latter photograph, a small quantity of riprap on the earth bank would have prevented undermining and sloughing of the soft earth at the downstream end of the right training wall.

The baffled chute shown in Figure 127 is on the Boulder Creek Supply Canal and has operated many times over a range of discharges approaching the design discharge. As a result, a shallow pool has been scoured at the base of the structure. This is desirable, since the pool tends to reduce surface waves and make bank protection downstream from the structure unnecessary. A relatively small quantity of riprap has been placed to achieve the maximum benefit. Also, the wetted area (darker color) adjacent to the training walls starts at about the second row of baffles. This is caused by a small amount of splash which rises above the walls and is carried by air currents. No reports have ever been received that this splash or water loss is of any consequence.

Figure 128 shows a low-drop baffled chute on the Bostwick Courtland Canal. It appears that grass has stabilized the banks sufficiently for the

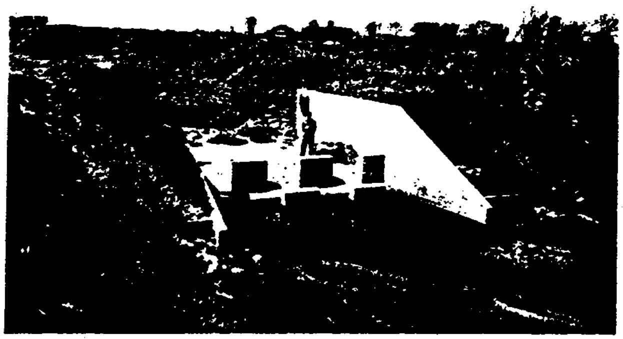




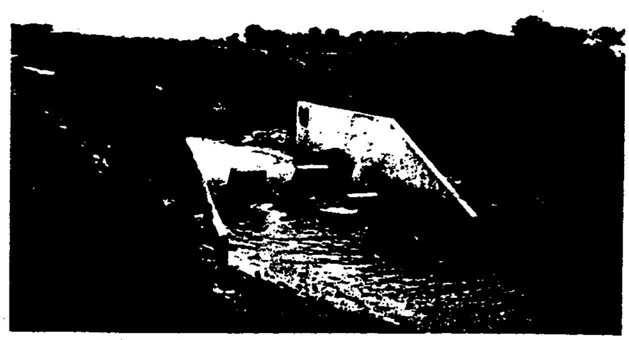
Dark rock area adjacent to training walls is wet from spray.

Baffled chute at Sta. 667+78, Extension Boulder Creek Supply Canal, Colorado-Big Thompson project, designed for 200 c.f.s. Discharges of 150 c.f.s. (upper left) and 100 c.f.s. (lower left) show excellent performance in both instances.

FIGURE 127.—*Prototype installation of baffled chute.*

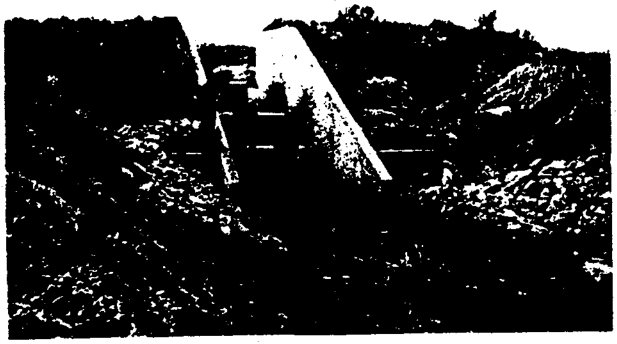


No flow through structure on Bostwick Courtland Canal, Drain A, Sta. 6+08, designed for 924 c.f.s.



With a discharge of about 5 c.f.s., the structure performs well. It is reported that larger flows are handled satisfactorily.

FIGURE 128.—*Prototype installation of baffled chute.*



No flow in structure on Bostwick Courtland Canal, Drain A, Sta. 67+93. Trash has accumulated at foot of chute. Design discharge 277 c.f.s.

Discharge about 3 c.f.s. Reports received indicate that structure performs well for large discharges.

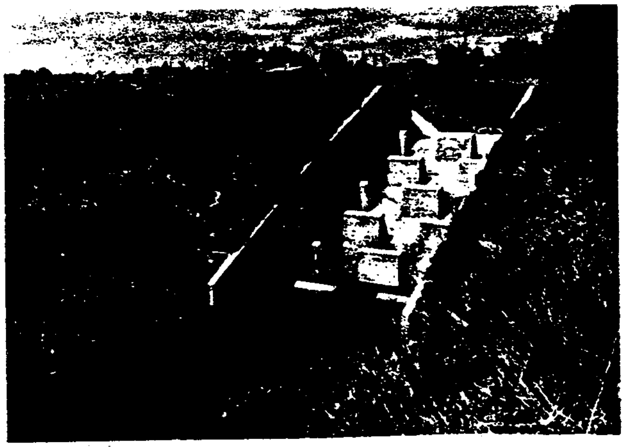
FIGURE 129.—*Prototype installation of baffled chute.*

height of fall indicated. Little, if any, riprap is evident and the structure has performed satisfactorily for a number of years with little maintenance. There is a shallow scoured pool at the base of the apron.

Figure 129 shows another structure on the Bostwick Courtland Canal. Trash has accumulated near the base of the structure. Field reports indicate that trash tends to collect during a falling stage and is removed by the water during the rising stage. Generally speaking, trash is not a problem on baffled chutes and does not contribute materially to maintenance costs. Well-placed riprap at the base of the structure contributes to bank stability.

Figure 130 shows two baffled chutes on the Bostwick Franklin Canal which have been in operation for over 4 years. In each case, grass has stabilized the downstream channel banks sufficiently to prevent bank erosion.

The series of photographs in Figure 131 show the progress of downstream scour from October 1956 to the spring of 1959 at a drain on the Bostwick Division, Missouri River Basin project. It may be noted that between October 1956 and September 1957, scouring occurred which exposed one row of the buried blocks. The bed material which was carried away consisted of fines; the coarse material that resembles riprap was left in place as shown in the photographs.



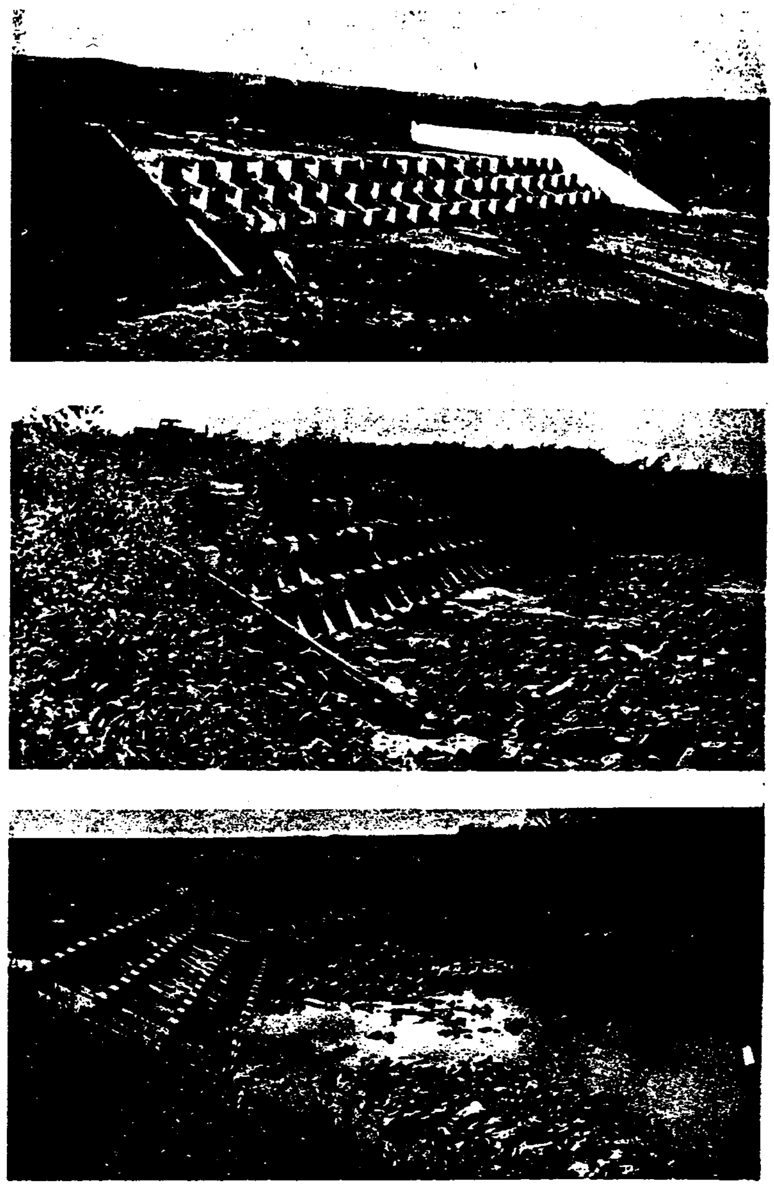
Structure after 4 years of operation. Performance has been satisfactory. Design discharge 625 c.f.s.

Bostwick Franklin Canal, Drain F-10.1, Sta. 84+88.

Structure after 5 years of operation. Performance has been satisfactory. Design discharge 1,100 c.f.s.

Bostwick Franklin Canal, Drain F-14.9, Sta. 5+20.

FIGURE 130.—*Prototype installations of baffled chutes.*



No flow in October 1956.

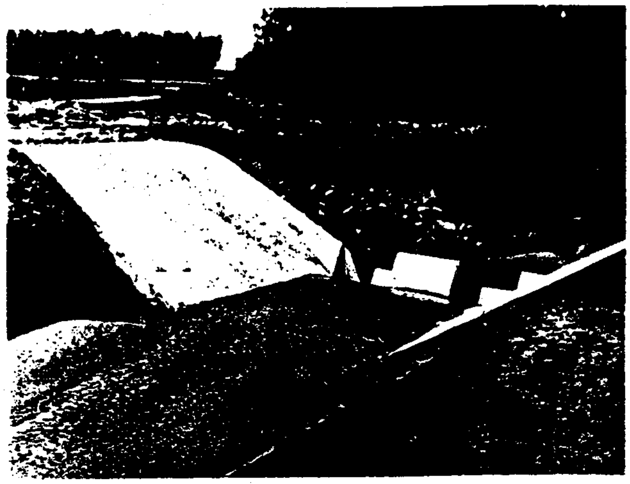
Erosion after a year of operation has exposed one more row of blocks. Rocks were sorted from finer material which moved. Rubbish has collected by September 1957.

Erosion did not continue at original rate, and is no more severe after 2½ years of operation in April 1959.

FIGURE 131.—*Progress of erosion in Bostwick Crow Creek Drain, Sta. 28+90. Design discharge 2,000 c.f.s.*

Figure 132 shows the Bostwick Superior Canal Drain after only a few months of operation. The soft earth banks were badly eroded, both upstream and downstream from the structure. The small amount of riprap placed downstream did much to protect the structure from complete failure. Stabilization of the banks with a grass cover eliminated sloughing of the banks. Figure 133 shows the same structure 6 years later, operating satisfactorily for a fraction of the design discharge. Now that the banks are stable, there is no maintenance problem.

The left photograph in Figure 134 shows Frenchman-Cambridge Drain 8C after 4½ years of operation. Performance has been excellent. Riprap originally placed at the base of the walls is covered by weed and grass cover. The shallow energy-dissipating pool has helped to reduce bank maintenance downstream. In the right photograph, the Culbertson Canal Wasteway 3.3 is



Unstable banks collapsed after only 6 months of operation. Protection was afforded by downstream riprap.

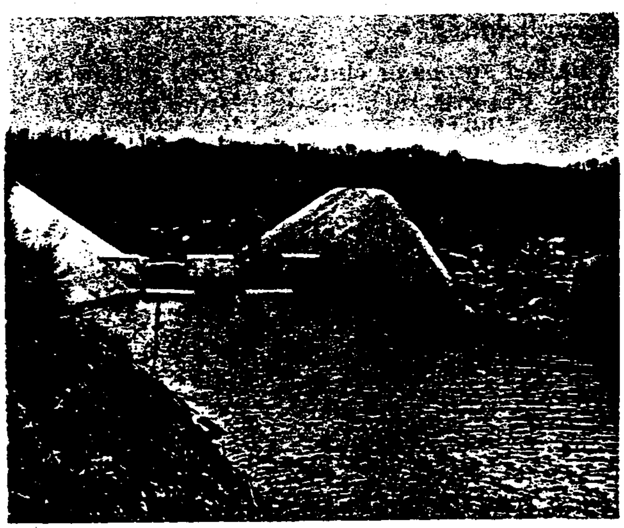
Upstream banks were badly eroded.

Figure 132.—*Unstable banks create an erosion problem on Bostwick Superior Canal, Drain 2A, Sta. 36+82.4.*

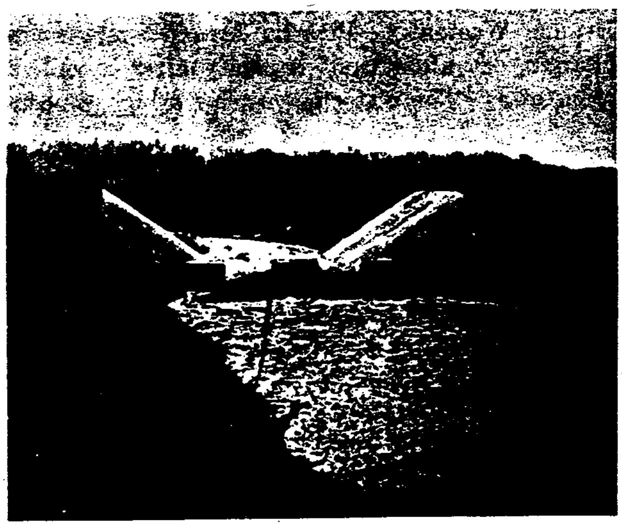
shown in operation shortly after construction was completed. The need for riprap at the waterline near the base of the baffled apron is beginning to become apparent. Figure 135 shows closer views of this same structure and indicates how energy dissipation is accomplished on the chute. Action in hydraulic models of baffled chutes is identical to that shown here. The left photograph in Figure 136 shows the wasteway after the discharge was stopped. It appears that additional riprap protection would be desirable, particularly if the discharge is greater than 75 c.f.s.

Figure 136, right photograph, shows the Robles-Casitas Canal discharging 500 c.f.s. into a baffled chute. The riprap affords adequate protection to the structure. Operation is excellent.

Figure 137 shows a drop on the Frenchman-Cambridge Wasteway. The right photograph

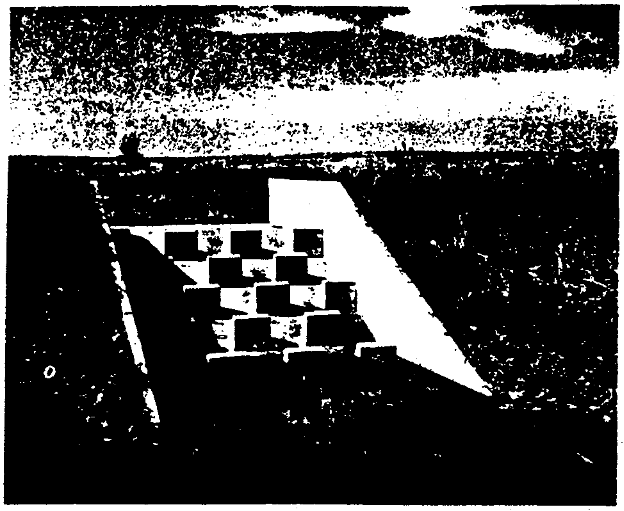


Stabilized banks in April 1959 show no evidence of erosion.



Performance of structure during rainstorm. Discharge 81 c.f.s. in May 1959. Design discharge 400 c.f.s.

Figure 133.—*S abilized banks present no erosion problem after the work was done on Bostwick Superior Canal, Drain 2A, Sta. 36+82.4. (See Fig. 132.)*



Frenchman-Cambridge Drain 8-C after 4½ years of operation. Excellent performance. Design discharge 1,000 c.f.s.

Baffled apron of Culbertson Canal Wasteway 3.3 discharging 75 c.f.s. Good performance. Design discharge 400 c.f.s.

FIGURE 134.—*Performance of prototype structures.*

shows how wingwalls can be used to protect the structure and how a small amount of riprap can be used to protect the wingwalls from undercutting. The left photograph shows the action of the water on the baffled chute for a very small discharge. There is practically no turbulence at the base of the apron (see right photograph also).

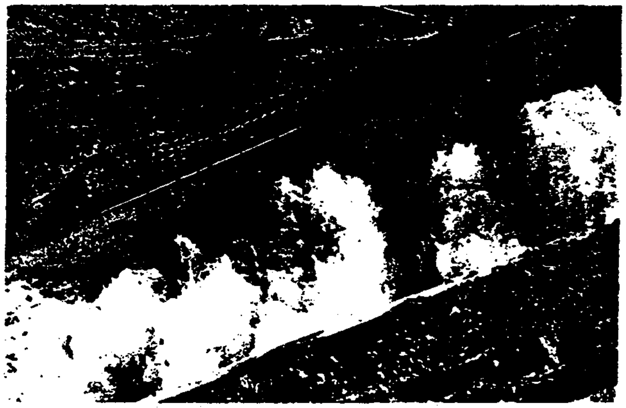
Figure 138, left photograph, shows the North Branch Wasteway—Picacho Arroyo System discharging at about half capacity after a violent rainstorm. The water is carrying a high concentration of sediment. After the flood, right photograph, it was found that the downstream channel had aggraded rather than scoured, partially covering one row of blocks which had been more exposed before the runoff. In this case, the reduction in velocity at the base of the apron caused sediment to settle out of the wasteway water.

★ ★ ★

Recapitulation

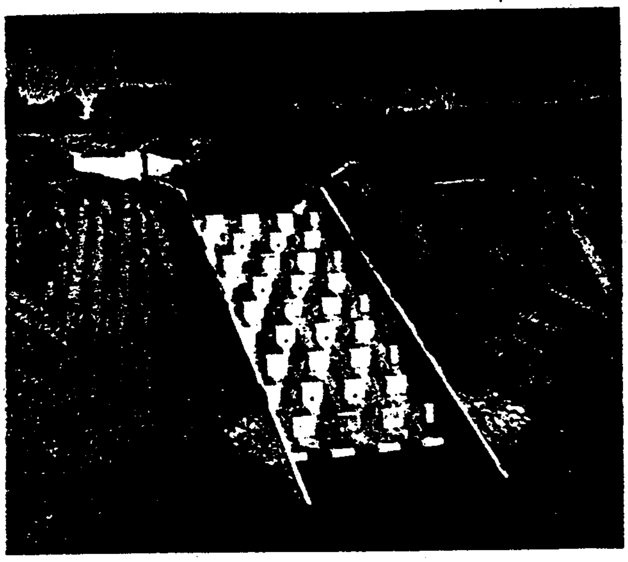
Baffled aprons or chutes are used in flow ways where water is to be lowered from one level to

The second row of baffles is completely covered because of acceleration of flow between the first and second rows with a flow of 75 c.f.s. at top of baffled chute.

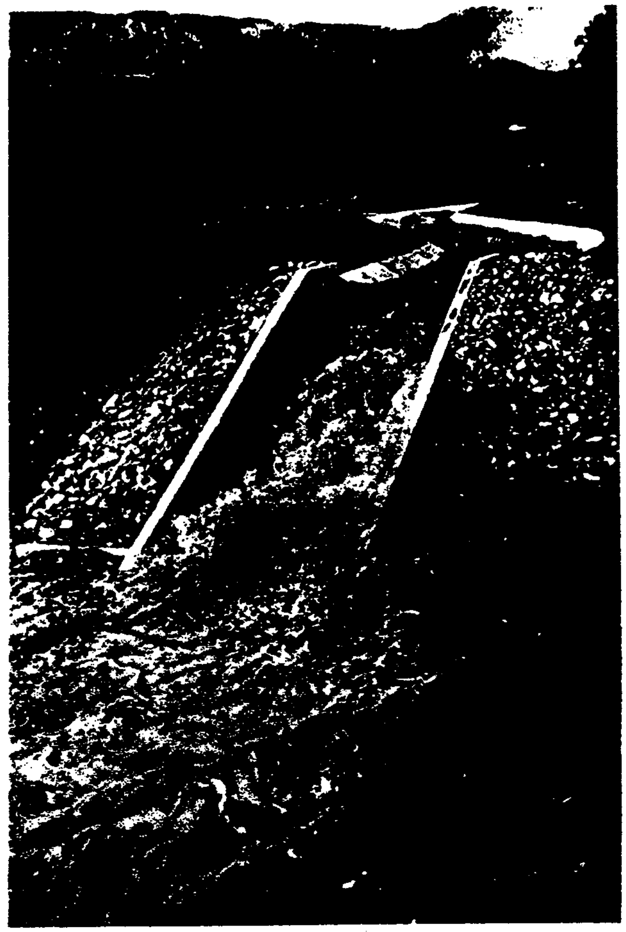


Same flow in midportion of chute. See right-hand photograph in Figure 134 for general view.

FIGURE 135.—*Performance of baffled chute on Culbertson Canal Wasteway 3.3.*



▲ Culbertson Canal Wasteway 3.3 after a discharge of 75 c.f.s. in May 1959.



Robles-Casitas Canal between Sta. 294 and Sta. 298 with 500 c.f.s. discharging into Santa Ana Creek. Waves in canal section occasionally splash over top of canal concrete lining. ▶

FIGURE 136.—*Performance of prototype structures.*

another. The baffle piers prevent undue acceleration of the flow as it passes down the chute. Since the flow velocities entering the downstream channel are relatively low, no stilling basin is required. The chute, on a 2:1 slope or flatter, may be designed to discharge up to 60 c.f.s. per foot of width, and the drop may be as high as structurally feasible. The lower end of the chute is constructed to below stream-bed level and backfilled as necessary. Degradation or scour of the stream bed, therefore, does not adversely affect the performance of the structure. The simplified hydraulic design procedure given in the numbered steps refers to Figure 140. More detailed explanations have been given in the text.

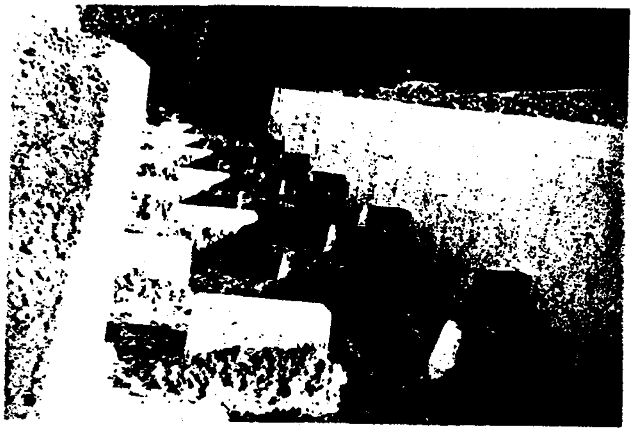
Simplified Design Procedure

1. The baffled apron should be designed for the maximum expected discharge, Q.

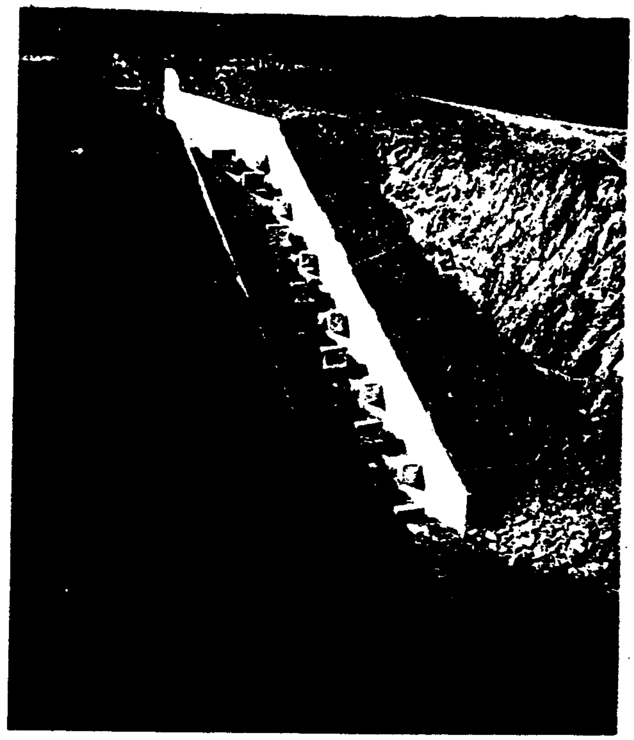
2. The unit design discharge $q=\frac{Q}{W}$ may be as high as 60 c.f.s. per foot of chute width, W. Less severe flow conditions at the base of the chute exist for 35 c.f.s. and a relatively mild condition occurs for unit discharges of 20 c.f.s. and less.

3. Entrance velocity, V_1, should be as low as practical. Ideal conditions exist when $V_1=\sqrt[3]{gq}-5$, Curve D, Figure 125. Flow conditions are not acceptable when $V_1=\sqrt[3]{gq}$, Curve C, Figure 125.

4. The vertical offset between the approach channel floor and the chute is used to create a stilling pool or desirable V_1 and will vary in individual installations; Figures 103, 105, 107, and 109 show various types of approach pools. Use a short radius curve to provide a crest on the sloping chute. Place the first row of baffle piers close to the top of the chute no more than 12 inches in elevation below the crest.



▲ Stilling action of blocks is most effective for small discharges.



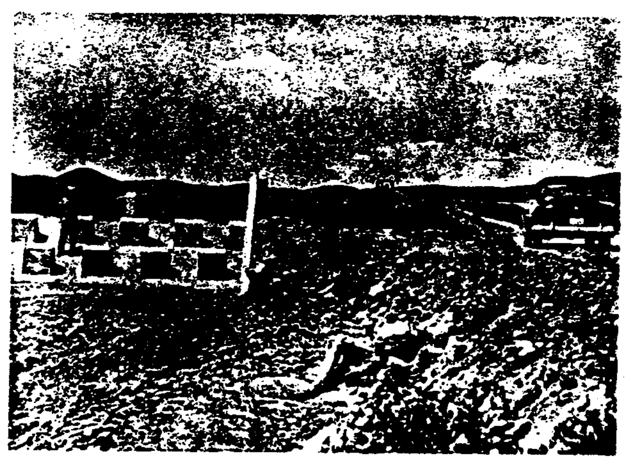
A small amount of riprap provides excellent protection to foot of chute. ▶

FIGURE 137.—*Frenchman-Cambridge Meeker Extension Canal Wasteway, Sta. 1777+18. Discharge about 5 c.f.s., design discharge 269 c.f.s.*

5. The baffle pier height, H, should be about 0.8 D_c, Curve B, Figure 125. The critical depth on the rectangular chute is $D_c=\sqrt[3]{\frac{q^2}{g}}$, Curve A. Baffle pier height is not a critical dimension but should not be less than recommended. The height may be increased to 0.9 D_c, Figure 125.

6. Baffle pier widths and spaces should be equal, preferably about 3/2 H, but not less than H. Other baffle pier dimensions are not critical;

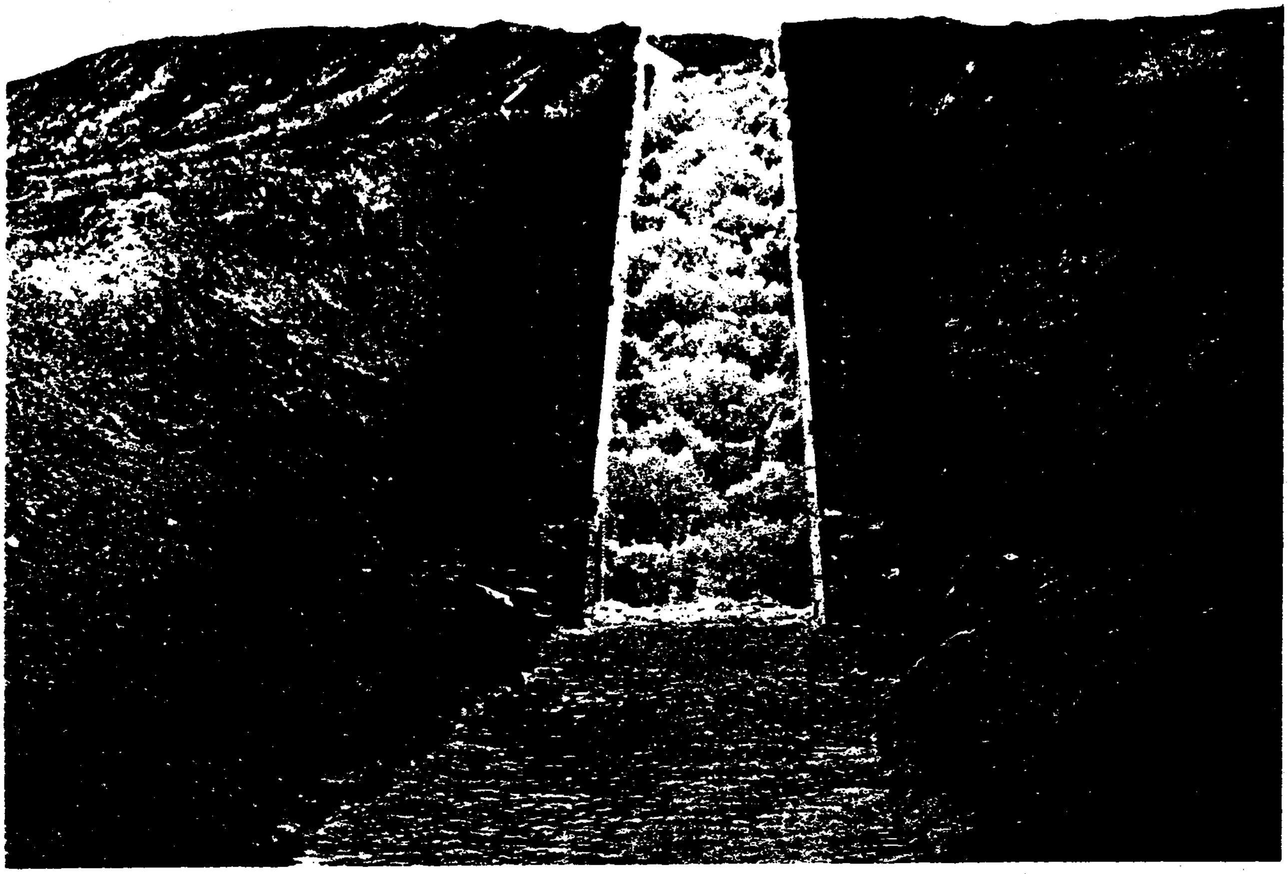
Estimated discharge 15 c.f.s. per foot width (half capacity).



Channel after flood—material was deposited rather than scoured.

North Branch Wasteway Channel, Picacho Arroyo System, Rio Grande project.

FIGURE 138.—*Baffled chute may produce channel aggradation rather than scour.*



Baffle piers 18″ high and 18″ wide—18″ spaces. Row spacing, 6′0″.

Chute 9′ wide and 90′ long—2 : 1 slope. Training walls 5′ high.

FIGURE 139.—*Kopp Wasteway on the Main East Canal, Michaud Flats project, Idaho, discharging 25 c.f.s. (one-third capacity).*

suggested cross section is shown. Partial blocks, width 1/3 H to 2/3 H, should be placed against the training walls in Rows 1, 3, 5, 7, etc., alternating with spaces of the same width in Rows 2, 4, 6, etc.

7. The slope distance (along a 2:1 slope) between rows of baffle piers should be 2 H, twice the baffle height H. When the baffle height is less than 3 feet, the row spacing may be greater than 2 H but should not exceed 6 feet. For slopes flatter than 2:1, the row spacing may be increased to provide the same vertical differential between rows as expressed by the spacing for a 2:1 slope.

8. The baffle piers are usually constructed with their upstream faces normal to the chute surface; however, piers with vertical faces may be used. Vertical face piers tend to produce more splash and less bed scour, but differences are not significant.

9. Four rows of baffle piers are required to establish full control of the flow, although fewer rows have operated successfully. Additional rows beyond the fourth maintain the control established upstream, and as many rows may be constructed as is necessary. The chute should be extended to below the normal downstream channel elevation as explained in the text of this section, and at least one row of baffles should be buried in the backfill.

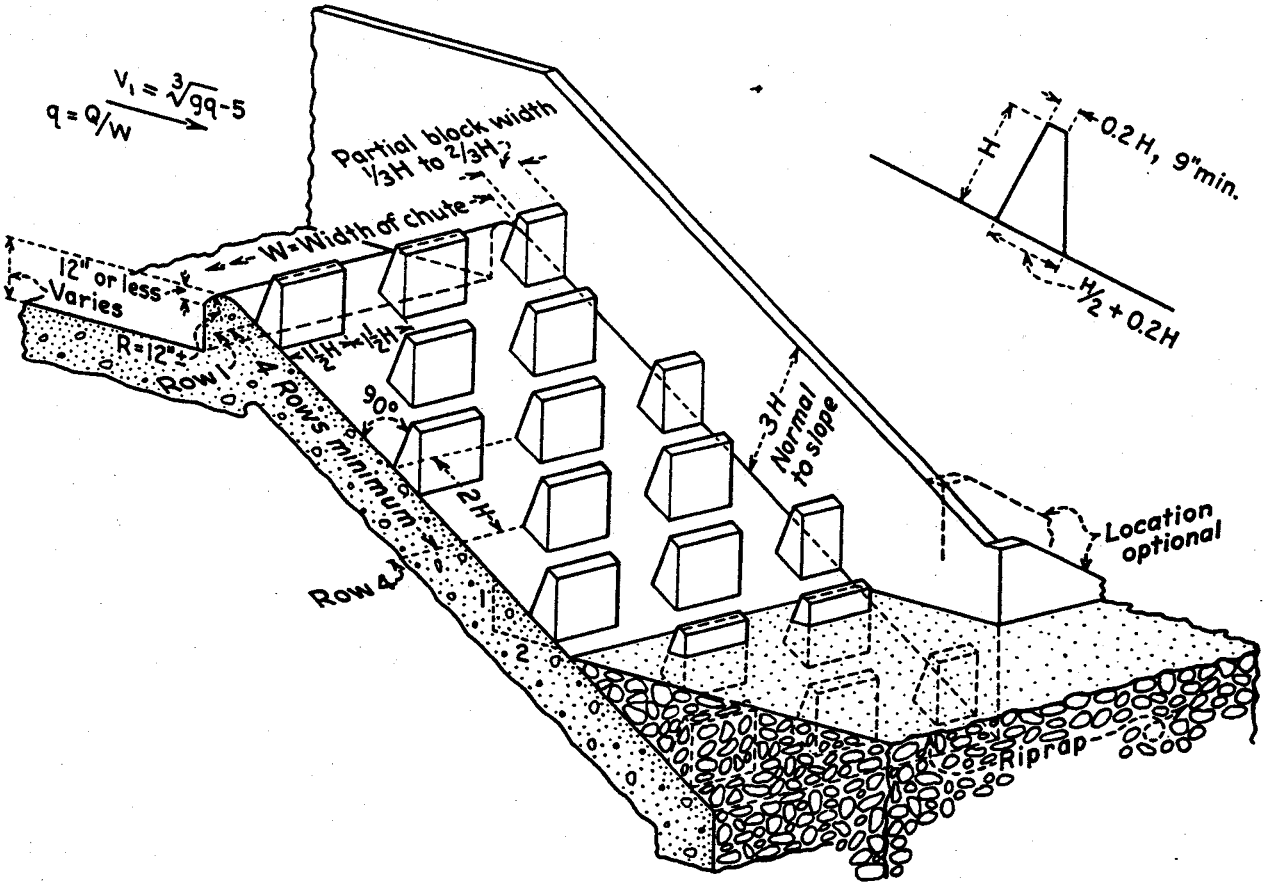


FIGURE 140.—*Basic proportions of a baffled chute.*

10. The chute training walls should be three times as high as the baffle piers (measured normal to the chute floor) to contain the main flow of water and splash. It is impractical to increase the wall heights to contain all the splash.

11. Riprap consisting of 6- to 12-inch stones should be placed at the downstream ends of the training walls to prevent eddies from working behind the chute. The riprap should not extend appreciably into the flow area. Figures 126 to 139 show effective and ineffective methods of placement on field structures.

6. HY8 Output for Basin 4 inlet culverts

CURRENT DATE: 09-23-1999
CURRENT TIME: 07:31:34

FILE DATE: 09-23-1999
FILE NAME: BASN4AIN

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

CULV NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	73.20	70.00	169.38	1 RCB	6.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: BASN4AIN DATE: 09-23-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
75.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
77.07	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.00	1
77.42	40.0	40.0	0.0	0.0	0.0	0.0	0.0	0.00	1
77.70	60.0	60.0	0.0	0.0	0.0	0.0	0.0	0.00	1
77.96	80.0	80.0	0.0	0.0	0.0	0.0	0.0	0.00	1
78.19	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.00	1
78.41	120.0	120.0	0.0	0.0	0.0	0.0	0.0	0.00	1
78.59	137.0	137.0	0.0	0.0	0.0	0.0	0.0	0.00	1
78.81	160.0	160.0	0.0	0.0	0.0	0.0	0.0	0.00	1
79.54	180.0	180.0	0.0	0.0	0.0	0.0	0.0	0.00	1
80.09	200.0	191.8	0.0	0.0	0.0	0.0	0.0	7.01	9
80.00	189.9	189.9	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: BASN4AIN DATE: 09-23-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
75.00	0.000	0.00	0.00	0.00
77.07	0.000	20.00	0.00	0.00
77.42	0.000	40.00	0.00	0.00
77.70	0.000	60.00	0.00	0.00
77.96	0.000	80.00	0.00	0.00
78.19	0.000	100.00	0.00	0.00
78.41	0.000	120.00	0.00	0.00
78.59	0.000	137.00	0.00	0.00
78.81	0.000	160.00	0.00	0.00
79.54	0.000	180.00	0.00	0.00
80.09	-0.005	200.00	1.22	0.61

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-23-1999
CURRENT TIME: 07:31:34

FILE DATE: 09-23-1999
FILE NAME: BASN4AIN

PERFORMANCE CURVE FOR CULVERT 1 - 1(6.00 (ft) BY 3.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	76.49	0.00	1.80	0-NF	0.00	0.00	0.00	5.00	0.00	0.00
20.00	77.07	3.87	1.84	1-S1f	0.38	0.70	1.80	5.00	1.85	0.00
40.00	77.42	4.22	1.97	1-S1f	0.61	1.12	1.70	5.00	3.92	0.00
60.00	77.70	4.50	4.50	1-S1f	0.79	1.46	1.60	5.00	6.25	0.00
80.00	77.96	4.76	4.76	1-S1f	0.96	1.77	1.90	5.00	7.02	0.00
100.00	78.19	4.99	4.99	1-S1f	1.12	2.06	2.20	5.00	7.58	0.00
120.00	78.41	5.21	3.32	4-FFt	1.26	2.32	1.26	5.00	15.82	0.00
137.00	78.59	5.39	3.78	4-FFt	1.38	2.54	1.38	5.00	16.50	0.00
160.00	78.81	5.61	4.51	4-FFt	1.54	2.81	1.54	5.00	17.29	0.00
180.00	79.54	6.34	5.23	4-FFt	1.67	3.00	1.67	5.00	17.93	0.00
191.76	80.09	6.89	5.69	4-FFt	1.75	3.00	1.75	5.00	18.26	0.00

El. inlet face invert 73.20 ft El. outlet invert 70.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 76.49 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	76.20 ft
OUTLET STATION	169.35 ft
OUTLET ELEVATION	70.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0189
CULVERT LENGTH ALONG SLOPE	169.38 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	BOX
BARREL SPAN	6.00 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (90-45 DEG.)
INLET DEPRESSION	YES

CURRENT DATE: 09-23-1999
CURRENT TIME: 07:31:34

FILE DATE: 09-23-1999
FILE NAME: BASN4AIN

IMPROVED INLET FOR CULVERT 1 - 1(6.00 (ft) BY 3.00 (ft)) RCB

DIS-CHARGE Flow (cfs)	HEAD-WATER Elev. (ft)	INLET CONTROL Depth (ft)	OUTLET CONTROL Depth (ft)	FLOW TYPE <F4>	CREST CONTROL Elev. (ft)	FACE CONTROL Elev. (ft)	THROAT CONTROL Elev. (ft)	TAILWATER Elev. (ft)
0	76.49	0.00	1.80	0-NF	76.49	73.20	0.00	75.00
20	77.07	3.87	1.84	1-S1f	77.07	74.39	0.00	75.00
40	77.42	4.22	1.97	1-S1f	77.42	75.07	0.00	75.00
60	77.70	4.50	4.50	1-S1f	77.70	75.64	0.00	75.00
80	77.96	4.76	4.76	1-S1f	77.96	76.17	0.00	75.00
100	78.19	4.99	4.99	1-S1f	78.19	76.71	0.00	75.00
120	78.41	5.21	3.32	4-FFt	78.41	77.29	0.00	75.00
137	78.59	5.39	3.78	4-FFt	78.59	77.84	0.00	75.00
160	78.81	5.61	4.51	4-FFt	78.81	78.69	0.00	75.00
180	79.54	6.34	5.23	4-FFt	79.00	79.54	0.00	75.00
192	80.09	6.89	5.69	4-FFt	79.11	80.09	0.00	75.00

CURRENT DATE: 09-23-1999
CURRENT TIME: 07:31:34

FILE DATE: 09-23-1999
FILE NAME: BASN4AIN

TAILWATER

CONSTANT WATER SURFACE ELEVATION
75.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	25.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	80.00 ft

CURRENT DATE: 09-23-1999
CURRENT TIME: 07:46:46

FILE DATE: 09-23-1999
FILE NAME: BASN4BIN

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.0

CULV NO.	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	74.90	71.00	181.78	1 RCB	6.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: BASN4BIN DATE: 09-23-1999

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
75.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
80.34	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
80.59	24.0	24.0	0.0	0.0	0.0	0.0	0.0	0.00	1
80.79	36.0	36.0	0.0	0.0	0.0	0.0	0.0	0.00	1
80.97	48.0	48.0	0.0	0.0	0.0	0.0	0.0	0.00	1
81.07	60.0	55.0	0.0	0.0	0.0	0.0	0.0	4.64	6
81.13	72.0	59.4	0.0	0.0	0.0	0.0	0.0	11.99	4
81.18	84.0	63.4	0.0	0.0	0.0	0.0	0.0	20.19	4
81.19	87.0	64.3	0.0	0.0	0.0	0.0	0.0	22.25	3
81.27	108.0	70.3	0.0	0.0	0.0	0.0	0.0	37.27	4
81.31	120.0	73.3	0.0	0.0	0.0	0.0	0.0	45.64	3
81.00	50.0	50.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: BASN4BIN DATE: 09-23-1999

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
75.00	0.000	0.00	0.00	0.00
80.34	0.000	12.00	0.00	0.00
80.59	0.000	24.00	0.00	0.00
80.79	0.000	36.00	0.00	0.00
80.97	0.000	48.00	0.00	0.00
81.07	-0.003	60.00	0.31	0.52
81.13	-0.006	72.00	0.63	0.88
81.18	-0.004	84.00	0.41	0.49
81.19	-0.004	87.00	0.43	0.49
81.27	-0.004	108.00	0.42	0.39
81.31	-0.009	120.00	1.02	0.85

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 09-23-1999 FILE DATE: 09-23-1999
CURRENT TIME: 07:46:46 FILE NAME: BASN4BIN

PERFORMANCE CURVE FOR CULVERT 1 - 1(6.00 (ft) BY 3.00 (ft)) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	79.93	0.00	0.10	0-NF	0.00	0.00	0.00	4.00	0.00	0.00
12.00	80.34	5.44	5.44	1-S1f	0.26	0.50	0.70	4.00	2.86	0.00
24.00	80.59	5.69	5.69	1-S1f	0.41	0.79	0.90	4.00	4.44	0.00
36.00	80.79	5.89	5.89	1-S1f	0.54	1.04	1.20	4.00	5.00	0.00
48.00	80.97	6.07	6.07	1-S1f	0.66	1.26	1.40	4.00	5.71	0.00
55.05	81.07	6.17	6.17	1-S1f	0.72	1.38	1.50	4.00	6.12	0.00
59.39	81.13	6.23	6.23	1-S1f	0.75	1.45	1.60	4.00	6.19	0.00
63.40	81.18	6.28	6.28	1-S1f	0.79	1.52	1.70	4.00	6.22	0.00
64.32	81.20	6.30	6.30	1-S1f	0.79	1.53	1.70	4.00	6.31	0.00
70.31	81.27	6.37	6.37	1-S1f	0.84	1.63	1.80	4.00	6.51	0.00
73.34	81.31	6.41	6.41	1-S1f	0.87	1.67	1.80	4.00	6.79	0.00

El. inlet face invert 74.90 ft El. outlet invert 71.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 79.93 ft

***** SITE DATA ***** CULVERT INVERT **************

INLET STATION	0.00 ft
INLET ELEVATION	79.40 ft
OUTLET STATION	181.74 ft
OUTLET ELEVATION	71.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0215
CULVERT LENGTH ALONG SLOPE	181.78 ft

***** CULVERT DATA SUMMARY ************************

BARREL SHAPE	BOX
BARREL SPAN	6.00 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (90-45 DEG.)
INLET DEPRESSION	YES

CURRENT DATE: 09-23-1999
CURRENT TIME: 07:46:46

FILE DATE: 09-23-1999
FILE NAME: BASN4BIN

IMPROVED INLET FOR CULVERT 1 - 1(6.00 (ft) BY 3.00 (ft)) RCB

DIS- CHARGE Flow (cfs)	HEAD- WATER Elev. (ft)	INLET CONTROL Depth (ft)	OUTLET CONTROL Depth (ft)	FLOW TYPE <F4>	CREST CONTROL Elev. (ft)	FACE CONTROL Elev. (ft)	THROAT CONTROL Elev. (ft)	TAILWATER Elev. (ft)
0	79.93	0.00	0.10	0-NF	79.93	74.90	0.00	75.00
12	80.34	5.44	5.44	1-S1f	80.34	75.77	0.00	75.00
24	80.59	5.69	5.69	1-S1f	80.59	76.24	0.00	75.00
36	80.79	5.89	5.89	1-S1f	80.79	76.64	0.00	75.00
48	80.97	6.07	6.07	1-S1f	80.97	77.00	0.00	75.00
55	81.07	6.17	6.17	1-S1f	81.07	77.20	0.00	75.00
59	81.13	6.23	6.23	1-S1f	81.13	77.32	0.00	75.00
63	81.18	6.28	6.28	1-S1f	81.18	77.43	0.00	75.00
64	81.20	6.30	6.30	1-S1f	81.20	77.45	0.00	75.00
70	81.27	6.37	6.37	1-S1f	81.27	77.61	0.00	75.00
73	81.31	6.41	6.41	1-S1f	81.31	77.69	0.00	75.00

CURRENT DATE: 09-23-1999
CURRENT TIME: 07:46:46

FILE DATE: 09-23-1999
FILE NAME: BASN4BIN

TAILWATER

CONSTANT WATER SURFACE ELEVATION
75.00

ROADWAY OVERTOPPING DATA

ROADWAY SURFACE	GRAVEL
EMBANKMENT TOP WIDTH	25.00 ft
CREST LENGTH	100.00 ft
OVERTOPPING CREST ELEVATION	81.00 ft

7. Sloping Drop Structure Calculations

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

Date 03/06/00
Job No. 9845
By JLM

FCDMC
Parkwood Ranch Det. Basin

Filepath: J:\9845\qpw\SLOPING.wb3

SLOPING DROP STRUCTURE HYDRAULIC DESIGN:

Drop Structure Sta: Cheshire St. Channel Inlet

INPUT DATA:

Drop bot.wid. =	8	ft.	Net Drop=	7.56	ft.	3
Drop height =	9.91	ft.	Upstream Channel:		D/S Channel:	
Design Disch. =	127	cfs	depth =	1.75	ft.	3
Face slope, Z =	4	H: 1V	velocity=	3.92	ft./sec.	1
Side Slope, z =	0	H: 1V				

CALCULATED DATA:

Drop Len. La =	39.64	ft.	Crit. Depth, Yc =	1.99	ft.
Avail. Head Ht=	12.89	ft.	Unit Disch., q =	15.88	cfs/ft
			Inlet Length Lu =	9.93	ft.
Face depth d1 =	0.55	ft.	Froude No., F =	6.81	(@ d1)
TW seq dep d2 =	5.05	ft.	Jump Type =	Steady	
			Jump Length =	30.97	ft.
D/S cutoff dep=	2.5	ft.	USBR Basin length :	15.66	ft.
U/S cutoff Dep=		ft. (per Weighted Creep analysis)			
Still Bas. dep=	2.05	ft. (ref. 16,pg.116)	d2/6 =	0.84	

LANES WEIGHTED CREEP RATIO:

Inlet Len Lu =	5	ft.	Upst. cutoff Lc =	1	ft.
Basin Len Lb =	10	ft.	Downst.cutoff Ld =	1	ft.
Still Bas. dep=	0	ft.	Head on Struc. H =	6.53	ft.

---

8. StormPlus Output (93^{rd} Street Storm Drain)

```
STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version `````
Serial Number `````````

Dec 18, 1999  18:27:37

Input file : J:\9959\sp\basin2.dat
Output file: J:\9959\sp\basin2.out


                                   INPUT FILE LISTING


T1   CAP BASIN 2 OUTLET PIPE                     DESIGN BY: DIBBLE & ASSOCIATES
T2   FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME:  BASIN2.DAT
T3   100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE.           JOB NO: 9845/9959
SO     00.0 1512.12  1                          1514.6
R     995.0 1520.04  1      0.035
JX    995.0 1520.04  1   1  0.013   168.        1525.0         45.
TS   1000.0 1520.18  5      0.035
WX   1000.0 1520.18  9
R    1118.0 1520.91  9      0.013
TS   1123.0 1520.94  6      0.013
R    1251.0 1521.74  6      0.013                                     45.
TS   1263.0 1521.85  8      0.013
R    1442.0 1523.48  8      0.013
R    1454.0 1523.53  8      0.013                                     45.
TS   1459.0 1523.57  7      0.013
R    1647.0 1525.19  7      0.013
JX   1647.0 1525.19  7 11   0.013    46.        1525.19        90.
R    1685.0 1525.53  7      0.013                                     45.
WE   1685.0 1525.53 12
TS   1703.0 1525.74 15      0.013
R    1990.4 1526.54 15      0.013
R    2084.5 1526.77 15      0.013                             89.85
R    2259.7 1527.21 15      0.013
R    2303.3 1527.32 15      0.013                             41.67
R    2439.6 1527.66 15      0.013
JX   2444.6 1527.67 15 11   0.013    11.        1527.67       77.00
R    2448.1 1527.68 15      0.013
TS   2454.1 1527.70 16      0.013
R    2525.2 1527.88 16      0.013
R    2530.2 1527.89 16      0.013                             41.62
R    2595.1 1528.05 16      0.013
R    3241.1 1535.28 16      0.013                                        3
JX   3246.1 1536.34 16 11   0.013    40         1536.9        76.04
TS   3251.1 1536.38 11      0.013
R    3297.8 1536.78 11      0.013                             28.44
R    3302.8 1536.82 11      0.013
R    4521.7 1547.18 11      0.013                                        3
TS   4526.7 1547.23 10      0.013
R    4729.7 1549.00 10      0.013                                  01.58  1
WE   4729.7 1549.00 13
TS   4735.2 1549.25 3       0.013
SH   4736.2 1550.17 3
1                                                 SP
                                     WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING          PAGE     1
```

BASIN 2
STORM-PLUS

0 CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	1	0	.00	5.00	20.00	2.00	2.00	.00										
CD	2	1	0	.00	4.00	4.00	2.00	2.00	.00										
CD	3	1	0	.00	8.00	800.00	6.00	6.00	.00										
CD	4	2	0	.00	4.00	6.00			.00										
CD	5	2	0	.00	3.00	20.90			.00										
CD	6	3	1	.75	3.00	14.80	.00	.00	.00										
CD	7	3	1	.67	3.00	13.40	.00	.00	.00										
CD	8	3	1	.75	3.00	16.80	.00	.00	.00										
CD	9	3	1	.92	3.00	20.90	.00	.00	.00										
CD	10	4			2.50														
CD	11	4			3.00														
CD	12	2	0	.00	3.00	13.40			.00										
CD	13	2	0	.00	6.70	5.50			.00										
CD	14	1	0	.00	4.00	4.00	2.00	2.00	.00										
CD	15	3	0	.00	3.00	6.00	.00	.00	.00										
CD	16	4			4.00														

```
1                                                                                                      PAGE NO    1
0                            WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                               CAP BASIN 2 OUTLET PIPE                      DESIGN BY: DIBBLE & ASSOCIATES
0HEADING LINE NO 2 IS -
0                               FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME:  BASIN2.DAT
0HEADING LINE NO 3 IS -
0                               100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE.          JOB NO: 9845/9959
1                                                                                                      PAGE NO    2
0                            WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET      *          *     *
                      U/S DATA   STATION    INVERT  SECT                                      W S ELEV
                                     .00 1512.12    1                                          1514.60
0 ELEMENT NO   2 IS A REACH              *          *     *
                      U/S DATA   STATION    INVERT  SECT              N                                  RADIUS  ANGLE  ANG PT  MAN H
                                  995.00 1520.04    1               .035                                    .00    .00     .00     0
0 ELEMENT NO   3 IS A JUNCTION           *          *     *     *                  *                   *           *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2  N       Q3        Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                  995.00 1520.04    1     1     0   .013    168.0        .0  1525.00      .00  45.00     .00
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO   4 IS A TRANSITION         *          *     *
                      U/S DATA   STATION    INVERT  SECT              N
                                 1000.00 1520.18    5               .035
0 ELEMENT NO   5 IS A  WALL  EXIT                         *
                      U/S DATA   STATION    INVERT  SECT
                                 1000.00 1520.18    9
0 ELEMENT NO   6 IS A REACH              *          *     *
                      U/S DATA   STATION    INVERT  SECT              N                                  RADIUS  ANGLE  ANG PT  MAN H
                                 1118.00 1520.91    9               .013                                    .00    .00     .00     0
0 ELEMENT NO   7 IS A TRANSITION         *          *     *
                      U/S DATA   STATION    INVERT  SECT              N
                                 1123.00 1520.94    6               .013
0 ELEMENT NO   8 IS A REACH              *          *     *
                      U/S DATA   STATION    INVERT  SECT              N                                  RADIUS  ANGLE  ANG PT  MAN H
                                 1251.00 1521.74    6               .013                                    .00    .00   45.00     0
0 ELEMENT NO   9 IS A TRANSITION         *          *     *
                      U/S DATA   STATION    INVERT  SECT              N
                                 1263.00 1521.85    8               .013
0 ELEMENT NO  10 IS A REACH              *          *     *
                      U/S DATA   STATION    INVERT  SECT              N                                  RADIUS  ANGLE  ANG PT  MAN H
                                 1442.00 1523.48    8               .013                                    .00    .00     .00     0
0 ELEMENT NO  11 IS A REACH              *          *     *
```

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                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      1454.00 1523.53    8                .013                                             .00    .00   45.00     0
0 ELEMENT NO  12 IS A TRANSITION           *          *     *
                         U/S DATA   STATION    INVERT  SECT                N
                                      1459.00 1523.57    7                .013
1                                                                                                                                        PAGE NO   3
0                              WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  13 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      1647.00 1525.19    7                .013                                             .00    .00     .00     0
0 ELEMENT NO  14 IS A JUNCTION             *          *     *     *                  *                  *               *
                         U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4     INVERT-3 INVERT-4   PHI 3    PHI 4
                                      1647.00 1525.19    7    11     0   .013    46.0        .0  1525.19      .00   90.00      .00
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
0 ELEMENT NO  15 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      1685.00 1525.53    7                .013                                             .00    .00   45.00     0
0 ELEMENT NO  16 IS A  WALL  ENTRANCE                       *
                         U/S DATA   STATION    INVERT  SECT                FP
                                      1685.00 1525.53   12                .500
0 ELEMENT NO  17 IS A TRANSITION           *          *     *
                         U/S DATA   STATION    INVERT  SECT                N
                                      1703.00 1525.74   15                .013
0 ELEMENT NO  18 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      1990.40 1526.54   15                .013                                             .00    .00     .00     0
0 ELEMENT NO  19 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2084.50 1526.77   15                .013                                             .00  89.85     .00     0
0 ELEMENT NO  20 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2259.70 1527.21   15                .013                                             .00    .00     .00     0
0 ELEMENT NO  21 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2303.30 1527.32   15                .013                                             .00  41.67     .00     0
0 ELEMENT NO  22 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2439.60 1527.66   15                .013                                             .00    .00     .00     0
0 ELEMENT NO  23 IS A JUNCTION             *          *     *     *                  *                  *               *
                         U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4     INVERT-3 INVERT-4   PHI 3    PHI 4
                                      2444.60 1527.67   15    11     0   .013    11.0        .0  1527.67      .00    7.00      .00
1                                                                                                                                        PAGE NO   4
0                              WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  24 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2448.10 1527.68   15                .013                                             .00    .00     .00     0
0 ELEMENT NO  25 IS A TRANSITION           *          *     *
                         U/S DATA   STATION    INVERT  SECT                N
                                      2454.10 1527.70   16                .013
0 ELEMENT NO  26 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2525.20 1527.88   16                .013                                             .00    .00     .00     0
0 ELEMENT NO  27 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2530.20 1527.89   16                .013                                             .00  41.62     .00     0
0 ELEMENT NO  28 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      2595.10 1528.05   16                .013                                             .00    .00     .00     0
0 ELEMENT NO  29 IS A REACH                *          *     *
                         U/S DATA   STATION    INVERT  SECT                N                                            RADIUS  ANGLE  ANG PT  MAN H
                                      3241.10 1535.28   16                .013                                             .00    .00     .00     3
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0 ELEMENT NO  30 IS A JUNCTION          *          *     *     *              *              *              *
                     U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                3246.10 1536.34   16    11     0   .013     4.0        .0  1536.90      .00   6.04     .00
0 ELEMENT NO  31 IS A TRANSITION        *          *     *
                     U/S DATA   STATION    INVERT  SECT                N
                                3251.10 1536.38   11                .013
0 ELEMENT NO  32 IS A REACH             *          *     *
                     U/S DATA   STATION    INVERT  SECT                N                                     RADIUS  ANGLE  ANG PT  MAN H
                                3297.80 1536.78   11                .013                                        .00  28.44     .00      0
0 ELEMENT NO  33 IS A REACH             *          *     *
                     U/S DATA   STATION    INVERT  SECT                N                                     RADIUS  ANGLE  ANG PT  MAN H
                                3302.80 1536.82   11                .013                                        .00    .00     .00      0
0 ELEMENT NO  34 IS A REACH             *          *     *
                     U/S DATA   STATION    INVERT  SECT                N                                     RADIUS  ANGLE  ANG PT  MAN H
                                4521.70 1547.18   11                .013                                        .00    .00     .00      3
0 ELEMENT NO  35 IS A TRANSITION        *          *     *
                     U/S DATA   STATION    INVERT  SECT                N
                                4526.70 1547.23   10                .013
1                                                                                                                  PAGE NO    5
0                         WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  36 IS A REACH             *          *     *
                     U/S DATA   STATION    INVERT  SECT                N                                     RADIUS  ANGLE  ANG PT  MAN H
                                4729.70 1549.00   10                .013                                        .00    .00    1.58      1
0 ELEMENT NO  37 IS A  WALL  ENTRANCE                    *
                     U/S DATA   STATION    INVERT  SECT               FP
                                4729.70 1549.00   13                .500
0 ELEMENT NO  38 IS A TRANSITION        *          *     *
                     U/S DATA   STATION    INVERT  SECT                N
                                4735.20 1549.25    3                .013
0 ELEMENT NO  39 IS A SYSTEM HEADWORKS                   *                      *
                     U/S DATA   STATION    INVERT  SECT                                           W S ELEV
                                4736.20 1550.17    3                                                  .00
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

 ERROR MESSAGE NO. 32 - CRITICAL DEPTH MAY BE INACCURATE IN ELEMENT  23   INCREMENT =    .000010
 ERROR MESSAGE NO. 32 - CRITICAL DEPTH MAY BE INACCURATE IN ELEMENT  22   INCREMENT =    .000010
 ERROR MESSAGE NO. 32 - CRITICAL DEPTH MAY BE INACCURATE IN ELEMENT  21   INCREMENT =    .000010
 ERROR MESSAGE NO. 32 - CRITICAL DEPTH MAY BE INACCURATE IN ELEMENT  20   INCREMENT =    .000010
 ERROR MESSAGE NO. 32 - CRITICAL DEPTH MAY BE INACCURATE IN ELEMENT  19   INCREMENT =    .000010
 ERROR MESSAGE NO. 32 - CRITICAL DEPTH MAY BE INACCURATE IN ELEMENT  18   INCREMENT =    .000010
 ERROR MESSAGE NO. 32 - CRITICAL DEPTH MAY BE INACCURATE IN ELEMENT  17   INCREMENT =    .000010
 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
1                                                                                                                      PAGE     1
                                                  WATER SURFACE PROFILE LISTING
                           CAP BASIN 2 OUTLET PIPE                    DESIGN BY: DIBBLE & ASSOCIATES
                           FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME:  BASIN2.DAT
                           100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE.        JOB NO: 9845/9959
```

0 STATION / 0 L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0 .00	1512.12	2.48	1514.60	281.0	4.54	.32	1514.92	.00	1.72		5.00	20.00	2.00	0	.00
0 21.26	.00796					.00491	.10			2.12			2.00		
0 21.26	1512.29	2.38	1514.67	281.0	4.76	.35	1515.02	.00	1.72		5.00	20.00	2.00	0	.00
0 25.24	.00796					.00565	.14			2.12			2.00		
0 46.49	1512.49	2.29	1514.78	281.0	4.99	.39	1515.17	.00	1.72		5.00	20.00	2.00	0	.00
0 35.37	.00796					.00650	.23			2.12			2.00		
0 81.86	1512.77	2.20	1514.97	281.0	5.24	.43	1515.40	.00	1.72		5.00	20.00	2.00	0	.00
0 84.84	.00796					.00746	.63			2.12			2.00		
0 166.70	1513.45	2.12	1515.56	281.0	5.48	.47	1516.03	.00	1.72		5.00	20.00	2.00	0	.00
0 828.30	.00796					.00796	6.59			2.12			2.00		
0 995.00	1520.04	2.12	1522.16	281.0	5.48	.47	1522.62	.00	1.72		5.00	20.00	2.00	0	.00

```
0JUNCT STR    .00000                                              .00058     .00                                                     2.00
0   995.00  1520.04      2.80    1522.84      113.0      1.57       .04    1522.88     .00       .96                  5.00    20.00   2.00    0      .00
0TRANS STR    .02800                                              .00067     .00                                                     2.00
0  1000.00  1520.18      2.65    1522.83      113.0      2.04       .06    1522.89     .00       .97                  3.00    20.90    .00    0      .00
0  WALL EXIT                                                                                                                          .00
0  1000.00  1520.18      2.65    1522.83      113.0      2.14       .07    1522.90     .00      1.00                  3.00    20.90    .00    1      .92
0    19.33    .00619                                              .00018     .00                           .80                       .00
0  1019.33  1520.30      2.52    1522.82      113.0      2.24       .08    1522.90     .00      1.00                  3.00    20.90    .00    1      .92
0    18.34    .00619                                              .00021     .00                           .80                       .00
0  1037.67  1520.41      2.41    1522.82      113.0      2.35       .09    1522.91     .00      1.00                  3.00    20.90    .00    1      .92
0    17.38    .00619                                              .00024     .00                           .80                       .00
1                                                                                                                                PAGE     2
                                                     WATER SURFACE PROFILE LISTING
                                  CAP BASIN 2 OUTLET PIPE                        DESIGN BY: DIBBLE & ASSOCIATES
                                  FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME:  BASIN2.DAT
                                  100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE.         JOB NO: 9845/9959
0 STATION     INVERT   DEPTH      W.S.        Q          VEL       VEL     ENERGY    SUPER  CRITICAL             HGT/    BASE/      ZL     NO  AVBPR
               ELEV   OF FLOW     ELEV                             HEAD   GRD.EL.    ELEV    DEPTH               DIA     ID NO.          PIER
0 L/ELEM       SO                                                  SF AVE    HF                      NORM DEPTH                     ZR
*************************************************************************************************************************************************
0  1055.05  1520.52      2.29    1522.82      113.0      2.47       .09    1522.91     .00      1.00                  3.00    20.90    .00    1      .92
0    16.46    .00619                                              .00027     .00                           .80                       .00
0  1071.52  1520.62      2.19    1522.81      113.0      2.59       .10    1522.91     .00      1.00                  3.00    20.90    .00    1      .92
0    15.57    .00619                                              .00031     .00                           .80                       .00
0  1087.09  1520.72      2.09    1522.80      113.0      2.71       .11    1522.92     .00      1.00                  3.00    20.90    .00    1      .92
0    14.70    .00619                                              .00036     .01                           .80                       .00
0  1101.79  1520.81      1.99    1522.80      113.0      2.84       .13    1522.92     .00      1.00                  3.00    20.90    .00    1      .92
0    13.86    .00619                                              .00042     .01                           .80                       .00
0  1115.65  1520.90      1.90    1522.79      113.0      2.98       .14    1522.93     .00      1.00                  3.00    20.90    .00    1      .92
0     2.35    .00619                                              .00045     .00                           .80                       .00
0  1118.00  1520.91      1.88    1522.79      113.0      3.01       .14    1522.93     .00      1.00                  3.00    20.90    .00    1      .92
0TRANS STR    .00598                                              .00096     .00                                                     .00
0  1123.00  1520.94      1.69    1522.63      113.0      4.77       .35    1522.98     .00      1.26                  3.00    14.80    .00    1      .75
0     9.20    .00625                                              .00158     .01                          1.03                       .00
0  1132.20  1521.00      1.61    1522.60      113.0      5.01       .39    1522.99     .00      1.26                  3.00    14.80    .00    1      .75
0     8.07    .00625                                              .00181     .01                          1.03                       .00
0  1140.27  1521.05      1.53    1522.58      113.0      5.25       .43    1523.01     .00      1.26                  3.00    14.80    .00    1      .75
0     1.81    .00625                                              .00198     .00                          1.03                       .00
0  1142.08  1521.06      1.51    1522.57      113.0      5.32       .44    1523.01     .00      1.26                  3.00    14.80    .00    1      .75
0HYDRAULIC JUMP                                                                                                                       .00
0  1142.08  1521.06      1.04    1522.10      113.0      7.74       .93    1523.03     .00      1.26                  3.00    14.80    .00    1      .75
0    23.23    .00625                                              .00613     .14                          1.03                       .00
1                                                                                                                                PAGE     3
                                                     WATER SURFACE PROFILE LISTING
                                  CAP BASIN 2 OUTLET PIPE                        DESIGN BY: DIBBLE & ASSOCIATES
                                  FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME:  BASIN2.DAT
                                  100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE.         JOB NO: 9845/9959
0 STATION     INVERT   DEPTH      W.S.        Q          VEL       VEL     ENERGY    SUPER  CRITICAL             HGT/    BASE/      ZL     NO  AVBPR
               ELEV   OF FLOW     ELEV                             HEAD   GRD.EL.    ELEV    DEPTH               DIA     ID NO.          PIER
0 L/ELEM       SO                                                  SF AVE    HF                      NORM DEPTH                     ZR
*************************************************************************************************************************************************
0  1165.31  1521.20      1.04    1522.25      113.0      7.72       .93    1523.17     .00      1.26                  3.00    14.80    .00    1      .75
0    59.53    .00625                                              .00569     .34                          1.03                       .00
0  1224.84  1521.58      1.09    1522.67      113.0      7.36       .84    1523.51     .00      1.26                  3.00    14.80    .00    1      .75
0    17.52    .00625                                              .00493     .09                          1.03                       .00
0  1242.35  1521.69      1.15    1522.83      113.0      7.02       .76    1523.60     .00      1.26                  3.00    14.80    .00    1      .75
0     6.87    .00625                                              .00427     .03                          1.03                       .00
0  1249.22  1521.73      1.20    1522.93      113.0      6.69       .70    1523.63     .00      1.26                  3.00    14.80    .00    1      .75
0     1.78    .00625                                              .00370     .01                          1.03                       .00
0  1251.00  1521.74      1.26    1523.00      113.0      6.37       .63    1523.63     .00      1.26                  3.00    14.80    .00    1      .75
0TRANS STR    .00917                                                                                                                 .00
0  1263.00  1521.85       .83    1522.68      113.0      8.49      1.12    1523.80     .00      1.15                  3.00    16.80    .00    1      .75
```

0	29.95	.00911					.00911	.27			.83			.00		
0	1292.95	1522.12	.83	1522.95	113.0	8.49	1.12	1524.07	.00	1.15		3.00	16.80	.00	1	.75
0	100.89	.00911					.00955	.96			.83			.00		
0	1393.84	1523.04	.80	1523.85	113.0	8.75	1.19	1525.04	.00	1.15		3.00	16.80	.00	1	.75
0	48.16	.00911					.01080	.52			.83			.00		
0	1442.00	1523.48	.77	1524.25	113.0	9.18	1.31	1525.56	.00	1.15		3.00	16.80	.00	1	.75
0	.65	.00417					.01165	.01			1.07			.00		
0	1442.65	1523.48	.76	1524.25	113.0	9.21	1.32	1525.56	.00	1.15		3.00	16.80	.00	1	.75
0	11.35	.00417					.01264	.14			1.07			.00		
0	1454.00	1523.53	.73	1524.26	113.0	9.66	1.45	1525.71	.00	1.15		3.00	16.80	.00	1	.75
0	TRANS STR	.00798					.01107	.06						.00		

1 PAGE 4

WATER SURFACE PROFILE LISTING

CAP BASIN 2 OUTLET PIPE DESIGN BY: DIBBLE & ASSOCIATES
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME: BASIN2.DAT
100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE. JOB NO: 9845/9959

0	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	1459.00	1523.57	1.01	1524.57	113.0	8.83	1.21	1525.79	.00	1.35		3.00	13.40	.00	1	.67
0	64.12	.00862					.00846	.54			1.00			.00		
0	1523.12	1524.12	1.01	1525.13	113.0	8.77	1.20	1526.33	.00	1.35		3.00	13.40	.00	1	.67
0	73.96	.00862					.00782	.58			1.00			.00		
0	1597.08	1524.76	1.06	1525.82	113.0	8.36	1.09	1526.91	.00	1.35		3.00	13.40	.00	1	.67
0	25.51	.00862					.00677	.17			1.00			.00		
0	1622.58	1524.98	1.11	1526.09	113.0	7.97	.99	1527.08	.00	1.35		3.00	13.40	.00	1	.67
0	12.94	.00862					.00587	.08			1.00			.00		
0	1635.53	1525.09	1.17	1526.26	113.0	7.60	.90	1527.16	.00	1.35		3.00	13.40	.00	1	.67
0	7.01	.00862					.00510	.04			1.00			.00		
0	1642.54	1525.15	1.22	1526.38	113.0	7.25	.82	1527.19	.00	1.35		3.00	13.40	.00	1	.67
0	3.45	.00862					.00443	.02			1.00			.00		
0	1645.99	1525.18	1.28	1526.47	113.0	6.91	.74	1527.21	.00	1.35		3.00	13.40	.00	1	.67
0	1.01	.00862					.00384	.00			1.00			.00		
0	1647.00	1525.19	1.35	1526.54	113.0	6.59	.67	1527.21	.00	1.35		3.00	13.40	.00	1	.67
0	JUNCT STR	.00000					.00195	.00						.00		
0	1647.00	1525.19	2.16	1527.35	67.0	2.44	.09	1527.44	.00	.95		3.00	13.40	.00	1	.67
0	10.59	.00895					.00035	.00			.70			.00		
0	1657.59	1525.28	2.06	1527.34	67.0	2.56	.10	1527.44	.00	.95		3.00	13.40	.00	1	.67
0	10.00	.00895					.00040	.00			.70			.00		
0	1667.60	1525.37	1.96	1527.34	67.0	2.68	.11	1527.45	.00	.95		3.00	13.40	.00	1	.67
0	9.43	.00895					.00046	.00			.70			.00		

1 PAGE 5

WATER SURFACE PROFILE LISTING

CAP BASIN 2 OUTLET PIPE DESIGN BY: DIBBLE & ASSOCIATES
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME: BASIN2.DAT
100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE. JOB NO: 9845/9959

0	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	1677.02	1525.46	1.87	1527.33	67.0	2.82	.12	1527.45	.00	.95		3.00	13.40	.00	1	.67
0	7.98	.00895					.00052	.00			.70			.00		
0	1685.00	1525.53	1.79	1527.32	67.0	2.94	.13	1527.46	.00	.95		3.00	13.40	.00	1	.67
0	WALL ENTRANCE													.00		
0	1685.00	1525.53	1.82	1527.35	67.0	2.75	.12	1527.47	.00	.92		3.00	13.40	.00	0	.00
0	TRANS STR	.01166												.00		
0	1703.00	1525.74	1.57	1527.31	67.0	7.11	.79	1528.10	.00	1.57		3.00	6.00	.00	0	.00
0	7.67	.00278					.00348	.03			1.74			.00		
0	1710.67	1525.76	1.65	1527.41	67.0	6.78	.71	1528.12	.00	1.57		3.00	6.00	.00	0	.00
0	62.59	.00278					.00303	.19			1.74			.00		
0	1773.26	1525.94	1.73	1527.66	67.0	6.46	.65	1528.31	.00	1.57		3.00	6.00	.00	0	.00

0	105.8[illegible]	.00278					.00281	.30			1.74			.00		
0	1879.12	1526.23	1.74	1527.97	67.0	6.43	.64	1528.61	.00	1.57		3.00	6.00	.00	0	.00
0	111.28	.00278					.00278	.31			1.74			.00		
0	1990.40	1526.54	1.74	1528.28	67.0	6.43	.64	1528.92	.00	1.57		3.00	6.00	.00	0	.00
0	.00	.00278					.00278	.00			1.74			.00		
0	1990.40	1526.54	1.74	1528.28	67.0	6.43	.64	1528.92	.00	1.57		3.00	6.00	.00	0	.00
0	94.10	.00244					.00265	.25			1.82			.00		
0	2084.50	1526.77	1.80	1528.57	67.0	6.20	.60	1529.17	.00	1.57		3.00	6.00	.00	0	.00
0	51.18	.00251					.00251	.13			1.80			.00		
0	2135.68	1526.90	1.80	1528.70	67.0	6.20	.60	1529.30	.00	1.57		3.00	6.00	.00	0	.00
0	124.02	.00251					.00251	.31			1.80			.00		

WATER SURFACE PROFILE LISTING

CAP BASIN 2 OUTLET PIPE DESIGN BY: DIBBLE & ASSOCIATES
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME: BASIN2.DAT
100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE. JOB NO: 9845/9959

0	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	2259.70	1527.21	1.80	1529.01	67.0	6.20	.60	1529.61	.00	1.57		3.00	6.00	.00	0	.00
0	43.60	.00252					.00251	.11			1.80			.00		
0	2303.30	1527.32	1.80	1529.12	67.0	6.20	.60	1529.72	.00	1.57		3.00	6.00	.00	0	.00
0	103.45	.00249					.00250	.26			1.81			.00		
0	2406.75	1527.58	1.81	1529.38	67.0	6.18	.59	1529.98	.00	1.57		3.00	6.00	.00	0	.00
0	HYDRAULIC JUMP													.00		
0	2406.75	1527.58	1.35	1528.93	67.0	8.25	1.06	1529.99	.00	1.57		3.00	6.00	.00	0	.00
0	8.21	.00249					.00597	.05			1.81			.00		
0	2414.96	1527.60	1.31	1528.91	67.0	8.50	1.12	1530.03	.00	1.57		3.00	6.00	.00	0	.00
0	12.14	.00249					.00670	.08			1.81			.00		
0	2427.11	1527.63	1.25	1528.88	67.0	8.91	1.23	1530.12	.00	1.57		3.00	6.00	.00	0	.00
0	12.49	.00249					.00770	.10			1.81			.00		
0	2439.60	1527.66	1.19	1528.85	67.0	9.35	1.36	1530.21	.00	1.57		3.00	6.00	.00	0	.00
0	JUNCT STR	.00200					.01381	.07						.00		
0	2444.60	1527.67	.80	1528.47	56.0	11.69	2.13	1530.59	.00	1.39		3.00	6.00	.00	0	.00
0	3.50	.00286					.01988	.07			1.52			.00		
0	2448.10	1527.68	.78	1528.46	56.0	11.89	2.20	1530.66	.00	1.39		3.00	6.00	.00	0	.00
0	TRANS STR	.00332					.01226	.07						.00		
0	2454.10	1527.70	2.25	1529.95	56.0	7.69	.92	1530.87	.00	2.25		4.00	.00	.00	0	.00
0	4.17	.00253					.00388	.02			2.64			.00		
0	2458.27	1527.71	2.34	1530.05	56.0	7.33	.83	1530.89	.00	2.25		4.00	.00	.00	0	.00
0	21.35	.00253					.00343	.07			2.64			.00		

WATER SURFACE PROFILE LISTING

CAP BASIN 2 OUTLET PIPE DESIGN BY: DIBBLE & ASSOCIATES
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME: BASIN2.DAT
100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE. JOB NO: 9845/9959

0	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	2479.62	1527.76	2.44	1530.20	56.0	6.99	.76	1530.96	.00	2.25		4.00	.00	.00	0	.00
0	45.58	.00253					.00307	.14			2.64			.00		
0	2525.20	1527.88	2.52	1530.40	56.0	6.73	.70	1531.10	.00	2.25		4.00	.00	.00	0	.00
0	.00	.00253					.00292	.00			2.64			.00		
0	2525.20	1527.88	2.52	1530.40	56.0	6.73	.70	1531.10	.00	2.25		4.00	.00	.00	0	.00
0	5.00	.00200					.00290	.01			2.89			.00		
0	2530.20	1527.89	2.53	1530.42	56.0	6.69	.69	1531.11	.00	2.25		4.00	.00	.00	0	.00
0	.32	.00247					.00288	.00			2.67			.00		
0	2530.52	1527.89	2.53	1530.42	56.0	6.69	.69	1531.11	.00	2.25		4.00	.00	.00	0	.00
0	HYDRAULIC JUMP													.00		
0	2530.52	1527.89	1.99	1529.89	56.0	8.94	1.24	1531.13	.00	2.25		4.00	.00	.00	0	.00

0	9.05	.00247					.00641	.06			2.67			.00		
0	2539.57	1527.91	1.94	1529.86	56.0	9.24	1.33	1531.18	.00	2.25		4.00	.00	.00	0	.00
0	13.17	.00247					.00715	.09			2.67			.00		
0	2552.74	1527.95	1.87	1529.82	56.0	9.69	1.46	1531.28	.00	2.25		4.00	.00	.00	0	.00
0	13.94	.00247					.00813	.11			2.67			.00		
0	2566.68	1527.98	1.81	1529.79	56.0	10.16	1.61	1531.39	.00	2.25		4.00	.00	.00	0	.00
0	14.09	.00247					.00925	.13			2.67			.00		
0	2580.77	1528.01	1.74	1529.76	56.0	10.66	1.77	1531.52	.00	2.25		4.00	.00	.00	0	.00
0	14.33	.00247					.01053	.15			2.67			.00		
0	2595.10	1528.05	1.68	1529.73	56.0	11.18	1.94	1531.67	.00	2.25		4.00	.00	.00	0	.00
0	309.11	.01119					.01121	3.46			1.68			.00		

WATER SURFACE PROFILE LISTING

CAP BASIN 2 OUTLET PIPE DESIGN BY: DIBBLE & ASSOCIATES
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME: BASIN2.DAT
100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE. JOB NO: 9845/9959

0	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	2904.21	1531.51	1.68	1533.19	56.0	11.18	1.94	1535.13	.00	2.25		4.00	.00	.00	0	.00
0	168.82	.01119					.01192	2.01			1.68			.00		
0	3073.03	1533.40	1.63	1535.02	56.0	11.68	2.12	1537.14	.00	2.25		4.00	.00	.00	0	.00
0	67.05	.01119					.01350	.91			1.68			.00		
0	3140.08	1534.15	1.57	1535.72	56.0	12.25	2.33	1538.05	.00	2.25		4.00	.00	.00	0	.00
0	42.67	.01119					.01539	.66			1.68			.00		
0	3182.75	1534.63	1.51	1536.14	56.0	12.85	2.57	1538.71	.00	2.25		4.00	.00	.00	0	.00
0	32.02	.01119					.01755	.56			1.68			.00		
0	3214.77	1534.99	1.46	1536.45	56.0	13.47	2.82	1539.27	.00	2.25		4.00	.00	.00	0	.00
0	26.33	.01119					.02001	.53			1.68			.00		
0	3241.10	1535.28	1.41	1536.69	56.0	14.13	3.10	1539.79	.00	2.25		4.00	.00	.00	0	.00
0	JUNCT STR	.21199					.01662	.08						.00		
0	3246.10	1536.34	1.59	1537.93	52.0	11.21	1.95	1539.88	.00	2.16		4.00	.00	.00	0	.00
0	TRANS STR	.00801					.01022	.05						.00		
0	3251.10	1536.38	2.11	1538.49	52.0	9.77	1.48	1539.98	.00	2.35		3.00	.00	.00	0	.00
0	46.70	.00857					.00849	.40			2.11			.00		
0	3297.80	1536.78	2.12	1538.90	52.0	9.74	1.47	1540.37	.00	2.35		3.00	.00	.00	0	.00
0	5.00	.00798					.00849	.04			2.17			.00		
0	3302.80	1536.82	2.12	1538.93	52.0	9.76	1.48	1540.42	.00	2.35		3.00	.00	.00	0	.00
0	.00	.00798					.00851	.00			2.17			.00		
0	3302.80	1536.82	2.12	1538.93	52.0	9.76	1.48	1540.42	.00	2.35		3.00	.00	.00	0	.00
0	972.52	.00850					.00851	8.28			2.12			.00		

WATER SURFACE PROFILE LISTING

CAP BASIN 2 OUTLET PIPE DESIGN BY: DIBBLE & ASSOCIATES
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME: BASIN2.DAT
100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE. JOB NO: 9845/9959

0	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	4275.32	1545.09	2.12	1547.20	52.0	9.76	1.48	1548.68	.00	2.35		3.00	.00	.00	0	.00
0	109.90	.00850					.00902	.99			2.12			.00		
0	4385.22	1546.02	2.03	1548.05	52.0	10.23	1.63	1549.67	.00	2.35		3.00	.00	.00	0	.00
0	49.12	.00850					.01012	.50			2.12			.00		
0	4434.34	1546.44	1.94	1548.38	52.0	10.73	1.79	1550.17	.00	2.35		3.00	.00	.00	0	.00
0	34.50	.00850					.01140	.39			2.12			.00		
0	4468.84	1546.73	1.87	1548.60	52.0	11.25	1.97	1550.56	.00	2.35		3.00	.00	.00	0	.00
0	28.42	.00850					.01286	.37			2.12			.00		
0	4497.25	1546.97	1.79	1548.76	52.0	11.80	2.16	1550.93	.00	2.35		3.00	.00	.00	0	.00
0	24.45	.00850					.01453	.36			2.12			.00		
0	4521.70	1547.18	1.72	1548.90	52.0	12.38	2.38	1551.28	.00	2.35		3.00	.00	.00	0	.00

0TRANS STR		.00998					.01467	.07						.00		
0	4526.70	1547.23	2.32	1549.55	52.0	10.94	1.86	1551.41	.00	2.32		2.50	.00	.00	0	.00
0	10.19	.00872					.01485	.15			2.50			.00		
0	4536.89	1547.32	2.50	1549.82	52.0	10.59	1.74	1551.56	.00	2.32		2.50	.00	.00	0	.00
0	192.81	.00872					.01594	3.07			2.50			.00		
0	4729.70	1549.00	4.00	1553.00	52.0	10.59	1.74	1554.74	.00	2.32		2.50	.00	.00	0	.00
0	WALL ENTRANCE													.00		
0	4729.70	1549.00	7.44	1556.44	52.0	1.27	.03	1556.46	.00	1.41		6.70	5.50	.00	0	.00
0TRANS STR		.04546					.00002	.00						.00		
0	4735.20	1549.25	7.22	1556.47	52.0	.01	.00	1556.47	.00	.05		8.00	800.00	6.00	0	.00
0TRANS STR		.04546					.00000	.00						6.00		

1

WATER SURFACE PROFILE LISTING

CAP BASIN 2 OUTLET PIPE DESIGN BY: DIBBLE & ASSOCIATES
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, Arizona FILENAME: BASIN2.DAT
100-YEAR PIPE DESIGN - HYDRAULIC GRADE LINE. JOB NO: 9845/9959

0	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	4736.20	1550.17	7.22	1557.39	52.0	.01	.00	1557.39	.00	.05		8.00	800.00	6.00	0	.00

1

9. StormPlus Table of Station conversions from plans

Basin 2 Outlet - Storm Plus Input

Plans	Dist.		StormPlus			Slope	Inv El	CD	Other Fields	
3910.12		WE	1685	Ex. Box			25.53	12		
3892.12	18	TS	1703	Approx Ex. Grate		0.01611	25.82	15		
3604.77	287.35	R	1990.35	PT		0.0025	26.54	15		
3510.64	94.13	R	2084.48	PC		0.0025	26.77	15	Deg of Curve	
3335.42	175.22	R	2259.7	PT		0.0025	27.21	15		
3291.78	43.64	R	2303.34	PC		0.0025	27.32	15	Deg of Curve	
3155.5	136.28	R	2439.62			0.0025	27.66	15		
3150.5	5	JX	2444.62	Junction		0.0025	27.67	15	Inflow Data	
3147	3.5	R	2448.12	End Transition		0.0025	27.68	15		
3141	6	TS	2454.12	Begin Transition		0.0025	27.70	16		
3069.89	71.11	R	2525.23	End Manhole		0.0025	27.88	16		
3064.89	5	R	2530.23	Begin Manhole		0.0025	27.89	16	Deg of Curve	
3000	64.89	R	2595.12			0.0025	28.05	16		
2354.05	645.95	R	3241.07			0.0112	35.28	16		
2349.05	5	JX	3246.07	Junction	1	0.0112	36.34	16	Inflow Data	
2344.05	5	TS	3251.07	Transition		0.0085	36.38	11		
2297.35	46.7	R	3297.77			0.0085	36.78	11	Deg of Curve	
2292.35	5	R	3302.77			0.0085	36.82	11		
1073.38	1218.97	R	4521.74			0.0085	47.18	11		
1068.38	5	TS	4526.74			0.0085	47.23	10		
865.43	202.95	R	4729.69			0.0088	49.01	10	Deg of Angle	
865.43	0	WE	4729.69				49.01	13		
859.93	5.5	TS	4735.19				49.25	3		
858.93	1	SH	4736.19				50.17	3		

10. HEC-RAS Output (Parkwood Ranch channel - 2 runs)

HEC-RAS September 1998 Version 2.2
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

PROJECT DATA
Project Title: Basin 5 Outlet Channel
Project File : basin5.prj
Run Date and Time: 9/24/99 6:57:56 AM

Project in English units

Project Description:
Parkwood Ranch Detention Basin Outlet Channel

PLAN DATA

Plan Title: Basin 5 Outlet Channel (n=0.020)
Plan File : j:\9845\hecras\basin5.p01

Geometry Title: Outlet Channel w/ ADOT Channel
Geometry File : j:\9845\hecras\basin5.g01

Flow Title : Outlet Channel Flow
Flow File : j:\9845\hecras\basin5.f01

Plan Summary Information:

Number of:				
	Cross Sections =	54	Mulitple Openings =	0
	Culverts =	1	Inline Weirs =	0
	Bridges =	0		

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 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: Outlet Channel Flow
Flow File : j:\9845\hecras\basin5.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Basin 5	Outlet Channel	3774.5	362
ADOT	Exst Channel US	1812.83	1
ADOT	Exst Channel DS	1650	362

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Basin 5	Outlet Channel	PF 1	Normal S = .0005	
ADOT	Exst Channel US	PF 1	Normal S = .0055	
ADOT	Exst Channel DS	PF 1		Normal S = .0055

GEOMETRY DATA

Geometry Title: Outlet Channel w/ ADOT Channel
Geometry File : j:\9845\hecras\basin5.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Basin 5	Outlet Channel		Junction 1
ADOT	Exst Channel US		Junction 1
ADOT	Exst Channel DS	Junction 1	

JUNCTION INFORMATION

Name: Junction 1
Description:
Energy computation Method

Length across Junction River	Reach		Tributary River	Reach	Length	Angle
ADOT	Exst Channel US	to ADOT		Exst Channel DS	69.92	
Basin 5	Outlet Channel	to ADOT		Exst Channel DS	25.69	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3774.5

INPUT
Description: DS Face of Outlet Box Culvert
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1524.13	60	1524.45	92	1516.45	108	1516.45	140	1524.45
156	1524.13								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	300	300	300	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1520.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.020	
W.S. Elev (ft)	1520.18	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)	1518.54	Flow Area (sq ft)		115.30	
E.G. Slope (ft/ft)	0.000536	Area (sq ft)		115.30	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.83	Top Width (ft)		45.83	
Vel Total (ft/s)	3.14	Avg. Vel. (ft/s)		3.14	
Max Chl Dpth (ft)	3.73	Hydr. Depth (ft)		2.52	
Conv. Total (cfs)	15636.1	Conv. (cfs)		15636.1	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		46.75	

Min Ch El (ft)	1516.45	Shear (lb/sq ft)	0.08
Alpha	1.00	Stream Power (lb/ft s)	0.26
Frctn Loss (ft)	0.16	Cum Volume (acre-ft)	5.40
C & E Loss (ft)	0.00	Cum SA (acres)	2.12

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3474.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.98	60	1524.3	92	1516.3	108	1516.3	140	1524.3
156	1523.98								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	300	300	300	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1520.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.020	
W.S. Elev (ft)	1520.02	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)		Flow Area (sq ft)		114.67	
E.G. Slope (ft/ft)	0.000544	Area (sq ft)		114.67	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.72	Top Width (ft)		45.72	
Vel Total (ft/s)	3.16	Avg. Vel. (ft/s)		3.16	
Max Chl Dpth (ft)	3.72	Hydr. Depth (ft)		2.51	
Conv. Total (cfs)	15519.8	Conv. (cfs)		15519.8	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		46.64	
Min Ch El (ft)	1516.30	Shear (lb/sq ft)		0.08	
Alpha	1.00	Stream Power (lb/ft s)		0.26	
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)		4.61	
C & E Loss (ft)	0.00	Cum SA (acres)		1.80	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3174.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.83	60	1524.15	92	1516.15	108	1516.15	140	1524.15
156	1523.83								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	161.5	161.5	161.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1520.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1519.85	Reach Len. (ft)	161.50	161.50	161.50
Crit W.S. (ft)		Flow Area (sq ft)		113.91	
E.G. Slope (ft/ft)	0.000554	Area (sq ft)		113.91	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.59	Top Width (ft)		45.59	
Vel Total (ft/s)	3.18	Avg. Vel. (ft/s)		3.18	
Max Chl Dpth (ft)	3.70	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	15378.3	Conv. (cfs)		15378.3	
Length Wtd. (ft)	161.50	Wetted Per. (ft)		46.50	

Min Ch El (ft)	1516.15	Shear (lb/sq ft)	0.08
Alpha	1.00	Stream Power (lb/ft s)	0.27
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	3.83
C & E Loss (ft)	0.00	Cum SA (acres)	1.49

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3013

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.74	60	1524.08	92	1516.08	108	1516.08	140	1524.08
156	1523.74								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1519.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1519.76	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		112.86	
E.G. Slope (ft/ft)	0.000568	Area (sq ft)		112.86	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.41	Top Width (ft)		45.41	
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)		3.21	
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	15184.3	Conv. (cfs)		15184.3	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.31	
Min Ch El (ft)	1516.08	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.28	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		3.40	
C & E Loss (ft)	0.00	Cum SA (acres)		1.32	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2988

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.73	60	1524.06	92	1516.06	108	1516.06	140	1524.06
156	1523.73								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1519.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1519.74	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		113.12	
E.G. Slope (ft/ft)	0.000565	Area (sq ft)		113.12	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.45	Top Width (ft)		45.45	
Vel Total (ft/s)	3.20	Avg. Vel. (ft/s)		3.20	
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	15232.4	Conv. (cfs)		15232.4	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.36	

Min Ch El (ft)	1516.06	Shear (lb/sq ft)	0.09
Alpha	1.00	Stream Power (lb/ft s)	0.28
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	3.34
C & E Loss (ft)	0.00	Cum SA (acres)	1.29

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2963

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.72	60	1524.05	92	1516.05	108	1516.05	140	1524.05
156	1523.72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1519.73	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		112.93	
E.G. Slope (ft/ft)	0.000567	Area (sq ft)		112.93	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.42	Top Width (ft)		45.42	
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)		3.21	
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	15197.6	Conv. (cfs)		15197.6	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.32	
Min Ch El (ft)	1516.05	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.28	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		3.28	
C & E Loss (ft)	0.00	Cum SA (acres)		1.27	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2938

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.71	60	1524.03	92	1516.03	108	1516.03	140	1524.03
156	1523.71								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25.03	25.03	25.03	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1519.71	Reach Len. (ft)	25.03	25.03	25.03
Crit W.S. (ft)		Flow Area (sq ft)		113.20	
E.G. Slope (ft/ft)	0.000564	Area (sq ft)		113.20	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.47	Top Width (ft)		45.47	
Vel Total (ft/s)	3.20	Avg. Vel. (ft/s)		3.20	
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	15247.8	Conv. (cfs)		15247.8	
Length Wtd. (ft)	25.03	Wetted Per. (ft)		46.37	

Min Ch El (ft)	1516.03	Shear (lb/sq ft)	0.09
Alpha	1.00	Stream Power (lb/ft s)	0.27
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	3.21
C & E Loss (ft)	0.00	Cum SA (acres)	1.24

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2912.97

INPUT
Description: Begin Road Vertical Taper
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.7	60	1524.02	92	1516.02	108	1516.02	140	1524.02
156	1523.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	46	46	46	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1519.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1519.70	Reach Len. (ft)	46.00	46.00	46.00
Crit W.S. (ft)		Flow Area (sq ft)		113.01	
E.G. Slope (ft/ft)	0.000566	Area (sq ft)		113.01	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.43	Top Width (ft)		45.43	
Vel Total (ft/s)	3.20	Avg. Vel. (ft/s)		3.20	
Max Chl Dpth (ft)	3.68	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	15212.9	Conv. (cfs)		15212.9	
Length Wtd. (ft)	46.00	Wetted Per. (ft)		46.34	
Min Ch El (ft)	1516.02	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.28	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)		3.15	
C & E Loss (ft)	0.00	Cum SA (acres)		1.21	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2866.97

INPUT
Description: End Earth Bottom and Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1522.7	67.976	1522.38	92	1516	108	1516	132.024	1522.38
156	1522.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.02	132.024	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1519.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.020	
W.S. Elev (ft)	1519.66	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)		Flow Area (sq ft)		109.00	
E.G. Slope (ft/ft)	0.000606	Area (sq ft)		109.00	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	43.56	Top Width (ft)		43.56	
Vel Total (ft/s)	3.32	Avg. Vel. (ft/s)		3.32	
Max Chl Dpth (ft)	3.66	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	14710.7	Conv. (cfs)		14710.7	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		44.52	

Min Ch El (ft)	1516.00	Shear (lb/sq ft)	0.09
Alpha	1.00	Stream Power (lb/ft s)	0.31
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.03
C & E Loss (ft)	0.00	Cum SA (acres)	1.17

CROSS SECTION   RIVER: Basin 5
REACH: Outlet Channel   RS: 2866.96

INPUT
Description: Begin Transition from 4:1 to 2:1, Conc. Bottom, Riprap Banks.
Station Elevation Data   num=   6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1522.7	67.976	1522.38	92	1516	108	1516	132.024	1522.38
156	1522.7								

Manning's n Values   num=   6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.033	92	.014	108	.014	132.024	.033
156	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	12.99	12.99	12.99	.1	.3

CROSS SECTION OUTPUT   Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.021	
W.S. Elev (ft)	1519.66	Reach Len. (ft)	12.99	12.99	12.99
Crit W.S. (ft)		Flow Area (sq ft)		109.00	
E.G. Slope (ft/ft)	0.000668	Area (sq ft)		109.00	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	43.56	Top Width (ft)		43.56	
Vel Total (ft/s)	3.32	Avg. Vel. (ft/s)		3.32	
Max Chl Dpth (ft)	3.66	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	14001.5	Conv. (cfs)		14001.5	
Length Wtd. (ft)	12.99	Wetted Per. (ft)		44.52	
Min Ch El (ft)	1516.00	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.34	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		3.03	
C & E Loss (ft)	0.09	Cum SA (acres)		1.17	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION   RIVER: Basin 5
REACH: Outlet Channel   RS: 2853.97

INPUT
Description: Before Top of Drop Structure, End Riprap Banks
Station Elevation Data   num=   6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1521.17	83.5	1521.49	94.5	1515.99	105.5	1515.99	116.5	1521.49
156	1521.17								

Manning's n Values   num=   6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.033	94.5	.014	105.5	.014	116.5	.033
156	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	1	1	1	.1	.3

CROSS SECTION OUTPUT   Profile #PF 1

E.G. Elev (ft)	1519.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	1518.70	Reach Len. (ft)	1.00	1.00	1.00

Crit W.S. (ft)	1518.70	Flow Area (sq ft)	44.53
E.G. Slope (ft/ft)	0.004918	Area (sq ft)	44.53
Q Total (cfs)	362.00	Flow (cfs)	362.00
Top Width (ft)	21.85	Top Width (ft)	21.85
Vel Total (ft/s)	8.13	Avg. Vel. (ft/s)	8.13
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)	2.04
Conv. Total (cfs)	5162.2	Conv. (cfs)	5162.2
Length Wtd. (ft)	1.00	Wetted Per. (ft)	23.13
Min Ch El (ft)	1515.99	Shear (lb/sq ft)	0.59
Alpha	1.00	Stream Power (lb/ft s)	4.81
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.01
C & E Loss (ft)	0.00	Cum SA (acres)	1.16

Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2852.97

INPUT
Description: Top of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1521.17	83.5	1521.49	94.5	1515.99	105.5	1515.99	116.5	1521.49
156	1521.17								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.014	116.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.014	
W.S. Elev (ft)	1518.70	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	1518.70	Flow Area (sq ft)		44.45	
E.G. Slope (ft/ft)	0.002461	Area (sq ft)		44.45	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	21.83	Top Width (ft)		21.83	
Vel Total (ft/s)	8.14	Avg. Vel. (ft/s)		8.14	
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)		2.04	
Conv. Total (cfs)	7297.1	Conv. (cfs)		7297.1	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		23.11	
Min Ch El (ft)	1515.99	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		2.41	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		3.00	
C & E Loss (ft)	0.23	Cum SA (acres)		1.16	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The 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: Basin 5
REACH: Outlet Channel RS: 2852.96

INPUT
Description: Bottom of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1521.17	74.6	1521.49	92	1512.79	108	1512.79	125.4	1521.49

156 1[illegible]7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	74.6	.014	125.4	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.6	125.4	34.49	34.49	34.49	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.28	Wt. n-Val.		0.014	
Vel Head (ft)	5.42	Reach Len. (ft)	34.49	34.49	34.49
W.S. Elev (ft)	1513.86	Flow Area (sq ft)		19.38	
Crit W.S. (ft)	1515.06	Area (sq ft)		19.38	
E.G. Slope (ft/ft)	0.034007	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		20.27	
Top Width (ft)	20.27	Avg. Vel. (ft/s)		18.68	
Vel Total (ft/s)	18.68	Hydr. Depth (ft)		0.96	
Max Chl Dpth (ft)	1.07	Conv. (cfs)		1963.0	
Conv. Total (cfs)	1963.0	Wetted Per. (ft)		20.78	
Length Wtd. (ft)	34.49	Shear (lb/sq ft)		1.98	
Min Ch El (ft)	1512.79	Stream Power (lb/ft s)		36.99	
Alpha	1.00	Cum Volume (acre-ft)		3.00	
Frctn Loss (ft)	0.00	Cum SA (acres)		1.16	
C & E Loss (ft)	0.44				

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

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2818.47

INPUT
Description: End of Drop Structure (Bottom of Sill)
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.46	76	1520.78	92	1512.78	108	1512.78	124	1520.78
156	1520.46								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	1.5	1.5	1.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.84	Wt. n-Val.		0.014	
Vel Head (ft)	0.25	Reach Len. (ft)	1.50	1.50	1.50
W.S. Elev (ft)	1516.59	Flow Area (sq ft)		90.13	
Crit W.S. (ft)	1515.05	Area (sq ft)		90.13	
E.G. Slope (ft/ft)	0.000376	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		31.26	
Top Width (ft)	31.26	Avg. Vel. (ft/s)		4.02	
Vel Total (ft/s)	4.02	Hydr. Depth (ft)		2.88	
Max Chl Dpth (ft)	3.81	Conv. (cfs)		18668.5	
Conv. Total (cfs)	18668.5	Wetted Per. (ft)		33.06	
Length Wtd. (ft)	1.50	Shear (lb/sq ft)		0.06	
Min Ch El (ft)	1512.78	Stream Power (lb/ft s)		0.26	
Alpha	1.00	Cum Volume (acre-ft)		2.96	
Frctn Loss (ft)	0.00	Cum SA (acres)		1.14	
C & E Loss (ft)	0.03				

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

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

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2816.97

INPUT
Description: End of Drop Structure (Top of Sill), Begin Transition from 2:1 to 4:1

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.46	76	1520.78	92	1513.53	108	1513.53	124	1520.78
156	1520.46								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.81	Wt. n-Val.		0.014	
Vel Head (ft)	0.58	Reach Len. (ft)	0.01	0.01	0.01
W.S. Elev (ft)	1516.24	Flow Area (sq ft)		59.45	
Crit W.S. (ft)		Area (sq ft)		59.45	
E.G. Slope (ft/ft)	0.001271	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		27.94	
Top Width (ft)	27.94	Avg. Vel. (ft/s)		6.09	
Vel Total (ft/s)	6.09	Hydr. Depth (ft)		2.13	
Max Chl Dpth (ft)	2.71	Conv. (cfs)		10155.8	
Conv. Total (cfs)	10155.8	Wetted Per. (ft)		29.11	
Length Wtd. (ft)	0.01	Shear (lb/sq ft)		0.16	
Min Ch El (ft)	1513.53	Stream Power (lb/ft s)		0.99	
Alpha	1.00	Cum Volume (acre-ft)		2.96	
Frctn Loss (ft)	0.00	Cum SA (acres)		1.13	
C & E Loss (ft)	0.09				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2816.96

INPUT
Description: Begin Riprap

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.46	76	1520.78	92	1512.78	108	1512.78	124	1520.78
156	1520.46								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.033	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	31.99	31.99	31.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.72	Wt. n-Val.		0.033	
Vel Head (ft)	0.28	Reach Len. (ft)	31.99	31.99	31.99
W.S. Elev (ft)	1516.44	Flow Area (sq ft)		85.41	
Crit W.S. (ft)		Area (sq ft)		85.41	
E.G. Slope (ft/ft)	0.002431	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		30.65	
Top Width (ft)	30.65	Avg. Vel. (ft/s)		4.24	
Vel Total (ft/s)	4.24	Hydr. Depth (ft)		2.79	
Max Chl Dpth (ft)	3.66	Conv. (cfs)		7342.3	
Conv. Total (cfs)	7342.3	Wetted Per. (ft)		32.38	
Length Wtd. (ft)	31.99	Shear (lb/sq ft)		0.40	
Min Ch El (ft)	1512.78	Stream Power (lb/ft s)		1.70	
Alpha	1.00	Cum Volume (acre-ft)		2.96	
Frctn Loss (ft)	0.06				

C & E Loss (ft)	0.04	Cum SA (acres)	1.13

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2784.97

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

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.44	60	1520.76	92	1512.76	108	1512.76	140	1520.76
156	1520.44								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.033	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1516.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.033	
W.S. Elev (ft)	1516.47	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)		Flow Area (sq ft)		114.33	
E.G. Slope (ft/ft)	0.001493	Area (sq ft)		114.33	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.67	Top Width (ft)		45.67	
Vel Total (ft/s)	3.17	Avg. Vel. (ft/s)		3.17	
Max Chl Dpth (ft)	3.71	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	9367.7	Conv. (cfs)		9367.7	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		46.58	
Min Ch El (ft)	1512.76	Shear (lb/sq ft)		0.23	
Alpha	1.00	Stream Power (lb/ft s)		0.72	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.88	
C & E Loss (ft)	0.00	Cum SA (acres)		1.11	

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: Basin 5
REACH: Outlet Channel RS: 2784.96

INPUT
Description: Begin DS Earth Channel
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.44	60	1520.76	92	1512.76	108	1512.76	140	1520.76
156	1520.44								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	23.99	23.99	23.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1516.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1516.47	Reach Len. (ft)	23.99	23.99	23.99
Crit W.S. (ft)		Flow Area (sq ft)		114.33	
E.G. Slope (ft/ft)	0.000549	Area (sq ft)		114.33	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.67	Top Width (ft)		45.67	
Vel Total (ft/s)	3.17	Avg. Vel. (ft/s)		3.17	
Max Chl Dpth (ft)	3.71	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	15456.7	Conv. (cfs)		15456.7	
Length Wtd. (ft)	23.99	Wetted Per. (ft)		46.58	

Min Ch El (ft)	1512.76	Shear (lb/sq ft)		0.08		
Alpha	1.00	Stream Power (lb/ft s)		0.27		
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		2.88		
C & E Loss (ft)	0.00	Cum SA (acres)		1.11		

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2760.97

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.43	60	1520.75	92	1512.75	108	1512.75	140	1520.75
156	1520.43								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.61	Wt. n-Val.		0.020	
Vel Head (ft)	0.16	Reach Len. (ft)	25.00	25.00	25.00
W.S. Elev (ft)	1516.45	Flow Area (sq ft)		114.19	
Crit W.S. (ft)		Area (sq ft)		114.19	
E.G. Slope (ft/ft)	0.000550	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.64	
Top Width (ft)	45.64	Avg. Vel. (ft/s)		3.17	
Vel Total (ft/s)	3.17	Hydr. Depth (ft)		2.50	
Max Chl Dpth (ft)	3.70	Conv. (cfs)		15429.9	
Conv. Total (cfs)	15429.9	Wetted Per. (ft)		46.55	
Length Wtd. (ft)	25.00	Shear (lb/sq ft)		0.08	
Min Ch El (ft)	1512.75	Stream Power (lb/ft s)		0.27	
Alpha	1.00	Cum Volume (acre-ft)		2.82	
Frctn Loss (ft)	0.01	Cum SA (acres)		1.08	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2735.97

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.41	60	1520.73	92	1512.73	108	1512.73	140	1520.73
156	1520.41								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	103	103	103	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.60	Wt. n-Val.		0.020	
Vel Head (ft)	0.16	Reach Len. (ft)	103.00	103.00	103.00
W.S. Elev (ft)	1516.44	Flow Area (sq ft)		114.48	
Crit W.S. (ft)		Area (sq ft)		114.48	
E.G. Slope (ft/ft)	0.000547	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.69	
Top Width (ft)	45.69	Avg. Vel. (ft/s)		3.16	
Vel Total (ft/s)	3.16	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.71	Conv. (cfs)		15483.6	
Conv. Total (cfs)	15483.6	Wetted Per. (ft)		46.60	
Length Wtd. (ft)	103.00				

Min Ch El (ft)	1512.73	Shear (lb/sq ft)		0.08		
Alpha	1.00	Stream Power (lb/ft s)		0.27		
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)		2.76		
C & E Loss (ft)	0.00	Cum SA (acres)		1.06		

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2632.97

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.36	60	1520.68	92	1512.68	108	1512.68	140	1520.68
156	1520.36								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	44.97	44.97	44.97	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1516.38	Reach Len. (ft)	44.97	44.97	44.97
Crit W.S. (ft)		Flow Area (sq ft)		114.16	
E.G. Slope (ft/ft)	0.000551	Area (sq ft)		114.16	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.64	Top Width (ft)		45.64	
Vel Total (ft/s)	3.17	Avg. Vel. (ft/s)		3.17	
Max Chl Dpth (ft)	3.70	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	15425.8	Conv. (cfs)		15425.8	
Length Wtd. (ft)	44.97	Wetted Per. (ft)		46.55	
Min Ch El (ft)	1512.68	Shear (lb/sq ft)		0.08	
Alpha	1.00	Stream Power (lb/ft s)		0.27	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)		2.49	
C & E Loss (ft)	0.00	Cum SA (acres)		0.95	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2588

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.33	60	1520.67	92	1512.67	108	1512.67	140	1520.67
156	1520.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1516.36	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		113.41	
E.G. Slope (ft/ft)	0.000561	Area (sq ft)		113.41	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.50	Top Width (ft)		45.50	
Vel Total (ft/s)	3.19	Avg. Vel. (ft/s)		3.19	
Max Chl Dpth (ft)	3.69	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	15285.7	Conv. (cfs)		15285.7	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.41	

Min Ch El (ft)	1512.67	Shear (lb/sq ft)	0.09
Alpha	1.00	Stream Power (lb/ft s)	0.27
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	2.37
C & E Loss (ft)	0.00	Cum SA (acres)	0.90

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2563

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.32	60	1520.65	92	1512.65	108	1512.65	140	1520.65
156	1520.32								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1516.34	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		113.69	
E.G. Slope (ft/ft)	0.000557	Area (sq ft)		113.69	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.55	Top Width (ft)		45.55	
Vel Total (ft/s)	3.18	Avg. Vel. (ft/s)		3.18	
Max Chl Dpth (ft)	3.69	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	15337.1	Conv. (cfs)		15337.1	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.46	
Min Ch El (ft)	1512.65	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.27	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		2.30	
C & E Loss (ft)	0.00	Cum SA (acres)		0.87	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2538

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.31	60	1520.64	92	1512.64	108	1512.64	140	1520.64
156	1520.31								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1516.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.020	
W.S. Elev (ft)	1516.33	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		113.50	
E.G. Slope (ft/ft)	0.000560	Area (sq ft)		113.50	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.52	Top Width (ft)		45.52	
Vel Total (ft/s)	3.19	Avg. Vel. (ft/s)		3.19	
Max Chl Dpth (ft)	3.69	Hydr. Depth (ft)		2.49	
Conv. Total (cfs)	15303.2	Conv. (cfs)		15303.2	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.43	

Min Ch El (ft)	1512.64	Shear (lb/sq ft)	0.09
Alpha	1.00	Stream Power (lb/ft s)	0.27
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	2.24
C & E Loss (ft)	0.00	Cum SA (acres)	0.85

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2513

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.3	60	1520.62	92	1512.62	108	1512.62	140	1520.62
156	1520.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25.03	25.03	25.03	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.47	Wt. n-Val.		0.020	
Vel Head (ft)	0.16	Reach Len. (ft)	25.03	25.03	25.03
W.S. Elev (ft)	1516.32	Flow Area (sq ft)		113.78	
Crit W.S. (ft)		Area (sq ft)		113.78	
E.G. Slope (ft/ft)	0.000556	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.57	
Top Width (ft)	45.57	Avg. Vel. (ft/s)		3.18	
Vel Total (ft/s)	3.18	Hydr. Depth (ft)		2.50	
Max Chl Dpth (ft)	3.70	Conv. (cfs)		15354.6	
Conv. Total (cfs)	15354.6	Wetted Per. (ft)		46.48	
Length Wtd. (ft)	25.03	Shear (lb/sq ft)		0.08	
Min Ch El (ft)	1512.62	Stream Power (lb/ft s)		0.27	
Alpha	1.00	Cum Volume (acre-ft)		2.17	
Frctn Loss (ft)	0.01	Cum SA (acres)		0.82	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2487.97

INPUT
Description: Begin Road Vertical Taper
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.29	60	1520.61	92	1512.61	108	1512.61	140	1520.61
156	1520.29								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	46	46	46	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.46	Wt. n-Val.		0.020	
Vel Head (ft)	0.16	Reach Len. (ft)	46.00	46.00	46.00
W.S. Elev (ft)	1516.30	Flow Area (sq ft)		113.60	
Crit W.S. (ft)		Area (sq ft)		113.60	
E.G. Slope (ft/ft)	0.000558	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.54	
Top Width (ft)	45.54	Avg. Vel. (ft/s)		3.19	
Vel Total (ft/s)	3.19	Hydr. Depth (ft)		2.49	
Max Chl Dpth (ft)	3.69	Conv. (cfs)		15321.7	
Conv. Total (cfs)	15321.7	Wetted Per. (ft)		46.45	
Length Wtd. (ft)	46.00				

Min Ch El (ft)	1512.61	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.27	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)		2.11	
C & E Loss (ft)	0.00	Cum SA (acres)		0.80	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2441.97

INPUT
Description: End Earth Bottom
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1519.29	67.976	1518.97	92	1512.59	108	1512.59	132.024	1518.97
156	1519.29								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.02	132.024	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.43	Wt. n-Val.		0.020	
Vel Head (ft)	0.17	Reach Len. (ft)	0.01	0.01	0.01
W.S. Elev (ft)	1516.26	Flow Area (sq ft)		109.59	
Crit W.S. (ft)		Area (sq ft)		109.59	
E.G. Slope (ft/ft)	0.000597	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		43.67	
Top Width (ft)	43.67	Avg. Vel. (ft/s)		3.30	
Vel Total (ft/s)	3.30	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.67	Conv. (cfs)		14821.4	
Conv. Total (cfs)	14821.4	Wetted Per. (ft)		44.62	
Length Wtd. (ft)	0.01	Shear (lb/sq ft)		0.09	
Min Ch El (ft)	1512.59	Stream Power (lb/ft s)		0.30	
Alpha	1.00	Cum Volume (acre-ft)		1.99	
Frctn Loss (ft)	0.00	Cum SA (acres)		0.75	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2441.96

INPUT
Description: Begin Riprap Banks, Concrete Bottom, Begin Transition from 4:1 to 2:1
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1519.29	67.976	1518.97	92	1512.59	108	1512.59	132.024	1518.97
156	1519.29								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.033	92	.014	108	.033	132.024	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	12.99	12.99	12.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.43	Wt. n-Val.		0.027	
Vel Head (ft)	0.17	Reach Len. (ft)	12.99	12.99	12.99
W.S. Elev (ft)	1516.26	Flow Area (sq ft)		109.59	
Crit W.S. (ft)		Area (sq ft)		109.59	
E.G. Slope (ft/ft)	0.001088	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		43.67	
Top Width (ft)	43.67	Avg. Vel. (ft/s)		3.30	
Vel Total (ft/s)	3.30	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.67	Conv. (cfs)		10974.3	
Conv. Total (cfs)	10974.3				

Length W[illegible]ft)	12.99	Wetted Per. (ft)	44.62
Min Ch E[illegible])	1512.59	Shear (lb/sq ft)	0.17
Alpha	1.00	Stream Power (lb/ft s)	0.55
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	1.99
C & E Loss (ft)	0.09	Cum SA (acres)	0.75

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2428.97

INPUT
Description: Before Top of Drop Structure, End Riprap Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.76	83.5	1518.08	94.5	1512.58	105.5	1512.58	116.5	1518.08
156	1517.76								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.033	94.5	.014	105.5	.033	116.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.025	
W.S. Elev (ft)	1515.29	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)	1515.29	Flow Area (sq ft)		44.50	
E.G. Slope (ft/ft)	0.007764	Area (sq ft)		44.50	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	21.84	Top Width (ft)		21.84	
Vel Total (ft/s)	8.13	Avg. Vel. (ft/s)		8.13	
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)		2.04	
Conv. Total (cfs)	4108.3	Conv. (cfs)		4108.3	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		23.12	
Min Ch El (ft)	1512.58	Shear (lb/sq ft)		0.93	
Alpha	1.00	Stream Power (lb/ft s)		7.59	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		1.97	
C & E Loss (ft)	0.00	Cum SA (acres)		0.74	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2427.97

INPUT
Description: Top of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.76	83.5	1518.08	94.5	1512.58	105.5	1512.58	116.5	1518.08
156	1517.76								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.014	116.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1516.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.014	
W.S. Elev (ft)	1515.29	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	1515.29	Flow Area (sq ft)		44.41	
E.G. Slope (ft/ft)	0.002467	Area (sq ft)		44.41	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	21.82	Top Width (ft)		21.82	
Vel Total (ft/s)	8.15	Avg. Vel. (ft/s)		8.15	
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)		2.04	
Conv. Total (cfs)	7288.5	Conv. (cfs)		7288.5	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		23.10	
Min Ch El (ft)	1512.58	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		2.41	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		1.97	
C & E Loss (ft)	0.24	Cum SA (acres)		0.74	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The 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: Basin 5
REACH: Outlet Channel RS: 2427.96

INPUT
Description: Bottom of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.76	74.6	1518.08	92	1509.38	108	1509.38	125.4	1518.08
156	1517.76								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	74.6	.014	125.4	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.6	125.4	34.49	34.49	34.49	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1515.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.42	Wt. n-Val.		0.014	
W.S. Elev (ft)	1510.45	Reach Len. (ft)	34.49	34.49	34.49
Crit W.S. (ft)	1511.65	Flow Area (sq ft)		19.37	
E.G. Slope (ft/ft)	0.034020	Area (sq ft)		19.37	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	20.27	Top Width (ft)		20.27	
Vel Total (ft/s)	18.68	Avg. Vel. (ft/s)		18.68	
Max Chl Dpth (ft)	1.07	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	1962.6	Conv. (cfs)		1962.6	
Length Wtd. (ft)	34.49	Wetted Per. (ft)		20.78	
Min Ch El (ft)	1509.38	Shear (lb/sq ft)		1.98	
Alpha	1.00	Stream Power (lb/ft s)		37.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		1.97	
C & E Loss (ft)	0.44	Cum SA (acres)		0.74	

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

CROSS SECTION RIVER: Basin 5

REACH: Outlet Channel RS: 2393.47

INPUT

Description: End of Drop Structure (Bottom of Sill)

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.05	76	1517.37	92	1509.37	108	1509.37	124	1517.37
156	1517.05								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	1.5	1.5	1.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.		0.014	
W.S. Elev (ft)	1513.30	Reach Len. (ft)	1.50	1.50	1.50
Crit W.S. (ft)	1511.64	Flow Area (sq ft)		93.69	
E.G. Slope (ft/ft)	0.000337	Area (sq ft)		93.69	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	31.71	Top Width (ft)		31.71	
Vel Total (ft/s)	3.86	Avg. Vel. (ft/s)		3.86	
Max Chl Dpth (ft)	3.93	Hydr. Depth (ft)		2.95	
Conv. Total (cfs)	19713.9	Conv. (cfs)		19713.9	
Length Wtd. (ft)	1.50	Wetted Per. (ft)		33.56	
Min Ch El (ft)	1509.37	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.23	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		1.92	
C & E Loss (ft)	0.02	Cum SA (acres)		0.72	

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

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

CROSS SECTION RIVER: Basin 5

REACH: Outlet Channel RS: 2391.97

INPUT

Description: End of Drop Structure (Top of Sill), Begin Transition from 2:1 to 4:1

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.05	76	1517.37	92	1510.12	108	1510.12	124	1517.37
156	1517.05								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1513.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.		0.014	
W.S. Elev (ft)	1513.02	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)		Flow Area (sq ft)		65.07	
E.G. Slope (ft/ft)	0.000982	Area (sq ft)		65.07	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	28.82	Top Width (ft)		28.82	
Vel Total (ft/s)	5.56	Avg. Vel. (ft/s)		5.56	
Max Chl Dpth (ft)	2.90	Hydr. Depth (ft)		2.26	
Conv. Total (cfs)	11554.0	Conv. (cfs)		11554.0	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		30.07	
Min Ch El (ft)	1510.12	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.74	

Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.92
C & E Loss (ft)	0.07	Cum SA (acres)	0.72

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: Basin 5
REACH: Outlet Channel   RS: 2391.96

INPUT
Description: Begin Riprap
Station Elevation Data   num=   6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.05	76	1517.37	92	1509.37	108	1509.37	124	1517.37
156	1517.05								

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.033	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	31.99	31.99	31.99	.1	.3

CROSS SECTION OUTPUT   Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.43	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.033	
W.S. Elev (ft)	1513.18	Reach Len. (ft)	31.99	31.99	31.99
Crit W.S. (ft)		Flow Area (sq ft)		90.12	
E.G. Slope (ft/ft)	0.002089	Area (sq ft)		90.12	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	31.26	Top Width (ft)		31.26	
Vel Total (ft/s)	4.02	Avg. Vel. (ft/s)		4.02	
Max Chl Dpth (ft)	3.81	Hydr. Depth (ft)		2.88	
Conv. Total (cfs)	7919.5	Conv. (cfs)		7919.5	
Length Wtd. (ft)	31.99	Wetted Per. (ft)		33.06	
Min Ch El (ft)	1509.37	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		1.43	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)		1.92	
C & E Loss (ft)	0.03	Cum SA (acres)		0.72	

CROSS SECTION   RIVER: Basin 5
REACH: Outlet Channel   RS: 2359.97

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

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.03	60	1517.35	92	1509.35	108	1509.35	140	1517.35
156	1517.03								

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.035	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT   Profile #PF 1

E.G. Elev (ft)	1513.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.035	
W.S. Elev (ft)	1513.21	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)		Flow Area (sq ft)		121.26	
E.G. Slope (ft/ft)	0.001430	Area (sq ft)		121.26	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	46.86	Top Width (ft)		46.86	
Vel Total (ft/s)	2.99	Avg. Vel. (ft/s)		2.99	
Max Chl Dpth (ft)	3.86	Hydr. Depth (ft)		2.59	
Conv. Total (cfs)	9574.0	Conv. (cfs)		9574.0	

