APPLICATION FOR CONDITIONAL LETTER OF MAP REVISION (CLOMR) MOUNTAINGATE DEVELOPMENT RENO, WASHOE COUNTY, NEVADA

Prepared For

RYDER HOMES

Prepared by

Nimbus Engineers

January 2005
Job Number 0428

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TABLE OF CONTENTS

FIGURES

PLATES

TABLES

APPENDICES

Appendix A – FEMA Forms and Attachments

Appendix B – Existing and Proposed Hydraulic Workmaps

Appendix C– Supporting Calculations for HEC-1 Parameters

Appendix D –Hard Copies of HEC-1 Models (Existing and Proposed Conditions)

Appendix E– Electronic Copy of HEC-1 and HEC-RAS Models and Hard Copy of Proposed Conditions HEC-RAS Model

Appendix F– Proposed Channel Profile and Sections

1.0 INTRODUCTION

Ryder Homes plans to develop the Dorostkar Property as the Mountaingate Project. The property is located in Section 20, T 18N. , R.20E. in Reno, Washoe County, Nevada (Figure 1). Whites Creek originates upstream of the project area in the Sierra Nevada Mountains. Whites Creek originates in the Sierra Nevada Mountains near Mt. Rose. The upstream portions of the creek are deeply incised in a single channel. The creek diverges into 4 less defined channels (Branches 1 through 4) as exits the steeper portions of the watershed (Section 30, T 18 N, R 20 E). Branches 2 and 3 cross the project site. Branch 3 will remain in its natural channel and with no modification, while Branch 2 will be diverted into a designed channel. Because no modifications are proposed for Branch 3 or its floodplain, this document focuses solely on Branch 2.

This application contains the information required for a Conditional Letter of Map Revision (CLOMR) for the proposed Branch 2 channel. The FEMA forms and supplemental statements are attached as Appendix A. The existing and proposed conditions hydraulic workmaps are attached as Plates 1 and 2 (Appendix B).

The project area is shown on Flood Insurance Rate Map (FIRM) 32031C 3170C. The Branch 2 and Branch 3 floodplains are designated Zone A while the remainder of the property is Zone X.

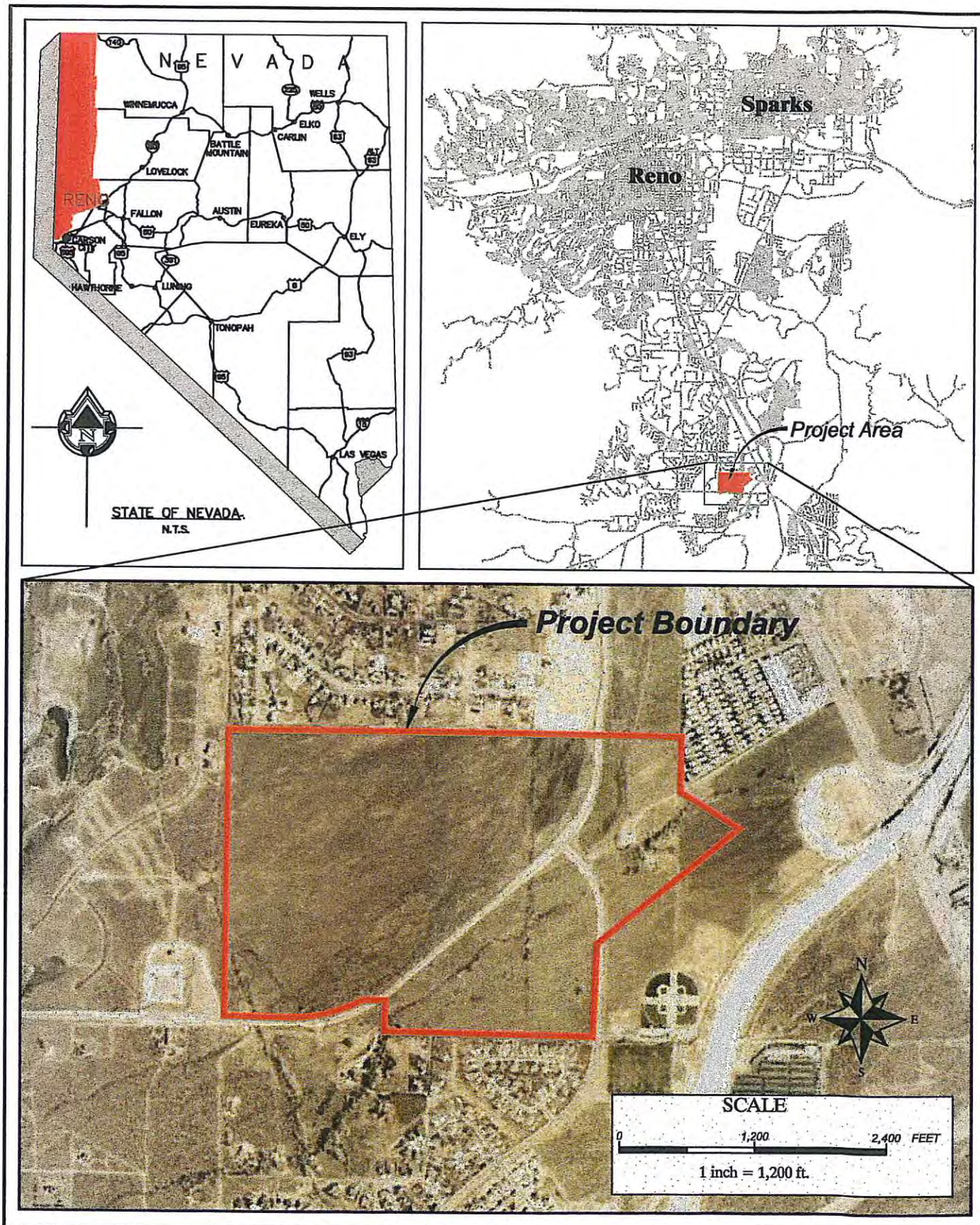

Figure 1

Vicinity Map

Mountaingate CLOMR

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Nimbus Job #0428

File: 0428_Dorostkar_R00.dwg

Date: January, 2004

2.0 EXISTING AND PROPOSED CONDITIONS

2.1 Existing Conditions As noted earlier, Whites Creek originates in the Sierra Nevada Mountains. Upstream watersheds are steep with vegetation consisting of native shrub and brush. Trees are limited to the higher elevations and areas immediately alongside the channels. Soils are largely in Hydrologic Soil Group C, which means they have relatively low infiltration rates. The channel's slope decreases to about 6% upstream of the diffluence. At the Whites Creek diffluence, Whites Creek splits into four branches designated Branches 1 through 4. Branch 2 enters the Mountaingate property after passing through three 10 x 5 box culverts under ArrowCreek Parkway. It then flows northeastward over relatively steep terrain in a moderately well defined channel. On the project site, the land slopes northeastward at about 3% with sagebrush and grass vegetation.

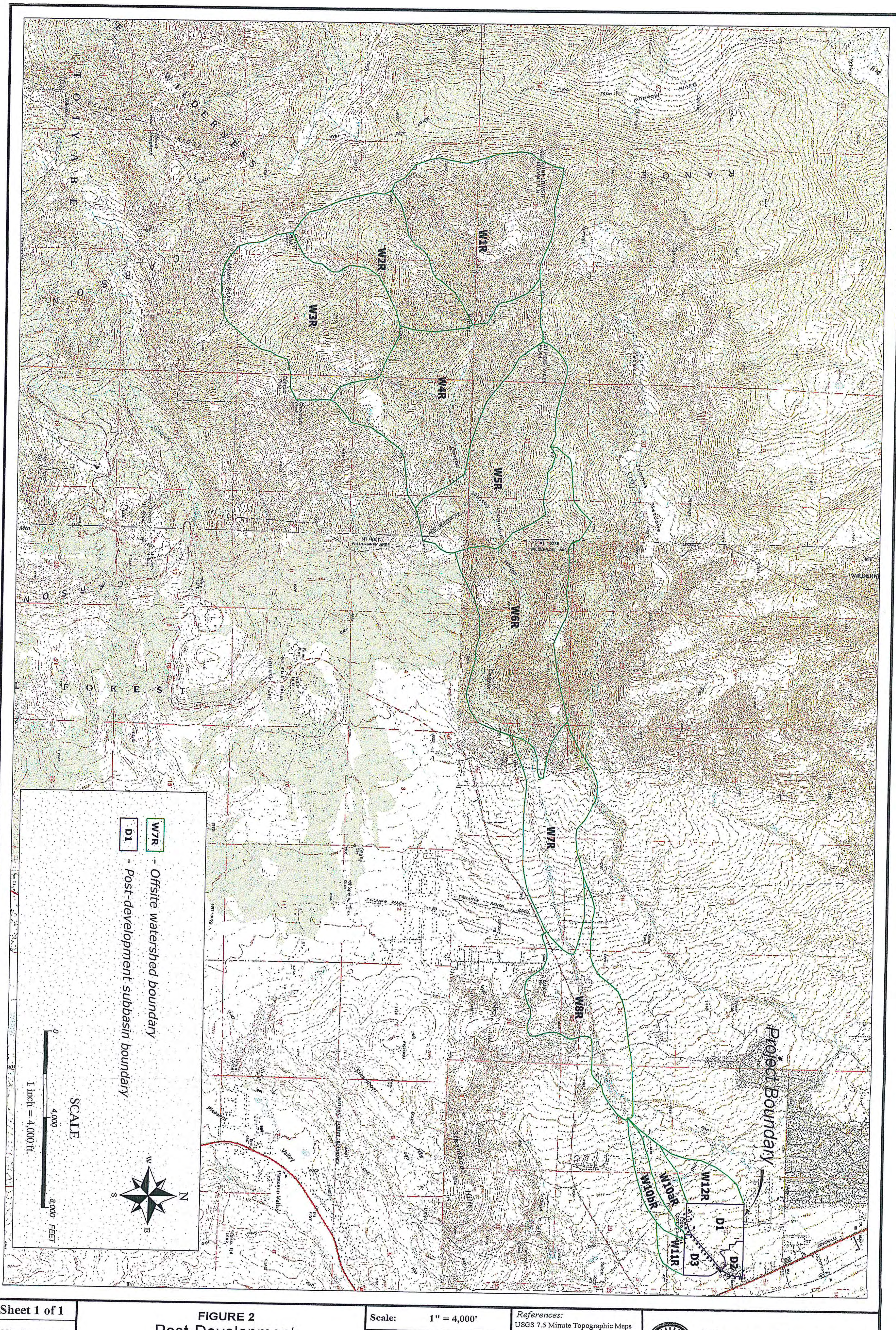
At the diffluence, Whites Creek splits into four branches designated Branches 1 through 4. Through previous hydrologic studies the flow rates in each of the branches has evolved as follows:

- In 1993 N:imbus prepared the Whites Creek Detention Facility Feasibility Study. In this study, lag times were computed by the Upland method for all watersheds and the flow rate at the diffluence was 5100 cfs. A hydraulic analysis of the diffluence resulted in a distribution to the 4 branches as follows: Branch 1 received 700 cfs, Branch 2 received 1950 cfs, Branch 3 received 1100 cfs, and Branch 4 received 1350 cfs. Branches 2 and 3 later recombine (downstream of the Mountaingate property), then split again each receiving 50% of the total flow at that point.

- In subsequent approved LOMR submittals, FEMA Case Number 96-09-1083P, Hydrologic and Hydraulic Analysis, Double Diamond Ranch, Phase I, Application for Letter of Map Revision (Nimbus, August 1996), Case Number 01-09-466P, Request for Letter of Map Revison (LOMR) Galena Meadows Subdivision (Nimbus, February 2001), and Case Number 01-09-588P, Application for Letter of Map Revision (LOMR), Branch 3 Whites Creek additional data submittal (Nimbus Engineers, March 29, 2002), the flow rate at the diffluence is 3220 cfs. The reduced flow rate was due to the use of the Bureau of Reclamation's Centroid Method of calculating lag times. These lag times were significantly longer than those from the earlier study. The model in those studies routed Branches 2 and 3 through the Mountaingate project site as a single combined flow and divided the flow downstream of the project (50% to each).

- In this analysis, Branches 2 and 3 are split at the diffluence just as in the 1993 report and as occurs naturally. Of the 3186 cfs at the diffluence, 983 cfs goes to Branch 2 and 828 goes to Branch 3.

2.2 Proposed Conditions The Mountaingate Project will be a residential community. It will have 225+/- residential units averaging 13,000 square feet (0.3 acre) in size. A proposed channel will be incorporated into the Moutaingate Development to revise the Whites Creek Branch 2 floodplain in the project area. The ArrowCreek Parkway culverts form the upstream limit of this study. The channel will collect flows from the box culverts under ArrowCreek Parkway and route them eastward a short distance and then turn northeast along side Arrow Creek Parkway (Figure 3). The 100-year (1% chance) flow will be contained within the channel. In order to control flow velocities in the channel, drop structures are planned. One road crossing within the development will be required. Channel improvements for the Mountaingate project end at the property boundary. The flow will continue for about 2000 feet north of the property in an existing channel before being discharged back to the natural channel. The point where Branch 2 returns to its natural channel is the downstream end of this study.



Sheet 1 of 1	FIGURE 2 Post-Development Watershed Map Mountaingate CLOMR Washoe County Nevada	Scale: 1" = 4,000'	*References:* USGS 7.5 Minute Topographic Maps of Nevada - Mt. Rose NW, Mt. Rose NE, Mt. Rose, Washoe City
Nimbus Job # 0428		CI: 20 feet	
		File Name: 0428_dorostkar_ROO	
Date: Jan. 2005		Drawn By: GH	
		Designed By: DW	

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3.0 HYDROLOGIC MODELING

3.1 Methodologies and Assumptions

3.1.1 Hydrologic Analysis Methods

The U.S.Army Corps of Engineers' (COE) Flood Hydrograph package, HEC-1, Version 4.0.1 was used to perform the hydrologic modeling for the study area. The HEC-1 models were prepared based upon the Soil Conservation Services's (SCS) Unit Hydrograph method outlined in the Draft Washoe County Hydrologic Criteria and Drainage Design Manual (HCDDM). The HEC-1 model utilizes the watershed parameters area, runoff curve number, lag time and precipitation to determine flow rates. These parameters are discussed below and supporting calculations are presented in Appendix C.

HEC-1 models were run for the 100-year, 24 hour event for existing and proposed conditions. The file names for these are 428CLMRE.DAT for existing conditions and 428CLOMR.DAT for proposed conditions. Hard and electronic copies of these models are included in Appendix D.

3.1.2 Basin Areas

The overall Whites Creek watershed was delineated utilizing United States Geological Survey (USGS) 7.5 minute quadrangle maps for the Mt. Rose, Mt Rose NE, Mt. Rose NW, and Washoe City areas. These maps were also used for delineating individual sub-basins. Areas within City of Reno boundaries were divided into sub-basins using a 2-foot contour map provided by the city. Additional resources in determining basin boundaries included subdivision site plans, major roadway profiles, and field investigations.

3.1.3 Precipitation

Precipitation within the HEC-1 program was modeled using a SCS Type II storm (PB/PC cards). Previous Whites Creek studies used rainfall depths from NOAA Atlas 2, Volume VII-Nevada (U.S. Dept. of Commerce, NOAA, National Weather Service, 1973). These values were used to maintain consistency with those studies.

3.1.4 Curve Numbers

The Soil Conservation Service (SCS), U. S. Department of Agriculture curve number method was used to determine curve number values for use in the hydrologic models. Hydrologic soil groups for each basin were determined using information from the SCS Soil Survey of Washoe County, Nevada, South Part. Land uses were obtained from Washoe County for the entire watershed. Field investigations were performed and aerial photos were reviewed in order to verify

and classify each basin's land use and cover designations, respectively. An Antecedent Moisture Condition II was used per the Washoe County HCDDM. The soils map for the project area is shown in Figure 3. It shows that the Mountaingate property is situated on B and D type soils.

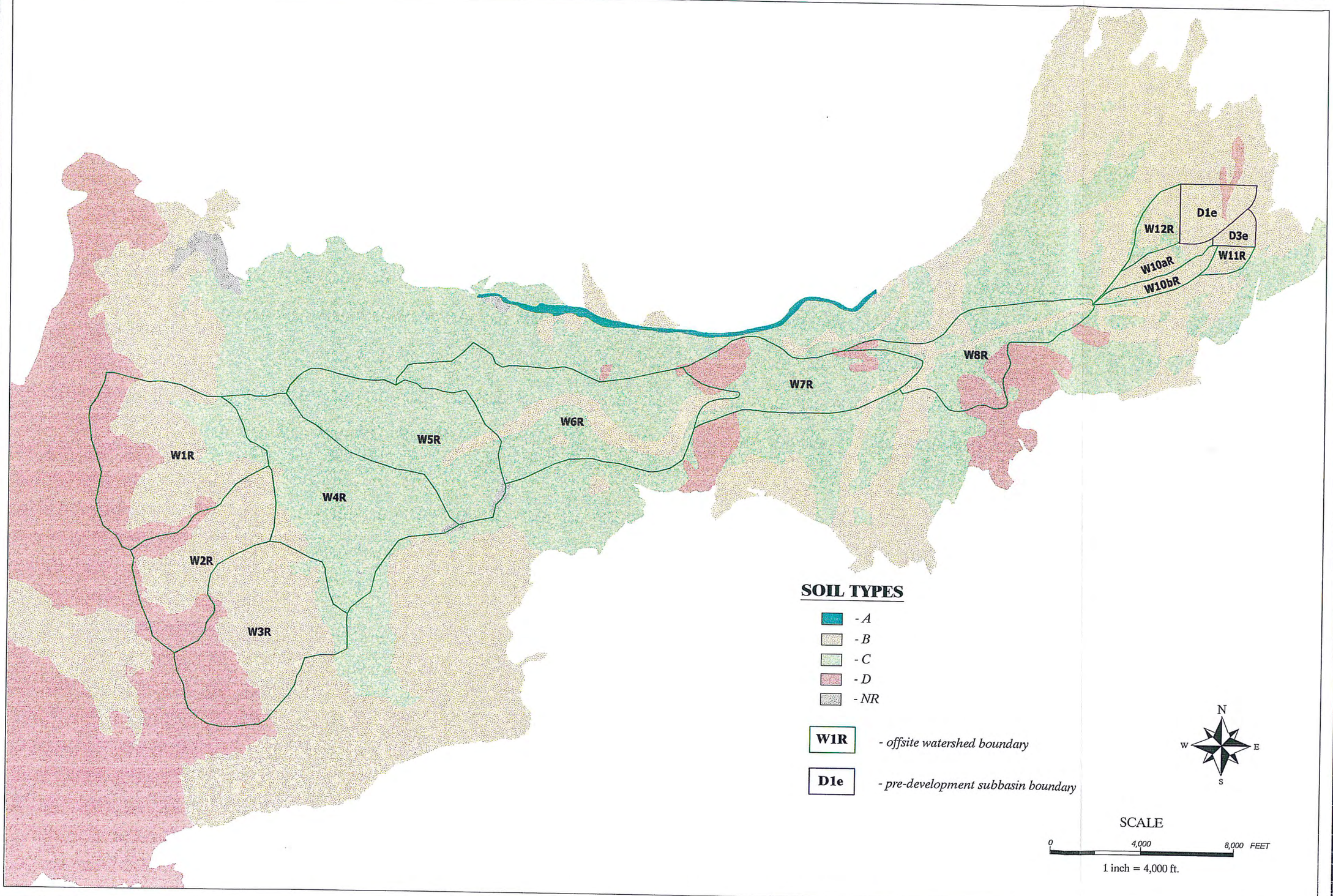
3.1.5 Lag Times

Two methods of computing lag times were used according to the SCS dimensionless unit hydrograph method. The lag parameter is equal to the lag (in hours) between the center of mass of rainfall excess and the peak of the unit hydrograph. For drainage basins less than one square mile and whose slopes are less than ten percent, the lag time parameter equals 60% of the time of concentration for the individual basin. The concentration time is composed of an initial overland flow time plus a travel time. The initial time was calculated according to Equation 702 of the Washoe County HCDDM, while the following travel time was estimated by measuring the travel length and dividing by an estimated flow velocity (Upland Method).

The lag times for basins W1R-W8R are those used in the earlier LOMR submittals for {FEMA Case Number 96-09-1083P (Nimbus, August 1996), and Case Number 01-09-588P (Nimbus Engineers, March 29, 2002)}, and used the Bureau of Reclamation centroid method for watersheds with areas greater than one square mile and/or slopes exceeding 10%.

3.1.6 Hydrograph Routing

The Muskingum and Muskingum-Cunge routing techniques were used as appropriate to route the majority of upstream hydrographs within the HEC-1 models. Channel properties for small natural channels were based upon topographic information and field investigations. For the designed channel, design plans served as the basis for input parameters.



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References:
Soils Data from Washoe County, Nevada

Scale:	1" = 4,000'
CI:	n/a
File Name:	0428_dorostkar_R00
Drawn By:	GH
Designed By:	DW

FIGURE 3
Soils Map
Mountaingate CLOMR

Washoe County, Nevada

Sheet 1 of 1	Nimbus Job # 0428	Date: Jan. 2005

4.0 RESULTS FROM HYDROLOGIC MODELING

4.1 Pre-Development Drainage Conditions

Plate 1 illustrates the pre-development drainage conditions for the subject site and the upstream drainage subbasins. Appendix C contains the HEC-1 pre-development analysis and results printouts for the 100-year storm events. The offsite subbasin boundaries and parameters are the same as those used in the model for the Detention Basin Feasibility Study, the parameters most widely used for Whites Creek. A summary table of pre-development watershed parameters is presented in Table 1.

Table 1. Off-site and On-site Pre-Development Watershed Parameters

Subbasin	CN	TLAG (hr)	Area (mi^2)	P* (in)
W1	63	0.48	1.36	5.5
W2	65	0.52	0.84	5.4
W3	65	0.54	1.38	5.25
W4	57	0.72	1.47	5
W5	58	0.85	1.27	4.8
W6	57	1.23	1.43	4.1
W7	68	0.96	0.85	3.4
W8	65	1.19	0.75	3
W10A	55	0.25	0.14	2.8
W10B	55	0.3	0.13	2.8
W11	73	0.24	0.07	2.7
W12	58	0.39	0.16	2.8
D1E**	62	0.18	0.22	2.8
D3E**	61	0.15	0.07	2.7

* 100-year, 24-hour rainfall, from NOAA Atlas 2 (1973).
** On-site watershed, all others are off-site.

4.2 Post-Development Drainage Conditions

Plate 2 illustrates the post-development drainage conditions for the subject site. Post-development hydrologic parameters for on-site watersheds are summarized in Table 2.

Table 2. On-site Post Development Watershed Parameters

Subbasin	CN	TLAG (hr)	Area (mi^2)	P* (in)
D1	73	0.34	0.18	2.8
D2	76	0.16	0.04	2.8
D3	72	0.21	0.07	2.7

* 100-year, 24-hour rainfall, from NOAA Atlas 2 (1973)

Note: Parameters for offsite watersheds remain the same as in pre-development conditions.

The results from modeling are shown in Table 3. This table shows the pre- and post-development flows at key points on and near the Mountaingate property. The node at the upstream project boundary is CP10A for Branch 2 and CPCH3 for Branch 3. The node at the downstream project boundary is CPD2 for Branch 2 and CPD3 for Branch 3 (Plate 1). CP DIF is the flow at the diffluence upstream of the project. These same designations are used in the HEC-1 models. The post-development model is shown in Appendix C.

Table 3. HEC-1 Model Results

Model Point	Location	100-year event flow rates, cfs	
		Existing	Proposed
CP DIF	Whites Creek Diffluence	3220	3220
CP10A	Branch 2 upstream of project	1123	1123
CPCH3	Branch 3 upstream of project	813	813
CPD2	Branch 2 downstream of project	1138	1144
CPD3	Branch 3 downstream of project	811	813

Table 3 shows the 100-year flow rate was increased by 6 cfs (0.5%) in Branch 2 and by 3 cfs (0.2%) in Branch 3. These changes are insignificant and will not affect downstream property or flood control structures.

5.0 HYDRAULIC ANLAYSIS OF PROPOSED STRUCTURES

The proposed channel and road crossing were modeled with the U.S. Army Corps of Engineers model HEC-RAS. The Branch 2 channel crossing the property will be realigned and designed to contain the 100-year (1%) storm event. The channel will follow Arrowcreek Parkway and connect to an existing channel at the northeast corner of the property and modify the effective FIRM. The effective FIRM is shown in Figure 4 and the proposed FIRM is shown in Figure 5. The basic channel design consists of the following (See Appendix F for drawings):

- A V-shaped low-flow channel with a top width of 40 feet and side slopes of 2%, resulting in a low flow channel depth of 0.4 feet.
- The right bank then slopes upwards with 3:1 side slopes
- The left bank rises 0.95 feet in 3 feet, then becomes vertical
- The channel will be constructed with a turf-reinforced mat material rated for the velocities and shear stresses expected in the channel.
- The drop structures will be constructed of gabions with a scour hole 24-feet long below the drop.

A channel consisting of 2 reaches was designed. The first reach, upstream of the Arrow Springs road crossing, generally has a slope of 4.4%, has 3 vertical drop structures with 4-foot drops, while Reach 2, downstream of the road crossing, has a typical slope of 3.2%, and has 1 drop structures with a 4-foot drop. Channel and drop structure designs are presented in Appendix F. The two reaches are summarized below.

Table 4. Proposed Channel Design

	Upstream Reach	Downstream Reach
Number of drops (ft)	3	1
Height of drops (ft)	4	4
Slope of Channel	4.4%	3.2%

The HEC-RAS model was run in mixed flow simulation with initial conditions of critical depth at the upstream and downstream cross sections. Using a design flow of 1138 cfs, the typical velocities (excluding the velocities over the drops) are 12 to 13 are ft/second in the upper reach and around 11 ft/second in the lower reach. The velocity will be reduced to about 8 ft/second prior to leaving the project site. This channel will convey 1138 cfs with a typical flow depth of 2.5 feet to 3 feet and a minimum 1.0 feet of freeboard. HEC-RAS model results are summarized in Appendix D.

One road crossing over the channel is planned for the project, near the intersection of Arrowcreek Parkway and Wedge Parkway. The proposed road crossing will consist of reinforced concrete box culverts (RCB). For the design flow of 1138 cfs, three culverts will be required. These RCBs will be 6 x 12 with an invert elevation of 4612.15. They will require a headwater elevation of 4616.98 feet. The proposed channel can accommodate this elevation without overtopping.

