

HYDROLOGY AND HYDRAULIC REPORT

**1822-1864 York Drive
PDS2021-MUP-21-008
PDS2021-ER-21-08-008**

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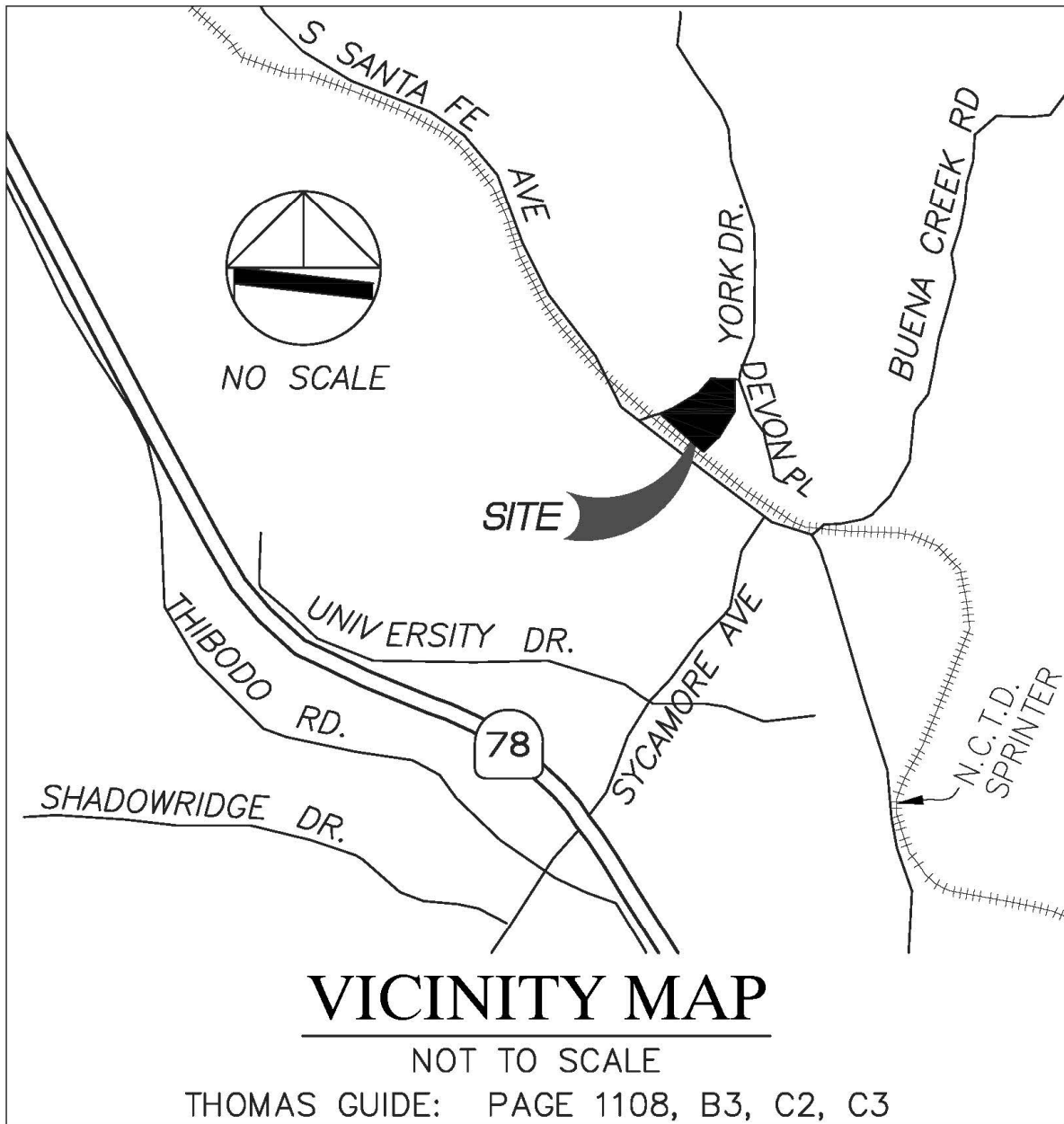
March 25, 2025

W.O. 1084-1119-601

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CHAPTER 1 – DISCUSSION



1.2 PURPOSE AND SCOPE

The purpose of this report is to publish the results of hydrology and hydraulic computer analysis for the proposed 1822-1864 York Drive Site Development Plan located in the County of San Diego. The scope of this study is to analyze the results of pre-developed and post-developed hydrology conditions and provide recommendations as to the design and size of various hydraulic systems considered as mitigation of any potential adverse effects of the proposed project. The mitigation measures proposed will include flow-based BMP calculations and sizing to attenuate the effects of development on storm water discharge. The 100-year storm frequency will be analyzed. Information contained in this report will be referred to for the purpose of sizing treatment and mitigation facilities as proposed in the associated Storm Water Quality Mitigation Plan (SWQMP).

1.3 PROJECT DESCRIPTION

The proposed 1822-1864 York Drive, Site Development Plan is located in the County of San Diego. The property consists of two lots, Assessor's Parcel Numbers 184-040-18, 184-040-19, 184-040-20, 184-040-21, 184-040-22 and 184-040-04. The Site Development Plan proposes to develop a senior living facility on the 4.27-acre site. There were three (3) single family homes existing on the property, 1822-1864 York Drive. These homes along with numerous ancillary structures have been demolished and removed from the property. The senior living facility will consist of one (1) four story building, parking lot, pool area, putting green and patio.

For this drainage analysis, the pre-developed and post-developed conditions peak flows were calculated using the Rational Method Hydrograph procedure set forth in the San Diego County Hydrology Manual (SDCHM). This is the prescribed method for drainage areas less than one square mile.

1.4 PRE-DEVELOPMENT CONDITIONS

The site is located on the east side of York Drive near the intersection of South Santa Fe Avenue. The site consists of four existing single family residential structures with accessory structures along with asphalt concrete pavement, concrete and landscaping areas. Drainage from the existing site drains in a southeasterly direction towards the easterly boundary where an existing graded channel with a concrete bottom conveys flow in a southerly direction to an existing 72-inch corrugated metal pipe (cmp) that crosses underneath the Inland Rail Trail and North County Transit District (NCTD) railroad tracks. Between the Inland Rail Trail and the NCTD railroad tracks is an existing concrete ditch that collects runoff and discharges the flow into a sump 36-inch cmp inlet that is connected to the top of the existing

72-inch cmp below. The property is bordered on the west and north by York Drive, to the east by a memory care facility and residential buildings, and to the south by Inland Rail Trail and NCTD railroad tracks. On-site topography includes elevations ranging from approximately 456 to 427 feet at gradients ranging from 1 percent to 10:1 (horizontal to vertical) slopes.

The project site is located in the Buena Subarea (904.32), part of the Carlsbad Hydrologic Unit (904.00). The site soil quality is predominately Type-D soil by NRCS Web Soil Survey. No contaminated or hazardous soil was located within the project area, and no evidence of scouring or excessive erosion resulting from concentrated runoff was in evidence at the site.

Pre-development site drainage is accompanied by offsite flows from the north. Concentrated runoff enters the site near the northeasterly corner of the project, Node 60, near York Drive and Montgomery Drive intersection. Runoff at Node 60 is conveyed in the existing graded channel with a concrete bottom to the existing 72-inch cmp at Node 40. The 4.27-acre site is approximately 18% impervious in the pre-development condition.

Please refer to the Pre-Developed and Post-Developed Hydrology Exhibits for drainage patterns and areas. Table 1 below summarizes the results of the pre-developed 100-year runoff information from the site.

TABLE 1 – Summary of Pre-Developed Peak Flows

Discharge Location	Discharge Location	Drainage Area (ac)	100-Year Peak Flow (cfs)
POC-1	40	4.58	11.13

1.5 POST-DEVELOPMENT CONDITIONS

Stormwater runoff from the proposed project site is routed to one (1) Point of Concentration (POC), POC-1 located near the southeast corner of the project site near the entrance of a 72-inch cmp that crosses underneath the Inland Rail Trail and NCTD railroad tracks. The majority of the project area will drain to a proposed onsite storm drain system that discharges flow into an proposed 72-inch cmp stormwater system for detention, then drained to a separate Modular Wetlands Systems (MWS) for pollutant control. The 72-inch cmp stormwater system is divided in to two separate units and connected to a storm drain cleanout where the initial 2.75 feet of storage will be directed to the MWS for pollutant control treatment. The remaining stormwater above the 2.75 feet of storage in the 72-inch cmp stormwater system will be detained and released via a system of orifices (slots) built within the storm drain cleanout to reduce the runoff to pre-developed runoff flows at POC 1.

The remaining onsite project areas (driveway entrance near the northeasterly corner of the

property) will drain towards York Drive. Runoff from the driveway will be treated by green street tree wells before leaving the site.

Conveyances from the POC-1 confluence in the existing channel that is conveyed into an existing 72-inch cmp that crosses underneath the Inland Rail Trail and NCTD railroad tracks. The proposed drainage pattern mimics the existing drainage pattern with regards to overall area and discharge points. Table 2 below summarizes the post-developed conditions.

TABLE 2 – Summary of Post-Developed Conditions Peak Flows

Discharge Location	Drainage Area (ac)	100-Year Undetained Peak Flow (cfs)	100-Year Detained Peak Flow (cfs)
POC-1	4.58	21.07	11.06

1.6 GENERAL HYDROLOGIC CONSIDERATIONS

Rainfall

Precipitation has been obtained from NOAA website at the coordinates of the project (Chapter 6 - References).

Rainfall was developed using the SDCHM, where the duration “t” is made equal to the time of concentration to maximize peak flow. However, longer durations up to 360 minutes are used to build the complete hyetograph (precipitation distribution for the 100-year, 6-hour storm event). The 6-hour storm is distributed according to the methodology explained in the SDCHM, where the peak precipitation starts four hours after the beginning of the storm (see intensity tables in Chapter 6 - References).

HEC-HMS allows for hydrology input time steps of 1, 2, 3, 4, 5, 10, 15 & 20 minutes. Rational Method analysis input was used to determine an inflow hydrograph using the 2/3's 1/3 distribution as detailed on pages 4-2 and 4-3 of the 2003 County of San Diego Hydrology Manual. The time of concentration (Tc) used for the construction of these hydrographs was rounded to the nearest time interval that HEC-HMS could accept. The peak flow remains as per the modified rational method analysis and is not reduced (or increased) from this hydrograph development accordingly.

HEC-HMS uses an elevation-storage-discharge function to model the basin volume (stage-storage) and basin discharge (stage-discharge) relationships, the available storage volume provided by WQ units.

Rational method hydrographs, stage-storage, stage-discharge relationships and HEC-HMS

model output is provided in Chapter 4 of this report.

Post-Developed Hydrograph Determination

For the post-developed condition, a runoff hydrograph was generated using the Rational Method Hydrograph Procedure discussed in the Section 6 of the SDCHM. These hydrographs were then entered into the developed condition HEC-HMS model.

Model Results

Table 3 below shows that the proposed 72-inch cmp stormwater system attenuates the peak flow to below the pre-development conditions.

TABLE 3 — Summary of 72-inch CMP Stormwater System Routing

Discharge Location	Undetained 100-Year Peak Flow (cfs)	Detained 100-Year Peak Flow (cfs)
175/176	19.56	8.31

The Rational Method study provided herein incorporates the outlet structure design in the underground detention facilities and is meant to show the site can sufficiently convey the 100-year storm event.

1.7 STUDY METHOD

The method of analysis was based on the Rational Method according to the San Diego County Hydrology Manual (SD HM). The Hydrology and Hydraulic Analysis were done on Hydro Soft by Advanced Engineering Software 2014. The study considers the runoff for a 100-year storm frequency.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the “2014 County of San Diego Drainage Design Manual.” A more detailed explanation of methodology used for this analysis is listed in Chapter 6 – References of this report.

The Rational Method for this project provided the following variable coefficients:

Rainfall Intensity – Initial time of concentration (T_c) values based on Table 3-2 of the SDCHM. Precipitation distribution for the 100-year, 6-hour storm events were obtained from the NOAA Precipitation Frequency Data Server (PFDS), see References.

$$I = 7.44 \times (P_6) \times (T_c)^{-0.645}$$

P₆ for 100-year storm = 3.20 inches

Runoff Coefficients – In accordance with the County of San Diego standards, runoff coefficients were based on land use and soil type. The soil conditions used in this study are consistent with Type-D soil qualities. An appropriate runoff coefficient (C) for each type of land use in the subarea was selected from Table 3-1 of SDCHM and multiplied by the percentage of total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient ($\Sigma[CA]$). See Table 1.1 for weighted runoff coefficient “C” calculations.

The Post-Developed Hydrology Exhibit shows the proposed on-site drainage system and nodal points. Table 4 summarizes the composite C-values calculated in the pre-developed and post-developed conditions.

TABLE 4 — Weighted Runoff Coefficient “C” Calculations

Pre-Developed Hydrology							
Up Node	Down Node	Total Area (ac)	Pervious C ₁	Pervious A ₁ (acres)	Impervious C ₂	Impervious A ₂ (acres)	C _{comp}
10	20	0.115	0.35	0.115	0.87	0.000	0.35
20	30	4.143	0.35	3.355	0.87	0.788	0.45
40	50	0.045	0.35	0.006	0.87	0.038	0.80
50	60	0.279	0.35	0.068	0.87	0.210	0.74

Post-Developed Hydrology							
Up Node	Down Node	Total Area (ac)	Pervious C ₁	Pervious A ₁ (acres)	Impervious C ₂	Impervious A ₂ (acres)	C _{comp}
10	20	0.114	0.35	0.014	0.87	0.100	0.81
20	30	0.300	0.35	0.073	0.87	0.227	0.74
40	40	0.125	0.35	0.034	0.87	0.092	0.73
50	50	0.125	0.35	0.029	0.87	0.095	0.75
60	60	0.379	0.35	0.054	0.87	0.325	0.80
70	70	0.166	0.35	0.019	0.87	0.147	0.81
80	80	0.361	0.35	0.056	0.87	0.305	0.79
90	100	0.114	0.35	0.014	0.87	0.100	0.81
100	110	0.506	0.35	0.140	0.87	0.367	0.73
120	120	0.231	0.35	0.079	0.87	0.153	0.69
130	130	0.143	0.35	0.050	0.87	0.093	0.69
140	140	0.273	0.35	0.021	0.87	0.252	0.83
150	150	0.176	0.35	0.088	0.87	0.088	0.61
160	160	0.220	0.35	0.020	0.87	0.200	0.82
180	190	0.047	0.35	0.007	0.87	0.040	0.79
190	200	0.595	0.35	0.109	0.87	0.487	0.78
200	220	0.700	0.35	0.700	0.87	0.000	0.35

1.8 HYDRAULIC EFFECTS OF PROJECT

The Federal Emergency Management Agency (FEMA) has not mapped any Special Flood Hazard Areas (SFHAs) through the project site. Nor has the County of San Diego mapped any flood plain or floodway through the project site. A pre-developed and post-developed 100-year flood inundation analyses has been done for the existing drainage channel at the project outlet of an existing 72-inch cmp the crosses underneath the Inland Rail Trail and NCTD railroad tracks using the “Hydrologic Engineering Centers River Analysis System” (HEC-RAS). The existing 36-inch cmp sump inlet not only collects runoff between the Inland Rail Trail and NCTD railroad tracks, but also acts as an emergency outlet to prevent the headwater at the entrance of the 72-inch cmp culvert from inundating or topping over the NCTD railroad tracks. The amount of flow entering the existing 36-inch cmp sump inlet is simulated using four (4) 12-inch cmp culverts using the culvert data editor in HEC-RAS. The four 12-inch cmp culverts have a similar rating curve (headwater depth-ft vs flow-cfs) when compared to the 36-inch cmp sump inlet. The four 12-inch cmp culverts were modeled conservatively, with the four 12-inch culverts accepting flow at the top of the Inland Rail Trail (438.0-feet). See comparison of four 12-inch cmp culverts and 36-inch cmp sump inlet rating curves in Chapter 5 of this report. For the purposes of this hydraulic analysis, the upstream limits begin at cross section 9+14.03, (downstream of an existing 48-inch x 36-inch CMP arch pipe at York Drive) and downstream limits end at cross section 1+71.95 (downstream of an existing 72-inch CMP crossing underneath the Inland Rail Trail and NCTD railroad tracks). Cross sections for both the pre-developed and post-developed conditions were generated by using the topography and proposed elevations shown on the preliminary grading plan. Disturbances to the shallow intermittent natural drainage swale has been minimized. The project is proposing to add fill onsite to raise the pad outside of the 100-year inundation limits in the post-developed condition. Comparison of the pre-developed and post-developed HEC-RAS 100-year flood inundation analyses and cross sections indicate there is no increase in water surface elevations and the limits of 100-year flood inundation lines in the easterly offsite areas are similar for both the pre-developed and post-developed conditions as delineated on the hydraulic exhibits. Comparison of the pre-developed and post-developed HEC-RAS 100-year flood inundation analyses indicate that the channel velocities in the post-developed condition modeled cross sections are similar to the pre-developed conditions and any differences are negligible. An average Manning’s roughness coefficient of 0.035 was used in both the pre-developed and post-developed HEC-RAS analyses. See Table 5 for comparison of HEC-RAS pre-developed and post-developed 100-year flood inundation cross sections.

TABLE 5 – Comparison of HEC-RAS Pre-Developed and Post-Developed 100-Year Flood Inundation Cross Sections

Cross Section No.	Q Total (cfs)	Pre-Developed Water Surface Elevation (ft)	Post-Developed Water Surface Elevation (ft)	Pre-Developed Velocity (ft/s)	Post-Developed Velocity (ft/s)
914.03	474.44	440.78	440.78	0.65	0.65
839.73	474.44	440.78	440.78	0.32	0.47
746.53	474.44	440.78	440.78	0.27	0.40
653.24	474.44	440.78	440.78	0.19	0.35
552.28	474.44	440.78	440.78	0.16	0.28
451.25	474.44	440.78	440.78	0.17	0.34
363.69	474.44	440.78	440.78	0.15	0.31
298.22	474.44	440.78	440.78	0.15	0.25
271.15	474.44	440.78	440.78	0.14	0.18
271.1	474.44	Culvert	Culvert		
185.28	474.44	431.49	431.49	3.29	3.29
171.95	474.44	431.60	431.60	0.76	0.76

1.9 CONCLUSIONS

Table 6 below summarizes the results of the pre-developed and post-developed condition drainage areas and resultant 100-year peak flow rates at POC-1 discharge locations from the project site. Please refer to the Pre-Developed and Post-Developed Hydrology Exhibits for drainage patterns and areas.

TABLE 6 - Summary Pre-Developed vs. Post-Developed Peak Flows

Condition	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Pre-Developed Condition	4.58	11.13
Post-Developed Condition	4.58	11.06
Difference	-0.01	-0.07

As shown in the table above, the rough grading of the 1822-1864 York Drive will result in a net decrease of 100-year peak flow discharged from the project site by approximately 0.07 cfs.

See Chapter 3 for a summary of the pre-developed and post developed condition drainage areas, time of concentration, and resultant peak flow rates for the 100-year storm frequency at the POC-1 discharge location.

Peak flow rates listed above were generated based on criteria set forth in “San Diego County Hydrology Manual” (methodology presented in Chapter 6 of this report). Rational method output is located in Chapter 3. HEC-HMS modeling results are located in Chapter 4. The hydraulic analysis shows that the proposed storm drain facilities can sufficiently convey the anticipated Q_{100} flowrate without any adverse effects. Based on this conclusion, runoff released from the proposed project site will be unlikely to cause any adverse impact to downstream water bodies or existing habitat integrity. Sediment will likely be reduced upon site development.

The development of the project will not increase the 100-year flood water surface elevations in the existing drainage channel between York Drive and the Inland Rail Trail/NCTD railroad tracks. Channel velocities in the existing drainage channel are similar in the pre-developed and post-developed conditions and any differences are negligible after development of the project.

This project is particularly effective at mitigating the potential impacts that development can have on stormwater runoff. It is our professional opinion that the recommendations provided in this report, and the drainage system as proposed effectively intercept, contain, convey, detain and treat the expected storm water runoff generated by this property to mimic pre-development conditions.

1.10 DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the Engineer of Work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for project design.



Bruce Rice

R.C.E. 60676 Expires 12/31/2026

3-25-25

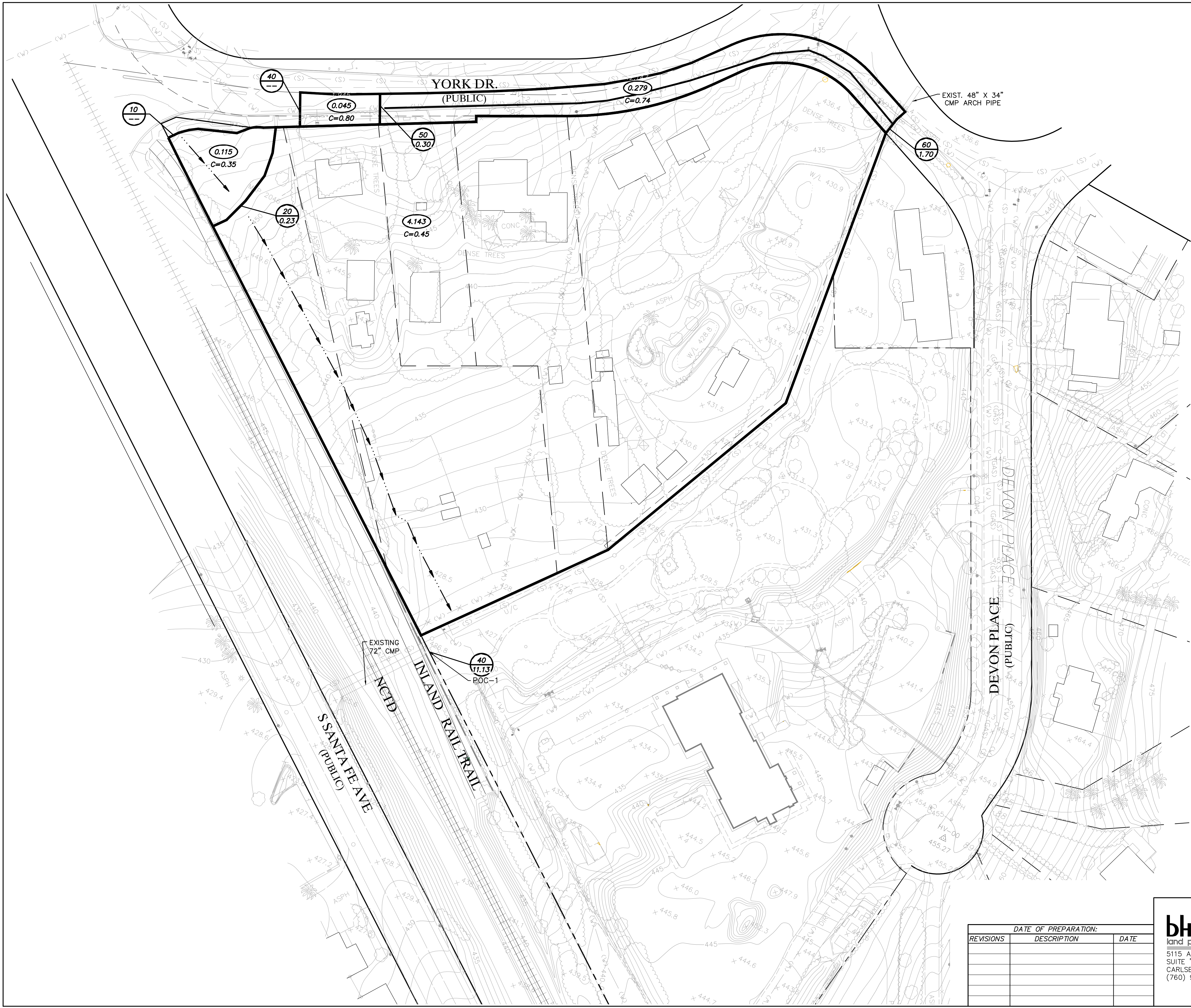
Date



CHAPTER 2

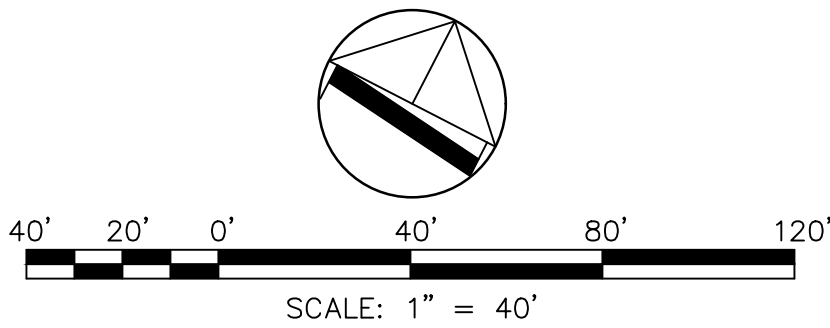
PRE-DEVELOPED AND POST-DEVELOPED

HYDROLOGY EXHIBITS



LEGEND

SURFACE NODE	40
SURFACE RUNOFF (CFS)	10.64
BASIN AREA (ACRES)	4.143
RUNOFF COEFFICIENT	C=0.45
POINT OF COMPLIANCE (POC)	POC-1
BASIN BOUNDARY/SUB-BOUNDARY	
PROJECT BOUNDARY	
FLOW DIRECTION	
EXISTING BROW DITCH	



DATE OF PREPARATION:		
REVISIONS	DESCRIPTION	DATE

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PRE-DEVELOPED HYDROLOGY EXHIBIT
1822-1864 YORK DRIVE
PDS2021-MUP-21-008, PDS2021-ER-21-08-008

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 1 OF 1

CHAPTER 3

CALCULATIONS

CHAPTER 3

CALCULATIONS

3.1 – Pre-Developed Condition Hydrology Calculations

100-YEAR STORM – PRE-DEVELOPED HYDROLOGY

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2014 Advanced Engineering Software (aes)
Ver. 21.0 Release Date: 06/01/2014 License ID 1459

Analysis prepared by:

BHA INC.
5115 AVENIDA ENCINAS, SUITE L
CARLSBAD, CA 92008

***** DESCRIPTION OF STUDY *****
* EXISTING HYDROLOGY *
* *
* *

FILE NAME: K:\HYDRO\1119\SDP\1119E1.DAT
TIME/DATE OF STUDY: 14:13 11/26/2021

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.200
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL
HALF- CROWN TO STREET-CROSSFALL: CURB GUTTER-GEOMETRIES: MANNING
WIDTH CROSSFALL IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR
NO. (FT) (FT) SIDE / SIDE/ WAY (FT) (FT) (FT) (FT) (n)
== =====
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0313 0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 10.00 TO NODE 20.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 455.00
DOWNSTREAM ELEVATION(FEET) = 451.50
ELEVATION DIFFERENCE(FEET) = 3.50
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 8.892

```

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.816
SUBAREA RUNOFF(CFS) = 0.23
TOTAL AREA(ACRES) = 0.12 TOTAL RUNOFF(CFS) = 0.23

*****
FLOW PROCESS FROM NODE 20.00 TO NODE 30.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 451.50 DOWNSTREAM(FEET) = 428.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 412.00 CHANNEL SLOPE = 0.0570
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 5.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 1.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.183
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.06
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.95
AVERAGE FLOW DEPTH(FEET) = 0.51 TRAVEL TIME(MIN.) = 1.74
Tc(MIN.) = 10.63
SUBAREA AREA(ACRES) = 4.14 SUBAREA RUNOFF(CFS) = 9.66
AREA-AVERAGE RUNOFF COEFFICIENT = 0.447
TOTAL AREA(ACRES) = 4.3 PEAK FLOW RATE(CFS) = 9.87

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.65 FLOW VELOCITY(FEET/SEC.) = 4.74
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 30.00 = 512.00 FEET.

*****
FLOW PROCESS FROM NODE 30.00 TO NODE 30.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 10.63
RAINFALL INTENSITY(INCH/HR) = 5.18
TOTAL STREAM AREA(ACRES) = 4.26
PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.87

*****
FLOW PROCESS FROM NODE 40.00 TO NODE 50.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 70.00
UPSTREAM ELEVATION(FEET) = 454.80
DOWNSTREAM ELEVATION(FEET) = 454.00
ELEVATION DIFFERENCE(FEET) = 0.80
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.321
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 0.30
TOTAL AREA(ACRES) = 0.05 TOTAL RUNOFF(CFS) = 0.30

*****
FLOW PROCESS FROM NODE 50.00 TO NODE 60.00 IS CODE = 61
-----

```

```

>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) = 454.00  DOWNSTREAM ELEVATION(FEET) = 436.00
STREET LENGTH(FEET) = 476.00  CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 15.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 1.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0140
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.03
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.21
HALFSTREET FLOOD WIDTH(FEET) = 4.28
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.42
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.73
STREET FLOW TRAVEL TIME(MIN.) = 2.32  Tc(MIN.) = 6.64
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.022
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7400
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.748
SUBAREA AREA(ACRES) = 0.28  SUBAREA RUNOFF(CFS) = 1.45
TOTAL AREA(ACRES) = 0.3  PEAK FLOW RATE(CFS) = 1.70

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.24  HALFSTREET FLOOD WIDTH(FEET) = 5.85
FLOW VELOCITY(FEET/SEC.) = 3.70  DEPTH*VELOCITY(FT*FT/SEC.) = 0.90
LONGEST FLOWPATH FROM NODE 40.00 TO NODE 60.00 = 546.00 FEET.

*****
FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 6.64
RAINFALL INTENSITY(INCH/HR) = 7.02
TOTAL STREAM AREA(ACRES) = 0.32
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.70

** CONFLUENCE DATA **
STREAM RUNOFF Tc INTENSITY AREA
NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE)
1 9.87 10.63 5.183 4.26
2 1.70 6.64 7.022 0.32

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM RUNOFF Tc INTENSITY
NUMBER (CFS) (MIN.) (INCH/HOUR)
1 7.87 6.64 7.022
2 11.13 10.63 5.183

```



```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      11.13   Tc(MIN.) =    10.63
TOTAL AREA(ACRES) =      4.6
LONGEST FLOWPATH FROM NODE    40.00 TO NODE    60.00 =    546.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =      4.6   TC(MIN.) =    10.63
PEAK FLOW RATE(CFS)   =      11.13
=====
=====
END OF RATIONAL METHOD ANALYSIS

```

CHAPTER 3

CALCULATIONS

3.2 – Post Developed Hydrology Calculations

100-YEAR STORM – POST DEVELOPED HYDROLOGY

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2014 Advanced Engineering Software (aes)
Ver. 21.0 Release Date: 06/01/2014 License ID 1459

Analysis prepared by:

BHA INC.
5115 AVENIDA ENCINAS, SUITE L
CARLSBAD, CA 92008

***** DESCRIPTION OF STUDY *****
* PROPOSED HYDROLOGY – UNDETAINED *
* *
* *

FILE NAME: K:\HYDRO\1119\SDP\1119P1.DAT
TIME/DATE OF STUDY: 14:49 11/26/2021

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.200
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 10.00 TO NODE 20.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 443.70
DOWNSTREAM ELEVATION(FEET) = 442.15
ELEVATION DIFFERENCE(FEET) = 1.55

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.990
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
 THE MAXIMUM OVERLAND FLOW LENGTH = 78.25
 (Reference: Table 3-1B of Hydrology Manual)
 THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) = 0.78
 TOTAL AREA(ACRES) = 0.11 TOTAL RUNOFF(CFS) = 0.78

 FLOW PROCESS FROM NODE 20.00 TO NODE 30.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION(FEET) =	442.15	DOWNSTREAM ELEVATION(FEET) =	440.81
STREET LENGTH(FEET) =	97.00	CURB HEIGHT(INCHES) =	6.0
STREET HALFWIDTH(FEET) =	24.00		

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 1.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.020
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0140
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.71
 STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
 STREET FLOW DEPTH(FEET) = 0.28
 HALFSTREET FLOOD WIDTH(FEET) = 7.59
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.47
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.69
 STREET FLOW TRAVEL TIME(MIN.) = 0.65 Tc(MIN.) = 4.64
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .7400
 S.C.S. CURVE NUMBER (AMC II) = 0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.759
 SUBAREA AREA(ACRES) = 0.30 SUBAREA RUNOFF(CFS) = 1.87
 TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 2.65

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.31 HALFSTREET FLOOD WIDTH(FEET) = 9.27
 FLOW VELOCITY(FEET/SEC.) = 2.71 DEPTH*VELOCITY(FT*FT/SEC.) = 0.85
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 30.00 = 197.00 FEET.

 FLOW PROCESS FROM NODE 30.00 TO NODE 40.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	436.81	DOWNSTREAM(FEET) =	435.96
FLOW LENGTH(FEET) =	84.53	MANNING'S N =	0.013
DEPTH OF FLOW IN	12.0 INCH PIPE IS	8.0 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	4.77		
GIVEN PIPE DIAMETER(INCH) =	12.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	2.65		
PIPE TRAVEL TIME(MIN.) =	0.30	Tc(MIN.) =	4.94
LONGEST FLOWPATH FROM NODE	10.00 TO NODE	40.00 =	281.53 FEET.

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*****
FLOW PROCESS FROM NODE      40.00 TO NODE      40.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7525
SUBAREA AREA(ACRES) = 0.12 SUBAREA RUNOFF(CFS) = 0.77
TOTAL AREA(ACRES) = 0.5 TOTAL RUNOFF(CFS) = 3.42
TC(MIN.) = 4.94

*****
FLOW PROCESS FROM NODE      40.00 TO NODE      50.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 435.46 DOWNSTREAM(FEET) = 434.17
FLOW LENGTH(FEET) = 128.91 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.11
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.42
PIPE TRAVEL TIME(MIN.) = 0.42 Tc(MIN.) = 5.36
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 50.00 = 410.44 FEET.

*****
FLOW PROCESS FROM NODE      50.00 TO NODE      50.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.061
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7520
SUBAREA AREA(ACRES) = 0.12 SUBAREA RUNOFF(CFS) = 0.76
TOTAL AREA(ACRES) = 0.7 TOTAL RUNOFF(CFS) = 4.03
TC(MIN.) = 5.36

*****
FLOW PROCESS FROM NODE      50.00 TO NODE      85.00 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 433.84 DOWNSTREAM(FEET) = 433.50
FLOW LENGTH(FEET) = 32.73 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.41
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 4.03
PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 5.46
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 85.00 = 443.17 FEET.

*****
FLOW PROCESS FROM NODE      60.00 TO NODE      60.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

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=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.965
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7695
SUBAREA AREA(ACRES) = 0.38 SUBAREA RUNOFF(CFS) = 2.42
TOTAL AREA(ACRES) = 1.0 TOTAL RUNOFF(CFS) = 6.39
TC(MIN.) = 5.46

*****
FLOW PROCESS FROM NODE 70.00 TO NODE 70.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.965
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7750
SUBAREA AREA(ACRES) = 0.17 SUBAREA RUNOFF(CFS) = 1.07
TOTAL AREA(ACRES) = 1.2 TOTAL RUNOFF(CFS) = 7.46
TC(MIN.) = 5.46

*****
FLOW PROCESS FROM NODE 80.00 TO NODE 80.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.965
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7900
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7785
SUBAREA AREA(ACRES) = 0.36 SUBAREA RUNOFF(CFS) = 2.27
TOTAL AREA(ACRES) = 1.6 TOTAL RUNOFF(CFS) = 9.73
TC(MIN.) = 5.46

+-----+
| 72-INCH CMP STORMWATER SYSTEM |
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*****
FLOW PROCESS FROM NODE 85.00 TO NODE 85.00 IS CODE = 10
-----
>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<
=====

*****
FLOW PROCESS FROM NODE 90.00 TO NODE 100.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 443.70
DOWNSTREAM ELEVATION(FEET) = 442.10
ELEVATION DIFFERENCE(FEET) = 1.60
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.967
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN

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      THE MAXIMUM OVERLAND FLOW LENGTH =      79.00
      (Reference: Table 3-1B of Hydrology Manual)
      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.431
    NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
    SUBAREA RUNOFF(CFS) =      0.78
    TOTAL AREA(ACRES) =      0.11    TOTAL RUNOFF(CFS) =      0.78

*****
FLOW PROCESS FROM NODE      100.00 TO NODE      110.00 IS CODE =   61
-----
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STANDARD CURB SECTION USED)<<<<<
=====
UPSTREAM ELEVATION(FEET) =  442.10  DOWNSTREAM ELEVATION(FEET) =  440.46
STREET LENGTH(FEET) =    147.00    CURB HEIGHT(INCHES) =    6.0
STREET HALFWIDTH(FEET) =    24.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =    1.00
INSIDE STREET CROSSFALL(DECIMAL) =    0.020
OUTSIDE STREET CROSSFALL(DECIMAL) =    0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =    1
STREET PARKWAY CROSSFALL(DECIMAL) =    0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) =    0.0140
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =    0.0200

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.34
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =    0.31
  HALFSTREET FLOOD WIDTH(FEET) =    9.18
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.43
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
  STREET FLOW TRAVEL TIME(MIN.) =    1.01    Tc(MIN.) =    4.98
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.431
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =    0
  AREA-AVERAGE RUNOFF COEFFICIENT =    0.745
  SUBAREA AREA(ACRES) =    0.51    SUBAREA RUNOFF(CFS) =    3.11
  TOTAL AREA(ACRES) =    0.6    PEAK FLOW RATE(CFS) =    3.89

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.36    HALFSTREET FLOOD WIDTH(FEET) =  11.45
FLOW VELOCITY(FEET/SEC.) =  2.72    DEPTH*VELOCITY(FT*FT/SEC.) =    0.97
LONGEST FLOWPATH FROM NODE      90.00 TO NODE      110.00 =    247.00 FEET.

*****
FLOW PROCESS FROM NODE      110.00 TO NODE      170.00 IS CODE =   41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  436.46  DOWNSTREAM(FEET) =  433.50
FLOW LENGTH(FEET) =    94.70    MANNING'S N =    0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS    7.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    8.10
GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =    3.89
PIPE TRAVEL TIME(MIN.) =    0.19    Tc(MIN.) =    5.17
LONGEST FLOWPATH FROM NODE      90.00 TO NODE      170.00 =    341.70 FEET.

*****

```

```

FLOW PROCESS FROM NODE      120.00 TO NODE      120.00 IS CODE =   81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6900
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7299
SUBAREA AREA(ACRES) =    0.23   SUBAREA RUNOFF(CFS) =    1.32
TOTAL AREA(ACRES) =    0.9     TOTAL RUNOFF(CFS) =    5.12
TC(MIN.) =    5.17

*****
FLOW PROCESS FROM NODE      130.00 TO NODE      130.00 IS CODE =   81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6900
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7241
SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.81
TOTAL AREA(ACRES) =    1.0     TOTAL RUNOFF(CFS) =    5.94
TC(MIN.) =    5.17

*****
FLOW PROCESS FROM NODE      140.00 TO NODE      140.00 IS CODE =   81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8300
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7469
SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    1.87
TOTAL AREA(ACRES) =    1.3     TOTAL RUNOFF(CFS) =    7.81
TC(MIN.) =    5.17

*****
FLOW PROCESS FROM NODE      150.00 TO NODE      150.00 IS CODE =   81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6100
S.C.S. CURVE NUMBER (AMC II) =    0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7302
SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.89
TOTAL AREA(ACRES) =    1.4     TOTAL RUNOFF(CFS) =    8.69
TC(MIN.) =    5.17

*****
FLOW PROCESS FROM NODE      160.00 TO NODE      160.00 IS CODE =   81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8200
S.C.S. CURVE NUMBER (AMC II) =    0

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AREA-AVERAGE RUNOFF COEFFICIENT = 0.7421
 SUBAREA AREA (ACRES) = 0.22 SUBAREA RUNOFF (CFS) = 1.49
 TOTAL AREA (ACRES) = 1.7 TOTAL RUNOFF (CFS) = 10.18
 TC (MIN.) = 5.17

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+-----+
| 72-INCH CMP STORMWATER SYSTEM |
|                                 |
|                                 |
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FLOW PROCESS FROM NODE 85.00 TO NODE 85.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<

=====

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	10.18	5.17	8.251	1.66

LONGEST FLOWPATH FROM NODE 90.00 TO NODE 85.00 = 341.70 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	9.73	5.46	7.965	1.57

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 85.00 = 443.17 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	19.40	5.17	8.251
2	19.56	5.46	7.965

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 19.56 Tc (MIN.) = 5.46
 TOTAL AREA (ACRES) = 3.2

FLOW PROCESS FROM NODE 85.00 TO NODE 85.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<

=====

FLOW PROCESS FROM NODE 176.00 TO NODE 177.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM (FEET) = 429.00 DOWNSTREAM (FEET) = 428.20
 FLOW LENGTH (FEET) = 34.74 MANNING'S N = 0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY (FEET/SEC.) = 11.07
 PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
 GIVEN PIPE DIAMETER (INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW (CFS) = 19.56
 PIPE TRAVEL TIME (MIN.) = 0.05 Tc (MIN.) = 5.51
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 177.00 = 477.91 FEET.

FLOW PROCESS FROM NODE 177.00 TO NODE 177.00 IS CODE = 1

=====

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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 5.51
RAINFALL INTENSITY(INCH/HR) = 7.92
TOTAL STREAM AREA(ACRES) = 3.23
PEAK FLOW RATE(CFS) AT CONFLUENCE = 19.56

*****
FLOW PROCESS FROM NODE 180.00 TO NODE 190.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7900
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 70.00
UPSTREAM ELEVATION(FEET) = 454.80
DOWNSTREAM ELEVATION(FEET) = 454.00
ELEVATION DIFFERENCE(FEET) = 0.80
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 4.465
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 0.31
TOTAL AREA(ACRES) = 0.05 TOTAL RUNOFF(CFS) = 0.31

*****
FLOW PROCESS FROM NODE 190.00 TO NODE 200.00 IS CODE = 61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 454.00 DOWNSTREAM ELEVATION(FEET) = 436.00
STREET LENGTH(FEET) = 476.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 1.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0140
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.96
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.25
HALFSTREET FLOOD WIDTH(FEET) = 6.32
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.80
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.96
STREET FLOW TRAVEL TIME(MIN.) = 2.09 Tc(MIN.) = 6.56
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.080
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7800
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.781
SUBAREA AREA(ACRES) = 0.60 SUBAREA RUNOFF(CFS) = 3.29
TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 3.55

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.30 HALFSTREET FLOOD WIDTH(FEET) = 8.44
FLOW VELOCITY(FEET/SEC.) = 4.27 DEPTH*VELOCITY(FT*FT/SEC.) = 1.26

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LONGEST FLOWPATH FROM NODE      180.00 TO NODE      200.00 =      546.00 FEET.

*****
FLOW PROCESS FROM NODE      200.00 TO NODE      210.00 IS CODE =   51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    436.00  DOWNSTREAM(FEET) =    428.50
CHANNEL LENGTH THRU SUBAREA(FEET) =    650.00  CHANNEL SLOPE =    0.0115
CHANNEL BASE(FEET) =    10.00  "Z" FACTOR =    2.000
MANNING'S FACTOR = 0.035  MAXIMUM DEPTH(FEET) =    5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    4.557
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =          4.13
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    1.69
AVERAGE FLOW DEPTH(FEET) =    0.23  TRAVEL TIME(MIN.) =    6.42
Tc(MIN.) =    12.98
SUBAREA AREA(ACRES) =          0.70  SUBAREA RUNOFF(CFS) =    1.12
AREA-AVERAGE RUNOFF COEFFICIENT =    0.556
TOTAL AREA(ACRES) =          1.3  PEAK FLOW RATE(CFS) =          3.55

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =    0.22  FLOW VELOCITY(FEET/SEC.) =    1.57
LONGEST FLOWPATH FROM NODE      180.00 TO NODE      210.00 =    1196.00 FEET.

*****
FLOW PROCESS FROM NODE      210.00 TO NODE      210.00 IS CODE =    1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS =    2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    12.98
RAINFALL INTENSITY(INCH/HR) =    4.56
TOTAL STREAM AREA(ACRES) =    1.34
PEAK FLOW RATE(CFS) AT CONFLUENCE =          3.55

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)      (ACRE)
  1          19.56      5.51          7.916          3.23
  2           3.55     12.98          4.557          1.34

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)      (INCH/HOUR)
  1          21.07      5.51          7.916
  2          14.81     12.98          4.557

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =          21.07  Tc(MIN.) =    5.51
TOTAL AREA(ACRES) =          4.6
LONGEST FLOWPATH FROM NODE      180.00 TO NODE      210.00 =    1196.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) =          4.6  TC(MIN.) =    5.51
PEAK FLOW RATE(CFS) =          21.07

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=====
END OF RATIONAL METHOD ANALYSIS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2014 Advanced Engineering Software (aes)
Ver. 21.0 Release Date: 06/01/2014 License ID 1459

Analysis prepared by:

BHA INC.
5115 AVENIDA ENCINAS, SUITE L
CARLSBAD, CA 92008

***** DESCRIPTION OF STUDY *****
* PROPOSED HYDROLOGY - DETAINED *
* *
* *

FILE NAME: K:\HYDRO\1119\SDP\1119P1D.DAT
TIME/DATE OF STUDY: 16:21 11/26/2021

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.200
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313 0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 10.00 TO NODE 20.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====

*USER SPECIFIED (SUBAREA) :
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 443.70
DOWNSTREAM ELEVATION(FEET) = 442.15
ELEVATION DIFFERENCE(FEET) = 1.55
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.990
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 78.25

(Reference: Table 3-1B of Hydrology Manual)
 THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) = 0.78
 TOTAL AREA(ACRES) = 0.11 TOTAL RUNOFF(CFS) = 0.78

```
*****
FLOW PROCESS FROM NODE      20.00 TO NODE      30.00 IS CODE =  61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 442.15  DOWNSTREAM ELEVATION(FEET) = 440.81
STREET LENGTH(FEET) = 97.00  CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 24.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 1.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0140
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.71
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.28
HALFSTREET FLOOD WIDTH(FEET) = 7.59
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.47
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.69
STREET FLOW TRAVEL TIME(MIN.) = 0.65  Tc(MIN.) = 4.64
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7400
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.759
SUBAREA AREA(ACRES) = 0.30  SUBAREA RUNOFF(CFS) = 1.87
TOTAL AREA(ACRES) = 0.4  PEAK FLOW RATE(CFS) = 2.65

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.31  HALFSTREET FLOOD WIDTH(FEET) = 9.27
FLOW VELOCITY(FEET/SEC.) = 2.71  DEPTH*VELOCITY(FT*FT/SEC.) = 0.85
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 30.00 = 197.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      30.00 TO NODE      40.00 IS CODE =  41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 436.81  DOWNSTREAM(FEET) = 435.96
FLOW LENGTH(FEET) = 84.53  MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.77
GIVEN PIPE DIAMETER(INCH) = 12.00  NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.65
PIPE TRAVEL TIME(MIN.) = 0.30  Tc(MIN.) = 4.94
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 40.00 = 281.53 FEET.
```

```
*****
FLOW PROCESS FROM NODE      40.00 TO NODE      40.00 IS CODE =  81
```

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-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7525
SUBAREA AREA(ACRES) = 0.12 SUBAREA RUNOFF(CFS) = 0.77
TOTAL AREA(ACRES) = 0.5 TOTAL RUNOFF(CFS) = 3.42
TC(MIN.) = 4.94

*****
FLOW PROCESS FROM NODE 40.00 TO NODE 50.00 IS CODE = 41
-----

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 435.46 DOWNSTREAM(FEET) = 434.17
FLOW LENGTH(FEET) = 128.91 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.11
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.42
PIPE TRAVEL TIME(MIN.) = 0.42 Tc(MIN.) = 5.36
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 50.00 = 410.44 FEET.

*****
FLOW PROCESS FROM NODE 50.00 TO NODE 50.00 IS CODE = 81
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.061
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7500
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7520
SUBAREA AREA(ACRES) = 0.12 SUBAREA RUNOFF(CFS) = 0.76
TOTAL AREA(ACRES) = 0.7 TOTAL RUNOFF(CFS) = 4.03
TC(MIN.) = 5.36

*****
FLOW PROCESS FROM NODE 50.00 TO NODE 85.00 IS CODE = 41
-----

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 433.84 DOWNSTREAM(FEET) = 433.50
FLOW LENGTH(FEET) = 32.73 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 7.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.41
GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 4.03
PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 5.46
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 85.00 = 443.17 FEET.

*****
FLOW PROCESS FROM NODE 60.00 TO NODE 60.00 IS CODE = 81
-----

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.965
*USER SPECIFIED(SUBAREA):

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USER-SPECIFIED RUNOFF COEFFICIENT = .8000
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7695
SUBAREA AREA(ACRES) = 0.38 SUBAREA RUNOFF(CFS) = 2.42
TOTAL AREA(ACRES) = 1.0 TOTAL RUNOFF(CFS) = 6.39
TC(MIN.) = 5.46

FLOW PROCESS FROM NODE 70.00 TO NODE 70.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.965
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7750
SUBAREA AREA(ACRES) = 0.17 SUBAREA RUNOFF(CFS) = 1.07
TOTAL AREA(ACRES) = 1.2 TOTAL RUNOFF(CFS) = 7.46
TC(MIN.) = 5.46

FLOW PROCESS FROM NODE 80.00 TO NODE 80.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.965
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7900
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7785
SUBAREA AREA(ACRES) = 0.36 SUBAREA RUNOFF(CFS) = 2.27
TOTAL AREA(ACRES) = 1.6 TOTAL RUNOFF(CFS) = 9.73
TC(MIN.) = 5.46

+-----+
| 72-INCH CMP STORMWATER SYSTEM |
| |
| |
+-----+

FLOW PROCESS FROM NODE 85.00 TO NODE 85.00 IS CODE = 10

>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<
=====

FLOW PROCESS FROM NODE 90.00 TO NODE 100.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====

*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8100
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 443.70
DOWNSTREAM ELEVATION(FEET) = 442.10
ELEVATION DIFFERENCE(FEET) = 1.60
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 3.967
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 79.00
(Reference: Table 3-1B of Hydrology Manual)
THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!

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100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) = 0.78
TOTAL AREA(ACRES) = 0.11 TOTAL RUNOFF(CFS) = 0.78

FLOW PROCESS FROM NODE 100.00 TO NODE 110.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>(STANDARD CURB SECTION USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) = 442.10 DOWNSTREAM ELEVATION(FEET) = 440.46
STREET LENGTH(FEET) = 147.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 24.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 1.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0140
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.34
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.31
HALFSTREET FLOOD WIDTH(FEET) = 9.18
AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.43
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.75
STREET FLOW TRAVEL TIME(MIN.) = 1.01 Tc(MIN.) = 4.98
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.745
SUBAREA AREA(ACRES) = 0.51 SUBAREA RUNOFF(CFS) = 3.11
TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 3.89

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.36 HALFSTREET FLOOD WIDTH(FEET) = 11.45
FLOW VELOCITY(FEET/SEC.) = 2.72 DEPTH*VELOCITY(FT*FT/SEC.) = 0.97
LONGEST FLOWPATH FROM NODE 90.00 TO NODE 110.00 = 247.00 FEET.

FLOW PROCESS FROM NODE 110.00 TO NODE 170.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 436.46 DOWNSTREAM(FEET) = 433.50
FLOW LENGTH(FEET) = 94.70 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.10
GIVEN PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.89
PIPE TRAVEL TIME(MIN.) = 0.19 Tc(MIN.) = 5.17
LONGEST FLOWPATH FROM NODE 90.00 TO NODE 170.00 = 341.70 FEET.

FLOW PROCESS FROM NODE 120.00 TO NODE 120.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6900
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7299
SUBAREA AREA(ACRES) = 0.23 SUBAREA RUNOFF(CFS) = 1.32
TOTAL AREA(ACRES) = 0.9 TOTAL RUNOFF(CFS) = 5.12
TC(MIN.) = 5.17

*****
FLOW PROCESS FROM NODE 130.00 TO NODE 130.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6900
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7241
SUBAREA AREA(ACRES) = 0.14 SUBAREA RUNOFF(CFS) = 0.81
TOTAL AREA(ACRES) = 1.0 TOTAL RUNOFF(CFS) = 5.94
TC(MIN.) = 5.17

*****
FLOW PROCESS FROM NODE 140.00 TO NODE 140.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8300
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7469
SUBAREA AREA(ACRES) = 0.27 SUBAREA RUNOFF(CFS) = 1.87
TOTAL AREA(ACRES) = 1.3 TOTAL RUNOFF(CFS) = 7.81
TC(MIN.) = 5.17

*****
FLOW PROCESS FROM NODE 150.00 TO NODE 150.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .6100
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7302
SUBAREA AREA(ACRES) = 0.18 SUBAREA RUNOFF(CFS) = 0.89
TOTAL AREA(ACRES) = 1.4 TOTAL RUNOFF(CFS) = 8.69
TC(MIN.) = 5.17

*****
FLOW PROCESS FROM NODE 160.00 TO NODE 160.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 8.251
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .8200
S.C.S. CURVE NUMBER (AMC II) = 0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.7421
SUBAREA AREA(ACRES) = 0.22 SUBAREA RUNOFF(CFS) = 1.49
TOTAL AREA(ACRES) = 1.7 TOTAL RUNOFF(CFS) = 10.18