```
  Length W     ft)             0.01   Wetted Per. (ft)                     47.81
  Min Ch El    t)           1509.35   Shear (lb/sq ft)                      0.23
  Alpha                        1.00   Stream Power (lb/ft s)                0.68
  Frctn Loss (ft)              0.00   Cum Volume (acre-ft)                  1.84
  C & E Loss (ft)              0.00   Cum SA (acres)                        0.69
```

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: Basin 5
REACH: Outlet Channel     RS: 2359.96

INPUT
Description: Begin DS Earth Channel
Station Elevation Data    num=       6
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      44  1517.03       60  1517.35       92  1509.35      108  1509.35      140  1517.35
     156  1517.03

Manning's n Values        num=       3
     Sta    n Val      Sta    n Val      Sta    n Val
      44     .035       60      .02      140     .035

Bank Sta: Left    Right    Lengths: Left Channel    Right      Coeff Contr.    Expan.
            60      140            23.99   23.99    23.99               .1        .3

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)            1513.35   Element                   Left OB    Channel    Right OB
  Vel Head (ft)                0.14   Wt. n-Val.                             0.020
  W.S. Elev (ft)            1513.21   Reach Len. (ft)             23.99      23.99       23.99
  Crit W.S. (ft)                      Flow Area (sq ft)                     121.26
  E.G. Slope (ft/ft)       0.000467   Area (sq ft)                          121.26
  Q Total (cfs)              362.00   Flow (cfs)                            362.00
  Top Width (ft)              46.86   Top Width (ft)                         46.86
  Vel Total (ft/s)             2.99   Avg. Vel. (ft/s)                        2.99
  Max Chl Dpth (ft)            3.86   Hydr. Depth (ft)                        2.59
  Conv. Total (cfs)         16754.5   Conv. (cfs)                          16754.5
  Length Wtd. (ft)            23.99   Wetted Per. (ft)                       47.81
  Min Ch El (ft)            1509.35   Shear (lb/sq ft)                        0.07
  Alpha                        1.00   Stream Power (lb/ft s)                  0.22
  Frctn Loss (ft)              0.01   Cum Volume (acre-ft)                    1.84
  C & E Loss (ft)              0.00   Cum SA (acres)                          0.69

CROSS SECTION          RIVER: Basin 5
REACH: Outlet Channel     RS: 2335.97

INPUT
Description:
Station Elevation Data    num=       6
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      44  1517.02       60  1517.34       92  1509.34      108  1509.34      140  1517.34
     156  1517.02

Manning's n Values        num=       3
     Sta    n Val      Sta    n Val      Sta    n Val
      44     .035       60      .02      140     .035

Bank Sta: Left    Right    Lengths: Left Channel    Right      Coeff Contr.    Expan.
            60      140               25      25       25               .1        .3

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)            1513.34   Element                   Left OB    Channel    Right OB
  Vel Head (ft)                0.14   Wt. n-Val.                             0.020
  W.S. Elev (ft)            1513.20   Reach Len. (ft)             25.00      25.00       25.00
  Crit W.S. (ft)                      Flow Area (sq ft)                     121.20
  E.G. Slope (ft/ft)       0.000467   Area (sq ft)                          121.20
  Q Total (cfs)              362.00   Flow (cfs)                            362.00
  Top Width (ft)              46.85   Top Width (ft)                         46.85
```

Vel Total (ft/s)	2.99	Avg. Vel. (ft/s)		2.99	
Max Chl Dpth (ft)	3.86	Hydr. Depth (ft)		2.59	
Conv. Total (cfs)	16743.7	Conv. (cfs)		16743.7	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		47.80	
Min Ch El (ft)	1509.34	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.22	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		1.77	
C & E Loss (ft)	0.00	Cum SA (acres)		0.66	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2310.97

INPUT
Description:
Station Elevation Data num= 6

Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
441517.008	601517.328	921509.328	1081509.328	1401517.328
1561517.008				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	203.01	203.01	203.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.020	
W.S. Elev (ft)	1513.18	Reach Len. (ft)	203.01	203.01	203.01
Crit W.S. (ft)		Flow Area (sq ft)		121.21	
E.G. Slope (ft/ft)	0.000467	Area (sq ft)		121.21	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	46.86	Top Width (ft)		46.86	
Vel Total (ft/s)	2.99	Avg. Vel. (ft/s)		2.99	
Max Chl Dpth (ft)	3.86	Hydr. Depth (ft)		2.59	
Conv. Total (cfs)	16745.9	Conv. (cfs)		16745.9	
Length Wtd. (ft)	203.01	Wetted Per. (ft)		47.81	
Min Ch El (ft)	1509.33	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.22	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)		1.70	
C & E Loss (ft)	0.00	Cum SA (acres)		0.64	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2107.96

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1516.9	60	1517.22	92	1509.22	108	1509.22	140	1517.22
156	1516.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.02	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	271.13	271.13	271.13	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.020	
W.S. Elev (ft)	1513.09	Reach Len. (ft)	271.13	271.13	271.13
Crit W.S. (ft)		Flow Area (sq ft)		121.91	
E.G. Slope (ft/ft)	0.000460	Area (sq ft)		121.91	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	46.97	Top Width (ft)		46.97	

```
  Vel Total (ft/s)             2.97   Avg. Vel. (ft/s)                      2.97
  Max Chl Dpth (ft)            3.87   Hydr. Depth (ft)                      2.60
  Conv. Total (cfs)         16878.2   Conv. (cfs)                        16878.2
  Length Wtd. (ft)           271.13   Wetted Per. (ft)                     47.93
  Min Ch El (ft)            1509.22   Shear (lb/sq ft)                      0.07
  Alpha                        1.00   Stream Power (lb/ft s)                0.22
  Frctn Loss (ft)              0.12   Cum Volume (acre-ft)                  1.14
  C & E Loss (ft)              0.00   Cum SA (acres)                        0.42


CROSS SECTION          RIVER: Basin 5
REACH: Outlet Channel      RS: 1836.83

INPUT
Description: 10 feet US of PT
Station Elevation Data     num=        6
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      44  1516.76       60  1517.08       92  1509.08      108  1509.08      140  1517.08
     156  1516.76

Manning's n Values          num=        3
     Sta    n Val      Sta    n Val      Sta    n Val
      44     .035       60      .02      140     .035

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.    Expan.
            60      140                31.5    31.5    31.5                .1        .3

CROSS SECTION OUTPUT     Profile #PF 1

  E.G. Elev (ft)            1513.10   Element                    Left OB    Channel    Right OB
  Vel Head (ft)                0.14   Wt. n-Val.                              0.020
  W.S. Elev (ft)            1512.97   Reach Len. (ft)              31.50      31.50       31.50
  Crit W.S. (ft)                      Flow Area (sq ft)                      122.75
  E.G. Slope (ft/ft)       0.000452   Area (sq ft)                           122.75
  Q Total (cfs)              362.00   Flow (cfs)                             362.00
  Top Width (ft)              47.12   Top Width (ft)                          47.12
  Vel Total (ft/s)             2.95   Avg. Vel. (ft/s)                         2.95
  Max Chl Dpth (ft)            3.89   Hydr. Depth (ft)                         2.61
  Conv. Total (cfs)         17036.2   Conv. (cfs)                           17036.2
  Length Wtd. (ft)            31.50   Wetted Per. (ft)                        48.07
  Min Ch El (ft)            1509.08   Shear (lb/sq ft)                         0.07
  Alpha                        1.00   Stream Power (lb/ft s)                   0.21
  Frctn Loss (ft)              0.01   Cum Volume (acre-ft)                     0.38
  C & E Loss (ft)              0.00   Cum SA (acres)                           0.12


CROSS SECTION          RIVER: Basin 5
REACH: Outlet Channel      RS: 1805.33

INPUT
Description: Begin Road Vertical Taper
Station Elevation Data     num=        6
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
      44  1516.74       60  1517.06       92  1509.06      108  1509.06      140  1517.06
     156  1516.74

Manning's n Values          num=        3
     Sta    n Val      Sta    n Val      Sta    n Val
      44     .035       60      .02      140     .035

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.    Expan.
            60      140               24.06   24.06   24.06                .1        .3

CROSS SECTION OUTPUT     Profile #PF 1

  E.G. Elev (ft)            1513.09   Element                    Left OB    Channel    Right OB
  Vel Head (ft)                0.13   Wt. n-Val.                              0.020
  W.S. Elev (ft)            1512.96   Reach Len. (ft)              24.06      24.06       24.06
  Crit W.S. (ft)                      Flow Area (sq ft)                      123.02
  E.G. Slope (ft/ft)       0.000449   Area (sq ft)                           123.02
  Q Total (cfs)              362.00   Flow (cfs)                             362.00
  Top Width (ft)              47.16   Top Width (ft)                          47.16
```

Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)	2.94
Max Chl Dpth (ft)	3.90	Hydr. Depth (ft)	2.61
Conv. Total (cfs)	17087.6	Conv. (cfs)	17087.6
Length Wtd. (ft)	24.06	Wetted Per. (ft)	48.12
Min Ch El (ft)	1509.06	Shear (lb/sq ft)	0.07
Alpha	1.00	Stream Power (lb/ft s)	0.21
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.29
C & E Loss (ft)	0.00	Cum SA (acres)	0.09

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1781.27

INPUT
Description: End Earth Bottom and Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
50.36	1515.14	66.36	1515.46	92	1509.05	108	1509.05	133.64	1515.46
149.64	1515.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
50.36	.035	66.36	.02	133.64	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.36	133.64	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT , Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.08	Wt. n-Val.		0.020	
Vel Head (ft)	0.13	Reach Len. (ft)	0.01	0.01	0.01
W.S. Elev (ft)	1512.94	Flow Area (sq ft)		122.98	
Crit W.S. (ft)		Area (sq ft)		122.98	
E.G. Slope (ft/ft)	0.000449	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		47.16	
Top Width (ft)	47.16	Avg. Vel. (ft/s)		2.94	
Vel Total (ft/s)	2.94	Hydr. Depth (ft)		2.61	
Max Chl Dpth (ft)	3.89	Conv. (cfs)		17080.0	
Conv. Total (cfs)	17080.0	Wetted Per. (ft)		48.11	
Length Wtd. (ft)	0.01	Shear (lb/sq ft)		0.07	
Min Ch El (ft)	1509.05	Stream Power (lb/ft s)		0.21	
Alpha	1.00	Cum Volume (acre-ft)		0.22	
Frctn Loss (ft)	0.00	Cum SA (acres)		0.06	
C & E Loss (ft)	0.00				

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

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1781.26

INPUT
Description: Begin Riprap Bottom and Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
50.36	1515.14	66.36	1515.46	92	1509.05	108	1509.05	133.64	1515.46
149.64	1515.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
50.36	.035	66.36	.033	133.64	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.36	133.64	10	10	10	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.08	Wt. n-Val.		0.033	
Vel Head (ft)	0.13	Reach Len. (ft)	10.00	10.00	10.00
W.S. Elev (ft)	1512.94	Flow Area (sq ft)		122.98	
Crit W.S. (ft)					

E.G. Slope (ft/ft)	0.001223	Area (sq ft)	122.98
Q Total (cfs)	362.00	Flow (cfs)	362.00
Top Width (ft)	47.16	Top Width (ft)	47.16
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)	2.94
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)	2.61
Conv. Total (cfs)	10351.5	Conv. (cfs)	10351.5
Length Wtd. (ft)	10.00	Wetted Per. (ft)	48.11
Min Ch El (ft)	1509.05	Shear (lb/sq ft)	0.20
Alpha	1.00	Stream Power (lb/ft s)	0.57
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.22
C & E Loss (ft)	0.00	Cum SA (acres)	0.06

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1771.26

INPUT
Description: US of 2-8x4 CBC
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
53.88	1514.26	69.88	1514.58	92	1509.05	108	1509.05	130.12	1514.58
146.12	1514.26								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
53.88	.035	69.88	.033	130.12	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
69.88	130.12	7	7	7	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.033	
W.S. Elev (ft)	1512.93	Reach Len. (ft)	7.00	7.00	7.00
Crit W.S. (ft)		Flow Area (sq ft)		122.35	
E.G. Slope (ft/ft)	0.001240	Area (sq ft)		122.35	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.05	Top Width (ft)		47.05	
Vel Total (ft/s)	2.96	Avg. Vel. (ft/s)		2.96	
Max Chl Dpth (ft)	3.88	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	10279.4	Conv. (cfs)		10279.4	
Length Wtd. (ft)	7.00	Wetted Per. (ft)		48.00	
Min Ch El (ft)	1509.05	Shear (lb/sq ft)		0.20	
Alpha	1.00	Stream Power (lb/ft s)		0.58	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		0.19	
C & E Loss (ft)	0.00	Cum SA (acres)		0.05	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1764.26

INPUT
Description: US Face of 2-8x4 CBC
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
55.12	1513.94	71.12	1514.26	92	1509.04	108	1509.04	128.88	1514.26
144.88	1513.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
55.12	.035	71.12	.033	128.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
71.12	128.88	84.16	84.16	84.16	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.033	
W.S. Elev (ft)	1512.92	Reach Len. (ft)	84.16	84.16	84.16
Crit W.S. (ft)	1511.13	Flow Area (sq ft)		122.41	

E.G. Slope (ft/ft)	0.001238	Area (sq ft)	122.41
Q Total (cfs)	362.00	Flow (cfs)	362.00
Top Width (ft)	47.06	Top Width (ft)	47.06
Vel Total (ft/s)	2.96	Avg. Vel. (ft/s)	2.96
Max Chl Dpth (ft)	3.88	Hydr. Depth (ft)	2.60
Conv. Total (cfs)	10286.6	Conv. (cfs)	10286.6
Length Wtd. (ft)	84.16	Wetted Per. (ft)	48.02
Min Ch El (ft)	1509.04	Shear (lb/sq ft)	0.20
Alpha	1.00	Stream Power (lb/ft s)	0.58
Frctn Loss (ft)		Cum Volume (acre-ft)	0.17
C & E Loss (ft)		Cum SA (acres)	0.05

CULVERT RIVER: Basin 5
REACH: Outlet Channel RS: 1722.18

INPUT
Description:
Distance from Upstream XS = 4
Deck/Roadway Width = 62.8
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1514.08	1505	160	1514.08	1505

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
55.12	1513.94	71.12	1514.26	92	1509.04	108	1509.04	128.88	1514.26
144.88	1513.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
55.12	.035	71.12	.033	128.88	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
71.12	128.88	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1514.88	1505	160	1514.08	1505

Downstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
91.62	1510.04	91.62	1505.27	108.37	1505.27	108.37	1510.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
91.62	.015	91.62	.015	108.37	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
91.62	108.37	.1	.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	4	8

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	n Value	Entrance Loss Coef	Exit Loss Coef
3	78.25	.014	.2	1

Number of Barrels = 2
Upstream Elevation = 1509.04
Centerline Stations

Sta.	Sta.
95.625	104.375

Downstream Elevation = 1505.3
Centerline Stations

Sta.	Sta.
95.625	104.375

CULVERT OUTPUT Profile #PF 1
Culvert ID : Culvert #1

Culv Q (cfs)	362.00	Culv Vel In (ft/s)	9.00
# Barrels	2	Culv Vel Out (ft/s)	17.56
Q Barrel (cfs)	181.00	Culv Inv El Up (ft)	1509.04
E.G. US. (ft)	1513.06	Culv Inv El Dn (ft)	1505.30
W.S. US. (ft)	1512.92	Culv Frctn Ls (ft)	1.44
Delta EG (ft)	2.14	Culv Ext Lss (ft)	1.74
Delta WS (ft)	6.36	Culv Ent Lss (ft)	0.25
E.G. IC (ft)	1513.01	Q Weir (cfs)	
E.G. OC (ft)	1513.06	Weir Sta Lft (ft)	
Culvert Control	Outlet	Weir Sta Rgt (ft)	
Culv WS In (ft)	1511.55	Weir Submerg	
Culv WS Out (ft)	1506.59	Weir Max Depth (ft)	
Culv Nml Depth (ft)	1.09	Weir Avg Depth (ft)	
Culv Crt Depth (ft)	2.51	Wr Flw Area (sq ft)	
Culv Ful Lngh (ft)		Min Top Rd (ft)	1514.34

Note: The flow in the culvert is entirely supercritical.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1680.10

INPUT
Description: DS Face of 2-8x4 CBC
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
91.62	1510.04	91.62	1505.27	108.37	1505.27	108.37	1510.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
91.62	.015	91.62	.015	108.37	.015

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
91.62	108.37	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1510.93	Wt. n-Val.		0.015	
Vel Head (ft)	4.37	Reach Len. (ft)	25.69	25.69	25.69
W.S. Elev (ft)	1506.56	Flow Area (sq ft)		21.58	
Crit W.S. (ft)	1507.70	Area (sq ft)		21.58	
E.G. Slope (ft/ft)	0.024748	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		16.75	
Top Width (ft)	16.75	Avg. Vel. (ft/s)		16.77	
Vel Total (ft/s)	16.77	Hydr. Depth (ft)		1.29	
Max Chl Dpth (ft)	1.29	Conv. (cfs)		2301.1	
Conv. Total (cfs)	2301.1	Wetted Per. (ft)		19.33	
Length Wtd. (ft)	25.69	Shear (lb/sq ft)		1.73	
Min Ch El (ft)	1505.27	Stream Power (lb/ft s)		28.94	
Alpha	1.00	Cum Volume (acre-ft)		0.01	
Frctn Loss (ft)		Cum SA (acres)			
C & E Loss (ft)					

CROSS SECTION RIVER: ADOT
REACH: Exst Channel US RS: 1812.83

INPUT
Description: ADOT Channel - Surveyed xsec
Station Elevation Data num= 6

Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
861510.924	871510.892	97 1506.06	1031505.965	1231515.524
1241515.525				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	41.85	41.85	41.85	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1506.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.015	
W.S. Elev (ft)	1506.14	Reach Len. (ft)	41.85	41.85	41.85
Crit W.S. (ft)	1506.11	Flow Area (sq ft)		0.83	
E.G. Slope (ft/ft)	0.002366	Area (sq ft)		0.83	
Q Total (cfs)	1.00	Flow (cfs)		1.00	
Top Width (ft)	6.55	Top Width (ft)		6.55	
Vel Total (ft/s)	1.21	Avg. Vel. (ft/s)		1.21	
Max Chl Dpth (ft)	0.18	Hydr. Depth (ft)		0.13	
Conv. Total (cfs)	20.6	Conv. (cfs)		20.6	
Length Wtd. (ft)	41.85	Wetted Per. (ft)		6.61	
Min Ch El (ft)	1505.96	Shear (lb/sq ft)		0.02	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		0.04	
C & E Loss (ft)	0.00	Cum SA (acres)		0.01	

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

CROSS SECTION RIVER: ADOT
REACH: Exst Channel US RS: 1770.98

INPUT
Description: ADOT Channel - Surveyed xsec
Station Elevation Data num= 6

Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
861510.654	871510.604	971505.873	103 1505.87	1231515.312
124 1515.29				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	44.48	44.48	44.48	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1506.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.		0.015	
W.S. Elev (ft)	1505.97	Reach Len. (ft)	44.48	44.48	44.48
Crit W.S. (ft)	1505.97	Flow Area (sq ft)		0.63	
E.G. Slope (ft/ft)	0.005877	Area (sq ft)		0.63	
Q Total (cfs)	1.00	Flow (cfs)		1.00	
Top Width (ft)	6.43	Top Width (ft)		6.43	
Vel Total (ft/s)	1.60	Avg. Vel. (ft/s)		1.60	
Max Chl Dpth (ft)	0.10	Hydr. Depth (ft)		0.10	
Conv. Total (cfs)	13.0	Conv. (cfs)		13.0	
Length Wtd. (ft)	44.48	Wetted Per. (ft)		6.47	
Min Ch El (ft)	1505.87	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.06	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)		0.04	
C & E Loss (ft)	0.00	Cum SA (acres)		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: 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: ADOT
REACH: Exst Channel US RS: 1726.50

INPUT
Description: ADOT Channel - Surveyed xsec
Station Elevation Data num= 6

Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
861510.671	87 1510.62	971505.494	1031505.448	1231515.126
1241515.174				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1505.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.015	
W.S. Elev (ft)	1505.54	Reach Len. (ft)	69.92	69.92	69.92
Crit W.S. (ft)	1505.58	Flow Area (sq ft)		0.44	
E.G. Slope (ft/ft)	0.018660	Area (sq ft)		0.44	
Q Total (cfs)	1.00	Flow (cfs)		1.00	
Top Width (ft)	6.29	Top Width (ft)		6.29	
Vel Total (ft/s)	2.28	Avg. Vel. (ft/s)		2.28	
Max Chl Dpth (ft)	0.09	Hydr. Depth (ft)		0.07	
Conv. Total (cfs)	7.3	Conv. (cfs)		7.3	
Length Wtd. (ft)	69.92	Wetted Per. (ft)		6.32	
Min Ch El (ft)	1505.45	Shear (lb/sq ft)		0.08	
Alpha	1.00	Stream Power (lb/ft s)		0.18	
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)		0.02	
C & E Loss (ft)	0.00	Cum SA (acres)			

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: ADOT
REACH: Exst Channel DS RS: 1650

INPUT
Description: ADOT Channel - Interpolated xsec
Station Elevation Data num= 6

Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
86 1510.15	87 1510.15	97 1505.11	103 1505.08	123 1514.55
124 1514.55				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	19.25	19.25	19.25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1509.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.		0.015	
W.S. Elev (ft)	1508.40	Reach Len. (ft)	19.25	19.25	19.25
Crit W.S. (ft)	1508.44	Flow Area (sq ft)		42.22	
E.G. Slope (ft/ft)	0.002965	Area (sq ft)		42.22	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	19.54	Top Width (ft)		19.54	
Vel Total (ft/s)	8.57	Avg. Vel. (ft/s)		8.57	

Max Chl Dpth (ft)	3.32	Hydr. Depth (ft)	2.16
Conv. Total (cfs)	6647.9	Conv. (cfs)	6647.9
Length Wtd. (ft)	19.25	Wetted Per. (ft)	21.07
Min Ch El (ft)	1505.08	Shear (lb/sq ft)	0.37
Alpha	1.00	Stream Power (lb/ft s)	3.18
Frctn Loss (ft)	1.17	Cum Volume (acre-ft)	0.39
C & E Loss (ft)	0.35	Cum SA (acres)	0.20

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 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: During supercritical flow calculations a junction was encountered. During standard step calculations the program used the stream with the greatest momentum to balance the energy equation.
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: ADOT
REACH: Exst Channel DS RS: 1630.75

INPUT
Description: ADOT Channel - Surveyed xsec 2
Station Elevation Data num= 6

Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
861510.114	871510.021	971504.958	1031504.981	1231514.464
1241514.462				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	48.08	48.08	48.08	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1509.45	Wt. n-Val.		0.015	
Vel Head (ft)	1.35	Reach Len. (ft)	48.08	48.08	48.08
W.S. Elev (ft)	1508.10	Flow Area (sq ft)		38.85	
Crit W.S. (ft)	1508.32	Area (sq ft)		38.85	
E.G. Slope (ft/ft)	0.003711	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		18.80	
Top Width (ft)	18.80	Avg. Vel. (ft/s)		9.32	
Vel Total (ft/s)	9.32	Hydr. Depth (ft)		2.07	
Max Chl Dpth (ft)	3.15	Conv. (cfs)		5942.1	
Conv. Total (cfs)	5942.1	Wetted Per. (ft)		20.25	
Length Wtd. (ft)	48.08	Shear (lb/sq ft)		0.44	
Min Ch El (ft)	1504.96	Stream Power (lb/ft s)		4.14	
Alpha	1.00	Cum Volume (acre-ft)		0.37	
Frctn Loss (ft)	0.06	Cum SA (acres)		0.19	
C & E Loss (ft)	0.02				

CROSS SECTION RIVER: ADOT
REACH: Exst Channel DS RS: 1582.67

INPUT
Description: ADOT Channel - Most DS surveyed xsec
Station Elevation Data num= 6

Sta Elev	Sta Elev	Sta Elev	Sta Elev	Sta Elev
861509.879	871509.841	971504.726	1031504.733	1231514.128
1241514.114				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta:	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
	123	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1509.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.47	Wt. n-Val.		0.015	
W.S. Elev (ft)	1507.77	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1508.07	Flow Area (sq ft)		37.19	
E.G. Slope (ft/ft)	0.004178	Area (sq ft)		37.19	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	18.43	Top Width (ft)		18.43	
Vel Total (ft/s)	9.73	Avg. Vel. (ft/s)		9.73	
Max Chl Dpth (ft)	3.05	Hydr. Depth (ft)		2.02	
Conv. Total (cfs)	5600.4	Conv. (cfs)		5600.4	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		19.85	
Min Ch El (ft)	1504.73	Shear (lb/sq ft)		0.49	
Alpha	1.00	Stream Power (lb/ft s)		4.76	
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)		0.33	
C & E Loss (ft)	0.01	Cum SA (acres)		0.17	

CROSS SECTION RIVER: ADOT
REACH: Exst Channel DS RS: 1382.67

INPUT
Description: ADOT Channel (Extended)
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1509.01	87	1508.92	97	1503.86	103	1503.88	123	1513.36
124	1513.36								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1508.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.52	Wt. n-Val.		0.015	
W.S. Elev (ft)	1506.88	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1507.21	Flow Area (sq ft)		36.60	
E.G. Slope (ft/ft)	0.004367	Area (sq ft)		36.60	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	18.30	Top Width (ft)		18.30	
Vel Total (ft/s)	9.89	Avg. Vel. (ft/s)		9.89	
Max Chl Dpth (ft)	3.02	Hydr. Depth (ft)		2.00	
Conv. Total (cfs)	5478.0	Conv. (cfs)		5478.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		19.70	
Min Ch El (ft)	1503.86	Shear (lb/sq ft)		0.51	
Alpha	1.00	Stream Power (lb/ft s)		5.01	
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		0.16	
C & E Loss (ft)	0.00	Cum SA (acres)		0.08	

CROSS SECTION RIVER: ADOT
REACH: Exst Channel DS RS: 1182.67

INPUT
Description: ADOT Channel (Extended)
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1507.91	87	1507.82	97	1502.76	103	1502.78	123	1512.26
124	1512.26								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	0	0	0	.1	.3

CROSS SECTION OUTPUT   Profile #PF 1

E.G. Elev (ft)	1507.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.79	Wt. n-Val.		0.015	
W.S. Elev (ft)	1505.62	Reach Len. (ft)			
Crit W.S. (ft)	1506.12	Flow Area (sq ft)		33.70	
E.G. Slope (ft/ft)	0.005466	Area (sq ft)		33.70	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	17.65	Top Width (ft)		17.65	
Vel Total (ft/s)	10.74	Avg. Vel. (ft/s)		10.74	
Max Chl Dpth (ft)	2.86	Hydr. Depth (ft)		1.91	
Conv. Total (cfs)	4896.5	Conv. (cfs)		4896.5	
Length Wtd. (ft)		Wetted Per. (ft)		18.97	
Min Ch El (ft)	1502.76	Shear (lb/sq ft)		0.61	
Alpha	1.00	Stream Power (lb/ft s)		6.51	
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)			
C & E Loss (ft)	0.03	Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Basin 5

Reach	River Sta.	n1	n2	n3	n4	n5	n6
Outlet Channel	3774.5	.035	.02	.035			
Outlet Channel	3474.5	.035	.02	.035			
Outlet Channel	3174.5	.035	.02	.035			
Outlet Channel	3013	.035	.02	.035			
Outlet Channel	2988	.035	.02	.035			
Outlet Channel	2963	.035	.02	.035			
Outlet Channel	2938	.035	.02	.035			
Outlet Channel	2912.97	.035	.02	.035			
Outlet Channel	2866.97	.035	.02	.035			
Outlet Channel	2866.96	.035	.033	.014	.014	.033	.035
Outlet Channel	2853.97	.035	.033	.014	.014	.033	.035
Outlet Channel	2852.97	.035	.014	.035			
Outlet Channel	2852.96	.035	.014	.035			
Outlet Channel	2818.47	.035	.014	.035			
Outlet Channel	2816.97	.035	.014	.035			
Outlet Channel	2816.96	.035	.033	.035			
Outlet Channel	2784.97	.035	.033	.035			
Outlet Channel	2784.96	.035	.02	.035			
Outlet Channel	2760.97	.035	.02	.035			
Outlet Channel	2735.97	.035	.02	.035			
Outlet Channel	2632.97	.035	.02	.035			
Outlet Channel	2588	.035	.02	.035			
Outlet Channel	2563	.035	.02	.035			
Outlet Channel	2538	.035	.02	.035			
Outlet Channel	2513	.035	.02	.035			
Outlet Channel	2487.97	.035	.02	.035			
Outlet Channel	2441.97	.035	.02	.035			
Outlet Channel	2441.96	.035	.033	.014	.033	.035	
Outlet Channel	2428.97	.035	.033	.014	.033	.035	
Outlet Channel	2427.97	.035	.014	.035			
Outlet Channel	2427.96	.035	.014	.035			
Outlet Channel	2393.47	.035	.014	.035			
Outlet Channel	2391.97	.035	.014	.035			
Outlet Channel	2391.96	.035	.033	.035			
Outlet Channel	2359.97	.035	.035	.035			
Outlet Channel	2359.96	.035	.02	.035			
Outlet Channel	2335.97	.035	.02	.035			
Outlet Channel	2310.97	.035	.02	.035			
Outlet Channel	2107.96	.035	.02	.035			
Outlet Channel	1836.83	.035	.02	.035			
Outlet Channel	1805.33	.035	.02	.035			
Outlet Channel	1781.27	.035	.02	.035			

Outlet Channel	1781.26	.035	.033	.035
Outlet Channel	1771.26	.035	.033	.035
Outlet Channel	1764.26	.035	.033	.035
Outlet Channel	1722.18	Culvert		
Outlet Channel	1680.10	.015	.015	.015

River:ADOT

Reach	River Sta.	n1	n2	n3
Exst Channel US	1812.83	.035	.015	.035
Exst Channel US	1770.98	.035	.015	.035
Exst Channel US	1726.50	.035	.015	.035
Exst Channel DS	1650	.035	.015	.035
Exst Channel DS	1630.75	.035	.015	.035
Exst Channel DS	1582.67	.035	.015	.035
Exst Channel DS	1382.67	.035	.015	.035
Exst Channel DS	1182.67	.035	.015	.035

SUMMARY OF REACH LENGTHS

River: Basin 5

Reach	River Sta.	Left	Channel	Right
Outlet Channel	3774.5	300	300	300
Outlet Channel	3474.5	300	300	300
Outlet Channel	3174.5	161.5	161.5	161.5
Outlet Channel	3013	25	25	25
Outlet Channel	2988	25	25	25
Outlet Channel	2963	25	25	25
Outlet Channel	2938	25.03	25.03	25.03
Outlet Channel	2912.97	46	46	46
Outlet Channel	2866.97	.01	.01	.01
Outlet Channel	2866.96	12.99	12.99	12.99
Outlet Channel	2853.97	1	1	1
Outlet Channel	2852.97	.01	.01	.01
Outlet Channel	2852.96	34.49	34.49	34.49
Outlet Channel	2818.47	1.5	1.5	1.5
Outlet Channel	2816.97	.01	.01	.01
Outlet Channel	2816.96	31.99	31.99	31.99
Outlet Channel	2784.97	.01	.01	.01
Outlet Channel	2784.96	23.99	23.99	23.99
Outlet Channel	2760.97	25	25	25
Outlet Channel	2735.97	103	103	103
Outlet Channel	2632.97	44.97	44.97	44.97
Outlet Channel	2588	25	25	25
Outlet Channel	2563	25	25	25
Outlet Channel	2538	25	25	25
Outlet Channel	2513	25.03	25.03	25.03
Outlet Channel	2487.97	46	46	46
Outlet Channel	2441.97	.01	.01	.01
Outlet Channel	2441.96	12.99	12.99	12.99
Outlet Channel	2428.97	1	1	1
Outlet Channel	2427.97	.01	.01	.01
Outlet Channel	2427.96	34.49	34.49	34.49
Outlet Channel	2393.47	1.5	1.5	1.5
Outlet Channel	2391.97	.01	.01	.01
Outlet Channel	2391.96	31.99	31.99	31.99
Outlet Channel	2359.97	.01	.01	.01
Outlet Channel	2359.96	23.99	23.99	23.99
Outlet Channel	2335.97	25	25	25
Outlet Channel	2310.97	203.01	203.01	203.01
Outlet Channel	2107.96	271.13	271.13	271.13
Outlet Channel	1836.83	31.5	31.5	31.5
Outlet Channel	1805.33	24.06	24.06	24.06
Outlet Channel	1781.27	.01	.01	.01
Outlet Channel	1781.26	10	10	10

Outlet Channel	1771.26	7	7	7
Outlet Channel	1764.26	84.16	84.16	84.16
Outlet Channel	1722.18	Culvert		
Outlet Channel	1680.10	0	0	0

River: ADOT

Reach	River Sta.	Left	Channel	Right
Exst Channel US	1812.83	41.85	41.85	41.85
Exst Channel US	1770.98	44.48	44.48	44.48
Exst Channel US	1726.50	0	0	0
Exst Channel DS	1650	19.25	19.25	19.25
Exst Channel DS	1630.75	48.08	48.08	48.08
Exst Channel DS	1582.67	200	200	200
Exst Channel DS	1382.67	200	200	200
Exst Channel DS	1182.67	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Basin 5

Reach	River Sta.	Contr.	Expan.
Outlet Channel	3774.5	.1	.3
Outlet Channel	3474.5	.1	.3
Outlet Channel	3174.5	.1	.3
Outlet Channel	3013	.1	.3
Outlet Channel	2988	.1	.3
Outlet Channel	2963	.1	.3
Outlet Channel	2938	.1	.3
Outlet Channel	2912.97	.1	.3
Outlet Channel	2866.97	.1	.3
Outlet Channel	2866.96	.1	.3
Outlet Channel	2853.97	.1	.3
Outlet Channel	2852.97	.1	.3
Outlet Channel	2852.96	.1	.3
Outlet Channel	2818.47	.1	.3
Outlet Channel	2816.97	.1	.3
Outlet Channel	2816.96	.1	.3
Outlet Channel	2784.97	.1	.3
Outlet Channel	2784.96	.1	.3
Outlet Channel	2760.97	.1	.3
Outlet Channel	2735.97	.1	.3
Outlet Channel	2632.97	.1	.3
Outlet Channel	2588	.1	.3
Outlet Channel	2563	.1	.3
Outlet Channel	2538	.1	.3
Outlet Channel	2513	.1	.3
Outlet Channel	2487.97	.1	.3
Outlet Channel	2441.97	.1	.3
Outlet Channel	2441.96	.1	.3
Outlet Channel	2428.97	.1	.3
Outlet Channel	2427.97	.1	.3
Outlet Channel	2427.96	.1	.3
Outlet Channel	2393.47	.1	.3
Outlet Channel	2391.97	.1	.3
Outlet Channel	2391.96	.1	.3
Outlet Channel	2359.97	.1	.3
Outlet Channel	2359.96	.1	.3
Outlet Channel	2335.97	.1	.3
Outlet Channel	2310.97	.1	.3
Outlet Channel	2107.96	.1	.3
Outlet Channel	1836.83	.1	.3
Outlet Channel	1805.33	.1	.3
Outlet Channel	1781.27	.1	.3
Outlet Channel	1781.26	.1	.3
Outlet Channel	1771.26	.1	.3

Outlet Channel	1764.26	.1	.3
Outlet Channel	1722.18	Culvert	
Outlet Channel	1680.10	.1	.3

River: ADOT

Reach	River Sta.	Contr.	Expan.
Exst Channel US	1812.83	.1	.3
Exst Channel US	1770.98	.1	.3
Exst Channel US	1726.50	.1	.3
Exst Channel DS	1650	.1	.3
Exst Channel DS	1630.75	.1	.3
Exst Channel DS	1582.67	.1	.3
Exst Channel DS	1382.67	.1	.3
Exst Channel DS	1182.67	.1	.3

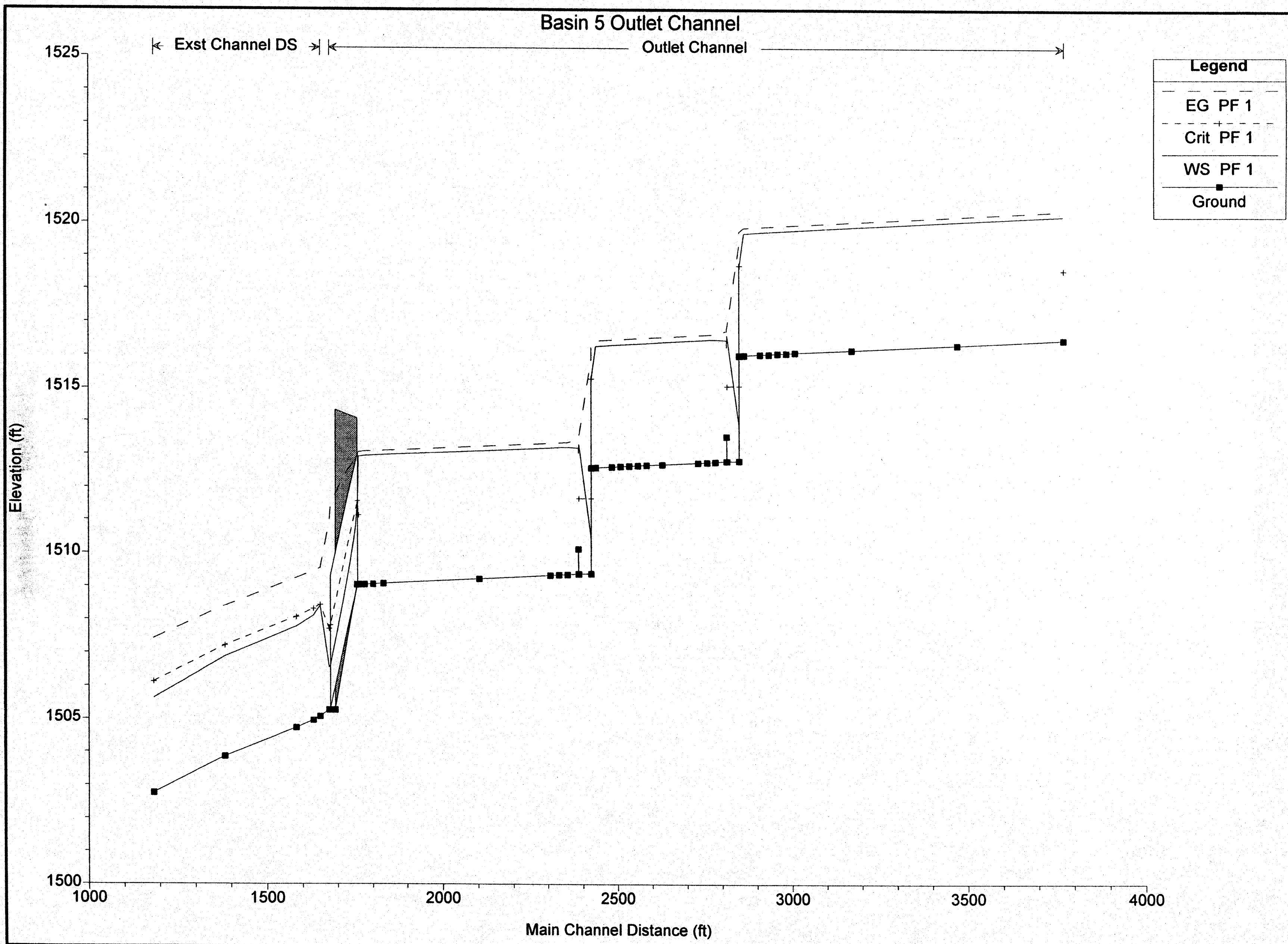
Profile Output Table - Standard Table 1

River	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
ADOT	Exst Channel US	1812.83	1.00	1505.96	1506.14	1506.11	1506.17	0.002366	1.21	0.83	6.55	0.60
ADOT	Exst Channel US	1770.98	1.00	1505.87	1505.97	1505.97	1506.01	0.005877	1.60	0.63	6.43	0.90
ADOT	Exst Channel US	1726.50	1.00	1505.45	1505.54	1505.58	1505.62	0.018660	2.28	0.44	6.29	1.52
ADOT	Exst Channel DS	1650	362.00	1505.08	1508.40	1508.44	1509.54	0.002965	8.57	42.22	19.54	1.03
ADOT	Exst Channel DS	1630.75	362.00	1504.96	1508.10	1508.32	1509.45	0.003711	9.32	38.85	18.80	1.14
ADOT	Exst Channel DS	1582.67	362.00	1504.73	1507.77	1508.07	1509.25	0.004178	9.73	37.19	18.43	1.21
ADOT	Exst Channel DS	1382.67	362.00	1503.86	1506.88	1507.21	1508.40	0.004367	9.89	36.60	18.30	1.23
ADOT	Exst Channel DS	1182.67	362.00	1502.76	1505.62	1506.12	1507.41	0.005466	10.74	33.70	17.65	1.37
Basin 5	Outlet Channel	3774.5	362.00	1516.45	1520.18	1518.54	1520.33	0.000536	3.14	115.30	45.83	0.35
Basin 5	Outlet Channel	3474.5	362.00	1516.30	1520.02		1520.17	0.000544	3.16	114.67	45.72	0.35
Basin 5	Outlet Channel	3174.5	362.00	1516.15	1519.85		1520.01	0.000554	3.18	113.91	45.59	0.35
Basin 5	Outlet Channel	3013	362.00	1516.08	1519.76		1519.92	0.000568	3.21	112.86	45.41	0.36
Basin 5	Outlet Channel	2988	362.00	1516.06	1519.74		1519.90	0.000565	3.20	113.12	45.45	0.36
Basin 5	Outlet Channel	2963	362.00	1516.05	1519.73		1519.89	0.000567	3.21	112.93	45.42	0.36
Basin 5	Outlet Channel	2938	362.00	1516.03	1519.71		1519.87	0.000564	3.20	113.20	45.47	0.36
Basin 5	Outlet Channel	2912.97	362.00	1516.02	1519.70		1519.86	0.000566	3.20	113.01	45.43	0.36
Basin 5	Outlet Channel	2866.97	362.00	1516.00	1519.66		1519.83	0.000606	3.32	109.00	43.56	0.37
Basin 5	Outlet Channel	2866.96	362.00	1516.00	1519.66		1519.83	0.000668	3.32	109.00	43.56	0.37
Basin 5	Outlet Channel	2853.97	362.00	1515.99	1518.70	1518.70	1519.73	0.004918	8.13	44.53	21.85	1.00
Basin 5	Outlet Channel	2852.97	362.00	1515.99	1518.70	1518.70	1519.73	0.002461	8.14	44.45	21.83	1.01
Basin 5	Outlet Channel	2852.96	362.00	1512.79	1513.86	1515.06	1519.28	0.034007	18.68	19.38	20.27	3.37
Basin 5	Outlet Channel	2818.47	362.00	1512.78	1516.59	1515.05	1516.84	0.000376	4.02	90.13	31.26	0.42
Basin 5	Outlet Channel	2816.97	362.00	1513.53	1516.24		1516.81	0.001271	6.09	59.45	27.94	0.74
Basin 5	Outlet Channel	2816.96	362.00	1512.78	1516.44		1516.72	0.002431	4.24	85.41	30.65	0.45
Basin 5	Outlet Channel	2784.97	362.00	1512.76	1516.47		1516.62	0.001493	3.17	114.33	45.67	0.35
Basin 5	Outlet Channel	2784.96	362.00	1512.76	1516.47		1516.62	0.000549	3.17	114.33	45.67	0.35
Basin 5	Outlet Channel	2760.97	362.00	1512.75	1516.45		1516.61	0.000550	3.17	114.19	45.64	0.35
Basin 5	Outlet Channel	2735.97	362.00	1512.73	1516.44		1516.60	0.000547	3.16	114.48	45.69	0.35
Basin 5	Outlet Channel	2632.97	362.00	1512.68	1516.38		1516.54	0.000551	3.17	114.16	45.64	0.35
Basin 5	Outlet Channel	2588	362.00	1512.67	1516.36		1516.52	0.000561	3.19	113.41	45.50	0.36
Basin 5	Outlet Channel	2563	362.00	1512.65	1516.34		1516.50	0.000557	3.18	113.69	45.55	0.36
Basin 5	Outlet Channel	2538	362.00	1512.64	1516.33		1516.49	0.000560	3.19	113.50	45.52	0.36
Basin 5	Outlet Channel	2513	362.00	1512.62	1516.32		1516.47	0.000556	3.18	113.78	45.57	0.35
Basin 5	Outlet Channel	2487.97	362.00	1512.61	1516.30		1516.46	0.000558	3.19	113.60	45.54	0.36
Basin 5	Outlet Channel	2441.97	362.00	1512.59	1516.26		1516.43	0.000597	3.30	109.59	43.67	0.37
Basin 5	Outlet Channel	2441.96	362.00	1512.59	1516.26		1516.43	0.001088	3.30	109.59	43.67	0.37
Basin 5	Outlet Channel	2428.97	362.00	1512.58	1515.29	1515.29	1516.32	0.007764	8.13	44.50	21.84	1.00
Basin 5	Outlet Channel	2427.97	362.00	1512.58	1515.29	1515.29	1516.32	0.002467	8.15	44.41	21.82	1.01
Basin 5	Outlet Channel	2427.96	362.00	1509.38	1510.45	1511.65	1515.87	0.034020	18.68	19.37	20.27	3.37
Basin 5	Outlet Channel	2393.47	362.00	1509.37	1513.30	1511.64	1513.53	0.000337	3.86	93.69	31.71	0.40
Basin 5	Outlet Channel	2391.97	362.00	1510.12	1513.02		1513.50	0.000982	5.56	65.07	28.82	0.65
Basin 5	Outlet Channel	2391.96	362.00	1509.37	1513.18		1513.43	0.002089	4.02	90.12	31.26	0.42
Basin 5	Outlet Channel	2359.97	362.00	1509.35	1513.21		1513.35	0.001430	2.99	121.26	46.86	0.33
Basin 5	Outlet Channel	2359.96	362.00	1509.35	1513.21		1513.35	0.000467	2.99	121.26	46.86	0.33
Basin 5	Outlet Channel	2335.97	362.00	1509.34	1513.20		1513.34	0.000467	2.99	121.20	46.85	0.33
Basin 5	Outlet Channel	2310.97	362.00	1509.33	1513.18		1513.32	0.000467	2.99	121.21	46.86	0.33
Basin 5	Outlet Channel	2107.96	362.00	1509.22	1513.09		1513.23	0.000460	2.97	121.91	46.97	0.32
Basin 5	Outlet Channel	1836.83	362.00	1509.08	1512.97		1513.10	0.000452	2.95	122.75	47.12	0.32

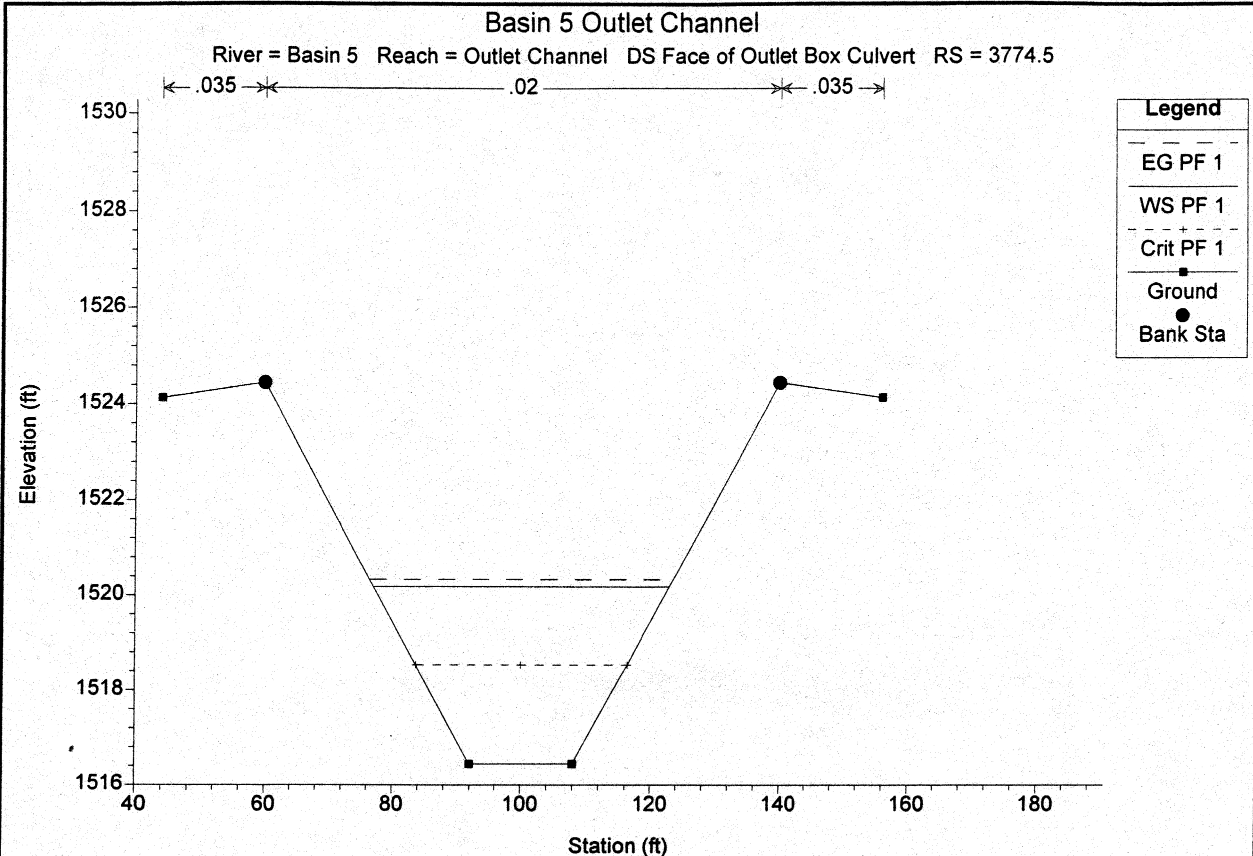
Basin 5	Outlet Channel	1805.33	362.00	1509.06	1512.96		1513.09	0.000449	2.94	123.02	47.16	0.32
Basin 5	Outlet Channel	1781.27	362.00	1509.05	1512.94		1513.08	0.000449	2.94	122.98	47.16	0.32
Basin 5	Outlet Channel	1781.26	362.00	1509.05	1512.94		1513.08	0.001223	2.94	122.98	47.16	0.32
Basin 5	Outlet Channel	1771.26	362.00	1509.05	1512.93		1513.07	0.001240	2.96	122.35	47.05	0.32
Basin 5	Outlet Channel	1764.26	362.00	1509.04	1512.92	1511.13	1513.06	0.001238	2.96	122.41	47.06	0.32
Basin 5	Outlet Channel	1722.18	Culvert									
Basin 5	Outlet Channel	1680.10	362.00	1505.27	1506.56	1507.70	1510.93	0.024748	16.77	21.58	16.75	0.32

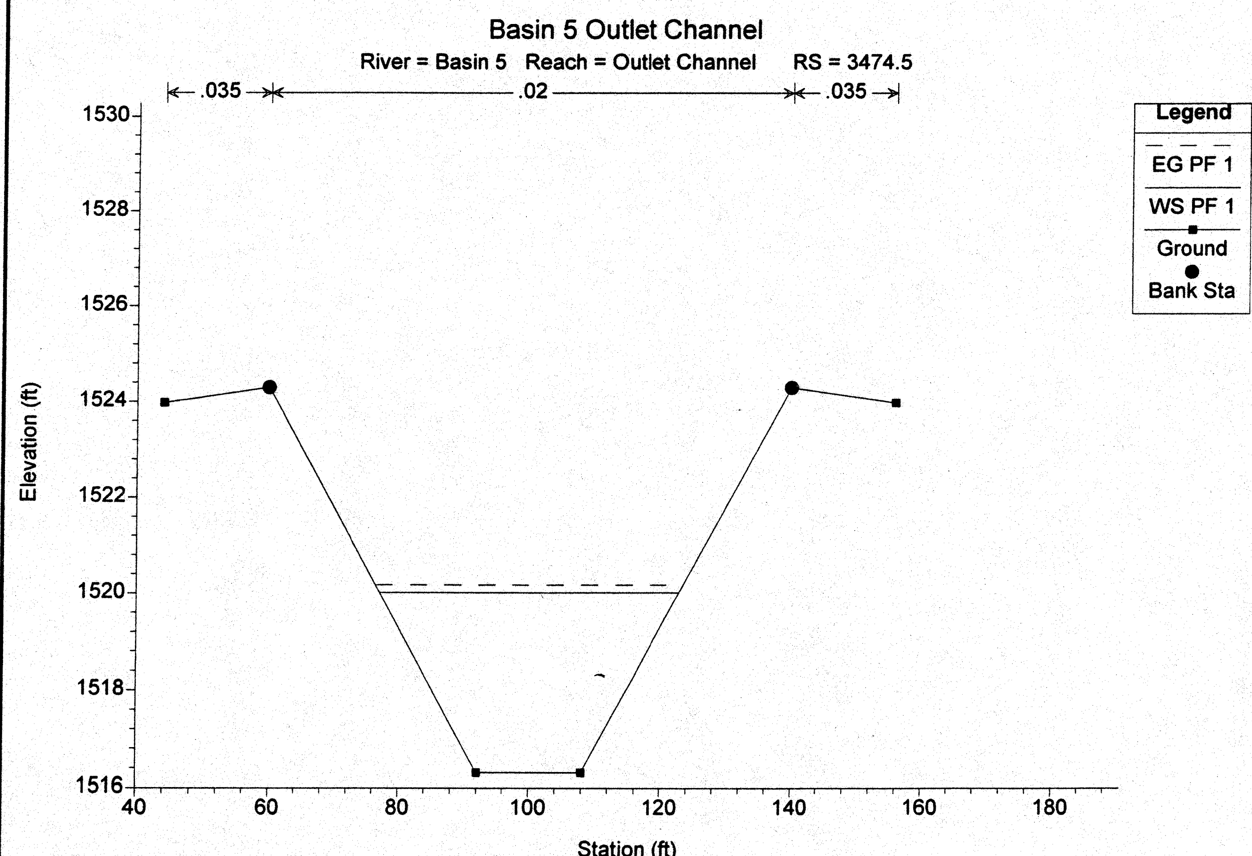
Profile Output Table - Standard Table 2

River	Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
ADOT	Exst Channel US	1812.83	1506.17	1506.14	0.02	0.15	0.00		1.00		6.55
ADOT	Exst Channel US	1770.98	1506.01	1505.97	0.04	0.24	0.00		1.00		6.43
ADOT	Exst Channel US	1726.50	1505.62	1505.54	0.08	0.40	0.00		1.00		6.29
ADOT	Exst Channel DS	1650	1509.54	1508.40	1.14	1.17	0.35		362.00		19.54
ADOT	Exst Channel DS	1630.75	1509.45	1508.10	1.35	0.06	0.02		362.00		18.80
ADOT	Exst Channel DS	1582.67	1509.25	1507.77	1.47	0.19	0.01		362.00		18.43
ADOT	Exst Channel DS	1382.67	1508.40	1506.88	1.52	0.85	0.00		362.00		18.30
ADOT	Exst Channel DS	1182.67	1507.41	1505.62	1.79	0.97	0.03		362.00		17.65
Basin 5	Outlet Channel	3774.5	1520.33	1520.18	0.15	0.16	0.00		362.00		45.83
Basin 5	Outlet Channel	3474.5	1520.17	1520.02	0.15	0.17	0.00		362.00		45.72
Basin 5	Outlet Channel	3174.5	1520.01	1519.85	0.16	0.09	0.00		362.00		45.59
Basin 5	Outlet Channel	3013	1519.92	1519.76	0.16	0.01	0.00		362.00		45.41
Basin 5	Outlet Channel	2988	1519.90	1519.74	0.16	0.01	0.00		362.00		45.45
Basin 5	Outlet Channel	2963	1519.89	1519.73	0.16	0.01	0.00		362.00		45.42
Basin 5	Outlet Channel	2938	1519.87	1519.71	0.16	0.01	0.00		362.00		45.47
Basin 5	Outlet Channel	2912.97	1519.86	1519.70	0.16	0.03	0.00		362.00		45.43
Basin 5	Outlet Channel	2866.97	1519.83	1519.66	0.17	0.00	0.00		362.00		43.56
Basin 5	Outlet Channel	2866.96	1519.83	1519.66	0.17	0.02	0.09		362.00		43.56
Basin 5	Outlet Channel	2853.97	1519.73	1518.70	1.03	0.00	0.00		362.00		21.85
Basin 5	Outlet Channel	2852.97	1519.73	1518.70	1.03	0.00	0.23		362.00		21.83
Basin 5	Outlet Channel	2852.96	1519.28	1513.86	5.42	0.00	0.44		362.00		20.27
Basin 5	Outlet Channel	2818.47	1516.84	1516.59	0.25	0.00	0.03		362.00		31.26
Basin 5	Outlet Channel	2816.97	1516.81	1516.24	0.58	0.00	0.09		362.00		27.94
Basin 5	Outlet Channel	2816.96	1516.72	1516.44	0.28	0.06	0.04		362.00		30.65
Basin 5	Outlet Channel	2784.97	1516.62	1516.47	0.16	0.00	0.00		362.00		45.67
Basin 5	Outlet Channel	2784.96	1516.62	1516.47	0.16	0.01	0.00		362.00		45.67
Basin 5	Outlet Channel	2760.97	1516.61	1516.45	0.16	0.01	0.00		362.00		45.64
Basin 5	Outlet Channel	2735.97	1516.60	1516.44	0.16	0.06	0.00		362.00		45.69
Basin 5	Outlet Channel	2632.97	1516.54	1516.38	0.16	0.03	0.00		362.00		45.64
Basin 5	Outlet Channel	2588	1516.52	1516.36	0.16	0.01	0.00		362.00		45.50
Basin 5	Outlet Channel	2563	1516.50	1516.34	0.16	0.01	0.00		362.00		45.55
Basin 5	Outlet Channel	2538	1516.49	1516.33	0.16	0.01	0.00		362.00		45.52
Basin 5	Outlet Channel	2513	1516.47	1516.32	0.16	0.01	0.00		362.00		45.57
Basin 5	Outlet Channel	2487.97	1516.46	1516.30	0.16	0.03	0.00		362.00		45.54
Basin 5	Outlet Channel	2441.97	1516.43	1516.26	0.17	0.00	0.00		362.00		43.67
Basin 5	Outlet Channel	2441.96	1516.43	1516.26	0.17	0.03	0.09		362.00		43.67
Basin 5	Outlet Channel	2428.97	1516.32	1515.29	1.03	0.00	0.00		362.00		21.84
Basin 5	Outlet Channel	2427.97	1516.32	1515.29	1.03	0.00	0.24		362.00		21.82
Basin 5	Outlet Channel	2427.96	1515.87	1510.45	5.42	0.00	0.44		362.00		20.27
Basin 5	Outlet Channel	2393.47	1513.53	1513.30	0.23	0.00	0.02		362.00		31.71
Basin 5	Outlet Channel	2391.97	1513.50	1513.02	0.48	0.00	0.07		362.00		28.82
Basin 5	Outlet Channel	2391.96	1513.43	1513.18	0.25	0.05	0.03		362.00		31.26
Basin 5	Outlet Channel	2359.97	1513.35	1513.21	0.14	0.00	0.00		362.00		46.86
Basin 5	Outlet Channel	2359.96	1513.35	1513.21	0.14	0.01	0.00		362.00		46.86
Basin 5	Outlet Channel	2335.97	1513.34	1513.20	0.14	0.01	0.00		362.00		46.85
Basin 5	Outlet Channel	2310.97	1513.32	1513.18	0.14	0.09	0.00		362.00		46.86
Basin 5	Outlet Channel	2107.96	1513.23	1513.09	0.14	0.12	0.00		362.00		46.97
Basin 5	Outlet Channel	1836.83	1513.10	1512.97	0.14	0.01	0.00		362.00		47.12
Basin 5	Outlet Channel	1805.33	1513.09	1512.96	0.13	0.01	0.00		362.00		47.16
Basin 5	Outlet Channel	1781.27	1513.08	1512.94	0.13	0.00	0.00		362.00		47.16
Basin 5	Outlet Channel	1781.26	1513.08	1512.94	0.13	0.01	0.00		362.00		47.16
Basin 5	Outlet Channel	1771.26	1513.07	1512.93	0.14	0.01	0.00		362.00		47.05
Basin 5	Outlet Channel	1764.26	1513.06	1512.92	0.14				362.00		47.06
Basin 5	Outlet Channel	1722.18	Culvert								
Basin 5	Outlet Channel	1680.10	1510.93	1506.56	4.37				362.00		16.75

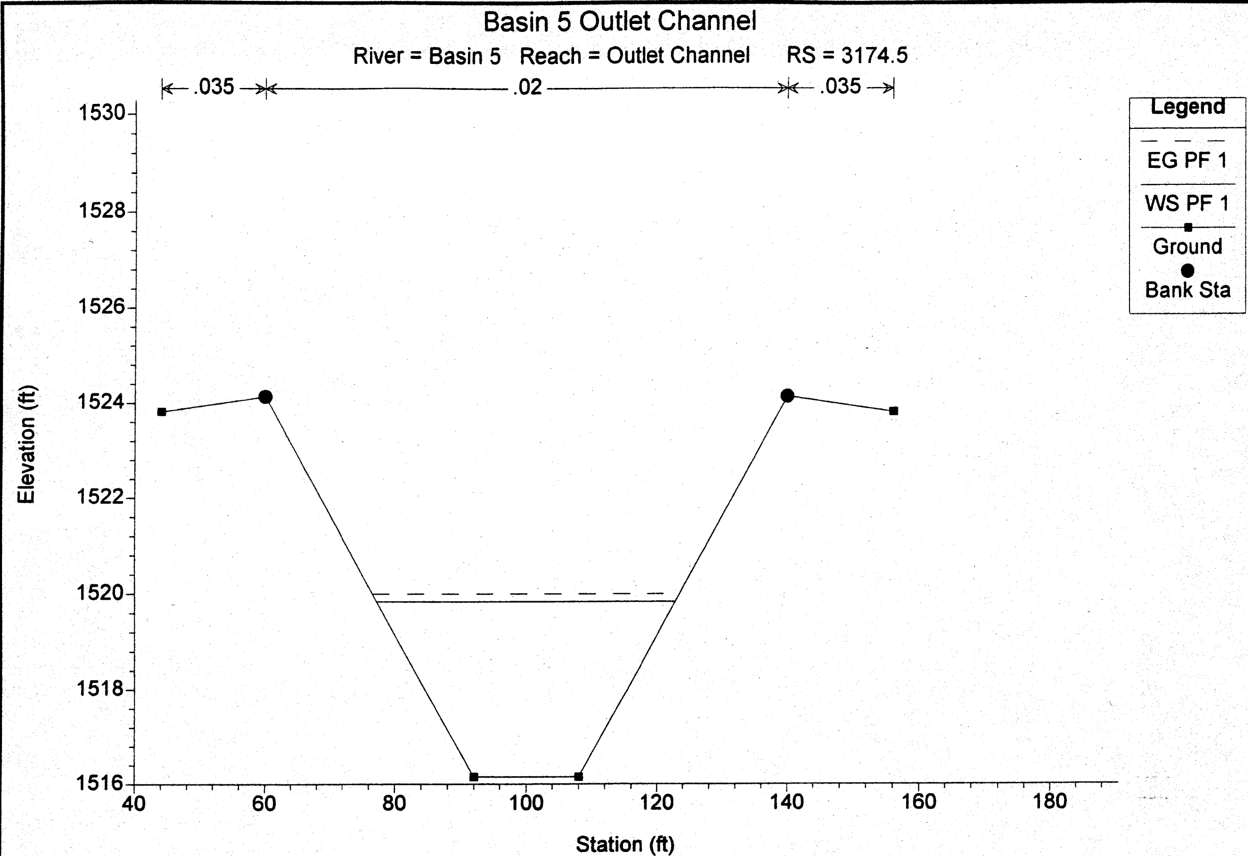


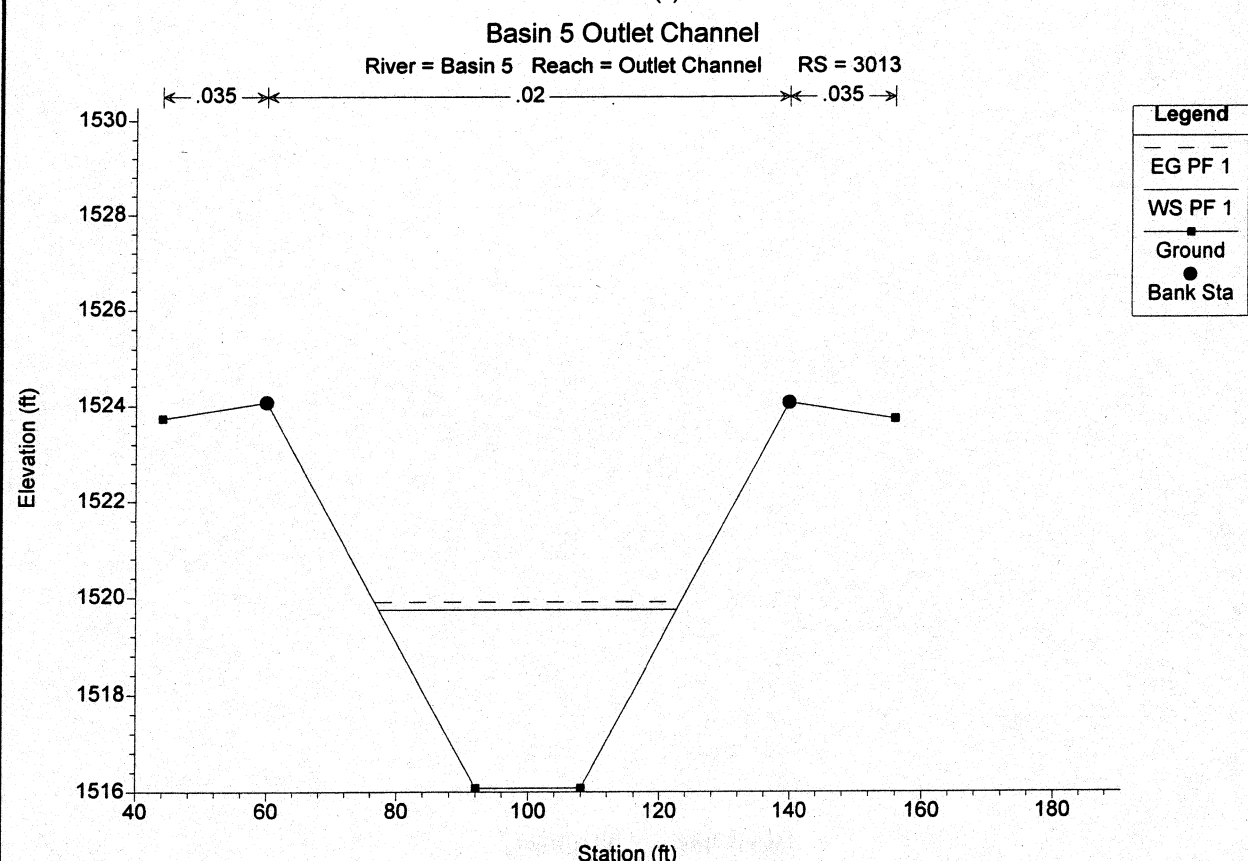
Basin 5 Outlet Channel
Exst Channel DS
Outlet Channel
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Elevation (ft)
1525
1520
1515
1510
1505
1500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)





1 in Horiz. = 30 ft 1 in Vert. = 4 ft





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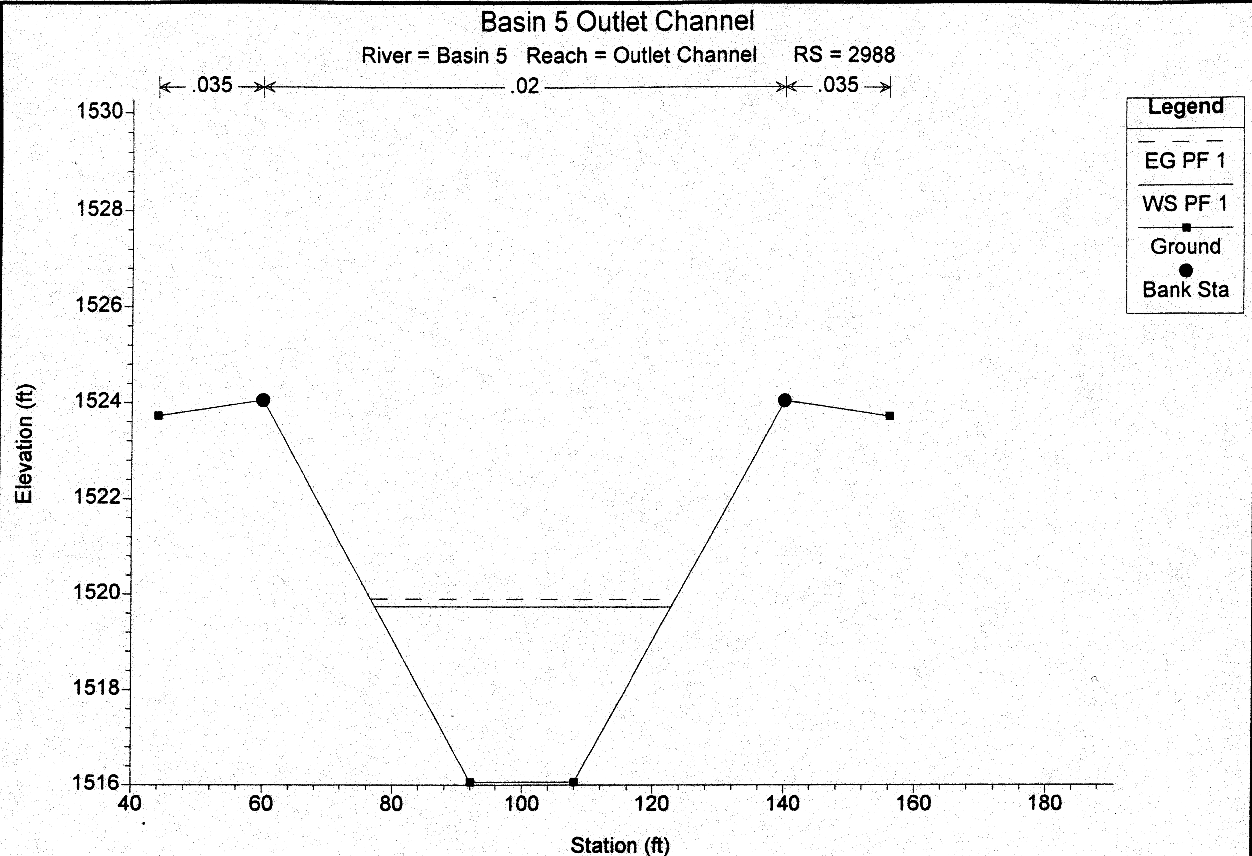
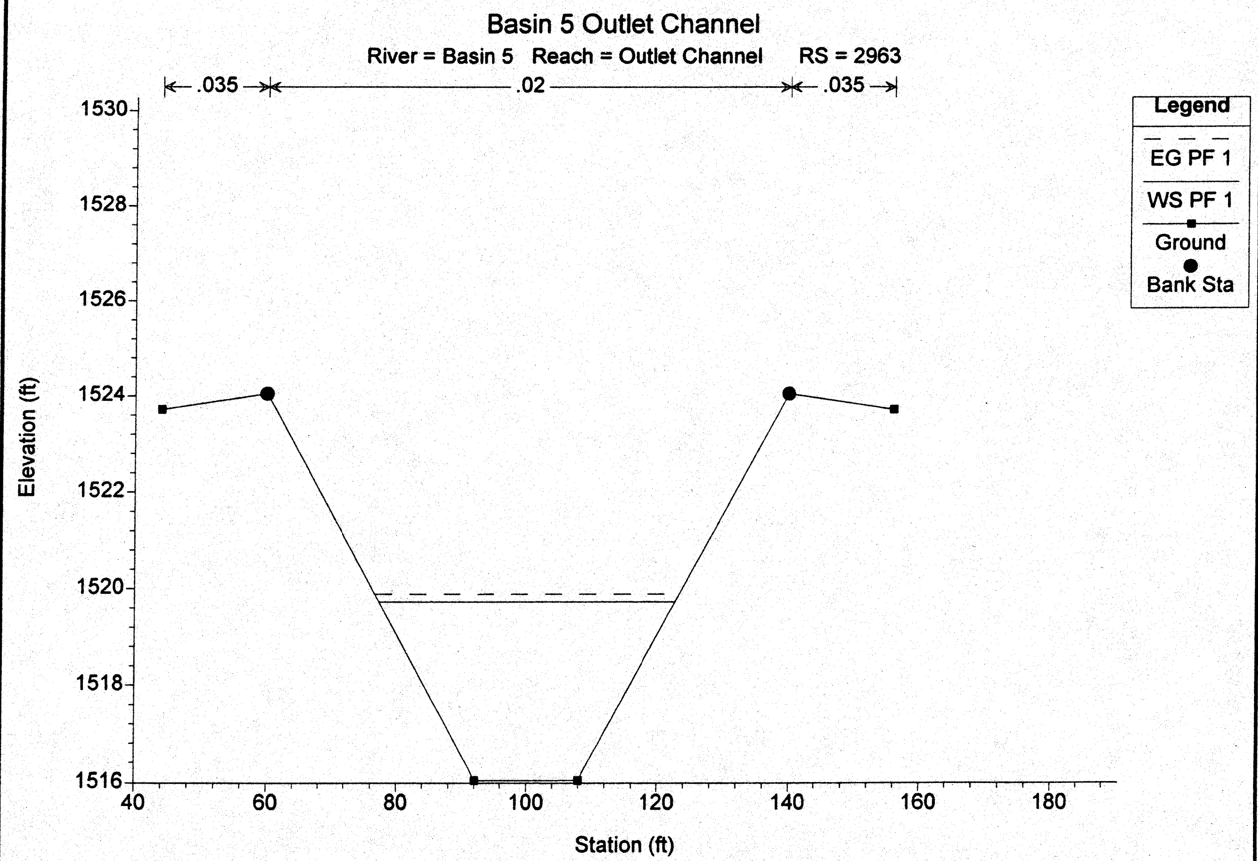
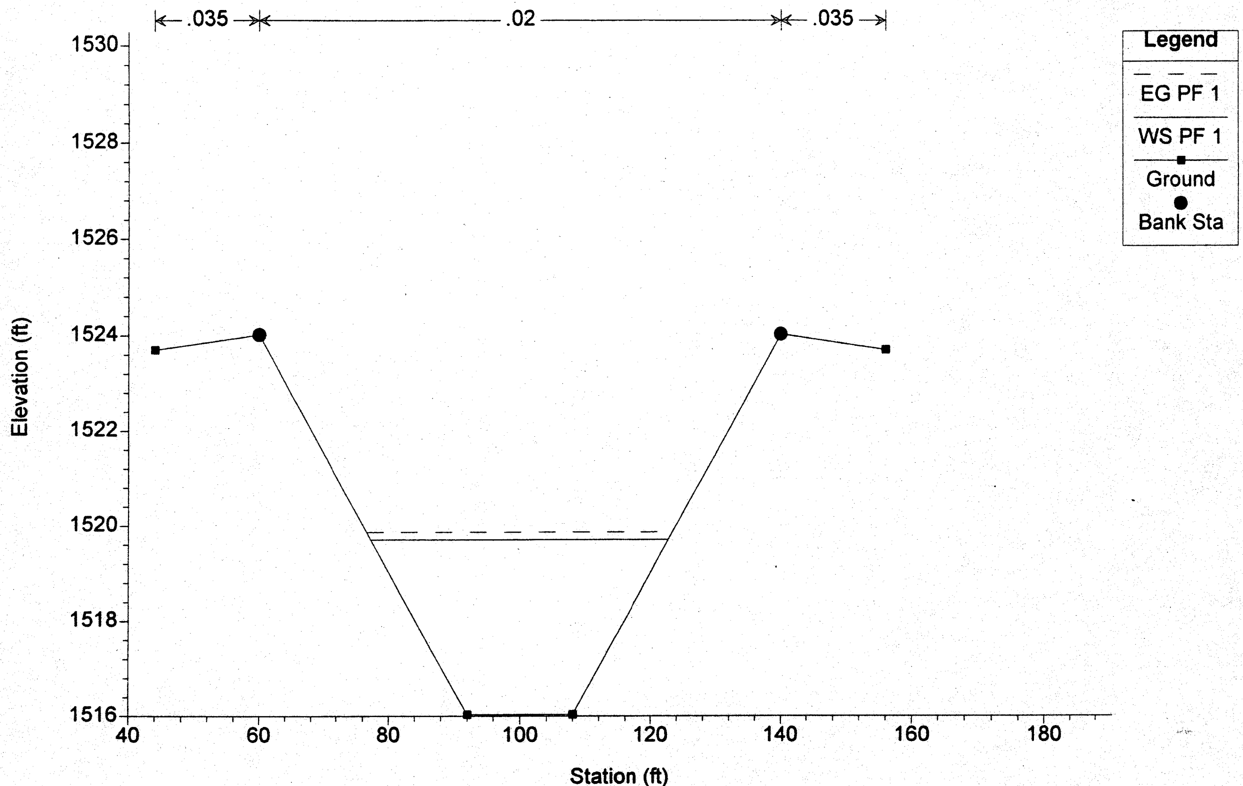




1 in Horiz. = 30 ft 1 in Vert. = 4 ft

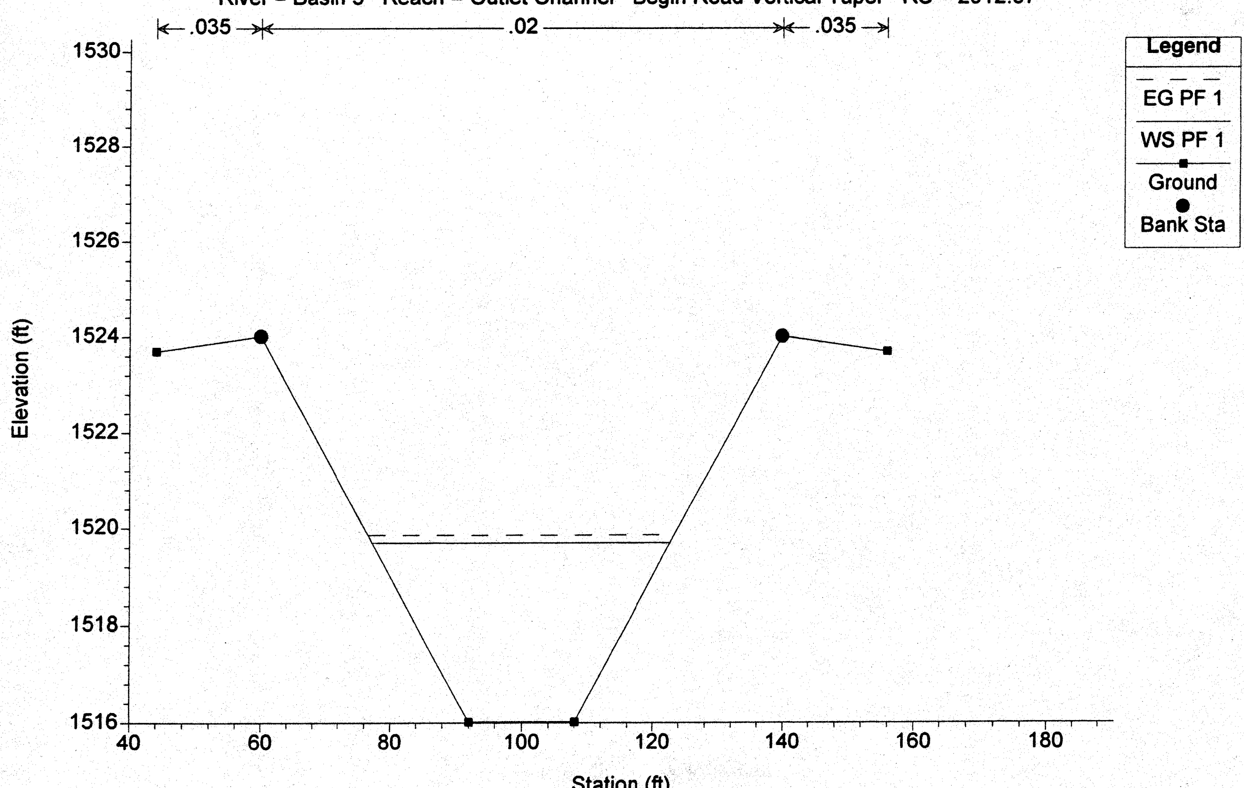
Basin 5 Outlet Channel

River = Basin 5 Reach = Outlet Channel RS = 2938



Basin 5 Outlet Channel

River = Basin 5 Reach = Outlet Channel Begin Road Vertical Taper RS = 2912.97



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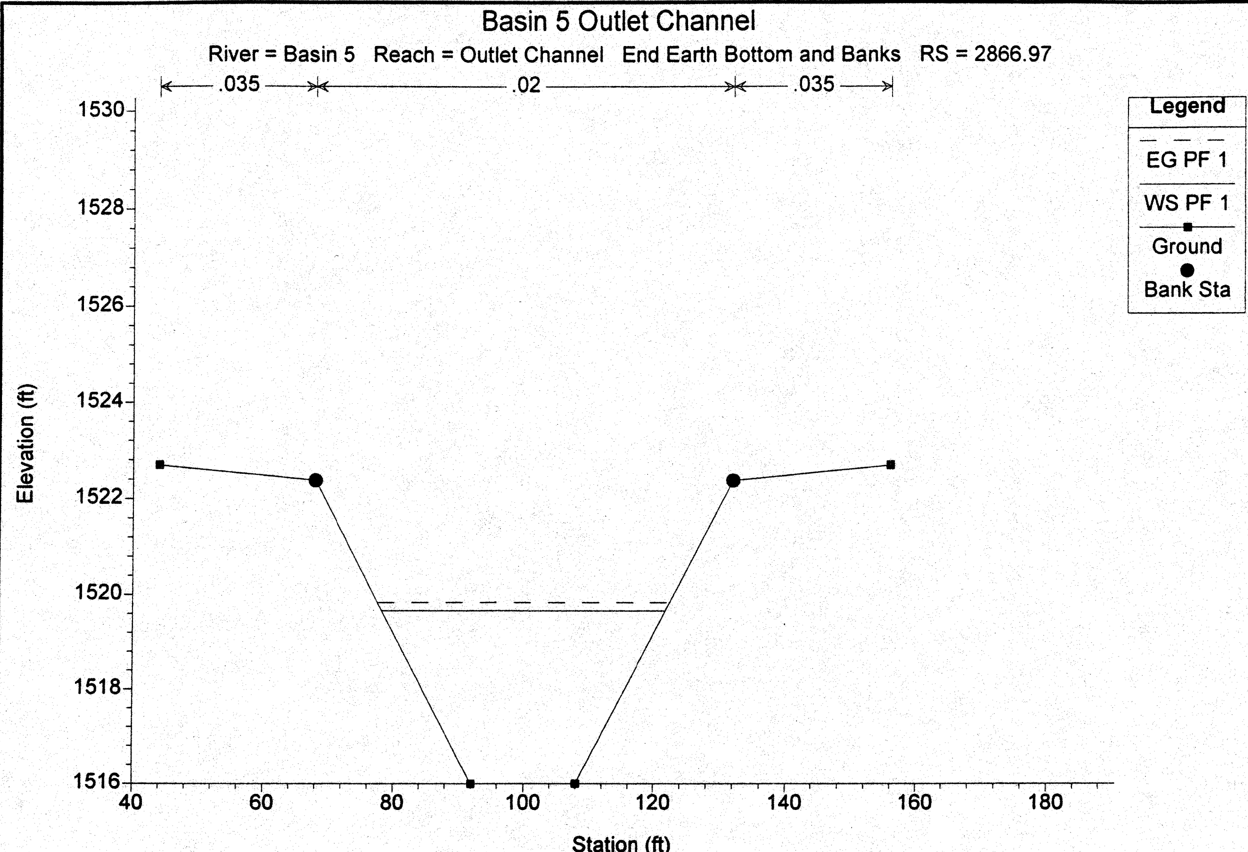