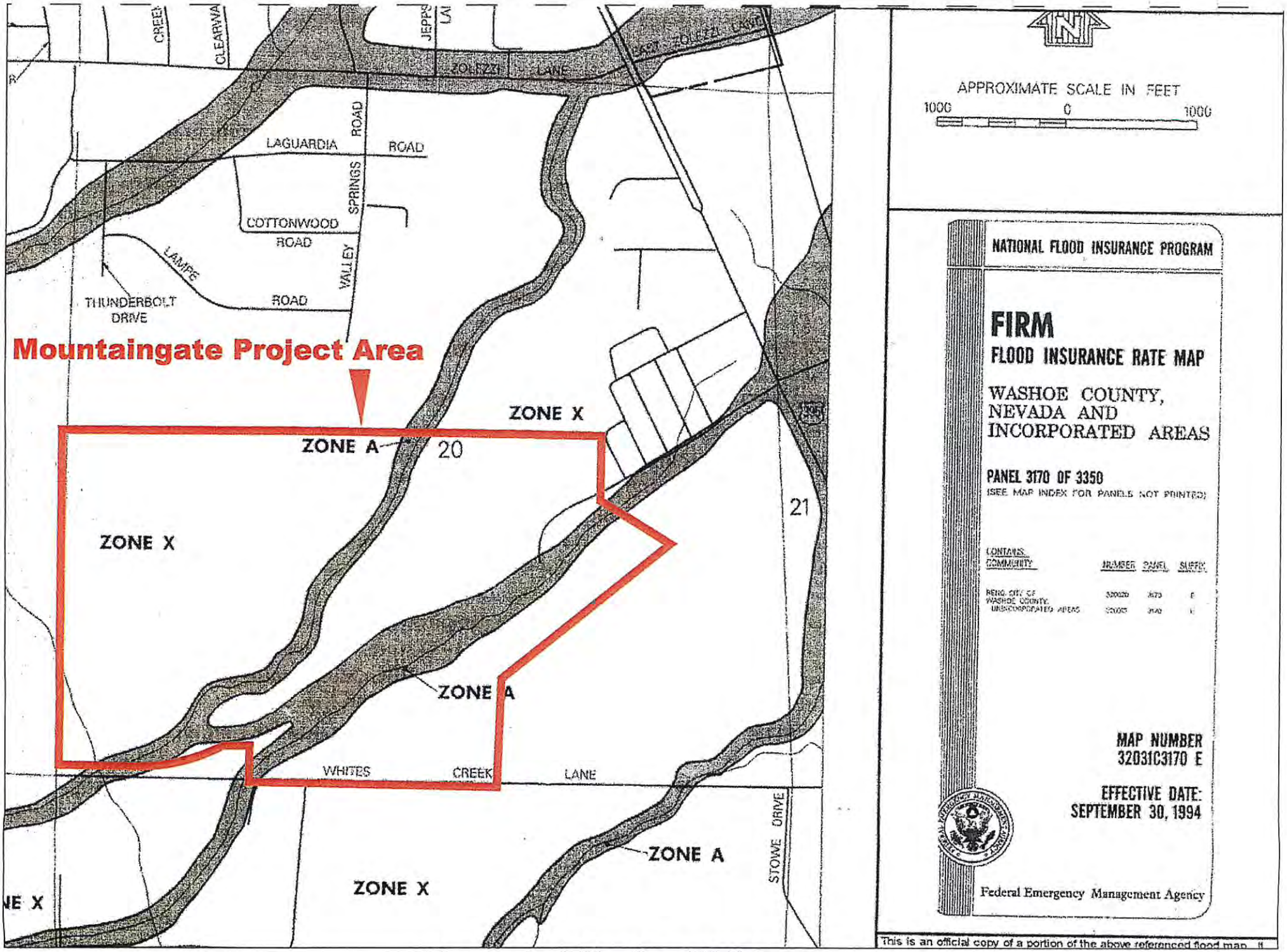

Figure 4. Effective FIRM

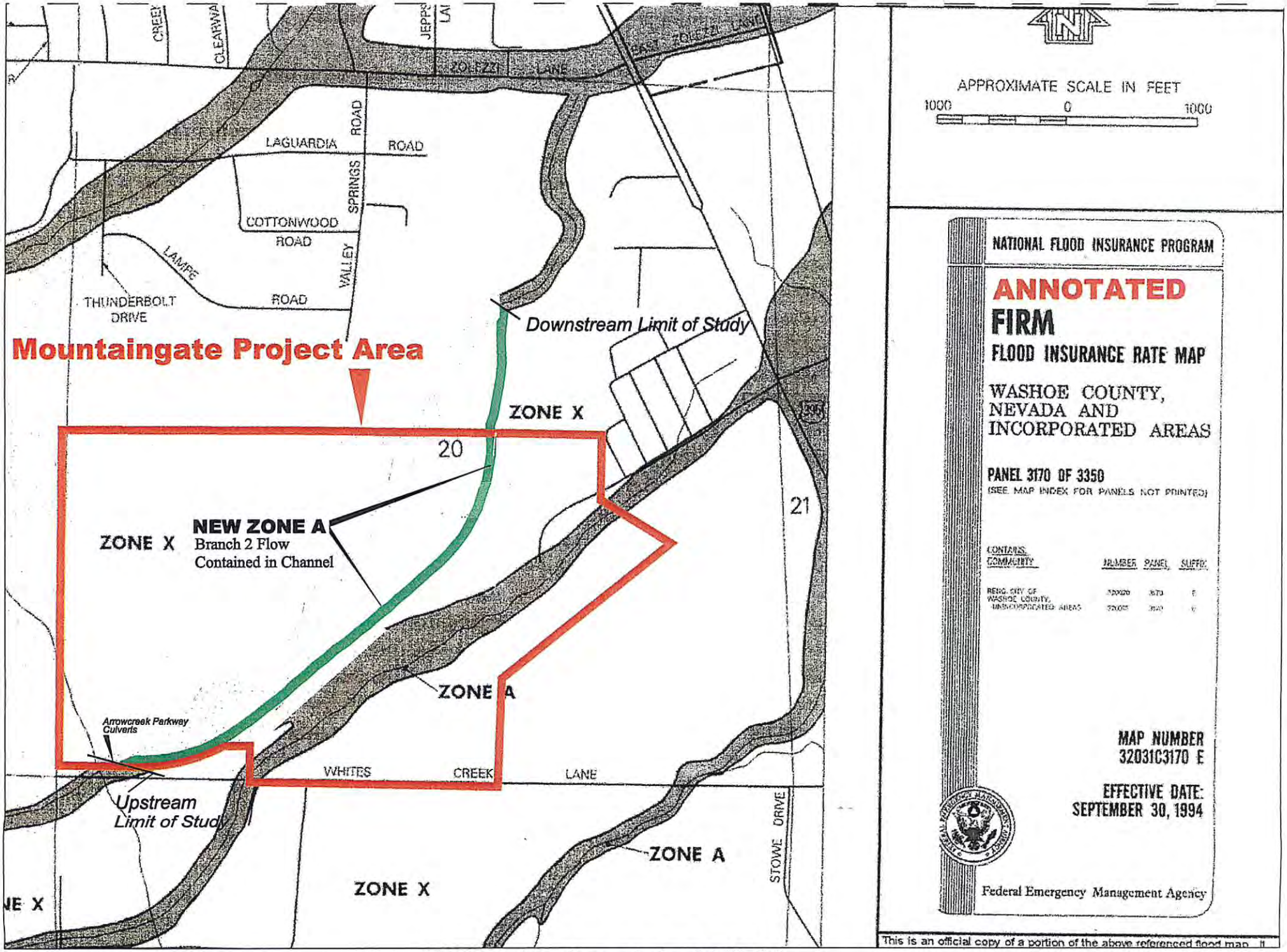

Figure 5. Annotated FIRM

6.0 FINDINGS

The findings of this study are listed below:

1. Development of the Mountaingate project slightly increases the 100-year flow rates in Branch 2 and Branch 3 of Whites Creek. These increases will have no adverse effects on downstream property or structures.

2. A channel has been designed that can contain and convey the 100-year flow in Branch 2 (1138 cfs) with one foot of freeboard.

3. Construction of this channel will re-route Branch 2 of Whites Creek and change the effective FIRM in the project area as shown in Figures 4 and 5.

7.0 REFERENCES

City of Reno, Public Works Department, Design Manual, November, 2000.

City of Reno, Major Drainageways Plan, June, 1992.

Department of Water Resources, Washoe County, Nevada, Southern Washoe County, Precipitation Frequency of the United States, NOAA Atlas 14, Volume 1 - Semi-arid Southwestern United States (Map), April 1997.

Nimbus Engineers, Whites Creek Detention Facility Feasibility Study, Washoe County, Nevada, June 1993.

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Nimbus Engineers, Request for Letter of Map Revison (LOMR) Galena Meadows Subdivision, February 2001.

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Washoe County, Hydrologic Criteria and Drainage Design Manual, December 2, 1996.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, Computer Program 723-X6-L2010, HEC-1, Flood Hydrograph Package, version 4.1, June 1998.

U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS: River Analysis System, version 3.0, Mar 2001.

U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Washoe County, Nevada, South Part, August 1983.

U.S. Department of Agriculture, Natural Resource Conservation Service, Urban Hydrology for Small Watersheds (TR-55), June 1986.

APPENDIX A

FEMA FORMS AND ATTACHMENTS

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☒ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
320020	City of Reno	NV	32031C	3170	9/30/94

2. Flooding Source: Whites Creek

3. Project Name/Identifier: Mountaingate

4. FEMA zone designations affected: A, X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☒ Physical Change ☐ Improved Methodology/Data

☐ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding:	☒ Riverine	☐ Coastal	☐ Shallow Flooding (e.g., Zones AO and AH)
	☐ Alluvial fan	☐ Lakes	☐ Other (Attach Description)
Structures:	☒ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $3800
	☐ No, Attach Explanation	

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Margaret Bowker	Company: Nimbus Engineers	
Mailing Address: 3785 Baker Lane Suite 201 Reno NV 89509	Daytime Telephone No.: (775) 689-8630	Fax No.: (775) 689-8614
	E-Mail Address:	
Signature of Requester (required): Margaret J Bowker		Date: 1/11/05

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Gary Stockhoff, P.E. Deputy Director of Public Works		Telephone No.: (775) 328-2041
Community Name: City of Reno	Community Official's Signature (required):	Date: 24 Jan. 05

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name:	License No.:	Expiration Date:
Company Name:	Telephone No.:	Fax No.:
Signature:		Date:

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Branch 2, Whites Creek
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☒ Proposed Conditions (CLOMR) ☒ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)
Model Pt: CP Dif	9.35	3220	3220

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model HEC-1 [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Branch 2 Whites Creek 2000' d/s Mtngat	-5124	N/A	4581.4
Upstream Limit	Branch 2 Whites Creek at Arrowcreek rcb	-1000	N/A	4750.23

2. Hydraulic Method Used

Hydraulic Analysis HEC-RAS [HEC-2 , HEC-RAS, Other (Attach description)]

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☐ Yes ☐ No

4. Models Submitted

Duplicate Effective Model*	Natural File Name:	Floodway File Name:
Corrected Effective Model*	Natural File Name:	Floodway File Name:
Existing or Pre-Project Conditions Model	Natural File Name: 428CLMRE.DAT	Floodway File Name:
Revised or Post-Project Conditions Model	Natural File Name: 428CLOMR.DAT	Floodway File Name:
Other - (attach description)	Natural File Name:	Floodway File Name:

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Branch 2, Whites Creek
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam ..... complete Section D
Levee/Floodwall ..... complete Section E
Sediment Transport ..... complete Section F (if required)

Description Of Structure

1. **Name of Structure: Whites Creek Branch 2 channel**

   Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Channel along Arrowcreek Parkway

   Downstream Limit/Cross Section: -5124

   Upstream Limit/Cross Section: -1000

2. **Name of Structure: Arrow Springs Drive Culverts**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: At the Arrow Springs Drive crossing of the Whites Creek Branch 3 channel

   Downstream Limit/Cross Section: -4095

   Upstream Limit/Cross Section: -3969

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source: Branch 2, Whites Creek

Name of Structure: Whites Creek Branch 3 Channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☒ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 1950 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☒ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☒ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Branch 2, Whites Creek

Name of Structure: Arrow Springs Drive Culvert

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided): To be submitted with LOMR.

- ☐ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☐ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Skew Angle
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection
- ☐ Low Chord Elevations – Upstream and Downstream
- ☐ Top of Road Elevations – Upstream and Downstream
- ☐ Structure Invert Elevations – Upstream and Downstream
- ☐ Stream Invert Elevations – Upstream and Downstream
- ☐ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

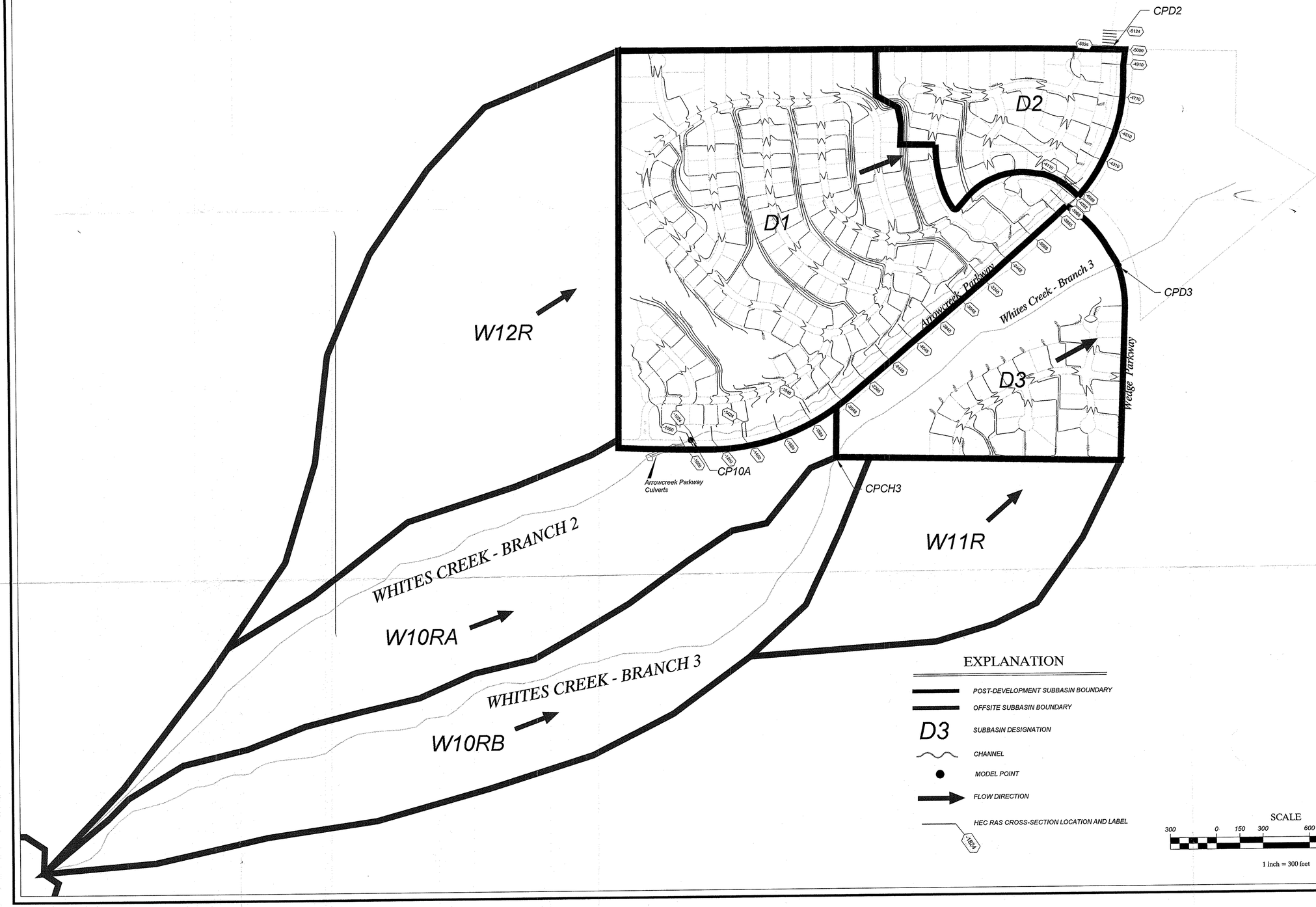
CHANNELIZATION

Question 3 potential for Hydraulic Jumps

Hydraulic jumps are likely downstream of the drop structures. These will be handled by rip-rapped scour holes, 24-feet in length with adequate freeboard. See Appendix F.

APPENDIX B

EXISTING AND PROPOSED CONDITIONS HYDRAULIC WORKMAPS



Nimbus Engineers
3795 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

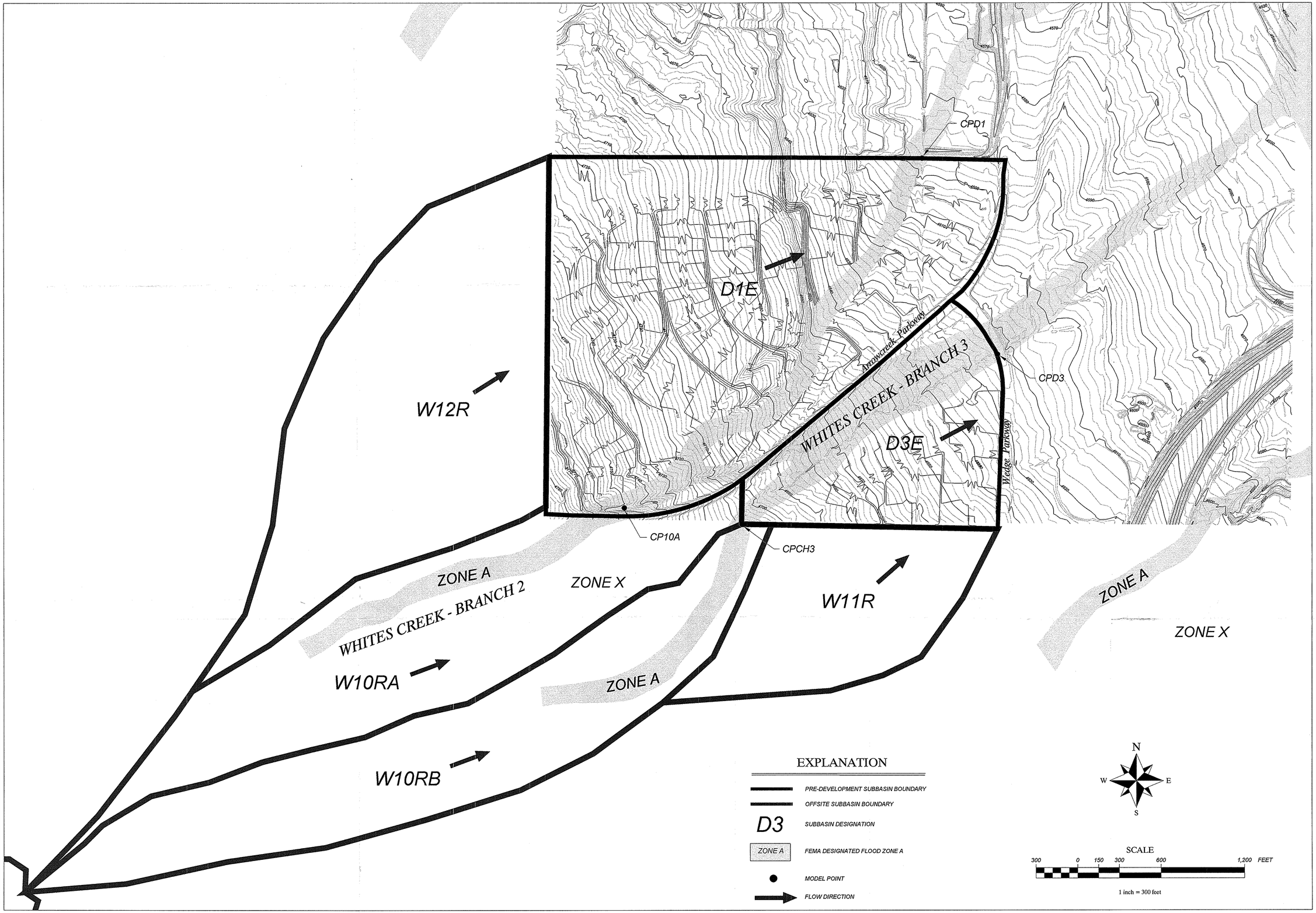
Revisions: | Date: | References: Proposed grading supplied by Mackay & Somps, Inc.

Scale:	1" = 300"
Date:	January, 2005
File Name:	0428_dorostfar_R00.dwg
Drawn By:	GH
Designed By:	DW

PLATE 2
HYDRAULIC WORK MAP
POST-DEVELOPMENT CONDITIONS
Mountaingate CLOMR
Washoe County *Nevada*

Sheet 1 of 1

Nimbus Job #
0428



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3785 Baker Ln., Suite 201 • Reno, NV 89509
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(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Revisions: | Date: | References

Scale: 1" = 300"
Contour Inverval = 2 feet
File Name: 0428 dorostkar_R00
Drawn By: GH
Designed By: DW

PLATE 1
HYDRAULIC WORK MAP
EXISTING CONDITIONS
Mountaingate CLOMR
Washoe County *Nevada*

Sheet 1 of 1
Nimbus Job # 0428
Date: January, 2005

APPENDIX C

SUPPORTING CALCULATIONS FOR HEC-1 PARAMETERS

Lag Time Calculations

Project Dorostkar

Location Sub-basin W10RA

Area (mi^2)	0.14	<	1 mi^2	Use Equation 709 (Washoe County Manual)
Average Slope (%)	5.6	<	10%	

t_l	**0 min**
Length of Overland Flow (Lo) (feet)	0 feet
Average Overland Slope(%)	5.6 %
Flow Runoff Coefficient	0.34

	t_c	**25** min
Reach 1	Velocity (ft/sec)	3.5 ft/sec
	Length (feet)	5324 ft

$t_c = t_l + t_t$	**25 min**

TLAG= 0.6*t_c	**0.25 hours**

Lag Time Calculations

Project Dorostkar

Location Sub-basin W10RB

Area (mi^2)	0.13	<	1 mi^2	Use Equation 709 (Washoe County Manual)
Average Slope (%)	5.5	<	10%	

t_l	**0 min**
Length of Overland Flow (Lo) (feet)	0 feet
Average Overland Slope(%)	5.5 %
Flow Runoff Coefficient	0.34

	t_c	**30** min
Reach 1	Velocity (ft/sec)	3.5 ft/sec
	Length (feet)	6234 ft

$t_c = t_l + t_t$	**30 min**

TLAG= 0.6*t_c	**0.30 hours**

Lag Time Calculations

Project Dorostkar

Location Sub-basin W11R

Area (mi^2)	0.07	<	1 mi^2	Use Equation 709 (Washoe County Manual)
Average Slope (%)	4.4	<	10%	

t_l	**13 min**
Length of Overland Flow (Lo) (feet)	500 feet
Average Overland Slope(%)	4.4 %
Flow Runoff Coefficient	0.57

	t_c	**11** min
Reach 1	Velocity (ft/sec)	3.25 ft/sec
	Length (feet)	2226 ft

$t_c = t_l + t_t$	**24 min**

TLAG= 0.6*t_c	**0.24 hours**

Lag Time Calculations

Project Dorostkar

Location Sub-basin W12RA

Area (mi^2)	0.16	<	1 mi^2	Use Equation 709 (Washoe County Manual)
Average Slope (%)	4.5	<	10%	

t_l	**18 min**
Length of Overland Flow (Lo) (feet)	500 feet
Average Overland Slope(%)	4.5 %
Flow Runoff Coefficient	0.38

	t_c	**21** min
Reach 1	Velocity (ft/sec)	3.25 ft/sec
	Length (feet)	4144 ft

$t_c = t_l + t_t$	**39 min**

TLAG= 0.6*t_c	**0.39 hours**

Lag Time Calculations

Project Dorostkar

Location Sub-basin D1

Area (mi^2)	0.18	<	1 mi^2	Use Equation 709 (Washoe County Manual)
Average Slope (%)	0.9	<	10%	

	t_l	**15 min**
	Length of Overland Flow (Lo) (feet)	220 feet
	Average Overland Slope(%)	0.9 %
	Flow Runoff Coefficient	0.57
	t_c	**19** min
Reach 1	Velocity (ft/sec)	3.8 ft/sec
	Length (feet)	4360 ft

$t_c = t_l + t_t$	**34 min**
TLAG= 0.6*t_c	**0.34 hours**

Lag Time Calculations

Project Dorostkar

Location Sub-basin D2

Area (mi^2)	0.04	<	1 mi^2	Use Equation 709 (Washoe County Manual)
Average Slope (%)	5	<	10%	

t_l	**9 min**
Length of Overland Flow (Lo) (feet)	300 feet
Average Overland Slope(%)	5 %
Flow Runoff Coefficient	0.61

	t_c	**7** min
Reach 1	Velocity (ft/sec)	3.5 ft/sec
	Length (feet)	1200 ft
Reach 2	Velocity (ft/sec)	1.8 ft/sec
	Length (feet)	160 ft

$t_c = t_l + t_t$	**16 min**

TLAG= 0.6*t_c	**0.16 hours**

Lag Time Calculations

Project Dorostkar

Location Sub-basin D3

Area (mi^2)	0.07	<	1 mi^2	Use Equation 709 (Washoe County Manual)
Average Slope (%)	1.9	<	10%	

t_l	**10 min**
Length of Overland Flow (Lo) (feet)	160 feet
Average Overland Slope(%)	1.9 %
Flow Runoff Coefficient	0.56

	t_c	**11** min
Reach 1	Velocity (ft/sec)	3.25 ft/sec
	Length (feet)	1380 ft
Reach 2	Velocity (ft/sec)	1 ft/sec
	Length (feet)	220 ft

$t_c = t_l + t_t$	**21 min**

TLAG= 0.6*t_c	**0.21 hours**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W1R

Area (mi^2) 1.36

Soil Number	Curve Number	Area (%)	Weighted Curve Number
756	61	25	15.25
1100	64	21	13.44
1440	59	10	5.9
1450	64	31	19.84
1460	66	13	8.58
	Total	**100**	**63**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W2R

Area (mi^2) 0.84

Soil Number	Curve Number	Area (%)	Weighted Curve Number
756	58	8	4.64
1100	61	49	29.89
1440	65	13	8.45
1450	73	30	21.9
	Total	**100**	**65**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W3R

Area (mi^2) 1.38

Soil Number	Curve Number	Area (%)	Weighted Curve Number
756	61	4	2.44
1100	64	55	35.2
1432	69	5	3.45
1440	59	10	5.9
1450	69	26	17.94
	Total	**100**	**65**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W4R

Area (mi^2) 1.47

Soil Number	Curve Number	Area (%)	Weighted Curve Number
756	55	73	40.15
1432	61	27	16.47
	Total	**100**	**57**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W5R

Area (mi^2) 1.27

Soil Number	Curve Number	Area (%)	Weighted Curve Number
756	54	47	25.38
1432	61	53	32.33
	Total	**100**	**58**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W6R

Area (mi^2) 1.43

Soil Number	Curve Number	Area (%)	Weighted Curve Number
1120/1121	50	19	9.5
1432	59	81	47.79
	Total	**100**	**57**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W7R

Area (mi^2) 0.85

Hydrologic Soil Type	Curve Number	Area (%)	Weighted Curve Number
A	-	0	-
B	56	8	4.48
C	68	77	52.36
D	75	15	11.25
	Total	**100**	**68**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W8R

Area (mi^2) 0.75

Hydrologic Soil Type	Curve Number	Area (%)	Weighted Curve Number
A	-	0	-
B	56	34	19.04
C	68	57	38.76
D	75	9	6.75
	Total	**100**	**65**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W10RA

Area (mi^2) 0.14

Hydrologic Soil Type	Curve Number	Area (%)	Weighted Curve Number
A	-	0	-
B	54	88	47.52
C	65	12	7.8
D	-	0	-
	Total	**100**	**55**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W10RB

Area (mi^2) 0.13

Hydrologic Soil Type	Curve Number	Area (%)	Weighted Curve Number
A	-	0	-
B	54	92	49.68
C	65	8	5.2
D	-	0	-
	Total	**100**	**55**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W11R

Area (mi^2) 0.07

Hydrologic Soil Type	Curve Number	Area (%)	Weighted Curve Number
A	-	0	-
B	73	97	70.81
C	82	3	2.46
D	-	0	-
	Total	**100**	**73**

Curve Number Worksheet

Project Dorostkar

Location Subbasin W12RA

Area (mi^2) 0.16

Hydrologic Soil Type	Curve Number	Area (%)	Weighted Curve Number
A	-	0	-
B	54	62	33.48
C	65	38	24.7
D	-	0	-
	Total	**100**	**58**

Curve Number Worksheet

Project Dorostkar

Location Subbasin D1

Area (mi^2) 0.18

Hydrologic Soil Type	Curve Number*	Area (%)	Weighted Curve Number
A	-	0	-
B	72	96	69.12
C	-	0	-
D	86	4	3.44
	Total	**100**	**73**

* Proposed land use: residential 1/3 acre lots.