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TC(MIN.) = 5.17

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+-----+
| 72-INCH CMP STORMWATER SYSTEM |
|                                 |
+-----+
```

FLOW PROCESS FROM NODE 85.00 TO NODE 85.00 IS CODE = 11

>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<

=====

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	10.18	5.17	8.251	1.66

LONGEST FLOWPATH FROM NODE 90.00 TO NODE 85.00 = 341.70 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	9.73	5.46	7.965	1.57

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 85.00 = 443.17 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	19.40	5.17	8.251
2	19.56	5.46	7.965

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 19.56 Tc(MIN.) = 5.46

TOTAL AREA(ACRES) = 3.2

FLOW PROCESS FROM NODE 85.00 TO NODE 85.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

=====

FLOW PROCESS FROM NODE 85.00 TO NODE 85.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<

=====

USER-SPECIFIED VALUES ARE AS FOLLOWS:

TC(MIN) = 10.00 RAIN INTENSITY(INCH/HOUR) = 5.39

TOTAL AREA(ACRES) = 3.23 TOTAL RUNOFF(CFS) = 8.31

FLOW PROCESS FROM NODE 176.00 TO NODE 177.00 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) = 429.00 DOWNSTREAM(Feet) = 428.20

FLOW LENGTH(Feet) = 34.74 MANNING'S N = 0.013

DEPTH OF FLOW IN 18.0 INCH PIPE IS 9.5 INCHES

PIPE-FLOW VELOCITY(Feet/Sec.) = 8.76

GIVEN PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 8.31

PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 10.07

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LONGEST FLOWPATH FROM NODE      10.00 TO NODE      177.00 =      477.91 FEET.

*****
FLOW PROCESS FROM NODE      177.00 TO NODE      177.00 IS CODE =      1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS =      2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =      10.07
RAINFALL INTENSITY(INCH/HR) =      5.37
TOTAL STREAM AREA(ACRES) =      3.23
PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.31

*****
FLOW PROCESS FROM NODE      180.00 TO NODE      190.00 IS CODE =      21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7900
S.C.S. CURVE NUMBER (AMC II) =      0
INITIAL SUBAREA FLOW-LENGTH(FEET) =      70.00
UPSTREAM ELEVATION(FEET) =      454.80
DOWNSTREAM ELEVATION(FEET) =      454.00
ELEVATION DIFFERENCE(FEET) =      0.80
SUBAREA OVERLAND TIME OF FLOW(MIN.) =      4.465
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =      8.431
NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
SUBAREA RUNOFF(CFS) =      0.31
TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.31

*****
FLOW PROCESS FROM NODE      190.00 TO NODE      200.00 IS CODE =      61
-----
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>(STANDARD CURB SECTION USED)<<<<
=====
UPSTREAM ELEVATION(FEET) = 454.00   DOWNSTREAM ELEVATION(FEET) = 436.00
STREET LENGTH(FEET) = 476.00   CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 1.00
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0140
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.96
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.25
HALFSTREET FLOOD WIDTH(FEET) = 6.32
AVERAGE FLOW VELOCITY(FEET/SEC.) = 3.80
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.96
STREET FLOW TRAVEL TIME(MIN.) = 2.09   Tc(MIN.) = 6.56
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.080
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .7800
S.C.S. CURVE NUMBER (AMC II) =      0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.781
SUBAREA AREA(ACRES) = 0.60   SUBAREA RUNOFF(CFS) = 3.29

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TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 3.55

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.30 HALFSTREET FLOOD WIDTH(FEET) = 8.44
FLOW VELOCITY(FEET/SEC.) = 4.27 DEPTH*VELOCITY(FT*FT/SEC.) = 1.26
LONGEST FLOWPATH FROM NODE 180.00 TO NODE 200.00 = 546.00 FEET.

FLOW PROCESS FROM NODE 200.00 TO NODE 210.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 436.00 DOWNSTREAM(FEET) = 428.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 650.00 CHANNEL SLOPE = 0.0115
CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 5.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.557
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .3500
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.13
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.69
AVERAGE FLOW DEPTH(FEET) = 0.23 TRAVEL TIME(MIN.) = 6.42
Tc(MIN.) = 12.98
SUBAREA AREA(ACRES) = 0.70 SUBAREA RUNOFF(CFS) = 1.12
AREA-AVERAGE RUNOFF COEFFICIENT = 0.556
TOTAL AREA(ACRES) = 1.3 PEAK FLOW RATE(CFS) = 3.55

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.22 FLOW VELOCITY(FEET/SEC.) = 1.57
LONGEST FLOWPATH FROM NODE 180.00 TO NODE 210.00 = 1196.00 FEET.

FLOW PROCESS FROM NODE 210.00 TO NODE 210.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 12.98
RAINFALL INTENSITY(INCH/HR) = 4.56
TOTAL STREAM AREA(ACRES) = 1.34
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.55

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	8.31	10.07	5.369	3.23
2	3.55	12.98	4.557	1.34

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	11.06	10.07	5.369
2	10.60	12.98	4.557

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 11.06 Tc(MIN.) = 10.07
TOTAL AREA(ACRES) = 4.6

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LONGEST FLOWPATH FROM NODE 180.00 TO NODE 210.00 = 1196.00 FEET.

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 4.6 TC (MIN.) = 10.07

PEAK FLOW RATE (CFS) = 11.06

=====

=====

END OF RATIONAL METHOD ANALYSIS

CHAPTER 3

CALCULATIONS

3.3 –Rip Rap Energy Dissipater Calculations

Node	BMP No.	Description	Pipe Size (in)	Q ₁₀₀ (cfs)	V ₁₀₀ (fps)	Rock Class (min)	T (min)	Width	Length
177	1	Rip Rap Dissipater ¹	18	8.31	8.7	No. 2 Backing	1.1 ft	6	10

Notes: 1. Rip Rap Energy Dissipater based on San Diego Regional Drawing D-40

CHAPTER 4

MODIFIED-PULS DETENTION ROUTING (HEC-HMS)

CHAPTER 4

MODIFIED-PULS DETENTION ROUTING (HEC-HMS)

4.1 – Rational Method Hydrographs

$Q_{100\text{yr}} = 19.56 \text{ cfs}$
 $T_c = 6 \text{ min}$
 $P_{6100\text{yr}} = 3.2 \text{ in}$
 $C = 0.76$
 $A = 3.233$
 $I = 7.44 * P_6 * D^{-0.645}$
 $VOL = I * D / 60$
 $\Delta VOL = V_1 - V_0$
 $I(\text{incr}) = \Delta VOL / T$
 $Q = CIA$
 $VOL = C * P_6 * A$

N	D (min)	I (in/hr)	VOL in	Δ VOL (in)	I (incr) (in\hr)	Q (cfs)	VOL (cf)	(Re-Ordered) Ordinate Sum =
0	0	0	0	0.75	7.50	19.5600	7042	0.0000
1	6	7.50	0.75	0.21	2.09	5.1383	1850	0.4687
2	12	4.79	0.96	0.15	1.48	3.6468	1313	0.4739
3	18	3.69	1.11	0.12	1.19	2.9250	1053	0.4846
4	24	3.07	1.23	0.10	1.01	2.4837	894	0.4902
5	30	2.65	1.33	0.09	0.89	2.1805	785	0.5020
6	36	2.36	1.42	0.08	0.80	1.9570	705	0.5081
7	42	2.14	1.50	0.07	0.73	1.7840	642	0.5210
8	48	1.96	1.57	0.07	0.67	1.6453	592	0.5278
9	54	1.82	1.64	0.06	0.62	1.5312	551	0.5420
10	60	1.70	1.70	0.06	0.58	1.4354	517	0.5495
11	66	1.60	1.76	0.06	0.55	1.3535	487	0.5653
12	72	1.51	1.81	0.05	0.52	1.2826	462	0.5737
13	78	1.43	1.86	0.05	0.50	1.2204	439	0.5913
14	84	1.37	1.91	0.05	0.47	1.1654	420	0.6007
15	90	1.31	1.96	0.05	0.45	1.1163	402	0.6207
16	96	1.25	2.01	0.04	0.44	1.0722	386	0.6313
17	102	1.21	2.05	0.04	0.42	1.0322	372	0.6540
18	108	1.16	2.09	0.04	0.41	0.9958	359	0.6662
19	114	1.12	2.13	0.04	0.39	0.9626	347	0.6923
20	120	1.09	2.17	0.04	0.38	0.9320	336	0.7064
21	126	1.05	2.21	0.04	0.37	0.9038	325	0.7370
22	132	1.02	2.25	0.04	0.36	0.8777	316	0.7535
23	138	0.99	2.28	0.03	0.35	0.8534	307	0.7898
24	144	0.97	2.32	0.03	0.34	0.8308	299	0.8096
25	150	0.94	2.35	0.03	0.33	0.8096	291	0.8534
26	156	0.92	2.38	0.03	0.32	0.7898	284	0.8777

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27	162	0.89	2.42	0.03	0.31	0.7711	278	0.9320
28	168	0.87	2.45	0.03	0.31	0.7535	271	0.9626
29	174	0.85	2.48	0.03	0.30	0.7370	265	1.0322
30	180	0.84	2.51	0.03	0.29	0.7213	260	1.0722
31	186	0.82	2.54	0.03	0.29	0.7064	254	1.1654
32	192	0.80	2.57	0.03	0.28	0.6923	249	1.2204
33	198	0.79	2.59	0.03	0.28	0.6789	244	1.3535
34	204	0.77	2.62	0.03	0.27	0.6662	240	1.4354
35	210	0.76	2.65	0.03	0.27	0.6540	235	1.6453
36	216	0.74	2.67	0.03	0.26	0.6424	231	1.7840
37	222	0.73	2.70	0.03	0.26	0.6313	227	2.1805
38	228	0.72	2.73	0.03	0.25	0.6207	223	2.4837
39	234	0.71	2.75	0.02	0.25	0.6105	220	3.6468
40	240	0.69	2.78	0.02	0.24	0.6007	216	5.1383
41	246	0.68	2.80	0.02	0.24	0.5913	213	19.5600
42	252	0.67	2.83	0.02	0.24	0.5823	210	2.9250
43	258	0.66	2.85	0.02	0.23	0.5737	207	1.9570
44	264	0.65	2.87	0.02	0.23	0.5653	204	1.5312
45	270	0.64	2.90	0.02	0.23	0.5573	201	1.2826
46	276	0.63	2.92	0.02	0.22	0.5495	198	1.1163
47	282	0.63	2.94	0.02	0.22	0.5420	195	0.9958
48	288	0.62	2.96	0.02	0.22	0.5348	193	0.9038
49	294	0.61	2.98	0.02	0.21	0.5278	190	0.8308
50	300	0.60	3.01	0.02	0.21	0.5210	188	0.7711
51	306	0.59	3.03	0.02	0.21	0.5145	185	0.7213
52	312	0.59	3.05	0.02	0.21	0.5081	183	0.6789
53	318	0.58	3.07	0.02	0.20	0.5020	181	0.6424
54	324	0.57	3.09	0.02	0.20	0.4960	179	0.6105
55	330	0.57	3.11	0.02	0.20	0.4902	176	0.5823
56	336	0.56	3.13	0.02	0.20	0.4846	174	0.5573
57	342	0.55	3.15	0.02	0.20	0.4792	172	0.5348
58	348	0.55	3.17	0.02	0.19	0.4739	171	0.5145
59	354	0.54	3.19	0.02	0.19	0.4687	169	0.4960
60	360	0.53	3.21	0.00	0.00	0.0000	0	0.0000

CHAPTER 4

MODIFIED-PULS DETENTION ROUTING (HEC-HMS)

4.2 – Stage-Storage & Stage-Discharge Relationships

Outlet Structure for Discharge of BMP 1
Discharge vs. Elevation Table

<u>Lower Slot</u>		<u>Emergency Slot</u>	
No. of slots:	1	No. of slots:	1
Invert:	0.000 ft	Invert:	2.000 ft
B (width):	1.833 ft	B (width):	1.750 ft
Area:	0.458 sf	Area:	1.750 sf
h _{slot} (height):	0.250 ft	h _{slot} (height):	1.000 ft
Cg-low:	0.62	Cg-low:	0.62
<u>Middle Slot</u>		<u>Upper slot</u>	
No. of slots:	1	No. of slots:	1
Invert:	0.750 ft	Invert:	1.500 ft
B (width):	1.333 ft	B (width):	0.250 ft
Area:	0.333 sf	Area:	0.146 sf
h _{slot} (height):	0.250 ft	h _{slot} (height):	0.583 ft
Cg-low:	0.62	Cg-low:	0.62

HMP Elevation-Storage-Discharge							
Flow Depth (ft)	Adj. Flow Depth (ft)	HMP Vol (acre-ft)	Q _{Lower Slot} (cfs)	Q _{Middle Slot} (cfs)	Q _{Upper-Slot} (cfs)	Q _{emerg Slot} (cfs)	Q _{tot} (cfs)
0.000	0.000	0.00000	0.000	0.000	0.000	0.000	0.067
0.083	0.000	0.00145	0.000	0.000	0.000	0.000	0.067
0.167	0.000	0.00410	0.000	0.000	0.000	0.000	0.067
0.250	0.000	0.00750	0.000	0.000	0.000	0.000	0.067
0.333	0.000	0.01149	0.000	0.000	0.000	0.000	0.067
0.417	0.000	0.01599	0.000	0.000	0.000	0.000	0.067
0.500	0.000	0.02093	0.000	0.000	0.000	0.000	0.067
0.583	0.000	0.02625	0.000	0.000	0.000	0.000	0.067
0.667	0.000	0.03193	0.000	0.000	0.000	0.000	0.067
0.750	0.000	0.03793	0.000	0.000	0.000	0.000	0.067
0.833	0.000	0.04422	0.000	0.000	0.000	0.000	0.067
0.917	0.000	0.05079	0.000	0.000	0.000	0.000	0.067
1.000	0.000	0.05760	0.000	0.000	0.000	0.000	0.067
1.083	0.000	0.06464	0.000	0.000	0.000	0.000	0.067
1.167	0.000	0.07190	0.000	0.000	0.000	0.000	0.067
1.250	0.000	0.07935	0.000	0.000	0.000	0.000	0.067
1.333	0.000	0.08700	0.000	0.000	0.000	0.000	0.067
1.417	0.000	0.09481	0.000	0.000	0.000	0.000	0.067
1.500	0.000	0.10279	0.000	0.000	0.000	0.000	0.067
1.583	0.000	0.11091	0.000	0.000	0.000	0.000	0.067
1.667	0.000	0.11917	0.000	0.000	0.000	0.000	0.067
1.750	0.000	0.12757	0.000	0.000	0.000	0.000	0.067
1.833	0.000	0.13608	0.000	0.000	0.000	0.000	0.067
1.917	0.000	0.14469	0.000	0.000	0.000	0.000	0.067
2.000	0.000	0.15341	0.000	0.000	0.000	0.000	0.067
2.083	0.000	0.16222	0.000	0.000	0.000	0.000	0.067
2.167	0.000	0.17112	0.000	0.000	0.000	0.000	0.067
2.250	0.000	0.18008	0.000	0.000	0.000	0.000	0.067
2.333	0.000	0.18912	0.000	0.000	0.000	0.000	0.067
2.417	0.000	0.19821	0.000	0.000	0.000	0.000	0.067
2.500	0.000	0.20736	0.000	0.000	0.000	0.000	0.067
2.583	0.000	0.21654	0.000	0.000	0.000	0.000	0.067
2.667	0.000	0.22577	0.000	0.000	0.000	0.000	0.067
2.750	0.000	0.23502	0.000	0.000	0.000	0.000	0.067

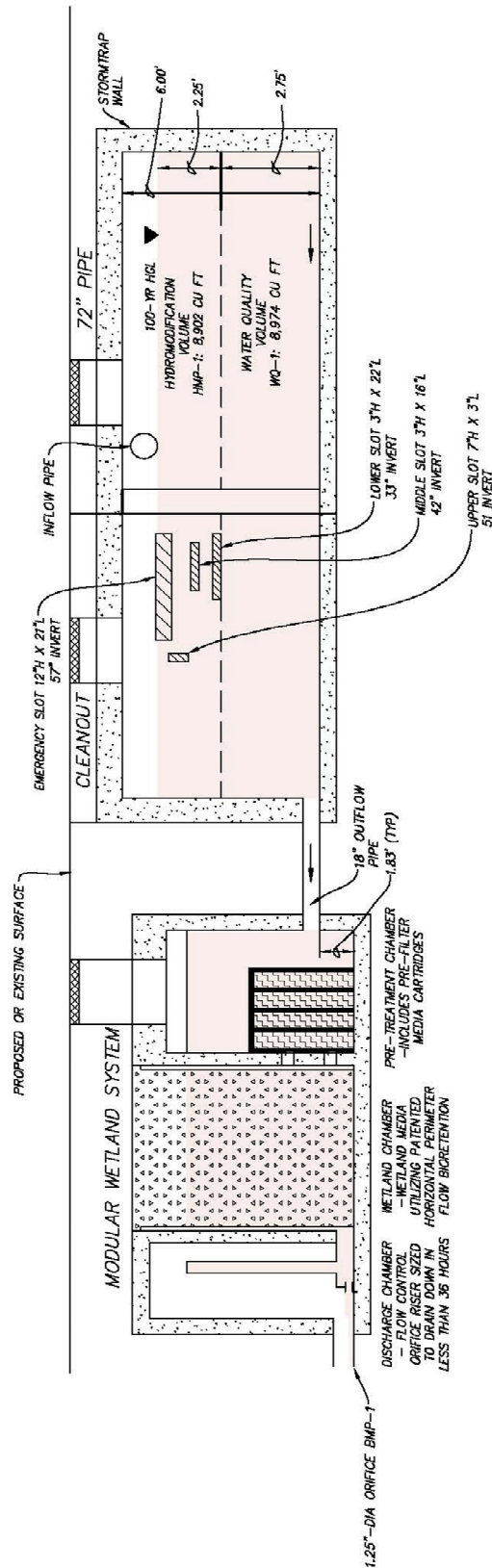
2.833	0.333	0.24430	0.531	0.000	0.000	0.000	0.531
2.917	0.417	0.25358	0.594	0.000	0.000	0.000	0.594
3.000	0.500	0.26288	0.650	0.000	0.000	0.000	0.650
3.083	0.583	0.27218	0.702	0.000	0.000	0.000	0.702
3.167	0.667	0.28147	0.751	0.000	0.000	0.000	0.751
3.250	0.750	0.29074	0.796	0.000	0.000	0.000	0.796
3.333	0.833	0.29999	0.839	0.337	0.000	0.000	1.176
3.417	0.917	0.30922	0.880	0.476	0.000	0.000	1.357
3.500	1.000	0.31841	0.920	0.583	0.000	0.000	1.503
3.583	1.083	0.32755	0.957	0.942	0.000	0.000	1.900
3.667	1.167	0.33664	0.993	1.057	0.000	0.000	2.050
3.750	1.250	0.34568	1.028	1.160	0.000	0.000	2.189
3.833	1.333	0.35465	1.062	1.255	0.000	0.000	2.317
3.917	1.417	0.36354	1.094	1.344	0.000	0.000	2.438
4.000	1.500	0.37235	1.126	1.426	0.000	0.000	2.552
4.083	1.583	0.38107	1.157	1.504	0.147	0.000	2.809
4.167	1.667	0.38969	1.187	1.579	0.208	0.000	2.974
4.250	1.750	0.39820	1.216	1.650	0.255	0.000	3.121
4.333	1.833	0.40659	1.245	1.718	0.295	0.000	3.258
4.417	1.917	0.41485	1.273	1.783	0.329	0.000	3.386
4.500	2.000	0.42298	1.300	1.847	0.361	0.000	3.508
4.583	2.083	0.43095	1.327	1.908	0.390	1.768	5.393
4.667	2.167	0.43877	1.354	1.967	0.582	2.501	6.402
4.750	2.250	0.44641	1.379	2.024	0.618	3.063	7.084
4.833	2.333	0.45386	1.405	2.080	0.653	3.536	7.674
4.917	2.417	0.46112	1.429	2.134	0.685	3.954	8.203
5.000	2.500	0.46816	1.454	2.187	0.717	4.331	8.689
5.083	2.583	0.47498	1.478	2.239	0.747	6.408	10.872
5.167	2.667	0.48154	1.502	2.290	0.776	6.884	11.450
5.250	2.750	0.48783	1.525	2.339	0.803	7.328	11.996
5.333	2.833	0.49383	1.548	2.388	0.830	7.747	12.513
5.417	2.917	0.49951	1.570	2.435	0.856	8.145	13.007
5.500	3.000	0.50484	1.593	2.482	0.881	8.524	13.480
5.583	3.083	0.50977	1.615	2.528	0.906	8.887	13.935
5.667	3.167	0.51427	1.636	2.573	0.930	9.235	14.374
5.750	3.250	0.51827	1.658	2.617	0.953	9.571	14.799
5.833	3.333	0.52166	1.679	2.660	0.976	9.896	15.211
5.917	3.417	0.52431	1.700	2.703	0.998	10.210	15.611
6.000	3.500	0.52576	1.720	2.745	1.020	10.515	16.000

			2.83	0.244	0.531
			2.92	0.254	0.594
			3.00	0.263	0.650
			3.08	0.272	0.702
			3.17	0.281	0.751
			3.25	0.291	0.796
			3.33	0.300	1.176
			3.42	0.309	1.357
			3.50	0.318	1.503
			3.58	0.328	1.900
			3.67	0.337	2.050
			3.75	0.346	2.189
			3.83	0.355	2.317
			3.92	0.364	2.438
			4.00	0.372	2.552
			4.08	0.381	2.809
			4.17	0.390	2.974
			4.25	0.398	3.121
			4.33	0.407	3.258
			4.42	0.415	3.386
			4.50	0.423	3.508
			4.58	0.431	5.393
			4.67	0.439	6.402
			4.75	0.446	7.084
			4.83	0.454	7.674
			4.92	0.461	8.203
			5.00	0.468	8.689
			5.08	0.475	10.872
			5.17	0.482	11.450
			5.25	0.488	11.996
			5.33	0.494	12.513
			5.42	0.500	13.007
			5.50	0.505	13.480
			5.58	0.510	13.935
			5.67	0.514	14.374
			5.75	0.518	14.799
			5.83	0.522	15.211
			5.92	0.524	15.611
			6.00	0.526	16.000
Flow Depth (ft)	Storage (ac-ft)	Flow (cfs)			
0.00	0.000	0.067			
0.08	0.001	0.067			
0.17	0.004	0.067			
0.25	0.007	0.067			
0.33	0.011	0.067			
0.42	0.016	0.067			
0.50	0.021	0.067			
0.58	0.026	0.067			
0.67	0.032	0.067			
0.75	0.038	0.067			
0.83	0.044	0.067			
0.92	0.051	0.067			
1.00	0.058	0.067			
1.08	0.065	0.067			
1.17	0.072	0.067			
1.25	0.079	0.067			
1.33	0.087	0.067			
1.42	0.095	0.067			
1.50	0.103	0.067			
1.58	0.111	0.067			
1.67	0.119	0.067			
1.75	0.128	0.067			
1.83	0.136	0.067			
1.92	0.145	0.067			
2.00	0.153	0.067			
2.08	0.162	0.067			
2.17	0.171	0.067			
2.25	0.180	0.067			
2.33	0.189	0.067			
2.42	0.198	0.067			
2.50	0.207	0.067			
2.58	0.217	0.067			
2.67	0.226	0.067			
2.75	0.235	0.067			

CHAPTER 4

MODIFIED-PULS DETENTION ROUTING (HEC-HMS)

4.3 – 72-inch CMP Stormwater System



72-INCH CMP STORMWATER SYSTEM & MWS DETAILS

NOT TO SCALE

CHAPTER 4

MODIFIED-PULS DETENTION ROUTING (HEC-HMS)

4.4 – HEC-HMS Modified-Puls Routing Results

Project: Sw Vault 2.75
Simulation Run: Q100
Simulation Start: 31 December 1999, 24:00
Simulation End: 1 January 2000, 06:00

HMS Version: 4.8
Executed: 27 November 2021, 00:40

Global Results Summary

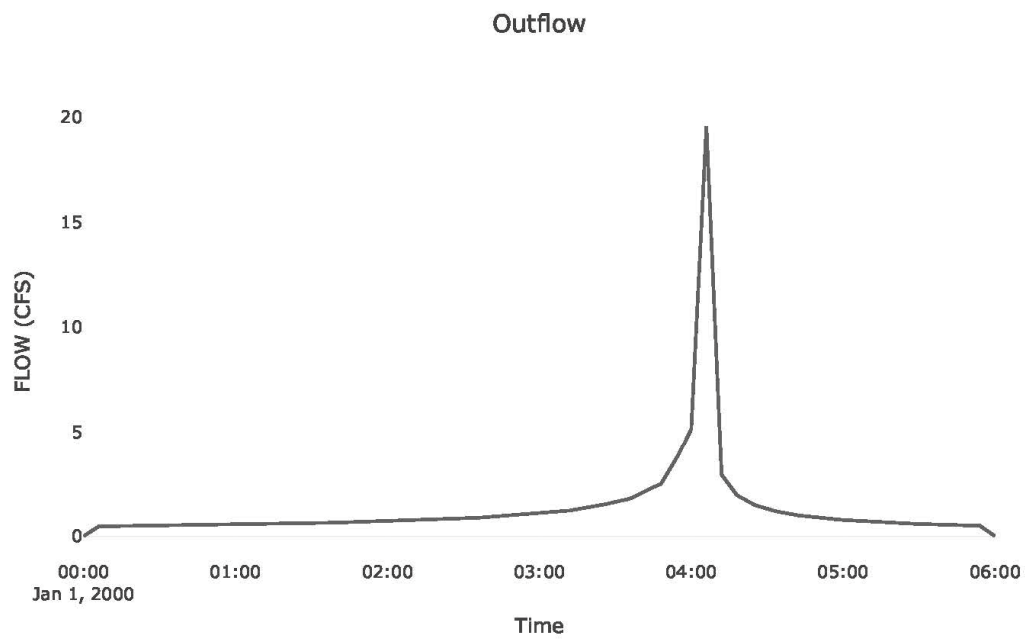
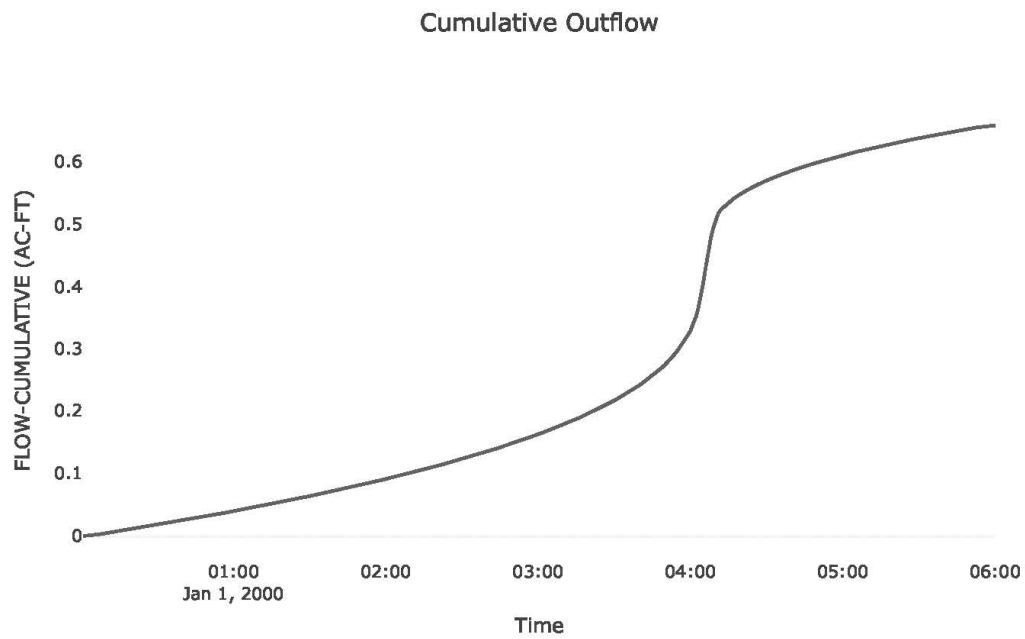
Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume ()
Dma 1	Not specified	19.56	01Jan2000, 04:06	Not specified
Basin 1	Not specified	8.31	01Jan2000, 04:10	Not specified

Source: DMA 1

Downstream : Basin 1
Flow Method : Gage Flow
Flow Gage : POC - 1

Results: DMA 1

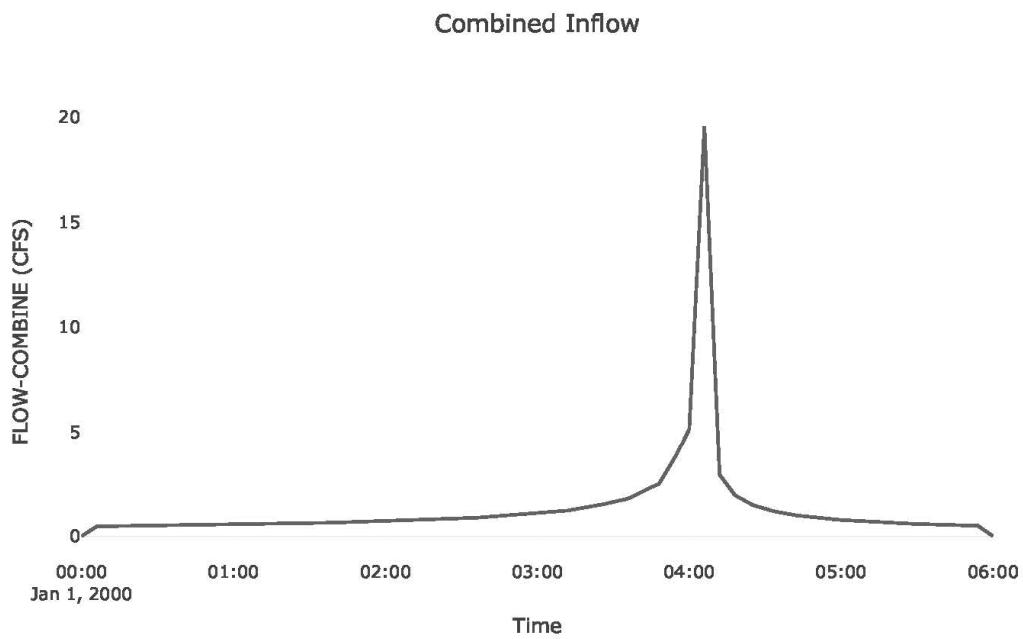
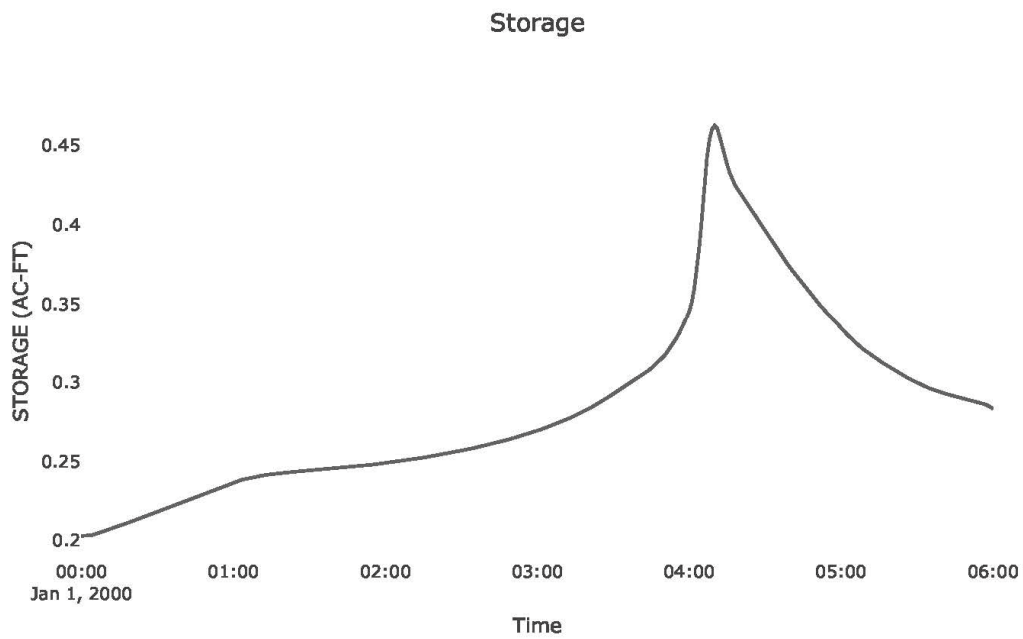
Peak Discharge (CFS)	19.56
Time of Peak Discharge	01Jan2000, 04:06

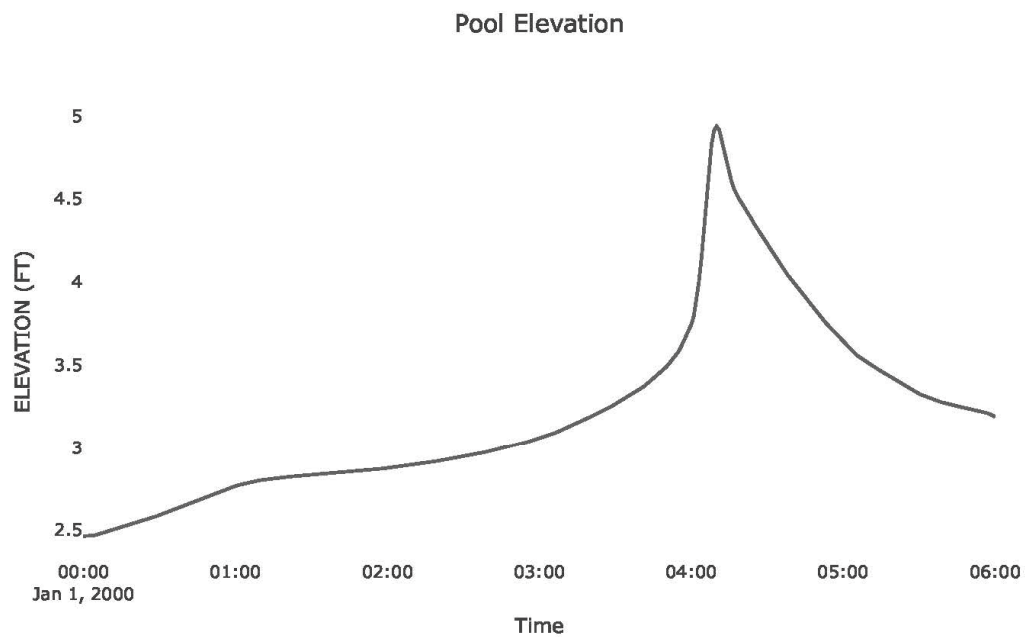
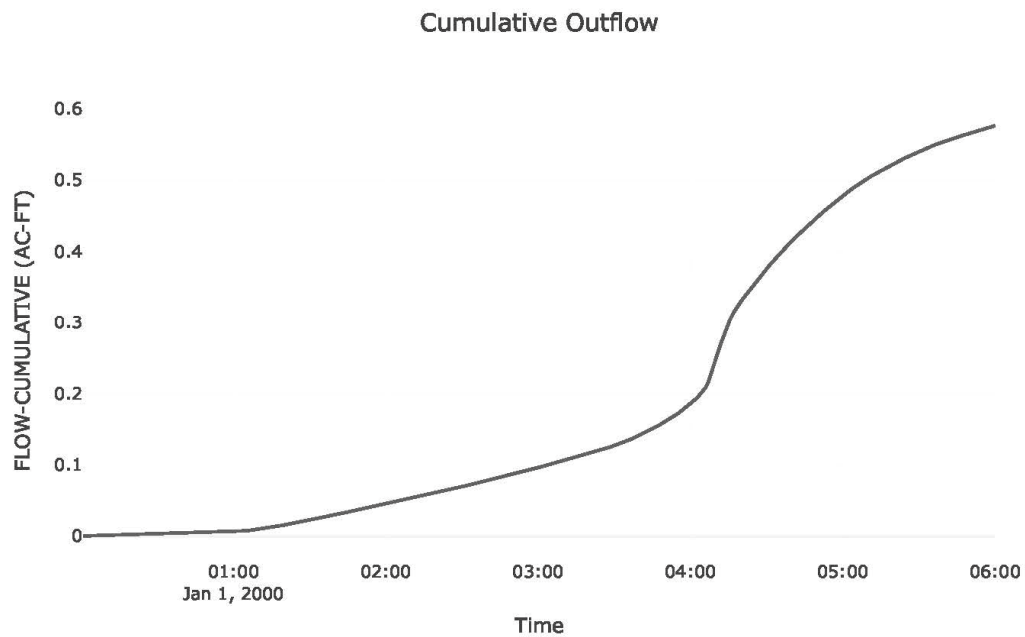


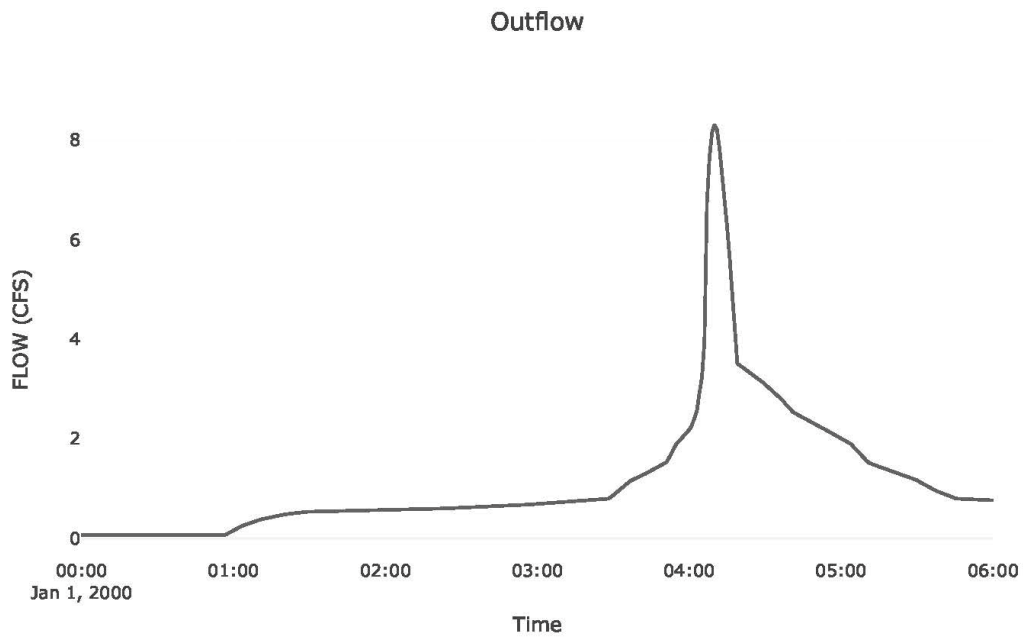
Reservoir: Basin 1

Results: Basin 1

Peak Discharge (CFS)	8.31
Time of Peak Discharge	01Jan2000, 04:10
Peak Inflow (CFS)	19.56
Time of Peak Inflow	01Jan2000, 04:06
Inflow Volume (AC - FT)	0.66
Maximum Storage (AC - FT)	0.46
Peak Elevation (FT)	4.94
Discharge Volume (AC - FT)	0.58







CHAPTER 5

FLOOD INUNDATION ANALYSES (HEC-RAS)

CHAPTER 5

FLOOD INUNDATION ANALYSES (HEC-RAS)

5.1 – HEC-RAS Hydrology Calculations

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
2003,1985,1981 HYDROLOGY MANUAL
(c) Copyright 1982-2014 Advanced Engineering Software (aes)
Ver. 21.0 Release Date: 06/01/2014 License ID 1459

Analysis prepared by:

BHA INC.
5115 AVENIDA ENCINAS, SUITE L
CARLSBAD, CA 92008

***** DESCRIPTION OF STUDY *****
* HEC-RAS HYDROLOGY - 100 YEAR *
* *
* *

FILE NAME: K:\HYDRO\1119\SDP\1119-EX.DAT
TIME/DATE OF STUDY: 15:38 11/26/2021

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00
6-HOUR DURATION PRECIPITATION (INCHES) = 3.200
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

FLOW PROCESS FROM NODE 10.00 TO NODE 20.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 697.00
DOWNSTREAM ELEVATION(FEET) = 695.00
ELEVATION DIFFERENCE(FEET) = 2.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 7.903
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
THE MAXIMUM OVERLAND FLOW LENGTH = 85.00
(Reference: Table 3-1B of Hydrology Manual)

1822-1864 York Drive, PDS2021-MUP-21-008, PDS2021-ER-08-008
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      THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.275
    SUBAREA RUNOFF(CFS) = 0.88
    TOTAL AREA(ACRES) = 0.28    TOTAL RUNOFF(CFS) = 0.88

*****
FLOW PROCESS FROM NODE    20.00 TO NODE    50.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 695.00 DOWNSTREAM(FEET) = 458.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 3800.00 CHANNEL SLOPE = 0.0622
CHANNEL BASE(FEET) = 32.00 "Z" FACTOR = 2.000
MANNING'S FACTOR = 0.035 MAXIMUM DEPTH(FEET) = 5.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.938
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) = 0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 160.03
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.56
AVERAGE FLOW DEPTH(FEET) = 0.64 TRAVEL TIME(MIN.) = 8.38
Tc(MIN.) = 16.28
SUBAREA AREA(ACRES) = 153.67 SUBAREA RUNOFF(CFS) = 302.54
AREA-AVERAGE RUNOFF COEFFICIENT = 0.500
TOTAL AREA(ACRES) = 153.9 PEAK FLOW RATE(CFS) = 303.09

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.93 FLOW VELOCITY(FEET/SEC.) = 9.65
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 50.00 = 3900.00 FEET.

*****
FLOW PROCESS FROM NODE    50.00 TO NODE    50.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 16.28
RAINFALL INTENSITY(INCH/HR) = 3.94
TOTAL STREAM AREA(ACRES) = 153.95
PEAK FLOW RATE(CFS) AT CONFLUENCE = 303.09

*****
FLOW PROCESS FROM NODE    30.00 TO NODE    40.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) = 0
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 727.00
DOWNSTREAM ELEVATION(FEET) = 725.00
ELEVATION DIFFERENCE(FEET) = 2.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 7.903
WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
         THE MAXIMUM OVERLAND FLOW LENGTH = 85.00
         (Reference: Table 3-1B of Hydrology Manual)
         THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.275
SUBAREA RUNOFF(CFS) = 1.22
TOTAL AREA(ACRES) = 0.39    TOTAL RUNOFF(CFS) = 1.22

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*****
FLOW PROCESS FROM NODE      40.00 TO NODE      50.00 IS CODE =   51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =      725.00  DOWNSTREAM(FEET) =      458.50
CHANNEL LENGTH THRU SUBAREA(FEET) =  2200.00  CHANNEL SLOPE =   0.1211
CHANNEL BASE(FEET) =    32.00  "Z" FACTOR =    2.000
MANNING'S FACTOR = 0.035  MAXIMUM DEPTH(FEET) =    5.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =   4.042
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      28.57
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.75
AVERAGE FLOW DEPTH(FEET) =    0.19  TRAVEL TIME(MIN.) =   7.73
Tc(MIN.) =   15.63
SUBAREA AREA(ACRES) =    25.85      SUBAREA RUNOFF(CFS) =    52.25
AREA-AVERAGE RUNOFF COEFFICIENT =   0.500
TOTAL AREA(ACRES) =    26.2      PEAK FLOW RATE(CFS) =    53.03

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.27  FLOW VELOCITY(FEET/SEC.) =   6.04
LONGEST FLOWPATH FROM NODE      30.00 TO NODE      50.00 =   2300.00 FEET.

*****
FLOW PROCESS FROM NODE      50.00 TO NODE      50.00 IS CODE =    1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   15.63
RAINFALL INTENSITY(INCH/HR) =    4.04
TOTAL STREAM AREA(ACRES) =    26.24
PEAK FLOW RATE(CFS) AT CONFLUENCE =    53.03

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)      (MIN.)  (INCH/HOUR)  (ACRE)
    1      303.09      16.28      3.938      153.95
    2      53.03      15.63      4.042      26.24

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc      INTENSITY
NUMBER      (CFS)      (MIN.)  (INCH/HOUR)
    1      344.04      15.63      4.042
    2      354.75      16.28      3.938

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    354.75  Tc(MIN.) =   16.28
TOTAL AREA(ACRES) =    180.2
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      50.00 =   3900.00 FEET.

*****
FLOW PROCESS FROM NODE      50.00 TO NODE      60.00 IS CODE =   51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

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=====
ELEVATION DATA: UPSTREAM(FEET) =    458.50  DOWNSTREAM(FEET) =    426.80
CHANNEL LENGTH THRU SUBAREA(FEET) =  2750.00  CHANNEL SLOPE =    0.0115
CHANNEL BASE(FEET) =    32.00  "Z" FACTOR =    2.000
MANNING'S FACTOR = 0.035  MAXIMUM DEPTH(FEET) =    5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =    3.123
*USER SPECIFIED(SUBAREA):
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .5000
S.C.S. CURVE NUMBER (AMC II) =    0
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    451.67
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    6.51
AVERAGE FLOW DEPTH(FEET) =    1.94  TRAVEL TIME(MIN.) =    7.04
Tc(MIN.) =    23.32
SUBAREA AREA(ACRES) =    123.69  SUBAREA RUNOFF(CFS) =    193.11
AREA-AVERAGE RUNOFF COEFFICIENT =    0.500
TOTAL AREA(ACRES) =    303.9  PEAK FLOW RATE(CFS) =    474.44

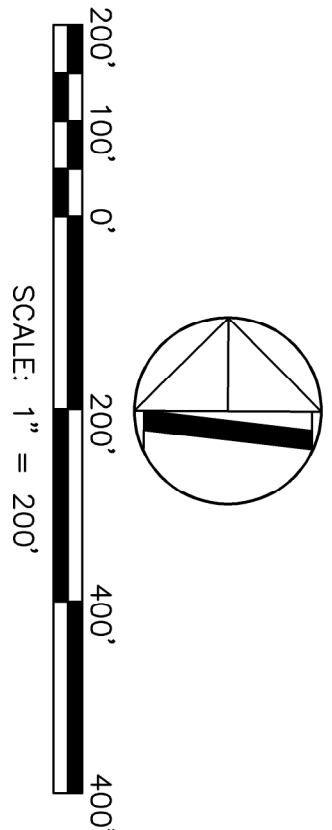
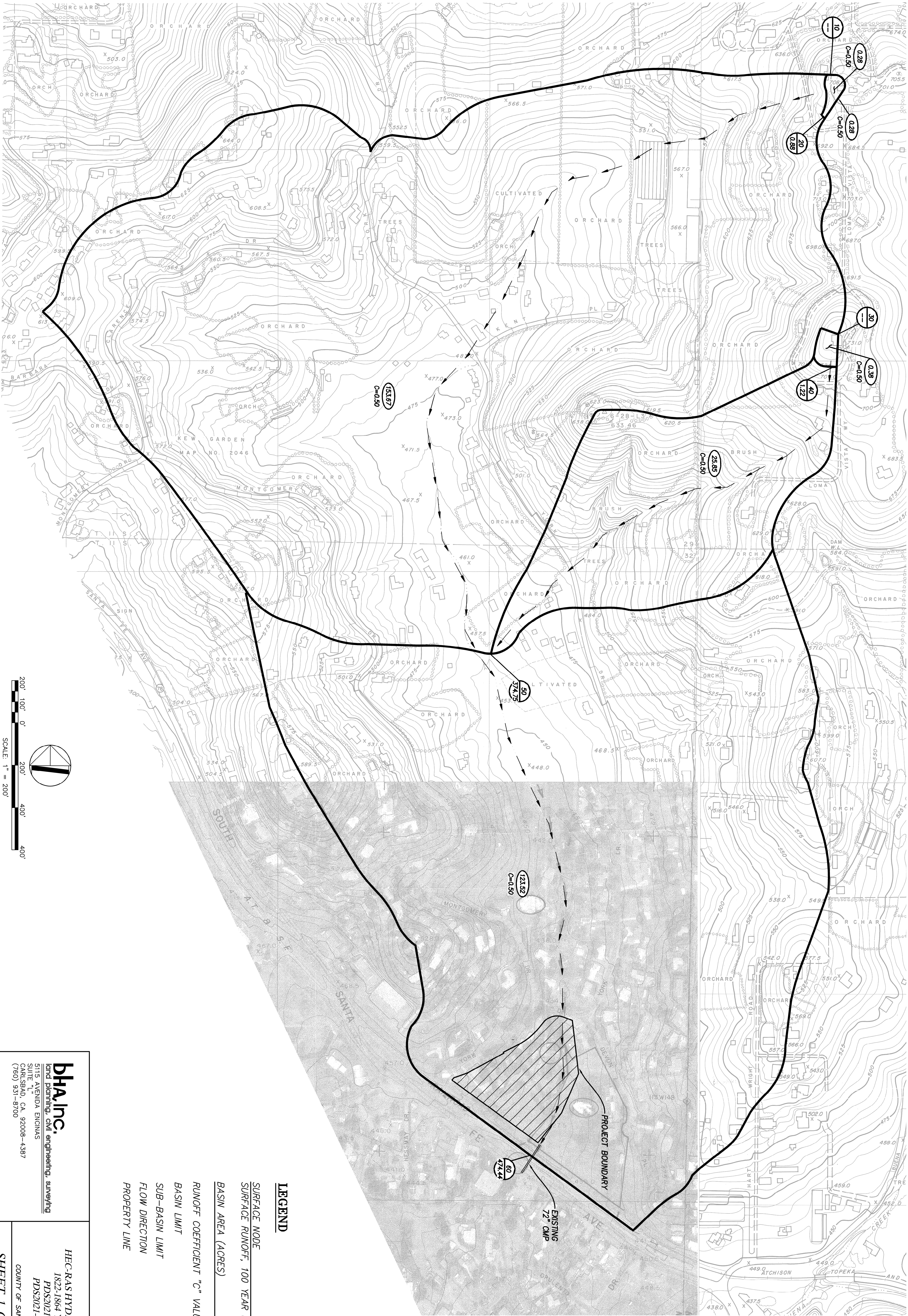
END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =    1.99  FLOW VELOCITY(FEET/SEC.) =    6.63
LONGEST FLOWPATH FROM NODE    10.00 TO NODE    60.00 =    6650.00 FEET.
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)    =    303.9  TC(MIN.) =    23.32
PEAK FLOW RATE(CFS) =    474.44
=====
END OF RATIONAL METHOD ANALYSIS
=====

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CHAPTER 5

FLOOD INUNDATION ANALYSES (HEC-RAS)

5.2 – HEC-RAS Hydrology Exhibit



bha, Inc.
land planning, civil engineering, surveying
5115 AVENIDA ENCINAS
SUITE "L"
CARLSBAD, CA, 92008-4387
(760) 931-8700

HEC-RAS HYDROLOGY EXHIBIT

1822-1864 YORK DRIVE

PDS2021-MUP-21-00,

PDS2021-ER-21-08-008

COUNTY OF SAN DIEGO, CALIFORNIA

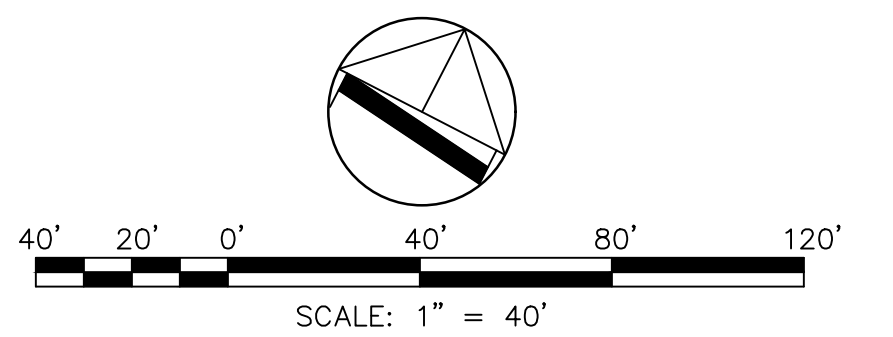
SHEET 1 OF 1 SHEETS

LEGEND	SYMBOL
SURFACE NODE	60
SURFACE RUNOFF, 100 YEAR (CFS)	474.44
BASIN AREA (ACRES)	123.52
RUNOFF COEFFICIENT "C" VALUE	C=0.50
BASIN LIMIT	—
SUB-BASIN LIMIT	—
FLOW DIRECTION	→
PROPERTY LINE	—

CHAPTER 5

FLOOD INUNDATION ANALYSES (HEC-RAS)

5.3 – HEC-RAS Cross Section Exhibits

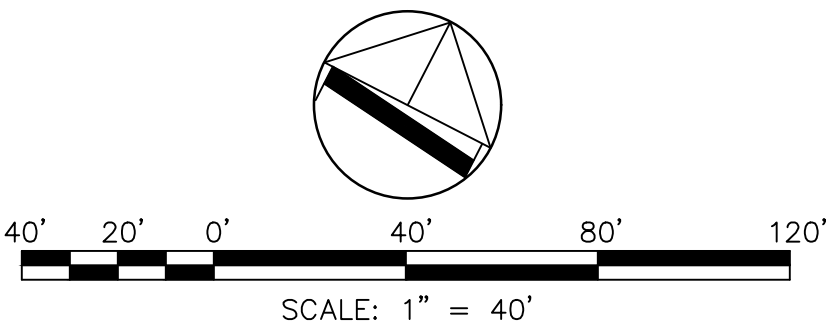
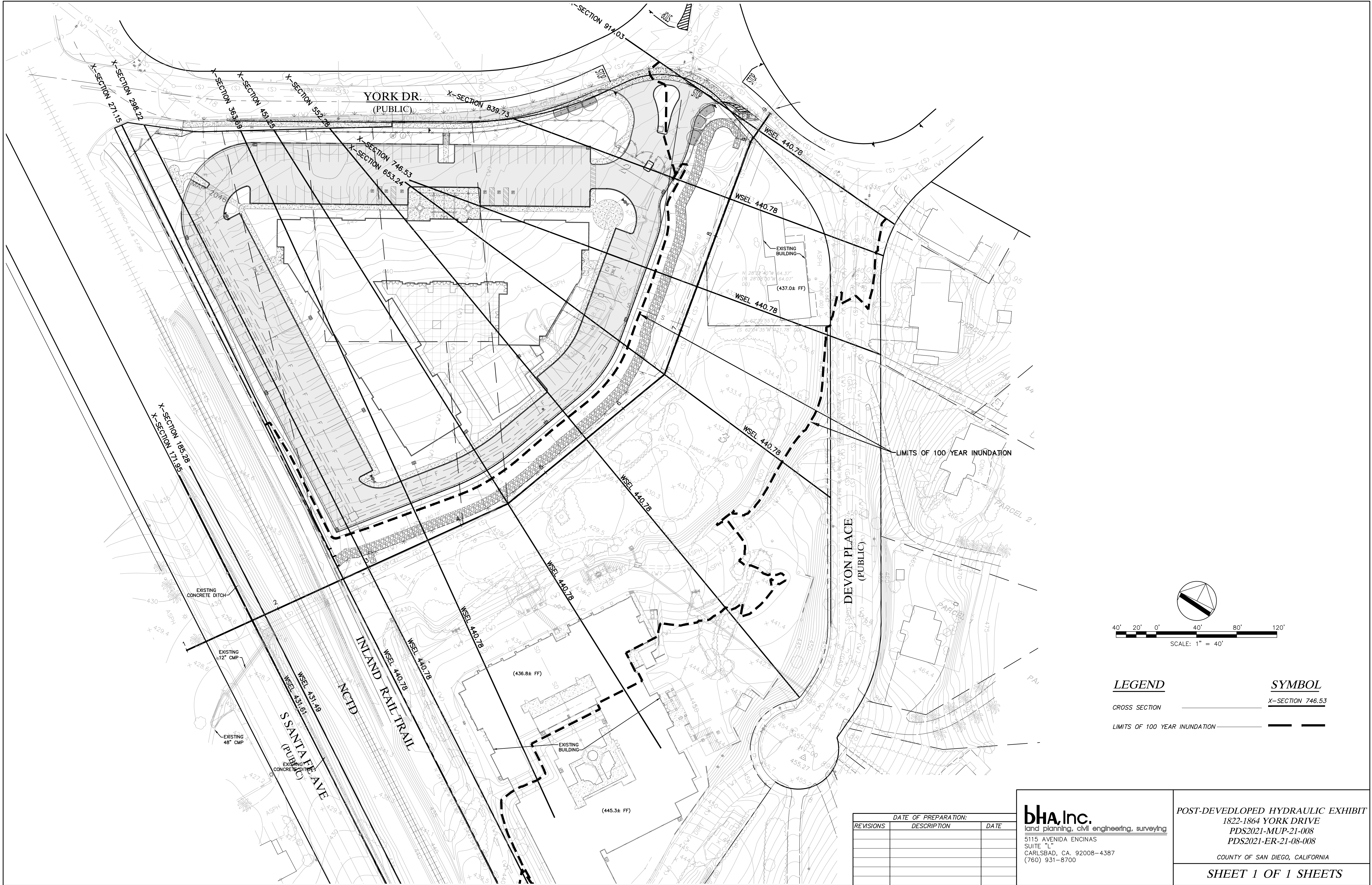


SYMBOL

PROPERTY BOUNDARY _____

LIMITS OF 100 YEAR INUNDATION _____

 <u>land planning, civil engineering, surveying</u> 5115 AVENIDA ENCINAS SUITE "L" CARLSBAD, CA. 92008-4387 (760) 931-8700	<i>PRE-DEVELOPED HYDRAULIC EXHIBIT</i> 1822-1864 YORK DRIVE PDS2021-MUP-21-008 PDS2021-ER-21-08-008
	COUNTY OF SAN DIEGO, CALIFORNIA <i>SHEET 1 OF 1 SHEETS</i>



LEGEND	SYMBOL
CROSS SECTION	X-SECTION 746.53
LIMITS OF 100 YEAR INUNDATION	

DATE OF PREPARATION:		
REVISIONS	DESCRIPTION	DATE

bha, Inc.
land planning, civil engineering, surveying
5115 AVENIDA ENCINAS
SUITE "L"
CARLSBAD, CA. 92008-4387
(760) 931-8700

POST-DEVELOPED HYDRAULIC EXHIBIT
1822-1864 YORK DRIVE
PDS2021-MUP-21-008
PDS2021-ER-21-08-008
COUNTY OF SAN DIEGO, CALIFORNIA
SHEET 1 OF 1 SHEETS

CHAPTER 5

FLOOD INUNDATION ANALYSES (HEC-RAS)

5.4 – Existing HEC-RAS Calculations

HEC-RAS HEC-RAS 6.5 February 2024
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X   X  XXXXXX   XXXX   XXXX   XX   XXXX
X   X  X       X   X   X   X   X   X   X
X   X  X       X   X   X   X   X   X   X
XXXXXXXX XXXX   X   XXX XXXX XXXXXX XXXX
X   X  X       X   X   X   X   X   X   X
X   X  X       X   X   X   X   X   X   X
X   X  XXXXXX   XXXX   X   X   X   X   XXXXX
```

PROJECT DATA
Project Title: EXIST CHANNEL W CULVERT RR USE
Project File : EXISTCHANNELWCULRR_USE.prj
Run Date and Time: 8/5/2024 4:32:35 PM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\EXISTCHANNELWCULRR_USE.p01

Geometry Title: EXIST CHANNEL
Geometry File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\EXISTCHANNELWCULRR_USE.g01

Flow Title : 100 YEAR FLOW
Flow File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\EXISTCHANNELWCULRR_USE.f02

Plan Summary Information:

Number of:	Cross Sections =	11	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

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

Computation Options

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

FLOW DATA

Flow Title: 100 YEAR FLOW
Flow File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\EXISTCHANNELWCULRR_USE.f02

Flow Data (cfs)

River	Reach	RS	100 YEAR	50 YEAR	10 YEAR	2 YEAR
CHANNEL CL	CHANNEL CL	914.03	474.44	383.56	257.63	156.13

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
CHANNEL CL	CHANNEL CL	100 YEAR		Known WS = 431.6
CHANNEL CL	CHANNEL CL	50 YEAR		Known WS = 431.6
CHANNEL CL	CHANNEL CL	10 YEAR		Known WS = 429.5
CHANNEL CL	CHANNEL CL	2 YEAR		Known WS = 429.5

GEOMETRY DATA

Geometry Title: EXIST CHANNEL
Geometry File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\EXISTCHANNELWCULRR_USE.g01

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 914.03

INPUT

Description: 8

Station Elevation Data		num=	77								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	442.15	.44	442.08	7.92	441.06	12.69	440.54	17.25	440.2		
18.59	439.51	20.34	438.77	25.39	438.78	27.79	438.81	31.89	438.78		

37.67	438.75	43.37	438.45	43.75	438.44	56.14	437.99	61.66	437.8
65.19	437.67	65.56	437.65	66.17	438.06	66.34	438.14	67.59	438.1
68	438.1	69.63	438.07	70.34	438.07	71.34	438.05	72.12	438.06
74.38	438.06	77.63	437.91	78.54	437.85	78.65	437.84	89.45	437.42
94.45	437.16	103.41	436.78	117.97	436.25	128.45	435.89	132.88	435.72
138.62	435.65	139.99	435.71	141.58	435.76	144.15	435.96	145.55	435.93
147.88	435.87	149.62	435.83	151.39	435.84	153.04	435.82	153.97	435.8
159.15	435.66	159.49	435.52	160.82	434.77	162.43	434.01	162.57	433.99
163	433.47	163.98	432.74	164.37	432.5	164.87	432.51	165.12	432.52
166.91	432.57	167.44	433.25	176.75	435.24	181.57	436.28	183.96	436.79
196.87	436.49	200.09	436.43	216.38	436.74	218.18	436.39	225.49	436.85
270.21	439	277.89	439.8	278.33	439.86	278.97	439.92	291.64	441.13
300.37	441.93	305.9	442.17	316.65	442.17	323.91	442.27	324.18	442.31
325.57	442.38	325.99	442.41						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	145.55	.035	181.57	.035

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

145.55	181.57	74.3	74.3	74.3	.1	.3
--------	--------	------	------	------	----	----

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	74.30	74.30	74.30
Crit W.S. (ft)		Flow Area (sq ft)	432.79	212.08	327.09
E.G. Slope (ft/ft)	0.000024	Area (sq ft)	432.79	212.08	327.09
Q Total (cfs)	474.44	Flow (cfs)	193.48	138.54	142.41
Top Width (ft)	277.51	Top Width (ft)	135.07	36.02	106.42
Vel Total (ft/s)	0.49	Avg. Vel. (ft/s)	0.45	0.65	0.44
Max Chl Dpth (ft)	8.28	Hydr. Depth (ft)	3.20	5.89	3.07
Conv. Total (cfs)	97647.6	Conv. (cfs)	39822.4	28514.5	29310.7
Length Wtd. (ft)	74.30	Wetted Per. (ft)	135.64	37.63	106.67
Min Ch El (ft)	432.50	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	7.02	31.03	6.25
C & E Loss (ft)	0.00	Cum SA (acres)	1.94	3.44	1.88

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 OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.21	Reach Len. (ft)	74.30	74.30	74.30
Crit W.S. (ft)		Flow Area (sq ft)	117.20	119.35	89.97

E.G. Slope (ft/ft)	0.000332	Area (sq ft)	117.20	119.35	89.97
Q Total (cfs)	383.56	Flow (cfs)	103.82	199.23	80.50
Top Width (ft)	203.54	Top Width (ft)	95.38	36.02	72.14
Vel Total (ft/s)	1.17	Avg. Vel. (ft/s)	0.89	1.67	0.89
Max Chl Dpth (ft)	5.71	Hydr. Depth (ft)	1.23	3.31	1.25
Conv. Total (cfs)	21057.9	Conv. (cfs)	5699.9	10938.2	4419.8
Length Wtd. (ft)	74.30	Wetted Per. (ft)	95.59	37.63	72.28
Min Ch El (ft)	432.50	Shear (lb/sq ft)	0.03	0.07	0.03
Alpha	1.32	Stream Power (lb/ft s)	0.02	0.11	0.02
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.25	22.55	2.79
C & E Loss (ft)	0.01	Cum SA (acres)	1.55	3.44	1.32

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 OUTPUT Profile #10 YEAR

E.G. Elev (ft)	436.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	436.10	Reach Len. (ft)	74.30	74.30	74.30
Crit W.S. (ft)	436.10	Flow Area (sq ft)	6.30	43.50	
E.G. Slope (ft/ft)	0.013991	Area (sq ft)	6.30	43.50	
Q Total (cfs)	257.63	Flow (cfs)	13.26	244.37	
Top Width (ft)	58.37	Top Width (ft)	23.19	35.18	
Vel Total (ft/s)	5.17	Avg. Vel. (ft/s)	2.11	5.62	
Max Chl Dpth (ft)	3.60	Hydr. Depth (ft)	0.27	1.24	
Conv. Total (cfs)	2178.1	Conv. (cfs)	112.1	2065.9	
Length Wtd. (ft)	74.30	Wetted Per. (ft)	23.20	36.77	
Min Ch El (ft)	432.50	Shear (lb/sq ft)	0.24	1.03	
Alpha	1.13	Stream Power (lb/ft s)	0.50	5.80	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.36	9.51	0.34
C & E Loss (ft)	0.14	Cum SA (acres)	0.42	3.02	0.36

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 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 OUTPUT Profile #2 YEAR

E.G. Elev (ft)	435.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.70	Wt. n-Val.		0.035	
W.S. Elev (ft)	435.26	Reach Len. (ft)	74.30	74.30	74.30

Crit W.S. (ft)	435.26	Flow Area (sq ft)	23.21
E.G. Slope (ft/ft)	0.018280	Area (sq ft)	23.21
Q Total (cfs)	156.13	Flow (cfs)	156.13
Top Width (ft)	16.89	Top Width (ft)	16.89
Vel Total (ft/s)	6.73	Avg. Vel. (ft/s)	6.73
Max Chl Dpth (ft)	2.76	Hydr. Depth (ft)	1.37
Conv. Total (cfs)	1154.8	Conv. (cfs)	1154.8
Length Wtd. (ft)	74.30	Wetted Per. (ft)	18.29
Min Ch El (ft)	432.50	Shear (lb/sq ft)	1.45
Alpha	1.00	Stream Power (lb/ft s)	9.74
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	0.12
C & E Loss (ft)	0.21	Cum SA (acres)	0.22

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.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
1	LOB	0.00	29.11	5.28	23.76	18.98	1.11	1.28	0.22	0.00
0.00										
2	LOB	29.11	58.22	22.99	68.18	29.13	4.85	2.34	0.34	0.00
0.00										
3	LOB	58.22	87.33	33.09	84.99	29.27	6.97	2.92	0.39	0.00
0.00										
4	LOB	87.33	116.44	54.04	113.87	29.14	11.39	3.91	0.47	0.01
0.00										
5	LOB	116.44	145.55	78.08	141.99	29.13	16.46	4.88	0.55	0.01
0.00										
6	Chan	145.55	152.75	20.97	35.46	7.21	4.42	4.92	0.59	0.01
0.00										
7	Chan	152.75	159.96	21.81	36.50	7.30	4.60	5.07	0.60	0.01
0.00										
8	Chan	159.96	167.16	37.45	52.92	8.22	7.89	7.35	0.71	0.01
0.01										
9	Chan	167.16	174.37	35.11	49.18	7.53	7.40	6.83	0.71	0.01
0.01										

10	Chan	174.37	181.57	23.21	38.02	7.37	4.89	5.28	0.61	0.01
0.00										
11	ROB	181.57	210.45	60.04	121.60	28.94	12.65	4.21	0.49	0.01
0.00										
12	ROB	210.45	239.34	52.43	112.12	28.95	11.05	3.88	0.47	0.01
0.00										
13	ROB	239.34	268.22	26.41	74.26	28.92	5.57	2.57	0.36	0.00
0.00										
14	ROB	268.22	297.11	3.53	19.11	19.86	0.74	0.97	0.18	0.00
0.00										

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

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	29.11	58.22	0.20	1.17	8.06	0.05	0.15	0.17	0.00	
0.00											
2	LOB	58.22	87.33	3.02	10.05	29.27	0.79	0.35	0.30	0.01	
0.00											
3	LOB	87.33	116.44	28.95	38.93	29.14	7.55	1.34	0.74	0.03	
0.02											
4	LOB	116.44	145.55	71.65	67.05	29.13	18.68	2.30	1.07	0.05	
0.05											
5	Chan	145.55	152.75	22.28	16.91	7.21	5.81	2.35	1.32	0.05	
0.06											
6	Chan	152.75	159.96	24.39	17.95	7.30	6.36	2.49	1.36	0.05	
0.07											
7	Chan	159.96	167.16	66.59	34.38	8.22	17.36	4.77	1.94	0.09	
0.17											
8	Chan	167.16	174.37	58.21	30.63	7.53	15.18	4.25	1.90	0.08	
0.16											
9	Chan	174.37	181.57	27.77	19.47	7.37	7.24	2.70	1.43	0.05	
0.08											
10	ROB	181.57	210.45	46.65	47.24	28.94	12.16	1.64	0.99	0.03	
0.03											
11	ROB	210.45	239.34	32.11	37.76	28.95	8.37	1.31	0.85	0.03	
0.02											
12	ROB	239.34	268.22	1.74	4.97	14.39	0.45	0.35	0.35	0.01	
0.00											

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

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
1	LOB	116.44	145.55	13.26	6.30	23.20	5.15	0.27	2.11	0.24	
0.50											
2	Chan	145.55	152.75	2.54	1.73	7.21	0.99	0.24	1.47	0.21	
0.31											
3	Chan	152.75	159.96	5.51	2.77	7.30	2.14	0.38	1.99	0.33	
0.66											
4	Chan	159.96	167.16	128.66	19.19	8.22	49.94	2.66	6.70	2.04	
13.68											
5	Chan	167.16	174.37	94.92	15.45	7.53	36.84	2.14	6.14	1.79	
11.00											
6	Chan	174.37	181.57	12.73	4.37	6.51	4.94	0.69	2.92	0.59	
1.71											

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 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.

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
1	Chan	159.96	167.16	96.34	13.15	8.22	61.71	1.83	7.33	1.83	
13.38											
2	Chan	167.16	174.37	58.36	9.40	7.53	37.38	1.31	6.21	1.42	
8.84											
3	Chan	174.37	181.57	1.43	0.66	2.53	0.91	0.26	2.18	0.30	
0.64											

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 CL
REACH: CHANNEL CL RS: 839.73

INPUT

Description: 7

Station	Elevation	Data	num=	79						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	441.24	4.13	440.92	7.45	440.9	10.37	439.8	10.92	439.61	
11.07	439.52	11.47	439.23	14.19	439.32	25.54	439.64	29.13	439.51	
30.54	439.48	32.23	439.42	40.69	439.2	40.94	439.31	41.29	439.48	
44.87	439.26	45.41	439.22	46.31	439.16	50.57	437.15	51.69	436.59	
51.98	436.3	52.47	435.78	58.04	435.64	59.66	435.63	65.79	435.51	
68.42	435.53	74.54	435.18	78.66	435.17	80.54	435.12	87.38	434.96	
94.17	434.84	98.54	434.89	101.06	434.85	101.91	434.83	103.25	434.84	
118.5	434.45	118.69	434.44	119	434.43	121.57	434.35	134.72	433.89	
150.44	433.51	166.99	433.23	167.33	433.22	167.61	433.08	173.4	430.86	
233.21	430.86	235.97	434.57	236.07	434.67	236.22	434.85	236.62	434.89	
244.07	435.65	245.65	435.79	247.1	435.83	254.41	436.08	258.31	436.12	
265.42	436.35	269.95	436.76	279.69	437.14	281.28	437.22	282.29	437.25	
284.73	437.31	299.42	437.8	302.8	438.09	309.73	438.96	311.9	439.09	
334.24	440.77	336.81	440.93	344.63	441.46	353.8	442.11	361.77	442.69	
370.1	443.23	370.26	443.25	370.63	443.28	371.16	443.34	383.6	444.99	
389.08	445.62	390.46	445.74	391.31	445.7	392.65	445.71			

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.035	101.06	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	101.06	236.22		93.2	93.2	.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)	339.00	1120.83	314.38
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	339.00	1120.83	314.38
Q Total (cfs)	474.44	Flow (cfs)	62.62	358.03	53.79
Top Width (ft)	326.68	Top Width (ft)	93.30	135.16	98.22
Vel Total (ft/s)	0.27	Avg. Vel. (ft/s)	0.18	0.32	0.17

Max Chl Dpth (ft)	9.92	Hydr. Depth (ft)	3.63	8.29	3.20
Conv. Total (cfs)	255258.4	Conv. (cfs)	33689.0	192627.1	28942.3
Length Wtd. (ft)	93.20	Wetted Per. (ft)	94.66	137.62	98.45
Min Ch El (ft)	430.86	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.19	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	6.36	29.89	5.70
C & E Loss (ft)	0.00	Cum SA (acres)	1.75	3.29	1.70

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)	149.22	774.85	105.50
E.G. Slope (ft/ft)	0.000010	Area (sq ft)	149.22	774.85	105.50
Q Total (cfs)	383.56	Flow (cfs)	39.25	325.50	18.81
Top Width (ft)	255.56	Top Width (ft)	52.76	135.16	67.64
Vel Total (ft/s)	0.37	Avg. Vel. (ft/s)	0.26	0.42	0.18
Max Chl Dpth (ft)	7.36	Hydr. Depth (ft)	2.83	5.73	1.56
Conv. Total (cfs)	122684.7	Conv. (cfs)	12553.4	104113.5	6017.8
Length Wtd. (ft)	93.20	Wetted Per. (ft)	53.50	137.62	67.75
Min Ch El (ft)	430.86	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.14	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.03	21.79	2.62
C & E Loss (ft)	0.00	Cum SA (acres)	1.43	3.29	1.20

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.21	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)		241.10	
E.G. Slope (ft/ft)	0.000228	Area (sq ft)		241.10	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	110.02	Top Width (ft)		110.02	
Vel Total (ft/s)	1.07	Avg. Vel. (ft/s)		1.07	
Max Chl Dpth (ft)	3.35	Hydr. Depth (ft)		2.19	
Conv. Total (cfs)	17049.6	Conv. (cfs)		17049.6	
Length Wtd. (ft)	93.20	Wetted Per. (ft)		112.16	
Min Ch El (ft)	430.86	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.03	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.35	9.27	0.34
C & E Loss (ft)	0.00	Cum SA (acres)	0.40	2.89	0.36

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 OUTPUT Profile #2 YEAR

E.G. Elev (ft)	433.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.035	
W.S. Elev (ft)	433.04	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)		138.02	
E.G. Slope (ft/ft)	0.000280	Area (sq ft)		138.02	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	67.10	Top Width (ft)		67.10	
Vel Total (ft/s)	1.13	Avg. Vel. (ft/s)		1.13	
Max Chl Dpth (ft)	2.18	Hydr. Depth (ft)		2.06	
Conv. Total (cfs)	9338.6	Conv. (cfs)		9338.6	
Length Wtd. (ft)	93.20	Wetted Per. (ft)		68.60	
Min Ch El (ft)	430.86	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.04	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.12	4.60	0.09
C & E Loss (ft)	0.03	Cum SA (acres)	0.22	2.17	0.17

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.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	0.00	20.21	1.13	15.02	12.78	0.24	1.21	0.08	0.00	
0.00											
2	LOB	20.21	40.42	2.21	26.93	20.22	0.47	1.33	0.08	0.00	
0.00											
3	LOB	40.42	60.64	10.37	69.40	21.21	2.19	3.43	0.15	0.00	
0.00											
4	LOB	60.64	80.85	22.87	109.42	20.22	4.82	5.41	0.21	0.00	
0.00											
5	LOB	80.85	101.06	26.03	118.24	20.22	5.49	5.85	0.22	0.00	
0.00											
6	Chan	101.06	128.09	44.55	168.92	27.04	9.39	6.25	0.26	0.00	
0.00											
7	Chan	128.09	155.12	54.44	190.50	27.04	11.48	7.05	0.29	0.00	
0.00											
8	Chan	155.12	182.16	74.29	231.04	27.48	15.66	8.55	0.32	0.00	
0.00											
9	Chan	182.16	209.19	96.32	268.23	27.03	20.30	9.92	0.36	0.00	
0.00											
10	Chan	209.19	236.22	88.42	262.15	29.02	18.64	9.70	0.34	0.00	
0.00											
11	ROB	236.22	267.51	31.07	153.58	31.35	6.55	4.91	0.20	0.00	
0.00											

12	ROB	267.51	298.79	18.05	110.82	31.31	3.80	3.54	0.16	0.00
0.00										
13	ROB	298.79	330.08	4.67	49.27	31.41	0.98	1.57	0.09	0.00
0.00										
14	ROB	330.08	361.36	0.01	0.70	4.38	0.00	0.16	0.02	0.00
0.00										

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	40.42	60.64	5.03	25.05	13.06	1.31	2.03	0.20	0.00	
0.00											
2	LOB	60.64	80.85	15.09	57.68	20.22	3.93	2.85	0.26	0.00	
0.00											
3	LOB	80.85	101.06	19.13	66.50	20.22	4.99	3.29	0.29	0.00	
0.00											
4	Chan	101.06	128.09	30.61	99.72	27.04	7.98	3.69	0.31	0.00	
0.00											
5	Chan	128.09	155.12	42.43	121.31	27.04	11.06	4.49	0.35	0.00	
0.00											
6	Chan	155.12	182.16	67.88	161.84	27.48	17.70	5.99	0.42	0.00	
0.00											
7	Chan	182.16	209.19	96.86	199.03	27.03	25.25	7.36	0.49	0.00	
0.00											
8	Chan	209.19	236.22	87.73	192.95	29.02	22.87	7.14	0.45	0.00	
0.00											
9	ROB	236.22	267.51	15.20	73.49	31.35	3.96	2.35	0.21	0.00	
0.00											
10	ROB	267.51	298.79	3.56	30.73	31.31	0.93	0.98	0.12	0.00	
0.00											
11	ROB	298.79	330.08	0.06	1.28	5.09	0.02	0.25	0.05	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	101.06	128.09	0.01	0.10	2.41	0.00	0.04	0.07	0.00	
0.00											
2	Chan	128.09	155.12	4.23	12.73	27.04	1.64	0.47	0.33	0.01	
0.00											
3	Chan	155.12	182.16	45.52	53.27	27.48	17.67	1.97	0.85	0.03	
0.02											

4	Chan	182.16	209.19	111.23	90.45	27.03	43.17	3.35	1.23	0.05
0.06										
5	Chan	209.19	236.22	96.64	84.55	28.19	37.51	3.19	1.14	0.04
0.05										

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.