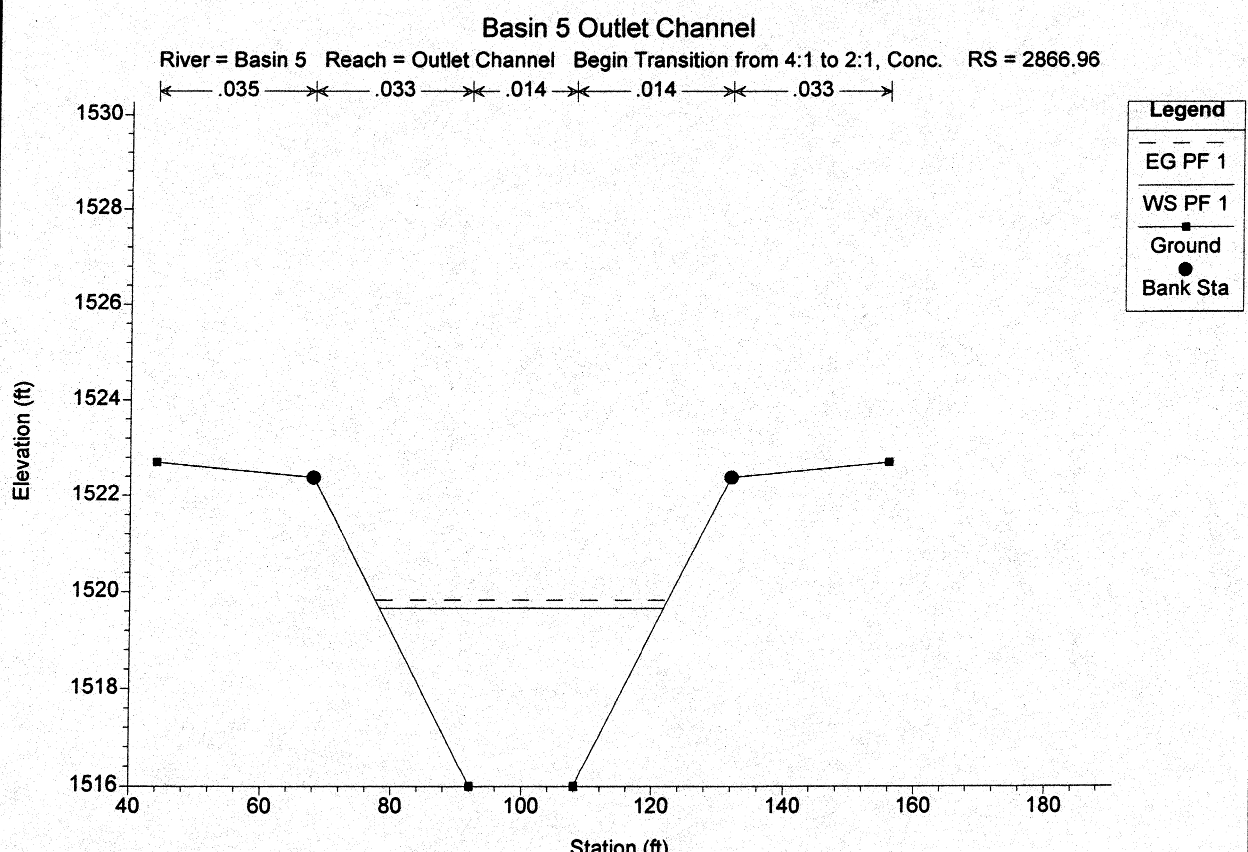

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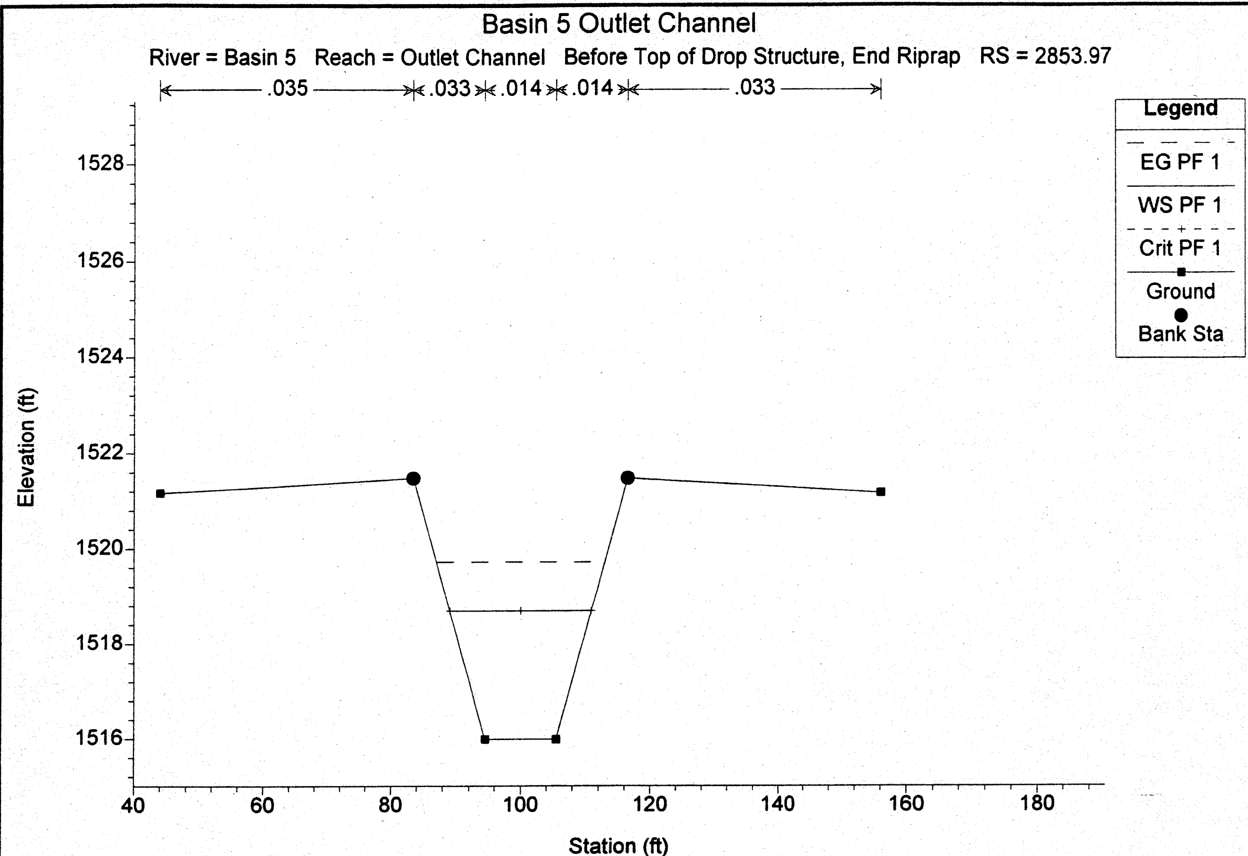

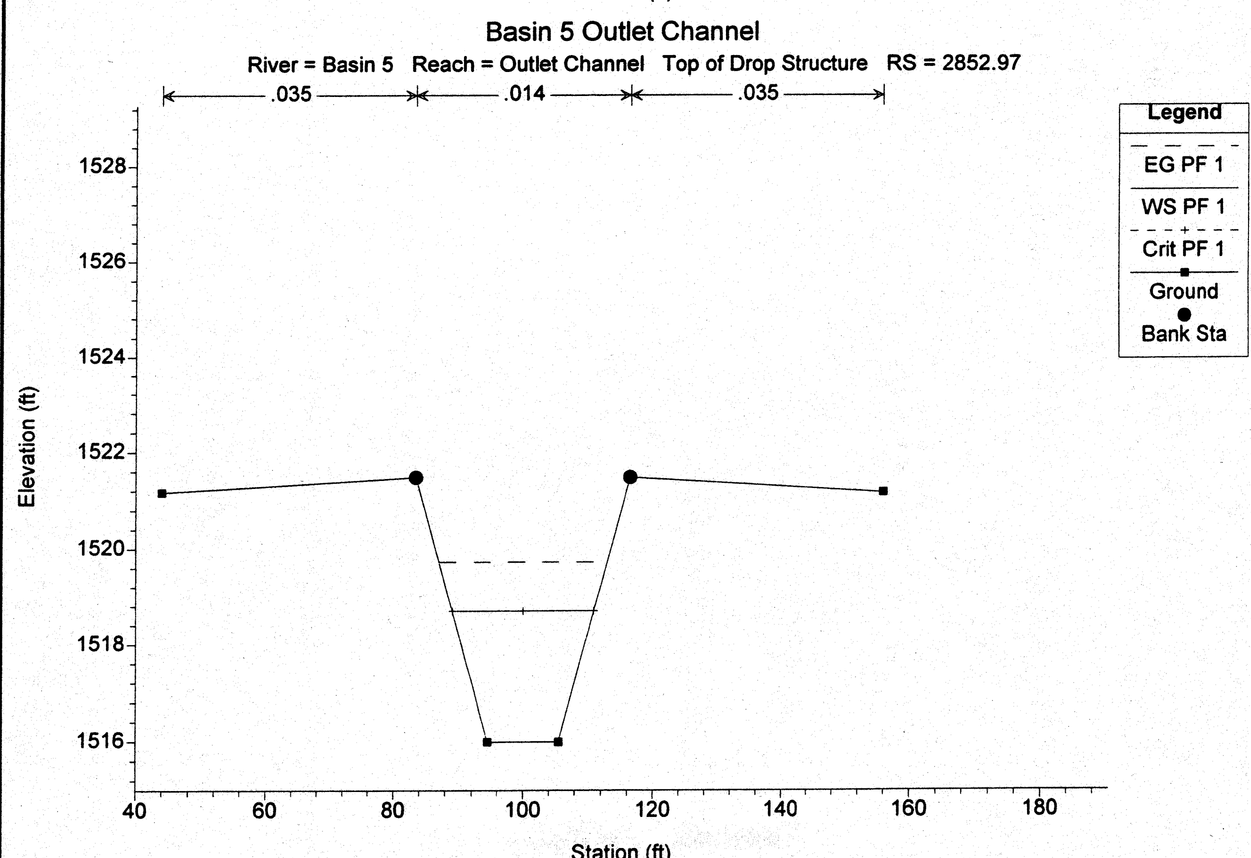

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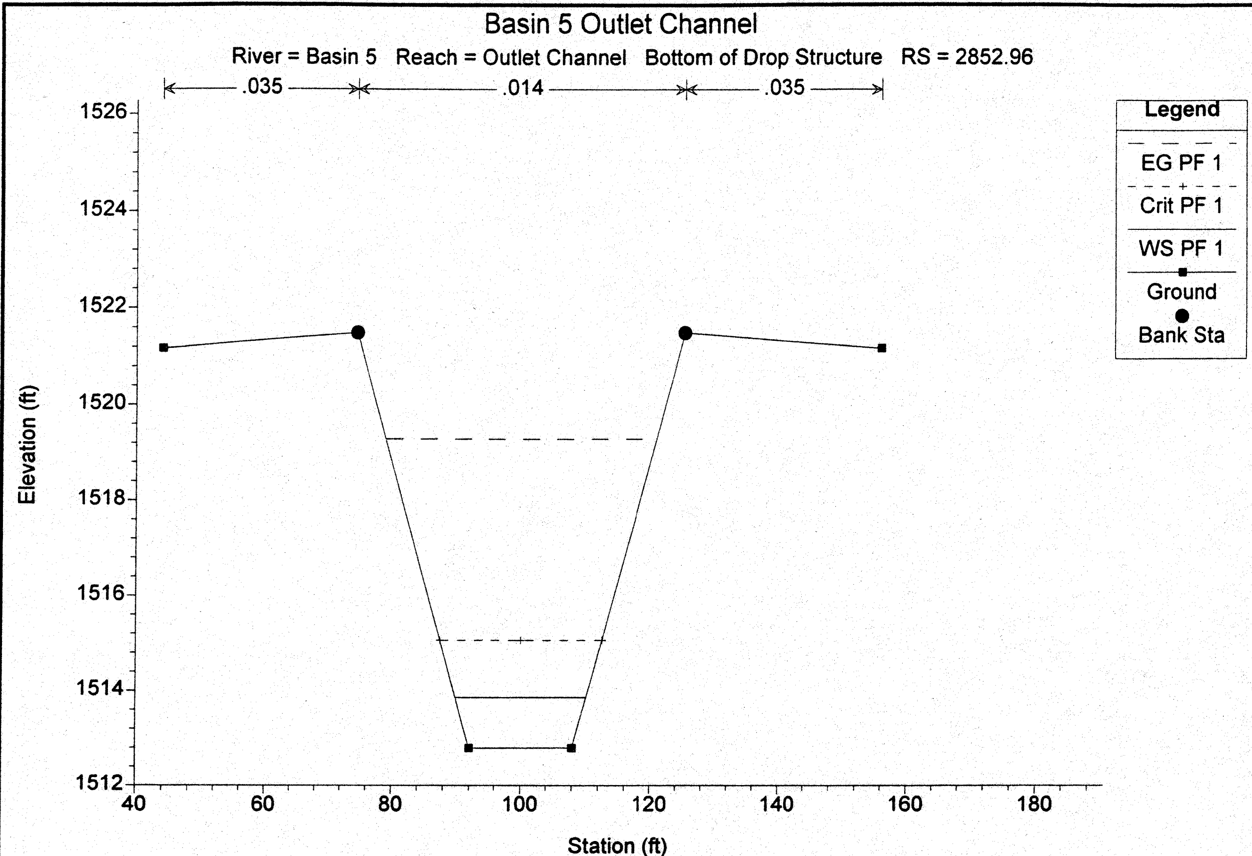

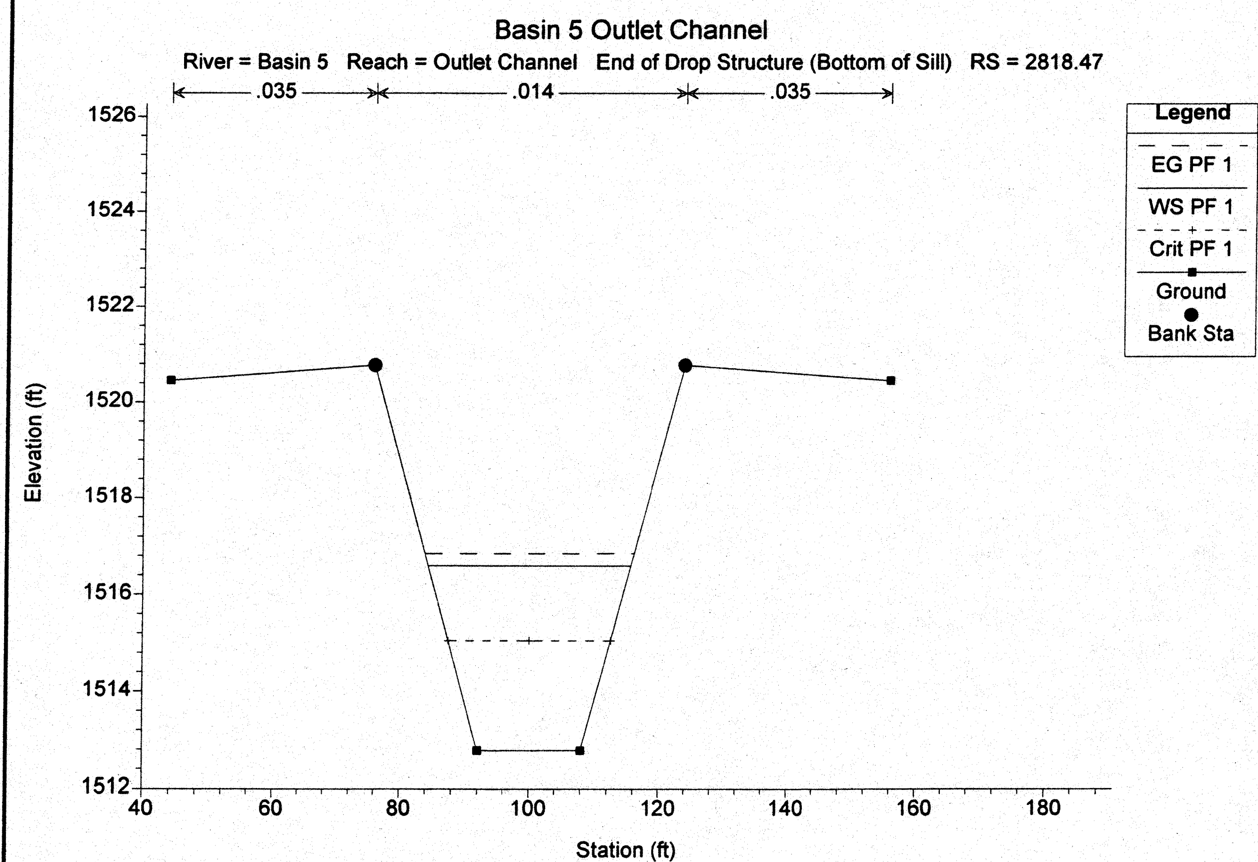

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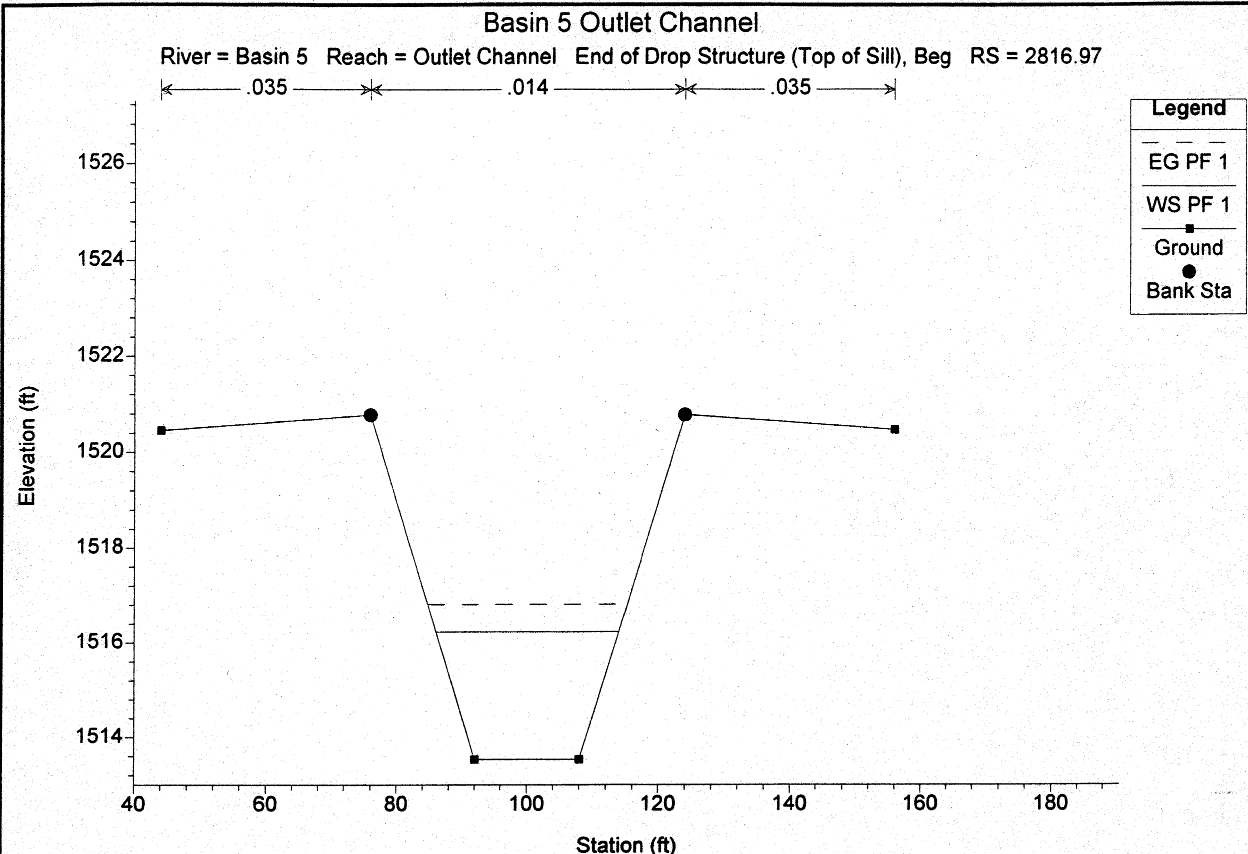

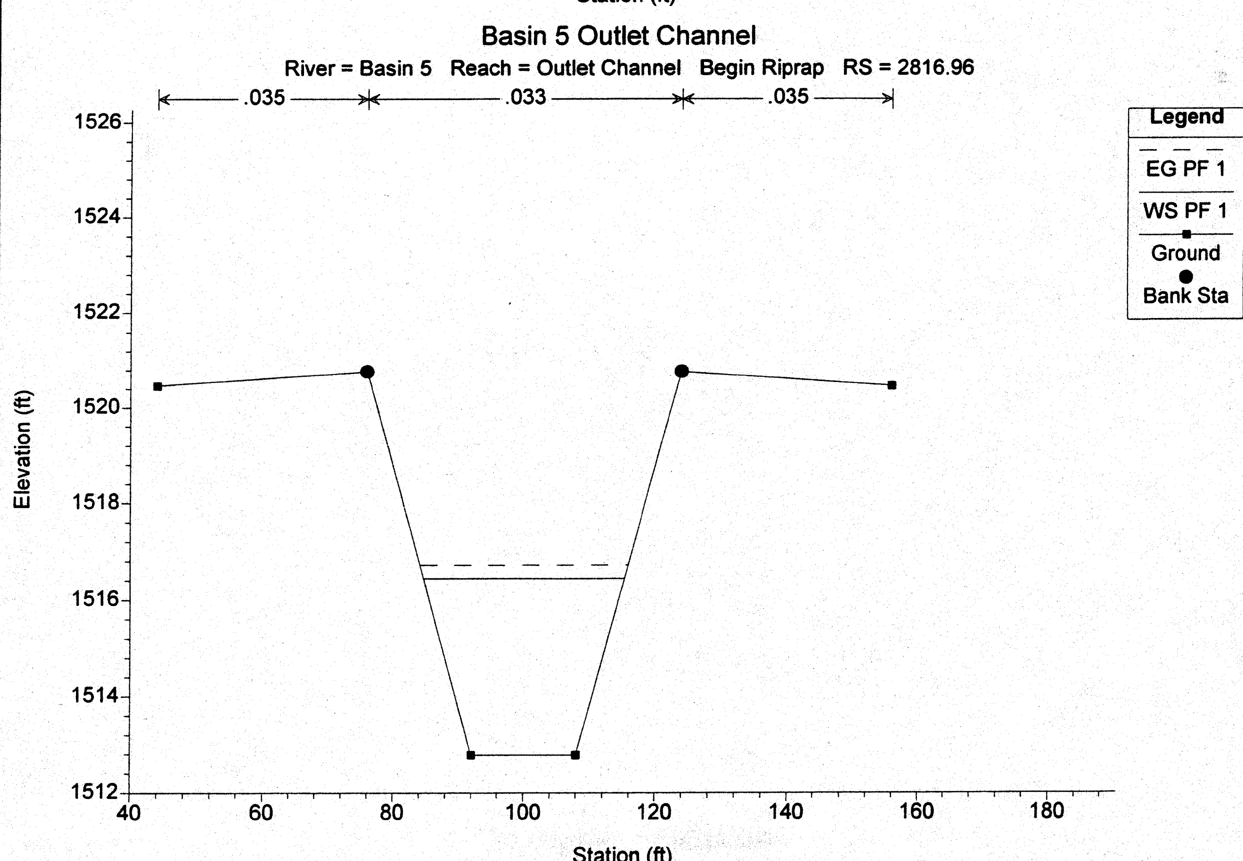

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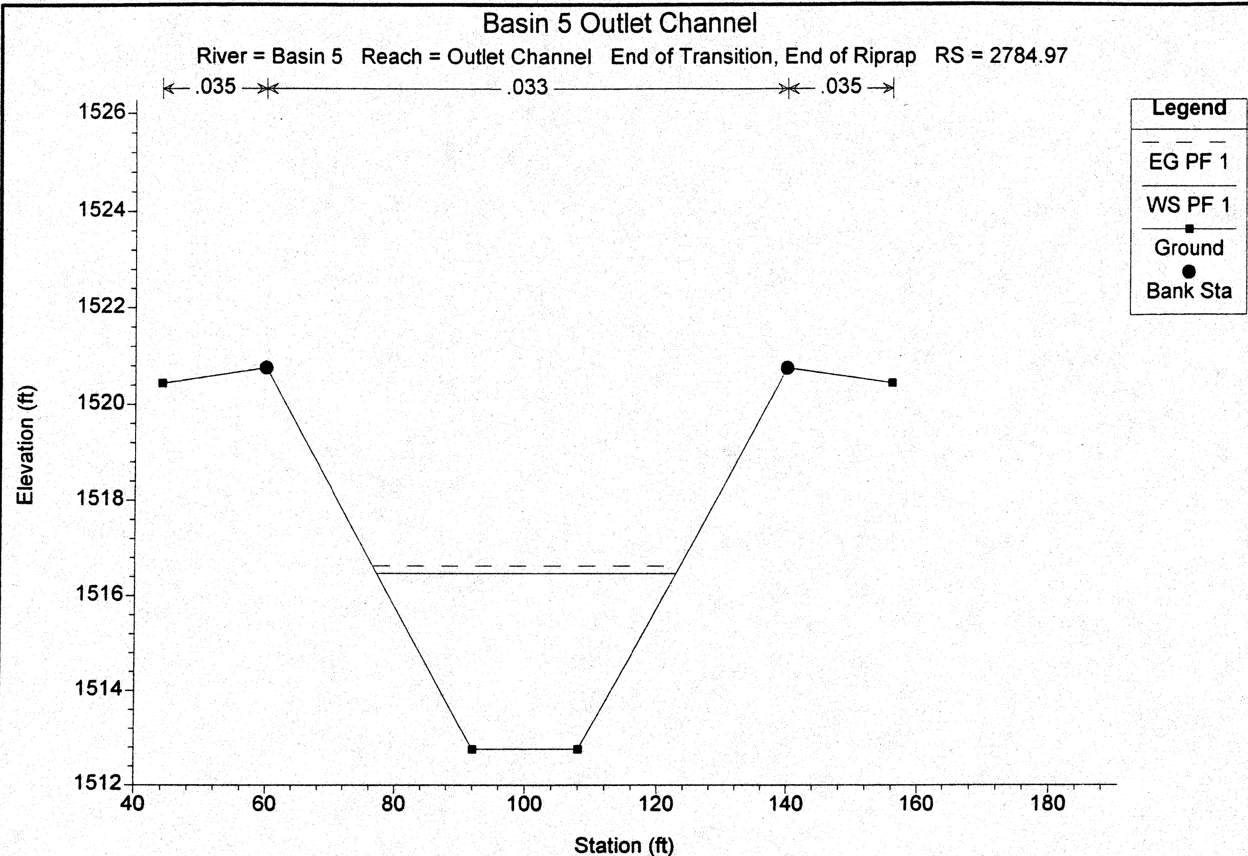
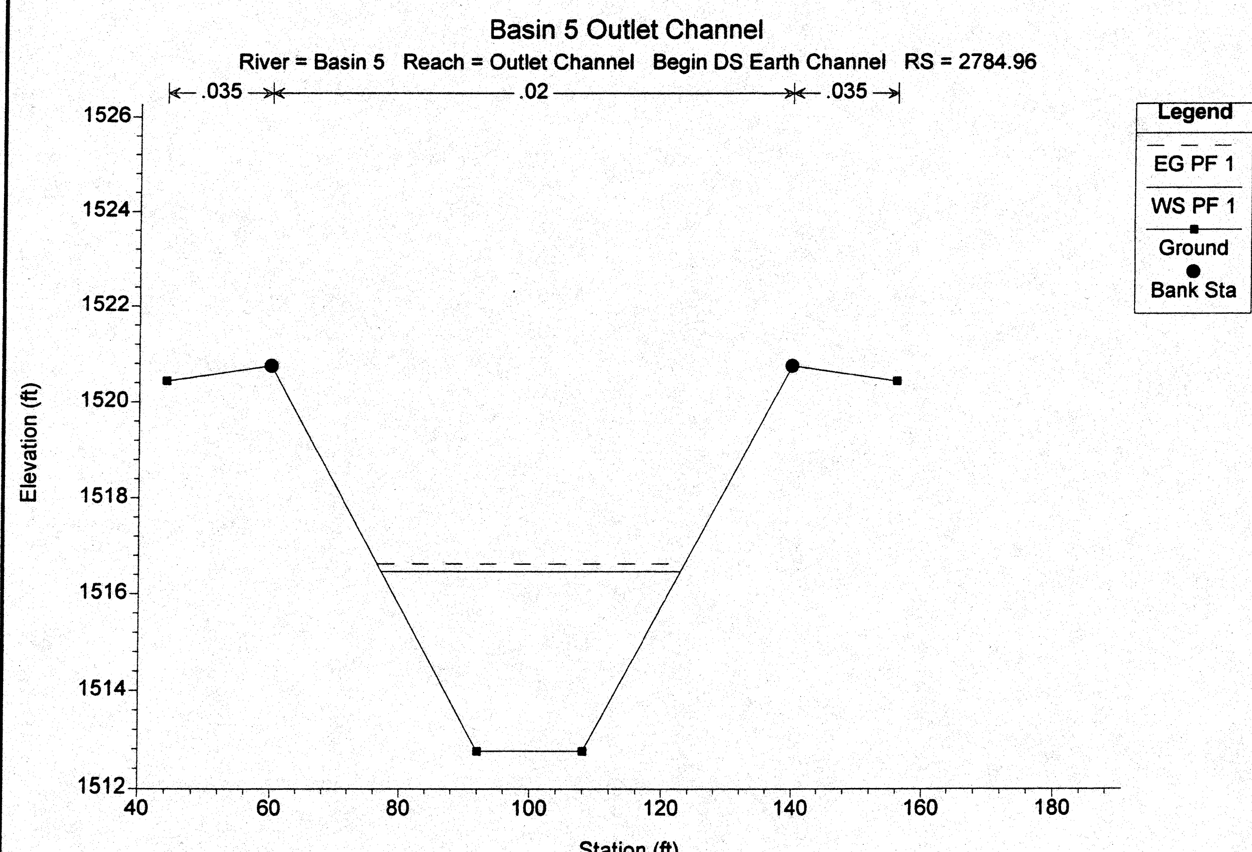
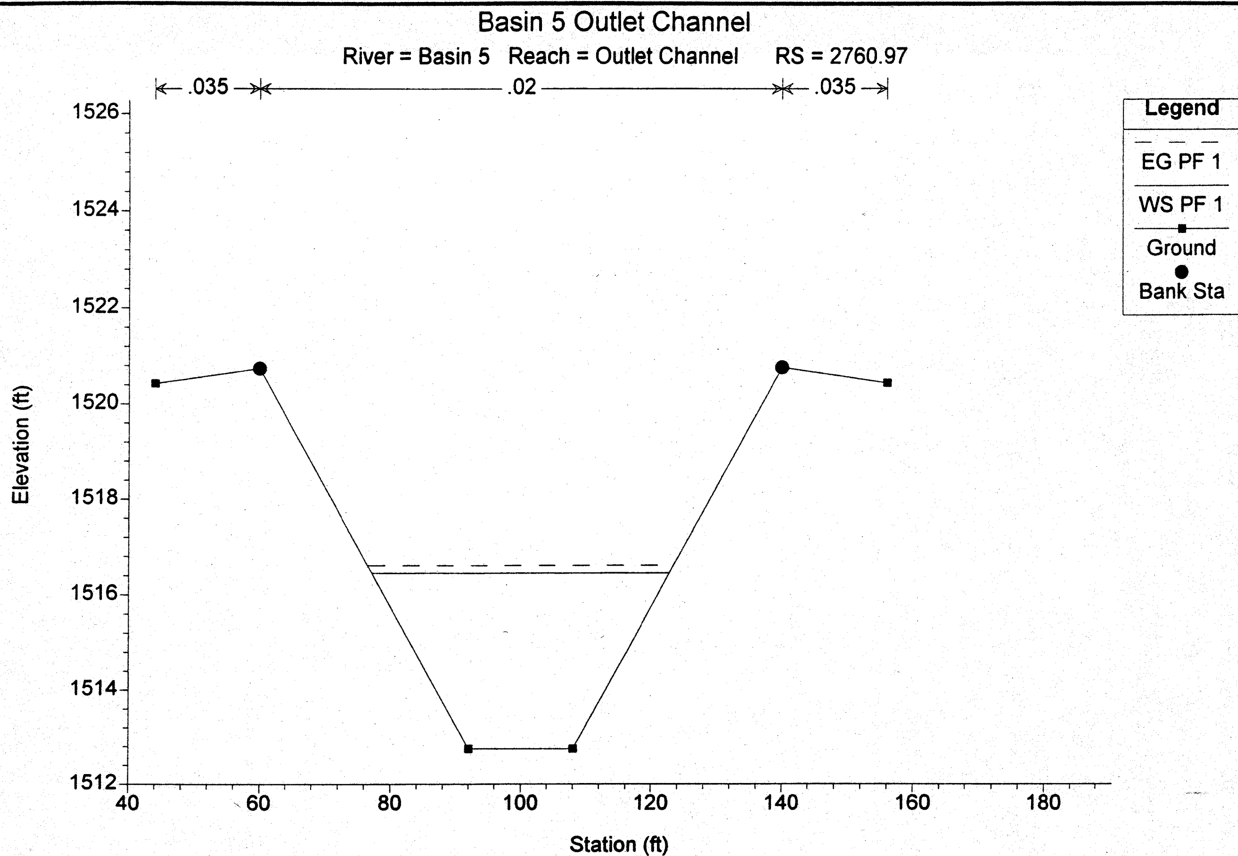
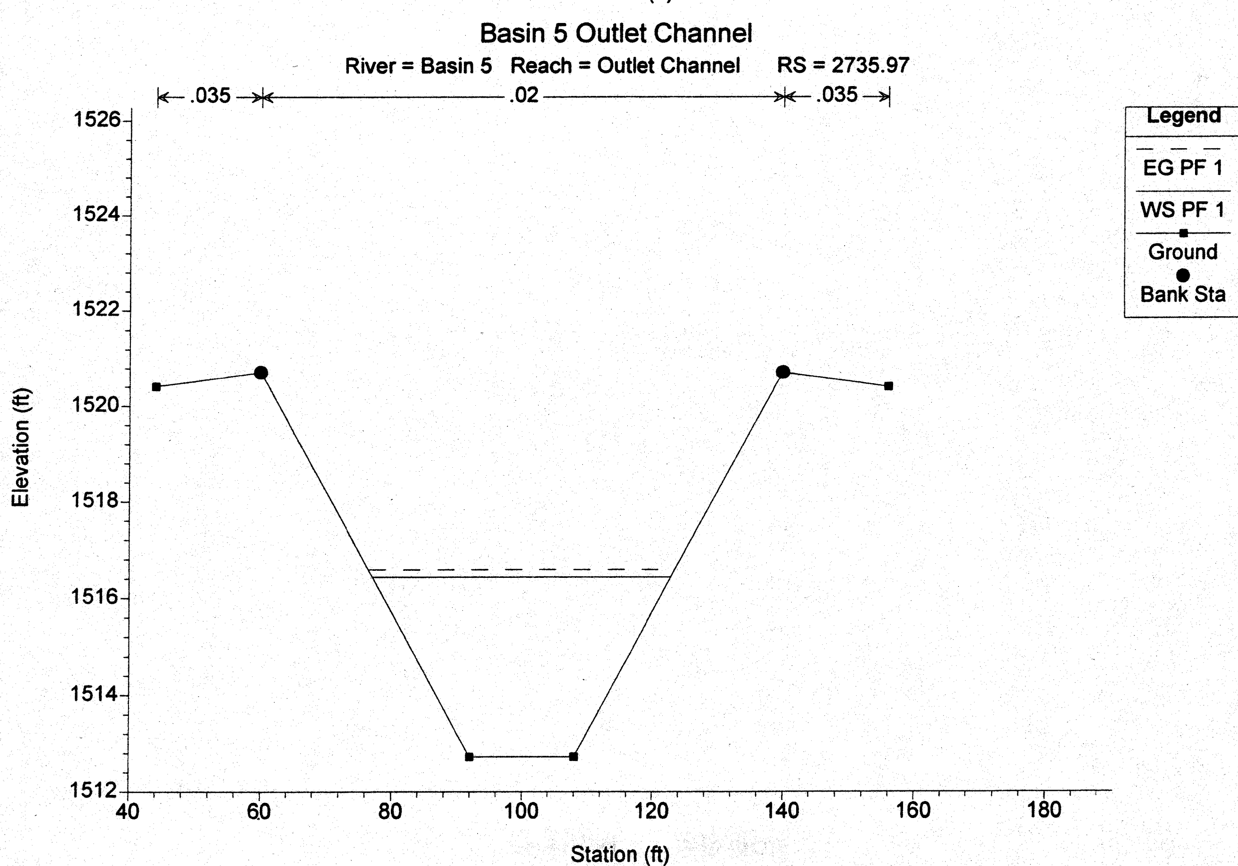


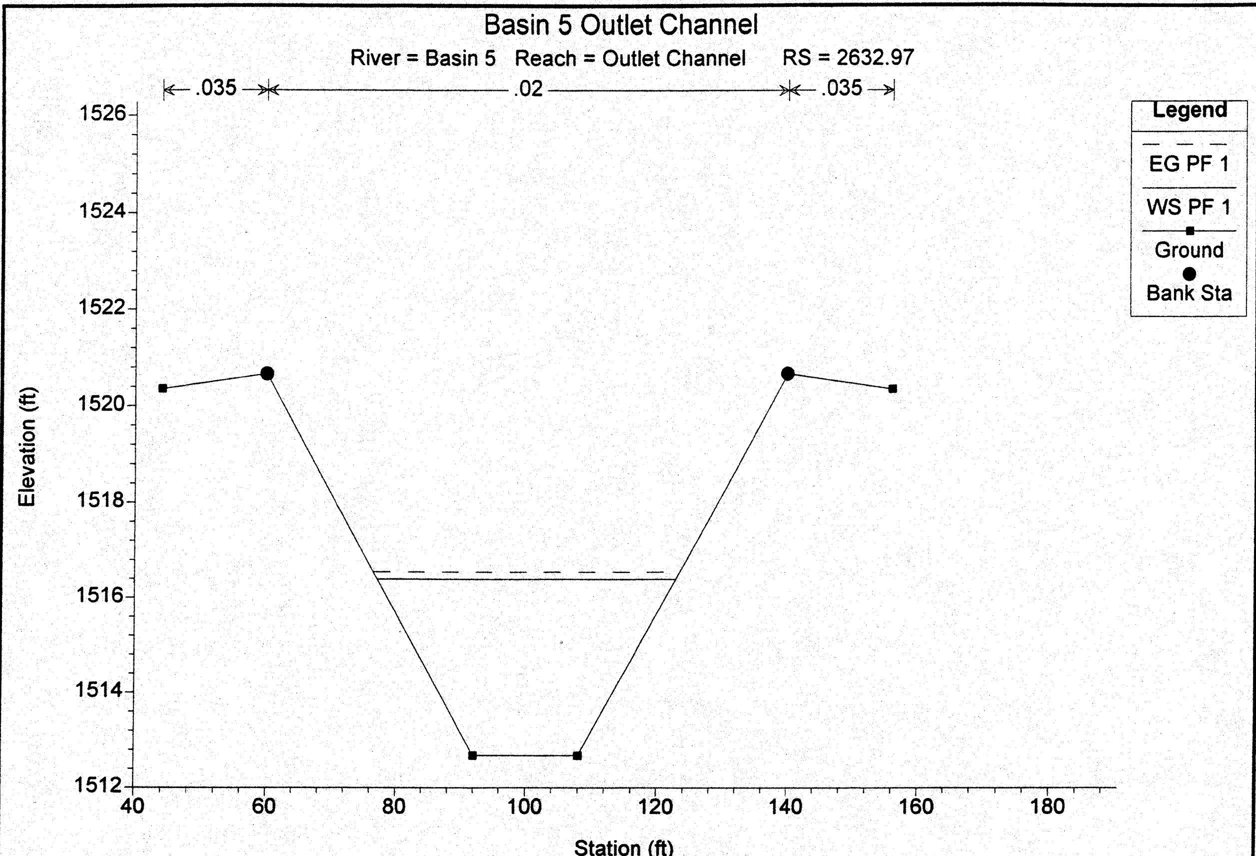


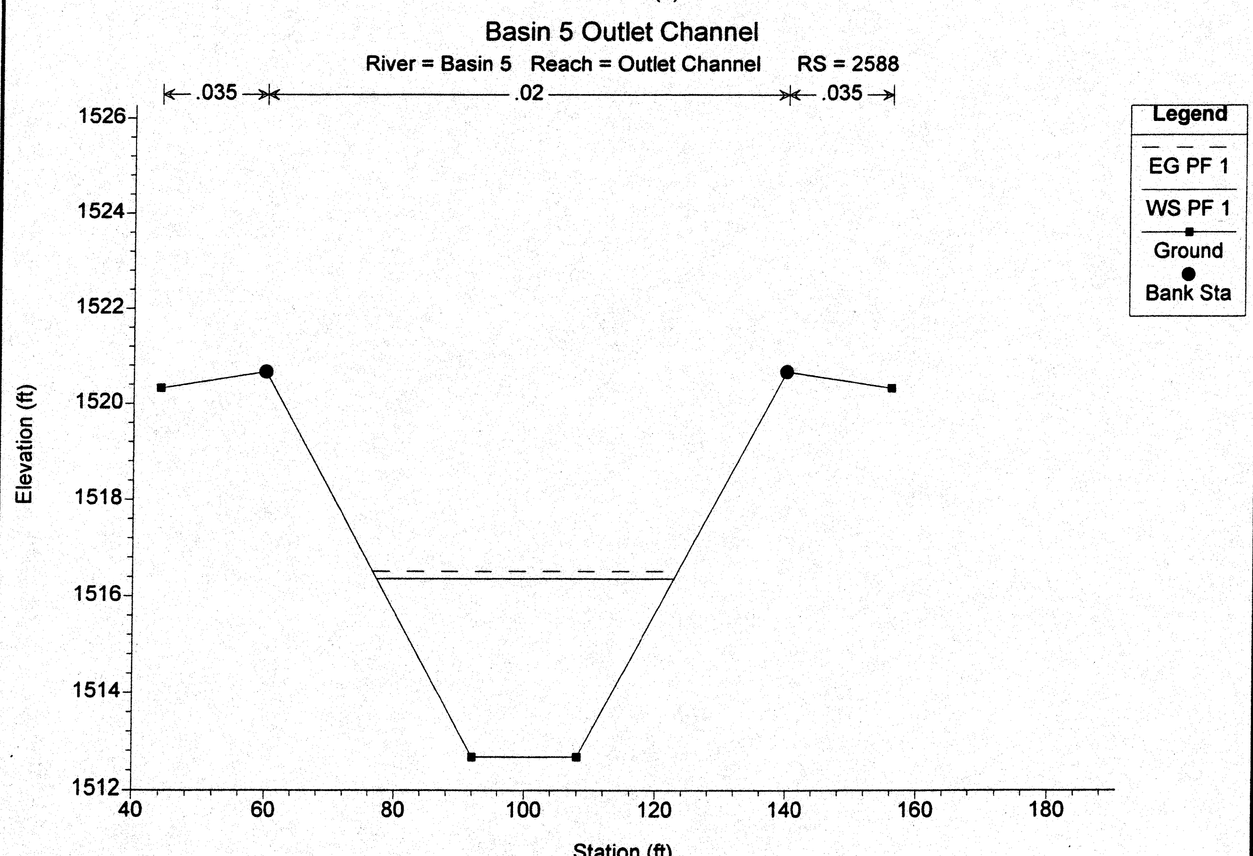
1 in Horiz. = 30 ft 1 in Vert. = 4 ft





1 in Horiz. = 30 ft   1 in Vert. = 4 ft





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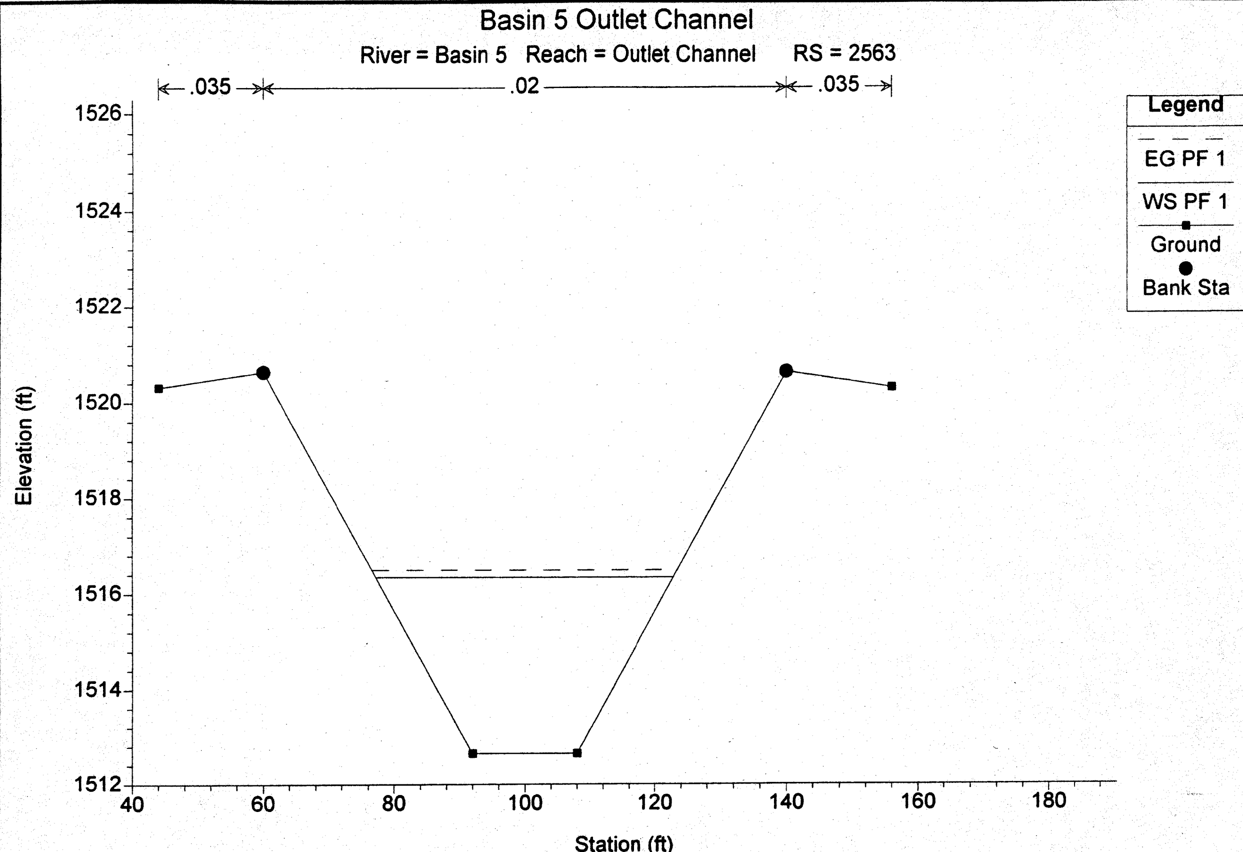

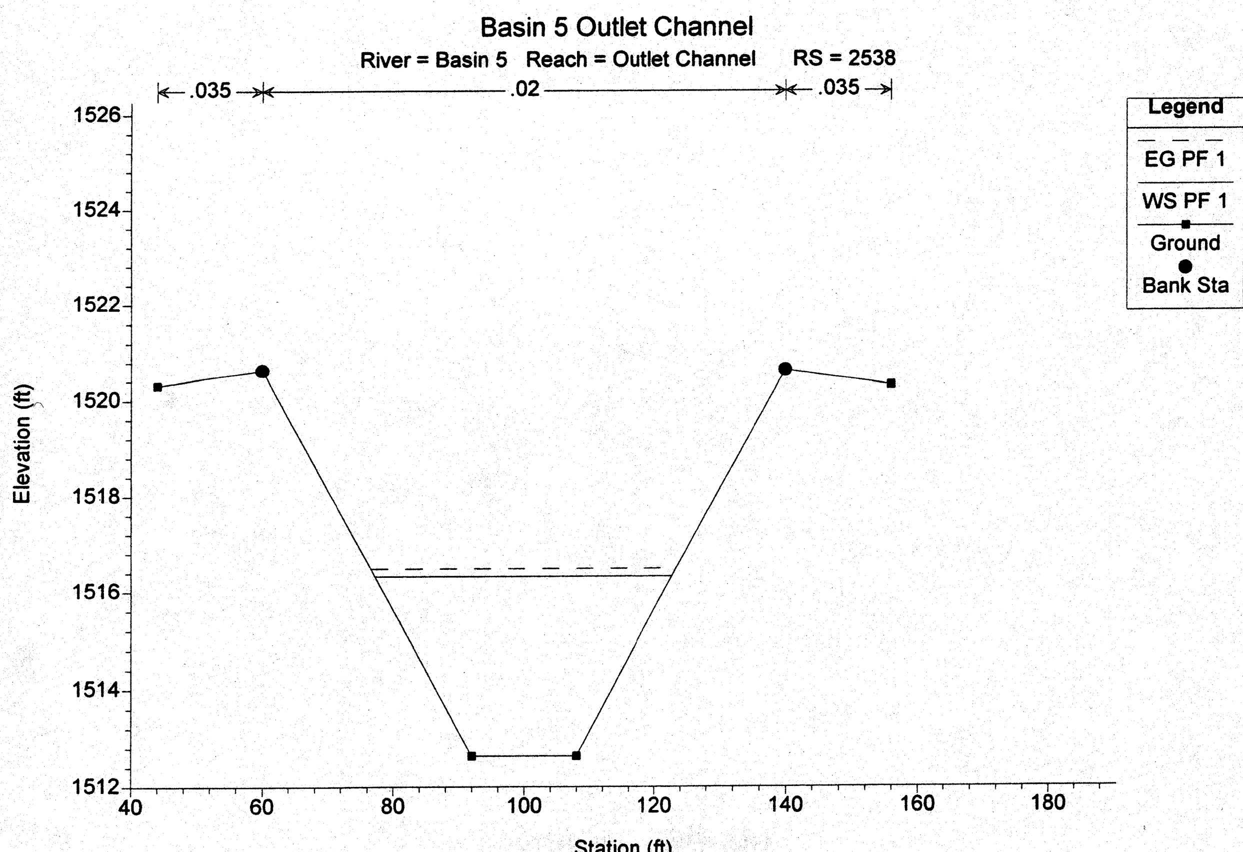

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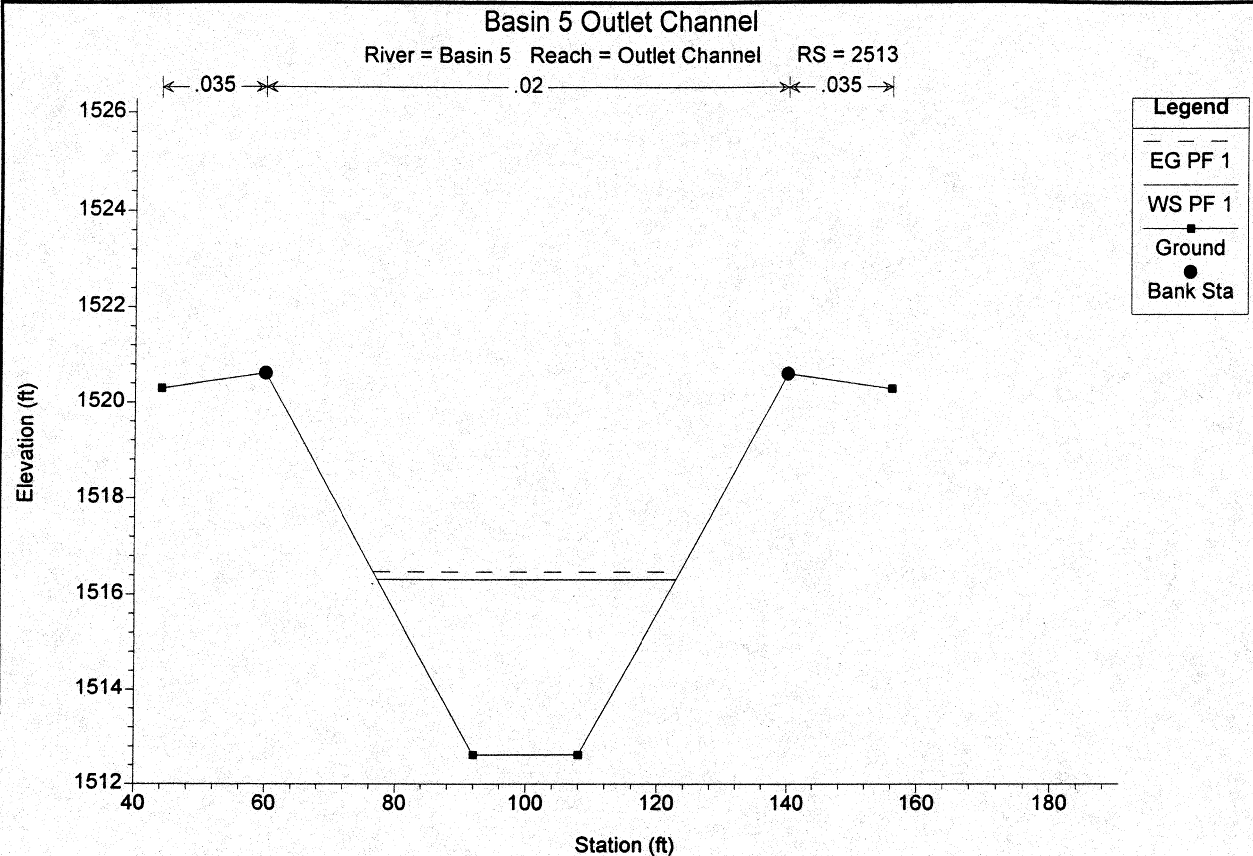
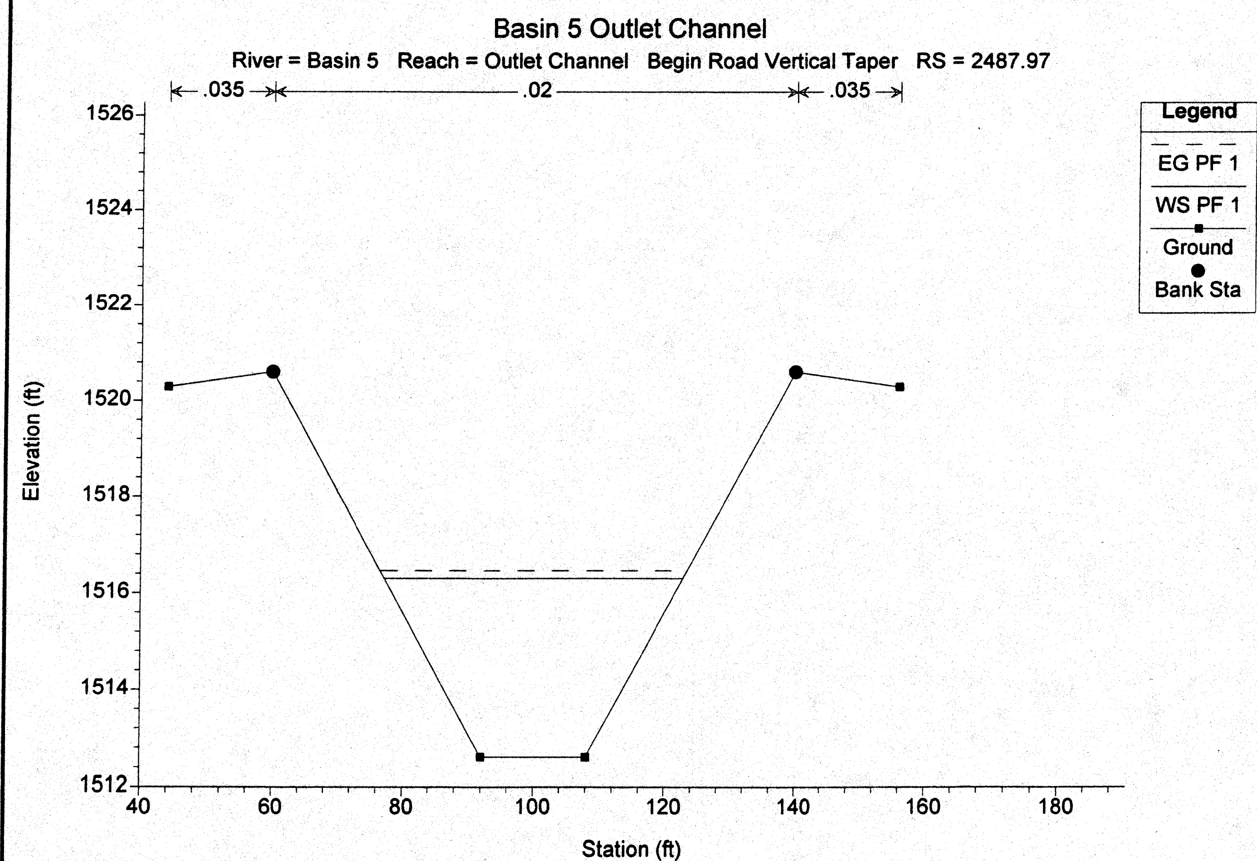
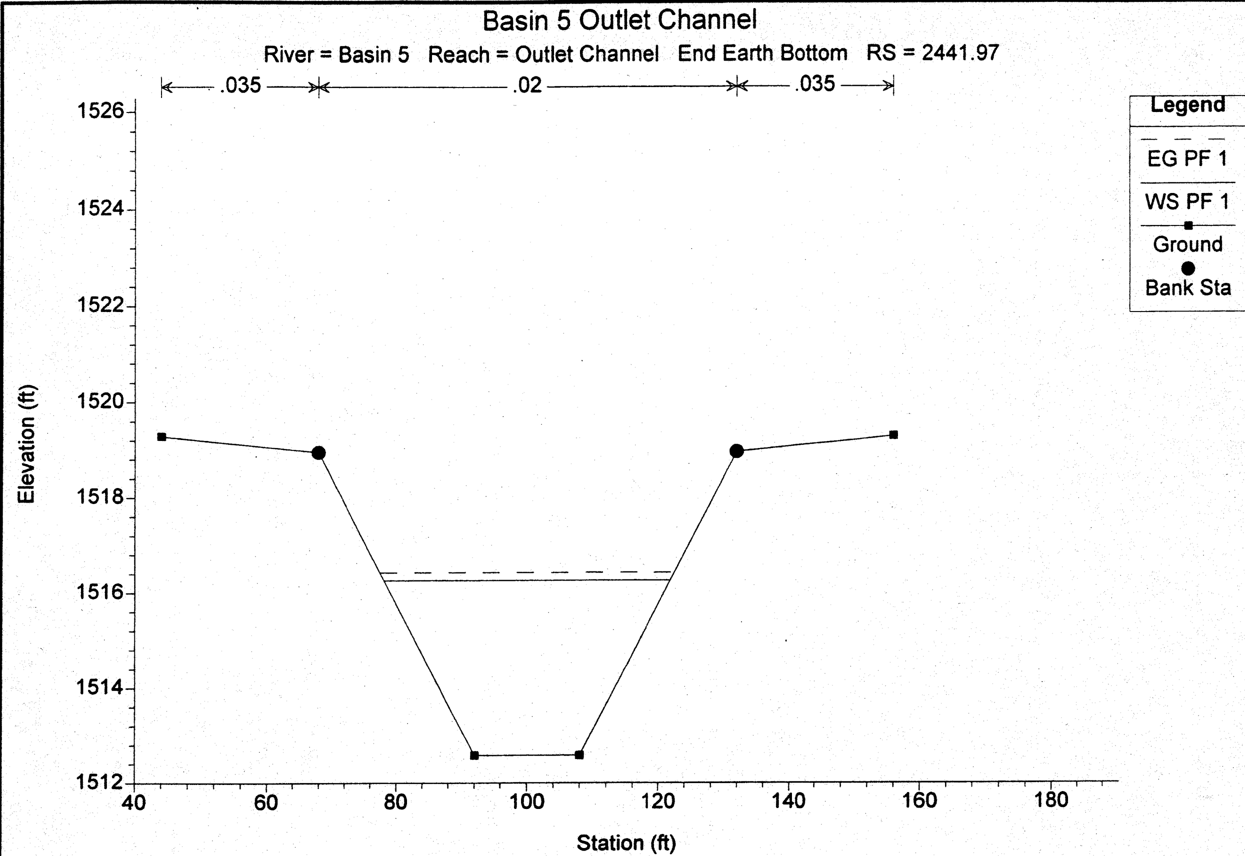
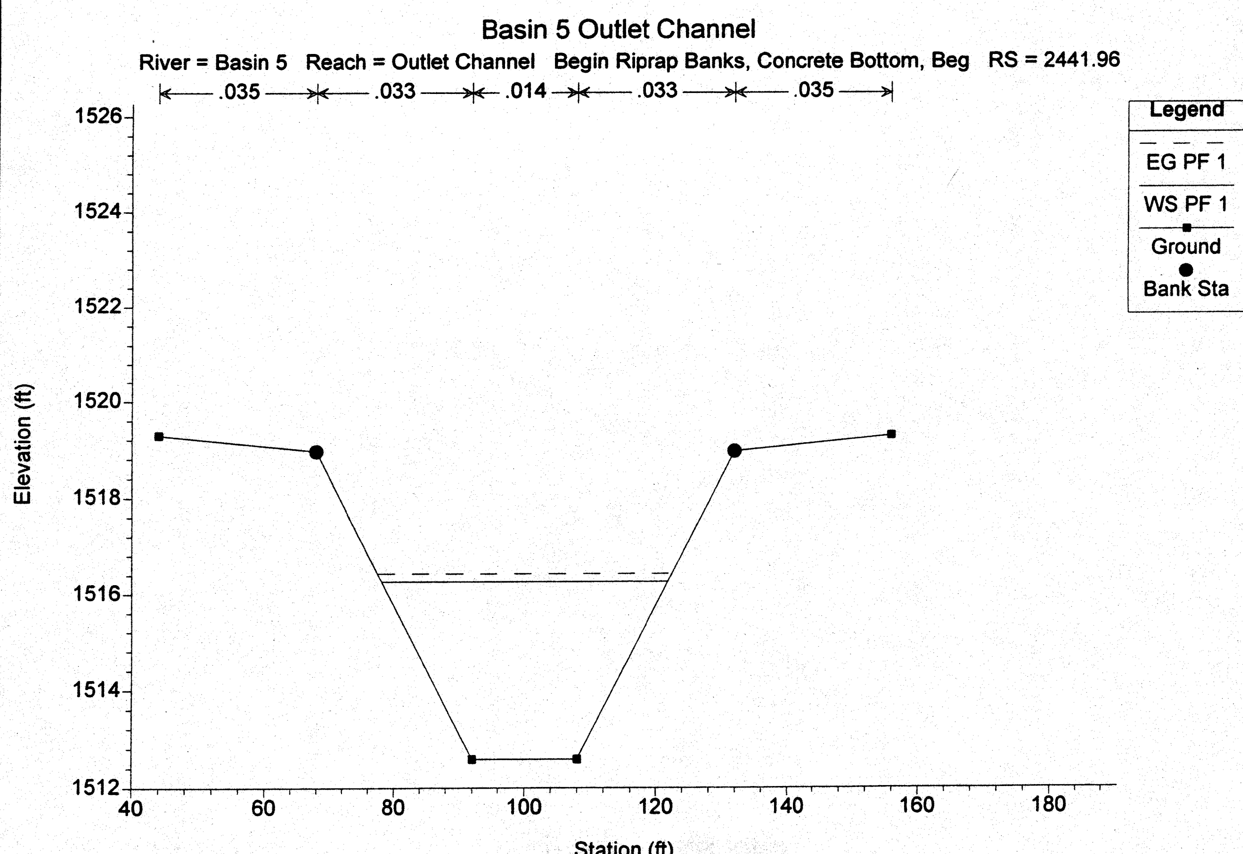


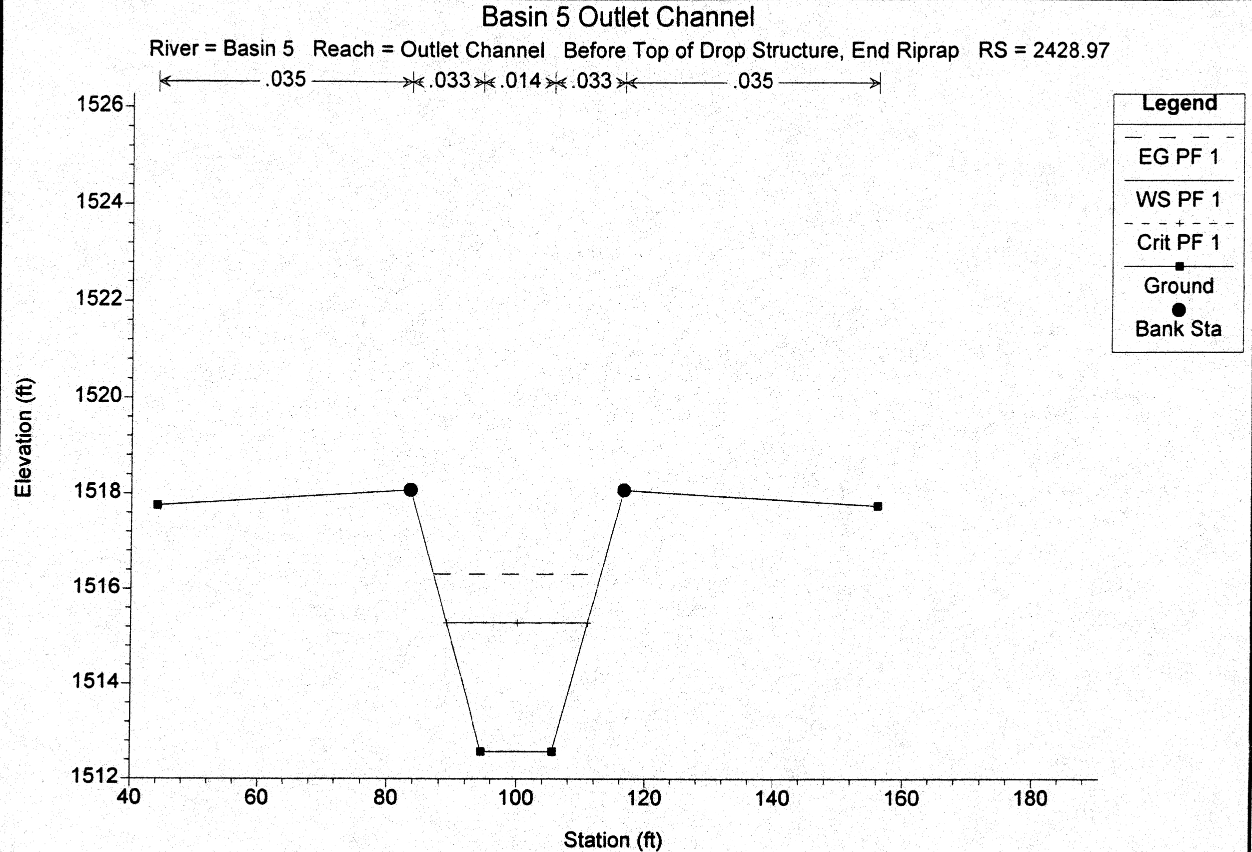


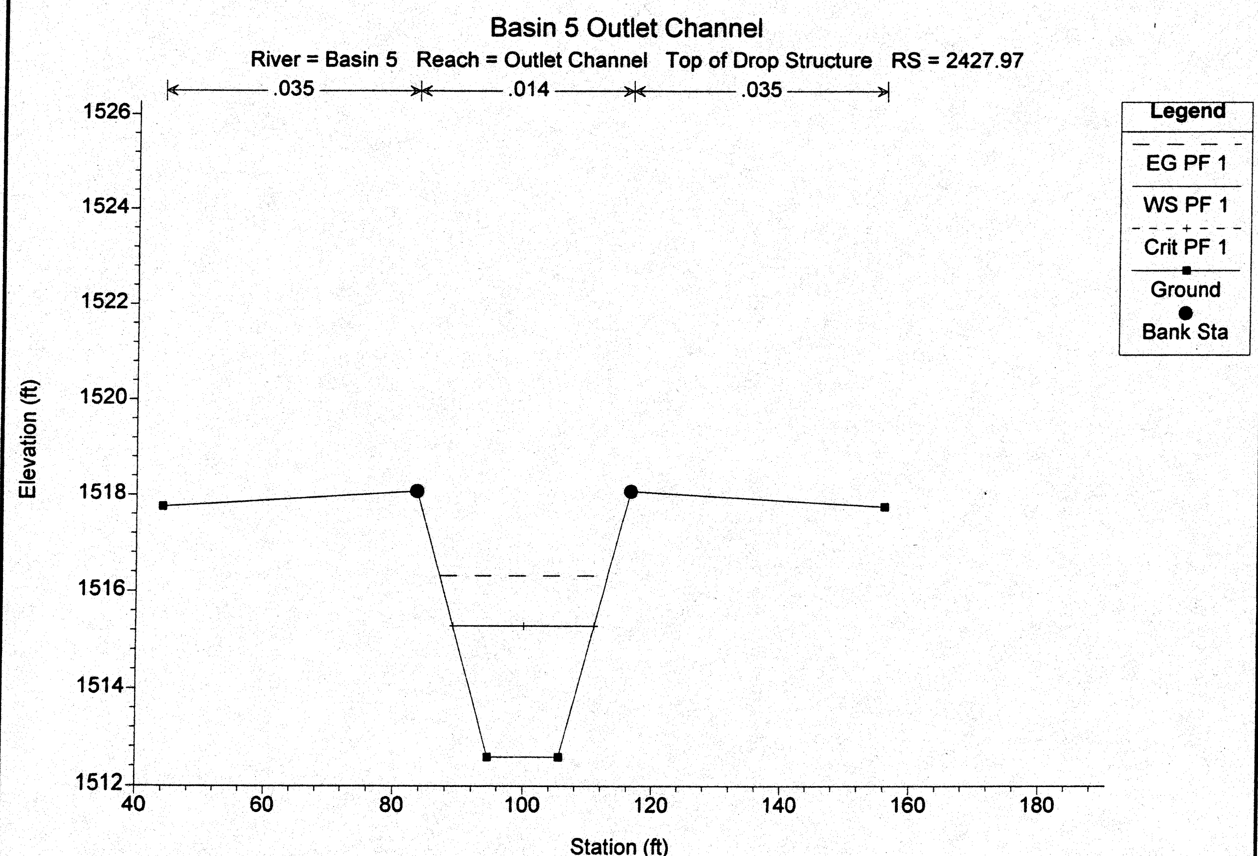
1 in Horiz. = 30 ft 1 in Vert. = 4 ft



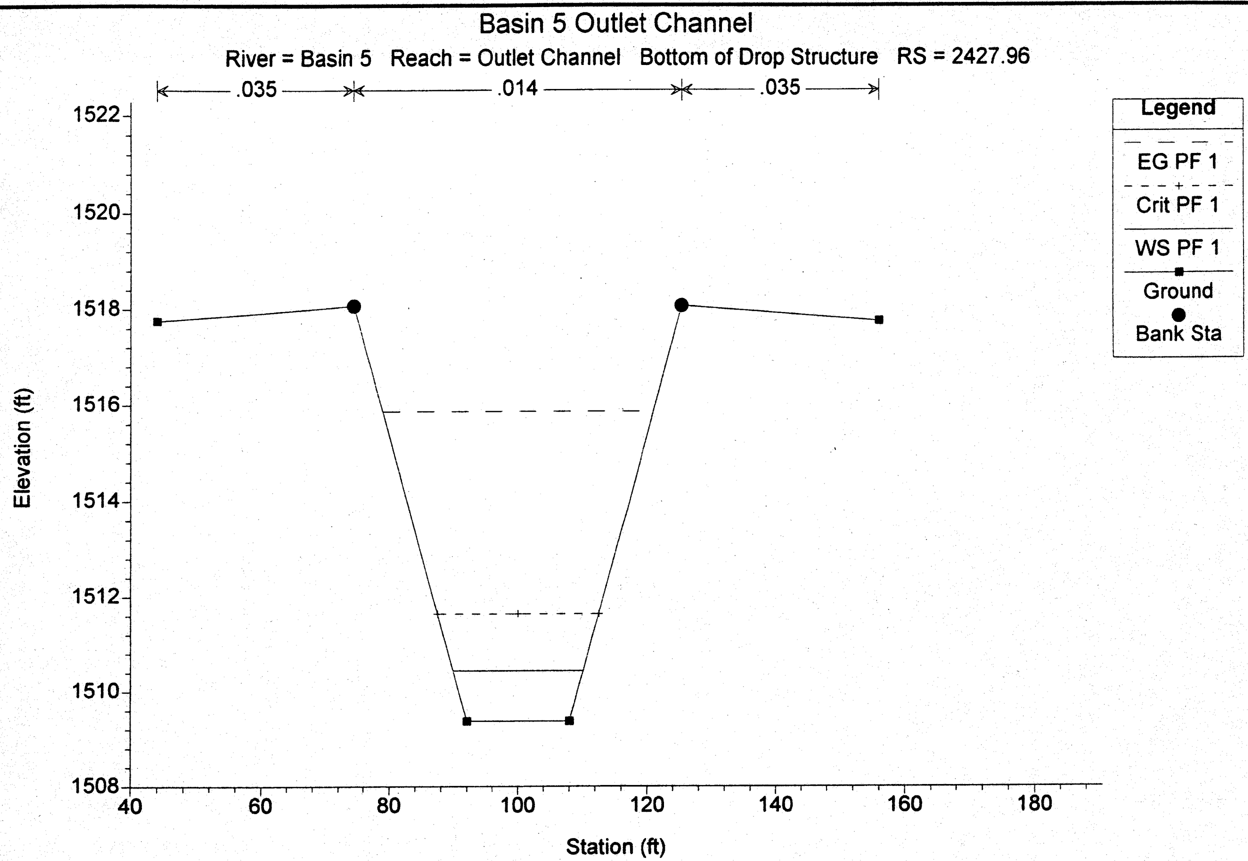


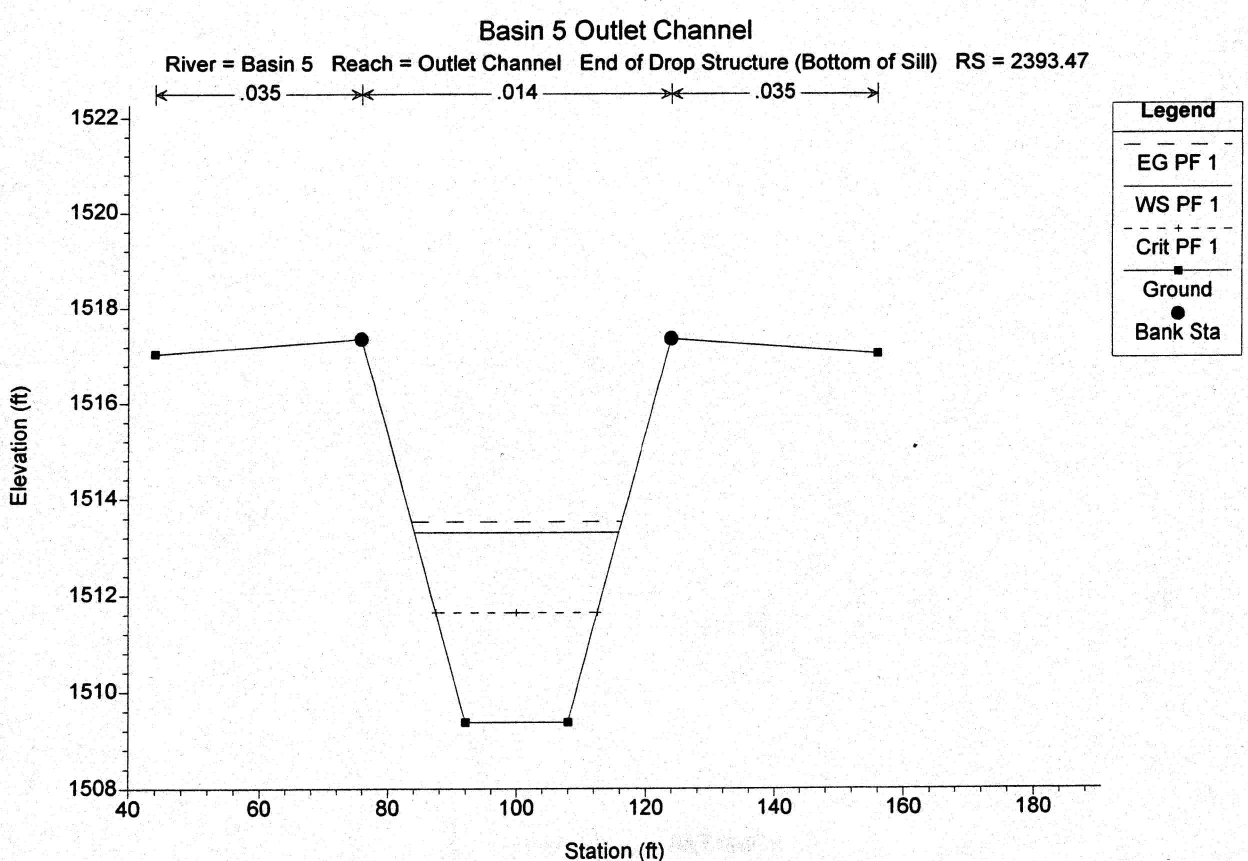
1 in Horiz. = 30 ft   1 in Vert. = 4 ft





1 in Horiz. = 30 ft 1 in Vert. = 4 ft





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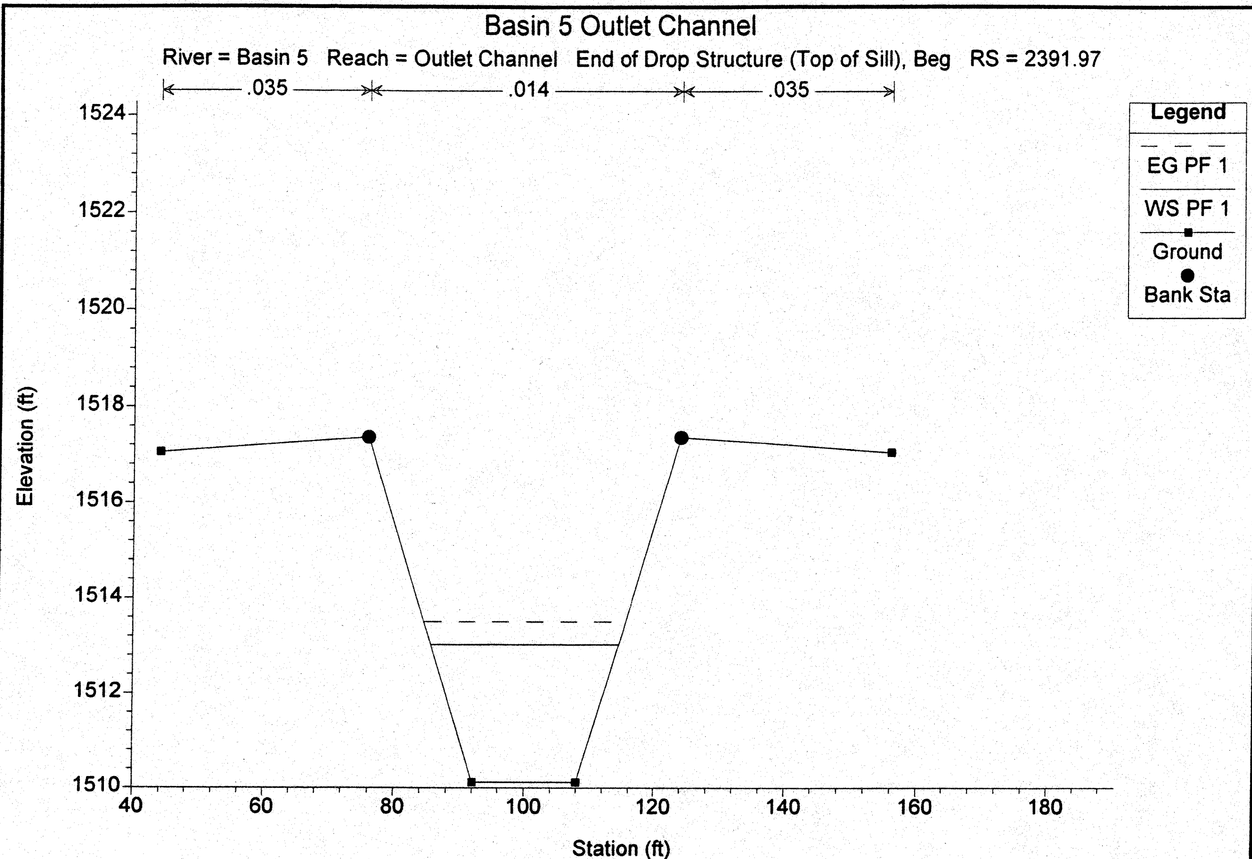

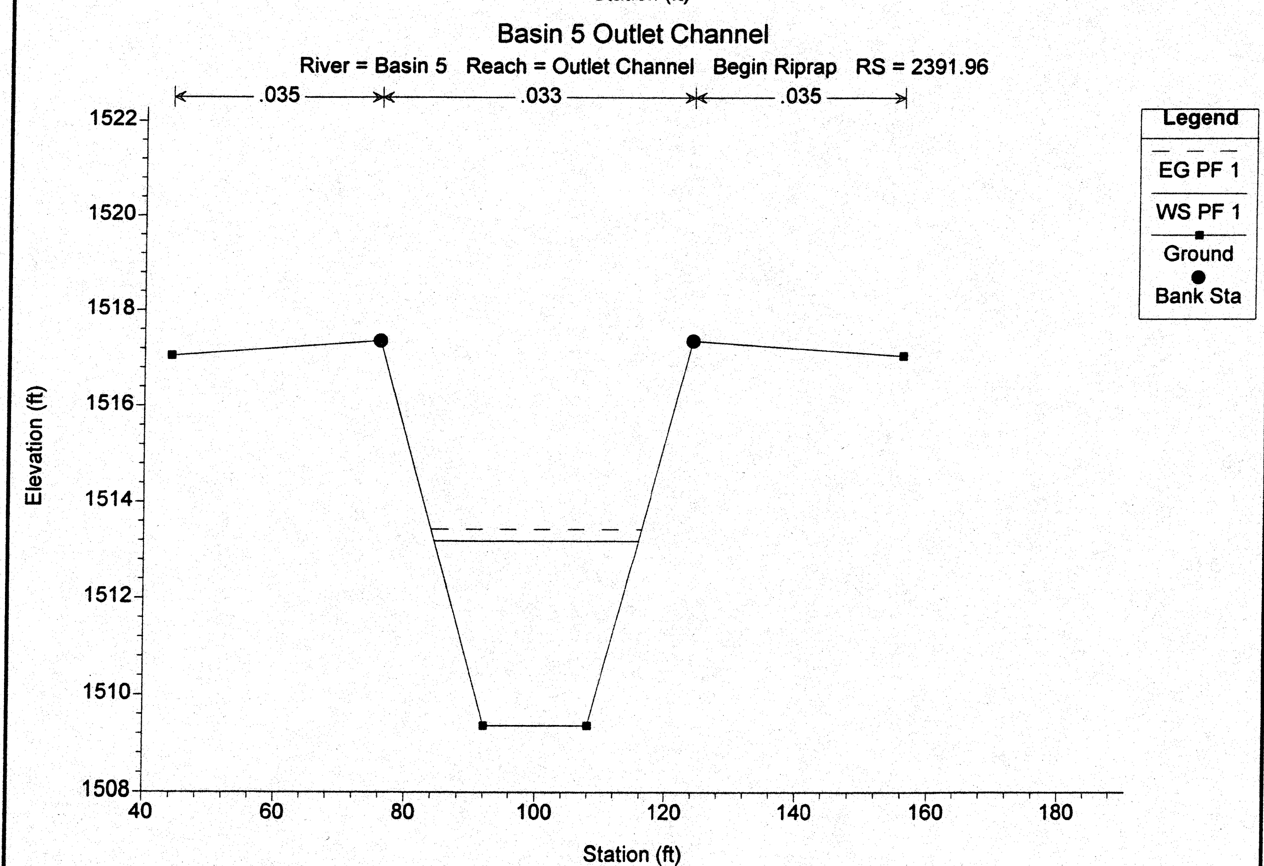

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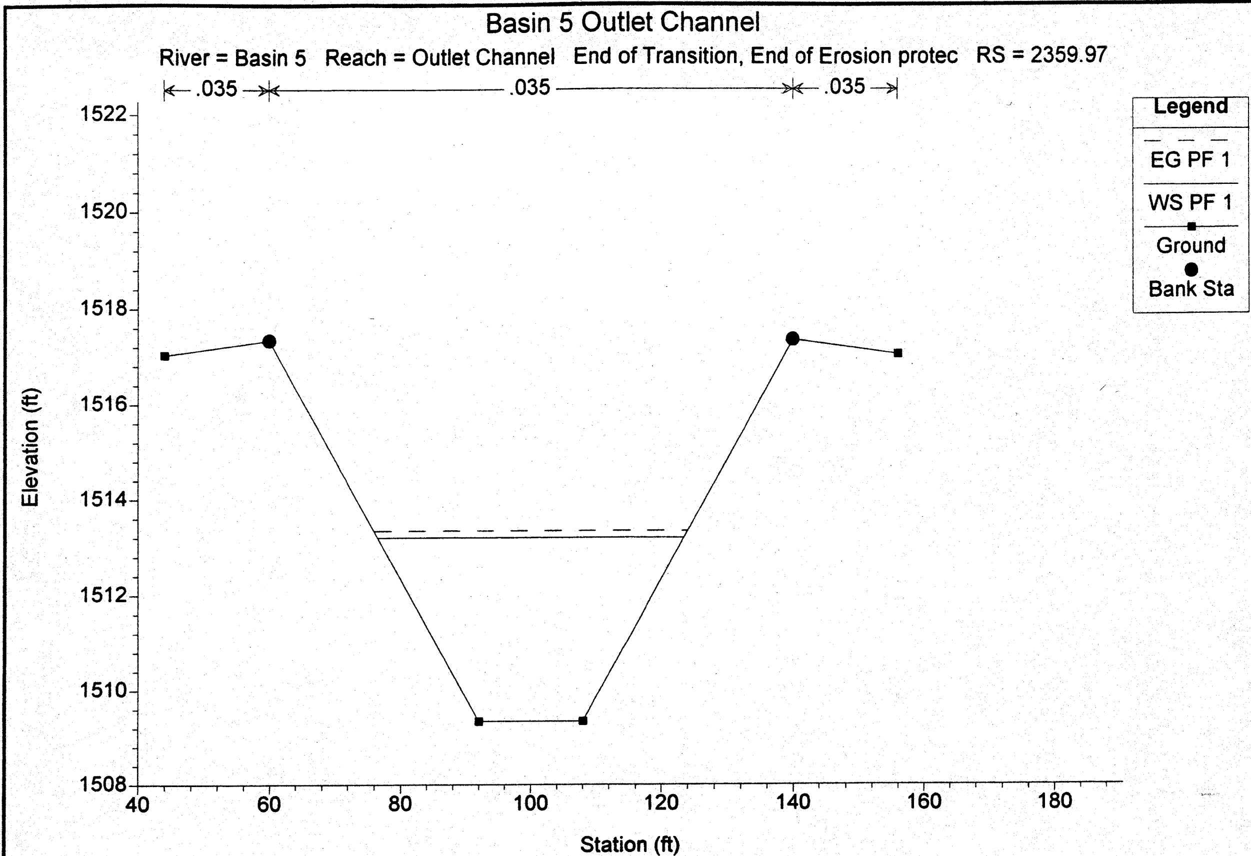

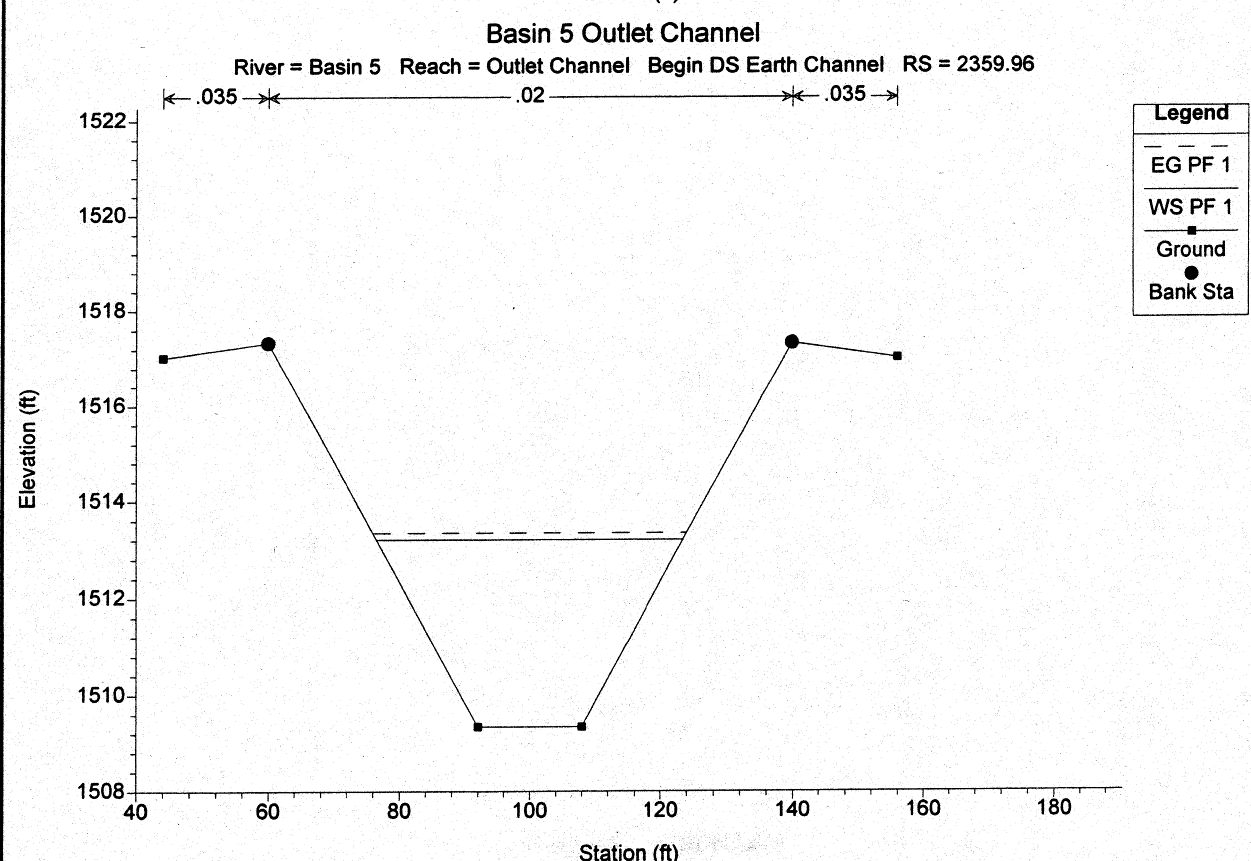

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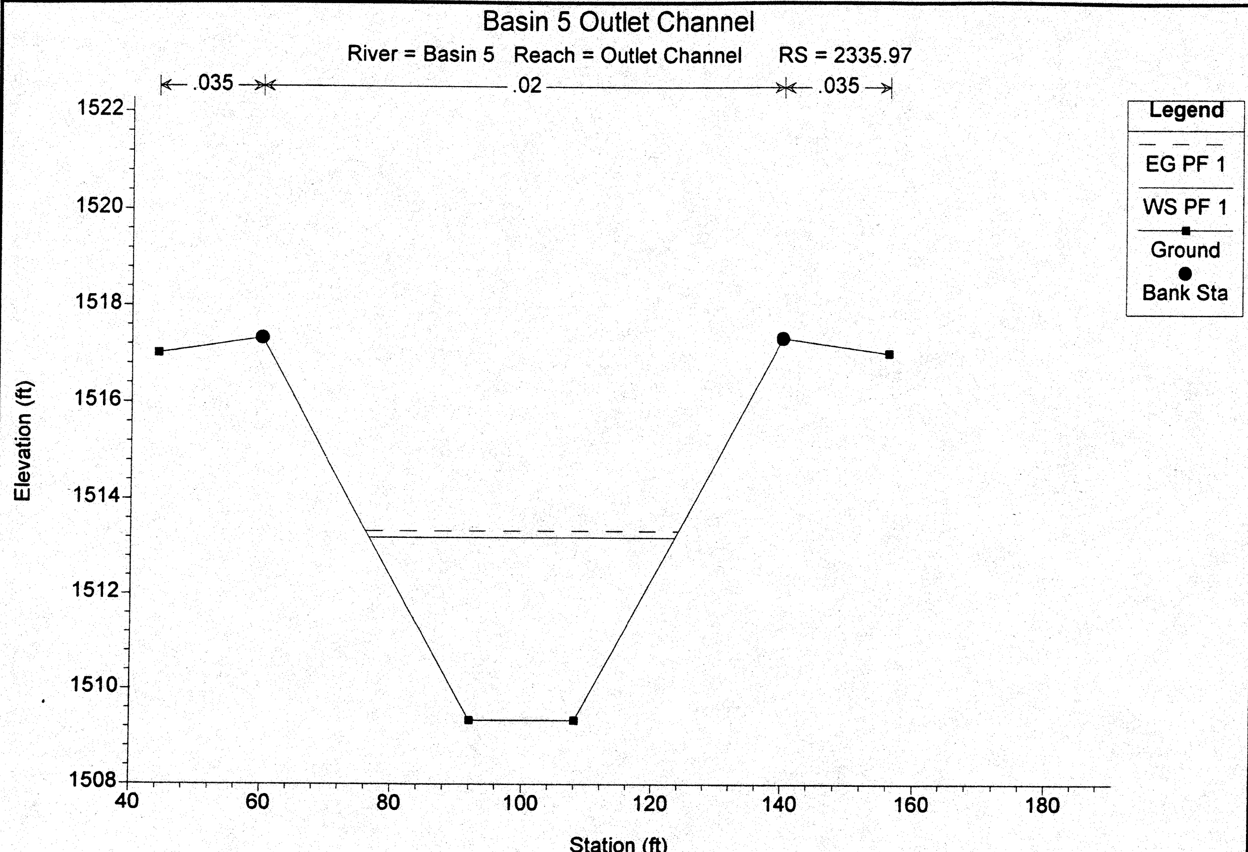

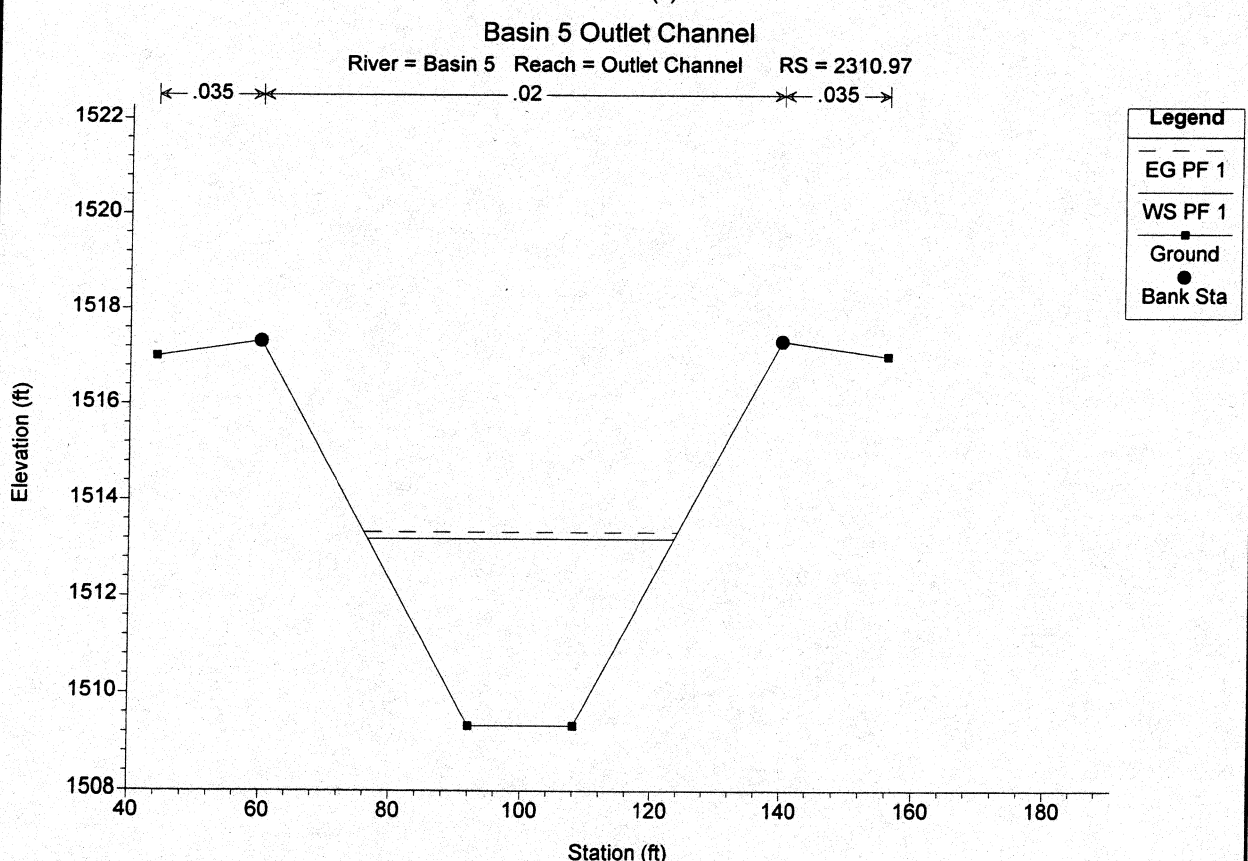

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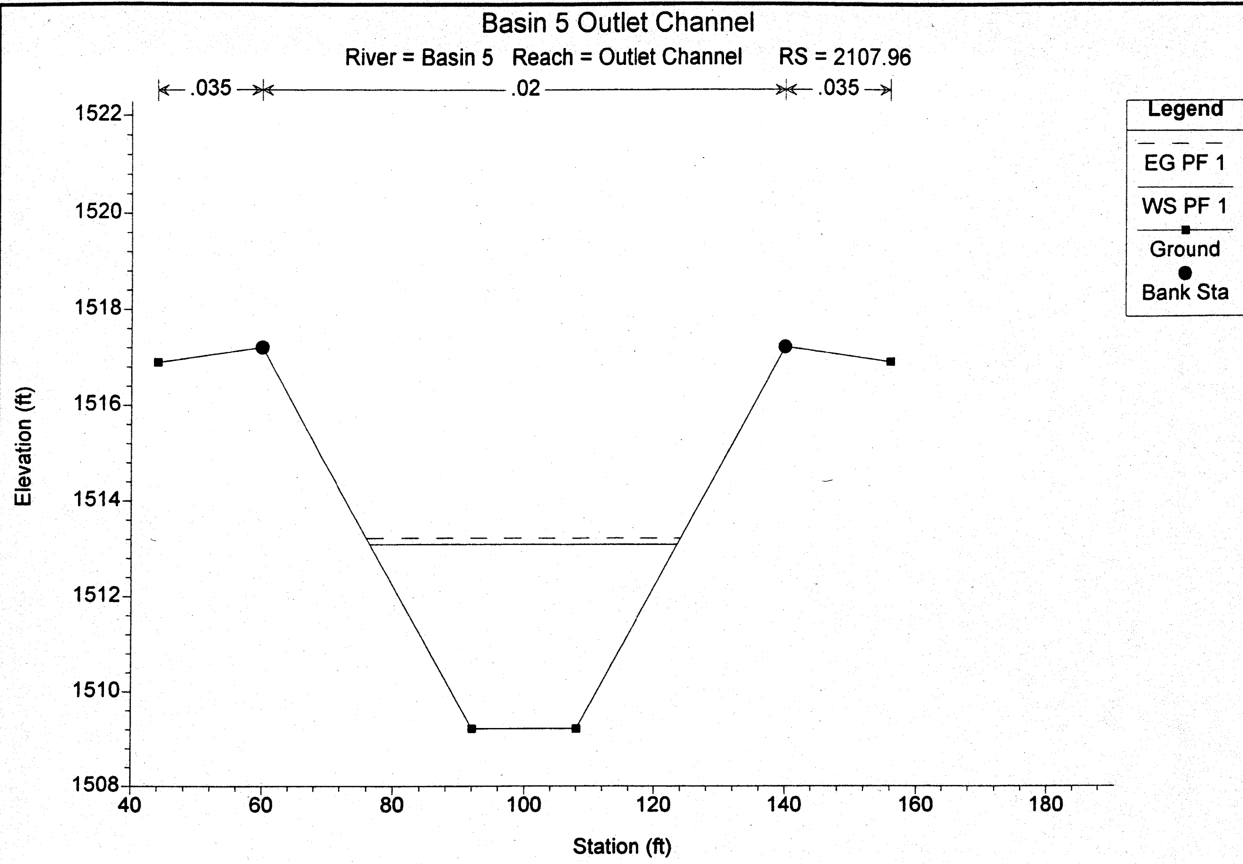