Curve Number Worksheet

Project Dorostkar

Location Subbasin D2

Area (mi^2) 0.04

Hydrologic Soil Type	Curve Number*	Area (%)	Weighted Curve Number
A	-	0	-
B	72	74	53.28
C	-	0	-
D	86	26	22.36
	Total	**100**	**76**

* Proposed land use: residential 1/3 acre lots.

Curve Number Worksheet

Project Dorostkar

Location Subbasin D3

Area (mi^2) 0.07

Hydrologic Soil Type	Curve Number*	Area (%)	Weighted Curve Number
A	-	0	-
B	72	100	72
C	-	0	-
D	-	0	-
	Total	**100**	**72**

* Proposed land use: residential 1/3 acre lots.

APPENDIX D

HARD COPIES OF HEC-1 MODELS

EXISTING CONDITIONS FILE NAME 428CLMRE.DAT
PROPOSED CONDITIONS FILE NAME 428CLOMR.DAT

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   05JAN05  TIME  07:28:17   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (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


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

              *DIAGRAM
    1         ID   ********************************************************************************
    2         ID     DOROSTKAR          FILE NAME: 428CLOMR.DAT
    3         ID     Nimbus Engineers                    JULY 2004
    4         ID     PROPOSED CONDITIONS, 100-YEAR, 24-HOUR STORM EVENT
    5         ID     MODIFIED FROM WHITES CREEK DETENTION FACILITY FEASIBILITY STUDY, JUNE 1993
    6         ID     DIFFERS FROM DOROSTKAR MASTER PLAN IN THAT NEWER LAG TIMES ARE USED TO
    7         ID     BE CONSISTENT WITH FEMA APPROVED MODELS ON WHITES CREEK
    8         ID   ********************************************************************************
              *
              *  ********************************************************************************
              *
              * IT     5 27JUL00    0005     288
    9         IT       5                     300
   10         IO       5       0
   11         IN    15.0
              *
   12         JR    PREC       1
              * reduction jan 04, 2 sq mi 4 sq mi 6 sq mi 8+sq mi
              * JR  PREC     1.0    .993    .990    .988    .985
              *

   13         KK     W1R Whites Creek 1
   14         BA    1.36
   15         PB     5.5
   16         PC     0.0    .002    .005    .008    .011    .014    .017    .020    .023    .026
   17         PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
   18         PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
   19         PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
   20         PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
   21         PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
   22         PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
   23         PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
   24         PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
   25         PC    .983    .986    .992    .995    .998   1.00
   26         LS              63
   27         UD    0.48
              *

   28         KK     W2R  Whites Creek No. 2
   29         BA    0.84
   30         PB     5.4
   31         LS              65
   32         UD    0.52
              *

   33         KK   W1+W2  Combine W1 and W2
   34         HC       2
              *
```



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

   35         KK    RT-A  Route to pt A
   36         RM       1   0.122     0.4
              *
```

```
 37          KK     W3R  Whites Creek No. 3
 38          BA    1.38
 39          PB    5.25
 40          LS              65
 41          UD    0.54
             *

 42          KK     RT-A  Route to pt A
 43          RM        1   0.095     0.4
             *

 44          KK     W4R  Whites Creek No. 4
 45          BA    1.47
 46          PB     5.0
 47          LS              57
 48          UD    0.72
             *

 49          KK   W1234  Combine W1-W4
 50          HC        3
             *

 51          KK     RT-B  Route to pt B
 52          RM        1  0.0597     0.4
             *

 53          KK     W5R  Whites Creek No. 5
 54          BA    1.27
 55          PB     4.8
 56          LS              58
 57          UD    0.85
             *

 58          KK   W5+CH  Combine W5 and channel
 59          HC        2
             *

 60          KK     RT-C  Route to pt C
 61          RM        2   0.185     0.4
             *

 62          KK     W6R  Whites Creek No. 6
 63          BA    1.43
 64          PB     4.1
 65          LS              57
 66          UD    1.23
             *
```

1 HEC-1 INPUT PAGE 3

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

 67          KK   W6+CH  Combine W6 and channel
 68          HC        2
             *

 69          KK     RT-D  Route to pt  WHERE FLOWS DIVERGE
 70          RM        1   0.122     0.4
             *

 71          KK     W7R  WHITES CREEK BASIN 7
 72          BA    0.85
 73          PB     3.4
 74          LS              68
 75          UD    0.96
             *

 76          KK   W7+CH COMBINE W7 AND CHANNEL
 77          HC        2
             *

 78          KK  RT-DIF ROUTE FLOWS TO DIFFLUENCE
 79          RM        1   0.104     0.4
             *

 80          KK     W8R WHITES CREEK BASIN 8
 81          BA    0.75
 82          PB     3.0
 83          LS              65
 84          UD    1.19
             *

 85          KK  CP DIF COMBINE FLOWS AT DIFFLUENCE
 86          HC        2
             *

 87          KK  DV 1&4 DIVERT FLOWS FROM CHANNELS 1 AND 4
 88          DT  CH 1&4
 89          DI        0    2000    3500    5100
 90          DQ        0     800    1400    2040
             *

 91          KK   DV 2  DIVERT CHANNEL 2
 92          DT    CH 2
```

```
 93          DI        0    2001    3050
 94          DQ        0    1161    1940
             *

 95          KK   RT10B ROUTE CHANNEL 3 TO W10RB
 96          RD    6230  0.0546    0.05            TRAP     100       5
             *
1                                        HEC-1 INPUT                                                    PAGE  4
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 97          KK   W10RB WHITES CREEK 10B
 98          BA    0.13
 99          PB     2.8
100          LS               55
101          UD     0.3
             *

102          KK  CP CH3 COMBINE FLOWS IN CHANNEL 3
103          HC       2
             *

104          KK   RTCH3 ROUTE CHANNEL 3 AND W10RB THROUGH PROPERTY
105          RD    2400  0.0329     0.05            TRAP      30       5
             *

106          KK   W11R  WHITES CREEK 11
107          BA    0.07
108          PB     2.7
109          LS               73
110          UD    0.24
             *

111          KK      D3 DOROSTKAR SUBBASIN 3
112          BA    0.07
113          PB     2.7
114          LS               72
115          UD    0.21
             *

116          KK    CPD3 COMBINE W11R AND D3 FLOWS
117          HC       3
             *

118          KK   DRCH2 RECALL CHANNEL 2 FLOW
119          DR    CH 2
             *

120          KK   RTCH2 ROUTE CHANNEL 2 TO W10RA
121          RD    5320  0.0564     0.05            TRAP     100       5
             *

122          KK   W10RA WHITES CREEK 10A
123          BA    0.14
124          PB     2.8
125          LS               55
126          UD     .32
             *

127          KK   CP10A COMBINE W10RA AND CHANNEL 2
128          HC       2
             *
1                                        HEC-1 INPUT                                                    PAGE  5
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

129          KK   RT10A ROUTE CP10A COMBINED FLOWS TO D1
130          RD    3100  0.0419     0.04            TRAP      40       3
             *

131          KK      D1 DOROSTKAR SUBBASIN 1
132          BA    0.18
133          PB     2.8
134          LS               73
135          UD    0.34
             *

136          KK   W12RA WHITES CREEK 12A
137          BA    0.51
138          PB     2.8
139          LS               58
140          UD    0.39
             *

141          KK    CPD1 COMBINE W10RA, W12R, AND D1 FLOWS
142          HC       3
             *

143          KK   RT D1 ROUTE COMBINED FLOWS THROUGH D2
144          RD    1000   0.027     0.04            TRAP      40       3
             *

145          KK      D2 DOROSTKAR SUBBASIN 2
```

```
146           BA    0.04
147           PB     2.8
148           LS                76
149           UD    0.21
              *

150           KK   CP D2 COMBINE FLOWS LEAVING PROPERTY
151           HC       2
              *
152           ZZ
```

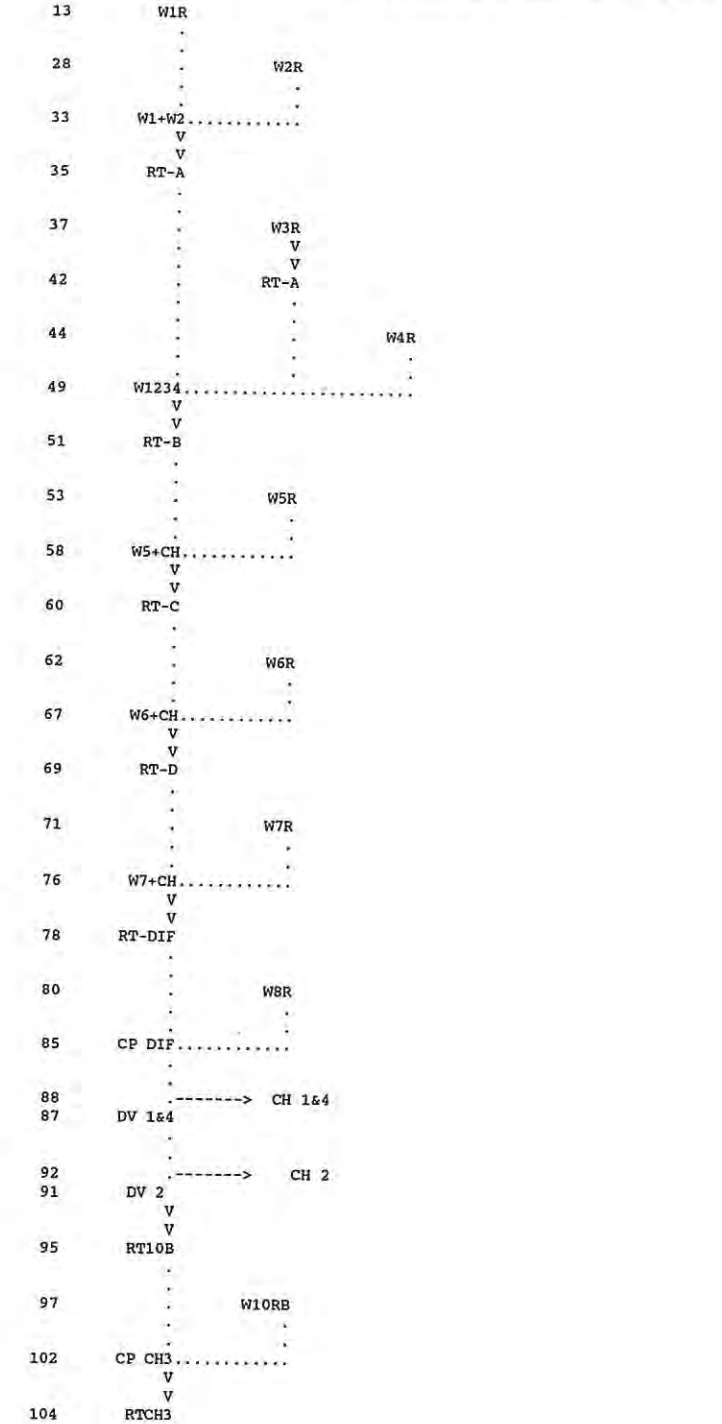
1

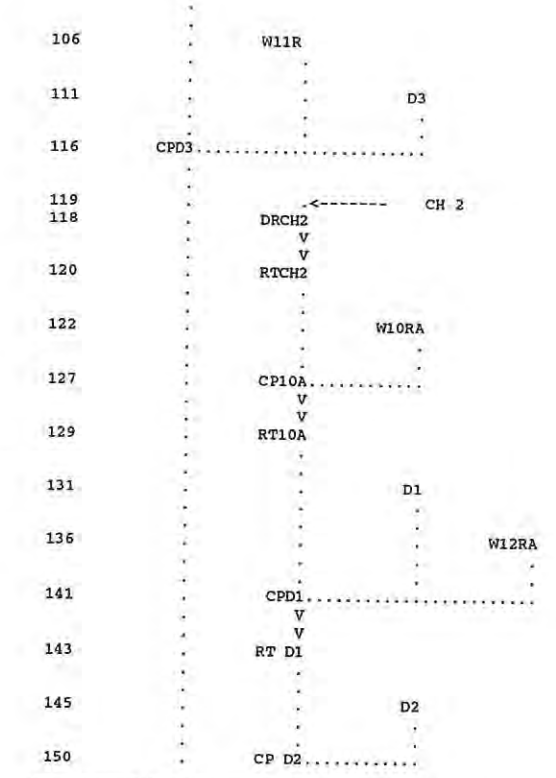
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   05JAN05  TIME  07:28:17   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
*************************************************************************
  DOROSTKAR          FILE NAME: 428CLOMR.DAT
  Nimbus Engineers                  JULY 2004
  PROPOSED CONDITIONS, 100-YEAR, 24-HOUR STORM EVENT
  MODIFIED FROM WHITES CREEK DETENTION FACILITY FEASIBILITY STUDY, JUNE 1993
  DIFFERS FROM DOROSTKAR MASTER PLAN IN THAT NEWER LAG TIMES ARE USED TO
  BE CONSISTENT WITH FEMA APPROVED MODELS ON WHITES CREEK
*************************************************************************
```

```
 10 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      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      2   0  ENDING DATE
                  NDTIME        0055  ENDING TIME
                   ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL      .08 HOURS
                 TOTAL TIME BASE   24.92 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

   JP        MULTI-PLAN OPTION
```

NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
1.00
***** WARNING ***** POSSIBLE INSTABILITIES IN THE MUSKINGUM ROUTING FOR REACH RT-A.
ADJUST NSTPS AND/OR COMPUTATION INTERVAL TO MEET CRITERIA IN USER MANUAL).
***** WARNING ***** POSSIBLE INSTABILITIES IN THE MUSKINGUM ROUTING FOR REACH RT-B.
ADJUST NSTPS AND/OR COMPUTATION INTERVAL TO MEET CRITERIA IN USER MANUAL).
***** WARNING ***** POSSIBLE INSTABILITIES IN THE MUSKINGUM ROUTING FOR REACH RT-D.
ADJUST NSTPS AND/OR COMPUTATION INTERVAL TO MEET CRITERIA IN USER MANUAL).
1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 1.00
HYDROGRAPH AT					
+	W1R	1.36	1	FLOW	932.
				TIME	12.42
HYDROGRAPH AT					
+	W2R	.84	1	FLOW	581.
				TIME	12.42
2 COMBINED AT					
+	W1+W2	2.20	1	FLOW	1513.
				TIME	12.42
ROUTED TO					
+	RT-A	2.20	1	FLOW	1481.
				TIME	12.50
HYDROGRAPH AT					
+	W3R	1.38	1	FLOW	874.
				TIME	12.50
ROUTED TO					
+	RT-A	1.38	1	FLOW	870.
				TIME	12.58
HYDROGRAPH AT					
+	W4R	1.47	1	FLOW	405.
				TIME	12.75
3 COMBINED AT					
+	W1234	5.05	1	FLOW	2737.
				TIME	12.58
ROUTED TO					
+	RT-B	5.05	1	FLOW	2717.
				TIME	12.67
HYDROGRAPH AT					
+	W5R	1.27	1	FLOW	300.
				TIME	12.92
2 COMBINED AT					
+	W5+CH	6.32	1	FLOW	2992.
				TIME	12.67
ROUTED TO					
+	RT-C	6.32	1	FLOW	2964.
				TIME	12.83
HYDROGRAPH AT					
+	W6R	1.43	1	FLOW	146.
				TIME	13.42
2 COMBINED AT					
+	W6+CH	7.75	1	FLOW	3068.
				TIME	12.83
ROUTED TO					
+	RT-D	7.75	1	FLOW	3021.
				TIME	13.00
HYDROGRAPH AT					
+	W7R	.85	1	FLOW	153.
				TIME	13.00
2 COMBINED AT					
+	W7+CH	8.60	1	FLOW	3174.
				TIME	13.00
ROUTED TO					
+	RT-DIF	8.60	1	FLOW	3163.
				TIME	13.08

HYDROGRAPH AT

+	W8R	.75	1	FLOW	61.
				TIME	13.42
2 COMBINED AT					
+	CP DIF	9.35	1	FLOW	3220.
				TIME	13.08
DIVERSION TO					
+	CH 1&4	9.35	1	FLOW	1288.
				TIME	13.08
HYDROGRAPH AT					
+	DV 1&4	9.35	1	FLOW	1932.
				TIME	13.08
DIVERSION TO					
+	CH 2	9.35	1	FLOW	1121.
				TIME	13.08
HYDROGRAPH AT					
+	DV 2	9.35	1	FLOW	811.
				TIME	13.08
ROUTED TO					
+	RT10B	9.35	1	FLOW	811.
				TIME	13.25
HYDROGRAPH AT					
+	W10RB	.13	1	FLOW	2.
				TIME	12.58
2 COMBINED AT					
+	CP CH3	9.48	1	FLOW	813.
				TIME	13.25
ROUTED TO					
+	RTCH3	9.48	1	FLOW	806.
				TIME	13.33
HYDROGRAPH AT					
+	W11R	.07	1	FLOW	25.
				TIME	12.17
HYDROGRAPH AT					
+	D3	.07	1	FLOW	24.
				TIME	12.17
3 COMBINED AT					
+	CPD3	9.62	1	FLOW	813.
				TIME	13.33
HYDROGRAPH AT					
+	DRCH2	.00	1	FLOW	1121.
				TIME	13.08
ROUTED TO					
+	RTCH2	.00	1	FLOW	1121.
				TIME	13.17
HYDROGRAPH AT					
+	W10RA	.14	1	FLOW	3.
				TIME	12.58
2 COMBINED AT					
+	CP10A	.14	1	FLOW	1123.
				TIME	13.17
ROUTED TO					
+	RT10A	.14	1	FLOW	1122.
				TIME	13.25
HYDROGRAPH AT					
+	D1	.18	1	FLOW	58.
				TIME	12.25
HYDROGRAPH AT					
+	W12RA	.51	1	FLOW	20.
				TIME	12.50
3 COMBINED AT					
+	CPD1	.83	1	FLOW	1147.
				TIME	13.25
ROUTED TO					
+	RT D1	.83	1	FLOW	1141.
				TIME	13.25
HYDROGRAPH AT					
+	D2	.04	1	FLOW	21.
				TIME	12.08
2 COMBINED AT					
+	CP D2	.87	1	FLOW	1144.
				TIME	13.25

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR PLAN = 1 RATIO= .00									
	RT10B MANE	5.00	811.49	795.00	.31	5.00	811.49	795.00	.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1552E+03 EXCESS= .0000E+00 OUTFLOW= .1539E+03 BASIN STORAGE= .2540E+01 PERCENT ERROR= -.7

FOR PLAN = 1 RATIO= .00									
	RTCH3 MANE	4.38	811.19	796.40	.30	5.00	805.61	800.00	.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1546E+03 EXCESS= .0000E+00 OUTFLOW= .1540E+03 BASIN STORAGE= .9256E+00 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00									
	RTCH2 MANE	5.00	1121.23	790.00	-1.00	5.00	1121.23	790.00	-1.00
FOR PLAN = 1 RATIO= .00									
	RT10A MANE	3.90	1122.43	794.77	28.51	5.00	1121.63	795.00	28.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2139E+03 EXCESS= .0000E+00 OUTFLOW= .2131E+03 BASIN STORAGE= .1211E+01 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00									
	RT D1 MANE	1.44	1145.28	796.02	5.10	5.00	1140.98	795.00	5.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2261E+03 EXCESS= .0000E+00 OUTFLOW= .2257E+03 BASIN STORAGE= .4633E+00 PERCENT ERROR= -.1

*** NORMAL END OF HEC-1 ***

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   03JAN05  TIME  13:40:24   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (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

              *DIAGRAM
    1         ID   ********************************************************************************
    2         ID     DOROSTKAR                          FILE NAME: 428CLMRE.DAT
    3         ID     Nimbus Engineers                    JAN 200R
    4         ID     EXISTING CONDITIONS, 100-YEAR, 24-HOUR STORM EVENT FOR CLOMR
    5         ID     MODIFIED FROM WHITES CREEK DETENTION FACILITY FEASIBILITY STUDY, JUNE 1993
    6         ID   ********************************************************************************
              *
              *  ***************************************************************************
              *
              * IT     5 27JUL00     0005      288
    7         IT       5                       300
    8         IO       5        0
    9         IN    15.0
              *
              * JR  PREC     0.94
              * reduction jan 04, 2 sq mi 4 sq mi 6 sq mi 8+sq mi
              * JR  PREC      1.0     .993     .990     .988     .985
              *
   10         KK     W1R Whites Creek 1
   11         BA    1.36
   12         PB     5.5
   13         PC     0.0    .002     .005     .008     .011     .014     .017     .020     .023     .026
   14         PC    .029    .032     .035     .038     .041     .044     .048     .052     .056     .060
   15         PC    .064    .068     .072     .076     .080     .085     .090     .095     .100     .105
   16         PC    .110    .115     .120     .126     .133     .140     .147     .155     .163     .172
   17         PC    .181    .191     .203     .218     .236     .257     .283     .387     .663     .707
   18         PC    .735    .758     .776     .791     .804     .815     .825     .834     .842     .849
   19         PC    .856    .863     .869     .875     .881     .887     .893     .898     .903     .908
   20         PC    .913    .918     .922     .926     .930     .934     .938     .942     .946     .950
   21         PC    .953    .956     .959     .962     .965     .968     .971     .974     .977     .980
   22         PC    .983    .986     .992     .995     .998    1.00
   23         LS               63
   24         UD    0.48
              *
   25         KK     W2R  Whites Creek No. 2
   26         BA    0.84
   27         PB     5.4
   28         LS               65
   29         UD    0.52
              *
   30         KK   W1+W2  Combine W1 and W2
   31         HC       2
              *
   32         KK    RT-A  Route to pt A
   33         RM       1   0.122      0.4
              *
```

1 HEC-1 INPUT PAGE 2

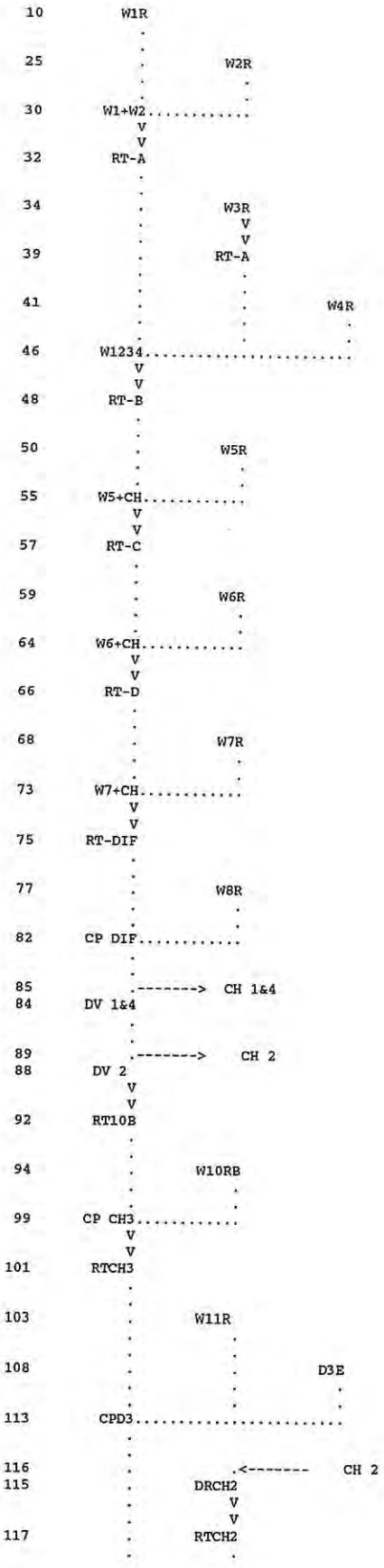
```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   34         KK     W3R  Whites Creek No. 3
```

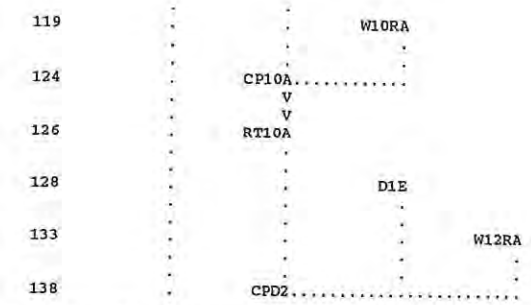
```
35          BA    1.38
36          PB    5.25
37          LS              65
38          UD    0.54
            *

39          KK    RT-A  Route to pt A
40          RM       1   0.095     0.4
            *

41          KK     W4R  Whites Creek No. 4
42          BA    1.47
43          PB     5.0
44          LS              57
45          UD    0.72
            *

46          KK   W1234  Combine W1-W4
47          HC       3
            *

48          KK    RT-B  Route to pt B
49          RM       1  0.0597     0.4
            *

50          KK     W5R  Whites Creek No. 5
51          BA    1.27
52          PB     4.8
53          LS              58
54          UD    0.85
            *

55          KK   W5+CH  Combine W5 and channel
56          HC       2
            *

57          KK    RT-C  Route to pt C
58          RM       2   0.185     0.4
            *

59          KK     W6R  Whites Creek No. 6
60          BA    1.43
61          PB     4.1
62          LS              57
63          UD    1.23
            *