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										
1	Chan	155.12	182.16	25.38	25.21	14.83	16.26	1.75	1.01	0.03
0.03										
2	Chan	182.16	209.19	69.75	58.80	27.03	44.68	2.18	1.19	0.04
0.05										
3	Chan	209.19	236.22	61.00	54.01	26.73	39.07	2.11	1.13	0.04
0.04										

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 CL
REACH: CHANNEL CL RS: 746.53

INPUT

Description: 6

Station	Elevation	Data	num=	113
Sta	Elev	Sta	Elev	Sta
0	443.41	.99	443.29	1.47
10.3	442.33	11.58	442.24	12.96
17.6	442.09	25.63	442.19	29.03
43.49	441.79	44.25	441.77	44.91
46.54	442.21	52.26	442.25	55.1
73.48	436.92	73.71	436.71	74.84
85.47	436.1	85.79	436.09	86.48
91.05	435.88	93.24	435.74	108.68
124.69	433.92	126.3	433.82	140.41
161.56	432.45	171.86	432.25	179.19
194.82	431.59	200.02	430.55	200.44
206.37	432.25	210.8	432.66	212.03
217.99	433.82	220.28	433.86	221.88
232.88	433.89	237.25	433.96	239.56

256.82	434.62	266.19	434.89	267.33	434.88	281.92	435.18	284.96	435.3
293.67	435.41	296.59	435.46	298.49	435.51	299.69	435.52	305.09	435.73
305.77	435.74	308.7	435.8	311.62	435.82	319.63	436.02	323.61	436.11
333.65	436.26	335.74	436.26	337.83	436.29	340.21	436.36	343.94	436.45
356.42	437.39	365.75	438.03	369.95	438.43	371.26	438.57	382.7	440.05
386.95	440.58	388.7	440.58	393.7	440.4	396.99	440.31	405.7	440.61
408.55	440.73	409.24	440.76	414.49	441.92	414.76	442	416.37	442.14
426.74	443	432.17	443.23	441.2	443.58	443.8	443.67	449.76	444
470.67	444.01	472.89	444.17	500.23	445.14				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	74.84	.035	323.61	.035

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

74.84	323.61	93.29	93.29	.1	.3
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CROSS SECTION OUTPUT Profile #100 YEAR

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	440.78				
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)		Flow Area (sq ft)	34.19	1663.93	207.76
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	34.19	1663.93	207.76
Q Total (cfs)	474.44	Flow (cfs)	4.02	442.35	28.08
Top Width (ft)	351.36	Top Width (ft)	16.86	248.77	85.73
Vel Total (ft/s)	0.25	Avg. Vel. (ft/s)	0.12	0.27	0.14
Max Chl Dpth (ft)	10.31	Hydr. Depth (ft)	2.03	6.69	2.42
Conv. Total (cfs)	268406.6	Conv. (cfs)	2272.0	250249.8	15884.8
Length Wtd. (ft)	93.29	Wetted Per. (ft)	17.46	249.56	85.96
Min Ch El (ft)	430.47	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.08	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	5.96	26.91	5.14
C & E Loss (ft)	0.00	Cum SA (acres)	1.63	2.88	1.51

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 OUTPUT Profile #50 YEAR

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	438.22				
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)		Flow Area (sq ft)	5.35	1027.00	61.14
E.G. Slope (ft/ft)	0.000011	Area (sq ft)	5.35	1027.00	61.14
Q Total (cfs)	383.56	Flow (cfs)	0.66	372.19	10.71
Top Width (ft)	299.11	Top Width (ft)	6.18	248.77	44.16
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)	0.12	0.36	0.18
Max Chl Dpth (ft)	7.75	Hydr. Depth (ft)	0.86	4.13	1.38

Conv. Total (cfs)	115389.6	Conv. (cfs)	199.8	111968.8	3220.9
Length Wtd. (ft)	93.29	Wetted Per. (ft)	6.48	249.56	44.23
Min Ch El (ft)	430.47	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.86	19.86	2.44
C & E Loss (ft)	0.00	Cum SA (acres)	1.36	2.88	1.08

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 OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.14	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)		Flow Area (sq ft)		157.73	
E.G. Slope (ft/ft)	0.001050	Area (sq ft)		157.73	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	121.20	Top Width (ft)		121.20	
Vel Total (ft/s)	1.63	Avg. Vel. (ft/s)		1.63	
Max Chl Dpth (ft)	3.67	Hydr. Depth (ft)		1.30	
Conv. Total (cfs)	7951.5	Conv. (cfs)		7951.5	
Length Wtd. (ft)	93.29	Wetted Per. (ft)		121.90	
Min Ch El (ft)	430.47	Shear (lb/sq ft)		0.08	
Alpha	1.00	Stream Power (lb/ft s)		0.14	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.35	8.84	0.34
C & E Loss (ft)	0.01	Cum SA (acres)	0.40	2.65	0.36

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 OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.33	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.61	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)	432.61	Flow Area (sq ft)		33.85	
E.G. Slope (ft/ft)	0.022819	Area (sq ft)		33.85	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	55.01	Top Width (ft)		55.01	
Vel Total (ft/s)	4.61	Avg. Vel. (ft/s)		4.61	
Max Chl Dpth (ft)	2.14	Hydr. Depth (ft)		0.62	
Conv. Total (cfs)	1033.6	Conv. (cfs)		1033.6	
Length Wtd. (ft)	93.29	Wetted Per. (ft)		55.48	
Min Ch El (ft)	430.47	Shear (lb/sq ft)		0.87	
Alpha	1.00	Stream Power (lb/ft s)		4.01	
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	0.12	4.42	0.09
C & E Loss (ft)	0.09	Cum SA (acres)	0.22	2.04	0.17

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

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

Warning: During 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.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	44.90	59.87	0.01	0.39	1.93	0.00	0.21	0.02	0.00	
0.00											
2	LOB	59.87	74.84	4.01	33.80	15.52	0.84	2.26	0.12	0.00	
0.00											
3	Chan	74.84	124.59	61.50	270.57	49.82	12.96	5.44	0.23	0.00	
0.00											
4	Chan	124.59	174.35	114.44	392.66	49.79	24.12	7.89	0.29	0.00	
0.00											
5	Chan	174.35	224.10	127.99	421.99	50.41	26.98	8.48	0.30	0.00	
0.00											
6	Chan	224.10	273.86	80.77	318.53	49.77	17.02	6.40	0.25	0.00	
0.00											
7	Chan	273.86	323.61	57.65	260.18	49.77	12.15	5.23	0.22	0.00	
0.00											
8	ROB	323.61	358.93	23.49	148.48	35.37	4.95	4.20	0.16	0.00	
0.00											
9	ROB	358.93	394.26	4.47	54.93	35.50	0.94	1.56	0.08	0.00	
0.00											
10	ROB	394.26	429.58	0.12	4.34	15.10	0.02	0.29	0.03	0.00	
0.00											

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

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	59.87	74.84	0.66	5.35	6.48	0.17	0.86	0.12	0.00	
0.00											

2	Chan	74.84	124.59	38.77	143.19	49.82	10.11	2.88	0.27	0.00
0.00										
3	Chan	124.59	174.35	108.39	265.27	49.79	28.26	5.33	0.41	0.00
0.00										
4	Chan	174.35	224.10	128.03	294.60	50.41	33.38	5.92	0.43	0.00
0.00										
5	Chan	224.10	273.86	62.79	191.14	49.77	16.37	3.84	0.33	0.00
0.00										
6	Chan	273.86	323.61	34.22	132.79	49.77	8.92	2.67	0.26	0.00
0.00										
7	ROB	323.61	358.93	10.51	58.04	35.37	2.74	1.64	0.18	0.00
0.00										
8	ROB	358.93	394.26	0.20	3.10	8.86	0.05	0.35	0.06	0.00
0.00										

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

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	74.84	124.59	0.10	0.36	3.33	0.04	0.11	0.28	0.01	
0.00											
2	Chan	124.59	174.35	88.63	62.19	49.79	34.40	1.25	1.43	0.08	
0.12											
3	Chan	174.35	224.10	167.37	91.53	50.41	64.97	1.84	1.83	0.12	
0.22											
4	Chan	224.10	273.86	1.53	3.65	18.38	0.59	0.20	0.42	0.01	
0.01											

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

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	124.59	174.35	8.47	4.14	19.13	5.43	0.22	2.05	0.31	
0.63											
2	Chan	174.35	224.10	147.66	29.71	36.35	94.57	0.83	4.97	1.16	
5.79											

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 conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: During 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 CL
REACH: CHANNEL CL RS: 653.24

INPUT

Description: 5

Station	Elevation	Data	num=	124						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	449.48	3.91	449.48	10.2	449.27	13.2	449.2	15.97	449.08	
17.05	448.96	17.7	448.85	18.35	448.75	20.14	448.52	20.47	448.43	
20.97	448.31	21.35	448.19	21.86	448.03	23.08	447.57	23.93	447.23	
24.26	446.86	24.43	446.66	25.44	446.6	36.35	446.03	42.75	445.8	
46.58	445.61	47.94	445.99	48.43	446.13	50.77	445.49	59.61	440.99	
63.85	439.11	67.15	437.55	68.98	436.66	69.42	436.24	73.73	436.28	
77.64	436.34	79.15	436.35	79.36	436.43	79.73	436.57	82.44	434.58	
82.95	434.19	83.69	433.78	95.07	433.68	111.3	433.67	112.81	433.68	
118.61	433.43	130.54	432.95	139.82	432.92	148.28	432.85	166.01	432.48	
169.58	432.43	188.33	432.34	193.1	432.29	193.34	431.83	194.23	431.78	
197.16	431.43	205.2	430.59	205.4	431.35	205.44	431.49	205.87	431.46	
210.61	431.16	215.44	430.82	216.33	430.62	218.69	430.03	220.47	430.79	
221.67	431.23	222.16	431.12	224.61	430.97	225.73	430.89	226.3	430.87	
230.1	430.93	236.95	431.02	242.26	431.1	245.01	431.13	249.08	431.21	
249.65	431.26	250.48	431.35	254.68	431.55	267.12	431.78	285.22	432.26	
286.7	430.59	287.58	429.65	287.66	429.56	288.83	429.28	289.94	429.05	
290.27	428.98	290.8	428.81	290.91	428.78	306.22	428.78	306.67	428.92	
307.3	429.29	312.11	432.08	312.93	432.57	313.3	432.6	313.64	432.62	
325.62	433.92	343.41	434.32	344.01	434.36	344.56	434.38	353.99	434.91	
354.78	434.96	370.36	435.4	375.72	435.7	380.42	435.99	387.5	436.55	
388.82	436.65	389.81	436.71	397.44	437.19	402.61	437.6	413.18	438.23	
413.47	438.25	414.29	438.29	421.5	438.59	422.51	438.64	431.62	440.97	
435.9	442.04	441.68	442.13	444.31	442.23	446.86	442.23	447.76	442.87	
448.08	442.89	449.89	443	454.28	443.44	465.66	444	466.97	444	
473.47	444.01	501.48	444.01	517.87	444.46	527.52	445			

Manning's	n	Values	num=	3		
Sta	n	Val	Sta	n	Val	
0	.035	82.44	.035	343.41	.035	

Bank	Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
	82.44	343.41	100.96	100.96	100.96		.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)		Flow Area (sq ft)	80.19	2256.19	357.88
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	80.19	2256.19	357.88
Q Total (cfs)	474.44	Flow (cfs)	8.07	425.12	41.25
Top Width (ft)	370.81	Top Width (ft)	22.36	260.97	87.48
Vel Total (ft/s)	0.18	Avg. Vel. (ft/s)	0.10	0.19	0.12
Max Chl Dpth (ft)	12.00	Hydr. Depth (ft)	3.59	8.65	4.09
Conv. Total (cfs)	445674.9	Conv. (cfs)	7580.2	399346.4	38748.3
Length Wtd. (ft)	100.96	Wetted Per. (ft)	24.13	265.04	87.88
Min Ch El (ft)	428.78	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	5.84	22.72	4.53
C & E Loss (ft)	0.00	Cum SA (acres)	1.59	2.33	1.32

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)		Flow Area (sq ft)	30.27	1588.07	148.41
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	30.27	1588.07	148.41
Q Total (cfs)	383.56	Flow (cfs)	2.98	363.55	17.04
Top Width (ft)	347.33	Top Width (ft)	16.71	260.97	69.64
Vel Total (ft/s)	0.22	Avg. Vel. (ft/s)	0.10	0.23	0.11
Max Chl Dpth (ft)	9.44	Hydr. Depth (ft)	1.81	6.09	2.13
Conv. Total (cfs)	234663.6	Conv. (cfs)	1822.2	222419.3	10422.1
Length Wtd. (ft)	100.96	Wetted Per. (ft)	17.93	265.04	69.76
Min Ch El (ft)	428.78	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.82	17.06	2.22
C & E Loss (ft)	0.00	Cum SA (acres)	1.34	2.33	0.95

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.15	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)		Flow Area (sq ft)		527.09	
E.G. Slope (ft/ft)	0.000051	Area (sq ft)		527.09	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	253.02	Top Width (ft)		253.02	
Vel Total (ft/s)	0.49	Avg. Vel. (ft/s)		0.49	
Max Chl Dpth (ft)	5.37	Hydr. Depth (ft)		2.08	

Conv. Total (cfs)	36128.0	Conv. (cfs)	36128.0		
Length Wtd. (ft)	100.96	Wetted Per. (ft)	256.94		
Min Ch El (ft)	428.78	Shear (lb/sq ft)	0.01		
Alpha	1.00	Stream Power (lb/ft s)	0.00		
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.35	8.11	0.34
C & E Loss (ft)	0.00	Cum SA (acres)	0.40	2.25	0.36

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 OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.19	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)		Flow Area (sq ft)		154.65	
E.G. Slope (ft/ft)	0.000404	Area (sq ft)		154.65	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	116.62	Top Width (ft)		116.62	
Vel Total (ft/s)	1.01	Avg. Vel. (ft/s)		1.01	
Max Chl Dpth (ft)	3.41	Hydr. Depth (ft)		1.33	
Conv. Total (cfs)	7768.5	Conv. (cfs)		7768.5	
Length Wtd. (ft)	100.96	Wetted Per. (ft)		120.16	
Min Ch El (ft)	428.78	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.03	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.12	4.22	0.09
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	1.86	0.17

Warning: Divided flow computed for this cross-section.

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.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										(lb/ft)
1	LOB	49.46	65.95	0.36	7.72	6.45	0.08	1.31	0.05	0.00
0.00										
2	LOB	65.95	82.44	7.71	72.47	17.68	1.62	4.40	0.11	0.00
0.00										
3	Chan	82.44	134.63	63.81	379.24	52.45	13.45	7.27	0.17	0.00
0.00										
4	Chan	134.63	186.83	77.70	425.98	52.20	16.38	8.16	0.18	0.00
0.00										
5	Chan	186.83	239.02	100.08	501.15	53.60	21.09	9.60	0.20	0.00
0.00										

6	Chan	239.02	291.22	95.58	487.16	53.51	20.15	9.33	0.20	0.00
0.00										
7	Chan	291.22	343.41	87.95	462.66	53.28	18.54	8.86	0.19	0.00
0.00										
8	ROB	343.41	380.23	27.59	207.53	36.86	5.81	5.64	0.13	0.00
0.00										
9	ROB	380.23	417.05	12.48	129.03	36.90	2.63	3.50	0.10	0.00
0.00										
10	ROB	417.05	453.88	1.18	21.32	14.11	0.25	1.54	0.06	0.00
0.00										

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	49.46	65.95	0.00	0.01	0.25	0.00	0.05	0.01	0.00	
0.00											
2	LOB	65.95	82.44	2.98	30.26	17.68	0.78	1.84	0.10	0.00	
0.00											
3	Chan	82.44	134.63	47.26	245.61	52.45	12.32	4.71	0.19	0.00	
0.00											
4	Chan	134.63	186.83	63.38	292.36	52.20	16.53	5.60	0.22	0.00	
0.00											
5	Chan	186.83	239.02	91.19	367.53	53.60	23.77	7.04	0.25	0.00	
0.00											
6	Chan	239.02	291.22	85.58	353.54	53.51	22.31	6.77	0.24	0.00	
0.00											
7	Chan	291.22	343.41	76.14	329.04	53.28	19.85	6.30	0.23	0.00	
0.00											
8	ROB	343.41	380.23	14.77	113.26	36.86	3.85	3.08	0.13	0.00	
0.00											
9	ROB	380.23	417.05	2.27	35.15	32.90	0.59	1.07	0.06	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	82.44	134.63	6.87	33.39	51.73	2.67	0.65	0.21	0.00	
0.00											
2	Chan	134.63	186.83	29.30	80.01	52.20	11.37	1.53	0.37	0.00	
0.00											
3	Chan	186.83	239.02	86.82	155.19	53.60	33.70	2.97	0.56	0.01	
0.01											

4	Chan	239.02	291.22	74.26	141.20	53.51	28.82	2.71	0.53	0.01
0.00										
5	Chan	291.22	343.41	60.39	117.30	45.90	23.44	2.62	0.51	0.01
0.00										

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

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft) (lb/ft
s)										
1	Chan	186.83	239.02	42.54	53.70	47.22	27.25	1.17	0.79	0.03
0.02										
2	Chan	239.02	291.22	23.73	39.00	50.95	15.20	0.79	0.61	0.02
0.01										
3	Chan	291.22	343.41	89.86	61.95	21.99	57.56	2.94	1.45	0.07
0.10										

Warning: Divided flow computed for this cross-section.

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 CL
REACH: CHANNEL CL RS: 552.28

INPUT

Description: 4

Station	Elevation	Data	num=	176						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	455.27	2.54	455.33	7.13	453.48	18.91	448.77	22.34	447.32	
24.58	446.27	27.79	444.7	30.29	443.57	30.64	443.5	30.79	443.52	
30.92	443.32	31.31	443.32	32.2	443.27	32.45	443.09	32.75	442.83	
35.07	442.77	35.92	442.77	36.57	442.75	37.95	442.73	43.78	442.56	
56.98	442.24	62.51	442.06	75.5	441.66	76.04	441.64	95.54	441.01	
95.77	441.05	95.97	441.09	97.79	441.41	104.15	441.19	105.72	441.1	
111.68	440.81	113.37	440.82	115.02	440.81	115.59	440.81	128.62	438.95	
128.96	438.65	129.49	438.64	133.16	438.52	141.12	438.21	142	438.16	
151.44	437.87	151.68	437.86	152.02	437.86	157.47	437.66	158.17	437.64	
160.9	437.48	170.18	436.92	171.58	436.86	172.56	436.75	172.93	436.72	
173.09	436.72	173.97	436.77	174.71	436.82	183.59	436.86	190.5	436.83	
190.57	436.92	191.05	437.43	192.49	437.09	196.2	436.29	199.31	434.74	
203.01	433.31	206.12	432.18	208.96	431.24	209.98	430.84	211.48	430.83	

228.37	430.75	243.86	430.27	247.41	430.21	252.15	430.15	266.46	430.15
285.5	429.91	296.54	429.71	304.54	429.61	320.45	430.2	320.82	430.22
321.1	429.65	321.27	429.64	332.24	428.61	332.49	429.58	332.77	429.6
332.97	429.61	333.52	429.65	339.6	430.06	342.14	429.77	342.51	429.7
344.72	429.29	345.85	429.96	346.25	430.17	350.08	430.23	358.83	430.42
360.96	430.47	363.68	430.51	370.93	430.68	377.59	430.93	379.77	431
381.38	431.03	382.22	431.08	386.96	431.26	387.83	431.29	395.01	431.65
396.39	431.69	397.98	431.74	411.38	431.96	420.87	432	425.77	432.03
435.35	432.14	436.87	432.17	441.74	432.4	449.58	432.72	454.55	432.95
456.88	433.17	474.11	434.07	474.66	434.11	475.33	434.13	475.92	434.16
477.49	434.27	478.63	434.36	481.89	434.6	487.34	434.98	489.41	435.14
491.26	435.24	495.71	435.58	497.5	435.69	514	436.87	515.62	436.93
525.39	437.7	526.05	437.75	529.73	437.99	533.04	438.16	534.47	438.23
546.13	439.24	552.09	439.84	555.33	440.13	571.34	441	572.16	441.09
575.37	441.47	580.01	442	583.02	442.36	589.11	443	591.57	443.23
591.84	443.24	592.19	443.26	593.11	443.32	601.23	443.91	601.82	443.95
601.94	443.96	602.66	444	611.38	444	613.55	443.96	613.75	443.96
615.87	443.92	618.01	443.97	622.35	443.95	623.35	443.94	624.89	443.94
627.58	443.92	629.96	443.91	630.1	443.91	631.93	443.93	632.88	443.93
636.52	443.96	640.09	443.98	647.34	444	647.66	444	649.02	444.07
652.32	444.6	654.84	445	655.4	445.07	655.59	445.09	666.8	446.31
690.12	449.76	696.75	450.33	700.93	450.66	725.95	452.98	732.4	453.47
734.58	453.61								

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	196.2	.035	497.5	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	196.2	497.5		101.03	101.03		.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)	234.20	2846.79	177.65
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	234.20	2846.79	177.65
Q Total (cfs)	474.44	Flow (cfs)	16.75	446.04	11.65
Top Width (ft)	451.56	Top Width (ft)	80.42	301.30	69.84
Vel Total (ft/s)	0.15	Avg. Vel. (ft/s)	0.07	0.16	0.07
Max Chl Dpth (ft)	12.17	Hydr. Depth (ft)	2.91	9.45	2.54
Conv. Total (cfs)	571160.2	Conv. (cfs)	20162.4	536970.1	14027.7
Length Wtd. (ft)	101.03	Wetted Per. (ft)	81.10	303.99	70.03
Min Ch El (ft)	428.61	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	5.47	16.80	3.91
C & E Loss (ft)	0.00	Cum SA (acres)	1.47	1.68	1.14

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)	52.29	2075.41	45.21
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	52.29	2075.41	45.21
Q Total (cfs)	383.56	Flow (cfs)	2.54	378.40	2.62
Top Width (ft)	393.52	Top Width (ft)	55.40	301.30	36.82
Vel Total (ft/s)	0.18	Avg. Vel. (ft/s)	0.05	0.18	0.06
Max Chl Dpth (ft)	9.61	Hydr. Depth (ft)	0.94	6.89	1.23
Conv. Total (cfs)	321423.2	Conv. (cfs)	2124.7	317100.8	2197.7
Length Wtd. (ft)	101.03	Wetted Per. (ft)	55.83	303.99	36.91
Min Ch El (ft)	428.61	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.73	12.82	1.99
C & E Loss (ft)	0.00	Cum SA (acres)	1.25	1.68	0.83

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.15	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)		871.04	
E.G. Slope (ft/ft)	0.000011	Area (sq ft)		871.04	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	274.97	Top Width (ft)		274.97	
Vel Total (ft/s)	0.30	Avg. Vel. (ft/s)		0.30	
Max Chl Dpth (ft)	5.54	Hydr. Depth (ft)		3.17	
Conv. Total (cfs)	79347.6	Conv. (cfs)		79347.6	
Length Wtd. (ft)	101.03	Wetted Per. (ft)		277.13	
Min Ch El (ft)	428.61	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.35	6.48	0.34
C & E Loss (ft)	0.00	Cum SA (acres)	0.40	1.63	0.36

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.19	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)		373.16	
E.G. Slope (ft/ft)	0.000052	Area (sq ft)		373.16	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	231.25	Top Width (ft)		231.25	
Vel Total (ft/s)	0.42	Avg. Vel. (ft/s)		0.42	
Max Chl Dpth (ft)	3.58	Hydr. Depth (ft)		1.61	
Conv. Total (cfs)	21685.9	Conv. (cfs)		21685.9	

Length Wtd. (ft)	101.03	Wetted Per. (ft)	233.01		
Min Ch El (ft)	428.61	Shear (lb/sq ft)	0.01		
Alpha	1.00	Stream Power (lb/ft s)	0.00		
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	3.61	0.09
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	1.46	0.17

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.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	78.48	117.72	0.00	0.27	1.96	0.00	0.14	0.01	0.00	
0.00											
2	LOB	117.72	156.96	4.80	85.62	39.48	1.01	2.18	0.06	0.00	
0.00											
3	LOB	156.96	196.20	11.95	148.31	39.66	2.52	3.78	0.08	0.00	
0.00											
4	Chan	196.20	256.46	90.00	578.42	61.33	18.97	9.60	0.16	0.00	
0.00											
5	Chan	256.46	316.72	111.87	654.51	60.27	23.58	10.86	0.17	0.00	
0.00											
6	Chan	316.72	376.98	108.04	647.20	61.74	22.77	10.74	0.17	0.00	
0.00											
7	Chan	376.98	437.24	82.39	544.83	60.28	17.37	9.04	0.15	0.00	
0.00											
8	Chan	437.24	497.50	53.74	421.84	60.37	11.33	7.00	0.13	0.00	
0.00											
9	ROB	497.50	544.92	11.27	161.80	47.54	2.37	3.41	0.07	0.00	
0.00											
10	ROB	544.92	592.33	0.39	15.85	22.49	0.08	0.71	0.02	0.00	
0.00											

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	117.72	156.96	0.08	4.44	16.17	0.02	0.27	0.02	0.00	
0.00											
2	LOB	156.96	196.20	2.45	47.85	39.66	0.64	1.22	0.05	0.00	
0.00											
3	Chan	196.20	256.46	76.27	424.14	61.33	19.89	7.04	0.18	0.00	
0.00											

4	Chan	256.46	316.72	101.58	500.23	60.27	26.48	8.30	0.20	0.00
0.00										
5	Chan	316.72	376.98	97.54	492.93	61.74	25.43	8.18	0.20	0.00
0.00										
6	Chan	376.98	437.24	67.24	390.55	60.28	17.53	6.48	0.17	0.00
0.00										
7	Chan	437.24	497.50	35.76	267.56	60.37	9.32	4.44	0.13	0.00
0.00										
8	ROB	497.50	544.92	2.62	45.21	36.91	0.68	1.23	0.06	0.00
0.00										

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	196.20	256.46	52.12	183.64	56.23	20.23	3.30	0.28	0.00	
0.00											
2	Chan	256.46	316.72	86.03	255.05	60.27	33.39	4.23	0.34	0.00	
0.00											
3	Chan	316.72	376.98	80.66	247.75	61.74	31.31	4.11	0.33	0.00	
0.00											
4	Chan	376.98	437.24	33.71	145.37	60.28	13.08	2.41	0.23	0.00	
0.00											
5	Chan	437.24	497.50	5.11	39.23	38.61	1.98	1.02	0.13	0.00	
0.00											

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	196.20	256.46	29.36	79.59	50.61	18.81	1.58	0.37	0.01	
0.00											
2	Chan	256.46	316.72	64.49	136.85	60.27	41.31	2.27	0.47	0.01	
0.00											
3	Chan	316.72	376.98	57.92	129.54	61.74	37.10	2.15	0.45	0.01	
0.00											
4	Chan	376.98	437.24	4.36	27.17	60.28	2.79	0.45	0.16	0.00	
0.00											

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

CROSS SECTION

RIVER: CHANNEL CL
 REACH: CHANNEL CL RS: 451.25

INPUT

Description: 3

Station Elevation Data		num=	130								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	445.3	75	445.3	75.1	436.83	150	436.83	155	436.73		
155.1	436.23	180.18	434.25	181.34	434.22	192.32	434.14	194.01	434.1		
194.77	434.32	195.79	434.62	196.19	434.57	196.71	434.46	197.12	433.95		
197.95	433.05	201.08	433.01	203.35	432.82	203.54	432.76	203.87	431.32		
205.88	431.36	208.77	431.39	209.31	431.37	209.84	431.39	216.13	429.52		
216.38	429.44	218.92	429.28	227.46	428.72	230.98	428.72	234.76	428.64		
250.51	428.48	257.41	428.6	275.74	429.28	276.89	429.32	277.18	428.8		
277.64	428.76	288.82	428.05	288.88	428.33	289.09	428.96	304.25	429.19		
308.49	429.32	323.64	429.67	331.92	429.91	337.58	430.03	352.27	430.43		
371.85	431.28	372.63	431.31	392.98	431.87	406.12	432.42	413.33	432.65		
423.88	433.17	433.69	433.57	440.4	433.89	454.04	434.61	471.77	435.78		
472.84	435.86	474.31	436.52	474.55	436.61	476.05	437.2	480.44	437.25		
482.28	437.24	483.3	437.23	483.96	437.25	488.33	436.88	488.94	436.95		
489.99	437.06	494.54	437.47	503.87	438.05	506.28	438.21	507.44	438.28		
509.29	438.38	510.17	438.43	512.23	438.56	515.1	438.81	516.75	438.82		
522.89	439.01	543.93	439.82	548.44	440	557.21	440.63	562.23	441		
567.24	441.41	575.54	442	577.61	442.26	583.19	442.8	584.28	442.92		
585.31	443	589.35	443.24	591.15	443.37	594.26	443.55	600.53	444		
603.6	444.16	613.18	445	615.57	445.35	617	445.54	618.36	445.71		
621.1	446	626.52	446.47	632.39	446.92	632.7	446.94	633.4	447		
635.58	447.24	637.42	447.4	638.07	447.47	638.52	447.52	639.16	447.61		
644.86	448	645.35	448.04	645.66	448.06	647.93	448.25	648.57	448.31		
649.4	448.39	650.57	448.53	652.63	448.78	653.31	448.86	654.35	449		
654.56	449	658.93	449.25	661.96	449.39	667.11	449.52	669.31	449.52		
670.89	449.51	671.9	449.49	674.12	449.45	676.98	449.39	680.94	449.33		
683.61	449.26	684.3	449.23	685.04	449.21	692.98	450.14	726.08	455.11		

Manning's n Values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	197.12	.035	433.69	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
197.12	433.69	87	87	87		.1	.3
Ineffective Flow		num=	2				
Sta L	Sta R	Elev	Permanent				
0	155	442	T				
726.08	726.08	442	T				

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
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Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	87.00	87.00	87.00
Crit W.S. (ft)		Flow Area (sq ft)	250.65	2474.49	427.62
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	566.81	2474.49	427.62
Q Total (cfs)	474.44	Flow (cfs)	28.53	412.02	33.89
Top Width (ft)	484.23	Top Width (ft)	122.07	236.57	125.59
Vel Total (ft/s)	0.15	Avg. Vel. (ft/s)	0.11	0.17	0.08
Max Chl Dpth (ft)	12.73	Hydr. Depth (ft)	5.95	10.46	3.40
Conv. Total (cfs)	573767.5	Conv. (cfs)	34497.9	498284.4	40985.3
Length Wtd. (ft)	87.00	Wetted Per. (ft)	42.94	239.55	126.07
Min Ch El (ft)	428.05	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.12	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	4.54	10.63	3.21
C & E Loss (ft)	0.00	Cum SA (acres)	1.23	1.06	0.91

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	87.00	87.00	87.00
Crit W.S. (ft)		Flow Area (sq ft)	142.82	1868.81	169.79
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	254.32	1868.81	169.79
Q Total (cfs)	383.56	Flow (cfs)	15.32	353.92	14.32
Top Width (ft)	431.40	Top Width (ft)	122.04	236.57	72.79
Vel Total (ft/s)	0.18	Avg. Vel. (ft/s)	0.11	0.19	0.08
Max Chl Dpth (ft)	10.17	Hydr. Depth (ft)	3.39	7.90	2.33
Conv. Total (cfs)	338228.6	Conv. (cfs)	13509.2	312088.2	12631.1
Length Wtd. (ft)	87.00	Wetted Per. (ft)	42.94	239.55	73.20
Min Ch El (ft)	428.05	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.09	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.37	8.24	1.75
C & E Loss (ft)	0.00	Cum SA (acres)	1.05	1.06	0.70

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.15	Reach Len. (ft)	87.00	87.00	87.00
Crit W.S. (ft)		Flow Area (sq ft)	0.09	906.13	3.49
E.G. Slope (ft/ft)	0.000008	Area (sq ft)	0.09	906.13	3.49
Q Total (cfs)	257.63	Flow (cfs)	0.00	257.45	0.18
Top Width (ft)	252.08	Top Width (ft)	3.82	236.57	11.69
Vel Total (ft/s)	0.28	Avg. Vel. (ft/s)	0.01	0.28	0.05
Max Chl Dpth (ft)	6.10	Hydr. Depth (ft)	0.02	3.83	0.30
Conv. Total (cfs)	93460.2	Conv. (cfs)	0.3	93393.6	66.2
Length Wtd. (ft)	87.00	Wetted Per. (ft)	3.92	239.55	11.71
Min Ch El (ft)	428.05	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.01	Stream Power (lb/ft s)	0.00	0.00	0.00

Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.35	4.42	0.34
C & E Loss (ft)	0.00	Cum SA (acres)	0.40	1.04	0.34

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.19	Reach Len. (ft)	87.00	87.00	87.00
Crit W.S. (ft)		Flow Area (sq ft)		469.54	
E.G. Slope (ft/ft)	0.000020	Area (sq ft)		469.54	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	196.95	Top Width (ft)		196.95	
Vel Total (ft/s)	0.33	Avg. Vel. (ft/s)		0.33	
Max Chl Dpth (ft)	4.14	Hydr. Depth (ft)		2.38	
Conv. Total (cfs)	35325.9	Conv. (cfs)		35325.9	
Length Wtd. (ft)	87.00	Wetted Per. (ft)		199.03	
Min Ch El (ft)	428.05	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	2.63	0.09
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.96	0.17

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.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										(lb/ft
1	LOB	38.75	77.50	0.00	9.58	6.35	0.00	3.91	0.00	0.00
0.00										
2	LOB	77.50	116.25	0.00	153.16	38.75	0.00	3.95	0.00	0.00
0.00										
3	LOB	116.25	155.00	0.00	153.41	38.75	0.00	3.96	0.00	0.00
0.00										
4	LOB	155.00	197.12	28.53	250.65	42.94	6.01	5.95	0.11	0.00
0.00										
5	Chan	197.12	244.43	85.10	512.37	49.18	17.94	10.83	0.17	0.00
0.00										
6	Chan	244.43	291.75	103.21	571.29	48.34	21.75	12.07	0.18	0.00
0.00										
7	Chan	291.75	339.06	93.57	534.12	47.33	19.72	11.29	0.18	0.00
0.00										
8	Chan	339.06	386.38	75.19	468.50	47.34	15.85	9.90	0.16	0.00
0.00										

9	Chan	386.38	433.69	54.95	388.19	47.35	11.58	8.20	0.14	0.00
0.00										
10	ROB	433.69	492.17	28.67	312.93	58.85	6.04	5.35	0.09	0.00
0.00										
11	ROB	492.17	550.65	5.19	111.98	58.56	1.09	1.91	0.05	0.00
0.00										
12	ROB	550.65	609.12	0.04	2.71	8.66	0.01	0.31	0.01	0.00
0.00										

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	38.75	77.50	0.00	3.35	3.79	0.00	1.39	0.00	0.00	
0.00											
2	LOB	77.50	116.25	0.00	53.95	38.75	0.00	1.39	0.00	0.00	
0.00											
3	LOB	116.25	155.00	0.00	54.20	38.75	0.00	1.40	0.00	0.00	
0.00											
4	LOB	155.00	197.12	15.32	142.82	42.94	3.99	3.39	0.11	0.00	
0.00											
5	Chan	197.12	244.43	73.96	391.24	49.18	19.28	8.27	0.19	0.00	
0.00											
6	Chan	244.43	291.75	94.53	450.16	48.34	24.65	9.51	0.21	0.00	
0.00											
7	Chan	291.75	339.06	83.05	412.99	47.33	21.65	8.73	0.20	0.00	
0.00											
8	Chan	339.06	386.38	62.23	347.37	47.34	16.22	7.34	0.18	0.00	
0.00											
9	Chan	386.38	433.69	40.14	267.06	47.35	10.47	5.64	0.15	0.00	
0.00											
10	ROB	433.69	492.17	14.15	163.22	58.85	3.69	2.79	0.09	0.00	
0.00											
11	ROB	492.17	550.65	0.17	6.58	14.35	0.04	0.46	0.03	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	155.00	197.12	0.00	0.09	3.92	0.00	0.02	0.01	0.00	
0.00											
2	Chan	197.12	244.43	55.29	198.70	49.18	21.46	4.20	0.28	0.00	
0.00											

3	Chan	244.43	291.75	86.22	257.62	48.34	33.47	5.44	0.33	0.00
0.00										
4	Chan	291.75	339.06	67.45	220.45	47.33	26.18	4.66	0.31	0.00
0.00										
5	Chan	339.06	386.38	37.42	154.83	47.34	14.53	3.27	0.24	0.00
0.00										
6	Chan	386.38	433.69	11.06	74.52	47.35	4.29	1.58	0.15	0.00
0.00										
7	ROB	433.69	492.17	0.18	3.49	11.71	0.07	0.30	0.05	0.00
0.00										

Warning: Divided flow computed for this cross-section.

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	197.12	244.43	36.72	111.34	41.77	23.52	2.73	0.33	0.00	
0.00											
2	Chan	244.43	291.75	64.01	164.74	48.34	41.00	3.48	0.39	0.00	
0.00											
3	Chan	291.75	339.06	42.39	127.57	47.33	27.15	2.70	0.33	0.00	
0.00											
4	Chan	339.06	386.38	12.72	61.95	47.34	8.14	1.31	0.21	0.00	
0.00											
5	Chan	386.38	433.69	0.29	3.94	14.26	0.18	0.28	0.07	0.00	
0.00											

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

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 363.69

INPUT

Description: 2

Station	Elevation	Data	num=	118						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	445.3	31	445.3	51	436.83	84	436.83	87	436.83	
163	436.83	167	435.82	167.5	434.97	185.24	434.08	189.37	433.86	
195.38	433.66	200.01	433.46	207	433.2	208.03	433.39	208.78	433.53	
216.19	432.02	217.09	431.82	217.54	431.8	220.94	431.69	221.58	431.66	
221.85	431.71	222.65	431.77	224.65	430.75	227.59	429.11	233.29	428.57	

239.08	428.13	258.32	427.72	272.48	427.78	283.27	428.22	290.5	428.4
299.29	427.85	302.1	427.68	302.27	428.38	302.35	428.6	303.46	428.6
322.32	428.56	343.23	428.69	350.41	428.82	372.68	429.59	394.94	430.64
399.83	430.88	417.21	431.84	428.14	432.34	439.48	432.92	456.44	433.86
461.74	434.06	481.31	435.13	484.01	435.27	484.74	435.32	485.84	435.43
486.93	435.53	488.22	435.64	501.28	436.85	503.27	436.93	504.06	436.98
505.22	437.04	506.98	437.1	512.16	437.39	528.83	437.98	529.36	438
533.78	438.46	536.67	438.65	538.21	438.79	538.8	438.85	540.65	438.98
540.92	438.98	542.72	439	548.64	439.69	550.14	440	550.36	440.03
552.21	440.2	557.26	441	558.99	441.16	561.48	441.29	562.88	441.37
564.39	441.44	566.33	441.55	569.36	441.74	573.21	442	575.05	442.18
578.21	442.52	579.67	442.69	584.16	443	586.66	443.25	587.02	443.3
587.55	443.37	588.21	443.43	588.81	443.47	592.53	443.85	594.88	443.91
596.53	443.99	597.23	444	597.83	444.02	615.03	445	615.79	445.02
622.49	445.24	624.2	445.29	625.67	445.33	628.08	445.42	635.63	445.74
640.93	445.98	641.55	445.98	642.44	446	644.51	446.12	645.68	446.18
651.09	446.52	654.38	446.72	658.8	447	664.08	447.29	674.34	447.65
679.42	447.87	681.12	447.9	683.32	448	732.06	452.61	732.57	452.63
741.43	454.02	745.65	454.62	751.62	455.34				

Manning's n Values	num=	3
Sta n Val	Sta n Val	Sta n Val
0 .035	208.78 .035	439.48 .035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
208.78	439.48	87.56	87.56	87.56	.1	.3	
Ineffective Flow	num=	2					
Sta L	Sta R	Elev	Permanent				
0	167	442	T				
751.62	751.62	442	T				

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)	282.78	2599.38	514.14
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	761.75	2599.38	514.14
Q Total (cfs)	474.44	Flow (cfs)	30.93	400.90	42.60
Top Width (ft)	514.22	Top Width (ft)	167.11	230.70	116.41
Vel Total (ft/s)	0.14	Avg. Vel. (ft/s)	0.11	0.15	0.08
Max Chl Dpth (ft)	13.10	Hydr. Depth (ft)	6.77	11.27	4.42
Conv. Total (cfs)	653098.2	Conv. (cfs)	42579.5	551871.6	58647.1
Length Wtd. (ft)	87.56	Wetted Per. (ft)	42.34	232.44	116.74
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.22	5.56	2.27
C & E Loss (ft)	0.00	Cum SA (acres)	0.94	0.59	0.67

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)	175.81	2008.72	242.64
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	341.63	2008.72	242.64
Q Total (cfs)	383.56	Flow (cfs)	18.58	346.06	18.92
Top Width (ft)	483.78	Top Width (ft)	161.07	230.70	92.02
Vel Total (ft/s)	0.16	Avg. Vel. (ft/s)	0.11	0.17	0.08
Max Chl Dpth (ft)	10.54	Hydr. Depth (ft)	4.21	8.71	2.64
Conv. Total (cfs)	398055.3	Conv. (cfs)	19284.3	359133.4	19637.6
Length Wtd. (ft)	87.56	Wetted Per. (ft)	42.34	232.44	92.19
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.11	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.78	4.37	1.33
C & E Loss (ft)	0.00	Cum SA (acres)	0.77	0.59	0.54

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.15	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)	13.07	1069.89	14.04
E.G. Slope (ft/ft)	0.000004	Area (sq ft)	13.07	1069.89	14.04
Q Total (cfs)	257.63	Flow (cfs)	0.73	256.05	0.85
Top Width (ft)	279.65	Top Width (ft)	24.99	230.70	23.96
Vel Total (ft/s)	0.23	Avg. Vel. (ft/s)	0.06	0.24	0.06
Max Chl Dpth (ft)	6.47	Hydr. Depth (ft)	0.52	4.64	0.59
Conv. Total (cfs)	126461.8	Conv. (cfs)	359.6	125685.3	416.9
Length Wtd. (ft)	87.56	Wetted Per. (ft)	25.04	232.44	23.99
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.03	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.34	2.45	0.32
C & E Loss (ft)	0.00	Cum SA (acres)	0.37	0.57	0.31

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.19	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)		626.59	
E.G. Slope (ft/ft)	0.000008	Area (sq ft)		626.59	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	209.49	Top Width (ft)		209.49	
Vel Total (ft/s)	0.25	Avg. Vel. (ft/s)		0.25	
Max Chl Dpth (ft)	4.51	Hydr. Depth (ft)		2.99	
Conv. Total (cfs)	54946.7	Conv. (cfs)		54946.7	

Length Wtd. (ft)	87.56	Wetted Per. (ft)	211.07		
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00		
Alpha	1.00	Stream Power (lb/ft s)	0.00		
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	1.53	0.09
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.55	0.17

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft) (lb/ft)
s)										
1	LOB	0.00	41.75	0.00	0.00	0.09	0.00	0.02	0.00	0.00
0.00										
2	LOB	41.75	83.50	0.00	146.90	42.55	0.00	3.52	0.00	0.00
0.00										
3	LOB	83.50	125.25	0.00	165.02	41.75	0.00	3.95	0.00	0.00
0.00										
4	LOB	125.25	167.00	0.00	167.04	41.88	0.00	4.00	0.00	0.00
0.00										
5	LOB	167.00	208.78	30.93	282.78	42.34	6.52	6.77	0.11	0.00
0.00										
6	Chan	208.78	254.92	76.92	511.70	47.04	16.21	11.09	0.15	0.00
0.00										
7	Chan	254.92	301.06	99.07	591.18	46.17	20.88	12.81	0.17	0.00
0.00										
8	Chan	301.06	347.20	90.31	562.49	46.85	19.04	12.19	0.16	0.00
0.00										
9	Chan	347.20	393.34	79.35	517.50	46.18	16.73	11.22	0.15	0.00
0.00										
10	Chan	393.34	439.48	55.25	416.52	46.20	11.64	9.03	0.13	0.00
0.00										
11	ROB	439.48	501.91	35.86	381.86	62.56	7.56	6.12	0.09	0.00
0.00										
12	ROB	501.91	564.34	6.74	132.27	54.18	1.42	2.45	0.05	0.00
0.00										

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft) (lb/ft)
s)										
1	LOB	41.75	83.50	0.00	47.54	36.07	0.00	1.33	0.00	0.00
0.00										
2	LOB	83.50	125.25	0.00	58.13	41.75	0.00	1.39	0.00	0.00
0.00										

3	LOB	125.25	167.00	0.00	60.15	41.88	0.00	1.44	0.00	0.00
0.00										
4	LOB	167.00	208.78	18.58	175.81	42.34	4.84	4.21	0.11	0.00
0.00										
5	Chan	208.78	254.92	65.56	393.56	47.04	17.09	8.53	0.17	0.00
0.00										
6	Chan	254.92	301.06	90.19	473.05	46.17	23.51	10.25	0.19	0.00
0.00										
7	Chan	301.06	347.20	80.48	444.36	46.85	20.98	9.63	0.18	0.00
0.00										
8	Chan	347.20	393.34	68.01	399.37	46.18	17.73	8.66	0.17	0.00
0.00										
9	Chan	393.34	439.48	41.83	298.39	46.20	10.90	6.47	0.14	0.00
0.00										
10	ROB	439.48	501.91	18.35	222.03	62.56	4.78	3.56	0.08	0.00
0.00										
11	ROB	501.91	564.34	0.57	20.61	29.62	0.15	0.70	0.03	0.00
0.00										

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	167.00	208.78	0.73	13.07	25.04	0.28	0.52	0.06	0.00	
0.00											
2	Chan	208.78	254.92	45.61	205.80	47.04	17.71	4.46	0.22	0.00	
0.00											
3	Chan	254.92	301.06	79.59	285.28	46.17	30.89	6.18	0.28	0.00	
0.00											
4	Chan	301.06	347.20	66.06	256.59	46.85	25.64	5.56	0.26	0.00	
0.00											
5	Chan	347.20	393.34	48.37	211.60	46.18	18.78	4.59	0.23	0.00	
0.00											
6	Chan	393.34	439.48	16.41	110.62	46.20	6.37	2.40	0.15	0.00	
0.00											
7	ROB	439.48	501.91	0.85	14.04	23.99	0.33	0.59	0.06	0.00	
0.00											

Profile #2 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
Power		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	208.78	254.92	27.68	119.62	40.33	17.73	3.02	0.23	0.00	
0.00											

2	Chan	254.92	301.06	56.96	194.69	46.17	36.49	4.22	0.29	0.00
0.00										
3	Chan	301.06	347.20	43.25	166.00	46.85	27.70	3.60	0.26	0.00
0.00										
4	Chan	347.20	393.34	25.79	121.01	46.18	16.52	2.62	0.21	0.00
0.00										
5	Chan	393.34	439.48	2.44	25.28	31.55	1.57	0.80	0.10	0.00
0.00										

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 298.22

INPUT

Description: 1

Station	Elevation	Data	num=	201						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	444.79	6.03	444.72	8.95	444.73	9.79	444.72	31.1	443.5	
31.2	443.49	31.42	443.49	44.91	443.01	60.92	442.62	67.04	442.57	
79.48	442.27	89.64	441.87	96.21	441.7	101.04	441.62	117.86	441.1	
118.95	441.07	120.56	441.02	127.55	440.82	138.77	440.56	139.27	440.54	
144.5	440.43	149.03	439.95	154.28	439.55	161.04	438.91	168.75	438.45	
170.91	438.5	178.97	438.37	188.25	438.17	191.18	437.99	191.45	437.95	
206.61	436.98	207.21	436.9	208.52	436.8	217.75	436.31	221.48	436.08	
222.61	435.99	223.75	435.96	236.84	435.87	237.71	435.87	238.81	435.86	
252.81	435.89	254.44	435.89	267.02	435.96	268.37	436.32	269.15	436.31	
269.37	436.27	270.25	436.28	273.12	436.15	273.33	436.14	274.12	435.85	
274.66	435.85	275.42	435.88	275.96	435.62	277.58	435.76	280.62	435.76	
281.27	435.86	282.5	435.83	283.96	435.66	285.34	435.77	286.78	435.69	
287.3	435.67	287.62	435.65	289.5	435.55	304.47	435.08	307.85	434.94	
308.46	434.97	311.9	434.9	312.31	434.68	313.06	434.66	325.34	433.87	
326.69	433.79	327.12	433.8	338.96	433.57	340.43	433.5	350.08	433.32	
351.3199	433.26	353.98	433.17	355.06	433.15	365.11	432.78	368.09	432.62	
369.72	432.71	375.33	432.72385	385.1299	432.41	386.4	432.39	389.43	432.32	
395.9	432.09	396.52	432.08	396.7	432.09	397.12	432.08	399.44	431.13	
402.12	429.66	403.16	429.13	403.69	428.88	403.81	428.85	403.92	428.82	
404.31	428.6	404.62	428.6	405.53	428.57	406	428.58	412.89	428.17	
413.69	428.11	417.02	428	418.8	427.96	419.53	427.94	420.44	428.07	
421.23	428.26	422.52	428.6	423.81	428.71	425.96	428.3	430.83	427.6	
437.3	427.5	442.06	427.46	450.55	427.81	455.02	428.1	466.34	427.5	
466.86	427.52	467.17	428.36	468.15	428.35	482.39	428.1	485.29	428.11	
503.41	428.3	506.93	428.4	507.7	428.45	528.99	429.38	530.95	429.54	
535.37	429.71	553.72	430.96	567.86	430.46	571.74	430.69	581.95	431.31	
593.05	432.26	594.56	432.22	594.71	432.22	594.85	432.23	595.98	432.33	
616.36	433.59	627.5	434.08	657.31	436.31	658.18	436.37	658.98	436.43	
681.2	438.07	681.7	438.1	682.21	438.14	686.77	438.77	695.24	439.35	
707.01	440.11	711.68	440.13	712.13	440.16	716.4	440.63	720.73	440.49	

729.47	440.91	735.81	441	736.28	441.03	736.47	441.04	739.73	441.26
748.1	441.79	751.3	442	754.26	442.2	766.31	443	770.14	443.36
771.74	443.47	776.04	443.81	776.9	443.88	778.63	444	781.12	444.22
785.35	444.52	786.99	444.65	791.68	445	795.99	445.4	801.59	445.93
802.56	446	809.6	446.43	813.81	446.71	814.58	446.77	818.6	447
829.58	447.73	834.66	448.1	841.93	449.13	854.54	449.83	856.2	449.9
856.39	449.91	857.18	450	866.49	450.93	867.15	451874.7599	451.66	
879.11	452	880.81	452	889.11	452.05	891.39	452.07	902.73	452.74
904.97	452.82	906.54	452.88	930	454.9	933.16	454.85	939.45	455.48
950.37	456.38	950.62	456.4	952.9	456.37	953.5	456.21	956.02	455.56
961.91	454.05								

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.035	395.9	.035
		553.72	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	395.9	553.72		27.07	27.07	.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	1300.89	1918.68	943.22
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	1300.89	1918.68	943.22
Q Total (cfs)	474.44	Flow (cfs)	106.00	285.72	82.72
Top Width (ft)	597.65	Top Width (ft)	266.74	157.82	173.10
Vel Total (ft/s)	0.11	Avg. Vel. (ft/s)	0.08	0.15	0.09
Max Chl Dpth (ft)	13.32	Hydr. Depth (ft)	4.88	12.16	5.45
Conv. Total (cfs)	710064.5	Conv. (cfs)	158638.2	427619.8	123806.6
Length Wtd. (ft)	27.07	Wetted Per. (ft)	267.23	159.52	173.50
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.25	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.14	1.02	0.81
C & E Loss (ft)	0.00	Cum SA (acres)	0.51	0.20	0.38

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	684.53	1514.61	569.78
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	684.53	1514.61	569.78
Q Total (cfs)	383.56	Flow (cfs)	58.66	265.13	59.77
Top Width (ft)	496.98	Top Width (ft)	210.07	157.82	129.09
Vel Total (ft/s)	0.14	Avg. Vel. (ft/s)	0.09	0.18	0.10
Max Chl Dpth (ft)	10.76	Hydr. Depth (ft)	3.26	9.60	4.41
Conv. Total (cfs)	417116.9	Conv. (cfs)	63793.4	288328.1	64995.4

Length Wtd. (ft)	27.07	Wetted Per. (ft)	210.48	159.52	129.37
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.25	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.74	0.83	0.52
C & E Loss (ft)	0.00	Cum SA (acres)	0.39	0.20	0.32

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.15	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	82.02	872.29	154.45
E.G. Slope (ft/ft)	0.000004	Area (sq ft)	82.02	872.29	154.45
Q Total (cfs)	257.63	Flow (cfs)	7.37	229.09	21.18
Top Width (ft)	307.52	Top Width (ft)	74.95	157.82	74.75
Vel Total (ft/s)	0.23	Avg. Vel. (ft/s)	0.09	0.26	0.14
Max Chl Dpth (ft)	6.69	Hydr. Depth (ft)	1.09	5.53	2.07
Conv. Total (cfs)	129265.4	Conv. (cfs)	3696.5	114944.0	10625.0
Length Wtd. (ft)	27.07	Wetted Per. (ft)	74.99	159.52	74.88
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.17	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.25	0.50	0.15
C & E Loss (ft)	0.00	Cum SA (acres)	0.27	0.18	0.21

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	432.19	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	0.14	562.37	43.81
E.G. Slope (ft/ft)	0.000007	Area (sq ft)	0.14	562.37	43.81
Q Total (cfs)	156.13	Flow (cfs)	0.00	150.61	5.52
Top Width (ft)	199.09	Top Width (ft)	2.77	157.82	38.50
Vel Total (ft/s)	0.26	Avg. Vel. (ft/s)	0.02	0.27	0.13
Max Chl Dpth (ft)	4.73	Hydr. Depth (ft)	0.05	3.56	1.14
Conv. Total (cfs)	57329.8	Conv. (cfs)	0.8	55303.9	2025.1
Length Wtd. (ft)	27.07	Wetted Per. (ft)	2.77	159.52	38.57
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	0.34	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.18	0.13

Profile #100 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
Power										

s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	79.18	158.36	0.29	16.66	29.26	0.06	0.57	0.02	0.00	
0.00											
2	LOB	158.36	237.54	15.32	268.68	79.28	3.23	3.39	0.06	0.00	
0.00											
3	LOB	237.54	316.72	30.84	409.12	79.45	6.50	5.17	0.08	0.00	
0.00											
4	LOB	316.72	395.90	59.54	606.43	79.23	12.55	7.66	0.10	0.00	
0.00											
5	Chan	395.90	427.46	54.05	374.54	32.53	11.39	11.87	0.14	0.00	
0.00											
6	Chan	427.46	459.03	64.75	412.71	31.62	13.65	13.08	0.16	0.00	
0.00											
7	Chan	459.03	490.59	61.12	401.40	32.16	12.88	12.72	0.15	0.00	
0.00											
8	Chan	490.59	522.16	58.43	387.86	31.58	12.32	12.29	0.15	0.00	
0.00											
9	Chan	522.16	553.72	47.37	342.17	31.62	9.99	10.84	0.14	0.00	
0.00											
10	ROB	553.72	635.36	70.14	693.96	81.79	14.78	8.50	0.10	0.00	
0.00											
11	ROB	635.36	717.00	12.57	247.51	81.88	2.65	3.03	0.05	0.00	
0.00											
12	ROB	717.00	798.63	0.01	1.76	9.83	0.00	0.18	0.01	0.00	
0.00											

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	158.36	237.54	3.31	74.43	51.79	0.86	1.44	0.04	0.00	
0.00											
2	LOB	237.54	316.72	13.62	206.39	79.45	3.55	2.61	0.07	0.00	
0.00											
3	LOB	316.72	395.90	41.73	403.70	79.23	10.88	5.10	0.10	0.00	
0.00											
4	Chan	395.90	427.46	49.54	293.73	32.53	12.92	9.31	0.17	0.00	
0.00											
5	Chan	427.46	459.03	61.89	331.90	31.62	16.13	10.52	0.19	0.00	
0.00											
6	Chan	459.03	490.59	57.75	320.58	32.16	15.06	10.16	0.18	0.00	
0.00											
7	Chan	490.59	522.16	54.40	307.04	31.58	14.18	9.73	0.18	0.00	
0.00											
8	Chan	522.16	553.72	41.55	261.35	31.62	10.83	8.28	0.16	0.00	
0.00											

9	ROB	553.72	635.36	55.41	484.94	81.79	14.45	5.94	0.11	0.00
0.00										
10	ROB	635.36	717.00	4.35	84.85	47.58	1.13	1.79	0.05	0.00
0.00										

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	316.72	395.90	7.37	82.02	74.99	2.86	1.09	0.09	0.00	
0.00											
2	Chan	395.90	427.46	40.87	165.27	32.53	15.87	5.24	0.25	0.00	
0.00											
3	Chan	427.46	459.03	58.89	203.44	31.62	22.86	6.45	0.29	0.00	
0.00											
4	Chan	459.03	490.59	52.93	192.12	32.16	20.54	6.09	0.28	0.00	
0.00											
5	Chan	490.59	522.16	47.43	178.58	31.58	18.41	5.66	0.27	0.00	
0.00											
6	Chan	522.16	553.72	28.96	132.89	31.62	11.24	4.21	0.22	0.00	
0.00											
7	ROB	553.72	635.36	21.18	154.45	74.88	8.22	2.07	0.14	0.00	
0.00											

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	316.72	395.90	0.00	0.14	2.77	0.00	0.05	0.02	0.00	
0.00											
2	Chan	395.90	427.46	25.12	103.28	32.53	16.09	3.27	0.24	0.00	
0.00											
3	Chan	427.46	459.03	43.24	141.45	31.62	27.70	4.48	0.31	0.00	
0.00											
4	Chan	459.03	490.59	37.21	130.13	32.16	23.83	4.12	0.29	0.00	
0.00											
5	Chan	490.59	522.16	31.36	116.60	31.58	20.09	3.69	0.27	0.00	
0.00											
6	Chan	522.16	553.72	13.68	70.91	31.62	8.76	2.25	0.19	0.00	
0.00											
7	ROB	553.72	635.36	5.52	43.81	38.57	3.53	1.14	0.13	0.00	
0.00											

CROSS SECTION

RIVER: CHANNEL CL
 REACH: CHANNEL CL RS: 271.15

INPUT

Description:

Station	Elevation	Data	num=	318						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	445.02	8.83	444.52	11.85	444.34	33.46	443.13	35.07	443.02	
38.65	442.82	55.08	442.26	68.47	441.75	83.85	441.07	91.89	440.86	
98.31	440.67	105.08	440.49	111.56	440.37	116.28	440.18	117.13	440.18	
118.59	440.17	119.69	440.17	120.38	440.16	123.92	439.78	124.17	439.91	
125.18	439.91	125.86	439.89	126.33	439.83	134.23	439.62	137.22	439.52	
138.59	439.46	147.08	439.21	150.99	438.95	152.53	438.89	154.1	438.82	
157.37	438.65	157.89	438.61	158.06	438.6	158.46	438.58	159	438.54	
159.16	438.55	163.15	438.52	165.18	438.48	174.14	438	183.95	437.45	
184.39	437.45	185.98	437.35	187.75	437.19	206.38	435.89	217.58	434.9	
223.5	434.31	227.99	433.77	247.4	432	248.25	431.91	250	431.82	
263.28	431.32	271.22	431.05	274.18	431.12	277.22	430.84	285.67	430.58	
292.83	430.44	307.04	430.19	308.63	430.16	314.48	430.12	319.78	429.98	
324.1	429.92	326.55	429.87	331.62	429.75	335.98	429.75	336.34	429.77	
336.86	429.76	350.06	429.7	357.67	429.49	359.73	429.49	361.3	429.47	
366.68	429.37	371.71	429.33	378.14	429.2	378.41	429.2	386.02	429.08	
388.2	429.09	396.29	429.02	397.33	429.05	398.03	429.04	398.42	429.05	
401.42	428.91	418.53	428.23	420.1	428.17	425.04	427.96	426.67	427.91	
428.31	427.85	429.96	427.8	431.61	427.74	433.25	427.69	436.64	427.57	
438.24	427.56	446.95	426.72	447.66	426.72	452.49	426.72	453.59	426.72	
455	426.72	458.1	426.72	463.13	427.37	464.47	427.57	467.19	427.95	
468.56	428.15	469.22	428.33	469.69	428.46	471.1	428.65	471.32	428.69	
472.22	428.93	472.5	429	472.85	429.09	473.91	429.24	476.53	429.62	
477.75	429.79	478.7	429.93	479.23	429.96	483.34	430.2	484.1	430.24	
488.31	430.48	488.93	430.43	492.69	430.11	504.7	430.14	510.78	430.36	
510.93	430.4	514.04	431.24	515.62	431.67	522.06	431.86	524.37	431.77	
525.38	431.72	525.8	431.69	527.17	431.58	528.61	431.47	529.87	431.37	
530.06	431.37	531.55	431.34	533.08	431.3	533.96	431.42	537.47	431.34	
540.39	431.44	542.74	431.37	543.81	431.34	544.27	431.36	545.8	431.41	
547.39	431.47	548.81	431.52	549	431.52	549.42	431.54	550.62	431.58	
553.88	431.72	554.15	431.73	555.52	431.85	556.11	431.91	558.09	431.99	
558.67	431.98	561.9	432.28	563.52	432.44	565.28	432.6	566.78	432.66	
568.38	432.71	569.5	432.75	569.97	432.76	571.92	432.85	573.65	432.9	
576.8	433	578.73	433.11	580.39	433.15	581.8	433.18	582.04	433.19	
588.52	433.35	591.25	433.28	593.14	433.32	595.03	433.37	597.71	433.61	
602.41	433.73	604.13	433.72	608.49	434.04	609.42	434.11	609.97	434.13	
611.4299	434.19	615.75	434.34	622.25	434.77	625.33	434.89	626.85	434.94	
628.36	435.630	3199	435.01	634.26	435.58	635.7	435.8	637.14	436.01	
638.01	436.14638	5699	436.19	639.99	436.31	641.4	436.44	643.79	436.42	
645.5599	436.58	648.08	436.78	653.28	437.24	653.52	437.26	655.37	437.42	
657.13	437.36	662.25	437.29	666.09	437.54673	1899	438.06	675.72	438.24	

677.5599	438.38	679.4	438.51	684.7	439.24	685.97	439.34	687.24	439.43
687.89	439.48	688.49	439.53	690.97	439.71	692.99	439.83	694.62	439.95
698.1899	440.22698	8199	440.27	699.36	440.3	700.52	440.36	701.67	440.43
702.8199	440.49	709.39	440.53	711.2	440.63	717.45	441.32	718.61	441.38
719.77	441.45	722.05	441.58	722.5	441.6	723.18	441.68	725.41	441.92
726.75	442.06728	6899	442.19	729.76	442.26	731.89	442.38	735.47	442.26
738.76	442.47	743.53	442.74	745.1	442.82	749.37	443.45	750.45	443.51
751.52	443.58752	5699	443.64	753.43	443.67	754.67	443.77	755.7	443.84
757.75	443.96	758.77	444.03	762.8	443.88	764.35	443.98	765.88	444.07
772.34	444.93	776.2	445.17	777.5	445.23	779.03	445.37	780.88	445.51
790.39	446.42	791.28	446.48	793.04	446.62	794.49	446.62	795.63	446.86
796.48	446.98797	3199	447.09	798.16	447.21	798.99	447.32	809.68	448.15
810.62	448.28	812.47	448.52813	8199	448.69	815.2	448.7	819.64	448.95
834.03	449.85	834.96	449.9	835.88	449.96	837.72	450.06	839.73	450.23
841.33	450.42	842.18	450.55	843.12	450.67	843.28	450.68	843.51	450.69
843.92	450.69	845.71	450.73853	9399	451.09	855.52	451.12	858.73	451.3
860.14	451.33	861.18	451.36	861.55	451.36	867.13	451.44	872.83	451.33
875.09	451.36876	3199	451.42	877.31	451.44	879.49	451.56	891.68	452.18
892.3	452.21	892.91	452.25	894.13	452.31	894.65	452.35	895.33	452.36
895.93	452.38	896.52	452.44	897.21	452.46	897.91	452.49	899.98	452.55
917.78	453.59	918.41	453.61	918.95	453.64921	2599	453.76921	7599	453.79
922.59	453.83	930.73	454.59931	5099	454.61	952.83	455.46	954.28	455.59
954.86	454.96	958.55	453.7	960.77	453.19	961.83	453.16	966.59	453.23
967.62	453.25	968.67	453.23	971.85	453.19				

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	396.29	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	396.29	472.22		85.87	85.87	.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

		Left OB	Channel	Right OB
E.G. Elev (ft)	440.78	Element	0.035	0.035
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	85.87	85.87
Crit W.S. (ft)	428.83	Flow Area (sq ft)	2089.29	1585.16
E.G. Slope (ft/ft)	0.000000	Area (sq ft)	2089.29	1585.16
Q Total (cfs)	474.44	Flow (cfs)	193.77	142.18
Top Width (ft)	618.08	Top Width (ft)	301.79	240.36
Vel Total (ft/s)	0.10	Avg. Vel. (ft/s)	0.09	0.09
Max Chl Dpth (ft)	14.06	Hydr. Depth (ft)	6.92	6.59
Conv. Total (cfs)	788175.4	Conv. (cfs)	321903.4	236193.4
Length Wtd. (ft)	85.87	Wetted Per. (ft)	302.21	241.09
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00
Alpha	1.13	Stream Power (lb/ft s)	0.00	0.00
Frcn Loss (ft)		Cum Volume (acre-ft)	0.09	0.02
C & E Loss (ft)		Cum SA (acres)	0.33	0.25

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	85.87	85.87	85.87
Crit W.S. (ft)	428.65	Flow Area (sq ft)	1421.59	789.88	1026.79
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	1421.59	789.88	1026.79
Q Total (cfs)	383.56	Flow (cfs)	159.77	124.10	99.69
Top Width (ft)	505.48	Top Width (ft)	226.30	75.93	203.25
Vel Total (ft/s)	0.12	Avg. Vel. (ft/s)	0.11	0.16	0.10
Max Chl Dpth (ft)	11.50	Hydr. Depth (ft)	6.28	10.40	5.05
Conv. Total (cfs)	492818.9	Conv. (cfs)	205285.1	159445.2	128088.6
Length Wtd. (ft)	85.87	Wetted Per. (ft)	226.62	76.19	203.86
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.12	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.09	0.12	0.02
C & E Loss (ft)		Cum SA (acres)	0.26	0.13	0.21

