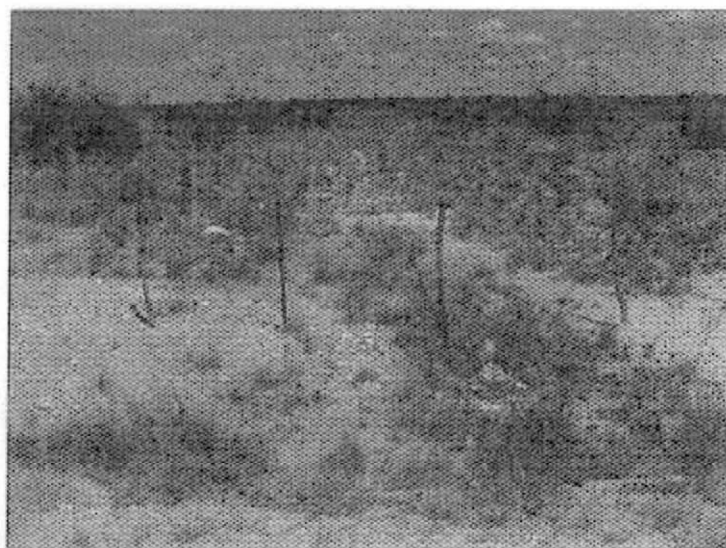




6 - 29" x 18" CMP ARCH CULVERTS  
UNDER THE ACCESS ROAD



SECTION OF THE DRAW



**FH** FREDERICK M. HAAS, P.E.  
CONSULTING ENGINEER  
3613A SUMMIT BEND  
AUSTIN, TEXAS 78759  
512-478-8580

DATE ISSUED: 02/09/04

PURPOSE:  
PERMIT RENEWAL

PROJECT: WASTE CONTROL SPECIALISTS LLC  
ANDREWS COUNTY, TEXAS  
RCRA PERMIT RENEWAL

SHEET TITLE:  
PHOTOGRAPHS

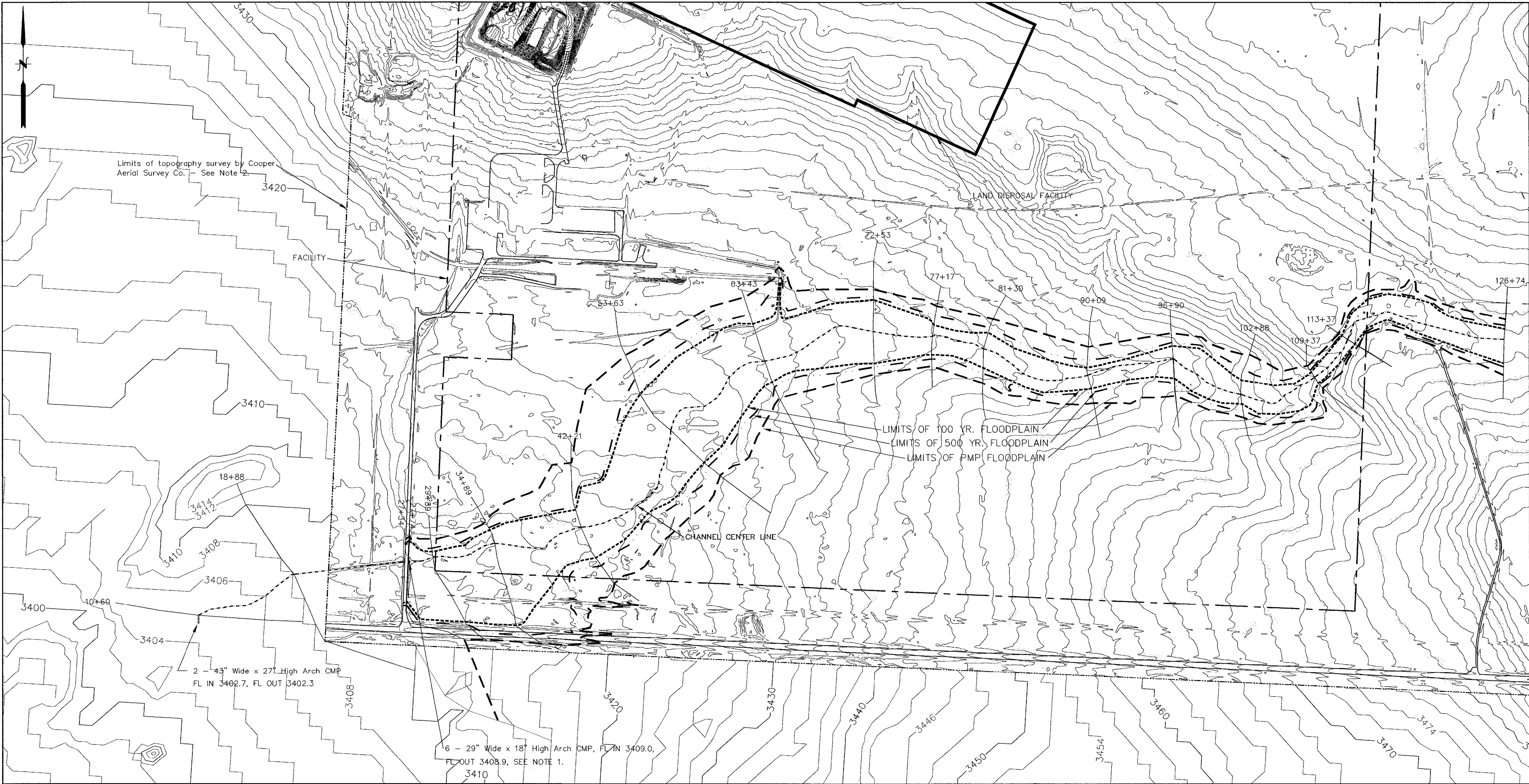
|                  |                 |                     |                                                  |      |
|------------------|-----------------|---------------------|--------------------------------------------------|------|
| DES BY<br>OGD    | DRAW BY<br>OGD  | CHK BY<br>FHH       | DRAWING NAME:<br>D:\WCS\DRAW\WCS_FLOODPLAIN\DWG\ | REV. |
| SCALE:<br>N.T.S. | SHEET<br>1 OF 1 | FIGURE NO.<br>11F.3 |                                                  |      |

NOTES:

- Existing pipe sizes taken from field observation. Pipe flowlines taken from Survey by West Texas Consultants, Inc., 305 NW Ave. C, Andrews, TX 79714, (915) 523-2181, Fax: (915) 524-2346, dated 10/07/06.
- Existing topographic information within the limits shown is provided by Cooper Aerial Survey Co., 11402 N. Cave Creek Road, Phoenix, AZ 85020, (602) 678-5111 Fax: (602) 678-5228, 1-800-229-2279.
- Existing topographic information outside the limits shown is based on a digital elevation model (DEM) provided by The Texas Natural Resources Information System (TNRIS).
- Facility boundary and Land Disposal Facility information provided by Waste Control Specialists LLC.

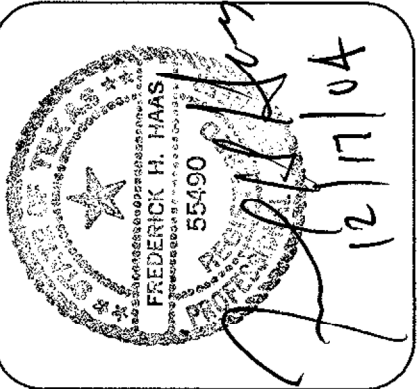
LEGEND

- PROBABLE MAXIMUM PRECIPITATION FLOODPLAIN LIMITS
- 500 YEAR FLOODPLAIN LIMITS
- 100 YEAR FLOODPLAIN LIMITS
- LIMITS OF TOPOGRAPHIC SURVEY BY COOPER AERIAL SURVEY CO.
- FACILITY
- CHANNEL CENTER LINE
- 34+89 CHANNEL CROSS-SECTION LOCATION



FLOODPLAIN MAP

SCALE: 1" = 400'



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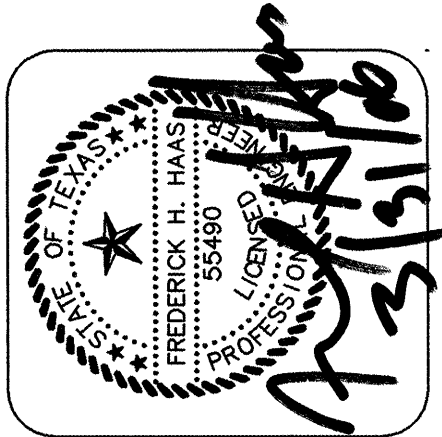


WASTE CONTROL SPECIALISTS LLC  
Andrews County, Texas

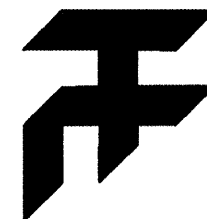
|               |              |              |
|---------------|--------------|--------------|
| DRAWN BY:     | DGD          | WCS          |
| DESIGNED BY:  | DGD          | FLDPLAINAPP2 |
| CHECKED BY:   | FHH          |              |
| DATE:         | 12/15/04     |              |
| REVISED:      |              |              |
| JOB NAME:     |              |              |
| DRAWING NAME: | FLDPLAINAPP2 |              |

II.F.4





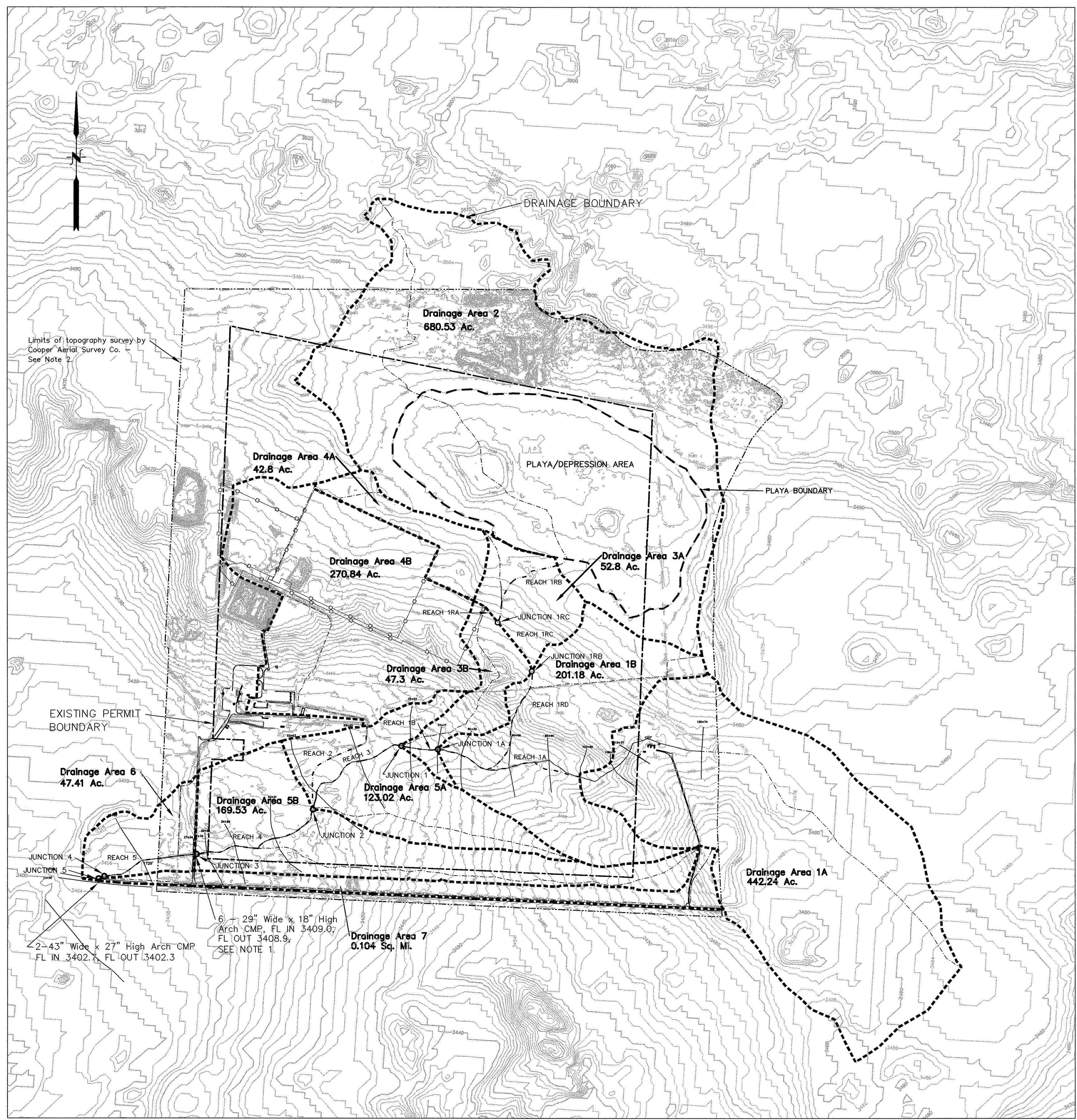
FREDERICK H. HAAS, P.E.  
CONSULTING ENGINEER  
802 WEST 11TH ST., STE 205  
AUSTIN, TEXAS 78701  
512-478-6550  
FAX 512-474-9463



WASTE CONTROL SPECIALISTS LLC  
Andrews County, Texas

|               |          |              |
|---------------|----------|--------------|
| DRAWN BY:     | DGD      | WCS          |
| DESIGNED BY:  | DGD      | DRAINAGE MAP |
| CHECKED BY:   | FHH      |              |
| DATE:         | 03/31/06 |              |
| REVISED:      |          |              |
| JOB NAME:     |          |              |
| DRAWING NAME: |          |              |

11.F.5



LEGEND

- PLAYA AREA BOUNDARY
- DRAINAGE AREA BOUNDARY
- LIMITS OF TOPOGRAPHIC SURVEY BY COOPER AERIAL SURVEY CO.
- EXISTING PERMIT BOUNDARY
- REACH LENGTH
- TRAVEL TIME FLOW PATH
- JUNCTION

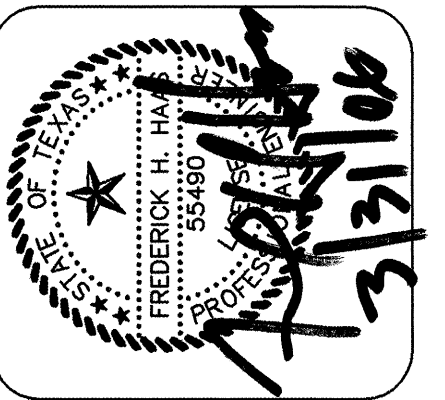
NOTES:

- Existing pipe sizes taken from field observation. Pipe flowlines taken from Survey by West Texas Consultants, Inc., 305 NW Ave. C, Andrews, TX 79714, (915) 523-2181, Fax: (915) 524-2346, dated 10/07/96.
- Existing topographic information within the limits shown is provided by Cooper Aerial Survey Co., 11402 N. Cave Creek Road, Phoenix, AZ 85020, (602) 678-5111 Fax: (602) 678-5228, 1-800-229-2279.
- Existing topographic information outside the limits shown is based on a digital elevation model (DEM) provided by The Texas Natural Resources Information System (TNRIS).
- Permit boundary and facility information provided by Waste Control Specialists LLC.

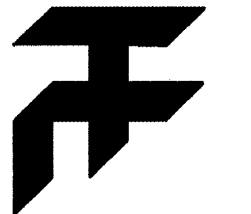
Developed Low Level &  
Byproduct Facility Drainage Area Map

SCALE: 1" = 1000'





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WASTE CONTROL SPECIALISTS LLC  
Andrews County, Texas

|           |              |               |       |
|-----------|--------------|---------------|-------|
| DGD       | DGD          | FHH           | WCS   |
|           |              | 03/31/06      | Map   |
|           |              |               | Soils |
| DRAWN BY: | DESIGNED BY: | CHECKED BY:   | DATE: |
|           |              |               |       |
| REVISED:  | JOB NAME:    | DRAWING NAME: |       |
|           |              |               |       |

II.F.6

LEGEND

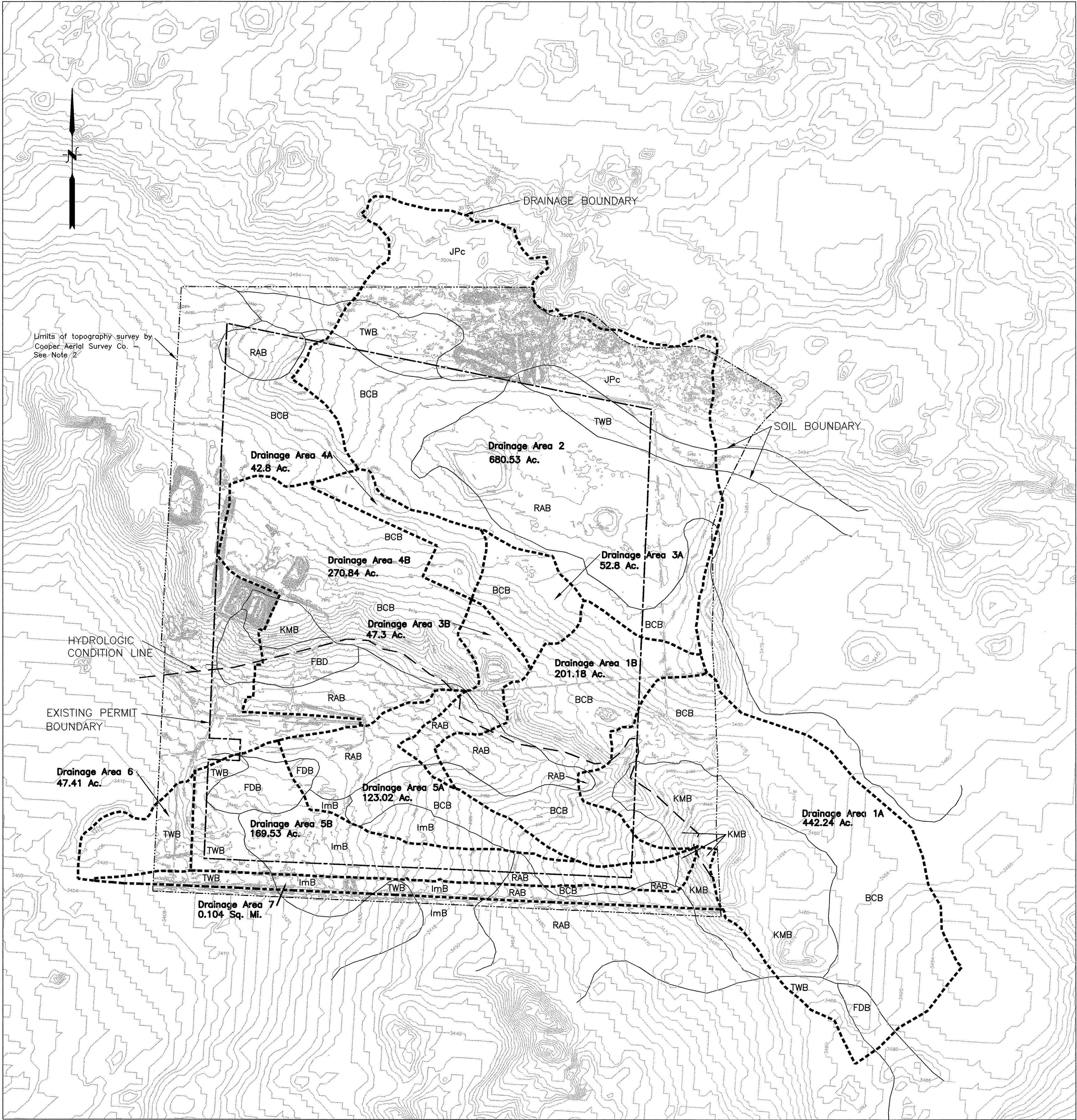
- SOIL BOUNDARY
- HYDROLOGIC CONDITION
- DRAINAGE AREA BOUNDARY
- LIMITS OF TOPOGRAPHIC SURVEY BY COOPER AERIAL SURVEY CO.
- EXISTING PERMIT BOUNDARY

| SYMBOL | GROUP | NAME      |
|--------|-------|-----------|
| JPC    | A     | Jalmar    |
| TWB    | B     | Triomas   |
| BCB    | B     | Blakeney  |
| RAB    | B     | Ratliff   |
| FDB    | B     | Faskin    |
| ImB    | B     | Ima       |
| KMB    | C     | Kimbrough |

- NOTES:
- Soil information taken from the Soil Conservation Service Soil Survey of Andrews County, Texas issued August 1974.
  - Existing topographic information within the limits shown is provided by Cooper Aerial Survey Co., 11402 N. Cave Creek Road, Phoenix, AZ 85020, (602) 678-5111, Fax: (602) 678-5228, 1-800-229-2279.
  - Existing topographic information outside the limits shown is based on a digital elevation model (DEM) provided by The Texas Natural Resources Information System (TNRIS).
  - Hydrologic condition north of the line is considered poor. Hydrologic condition south of the line is considered fair.
  - Permit boundary information provided by Waste Control Specialists LLC.

Developed Low Level & Byproduct Facility Soils Map

SCALE: 1" = 1000'

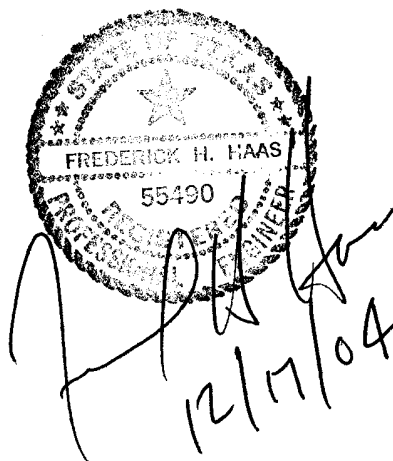






## APPENDIX A

### DRAINAGE CALCULATIONS





## 500 YEAR STORM CALCULATIONS

REF: DEPTH-DURATION FREQUENCY OF PRECIPITATION FOR TEXAS, W.H. ASQUITH,  
WATER RESOURCES INVESTIGATIONS REPORT 98-4044, U.S. GEOLOGICAL  
SURVEY, 1998 (98-4044)

## GENERALIZED LOGISTIC DISTRIBUTION

$$X_d(F) = \xi + \alpha / \kappa \{1 - [(1 - F)/F]^\kappa\} \quad \text{EQ 10, 98-4044}$$

WHERE:  $X_d(F)$  = PRECIPITATION DEPTH FOR A GIVEN  
FREQUENCY

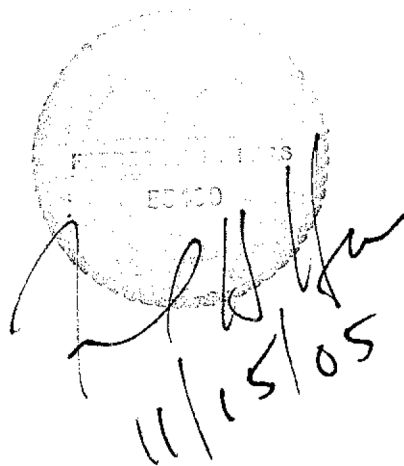
$\xi, \alpha, \text{ and } \kappa$  = LOCATION, SCALE AND SHAPE  
PARAMETERS FOR THE GLO DIST.

$F$  = ANNUAL NONEXCEEDANCE PROBABILITY

## FOR 500 YEAR STORM

|                  |                    |
|------------------|--------------------|
| $\xi = 1.93$     | FIGURE 18, 98-4044 |
| $\alpha = 0.55$  | FIGURE 32, 98-4044 |
| $\kappa = -0.22$ | FIGURE 46, 98-4044 |
| $F = 0.998$      |                    |

$X_d(F) = 9.24$  INCHES



# Synthetic Rainfall Distributions and Rainfall Data Sources

The highest peak discharges from small watersheds in the United States are usually caused by intense, brief rainfalls that may occur as distinct events or as part of a longer storm. These intense rainstorms do not usually extended over a large area and intensities vary greatly. One common practice in rainfall-runoff analysis is to develop a synthetic rainfall distribution to use in lieu of actual storm events. This distribution includes maximum rainfall intensities for the selected design frequency arranged in a sequence that is critical for producing peak runoff.

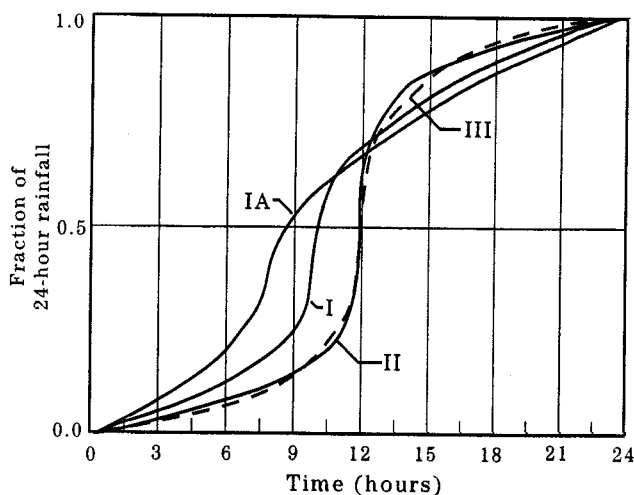
## Synthetic rainfall distributions

The length of the most intense rainfall period contributing to the peak runoff rate is related to the time of concentration ( $T_c$ ) for the watershed. In a hydrograph created with NRCS procedures, the duration of rainfall that directly contributes to the peak is about 170 percent of the  $T_c$ . For example, the most intense 8.5-minute rainfall period would contribute to the peak discharge for a watershed with a  $T_c$  of 5 minutes. The most intense 8.5-hour period would contribute to the peak for a watershed with a 5-hour  $T_c$ .

Different rainfall distributions can be developed for each of these watersheds to emphasize the critical rainfall duration for the peak discharges. However, to avoid the use of a different set of rainfall intensities for each drainage area size, a set of synthetic rainfall distributions having "nested" rainfall intensities was developed. The set "maximizes" the rainfall intensities by incorporating selected short duration intensities within those needed for longer durations at the same probability level.

For the size of the drainage areas for which NRCS usually provides assistance, a storm period of 24 hours was chosen the synthetic rainfall distributions. The 24-hour storm, while longer than that needed to determine peaks for these drainage areas, is appropriate for determining runoff volumes. Therefore, a single storm duration and associated synthetic rainfall distribution can be used to represent not only the peak discharges but also the runoff volumes for a range of drainage area sizes.

Figure B-1 SCS 24-hour rainfall distributions

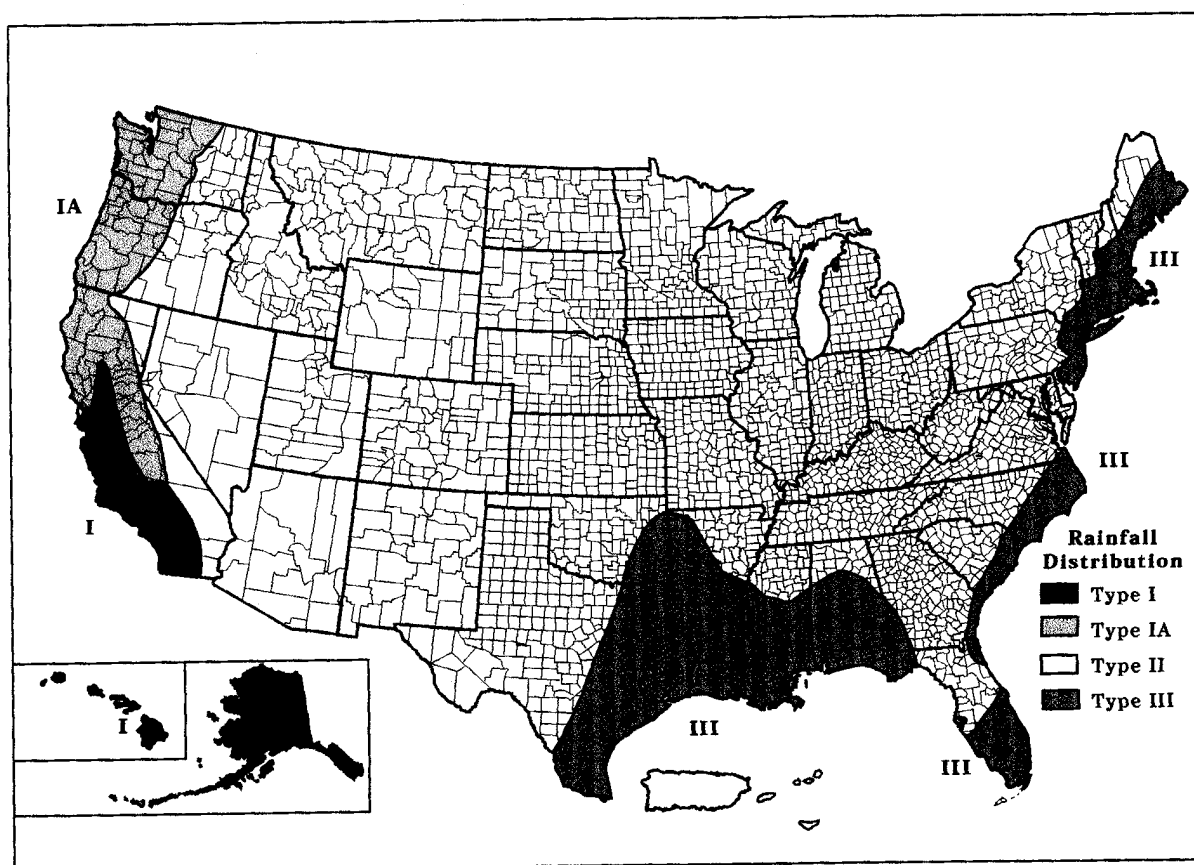


The intensity of rainfall varies considerably during a storm as well as geographic regions. To represent various regions of the United States, NRCS developed four synthetic 24-hour rainfall distributions (I, IA, II, and III) from available National Weather Service (NWS) duration-frequency data (Hershfield 1061; Frederick et al., 1977) or local storm data. Type IA is the least intense and type II the most intense short duration rainfall. The four distributions are shown in figure B-1, and figure B-2 shows their approximate geographic boundaries.

Types I and IA represent the Pacific maritime climate with wet winters and dry summers. Type III represents Gulf of Mexico and Atlantic coastal areas where tropical storms bring large 24-hour rainfall amounts. Type II represents the rest of the country. For more precise distribution boundaries in a state having more than one type, contact the NRCS State Conservation Engineer.



**Figure B-2** Approximate geographic boundaries for NRCS (SCS) rainfall distributions



### Rainfall data sources

This section lists the most current 24-hour rainfall data published by the National Weather Service (NWS) for various parts of the country. Because NWS Technical Paper 40 (TP-40) is out of print, the 24-hour rainfall maps for areas east of the 105th meridian are included here as figures B-3 through B-8. For the area generally west of the 105th meridian, TP-40 has been superseded by NOAA Atlas 2, the Precipitation-Frequency Atlas of the Western United States, published by the National Ocean and Atmospheric Administration.

#### East of 105th meridian

Hershfield, D.M. 1961. Rainfall frequency atlas of the United States for durations from 30 minutes to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 40. Washington, DC. 155 p.

#### West of 105th meridian

Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. Precipitation-frequency atlas of the Western United States. Vol. I Montana; Vol. II, Wyoming; Vol. III, Colorado; Vol. IV, New Mexico; Vol. V, Idaho; Vol. VI, Utah; Vol. VII, Nevada; Vol. VIII, Arizona; Vol. IX, Washington; Vol. X, Oregon; Vol. XI, California. U.S. Dept. of

Commerce, National Weather Service, NOAA Atlas 2. Silver Spring, MD.

#### Alaska

Miller, John F. 1963. Probable maximum precipitation and rainfall-frequency data for Alaska for areas to 400 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. of Commerce, Weather Bur. Tech. Pap. No. 47. Washington, DC. 69 p.

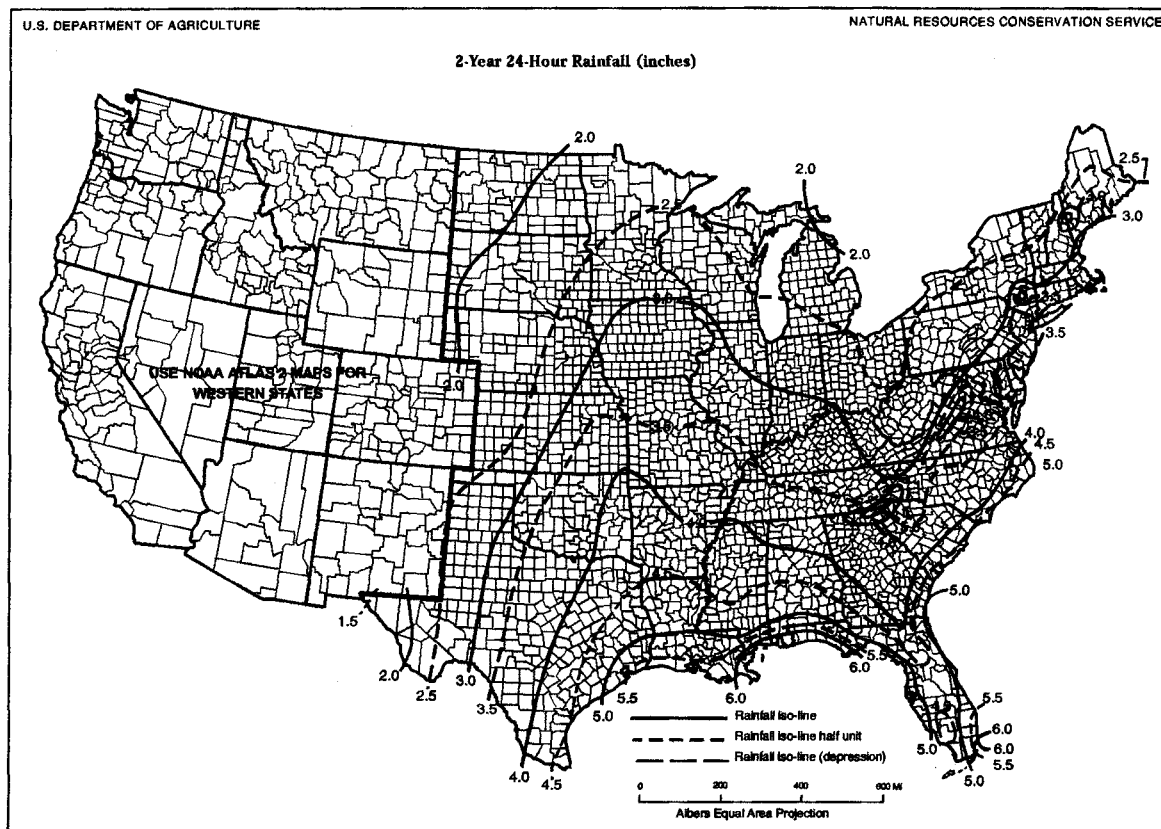
#### Hawaii

Weather Bureau. 1962. Rainfall-frequency atlas of the Hawaiian Islands for areas to 200 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 43. Washington, DC. 60 p.

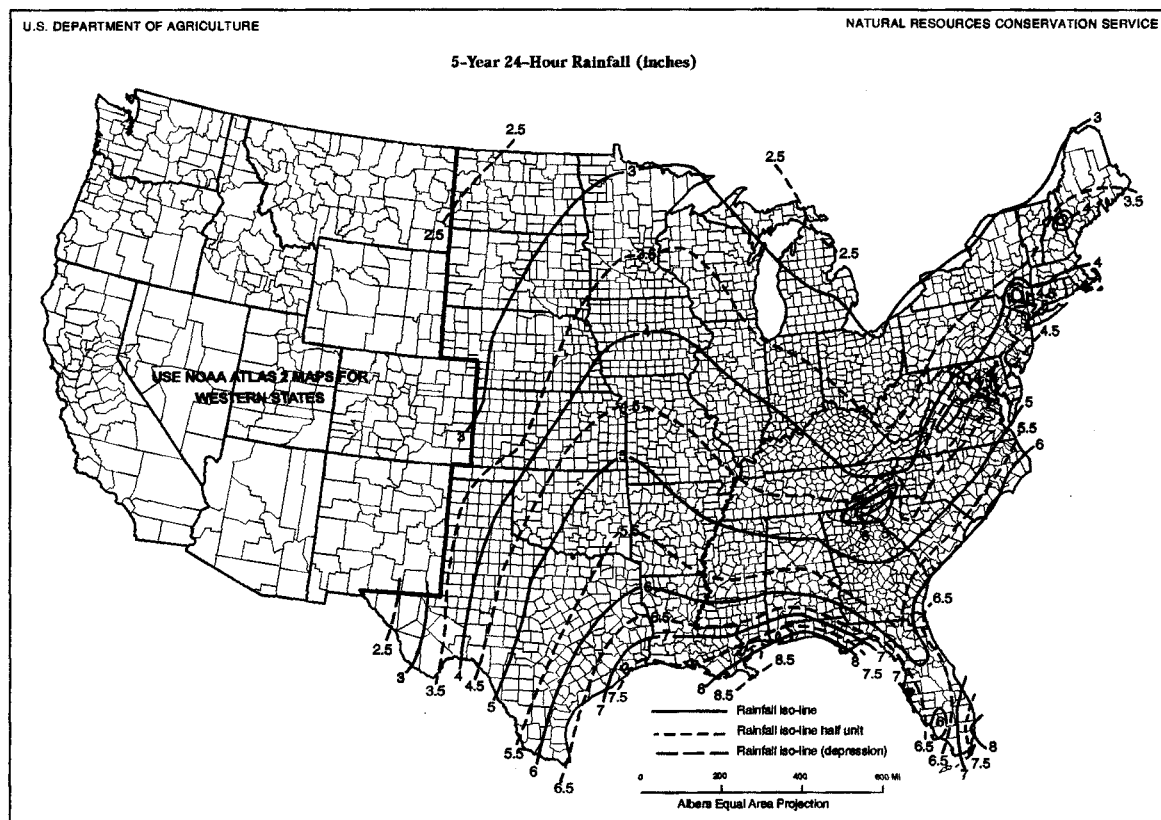
#### Puerto Rico and Virgin Islands

Weather Bureau. 1961. Generalized estimates of probable maximum precipitation and rainfall-frequency data for Puerto Rico and Virgin Islands for areas to 400 square miles, durations to 24 hours, and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 42. Washington, DC. 94 P.