64          KK   W6+CH  Combine W6 and channel
65          HC       2
            *
```



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

66          KK    RT-D  Route to pt  WHERE FLOWS DIVERGE
67          RM       1   0.122     0.4
            *

68          KK     W7R  WHITES CREEK BASIN 7
69          BA    0.85
70          PB     3.4
71          LS              68
72          UD    0.96
            *

73          KK   W7+CH COMBINE W7 AND CHANNEL
74          HC       2
            *

75          KK  RT-DIF ROUTE FLOWS TO DIFFLUENCE
76          RM       1   0.104     0.4
            *

77          KK     W8R WHITES CREEK BASIN 8
78          BA    0.75
79          PB     3.0
80          LS              65
81          UD    1.19
            *

82          KK  CP DIF COMBINE FLOWS AT DIFFLUENCE
83          HC       2
            *

84          KK  DV 1&4 DIVERT FLOWS FROM CHANNELS 1 AND 4
85          DT  CH 1&4
86          DI       0    2000    3500    5100
87          DQ       0     800    1400    2040
            *

88          KK   DV 2  DIVERT CHANNEL 2
89          DT    CH 2
90          DI       0    2001    3050
91          DQ       0    1161    1940
```

```
                *
     92         KK   RT10B ROUTE CHANNEL 3 TO W10RB
     93         RD    6230  0.0546    0.05            TRAP     100       5
                *
     94         KK   W10RB WHITES CREEK 10B
     95         BA    0.13
     96         PB     2.8
     97         LS              55
     98         UD     0.3
                *
1                                        HEC-1 INPUT                                                    PAGE  4
   LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

     99         KK  CP CH3 COMBINE FLOWS IN CHANNEL 3
    100         HC       2
                *
    101         KK   RTCH3 ROUTE CHANNEL 3 AND W10RB THROUGH PROPERTY
    102         RD    2400  0.0329    0.05            TRAP      30       5
                *
    103         KK   W11R  WHITES CREEK 11
    104         BA    0.07
    105         PB     2.7
    106         LS              73
    107         UD    0.24
                *
    108         KK     D3E DOROSTKAR SUBBASIN 3
    109         BA    0.07
    110         PB     2.7
    111         LS              61
    112         UD    0.15
                *
    113         KK    CPD3 COMBINE W11R AND D3 FLOWS
    114         HC       3
                *
    115         KK   DRCH2 RECALL CHANNEL 2 FLOW
    116         DR    CH 2
                *
    117         KK   RTCH2 ROUTE CHANNEL 2 TO W10RA
    118         RD    5320  0.0564    0.05            TRAP     100       5
                *
    119         KK   W10RA WHITES CREEK 10A
    120         BA    0.14
    121         PB     2.8
    122         LS              55
    123         UD     .32
                *
    124         KK   CP10A COMBINE W10RA AND CHANNEL 2
    125         HC       2
                *
    126         KK   RT10A ROUTE CP10A COMBINED FLOWS TO D1
    127         RD    3700  0.0470    0.04            TRAP      40       5
                *
1                                        HEC-1 INPUT                                                    PAGE  5
   LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

    128         KK     D1E DOROSTKAR SUBBASIN 1
    129         BA    0.22
    130         PB     2.8
    131         LS              62
    132         UD    0.18
                *
    133         KK   W12RA WHITES CREEK 12A
    134         BA    0.51
    135         PB     2.8
    136         LS              58
    137         UD    0.39
                *
    138         KK    CPD2 COMBINE W10RA, W12R, AND D1 FLOWS
    139         HC       3
                *
    140         ZZ
1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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


10 W1R
25 W2R
30 W1+W2
32 RT-A
34 W3R
39 RT-A
41 W4R
46 W1234
48 RT-B
50 W5R
55 W5+CH
57 RT-C
59 W6R
64 W6+CH
66 RT-D
68 W7R
73 W7+CH
75 RT-DIF
77 W8R
82 CP DIF
85 CH 1&4
84 DV 1&4
89 CH 2
88 DV 2
92 RT10B
94 W10RB
99 CP CH3
101 RTCH3
103 W11R
108 D3E
113 CPD3
116 CH 2
115 DRCH2
117 RTCH2



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   03JAN05  TIME  13:40:24   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
*****************************************************************************
 DOROSTKAR                              FILE NAME: 428CLMRE.DAT
 Nimbus Engineers                       JAN 200R
 EXISTING CONDITIONS, 100-YEAR, 24-HOUR STORM EVENT FOR CLOMR
 MODIFIED FROM WHITES CREEK DETENTION FACILITY FEASIBILITY STUDY, JUNE 1993
*****************************************************************************

  8 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     1   0  STARTING DATE
                ITIME      0000  STARTING TIME
                NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE    2   0  ENDING DATE
                NDTIME     0055  ENDING TIME
                ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL      .08 HOURS
                 TOTAL TIME BASE    24.92 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
***** WARNING *****  POSSIBLE INSTABILITIES IN THE MUSKINGUM ROUTING FOR REACH    RT-A.
      ADJUST NSTPS AND/OR COMPUTATION INTERVAL TO MEET CRITERIA IN USER MANUAL).
***** WARNING *****  POSSIBLE INSTABILITIES IN THE MUSKINGUM ROUTING FOR REACH    RT-B.
      ADJUST NSTPS AND/OR COMPUTATION INTERVAL TO MEET CRITERIA IN USER MANUAL).
***** WARNING *****  POSSIBLE INSTABILITIES IN THE MUSKINGUM ROUTING FOR REACH    RT-D.
      ADJUST NSTPS AND/OR COMPUTATION INTERVAL TO MEET CRITERIA IN USER MANUAL).
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	W1R	932.	12.42	217.	67.	65.	1.36		
+	HYDROGRAPH AT	W2R	581.	12.42	141.	43.	42.	.84		
+	2 COMBINED AT	W1+W2	1513.	12.42	358.	111.	106.	2.20		
+	ROUTED TO	RT-A	1481.	12.50	358.	110.	106.	2.20		
+	HYDROGRAPH AT	W3R	874.	12.50	219.	68.	65.	1.38		

+	ROUTED TO	RT-A	870.	12.58	219.	68.	65.	1.38
+	HYDROGRAPH AT	W4R	405.	12.75	135.	44.	42.	1.47
+	3 COMBINED AT	W1234	2737.	12.58	711.	222.	213.	5.05
+	ROUTED TO	RT-B	2717.	12.67	711.	221.	213.	5.05
+	HYDROGRAPH AT	W5R	300.	12.92	111.	36.	35.	1.27
+	2 COMBINED AT	W5+CH	2992.	12.67	822.	257.	248.	6.32
+	ROUTED TO	RT-C	2964.	12.83	822.	257.	248.	6.32
+	HYDROGRAPH AT	W6R	146.	13.42	74.	25.	24.	1.43
+	2 COMBINED AT	W6+CH	3068.	12.83	895.	282.	272.	7.75
+	ROUTED TO	RT-D	3021.	13.00	895.	282.	271.	7.75
+	HYDROGRAPH AT	W7R	153.	13.00	60.	19.	18.	.85
+	2 COMBINED AT	W7+CH	3174.	13.00	954.	301.	290.	8.60
+	ROUTED TO	RT-DIF	3163.	13.08	954.	300.	289.	8.60
+	HYDROGRAPH AT	W8R	61.	13.42	30.	10.	10.	.75
+	2 COMBINED AT	CP DIF	3220.	13.08	983.	311.	299.	9.35
+	DIVERSION TO	CH 1&4	1288.	13.08	393.	124.	120.	9.35
+	HYDROGRAPH AT	DV 1&4	1932.	13.08	590.	186.	179.	9.35
+	DIVERSION TO	CH 2	1121.	13.08	342.	108.	104.	9.35
+	HYDROGRAPH AT	DV 2	811.	13.08	248.	78.	75.	9.35
+	ROUTED TO	RT10B	811.	13.25	248.	77.	75.	9.35
+	HYDROGRAPH AT	W10RB	2.	12.58	1.	1.	0.	.13
+	2 COMBINED AT	CP CH3	813.	13.25	249.	78.	75.	9.48
+	ROUTED TO	RTCH3	806.	13.33	248.	78.	75.	9.48
+	HYDROGRAPH AT	W11R	25.	12.17	4.	1.	1.	.07
+	HYDROGRAPH AT	D3E	7.	12.08	1.	0.	0.	.07
+	3 COMBINED AT	CPD3	811.	13.33	251.	79.	76.	9.62
+	HYDROGRAPH AT	DRCH2	1121.	13.08	342.	108.	104.	.00
+	ROUTED TO	RTCH2	1121.	13.17	342.	107.	103.	.00
+	HYDROGRAPH AT	W10RA	3.	12.58	1.	1.	1.	.14
+	2 COMBINED AT	CP10A	1123.	13.17	343.	108.	104.	.14
+	ROUTED TO	RT10A	1118.	13.25	343.	107.	103.	.14
+	HYDROGRAPH AT	D1E	28.	12.17	6.	2.	2.	.22

	HYDROGRAPH AT							
+		W12RA	20.	12.50	8.	3.	3.	.51
	3 COMBINED AT							
+		CPD2	1138.	13.25	354.	112.	108.	.87
1								

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RT10B	MANE	5.00	811.49	795.00	.31	5.00	811.49	795.00	.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1552E+03 EXCESS= .0000E+00 OUTFLOW= .1539E+03 BASIN STORAGE= .2540E+01 PERCENT ERROR= -.7

RTCH3	MANE	4.38	811.19	796.40	.30	5.00	805.61	800.00	.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1546E+03 EXCESS= .0000E+00 OUTFLOW= .1540E+03 BASIN STORAGE= .9256E+00 PERCENT ERROR= -.2

RTCH2	MANE	5.00	1121.23	790.00	-1.00	5.00	1121.23	790.00	-1.00
RT10A	MANE	4.82	1121.69	795.92	28.47	5.00	1118.43	795.00	28.54

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2138E+03 EXCESS= .0000E+00 OUTFLOW= .2129E+03 BASIN STORAGE= .1432E+01 PERCENT ERROR= -.2

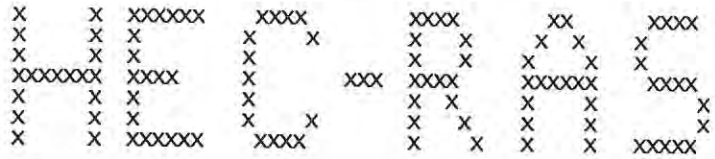
*** NORMAL END OF HEC-1 ***

APPENDIX E

ELECTRONIC COPIES OF HEC-1 AND HEC-RAS MODELS

HARD COPY OF
PROPOSED CONDITIONS HEC-RAS MODEL

HEC-RAS Version 3.1.1 May 2003
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104



PROJECT DATA
Project Title: Dorostkar-Upper Channel
Project File : Dorostkar4.prj
Run Date and Time: 1/4/2005 4:05:21 PM

Project in English units

Project Description:

PLAN DATA

Plan Title: Plan 42
Plan File : j:\0428 Ryder Dorostkar\hydro\ras\Dorostkar4.p42

Geometry Title: reddepthw/drops
Geometry File : j:\0428 Ryder Dorostkar\hydro\ras\Dorostkar4.g16

Flow Title : CLOMR FLOW 1138 CFS
Flow File : j:\0428 Ryder Dorostkar\hydro\ras\Dorostkar4.f09

Plan Summary Information:
Number of: Cross Sections = 41 Mulitple Openings = 0
Culverts = 2 Inline Structures = 0
Bridges = 0 Lateral Structures = 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: CLOMR FLOW 1138 CFS
Flow File : j:\0428 Ryder Dorostkar\hydro\ras\Dorostkar4.f09

Flow Data (cfs)

River	Reach	RS	PF 1
Channel	Channel	5100	1138

Boundary Conditions

River	Reach	Profile	Upstream	Downstream

Channel Channel PF 1 Critical Critical

GEOMETRY DATA

Geometry Title: reddepthw/drops
Geometry File : j:\0428 Ryder Dorostkar\hydro\ras\Dorostkar4.g16

CROSS SECTION

RIVER: Channel
REACH: Channel RS: 5100

INPUT
Description: Natural cross section approx. 60 ft u/s of concrete apron
Station Elevation Data num= 4

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	4777.96	122	4771.95	162	4769.94	190	4776

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.04	100	.04	190	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	190	45	60	72	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	4774.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.11	Wt. n-Val.		0.040	
W.S. Elev (ft)	4773.48	Reach Len. (ft)	45.00	60.00	72.00
Crit W.S. (ft)	4773.48	Flow Area (sq ft)		134.75	
E.G. Slope (ft/ft)	0.018598	Area (sq ft)		134.75	
Q Total (cfs)	1138.00	Flow (cfs)		1138.00	
Top Width (ft)	61.97	Top Width (ft)		61.97	
Vel Total (ft/s)	8.45	Avg. Vel. (ft/s)		8.45	
Max Chl Dpth (ft)	3.54	Hydr. Depth (ft)		2.17	
Conv. Total (cfs)	8344.7	Conv. (cfs)		8344.7	
Length Wtd. (ft)	60.00	Wetted Per. (ft)		62.61	
Min Ch El (ft)	4769.94	Shear (lb/sq ft)		2.50	
Alpha	1.00	Stream Power (lb/ft s)		21.10	
Frctn Loss (ft)	1.10	Cum Volume (acre-ft)	0.44	9.03	0.70
C & E Loss (ft)	0.00	Cum SA (acres)	0.28	4.09	0.63

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

CROSS SECTION

RIVER: Channel
REACH: Channel RS: 5000

INPUT
Description: Start of concrete apron
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	4776.5	119.05	4774.5	129.85	4772.5	138.1	4770.5	142.55	4768.5
153.98	4766.5	165.02	4764.5	181.92	4764.5	192.25	4766.5	207.32	4768.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.04	142.55	.04	207.32	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
142.55	207.32	45	30	25	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4771.81	Element			
Vel Head (ft)	5.12	Wt. n-Val.		0.040	
W.S. Elev (ft)	4766.69	Reach Len. (ft)	45.00	30.00	25.00
Crit W.S. (ft)	4768.11	Flow Area (sq ft)		62.68	
E.G. Slope (ft/ft)	0.136473	Area (sq ft)		62.68	
Q Total (cfs)	1138.00	Flow (cfs)		1138.00	
Top Width (ft)	40.79	Top Width (ft)		40.79	
Vel Total (ft/s)	18.16	Avg. Vel. (ft/s)		18.16	
Max Chl Dpth (ft)	2.19	Hydr. Depth (ft)		1.54	
Conv. Total (cfs)	3080.5	Conv. (cfs)		3080.5	
Length Wtd. (ft)	30.00	Wetted Per. (ft)		41.19	
Min Ch El (ft)	4764.50	Shear (lb/sq ft)		12.97	
Alpha	1.00	Stream Power (lb/ft s)		235.41	
Frctn Loss (ft)	2.38	Cum Volume (acre-ft)	0.44	8.89	0.70
C & E Loss (ft)	0.40	Cum SA (acres)	0.28	4.02	0.63

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Channel
REACH: Channel RS: 4900

INPUT
Description: ArrowCreek Pkwy Culvert inlet
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	4770.5	101.95	4770.5	102	4756.37	112	4756.27	115	4756.01
125	4756.01	128	4755.76	138	4755.76	138.1	4769.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.04	100	.04	138.1	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
100	138.1	210	210	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4765.76	Element			
Vel Head (ft)	8.38	Wt. n-Val.		0.040	
W.S. Elev (ft)	4757.39	Reach Len. (ft)	210.00	210.00	210.00
Crit W.S. (ft)	4759.15	Flow Area (sq ft)		49.00	
E.G. Slope (ft/ft)	0.285069	Area (sq ft)		49.00	
Q Total (cfs)	1138.00	Flow (cfs)		1138.00	
Top Width (ft)	36.02	Top Width (ft)		36.02	
Vel Total (ft/s)	23.23	Avg. Vel. (ft/s)		23.23	
Max Chl Dpth (ft)	1.63	Hydr. Depth (ft)		1.36	
Conv. Total (cfs)	2131.4	Conv. (cfs)		2131.4	
Length Wtd. (ft)	210.00	Wetted Per. (ft)		38.67	
Min Ch El (ft)	4755.76	Shear (lb/sq ft)		22.55	
Alpha	1.00	Stream Power (lb/ft s)		523.75	
Frctn Loss (ft)	5.72	Cum Volume (acre-ft)	0.44	8.85	0.70
C & E Loss (ft)	0.33	Cum SA (acres)	0.28	3.99	0.63

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.

CULVERT

RIVER: Channel
REACH: Channel RS: 4850

```
INPUT
Description: ArrowCreek Pkway, three 5x10 RCBs
Distance from Upstream XS =        1
Deck/Roadway Width        =       60
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=        4
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
     100    4776    4756      120    4776    4756      133    4776  4755.5
     150    4776  4755.5

Upstream Bridge Cross Section Data
Station Elevation Data    num=        9
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     100  4770.5   101.95  4770.5      102 4756.37      112 4756.27      115 4756.01
     125 4756.01      128 4755.76      138 4755.76    138.1  4769.5

Manning's n Values        num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
     100     .04      100     .04    138.1     .04

Bank Sta: Left   Right    Coeff Contr.    Expan.
           100   138.1              .1       .3

Downstream  Deck/Roadway Coordinates
    num=        5
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
     100    4776    4748   116.43    4776    4748   133.46    4776    4748
  150.48    4776    4747      180    4776  4746.5

Downstream Bridge Cross Section Data
Station Elevation Data    num=       16
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
     100  4760.5   102.67  4758.5   103.81  4756.5   106.73  4754.5   108.89  4752.5
  111.42  4750.5   111.43  4748.5   116.43  4748.5   128.46 4748.21   133.46 4748.21
  145.48 4747.39   150.48 4747.39   155.48    4747    163.5  4752.5   172.39  4754.5
  180.01  4756.5

Manning's n Values        num=        3
     Sta   n Val      Sta   n Val      Sta   n Val
     100     .04   106.73     .04   172.39     .04

Bank Sta: Left   Right    Coeff Contr.    Expan.
        106.73  172.39              .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            =    4776
Energy head used in spillway design            =
Spillway height used in design                 =
Weir crest shape                               = Broad Crested

Number of Culverts =  3

Culvert Name      Shape      Rise    Span
Culvert #1            Box       5      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  1     173     .013     .013        0                  .5                 1
Upstream   Elevation =  4756.27
           Centerline Station =  107
Downstream Elevation =  4749.11
           Centerline Station =  116.43