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.15	Reach Len. (ft)	85.87	85.87	85.87
Crit W.S. (ft)	428.33	Flow Area (sq ft)	625.38	480.86	333.95
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	625.38	480.86	333.95
Q Total (cfs)	257.63	Flow (cfs)	102.47	113.65	41.51
Top Width (ft)	385.71	Top Width (ft)	171.48	75.93	138.30
Vel Total (ft/s)	0.18	Avg. Vel. (ft/s)	0.16	0.24	0.12
Max Chl Dpth (ft)	7.43	Hydr. Depth (ft)	3.65	6.33	2.41
Conv. Total (cfs)	158056.7	Conv. (cfs)	62866.6	69722.6	25467.5
Length Wtd. (ft)	85.87	Wetted Per. (ft)	171.64	76.19	138.71
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.18	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.03	0.08	0.00
C & E Loss (ft)		Cum SA (acres)	0.19	0.11	0.14

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	432.19	Reach Len. (ft)	85.87	85.87	85.87
Crit W.S. (ft)	428.01	Flow Area (sq ft)	307.95	331.74	113.94
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	307.95	331.74	113.94
Q Total (cfs)	156.13	Flow (cfs)	51.06	91.22	13.85
Top Width (ft)	315.58	Top Width (ft)	150.96	75.93	88.70
Vel Total (ft/s)	0.21	Avg. Vel. (ft/s)	0.17	0.27	0.12
Max Chl Dpth (ft)	5.47	Hydr. Depth (ft)	2.04	4.37	1.28

Conv. Total (cfs)	64280.0	Conv. (cfs)	21023.5	37555.3	5701.2
Length Wtd. (ft)	85.87	Wetted Per. (ft)	151.02	76.19	89.04
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.27	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.03	0.06	0.00
C & E Loss (ft)		Cum SA (acres)	0.17	0.11	0.09

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	79.26	158.52	1.28	61.57	64.10	0.27	0.96	0.02	0.00	
0.00											
2	LOB	158.52	237.77	21.06	360.08	79.49	4.44	4.54	0.06	0.00	
0.00											
3	LOB	237.77	317.03	75.53	774.31	79.34	15.92	9.77	0.10	0.00	
0.00											
4	LOB	317.03	396.29	95.91	893.33	79.27	20.21	11.27	0.11	0.00	
0.00											
5	Chan	396.29	411.48	24.27	181.82	15.20	5.12	11.97	0.13	0.00	
0.00											
6	Chan	411.48	426.66	26.34	190.98	15.20	5.55	12.58	0.14	0.00	
0.00											
7	Chan	426.66	441.85	28.34	199.62	15.21	5.97	13.14	0.14	0.00	
0.00											
8	Chan	441.85	457.03	31.41	212.30	15.21	6.62	13.98	0.15	0.00	
0.00											
9	Chan	457.03	472.22	28.13	199.58	15.37	5.93	13.14	0.14	0.00	
0.00											
10	ROB	472.22	572.15	99.72	968.12	100.30	21.02	9.69	0.10	0.00	
0.00											
11	ROB	572.15	672.07	41.28	569.94	100.15	8.70	5.70	0.07	0.00	
0.00											
12	ROB	672.07	772.00	1.18	47.10	40.63	0.25	1.16	0.03	0.00	
0.00											

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	158.52	237.77	8.46	159.80	68.01	2.20	2.36	0.05	0.00	
0.00											
2	LOB	237.77	317.03	63.80	571.39	79.34	16.63	7.21	0.11	0.00	
0.00											

3	LOB	317.03	396.29	87.51	690.40	79.27	22.82	8.71	0.13	0.00
0.00										
4	Chan	396.29	411.48	21.00	142.94	15.20	5.47	9.41	0.15	0.00
0.00										
5	Chan	411.48	426.66	23.29	152.10	15.20	6.07	10.02	0.15	0.00
0.00										
6	Chan	426.66	441.85	25.52	160.73	15.21	6.65	10.58	0.16	0.00
0.00										
7	Chan	441.85	457.03	28.96	173.42	15.21	7.55	11.42	0.17	0.00
0.00										
8	Chan	457.03	472.22	25.33	160.70	15.37	6.60	10.58	0.16	0.00
0.00										
9	ROB	472.22	572.15	79.39	712.28	100.30	20.70	7.13	0.11	0.00
0.00										
10	ROB	572.15	672.07	20.30	314.10	100.15	5.29	3.14	0.06	0.00
0.00										
11	ROB	672.07	772.00	0.00	0.41	3.41	0.00	0.12	0.01	0.00
0.00										

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	158.52	237.77	0.44	8.72	13.03	0.17	0.67	0.05	0.00	
0.00											
2	LOB	237.77	317.03	34.95	248.82	79.34	13.57	3.14	0.14	0.00	
0.00											
3	LOB	317.03	396.29	67.09	367.84	79.27	26.04	4.64	0.18	0.00	
0.00											
4	Chan	396.29	411.48	17.05	81.13	15.20	6.62	5.34	0.21	0.00	
0.00											
5	Chan	411.48	426.66	20.37	90.29	15.20	7.91	5.95	0.23	0.00	
0.00											
6	Chan	426.66	441.85	23.71	98.93	15.21	9.20	6.51	0.24	0.00	
0.00											
7	Chan	441.85	457.03	28.99	111.61	15.21	11.25	7.35	0.26	0.00	
0.00											
8	Chan	457.03	472.22	23.53	98.89	15.37	9.13	6.51	0.24	0.00	
0.00											
9	ROB	472.22	572.15	40.07	305.60	100.30	15.55	3.06	0.13	0.00	
0.00											
10	ROB	572.15	672.07	1.44	28.35	38.41	0.56	0.74	0.05	0.00	
0.00											

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	237.77	317.03	11.29	95.77	71.75	7.23	1.34	0.12	0.00	
0.00											
2	LOB	317.03	396.29	39.78	212.18	79.27	25.48	2.68	0.19	0.00	
0.00											
3	Chan	396.29	411.48	11.76	51.31	15.20	7.53	3.38	0.23	0.00	
0.00											
4	Chan	411.48	426.66	15.46	60.47	15.20	9.90	3.98	0.26	0.00	
0.00											
5	Chan	426.66	441.85	19.30	69.11	15.21	12.36	4.55	0.28	0.00	
0.00											
6	Chan	441.85	457.03	25.56	81.79	15.21	16.37	5.39	0.31	0.00	
0.00											
7	Chan	457.03	472.22	19.15	69.07	15.37	12.26	4.55	0.28	0.00	
0.00											
8	ROB	472.22	572.15	13.85	113.94	89.04	8.87	1.28	0.12	0.00	
0.00											

CULVERT

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 271.10

INPUT

Description:

Distance from Upstream XS = 41

Deck/Roadway Width = 20

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 44

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	441.7				31.2	441.5				33	441.5			
80.7	441.4				88.7	441.3				162.5	441.2			
167.8	441.2				168.9	441.2				207.2	441.1			
255.8	441.2				256.1	441.2				260.1	441.3			
307.8	441.3				361.6	441.7				425.4	442			
470	442.6				470	442.6				471.5	442.6			
483.9	442.7				527.6	443.1				531.3	443.2			
565.4	443.7				570.6	443.8				581.7	444			
583.1	444.1				640.4	445.2				645.6	445.2			
647.7	445.3				653.9	445.1				654.3	445			
661.6	445				663.5	445				681	445.1			
682.5	445.1				688.5	445.8				689.5	445.8			
693.6	446				695.6	446				727.2	446.2			
735	446.4				744.3	446.8				744.8	446.9			

746	447	772.7	447						
Upstream Bridge Cross Section Data									
Station Elevation Data		num=		318					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	445.02	8.83	444.52	11.85	444.34	33.46	443.13	35.07	443.02
38.65	442.82	55.08	442.26	68.47	441.75	83.85	441.07	91.89	440.86
98.31	440.67	105.08	440.49	111.56	440.37	116.28	440.18	117.13	440.18
118.59	440.17	119.69	440.17	120.38	440.16	123.92	439.78	124.17	439.91
125.18	439.91	125.86	439.89	126.33	439.83	134.23	439.62	137.22	439.52
138.59	439.46	147.08	439.21	150.99	438.95	152.53	438.89	154.1	438.82
157.37	438.65	157.89	438.61	158.06	438.6	158.46	438.58	159	438.54
159.16	438.55	163.15	438.52	165.18	438.48	174.14	438	183.95	437.45
184.39	437.45	185.98	437.35	187.75	437.19	206.38	435.89	217.58	434.9
223.5	434.31	227.99	433.77	247.4	432	248.25	431.91	250	431.82
263.28	431.32	271.22	431.05	274.18	431.12	277.22	430.84	285.67	430.58
292.83	430.44	307.04	430.19	308.63	430.16	314.48	430.12	319.78	429.98
324.1	429.92	326.55	429.87	331.62	429.75	335.98	429.75	336.34	429.77
336.86	429.76	350.06	429.7	357.67	429.49	359.73	429.49	361.3	429.47
366.68	429.37	371.71	429.33	378.14	429.2	378.41	429.2	386.02	429.08
388.2	429.09	396.29	429.02	397.33	429.05	398.03	429.04	398.42	429.05
401.42	428.91	418.53	428.23	420.1	428.17	425.04	427.96	426.67	427.91
428.31	427.85	429.96	427.8	431.61	427.74	433.25	427.69	436.64	427.57
438.24	427.56	446.95	426.72	447.66	426.72	452.49	426.72	453.59	426.72
455	426.72	458.1	426.72	463.13	427.37	464.47	427.57	467.19	427.95
468.56	428.15	469.22	428.33	469.69	428.46	471.1	428.65	471.32	428.69
472.22	428.93	472.5	429	472.85	429.09	473.91	429.24	476.53	429.62
477.75	429.79	478.7	429.93	479.23	429.96	483.34	430.2	484.1	430.24
488.31	430.48	488.93	430.43	492.69	430.11	504.7	430.14	510.78	430.36
510.93	430.4	514.04	431.24	515.62	431.67	522.06	431.86	524.37	431.77
525.38	431.72	525.8	431.69	527.17	431.58	528.61	431.47	529.87	431.37
530.06	431.37	531.55	431.34	533.08	431.3	533.96	431.42	537.47	431.34
540.39	431.44	542.74	431.37	543.81	431.34	544.27	431.36	545.8	431.41
547.39	431.47	548.81	431.52	549	431.52	549.42	431.54	550.62	431.58
553.88	431.72	554.15	431.73	555.52	431.85	556.11	431.91	558.09	431.99
558.67	431.98	561.9	432.28	563.52	432.44	565.28	432.6	566.78	432.66
568.38	432.71	569.5	432.75	569.97	432.76	571.92	432.85	573.65	432.9
576.8	433	578.73	433.11	580.39	433.15	581.8	433.18	582.04	433.19
588.52	433.35	591.25	433.28	593.14	433.32	595.03	433.37	597.71	433.61
602.41	433.73	604.13	433.72	608.49	434.04	609.42	434.11	609.97	434.13
611.4299	434.19	615.75	434.34	622.25	434.77	625.33	434.89	626.85	434.94
628.36	435.630	3199	435.01	634.26	435.58	635.7	435.8	637.14	436.01
638.01	436.14638	5699	436.19	639.99	436.31	641.4	436.44	643.79	436.42
645.5599	436.58	648.08	436.78	653.28	437.24	653.52	437.26	655.37	437.42
657.13	437.36	662.25	437.29	666.09	437.54673	1899	438.06	675.72	438.24
677.5599	438.38	679.4	438.51	684.7	439.24	685.97	439.34	687.24	439.43
687.89	439.48	688.49	439.53	690.97	439.71	692.99	439.83	694.62	439.95
698.1899	440.22698	8199	440.27	699.36	440.3	700.52	440.36	701.67	440.43
702.8199	440.49	709.39	440.53	711.2	440.63	717.45	441.32	718.61	441.38
719.77	441.45	722.05	441.58	722.5	441.6	723.18	441.68	725.41	441.92

726.75	442.06728.6899	442.19	729.76	442.26	731.89	442.38	735.47	442.26
738.76	442.47 743.53	442.74	745.1	442.82	749.37	443.45	750.45	443.51
751.52	443.58752.5699	443.64	753.43	443.67	754.67	443.77	755.7	443.84
757.75	443.96 758.77	444.03	762.8	443.88	764.35	443.98	765.88	444.07
772.34	444.93 776.2	445.17	777.5	445.23	779.03	445.37	780.88	445.51
790.39	446.42 791.28	446.48	793.04	446.62	794.49	446.62	795.63	446.86
796.48	446.98797.3199	447.09	798.16	447.21	798.99	447.32	809.68	448.15
810.62	448.28 812.47	448.52813.8199	448.69	815.2	448.7	819.64	448.95	
834.03	449.85 834.96	449.9	835.88	449.96	837.72	450.06	839.73	450.23
841.33	450.42 842.18	450.55	843.12	450.67	843.28	450.68	843.51	450.69
843.92	450.69 845.71	450.73853.9399	451.09	855.52	451.12	858.73	451.3	
860.14	451.33 861.18	451.36	861.55	451.36	867.13	451.44	872.83	451.33
875.09	451.36876.3199	451.42	877.31	451.44	879.49	451.56	891.68	452.18
892.3	452.21 892.91	452.25	894.13	452.31	894.65	452.35	895.33	452.36
895.93	452.38 896.52	452.44	897.21	452.46	897.91	452.49	899.98	452.55
917.78	453.59 918.41	453.61	918.95	453.64921.2599	453.76921.7599	453.79		
922.59	453.83 930.73	454.59931.5099	454.61	952.83	455.46	954.28	455.59	
954.86	454.96 958.55	453.7	960.77	453.19	961.83	453.16	966.59	453.23
967.62	453.25 968.67	453.23	971.85	453.19				

Manning's n Values	num=	3
Sta n Val Sta n Val Sta n Val		
0 .035 396.29 .035 472.22 .035		

Bank Sta: Left Right Coeff Contr. Expan.		
396.29 472.22 .1 .3		

Downstream Deck/Roadway Coordinates		
num=	44	
Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord		
0 441.7 31.2 441.5 33 441.5		
80.7 441.4 88.7 441.3 162.5 441.2		
167.8 441.2 168.9 441.2 207.2 441.1		
255.8 441.2 256.1 441.2 260.1 441.3		
307.8 441.3 361.6 441.7 425.4 442		
470 442.6 470 442.6 471.5 442.6		
483.9 442.7 527.6 443.1 531.3 443.2		
565.4 443.7 570.6 443.8 581.7 444		
583.1 444.1 640.4 445.2 645.6 445.2		
647.7 445.3 653.9 445.1 654.3 445		
661.6 445 663.5 445 681 445.1		
682.5 445.1 688.5 445.8 689.5 445.8		
693.6 446 695.6 446 727.2 445		
735 446.4 744.3 446.8 744.8 446.9		
746 447 772.7 447		

Downstream Bridge Cross Section Data		
Station Elevation Data num=	136	
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev		
0 438.56 .52 438.56 3.47 438.91 5.21 439.19 5.79 439.22		

6.48	439.32	7.21	439.46	9.39	439.96	10.42	439.82	11.63	439.77
14.17	439.74	17.5	439.52	19.9	439.42	24.64	439.38	24.96	439.38
25.88	439.13	27.29	438.8	27.83	438.68	28.27	438.67	29.58	438.67
29.69	438.66	30.47	438.66	31.7	438.68	33.39	438.68	41.29	438.65
43.2	438.65	43.72	438.68	44.98	438.66	46.27	438.66	57.69	438.34
61.78	438.21	67.52	438.1	79.03	438.11	79.79	438.08	83.19	438.05
83.67	438.06	83.87	438.05	85.26	437.99	97.34	437.33	98.1	437.3
99.14	437.25	99.67	437.24	99.95	437.23	100.24	437.22	101.33	437.19
109.06	436.72	120.69	436.19	125.03	435.95	134.55	435.68	144.14	435.59
151.94	435.41	162.99	435.32	165.76	435.25	175.86	435.11	186.81	434.79
187.37	434.79	187.73	434.76	202.15	434.08	204.04	434.07	210.39	434.22
212.56	434.07	216.63	434.05	225.53	434.51	226.36	434.51	230.6	434.41
246.45	434.01	248.95	433.96	252.21	433.96	263.75	433.83	274.01	433.48
276.27	433.45	288.67	433.53	295.44	433.5	296.59	433.51	306.09	433.26
312.13	433.15	312.86	433.12	317.05	433.04	324.51	432.97	335.91	432.96
337.08	432.99	337.81	432.98	338.13	432.99	338.66	432.98	350.03	432.83
360.24	432.5	362.59	432.47	365.73	432.35	377.99	432.59	381.89	432.45
385.64	432.51	395.55	432.69	399.89	432.82	400.56	432.83	403.5	432.9
413.73	432.98	425.11	432.31	425.28	432.31	425.55	432.26	425.74	432.25
425.89	432.25	444.28	425.7	459.38	425.7	461.28	430.85	470.41	431.33
471.48	431.74	472.01	431.78	472.56	431.9	472.96	431.99	473.71	432.3
485.01	433.45	486.56	433.63	489.95	433.7	499.8	434.41	511.37	434.58
512.92	434.65	514.82	434.73	524.86	435.12	533.18	435.21	538.78	435.36
552.99	435.78	554.79	435.81	559.46	435.91	574.46	436.32	575.5	436.34
576.57	436.37	589.06	436.74	598.02	436.85	600.36	436.92	604.28	437.17
612.34	437.61	613.87	437.61	619.63	437.78	621.34	437.88	634.1	438.21
638.43	438.29								

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	425.55	.035
		473.71	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	425.55	473.71	.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	=	.98
Elevation at which weir flow begins	=	441.1
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	Circular	6	6
FHWA Chart # 2 - Corrugated Metal Pipe Culvert			
FHWA Scale # 1 - Headwall			
Solution Criteria = Highest U.S. EG			

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
.17	85	.024	.024	0	.5	1
Upstream Elevation =	426.72					
Centerline Station =	455					
Downstream Elevation =	425.7					
Centerline Station =	455					

Culvert Name	Shape	Rise	Span
Culvert #2	Circular	1	1
FHWA Chart # 2 - Corrugated Metal Pipe Culvert			
FHWA Scale # 1 - Headwall			
Solution Criteria = Highest U.S. EG			

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
.17	85	.024	.024	0	.5	1
Number of Barrels = 4						
Upstream Elevation =	438					
Centerline Stations						
Sta.	Sta.	Sta.	Sta.			
465	470	475	480			
Downstream Elevation =	425.7					
Centerline Stations						
Sta.	Sta.	Sta.	Sta.			
465	470	475	480			

CULVERT OUTPUT Profile #100 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	450.84	Culv Full Len (ft)	80.18
# Barrels	1	Culv Vel US (ft/s)	15.95
Q Barrel (cfs)	450.84	Culv Vel DS (ft/s)	16.13
E.G. US. (ft)	440.78	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	440.78	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.66	Culv Frctn Ls (ft)	3.28
W.S. DS (ft)	431.49	Culv Exit Loss (ft)	3.87
Delta EG (ft)	9.13	Culv Entr Loss (ft)	1.98
Delta WS (ft)	9.30	Q Weir (cfs)	
E.G. IC (ft)	440.46	Weir Sta Lft (ft)	
E.G. OC (ft)	440.78	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	432.72	Weir Max Depth (ft)	
Culv WS Outlet (ft)	431.49	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	6.00	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	5.54	Min El Weir Flow (ft)	441.11

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CULVERT OUTPUT Profile #50 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	383.24	Culv Full Len (ft)	76.55
--------------------	--------	--------------------	-------

# Barrels	1	Culv Vel US (ft/s)	13.55
Q Barrel (cfs)	383.24	Culv Vel DS (ft/s)	13.67
E.G. US. (ft)	438.22	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	438.22	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.64	Culv Frctn Ls (ft)	2.36
W.S. DS (ft)	431.53	Culv Exit Loss (ft)	2.79
Delta EG (ft)	6.59	Culv Entr Loss (ft)	1.43
Delta WS (ft)	6.69	Q Weir (cfs)	
E.G. IC (ft)	437.79	Weir Sta Lft (ft)	
E.G. OC (ft)	438.22	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	432.72	Weir Max Depth (ft)	
Culv WS Outlet (ft)	431.53	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	6.00	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	5.25	Min El Weir Flow (ft)	441.11

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CULVERT OUTPUT Profile #10 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	257.63	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	10.38
Q Barrel (cfs)	257.63	Culv Vel DS (ft/s)	11.60
E.G. US. (ft)	434.15	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	434.15	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	429.57	Culv Frctn Ls (ft)	1.13
W.S. DS (ft)	429.40	Culv Exit Loss (ft)	2.62
Delta EG (ft)	4.58	Culv Entr Loss (ft)	0.84
Delta WS (ft)	4.75	Q Weir (cfs)	
E.G. IC (ft)	433.89	Weir Sta Lft (ft)	
E.G. OC (ft)	434.15	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	431.64	Weir Max Depth (ft)	
Culv WS Outlet (ft)	430.10	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	5.06	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.40	Min El Weir Flow (ft)	441.11

CULVERT OUTPUT Profile #2 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	156.13	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	9.37
Q Barrel (cfs)	156.13	Culv Vel DS (ft/s)	8.36
E.G. US. (ft)	432.19	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	432.19	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	429.53	Culv Frctn Ls (ft)	0.96
W.S. DS (ft)	429.47	Culv Exit Loss (ft)	1.03
Delta EG (ft)	2.66	Culv Entr Loss (ft)	0.68

Delta WS (ft)	2.72	Q Weir (cfs)	
E.G. IC (ft)	431.71	Weir Sta Lft (ft)	
E.G. OC (ft)	432.19	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	430.14	Weir Max Depth (ft)	
Culv WS Outlet (ft)	429.47	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.42	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	3.40	Min El Weir Flow (ft)	441.11

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)	23.60	Culv Full Len (ft)	85.00
# Barrels	4	Culv Vel US (ft/s)	7.51
Q Barrel (cfs)	5.90	Culv Vel DS (ft/s)	7.51
E.G. US. (ft)	440.78	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	440.78	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.66	Culv Frctn Ls (ft)	7.98
W.S. DS (ft)	431.49	Culv Exit Loss (ft)	0.71
Delta EG (ft)	9.13	Culv Entr Loss (ft)	0.44
Delta WS (ft)	9.30	Q Weir (cfs)	
E.G. IC (ft)	440.76	Weir Sta Lft (ft)	
E.G. OC (ft)	440.76	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	439.00	Weir Max Depth (ft)	
Culv WS Outlet (ft)	426.70	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	0.68	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.00	Min El Weir Flow (ft)	441.11

Note: Culvert critical depth exceeds the height of the culvert.

Note: During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth. Therefore, the outlet will be at normal depth.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CULVERT OUTPUT Profile #50 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)	0.32	Culv Full Len (ft)	34.11
# Barrels	4	Culv Vel US (ft/s)	1.58
Q Barrel (cfs)	0.08	Culv Vel DS (ft/s)	0.10
E.G. US. (ft)	438.22	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	438.22	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.64	Culv Frctn Ls (ft)	6.52
W.S. DS (ft)	431.53	Culv Exit Loss (ft)	0.00
Delta EG (ft)	6.59	Culv Entr Loss (ft)	0.00
Delta WS (ft)	6.69	Q Weir (cfs)	

E.G. IC (ft)	438.08	Weir Sta Lft (ft)	
E.G. OC (ft)	438.17	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	438.12	Weir Max Depth (ft)	
Culv WS Outlet (ft)	426.70	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	0.08	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	0.12	Min El Weir Flow (ft)	441.11

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT Profile #10 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)		Culv Full Len (ft)	
# Barrels	4	Culv Vel US (ft/s)	
Q Barrel (cfs)		Culv Vel DS (ft/s)	
E.G. US. (ft)	434.15	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	434.15	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	429.57	Culv Frctn Ls (ft)	
W.S. DS (ft)	429.40	Culv Exit Loss (ft)	
Delta EG (ft)	4.58	Culv Entr Loss (ft)	
Delta WS (ft)	4.75	Q Weir (cfs)	
E.G. IC (ft)		Weir Sta Lft (ft)	
E.G. OC (ft)		Weir Sta Rgt (ft)	
Culvert Control		Weir Submerg	
Culv WS Inlet (ft)		Weir Max Depth (ft)	
Culv WS Outlet (ft)		Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)		Min El Weir Flow (ft)	441.11

CULVERT OUTPUT Profile #2 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)		Culv Full Len (ft)	
# Barrels	4	Culv Vel US (ft/s)	
Q Barrel (cfs)		Culv Vel DS (ft/s)	
E.G. US. (ft)	432.19	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	432.19	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	429.53	Culv Frctn Ls (ft)	
W.S. DS (ft)	429.47	Culv Exit Loss (ft)	
Delta EG (ft)	2.66	Culv Entr Loss (ft)	
Delta WS (ft)	2.72	Q Weir (cfs)	
E.G. IC (ft)		Weir Sta Lft (ft)	
E.G. OC (ft)		Weir Sta Rgt (ft)	
Culvert Control		Weir Submerg	
Culv WS Inlet (ft)		Weir Max Depth (ft)	
Culv WS Outlet (ft)		Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	


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Culv Crt Depth (ft)          Min El Weir Flow (ft)      441.11

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL          RS: 185.28

INPUT
Description:
Station Elevation Data      num=      136
Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev
  0  438.56      .52  438.56      3.47  438.91      5.21  439.19      5.79  439.22
  6.48  439.32      7.21  439.46      9.39  439.96      10.42  439.82      11.63  439.77
 14.17  439.74      17.5  439.52      19.9  439.42      24.64  439.38      24.96  439.38
 25.88  439.13      27.29  438.8  27.83  438.68      28.27  438.67      29.58  438.67
 29.69  438.66      30.47  438.66      31.7  438.68      33.39  438.68      41.29  438.65
  43.2  438.65      43.72  438.68      44.98  438.66      46.27  438.66      57.69  438.34
 61.78  438.21      67.52  438.1  79.03  438.11      79.79  438.08      83.19  438.05
 83.67  438.06      83.87  438.05      85.26  437.99      97.34  437.33      98.1  437.3
 99.14  437.25      99.67  437.24      99.95  437.23      100.24  437.22      101.33  437.19
109.06  436.72      120.69  436.19      125.03  435.95      134.55  435.68      144.14  435.59
151.94  435.41      162.99  435.32      165.76  435.25      175.86  435.11      186.81  434.79
187.37  434.79      187.73  434.76      202.15  434.08      204.04  434.07      210.39  434.22
212.56  434.07      216.63  434.05      225.53  434.51      226.36  434.51      230.6  434.41
246.45  434.01      248.95  433.96      252.21  433.96      263.75  433.83      274.01  433.48
276.27  433.45      288.67  433.53      295.44  433.5  296.59  433.51      306.09  433.26
312.13  433.15      312.86  433.12      317.05  433.04      324.51  432.97      335.91  432.96
337.08  432.99      337.81  432.98      338.13  432.99      338.66  432.98      350.03  432.83
360.24  432.5  362.59  432.47      365.73  432.35      377.99  432.59      381.89  432.45
385.64  432.51      395.55  432.69      399.89  432.82      400.56  432.83      403.5  432.9
413.73  432.98      425.11  432.31      425.28  432.31      425.55  432.26      425.74  432.25
425.89  432.25      444.28  425.7  459.38  425.7  461.28  430.85      470.41  431.33
471.48  431.74      472.01  431.78      472.56  431.9  472.96  431.99      473.71  432.3
485.01  433.45      486.56  433.63      489.95  433.7  499.8  434.41      511.37  434.58
512.92  434.65      514.82  434.73      524.86  435.12      533.18  435.21      538.78  435.36
552.99  435.78      554.79  435.81      559.46  435.91      574.46  436.32      575.5  436.34
576.57  436.37      589.06  436.74      598.02  436.85      600.36  436.92      604.28  437.17
612.34  437.61      613.87  437.61      619.63  437.78      621.34  437.88      634.1  438.21
638.43  438.29

Manning's n Values      num=      3
Sta      n Val      Sta      n Val      Sta      n Val
  0      .035  425.55      .035  473.71      .035

Bank Sta: Left      Right      Lengths: Left Channel      Right      Coeff Contr.      Expan.
      425.55  473.71      13.33  13.33  13.33      .1      .3

CROSS SECTION OUTPUT Profile #100 YEAR

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E.G. Elev (ft)	431.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.035	
W.S. Elev (ft)	431.49	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		144.18	
E.G. Slope (ft/ft)	0.001364	Area (sq ft)		144.18	
Q Total (cfs)	474.44	Flow (cfs)		474.44	
Top Width (ft)	42.79	Top Width (ft)		42.79	
Vel Total (ft/s)	3.29	Avg. Vel. (ft/s)		3.29	
Max Chl Dpth (ft)	5.79	Hydr. Depth (ft)		3.37	
Conv. Total (cfs)	12846.6	Conv. (cfs)		12846.6	
Length Wtd. (ft)	13.33	Wetted Per. (ft)		47.42	
Min Ch El (ft)	425.70	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		0.85	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.09	0.05	0.02
C & E Loss (ft)	0.05	Cum SA (acres)	0.03	0.01	0.01

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

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	431.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.035	
W.S. Elev (ft)	431.53	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		145.93	
E.G. Slope (ft/ft)	0.000862	Area (sq ft)		145.93	
Q Total (cfs)	383.56	Flow (cfs)		383.56	
Top Width (ft)	43.01	Top Width (ft)		43.01	
Vel Total (ft/s)	2.63	Avg. Vel. (ft/s)		2.63	
Max Chl Dpth (ft)	5.83	Hydr. Depth (ft)		3.39	
Conv. Total (cfs)	13064.2	Conv. (cfs)		13064.2	
Length Wtd. (ft)	13.33	Wetted Per. (ft)		47.66	
Min Ch El (ft)	425.70	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.43	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.09	0.05	0.02
C & E Loss (ft)	0.03	Cum SA (acres)	0.03	0.01	0.01

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

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	429.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.035	
W.S. Elev (ft)	429.40	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		77.68	
E.G. Slope (ft/ft)	0.001723	Area (sq ft)		77.68	

Q Total (cfs)	257.63	Flow (cfs)	257.63
Top Width (ft)	26.86	Top Width (ft)	26.86
Vel Total (ft/s)	3.32	Avg. Vel. (ft/s)	3.32
Max Chl Dpth (ft)	3.70	Hydr. Depth (ft)	2.89
Conv. Total (cfs)	6207.2	Conv. (cfs)	6207.2
Length Wtd. (ft)	13.33	Wetted Per. (ft)	30.08
Min Ch El (ft)	425.70	Shear (lb/sq ft)	0.28
Alpha	1.00	Stream Power (lb/ft s)	0.92
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.03
C & E Loss (ft)	0.05	Cum SA (acres)	0.03

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

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	429.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.		0.035	
W.S. Elev (ft)	429.47	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		79.39	
E.G. Slope (ft/ft)	0.000595	Area (sq ft)		79.39	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	27.06	Top Width (ft)		27.06	
Vel Total (ft/s)	1.97	Avg. Vel. (ft/s)		1.97	
Max Chl Dpth (ft)	3.77	Hydr. Depth (ft)		2.93	
Conv. Total (cfs)	6400.6	Conv. (cfs)		6400.6	
Length Wtd. (ft)	13.33	Wetted Per. (ft)		30.34	
Min Ch El (ft)	425.70	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.19	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	0.03	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.03	0.01	0.00

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

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
1	Chan	425.55	435.18	13.34	9.11	7.59	2.81	1.27	1.47	0.10
0.15										
2	Chan	435.18	444.81	134.60	41.01	10.19	28.37	4.26	3.28	0.34
1.12										
3	Chan	444.81	454.45	233.18	55.75	9.63	49.15	5.79	4.18	0.49
2.06										

4	Chan	454.45	464.08	92.08	36.24	13.23	19.41	3.76	2.54	0.23
0.59										
5	Chan	464.08	473.71	1.23	2.08	6.78	0.26	0.31	0.59	0.03
0.02										

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

Profile #50 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
Power		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	425.55	435.18	11.08	9.40	7.71	2.89	1.29	1.18	0.07	
0.08											
2	Chan	435.18	444.81	108.86	41.40	10.19	28.38	4.30	2.63	0.22	
0.57											
3	Chan	444.81	454.45	187.80	56.14	9.63	48.96	5.83	3.35	0.31	
1.05											
4	Chan	454.45	464.08	74.62	36.63	13.23	19.46	3.80	2.04	0.15	
0.30											
5	Chan	464.08	473.71	1.19	2.36	6.90	0.31	0.34	0.51	0.02	
0.01											

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

Profile #10 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
Power		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	425.55	435.18	0.18	0.30	1.38	0.07	0.23	0.60	0.02	
0.01											
2	Chan	435.18	444.81	55.83	20.92	10.19	21.67	2.17	2.67	0.22	
0.59											
3	Chan	444.81	454.45	141.02	35.66	9.63	54.74	3.70	3.95	0.40	
1.57											
4	Chan	454.45	464.08	60.60	20.80	8.88	23.52	3.30	2.91	0.25	
0.73											

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

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft) (lb/ft
s)										
1	Chan	425.55	435.18	0.15	0.39	1.57	0.09	0.26	0.38	0.01
0.00										
2	Chan	435.18	444.81	34.36	21.53	10.19	22.01	2.24	1.60	0.08
0.13										
3	Chan	444.81	454.45	85.11	36.27	9.63	54.51	3.77	2.35	0.14
0.33										
4	Chan	454.45	464.08	36.51	21.20	8.95	23.39	3.35	1.72	0.09
0.15										

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

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 171.95

INPUT

Description: 9

Station	Elevation	Data	num=	128						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	439.64	6.63	439.43	19.79	438.97	25.78	438.75	27.03	438.71	
34.75	438.42	36.32	438.35	48.22	437.95	48.88	437.92	50.78	437.82	
56.13	437.6	62.4	437.41	63.59	437.37	64.22	437.36	78.64	436.84	
80.26	436.75	80.83	436.7	81.14	436.69	81.34	436.68	91.03	436.22	
95.85	435.87	103.84	435.43	117.73	434.74	123.52	434.43	136.7	433.95	
140.55	433.86	144.32	433.78	159.47	433.06	165.97	432.95	177.09	432.63	
179.03	432.57	181.8	432.47	191.09	432.3	195.42	432.14	198.51	432.02	
201.23	431.9	202.96	431.84	205.2	431.71	207.5	431.61	214.28	431.14	
216.43	431.04	226.79	431.05	228.78	430.98	230.81	430.92	241.41	430.18	
243.22	430.13	244.93	430.07	262.86	429.64	264.14	429.6	267.94	429.5	
270.48	429.47	287.15	429.18	292.2	429.12	308.1	428.75	310.64	428.72	
326.21	428.56	334.07	428.49	338.46	428.44	342.28	428.42	349.29	428.36	
349.46	428.36	353.21	428.33	364.16	428.25	368.25	428.23	377.64	428.15	
382.51	428.14	387.3	428.12	394.96	428.07	398.75	428.07	402.06	428.1	
412.2	428.05	415.19	428.08	418.41	428.1	428.3	428.07	431.23	428.08	
434.03	428.08	436.71	427.88	439.77	427.57	439.99	427.56	440.24	427.55	
440.62	427.59	441.09	427.61	442.21	427.03	443.48	426.93	444.64	425.34	
445.07	425.35	449.36	425.36	453.63	426.71	455.65	426.97	457.97	426.85	
460.09	426.99	463.93	427.3	465.04	427.53	465.55	427.66	466.02	427.85	
467.67	428.63	468.62	428.65	471.58	428.78	472.85	428.81	476.14	428.9	
477.72	428.95	481.65	429.06	484.59	429.13	487.94	429.22	498.13	429.54	
500.35	429.6	501.61	429.64	502.96	429.68	512.16	430.1	514.24	430.16	

516.21	430.21	526.11	430.66	529.02	430.76	530.4	430.8	541.06	431.05
542.81	431.11	544.74	431.19	555.5	431.43	569.63	432.04	572.04	432.14
575.49	432.31	584.55	432.67	588.68	432.87	596.8	433.2	601.52	433.43
610.17	434.05	620.37	434.55	634.38	435.11				

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	434.03	.035	467.67	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
434.03	467.67	56.58	56.58	56.58	.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	431.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	431.60	Reach Len. (ft)			
Crit W.S. (ft)	428.74	Flow Area (sq ft)	585.37	158.68	135.36
E.G. Slope (ft/ft)	0.000043	Area (sq ft)	585.37	158.68	135.36
Q Total (cfs)	474.44	Flow (cfs)	305.62	120.22	48.60
Top Width (ft)	351.79	Top Width (ft)	226.39	33.64	91.77
Vel Total (ft/s)	0.54	Avg. Vel. (ft/s)	0.52	0.76	0.36
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	2.59	4.72	1.48
Conv. Total (cfs)	72664.6	Conv. (cfs)	46808.3	18412.4	7443.9
Length Wtd. (ft)		Wetted Per. (ft)	226.45	35.12	91.82
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.01	0.01	0.00
Alpha	1.15	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	431.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	431.60	Reach Len. (ft)			
Crit W.S. (ft)	428.59	Flow Area (sq ft)	585.37	158.68	135.36
E.G. Slope (ft/ft)	0.000028	Area (sq ft)	585.37	158.68	135.36
Q Total (cfs)	383.56	Flow (cfs)	247.08	97.19	39.29
Top Width (ft)	351.79	Top Width (ft)	226.39	33.64	91.77
Vel Total (ft/s)	0.44	Avg. Vel. (ft/s)	0.42	0.61	0.29
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	2.59	4.72	1.48
Conv. Total (cfs)	72664.6	Conv. (cfs)	46808.3	18412.4	7443.9
Length Wtd. (ft)		Wetted Per. (ft)	226.45	35.12	91.82
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.15	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	429.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	429.50	Reach Len. (ft)			
Crit W.S. (ft)	428.30	Flow Area (sq ft)	167.80	88.03	12.54
E.G. Slope (ft/ft)	0.000321	Area (sq ft)	167.80	88.03	12.54
Q Total (cfs)	257.63	Flow (cfs)	128.57	123.63	5.43
Top Width (ft)	228.92	Top Width (ft)	166.09	33.64	29.19
Vel Total (ft/s)	0.96	Avg. Vel. (ft/s)	0.77	1.40	0.43
Max Chl Dpth (ft)	4.16	Hydr. Depth (ft)	1.01	2.62	0.43
Conv. Total (cfs)	14372.3	Conv. (cfs)	7172.2	6897.0	303.0
Length Wtd. (ft)		Wetted Per. (ft)	166.10	35.12	29.20
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.02	0.05	0.01
Alpha	1.35	Stream Power (lb/ft s)	0.02	0.07	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	429.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	429.50	Reach Len. (ft)			
Crit W.S. (ft)	427.60	Flow Area (sq ft)	167.80	88.03	12.54
E.G. Slope (ft/ft)	0.000118	Area (sq ft)	167.80	88.03	12.54
Q Total (cfs)	156.13	Flow (cfs)	77.91	74.92	3.29
Top Width (ft)	228.92	Top Width (ft)	166.09	33.64	29.19
Vel Total (ft/s)	0.58	Avg. Vel. (ft/s)	0.46	0.85	0.26
Max Chl Dpth (ft)	4.16	Hydr. Depth (ft)	1.01	2.62	0.43
Conv. Total (cfs)	14372.3	Conv. (cfs)	7172.2	6897.0	303.0
Length Wtd. (ft)		Wetted Per. (ft)	166.10	35.12	29.20
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.01	0.02	0.00
Alpha	1.35	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	173.61	260.42	14.02	53.74	52.83	2.95	1.02	0.26	0.00	
0.00											
2	LOB	260.42	347.22	115.46	232.31	86.82	24.34	2.68	0.50	0.01	
0.00											
3	LOB	347.22	434.03	176.15	299.31	86.81	37.13	3.45	0.59	0.01	
0.01											

4	Chan	434.03	440.76	17.01	25.54	6.75	3.58	3.80	0.67	0.01
0.01										
5	Chan	440.76	447.49	27.80	36.11	7.68	5.86	5.37	0.77	0.01
0.01										
6	Chan	447.49	454.21	32.80	38.29	6.94	6.91	5.69	0.86	0.01
0.01										
7	Chan	454.21	460.94	24.11	31.48	6.75	5.08	4.68	0.77	0.01
0.01										
8	Chan	460.94	467.67	18.51	27.25	6.99	3.90	4.05	0.68	0.01
0.01										
9	ROB	467.67	501.01	35.23	82.30	33.36	7.43	2.47	0.43	0.01
0.00										
10	ROB	501.01	534.35	12.22	43.61	33.37	2.58	1.31	0.28	0.00
0.00										
11	ROB	534.35	567.70	1.16	9.45	25.09	0.24	0.38	0.12	0.00
0.00										

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	173.61	260.42	11.33	53.74	52.83	2.95	1.02	0.21	0.00	
0.00											
2	LOB	260.42	347.22	93.34	232.31	86.82	24.34	2.68	0.40	0.00	
0.00											
3	LOB	347.22	434.03	142.40	299.31	86.81	37.13	3.45	0.48	0.01	
0.00											
4	Chan	434.03	440.76	13.75	25.54	6.75	3.58	3.80	0.54	0.01	
0.00											
5	Chan	440.76	447.49	22.47	36.11	7.68	5.86	5.37	0.62	0.01	
0.01											
6	Chan	447.49	454.21	26.51	38.29	6.94	6.91	5.69	0.69	0.01	
0.01											
7	Chan	454.21	460.94	19.49	31.48	6.75	5.08	4.68	0.62	0.01	
0.01											
8	Chan	460.94	467.67	14.97	27.25	6.99	3.90	4.05	0.55	0.01	
0.00											
9	ROB	467.67	501.01	28.48	82.30	33.36	7.43	2.47	0.35	0.00	
0.00											
10	ROB	501.01	534.35	9.88	43.61	33.37	2.58	1.31	0.23	0.00	
0.00											
11	ROB	534.35	567.70	0.93	9.45	25.09	0.24	0.38	0.10	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	260.42	347.22	26.87	50.78	79.29	10.43	0.64	0.53	0.01	
0.01											
2	LOB	347.22	434.03	101.70	117.02	86.81	39.47	1.35	0.87	0.03	
0.02											
3	Chan	434.03	440.76	11.88	11.41	6.75	4.61	1.70	1.04	0.03	
0.04											
4	Chan	440.76	447.49	32.50	21.98	7.68	12.62	3.27	1.48	0.06	
0.08											
5	Chan	447.49	454.21	40.72	24.17	6.94	15.81	3.59	1.69	0.07	
0.12											
6	Chan	454.21	460.94	23.89	17.35	6.75	9.27	2.58	1.38	0.05	
0.07											
7	Chan	460.94	467.67	14.64	13.12	6.99	5.68	1.95	1.12	0.04	
0.04											
8	ROB	467.67	501.01	5.43	12.54	29.20	2.11	0.43	0.43	0.01	
0.00											

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	260.42	347.22	16.28	50.78	79.29	10.43	0.64	0.32	0.00	
0.00											
2	LOB	347.22	434.03	61.63	117.02	86.81	39.47	1.35	0.53	0.01	
0.01											
3	Chan	434.03	440.76	7.20	11.41	6.75	4.61	1.70	0.63	0.01	
0.01											
4	Chan	440.76	447.49	19.70	21.98	7.68	12.62	3.27	0.90	0.02	
0.02											
5	Chan	447.49	454.21	24.68	24.17	6.94	15.81	3.59	1.02	0.03	
0.03											
6	Chan	454.21	460.94	14.48	17.35	6.75	9.27	2.58	0.83	0.02	
0.02											
7	Chan	460.94	467.67	8.87	13.12	6.99	5.68	1.95	0.68	0.01	
0.01											
8	ROB	467.67	501.01	3.29	12.54	29.20	2.11	0.43	0.26	0.00	
0.00											

SUMMARY OF MANNING'S N VALUES

River: CHANNEL CL

Reach	River Sta.	n1	n2	n3
CHANNEL CL	914.03	.035	.035	.035
CHANNEL CL	839.73	.035	.035	.035
CHANNEL CL	746.53	.035	.035	.035
CHANNEL CL	653.24	.035	.035	.035
CHANNEL CL	552.28	.035	.035	.035
CHANNEL CL	451.25	.035	.035	.035
CHANNEL CL	363.69	.035	.035	.035
CHANNEL CL	298.22	.035	.035	.035
CHANNEL CL	271.15	.035	.035	.035
CHANNEL CL	271.10	Culvert		
CHANNEL CL	185.28		.035	.035
CHANNEL CL	171.95		.035	.035

SUMMARY OF REACH LENGTHS

River: CHANNEL CL

Reach	River Sta.	Left	Channel	Right
CHANNEL CL	914.03	74.3	74.3	74.3
CHANNEL CL	839.73	93.2	93.2	93.2
CHANNEL CL	746.53	93.29	93.29	93.29
CHANNEL CL	653.24	100.96	100.96	100.96
CHANNEL CL	552.28	101.03	101.03	101.03
CHANNEL CL	451.25	87	87	87
CHANNEL CL	363.69	87.56	87.56	87.56
CHANNEL CL	298.22	27.07	27.07	27.07
CHANNEL CL	271.15	85.87	85.87	85.87
CHANNEL CL	271.10	Culvert		
CHANNEL CL	185.28		13.33	13.33
CHANNEL CL	171.95		56.58	56.58

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: CHANNEL CL

Reach	River Sta.	Contr.	Expan.
CHANNEL CL	914.03	.1	.3
CHANNEL CL	839.73	.1	.3

CHANNEL CL	746.53	.1	.3
CHANNEL CL	653.24	.1	.3
CHANNEL CL	552.28	.1	.3
CHANNEL CL	451.25	.1	.3
CHANNEL CL	363.69	.1	.3
CHANNEL CL	298.22	.1	.3
CHANNEL CL	271.15	.1	.3
CHANNEL CL	271.10	Culvert	
CHANNEL CL	185.28	.1	.3
CHANNEL CL	171.95	.1	.3

Profile Output Table - Standard Table 1

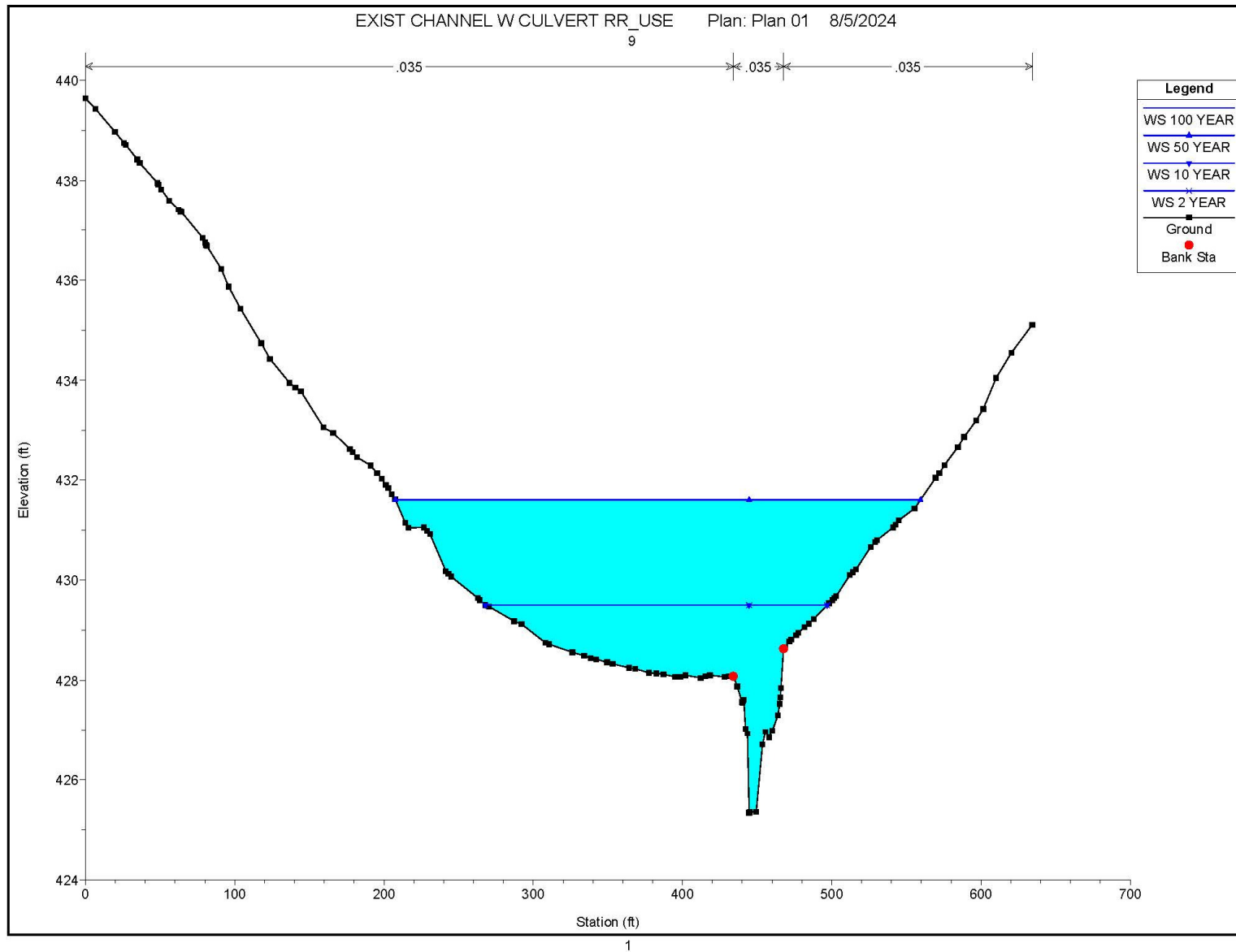
Reach Top Width (ft)	River Sta Froude # Chl	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)
CHANNEL CL	914.03	100 YEAR	474.44	432.50	440.78		440.79	0.000024	0.65	971.96
277.51	0.05									
CHANNEL CL	914.03	50 YEAR	383.56	432.50	438.21		438.24	0.000332	1.67	326.52
203.54	0.16									
CHANNEL CL	914.03	10 YEAR	257.63	432.50	436.10	436.10	436.57	0.013991	5.62	49.80
58.37	0.89									
CHANNEL CL	914.03	2 YEAR	156.13	432.50	435.26	435.26	435.96	0.018280	6.73	23.21
16.89	1.01									
CHANNEL CL	839.73	100 YEAR	474.44	430.86	440.78		440.78	0.000003	0.32	1774.21
326.68	0.02									
CHANNEL CL	839.73	50 YEAR	383.56	430.86	438.22		438.23	0.000010	0.42	1029.57
255.56	0.03									
CHANNEL CL	839.73	10 YEAR	257.63	430.86	434.21		434.22	0.000228	1.07	241.10
110.02	0.13									
CHANNEL CL	839.73	2 YEAR	156.13	430.86	433.04		433.05	0.000280	1.13	138.02
67.10	0.14									
CHANNEL CL	746.53	100 YEAR	474.44	430.47	440.78		440.78	0.000003	0.27	1905.88
351.36	0.02									
CHANNEL CL	746.53	50 YEAR	383.56	430.47	438.22		438.22	0.000011	0.36	1093.48
299.11	0.03									
CHANNEL CL	746.53	10 YEAR	257.63	430.47	434.14		434.18	0.001050	1.63	157.73
121.20	0.25									
CHANNEL CL	746.53	2 YEAR	156.13	430.47	432.61	432.61	432.94	0.022819	4.61	33.85
55.01	1.04									
CHANNEL CL	653.24	100 YEAR	474.44	428.78	440.78		440.78	0.000001	0.19	2694.26
370.81	0.01									
CHANNEL CL	653.24	50 YEAR	383.56	428.78	438.22		438.22	0.000003	0.23	1766.75
347.33	0.02									

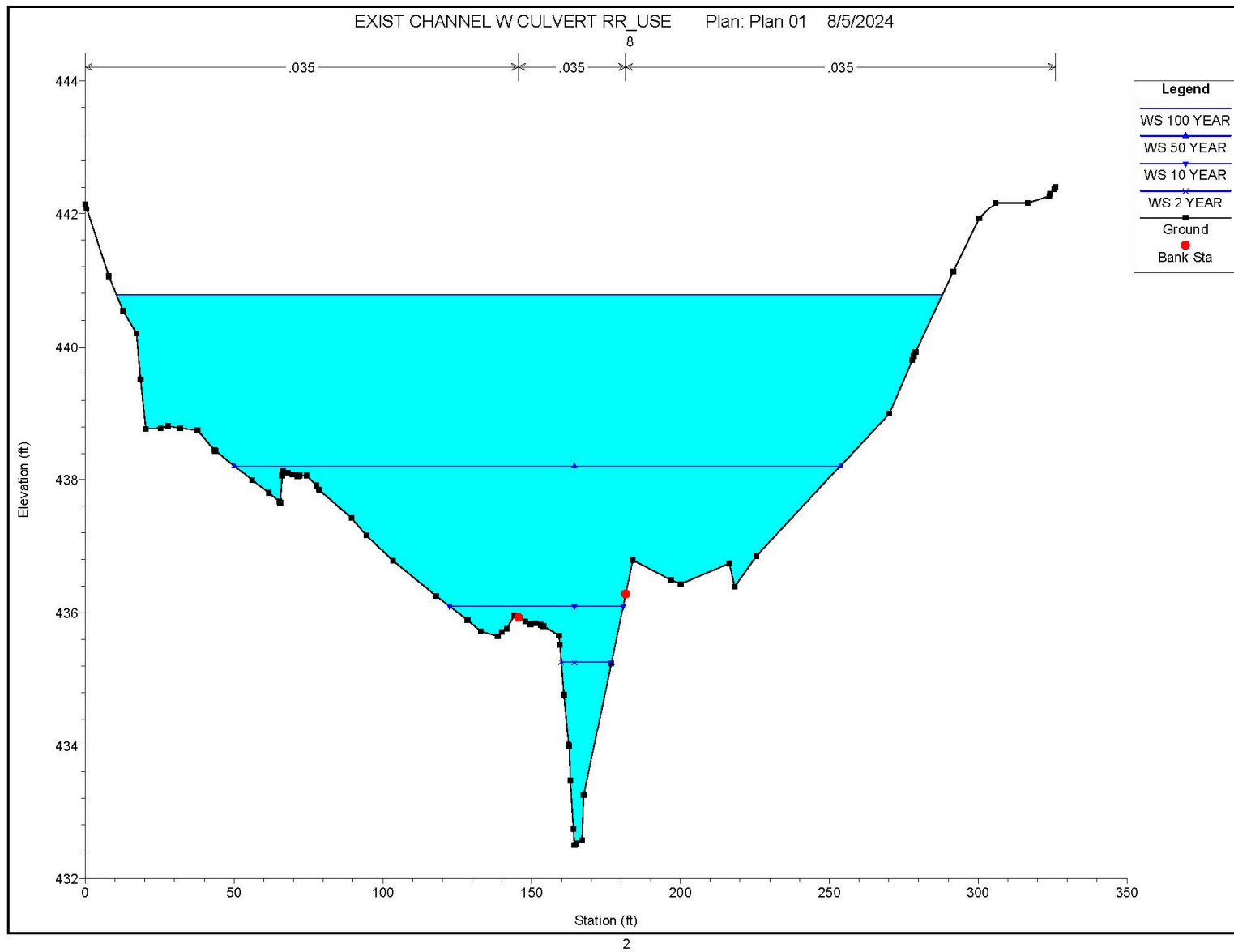
CHANNEL CL 253.02	653.24 0.06	10 YEAR	257.63	428.78	434.15		434.16	0.000051	0.49	527.09
CHANNEL CL 116.62	653.24 0.15	2 YEAR	156.13	428.78	432.19		432.21	0.000404	1.01	154.65
CHANNEL CL 451.56	552.28 0.01	100 YEAR	474.44	428.61	440.78		440.78	0.000001	0.16	3258.64
CHANNEL CL 393.52	552.28 0.01	50 YEAR	383.56	428.61	438.22		438.22	0.000001	0.18	2172.91
CHANNEL CL 274.97	552.28 0.03	10 YEAR	257.63	428.61	434.15		434.16	0.000011	0.30	871.04
CHANNEL CL 231.25	552.28 0.06	2 YEAR	156.13	428.61	432.19		432.20	0.000052	0.42	373.16
CHANNEL CL 484.23	451.25 0.01	100 YEAR	474.44	428.05	440.78		440.78	0.000001	0.17	3152.76
CHANNEL CL 431.40	451.25 0.01	50 YEAR	383.56	428.05	438.22		438.22	0.000001	0.19	2181.42
CHANNEL CL 252.08	451.25 0.03	10 YEAR	257.63	428.05	434.15		434.15	0.000008	0.28	909.71
CHANNEL CL 196.95	451.25 0.04	2 YEAR	156.13	428.05	432.19		432.19	0.000020	0.33	469.54
CHANNEL CL 514.22	363.69 0.01	100 YEAR	474.44	427.68	440.78		440.78	0.000001	0.15	3396.30
CHANNEL CL 483.78	363.69 0.01	50 YEAR	383.56	427.68	438.22		438.22	0.000001	0.17	2427.18
CHANNEL CL 279.65	363.69 0.02	10 YEAR	257.63	427.68	434.15		434.15	0.000004	0.24	1096.99
CHANNEL CL 209.49	363.69 0.03	2 YEAR	156.13	427.68	432.19		432.19	0.000008	0.25	626.59
CHANNEL CL 597.65	298.22 0.01	100 YEAR	474.44	427.46	440.78		440.78	0.000000	0.15	4162.79
CHANNEL CL 496.98	298.22 0.01	50 YEAR	383.56	427.46	438.22		438.22	0.000001	0.18	2768.91
CHANNEL CL 307.52	298.22 0.02	10 YEAR	257.63	427.46	434.15		434.15	0.000004	0.26	1108.76
CHANNEL CL 199.09	298.22 0.03	2 YEAR	156.13	427.46	432.19		432.19	0.000007	0.27	606.32
CHANNEL CL 618.08	271.15 0.01	100 YEAR	474.44	426.72	440.78	428.83	440.78	0.000000	0.14	4658.74
CHANNEL CL 505.48	271.15 0.01	50 YEAR	383.56	426.72	438.22	428.65	438.22	0.000001	0.16	3238.27
CHANNEL CL 385.71	271.15 0.02	10 YEAR	257.63	426.72	434.15	428.33	434.15	0.000003	0.24	1440.19
CHANNEL CL 315.58	271.15 0.02	2 YEAR	156.13	426.72	432.19	428.01	432.19	0.000006	0.27	753.63

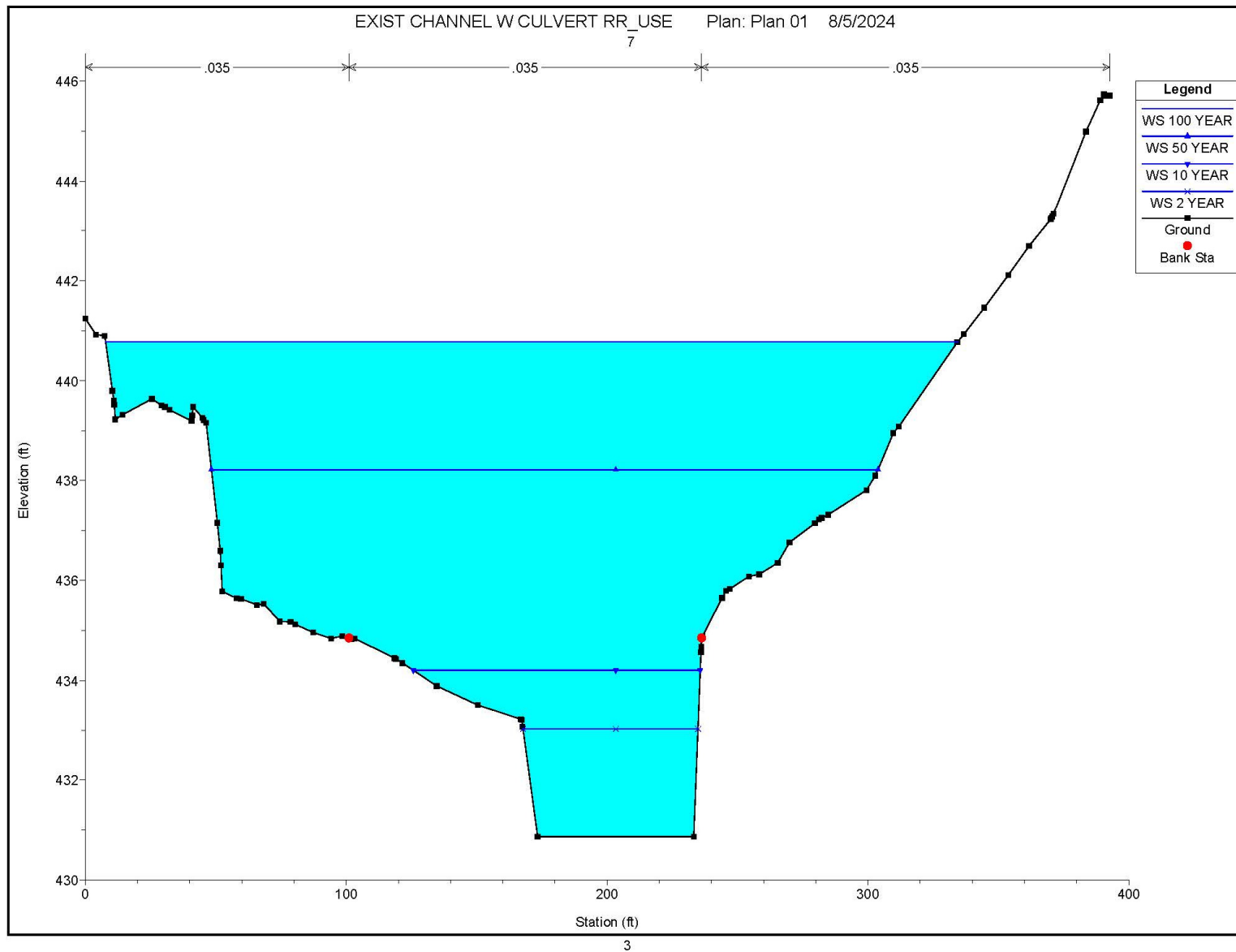
CHANNEL CL	271.10		Culvert							
CHANNEL CL	185.28	100 YEAR	474.44	425.70	431.49		431.66	0.001364	3.29	144.18
42.79	0.32									
CHANNEL CL	185.28	50 YEAR	383.56	425.70	431.53		431.64	0.000862	2.63	145.93
43.01	0.25									
CHANNEL CL	185.28	10 YEAR	257.63	425.70	429.40		429.57	0.001723	3.32	77.68
26.86	0.34									
CHANNEL CL	185.28	2 YEAR	156.13	425.70	429.47		429.53	0.000595	1.97	79.39
27.06	0.20									
CHANNEL CL	171.95	100 YEAR	474.44	425.34	431.60	428.74	431.61	0.000043	0.76	879.41
351.79	0.06									
CHANNEL CL	171.95	50 YEAR	383.56	425.34	431.60	428.59	431.60	0.000028	0.61	879.41
351.79	0.05									
CHANNEL CL	171.95	10 YEAR	257.63	425.34	429.50	428.30	429.52	0.000321	1.40	268.37
228.92	0.15									
CHANNEL CL	171.95	2 YEAR	156.13	425.34	429.50	427.60	429.51	0.000118	0.85	268.37
228.92	0.09									