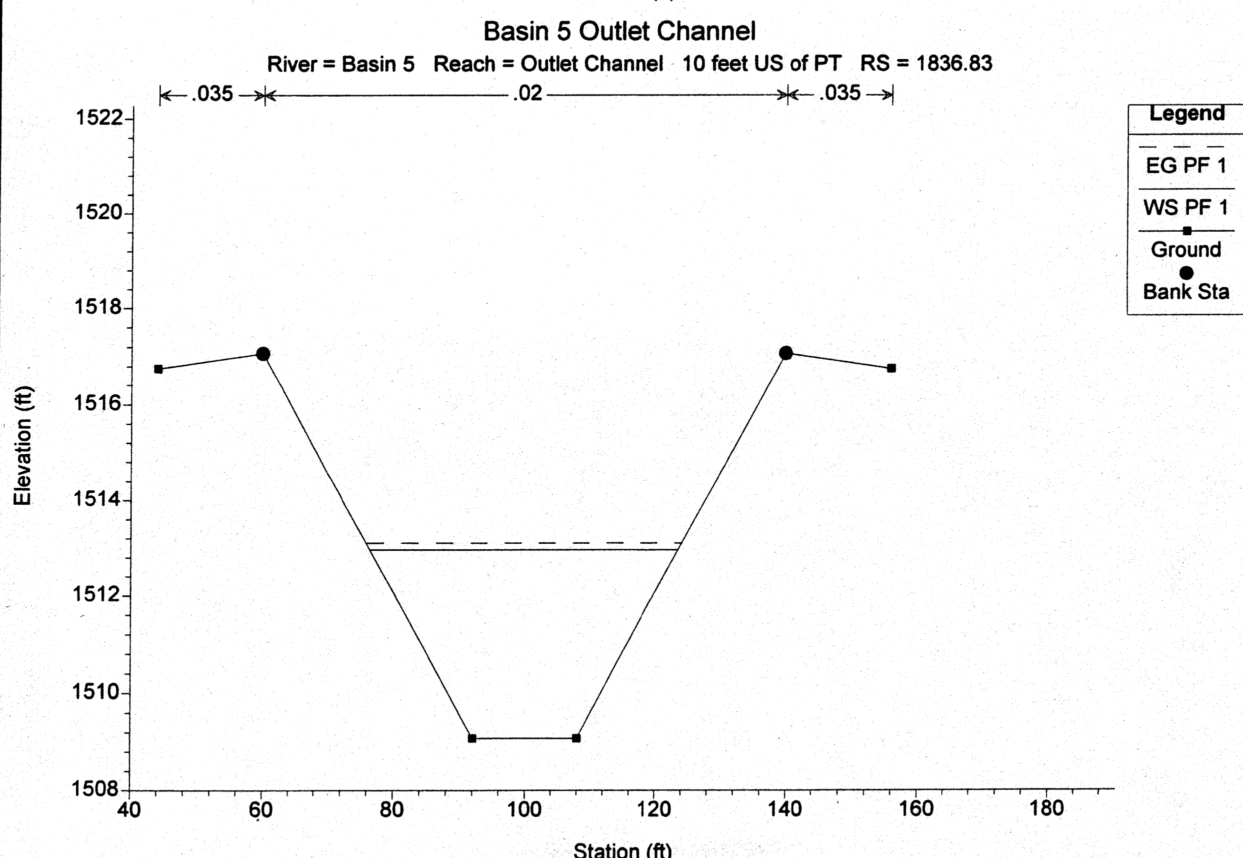

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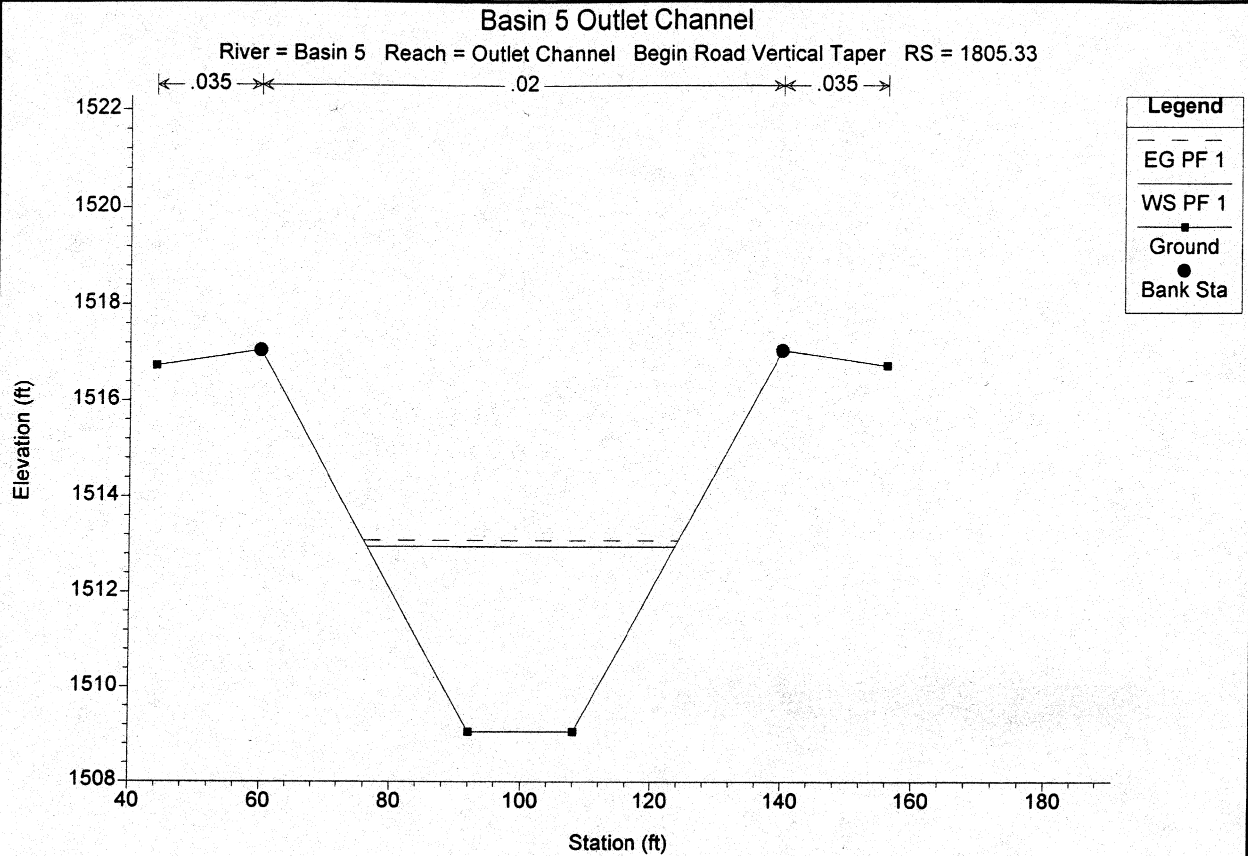

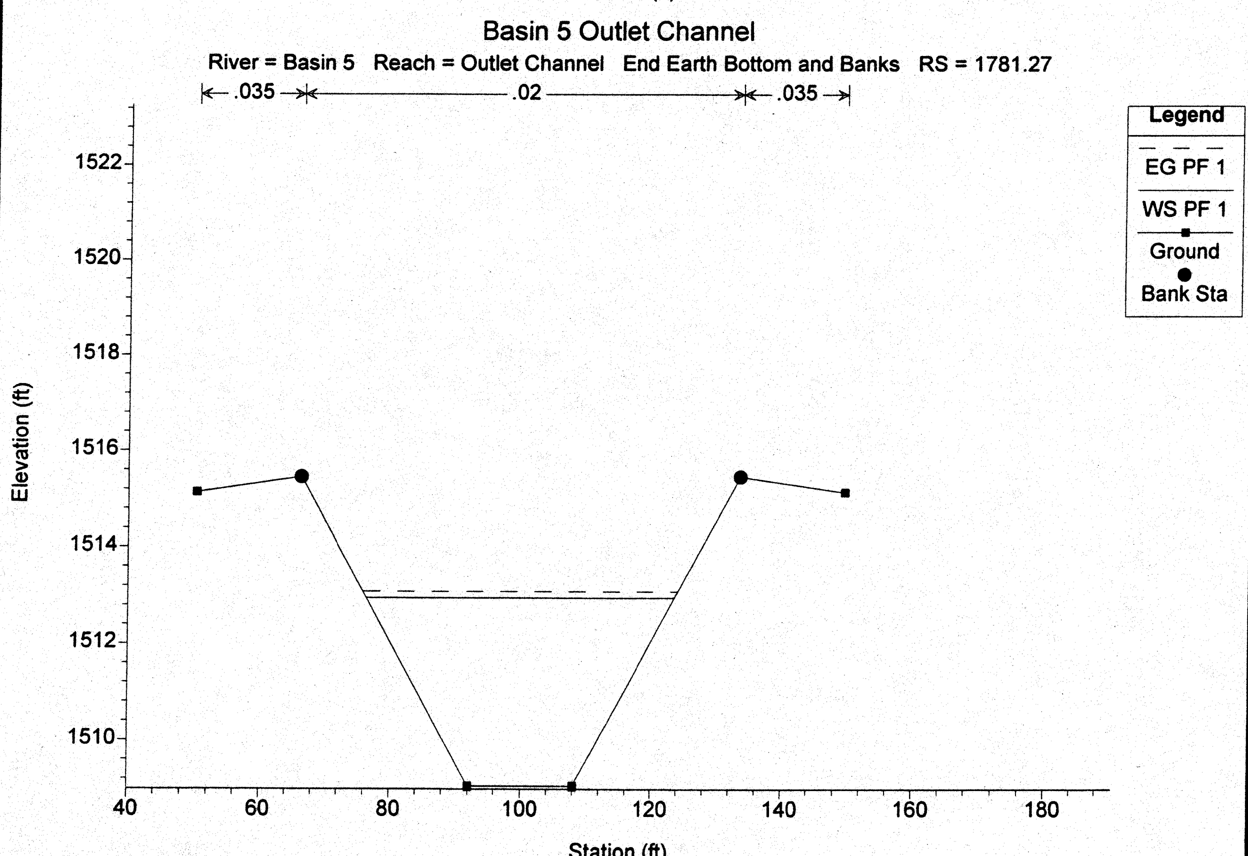

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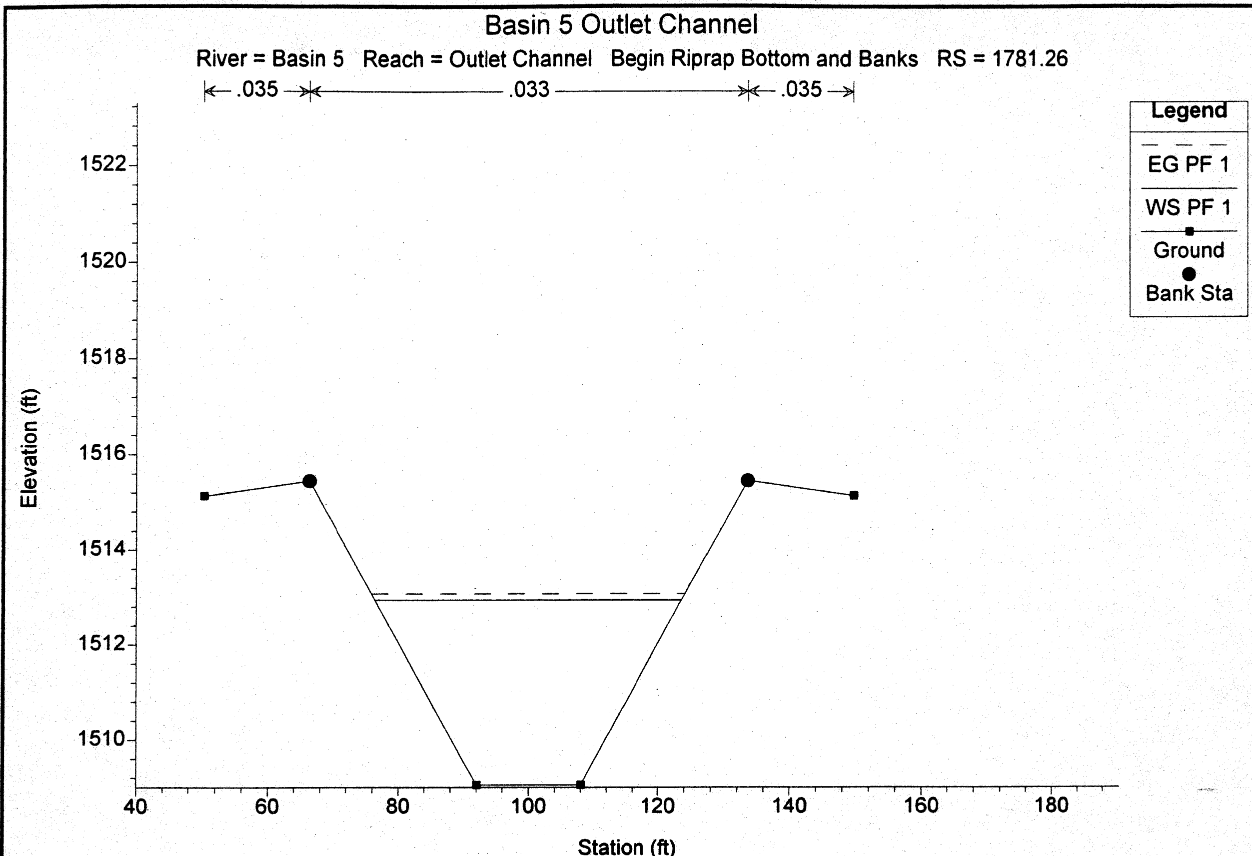

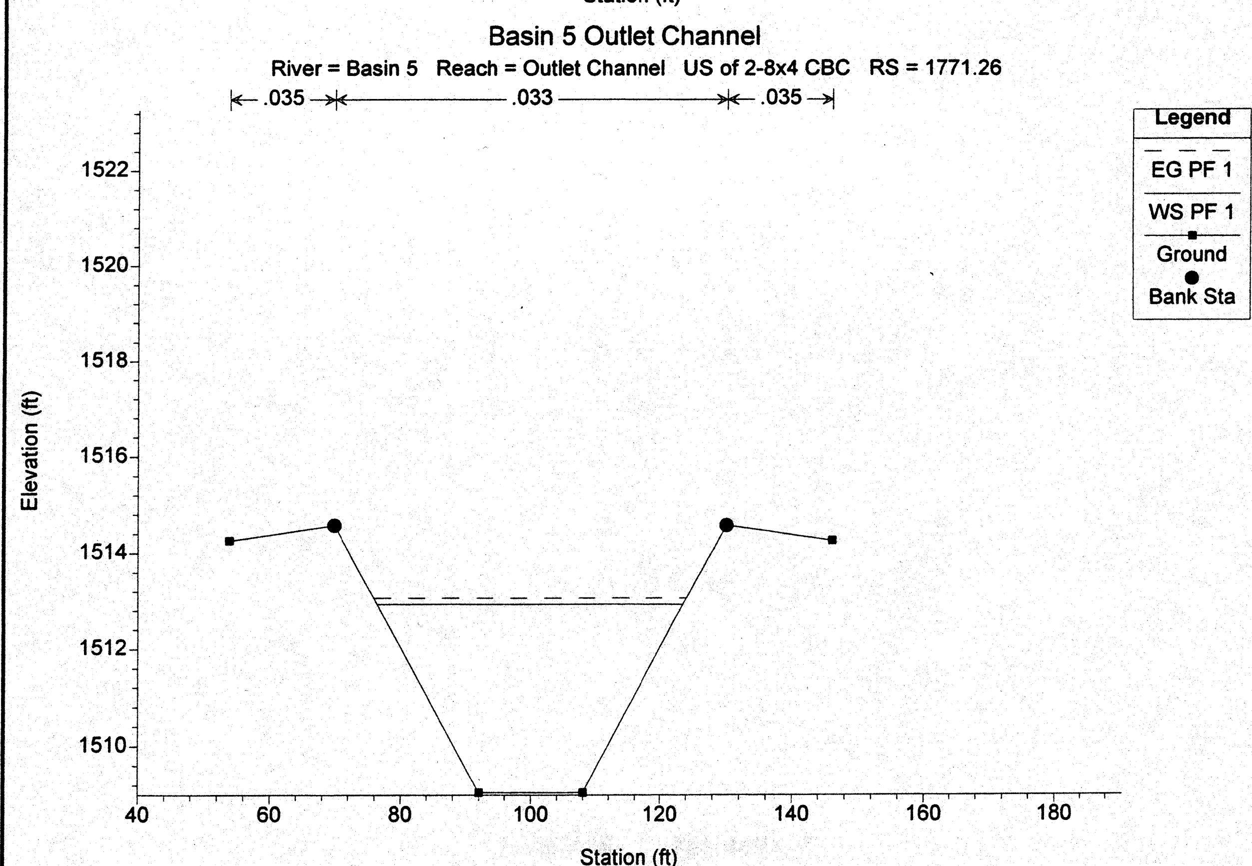

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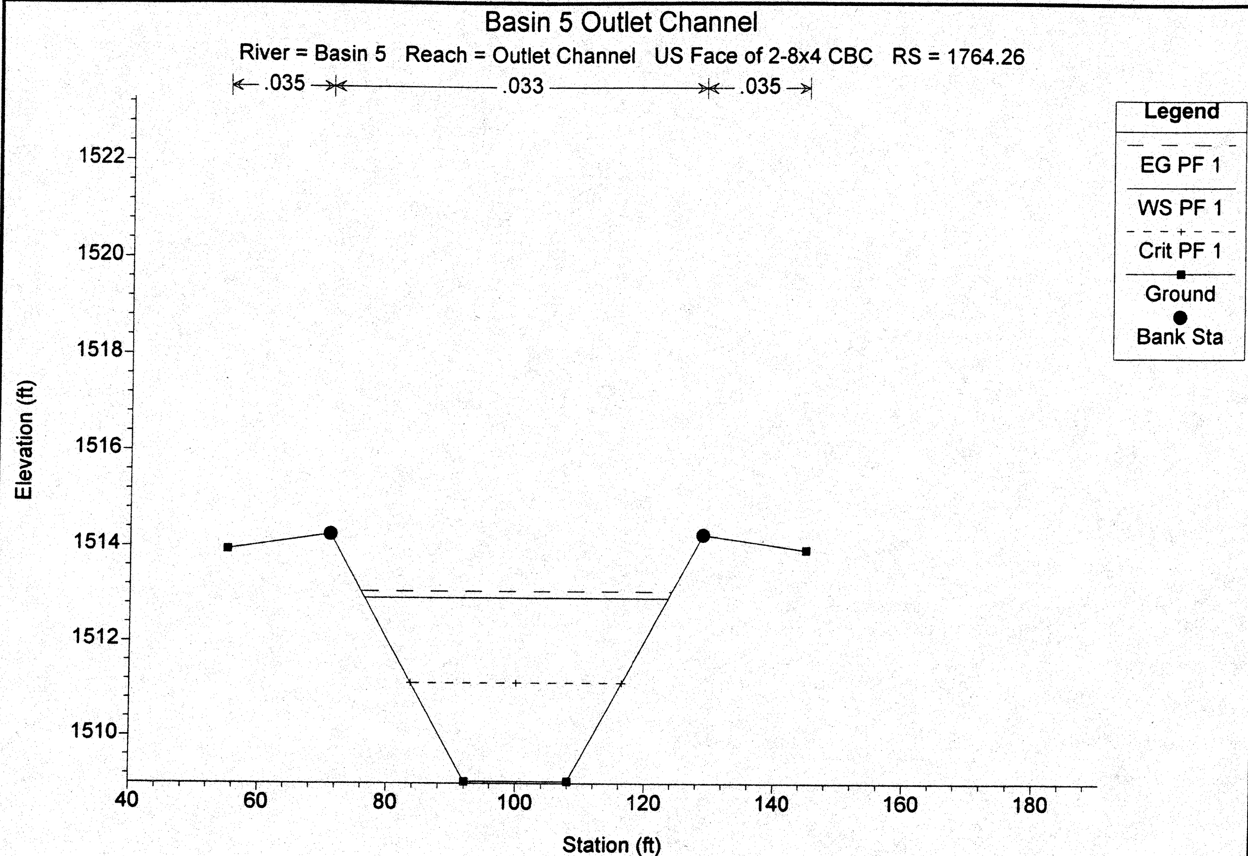

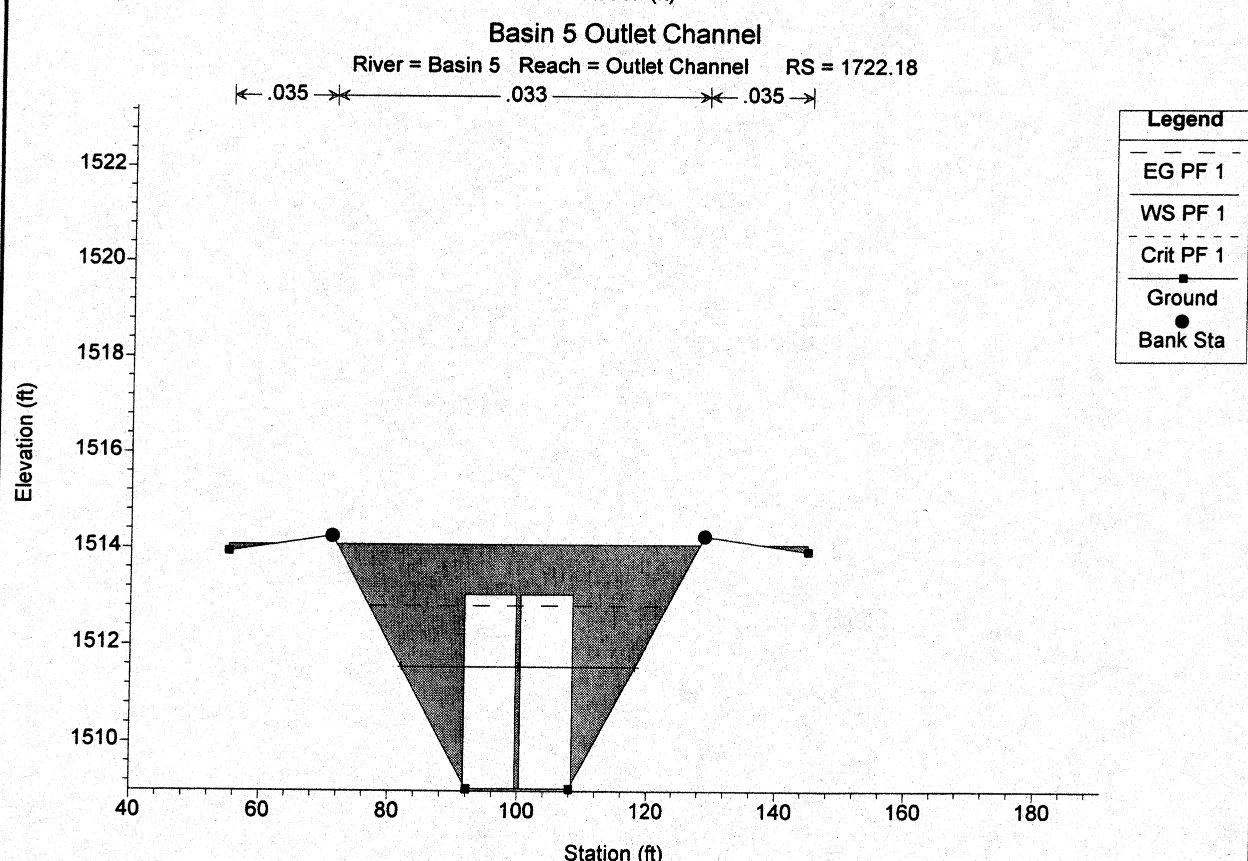

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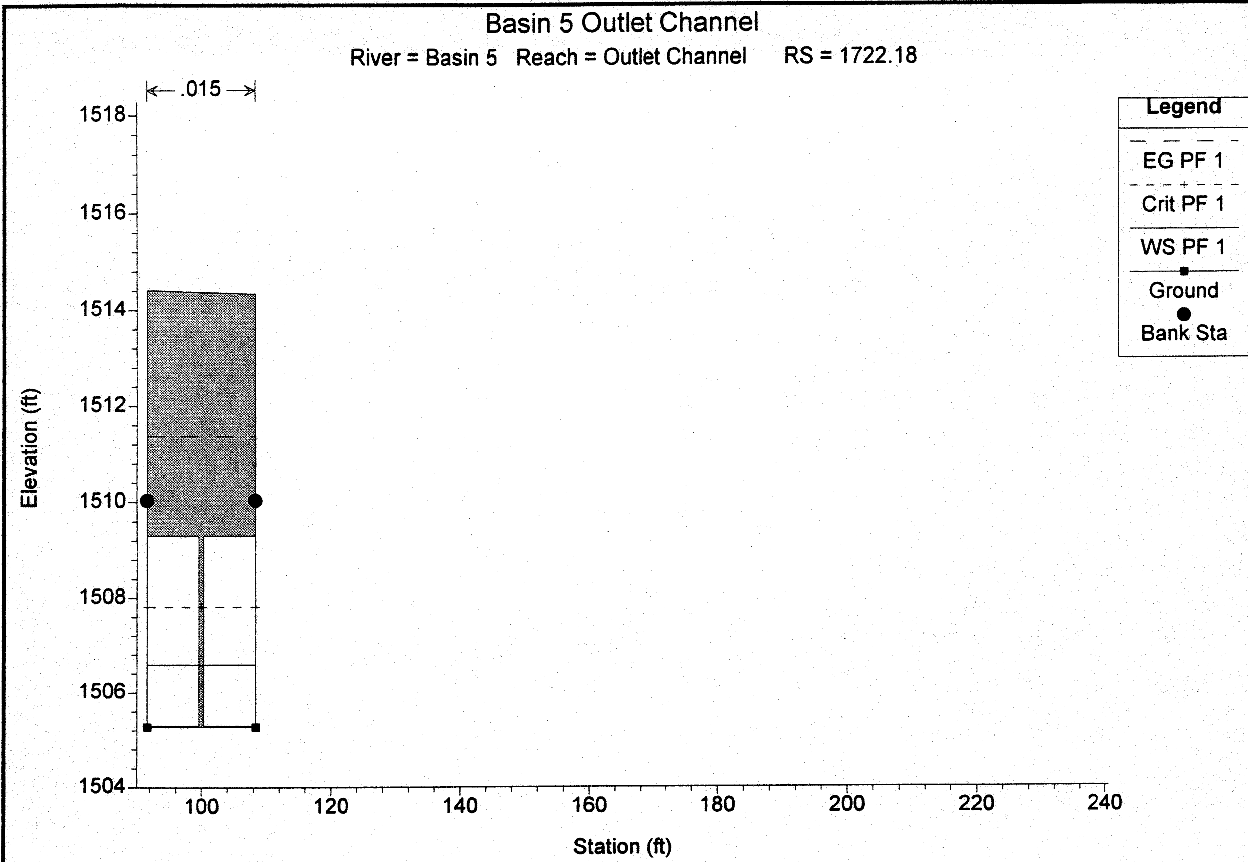

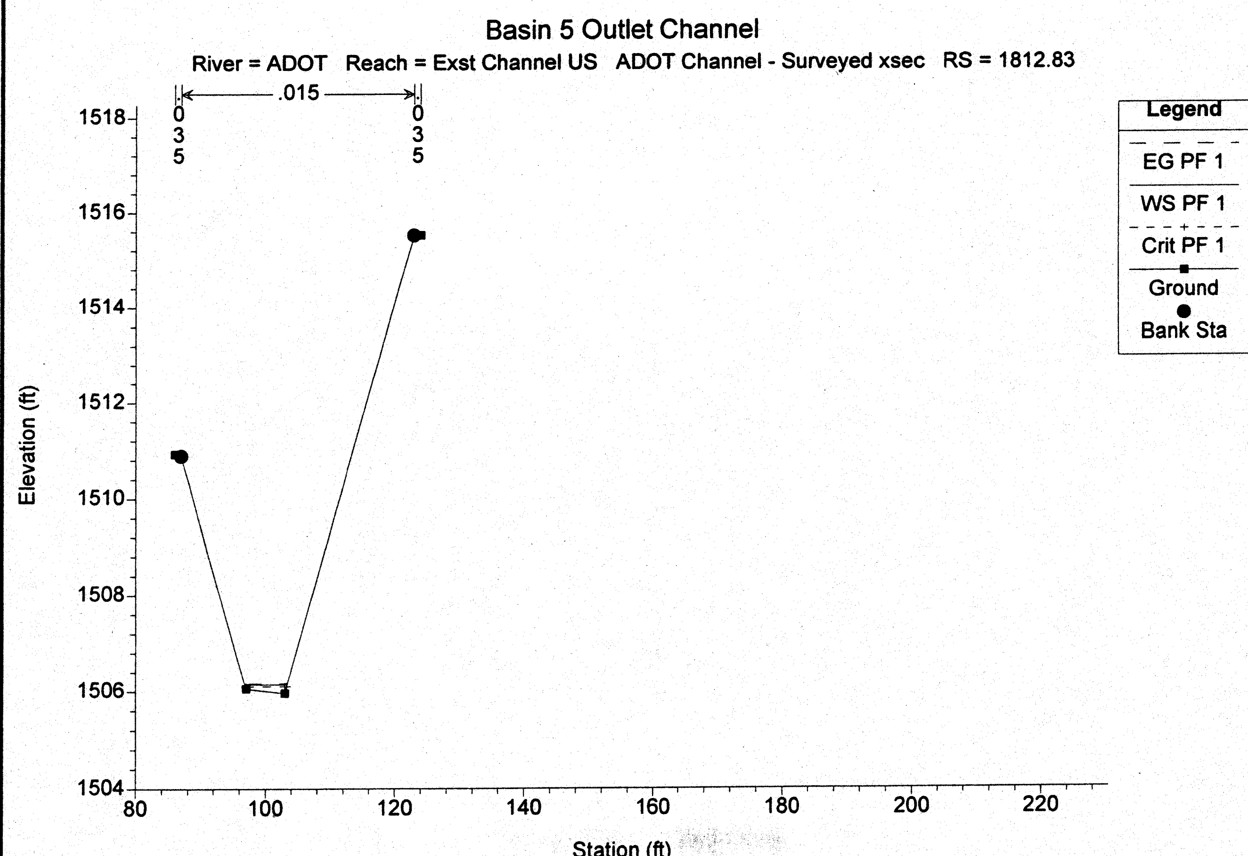

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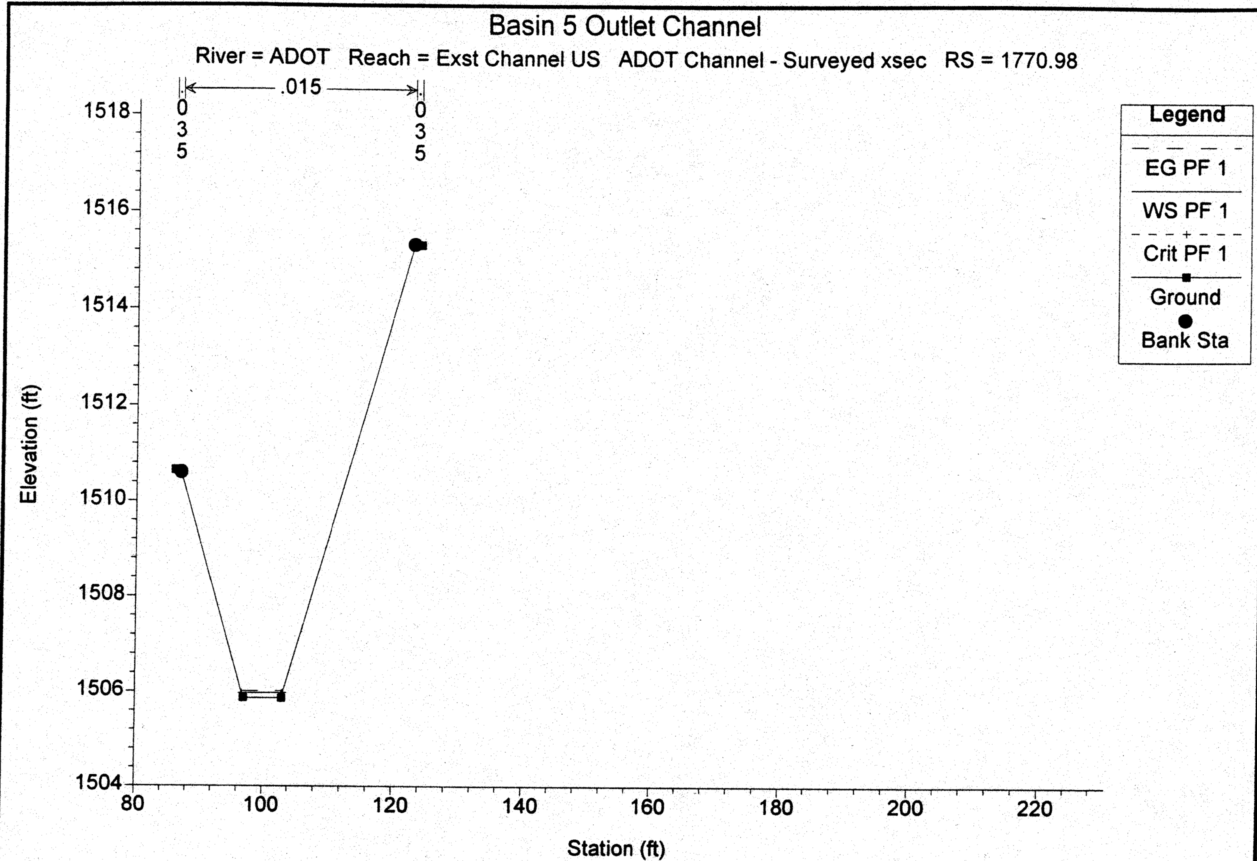

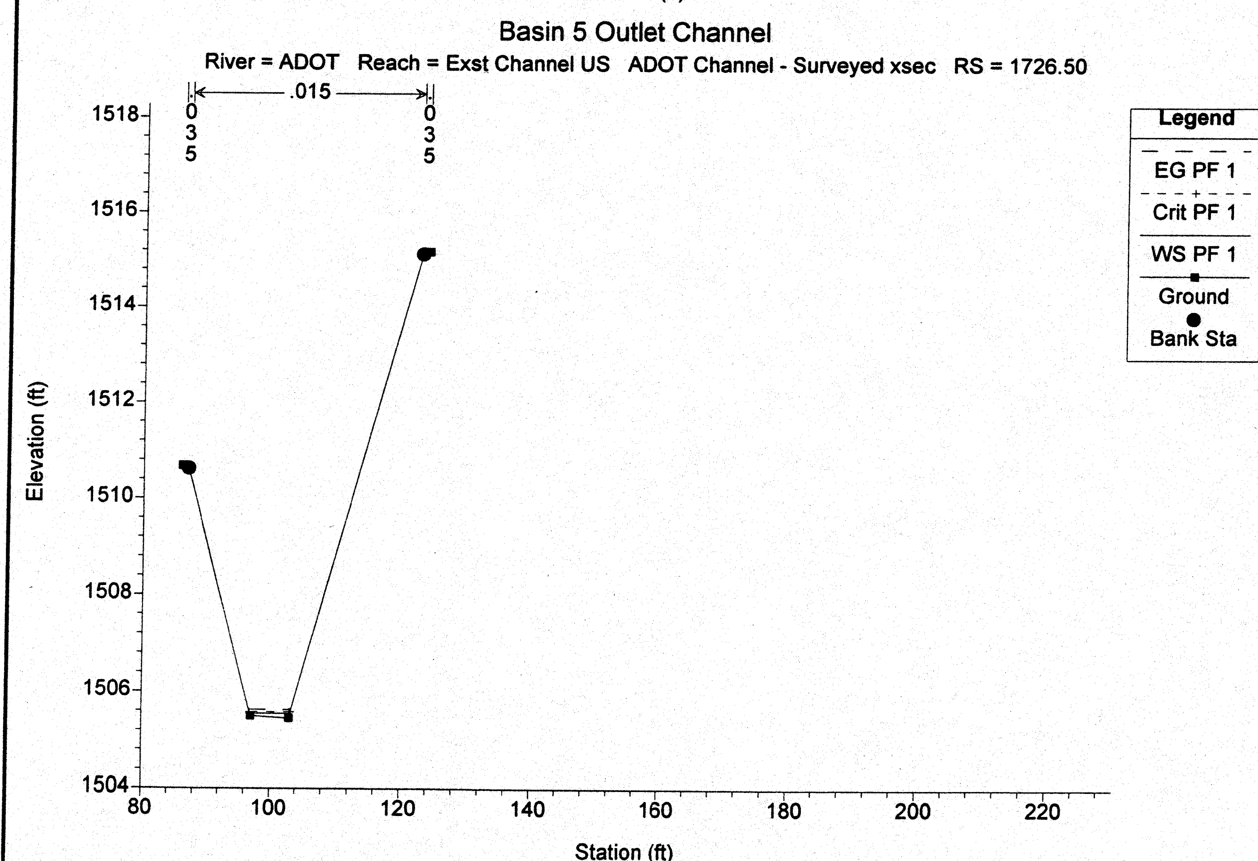

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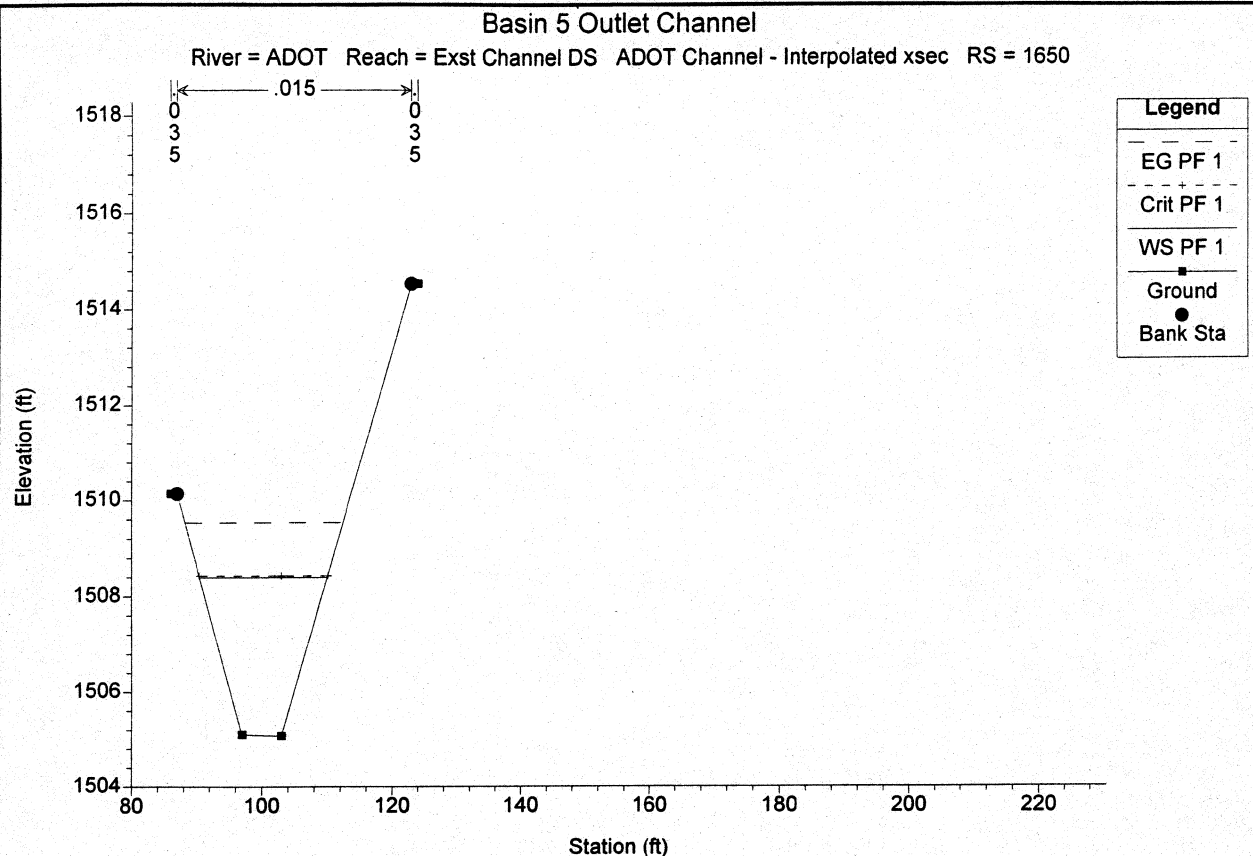

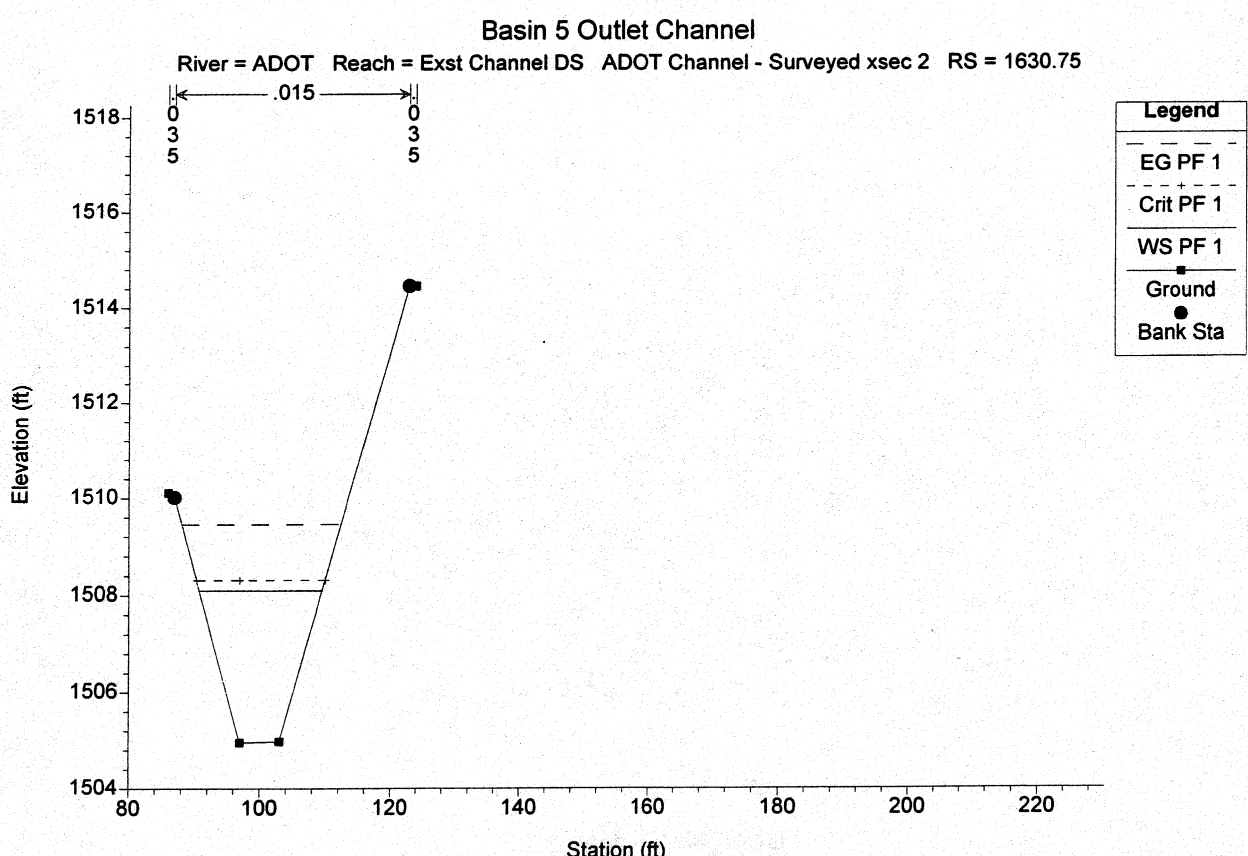

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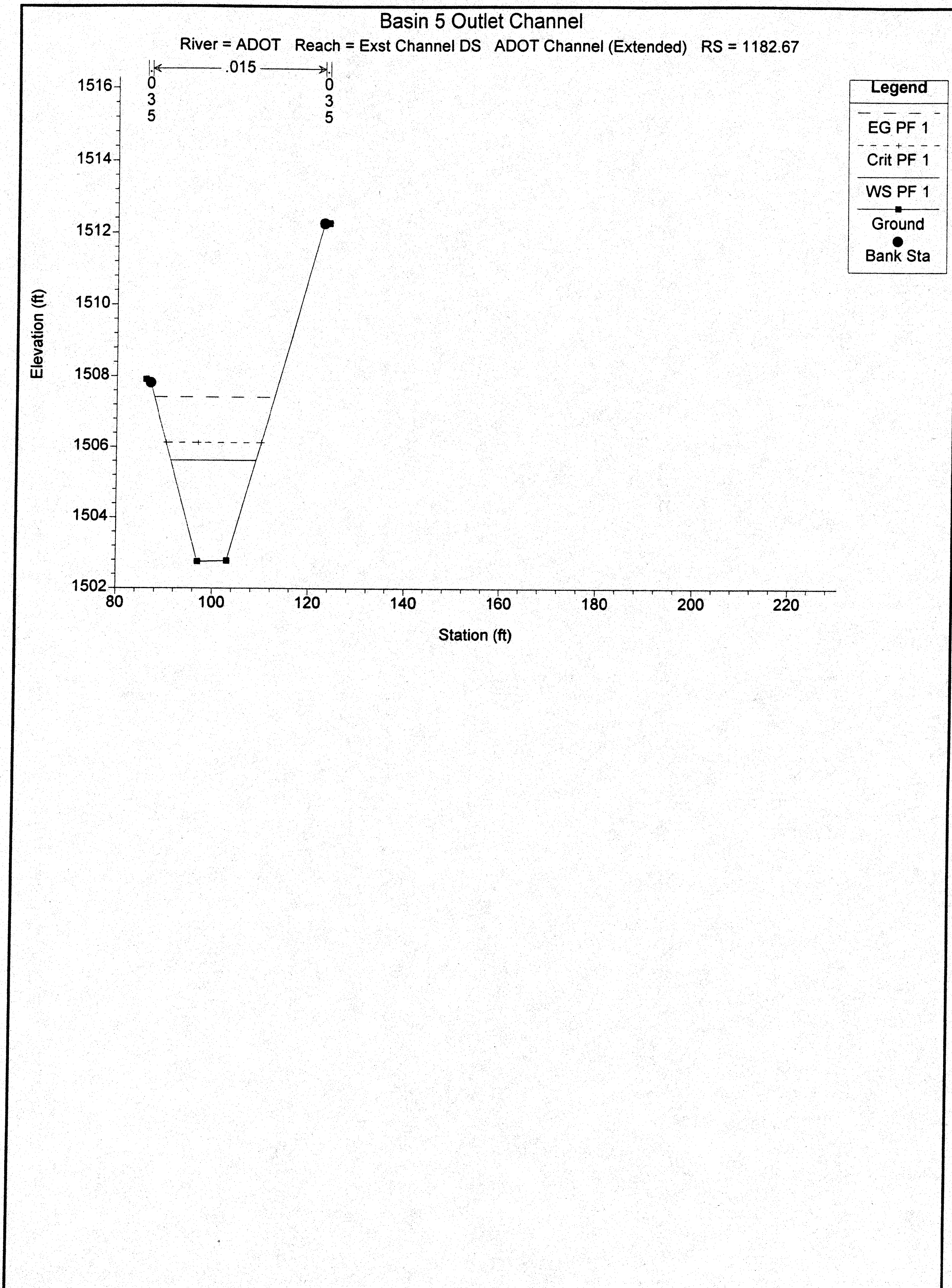

1 in Horiz. = 30 ft 1 in Vert. = 4 ft

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                    HEC-RAS September 1998 Version 2.2
                      U.S. Army Corp of Engineers
                     Hydrologic Engineering Center
                      609 Second Street, Suite D
                     Davis, California 95616-4687
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     X     X  XXXXXX   XXXX        XXXX      XX     XXXX
     X     X  X       X    X       X   X    X  X   X
     X     X  X       X            X   X   X    X  X
     XXXXXXX  XXXX    X      XXX   XXXX    XXXXXX   XXXX
     X     X  X       X            X  X    X    X       X
     X     X  X       X    X       X   X   X    X       X
     X     X  XXXXXX   XXXX        X    X  X    X  XXXXX
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PROJECT DATA
Project Title: Basin 5 Outlet Channel
Project File : basin5.prj
Run Date and Time: 3/3/00 8:54:58 AM

Project in English units

Project Description:
Parkwood Ranch Detention Basin Outlet Channel

PLAN DATA

Plan Title: Basin 5 Outlet Channel (n=.025)
Plan File : j:\9845\hecras\basin5.p02

Geometry Title: Outlet Channel w/ ADOT Channel (n=.025)
Geometry File : j:\9845\hecras\basin5.g02

Flow Title   : Outlet Channel Flow
Flow File   : j:\9845\hecras\basin5.f01

Plan Summary Information:

Number of:	Cross Sections	= 54		Mulitple Openings	=	0
	Culverts	= 1		Inline Weirs	=	0
	Bridges	= 0				

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculaton tolerance = 0.01
    Maximum number of interations   = 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: Outlet Channel Flow
Flow File : j:\9845\hecras\basin5.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Basin 5	Outlet Channel	3774.5	362
ADOT	Exst Channel US	1812.83	1
ADOT	Exst Channel DS	1650	362

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Basin 5	Outlet Channel	PF 1	Normal S = .0005	
ADOT	Exst Channel US	PF 1	Normal S = .0055	
ADOT	Exst Channel DS	PF 1		Normal S = .0055

GEOMETRY DATA

Geometry Title: Outlet Channel w/ ADOT Channel (n=.025)
Geometry File : j:\9845\hecras\basin5.g02

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Basin 5	Outlet Channel		Junction 1
ADOT	Exst Channel US		Junction 1
ADOT	Exst Channel DS	Junction 1	

JUNCTION INFORMATION

Name: Junction 1
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
ADOT	Exst Channel US	to ADOT	Exst Channel DS	69.92	
Basin 5	Outlet Channel	to ADOT	Exst Channel DS	25.69	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3774.5

INPUT
Description: DS Face of Outlet Box Culvert
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1524.13	60	1524.45	92	1516.45	108	1516.45	140	1524.45
156	1524.13								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	300	300	300	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1520.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.025	
W.S. Elev (ft)	1520.39	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)	1518.54	Flow Area (sq ft)		125.27	
E.G. Slope (ft/ft)	0.000667	Area (sq ft)		125.27	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.54	Top Width (ft)		47.54	
Vel Total (ft/s)	2.89	Avg. Vel. (ft/s)		2.89	
Max Chl Dpth (ft)	3.94	Hydr. Depth (ft)		2.63	
Conv. Total (cfs)	14014.0	Conv. (cfs)		14014.0	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		48.51	

Min Ch El (ft)	1516.45	Shear (lb/sq ft)	0.11
Alpha	1.00	Stream Power (lb/ft s)	0.31
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	5.59
C & E Loss (ft)	0.00	Cum SA (acres)	2.15

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3474.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.98	60	1524.3	92	1516.3	108	1516.3	140	1524.3
156	1523.98								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	300	300	300	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1520.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.025	
W.S. Elev (ft)	1520.18	Reach Len. (ft)	300.00	300.00	300.00
Crit W.S. (ft)		Flow Area (sq ft)		122.23	
E.G. Slope (ft/ft)	0.000714	Area (sq ft)		122.23	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.03	Top Width (ft)		47.03	
Vel Total (ft/s)	2.96	Avg. Vel. (ft/s)		2.96	
Max Chl Dpth (ft)	3.88	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	13550.4	Conv. (cfs)		13550.4	
Length Wtd. (ft)	300.00	Wetted Per. (ft)		47.98	
Min Ch El (ft)	1516.30	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.34	
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)		4.74	
C & E Loss (ft)	0.00	Cum SA (acres)		1.82	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3174.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.83	60	1524.15	92	1516.15	108	1516.15	140	1524.15
156	1523.83								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	161.5	161.5	161.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1520.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.025	
W.S. Elev (ft)	1519.94	Reach Len. (ft)	161.50	161.50	161.50
Crit W.S. (ft)		Flow Area (sq ft)		118.31	
E.G. Slope (ft/ft)	0.000780	Area (sq ft)		118.31	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	46.36	Top Width (ft)		46.36	
Vel Total (ft/s)	3.06	Avg. Vel. (ft/s)		3.06	
Max Chl Dpth (ft)	3.79	Hydr. Depth (ft)		2.55	
Conv. Total (cfs)	12959.5	Conv. (cfs)		12959.5	
Length Wtd. (ft)	161.50	Wetted Per. (ft)		47.29	

Min Ch El (ft)	1516.15	Shear (lb/sq ft)	0.12
Alpha	1.00	Stream Power (lb/ft s)	0.37
Frctn Loss (ft)	0.13	Cum Volume (acre-ft)	3.91
C & E Loss (ft)	0.00	Cum SA (acres)	1.50

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 3013

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.74	60	1524.08	92	1516.08	108	1516.08	140	1524.08
156	1523.74								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.96	Wt. n-Val.		0.025	
Vel Head (ft)	0.15	Reach Len. (ft)	25.00	25.00	25.00
W.S. Elev (ft)	1519.80	Flow Area (sq ft)		115.10	
Crit W.S. (ft)		Area (sq ft)		115.10	
E.G. Slope (ft/ft)	0.000842	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.80	
Top Width (ft)	45.80	Avg. Vel. (ft/s)		3.15	
Vel Total (ft/s)	3.15	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.72	Conv. (cfs)		12478.9	
Conv. Total (cfs)	12478.9	Wetted Per. (ft)		46.72	
Length Wtd. (ft)	25.00	Shear (lb/sq ft)		0.13	
Min Ch El (ft)	1516.08	Stream Power (lb/ft s)		0.41	
Alpha	1.00	Cum Volume (acre-ft)		3.48	
Frctn Loss (ft)	0.02	Cum SA (acres)		1.33	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2988

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.73	60	1524.06	92	1516.06	108	1516.06	140	1524.06
156	1523.73								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.94	Wt. n-Val.		0.025	
Vel Head (ft)	0.15	Reach Len. (ft)	25.00	25.00	25.00
W.S. Elev (ft)	1519.78	Flow Area (sq ft)		115.04	
Crit W.S. (ft)		Area (sq ft)		115.04	
E.G. Slope (ft/ft)	0.000843	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.79	
Top Width (ft)	45.79	Avg. Vel. (ft/s)		3.15	
Vel Total (ft/s)	3.15	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.72	Conv. (cfs)		12470.6	
Conv. Total (cfs)	12470.6	Wetted Per. (ft)		46.71	
Length Wtd. (ft)	25.00				

Min Ch El (ft)	1516.06	Shear (lb/sq ft)	0.13
Alpha	1.00	Stream Power (lb/ft s)	0.41
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	3.42
C & E Loss (ft)	0.00	Cum SA (acres)	1.30

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2963

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.72	60	1524.05	92	1516.05	108	1516.05	140	1524.05
156	1523.72								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.92	Wt. n-Val.		0.025	
Vel Head (ft)	0.16	Reach Len. (ft)	25.00	25.00	25.00
W.S. Elev (ft)	1519.76	Flow Area (sq ft)		114.48	
Crit W.S. (ft)		Area (sq ft)		114.48	
E.G. Slope (ft/ft)	0.000854	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.69	
Top Width (ft)	45.69	Avg. Vel. (ft/s)		3.16	
Vel Total (ft/s)	3.16	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.71	Conv. (cfs)		12386.9	
Conv. Total (cfs)	12386.9	Wetted Per. (ft)		46.60	
Length Wtd. (ft)	25.00	Shear (lb/sq ft)		0.13	
Min Ch El (ft)	1516.05	Stream Power (lb/ft s)		0.41	
Alpha	1.00	Cum Volume (acre-ft)		3.35	
Frctn Loss (ft)	0.02	Cum SA (acres)		1.28	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2938

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.71	60	1524.03	92	1516.03	108	1516.03	140	1524.03
156	1523.71								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25.03	25.03	25.03	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.90	Wt. n-Val.		0.025	
Vel Head (ft)	0.16	Reach Len. (ft)	25.03	25.03	25.03
W.S. Elev (ft)	1519.74	Flow Area (sq ft)		114.41	
Crit W.S. (ft)		Area (sq ft)		114.41	
E.G. Slope (ft/ft)	0.000855	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.68	
Top Width (ft)	45.68	Avg. Vel. (ft/s)		3.16	
Vel Total (ft/s)	3.16	Hydr. Depth (ft)		2.50	
Max Chl Dpth (ft)	3.71	Conv. (cfs)		12377.8	
Conv. Total (cfs)	12377.8	Wetted Per. (ft)		46.59	
Length Wtd. (ft)	25.03				

Min Ch El (ft)	1516.03	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.41	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		3.28	
C & E Loss (ft)	0.00	Cum SA (acres)		1.25	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2912.97

INPUT
Description: Begin Road Vertical Taper
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1523.7	60	1524.02	92	1516.02	108	1516.02	140	1524.02
156	1523.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	46	46	46	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.87	Wt. n-Val.		0.025	
Vel Head (ft)	0.16	Reach Len. (ft)	46.00	46.00	46.00
W.S. Elev (ft)	1519.72	Flow Area (sq ft)		113.84	
Crit W.S. (ft)		Area (sq ft)		113.84	
E.G. Slope (ft/ft)	0.000867	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		45.58	
Top Width (ft)	45.58	Avg. Vel. (ft/s)		3.18	
Vel Total (ft/s)	3.18	Hydr. Depth (ft)		2.50	
Max Chl Dpth (ft)	3.70	Conv. (cfs)		12291.9	
Conv. Total (cfs)	12291.9	Wetted Per. (ft)		46.49	
Length Wtd. (ft)	46.00	Shear (lb/sq ft)		0.13	
Min Ch El (ft)	1516.02	Stream Power (lb/ft s)		0.42	
Alpha	1.00	Cum Volume (acre-ft)		3.22	
Frctn Loss (ft)	0.04	Cum SA (acres)		1.23	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2866.97

INPUT
Description: End Earth Bottom and Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1522.7	67.976	1522.38	92	1516	108	1516	132.024	1522.38
156	1522.7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.025	132.024	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.83	Wt. n-Val.		0.025	
Vel Head (ft)	0.17	Reach Len. (ft)	0.01	0.01	0.01
W.S. Elev (ft)	1519.66	Flow Area (sq ft)		109.00	
Crit W.S. (ft)		Area (sq ft)		109.00	
E.G. Slope (ft/ft)	0.000946	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		43.56	
Top Width (ft)	43.56	Avg. Vel. (ft/s)		3.32	
Vel Total (ft/s)	3.32	Hydr. Depth (ft)		2.50	
Max Chl Dpth (ft)	3.66	Conv. (cfs)		11768.6	
Conv. Total (cfs)	11768.6	Wetted Per. (ft)		44.52	
Length Wtd. (ft)	0.01				

Min Ch El (ft)	1516.00	Shear (lb/sq ft)	0.14
Alpha	1.00	Stream Power (lb/ft s)	0.48
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.10
C & E Loss (ft)	0.00	Cum SA (acres)	1.18

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2866.96

INPUT
Description: Begin Transition from 4:1 to 2:1, Conc. Bottom, Riprap Banks.
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1522.7	67.976	1522.38	92	1516	108	1516	132.024	1522.38
156	1522.7								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.033	92	.014	108	.014	132.024	.033
156	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	12.99	12.99	12.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.021	
W.S. Elev (ft)	1519.66	Reach Len. (ft)	12.99	12.99	12.99
Crit W.S. (ft)		Flow Area (sq ft)		109.00	
E.G. Slope (ft/ft)	0.000668	Area (sq ft)		109.00	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	43.56	Top Width (ft)		43.56	
Vel Total (ft/s)	3.32	Avg. Vel. (ft/s)		3.32	
Max Chl Dpth (ft)	3.66	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	14001.5	Conv. (cfs)		14001.5	
Length Wtd. (ft)	12.99	Wetted Per. (ft)		44.52	
Min Ch El (ft)	1516.00	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.34	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		3.10	
C & E Loss (ft)	0.09	Cum SA (acres)		1.18	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2853.97

INPUT
Description: Before Top of Drop Structure, End Riprap Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1521.17	83.5	1521.49	94.5	1515.99	105.5	1515.99	116.5	1521.49
156	1521.17								

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.033	94.5	.014	105.5	.014	116.5	.033
156	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1519.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	1518.70	Reach Len. (ft)	1.00	1.00	1.00

Crit W.S. (ft)	1518.70	Flow Area (sq ft)	44.53
E.G. Slope (ft/ft)	0.004918	Area (sq ft)	44.53
Q Total (cfs)	362.00	Flow (cfs)	362.00
Top Width (ft)	21.85	Top Width (ft)	21.85
Vel Total (ft/s)	8.13	Avg. Vel. (ft/s)	8.13
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)	2.04
Conv. Total (cfs)	5162.2	Conv. (cfs)	5162.2
Length Wtd. (ft)	1.00	Wetted Per. (ft)	23.13
Min Ch El (ft)	1515.99	Shear (lb/sq ft)	0.59
Alpha	1.00	Stream Power (lb/ft s)	4.81
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.08
C & E Loss (ft)	0.00	Cum SA (acres)	1.17

Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2852.97

INPUT
Description: Top of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1521.17	83.5	1521.49	94.5	1515.99	105.5	1515.99	116.5	1521.49
156	1521.17								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.014	116.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1519.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.014	
W.S. Elev (ft)	1518.70	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	1518.70	Flow Area (sq ft)		44.45	
E.G. Slope (ft/ft)	0.002461	Area (sq ft)		44.45	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	21.83	Top Width (ft)		21.83	
Vel Total (ft/s)	8.14	Avg. Vel. (ft/s)		8.14	
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)		2.04	
Conv. Total (cfs)	7297.1	Conv. (cfs)		7297.1	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		23.11	
Min Ch El (ft)	1515.99	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		2.41	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		3.08	
C & E Loss (ft)	0.24	Cum SA (acres)		1.17	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The 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: Basin 5
REACH: Outlet Channel RS: 2852.96

INPUT
Description: Bottom of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1521[illegible]	74.6	1521.49	92	1512.79	108	1512.79	125.4	1521.49

156 1521.17

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	74.6	.014	125.4	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.6	125.4	34.49	34.49	34.49	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1519.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.42	Wt. n-Val.		0.014	
W.S. Elev (ft)	1513.86	Reach Len. (ft)	34.49	34.49	34.49
Crit W.S. (ft)	1515.06	Flow Area (sq ft)		19.38	
E.G. Slope (ft/ft)	0.034007	Area (sq ft)		19.38	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	20.27	Top Width (ft)		20.27	
Vel Total (ft/s)	18.68	Avg. Vel. (ft/s)		18.68	
Max Chl Dpth (ft)	1.07	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	1963.0	Conv. (cfs)		1963.0	
Length Wtd. (ft)	34.49	Wetted Per. (ft)		20.78	
Min Ch El (ft)	1512.79	Shear (lb/sq ft)		1.98	
Alpha	1.00	Stream Power (lb/ft s)		36.99	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		3.08	
C & E Loss (ft)	0.44	Cum SA (acres)		1.17	

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

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2818.47

INPUT
Description: End of Drop Structure (Bottom of Sill)
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.46	76	1520.78	92	1512.78	108	1512.78	124	1520.78
156	1520.46								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	1.5	1.5	1.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1516.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.		0.014	
W.S. Elev (ft)	1516.67	Reach Len. (ft)	1.50	1.50	1.50
Crit W.S. (ft)	1515.05	Flow Area (sq ft)		92.41	
E.G. Slope (ft/ft)	0.000350	Area (sq ft)		92.41	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	31.55	Top Width (ft)		31.55	
Vel Total (ft/s)	3.92	Avg. Vel. (ft/s)		3.92	
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)		2.93	
Conv. Total (cfs)	19337.2	Conv. (cfs)		19337.2	
Length Wtd. (ft)	1.50	Wetted Per. (ft)		33.38	
Min Ch El (ft)	1512.78	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.24	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		3.03	
C & E Loss (ft)	0.03	Cum SA (acres)		1.15	

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

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

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2816.97

INPUT
Description: End of Drop Structure (Top of Sill), Begin Transition from 2:1 to 4:1

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.46	76	1520.78	92	1513.53	108	1513.53	124	1520.78
156	1520.46								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.88	Wt. n-Val.		0.014	
Vel Head (ft)	0.51	Reach Len. (ft)	0.01	0.01	0.01
W.S. Elev (ft)	1516.37	Flow Area (sq ft)		63.23	
Crit W.S. (ft)		Area (sq ft)		63.23	
E.G. Slope (ft/ft)	0.001065	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		28.53	
Top Width (ft)	28.53	Avg. Vel. (ft/s)		5.73	
Vel Total (ft/s)	5.73	Hydr. Depth (ft)		2.22	
Max Chl Dpth (ft)	2.84	Conv. (cfs)		11090.9	
Conv. Total (cfs)	11090.9	Wetted Per. (ft)		29.76	
Length Wtd. (ft)	0.01	Shear (lb/sq ft)		0.14	
Min Ch El (ft)	1513.53	Stream Power (lb/ft s)		0.81	
Alpha	1.00	Cum Volume (acre-ft)		3.03	
Frctn Loss (ft)	0.00	Cum SA (acres)		1.15	
C & E Loss (ft)	0.07				

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: Basin 5
REACH: Outlet Channel RS: 2816.96

INPUT
Description: Begin Riprap

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.46	76	1520.78	92	1512.78	108	1512.78	124	1520.78
156	1520.46								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.033	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	31.99	31.99	31.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.80	Wt. n-Val.		0.033	
Vel Head (ft)	0.26	Reach Len. (ft)	31.99	31.99	31.99
W.S. Elev (ft)	1516.54	Flow Area (sq ft)		88.54	
Crit W.S. (ft)		Area (sq ft)		88.54	
E.G. Slope (ft/ft)	0.002196	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		31.05	
Top Width (ft)	31.05	Avg. Vel. (ft/s)		4.09	
Vel Total (ft/s)	4.09	Hydr. Depth (ft)		2.85	
Max Chl Dpth (ft)	3.76	Conv. (cfs)		7724.6	
Conv. Total (cfs)	7724.6	Wetted Per. (ft)		32.83	
Length Wtd. (ft)	31.99				

Min Ch El (ft)	1512.78	Shear (lb/sq ft)	0.37
Alpha	1.00	Stream Power (lb/ft s)	1.51
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	3.03
C & E Loss (ft)	0.03	Cum SA (acres)	1.15

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2784.97

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

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.44	60	1520.76	92	1512.76	108	1512.76	140	1520.76
156	1520.44								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.033	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.033	
W.S. Elev (ft)	1516.57	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)		Flow Area (sq ft)		119.06	
E.G. Slope (ft/ft)	0.001336	Area (sq ft)		119.06	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	46.49	Top Width (ft)		46.49	
Vel Total (ft/s)	3.04	Avg. Vel. (ft/s)		3.04	
Max Chl Dpth (ft)	3.81	Hydr. Depth (ft)		2.56	
Conv. Total (cfs)	9902.3	Conv. (cfs)		9902.3	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		47.42	
Min Ch El (ft)	1512.76	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		0.64	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.95	
C & E Loss (ft)	0.00	Cum SA (acres)		1.12	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2784.96

INPUT
Description: Begin DS Earth Channel
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.44	60	1520.76	92	1512.76	108	1512.76	140	1520.76
156	1520.44								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	23.99	23.99	23.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.025	
W.S. Elev (ft)	1516.57	Reach Len. (ft)	23.99	23.99	23.99
Crit W.S. (ft)		Flow Area (sq ft)		119.06	
E.G. Slope (ft/ft)	0.000767	Area (sq ft)		119.06	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	46.49	Top Width (ft)		46.49	
Vel Total (ft/s)	3.04	Avg. Vel. (ft/s)		3.04	
Max Chl Dpth (ft)	3.81	Hydr. Depth (ft)		2.56	
Conv. Total (cfs)	13071.0	Conv. (cfs)		13071.0	
Length Wtd. (ft)	23.99	Wetted Per. (ft)		47.42	

Min Ch El (ft)	1512.76	Shear (lb/sq ft)	0.12
Alpha	1.00	Stream Power (lb/ft s)	0.37
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	2.95
C & E Loss (ft)	0.00	Cum SA (acres)	1.12

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2760.97

INPUT
Description:

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.43	60	1520.75	92	1512.75	108	1512.75	140	1520.75
156	1520.43								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.70	Wt. n-Val.		0.025	
Vel Head (ft)	0.14	Reach Len. (ft)	25.00	25.00	25.00
W.S. Elev (ft)	1516.55	Flow Area (sq ft)		118.66	
Crit W.S. (ft)		Area (sq ft)		118.66	
E.G. Slope (ft/ft)	0.000774	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		46.42	
Top Width (ft)	46.42	Avg. Vel. (ft/s)		3.05	
Vel Total (ft/s)	3.05	Hydr. Depth (ft)		2.56	
Max Chl Dpth (ft)	3.80	Conv. (cfs)		13011.3	
Conv. Total (cfs)	13011.3	Wetted Per. (ft)		47.35	
Length Wtd. (ft)	25.00	Shear (lb/sq ft)		0.12	
Min Ch El (ft)	1512.75	Stream Power (lb/ft s)		0.37	
Alpha	1.00	Cum Volume (acre-ft)		2.89	
Frctn Loss (ft)	0.02	Cum SA (acres)		1.09	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2735.97

INPUT
Description:

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.41	60	1520.73	92	1512.73	108	1512.73	140	1520.73
156	1520.41								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	103	103	103	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.68	Wt. n-Val.		0.025	
Vel Head (ft)	0.14	Reach Len. (ft)	103.00	103.00	103.00
W.S. Elev (ft)	1516.53	Flow Area (sq ft)		118.69	
Crit W.S. (ft)		Area (sq ft)		118.69	
E.G. Slope (ft/ft)	0.000773	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		46.42	
Top Width (ft)	46.42	Avg. Vel. (ft/s)		3.05	
Vel Total (ft/s)	3.05	Hydr. Depth (ft)		2.56	
Max Chl Dpth (ft)	3.80	Conv. (cfs)		13016.4	
Conv. Total (cfs)	13016.4	Wetted Per. (ft)		47.36	
Length Wtd. (ft)	103.00				

Min Ch El (ft)	1512.73	Shear (lb/sq ft)	0.12
Alpha	1.00	Stream Power (lb/ft s)	0.37
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	2.82
C & E Loss (ft)	0.00	Cum SA (acres)	1.07

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2632.97

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.36	60	1520.68	92	1512.68	108	1512.68	140	1520.68
156	1520.36								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	44.97	44.97	44.97	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.025	
W.S. Elev (ft)	1516.45	Reach Len. (ft)	44.97	44.97	44.97
Crit W.S. (ft)		Flow Area (sq ft)		117.03	
E.G. Slope (ft/ft)	0.000804	Area (sq ft)		117.03	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	46.14	Top Width (ft)		46.14	
Vel Total (ft/s)	3.09	Avg. Vel. (ft/s)		3.09	
Max Chl Dpth (ft)	3.77	Hydr. Depth (ft)		2.54	
Conv. Total (cfs)	12767.5	Conv. (cfs)		12767.5	
Length Wtd. (ft)	44.97	Wetted Per. (ft)		47.06	
Min Ch El (ft)	1512.68	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.39	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)		2.54	
C & E Loss (ft)	0.00	Cum SA (acres)		0.96	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2588

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.33	60	1520.67	92	1512.67	108	1512.67	140	1520.67
156	1520.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1516.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.025	
W.S. Elev (ft)	1516.41	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		115.62	
E.G. Slope (ft/ft)	0.000831	Area (sq ft)		115.62	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.89	Top Width (ft)		45.89	
Vel Total (ft/s)	3.13	Avg. Vel. (ft/s)		3.13	
Max Chl Dpth (ft)	3.74	Hydr. Depth (ft)		2.52	
Conv. Total (cfs)	12556.4	Conv. (cfs)		12556.4	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.81	

Min Ch El (ft)	1512.67	Shear (lb/sq ft)	0.13
Alpha	1.00	Stream Power (lb/ft s)	0.40
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	2.42
C & E Loss (ft)	0.00	Cum SA (acres)	0.91

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2563

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.32	60	1520.65	92	1512.65	108	1512.65	140	1520.65
156	1520.32								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.025	
W.S. Elev (ft)	1516.39	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		115.58	
E.G. Slope (ft/ft)	0.000832	Area (sq ft)		115.58	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.88	Top Width (ft)		45.88	
Vel Total (ft/s)	3.13	Avg. Vel. (ft/s)		3.13	
Max Chl Dpth (ft)	3.74	Hydr. Depth (ft)		2.52	
Conv. Total (cfs)	12551.4	Conv. (cfs)		12551.4	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.80	
Min Ch El (ft)	1512.65	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.40	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		2.35	
C & E Loss (ft)	0.00	Cum SA (acres)		0.88	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2538

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.31	60	1520.64	92	1512.64	108	1512.64	140	1520.64
156	1520.31								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.025	
W.S. Elev (ft)	1516.36	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		115.03	
E.G. Slope (ft/ft)	0.000843	Area (sq ft)		115.03	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.79	Top Width (ft)		45.79	
Vel Total (ft/s)	3.15	Avg. Vel. (ft/s)		3.15	
Max Chl Dpth (ft)	3.72	Hydr. Depth (ft)		2.51	
Conv. Total (cfs)	12469.0	Conv. (cfs)		12469.0	
Length Wtd. (ft)	25.00	Wetted Per. (ft)		46.70	

Min Ch El (ft)	1512.64	Shear (lb/sq ft)	0.13
Alpha	1.00	Stream Power (lb/ft s)	0.41
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	2.29
C & E Loss (ft)	0.00	Cum SA (acres)	0.86

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2513

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.3	60	1520.62	92	1512.62	108	1512.62	140	1520.62
156	1520.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25.03	25.03	25.03	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.025	
W.S. Elev (ft)	1516.34	Reach Len. (ft)	25.03	25.03	25.03
Crit W.S. (ft)		Flow Area (sq ft)		114.98	
E.G. Slope (ft/ft)	0.000844	Area (sq ft)		114.98	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.78	Top Width (ft)		45.78	
Vel Total (ft/s)	3.15	Avg. Vel. (ft/s)		3.15	
Max Chl Dpth (ft)	3.72	Hydr. Depth (ft)		2.51	
Conv. Total (cfs)	12461.5	Conv. (cfs)		12461.5	
Length Wtd. (ft)	25.03	Wetted Per. (ft)		46.69	
Min Ch El (ft)	1512.62	Shear (lb/sq ft)		0.13	
Alpha	1.00	Stream Power (lb/ft s)		0.41	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		2.22	
C & E Loss (ft)	0.00	Cum SA (acres)		0.83	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2487.97

INPUT
Description: Begin Road Vertical Taper
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1520.29	60	1520.61	92	1512.61	108	1512.61	140	1520.61
156	1520.29								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	46	46	46	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1516.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.16	Wt. n-Val.		0.025	
W.S. Elev (ft)	1516.32	Reach Len. (ft)	46.00	46.00	46.00
Crit W.S. (ft)		Flow Area (sq ft)		114.41	
E.G. Slope (ft/ft)	0.000855	Area (sq ft)		114.41	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	45.68	Top Width (ft)		45.68	
Vel Total (ft/s)	3.16	Avg. Vel. (ft/s)		3.16	
Max Chl Dpth (ft)	3.71	Hydr. Depth (ft)		2.50	
Conv. Total (cfs)	12377.8	Conv. (cfs)		12377.8	
Length Wtd. (ft)	46.00	Wetted Per. (ft)		46.59	

Min Ch El (ft)	1512.61	Shear (lb/sq ft)	0.13
Alpha	1.00	Stream Power (lb/ft s)	0.41
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	2.16
C & E Loss (ft)	0.00	Cum SA (acres)	0.80

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2441.97

INPUT
Description: End Earth Bottom
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1519.29	67.976	1518.97	92	1512.59	108	1512.59	132.024	1518.97
156	1519.29								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.025	132.024	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.43	Wt. n-Val.		0.025	
Vel Head (ft)	0.17	Reach Len. (ft)	0.01	0.01	0.01
W.S. Elev (ft)	1516.26	Flow Area (sq ft)		109.59	
Crit W.S. (ft)		Area (sq ft)		109.59	
E.G. Slope (ft/ft)	0.000932	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		43.67	
Top Width (ft)	43.67	Avg. Vel. (ft/s)		3.30	
Vel Total (ft/s)	3.30	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.67	Conv. (cfs)		11857.2	
Conv. Total (cfs)	11857.2	Wetted Per. (ft)		44.62	
Length Wtd. (ft)	0.01	Shear (lb/sq ft)		0.14	
Min Ch El (ft)	1512.59	Stream Power (lb/ft s)		0.47	
Alpha	1.00	Cum Volume (acre-ft)		2.04	
Frctn Loss (ft)	0.00	Cum SA (acres)		0.76	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2441.96

INPUT
Description: Begin Riprap Banks, Concrete Bottom, Begin Transition from 4:1 to 2:1
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1519.29	67.976	1518.97	92	1512.59	108	1512.59	132.024	1518.97
156	1519.29								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	67.976	.033	92	.014	108	.033	132.024	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.976	132.024	12.99	12.99	12.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.43	Wt. n-Val.		0.027	
Vel Head (ft)	0.17	Reach Len. (ft)	12.99	12.99	12.99
W.S. Elev (ft)	1516.26	Flow Area (sq ft)		109.59	
Crit W.S. (ft)		Area (sq ft)		109.59	
E.G. Slope (ft/ft)	0.001088	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		43.67	
Top Width (ft)	43.67	Avg. Vel. (ft/s)		3.30	
Vel Total (ft/s)	3.30	Hydr. Depth (ft)		2.51	
Max Chl Dpth (ft)	3.67	Conv. (cfs)		10974.3	
Conv. Total (cfs)	10974.3				

Length Wtd. (ft)	12.99	Wetted Per. (ft)	44.62
Min Ch El (ft)	1512.59	Shear (lb/sq ft)	0.17
Alpha	1.00	Stream Power (lb/ft s)	0.55
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	2.04
C & E Loss (ft)	0.09	Cum SA (acres)	0.76

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2428.97

INPUT
Description: Before Top of Drop Structure, End Riprap Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.76	83.5	1518.08	94.5	1512.58	105.5	1512.58	116.5	1518.08
156	1517.76								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.033	94.5	.014	105.5	.033	116.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1516.32	Wt. n-Val.		0.025	
Vel Head (ft)	1.03	Reach Len. (ft)	1.00	1.00	1.00
W.S. Elev (ft)	1515.29	Flow Area (sq ft)		44.50	
Crit W.S. (ft)	1515.29	Area (sq ft)		44.50	
E.G. Slope (ft/ft)	0.007764	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		21.84	
Top Width (ft)	21.84	Avg. Vel. (ft/s)		8.13	
Vel Total (ft/s)	8.13	Hydr. Depth (ft)		2.04	
Max Chl Dpth (ft)	2.71	Conv. (cfs)		4108.3	
Conv. Total (cfs)	4108.3	Wetted Per. (ft)		23.12	
Length Wtd. (ft)	1.00	Shear (lb/sq ft)		0.93	
Min Ch El (ft)	1512.58	Stream Power (lb/ft s)		7.59	
Alpha	1.00	Cum Volume (acre-ft)		2.02	
Frctn Loss (ft)	0.00	Cum SA (acres)		0.75	
C & E Loss (ft)	0.00				

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2427.97

INPUT
Description: Top of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.76	83.5	1518.08	94.5	1512.58	105.5	1512.58	116.5	1518.08
156	1517.76								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	83.5	.014	116.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.5	116.5	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1516.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.		0.014	
W.S. Elev (ft)	1515.29	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	1515.29	Flow Area (sq ft)		44.41	
E.G. Slope (ft/ft)	0.002467	Area (sq ft)		44.41	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	21.82	Top Width (ft)		21.82	
Vel Total (ft/s)	8.15	Avg. Vel. (ft/s)		8.15	
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)		2.04	
Conv. Total (cfs)	7288.5	Conv. (cfs)		7288.5	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		23.10	
Min Ch El (ft)	1512.58	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		2.41	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.01	
C & E Loss (ft)	0.24	Cum SA (acres)		0.75	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The 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: Basin 5
REACH: Outlet Channel RS: 2427.96

INPUT
Description: Bottom of Drop Structure
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.76	74.6	1518.08	92	1509.38	108	1509.38	125.4	1518.08
156	1517.76								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	74.6	.014	125.4	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.6	125.4	34.49	34.49	34.49	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1515.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	5.42	Wt. n-Val.		0.014	
W.S. Elev (ft)	1510.45	Reach Len. (ft)	34.49	34.49	34.49
Crit W.S. (ft)	1511.65	Flow Area (sq ft)		19.37	
E.G. Slope (ft/ft)	0.034020	Area (sq ft)		19.37	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	20.27	Top Width (ft)		20.27	
Vel Total (ft/s)	18.68	Avg. Vel. (ft/s)		18.68	
Max Chl Dpth (ft)	1.07	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	1962.6	Conv. (cfs)		1962.6	
Length Wtd. (ft)	34.49	Wetted Per. (ft)		20.78	
Min Ch El (ft)	1509.38	Shear (lb/sq ft)		1.98	
Alpha	1.00	Stream Power (lb/ft s)		37.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.01	
C & E Loss (ft)	0.44	Cum SA (acres)		0.75	

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

CROSS SECTION RIVER: Basin 5

REACH: Outlet Channel RS: 2393.47

INPUT

Description: End of Drop Structure (Bottom of Sill)

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.05	76	1517.37	92	1509.37	108	1509.37	124	1517.37
156	1517.05								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	1.5	1.5	1.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.		0.014	
W.S. Elev (ft)	1513.41	Reach Len. (ft)	1.50	1.50	1.50
Crit W.S. (ft)	1511.64	Flow Area (sq ft)		97.14	
E.G. Slope (ft/ft)	0.000305	Area (sq ft)		97.14	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	32.14	Top Width (ft)		32.14	
Vel Total (ft/s)	3.73	Avg. Vel. (ft/s)		3.73	
Max Chl Dpth (ft)	4.04	Hydr. Depth (ft)		3.02	
Conv. Total (cfs)	20738.5	Conv. (cfs)		20738.5	
Length Wtd. (ft)	1.50	Wetted Per. (ft)		34.05	
Min Ch El (ft)	1509.37	Shear (lb/sq ft)		0.05	
Alpha	1.00	Stream Power (lb/ft s)		0.20	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		1.97	
C & E Loss (ft)	0.02	Cum SA (acres)		0.73	

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

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

CROSS SECTION RIVER: Basin 5

REACH: Outlet Channel RS: 2391.97

INPUT

Description: End of Drop Structure (Top of Sill), Begin Transition from 2:1 to 4:1

Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.05	76	1517.37	92	1510.12	108	1510.12	124	1517.37
156	1517.05								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.014	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1513.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.		0.014	
W.S. Elev (ft)	1513.18	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)		Flow Area (sq ft)		69.66	
E.G. Slope (ft/ft)	0.000809	Area (sq ft)		69.66	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	29.51	Top Width (ft)		29.51	
Vel Total (ft/s)	5.20	Avg. Vel. (ft/s)		5.20	
Max Chl Dpth (ft)	3.06	Hydr. Depth (ft)		2.36	
Conv. Total (cfs)	12728.5	Conv. (cfs)		12728.5	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		30.83	
Min Ch El (ft)	1510.12	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.59	

Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.97
C & E Loss (ft)	0.06	Cum SA (acres)	0.72

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: Basin 5
REACH: Outlet Channel RS: 2391.96

INPUT
Description: Begin Riprap
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.05	76	1517.37	92	1509.37	108	1509.37	124	1517.37
156	1517.05								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	76	.033	124	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76	124	31.99	31.99	31.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.54	Wt. n-Val.		0.033	
Vel Head (ft)	0.23	Reach Len. (ft)	31.99	31.99	31.99
W.S. Elev (ft)	1513.31	Flow Area (sq ft)		94.21	
Crit W.S. (ft)		Area (sq ft)		94.21	
E.G. Slope (ft/ft)	0.001845	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		31.78	
Top Width (ft)	31.78	Avg. Vel. (ft/s)		3.84	
Vel Total (ft/s)	3.84	Hydr. Depth (ft)		2.96	
Max Chl Dpth (ft)	3.94	Conv. (cfs)		8428.6	
Conv. Total (cfs)	8428.6	Wetted Per. (ft)		33.64	
Length Wtd. (ft)	31.99	Shear (lb/sq ft)		0.32	
Min Ch El (ft)	1509.37	Stream Power (lb/ft s)		1.24	
Alpha	1.00	Cum Volume (acre-ft)		1.97	
Frctn Loss (ft)	0.05	Cum SA (acres)		0.72	
C & E Loss (ft)	0.03				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2359.97

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

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.03	60	1517.35	92	1509.35	108	1509.35	140	1517.35
156	1517.03								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.035	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.46	Wt. n-Val.		0.035	
Vel Head (ft)	0.13	Reach Len. (ft)	0.01	0.01	0.01
W.S. Elev (ft)	1513.34	Flow Area (sq ft)		127.46	
Crit W.S. (ft)		Area (sq ft)		127.46	
E.G. Slope (ft/ft)	0.001247	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		47.91	
Top Width (ft)	47.91	Avg. Vel. (ft/s)		2.84	
Vel Total (ft/s)	2.84	Hydr. Depth (ft)		2.66	
Max Chl Dpth (ft)	3.99	Conv. (cfs)		10249.5	
Conv. Total (cfs)	10249.5				

Length Wtd. (ft)	0.01	Wetted Per. (ft)	48.89
Min Ch El (ft)	1509.35	Shear (lb/sq ft)	0.20
Alpha	1.00	Stream Power (lb/ft s)	0.58
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.88
C & E Loss (ft)	0.00	Cum SA (acres)	0.70

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2359.96

INPUT
Description: Begin DS Earth Channel
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.03	60	1517.35	92	1509.35	108	1509.35	140	1517.35
156	1517.03								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	23.99	23.99	23.99	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.025	
W.S. Elev (ft)	1513.34	Reach Len. (ft)	23.99	23.99	23.99
Crit W.S. (ft)		Flow Area (sq ft)		127.46	
E.G. Slope (ft/ft)	0.000636	Area (sq ft)		127.46	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.91	Top Width (ft)		47.91	
Vel Total (ft/s)	2.84	Avg. Vel. (ft/s)		2.84	
Max Chl Dpth (ft)	3.99	Hydr. Depth (ft)		2.66	
Conv. Total (cfs)	14349.4	Conv. (cfs)		14349.4	
Length Wtd. (ft)	23.99	Wetted Per. (ft)		48.89	
Min Ch El (ft)	1509.35	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.29	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		1.88	
C & E Loss (ft)	0.00	Cum SA (acres)		0.70	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2335.97

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.02	60	1517.34	92	1509.34	108	1509.34	140	1517.34
156	1517.02								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	25	25	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.025	
W.S. Elev (ft)	1513.32	Reach Len. (ft)	25.00	25.00	25.00
Crit W.S. (ft)		Flow Area (sq ft)		127.20	
E.G. Slope (ft/ft)	0.000640	Area (sq ft)		127.20	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.87	Top Width (ft)		47.87	
Vel Total (ft/s)	2.85	Avg. Vel. (ft/s)		2.85	
Max Chl Dpth (ft)	3.98	Hydr. Depth (ft)		2.66	
Conv. Total (cfs)	14309.8	Conv. (cfs)		14309.8	

Length Wtd. (ft)	25.00	Wetted Per. (ft)	48.85
Min Ch El (ft)	1509.34	Shear (lb/sq ft)	0.10
Alpha	1.00	Stream Power (lb/ft s)	0.30
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	1.81
C & E Loss (ft)	0.00	Cum SA (acres)	0.67

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2310.97

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1517.008	60	1517.328	92	1509.328	108	1509.328	140	1517.328
156	1517.008								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	203.01	203.01	203.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.43	Wt. n-Val.		0.025	
Vel Head (ft)	0.13	Reach Len. (ft)	203.01	203.01	203.01
W.S. Elev (ft)	1513.31	Flow Area (sq ft)		127.00	
Crit W.S. (ft)		Area (sq ft)		127.00	
E.G. Slope (ft/ft)	0.000643	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		47.83	
Top Width (ft)	47.83	Avg. Vel. (ft/s)		2.85	
Vel Total (ft/s)	2.85	Hydr. Depth (ft)		2.66	
Max Chl Dpth (ft)	3.98	Conv. (cfs)		14279.2	
Conv. Total (cfs)	14279.2	Wetted Per. (ft)		48.81	
Length Wtd. (ft)	203.01	Shear (lb/sq ft)		0.10	
Min Ch El (ft)	1509.33	Stream Power (lb/ft s)		0.30	
Alpha	1.00	Cum Volume (acre-ft)		1.74	
Frctn Loss (ft)	0.13	Cum SA (acres)		0.64	
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 2107.96

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1516.9	60	1517.22	92	1509.22	108	1509.22	140	1517.22
156	1516.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	271.13	271.13	271.13	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.30	Wt. n-Val.		0.025	
Vel Head (ft)	0.13	Reach Len. (ft)	271.13	271.13	271.13
W.S. Elev (ft)	1513.17	Flow Area (sq ft)		125.72	
Crit W.S. (ft)		Area (sq ft)		125.72	
E.G. Slope (ft/ft)	0.000661	Flow (cfs)		362.00	
Q Total (cfs)	362.00	Top Width (ft)		47.62	
Top Width (ft)	47.62	Avg. Vel. (ft/s)		2.88	
Vel Total (ft/s)	2.88	Hydr. Depth (ft)		2.64	
Max Chl Dpth (ft)	3.95	Conv. (cfs)		14083.4	
Conv. Total (cfs)	14083.4				

Length Wtd. (ft)	271.13	Wetted Per. (ft)	48.59
Min Ch El (ft)	1509.22	Shear (lb/sq ft)	0.11
Alpha	1.00	Stream Power (lb/ft s)	0.31
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	1.15
C & E Loss (ft)	0.00	Cum SA (acres)	0.42

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1836.83

INPUT
Description: 10 feet US of PT
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1516.76	60	1517.08	92	1509.08	108	1509.08	140	1517.08
156	1516.76								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	31.5	31.5	31.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.025	
W.S. Elev (ft)	1512.98	Reach Len. (ft)	31.50	31.50	31.50
Crit W.S. (ft)		Flow Area (sq ft)		123.40	
E.G. Slope (ft/ft)	0.000695	Area (sq ft)		123.40	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.23	Top Width (ft)		47.23	
Vel Total (ft/s)	2.93	Avg. Vel. (ft/s)		2.93	
Max Chl Dpth (ft)	3.90	Hydr. Depth (ft)		2.61	
Conv. Total (cfs)	13727.9	Conv. (cfs)		13727.9	
Length Wtd. (ft)	31.50	Wetted Per. (ft)		48.19	
Min Ch El (ft)	1509.08	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.33	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.38	
C & E Loss (ft)	0.00	Cum SA (acres)		0.12	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1805.33

INPUT
Description: Begin Road Vertical Taper
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
44	1516.74	60	1517.06	92	1509.06	108	1509.06	140	1517.06
156	1516.74								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
44	.035	60	.025	140	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60	140	24.06	24.06	24.06	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.025	
W.S. Elev (ft)	1512.96	Reach Len. (ft)	24.06	24.06	24.06
Crit W.S. (ft)		Flow Area (sq ft)		123.30	
E.G. Slope (ft/ft)	0.000697	Area (sq ft)		123.30	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.21	Top Width (ft)		47.21	
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)		2.94	
Max Chl Dpth (ft)	3.90	Hydr. Depth (ft)		2.61	
Conv. Total (cfs)	13713.0	Conv. (cfs)		13713.0	

Length Wtd. (ft)	24.06	Wetted Per. (ft)		48.17	
Min Ch El (ft)	1509.06	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.33	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)		0.29	
C & E Loss (ft)	0.00	Cum SA (acres)		0.09	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1781.27

INPUT
Description: End Earth Bottom and Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
50.36	1515.14	66.36	1515.46	92	1509.05	108	1509.05	133.64	1515.46
149.64	1515.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
50.36	.035	66.36	.025	133.64	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.36	133.64	.01	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1513.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.025	
W.S. Elev (ft)	1512.94	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)		Flow Area (sq ft)		122.98	
E.G. Slope (ft/ft)	0.000702	Area (sq ft)		122.98	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.16	Top Width (ft)		47.16	
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)		2.94	
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)		2.61	
Conv. Total (cfs)	13664.0	Conv. (cfs)		13664.0	
Length Wtd. (ft)	0.01	Wetted Per. (ft)		48.11	
Min Ch El (ft)	1509.05	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.33	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.22	
C & E Loss (ft)	0.00	Cum SA (acres)		0.06	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1781.26

INPUT
Description: Begin Riprap Bottom and Banks
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
50.36	1515.14	66.36	1515.46	92	1509.05	108	1509.05	133.64	1515.46
149.64	1515.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
50.36	.035	66.36	.033	133.64	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.36	133.64	10	10	10	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1513.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.		0.033	
W.S. Elev (ft)	1512.94	Reach Len. (ft)	10.00	10.00	10.00
Crit W.S. (ft)		Flow Area (sq ft)		122.98	
E.G. Slope (ft/ft)	0.001223	Area (sq ft)		122.98	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.16	Top Width (ft)		47.16	
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)		2.94	
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)		2.61	
Conv. Total (cfs)	10351.5	Conv. (cfs)		10351.5	

Length Wtd. (ft)	10.00	Wetted Per. (ft)	48.11
Min Ch El (ft)	1509.05	Shear (lb/sq ft)	0.20
Alpha	1.00	Stream Power (lb/ft s)	0.57
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.22
C & E Loss (ft)	0.00	Cum SA (acres)	0.06

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1771.26

INPUT
Description: US of 2-8x4 CBC
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
53.88	1514.26	69.88	1514.58	92	1509.05	108	1509.05	130.12	1514.58
146.12	1514.26								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
53.88	.035	69.88	.033	130.12	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
69.88	130.12	7	7	7	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.07	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.033	
W.S. Elev (ft)	1512.93	Reach Len. (ft)	7.00	7.00	7.00
Crit W.S. (ft)		Flow Area (sq ft)		122.35	
E.G. Slope (ft/ft)	0.001240	Area (sq ft)		122.35	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.05	Top Width (ft)		47.05	
Vel Total (ft/s)	2.96	Avg. Vel. (ft/s)		2.96	
Max Chl Dpth (ft)	3.88	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	10279.4	Conv. (cfs)		10279.4	
Length Wtd. (ft)	7.00	Wetted Per. (ft)		48.00	
Min Ch El (ft)	1509.05	Shear (lb/sq ft)		0.20	
Alpha	1.00	Stream Power (lb/ft s)		0.58	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		0.19	
C & E Loss (ft)	0.00	Cum SA (acres)		0.05	

CROSS SECTION RIVER: Basin 5
REACH: Outlet Channel RS: 1764.26

INPUT
Description: US Face of 2-8x4 CBC
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
55.12	1513.94	71.12	1514.26	92	1509.04	108	1509.04	128.88	1514.26
144.88	1513.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
55.12	.035	71.12	.033	128.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
71.12	128.88	84.16	84.16	84.16	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1513.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.033	
W.S. Elev (ft)	1512.92	Reach Len. (ft)	84.16	84.16	84.16
Crit W.S. (ft)	1511.13	Flow Area (sq ft)		122.41	
E.G. Slope (ft/ft)	0.001238	Area (sq ft)		122.41	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	47.06	Top Width (ft)		47.06	
Vel Total (ft/s)	2.96	Avg. Vel. (ft/s)		2.96	
Max Chl Dpth (ft)	3.88	Hydr. Depth (ft)		2.60	
Conv. Total (cfs)	10286.6	Conv. (cfs)		10286.6	

Length Wtd. (ft)	84.16	Wetted Per. (ft)	48.02
Min Ch El (ft)	1509.04	Shear (lb/sq ft)	0.20
Alpha	1.00	Stream Power (lb/ft s)	0.58
Frctn Loss (ft)		Cum Volume (acre-ft)	0.17
C & E Loss (ft)		Cum SA (acres)	0.05

CULVERT RIVER: Basin 5
REACH: Outlet Channel RS: 1722.18

INPUT
Description:
Distance from Upstream XS = 4
Deck/Roadway Width = 62.8
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1514.08	1505	160	1514.08	1505

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
55.12	1513.94	71.12	1514.26	92	1509.04	108	1509.04	128.88	1514.26
144.88	1513.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
55.12	.035	71.12	.033	128.88	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
71.12	128.88	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1514.88	1505	160	1514.08	1505

Downstream Bridge Cross Section Data
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
91.62	1510.04	91.62	1505.27	108.37	1505.27	108.37	1510.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
91.62	.015	91.62	.015	108.37	.015

Bank Sta: Left	Right	Coeff Contr.	Expan.
91.62	108.37	.1	.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	4	8

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	n Value	Entrance Loss Coef	Exit Loss Coef
3	78.25	.014	.2	1