Culvert Name      Shape      Rise    Span
Culvert #2            Box       5      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  1     182     .013     .013        0                  .5                 1
Upstream   Elevation =  4756.01
           Centerline Station =  120
Downstream Elevation =  4748.21
           Centerline Station =  133.46
```

Culvert Name	Shape	Rise	Span
Culvert #3	Box	5	10

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	1	200	.013	.013	0	.5	1

Upstream Elevation = 4755.76
Upstream Centerline Station = 133
Downstream Elevation = 4747.39
Downstream Centerline Station = 150.48

CROSS SECTION

RIVER: Channel
REACH: Channel RS: 4800

INPUT
Description: Outlet of ArrowCreek Pkwy Culverts
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
100	4760.5	102.67	4758.5	103.81	4756.5	106.73	4754.5	108.89	4752.5
111.42	4750.5	111.43	4748.5	116.43	4748.5	128.46	4748.21	133.46	4748.21
145.48	4747.39	150.48	4747.39	155.48	4747	163.5	4752.5	172.39	4754.5
180.01	4756.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
100	.04	106.73	.04	172.39	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
106.73	172.39	30	10	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4751.87	Element			
Vel Head (ft)	1.27	Wt. n-Val.		0.040	
W.S. Elev (ft)	4750.60	Reach Len. (ft)	30.00	10.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)		125.73	
E.G. Slope (ft/ft)	0.018588	Area (sq ft)		125.73	
Q Total (cfs)	1138.00	Flow (cfs)		1138.00	
Top Width (ft)	49.44	Top Width (ft)		49.44	
Vel Total (ft/s)	9.05	Avg. Vel. (ft/s)		9.05	
Max Chl Dpth (ft)	3.60	Hydr. Depth (ft)		2.54	
Conv. Total (cfs)	8346.9	Conv. (cfs)		8346.9	
Length Wtd. (ft)	10.38	Wetted Per. (ft)		52.63	
Min Ch El (ft)	4747.00	Shear (lb/sq ft)		2.77	
Alpha	1.00	Stream Power (lb/ft s)		25.09	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.44	8.43	0.70
C & E Loss (ft)		Cum SA (acres)	0.28	3.79	0.63

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -1000

INPUT
Description: Start designed channel
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4754.52	0	4748.35	.1	4748.32	3	4747.4	23	4747
43	4747.4	50	4749.62	71.5	4756.43				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	50	50	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4751.29	Element			
Vel Head (ft)	1.06	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4750.23	Reach Len. (ft)	50.00	50.00	50.00

Crit W.S. (ft)	4749.99	Flow Area (sq ft)	7.06	121.10	12.61
E.G. Slope (ft/ft)	0.011434	Area (sq ft)	7.06	121.10	12.61
Q Total (cfs)	1138.00	Flow (cfs)	70.29	1006.63	61.08
Top Width (ft)	51.92	Top Width (ft)	3.00	40.00	8.92
Vel Total (ft/s)	8.08	Avg. Vel. (ft/s)	9.96	8.31	4.85
Max Chl Dpth (ft)	3.23	Hydr. Depth (ft)	2.35	3.03	1.41
Conv. Total (cfs)	10642.4	Conv. (cfs)	657.3	9413.8	571.2
Length Wtd. (ft)	50.00	Wetted Per. (ft)	5.02	40.01	9.36
Min Ch El (ft)	4747.00	Shear (lb/sq ft)	1.00	2.16	0.96
Alpha	1.05	Stream Power (lb/ft s)	9.99	17.96	4.66
Frctn Loss (ft)	0.66	Cum Volume (acre-ft)	0.44	8.40	0.70
C & E Loss (ft)	0.02	Cum SA (acres)	0.28	3.78	0.63

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -1049.99

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4753.87	0	4747.7	.1	4747.67	3	4746.75	23	4746.35
43	4746.75	50	4748.97	71.5	4755.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	4750.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.28	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4749.34	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	4749.34	Flow Area (sq ft)	6.33	111.47	10.55
E.G. Slope (ft/ft)	0.015242	Area (sq ft)	6.33	111.47	10.55
Q Total (cfs)	1138.00	Flow (cfs)	70.04	1012.33	55.63
Top Width (ft)	51.16	Top Width (ft)	3.00	40.00	8.16
Vel Total (ft/s)	8.87	Avg. Vel. (ft/s)	11.06	9.08	5.27
Max Chl Dpth (ft)	2.99	Hydr. Depth (ft)	2.11	2.79	1.29
Conv. Total (cfs)	9217.6	Conv. (cfs)	567.3	8199.7	450.6
Length Wtd. (ft)	0.01	Wetted Per. (ft)	4.78	40.01	8.56
Min Ch El (ft)	4746.35	Shear (lb/sq ft)	1.26	2.65	1.17
Alpha	1.05	Stream Power (lb/ft s)	13.93	24.08	6.19
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.43	8.27	0.68
C & E Loss (ft)	0.17	Cum SA (acres)	0.28	3.73	0.62

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: Channel
REACH: Channel RS: -1050

INPUT
Description: Base of Drop
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4749.87	0	4743.7	.1	4743.67	3	4742.75	23	4742.35
43	4742.75	50	4744.97	71.5	4751.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	24	24	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4750.12	Element			
Vel Head (ft)	6.23	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4743.89	Reach Len. (ft)	24.00	24.00	24.00
Crit W.S. (ft)	4745.34	Flow Area (sq ft)	1.98	53.41	2.03
E.G. Slope (ft/ft)	0.197711	Area (sq ft)	1.98	53.41	2.03
Q Total (cfs)	1138.00	Flow (cfs)	46.17	1069.55	22.28
Top Width (ft)	46.58	Top Width (ft)	3.00	40.00	3.58
Vel Total (ft/s)	19.82	Avg. Vel. (ft/s)	23.34	20.03	10.97
Max Chl Dpth (ft)	1.54	Hydr. Depth (ft)	0.66	1.34	0.57
Conv. Total (cfs)	2559.3	Conv. (cfs)	103.8	2405.4	50.1
Length Wtd. (ft)	24.00	Wetted Per. (ft)	3.33	40.01	3.76
Min Ch El (ft)	4742.35	Shear (lb/sq ft)	7.33	16.48	6.68
Alpha	1.02	Stream Power (lb/ft s)	171.04	329.97	73.25
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.43	8.27	0.68
C & E Loss (ft)	0.50	Cum SA (acres)	0.28	3.73	0.62

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

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -1074

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4749.87	0	4743.7	.1	4743.67	3	4742.75	23	4742.35
43	4742.75	50	4744.97	71.5	4751.78				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	126	126	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4747.07	Element			
Vel Head (ft)	2.45	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4744.62	Reach Len. (ft)	126.00	126.00	126.00
Crit W.S. (ft)	4745.34	Flow Area (sq ft)	4.18	82.72	5.50
E.G. Slope (ft/ft)	0.042923	Area (sq ft)	4.18	82.72	5.50
Q Total (cfs)	1138.00	Flow (cfs)	65.47	1033.34	39.19
Top Width (ft)	48.89	Top Width (ft)	3.00	40.00	5.89
Vel Total (ft/s)	12.32	Avg. Vel. (ft/s)	15.67	12.49	7.12
Max Chl Dpth (ft)	2.27	Hydr. Depth (ft)	1.39	2.07	0.93
Conv. Total (cfs)	5492.8	Conv. (cfs)	316.0	4987.6	189.2
Length Wtd. (ft)	126.00	Wetted Per. (ft)	4.06	40.01	6.18
Min Ch El (ft)	4742.35	Shear (lb/sq ft)	2.75	5.54	2.39
Alpha	1.04	Stream Power (lb/ft s)	43.16	69.21	16.99
Frctn Loss (ft)	1.92	Cum Volume (acre-ft)	0.43	8.23	0.68
C & E Loss (ft)	1.14	Cum SA (acres)	0.28	3.71	0.61

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -1200

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4744.33	0	4738.16	.1	4738.13	3	4737.21	23	4736.81
43	4737.21	50	4739.43	71.5	4746.24				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4741.56	Element			
Vel Head (ft)	2.50	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4739.06	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4739.80	Flow Area (sq ft)	4.12	81.90	5.38
E.G. Slope (ft/ft)	0.044436	Area (sq ft)	4.12	81.90	5.38
Q Total (cfs)	1138.00	Flow (cfs)	65.21	1034.07	38.72
Top Width (ft)	48.83	Top Width (ft)	3.00	40.00	5.83
Vel Total (ft/s)	12.45	Avg. Vel. (ft/s)	15.84	12.63	7.19
Max Chl Dpth (ft)	2.25	Hydr. Depth (ft)	1.37	2.05	0.92
Conv. Total (cfs)	5398.5	Conv. (cfs)	309.4	4905.5	183.7
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.04	40.01	6.11
Min Ch El (ft)	4736.81	Shear (lb/sq ft)	2.82	5.68	2.44
Alpha	1.04	Stream Power (lb/ft s)	44.73	71.70	17.58
Frctn Loss (ft)	5.50	Cum Volume (acre-ft)	0.42	8.00	0.67
C & E Loss (ft)	0.01	Cum SA (acres)	0.27	3.59	0.60

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: Channel
REACH: Channel RS: -1399.99

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4735.53	0	4729.36	.1	4729.33	3	4728.41	23	4728.01
43	4728.41	50	4730.63	71.5	4737.44				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4732.74	Element			
Vel Head (ft)	2.47	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4730.27	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	4730.99	Flow Area (sq ft)	4.15	82.32	5.44
E.G. Slope (ft/ft)	0.043655	Area (sq ft)	4.15	82.32	5.44
Q Total (cfs)	1138.00	Flow (cfs)	65.33	1033.72	38.96
Top Width (ft)	48.86	Top Width (ft)	3.00	40.00	5.86
Vel Total (ft/s)	12.38	Avg. Vel. (ft/s)	15.76	12.56	7.16
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)	1.38	2.06	0.93
Conv. Total (cfs)	5446.6	Conv. (cfs)	312.7	4947.5	186.4
Length Wtd. (ft)	0.01	Wetted Per. (ft)	4.05	40.01	6.15
Min Ch El (ft)	4728.01	Shear (lb/sq ft)	2.79	5.61	2.41
Alpha	1.04	Stream Power (lb/ft s)	43.91	70.42	17.27
Frctn Loss (ft)	8.81	Cum Volume (acre-ft)	0.40	7.62	0.64

C & E Loss (ft)	0.01	Cum SA (acres)	0.26	3.41	0.57

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: Channel
REACH: Channel RS: -1400

INPUT
Description: Base of drop
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4731.53	0	4725.36	.1	4725.33	3	4724.41	23	4724.01
43	4724.41	50	4726.63	71.5	4733.44				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	24	24	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4732.30	Element			
Vel Head (ft)	6.81	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4725.49	Reach Len. (ft)	24.00	24.00	24.00
Crit W.S. (ft)	4726.99	Flow Area (sq ft)	1.81	51.23	1.84
E.G. Slope (ft/ft)	0.228828	Area (sq ft)	1.81	51.23	1.84
Q Total (cfs)	1138.00	Flow (cfs)	43.47	1073.51	21.02
Top Width (ft)	46.41	Top Width (ft)	3.00	40.00	3.41
Vel Total (ft/s)	20.73	Avg. Vel. (ft/s)	23.96	20.95	11.42
Max Chl Dpth (ft)	1.48	Hydr. Depth (ft)	0.60	1.28	0.54
Conv. Total (cfs)	2379.0	Conv. (cfs)	90.9	2244.1	43.9
Length Wtd. (ft)	24.00	Wetted Per. (ft)	3.28	40.01	3.57
Min Ch El (ft)	4724.01	Shear (lb/sq ft)	7.91	18.29	7.36
Alpha	1.02	Stream Power (lb/ft s)	189.48	383.32	84.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.40	7.62	0.64
C & E Loss (ft)	0.43	Cum SA (acres)	0.26	3.41	0.57

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

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -1424

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4731.53	0	4725.36	.1	4725.33	3	4724.41	23	4724.01
43	4724.41	50	4726.63	71.5	4733.44				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4728.86	Element			
Vel Head (ft)	2.65	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4726.20	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4726.99	Flow Area (sq ft)	3.95	79.65	5.06
E.G. Slope (ft/ft)	0.048970	Area (sq ft)	3.95	79.65	5.06
Q Total (cfs)	1138.00	Flow (cfs)	64.41	1036.17	37.41

Top Width (ft)	48.65	Top Width (ft)	3.00	40.00	5.65
Vel Total (ft/s)	12.84	Avg. Vel. (ft/s)	16.32	13.01	7.40
Max Chl Dpth (ft)	2.19	Hydr. Depth (ft)	1.32	1.99	0.90
Conv. Total (cfs)	5142.5	Conv. (cfs)	291.1	4682.4	169.1
Length Wtd. (ft)	200.00	Wetted Per. (ft)	3.99	40.01	5.93
Min Ch El (ft)	4724.01	Shear (lb/sq ft)	3.02	6.09	2.61
Alpha	1.04	Stream Power (lb/ft s)	49.38	79.18	19.30
Frctn Loss (ft)	2.20	Cum Volume (acre-ft)	0.40	7.58	0.64
C & E Loss (ft)	1.25	Cum SA (acres)	0.25	3.39	0.57

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -1624

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4722.73	0	4716.56	.1	4716.53	3	4715.61	23	4715.21
43	4715.61	50	4717.83	71.5	4724.64				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4719.88	Element			
Vel Head (ft)	2.36	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4717.51	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4718.20	Flow Area (sq ft)	4.28	84.07	5.70
E.G. Slope (ft/ft)	0.040579	Area (sq ft)	4.28	84.07	5.70
Q Total (cfs)	1138.00	Flow (cfs)	65.89	1032.15	39.96
Top Width (ft)	49.00	Top Width (ft)	3.00	40.00	6.00
Vel Total (ft/s)	12.10	Avg. Vel. (ft/s)	15.40	12.28	7.01
Max Chl Dpth (ft)	2.30	Hydr. Depth (ft)	1.43	2.10	0.95
Conv. Total (cfs)	5649.3	Conv. (cfs)	327.1	5123.8	198.4
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.10	40.01	6.29
Min Ch El (ft)	4715.21	Shear (lb/sq ft)	2.64	5.32	2.30
Alpha	1.04	Stream Power (lb/ft s)	40.72	65.36	16.09
Frctn Loss (ft)	8.90	Cum Volume (acre-ft)	0.38	7.21	0.62
C & E Loss (ft)	0.09	Cum SA (acres)	0.24	3.20	0.54

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: Channel
REACH: Channel RS: -1823.99

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4713.93	0	4707.76	.1	4707.73	3	4706.81	23	4706.41
43	4706.81	50	4709.03	71.5	4715.84				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4711.20	Element			
Vel Head (ft)	2.56	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4708.63	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	4709.39	Flow Area (sq ft)	4.04	80.95	5.24
E.G. Slope (ft/ft)	0.046289	Area (sq ft)	4.04	80.95	5.24
Q Total (cfs)	1138.00	Flow (cfs)	64.89	1034.94	38.18
Top Width (ft)	48.75	Top Width (ft)	3.00	40.00	5.75
Vel Total (ft/s)	12.61	Avg. Vel. (ft/s)	16.05	12.79	7.28
Max Chl Dpth (ft)	2.22	Hydr. Depth (ft)	1.35	2.02	0.91
Conv. Total (cfs)	5289.3	Conv. (cfs)	301.6	4810.3	177.4
Length Wtd. (ft)	0.01	Wetted Per. (ft)	4.02	40.01	6.03
Min Ch El (ft)	4706.41	Shear (lb/sq ft)	2.91	5.85	2.51
Alpha	1.04	Stream Power (lb/ft s)	46.64	74.76	18.28
Frctn Loss (ft)	8.66	Cum Volume (acre-ft)	0.36	6.83	0.59
C & E Loss (ft)	0.02	Cum SA (acres)	0.23	3.02	0.51

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: Channel
REACH: Channel RS: -1824

INPUT
Description: Base of drop
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4709.93	0	4703.76	.1	4703.73	3	4702.81	23	4702.41
43	4702.81	50	4705.03	71.5	4711.84				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	24	24	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4710.76	Element			
Vel Head (ft)	6.88	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4703.89	Reach Len. (ft)	24.00	24.00	24.00
Crit W.S. (ft)	4705.39	Flow Area (sq ft)	1.80	50.99	1.82
E.G. Slope (ft/ft)	0.232682	Area (sq ft)	1.80	50.99	1.82
Q Total (cfs)	1138.00	Flow (cfs)	43.18	1073.93	20.89
Top Width (ft)	46.39	Top Width (ft)	3.00	40.00	3.39
Vel Total (ft/s)	20.84	Avg. Vel. (ft/s)	24.03	21.06	11.47
Max Chl Dpth (ft)	1.47	Hydr. Depth (ft)	0.60	1.27	0.54
Conv. Total (cfs)	2359.2	Conv. (cfs)	89.5	2226.4	43.3
Length Wtd. (ft)	24.00	Wetted Per. (ft)	3.27	40.01	3.56
Min Ch El (ft)	4702.41	Shear (lb/sq ft)	7.98	18.51	7.44
Alpha	1.02	Stream Power (lb/ft s)	191.73	389.93	85.35
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.36	6.83	0.59
C & E Loss (ft)	0.43	Cum SA (acres)	0.23	3.02	0.51

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

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -1848

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4709.93	0	4703.76	.1	4703.73	3	4702.81	23	4702.41
43	4702.81	50	4705.03	71.5	4711.84				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4707.27	Element			
Vel Head (ft)	2.68	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4704.59	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4705.39	Flow Area (sq ft)	3.92	79.31	5.01
E.G. Slope (ft/ft)	0.049706	Area (sq ft)	3.92	79.31	5.01
Q Total (cfs)	1138.00	Flow (cfs)	64.30	1036.47	37.23
Top Width (ft)	48.62	Top Width (ft)	3.00	40.00	5.62
Vel Total (ft/s)	12.90	Avg. Vel. (ft/s)	16.40	13.07	7.43
Max Chl Dpth (ft)	2.18	Hydr. Depth (ft)	1.31	1.98	0.89
Conv. Total (cfs)	5104.3	Conv. (cfs)	288.4	4648.9	167.0
Length Wtd. (ft)	200.00	Wetted Per. (ft)	3.98	40.01	5.90
Min Ch El (ft)	4702.41	Shear (lb/sq ft)	3.06	6.15	2.64
Alpha	1.04	Stream Power (lb/ft s)	50.14	80.39	19.59
Frctn Loss (ft)	2.23	Cum Volume (acre-ft)	0.36	6.79	0.59
C & E Loss (ft)	1.26	Cum SA (acres)	0.22	3.00	0.51

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -2048

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4701.13	0	4694.96	.1	4694.93	3	4694.01	23	4693.61
43	4694.01	50	4696.23	71.5	4703.04				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4698.27	Element			
Vel Head (ft)	2.35	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4695.92	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4696.60	Flow Area (sq ft)	4.30	84.33	5.74
E.G. Slope (ft/ft)	0.040157	Area (sq ft)	4.30	84.33	5.74
Q Total (cfs)	1138.00	Flow (cfs)	65.94	1031.95	40.11
Top Width (ft)	49.02	Top Width (ft)	3.00	40.00	6.02
Vel Total (ft/s)	12.06	Avg. Vel. (ft/s)	15.35	12.24	6.99
Max Chl Dpth (ft)	2.31	Hydr. Depth (ft)	1.43	2.11	0.95
Conv. Total (cfs)	5678.8	Conv. (cfs)	329.1	5149.6	200.2
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.10	40.01	6.31
Min Ch El (ft)	4693.61	Shear (lb/sq ft)	2.62	5.28	2.28
Alpha	1.04	Stream Power (lb/ft s)	40.27	64.66	15.93
Frctn Loss (ft)	8.91	Cum Volume (acre-ft)	0.34	6.42	0.56
C & E Loss (ft)	0.10	Cum SA (acres)	0.21	2.81	0.49

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: Channel
REACH: Channel RS: -2248

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4692.33	0	4686.16	.1	4686.13	3	4685.21	23	4684.81
43	4685.21	50	4687.43	71.5	4694.24				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4689.60	Element			
Vel Head (ft)	2.57	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4687.03	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4687.80	Flow Area (sq ft)	4.03	80.79	5.22
E.G. Slope (ft/ft)	0.046602	Area (sq ft)	4.03	80.79	5.22
Q Total (cfs)	1138.00	Flow (cfs)	64.84	1035.09	38.08
Top Width (ft)	48.74	Top Width (ft)	3.00	40.00	5.74
Vel Total (ft/s)	12.64	Avg. Vel. (ft/s)	16.08	12.81	7.29
Max Chl Dpth (ft)	2.22	Hydr. Depth (ft)	1.34	2.02	0.91
Conv. Total (cfs)	5271.6	Conv. (cfs)	300.3	4794.9	176.4
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.02	40.01	6.02
Min Ch El (ft)	4684.81	Shear (lb/sq ft)	2.92	5.88	2.52
Alpha	1.04	Stream Power (lb/ft s)	46.96	75.27	18.40
Frctn Loss (ft)	8.64	Cum Volume (acre-ft)	0.32	6.04	0.54
C & E Loss (ft)	0.02	Cum SA (acres)	0.20	2.63	0.46

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: Channel
REACH: Channel RS: -2448

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4683.53	0	4677.36	.1	4677.33	3	4676.41	23	4676.01
43	4676.41	50	4678.63	71.5	4685.44				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4680.71	Element			
Vel Head (ft)	2.42	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4678.29	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4678.99	Flow Area (sq ft)	4.21	83.20	5.57
E.G. Slope (ft/ft)	0.042073	Area (sq ft)	4.21	83.20	5.57
Q Total (cfs)	1138.00	Flow (cfs)	65.61	1032.93	39.46
Top Width (ft)	48.93	Top Width (ft)	3.00	40.00	5.93
Vel Total (ft/s)	12.24	Avg. Vel. (ft/s)	15.57	12.41	7.08
Max Chl Dpth (ft)	2.28	Hydr. Depth (ft)	1.40	2.08	0.94
Conv. Total (cfs)	5548.0	Conv. (cfs)	319.8	5035.8	192.4
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.08	40.01	6.22
Min Ch El (ft)	4676.01	Shear (lb/sq ft)	2.71	5.46	2.35

Alpha	1.04	Stream Power (lb/ft s)	42.27	67.81	16.67
Frctn Loss (ft)	8.85	Cum Volume (acre-ft)	0.30	5.66	0.51
C & E Loss (ft)	0.05	Cum SA (acres)	0.18	2.45	0.43

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: Channel
REACH: Channel RS: -2648

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4674.73	0	4668.56	.1	4668.53	3	4667.61	23	4667.21
43	4667.61	50	4669.83	71.5	4676.64				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4671.97	Element			
Vel Head (ft)	2.53	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4669.45	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4670.20	Flow Area (sq ft)	4.09	81.51	5.32
E.G. Slope (ft/ft)	0.045181	Area (sq ft)	4.09	81.51	5.32
Q Total (cfs)	1138.00	Flow (cfs)	65.08	1034.43	38.49
Top Width (ft)	48.79	Top Width (ft)	3.00	40.00	5.79
Vel Total (ft/s)	12.52	Avg. Vel. (ft/s)	15.93	12.69	7.23
Max Chl Dpth (ft)	2.24	Hydr. Depth (ft)	1.36	2.04	0.92
Conv. Total (cfs)	5353.8	Conv. (cfs)	306.2	4866.6	181.1
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.03	40.01	6.08
Min Ch El (ft)	4667.21	Shear (lb/sq ft)	2.86	5.75	2.47
Alpha	1.04	Stream Power (lb/ft s)	45.50	72.93	17.86
Frctn Loss (ft)	8.72	Cum Volume (acre-ft)	0.29	5.28	0.49
C & E Loss (ft)	0.01	Cum SA (acres)	0.17	2.26	0.41

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: Channel
REACH: Channel RS: -2848

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4665.93	0	4659.76	.1	4659.73	3	4658.81	23	4658.41
43	4658.81	50	4661.03	71.5	4667.84				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4663.13	Element			
Vel Head (ft)	2.45	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4660.68	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4661.39	Flow Area (sq ft)	4.17	82.63	5.49
E.G. Slope (ft/ft)	0.043099	Area (sq ft)	4.17	82.63	5.49

Q Total (cfs)	1138.00	Flow (cfs)	65.44	1033.42	39.14
Top Width (ft)	48.88	Top Width (ft)	3.00	40.00	5.88
Vel Total (ft/s)	12.33	Avg. Vel. (ft/s)	15.69	12.51	7.13
Max Chl Dpth (ft)	2.27	Hydr. Depth (ft)	1.39	2.07	0.93
Conv. Total (cfs)	5481.6	Conv. (cfs)	315.2	4977.8	188.5
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.06	40.01	6.17
Min Ch El (ft)	4658.41	Shear (lb/sq ft)	2.76	5.56	2.39
Alpha	1.04	Stream Power (lb/ft s)	43.34	69.50	17.06
Frctn Loss (ft)	8.82	Cum Volume (acre-ft)	0.27	4.91	0.46
C & E Loss (ft)	0.02	Cum SA (acres)	0.16	2.08	0.38

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: Channel
REACH: Channel RS: -3048

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4657.13	0	4650.96	.1	4650.93	3	4650.01	23	4649.61
43	4650.01	50	4652.23	71.5	4659.04				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	4654.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.50	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4651.86	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4652.60	Flow Area (sq ft)	4.11	81.85	5.37
E.G. Slope (ft/ft)	0.044549	Area (sq ft)	4.11	81.85	5.37
Q Total (cfs)	1138.00	Flow (cfs)	65.17	1034.14	38.68
Top Width (ft)	48.82	Top Width (ft)	3.00	40.00	5.82
Vel Total (ft/s)	12.46	Avg. Vel. (ft/s)	15.86	12.64	7.20
Max Chl Dpth (ft)	2.25	Hydr. Depth (ft)	1.37	2.05	0.92
Conv. Total (cfs)	5391.7	Conv. (cfs)	308.8	4899.6	183.3
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.04	40.01	6.11
Min Ch El (ft)	4649.61	Shear (lb/sq ft)	2.83	5.69	2.45
Alpha	1.04	Stream Power (lb/ft s)	44.83	71.89	17.62
Frctn Loss (ft)	8.76	Cum Volume (acre-ft)	0.25	4.53	0.44
C & E Loss (ft)	0.01	Cum SA (acres)	0.14	1.90	0.35

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: Channel
REACH: Channel RS: -3248

INPUT
Description: 4.4% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4648.33	0	4642.16	.1	4642.13	3	4641.21	23	4640.81
43	4641.21	50	4643.43	71.5	4650.24				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4645.54	Element			
Vel Head (ft)	2.47	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4643.07	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4643.80	Flow Area (sq ft)	4.15	82.35	5.45
E.G. Slope (ft/ft)	0.043599	Area (sq ft)	4.15	82.35	5.45
Q Total (cfs)	1138.00	Flow (cfs)	65.36	1033.67	38.98
Top Width (ft)	48.86	Top Width (ft)	3.00	40.00	5.86
Vel Total (ft/s)	12.38	Avg. Vel. (ft/s)	15.75	12.55	7.16
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)	1.38	2.06	0.93
Conv. Total (cfs)	5450.1	Conv. (cfs)	313.0	4950.4	186.7
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.06	40.01	6.15
Min Ch El (ft)	4640.81	Shear (lb/sq ft)	2.78	5.60	2.41
Alpha	1.04	Stream Power (lb/ft s)	43.86	70.32	17.25
Frctn Loss (ft)	8.81	Cum Volume (acre-ft)	0.23	4.15	0.41
C & E Loss (ft)	0.01	Cum SA (acres)	0.13	1.71	0.32

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: Channel
REACH: Channel RS: -3448

INPUT
Description: 4.4% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4639.53	0	4633.36	.1	4633.33	3	4632.41	23	4632.01
43	4632.41	50	4634.63	71.5	4641.44				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4636.75	Element			
Vel Head (ft)	2.49	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4634.26	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4634.99	Flow Area (sq ft)	4.12	81.99	5.39
E.G. Slope (ft/ft)	0.044273	Area (sq ft)	4.12	81.99	5.39
Q Total (cfs)	1138.00	Flow (cfs)	65.22	1034.02	38.76
Top Width (ft)	48.83	Top Width (ft)	3.00	40.00	5.83
Vel Total (ft/s)	12.44	Avg. Vel. (ft/s)	15.82	12.61	7.19
Max Chl Dpth (ft)	2.25	Hydr. Depth (ft)	1.37	2.05	0.92
Conv. Total (cfs)	5408.5	Conv. (cfs)	310.0	4914.3	184.2
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.05	40.01	6.12
Min Ch El (ft)	4632.01	Shear (lb/sq ft)	2.82	5.66	2.44
Alpha	1.04	Stream Power (lb/ft s)	44.55	71.43	17.51
Frctn Loss (ft)	8.79	Cum Volume (acre-ft)	0.21	3.77	0.39
C & E Loss (ft)	0.00	Cum SA (acres)	0.11	1.53	0.30

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: Channel
REACH: Channel RS: -3668

INPUT
Description: 4.4% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4630.73	0	4624.56	.1	4624.53	3	4623.61	23	4623.21
43	4623.61	50	4625.83	71.5	4632.64				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	217	217	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4627.95	Element			
Vel Head (ft)	2.48	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4625.47	Reach Len. (ft)	217.00	217.00	217.00
Crit W.S. (ft)	4626.20	Flow Area (sq ft)	4.14	82.22	5.43
E.G. Slope (ft/ft)	0.043852	Area (sq ft)	4.14	82.22	5.43
Q Total (cfs)	1138.00	Flow (cfs)	65.31	1033.79	38.90
Top Width (ft)	48.85	Top Width (ft)	3.00	40.00	5.85
Vel Total (ft/s)	12.40	Avg. Vel. (ft/s)	15.78	12.57	7.17
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)	1.38	2.06	0.93
Conv. Total (cfs)	5434.4	Conv. (cfs)	311.9	4936.7	185.7
Length Wtd. (ft)	217.00	Wetted Per. (ft)	4.05	40.01	6.14
Min Ch El (ft)	4623.21	Shear (lb/sq ft)	2.80	5.63	2.42
Alpha	1.04	Stream Power (lb/ft s)	44.13	70.74	17.35
Frctn Loss (ft)	8.81	Cum Volume (acre-ft)	0.19	3.40	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.10	1.34	0.27

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: Channel
REACH: Channel RS: -3885

INPUT
Description: 1.8% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4621.18	0	4615.01	.1	4614.98	3	4614.06	23	4613.66
43	4614.06	50	4616.28	71.5	4623.09				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	91	91	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4618.40	Element			
Vel Head (ft)	2.49	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4615.91	Reach Len. (ft)	91.00	91.00	91.00
Crit W.S. (ft)	4616.64	Flow Area (sq ft)	4.13	82.06	5.41
E.G. Slope (ft/ft)	0.044142	Area (sq ft)	4.13	82.06	5.41
Q Total (cfs)	1138.00	Flow (cfs)	65.26	1033.93	38.82
Top Width (ft)	48.84	Top Width (ft)	3.00	40.00	5.84
Vel Total (ft/s)	12.42	Avg. Vel. (ft/s)	15.81	12.60	7.18
Max Chl Dpth (ft)	2.25	Hydr. Depth (ft)	1.38	2.05	0.93
Conv. Total (cfs)	5416.4	Conv. (cfs)	310.6	4921.1	184.7
Length Wtd. (ft)	91.00	Wetted Per. (ft)	4.05	40.01	6.13
Min Ch El (ft)	4613.66	Shear (lb/sq ft)	2.81	5.65	2.43
Alpha	1.04	Stream Power (lb/ft s)	44.42	71.22	17.46
Frctn Loss (ft)	9.55	Cum Volume (acre-ft)	0.17	2.99	0.34
C & E Loss (ft)	0.00	Cum SA (acres)	0.09	1.15	0.24

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: Channel
REACH: Channel RS: -3968

INPUT
Description: Upstream of Arrow Springs
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4619.17	0	4613	.1	4612.97	3	4612.15	16	4612.15
17	4612.15	23	4612.15	29	4612.15	30	4612.15	43	4612.15
50	4614.27	71.5	4621.08						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

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

3	43	128	128	128	.1	.3

Ineffective Flow num= 4

Sta L	Sta R	Elev	Permanent
0	4	4619.85	T
16	17	4619.85	T
29	30	4619.85	T
42	71	4619.85	T

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	4617.65	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.66	Wt. n-Val.		0.040	
W.S. Elev (ft)	4616.98	Reach Len. (ft)	128.00	128.00	128.00
Crit W.S. (ft)	4615.29	Flow Area (sq ft)		174.04	
E.G. Slope (ft/ft)	0.003790	Area (sq ft)	13.23	193.38	38.05
Q Total (cfs)	1138.00	Flow (cfs)		1138.00	
Top Width (ft)	58.57	Top Width (ft)	3.00	40.00	15.57
Vel Total (ft/s)	6.54	Avg. Vel. (ft/s)		6.54	
Max Chl Dpth (ft)	4.83	Hydr. Depth (ft)		4.83	
Conv. Total (cfs)	18485.0	Conv. (cfs)		18485.0	
Length Wtd. (ft)	128.00	Wetted Per. (ft)		36.00	
Min Ch El (ft)	4612.15	Shear (lb/sq ft)		1.14	
Alpha	1.00	Stream Power (lb/ft s)		7.48	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.15	2.70	0.29
C & E Loss (ft)		Cum SA (acres)	0.08	1.06	0.22

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

CULVERT

RIVER: Channel
REACH: Channel RS: -4050

INPUT
Description:
Distance from Upstream XS = 15
Deck/Roadway Width = 50
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 9

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	4621.5	4618.2	3	4621.5	4618.2	13	4621.5	4618
23	4621.5	4618	33	4621.5	4618	43	4621.5	4618
53	4621.5	4618	63	4621.5	4618	71.5	4621.5	4618

Upstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4619.17	0	4613	.1	4612.97	3	4612.15	16	4612.15
17	4612.15	23	4612.15	29	4612.15	30	4612.15	43	4612.15
50	4614.27	71.5	4621.08						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left Right Coeff Contr. Expan.

3	43	.1	.3

Ineffective Flow num= 4

Sta L	Sta R	Elev	Permanent
0	4	4619.85	T
16	17	4619.85	T
29	30	4619.85	T
42	71	4619.85	T

Downstream Deck/Roadway Coordinates
num= 9

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	4621.3	4617.4	3	4621.3	4617.4	13	4621.3	4617.4
23	4621.3	4617.4	33	4621.3	4617.4	43	4621.3	4617.4
53	4621.3	4617.4	63	4621.3	4617.4	71.5	4621.3	4617.4

Downstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4617.92	0	4611.37	.1	4611.34	3	4611.42	16	4611.42
17	4611.42	23	4611.42	29	4611.42	30	4611.42	43	4611.42
50	4612.64	71.5	4619.45						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left Right Coeff Contr. Expan.
3 43 .1 .3

Ineffective Flow num= 4

Sta L	Sta R	Elev	Permanent
0	4	4618.22	T
16	17	4618.22	T
29	30	4618.22	T
42	57	4618.22	T

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 = 4621.3
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 2

Culvert Name Shape Rise Span
Culvert #1 Box 6 12
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	1	126	.012	.012	0	.5	1

Number of Barrels = 2
Upstream Elevation = 4612.15
Centerline Stations

Sta.	Sta.
10	36

Downstream Elevation = 4611.42
Centerline Stations

Sta.	Sta.
10	36

Culvert Name Shape Rise Span
Culvert #2 Box 6 12
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	1	126	.013	.013	0	.5	1

Upstream Elevation = 4612.15
Centerline Station = 23
Downstream Elevation = 4611.42
Centerline Station = 23

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -4096

INPUT
Description: Downstream of Arrow Springs
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4617.92	0	4611.37	.1	4611.34	3	4611.42	16	4611.42
17	4611.42	23	4611.42	29	4611.42	30	4611.42	43	4611.42

50 4612.64 71.5 4619.45

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	14	14	.1	.3

Ineffective Flow num= 4

Sta L	Sta R	Elev	Permanent
0	4	4618.22	T
16	17	4618.22	T
29	30	4618.22	T
42	57	4618.22	T

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4616.13	Element			
Vel Head (ft)	1.58	Wt. n-Val.		0.040	
W.S. Elev (ft)	4614.56	Reach Len. (ft)	14.00	14.00	14.00
Crit W.S. (ft)	4614.56	Flow Area (sq ft)		112.85	
E.G. Slope (ft/ft)	0.016062	Area (sq ft)	9.53	125.39	23.46
Q Total (cfs)	1138.00	Flow (cfs)		1138.00	
Top Width (ft)	56.04	Top Width (ft)	3.00	40.00	13.04
Vel Total (ft/s)	10.08	Avg. Vel. (ft/s)		10.08	
Max Chl Dpth (ft)	3.21	Hydr. Depth (ft)		3.13	
Conv. Total (cfs)	8979.4	Conv. (cfs)		8979.4	
Length Wtd. (ft)	14.00	Wetted Per. (ft)		36.00	
Min Ch El (ft)	4611.42	Shear (lb/sq ft)		3.14	
Alpha	1.00	Stream Power (lb/ft s)		31.70	
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.12	2.23	0.20
C & E Loss (ft)	0.09	Cum SA (acres)	0.07	0.94	0.18

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: Channel
REACH: Channel RS: -4110

INPUT
Description: 3.2%
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4618.9	0	4612.4	.1	4612.37	3	4611.4	23	4611
43	4611.4	50	4613.4	72	4620.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4615.70	Element			
Vel Head (ft)	2.44	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4613.26	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4613.98	Flow Area (sq ft)	4.08	82.43	6.06
E.G. Slope (ft/ft)	0.043237	Area (sq ft)	4.08	82.43	6.06
Q Total (cfs)	1138.00	Flow (cfs)	63.55	1030.99	43.46
Top Width (ft)	49.51	Top Width (ft)	3.00	40.00	6.51
Vel Total (ft/s)	12.29	Avg. Vel. (ft/s)	15.59	12.51	7.17
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)	1.36	2.06	0.93
Conv. Total (cfs)	5472.9	Conv. (cfs)	305.6	4958.2	209.0
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.02	40.01	6.77
Min Ch El (ft)	4611.00	Shear (lb/sq ft)	2.74	5.56	2.41
Alpha	1.04	Stream Power (lb/ft s)	42.64	69.56	17.32
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.12	2.20	0.20
C & E Loss (ft)	0.09	Cum SA (acres)	0.07	0.93	0.17

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.

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -4310

INPUT
Description: 3.2% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4612.5	0	4606	.1	4605.97	3	4605	23	4604.6
43	4605	50	4607	72	4614				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	200	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4608.95	Element			
Vel Head (ft)	1.76	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4607.19	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4607.58	Flow Area (sq ft)	5.08	95.77	8.42
E.G. Slope (ft/ft)	0.025618	Area (sq ft)	5.08	95.77	8.42
Q Total (cfs)	1138.00	Flow (cfs)	66.87	1018.99	52.14
Top Width (ft)	50.61	Top Width (ft)	3.00	40.00	7.61
Vel Total (ft/s)	10.41	Avg. Vel. (ft/s)	13.17	10.64	6.19
Max Chl Dpth (ft)	2.59	Hydr. Depth (ft)	1.69	2.39	1.11
Conv. Total (cfs)	7110.0	Conv. (cfs)	417.8	6366.5	325.8
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.36	40.01	7.92
Min Ch El (ft)	4604.60	Shear (lb/sq ft)	1.86	3.83	1.70
Alpha	1.04	Stream Power (lb/ft s)	24.55	40.73	10.53
Frctn Loss (ft)	6.54	Cum Volume (acre-ft)	0.09	1.79	0.16
C & E Loss (ft)	0.20	Cum SA (acres)	0.06	0.75	0.14

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The 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: Channel
REACH: Channel RS: -4510

INPUT
Description: 3.2% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4606.1	0	4599.6	.1	4599.57	3	4598.6	23	4598.2
43	4598.6	50	4600.6	72	4607.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	200	.1 .3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4602.78	Element			
Vel Head (ft)	2.23	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4600.55	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4601.18	Flow Area (sq ft)	4.34	85.97	6.65
E.G. Slope (ft/ft)	0.037344	Area (sq ft)	4.34	85.97	6.65
Q Total (cfs)	1138.00	Flow (cfs)	64.67	1027.62	45.71

Top Width (ft)	49.82	Top Width (ft)	3.00	40.00	6.82
Vel Total (ft/s)	11.74	Avg. Vel. (ft/s)	14.89	11.95	6.87
Max Chl Dpth (ft)	2.35	Hydr. Depth (ft)	1.45	2.15	0.97
Conv. Total (cfs)	5888.9	Conv. (cfs)	334.7	5317.7	236.5
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.11	40.01	7.10
Min Ch El (ft)	4598.20	Shear (lb/sq ft)	2.46	5.01	2.18
Alpha	1.04	Stream Power (lb/ft s)	36.67	59.88	15.02
Frctn Loss (ft)	6.13	Cum Volume (acre-ft)	0.07	1.37	0.13
C & E Loss (ft)	0.05	Cum SA (acres)	0.04	0.56	0.11

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: Channel
REACH: Channel RS: -4710

INPUT
Description: 3.2% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4599.7	0	4593.2	.1	4593.17	3	4592.2	23	4591.8
43	4592.2	50	4594.2	72	4601.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	4596.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.87	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4594.33	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	4594.78	Flow Area (sq ft)	4.88	93.09	7.91
E.G. Slope (ft/ft)	0.028291	Area (sq ft)	4.88	93.09	7.91
Q Total (cfs)	1138.00	Flow (cfs)	66.38	1021.26	50.37
Top Width (ft)	50.40	Top Width (ft)	3.00	40.00	7.40
Vel Total (ft/s)	10.75	Avg. Vel. (ft/s)	13.61	10.97	6.36
Max Chl Dpth (ft)	2.53	Hydr. Depth (ft)	1.63	2.33	1.07
Conv. Total (cfs)	6765.8	Conv. (cfs)	394.6	6071.7	299.4
Length Wtd. (ft)	200.00	Wetted Per. (ft)	4.29	40.01	7.70
Min Ch El (ft)	4591.80	Shear (lb/sq ft)	2.01	4.11	1.82
Alpha	1.04	Stream Power (lb/ft s)	27.33	45.08	11.55
Frctn Loss (ft)	6.47	Cum Volume (acre-ft)	0.05	0.96	0.10
C & E Loss (ft)	0.11	Cum SA (acres)	0.03	0.38	0.08

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: Channel
REACH: Channel RS: -4910

INPUT
Description: 3.2% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4593.3	0	4586.8	.1	4586.77	3	4585.8	23	4585.4
43	4585.8	50	4587.8	72	4594.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	90	90	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	4589.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.13	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4587.79	Reach Len. (ft)	90.00	90.00	90.00
Crit W.S. (ft)	4588.38	Flow Area (sq ft)	4.48	87.78	6.96
E.G. Slope (ft/ft)	0.034719	Area (sq ft)	4.48	87.78	6.96
Q Total (cfs)	1138.00	Flow (cfs)	65.16	1025.98	46.86
Top Width (ft)	49.98	Top Width (ft)	3.00	40.00	6.98
Vel Total (ft/s)	11.47	Avg. Vel. (ft/s)	14.55	11.69	6.73
Max Chl Dpth (ft)	2.39	Hydr. Depth (ft)	1.49	2.19	1.00
Conv. Total (cfs)	6107.5	Conv. (cfs)	349.7	5506.3	251.5
Length Wtd. (ft)	90.00	Wetted Per. (ft)	4.16	40.01	7.26
Min Ch El (ft)	4585.40	Shear (lb/sq ft)	2.34	4.76	2.08
Alpha	1.04	Stream Power (lb/ft s)	33.97	55.58	13.99
Frctn Loss (ft)	6.25	Cum Volume (acre-ft)	0.03	0.55	0.06
C & E Loss (ft)	0.03	Cum SA (acres)	0.01	0.20	0.04

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: Channel
REACH: Channel RS: -4999.99

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4590.42	0	4583.92	.1	4583.89	3	4582.92	23	4582.52
43	4582.92	50	4584.92	72	4591.92				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	.01	.01	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	4586.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.96	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4585.00	Reach Len. (ft)	0.01	0.01	0.01
Crit W.S. (ft)	4585.50	Flow Area (sq ft)	4.74	91.26	7.58
E.G. Slope (ft/ft)	0.030316	Area (sq ft)	4.74	91.26	7.58
Q Total (cfs)	1138.00	Flow (cfs)	65.99	1022.83	49.17
Top Width (ft)	50.26	Top Width (ft)	3.00	40.00	7.26
Vel Total (ft/s)	10.99	Avg. Vel. (ft/s)	13.92	11.21	6.49
Max Chl Dpth (ft)	2.48	Hydr. Depth (ft)	1.58	2.28	1.04
Conv. Total (cfs)	6535.9	Conv. (cfs)	379.0	5874.5	282.4
Length Wtd. (ft)	0.01	Wetted Per. (ft)	4.24	40.01	7.55
Min Ch El (ft)	4582.52	Shear (lb/sq ft)	2.11	4.32	1.90
Alpha	1.04	Stream Power (lb/ft s)	29.43	48.39	12.33
Frctn Loss (ft)	2.92	Cum Volume (acre-ft)	0.02	0.36	0.05
C & E Loss (ft)	0.05	Cum SA (acres)	0.01	0.11	0.03

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: Channel
REACH: Channel RS: -5000

INPUT
Description: Base of drop
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4586.42	0	4579.92	.1	4579.89	3	4578.92	23	4578.52
43	4578.92	50	4580.92	72	4587.92				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	24	24	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4586.50	Element			
Vel Head (ft)	6.47	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4580.03	Reach Len. (ft)	24.00	24.00	24.00
Crit W.S. (ft)	4581.50	Flow Area (sq ft)	1.82	52.37	2.15
E.G. Slope (ft/ft)	0.211843	Area (sq ft)	1.82	52.37	2.15
Q Total (cfs)	1138.00	Flow (cfs)	42.20	1071.58	24.22
Top Width (ft)	46.88	Top Width (ft)	3.00	40.00	3.88
Vel Total (ft/s)	20.20	Avg. Vel. (ft/s)	23.15	20.46	11.24
Max Chl Dpth (ft)	1.51	Hydr. Depth (ft)	0.61	1.31	0.55
Conv. Total (cfs)	2472.5	Conv. (cfs)	91.7	2328.2	52.6
Length Wtd. (ft)	24.00	Wetted Per. (ft)	3.27	40.01	4.04
Min Ch El (ft)	4578.52	Shear (lb/sq ft)	7.37	17.31	7.05
Alpha	1.02	Stream Power (lb/ft s)	170.60	354.23	79.32
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.02	0.36	0.05
C & E Loss (ft)	0.45	Cum SA (acres)	0.01	0.11	0.03

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

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -5024

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4586.42	0	4579.92	.1	4579.89	3	4578.92	23	4578.52
43	4578.92	50	4580.92	72	4587.92				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4583.77	Element			
Vel Head (ft)	0.40	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4583.37	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	4581.50	Flow Area (sq ft)	11.85	186.04	33.60
E.G. Slope (ft/ft)	0.002523	Area (sq ft)	11.85	186.04	33.60
Q Total (cfs)	1138.00	Flow (cfs)	65.22	967.15	105.63
Top Width (ft)	57.70	Top Width (ft)	3.00	40.00	14.70
Vel Total (ft/s)	4.92	Avg. Vel. (ft/s)	5.50	5.20	3.14
Max Chl Dpth (ft)	4.85	Hydr. Depth (ft)	3.95	4.65	2.29
Conv. Total (cfs)	22655.9	Conv. (cfs)	1298.5	19254.6	2102.9
Length Wtd. (ft)	20.00	Wetted Per. (ft)	6.61	40.01	15.36
Min Ch El (ft)	4578.52	Shear (lb/sq ft)	0.28	0.73	0.34
Alpha	1.06	Stream Power (lb/ft s)	1.55	3.81	1.08
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	0.02	0.29	0.04
C & E Loss (ft)	0.06	Cum SA (acres)	0.01	0.09	0.02

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

CROSS SECTION

RIVER: Channel

REACH: Channel RS: -5044

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4587.22	0	4580.72	.1	4580.69	3	4579.72	23	4579.32
43	4579.72	50	4581.72	72	4588.72				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4583.62	Element			
Vel Head (ft)	0.97	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4582.65	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	7.27	125.06	14.83
E.G. Slope (ft/ft)	0.010109	Area (sq ft)	7.27	125.06	14.83
Q Total (cfs)	1138.00	Flow (cfs)	68.95	998.56	70.48
Top Width (ft)	52.91	Top Width (ft)	3.00	40.00	9.91
Vel Total (ft/s)	7.73	Avg. Vel. (ft/s)	9.48	7.98	4.75
Max Chl Dpth (ft)	3.33	Hydr. Depth (ft)	2.42	3.13	1.50
Conv. Total (cfs)	11318.6	Conv. (cfs)	685.8	9931.8	701.0
Length Wtd. (ft)	20.00	Wetted Per. (ft)	5.09	40.01	10.34
Min Ch El (ft)	4579.32	Shear (lb/sq ft)	0.90	1.97	0.91
Alpha	1.05	Stream Power (lb/ft s)	8.55	15.75	4.30
Frctn Loss (ft)	0.20	Cum Volume (acre-ft)	0.01	0.22	0.03
C & E Loss (ft)	0.00	Cum SA (acres)	0.01	0.07	0.02

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -5064

INPUT
Description: 1% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4587.02	0	4580.52	.1	4580.49	3	4579.52	23	4579.12
43	4579.52	50	4581.52	72	4588.52				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4583.42	Element			
Vel Head (ft)	0.98	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4582.44	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	7.25	124.70	14.75
E.G. Slope (ft/ft)	0.010211	Area (sq ft)	7.25	124.70	14.75
Q Total (cfs)	1138.00	Flow (cfs)	68.95	998.77	70.28
Top Width (ft)	52.88	Top Width (ft)	3.00	40.00	9.88
Vel Total (ft/s)	7.76	Avg. Vel. (ft/s)	9.51	8.01	4.77
Max Chl Dpth (ft)	3.32	Hydr. Depth (ft)	2.42	3.12	1.49
Conv. Total (cfs)	11261.8	Conv. (cfs)	682.4	9884.0	695.5
Length Wtd. (ft)	20.00	Wetted Per. (ft)	5.08	40.01	10.31
Min Ch El (ft)	4579.12	Shear (lb/sq ft)	0.91	1.99	0.91
Alpha	1.05	Stream Power (lb/ft s)	8.65	15.91	4.35
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.01	0.17	0.02
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	0.06	0.01

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -5084

INPUT
Description: 1% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4586.82	0	4580.32	.1	4580.29	3	4579.32	23	4578.92
43	4579.32	50	4581.32	72	4588.32				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4583.21	Element			
Vel Head (ft)	1.00	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4582.21	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	7.17	123.72	14.50
E.G. Slope (ft/ft)	0.010495	Area (sq ft)	7.17	123.72	14.50
Q Total (cfs)	1138.00	Flow (cfs)	68.95	999.36	69.69
Top Width (ft)	52.81	Top Width (ft)	3.00	40.00	9.81
Vel Total (ft/s)	7.83	Avg. Vel. (ft/s)	9.61	8.08	4.80
Max Chl Dpth (ft)	3.29	Hydr. Depth (ft)	2.39	3.09	1.48
Conv. Total (cfs)	11108.6	Conv. (cfs)	673.1	9755.3	680.2
Length Wtd. (ft)	20.00	Wetted Per. (ft)	5.06	40.01	10.23
Min Ch El (ft)	4578.92	Shear (lb/sq ft)	0.93	2.03	0.93
Alpha	1.05	Stream Power (lb/ft s)	8.94	16.37	4.46
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.01	0.11	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	0.04	0.01

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -5104

INPUT
Description: 1% slope
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4586.62	0	4580.12	.1	4580.09	3	4579.12	23	4578.72
43	4579.12	50	4581.12	72	4588.12				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	20	20	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4582.99	Element			
Vel Head (ft)	1.08	Wt. n-Val.	0.020	0.040	0.040
W.S. Elev (ft)	4581.91	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)	4581.70	Flow Area (sq ft)	6.87	119.64	13.52
E.G. Slope (ft/ft)	0.011796	Area (sq ft)	6.87	119.64	13.52
Q Total (cfs)	1138.00	Flow (cfs)	68.92	1001.89	67.20
Top Width (ft)	52.49	Top Width (ft)	3.00	40.00	9.49
Vel Total (ft/s)	8.13	Avg. Vel. (ft/s)	10.03	8.37	4.97
Max Chl Dpth (ft)	3.19	Hydr. Depth (ft)	2.29	2.99	1.43
Conv. Total (cfs)	10478.0	Conv. (cfs)	634.5	9224.8	618.7
Length Wtd. (ft)	20.00	Wetted Per. (ft)	4.95	40.01	9.89
Min Ch El (ft)	4578.72	Shear (lb/sq ft)	1.02	2.20	1.01
Alpha	1.05	Stream Power (lb/ft s)	10.25	18.44	5.00
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	0.00	0.05	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.00	0.02	0.00

CROSS SECTION

RIVER: Channel
REACH: Channel RS: -5124

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4586.82	0	4579.77	.1	4579.74	3	4578.82	23	4578.42
43	4578.82	50	4581.03	71.5	4587.84				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	3	.04	43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
3	43	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	4582.70	Element			
Vel Head (ft)	1.29	Wt. n-Val.	0.040	0.040	0.040
W.S. Elev (ft)	4581.40	Reach Len. (ft)			
Crit W.S. (ft)	4581.40	Flow Area (sq ft)	6.32	111.32	10.57
E.G. Slope (ft/ft)	0.016296	Area (sq ft)	6.32	111.32	10.57
Q Total (cfs)	1138.00	Flow (cfs)	36.11	1044.30	57.58
Top Width (ft)	51.18	Top Width (ft)	3.00	40.00	8.18
Vel Total (ft/s)	8.88	Avg. Vel. (ft/s)	5.71	9.38	5.45
Max Chl Dpth (ft)	2.98	Hydr. Depth (ft)	2.11	2.78	1.29
Conv. Total (cfs)	8914.5	Conv. (cfs)	282.9	8180.5	451.1
Length Wtd. (ft)		Wetted Per. (ft)	4.78	40.01	8.58
Min Ch El (ft)	4578.42	Shear (lb/sq ft)	1.35	2.83	1.25
Alpha	1.06	Stream Power (lb/ft s)	7.69	26.56	6.83
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:Channel

Reach	River Sta.	n1	n2	n3
Channel	5100	.04	.04	.04
Channel	5000	.04	.04	.04
Channel	4900	.04	.04	.04
Channel	4850	Culvert		
Channel	4800	.04	.04	.04
Channel	-1000	.02	.04	.04
Channel	-1049.99	.02	.04	.04
Channel	-1050	.02	.04	.04
Channel	-1074	.02	.04	.04
Channel	-1200	.02	.04	.04
Channel	-1399.99	.02	.04	.04
Channel	-1400	.02	.04	.04
Channel	-1424	.02	.04	.04
Channel	-1624	.02	.04	.04
Channel	-1823.99	.02	.04	.04
Channel	-1824	.02	.04	.04
Channel	-1848	.02	.04	.04
Channel	-2048	.02	.04	.04
Channel	-2248	.02	.04	.04
Channel	-2448	.02	.04	.04
Channel	-2648	.02	.04	.04
Channel	-2848	.02	.04	.04
Channel	-3048	.02	.04	.04
Channel	-3248	.02	.04	.04
Channel	-3448	.02	.04	.04
Channel	-3668	.02	.04	.04
Channel	-3885	.02	.04	.04
Channel	-3968	.02	.04	.04
Channel	-4050	Culvert		
Channel	-4096	.02	.04	.04
Channel	-4110	.02	.04	.04
Channel	-4310	.02	.04	.04
Channel	-4510	.02	.04	.04
Channel	-4710	.02	.04	.04
Channel	-4910	.02	.04	.04
Channel	-4999.99	.02	.04	.04
Channel	-5000	.02	.04	.04
Channel	-5024	.02	.04	.04

Channel	-5044	.02	.04	.04
Channel	-5064	.02	.04	.04
Channel	-5084	.02	.04	.04
Channel	-5104	.02	.04	.04
Channel	-5124	.04	.04	.04

SUMMARY OF REACH LENGTHS

River: Channel

Reach	River Sta.	Left	Channel	Right
Channel	5100	45	60	72
Channel	5000	45	30	25
Channel	4900	210	210	210
Channel	4850	Culvert		
Channel	4800	30	10	1
Channel	-1000	50	50	50
Channel	-1049.99	.01	.01	.01
Channel	-1050	24	24	24
Channel	-1074	126	126	126
Channel	-1200	200	200	200
Channel	-1399.99	.01	.01	.01
Channel	-1400	24	24	24
Channel	-1424	200	200	200
Channel	-1624	200	200	200
Channel	-1823.99	.01	.01	.01
Channel	-1824	24	24	24
Channel	-1848	200	200	200
Channel	-2048	200	200	200
Channel	-2248	200	200	200
Channel	-2448	200	200	200
Channel	-2648	200	200	200
Channel	-2848	200	200	200
Channel	-3048	200	200	200
Channel	-3248	200	200	200
Channel	-3448	200	200	200
Channel	-3668	217	217	217
Channel	-3885	91	91	91
Channel	-3968	128	128	128
Channel	-4050	Culvert		
Channel	-4096	14	14	14
Channel	-4110	200	200	200
Channel	-4310	200	200	200
Channel	-4510	200	200	200
Channel	-4710	200	200	200
Channel	-4910	90	90	90
Channel	-4999.99	.01	.01	.01
Channel	-5000	24	24	24
Channel	-5024	20	20	20
Channel	-5044	20	20	20
Channel	-5064	20	20	20
Channel	-5084	20	20	20
Channel	-5104	20	20	20
Channel	-5124	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Channel

Reach	River Sta.	Contr.	Expan.
Channel	5100	.1	.3
Channel	5000	.1	.3
Channel	4900	.1	.3
Channel	4850	Culvert	
Channel	4800	.1	.3
Channel	-1000	.1	.3
Channel	-1049.99	.1	.3
Channel	-1050	.1	.3
Channel	-1074	.1	.3
Channel	-1200	.1	.3
Channel	-1399.99	.1	.3

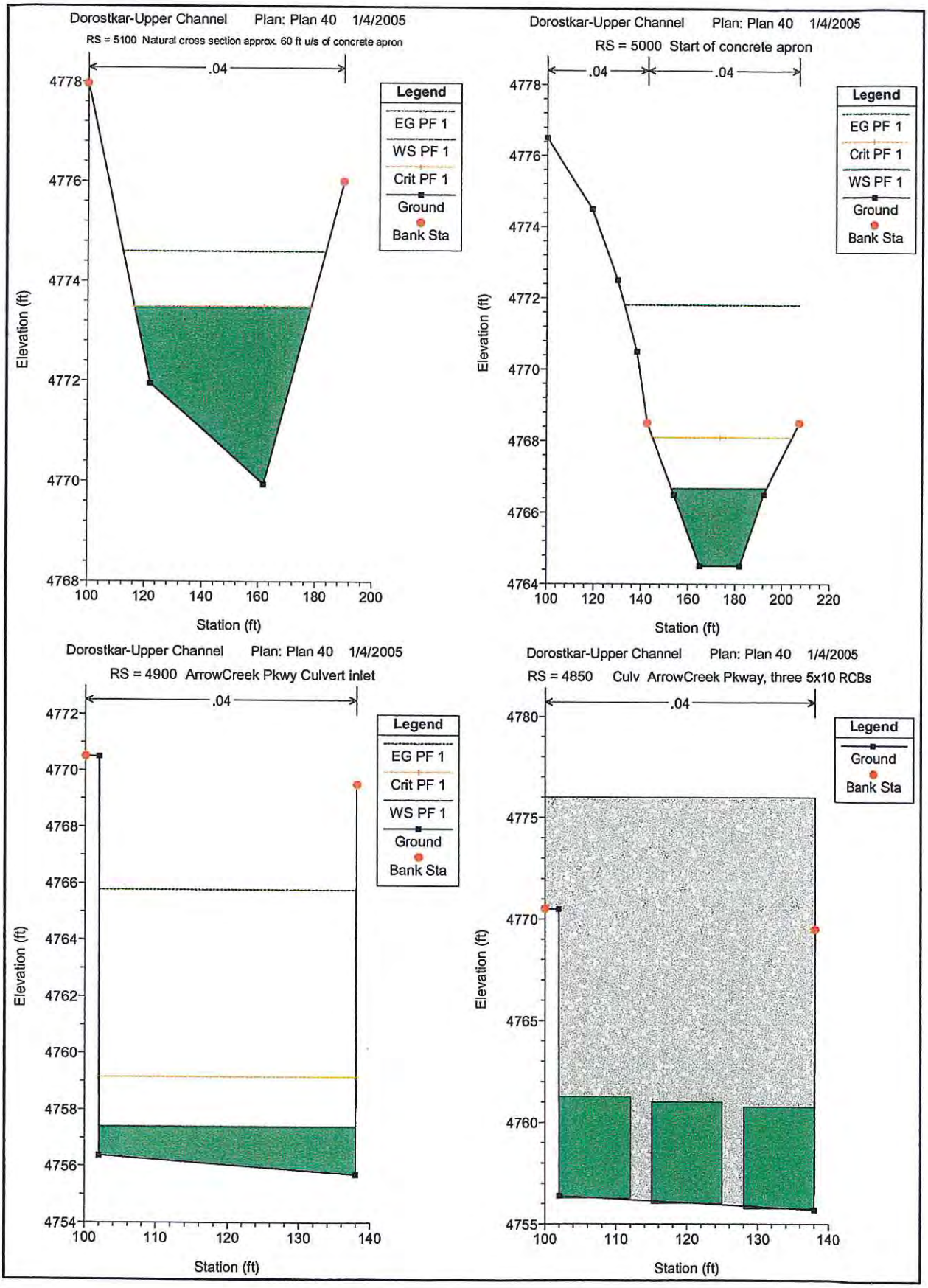
Channel	-1400	.1	.3
Channel	-1424	.1	.3
Channel	-1624	.1	.3
Channel	-1823.99	.1	.3
Channel	-1824	.1	.3
Channel	-1848	.1	.3
Channel	-2048	.1	.3
Channel	-2248	.1	.3
Channel	-2448	.1	.3
Channel	-2648	.1	.3
Channel	-2848	.1	.3
Channel	-3048	.1	.3
Channel	-3248	.1	.3
Channel	-3448	.1	.3
Channel	-3668	.1	.3
Channel	-3885	.1	.3
Channel	-3968	.1	.3
Channel	-4050	Culvert	
Channel	-4096	.1	.3
Channel	-4110	.1	.3
Channel	-4310	.1	.3
Channel	-4510	.1	.3
Channel	-4710	.1	.3
Channel	-4910	.1	.3
Channel	-4999.99	.1	.3
Channel	-5000	.1	.3
Channel	-5024	.1	.3
Channel	-5044	.1	.3
Channel	-5064	.1	.3
Channel	-5084	.1	.3
Channel	-5104	.1	.3
Channel	-5124	.1	.3

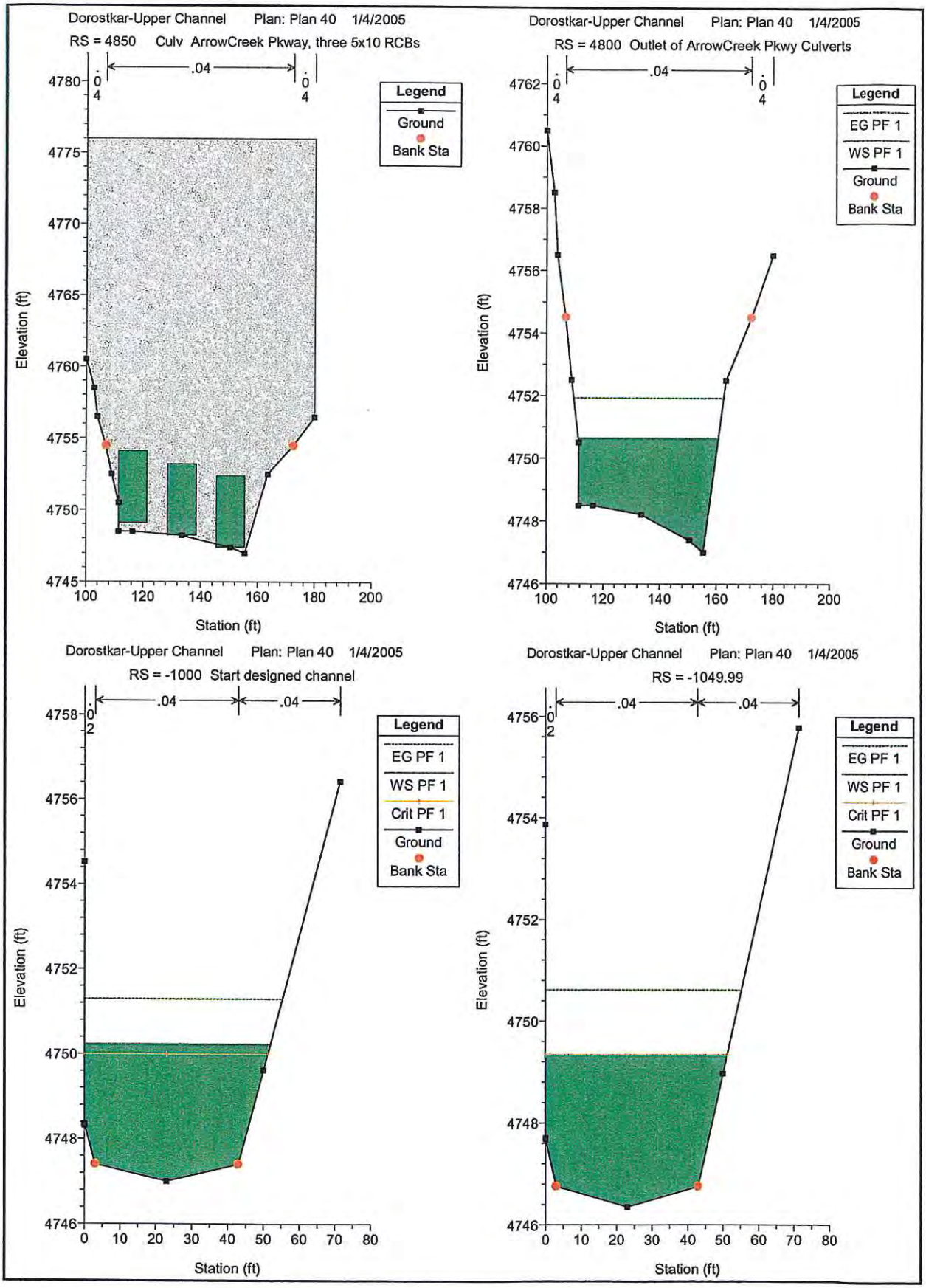
HEC-RAS Plan: Plan 35 River: Channel Reach: Channel Profile: PF 1

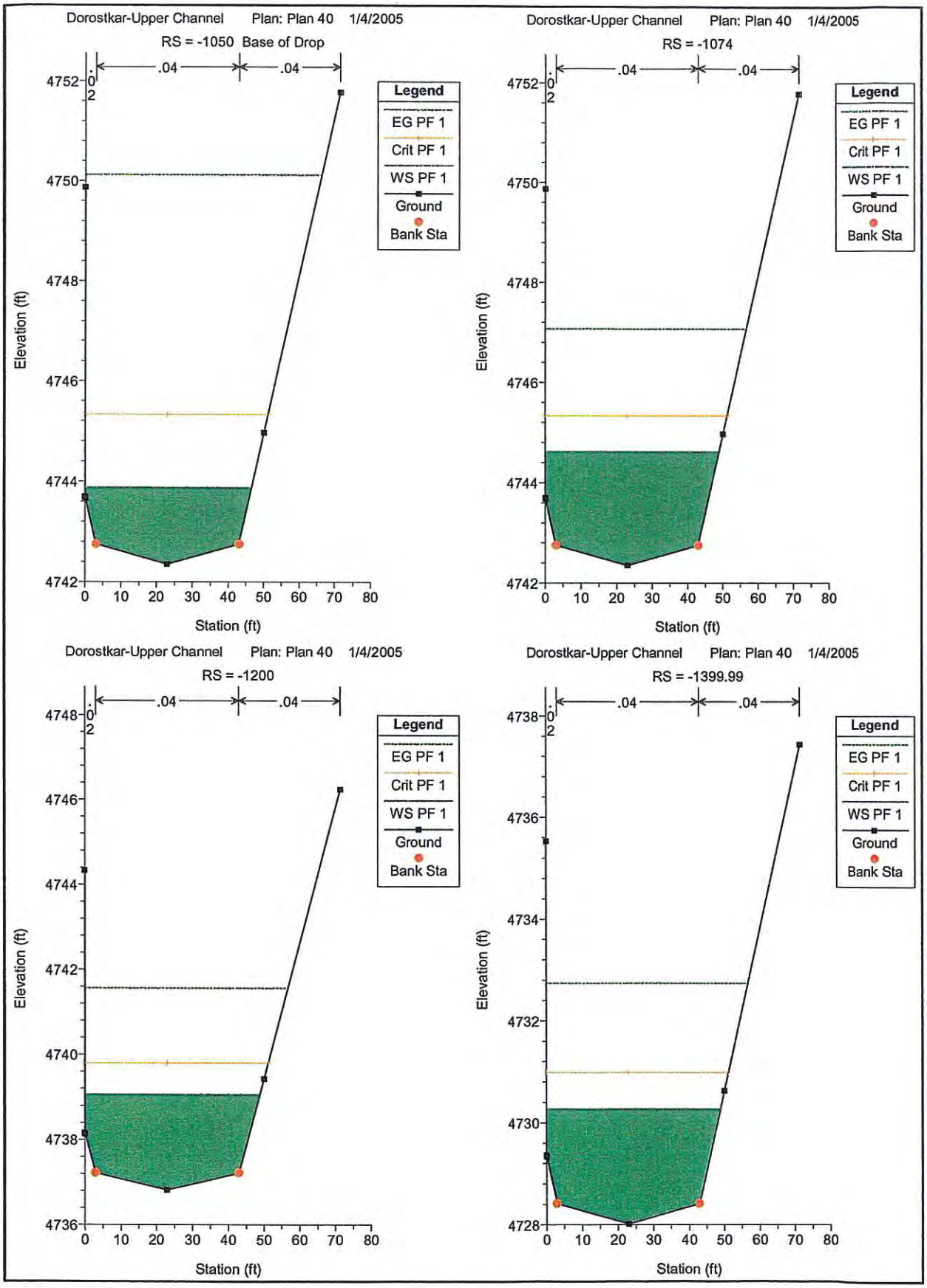
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Channel	5100	PF 1	1138.00	4769.94	4773.48	4773.48	4774.59	0.018598	8.45	134.75	61.97	1.01
Channel	5000	PF 1	1138.00	4764.50	4766.69	4768.11	4771.81	0.136473	18.16	62.68	40.79	2.58
Channel	4900	PF 1	1138.00	4755.70	4757.40	4759.16	4765.77	0.285252	23.21	49.02	36.02	3.51
Channel	4850		Culvert									
Channel	4800	PF 1	1138.00	4747.00	4750.65		4751.93	0.018914	9.09	125.21	49.56	3.51
Channel	-1000	PF 1	1138.00	4747.00	4750.23	4749.99	4751.29	0.011434	8.31	140.76	51.92	0.84
Channel	-1049.99	PF 1	1138.00	4746.35	4749.34	4749.34	4750.61	0.015242	9.08	128.36	51.16	0.96
Channel	-1050	PF 1	1138.00	4742.35	4743.89	4745.34	4750.12	0.197711	20.03	57.42	46.58	3.05
Channel	-1074	PF 1	1138.00	4742.35	4744.62	4745.34	4747.07	0.042923	12.49	92.40	48.89	1.53
Channel	-1200	PF 1	1138.00	4736.81	4739.06	4739.80	4741.56	0.044436	12.63	91.40	48.83	1.55
Channel	-1399.99	PF 1	1138.00	4728.01	4730.27	4730.99	4732.74	0.043655	12.56	91.91	48.86	1.54
Channel	-1400	PF 1	1138.00	4724.01	4725.49	4726.99	4732.30	0.228828	20.95	54.89	46.41	3.26
Channel	-1424	PF 1	1138.00	4724.01	4726.20	4726.99	4728.86	0.048970	13.01	88.65	48.65	1.62
Channel	-1624	PF 1	1138.00	4715.21	4717.51	4718.20	4719.88	0.040579	12.28	94.05	49.00	1.49
Channel	-1823.99	PF 1	1138.00	4706.41	4708.63	4709.39	4711.20	0.046289	12.79	90.24	48.75	1.58
Channel	-1824	PF 1	1138.00	4702.41	4703.89	4705.39	4710.76	0.232682	21.06	54.60	46.39	3.29
Channel	-1848	PF 1	1138.00	4702.41	4704.59	4705.39	4707.27	0.049706	13.07	88.24	48.62	1.64
Channel	-2048	PF 1	1138.00	4693.61	4695.92	4696.60	4698.27	0.040157	12.24	94.36	49.02	1.49
Channel	-2248	PF 1	1138.00	4684.81	4687.03	4687.80	4689.60	0.046602	12.81	90.04	48.74	1.59
Channel	-2448	PF 1	1138.00	4676.01	4678.29	4678.99	4680.71	0.042073	12.41	92.99	48.93	1.52
Channel	-2648	PF 1	1138.00	4667.21	4669.45	4670.20	4671.97	0.045181	12.69	90.92	48.79	1.57
Channel	-2848	PF 1	1138.00	4658.41	4660.68	4661.39	4663.13	0.043099	12.51	92.29	48.88	1.53
Channel	-3048	PF 1	1138.00	4649.61	4651.86	4652.60	4654.36	0.044549	12.64	91.33	48.82	1.56
Channel	-3248	PF 1	1138.00	4640.81	4643.07	4643.80	4645.54	0.043599	12.55	91.95	48.86	1.54
Channel	-3448	PF 1	1138.00	4632.01	4634.26	4634.99	4636.75	0.044273	12.61	91.51	48.83	1.55
Channel	-3668	PF 1	1138.00	4623.21	4625.47	4626.20	4627.95	0.043852	12.57	91.78	48.85	1.55
Channel	-3885	PF 1	1138.00	4613.66	4615.91	4616.64	4618.40	0.044142	12.60	91.59	48.84	1.55
Channel	-3968	PF 1	1138.00	4612.15	4616.98	4615.29	4617.65	0.003790	6.54	174.04	58.57	0.52
Channel	-4050		Culvert									
Channel	-4096	PF 1	1138.00	4611.42	4614.56	4614.56	4616.13	0.016062	10.08	112.85	56.04	1.00
Channel	-4110	PF 1	1138.00	4611.00	4613.26	4613.98	4615.70	0.043237	12.51	92.57	49.51	1.54
Channel	-4310	PF 1	1138.00	4604.60	4607.19	4607.58	4608.95	0.025618	10.64	109.27	50.61	1.21
Channel	-4510	PF 1	1138.00	4598.20	4600.55	4601.18	4602.78	0.037344	11.95	96.96	49.82	1.44
Channel	-4710	PF 1	1138.00	4591.80	4594.33	4594.78	4596.20	0.028291	10.97	105.88	50.40	1.27
Channel	-4910	PF 1	1138.00	4585.40	4587.79	4588.38	4589.92	0.034719	11.69	99.22	49.98	1.39
Channel	-4999.99	PF 1	1138.00	4582.52	4585.00	4585.50	4586.96	0.030316	11.21	103.58	50.26	1.31
Channel	-5000	PF 1	1138.00	4578.52	4580.03	4581.50	4586.50	0.211843	20.46	56.35	46.88	3.15
Channel	-5024	PF 1	1138.00	4578.52	4583.37	4581.50	4583.77	0.002523	5.20	231.49	57.70	0.42

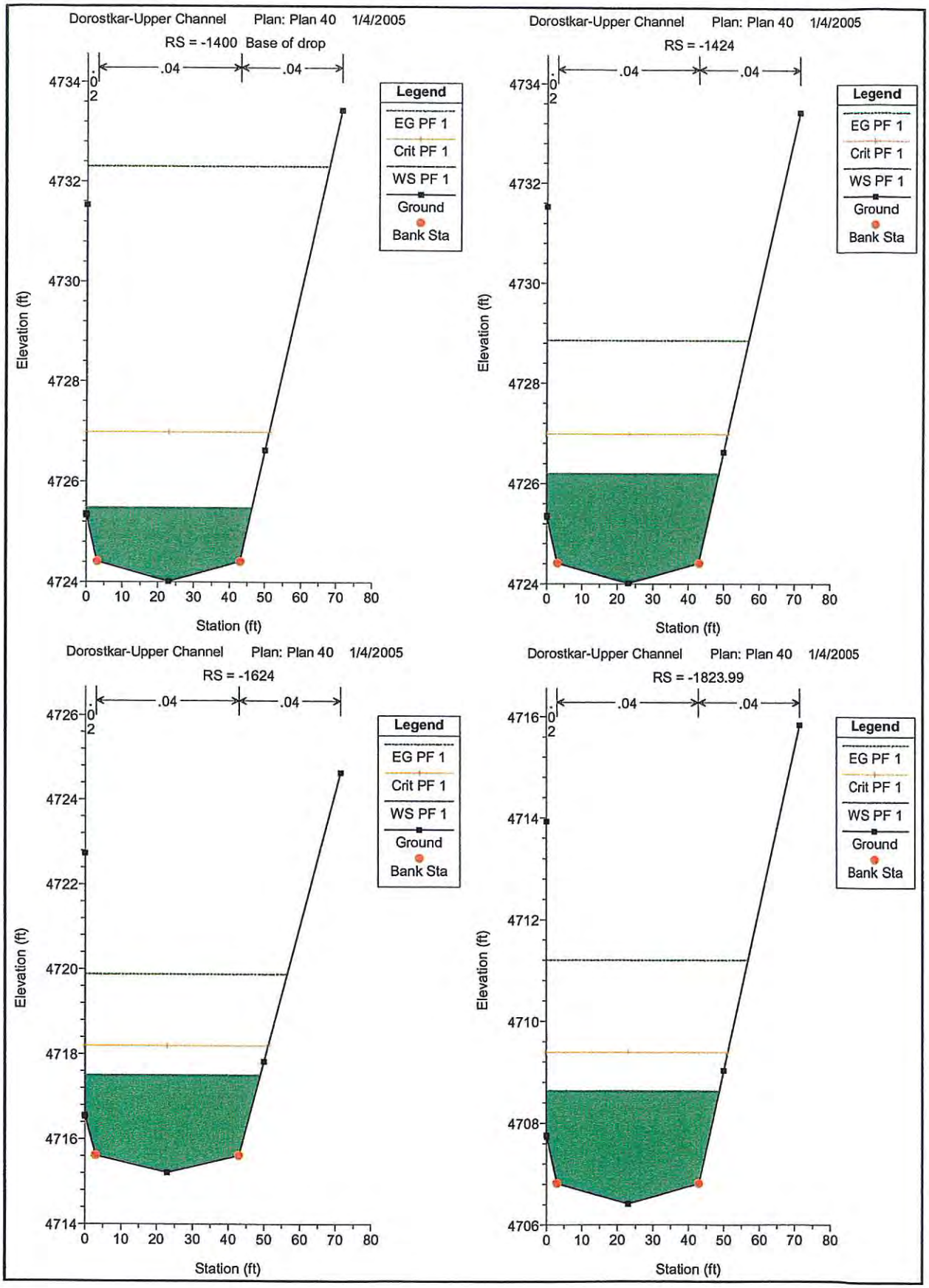
HEC-RAS Plan: Plan 35 River: Channel Reach: Channel Profile: PF 1 (Continued)

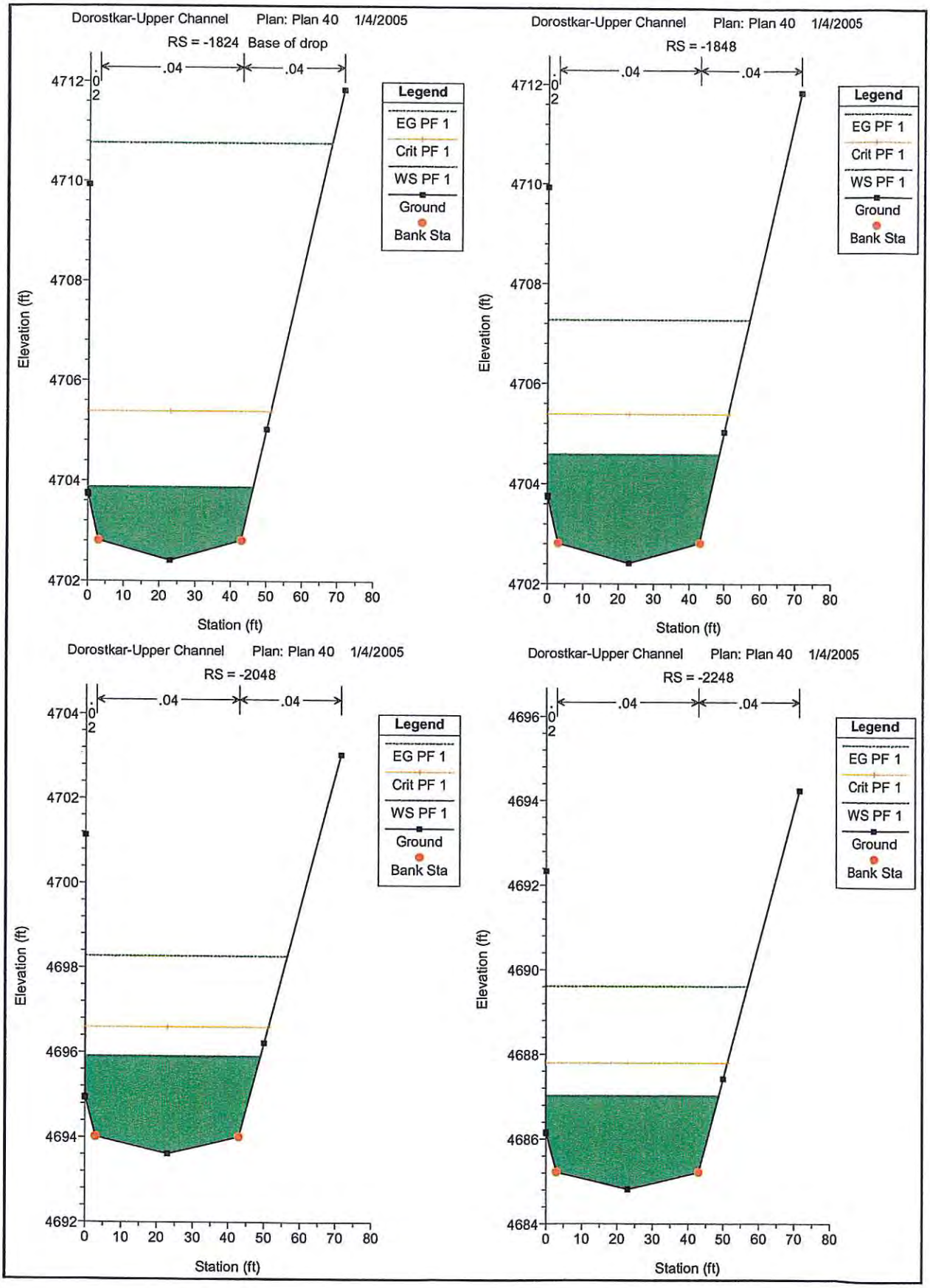
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Channel	5044	PF 1	1138.00	4579.32	4582.65		4583.62	0.010109	7.98	147.16	52.91	0.80
Channel	5064	PF 1	1138.00	4579.12	4582.44		4583.42	0.010211	8.01	146.69	52.88	0.80
Channel	5084	PF 1	1138.00	4578.92	4582.21		4583.21	0.010495	8.08	145.40	52.81	0.81
Channel	5104	PF 1	1138.00	4578.72	4581.91	4581.70	4582.99	0.011796	8.37	140.03	52.49	0.85
Channel	5124	PF 1	1138.00	4578.42	4581.40	4581.40	4582.70	0.016296	9.38	128.21	51.18	0.99

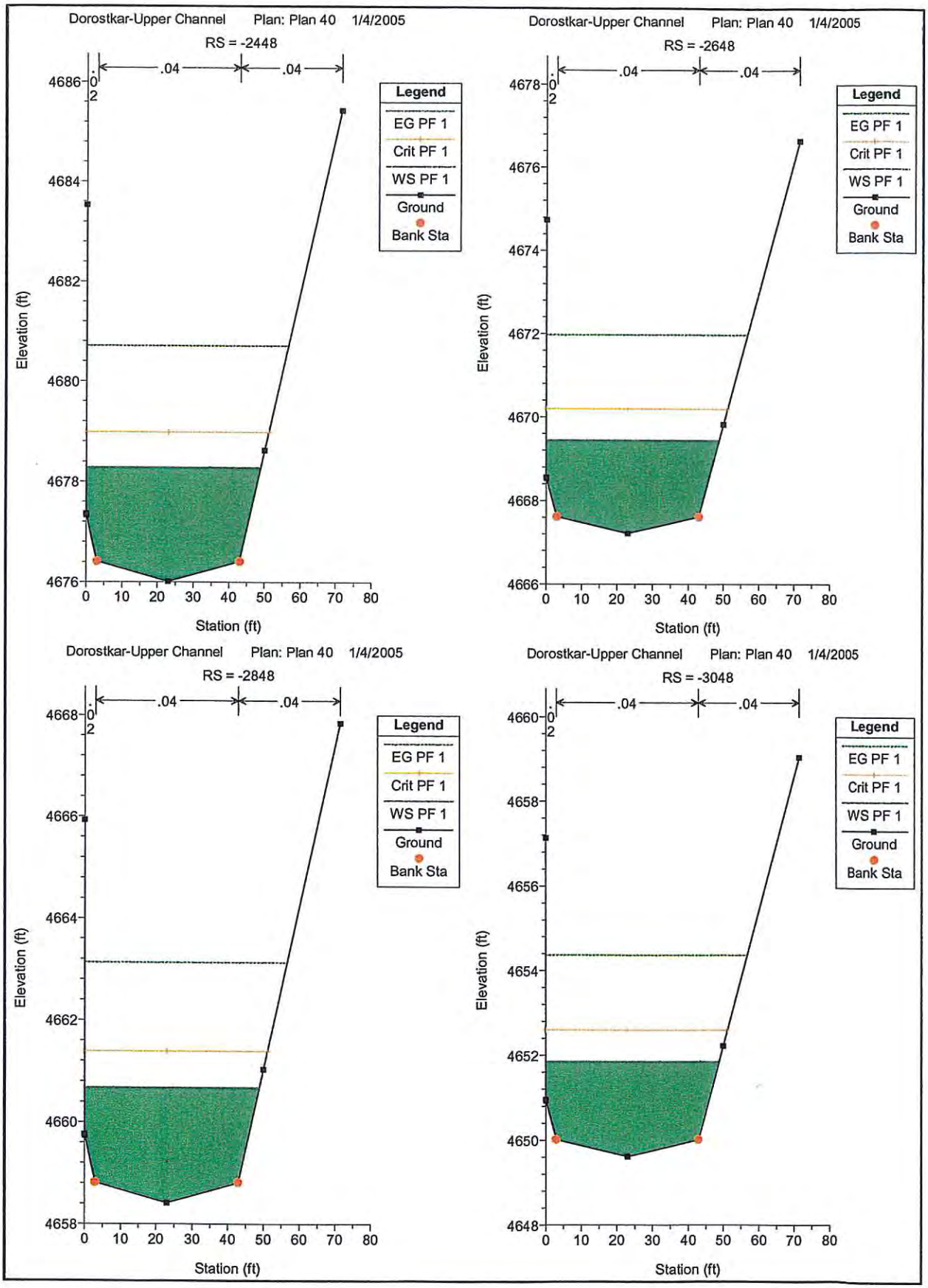

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = 5100 Natural cross section approx. 60 ft u/s of concrete apron
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = 5000 Start of concrete apron
.04
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = 4900 ArrowCreek Pkwy Culvert inlet
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = 4850 Culv ArrowCreek Pkway, three 5x10 RCBs
.04
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)

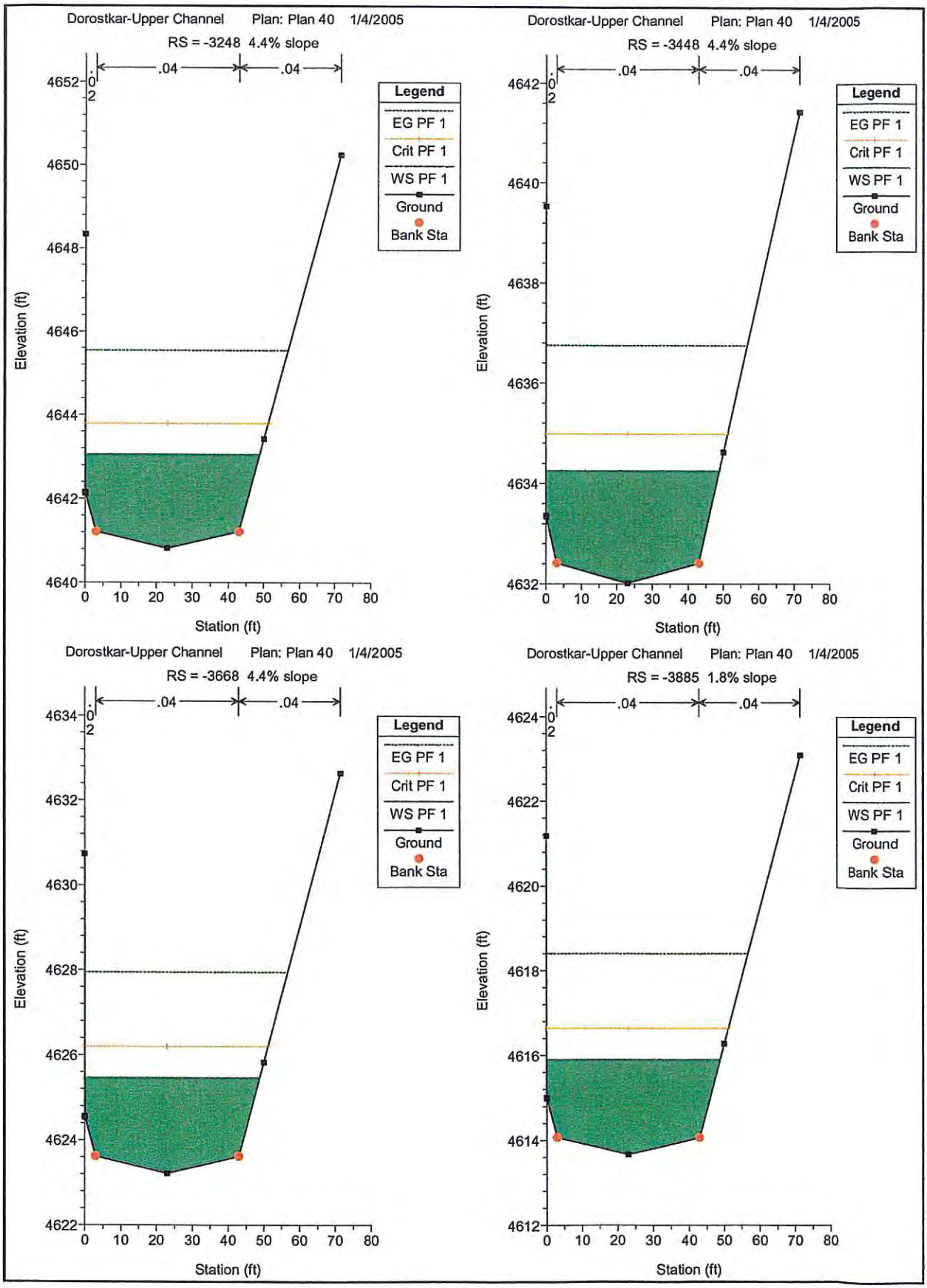

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = 4850 Culv ArrowCreek Pkway, three 5x10 RCBs
.04
.04
0
4
0
4
Legend
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = 4800 Outlet of ArrowCreek Pkwy Culverts
.04
.04
0
4
0
4
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1000 Start designed channel
.04
.04
0
2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1049.99
.04
.04
0
2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

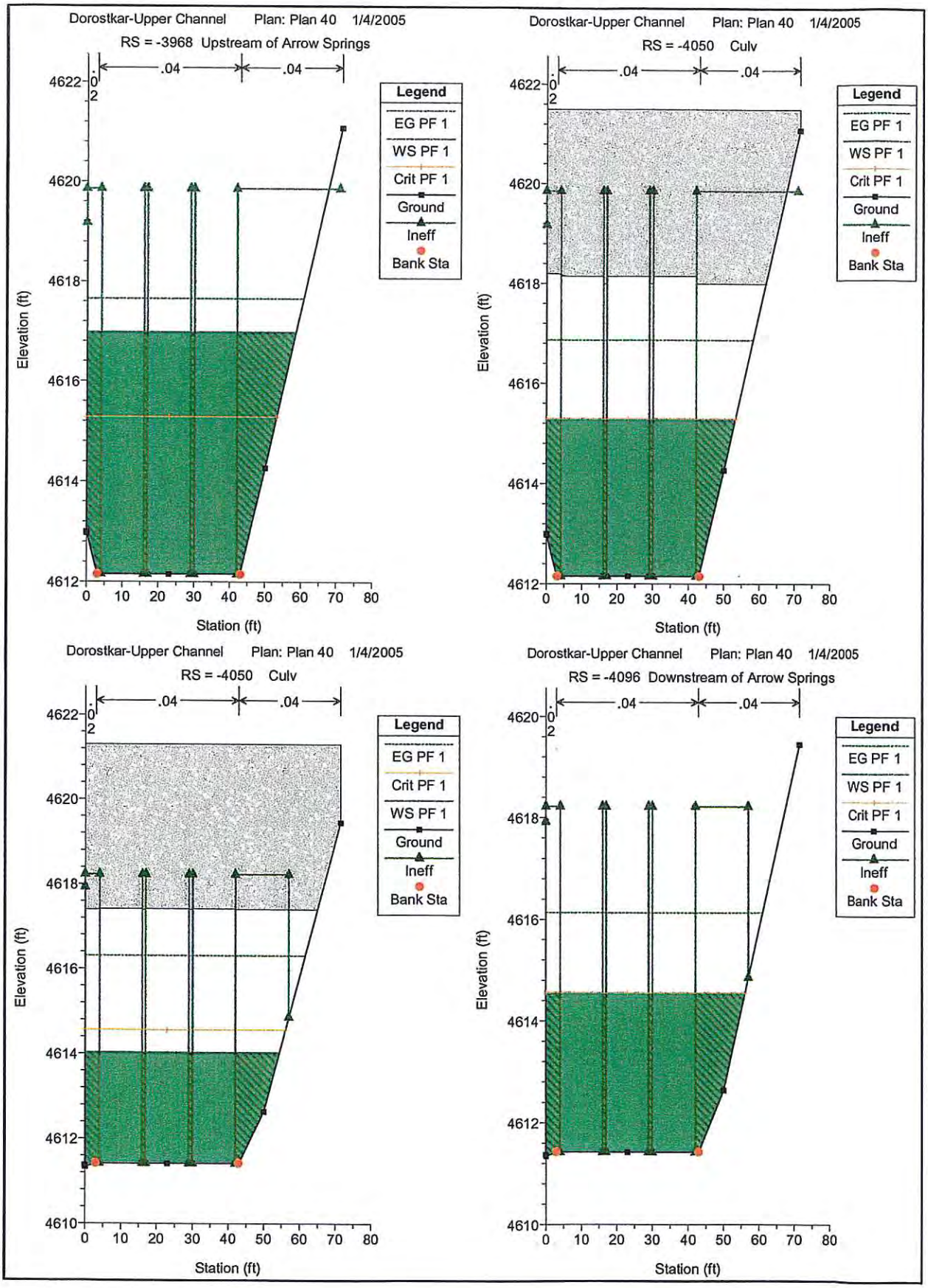

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1050 Base of Drop
.02
.04
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1074
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1200
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1399.99

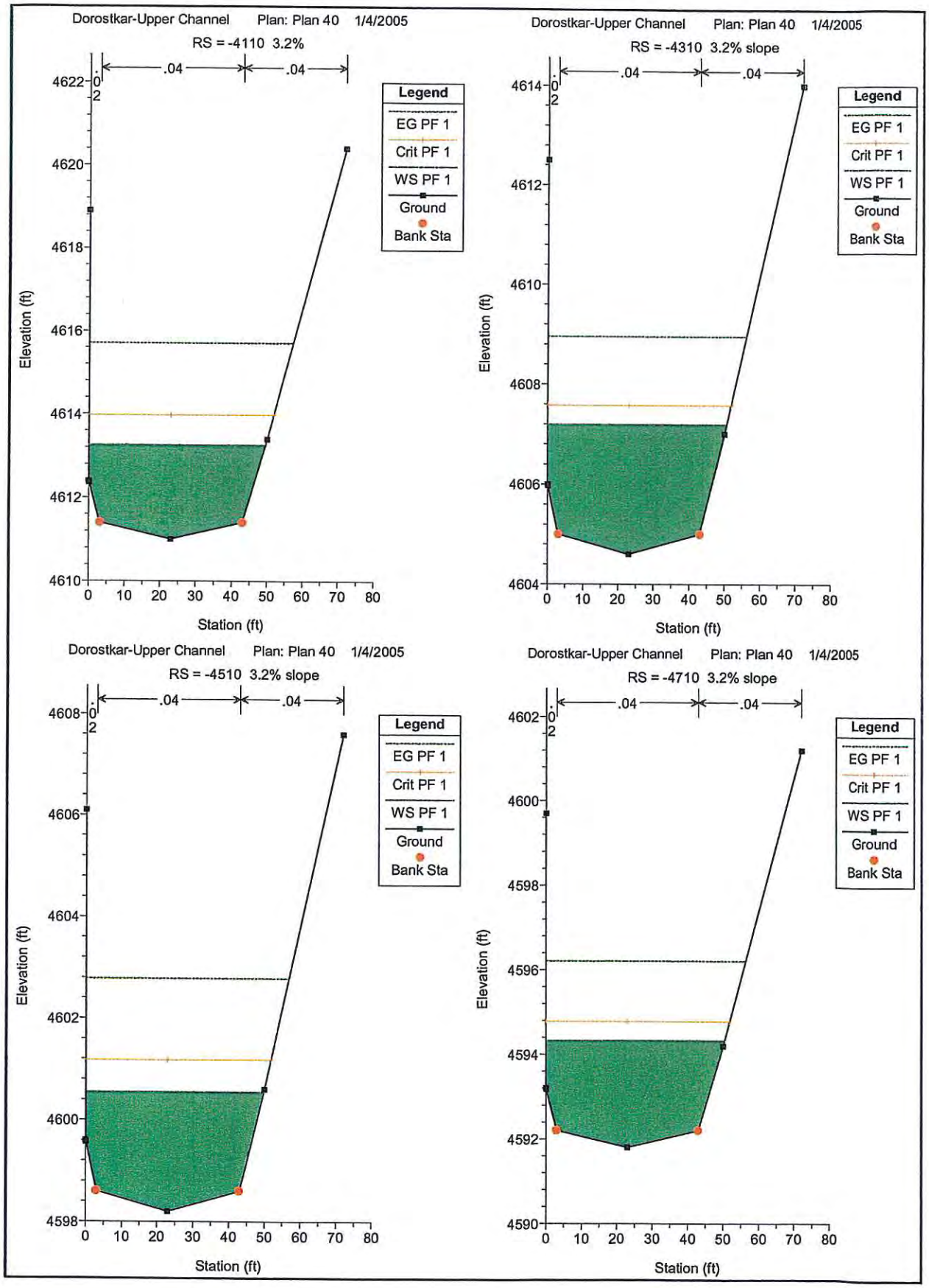

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1400 Base of drop
.04
.04
.02
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1424
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1624
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1823.99

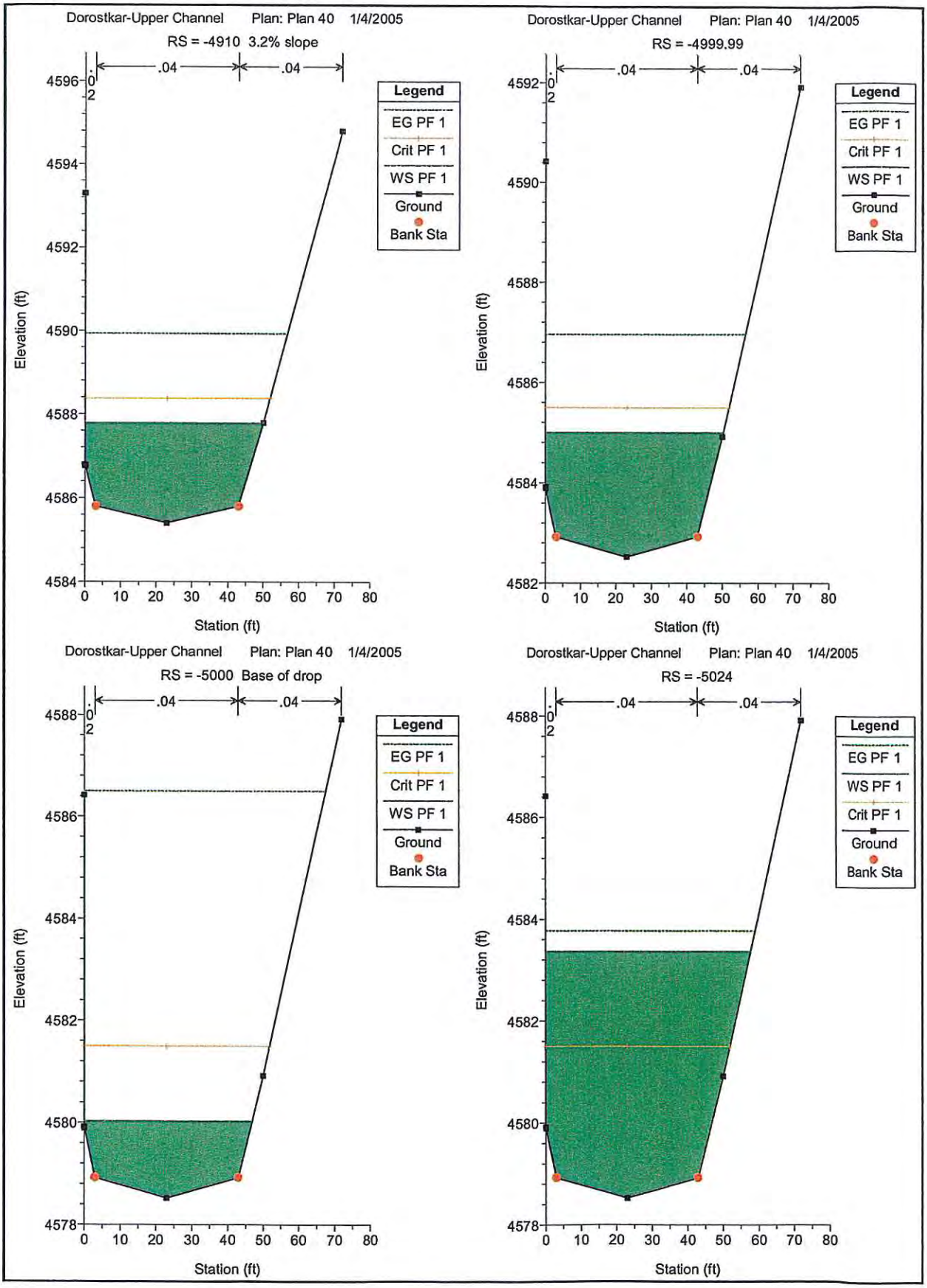

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1824 Base of drop
.04
.04
.02
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -1848
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -2048
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -2248

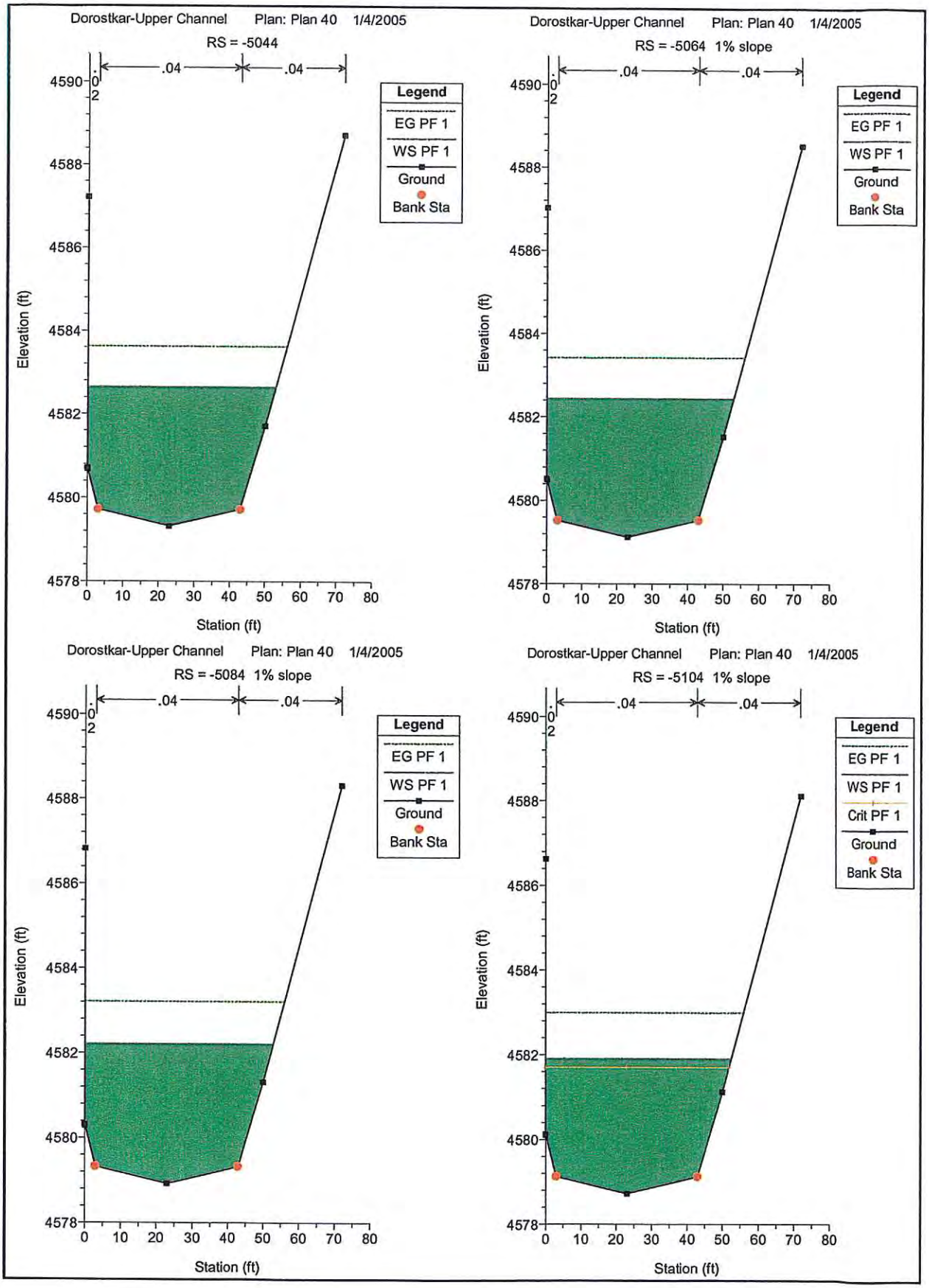

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -2448
.04
.04
0.2
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -2648
.04
.04
0.2
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -2848
.04
.04
0.2
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -3048
.04
.04
0.2
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

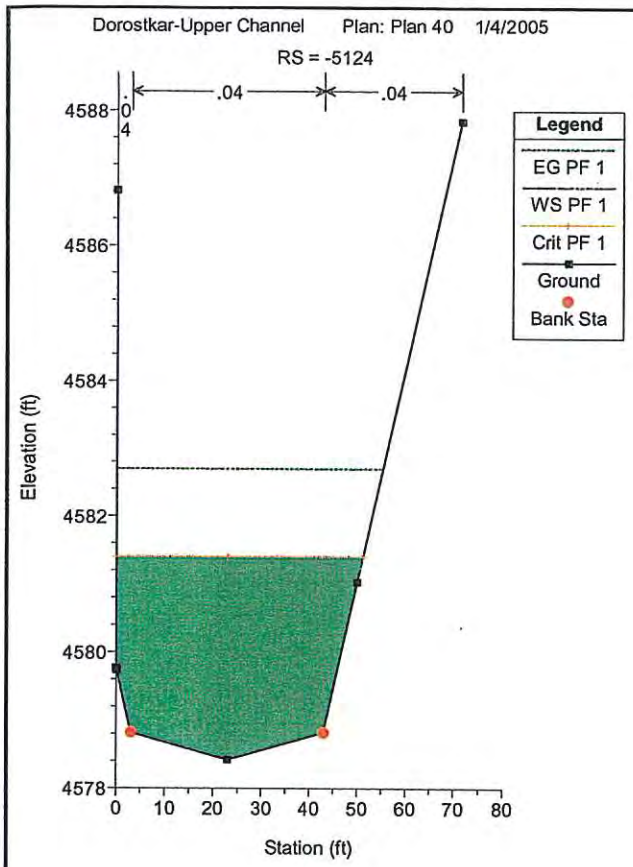

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -3248 4.4% slope
.04
.04
.02
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -3448 4.4% slope
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -3668 4.4% slope
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -3885 1.8% slope


Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -3968 Upstream of Arrow Springs
.02
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4050 Culv
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4050 Culv
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4096 Downstream of Arrow Springs


Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4110 3.2%
.04
.04
.02
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4310 3.2% slope
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4510 3.2% slope
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4710 3.2% slope

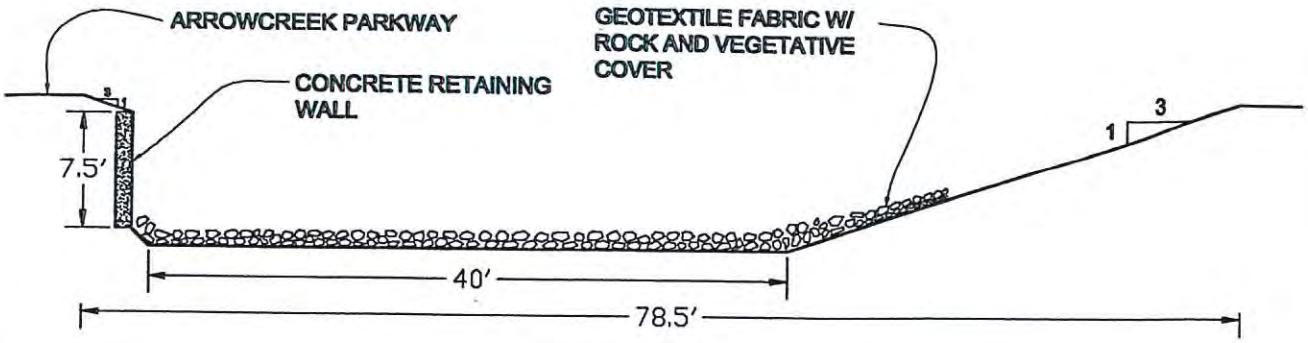

Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4910 3.2% slope
.02
.04
.04
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -4999.99
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -5000 Base of drop
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -5024


Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -5044
.04
.04
.02
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -5064 1% slope
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -5084 1% slope
Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -5104 1% slope
Crit PF 1


Dorostkar-Upper Channel Plan: Plan 40 1/4/2005
RS = -5124
.04
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
4588
4586
4584
4582
4580
4578
0
10
20
30
40
50
60
70
80
Station (ft)

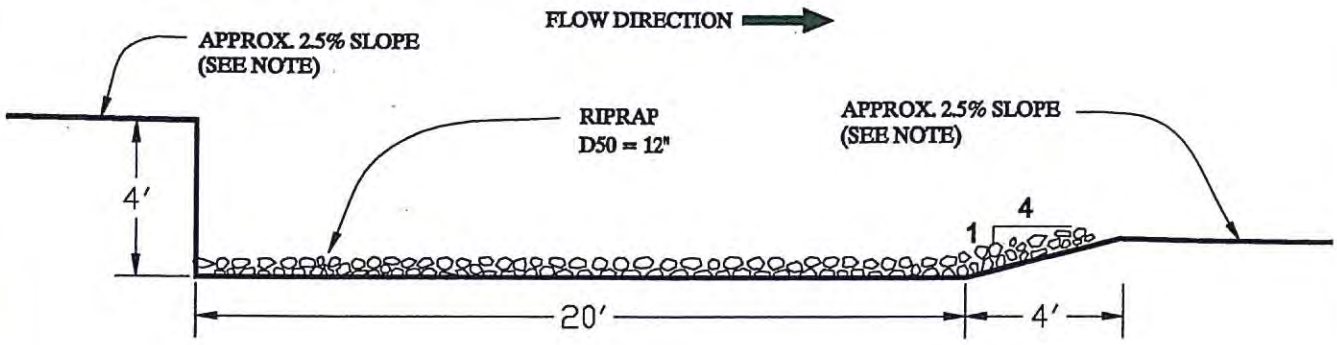
APPENDIX F

PROPOSED CHANNEL PROFILE AND SECTIONS



TYPICAL CHANNEL SECTION

NTS



NOTE:
2.5% SLOPE EXTENDS 75 FEET FOR DROPS UPSTREAM OF ARROW SPRINGS CROSSING AND FOR 175 FEET FOR DROPS DOWNSTREAM OF THE CROSSING

TYPICAL DROP STRUCTURE PROFILE

NTS

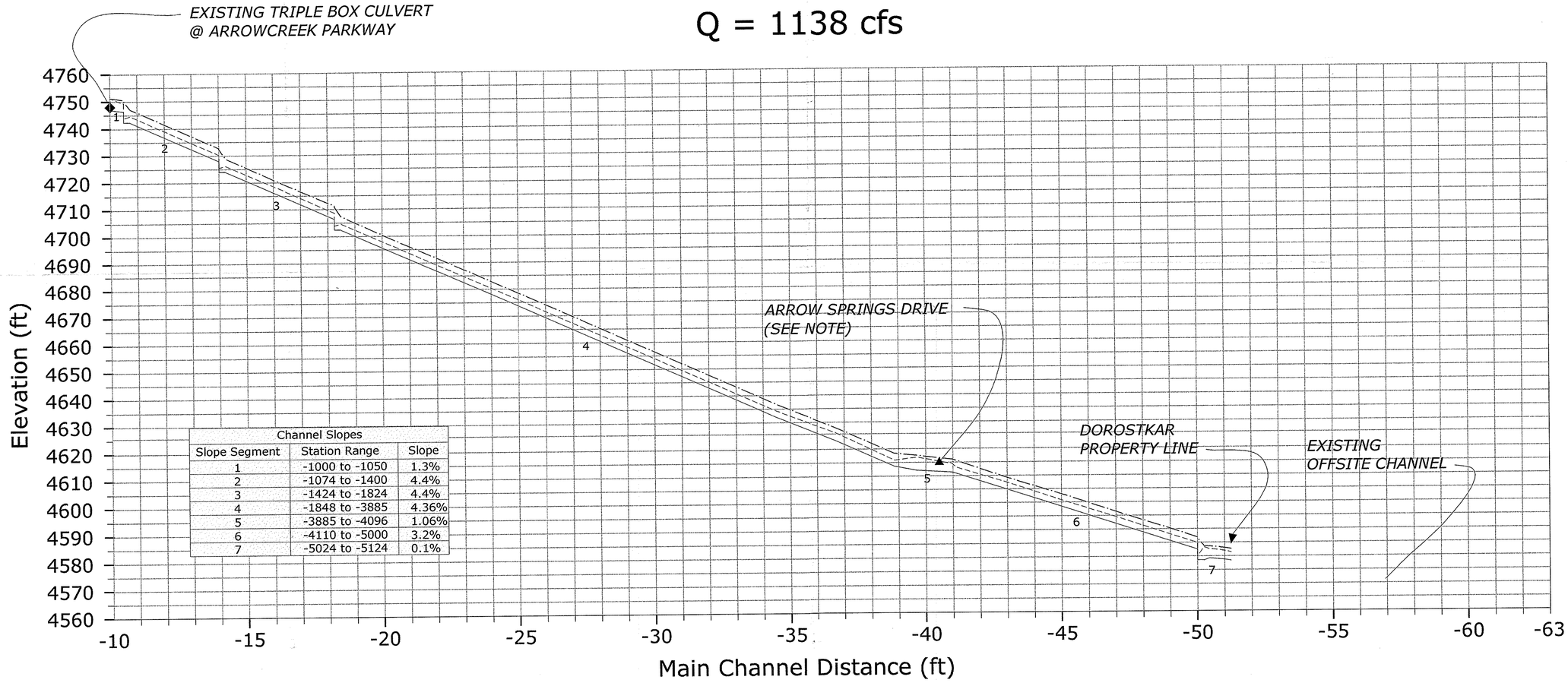
Figure F-4
Typical Channel Details
Dorostkar

Nimbus Engineers
3785 Baker Ln., Suite 201 • Reno, NV 89509
Mail: P.O. Box 10220 • Reno, NV 89510
(775) 689-8630 • Fax (775) 689-8614
www.nimbusengineers.com

Nimbus Job #0428

Date: August 2004

Q = 1138 cfs



Channel Slopes		
Slope Segment	Station Range	Slope
1	-1000 to -1050	1.3%
2	-1074 to -1400	4.4%
3	-1424 to -1824	4.4%
4	-1848 to -3885	4.36%
5	-3885 to -4096	1.06%
6	-4110 to -5000	3.2%
7	-5024 to -5124	0.1%

SCALE

1" = 200 FT HORIZONTAL
1" = 20 FT VERTICAL

EXPLANATION

—·—·— - *ENERGY GRADE ELEVATION*

---------- - *WATER SURFACE*

——— - *CHANNEL*

NOTE:

ASSUMES THREE 6X12 RCB'S AT ARROW SPRINGS DRIVE

Nimbus Engineers
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(775) 689-8630 • Fax: (775) 689-8614
www.nimbusengineers.com

Revisions: | Date: | References

Scale: 1" = 20 feet
Date: January, 2005
File Name: 0428_profiles-rev4
Drawn By: GH
Designed By: DW

PLATE 3
CHANNEL PROFILE
Q = 1138 cfs
Mountaingate CLOMR
Washoe County *Nevada*

Sheet 1 of 1

Nimbus Job # 0428