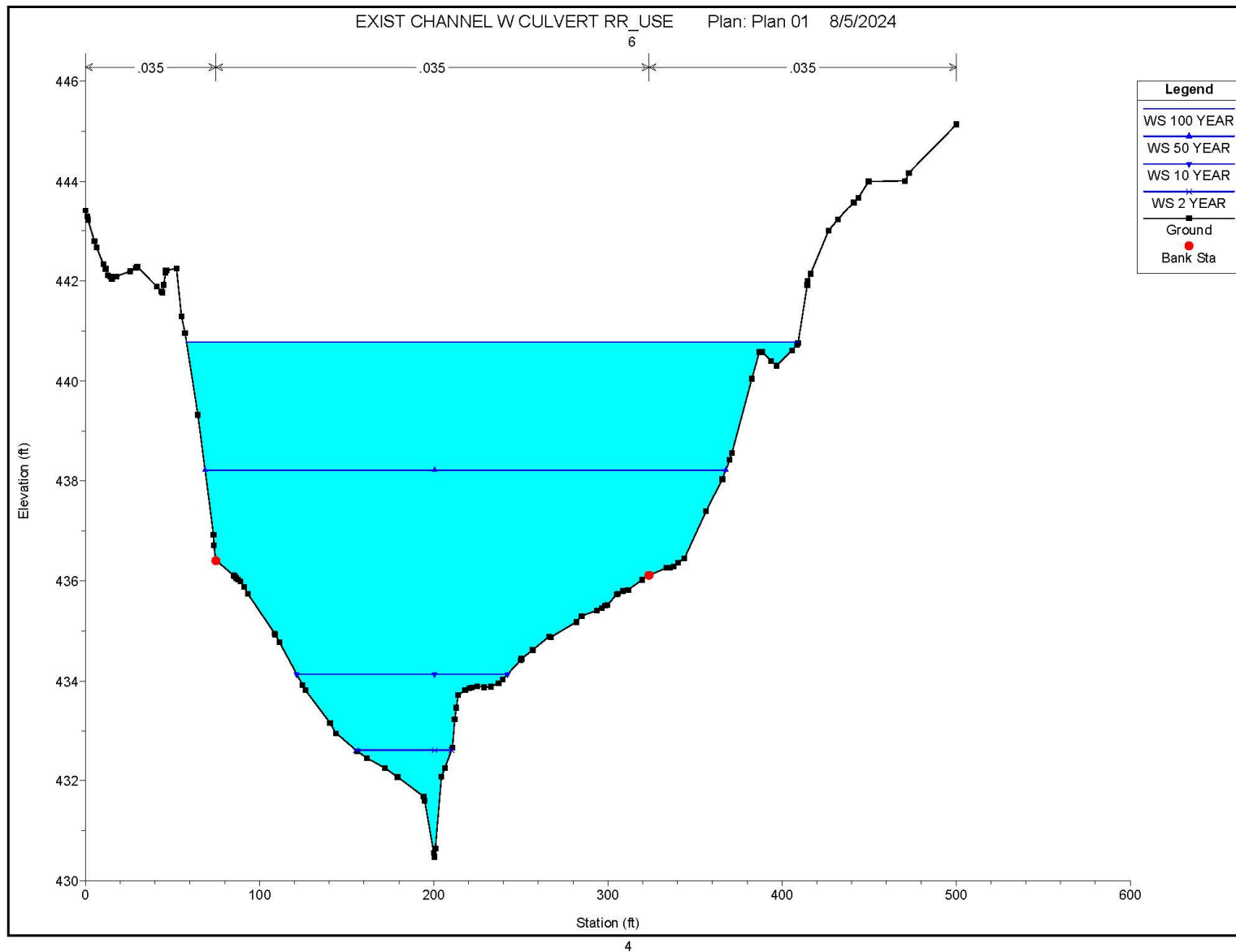
Profile Output Table - Culvert Only

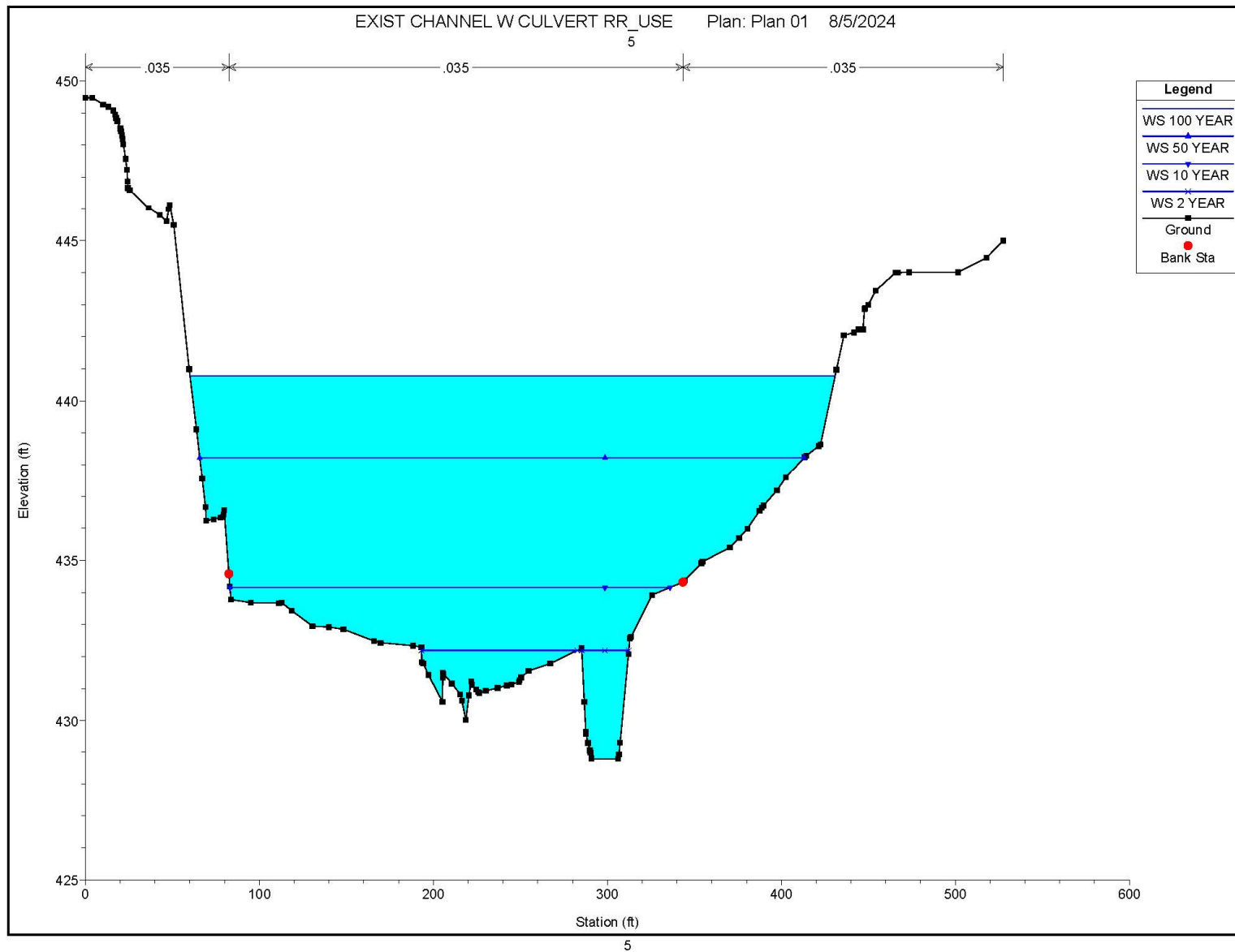
Reach Delta WS	River Sta Culv Vel US	Sta Culv Vel DS	Profile	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir Flow (ft)	Q Culv Group (cfs)	Q Weir (cfs)
(ft)	(ft/s)	(ft/s)								
CHANNEL CL	271.10	Culvert #1	100 YEAR	440.78	440.78	440.46	440.78	441.11	450.84	
9.30	15.95	16.13								
CHANNEL CL	271.10	Culvert #2	100 YEAR	440.78	440.78	440.76	440.76	441.11	23.60	
9.30	7.51	7.51								
CHANNEL CL	271.10	Culvert #1	50 YEAR	438.22	438.22	437.79	438.22	441.11	383.24	
6.69	13.55	13.67								
CHANNEL CL	271.10	Culvert #2	50 YEAR	438.22	438.22	438.08	438.17	441.11	0.32	
6.69	1.58	0.10								
CHANNEL CL	271.10	Culvert #1	10 YEAR	434.15	434.15	433.89	434.15	441.11	257.63	
4.75	10.38	11.60								
CHANNEL CL	271.10	Culvert #2	10 YEAR	434.15	434.15			441.11		
4.75										
CHANNEL CL	271.10	Culvert #1	2 YEAR	432.19	432.19	431.71	432.19	441.11	156.13	
2.72	9.37	8.36								
CHANNEL CL	271.10	Culvert #2	2 YEAR	432.19	432.19			441.11		
2.72										

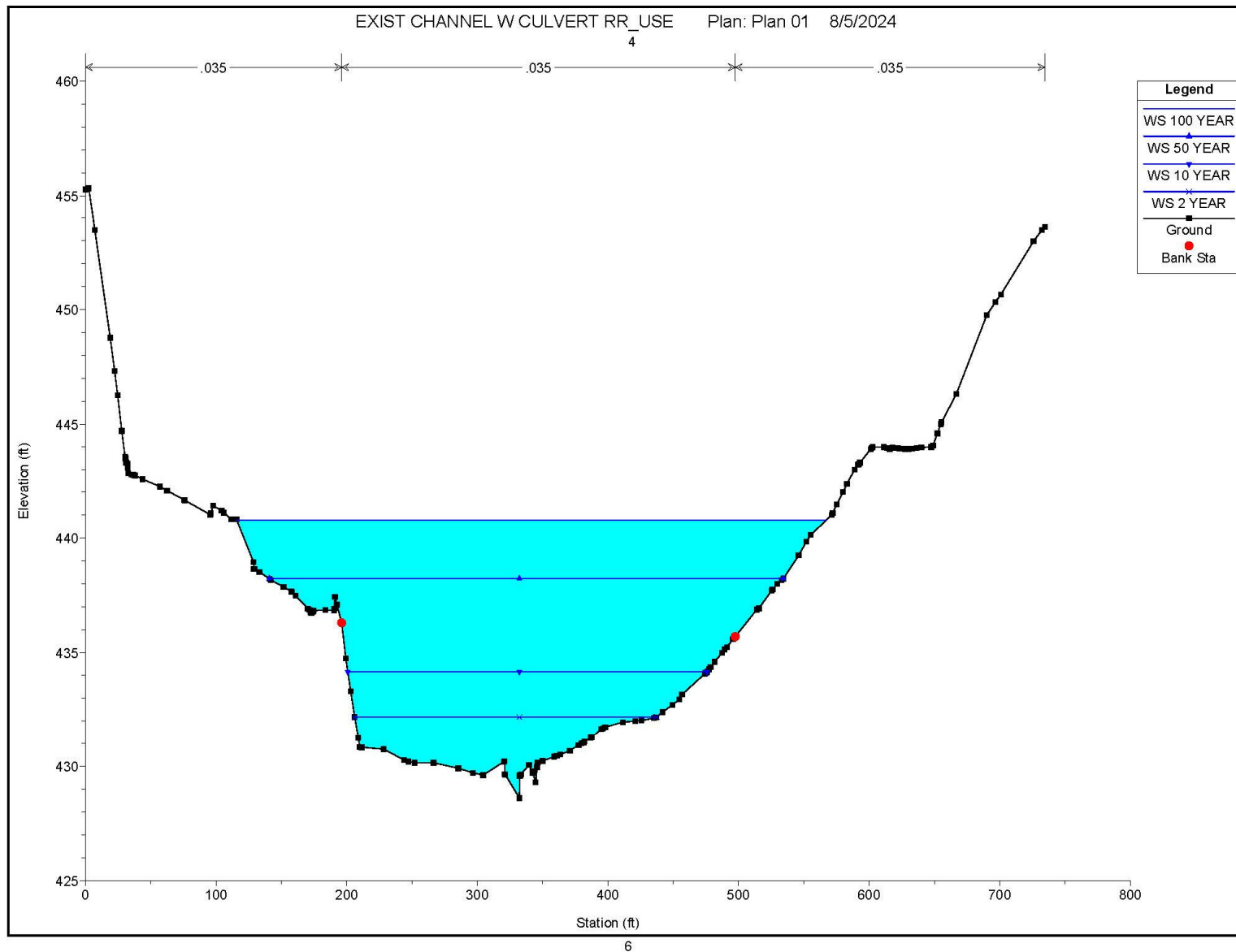


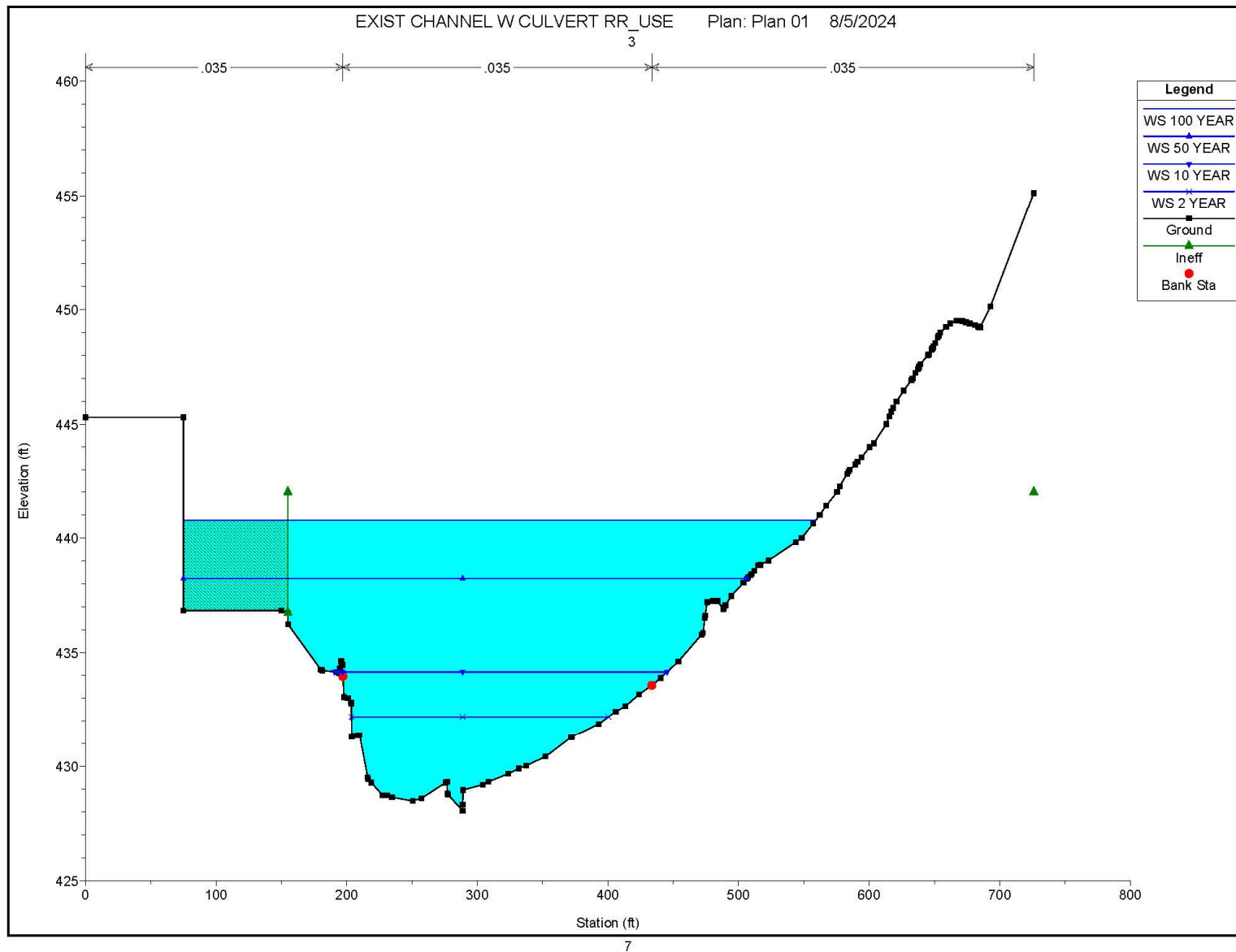


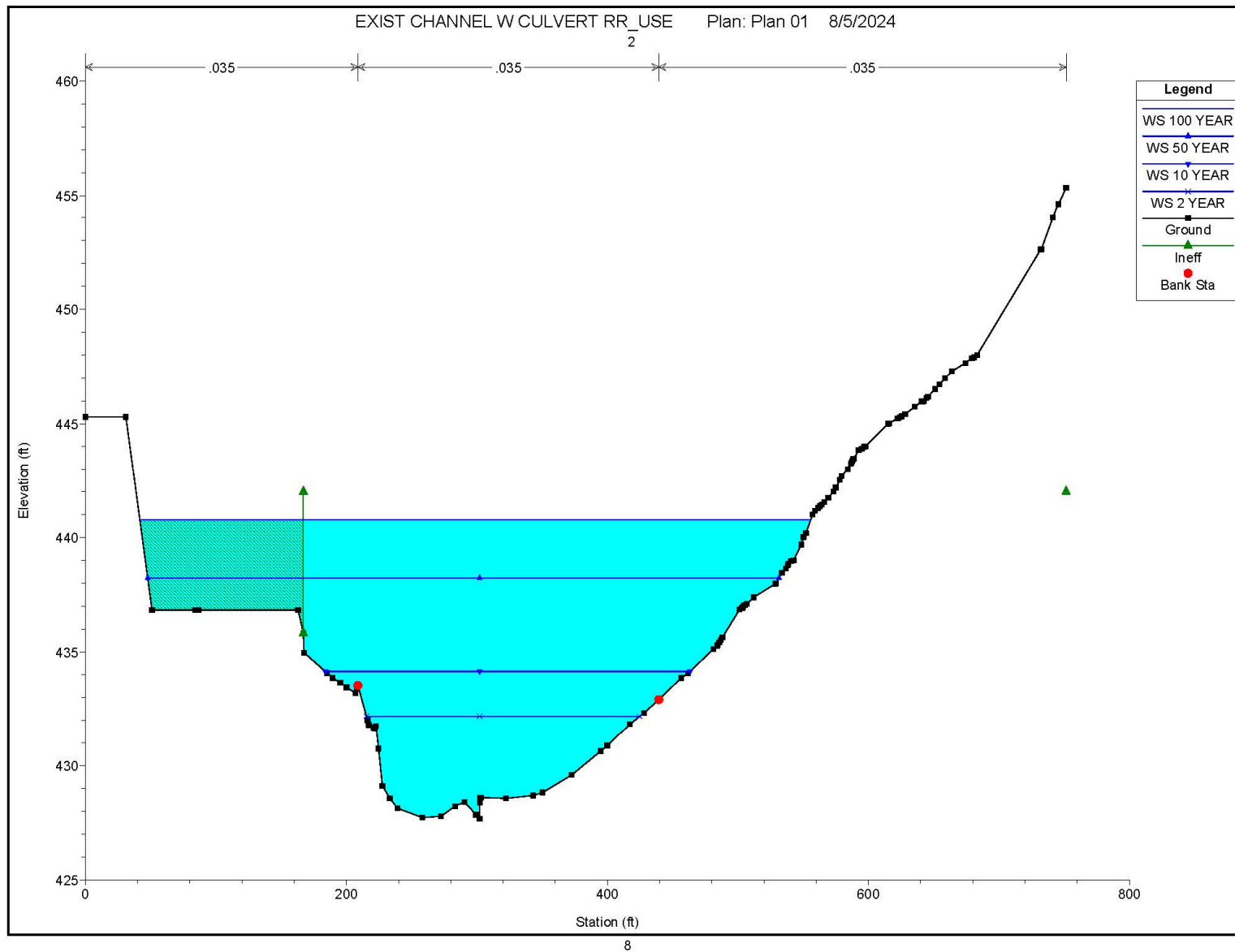


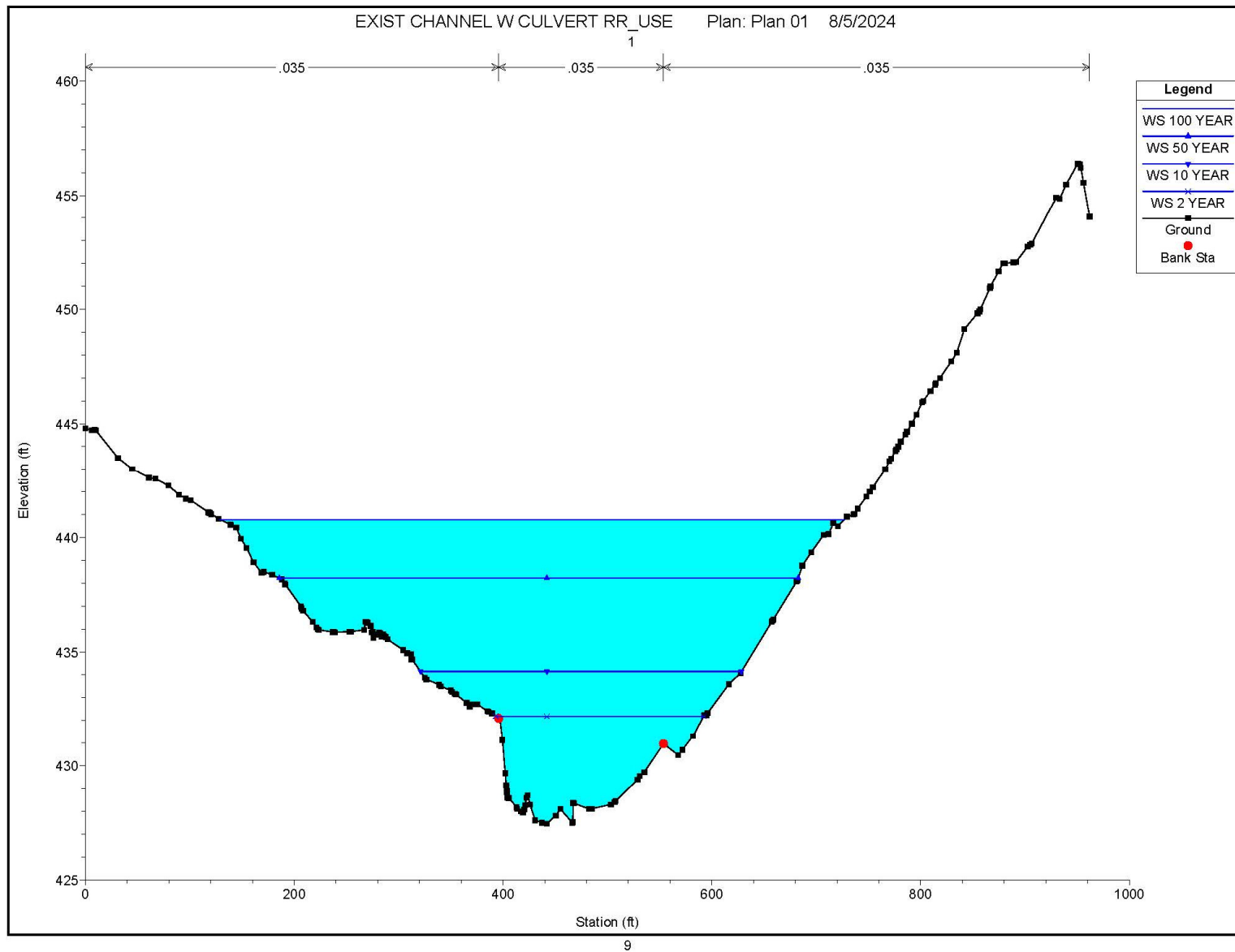


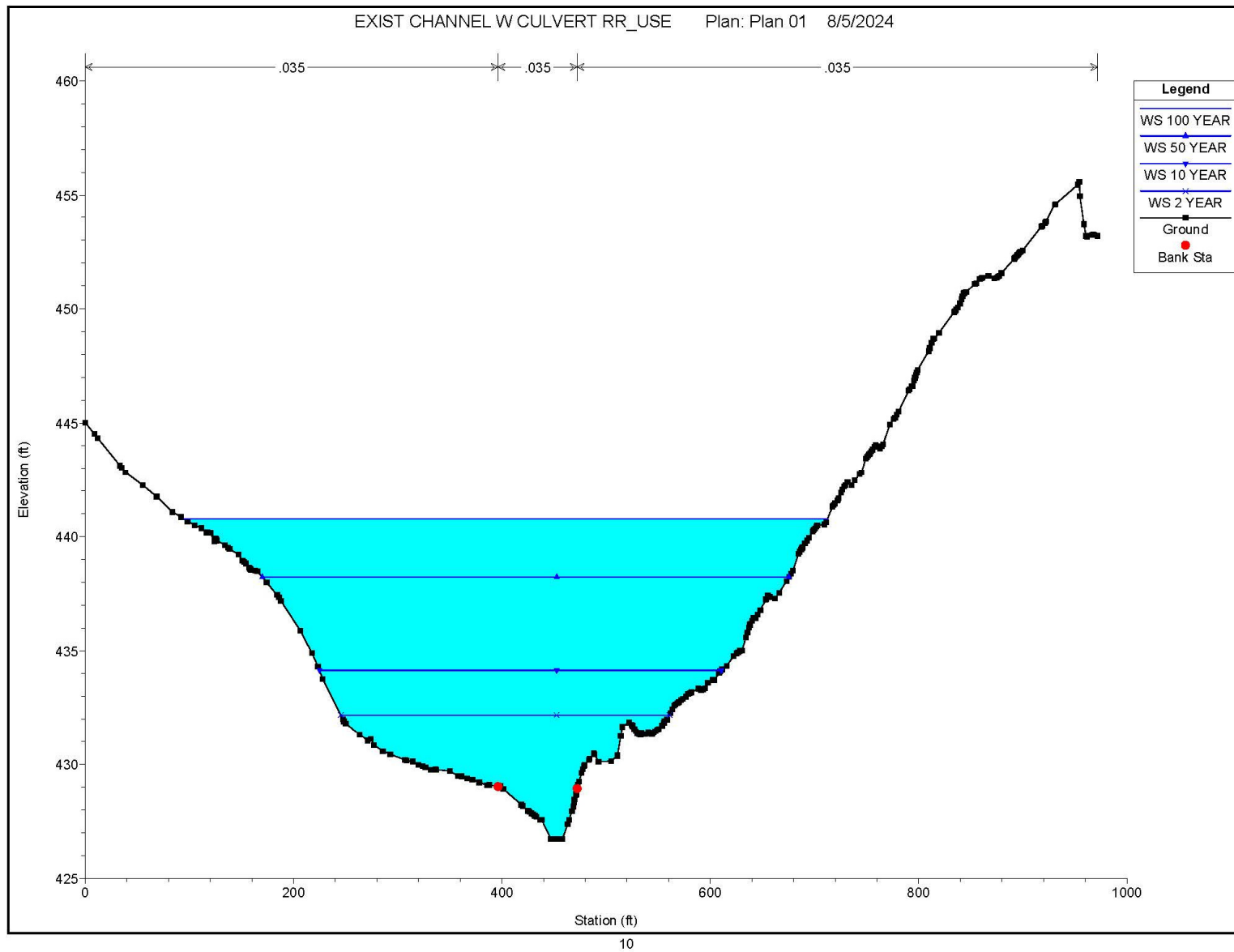


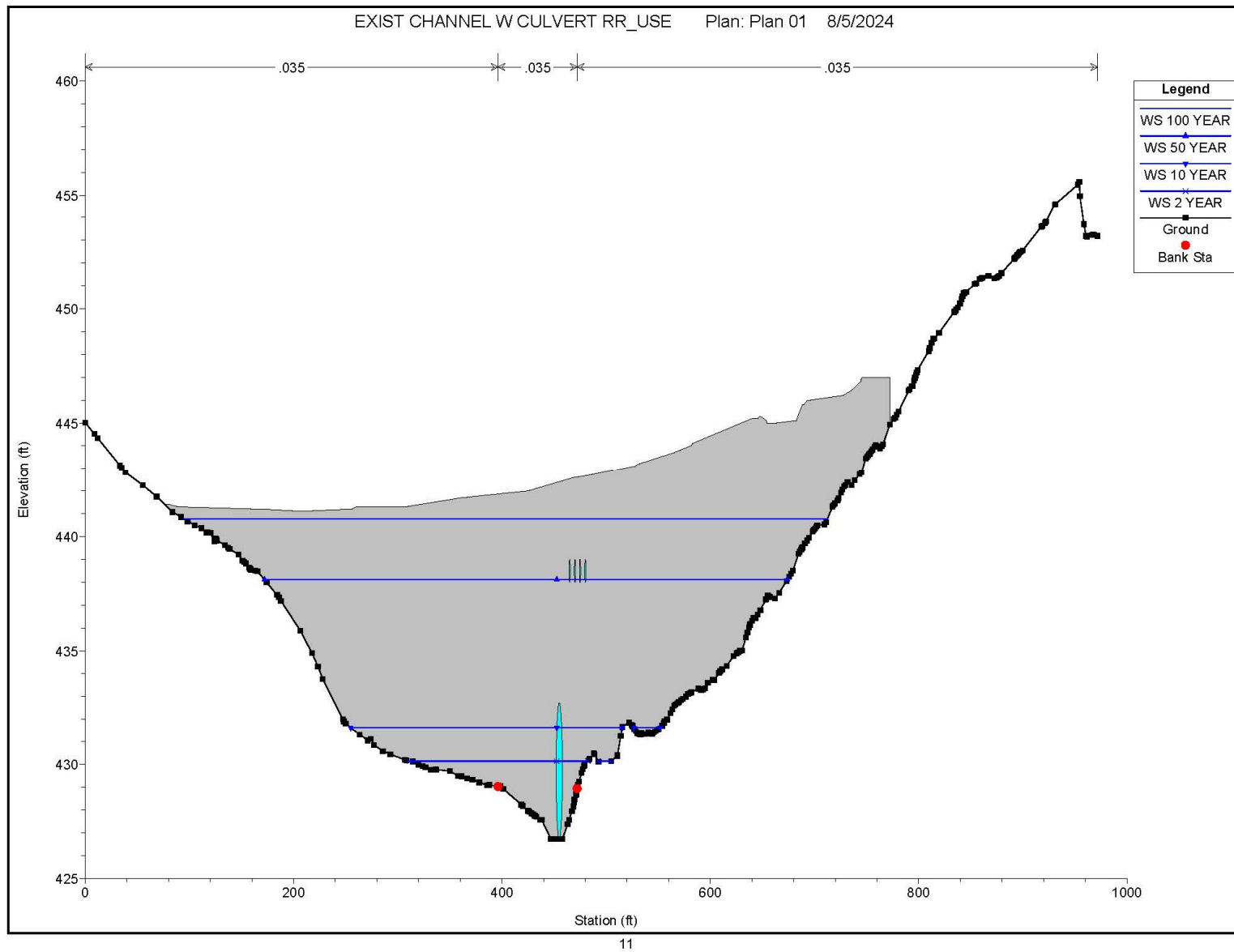


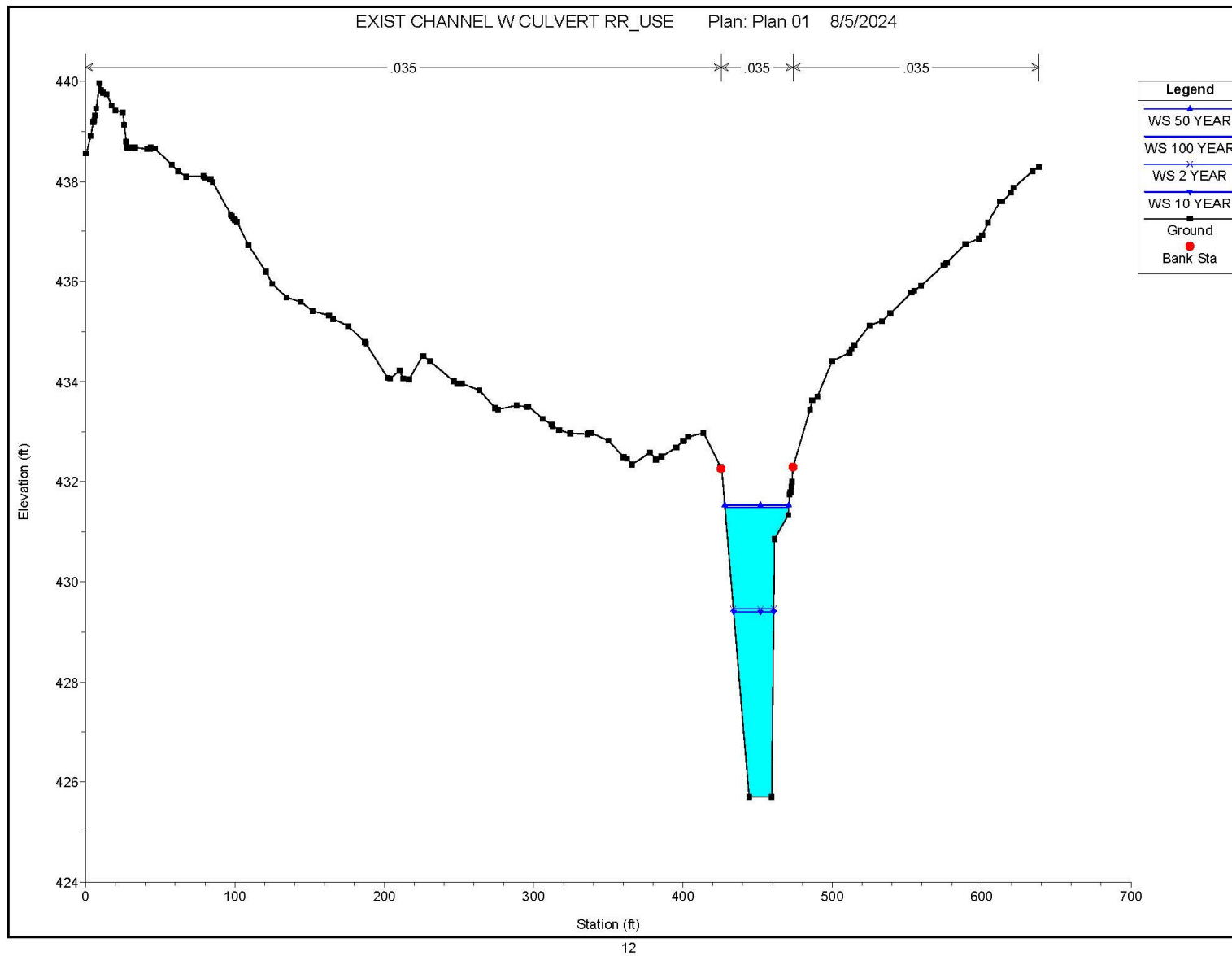












CHAPTER 5

FLOOD INUNDATION ANALYSES (HEC-RAS)

5.5 – Developed HEC-RAS Calculations

HEC-RAS HEC-RAS 6.5 February 2024
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: PROP SDF CHANNEL W CULVERT RR
Project File : PROPSDFCHANNELWCULRR.prj
Run Date and Time: 8/5/2024 4:46:35 PM

Project in English units

PLAN DATA

Plan Title: Plan 03
Plan File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\PROPSDFCHANNELWCULRR.p03

Geometry Title: PROP CHANNEL
Geometry File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\PROPSDFCHANNELWCULRR.g01

Flow Title : 100 YEAR FLOW
Flow File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\PROPSDFCHANNELWCULRR.f02

Plan Summary Information:

Number of:	Cross Sections =	11	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

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

Computation Options

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

FLOW DATA

Flow Title: 100 YEAR FLOW

Flow File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\PROPSDPCHANNELWCULRR.f02

Flow Data (cfs)

River	Reach	RS	100 YEAR	50 YEAR	10 YEAR	2 YEAR
CHANNEL CL	CHANNEL CL	914.03	474.44	383.56	257.63	156.13

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
CHANNEL CL	CHANNEL CL	100 YEAR		Known WS = 431.6
CHANNEL CL	CHANNEL CL	50 YEAR		Known WS = 431.6
CHANNEL CL	CHANNEL CL	10 YEAR		Known WS = 431.6
CHANNEL CL	CHANNEL CL	2 YEAR		Known WS = 429.5

GEOMETRY DATA

Geometry Title: PROP CHANNEL

Geometry File : k:\Civil 3D\1119\REPORTS\HYDROLOGY\HEC-RAS\PROPSDPCHANNELWCULRR.g01

CROSS SECTION

RIVER: CHANNEL CL
 REACH: CHANNEL CL RS: 914.03

INPUT

Description: 8

Station Elevation Data		num=		77							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	442.15	.44	442.08	7.92	441.06	12.69	440.54	17.25	440.2		
18.59	439.51	20.34	438.77	25.39	438.78	27.79	438.81	31.89	438.78		

37.67	438.75	43.37	438.45	43.75	438.44	56.14	437.99	61.66	437.8
65.19	437.67	65.56	437.65	66.17	438.06	66.34	438.14	67.59	438.1
68	438.1	69.63	438.07	70.34	438.07	71.34	438.05	72.12	438.06
74.38	438.06	77.63	437.91	78.54	437.85	78.65	437.84	89.45	437.42
94.45	437.16	103.41	436.78	117.97	436.25	128.45	435.89	132.88	435.72
138.62	435.65	139.99	435.71	141.58	435.76	144.15	435.96	145.55	435.93
147.88	435.87	149.62	435.83	151.39	435.84	153.04	435.82	153.97	435.8
159.15	435.66	159.49	435.52	160.82	434.77	162.43	434.01	162.57	433.99
163	433.47	163.98	432.74	164.37	432.5	164.87	432.51	165.12	432.52
166.91	432.57	167.44	433.25	176.75	435.245	181.57	436.278	183.96	436.79
196.87	436.49	200.09	436.43	216.38	436.74	218.18	436.39	225.49	436.85
270.21	439	277.89	439.8	278.33	439.86	278.97	439.92	291.64	441.13
300.37	441.93	305.9	442.17	316.65	442.17	323.91	442.27	324.18	442.31
325.57	442.38	325.99	442.41						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	145.55	.035	181.57	.035

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

145.55	181.57	74.3	74.3	74.3	.1	.3
--------	--------	------	------	------	----	----

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	74.30	74.30	74.30
Crit W.S. (ft)		Flow Area (sq ft)	433.06	212.12	327.31
E.G. Slope (ft/ft)	0.000024	Area (sq ft)	433.06	212.12	327.31
Q Total (cfs)	474.44	Flow (cfs)	193.52	138.48	142.44
Top Width (ft)	277.55	Top Width (ft)	135.09	36.02	106.44
Vel Total (ft/s)	0.49	Avg. Vel. (ft/s)	0.45	0.65	0.44
Max Chl Dpth (ft)	8.28	Hydr. Depth (ft)	3.21	5.89	3.08
Conv. Total (cfs)	97725.0	Conv. (cfs)	39861.0	28524.4	29339.6
Length Wtd. (ft)	74.30	Wetted Per. (ft)	135.66	37.63	106.69
Min Ch El (ft)	432.50	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	8.02	19.84	1.11
C & E Loss (ft)	0.00	Cum SA (acres)	2.16	2.18	0.57

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 OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.21	Reach Len. (ft)	74.30	74.30	74.30
Crit W.S. (ft)		Flow Area (sq ft)	117.77	119.53	90.40

E.G. Slope (ft/ft)	0.000329	Area (sq ft)	117.77	119.53	90.40
Q Total (cfs)	383.56	Flow (cfs)	104.06	198.82	80.68
Top Width (ft)	203.83	Top Width (ft)	95.54	36.02	72.27
Vel Total (ft/s)	1.17	Avg. Vel. (ft/s)	0.88	1.66	0.89
Max Chl Dpth (ft)	5.71	Hydr. Depth (ft)	1.23	3.32	1.25
Conv. Total (cfs)	21155.5	Conv. (cfs)	5739.3	10966.2	4449.9
Length Wtd. (ft)	74.30	Wetted Per. (ft)	95.76	37.63	72.41
Min Ch El (ft)	432.50	Shear (lb/sq ft)	0.03	0.07	0.03
Alpha	1.32	Stream Power (lb/ft s)	0.02	0.11	0.02
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.70	14.60	0.40
C & E Loss (ft)	0.01	Cum SA (acres)	1.77	2.18	0.26

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 OUTPUT Profile #10 YEAR

E.G. Elev (ft)	436.57	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.47	Wt. n-Val.	0.035	0.035	
W.S. Elev (ft)	436.10	Reach Len. (ft)	74.30	74.30	74.30
Crit W.S. (ft)	436.10	Flow Area (sq ft)	6.31	43.49	
E.G. Slope (ft/ft)	0.014001	Area (sq ft)	6.31	43.49	
Q Total (cfs)	257.63	Flow (cfs)	13.31	244.32	
Top Width (ft)	58.39	Top Width (ft)	23.20	35.19	
Vel Total (ft/s)	5.17	Avg. Vel. (ft/s)	2.11	5.62	
Max Chl Dpth (ft)	3.60	Hydr. Depth (ft)	0.27	1.24	
Conv. Total (cfs)	2177.3	Conv. (cfs)	112.5	2064.8	
Length Wtd. (ft)	74.30	Wetted Per. (ft)	23.22	36.78	
Min Ch El (ft)	432.50	Shear (lb/sq ft)	0.24	1.03	
Alpha	1.13	Stream Power (lb/ft s)	0.50	5.81	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.52	7.12	0.06
C & E Loss (ft)	0.12	Cum SA (acres)	0.53	2.03	0.06

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 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 OUTPUT Profile #2 YEAR

E.G. Elev (ft)	435.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.70	Wt. n-Val.		0.035	
W.S. Elev (ft)	435.26	Reach Len. (ft)	74.30	74.30	74.30

Crit W.S. (ft)	435.26	Flow Area (sq ft)	23.18
E.G. Slope (ft/ft)	0.018313	Area (sq ft)	23.18
Q Total (cfs)	156.13	Flow (cfs)	156.13
Top Width (ft)	16.87	Top Width (ft)	16.87
Vel Total (ft/s)	6.73	Avg. Vel. (ft/s)	6.73
Max Chl Dpth (ft)	2.76	Hydr. Depth (ft)	1.37
Conv. Total (cfs)	1153.7	Conv. (cfs)	1153.7
Length Wtd. (ft)	74.30	Wetted Per. (ft)	18.27
Min Ch El (ft)	432.50	Shear (lb/sq ft)	1.45
Alpha	1.00	Stream Power (lb/ft s)	9.77
Frctn Loss (ft)	0.67	Cum Volume (acre-ft)	0.12
C & E Loss (ft)	0.16	Cum SA (acres)	0.22
			1.49
			0.03

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.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										(lb/ft
1	LOB	0.00	29.11	5.29	23.80	18.99	1.11	1.28	0.22	0.00
0.00										
2	LOB	29.11	58.22	23.01	68.24	29.13	4.85	2.34	0.34	0.00
0.00										
3	LOB	58.22	87.33	33.10	85.05	29.27	6.98	2.92	0.39	0.00
0.00										
4	LOB	87.33	116.44	54.05	113.93	29.14	11.39	3.91	0.47	0.01
0.00										
5	LOB	116.44	145.55	78.07	142.05	29.13	16.46	4.88	0.55	0.01
0.00										
6	Chan	145.55	152.75	20.97	35.47	7.21	4.42	4.92	0.59	0.01
0.00										
7	Chan	152.75	159.96	21.80	36.51	7.30	4.60	5.07	0.60	0.01
0.00										
8	Chan	159.96	167.16	37.44	52.94	8.22	7.89	7.35	0.71	0.01
0.01										
9	Chan	167.16	174.37	35.08	49.18	7.54	7.39	6.83	0.71	0.01
0.01										

10	Chan	174.37	181.57	23.19	38.02	7.37	4.89	5.28	0.61	0.01
0.00										
11	ROB	181.57	210.45	60.04	121.66	28.94	12.65	4.21	0.49	0.01
0.00										
12	ROB	210.45	239.34	52.44	112.18	28.95	11.05	3.88	0.47	0.01
0.00										
13	ROB	239.34	268.22	26.42	74.32	28.92	5.57	2.57	0.36	0.00
0.00										
14	ROB	268.22	297.11	3.54	19.16	19.88	0.75	0.97	0.18	0.00
0.00										

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

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	29.11	58.22	0.21	1.22	8.22	0.05	0.15	0.17	0.00	
0.00											
2	LOB	58.22	87.33	3.10	10.22	29.27	0.81	0.35	0.30	0.01	
0.00											
3	LOB	87.33	116.44	29.06	39.10	29.14	7.58	1.34	0.74	0.03	
0.02											
4	LOB	116.44	145.55	71.70	67.22	29.13	18.69	2.31	1.07	0.05	
0.05											
5	Chan	145.55	152.75	22.28	16.96	7.21	5.81	2.35	1.31	0.05	
0.06											
6	Chan	152.75	159.96	24.37	17.99	7.30	6.35	2.50	1.35	0.05	
0.07											
7	Chan	159.96	167.16	66.43	34.42	8.22	17.32	4.78	1.93	0.09	
0.17											
8	Chan	167.16	174.37	58.04	30.66	7.54	15.13	4.26	1.89	0.08	
0.16											
9	Chan	174.37	181.57	27.71	19.50	7.37	7.22	2.71	1.42	0.05	
0.08											
10	ROB	181.57	210.45	46.71	47.42	28.94	12.18	1.64	0.99	0.03	
0.03											
11	ROB	210.45	239.34	32.20	37.93	28.95	8.39	1.31	0.85	0.03	
0.02											
12	ROB	239.34	268.22	1.77	5.05	14.51	0.46	0.35	0.35	0.01	
0.00											

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

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
1	LOB	116.44	145.55	13.31	6.31	23.22	5.16	0.27	2.11	0.24	
0.50											
2	Chan	145.55	152.75	2.55	1.73	7.21	0.99	0.24	1.47	0.21	
0.31											
3	Chan	152.75	159.96	5.53	2.77	7.30	2.15	0.38	2.00	0.33	
0.66											
4	Chan	159.96	167.16	128.74	19.20	8.22	49.97	2.67	6.71	2.04	
13.70											
5	Chan	167.16	174.37	94.85	15.44	7.54	36.81	2.14	6.14	1.79	
11.00											
6	Chan	174.37	181.57	12.66	4.35	6.52	4.91	0.68	2.91	0.58	
1.70											

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 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.

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
1	Chan	159.96	167.16	96.44	13.15	8.22	61.77	1.83	7.33	1.83	
13.42											
2	Chan	167.16	174.37	58.29	9.39	7.54	37.33	1.30	6.21	1.42	
8.84											
3	Chan	174.37	181.57	1.40	0.65	2.51	0.90	0.26	2.17	0.29	
0.64											

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 CL
REACH: CHANNEL CL RS: 839.73

INPUT

Description: 7

Station	Elevation	Data	num=	62						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	441.24	4.13	440.92	7.45	440.9	10.37	439.8	10.92	439.61	
11.07	439.52	11.47	439.23	14.19	439.32	25.54	439.64	29.13	439.51	
30.54	439.48	32.23	439.42	40.69	439.2	40.94	439.31	41.29	439.48	
44.87	439.26	45.41	439.22	46.31	439.16	50.57	437.15	51.69	436.59	
51.98	436.3	52.47	435.78	58.04	435.64	59.66	435.63	65.79	435.51	
68.42	435.53	74.54	435.18	78.66	435.17	80.54	435.12	87.38	434.96	
94.16	434.84	98.54	434.89	101.06	434.85	101.91	434.83	103.25	434.84	
118.5	434.45	118.69	434.44	119	434.43	121.57	434.35	134.72	433.89	
150.44	433.51	164.25	433.27	166.94	431.93	199.17	431.98	204.98	434.85	
217.58	441.03	222.67	440.95	222.68	440.45	270.64	441.52	280.25	441.52	
280.26	442.02	301.54	441.96	310.52	441.02	311.01	440.87	313.45	440.83	
313.48	441.33	335.78	442.68	338.04	443	350.17	443.57	352.69	444	
376.28	446.51	392.65	446.86							

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.035	101.06	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	101.06	204.98		93.2	93.2		.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)	339.04	776.64	38.37
E.G. Slope (ft/ft)	0.000009	Area (sq ft)	339.04	776.64	38.37
Q Total (cfs)	474.44	Flow (cfs)	98.75	367.01	8.67
Top Width (ft)	224.25	Top Width (ft)	93.30	103.92	27.03
Vel Total (ft/s)	0.41	Avg. Vel. (ft/s)	0.29	0.47	0.23
Max Chl Dpth (ft)	8.85	Hydr. Depth (ft)	3.63	7.47	1.42
Conv. Total (cfs)	161881.8	Conv. (cfs)	33695.8	125227.4	2958.7
Length Wtd. (ft)	93.20	Wetted Per. (ft)	94.66	104.93	28.74

Min Ch El (ft)	431.93	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.13	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	7.36	19.00	0.79
C & E Loss (ft)	0.00	Cum SA (acres)	1.97	2.06	0.46

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)	149.29	510.70	11.60
E.G. Slope (ft/ft)	0.000026	Area (sq ft)	149.29	510.70	11.60
Q Total (cfs)	383.56	Flow (cfs)	63.84	316.42	3.30
Top Width (ft)	163.57	Top Width (ft)	52.77	103.92	6.88
Vel Total (ft/s)	0.57	Avg. Vel. (ft/s)	0.43	0.62	0.28
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)	2.83	4.91	1.69
Conv. Total (cfs)	75483.0	Conv. (cfs)	12562.5	62270.8	649.8
Length Wtd. (ft)	93.20	Wetted Per. (ft)	53.50	104.93	7.66
Min Ch El (ft)	431.93	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.48	14.06	0.31
C & E Loss (ft)	0.00	Cum SA (acres)	1.64	2.06	0.19

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.52	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)		128.61	
E.G. Slope (ft/ft)	0.001373	Area (sq ft)		128.61	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	88.56	Top Width (ft)		88.56	
Vel Total (ft/s)	2.00	Avg. Vel. (ft/s)		2.00	
Max Chl Dpth (ft)	2.59	Hydr. Depth (ft)		1.45	
Conv. Total (cfs)	6953.6	Conv. (cfs)		6953.6	
Length Wtd. (ft)	93.20	Wetted Per. (ft)		89.48	
Min Ch El (ft)	431.93	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.25	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.52	6.98	0.06
C & E Loss (ft)	0.01	Cum SA (acres)	0.51	1.93	0.06

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

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	433.44	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.		0.035	
W.S. Elev (ft)	433.25	Reach Len. (ft)	93.20	93.20	93.20
Crit W.S. (ft)		Flow Area (sq ft)		45.11	
E.G. Slope (ft/ft)	0.005297	Area (sq ft)		45.11	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	37.45	Top Width (ft)		37.45	
Vel Total (ft/s)	3.46	Avg. Vel. (ft/s)		3.46	
Max Chl Dpth (ft)	1.32	Hydr. Depth (ft)		1.20	
Conv. Total (cfs)	2145.3	Conv. (cfs)		2145.3	
Length Wtd. (ft)	93.20	Wetted Per. (ft)		38.06	
Min Ch El (ft)	431.93	Shear (lb/sq ft)		0.39	
Alpha	1.00	Stream Power (lb/ft s)		1.36	
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	0.12	3.44	0.01
C & E Loss (ft)	0.03	Cum SA (acres)	0.22	1.45	0.03

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	0.00	20.21	1.79	15.02	12.79	0.38	1.21	0.12	0.00	
0.00											
2	LOB	20.21	40.42	3.49	26.94	20.22	0.74	1.33	0.13	0.00	
0.00											
3	LOB	40.42	60.64	16.36	69.41	21.21	3.45	3.43	0.24	0.00	
0.00											
4	LOB	60.64	80.85	36.07	109.43	20.22	7.60	5.41	0.33	0.00	
0.00											
5	LOB	80.85	101.06	41.05	118.25	20.22	8.65	5.85	0.35	0.00	
0.00											
6	Chan	101.06	121.84	53.08	127.99	20.79	11.19	6.16	0.41	0.00	
0.00											
7	Chan	121.84	142.63	62.45	141.12	20.79	13.16	6.79	0.44	0.00	
0.00											
8	Chan	142.63	163.41	70.61	151.89	20.79	14.88	7.31	0.46	0.00	
0.00											
9	Chan	163.41	184.20	93.50	180.84	21.10	19.71	8.70	0.52	0.00	
0.00											
10	Chan	184.20	204.98	87.38	174.80	21.45	18.42	8.41	0.50	0.00	
0.00											
11	ROB	204.98	242.51	8.67	38.37	28.74	1.83	1.42	0.23	0.00	
0.00											

Warning: Divided flow computed for this cross-section.

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	40.42	60.64	8.18	25.06	13.06	2.13	2.03	0.33	0.00	
0.00											
2	LOB	60.64	80.85	24.54	57.71	20.22	6.40	2.85	0.43	0.00	
0.00											
3	LOB	80.85	101.06	31.11	66.52	20.22	8.11	3.29	0.47	0.01	
0.00											
4	Chan	101.06	121.84	37.18	74.81	20.79	9.69	3.60	0.50	0.01	
0.00											
5	Chan	121.84	142.63	48.67	87.93	20.79	12.69	4.23	0.55	0.01	
0.00											
6	Chan	142.63	163.41	59.02	98.70	20.79	15.39	4.75	0.60	0.01	
0.00											
7	Chan	163.41	184.20	89.71	127.65	21.10	23.39	6.14	0.70	0.01	
0.01											
8	Chan	184.20	204.98	81.84	121.61	21.45	21.34	5.85	0.67	0.01	
0.01											
9	ROB	204.98	242.51	3.30	11.60	7.66	0.86	1.69	0.28	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	101.06	121.84	0.13	0.52	6.09	0.05	0.09	0.26	0.01	
0.00											
2	Chan	121.84	142.63	9.43	10.95	20.79	3.66	0.53	0.86	0.05	
0.04											
3	Chan	142.63	163.41	29.51	21.72	20.79	11.45	1.05	1.36	0.09	
0.12											
4	Chan	163.41	184.20	119.90	50.67	21.10	46.54	2.44	2.37	0.21	
0.49											
5	Chan	184.20	204.98	98.66	44.74	20.71	38.29	2.22	2.21	0.19	
0.41											

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.

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft) (lb/ft)
s)										
1	Chan	163.41	184.20	84.83	24.29	20.22	54.33	1.22	3.49	0.40
1.39										
2	Chan	184.20	204.98	71.30	20.82	17.84	45.67	1.19	3.42	0.39
1.32										

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 746.53

INPUT

Description: 6

Station	Elevation	Data	num=	72						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	443.41	.99	443.29	1.47	443.22	5.2	442.79	6.47	442.67	
10.3	442.33	11.58	442.24	12.96	442.11	14.57	442.09	15.17	442.04	
17.6	442.09	25.63	442.19	29.03	442.26	29.71	442.28	40.85	441.89	
43.49	441.79	44.25	441.77	44.91	441.92	46.03	442.16	46.18	442.21	
46.54	442.21	52.26	442.25	55.1	441.29	57.18	440.96	64.55	439.33	
73.48	436.92	73.71	436.71	74.84	436.4	75.28	436.41	85.08	436.11	
85.47	436.1	85.79	436.09	86.48	436.06	87.63	436.03	88.94	435.99	
91.05	435.88	93.24	435.74	108.68	434.95	108.97	434.93	111.37	434.78	
124.69	433.92	126.3	433.82	140.41	433.17	143.93	432.95	156.14	432.58	
161.56	432.45	171.86	432.25	179.19	432.07	194.12	431.68	194.4	431.68	
194.82	431.59	195.82	431.39	196.05	431.28	222.04	432	224.04	433.88	
225.61	433.89	230.76	436.36	243.58	442.77	248.58	442.67	248.59	442.17	
250.08	442.3	254.47	442.47	273.62	442.94	285.29	443	290.57	443.11	
290.58	443.11	309.5	443	381.14	443	397.89	442.93	424.89	443.45	
463.14	443.49	500.23	442.95							

Manning's n	Values	num=	3			
Sta	n Val	Sta	n Val	Sta	n Val	
0	.035	74.84	.035	230.76	.035	

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	74.84	230.76		93.29	93.29		.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)		Flow Area (sq ft)	34.19	1149.23	19.56
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	34.19	1149.23	19.56

Q Total (cfs)	474.44	Flow (cfs)	5.76	465.37	3.32
Top Width (ft)	181.62	Top Width (ft)	16.86	155.92	8.85
Vel Total (ft/s)	0.39	Avg. Vel. (ft/s)	0.17	0.40	0.17
Max Chl Dpth (ft)	9.50	Hydr. Depth (ft)	2.03	7.37	2.21
Conv. Total (cfs)	187206.8	Conv. (cfs)	2272.3	183626.0	1308.5
Length Wtd. (ft)	93.29	Wetted Per. (ft)	17.46	157.40	9.89
Min Ch El (ft)	431.28	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	6.97	16.94	0.73
C & E Loss (ft)	0.00	Cum SA (acres)	1.85	1.78	0.42

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)		Flow Area (sq ft)	5.35	750.12	3.47
E.G. Slope (ft/ft)	0.000018	Area (sq ft)	5.35	750.12	3.47
Q Total (cfs)	383.56	Flow (cfs)	0.85	382.16	0.55
Top Width (ft)	165.83	Top Width (ft)	6.19	155.92	3.73
Vel Total (ft/s)	0.51	Avg. Vel. (ft/s)	0.16	0.51	0.16
Max Chl Dpth (ft)	6.94	Hydr. Depth (ft)	0.87	4.81	0.93
Conv. Total (cfs)	90517.1	Conv. (cfs)	200.1	90186.6	130.5
Length Wtd. (ft)	93.29	Wetted Per. (ft)	6.48	157.40	4.17
Min Ch El (ft)	431.28	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.01	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.31	12.71	0.30
C & E Loss (ft)	0.00	Cum SA (acres)	1.58	1.78	0.18

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.49	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)		Flow Area (sq ft)		217.14	
E.G. Slope (ft/ft)	0.000323	Area (sq ft)		217.14	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	111.07	Top Width (ft)		111.07	
Vel Total (ft/s)	1.19	Avg. Vel. (ft/s)		1.19	
Max Chl Dpth (ft)	3.21	Hydr. Depth (ft)		1.96	
Conv. Total (cfs)	14327.7	Conv. (cfs)		14327.7	
Length Wtd. (ft)	93.29	Wetted Per. (ft)		112.07	
Min Ch El (ft)	431.28	Shear (lb/sq ft)		0.04	
Alpha	1.00	Stream Power (lb/ft s)		0.05	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.52	6.61	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.51	1.71	0.06

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	433.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.91	Reach Len. (ft)	93.29	93.29	93.29
Crit W.S. (ft)		Flow Area (sq ft)		67.01	
E.G. Slope (ft/ft)	0.003708	Area (sq ft)		67.01	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	77.86	Top Width (ft)		77.86	
Vel Total (ft/s)	2.33	Avg. Vel. (ft/s)		2.33	
Max Chl Dpth (ft)	1.63	Hydr. Depth (ft)		0.86	
Conv. Total (cfs)	2564.2	Conv. (cfs)		2564.2	
Length Wtd. (ft)	93.29	Wetted Per. (ft)		78.31	
Min Ch El (ft)	431.28	Shear (lb/sq ft)		0.20	
Alpha	1.00	Stream Power (lb/ft s)		0.46	
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)	0.12	3.32	0.01
C & E Loss (ft)	0.03	Cum SA (acres)	0.22	1.32	0.03

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

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	44.90	59.87	0.01	0.40	1.94	0.00	0.21	0.04	0.00	
0.00											
2	LOB	59.87	74.84	5.74	33.80	15.52	1.21	2.26	0.17	0.00	
0.00											
3	Chan	74.84	106.02	47.22	154.29	31.21	9.95	4.95	0.31	0.00	
0.00											
4	Chan	106.02	137.21	76.87	206.73	31.24	16.20	6.63	0.37	0.00	
0.00											
5	Chan	137.21	168.39	106.58	251.41	31.20	22.46	8.06	0.42	0.00	
0.00											
6	Chan	168.39	199.58	125.04	276.86	31.25	26.36	8.88	0.45	0.00	
0.00											
7	Chan	199.58	230.76	109.65	259.93	32.50	23.11	8.34	0.42	0.00	
0.00											
8	ROB	230.76	284.65	3.32	19.56	9.89	0.70	2.21	0.17	0.00	
0.00											

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
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		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
s)											
1	LOB	59.87	74.84	0.85	5.35	6.48	0.22	0.87	0.16	0.00	
0.00											
2	Chan	74.84	106.02	22.81	74.46	31.21	5.95	2.39	0.31	0.00	
0.00											
3	Chan	106.02	137.21	55.45	126.91	31.24	14.46	4.07	0.44	0.00	
0.00											
4	Chan	137.21	168.39	91.73	171.59	31.20	23.91	5.50	0.53	0.01	
0.00											
5	Chan	168.39	199.58	115.39	197.04	31.25	30.08	6.32	0.59	0.01	
0.00											
6	Chan	199.58	230.76	96.78	180.11	32.50	25.23	5.78	0.54	0.01	
0.00											
7	ROB	230.76	284.65	0.55	3.47	4.17	0.14	0.93	0.16	0.00	
0.00											

Profile #10 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
Power		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
s)											
1	Chan	106.02	137.21	7.15	13.64	21.44	2.77	0.64	0.52	0.01	
0.01											
2	Chan	137.21	168.39	57.35	55.30	31.20	22.26	1.77	1.04	0.04	
0.04											
3	Chan	168.39	199.58	107.67	80.75	31.25	41.79	2.59	1.33	0.05	
0.07											
4	Chan	199.58	230.76	85.46	67.45	28.18	33.17	2.47	1.27	0.05	
0.06											

Profile #2 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
Power		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
s)											
1	Chan	137.21	168.39	8.50	7.61	23.25	5.45	0.33	1.12	0.08	
0.08											
2	Chan	168.39	199.58	74.40	31.46	31.25	47.65	1.01	2.37	0.23	
0.55											
3	Chan	199.58	230.76	73.23	27.95	23.81	46.90	1.19	2.62	0.27	
0.71											

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 CL
 REACH: CHANNEL CL RS: 653.24

INPUT

Description: 5

Station Elevation Data				num= 69			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	449.48	3.91	449.48	10.2	449.27	13.23	449.2
17.05	448.96	17.7	448.85	18.35	448.75	20.14	448.52
20.97	448.31	21.35	448.19	21.86	448.03	23.08	447.57
24.26	446.86	24.43	446.66	25.44	446.6	36.35	446.03
46.58	445.61	47.94	445.99	48.43	446.13	50.77	445.49
63.8	439.11	67.15	437.55	68.98	436.66	69.42	436.24
77.64	436.34	79.15	436.35	79.36	436.43	79.73	436.57
82.95	434.19	83.69	433.78	95.07	433.68	111.3	433.67
118.61	433.43	130.54	432.95	139.82	432.92	148.28	432.85
169.58	432.43	188.33	432.34	193.1	432.29	193.34	431.83
197.16	431.43	205.2	430.59	205.4	431.35	205.44	431.49
219.36	431	231.8	430.95	239.25	434.57	256.2	442.75
261.55	442.14	263.07	442.26	305.17	442.95	305.18	443.45
326.39	443	465.81	443.75	491.59	443.56	527.52	442.93

Manning's n Values				num= 3			
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	82.44	.035	239.25	.035		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	82.44	239.25		100.96	100.96		.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)		Flow Area (sq ft)	80.27	1290.55	39.99
E.G. Slope (ft/ft)	0.000004	Area (sq ft)	80.27	1290.55	39.99
Q Total (cfs)	474.44	Flow (cfs)	15.51	452.05	6.88
Top Width (ft)	192.05	Top Width (ft)	22.37	156.81	12.87
Vel Total (ft/s)	0.34	Avg. Vel. (ft/s)	0.19	0.35	0.17
Max Chl Dpth (ft)	10.19	Hydr. Depth (ft)	3.59	8.23	3.11
Conv. Total (cfs)	232298.6	Conv. (cfs)	7592.8	221335.0	3370.7
Length Wtd. (ft)	100.96	Wetted Per. (ft)	24.14	158.95	14.29
Min Ch El (ft)	430.59	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.00	0.00
Frcn Loss (ft)	0.00	Cum Volume (acre-ft)	6.84	14.33	0.67
C & E Loss (ft)	0.00	Cum SA (acres)	1.81	1.44	0.39

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 OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)		Flow Area (sq ft)	30.28	889.11	13.82
E.G. Slope (ft/ft)	0.000010	Area (sq ft)	30.28	889.11	13.82
Q Total (cfs)	383.56	Flow (cfs)	5.75	375.23	2.58
Top Width (ft)	181.11	Top Width (ft)	16.73	156.81	7.57
Vel Total (ft/s)	0.41	Avg. Vel. (ft/s)	0.19	0.42	0.19
Max Chl Dpth (ft)	7.63	Hydr. Depth (ft)	1.81	5.67	1.83
Conv. Total (cfs)	121587.3	Conv. (cfs)	1821.8	118947.7	817.7
Length Wtd. (ft)	100.96	Wetted Per. (ft)	17.95	158.95	8.40
Min Ch El (ft)	430.59	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.04	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.27	10.96	0.28
C & E Loss (ft)	0.00	Cum SA (acres)	1.55	1.44	0.17

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 OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.48	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)		Flow Area (sq ft)		302.22	
E.G. Slope (ft/ft)	0.000171	Area (sq ft)		302.22	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	156.49	Top Width (ft)		156.49	
Vel Total (ft/s)	0.85	Avg. Vel. (ft/s)		0.85	
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)		1.93	
Conv. Total (cfs)	19722.8	Conv. (cfs)		19722.8	
Length Wtd. (ft)	100.96	Wetted Per. (ft)		158.58	
Min Ch El (ft)	430.59	Shear (lb/sq ft)		0.02	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.52	6.05	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.51	1.43	0.06

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

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.35	Wt. n-Val.		0.035	
W.S. Elev (ft)	431.98	Reach Len. (ft)	100.96	100.96	100.96
Crit W.S. (ft)	431.93	Flow Area (sq ft)		33.07	
E.G. Slope (ft/ft)	0.016875	Area (sq ft)		33.07	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	40.67	Top Width (ft)		40.67	
Vel Total (ft/s)	4.72	Avg. Vel. (ft/s)		4.72	
Max Chl Dpth (ft)	1.39	Hydr. Depth (ft)		0.81	
Conv. Total (cfs)	1201.9	Conv. (cfs)		1201.9	
Length Wtd. (ft)	100.96	Wetted Per. (ft)		41.76	
Min Ch El (ft)	430.59	Shear (lb/sq ft)		0.83	
Alpha	1.00	Stream Power (lb/ft s)		3.94	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.12	3.21	0.01
C & E Loss (ft)	0.10	Cum SA (acres)	0.22	1.20	0.03

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

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	49.46	65.95	0.70	7.80	6.46	0.15	1.33	0.09	0.00	
0.00											
2	LOB	65.95	82.44	14.80	72.48	17.68	3.12	4.40	0.20	0.00	
0.00											
3	Chan	82.44	113.80	70.14	221.71	31.60	14.78	7.07	0.32	0.00	
0.00											
4	Chan	113.80	145.16	80.66	240.40	31.38	17.00	7.67	0.34	0.00	
0.00											
5	Chan	145.16	176.53	89.86	256.47	31.37	18.94	8.18	0.35	0.00	
0.00											
6	Chan	176.53	207.89	102.06	280.43	32.40	21.51	8.94	0.36	0.00	
0.00											
7	Chan	207.89	239.25	109.33	291.54	32.20	23.04	9.30	0.38	0.00	
0.00											
8	ROB	239.25	296.90	6.88	39.99	14.29	1.45	3.11	0.17	0.00	
0.00											

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

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	49.46	65.95	0.00	0.01	0.27	0.00	0.06	0.02	0.00	
0.00											
2	LOB	65.95	82.44	5.75	30.27	17.68	1.50	1.84	0.19	0.00	
0.00											
3	Chan	82.44	113.80	50.93	141.42	31.60	13.28	4.51	0.36	0.00	
0.00											
4	Chan	113.80	145.16	62.93	160.11	31.38	16.41	5.11	0.39	0.00	
0.00											
5	Chan	145.16	176.53	73.83	176.18	31.37	19.25	5.62	0.42	0.00	
0.00											
6	Chan	176.53	207.89	89.36	200.15	32.40	23.30	6.38	0.45	0.00	
0.00											
7	Chan	207.89	239.25	98.18	211.25	32.20	25.60	6.74	0.46	0.00	
0.00											
8	ROB	239.25	296.90	2.58	13.82	8.40	0.67	1.83	0.19	0.00	
0.00											

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

Profile #10 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
Power		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	82.44	113.80	10.18	24.05	31.44	3.95	0.77	0.42	0.01	
0.00											
2	Chan	113.80	145.16	26.57	42.73	31.38	10.31	1.36	0.62	0.01	
0.01											
3	Chan	145.16	176.53	45.24	58.80	31.37	17.56	1.87	0.77	0.02	
0.02											
4	Chan	176.53	207.89	78.27	82.77	32.40	30.38	2.64	0.95	0.03	
0.03											
5	Chan	207.89	239.25	97.37	93.88	32.00	37.80	3.01	1.04	0.03	
0.03											

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

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
-------	-----	----------	-----------	------	------	------	---------	------	----------	-------

		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	176.53	207.89	45.28	10.62	15.48	29.00	0.73	4.26	0.72	
3.08											
2	Chan	207.89	239.25	110.85	22.46	26.28	71.00	0.86	4.94	0.90	
4.44											