Number of Barrels = 2
Upstream Elevation = 1509.04
Centerline Stations
Sta.

```
  95.625 104.375
Downstream Elevation =  1505.3
Centerline Stations
    Sta.    Sta.
  95.625 104.375

CULVERT OUTPUT    Profile #PF 1
Culvert ID : Culvert #1

  Culv Q (cfs)              362.00   Culv Vel In (ft/s)        9.00
  # Barrels                      2   Culv Vel Out (ft/s)      17.56
  Q Barrel (cfs)            181.00   Culv Inv El Up (ft)    1509.04
  E.G. US. (ft)            1513.06   Culv Inv El Dn (ft)    1505.30
  W.S. US. (ft)            1512.92   Culv Frctn Ls (ft)        1.44
  Delta EG (ft)               2.14   Culv Ext Lss (ft)         1.74
  Delta WS (ft)               6.36   Culv Ent Lss (ft)         0.25
  E.G. IC (ft)             1513.01   Q Weir (cfs)
  E.G. OC (ft)             1513.06   Weir Sta Lft (ft)
  Culvert Control           Outlet   Weir Sta Rgt (ft)
  Culv WS In (ft)          1511.55   Weir Submerg
  Culv WS Out (ft)         1506.59   Weir Max Depth (ft)
  Culv Nml Depth (ft)         1.09   Weir Avg Depth (ft)
  Culv Crt Depth (ft)         2.51   Wr Flw Area (sq ft)
  Culv Ful Lngh (ft)                 Min Top Rd (ft)        1514.34

Note:    The flow in the culvert is entirely supercritical.

CROSS SECTION          RIVER: Basin 5
REACH: Outlet Channel     RS: 1680.10

INPUT
Description: DS Face of 2-8x4 CBC
Station Elevation Data    num=        4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
   91.62 1510.04    91.62 1505.27   108.37 1505.27   108.37 1510.04

Manning's n Values        num=        3
     Sta    n Val     Sta    n Val     Sta    n Val
   91.62    .015    91.62    .015   108.37    .015

Bank Sta: Left   Right    Lengths: Left Channel    Right      Coeff Contr.    Expan.
         91.62  108.37                  0        0       0              .1        .3

CROSS SECTION OUTPUT    Profile #PF 1

  E.G. Elev (ft)              1510.93   Element                 Left OB     Channel    Right OB
  Vel Head (ft)                  4.37   Wt. n-Val.                            0.015
  W.S. Elev (ft)              1506.56   Reach Len. (ft)           25.69       25.69       25.69
  Crit W.S. (ft)              1507.70   Flow Area (sq ft)                     21.58
  E.G. Slope (ft/ft)         0.024748   Area (sq ft)                          21.58
  Q Total (cfs)                362.00   Flow (cfs)                           362.00
  Top Width (ft)                16.75   Top Width (ft)                        16.75
  Vel Total (ft/s)              16.77   Avg. Vel. (ft/s)                      16.77
  Max Chl Dpth (ft)              1.29   Hydr. Depth (ft)                       1.29
  Conv. Total (cfs)            2301.1   Conv. (cfs)                          2301.1
  Length Wtd. (ft)              25.69   Wetted Per. (ft)                      19.33
  Min Ch El (ft)              1505.27   Shear (lb/sq ft)                       1.73
  Alpha                          1.00   Stream Power (lb/ft s)                28.94
  Frctn Loss (ft)                       Cum Volume (acre-ft)                   0.01
  C & E Loss (ft)                       Cum SA (acres)

CROSS SECTION          RIVER: ADOT
REACH: Exst Channel US    RS: 1812.83

INPUT
Description: ADOT Channel - Surveyed xsec
Station Elevation Data    num=        6
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     861510.924     871510.892      97 1506.06     1031505.965     1231515.524
    1241515.525
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	41.85	41.85	41.85	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1506.17	Wt. n-Val.		0.015	
Vel Head (ft)	0.02	Reach Len. (ft)	41.85	41.85	41.85
W.S. Elev (ft)	1506.14	Flow Area (sq ft)		0.83	
Crit W.S. (ft)	1506.11	Area (sq ft)		0.83	
E.G. Slope (ft/ft)	0.002366	Flow (cfs)		1.00	
Q Total (cfs)	1.00	Top Width (ft)		6.55	
Top Width (ft)	6.55	Avg. Vel. (ft/s)		1.21	
Vel Total (ft/s)	1.21	Hydr. Depth (ft)		0.13	
Max Chl Dpth (ft)	0.18	Conv. (cfs)		20.6	
Conv. Total (cfs)	20.6	Wetted Per. (ft)		6.61	
Length Wtd. (ft)	41.85	Shear (lb/sq ft)		0.02	
Min Ch El (ft)	1505.96	Stream Power (lb/ft s)		0.02	
Alpha	1.00	Cum Volume (acre-ft)		0.04	
Frctn Loss (ft)	0.15	Cum SA (acres)		0.01	
C & E Loss (ft)	0.00				

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

CROSS SECTION RIVER: ADOT
REACH: Exst Channel US RS: 1770.98

INPUT
Description: ADOT Channel - Surveyed xsec
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1510.654	87	1510.604	97	1505.873	103	1505.87	123	1515.312
124	1515.29								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	44.48	44.48	44.48	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1506.01	Wt. n-Val.		0.015	
Vel Head (ft)	0.04	Reach Len. (ft)	44.48	44.48	44.48
W.S. Elev (ft)	1505.97	Flow Area (sq ft)		0.63	
Crit W.S. (ft)	1505.97	Area (sq ft)		0.63	
E.G. Slope (ft/ft)	0.005877	Flow (cfs)		1.00	
Q Total (cfs)	1.00	Top Width (ft)		6.43	
Top Width (ft)	6.43	Avg. Vel. (ft/s)		1.60	
Vel Total (ft/s)	1.60	Hydr. Depth (ft)		0.10	
Max Chl Dpth (ft)	0.10	Conv. (cfs)		13.0	
Conv. Total (cfs)	13.0	Wetted Per. (ft)		6.47	
Length Wtd. (ft)	44.48	Shear (lb/sq ft)		0.04	
Min Ch El (ft)	1505.87	Stream Power (lb/ft s)		0.06	
Alpha	1.00	Cum Volume (acre-ft)		0.04	
Frctn Loss (ft)	0.24	Cum SA (acres)		0.00	
C & E Loss (ft)	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: 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: ADOT
REACH: Exst Channel US RS: 1726.50

INPUT
Description: ADOT Channel - Surveyed xsec
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
861510.671		87	1510.62	971505.494		1031505.448		1231515.126	
1241515.174									

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1505.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.015	
W.S. Elev (ft)	1505.54	Reach Len. (ft)	69.92	69.92	69.92
Crit W.S. (ft)	1505.58	Flow Area (sq ft)		0.44	
E.G. Slope (ft/ft)	0.018660	Area (sq ft)		0.44	
Q Total (cfs)	1.00	Flow (cfs)		1.00	
Top Width (ft)	6.29	Top Width (ft)		6.29	
Vel Total (ft/s)	2.28	Avg. Vel. (ft/s)		2.28	
Max Chl Dpth (ft)	0.09	Hydr. Depth (ft)		0.07	
Conv. Total (cfs)	7.3	Conv. (cfs)		7.3	
Length Wtd. (ft)	69.92	Wetted Per. (ft)		6.32	
Min Ch El (ft)	1505.45	Shear (lb/sq ft)		0.08	
Alpha	1.00	Stream Power (lb/ft s)		0.18	
Frctn Loss (ft)	0.40	Cum Volume (acre-ft)		0.02	
C & E Loss (ft)	0.00	Cum SA (acres)			

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: ADOT
REACH: Exst Channel DS RS: 1650

INPUT
Description: ADOT Channel - Interpolated xsec
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1510.15	87	1510.15	97	1505.11	103	1505.08	123	1514.55
124	1514.55								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	19.25	19.25	19.25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1509.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.		0.015	
W.S. Elev (ft)	1508.40	Reach Len. (ft)	19.25	19.25	19.25
Crit W.S. (ft)	1508.44	Flow Area (sq ft)		42.22	
E.G. Slope (ft/ft)	0.002965	Area (sq ft)		42.22	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	19.54	Top Width (ft)		19.54	
Vel Total (ft/s)	8.57	Avg. Vel. (ft/s)		8.57	
Max Chl Dpth (ft)	3.32	Hydr. Depth (ft)		2.16	
Conv. Total (cfs)	6647.9	Conv. (cfs)		6647.9	
Length Wtd. (ft)	19.25	Wetted Per. (ft)		21.07	
Min Ch El (ft)	1505.08	Shear (lb/sq ft)		0.37	
Alpha	1.00	Stream Power (lb/ft s)		3.18	
Frctn Loss (ft)	1.17	Cum Volume (acre-ft)		0.39	

C & E Loss (ft)	0.35	Cum SA (acres)	0.20

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 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: During supercritical flow calculations a junction was encountered. During standard step calculations the program used the stream with the greatest momentum to balance the energy equation.
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: ADOT
REACH: Exst Channel DS RS: 1630.75

INPUT
Description: ADOT Channel - Surveyed xsec 2
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1510.114	87	1510.021	97	1504.958	103	1504.981	123	1514.464
124	1514.462								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	48.08	48.08	48.08	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1509.45	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.35	Wt. n-Val.		0.015	
W.S. Elev (ft)	1508.10	Reach Len. (ft)	48.08	48.08	48.08
Crit W.S. (ft)	1508.32	Flow Area (sq ft)		38.85	
E.G. Slope (ft/ft)	0.003711	Area (sq ft)		38.85	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	18.80	Top Width (ft)		18.80	
Vel Total (ft/s)	9.32	Avg. Vel. (ft/s)		9.32	
Max Chl Dpth (ft)	3.15	Hydr. Depth (ft)		2.07	
Conv. Total (cfs)	5942.1	Conv. (cfs)		5942.1	
Length Wtd. (ft)	48.08	Wetted Per. (ft)		20.25	
Min Ch El (ft)	1504.96	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		4.14	
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)		0.37	
C & E Loss (ft)	0.02	Cum SA (acres)		0.19	

CROSS SECTION RIVER: ADOT
REACH: Exst Channel DS RS: 1582.67

INPUT
Description: ADOT Channel - Most DS surveyed xsec
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1509.879	87	1509.841	97	1504.726	103	1504.733	123	1514.128
124	1514.114								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev	1509.25	Element	Left OB	Channel	OB

Vel Head (ft)	1.47	Wt. n-Val.		0.015	
W.S. Elev (ft)	1507.77	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1508.07	Flow Area (sq ft)		37.19	
E.G. Slope (ft/ft)	0.004178	Area (sq ft)		37.19	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	18.43	Top Width (ft)		18.43	
Vel Total (ft/s)	9.73	Avg. Vel. (ft/s)		9.73	
Max Chl Dpth (ft)	3.05	Hydr. Depth (ft)		2.02	
Conv. Total (cfs)	5600.4	Conv. (cfs)		5600.4	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		19.85	
Min Ch El (ft)	1504.73	Shear (lb/sq ft)		0.49	
Alpha	1.00	Stream Power (lb/ft s)		4.76	
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)		0.33	
C & E Loss (ft)	0.01	Cum SA (acres)		0.17	

CROSS SECTION RIVER: ADOT
REACH: Exst Channel DS RS: 1382.67

INPUT
Description: ADOT Channel (Extended)
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1509.01	87	1508.92	97	1503.86	103	1503.88	123	1513.36
124	1513.36								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1508.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.52	Wt. n-Val.		0.015	
W.S. Elev (ft)	1506.88	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1507.21	Flow Area (sq ft)		36.60	
E.G. Slope (ft/ft)	0.004367	Area (sq ft)		36.60	
Q Total (cfs)	362.00	Flow (cfs)		362.00	
Top Width (ft)	18.30	Top Width (ft)		18.30	
Vel Total (ft/s)	9.89	Avg. Vel. (ft/s)		9.89	
Max Chl Dpth (ft)	3.02	Hydr. Depth (ft)		2.00	
Conv. Total (cfs)	5478.0	Conv. (cfs)		5478.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		19.70	
Min Ch El (ft)	1503.86	Shear (lb/sq ft)		0.51	
Alpha	1.00	Stream Power (lb/ft s)		5.01	
Frctn Loss (ft)	0.85	Cum Volume (acre-ft)		0.16	
C & E Loss (ft)	0.00	Cum SA (acres)		0.08	

CROSS SECTION RIVER: ADOT
REACH: Exst Channel DS RS: 1182.67

INPUT
Description: ADOT Channel (Extended)
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
86	1507.91	87	1507.82	97	1502.76	103	1502.78	123	1512.26
124	1512.26								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
86	.035	87	.015	123	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
87	123	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1507.41	Element	Left OB	Channel	Right OB

Vel Head (ft)	1.79	Wt. n-Val.	0.015
W.S. Elev (ft)	1505.62	Reach Len. (ft)	
Crit W.S. (ft)	1506.12	Flow Area (sq ft)	33.70
E.G. Slope (ft/ft)	0.005466	Area (sq ft)	33.70
Q Total (cfs)	362.00	Flow (cfs)	362.00
Top Width (ft)	17.65	Top Width (ft)	17.65
Vel Total (ft/s)	10.74	Avg. Vel. (ft/s)	10.74
Max Chl Dpth (ft)	2.86	Hydr. Depth (ft)	1.91
Conv. Total (cfs)	4896.5	Conv. (cfs)	4896.5
Length Wtd. (ft)		Wetted Per. (ft)	18.97
Min Ch El (ft)	1502.76	Shear (lb/sq ft)	0.61
Alpha	1.00	Stream Power (lb/ft s)	6.51
Frctn Loss (ft)	0.97	Cum Volume (acre-ft)	
C & E Loss (ft)	0.03	Cum SA (acres)	

SUMMARY OF MANNING'S N VALUES

River:Basin 5

Reach	River Sta.	n1	n2	n3	n4	n5	n6
Outlet Channel	3774.5	.035	.025	.035			
Outlet Channel	3474.5	.035	.025	.035			
Outlet Channel	3174.5	.035	.025	.035			
Outlet Channel	3013	.035	.025	.035			
Outlet Channel	2988	.035	.025	.035			
Outlet Channel	2963	.035	.025	.035			
Outlet Channel	2938	.035	.025	.035			
Outlet Channel	2912.97	.035	.025	.035			
Outlet Channel	2866.97	.035	.025	.035			
Outlet Channel	2866.96	.035	.033	.014	.014	.033	.035
Outlet Channel	2853.97	.035	.033	.014	.014	.033	.035
Outlet Channel	2852.97	.035	.014	.035			
Outlet Channel	2852.96	.035	.014	.035			
Outlet Channel	2818.47	.035	.014	.035			
Outlet Channel	2816.97	.035	.014	.035			
Outlet Channel	2816.96	.035	.033	.035			
Outlet Channel	2784.97	.035	.033	.035			
Outlet Channel	2784.96	.035	.025	.035			
Outlet Channel	2760.97	.035	.025	.035			
Outlet Channel	2735.97	.035	.025	.035			
Outlet Channel	2632.97	.035	.025	.035			
Outlet Channel	2588	.035	.025	.035			
Outlet Channel	2563	.035	.025	.035			
Outlet Channel	2538	.035	.025	.035			
Outlet Channel	2513	.035	.025	.035			
Outlet Channel	2487.97	.035	.025	.035			
Outlet Channel	2441.97	.035	.025	.035			
Outlet Channel	2441.96	.035	.033	.014	.033	.035	
Outlet Channel	2428.97	.035	.033	.014	.033	.035	
Outlet Channel	2427.97	.035	.014	.035			
Outlet Channel	2427.96	.035	.014	.035			
Outlet Channel	2393.47	.035	.014	.035			
Outlet Channel	2391.97	.035	.014	.035			
Outlet Channel	2391.96	.035	.033	.035			
Outlet Channel	2359.97	.035	.035	.035			
Outlet Channel	2359.96	.035	.025	.035			
Outlet Channel	2335.97	.035	.025	.035			
Outlet Channel	2310.97	.035	.025	.035			
Outlet Channel	2107.96	.035	.025	.035			
Outlet Channel	1836.83	.035	.025	.035			
Outlet Channel	1805.33	.035	.025	.035			
Outlet Channel	1781.27	.035	.025	.035			
Outlet Channel	1781.26	.035	.033	.035			
Outlet Channel	1771.26	.035	.033	.035			
Outlet Channel	1764.26	.035	.033	.035			
Outlet Channel	1722.18	Culvert					
Outlet Channel	1680.10	.015	.015	.015			

River:ADOT

Reach	River Sta.	n1	n2	n3
Exst Channel US	1812.83	.035	.015	.035
Exst Channel US	1770.98	.035	.015	.035
Exst Channel US	1726.50	.035	.015	.035
Exst Channel DS	1650	.035	.015	.035
Exst Channel DS	1630.75	.035	.015	.035
Exst Channel DS	1582.67	.035	.015	.035
Exst Channel DS	1382.67	.035	.015	.035
Exst Channel DS	1182.67	.035	.015	.035

SUMMARY OF REACH LENGTHS

River: Basin 5

Reach	River Sta.	Left	Channel	Right
Outlet Channel	3774.5	300	300	300
Outlet Channel	3474.5	300	300	300
Outlet Channel	3174.5	161.5	161.5	161.5
Outlet Channel	3013	25	25	25
Outlet Channel	2988	25	25	25
Outlet Channel	2963	25	25	25
Outlet Channel	2938	25.03	25.03	25.03
Outlet Channel	2912.97	46	46	46
Outlet Channel	2866.97	.01	.01	.01
Outlet Channel	2866.96	12.99	12.99	12.99
Outlet Channel	2853.97	1	1	1
Outlet Channel	2852.97	.01	.01	.01
Outlet Channel	2852.96	34.49	34.49	34.49
Outlet Channel	2818.47	1.5	1.5	1.5
Outlet Channel	2816.97	.01	.01	.01
Outlet Channel	2816.96	31.99	31.99	31.99
Outlet Channel	2784.97	.01	.01	.01
Outlet Channel	2784.96	23.99	23.99	23.99
Outlet Channel	2760.97	25	25	25
Outlet Channel	2735.97	103	103	103
Outlet Channel	2632.97	44.97	44.97	44.97
Outlet Channel	2588	25	25	25
Outlet Channel	2563	25	25	25
Outlet Channel	2538	25	25	25
Outlet Channel	2513	25.03	25.03	25.03
Outlet Channel	2487.97	46	46	46
Outlet Channel	2441.97	.01	.01	.01
Outlet Channel	2441.96	12.99	12.99	12.99
Outlet Channel	2428.97	1	1	1
Outlet Channel	2427.97	.01	.01	.01
Outlet Channel	2427.96	34.49	34.49	34.49
Outlet Channel	2393.47	1.5	1.5	1.5
Outlet Channel	2391.97	.01	.01	.01
Outlet Channel	2391.96	31.99	31.99	31.99
Outlet Channel	2359.97	.01	.01	.01
Outlet Channel	2359.96	23.99	23.99	23.99
Outlet Channel	2335.97	25	25	25
Outlet Channel	2310.97	203.01	203.01	203.01
Outlet Channel	2107.96	271.13	271.13	271.13
Outlet Channel	1836.83	31.5	31.5	31.5
Outlet Channel	1805.33	24.06	24.06	24.06
Outlet Channel	1781.27	.01	.01	.01
Outlet Channel	1781.26	10	10	10
Outlet Channel	1771.26	7	7	7
Outlet Channel	1764.26	84.16	84.16	84.16
Outlet Channel	1722.18	Culvert		
Outlet Channel	1680.10	0	0	0

River: ADOT

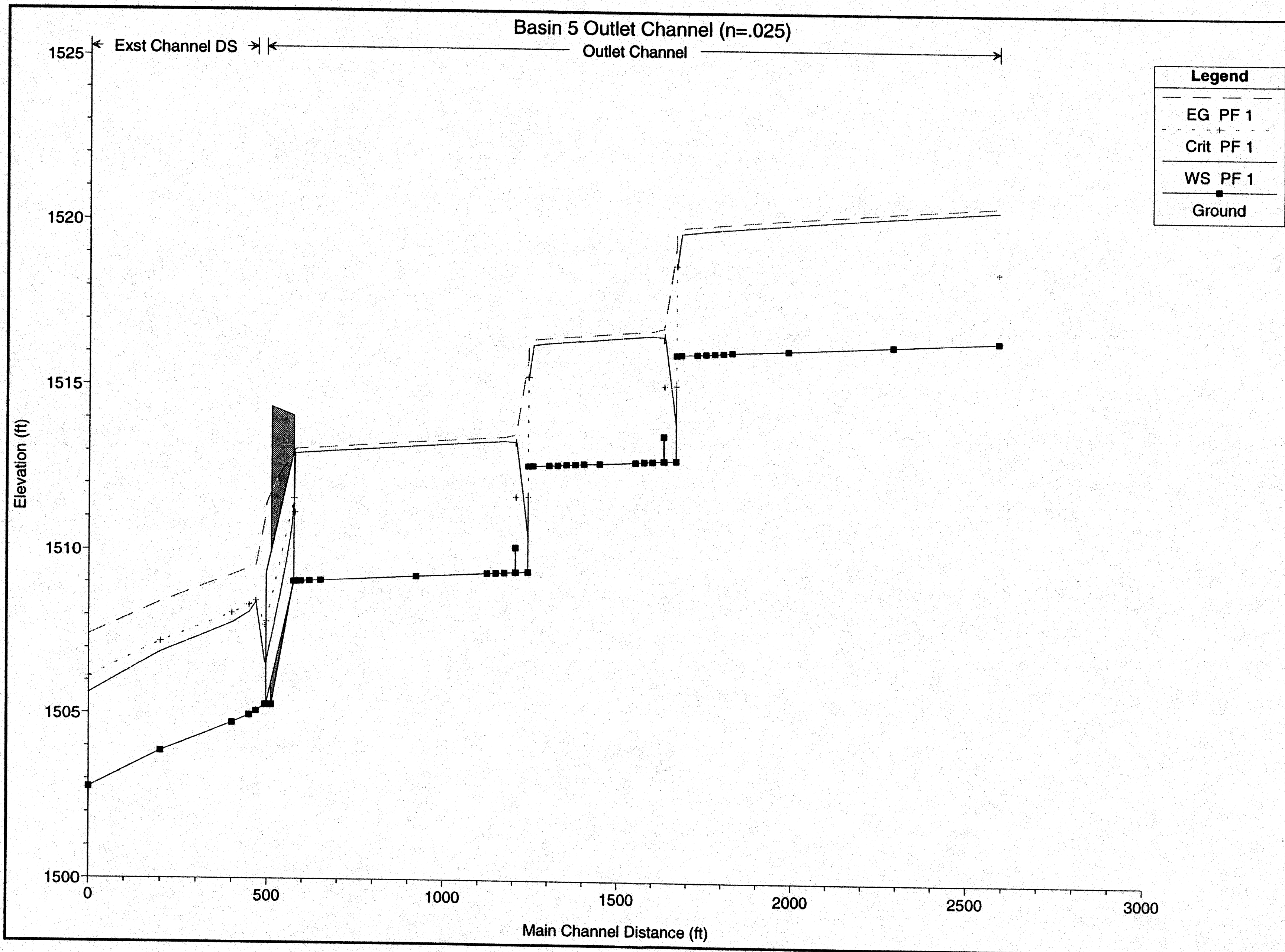
Reach	River Sta.	Left	Channel	Right
Exst Channel US	1812.83	41.85	41.85	41.85
Exst Channel US	1770.98	44.48	44.48	44.48
Exst Channel US	1726.50	0	0	0
Exst Channel DS	1650	19.25	19.25	19.25
Exst Channel DS	1630.75	48.08	48.08	48.08
Exst Channel DS	1582.67	200	200	200
Exst Channel DS	1382.67	200	200	200
Exst Channel DS	1182.67	0	0	0

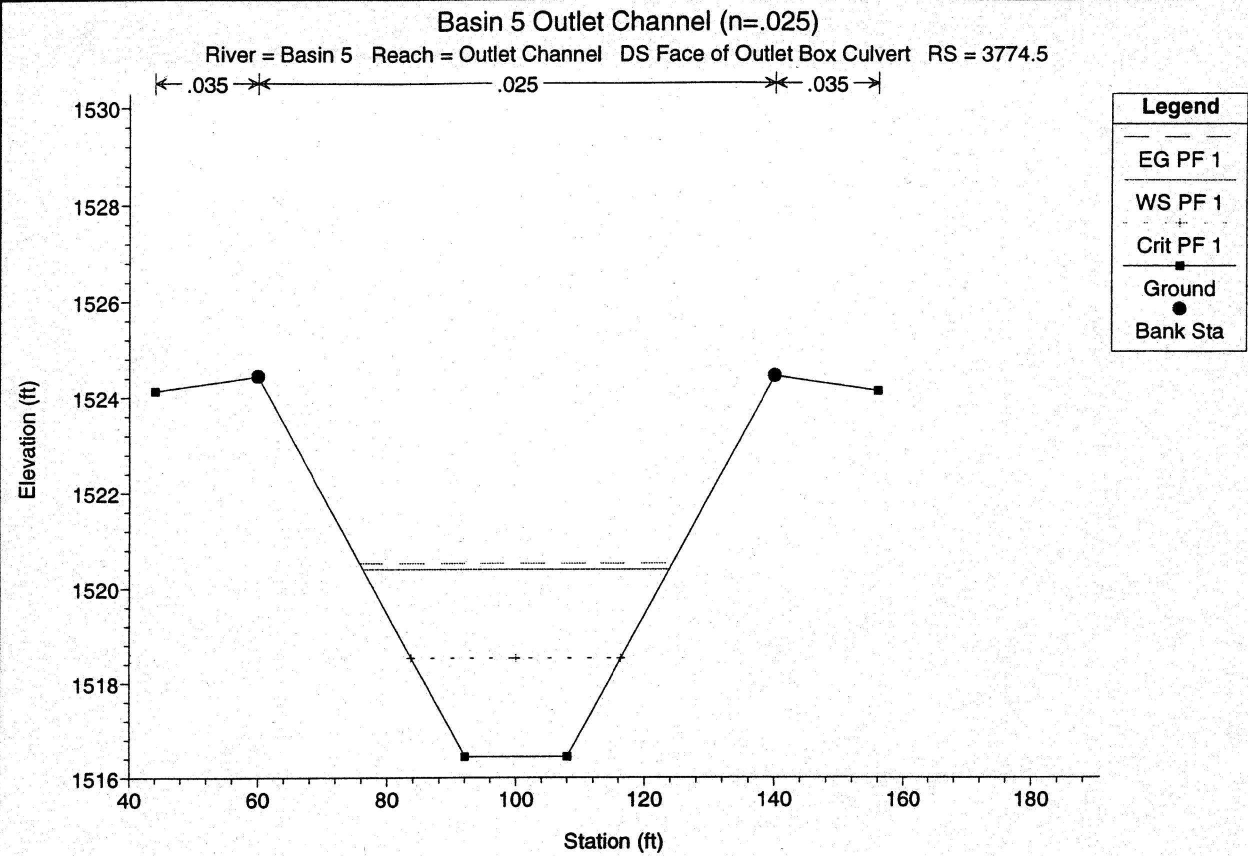
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Basin 5

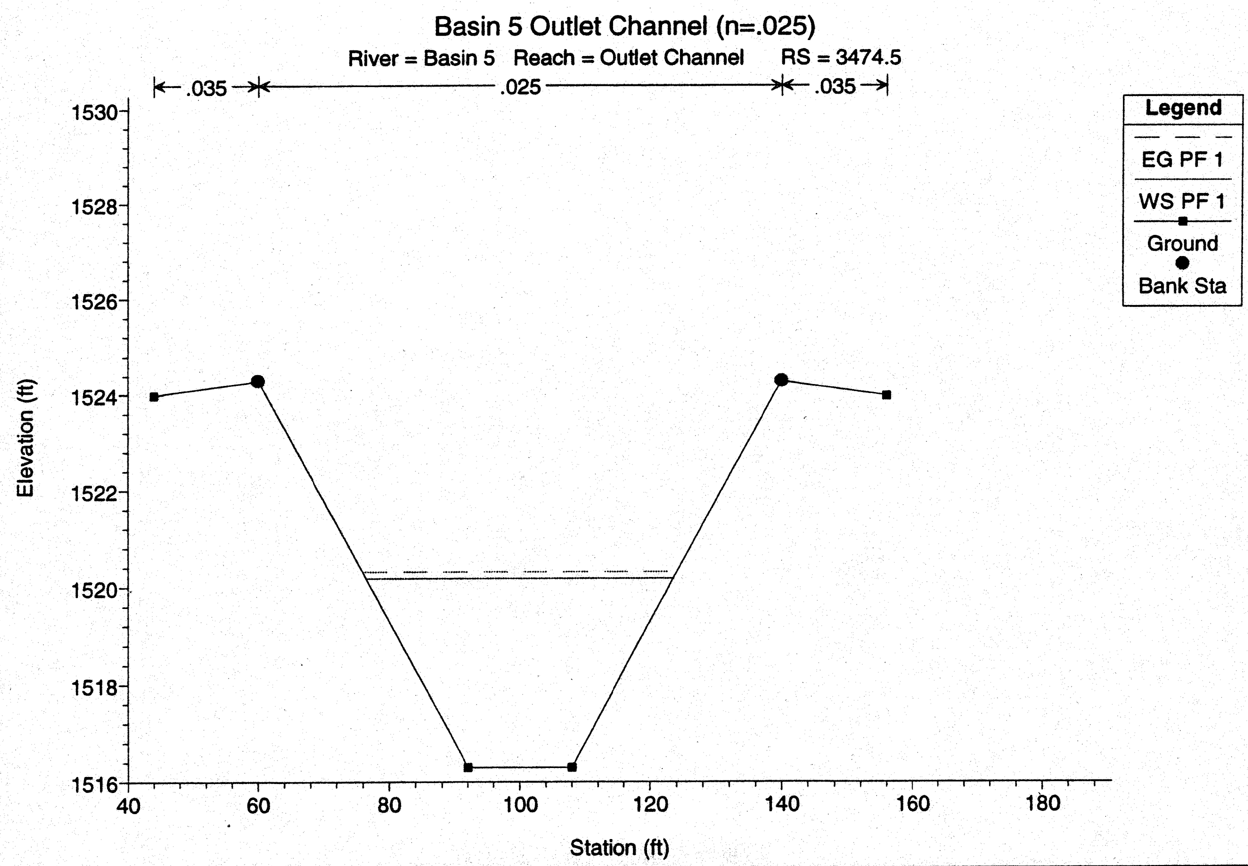
Reach	River Sta.	Contr.	Expan.
Outlet Channel	3774.5	.1	.3
Outlet Channel	3474.5	.1	.3
Outlet Channel	3174.5	.1	.3
Outlet Channel	3013	.1	.3
Outlet Channel	2988	.1	.3
Outlet Channel	2963	.1	.3
Outlet Channel	2938	.1	.3
Outlet Channel	2912.97	.1	.3
Outlet Channel	2866.97	.1	.3
Outlet Channel	2866.96	.1	.3
Outlet Channel	2853.97	.1	.3
Outlet Channel	2852.97	.1	.3
Outlet Channel	2852.96	.1	.3
Outlet Channel	2818.47	.1	.3
Outlet Channel	2816.97	.1	.3
Outlet Channel	2816.96	.1	.3
Outlet Channel	2784.97	.1	.3
Outlet Channel	2784.96	.1	.3
Outlet Channel	2760.97	.1	.3
Outlet Channel	2735.97	.1	.3
Outlet Channel	2632.97	.1	.3
Outlet Channel	2588	.1	.3
Outlet Channel	2563	.1	.3
Outlet Channel	2538	.1	.3
Outlet Channel	2513	.1	.3
Outlet Channel	2487.97	.1	.3
Outlet Channel	2441.97	.1	.3
Outlet Channel	2441.96	.1	.3
Outlet Channel	2428.97	.1	.3
Outlet Channel	2427.97	.1	.3
Outlet Channel	2427.96	.1	.3
Outlet Channel	2393.47	.1	.3
Outlet Channel	2391.97	.1	.3
Outlet Channel	2391.96	.1	.3
Outlet Channel	2359.97	.1	.3
Outlet Channel	2359.96	.1	.3
Outlet Channel	2335.97	.1	.3
Outlet Channel	2310.97	.1	.3
Outlet Channel	2107.96	.1	.3
Outlet Channel	1836.83	.1	.3
Outlet Channel	1805.33	.1	.3
Outlet Channel	1781.27	.1	.3
Outlet Channel	1781.26	.1	.3
Outlet Channel	1771.26	.1	.3
Outlet Channel	1764.26	.1	.3
Outlet Channel	1722.18 Culvert		
Outlet Channel	1680.10	.1	.3

River: ADOT

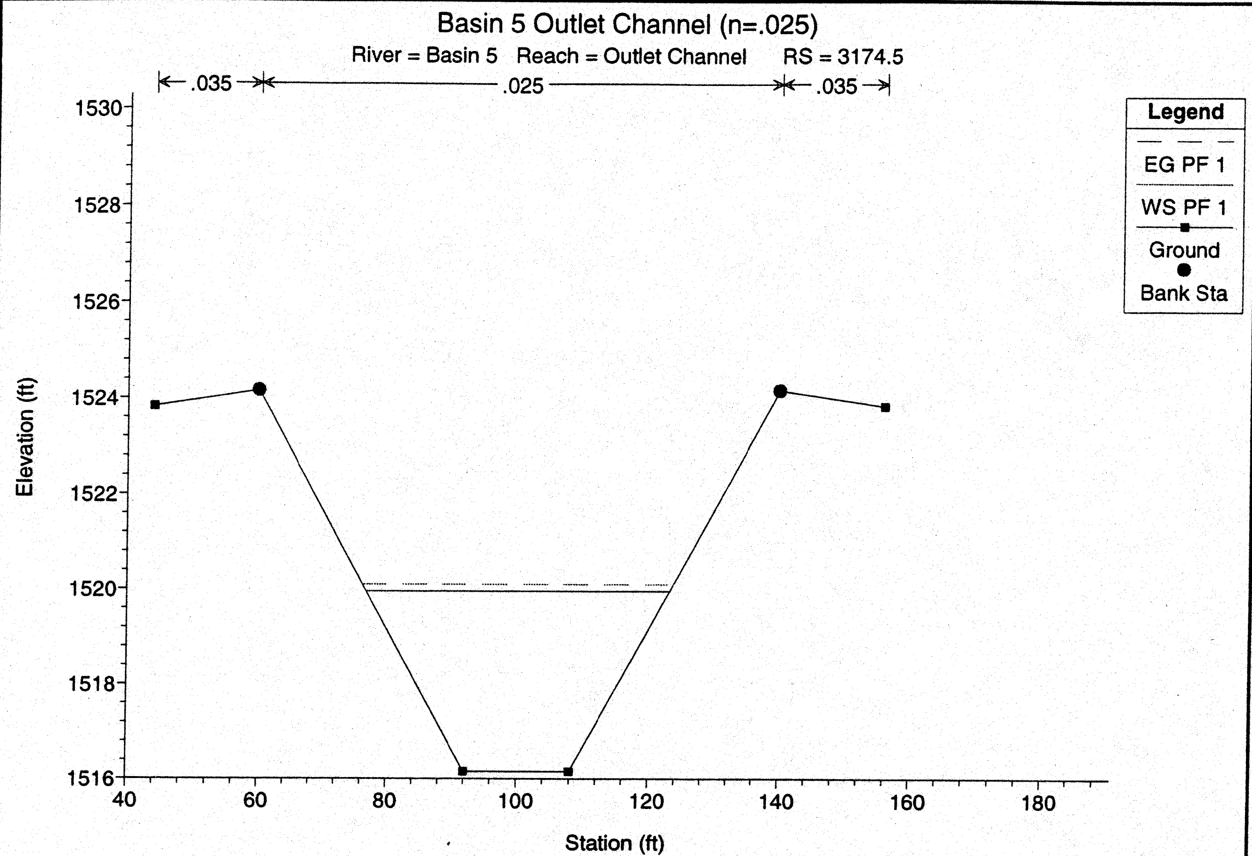
Reach	River Sta.	Contr.	Expan.
Exst Channel US	1812.83	.1	.3
Exst Channel US	1770.98	.1	.3
Exst Channel US	1726.50	.1	.3
Exst Channel DS	1650	.1	.3
Exst Channel DS	1630.75	.1	.3
Exst Channel DS	1582.67	.1	.3
Exst Channel DS	1382.67	.1	.3
Exst Channel DS	1182.67	.1	.3

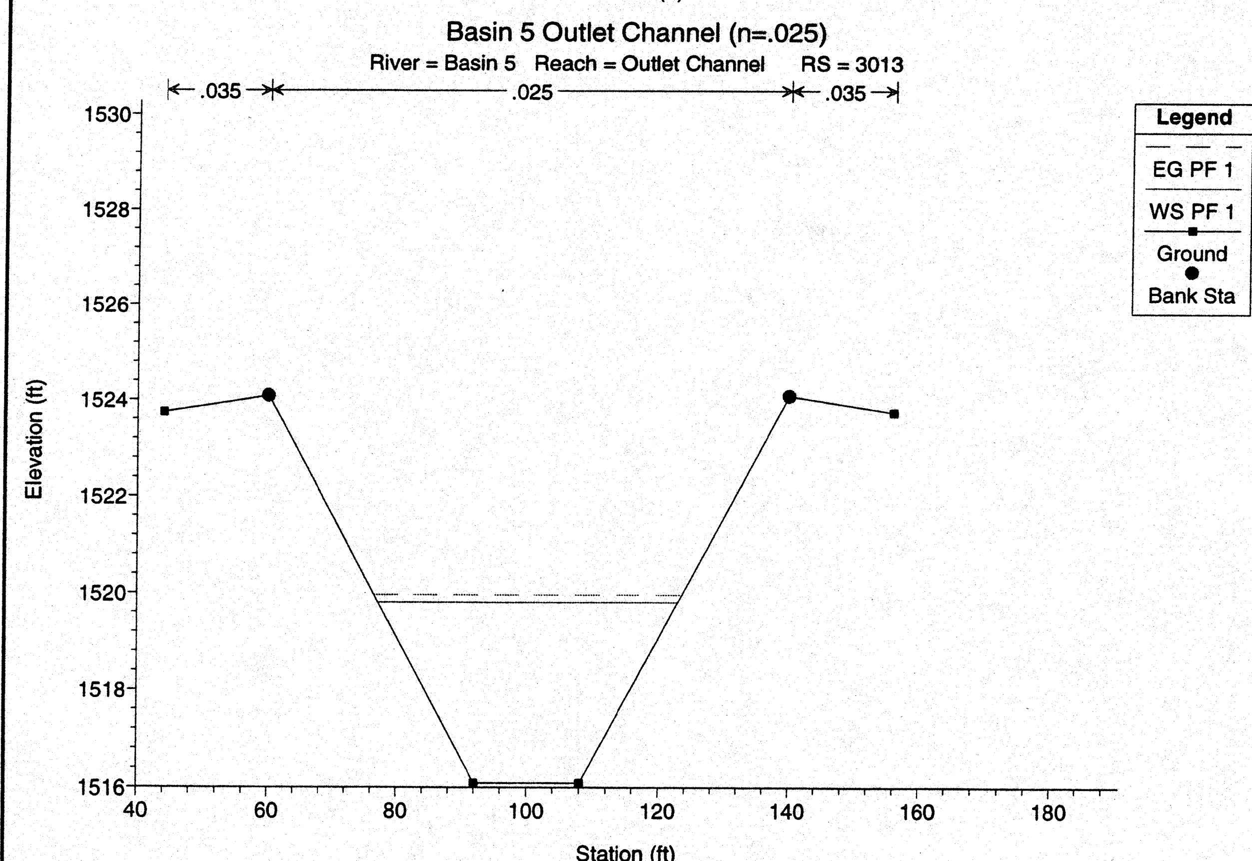

Basin 5 Outlet Channel (n=.025)
Exst Channel DS
Outlet Channel
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Elevation (ft)
1525
1520
1515
1510
1505
1500
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)





1 in Horiz. = 30 ft 1 in Vert. = 4 ft





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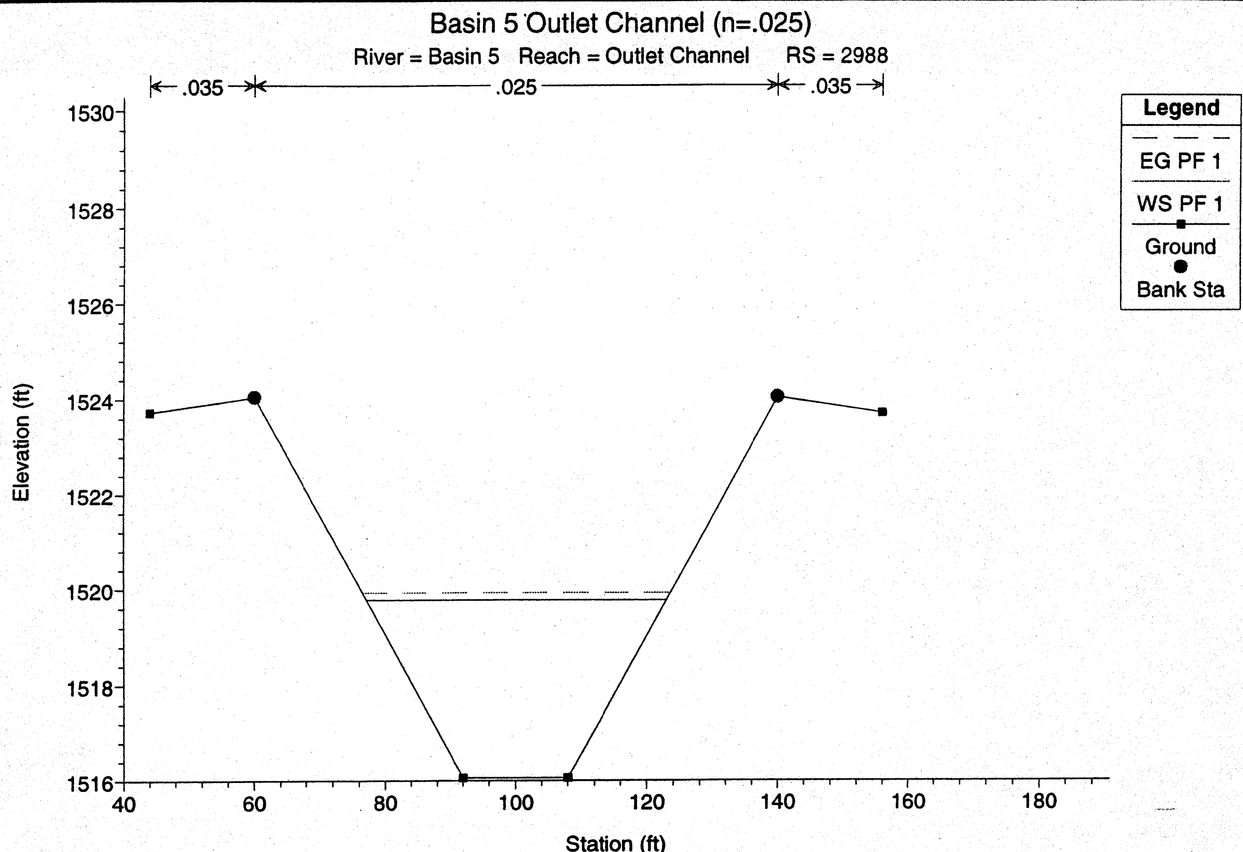

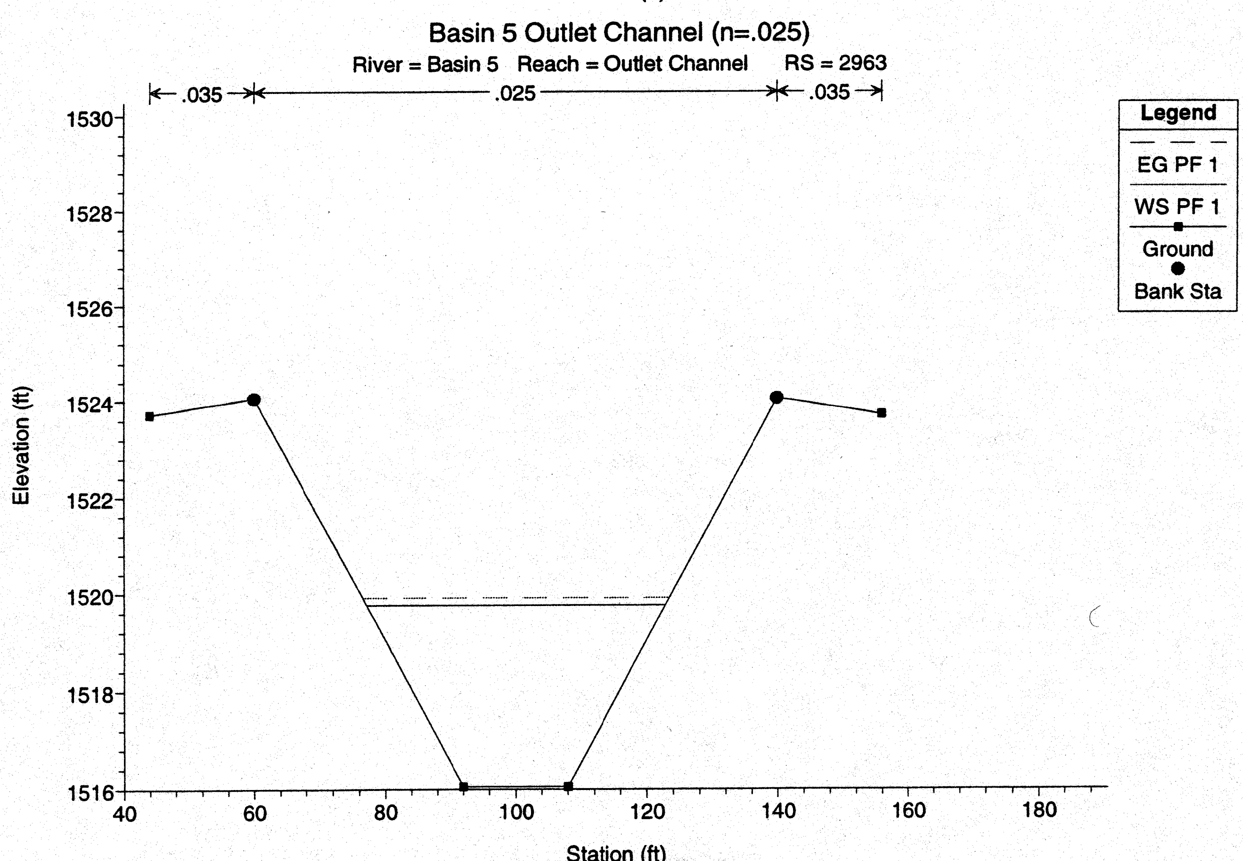

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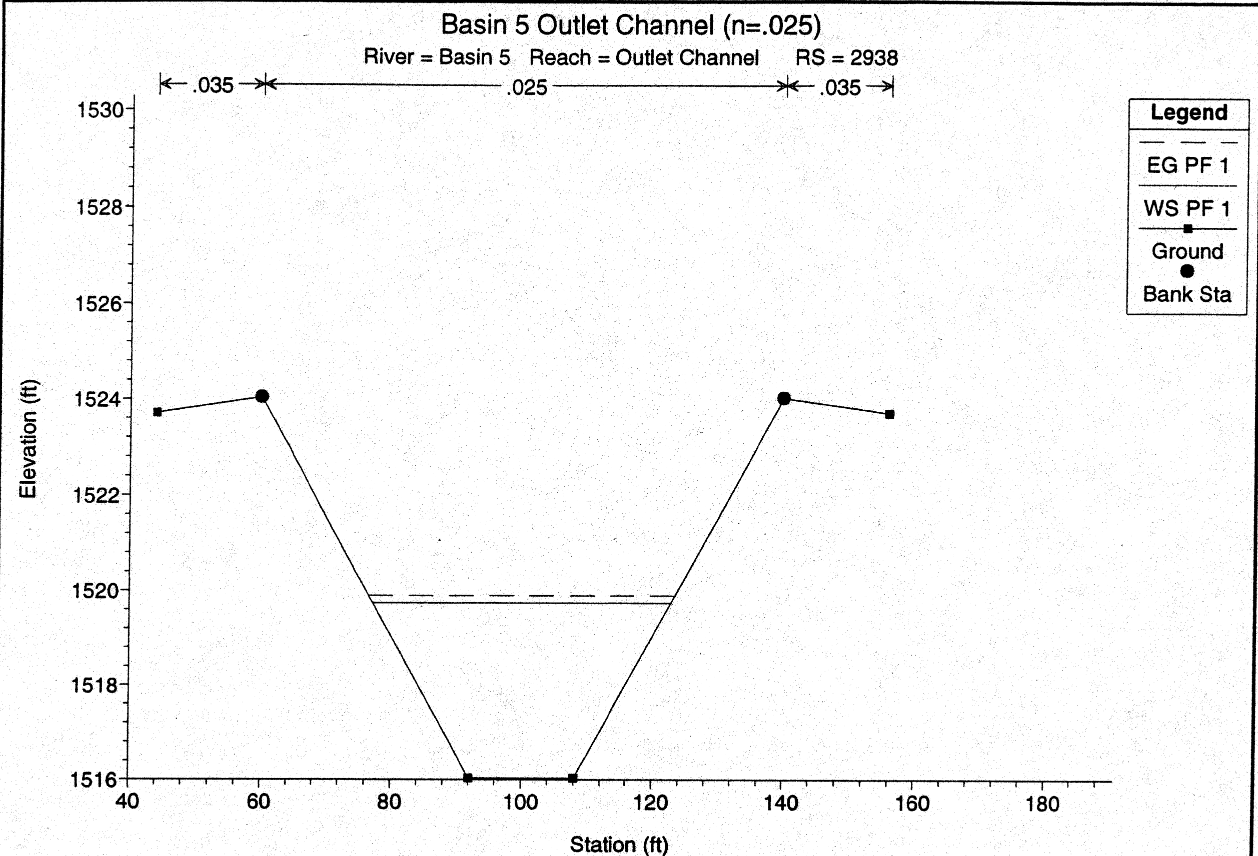
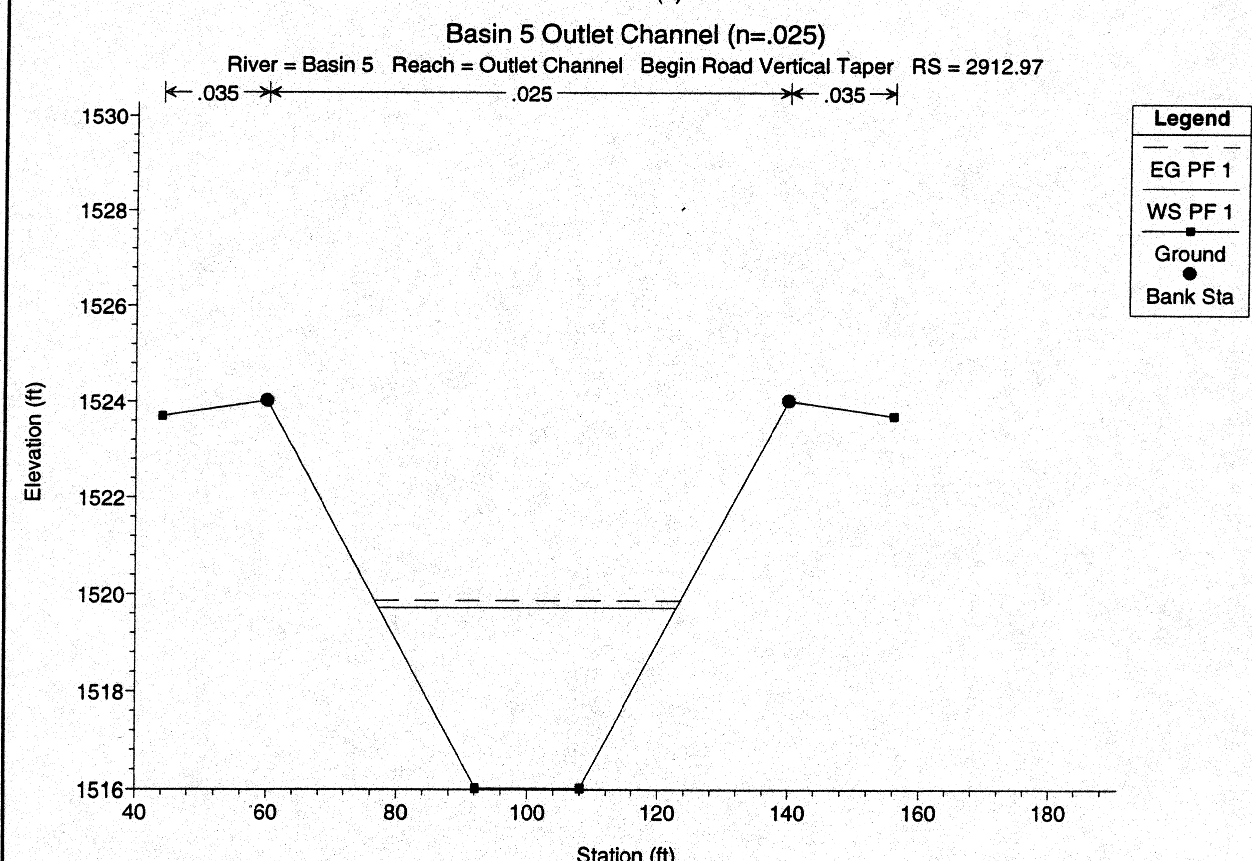
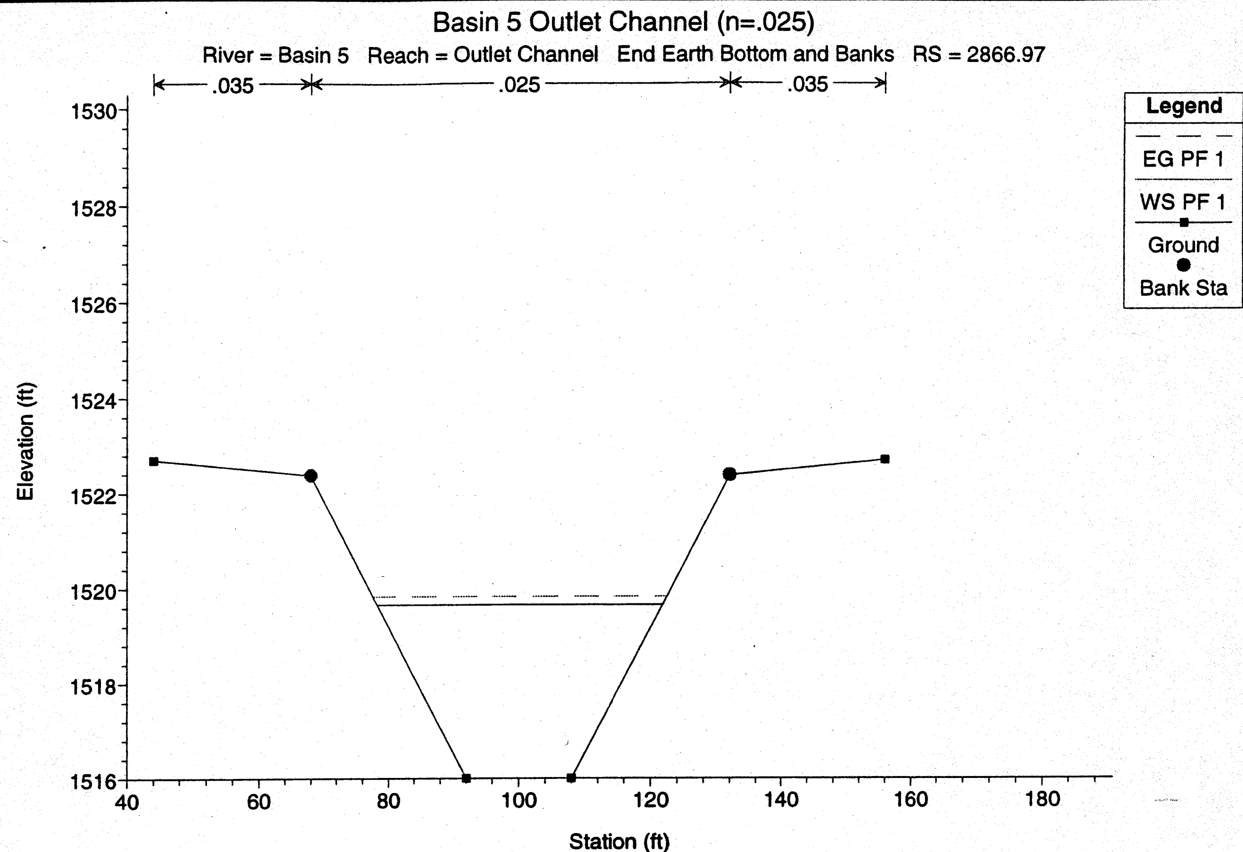
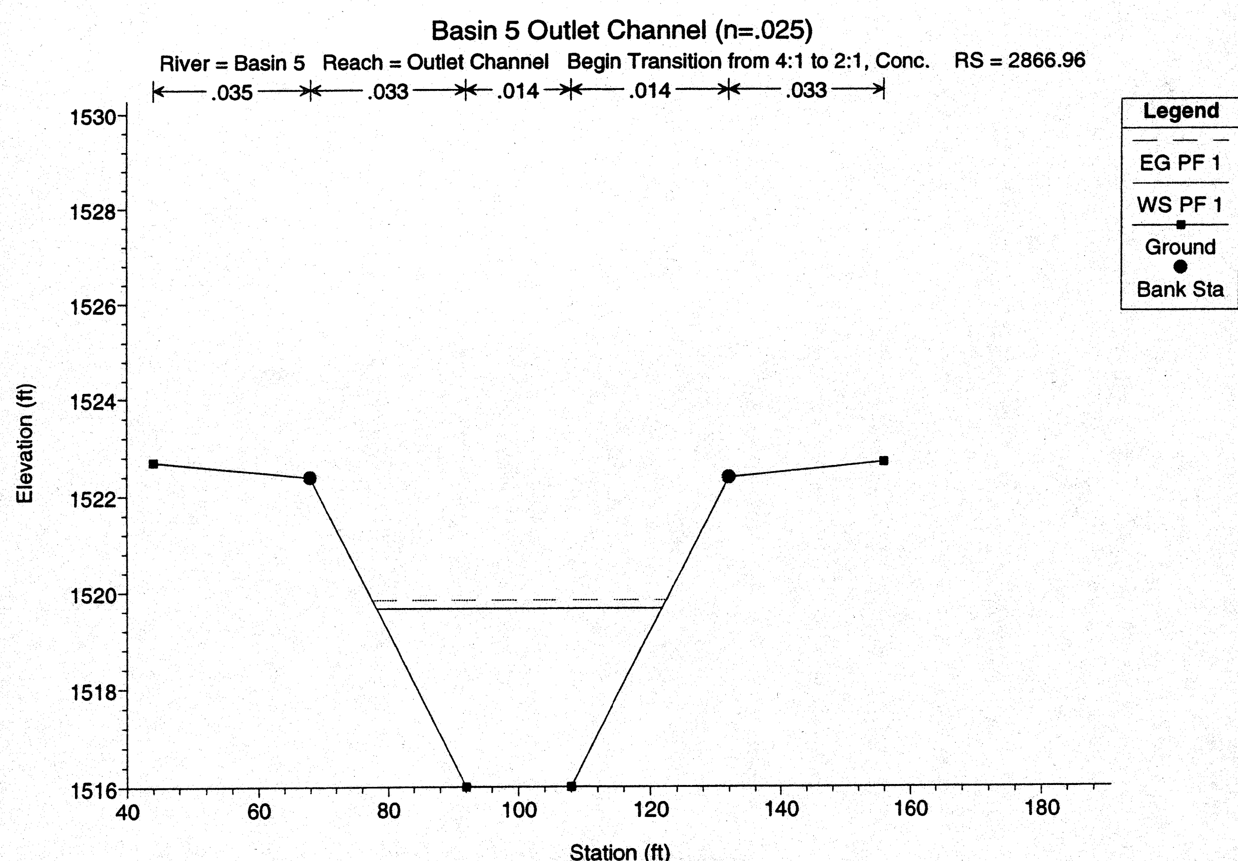




1 in Horiz. = 30 ft 1 in Vert. = 4 ft





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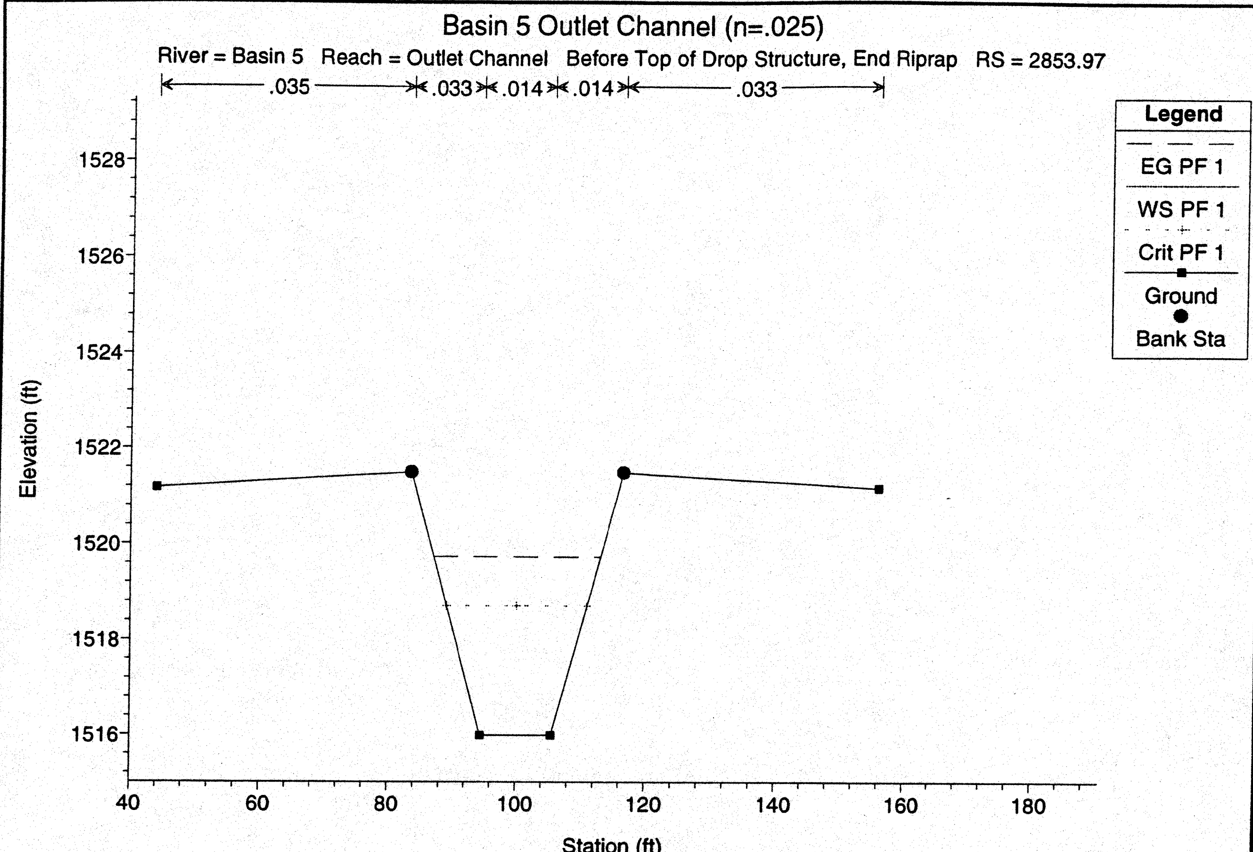

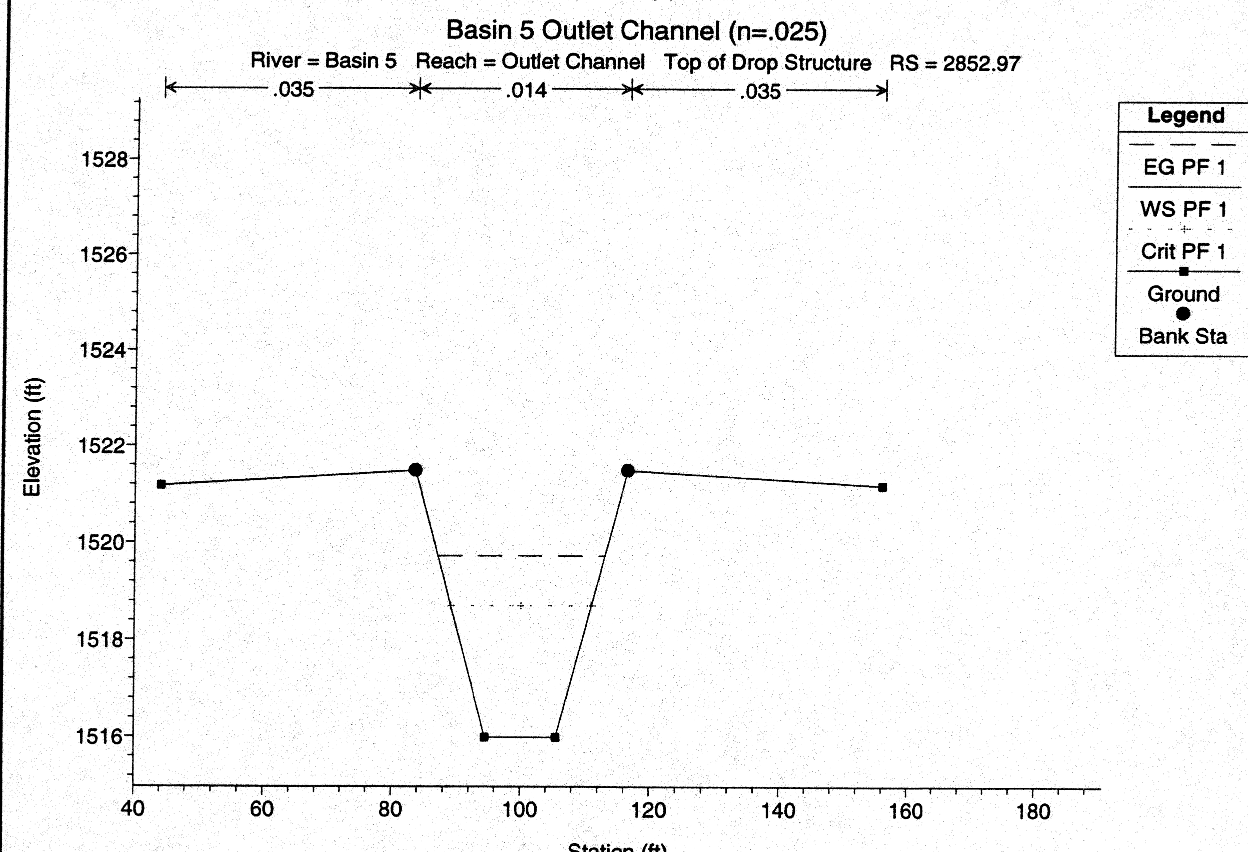

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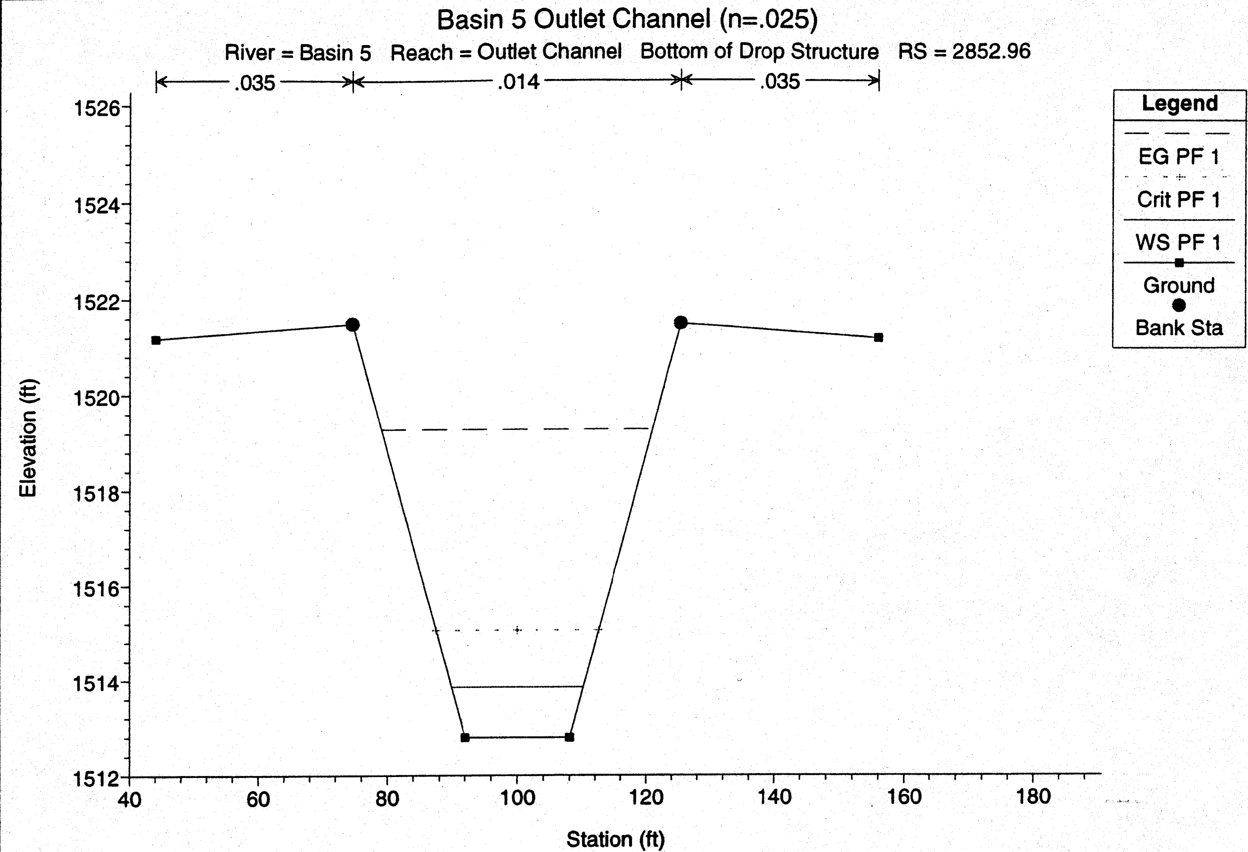

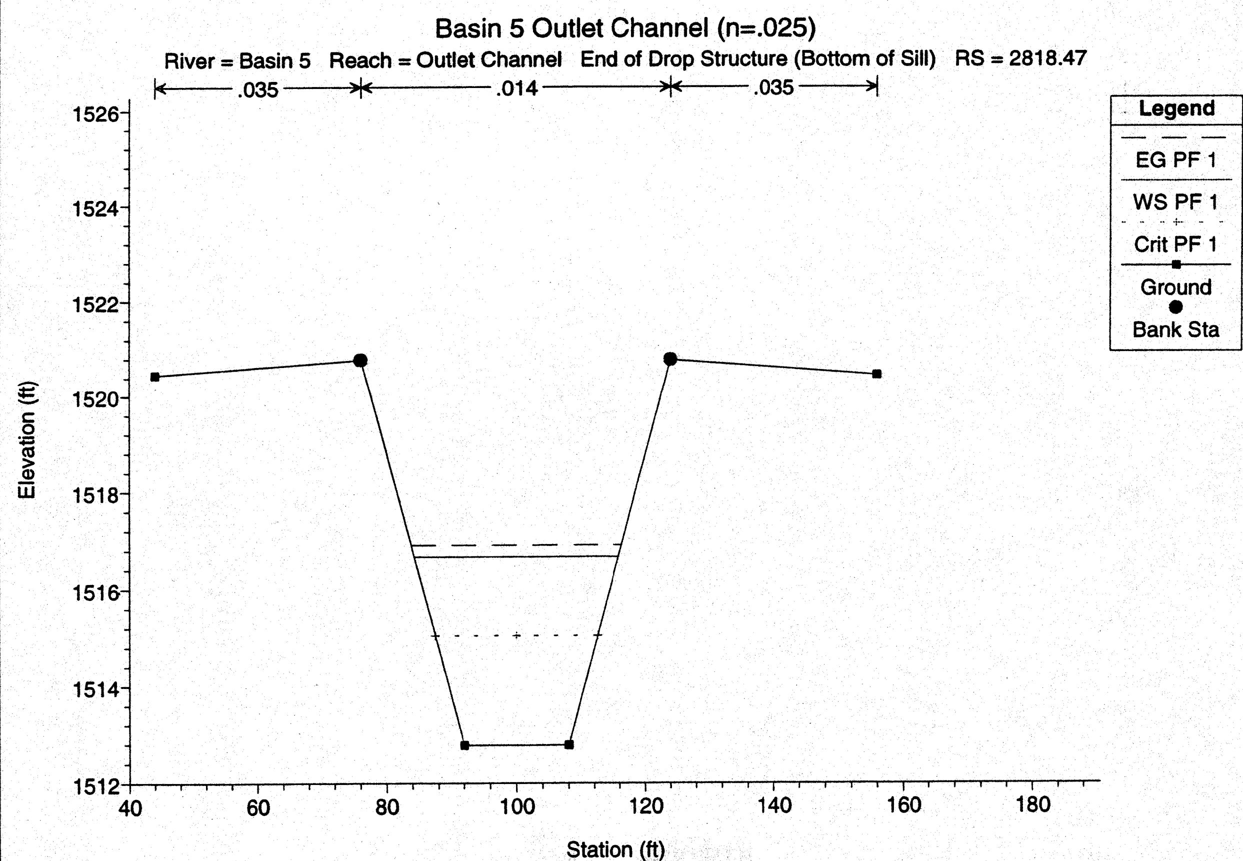

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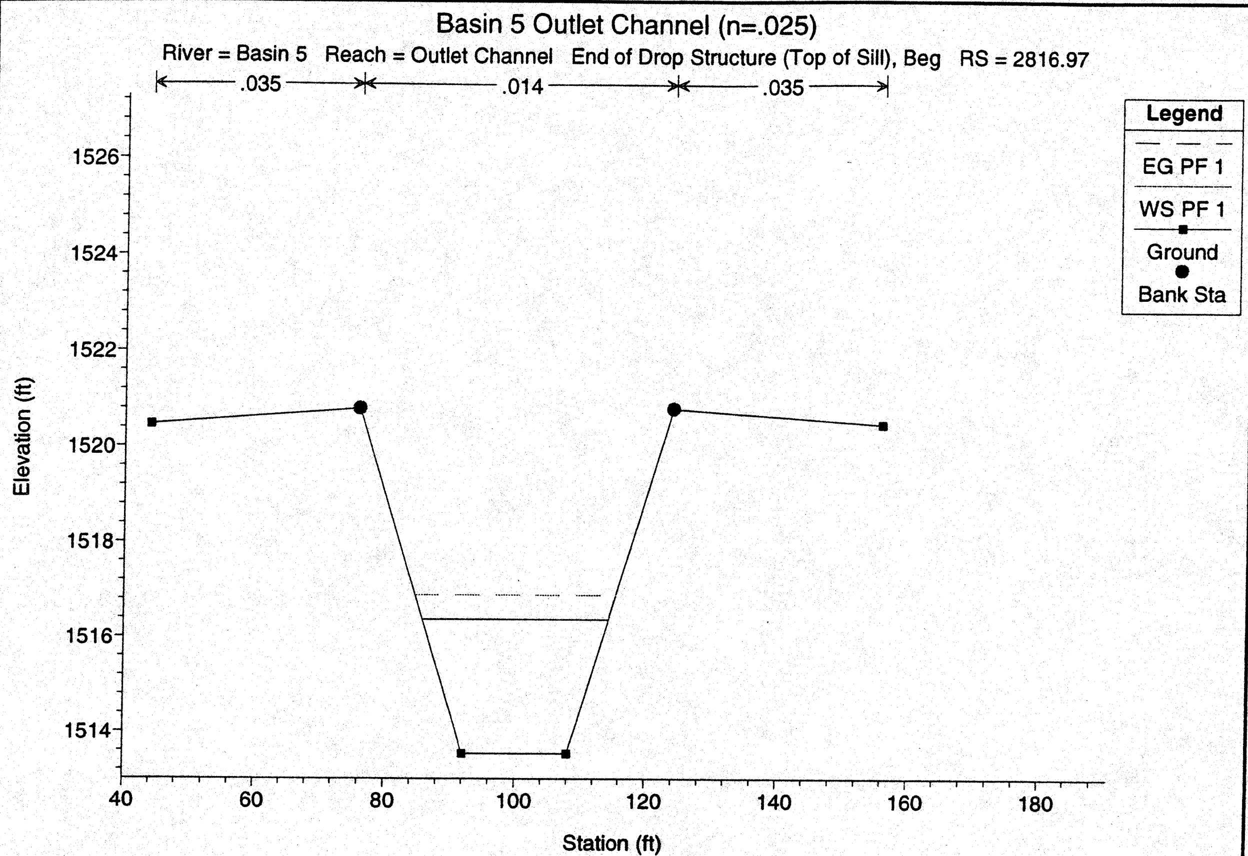

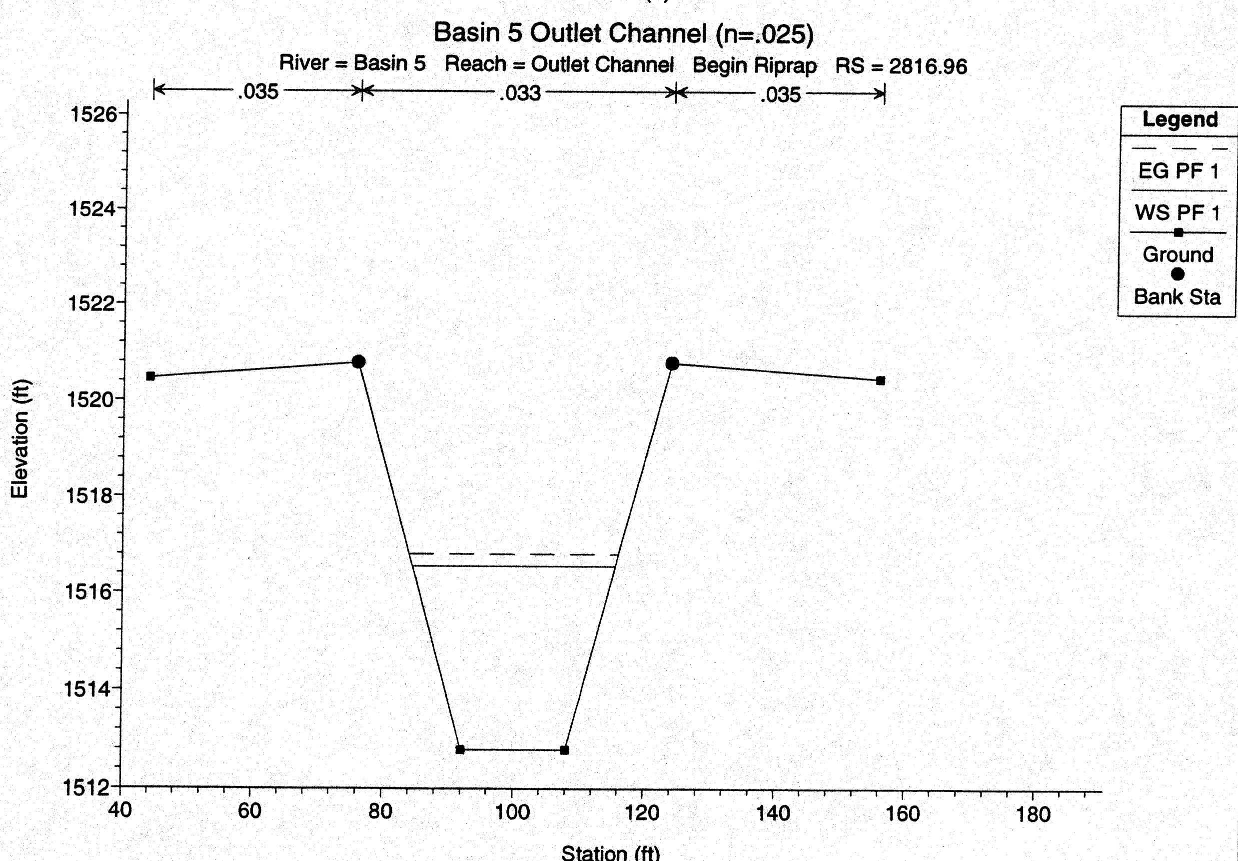

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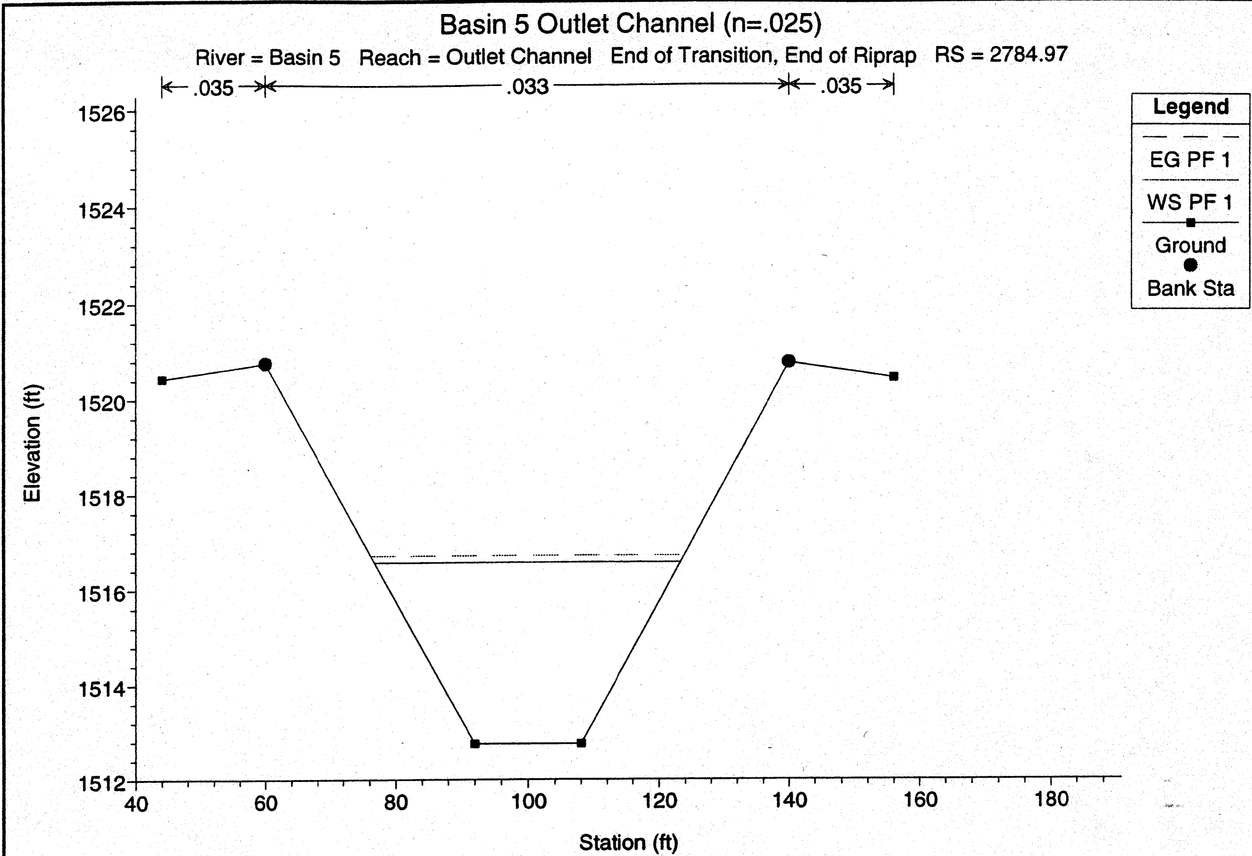
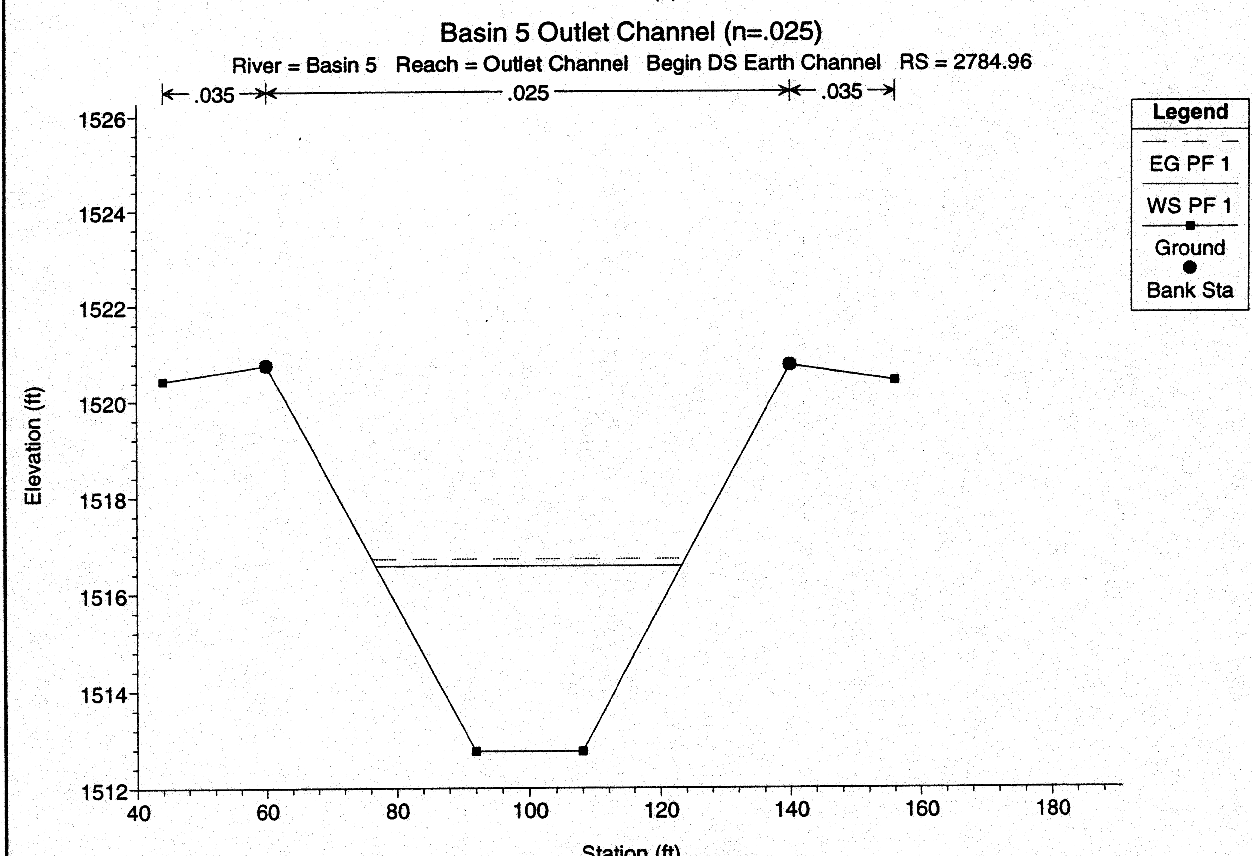
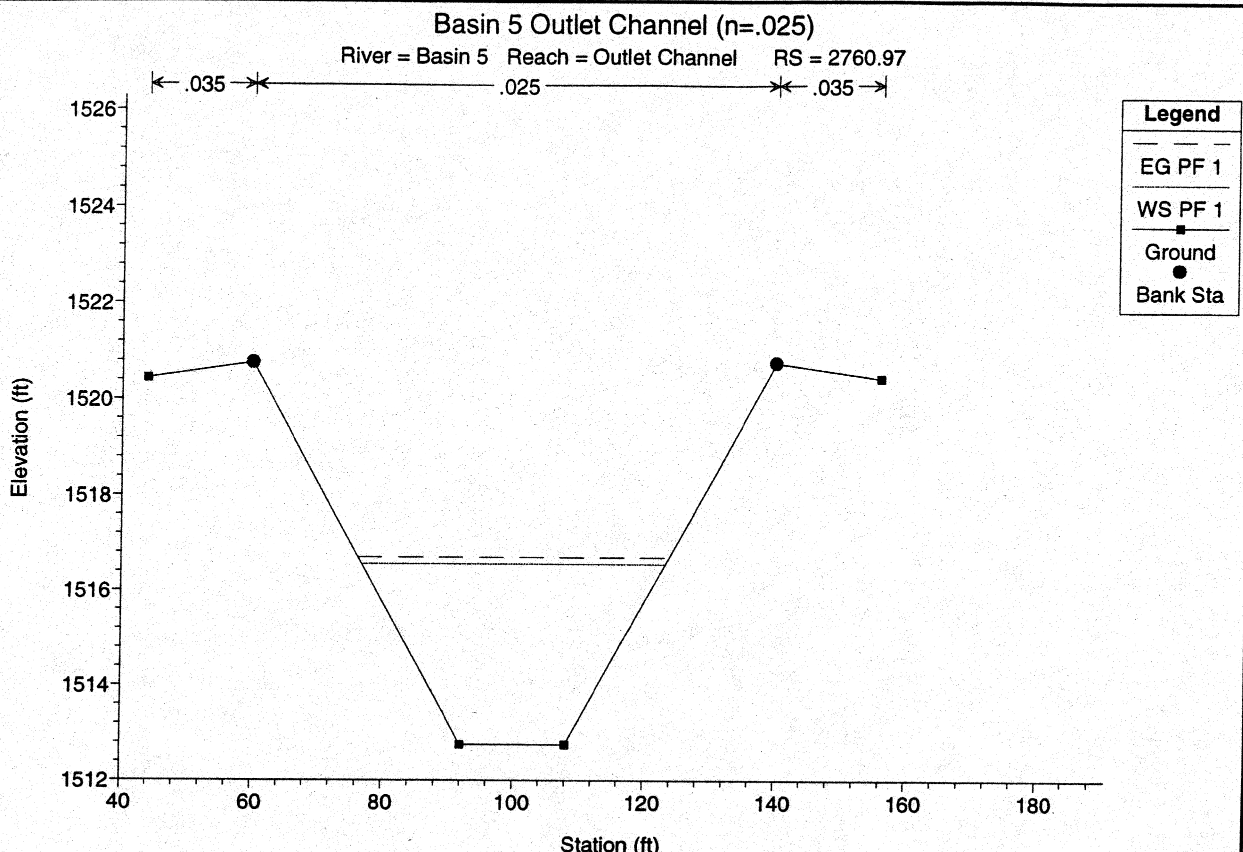
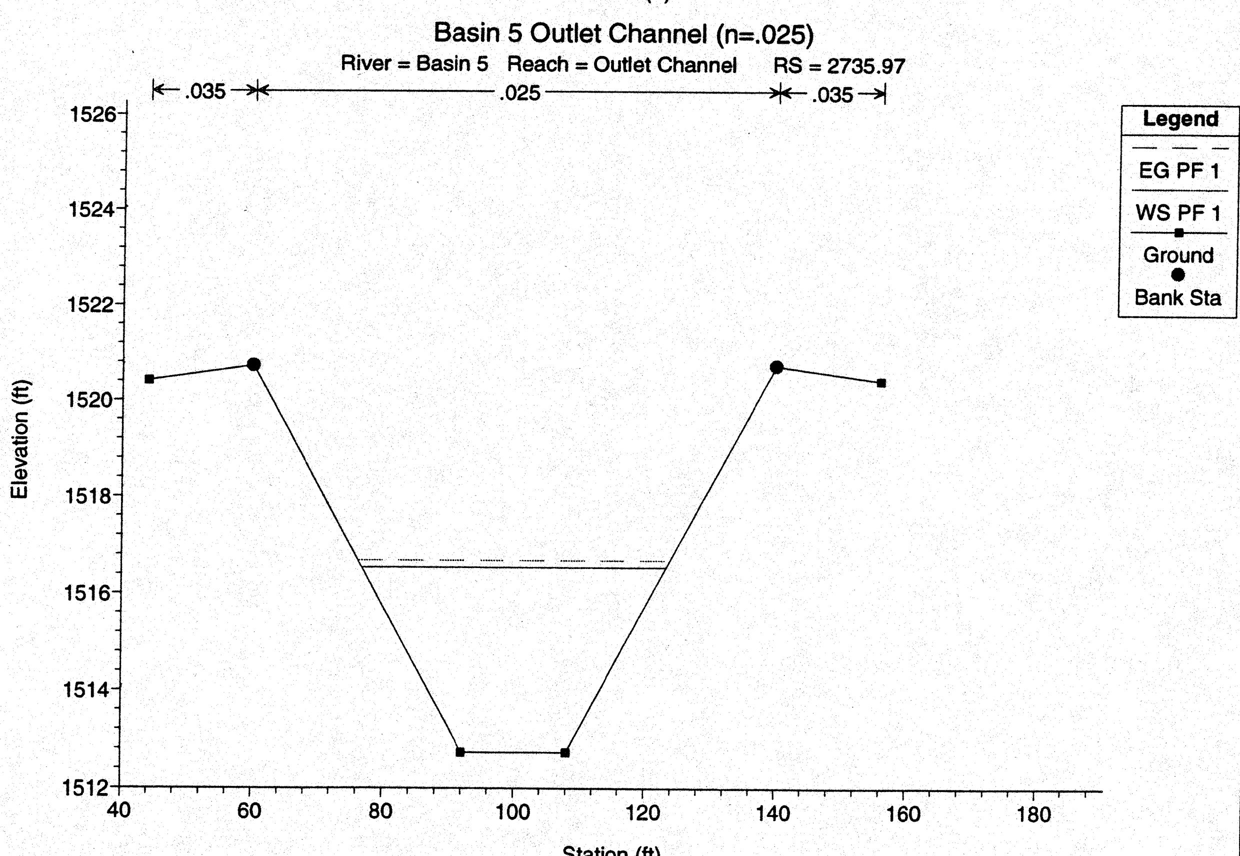


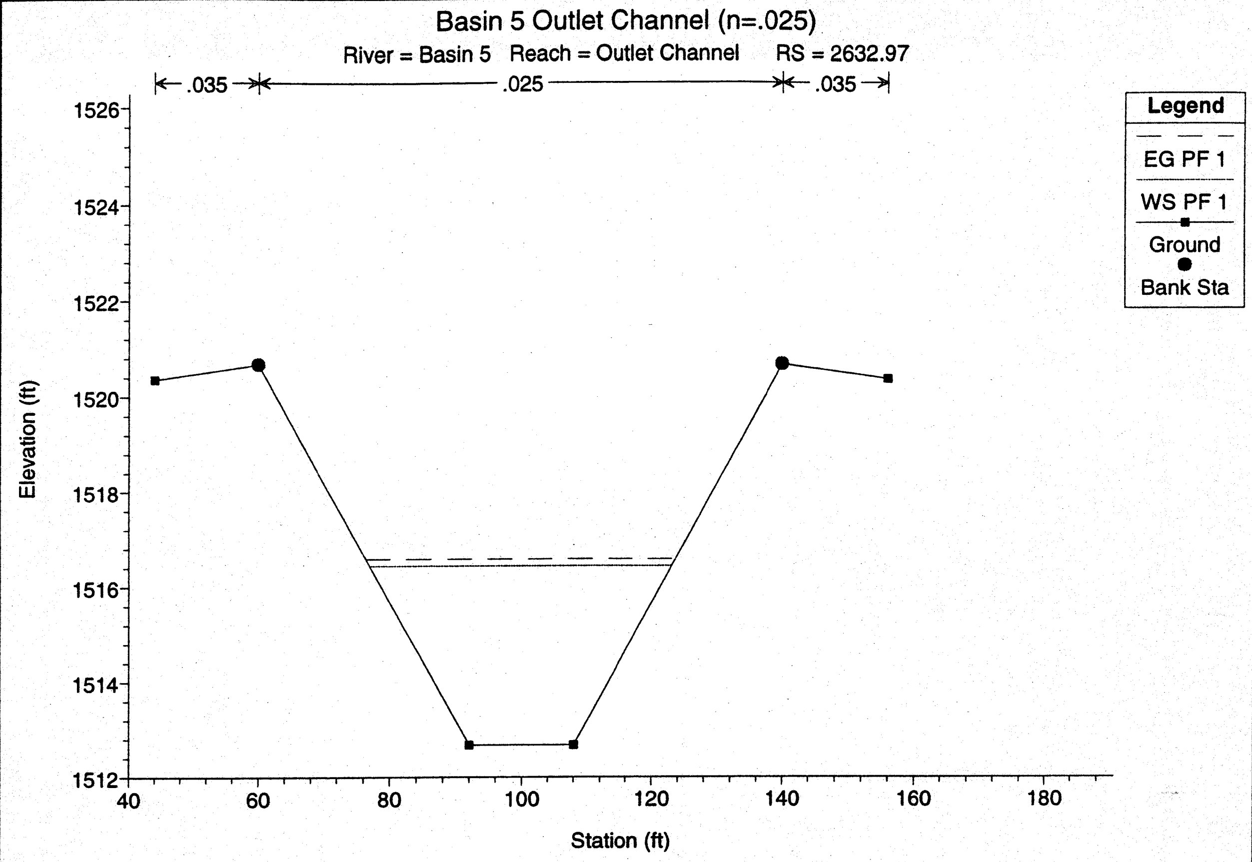


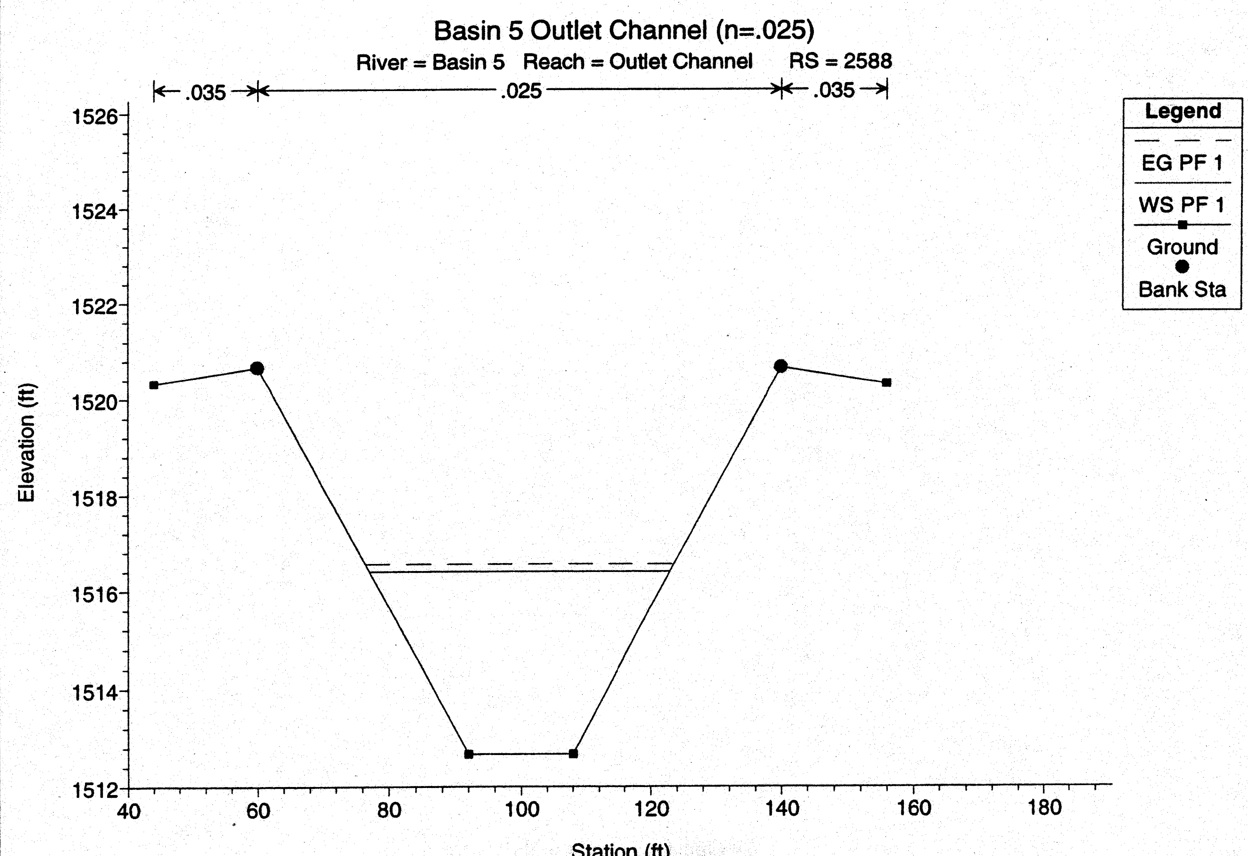
1 in Horiz. = 30 ft 1 in Vert. = 4 ft





1 in Horiz. = 30 ft 1 in Vert. = 4 ft





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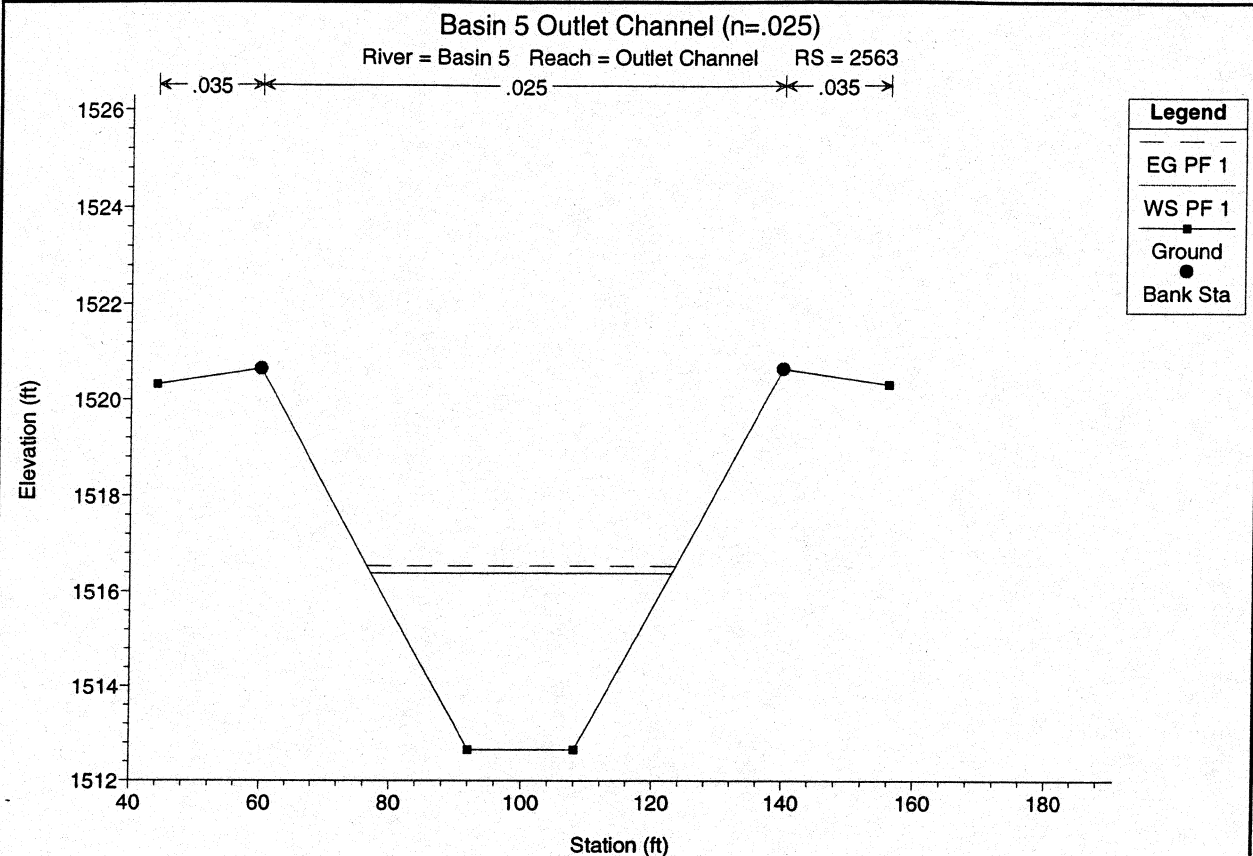
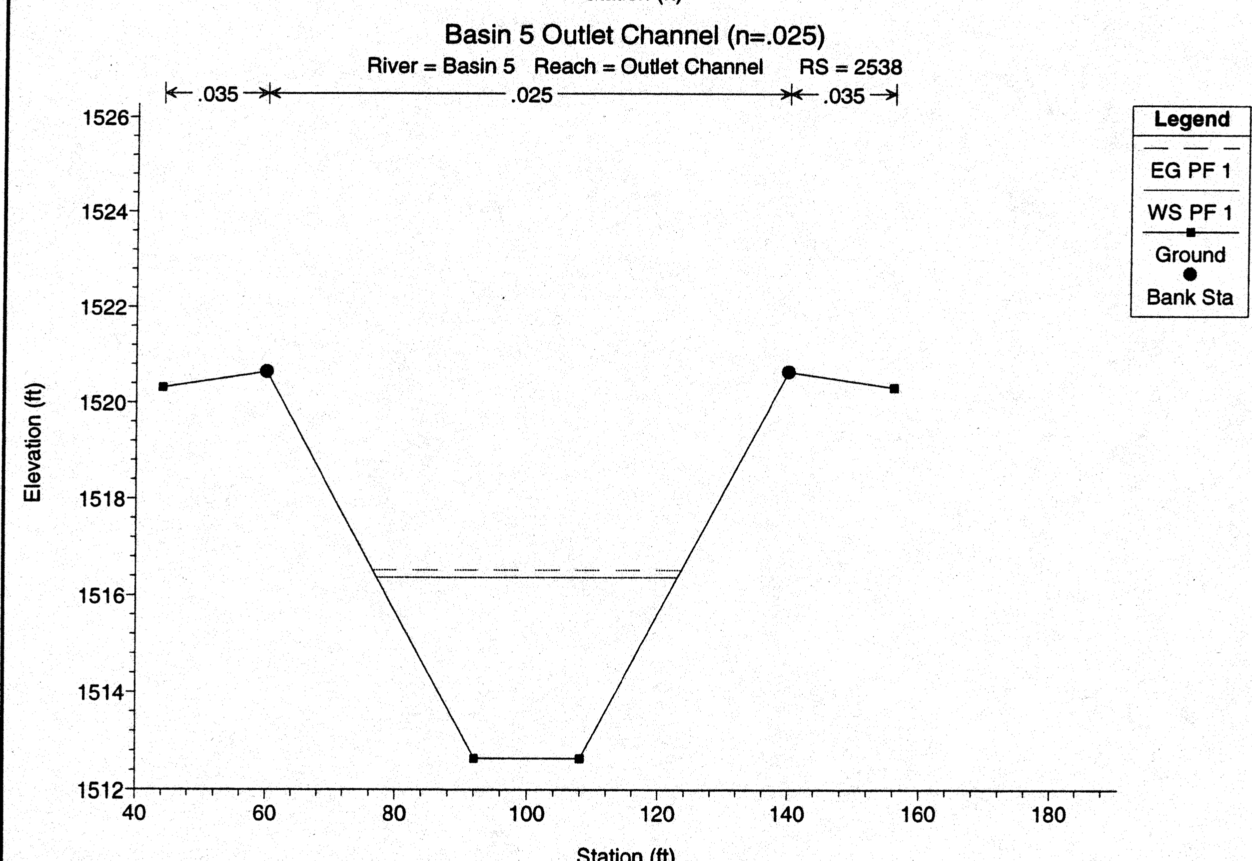
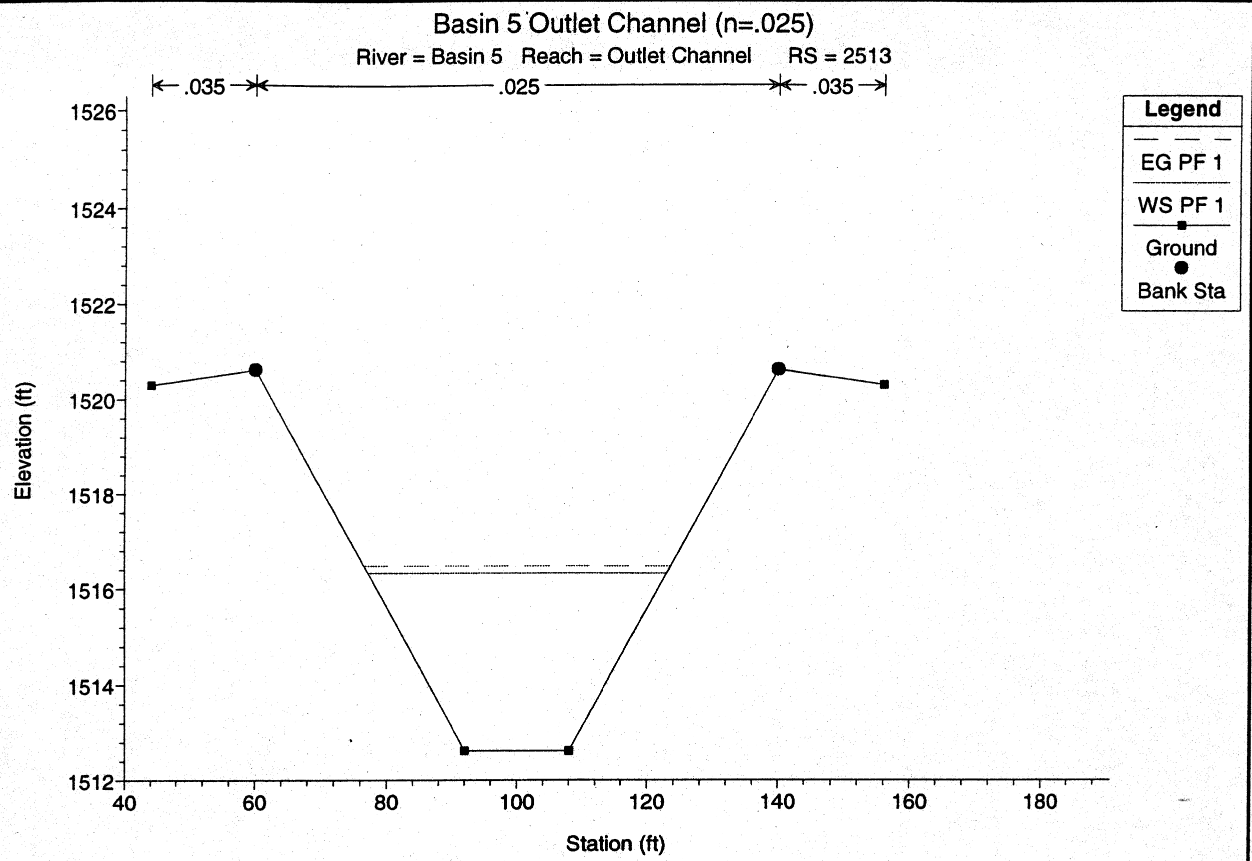
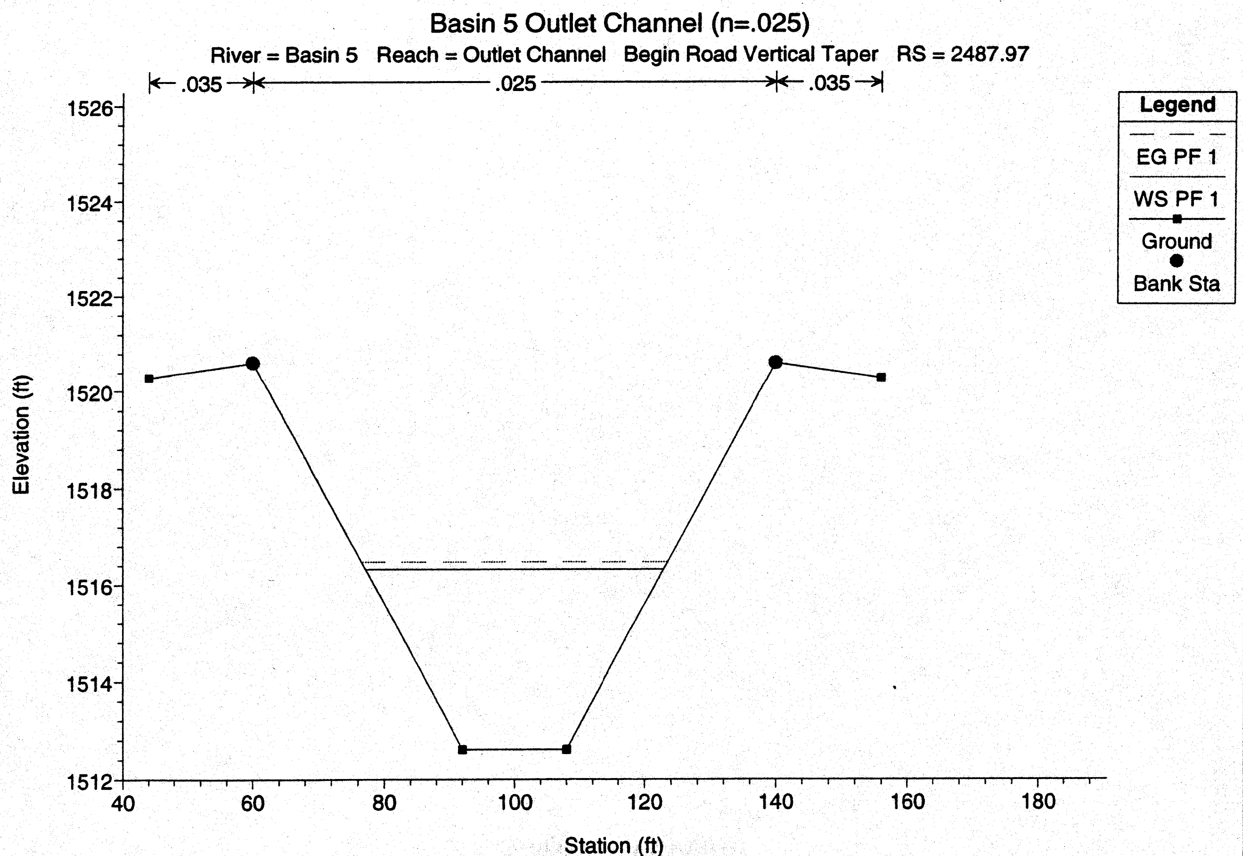


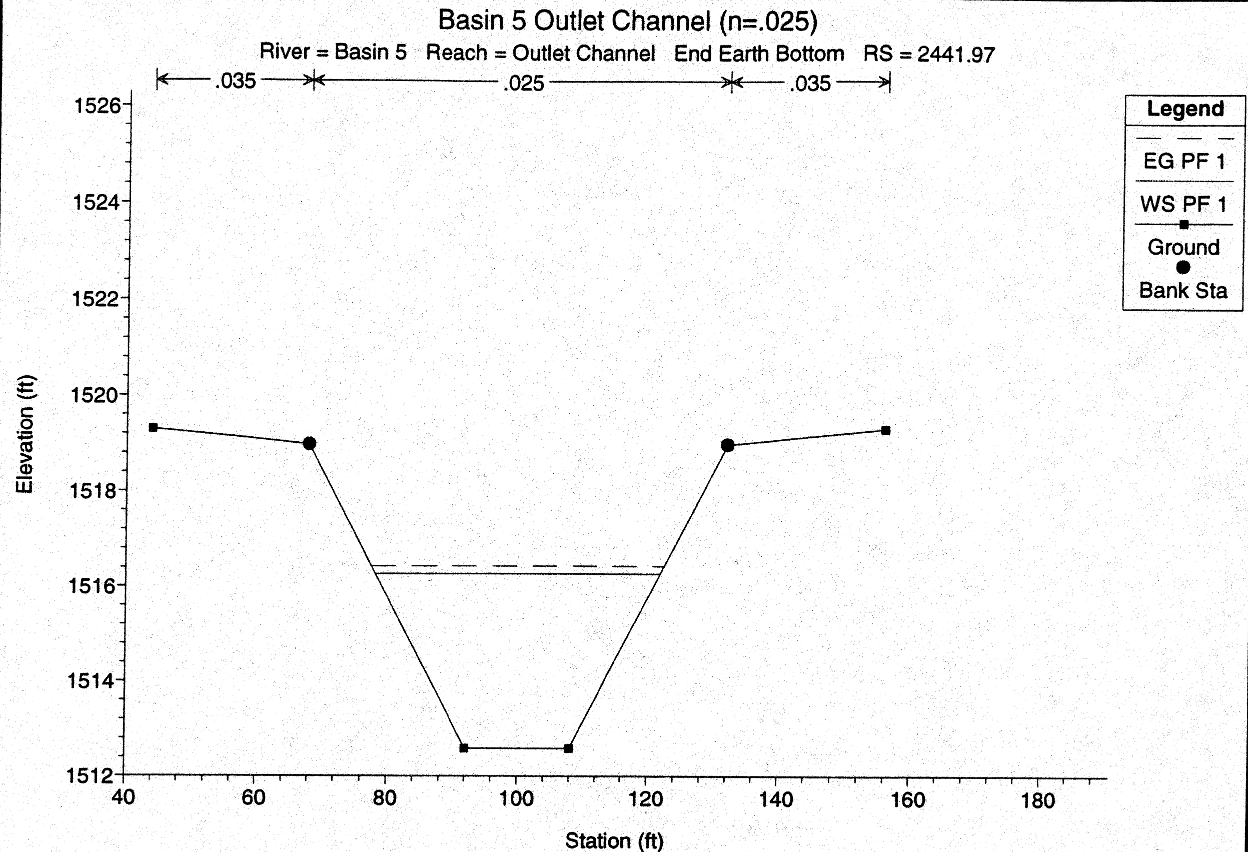


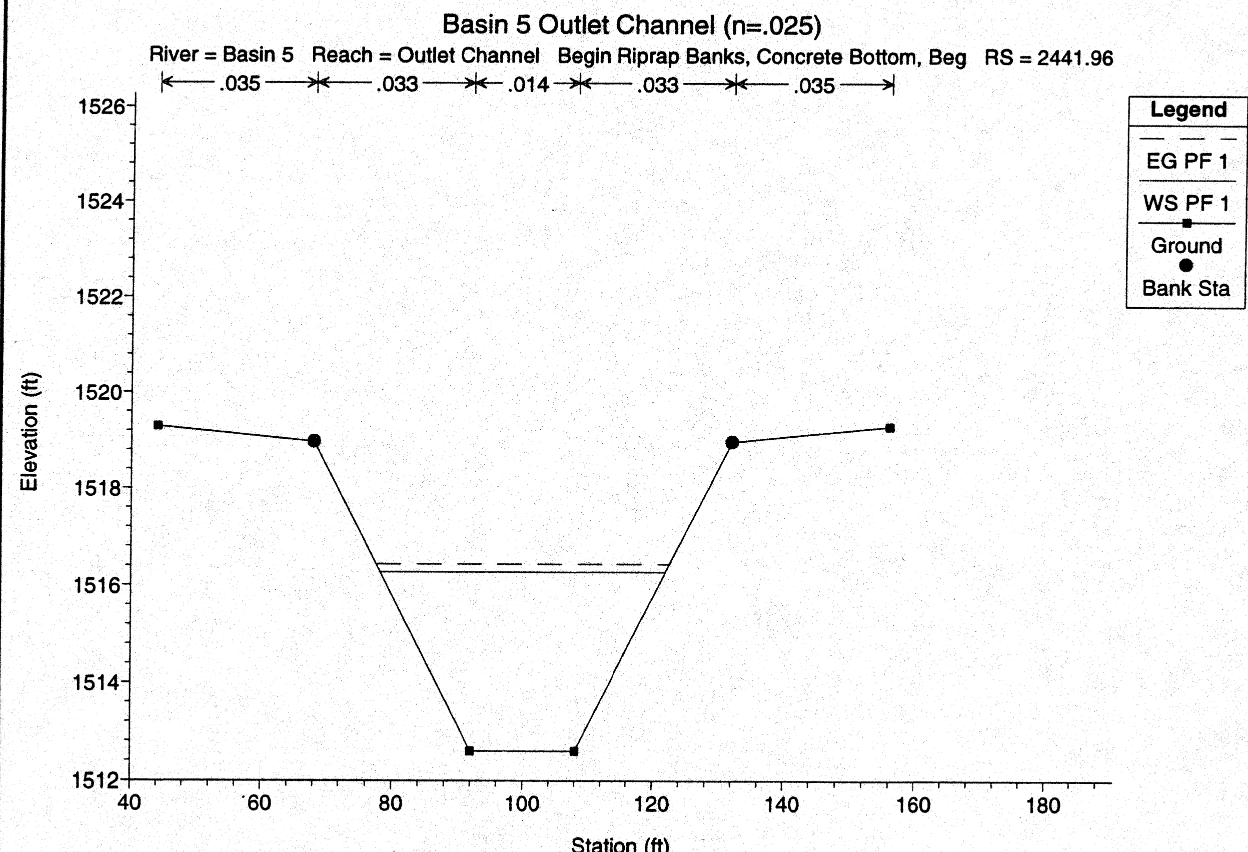
1 in Horiz. = 30 ft 1 in Vert. = 4 ft





1 in Horiz. = 30 ft 1 in Vert. = 4 ft





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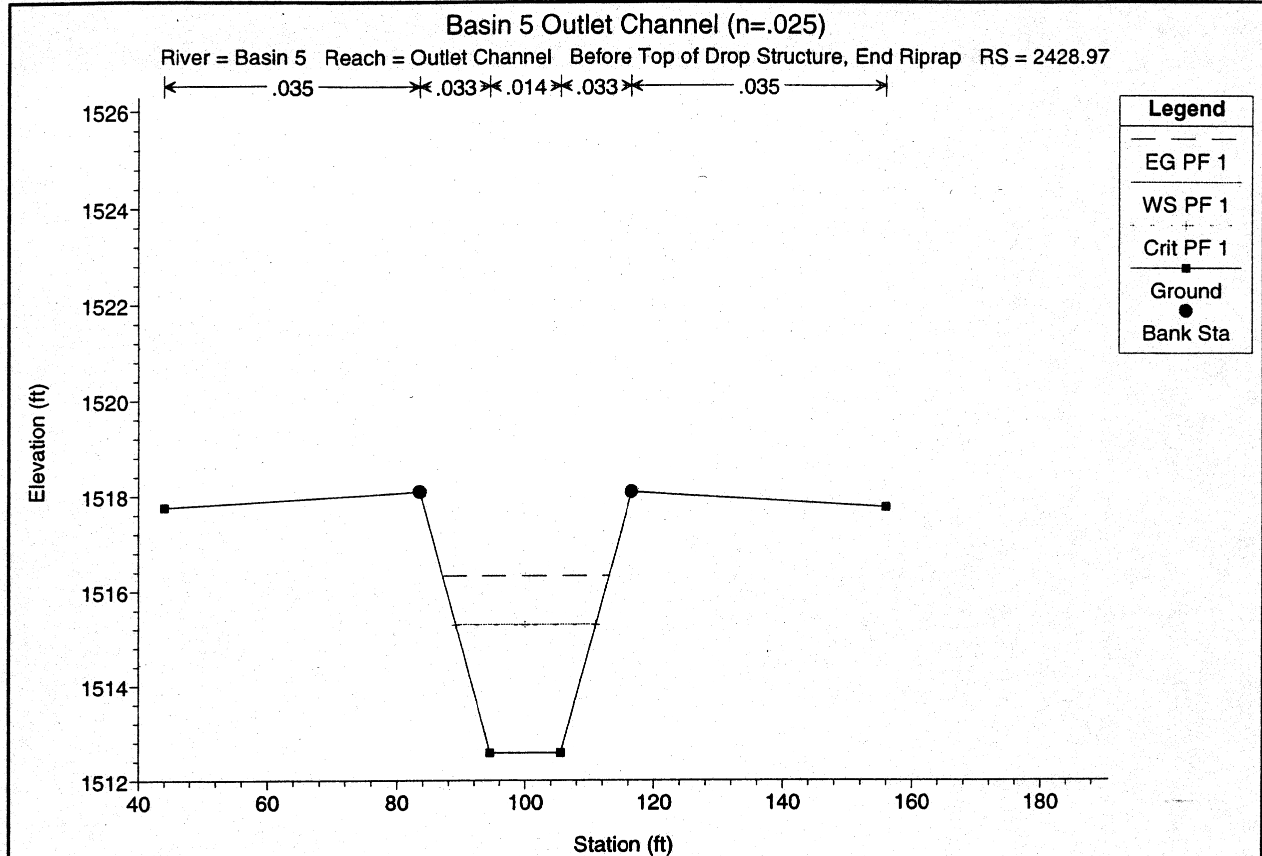

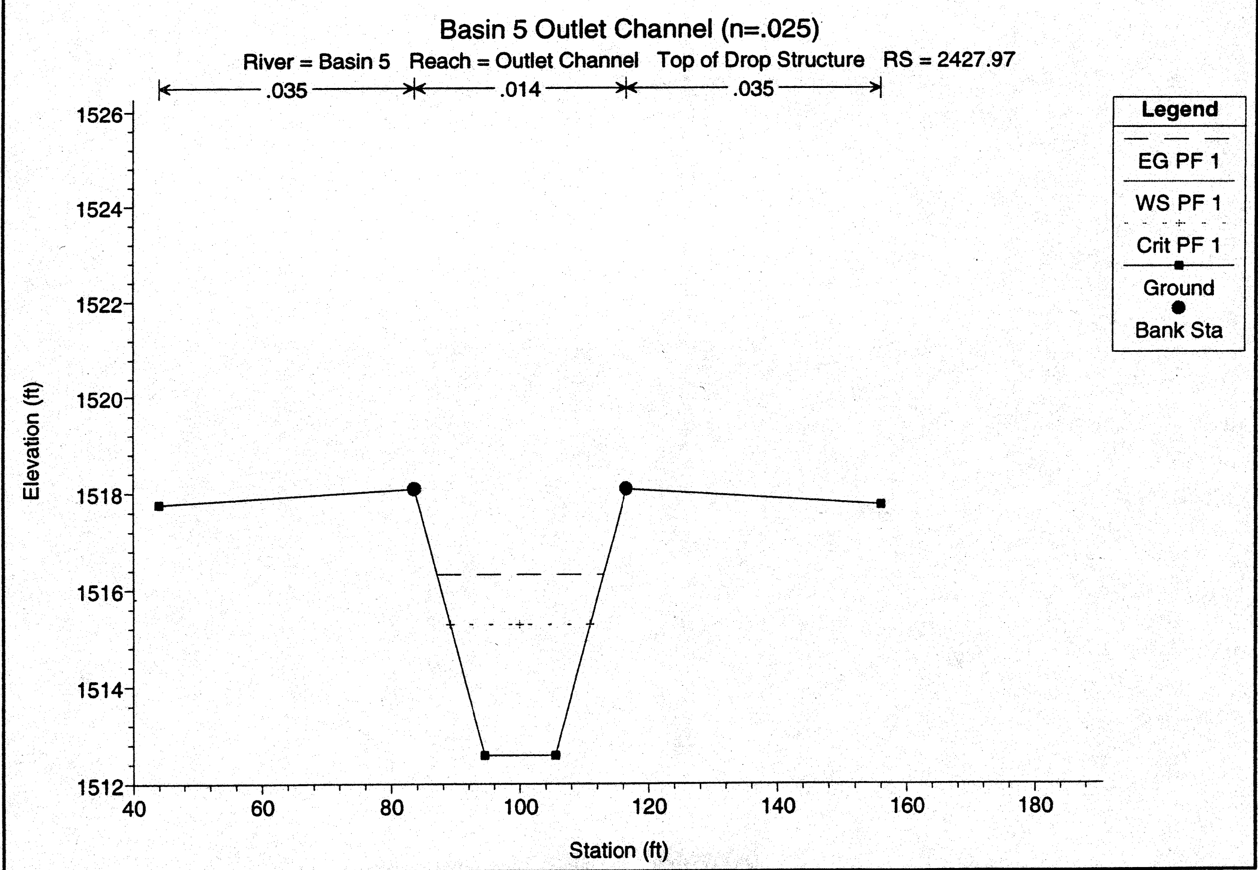

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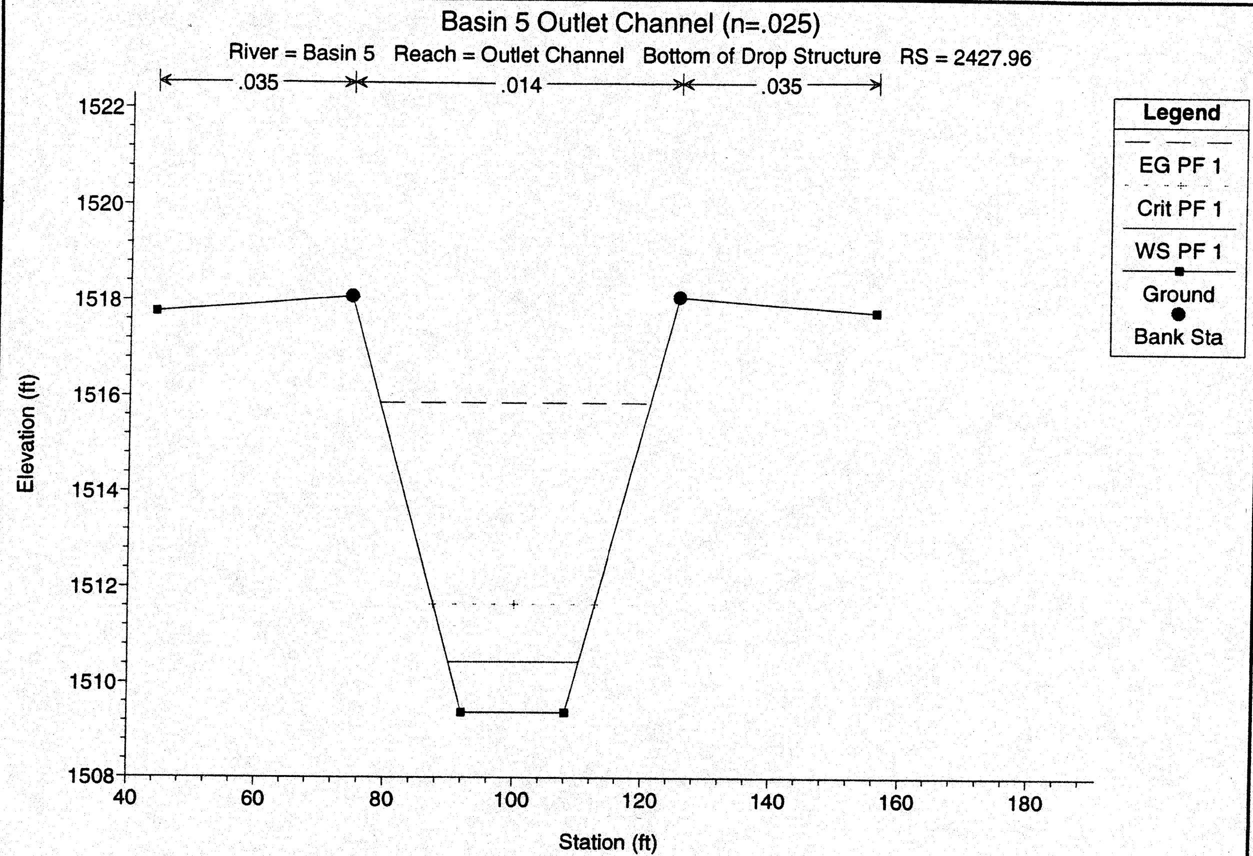
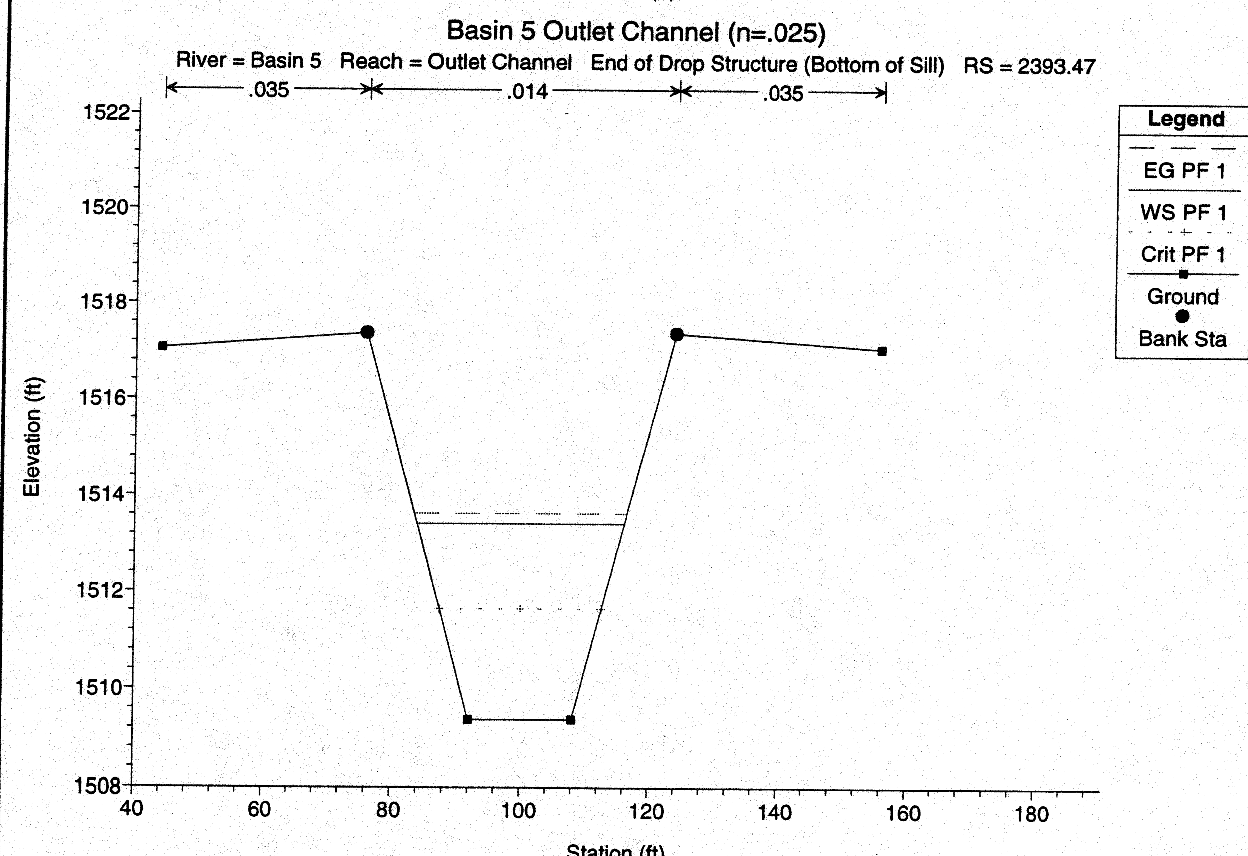
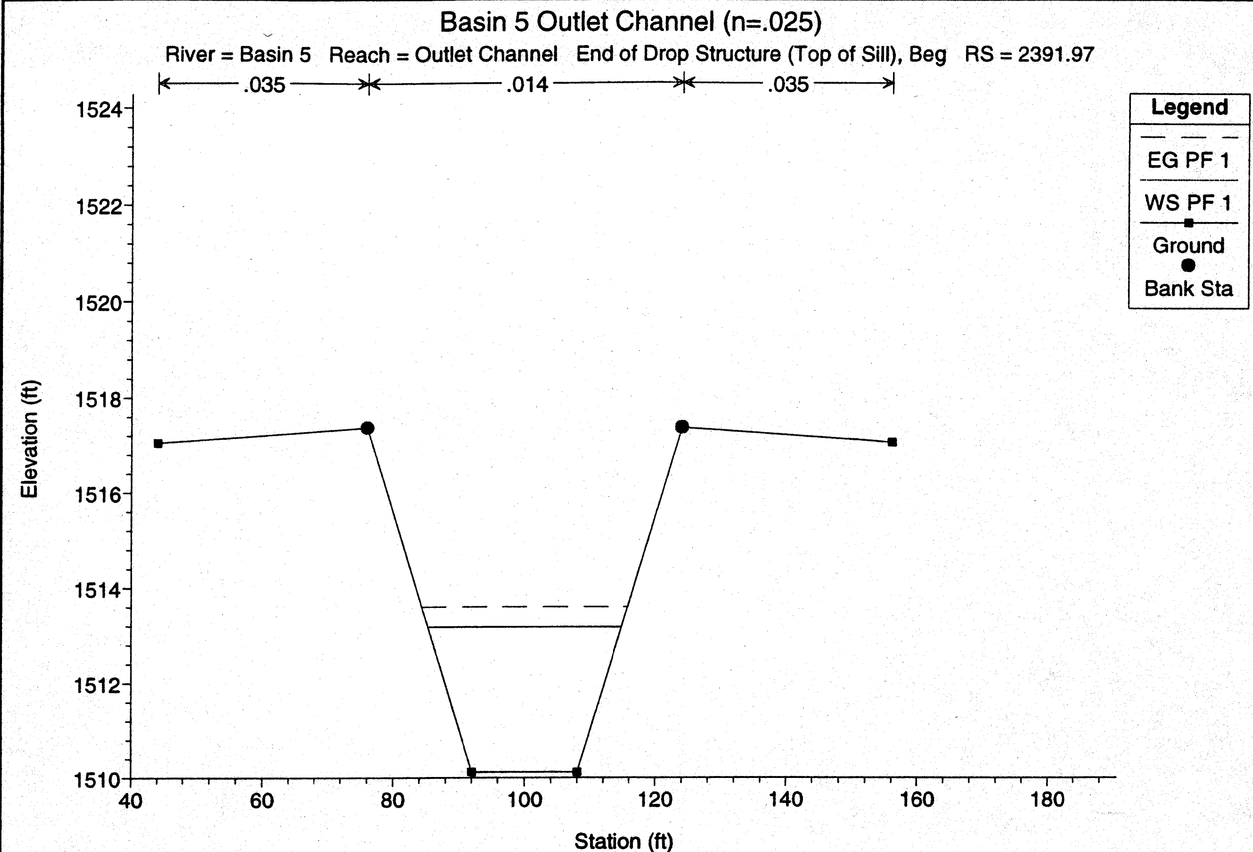
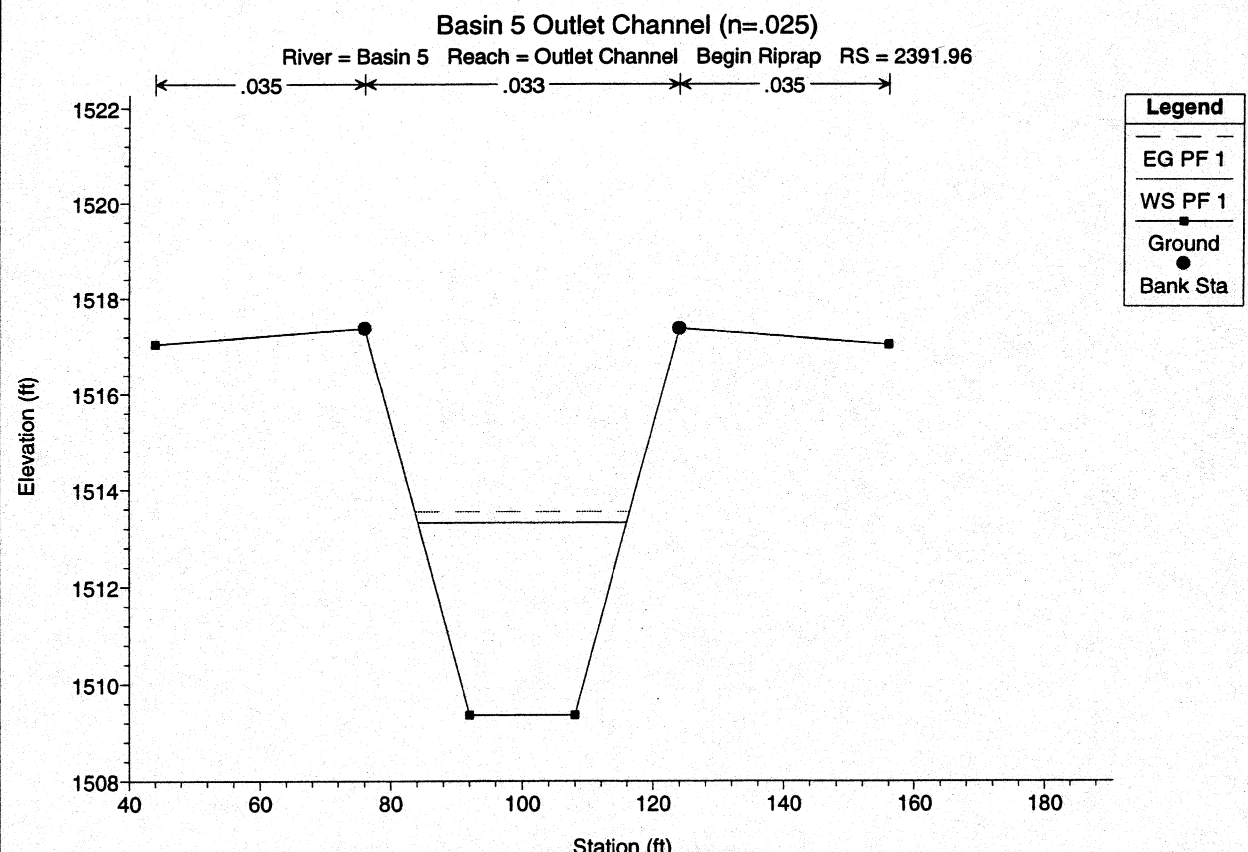


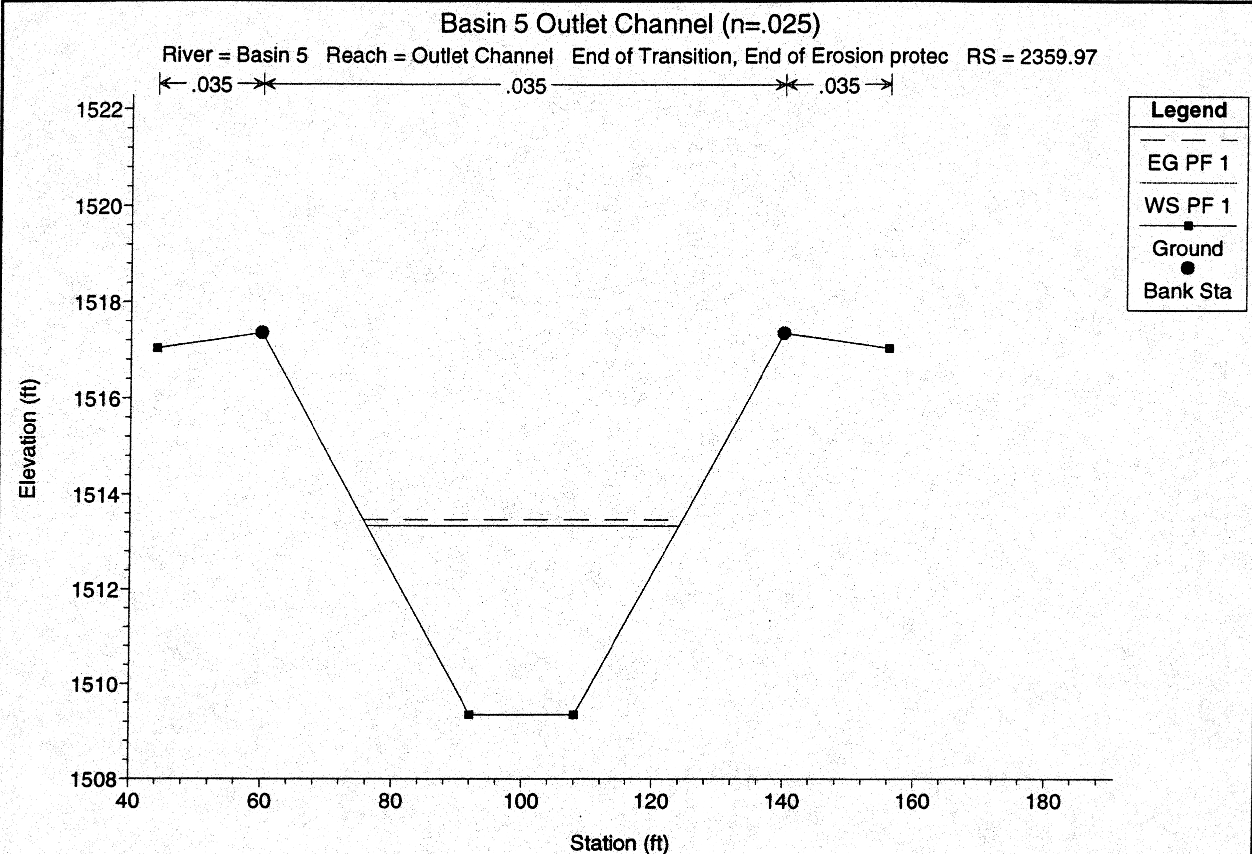


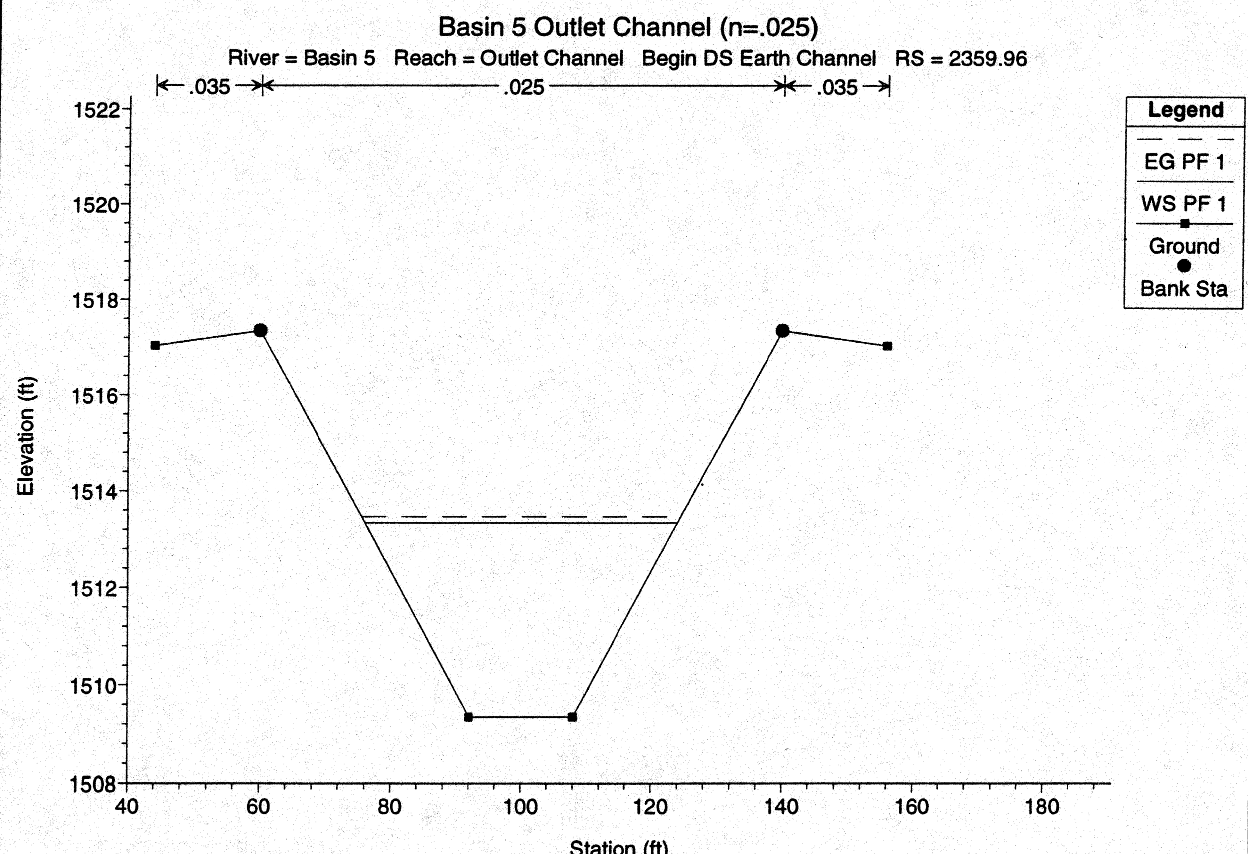
1 in Horiz. = 30 ft 1 in Vert. = 4 ft



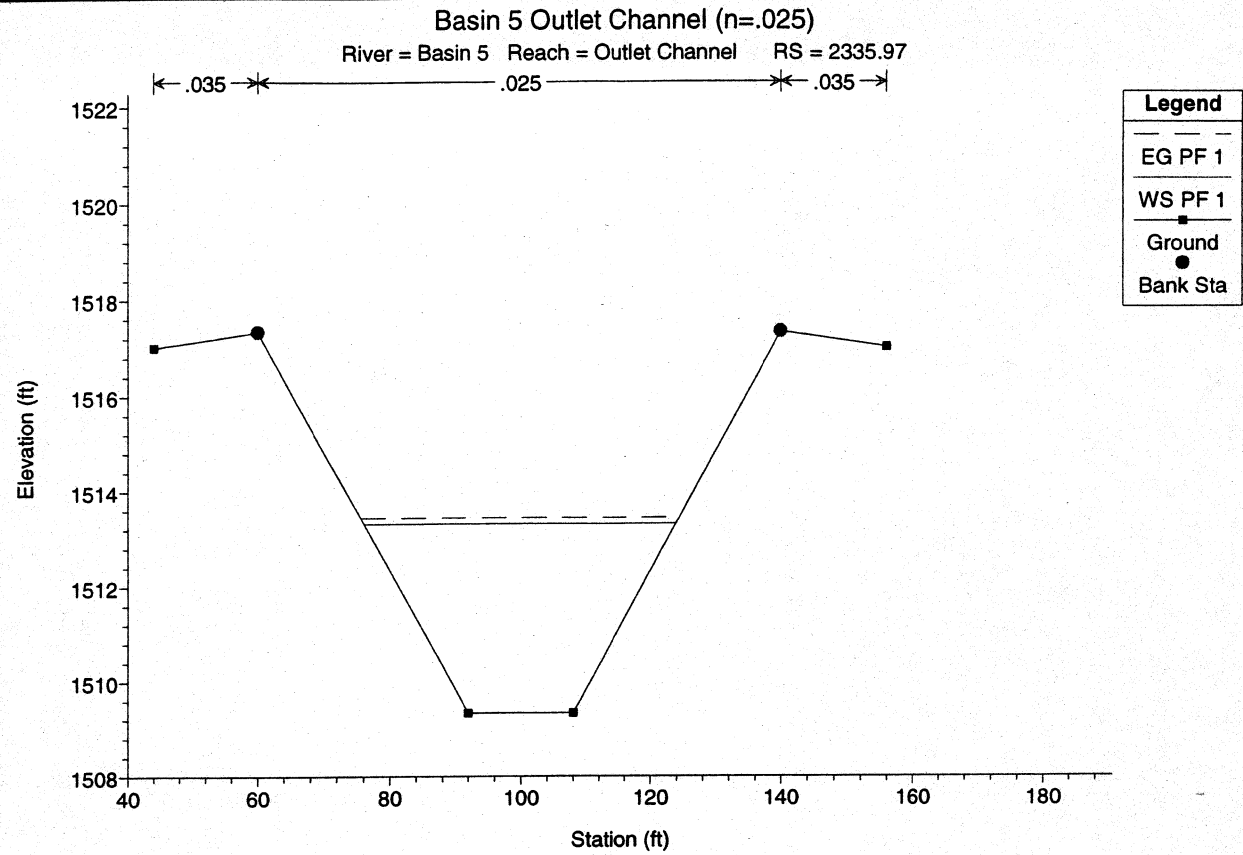


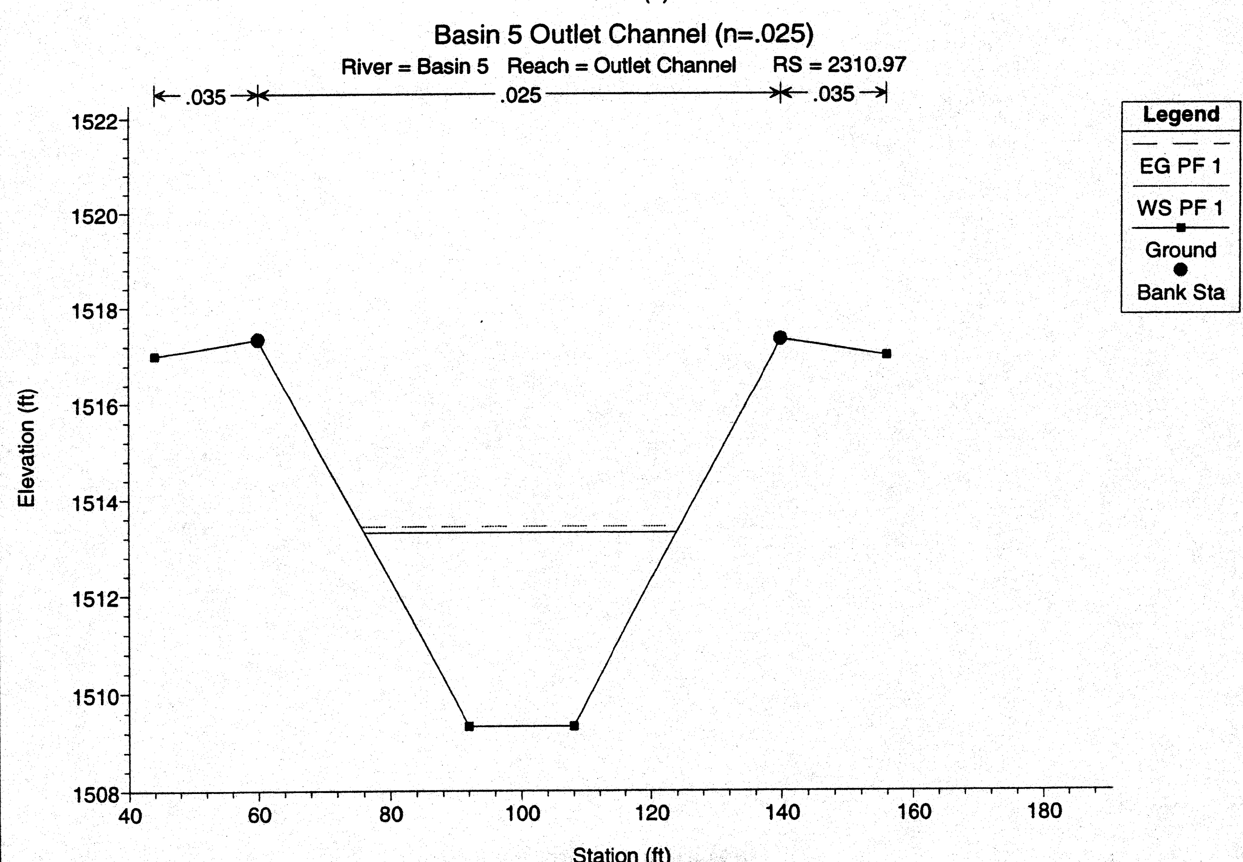
1 in Horiz. = 30 ft 1 in Vert. = 4 ft



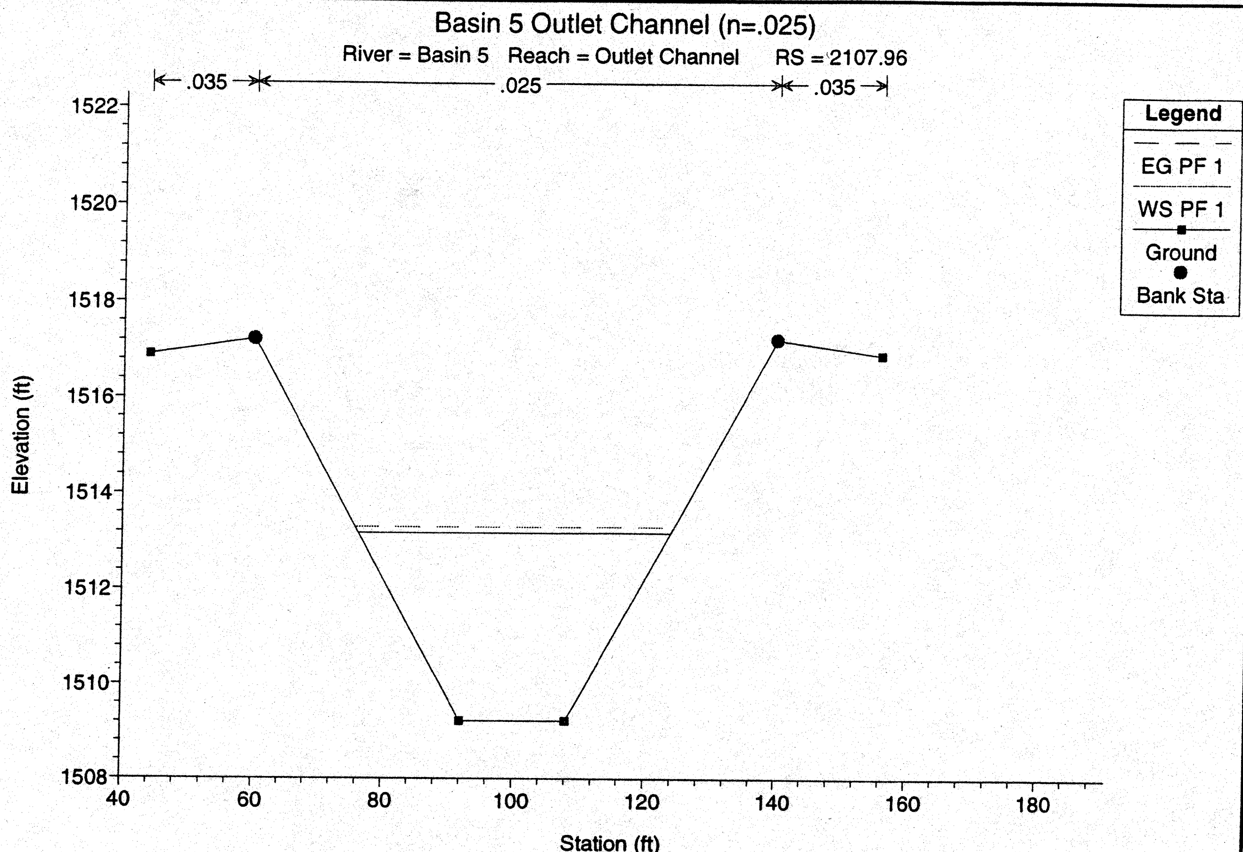


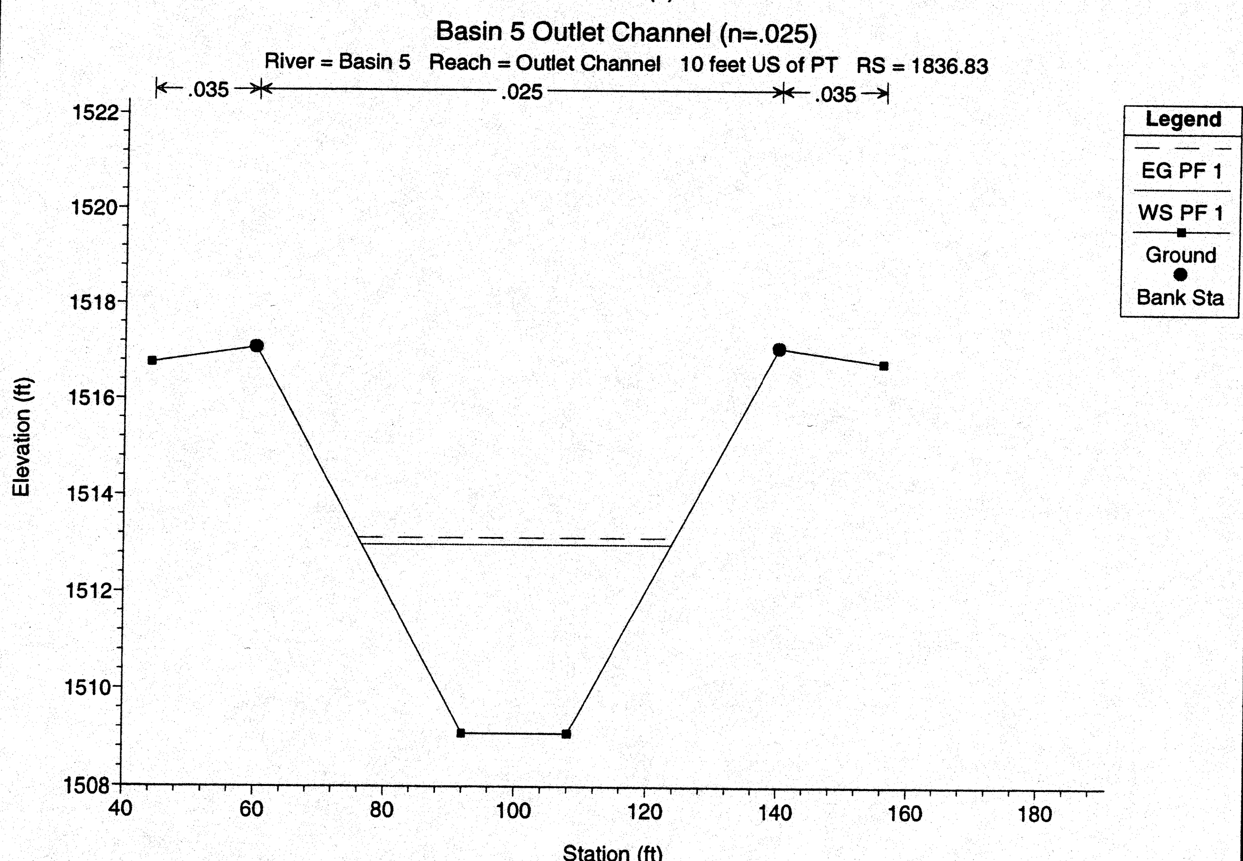
1 in Horiz. = 30 ft 1 in Vert. = 4 ft



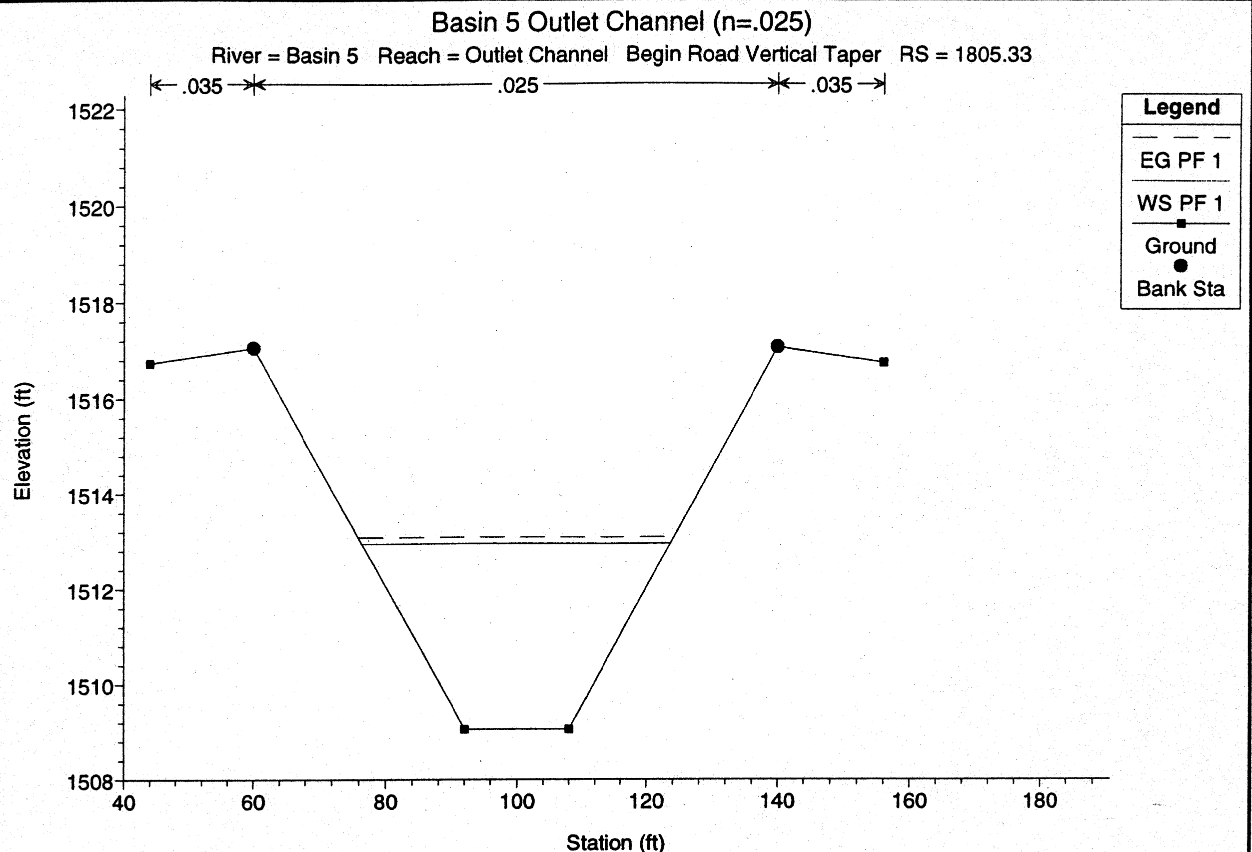


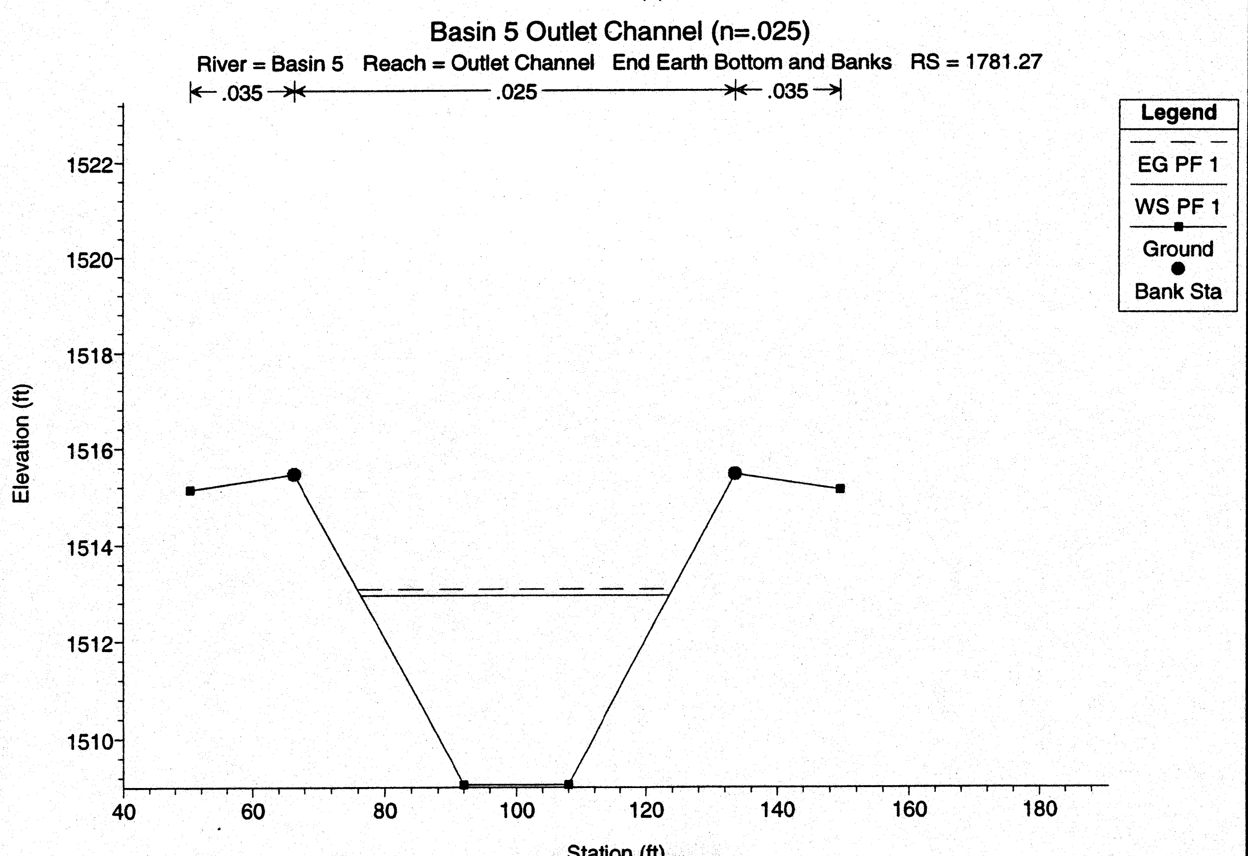
1 in Horiz. = 30 ft 1 in Vert. = 4 ft



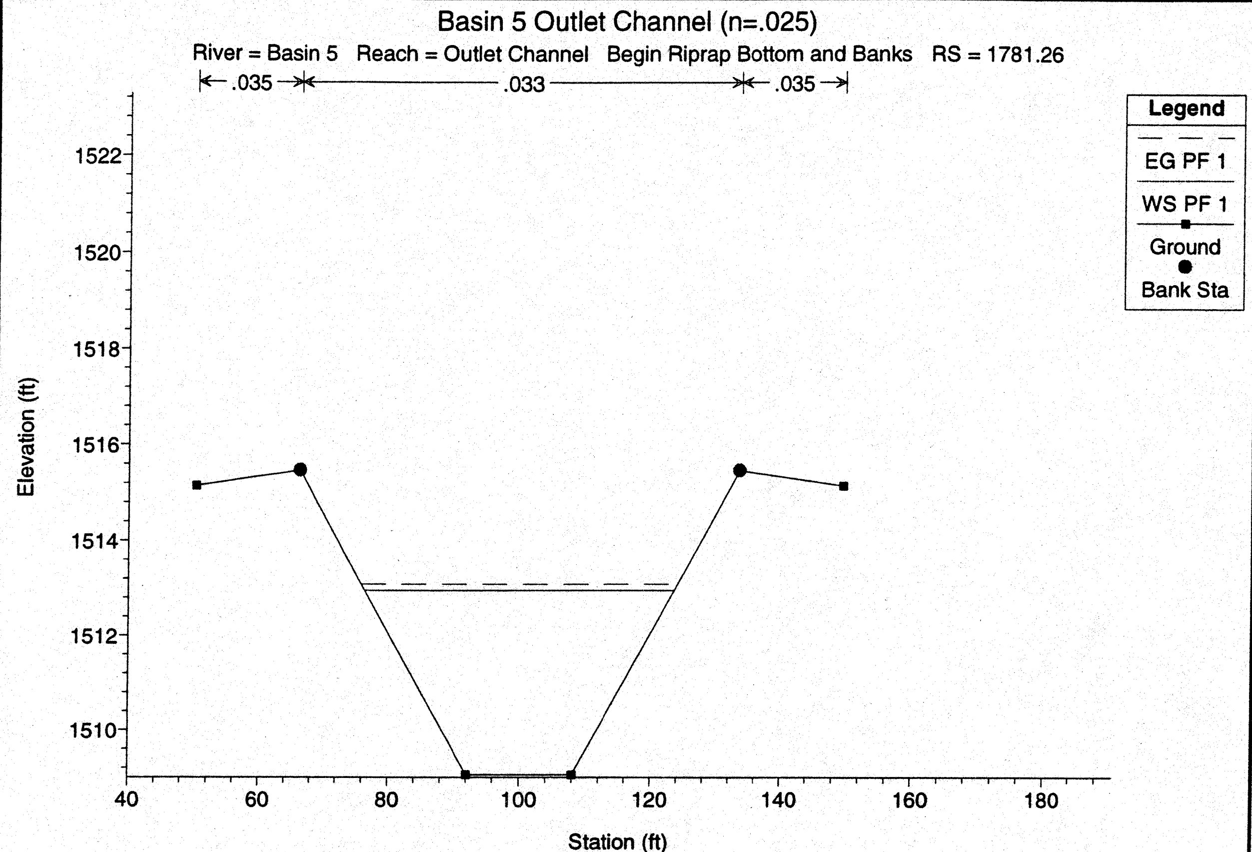


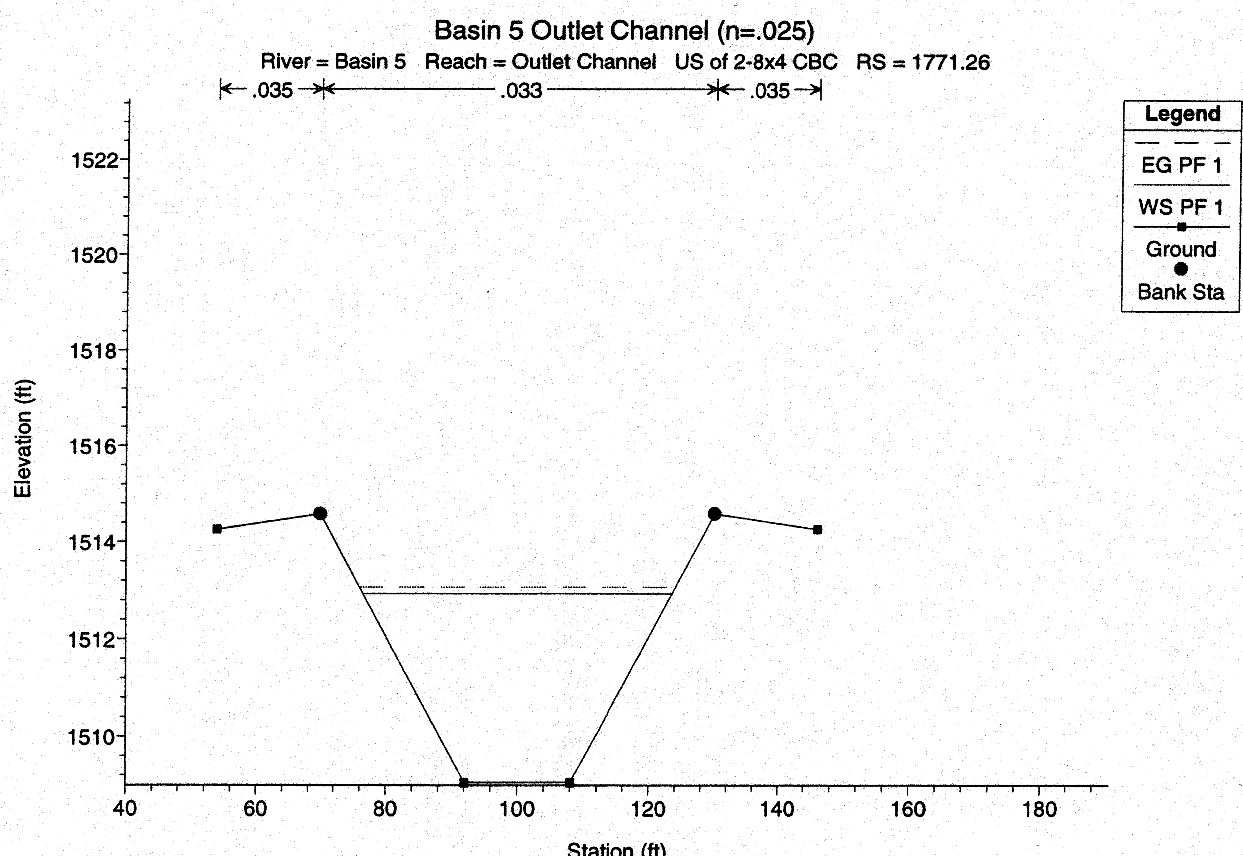
1 in Horiz. = 30 ft 1 in Vert. = 4 ft



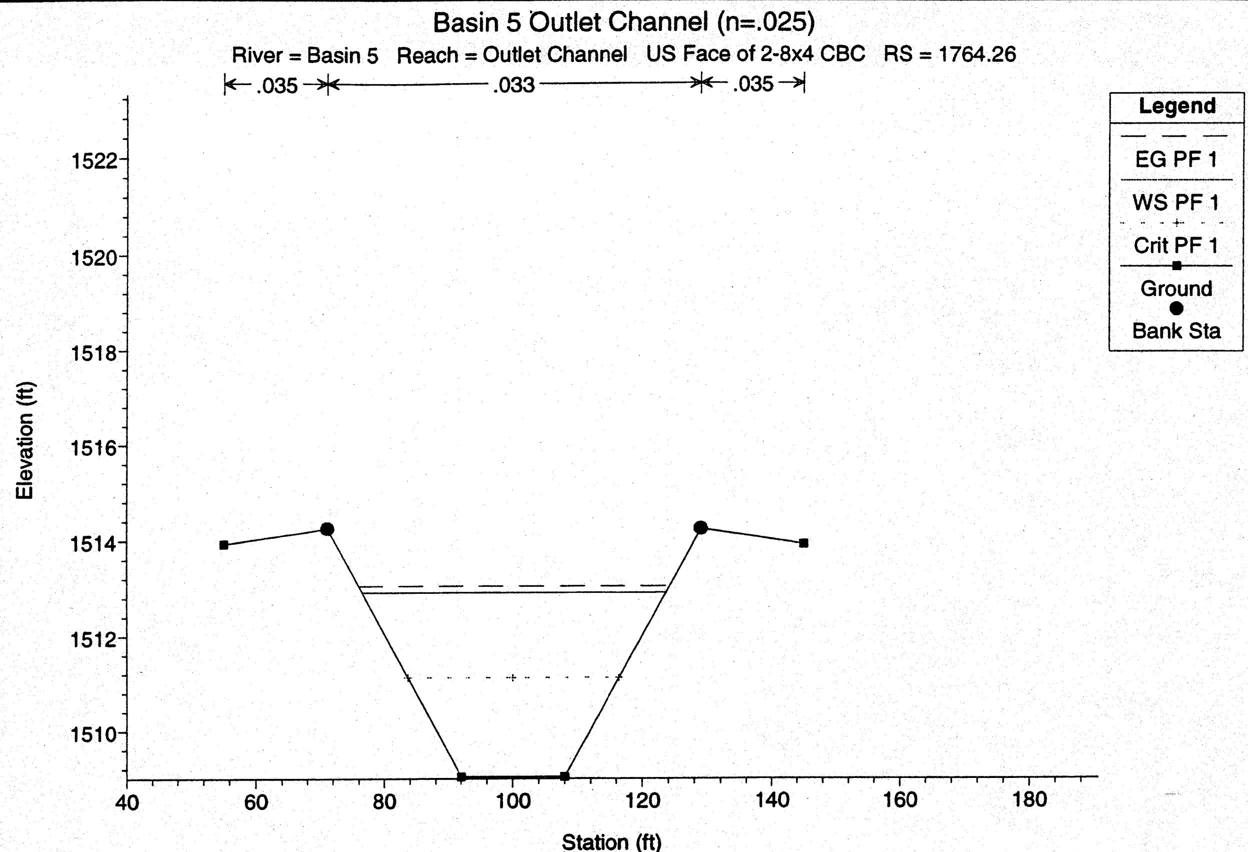


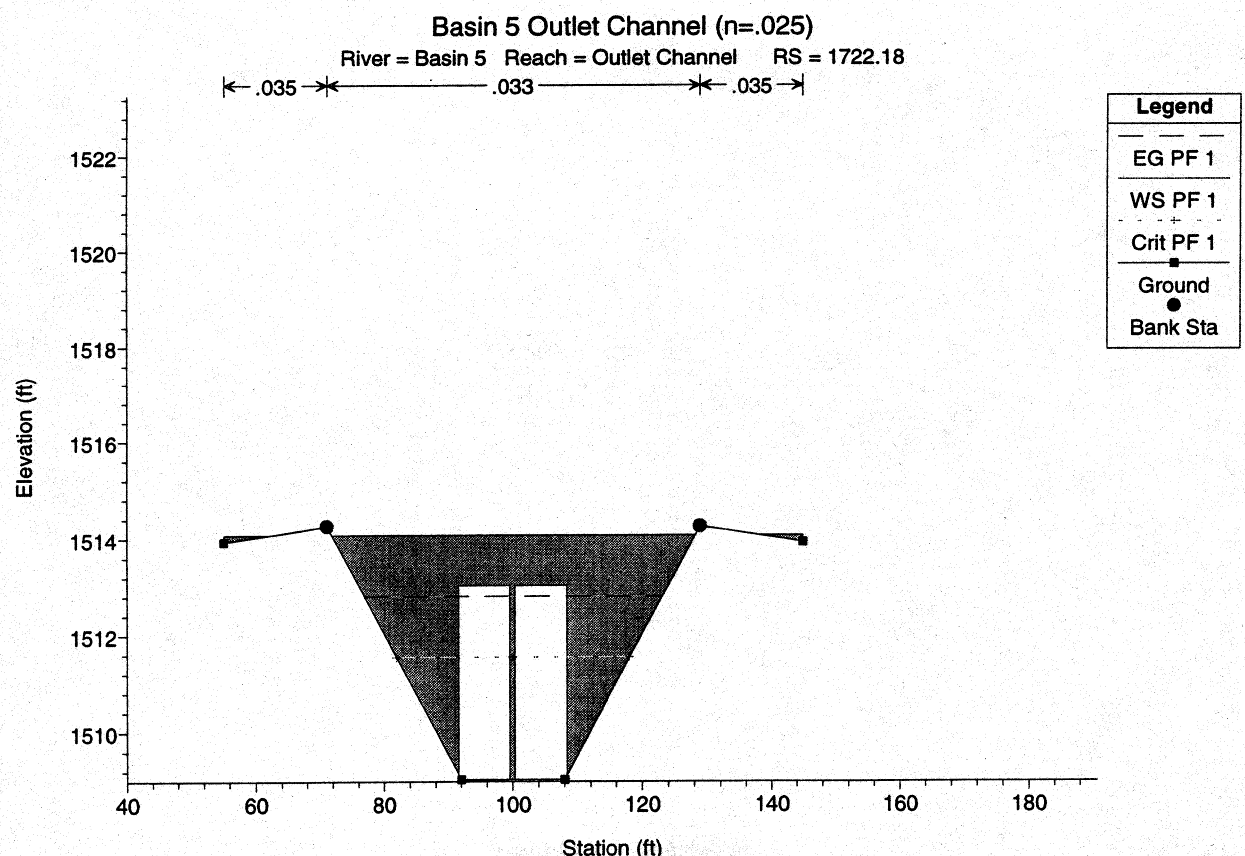
1 in Horiz. = 30 ft 1 in Vert. = 4 ft





1 in Horiz. = 30 ft 1 in Vert. = 4 ft

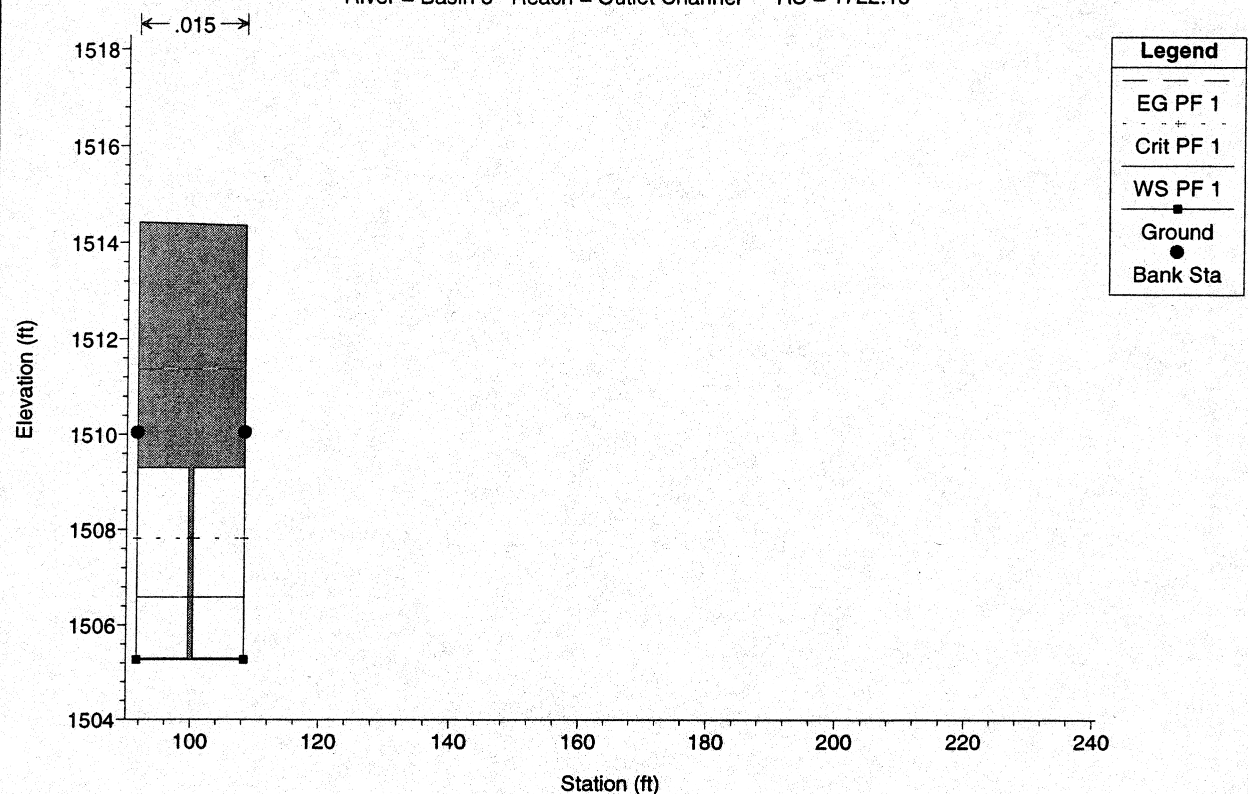




1 in Horiz. = 30 ft 1 in Vert. = 4 ft

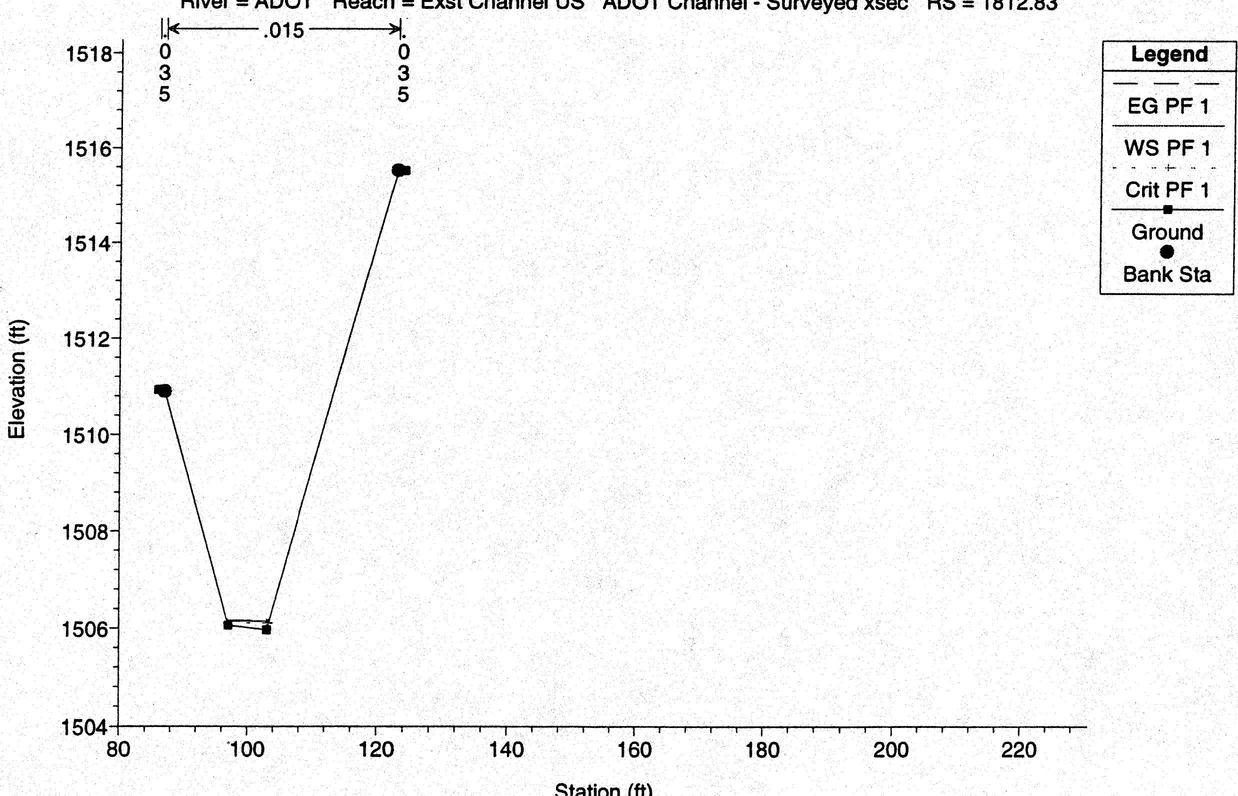
Basin 5 Outlet Channel (n=.025)

River = Basin 5 Reach = Outlet Channel RS = 1722.18

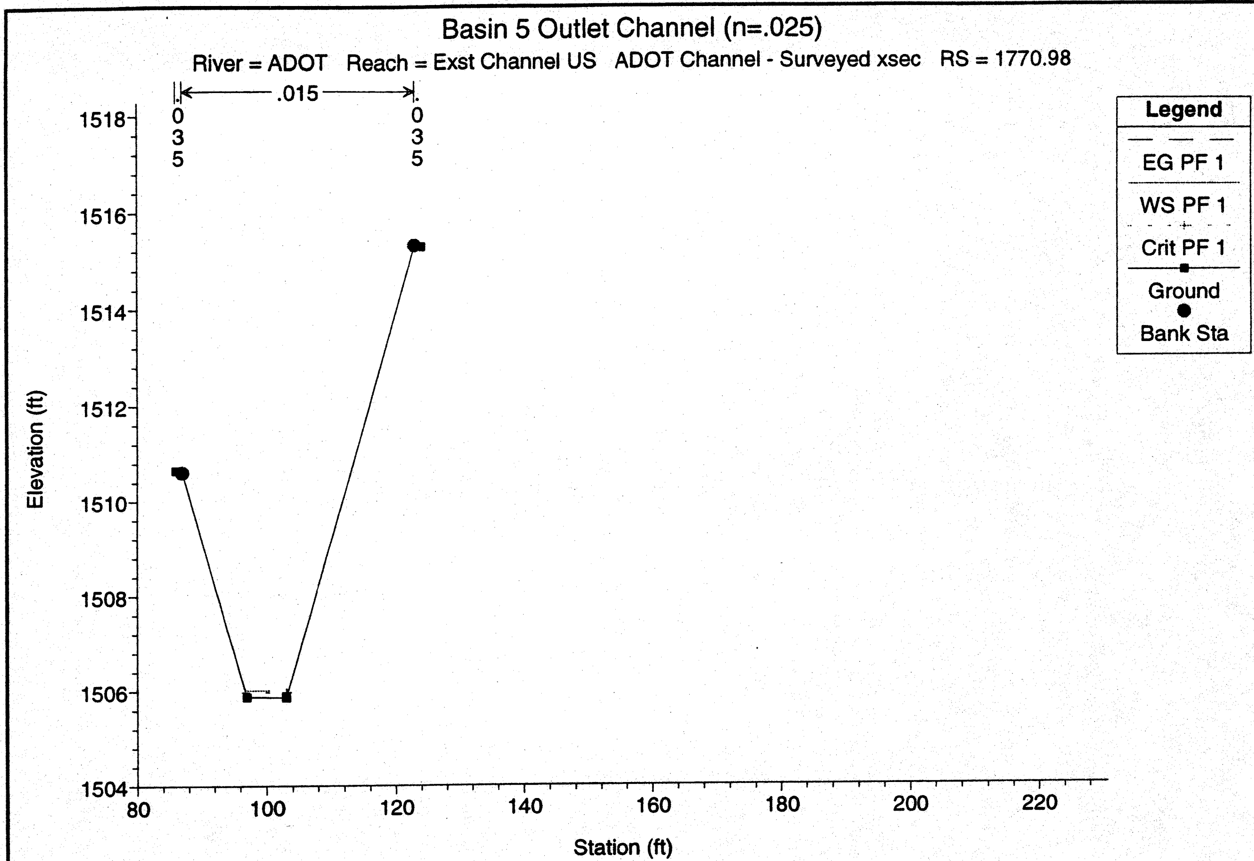


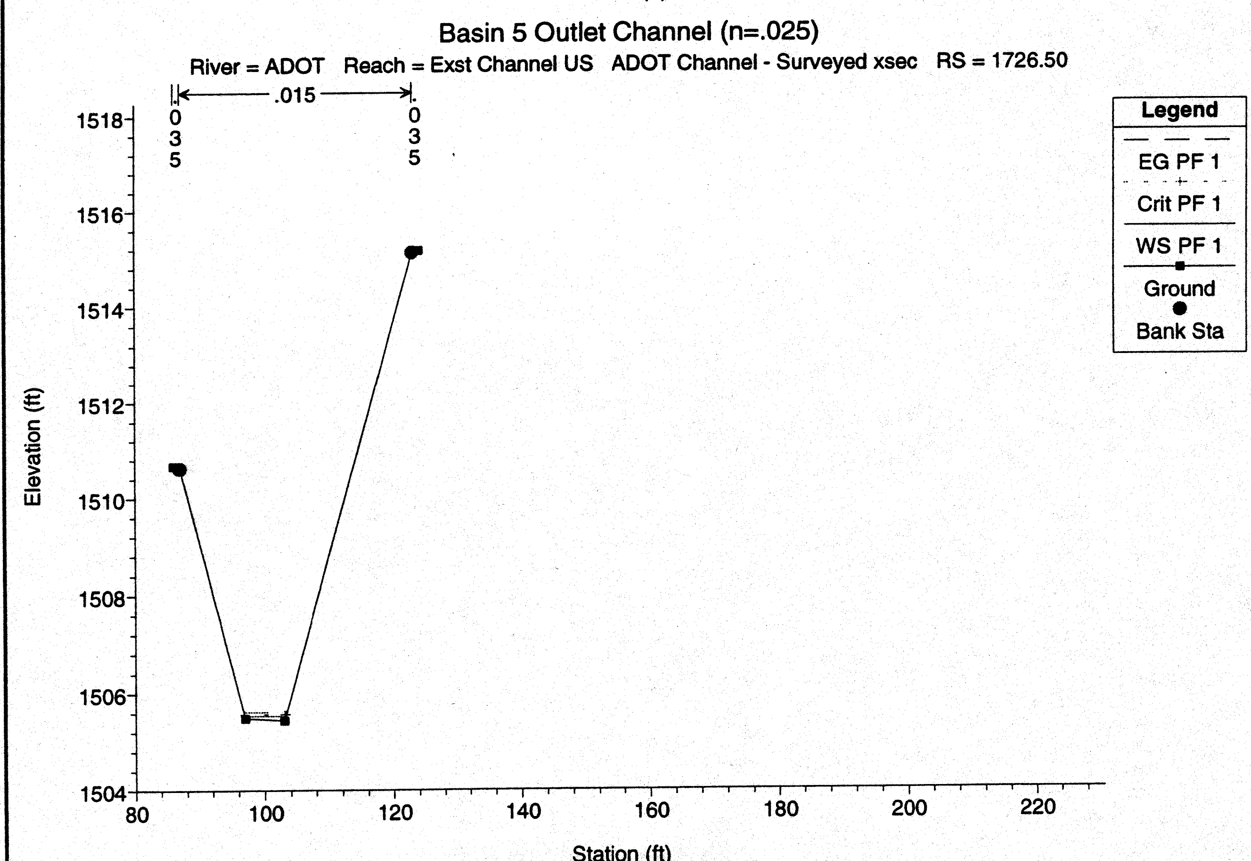
Basin 5 Outlet Channel (n=.025)

River = ADOT Reach = Exst Channel US ADOT Channel - Surveyed xsec RS = 1812.83

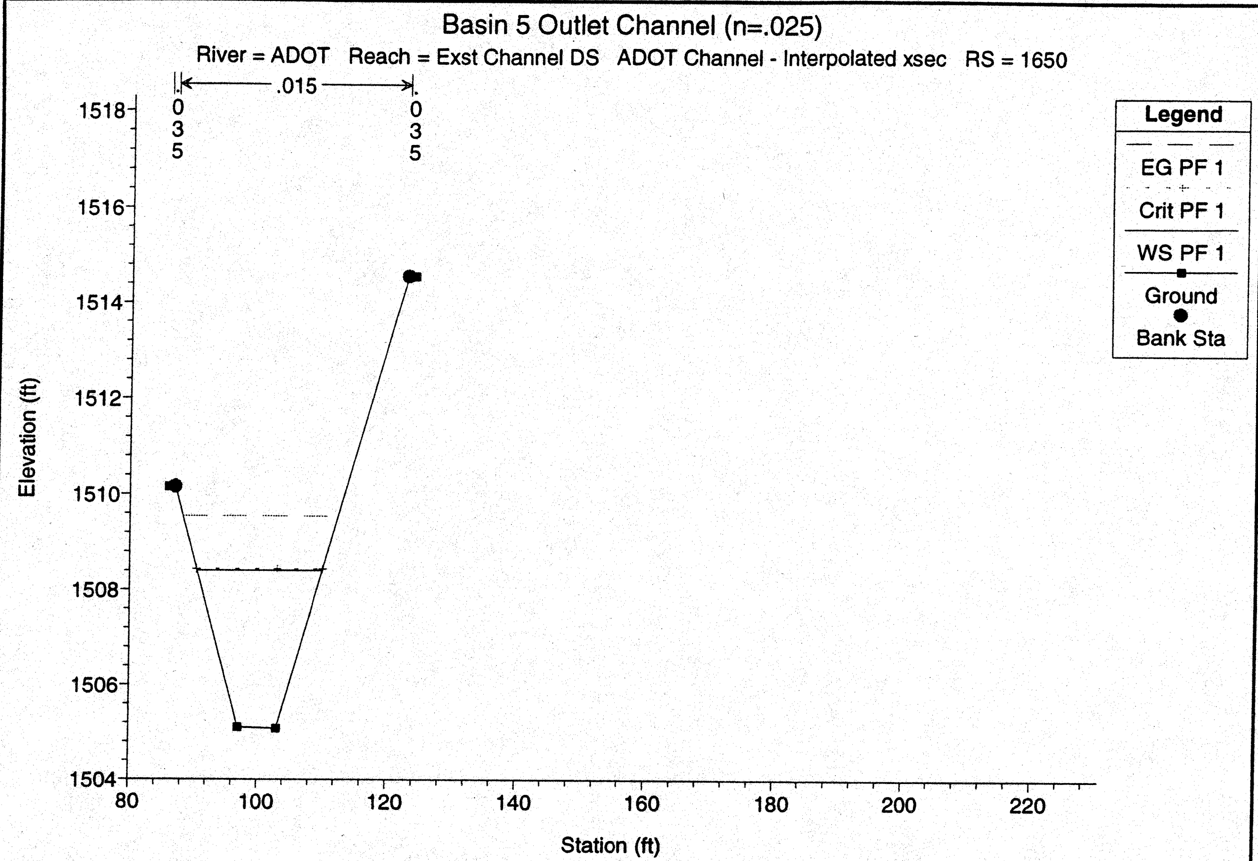


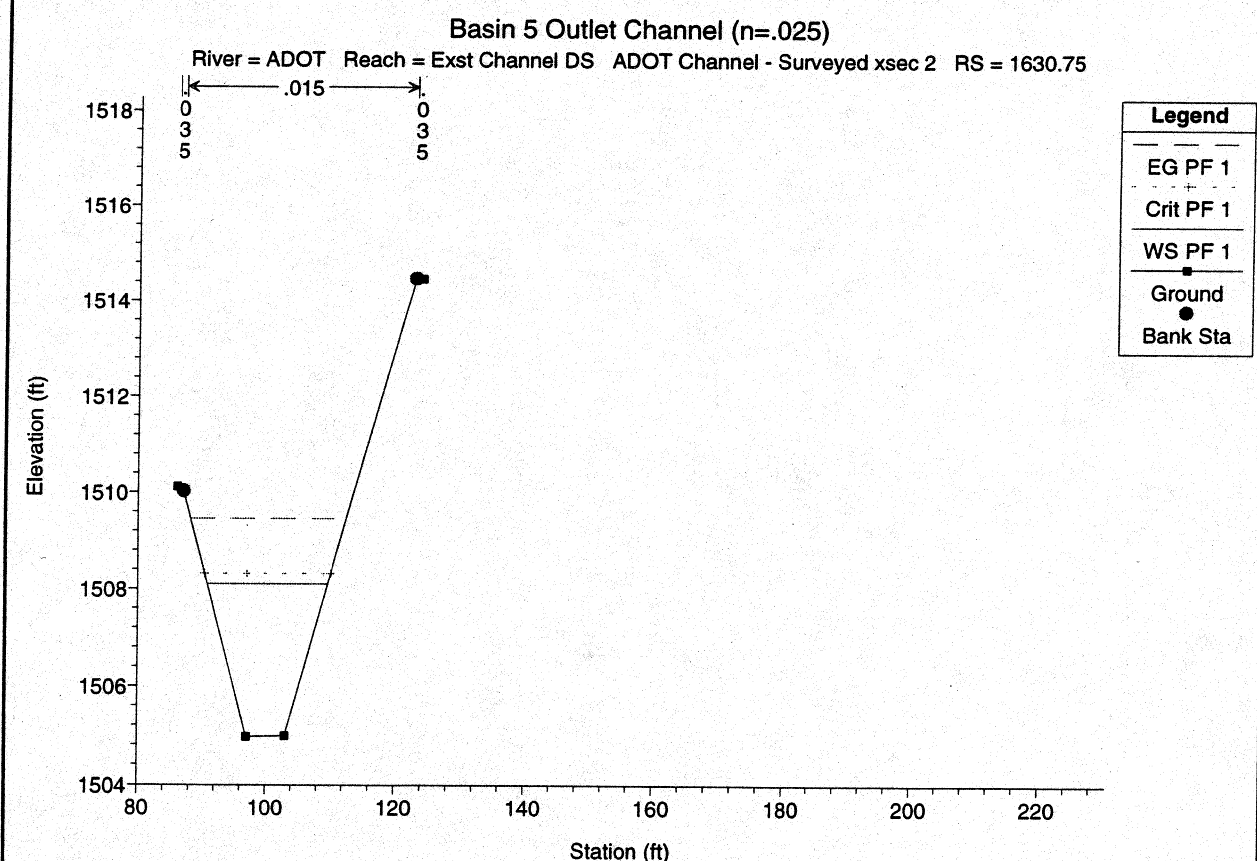
1 in Horiz. = 30 ft 1 in Vert. = 4 ft



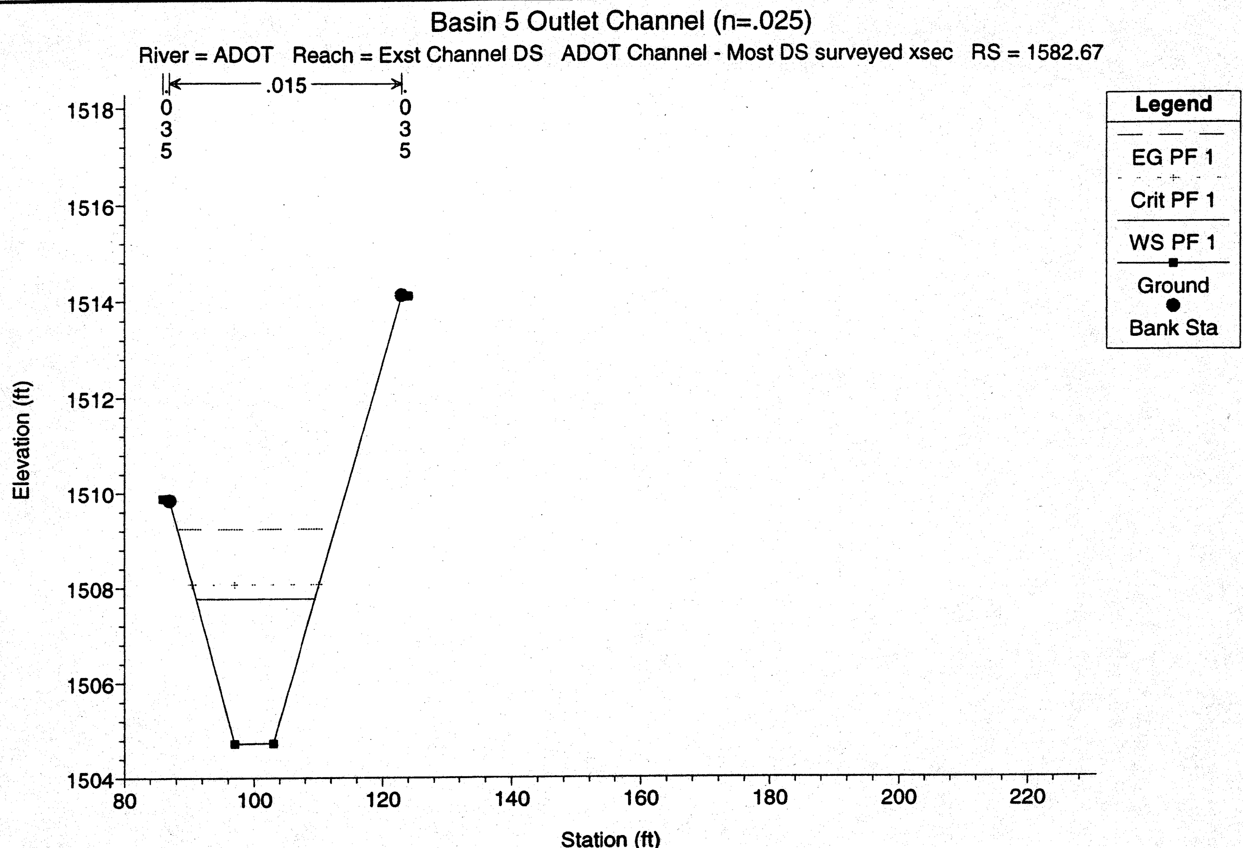


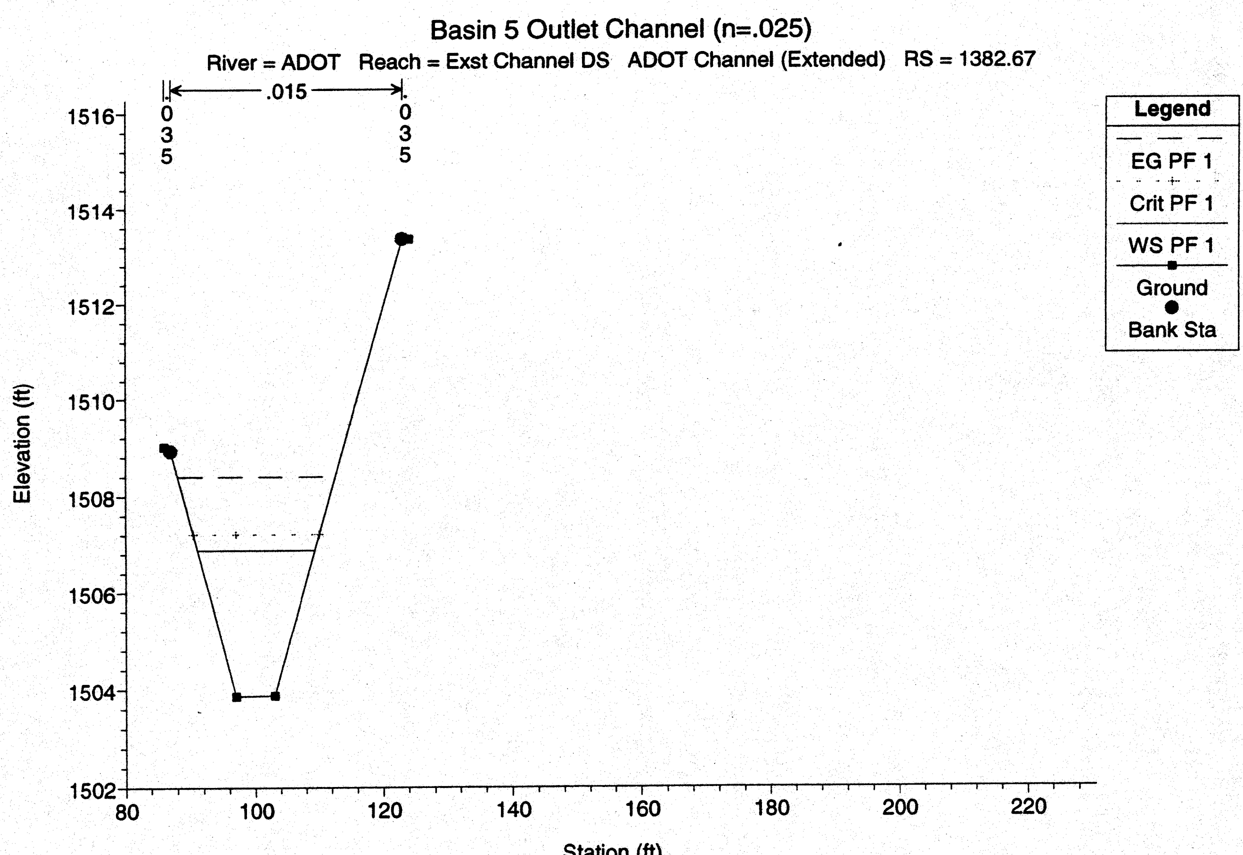
1 in Horiz. = 30 ft 1 in Vert. = 4 ft





1 in Horiz. = 30 ft 1 in Vert. = 4 ft

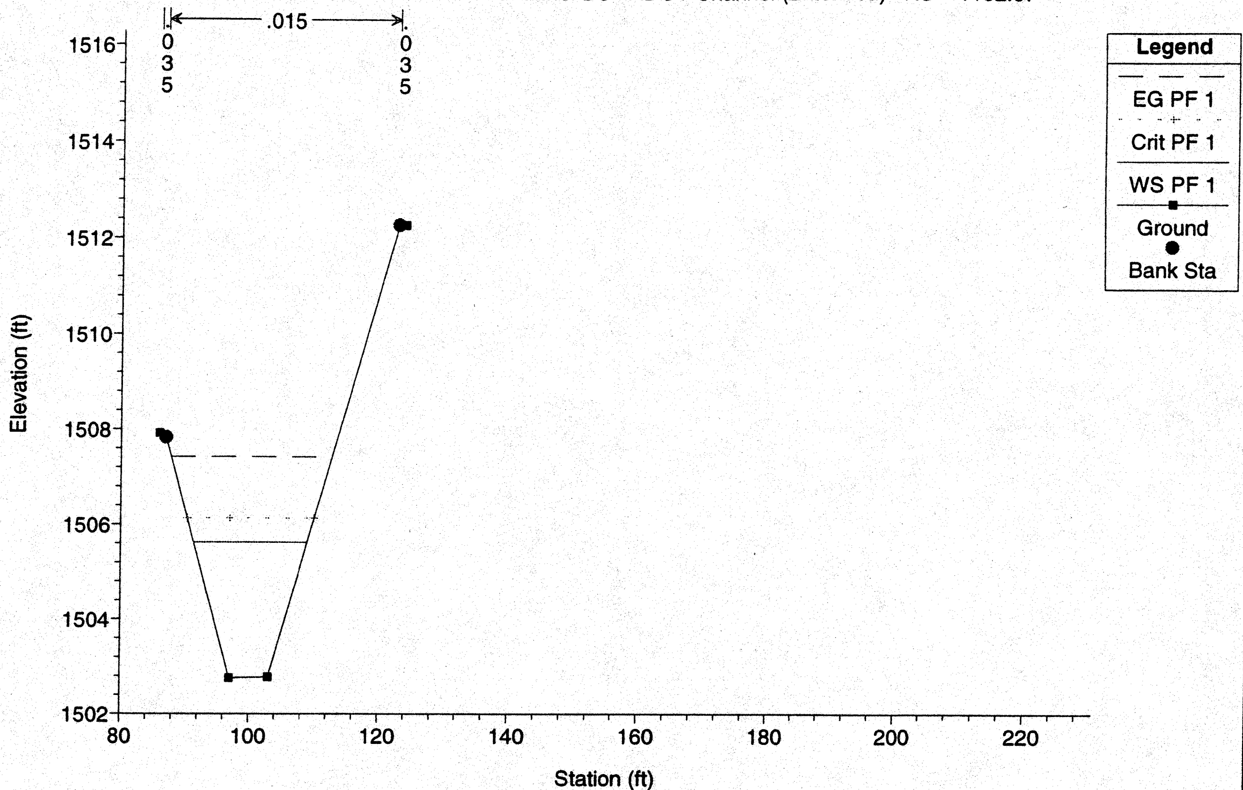




1 in Horiz. = 30 ft 1 in Vert. = 4 ft

Basin 5 Outlet Channel (n=.025)

River = ADOT Reach = Exst Channel DS ADOT Channel (Extended) RS = 1182.67



1 in Horiz. = 30 ft 1 in Vert. = 4 ft

11. Vertical Drop Structure Calculations

DIBBLE & ASSOCIATES		Date	03/06/00
CONSULTING ENGINEERS		Job No.	9845
		By	JLM

FCDMC
Parkwood Ranch Outlet Channel

Filepath: J:\9845\qpw\VERTICAL.wb3

VERTICAL DROP STRUCTURE HYDRAULIC DESIGN:
Drop Structure Sta: **24+28 and 28+53**

INPUT DATA:

Drop bot.wid. =	11	ft.	Net Drop=	3.2	ft.	TW =	3.85
Drop height,h =	3.2	ft.	Upstream Channel:			D/S Channel:	
Design Disch. =	388	cfs	depth =	3.85	ft.		3.85
Side Slope, z =	2	H: 1V	velocity=	3.23	ft./sec.		3.23
							1

CALCULATED DATA:

Drop No. Dn =	0.550		Crit. Depth, Yc =	2.62	ft.
Drop Len. La =	13.52	ft.	Unit Disch., q =	24.10	cfs/ft
Pool Dep. dp =	2.81	ft.	Inlet Length Lu =	13.11	ft.
Nappe dep. d1 =	1.34	ft.	Froude No. =	2.736	(@ d1)
TW seq dep d2 =	4.52	ft.	Jump Type =	Oscillating	
			Jump Length =	23.96	ft.
D/S cutoff dep=	2.3	ft.			
U/S cutoff Dep=		ft. (per Weighted Creep analysis)			
Still Bas. dep=	0.67	ft. (ref. 16,pg.116)	d2/6 =	0.75	

===

LANE'S WEIGHTED CREEP RATIO:

			Still Bas. Depth =	0	ft.
Inlet Len Lu =	12	ft.	Upst. cutoff Lc =	3	ft.
Drop Len. La =	14	ft.	Downst.cutoff Ld =	3	ft.
Basin Len Lb =	21	ft.	Head on Struc. H =	3.20	ft.

Creep Ratio, Cw = 9.6

===

EFFECT OF BAFFLE BLOCKS:		New seq dep, d2 =	4.17	ft.
No. of rows =	1	New jump length =	22.09	ft.

Cd =	1.5		Drag, D=	270.3614	lb/block
block area =	2.2	ft^2	# blocks=	5	
V =	9.19	fps	Total D =	1351.81	lb
Equiv W =	16.10	ft.	Pf =	83.96	lb/ft

===

NOTES: 1. Blocks are 0.8*Yc high, 0.4*Yc wide, and spaced @ 0.8*Yc on centers.
2. V is based on critical depth.
3. Pf is the drag force per foot of channel width.

12. Quantity Calculations

Prismoidal Volume Results

Original Surface Model: Existing Ground @ Basin 2
Final Surface Model: Basin2 Site
Cut Compaction Factor: 0.00
Fill Compaction Factor: 0.00

Raw Cut Volume: 103539.80 cu yd
Compacted Cut Volume: 0.00 cu yd
Total Cut Volume: 103539.80 cu yd

Raw Fill Volume: 626.97 cu yd
Compacted Fill Volume: 0.00 cu yd
Total Fill Volume: 626.97 cu yd

Prismoidal Volume Results

Original Surface Model: Existing Ground @ Basin 4
Final Surface Model: Basin4 Site
Cut Compaction Factor: 0.00
Fill Compaction Factor: 0.00

Raw Cut Volume: 70062.71 cu yd
Compacted Cut Volume: 0.00 cu yd
Total Cut Volume: 70062.71 cu yd

Raw Fill Volume: 4474.13 cu yd
Compacted Fill Volume: 0.00 cu yd
Total Fill Volume: 4474.13 cu yd

User Name: JMikkelsen
Project: Parkwood Ranch Basin (CAP 5)
Prismoidal Volume Results

Date: 09-20-99
Time: 14:03:34
Page: 1

Prismoidal Volume Results

==

Original Surface Model: Existing
Final Surface Model: Basin5
Cut Compaction Factor: 0.00
Fill Compaction Factor: 0.00

Raw Cut Volume: 116940.80 cu yd
Compacted Cut Volume: 0.00 cu yd
Total Cut Volume: 116940.80 cu yd

Raw Fill Volume: 1905.33 cu yd
Compacted Fill Volume: 0.00 cu yd
Total Fill Volume: 1905.33 cu yd

User Name: JMikkelsen
Project: Basin 5 Outlet Channel
Subproject: Outlet Channel Alignment, 001

Date: 09-21-99
Time: 17:35:58
Page: 1

ROADCALC DESIGN EARTHWORK - RAW VOLUMES

STATION	MATERIAL	CUT AREA (FT^2)	CUT VOLUME (yd^3)	FILL AREA (FT^2)	FILL VOLUME (yd^3)
16+62.50	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
16+62.50	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
17+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
17+61.26	Orig_Surface	199.84	227.16		
	Total	199.84	227.16	113.62	122.45
18+00.00	Orig_Surface	210.79	295.21		
	Total	210.79	295.21	108.12	154.70
18+00.00	Orig_Surface	210.79	0.00		
	Total	210.79	0.00	108.12	0.00
18+26.83	Orig_Surface	217.25	211.93		
	Total	217.25	211.93	101.43	107.45
19+00.00	Orig_Surface	249.78	630.00		
	Total	249.78	630.00	75.01	251.38
19+00.00	Orig_Surface	249.78	0.00		
	Total	249.78	0.00	75.01	0.00
20+00.00	Orig_Surface	296.67	1009.97		
	Total	296.67	1009.97	43.07	225.20
20+00.00	Orig_Surface	296.67	0.00		

	Total	296.67	0.00	43.07	0.00
21+00.00	Orig_Surface	338.64	1176.52		
	Total	338.64	1176.52	12.76	103.39
21+00.00	Orig_Surface	338.64	0.00		
	Total	338.64	0.00	12.76	0.00
22+00.00	Orig_Surface	424.65	1413.50		
	Total	424.65	1413.50	9.54	41.29
22+00.00	Orig_Surface	424.65	0.00		
	Total	424.65	0.00	9.54	0.00
23+00.00	Orig_Surface	404.93	1536.25		
	Total	404.93	1536.25	0.84	19.22
23+00.00	Orig_Surface	404.93	0.00		
	Total	404.93	0.00	0.84	0.00
24+00.00	Orig_Surface	344.61	1388.04		
	Total	344.61	1388.04	0.00	1.55
24+00.00	Orig_Surface	344.61	0.00		
	Total	344.61	0.00	0.00	0.00
25+00.00	Orig_Surface	230.09	1064.26		
	Total	230.09	1064.26	92.17	170.68
25+00.00	Orig_Surface	230.09	0.00		
	Total	230.09	0.00	92.17	0.00
26+00.00	Orig_Surface	277.27	939.56		
	Total	277.27	939.56	54.39	271.40
26+00.00	Orig_Surface	277.27	0.00		
	Total	277.27	0.00	54.39	0.00
27+00.00	Orig_Surface	341.20	1145.32		
	Total	341.20	1145.32	17.47	133.08

27+00.00	Orig_Surface	341.20	0.00		
	Total	341.20	0.00	17.47	0.00
28+00.00	Orig_Surface	368.28	1313.85		
	Total	368.28	1313.85	0.00	32.36
28+00.00	Orig_Surface	368.28	0.00		
	Total	368.28	0.00	0.00	0.00
29+00.00	Orig_Surface	240.39	1127.17		
	Total	240.39	1127.17	49.35	91.39
29+00.00	Orig_Surface	240.39	0.00		
	Total	240.39	0.00	49.35	0.00
29+65.61	Orig_Surface	342.52	708.20		
	Total	342.52	708.20	20.31	84.63
30+00.00	Orig_Surface	392.45	468.11		
	Total	392.45	468.11	3.78	15.34
30+00.00	Orig_Surface	392.45	0.00		
	Total	392.45	0.00	3.78	0.00
30+64.45	Orig_Surface	396.08	941.13		
	Total	396.08	941.13	5.87	11.52
31+00.00	Orig_Surface	377.19	509.07		
	Total	377.19	509.07	10.81	10.98
31+00.00	Orig_Surface	377.19	0.00		
	Total	377.19	0.00	10.81	0.00
32+00.00	Orig_Surface	338.90	1326.09		
	Total	338.90	1326.09	14.23	46.38
32+00.00	Orig_Surface	338.90	0.00		
	Total	338.90	0.00	14.23	0.00

33+00.00	Orig_Surface	388.13	1346.35		
	Total	388.13	1346.35	5.99	37.44
33+00.00	Orig_Surface	388.13	0.00		
	Total	388.13	0.00	5.99	0.00
33+27.00	Orig_Surface	401.26	394.74		
	Total	401.26	394.74	6.88	6.43
34+00.00	Orig_Surface	397.08	1079.21		
	Total	397.08	1079.21	7.11	18.92
34+00.00	Orig_Surface	397.08	0.00		
	Total	397.08	0.00	7.11	0.00
34+48.79	Orig_Surface	336.42	662.67		
	Total	336.42	662.67	14.81	19.81
35+00.00	Orig_Surface	344.22	645.54		
	Total	344.22	645.54	15.19	28.45
35+00.00	Orig_Surface	344.22	0.00		
	Total	344.22	0.00	15.19	0.00
35+90.09	Orig_Surface	350.85	1159.60		
	Total	350.85	1159.60	12.70	46.53
36+00.00	Orig_Surface	353.71	129.31		
	Total	353.71	129.31	14.27	4.95
36+00.00	Orig_Surface	353.71	0.00		
	Total	353.71	0.00	14.27	0.00
37+00.00	Orig_Surface	376.75	1352.70		
	Total	376.75	1352.70	7.70	40.67
37+00.00	Orig_Surface	376.75	0.00		
	Total	376.75	0.00	7.70	0.00
37+84.50	Orig_Surface	405.46	1224.01		

	Total	405.46	1224.01	2.49	15.94
37+84.50	Orig_Surface	0.00	0.03		
	Total	0.00	0.03	0.00	0.00
38+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
38+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
39+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
39+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
40+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
40+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
40+00.00	Orig_Surface	0.00	0.00		
	Total	0.00	0.00	0.00	0.00
Total	Orig_Surface	16041.15	25425.48		
	Total	16041.15	25425.48	1361.69	2113.50
			(Cut)		(Fill)

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CONSULTING ENGINEERS
Since 1962

CALC JLH DATE 9/14/99 JOB 9845
CHKD ______ DATE ______ SHT 1 OF ____

TITLE CAP Basins
Quantity Calcs - Basin 5

Drawing No C1

3" DG Access Road
- Area from CAD = 20412.3 ft² = 2268.03 SY
- ~~3" Depth → Volume = (20412.3 ft²)(3"/12") = 5103.15 ft³ = 189.01 yd³~~
- Use 2268 SY

6" ABC Invert Access Ramp
- Area from CAD = 3472.55 ft² = 385.84 SY
- ~~6" Depth → Vol = (3472.55 ft²)(6"/12") = 1736.27 ft³ = 64.31 yd³~~
- Use 386 SY

Shotcrete Lining
- Area from CAD = 17494.58 ft² = 1943.84 SY (Adj. for Avg Slope of 2.5 to 1)
- Use 1944 SY

Drawing No C2

Remove Exst. Conc. S/W.
- Area from CAD = 4520.21 SF
- Use 4520 SF

Remove Exst AC Pavement.
- Width = 24 ft, Avg Length = 39.85
- Area = (24')(39.85') = 460 SF
- Use 460 SF = 96 SY

3" DG Access Road
- Area from CAD = 31068.21 ft² = 3452.02 SY
- ~~3" Depth → Vol = (31068.21 ft²)(3"/12") = 7767.05 ft³ = 287.67 yd³~~
- Use 3452 SY

New Conc. S/W
- Area from CAD = 1318.57 SF
- Use 1319 SF

AC Pvmt Replacement
- Same as Removal
- Use 460 SF = 95.56 SY ⇒ Use 96 SY

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CALC JLM DATE 9/14/99 JOB 9845
CHKD ______ DATE ______ SHT 2 OF ____

TITLE CAP Basins
Quantity Calcs - Basin 5

Drawing No. C3

Remove Conc. Channel Lining
- Area = (85')(21') = 1785 SF
- Adjusted for 2:1 Slope = 1995.69 SF = 221.74 SY
- Use 222 SY

6" ABC Maintenance Road
- Area from CAD = 13962.10 SF = 1551.34 SY
- ~~6" Depth ⇒ Vol. = 6981.05 CF = 258.56 CY~~
- Use 1552 SY

New Conc Channel Lining
- Same as Removed, minus area where box culvert comes in.
- Area of box culvert section = 401.67 SF
- Adjusted for 2:1 Slope = 449.04 SF = 49.90 SY
- New Area = (222 SY) - (50 SY) = 172 SY

Grouted Rip-Rap
- Length = 20', Avg Width = 47'
- Area = (20')(47') = 940 SF
- Use 940 SF

Drawing No. C4

6" ABC Maintenance Road
- Length = 520', Width = 16'
- Area = (520')(16') = 8320 SF
- Add Area at Drop (from CAD) = 2386 SF
- Area = 8320 + 2386 = 10706 SF = 1189.56 SY
- Use 1190 SY

Grouted Rip-Rap (Note 4)
- Area from CAD = 2131.09 SF (Adj. for Avg Slope of 3:1)
- ~~Depth = 3' ⇒ Vol. = (2131.09)(3) = 6393.26 CF = 236.79 CY~~
- Use 2131 SF

Grouted Rip-Rap (Note 5)
- Area from CAD = 490.38 SF (Adj. for Avg. Slope of 3:1)
- ~~Depth = 3' ⇒ Vol. = (490.38)(3) = 1471.15 CF = 54.49 CY~~
- Use 491 SF

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CALC JLM DATE 9/14/99 JOB 9845
CHKD DATE SHT 3 OF

TITLE CAP Basins
Quantity Calcs Basin 5

Drawing No. C5

6" ABC Maintenance Road
- Same as Dwg C4
- Use 1190 SY

Grouted Rip-Rap (Note 4)
- Same as Dwg C4
- Use 2131 SF

Grouted Rip-Rap (Note 5)
- Same as Dwg C4
- Use 491 SF

Drawing No. C6

6" ABC Maintenance Road
- Length = 520', Width = 16'
- Vol = (520')(16') = 8320 SF = 924.44 SY
- Use 925 SY

Drawing No. C7

6" ABC Maintenance Road
- Avg. Length = 109', Width = 16'
- Area = (109')(16') = 1744 SF = 193.78 SY
- Use 194 SY

AC Turnout
- Area = (10')(16') + (2)(21.46 SF) = 202.92 SF / per TO
- 2 TO's = 405.84 SF = 45.09 SY
- Use 45 SY

Remove Exist AC. Pvmt / AC Pvmt Replacement
- Area: Avg Width = 19 ft, Avg. Length = 39 ft A = (19)(39) = 741 SF
- Use 83 SY

Grouted Rip-Rap
- Length = 30', Width = 76' ⇒ Area = 2459.09 SF (Adj. for 4:1 Slope)
- ~~Depth = 3' ⇒ Vol = 7377.27 CF = 273.25 CY~~
- Use 2459 SF

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Since 1962

CALC JLM DATE 9/20/99 JOB 9845
CHKD ______ DATE ______ SHT 4 OF ____

TITLE CAP Basins
Quantity Calcs - Basin 5

Drawing D2

Drop Structure Detail

Concrete (Class 'A')

Approach Apron
$(14'-10''-9'')(\frac{16'+11'}{2})(0.5') = 83.81$ CF

Approach Apron Cut-Off Wall
$(16')(3')(9'') = 36$ CF

Drop Wall
$[(8.9')(8.7') + (\frac{1}{2})(11')(5.5') + (11')(3.2') + (5.5')(3.2')](12'') \times 2 = 320.96$ CF

Drop Wall Footing
$(6.25')(14'')(50.8') = 370.42$ CF

Baffle Blocks
$(1.05')(1.05')(2.10') \times 8 = 35.28$ CF

Stilling Basin Floor
$(16')(36'-1'8''-9'')(6'') = 268.67$ CF

Downstream Cut-Off Wall
$(19')(3')(9'') = 42.75$ CF

Downstream Sill
$(19')(9'')(6'') + (\frac{1}{2})(17.5')(9'')(2.25') = 21.89$ CF

Stilling Basin Slope Slabs
2:1 Slope ⇒ Multiply dist. by 1.1180 to get actual length along slope.
$[(\frac{17.4'+17.32'}{2})(1.1180)(1')(9'') + (17.32')(1.1180)(16')(9'') + (\frac{17.32'+16.00'}{2})(1.1180)(15.74')(9'') +$
$+ (16')(1.1180)(3.26')(9'')] \times 2 = 617.81$ CF

Slope Slab Cut-Off Walls
$(2.5')(10'')(36') \times 2 = 150$ CF

Total Concrete = Sum of Above Qty's = 1947.59 CF = 72.13 CY
Use 73 CY

Welded Wire Fabric
Approach Apron
$(14'-10\frac{1}{2}-9\frac{1}{2})(\frac{16'+11'}{2}) = 178.31$ SF
Approach Apron Cut-Off Wall
$(3'-3''-6\frac{1}{2})(16') = 40$ SF

Total WWF = 218.31 SF

Use 220 SF

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CALC JLM DATE 9/21/99 JOB 9945
CHKD ______ DATE ______ SHT 5 OF ______

TITLE CAP Basins
Quantity Calcs – Basin 5

Drawing D2 (cont'd)

Drop Structure Detail (cont'd)

Reinforcing Steel
#4 bar = 0.668 lbs/LF
Drop Wall & Footing
ADOT Qty Table ⇒ 55 lbs/LF ⇒ (55 lbs/LF)(50.8') = 2794 LBS
Baffle Blocks
(20.42 LF)(0.668 lbs/LF) × 8 = 109.11 LBS
Stilling Basin Floor
[(33 bars × 16') + (16 bars × 33')] (0.668 lbs/LF) = 705.41 LBS
Downstream Cut Off Wall and Sill
[(2 bars × 19') + (11 bars × (3.5 + 2.5' + 1.5'))] (0.668 lbs/LF) = 80.49 LBS
Slope Slabs and Cut off walls
[(36 bars × 21.5' (Avg Length)) + (22 bars × 36')] (0.668 lbs/LF) × 2 = 2092.18 LBS

Total Steel = Sum of Above Qty's = 5781.19 LBS

Use 5785 LBS

TITLE CAP Basins
Quantity Calcs - Basin 5

Drawing D5

Channel Replacement Section

Concrete (Class 'A')

Cut-Off Wall
(85')(1')(0.5') + (85')(0.5')(0.5') = 63.75 CF

Side Slope
Area (from CAD) = 1271.00 SF ⇒ Adjust for 2:1 Slope = 1421.02
(1421.02)(0.5') = 710.51 CF

Channel Bottom
(85')(3')(0.5') = 127.50 CF

Conc. Apron
Area (from CAD) = 332 SF
(332)(0.5') = 166 CF

Total = Sum of Above Qty's = 1067.76 CF = 39.55 CY

Use 40 CY

Welded Wire Fabric

Cut-Off Wall
(85')(9"+9") = 127.50 SF

Side Slope
Area (from CAD) = 1421.02 SF

Channel Bottom
(85')(3') = 255 SF

Conc. Apron
Area (from CAD) = 332 SF

Total = Sum of Above Qty's = 2135.52 SF

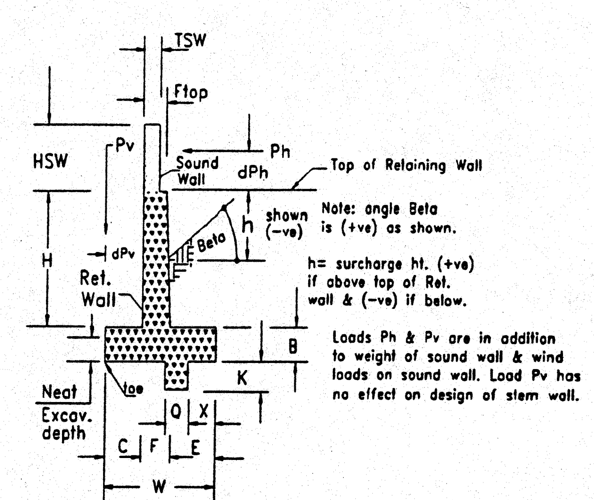
Use 2136 SF

13. Structural Calculations

PREMIER
ENGINEERING CORPORATION

SHEET NO 1 OF 17
JOB NUMBER 9917

TITLE
SUBJECT BASIN #1 INLET WINGS
MADE BY DEP DATE 6\99 CHECKED BY [illegible] DATE 9/99



INPUT DATA (Units : KIP, FEET, U.N.O.)

Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	Ignore top one meter **passive** force (yes or no)
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	7.00	Ft.	no
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top)	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	-1.50	K/ft	H =	7.00	Ft
dPh =	-8.00	Ft.	B =	1.50	Ft
Surc. ht. h =	0.00	Ft.	W =	5.00	Ft
Beta (b) =	0.00	Deg.	C =	2.00	Ft
Soil on toe=	0.00	Ft.	K=	0.00	Ft
SOIL DATA			X =	0.00	Ft
Cohesion =	0	psf	Q =	0.00	Ft
g(s) (kcf) =	0.13		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	20.00	Deg.			
phi (passive) =	30.00	Deg.		[native soil]	
Ph above Impact load ? yes or no =	no				

Rustication enter (0,1 or 2 faces) =	0	
Rustication thick (inches) =	1.5	
Wt. of Mas. Wall (psf) =	65	
Masonry Str. f'_m (psi) =	1350	
Sound Wall Reinforcing cl.		
1. Outside face (inches) =	3.00	
2. Soil face (inches)	3.00	
Neat excavation : depth =	0.00	Ft
Backwall slope	90.00	Deg.

Equivalent Fluid Pressures

EFP =	0.064	kcf active
EFP =	0.390	kcf passive

Note: If "yes" Wall length must be >=2* (H+B+dPh)

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ENGINEERING CORPORATION

SHEET NO 2 OF ?
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY [illegible] DATE 7/99

CALCULATIONS OF SLIDING AND OVERTURNING SAFETY FACTORS (>= 1.5)

DETERMINE HORIZONTAL FORCES AND OVERTURNING MOMENT

				Force	Arm	Moment
Wind load on Sound Wall :			Wind	0.000	8.5	0.000
Active & surcharge on Key :			Surcharge	0.000	4.25	0.000
Top of Key =	0.542		Reg. Soil	2.303	2.83	6.524
Bottom of Key =	0.542		P(h) =	-1.500	0.5	-0.750
Passive pressures:			Active S.Key	0.000		
Top Neat =	0.5850	ksf	Passive on Neat Exc	0.000		0.000
Bot.Neat =	0.5850	ksf	Passive on Sh.Key	0.000		
Bot.Key =	0.5850	ksf		========		=========
			Sum of horizontal active forces =	0.803	Mo =	5.774
			Sum of available horizontal passive forces =	0.000		

DETERMINE VERTICAL FORCES AND RESISTING MOMENT ABOUT TOE

		P vertical	Arm	M resisting
	1. Sound Wall	0.000	2.00	0.000
Activate active pressure	2. Stem	1.015	2.50	2.538
on Shear Key by using "1"	3. Strem's taper	0.000	3.00	0.000
Otherwise , use "0" --> 0	4. Footing	1.088	2.50	2.719
	5. Key	0.000	5.00	0.000
	6. Soil (horiz.)	1.820	4.00	7.280
* NOTE :	7. Surcharge *	0.000	4.00	0.000
Some designers do not use	8. Soil (sloping)	0.000	4.33	0.000
surcharge in vertical direction.	9. P(v)	0.000	0.00	0.000
Activate vetical component of the	10. Soil (on toe)	0.000	1.00	0.000
surcharge weight by using "1" switch,		=========		=========
Otherwise , use "0" --> 1	P =	3.923	**** Mr =	12.536
			Mr bout Toe =	12.536

	with wind	without wind
OVT. FOS=	2.17	2.17
SLD. FOS=	1.96	1.96

	with wind		without wind
f_{soil} max =	1.52	ksf	1.52
f_{soil} min =	0.05	ksf	0.05
f_{soil} reduced=	1.14	ksf	1.14

	with wind	without wind	
Ecc. =	0.78	0.78	Ft.
Kern =	0.83	0.83	Ft.
	Resultant within kern	Resultant within kern	

****Note: if eccentricity is a negative value then resisting Moment is taken about the heel

PREMIER
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SHEET NO 3 OF 17
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY [illegible] DATE 9/99

Sect.	Dist below top of Ret Wall (Ft.)	M without wind	M wind	M including wind	M design adjusted by /1.25	V without wind	V Including wind	V design adjusted by /1.25	Vc allowable shear
Top of Ret. W.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.70	0.00	0.00	0.00	0.00	0.06	0.06	0.06	5.78
2	1.40	0.03	0.00	0.03	0.04	0.15	0.15	0.15	5.79
3	2.10	0.10	0.00	0.10	0.13	0.27	0.27	0.27	5.80
4	2.80	0.23	0.00	0.23	0.31	0.43	0.43	0.43	5.81
5	3.50	0.46	0.00	0.46	0.61	0.61	0.61	0.61	5.83
5.5	3.85	0.61	0.00	0.61	0.81	0.72	0.72	0.72	5.83
6	4.20	0.79	0.00	0.79	1.05	0.83	0.83	0.83	5.84
6.5	4.55	1.00	0.00	1.00	1.33	0.95	0.95	0.95	5.85
7	4.90	1.25	0.00	1.25	1.66	1.08	1.08	1.08	5.86
7.5	5.25	1.54	0.00	1.54	2.04	1.21	1.21	1.21	5.88
8	5.60	1.87	0.00	1.87	2.48	1.36	1.36	1.36	5.89
8.5	5.95	2.24	0.00	2.24	2.98	1.51	1.51	1.51	5.90
9	6.30	2.66	0.00	2.66	3.53	1.67	1.67	1.67	5.92
9.5	6.65	3.12	0.00	3.12	4.15	1.83	1.83	1.83	5.93
10	7.00	3.64	0.00	3.64	4.85	2.01	2.01	2.01	5.95
Toe	8.5	2.21	0.00	2.21	2.93	0.96	0.96	0.96	8.95
Heel	8.5	1.76	0.00	1.76	2.34	0.71	0.71	0.71	9.56
Shr. Key	8.5	0.00		0.00	#DIV/0!	0.00	0.00	0.00	0.00

Shear OK in all members

<u>Procedure for Determining the Design Moments and Shears</u>

Working Stress Design

Example : Find Design Moment and Shear at Sect 10 = 7.00 Ft below top of Ret. Wall

$M_{with\ wind}$ =	3.64	ft-k	$M_{no\ wind}$ =	3.64	ft-k
$1.2{*}M_{cr}$ =	11.83	ft-k	M_{wind} =	0.00	ft-k
$M_{capacity}$ =	16.24	ft-k	with wind allow 1.25 stress increase		

(1) First determine the greater value; (a) 0.8*Moment with wind or ; (b) Moment without wind.
here (a)= 0.8* 3.64 = 2.91 ; & (b)= 3.64 ft-k
M without wind >0.8*M with wind therefore 3.64 ft-k is the controling Moment

(2) Determine the greater value of; (a) controling Moment chosen above or ; (b) $1.2{*}M_{cr}$
here (a)= 3.64 ft-k ; & (b)= 11.83 ft-k
1.2*Mcr controls therefore 11.83 ft-k is greater

(3) Determine if 1.33*(controling Moment) chosen in item (1) above is less than $1.2{*}M_{cr}$
here 1.33* (controling Moment) = 4.85 ft-k & 1.2*Mcr = 11.83 ft-k
use 1.33*(controling Moment) (1) above = 4.85 ft-k = M_{design} < 16.24 ok

(4) Similarly for Shear greater of (0.8*Vwith wind) or (V without wind) <= V_c (allowable shear)
0.8* 2.01 = 1.61 k or 2.01 k <= V_c = 5.95 k ok

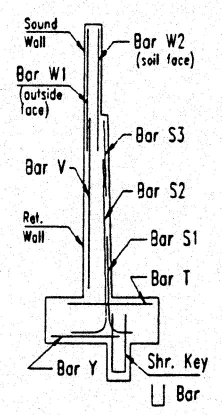
PREMIER
ENGINEERING CORPORATION

SHEET NO 4 OF 17
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY JG DATE 7/99



Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

Sect.	Dist. (ft) below top of Ret. W.	Design M Ft-K	As req'd. In^2/Ft.	Input Bar Size(s) desired and spacing						As prov. In^2/Ft.	stress fs psi	stress fc psi
Top of Ret.W.				Bar No.	Spc. In.	Bar No.	Spc. In.	Bar No.	Spc. In.			
				W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.70	0.00	0.000	5	12	0	8	0	0	0.31	22	1
2	1.40	0.04	0.002	5	12	0	8	0	0	0.31	174	5
3	2.10	0.13	0.007	5	12	0	8	0	0	0.31	587	16
4	2.80	0.31	0.017	5	12	0	8	0	0	0.31	1392	38
5	3.50	0.61	0.034	5	12	0	8	0	0	0.31	2718	75
5.5	3.85	0.81	0.045	5	12	0	8	0	0	0.31	3618	100
6	4.20	1.05	0.058	5	12	0	8	0	0	0.31	4697	130
6.5	4.55	1.33	0.075	5	12	0	8	0	0	0.31	5972	165
7	4.90	1.66	0.093	5	12	0	8	0	0	0.31	7459	206
7.5	5.25	2.04	0.115	5	12	0	8	0	0	0.31	9174	253
8	5.60	2.48	0.141	5	12	0	8	0	0	0.31	11134	307
8.5	5.95	2.98	0.170	5	12	0	0	0	0	0.31	13355	369
9	6.30	3.53	0.202	5	12	0	0	0	0	0.31	15853	438
9.5	6.65	4.15	0.239	5	12	0	0	0	0	0.31	18645	515
10	7.00	4.85	0.280	5	12	0	0			0.31	21747	600
								Bar Y	Spc.			
Toe	8.25	2.93	0.107	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	8437	184
								Bar T	Spc.			
Heel	7.25	2.34	0.079	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	6271	131
								Sh. Key	Spc.			
Sh. Key		No Key	No Key					4	12	0.20	No Key	No Key

Working stress dssign -- Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 in. spc. provides -0.31 In^2/ Ft. for Masonry = 450

BASIN #1
INLET WING

Height of Sound Wall = 10.00 **Wall Dimensions and Reinforcing**

Dimensions							Steel List																						Quantities		ksf
							S1			S2			S3			W1 & W2		H	V	Y			F1	T			F2	yd^3/ft	lb/ft	pres.
H	W	B	C	F	E	X	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Bar Size	Length	Number	Length	Bar Size	Spacing	Length	Number	Bar Size	Spacing	Length	Number	Conc.	Steel	max toe
4.00																														
5.00																														
6.00																														
7.00	5.00	1.50	2.00	1	2.00		5	12	9.00	5	12	4.30						8	6.75	5	12	4.5	4	5	12	4.50	4	0.54	50	1.52
8.00																														
9.00																														
10.00																														
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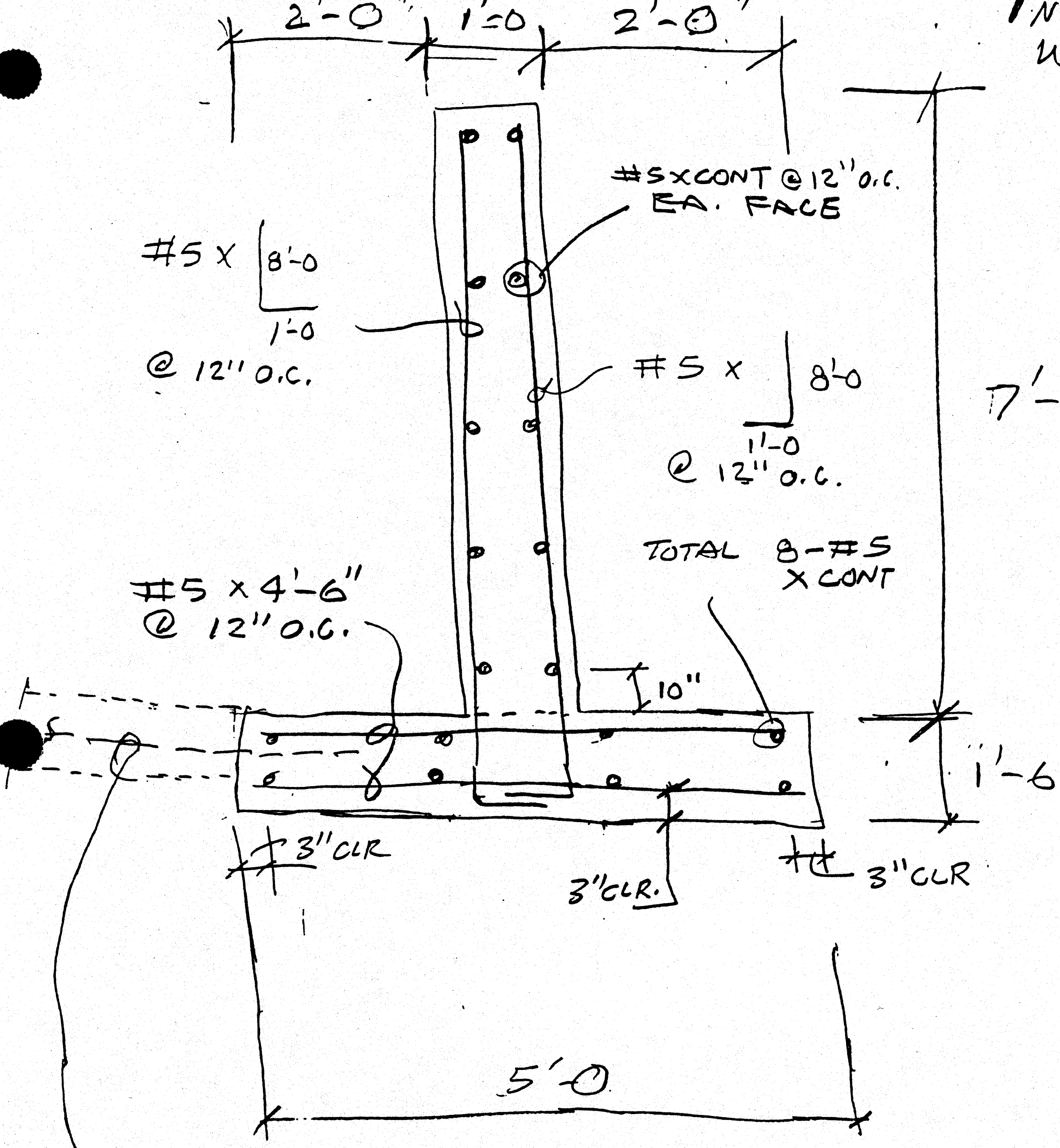
5/17

BASIN #7
INLET WING

6/17



EXPOSE
1'-6" MIN
OF EXISITING
REINFORCING AND
PROJECT INTO NEW
FOOTING

NOTE: ALL REINFORCING
IS 2" CLR.
UNO

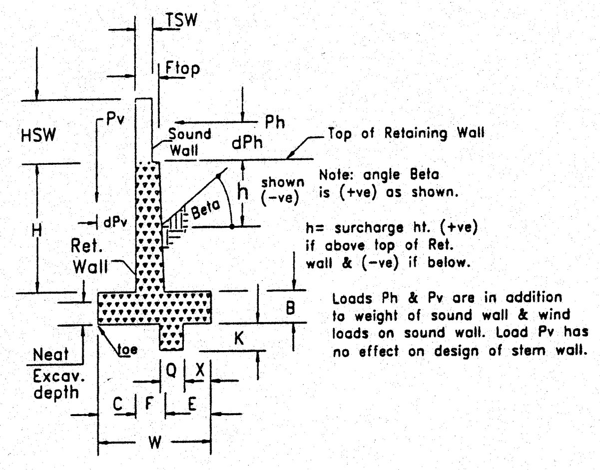
PREMIER
ENGINEERING CORPORATION

SHEET NO 7 OF 17
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 OUTLET WING

MADE BY DEP DATE 6\99 CHECKED BY [illegible] DATE 7/99



INPUT DATA (Units : KIP, FEET, U.N.O.)

			Ignore top one meter **passive** force (yes or no)
Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	6.00	Ft.	no
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top) =	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	0.00	K/ft	H =	6.00	Ft
dPh =	0.00	Ft.	B =	1.50	Ft
Surc. ht. h =	0.00	Ft.	W =	4.00	Ft
Beta (b) =	0.00	Deg.	C =	1.50	Ft
Soil on toe=	0.00	Ft.	K=	1.00	Ft
SOIL DATA			X =	1.50	Ft
Cohesion =	0	psf	Q =	1.00	Ft
g(s) (kcf) =	0.12		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	28.00	Deg.			
phi (passive) =	30.00	Deg.	[native soil]		

Ph above Impact load ? yes or no = no

Rustication enter (0,1 or 2 faces) =	0
Rustication thick (inches) =	1.5
Wt. of Mas. Wall (psf) =	65
Masonry Str. f'_m (psi) =	1350

Sound Wall Reinforcing cl.

1. Outside face (inches) =	3.00
2. Soil face (inches) =	3.00

Neat excavation :
depth = 0.00 Ft

Backwall slope 90.00 Deg.

Equivalent Fluid Pressures

EFP =	0.043	kcf active
EFP =	0.360	kcf passive

Note: If "yes" Wall length must be >=2* (H+B+dPh)

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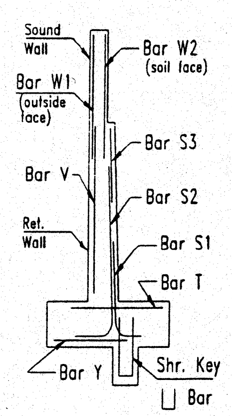
ENGINEERING CORPORATION

SHEET NO 8 OF 17
JOB NUMBER 9917

TITLE ______
SUBJECT BASIN #1 OUTLET WING
MADE BY DEP DATE 6/99 CHECKED BY JJ DATE 9/99



Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

Sect.	Dist. (ft)	Design	As	Input Bar Size(s) desired and spacing						As	stress	stress
Top of Ret.W.	below top of Ret. W.	M Ft-K	req'd. In^2/Ft.	Bar No.	Spc. In.	Bar No.	Spc. In.	Bar No.	Spc. In.	prov. In^2/Ft.	fs psi	fc psi
				W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.60	0.00	0.000	5	12	0	12	0	0	0.31	9	0
2	1.20	0.02	0.001	5	12	0	12	0	0	0.31	74	2
3	1.80	0.06	0.003	5	12	0	12	0	0	0.31	251	7
4	2.40	0.13	0.007	5	12	0	12	0	0	0.31	596	16
5	3.00	0.26	0.014	5	12	0	12	0	0	0.31	1164	32
5.5	3.30	0.35	0.019	5	12	0	12	0	0	0.31	1549	43
6	3.60	0.45	0.025	5	12	0	12	0	0	0.31	2011	56
6.5	3.90	0.57	0.032	5	12	0	12	0	0	0.31	2556	71
7	4.20	0.71	0.039	5	12	0	12	0	0	0.31	3193	88
7.5	4.50	0.88	0.049	5	12	0	12	0	0	0.31	3927	108
8	4.80	1.06	0.059	5	12	0	12	0	0	0.31	4766	132
8.5	5.10	1.27	0.071	5	12	5	12	0	0	0.62	2933	120
9	5.40	1.51	0.085	5	12	5	12	0	0	0.62	3481	142
9.5	5.70	1.78	0.100	5	12	5	12	0	0	0.62	4094	167
10	6.00	2.07	0.117	5	12	5	12			0.62	4775	195
								Bar Y	Spc.			
Toe	7.25	1.50	0.054	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	4307	94
								Bar T	Spc.			
Heel	6.25	1.01	0.034	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	2703	57
								Sh. Key	Spc.			
Sh. Key		0.52	0.032					4	12	0.20	4006	92

Working stress dssign -- Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 in. spc. provides -0.31 In^2 / Ft. for Masonry = 450

BASIN #1 OUTLET WING

Height of Sound Wall = 10.00 **Wall Dimensions and Reinforcing**

Dimensions							Steel List																					Quantities		ksf
							S1			S2			S3			W1 & W2		H	V	Y			F1	T			F2	yd³/ft	lb/ft	pres.
H	W	B	C	F	E	X	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Bar Size	Length	Number	Length	Bar Size	Spacing	Length	Number	Bar Size	Spacing	Length	Number	Conc.	Steel	max toe
4.00																														
5.00																														
6.00	4.00	1.50	1.5	1	1.50	1.50	5	12	8.00	5	12	4.15						6	5.75	5	12	3.5	4	5	12	3.50	4	0.48	40	1.38
7.00																														
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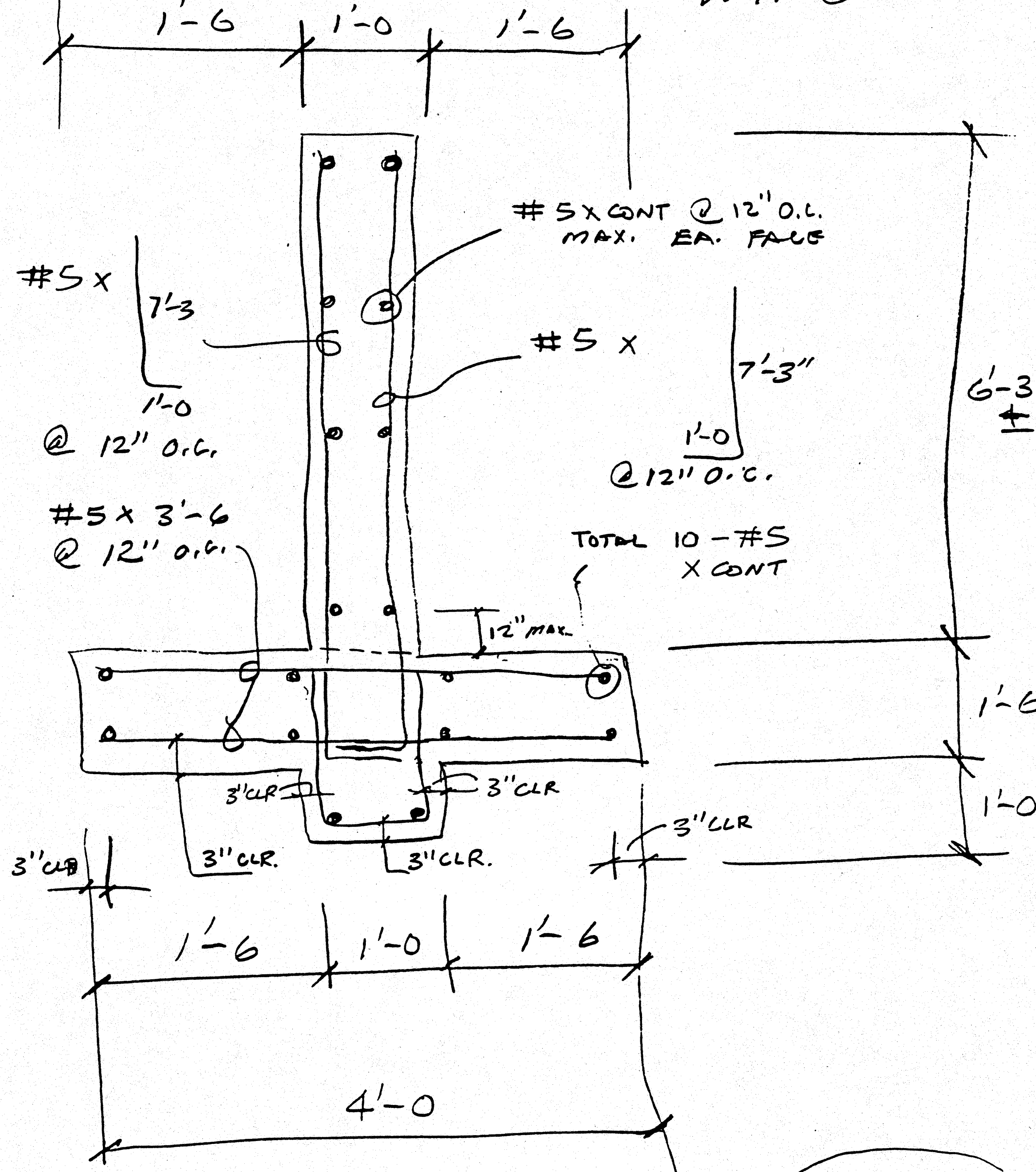
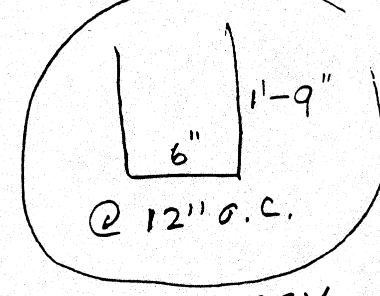


NOTE: ALL REINFORCING IS 2" CLR UNO



SHEAR KEY

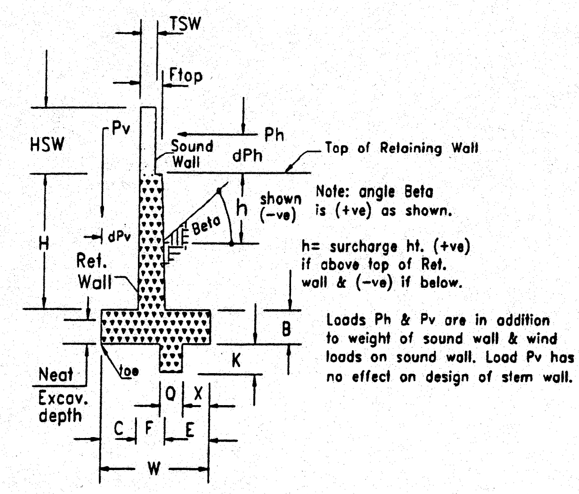
PREMIER
ENGINEERING CORPORATION

SHEET NO 11 OF 17
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY JJ DATE 7/99



INPUT DATA (Units : KIP, FEET, U.N.O.)

Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	Ignore top one meter **passive** force (yes or no)
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	7.00	Ft.	no
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top)	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	-1.50	K/ft	H =	7.00	Ft
dPh =	-8.00	Ft.	B =	1.50	Ft
Surc. ht. h =	0.00	Ft.	W =	5.00	Ft
Beta (b) =	0.00	Deg.	C =	2.00	Ft
Soil on toe=	0.00	Ft.	K=	0.00	Ft
SOIL DATA			X =	0.00	Ft
Cohesion =	0	psf	Q =	0.00	Ft
g(s) (kcf) =	0.13		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	20.00	Deg.			
phi (passive) =	30.00	Deg.	[native soil]		

Ph above Impact load ? yes or no = no

Rustication enter (0,1 or 2 faces) = 0
Rustication thick (inches) = 1.5
Wt. of Mas. Wall (psf) = 65
Masonry Str. f'_m (psi) = 1350

Sound Wall Reinforcing cl.
1. Outside face (inches) = 3.00
2. Soil face (inches) 3.00

Neat excavation :
depth = 0.00 Ft

Backwall slope 90.00 Deg.

Equivalent Fluid Pressures
EFP = 0.064 kcf active
EFP = 0.390 kcf passive

Note: If "yes" Wall length must be >=2* (H+B+dPh)

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SHEET NO 12 OF 17
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY JJ DATE 9/99

CALCULATIONS OF SLIDING AND OVERTURNING SAFETY FACTORS (>= 1.5)

DETERMINE HORIZONTAL FORCES AND OVERTURNING MOMENT

				Force	Arm	Moment
Wind load on Sound Wall :			Wind	0.000	8.5	0.000
Active & surcharge on Key :			Surcharge	0.000	4.25	0.000
Top of Key =	0.542		Reg. Soil	2.303	2.83	6.524
Bottom of Key =	0.542		P(h) =	-1.500	0.5	-0.750
Passive pressures:			Active S.Key	0.000		
Top Neat =	0.5850	ksf	Passive on Neat Exc	0.000		0.000
Bot.Neat =	0.5850	ksf	Passive on Sh.Key	0.000		
Bot.Key =	0.5850	ksf		========		=========

Sum of horizontal active forces = 0.803 Mo = 5.774

Sum of available horizontal passive forces = 0.000

DETERMINE VERTICAL FORCES AND RESISTING MOMENT ABOUT TOE

	P vertical	Arm	M resisting
1. Sound Wall	0.000	2.00	0.000
2. Stem	1.015	2.50	2.538
3. Strem's taper	0.000	3.00	0.000
4. Footing	1.088	2.50	2.719
5. Key	0.000	5.00	0.000
6. Soil (horiz.)	1.820	4.00	7.280
7. Surcharge *	0.000	4.00	0.000
8. Soil (sloping)	0.000	4.33	0.000
9. P(v)	0.000	0.00	0.000
10. Soil (on toe)	0.000	1.00	0.000
	=========		=========
	P = 3.923	**** Mr =	12.536
		Mr bout Toe =	12.536

Activate active pressure on Shear Key by using "1" Otherwise , use "0" --> 0

* NOTE :
Some designers do not use surcharge in vertical direction.
Activate vetical component of the surcharge weight by using "1" switch, Otherwise , use "0" --> 1

	with wind	without wind
OVT. FOS=	2.17	2.17
SLD. FOS=	1.96	1.96

	with wind		without wind
f_{soil} max =	1.52	ksf	1.52
f_{soil} min =	0.05	ksf	0.05
f_{soil} reduced=	1.14	ksf	1.14

Ecc. =	0.78	0.78	Ft.
Kern =	0.83	0.83	Ft.
Resultant within kern		Resultant within kern	

****Note: if eccentricity is a negative value then resisting Moment is taken about the heel

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SHEET NO 13 OF 17
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY [illegible] DATE 9/99

Sect.	Dist below top of Ret Wall (Ft.)	M without wind	M wind	M including wind	M design adjusted by /1.25	V without wind	V including wind	V design adjusted by /1.25	Vc allowable shear
Top of Ret. W.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.70	0.00	0.00	0.00	0.00	0.06	0.06	0.06	5.78
2	1.40	0.03	0.00	0.03	0.04	0.15	0.15	0.15	5.79
3	2.10	0.10	0.00	0.10	0.13	0.27	0.27	0.27	5.80
4	2.80	0.23	0.00	0.23	0.31	0.43	0.43	0.43	5.81
5	3.50	0.46	0.00	0.46	0.61	0.61	0.61	0.61	5.83
5.5	3.85	0.61	0.00	0.61	0.81	0.72	0.72	0.72	5.83
6	4.20	0.79	0.00	0.79	1.05	0.83	0.83	0.83	5.84
6.5	4.55	1.00	0.00	1.00	1.33	0.95	0.95	0.95	5.85
7	4.90	1.25	0.00	1.25	1.66	1.08	1.08	1.08	5.86
7.5	5.25	1.54	0.00	1.54	2.04	1.21	1.21	1.21	5.88
8	5.60	1.87	0.00	1.87	2.48	1.36	1.36	1.36	5.89
8.5	5.95	2.24	0.00	2.24	2.98	1.51	1.51	1.51	5.90
9	6.30	2.66	0.00	2.66	3.53	1.67	1.67	1.67	5.92
9.5	6.65	3.12	0.00	3.12	4.15	1.83	1.83	1.83	5.93
10	7.00	3.64	0.00	3.64	4.85	2.01	2.01	2.01	5.95
Toe	8.5	2.21	0.00	2.21	2.93	0.96	0.96	0.96	8.95
Heel	8.5	1.76	0.00	1.76	2.34	0.71	0.71	0.71	9.56
Shr. Key	8.5	0.00		0.00	#DIV/0!	0.00	0.00	0.00	0.00

Shear OK in all members

Procedure for Determining the Design Moments and Shears

Working Stress Design

Example : Find Design Moment and Shear at Sect 10 = 7.00 Ft below top of Ret. Wall

$M_{\text{with wind}}$ = 3.64 ft-k $M_{\text{no wind}}$ = 3.64 ft-k
1.2^*M_{cr} = 11.83 ft-k M_{wind} = 0.00 ft-k
M_{capacity} = 16.24 ft-k   with wind allow 1.25 stress increase

(1) First determine the greater value; (a) 0.8*Moment with wind or ; (b) Moment without wind.
here (a)= 0.8* 3.64 = 2.91 ; & (b)= 3.64 ft-k
M without wind >0.8*M with wind therefore 3.64 ft-k is the controling Moment

(2) Determine the greater value of; (a) controling Moment chosen above or ; (b) 1.2^*M_{cr}
here (a)= 3.64 ft-k ; & (b)= 11.83 ft-k
1.2*Mcr controls therefore 11.83 ft-k is greater

(3) Determine if 1.33*(controling Moment) chosen in item (1) above is less than 1.2^*M_{cr}
here 1.33* (controling Moment) = 4.85 ft-k & 1.2*Mcr = 11.83 ft-k
use 1.33*(controling Moment) (1) above = 4.85 ft-k = M_{design} < 16.24 ok

(4) Similarly for Shear greater of (0.8*Vwith wind) or (V without wind) <= V_c (allowable shear)
0.8* 2.01 = 1.61 k or 2.01 k <= V_c = 5.95 k ok

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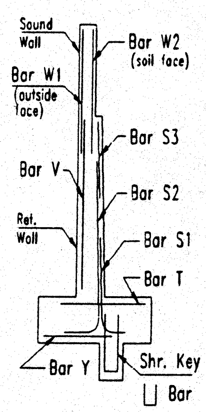
ENGINEERING CORPORATION

SHEET NO 14 OF 17
JOB NUMBER 9917

TITLE

SUBJECT BASIN #1 INLET WINGS

MADE BY DEP DATE 6/99 CHECKED BY [illegible] DATE 9/99



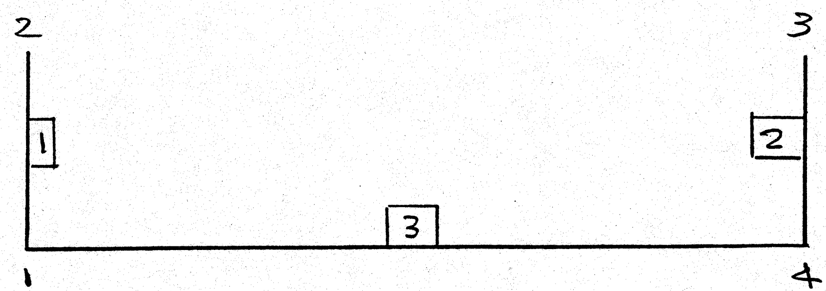
Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

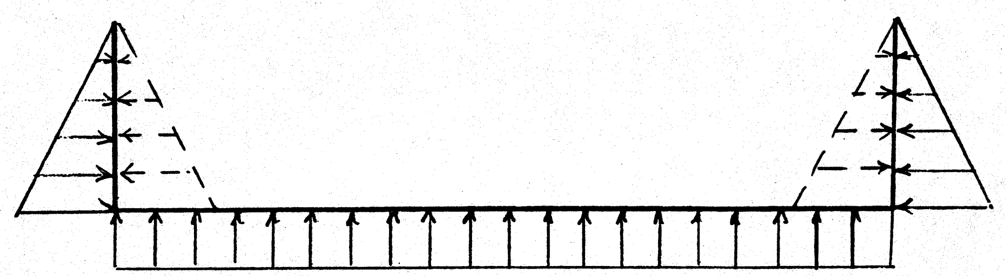
Sect.	Dist. (ft)	Design	As	Input Bar Size(s) desired and spacing						As	stress	stress
Top of Ret.W.	below top of Ret. W.	M Ft-K	req'd. In^2/Ft.	Bar No.	Spc. In.	Bar No.	Spc. In.	Bar No.	Spc. In.	prov. In^2/Ft.	fs psi	fc psi
				W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.70	0.00	0.000	5	12	0	8	0	0	0.31	22	1
2	1.40	0.04	0.002	5	12	0	8	0	0	0.31	174	5
3	2.10	0.13	0.007	5	12	0	8	0	0	0.31	587	16
4	2.80	0.31	0.017	5	12	0	8	0	0	0.31	1392	38
5	3.50	0.61	0.034	5	12	0	8	0	0	0.31	2718	75
5.5	3.85	0.81	0.045	5	12	0	8	0	0	0.31	3618	100
6	4.20	1.05	0.058	5	12	0	8	0	0	0.31	4697	130
6.5	4.55	1.33	0.075	5	12	0	8	0	0	0.31	5972	165
7	4.90	1.66	0.093	5	12	0	8	0	0	0.31	7459	206
7.5	5.25	2.04	0.115	5	12	0	8	0	0	0.31	9174	253
8	5.60	2.48	0.141	5	12	0	8	0	0	0.31	11134	307
8.5	5.95	2.98	0.170	5	12	0	0	0	0	0.31	13355	369
9	6.30	3.53	0.202	5	12	0	0	0	0	0.31	15853	438
9.5	6.65	4.15	0.239	5	12	0	0	0	0	0.31	18645	515
10	7.00	4.85	0.280	5	12	0	0			0.31	21747	600
								Bar Y	Spc.			
Toe	8.25	2.93	0.107	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	8437	184
								Bar T	Spc.			
Heel	7.25	2.34	0.079	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	6271	131
								Sh. Key	Spc.			
Sh. Key		No Key	No Key					4	12	0.20	No Key	No Key

Working stress dssign -- Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 in. spc. provides -0.31 In^2/ Ft. for Masonry = 450

TITLE
SUBJECT SPILLWAY
MADE BY DEP DATE 6/99 CHECKED BY [illegible] DATE 9/99





$M_{MAX} \approx 6.01\ FT^K/FT$ (SEE SHT. 3)

@ $d \approx 8''$ W/ #5'S @ 8" O.C.

$A_s = 0.31 \times 12/8 = 0.46\ IN^2/FT$ $n = 12$

$f_s = 21.7$ K.S.I. $f_c = 725$ P.S.I.

$k = 0.2863$ $j = 0.9046$

USE #5 @ 8" O.C.

RISA-3D (R) Version 3.01

Piggott Engineering
4503 E. Desert Wind Drive
Phoenix, AZ 85044-6023

Job : 9727
Page: 2
Date: 6\99
File: 9917SPLW

Flood Control Distric of Maricopa County
Baffled Spillway

Joint Coordinates

Joint No	X Coordinate (ft)	Y Coordinate (ft)	Z Coordinate (ft)	Joint Temperature (½F)
1	0.000	0.000	0.000	0.00
2	0.000	5.000	0.000	0.00
3	39.250	5.000	0.000	0.00
4	39.250	0.000	0.000	0.00

Sections

Section Label	Database Shape	Material Label	Area (in^2)	As yy	As zz	I yy (in^4)	I zz (in^4)	Torsion J (in^4)
WALL		CONC	144.00	1.2	1.2	1728.00	1728.00	3456.00
BOTT		CONC	144.00	1.2	1.2	1728.00	1728.00	3456.00

Members

Member No	Joints I	J	K	x Axis Rotate	Section Set	End Releases I: MMM (xyzxyz)	J: MMM (xyzxyz)	Offsets I-End (in)	J-End (in)	Inactive? Label	Length (ft)
1	1	2			WALL						5.0
2	4	3			WALL						5.0
3	1	4			BOTT						39.2

Basic Load Case Data

BLC No.	Basic Load Case Description	Nodal	Point	Dist.	Surface
1	Lateral Loading			2	
2	Bott Loading			1	

Member Distributed Loads, BLC 1

Member	Joints I	J	Load Pattern Label	Pattern Multiplier
1	1	2	LOAD1	1.0000
2	4	3	LOAD2	1.0000

Member Distributed Loads, BLC 2

Member	Joints I	J	Load Pattern Label	Pattern Multiplier
3	1	4	BOTT	1.0000

Load Patterns

Pattern Label	Dir	Magnitudes Start (K/ft,F)	End (K/ft,F)	Locations Start (ft or %)	End (ft or %)
LOAD1	X	0.313	0.000	0.000	0.000
LOAD2	X	-0.313	0.000	0.000	0.000

RISA-3D (R) Version 3.01

Piggott Engineering
4503 E. Desert Wind Drive
Phoenix, AZ 85044-6023

Job : 9727
Page: 3
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Flood Control Distric of Maricopa County
Baffled Spillway

< Load Patterns >

Pattern Label	Dir	Magnitudes Start K/ft,F	Magnitudes End K/ft,F	Locations Start ft or %	Locations End ft or %
BOTT	Y	0.188	0.188	0.000	0.000

< Load Combinations >

No.	Description	BLC	Fac	BLC	Fac	BLC	Fac	BLC	Fac	BLC	Fac	RWPE SSdv
1	Self Wt	Y	-1									
2	Lateral Load			1	1							
3	Sum DL+Bott+Lat	L1	1	1	1	2	1					

< Member Section Forces, LC 3 : Sum DL+Bott+Lat >

Member	Joints I - J	Sec	Axial K	Shear y-y K	Shear z-z K	Torque K-ft	Moment y-y K-ft	Moment z-z K-ft
1	1- 2	1	0.75	0.78	0.00	0.00	0.00	1.3
		2	0.56	0.44	0.00	0.00	0.00	0.5
		3	0.38	0.20	0.00	0.00	0.00	0.1
		4	0.19	0.05	0.00	0.00	0.00	0.0
		5	0.00	0.00	0.00	0.00	0.00	0.0
2	4- 3	1	0.75	-0.78	0.00	0.00	0.00	-1.3
		2	0.56	-0.44	0.00	0.00	0.00	-0.5
		3	0.38	-0.20	0.00	0.00	0.00	-0.1
		4	0.19	-0.05	0.00	0.00	0.00	-0.0
		5	0.00	0.00	0.00	0.00	0.00	0.0
3	1- 4	1	0.78	-0.75	0.00	0.00	0.00	-1.3
		2	0.78	-0.37	0.00	0.00	0.00	4.1
		3	0.78	0.00	0.00	0.00	0.00	6.0
		4	0.78	0.37	0.00	0.00	0.00	4.1
		5	0.78	0.75	0.00	0.00	0.00	-1.3

< Joint Coordinates >

Joint No	X Coordinate ft	Y Coordinate ft	Z Coordinate ft	Joint Temperature ½F
1	0.000	0.000	0.000	0.00
2	0.000	5.000	0.000	0.00
3	39.250	5.000	0.000	0.00
4	39.250	0.000	0.000	0.00

PREMIER
ENGINEERING CORPORATION

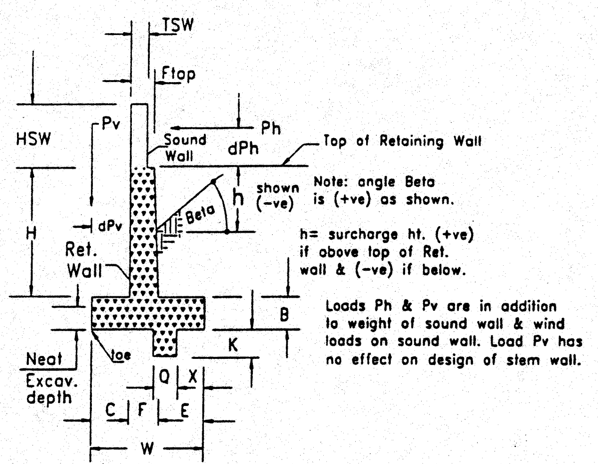
SHEET NO 1 OF 15
JOB NUMBER 9917

TITLE

SUBJECT BASIN #3 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY [illegible] DATE 9/99

USE FOR BASIN #2 INLET (H=5.5') ALSO



INPUT DATA (Units : KIP, FEET, U.N.O.)

			Ignore top one meter **passive** force (yes or no)
Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	6.00	Ft.	no
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top) =	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	-1.00	K/ft	H =	6.00	Ft
dPh =	-7.00	Ft.	B =	1.50	Ft
Surc. ht. h =	0.00	Ft.	W =	4.50	Ft
Beta (b) =	0.00	Deg.	C =	1.75	Ft
Soil on toe=	0.00	Ft.	K=	0.00	Ft
SOIL DATA			X =	0.00	Ft
Cohesion =	0	psf	Q =	0.00	Ft
g(s) (kcf) =	0.13		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	20.00	Deg.			
phi (passive) =	30.00	Deg.		[native soil]	

Ph above Impact load ? yes or no = no

Rustication enter (0,1 or 2 faces) =	0	
Rustication thick (inches) =	1.5	
Wt. of Mas. Wall (psf) =	65	
Masonry Str. f'_m (psi) =	1350	
Sound Wall Reinforcing cl.		
1. Outside face (inches) =	3.00	
2. Soil face (inches) =	3.00	
Neat excavation : depth =	0.00	Ft
Backwall slope	90.00	Deg.

Equivalent Fluid Pressures

EFP =	0.064	kcf active
EFP =	0.390	kcf passive

Note: If "yes" Wall length must be >=2* (H+B+dPh)

PREMIER
ENGINEERING CORPORATION

SHEET NO 2 OF 15
JOB NUMBER 9917

TITLE

SUBJECT BASIN #3 INLET WINGS

MADE BY DEP DATE 6/99 CHECKED BY [illegible] DATE 9/99

CALCULATIONS OF SLIDING AND OVERTURNING SAFETY FACTORS (>= 1.5)

DETERMINE HORIZONTAL FORCES AND OVERTURNING MOMENT

				Force	Arm	Moment
Wind load on Sound Wall :			Wind	0.000	7.5	0.000
Active & surcharge on Key :			Surcharge	0.000	3.75	0.000
Top of Key =		0.478	Reg. Soil	1.793	2.50	4.482
Bottom of Key =		0.478	P(h) =	-1.500	0.5	-0.750
Passive pressures:			Active S.Key	0.000		
Top Neat =	0.5850	ksf	Passive on Neat Exc	0.000		0.000
Bot.Neat =	0.5850	ksf	Passive on Sh.Key	0.000		
Bot.Key =	0.5850	ksf		========		=========

Sum of horizontal active forces = 0.293 Mo = 3.732

Sum of available horizontal passive forces = 0.000

DETERMINE VERTICAL FORCES AND RESISTING MOMENT ABOUT TOE

	P vertical	Arm	M resisting
1. Sound Wall	0.000	1.75	0.000
2. Stem	0.870	2.25	1.958
3. Strem's taper	0.000	2.75	0.000
4. Footing	0.979	2.25	2.202
5. Key	0.000	4.50	0.000
6. Soil (horiz.)	1.365	3.63	4.948
7. Surcharge *	0.000	3.63	0.000
8. Soil (sloping)	0.000	3.92	0.000
9. P(v)	0.000	0.00	0.000
10. Soil (on toe)	0.000	0.88	0.000
	=========		=========
P =	3.214	**** Mr =	9.108
		Mr bout Toe =	9.108

Activate active pressure on Shear Key by using "1" Otherwise , use "0" --> 0

* NOTE :
Some designers do not use surcharge in vertical direction.
Activate vetical component of the surcharge weight by using "1" switch, Otherwise , use "0" --> 1

	with wind	without wind
OVT. FOS=	2.44	2.44
SLD. FOS=	4.39	4.39

	with wind		without wind
f_{soil} max =	1.26	ksf	1.26
f_{soil} min =	0.16	ksf	0.16
f_{soil} reduced=	0.96	ksf	0.96

	with wind	without wind	
Ecc. =	0.58	0.58	Ft.
Kern =	0.75	0.75	Ft.
	Resultant within kern	Resultant within kern	

****Note: if eccentricity is a negative value then resisting Moment is taken about the heel

PREMIER
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SHEET NO 3 OF 15
JOB NUMBER 9917

TITLE

SUBJECT BASIN #3 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY [illegible] DATE 7/99

Sect.	Dist below top of Ret Wall (Ft.)	M without wind	M wind	M including wind	M design adjusted by /1.25	V without wind	V Including wind	V design adjusted by /1.25	Vc allowable shear
Top of Ret. W.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.60	0.00	0.00	0.00	0.00	0.05	0.05	0.05	5.78
2	1.20	0.02	0.00	0.02	0.02	0.12	0.12	0.12	5.79
3	1.80	0.06	0.00	0.06	0.08	0.22	0.22	0.22	5.79
4	2.40	0.15	0.00	0.15	0.20	0.34	0.34	0.34	5.80
5	3.00	0.29	0.00	0.29	0.38	0.48	0.48	0.48	5.81
5.5	3.30	0.38	0.00	0.38	0.51	0.56	0.56	0.56	5.82
6	3.60	0.50	0.00	0.50	0.66	0.64	0.64	0.64	5.83
6.5	3.90	0.63	0.00	0.63	0.84	0.73	0.73	0.73	5.84
7	4.20	0.79	0.00	0.79	1.05	0.83	0.83	0.83	5.84
7.5	4.50	0.97	0.00	0.97	1.29	0.93	0.93	0.93	5.85
8	4.80	1.17	0.00	1.17	1.56	1.04	1.04	1.04	5.86
8.5	5.10	1.41	0.00	1.41	1.87	1.15	1.15	1.15	5.87
9	5.40	1.67	0.00	1.67	2.22	1.27	1.27	1.27	5.88
9.5	5.70	1.97	0.00	1.97	2.62	1.40	1.40	1.40	5.89
10	6.00	2.29	0.00	2.29	3.05	1.53	1.53	1.53	5.90
Toe	7.5	1.38	0.00	1.38	1.84	0.55	0.55	0.55	8.93
Heel	7.5	1.06	0.00	1.06	1.41	0.37	0.37	0.37	9.54
Shr. Key	7.5	0.00		0.00	#DIV/0!	0.00	0.00	0.00	0.00

Shear OK in all members

Procedure for Determining the Design Moments and Shears

Working Stress Design

Example : Find Design Moment and Shear at Sect 10 = 6.00 Ft below top of Ret. Wall

$M_{with\ wind}$ = 2.29 ft-k $M_{no\ wind}$ = 2.29 ft-k

1.2^*M_{cr} = 11.83 ft-k M_{wind} = 0.00 ft-k

$M_{capacity}$ = 16.24 ft-k   with wind allow 1.25 stress increase

(1) First determine the greater value; (a) 0.8*Moment with wind or ; (b) Moment without wind.

here (a)= 0.8* 2.29 = 1.84 ; & (b)= 2.29 ft-k

M without wind >0.8*M with wind therefore 2.29 ft-k is the controling Moment

(2) Determine the greater value of; (a) controling Moment chosen above or ; (b) 1.2^*M_{cr}

here (a)= 2.29 ft-k ; & (b)= 11.83 ft-k

1.2*Mcr controls therefore 11.83 ft-k is greater

(3) Determine if 1.33*(controling Moment) chosen in item (1) above is less than 1.2^*M_{cr}

here 1.33* (controling Moment) = 3.05 ft-k & 1.2*Mcr = 11.83 ft-k

use 1.33*(controling Moment) (1) above = 3.05 ft-k = M_{design} < 16.24 ok

(4) Similarly for Shear greater of (0.8*Vwith wind) or (V without wind) <= V_c (allowable shear)

0.8* 1.53 = 1.22 k or 1.53 k <= V_c = 5.90 k ok

PREMIER
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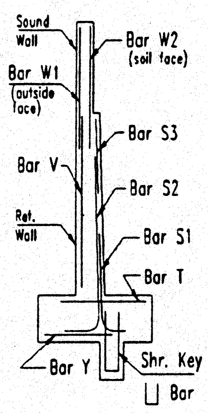
SHEET NO 4 OF 15
JOB NUMBER 9917

TITLE
SUBJECT BASIN #3 INLET WINGS
MADE BY DEP DATE 6/99 CHECKED BY JJ DATE 9/99



Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

Sect.	Dist. (ft)	Design	As	Input Bar Size(s) desired and spacing						As	stress	stress
	below	M	req'd.	Bar	Spc.	Bar	Spc.	Bar	Spc.	prov.	fs	fc
Top of	top of	Ft-K	In^2/Ft.	No.	In.	No.	In.	No.	In.	In^2/Ft.	psi	psi
Ret.W.	Ret. W.			W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.60	0.00	0.000	5	12	0	8	0	0	0.31	14	0
2	1.20	0.02	0.001	5	12	0	8	0	0	0.31	110	3
3	1.80	0.08	0.004	5	12	0	8	0	0	0.31	370	10
4	2.40	0.20	0.011	5	12	0	8	0	0	0.31	876	24
5	3.00	0.38	0.021	5	12	0	8	0	0	0.31	1712	47
5.5	3.30	0.51	0.028	5	12	0	8	0	0	0.31	2278	63
6	3.60	0.66	0.037	5	12	0	8	0	0	0.31	2958	82
6.5	3.90	0.84	0.047	5	12	0	8	0	0	0.31	3761	104
7	4.20	1.05	0.058	5	12	0	8	0	0	0.31	4697	130
7.5	4.50	1.29	0.072	5	12	0	8	0	0	0.31	5777	159
8	4.80	1.56	0.088	5	12	0	8	0	0	0.31	7012	194
8.5	5.10	1.87	0.106	5	12	0	0	0	0	0.31	8410	232
9	5.40	2.22	0.126	5	12	0	0	0	0	0.31	9983	276
9.5	5.70	2.62	0.149	5	12	0	0	0	0	0.31	11742	324
10	6.00	3.05	0.174	5	12	0	0			0.31	13695	378
								Bar Y	Spc.			
Toe	7.25	1.84	0.066	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	5294	115
								Bar T	Spc.			
Heel	6.25	1.41	0.047	Full Ftg.	Wd. Bars	Y or N =	y	5	12	0.31	3772	79
								Sh. Key	Spc.			
Sh. Key		No Key	No Key					4	12	0.20	No Key	No Key

Working stress dssign -- Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 in. spc. provides -0.31 In^2/ Ft. for Masonry = 450

BASIN #3 INLET WING

Height of Sound Wall = 10.00

Wall Dimensions and Reinforcing

Dimensions							Steel List																					Quantities		ksf
							S1			S2			S3			W1 & W2		H	V	Y			F1	T			F2	yd^3/ft	lb/ft	pres.
H	W	B	C	F	E	X	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Bar Size	Length	Number	Length	Bar Size	Spacing	Length	Number	Bar Size	Spacing	Length	Number	Conc.	Steel	max toe
4.00																														
5.00																														
6.00	4.50	1.50	1.75	1	1.75		5	12	8.00									6	5.75	5	12	4	5	5	12	4.00	6	0.47	40	1.34
7.00																														
8.00																														
9.00																														
10.00																														
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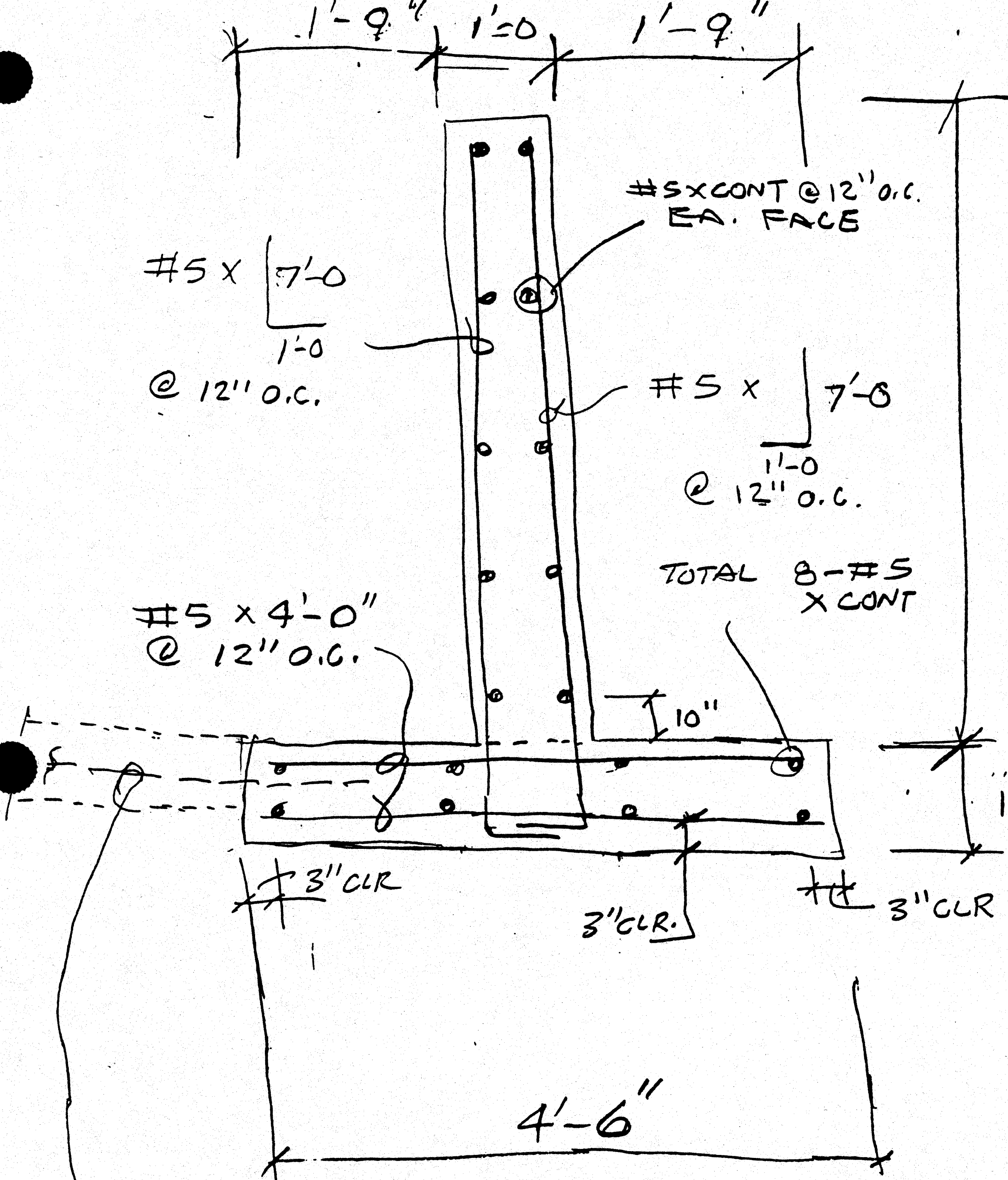
9917 BASIN #3 INLET WING 6/1



EXPOSE
1'-6" MIN
OF EXISITING
REINFORCING AND
PROJECT INTO NEW
FOOTING

NOTE: ALL REINFORCING
IS 2" CLR.
UNO

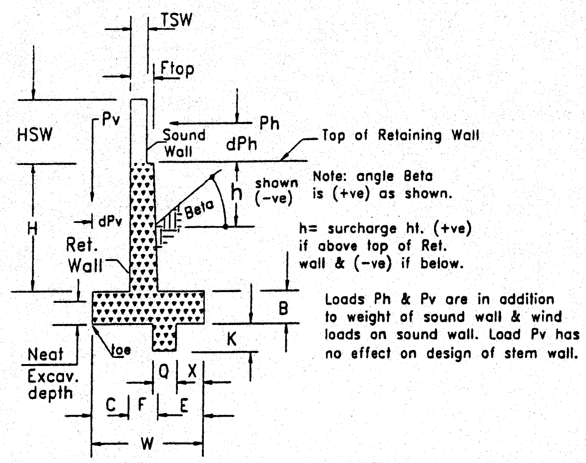
PREMIER
ENGINEERING CORPORATION

SHEET NO 7 OF 15
JOB NUMBER 9917

TITLE

SUBJECT BASINS # 2 & 3 / INLET WINGS

MADE BY DEV DATE 6\99 CHECKED BY JJ DATE 9/99



INPUT DATA (Units : KIP, FEET, U.N.O.)

Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	6.00	Ft.	
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

Ignore top one meter **passive** force (yes or no): no

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top) =	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	-1.00	K/ft	H =	6.00	Ft
dPh =	-7.00	Ft.	B =	1.50	Ft
Surc. ht. h =	0.00	Ft.	W =	4.50	Ft
Beta (b) =	0.00	Deg.	C =	1.75	Ft
Soil on toe=	0.00	Ft.	K=	0.00	Ft
SOIL DATA			X =	0.00	Ft
Cohesion =	0	psf	Q =	0.00	Ft
g(s) (kcf) =	0.13		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	20.00	Deg.			
phi (passive) =	30.00	Deg.	[native soil]		

Ph above Impact load ? yes or no = no

Rustication enter (0,1 or 2 faces) =	0	
Rustication thick (inches) =	1.5	
Wt. of Mas. Wall (psf) =	65	
Masonry Str. f'_m (psi) =	1350	

Sound Wall Reinforcing cl.

1. Outside face (inches) = 3.00
2. Soil face (inches) = 3.00

Neat excavation :
depth = 0.00 Ft

Backwall slope 90.00 Deg.

Equivalent Fluid Pressures

EFP = 0.064 kcf active
EFP = 0.390 kcf passive

Note: If "yes" Wall length must be >=2* (H+B+dPh)

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SHEET NO 8 OF 15
JOB NUMBER 9917

TITLE

SUBJECT BASIN #3 INLET WINGS

MADE BY DEF DATE 6/99 CHECKED BY JG DATE 9/99

CALCULATIONS OF SLIDING AND OVERTURNING SAFETY FACTORS (>= 1.5)

DETERMINE HORIZONTAL FORCES AND OVERTURNING MOMENT

Wind load on Sound Wall :
Active & surcharge on Key :
Top of Key = 0.478
Bottom of Key = 0.478
Passive pressures:
Top Neat = 0.5850 ksf
Bot.Neat = 0.5850 ksf
Bot.Key = 0.5850 ksf

	Force	Arm	Moment
Wind	0.000	7.5	0.000
Surcharge	0.000	3.75	0.000
Reg. Soil	1.793	2.50	4.482
P(h) =	-1.500	0.5	-0.750
Active S.Key	0.000		
Passive on Neat Exc	0.000		0.000
Passive on Sh.Key	0.000		
	========		=========
Sum of horizontal active forces =	0.293	Mo =	3.732
Sum of available horizontal passive forces =	0.000		

DETERMINE VERTICAL FORCES AND RESISTING MOMENT ABOUT TOE

	P vertical	Arm	M resisting
1. Sound Wall	0.000	1.75	0.000
2. Stem	0.870	2.25	1.958
3. Strem's taper	0.000	2.75	0.000
4. Footing	0.979	2.25	2.202
5. Key	0.000	4.50	0.000
6. Soil (horiz.)	1.365	3.63	4.948
7. Surcharge *	0.000	3.63	0.000
8. Soil (sloping)	0.000	3.92	0.000
9. P(v)	0.000	0.00	0.000
10. Soil (on toe)	0.000	0.88	0.000
	=========		=========
P =	3.214	**** Mr =	9.108
		Mr bout Toe =	9.108

Activate active pressure on Shear Key by using "1" Otherwise , use "0" --> 0

* NOTE :
Some designers do not use surcharge in vertical direction.
Activate vetical component of the surcharge weight by using "1" switch, Otherwise , use "0" --> 1

	with wind	without wind
OVT. FOS=	2.44	2.44
SLD. FOS=	4.39	4.39

	with wind		without wind
f_{soil} max =	1.26	ksf	1.26