**Figure B-3** 2-year, 24-hr rainfall

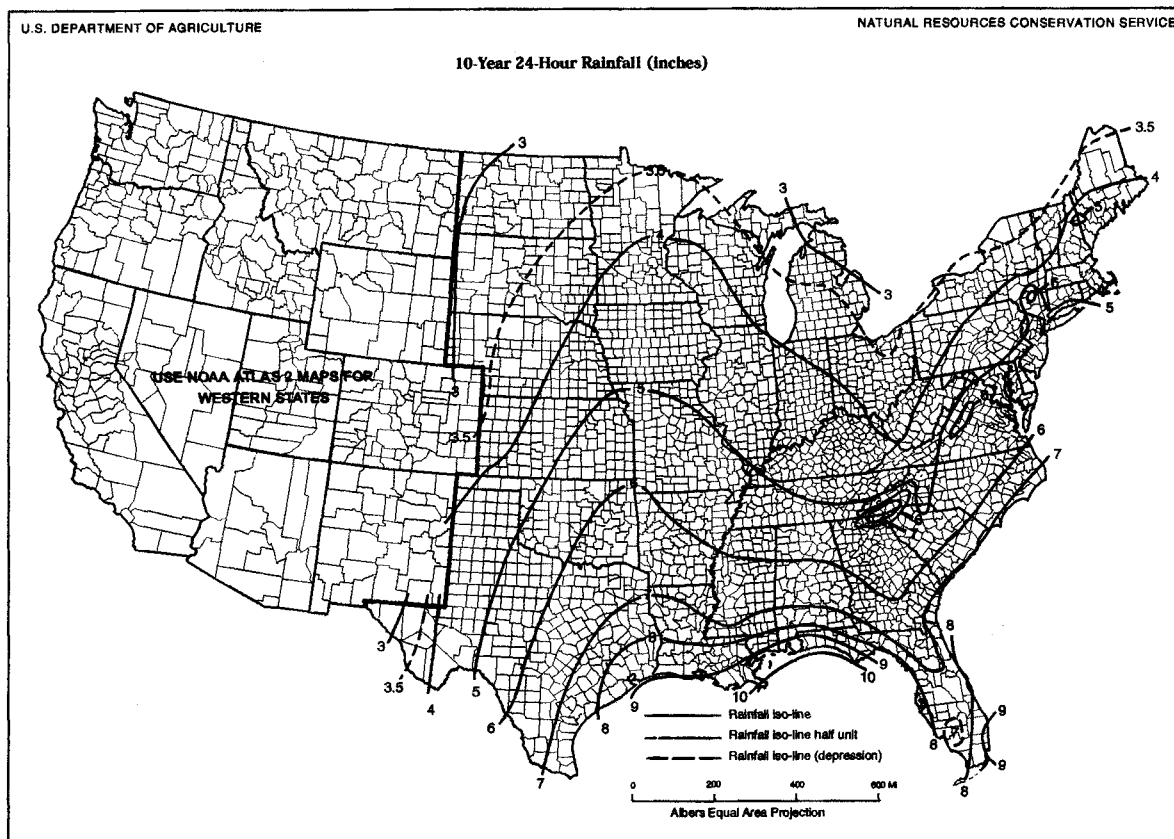


**Figure B-4** 5-year, 24-hour rainfall

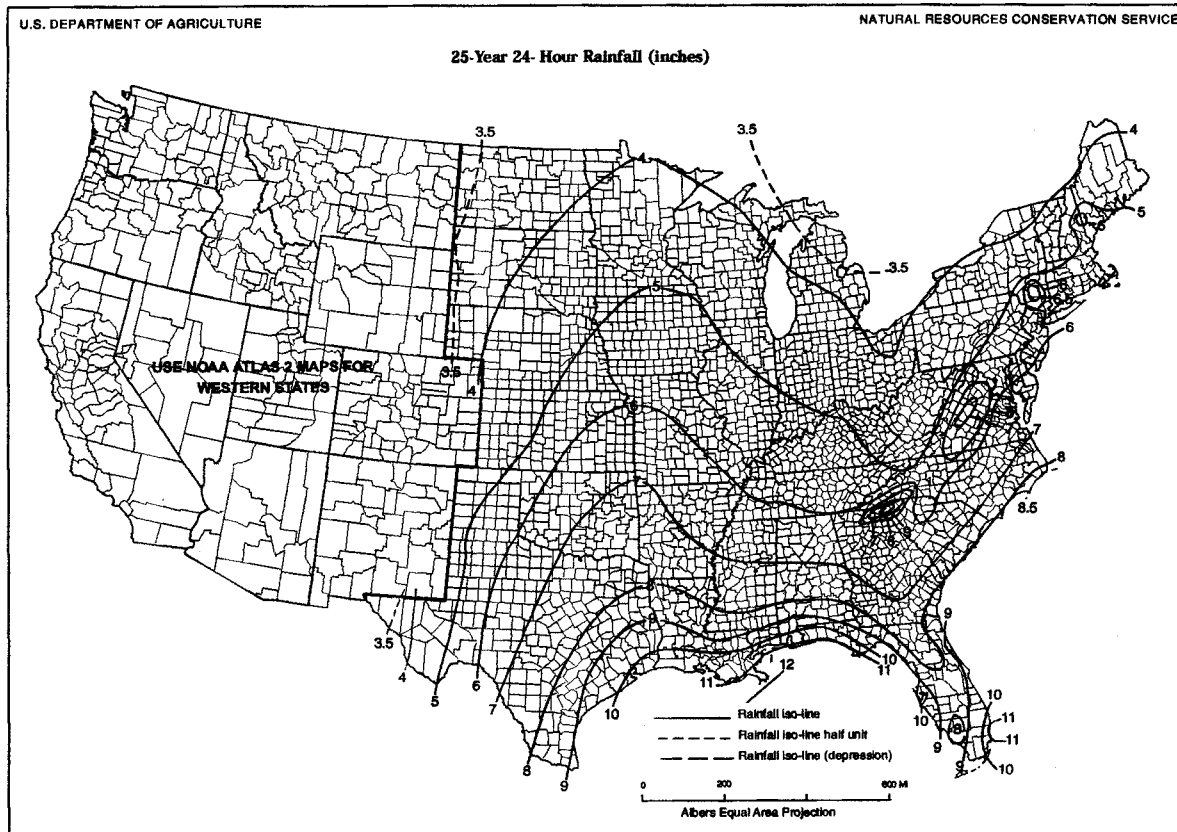




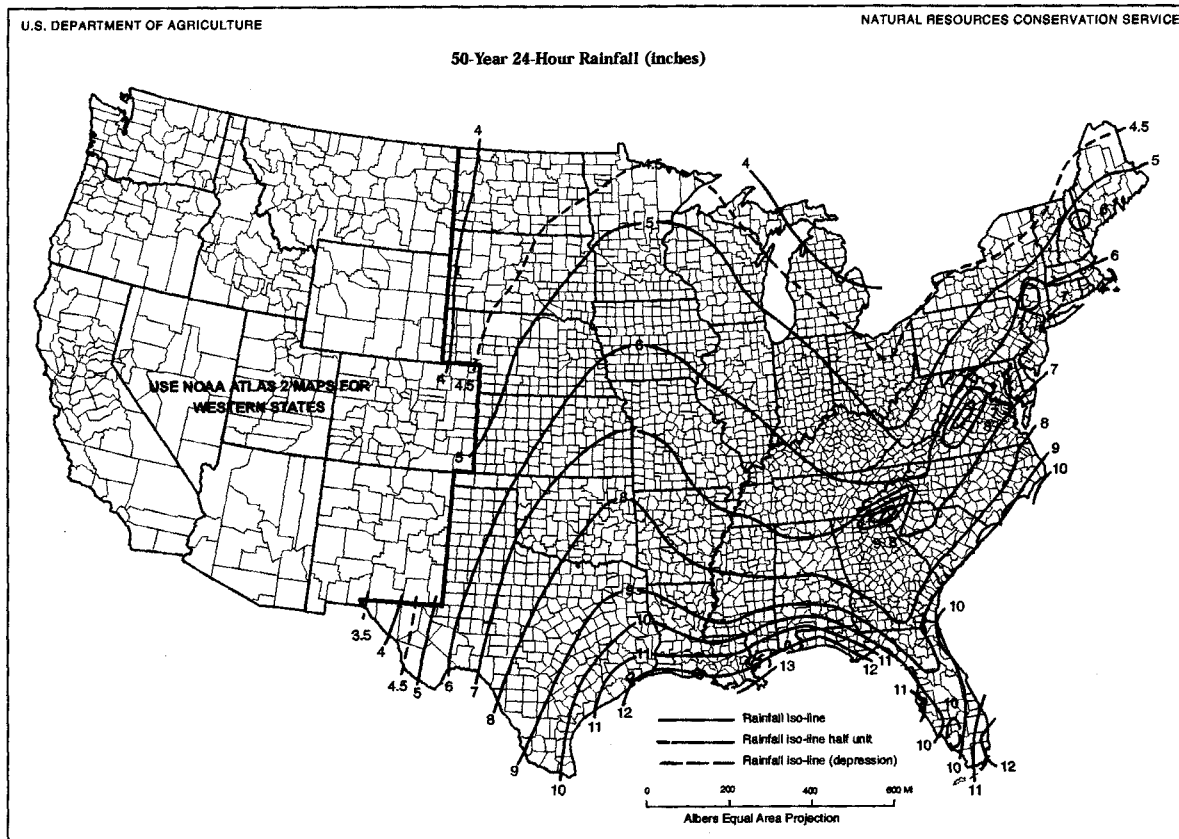
**Figure B-5** 10-year, 24-hour rainfall



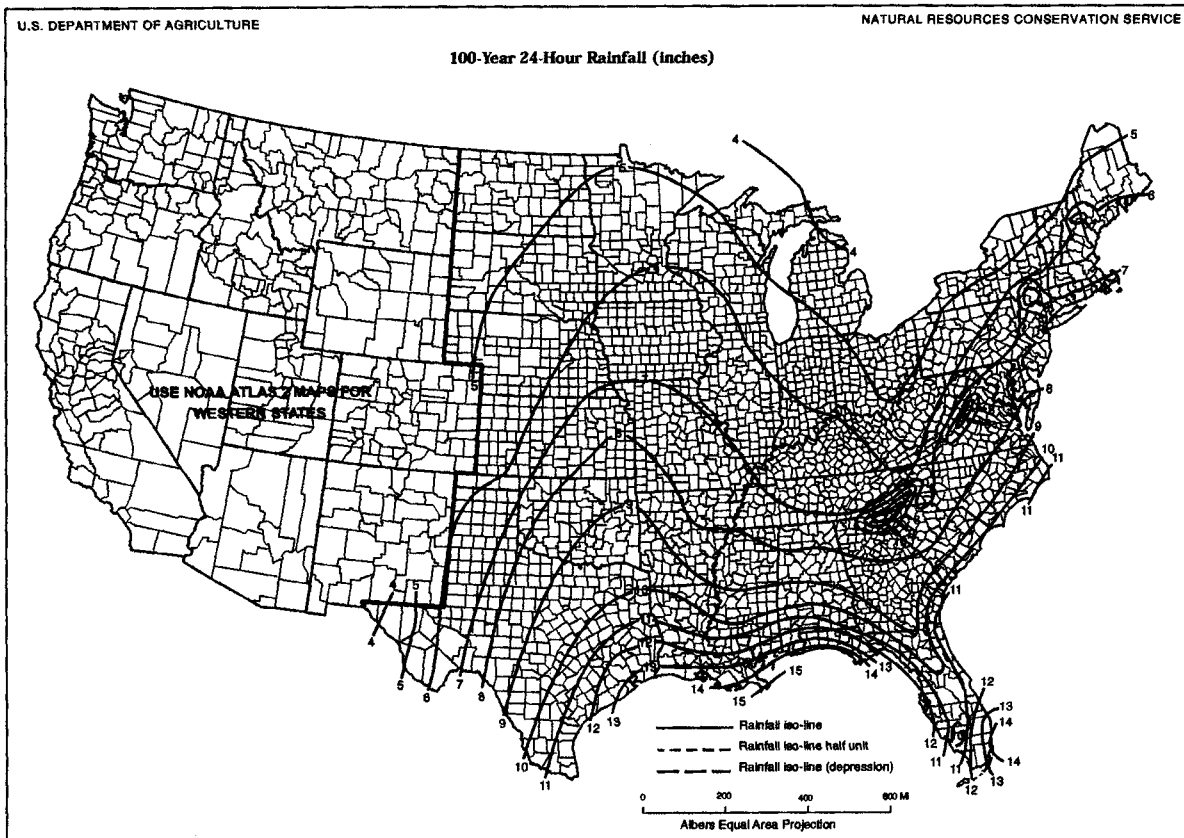
**Figure B-6** 25-year, 24-hour rainfall



**Figure B-7** 50-year, 24-hour rainfall



**Figure B-8** 100-year, 24-hour rainfall



# 100-YEAR 24-HOUR RAINFALL (INCHES)

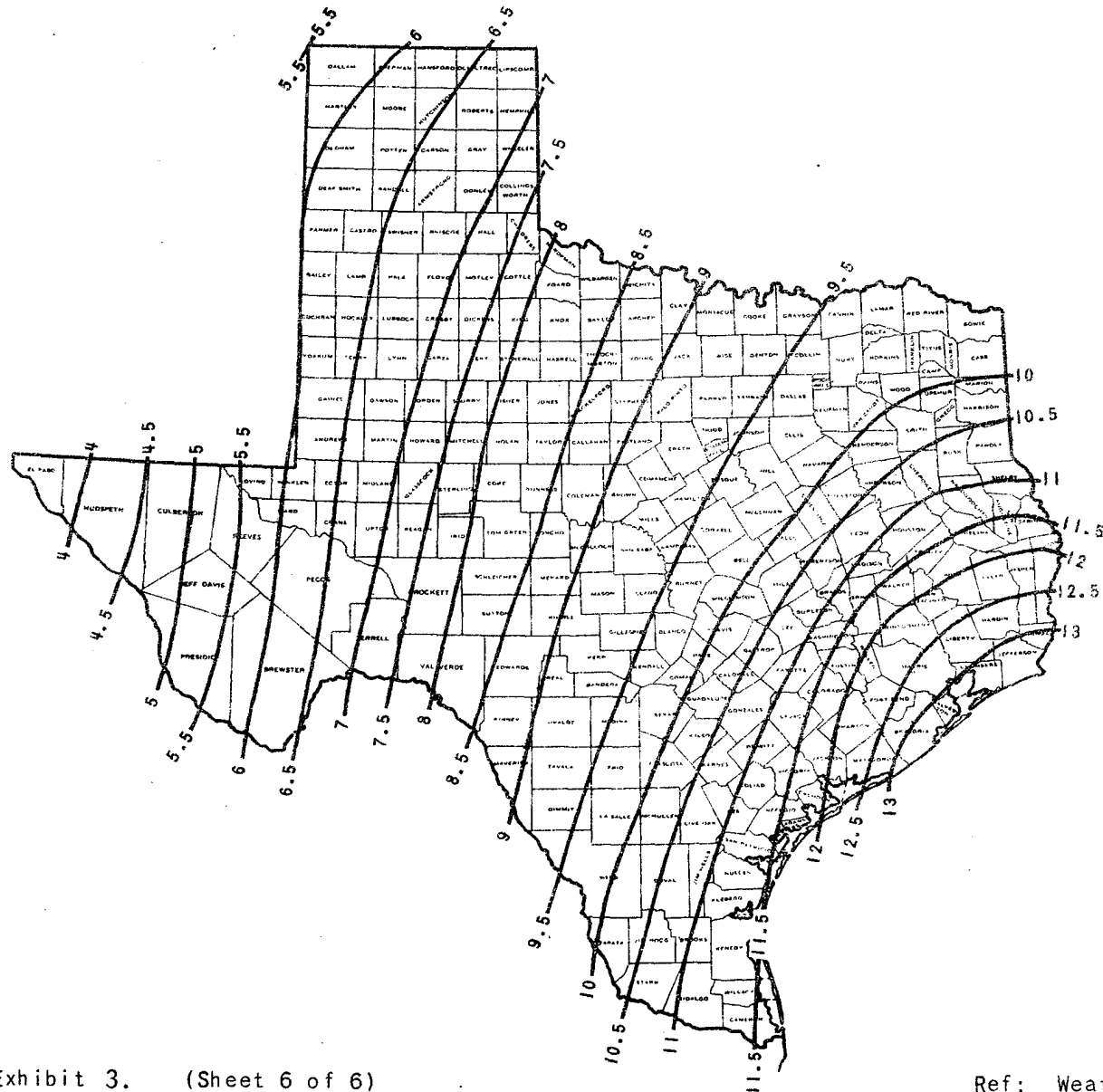


Exhibit 3. (Sheet 6 of 6)

Ref: Weather Bureau TP No. 40



## 500 YEAR STORM CALCULATIONS

REF: DEPTH-DURATION FREQUENCY OF PRECIPITATION FOR TEXAS, W.H. ASQUITH,  
WATER RESOURCES INVESTIGATIONS REPORT 98-4044, U.S. GEOLOGICAL  
SURVEY, 1998 (98-4044)

## GENERALIZED LOGISTIC DISTRIBUTION

$$X_d(F) = \xi + \alpha / \kappa \{1 - [(1 - F) / F]^{\kappa}\} \quad \text{EQ. 10, 98-4044}$$

WHERE:  $X_d(F)$  = PRECIPITATION DEPTH FOR A GIVEN  
FREQUENCY

$\xi, \alpha, \text{ and } \kappa$  = LOCATION, SCALE AND SHAPE  
PARAMETERS FOR THE GLO DIST.

$F$  = ANNUAL NONEXCEEDANCE PROBABILITY

## FOR 500 YEAR STORM

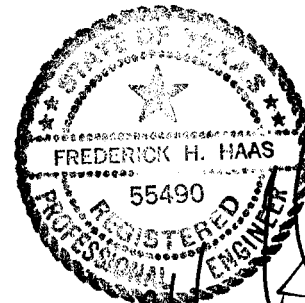
$$\xi = 1.93 \quad \text{FIGURE 18, 98-4044}$$

$$\alpha = 0.55 \quad \text{FIGURE 32, 98-4044}$$

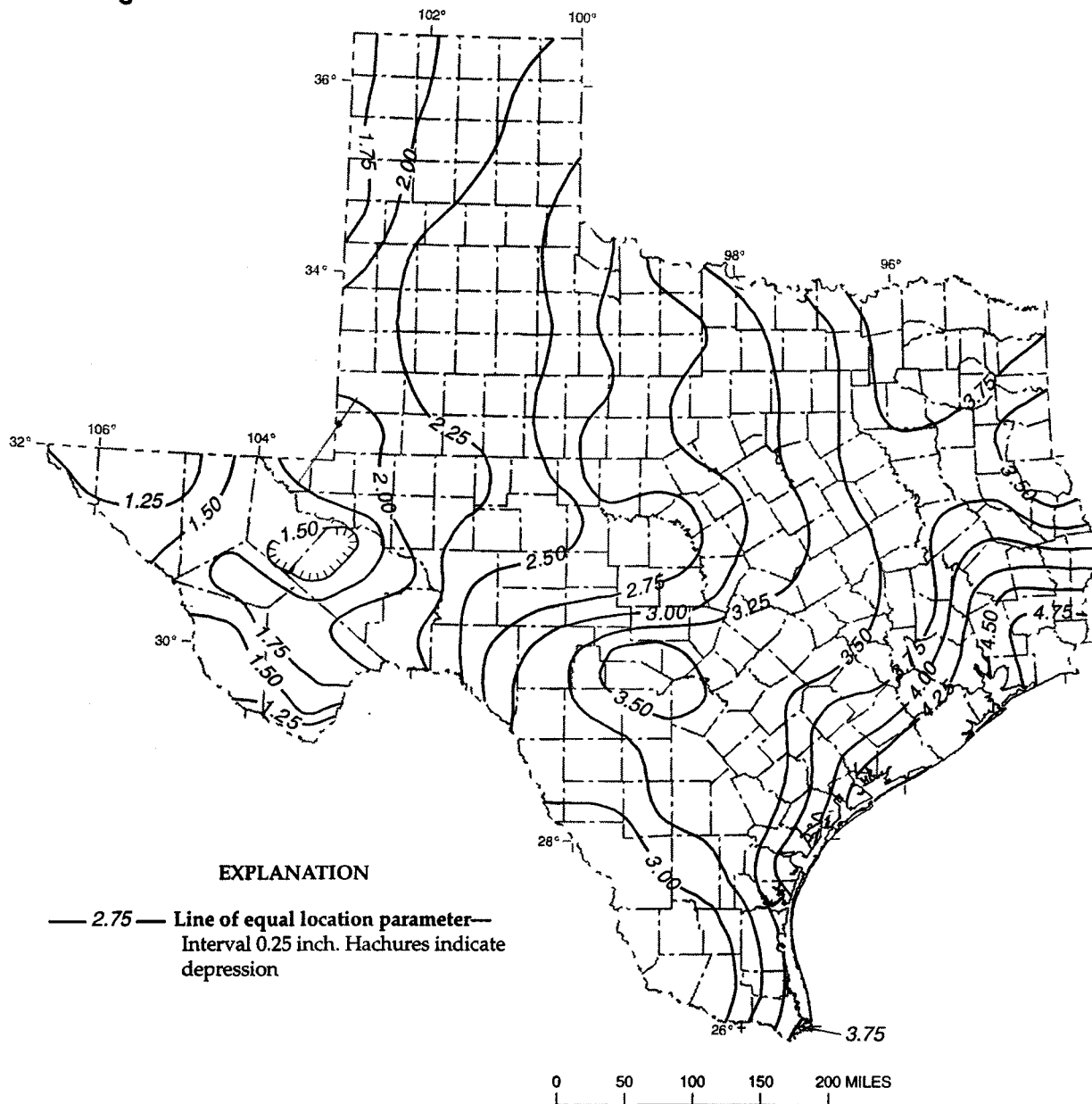
$$\kappa = -0.20 \quad \text{FIGURE 46, 98-4044}$$

$$F = 0.998$$

$$X_d(F) = 8.71 \quad \text{INCHES}$$

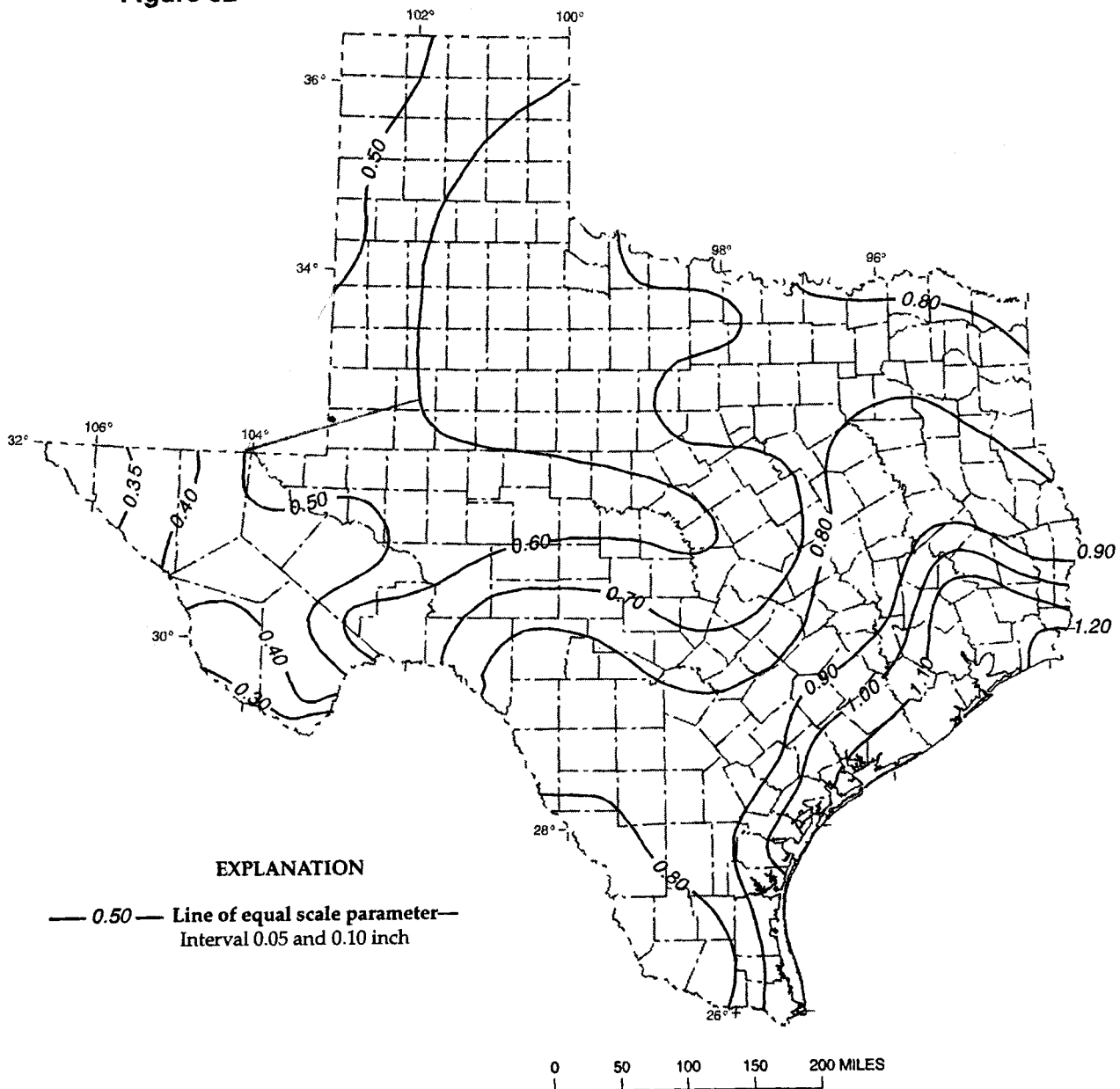


**Figure 18**



**Figure 18.** Location ( $\xi$ ) parameter of generalized logistic (GLO) distribution for 24-hour precipitation duration in Texas.

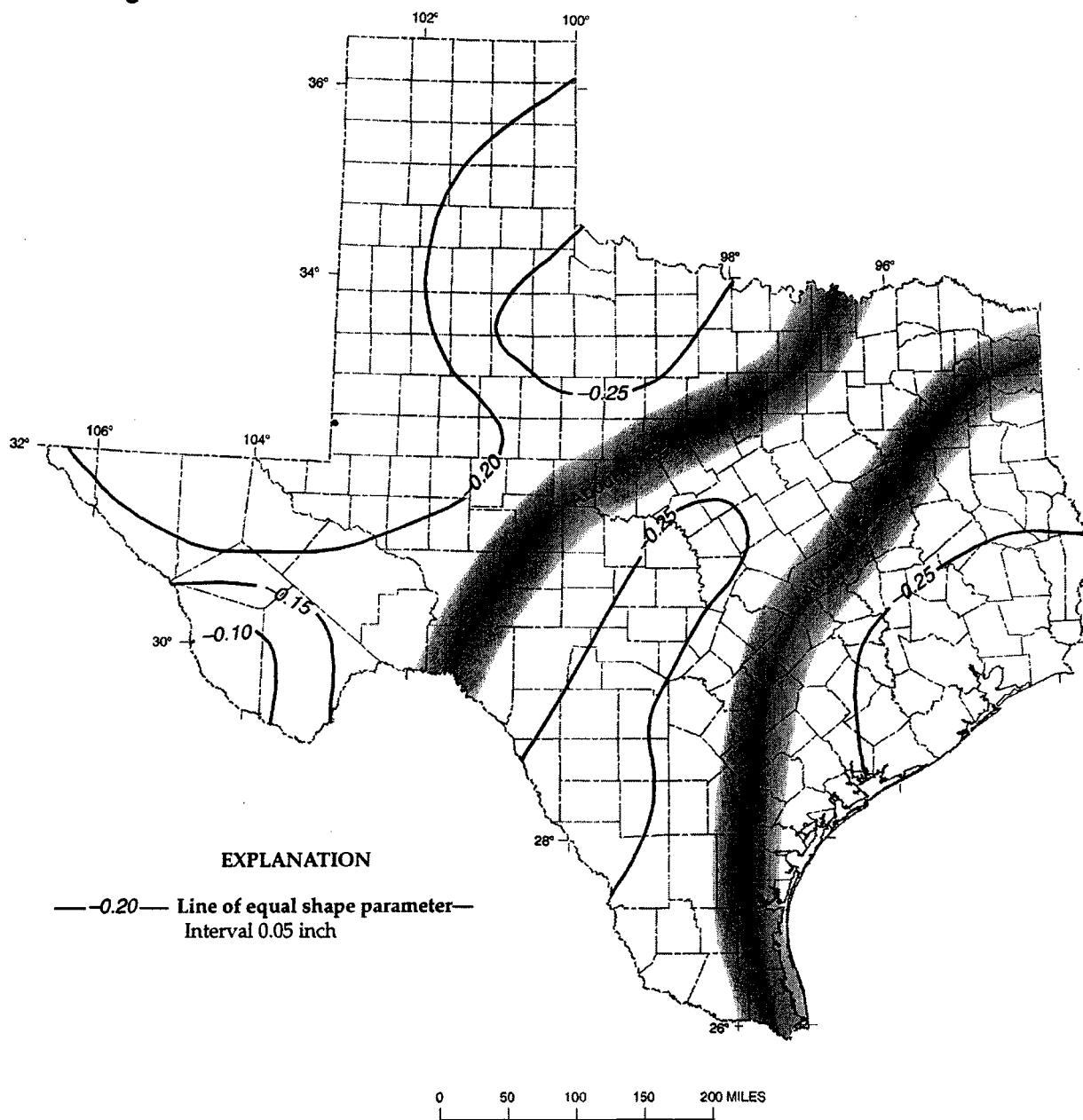
**Figure 32**



**Figure 32.** Scale ( $\alpha$ ) parameter of generalized logistic (GLO) distribution for 24-hour precipitation duration in Texas.



**Figure 46**



**Figure 46.** Shape ( $\kappa$ ) parameter of generalized logistic (GLO) distribution for 24-hour precipitation duration in Texas.

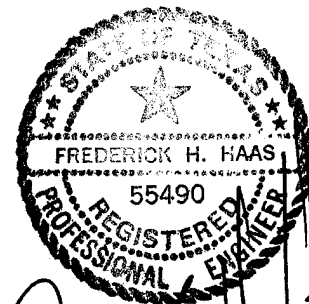
## PMP CALCULATIONS

REF: HYDROMETEOROLOGICAL REPORT NO. 51, PROBABLE MAXIMUM  
PRECIPITATION ESTIMATES, UNITED STATES EAST OF THE 105TH  
MERIDIAN, NATIONAL WEATHER SERVICE, 1978 (HMR 51)

NOAA HYDROMETEOROLOGICAL REPORT NO. 52, APPLICATION  
OF PROBABLE MAXIMUM PRECIPITATION ESTIMATES - UNITED  
STATES EAST OF THE 105TH MERIDIAN, NATIONAL WEATHER  
SERVICE, 1982 (HMR 52)

## AREA-DEPTH-DURATION FROM HMR 51

| AREA<br>SQ.MI. | DURATION (HR) |      |      |      |      |
|----------------|---------------|------|------|------|------|
|                | 6             | 12   | 24   | 48   | 72   |
| 10             | 25.0          | 30.5 | 35.0 | 39.0 | 40.5 |
| 25             | 23.2          | 28.1 | 32.5 | 36.6 | 38.2 |
| 50             | 21.9          | 26.1 | 30.3 | 34.5 | 36.2 |
| 100            | 20.1          | 24.0 | 28.1 | 32.2 | 34.0 |
| 175            | 18.8          | 22.3 | 26.3 | 30.2 | 32.3 |
| 300            | 17.1          | 20.4 | 24.4 | 28.2 | 30.2 |
| 450            | 15.7          | 19.0 | 22.9 | 26.9 | 28.8 |
| 700            | 14.2          | 17.4 | 21.1 | 25.0 | 27.0 |
| 1000           | 13.0          | 16.1 | 19.6 | 23.5 | 25.0 |



## FROM CURVE

| AREA<br>SQ.MI. | 18 - HR<br>DURATION |
|----------------|---------------------|
| 10             | 33.0                |
| 25             | 30.6                |
| 50             | 28.5                |
| 100            | 26.4                |
| 175            | 24.7                |
| 300            | 22.8                |
| 450            | 21.3                |
| 700            | 19.6                |
| 1000           | 18.1                |

## FIRST THREE SIX HOURS

| AREA<br>SQ.MI. | 1    | 2   | 3   |
|----------------|------|-----|-----|
| 10             | 25.0 | 5.5 | 2.5 |
| 25             | 23.2 | 4.9 | 2.5 |
| 50             | 21.9 | 4.2 | 2.4 |
| 100            | 20.1 | 3.9 | 2.4 |
| 175            | 18.8 | 3.5 | 2.4 |
| 300            | 17.1 | 3.3 | 2.4 |
| 450            | 15.7 | 3.3 | 2.3 |
| 700            | 14.2 | 3.2 | 2.2 |
| 1000           | 13.0 | 3.1 | 2.0 |

## FROM GRAPH

| AREA<br>SQ.MI. | 1     | 2    | 3    |
|----------------|-------|------|------|
| 10             | 24.99 | 5.50 | 2.53 |
| 25             | 23.50 | 4.62 | 2.51 |
| 50             | 21.90 | 4.20 | 2.48 |
| 100            | 20.10 | 3.86 | 2.44 |
| 175            | 18.60 | 3.63 | 2.40 |
| 300            | 17.00 | 3.42 | 2.35 |
| 450            | 15.70 | 3.30 | 2.29 |
| 700            | 14.20 | 3.18 | 2.20 |
| 1000           | 13.00 | 3.08 | 2.02 |

| 6-HR INC. | PRECIP.<br>(IN.) | DELTA PRECIP<br>(IN.) |
|-----------|------------------|-----------------------|
| 1         | 24.99            | 24.99                 |
| 2         | 30.49            | 5.50                  |
| 3         | 33.02            | 2.53                  |
| 4         | 35.00            | 1.98                  |
| 5         | 36.00            | 1.00                  |
| 6         | 37.00            | 1.00                  |
| 7         | 38.00            | 1.00                  |
| 8         | 39.00            | 1.00                  |
| 9         | 39.50            | 0.50                  |
| 10        | 40.00            | 0.50                  |
| 11        | 40.30            | 0.30                  |
| 12        | 40.50            | 0.20                  |

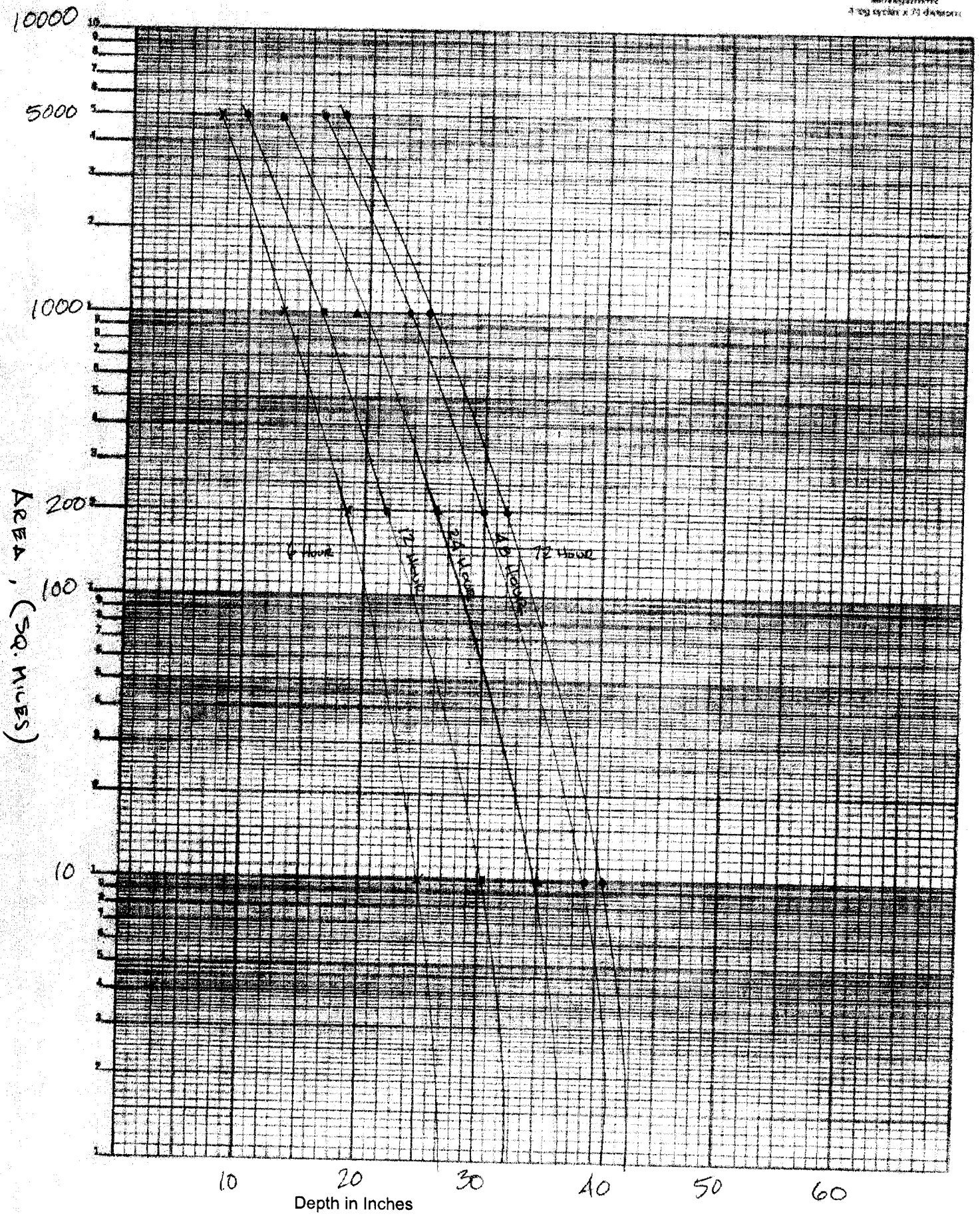
## TEMPORAL DISTRIBUTION

| INTERVAL | SEQUENCE A | SEQUENCE B |
|----------|------------|------------|
| (HR)     |            |            |
| 0 to 6   | 0.20       | 0.30       |
| 6 to 12  | 0.30       | 0.50       |
| 12 to 18 | 0.50       | 1.00       |
| 18 to 24 | 0.50       | 1.00       |
| 24 to 30 | 1.00       | 24.99      |
| 30 to 36 | 1.00       | 5.50       |
| 36 to 42 | 1.00       | 2.53       |
| 42 to 48 | 2.53       | 1.98       |
| 48 to 54 | 24.99      | 1.00       |
| 54 to 60 | 5.50       | 1.00       |
| 60 to 66 | 1.98       | 0.50       |
| 66 to 72 | 1.00       | 0.20       |



711H 12/04

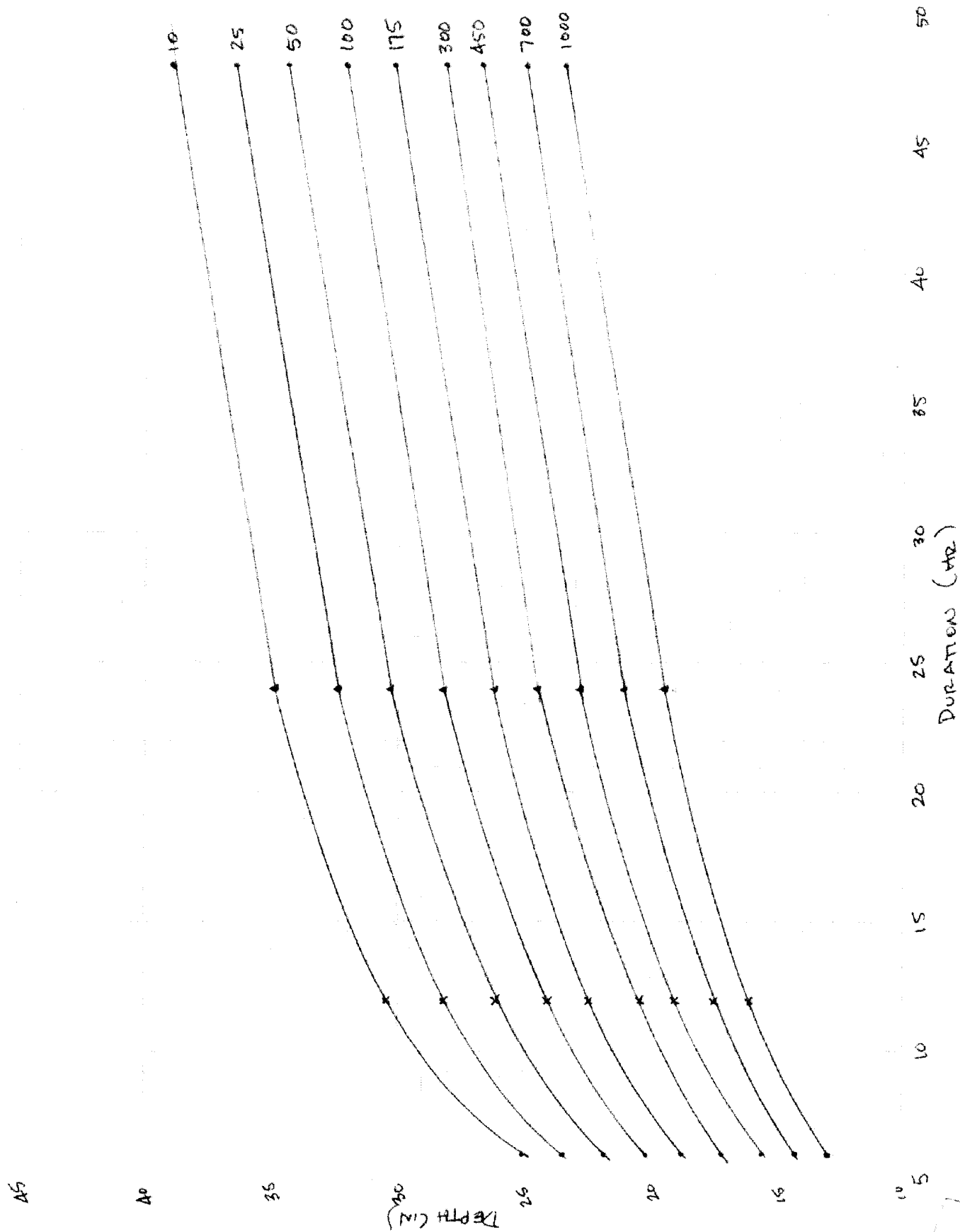
Standard Hydrograph  
for a unit of 1 inch of rain



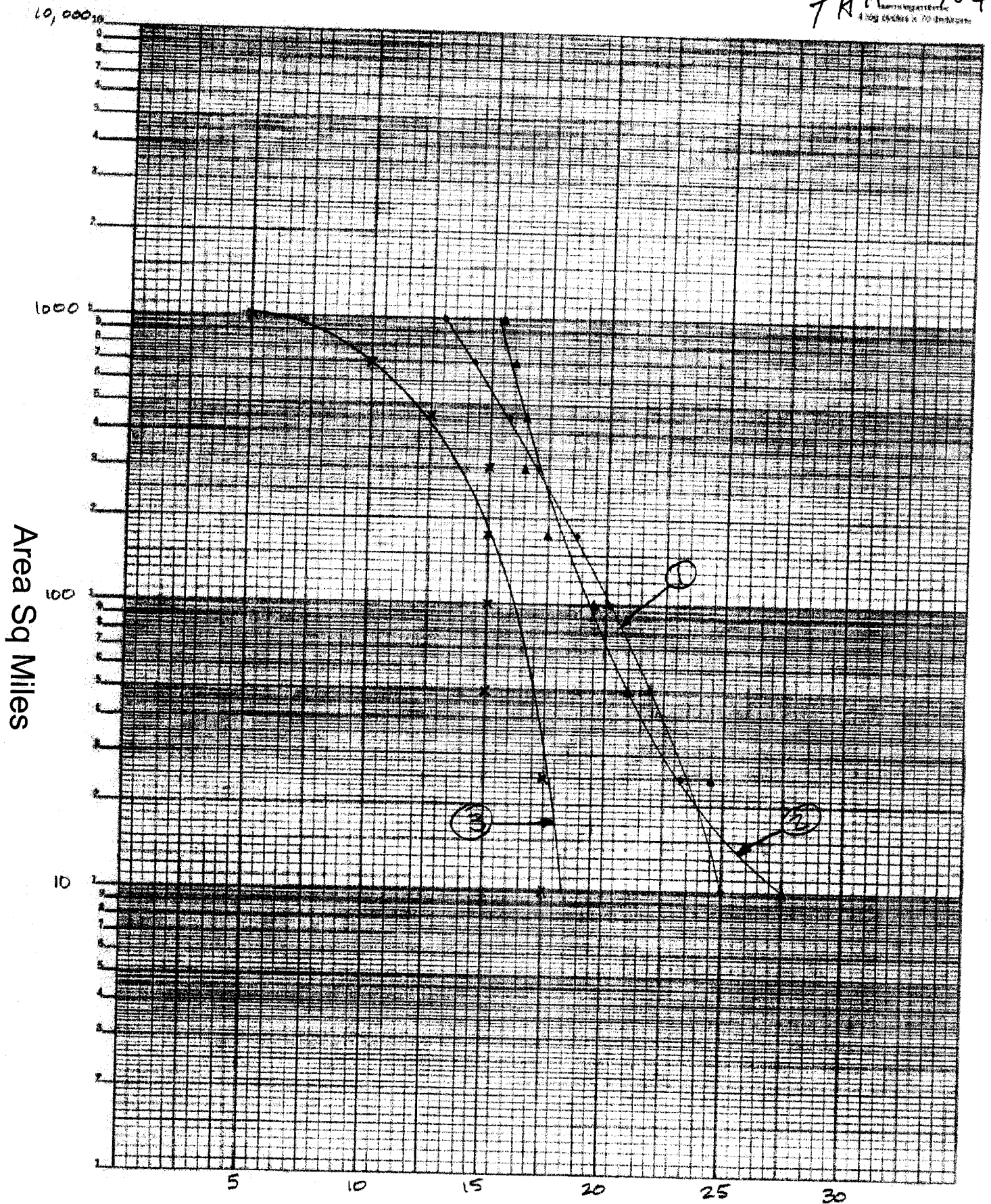


HAESTAD METHODS  
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WATERBURY, CT 06708 USA  
PHONE: +1-203-755-1666 • FAX: +1-203-597-1488  
INTERNET: www.haestad.com & www.civilprojects.com

Project \_\_\_\_\_  
Project # \_\_\_\_\_  
Date 12/04  
Engineer 7/11/11



FHH 12/04



1st 6-Hr Avg. Depths (in.)

1 2 3 4 5 6

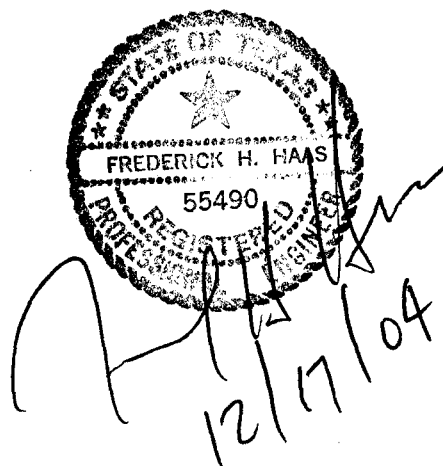
2<sup>ND</sup> 6-Hr Avg. Depths (in.)

2



## APPENDIX B

### HEC-HMS MODEL FOR THE CALCULATION OF THE 100-YEAR PEAK DISCHARGES



## PLAYA ELEVATION, STORAGE, OUTFLOW

## ELEVATION AND STORAGE

| ELEV. | AREA     | DELTA E | AVERAGE<br>AREA | STORAGE<br>VOLUME | CUMULATIVE<br>STORAGE |        |
|-------|----------|---------|-----------------|-------------------|-----------------------|--------|
| MSL   | SQ. FT.  | FT.     | SQ. FT.         | CU. FT.           | CU. FT.               | AC.-FT |
| 3478  | 402878   |         |                 | 0                 | 0                     | 0      |
|       |          | 2       | 517775          |                   |                       |        |
| 3480  | 632672   |         |                 | 1035550           | 1035550               | 24     |
|       |          | 2       | 811324.5        |                   |                       |        |
| 3482  | 989977   |         |                 | 1622649           | 2658199               | 61     |
|       |          | 2       | 2375467         |                   |                       |        |
| 3484  | 3760957  |         |                 | 4750934           | 7409133               | 170    |
|       |          | 2       | 6247779.5       |                   |                       |        |
| 3486  | 8734602  |         |                 | 12495559          | 19904692              | 457    |
|       |          | 2       | 10261979        |                   |                       |        |
| 3488  | 11789356 |         |                 | 20523958          | 40428650              | 928    |

## OUTFLOW

## WEIR EQUATION

$$Q = C * L * H^{3/2}$$

WHERE:

Q= FLOW, CFS

C= WEIR COEFFICIENT

L= HORIZONTAL LENGTH, FT

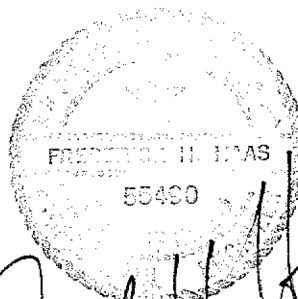
H= HEAD ON WEIR, FT

ASSUME TOP OF PLAYA IS ELEVATION 3486

LENGTH OF 3486 CONTOUR IS 241 FT.

| HEAD<br>FT. | Cw   | Q<br>CU FT./SEC |
|-------------|------|-----------------|
| 0.5         | 3.58 | 305             |
| 1.0         | 3.58 | 863             |
| 1.5         | 3.58 | 1585            |
| 2.0         | 3.56 | 2427            |

NOTE: Cw IS FROM WATER-RESOURCES ENGINEERING, LINSLEY AND FRANZINI





**HMS - Meteorologic Model**

File Edit Help

Meteorologic Model Met100 Year

Description 100 Year, 24 Hour Storm

Precipitation Evapotranspiration

Method SCS Hypothetical Storm

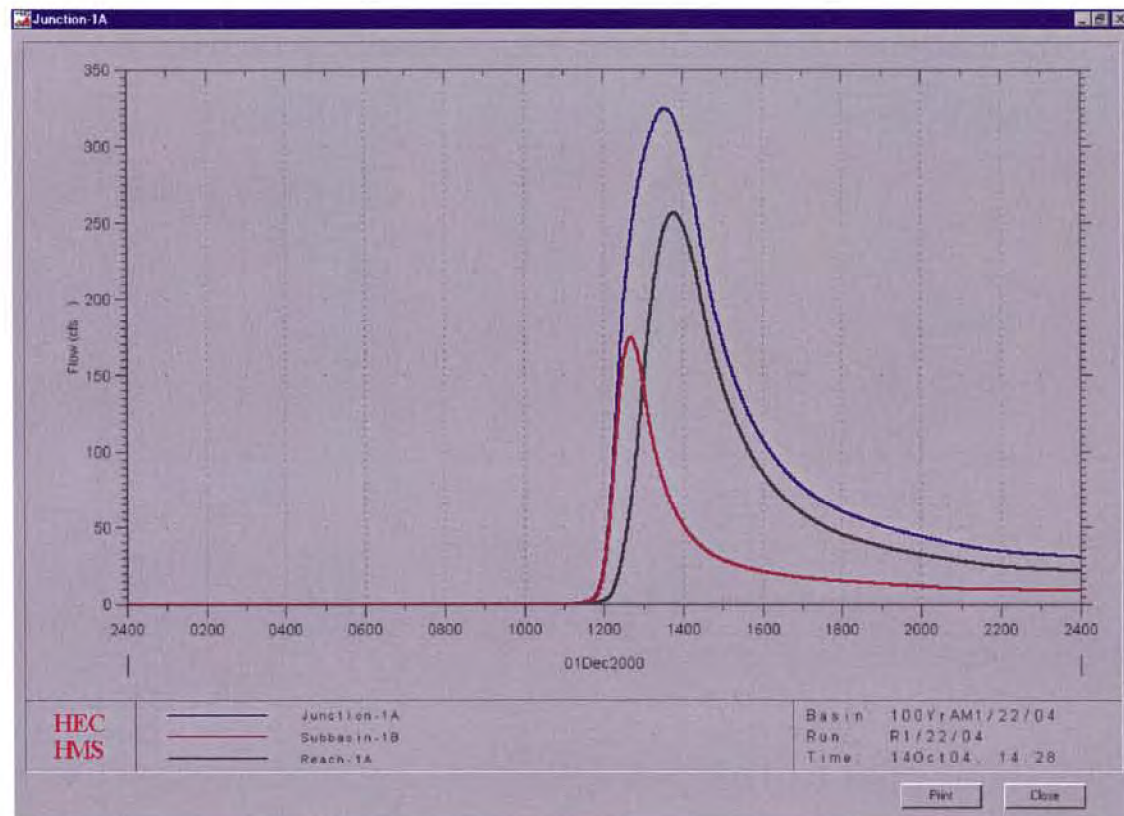
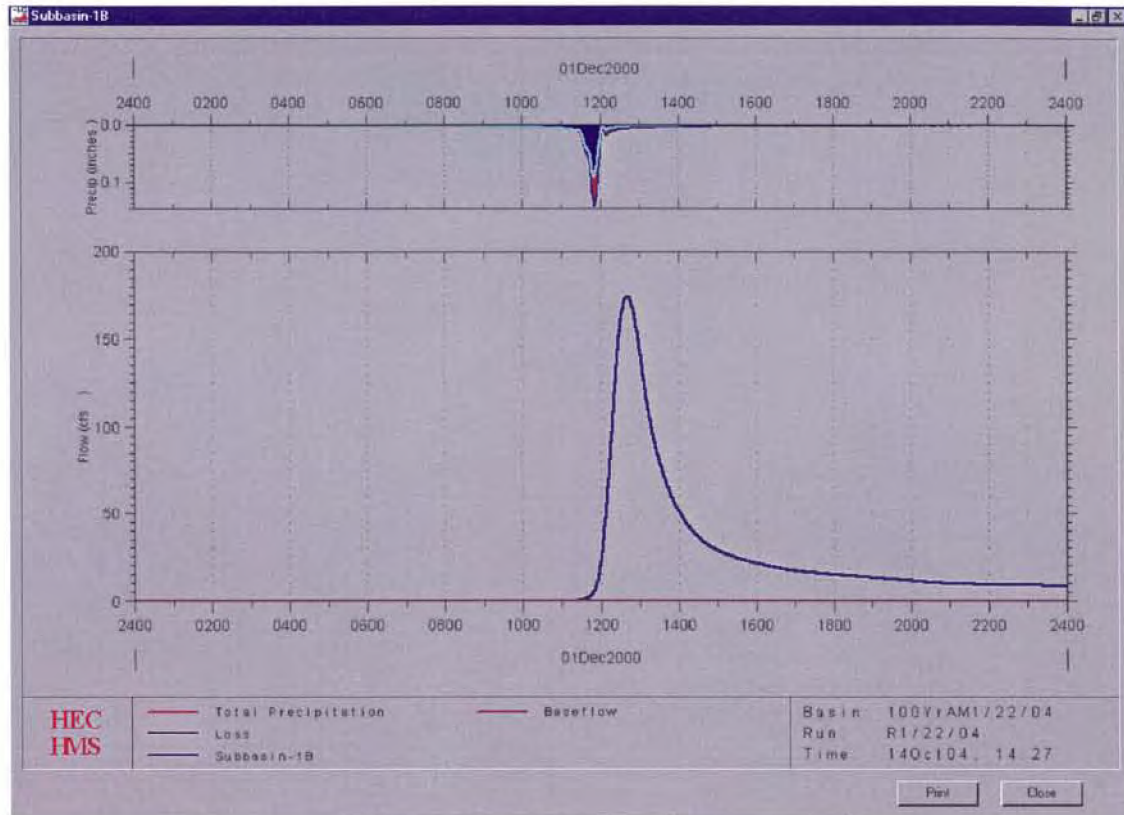
Storm Selection Type II

Storm Depth (in) 6.0

# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

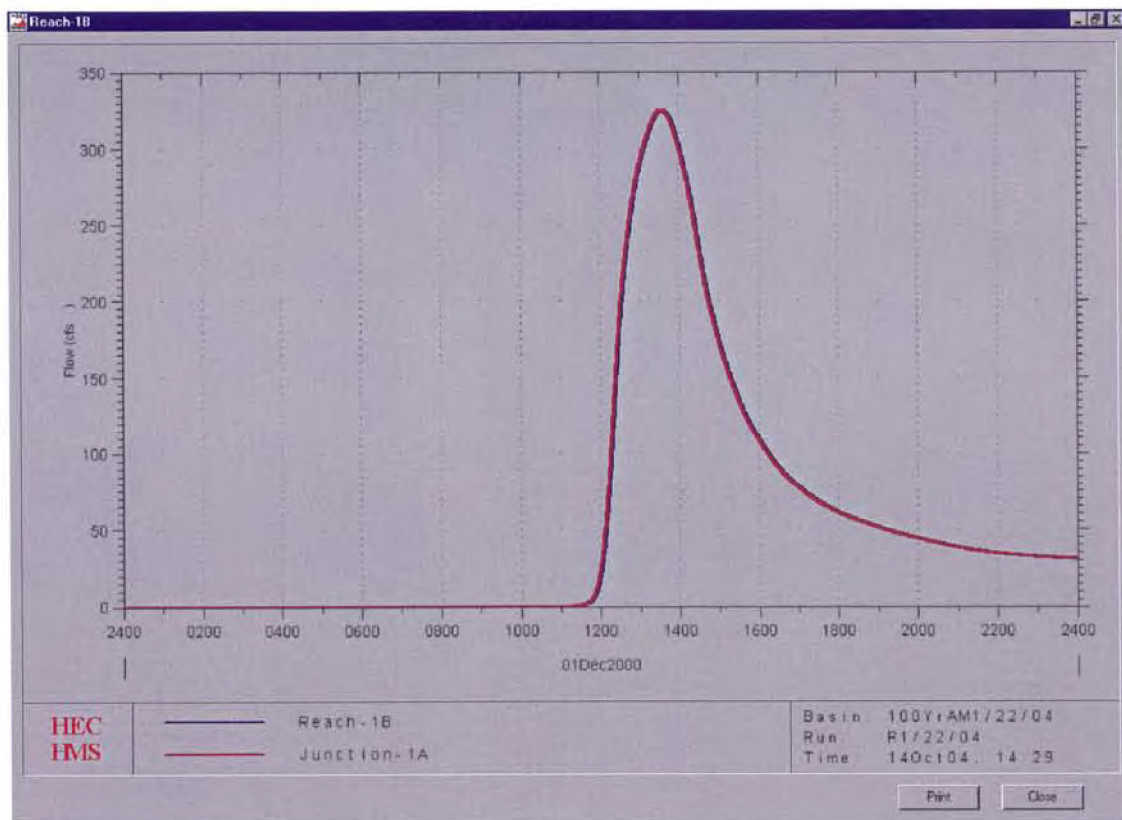


# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS





# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

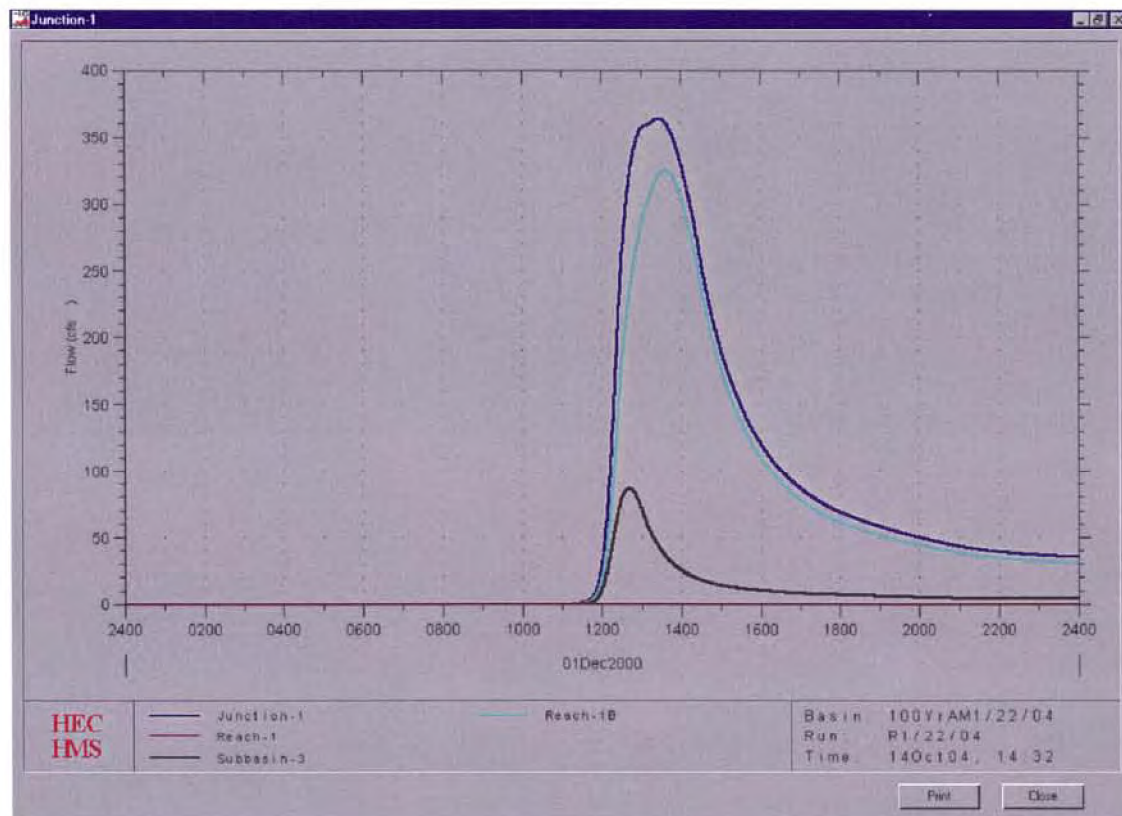
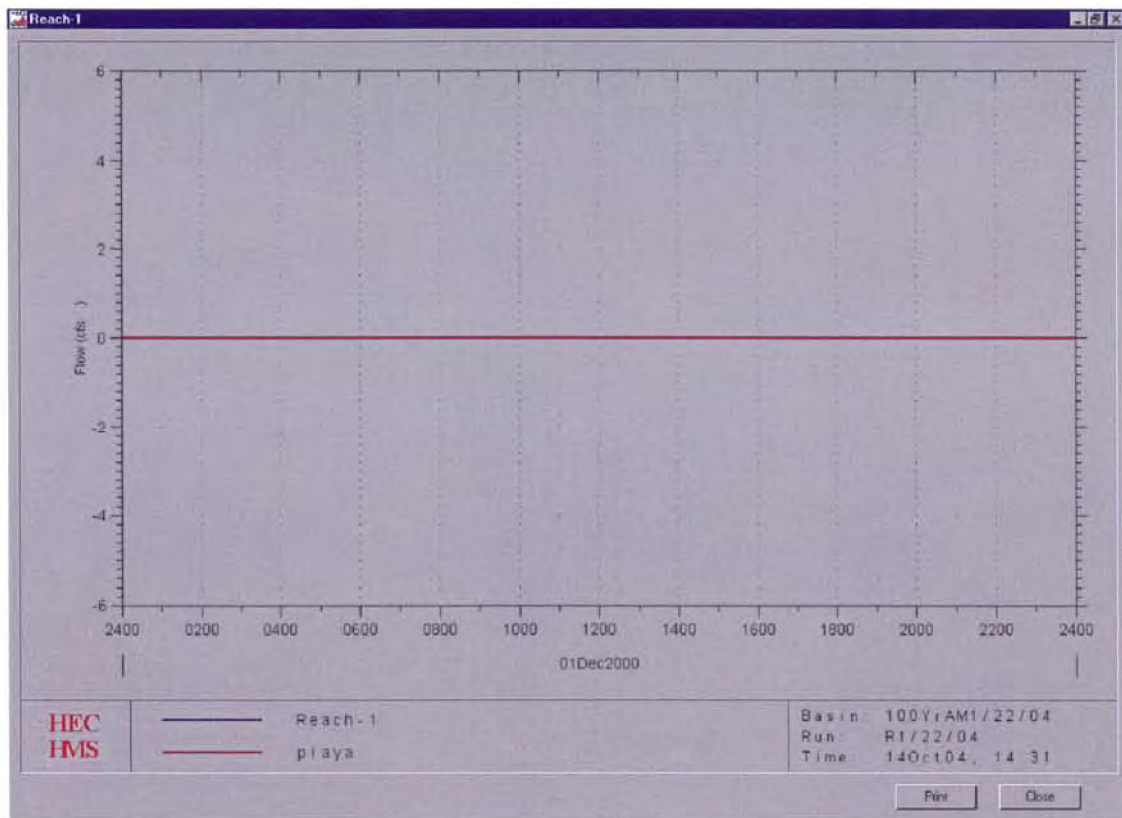


# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

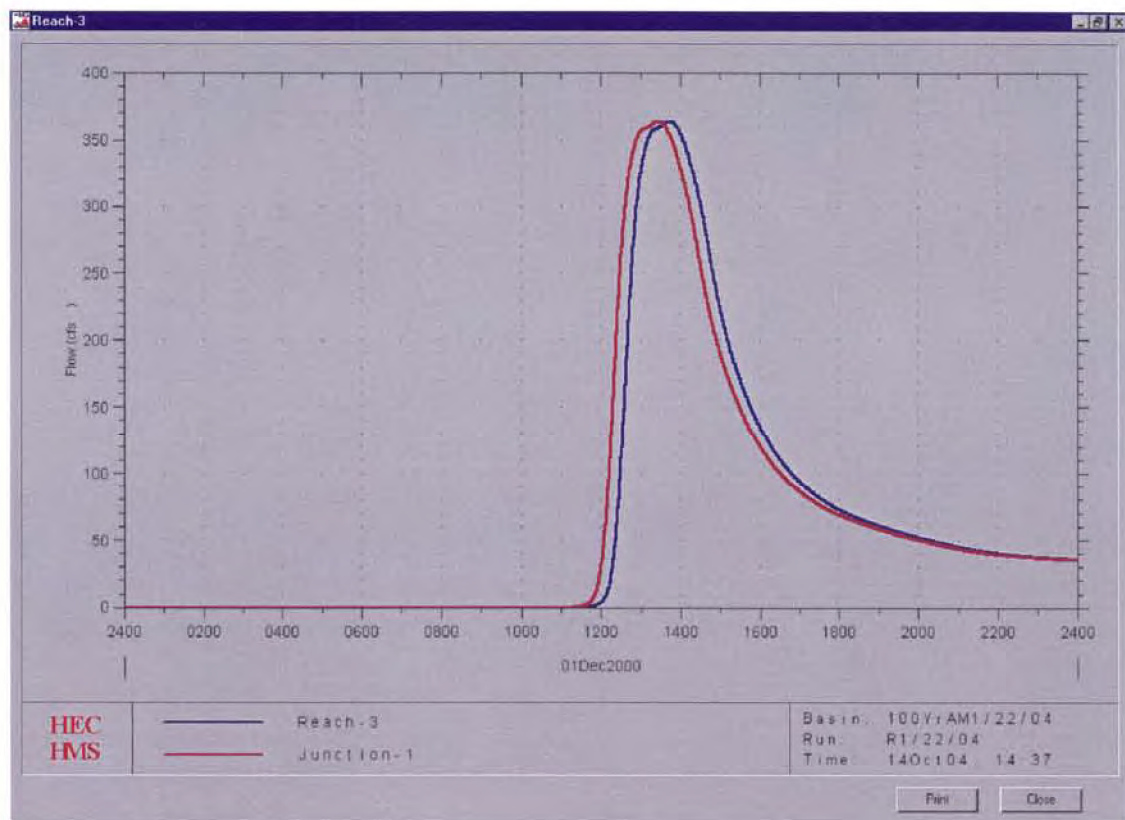




# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

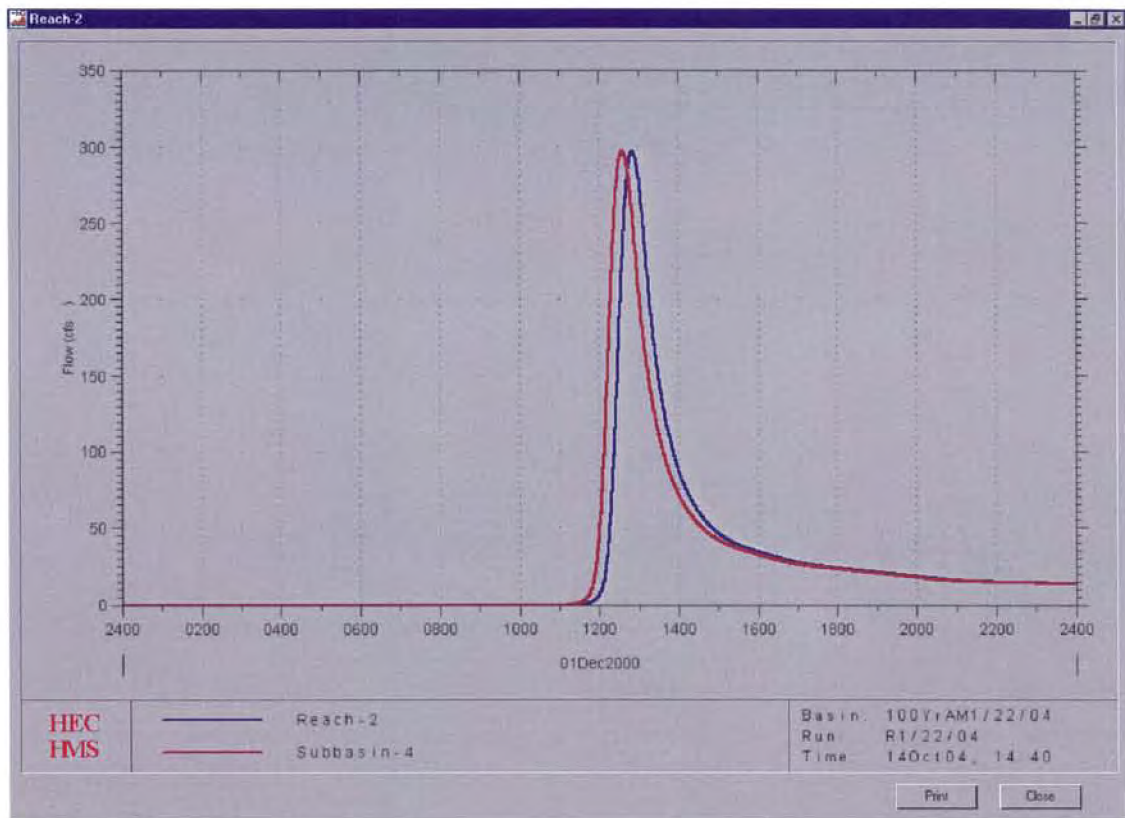


# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

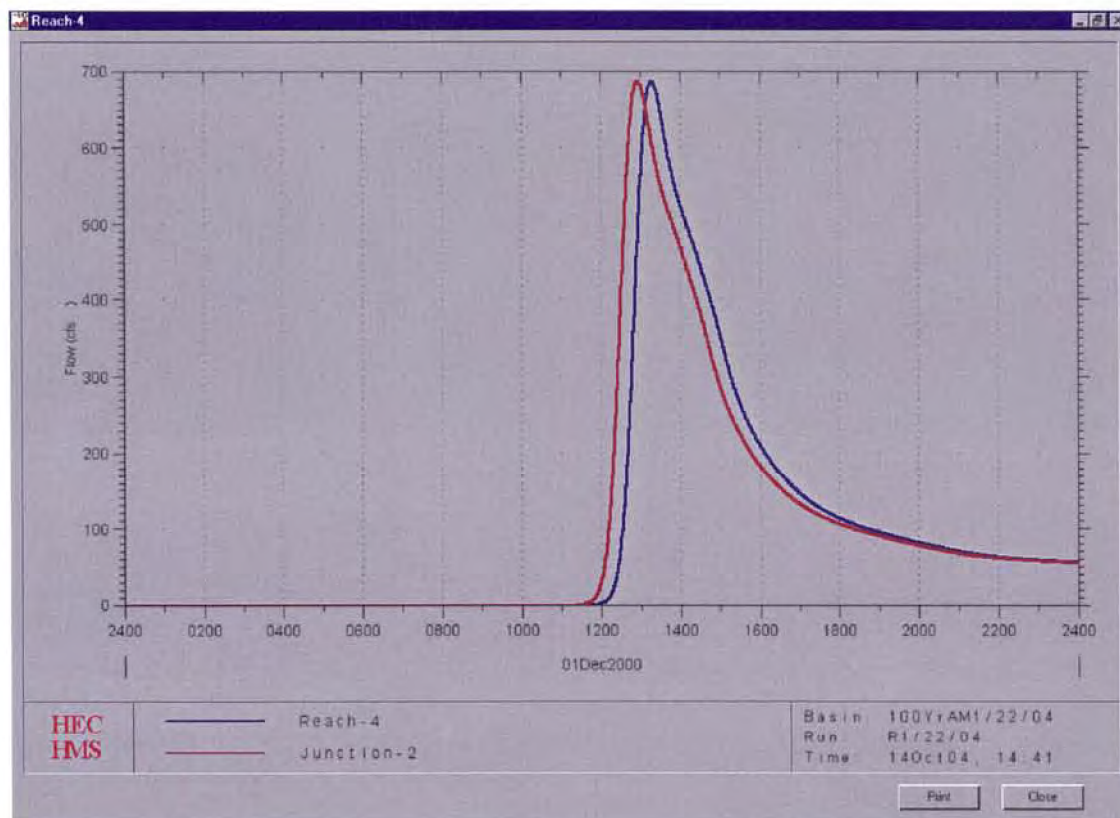




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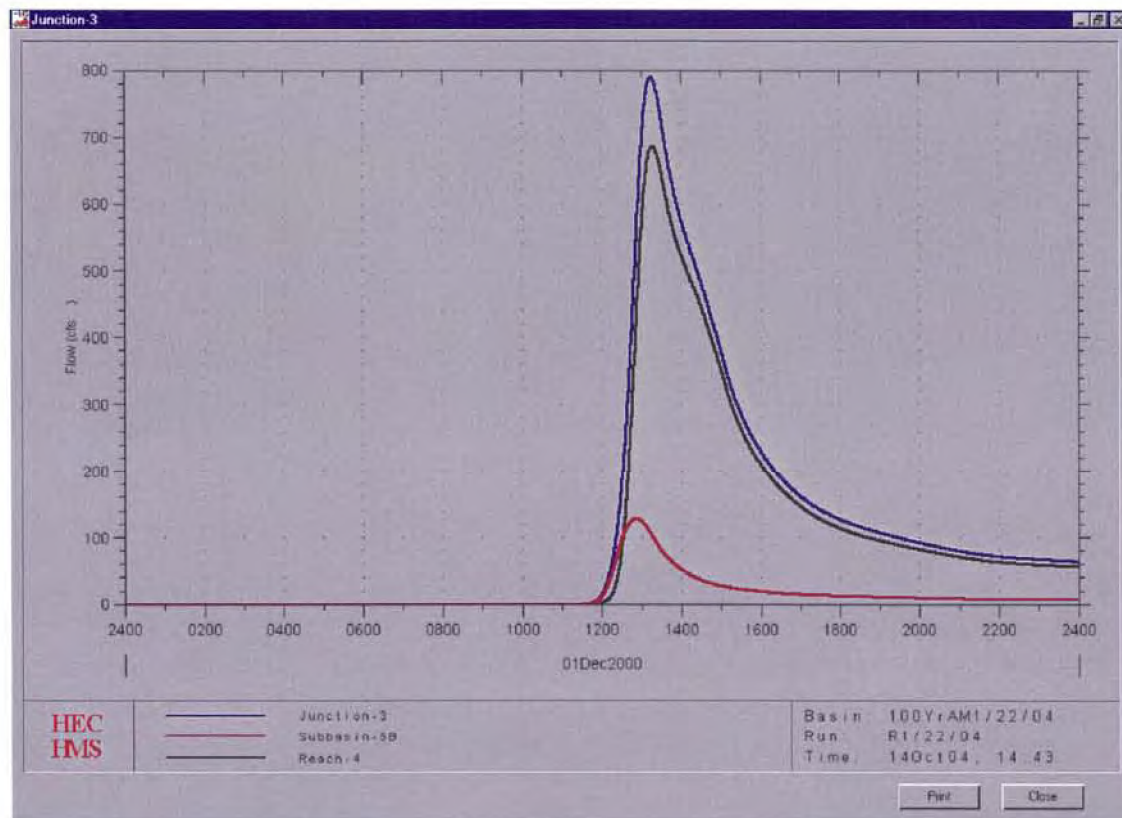
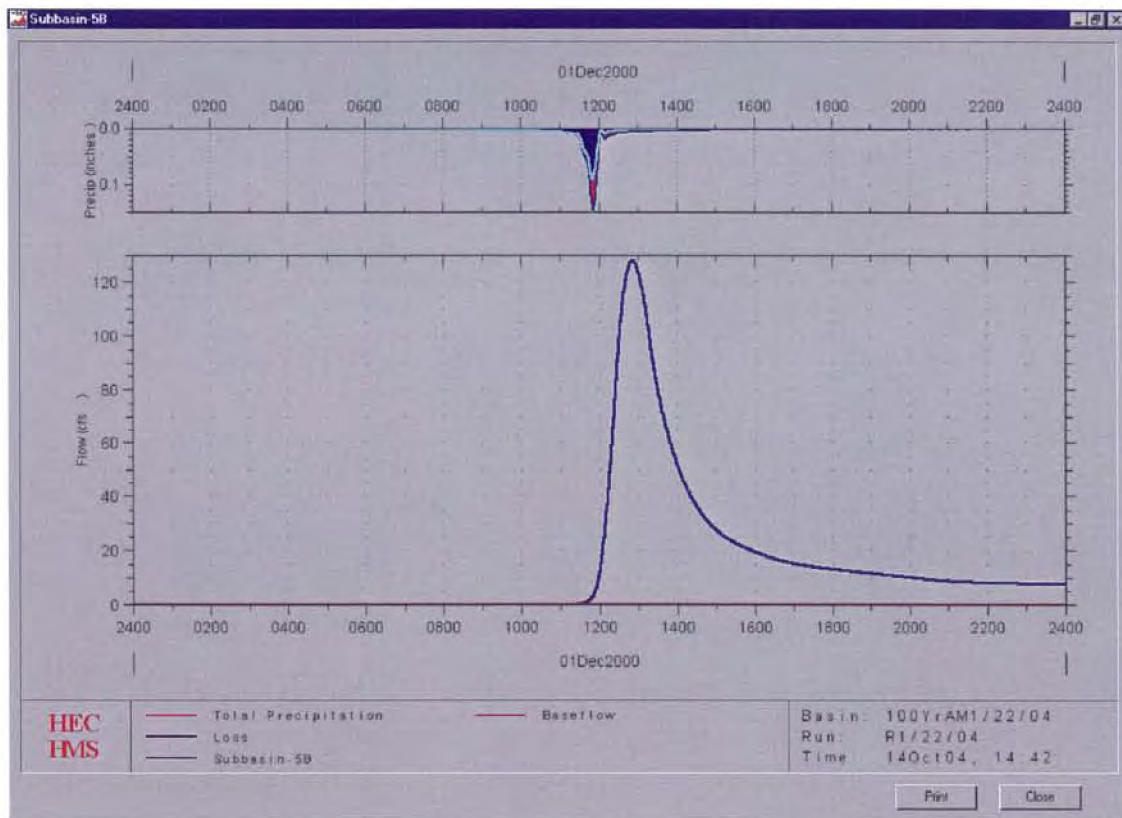


# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

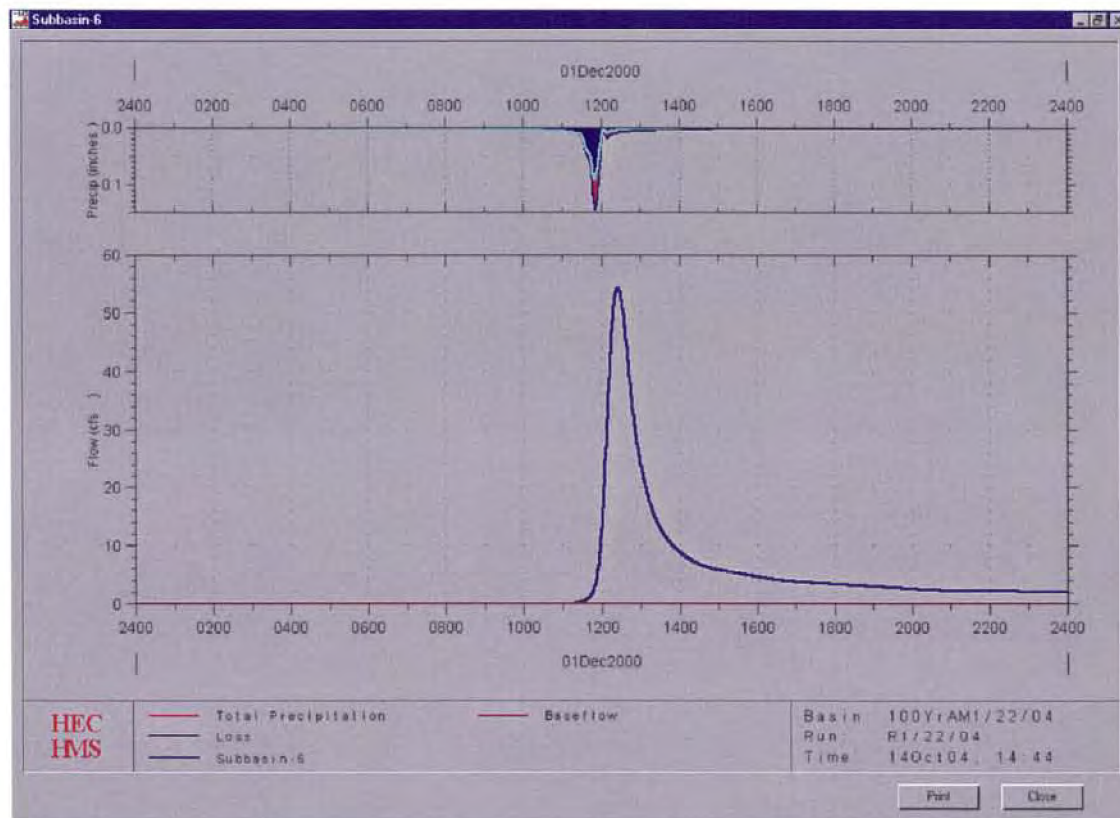
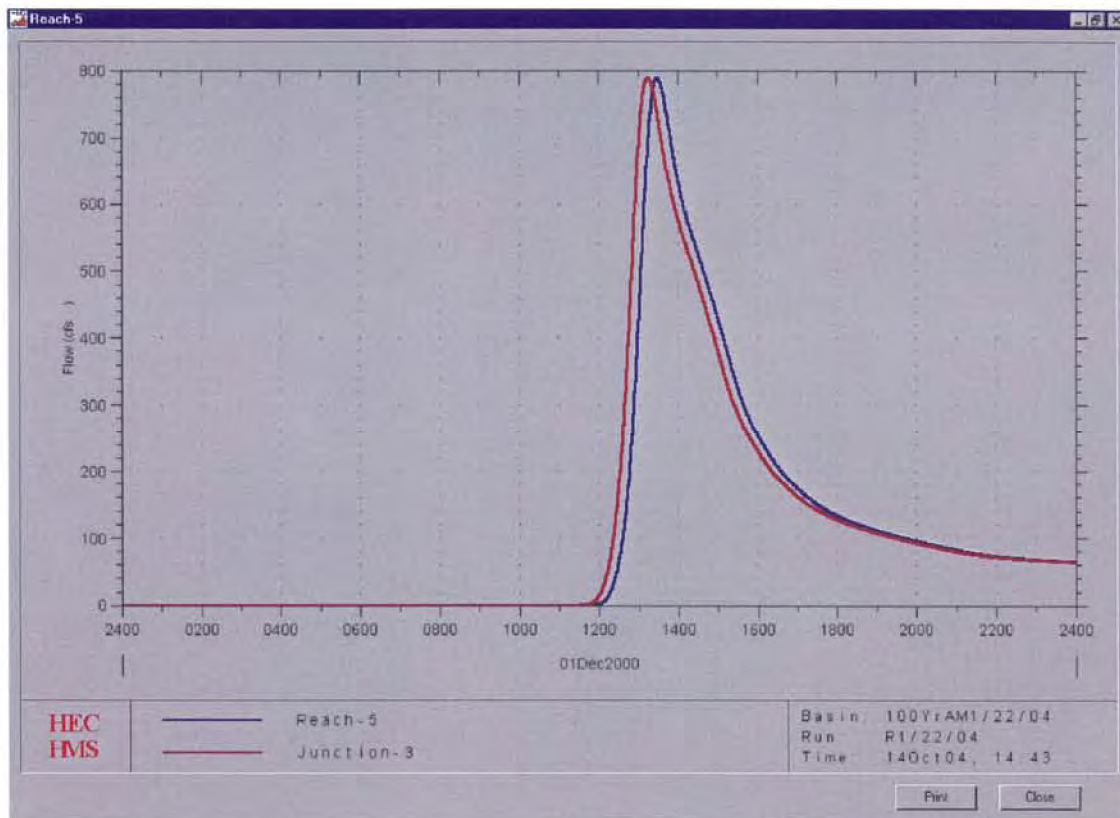




# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

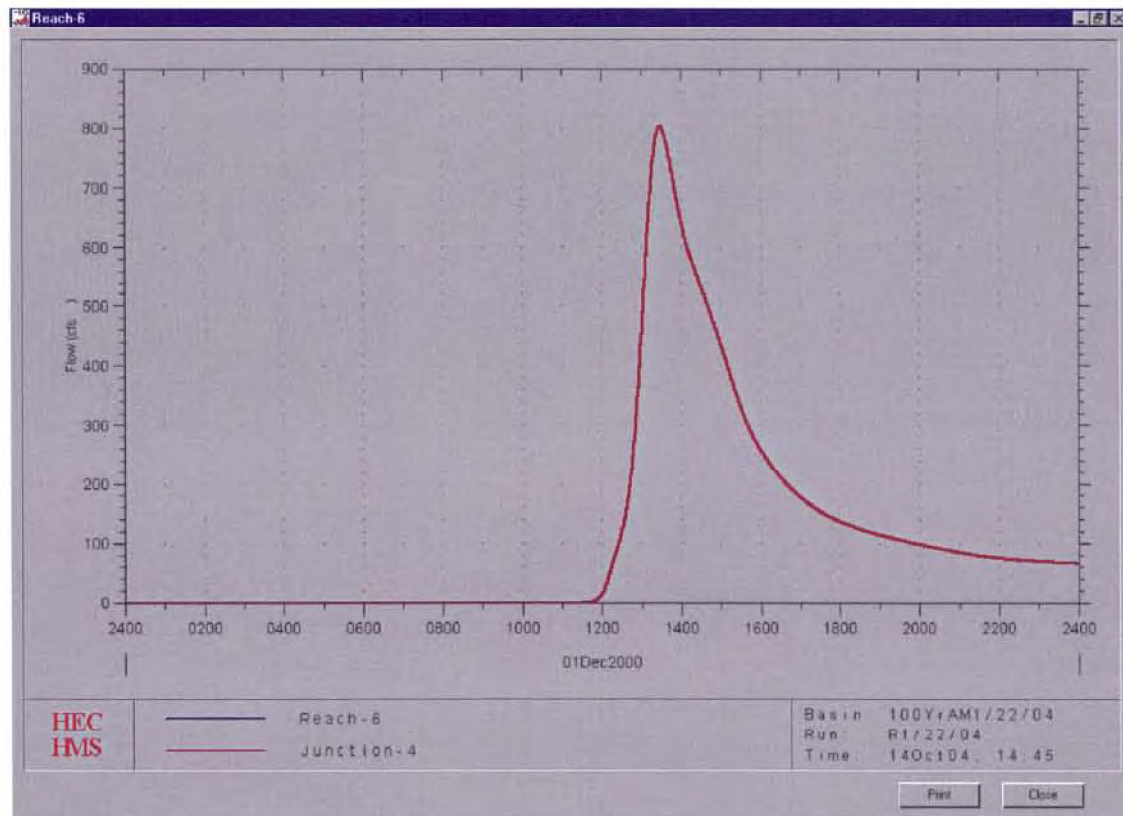
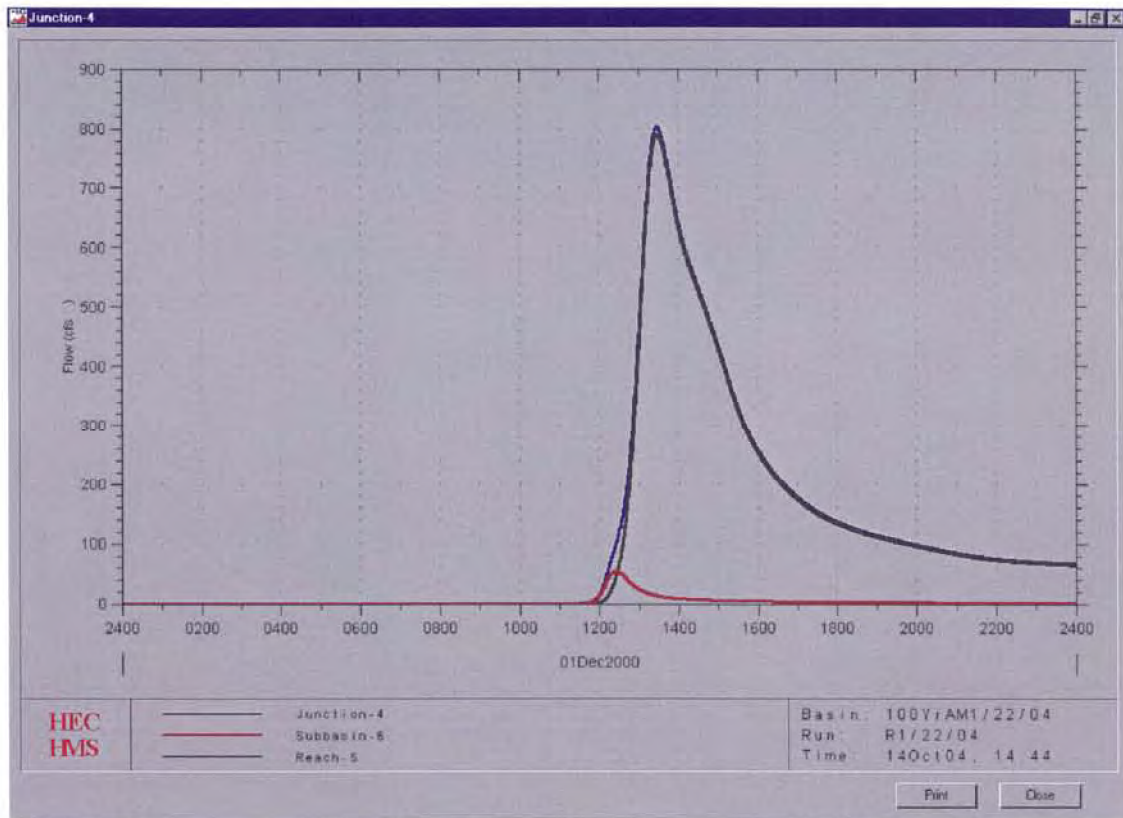


# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

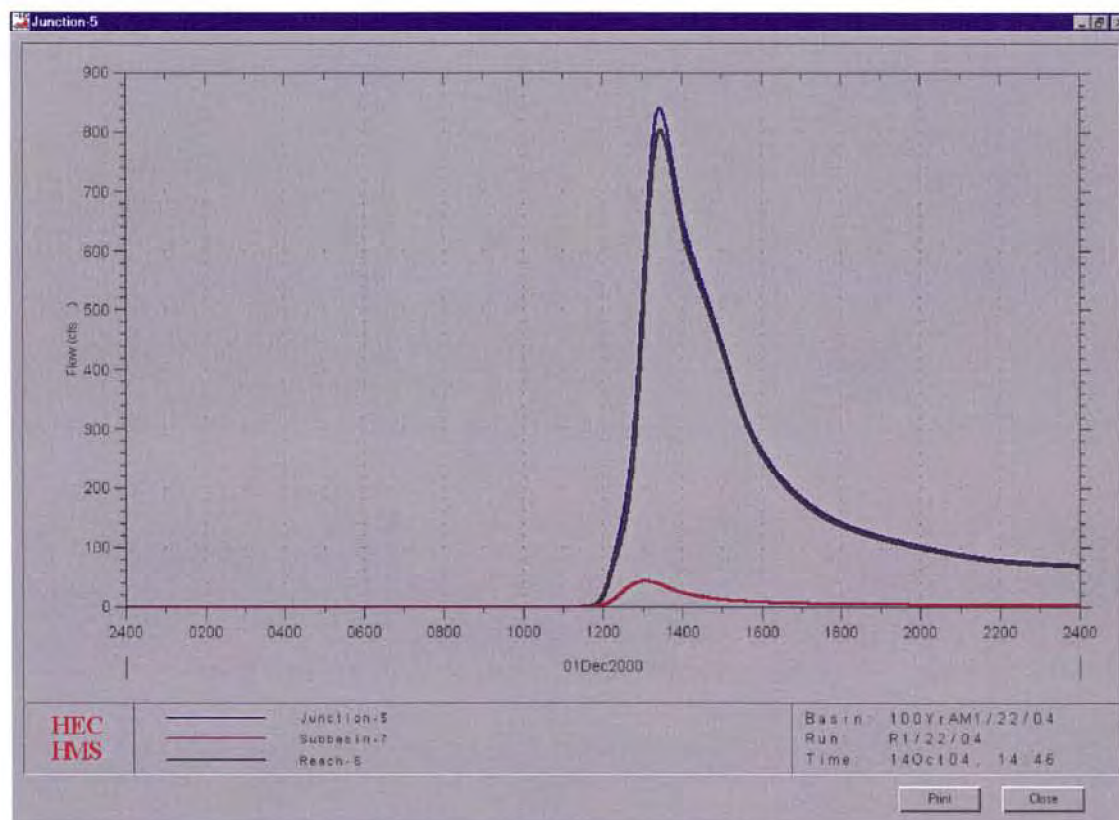
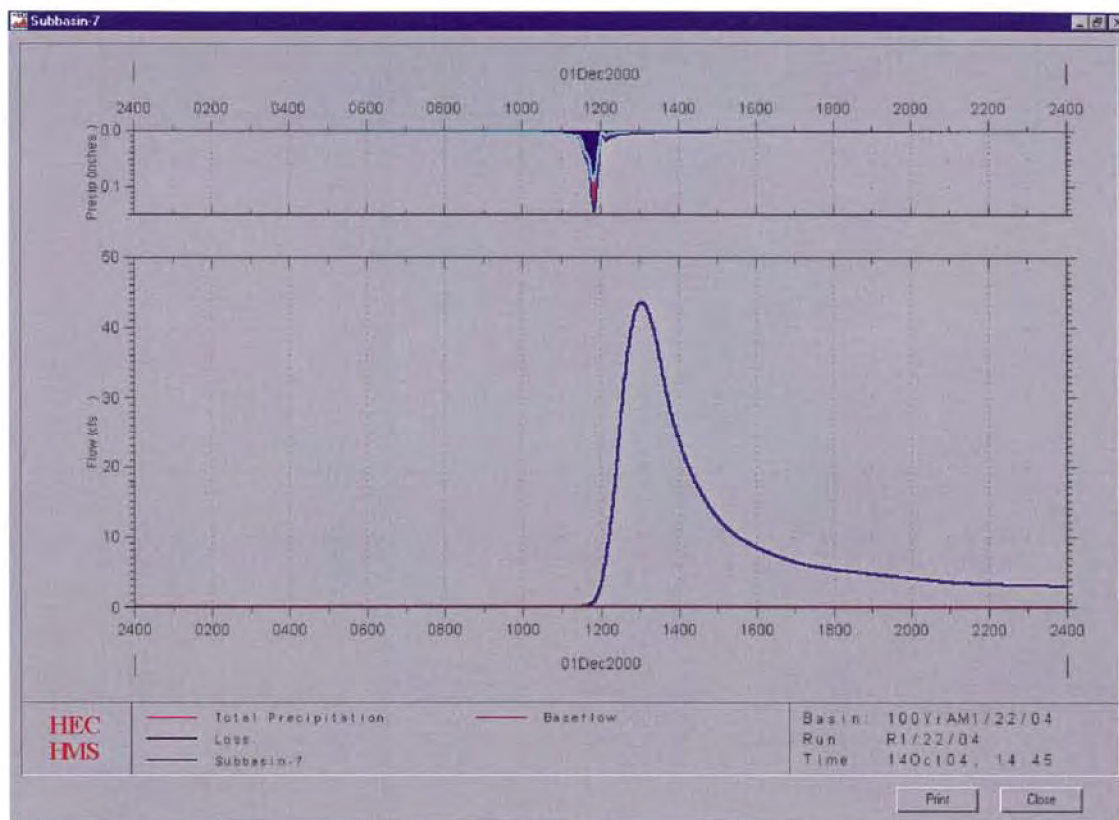




# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS



# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS





# HMS \* Summary of Results

Project : WCS

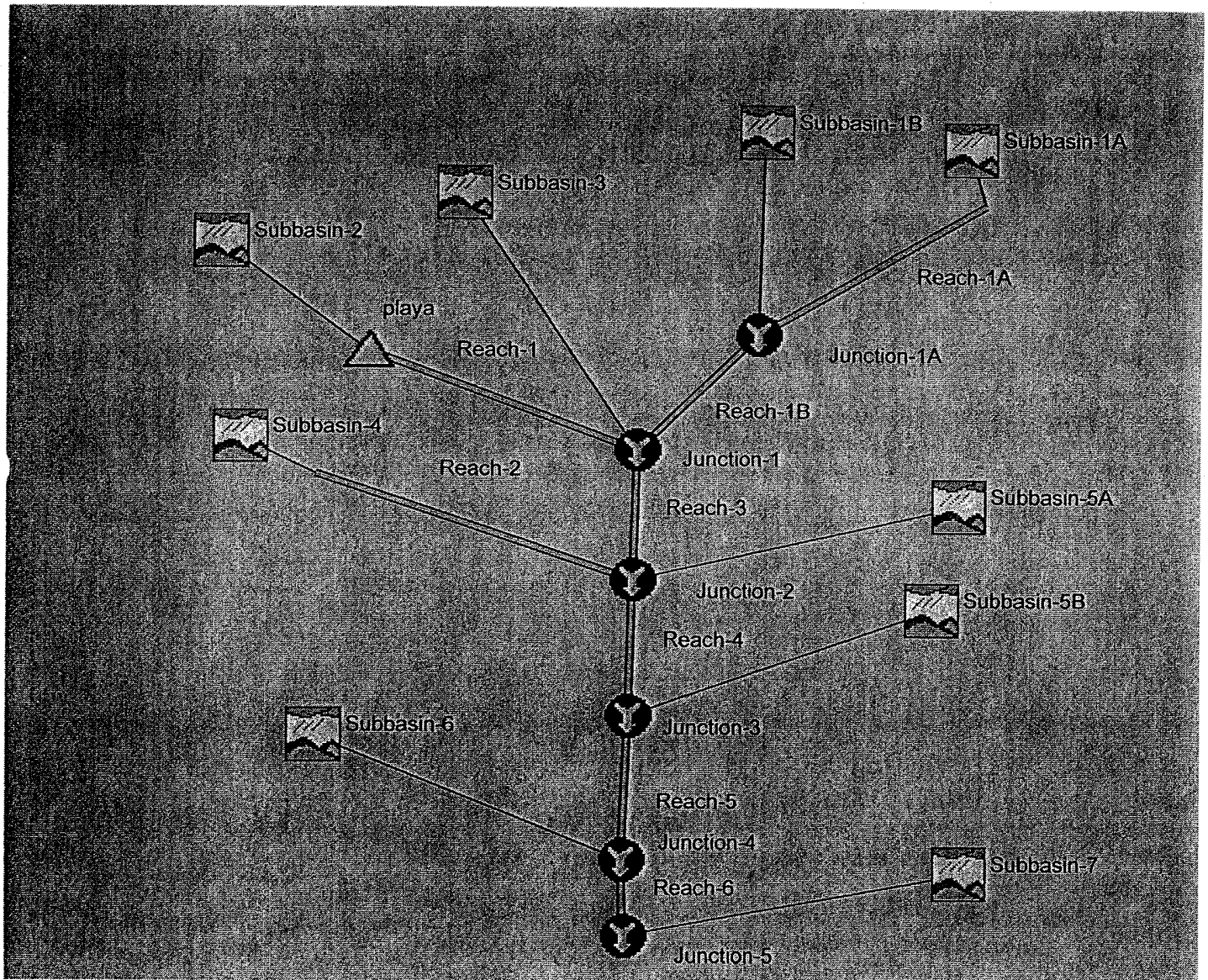
Run Name : R1/22/04

Start of Run : 01Dec00 0000 Basin Model : 100YrAM1/22/04

End of Run : 02Dec00 0000 Met. Model : Met100 Year

Execution Time : 29Jan04 1349 Control Specs : Control 1

| Hydrologic<br>Element | Discharge<br>Peak<br>(cfs) | Time of<br>Peak | Volume<br>(ac<br>ft) | Drainage<br>Area<br>(sq mi) |
|-----------------------|----------------------------|-----------------|----------------------|-----------------------------|
| Subbasin-4            | 297.60                     | 01 Dec 00 1235  | 49.246               | 0.490                       |
| Reach-2               | 297.60                     | 01 Dec 00 1250  | 48.953               | 0.490                       |
| Subbasin-2            | 440.24                     | 01 Dec 00 1305  | 105.39               | 1.063                       |
| playa                 | 0.0                        | 30 Nov 00 2400  | 0.0                  | 1.063                       |
| Reach-1               | 0.0                        | 30 Nov 00 2400  | 0.0                  | 1.063                       |
| Subbasin-1A           | 256.61                     | 01 Dec 00 1328  | 73.808               | 0.691                       |
| Reach-1A              | 256.61                     | 01 Dec 00 1345  | 73.298               | 0.691                       |
| Subbasin-1B           | 174.42                     | 01 Dec 00 1241  | 31.477               | 0.314                       |
| Junction-1A           | 324.86                     | 01 Dec 00 1332  | 104.77               | 1.005                       |
| Reach-1B              | 324.86                     | 01 Dec 00 1335  | 104.65               | 1.005                       |
| Subbasin-3            | 86.653                     | 01 Dec 00 1241  | 15.638               | 0.156                       |
| Junction-1            | 364.05                     | 01 Dec 00 1326  | 120.28               | 2.224                       |
| Reach-3               | 364.05                     | 01 Dec 00 1343  | 119.45               | 2.224                       |
| Subbasin-5A           | 118.86                     | 01 Dec 00 1234  | 19.306               | 0.192                       |
| Junction-2            | 686.69                     | 01 Dec 00 1255  | 187.71               | 2.906                       |
| Reach-4               | 686.69                     | 01 Dec 00 1316  | 186.08               | 2.906                       |
| Subbasin-5B           | 128.06                     | 01 Dec 00 1251  | 26.440               | 0.265                       |
| Junction-3            | 790.00                     | 01 Dec 00 1314  | 212.52               | 3.171                       |
| Reach-5               | 790.00                     | 01 Dec 00 1328  | 211.28               | 3.171                       |
| Subbasin-6            | 54.403                     | 01 Dec 00 1225  | 7.4715               | 0.074                       |
| Junction-4            | 803.31                     | 01 Dec 00 1328  | 218.75               | 3.245                       |
| Reach-6               | 803.31                     | 01 Dec 00 1328  | 218.75               | 3.245                       |
| Subbasin-7            | 43.582                     | 01 Dec 00 1304  | 10.316               | 0.104                       |
| Junction-5            | 841.14                     | 01 Dec 00 1327  | 229.07               | 3.349                       |



**HMS \* Basin Model \* SCS Curve Number**

Soil: Hap

Basin Model ID: 100YAM1/22/04

| Subbasin Name | SCS Curve Number | Initial Abstraction (in) | Imperviousness (%) |
|---------------|------------------|--------------------------|--------------------|
| Subbasin 1A   | 62               |                          | 0.0                |
| Subbasin 2    | 60               |                          | 0.0                |
| Subbasin 3    | 60               |                          | 0.0                |
| Subbasin 4    | 60               |                          | 0.0                |
| Subbasin 5B   | 60               |                          | 0.0                |
| Subbasin 6    | 60               |                          | 0.0                |
| Subbasin 1B   | 60               |                          | 0.0                |
| Subbasin 5A   | 60               |                          | 0.0                |
| Subbasin 7    | 60               |                          | 0.0                |

**HMS \* Basin Model \* SCS UH**

Soil: Hap

Basin Model ID: 100YAM1/22/04

Time Units:  

| Subbasin Name | SCS Lag (min) |
|---------------|---------------|
| Subbasin 1A   | 86            |
| Subbasin 2    | 65            |
| Subbasin 3    | 44            |
| Subbasin 4    | 39            |
| Subbasin 5B   | 53            |
| Subbasin 6    | 30            |
| Subbasin 1B   | 44            |
| Subbasin 5A   | 38            |
| Subbasin 7    | 64            |
|               |               |

HMS \* Basin Model \* Lag Routing

Basin Model ID: 1007/AVH/22/04

Interval: Minutes ☒

| Reach Name | Lag (min) |
|------------|-----------|
| Reach 1    | 35        |
| Reach 2    | 15        |
| Reach 3    | 17        |
| Reach 4    | 21        |
| Reach 5    | 14        |
| Reach 6A   | 17        |
| Reach 6B   | 3         |
| Reach 6C   | 0         |

HMS \* Basin Model \* Reservoir Editor

Reservoir Name: playa

Description:

Method: Elevation-Storage-Outflow

Initial Elevation (ft): 3478

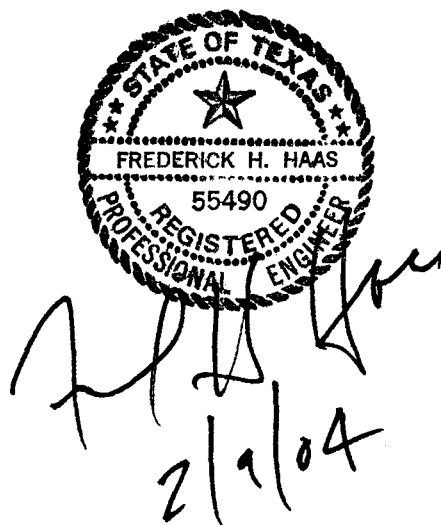
| Elevation (ft) | Storage (acre-feet) | Outflow (cfs) |
|----------------|---------------------|---------------|
| 3478.0         | 0.0                 | 0.0           |
| 3480.0         | 24.0                | 0.0           |
| 3482.0         | 61.0                | 0.0           |
| 3484.0         | 170.0               | 0.0           |
| 3486.0         | 457.0               | 0.0           |
| 3487.0         | 693.0               | 863.0         |
| 3488.0         | 928.0               | 2427.0        |





## APPENDIX C

### HEC-RAS MODEL FOR THE CALCULATION OF THE 100-YEAR WATER SURFACE PROFILE



[illegible]

HEC-RAS Plan: 100YR River: Ditch A Reach: 5 (Continued)

|        |         |         |         |      |         |          |      |        |         |         |         |      |
|--------|---------|---------|---------|------|---------|----------|------|--------|---------|---------|---------|------|
| 841.00 | 3402.70 | 3405.00 | 3403.77 | 2.30 | 3405.01 | 0.000467 | 0.91 | 540.97 | 1554.00 | 921.10  | 1013.03 | 0.17 |
| 841.00 | 3402.70 | 3406.00 | 3403.77 | 3.30 | 3406.00 | 0.000042 | 0.42 | 394.00 | 1554.00 | 2007.81 | 1160.00 | 0.06 |
| 841.00 | 3402.70 | 3407.00 | 3403.77 | 4.30 | 3407.00 | 0.000009 | 0.26 | 247.00 | 1554.00 | 3241.11 | 1307.00 | 0.03 |

# FloodPlain.rep

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

```

X   X   XXXXXX   XXXX   XXXX   XX   XXXX
X   X   X       X   X   X   X   X   X
X   X   X       X   X   X   X   X   X
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   XXXXXX   XXXX   X   X   X   X   XXXXX
  
```

## PROJECT DATA

Project Title: WCS  
 Project File : FloodPlain.prj  
 Run Date and Time: 2/4/04 9:56:12 AM

Project in English units

Project Description:  
 100year

## PLAN DATA

Plan Title: 2-04-04MANY  
 Plan File : D:\program files\WCS\FloodPlain.p21

Geometry Title: 1-20-04SecRemoved  
 Geometry File : D:\program files\WCS\FloodPlain.g03

Flow Title : 100YrAM2-04-04Many  
 Flow File : D:\program files\WCS\FloodPlain.f21

## Plan Summary Information:

|                             |    |                      |   |
|-----------------------------|----|----------------------|---|
| Number of: Cross Sections = | 18 | Multitple Openings = | 0 |
| Culverts =                  | 1  | Inline Weirs =       | 0 |
| Bridges =                   | 0  |                      |   |

## Computational Information

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

## Computation Options

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



# FloodPlain.rep

## FLOW DATA

Flow Title: 100YrAM2-04-04Many

Flow File : D:\program files\WCS\FloodPlain.f21

Flow Data (cfs)

| River          | Reach | RS    | 100 Yr.-WS3404.5 | 100 Yr.-WS3405 | 100 Yr.-WS3406 |
|----------------|-------|-------|------------------|----------------|----------------|
| 100 Yr.-WS3407 |       |       |                  |                |                |
| Ditch A        | 5     | 12674 | 257              | 257            | 257            |
| 257            |       |       |                  |                |                |
| Ditch A        | 5     | 9690  | 325              | 325            | 325            |
| 325            |       |       |                  |                |                |
| Ditch A        | 5     | 7253  | 364              | 364            | 364            |
| 364            |       |       |                  |                |                |
| Ditch A        | 5     | 6343  | 687              | 687            | 687            |
| 687            |       |       |                  |                |                |
| Ditch A        | 5     | 4221  | 790              | 790            | 790            |
| 790            |       |       |                  |                |                |
| Ditch A        | 5     | 1888  | 803              | 803            | 803            |
| 803            |       |       |                  |                |                |
| Ditch A        | 5     | 1060  | 841              | 841            | 841            |
| 841            |       |       |                  |                |                |

## Boundary Conditions

| River stream | Reach | Profile          | Upstream | Down     |
|--------------|-------|------------------|----------|----------|
| Ditch A      | 5     | 100 Yr.-WS3404.5 | Critical | Known WS |
| = 3404.5     |       |                  |          |          |
| Ditch A      | 5     | 100 Yr.-WS3405   | Critical | Known    |
| WS = 3405    |       |                  |          |          |
| Ditch A      | 5     | 100 Yr.-WS3406   | Critical | Known    |
| WS = 3406    |       |                  |          |          |
| Ditch A      | 5     | 100 Yr.-WS3407   | Critical | Known    |
| WS = 3407    |       |                  |          |          |

## GEOMETRY DATA

Geometry Title: 1-20-04SecRemoved

Geometry File : D:\program files\WCS\FloodPlain.g03

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 12674

## INPUT

Description: Sta. 12674

| Station Elevation Data |      | num= | 6    |     |      |     |      |     |      |
|------------------------|------|------|------|-----|------|-----|------|-----|------|
| Sta                    | Elev | Sta  | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
| 100                    | 3482 | 380  | 3478 | 560 | 3477 | 635 | 3478 | 761 | 3480 |
| 964                    | 3482 |      |      |     |      |     |      |     |      |

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val

## FloodPlain.rep

100 .033 380 .033 635 .033

|           |      |       |          |              |       |              |        |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|           | 380  | 635   |          | 1206 1337    | 1433  | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

|                    |          |                        |         |         |          |
|--------------------|----------|------------------------|---------|---------|----------|
| E.G. Elev (ft)     | 3478.13  | Element                | Left OB | Channel | Right OB |
| Vel Head (ft)      | 0.05     | Wt. n-Val.             | 0.033   | 0.033   | 0.033    |
| W.S. Elev (ft)     | 3478.09  | Reach Len. (ft)        | 1206.00 | 1337.00 | 1433.00  |
| Crit W.S. (ft)     | 3477.76  | Flow Area (sq ft)      | 0.27    | 149.79  | 0.24     |
| E.G. Slope (ft/ft) | 0.002948 | Area (sq ft)           | 0.27    | 149.79  | 0.24     |
| Q Total (cfs)      | 257.00   | Flow (cfs)             | 0.08    | 256.85  | 0.07     |
| Top Width (ft)     | 266.62   | Top Width (ft)         | 6.12    | 255.00  | 5.51     |
| Vel Total (ft/s)   | 1.71     | Avg. Vel. (ft/s)       | 0.30    | 1.71    | 0.30     |
| Max Chl Dpth (ft)  | 1.09     | Hydr. Depth (ft)       | 0.04    | 0.59    | 0.04     |
| Conv. Total (cfs)  | 4733.3   | Conv. (cfs)            | 1.5     | 4730.5  | 1.3      |
| Length Wtd. (ft)   | 1336.99  | Wetted Per. (ft)       | 6.12    | 255.01  | 5.51     |
| Min Ch El (ft)     | 3477.00  | Shear (lb/sq ft)       | 0.01    | 0.11    | 0.01     |
| Alpha              | 1.01     | Stream Power (lb/ft s) | 0.00    | 0.19    | 0.00     |
| Frctn Loss (ft)    | 7.80     | Cum Volume (acre-ft)   | 9.42    | 58.71   | 1.69     |
| C & E Loss (ft)    | 0.02     | Cum SA (acres)         | 11.65   | 95.98   | 1.54     |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 11337

## INPUT

Description: Sta. 11337

|                        |      |      |      |
|------------------------|------|------|------|
| Station Elevation Data |      | num= | 8    |
| Sta                    | Elev | Sta  | Elev |
| 100                    | 3477 | 315  | 3474 |
| 550                    | 3470 | 591  | 3472 |
|                        |      | 694  | 3474 |

|                    |       |      |       |
|--------------------|-------|------|-------|
| Manning's n Values |       | num= | 3     |
| Sta                | n Val | Sta  | n Val |
| 100                | .033  | 435  | .033  |
|                    |       | 550  | .033  |

|           |      |       |          |              |       |              |        |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|           | 435  | 550   |          | 545 400      | 332   | .1           | .3     |

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CROSS SECTION OUTPUT      Profile #100 Yr.-WS3405

|                    |          |                        |         |         |          |
|--------------------|----------|------------------------|---------|---------|----------|
| E.G. Elev (ft)     | 3470.31  | Element                | Left OB | Channel | Right OB |
| Vel Head (ft)      | 0.24     | Wt. n-Val.             | 0.033   | 0.033   | 0.033    |
| W.S. Elev (ft)     | 3470.06  | Reach Len. (ft)        | 545.00  | 400.00  | 332.00   |
| Crit W.S. (ft)     | 3470.03  | Flow Area (sq ft)      | 0.04    | 64.88   | 0.04     |
| E.G. Slope (ft/ft) | 0.016594 | Area (sq ft)           | 0.04    | 64.88   | 0.04     |
| Q Total (cfs)      | 257.00   | Flow (cfs)             | 0.03    | 256.95  | 0.02     |
| Top Width (ft)     | 117.70   | Top Width (ft)         | 1.38    | 115.00  | 1.32     |
| Vel Total (ft/s)   | 3.96     | Avg. Vel. (ft/s)       | 0.59    | 3.96    | 0.59     |
| Max Chl Dpth (ft)  | 1.06     | Hydr. Depth (ft)       | 0.03    | 0.56    | 0.03     |
| Conv. Total (cfs)  | 1995.1   | Conv. (cfs)            | 0.2     | 1994.7  | 0.2      |
| Length Wtd. (ft)   | 400.00   | Wetted Per. (ft)       | 1.38    | 115.02  | 1.32     |
| Min Ch El (ft)     | 3469.00  | Shear (lb/sq ft)       | 0.03    | 0.58    | 0.03     |
| Alpha              | 1.00     | Stream Power (lb/ft s) | 0.02    | 2.31    | 0.02     |
| Frctn Loss (ft)    | 4.72     | Cum Volume (acre-ft)   | 9.42    | 55.42   | 1.68     |
| C & E Loss (ft)    | 0.02     | Cum SA (acres)         | 11.55   | 90.30   | 1.43     |

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION      RIVER: Ditch A  
REACH: 5      RS: 10937

INPUT

Description: Sta. 10937

| Station Elevation Data |      |     |      | num= | 9    |     |      |     |      |
|------------------------|------|-----|------|------|------|-----|------|-----|------|
| Sta                    | Elev | Sta | Elev | Sta  | Elev | Sta | Elev | Sta | Elev |
| 100                    | 3470 | 351 | 3468 | 428  | 3467 | 465 | 3466 | 536 | 3464 |
| 543                    | 3464 | 609 | 3466 | 683  | 3468 | 811 | 3472 |     |      |

| Manning's n Values |       |     |       | num= | 3     |     |       |     |       |
|--------------------|-------|-----|-------|------|-------|-----|-------|-----|-------|
| Sta                | n Val | Sta | n Val | Sta  | n Val | Sta | n Val | Sta | n Val |
| 100                | .033  | 428 | .033  | 609  | .033  |     |       |     |       |

|                |       |               |         |       |              |        |
|----------------|-------|---------------|---------|-------|--------------|--------|
| Bank Sta: Left | Right | Lengths: Left | Channel | Right | Coeff Contr. | Expan. |
| 428            | 609   | 729           | 649     | 445   | .1           | .3     |

CROSS SECTION OUTPUT      Profile #100 Yr.-WS3405

|                |         |                 |         |         |          |
|----------------|---------|-----------------|---------|---------|----------|
| E.G. Elev (ft) | 3465.56 | Element         | Left OB | Channel | Right OB |
| Vel Head (ft)  | 0.18    | Wt. n-Val.      |         | 0.033   |          |
| W.S. Elev (ft) | 3465.38 | Reach Len. (ft) | 729.00  | 649.00  | 445.00   |

## FloodPlain.rep

|                    |          |                        |        |       |      |
|--------------------|----------|------------------------|--------|-------|------|
| Crit W.S. (ft)     | 3465.18  | Flow Area (sq ft)      | 74.55  |       |      |
| E.G. Slope (ft/ft) | 0.008826 | Area (sq ft)           | 74.55  |       |      |
| Q Total (cfs)      | 257.00   | Flow (cfs)             | 257.00 |       |      |
| Top Width (ft)     | 101.30   | Top Width (ft)         | 101.30 |       |      |
| Vel Total (ft/s)   | 3.45     | Avg. Vel. (ft/s)       | 3.45   |       |      |
| Max Chl Dpth (ft)  | 1.38     | Hydr. Depth (ft)       | 0.74   |       |      |
| Conv. Total (cfs)  | 2735.6   | Conv. (cfs)            | 2735.6 |       |      |
| Length Wtd. (ft)   | 649.00   | Wetted Per. (ft)       | 101.34 |       |      |
| Min Ch El (ft)     | 3464.00  | Shear (lb/sq ft)       | 0.41   |       |      |
| Alpha              | 1.00     | Stream Power (lb/ft s) | 1.40   |       |      |
| Frctn Loss (ft)    | 8.69     | Cum Volume (acre-ft)   | 9.42   | 54.78 | 1.68 |
| C & E Loss (ft)    | 0.00     | Cum SA (acres)         | 11.54  | 89.31 | 1.43 |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross

section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 10288

## INPUT

Description: Sta. 10288

| Station Elevation Data |      | num= 12 |      |     |        |     |      |     |      |     |      |
|------------------------|------|---------|------|-----|--------|-----|------|-----|------|-----|------|
| Sta                    | Elev | Sta     | Elev | Sta | Elev   | Sta | Elev | Sta | Elev | Sta | Elev |
| 100                    | 3464 | 177     | 3462 | 238 | 3460   | 298 | 3458 | 493 | 3456 |     |      |
| 519                    | 3456 | 662     | 3457 | 778 | 3457.1 | 857 | 3458 | 903 | 3460 |     |      |
| 947                    | 3462 | 989     | 3464 |     |        |     |      |     |      |     |      |

| Manning's n Values |       | num= 3 |       |     |       |
|--------------------|-------|--------|-------|-----|-------|
| Sta                | n Val | Sta    | n Val | Sta | n Val |
| 100                | .033  | 298    | .033  | 857 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 298  | 857   |          | 552 598      | 633   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

|                    |          |                   |         |         |          |
|--------------------|----------|-------------------|---------|---------|----------|
| E.G. Elev (ft)     | 3456.87  | Element           | Left OB | Channel | Right OB |
| Vel Head (ft)      | 0.20     | Wt. n-Val.        |         | 0.033   |          |
| W.S. Elev (ft)     | 3456.67  | Reach Len. (ft)   | 552.00  | 598.00  | 633.00   |
| Crit W.S. (ft)     | 3456.67  | Flow Area (sq ft) |         | 71.89   |          |
| E.G. Slope (ft/ft) | 0.022674 | Area (sq ft)      |         | 71.89   |          |



## FloodPlain.rep

|                   |         |                        |                  |
|-------------------|---------|------------------------|------------------|
| Q Total (cfs)     | 257.00  | Flow (cfs)             | 257.00           |
| Top Width (ft)    | 187.76  | Top Width (ft)         | 187.76           |
| Vel Total (ft/s)  | 3.57    | Avg. Vel. (ft/s)       | 3.57             |
| Max Chl Dpth (ft) | 0.67    | Hydr. Depth (ft)       | 0.38             |
| Conv. Total (cfs) | 1706.8  | Conv. (cfs)            | 1706.8           |
| Length Wtd. (ft)  | 598.00  | Wetted Per. (ft)       | 187.77           |
| Min Ch El (ft)    | 3456.00 | Shear (lb/sq ft)       | 0.54             |
| Alpha             | 1.00    | Stream Power (lb/ft s) | 1.94             |
| Frctn Loss (ft)   | 4.59    | Cum Volume (acre-ft)   | 9.42 53.69 1.68  |
| C & E Loss (ft)   | 0.04    | Cum SA (acres)         | 11.54 87.16 1.43 |

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 RIVER: Ditch A  
REACH: 5 RS: 9690

## INPUT

Description: Sta. 9690

| Station Elevation Data |        | num= 8 |      |      |      |     |      |     |      |     |      |
|------------------------|--------|--------|------|------|------|-----|------|-----|------|-----|------|
| Sta                    | Elev   | Sta    | Elev | Sta  | Elev | Sta | Elev | Sta | Elev | Sta | Elev |
| 100                    | 3454.5 | 202    | 3454 | 381  | 3452 | 632 | 3450 | 638 | 3450 |     |      |
| 799                    | 3452   | 897    | 3454 | 1010 | 3458 |     |      |     |      |     |      |

| Manning's n Values |       | num= 3 |       |     |       |     |       |     |       |     |       |
|--------------------|-------|--------|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| Sta                | n Val | Sta    | n Val | Sta | n Val | Sta | n Val | Sta | n Val | Sta | n Val |
| 100                | .033  | 381    | .033  | 799 | .033  |     |       |     |       |     |       |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 381  | 799   |          | 639 681      | 658   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft) | 3451.26 | Element    | Left OB | Channel | Right OB |
|----------------|---------|------------|---------|---------|----------|
| Vel Head (ft)  | 0.07    | Wt. n-Val. |         | 0.033   |          |

|                    |          |                                   |        |        |        |
|--------------------|----------|-----------------------------------|--------|--------|--------|
| W.S. Elev (ft)     | 3451.19  | FloodPlain.rep<br>Reach Len. (ft) | 639.00 | 681.00 | 658.00 |
| Crit W.S. (ft)     | 3450.87  | Flow Area (sq ft)                 |        | 152.62 |        |
| E.G. Slope (ft/ft) | 0.004338 | Area (sq ft)                      |        | 152.62 |        |
| Q Total (cfs)      | 325.00   | Flow (cfs)                        |        | 325.00 |        |
| Top Width (ft)     | 250.83   | Top Width (ft)                    |        | 250.83 |        |
| Vel Total (ft/s)   | 2.13     | Avg. Vel. (ft/s)                  |        | 2.13   |        |
| Max Chl Dpth (ft)  | 1.19     | Hydr. Depth (ft)                  |        | 0.61   |        |
| Conv. Total (cfs)  | 4934.2   | Conv. (cfs)                       |        | 4934.2 |        |
| Length Wtd. (ft)   | 681.00   | Wetted Per. (ft)                  |        | 250.84 |        |
| Min Ch El (ft)     | 3450.00  | Shear (lb/sq ft)                  |        | 0.16   |        |
| Alpha              | 1.00     | Stream Power (lb/ft s)            |        | 0.35   |        |
| Frctn Loss (ft)    | 4.93     | Cum Volume (acre-ft)              | 9.42   | 52.14  | 1.68   |
| C & E Loss (ft)    | 0.01     | Cum SA (acres)                    | 11.54  | 84.15  | 1.43   |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 9009

#### INPUT

Description: Sta. 9009

|                        |      |      |      |
|------------------------|------|------|------|
| Station Elevation Data |      | num= | 9    |
| Sta                    | Elev | Sta  | Elev |
| 100                    | 3452 | 203  | 3450 |
| 637                    | 3446 | 892  | 3448 |
|                        |      | 1007 | 3450 |
|                        |      | 1124 | 3452 |

|                    |       |      |       |
|--------------------|-------|------|-------|
| Manning's n Values |       | num= | 3     |
| Sta                | n Val | Sta  | n Val |
| 100                | .033  | 325  | .033  |
|                    |       | 892  | .033  |

|                |       |                       |       |              |        |
|----------------|-------|-----------------------|-------|--------------|--------|
| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
| 325            | 892   | 898                   | 879   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

|                    |          |                   |         |         |          |
|--------------------|----------|-------------------|---------|---------|----------|
| E.G. Elev (ft)     | 3446.32  | Element           | Left OB | Channel | Right OB |
| Vel Head (ft)      | 0.20     | Wt. n-Val.        |         | 0.033   |          |
| W.S. Elev (ft)     | 3446.12  | Reach Len. (ft)   | 898.00  | 879.00  | 794.00   |
| Crit W.S. (ft)     | 3446.04  | Flow Area (sq ft) |         | 91.07   |          |
| E.G. Slope (ft/ft) | 0.014428 | Area (sq ft)      |         | 91.07   |          |

## FloodPlain.rep

|                   |         |                        |                  |
|-------------------|---------|------------------------|------------------|
| Q Total (cfs)     | 325.00  | Flow (cfs)             | 325.00           |
| Top Width (ft)    | 169.88  | Top Width (ft)         | 169.88           |
| Vel Total (ft/s)  | 3.57    | Avg. Vel. (ft/s)       | 3.57             |
| Max Chl Dpth (ft) | 1.12    | Hydr. Depth (ft)       | 0.54             |
| Conv. Total (cfs) | 2705.7  | Conv. (cfs)            | 2705.7           |
| Length Wtd. (ft)  | 879.00  | Wetted Per. (ft)       | 169.90           |
| Min Ch El (ft)    | 3445.00 | Shear (lb/sq ft)       | 0.48             |
| Alpha             | 1.00    | Stream Power (lb/ft s) | 1.72             |
| Frctn Loss (ft)   | 4.96    | Cum Volume (acre-ft)   | 9.42 50.24 1.68  |
| C & E Loss (ft)   | 0.04    | Cum SA (acres)         | 11.54 80.86 1.43 |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 8130

## INPUT

Description: Sta. 8130

| Station Elevation Data |      | num= 8 |      |
|------------------------|------|--------|------|
| Sta                    | Elev | Sta    | Elev |
| 100                    | 3448 | 303    | 3444 |
| 852                    | 3442 | 995    | 3444 |
|                        |      | 419    | 3442 |
|                        |      | 1104   | 3446 |

| Manning's n Values |       | num= 3 |       |
|--------------------|-------|--------|-------|
| Sta                | n Val | Sta    | n Val |
| 100                | .033  | 419    | .033  |
|                    |       | 852    | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 419  | 852   |          | 399 413      | 456   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3441.30  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.05     | Wt. n-Val.        |         | 0.033   |          |
| W.S. Elev (ft)     | 3441.25  | Reach Len. (ft)   | 399.00  | 413.00  | 456.00   |
| Crit W.S. (ft)     | 3440.85  | Flow Area (sq ft) |         | 176.81  |          |
| E.G. Slope (ft/ft) | 0.002988 | Area (sq ft)      |         | 176.81  |          |
| Q Total (cfs)      | 325.00   | Flow (cfs)        |         | 325.00  |          |
| Top Width (ft)     | 273.95   | Top Width (ft)    |         | 273.95  |          |

|                   |         | FloodPlain.rep         |       |        |      |
|-------------------|---------|------------------------|-------|--------|------|
| Vel Total (ft/s)  | 1.84    | Avg. Vel. (ft/s)       |       | 1.84   |      |
| Max Chl Dpth (ft) | 1.25    | Hydr. Depth (ft)       |       | 0.65   |      |
| Conv. Total (cfs) | 5945.6  | Conv. (cfs)            |       | 5945.6 |      |
| Length Wtd. (ft)  | 413.00  | Wetted Per. (ft)       |       | 273.96 |      |
| Min Ch El (ft)    | 3440.00 | Shear (lb/sq ft)       |       | 0.12   |      |
| Alpha             | 1.00    | Stream Power (lb/ft s) |       | 0.22   |      |
| Frctn Loss (ft)   | 2.64    | Cum Volume (acre-ft)   | 9.42  | 47.54  | 1.68 |
| C & E Loss (ft)   | 0.02    | Cum SA (acres)         | 11.54 | 76.38  | 1.43 |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 7717

#### INPUT

Description: Sta 7717

| Station Elevation Data |      | num= | 8    |     |      |     |        |     |      |     |      |
|------------------------|------|------|------|-----|------|-----|--------|-----|------|-----|------|
| Sta                    | Elev | Sta  | Elev | Sta | Elev | Sta | Elev   | Sta | Elev | Sta | Elev |
| 100                    | 3442 | 233  | 3440 | 383 | 3438 | 492 | 3437.8 | 510 | 3438 |     |      |
| 657                    | 3439 | 747  | 3440 | 879 | 3442 |     |        |     |      |     |      |

| Manning's n Values |       | num= | 3     |     |       |
|--------------------|-------|------|-------|-----|-------|
| Sta                | n Val | Sta  | n Val | Sta | n Val |
| 100                | .033  | 233  | .033  | 747 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 233  | 747   |          | 444 464      | 510   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3438.64  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.21     | Wt. n-Val.        |         | 0.033   |          |
| W.S. Elev (ft)     | 3438.44  | Reach Len. (ft)   | 444.00  | 464.00  | 510.00   |
| Crit W.S. (ft)     | 3438.44  | Flow Area (sq ft) |         | 89.29   |          |
| E.G. Slope (ft/ft) | 0.022265 | Area (sq ft)      |         | 89.29   |          |
| Q Total (cfs)      | 325.00   | Flow (cfs)        |         | 325.00  |          |
| Top Width (ft)     | 223.91   | Top Width (ft)    |         | 223.91  |          |
| Vel Total (ft/s)   | 3.64     | Avg. Vel. (ft/s)  |         | 3.64    |          |
| Max Chl Dpth (ft)  | 0.64     | Hydr. Depth (ft)  |         | 0.40    |          |
| Conv. Total (cfs)  | 2178.1   | Conv. (cfs)       |         | 2178.1  |          |



## FloodPlain.rep

|                  |         |                        |        |       |      |
|------------------|---------|------------------------|--------|-------|------|
| Length Wtd. (ft) | 464.00  | Wetted Per. (ft)       | 223.91 |       |      |
| Min Ch El (ft)   | 3437.80 | Shear (lb/sq ft)       | 0.55   |       |      |
| Alpha            | 1.00    | Stream Power (lb/ft s) | 2.02   |       |      |
| Frctn Loss (ft)  | 1.76    | Cum Volume (acre-ft)   | 9.42   | 46.28 | 1.68 |
| C & E Loss (ft)  | 0.05    | Cum SA (acres)         | 11.54  | 74.02 | 1.43 |

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 RIVER: Ditch A  
REACH: 5 RS: 7253

## INPUT

Description: Sta. 7253

| Station Elevation Data |      |      |        | num= | 9    |      |      |     |      |
|------------------------|------|------|--------|------|------|------|------|-----|------|
| Sta                    | Elev | Sta  | Elev   | Sta  | Elev | Sta  | Elev | Sta | Elev |
| 100                    | 3438 | 109  | 3438.7 | 321  | 3438 | 424  | 3436 | 668 | 3435 |
| 906                    | 3436 | 1005 | 3438   | 1200 | 3440 | 1365 | 3442 |     |      |

| Manning's n Values |       |     |       | num= | 3     |     |       |     |       |
|--------------------|-------|-----|-------|------|-------|-----|-------|-----|-------|
| Sta                | n Val | Sta | n Val | Sta  | n Val | Sta | n Val | Sta | n Val |
| 100                | .033  | 424 | .033  | 906  | .033  |     |       |     |       |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 424  | 906   |          | 756 910      | 980   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3436.12  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.03     | Wt. n-Val.        | 0.033   | 0.033   | 0.033    |
| W.S. Elev (ft)     | 3436.09  | Reach Len. (ft)   | 756.00  | 910.00  | 980.00   |
| Crit W.S. (ft)     | 3435.67  | Flow Area (sq ft) | 0.21    | 284.42  | 0.20     |
| E.G. Slope (ft/ft) | 0.001631 | Area (sq ft)      | 0.21    | 284.42  | 0.20     |
| Q Total (cfs)      | 364.00   | Flow (cfs)        | 0.05    | 363.91  | 0.05     |
| Top Width (ft)     | 491.10   | Top Width (ft)    | 4.64    | 482.00  | 4.46     |

|                   |         | FloodPlain.rep         |       |        |      |
|-------------------|---------|------------------------|-------|--------|------|
| Vel Total (ft/s)  | 1.28    | Avg. Vel. (ft/s)       | 0.23  | 1.28   | 0.23 |
| Max Chl Dpth (ft) | 1.09    | Hydr. Depth (ft)       | 0.05  | 0.59   | 0.05 |
| Conv. Total (cfs) | 9012.2  | Conv. (cfs)            | 1.2   | 9009.9 | 1.1  |
| Length Wtd. (ft)  | 910.00  | Wetted Per. (ft)       | 4.64  | 482.00 | 4.46 |
| Min Ch El (ft)    | 3435.00 | Shear (lb/sq ft)       | 0.00  | 0.06   | 0.00 |
| Alpha             | 1.00    | Stream Power (lb/ft s) | 0.00  | 0.08   | 0.00 |
| Frctn Loss (ft)   | 5.42    | Cum Volume (acre-ft)   | 9.41  | 44.29  | 1.68 |
| C & E Loss (ft)   | 0.02    | Cum SA (acres)         | 11.52 | 70.26  | 1.40 |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 6343

#### INPUT

Description: Sta. 6343

| Station Elevation Data |      | num= | 9    |      |        |      |      |     |        |
|------------------------|------|------|------|------|--------|------|------|-----|--------|
| Sta                    | Elev | Sta  | Elev | Sta  | Elev   | Sta  | Elev | Sta | Elev   |
| 100                    | 3434 | 346  | 3433 | 663  | 3432   | 732  | 3431 | 860 | 3430.2 |
| 981                    | 3430 | 1273 | 3430 | 1320 | 3431.5 | 1566 | 3432 |     |        |

| Manning's n Values |       | num= | 3     |      |       |
|--------------------|-------|------|-------|------|-------|
| Sta                | n Val | Sta  | n Val | Sta  | n Val |
| 100                | .033  | 663  | .033  | 1320 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 663  | 1320  |          | 767 980      | 1051  | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3430.67  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.21     | Wt. n-Val.        |         | 0.033   |          |
| W.S. Elev (ft)     | 3430.46  | Reach Len. (ft)   | 767.00  | 980.00  | 1051.00  |
| Crit W.S. (ft)     | 3430.46  | Flow Area (sq ft) |         | 188.08  |          |
| E.G. Slope (ft/ft) | 0.022292 | Area (sq ft)      |         | 188.08  |          |
| Q Total (cfs)      | 687.00   | Flow (cfs)        |         | 687.00  |          |
| Top Width (ft)     | 469.62   | Top Width (ft)    |         | 469.62  |          |
| Vel Total (ft/s)   | 3.65     | Avg. Vel. (ft/s)  |         | 3.65    |          |
| Max Chl Dpth (ft)  | 0.46     | Hydr. Depth (ft)  |         | 0.40    |          |
| Conv. Total (cfs)  | 4601.3   | Conv. (cfs)       |         | 4601.3  |          |

## FloodPlain.rep

|                  |         |                        |        |       |      |
|------------------|---------|------------------------|--------|-------|------|
| Length Wtd. (ft) | 980.00  | Wetted Per. (ft)       | 469.63 |       |      |
| Min Ch El (ft)   | 3430.00 | Shear (lb/sq ft)       | 0.56   |       |      |
| Alpha            | 1.00    | Stream Power (lb/ft s) | 2.04   |       |      |
| Frctn Loss (ft)  | 4.09    | Cum Volume (acre-ft)   | 9.41   | 39.35 | 1.68 |
| C & E Loss (ft)  | 0.05    | Cum SA (acres)         | 11.48  | 60.32 | 1.35 |

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 RIVER: Ditch A  
REACH: 5 RS: 5363

## INPUT

Description: Sta. 5363

| Station Elevation Data |      | num= 10 |      |      |      |      |      |      |      |
|------------------------|------|---------|------|------|------|------|------|------|------|
| Sta                    | Elev | Sta     | Elev | Sta  | Elev | Sta  | Elev | Sta  | Elev |
| 100                    | 3432 | 282     | 3430 | 550  | 3428 | 742  | 3426 | 885  | 3425 |
| 1097                   | 3425 | 1476    | 3426 | 1877 | 3428 | 1966 | 3428 | 2160 | 3430 |

| Manning's n Values |       | num= 3 |       |      |       |
|--------------------|-------|--------|-------|------|-------|
| Sta                | n Val | Sta    | n Val | Sta  | n Val |
| 100                | .033  | 742    | .033  | 1476 | .033  |

|                |       |                       |       |              |        |
|----------------|-------|-----------------------|-------|--------------|--------|
| Bank Sta: Left | Right | Lengths: Left Channel | Right | Coeff Contr. | Expan. |
| 742            | 1476  | 1199 1142             | 713   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3426.05  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.03     | Wt. n-Val.        | 0.033   | 0.033   | 0.033    |
| W.S. Elev (ft)     | 3426.02  | Reach Len. (ft)   | 1199.00 | 1142.00 | 713.00   |
| Crit W.S. (ft)     | 3425.54  | Flow Area (sq ft) | 0.02    | 486.80  | 0.04     |
| E.G. Slope (ft/ft) | 0.001698 | Area (sq ft)      | 0.02    | 486.80  | 0.04     |
| Q Total (cfs)      | 687.00   | Flow (cfs)        | 0.00    | 687.00  | 0.00     |
| Top Width (ft)     | 739.57   | Top Width (ft)    | 1.80    | 734.00  | 3.77     |

|                   |         | FloodPlain.rep         |       |         |      |
|-------------------|---------|------------------------|-------|---------|------|
| Vel Total (ft/s)  | 1.41    | Avg. Vel. (ft/s)       | 0.08  | 1.41    | 0.08 |
| Max Chl Dpth (ft) | 1.02    | Hydr. Depth (ft)       | 0.01  | 0.66    | 0.01 |
| Conv. Total (cfs) | 16669.9 | Conv. (cfs)            | 0.0   | 16669.8 | 0.1  |
| Length Wtd. (ft)  | 1142.00 | Wetted Per. (ft)       | 1.80  | 734.00  | 3.77 |
| Min Ch El (ft)    | 3425.00 | Shear (lb/sq ft)       | 0.00  | 0.07    | 0.00 |
| Alpha             | 1.00    | Stream Power (lb/ft s) | 0.00  | 0.10    | 0.00 |
| Frctn Loss (ft)   | 5.07    | Cum Volume (acre-ft)   | 9.41  | 31.76   | 1.68 |
| C & E Loss (ft)   | 0.02    | Cum SA (acres)         | 11.46 | 46.78   | 1.30 |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m) between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 4221

#### INPUT

Description: Sta. 4221

| Station Elevation Data |        | num= 12 |      |     |      |      |      |      |      |
|------------------------|--------|---------|------|-----|------|------|------|------|------|
| Sta                    | Elev   | Sta     | Elev | Sta | Elev | Sta  | Elev | Sta  | Elev |
| 100                    | 3423   | 341     | 3422 | 544 | 3421 | 640  | 3420 | 669  | 3420 |
| 753                    | 3420.2 | 829     | 3420 | 837 | 3420 | 1030 | 3421 | 1320 | 3422 |
| 1407                   | 3423   | 1497    | 3424 |     |      |      |      |      |      |

| Manning's n Values |       | num= 3 |       |      |       |
|--------------------|-------|--------|-------|------|-------|
| Sta                | n Val | Sta    | n Val | Sta  | n Val |
| 100                | .033  | 544    | .033  | 1407 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff, Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|---------------|--------|
|           | 544  | 1407  |          | 749 732      | 843   | .1            | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3420.96  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.25     | Wt. n-Val.        |         | 0.033   |          |
| W.S. Elev (ft)     | 3420.71  | Reach Len. (ft)   | 749.00  | 732.00  | 843.00   |
| Crit W.S. (ft)     | 3420.71  | Flow Area (sq ft) |         | 196.80  |          |
| E.G. Slope (ft/ft) | 0.020617 | Area (sq ft)      |         | 196.80  |          |
| Q Total (cfs)      | 790.00   | Flow (cfs)        |         | 790.00  |          |
| Top Width (ft)     | 402.25   | Top Width (ft)    |         | 402.25  |          |
| Vel Total (ft/s)   | 4.01     | Avg. Vel. (ft/s)  |         | 4.01    |          |
| Max Chl Dpth (ft)  | 0.71     | Hydr. Depth (ft)  |         | 0.49    |          |

|                   |         | FloodPlain.rep         |       |        |      |
|-------------------|---------|------------------------|-------|--------|------|
| Conv. Total (cfs) | 5502.0  | Conv. (cfs)            |       | 5502.0 |      |
| Length Wtd. (ft)  | 736.33  | Wetted Per. (ft)       |       | 402.26 |      |
| Min Ch El (ft)    | 3420.00 | Shear (lb/sq ft)       |       | 0.63   |      |
| Alpha             | 1.00    | Stream Power (lb/ft s) |       | 2.53   |      |
| Frctn Loss (ft)   | 3.65    | Cum Volume (acre-ft)   | 9.41  | 22.80  | 1.68 |
| C & E Loss (ft)   | 0.06    | Cum SA (acres)         | 11.44 | 31.89  | 1.27 |

Warning: The energy equation could not be balanced within the specified number of iterations.  
The

program selected the water surface that had the least amount of error between computed and assumed values.

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

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 3489

#### INPUT

Description: Sta. 3489

| Station Elevation Data |      | num= 15 |        |     |        |      |        |      |        |
|------------------------|------|---------|--------|-----|--------|------|--------|------|--------|
| Sta                    | Elev | Sta     | Elev   | Sta | Elev   | Sta  | Elev   | Sta  | Elev   |
| 100                    | 3417 | 258     | 3416.5 | 299 | 3416   | 309  | 3415   | 318  | 3416   |
| 405                    | 3416 | 422     | 3416   | 539 | 3416.4 | 581  | 3416.2 | 642  | 3416.4 |
| 744                    | 3416 | 830     | 3416   | 918 | 3418   | 1068 | 3420   | 1159 | 3421   |

| Manning's n Values |       | num= 3 |       |     |       |
|--------------------|-------|--------|-------|-----|-------|
| Sta                | n Val | Sta    | n Val | Sta | n Val |
| 100                | .033  | 539    | .033  | 918 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 539  | 918   |          | 464 500      | 457   | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3416.96  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.04     | Wt. n-Val.        | 0.033   | 0.033   |          |
| W.S. Elev (ft)     | 3416.92  | Reach Len. (ft)   | 464.00  | 500.00  | 457.00   |
| Crit W.S. (ft)     | 3416.52  | Flow Area (sq ft) | 260.10  | 233.33  |          |
| E.G. Slope (ft/ft) | 0.002177 | Area (sq ft)      | 260.10  | 233.33  |          |
| Q Total (cfs)      | 790.00   | Flow (cfs)        | 401.97  | 388.03  |          |



## FloodPlain.rep

|                   |         |                        |        |        |      |
|-------------------|---------|------------------------|--------|--------|------|
| Top Width (ft)    | 743.33  | Top Width (ft)         | 412.08 | 331.25 |      |
| Vel Total (ft/s)  | 1.60    | Avg. Vel. (ft/s)       | 1.55   | 1.66   |      |
| Max Chl Dpth (ft) | 1.91    | Hydr. Depth (ft)       | 0.63   | 0.70   |      |
| Conv. Total (cfs) | 16933.4 | Conv. (cfs)            | 8616.2 | 8317.2 |      |
| Length Wtd. (ft)  | 482.36  | Wetted Per. (ft)       | 412.18 | 331.26 |      |
| Min Ch El (ft)    | 3416.00 | Shear (lb/sq ft)       | 0.09   | 0.10   |      |
| Alpha             | 1.00    | Stream Power (lb/ft s) | 0.13   | 0.16   |      |
| Frctn Loss (ft)   | 2.43    | Cum Volume (acre-ft)   | 7.18   | 19.18  | 1.68 |
| C & E Loss (ft)   | 0.02    | Cum SA (acres)         | 7.89   | 25.72  | 1.27 |

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

Warning: The energy loss was greater than 1.0 ft (0.3 m) between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 2989

## INPUT

Description: Sta. 2989

| Station Elevation Data |        | num= 12 |      |     |        |     |         |     |      |     |      |
|------------------------|--------|---------|------|-----|--------|-----|---------|-----|------|-----|------|
| Sta                    | Elev   | Sta     | Elev | Sta | Elev   | Sta | Elev    | Sta | Elev | Sta | Elev |
| 170                    | 3414.8 | 196     | 3414 | 436 | 3413.8 | 613 | 3414    | 651 | 3414 |     |      |
| 700                    | 3414   | 747     | 3414 | 761 | 3414   | 841 | 3415.01 | 920 | 3416 |     |      |
| 976                    | 3418   | 1067    | 3420 |     |        |     |         |     |      |     |      |

| Manning's n Values |       | num= 3 |       |     |       |
|--------------------|-------|--------|-------|-----|-------|
| Sta                | n Val | Sta    | n Val | Sta | n Val |
| 170                | .033  | 436    | .033  | 841 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 436  | 841   |          | 317 215      | 172   | .3           | .5     |

## CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3414.51  | Element           | Left OB | Channel | Right OB |
|--------------------|----------|-------------------|---------|---------|----------|
| Vel Head (ft)      | 0.19     | Wt. n-Val.        | 0.033   | 0.033   |          |
| W.S. Elev (ft)     | 3414.32  | Reach Len. (ft)   | 317.00  | 215.00  | 172.00   |
| Crit W.S. (ft)     | 3414.32  | Flow Area (sq ft) | 101.56  | 124.49  |          |
| E.G. Slope (ft/ft) | 0.022050 | Area (sq ft)      | 101.56  | 124.49  |          |
| Q Total (cfs)      | 790.00   | Flow (cfs)        | 372.18  | 417.82  |          |
| Top Width (ft)     | 600.34   | Top Width (ft)    | 250.28  | 350.06  |          |
| Vel Total (ft/s)   | 3.49     | Avg. Vel. (ft/s)  | 3.66    | 3.36    |          |

## FloodPlain.rep

|                   |         |                        |        |            |
|-------------------|---------|------------------------|--------|------------|
| Max Chl Dpth (ft) | 0.52    | Hydr. Depth (ft)       | 0.41   | 0.36       |
| Conv. Total (cfs) | 5320.2  | Conv. (cfs)            | 2506.4 | 2813.8     |
| Length Wtd. (ft)  | 260.56  | Wetted Per. (ft)       | 250.29 | 350.06     |
| Min Ch El (ft)    | 3413.80 | Shear (lb/sq ft)       | 0.56   | 0.49       |
| Alpha             | 1.01    | Stream Power (lb/ft s) | 2.05   | 1.64       |
| Frctn Loss (ft)   | 0.06    | Cum Volume (acre-ft)   | 5.25   | 17.13 1.68 |
| C & E Loss (ft)   | 0.09    | Cum SA (acres)         | 4.36   | 21.81 1.27 |

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: Ditch A  
REACH: 5 RS: 2774

## INPUT

Description: Sta. 2774 Upstream of culverts

| Station Elevation Data |        | num= 13 |        |     |      |     |      |     |        |
|------------------------|--------|---------|--------|-----|------|-----|------|-----|--------|
| Sta                    | Elev   | Sta     | Elev   | Sta | Elev | Sta | Elev | Sta | Elev   |
| 100                    | 3413.8 | 175     | 3413.8 | 204 | 3412 | 261 | 3412 | 298 | 3411.2 |
| 402                    | 3410.9 | 437     | 3410   | 469 | 3409 | 491 | 3409 | 511 | 3410   |
| 560                    | 3412   | 641     | 3414   | 725 | 3416 |     |      |     |        |

| Manning's n Values |       | num= 3 |       |     |       |  |
|--------------------|-------|--------|-------|-----|-------|--|
| Sta                | n Val | Sta    | n Val | Sta | n Val |  |
| 100                | .033  | 437    | .033  | 511 | .033  |  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 437  | 511   |          | 40 40        | 40    | .3           | .5     |

| Ineffective Flow |       | num= 2 |           |  |
|------------------|-------|--------|-----------|--|
| Sta L            | Sta R | Elev   | Permanent |  |
| 888              | F     |        |           |  |
| 888              | F     |        |           |  |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft) | 3413.72 | Element           | Left OB | Channel | Right OB |
|----------------|---------|-------------------|---------|---------|----------|
| Vel Head (ft)  | 0.01    | Wt. n-Val.        | 0.033   | 0.033   | 0.033    |
| W.S. Elev (ft) | 3413.71 | Reach Len. (ft)   | 40.00   | 40.00   | 40.00    |
| Crit W.S. (ft) | 3412.70 | Flow Area (sq ft) | 588.63  | 322.19  | 191.45   |

|                    |          | FloodPlain.rep         |         |         |         |
|--------------------|----------|------------------------|---------|---------|---------|
| E.G. Slope (ft/ft) | 0.000067 | Area (sq ft)           | 588.63  | 322.19  | 191.45  |
| Q Total (cfs)      | 790.00   | Flow (cfs)             | 374.76  | 317.56  | 97.68   |
| Top Width (ft)     | 452.54   | Top Width (ft)         | 260.47  | 74.00   | 118.07  |
| Vel Total (ft/s)   | 0.72     | Avg. Vel. (ft/s)       | 0.64    | 0.99    | 0.51    |
| Max Chl Dpth (ft)  | 4.71     | Hydr. Depth (ft)       | 2.26    | 4.35    | 1.62    |
| Conv. Total (cfs)  | 96197.5  | Conv. (cfs)            | 45634.1 | 38669.0 | 11894.4 |
| Length Wtd. (ft)   | 40.00    | Wetted Per. (ft)       | 260.55  | 74.04   | 118.13  |
| Min Ch El (ft)     | 3409.00  | Shear (lb/sq ft)       | 0.01    | 0.02    | 0.01    |
| Alpha              | 1.20     | Stream Power (lb/ft s) | 0.01    | 0.02    | 0.00    |
| Frctn Loss (ft)    |          | Cum Volume (acre-ft)   | 2.74    | 16.03   | 1.30    |
| C & E Loss (ft)    |          | Cum SA (acres)         | 2.51    | 20.77   | 1.04    |

CULVERT RIVER: Ditch A  
REACH: 5 RS: 2773

#### INPUT

##### Description:

Distance from Upstream XS = 8

Deck/Roadway Width = 24

Weir Coefficient = 3

##### Upstream Deck/Roadway Coordinates

num= 6

| Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord |
|-----|---------|---------|-----|---------|---------|-----|---------|---------|
| 26  | 3413.8  |         | 100 | 3413.8  |         | 402 | 3412.7  |         |
| 500 | 3412.8  |         | 600 | 3413.9  |         | 700 | 3415.7  |         |

##### Upstream Bridge Cross Section Data

Station Elevation Data num= 13

| Sta | Elev   | Sta | Elev   | Sta | Elev | Sta | Elev | Sta | Elev   |
|-----|--------|-----|--------|-----|------|-----|------|-----|--------|
| 100 | 3413.8 | 175 | 3413.8 | 204 | 3412 | 261 | 3412 | 298 | 3411.2 |
| 402 | 3410.9 | 437 | 3410   | 469 | 3409 | 491 | 3409 | 511 | 3410   |
| 560 | 3412   | 641 | 3414   | 725 | 3416 |     |      |     |        |

##### Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|-----|-------|-----|-------|-----|-------|
| 100 | .033  | 437 | .033  | 511 | .033  |

| Bank Sta: | Left | Right | Coeff Contr. | Expan. |
|-----------|------|-------|--------------|--------|
|           | 437  | 511   | .3           | .5     |

##### Ineffective Flow num= 2

| Sta L | Sta R | Elev | Permanent |
|-------|-------|------|-----------|
| 888   | F     |      |           |
| 888   | F     |      |           |

##### Downstream Deck/Roadway Coordinates

num= 6

| Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord | Sta | Hi Cord | Lo Cord |
|-----|---------|---------|-----|---------|---------|-----|---------|---------|
| 26  | 3413.8  |         | 100 | 3413.8  |         | 402 | 3412.7  |         |
| 500 | 3412.8  |         | 600 | 3413.9  |         | 700 | 3415.7  |         |

##### Downstream Bridge Cross Section Data

Station Elevation Data num= 15

## FloodPlain.rep

| Sta | Elev   | Sta   | Elev   | Sta   | Elev   | Sta   | Elev   | Sta   | Elev   |
|-----|--------|-------|--------|-------|--------|-------|--------|-------|--------|
| 26  | 3413.8 | 100   | 3412.4 | 155   | 3412   | 299   | 3411.4 | 349   | 3410   |
| 387 | 3408.9 | 391.4 | 3408.9 | 395.8 | 3408.9 | 400.2 | 3408.9 | 404.6 | 3408.9 |
| 409 | 3408.9 | 434   | 3410   | 487   | 3412   | 568   | 3414   | 658   | 3416   |

Manning's n Values num= 3

| Sta | n Val | Sta | n Val | Sta | n Val |
|-----|-------|-----|-------|-----|-------|
| 26  | .033  | 349 | .033  | 434 | .033  |

Bank Sta: Left Right Coeff Contr. Expan.

| Left | Right | Coeff | Contr. | Expan. |
|------|-------|-------|--------|--------|
| 349  | 434   | .3    | .5     |        |

Ineffective Flow num= 2

| Sta L | Sta R | Elev | Permanent |
|-------|-------|------|-----------|
| 888   | F     |      |           |
| 888   | F     |      |           |

Upstream Embankment side slope = 3 horiz. to 1.0 vertical  
 Downstream Embankment side slope = 3 horiz. to 1.0 vertical  
 Maximum allowable submergence for weir flow = .95  
 Elevation at which weir flow begins = 3412.7  
 Energy head used in spillway design =  
 Spillway height used in design =  
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span  
 Culvert #1 Pipe Arch 1.833 2.43  
 FHWA Chart # 34- 18 inch corner radius; Corrugated metal  
 FHWA Scale # 1 - 90 Degree headwall  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length n Value Entrance Loss Coef Exit Loss Coef  
 1 39 .024 .5 1

Number of Barrels = 6  
 Upstream Elevation = 3409  
 Centerline Stations

| Sta. | Sta.  | Sta.  | Sta.  | Sta.  | Sta. |
|------|-------|-------|-------|-------|------|
| 469  | 473.4 | 477.8 | 482.2 | 486.6 | 491  |

Downstream Elevation = 3408.9

Centerline Stations

| Sta. | Sta.  | Sta.  | Sta.  | Sta.  | Sta. |
|------|-------|-------|-------|-------|------|
| 387  | 391.4 | 395.8 | 400.2 | 404.6 | 409  |

CULVERT OUTPUT Profile #100 Yr.-WS3405  
 Culvert ID : Culvert #1

|                     |         |                       |         |
|---------------------|---------|-----------------------|---------|
| Culv Q (cfs)        | 124.90  | Culv Ful Lngh (ft)    | 39.00   |
| # Barrels           | 6       | Culv Vel US (ft/s)    | 4.73    |
| Q Barrel (cfs)      | 20.82   | Culv Vel DS (ft/s)    | 4.73    |
| E.G. US. (ft)       | 3413.72 | Culv Inv El Up (ft)   | 3409.00 |
| W.S. US. (ft)       | 3413.71 | Culv Inv El Dn (ft)   | 3408.90 |
| E.G. DS (ft)        | 3412.73 | Culv Frctn Ls (ft)    | 0.49    |
| W.S. DS (ft)        | 3412.70 | Culv Ext Lss (ft)     | 0.32    |
| Delta EG (ft)       | 0.98    | Culv Ent Lss (ft)     | 0.17    |
| Delta WS (ft)       | 1.01    | Q Weir (cfs)          | 665.10  |
| E.G. IC (ft)        | 3413.62 | Weir Sta Lft (ft)     | 176.47  |
| E.G. OC (ft)        | 3413.72 | Weir Sta Rgt (ft)     | 582.62  |
| Culvert Control     | Outlet  | Weir Submerg          | 0.00    |
| Culv WS Inlet (ft)  | 3410.83 | Weir Max Depth (ft)   | 1.01    |
| Culv WS Outlet (ft) | 3410.73 | Weir Avg Depth (ft)   | 0.66    |
| Culv Nml Depth (ft) |         | Wr Flw Area (sq ft)   | 266.04  |
| Culv Crt Depth (ft) | 1.16    | Min El Weir Flow (ft) | 3412.71 |

CROSS SECTION

RIVER: Ditch A

REACH: 5

RS: 2734

## INPUT

Description: Sta. 2734 Downstream of culverts

| Station Elevation Data |        | num= 15 |        |       |        |       |        |       |        |     |      |
|------------------------|--------|---------|--------|-------|--------|-------|--------|-------|--------|-----|------|
| Sta                    | Elev   | Sta     | Elev   | Sta   | Elev   | Sta   | Elev   | Sta   | Elev   | Sta | Elev |
| 26                     | 3413.8 | 100     | 3412.4 | 155   | 3412   | 299   | 3411.4 | 349   | 3410   |     |      |
| 387                    | 3408.9 | 391.4   | 3408.9 | 395.8 | 3408.9 | 400.2 | 3408.9 | 404.6 | 3408.9 |     |      |
| 409                    | 3408.9 | 434     | 3410   | 487   | 3412   | 568   | 3414   | 658   | 3416   |     |      |

## Manning's n Values

| num= 3 |       |     |       |     |       |
|--------|-------|-----|-------|-----|-------|
| Sta    | n Val | Sta | n Val | Sta | n Val |
| 26     | .033  | 349 | .033  | 434 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 349  | 434   |          | 745 846      | 1015  | .3           | .5     |

| Ineffective Flow |       | num= 2 |           |
|------------------|-------|--------|-----------|
| Sta L            | Sta R | Elev   | Permanent |
| 888              | F     |        |           |
| 888              | F     |        |           |

## CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3412.73  | Element                | Left OB | Channel | Right OB |
|--------------------|----------|------------------------|---------|---------|----------|
| Vel Head (ft)      | 0.03     | Wt. n-Val.             | 0.033   | 0.033   | 0.033    |
| W.S. Elev (ft)     | 3412.70  | Reach Len. (ft)        | 745.00  | 846.00  | 1015.00  |
| Crit W.S. (ft)     | 3412.70  | Flow Area (sq ft)      | 273.94  | 288.37  | 100.04   |
| E.G. Slope (ft/ft) | 0.000281 | Area (sq ft)           | 273.94  | 288.37  | 100.04   |
| Q Total (cfs)      | 790.00   | Flow (cfs)             | 211.62  | 491.68  | 86.70    |
| Top Width (ft)     | 431.23   | Top Width (ft)         | 264.87  | 85.00   | 81.36    |
| Vel Total (ft/s)   | 1.19     | Avg. Vel. (ft/s)       | 0.77    | 1.71    | 0.87     |
| Max Chl Dpth (ft)  | 3.80     | Hydr. Depth (ft)       | 1.03    | 3.39    | 1.23     |
| Conv. Total (cfs)  | 47090.5  | Conv. (cfs)            | 12614.4 | 29308.0 | 5168.1   |
| Length Wtd. (ft)   | 841.78   | Wetted Per. (ft)       | 264.90  | 85.04   | 81.40    |
| Min Ch El (ft)     | 3408.90  | Shear (lb/sq ft)       | 0.02    | 0.06    | 0.02     |
| Alpha              | 1.44     | Stream Power (lb/ft s) | 0.01    | 0.10    | 0.02     |
| Frctn Loss (ft)    | 0.77     | Cum Volume (acre-ft)   | 2.34    | 15.75   | 1.17     |
| C & E Loss (ft)    | 0.05     | Cum SA (acres)         | 2.27    | 20.69   | 0.95     |

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 sections.



## FloodPlain.rep

OSS

section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to

critical depth, the calculated water surface came back below critical depth. This indicates

that there is not a valid subcritical answer. The program defaulted to critical depth.

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

CROSS SECTION RIVER: Ditch A  
REACH: 5 RS: 1888

## INPUT

Description: Sta. 1888

| Station | Elevation | Data | num= | 6   | Sta  | Elev | Sta  | Elev | Sta  | Elev | Sta | Elev |
|---------|-----------|------|------|-----|------|------|------|------|------|------|-----|------|
| 100     | 3410.2    | 110  | 3410 | 331 | 3408 | 532  | 3408 | 690  | 3408 |      |     |      |
| 1180    | 3410      |      |      |     |      |      |      |      |      |      |     |      |

| Manning's n | Values | num= | 3    | Sta  | n Val | Sta | n Val |
|-------------|--------|------|------|------|-------|-----|-------|
| 100         | .033   | 100  | .033 | 1180 | .033  |     |       |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 100  | 1180  |          | 305 828      | 980   | .1           | .3     |

## CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3408.70  | Element                | Left OB | Channel | Right OB |
|--------------------|----------|------------------------|---------|---------|----------|
| Vel Head (ft)      | 0.21     | Wt. n-Val.             |         | 0.033   |          |
| W.S. Elev (ft)     | 3408.49  | Reach Len. (ft)        | 305.00  | 828.00  | 980.00   |
| Crit W.S. (ft)     | 3408.49  | Flow Area (sq ft)      |         | 218.19  |          |
| E.G. Slope (ft/ft) | 0.021974 | Area (sq ft)           |         | 218.19  |          |
| Q Total (cfs)      | 803.00   | Flow (cfs)             |         | 803.00  |          |
| Top Width (ft)     | 532.93   | Top Width (ft)         |         | 532.93  |          |
| Vel Total (ft/s)   | 3.68     | Avg. Vel. (ft/s)       |         | 3.68    |          |
| Max Chl Dpth (ft)  | 0.49     | Hydr. Depth (ft)       |         | 0.41    |          |
| Conv. Total (cfs)  | 5417.1   | Conv. (cfs)            |         | 5417.1  |          |
| Length Wtd. (ft)   | 828.00   | Wetted Per. (ft)       |         | 532.93  |          |
| Min Ch El (ft)     | 3408.00  | Shear (lb/sq ft)       |         | 0.56    |          |
| Alpha              | 1.00     | Stream Power (lb/ft s) |         | 2.07    |          |
| Frctn Loss (ft)    | 1.14     | Cum Volume (acre-ft)   |         | 10.83   |          |
| C & E Loss (ft)    | 0.06     | Cum SA (acres)         |         | 14.69   |          |

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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 RIVER: Ditch A  
REACH: 5 RS: 1060

INPUT

Description: Sta. 1060

| Station Elevation Data |        | num= 6 |      |     |        |     |        |      |      |
|------------------------|--------|--------|------|-----|--------|-----|--------|------|------|
| Sta                    | Elev   | Sta    | Elev | Sta | Elev   | Sta | Elev   | Sta  | Elev |
| 100                    | 3408   | 394    | 3406 | 879 | 3402.7 | 909 | 3402.7 | 1206 | 3405 |
| 1554                   | 3404.3 |        |      |     |        |     |        |      |      |

| Manning's n Values |       | num= 3 |       |      |       |
|--------------------|-------|--------|-------|------|-------|
| Sta                | n Val | Sta    | n Val | Sta  | n Val |
| 100                | .033  | 394    | .033  | 1554 | .033  |

| Bank Sta: | Left | Right | Lengths: | Left Channel | Right | Coeff Contr. | Expan. |
|-----------|------|-------|----------|--------------|-------|--------------|--------|
|           | 394  | 1554  |          | 60 60        | 60    | .1           | .3     |

CROSS SECTION OUTPUT Profile #100 Yr.-WS3405

| E.G. Elev (ft)     | 3405.01  | Element                | Left OB | Channel | Right OB |
|--------------------|----------|------------------------|---------|---------|----------|
| Vel Head (ft)      | 0.01     | Wt. n-Val.             |         | 0.033   |          |
| W.S. Elev (ft)     | 3405.00  | Reach Len. (ft)        |         |         |          |
| Crit W.S. (ft)     | 3403.77  | Flow Area (sq ft)      |         | 921.10  |          |
| E.G. Slope (ft/ft) | 0.000467 | Area (sq ft)           |         | 921.10  |          |
| Q Total (cfs)      | 841.00   | Flow (cfs)             |         | 841.00  |          |
| Top Width (ft)     | 1013.03  | Top Width (ft)         |         | 1013.03 |          |
| Vel Total (ft/s)   | 0.91     | Avg. Vel. (ft/s)       |         | 0.91    |          |
| Max Chl Dpth (ft)  | 2.30     | Hydr. Depth (ft)       |         | 0.91    |          |
| Conv. Total (cfs)  | 38907.7  | Conv. (cfs)            |         | 38907.7 |          |
| Length Wtd. (ft)   |          | Wetted Per. (ft)       |         | 1013.75 |          |
| Min Ch El (ft)     | 3402.70  | Shear (lb/sq ft)       |         | 0.03    |          |
| Alpha              | 1.00     | Stream Power (lb/ft s) |         | 0.02    |          |
| Frctn Loss (ft)    |          | Cum Volume (acre-ft)   |         |         |          |

C & E Loss (ft)

FloodPlain.rep  
Cum SA (acres)

Warning: Divided flow computed for this cross-section.

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

# SUMMARY OF MANNING'S N VALUES

River: Ditch A

| Reach | River Sta. | n1      | n2   | n3   |
|-------|------------|---------|------|------|
| 5     | 12674      | .033    | .033 | .033 |
| 5     | 11337      | .033    | .033 | .033 |
| 5     | 10937      | .033    | .033 | .033 |
| 5     | 10288      | .033    | .033 | .033 |
| 5     | 9690       | .033    | .033 | .033 |
| 5     | 9009       | .033    | .033 | .033 |
| 5     | 8130       | .033    | .033 | .033 |
| 5     | 7717       | .033    | .033 | .033 |
| 5     | 7253       | .033    | .033 | .033 |
| 5     | 6343       | .033    | .033 | .033 |
| 5     | 5363       | .033    | .033 | .033 |
| 5     | 4221       | .033    | .033 | .033 |
| 5     | 3489       | .033    | .033 | .033 |
| 5     | 2989       | .033    | .033 | .033 |
| 5     | 2774       | .033    | .033 | .033 |
| 5     | 2773       | Culvert |      |      |
| 5     | 2734       | .033    | .033 | .033 |
| 5     | 1888       | .033    | .033 | .033 |
| 5     | 1060       | .033    | .033 | .033 |

# SUMMARY OF REACH LENGTHS

River: Ditch A

| Reach | River Sta. | Left    | Channel | Right |
|-------|------------|---------|---------|-------|
| 5     | 12674      | 1206    | 1337    | 1433  |
| 5     | 11337      | 545     | 400     | 332   |
| 5     | 10937      | 729     | 649     | 445   |
| 5     | 10288      | 552     | 598     | 633   |
| 5     | 9690       | 639     | 681     | 658   |
| 5     | 9009       | 898     | 879     | 794   |
| 5     | 8130       | 399     | 413     | 456   |
| 5     | 7717       | 444     | 464     | 510   |
| 5     | 7253       | 756     | 910     | 980   |
| 5     | 6343       | 767     | 980     | 1051  |
| 5     | 5363       | 1199    | 1142    | 713   |
| 5     | 4221       | 749     | 732     | 843   |
| 5     | 3489       | 464     | 500     | 457   |
| 5     | 2989       | 317     | 215     | 172   |
| 5     | 2774       | 40      | 40      | 40    |
| 5     | 2773       | Culvert |         |       |
| 5     | 2734       | 745     | 846     | 1015  |
| 5     | 1888       | 305     | 828     | 980   |
| 5     | 1060       | 60      | 60      | 60    |

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS  
River: Ditch A

| Reach | River Sta. | Contr.  | Expan. |
|-------|------------|---------|--------|
| 5     | 12674      | .1      | .3     |
| 5     | 11337      | .1      | .3     |
| 5     | 10937      | .1      | .3     |
| 5     | 10288      | .1      | .3     |
| 5     | 9690       | .1      | .3     |
| 5     | 9009       | .1      | .3     |
| 5     | 8130       | .1      | .3     |
| 5     | 7717       | .1      | .3     |
| 5     | 7253       | .1      | .3     |
| 5     | 6343       | .1      | .3     |
| 5     | 5363       | .1      | .3     |
| 5     | 4221       | .1      | .3     |
| 5     | 3489       | .1      | .3     |
| 5     | 2989       | .3      | .5     |
| 5     | 2774       | .3      | .5     |
| 5     | 2773       | Culvert |        |
| 5     | 2734       |         | .5     |
| 5     | 1888       | .1      | .3     |
| 5     | 1060       | .1      | .3     |

Profile Output Table - Standard Table 1

| Reach<br>lope | Vel Chnl<br>(ft/s) | River Sta<br>Flow Area<br>(sq ft) | Q Total<br>Top Width<br>(ft) | Min Ch El<br>Froude # Chl<br>(ft) | W.S. Elev<br>(ft) | Crit W.S.<br>(ft) | E.G. Elev<br>(ft) | E.G. S<br>(ft) |
|---------------|--------------------|-----------------------------------|------------------------------|-----------------------------------|-------------------|-------------------|-------------------|----------------|
| 5             |                    | 12674                             | 257.00                       | 3477.00                           | 3478.09           | 3477.76           | 3478.13           | 0.00           |
| 2948          | 1.71               | 150.30                            | 266.62                       | 0.39                              |                   |                   |                   |                |
| 5             |                    | 11337                             | 257.00                       | 3469.00                           | 3470.06           | 3470.03           | 3470.31           | 0.01           |
| 6594          | 3.96               | 64.97                             | 117.70                       | 0.93                              |                   |                   |                   |                |
| 5             |                    | 10937                             | 257.00                       | 3464.00                           | 3465.38           | 3465.18           | 3465.56           | 0.00           |
| 8826          | 3.45               | 74.55                             | 101.30                       | 0.71                              |                   |                   |                   |                |
| 5             |                    | 10288                             | 257.00                       | 3456.00                           | 3456.67           | 3456.67           | 3456.87           | 0.02           |
| 2674          | 3.57               | 71.89                             | 187.76                       | 1.02                              |                   |                   |                   |                |
| 5             |                    | 9690                              | 325.00                       | 3450.00                           | 3451.19           | 3450.87           | 3451.26           | 0.00           |
| 4338          | 2.13               | 152.62                            | 250.83                       | 0.48                              |                   |                   |                   |                |
| 5             |                    | 9009                              | 325.00                       | 3445.00                           | 3446.12           | 3446.04           | 3446.32           | 0.01           |
| 4428          | 3.57               | 91.07                             | 169.88                       | 0.86                              |                   |                   |                   |                |
| 5             |                    | 8130                              | 325.00                       | 3440.00                           | 3441.25           | 3440.85           | 3441.30           | 0.00           |
| 2988          | 1.84               | 176.81                            | 273.95                       | 0.40                              |                   |                   |                   |                |
| 5             |                    | 7717                              | 325.00                       | 3437.80                           | 3438.44           | 3438.44           | 3438.64           | 0.02           |
| 2265          | 3.64               | 89.29                             | 223.91                       | 1.02                              |                   |                   |                   |                |
| 5             |                    | 7253                              | 364.00                       | 3435.00                           | 3436.09           | 3435.67           | 3436.12           | 0.00           |
| 1631          | 1.28               | 284.83                            | 491.10                       | 0.29                              |                   |                   |                   |                |
| 5             |                    | 6343                              | 687.00                       | 3430.00                           | 3430.46           | 3430.46           | 3430.67           | 0.02           |
| 2292          | 3.65               | 188.08                            | 469.62                       | 1.02                              |                   |                   |                   |                |
| 5             |                    | 5363                              | 687.00                       | 3425.00                           | 3426.02           | 3425.54           | 3426.05           | 0.00           |
| 1698          | 1.41               | 486.85                            | 739.57                       | 0.31                              |                   |                   |                   |                |
| 5             |                    | 4221                              | 790.00                       | 3420.00                           | 3420.71           | 3420.71           | 3420.96           | 0.02           |
| 0617          | 4.01               | 196.80                            | 402.25                       | 1.01                              |                   |                   |                   |                |
| 5             |                    | 3489                              | 790.00                       | 3416.00                           | 3416.92           | 3416.52           | 3416.96           | 0.00           |

| FloodPlain.rep |      |         |         |         |         |         |         |      |
|----------------|------|---------|---------|---------|---------|---------|---------|------|
| 2177           | 1.66 | 493.43  | 743.33  | 0.35    |         |         |         |      |
| 5              |      | 2989    | 790.00  | 3413.80 | 3414.32 | 3414.32 | 3414.51 | 0.02 |
| 2050           | 3.36 | 226.05  | 600.34  | 0.99    |         |         |         |      |
| 5              |      | 2774    | 790.00  | 3409.00 | 3413.71 | 3412.70 | 3413.72 | 0.00 |
| 0067           | 0.99 | 1102.27 | 452.54  | 0.08    |         |         |         |      |
| 5              |      | 2773    | Culvert |         |         |         |         |      |
| 5              |      | 2734    | 790.00  | 3408.90 | 3412.70 | 3412.70 | 3412.73 | 0.00 |
| 0281           | 1.71 | 662.35  | 431.23  | 0.16    |         |         |         |      |
| 5              |      | 1888    | 803.00  | 3408.00 | 3408.49 | 3408.49 | 3408.70 | 0.02 |
| 1974           | 3.68 | 218.19  | 532.93  | 1.01    |         |         |         |      |
| 5              |      | 1060    | 841.00  | 3402.70 | 3405.00 | 3403.77 | 3405.01 | 0.00 |
| 0467           | 0.91 | 921.10  | 1013.03 | 0.17    |         |         |         |      |

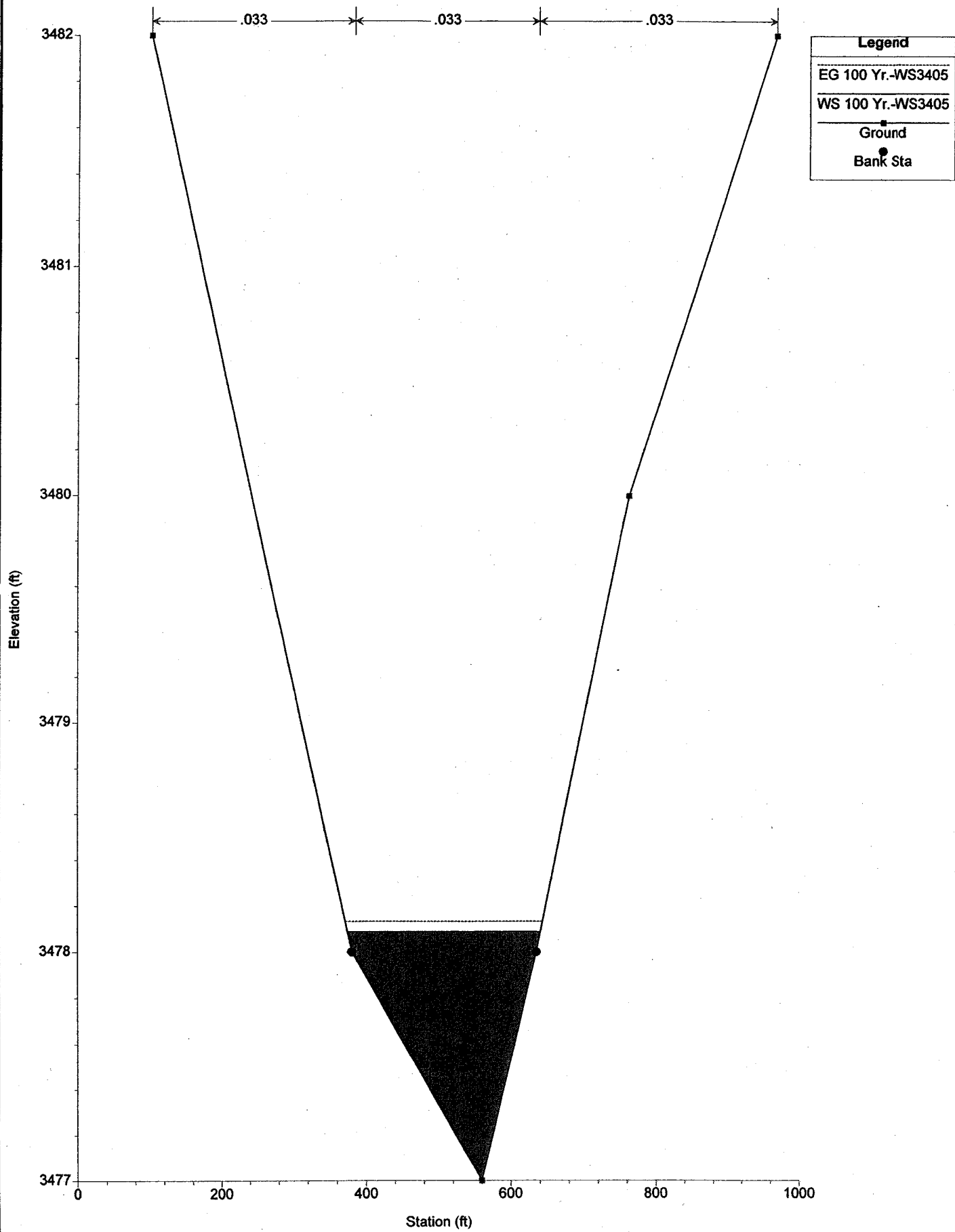
# Profile Output Table - Report

| Reach  | River Sta  | Q Total  | Min Ch El     | W.S. Elev    | Crit W.S.       | Max Chl Dpth | E.G          |
|--------|------------|----------|---------------|--------------|-----------------|--------------|--------------|
| . Elev | E.G. Slope | Vel Chnl | Sta W.S. Lft  | Sta W.S. Rgt | Flow Area       | Top Width    | Froude # Chl |
| (ft)   | (ft/ft)    | (ft/s)   | (cfs)<br>(ft) | (ft)<br>(ft) | (ft)<br>(sq ft) | (ft)         | (ft)         |
| 5      | 12674      |          | 257.00        | 3477.00      | 3478.09         | 3477.76      | 1.09 3       |
| 478.13 | 0.002948   | 1.71     | 373.88        | 640.51       | 150.30          | 266.62       | 0.39         |
| 5      | 11337      |          | 257.00        | 3469.00      | 3470.06         | 3470.03      | 1.06 3       |
| 470.31 | 0.016594   | 3.96     | 433.62        | 551.32       | 64.97           | 117.70       | 0.93         |
| 5      | 10937      |          | 257.00        | 3464.00      | 3465.38         | 3465.18      | 1.38 3       |
| 465.56 | 0.008826   | 3.45     | 487.13        | 588.43       | 74.55           | 101.30       | 0.71         |
| 5      | 10288      |          | 257.00        | 3456.00      | 3456.67         | 3456.67      | 0.67 3       |
| 456.87 | 0.022674   | 3.57     | 427.42        | 615.18       | 71.89           | 187.76       | 1.02         |
| 5      | 9690       |          | 325.00        | 3450.00      | 3451.19         | 3450.87      | 1.19 3       |
| 451.26 | 0.004338   | 2.13     | 482.85        | 733.67       | 152.62          | 250.83       | 0.48         |
| 5      | 9009       |          | 325.00        | 3445.00      | 3446.12         | 3446.04      | 1.12 3       |
| 446.32 | 0.014428   | 3.57     | 482.15        | 652.03       | 91.07           | 169.88       | 0.86         |
| 5      | 8130       |          | 325.00        | 3440.00      | 3441.25         | 3440.85      | 1.25 3       |
| 441.30 | 0.002988   | 1.84     | 507.15        | 781.10       | 176.81          | 273.95       | 0.40         |
| 5      | 7717       |          | 325.00        | 3437.80      | 3438.44         | 3438.44      | 0.64 3       |
| 438.64 | 0.022265   | 3.64     | 350.26        | 574.17       | 89.29           | 223.91       | 1.02         |
| 5      | 7253       |          | 364.00        | 3435.00      | 3436.09         | 3435.67      | 1.09 3       |
| 436.12 | 0.001631   | 1.28     | 419.36        | 910.46       | 284.83          | 491.10       | 0.29         |
| 5      | 6343       |          | 687.00        | 3430.00      | 3430.46         | 3430.46      | 0.46 3       |
| 430.67 | 0.022292   | 3.65     | 817.89        | 1287.51      | 188.08          | 469.62       | 1.02         |
| 5      | 5363       |          | 687.00        | 3425.00      | 3426.02         | 3425.54      | 1.02 3       |
| 426.05 | 0.001698   | 1.41     | 740.20        | 1479.77      | 486.85          | 739.57       | 0.31         |
| 5      | 4221       |          | 790.00        | 3420.00      | 3420.71         | 3420.71      | 0.71 3       |
| 420.96 | 0.020617   | 4.01     | 571.82        | 974.07       | 196.80          | 402.25       | 1.01         |



| FloodPlain.rep |          |      |         |         |         |         |         |      |  |
|----------------|----------|------|---------|---------|---------|---------|---------|------|--|
| 5              | 3489     |      | 790.00  | 3416.00 | 3416.92 | 3416.52 | 1.91    | 3    |  |
| 416.96         | 0.002177 | 1.66 | 126.92  |         | 870.25  | 493.43  | 743.33  | 0.35 |  |
| 5              | 2989     |      | 790.00  | 3413.80 | 3414.32 | 3414.32 | 0.52    | 3    |  |
| 414.51         | 0.022050 | 3.36 | 185.72  |         | 786.06  | 226.05  | 600.34  | 0.99 |  |
| 5              | 2774     |      | 790.00  | 3409.00 | 3413.71 | 3412.70 | 4.71    | 3    |  |
| 413.72         | 0.000067 | 0.99 | 176.53  |         | 629.07  | 1102.27 | 452.54  | 0.08 |  |
| 5              | 2773     |      | Culvert |         |         |         |         |      |  |
| 5              | 2734     |      | 790.00  | 3408.90 | 3412.70 | 3412.70 | 3.80    | 3    |  |
| 412.73         | 0.000281 | 1.71 | 84.13   |         | 515.36  | 662.35  | 431.23  | 0.16 |  |
| 5              | 1888     |      | 803.00  | 3408.00 | 3408.49 | 3408.49 | 0.49    | 3    |  |
| 408.70         | 0.021974 | 3.68 | 276.94  |         | 809.87  | 218.19  | 532.93  | 1.01 |  |
| 5              | 1060     |      | 841.00  | 3402.70 | 3405.00 | 3403.77 | 2.30    | 3    |  |
| 405.01         | 0.000467 | 0.91 | 540.97  |         | 1554.00 | 921.10  | 1013.03 | 0.17 |  |

WCS Plan: 2-04-04MANY  
Sta. 12674



# WCS Plan: 2-04-04MANY

Sta. 11337

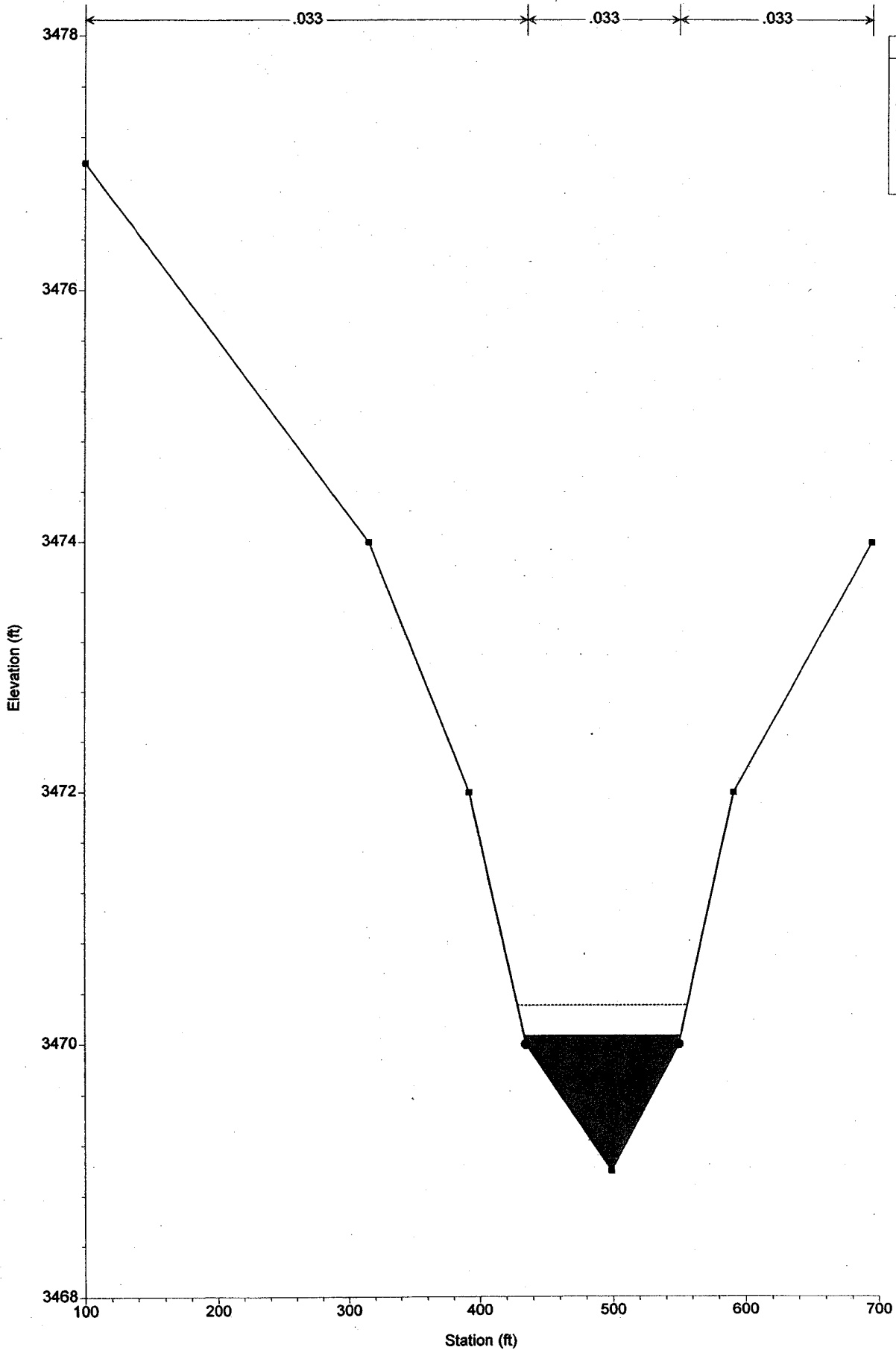
## Legend

EG 100 Yr.-WS3405

WS 100 Yr.-WS3405

Ground

Bank Sta



WCS Plan: 2-04-04MANY

Sta. 10937

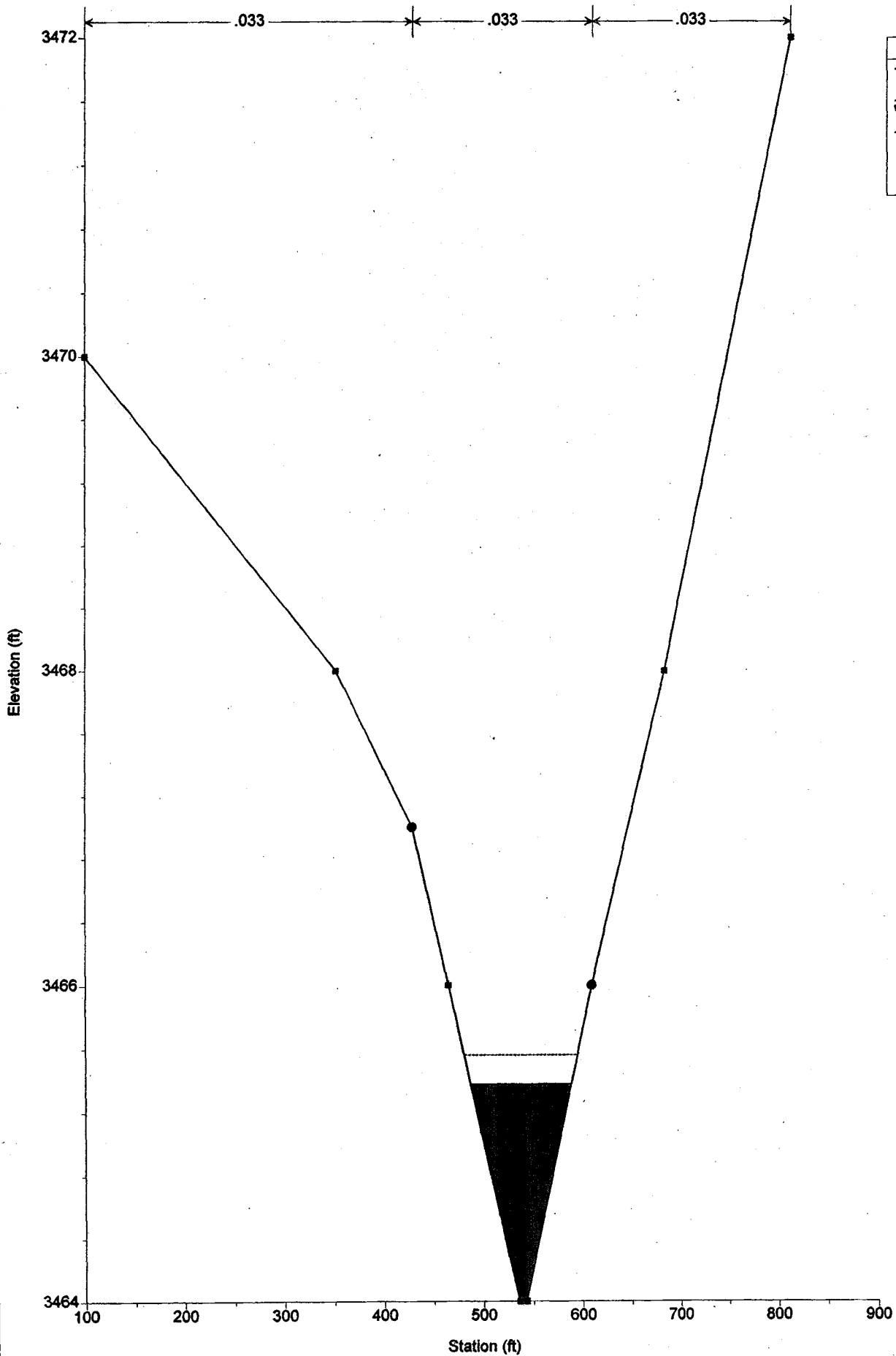
Legend

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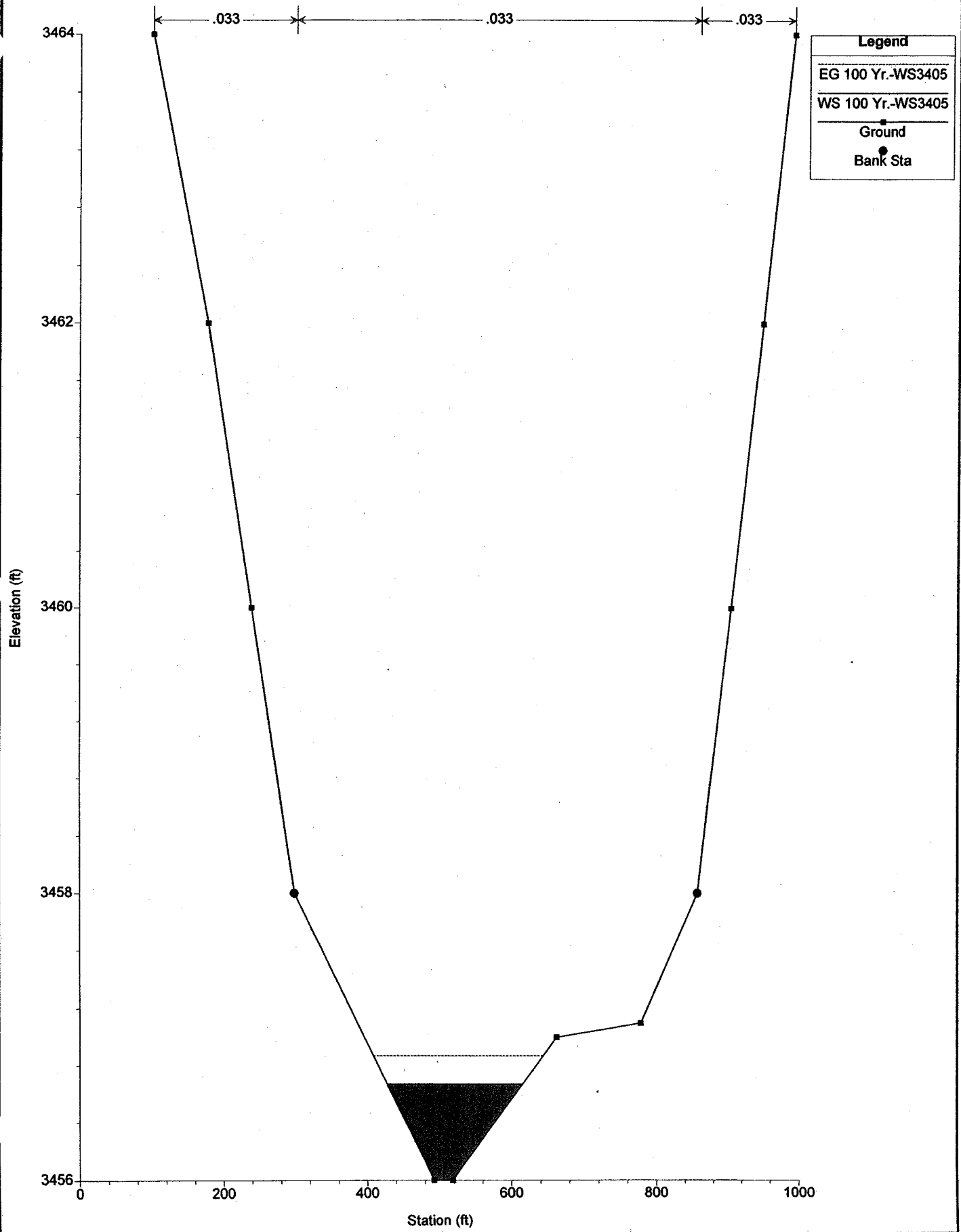
WS 100 Yr.-WS3405

Ground

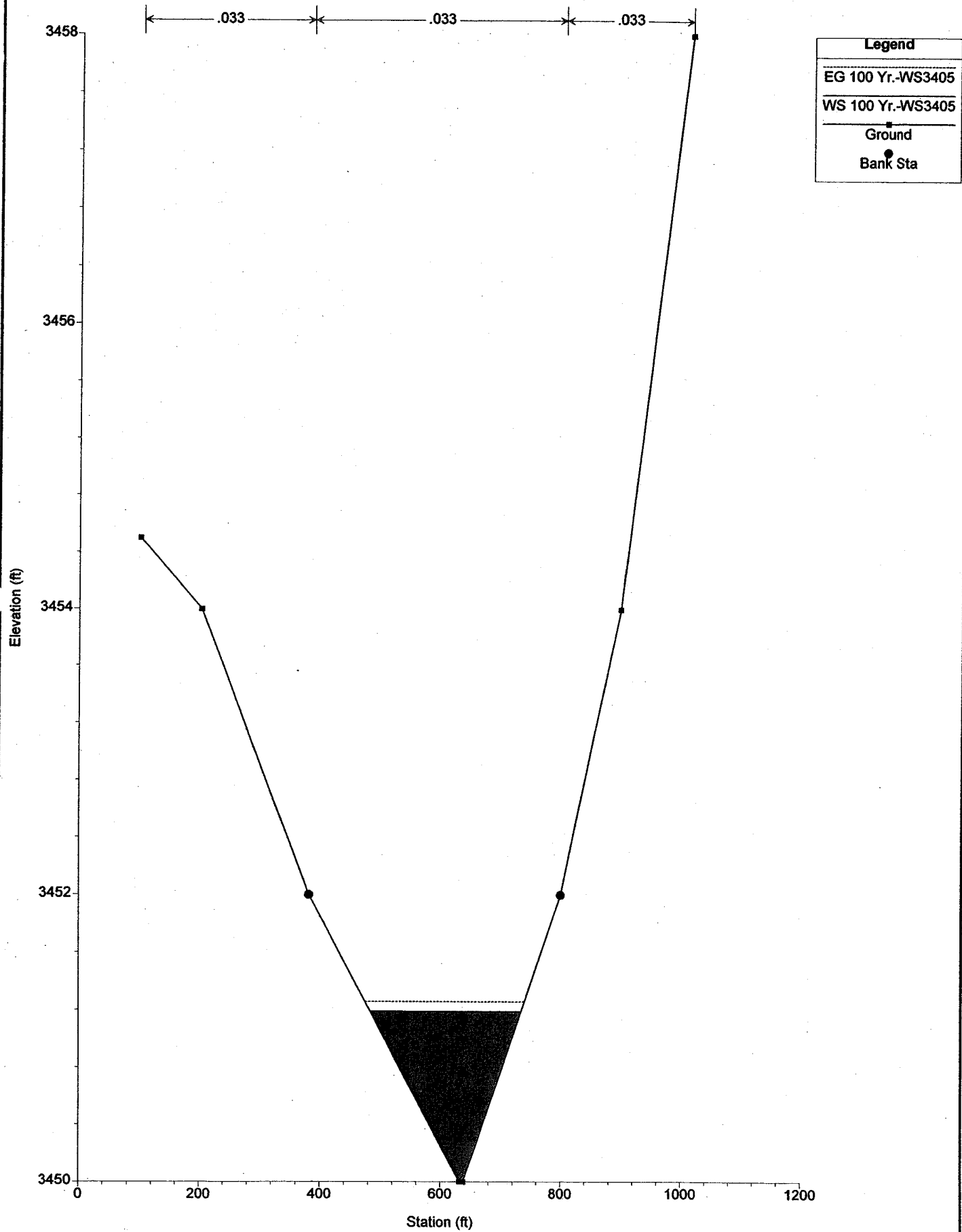
Bank Sta



WCS Plan: 2-04-04MANY  
Sta. 10288

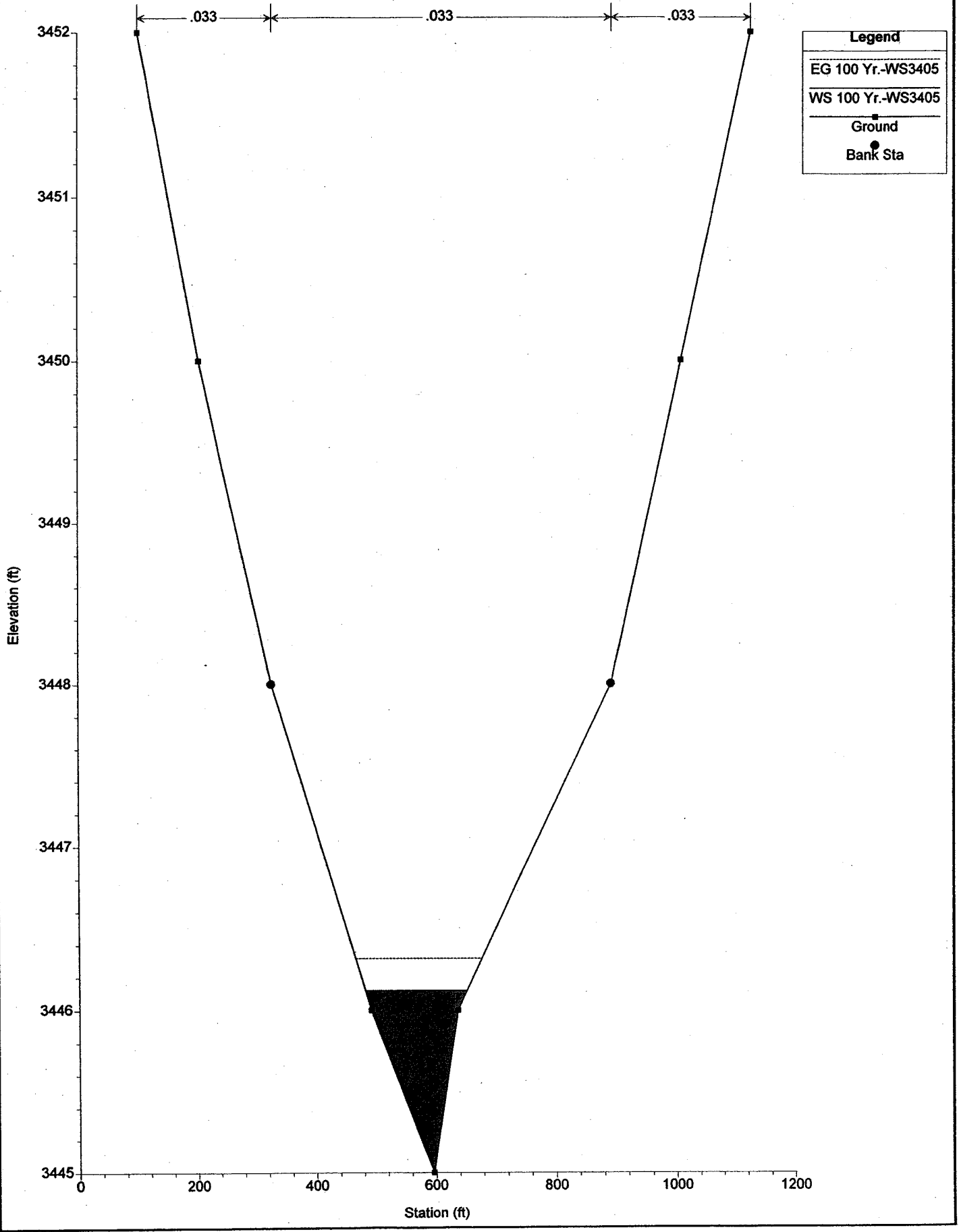


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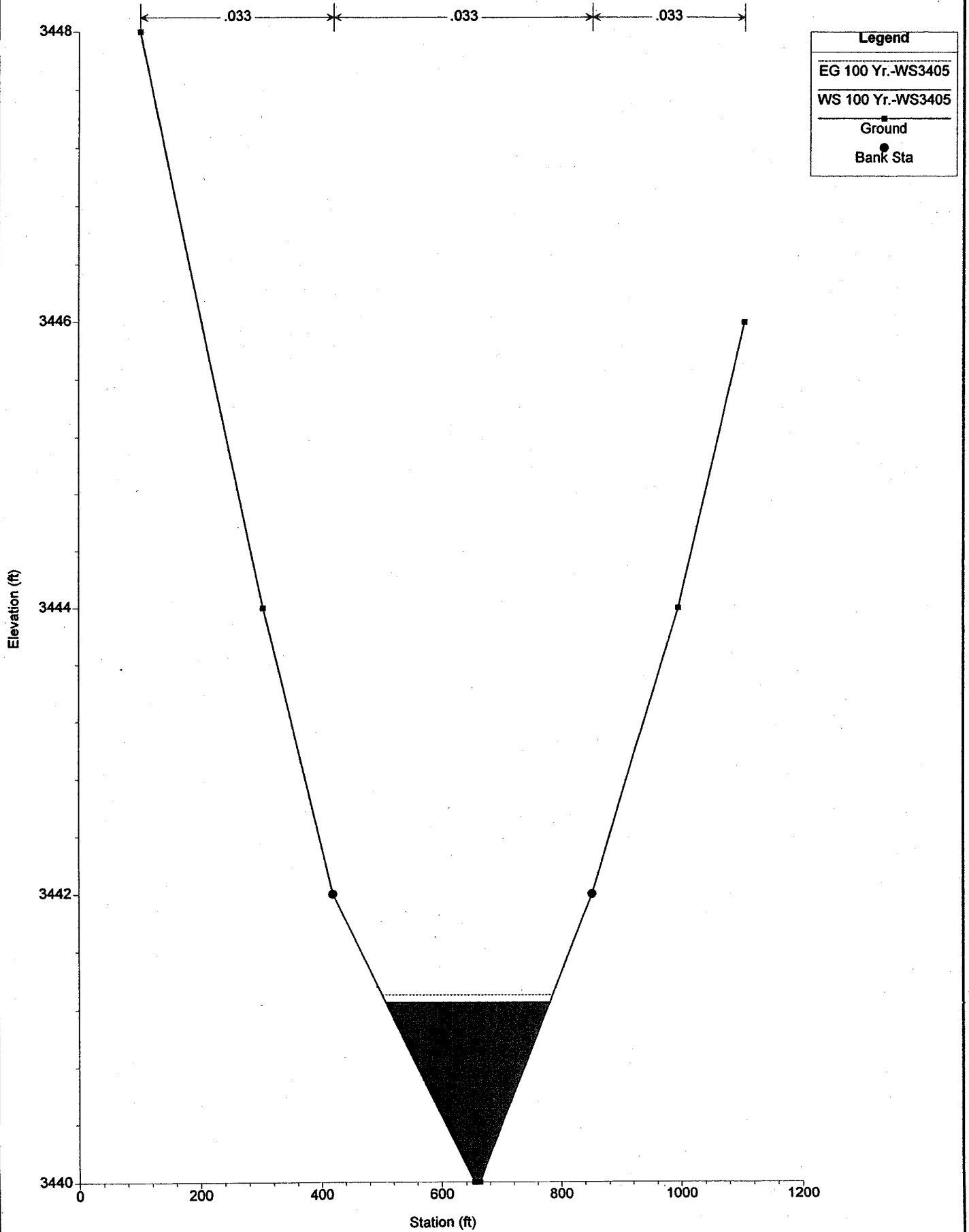




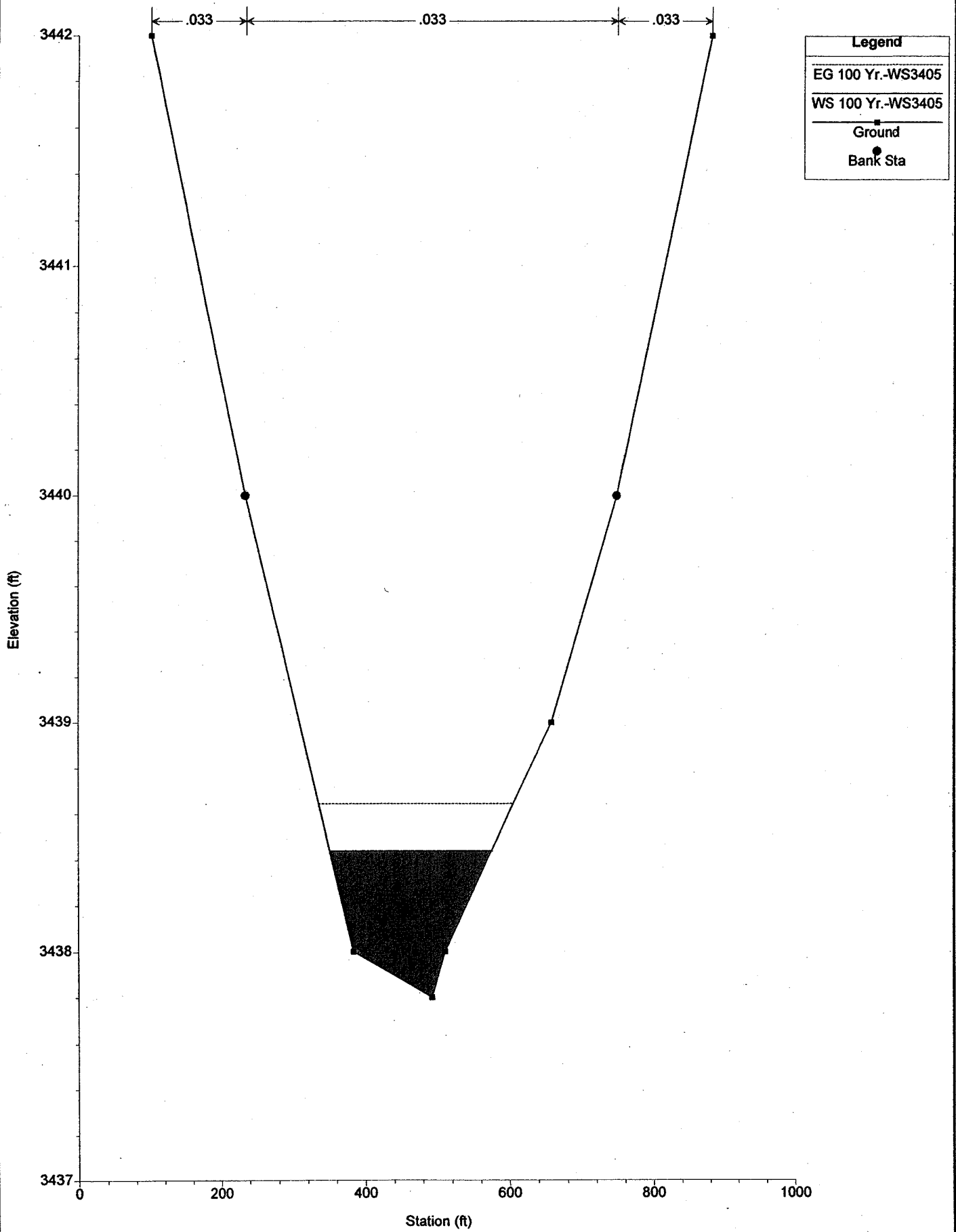
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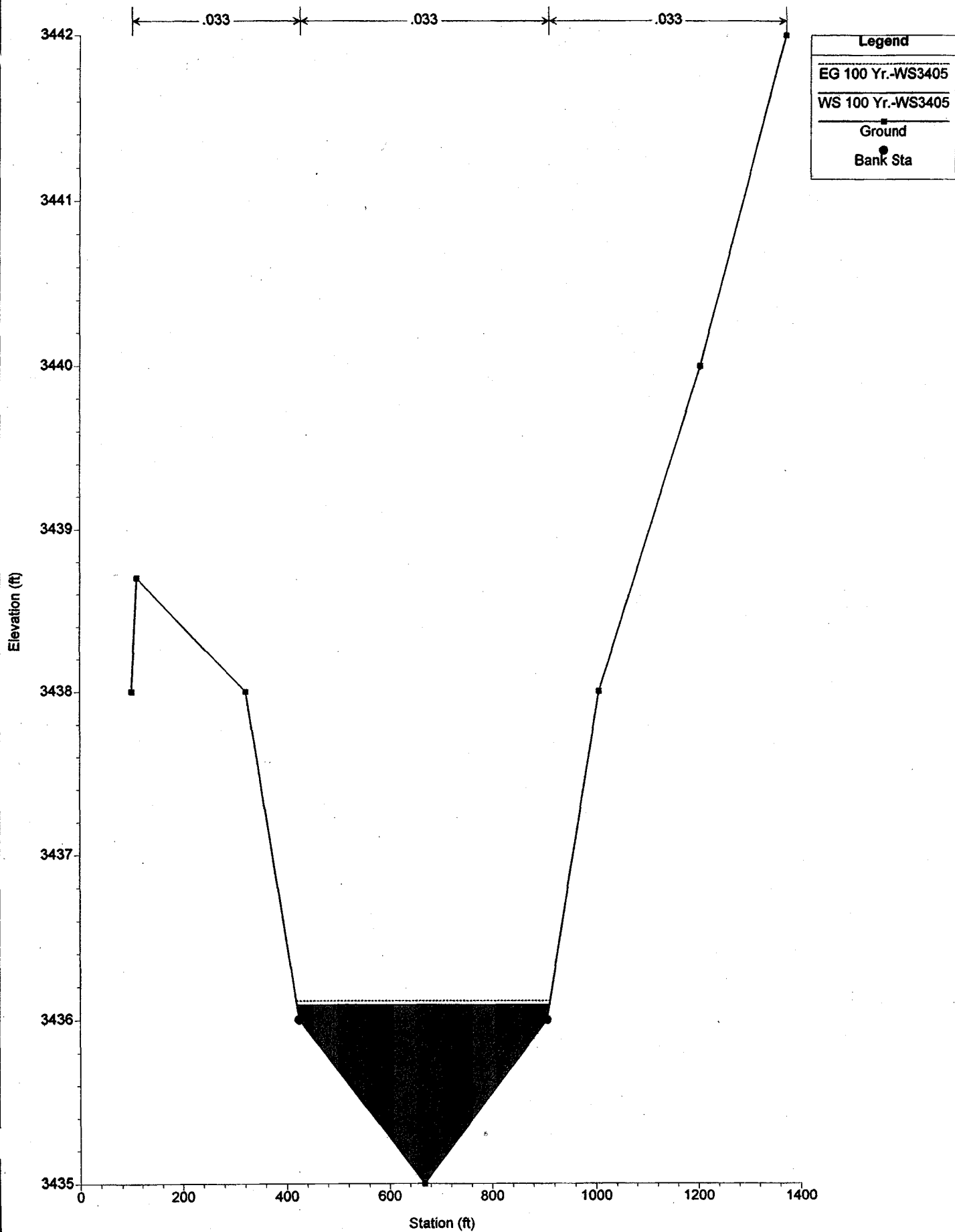
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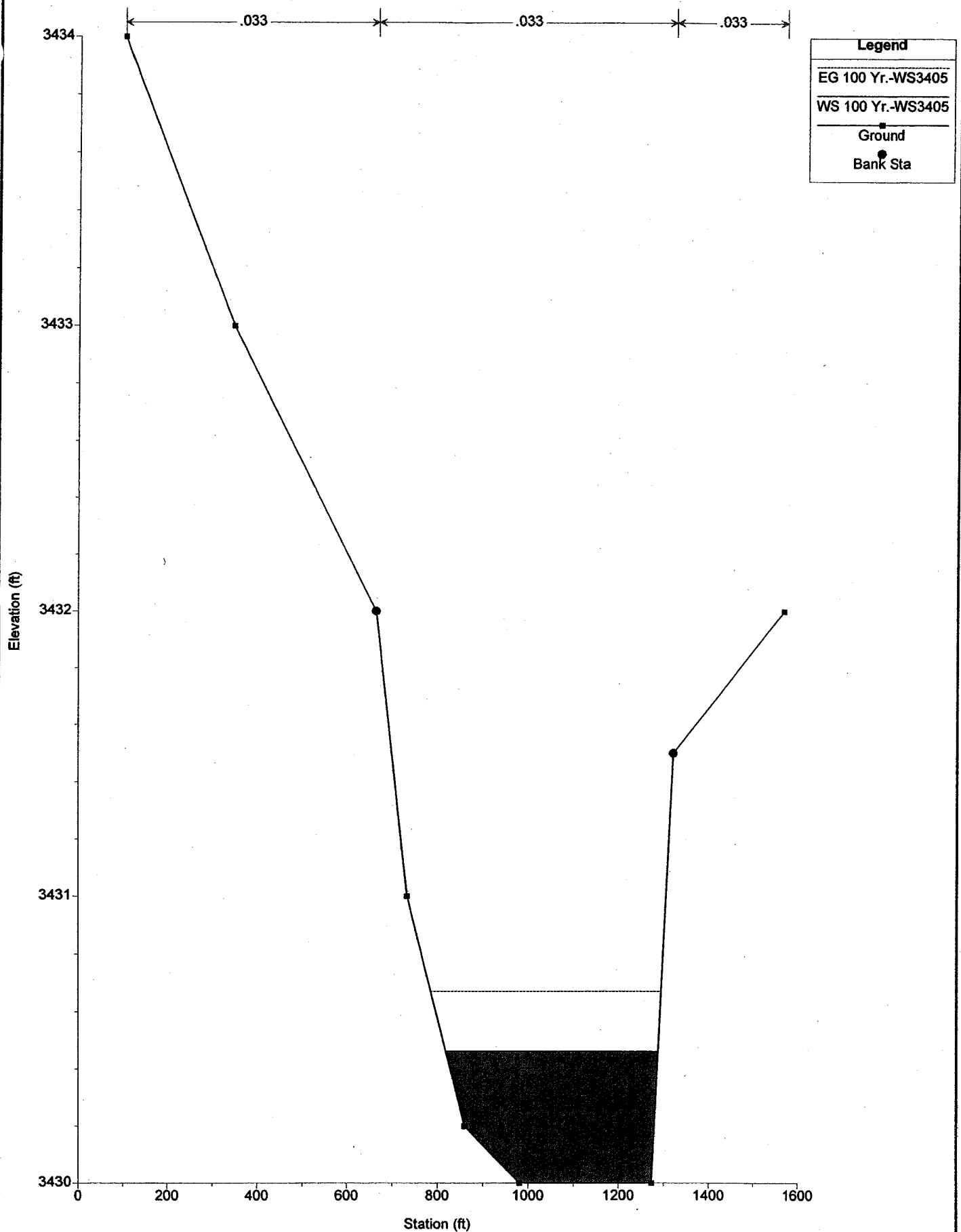
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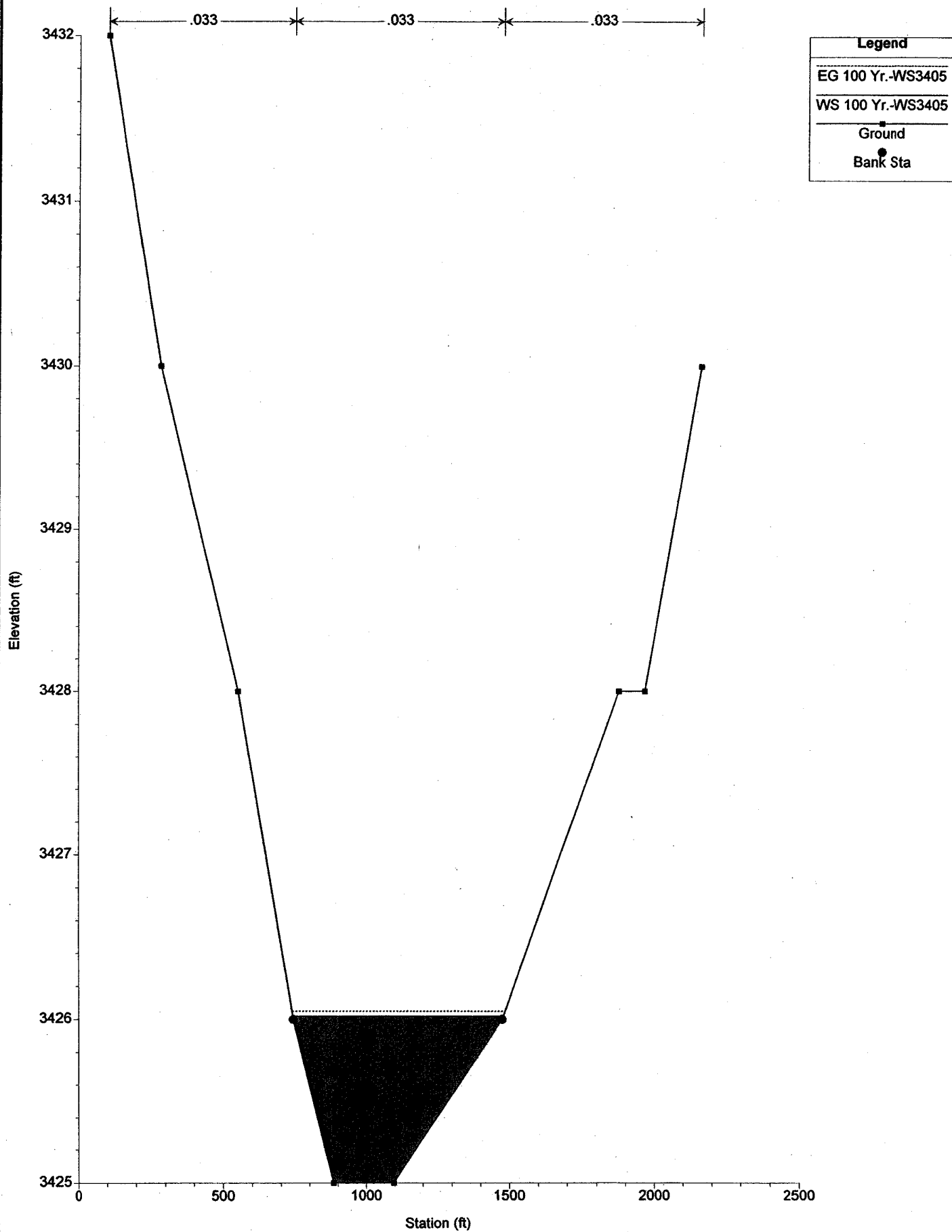
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WCS Plan: 2-04-04MANY  
Sta. 6343

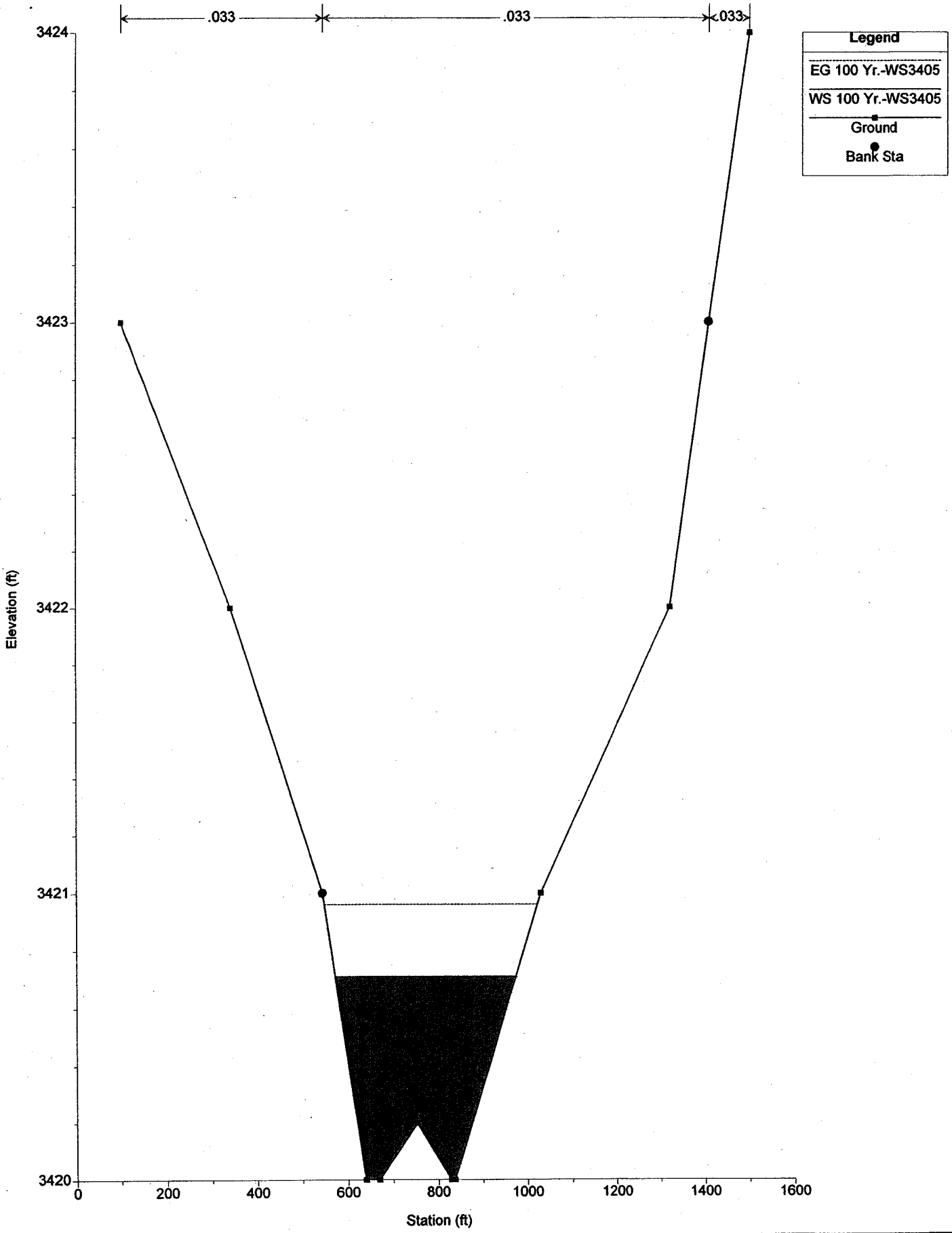


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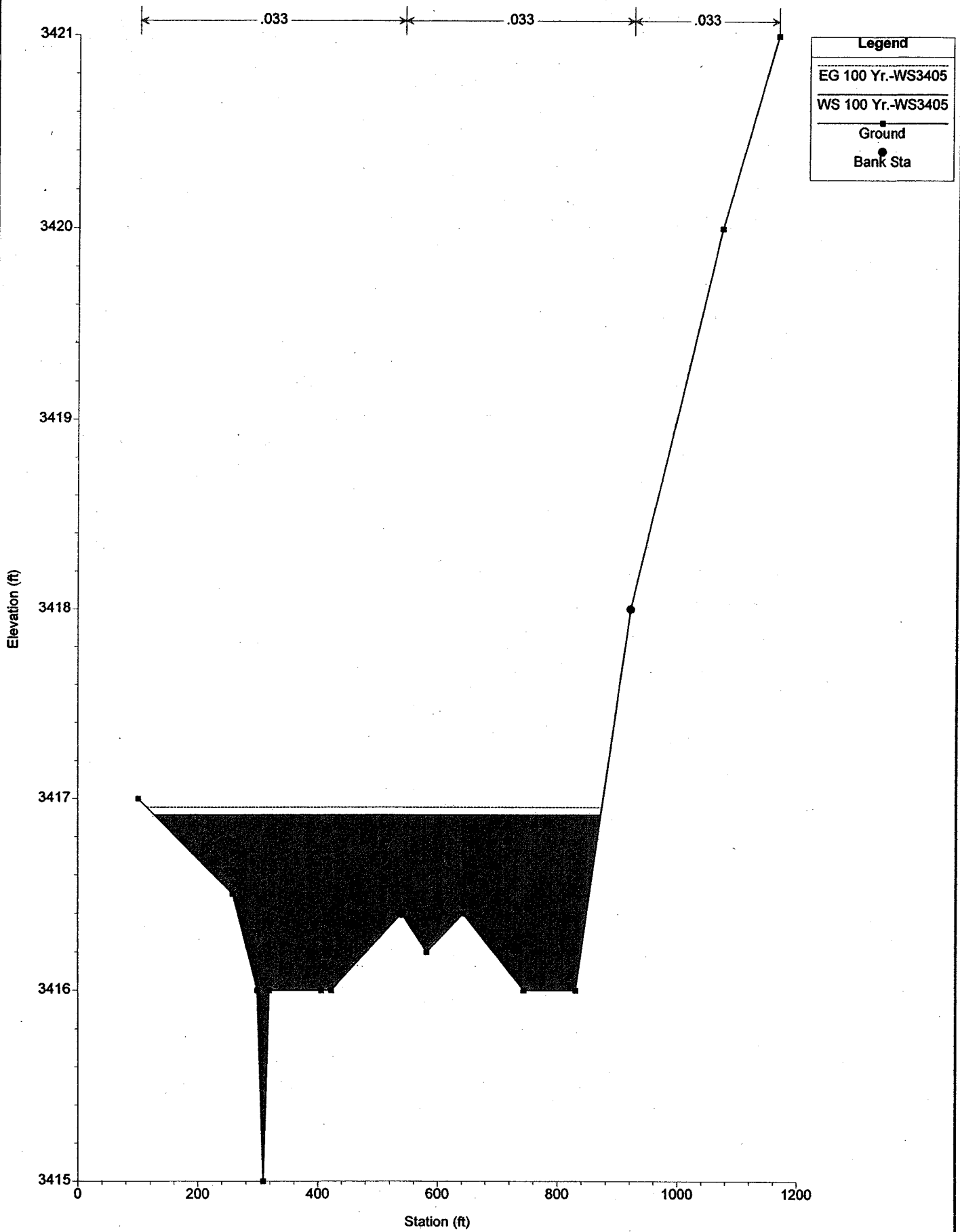




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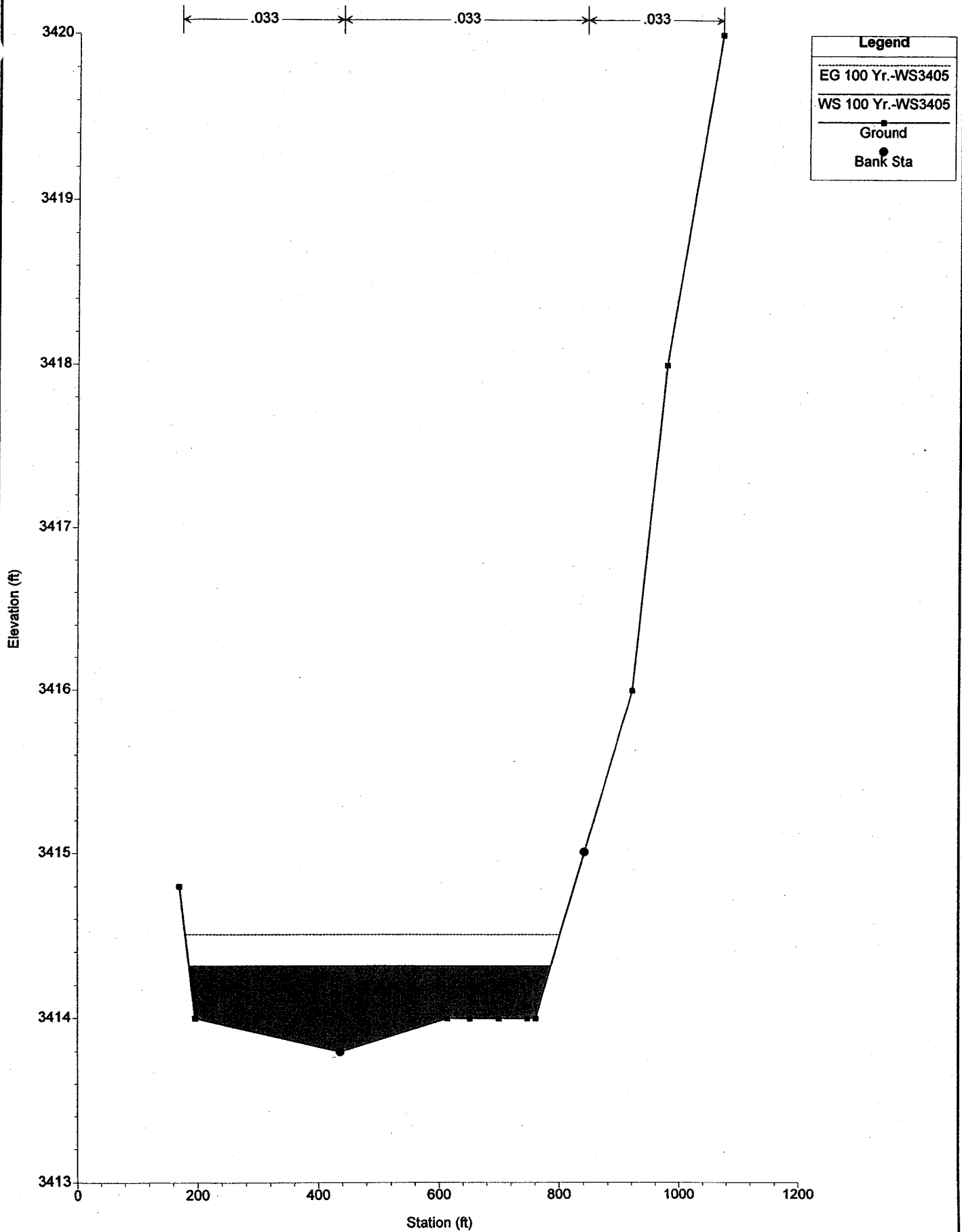


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Sta. 3489

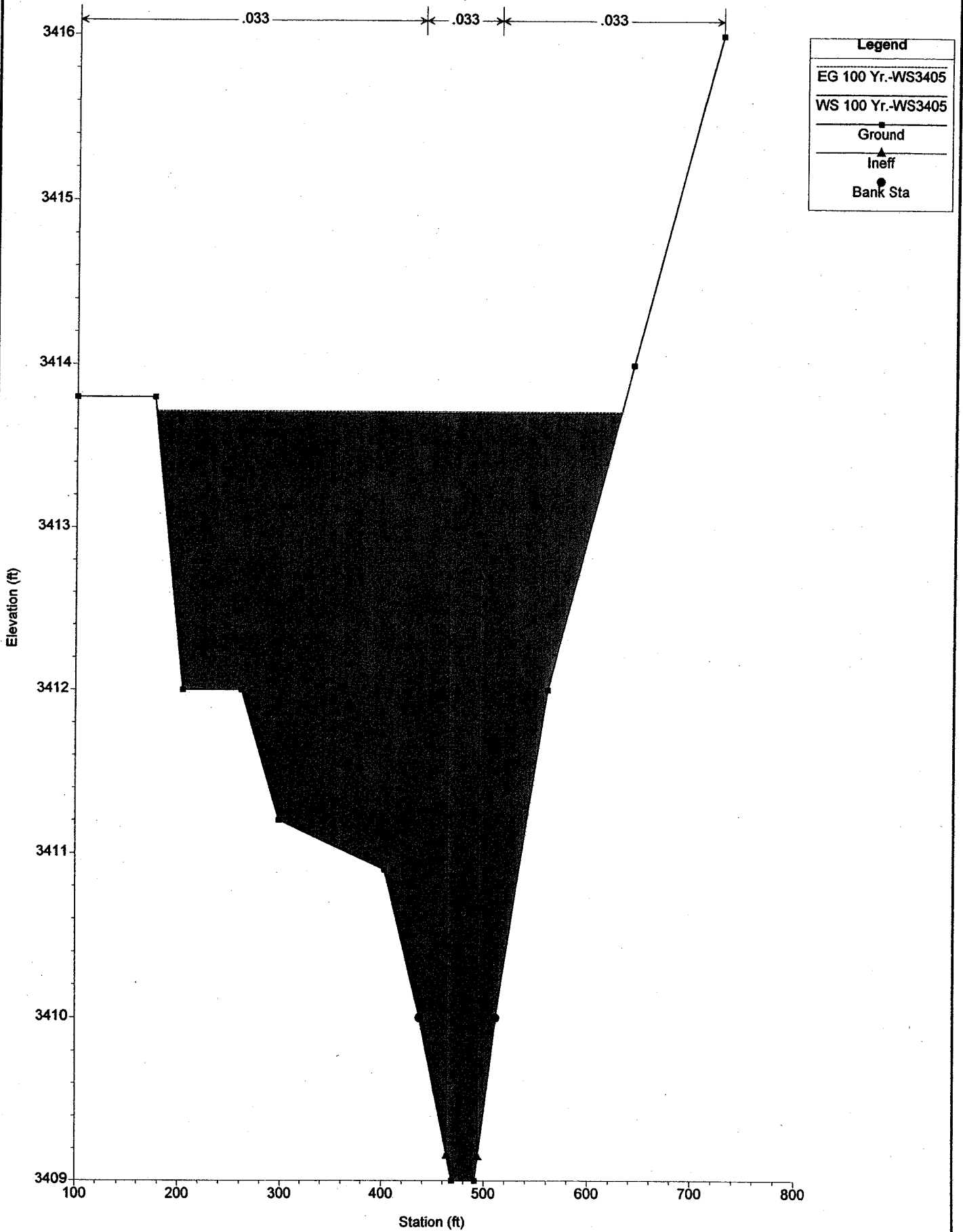


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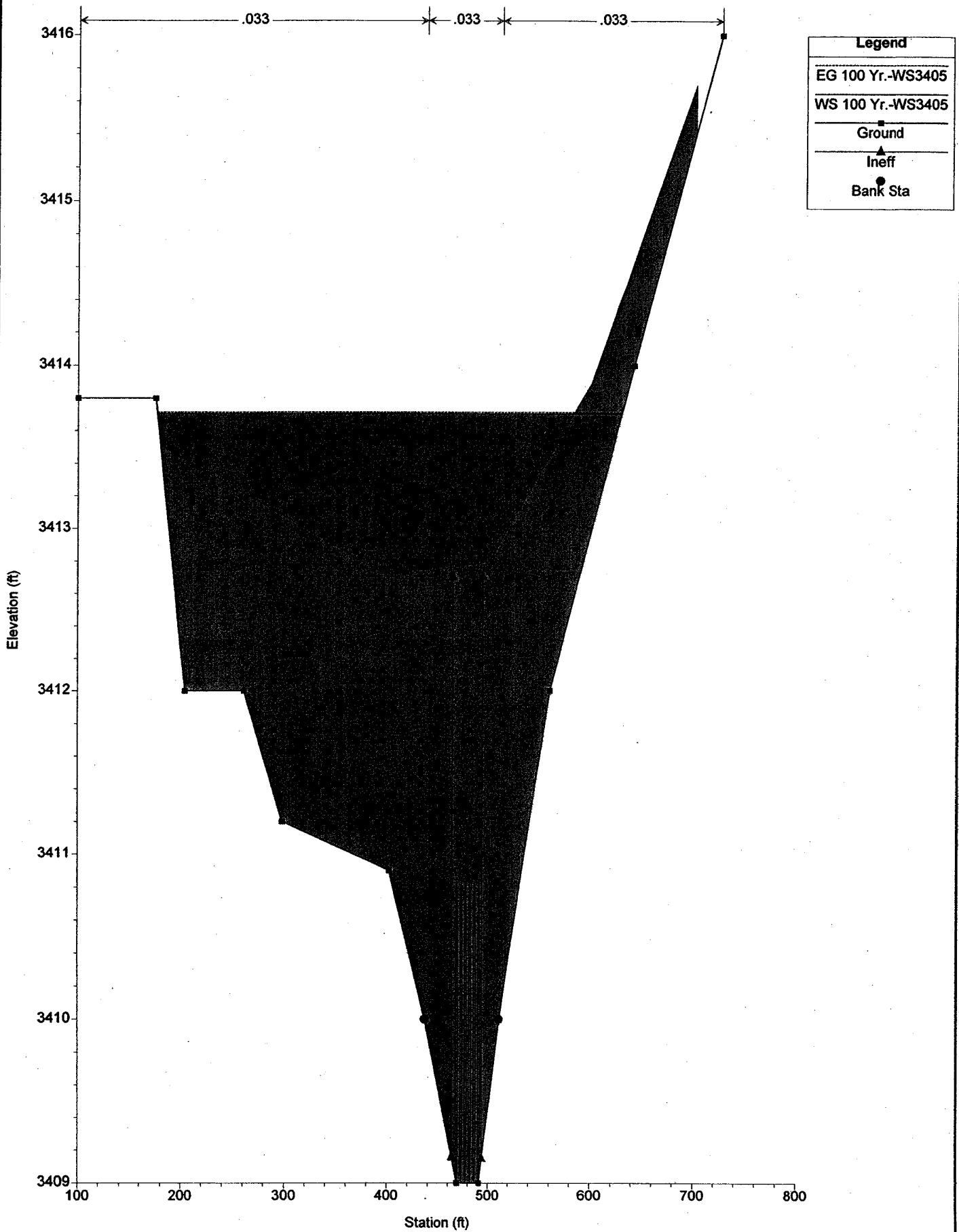
Sta. 2989



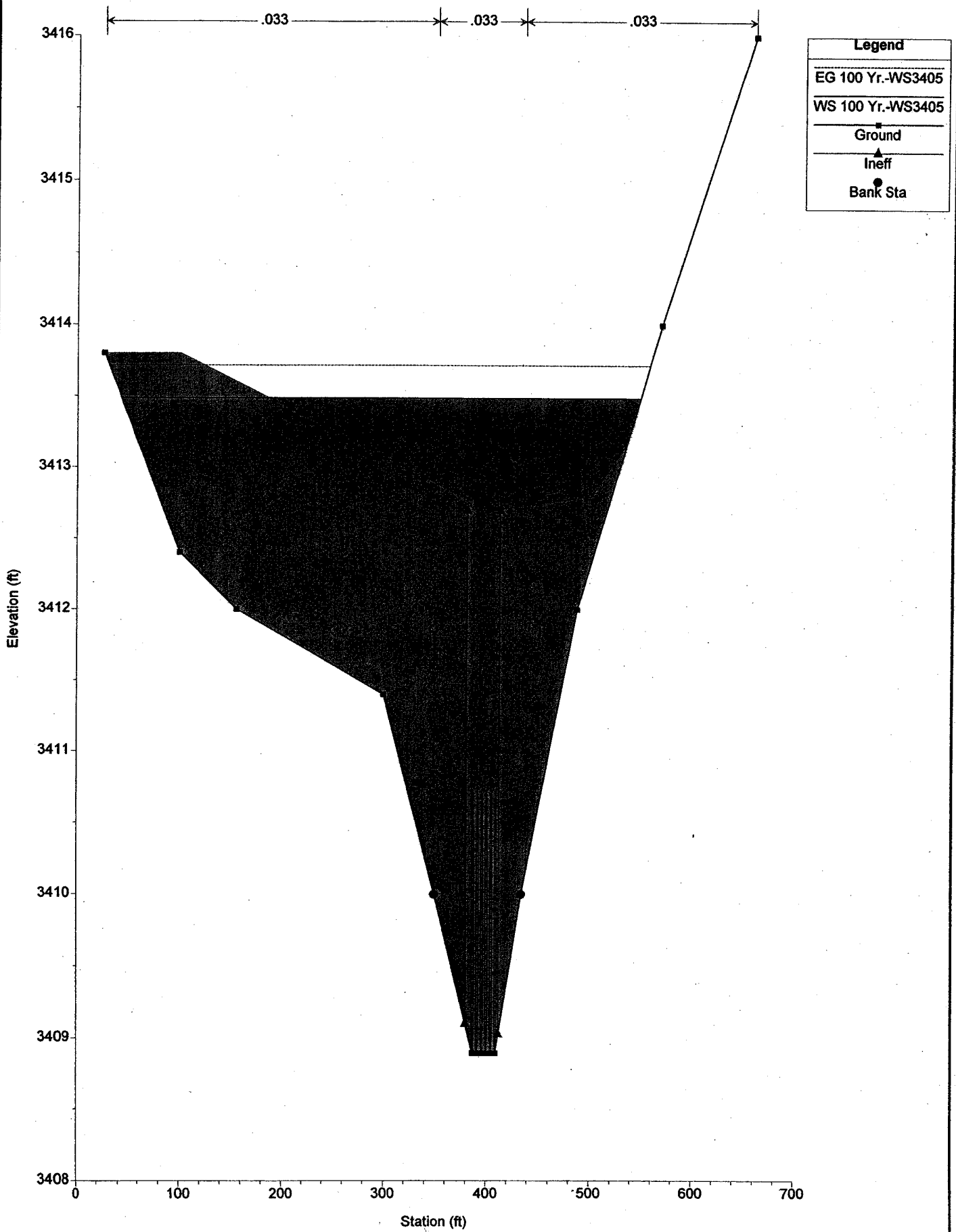
WCS Plan: 2-04-04MANY  
Sta. 2774 Upstream of culverts



WCS Plan: 2-04-04MANY

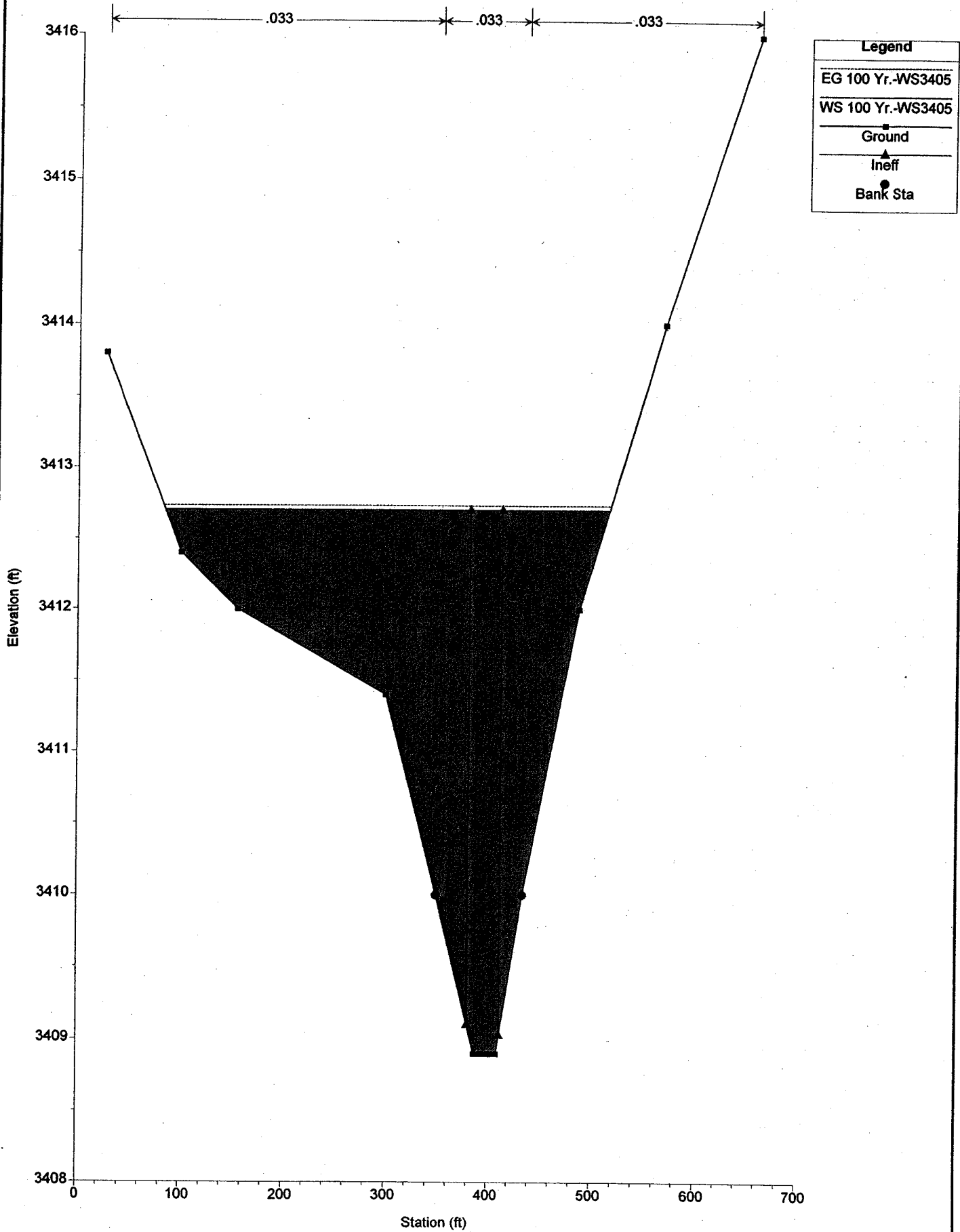


WCS Plan: 2-04-04MANY

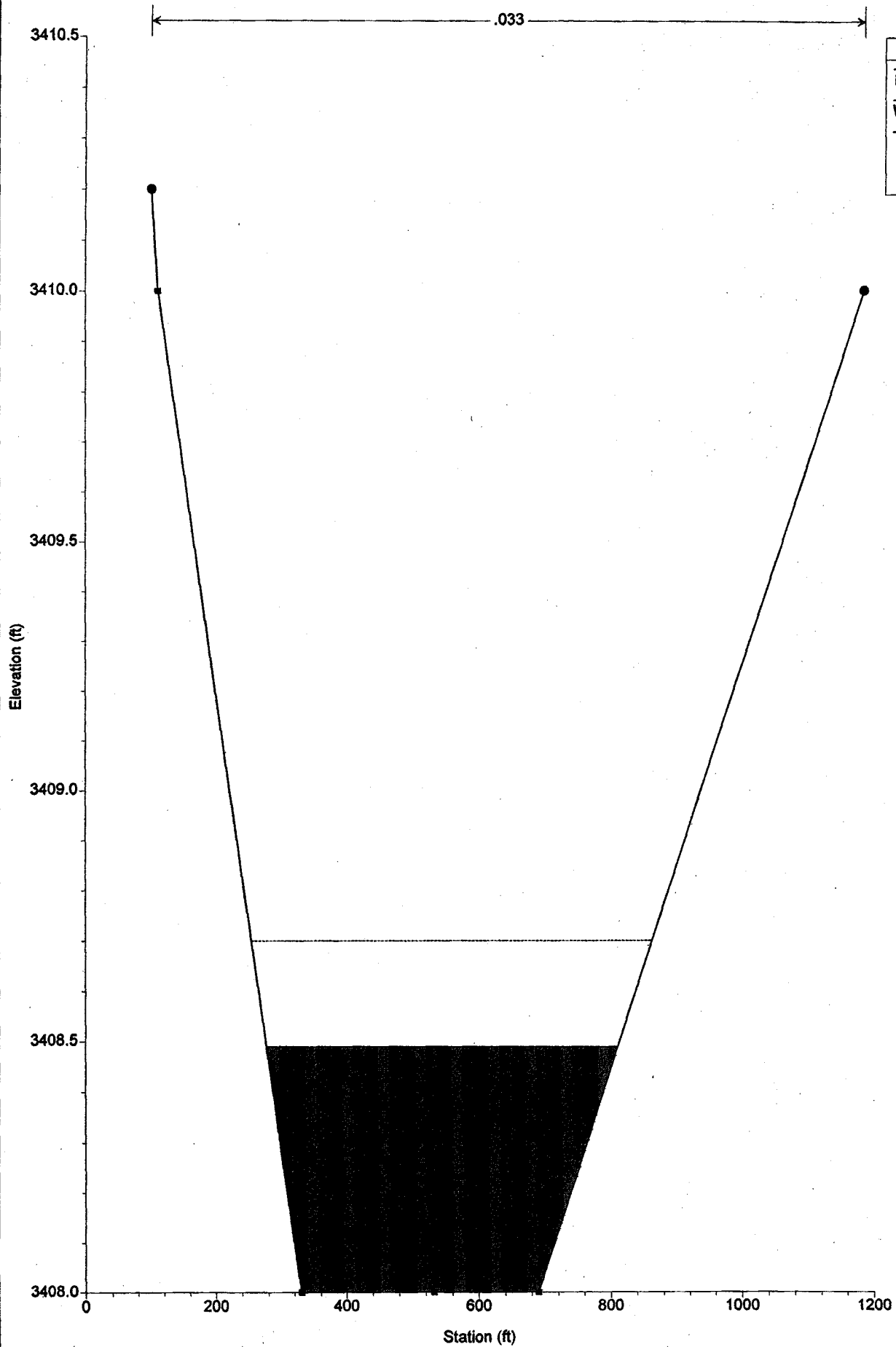




WCS Plan: 2-04-04MANY  
Sta. 2734 Downstream of culverts

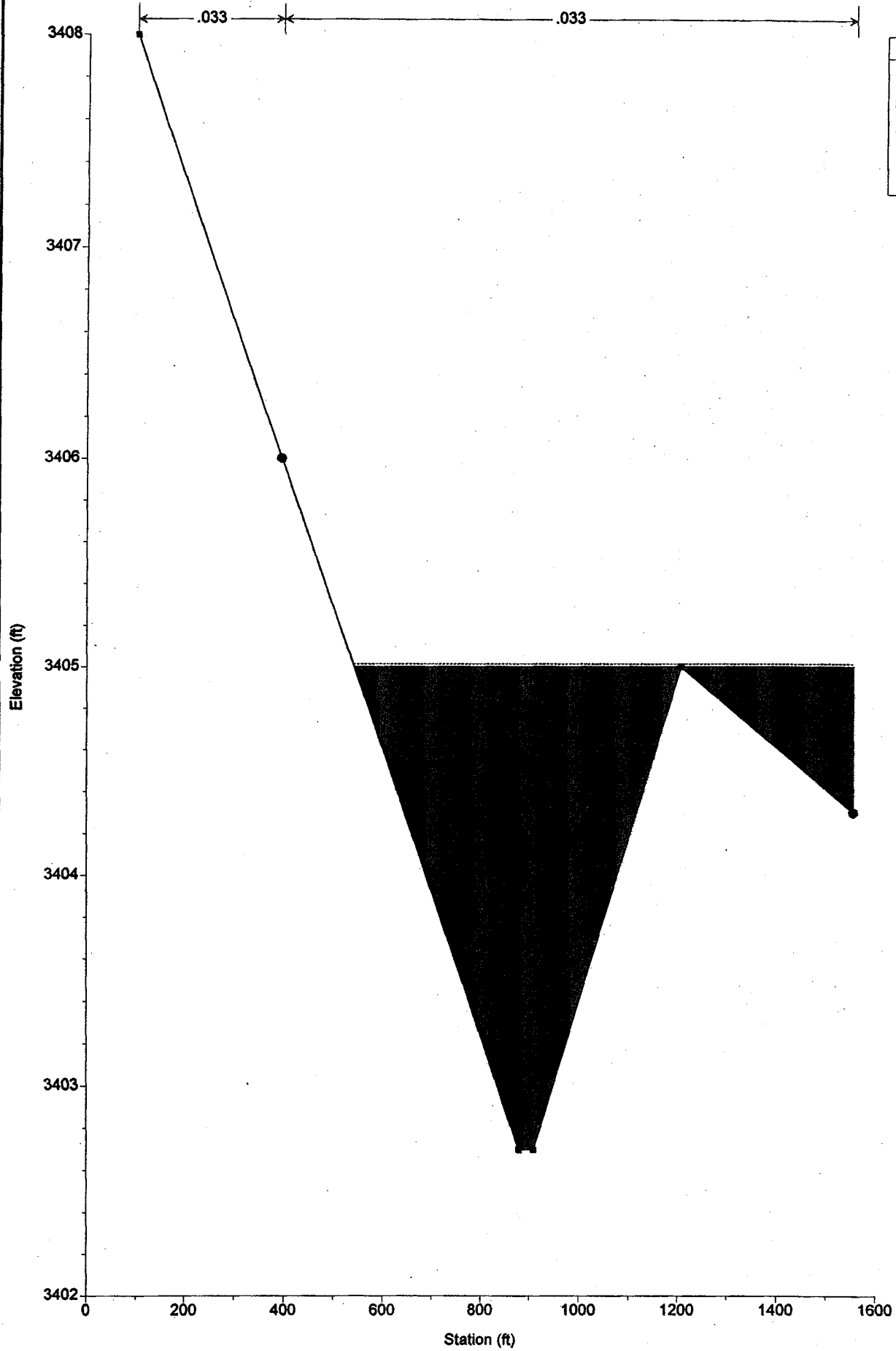


.033



| Legend            |   |
|-------------------|---|
| EG 100 Yr.-WS3405 |   |
| WS 100 Yr.-WS3405 |   |
| Ground            | ● |
| Bank Sta          | ● |

WCS Plan: 2-04-04MANY  
Sta. 1060



| Legend            |   |
|-------------------|---|
| EG 100 Yr.-WS3405 |   |
| WS 100 Yr.-WS3405 |   |
| Ground            | ● |
| Bank Sta          | ● |



## APPENDIX D

### HEC-HMS MODEL FOR THE CALCULATION OF THE 500-YEAR PEAK DISCHARGES



*[Handwritten Signature]*  
12/17/04

# HMS \* Summary of Results

Project : WCS

Run Name : 500 Year Storm

Start of Run : 01Dec00 0000 Basin Model : 100YrAM1/22/04  
 End of Run : 02Dec00 0000 Met. Model : Met 500 Year  
 Execution Time : 16Dec04 1252 Control Specs : Control 1

| Hydrologic<br>Element | Discharge<br>Peak<br>(cfs) | Time of<br>Peak | Volume<br>(ac<br>ft) | Drainage<br>Area<br>(sq mi) |
|-----------------------|----------------------------|-----------------|----------------------|-----------------------------|
| Subbasin-4            | 641.22                     | 01 Dec 00 1233  | 99.591               | 0.490                       |
| Reach-2               | 641.22                     | 01 Dec 00 1248  | 99.086               | 0.490                       |
| Subbasin-2            | 949.25                     | 01 Dec 00 1302  | 213.56               | 1.063                       |
| playa                 | 0.0                        | 30 Nov 00 2400  | 0.0                  | 1.063                       |
| Reach-1               | 0.0                        | 30 Nov 00 2400  | 0.0                  | 1.063                       |
| Subbasin-1A           | 533.30                     | 01 Dec 00 1325  | 146.15               | 0.691                       |
| Reach-1A              | 533.30                     | 01 Dec 00 1342  | 145.29               | 0.691                       |
| Subbasin-1B           | 376.03                     | 01 Dec 00 1239  | 63.679               | 0.314                       |
| Junction-1A           | 676.52                     | 01 Dec 00 1327  | 208.96               | 1.005                       |
| Reach-1B              | 676.52                     | 01 Dec 00 1330  | 208.75               | 1.005                       |
| Subbasin-3            | 186.82                     | 01 Dec 00 1239  | 31.637               | 0.156                       |
| Junction-1            | 769.83                     | 01 Dec 00 1300  | 240.38               | 2.224                       |
| Reach-3               | 769.83                     | 01 Dec 00 1317  | 238.95               | 2.224                       |
| Subbasin-5A           | 256.07                     | 01 Dec 00 1232  | 39.040               | 0.192                       |
| Junction-2            | 1495.7                     | 01 Dec 00 1253  | 377.08               | 2.906                       |
| Reach-4               | 1495.7                     | 01 Dec 00 1314  | 374.29               | 2.906                       |
| Subbasin-5B           | 276.18                     | 01 Dec 00 1249  | 53.528               | 0.265                       |
| Junction-3            | 1716.7                     | 01 Dec 00 1312  | 427.82               | 3.171                       |
| Reach-5               | 1716.7                     | 01 Dec 00 1326  | 425.68               | 3.171                       |
| Subbasin-6            | 116.97                     | 01 Dec 00 1223  | 15.099               | 0.074                       |
| Junction-4            | 1742.7                     | 01 Dec 00 1325  | 440.78               | 3.245                       |
| Reach-6               | 1742.7                     | 01 Dec 00 1325  | 440.78               | 3.245                       |
| Subbasin-7            | 93.976                     | 01 Dec 00 1301  | 20.903               | 0.104                       |
| Junction-5            | 1823.2                     | 01 Dec 00 1325  | 461.69               | 3.349                       |

## Meteorologic Model Input

**HMS - Meteorologic Model**

File Edit Help

Meteorologic Model: Met 500 Year

Description: 500 Year, 24 Hour Storm

Subbasin List

Precipitation: Evaporation

Method: SCS Hypothetical Storm

Storm Selection: Type II

Storm Depth (in): 8.71

OK Apply Cancel



# WCS FACILITY FLOOD PLAIN STUDY HYDROGRAPHS