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 CL
REACH: CHANNEL CL RS: 552.28

INPUT

Description: 4

Station	Elevation	Data	num=	103							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	455.27	2.54	455.33	7.13	453.48	18.91	448.77	22.34	447.32		
24.58	446.27	27.79	444.7	30.29	443.57	30.64	443.5	30.79	443.52		
30.92	443.32	31.31	443.32	32.2	443.27	32.45	443.09	32.75	442.83		
35.07	442.77	35.92	442.77	36.57	442.75	37.95	442.73	43.78	442.56		
56.98	442.24	62.51	442.06	75.5	441.66	76.04	441.64	95.54	441.01		
95.77	441.05	95.97	441.09	97.79	441.41	104.15	441.19	105.72	441.1		
111.68	440.81	113.37	440.82	115.02	440.81	115.59	440.81	128.62	438.95		
128.96	438.65	129.49	438.64	133.16	438.52	141.12	438.21	142	438.16		
151.44	437.87	151.68	437.86	152.02	437.86	157.47	437.66	158.17	437.64		
160.9	437.48	170.18	436.92	171.58	436.86	172.56	436.75	172.93	436.72		
173.09	436.72	173.97	436.77	174.71	436.82	183.59	436.86	190.5	436.83		
190.57	436.92	191.05	437.43	192.49	437.09	196.2	436.29	199.31	434.74		
203.01	433.31	206.12	432.18	208.96	431.24	209.98	430.84	211.48	430.83		
228.37	430.75	243.86	430.27	247.41	430.21	252.15	430.15	266.46	430.15		
285.5	429.91	296.54	429.71	304.54	429.61	320.45	430.2	320.82	430.22		
321.1	429.65	321.27	429.64	332.24	428.61	332.49	429.58	332.77	429.6		
332.97	429.61	333.52	429.65	339.6	430.06	340.64	429.94	353.35	436.29		
365.2	442.21	370.2	442.11	370.21	441.61	371.7	441.74	394.2	442.44		
394.21	442.94	397.45	443	403.53	442.61	409.07	443.38	425.94	443		
613.73	443	618.29	443	626.4	443.39	712.41	441.46	714.36	441.53		
715.25	447.77	730.06	453.74	734.58	453.76						

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.035	196.2	.035

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	196.2	353.35		101.03	101.03	101.03		.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)	234.22	1598.95	20.20
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	234.22	1598.95	20.20
Q Total (cfs)	474.44	Flow (cfs)	28.53	443.97	1.93
Top Width (ft)	246.56	Top Width (ft)	80.42	157.15	8.99
Vel Total (ft/s)	0.26	Avg. Vel. (ft/s)	0.12	0.28	0.10
Max Chl Dpth (ft)	12.17	Hydr. Depth (ft)	2.91	10.17	2.25
Conv. Total (cfs)	335293.7	Conv. (cfs)	20164.6	313763.2	1365.9
Length Wtd. (ft)	101.03	Wetted Per. (ft)	81.10	160.91	10.05
Min Ch El (ft)	428.61	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.12	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	6.48	10.98	0.60
C & E Loss (ft)	0.00	Cum SA (acres)	1.69	1.08	0.37

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)	52.31	1196.65	3.74
E.G. Slope (ft/ft)	0.000004	Area (sq ft)	52.31	1196.65	3.74
Q Total (cfs)	383.56	Flow (cfs)	4.16	379.11	0.28
Top Width (ft)	216.43	Top Width (ft)	55.41	157.15	3.87
Vel Total (ft/s)	0.31	Avg. Vel. (ft/s)	0.08	0.32	0.08
Max Chl Dpth (ft)	9.61	Hydr. Depth (ft)	0.94	7.61	0.97
Conv. Total (cfs)	195832.4	Conv. (cfs)	2126.0	193562.3	144.1
Length Wtd. (ft)	101.03	Wetted Per. (ft)	55.84	160.91	4.32
Min Ch El (ft)	428.61	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.06	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.18	8.54	0.26
C & E Loss (ft)	0.00	Cum SA (acres)	1.47	1.08	0.16

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	434.48	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)		615.37	
E.G. Slope (ft/ft)	0.000015	Area (sq ft)		615.37	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	149.75	Top Width (ft)		149.75	
Vel Total (ft/s)	0.42	Avg. Vel. (ft/s)		0.42	
Max Chl Dpth (ft)	5.87	Hydr. Depth (ft)		4.11	
Conv. Total (cfs)	66167.6	Conv. (cfs)		66167.6	

Length Wtd. (ft)	101.03	Wetted Per. (ft)	152.67
Min Ch El (ft)	428.61	Shear (lb/sq ft)	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.52
C & E Loss (ft)	0.00	Cum SA (acres)	0.51

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.20	Reach Len. (ft)	101.03	101.03	101.03
Crit W.S. (ft)		Flow Area (sq ft)		285.18	
E.G. Slope (ft/ft)	0.000065	Area (sq ft)		285.18	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	139.08	Top Width (ft)		139.08	
Vel Total (ft/s)	0.55	Avg. Vel. (ft/s)		0.55	
Max Chl Dpth (ft)	3.59	Hydr. Depth (ft)		2.05	
Conv. Total (cfs)	19358.7	Conv. (cfs)		19358.7	
Length Wtd. (ft)	101.03	Wetted Per. (ft)		141.05	
Min Ch El (ft)	428.61	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	2.84	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.99	0.03

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
1	LOB	78.48	117.72	0.00	0.27	1.96	0.00	0.14	0.02	0.00
0.00										
2	LOB	117.72	156.96	8.17	85.63	39.48	1.72	2.18	0.10	0.00
0.00										
3	LOB	156.96	196.20	20.36	148.31	39.66	4.29	3.78	0.14	0.00
0.00										
4	Chan	196.20	227.63	69.69	278.37	32.49	14.69	8.86	0.25	0.00
0.00										
5	Chan	227.63	259.06	93.50	327.71	31.44	19.71	10.43	0.29	0.00
0.00										
6	Chan	259.06	290.49	98.41	337.90	31.43	20.74	10.75	0.29	0.00
0.00										
7	Chan	290.49	321.92	101.00	344.82	31.80	21.29	10.97	0.29	0.00
0.00										
8	Chan	321.92	353.35	81.37	310.16	33.75	17.15	9.87	0.26	0.00
0.00										
9	ROB	353.35	429.60	1.93	20.20	10.05	0.41	2.25	0.10	0.00
0.00										

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	117.72	156.96	0.14	4.45	16.18	0.04	0.28	0.03	0.00	
0.00											
2	LOB	156.96	196.20	4.02	47.86	39.66	1.05	1.22	0.08	0.00	
0.00											
3	Chan	196.20	227.63	54.48	197.91	32.49	14.20	6.30	0.28	0.00	
0.00											
4	Chan	227.63	259.06	80.70	247.25	31.44	21.04	7.87	0.33	0.00	
0.00											
5	Chan	259.06	290.49	86.33	257.44	31.43	22.51	8.19	0.34	0.00	
0.00											
6	Chan	290.49	321.92	89.53	264.35	31.80	23.34	8.41	0.34	0.00	
0.00											
7	Chan	321.92	353.35	68.09	229.70	33.75	17.75	7.31	0.30	0.00	
0.00											
8	ROB	353.35	429.60	0.28	3.74	4.32	0.07	0.97	0.08	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	196.20	227.63	28.15	83.64	28.30	10.93	3.02	0.34	0.00	
0.00											
2	Chan	227.63	259.06	54.51	129.68	31.44	21.16	4.13	0.42	0.00	
0.00											
3	Chan	259.06	290.49	61.85	139.87	31.43	24.01	4.45	0.44	0.00	
0.00											
4	Chan	290.49	321.92	66.51	146.78	31.80	25.81	4.67	0.45	0.00	
0.00											
5	Chan	321.92	353.35	46.61	115.40	29.70	18.09	4.15	0.40	0.00	
0.00											

Profile #2 YEAR

	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
Power		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											

1	Chan	196.20	227.63	10.65	27.29	21.79	6.82	1.27	0.39	0.01
0.00										
2	Chan	227.63	259.06	29.15	57.84	31.44	18.67	1.84	0.50	0.01
0.00										
3	Chan	259.06	290.49	38.21	68.03	31.43	24.47	2.16	0.56	0.01
0.00										
4	Chan	290.49	321.92	44.55	74.95	31.80	28.53	2.38	0.59	0.01
0.01										
5	Chan	321.92	353.35	33.58	57.07	24.59	21.50	2.46	0.59	0.01
0.01										

CROSS SECTION

RIVER: CHANNEL CL
 REACH: CHANNEL CL RS: 451.25

INPUT

Description: 3

Station Elevation Data		num= 60									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	445.3	75	445.3	75.1	436.83	150	436.83	155	436.73		
155.1	436.23	180.18	434.25	181.34	434.22	192.32	434.14	194.01	434.1		
194.77	434.32	195.79	434.62	196.19	434.57	196.71	434.46	197.12	433.95		
197.95	433.05	201.08	433.01	203.35	432.82	203.54	432.76	203.87	431.32		
205.88	431.36	208.77	431.39	209.31	431.37	209.84	431.39	216.13	429.52		
216.38	429.44	218.92	429.28	227.46	428.72	230.98	428.72	234.76	428.64		
250.51	428.48	257.41	428.6	275.74	429.28	276.89	429.32	277.18	428.8		
277.64	428.76	288.82	428.05	288.88	428.33	289.09	428.96	296.89	429.03		
303.71	433.95	321.34	442.77	326.97	442.67	326.98	442.17	328.78	442.3		
351.24	442.93	351.26	443.75	355.07	443.85	366.92	442.49	377.18	443		
522.95	443	622.95	443	638.98	442.73	638.99	442.23	644.42	442.29		
708.43	440.86	710.2	440.73	711.01	449.25	724.46	455.1	726.08	455.08		

Manning's n Values		num= 3			
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	197.12	.035	303.71	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
197.12	303.71	153.03	153.03	153.03	.1		.3

Ineffective Flow		num= 2			
Sta L	Sta R	Elev	Permanent		
0	155	442	F		
726.08	726.08	442	F		

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035

W.S. Elev (ft)	440.78	Reach Len. (ft)	153.03	153.03	153.03
Crit W.S. (ft)	429.79	Flow Area (sq ft)	250.63	1207.56	46.67
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	566.75	1207.56	46.67
Q Total (cfs)	474.44	Flow (cfs)	56.38	411.24	6.82
Top Width (ft)	243.03	Top Width (ft)	122.07	106.59	14.37
Vel Total (ft/s)	0.32	Avg. Vel. (ft/s)	0.22	0.34	0.15
Max Chl Dpth (ft)	12.73	Hydr. Depth (ft)	5.95	11.33	3.25
Conv. Total (cfs)	290257.5	Conv. (cfs)	34493.1	251594.3	4170.0
Length Wtd. (ft)	153.03	Wetted Per. (ft)	42.94	111.07	16.03
Min Ch El (ft)	428.05	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	5.55	7.72	0.52
C & E Loss (ft)	0.00	Cum SA (acres)	1.45	0.77	0.34

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	153.03	153.03	153.03
Crit W.S. (ft)	429.65	Flow Area (sq ft)	142.80	934.67	18.24
E.G. Slope (ft/ft)	0.000005	Area (sq ft)	254.27	934.67	18.24
Q Total (cfs)	383.56	Flow (cfs)	28.96	352.04	2.56
Top Width (ft)	237.17	Top Width (ft)	122.04	106.59	8.54
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)	0.20	0.38	0.14
Max Chl Dpth (ft)	10.17	Hydr. Depth (ft)	3.39	8.77	2.14
Conv. Total (cfs)	178863.6	Conv. (cfs)	13506.2	164165.3	1192.1
Length Wtd. (ft)	153.03	Wetted Per. (ft)	42.94	111.07	9.55
Min Ch El (ft)	428.05	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.09	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.82	6.07	0.23
C & E Loss (ft)	0.00	Cum SA (acres)	1.26	0.77	0.14

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.48	Reach Len. (ft)	153.03	153.03	153.03
Crit W.S. (ft)	429.44	Flow Area (sq ft)	4.88	535.79	0.28
E.G. Slope (ft/ft)	0.000016	Area (sq ft)	4.88	535.79	0.28
Q Total (cfs)	257.63	Flow (cfs)	0.33	257.28	0.02
Top Width (ft)	126.19	Top Width (ft)	18.55	106.59	1.06
Vel Total (ft/s)	0.48	Avg. Vel. (ft/s)	0.07	0.48	0.06
Max Chl Dpth (ft)	6.43	Hydr. Depth (ft)	0.26	5.03	0.26

Conv. Total (cfs)	65028.4	Conv. (cfs)	84.4	64939.4	4.6
Length Wtd. (ft)	153.03	Wetted Per. (ft)	18.86	111.07	1.18
Min Ch El (ft)	428.05	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.02	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.51	3.65	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.49	0.77	0.06

Warning: Divided flow computed for this cross-section.
 Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.19	Reach Len. (ft)	153.03	153.03	153.03
Crit W.S. (ft)	429.24	Flow Area (sq ft)		299.60	
E.G. Slope (ft/ft)	0.000035	Area (sq ft)		299.60	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	97.60	Top Width (ft)		97.60	
Vel Total (ft/s)	0.52	Avg. Vel. (ft/s)		0.52	
Max Chl Dpth (ft)	4.14	Hydr. Depth (ft)		3.07	
Conv. Total (cfs)	26319.9	Conv. (cfs)		26319.9	
Length Wtd. (ft)	153.03	Wetted Per. (ft)		100.66	
Min Ch El (ft)	428.05	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	2.16	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.71	0.03

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										(lb/ft)
1	LOB	38.75	77.50	0.00	9.58	6.35	0.00	3.91	0.00	0.00
0.00										
2	LOB	77.50	116.25	0.00	153.14	38.75	0.00	3.95	0.00	0.00
0.00										
3	LOB	116.25	155.00	0.00	153.39	38.75	0.00	3.96	0.00	0.00
0.00										
4	LOB	155.00	197.12	56.38	250.63	42.94	11.88	5.95	0.22	0.00
0.00										
5	Chan	197.12	218.44	57.92	200.05	23.17	12.21	9.38	0.29	0.00
0.00										
6	Chan	218.44	239.76	91.77	255.15	21.34	19.34	11.97	0.36	0.00
0.00										

7	Chan	239.76	261.07	95.09	260.57	21.32	20.04	12.22	0.36	0.00
0.00										
8	Chan	261.07	282.39	89.43	252.65	21.65	18.85	11.85	0.35	0.00
0.00										
9	Chan	282.39	303.71	77.03	239.15	23.60	16.24	11.22	0.32	0.00
0.00										
10	ROB	303.71	388.18	6.82	46.65	15.27	1.44	3.42	0.15	0.00
0.00										
11	ROB	388.18	472.66							0.00
0.00										
12	ROB	472.66	557.13							0.00
0.00										
13	ROB	557.13	641.61							0.00
0.00										
14	ROB	641.61	726.08	0.00	0.02	0.76	0.00	0.03	0.01	0.00
0.00										

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	38.75	77.50	0.00	3.35	3.79	0.00	1.39	0.00	0.00	
0.00											
2	LOB	77.50	116.25	0.00	53.94	38.75	0.00	1.39	0.00	0.00	
0.00											
3	LOB	116.25	155.00	0.00	54.19	38.75	0.00	1.40	0.00	0.00	
0.00											
4	LOB	155.00	197.12	28.96	142.80	42.94	7.55	3.39	0.20	0.00	
0.00											
5	Chan	197.12	218.44	44.51	145.47	23.17	11.60	6.82	0.31	0.00	
0.00											
6	Chan	218.44	239.76	80.30	200.57	21.34	20.93	9.41	0.40	0.00	
0.00											
7	Chan	239.76	261.07	83.99	205.99	21.32	21.90	9.66	0.41	0.00	
0.00											
8	Chan	261.07	282.39	77.89	198.07	21.65	20.31	9.29	0.39	0.00	
0.00											
9	Chan	282.39	303.71	65.36	184.57	23.60	17.04	8.66	0.35	0.00	
0.00											
10	ROB	303.71	388.18	2.56	18.24	9.55	0.67	2.14	0.14	0.00	
0.00											

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	155.00	197.12	0.33	4.88	18.86	0.13	0.26	0.07	0.00	
0.00											
2	Chan	197.12	218.44	21.46	65.70	23.17	8.33	3.08	0.33	0.00	
0.00											
3	Chan	218.44	239.76	62.54	120.79	21.34	24.27	5.67	0.52	0.01	
0.00											
4	Chan	239.76	261.07	67.32	126.21	21.32	26.13	5.92	0.53	0.01	
0.00											
5	Chan	261.07	282.39	59.82	118.30	21.65	23.22	5.55	0.51	0.01	
0.00											
6	Chan	282.39	303.71	46.14	104.79	23.60	17.91	4.92	0.44	0.00	
0.00											
7	ROB	303.71	388.18	0.02	0.28	1.18	0.01	0.26	0.06	0.00	
0.00											

Warning: Divided flow computed for this cross-section.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	Chan	197.12	218.44	6.92	22.43	15.75	4.43	1.52	0.31	0.00	
0.00											
2	Chan	218.44	239.76	39.48	72.03	21.34	25.28	3.38	0.55	0.01	
0.00											
3	Chan	239.76	261.07	44.57	77.45	21.32	28.55	3.63	0.58	0.01	
0.00											
4	Chan	261.07	282.39	36.87	69.53	21.65	23.61	3.26	0.53	0.01	
0.00											
5	Chan	282.39	303.71	28.30	58.17	20.60	18.13	3.08	0.49	0.01	
0.00											

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: CHANNEL CL

REACH: CHANNEL CL RS: 363.69

INPUT

Description: 2

Station	Elevation	Data	num=	57					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	445.3	31	445.3	51	436.83	84	436.83	87	436.83
163	436.83	167	435.82	167.5	434.97	185.24	434.08	189.37	433.86
195.38	433.66	200.01	433.46	207	433.2	208.03	433.39	208.78	433.53
216.19	432.02	217.09	431.82	217.54	431.8	220.94	431.69	221.58	431.66
221.85	431.71	222.65	431.77	224.65	430.75	227.59	429.11	233.29	428.57
239.08	428.13	258.32	427.72	272.48	427.78	283.27	428.22	290.5	428.4
299.29	427.85	302.1	427.68	302.27	428.38	302.35	428.6	303.46	428.6
311.39	428.58	321.31	433.53	338.86	442.28	343.86	442.17	343.87	441.67
345.37	441.79	367.91	442.23	367.92	442.73	386.89	442.9	445.74	442.48
485.44	442.93	514.15	443	645.77	443	665.14	443	671.89	442.73
671.9	442.23	736	440.7	737.57	441.04	737.58	441.1	738.33	449.15
751.41	455.41	751.62	455.41						

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	208.78	.035	321.31	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	208.78	321.31		87.56	87.56		.1	.3

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
0	167	442	T
751.62	751.62	442	T

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)	282.76	1326.25	52.90
E.G. Slope (ft/ft)	0.000002	Area (sq ft)	761.64	1326.25	52.90
Q Total (cfs)	474.44	Flow (cfs)	60.41	407.06	6.97
Top Width (ft)	298.00	Top Width (ft)	167.11	112.53	18.36
Vel Total (ft/s)	0.29	Avg. Vel. (ft/s)	0.21	0.31	0.13
Max Chl Dpth (ft)	13.10	Hydr. Depth (ft)	6.77	11.79	2.88
Conv. Total (cfs)	334334.3	Conv. (cfs)	42572.8	286852.9	4908.5
Length Wld. (ft)	87.56	Wetted Per. (ft)	42.34	115.34	20.07
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.07	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.22	3.27	0.35
C & E Loss (ft)	0.00	Cum SA (acres)	0.94	0.39	0.28

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)	175.79	1038.14	22.07
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	341.52	1038.14	22.07
Q Total (cfs)	383.56	Flow (cfs)	34.96	345.82	2.79
Top Width (ft)	283.01	Top Width (ft)	161.07	112.53	9.41
Vel Total (ft/s)	0.31	Avg. Vel. (ft/s)	0.20	0.33	0.13
Max Chl Dpth (ft)	10.54	Hydr. Depth (ft)	4.21	9.23	2.35
Conv. Total (cfs)	211525.8	Conv. (cfs)	19278.9	190710.3	1536.5
Length Wtd. (ft)	87.56	Wetted Per. (ft)	42.34	115.34	10.51
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.08	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.78	2.60	0.16
C & E Loss (ft)	0.00	Cum SA (acres)	0.77	0.39	0.11

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.48	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)	22.26	616.92	0.90
E.G. Slope (ft/ft)	0.000010	Area (sq ft)	22.26	616.92	0.90
Q Total (cfs)	257.63	Flow (cfs)	2.39	255.17	0.07
Top Width (ft)	145.91	Top Width (ft)	31.48	112.53	1.90
Vel Total (ft/s)	0.40	Avg. Vel. (ft/s)	0.11	0.41	0.08
Max Chl Dpth (ft)	6.80	Hydr. Depth (ft)	0.71	5.48	0.47
Conv. Total (cfs)	80876.7	Conv. (cfs)	749.3	80105.8	21.6
Length Wtd. (ft)	87.56	Wetted Per. (ft)	31.54	115.34	2.13
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.05	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.46	1.63	0.06
C & E Loss (ft)	0.00	Cum SA (acres)	0.40	0.39	0.06

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.035	
W.S. Elev (ft)	432.19	Reach Len. (ft)	87.56	87.56	87.56
Crit W.S. (ft)		Flow Area (sq ft)		365.53	
E.G. Slope (ft/ft)	0.000019	Area (sq ft)		365.53	
Q Total (cfs)	156.13	Flow (cfs)		156.13	
Top Width (ft)	103.26	Top Width (ft)		103.26	
Vel Total (ft/s)	0.43	Avg. Vel. (ft/s)		0.43	
Max Chl Dpth (ft)	4.51	Hydr. Depth (ft)		3.54	

Conv. Total (cfs)	35505.7	Conv. (cfs)	35505.7		
Length Wtd. (ft)	87.56	Wetted Per. (ft)	105.62		
Min Ch El (ft)	427.68	Shear (lb/sq ft)	0.00		
Alpha	1.00	Stream Power (lb/ft s)	0.00		
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	1.00	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.36	0.03

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										(lb/ft)
1	LOB	0.00	41.75	0.00	0.00	0.09	0.00	0.02	0.00	0.00
0.00										
2	LOB	41.75	83.50	0.00	146.88	42.55	0.00	3.52	0.00	0.00
0.00										
3	LOB	83.50	125.25	0.00	164.99	41.75	0.00	3.95	0.00	0.00
0.00										
4	LOB	125.25	167.00	0.00	167.01	41.88	0.00	4.00	0.00	0.00
0.00										
5	LOB	167.00	208.78	60.41	282.76	42.34	12.73	6.77	0.21	0.00
0.00										
6	Chan	208.78	231.29	55.12	212.32	23.38	11.62	9.43	0.26	0.00
0.00										
7	Chan	231.29	253.79	92.11	284.70	22.54	19.41	12.65	0.32	0.00
0.00										
8	Chan	253.79	276.30	96.59	292.80	22.51	20.36	13.01	0.33	0.00
0.00										
9	Chan	276.30	298.80	91.59	283.72	22.53	19.31	12.61	0.32	0.00
0.00										
10	Chan	298.80	321.31	71.64	252.70	24.38	15.10	11.23	0.28	0.00
0.00										
11	ROB	321.31	407.37	6.96	52.74	16.25	1.47	3.63	0.13	0.00
0.00										
12	ROB	407.37	493.43							0.00
0.00										
13	ROB	493.43	579.50							0.00
0.00										
14	ROB	579.50	665.56							0.00
0.00										
15	ROB	665.56	751.62	0.00	0.16	3.82	0.00	0.04	0.01	0.00
0.00										

Warning: Divided flow computed for this cross-section.

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	41.75	83.50	0.00	47.51	36.07	0.00	1.33	0.00	0.00	
0.00											
2	LOB	83.50	125.25	0.00	58.10	41.75	0.00	1.39	0.00	0.00	
0.00											
3	LOB	125.25	167.00	0.00	60.12	41.88	0.00	1.44	0.00	0.00	
0.00											
4	LOB	167.00	208.78	34.96	175.79	42.34	9.11	4.21	0.20	0.00	
0.00											
5	Chan	208.78	231.29	41.34	154.70	23.38	10.78	6.87	0.27	0.00	
0.00											
6	Chan	231.29	253.79	80.33	227.08	22.54	20.94	10.09	0.35	0.00	
0.00											
7	Chan	253.79	276.30	85.22	235.18	22.51	22.22	10.45	0.36	0.00	
0.00											
8	Chan	276.30	298.80	79.76	226.10	22.53	20.79	10.05	0.35	0.00	
0.00											
9	Chan	298.80	321.31	59.17	195.08	24.38	15.43	8.67	0.30	0.00	
0.00											
10	ROB	321.31	407.37	2.79	22.07	10.51	0.73	2.35	0.13	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	167.00	208.78	2.39	22.26	31.54	0.93	0.71	0.11	0.00	
0.00											
2	Chan	208.78	231.29	19.13	70.46	23.38	7.43	3.13	0.27	0.00	
0.00											
3	Chan	231.29	253.79	63.67	142.84	22.54	24.71	6.35	0.45	0.00	
0.00											
4	Chan	253.79	276.30	69.85	150.94	22.51	27.11	6.71	0.46	0.00	
0.00											
5	Chan	276.30	298.80	62.95	141.86	22.53	24.43	6.30	0.44	0.00	
0.00											
6	Chan	298.80	321.31	39.58	110.83	24.38	15.36	4.92	0.36	0.00	
0.00											
7	ROB	321.31	407.37	0.07	0.90	2.13	0.03	0.47	0.08	0.00	
0.00											

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft) (lb/ft
s)										
1	Chan	208.78	231.29	5.19	23.35	16.66	3.32	1.47	0.22	0.00
0.00										
2	Chan	231.29	253.79	41.18	91.32	22.54	26.37	4.06	0.45	0.00
0.00										
3	Chan	253.79	276.30	47.48	99.41	22.51	30.41	4.42	0.48	0.01
0.00										
4	Chan	276.30	298.80	40.45	90.33	22.53	25.91	4.01	0.45	0.00
0.00										
5	Chan	298.80	321.31	21.84	61.12	21.38	13.99	3.08	0.36	0.00
0.00										

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 298.22

INPUT

Description: 1

Station	Elevation	Data	num=	141						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	444.79	6.03	444.72	8.95	444.73	9.799	444.72	31.1	443.5	
31.22	443.49	31.42	443.49	44.91	443.01	60.99	442.62	67.04	442.57	
79.48	442.27	89.64	441.87	96.21	441.7	101.04	441.62	117.86	441.1	
118.95	441.07	120.56	441.02	127.55	440.82	138.77	440.56	139.27	440.54	
144.5	440.43	149.03	439.95	154.28	439.55	161.04	438.91	168.75	438.45	
170.91	438.5	178.97	438.37	188.25	438.17	191.18	437.99	191.45	437.95	
206.61	436.98	207.21	436.9	208.52	436.8	217.75	436.31	221.48	436.08	
222.61	435.99	223.75	435.96	236.84	435.87	237.71	435.87	238.81	435.86	
252.81	435.89	254.44	435.89	267.02	435.96	268.37	436.32	269.15	436.31	
269.37	436.27	270.25	436.28	273.12	436.15	273.33	436.14	274.12	435.85	
274.66	435.85	275.42	435.88	275.96	435.62	277.58	435.76	280.62	435.76	
281.27	435.86	282.50	435.83	283.96	435.66	285.34	435.77	286.78	435.69	
287.3	435.67	287.62	435.65	289.50	435.55	304.47	435.08	307.85	434.94	
308.46	434.97	311.9	434.93	312.31	434.68	313.06	434.66	325.34	433.87	
326.69	433.79	327.12	433.8	338.96	433.57	340.43	433.5	350.08	433.32	
351.31	433.26	353.98	433.17	355.06	433.15	365.11	432.78	368.09	432.62	
369.72	432.71	375.33	432.72	385.12	432.41	386.4	432.39	389.43	432.32	
395.9	432.09	396.52	432.08	396.7	432.09	397.12	432.08	399.44	431.13	
402.12	429.66	403.16	429.13	403.69	428.88	403.81	428.85	403.92	428.82	
404.31	428.64	404.62	428.6	405.53	428.57	406	428.58	412.89	428.17	
413.69	428.11	417.02	428	418.8	427.96	419.53	427.94	420.44	428.07	
421.23	428.26	422.52	428.6	423.81	428.71	425.96	428.3	430.83	427.6	
437.3	427.5	442.06	427.46	450.55	427.81	455.02	428.1	466.34	427.5	
466.86	427.52	467.17	428.36	468.15	428.35	480.93	428.12	488.95	432.09	

507.41	441.24	512.44	441.13	512.45	440.63	513.95	440.74	592.65	441.9
620.94	441.99	626.94	441.94	669.56	441.63	734.94	442.17	775.17	442.52
781.49	442.62	838.99	441.44	873.43	441.46	875.88	441.42	875.9	441.92
895.04	442.3	914.57	443.68	923.2	444.08	942.74	452.96	952.96	454.04
961.91	453.94								

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.035	395.9	.035
		488.95	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	395.9	488.95		27.07	27.07	.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	1300.79	1151.98	76.42
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	1300.79	1151.98	76.42
Q Total (cfs)	474.44	Flow (cfs)	177.62	287.85	8.97
Top Width (ft)	381.67	Top Width (ft)	266.72	93.05	21.91
Vel Total (ft/s)	0.19	Avg. Vel. (ft/s)	0.14	0.25	0.12
Max Chl Dpth (ft)	13.32	Hydr. Depth (ft)	4.88	12.38	3.49
Conv. Total (cfs)	423691.1	Conv. (cfs)	158623.8	257057.3	8009.9
Length Wtd. (ft)	27.07	Wetted Per. (ft)	267.21	95.60	24.09
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.28	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	1.14	0.78	0.22
C & E Loss (ft)	0.00	Cum SA (acres)	0.51	0.18	0.24

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	684.40	913.72	37.93
E.G. Slope (ft/ft)	0.000003	Area (sq ft)	684.40	913.72	37.93
Q Total (cfs)	383.56	Flow (cfs)	101.24	277.31	5.01
Top Width (ft)	315.47	Top Width (ft)	210.05	93.05	12.37
Vel Total (ft/s)	0.23	Avg. Vel. (ft/s)	0.15	0.30	0.13
Max Chl Dpth (ft)	10.76	Hydr. Depth (ft)	3.26	9.82	3.07
Conv. Total (cfs)	241644.4	Conv. (cfs)	63779.1	174707.1	3158.1
Length Wtd. (ft)	27.07	Wetted Per. (ft)	210.45	95.60	13.81
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.32	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.74	0.64	0.10

C & E Loss (ft)	0.00	Cum SA (acres)	0.39	0.18	0.09
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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 OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.48	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	107.22	565.33	5.75
E.G. Slope (ft/ft)	0.000009	Area (sq ft)	107.22	565.33	5.75
Q Total (cfs)	257.63	Flow (cfs)	16.91	239.94	0.78
Top Width (ft)	177.87	Top Width (ft)	80.00	93.05	4.82
Vel Total (ft/s)	0.38	Avg. Vel. (ft/s)	0.16	0.42	0.14
Max Chl Dpth (ft)	7.02	Hydr. Depth (ft)	1.34	6.08	1.19
Conv. Total (cfs)	84272.0	Conv. (cfs)	5530.7	78485.9	255.3
Length Wtd. (ft)	27.07	Wetted Per. (ft)	80.06	95.60	5.38
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.17	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.33	0.44	0.05
C & E Loss (ft)	0.00	Cum SA (acres)	0.29	0.18	0.05

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 OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	432.19	Reach Len. (ft)	27.07	27.07	27.07
Crit W.S. (ft)		Flow Area (sq ft)	0.13	352.22	0.01
E.G. Slope (ft/ft)	0.000019	Area (sq ft)	0.13	352.22	0.01
Q Total (cfs)	156.13	Flow (cfs)	0.00	156.13	0.00
Top Width (ft)	95.98	Top Width (ft)	2.74	93.05	0.20
Vel Total (ft/s)	0.44	Avg. Vel. (ft/s)	0.02	0.44	0.02
Max Chl Dpth (ft)	4.73	Hydr. Depth (ft)	0.05	3.79	0.05
Conv. Total (cfs)	35671.3	Conv. (cfs)	0.8	35670.5	0.1
Length Wtd. (ft)	27.07	Wetted Per. (ft)	2.74	95.60	0.22
Min Ch El (ft)	427.46	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.12	0.27	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.22	0.16	0.03

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

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
1	LOB	79.18	158.36	0.48	16.65	29.24	0.10	0.57	0.03	0.00	
0.00											
2	LOB	158.36	237.54	25.68	268.65	79.28	5.41	3.39	0.10	0.00	
0.00											
3	LOB	237.54	316.72	51.68	409.09	79.45	10.89	5.17	0.13	0.00	
0.00											
4	LOB	316.72	395.90	99.78	606.40	79.23	21.03	7.66	0.16	0.00	
0.00											
5	Chan	395.90	414.51	49.38	211.89	19.44	10.41	11.39	0.23	0.00	
0.00											
6	Chan	414.51	433.12	60.64	236.42	18.78	12.78	12.70	0.26	0.00	
0.00											
7	Chan	433.12	451.73	64.98	245.59	18.62	13.70	13.20	0.26	0.00	
0.00											
8	Chan	451.73	470.34	60.96	239.37	19.22	12.85	12.86	0.25	0.00	
0.00											
9	Chan	470.34	488.95	51.88	218.72	19.54	10.93	11.75	0.24	0.00	
0.00											
10	ROB	488.95	583.54	8.97	76.42	24.09	1.89	3.49	0.12	0.00	
0.00											

Warning: Divided flow computed for this cross-section.

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft)
1	LOB	158.36	237.54	5.71	74.40	51.76	1.49	1.44	0.08	0.00	
0.00											
2	LOB	237.54	316.72	23.50	206.34	79.45	6.13	2.61	0.11	0.00	
0.00											
3	LOB	316.72	395.90	72.03	403.66	79.23	18.78	5.10	0.18	0.00	
0.00											
4	Chan	395.90	414.51	45.72	164.23	19.44	11.92	8.83	0.28	0.00	
0.00											
5	Chan	414.51	433.12	59.00	188.77	18.78	15.38	10.14	0.31	0.00	
0.00											
6	Chan	433.12	451.73	64.22	197.93	18.62	16.74	10.64	0.32	0.00	
0.00											
7	Chan	451.73	470.34	59.62	191.71	19.22	15.54	10.30	0.31	0.00	
0.00											

8	Chan	470.34	488.95	48.76	171.06	19.54	12.71	9.19	0.29	0.00
0.00										
9	ROB	488.95	583.54	5.01	37.93	13.81	1.31	3.07	0.13	0.00
0.00										

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

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	237.54	316.72	0.00	0.02	0.83	0.00	0.03	0.01	0.00	
0.00											
2	LOB	316.72	395.90	16.91	107.20	79.23	6.56	1.35	0.16	0.00	
0.00											
3	Chan	395.90	414.51	34.90	94.56	19.44	13.55	5.08	0.37	0.00	
0.00											
4	Chan	414.51	433.12	52.46	119.10	18.78	20.36	6.40	0.44	0.00	
0.00											
5	Chan	433.12	451.73	59.70	128.26	18.62	23.17	6.89	0.47	0.00	
0.00											
6	Chan	451.73	470.34	53.81	122.04	19.22	20.88	6.56	0.44	0.00	
0.00											
7	Chan	470.34	488.95	39.07	101.39	19.54	15.17	5.45	0.39	0.00	
0.00											
8	ROB	488.95	583.54	0.78	5.75	5.38	0.30	1.19	0.14	0.00	
0.00											

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

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	316.72	395.90	0.00	0.13	2.74	0.00	0.05	0.02	0.00	
0.00											
2	Chan	395.90	414.51	18.18	51.93	19.44	11.64	2.79	0.35	0.00	
0.00											
3	Chan	414.51	433.12	35.45	76.47	18.78	22.71	4.11	0.46	0.00	
0.00											
4	Chan	433.12	451.73	43.06	85.63	18.62	27.58	4.60	0.50	0.01	
0.00											

5	Chan	451.73	470.34	37.18	79.41	19.22	23.81	4.27	0.47	0.00
0.00										
6	Chan	470.34	488.95	22.26	58.76	19.54	14.26	3.16	0.38	0.00
0.00										
7	ROB	488.95	583.54	0.00	0.01	0.22	0.00	0.05	0.02	0.00
0.00										

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

CROSS SECTION

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 271.15

INPUT

Description:

Station	Elevation	Data	num=	131						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	445.02	8.83	444.52	11.85	444.34	33.46	443.13	35.07	443.02	
38.65	442.82	55.08	442.26	68.47	441.75	83.85	441.07	91.89	440.86	
98.31	440.67	105.08	440.49	111.56	440.37	116.28	440.18	117.13	440.18	
118.59	440.17	119.69	440.17	120.38	440.16	123.92	439.78	124.17	439.91	
125.18	439.91	125.86	439.89	126.33	439.83	134.23	439.62	137.22	439.52	
138.59	439.46	147.08	439.21	150.99	438.95	152.53	438.89	154.1	438.82	
157.37	438.65	157.89	438.61	158.06	438.6	158.46	438.58	159	438.54	
159.16	438.55	163.15	438.52	165.18	438.48	174.14	438	183.95	437.45	
184.39	437.45	185.98	437.35	187.7	437.19	206.38	435.89	217.58	434.9	
223.5	434.31	227.99	433.77	247.4	432	248.25	431.91	250	431.82	
263.28	431.32	271.22	431.05	274.18	431.12	277.22	430.84	285.67	430.58	
292.83	430.44	307.04	430.19	308.63	430.16	314.48	430.12	319.78	429.98	
324.1	429.92	326.55	429.87	331.62	429.75	335.98	429.75	336.34	429.77	
336.86	429.76	350.06	429.7	357.67	429.49	359.73	429.49	361.3	429.47	
366.68	429.37	371.71	429.33	378.14	429.2	378.41	429.2	386.02	429.08	
388.2	429.09	396.29	429.02	397.33	429.05	398.03	429.04	398.42	429.05	
401.42	428.91	418.53	428.23	420.1	428.17	425.04	427.96	426.67	427.91	
428.31	427.85	429.96	427.8	431.61	427.74	433.25	427.69	436.64	427.57	
438.24	427.56	446.95	426.72	447.66	426.72	452.49	426.72	453.59	426.72	
455	426.72	458.1	426.72	463.13	427.37	464.47	427.57	467.19	427.95	
468.56	428.15	469.22	428.33	469.69	428.46	471.1	428.65	471.32	428.69	
472.22	428.93	472.5	429	472.85	429.09	473.91	429.24	476.53	429.62	
477.75	429.79	478.7	429.93	479.23	429.96	483.16	430.2	484.73	430.28	
491.69	430.95	506.28	437.29	508.53	437.41	512.26	438	515.2	438	
576.45	439	602.75	438.94	794.31	447.41	814.63	449.74	893.92	452.7	
926.63	454.66	943.55	455.34	947.63	455.94	949.85	455.88	958.34	453.45	
971.85	452.88									

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	396.29	.035	472.85	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	396.29	472.85		85.87	85.87	.1	.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	440.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	440.78	Reach Len. (ft)	85.87	85.87	85.87
Crit W.S. (ft)	428.83	Flow Area (sq ft)	2089.28	991.69	551.52
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	2089.28	991.69	551.52
Q Total (cfs)	474.44	Flow (cfs)	252.75	181.89	39.81
Top Width (ft)	549.91	Top Width (ft)	301.78	76.56	171.57
Vel Total (ft/s)	0.13	Avg. Vel. (ft/s)	0.12	0.18	0.07
Max Chl Dpth (ft)	14.06	Hydr. Depth (ft)	6.92	12.95	3.21
Conv. Total (cfs)	604260.0	Conv. (cfs)	321904.5	231655.1	50700.3
Length Wtd. (ft)	85.87	Wetted Per. (ft)	302.20	76.84	173.09
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.24	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.09	0.12	0.02
C & E Loss (ft)		Cum SA (acres)	0.33	0.13	0.18

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	438.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	438.22	Reach Len. (ft)	85.87	85.87	85.87
Crit W.S. (ft)	428.64	Flow Area (sq ft)	1421.59	795.67	218.74
E.G. Slope (ft/ft)	0.000001	Area (sq ft)	1421.59	795.67	218.74
Q Total (cfs)	383.56	Flow (cfs)	202.72	158.48	22.37
Top Width (ft)	358.81	Top Width (ft)	226.30	76.56	55.96
Vel Total (ft/s)	0.16	Avg. Vel. (ft/s)	0.14	0.20	0.10
Max Chl Dpth (ft)	11.50	Hydr. Depth (ft)	6.28	10.39	3.91
Conv. Total (cfs)	388421.8	Conv. (cfs)	205285.9	160486.4	22649.5
Length Wtd. (ft)	85.87	Wetted Per. (ft)	226.61	76.84	57.43
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.12	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.09	0.11	0.02
C & E Loss (ft)		Cum SA (acres)	0.26	0.13	0.07

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	434.48	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	434.48	Reach Len. (ft)	85.87	85.87	85.87
Crit W.S. (ft)	428.33	Flow Area (sq ft)	681.80	509.09	96.64

E.G. Slope (ft/ft)	0.000003	Area (sq ft)	681.80	509.09	96.64
Q Total (cfs)	257.63	Flow (cfs)	117.44	124.78	15.41
Top Width (ft)	278.00	Top Width (ft)	174.48	76.56	26.96
Vel Total (ft/s)	0.20	Avg. Vel. (ft/s)	0.17	0.25	0.16
Max Chl Dpth (ft)	7.76	Hydr. Depth (ft)	3.91	6.65	3.58
Conv. Total (cfs)	157420.3	Conv. (cfs)	71762.1	76242.6	9415.6
Length Wtd. (ft)	85.87	Wetted Per. (ft)	174.66	76.84	27.80
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.10	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.09	0.11	0.02
C & E Loss (ft)		Cum SA (acres)	0.21	0.13	0.04

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	432.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	432.19	Reach Len. (ft)	85.87	85.87	85.87
Crit W.S. (ft)	428.01	Flow Area (sq ft)	307.93	333.73	40.92
E.G. Slope (ft/ft)	0.000006	Area (sq ft)	307.93	333.73	40.92
Q Total (cfs)	156.13	Flow (cfs)	53.49	95.97	6.68
Top Width (ft)	249.21	Top Width (ft)	150.96	76.56	21.69
Vel Total (ft/s)	0.23	Avg. Vel. (ft/s)	0.17	0.29	0.16
Max Chl Dpth (ft)	5.47	Hydr. Depth (ft)	2.04	4.36	1.89
Conv. Total (cfs)	61363.5	Conv. (cfs)	21021.6	37718.0	2623.9
Length Wtd. (ft)	85.87	Wetted Per. (ft)	151.02	76.84	22.05
Min Ch El (ft)	426.72	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.19	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.03	0.06	0.00
C & E Loss (ft)		Cum SA (acres)	0.17	0.11	0.03

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft) (lb/ft
1	LOB	79.26	158.52	1.67	61.56	64.10	0.35	0.96	0.03	0.00
0.00										
2	LOB	158.52	237.77	27.47	360.10	79.49	5.79	4.54	0.08	0.00
0.00										
3	LOB	237.77	317.03	98.51	774.30	79.34	20.76	9.77	0.13	0.00
0.00										
4	LOB	317.03	396.29	125.10	893.32	79.27	26.37	11.27	0.14	0.00
0.00										
5	Chan	396.29	411.60	31.93	183.36	15.32	6.73	11.98	0.17	0.00
0.00										
6	Chan	411.60	426.91	34.68	192.67	15.32	7.31	12.58	0.18	0.00
0.00										

7	Chan	426.91	442.23	37.35	201.51	15.34	7.87	13.16	0.19	0.00
0.00										
8	Chan	442.23	457.54	41.37	214.25	15.33	8.72	13.99	0.19	0.00
0.00										
9	Chan	457.54	472.85	36.56	199.90	15.52	7.71	13.06	0.18	0.00
0.00										
10	ROB	472.85	572.65	36.59	458.57	101.28	7.71	4.59	0.08	0.00
0.00										
11	ROB	572.65	672.45	3.22	92.95	71.81	0.68	1.30	0.03	0.00
0.00										

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	158.52	237.77	10.73	159.82	68.00	2.80	2.36	0.07	0.00	
0.00											
2	LOB	237.77	317.03	80.95	571.37	79.34	21.11	7.21	0.14	0.00	
0.00											
3	LOB	317.03	396.29	111.03	690.39	79.27	28.95	8.71	0.16	0.00	
0.00											
4	Chan	396.29	411.60	26.87	144.16	15.32	7.01	9.41	0.19	0.00	
0.00											
5	Chan	411.60	426.91	29.83	153.47	15.32	7.78	10.02	0.19	0.00	
0.00											
6	Chan	426.91	442.23	32.72	162.30	15.34	8.53	10.60	0.20	0.00	
0.00											
7	Chan	442.23	457.54	37.12	175.04	15.33	9.68	11.43	0.21	0.00	
0.00											
8	Chan	457.54	472.85	31.93	160.70	15.52	8.33	10.50	0.20	0.00	
0.00											
9	ROB	472.85	572.65	22.37	218.74	57.43	5.83	3.91	0.10	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	158.52	237.77	0.78	13.41	16.05	0.30	0.84	0.06	0.00	
0.00											
2	LOB	237.77	317.03	41.32	274.69	79.34	16.04	3.47	0.15	0.00	
0.00											
3	LOB	317.03	396.29	75.34	393.70	79.27	29.24	4.97	0.19	0.00	
0.00											

4	Chan	396.29	411.60	19.07	86.84	15.32	7.40	5.67	0.22	0.00
0.00										
5	Chan	411.60	426.91	22.60	96.15	15.32	8.77	6.28	0.24	0.00
0.00										
6	Chan	426.91	442.23	26.15	104.98	15.34	10.15	6.86	0.25	0.00
0.00										
7	Chan	442.23	457.54	31.66	117.73	15.33	12.29	7.69	0.27	0.00
0.00										
8	Chan	457.54	472.85	25.29	103.38	15.52	9.82	6.75	0.24	0.00
0.00										
9	ROB	472.85	572.65	15.41	96.64	27.80	5.98	3.58	0.16	0.00
0.00										

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	237.77	317.03	11.82	95.76	71.75	7.57	1.34	0.12	0.00	
0.00											
2	LOB	317.03	396.29	41.66	212.17	79.27	26.68	2.68	0.20	0.00	
0.00											
3	Chan	396.29	411.60	12.43	51.77	15.32	7.96	3.38	0.24	0.00	
0.00											
4	Chan	411.60	426.91	16.37	61.08	15.32	10.49	3.99	0.27	0.00	
0.00											
5	Chan	426.91	442.23	20.50	69.91	15.34	13.13	4.57	0.29	0.00	
0.00											
6	Chan	442.23	457.54	27.10	82.66	15.33	17.36	5.40	0.33	0.00	
0.00											
7	Chan	457.54	472.85	19.57	68.31	15.52	12.53	4.46	0.29	0.00	
0.00											
8	ROB	472.85	572.65	6.68	40.92	22.05	4.28	1.89	0.16	0.00	
0.00											

CULVERT

RIVER: CHANNEL CL
REACH: CHANNEL CL RS: 271.10

INPUT
Description:
Distance from Upstream XS = 41
Deck/Roadway Width = 13
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	396.29	.035	472.85	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	396.29	472.85		.1	.3

Downstream Deck/Roadway Coordinates

num=	44				
Sta	Hi	Cord	Lo	Cord	
0	441.7		31.2	441.5	33
80.7	441.4		88.7	441.3	162.5
167.8	441.2		168.9	441.2	207.2
255.8	441.2		256.1	441.2	260.1
307.8	441.3		361.6	441.7	425.4
470	442.6		470	442.6	471.5
483.9	442.7		527.6	443.1	531.3
565.4	443.7		570.6	443.8	581.7
583.1	444.1		640.4	445.2	645.6
647.7	445.3		653.9	445.1	654.3
661.6	445		663.5	445	681
682.5	445.1		688.5	445.8	689.5
693.6	446		695.6	446	727.2
735	446.4		744.3	446.8	744.8
746	447		772.7	447	

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	140					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	438.56	.52	438.56	3.47	438.91	5.21	439.19	5.79	439.22
6.48	439.32	7.21	439.46	9.39	439.96	10.42	439.82	11.63	439.77
14.17	439.74	17.5	439.52	19.9	439.42	24.64	439.38	24.96	439.38
25.88	439.13	27.29	438.8	27.83	438.68	28.27	438.67	29.58	438.67
29.69	438.66	30.47	438.66	31.7	438.68	33.39	438.68	41.29	438.65
43.2	438.65	43.72	438.68	44.98	438.66	46.27	438.66	57.69	438.34
61.78	438.21	67.52	438.1	79.03	438.11	79.79	438.08	83.19	438.05
83.67	438.06	83.87	438.05	85.26	437.99	97.34	437.33	98.1	437.3
99.14	437.25	99.67	437.24	99.95	437.23	100.24	437.22	101.33	437.19
109.06	436.72	120.69	436.19	125.03	435.95	134.55	435.68	144.14	435.59
151.94	435.41	162.99	435.32	165.76	435.25	175.86	435.11	186.81	434.79
187.37	434.79	187.73	434.76	202.15	434.08	204.04	434.07	210.39	434.22
212.56	434.07	216.63	434.05	225.53	434.51	226.36	434.51	230.6	434.41
246.45	434.01	248.95	433.96	252.21	433.96	263.75	433.83	274.01	433.48
276.27	433.45	288.67	433.53	295.44	433.5	296.59	433.51	306.09	433.26
312.13	433.15	312.86	433.12	317.05	433.04	324.51	432.97	335.91	432.96
337.08	432.99	337.81	432.98	338.13	432.99	338.66	432.98	350.03	432.83
360.24	432.5	362.59	432.47	365.73	432.35	377.99	432.59	381.89	432.45
385.64	432.51	395.55	432.69	399.89	432.82	400.56	432.83	403.5	432.9
413.73	432.98	425.11	432.31	425.28	432.31	425.55	432.26	425.74	432.25
425.89	432.25	444.28	425.7	449.42	425.7	452.24	425.7	456.49	425.7
457.65	425.7	459.38	425.7	461.28	430.85	470.41	431.33	471.48	431.74

472.01	431.78	472.56	431.9	472.96	431.99	473.71	432.3	485.01	433.45
486.56	433.63	489.95	433.7	499.8	434.41	511.37	434.58	512.92	434.65
514.82	434.73	524.86	435.12	533.18	435.21	538.78	435.36	552.99	435.78
554.79	435.81	559.46	435.91	574.46	436.32	575.5	436.34	576.57	436.37
589.06	436.74	598.02	436.85	600.36	436.92	604.28	437.17	612.34	437.61
613.87	437.61	619.63	437.78	621.34	437.88	634.1	438.21	638.43	438.29

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	425.55	.035	473.71	.035

Bank Sta: Left Right Coeff Contr. Expan.

425.55	473.71	.1	.3
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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 = .98
Elevation at which weir flow begins = 441.1
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 Circular 6 6

FHWA Chart # 2 - Corrugated Metal Pipe Culvert

FHWA Scale # 1 - Headwall

Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
.17	.85	.024	.024	0	.5	1

Upstream Elevation = 426.72
Centerline Station = 455

Downstream Elevation = 425.7
Centerline Station = 455

Culvert Name Shape Rise Span

Culvert #2 Circular 1 1

FHWA Chart # 2 - Corrugated Metal Pipe Culvert

FHWA Scale # 1 - Headwall

Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
.17	.85	.024	.024	0	.5	1

Number of Barrels = 4

Upstream Elevation = 438
Centerline Stations

Sta.	Sta.	Sta.	Sta.
465	470	475	480

Downstream Elevation = 425.7
Centerline Stations

Sta.	Sta.	Sta.	Sta.
465	470	475	480

CULVERT OUTPUT Profile #100 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	450.84	Culv Full Len (ft)	80.18
# Barrels	1	Culv Vel US (ft/s)	15.95
Q Barrel (cfs)	450.84	Culv Vel DS (ft/s)	16.13
E.G. US. (ft)	440.78	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	440.78	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.66	Culv Frctn Ls (ft)	3.28
W.S. DS (ft)	431.49	Culv Exit Loss (ft)	3.87
Delta EG (ft)	9.13	Culv Entr Loss (ft)	1.98
Delta WS (ft)	9.29	Q Weir (cfs)	
E.G. IC (ft)	440.46	Weir Sta Lft (ft)	
E.G. OC (ft)	440.78	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	432.72	Weir Max Depth (ft)	
Culv WS Outlet (ft)	431.49	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	6.00	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	5.54	Min El Weir Flow (ft)	441.11

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CULVERT OUTPUT Profile #50 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	383.24	Culv Full Len (ft)	76.55
# Barrels	1	Culv Vel US (ft/s)	13.55
Q Barrel (cfs)	383.24	Culv Vel DS (ft/s)	13.67
E.G. US. (ft)	438.22	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	438.22	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.64	Culv Frctn Ls (ft)	2.36
W.S. DS (ft)	431.53	Culv Exit Loss (ft)	2.79
Delta EG (ft)	6.59	Culv Entr Loss (ft)	1.43
Delta WS (ft)	6.69	Q Weir (cfs)	
E.G. IC (ft)	437.79	Weir Sta Lft (ft)	
E.G. OC (ft)	438.22	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	432.72	Weir Max Depth (ft)	
Culv WS Outlet (ft)	431.53	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	6.00	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	5.25	Min El Weir Flow (ft)	441.11

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CULVERT OUTPUT Profile #10 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	257.63	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	9.22
Q Barrel (cfs)	257.63	Culv Vel DS (ft/s)	9.16
E.G. US. (ft)	434.48	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	434.48	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.62	Culv Frctn Ls (ft)	0.95
W.S. DS (ft)	431.57	Culv Exit Loss (ft)	1.26
Delta EG (ft)	2.86	Culv Entr Loss (ft)	0.66
Delta WS (ft)	2.91	Q Weir (cfs)	
E.G. IC (ft)	433.89	Weir Sta Lft (ft)	
E.G. OC (ft)	434.48	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	432.50	Weir Max Depth (ft)	
Culv WS Outlet (ft)	431.57	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	5.06	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.40	Min El Weir Flow (ft)	441.11

CULVERT OUTPUT Profile #2 YEAR Culv Group: Culvert #1

Q Culv Group (cfs)	156.13	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	9.37
Q Barrel (cfs)	156.13	Culv Vel DS (ft/s)	8.36
E.G. US. (ft)	432.19	Culv Inv El Up (ft)	426.72
W.S. US. (ft)	432.19	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	429.53	Culv Frctn Ls (ft)	0.96
W.S. DS (ft)	429.47	Culv Exit Loss (ft)	1.03
Delta EG (ft)	2.66	Culv Entr Loss (ft)	0.68
Delta WS (ft)	2.72	Q Weir (cfs)	
E.G. IC (ft)	431.71	Weir Sta Lft (ft)	
E.G. OC (ft)	432.19	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	430.14	Weir Max Depth (ft)	
Culv WS Outlet (ft)	429.47	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.42	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	3.40	Min El Weir Flow (ft)	441.11

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)	23.60	Culv Full Len (ft)	85.00
# Barrels	4	Culv Vel US (ft/s)	7.51
Q Barrel (cfs)	5.90	Culv Vel DS (ft/s)	7.51
E.G. US. (ft)	440.78	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	440.78	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.66	Culv Frctn Ls (ft)	7.98
W.S. DS (ft)	431.49	Culv Exit Loss (ft)	0.71

Delta EG (ft)	9.13	Culv Entr Loss (ft)	0.44
Delta WS (ft)	9.29	Q Weir (cfs)	
E.G. IC (ft)	440.76	Weir Sta Lft (ft)	
E.G. OC (ft)	440.76	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	439.00	Weir Max Depth (ft)	
Culv WS Outlet (ft)	426.70	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	0.68	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.00	Min El Weir Flow (ft)	441.11

Note: Culvert critical depth exceeds the height of the culvert.

Note: During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth. Therefore, the outlet will be at normal depth.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

Note: The culvert inlet is submerged and the culvert flows full over part or all of its length. Therefore, the culvert inlet equations are not valid and the supercritical result has been discarded. The outlet answer will be used.