f_{soil} min =	0.16	ksf	0.16
f_{soil} reduced=	0.96	ksf	0.96

Ecc. =	0.58	0.58	Ft.
Kern =	0.75	0.75	Ft.
Resultant within kern		Resultant within kern	

****Note: if eccentricity is a negative value then resisting Moment is taken about the heel

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SHEET NO 9 OF 15
JOB NUMBER 9917

TITLE

SUBJECT BASIN #3 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY JJ DATE 9/99

Sect.	Dist below top of Ret Wall (Ft.)	M without wind	M wind	M including wind	M design adjusted by /1.25	V without wind	V including wind	V design adjusted by /1.25	Vc allowable shear
Top of Ret. W.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.60	0.00	0.00	0.00	0.00	0.05	0.05	0.05	5.78
2	1.20	0.02	0.00	0.02	0.02	0.12	0.12	0.12	5.79
3	1.80	0.06	0.00	0.06	0.08	0.22	0.22	0.22	5.79
4	2.40	0.15	0.00	0.15	0.20	0.34	0.34	0.34	5.80
5	3.00	0.29	0.00	0.29	0.38	0.48	0.48	0.48	5.81
5.5	3.30	0.38	0.00	0.38	0.51	0.56	0.56	0.56	5.82
6	3.60	0.50	0.00	0.50	0.66	0.64	0.64	0.64	5.83
6.5	3.90	0.63	0.00	0.63	0.84	0.73	0.73	0.73	5.84
7	4.20	0.79	0.00	0.79	1.05	0.83	0.83	0.83	5.84
7.5	4.50	0.97	0.00	0.97	1.29	0.93	0.93	0.93	5.85
8	4.80	1.17	0.00	1.17	1.56	1.04	1.04	1.04	5.86
8.5	5.10	1.41	0.00	1.41	1.87	1.15	1.15	1.15	5.87
9	5.40	1.67	0.00	1.67	2.22	1.27	1.27	1.27	5.88
9.5	5.70	1.97	0.00	1.97	2.62	1.40	1.40	1.40	5.89
10	6.00	2.29	0.00	2.29	3.05	1.53	1.53	1.53	5.90
Toe	7.5	1.38	0.00	1.38	1.84	0.55	0.55	0.55	8.93
Heel	7.5	1.06	0.00	1.06	1.41	0.37	0.37	0.37	9.54
Shr. Key	7.5	0.00		0.00	#DIV/0!	0.00	0.00	0.00	0.00

Shear OK in all members

Procedure for Determining the Design Moments and Shears

Working Stress Design

Example : Find Design Moment and Shear at Sect 10 = 6.00 Ft below top of Ret. Wall

$M_{with\ wind}$ = 2.29 ft-k $M_{no\ wind}$ = 2.29 ft-k

$1.2*M_{cr}$ = 11.83 ft-k M_{wind} = 0.00 ft-k

$M_{capacity}$ = 16.24 ft-k   with wind allow 1.25 stress increase

(1) First determine the greater value; (a) 0.8*Moment with wind or ; (b) Moment without wind.
here (a)= 0.8* 2.29 = 1.84 ; & (b)= 2.29 ft-k
M without wind >0.8*M with wind therefore 2.29 ft-k is the controling Moment

(2) Determine the greater value of; (a) controling Moment chosen above or ; (b) $1.2*M_{cr}$
here (a)= 2.29 ft-k ; & (b)= 11.83 ft-k
1.2*Mcr controls therefore 11.83 ft-k is greater

(3) Determine if 1.33*(controling Moment) chosen in item (1) above is less than $1.2*M_{cr}$
here 1.33* (controling Moment) = 3.05 ft-k & 1.2*Mcr = 11.83 ft-k
use 1.33*(controling Moment) (1) above = 3.05 ft-k = M_{design} < 16.24 ok

(4) Similarly for Shear greater of (0.8*Vwith wind) or (V without wind) <= V_c (allowable shear)
0.8* 1.53 = 1.22 k or 1.53 k <= V_c = 5.90 k ok

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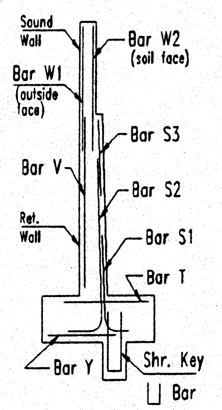
SHEET NO 10 OF 15
JOB NUMBER 9917

TITLE

SUBJECT BASIN #3 INLET WINGS

MADE BY DEP DATE 6/99 CHECKED BY [illegible] DATE 9/99



Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

Sect.	Dist. (ft)	Design	As	Input Bar Size(s) desired and spacing						As	stress	stress
	below	M	req'd.	Bar	Spc.	Bar	Spc.	Bar	Spc.	prov.	fs	fc
Top of	top of	Ft-K	In^2/Ft.	No.	In.	No.	In.	No.	In.	In^2/Ft.	psi	psi
Ret.W.	Ret. W.			W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.60	0.00	0.000	5	12	0	8	0	0	0.31	14	0
2	1.20	0.02	0.001	5	12	0	8	0	0	0.31	110	3
3	1.80	0.08	0.004	5	12	0	8	0	0	0.31	370	10
4	2.40	0.20	0.011	5	12	0	8	0	0	0.31	876	24
5	3.00	0.38	0.021	5	12	0	8	0	0	0.31	1712	47
5.5	3.30	0.51	0.028	5	12	0	8	0	0	0.31	2278	63
6	3.60	0.66	0.037	5	12	0	8	0	0	0.31	2958	82
6.5	3.90	0.84	0.047	5	12	0	8	0	0	0.31	3761	104
7	4.20	1.05	0.058	5	12	0	8	0	0	0.31	4697	130
7.5	4.50	1.29	0.072	5	12	0	8	0	0	0.31	5777	159
8	4.80	1.56	0.088	5	12	0	8	0	0	0.31	7012	194
8.5	5.10	1.87	0.106	5	12	0	0	0	0	0.31	8410	232
9	5.40	2.22	0.126	5	12	0	0	0	0	0.31	9983	276
9.5	5.70	2.62	0.149	5	12	0	0	0	0	0.31	11742	324
10	6.00	3.05	0.174	5	12	0	0			0.31	13695	378
								Bar Y	Spc.			
Toe	7.25	1.84	0.066	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	5294	115
								Bar T	Spc.			
Heel	6.25	1.41	0.047	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	3772	79
								Sh. Key	Spc.			
Sh. Key		No Key	No Key					4	12	0.20	No Key	No Key

Working stress dssign -- Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 in. spc. provides -0.31 In^2/ Ft. for Masonry = 450

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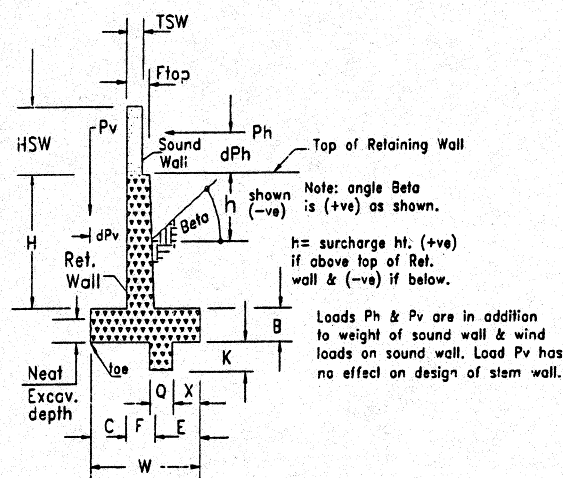
SHEET NO 11 OF 15
JOB NUMBER 9917

TITLE

SUBJECT SPILLWAY

MADE BY DEP DATE 6/99 CHECKED BY [illegible] DATE 9/99



INPUT DATA (Units : KIP, FEET, U.N.O.)

			Ignore top one meter **passive** force (yes or no)
Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	5.50	Ft.	no
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top)	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	-1.00	K/ft	H =	5.50	Ft
dPh =	-6.00	Ft.	B =	1.17	Ft
Surc. ht. h =	0.00	Ft.	W =	4.00	Ft
Beta (b) =	26.57	Deg.	C =	1.50	Ft
Soil on toe=	0.00	Ft.	K=	0.00	Ft
SOIL DATA			X =	0.00	Ft
Cohesion =	0	psf	Q =	0.00	Ft
g(s) (kcf) =	0.13		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	30.00	Deg.			
phi (passive) =	30.00	Deg.		[native soil]	

Rustication enter (0,1 or 2 faces) =	0	
Rustication thick (inches) =	1.5	
Wt. of Mas. Wall (psf) =	65	
Masonry Str. f'_m (psi) =	1350	
Sound Wall Reinforcing cl.		
1. Outside face (inches) =	3.00	
2. Soil face (inches)	3.00	
Neat excavation : depth =	0.00	Ft
Backwall slope	90.00	Deg.

Equivalent Fluid Pressures

EFP =	0.070	kcf active
EFP =	0.390	kcf passive

Ph above Impact load ? yes or no = no

Note: If "yes" Wall length must be >=2* (H+B+dPh)

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SHEET NO 12 OF 15
JOB NUMBER 9917

TITLE ______

SUBJECT SPILLWAY

MADE BY DEP DATE 6\99 CHECKED BY JG DATE 7/99

CALCULATIONS OF SLIDING AND OVERTURNING SAFETY FACTORS (>= 1.5)

DETERMINE HORIZONTAL FORCES AND OVERTURNING MOMENT

Wind load on Sound Wall :
Active & surcharge on Key :
Top of Key = 0.465
Bottom of Key = 0.465
Passive pressures:
Top Neat = 0.4563 ksf
Bot.Neat = 0.4563 ksf
Bot.Key = 0.4563 ksf

	Force	Arm	Moment
Wind	0.000	6.67	0.000
Surcharge	0.000	3.34	0.000
Reg. Soil	1.552	2.22	3.451
P(h) =	-1.000	0.67	-0.670
Active S.Key	0.000		
Passive on Neat Exc	0.000		0.000
Passive on Sh.Key	0.000		
	========		=========
Sum of horizontal active forces =	0.552	Mo =	2.781
Sum of available horizontal passive forces =	0.000		

DETERMINE VERTICAL FORCES AND RESISTING MOMENT ABOUT TOE

	P vertical	Arm	M resisting
1. Sound Wall	0.000	1.50	0.000
2. Stem	0.798	2.00	1.595
3. Strem's taper	0.000	2.50	0.000
4. Footing	0.679	2.00	1.357
5. Key	0.000	4.00	0.000
6. Soil (horiz.)	1.073	3.25	3.486
7. Surcharge *	0.000	3.25	0.000
8. Soil (sloping)	0.073	3.50	0.256
9. P(v)	0.000	0.00	0.000
10. Soil (on toe)	0.000	0.75	0.000
	=========		=========
P =	2.622	**** Mr =	6.694
		Mr bout Toe =	6.694

Activate active pressure
on Shear Key by using "1"
Otherwise , use "0" --> 0

* NOTE :
Some designers do not use
surcharge in vertical direction.
Activate vetical component of the
surcharge weight by using "1" switch,
Otherwise , use "0" --> 1

	with wind	without wind
OVT. FOS=	2.41	2.41
SLD. FOS=	1.90	1.90

	with wind		without wind
f_{soil} max =	1.15	ksf	1.15
f_{soil} min =	0.16	ksf	0.16
f_{soil} reduced=	0.88	ksf	0.88

	with wind	without wind	
Ecc. =	0.51	0.51	Ft.
Kern =	0.67	0.67	Ft.
	Resultant within kern	Resultant within kern	

****Note: if eccentricity is a negative value then resisting Moment is taken about the heel

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SHEET NO 13 OF 15
JOB NUMBER 9917

TITLE
SUBJECT SPILLWAY
MADE BY DEP DATE 6\99 CHECKED BY JJ DATE 9/99

Sect.	Dist below top of Ret Wall (Ft.)	M without wind	M wind	M including wind	M design adjusted by /1.25	V without wind	V including wind	V design adjusted by /1.25	Vc allowable shear
Top of Ret. W.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.55	0.00	0.00	0.00	0.00	0.03	0.03	0.03	5.78
2	1.10	0.02	0.00	0.02	0.02	0.09	0.09	0.09	5.78
3	1.65	0.05	0.00	0.05	0.07	0.17	0.17	0.17	5.79
4	2.20	0.12	0.00	0.12	0.16	0.26	0.26	0.26	5.80
5	2.75	0.24	0.00	0.24	0.32	0.38	0.38	0.38	5.81
5.5	3.03	0.32	0.00	0.32	0.43	0.45	0.45	0.45	5.81
6	3.30	0.42	0.00	0.42	0.56	0.52	0.52	0.52	5.82
6.5	3.58	0.53	0.00	0.53	0.71	0.60	0.60	0.60	5.82
7	3.85	0.66	0.00	0.66	0.88	0.68	0.68	0.68	5.83
7.5	4.13	0.82	0.00	0.82	1.09	0.77	0.77	0.77	5.84
8	4.40	0.99	0.00	0.99	1.32	0.87	0.87	0.87	5.85
8.5	4.68	1.19	0.00	1.19	1.58	0.97	0.97	0.97	5.86
9	4.95	1.41	0.00	1.41	1.88	1.07	1.07	1.07	5.86
9.5	5.23	1.66	0.00	1.66	2.21	1.18	1.18	1.18	5.87
10	5.50	1.94	0.00	1.94	2.57	1.29	1.29	1.29	5.88
Toe	6.67	0.97	0.00	0.97	1.29	0.58	0.58	0.58	6.47
Heel	6.67	0.75	0.00	0.75	1.00	0.37	0.41	0.37	7.08
Shr. Key	6.67	0.00		0.00	#DIV/0!	0.00	0.00	0.00	0.00

Shear OK in all members

Procedure for Determining the Design Moments and Shears

Working Stress Design

Example : Find Design Moment and Shear at Sect 10 = 5.50 Ft below top of Ret. Wall

$M_{with\ wind}$ =	1.94	ft-k	$M_{no\ wind}$ =	1.94	ft-k
$1.2{*}M_{cr}$ =	11.83	ft-k	M_{wind} =	0.00	ft-k
$M_{capacity}$ =	16.24	ft-k	with wind allow 1.25 stress increase		

(1) First determine the greater value; (a) 0.8*Moment with wind or ; (b) Moment without wind.
here (a)= 0.8* 1.94 = 1.55 ; & (b)= 1.94 ft-k
M without wind >0.8*M with wind therefore 1.94 ft-k is the controling Moment

(2) Determine the greater value of; (a) controling Moment chosen above or ; (b) $1.2{*}M_{cr}$
here (a)= 1.94 ft-k ; & (b)= 11.83 ft-k
1.2*Mcr controls therefore 11.83 ft-k is greater

(3) Determine if 1.33*(controling Moment) chosen in item (1) above is less than $1.2{*}M_{cr}$
here 1.33* (controling Moment) = 2.57 ft-k & 1.2*Mcr = 11.83 ft-k
use 1.33*(controling Moment) (1) above = 2.57 ft-k = M_{design} < 16.24 ok

(4) Similarly for Shear greater of (0.8*Vwith wind) or (V without wind) <= V_c (allowable shear)
0.8* 1.29 = 1.04 k or 1.29 k <= V_c = 5.88 k ok

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ENGINEERING CORPORATION

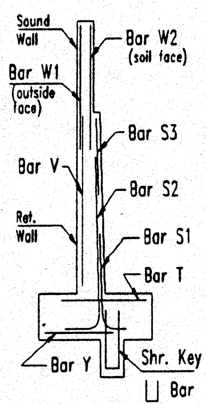
SHEET NO 14 OF 15

JOB NUMBER 9917

TITLE

SUBJECT SPILLWAY

MADE BY DEP DATE 6/99 CHECKED BY JJ DATE 9/99



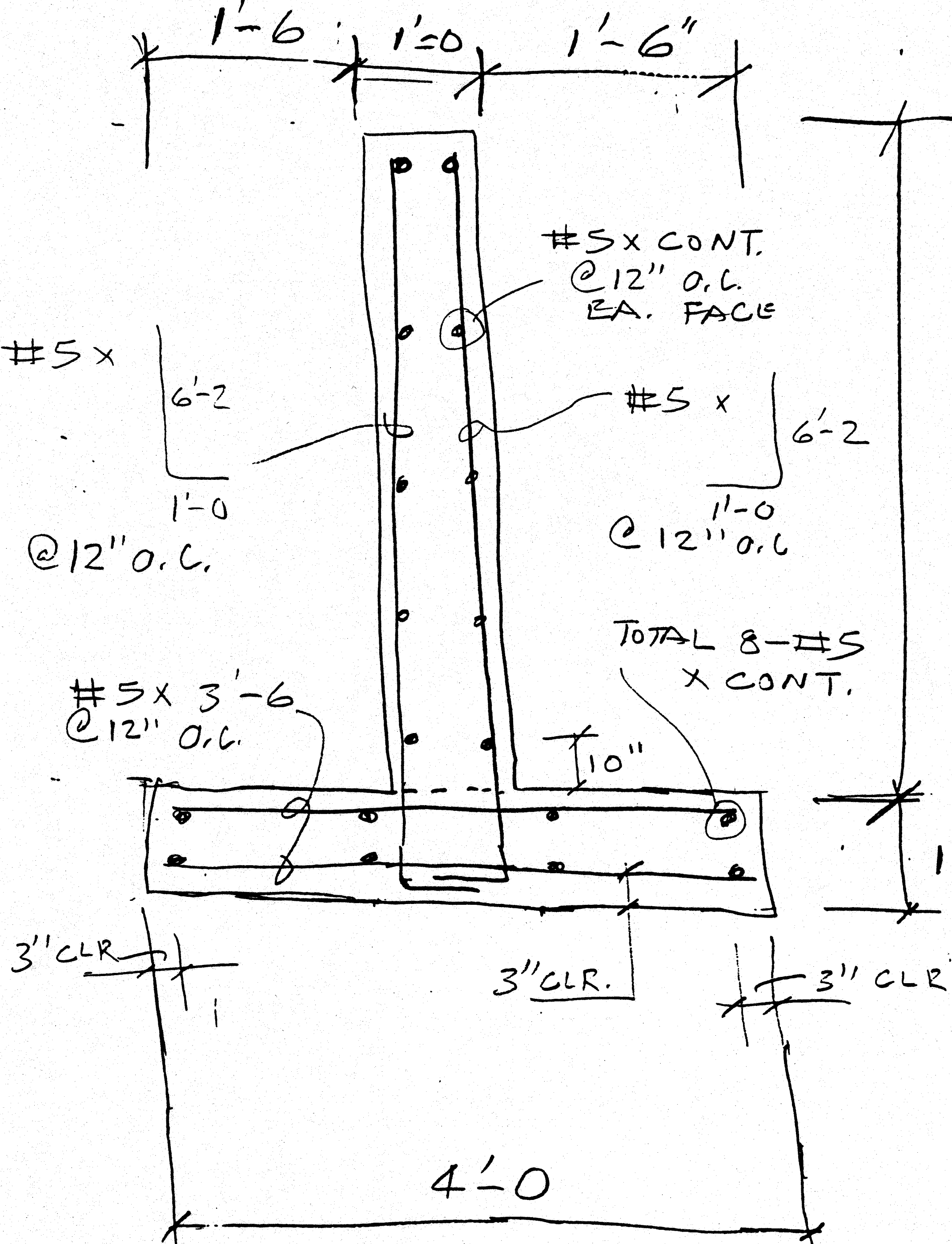
Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

Sect.	Dist. (ft) below top of Ret. W.	Design M Ft-K	As req'd. In^2/Ft.	Input Bar Size(s) desired and spacing: Bar No.	Spc. In.	Bar No.	Spc. In.	Bar No.	Spc. In.	As prov. In^2/Ft.	stress fs psi	stress fc psi
Top of Ret.W.				W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.55	0.00	0.000	5	12	0	8	0	0	0.31	12	0
2	1.10	0.02	0.001	5	12	0	8	0	0	0.31	92	3
3	1.65	0.07	0.004	5	12	0	8	0	0	0.31	312	9
4	2.20	0.16	0.009	5	12	0	8	0	0	0.31	739	20
5	2.75	0.32	0.018	5	12	0	8	0	0	0.31	1444	40
5.5	3.03	0.43	0.024	5	12	0	8	0	0	0.31	1922	53
6	3.30	0.56	0.031	5	12	0	8	0	0	0.31	2495	69
6.5	3.58	0.71	0.039	5	12	0	8	0	0	0.31	3172	88
7	3.85	0.88	0.049	5	12	0	8	0	0	0.31	3961	109
7.5	4.13	1.09	0.061	5	12	0	8	0	0	0.31	4872	135
8	4.40	1.32	0.074	5	12	0	8	0	0	0.31	5913	163
8.5	4.68	1.58	0.089	5	12	0	0	0	0	0.31	7093	196
9	4.95	1.88	0.106	5	12	0	0	0	0	0.31	8420	232
9.5	5.23	2.21	0.125	5	12	0	0	0	0	0.31	9902	273
10	5.50	2.57	0.146	5	12	0	0			0.31	11550	319
								Bar Y	Spc.			
Toe	6.42	1.29	0.065	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	5174	135
								Bar T	Spc.			
Heel	5.75	1.00	0.045	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	3656	90
								Sh. Key	Spc.			
Sh. Key		No Key	No Key					4	12	0.20	No Key	No Key

Working stress dssign -- Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 in. spc. provides -0.31 In^2/ Ft. for Masonry = 450

9917 15/
6/29/99
DEP



NOTE: ALL REINFORCING
IS 3" CLR. U.N.O.

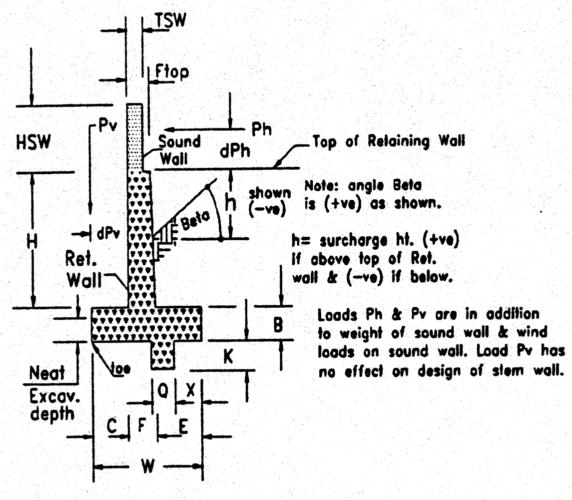
PREMIER
ENGINEERING CORPORATION

SHEET NO 1 OF 4
JOB NUMBER 9917

TITLE

SUBJECT BASIN NOS. 2 & 4 OUTLET WINGS

MADE BY DEP DATE 6/99 CHECKED BY [illegible] DATE 6/99



INPUT DATA (Units : KIP, FEET, U.N.O.)

Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	Ignore top one meter **passive** force (yes or no)
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	4.50	Ft.	no
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top)	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	0.00	K/ft	H =	4.50	Ft
dPh =	0.00	Ft.	B =	1.50	Ft
Surc. ht. h =	0.00	Ft.	W =	4.00	Ft
Beta (b) =	0.00	Deg.	C =	1.50	Ft
Soil on toe=	0.00	Ft.	K=	1.00	Ft
SOIL DATA			X =	1.50	Ft
Cohesion =	0	psf	Q =	1.00	Ft
g(s) (kcf) =	0.13		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	20.00	Deg.			
phi (passive) =	30.00	Deg.	[native soil]		

Ph above Impact load ? yes or no = no

Rustication enter (0,1 or 2 faces) =	0	
Rustication thick (inches) =	1.5	
Wt. of Mas. Wall (psf) =	65	
Masonry Str. f'_m (psi) =	1350	
Sound Wall Reinforcing cl.		
1. Outside face (inches) =	3.00	
2. Soil face (inches)	3.00	
Neat excavation : depth =	0.00	Ft
Backwall slope	90.00	Deg.

Equivalent Fluid Pressures

EFP =	0.064	kcf active
EFP =	0.390	kcf passive

Note: If "yes" Wall length must be >=2* (H+B+dPh)

TITLE

SUBJECT BASIN NOS. 2 & 4 OUTLET WINGS

MADE BY DCP DATE 6\99 CHECKED BY [illegible] DATE 6/99

CALCULATIONS OF SLIDING AND OVERTURNING SAFETY FACTORS (>= 1.5)

DETERMINE HORIZONTAL FORCES AND OVERTURNING MOMENT

				Force	Arm	Moment
Wind load on Sound Wall :			Wind	0.000	6	0.000
Active & surcharge on Key :			Surcharge	0.000	3.00	0.000
Top of Key	=	0.382	Reg. Soil	1.147	2.00	2.295
Bottom of Key	=	0.446	P(h) =	0.000	6	0.000
Passive pressures:			Active S.Key	0.000		
Top Neat =	0.5850	ksf	Passive on Neat Exc	0.000		0.000
Bot.Neat =	0.5850	ksf	Passive on Sh.Key	-0.780		
Bot.Key =	0.9750	ksf		========		=========
			Sum of horizontal active forces =	1.147	Mo =	2.295
			Sum of available horizontal passive forces =	-0.780		

DETERMINE VERTICAL FORCES AND RESISTING MOMENT ABOUT TOE

		P vertical	Arm	M resisting
	1. Sound Wall	0.000	1.50	0.000
Activate active pressure	2. Stem	0.653	2.00	1.305
on Shear Key by using "1"	3. Strem's taper	0.000	2.50	0.000
Otherwise , use "0" --> 0	4. Footing	0.870	2.00	1.740
	5. Key	0.145	2.00	0.290
	6. Soil (horiz.)	0.878	3.25	2.852
* NOTE :	7. Surcharge *	0.000	3.25	0.000
Some designers do not use	8. Soil (sloping)	0.000	3.50	0.000
surcharge in vertical direction.	9. P(v)	0.000	0.00	0.000
Activate vetical component of the	10. Soil (on toe)	0.000	0.75	0.000
surcharge weight by using "1" switch,		=========		=========
Otherwise , use "0" --> 1	P =	2.545	**** Mr =	6.187
			Mr bout Toe =	6.187

	with wind	without wind
OVT. FOS=	2.70	2.70
SLD. FOS=	1.57	1.57

	with wind		without wind
f_{soil} max =	1.09	ksf	1.09
f_{soil} min =	0.19	ksf	0.19
f_{soil} reduced=	0.83	ksf	0.83

	with wind	without wind	
Ecc. =	0.47	0.47	Ft.
Kern =	0.67	0.67	Ft.
Resultant within kern		Resultant within kern	

****Note: if eccentricity is a negative value then resisting Moment is taken about the heel

PREMIER
ENGINEERING CORPORATION

SHEET NO 3 OF 4
JOB NUMBER 9917

TITLE

SUBJECT BASIN NOS. 2 & 4 OUTLET WINGS

MADE BY DEP DATE 6/99 CHECKED BY [illegible] DATE 6/99

Sect.	Dist below top of Ret Wall (Ft.)	M without wind	M wind	M including wind	M design adjusted by /1.25	V without wind	V Including wind	V design adjusted by /1.25	Vc allowable shear
Top of Ret. W.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.45	0.00	0.00	0.00	0.00	0.04	0.04	0.04	5.78
2	0.90	0.01	0.00	0.01	0.01	0.08	0.08	0.08	5.78
3	1.35	0.03	0.00	0.03	0.03	0.14	0.14	0.14	5.79
4	1.80	0.06	0.00	0.06	0.08	0.22	0.22	0.22	5.79
5	2.25	0.12	0.00	0.12	0.16	0.30	0.30	0.30	5.80
5.5	2.48	0.16	0.00	0.16	0.21	0.35	0.35	0.35	5.80
6	2.70	0.21	0.00	0.21	0.28	0.40	0.40	0.40	5.81
6.5	2.93	0.27	0.00	0.27	0.35	0.46	0.46	0.46	5.81
7	3.15	0.33	0.00	0.33	0.44	0.52	0.52	0.52	5.82
7.5	3.38	0.41	0.00	0.41	0.54	0.58	0.58	0.58	5.82
8	3.60	0.50	0.00	0.50	0.66	0.64	0.64	0.64	5.83
8.5	3.83	0.59	0.00	0.59	0.79	0.71	0.71	0.71	5.83
9	4.05	0.71	0.00	0.71	0.94	0.78	0.78	0.78	5.84
9.5	4.28	0.83	0.00	0.83	1.10	0.85	0.85	0.85	5.85
10	4.50	0.97	0.00	0.97	1.29	0.93	0.93	0.93	5.85
Toe	6	0.85	0.00	0.85	1.13	0.26	0.26	0.26	8.91
Heel	6	0.57	0.00	0.57	0.75	0.14	0.14	0.14	9.53
Shr. Key	7	0.42		0.42	0.56	0.78	0.78	0.78	5.22

Shear OK in all members

Procedure for Determining the Design Moments and Shears

Working Stress Design

Example : Find Design Moment and Shear at Sect 10 = 4.50 Ft below top of Ret. Wall

$M_{with\ wind}$ = 0.97 ft-k — $M_{no\ wind}$ = 0.97 ft-k
$1.2{*}M_{cr}$ = 11.83 ft-k — M_{wind} = 0.00 ft-k
$M_{capacity}$ = 16.24 ft-k — with wind allow 1.25 stress increase

(1) First determine the greater value; (a) 0.8*Moment with wind or ; (b) Moment without wind.
here (a)= 0.8* 0.97 = 0.77 ; & (b)= 0.97 ft-k
M without wind >0.8*M with wind therefore 0.97 ft-k is the controling Moment

(2) Determine the greater value of; (a) controlng Moment chosen above or ; (b) $1.2{*}M_{cr}$
here (a)= 0.97 ft-k ; & (b)= 11.83 ft-k
1.2*Mcr controls therefore 11.83 ft-k is greater

(3) Determine if 1.33*(controlng Moment) chosen in item (1) above is less than $1.2{*}M_{cr}$
here 1.33* (controlng Moment) = 1.29 ft-k & 1.2*Mcr = 11.83 ft-k
use 1.33*(controlng Moment) (1) above = 1.29 ft-k = M_{design} < 16.24 ok

(4) Similarly for Shear greater of (0.8*Vwith wind) or (V without wind) <= V_c (allowable shear)
0.8* 0.93 = 0.75 k or 0.93 k <= V_c = 5.85 k ok

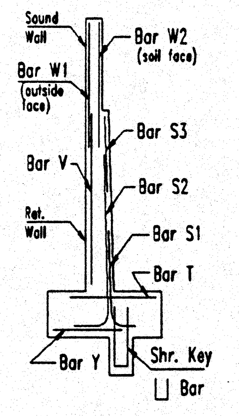
PREMIER
ENGINEERING CORPORATION

SHEET NO 4 OF 4
JOB NUMBER 9917

TITLE

SUBJECT BASIN NOS. 2 & 4 OUTLET WINGS

MADE BY DEP DATE 6/99 CHECKED BY JJ DATE 6/99



Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

Sect.	Dist. (ft)	Design	As	Input Bar Size(s) desired and spacing						As	stress	stress
Top of Ret.W.	below top of Ret. W.	M Ft-K	req'd. In^2/Ft.	Bar No.	Spc. In.	Bar No.	Spc. In.	Bar No.	Spc. In.	prov. In^2/Ft.	fs psi	fc psi
				W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.45	0.00	0.000	5	12	0	8	0	0	0.31	6	0
2	0.90	0.01	0.001	5	12	0	8	0	0	0.31	46	1
3	1.35	0.03	0.002	5	12	0	8	0	0	0.31	156	4
4	1.80	0.08	0.004	5	12	0	8	0	0	0.31	370	10
5	2.25	0.16	0.009	5	12	0	8	0	0	0.31	722	20
5.5	2.48	0.21	0.012	5	12	0	8	0	0	0.31	961	27
6	2.70	0.28	0.015	5	12	0	8	0	0	0.31	1248	34
6.5	2.93	0.35	0.019	5	12	0	8	0	0	0.31	1587	44
7	3.15	0.44	0.024	5	12	0	8	0	0	0.31	1982	55
7.5	3.38	0.54	0.030	5	12	0	8	0	0	0.31	2437	67
8	3.60	0.66	0.037	5	12	0	8	0	0	0.31	2958	82
8.5	3.83	0.79	0.044	5	12	0	0	0	0	0.31	3548	98
9	4.05	0.94	0.052	5	12	0	0	0	0	0.31	4212	116
9.5	4.28	1.10	0.062	5	12	0	0	0	0	0.31	4953	137
10	4.50	1.29	0.072	5	12	0	0			0.31	5777	159
								Bar Y	Spc.			
Toe	5.75	1.13	0.041	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	3252	71
								Bar T	Spc.			
Heel	4.75	0.75	0.025	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	2020	42
								Sh. Key	Spc.			
Sh. Key		0.56	0.035					4	12	0.20	4340	100

Working stress dssign -- Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 in. spc. provides -0.31 In^2/ Ft. for Masonry = 450

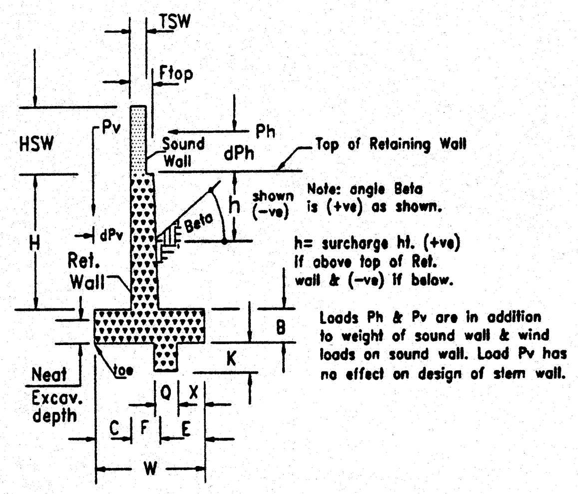
PREMIER
ENGINEERING CORPORATION

SHEET NO 1 OF 4
JOB NUMBER 9917

TITLE

SUBJECT BASIN #4 INLET WINGS

MADE BY DCP DATE 6/99 CHECKED BY FJ DATE 6/99



INPUT DATA (Units : KIP, FEET, U.N.O.)

Height of Sound Wall above Ret. Wall (HSW) =	0.00	Ft.	Ignore top one meter **passive** force (yes or no)
Thickness of Sound Wall (TSW) (inches) =	0.00	In.	
Enter (0) if Sound Wall is Masonry or enter (1) if Concrete =	0		
Wind Load on Sound Wall (psf) =	0.0	psf	
Height of Retaining Wall (H) =	3.67	Ft.	no
O.Face of Sound Wall to O.Face of Retaining Wall (inches) =	0.00	In.	

The Following is for Retaining Wall only

LOADING DATA			WALL PARAMETERS		
Pv =	0.00	K/ft	F(top)	1.00	Ft.
dPv =	0.00	Ft.	F =	1.00	Ft
Ph =	-0.60	K/ft	H =	3.67	Ft
dPh =	-4.67	Ft.	B =	1.50	Ft
Surc. ht. h =	0.00	Ft.	W =	2.50	Ft
Beta (b) =	0.00	Deg.	C =	0.75	Ft
Soil on toe=	0.00	Ft.	K=	0.00	Ft
SOIL DATA			X =	0.00	Ft
Cohesion =	0	psf	Q =	0.00	Ft
g(s) (kcf) =	0.13		f'c =	3000	psi
Friction=	0.40	ksf	fs =	24000	psi
phi (active) =	20.00	Deg.			
phi (passive) =	30.00	Deg.		[native soil]	

Ph above Impact load ? yes or no = no

Rustication enter (0,1 or 2 faces) =	0
Rustication thick (inches) =	1.5
Wt. of Mas. Wall (psf) =	65
Masonry Str. f'_m (psi) =	1350

Sound Wall Reinforcing cl.

1. Outside face (inches) =	3.00
2. Soil face (inches)	3.00

Neat excavation :
depth = 0.00 Ft

Backwall slope 90.00 Deg.

Equivalent Fluid Pressures

EFP =	0.064	kcf active
EFP =	0.390	kcf passive

Note: If "yes" Wall length must be >=2* (H+B+dPh)

PREMIER
ENGINEERING CORPORATION

SHEET NO 2 OF 4
JOB NUMBER 9917

TITLE

SUBJECT BASIN #4 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY JJ DATE 6/99

CALCULATIONS OF SLIDING AND OVERTURNING SAFETY FACTORS (>= 1.5)

DETERMINE HORIZONTAL FORCES AND OVERTURNING MOMENT

Wind load on Sound Wall :
Active & surcharge on Key :
Top of Key = 0.330
Bottom of Key = 0.330
Passive pressures:
Top Neat = 0.5850 ksf
Bot.Neat = 0.5850 ksf
Bot.Key = 0.5850 ksf

	Force	Arm	Moment
Wind	0.000	5.17	0.000
Surcharge	0.000	2.59	0.000
Reg. Soil	0.852	1.72	1.468
P(h) =	-0.600	0.5	-0.300
Active S.Key	0.000		
Passive on Neat Exc	0.000		0.000
Passive on Sh.Key	0.000		
	========		=========
Sum of horizontal active forces =	0.252	Mo =	1.168
Sum of available horizontal passive forces =	0.000		

DETERMINE VERTICAL FORCES AND RESISTING MOMENT ABOUT TOE

	P vertical	Arm	M resisting
1. Sound Wall	0.000	0.75	0.000
2. Stem	0.532	1.25	0.665
3. Strem's taper	0.000	1.75	0.000
4. Footing	0.544	1.25	0.680
5. Key	0.000	2.50	0.000
6. Soil (horiz.)	0.358	2.13	0.760
7. Surcharge *	0.000	2.13	0.000
8. Soil (sloping)	0.000	2.25	0.000
9. P(v)	0.000	0.00	0.000
10. Soil (on toe)	0.000	0.38	0.000
	=========		=========
P =	1.434	**** Mr =	2.105
		Mr bout Toe =	2.105

Activate active pressure on Shear Key by using "1" Otherwise , use "0" --> 0

* NOTE :
Some designers do not use surcharge in vertical direction.
Activate vetical component of the surcharge weight by using "1" switch, Otherwise , use "0" --> 1

	with wind	without wind
OVT. FOS=	1.80	1.80
SLD. FOS=	2.28	2.28

	with wind		without wind
f_{soil} max =	1.46	ksf	1.46
f_{soil} min =	0.00	ksf	0.00
f_{soil} reduced=	1.10	ksf	1.10

	with wind	without wind	
Ecc. =	0.60	0.60	Ft.
Kern =	0.42	0.42	Ft.
	Resultant out of kern !!	Resultant out of kern !!	

****Note: if eccentricity is a negative value then resisting Moment is taken about the heel

PREMIER
ENGINEERING CORPORATION

SHEET NO 3 OF 4
JOB NUMBER 9917

TITLE

SUBJECT BASIN #4 INLET WINGS

MADE BY DEP DATE 6\99 CHECKED BY JJ DATE 6/99

Sect.	Dist below top of Ret Wall (Ft.)	M without wind	M wind	M including wind	M design adjusted by /1.25	V without wind	V including wind	V design adjusted by /1.25	Vc allowable shear
Top of Ret. W.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.37	0.00	0.00	0.00	0.00	0.03	0.03	0.03	5.78
2	0.73	0.00	0.00	0.00	0.01	0.06	0.06	0.06	5.78
3	1.10	0.01	0.00	0.01	0.02	0.11	0.11	0.11	5.78
4	1.47	0.03	0.00	0.03	0.04	0.16	0.16	0.16	5.79
5	1.84	0.07	0.00	0.07	0.09	0.22	0.22	0.22	5.79
5.5	2.02	0.09	0.00	0.09	0.12	0.26	0.26	0.26	5.80
6	2.20	0.11	0.00	0.11	0.15	0.29	0.29	0.29	5.80
6.5	2.39	0.14	0.00	0.14	0.19	0.33	0.33	0.33	5.80
7	2.57	0.18	0.00	0.18	0.24	0.37	0.37	0.37	5.81
7.5	2.75	0.22	0.00	0.22	0.29	0.42	0.42	0.42	5.81
8	2.94	0.27	0.00	0.27	0.36	0.46	0.46	0.46	5.81
8.5	3.12	0.32	0.00	0.32	0.43	0.51	0.51	0.51	5.82
9	3.30	0.38	0.00	0.38	0.51	0.56	0.56	0.56	5.82
9.5	3.49	0.45	0.00	0.45	0.60	0.61	0.61	0.61	5.83
10	3.67	0.53	0.00	0.53	0.70	0.66	0.66	0.66	5.83
Toe	5.17	0.30	0.00	0.30	0.40	0.72	0.72	0.72	8.94
Heel	5.17	0.19	0.00	0.19	0.26	0.50	0.50	0.50	9.55
Shr. Key	5.17	0.00		0.00	#DIV/0!	0.00	0.00	0.00	0.00

Shear OK in all members

Procedure for Determining the Design Moments and Shears

Working Stress Design

Example : Find Design Moment and Shear at Sect 10 = 3.67 Ft below top of Ret. Wall

$M_{with\ wind} =$	0.53	ft-k	$M_{no\ wind} =$	0.53	ft-k
$1.2^*M_{cr} =$	11.83	ft-k	$M_{wind} =$	0.00	ft-k
$M_{capacity} =$	16.24	ft-k	with wind allow 1.25 stress increase		

(1) First determine the greater value; (a) 0.8*Moment with wind or ; (b) Moment without wind.
here (a)= 0.8* 0.53 = 0.42 ; & (b)= 0.53 ft-k
M without wind >0.8*M with wind therefore 0.53 ft-k is the controling Moment

(2) Determine the greater value of; (a) controling Moment chosen above or ; (b) 1.2^*M_{cr}
here (a)= 0.53 ft-k ; & (b)= 11.83 ft-k
1.2*Mcr controls therefore 11.83 ft-k is greater

(3) Determine if 1.33*(controling Moment) chosen in item (1) above is less than 1.2^*M_{cr}
here 1.33* (controling Moment) = 0.70 ft-k & 1.2*Mcr = 11.83 ft-k
use 1.33*(controling Moment) (1) above = 0.70 ft-k = M_{design} < 16.24 ok

(4) Similarly for Shear greater of (0.8*Vwith wind) or (V without wind) <= V_c (allowable shear)
0.8* 0.66 = 0.53 k or 0.66 k <= V_c = 5.83 k ok

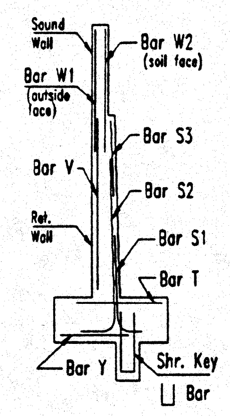
PREMIER
ENGINEERING CORPORATION

SHEET NO 4 OF 4
JOB NUMBER 9917

TITLE

SUBJECT BASIN #4 INLET WINGS

MADE BY DEP DATE 6/99 CHECKED BY JJ DATE 6/99



Note: If the Moment and/or Reinforcing values are indicated as negative. Then the reinforcing bars for those values need to be placed in opposite face than as shown in this diagram.

Sect.	Dist. (ft) below top of Ret. W.	Design M Ft-K	As req'd. In^2/Ft.	Input Bar Size(s) desired and spacing						As prov. In^2/Ft.	stress fs psi	stress fc psi
Top of Ret.W.				Bar No.	Spc. In.	Bar No.	Spc. In.	Bar No.	Spc. In.			
				W_1	Spc.							
O.F.	0.00	0.00	chk cl	0	0	W_2	Spc.			0.00		
Soil F.	0.00	0.00	chk cl			0	0			0.00		
				S1	Spc.	S2	Spc.	S3	Spc.			
1	0.37	0.00	0.000	5	12	0	8	0	0	0.31	3	0
2	0.73	0.01	0.000	5	12	0	8	0	0	0.31	25	1
3	1.10	0.02	0.001	5	12	0	8	0	0	0.31	85	2
4	1.47	0.04	0.002	5	12	0	8	0	0	0.31	201	6
5	1.84	0.09	0.005	5	12	0	8	0	0	0.31	392	11
5.5	2.02	0.12	0.006	5	12	0	8	0	0	0.31	521	14
6	2.20	0.15	0.008	5	12	0	8	0	0	0.31	677	19
6.5	2.39	0.19	0.011	5	12	0	8	0	0	0.31	861	24
7	2.57	0.24	0.013	5	12	0	8	0	0	0.31	1075	30
7.5	2.75	0.29	0.016	5	12	0	8	0	0	0.31	1322	36
8	2.94	0.36	0.020	5	12	0	8	0	0	0.31	1605	44
8.5	3.12	0.43	0.024	5	12	0	0	0	0	0.31	1925	53
9	3.30	0.51	0.028	5	12	0	0	0	0	0.31	2285	63
9.5	3.49	0.60	0.033	5	12	0	0	0	0	0.31	2687	74
10	3.67	0.70	0.039	5	12	0	0			0.31	3134	87
								Bar Y	Spc.			
Toe	4.92	0.40	0.014	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	1139	25
								Bar T	Spc.			
Heel	3.92	0.26	0.009	Full Ftg. Wd. Bars Y or N =			y	5	12	0.31	693	15
								Sh. Key	Spc.			
Sh. Key		No Key	No Key					4	12	0.20	No Key	No Key

Working stress dssign – Allow = 24000 1200

O.Face "V" bars #'s 5 at 12 _in. spc. provides -0.31 In^2/ Ft. for Masonry = 450

14. Project Survey Report

Southeast Mesa
ADMP
Retention Sites 1-4

Survey Control

Larry Maldonado

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
16863
LARRY M.
MALDONADO
Date Signed 4-24-98
ARIZONA, U. S. A.

Project Engineering Consultants
April 24, 1998

11	881268.75656 584215.81064	1529.059	Fd. Brass Cap in Handhole @ 88th Street & University Drive
12	883911.55087 586859.32007	1586.985	Fd. Maricopa County Highway Department Brass Cap in Handhole @ University Drive & Ellsworth
13	881271.39900 586863.81482	1552.684	Fd. Brass Cap in Handhole @ University Drive & Ellsworth
16	881273.35232 589511.33991	1574.954	Fd. Brass Cap in Handhole @ 96th Street & University Drive
17	881276.02276 592155.04738	1595.600	Fd. Brass Cap in Handhole @ University Drive & Crismon Road
20	881281.17162 594470.70843	1606.001	Fd. Brass Cap in Handhole @ University Drive & Merrill
29	882621.65494 588510.45592	1582.887	Fd. MCC Brass Cap flush w/pavement @ 94th Way & Des Moines
36	879953.11636 588847.93489	1555.515	Fd. Maricopa County Highway Department Brass Cap flush w/pavement @ 95th Street & Boise
253		1570.333	Fd. Brass Cap in Handhole @ 95th Place & University Drive

Project: SE Mesa ADMP
Aerial Control Points
Retention Sites 1-4

Project Eng. Consult.
4-24-98

Datum: Modified NAD27 Datum (Ground)
NGVD29 Elevations

Basis of Bearing: Grid North

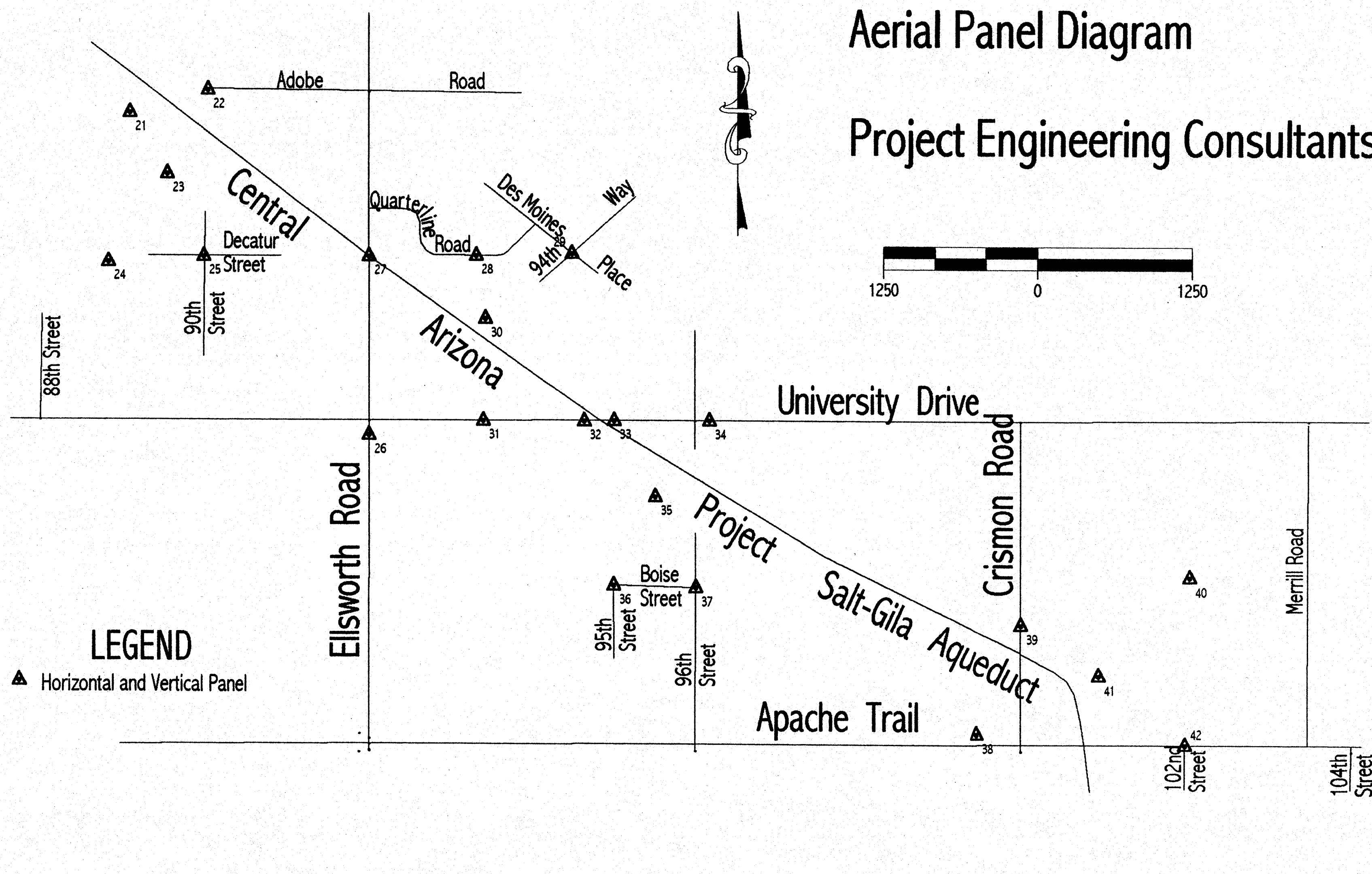
Point of Translation, Grid to Ground: Panel Point 35

Combined Scale Factor for Project: 1.000165879

Pt.	Northing	Easting	Pnl Elev	Notes
21,	883736.08377,	584927.80073,	1568.38599,	
22,	883920.41734,	585562.18194,	1576.07996,	
23,	883243.74111,	585229.81282,	1564.66602,	
24,	882542.08274,	584757.63150,	1551.99500,	
25,	882588.06937,	585529.05245,	1558.01904,	
26,	881151.18706,	586861.56544,	1552.00806,	
27,	882591.46093,	586861.26239,	1576.31604,	
28,	882599.43625,	587730.45655,	1576.69299,	
29,	882621.65494,	588510.45592,	1582.88700,	
30,	882095.03360,	587804.00275,	1570.62000,	
31,	881271.85007,	587788.87024,	1560.66296,	
32,	881272.44817,	588609.89441,	1570.48596,	
33,	881272.91325,	588850.40130,	1570.35400,	
34,	881273.08427,	589627.84724,	1576.61401,	
35,	880662.45000,	589186.26600,	1565.17700,	
36,	879953.11636,	588847.93489,	1555.51501,	
37,	879937.06769,	589511.64897,	1560.34802,	
38,	878776.56822,	591795.32272,	1567.27698,	
39,	879646.96058,	592153.25008,	1576.31897,	
40,	880025.41835,	593518.98559,	1588.62903,	
41,	879242.70353,	592777.90368,	1578.31006,	
42,	878691.42610,	593479.66207,	1580.36400,	

SE Mesa ADMP
Retention Sites 1-4
Aerial Panel Diagram

Project Engineering Consultants



Project: SE Mesa ADMP
Section Corners and Quarter Corners
Retention Sites 1-4

Project Eng. Consult.
4-24-98

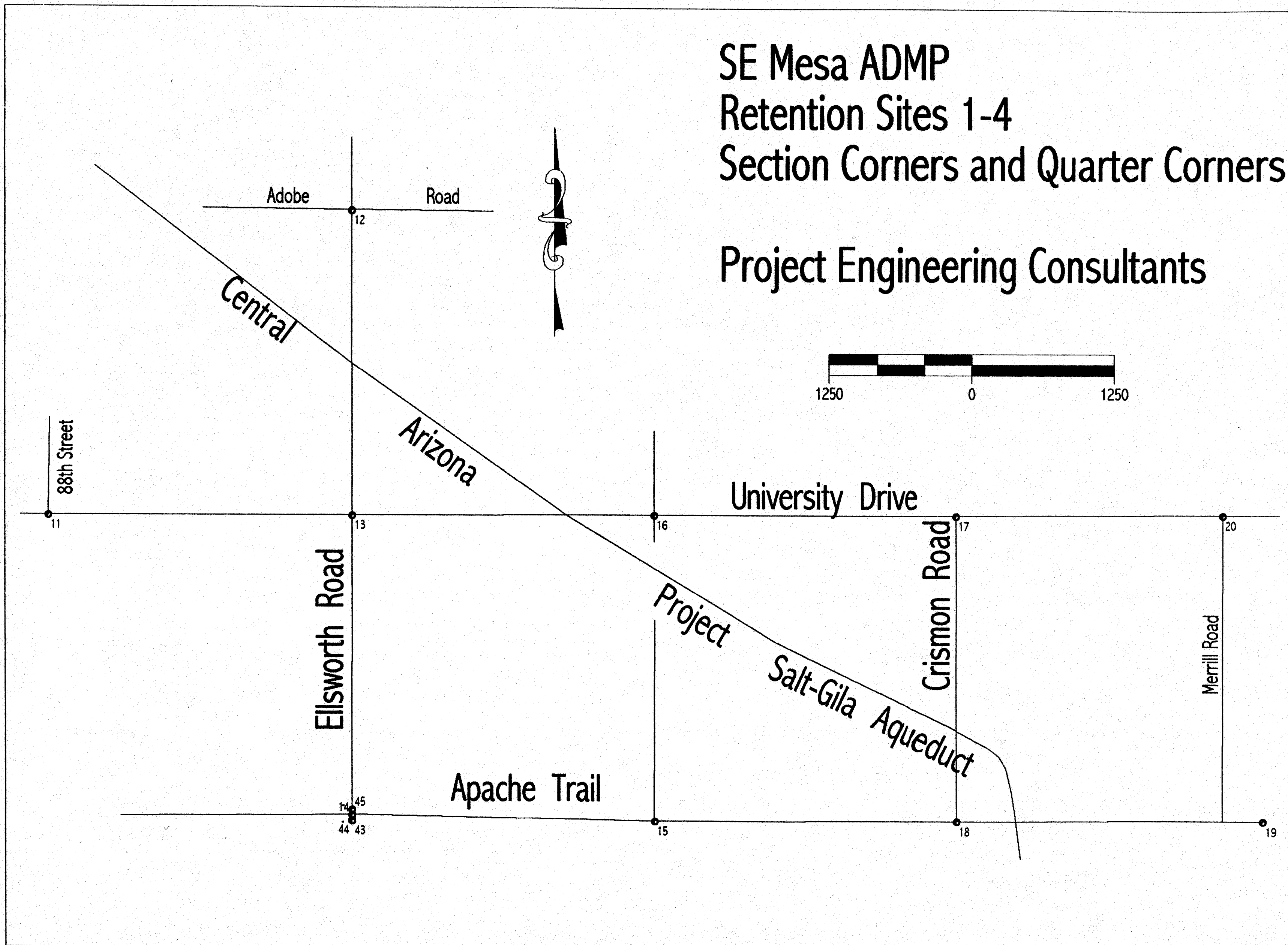
Datum: Modified NAD27 Datum (Ground)
NGVD29 Elevations

Basis of Bearing: Grid North

Point of Translation, Grid to Ground: Panel Point 35

Combined Scale Factor for Project: 1.000165879

Pt	Northing	Easting	Elevation	Notes
11,	881268.75656,	584215.81064,	1529.05896,	BC in HH
12,	883911.55087,	586859.32007,	1586.98500,	BC in HH
13,	881271.39900,	586863.81482,	1552.68396,	BC in HH
14,	878684.77914,	586861.54091,	0.00000,	BC in HH
15,	878633.78354,	589508.34942,	1550.15100,	Rebar in Pothole
16,	881273.35232,	589511.33991,	1574.95398,	BC in HH
17,	881276.02276,	592155.04738,	1595.59998,	BC in HH
18,	878636.91706,	592155.68448,	1570.21704,	BC in HH
19,	878643.92923,	594803.21358,	1587.10300,	Steel Pin
20,	881281.17162,	594470.70843,	1606.00098,	BC in HH
43,	878630.93987,	586861.37276,	0.00000,	BC in HH
44,	878638.71806,	586861.31472,	0.00000,	BC in HH
45,	878730.83769,	586861.49714,	0.00000,	BC in HH


SE Mesa ADMP
Retention Sites 1-4
Section Corners and Quarter Corners
Project Engineering Consultants
1250
0
1250
Adobe
Road
12
Central
Arizona
Project
Salt-Gila
Aqueduct
88th Street
University Drive
11
13
16
17
20
Ellsworth Road
Crismon Road
Merrill Road
Apache Trail
14
45
44
43
15
18
19

2044,879054.293432,592185.981751, 1573.421862,NAIL
2045,879170.843689,592526.350008, 1575.490964,NAIL
2046,879239.938320,592401.710229, 1567.492351,CONC
2047,879258.386608,592385.309209, 1567.532566,CONC
2048,879260.075894,592379.537801, 1569.762508,WW
2049,879236.827180,592401.211742, 1568.823043,WW
2050,879234.525935,592389.362191, 1567.722337,INV
2051,879242.078193,592382.948863, 1567.867179,INV
2052,879249.967594,592376.064861, 1567.926088,INV
2053,879253.540297,592373.430961, 1575.910102,HDWL
2054,879231.356189,592392.007121, 1575.866225,HDWL
2055,879067.032757,592506.804474, 1569.091733,WW
2056,879062.831678,592510.558969, 1567.876297,CONC
2057,879040.427307,592521.156793, 1567.858606,CONC
2058,879037.553213,592520.529655, 1568.945204,WW
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2060,879048.199918,592504.455860, 1568.111538,INV
2061,879057.440757,592500.278778, 1568.067852,INV
2062,879061.455159,592498.366565, 1575.777171,HDWL
2063,879034.963571,592510.211969, 1575.906041,HDWL
2064,879129.985928,592225.717936, 1566.459756,WW
2065,879120.514790,592229.605259, 1564.406380,CONC
2066,879105.239779,592245.359524, 1565.853052,WW
2067,879116.827798,592250.165128, 1564.453765,INV
2068,879124.542532,592243.523795, 1564.402206,INV
2069,879132.488921,592236.907079, 1564.442794,INV
2070,879135.396246,592234.557120, 1573.363104,HDWL
2071,879114.129771,592252.628195, 1573.342414,HDWL
2072,879108.060505,592210.692904, 1565.206046,INV
2073,879119.254342,592213.574246, 1565.387333,INV
2074,878984.797042,592322.587189, 1566.927853,WW
2075,878956.194134,592335.088777, 1566.970110,WW
2076,878965.756773,592341.655113, 1570.341704,TOP PIPE
2077,878974.898045,592337.652218, 1570.517076,TOP PIPE
2078,878983.702244,592333.855569, 1570.364858,TOP PIPE
2079,878961.663300,592343.519265, 1573.412615,HDWL
2080,878987.223594,592332.296851, 1573.350355,HDWL
2081,879116.353595,592028.803982, 1568.658733,TOP PIPE
2082,879127.839110,592030.482533, 1569.072759,TOP PIPE
2083,878615.886589,592399.699119, 1573.072247,NAIL
2084,878595.762391,592370.335647, 1568.919446,TOP PIPE
2085,878595.977864,592358.232581, 1568.878171,TOP PIPE
2086,878596.210542,592346.736793, 1568.732424,TOP PIPE
2087,878563.968229,592309.855351, 1571.960135,HDWL
2088,878563.373951,592327.585735, 1571.305554,HDWL
2089,878562.653903,592344.664285, 1571.968888,HDWL
2090,878563.494038,592337.184421, 1565.821179,INV
2091,878563.924264,592330.273315, 1565.566153,INV
2092,878564.018904,592323.250623, 1565.556454,INV
2093,878564.297087,592316.307897, 1565.688257,INV
2094,878779.380514,592347.000565, 1570.000849,TOP PIPE
2095,878779.477446,592359.026752, 1570.027748,TOP PIPE
2096,878778.962230,592370.554683, 1569.887231,TOP PIPE
2097,883911.550900,586859.320100, 1586.985000,BC
2098,883720.802565,585456.836960, 1574.100050,NAIL
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2100,883633.630689,585487.789933, 1565.573424,CONC
2101,883627.366321,585481.843571, 1572.005552,HDWL
2102,883639.890680,585463.621888, 1572.018689,HDWL
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2106,883497.690573,585363.625524, 1565.463421,CONC
2107,883483.155678,585382.530080, 1565.963398,WW
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2112,883491.801499,585387.190922,  1572.204556,HDWL
2113,882015.160295,587817.076028,  1565.285836,CONC
2114,881991.132963,587851.881878,  1565.272007,CONC
2115,881984.442085,587844.978678,  1571.621337,HDWL
2116,882006.378498,587813.134699,  1571.585470,HDWL
2117,882006.542737,587813.362383,  1565.313311,INV
2118,882001.497689,587820.757486,  1565.264836,INV
2119,881995.903186,587828.818155,  1565.229591,INV
2120,881990.337320,587836.947361,  1565.281527,INV
2121,881984.767448,587844.958471,  1565.298056,INV
2122,881872.740527,587719.014411,  1565.284960,TOE
2123,881881.538938,587726.675102,  1565.288338,INV
2124,881881.613623,587726.704494,  1571.942093,HDWL
2125,881859.386101,587758.179387,  1571.912977,HDWL
2126,881859.621902,587758.224055,  1565.321744,INV
2127,881849.262939,587753.597618,  1565.293855,TOE
```

CURVE FORMULAS

$T = R \tan \frac{1}{2} I$

$T = \dfrac{50 \tan \frac{1}{2} I}{\text{Sin. } \frac{1}{2} D}$

$\text{Sin. } \frac{1}{2} D = \dfrac{50}{R}$

$\text{Sin. } \frac{1}{2} D = \dfrac{50 \tan \frac{1}{2} I}{T}$

$R = T \text{ cot. } \frac{1}{2} I$

$R = \dfrac{50}{\text{Sin. } \frac{1}{2} D}$

$E = R \text{ ex. sec } \frac{1}{2} I$

$E = T \tan \frac{1}{4} I$

$\text{Chord def.} = \dfrac{\text{chord}^2}{R}$

$\text{No. chords} = \dfrac{I}{D}$

Tan. def. = ½ chord def.

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

Right Angle Triangles. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. $10. 10^2 \div 200 = .5.$ $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25. 25^2 \div 200 = 3.125.$ $100 - 3.125 = 96.875$ = Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

Leveling. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574\ d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3} d^2$. The combined correction is negative.

Probable Error. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean =

$$\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$$

MINUTES IN DECIMALS OF A DEGREE

1′	.0167	11′	.1833	21′	.3500	31′	.5167	41′	.6833	51′	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	[illegible]
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	[illegible]
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	[illegible]
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	[illegible]
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	[illegible]
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	[illegible]
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	[illegible]
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

INCHES IN DECIMALS OF A FOOT

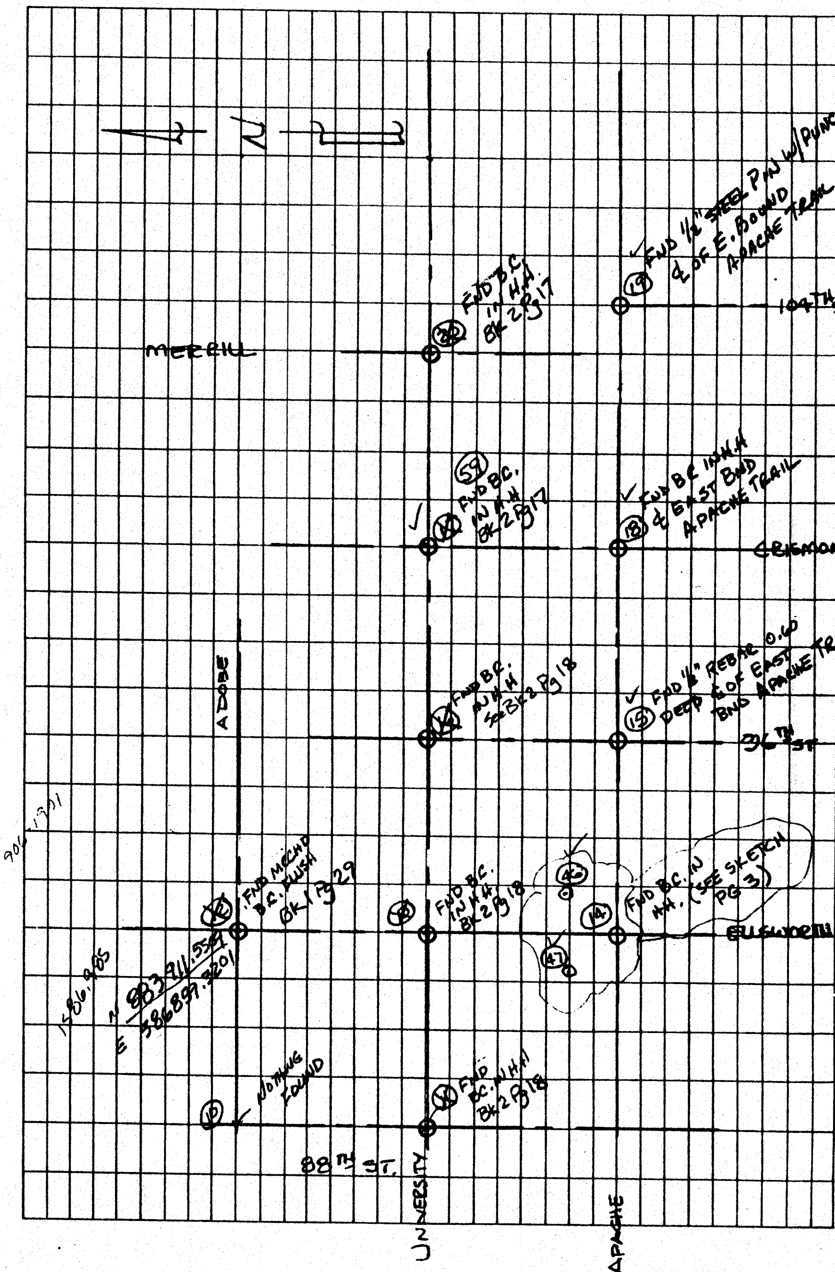
1/16	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	[illegible]
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	[illegible]
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	[illegible]

Elan Publishing Co., Inc. Meredith, N.H. 03253

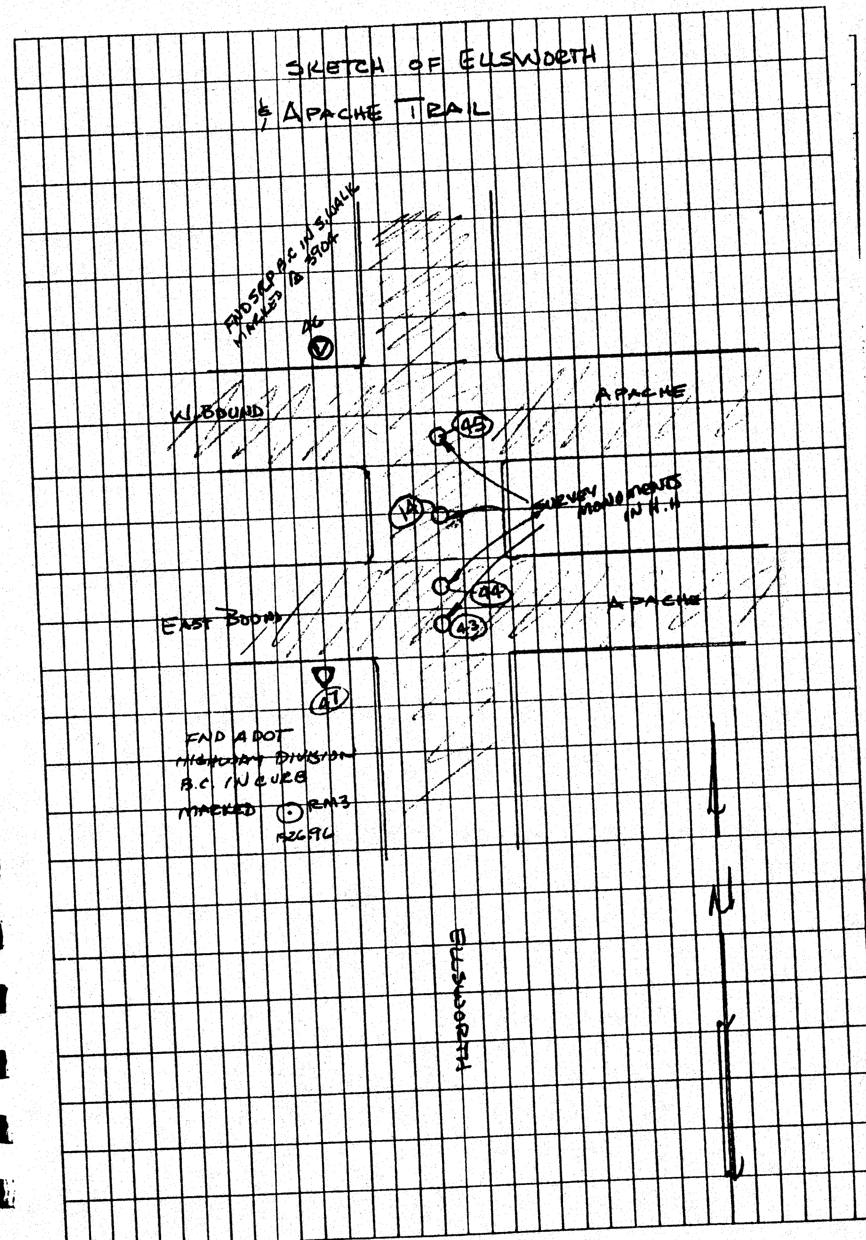
ADDITIONAL DATA
FOR S.E MESA ADMP

3/19/98
J. ROSS
G ANKRUM

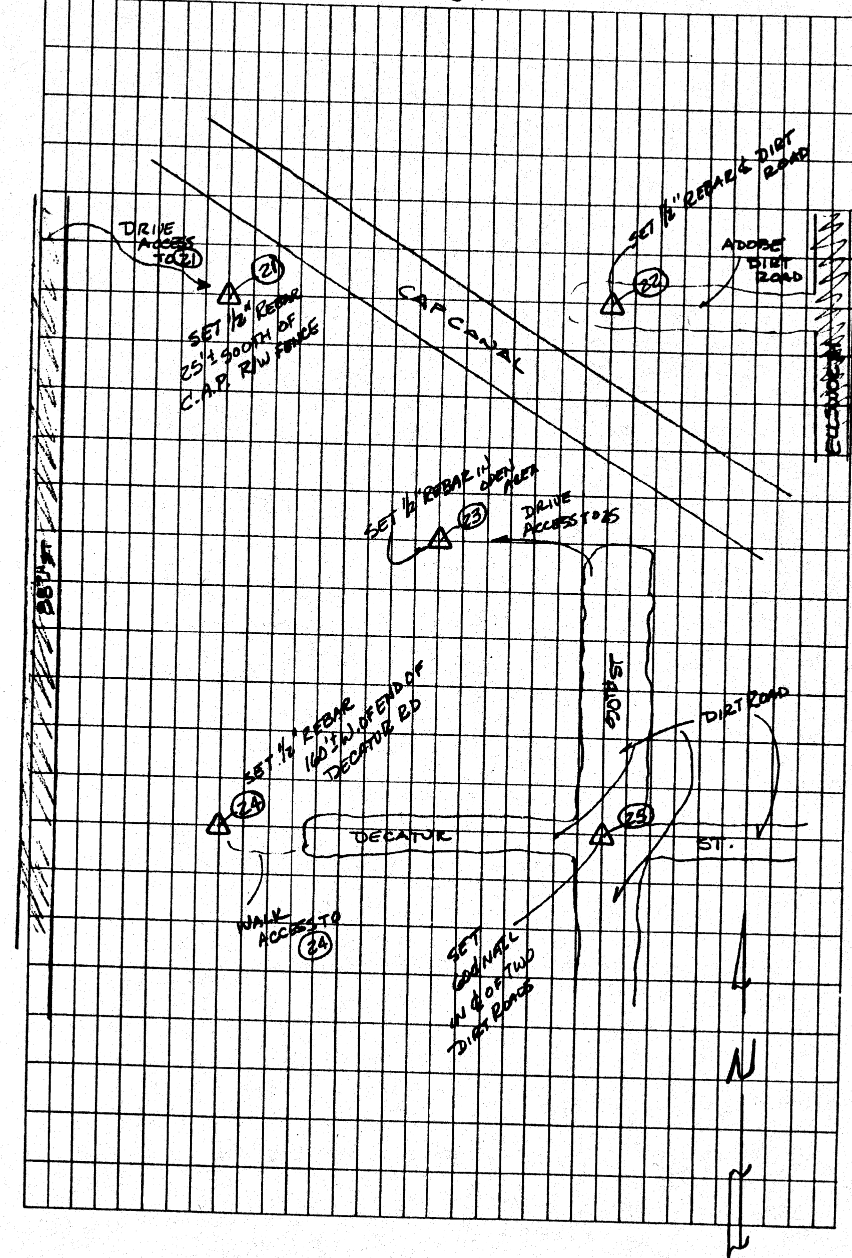
CONTROL SKETCH



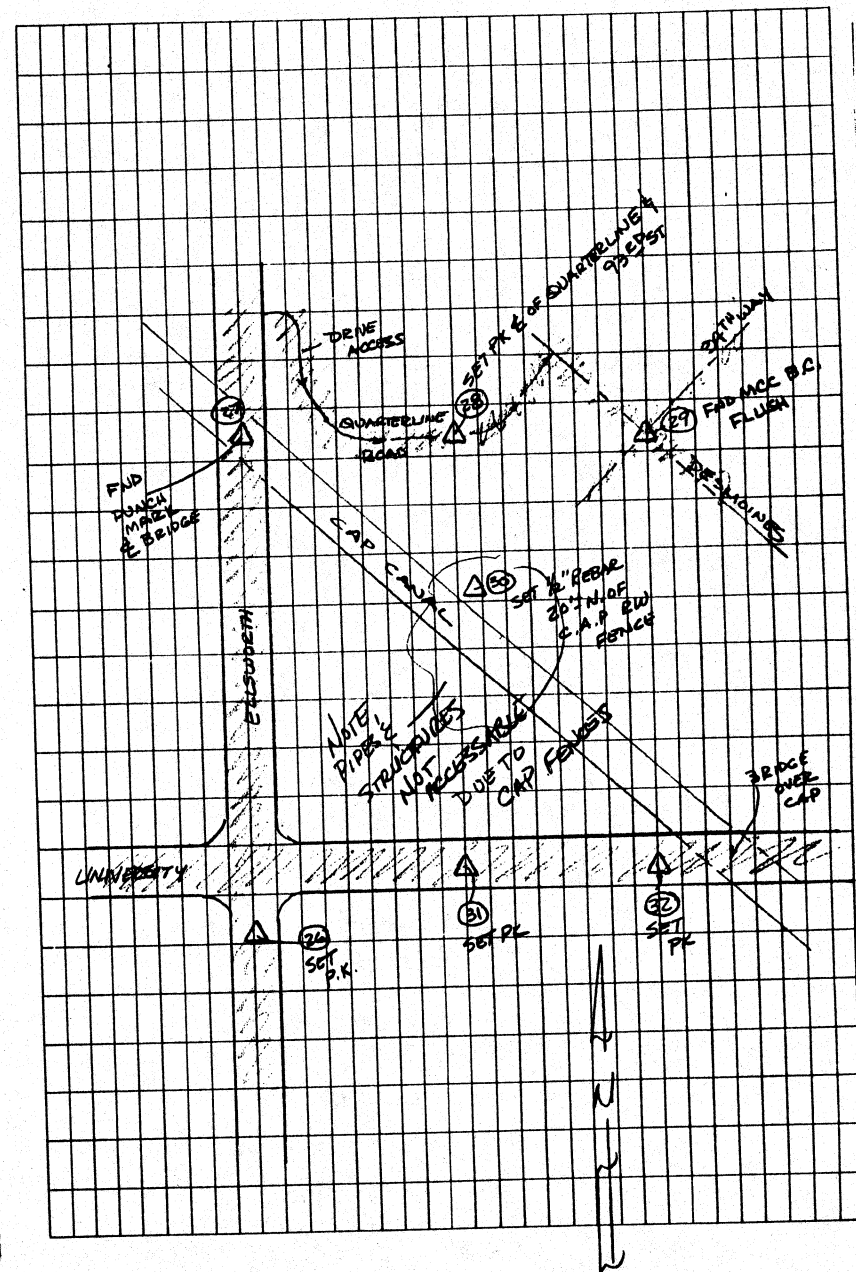
	Horiz ∠	Horiz Dist.
⊼@ 46		
BS@ 47	00-00-00	147.794
FS 45	290-59-26	88.326
FS 14	312-58-53	113.954
FS 44	325-49-55	149.562
FS 43	327-22-22	156.166



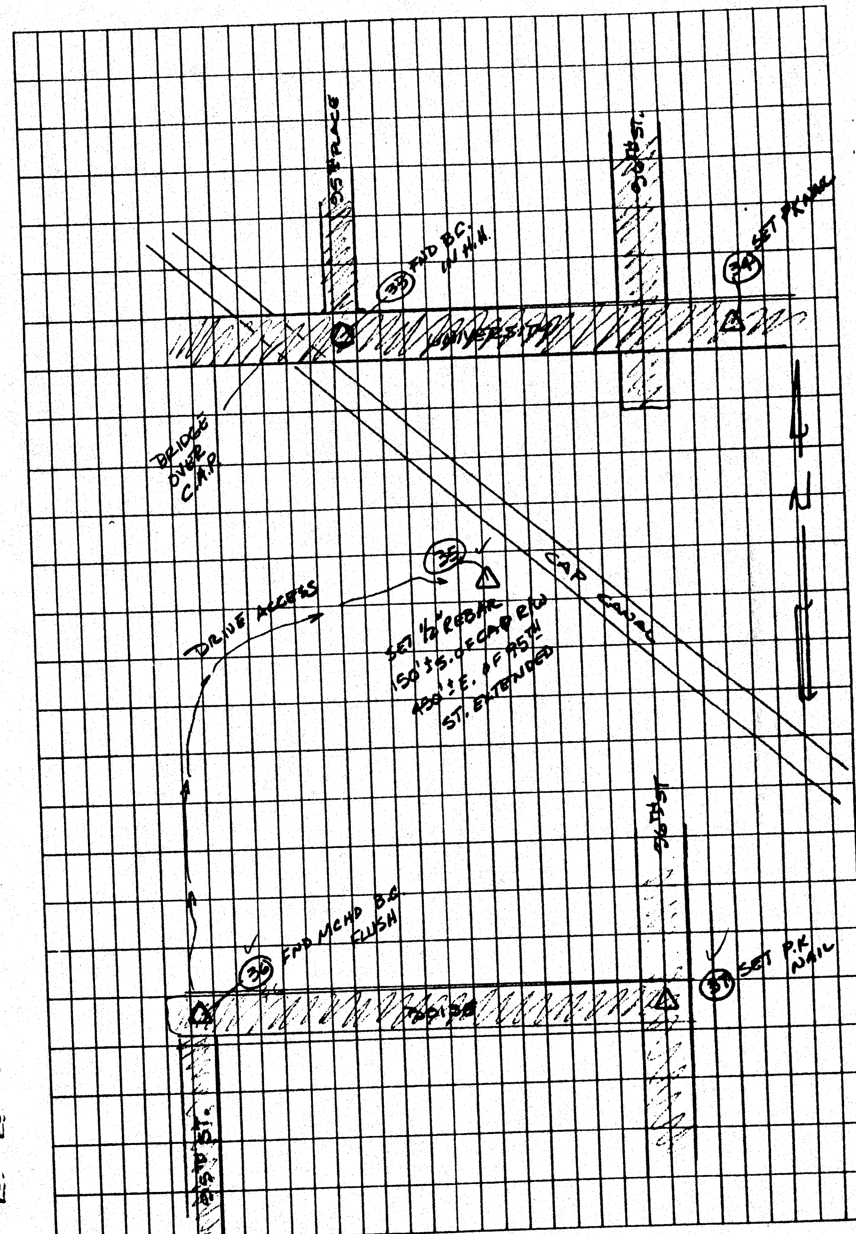
TOPO AREA #1

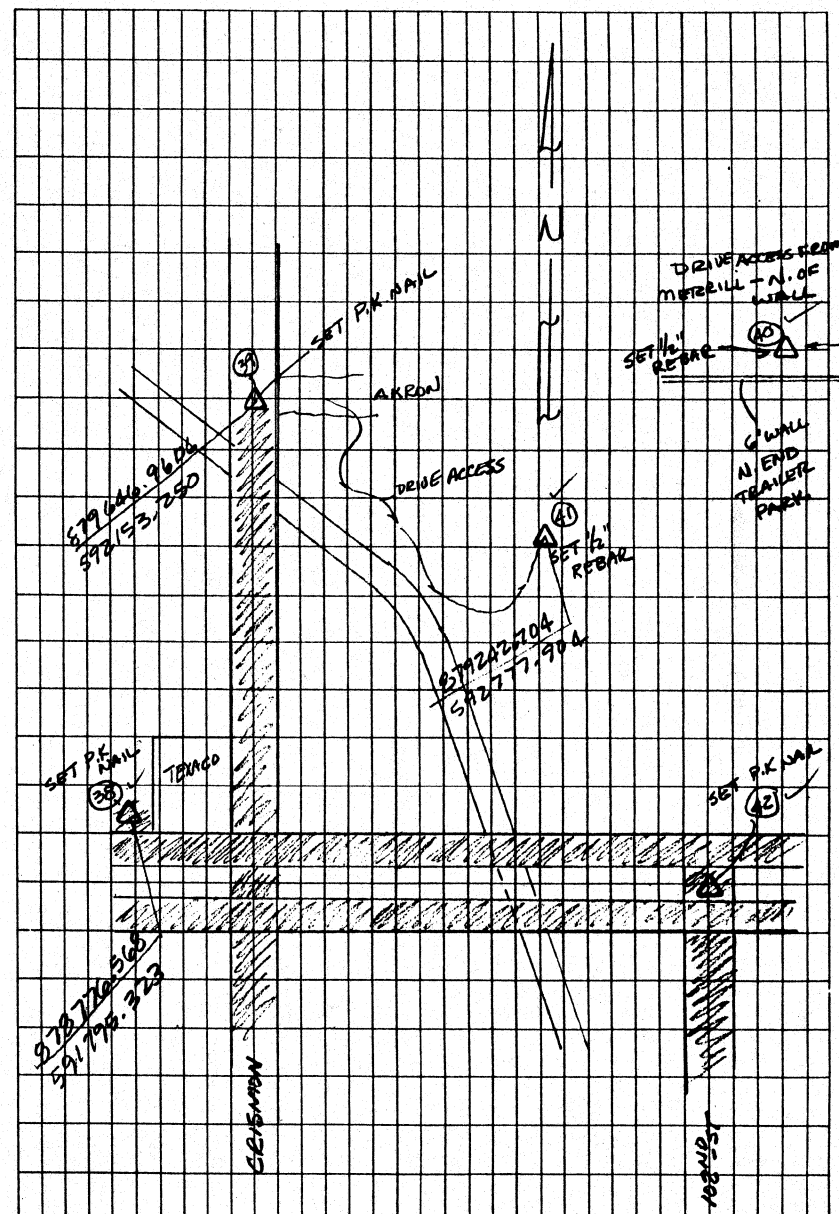

DRIVE ACCESS TO 21
21
SET 1/2" REBAR 25'± SOUTH OF C.A.P. R/W FENCE
CAP CANAL
SET 1/2" REBAR @ DIRT ROAD
22
ADOBE DIRT ROAD
SET 1/2" REBAR IN OPEN AREA
23
DRIVE ACCESS TO 25
38TH ST
60TH ST
DIRT ROAD
SET 1/2" REBAR 160'± W. OF END OF DECATUR RD
24
DECATUR
ST.
25
WALK ACCESS TO 24
SET 60D NAIL IN ℄ OF TWO DIRT ROADS
N

TOPO AREA #2


DRIVE ACCESS
SET PK ℄ OF QUARTERLINE & 93RD ST
PATHWAY
27
28
29
FND MCC B.C. FLUSH
QUARTERLINE ROAD
DES MOINES
FND PUNCH MARK ℄ BRIDGE
CAP
CAP
30
SET ½" REBAR 20'± N. OF C.A.P. R/W FENCE
ELLSWORTH
NOTE: PIPES & STRUCTURES NOT ACCESSABLE DUE TO CAP FENCES
BRIDGE OVER CAP
UNIVERSITY
26
SET P.K.
31
SET PK
32
SET PK
N

TOPO AREA
#3


35TH PLACE
34TH ST.
33 FND B.C. IN H.H.
34 SET PK NAIL
UNIVERSITY
BRIDGE OVER C.A.P.
CAP CANAL
N
35
DRIVE ACCESS
SET 1/2" REBAR 150'± S. OF CAP R/W 450'± E. OF 35TH ST. EXTENDED
36 FND MCHD B.C. FLUSH
37 SET P.K NAIL
36TH ST
35TH ST.


N
DRIVE ACCESS FROM MERRILL - N. OF WALL
SET P.K NAIL
39
AKRON
SET 1/2" REBAR
40
6' WALL N. END TRAILER PARK
879646.9606
592153.250
DRIVE ACCESS
41
SET 1/2" REBAR
879424.704
592777.904
SET P.K NAIL
38
TEXACO
SET P.K NAIL
42
878776.568
591795.323
CRISMAN
102ND ST

POINT LIST

PT#	DESCRIPTION	PAINT OR PAPER	SET PANEL	PANEL ELEVATION
✓ 10	NOTHING FOUND	—	—	—
~~11~~	FND B.C. IN H.H. 88TH ST & UNIVERSITY	—	—	—
~~12~~	FND MCCHD B.C. FLUSH ADOBE & ELLSWORTH	—	—	—
~~13~~	FND BC. IN H.H. @ UNIVERSITY & ELLSWORTH	—	—	—
14	FND B.C. IN H.H @ ELLSWORTH & APACHE TRAIL	—	—	—
15	FND 1/2" REBAR 0.60 DEEP @ 96TH ST. & E. BOUND APACHE TRAIL	—	—	—
~~16~~	FND B.C. IN H.H @ 96TH ST & UNIVERSITY	—	—	—
~~17~~	FND B.C. IN H.H. @ CRISMON & UNIVERSITY	—	—	—
18	FND BC. IN H.H @ CRISMON & E. BOUND APACHE TRAIL	—	—	—
19	FND 1/2" STEEL PIN W/ PUNCH @ 104TH ST & E. BOUND APACHE TR.	—	—	—
~~20~~	FND B.C. IN H.H. @ MERRILL & UNIVERSITY	—	—	—
✓ 21	SET 1/2" REBAR 25'± S. OF C.A.P. R/W FENCE	PAPER		1568.38
22	SET 1/2" REBAR ℄ OF ADOBE - DIRT ROAD	PAPER		1576.09
✓ 23	SET 1/2" REBAR	PAPER		1564.66
24	SET 1/2" REBAR	PAPER		1551.99
25	SET 60d NAIL INTERSEC. DECATUR & 90TH ST.	PAPER		1558.02
26	SET P.K. ℄ ELLSWORTH 60'± SOUTH OF UNIV.	PAINT	✓	1552.01
27	FND PUNCH MARK & CAP BRIDGE & ELLSWORTH	PAINT	✓	1574.32
28	SET P.K. @ QUARTERLINE RD & 93RD ST	PAINT	✓	1576.70
29	FND MCC BC FLUSH @ 94TH WAY & DES MOINES	PAINT	✓	1582.90
30	SET 1/2" REBAR N. OF C.A.P. R/W	PAPER		1570.63
31	SET P.K. NAIL ℄ OF UNIVERSITY	PAINT	✓	1560.67
32	SET P.K NAIL ℄ OF UNIVERSITY	PAINT	✓	1570.49
33	FND B.C. IN H.H @ UNIVERSITY & 95TH PLACE	PAINT	✓	1570.77
34	SET P.K IN ℄ UNIVERSITY 130'± E. OF 96TH ST.	PAINT	✓	1576.67

POINT LIST CONTINUED

PT #	DESCRIPTION	PAINT OR PAPER	
35	SET 1/2" REBAR 150'± S. OF C.A.P R.W. 450'± E. OF 95TH ST. EXTENDED	PAPER	
36	FND MCHD BC FLUSH @ BOISE & 95TH ST.	PAINT	✓
37	SET P.K NAIL @ BOISE & 96TH ST	PAINT	✓
38	SET P.K NAIL N. OF APACHE TRAIL & W. OF CRISMON. (W. OF TEXACO)	PAINT	✓
39	SET PK NAIL ℄ OF CRISMON & AKRON (EAST)	PAINT	✓
40	SET 1/2" REBAR 15' N OF WALL TRAILER PARK ON 102ND ST. EXTENDED	PAPER	
41	SET 1/2" REBAR	PAPER	
42	SET P.K. NAIL ON ℄ 102ND ST. X-OVER BETWEEN E & W BOUND APACHE	PAINT	✓
43		—	
44		—	
45		—	
46		—	
47		—	

PANEL ELEV
1565.18
1555.52
1560.35
1567.28
1576.33
~~1588.57~~
1578.32
1580.37

BENCH LOOPS
TO PANELS

LOOPS ARE RUN FROM
ADJUSTED ELEVATIONS. REFERENCES
ARE TO ORIGINAL NOTES

3-20-98
JR
GA

PT#	+	HI	−	ELEV		DESCRIPTION	
#211				1570.61		BK 2 PG 5 "+" ON CURB - ADJUSTED ELEV	
	4.79	1575.40					
PANEL 38			8.12	1567.28		PK NAIL - SEE PG 7	477.707
	8.25	1575.53					
#211			4.92	1570.61		✓, N	
#244				1595.15		PK - BK 2 - PG 17	
	3.23	1598.38					
TP			5.56	1592.82			
	4.92	1597.74					
TP			4.15	1593.59			
	2.55	1596.14					
PANEL #40			7.57	~~1588~~.57	→	1/2" REBAR - SEE PG 7 (REBAR DESTROYED TWICE)	
	7.91	1596.48					
TP			2.66	1593.82			
	4.22	1598.04					
TP			5.00	1593.04			
	5.79	1598.83					
#244			3.67	1595.16	(.01)	✓	

PT#	+	HI	−	ELEV	DESCRIPTION
#69				1566.88	PK NAIL - BK2 - PG 37
	8.12	1575.00			
			3.18	1571.82	
	7.71	1579.53			
			3.80	1575.73	
	6.56	1582.29			
PANEL #42			1.92	1580.37	PK NAIL - SEE PG 7 481.697m
	1.76	1582.13			
			6.48	1575.65	
	3.67	1579.32			
			7.66	1571.66	
	3.05	1574.71			
#69			7.83	1566.88	CHECK IN ✓

PT	+	HI	−	ELEV	
#211				1570.61	
	6.92	1577.53			
TP			2.64	1574.89	
	5.50	1580.39			
PANEL# 39			4.06	1576.33	1576.327
	4.06	1580.39			
TP			4.34	1576.05	
	5.94	1581.99			
PANEL# 41			3.67	1578.32	1578.313
	2.44	1580.76			
TP			6.98	1573.78	
	2.21	1575.99			
#211			5.37	1570.62	(.01)

BK 2 PG 5 - "+" ON CURB

SEE PG 7 P.K 480.464

1/2" REBAR SEE PG 7 481.070

B2 PG 5 V/W

PT# STA	+	HI	-	ELEV	
#213				1550.30	
	6.30	1556.60			
TP			1.43	1555.17	
	7.72	1562.89			
PANEL #37			2.54	1560.35	1560.352
	2.92	1563.27			
PANEL # 36			7.75	1555.52	1555.523
	8.12	1563.64			
TP			1.39	1562.25	
	7.00	1569.25			
PANEL # 35			4.07	1565.18	1565.185
	3.33	1568.51			
TP			6.85	1561.66	
	2.29	1563.95			
TP			7.11	1556.84	
	4.17	1561.01			
TP			4.92	1556.09	
	2.77	1558.86			
TP			5.90	1552.96	
	2.97	1555.93			
#213			5.64	1550.29	(.01)

PK SEE BK 2 PG 5

SEE PG 6 - PK 475.595 m

SEE PG 6 - BC. 474.123

SEE PG 6 - ½" REBAR 477.068

✓ /N

PT#	+	HI	−	ELEV	
#252				1574.92	
	6.34	1581.26			
PANEL #34			4.64	1576.62	
	4.40	1581.02			
#252			6.10	1574.92	
#253				1570.33	
	5.52	1575.85		~~1570.77~~	
PANEL #33			5.08	1570.77	
	5.08	1575.85			
S.S PANEL #32			5.36	1570.49	
TP			8.13	1567.72	
	1.11	1568.83			
PANEL #31			8.16	1560.67	
	2.06	1562.73			
TP			4.88	1557.85	
	1.09	1558.94			
#254			6.28	1552.66	(1552.66)

BK 2 PG 18 BC IN H.H. 96TH ST & UNIV

480.954

BK 2 PG 18 BC IN HH 95TH PL & UNIV.

PANEL ON SURFACE INTER 95TH PL & UNIVERSITY 478.771

PK SEE PG 5 478.685

PK SEE PG 5 475.692

BK 2 PG 18 ✓ IN

PT#	+	HI	-	ELEV	
#254				1552.66	
	4.90	1557.56			
PANEL #26			5.55	1552.01	
	5.40	1557.41			
#254			4.75	1552.66✓	

BK 2 PG 18 BC IN H.H

SEE PG 5 PK 473.053

BK 2 PG 18 BC IN H.H

PT #	+	HI	-	ELEV	
#325				1586.90	
	1.45	1588.35			
T.P.			8.35	1580.00	
	0.15	1580.15			
TP			4.46	1575.69	
	5.60	1581.29			
PANEL # 27			4.97	1576.32	1576.317
	2.18	1578.50			
T.P			8.04	1570.46	
	8.49	1578.95			
PANEL # 28			2.25	1576.70	1576.695
	1.53	1578.23			
PANEL # 30			7.60	1570.63	1570.625
	8.00	~~17~~ 1578.63			
TP			1.93	1576.70	
	8.85	1585.55			
TP			3.13	1582.42	
	5.55	1587.97			
PANEL # 29			5.07	1582.90	1582.892
	6.00	1588.90			
TP			2.64	1586.26	
	6.85	1593.11			
#57			1.18	1591.93	(1591.92)

SEE B1 PAGE 9

"+" ON BRIDGE (C.A.P.) SEE PG 5 480.462

P.K. SEE PG 5 480.577

½" REBAR SEE PG 5 478.726

B.C. SEE PG 5 482.465

BK 2 PG 25 CK. ✓ IN

PT#	+	HI	−	ELEV	
PANEL #27				1576.32	
	3.36	1579.68			
TP			10.31	1569.37	
	0.19	1569.56			
TP			8.67	1560.89	
	4.46	1565.35			
PANEL # 25			7.33	1558.02	1558.024
	3.97	1561.99			
TP			6.15	1555.84	
	3.59	1559.43			
PANEL # 24			7.44	1551.99	1551.997
	7.64	1559.63			
TP			1.60	1558.03	
	6.11	1564.14			
TP			1.44	1562.70	
	8.29	1570.99			
PANEL # 21			2.61	1568.38	1568.391
	4.69	1573.07			
TP			8.75	1564.32	
	5.06	1569.38			
PANEL # 23			4.72	1564.66	1564.673
	2.67	1567.33			
TP			8.02	1559.31	
	4.98	1564.29			
TP			3.37	1560.92	

SEE PG 16	
SEE PG 4 GODNAIL	474.886
1/2" REBAR SEE PG 4	473.049
1/2" REBAR SEE PG 4	478.046
1/2" REBAR SEE PG 4	476.912

PT#	+	HI	−	ELEV	
	8.84	1569.76			
TP			0.35	1569.41	
	10.71	1580.12			
PANEL #27			3.82	1576.30	(1576.32)

SEE PG 16

PT#	+	HI	−	ELEV	
#325				1586.90	
	2.02	1588.92			
TP			7.41	1581.51	
	2.17	1583.68			
PANEL #22			7.59	1576.09	1576.085
	7.73	1583.82			
TP			2.31	1581.51	
	7.51	1589.02			
#325			2.11	1586.91	(1586.90)

SEE BK1 PG 9

1/2" REBAR SEE PG 4 480.391m

✓ IN

3-24-98

G.P.S SESSION # 0

PT#	H.I	OPERATOR	TIME ON	TIME OFF	EPOCHS	
SGC 17 BASE	1.891	JKR	8:07	12:55		SGC B.C. in Conc. NEAR R/W FENCE OF FREEWAY SOUTH SIDE & WEST OF MERDIAN Rd
SØ21 BASE	1.877	JKR	8:31	12:34		REBAR PG 4
~~SØ23~~	2.034	JKR	8:43	8:52	120	REBAR ~~see~~ PG 4
~~SØ25~~	2.034	JKR	8:58	8:59	12	NAIL PG 4
~~SØ24~~	2.034	JKR	9:04	9:05	12	REBAR PG 4
~~SØ027~~	2.034	JKR	9:10	9:11	12	"+" ON CONC PG 5
~~SØ22~~	2.034	JKR	9:16	9:17	12	REBAR PG 4
~~SØ12~~ S325	2.034	JKR	9:20	9:21	12	BCAP PG 12
SØ28	2.034	JKR	9:26	9:27	12	PK PG 6
SØ30	2.034	JKR	9:31	9:32	12	REBAR PG 5
SØ29	2.034	JKR	9:36	9:37	12	BC PG 5
*SØ57 ✓	2.034	JKR	9:43	9:44	12	PK #57 FROM EARLIER PHASE 96th ST & QUARTERLINE THIS JOB BK 2 PG 25
SØ34	2.034	JKR	9:48	9:49	12	PK PG 6
~~SØ16~~ S252	2.034	JKR	9:53	9:54	12	BC IN HH 96th & UNIV. PG 2
SØ33	2.034	JKR	9:58	9:59	12	BC IN HH PG 6
SØ32	2.034	JKR	10:01	10:02	12	PK PG 5
SØ31	2.034	JKR	10:05	10:06	12	PK PG 5
SØ26	2.034	JKR	10:10	10:11	12	PK PG 5
~~SØ15~~ S254	2.034	JKR	10:14	10:15	12	BC IN HH PG 2 ELLSWORTH & UNIV
~~SØ11~~ S256	2.034	JKR	10:22	10:23	12	BC IN HH PG 2
SØ46	2.034	JKR	10:30	10:31	12	BC PG 3
SØ47	2.034	JKR	10:37	10:38	12	BC PG 3
SØ37	2.034	JKR	10:44	10:45	12	PK PG 6
SØ36	2.034	JKR	10:48	10:49	12	BC PG 6

SESSION # -0- CONT.

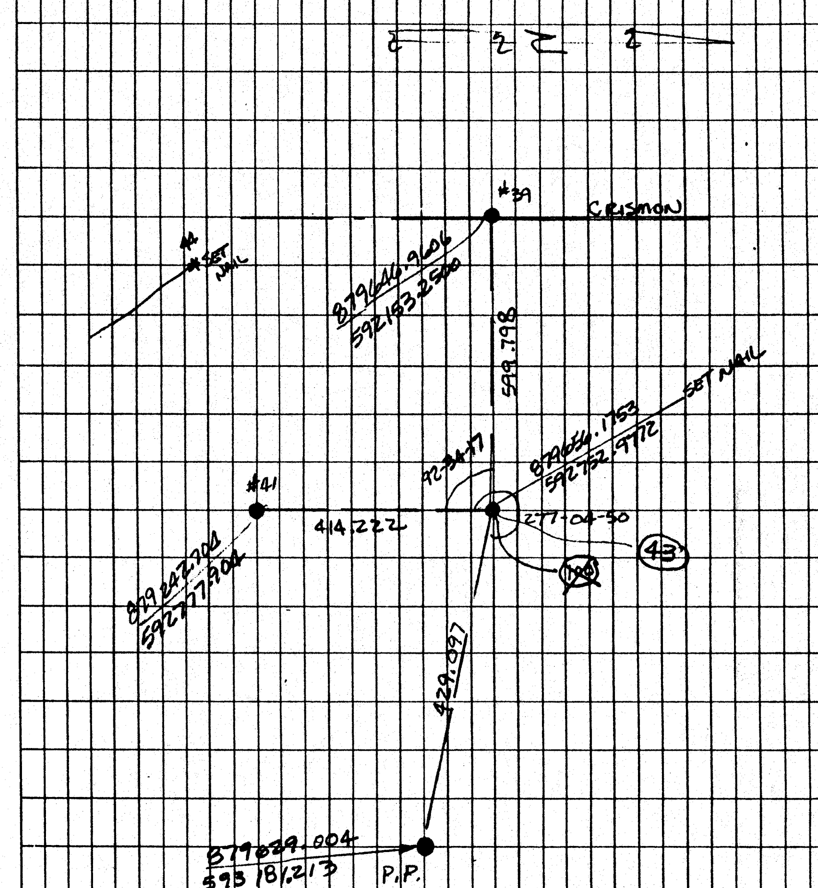
PT #	H.I	OPER.	TIME ON	TIME OFF	EPOCHS
SØ35	2.034	JKR	10:54	10:55	12
SØ15	2.034	"	11:02	11:03	12
SØ18	2.034	"	11:09	11:10	12
SØ19	2.034	"	11:18	11:19	12
SØ40	2.034	"	11:28	11:29	12
SØ42	2.034	"	11:38	11:39	12
SØ38	2.034	"	11:44	11:45	12
SØ41	2.034	"	11:51	11:52	12
SØ39	2.034	"	11:59	12:00	12
* ~~SØ17~~ S059	2.034	"	12:06	12:07	12
~~SØ20~~ S245	2.034	"	12:13	12:23	10MIN.

ALSO POINT # 59

REBAR PG 6
REBAR PG 2
BC PAGE 2
STEEL PIN PG 2
REBAR PG 7
PK PG 7
PK PG 7
REBAR PG 7
PK PG 7
BC IN HH UNN & CRISMON PG 2
BC IN HH MERRILL & UNN. PG 2

3/31/98 SESSION P

			ON	OFF	EPOCHS
SGC 1	1.838	JKR	9.51	1:11	—
SØ21	1.865	JKR	10.18	12:47	—
SØ46	2.034	JKR	10:43 ~~10:38~~	10:52	120
SØ 47	2.034	JKR	10:58	11:00	24
SØ15	2.034	JKR	11:07	11:08	12
SØ18	2.034	JKR	11:13	11:14	12
SØ19	2.034	JKR	11:18	11:19	12
SØ40	2.034	JKR	11:28	11:30	24
SØ42	2.034	JKR	11.39	11:41	24
SØ38	2.034	JKR	11:47	11:49	24
SØ41	2.034	JKR	11:55	11:57	24
SØ17	2.034	JKR	12:03	12:05	24
SØ37	2.034	JKR	12:12	12:14	24
SØ36	2.034	JKR	12:18	12:20	24
SØ35	2.034	JKR	12:26	12:36	10MIN



GROUND ELEV @ P.P. = 1584.26 FEET
POLE INDICATED ON
AERIAL PHOTO

POINT 35

Scale 0.9999091

SLF -0.0000747

Total Scale Factor 1.000165621

Job (Excluding SGC17)

Scale 0.99990905

SLF -0.0000752

Total Scale Factor 1.000166136

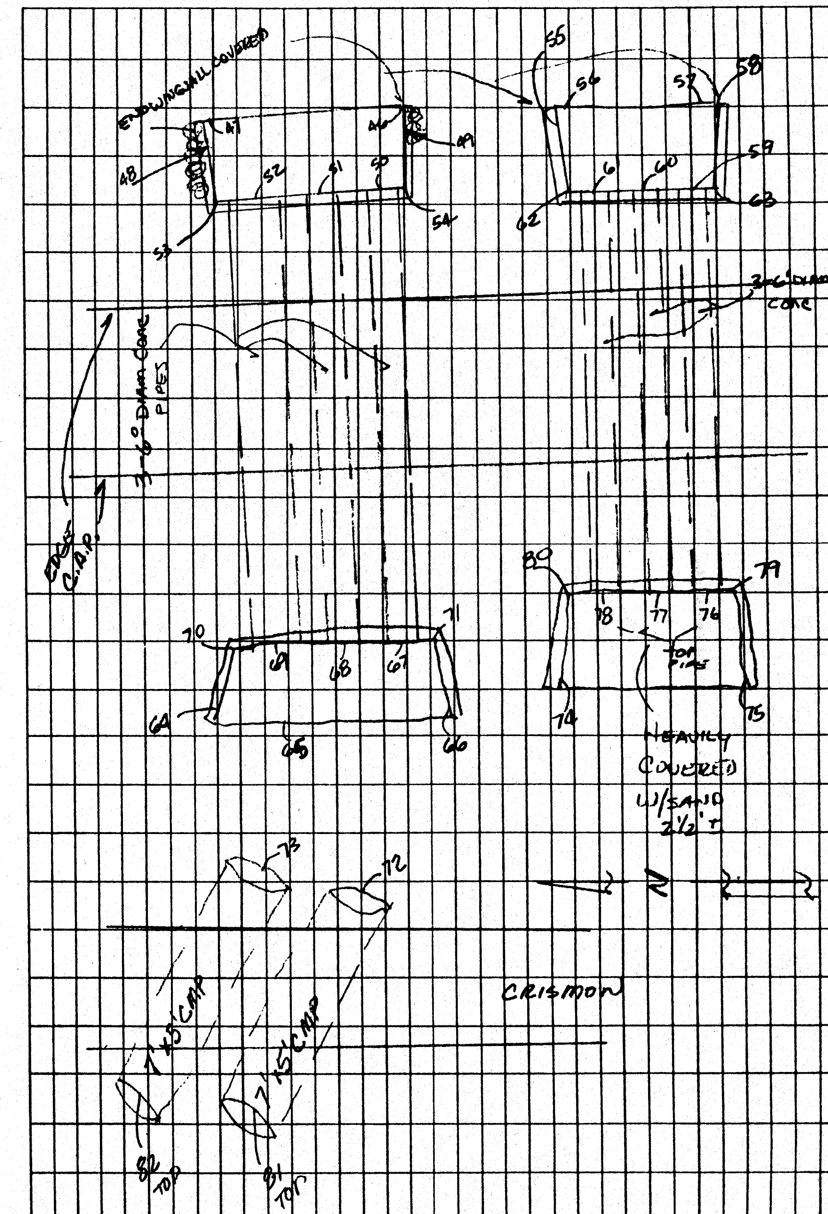
PROJECT SCALE FACTOR

1.000165879

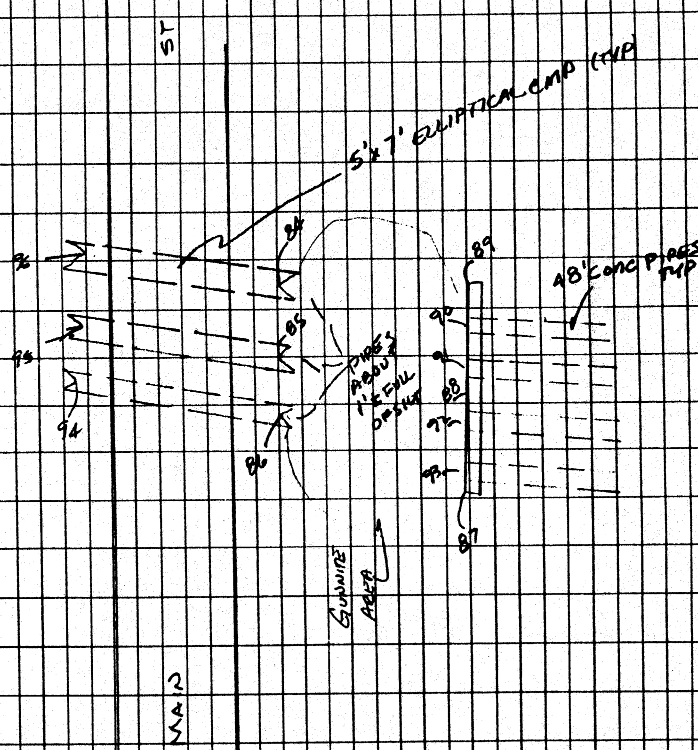
Hold Point 35

Pt	Rod	Descript			
@45					
BS@41	5.18				
46	8.97	Conc			
47		"			
48		W.W			
49		W.W			
50	8.97	INV			
51		INV			
52		INV			
53		H.W			
54	8.97	H.W.			
55		W.W.			
56		Conc			
57		"			
58	8.97	W.W			
59		INV			
60		INV			
61		INV			
62		HW			
63	8.97	H.W.			

** Note - Add 2000 to all topo point numbers to correspond to ASCII file

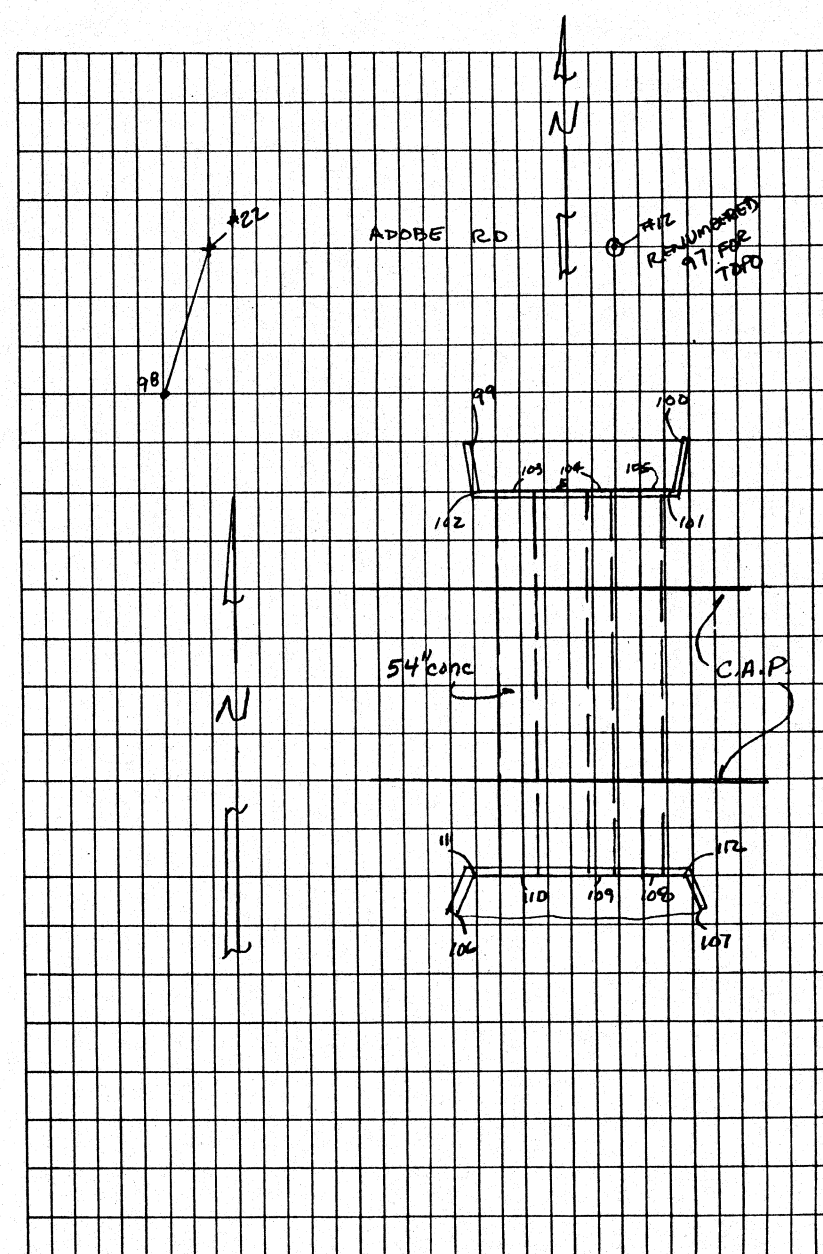


STA	ROD	DESCR
⊼@44	5.35	
BS@39	5.31	
64	8.97	W.W
65		Conc
66		W.W.
67		INV
68	8.97	INV
69		INV
70	8.97	H.W
71	0.25	H.W
72	8.97	INV
73	8.97	INV
74		W.W.
75		W.W
76		TOP OF OPENING PIPE
77		" " " "
78	8.97	" " " "
79		H.W
80		HW
81		TOP OF C.MP
82		" " "
83	8.97	SET NAIL

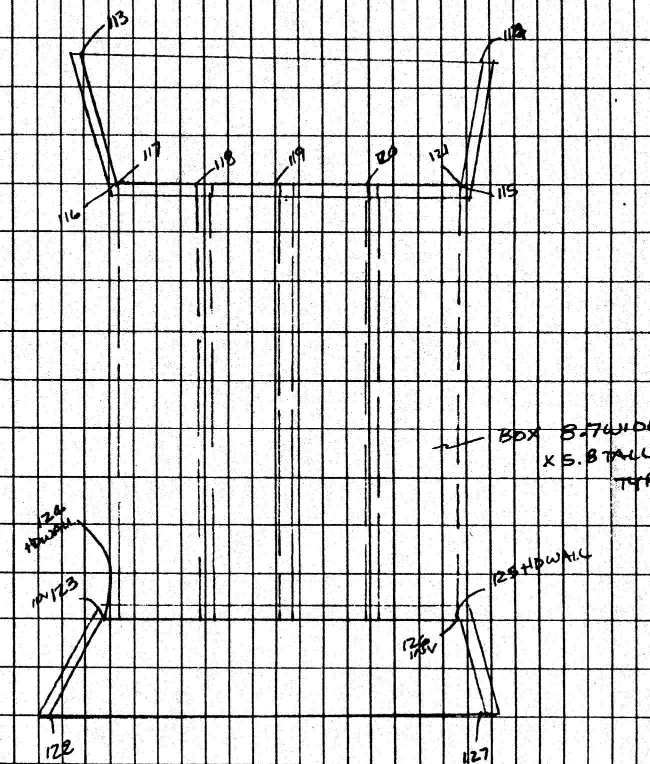


[illegible]	Rod	Desc
[illegible]@83	5.37	
BS@44	5.21	
84	8.97	TOP OF PIPE
85		" " "
86		" " "
87		H.W.
88	8.97	"
89		"
90		INV
91		INV
92	8.97	INV
93		INV
94		TOP OF PIPE
95		" " "
96	8.97	" " "

⊼@22	5.48	
BS@97	5.35	ALSO POINT # 12 - COULD NOT USE #12 IN THIS FILE
98	8.97	Set nail
⊼@98		
BS@22	5.24	
99	8.97	Conc @ END WW
100		" " " "
101		HW
102		HW
103		INV
104		INV
105	8.97	INV
106	12.97	Conc @ END WING WALL
107	14.97	WING WALL (Conc UNDER SILT)
108	14.97	INV
109	14.97	INV
110	14.97	INV
111	12.97	H. WALL
112	12.97	H. WALL



	ROD	
⊼@30	5.43	
BS@28	9.33	
113	8.97	Conc
114		Conc
115		HdWALL
116		HdWALL
117	8.97	INV
118		INV
119		INV
120		INV
121	8.97	INV
122	12.97	Conc
123		INV
124		HdWALL
125		HdWALL
126		INV
127	12.97	Conc (± COULDNOT GET TO FILLED W/DIRT



95061.ASC

2044	879054.293432	592185.981751	1573.421862	NAIL
2045	879170.843689	592526.350008	1575.490964	NAIL
2046	879239.938320	592401.710229	1567.492351	CONC
2047	879258.386608	592385.309209	1567.532566	CONC
2048	879260.075894	592379.537801	1569.762508	WW
2049	879236.827180	592401.211742	1568.823043	WW
2050	879234.525935	592389.362191	1567.722337	INV
2051	879242.078193	592382.948863	1567.867179	INV
2052	879249.967594	592376.064861	1567.926088	INV
2053	879253.540297	592373.430961	1575.910102	HDWL
2054	879231.356189	592392.007121	1575.866225	HDWL
2055	879067.032757	592506.804474	1569.091733	WW
2056	879062.831678	592510.558969	1567.876297	CONC
2057	879040.427307	592521.156793	1567.858606	CONC
2058	879037.553213	592520.529655	1568.945204	WW
2059	879039.197094	592508.534324	1568.054247	INV
2060	879048.199918	592504.455860	1568.111538	INV
2061	879057.440757	592500.278778	1568.067852	INV
2062	879061.455159	592498.366565	1575.777171	HDWL
2063	879034.963571	592510.211969	1575.906041	HDWL
2064	879129.985928	592225.717936	1566.459756	WW
2065	879120.514790	592229.605259	1564.406380	CONC
2066	879105.239779	592245.359524	1565.853052	WW
2067	879116.827798	592250.165128	1564.453765	INV
2068	879124.542532	592243.523795	1564.402206	INV
2069	879132.488921	592236.907079	1564.442794	INV
2070	879135.396246	592234.557120	1573.363104	HDWL
2071	879114.129771	592252.628195	1573.342414	HDWL
2072	879108.060505	592210.692904	1565.206046	INV
2073	879119.254342	592213.574246	1565.387333	INV
2074	878984.797042	592322.587189	1566.927853	WW
2075	878956.194134	592335.088777	1566.970110	WW
2076	878965.756773	592341.655113	1570.341704	TOP PIPE
2077	878974.898045	592337.652218	1570.517076	TOP PIPE
2078	878983.702244	592333.855569	1570.364858	TOP PIPE
2079	878961.663300	592343.519265	1573.412615	HDWL
2080	878987.223594	592332.296851	1573.350355	HDWL
2081	879116.353595	592028.803982	1568.658733	TOP PIPE
2082	879127.839110	592030.482533	1569.072759	TOP PIPE
2083	878615.886589	592399.699119	1573.072247	NAIL
2084	878595.762391	592370.335647	1568.919446	TOP PIPE
2085	878595.977864	592358.232581	1568.878171	TOP PIPE
2086	878596.210542	592346.736793	1568.732424	TOP PIPE
2087	878563.968229	592309.855351	1571.960135	HDWL
2088	878563.373951	592327.585735	1571.305554	HDWL
2089	878562.653903	592344.664285	1571.968888	HDWL
2090	878563.494038	592337.184421	1565.821179	INV
2091	878563.924264	592330.273315	1565.566153	INV
2092	878564.018904	592323.250623	1565.556454	INV
2093	878564.297087	592316.307897	1565.688257	INV
2094	878779.380514	592347.000565	1570.000849	TOP PIPE
2095	878779.477446	592359.026752	1570.027748	TOP PIPE
2096	878778.962230	592370.554683	1569.887231	TOP PIPE
2097	883911.550900	586859.320100	1586.985000	BC
2098	883720.802565	585456.836960	1574.100050	NAIL
2099	883647.952180	585467.455708	1565.546878	CONC
2100	883633.630689	585487.789933	1565.573424	CONC
2101	883627.366321	585481.843571	1572.005552	HDWL
2102	883639.890680	585463.621888	1572.018689	HDWL
2103	883638.605670	585466.372150	1566.018893	INV
2104	883633.936434	585472.947154	1566.099481	INV
2105	883629.819551	585478.707166	1565.958263	INV
2106	883497.690573	585363.625524	1565.463421	CONC
2107	883483.155678	585382.530080	1565.963398	WW
2108	883492.859571	585384.141141	1565.260743	INV
2109	883497.035176	585377.965441	1565.232855	INV

2110	883501.273525	585371.692305	1565.225394	INV
2111	883503.400795	585369.303780	1572.205037	HDWL
2112	883491.801499	585387.190922	1572.204556	HDWL
2113	882015.160295	587817.076028	1565.285836	CONC
2114	881991.132963	587851.881878	1565.272007	CONC
2115	881984.442085	587844.978678	1571.621337	HDWL
2116	882006.378498	587813.134699	1571.585470	HDWL
2117	882006.542737	587813.362383	1565.313311	INV
2118	882001.497689	587820.757486	1565.264836	INV
2119	881995.903186	587828.818155	1565.229591	INV
2120	881990.337320	587836.947361	1565.281527	INV
2121	881984.767448	587844.958471	1565.298056	INV
2122	881872.740527	587719.014411	1565.284960	TOE
2123	881881.538938	587726.675102	1565.288338	INV
2124	881881.613623	587726.704494	1571.942093	HDWL
2125	881859.386101	587758.179387	1571.912977	HDWL
2126	881859.621902	587758.224055	1565.321744	INV
2127	881849.262939	587753.597618	1565.293855	TOE