CULVERT OUTPUT Profile #50 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)	0.32	Culv Full Len (ft)	34.11
# Barrels	4	Culv Vel US (ft/s)	1.58
Q Barrel (cfs)	0.08	Culv Vel DS (ft/s)	0.10
E.G. US. (ft)	438.22	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	438.22	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.64	Culv Frctn Ls (ft)	6.52
W.S. DS (ft)	431.53	Culv Exit Loss (ft)	0.00
Delta EG (ft)	6.59	Culv Entr Loss (ft)	0.00
Delta WS (ft)	6.69	Q Weir (cfs)	
E.G. IC (ft)	438.08	Weir Sta Lft (ft)	
E.G. OC (ft)	438.17	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	438.12	Weir Max Depth (ft)	
Culv WS Outlet (ft)	426.70	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	0.08	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	0.12	Min El Weir Flow (ft)	441.11

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CULVERT OUTPUT Profile #10 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)		Culv Full Len (ft)	
# Barrels	4	Culv Vel US (ft/s)	
Q Barrel (cfs)		Culv Vel DS (ft/s)	
E.G. US. (ft)	434.48	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	434.48	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	431.62	Culv Frctn Ls (ft)	

W.S. DS (ft)	431.57	Culv Exit Loss (ft)	
Delta EG (ft)	2.86	Culv Entr Loss (ft)	
Delta WS (ft)	2.91	Q Weir (cfs)	
E.G. IC (ft)		Weir Sta Lft (ft)	
E.G. OC (ft)		Weir Sta Rgt (ft)	
Culvert Control		Weir Submerg	
Culv WS Inlet (ft)		Weir Max Depth (ft)	
Culv WS Outlet (ft)		Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)		Min El Weir Flow (ft)	441.11

CULVERT OUTPUT Profile #2 YEAR Culv Group: Culvert #2

Q Culv Group (cfs)		Culv Full Len (ft)	
# Barrels	4	Culv Vel US (ft/s)	
Q Barrel (cfs)		Culv Vel DS (ft/s)	
E.G. US. (ft)	432.19	Culv Inv El Up (ft)	438.00
W.S. US. (ft)	432.19	Culv Inv El Dn (ft)	425.70
E.G. DS (ft)	429.53	Culv Frctn Ls (ft)	
W.S. DS (ft)	429.47	Culv Exit Loss (ft)	
Delta EG (ft)	2.66	Culv Entr Loss (ft)	
Delta WS (ft)	2.72	Q Weir (cfs)	
E.G. IC (ft)		Weir Sta Lft (ft)	
E.G. OC (ft)		Weir Sta Rgt (ft)	
Culvert Control		Weir Submerg	
Culv WS Inlet (ft)		Weir Max Depth (ft)	
Culv WS Outlet (ft)		Weir Avg Depth (ft)	
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	
Culv Crt Depth (ft)		Min El Weir Flow (ft)	441.11

CROSS SECTION

RIVER: CHANNEL CL
 REACH: CHANNEL CL RS: 185.28

INPUT

Description:

Station		Elevation Data		num= 140					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	438.56	.52	438.56	3.47	438.91	5.21	439.19	5.79	439.22
6.48	439.32	7.21	439.46	9.39	439.96	10.42	439.82	11.63	439.77
14.17	439.74	17.5	439.52	19.9	439.42	24.64	439.38	24.96	439.38
25.88	439.13	27.29	438.8	27.83	438.68	28.27	438.67	29.58	438.67
29.69	438.66	30.47	438.66	31.7	438.68	33.39	438.68	41.29	438.65
43.2	438.65	43.72	438.68	44.98	438.66	46.27	438.66	57.69	438.34
61.78	438.21	67.52	438.1	79.03	438.11	79.79	438.08	83.19	438.05
83.67	438.06	83.87	438.05	85.26	437.99	97.34	437.33	98.1	437.3

99.14	437.25	99.67	437.24	99.95	437.23	100.24	437.22	101.33	437.19
109.06	436.72	120.69	436.19	125.03	435.95	134.55	435.68	144.14	435.59
151.94	435.41	162.99	435.32	165.76	435.25	175.86	435.11	186.81	434.79
187.37	434.79	187.73	434.76	202.15	434.08	204.04	434.07	210.39	434.22
212.56	434.07	216.63	434.05	225.53	434.51	226.36	434.51	230.6	434.41
246.45	434.01	248.95	433.96	252.21	433.96	263.75	433.83	274.01	433.48
276.27	433.45	288.67	433.53	295.44	433.5	296.59	433.51	306.09	433.26
312.13	433.15	312.86	433.12	317.05	433.04	324.51	432.97	335.91	432.96
337.08	432.99	337.81	432.98	338.13	432.99	338.66	432.98	350.03	432.83
360.24	432.5	362.59	432.47	365.73	432.35	377.99	432.59	381.89	432.45
385.64	432.51	395.55	432.69	399.89	432.82	400.56	432.83	403.5	432.9
413.73	432.98	425.11	432.31	425.28	432.31	425.55	432.26	425.74	432.25
425.89	432.25	444.28	425.7	449.42	425.7	452.24	425.7	456.49	425.7
457.65	425.7	459.38	425.7	461.28	430.85	470.41	431.33	471.48	431.74
472.01	431.78	472.56	431.9	472.96	431.99	473.71	432.3	485.01	433.45
486.56	433.63	489.95	433.7	499.8	434.41	511.37	434.58	512.92	434.65
514.82	434.73	524.86	435.12	533.18	435.21	538.78	435.36	552.99	435.78
554.79	435.81	559.46	435.91	574.46	436.32	575.5	436.34	576.57	436.37
589.06	436.74	598.02	436.85	600.36	436.92	604.28	437.17	612.34	437.61
613.87	437.61	619.63	437.78	621.34	437.88	634.1	438.21	638.43	438.29

Manning's n Values num= 3
Sta n Val Sta n Val
0 .035 425.55 .035 473.71 .035

Dank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
425.55 473.71 13.33 13.33 13.33 .1 .3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	431.66	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.		0.035	
W.S. Elev (ft)	431.49	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		144.18	
E.G. Slope (ft/ft)	0.001364	Area (sq ft)		144.18	
Q Total (cfs)	474.44	Flow (cfs)		474.44	
Top Width (ft)	42.79	Top Width (ft)		42.79	
Vel Total (ft/s)	3.29	Avg. Vel. (ft/s)		3.29	
Max Chl Dpth (ft)	5.79	Hydr. Depth (ft)		3.37	
Conv. Total (cfs)	12846.6	Conv. (cfs)		12846.6	
Length Wtd. (ft)	13.33	Wetted Per. (ft)		47.42	
Min Ch El (ft)	425.70	Shear (lb/sq ft)		0.26	
Alpha	1.00	Stream Power (lb/ft s)		0.85	
Frcn Loss (ft)	0.00	Cum Volume (acre-ft)	0.09	0.05	0.02
C & E Loss (ft)	0.05	Cum SA (acres)	0.03	0.01	0.01

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

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	431.64	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.		0.035	
W.S. Elev (ft)	431.53	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		145.93	
E.G. Slope (ft/ft)	0.000862	Area (sq ft)		145.93	
Q Total (cfs)	383.56	Flow (cfs)		383.56	
Top Width (ft)	43.01	Top Width (ft)		43.01	
Vel Total (ft/s)	2.63	Avg. Vel. (ft/s)		2.63	
Max Chl Dpth (ft)	5.83	Hydr. Depth (ft)		3.39	
Conv. Total (cfs)	13064.2	Conv. (cfs)		13064.2	
Length Wtd. (ft)	13.33	Wetted Per. (ft)		47.66	
Min Ch El (ft)	425.70	Shear (lb/sq ft)		0.16	
Alpha	1.00	Stream Power (lb/ft s)		0.43	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.09	0.05	0.02
C & E Loss (ft)	0.03	Cum SA (acres)	0.03	0.01	0.01

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

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	431.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n Val.		0.035	
W.S. Elev (ft)	431.57	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		147.66	
E.G. Slope (ft/ft)	0.000376	Area (sq ft)		147.66	
Q Total (cfs)	257.63	Flow (cfs)		257.63	
Top Width (ft)	43.23	Top Width (ft)		43.23	
Vel Total (ft/s)	1.74	Avg. Vel. (ft/s)		1.74	
Max Chl Dpth (ft)	5.87	Hydr. Depth (ft)		3.42	
Conv. Total (cfs)	13280.2	Conv. (cfs)		13280.2	
Length Wtd. (ft)	13.33	Wetted Per. (ft)		47.89	
Min Ch El (ft)	425.70	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.13	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.09	0.05	0.02
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	0.01	0.01

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

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	429.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.		0.035	
W.S. Elev (ft)	429.47	Reach Len. (ft)	13.33	13.33	13.33
Crit W.S. (ft)		Flow Area (sq ft)		79.39	

E.G. Slope (ft/ft)	0.000595	Area (sq ft)	79.39
Q Total (cfs)	156.13	Flow (cfs)	156.13
Top Width (ft)	27.06	Top Width (ft)	27.06
Vel Total (ft/s)	1.97	Avg. Vel. (ft/s)	1.97
Max Chl Dpth (ft)	3.77	Hydr. Depth (ft)	2.93
Conv. Total (cfs)	6400.6	Conv. (cfs)	6400.6
Length Wtd. (ft)	13.33	Wetted Per. (ft)	30.34
Min Ch El (ft)	425.70	Shear (lb/sq ft)	0.10
Alpha	1.00	Stream Power (lb/ft s)	0.19
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03
C & E Loss (ft)	0.02	Cum SA (acres)	0.03

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

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										(lb/ft)
1	Chan	425.55	435.18	13.34	9.11	7.59	2.81	1.27	1.47	0.10
0.15										
2	Chan	435.18	444.81	134.60	41.01	10.19	28.37	4.26	3.28	0.34
1.12										
3	Chan	444.81	454.45	233.18	55.75	9.63	49.15	5.79	4.18	0.49
2.06										
4	Chan	454.45	464.08	92.08	36.24	13.23	19.41	3.76	2.54	0.23
0.59										
5	Chan	464.08	473.71	1.23	2.08	6.78	0.26	0.31	0.59	0.03
0.02										

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

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)
s)										(lb/ft)
1	Chan	425.55	435.18	11.08	9.40	7.71	2.89	1.29	1.18	0.07
0.08										
2	Chan	435.18	444.81	108.86	41.40	10.19	28.38	4.30	2.63	0.22
0.57										
3	Chan	444.81	454.45	187.80	56.14	9.63	48.96	5.83	3.35	0.31
1.05										

4	Chan	454.45	464.08	74.62	36.63	13.23	19.46	3.80	2.04	0.15
0.30										
5	Chan	464.08	473.71	1.19	2.36	6.90	0.31	0.34	0.51	0.02
0.01										

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

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	425.55	435.18	7.64	9.70	7.83	2.96	1.31	0.79	0.03	
0.02											
2	Chan	435.18	444.81	73.14	41.78	10.19	28.39	4.34	1.75	0.10	
0.17											
3	Chan	444.81	454.45	125.67	56.52	9.63	48.78	5.87	2.22	0.14	
0.31											
4	Chan	454.45	464.08	50.24	37.02	13.23	19.50	3.84	1.36	0.07	
0.09											
5	Chan	464.08	473.71	0.94	2.64	7.01	0.36	0.38	0.36	0.01	
0.00											

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

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	Chan	425.55	435.18	0.15	0.39	1.57	0.09	0.26	0.38	0.01	
0.00											
2	Chan	435.18	444.81	34.36	21.53	10.19	22.01	2.24	1.60	0.08	
0.13											
3	Chan	444.81	454.45	85.11	36.27	9.63	54.51	3.77	2.35	0.14	
0.33											
4	Chan	454.45	464.08	36.51	21.20	8.95	23.39	3.35	1.72	0.09	
0.15											

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

CROSS SECTION

RIVER: CHANNEL CL
 REACH: CHANNEL CL RS: 171.95

INPUT

Description: 9

Station Elevation Data		num=	128								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	439.64	6.63	439.43	19.79	438.97	25.78	438.75	27.03	438.71		
34.75	438.42	36.32	438.35	48.22	437.95	48.88	437.92	50.78	437.82		
56.13	437.6	62.4	437.41	63.59	437.37	64.22	437.36	78.64	436.84		
80.26	436.75	80.83	436.7	81.14	436.69	81.34	436.68	91.03	436.22		
95.85	435.87	103.84	435.43	117.73	434.74	123.52	434.43	136.7	433.95		
140.55	433.86	144.32	433.78	159.47	433.06	165.97	432.95	177.09	432.63		
179.03	432.57	181.8	432.47	191.09	432.3	195.42	432.14	198.51	432.02		
201.23	431.9	202.96	431.84	205.2	431.71	207.5	431.61	214.28	431.14		
216.43	431.04	226.79	431.05	228.78	430.98	230.81	430.92	241.41	430.18		
243.22	430.13	244.93	430.07	262.86	429.64	264.14	429.6	267.94	429.5		
270.48	429.47	287.15	429.18	292.2	429.12	308.1	428.75	310.64	428.72		
326.21	428.56	334.07	428.49	338.46	428.44	342.28	428.42	349.29	428.36		
349.46	428.36	353.21	428.33	364.16	428.25	368.25	428.23	377.64	428.15		
382.51	428.14	387.3	428.12	394.96	428.07	398.75	428.07	402.06	428.1		
412.2	428.05	415.19	428.08	418.41	428.1	428.3	428.07	431.23	428.08		
434.03	428.08	436.71	427.88	439.77	427.57	439.99	427.56	440.24	427.55		
440.62	427.59	441.09	427.61	442.21	427.03	443.48	426.93	444.64	425.34		
445.07	425.35	449.36	425.36	453.63	426.71	455.65	426.97	457.97	426.85		
460.09	426.99	463.93	427.3	465.04	427.53	465.55	427.66	466.02	427.85		
467.67	428.63	468.62	428.65	471.58	428.78	472.85	428.81	476.14	428.9		
477.72	428.95	481.65	429.06	484.59	429.13	487.94	429.22	498.13	429.54		
500.35	429.6	501.61	429.64	502.96	429.68	512.16	430.1	514.24	430.16		
516.21	430.21	526.11	430.66	529.02	430.76	530.4	430.8	541.06	431.05		
542.81	431.11	544.74	431.19	555.5	431.43	569.63	432.04	572.04	432.14		
575.49	432.31	584.55	432.67	588.68	432.87	596.8	433.2	601.52	433.43		
610.17	434.05	620.37	434.55	634.38	435.11						

Manning's n Values		num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	434.03	.035	467.67	.035

Bank Sta:	Left	Right	Lengths: Left Channel		Right	Coeff	Contr.	Expan.
	434.03	467.67	56.58	56.58	56.58	.1		.3

CROSS SECTION OUTPUT Profile #100 YEAR

E.G. Elev (ft)	431.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	431.60	Reach Len. (ft)			
Crit W.S. (ft)	428.74	Flow Area (sq ft)	585.37	158.68	135.36
E.G. Slope (ft/ft)	0.000043	Area (sq ft)	585.37	158.68	135.36

Q Total (cfs)	474.44	Flow (cfs)	305.62	120.22	48.60
Top Width (ft)	351.79	Top Width (ft)	226.39	33.64	91.77
Vel Total (ft/s)	0.54	Avg. Vel. (ft/s)	0.52	0.76	0.36
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	2.59	4.72	1.48
Conv. Total (cfs)	72664.6	Conv. (cfs)	46808.3	18412.4	7443.9
Length Wtd. (ft)		Wetted Per. (ft)	226.45	35.12	91.82
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.01	0.01	0.00
Alpha	1.15	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #50 YEAR

E.G. Elev (ft)	431.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	431.60	Reach Len. (ft)			
Crit W.S. (ft)	428.59	Flow Area (sq ft)	585.37	158.68	135.36
E.G. Slope (ft/ft)	0.000028	Area (sq ft)	585.37	158.68	135.36
Q Total (cfs)	383.56	Flow (cfs)	247.08	97.19	39.29
Top Width (ft)	351.79	Top Width (ft)	226.39	33.64	91.77
Vel Total (ft/s)	0.44	Avg. Vel. (ft/s)	0.42	0.61	0.29
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	2.59	4.72	1.48
Conv. Total (cfs)	72664.6	Conv. (cfs)	46808.3	18412.4	7443.9
Length Wtd. (ft)		Wetted Per. (ft)	226.45	35.12	91.82
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.15	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #10 YEAR

E.G. Elev (ft)	431.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	431.60	Reach Len. (ft)			
Crit W.S. (ft)	428.30	Flow Area (sq ft)	585.37	158.68	135.36
E.G. Slope (ft/ft)	0.000013	Area (sq ft)	585.37	158.68	135.36
Q Total (cfs)	257.63	Flow (cfs)	165.96	65.28	26.39
Top Width (ft)	351.79	Top Width (ft)	226.39	33.64	91.77
Vel Total (ft/s)	0.29	Avg. Vel. (ft/s)	0.28	0.41	0.19
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	2.59	4.72	1.48
Conv. Total (cfs)	72664.6	Conv. (cfs)	46808.3	18412.4	7443.9
Length Wtd. (ft)		Wetted Per. (ft)	226.45	35.12	91.82
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.00	0.00	0.00
Alpha	1.15	Stream Power (lb/ft s)	0.00	0.00	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #2 YEAR

E.G. Elev (ft)	429.51	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	429.50	Reach Len. (ft)			
Crit W.S. (ft)	427.60	Flow Area (sq ft)	167.80	88.03	12.54
E.G. Slope (ft/ft)	0.000118	Area (sq ft)	167.80	88.03	12.54
Q Total (cfs)	156.13	Flow (cfs)	77.91	74.92	3.29
Top Width (ft)	228.92	Top Width (ft)	166.09	33.64	29.19
Vel Total (ft/s)	0.58	Avg. Vel. (ft/s)	0.46	0.85	0.26
Max Chl Dpth (ft)	4.16	Hydr. Depth (ft)	1.01	2.62	0.43
Conv. Total (cfs)	14372.3	Conv. (cfs)	7172.2	6897.0	303.0
Length Wtd. (ft)		Wetted Per. (ft)	166.10	35.12	29.20
Min Ch El (ft)	425.34	Shear (lb/sq ft)	0.01	0.02	0.00
Alpha	1.35	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Profile #100 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	173.61	260.42	14.02	53.74	52.83	2.95	1.02	0.26	0.00	
0.00											
2	LOB	260.42	347.22	115.46	232.31	86.82	24.34	2.68	0.50	0.01	
0.00											
3	LOB	347.22	434.03	176.15	299.31	86.81	37.13	3.45	0.59	0.01	
0.01											
4	Chan	434.03	440.76	17.01	25.54	6.75	3.58	3.80	0.67	0.01	
0.01											
5	Chan	440.76	447.49	27.80	36.11	7.68	5.86	5.37	0.77	0.01	
0.01											
6	Chan	447.49	454.21	32.80	38.29	6.94	6.91	5.69	0.86	0.01	
0.01											
7	Chan	454.21	460.94	24.11	31.48	6.75	5.08	4.68	0.77	0.01	
0.01											
8	Chan	460.94	467.67	18.51	27.25	6.99	3.90	4.05	0.68	0.01	
0.01											
9	ROB	467.67	501.01	35.23	82.30	33.36	7.43	2.47	0.43	0.01	
0.00											
10	ROB	501.01	534.35	12.22	43.61	33.37	2.58	1.31	0.28	0.00	
0.00											
11	ROB	534.35	567.70	1.16	9.45	25.09	0.24	0.38	0.12	0.00	
0.00											

Profile #50 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
s)		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	173.61	260.42	11.33	53.74	52.83	2.95	1.02	0.21	0.00	
0.00											
2	LOB	260.42	347.22	93.34	232.31	86.82	24.34	2.68	0.40	0.00	
0.00											
3	LOB	347.22	434.03	142.40	299.31	86.81	37.13	3.45	0.48	0.01	
0.00											
4	Chan	434.03	440.76	13.75	25.54	6.75	3.58	3.80	0.54	0.01	
0.00											
5	Chan	440.76	447.49	22.47	36.11	7.68	5.86	5.37	0.62	0.01	
0.01											
6	Chan	447.49	454.21	26.51	38.29	6.94	6.91	5.69	0.69	0.01	
0.01											
7	Chan	454.21	460.94	19.49	31.48	6.75	5.08	4.68	0.62	0.01	
0.01											
8	Chan	460.94	467.67	14.97	27.25	6.99	3.90	4.05	0.55	0.01	
0.00											
9	ROB	467.67	501.01	28.48	82.30	33.36	7.43	2.47	0.35	0.00	
0.00											
10	ROB	501.01	534.35	9.88	43.61	33.37	2.58	1.31	0.23	0.00	
0.00											
11	ROB	534.35	567.70	0.93	9.45	25.09	0.24	0.38	0.10	0.00	
0.00											

Profile #10 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
s)											
1	LOB	173.61	260.42	7.61	53.74	52.83	2.95	1.02	0.14	0.00	
0.00											
2	LOB	260.42	347.22	62.70	232.31	86.82	24.34	2.68	0.27	0.00	
0.00											
3	LOB	347.22	434.03	95.65	299.31	86.81	37.13	3.45	0.32	0.00	
0.00											
4	Chan	434.03	440.76	9.24	25.54	6.75	3.58	3.80	0.36	0.00	
0.00											
5	Chan	440.76	447.49	15.09	36.11	7.68	5.86	5.37	0.42	0.00	
0.00											
6	Chan	447.49	454.21	17.81	38.29	6.94	6.91	5.69	0.47	0.00	
0.00											
7	Chan	454.21	460.94	13.09	31.48	6.75	5.08	4.68	0.42	0.00	
0.00											

8	Chan	460.94	467.67	10.05	27.25	6.99	3.90	4.05	0.37	0.00
0.00										
9	ROB	467.67	501.01	19.13	82.30	33.36	7.43	2.47	0.23	0.00
0.00										
10	ROB	501.01	534.35	6.64	43.61	33.37	2.58	1.31	0.15	0.00
0.00										
11	ROB	534.35	567.70	0.63	9.45	25.09	0.24	0.38	0.07	0.00
0.00										

Profile #2 YEAR

Power	Pos	Left Sta	Right Sta	Flow	Area	W.P.	Percent	Hydr	Velocity	Shear	
		(ft)	(ft)	(cfs)	(sq ft)	(ft)	Conv	Depth(ft)	(ft/s)	(lb/sq ft)	(lb/ft
1	LOB	260.42	347.22	16.28	50.78	79.29	10.43	0.64	0.32	0.00	
0.00											
2	LOB	347.22	434.03	61.63	117.02	86.81	39.47	1.35	0.53	0.01	
0.01											
3	Chan	434.03	440.76	7.20	11.41	6.75	4.61	1.70	0.63	0.01	
0.01											
4	Chan	440.76	447.49	19.70	21.98	7.68	12.62	3.27	0.90	0.02	
0.02											
5	Chan	447.49	454.21	24.68	24.17	6.94	15.81	3.59	1.02	0.03	
0.03											
6	Chan	454.21	460.94	14.48	17.35	6.75	9.27	2.58	0.83	0.02	
0.02											
7	Chan	460.94	467.67	8.87	13.12	6.99	5.68	1.95	0.68	0.01	
0.01											
8	ROB	467.67	501.01	3.29	12.54	29.20	2.11	0.43	0.26	0.00	
0.00											

SUMMARY OF MANNING'S N VALUES

River:CHANNEL CL

Reach	River Sta.	n1	n2	n3
CHANNEL CL	914.03	.035	.035	.035
CHANNEL CL	839.73	.035	.035	.035
CHANNEL CL	746.53	.035	.035	.035
CHANNEL CL	653.24	.035	.035	.035
CHANNEL CL	552.28	.035	.035	.035
CHANNEL CL	451.25	.035	.035	.035
CHANNEL CL	363.69	.035	.035	.035
CHANNEL CL	298.22	.035	.035	.035

CHANNEL CL	271.15	.035	.035	.035
CHANNEL CL	271.10	Culvert		
CHANNEL CL	185.28	.035	.035	.035
CHANNEL CL	171.95	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: CHANNEL CL

Reach	River Sta.	Left	Channel	Right
CHANNEL CL	914.03	74.3	74.3	74.3
CHANNEL CL	839.73	93.2	93.2	93.2
CHANNEL CL	746.53	93.29	93.29	93.29
CHANNEL CL	653.24	100.96	100.96	100.96
CHANNEL CL	552.28	101.03	101.03	101.03
CHANNEL CL	451.25	153.03	153.03	153.03
CHANNEL CL	363.69	87.56	87.56	87.56
CHANNEL CL	298.22	27.07	27.07	27.07
CHANNEL CL	271.15	85.87	85.87	85.87
CHANNEL CL	271.10	Culvert		
CHANNEL CL	185.28	13.33	13.33	13.33
CHANNEL CL	171.95	56.58	56.58	56.58

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: CHANNEL CL

Reach	River Sta.	Contr.	Expan.
CHANNEL CL	914.03	.1	.3
CHANNEL CL	839.73	.1	.3
CHANNEL CL	746.53	.1	.3
CHANNEL CL	653.24	.1	.3
CHANNEL CL	552.28	.1	.3
CHANNEL CL	451.25	.1	.3
CHANNEL CL	363.69	.1	.3
CHANNEL CL	298.22	.1	.3
CHANNEL CL	271.15	.1	.3
CHANNEL CL	271.10	Culvert	
CHANNEL CL	185.28	.1	.3
CHANNEL CL	171.95	.1	.3

Profile Output Table - Standard Table 1

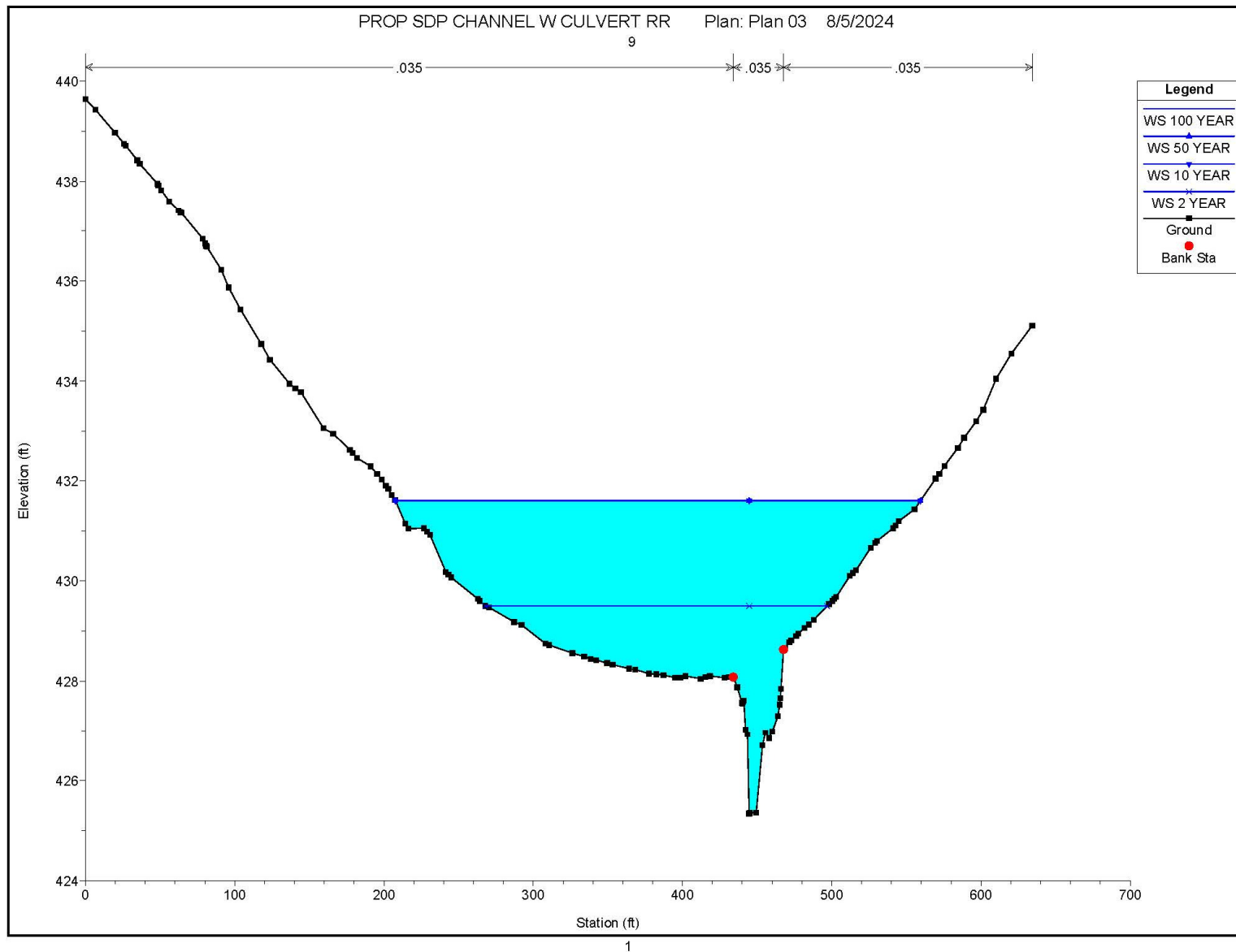
Reach Top Width (ft)	River Sta Froude # Chl	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)
CHANNEL CL 277.55	914.03 0.05	100 YEAR	474.44	432.50	440.78		440.79	0.000024	0.65	972.50
CHANNEL CL 203.83	914.03 0.16	50 YEAR	383.56	432.50	438.21		438.24	0.000329	1.66	327.70
CHANNEL CL 58.39	914.03 0.89	10 YEAR	257.63	432.50	436.10	436.10	436.57	0.014001	5.62	49.80
CHANNEL CL 16.87	914.03 1.01	2 YEAR	156.13	432.50	435.26	435.26	435.96	0.018313	6.73	23.18
CHANNEL CL 224.25	839.73 0.03	100 YEAR	474.44	431.93	440.78		440.79	0.000009	0.47	1154.05
CHANNEL CL 163.57	839.73 0.05	50 YEAR	383.56	431.93	438.22		438.23	0.000026	0.62	671.60
CHANNEL CL 88.56	839.73 0.29	10 YEAR	257.63	431.93	434.52		434.58	0.001373	2.00	128.61
CHANNEL CL 37.45	839.73 0.56	2 YEAR	156.13	431.93	433.25		433.44	0.005297	3.46	45.11
CHANNEL CL 181.62	746.53 0.03	100 YEAR	474.44	431.28	440.78		440.79	0.000006	0.40	1202.98
CHANNEL CL 165.83	746.53 0.04	50 YEAR	383.56	431.28	438.22		438.23	0.000018	0.51	758.94
CHANNEL CL 111.07	746.53 0.15	10 YEAR	257.63	431.28	434.49		434.52	0.000323	1.19	217.14
CHANNEL CL 77.86	746.53 0.44	2 YEAR	156.13	431.28	432.91		433.00	0.003708	2.33	67.01
CHANNEL CL 192.05	653.24 0.02	100 YEAR	474.44	430.59	440.78		440.78	0.000004	0.35	1410.81
CHANNEL CL 181.11	653.24 0.03	50 YEAR	383.56	430.59	438.22		438.23	0.000010	0.42	933.22
CHANNEL CL 156.49	653.24 0.11	10 YEAR	257.63	430.59	434.48		434.49	0.000171	0.85	302.22
CHANNEL CL 40.67	653.24 0.92	2 YEAR	156.13	430.59	431.98	431.93	432.33	0.016875	4.72	33.07
CHANNEL CL 246.56	552.28 0.02	100 YEAR	474.44	428.61	440.78		440.78	0.000002	0.28	1853.37
CHANNEL CL 216.43	552.28 0.02	50 YEAR	383.56	428.61	438.22		438.22	0.000004	0.32	1252.70
CHANNEL CL 149.75	552.28 0.04	10 YEAR	257.63	428.61	434.48		434.48	0.000015	0.42	615.37

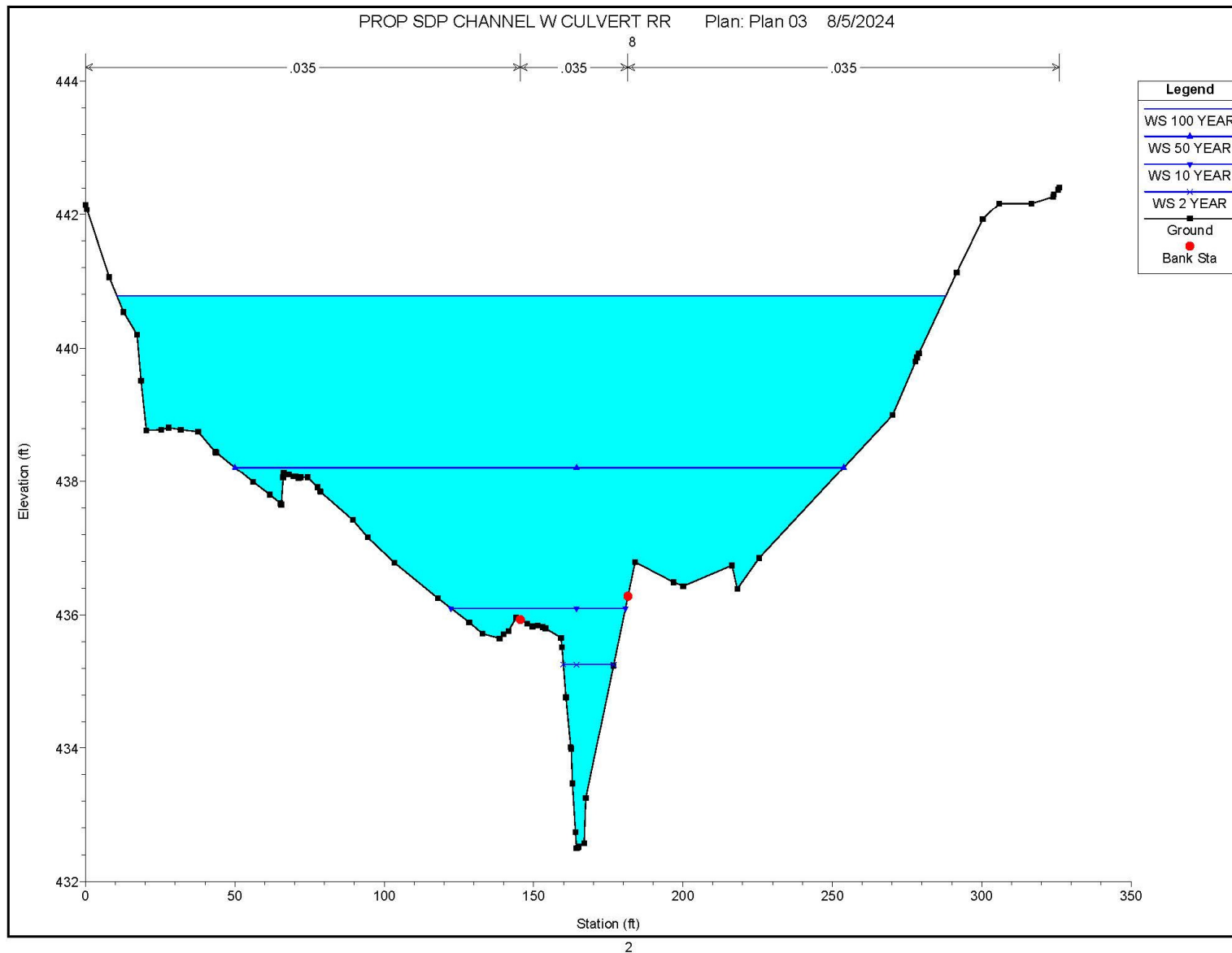
CHANNEL CL 139.08	552.28 0.07	2 YEAR	156.13	428.61	432.20		432.20	0.000065	0.55	285.18
CHANNEL CL 243.03	451.25 0.02	100 YEAR	474.44	428.05	440.78	429.79	440.78	0.000003	0.34	1504.86
CHANNEL CL 237.17	451.25 0.02	50 YEAR	383.56	428.05	438.22	429.65	438.22	0.000005	0.38	1095.70
CHANNEL CL 126.19	451.25 0.04	10 YEAR	257.63	428.05	434.48	429.44	434.48	0.000016	0.48	540.95
CHANNEL CL 97.60	451.25 0.05	2 YEAR	156.13	428.05	432.19	429.24	432.20	0.000035	0.52	299.60
CHANNEL CL 298.00	363.69 0.02	100 YEAR	474.44	427.68	440.78		440.78	0.000002	0.31	1661.91
CHANNEL CL 283.01	363.69 0.02	50 YEAR	383.56	427.68	438.22		438.22	0.000003	0.33	1236.00
CHANNEL CL 145.91	363.69 0.03	10 YEAR	257.63	427.68	434.48		434.48	0.000010	0.41	640.08
CHANNEL CL 103.26	363.69 0.04	2 YEAR	156.13	427.68	432.19		432.19	0.000019	0.43	365.53
CHANNEL CL 381.67	298.22 0.01	100 YEAR	474.44	427.46	440.78		440.78	0.000001	0.25	2529.19
CHANNEL CL 315.47	298.22 0.02	50 YEAR	383.56	427.46	438.22		438.22	0.000003	0.30	1636.04
CHANNEL CL 177.87	298.22 0.03	10 YEAR	257.63	427.46	434.48		434.48	0.000009	0.42	678.30
CHANNEL CL 95.98	298.22 0.04	2 YEAR	156.13	427.46	432.19		432.19	0.000019	0.44	352.36
CHANNEL CL 549.91	271.15 0.01	100 YEAR	474.44	426.72	440.78	428.83	440.78	0.000001	0.18	3632.49
CHANNEL CL 358.81	271.15 0.01	50 YEAR	383.56	426.72	438.22	428.64	438.22	0.000001	0.20	2436.00
CHANNEL CL 278.00	271.15 0.02	10 YEAR	257.63	426.72	434.48	428.33	434.48	0.000003	0.25	1287.53
CHANNEL CL 249.21	271.15 0.02	2 YEAR	156.13	426.72	432.19	428.01	432.19	0.000006	0.29	682.59
CHANNEL CL	271.10		Culvert							
CHANNEL CL 42.79	185.28 0.32	100 YEAR	474.44	425.70	431.49		431.66	0.001364	3.29	144.18
CHANNEL CL 43.01	185.28 0.25	50 YEAR	383.56	425.70	431.53		431.64	0.000862	2.63	145.93
CHANNEL CL 43.23	185.28 0.17	10 YEAR	257.63	425.70	431.57		431.62	0.000376	1.74	147.66
CHANNEL CL 27.06	185.28 0.20	2 YEAR	156.13	425.70	429.47		429.53	0.000595	1.97	79.39

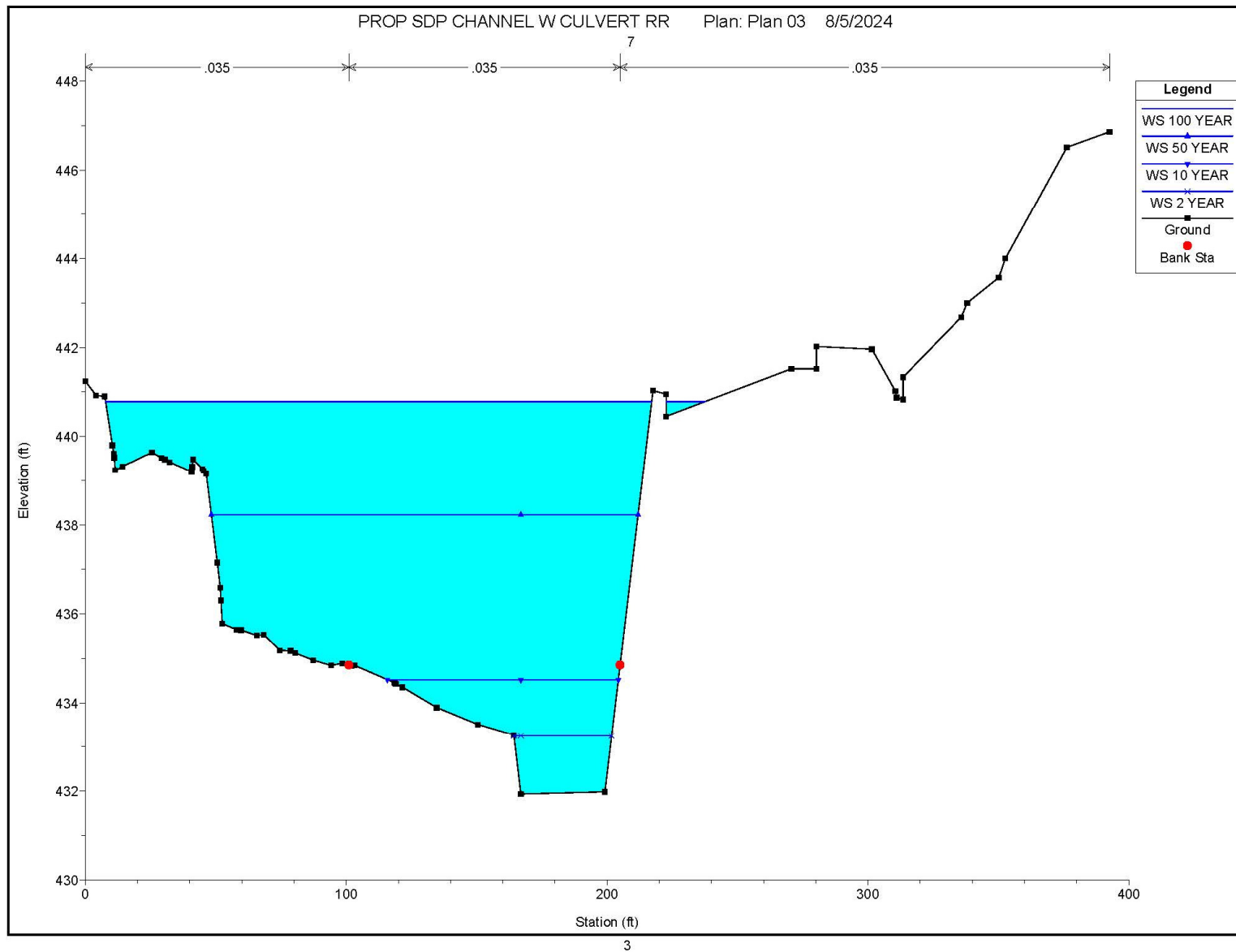
CHANNEL CL	171.95	100 YEAR	474.44	425.34	431.60	428.74	431.61	0.000043	0.76	879.41
351.79	0.06									
CHANNEL CL	171.95	50 YEAR	383.56	425.34	431.60	428.59	431.60	0.000028	0.61	879.41
351.79	0.05									
CHANNEL CL	171.95	10 YEAR	257.63	425.34	431.60	428.30	431.60	0.000013	0.41	879.41
351.79	0.03									
CHANNEL CL	171.95	2 YEAR	156.13	425.34	429.50	427.60	429.51	0.000118	0.85	268.37
228.92	0.09									

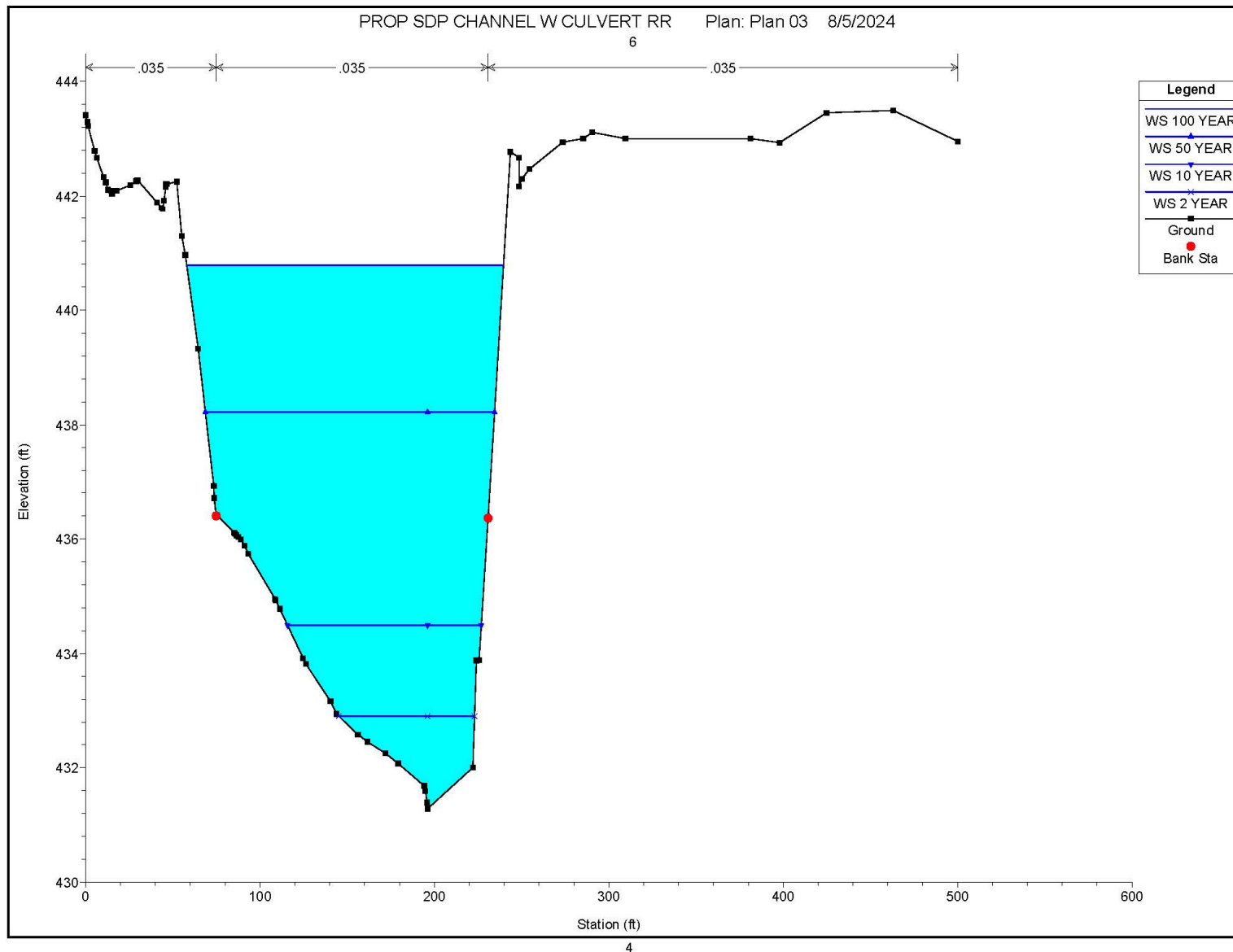
Profile Output Table - Culvert Only

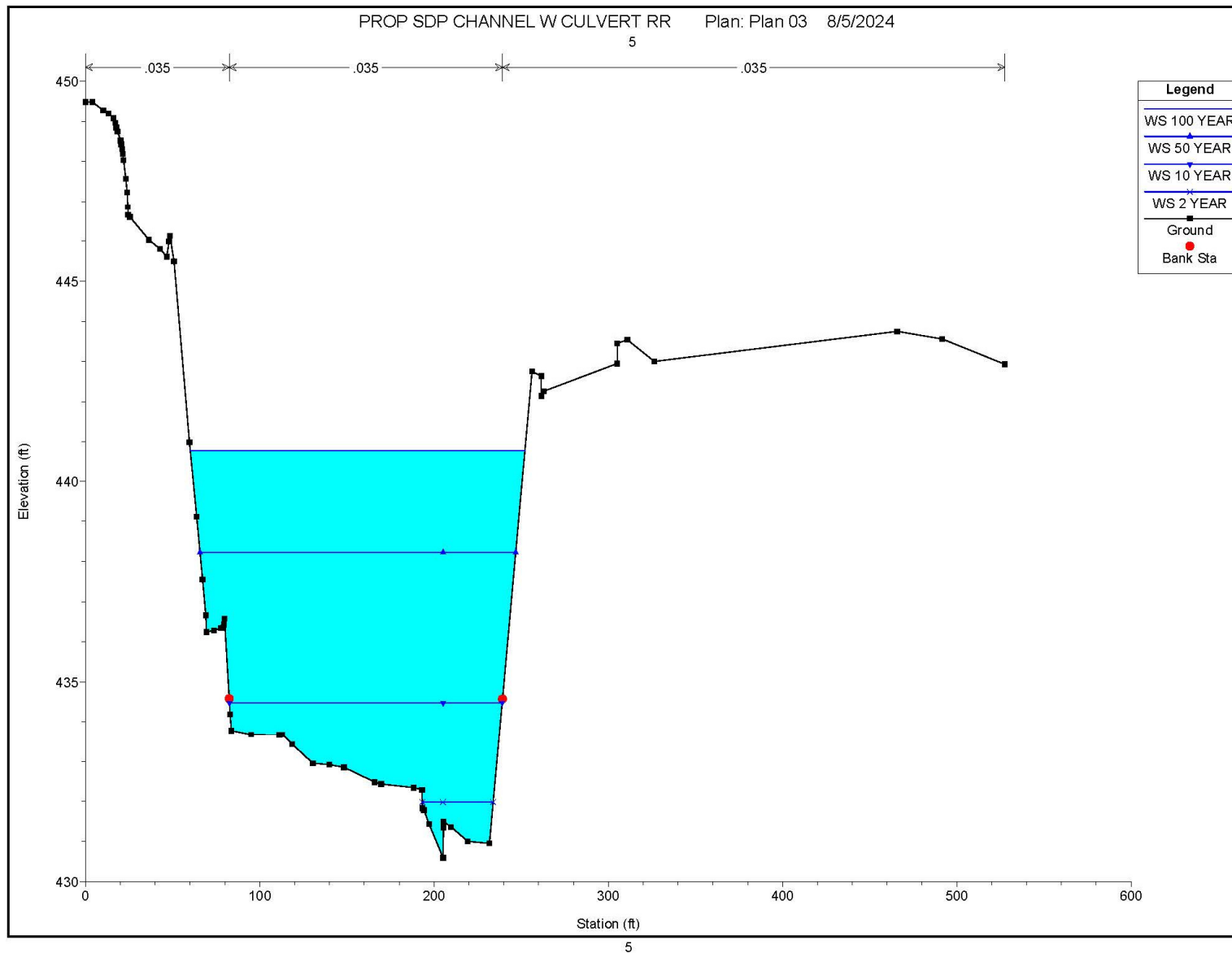
Reach	River Sta	Profile	E.G. US.	W.S. US.	E.G. IC	E.G. OC	Min El Weir Flow	Q Culv Group	Q Weir
Delta WS	Culv Vel US	Culv Vel DS							
(ft)	(ft/s)	(ft/s)		(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)
CHANNEL CL	271.10	Culvert #1	100 YEAR	440.78	440.78	440.46	440.78	441.11	450.84
9.29	15.95	16.13							
CHANNEL CL	271.10	Culvert #2	100 YEAR	440.78	440.78	440.76	440.76	441.11	23.60
9.29	7.51	7.51							
CHANNEL CL	271.10	Culvert #1	50 YEAR	438.22	438.22	437.79	438.22	441.11	383.24
6.69	13.55	13.67							
CHANNEL CL	271.10	Culvert #2	50 YEAR	438.22	438.22	438.08	438.17	441.11	0.32
6.69	1.58	0.10							
CHANNEL CL	271.10	Culvert #1	10 YEAR	434.48	434.48	433.89	434.48	441.11	257.63
2.91	9.22	9.16							
CHANNEL CL	271.10	Culvert #2	10 YEAR	434.48	434.48			441.11	
2.91									
CHANNEL CL	271.10	Culvert #1	2 YEAR	432.19	432.19	431.71	432.19	441.11	156.13
2.72	9.37	8.36							
CHANNEL CL	271.10	Culvert #2	2 YEAR	432.19	432.19			441.11	
2.72									

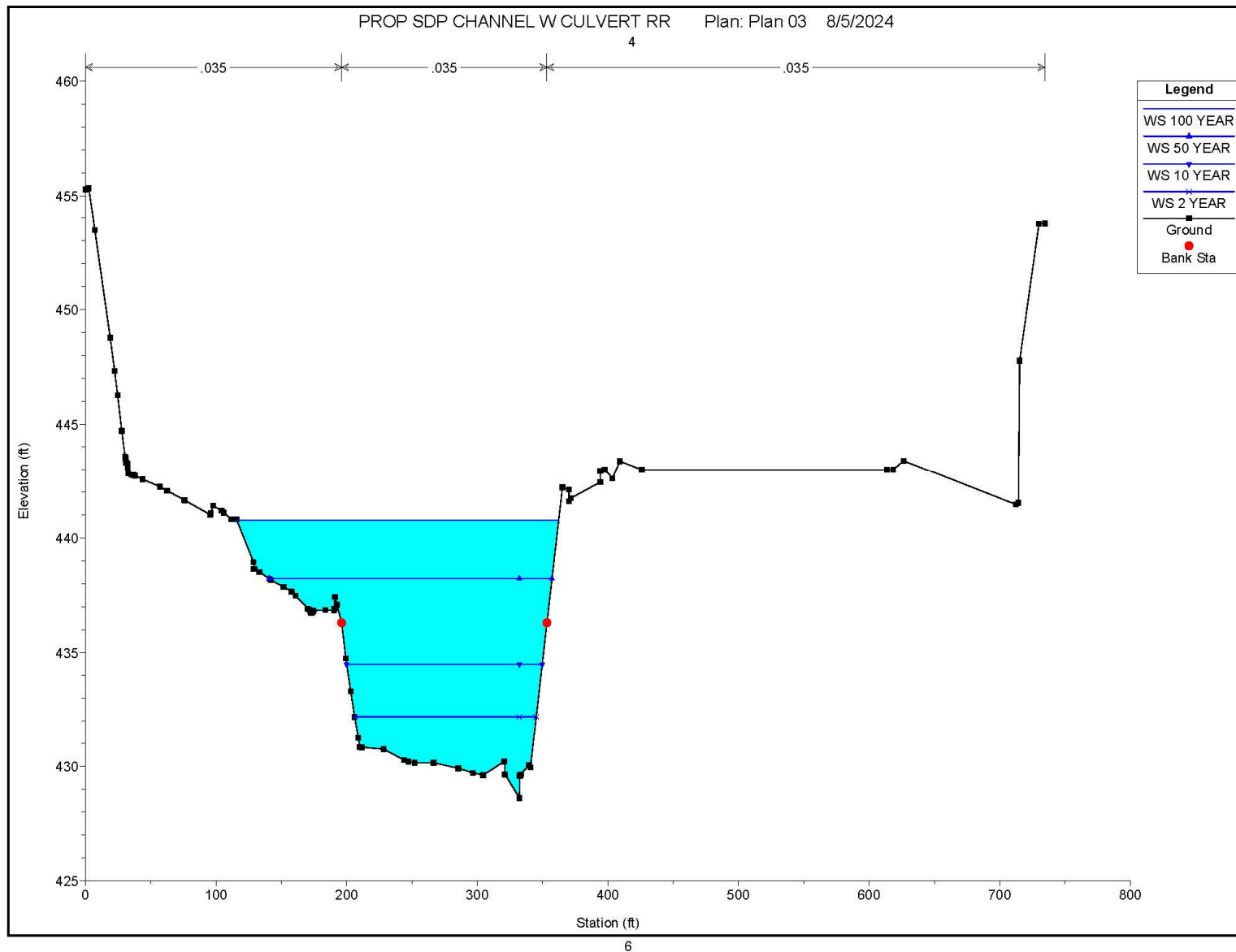


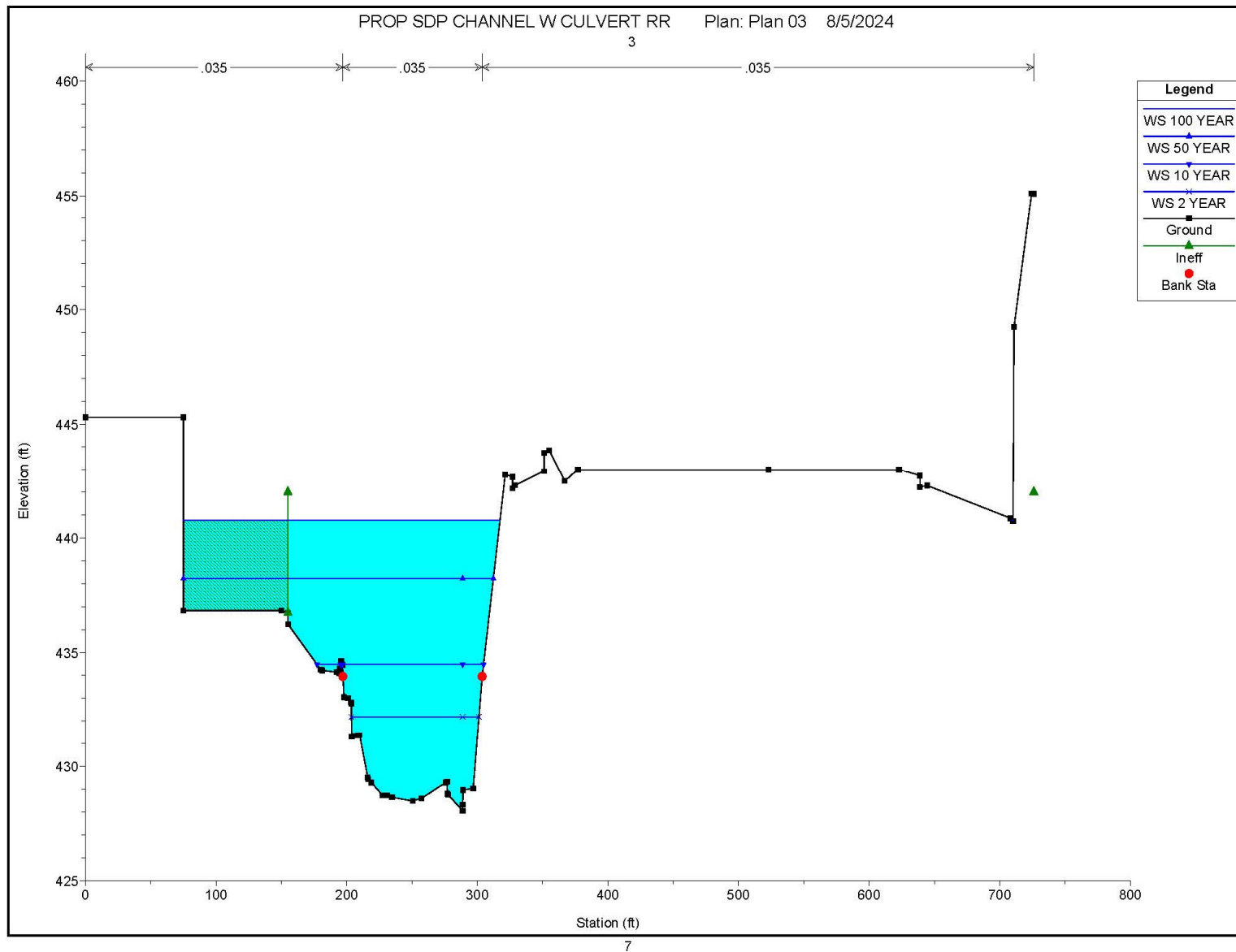


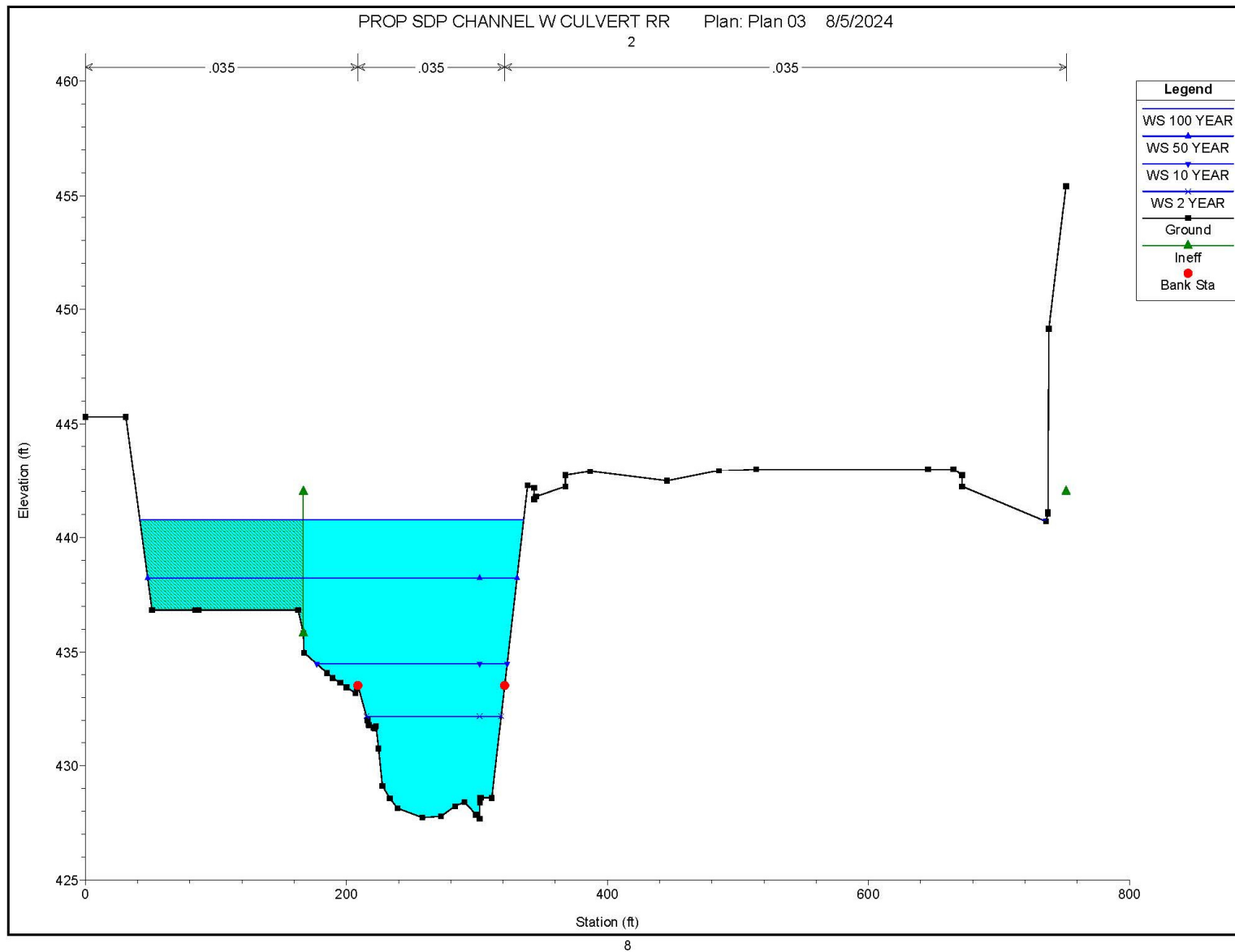


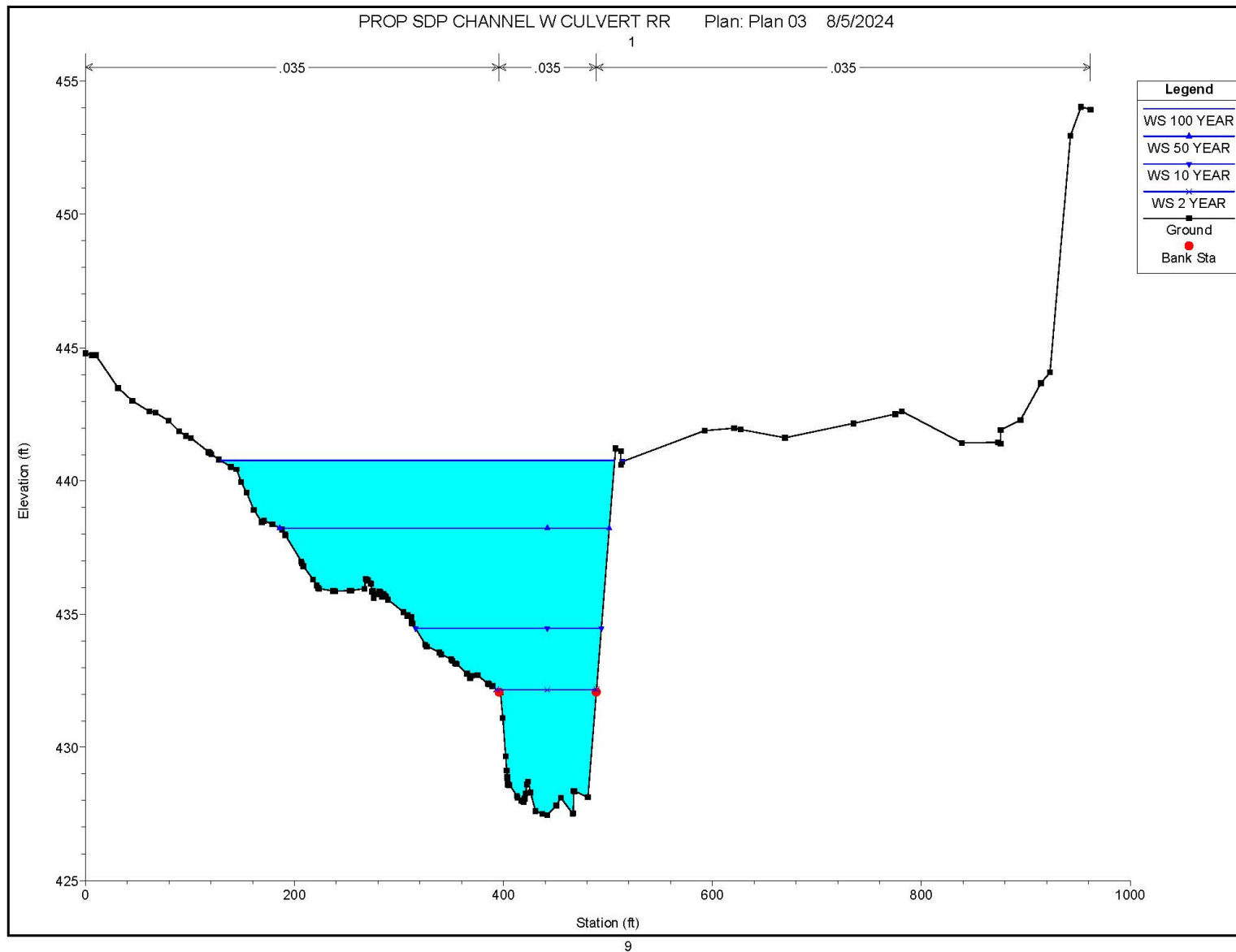


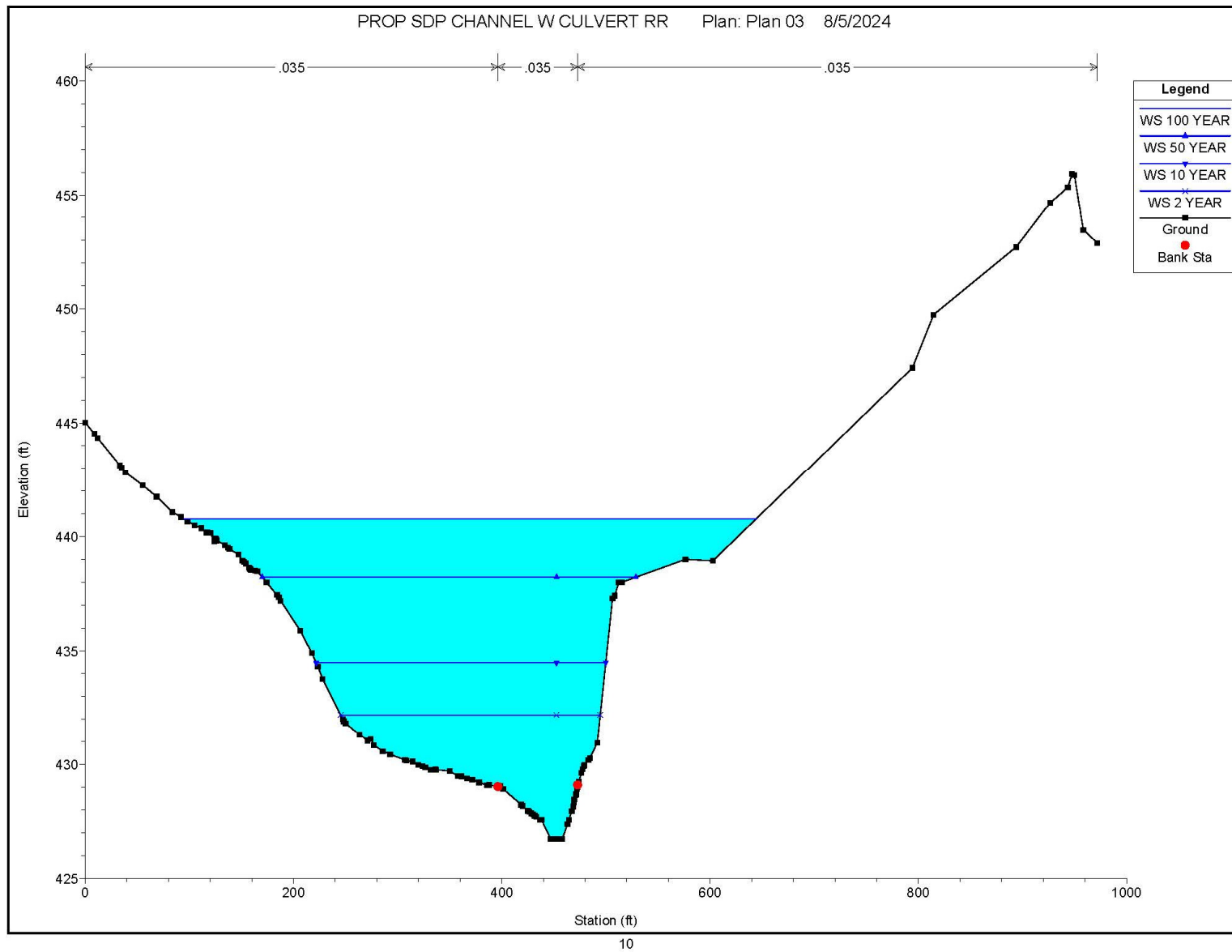


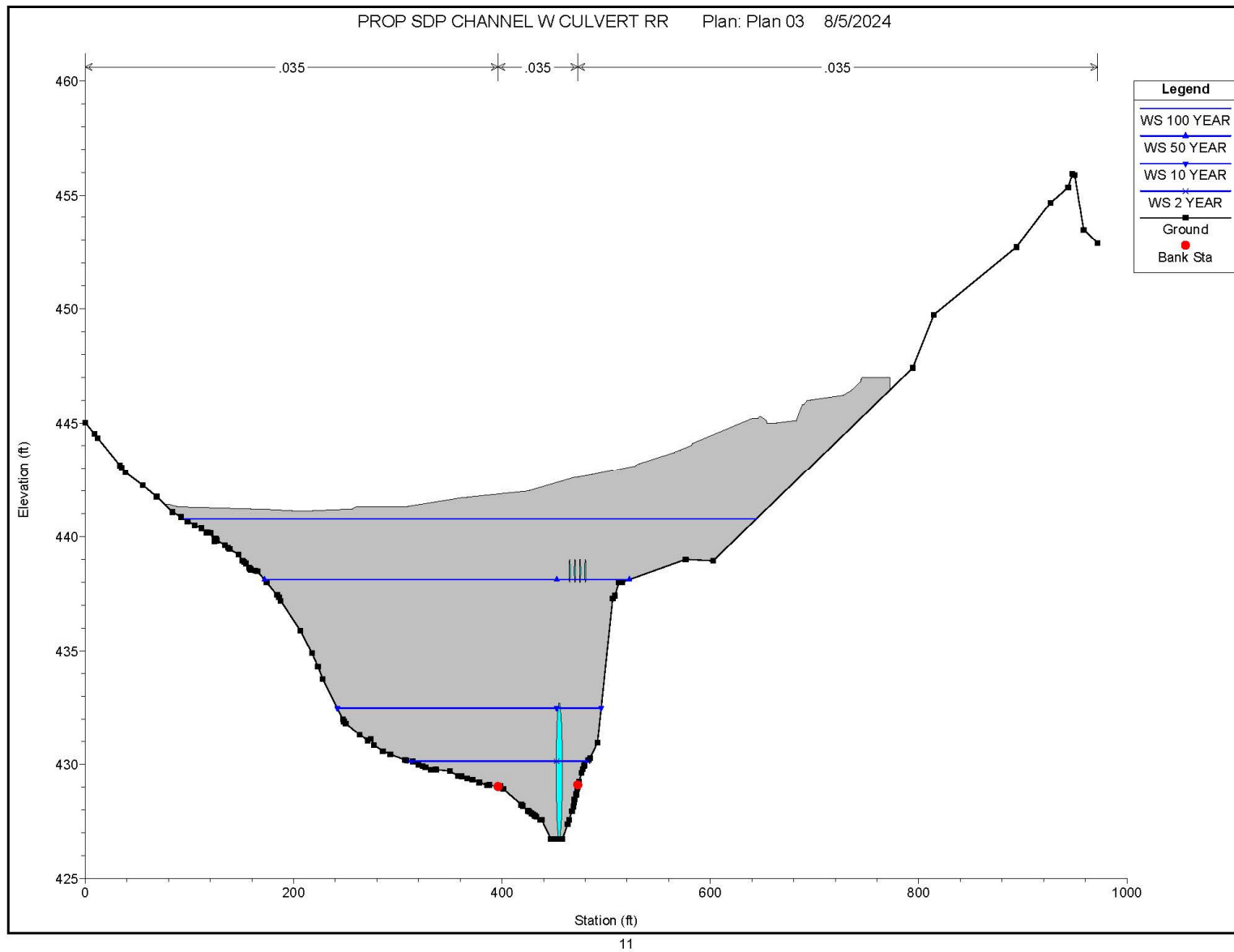


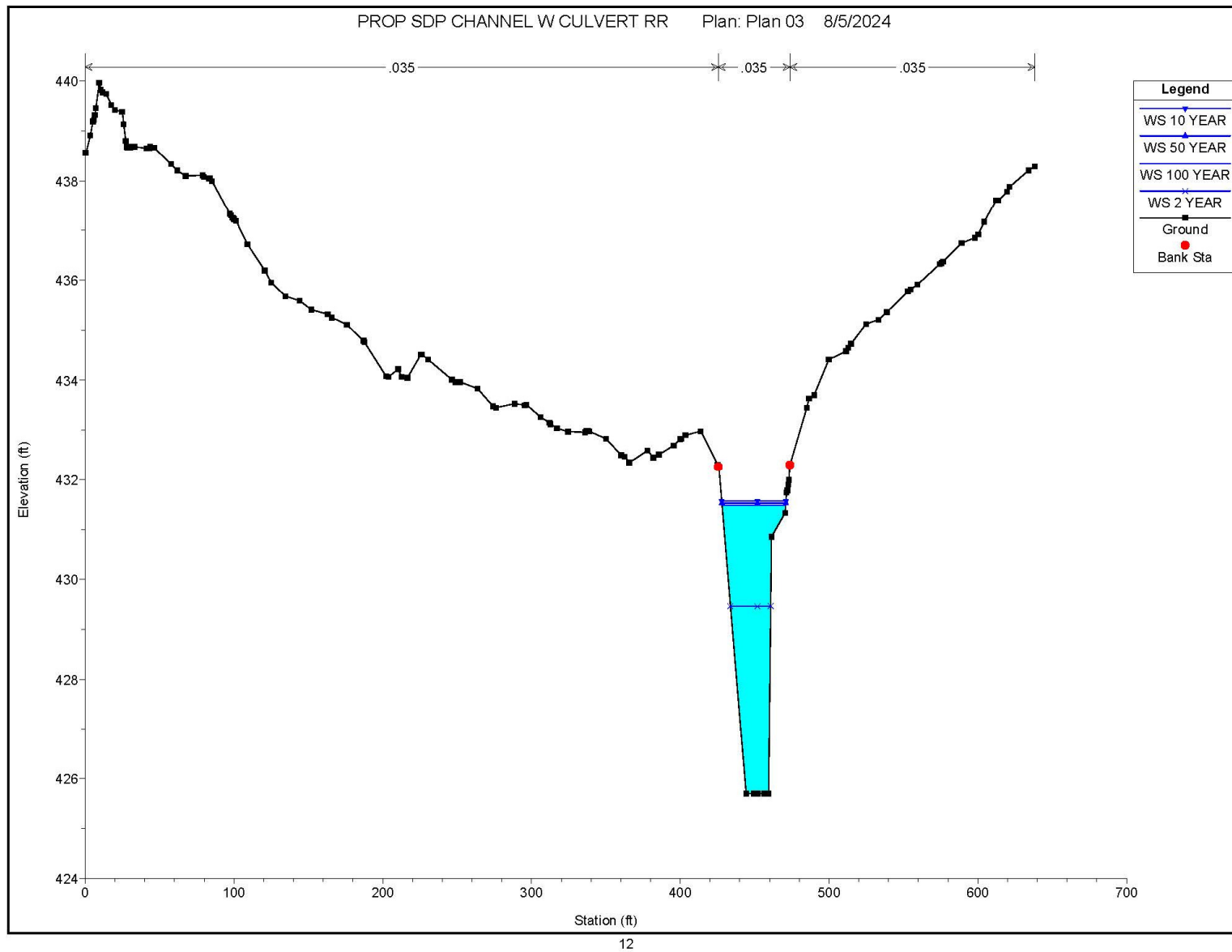










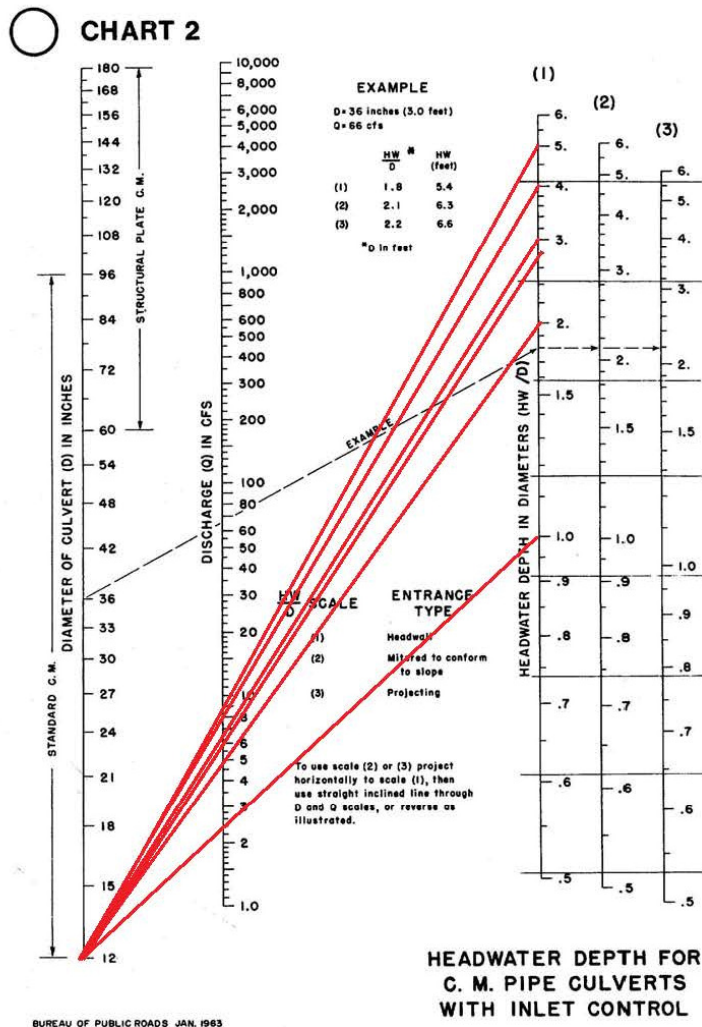


CHAPTER 5

FLOOD INUNDATION ANALYSES (HEC-RAS)

5.6 – Comparison of Rating Curves for four 12-inch cnp culverts and 36-inch cnp sump Inlet

ORIFICE FLOW EXISTING 36-INCH CMP SUMP INLET							
$Q = C_o A_e (2gd)^{1/2}$ $A_e = (1 - C_A) A * 0.8$ Q = INLET CAPACITY OF THE GRATED INLET (cfs) C_o = ORIFICE COEFFICIENT (0.67) d = head (ft) g = GRAVITATIONAL ACCELERATION (32.2 ft/s²) A_e = EFFECTIVE (CLOGGED) GRATE AREA (2.83 sf) A = ACTUAL AREA OF THE GRATE (5.65 sf) C_A = AREA CLOGGING FACTOR (0.50)							
Q (Chart 2*) x 1 (cfs)	Q (Chart 2*) x 4 (cfs)	Q (Orifice Flow) (cfs)	C _o -	A _e (ft)	2g (ft/s ²)	d (ft)	Elevation (ft)
2.4	9.6	15.2	0.67	2.827433388	64.4	1	439
5	20	21.5	0.67	2.827433388	64.4	2	440
5.9	23.6	25.4	0.67	2.827433388	64.4	2.8	440.8
6.5	26	26.3	0.67	2.827433388	64.4	3	441
8	32	30.4	0.67	2.827433388	64.4	4	442
9	36	34.0	0.67	2.827433388	64.4	5	443
* Chart 2 - Headwater Depth for C.M. pipe Culverts with inlet control San Diego County Hydraulic Design Manual, September 2014							



CHAPTER 6

REFERENCES

CHAPTER 6

REFERENCES

6.1 – Methodology – Rational Method Peak Flow Determination

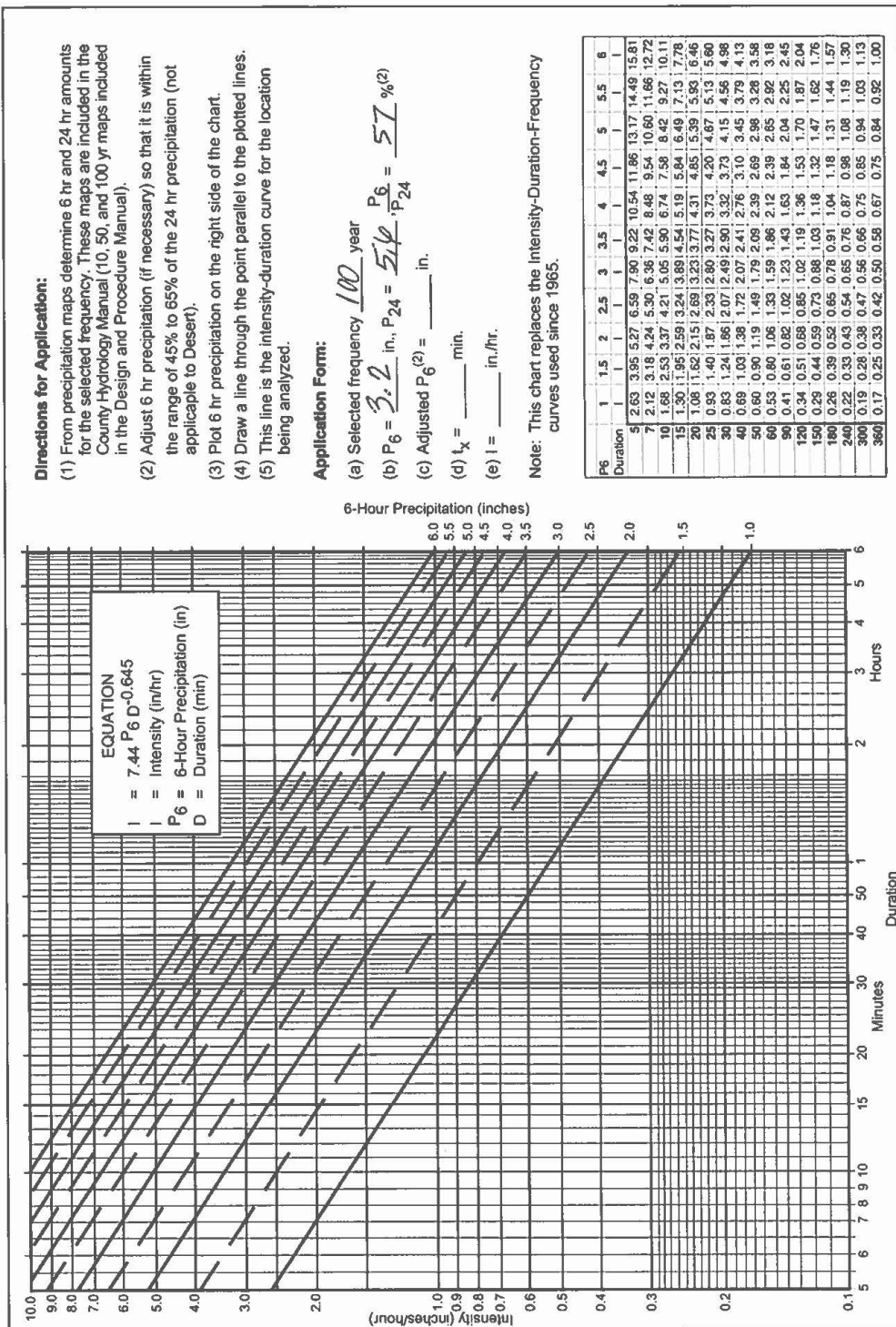


FIGURE
3-1
Intensity-Duration Design Chart - Template

County of San Diego Hydrology Manual



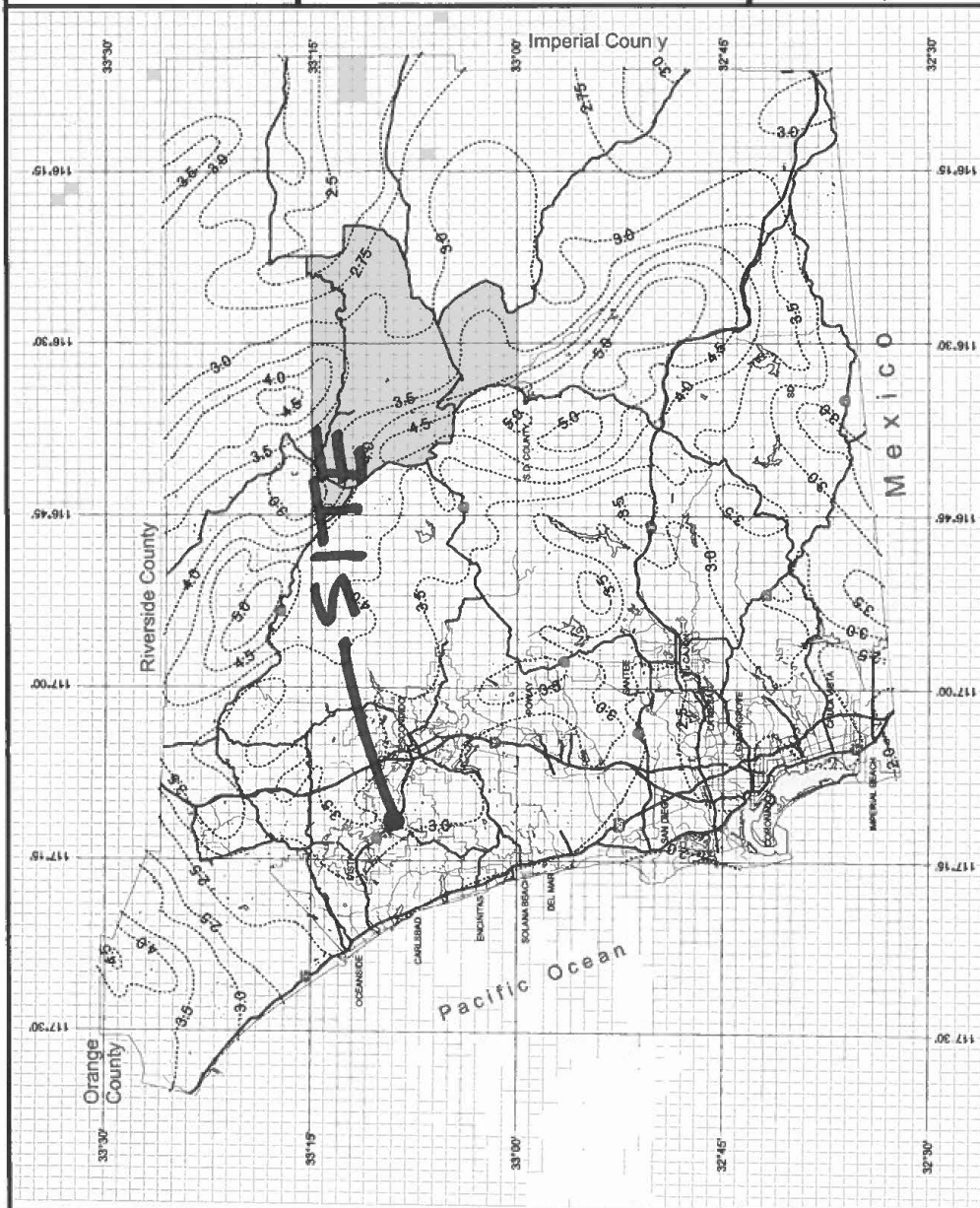
Rainfall Isopliths

100 Year Rainfall Event - 6 Hours

..... Isoplith (inches)



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County of San Diego Hydrology Manual



Rainfall Isophyvals

100 Year Rainfall Event - 24 Hours

..... Isophyval (inches)

GIS

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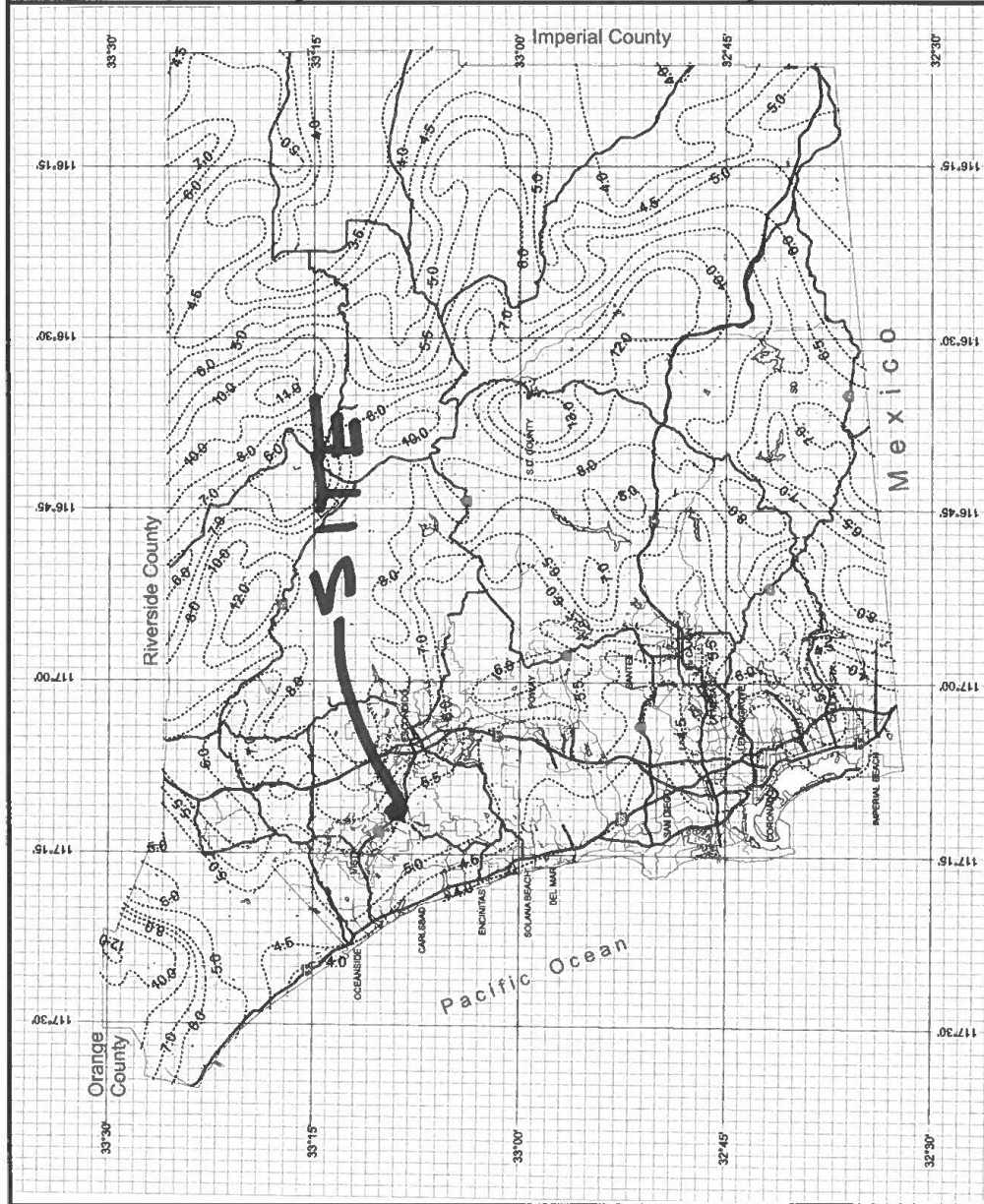


Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

$$C = 0.90 \times (\% \text{ Impervious}) + C_p \times (1 - \% \text{ Impervious})$$

Where: C_p = Pervious Coefficient Runoff Value for the soil type (shown in Table 3-1 as Undisturbed Natural Terrain/Permanent Open Space, 0% Impervious). Soil type can be determined from the soil type map provided in Appendix A.

The values in Table 3-1 are typical for most urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the local agency.



NOAA Atlas 14, Volume 6, Version 2
 Location name: Vista, California, USA*
 Latitude: 33.1766°, Longitude: -117.2111°
 Elevation: 440.99 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

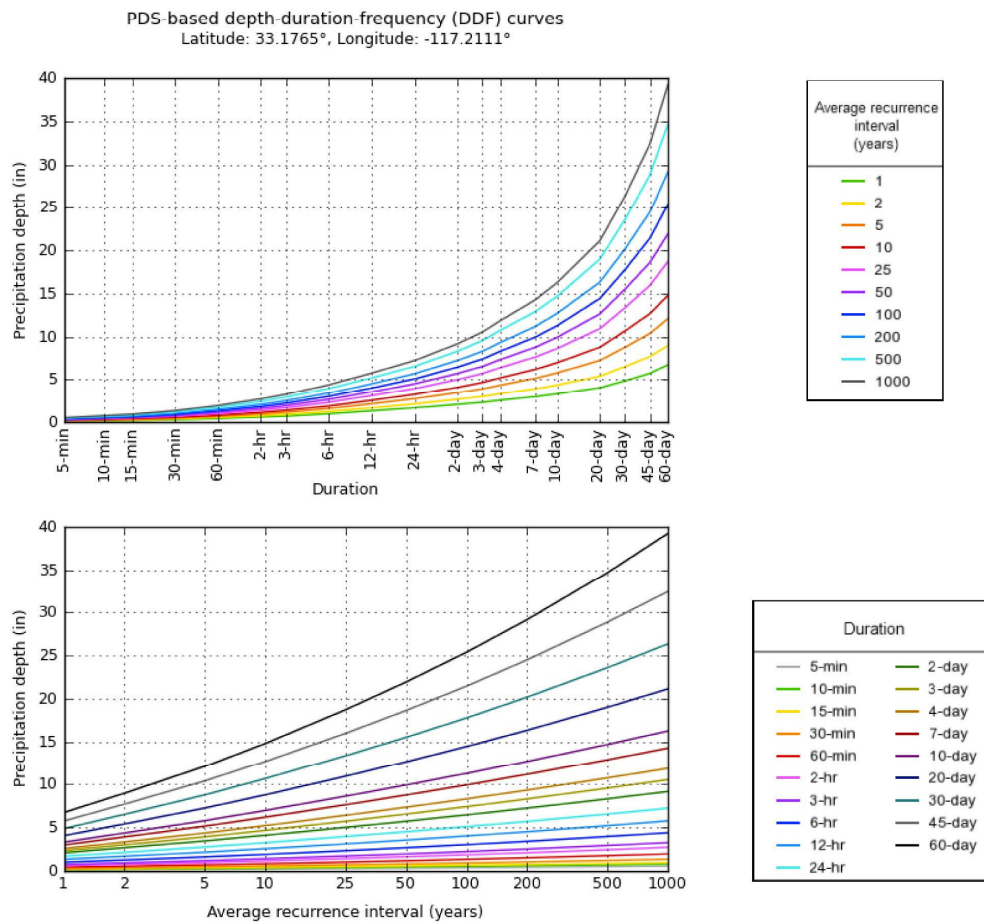
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.122 (0.102-0.146)	0.163 (0.129-0.184)	0.197 (0.165-0.237)	0.234 (0.194-0.284)	0.286 (0.230-0.361)	0.329 (0.258-0.424)	0.374 (0.286-0.495)	0.423 (0.313-0.576)	0.492 (0.349-0.701)	0.548 (0.375-0.810)
10-min	0.174 (0.147-0.209)	0.220 (0.185-0.264)	0.282 (0.236-0.340)	0.335 (0.278-0.407)	0.411 (0.329-0.517)	0.472 (0.370-0.608)	0.536 (0.410-0.709)	0.606 (0.449-0.826)	0.705 (0.500-1.00)	0.786 (0.537-1.16)
15-min	0.211 (0.178-0.253)	0.266 (0.223-0.319)	0.341 (0.286-0.411)	0.405 (0.337-0.492)	0.497 (0.398-0.625)	0.570 (0.447-0.735)	0.648 (0.495-0.858)	0.733 (0.543-0.998)	0.852 (0.604-1.21)	0.950 (0.649-1.41)
30-min	0.300 (0.252-0.359)	0.378 (0.318-0.453)	0.485 (0.406-0.584)	0.576 (0.479-0.700)	0.706 (0.566-0.889)	0.811 (0.636-1.04)	0.922 (0.704-1.22)	1.04 (0.772-1.42)	1.21 (0.859-1.73)	1.35 (0.923-2.00)
60-min	0.435 (0.366-0.521)	0.548 (0.461-0.658)	0.703 (0.590-0.847)	0.836 (0.695-1.01)	1.02 (0.821-1.29)	1.18 (0.923-1.52)	1.34 (1.02-1.77)	1.51 (1.12-2.06)	1.76 (1.25-2.51)	1.96 (1.34-2.90)
2-hr	0.611 (0.514-0.732)	0.766 (0.644-0.919)	0.979 (0.821-1.18)	1.16 (0.965-1.41)	1.42 (1.14-1.79)	1.63 (1.28-2.10)	1.85 (1.42-2.45)	2.10 (1.55-2.86)	2.44 (1.73-3.47)	2.72 (1.86-4.02)
3-hr	0.737 (0.621-0.884)	0.924 (0.777-1.11)	1.18 (0.990-1.42)	1.40 (1.16-1.70)	1.71 (1.37-2.15)	1.96 (1.54-2.53)	2.23 (1.70-2.95)	2.52 (1.87-3.43)	2.93 (2.08-4.17)	3.27 (2.23-4.83)
6-hr	1.00 (0.847-1.21)	1.26 (1.06-1.51)	1.61 (1.35-1.94)	1.91 (1.59-2.32)	2.33 (1.87-2.93)	2.67 (2.09-3.44)	3.03 (2.31-4.00)	3.41 (2.53-4.65)	3.96 (2.81-5.64)	4.40 (3.01-6.51)
12-hr	1.34 (1.13-1.61)	1.69 (1.42-2.03)	2.16 (1.81-2.60)	2.56 (2.13-3.11)	3.11 (2.50-3.92)	3.56 (2.79-4.58)	4.02 (3.07-5.32)	4.52 (3.35-6.16)	5.21 (3.70-7.43)	5.77 (3.94-8.53)
24-hr	1.69 (1.49-1.96)	2.14 (1.89-2.48)	2.75 (2.42-3.19)	3.26 (2.84-3.81)	3.96 (3.35-4.78)	4.52 (3.75-5.56)	5.10 (4.13-6.42)	5.71 (4.50-7.38)	6.55 (4.97-8.81)	7.23 (5.31-10.0)
2-day	2.09 (1.85-2.42)	2.68 (2.36-3.10)	3.46 (3.04-4.01)	4.11 (3.58-4.80)	5.01 (4.24-6.05)	5.72 (4.75-7.04)	6.46 (5.24-8.14)	7.24 (5.71-9.36)	8.31 (6.31-11.2)	9.17 (6.73-12.7)
3-day	2.33 (2.06-2.70)	3.01 (2.66-3.49)	3.92 (3.45-4.55)	4.68 (4.08-5.47)	5.73 (4.84-6.91)	6.55 (5.43-8.06)	7.41 (6.00-9.33)	8.31 (6.56-10.7)	9.55 (7.25-12.9)	10.5 (7.74-14.7)
4-day	2.57 (2.27-2.97)	3.34 (2.95-3.87)	4.37 (3.84-5.07)	5.22 (4.56-6.10)	6.41 (5.42-7.73)	7.34 (6.09-9.03)	8.31 (6.73-10.5)	9.33 (7.36-12.1)	10.7 (8.15-14.4)	11.9 (8.71-16.5)
7-day	2.99 (2.64-3.45)	3.92 (3.45-4.53)	5.16 (4.54-5.98)	6.19 (5.40-7.24)	7.63 (6.45-9.20)	8.76 (7.26-10.8)	9.93 (8.05-12.5)	11.2 (8.81-14.4)	12.9 (9.77-17.3)	14.2 (10.5-19.8)
10-day	3.32 (2.93-3.83)	4.37 (3.86-5.06)	5.79 (5.09-6.72)	6.97 (6.09-8.15)	8.62 (7.29-10.4)	9.92 (8.22-12.2)	11.3 (9.13-14.2)	12.7 (10.0-16.4)	14.7 (11.1-19.7)	16.2 (11.9-22.6)
20-day	4.06 (3.59-4.70)	5.42 (4.78-6.27)	7.24 (6.37-8.40)	8.78 (7.66-10.3)	10.9 (9.24-13.2)	12.6 (10.5-15.6)	14.4 (11.7-18.2)	16.3 (12.9-21.1)	19.0 (14.4-25.5)	21.1 (15.5-29.4)
30-day	4.87 (4.30-5.63)	6.52 (5.75-7.55)	8.77 (7.71-10.2)	10.7 (9.31-12.5)	13.3 (11.3-16.1)	15.5 (12.8-19.1)	17.8 (14.4-22.4)	20.2 (15.9-26.1)	23.6 (17.9-31.7)	26.3 (19.3-36.6)
45-day	5.76 (5.08-6.66)	7.70 (6.79-8.92)	10.4 (9.13-12.1)	12.7 (11.1-14.8)	16.0 (13.5-19.3)	18.6 (15.4-22.9)	21.4 (17.4-27.0)	24.5 (19.3-31.7)	28.9 (21.9-38.8)	32.4 (23.8-45.1)
60-day	6.73 (5.94-7.79)	8.97 (7.91-10.4)	12.1 (10.6-14.0)	14.8 (12.9-17.3)	18.7 (15.8-22.6)	21.9 (18.2-27.0)	25.4 (20.6-32.0)	29.2 (23.0-37.7)	34.6 (26.3-46.6)	39.2 (28.8-54.5)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical



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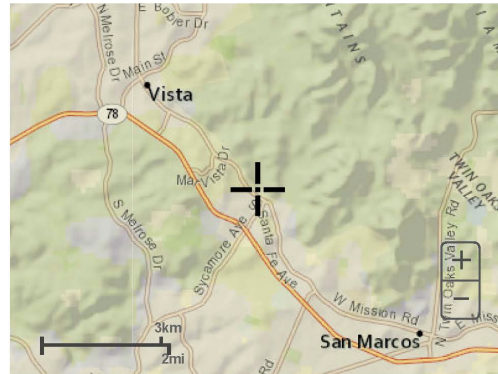
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Maps & aeri

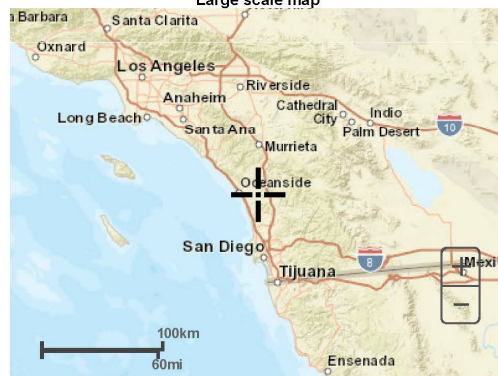
Small scale terrain



Large scale terrain



Large scale map



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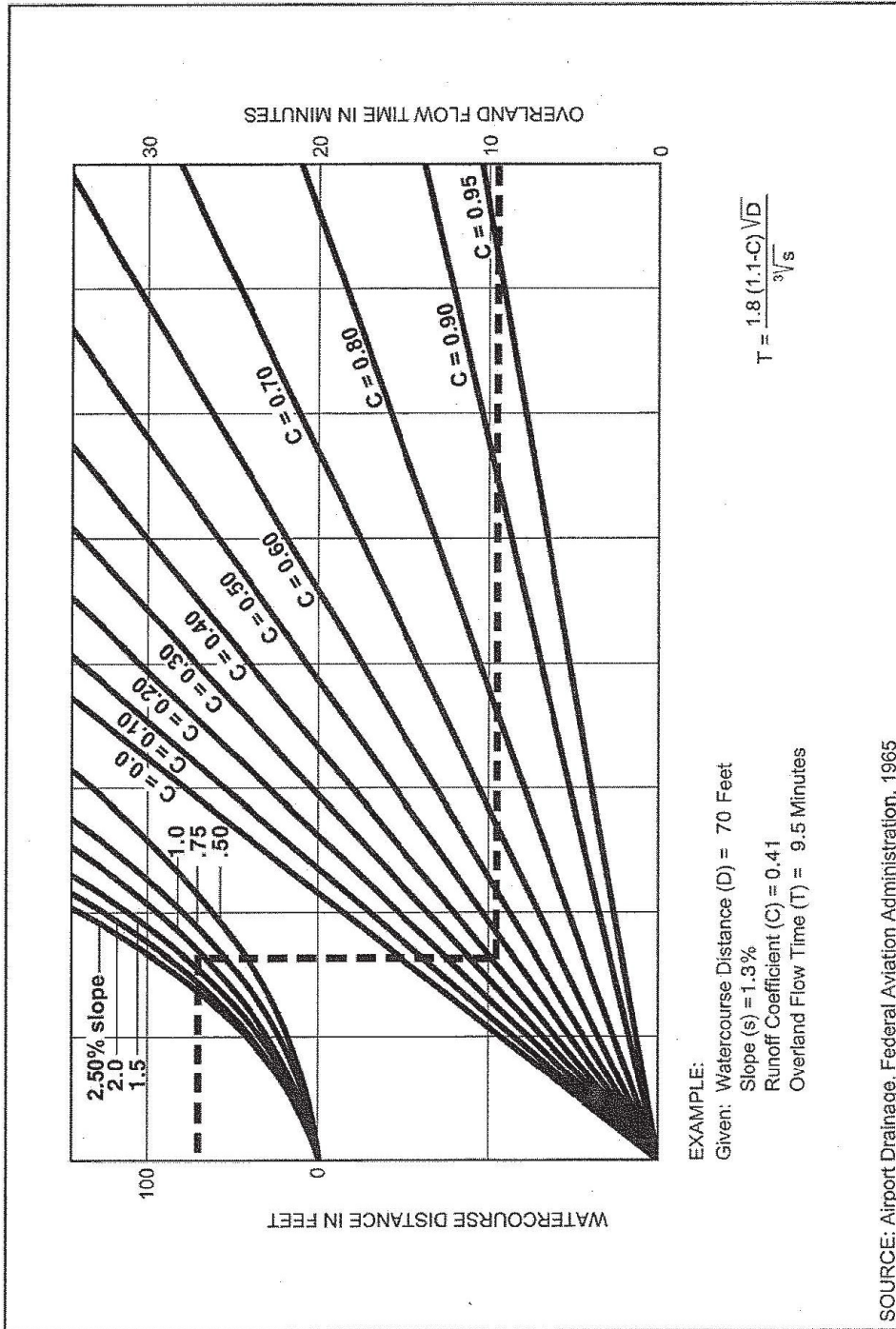


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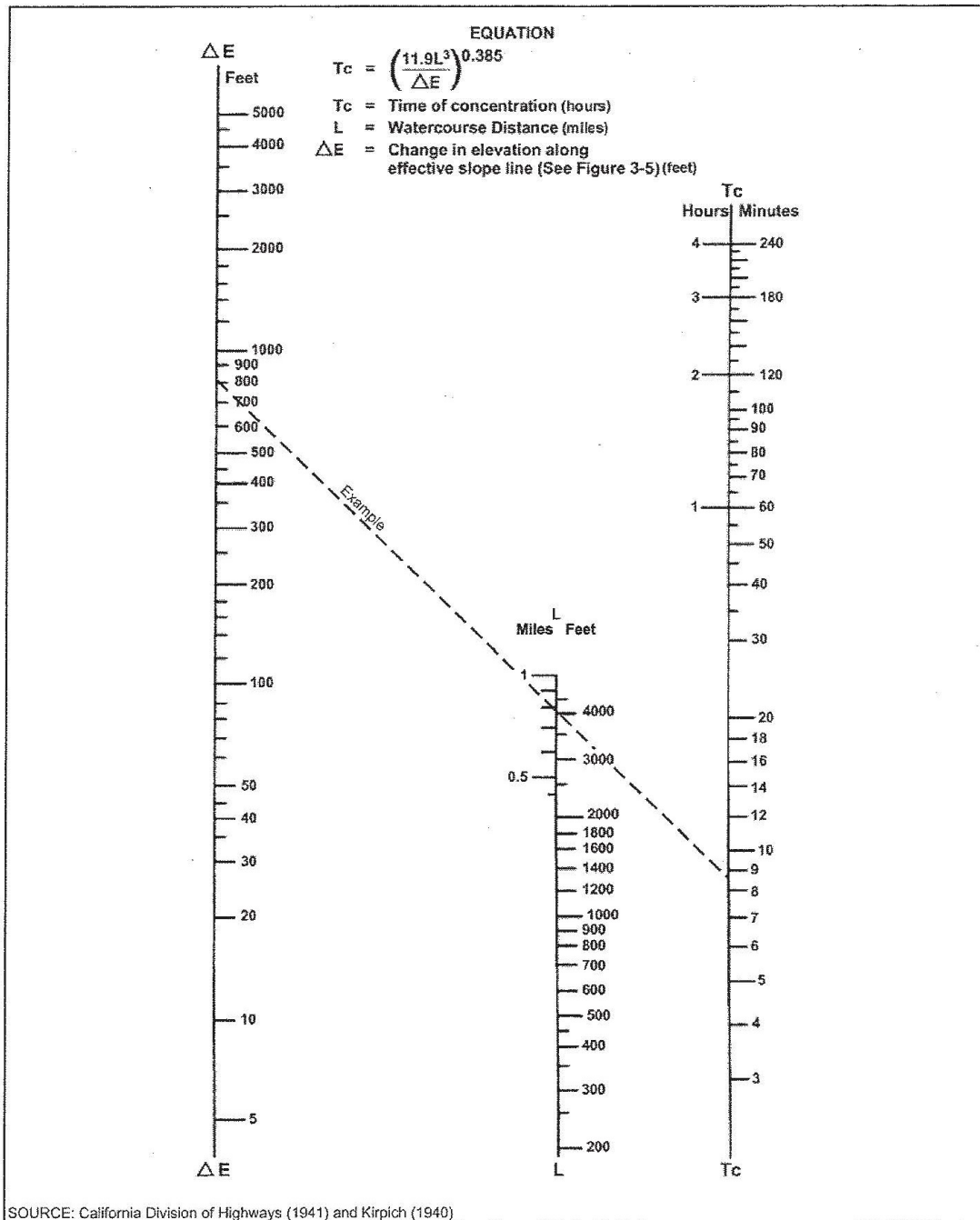
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FIGURE

3-3

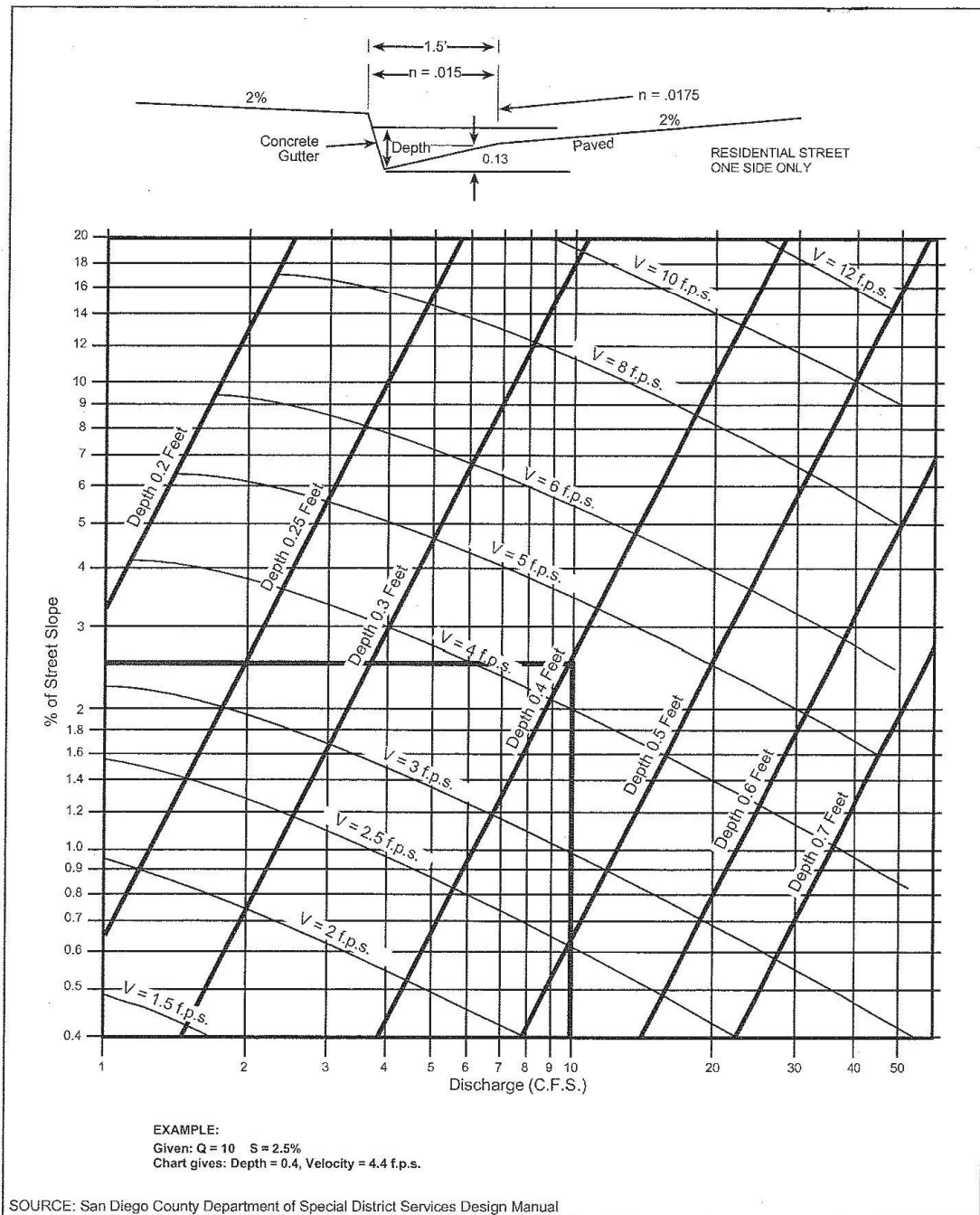
Rational Formula - Overland Time of Flow Nomograph



Nomograph for Determination of
Time of Concentration (T_c) or Travel Time (T_t) for Natural Watersheds

FIGURE

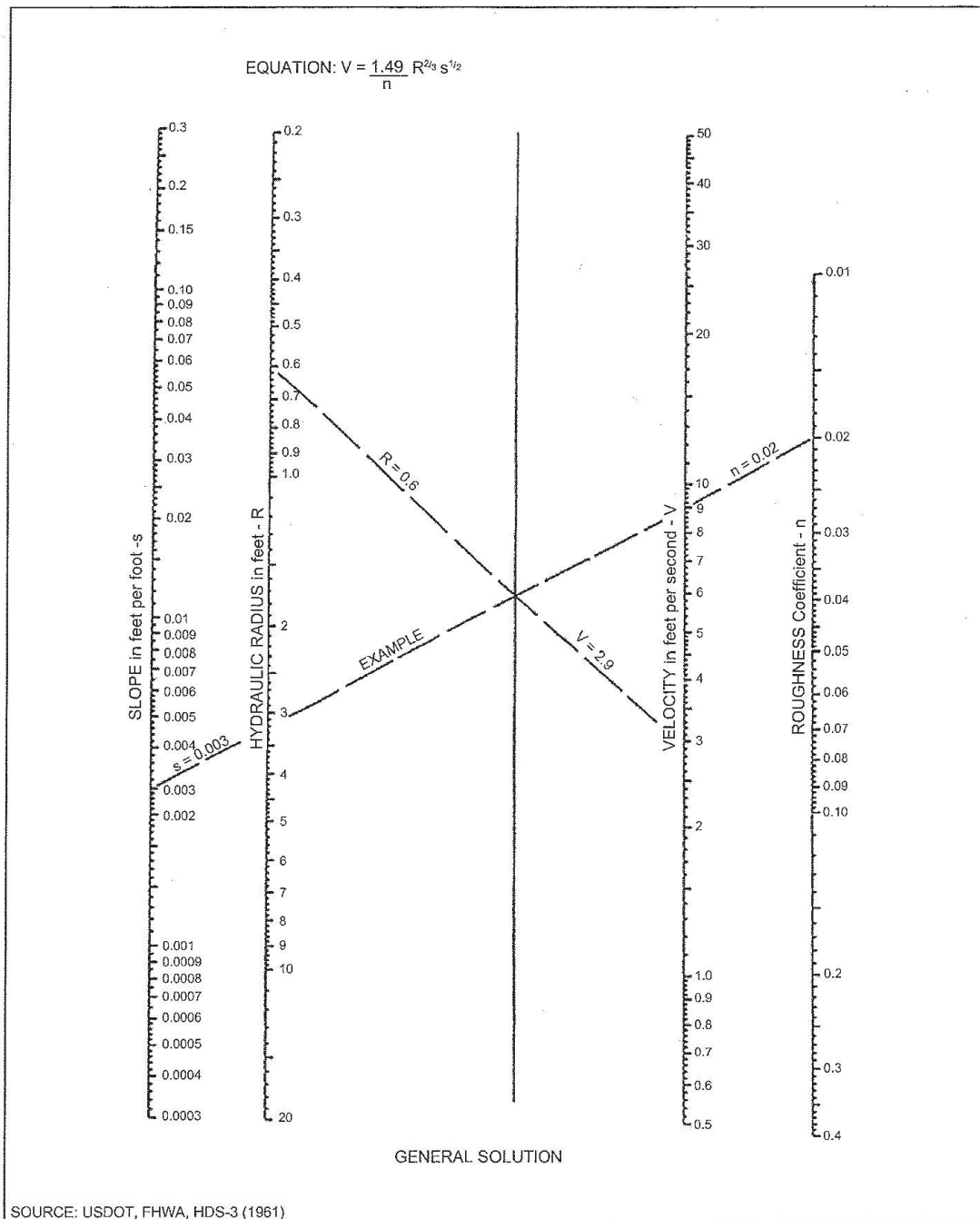
3-4



Gutter and Roadway Discharge - Velocity Chart

FIGURE

3-6



Manning's Equation Nomograph

FIGURE

3-7

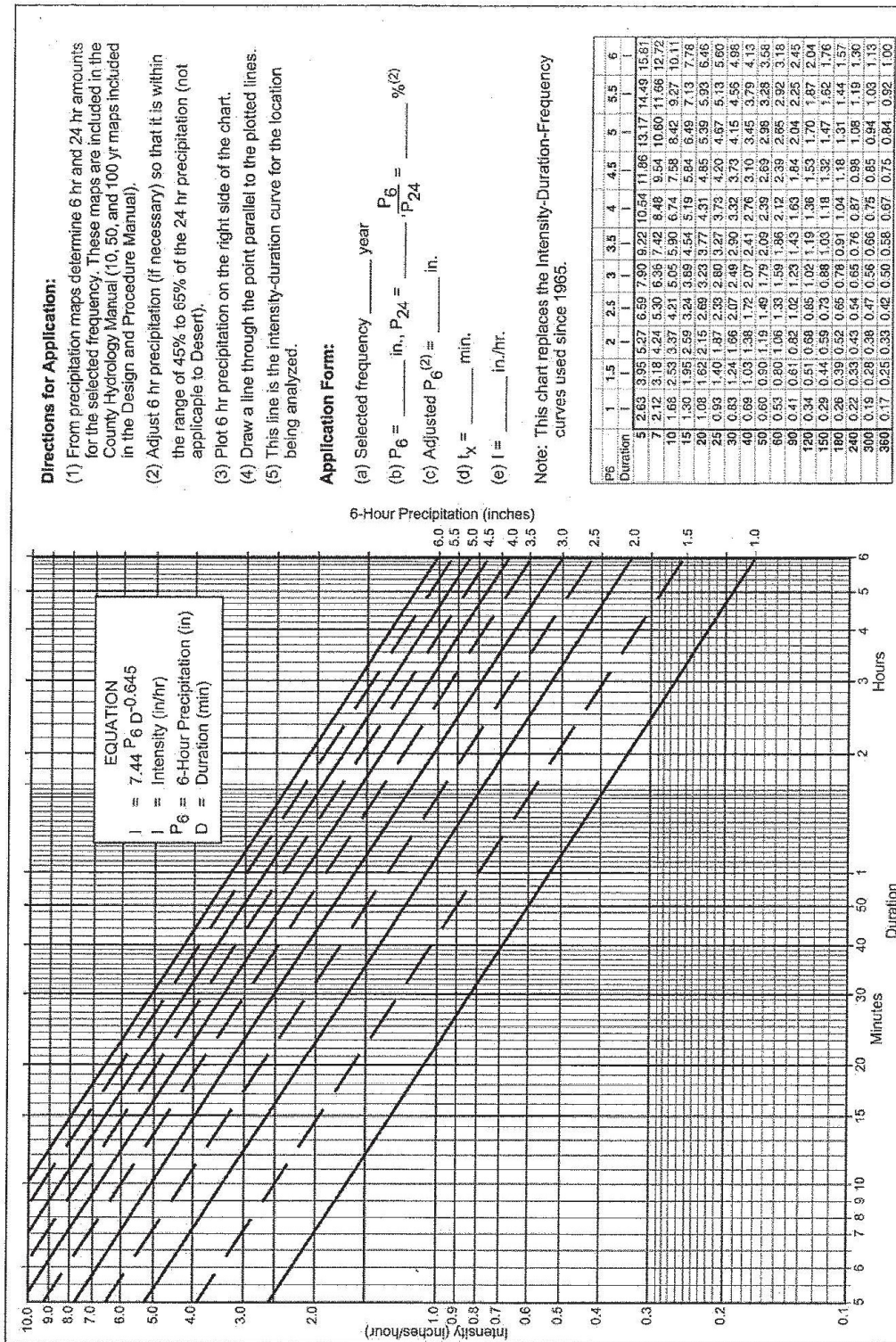


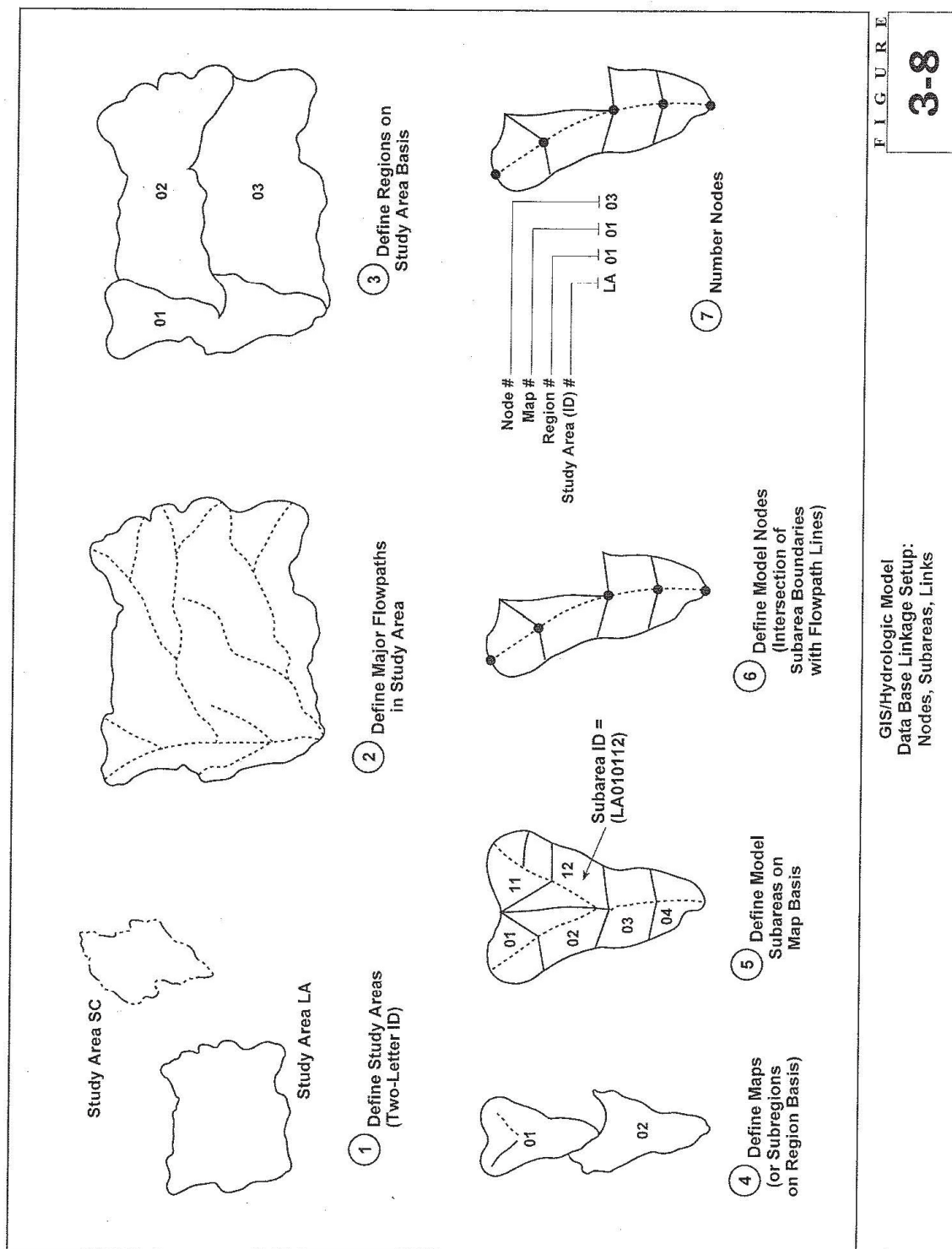
FIGURE
3-1

Intensity-Duration Design Chart - Template

3.2 DEVELOPING INPUT DATA FOR THE RATIONAL METHOD

This section describes the development of the necessary data to perform RM calculations. Section 3.3 describes the RM calculation process. Input data for calculating peak flows and T_c 's with the RM should be developed as follows:

1. On a topographic base map, outline the overall drainage area boundary, showing adjacent drains, existing and proposed drains, and overland flow paths.
2. Verify the accuracy of the drainage map in the field.
3. Divide the drainage area into subareas by locating significant points of interest. These divisions should be based on topography, soil type, and land use. Ensure that an appropriate first subarea is delineated. For natural areas, the first subarea flow path length should be less than or equal to 4,000 feet plus the overland flow length (Table 3-2). For developed areas, the initial subarea flow path length should be consistent with Table 3-2. The topography and slope within the initial subarea should be generally uniform.
4. Working from upstream to downstream, assign a number representing each subarea in the drainage system to each point of interest. Figure 3-8 provides guidelines for node numbers for geographic information system (GIS)-based studies.
5. Measure each subarea in the drainage area to determine its size in acres (A).
6. Determine the length and effective slope of the flow path in each subarea.
7. Identify the soil type for each subarea.



FIGURE

3-8

GIS/Hydrologic Model
Data Base Linkage Setup:
Nodes, Subareas, Links

8. Determine the runoff coefficient (C) for each subarea based on Table 3-1. If the subarea contains more than one type of development classification, use a proportionate average for C. In determining C for the subarea, use future land use taken from the applicable community plan, Multiple Species Conservation Plan, National Forest land use plan, etc.
9. Calculate the CA value for the subarea.
10. Calculate the $\Sigma(CA)$ value(s) for the subareas upstream of the point(s) of interest.
11. Determine P_6 and P_{24} for the study using the isopluvial maps provided in Appendix B. If necessary, adjust the value for P_6 to be within 45% to 65% of the value for P_{24} .

See Section 3.3 for a description of the RM calculation process.

3.3 PERFORMING RATIONAL METHOD CALCULATIONS

This section describes the RM calculation process. Using the input data, calculation of peak flows and T_c 's should be performed as follows:

1. Determine T_i for the first subarea. Use Table 3-2 or Figure 3-3 as discussed in Section 3.1.4. If the watershed is natural, the travel time to the downstream end of the first subarea can be added to T_i to obtain the T_c . Refer to paragraph 3.1.4.2 (a).
2. Determine I for the subarea using Figure 3-1. If T_i was less than 5 minutes, use the 5 minute time to determine intensity for calculating the flow.
3. Calculate the peak discharge flow rate for the subarea, where $Q_p = \Sigma(CA) I$.
In case that the downstream flow rate is less than the upstream flow rate, due to the long travel time that is not offset by the additional subarea runoff, use the upstream peak flow for design purposes until downstream flows increase again.

4. Estimate the T_t to the next point of interest.
5. Add the T_t to the previous T_c to obtain a new T_c .
6. Continue with step 2, above, until the final point of interest is reached.

Note: The MRM should be used to calculate the peak discharge when there is a junction from independent subareas into the drainage system.

3.4 MODIFIED RATIONAL METHOD (FOR JUNCTION ANALYSIS)

The purpose of this section is to describe the steps necessary to develop a hydrology report for a small watershed using the MRM. It is necessary to use the MRM if the watershed contains junctions of independent drainage systems. The process is based on the design manuals of the City/County of San Diego. The general process description for using this method, including an example of the application of this method, is described below.

The engineer should only use the MRM for drainage areas up to approximately 1 square mile in size. If the watershed will significantly exceed 1 square mile then the NRCS method described in Section 4 should be used. The engineer may choose to use either the RM or the MRM for calculations for up to an approximately 1-square-mile area and then transition the study to the NRCS method for additional downstream areas that exceed approximately 1 square mile. The transition process is described in Section 4.

3.4.1 Modified Rational Method General Process Description

The general process for the MRM differs from the RM only when a junction of independent drainage systems is reached. The peak Q , T_c , and I for each of the independent drainage systems at the point of the junction are calculated by the RM. The independent drainage systems are then combined using the MRM procedure described below. The peak Q , T_c , and I for each of the independent drainage systems at the point of the junction must be calculated prior to using the MRM procedure to combine the independent drainage systems, as these

values will be used for the MRM calculations. After the independent drainage systems have been combined, RM calculations are continued to the next point of interest.

3.4.2 Procedure for Combining Independent Drainage Systems at a Junction

Calculate the peak Q , T_c , and I for each of the independent drainage systems at the point of the junction. These values will be used for the MRM calculations.

At the junction of two or more independent drainage systems, the respective peak flows are combined to obtain the maximum flow out of the junction at T_c . Based on the approximation that total runoff increases directly in proportion to time, a general equation may be written to determine the maximum Q and its corresponding T_c using the peak Q , T_c , and I for each of the independent drainage systems at the point immediately before the junction. The general equation requires that contributing Q 's be numbered in order of increasing T_c .

Let Q_1 , T_1 , and I_1 correspond to the tributary area with the shortest T_c . Likewise, let Q_2 , T_2 , and I_2 correspond to the tributary area with the next longer T_c ; Q_3 , T_3 , and I_3 correspond to the tributary area with the next longer T_c ; and so on. When only two independent drainage systems are combined, leave Q_3 , T_3 , and I_3 out of the equation. Combine the independent drainage systems using the junction equation below:

Junction Equation: $T_1 < T_2 < T_3$

$$Q_{T1} = Q_1 + \frac{T_1}{T_2} Q_2 + \frac{T_1}{T_3} Q_3$$

$$Q_{T2} = Q_2 + \frac{I_2}{I_1} Q_1 + \frac{T_2}{T_3} Q_3$$

$$Q_{T3} = Q_3 + \frac{I_3}{I_1} Q_1 + \frac{I_3}{I_2} Q_2$$

Calculate Q_{T1} , Q_{T2} , and Q_{T3} . Select the largest Q and use the T_c associated with that Q for further calculations (see the three Notes for options). If the largest calculated Q 's are equal (e.g., $Q_{T1} = Q_{T2} > Q_{T3}$), use the shorter of the T_c 's associated with that Q .

This equation may be expanded for a junction of more than three independent drainage systems using the same concept. The concept is that when Q from a selected subarea (e.g., Q_2) is combined with Q from another subarea with a shorter T_c (e.g., Q_1), the Q from the subarea with the shorter T_c is reduced by the ratio of the I 's (I_2/I_1); and when Q from a selected subarea (e.g., Q_2) is combined with Q from another subarea with a longer T_c (e.g., Q_3), the Q from the subarea with the longer T_c is reduced by the ratio of the T_c 's (T_2/T_3).

Note #1: At a junction of two independent drainage systems that have the same T_c , the tributary flows may be added to obtain the Q_p .

$$Q_p = Q_1 + Q_2; \text{ when } T_1 = T_2; \text{ and } T_c = T_1 = T_2$$

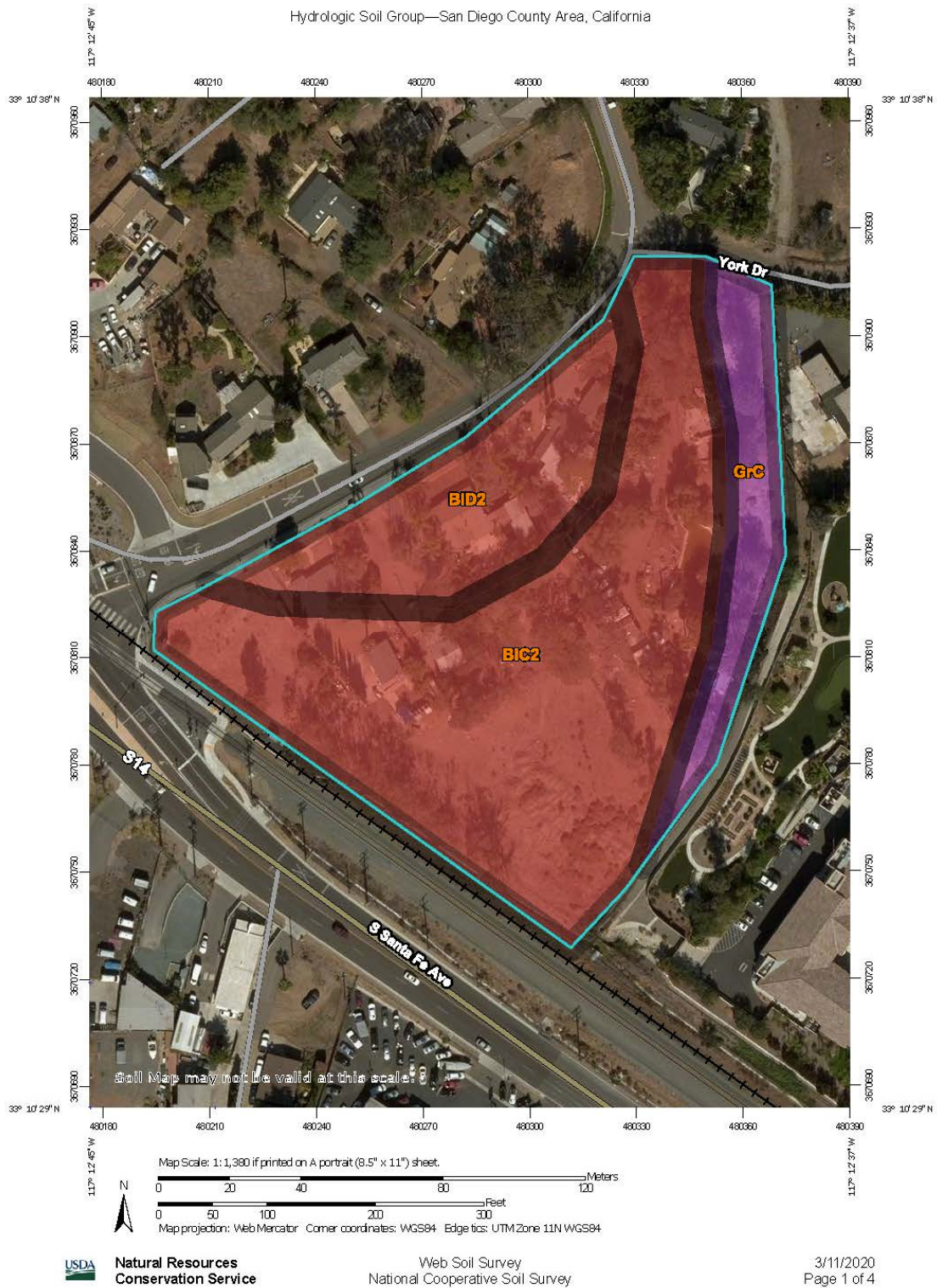
This can be verified by using the junction equation above. Let Q_3 , T_3 , and $I_3 = 0$. When T_1 and T_2 are the same, I_1 and I_2 are also the same, and T_1/T_2 and $I_2/I_1 = 1$. T_1/T_2 and I_2/I_1 are cancelled from the equations. At this point, $Q_{T1} = Q_{T2} = Q_1 + Q_2$.

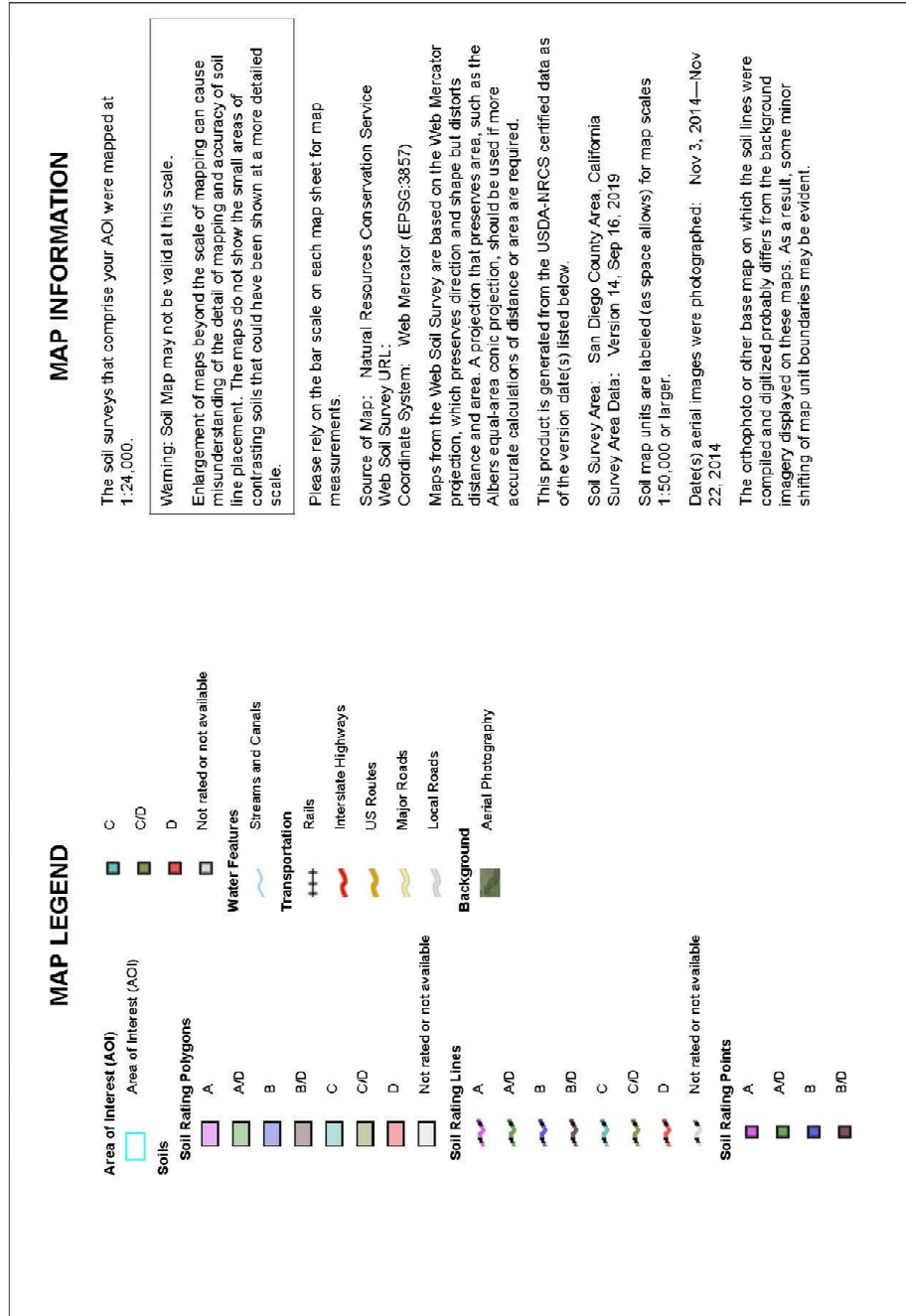
Note #2: In the upstream part of a watershed, a conservative computation is acceptable. When the times of concentration (T_c 's) are relatively close in magnitude (within 10%), use the shorter T_c for the intensity and the equation $Q = \Sigma(CA)I$.

Note #3: . An optional method of determining the T_c is to use the equation

$$T_c = [(\Sigma(CA)7.44 P_6)/Q]^{1.55}$$

This equation is from $Q = \Sigma(CA)I = \Sigma(CA)(7.44 P_6/T_c^{.645})$ and solving for T_c . The advantage in this option is that the T_c is consistent with the peak flow Q , and avoids inappropriate fluctuation in downstream flows in some cases.





Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BIC2	Bonsall sandy loam, 2 to 9 percent slopes, eroded	D	3.1	66.2%
BID2	Bonsall sandy loam, 9 to 15 percent slopes, eroded	D	1.0	21.4%
GrC	Greenfield sandy loam, 5 to 9 percent slopes	A	0.6	12.4%
Totals for Area of Interest			4.6	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher