Sugarbush Residential Development Project

APPENDIX J

HYDROLOGY REPORT

GPA 05-010/TM 5295RPL7/R04-008/SP 03-003/
S04-015/Log No. 02-08-047
SCH No. 2005121098

for the

DRAFT FINAL ENVIRONMENTAL IMPACT REPORT

August 2010

CEQA HYDROLOGY REPORT FOR TM - 5295RPL7/R04-008/GPAR05-10/ SP03-003/S04-015/ LOG NO. 02-08-047

SUGARBUSH COUNTY OF SAN DIEGO

Prepared for:

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June 25, 2004
Revised July 8, 2008
Revised May 26, 2009

W.O. 600-0813-400

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I. DISCUSSION

DISCUSSION:

This is a Hydrology Report for the proposed Tentative Map for Sugarbush, LLC, TM - 5295. This 115.5 acre site is generally located east of South Santa Fe Avenue, west of Interstate 15, and south of Buena Creek Road near the southeast portion of Vista (see location map). The Development proposes 45 residential lots with lots size no smaller than one half acre. The remainder of the site will be dedicated to County of San Diego as an open space easement and remains in its natural state.

The site falls west of the San Marcos Mountains, and topography varies from moderate to steep. Onsite elevation ranges from 900 feet to 540 feet above mean sea level. Storm water runoff from the site is conveyed by several natural drainage courses in a westerly direction toward Buena Creek identified in the Existing Condition Map. The existing topography and the various drainage basins and sub basins are shown on this map.

The Existing Condition Map shows three drainage basins labeled A through C. Basin A to Basin C are separated by prominent ridge lines and direction of flow. Basin A is located in the northern portion of the project and is approximately 145 acres is size. The runoff from Basin A exits the site at Node 6 and drains into a tributary of Buena Creek. Basin B is in the central portion of the project and is approximately 34 acres in size. The runoff from Basin B exits the site at Node 13 and drains into a shallow channel west of the project. Basin C is in the southern portion of the project and is approximately 9 acres in size. The runoff from Basin C exits the site at Node 21 and drains onto an existing driveway west of the project.

The development of the site is generally located on the moderate slopes and western portion of the site. The Development proposes 45 residential lots with lots size no smaller than one half acre. The majority of the site drains toward the westerly boundary. The remaining area in the southeasterly corner of the property drains in an southeasterly direction into a proposed permanent open space area.

The Developed Basin A will respect existing drainage course. The majority of Developed Basin A will remain natural except for the extension of Sugarbush Drive and the development of Lots 21, 22, 44, and 45. The runoff travels through existing natural drainage courses and the proposed culverts underneath the proposed extension of Sugarbush Drive. The runoff from Lots 21, 22, 44, and 45 travels through the proposed curb and gutter and into the proposed curb inlets near Lot 21. From the curb inlets, the runoff is conveyed into a detention-bioretention basin prior to being released into Buena Creek via a proposed 18-inch storm drain (Node 6.4 to Node 6.) and into an existing drainage course. The runoff exits the site at Node 6.

The Developed Basin B consists of runoff from the off-site basin east of the project and the central portion of the project. The off-site runoff is collected by minor drainage channel along the eastern boundary and is conveyed to Node 12 and Node 15 where the runoff enters the proposed storm drains system. The runoff from the lots enters the street and is collected by a series of curb inlets. The runoff from the off-site basin and lots are conveyed through the proposed storm drain system (the storm drain system consists of pipes from 18-inch to 30-inch) and into a detention-bioretention basin. From the detention-bioretention basin the runoff is released off the property at Node 13. From Node 13, the runoff flows west through a shallow channel west of the project.

The Developed Basin C consists of runoff from the southern portion of the project. The runoff from the lots enters the street and is collected by the curb inlets near Lot 15. The runoff is piped into a detention-bioretention basin and released through an energy

dissipaters along the western boundary at Node 21. From Node 21, the runoff exits the site onto an existing driveway. This project proposes the improvement of the existing driveway with new pavement and berm. This improvement will improve the drainage capacity of the existing driveway.
The proposed drainage facility improvements will consist of minor concrete drainage channels, storm drain pipes, curb inlets, and three detention-bioretention basin. The size, details, and exact placement of the drainage facilities will be designed during the final engineering. The detention-bioretention basins will serve as a stormwater treatment BMPs for the project runoff. The Homeowners Association will maintain the private streets, storm drain system and the detention-bioretention basins.

Drainage basin areas were determined from the proposed finish grades as shown on the Tentative Map for the above referenced project. The method of analysis was based on the Rational Method according to the San Diego County Hydrology Manual. The Hydrology and Hydraulic Analysis were done on HydroSoft by Advanced Engineering Software. Using the Rational Method, the on-site Runoff Coefficients were determined as:

User Specified Storm Event (Year) = 100
6-Hour Duration Precipitation (Inches) = 3.5
Soil Classification is "D"
Existing Natural Land Runoff Coefficient = 0.35
Rural Development Runoff Coefficient = 0.46

The exhibits show the proposed on-site drainage system, subarea, acreage, and nodal points.

This study considers the runoff for a 100-year storm frequency and the on-site drainage system shown on the tentative map.

CONCLUSION:

The proposed Tentative Map design does not adversely affect the surrounding properties. The detention-bioretention basins will lower the peak developed runoff from the project site to simulate existing runoff conditions. The developed drainage basins respect the existing drainage patterns. A summary of existing and developed runoff is in Table 1-1 below:

Table 1-1 Summary of Existing and Developed Runoff.

	Existing Condition Q(cfs)/Area (acre)	Developed Condition w/o Detention Q(cfs)/Area(acre)	Developed Condition with Detention Q(cfs)/Area(acre)
Basin A (Node 6)	243.2/144.3	238.9/141.5	236.3/141.5
Basin B (Node 13)	69.1/34.5	84.0/38.0	63.2/38.0
Basin C (Node 21)	18.5/9.2	20.8/8.5	15.6/8.5
Total	330.8/188	343.7/188	315.1/188

While the actual developed drainage area for basin A, B, and C differ from the original undeveloped existing condition, any negative impacts created by these area diversions are mitigated by the proposed detention-bioretention basins. Detained runoff discharge rates are actually less than that of the undeveloped existing condition, for 1.9% at Node 6, 8.5% at Node 13, and 15.7% at Node 21.

Preliminary curb inlet sizing is listed in Table 1-2 below:

Table 1-2 Summary of Curb Inlet Size.

Node	Q (cfs)per side of street	Flow Depth (ft)	Slope	Inlet Size (ft)*
5.5	3.2	0.28	5.1%	11
6.3	4.5	0.32	3.3%	14
12.2	9.9	0.35	11.2%	26
12.5	6.4	0.39	3.5%	16
13.3	6.1	0.35	4.6%	17
21.3	8.7	0.36	9.1%	23

* Per County of San Diego Drainage Design Manual (Q/Lt=0.7(a+y)3/2).

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

RONALD L. HOLLOWAY — 5/26/09 DATE

REGISTERED PROFESSIONAL ENGINEER
RONALD L. HOLLOWAY
No. 29271
Exp. 3/31/11
CIVIL
STATE OF CALIFORNIA

II. CALCULATIONS

II. CALCULATIONS

A. EXISTING 100-YEAR STORM HYDROLOGY

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2003 Advanced Engineering Software (aes)
             Ver. 1.5A Release Date: 01/01/2003  License ID 1459

                          Analysis prepared by:

                                 bHA, Inc.
                       5115 Avenida Encinas, Suite L
                           Carlsbad, Calif 92008


----------------------------------------------------------------------------
  FILE NAME: K:\HYDRO\0813\EX-A.DAT
  TIME/DATE OF STUDY: 13:37 10/01/2004
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  =====  ====  ====  =====
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+--------------------------------------------------------------------------+
| SUGARBUSH - W.O. 600-0813-400                                            |
| EXISTING 100 YEAR HYDROLOGY                                              |
| BASIN A                                                                  |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
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  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1165.00
  DOWNSTREAM ELEVATION(FEET) =   1157.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.750
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.598
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE      1.10 TO NODE      2.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1157.00  DOWNSTREAM(FEET) =    890.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   650.00   CHANNEL SLOPE =  0.4108
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.782
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     12.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.33
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   1.30
  Tc(MIN.) =   8.05
  SUBAREA AREA(ACRES) =     9.62       SUBAREA RUNOFF(CFS) =   22.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      9.82         PEAK FLOW RATE(CFS) =      23.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =  10.71
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.00 =   750.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.10 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    890.00  DOWNSTREAM(FEET) =    675.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1950.00   CHANNEL SLOPE =  0.1103
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.620
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     64.12
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.93
  AVERAGE FLOW DEPTH(FEET) =   0.81   TRAVEL TIME(MIN.) =   2.72
  Tc(MIN.) =  10.78
  SUBAREA AREA(ACRES) =    41.23       SUBAREA RUNOFF(CFS) =   81.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     51.05         PEAK FLOW RATE(CFS) =     100.41
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  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.03   FLOW VELOCITY(FEET/SEC.) =  13.73
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.10 =  2700.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    675.00  DOWNSTREAM(FEET) =    625.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1030.00   CHANNEL SLOPE =  0.0485
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.136
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    114.25
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.63
  AVERAGE FLOW DEPTH(FEET) =   1.38   TRAVEL TIME(MIN.) =   1.62
  Tc(MIN.) =  12.39
  SUBAREA AREA(ACRES) =    15.39       SUBAREA RUNOFF(CFS) =   27.66
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     66.44         PEAK FLOW RATE(CFS) =     119.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.42   FLOW VELOCITY(FEET/SEC.) =  10.77
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  3730.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      2.20 TO NODE      2.50 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1025.00
  DOWNSTREAM ELEVATION(FEET) =    970.00
  ELEVATION DIFFERENCE(FEET) =     55.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

****************************************************************************
  FLOW PROCESS FROM NODE      2.50 TO NODE      2.30 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    970.00  DOWNSTREAM(FEET) =    685.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   770.00   CHANNEL SLOPE =  0.3701
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.765
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      8.48
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.06
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.82
  Tc(MIN.) =   8.08
  SUBAREA AREA(ACRES) =     6.86       SUBAREA RUNOFF(CFS) =   16.24
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      6.96         PEAK FLOW RATE(CFS) =      16.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   9.23
  LONGEST FLOWPATH FROM NODE      2.20 TO NODE      2.30 =   870.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.30 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    685.00  DOWNSTREAM(FEET) =    625.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   850.00   CHANNEL SLOPE =  0.0706
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =     16.48
  FLOW VELOCITY(FEET/SEC.) =   6.64   FLOW DEPTH(FEET) =   0.42
  TRAVEL TIME(MIN.) =   2.13   Tc(MIN.) =  10.22
  LONGEST FLOWPATH FROM NODE      2.20 TO NODE      3.00 =  1720.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       16.48     10.22       5.816        6.96
  LONGEST FLOWPATH FROM NODE      2.20 TO NODE      3.00 =  1720.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      119.43     12.39       5.136       66.44
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  3730.00 FEET.
```

```
** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc       INTENSITY
NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
    1     114.96     10.22        5.816
    2     133.98     12.39        5.136

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    133.98   Tc(MIN.) =   12.39
TOTAL AREA(ACRES) =     73.40

****************************************************************************
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE      4.00 TO NODE      4.10 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
UPSTREAM ELEVATION(FEET) =   1144.00
DOWNSTREAM ELEVATION(FEET) =   1130.00
ELEVATION DIFFERENCE(FEET) =     14.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
SUBAREA RUNOFF(CFS) =      1.67
TOTAL AREA(ACRES) =      0.60   TOTAL RUNOFF(CFS) =      1.67

****************************************************************************
FLOW PROCESS FROM NODE      4.10 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1130.00  DOWNSTREAM(FEET) =    685.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  2120.00   CHANNEL SLOPE =  0.2099
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     46.38
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.21
AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   3.15
```

```
  Tc(MIN.) =   9.42
  SUBAREA AREA(ACRES) =    40.89       SUBAREA RUNOFF(CFS) =   87.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     41.49         PEAK FLOW RATE(CFS) =      89.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOW VELOCITY(FEET/SEC.) =  14.24
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      5.00 =  2220.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    685.00  DOWNSTREAM(FEET) =    625.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   775.00   CHANNEL SLOPE =  0.0774
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.719
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    100.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.10
  AVERAGE FLOW DEPTH(FEET) =   1.14   TRAVEL TIME(MIN.) =   1.07
  Tc(MIN.) =  10.49
  SUBAREA AREA(ACRES) =    11.55       SUBAREA RUNOFF(CFS) =   23.12
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     53.04         PEAK FLOW RATE(CFS) =     106.16

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.18   FLOW VELOCITY(FEET/SEC.) =  12.25
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =  2995.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)   (MIN.)   (INCH/HOUR)   (ACRE)
     1      106.16    10.49       5.719       53.04
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =  2995.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)   (MIN.)   (INCH/HOUR)   (ACRE)
     1      133.98    12.39       5.136       73.40
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  3730.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     219.57      10.49       5.719
```

```
    2      229.32       12.39        5.136

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    229.32   Tc(MIN.) =   12.39
  TOTAL AREA(ACRES) =    126.44

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    625.00  DOWNSTREAM(FEET) =    545.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1100.00   CHANNEL SLOPE =  0.0727
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.815
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    244.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  14.09
  AVERAGE FLOW DEPTH(FEET) =   1.36   TRAVEL TIME(MIN.) =   1.30
  Tc(MIN.) =  13.69
  SUBAREA AREA(ACRES) =    17.88       SUBAREA RUNOFF(CFS) =   30.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =    144.32         PEAK FLOW RATE(CFS) =     243.24

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.36   FLOW VELOCITY(FEET/SEC.) =  14.03
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =  4830.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =    144.32  TC(MIN.) =     13.69
  PEAK FLOW RATE(CFS)    =    243.24
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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                          Analysis prepared by:

                                 bHA, Inc.
                       5115 Avenida Encinas, Suite L
                           Carlsbad, Calif 92008


----------------------------------------------------------------------------
  FILE NAME: K:\HYDRO\0813\EX-B.DAT
  TIME/DATE OF STUDY: 13:44 10/01/2004
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+--------------------------------------------------------------------------+
| SUGARBUSH - W.O. 600-0813-400                                            |
| EXISTING 100 YEAR HYDROLOGY                                              |
| BASIN B                                                                  |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    892.00
  DOWNSTREAM ELEVATION(FEET) =    870.00
  ELEVATION DIFFERENCE(FEET) =     22.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =      1.40
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.40

****************************************************************************
  FLOW PROCESS FROM NODE     10.10 TO NODE     11.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    870.00  DOWNSTREAM(FEET) =    725.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   450.00   CHANNEL SLOPE =  0.3222
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.122
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      6.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.27
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.20
  Tc(MIN.) =   7.46
  SUBAREA AREA(ACRES) =     4.21       SUBAREA RUNOFF(CFS) =   10.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      4.71         PEAK FLOW RATE(CFS) =      11.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   7.71
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     11.00 =   550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    725.00  DOWNSTREAM(FEET) =    660.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.1083
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.474
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     21.72
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.40
  AVERAGE FLOW DEPTH(FEET) =   0.44   TRAVEL TIME(MIN.) =   1.19
  Tc(MIN.) =   8.65
  SUBAREA AREA(ACRES) =     8.80       SUBAREA RUNOFF(CFS) =   19.94
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
```

```
  TOTAL AREA(ACRES) =      13.51          PEAK FLOW RATE(CFS) =       30.61

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.54   FLOW VELOCITY(FEET/SEC.) =   9.39
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =  1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    660.00  DOWNSTREAM(FEET) =    580.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   950.00   CHANNEL SLOPE =  0.0842
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.711
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     48.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.53
  AVERAGE FLOW DEPTH(FEET) =   0.51   TRAVEL TIME(MIN.) =   1.86
  Tc(MIN.) =  10.51
  SUBAREA AREA(ACRES) =    17.70       SUBAREA RUNOFF(CFS) =   35.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      31.21         PEAK FLOW RATE(CFS) =       62.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.60   FLOW VELOCITY(FEET/SEC.) =   9.32
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =  2100.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    810.00
  DOWNSTREAM ELEVATION(FEET) =    800.00
  ELEVATION DIFFERENCE(FEET) =     10.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =       0.28
  TOTAL AREA(ACRES) =       0.10   TOTAL RUNOFF(CFS) =       0.28

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

```
  FLOW PROCESS FROM NODE     14.10 TO NODE     15.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    800.00  DOWNSTREAM(FEET) =    650.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   610.00   CHANNEL SLOPE =  0.2459
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.542
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      3.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.52
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   2.25
  Tc(MIN.) =   8.51
  SUBAREA AREA(ACRES) =     3.20       SUBAREA RUNOFF(CFS) =    7.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      3.30         PEAK FLOW RATE(CFS) =       7.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   5.90
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     15.00 =   710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     13.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    650.00  DOWNSTREAM(FEET) =    580.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   830.00   CHANNEL SLOPE =  0.0843
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =      7.56
  FLOW VELOCITY(FEET/SEC.) =   4.28   FLOW DEPTH(FEET) =   0.17
  TRAVEL TIME(MIN.) =   3.23   Tc(MIN.) =  11.75
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     13.00 =  1540.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)   (MIN.)   (INCH/HOUR)   (ACRE)
     1         7.56    11.75       5.316        3.30
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     13.00 =  1540.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)   (MIN.)   (INCH/HOUR)   (ACRE)
     1        62.38    10.51       5.711       31.21
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =  2100.00 FEET.
```

```
** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc       INTENSITY
NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
    1      69.14      10.51        5.711
    2      65.62      11.75        5.316

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     69.14   Tc(MIN.) =   10.51
TOTAL AREA(ACRES) =     34.51

****************************************************************************
FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =     34.51  TC(MIN.) =     10.51
PEAK FLOW RATE(CFS)    =     69.14
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

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

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             Ver. 1.5A Release Date: 01/01/2003  License ID 1459

                          Analysis prepared by:

                               bHA, Inc.
                       5115 Avenida Encinas, Suite L
                           Carlsbad, Calif 92008


----------------------------------------------------------------------------
  FILE NAME: K:\HYDRO\0813\EX-C.DAT
  TIME/DATE OF STUDY: 13:52 10/01/2004
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+--------------------------------------------------------------------------+
| SUGARBUSH - W.O. 600-0813-400                                            |
| EXISTING 100 YEAR HYDROLOGY                                              |
| BASIN C                                                                  |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    739.20
  DOWNSTREAM ELEVATION(FEET) =    735.00
  ELEVATION DIFFERENCE(FEET) =      4.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.368
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.615
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE     20.10 TO NODE     21.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    735.00  DOWNSTREAM(FEET) =    605.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   690.00   CHANNEL SLOPE =  0.1884
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.780
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      9.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.91
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   1.95
  Tc(MIN.) =  10.32
  SUBAREA AREA(ACRES) =     9.06       SUBAREA RUNOFF(CFS) =   18.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      9.16         PEAK FLOW RATE(CFS) =      18.53

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   7.84
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     21.00 =   790.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      9.16  TC(MIN.) =     10.32
  PEAK FLOW RATE(CFS)    =     18.53
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

II. CALCULATIONS

B. DEVELOPED 100-YEAR STORM HYDROLOGY

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

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                          Analysis prepared by:

                              BHA, INC.
                        5115 Avenida Encinas, Suite L
                       Carlsbad, California 92008-4387


 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DEVELOPED HYDROLOGY CALCULATION                                *
* BASIN A- WITHOUT DETENTION SYSTEM                                       *
* 600-0813-400                                                            *
 **************************************************************************

  FILE NAME: K:\HYDRO\0813\AH\P1.DAT
  TIME/DATE OF STUDY: 16:39 04/15/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+--------------------------------------------------------------------------+
| BEGIN BASIN A-1 CALCULATION                                              |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.10 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1165.00
  DOWNSTREAM ELEVATION(FEET) =   1157.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.750
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.598
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE      1.10 TO NODE      2.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1157.00  DOWNSTREAM(FEET) =    890.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   650.00   CHANNEL SLOPE =  0.4108
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.782
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.33
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   1.30
  Tc(MIN.) =    8.05
  SUBAREA AREA(ACRES) =     9.62       SUBAREA RUNOFF(CFS) =   22.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        9.8         PEAK FLOW RATE(CFS) =      23.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =  10.71
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.00 =     750.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.10 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    890.00  DOWNSTREAM(FEET) =    675.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1950.00   CHANNEL SLOPE =  0.1103
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.629
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      66.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.05
```

```
  AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   2.70
  Tc(MIN.) =   10.75
  SUBAREA AREA(ACRES) =    43.34       SUBAREA RUNOFF(CFS) =   85.39
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       53.2         PEAK FLOW RATE(CFS) =     104.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.06   FLOW VELOCITY(FEET/SEC.) =  13.92
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.10 =    2700.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      2.11 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   675.00  DOWNSTREAM(FEET) =   664.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.65
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     104.73
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   10.82
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.11 =    2813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.11 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    664.70  DOWNSTREAM(FEET) =    625.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   887.00   CHANNEL SLOPE =  0.0448
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.137
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     116.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   9.42
  AVERAGE FLOW DEPTH(FEET) =   1.03   TRAVEL TIME(MIN.) =   1.57
  Tc(MIN.) =   12.38
  SUBAREA AREA(ACRES) =    13.29       SUBAREA RUNOFF(CFS) =   23.90
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       66.4         PEAK FLOW RATE(CFS) =     119.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.04   FLOW VELOCITY(FEET/SEC.) =   9.48
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    3700.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
+----------------------------------------------------------------------------+
| BEGIN BASIN A-2 CALCULATION                                                |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1144.00
  DOWNSTREAM ELEVATION(FEET) =   1130.00
  ELEVATION DIFFERENCE(FEET) =     14.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =      1.67
  TOTAL AREA(ACRES) =      0.60   TOTAL RUNOFF(CFS) =      1.67

****************************************************************************
  FLOW PROCESS FROM NODE      4.10 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1130.00  DOWNSTREAM(FEET) =    685.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2120.00   CHANNEL SLOPE =  0.2099
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      46.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.21
  AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   3.15
  Tc(MIN.) =    9.42
  SUBAREA AREA(ACRES) =    40.89       SUBAREA RUNOFF(CFS) =   87.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       41.5         PEAK FLOW RATE(CFS) =      89.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOW VELOCITY(FEET/SEC.) =  14.24
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      5.00 =    2220.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      3.10 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    685.00  DOWNSTREAM(FEET) =    633.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   685.00   CHANNEL SLOPE =  0.0759
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.725
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     105.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.87
  AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   1.05
  Tc(MIN.) =   10.47
  SUBAREA AREA(ACRES) =    16.77       SUBAREA RUNOFF(CFS) =   33.60
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       58.3         PEAK FLOW RATE(CFS) =     116.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.88   FLOW VELOCITY(FEET/SEC.) =  11.25
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.10 =    2905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   633.00  DOWNSTREAM(FEET) =   625.00
  FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  18.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.78
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     116.73
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   10.53
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =    2998.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      116.73    10.53       5.705       58.26
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =    2998.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      119.48    12.38       5.137       66.45
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    3700.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     218.28      10.53       5.705
     2     224.59      12.38       5.137
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     224.59   Tc(MIN.) =   12.38
  TOTAL AREA(ACRES) =      124.7

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      6.45 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    625.00  DOWNSTREAM(FEET) =    574.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1048.85   CHANNEL SLOPE =  0.0486
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.784
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     235.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.09
  AVERAGE FLOW DEPTH(FEET) =   1.50   TRAVEL TIME(MIN.) =   1.45
  Tc(MIN.) =   13.83
  SUBAREA AREA(ACRES) =    12.97       SUBAREA RUNOFF(CFS) =   21.72
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      137.7         PEAK FLOW RATE(CFS) =     230.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.48   FLOW VELOCITY(FEET/SEC.) =  12.05
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.45 =    4748.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.40 TO NODE      6.40 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| BEGIN ON-SITE DRAINAGE CALCULATION                                       |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      6.10 TO NODE      6.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     85.00
  UPSTREAM ELEVATION(FEET) =     625.00
  DOWNSTREAM ELEVATION(FEET) =     623.00
  ELEVATION DIFFERENCE(FEET) =       2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =       2.41
  TOTAL AREA(ACRES) =       0.77   TOTAL RUNOFF(CFS) =       2.41

****************************************************************************
  FLOW PROCESS FROM NODE       6.20 TO NODE       6.30 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  623.00  DOWNSTREAM ELEVATION(FEET) =  601.00
  STREET LENGTH(FEET) =   664.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.92
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.23
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.72
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.08
  STREET FLOW TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =   10.96
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.559
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    2.73      SUBAREA RUNOFF(CFS) =    6.98
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =       8.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.92
  FLOW VELOCITY(FEET/SEC.) =  4.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.32
  LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.30 =     749.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE       6.30 TO NODE       6.40 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   595.00  DOWNSTREAM(FEET) =   590.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.58
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        8.95
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   11.05
  LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.40 =     819.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.40 TO NODE      6.40 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.531
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4600
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    0.71
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =       9.62
  TC(MIN.) =   11.05

****************************************************************************
  FLOW PROCESS FROM NODE      6.40 TO NODE      6.45 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   587.25  DOWNSTREAM(FEET) =   574.00
  FLOW LENGTH(FEET) =    81.20   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.70
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        9.62
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   11.12
  LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.45 =     900.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.45 TO NODE      6.45 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        9.62    11.12       5.507        3.78
  LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.45 =     900.20 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      230.54    13.83       4.784      137.68
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.45 =    4748.85 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     194.95      11.12        5.507
```

```
     2      238.89       13.83         4.784

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      238.89   Tc(MIN.) =   13.83
  TOTAL AREA(ACRES) =       141.5

****************************************************************************
  FLOW PROCESS FROM NODE      6.45 TO NODE      6.45 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      6.45 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    574.00  DOWNSTREAM(FEET) =    545.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    52.00   CHANNEL SLOPE =  0.5577
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  CHANNEL FLOW THRU SUBAREA(CFS) =     238.89
  FLOW VELOCITY(FEET/SEC.) =  27.67   FLOW DEPTH(FEET) =   0.75
  TRAVEL TIME(MIN.) =   0.03   Tc(MIN.) =   13.86
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    4800.85 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =      141.5  TC(MIN.) =     13.86
  PEAK FLOW RATE(CFS)    =     238.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
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            Ver. 15.0 Release Date: 04/01/2008  License ID 1459

                          Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DEVELOPED HYDROLOGY CALCULATION                                 *
* BASIN A WITH DETENTION SYSTEM                                            *
* 600-0813-400                                                             *
 ***************************************************************************

  FILE NAME: K:\HYDRO\0813\AH\P1WD.DAT
  TIME/DATE OF STUDY: 16:34 04/15/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

+--------------------------------------------------------------------------+
| BEGIN BASIN A-1 CALCULATION                                              |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.10 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1165.00
  DOWNSTREAM ELEVATION(FEET) =   1157.00
  ELEVATION DIFFERENCE(FEET) =      8.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.750
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.598
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE      1.10 TO NODE      2.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1157.00  DOWNSTREAM(FEET) =    890.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   650.00   CHANNEL SLOPE =  0.4108
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.782
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.33
  AVERAGE FLOW DEPTH(FEET) =   0.14   TRAVEL TIME(MIN.) =   1.30
  Tc(MIN.) =    8.05
  SUBAREA AREA(ACRES) =     9.62       SUBAREA RUNOFF(CFS) =   22.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        9.8         PEAK FLOW RATE(CFS) =      23.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =  10.71
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.00 =     750.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.10 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    890.00  DOWNSTREAM(FEET) =    675.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1950.00   CHANNEL SLOPE =  0.1103
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.629
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      66.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.05
```

```
  AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   2.70
  Tc(MIN.) =   10.75
  SUBAREA AREA(ACRES) =    43.34       SUBAREA RUNOFF(CFS) =   85.39
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       53.2         PEAK FLOW RATE(CFS) =     104.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.06   FLOW VELOCITY(FEET/SEC.) =  13.92
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.10 =    2700.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      2.11 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   675.00  DOWNSTREAM(FEET) =   664.70
  FLOW LENGTH(FEET) =   113.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.65
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     104.73
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   10.82
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      2.11 =    2813.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.11 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    664.70  DOWNSTREAM(FEET) =    625.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   887.00   CHANNEL SLOPE =  0.0448
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.137
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     116.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   9.42
  AVERAGE FLOW DEPTH(FEET) =   1.03   TRAVEL TIME(MIN.) =   1.57
  Tc(MIN.) =   12.38
  SUBAREA AREA(ACRES) =    13.29       SUBAREA RUNOFF(CFS) =   23.90
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       66.4         PEAK FLOW RATE(CFS) =     119.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.04   FLOW VELOCITY(FEET/SEC.) =   9.48
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    3700.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

```
+----------------------------------------------------------------------------+
| BEGIN BASIN A-2 CALCULATION                                                |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1144.00
  DOWNSTREAM ELEVATION(FEET) =   1130.00
  ELEVATION DIFFERENCE(FEET) =     14.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =      1.67
  TOTAL AREA(ACRES) =      0.60   TOTAL RUNOFF(CFS) =      1.67

****************************************************************************
  FLOW PROCESS FROM NODE      4.10 TO NODE      5.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1130.00  DOWNSTREAM(FEET) =    685.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2120.00   CHANNEL SLOPE =  0.2099
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.129
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      46.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.21
  AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   3.15
  Tc(MIN.) =    9.42
  SUBAREA AREA(ACRES) =    40.89       SUBAREA RUNOFF(CFS) =   87.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       41.5         PEAK FLOW RATE(CFS) =      89.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOW VELOCITY(FEET/SEC.) =  14.24
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      5.00 =    2220.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      3.10 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    685.00  DOWNSTREAM(FEET) =    633.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   685.00   CHANNEL SLOPE =  0.0759
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.725
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     105.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.87
  AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   1.05
  Tc(MIN.) =   10.47
  SUBAREA AREA(ACRES) =    16.77       SUBAREA RUNOFF(CFS) =   33.60
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       58.3         PEAK FLOW RATE(CFS) =     116.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.88   FLOW VELOCITY(FEET/SEC.) =  11.25
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.10 =    2905.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   633.00  DOWNSTREAM(FEET) =   625.00
  FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  18.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  27.78
  GIVEN PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     116.73
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   10.53
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =    2998.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      116.73    10.53       5.705       58.26
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =    2998.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      119.48    12.38       5.137       66.45
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    3700.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     218.28      10.53        5.705
     2     224.59      12.38        5.137
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     224.59   Tc(MIN.) =   12.38
  TOTAL AREA(ACRES) =      124.7

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      6.45 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    625.00  DOWNSTREAM(FEET) =    574.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1048.85   CHANNEL SLOPE =  0.0486
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.784
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     235.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.09
  AVERAGE FLOW DEPTH(FEET) =   1.50   TRAVEL TIME(MIN.) =   1.45
  Tc(MIN.) =   13.83
  SUBAREA AREA(ACRES) =    12.97       SUBAREA RUNOFF(CFS) =   21.72
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      137.7         PEAK FLOW RATE(CFS) =     230.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.48   FLOW VELOCITY(FEET/SEC.) =  12.05
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.45 =    4748.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.40 TO NODE      6.40 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| BEGIN ON-SITE DRAINAGE CALCULATION                                       |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      6.10 TO NODE      6.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     85.00
  UPSTREAM ELEVATION(FEET) =     625.00
  DOWNSTREAM ELEVATION(FEET) =     623.00
  ELEVATION DIFFERENCE(FEET) =       2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =       2.41
  TOTAL AREA(ACRES) =       0.77   TOTAL RUNOFF(CFS) =       2.41

****************************************************************************
  FLOW PROCESS FROM NODE      6.20 TO NODE      6.30 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  623.00  DOWNSTREAM ELEVATION(FEET) =  601.00
  STREET LENGTH(FEET) =   664.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.92
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.23
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.72
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.08
  STREET FLOW TRAVEL TIME(MIN.) =   2.97   Tc(MIN.) =   10.96
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.559
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    2.73      SUBAREA RUNOFF(CFS) =    6.98
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =       8.95

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.92
  FLOW VELOCITY(FEET/SEC.) =  4.06   DEPTH*VELOCITY(FT*FT/SEC.) =   1.32
  LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.30 =     749.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.30 TO NODE      6.40 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   595.00  DOWNSTREAM(FEET) =   590.00
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.58
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        8.95
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   11.05
  LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.40 =     819.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.40 TO NODE      6.40 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.531
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4600
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    0.71
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =       9.62
  TC(MIN.) =   11.05

+--------------------------------------------------------------------------+
| DETENTION-BIORETENTION SYSTEM                                            |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      6.40 TO NODE      6.40 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.05   RAIN INTENSITY(INCH/HOUR) =  5.53
  TOTAL AREA(ACRES) =     3.80   TOTAL RUNOFF(CFS) =      6.63

****************************************************************************
  FLOW PROCESS FROM NODE      6.40 TO NODE      6.45 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   587.25  DOWNSTREAM(FEET) =   574.00
  FLOW LENGTH(FEET) =    81.20   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.83
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        6.63
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   11.13
  LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.45 =     900.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.45 TO NODE      6.45 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
```

```
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
   1         6.63    11.13       5.504        3.80
LONGEST FLOWPATH FROM NODE      6.10 TO NODE      6.45 =     900.20 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
   1       230.54    13.83       4.784      137.68
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.45 =    4748.85 FEET.

** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc      INTENSITY
NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
   1      192.16      11.13       5.504
   2      236.30      13.83       4.784

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     236.30   Tc(MIN.) =   13.83
TOTAL AREA(ACRES) =      141.5

****************************************************************************
FLOW PROCESS FROM NODE      6.45 TO NODE      6.45 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE      6.45 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    574.00  DOWNSTREAM(FEET) =    545.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    52.00   CHANNEL SLOPE =  0.5577
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
CHANNEL FLOW THRU SUBAREA(CFS) =     236.30
FLOW VELOCITY(FEET/SEC.) =  27.61   FLOW DEPTH(FEET) =   0.74
TRAVEL TIME(MIN.) =   0.03   Tc(MIN.) =   13.86
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =    4800.85 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =      141.5  TC(MIN.) =     13.86
PEAK FLOW RATE(CFS)    =     236.30
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
        (c) Copyright 1982-2008 Advanced Engineering Software (aes)
            Ver. 15.0 Release Date: 04/01/2008  License ID 1459

                          Analysis prepared by:

                              BHA, INC.
                        5115 Avenida Encinas, Suite L
                       Carlsbad, California 92008-4387


 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DEVELOPED HYDROLOGY CALCULATION                                 *
* BASIN B- WITHOUT DETENTION SYSTEM                                        *
* 600-0813-400                                                             *
 ***************************************************************************

  FILE NAME: K:\HYDRO\0813\AH\P-2.DAT
  TIME/DATE OF STUDY: 16:48 04/15/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    892.00
  DOWNSTREAM ELEVATION(FEET) =    870.00
  ELEVATION DIFFERENCE(FEET) =     22.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =      1.40
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.40

****************************************************************************
  FLOW PROCESS FROM NODE     10.10 TO NODE     11.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    870.00  DOWNSTREAM(FEET) =    725.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   450.00   CHANNEL SLOPE =  0.3222
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.122
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.27
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.20
  Tc(MIN.) =    7.46
  SUBAREA AREA(ACRES) =     4.21       SUBAREA RUNOFF(CFS) =   10.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =      11.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   7.71
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     11.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    725.00  DOWNSTREAM(FEET) =    660.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.1083
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.341
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.79
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   1.47
  Tc(MIN.) =    8.94
  SUBAREA AREA(ACRES) =     7.98       SUBAREA RUNOFF(CFS) =   17.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.7         PEAK FLOW RATE(CFS) =      28.16
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   7.61
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   660.00  DOWNSTREAM(FEET) =   641.30
  FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.08
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.16
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    9.14
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.10 =    1380.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.10 TO NODE     12.20 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   641.30  DOWNSTREAM(FEET) =   630.00
  FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  13.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.52
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.16
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    9.39
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.20 =    1620.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.20 TO NODE     12.20 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     12.30 TO NODE     12.40 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    697.00
  DOWNSTREAM ELEVATION(FEET) =    695.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =      1.29
  TOTAL AREA(ACRES) =      0.41   TOTAL RUNOFF(CFS) =      1.29
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     12.40 TO NODE     12.20 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  695.00  DOWNSTREAM ELEVATION(FEET) =  635.90
  STREET LENGTH(FEET) =   700.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.70
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.76
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.82
  STREET FLOW TRAVEL TIME(MIN.) =   1.93   Tc(MIN.) =    9.92
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.929
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    6.87      SUBAREA RUNOFF(CFS) =   18.74
  TOTAL AREA(ACRES) =        7.3        PEAK FLOW RATE(CFS) =      19.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.36
  FLOW VELOCITY(FEET/SEC.) =  7.04   DEPTH*VELOCITY(FT*FT/SEC.) =   2.49
  LONGEST FLOWPATH FROM NODE     12.30 TO NODE     12.20 =     785.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.20 TO NODE     12.20 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       19.85     9.92       5.929        7.28
  LONGEST FLOWPATH FROM NODE     12.30 TO NODE     12.20 =     785.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       28.16     9.39       6.140       12.69
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.20 =    1620.00 FEET.
```

```
** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc       INTENSITY
NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
    1      46.97      9.39        6.140
    2      47.05      9.92        5.929

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      47.05   Tc(MIN.) =    9.92
TOTAL AREA(ACRES) =       20.0

****************************************************************************
FLOW PROCESS FROM NODE     12.20 TO NODE     12.20 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     12.20 TO NODE     12.50 IS CODE =  41
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   630.00  DOWNSTREAM(FEET) =   617.80
FLOW LENGTH(FEET) =   513.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  13.53
GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      47.05
PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =   10.55
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.50 =    2133.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     14.00 TO NODE     14.10 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
UPSTREAM ELEVATION(FEET) =    810.00
DOWNSTREAM ELEVATION(FEET) =    800.00
ELEVATION DIFFERENCE(FEET) =     10.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
SUBAREA RUNOFF(CFS) =      0.28
TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

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

```
  FLOW PROCESS FROM NODE     14.10 TO NODE     15.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    800.00  DOWNSTREAM(FEET) =    650.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   610.00   CHANNEL SLOPE =  0.2459
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.542
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.52
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   2.25
  Tc(MIN.) =    8.51
  SUBAREA AREA(ACRES) =     3.20       SUBAREA RUNOFF(CFS) =    7.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.3         PEAK FLOW RATE(CFS) =       7.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   5.90
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     15.00 =     710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     12.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   650.00  DOWNSTREAM(FEET) =   617.80
  FLOW LENGTH(FEET) =   210.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.09
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.56
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    8.72
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     12.50 =     920.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        7.56     8.72       6.443        3.30
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     12.50 =     920.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       47.05    10.55       5.697       19.97
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.50 =    2133.00 FEET.
```

```
** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc       INTENSITY
NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
    1      46.44      8.72        6.443
    2      53.73     10.55        5.697

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      53.73   Tc(MIN.) =   10.55
TOTAL AREA(ACRES) =       23.3

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     15.20 TO NODE     15.30 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  84
INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
UPSTREAM ELEVATION(FEET) =    638.00
DOWNSTREAM ELEVATION(FEET) =    636.00
ELEVATION DIFFERENCE(FEET) =      2.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.986
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
SUBAREA RUNOFF(CFS) =      1.41
TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =      1.41

****************************************************************************
FLOW PROCESS FROM NODE     15.30 TO NODE     12.50 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  636.00  DOWNSTREAM ELEVATION(FEET) =  623.80
STREET LENGTH(FEET) =   533.00   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.018
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
```

```
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.34
    HALFSTREET FLOOD WIDTH(FEET) =   10.04
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.33
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.14
  STREET FLOW TRAVEL TIME(MIN.) =   2.67   Tc(MIN.) =   10.65
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.662
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    4.49      SUBAREA RUNOFF(CFS) =   11.69
  TOTAL AREA(ACRES) =        4.9        PEAK FLOW RATE(CFS) =      12.87

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.01
  FLOW VELOCITY(FEET/SEC.) =  3.77   DEPTH*VELOCITY(FT*FT/SEC.) =   1.49
  LONGEST FLOWPATH FROM NODE     15.20 TO NODE     12.50 =     618.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       12.87    10.65       5.662        4.94
  LONGEST FLOWPATH FROM NODE     15.20 TO NODE     12.50 =     618.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       53.73    10.55       5.697       23.27
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.50 =    2133.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      66.48      10.55       5.697
     2      66.27      10.65       5.662

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      66.48   Tc(MIN.) =   10.55
  TOTAL AREA(ACRES) =       28.2

****************************************************************************
  FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
  ***MEMORY BANK #  1 IS EMPTY - PROCESS IGNORED.***
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     12.50 TO NODE     12.55 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   617.80  DOWNSTREAM(FEET) =   609.60
  FLOW LENGTH(FEET) =   273.80   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.64
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      66.48
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   10.84
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.55 =    2406.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.55 TO NODE     12.55 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.84
  RAINFALL INTENSITY(INCH/HR) =   5.60
  TOTAL STREAM AREA(ACRES) =    28.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     66.48

****************************************************************************
  FLOW PROCESS FROM NODE      5.10 TO NODE      5.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    683.20
  DOWNSTREAM ELEVATION(FEET) =    679.50
  ELEVATION DIFFERENCE(FEET) =      3.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.449
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.131
  SUBAREA RUNOFF(CFS) =      0.49
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
  FLOW PROCESS FROM NODE      5.20 TO NODE      5.50 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  679.50  DOWNSTREAM ELEVATION(FEET) =  621.90
  STREET LENGTH(FEET) =  1265.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

```
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.52
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.24
  HALFSTREET FLOOD WIDTH(FEET) =    5.91
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.77
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.92
STREET FLOW TRAVEL TIME(MIN.) =   5.60   Tc(MIN.) =   13.05
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.968
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  84
AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    5.96
TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       6.31

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.89
FLOW VELOCITY(FEET/SEC.) =  4.26   DEPTH*VELOCITY(FT*FT/SEC.) =   1.21
LONGEST FLOWPATH FROM NODE      5.10 TO NODE      5.50 =    1365.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      5.50 TO NODE     12.55 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   13.05
RAINFALL INTENSITY(INCH/HR) =   4.97
TOTAL STREAM AREA(ACRES) =     2.76
PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.31

** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1       66.48    10.84        5.598         28.21
    2        6.31    13.05        4.968          2.76

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF       Tc      INTENSITY
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
    1       71.72    10.84        5.598
    2       65.30    13.05        4.968

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      71.72   Tc(MIN.) =   10.84
TOTAL AREA(ACRES) =       31.0
```

```
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.55 =    2406.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.55 TO NODE     12.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   609.60  DOWNSTREAM(FEET) =   590.00
  FLOW LENGTH(FEET) =   642.67   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.61
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       71.72
  PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =   11.57
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.60 =    3049.47 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     13.10 TO NODE     13.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    629.00
  DOWNSTREAM ELEVATION(FEET) =    627.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =      1.13
  TOTAL AREA(ACRES) =      0.36   TOTAL RUNOFF(CFS) =      1.13

****************************************************************************
  FLOW PROCESS FROM NODE     13.20 TO NODE     13.30 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  627.00  DOWNSTREAM ELEVATION(FEET) =  603.50
  STREET LENGTH(FEET) =   732.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
```

```
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.79
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.86
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.14
  STREET FLOW TRAVEL TIME(MIN.) =   3.25   Tc(MIN.) =   11.23
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.471
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    4.46      SUBAREA RUNOFF(CFS) =   11.22
  TOTAL AREA(ACRES) =        4.8        PEAK FLOW RATE(CFS) =      12.13

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.32
  FLOW VELOCITY(FEET/SEC.) =  4.33   DEPTH*VELOCITY(FT*FT/SEC.) =   1.53
  LONGEST FLOWPATH FROM NODE     13.10 TO NODE     13.30 =     817.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.30 TO NODE     12.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   597.50  DOWNSTREAM(FEET) =   590.00
  FLOW LENGTH(FEET) =    78.24   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.41
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.13
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   11.31
  LONGEST FLOWPATH FROM NODE     13.10 TO NODE     12.60 =     895.24 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       12.13    11.31       5.446        4.82
  LONGEST FLOWPATH FROM NODE     13.10 TO NODE     12.60 =     895.24 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       71.72    11.57       5.366       30.97
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.60 =    3049.47 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM     RUNOFF        Tc       INTENSITY
  NUMBER      (CFS)      (MIN.)    (INCH/HOUR)
     1        82.23      11.31        5.446
     2        83.67      11.57        5.366

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       83.67   Tc(MIN.) =   11.57
  TOTAL AREA(ACRES) =        35.8

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.366
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4117
  SUBAREA AREA(ACRES) =     0.64   SUBAREA RUNOFF(CFS) =     1.58
  TOTAL AREA(ACRES) =        36.4   TOTAL RUNOFF(CFS) =      83.67
  TC(MIN.) =   11.57
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     13.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   587.25  DOWNSTREAM(FEET) =   583.00
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.01
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.82 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       83.67
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   11.66
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    3145.47 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.341
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4137
```

```
  SUBAREA AREA(ACRES) =     1.57   SUBAREA RUNOFF(CFS) =     3.86
  TOTAL AREA(ACRES) =        38.0   TOTAL RUNOFF(CFS) =      83.97
  TC(MIN.) =   11.66
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        38.0  TC(MIN.) =     11.66
  PEAK FLOW RATE(CFS)    =       83.97
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
        (c) Copyright 1982-2008 Advanced Engineering Software (aes)
            Ver. 15.0 Release Date: 04/01/2008  License ID 1459

                          Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DEVELOPED HYDROLOGY CALCULATION                                 *
* BASIN B - WITH DETENTION SYSTEM                                          *
* 600-0813-400                                                             *
 ***************************************************************************

  FILE NAME: K:\HYDRO\0813\AH\P-2WD.DAT
  TIME/DATE OF STUDY: 16:54 04/15/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    892.00
  DOWNSTREAM ELEVATION(FEET) =    870.00
  ELEVATION DIFFERENCE(FEET) =     22.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
  SUBAREA RUNOFF(CFS) =      1.40
  TOTAL AREA(ACRES) =      0.50   TOTAL RUNOFF(CFS) =      1.40

****************************************************************************
  FLOW PROCESS FROM NODE     10.10 TO NODE     11.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    870.00  DOWNSTREAM(FEET) =    725.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   450.00   CHANNEL SLOPE =  0.3222
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.122
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.27
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.20
  Tc(MIN.) =    7.46
  SUBAREA AREA(ACRES) =     4.21       SUBAREA RUNOFF(CFS) =   10.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =      11.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   7.71
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     11.00 =     550.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    725.00  DOWNSTREAM(FEET) =    660.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   600.00   CHANNEL SLOPE =  0.1083
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.341
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      20.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.79
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   1.47
  Tc(MIN.) =    8.94
  SUBAREA AREA(ACRES) =     7.98       SUBAREA RUNOFF(CFS) =   17.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.7         PEAK FLOW RATE(CFS) =      28.16
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   7.61
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.10 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   660.00  DOWNSTREAM(FEET) =   641.30
  FLOW LENGTH(FEET) =   230.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  11.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  19.08
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.16
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    9.14
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.10 =    1380.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.10 TO NODE     12.20 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   641.30  DOWNSTREAM(FEET) =   630.00
  FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  13.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.52
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.16
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    9.39
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.20 =    1620.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.20 TO NODE     12.20 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     12.30 TO NODE     12.40 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    697.00
  DOWNSTREAM ELEVATION(FEET) =    695.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =      1.29
  TOTAL AREA(ACRES) =      0.41   TOTAL RUNOFF(CFS) =      1.29
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     12.40 TO NODE     12.20 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  695.00  DOWNSTREAM ELEVATION(FEET) =  635.90
  STREET LENGTH(FEET) =   700.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 14.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.70
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.76
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    6.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.82
  STREET FLOW TRAVEL TIME(MIN.) =   1.93   Tc(MIN.) =    9.92
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.929
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    6.87      SUBAREA RUNOFF(CFS) =   18.74
  TOTAL AREA(ACRES) =        7.3        PEAK FLOW RATE(CFS) =      19.85

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.36
  FLOW VELOCITY(FEET/SEC.) =  7.04   DEPTH*VELOCITY(FT*FT/SEC.) =   2.49
  LONGEST FLOWPATH FROM NODE     12.30 TO NODE     12.20 =     785.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.20 TO NODE     12.20 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       19.85     9.92       5.929        7.28
  LONGEST FLOWPATH FROM NODE     12.30 TO NODE     12.20 =     785.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       28.16     9.39       6.140       12.69
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.20 =    1620.00 FEET.
```

```
** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc       INTENSITY
NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
    1      46.97       9.39        6.140
    2      47.05       9.92        5.929

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      47.05   Tc(MIN.) =    9.92
TOTAL AREA(ACRES) =       20.0

****************************************************************************
FLOW PROCESS FROM NODE     12.20 TO NODE     12.20 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     12.20 TO NODE     12.50 IS CODE =  41
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   630.00  DOWNSTREAM(FEET) =   617.80
FLOW LENGTH(FEET) =   513.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =  13.53
GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =      47.05
PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =   10.55
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.50 =    2133.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     14.00 TO NODE     14.10 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
UPSTREAM ELEVATION(FEET) =    810.00
DOWNSTREAM ELEVATION(FEET) =    800.00
ELEVATION DIFFERENCE(FEET) =     10.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.972
SUBAREA RUNOFF(CFS) =      0.28
TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

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

```
  FLOW PROCESS FROM NODE     14.10 TO NODE     15.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    800.00  DOWNSTREAM(FEET) =    650.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   610.00   CHANNEL SLOPE =  0.2459
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.542
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.52
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   2.25
  Tc(MIN.) =    8.51
  SUBAREA AREA(ACRES) =     3.20       SUBAREA RUNOFF(CFS) =    7.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.3         PEAK FLOW RATE(CFS) =       7.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   5.90
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     15.00 =     710.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     12.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   650.00  DOWNSTREAM(FEET) =   617.80
  FLOW LENGTH(FEET) =   210.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.09
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.56
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    8.72
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     12.50 =     920.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        7.56     8.72       6.443        3.30
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     12.50 =     920.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       47.05    10.55       5.697       19.97
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.50 =    2133.00 FEET.
```

```
** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc       INTENSITY
NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
    1      46.44      8.72        6.443
    2      53.73     10.55        5.697

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      53.73   Tc(MIN.) =   10.55
TOTAL AREA(ACRES) =       23.3

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     15.20 TO NODE     15.30 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  84
INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
UPSTREAM ELEVATION(FEET) =    638.00
DOWNSTREAM ELEVATION(FEET) =    636.00
ELEVATION DIFFERENCE(FEET) =      2.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.986
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
SUBAREA RUNOFF(CFS) =      1.41
TOTAL AREA(ACRES) =      0.45   TOTAL RUNOFF(CFS) =      1.41

****************************************************************************
FLOW PROCESS FROM NODE     15.30 TO NODE     12.50 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  636.00  DOWNSTREAM ELEVATION(FEET) =  623.80
STREET LENGTH(FEET) =   533.00   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.018
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
```

```
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.29
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.34
  HALFSTREET FLOOD WIDTH(FEET) =   10.04
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.33
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.14
STREET FLOW TRAVEL TIME(MIN.) =   2.67   Tc(MIN.) =   10.65
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.662
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  84
AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
SUBAREA AREA(ACRES) =    4.49      SUBAREA RUNOFF(CFS) =   11.69
TOTAL AREA(ACRES) =        4.9        PEAK FLOW RATE(CFS) =      12.87

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  13.01
FLOW VELOCITY(FEET/SEC.) =  3.77   DEPTH*VELOCITY(FT*FT/SEC.) =   1.49
LONGEST FLOWPATH FROM NODE     15.20 TO NODE     12.50 =     618.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1       12.87    10.65       5.662        4.94
LONGEST FLOWPATH FROM NODE     15.20 TO NODE     12.50 =     618.00 FEET.

** MEMORY BANK #  2 CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1       53.73    10.55       5.697       23.27
LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.50 =    2133.00 FEET.

** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc      INTENSITY
NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
    1      66.48      10.55       5.697
    2      66.27      10.65       5.662

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      66.48   Tc(MIN.) =   10.55
TOTAL AREA(ACRES) =       28.2

****************************************************************************
FLOW PROCESS FROM NODE     12.50 TO NODE     12.50 IS CODE =  12
----------------------------------------------------------------------------
>>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
***MEMORY BANK #  1 IS EMPTY - PROCESS IGNORED.***
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     12.50 TO NODE     12.55 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   617.80  DOWNSTREAM(FEET) =   609.60
  FLOW LENGTH(FEET) =   273.80   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.64
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      66.48
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   10.84
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.55 =    2406.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.55 TO NODE     12.55 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.84
  RAINFALL INTENSITY(INCH/HR) =   5.60
  TOTAL STREAM AREA(ACRES) =    28.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     66.48

****************************************************************************
  FLOW PROCESS FROM NODE      5.10 TO NODE      5.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    683.20
  DOWNSTREAM ELEVATION(FEET) =    679.50
  ELEVATION DIFFERENCE(FEET) =      3.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.449
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.131
  SUBAREA RUNOFF(CFS) =      0.49
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.49

****************************************************************************
  FLOW PROCESS FROM NODE      5.20 TO NODE      5.50 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  679.50  DOWNSTREAM ELEVATION(FEET) =  621.90
  STREET LENGTH(FEET) =  1265.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

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

```
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.52
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.24
  HALFSTREET FLOOD WIDTH(FEET) =    5.91
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.77
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.92
STREET FLOW TRAVEL TIME(MIN.) =   5.60   Tc(MIN.) =   13.05
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.968
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  84
AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
SUBAREA AREA(ACRES) =    2.61      SUBAREA RUNOFF(CFS) =    5.96
TOTAL AREA(ACRES) =        2.8        PEAK FLOW RATE(CFS) =       6.31

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   7.89
FLOW VELOCITY(FEET/SEC.) =  4.26   DEPTH*VELOCITY(FT*FT/SEC.) =   1.21
LONGEST FLOWPATH FROM NODE      5.10 TO NODE      5.50 =    1365.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      5.50 TO NODE     12.55 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   13.05
RAINFALL INTENSITY(INCH/HR) =   4.97
TOTAL STREAM AREA(ACRES) =     2.76
PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.31

** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1       66.48    10.84        5.598        28.21
    2        6.31    13.05        4.968         2.76

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF       Tc      INTENSITY
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
    1       71.72    10.84        5.598
    2       65.30    13.05        4.968

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =      71.72   Tc(MIN.) =   10.84
TOTAL AREA(ACRES) =       31.0
```

```
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.55 =    2406.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.55 TO NODE     12.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   609.60  DOWNSTREAM(FEET) =   590.00
  FLOW LENGTH(FEET) =   642.67   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.61
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      71.72
  PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =   11.57
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.60 =    3049.47 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     13.10 TO NODE     13.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    629.00
  DOWNSTREAM ELEVATION(FEET) =    627.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =      1.13
  TOTAL AREA(ACRES) =      0.36   TOTAL RUNOFF(CFS) =      1.13

****************************************************************************
  FLOW PROCESS FROM NODE     13.20 TO NODE     13.30 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  627.00  DOWNSTREAM ELEVATION(FEET) =  603.50
  STREET LENGTH(FEET) =   732.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
```

```
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.79
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.86
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.14
  STREET FLOW TRAVEL TIME(MIN.) =   3.25   Tc(MIN.) =   11.23
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.471
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    4.46      SUBAREA RUNOFF(CFS) =   11.22
  TOTAL AREA(ACRES) =        4.8        PEAK FLOW RATE(CFS) =      12.13

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.35   HALFSTREET FLOOD WIDTH(FEET) =  11.32
  FLOW VELOCITY(FEET/SEC.) =  4.33   DEPTH*VELOCITY(FT*FT/SEC.) =   1.53
  LONGEST FLOWPATH FROM NODE     13.10 TO NODE     13.30 =     817.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.30 TO NODE     12.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   597.50  DOWNSTREAM(FEET) =   590.00
  FLOW LENGTH(FEET) =    78.24   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.41
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.13
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   11.31
  LONGEST FLOWPATH FROM NODE     13.10 TO NODE     12.60 =     895.24 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       12.13    11.31       5.446        4.82
  LONGEST FLOWPATH FROM NODE     13.10 TO NODE     12.60 =     895.24 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       71.72    11.57       5.366       30.97
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.60 =    3049.47 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM     RUNOFF        Tc       INTENSITY
  NUMBER      (CFS)      (MIN.)    (INCH/HOUR)
     1       82.23       11.31        5.446
     2       83.67       11.57        5.366

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       83.67   Tc(MIN.) =   11.57
  TOTAL AREA(ACRES) =        35.8

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.366
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4117
  SUBAREA AREA(ACRES) =     0.64   SUBAREA RUNOFF(CFS) =     1.58
  TOTAL AREA(ACRES) =        36.4   TOTAL RUNOFF(CFS) =      83.67
  TC(MIN.) =   11.57
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

+--------------------------------------------------------------------------+
| DETENTION-BIORETENTION BASIN                                             |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     12.60 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.57   RAIN INTENSITY(INCH/HOUR) =  5.37
  TOTAL AREA(ACRES) =    36.40   TOTAL RUNOFF(CFS) =     59.63

****************************************************************************
  FLOW PROCESS FROM NODE     12.60 TO NODE     13.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   587.25  DOWNSTREAM(FEET) =   583.00
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.20
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      59.63
```

```
  PIPE TRAVEL TIME(MIN.) =    0.09     Tc(MIN.) =    11.66
  LONGEST FLOWPATH FROM NODE      10.00 TO NODE      13.00 =     3145.47 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.342
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3116
  SUBAREA AREA(ACRES) =     1.57    SUBAREA RUNOFF(CFS) =     3.86
  TOTAL AREA(ACRES) =        38.0    TOTAL RUNOFF(CFS) =       63.20
  TC(MIN.) =    11.66
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        38.0  TC(MIN.) =      11.66
  PEAK FLOW RATE(CFS)    =       63.20
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2008 Advanced Engineering Software (aes)
             Ver. 15.0 Release Date: 04/01/2008  License ID 1459

                          Analysis prepared by:

                                BHA, INC.
                        5115 Avenida Encinas, Suite L
                       Carlsbad, California 92008-4387


 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DEVELOPED HYDROLOGY                                             *
* BASIN C - WITHOUT DETENTION SYSTEM                                       *
* 600-0813-400                                                             *
 ***************************************************************************

  FILE NAME: K:\HYDRO\0813\AH\P-3.DAT
  TIME/DATE OF STUDY: 17:02 04/15/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     21.10 TO NODE     21.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     85.00
  UPSTREAM ELEVATION(FEET) =     700.00
  DOWNSTREAM ELEVATION(FEET) =     698.00
  ELEVATION DIFFERENCE(FEET) =       2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =       0.82
  TOTAL AREA(ACRES) =       0.26   TOTAL RUNOFF(CFS) =       0.82

****************************************************************************
  FLOW PROCESS FROM NODE     21.20 TO NODE     21.30 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  698.00  DOWNSTREAM ELEVATION(FEET) =  633.00
  STREET LENGTH(FEET) =  1076.50   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.86
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.56
  STREET FLOW TRAVEL TIME(MIN.) =   3.48   Tc(MIN.) =   11.47
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.398
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    6.78      SUBAREA RUNOFF(CFS) =   16.84
  TOTAL AREA(ACRES) =        7.0        PEAK FLOW RATE(CFS) =      17.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.61
  FLOW VELOCITY(FEET/SEC.) =  5.97   DEPTH*VELOCITY(FT*FT/SEC.) =   2.14
  LONGEST FLOWPATH FROM NODE     21.10 TO NODE     21.30 =    1161.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.30 TO NODE     21.40 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   627.00  DOWNSTREAM(FEET) =   612.00
  FLOW LENGTH(FEET) =   228.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.9 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.57
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.48
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   11.71
  LONGEST FLOWPATH FROM NODE     21.10 TO NODE     21.40 =    1389.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.40 TO NODE     21.40 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.325
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4600
  SUBAREA AREA(ACRES) =    0.54   SUBAREA RUNOFF(CFS) =    1.32
  TOTAL AREA(ACRES) =        7.6   TOTAL RUNOFF(CFS) =      18.57
  TC(MIN.) =   11.71

****************************************************************************
  FLOW PROCESS FROM NODE     21.40 TO NODE     21.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   609.25  DOWNSTREAM(FEET) =   605.00
  FLOW LENGTH(FEET) =    52.62   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.04
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.57
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   11.76
  LONGEST FLOWPATH FROM NODE     21.10 TO NODE     21.00 =    1442.12 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.310
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4600
  SUBAREA AREA(ACRES) =    0.92   SUBAREA RUNOFF(CFS) =    2.25
  TOTAL AREA(ACRES) =        8.5   TOTAL RUNOFF(CFS) =      20.76
  TC(MIN.) =   11.76
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        8.5  TC(MIN.) =     11.76
  PEAK FLOW RATE(CFS)    =      20.76
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                        2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2008 Advanced Engineering Software (aes)
             Ver. 15.0 Release Date: 04/01/2008  License ID 1459

                          Analysis prepared by:

                                BHA, INC.
                        5115 Avenida Encinas, Suite L
                       Carlsbad, California 92008-4387


 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DEVELOPED HYDROLOGY                                             *
* BASIN C - WITH DETENTION BASIN SYSTEM                                    *
* 600-0813-400                                                             *
 ***************************************************************************

  FILE NAME: K:\HYDRO\0813\AH\P-3WD.DAT
  TIME/DATE OF STUDY: 17:06 04/15/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     21.10 TO NODE     21.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     85.00
  UPSTREAM ELEVATION(FEET) =     700.00
  DOWNSTREAM ELEVATION(FEET) =     698.00
  ELEVATION DIFFERENCE(FEET) =       2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     7.986
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.818
  SUBAREA RUNOFF(CFS) =       0.82
  TOTAL AREA(ACRES) =       0.26   TOTAL RUNOFF(CFS) =       0.82

****************************************************************************
  FLOW PROCESS FROM NODE     21.20 TO NODE     21.30 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  698.00  DOWNSTREAM ELEVATION(FEET) =  633.00
  STREET LENGTH(FEET) =  1076.50   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   9.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.31
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.86
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.15
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.56
  STREET FLOW TRAVEL TIME(MIN.) =   3.48   Tc(MIN.) =   11.47
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.398
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.460
  SUBAREA AREA(ACRES) =    6.78      SUBAREA RUNOFF(CFS) =   16.84
  TOTAL AREA(ACRES) =        7.0        PEAK FLOW RATE(CFS) =      17.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.61
  FLOW VELOCITY(FEET/SEC.) =  5.97   DEPTH*VELOCITY(FT*FT/SEC.) =   2.14
  LONGEST FLOWPATH FROM NODE     21.10 TO NODE     21.30 =    1161.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.30 TO NODE     21.40 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   627.00  DOWNSTREAM(FEET) =   612.00
  FLOW LENGTH(FEET) =   228.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.9 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.57
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.48
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =   11.71
  LONGEST FLOWPATH FROM NODE     21.10 TO NODE     21.40 =    1389.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.40 TO NODE     21.40 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.325
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4600
  SUBAREA AREA(ACRES) =    0.54   SUBAREA RUNOFF(CFS) =    1.32
  TOTAL AREA(ACRES) =        7.6   TOTAL RUNOFF(CFS) =      18.57
  TC(MIN.) =   11.71

+--------------------------------------------------------------------------+
| DETENTION-BIORETENTION BASIN                                             |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     21.40 TO NODE     21.40 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  11.71   RAIN INTENSITY(INCH/HOUR) =  5.33
  TOTAL AREA(ACRES) =     7.60   TOTAL RUNOFF(CFS) =     13.37

****************************************************************************
  FLOW PROCESS FROM NODE     21.40 TO NODE     21.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   609.25  DOWNSTREAM(FEET) =   605.00
  FLOW LENGTH(FEET) =    52.62   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.55
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.37
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   11.77
  LONGEST FLOWPATH FROM NODE     21.10 TO NODE     21.00 =    1442.12 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.310
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3443
  SUBAREA AREA(ACRES) =    0.92   SUBAREA RUNOFF(CFS) =    2.25
  TOTAL AREA(ACRES) =        8.5   TOTAL RUNOFF(CFS) =      15.58
  TC(MIN.) =   11.77
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        8.5  TC(MIN.) =     11.77
  PEAK FLOW RATE(CFS)    =      15.58
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
****
                HYDRAULIC ELEMENTS - I  PROGRAM PACKAGE
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                          Analysis prepared by:

                                BHA, INC.
                        5115 Avenida Encinas, Suite L
                       Carlsbad, California 92008-4387


----------------------------------------------------------------------------
----
   TIME/DATE OF STUDY: 10:53 05/20/2009

============================================================================
====
  Problem Descriptions:
   100-year flow calculation for vegetated swales around lots
   Q=CIA=(0.46)(9.22)(0.7)=2.97CFS - Q\2=1.48 CFS
   Tc=5 Min

****************************************************************************
****
 >>>>CHANNEL INPUT INFORMATION<<<<

----------------------------------------------------------------------------
----
     CHANNEL Z1(HORIZONTAL/VERTICAL) =   50.00
             Z2(HORIZONTAL/VERTICAL) =   50.00
     BASEWIDTH(FEET) =      0.00
     CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.010000
     UNIFORM FLOW(CFS) =         1.48
     MANNINGS FRICTION FACTOR = 0.0250

============================================================================
====
     NORMAL-DEPTH FLOW INFORMATION:

----------------------------------------------------------------------------
----
     >>>>> NORMAL DEPTH(FEET) =   0.16
     FLOW TOP-WIDTH(FEET) =        16.21
     FLOW AREA(SQUARE FEET) =            1.31
     HYDRAULIC DEPTH(FEET) =      0.08
     FLOW AVERAGE VELOCITY(FEET/SEC.) =      1.13
     UNIFORM FROUDE NUMBER =    0.697
     PRESSURE + MOMENTUM(POUNDS) =             7.66
     AVERAGED VELOCITY HEAD(FEET) =       0.020
     SPECIFIC ENERGY(FEET) =      0.182

============================================================================
====
     CRITICAL-DEPTH FLOW INFORMATION:
```

```
-----------------------------------------------------------------------
----
     CRITICAL FLOW TOP-WIDTH(FEET) =        13.95
     CRITICAL FLOW AREA(SQUARE FEET) =            0.97
     CRITICAL FLOW HYDRAULIC DEPTH(FEET) =      0.07
     CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =     1.52
     CRITICAL DEPTH(FEET) =     0.14
     CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =            7.19
     AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =      0.036
     CRITICAL FLOW SPECIFIC ENERGY(FEET) =      0.175

=======================================================================
====
```

II. CALCULATIONS

C.100-YEAR DETENTION-BIORETENTION BASINS

Detention-Bioretention at Basin A:

Depth vs. Storage

Elevation (ft)	Area (sf)	Average Area (sf)	Average Storage (ac-ft)	Total Storage (ac-ft)
590	4432.49	0	0	0
591	4932.34	4682.41	0.107	0.107
592	5430.26	5181.30	0.119	0.226
593	5948.75	5689.51	0.131	0.357
594	6475.68	6212.22	0.143	0.500

The outlet overflow pipe for this bioretention system which convey the 100-year flow is an 18-inch HDPE stand pipe. Orifice formula is used Q out= $0.62A(2gh)^{1/2}$

Depth vs. Discharge Flow

Depth (ft)	head (ft)	Q out (cfs)	Total Storage (ac-ft)
0	0	0	0
1	0.5	6.2	0.107
2	1.5	4.8	0.226
3	2.5	6.2	0.357
4	3.5	7.3	0.500

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 4/15/2009
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 11 MIN.
6 HOUR RAINFALL 3.5 INCHES
BASIN AREA 3.8 ACRES
RUNOFF COEFFICIENT 0.46
PEAK DISCHARGE 9.62 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 0.4
TIME (MIN) = 22	DISCHARGE (CFS) = 0.4
TIME (MIN) = 33	DISCHARGE (CFS) = 0.4
TIME (MIN) = 44	DISCHARGE (CFS) = 0.4
TIME (MIN) = 55	DISCHARGE (CFS) = 0.4
TIME (MIN) = 66	DISCHARGE (CFS) = 0.4
TIME (MIN) = 77	DISCHARGE (CFS) = 0.4
TIME (MIN) = 88	DISCHARGE (CFS) = 0.5
TIME (MIN) = 99	DISCHARGE (CFS) = 0.5
TIME (MIN) = 110	DISCHARGE (CFS) = 0.5
TIME (MIN) = 121	DISCHARGE (CFS) = 0.5
TIME (MIN) = 132	DISCHARGE (CFS) = 0.6
TIME (MIN) = 143	DISCHARGE (CFS) = 0.6
TIME (MIN) = 154	DISCHARGE (CFS) = 0.6
TIME (MIN) = 165	DISCHARGE (CFS) = 0.7
TIME (MIN) = 176	DISCHARGE (CFS) = 0.8
TIME (MIN) = 187	DISCHARGE (CFS) = 0.9
TIME (MIN) = 198	DISCHARGE (CFS) = 0.9
TIME (MIN) = 209	DISCHARGE (CFS) = 1.1
TIME (MIN) = 220	DISCHARGE (CFS) = 1.3
TIME (MIN) = 231	DISCHARGE (CFS) = 1.9
TIME (MIN) = 242	DISCHARGE (CFS) = 2.8
TIME (MIN) = 253	DISCHARGE (CFS) = 9.62
TIME (MIN) = 264	DISCHARGE (CFS) = 1.5
TIME (MIN) = 275	DISCHARGE (CFS) = 1
TIME (MIN) = 286	DISCHARGE (CFS) = 0.8
TIME (MIN) = 297	DISCHARGE (CFS) = 0.7
TIME (MIN) = 308	DISCHARGE (CFS) = 0.6
TIME (MIN) = 319	DISCHARGE (CFS) = 0.5
TIME (MIN) = 330	DISCHARGE (CFS) = 0.5
TIME (MIN) = 341	DISCHARGE (CFS) = 0.4
TIME (MIN) = 352	DISCHARGE (CFS) = 0.4
TIME (MIN) = 363	DISCHARGE (CFS) = 0.4
TIME (MIN) = 374	DISCHARGE (CFS) = 0

```
****************************************************************************
                HYDRAULICS ELEMENTS - II  PROGRAM PACKAGE

                STORAGE BASIN HYDROGRAPH ROUTING MODEL
****************************************************************************
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                        Analysis prepared by:

                            BHA, INC.
                     5115 Avenida Encinas, Suite L
                    Carlsbad, California 92008-4387


 ************************** DESCRIPTION OF STUDY **************************
* 100 YEAR DETENTION CALCULATION FOR BASIN A                               *
* SUGABUSH                                                                 *
* 600-0813-400                                                             *
 ***************************************************************************

    FILE NAME: K:\HYDRO\0813\AH\DB-A.DAT
    TIME/DATE OF STUDY: 14:19 04/15/2009
===========================================================================
    ENTERED INFORMATION:
---------------------------------------------------------------------------
    TOTAL NUMBER OF INFLOW HYDROGRAPH INTERVALS =   35
    CONSTANT HYDROGRAPH TIME UNIT(MINUTES) =   11.000
    ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN =    0.00
---------------------------------------------------------------------------
    ENTERED INFLOW HYDROGRAPH ORDINATES(CFS):
    *INTERVAL    FLOW   *INTERVAL    FLOW   *INTERVAL    FLOW   *
    * NUMBER     (CFS)  * NUMBER     (CFS)  * NUMBER     (CFS)  *
    *    1:        0.00*    2:        0.40*    3:        0.40*
    *    4:        0.40*    5:        0.40*    6:        0.40*
    *    7:        0.40*    8:        0.40*    9:        0.50*
    *   10:        0.50*   11:        0.50*   12:        0.50*
    *   13:        0.60*   14:        0.60*   15:        0.60*
    *   16:        0.70*   17:        0.80*   18:        0.90*
    *   19:        0.90*   20:        1.10*   21:        1.30*
    *   22:        1.90*   23:        2.80*   24:        9.62*
    *   25:        1.50*   26:        1.00*   27:        0.80*
    *   28:        0.70*   29:        0.60*   30:        0.50*
    *   31:        0.50*   32:        0.40*   33:        0.40*
    *   34:        0.40*   35:        0.00*
===========================================================================
    DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
---------------------------------------------------------------------------
    TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES =   5
---------------------------------------------------------------------------
    *BASIN-DEPTH  STORAGE    OUTFLOW  **BASIN-DEPTH  STORAGE    OUTFLOW  *
    *   (FEET)  (ACRE-FEET)   (CFS)   **   (FEET)  (ACRE-FEET)   (CFS)   *
    *     0.000      0.000     0.000**     1.000      0.107      6.200*
    *     2.000      0.226    10.800**     3.000      0.357     13.900*
    *     4.000      0.500    16.400**
****************************************************************************
```

```
-----------------------------------------------------------------------------
    INITIAL BASIN DEPTH(FEET) =     0.00
    INITIAL BASIN STORAGE(ACRE-FEET) =        0.00
    INITIAL BASIN OUTFLOW(CFS) =        0.00
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
    BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:
     INTERVAL    {S-O*DT/2}    {S+O*DT/2}
      NUMBER    (ACRE-FEET)  (ACRE-FEET)
          1       0.00000      0.00000
          2       0.06003      0.15397
          3       0.14418      0.30782
          4       0.25170      0.46230
          5       0.37576      0.62424
    WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT(MIN.)
-----------------------------------------------------------------------------


        *UNIT-HYDROGRAPH STORAGE-BASIN ROUTING*
    NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES
          OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE
          AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

    GRAPH NOTATION: "I"=MEAN UNIT INFLOW; "O"=OUTFLOW AT GIVEN TIME
-----------------------------------------------------------------------------
     TIME    INFLOW  OUTFLOW    STORAGE
    (HOURS) (CFS)    (CFS)    (ACRE-FT)  0.       2.       5.       7.      10.
       0.18     0.00     0.00       0.000 O       .        .        .        .
         [BASIN DEPTH(FEET) =    0.00]
       0.37     0.40     0.24       0.004 OI      .        .        .        .
         [BASIN DEPTH(FEET) =    0.04]
       0.55     0.40     0.34       0.006 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.05]
       0.73     0.40     0.38       0.006 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.06]
       0.92     0.40     0.39       0.007 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.06]
       1.10     0.40     0.40       0.007 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.06]
       1.28     0.40     0.40       0.007 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.06]
       1.47     0.40     0.40       0.007 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.06]
       1.65     0.50     0.46       0.008 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.07]
       1.83     0.50     0.48       0.008 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.08]
       2.02     0.50     0.49       0.009 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.08]
       2.20     0.50     0.50       0.009 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.08]
       2.38     0.60     0.56       0.010 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.09]
       2.57     0.60     0.58       0.010 .O      .        .        .        .
```

```
  [BASIN DEPTH(FEET) =    0.09]
2.75     0.60     0.59       0.010 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.10]
2.93     0.70     0.66       0.011 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.11]
3.12     0.80     0.74       0.013 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.12]
3.30     0.90     0.84       0.014 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.14]
3.48     0.90     0.88       0.015 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.14]
3.67     1.10     1.01       0.017 .  O    .       .       .       .
  [BASIN DEPTH(FEET) =    0.16]
3.85     1.30     1.19       0.021 .  OI   .       .       .       .
  [BASIN DEPTH(FEET) =    0.19]
4.03     1.90     1.62       0.028 .    OI .       .       .       .
  [BASIN DEPTH(FEET) =    0.26]
4.22     2.80     2.34       0.040 .      O.I      .       .       .
  [BASIN DEPTH(FEET) =    0.38]
4.40     9.62     6.63       0.118 .       .       .     O .       I
  [BASIN DEPTH(FEET) =    1.09]
4.58     1.50     3.65       0.063 .   I   .   O   .       .       .
  [BASIN DEPTH(FEET) =    0.59]
4.77     1.00     2.03       0.035 .  I  O .       .       .       .
  [BASIN DEPTH(FEET) =    0.33]
4.95     0.80     1.28       0.022 . I O   .       .       .       .
  [BASIN DEPTH(FEET) =    0.21]
5.13     0.70     0.93       0.016 . IO    .       .       .       .
  [BASIN DEPTH(FEET) =    0.15]
5.32     0.60     0.73       0.013 .IO     .       .       .       .
  [BASIN DEPTH(FEET) =    0.12]
5.50     0.50     0.59       0.010 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.09]
5.68     0.50     0.53       0.009 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.09]
5.87     0.40     0.45       0.008 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.07]
6.05     0.40     0.42       0.007 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.07]
6.23     0.40     0.41       0.007 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.07]
6.42     0.00     0.16       0.003 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.03]
6.60     0.00     0.06       0.001 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.01]
6.78     0.00     0.02       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
6.97     0.00     0.01       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
7.15     0.00     0.00       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
7.33     0.00     0.00       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
7.52     0.00     0.00       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
7.70     0.00     0.00       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
```

```
 7.88     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 8.07     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 8.25     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 8.43     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 8.62     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 8.80     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 8.98     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.17     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.35     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.53     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.72     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.90     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
10.08     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
10.27     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
10.45     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
10.63     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
10.82     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
11.00     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
11.18     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
11.37     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
11.55     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
11.73     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
11.92     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
12.10     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
12.28     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
12.47     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
12.65     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
12.83     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
13.02     0.00     0.00       0.000 O       .       .       .       .
```

```
   [BASIN DEPTH(FEET) =    0.00]
13.20     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
13.38     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
13.57     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
13.75     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
```

Detention-Bioretention at Basin B:

Depth vs. Storage

Elevation (ft)	Area (sf)	Average Area (sf)	Average Storage (ac-ft)	Total Storage (ac-ft)
590	12509.3	12509.3	0	0
591	13355.1	12932.2	0.300	0.300
592	14233.1	13794.1	0.317	0.614
593	15132.9	14683.0	0.337	0.951
594	16051.7	15592.3	0.357	1.308
595	16993.9	16522.8	0.380	1.688

The outlet overflow pipe for this bioretention system which convey the 100-year flow is an 36-inch HDPE stand pipe. Orifice formula are used Q out= $0.62A(2gh)^{1/2}$

Depth vs. Discharge Flow

Depth (ft)	head (ft)	Q out (cfs)	Total Storage (ac-ft)
0	0	0	0
1	0.5	12.2*	0.300
2	1.5	43.1	0.614
3	2.5	55.6	0.951
4	3.5	65.8	1.308
5	4.5	74.6	1.688

* The structure behaves as weir at this depth. Q out= CL(H)3/2 , C= 3.27+0.4(h/hw)

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 4/15/2009
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 12 MIN.
6 HOUR RAINFALL 3.5 INCHES
BASIN AREA 36.4 ACRES
RUNOFF COEFFICIENT 0.4
PEAK DISCHARGE 83.67 CFS

1	TIME (MIN) = 0	DISCHARGE (CFS) = 0
2	TIME (MIN) = 12	DISCHARGE (CFS) = 3.1
3	TIME (MIN) = 24	DISCHARGE (CFS) = 3.1
4	TIME (MIN) = 36	DISCHARGE (CFS) = 3.3
5	TIME (MIN) = 48	DISCHARGE (CFS) = 3.4
6	TIME (MIN) = 60	DISCHARGE (CFS) = 3.5
7	TIME (MIN) = 72	DISCHARGE (CFS) = 3.6
8	TIME (MIN) = 84	DISCHARGE (CFS) = 3.9
9	TIME (MIN) = 96	DISCHARGE (CFS) = 4
10	TIME (MIN) = 108	DISCHARGE (CFS) = 4.3
11	TIME (MIN) = 120	DISCHARGE (CFS) = 4.4
12	TIME (MIN) = 132	DISCHARGE (CFS) = 4.8
13	TIME (MIN) = 144	DISCHARGE (CFS) = 5.1
14	TIME (MIN) = 156	DISCHARGE (CFS) = 5.6
15	TIME (MIN) = 168	DISCHARGE (CFS) = 5.9
16	TIME (MIN) = 180	DISCHARGE (CFS) = 6.8
17	TIME (MIN) = 192	DISCHARGE (CFS) = 7.4
18	TIME (MIN) = 204	DISCHARGE (CFS) = 9
19	TIME (MIN) = 216	DISCHARGE (CFS) = 10.3
20	TIME (MIN) = 228	DISCHARGE (CFS) = 15.1
21	TIME (MIN) = 240	DISCHARGE (CFS) = 14
22	TIME (MIN) = 252	DISCHARGE (CFS) = 83.67
23	TIME (MIN) = 264	DISCHARGE (CFS) = 12.1
24	TIME (MIN) = 276	DISCHARGE (CFS) = 8.1
25	TIME (MIN) = 288	DISCHARGE (CFS) = 6.3
26	TIME (MIN) = 300	DISCHARGE (CFS) = 5.3
27	TIME (MIN) = 312	DISCHARGE (CFS) = 4.6
28	TIME (MIN) = 324	DISCHARGE (CFS) = 4.1
29	TIME (MIN) = 336	DISCHARGE (CFS) = 3.7
30	TIME (MIN) = 348	DISCHARGE (CFS) = 3.4
31	TIME (MIN) = 360	DISCHARGE (CFS) = 3.2
32	TIME (MIN) = 372	DISCHARGE (CFS) = 0

```
****************************************************************************
                HYDRAULICS ELEMENTS - II  PROGRAM PACKAGE

                STORAGE BASIN HYDROGRAPH ROUTING MODEL
****************************************************************************
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            Ver. 15.0  Release Date: 04/01/2008  License ID 1459

                        Analysis prepared by:

                              BHA, INC.
                      5115 Avenida Encinas, Suite L
                     Carlsbad, California 92008-4387


 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DETENTION BASIN CALCULATION FOR BASIN B                         *
* SUGABUSH                                                                 *
* 600-0813-400                                                             *
 ***************************************************************************

    FILE NAME: K:\HYDRO\0813\AH\DB-B.DAT
    TIME/DATE OF STUDY: 15:35 04/15/2009
===========================================================================
    ENTERED INFORMATION:
---------------------------------------------------------------------------
    TOTAL NUMBER OF INFLOW HYDROGRAPH INTERVALS =   32
    CONSTANT HYDROGRAPH TIME UNIT(MINUTES) =   12.000
    ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN =    0.00
---------------------------------------------------------------------------
    ENTERED INFLOW HYDROGRAPH ORDINATES(CFS):
    *INTERVAL    FLOW   *INTERVAL    FLOW   *INTERVAL    FLOW   *
    * NUMBER     (CFS)  * NUMBER     (CFS)  * NUMBER     (CFS)  *
    *    1:        0.00*    2:        3.10*    3:        3.10*
    *    4:        3.30*    5:        3.40*    6:        3.50*
    *    7:        3.60*    8:        3.90*    9:        4.00*
    *   10:        4.30*   11:        4.40*   12:        4.80*
    *   13:        5.10*   14:        5.60*   15:        5.90*
    *   16:        6.80*   17:        7.40*   18:        9.00*
    *   19:       10.30*   20:       15.10*   21:       14.00*
    *   22:       83.67*   23:       12.10*   24:        8.10*
    *   25:        6.30*   26:        5.30*   27:        4.60*
    *   28:        4.10*   29:        3.70*   30:        3.40*
    *   31:        3.20*   32:        0.00*
===========================================================================
    DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
---------------------------------------------------------------------------
    TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES =   6
---------------------------------------------------------------------------
    *BASIN-DEPTH  STORAGE    OUTFLOW  **BASIN-DEPTH  STORAGE    OUTFLOW  *
    *   (FEET)  (ACRE-FEET)   (CFS)   **   (FEET)  (ACRE-FEET)   (CFS)   *
    *     0.000      0.000     0.000**     1.000      0.300     12.220*
    *     2.000      0.614    43.100**     3.000      0.951     55.600*
    *     4.000      1.308    65.800**     5.000      1.688     74.600*
****************************************************************************
---------------------------------------------------------------------------
```

```
    INITIAL BASIN DEPTH(FEET) =     0.00
    INITIAL BASIN STORAGE(ACRE-FEET) =        0.00
    INITIAL BASIN OUTFLOW(CFS) =        0.00
-------------------------------------------------------------------------
-------------------------------------------------------------------------
    BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:
     INTERVAL    {S-O*DT/2}    {S+O*DT/2}
      NUMBER    (ACRE-FEET)  (ACRE-FEET)
          1       0.00000      0.00000
          2       0.19901      0.40099
          3       0.25780      0.97020
          4       0.49150      1.41050
          5       0.76420      1.85180
          6       1.07147      2.30453
    WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT(MIN.)
-------------------------------------------------------------------------
```

```
        *UNIT-HYDROGRAPH STORAGE-BASIN ROUTING*
    NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES
          OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE
          AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

    GRAPH NOTATION: "I"=MEAN UNIT INFLOW; "O"=OUTFLOW AT GIVEN TIME
-------------------------------------------------------------------------
     TIME    INFLOW  OUTFLOW    STORAGE
    (HOURS) (CFS)    (CFS)    (ACRE-FT)  0.      21.      42.      63.      84.
       0.20     0.00     0.00       0.000 O       .        .        .        .
         [BASIN DEPTH(FEET) =    0.00]
       0.40     3.10     1.56       0.038 OI      .        .        .        .
         [BASIN DEPTH(FEET) =    0.13]
       0.60     3.10     2.34       0.057 OI      .        .        .        .
         [BASIN DEPTH(FEET) =    0.19]
       0.80     3.30     2.82       0.069 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.23]
       1.00     3.40     3.11       0.076 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.25]
       1.20     3.50     3.31       0.081 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.27]
       1.40     3.60     3.46       0.085 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.28]
       1.60     3.90     3.68       0.090 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.30]
       1.80     4.00     3.84       0.094 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.31]
       2.00     4.30     4.07       0.100 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.33]
       2.20     4.40     4.24       0.104 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.35]
       2.40     4.80     4.52       0.111 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.37]
       2.60     5.10     4.81       0.118 .O      .        .        .        .
         [BASIN DEPTH(FEET) =    0.39]
       2.80     5.60     5.21       0.128 .OI     .        .        .        .
```

```
  [BASIN DEPTH(FEET) =    0.43]
3.00     5.90     5.56       0.136 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.45]
3.20     6.80     6.18       0.152 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.51]
3.40     7.40     6.80       0.167 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.56]
3.60     9.00     7.91       0.194 .  O    .       .       .       .
  [BASIN DEPTH(FEET) =    0.65]
3.80    10.30     9.11       0.224 .  O    .       .       .       .
  [BASIN DEPTH(FEET) =    0.75]
4.00    15.10    12.13       0.298 .   OI  .       .       .       .
  [BASIN DEPTH(FEET) =    0.99]
4.20    14.00    13.74       0.315 .    O  .       .       .       .
  [BASIN DEPTH(FEET) =    1.05]
4.40    83.67    59.63       1.092 .       .       .     O .       I
  [BASIN DEPTH(FEET) =    3.40]
4.60    12.10    33.83       0.520 .   I   .   O   .       .       .
  [BASIN DEPTH(FEET) =    1.70]
4.80     8.10    11.40       0.280 .  IO   .       .       .       .
  [BASIN DEPTH(FEET) =    0.93]
5.00     6.30     8.83       0.217 . IO    .       .       .       .
  [BASIN DEPTH(FEET) =    0.72]
5.20     5.30     7.05       0.173 . O     .       .       .       .
  [BASIN DEPTH(FEET) =    0.58]
5.40     4.60     5.82       0.143 .IO     .       .       .       .
  [BASIN DEPTH(FEET) =    0.48]
5.60     4.10     4.95       0.122 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.41]
5.80     3.70     4.32       0.106 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.35]
6.00     3.40     3.86       0.095 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.32]
6.20     3.20     3.53       0.087 .O      .       .       .       .
  [BASIN DEPTH(FEET) =    0.29]
6.40     0.00     1.75       0.043 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.14]
6.60     0.00     0.87       0.021 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.07]
6.80     0.00     0.43       0.011 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.04]
7.00     0.00     0.21       0.005 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.02]
7.20     0.00     0.11       0.003 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.01]
7.40     0.00     0.05       0.001 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
7.60     0.00     0.03       0.001 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
7.80     0.00     0.01       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
8.00     0.00     0.01       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
8.20     0.00     0.00       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
8.40     0.00     0.00       0.000 O       .       .       .       .
  [BASIN DEPTH(FEET) =    0.00]
```

```
 8.60      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
 8.80      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
 9.00      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
 9.20      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
 9.40      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
 9.60      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
 9.80      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
10.00      0.00      0.00        0.000 O        .        .        .        .
   [BASIN DEPTH(FEET) =    0.00]
```

Detention-Bioretention at Basin C:

Depth vs. Storage

Elevation (ft)	Area (sf)	Average Area (sf)	Average Storage (ac-ft)	Total Storage (ac-ft)
612	4811.6	4811.6	0	0
613	5580.5	5196.0	0.119	0.119
614	6155.5	5868.0	0.135	0.425
615	6734.4	6444.9	0.148	0.573
616	7291.4	7012.9	0.161	0.734

The outlet overflow pipe for this bioretention system which convey the 100-year flow is an 24-inch HDPE stand pipe. Orifice formula are used Q out= $0.62A(2gh)^{1/2}$

Depth vs. Discharge Flow

Depth (ft)	head (ft)	Q out (cfs)	Total Storage (ac-ft)
0	0	0	0
1	0.5	11.0	0.119
2	1.5	19.1	0.425
3	2.5	24.7	0.573
4	3.5	29.2	0.734

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 4/15/2009
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 12 MIN.
6 HOUR RAINFALL 3.5 INCHES
BASIN AREA 7.6 ACRES
RUNOFF COEFFICIENT 0.46
PEAK DISCHARGE 18.57 CFS

1	TIME (MIN) = 0	DISCHARGE (CFS) = 0
2	TIME (MIN) = 12	DISCHARGE (CFS) = 0.7
3	TIME (MIN) = 24	DISCHARGE (CFS) = 0.7
4	TIME (MIN) = 36	DISCHARGE (CFS) = 0.8
5	TIME (MIN) = 48	DISCHARGE (CFS) = 0.8
6	TIME (MIN) = 60	DISCHARGE (CFS) = 0.8
7	TIME (MIN) = 72	DISCHARGE (CFS) = 0.9
8	TIME (MIN) = 84	DISCHARGE (CFS) = 0.9
9	TIME (MIN) = 96	DISCHARGE (CFS) = 1
0	TIME (MIN) = 108	DISCHARGE (CFS) = 1
11	TIME (MIN) = 120	DISCHARGE (CFS) = 1.1
12	TIME (MIN) = 132	DISCHARGE (CFS) = 1.2
13	TIME (MIN) = 144	DISCHARGE (CFS) = 1.2
14	TIME (MIN) = 156	DISCHARGE (CFS) = 1.3
15	TIME (MIN) = 168	DISCHARGE (CFS) = 1.4
16	TIME (MIN) = 180	DISCHARGE (CFS) = 1.6
17	TIME (MIN) = 192	DISCHARGE (CFS) = 1.8
18	TIME (MIN) = 204	DISCHARGE (CFS) = 2.2
19	TIME (MIN) = 216	DISCHARGE (CFS) = 2.5
20	TIME (MIN) = 228	DISCHARGE (CFS) = 3.6
21	TIME (MIN) = 240	DISCHARGE (CFS) = 4.9
22	TIME (MIN) = 252	DISCHARGE (CFS) = 18.57
23	TIME (MIN) = 264	DISCHARGE (CFS) = 2.9
24	TIME (MIN) = 276	DISCHARGE (CFS) = 1.9
25	TIME (MIN) = 288	DISCHARGE (CFS) = 1.5
26	TIME (MIN) = 300	DISCHARGE (CFS) = 1.3
27	TIME (MIN) = 312	DISCHARGE (CFS) = 1.1
28	TIME (MIN) = 324	DISCHARGE (CFS) = 1
29	TIME (MIN) = 336	DISCHARGE (CFS) = 0.9
30	TIME (MIN) = 348	DISCHARGE (CFS) = 0.8
31	TIME (MIN) = 360	DISCHARGE (CFS) = 0.8
32	TIME (MIN) = 372	DISCHARGE (CFS) = 0

```
****************************************************************************
                HYDRAULICS ELEMENTS - II  PROGRAM PACKAGE

                 STORAGE BASIN HYDROGRAPH ROUTING MODEL
****************************************************************************
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             Ver. 15.0  Release Date: 04/01/2008  License ID 1459

                          Analysis prepared by:

                              BHA, INC.
                       5115 Avenida Encinas, Suite L
                      Carlsbad, California 92008-4387


 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR DETENTION NBASIN CALCULATION-BASIN C                            *
* SUGABUSH                                                                 *
* 600-0813-400                                                             *
 ***************************************************************************

    FILE NAME: K:\HYDRO\0813\AH\DB-C.DAT
    TIME/DATE OF STUDY: 16:17 04/15/2009
============================================================================
    ENTERED INFORMATION:
----------------------------------------------------------------------------
    TOTAL NUMBER OF INFLOW HYDROGRAPH INTERVALS =   32
    CONSTANT HYDROGRAPH TIME UNIT(MINUTES) =   12.000
    ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN =    0.00
----------------------------------------------------------------------------
    ENTERED INFLOW HYDROGRAPH ORDINATES(CFS):
    *INTERVAL    FLOW   *INTERVAL    FLOW   *INTERVAL    FLOW   *
    * NUMBER     (CFS)  * NUMBER     (CFS)  * NUMBER     (CFS)  *
    *    1:        0.00*    2:        0.70*    3:        0.70*
    *    4:        0.80*    5:        0.80*    6:        0.80*
    *    7:        0.90*    8:        0.90*    9:        1.00*
    *   10:        1.00*   11:        1.10*   12:        1.20*
    *   13:        1.20*   14:        1.30*   15:        1.40*
    *   16:        1.60*   17:        1.80*   18:        2.20*
    *   19:        2.50*   20:        3.60*   21:        4.90*
    *   22:       18.57*   23:        2.90*   24:        1.90*
    *   25:        1.50*   26:        1.30*   27:        1.10*
    *   28:        1.00*   29:        0.90*   30:        0.80*
    *   31:        0.80*   32:        0.00*
============================================================================
    DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
----------------------------------------------------------------------------
    TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES =   5
----------------------------------------------------------------------------
    *BASIN-DEPTH  STORAGE    OUTFLOW  **BASIN-DEPTH  STORAGE    OUTFLOW  *
    *   (FEET)  (ACRE-FEET)   (CFS)   **   (FEET)  (ACRE-FEET)   (CFS)   *
    *     0.000      0.000     0.000**     1.000      0.119     11.000*
    *     2.000      0.425    19.100**     3.000      0.573     24.710*
    *     4.000      0.734    29.240**
****************************************************************************
----------------------------------------------------------------------------
```

```
    INITIAL BASIN DEPTH(FEET) =     0.00
    INITIAL BASIN STORAGE(ACRE-FEET) =        0.00
    INITIAL BASIN OUTFLOW(CFS) =        0.00
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
    BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:
     INTERVAL    {S-O*DT/2}    {S+O*DT/2}
      NUMBER    (ACRE-FEET)  (ACRE-FEET)
          1       0.00000      0.00000
          2       0.02809      0.20991
          3       0.26715      0.58285
          4       0.36879      0.77721
          5       0.49235      0.97565
    WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT(MIN.)
-------------------------------------------------------------------------------


         *UNIT-HYDROGRAPH STORAGE-BASIN ROUTING*
    NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES
          OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE
          AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

    GRAPH NOTATION: "I"=MEAN UNIT INFLOW; "O"=OUTFLOW AT GIVEN TIME
-------------------------------------------------------------------------------
     TIME    INFLOW  OUTFLOW    STORAGE
    (HOURS) (CFS)    (CFS)    (ACRE-FT)  0.      5.      9.     14.     19.
       0.20     0.00     0.00       0.000 O       .       .       .       .
         [BASIN DEPTH(FEET) =    0.00]
       0.40     0.70     0.61       0.007 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.06]
       0.60     0.70     0.69       0.007 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.06]
       0.80     0.80     0.78       0.008 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.07]
       1.00     0.80     0.80       0.009 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.07]
       1.20     0.80     0.80       0.009 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.07]
       1.40     0.90     0.89       0.010 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.08]
       1.60     0.90     0.90       0.010 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.08]
       1.80     1.00     0.99       0.011 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.09]
       2.00     1.00     1.00       0.011 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.09]
       2.20     1.10     1.09       0.012 .O      .       .       .       .
         [BASIN DEPTH(FEET) =    0.10]
       2.40     1.20     1.18       0.013 . O     .       .       .       .
         [BASIN DEPTH(FEET) =    0.11]
       2.60     1.20     1.20       0.013 . O     .       .       .       .
         [BASIN DEPTH(FEET) =    0.11]
       2.80     1.30     1.29       0.014 . O     .       .       .       .
         [BASIN DEPTH(FEET) =    0.12]
```

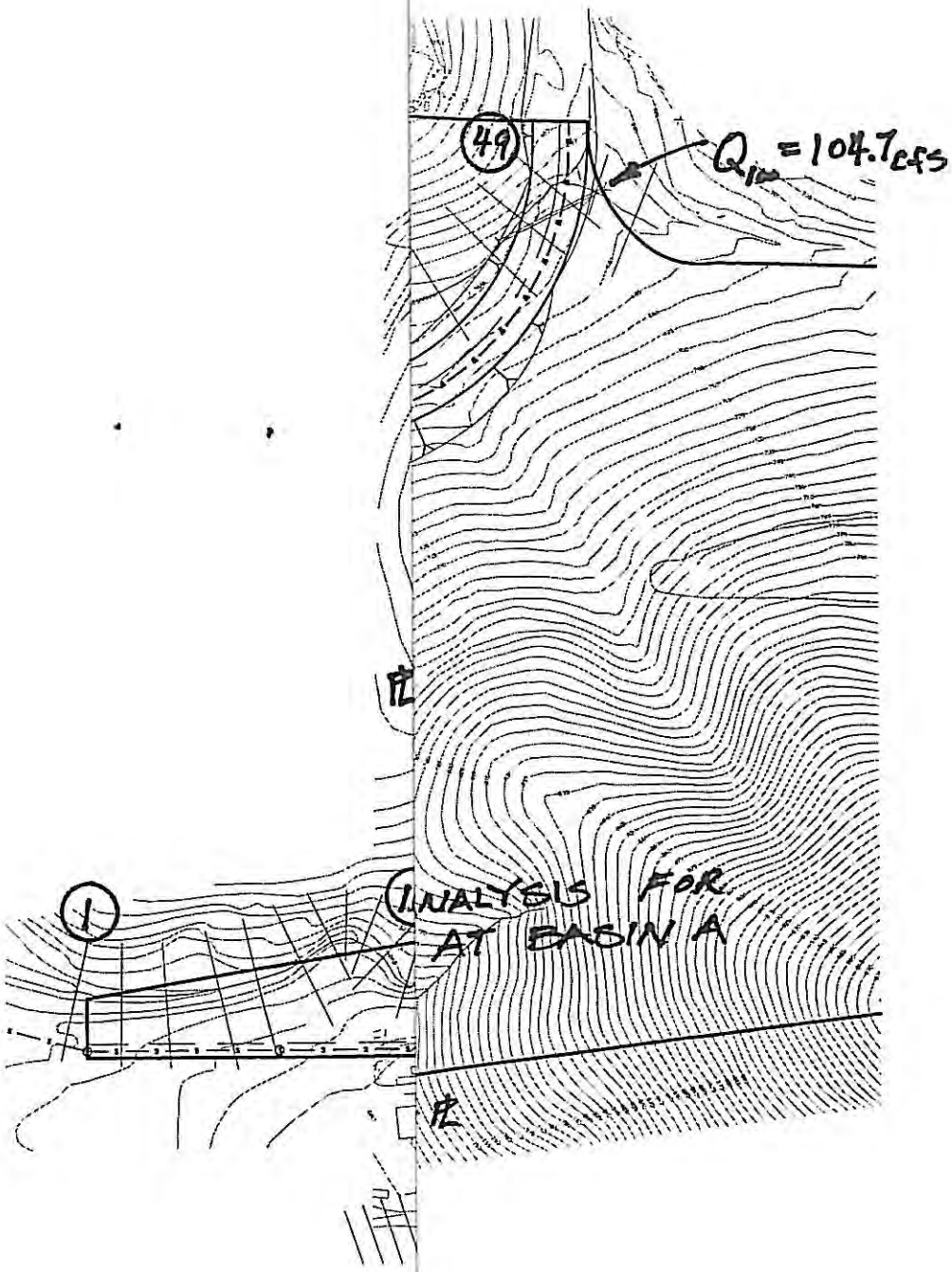
```
3.00      1.40      1.38        0.015 . O      .        .        .        .
  [BASIN DEPTH(FEET) =     0.13]
3.20      1.60      1.57        0.017 . O      .        .        .        .
  [BASIN DEPTH(FEET) =     0.14]
3.40      1.80      1.77        0.019 .  O     .        .        .        .
  [BASIN DEPTH(FEET) =     0.16]
3.60      2.20      2.14        0.023 .  O     .        .        .        .
  [BASIN DEPTH(FEET) =     0.19]
3.80      2.50      2.45        0.027 .   O    .        .        .        .
  [BASIN DEPTH(FEET) =     0.22]
4.00      3.60      3.45        0.037 .    OI  .        .        .        .
  [BASIN DEPTH(FEET) =     0.31]
4.20      4.90      4.71        0.051 .        O        .        .        .
  [BASIN DEPTH(FEET) =     0.43]
4.40     18.57     13.37        0.208 .        .        .       O.        I
  [BASIN DEPTH(FEET) =     1.29]
4.60      2.90      7.65        0.083 .   I    .    O   .        .        .
  [BASIN DEPTH(FEET) =     0.70]
4.80      1.90      2.67        0.029 .  IO    .        .        .        .
  [BASIN DEPTH(FEET) =     0.24]
5.00      1.50      1.66        0.018 . O      .        .        .        .
  [BASIN DEPTH(FEET) =     0.15]
5.20      1.30      1.35        0.015 . O      .        .        .        .
  [BASIN DEPTH(FEET) =     0.12]
5.40      1.10      1.13        0.012 .O       .        .        .        .
  [BASIN DEPTH(FEET) =     0.10]
5.60      1.00      1.02        0.011 .O       .        .        .        .
  [BASIN DEPTH(FEET) =     0.09]
5.80      0.90      0.92        0.010 .O       .        .        .        .
  [BASIN DEPTH(FEET) =     0.08]
6.00      0.80      0.82        0.009 .O       .        .        .        .
  [BASIN DEPTH(FEET) =     0.07]
6.20      0.80      0.80        0.009 .O       .        .        .        .
  [BASIN DEPTH(FEET) =     0.07]
6.40      0.00      0.11        0.001 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.01]
6.60      0.00      0.01        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
6.80      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
7.00      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
7.20      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
7.40      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
7.60      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
7.80      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
8.00      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
8.20      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
8.40      0.00      0.00        0.000 O        .        .        .        .
  [BASIN DEPTH(FEET) =     0.00]
8.60      0.00      0.00        0.000 O        .        .        .        .
```

```
   [BASIN DEPTH(FEET) =    0.00]
 8.80     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.00     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.20     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.40     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.60     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
 9.80     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
10.00     0.00     0.00       0.000 O       .       .       .       .
   [BASIN DEPTH(FEET) =    0.00]
```

II. CALCULATIONS

D. 100-YEAR FLOOD INNUNDATION CALCULATION

HEC-RAS CALCULATION
FOR
100 YEAR FLOOD AT BASIN A


49
Q_{100} = 104.7 cfs
1
ANALYSIS FOR
AT BASIN A

HEC-RAS Version 1.2 April 1996
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

****

PROJECT DATA
Project Title: 100 YEAR FLOOD CALCULATION AT BASIN A
Project File : 100-a.prj
Run Date and Time: 1/31/2005 8:58:56 AM

Project in English units

****

PLAN DATA

Plan Title: Imported Plan 01
Plan File : k:\landpr~1\600-08~1\hd\100-a.p01

Geometry Title: Imported Plan 01
Geometry File : k:\landpr~1\600-08~1\hd\100-a.p01

Flow Title : Imported Plan 01
Flow File : k:\landpr~1\600-08~1\hd\100-a.p01

Plan Summary Information:

Number of:	Cross Sections	= 51	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 0			

Computational Information

Water surface calculation tolerance	=	.01
Critical depth calculaton tolerance	=	.01
Maximum number of interations	=	20
Maximum difference tolerance	=	.3
Flow tolerance factor	=	.001

Computational Flow Regime: Mixed Flow

Encroachment Data: None

Flow Distribution Locations: None

****

FLOW DATA

Flow Title: Imported Flow 01
Flow File : k:\landpr~1\600-08~1\hd\100-a.f01

Flow Data (cfs)

Reach	Riv Sta	PF#1
1	51	104.7
1	32	228
1	18	247

Boundary Conditions

Reach	Profile	Upstream	Downstream
1	1	Known WS = 679.24	Known WS = 554.5

****

GEOMETRY DATA

Geometry Title: Imported Geom 01
Geometry File : k:\landpr~1\600-08~1\hd\100-a.g01

CROSS SECTION INPUT Reach: 1 River Station: 51
Description: 51

Station Elevation Data, num = 65

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	686.89	.79	686.79	1.58	686.69	2.29	686.55	2.47	686.52
3.31	686.37	5	686	5.56	685.88	6.89	685.59	9.63	685
11.71	684.56	14.29	684	15.92	683.67	19.02	683	21.24	682.5
23.6	682	27.14	681.44	29.53	681	32.89	680.53	34.26	680.33
36.29	680	36.75	679.95	36.96	679.94	40.77	679.54	48.82	679.14
49.47	679.1	49.84	679.08	51.83	679	52.29	678.97	53.66	678.82
60.67	678	61.7	677.88	63.47	677.66	63.63	677.65	63.98	677.64
64.18	677.64	64.55	677.66	65.27	677.73	67.03	677.95	67.42	678
68.4	678.18	72.92	679	76.55	679.71	78.14	680	79.47	680.1
82.51	680.3	84.9	680.41	87.08	680.48	88.91	680.52	91.44	680.56
93.48	680.6	93.83	680.6	95.22	680.59	98.48	680.62	102.86	680.58
105.88	680.61	108.6	680.58	113.4	680.61	114.63	680.6	119.98	680.63
124.37	680.66	129.08	680.69	129.48	680.71	130.4	680.72	135.68	680.86

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	68.4	.035	72.92	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
68.4	72.92	54.44	54.29	71.48	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 51 Profile # 1

W.S. Elev (ft)	679.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	679.63	Reach Len. (ft)	54.44	54.29	71.48
E.G. Slope (ft/ft)	0.018874	Flow Area (sq ft)	17.90	2.94	0.15
Q Total (cfs)	104.70	Flow (cfs)	91.77	12.72	0.21
Top Width (ft)	27.34	Top Width (ft)	21.59	4.52	1.23
Vel Total (ft/s)	4.99	Avg. Vel. (ft/s)	5.13	4.33	1.40
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)	0.83	0.65	0.12
Crit W.S. (ft)	679.24	Wetted Per. (ft)	21.71	4.59	1.25
Conv. Total (cfs)	762.1	Conv. (cfs)	668.0	92.6	1.5

CROSS SECTION INPUT Reach: 1 River Station: 50
Description: 50

Station Elevation Data, num = 33

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	678.58	1.81	678.38	3.87	678.17	5.85	678	6.69	677.92
8.58	677.77	11.09	677.6	21.47	677	23.24	676.92	25.9	676.68
31.15	676.3	33.42	676	36.35	675.67	39.33	675.35	40.76	675.19
41.36	675.13	42.8	675	42.92	674.99	43.21	674.98	43.73	675
44.56	675.04	48.15	675.16	48.58	675.18	49.41	675.22	50.39	675.26
53.22	675.36	60.26	675.69	65.26	675.8	66.43	675.85	66.67	675.86
66.89	675.86	67.17	675.86	70.05	675.9				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	36.35	.035	39.33	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
36.35	39.33	100.91	44.89	18.64	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 50 Profile # 1

W.S. Elev (ft)	675.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.17	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	676.98	Reach Len. (ft)	100.91	44.89	18.64
E.G. Slope (ft/ft)	0.132530	Flow Area (sq ft)	0.08	0.88	11.20
Q Total (cfs)	104.70	Flow (cfs)	0.21	6.05	98.44
Top Width (ft)	30.28	Top Width (ft)	1.21	2.98	26.08
Vel Total (ft/s)	8.61	Avg. Vel. (ft/s)	2.57	6.85	8.79
Max Chl Dpth (ft)	0.83	Hydr. Depth (ft)	0.07	0.30	0.43
Crit W.S. (ft)	676.12	Wetted Per. (ft)	1.22	3.00	26.12
Conv. Total (cfs)	287.6	Conv. (cfs)	0.6	16.6	270.4

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

CROSS SECTION INPUT Reach: 1 River Station: 49

Description: 49

Station Elevation Data, num = 67

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	688.49	.38	688.39	1.79	688	4.33	687.31	5.45	687
8.59	686.15	9.15	686	11.35	685.46	12.9	685	14.64	684.62
17.58	684	20.05	683.04	20.15	683	22.53	682.11	22.82	682
24.91	681.24	25.58	681	25.69	680.96	28.37	680	29.07	679.74
31.14	679	32.18	678.61	33.96	678	34.82	677.68	36.82	677
37.49	676.76	39.71	676	41.02	675.5	42.03	675	42.69	674.68
44.16	674	45.98	673.13	46.29	673	46.33	672.98	46.43	672.92
48.11	672	49.03	671.27	49.39	671	50.47	670.15	50.69	670
50.77	669.98	50.85	670	51.46	670	51.92	670.33	52.97	671
53.35	671.27	54.5	672	69.57	672.98	69.74	673	69.84	673.01
69.86	673.01	69.91	673.01	70.04	673.02	72.83	673.26	79.21	674
81.17	674.17	91.04	675	91.11	675	94.63	675.22	98.88	675.54
102.33	675.76	103.3	675.83	105.09	676	107.94	676.35	113.06	677
115.32	677.22	121.54	677.95						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	69.57	.035	69.74	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
69.57	69.74	52.87	50.3	47.75	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 49 Profile # 1

W.S. Elev (ft)	672.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.66	Wt. n-Val.	0.035		
E.G. Elev (ft)	673.37	Reach Len. (ft)	52.87	50.30	47.75
E.G. Slope (ft/ft)	0.031906	Flow Area (sq ft)	16.06		
Q Total (cfs)	104.70	Flow (cfs)	104.70		
Top Width (ft)	18.64	Top Width (ft)	18.64		
Vel Total (ft/s)	6.52	Avg. Vel. (ft/s)	6.52		
Max Chl Dpth (ft)	2.73	Hydr. Depth (ft)	0.86		
Crit W.S. (ft)	672.87	Wetted Per. (ft)	20.13		
Conv. Total (cfs)	586.2	Conv. (cfs)	586.2		

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

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

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

CROSS SECTION INPUT Reach: 1 River Station: 48

Description: 48

Station Elevation Data, num = 85

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	691.8	1.96	691	3.58	690.35	4.41	690	5.59	689.56
6.99	6899.520001	688.08		9.76	688	10.12	687.88	12.63	687
15.06	686.17	15.53	686	16.08	685.8	18.37	685	20.39	684.29

21.19	684	22.93	683.4	24.06	683	25.86	682.37	26.86	682
29.53	681.02	29.59	681	29.66	680.97	30.06	680.82	32.13	680
34.68	679.01	34.71	679	34.73	678.99	37.31	678	39.75	677.08
39.97	677	40.72	676.74	42.78	676	45.11	675.17	45.59	675
45.84	674.91	48.25	674	49.85	673.21	50.26	673	51.4	672.44
52.25	672	54.11	671.11	54.33	671	54.68	670.83	56.41	670
56.99	669.72	58.58	669	59.47	668.38	60.26	668	60.96	667.34
61.37	667	61.78	666.68	62.11	666.53	62.31	666.49	62.4	666.55
62.43	666.76	62.65	667	63.68	667.94	63.76	668	63.9	668.12
66.37	669	70.28	669.27	72.7	669.58	74.01	669.72	76.24	670
77.3	670.16	79.55	670.42	82.41	670.73	82.96	670.79	84.9	671
87.44	671.19	90.76	671.45	91.56	671.52	94.91	671.88	95.44	671.93
96.02	672	101.55	672.55	104.94	672.89	106	673	106.28	673.03
114.06	674	119.13	674.69	121.5	675	124.51	675.38	125.09	675.44

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	62.65	.035	63.68	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.65	63.68	44.61	49.37	55.58	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 48 Profile # 1

W.S. Elev (ft)	669.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.85	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	671.05	Reach Len. (ft)	44.61	49.37	55.58
E.G. Slope (ft/ft)	0.058862	Flow Area (sq ft)	6.41	1.79	2.16
Q Total (cfs)	104.70	Flow (cfs)	71.58	21.73	11.39
Top Width (ft)	11.22	Top Width (ft)	4.52	1.03	5.66
Vel Total (ft/s)	10.11	Avg. Vel. (ft/s)	11.16	12.15	5.28
Max Chl Dpth (ft)	2.72	Hydr. Depth (ft)	1.42	1.74	0.38
Crit W.S. (ft)	669.82	Wetted Per. (ft)	5.69	1.39	5.89
Conv. Total (cfs)	431.5	Conv. (cfs)	295.0	89.6	47.0

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

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

CROSS SECTION INPUT Reach: 1 River Station: 47

Description: 47

Station Elevation Data, num = 82

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	688.92	.33	688.8	2.72	688	3.56	687.72	5.69	687
7.21	686.5	8.71	686	10.01	685.58	11.77	685	14.25	684.18
14.79	684	15.66	683.72	17.9	683	19.63	682.44	20.89	682
22.14	681.54	23.5	681	24.57	680.61	26.26	680	28.93	679.05
29.08	679	29.36	678.9	31.83	678	34.07	677.2	34.62	677
34.85	676.92	37.41	676	37.46	675.98	37.59	675.94	40.12	675
42.14	674.25	42.8	674	44.83	673.24	45.49	673	45.67	672.94
48.47	672	50.33	671.39	51.54	671	52.72	670.64	54.76	670
57.12	669.35	58.48	669	60.47	668.45	62.03	668	65.08	667.11
65.47	667	65.76	666.91	67.48	666.38	68.69	666	68.84	665.91

70.84	665	72.43	664.21	72.99	664	73.1	663.98	73.27	664
74.53	664.71	74.96	665	75.04	665.07	76.35	666	82.37	666.49
85.9	666.71	90.37	667	91.46	667.22	93.32	667.62	95.07	668
97.57	668.48	100.54	669	104.72	669.54	108.2	670	111.49	670.43
115.79	671	121.39	671.67	123.24	671.92	123.75	672	128.29	672.84
129.16	673	129.71	673.09	133.48	673.74	134.81	674	139.01	674.75
140.26	675	141.41	675.24						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	70.84	.035	72.43	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
70.84	72.43	60.07	74.66	90.14	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 47 Profile # 1

W.S. Elev (ft)	666.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.82	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	668.06	Reach Len. (ft)	60.07	74.66	90.14
E.G. Slope (ft/ft)	0.063073	Flow Area (sq ft)	1.68	2.59	6.12
Q Total (cfs)	104.70	Flow (cfs)	11.83	35.49	57.37
Top Width (ft)	11.27	Top Width (ft)	2.89	1.59	6.78
Vel Total (ft/s)	10.07	Avg. Vel. (ft/s)	7.02	13.71	9.37
Max Chl Dpth (ft)	2.25	Hydr. Depth (ft)	0.58	1.63	0.90
Crit W.S. (ft)	666.90	Wetted Per. (ft)	3.15	1.78	7.43
Conv. Total (cfs)	416.9	Conv. (cfs)	47.1	141.3	228.5

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 INPUT Reach: 1 River Station: 46
Description: 46

Station Elevation Data, num = 71

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	678.33	.18	678.26	.9	678	1.58	677.75	3.53	677
5.03	676.43	6.16	676	7.08	675.67	8.85	675	10.91	674.23
11.65	674	12.37	673.79	15.03	673	18.48	672.04	18.62	672
22.24	671.02	22.32	671	22.51	670.95	26.07	670	28.35	669.38
29.75	669	31.09	668.63	33.45	668	36.92	667.16	37.68	667
42.19	666.12	42.79	666	42.93	665.97	47.82	665	48.77	664.81
52.92	664	53.38	663.91	56.08	663	57.23	662.35	57.9	662
58.91	661.5	59.78	661	61.4	660.08	61.55	660	61.63	660
62.49	660	63.06	660.51	63.54	661	64.21	661.65	64.52	662
64.96	662.44	65.52	663	69.12	663.37	72.35	663.51	75.05	663.65
81.38	664	88.99	664.98	89.12	664.99	89.14	665	89.19	665.02
91.62	666	92.37	666.3	93.72	666.86	94.05	667	94.1	667.02
96.36	668	100.61	668.48	104.76	669	105.79	669.31	108.13	670
109.17	670.32	111.47	671	113.42	671.35	117.68	672	119.46	672.24
123.95	672.95								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	62.49	.035	63.06	.035

```
Bank Sta: Left   Right    Lengths: Left Channel   Right    Coeff Contr.   Expan.
          62.49   63.06             69.67   84.99  100.32              .1       .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  46       Profile # 1
*******************************************************************************
* W.S. Elev (ft)     *   662.39 * Element            *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     1.70 * Wt. n-Val.          *    0.035 *    0.035 *    0.035 *
* E.G. Elev (ft)     *   664.09 * Reach Len. (ft)     *    69.67 *    84.99 *   100.32 *
* E.G. Slope (ft/ft)* 0.045936 * Flow Area (sq ft)  *     7.37 *     1.22 *     1.75 *
* Q Total (cfs)      *   104.70 * Flow (cfs)          *    77.53 *    15.08 *    12.09 *
* Top Width (ft)     *     7.75 * Top Width (ft)      *     5.33 *     0.57 *     1.85 *
* Vel Total (ft/s)   *    10.13 * Avg. Vel. (ft/s)    *    10.51 *    12.40 *     6.92 *
* Max Chl Dpth (ft)  *     2.39 * Hydr. Depth (ft)    *     1.38 *     2.13 *     0.95 *
* Crit W.S. (ft)     *   662.94 * Wetted Per. (ft)    *     5.94 *     0.76 *     2.64 *
* Conv. Total (cfs)  *    488.5 * Conv. (cfs)         *    361.7 *     70.4 *     56.4 *
*******************************************************************************

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 INPUT     Reach:  1              River Station:  45
Description:  45

Station Elevation Data,  num = 77
    Sta.   Elev.     Sta.   Elev.     Sta.   Elev.     Sta.   Elev.     Sta.   Elev.
       0  677.27      .24  677.17      .63     677     2.23  676.33     3.01     676
    5.11   675.1     5.34     675     5.89  674.76     7.93     674    10.05  673.25
   10.75     673    10.98  672.91     13.6     672    13.78  671.94    16.46     671
   16.86  670.86    19.33     670    21.29  669.33    22.23     669     25.1  668.02
   25.15     668    25.26  667.96    27.66     667    29.31  666.31    30.03     666
   32.34  665.05    32.46     665    32.62  664.94    34.86     664    35.28  663.83
   37.28     663    38.84  662.37    39.76     662    41.77  661.21    42.28     661
   44.86  660.26    45.78     660     46.6  659.77    49.07     659    51.08  657.46
   54.66     655     54.9     655    55.71     655    57.62  657.63     59.3   658.3
   60.71     659    62.61  659.12    63.81  659.18    66.06  659.31    67.75   659.4
   69.07  659.45    70.14  659.49    71.69  659.54    72.63  659.55    73.29  659.55
      75  659.68    78.12  659.93     78.2  659.93    78.93     660    83.12  660.61
   84.37  660.79    85.58     661    86.22  661.21    88.47     662    89.98  662.32
    92.9     663    94.86  663.34    98.19     664   101.16  664.51   103.97     665
  105.08  665.24   108.56     666   110.65  666.45   113.25     667   115.99   667.6
  117.85     668   118.03  668.04

Manning's n Values,  num = 3
    Sta.   Value     Sta.   Value     Sta.   Value
       0    .035     59.3    .035    60.71    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right    Coeff Contr.   Expan.
          59.3    60.71             64.44   56.53   49.29              .1       .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  45       Profile # 1
*******************************************************************************
* W.S. Elev (ft)     *   657.36 * Element            *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     2.34 * Wt. n-Val.          *    0.035 *          *          *
* E.G. Elev (ft)     *   659.70 * Reach Len. (ft)     *    64.44 *    56.53 *    49.29 *
* E.G. Slope (ft/ft)* 0.078357 * Flow Area (sq ft)  *     8.53 *          *          *
```

```
* Q Total (cfs)      *   104.70 * Flow (cfs)          *   104.70 *          *          *
* Top Width (ft)     *     6.19 * Top Width (ft)      *     6.19 *          *          *
* Vel Total (ft/s)   *    12.28 * Avg. Vel. (ft/s)    *    12.28 *          *          *
* Max Chl Dpth (ft)  *     2.36 * Hydr. Depth (ft)    *     1.38 *          *          *
* Crit W.S. (ft)     *   658.15 * Wetted Per. (ft)    *     8.12 *          *          *
* Conv. Total (cfs)  *    374.0 * Conv. (cfs)         *    374.0 *          *          *
*******************************************************************************************

Warning - The velocity head has changed by more than 0.5 ft (0.15 m).  This
                may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the
                current and previous cross section.  This may indicate the need for
                additional cross sections.

CROSS SECTION INPUT    Reach:  1              River Station:  44
Description:  44

Station Elevation Data,  num = 76
    Sta.   Elev.     Sta.   Elev.     Sta.   Elev.     Sta.   Elev.     Sta.   Elev.
       0  672.56     1.37  672.17     1.97     672      2.8  671.75     5.44     671
    6.39  670.71     8.93     670     9.55  669.82     12.6     669    13.22   668.8
   15.99     668    17.76  667.27    18.41     667    19.58   666.5    20.77     666
   21.37  665.76    23.21     665    24.77  664.35    25.59     664     26.6   663.6
   28.09     663    30.07   662.2    30.58     662    30.99  661.84    33.01  661.05
   33.14     661    33.21  660.98     35.8     660    37.83  659.26    38.54     659
   40.27  658.36    41.22     658    41.39  657.94    43.88     657     46.6  656.05
   46.79  655.95     49.1     655     49.2  654.93    50.78     654    51.45  653.64
   51.78  653.46    52.12  653.34    52.15  653.33    52.59  653.26    52.76  653.38
   53.66  653.78    54.07     654    55.62   654.9    55.78     655    62.89  655.61
   68.14     656    70.62  656.77    71.22     657    73.79  657.84    74.21     658
   78.52  658.64    80.29     659    83.24  659.37    87.48     660    89.73  660.51
   91.63     661    94.07  661.66    95.44     662    97.05  662.36    99.58     663
  106.07  663.96   106.32     664   113.01  664.92   113.57     665   114.04  665.06
  120.32     666   122.38  666.36   124.91     667   128.51  667.94   128.73     668
  129.09  668.09

Manning's n Values,  num = 3
    Sta.   Value     Sta.   Value     Sta.   Value
       0    .035    68.14    .035    70.62    .035

Bank Sta: Left    Right    Lengths: Left Channel    Right    Coeff Contr.    Expan.
         68.14    70.62             46.42    59.5   75.87              .1        .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  44        Profile # 1
*******************************************************************************************
* W.S. Elev (ft)     *   655.83 * Element            *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     0.60 * Wt. n-Val.          *    0.035 *          *          *
* E.G. Elev (ft)     *   656.43 * Reach Len. (ft)     *    46.42 *    59.50 *    75.87 *
* E.G. Slope (ft/ft)* 0.026692 * Flow Area (sq ft)  *    16.87 *          *          *
* Q Total (cfs)      *   104.70 * Flow (cfs)          *   104.70 *          *          *
* Top Width (ft)     *    18.84 * Top Width (ft)      *    18.84 *          *          *
* Vel Total (ft/s)   *     6.21 * Avg. Vel. (ft/s)    *     6.21 *          *          *
* Max Chl Dpth (ft)  *     2.57 * Hydr. Depth (ft)    *     0.90 *          *          *
* Crit W.S. (ft)     *   655.94 * Wetted Per. (ft)    *    19.93 *          *          *
* Conv. Total (cfs)  *    640.8 * Conv. (cfs)         *    640.8 *          *          *
*******************************************************************************************
```

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

CROSS SECTION INPUT Reach: 1 River Station: 43
Description: 43

Station Elevation Data, num = 94

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	673.46	1.18	673	2.4	672.51	3.97	672	6.72	671.21
7.43	671	8.63	670.65	11.01	670	12.91	669.48	14.64	669
16.61	668.39	17.93	668	20.31	667.22	20.85	667.06	21.04	667
21.16	666.96	24.05	666	25.37	665.55	26.93	665	28.25	664.52
29.77	664	31.08	663.53	32.63	663	34.03	662.49	35.45	662
36.92	661.45	38.22	661	39.09	660.63	40.56	660	41.52	659.49
42.58	659	44.27	658.07	44.4	658	45.13	657.71	46.62	657
50.04	656.49	53.32	656	53.78	655.8	56.19	655	61	651.58
63.46	650	63.67	649.78	64.04	649.55	64.68	649.28	64.76	649.27
64.79	649.28	64.87	649.65	65.34	650	65.61	650.17	67	651
67.57	651.36	68.68	652	68.97	652.17	70.37	653	71.49	653
72.65	653	73.68	653	74	653	74.24	653.05	80.47	654
86.38	654.87	87.3	655	88.51	655.17	91.42	655.6	93.22	655.87
94.11	656	94.99	656.13	100.82	657	105.41	657.67	107.48	658
113.56	658.89	114.27	659	114.71	659.08	115.22	659.19	118.34	659.91
121.91	660.71	123.03	661	123.81	661.19	127.03	662	131.17	663
131.18	663	131.2	663	135.28	664	135.5	664.05	139.27	665
145.32	665.79	146.78	666	147.49	666.25	149.49	667	151.75	667.78
152.38	668	154.5	668.75	155.22	669	155.26	669.01		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	80.47	.035	86.38	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
80.47	86.38	47.69	50.67	59.34	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 43 Profile # 1

W.S. Elev (ft)	651.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.46	Wt. n-Val.	0.035		
E.G. Elev (ft)	654.13	Reach Len. (ft)	47.69	50.67	59.34
E.G. Slope (ft/ft)	0.094930	Flow Area (sq ft)	8.32		
Q Total (cfs)	104.70	Flow (cfs)	104.70		
Top Width (ft)	7.23	Top Width (ft)	7.23		
Vel Total (ft/s)	12.59	Avg. Vel. (ft/s)	12.59		
Max Chl Dpth (ft)	2.40	Hydr. Depth (ft)	1.15		
Crit W.S. (ft)	652.43	Wetted Per. (ft)	8.81		
Conv. Total (cfs)	339.8	Conv. (cfs)	339.8		

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

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

CROSS SECTION INPUT Reach: 1 River Station: 42
Description: 42

Station Elevation Data, num = 93

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	666.42	1.34	666	2.73	665.5	4.3	665	6.15	664.34
7.08	664	8.9	663.35	9.8	663	12.31	662.07	12.47	662
15.08	661.02	15.13	661	15.38	660.97	17.24	660.78	24.58	660
25.32	659.67	26.72	659	28.2	658.32	28.86	658	30.9	657.05
30.99	657	31.05	656.98	33.08	656	34.25	655.46	35.21	655
36.83	654.26	37.35	654	39.63	653.07	39.79	653	40.15	652.86
42.31	652	43.48	651.52	44.8	651	46.31	650.4	47.32	650
49.08	649.11	49.3	649	51.32	648	51.33	648	51.33	648
51.44	647.87	52.43	647.87	52.57	648	52.58	648	52.59	648.01
53.97	649	55	649.79	55.34	650	56.61	650.81	56.81	650.8
56.85	650.82	56.92	650.83	57.09	650.84	57.32	650.85	57.43	650.86
57.7	650.84	58.27	650.78	59.8	650.57	61.47	650.32	61.76	650.27
61.86	650.26	61.95	650.27	62.38	650.34	64.78	650.76	64.89	650.76
65.07	650.79	66.12	651	68.13	651.36	71.65	652	73.11	652.27
77.17	653	81.5	653.8	82.61	654	83.86	654.23	85.64	654.56
87.2	654.82	88.23	655	91.21	655.54	93.81	656	95.03	656.22
98.42	656.85	99.19	657	103.33	657.84	104.11	658	104.36	658.06
108.06	659	108.6	659.12	112.03	660	112.72	660.17	115.94	661
119.12	661.77	120.05	662	120.27	662.05				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	61.47	.035	61.76	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
61.47	61.76	55.4	51.25	48.21	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 42 Profile # 1

W.S. Elev (ft)	650.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	651.40	Reach Len. (ft)	55.40	51.25	48.21
E.G. Slope (ft/ft)	0.028930	Flow Area (sq ft)	13.05	0.03	0.08
Q Total (cfs)	104.70	Flow (cfs)	104.53	0.05	0.11
Top Width (ft)	11.54	Top Width (ft)	10.26	0.29	1.00
Vel Total (ft/s)	7.96	Avg. Vel. (ft/s)	8.01	1.65	1.36
Max Chl Dpth (ft)	2.54	Hydr. Depth (ft)	1.27	0.11	0.08
Crit W.S. (ft)	650.76	Wetted Per. (ft)	11.69	0.29	1.01
Conv. Total (cfs)	615.6	Conv. (cfs)	614.6	0.3	0.7

Warning - Divided flow computed for this cross-section.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by

downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION INPUT Reach: 1 River Station: 41
Description: 41

Station Elevation Data, num = 69

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	660.93	2.28	660.3	3.79	660	11.39	659.02	11.5	659.01
11.56	659	11.6	658.98	13.63	658	14.44	657.59	15.66	657
16.49	656.58	17.7	656	19.56	655.06	19.68	655	19.75	654.97
21.73	654	23.57	653.11	23.91	653	24.8	652.76	27.69	652
30.59	651.26	31.14	651.12	31.62	651	32.48	650.78	35.07	650.12
35.52	650	35.84	649.91	39.16	649	42.5	648.2	43.29	648
43.64	647.92	46.28	647	47.97	646.26	48.5	646	50.19	645.21
50.75	645	51.04	644.96	51.39	644.99	51.42	645	52.41	645.55
53.16	646	54.11	646.55	54.85	647	55.42	647.33	56.59	648
63.22	648.91	63.9	649	65.43	649.43	67.57	650	70.82	650.71
71.5	650.86	72.01	651	72.42	651.07	77.07	651.89	77.67	652
78.23	652.1	83.32	653	84.11	653.14	88.99	654	92.89	654.93
93.21	655	93.34	655.04	93.49	655.09	96.35	656	98.37	656.66
99.46	657	103.05	657.84	103.73	658	105.89	658.47		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	53.16	.035	54.11	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
53.16	54.11	75.1	62.67	50.35	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 41 Profile # 1

W.S. Elev (ft)	647.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.03	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	649.03	Reach Len. (ft)	75.10	62.67	50.35
E.G. Slope (ft/ft)	0.064617	Flow Area (sq ft)	8.48	0.69	0.17
Q Total (cfs)	104.70	Flow (cfs)	98.66	5.44	0.60
Top Width (ft)	8.57	Top Width (ft)	6.88	0.95	0.74
Vel Total (ft/s)	11.21	Avg. Vel. (ft/s)	11.63	7.91	3.59
Max Chl Dpth (ft)	2.04	Hydr. Depth (ft)	1.23	0.72	0.22
Crit W.S. (ft)	647.66	Wetted Per. (ft)	7.58	1.10	0.86
Conv. Total (cfs)	411.9	Conv. (cfs)	388.1	21.4	2.3

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

CROSS SECTION INPUT Reach: 1 River Station: 40

Description: 40

Station Elevation Data, num = 77

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	657.36	1.33	657.12	1.97	657	2.26	656.89	4.74	656
6.74	655.19	7.23	655	9.54	654.09	9.76	654	10.58	653.67
12.3	653	13.95	652.34	14.82	652	15.09	651.89	17.37	651
19.4	650.2	19.88	650	22.22	649.07	22.39	649	22.64	648.9
23.18	648.69	25.01	648	26.69	647.44	28.21	647	28.89	646.86
30.38	646.61	33.08	646	36.53	645.31	37.73	645	39.01	644.43
40.01	644	40.74	643.68	42.28	643	44.13	642.2	44.35	642.11
44.46	642.08	44.59	642.05	44.62	642.04	44.66	642.03	44.67	642.03
44.67	642.03	44.68	642.05	44.73	642.08	44.81	642.12	46.97	643
47.81	643.34	49.32	644	51.19	644.82	51.64	645	52.35	645.3
53.82	645.92	54.03	646	54.25	646.03	57.7	646.41	59.79	646.62
63.45	647	64.56	647.54	65.56	648	66.65	648.58	67.56	649
70.21	649.56	71.73	649.85	72.75	650	76.05	650.49	79.62	651
81.8	651.34	86.15	652	89.75	652.78	90.71	652.99	90.76	653
90.8	653.02	93.95	654	95.4	654.49	97	655	99.64	655.77
100.28	656	102.49	656.46						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	51.64	.035	52.35	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
51.64	52.35	65.28	50.71	39.75	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 40 Profile # 1

W.S. Elev (ft)	644.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.03	Wt. n-Val.	0.035		
E.G. Elev (ft)	645.38	Reach Len. (ft)	65.28	50.71	39.75
E.G. Slope (ft/ft)	0.033304	Flow Area (sq ft)	12.83		
Q Total (cfs)	104.70	Flow (cfs)	104.70		
Top Width (ft)	10.91	Top Width (ft)	10.91		
Vel Total (ft/s)	8.16	Avg. Vel. (ft/s)	8.16		
Max Chl Dpth (ft)	2.32	Hydr. Depth (ft)	1.18		
Crit W.S. (ft)	644.62	Wetted Per. (ft)	11.86		
Conv. Total (cfs)	573.7	Conv. (cfs)	573.7		

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

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

CROSS SECTION INPUT Reach: 1 River Station: 39

Description: 39

Station Elevation Data, num = 82

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	659.77	1.09	659.48	2.95	659	5.49	658.28	6.58	658
7.39	657.77	9.89	657	12.49	656.2	13.17	656	13.98	655.78
16.73	655	20.05	654.12	20.49	654	20.92	653.88	24.35	653
24.88	652.86	25.37	652.74	28.59	652	31.15	651.34	31.78	651.19

32.52	651	33.59	650.71	34.26	650.48	34.64	650.34	35.45	650
37.33	649.28	38.07	649	38.23	648.95	40.62	648	42.29	647.31
43.09	647	44.01	646.65	45.62	646	47.45	645.25	48.08	645
49.38	644.47	50.66	644	56.96	643.2	58.28	643.03	58.29	643.03
58.34	643.03	58.39	643.03	58.45	643.02	58.56	643	58.65	642.98
61.95	642	65.21	641.06	65.42	641	65.43	641	65.48	641.02
67.36	642	67.53	642.02	73.59	643	78.48	643.92	78.79	644
78.96	644.05	82.54	645	84.68	645.56	86.37	646	87.56	646.26
91.53	647	96.65	647.87	97.38	648	103.37	648.88	104.18	649
108.11	649.75	109.35	650	111.56	650.69	112.56	651	115.88	651.98
115.96	652	116.03	652.02	119.38	653	121.07	653.47	122.94	654
125.03	654.57	126.58	655	127.19	655.17	128.94	655.64	130.2	656
130.96	656.23	132.36	656.63						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	67.36	.035	67.53	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67.36	67.53	59.7	55.05	54.22	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 39 Profile # 1

W.S. Elev (ft)	643.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	643.85	Reach Len. (ft)	59.70	55.05	54.22
E.G. Slope (ft/ft)	0.019551	Flow Area (sq ft)	12.83	0.22	5.04
Q Total (cfs)	104.70	Flow (cfs)	80.76	1.54	22.41
Top Width (ft)	19.03	Top Width (ft)	11.20	0.17	7.66
Vel Total (ft/s)	5.79	Avg. Vel. (ft/s)	6.29	7.01	4.45
Max Chl Dpth (ft)	2.30	Hydr. Depth (ft)	1.15	1.29	0.66
Crit W.S. (ft)	643.36	Wetted Per. (ft)	11.75	0.17	7.77
Conv. Total (cfs)	748.8	Conv. (cfs)	577.5	11.0	160.2

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 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 INPUT Reach: 1 River Station: 38

Description: 38

Station Elevation Data, num = 114

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	654.89	2.83	654	4.6	653.44	5.95	653	6.99	652.65
9.020001	652	11.02	651.3	11.9	651	13.35	650.46	14.29	650.14
14.76	650	17.79	649.44	19.91	649	20.93	648.67	24.62	648
25.75	647.4	26.51	647	27.83	646.29	28.41	646	29.51	645.42
30.25	645	32.04	644.03	32.09	644	32.17	643.96	33.81	643
34.47	642.65	35.56	642	36.86	641.7	37.33	641.69	38.63	641.68
39.5	641.66	40.69	641.62	42.46	641.55	45.31	641.42	46.4	641.35
48.4	641.24	49.19	641.21	49.8	641.19	50.3	641.19	50.77	641.2
51.68	641.24	54	641	55.73	640.77	61.01	640	64.22	639.61

65.11	639.5	66.64	639.35	68.75	639.17	71.07	639.03	71.3	639.01
71.31	639.01	71.33	639.01	71.35	639.01	71.35	639.01	71.35	639.01
71.36	639.01	71.37	639.01	71.38	639.01	71.39	639.01	71.41	639.01
71.43	639.02	72.23	639.01	73.18	639.05	74.03	639.16	74.55	639.31
75.47	640	76.12	640.55	76.7	641	77.69	641.76	77.94	642
78.69	642.46	79.28	643	79.77	643.1	83.52	643.88	83.97	644
88.78	644.95	89.01	645	89.05	645.01	94.17	646	96.67	646.51
98.91	647	100.07	647.26	103.51	648	105.71	648.48	108.01	649
110.58	649.66	111.82	650	114.13	650.61	115.59	651	118.94	651.91
119.27	652	119.83	652.15	123	653	123.32	653.09	126.84	654
129.02	654.58	130.62	655	131.93	655.35	134.41	656	136.73	656.63
138.08	657	139.54	657.42	141.64	658	143.68	658.58	145.16	659
147.41	659.65	148.64	660	151.95	660.9	152.34	661	152.86	661.13
156.44	662	158.47	662.59	159.86	663	160.44	663.15		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	83.52	.035	83.97	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
83.52	83.97	104.97	101.93	100.38	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 38 Profile # 1

W.S. Elev (ft)	640.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.46	Wt. n-Val.	0.035		
E.G. Elev (ft)	641.57	Reach Len. (ft)	104.97	101.93	100.38
E.G. Slope (ft/ft)	0.086034	Flow Area (sq ft)	10.81		
Q Total (cfs)	104.70	Flow (cfs)	104.70		
Top Width (ft)	15.38	Top Width (ft)	15.38		
Vel Total (ft/s)	9.69	Avg. Vel. (ft/s)	9.69		
Max Chl Dpth (ft)	1.10	Hydr. Depth (ft)	0.70		
Crit W.S. (ft)	640.56	Wetted Per. (ft)	15.75		
Conv. Total (cfs)	357.0	Conv. (cfs)	357.0		

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

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

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

CROSS SECTION INPUT Reach: 1 River Station: 37

Description: 37

Station Elevation Data, num = 80

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	645.73	2.12	645	3.09	644.68	4.99	644	6.12	643.62
7.9	643	9.55	642.45	10.79	642	13.8	641	13.81	641
14.07	640.93	17.78	640	18.3	639.87	21.84	639	24.74	638.49
26.62	638	37.4	637.04	37.91	637	40.82	636.73	47.8	636
54.29	635.3	56.18	635.06	56.68	635	59.57	634.62	60.22	634.56
60.76	634.53	61.23	634.52	61.61	634.54	61.91	634.57	62.13	634.63
62.61	634.9	62.76	635	72.1	635.95	72.3	635.97	72.32	635.97

72.33	635.97	72.33	635.97	72.35	635.95	72.36	635.94	72.38	635.94
72.5	636	72.63	636.09	73.9	637	75.06	637.85	75.27	638
75.34	638.04	75.56	638.11	77.02	638.64	77.4	638.76	78.51	639
79.93	639.3	83.13	640	84.85	640.38	87.66	641	89.75	641.45
92.16	642	94.68	642.56	96.59	643	99.63	643.73	100.59	644
102.54	644.53	104.29	645	105.77	645.39	108	646	110.19	646.59
111.71	647	112.5	647.21	115.3	648	115.81	648.14	118.76	649
120.35	649.45	122.27	650	123.8	650.43	125.8	651	127.57	651.5
129.4	652	131.61	652.59	133.04	653	135.41	653.63	136.67	653.99

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	72.1	.035	72.3	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
72.1	72.3	50.07	49.63	49.95	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 37 Profile # 1

W.S. Elev (ft)	636.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.51	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	636.56	Reach Len. (ft)	50.07	49.63	49.95
E.G. Slope (ft/ft)	0.028027	Flow Area (sq ft)	18.19	0.02	0.02
Q Total (cfs)	104.70	Flow (cfs)	104.66	0.02	0.02
Top Width (ft)	25.19	Top Width (ft)	24.73	0.20	0.26
Vel Total (ft/s)	5.75	Avg. Vel. (ft/s)	5.75	1.37	1.05
Max Chl Dpth (ft)	1.52	Hydr. Depth (ft)	0.74	0.08	0.07
Crit W.S. (ft)	636.14	Wetted Per. (ft)	24.97	0.20	0.31
Conv. Total (cfs)	625.4	Conv. (cfs)	625.2	0.1	0.1

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

CROSS SECTION INPUT Reach: 1 River Station: 36
Description: 36

Station Elevation Data, num = 86

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	643.46	.59	643.36	2.77	643	5.77	642.53	9.69	642
16.31	641.18	17.64	641	18.44	640.91	18.76	640.88	18.93	640.86
19.74	640.73	22.08	640.41	24.04	640	25.55	639.55	27.31	639
30.49	638.05	30.65	638	30.85	637.94	33.88	637	34.57	636.79
37.15	636	41.17	635.08	41.37	635	42.4	634.84	42.97	634.77
43.54	634.72	47.78	634.19	49.94	634.1	51.74	634	56.62	633.81
58.2	633.75	60.57	633.64	61.13	633.61	64.51	633.42	66.49	633.31
71.77	633.01	71.94	633	72.69	632.97	73.49	632.97	73.89	633
76.07	633.31	81.36	634	81.58	634	81.82	634	82.15	634
85.16	633.84	87.25	634	89.16	634.7	89.93	635	90.34	635.14
92.69	636	93.94	636.39	95.78	637	98.14	637.72	99	638
102.2	638.99	102.24	639	104.45	639.71	105.28	640	107.2	640.64

108.29	641	108.74	641.14	111.25	642	112.23	642.29	114.68	643
116.89	643.65	118.13	644	120.6	644.71	121.6	645	122.2	645.18
125.12	646	127.77	646.81	128.36	647	129.17	647.25	131.61	648
133.81	648.68	134.85	649	135.69	649.25	138.07	650	139.99	650.62
141.16	651	141.87	651.24	144.21	652	147.05	652.92	147.3	653
148.96	653.5								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	76.07	.035	81.36	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76.07	81.36	52.48	53.95	57.63	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 36 Profile # 1

W.S. Elev (ft)	634.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.61	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	634.66	Reach Len. (ft)	52.48	53.95	57.63
E.G. Slope (ft/ft)	0.048784	Flow Area (sq ft)	14.38	2.10	0.72
Q Total (cfs)	104.70	Flow (cfs)	92.46	10.60	1.64
Top Width (ft)	36.60	Top Width (ft)	25.28	5.29	6.03
Vel Total (ft/s)	6.09	Avg. Vel. (ft/s)	6.43	5.04	2.27
Max Chl Dpth (ft)	1.08	Hydr. Depth (ft)	0.57	0.40	0.12
Crit W.S. (ft)	634.23	Wetted Per. (ft)	25.33	5.33	6.05
Conv. Total (cfs)	474.0	Conv. (cfs)	418.6	48.0	7.4

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 INPUT Reach: 1 River Station: 35
Description: 35

Station Elevation Data, num = 70

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	635.74	1.29	635.62	5.85	635.13	6.99	635	10.95	634.47
11.89	634.32	13.86	634	18.91	633.23	20.5	633	23.9	632.67
30.03	632	31.18	631.88	31.38	631.86	31.57	631.85	33.09	631.7
34.21	631.56	45.42	631.24	47.68	631.11	48.13	631.09	48.4	631.08
48.59	631.08	48.75	631.07	49.05	631.07	54.32	631.01	54.35	631.01
55.6	631	56.65	630.99	57.69	631	58.56	631.01	58.59	631.01
60.58	631.12	60.72	631.14	62.35	631.28	62.92	631.32	65.13	631.55
74.76	632	74.91	632.01	75.1	632.02	80.25	632.39	83.24	632.61
85.49	633	86.63	633.53	87.86	634	89.31	634.54	90.53	635
91.51	635.34	93.34	636	95.87	636.89	96.17	637	97.55	637.49
98.95	638	100.14	638.44	101.65	639	102.29	639.23	104.17	640
107.1	640.96	107.18	641	107.67	641.13	109.01	641.51	110.66	642
111.9	642.38	113.99	643	114.75	643.22	117.16	644	118.53	644.44
120.34	645	122.28	645.61	123.54	646	125.68	646.66	126.57	646.93

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	65.13	.035	74.76	.035

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

```
        65.13   74.76            11.16   63.99  117.69             .1       .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  35       Profile # 1
*******************************************************************************
* W.S. Elev (ft)     *   631.80 * Element            *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     0.50 * Wt. n-Val.          *    0.035 *    0.035 *          *
* E.G. Elev (ft)     *   632.30 * Reach Len. (ft)     *    11.16 *    63.99 *   117.69 *
* E.G. Slope (ft/ft)* 0.040107 * Flow Area (sq ft) *    18.14 *     0.67 *          *
* Q Total (cfs)      *   104.70 * Flow (cfs)          *   103.28 *     1.42 *          *
* Top Width (ft)     *    38.40 * Top Width (ft)      *    33.05 *     5.34 *          *
* Vel Total (ft/s)   *     5.57 * Avg. Vel. (ft/s)    *     5.69 *     2.12 *          *
* Max Chl Dpth (ft) *     0.81 * Hydr. Depth (ft)    *     0.55 *     0.12 *          *
* Crit W.S. (ft)     *   631.94 * Wetted Per. (ft)    *    33.10 *     5.35 *          *
* Conv. Total (cfs) *    522.8 * Conv. (cfs)         *    515.7 *      7.1 *          *
*******************************************************************************

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 INPUT    Reach:  1              River Station:  34
Description:  34

Station Elevation Data,  num = 54
    Sta.   Elev.     Sta.   Elev.     Sta.   Elev.     Sta.   Elev.     Sta.   Elev.
       0  634.25      .59  634.18     2.03     634     7.21  633.09     7.73      633
    8.58  632.86    15.33     632    22.69  631.17     24.2     631    25.23   630.93
   36.11     630    52.36  629.03     52.9     629    57.46  628.69    68.69      628
   68.84     628    70.59     628    70.69     628    72.41     628    72.85      628
   74.44     628    75.09     628    77.67     628    79.87     628    81.18      628
   82.49  628.21    84.17  628.48    87.94     629    91.17  629.85    91.77      630
   92.16   630.1    95.64     631    97.89   631.6    99.49     632   102.12   632.68
  103.31     633   106.07  633.63   108.13     634   108.43  634.05   108.66   634.08
  110.73  634.36   111.89  634.49   113.86  634.72    114.9  634.82   116.69      635
  119.38  635.22   120.04  635.28   120.95  635.35   123.35  635.51   124.48   635.57
   125.6  635.62   126.52  635.64   130.48  635.75   134.28  635.78

Manning's n Values,  num = 3
    Sta.   Value     Sta.   Value     Sta.   Value
       0    .035    68.69    .035    68.84    .035

Bank Sta: Left    Right     Lengths: Left Channel    Right     Coeff Contr.    Expan.
         68.69   68.84              63.14    50.8   39.46              .1       .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  34       Profile # 1
*******************************************************************************
* W.S. Elev (ft)     *   628.70 * Element            *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     0.87 * Wt. n-Val.          *    0.035 *    0.035 *    0.035 *
* E.G. Elev (ft)     *   629.57 * Reach Len. (ft)     *    63.14 *    50.80 *    39.46 *
* E.G. Slope (ft/ft)* 0.068239 * Flow Area (sq ft) *     4.04 *     0.11 *    10.27 *
* Q Total (cfs)      *   104.70 * Flow (cfs)          *    22.38 *     0.93 *    81.39 *
* Top Width (ft)     *    28.56 * Top Width (ft)      *    11.45 *     0.15 *    16.96 *
* Vel Total (ft/s)   *     7.26 * Avg. Vel. (ft/s)    *     5.53 *     8.78 *     7.92 *
* Max Chl Dpth (ft) *     0.70 * Hydr. Depth (ft)    *     0.35 *     0.70 *     0.61 *
* Crit W.S. (ft)     *   628.98 * Wetted Per. (ft)    *    11.47 *     0.15 *    17.01 *
* Conv. Total (cfs) *    400.8 * Conv. (cfs)         *     85.7 *      3.6 *    311.6 *
*******************************************************************************
```

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 INPUT Reach: 1 River Station: 33
Description: 33

Station Elevation Data, num = 58

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	635.58	3	635	3.71	634.91	9.13	634	11.39	633.7
16.59	633	21.28	632.34	23.73	632	28.73	631.31	30.85	631
31.99	630.83	37.33	630	41.22	629.35	43.34	629	46.46	628.47
48.68	628	50.86	627.44	52.74	627	55.58	626.34	58.07	626
58.08	626	58.1	626	60.34	626.1	69.94	627	70.74	627.08
71.12	627.09	73.92	627.3	74.91	627.36	75.89	627.4	76.98	627.43
78.98	627.48	83.35	627.58	85.52	627.62	87.38	627.63	90.44	627.7
92.08	627.69	94.35	627.65	95.46	627.65	97.12	627.67	102.9	627.77
105.94	627.83	108.13	627.83	108.86	627.78	109.9	627.64	115.85	627.91
117.85	628	119.78	628.1	121.1	628.15	123.06	628.21	124.01	628.25
124.98	628.3	126.47	628.36	127.42	628.42	136.91	629	139.84	629.33
141.88	629.49	148.06	630	148.7	630.06				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	74.91	.035	75.89	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.91	75.89	53.13	52.49	51.94	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 33 Profile # 1

W.S. Elev (ft)	627.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.60	Wt. n-Val.	0.035		
E.G. Elev (ft)	627.96	Reach Len. (ft)	53.13	52.49	51.94
E.G. Slope (ft/ft)	0.034591	Flow Area (sq ft)	16.78		
Q Total (cfs)	104.70	Flow (cfs)	104.70		
Top Width (ft)	23.69	Top Width (ft)	23.69		
Vel Total (ft/s)	6.24	Avg. Vel. (ft/s)	6.24		
Max Chl Dpth (ft)	1.36	Hydr. Depth (ft)	0.71		
Crit W.S. (ft)	627.52	Wetted Per. (ft)	23.89		
Conv. Total (cfs)	562.9	Conv. (cfs)	562.9		

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 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 INPUT Reach: 1 River Station: 32
Description: 32

Station Elevation Data, num = 80

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.

0	636.45	2.8	636	3.23	635.93	4.45	635.75	13.29	634.35
15.25	634	17.18	633.45	18.74	633	22.04	632.06	22.23	632.01
22.26	632	22.28	632	22.51	631.93	25.75	631	27.19	630.6
31.27	629.42	32.76	629	34.35	628.4	35.31	628	37.28	627.21
37.85	627	38.52	626.86	43.8	626	49.7	625.32	52.22	625
53.73	624.82	54.58	624.73	57.01	624.49	60.06	624.17	63.16	624.01
63.23	624.01	65.75	624.03	65.79	624.03	65.82	624.03	65.86	624.02
65.88	624.02	65.9	624.02	65.93	624.02	65.98	624.02	66.05	624.03
66.26	624.03	69.48	624.11	70.1	624.12	72.82	624.19	74.29	624.22
75.7	624.25	77.22	624.28	78.88	624.32	81.44	624.39	83.54	624.44
85.22	624.48	86.78	624.53	89.19	624.58	94.55	624.76	97.11	624.82
100.96	624.96	102.02	625	105.36	625.11	105.93	625.13	109.38	625.22
109.9	625.23	110.09	625.24	112.54	625.38	114.9	625.44	117	625.49
119.96	625.7	120.25	625.72	124.26	626	132.05	626.6	137.54	627
140	627.16	140.34	627.18	140.56	627.19	143.68	627.39	145.55	627.52
145.85	627.52	146.21	627.5	147.16	627.52	153.22	627.68	153.26	627.69

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	77.22	.035	78.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
77.22	78.88	83.2	59.13	37.68	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 32 Profile # 1

W.S. Elev (ft)	625.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.77	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	625.89	Reach Len. (ft)	83.20	59.13	37.68
E.G. Slope (ft/ft)	0.041922	Flow Area (sq ft)	21.33	1.35	11.27
Q Total (cfs)	228.00	Flow (cfs)	162.58	10.27	55.14
Top Width (ft)	54.22	Top Width (ft)	25.91	1.66	26.65
Vel Total (ft/s)	6.72	Avg. Vel. (ft/s)	7.62	7.59	4.90
Max Chl Dpth (ft)	1.11	Hydr. Depth (ft)	0.82	0.82	0.42
Crit W.S. (ft)	625.35	Wetted Per. (ft)	25.97	1.66	26.66
Conv. Total (cfs)	1113.6	Conv. (cfs)	794.1	50.2	269.3

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 INPUT Reach: 1 River Station: 31

Description: 31

Station Elevation Data, num = 83

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	642.75	.43	642.6	2.22	642	3.38	641.62	5.22	641
7.31	640.32	8.26	640	10.55	639.24	11.3	639	11.81	638.85
14.52	638	17.18	637.26	18.05	637	19.71	636.54	21.64	636
24.46	635.23	25.27	635	26.96	634.53	28.85	634	29.87	633.72
32.43	633	33.06	632.82	33.48	632.67	35.5	632	36.44	631.6
37.64	631	39.32	630.1	39.52	630	39.9	629.79	41.45	629
42.95	628.2	43.36	628	44.87	627.23	45.34	627	46.66	626.33

47.34	626	48.49	625.42	49.35	625	50.35	624.5	51.38	624
53.1	623.15	53.41	623	53.67	622.88	58.15	622	61.97	621.61
67.05	621.07	67.84	621.01	67.87	621	68.32	621.01	71.11	621.21
72.84	621.09	75.49	621.15	75.83	621.14	75.99	621.13	76.16	621.13
76.35	621.13	76.56	621.14	77.06	621.15	77.37	621.16	77.75	621.17
81.55	621.25	82.97	621.27	84.01	621.29	88.16	621.39	89.92	621.43
92.38	621.48	95.94	621.57	100.85	621.7	105.09	621.82	110.53	621.97
111.41	622	114.75	622.22	117.82	622.4	120.28	622.56	121.47	622.64
125.52	622.96	125.98	623	134.83	623.93	135.46	624	138.64	624.32
145.34	625	147.06	625.16	149.73	625.42				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	75.49	.035	75.83	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
75.49	75.83	103.17	89.45	79.11	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 31 Profile # 1

W.S. Elev (ft)	622.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.78	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	622.86	Reach Len. (ft)	103.17	89.45	79.11
E.G. Slope (ft/ft)	0.051807	Flow Area (sq ft)	13.00	0.32	19.49
Q Total (cfs)	228.00	Flow (cfs)	101.79	2.93	123.28
Top Width (ft)	54.85	Top Width (ft)	17.74	0.34	36.77
Vel Total (ft/s)	6.95	Avg. Vel. (ft/s)	7.83	9.23	6.33
Max Chl Dpth (ft)	1.08	Hydr. Depth (ft)	0.73	0.93	0.53
Crit W.S. (ft)	622.32	Wetted Per. (ft)	17.81	0.34	36.79
Conv. Total (cfs)	1001.7	Conv. (cfs)	447.2	12.9	541.6

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 INPUT Reach: 1 River Station: 30
Description: 30

Station Elevation Data, num = 66

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	636.38	1.03	636.17	1.81	636	4.76	635.38	6.5	635
8.73	634.53	11.15	634	12.44	633.72	15.73	633	19.04	632.2
19.92	632	22.53	631.37	23.9	631	26.33	630.32	27.31	630
27.86	629.78	29.82	629	31.4	628.38	32.35	628	33.66	627.47
34.87	627	36.54	626.32	37.36	626	39.5	625.13	39.83	625
40.48	624.74	42.19	624	43.26	623.39	43.88	623	44.32	622.73
45.53	622	46.3	621.57	47.31	621	48.66	620.41	48.88	620.16
49.17	620	49.51	619.81	49.71	619.73	51.8	619	51.9	618.97
52.08	618.89	53.5	618.32	54.12	618	55.15	617.47	56.08	617
56.71	616.78	57.49	616.57	59.93	616	60	616	60.92	616
61.05	616	63.52	616.14	67.8	616.41	78.39	617	79.36	617.07
92.57	618	95.32	618.2	103.19	618.92	103.67	618.97	104.03	619
113.78	619.83	115.8	620	118.28	620.28	122.12	620.69	124.82	621
124.92	621.01								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	63.52	.035	67.8	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
63.52	67.8	53.56	93.42	133.29	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 30 Profile # 1

W.S. Elev (ft)	617.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.15	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	618.76	Reach Len. (ft)	53.56	93.42	133.29
E.G. Slope (ft/ft)	0.038959	Flow Area (sq ft)	10.34	5.69	12.11
Q Total (cfs)	228.00	Flow (cfs)	95.75	57.59	74.66
Top Width (ft)	32.07	Top Width (ft)	8.63	4.28	19.15
Vel Total (ft/s)	8.10	Avg. Vel. (ft/s)	9.26	10.12	6.16
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)	1.20	1.33	0.63
Crit W.S. (ft)	617.97	Wetted Per. (ft)	8.91	4.29	19.19
Conv. Total (cfs)	1155.1	Conv. (cfs)	485.1	291.8	378.3

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 INPUT Reach: 1 River Station: 29
Description: 29

Station Elevation Data, num = 78

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	626.62	.57	626.45	2.07	626	4.51	625.17	5.04	625
6.24	624.53	7.55	624	9.12	623.32	9.9	623	10.27	622.85
11.76	622.19	12.19	622	12.3	621.95	14.46	621	15.95	620.34
16.73	620	18.25	619.34	19.02	619	19.43	618.82	21.44	618
21.93	617.82	24.05	617	24.98	616.76	27.99	616	31.16	615.2
31.93	615	35.59	614.07	35.86	614	40.71	613.09	40.74	613.09
40.77	613.09	40.81	613.08	41.07	613.09	41.73	613.08	43.65	613.07
43.89	613.07	51.65	613.03	51.77	613.03	51.88	613.04	51.98	613.04
52.16	613.04	61.7	613.01	61.72	613.01	61.75	613.01	69.91	613.01
70	613.01	75.18	613.02	75.23	613.02	75.25	613.03	75.28	613.03
75.3	613.03	75.38	613.04	77.27	613.07	78.84	613.12	81	613.24
85.44	614	87.26	614.39	89.93	615	92.6	615.6	94.36	616
97.31	616.66	98.13	616.81	98.63	616.9	99.25	617	102.13	617.33
108.7	618	115.99	618.98	116.13	619	119.07	619.27	126.9	620
135.36	620.93	135.99	621	136.24	621.03	138.78	621.26	145.01	621.83
147.06	622	151.81	622.51	154.57	622.8				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	78.84	.035	81	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
78.84	81	50.59	55.01	63.35	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 29 Profile # 1

W.S. Elev (ft)	613.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.14	Wt. n-Val.	0.035	0.035	0.035

E.G. Elev (ft)	614.81	Reach Len. (ft)	50.59	55.01	63.35
E.G. Slope (ft/ft)	0.079765	Flow Area (sq ft)	25.22	1.06	0.55
Q Total (cfs)	228.00	Flow (cfs)	217.73	7.94	2.33
Top Width (ft)	45.92	Top Width (ft)	41.23	2.16	2.53
Vel Total (ft/s)	8.50	Avg. Vel. (ft/s)	8.63	7.47	4.28
Max Chl Dpth (ft)	0.66	Hydr. Depth (ft)	0.61	0.49	0.22
Crit W.S. (ft)	614.02	Wetted Per. (ft)	41.29	2.16	2.56
Conv. Total (cfs)	807.3	Conv. (cfs)	770.9	28.1	8.3

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 INPUT Reach: 1 River Station: 28
Description: 28

Station Elevation Data, num = 42

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	627.65	.74	627.33	5.79	625	13.3	621.67	17.64	620
24.63	615.38	24.95	615.17	25.22	615	25.28	614.98	27.87	614
28.14	613.94	32.09	613	35.48	612.23	36.45	612	40.69	611.05
40.9	611	51.57	610.3	52.15	610.26	52.71	610.23	53.04	610.22
53.51	610.21	54.18	610.19	55.86	610.16	61.45	610	61.69	609.99
61.94	610	62	610	78.63	610.79	81.02	611	84.78	611.55
87.83	612	93.52	612.8	94.87	613	100.75	613.83	101.88	614
104.05	614.23	108.51	614.69	111.67	615	119.88	615.8	122.24	616
123.63	616.12	123.83	616.13						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	61.94	.035	62	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
61.94	62	75.14	54.07	33.31	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 28 Profile # 1

W.S. Elev (ft)	611.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	611.97	Reach Len. (ft)	75.14	54.07	33.31
E.G. Slope (ft/ft)	0.035151	Flow Area (sq ft)	18.25	0.08	15.37
Q Total (cfs)	228.00	Flow (cfs)	127.35	0.70	99.95
Top Width (ft)	42.98	Top Width (ft)	22.16	0.06	20.76
Vel Total (ft/s)	6.77	Avg. Vel. (ft/s)	6.98	9.26	6.50
Max Chl Dpth (ft)	1.26	Hydr. Depth (ft)	0.82	1.25	0.74
Crit W.S. (ft)	611.44	Wetted Per. (ft)	22.22	0.06	20.80
Conv. Total (cfs)	1216.1	Conv. (cfs)	679.3	3.7	533.1

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 INPUT Reach: 1 River Station: 27
Description: 27

Station Elevation Data, num = 70

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	634.5	1.38	634	3.13	633.35	3.72	633	4.56	632.6
5.85	632	7.06	631.42	7.95	631	8.9	630.53	10.02	630
15.79	627.22	20.39	625	21.83	624.15	28.84	620	32.16	617.7
36.08	615	37.42	614.09	37.54	614	38.79	613.15	39.02	613
39.33	612.85	41.41	612	42.95	611.4	43.98	611	45.03	610.6
46.74	610	49.67	609.05	49.82	609	50.13	608.89	52.96	608
54.48	607.73	56.52	607.61	58.96	607.36	63.06	607.18	63.77	607.12
64.05	607.1	64.22	607.09	65.54	607.06	65.89	607.05	66.91	607.07
67.26	607.05	67.31	607.05	67.36	607.05	67.4	607.05	67.44	607.05
67.74	607.07	69.35	607.13	73.11	607.33	75.85	607.47	79.24	607.65
83.79	607.9	85.61	608	87.87	608.3	88.96	608.46	92.28	609
94.61	609.37	98.83	610	103.13	610.73	104.67	611	107.76	611.45
111.84	612	114.6	612.25	117.79	612.53	122.52	613	125.41	613.29
126.91	613.44	132	613.89	132.56	613.94	133.29	614	139.18	614.48

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	73.11	.035	75.85	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
73.11	75.85	68.72	67.43	66.16	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 27 Profile # 1

W.S. Elev (ft)	608.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.08	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	609.38	Reach Len. (ft)	68.72	67.43	66.16
E.G. Slope (ft/ft)	0.046043	Flow Area (sq ft)	19.93	2.46	5.85
Q Total (cfs)	228.00	Flow (cfs)	174.17	20.86	32.97
Top Width (ft)	35.85	Top Width (ft)	21.10	2.74	12.01
Vel Total (ft/s)	8.07	Avg. Vel. (ft/s)	8.74	8.47	5.63
Max Chl Dpth (ft)	1.25	Hydr. Depth (ft)	0.94	0.90	0.49
Crit W.S. (ft)	608.63	Wetted Per. (ft)	21.20	2.74	12.04
Conv. Total (cfs)	1062.6	Conv. (cfs)	811.7	97.2	153.7

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 INPUT Reach: 1 River Station: 26
Description: 26

Station Elevation Data, num = 69

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	629.93	2.96	628.63	3.95	628.17	10.32	625	15.27	622.26
19.39	620	23.01	617.33	26.37	615	33.12	610.98	34.75	610
36.6	609.05	36.7	609	37.05	608.83	38.65	608	39.59	607.51
40.56	607	41.18	606.69	42.46	606	45.3	605.2	47.28	605.14

54.44	605.01	56.1	605	56.12	605	56.13	605	56.13	605
56.13	605	56.13	605	56.14	605	56.14	605	56.14	605
56.14	605	56.14	605	56.15	605	56.15	605	56.16	605
67.66	605.01	67.69	605.01	67.72	605.01	67.76	605.01	67.76	605.01
67.77	605.01	67.79	605.01	67.85	605.02	72.16	605.01	74.41	605
76.45	604.99	77.38	605	77.49	605	79.04	605.17	81.26	605.49
84.51	606	86.64	606.31	91.31	607	92.75	607.2	98.24	608
102.74	608.55	106.68	609	109.92	609.36	116.06	610	117.7	610.14
119.3	610.21	123.81	610.5	125.38	610.59	129.45	610.76	135.6	611
136.76	611.05	136.92	611.06	137.17	611.07	141.04	611.25		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	72.16	.035	74.41	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
72.16	74.41	72.48	81.09	89.73	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 26 Profile # 1

W.S. Elev (ft)	605.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.71	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	606.66	Reach Len. (ft)	72.48	81.09	89.73
E.G. Slope (ft/ft)	0.032167	Flow Area (sq ft)	25.56	2.13	6.35
Q Total (cfs)	228.00	Flow (cfs)	176.32	15.64	36.04
Top Width (ft)	41.57	Top Width (ft)	29.53	2.25	9.79
Vel Total (ft/s)	6.70	Avg. Vel. (ft/s)	6.90	7.34	5.68
Max Chl Dpth (ft)	0.96	Hydr. Depth (ft)	0.87	0.95	0.65
Crit W.S. (ft)	606.12	Wetted Per. (ft)	29.64	2.25	9.86
Conv. Total (cfs)	1271.2	Conv. (cfs)	983.1	87.2	201.0

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 INPUT Reach: 1 River Station: 25
Description: 25

Station Elevation Data, num = 64

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	622.83	4.36	620	9.57	617.99	14.55	616.06	16.89	615
19.16	614.02	20.71	613.37	28.76	610	29.96	609.48	31.1	609
32.59	608.49	34.13	608	35.7	607.47	37.2	607	39.29	606.32
40.25	606	40.65	605.89	42.65	605.28	43.52	605	43.94	604.86
46.68	604	49.37	603.15	49.85	603	52.48	602.16	52.96	602
56.95	601.19	62.29	601.1	62.49	601.08	62.54	601.08	62.61	601.07
62.73	601.07	62.89	601.07	63.35	601.06	68.44	601.03	68.53	601.03
76.71	601	76.73	601	76.74	601	80.43	601	80.43	601
80.44	601	80.44	601	80.46	601	80.46	601	83.1	601.02
83.2	601.03	85.81	601.09	86.29	601.11	89.64	601.58	90.21	601.65
92.6	602	99.2	602.95	99.55	603	102.93	603.48	108.3	604
113.51	604.48	120.23	605	121.58	605.09	122.02	605.11	122.59	605.13
126.21	605.33	127.24	605.37	130.15	605.47	141.04	605.76		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value

0	.035	76.71	.035	76.73	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
76.71	76.73	40.55	51.38	63.33	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 25 Profile # 1

W.S. Elev (ft)	601.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.24	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	603.06	Reach Len. (ft)	40.55	51.38	63.33
E.G. Slope (ft/ft)	0.074221	Flow Area (sq ft)	16.05	0.02	9.46
Q Total (cfs)	228.00	Flow (cfs)	146.31	0.17	81.52
Top Width (ft)	37.56	Top Width (ft)	22.88	0.02	14.66
Vel Total (ft/s)	8.93	Avg. Vel. (ft/s)	9.11	10.16	8.62
Max Chl Dpth (ft)	0.82	Hydr. Depth (ft)	0.70	0.82	0.65
Crit W.S. (ft)	602.20	Wetted Per. (ft)	22.95	0.02	14.72
Conv. Total (cfs)	836.9	Conv. (cfs)	537.0	0.6	299.2

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

CROSS SECTION INPUT Reach: 1 River Station: 24
Description: 24

Station Elevation Data, num = 85

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	632.51	1.16	632	2.02	631.62	3.47	631	5.23	630.19
5.66	630	7.7	629	12.82	626.44	15.64	625	22.55	621.2
24.66	620	27.6	617.96	31.84	615	37.26	611.25	39.04	610
39.73	609.52	40.54	609	41.31	608.49	42.11	608	42.94	607.63
44.29	607	45.85	606.45	47.09	606	48.11	605.6	49.66	605
51.08	604.45	52.23	604	54.21	603.23	54.81	603	56.86	602.21
57.42	602	58.4	601.63	60.11	601	60.47	600.86	62.86	600
65.37	599.09	65.62	599	65.83	598.92	66.1	598.85	67.7	598.52
69.8	598.04	71.37	598	72.03	597.99	74.08	598	77.49	598.01
77.54	598.01	77.55	598.01	77.56	598.01	77.56	598.01	77.57	598.01
77.61	598.01	77.68	598.01	83.21	598	83.22	598	83.23	598
86.48	598	87.34	598	87.35	598	87.4	598	91.36	598.07
91.77	598.08	97.19	598.23	97.78	598.25	98.52	598.29	100.59	598.37
102.51	598.51	103.66	598.58	105.52	598.74	106.01	598.78	107.71	599
111.47	599.46	116.51	600	117.14	600.07	117.97	600.15	121.29	600.44
126.57	600.93	127.92	601	129.65	601.1	130.78	601.14	140.66	601.58
146.03	601.72	147.46	601.77	148.33	601.79	149.58	601.81	151.72	601.86

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	77.49	.035	77.54	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
77.49	77.54	86.4	49.59	15.26	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 24 Profile # 1

W.S. Elev (ft)	598.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.90	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	599.82	Reach Len. (ft)	86.40	49.59	15.26
E.G. Slope (ft/ft)	0.049174	Flow Area (sq ft)	8.79	0.05	21.18
Q Total (cfs)	228.00	Flow (cfs)	68.10	0.40	159.49
Top Width (ft)	41.28	Top Width (ft)	11.66	0.05	29.56
Vel Total (ft/s)	7.60	Avg. Vel. (ft/s)	7.75	8.85	7.53
Max Chl Dpth (ft)	0.93	Hydr. Depth (ft)	0.75	0.91	0.72
Crit W.S. (ft)	599.19	Wetted Per. (ft)	11.76	0.05	29.59
Conv. Total (cfs)	1028.2	Conv. (cfs)	307.1	1.8	719.2

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 INPUT Reach: 1 River Station: 23
Description: 23

Station Elevation Data, num = 72

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	624.74	6.68	621.31	9.23	620	13.02	618.07	18.1	615.33
18.66	615	24.83	611.24	26.82	610	31.17	607.53	35.59	605
36.66	604.43	37.45	604	38.73	603.32	39.33	603	40.67	602.29
41.18	602	41.98	601.57	43.08	601	44.26	600.34	44.89	600
45.7	599.57	46.73	599	47.88	598.39	48.58	598	49.55	597.46
50.36	597	50.7	596.82	52.16	596	54.39	595.15	55.52	595.1
56.86	595.08	58.22	595.07	60.76	595.04	61.66	595.04	61.78	595.03
61.81	595.03	61.84	595.03	61.89	595.03	61.95	595.03	62.02	595.03
62.11	595.03	62.2	595.03	62.31	595.03	62.46	595.04	62.68	595.04
66.48	595.16	68.65	595.26	71.84	595.36	75.01	595.44	76.55	595.52
78.32	595.62	80.56	595.76	82.71	595.83	84.3	596	86.99	596.32
92.89	597	97.95	597.58	100.31	597.84	101.65	598	103.75	598.27
106.25	598.57	110.28	599	114.06	599.34	118.76	599.7	120.9	599.86
121.56	599.9	122.83	600	126.47	600.2	128.44	600.31	132.49	600.52
136.47	600.72	138.01	600.79						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	71.84	.035	75.01	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
71.84	75.01	81.4	49.08	21.02	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 23 Profile # 1

W.S. Elev (ft)	596.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.09	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	597.32	Reach Len. (ft)	81.40	49.08	21.02
E.G. Slope (ft/ft)	0.042765	Flow Area (sq ft)	20.49	2.62	5.14
Q Total (cfs)	228.00	Flow (cfs)	180.93	20.22	26.84
Top Width (ft)	34.44	Top Width (ft)	20.08	3.17	11.19
Vel Total (ft/s)	8.07	Avg. Vel. (ft/s)	8.83	7.73	5.22
Max Chl Dpth (ft)	1.20	Hydr. Depth (ft)	1.02	0.83	0.46

```
* Crit W.S. (ft)     *   596.56 * Wetted Per. (ft)  *    20.31 *     3.17 *    11.22 *
* Conv. Total (cfs) *   1102.5 * Conv. (cfs)       *    874.9 *     97.8 *    129.8 *
*****************************************************************************************

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 INPUT    Reach:  1              River Station:  22
Description:  22

Station Elevation Data,  num = 57
    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.
       0  606.33     .44  606.18     .99     606    3.31  605.21    3.98     605
     4.8  604.73    6.98     604    9.23  603.23    9.92     603   10.38  602.84
   12.85     602   15.13  601.27   15.86     601   17.99  600.25   18.79     600
    19.6  599.75   21.76     599   22.53  598.76   24.71     598   26.36  597.42
   27.87     597   30.85   596.4    32.8     596    33.5  595.86   37.46     595
   40.09  594.44   42.22     594   45.35  593.34   47.11     593   50.04  592.46
   52.01  592.14   53.03     592   53.35  591.99   54.24     592   54.38     592
   56.19  592.07   60.21  592.26   68.71   592.7   70.85  592.81   72.08  592.88
   74.29     593   78.97  593.49   80.42  593.66   82.65     594   87.93  594.86
   88.83     595   89.21  595.06   95.08     596   95.84  596.09  103.31     597
  104.29  597.11  108.63  597.56  113.02     598  119.79  598.63  121.56  598.81
  123.67     599  126.09   599.2

Manning's n Values,  num = 3
    Sta.   Value    Sta.   Value    Sta.   Value
       0    .035   68.71    .035   70.85    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right    Coeff Contr.   Expan.
         68.71   70.85             75.86   73.42   71.06             .1       .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  22       Profile # 1
*****************************************************************************************
* W.S. Elev (ft)     *   593.49 * Element           *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     0.96 * Wt. n-Val.        *    0.035 *    0.035 *    0.035 *
* E.G. Elev (ft)     *   594.45 * Reach Len. (ft)   *    75.86 *    73.42 *    71.06 *
* E.G. Slope (ft/ft)* 0.034441 * Flow Area (sq ft) *    25.26 *     1.58 *     3.17 *
* Q Total (cfs)      *   228.00 * Flow (cfs)        *   204.54 *    10.14 *    13.32 *
* Top Width (ft)     *    34.36 * Top Width (ft)    *    24.08 *     2.14 *     8.14 *
* Vel Total (ft/s)   *     7.60 * Avg. Vel. (ft/s)  *     8.10 *     6.42 *     4.20 *
* Max Chl Dpth (ft)  *     1.50 * Hydr. Depth (ft)  *     1.05 *     0.74 *     0.39 *
* Crit W.S. (ft)     *   593.78 * Wetted Per. (ft)  *    24.23 *     2.14 *     8.17 *
* Conv. Total (cfs)  *   1228.6 * Conv. (cfs)       *   1102.2 *     54.6 *     71.8 *
*****************************************************************************************

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 INPUT    Reach:  1              River Station:  21
Description:  21

Station Elevation Data,  num = 46
    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.
       0   598.6    2.59   598.2    3.17   598.1    3.66     598     4.4  597.86
```

8.67	597	12.26	596.28	13.72	596	15.63	595.64	18.96	595
21.08	594.64	24.67	594	25.84	593.8	30.26	593	32.6	592.63
36.84	592	40.77	591.48	44.46	591	44.47	591	51.93	590
53.39	589.82	59.55	589	59.63	588.99	60.14	588.96	60.43	588.97
60.83	589	70.35	589.53	73.89	589.83	76.12	590	81.49	590.37
89.78	591	93.36	591.47	96.95	592	97.51	592.08	102.3	592.79
103.65	593	109.11	593.88	109.88	594	110.67	594.13	115.05	594.88
115.83	595	116.43	595.11	121.57	596	122.43	596.15	127.27	597
130.82	597.57								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	70.35	.035	73.89	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
70.35	73.89	26.05	52.05	80.03	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 21 Profile # 1

W.S. Elev (ft)	590.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.09	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	591.59	Reach Len. (ft)	26.05	52.05	80.03
E.G. Slope (ft/ft)	0.041675	Flow Area (sq ft)	22.26	2.91	3.13
Q Total (cfs)	228.00	Flow (cfs)	192.86	22.09	13.05
Top Width (ft)	35.05	Top Width (ft)	22.17	3.54	9.34
Vel Total (ft/s)	8.06	Avg. Vel. (ft/s)	8.66	7.59	4.17
Max Chl Dpth (ft)	1.54	Hydr. Depth (ft)	1.00	0.82	0.33
Crit W.S. (ft)	590.85	Wetted Per. (ft)	22.28	3.55	9.36
Conv. Total (cfs)	1116.9	Conv. (cfs)	944.7	108.2	63.9

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 INPUT Reach: 1 River Station: 20
Description: 20

Station Elevation Data, num = 48

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	594.57	1.32	594.32	3.01	594	4.18	593.79	8.16	593
8.270001	592.98	13.47	592	14.43	591.83	18.71	591	22.91	590.17
23.73	590	25.97	589.56	28.78	589	33.13	588.39	36.59	588
41.58	587.45	45.5	587	51.12	586.43	54.72	586.16	57.57	586
58.1	585.98	58.86	586	60.28	586.04	67.23	586.71	69.52	586.93
69.86	586.96	70.24	587	77.17	587.67	80.33	588	82.7	588.38
86.59	589	88.41	589.31	92.39	590	94.34	590.36	97.53	591
98.58	591.28	101.14	592	101.64	592.14	104.43	593	106.65	593.64
107.8	594	110.09	594.67	111.17	595	112.33	595.35	114.55	596
117.25	596.76	118.05	597	119.3	597.35				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	60.28	.035	67.23	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60.28	67.23	37.88	47.76	59.41	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 20 Profile # 1

W.S. Elev (ft)	587.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.17	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	589.38	Reach Len. (ft)	37.88	47.76	59.41
E.G. Slope (ft/ft)	0.110123	Flow Area (sq ft)	12.69	5.78	1.28
Q Total (cfs)	228.00	Flow (cfs)	149.21	71.70	7.10
Top Width (ft)	28.67	Top Width (ft)	16.57	6.95	5.14
Vel Total (ft/s)	11.55	Avg. Vel. (ft/s)	11.76	12.41	5.55
Max Chl Dpth (ft)	1.23	Hydr. Depth (ft)	0.77	0.83	0.25
Crit W.S. (ft)	587.82	Wetted Per. (ft)	16.63	6.98	5.16
Conv. Total (cfs)	687.1	Conv. (cfs)	449.6	216.1	21.4

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

CROSS SECTION INPUT Reach: 1 River Station: 19
Description: 19

Station Elevation Data, num = 86

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	593.56	2	593.18	2.91	593	3.17	592.95	7.68	592
10.93	591.34	12.57	591	14.42	590.62	17.7	590	20.42	589.5
23.11	589	28.45	588.1	29.01	588	29.78	587.87	35.33	587
39.63	586.34	41.88	586	48	585.18	49.36	585	56.96	584.1
58.3	584.02	59.03	584	59.45	583.99	61.11	584	63.42	584.02
63.47	584.01	63.51	584.01	63.52	584.01	63.53	584.01	63.54	584.01
63.54	584.01	63.55	584.01	63.56	584.01	63.56	584.01	63.59	584.01
63.61	584.01	63.64	584.01	66.76	584.04	67.12	584.06	67.31	584.07
67.51	584.08	71.13	584.19	72.46	584.3	77.38	584.7	79.17	584.83
80.87	585	81.29	585.09	84.47	586	87.17	586.9	87.47	587
87.82	587.12	89.61	587.66	91.17	588	92.3	588.44	94.01	589
95.35	589.4	97.07	590	99.06	590.68	100.02	591	101.98	591.68
102.78	592	104.76	592.81	105.22	593	105.66	593.2	107.61	594
108.9	594.5	110.27	595	111.39	595.41	112.96	596	114.2	596.46
115.61	597	116.33	597.24	118.43	598	119.36	598.29	121.57	599
124.5	599.92	124.75	600	126.2	600.45	127.92	601	128.46	601.18
131.07	602	131.17	602.03	131.56	602.13	134.96	603	138.7	603.47
138.74	603.48								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	71.13	.035	72.46	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
71.13	72.46	68.27	54	48.11	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 19 Profile # 1

W.S. Elev (ft)	585.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.07	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	586.29	Reach Len. (ft)	68.27	54.00	48.11
E.G. Slope (ft/ft)	0.044978	Flow Area (sq ft)	21.83	1.30	4.97
Q Total (cfs)	228.00	Flow (cfs)	187.15	11.44	29.41
Top Width (ft)	34.04	Top Width (ft)	23.42	1.33	9.28
Vel Total (ft/s)	8.11	Avg. Vel. (ft/s)	8.57	8.83	5.91
Max Chl Dpth (ft)	1.23	Hydr. Depth (ft)	0.93	0.97	0.54
Crit W.S. (ft)	585.55	Wetted Per. (ft)	23.50	1.33	9.34
Conv. Total (cfs)	1075.1	Conv. (cfs)	882.5	53.9	138.7

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

CROSS SECTION INPUT Reach: 1 River Station: 18
Description: 18

Station Elevation Data, num = 66

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	592.46	2.89	592.01	2.95	592	3.01	591.99	9.11	591
11	590.68	14.19	590	16.85	589.37	18.4	589	21.59	588.25
22.61	588	23.76	587.72	26.72	587	28.14	586.68	29.37	586.45
31.92	586	34.6	585.51	37.52	585	41.13	584.35	43.16	584
46.86	583.35	48.86	583	51.28	582.58	52.3	582.4	53.51	582.23
53.9	582.17	54.74	582.16	55.44	582.08	56.85	582.16	59.91	582.42
61.55	582.34	62.85	582.29	63.5	582.26	63.75	582.26	64.07	582.26
64.55	582.26	65.11	582.26	65.7	582.27	66.3	582.28	68.26	582.37
70.27	582.45	81.09	582.88	83.68	583	83.87	583.03	86.73	584
88.88	584.81	89.38	585	90.09	585.27	91.69	585.89	92.01	586
94.32	586.88	94.69	587	94.9	587.07	97.63	588	100.38	588.89
100.73	589	101.93	589.39	103.81	590	105.41	590.5	107.11	591
108.84	591.48	110.68	592	113.04	592.48	114.26	592.73	115.33	593
116.65	593.32								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	59.91	.035	61.55	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
59.91	61.55	58.45	65.3	72.32	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 18 Profile # 1

W.S. Elev (ft)	583.53	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.68	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	584.21	Reach Len. (ft)	58.45	65.30	72.32
E.G. Slope (ft/ft)	0.026043	Flow Area (sq ft)	13.60	1.89	21.97
Q Total (cfs)	247.00	Flow (cfs)	90.43	14.23	142.34
Top Width (ft)	39.53	Top Width (ft)	14.09	1.64	23.80
Vel Total (ft/s)	6.59	Avg. Vel. (ft/s)	6.65	7.53	6.48

```
* Max Chl Dpth (ft) *     1.45 * Hydr. Depth (ft)  *     0.97 *     1.15 *     0.92 *
* Crit W.S. (ft)     *   583.65 * Wetted Per. (ft)  *    14.22 *     1.64 *    23.90 *
* Conv. Total (cfs) *   1530.6 * Conv. (cfs)       *    560.4 *     88.2 *    882.0 *
*******************************************************************************

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 INPUT    Reach:  1            River Station:  17
Description:  17

Station Elevation Data,  num = 61
    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.    Sta.   Elev.
       0  585.52    1.59  585.32    4.44     585    8.04   584.5    9.68  584.28
   10.15  584.22    12.1     584   15.34  583.58    15.9  583.45   17.66     583
   17.88  582.93   20.13  582.25   20.92     582   22.47  581.57   24.43     581
   25.31  580.78   27.99     580   29.01  579.77   32.17     579   36.63  578.05
   37.06     578   38.06  577.97   39.69  577.97   40.65     578   42.57  578.12
   46.57  578.44   50.39  578.74   51.93  578.87   52.31  578.89   53.69     579
   59.05  579.52    61.1     580   63.45  580.64   64.75     581   65.61  581.24
   66.53  581.49   68.42     582   71.13  582.73   72.09     583   73.84  583.48
   75.74     584   78.28  584.68   79.37     585   86.89  588.79   88.12  589.44
   89.01     590   89.77  590.59   89.92  590.66   96.88     595   97.14  595.17
   97.31  595.22   97.39  595.24   97.47  595.27   99.74  596.28  101.15  596.79
  104.33  598.02  109.28     600  110.72  600.41  111.62  600.73  112.34     601
  113.73  601.15

Manning's n Values,  num = 3
    Sta.   Value    Sta.   Value    Sta.   Value
       0    .035   59.05    .035    61.1    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right    Coeff Contr.   Expan.
         59.05    61.1             15.53   45.33   76.22             .1       .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  17       Profile # 1
*******************************************************************************
* W.S. Elev (ft)     *   579.38 * Element           *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     1.93 * Wt. n-Val.        *    0.035 *          *          *
* E.G. Elev (ft)     *   581.31 * Reach Len. (ft)   *    15.53 *    45.33 *    76.22 *
* E.G. Slope (ft/ft)* 0.090919 * Flow Area (sq ft) *    22.14 *          *          *
* Q Total (cfs)      *   247.00 * Flow (cfs)        *   247.00 *          *          *
* Top Width (ft)     *    27.02 * Top Width (ft)    *    27.02 *          *          *
* Vel Total (ft/s)   *    11.15 * Avg. Vel. (ft/s)  *    11.15 *          *          *
* Max Chl Dpth (ft) *     1.41 * Hydr. Depth (ft)  *     0.82 *          *          *
* Crit W.S. (ft)     *   579.96 * Wetted Per. (ft)  *    27.23 *          *          *
* Conv. Total (cfs) *    819.2 * Conv. (cfs)       *    819.2 *          *          *
*******************************************************************************

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

CROSS SECTION INPUT Reach: 1 River Station: 16
Description: 16

Station Elevation Data, num = 65

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	582.99	2.71	582.46	5.05	582	8.53	581.18	9.23	581
12.11	580.43	14.28	580	17.78	579.43	20.45	579	21.2	578.88
26.34	578	32.91	577.16	34.13	577	37.78	576.72	38.66	576.66
39.49	576.61	40.39	576.57	41.51	576.53	42.92	576.5	48.75	576.3
51.08	576.25	53.79	576.16	54.72	576.14	54.97	576.14	55.22	576.14
55.56	576.16	57.53	576.09	58.04	576.14	59.72	576.08	59.92	576.11
60.7	576.29	62.16	576.41	63.1	576.61	63.45	576.74	63.91	577
64.25	577.2	65.72	578	66.9	578.66	67.53	579	68.15	579.32
68.88	579.68	69.47	580	71.09	580.92	77.79	584.45	78.56	584.87
78.83	585	84.7	588.44	86.83	590	88.29	591.06	90.35	592.65
91.03	593.12	91.06	593.14	93.14	594	95.13	594.38	98.71	595
102.03	595.62	103.07	595.8	104.24	596	109.35	596.55	112.63	596.85
114.23	597	118.76	597.24	119.36	597.28	119.89	597.31	120.21	597.34

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	60.7	.035	62.16	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
60.7	62.16	86.05	67.06	48.8	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 16 Profile # 1

W.S. Elev (ft)	577.10	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.24	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	579.34	Reach Len. (ft)	86.05	67.06	48.80
E.G. Slope (ft/ft)	0.133431	Flow Area (sq ft)	18.76	1.10	0.82
Q Total (cfs)	247.00	Flow (cfs)	225.97	14.10	6.93
Top Width (ft)	30.75	Top Width (ft)	27.36	1.46	1.93
Vel Total (ft/s)	11.94	Avg. Vel. (ft/s)	12.04	12.81	8.40
Max Chl Dpth (ft)	1.02	Hydr. Depth (ft)	0.69	0.75	0.43
Crit W.S. (ft)	577.72	Wetted Per. (ft)	27.42	1.46	2.07
Conv. Total (cfs)	676.2	Conv. (cfs)	618.6	38.6	19.0

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 INPUT Reach: 1 River Station: 15
Description: 15

Station Elevation Data, num = 68

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	582.74	1.35	582.49	3.05	582.16	3.84	582	8.51	581.02
8.58	5818.770001		580.96	13.28	580	15	579.63	18.03	579
19.57	578.67	22.76	578	25.07	577.48	27.25	577	30.41	576.25
31.5	576	32.43	575.78	34.53	575.28	35.36	575.09	35.76	575
40.2	574.16	41.43	574.12	46.1	574	46.48	574	48.3	573.98
48.49	573.98	51.1	573.98	58.72	573.99	62.31	573.99	65.87	573.96
66.53	573.97	66.97	574	68.79	574.48	71.03	575	71.66	575.16

74.87	576	76.64	576.46	78.68	577	80.32	577.58	81.52	578
83.49	578.7	84.34	579	84.77	579.15	87.18	580	88.94	580.65
89.94	581	91.9	581.71	92.72	582	93.49	582.28	95.49	583
97.94	583.91	98.18	584	98.47	584.11	100.9	585	102.15	585.48
103.56	586	104.98	586.55	106.2	587	107.84	587.64	108.81	588
109.81	588.37	111.38	589	112.92	589.59	113.9	590	115.32	590.57
116.56	591	120.01	591.51	122	591.8				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	62.31	.035	65.87	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.31	65.87	49.38	52.42	57.08	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 15 Profile # 1

W.S. Elev (ft)	575.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	575.86	Reach Len. (ft)	49.38	52.42	57.08
E.G. Slope (ft/ft)	0.016547	Flow Area (sq ft)	32.25	4.76	4.90
Q Total (cfs)	247.00	Flow (cfs)	193.38	31.55	22.06
Top Width (ft)	37.85	Top Width (ft)	27.92	3.56	6.37
Vel Total (ft/s)	5.89	Avg. Vel. (ft/s)	6.00	6.63	4.51
Max Chl Dpth (ft)	1.35	Hydr. Depth (ft)	1.16	1.34	0.77
Crit W.S. (ft)	575.32	Wetted Per. (ft)	28.03	3.56	6.53
Conv. Total (cfs)	1920.2	Conv. (cfs)	1503.3	245.3	171.5

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

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

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

CROSS SECTION INPUT Reach: 1 River Station: 14

Description: 14

Station Elevation Data, num = 75

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	579.27	1.15	579	3.15	578.38	4.48	578	5.14	577.79
7.57	577	8.89	576.56	10.59	576	13.37	575.09	13.66	575
13.98	574.9	16.71	574	18.68	573.36	19.76	573	21.28	572.43
22.34	572	22.35	572	22.37	572	22.42	571.99	25.84	571.29
27.75	571	30.42	570.73	31.2	570.65	32.63	570.53	35.37	570.27
37.58	570.16	38.2	570.11	40.59	570.04	40.65	570.03	40.7	570.03
40.75	570.03	42.58	570	44.26	569.98	45.63	569.98	47.19	570
50.01	570.04	50.3	570.05	50.36	570.05	50.41	570.05	50.48	570.05
50.58	570.06	51.12	570.12	54.66	570.3	59	571	59.94	571.47
60.91	572	62.05	572.58	62.83	573	63.31	573.26	64.75	574
65	574.13	66.7	575	68.34	575.84	68.67	576	68.83	576.07
70.78	577	71.73	577.44	72.92	578	74.77	578.81	75.18	579
76.56	579.39	78.77	580	81.34	580.73	82.3	581	85.25	581.84
85.81	582	86.02	582.06	89.37	583	90.1	583.19	93.53	584

95.72	584.51	97.85	585	100.05	585.51	102.18	586	102.29	586.02

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	54.66	.035	59	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
54.66	59	38.3	25.18	23.92	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 14 Profile # 1

W.S. Elev (ft)	570.88	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.83	Wt. n-Val.	0.035	0.035	
E.G. Elev (ft)	573.71	Reach Len. (ft)	38.30	25.18	23.92
E.G. Slope (ft/ft)	0.173680	Flow Area (sq ft)	17.49	1.06	
Q Total (cfs)	247.00	Flow (cfs)	238.82	8.18	
Top Width (ft)	29.39	Top Width (ft)	25.77	3.62	
Vel Total (ft/s)	13.31	Avg. Vel. (ft/s)	13.65	7.73	
Max Chl Dpth (ft)	0.90	Hydr. Depth (ft)	0.68	0.29	
Crit W.S. (ft)	571.56	Wetted Per. (ft)	25.81	3.67	
Conv. Total (cfs)	592.7	Conv. (cfs)	573.0	19.6	

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

CROSS SECTION INPUT Reach: 1 River Station: 13
Description: 13

Station Elevation Data, num = 45

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	573.47	.95	573.27	2.18	573	5.89	572.22	6.9	572
9.98	571.33	11.57	571	13.31	570.6	15.93	570	17.51	569.79
23.15	569	25.31	568.55	27.21	568.26	29.47	568	29.9	567.93
31.38	567.96	31.7	568	33.96	568.18	35.21	568.37	37.81	568.68
39.41	569	41.06	569.24	44.01	570	45.47	570.59	46.5	571
47.75	571.5	48.97	572	51.21	572.89	51.47	573	51.61	573.06
53.94	574	54.51	574.23	56.39	575	58.32	575.76	58.9	576
59.45	576.23	61.38	577	63	577.65	63.87	578	64.39	578.18
66.46	579	69.82	579.95	69.99	580	70.04	580.01	71.31	580.39

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	37.81	.035	39.41	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
37.81	39.41	21.93	20.74	25.22	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 13 Profile # 1

W.S. Elev (ft)	569.92	Element	Left OB	Channel	Right OB

Vel Head (ft)	1.06	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	570.97	Reach Len. (ft)	21.93	20.74	25.22
E.G. Slope (ft/ft)	0.029483	Flow Area (sq ft)	26.60	1.73	2.21
Q Total (cfs)	247.00	Flow (cfs)	223.72	13.06	10.22
Top Width (ft)	27.15	Top Width (ft)	21.27	1.60	4.28
Vel Total (ft/s)	8.09	Avg. Vel. (ft/s)	8.41	7.57	4.62
Max Chl Dpth (ft)	1.99	Hydr. Depth (ft)	1.25	1.08	0.52
Crit W.S. (ft)	570.21	Wetted Per. (ft)	21.46	1.63	4.39
Conv. Total (cfs)	1438.5	Conv. (cfs)	1302.9	76.1	59.5

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

CROSS SECTION INPUT Reach: 1 River Station: 12
Description: 12

Station Elevation Data, num = 42

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	569.85	3.65	569.53	6.29	569.29	8.67	569	10.8	568.63
11.75	568.52	16.2	568.04	16.57	568	16.64	567.95	18.25	567
19.1	566.44	19.69	566	20.78	565.27	21.57	565	21.61	564.99
21.65	565	22.25	565.29	23.77	566	24.39	566.41	24.9	566.75
25.24	566.98	26.8	567.98	28.38	569	28.4	569.01	28.97	569.41
29.87	570	31.7	570.98	31.74	571	31.75	571	31.9	571.06
34.51	572	36.78	572.82	37.26	573	39.68	573.88	40.01	574
42.05	574.76	42.72	575	43.1	575.14	45.47	576	46.54	576.39
48.19	577	48.77	577.22						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	24.39	.035	24.9	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
24.39	24.9	7.78	31.35	65.69	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 12 Profile # 1

W.S. Elev (ft)	568.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.61	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	570.22	Reach Len. (ft)	7.78	31.35	65.69
E.G. Slope (ft/ft)	0.036813	Flow Area (sq ft)	20.96	1.04	2.66
Q Total (cfs)	247.00	Flow (cfs)	216.71	11.96	18.33
Top Width (ft)	16.80	Top Width (ft)	13.41	0.51	2.88
Vel Total (ft/s)	10.02	Avg. Vel. (ft/s)	10.34	11.55	6.89
Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)	1.56	2.03	0.93
Crit W.S. (ft)	569.13	Wetted Per. (ft)	14.65	0.61	3.42
Conv. Total (cfs)	1287.3	Conv. (cfs)	1129.5	62.3	95.5

Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This

may indicate the need for additional cross sections.

CROSS SECTION INPUT Reach: 1 River Station: 11
Description: 11

Station Elevation Data, num = 60

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	571.32	.19	571.28	1.55	571	3.71	570.63	7.33	570
10.69	569.72	11.61	569.66	12.6	569.58	13.7	569.44	15.27	569.17
16.1	569	17.07	568.82	18.31	568.63	20.12	568.3	20.55	568.2
22.06	568	25.09	567.5	28.06	567	29.52	566.76	30.31	566.66
31.98	566.42	35.58	566.01	35.65	566	37.04	565.38	37.78	565
39.25	564.07	39.39	564	39.96	563.7	40.6	563.29	41.09	563
41.09	562.99	41.27	562.96	41.65	562.99	41.73	563	42.79	563.79
43.03	564	44.16	564.89	44.28	565	48.9	568.76	50.52	570
52.46	571.61	56.58	575	57.08	575.41	57.8	576	58.49	576.56
59.01	577	59.44	577.35	60.24	578	61.11	578.4	62.26	579
65.86	579.73	67.24	580	70.54	580.68	72.18	581	75.76	581.73
77.05	582	77.85	582.13	78.82	582.25	79.5	582.32	80.14	582.4

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	40.6	.035	41.09	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
40.6	41.09	82.54	38.42	106.22	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 11 Profile # 1

W.S. Elev (ft)	566.46	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.52	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	568.98	Reach Len. (ft)	82.54	38.42	106.22
E.G. Slope (ft/ft)	0.049556	Flow Area (sq ft)	9.51	1.63	9.87
Q Total (cfs)	247.00	Flow (cfs)	88.98	30.92	127.10
Top Width (ft)	14.39	Top Width (ft)	8.92	0.49	4.99
Vel Total (ft/s)	11.76	Avg. Vel. (ft/s)	9.36	19.02	12.87
Max Chl Dpth (ft)	3.50	Hydr. Depth (ft)	1.07	3.32	1.98
Crit W.S. (ft)	567.32	Wetted Per. (ft)	9.65	0.57	6.21
Conv. Total (cfs)	1109.6	Conv. (cfs)	399.7	138.9	570.9

Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION INPUT Reach: 1 River Station: 10
Description: 10

Station Elevation Data, num = 219

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	573.72	.45	573.65	.8	573.59	1.55	573.47	1.85	573.42
2.2	573.36	2.85	573.25	4.01	573.06	4.21	573.03	4.41	573
5.99	572.75	6.11	572.73	6.42	572.68	6.48	572.67	6.53	572.66
6.58	572.65	6.62	572.64	6.65	572.64	6.68	572.63	6.71	572.63
6.74	572.62	6.76	572.62	6.8	572.61	6.82	572.61	6.84	572.6

6.86	572.6	6.88	572.6	6.9	572.59	6.93	572.59	6.95	572.58
6.97	572.58	7	572.57	7.03	572.57	7.06	572.56	7.09	572.56
7.12	572.55	7.15	572.54	7.18	572.54	7.22	572.53	7.24	572.52
7.27	572.52	7.29	572.51	7.65	572.43	7.68	572.43	7.7	572.42
7.73	572.42	7.85	572.39	8.14	572.33	8.2	572.32	8.23	572.31
8.26	572.3	8.3	572.3	8.53	572.24	8.56	572.24	8.59	572.23
8.62	572.23	8.89	572.17	8.92	572.16	8.94	572.16	9.09	572.12
9.11	572.129	9.270001	572.09	9.28	572.08	9.46	572.05	9.46	572.05
9.47	572.04	9.65	572.01	9.65	572.01	9.68	572	9.83	571.97
9.84	571.97	10.02	571.93	10.03	571.93	10.21	571.89	10.23	571.88
10.4	571.85	10.42	571.84	10.58	571.81	10.62	571.8	10.77	571.77
10.81	571.76	10.95	571.73	11.04	571.71	11.24	571.67	11.98	571.52
12.05	571.51	12.12	571.49	12.2	571.47	12.28	571.46	12.46	571.42
12.55	571.4	12.65	571.38	12.72	571.36	12.83	571.34	12.95	571.31
13.01	571.3	13.15	571.27	13.2	571.25	13.35	571.22	13.51	571.18
13.55	571.17	13.74	571.13	13.77	571.12	13.98	571.07	13.99	571.07
14.23	571.01	14.23	571.01	14.28	571	14.39	570.97	14.53	570.94
14.66	570.91	14.79	570.87	18.18	570	19.3	569.81	19.38	569.79
19.42	569.79	19.46	569.78	19.51	569.77	19.56	569.76	19.62	569.75
19.67	569.74	19.73	569.72	19.8	569.71	19.86	569.7	19.93	569.68
20.01	569.67	20.08	569.65	20.16	569.64	20.25	569.62	20.35	569.6
20.45	569.58	20.56	569.55	20.68	569.52	20.82	569.49	20.97	569.46
21.85	569.26	22.19	569.19	22.61	569.09	23.02	569	23.1	568.98
23.11	568.98	23.49	568.89	23.81	568.82	23.9	568.8	24.2	568.73
24.46	568.67	24.6	568.64	24.84	568.59	25.02	568.55	25.22	568.5
25.43	568.45	25.68	568.4	25.99	568.33	26.6	568.19	26.85	568.13
27.13	568.07	27.15	568.06	27.42	568	28.65	567.72	28.72	567.7
28.8	567.68	29.21	567.59	29.44	567.54	29.63	567.49	29.77	567.46
29.92	567.42	30.08	567.39	30.24	567.35	30.43	567.3	30.55	567.28
30.75	567.23	30.98	567.17	31.05	567.16	31.3	567.1	31.58	567.03
31.7	567	31.98	566.92	35.33	566	36.51	565.66	38.75	565
39.69	564.81	44.04	564	44.64	563.67	46.06	563	47.83	562.19
47.89	562.13	48.27	562.09	48.58	562.2	50.81	563	51.36	563.21
53.15	564	53.98	564.34	55.45	565	57.1	565.63	58.12	566
59.38	566.46	60.83	567	62.04	567.44	63.6	568	64.67	568.4
66.4	569	67.68	569.43	70.11	570.31	71.99	571	73.93	571.74
74.65	572	77.13	572.92	77.46	573	78.91	573.29	80.86	573.66
82.38	574	83.11	574.14	87.95	575	90.43	575.49	92.98	576
93.31	576.06	94.84	576.31	96.03	576.47	98.25	576.81		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	50.81	.035	51.36	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
50.81	51.36	17.57	30.54	47.29	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 10 Profile # 1

W.S. Elev (ft)	565.47	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.05	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	566.52	Reach Len. (ft)	17.57	30.54	47.29
E.G. Slope (ft/ft)	0.020476	Flow Area (sq ft)	23.48	1.30	5.86
Q Total (cfs)	247.00	Flow (cfs)	197.69	13.36	35.95
Top Width (ft)	19.50	Top Width (ft)	13.64	0.55	5.31
Vel Total (ft/s)	8.06	Avg. Vel. (ft/s)	8.42	10.29	6.14
Max Chl Dpth (ft)	3.38	Hydr. Depth (ft)	1.72	2.36	1.10

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* Crit W.S. (ft)     *   565.65 * Wetted Per. (ft)  *    14.40 *      0.59 *      5.77 *
* Conv. Total (cfs) *   1726.1 * Conv. (cfs)        *   1381.5 *      93.4 *     251.2 *
*********************************************************************************************

Warning - The energy equation could not be balanced within the specified
                number of iterations.  The program selected the water surface that
                had the least amount of error between computed and assumed
                values.
Warning - The velocity head has changed by more than 0.5 ft (0.15 m).  This
                may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by
                downstream conveyance) is less than 0.7 or greater than 1.4.  This
                may indicate the need for additional cross sections.
Warning - 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 INPUT    Reach:  1              River Station:  9
Description:  9

Station Elevation Data,  num = 268
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Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	569.25	.22	569.22	.5	569.17	.79	569.13	1.1	569.08
1.42	569.03	1.62	569	1.82	568.97	1.84	568.97	1.86	568.96
2.4	568.88	2.47	568.87	2.92	568.8	3.03	568.78	3.16	568.76
3.56	568.69	3.72	568.66	4.05	568.61	4.25	568.58	4.51	568.53
4.75	568.49	5.02	568.45	5.23	568.41	5.53	568.36	5.68	568.33
6.01	568.27	6.12	568.26	6.48	568.19	6.89	568.12	6.94	568.11
7.38	568.03	7.39	568.03	7.56	568	7.92	567.93	7.98	567.92
8.51	567.83	8.64	567.8	9.1	567.72	9.31	567.68	9.56	567.63
9.96	567.56	10.29	567.5	10.6	567.44	11.01	567.36	11.22	567.32
11.69	567.24	12.26	567.13	12.34	567.11	12.95	567	12.97	567
13.71	566.85	13.86	566.83	14.46	566.71	14.58	566.69	15.02	566.61
15.16	566.58	15.29	566.55	15.43	566.53	15.57	566.5	16.57	566.31
16.68	566.29	16.79	566.27	16.9	566.25	16.97	566.24	17.04	566.22
17.09	566.21	17.13	566.2	17.17	566.2	17.21	566.19	17.23	566.19
17.26	566.18	17.28	566.18	17.31	566.17	17.33	566.17	17.35	566.17
17.37	566.16	17.38	566.16	17.4	566.15	17.42	566.15	17.51	566.14
17.57	566.12	17.59	566.12	17.65	566.11	17.67	566.11	17.72	566.1
17.74	566.09	17.8	566.08	17.85	566.07	17.87	566.07	17.92	566.06
18.12	566.02	18.21	566.01	18.26	566	18.31	565.99	18.43	565.97
18.55	565.95	18.69	565.92	18.84	565.89	19	565.86	19.17	565.83
19.34	565.8	19.52	565.76	19.7	565.73	19.88	565.69	20.06	565.65
20.24	565.62	20.42	565.58	20.59	565.55	20.75	565.52	20.91	565.49
21.06	565.45	21.2	565.43	21.34	565.4	21.57	565.35	23.24	565
24.42	564.69	26.17	564	27.39	563.56	28.9	563	31.39	562.04
31.5	562	31.56	561.98	34.33	561	34.52	560.95	37.46	560.96
37.66	561	40.08	561.77	40.71	562	43.38	562.96	43.47	563
43.47	563	43.73	563.11	44.22	563.34	44.61	563.51	44.84	563.62
45	563.69	45.11	563.74	45.19	563.77	45.25	563.8	45.34	563.84
45.42	563.88	45.68	564	45.71	564.02	45.79	564.06	45.85	564.09
45.9	564.12	45.94	564.14	46	564.18	46.02	564.25	47.78	565
48.75	565.45	48.8	565.47	48.84	565.48	48.88	565.49	48.9	565.5
48.92	565.51	48.94	565.51	48.96	565.52	48.98	565.53	49	565.53
49.03	565.54	49.05	565.54	49.07	565.55	49.09	565.56	49.11	565.56
49.15	565.57	49.28	565.6	49.29	565.61	49.31	565.61	49.32	565.61
49.33	565.62	49.34	565.62	49.35	565.62	49.36	565.63	49.37	565.63

49.38	565.63	49.39	565.64	49.4	565.64	49.42	565.65	49.63	565.74
50.27	566	52.56	566.93	52.74	567	53.66	567.37	53.83	567.44
54.1	567.55	55.23	568	55.48	568.1	55.49	568.11	55.5	568.11
55.51	568.12	55.52	568.12	55.54	568.13	55.55	568.13	55.57	568.14
55.59	568.15	55.61	568.16	55.65	568.17	55.7	568.2	55.77	568.23
55.88	568.28	56.54	568.56	56.78	568.67	56.92	568.73	57.02	568.77
57.09	568.8	57.14	568.82	57.18	568.84	57.54	569	57.57	569.01
57.63	569.04	59.73	570	60.44	570.28	60.45	570.28	60.48	570.29
60.5	570.3	60.53	570.31	60.55	570.32	60.62	570.34	61.42	570.63
61.7	570.73	61.87	570.79	62.05	570.86	62.24	570.92	62.45	571
62.46	571	63.99	571.51	64.69	571.74	65.47	572	65.59	572.04
65.85	572.12	66.07	572.18	66.25	572.24	66.41	572.28	66.54	572.32
66.66	572.36	66.87	572.42	67.07	572.35	67.15	572.38	67.25	572.42
67.36	572.46	67.51	572.51	68.21	572.76	68.79	573	69.25	573
69.52	573.11	71.5	574	71.71	574	72.21	574.2	74.14	575
76.41	575.82	76.94	576	77.46	576.16	78.28	576.47	79.6	577
80.4	577.34	81.97	578	83.24	578.55	84.37	579	85.78	579.61
86.73	580	88.45	580.75	89.12	581	91.16	581.74	91.84	582
92.32	582.15	93.62	582.52	93.91	582.59				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	47.78	.035	48.75	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
47.78	48.75	16.87	24.46	37.78	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 9 Profile # 1

W.S. Elev (ft)	563.04	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.66	Wt. n-Val.	0.035		
E.G. Elev (ft)	565.69	Reach Len. (ft)	16.87	24.46	37.78
E.G. Slope (ft/ft)	0.072837	Flow Area (sq ft)	18.88		
Q Total (cfs)	247.00	Flow (cfs)	247.00		
Top Width (ft)	14.75	Top Width (ft)	14.75		
Vel Total (ft/s)	13.08	Avg. Vel. (ft/s)	13.08		
Max Chl Dpth (ft)	2.09	Hydr. Depth (ft)	1.28		
Crit W.S. (ft)	563.87	Wetted Per. (ft)	15.47		
Conv. Total (cfs)	915.2	Conv. (cfs)	915.2		

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

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

CROSS SECTION INPUT Reach: 1 River Station: 8

Description: 8

Station Elevation Data, num = 211

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	566.43	.85	566.29	1.06	566.25	1.29	566.21	1.55	566.17
1.87	566.12	2.25	566.05	2.3	566.04	2.56	566	6.31	565.37
6.7	565.3	6.99	565.25	7.21	565.22	7.38	565.19	7.52	565.16
7.63	565.15	7.72	565.13	7.8	565.12	7.87	565.1	7.93	565.09
7.98	565.09	8.020001	565.08	8.06	565.07	8.1	565.07	8.13	565.06

8.15	565.06	8.18	565.05	8.2	565.05	8.22	565.04	8.23	565.04
8.25	565.04	8.26	565.04	8.270001	565.03	8.28	565.03	8.29	565.03
8.46	565	8.56	564.95	10.54	564	10.8	563.88	11.78	563.4
12.21	563.2	12.53	563.04	12.61	563	14.56	562.06	14.62	562.03
14.68	562	15.75	561.48	16.73	561	17.66	560.55	18.04	560.36
18.79	560	21.53	559.15	21.96	559.02	21.99	559.02	22.04	559.02
22.15	559.02	25.96	559.08	26.45	559.12	31.68	560	32.18	560.41
32.48	560.66	32.88	561	33.43	561.45	34.08	562	34.58	562.41
35.29	563	35.37	563.07	35.44	563.13	36.15	563.71	36.45	563.96
36.5	564	36.52	564.02	36.53	564.03	36.54	564.05	36.55	564.07
36.56	564.08	36.57	564.1	36.58	564.11	36.58	564.13	36.59	564.14
36.6	564.16	36.6	564.17	36.61	564.2	37.75	565	38.18	565.35
38.19	565.35	38.2	565.36	38.22	565.37	38.23	565.38	38.24	565.39
38.28	565.41	38.58	565.62	38.65	565.67	38.69	565.7	38.74	565.72
38.83	565.79	39.05	565.92	39.11	565.97	39.16	566	39.99	566.59
40.24	566.76	40.57	567	40.65	567.05	41.98	568	42.16	568.14
43.37	569	43.43	569.04	43.62	569.19	43.7	569.24	43.76	569.3
43.82	569.34	43.87	569.38	43.91	569.42	43.95	569.45	43.98	569.48
44.01	569.5	44.03	569.53	44.05	569.55	44.06	569.57	44.07	569.58
44.78	570	45.62	570.69	45.65	570.72	45.72	570.76	45.85	570.86
46.04	571	46.59	571.43	47.32	572	48.37	572.8	48.64	573
48.74	573.08	49.09	573.34	50.01	574	50.35	574.23	51.43	575
53.15	575.77	53.26	575.82	53.38	575.88	53.51	575.94	53.64	576
53.71	576.03	53.75	576.05	54.44	576.38	54.88	576.59	55.17	576.73
55.73	577	56.17	577.22	56.86	577.57	57.12	577.7	57.7	578
58.17	578.24	58.7	578.52	59.63	579	59.95	579.17	61.55	580
63.48	580.86	63.81	581	65.98	581.96	66.07	582	67.18	582.49
68.33	583	68.58	583.11	69.03	583.31	70.09	583.78	70.58	584
71.12	584.24	71.77	584.53	72.47	584.84	72.61	584.91	72.82	585
73.02	585.11	73.06	585.14	73.09	585.15	73.11	585.16	73.15	585.18
73.18	585.2	73.22	585.22	73.27	585.24	73.32	585.27	73.38	585.3
73.45	585.33	73.53	585.37	73.62	585.41	73.73	585.47	73.86	585.53
74.02	585.6	74.21	585.69	74.46	585.8	74.79	585.95	74.9	586
75.05	586.07	75.07	586.08	75.27	586.17	75.32	586.19	75.5	586.27
75.58	586.31	75.99	586.49	76.64	586.77	76.71	586.8	76.76	586.83
77	586.93	77.02	586.94	77.16	587	77.28	587.05	77.51	587.15
77.55	587.17	77.75	587.26	77.82	587.29	78	587.37	78.1	587.41
78.23	587.47								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	39.16	.035	39.99	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
39.16	39.99	22.63	22.38	42.06	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 8 Profile # 1

W.S. Elev (ft)	563.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.	0.035		
E.G. Elev (ft)	563.29	Reach Len. (ft)	22.63	22.38	42.06
E.G. Slope (ft/ft)	0.002534	Flow Area (sq ft)	62.50		
Q Total (cfs)	247.00	Flow (cfs)	247.00		
Top Width (ft)	22.82	Top Width (ft)	22.82		
Vel Total (ft/s)	3.95	Avg. Vel. (ft/s)	3.95		
Max Chl Dpth (ft)	4.03	Hydr. Depth (ft)	2.74		
Crit W.S. (ft)		Wetted Per. (ft)	24.85		

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* Conv. Total (cfs) *    4906.7 * Conv. (cfs)        *    4906.7 *          *          *
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CROSS SECTION INPUT Reach: 1 River Station: 7
Description: 7

Station Elevation Data, num = 412

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	570.52	1.85	570	6.29	569.26	7.84	569	12.94	568.15
13.55	568.05	13.86	568	13.87	568	13.87	568	14.32	567.93
14.67	567.87	14.96	567.82	15.1	567.8	15.36	567.76	15.57	567.72
15.76	567.69	15.91	567.67	16.22	567.62	16.37	567.6	16.5	567.58
16.62	567.56	16.73	567.54	16.95	567.5	17.23	567.46	17.63	567.4
17.97	567.34	18.15	567.31	18.54	567.25	18.62	567.24	19.1	567.16
19.15	567.15	19.21	567.15	19.76	567.06	19.78	567.05	20.12	567
20.42	566.95	20.47	566.94	21.13	566.84	21.32	566.81	21.92	566.71
22.41	566.63	22.81	566.57	23.22	566.5	23.8	566.41	24.11	566.36
24.9	566.23	25.08	566.2	26.14	566.03	26.16	566.02	26.31	566
26.92	565.9	29.42	565.51	30.4	565.36	30.92	565.28	31.25	565.23
31.47	565.19	31.63	565.17	31.75	565.15	31.84	565.13	32.69	565
32.88	564.92	32.92	564.9	32.95	564.88	32.99	564.86	33.02	564.85
33.05	564.84	33.08	564.82	33.11	564.81	33.15	564.79	33.19	564.77
33.24	564.75	33.3	564.72	33.37	564.68	33.45	564.64	33.56	564.59
33.71	564.51	33.93	564.4	34.26	564.23	34.72	564	34.87	563.93
35.01	563.86	35.73	563.5	36.72	563	36.78	562.97	36.82	562.95
37.64	562.54	38.37	562.18	38.53	562.1	38.73	562	39.68	561.53
40.65	561.05	40.71	561.02	40.75	561	41.66	560.56	42.01	560.38
42.2	560.29	42.31	560.24	42.39	560.2	42.44	560.17	42.48	560.15
42.52	560.13	42.54	560.12	42.57	560.11	42.59	560.1	42.6	560.09
42.62	560.08	42.63	560.07	42.64	560.07	42.65	560.06	42.67	560.05
42.69	560.04	42.76	560	42.79	559.98	43.54	559	44.85	558.31
46.95	558.02	46.98	558.01	47.01	558.01	47.05	558.01	49.49	559
51.99	559.95	52.08	560	52.23	560.13	52.25	560.15	52.26	560.16
52.28	560.18	52.3	560.2	52.32	560.22	52.35	560.24	52.38	560.28
52.42	560.32	52.47	560.37	52.53	560.44	52.61	560.53	52.73	560.67
52.9	560.87	53.01	561	53.44	561.45	54	562	54.3	562.31
54.84	562.83	54.94	562.93	55.01	563	55.59	563.56	56.06	564
56.06	564.01	56.08	564.05	56.09	564.07	56.1	564.1	56.1	564.12
57.12	565	57.7	565.41	57.71	565.42	57.71	565.42	57.72	565.43
57.74	565.44	57.93	565.6	58	565.65	58.07	565.71	58.11	565.75
58.16	565.79	58.2	565.83	58.25	565.87	58.3	565.92	58.35	565.96
58.38	566	58.57	566.16	58.81	566.36	59.25	566.72	59.58	567
60.23	567.58	60.69	568	61.68	568.96	61.72	569	61.72	569
61.74	569.06	61.75	569.12	61.77	570	62.07	570.2	62.07	570.2
62.07	570.21	62.07	570.21	62.07	570.21	62.07	570.21	62.08	570.22
62.08	570.22	62.08	570.23	62.09	570.23	62.1	570.24	62.11	570.25
62.13	570.27	62.15	570.29	62.17	570.3	62.17	570.3	62.18	570.31
62.18	570.31	62.19	570.32	62.2	570.32	62.21	570.32	62.21	570.33
62.22	570.33	62.23	570.34	62.24	570.34	62.25	570.34	62.26	570.35
62.27	570.35	62.29	570.36	62.3	570.36	62.32	570.37	62.34	570.37
62.36	570.38	62.38	570.38	62.41	570.39	62.53	570.42	62.56	570.42
62.6	570.43	62.64	570.44	62.68	570.45	62.72	570.46	62.76	570.47
62.8	570.49	62.85	570.5	62.89	570.51	62.94	570.53	62.99	570.54
63.03	570.56	63.08	570.58	63.13	570.6	63.18	570.62	63.22	570.64
63.27	570.67	63.31	570.69	63.36	570.72	63.41	570.75	63.45	570.78
63.5	570.82	63.55	570.86	63.6	570.9	63.65	570.94	63.7	570.99
63.72	571	63.88	571.16	63.99	571.27	64.37	571.65	64.71	572

64.72	572.01	64.73	572.02	65.33	572.5	65.95	573	66.29	573.25
67.32	574	67.5	574.14	67.8	574.38	67.97	574.52	68.08	574.61
68.16	574.67	68.22	574.71	68.26	574.75	68.29	574.78	68.32	574.8
68.35	574.82	68.37	574.83	68.38	574.84	68.4	574.85	68.61	575
69.26	575.19	69.54	575.28	69.69	575.32	69.89	575.38	70.19	575.47
70.66	575.6	71.48	575.84	72.05	576	73.96	576.58	75.37	577
78.53	577.95	78.69	578	80.83	578.64	82.01	579	83	579.3
83.56	579.47	83.9	579.57	84.13	579.64	84.29	579.69	84.42	579.72
84.52	579.75	84.6	579.78	84.67	579.8	84.73	579.81	84.78	579.83
84.82	579.84	84.86	579.85	84.89	579.86	84.92	579.87	84.95	579.88
84.98	579.89	85	579.89	85.02	579.9	85.05	579.9	85.07	579.91
85.08	579.91	85.1	579.92	85.12	579.92	85.13	579.92	85.14	579.93
85.16	579.93	85.17	579.93	85.18	579.94	85.19	579.94	85.2	579.94
85.21	579.94	85.21	579.94	85.22	579.95	85.23	579.95	85.23	579.95
85.24	579.95	85.24	579.95	85.25	579.95	85.25	579.95	85.26	579.95
85.26	579.95	85.27	579.95	85.27	579.96	85.27	579.96	85.28	579.96
85.28	579.96	85.29	579.96	85.29	579.96	85.29	579.96	85.3	579.96
85.3	579.96	85.3	579.96	85.31	579.97	85.31	579.97	85.31	579.97
85.32	579.97	85.32	579.97	85.32	579.97	85.33	579.97	85.33	579.98
85.33	579.98	85.34	579.98	85.34	579.98	85.35	579.98	85.35	579.99
85.35	579.99	85.35	579.99	85.36	579.99	85.36	579.99	85.36	579.99
85.36	579.99	85.36	579.99	85.36	579.99	85.36	579.99	85.36	579.99
85.36	579.99	85.36	579.99	85.36	579.99	85.36	579.99	85.36	579.99
85.36	579.99	85.36	579.99	85.36	579.99	85.36	579.99	85.37	580
85.41	580.02	85.41	580.02	85.41	580.02	85.41	580.02	85.42	580.02
85.42	580.02	85.43	580.03	85.43	580.03	85.44	580.03	85.45	580.04
85.45	580.04	85.46	580.04	85.47	580.05	85.49	580.06	85.51	580.06
85.53	580.07	85.56	580.09	85.6	580.11	85.67	580.14	85.8	580.2
87.47	581	87.54	581.03	89.55	582	89.67	582.05	91.63	583
92.48	583.41	93.7	584	94.18	584.23	95.77	585	97.14	585.74
97.43	585.91	97.6	586	98.7	586.6	99.42	587	100.57	587.63
101.24	588	101.42	588.1	101.52	588.15	102.22	588.54	102.74	588.82
103.06	589	103.25	589.11	104.32	589.7	104.87	590	106.1	590.35
106.22	590.38	106.61	590.5						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	53.44	.035	54	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
53.44	54	54.04	42.15	38.59	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 7 Profile # 1

W.S. Elev (ft)	562.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.40	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	563.20	Reach Len. (ft)	54.04	42.15	38.59
E.G. Slope (ft/ft)	0.004141	Flow Area (sq ft)	47.90	0.60	0.31
Q Total (cfs)	247.00	Flow (cfs)	245.27	1.37	0.37
Top Width (ft)	17.67	Top Width (ft)	16.31	0.56	0.80
Vel Total (ft/s)	5.06	Avg. Vel. (ft/s)	5.12	2.28	1.16
Max Chl Dpth (ft)	4.79	Hydr. Depth (ft)	2.94	1.07	0.39
Crit W.S. (ft)		Wetted Per. (ft)	18.66	0.78	1.13
Conv. Total (cfs)	3838.3	Conv. (cfs)	3811.3	21.3	5.7

Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This

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

CROSS SECTION INPUT Reach: 1 River Station: 6
Description: 6

Station Elevation Data, num = 280

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	578.45	.81	578.34	1.17	578.28	1.58	578.22	2.08	578.15
2.67	578.07	2.71	578.06	2.74	578.06	2.76	578.05	2.79	578.05
2.81	578.05	3.12	578	6.8	577.45	7.82	577.3	8.01	577.27
8.68	577.17	8.79	577.15	8.88	577.14	9.59	577.03	9.6	577.03
9.79	577	10.36	576.91	10.44	576.9	11.11	576.8	11.62	576.72
11.83	576.69	12.26	576.63	12.52	576.59	12.87	576.54	13.17	576.49
13.45	576.45	13.67	576.42	14	576.36	14.17	576.34	14.52	576.29
14.65	576.27	15.02	576.21	15.11	576.2	16.4	576	16.78	575.94
17.15	575.89	17.48	575.84	17.77	575.79	18.04	575.75	18.29	575.71
18.53	575.67	18.76	575.64	18.97	575.6	19.18	575.57	19.38	575.54
19.57	575.51	19.75	575.48	19.91	575.45	20.07	575.42	20.35	575.38
21.22	575.23	22.61	575	25.98	574.17	26.45	574.05	26.66	574
27.15	573.88	27.36	573.83	28.43	573.56	29.18	573.38	30.7	573
30.94	572.94	32.12	572.65	32.75	572.49	33.37	572.34	34.52	572.05
34.73	572	36.29	571.62	37.54	571.31	38.07	571.17	38.51	571.06
38.76	571	39.04	570.93	39.62	570.78	40.07	570.67	40.43	570.58
40.95	570.45	42.78	570	43.4	569.86	43.44	569.85	43.54	569.82
44.56	569.59	45.77	569.32	47.18	569	50.58	568.23	51.58	568
53.32	567.6	54.39	567.36	55.97	567	56.71	566.83	57.14	566.73
60.35	566	60.82	565.89	62.95	565.4	63.17	565.35	63.26	565.33
63.34	565.31	63.41	565.29	63.47	565.28	63.52	565.27	63.57	565.26
64.73	565	66.16	564.23	66.34	564.13	66.55	564.01	66.57	564
66.62	563.97	66.86	563.84	67.88	563.27	68.08	563.16	68.37	563
69.56	562.33	69.86	562.16	69.95	562.11	70.14	562	70.66	561.71
71.9	561	72.77	560.52	73.65	560	74.79	559.54	75.91	559
77.07	558.32	77.54	558	78.18	557.83	78.79	558	79.01	558
80.03	558.69	80.46	559	82.32	559.89	82.58	560	82.72	560.08
82.73	560.09	82.75	560.09	82.76	560.1	82.8	560.13	82.87	560.16
83	560.23	83.3	560.39	84.43	561	85.08	561.36	86.24	562
87.48	562.69	88.03	563	88.1	563.04	89.22	563.69	89.45	563.82
89.75	564	90.68	564.54	90.81	564.62	90.86	564.64	90.88	564.65
90.9	564.66	90.92	564.67	90.93	564.68	91.45	565	93.41	565.85
93.46	565.89	93.51	565.94	93.59	566	93.63	566.02	95.58	567
96.97	567.67	97.66	568	98.56	568.42	99.84	569	99.99	569.06
100.13	569.12	100.25	569.17	100.35	569.21	100.44	569.25	102.09	570
105.37	570.68	105.97	570.81	106.82	570.98	106.9	571	107.2	571.06
107.46	571.12	111.6	571.98	111.7	572	111.7	572	112.43	572.15
116.54	573	116.58	573.01	116.59	573.01	116.63	573.02	119.03	573.51
121.41	574	122.04	574.13	122.4	574.2	122.71	574.27	122.98	574.33
123.22	574.38	123.43	574.42	126.3	575	127.48	575.63	128.02	575.9
128.22	576	129.16	576.5	129.9	576.89	130.12	577	131.09	577.52
132	578	132.04	578.02	132.07	578.04	133.04	578.57	133.76	578.96
133.83	579	133.91	579.04	134.61	579.45	134.89	579.61	135.05	579.7
135.14	579.76	135.21	579.8	135.4	579.9	135.43	579.92	135.45	579.93
135.47	579.94	135.48	579.95	135.49	579.96	135.49	579.96	135.5	579.96
135.5	579.96	135.5	579.96	135.5	579.97	135.51	579.97	135.51	579.97
135.53	580	135.63	580.04	135.64	580.05	135.76	580.12	135.83	580.17

135.88	580.2	135.91	580.21	135.94	580.23	135.97	580.25	136	580.27
136.04	580.29	136.08	580.31	136.13	580.34	136.18	580.37	136.24	580.4
136.31	580.44	136.39	580.49	136.5	580.55	136.64	580.63	136.83	580.74
137.14	580.91	137.3	581	137.48	581.1	137.54	581.14	137.84	581.3
138.05	581.42	138.27	581.54	138.67	581.76	139.1	582	139.27	582.09
139.33	582.13	139.7	582.33	139.92	582.45	140.4	582.72	140.91	583
141.15	583.14	141.25	583.19	141.48	583.32	142.54	583.9	142.7	583.99
142.72	584	142.8	584.05	143.12	584.24	143.21	584.29	143.29	584.34
144.53	585	147.34	585.86	147.64	585.95	147.79	586	147.98	586.06

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	74.79	.035	75.91	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.79	75.91	67.58	51.69	35.85	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 6 Profile # 1

W.S. Elev (ft)	561.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.04	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	562.80	Reach Len. (ft)	67.58	51.69	35.85
E.G. Slope (ft/ft)	0.014856	Flow Area (sq ft)	4.96	2.79	23.27
Q Total (cfs)	247.00	Flow (cfs)	26.31	24.71	195.99
Top Width (ft)	15.23	Top Width (ft)	4.22	1.12	9.89
Vel Total (ft/s)	7.96	Avg. Vel. (ft/s)	5.31	8.86	8.42
Max Chl Dpth (ft)	3.93	Hydr. Depth (ft)	1.18	2.49	2.35
Crit W.S. (ft)	561.76	Wetted Per. (ft)	4.77	1.24	11.21
Conv. Total (cfs)	2026.5	Conv. (cfs)	215.8	202.7	1608.0

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

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

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

CROSS SECTION INPUT Reach: 1 River Station: 5

Description: 5

Station Elevation Data, num = 150

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	577.81	.36	577.77	.86	577.71	7.02	577	8.26	576.86
8.41	576.84	15.7	576	16.2	575.94	17.93	575.74	21.6	575.32
24.36	575	27.03	574.59	30.99	574	31.12	573.98	37.55	573
42.11	572.3	44.04	572	46.41	571.63	50.39	571	50.5	570.98
51.17	570.88	51.74	570.79	52.23	570.71	52.65	570.64	53.03	570.58
53.36	570.53	53.9	570.44	54.48	570.34	55.22	570.22	55.56	570.17
56.54	570	58.6	569.25	58.88	569.14	59.21	569.01	59.24	569
60.84	568.4	61.9	568	63.98	567.2	64.51	567	66	566.42
67.09	566	67.13	565.98	67.22	565.94	67.3	565.9	67.36	565.87

67.41	565.84	67.46	565.81	67.5	565.79	67.53	565.77	67.56	565.75
69.64	565	70.2	564.64	70.21	564.63	70.22	564.62	70.23	564.61
70.27	564.58	70.59	564.33	71.01	564	71.98	563.31	72.42	563
73.8	562	73.81	562	73.82	561.99	75.17	561	75.32	560.89
75.85	560.5	76.52	560	77.72	559.47	78.63	559	80.52	558.11
80.76	558	81.81	557.51	82.93	557	86.82	556.01	86.83	556
86.84	556	86.85	556	86.86	556.01	90.07	557	90.61	557.27
92.91	558	94.32	558.43	96.03	559	98.6	559.79	99.47	560
100.29	560.35	101.37	560.81	101.79	561	104.08	561.98	104.12	562
106.26	562.92	106.43	563	106.77	563.15	108.74	564	109.41	564.29
110.2	564.62	110.37	564.69	110.43	564.72	110.48	564.74	110.5	564.75
110.52	564.75	111.06	565	114.58	565.79	115.49	566	116.01	566.12
116.2	566.16	116.58	566.25	117.73	566.51	119.22	566.86	119.84	567
120.77	567.22	124.11	568	127.84	568.88	128.36	569	131.89	569.85
131.99	569.87	132.54	570	132.95	570.17	133.26	570.3	133.89	570.54
135.04	571	135.61	571.23	137.47	572	137.8	572.14	138.36	572.37
139.9	573	141.19	573.52	142.38	574	142.74	574.14	143.36	574.39
144.11	574.69	144.91	575	146.41	575.45	147.41	575.76	148.16	575.99
148.18	576	148.26	576.02	148.32	576.04	148.7	576.16	151.09	576.89
151.45	577	152.2	577.23	152.49	577.32	153.17	577.52	153.84	577.73
154.73	578	155	578.08	155.11	578.12	155.99	578.39	156.1	578.42

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	78.63	.035	80.52	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
78.63	80.52	43.43	43.43	43.43	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 5 Profile # 1

W.S. Elev (ft)	558.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.17	Wt. n-Val.		0.035	0.035
E.G. Elev (ft)	561.49	Reach Len. (ft)	43.43	43.43	43.43
E.G. Slope (ft/ft)	0.087303	Flow Area (sq ft)		0.05	17.27
Q Total (cfs)	247.00	Flow (cfs)		0.13	246.87
Top Width (ft)	13.91	Top Width (ft)		0.46	13.45
Vel Total (ft/s)	14.26	Avg. Vel. (ft/s)		2.65	14.29
Max Chl Dpth (ft)	2.32	Hydr. Depth (ft)		0.11	1.28
Crit W.S. (ft)	559.29	Wetted Per. (ft)		0.50	14.20
Conv. Total (cfs)	836.0	Conv. (cfs)		0.4	835.5

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

CROSS SECTION INPUT Reach: 1 River Station: 4
Description: 4

Station Elevation Data, num = 318

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	577.14	1.4	577	1.75	576.97	2.14	576.93	5.02	576.64
5.87	576.56	11.58	576	12.73	575.94	15.89	575.77	16.99	575.71
17.88	575.66	25.9	575	32.54	574.08	33.08	574	35.92	573.6
36.93	573.46	40.2	573	45.7	572.22	47.25	572	50.19	571.58
51.54	571.38	54.2	571	54.73	570.92	55.11	570.86	55.4	570.82
55.52	570.8	61.1	570	61.94	569.56	62.08	569.49	62.66	569.19
63.01	569	64.3	568.32	64.92	568	66.38	567.24	66.83	567
68.02	566.38	68.74	566	68.97	565.88	69.35	565.68	69.6	565.55
69.92	565.39	70.16	565.26	70.36	565.16	70.47	565.1	70.53	565.07
70.65	565	70.97	564.8	72.14	564	72.83	563.6	74.13	563
75.38	562.28	75.79	562	76.12	561.71	77.35	561	77.74	560.64
78.38	560	79.44	559.55	79.89	559.41	79.97	559.39	80.06	559.36
80.7	559	81.78	558.41	82.77	558	83.62	557.41	84.38	557
85.29	556.54	88.34	555.01	88.44	555	91.28	555	92.28	555.17
92.63	555.23	92.74	555.25	92.86	555.27	93.01	555.29	93.18	555.33
93.39	555.36	93.64	555.41	93.95	555.47	94.35	555.54	94.86	555.63
95.54	555.76	96.53	555.94	96.82	556	96.92	556.02	96.93	556.02
96.94	556.02	96.95	556.02	97.46	556.1	97.51	556.11	97.58	556.12
97.66	556.13	98.21	556.22	98.37	556.24	98.56	556.27	98.81	556.31
99.38	556.4	99.75	556.46	100.26	556.54	100.71	556.61	101.39	556.72
101.67	556.76	102.53	556.9	102.63	556.91	103.17	557	104.81	557.25
104.98	557.28	105.46	557.35	105.7	557.39	106.11	557.45	106.44	557.5
106.75	557.54	107.03	557.59	107.25	557.62	107.62	557.67	107.8	557.7
107.95	557.72	108.35	557.77	108.47	557.79	108.57	557.8	108.66	557.82
108.73	557.83	109.13	557.88	109.18	557.89	109.23	557.89	109.65	557.95
109.67	557.95	109.69	557.95	110.07	558	110.12	558.01	110.13	558.01
110.54	558.06	110.56	558.06	110.97	558.11	111.34	558.16	111.4	558.17
111.75	558.21	111.83	558.22	112.17	558.26	112.28	558.28	112.41	558.29
113.31	558.4	113.49	558.42	113.7	558.45	113.95	558.48	114.2	558.51
114.43	558.54	114.63	558.56	114.81	558.58	114.98	558.6	117.4	558.88
117.47	558.89	117.53	558.9	117.58	558.9	118.13	558.97	118.14	558.97
118.43	559	118.58	559.02	118.86	559.05	119.12	559.09	119.36	559.12
119.57	559.14	127.27	560	127.6	560.17	127.62	560.18	127.64	560.19
127.66	560.2	127.69	560.21	127.72	560.22	127.75	560.24	127.79	560.25
127.83	560.27	127.88	560.29	127.93	560.3	127.98	560.33	128.04	560.35
128.11	560.37	128.18	560.39	128.26	560.42	128.34	560.44	128.42	560.47
128.73	560.56	128.85	560.6	128.99	560.64	129.14	560.69	129.32	560.75
129.54	560.83	129.82	560.92	130.04	561	130.11	561.02	130.11	561.02
130.31	561.09	130.33	561.1	130.52	561.16	130.56	561.17	130.75	561.24
130.81	561.25	130.88	561.27	131.07	561.33	131.16	561.36	131.33	561.42
131.45	561.45	131.6	561.49	131.75	561.54	131.93	561.59	132.15	561.66
132.27	561.7	132.53	561.78	132.61	561.8	132.91	561.9	133.24	562
133.27	562.01	133.28	562.01	133.28	562.01	133.6	562.11	133.64	562.12
133.68	562.14	133.98	562.23	134.06	562.25	134.32	562.34	134.43	562.37
134.57	562.41	134.79	562.48	134.97	562.54	135.14	562.59	135.36	562.66
135.65	562.75	135.75	562.79	135.83	562.81	135.89	562.83	136.43	563
137.13	563.22	137.22	563.25	137.52	563.33	137.82	563.42	138.05	563.49
138.23	563.55	138.38	563.6	138.51	563.63	138.61	563.67	139.04	563.79
139.76	564	140.46	564.2	144.43	565	145.07	565.71	145.09	565.74
145.11	565.77	145.14	565.81	145.17	565.85	145.2	565.9	145.28	566
145.87	566.67	146.16	566.99	146.17	567	146.49	567.33	146.63	567.46
146.8	567.63	147.05	567.87	147.09	567.91	147.2	568	147.36	568.14
147.41	568.18	147.62	568.36	147.76	568.47	147.91	568.59	148	568.67
148.06	568.72	148.43	569	148.58	569.1	148.65	569.15	148.72	569.2
148.78	569.24	148.83	569.27	149.77	574.7	152.2	570.81	152.43	570.88
152.55	570.92	152.66	570.95	152.78	570.99	152.81	571	152.94	571.04

153.08	571.08	153.09	571.09	153.22	571.12	153.23	571.13	153.35	571.16
153.45	571.19	153.48	571.2	153.58	571.23	153.67	571.25	153.7	571.26
153.79	571.29	153.87	571.31	153.91	571.32	153.98	571.34	154.06	571.36
154.11	571.37	154.18	571.39	154.23	571.4	154.31	571.42	154.38	571.44
154.44	571.45	154.51	571.47	154.57	571.49	154.65	571.5	154.72	571.52
154.79	571.54	154.86	571.56	154.94	571.57	155.02	571.59	155.09	571.61
155.17	571.63	155.27	571.65	155.4	571.68	155.5	571.71	155.61	571.73
155.74	571.76	155.88	571.8	156.1	571.85				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	78.38	.035	79.44	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
78.38	79.44	74	60.96	49.06	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 4 Profile # 1

W.S. Elev (ft)	557.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.34	Wt. n-Val.			0.035
E.G. Elev (ft)	558.60	Reach Len. (ft)	74.00	60.96	49.06
E.G. Slope (ft/ft)	0.036601	Flow Area (sq ft)			26.57
Q Total (cfs)	247.00	Flow (cfs)			247.00
Top Width (ft)	20.98	Top Width (ft)			20.98
Vel Total (ft/s)	9.30	Avg. Vel. (ft/s)			9.30
Max Chl Dpth (ft)	2.26	Hydr. Depth (ft)			1.27
Crit W.S. (ft)	557.67	Wetted Per. (ft)			21.70
Conv. Total (cfs)	1291.1	Conv. (cfs)			1291.1

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

CROSS SECTION INPUT Reach: 1 River Station: 3
Description: 3

Station Elevation Data, num = 166

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	573.24	2.83	573	3.26	572.96	3.29	572.96	3.32	572.96
3.35	572.96	3.96	572.9	4.04	572.9	4.62	572.85	5.14	572.8
5.28	572.79	5.78	572.75	5.95	572.74	6.41	572.7	6.83	572.66
7.04	572.64	7.43	572.61	7.67	572.59	8.03	572.56	8.29	572.54
8.62	572.51	8.91	572.49	9.2	572.46	9.46	572.44	9.71	572.42
9.93	572.4	10.14	572.39	12.36	572.2	12.9	572.16	13.33	572.12
13.82	572.08	14.37	572.03	14.79	572	15.02	571.98	15.7	571.92
15.89	571.9	16.62	571.84	17.28	571.78	17.89	571.73	19.93	571.55
20.59	571.49	21.14	571.44	21.6	571.4	22	571.36	22.34	571.33
22.64	571.31	23.11	571.26	26.04	571	29.69	570.67	37.09	570
39.21	569.58	41.72	569	45.18	568.3	46.34	568	47.41	567.69
50.45	567	53.78	566.26	54.85	566	57.33	565.37	58.49	565
59.15	564.31	59.82	564	61.09	563.01	61.1	563	61.13	562.98

62.87	562	63.16	561.78	63.99	561	64.55	560.59	65.17	560
66.27	559.3	66.79	559	67.28	558.73	68.38	558	69.67	557.11
69.88	557	70.26	556.74	71.7	556	73.47	555.13	73.74	555
74.09	554.97	78.77	554.78	81.58	554.65	84.47	554.7	84.49	554.81
85.18	555	85.18	555	85.18	555	85.18	555	85.18	555
85.18	555	85.18	555	85.19	555	85.19	555	85.19	555
85.19	555	85.19	555	85.2	555	85.21	555	85.23	555.01
90.69	556	95.9	556.92	96.1	556.96	96.34	557	98.43	557.37
102.06	558	102.14	558.01	103.03	558.17	105.89	558.67	106.6	558.79
107.82	559	108.11	559.05	110.32	559.42	113.6	560	115.38	560.49
116.23	560.72	117.29	561	117.42	561.03	117.46	561.05	117.53	561.07
117.71	561.11	118.84	561.42	120.7	561.92	121.01	562	122.11	562.29
122.63	562.43	123.38	562.63	124.42	562.9	124.54	562.93	124.79	563
125.68	563.23	126	563.31	126.76	563.51	127.48	563.69	127.81	563.78
128.7	564	128.75	564.01	129.08	564.1	129.37	564.17	129.83	564.29
130.84	564.55	130.91	564.57	130.98	564.59	131.03	564.6	131.09	564.62
131.13	564.63	131.17	564.64	131.2	564.65	132.74	565	134.45	565.78
134.51	565.82	134.57	565.86	134.65	565.91	134.73	565.96	134.8	566
135.79	566.52	136.71	567	136.98	567.15	137.02	567.17	137.08	567.2
137.16	567.25	137.3	567.33	137.57	567.49	138.41	567.97	138.44	567.99
138.45	567.99								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	69.67	.035	69.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
69.67	69.88	56.7	51.1	45.53	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 3 Profile # 1

W.S. Elev (ft)	557.40	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	557.76	Reach Len. (ft)	56.70	51.10	45.53
E.G. Slope (ft/ft)	0.006062	Flow Area (sq ft)	0.06	0.07	51.56
Q Total (cfs)	247.00	Flow (cfs)			247.00
Top Width (ft)	29.39	Top Width (ft)	0.43	0.21	28.75
Vel Total (ft/s)	4.78	Avg. Vel. (ft/s)	0.81	1.51	4.79
Max Chl Dpth (ft)	2.75	Hydr. Depth (ft)	0.15	0.35	1.79
Crit W.S. (ft)		Wetted Per. (ft)	0.52	0.24	29.58
Conv. Total (cfs)	3172.5	Conv. (cfs)	0.7	1.4	3170.4

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

CROSS SECTION INPUT Reach: 1 River Station: 2
Description: 2

Station Elevation Data, num = 177

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	569.76	5.53	569.36	9.58	569.17	12.96	569	13.5	568.96
13.65	568.95	16.11	568.77	16.67	568.73	17.66	568.66	18.45	568.6
19.34	568.54	20.01	568.49	20.55	568.45	21.08	568.42	21.67	568.37
22.08	568.34	22.7	568.3	23.02	568.28	23.66	568.23	23.89	568.22
24.54	568.17	25.24	568.12	25.36	568.11	26.04	568.07	26.1	568.06

26.77	568.02	26.78	568.02	27.01	568	27.41	567.97	27.44	567.97
29.02	567.86	29.07	567.86	29.13	567.86	29.18	567.85	29.24	567.85
29.3	567.84	29.36	567.84	29.43	567.83	29.51	567.83	29.6	567.82
30.09	567.78	30.2	567.77	30.33	567.76	30.49	567.74	30.95	567.71
31.16	567.69	31.41	567.66	31.83	567.63	32.16	567.6	32.54	567.57
32.97	567.52	33.3	567.49	33.87	567.42	34.14	567.4	34.91	567.31
35.12	567.29	36.16	567.17	36.28	567.16	37.58	567	39.6	566.72
43.78	566.14	44.24	566.08	44.41	566.05	44.51	566.04	44.56	566.03
44.79	566	45.99	565.83	46.48	565.77	51.81	565	52.36	564.66
52.37	564.65	52.39	564.63	52.43	564.6	52.56	564.51	52.81	564.33
53.3	564	53.34	563.98	54.8	563	55.81	562.33	56.31	562
57.09	561.5	57.77	561.05	57.84	561	57.89	560.97	58.42	560.62
58.72	560.44	58.9	560.32	59.06	560.23	59.17	560.16	59.46	560
59.86	559.83	60.03	559.75	60.61	559.5	61.43	559.12	61.71	559
63.02	558.42	63.97	558	66.05	557.09	66.25	557	68.06	556.21
68.55	556	68.72	555.93	69.8	555.46	70.13	555.32	70.32	555.24
70.42	555.19	70.85	555	74.85	554.59	77.52	554.4	79.41	554.32
80.55	554.27	81.73	554.29	81.74	554.33	82.02	554.41	83.44	554.63
85.17	555	86.95	555.48	87.3	555.57	87.85	555.71	88.26	555.81
88.81	555.95	89	556	91.87	556.8	92.61	557	94.86	557.62
96.26	558	97.93	558.45	99.97	559	100.9	559.26	101.99	559.56
102.44	559.69	102.69	559.76	103.58	560	104.4	560.27	105.06	560.49
106.01	560.81	106.59	561	108.35	561.58	109.61	562	111.87	562.75
112.63	563	113.57	563.31	115.66	564	116.22	564.2	116.77	564.39
117.22	564.54	117.48	564.63	117.69	564.7	117.82	564.74	117.86	564.75
117.88	564.76	118.6	565	120.97	565.94	121.1	566	123.02	566.78
123.57	567	125.78	567.9	126.03	568	127.51	568.6	128.5	569
128.53	569.01	128.94	569.18	129.83	569.53	130.15	569.65	130.27	569.7
130.34	569.73	130.39	569.75	130.42	569.76	130.44	569.76	130.46	569.77
131.03	570	132.79	570.93	132.84	570.97	132.88	571	134	571.67
134.54	572	136.06	572.91						

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	68.06	.035	68.55	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
68.06	68.55	66.59	52.88	39.18	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 2 Profile # 1

W.S. Elev (ft)	556.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.77	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	557.30	Reach Len. (ft)	66.59	52.88	39.18
E.G. Slope (ft/ft)	0.015569	Flow Area (sq ft)	0.12	0.21	35.02
Q Total (cfs)	247.00	Flow (cfs)	0.18	0.60	246.22
Top Width (ft)	23.61	Top Width (ft)	0.75	0.49	22.37
Vel Total (ft/s)	6.99	Avg. Vel. (ft/s)	1.49	2.85	7.03
Max Chl Dpth (ft)	2.27	Hydr. Depth (ft)	0.16	0.43	1.57
Crit W.S. (ft)	556.54	Wetted Per. (ft)	0.81	0.53	22.91
Conv. Total (cfs)	1979.5	Conv. (cfs)	1.4	4.8	1973.3

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

Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This

may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning - During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION INPUT Reach: 1 River Station: 1
Description: 1

Station Elevation Data, num = 251

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	566.19	.01	566.19	.59	566.13	.81	566.11	.89	566.1
1.88	566	7.44	565.75	12.02	565.4	14.02	565.29	14.74	565.24
14.99	565.23	15.2	565.22	15.38	565.21	17.36	565	19.18	564.74
20.73	564.63	22.62	564.57	24.91	564.58	26.68	564.62	28.38	564.71
30.21	564.98	30.3	565	30.57	565	31.42	565	43.67	565
45.28	564.14	45.55	564	46.38	563.56	47.42	563	47.73	562.83
49.27	562	49.73	561.76	51.12	561	51.55	560.77	52.97	560
55.38	559.29	55.72	559.18	55.91	559.12	56.12	559.05	56.28	559
57.45	558.61	59.23	558	60.37	557.55	61.73	557	64.03	556.05
64.15	556	64.36	555.91	68.65	554	68.68	554	68.68	554
68.75	554	68.76	554	68.77	554	68.84	554	68.85	554
68.87	554	68.95	554	69.03	554	69.11	554	69.18	554
69.2	554	70.24	553.27	70.34	553.2	70.46	553.12	70.63	553.03
70.68	553	71.81	552.44	72.7	552	74.57	551.08	74.73	551
75.08	550.84	75.34	550.71	75.54	550.62	75.7	550.55	75.83	550.49
75.93	550.44	76.02	550.4	76.09	550.37	76.35	550.26	76.38	550.24
76.41	550.23	76.8	550	79.33	550	80.89	550	83.03	550.64
83.08	550.68	83.15	550.72	83.23	550.77	83.32	550.83	83.43	550.9
83.55	550.97	83.61	551	83.77	551.07	83.79	551.09	84.04	551.2
84.23	551.29	84.31	551.33	84.47	551.41	84.58	551.46	84.72	551.54
85.02	551.68	85.16	551.76	85.33	551.84	85.37	551.86	85.55	551.96
85.56	551.96	85.64	552	85.76	552.06	85.78	552.07	85.98	552.16
86.02	552.18	86.19	552.27	86.25	552.3	86.52	552.43	86.59	552.47
86.69	552.52	86.77	552.56	86.86	552.6	86.95	552.65	87.01	552.68
87.1	552.73	87.21	552.78	87.25	552.8	87.48	552.92	87.5	552.93
87.63	552.99	87.63	552.99	87.64	553	87.77	553.06	87.78	553.07
87.92	553.14	87.93	553.14	88.06	553.21	88.07	553.22	88.19	553.28
88.21	553.28	88.23	553.29	88.25	553.3	88.36	553.36	88.38	553.37
88.41	553.39	88.44	553.41	88.54	553.46	88.58	553.48	88.63	553.5
88.72	553.55	88.77	553.58	88.84	553.61	88.91	553.65	89	553.69
89.1	553.75	89.15	553.77	89.27	553.84	89.3	553.86	89.45	553.93
89.57	554	89.61	554.02	89.73	554.09	89.85	554.15	89.95	554.21
90.15	554.32	90.39	554.45	90.52	554.52	90.63	554.58	90.68	554.61
90.72	554.63	90.76	554.66	90.79	554.68	90.82	554.69	90.85	554.71
90.87	554.72	90.89	554.74	90.91	554.75	90.93	554.76	90.94	554.77
90.94	554.77	92.72	555.7	92.9	555.78	93.11	555.87	93.38	555.98
93.41	556	93.52	556.04	94.12	556.3	94.46	556.45	94.83	556.62
95.58	556.96	95.61	556.97	95.63	556.98	95.67	557	97	557.56
98.02	558	98.89	558.36	100.41	559	100.51	559.04	102.78	560

105.5	560.9	105.7	560.96	105.83	561	107.22	561.47	108.8	562
110.9	562.7	111.79	563	114.28	563.83	114.8	564	114.88	564.03
115.28	564.16	115.88	564.36	116.59	564.59	117.14	564.78	117.34	564.84
117.42	564.86	117.44	564.87	117.83	565	119.19	565.46	119.37	565.52
119.59	565.59	119.87	565.68	120.24	565.8	120.75	565.96	120.88	566
122.39	566.49	123.96	567	125.08	567.36	127.05	568	129.62	568.83
129.96	568.94	130.03	568.96	130.15	569	130.17	569	130.61	569.15
130.93	569.24	131.09	569.29	131.15	569.31	131.21	569.33	131.27	569.35
131.32	569.36	133.25	570	134.3	570.52	134.31	570.52	134.31	570.53
134.32	570.54	134.33	570.55	134.35	570.56	134.36	570.57	134.39	570.59
134.41	570.61	134.44	570.62	134.51	570.67	134.68	570.77	135.1	571
135.76	571.36								

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	68.65	.035	68.68	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
68.65	68.68	0	0	0	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 1 Profile # 1

W.S. Elev (ft)	554.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	554.75	Reach Len. (ft)			
E.G. Slope (ft/ft)	0.002472	Flow Area (sq ft)	0.28	0.01	61.91
Q Total (cfs)	247.00	Flow (cfs)			247.00
Top Width (ft)	22.96	Top Width (ft)	1.12	0.03	21.80
Vel Total (ft/s)	3.97	Avg. Vel. (ft/s)	0.79	1.33	3.99
Max Chl Dpth (ft)	4.50	Hydr. Depth (ft)	0.25	0.50	2.84
Crit W.S. (ft)	552.95	Wetted Per. (ft)	1.23	0.03	23.86
Conv. Total (cfs)	4967.5	Conv. (cfs)	4.5	0.4	4962.6

SUMMARY OF MANNING'S N VALUES

Reach	River Sta.	n1	n2	n3
1	51	.035	.035	.035
1	50	.035	.035	.035
1	49	.035	.035	.035
1	48	.035	.035	.035
1	47	.035	.035	.035
1	46	.035	.035	.035
1	45	.035	.035	.035
1	44	.035	.035	.035
1	43	.035	.035	.035
1	42	.035	.035	.035
1	41	.035	.035	.035
1	40	.035	.035	.035
1	39	.035	.035	.035
1	38	.035	.035	.035
1	37	.035	.035	.035
1	36	.035	.035	.035

1	35	.035	.035	.035
1	34	.035	.035	.035
1	33	.035	.035	.035
1	32	.035	.035	.035
1	31	.035	.035	.035
1	30	.035	.035	.035
1	29	.035	.035	.035
1	28	.035	.035	.035
1	27	.035	.035	.035
1	26	.035	.035	.035
1	25	.035	.035	.035
1	24	.035	.035	.035
1	23	.035	.035	.035
1	22	.035	.035	.035
1	21	.035	.035	.035
1	20	.035	.035	.035
1	19	.035	.035	.035
1	18	.035	.035	.035
1	17	.035	.035	.035
1	16	.035	.035	.035
1	15	.035	.035	.035
1	14	.035	.035	.035
1	13	.035	.035	.035
1	12	.035	.035	.035
1	11	.035	.035	.035
1	10	.035	.035	.035
1	9	.035	.035	.035
1	8	.035	.035	.035
1	7	.035	.035	.035
1	6	.035	.035	.035
1	5	.035	.035	.035
1	4	.035	.035	.035
1	3	.035	.035	.035
1	2	.035	.035	.035
1	1	.035	.035	.035

SUMMARY OF REACH LENGTHS

Reach	River Sta.	Left	Channel	Right
1	51	54.44	54.29	71.48
1	50	100.91	44.89	18.64
1	49	52.87	50.3	47.75
1	48	44.61	49.37	55.58
1	47	60.07	74.66	90.14
1	46	69.67	84.99	100.32
1	45	64.44	56.53	49.29
1	44	46.42	59.5	75.87
1	43	47.69	50.67	59.34
1	42	55.4	51.25	48.21
1	41	75.1	62.67	50.35
1	40	65.28	50.71	39.75
1	39	59.7	55.05	54.22
1	38	104.97	101.93	100.38

1	37	50.07	49.63	49.95	
1	36	52.48	53.95	57.63	
1	35	11.16	63.99	117.69	
1	34	63.14	50.8	39.46	
1	33	53.13	52.49	51.94	
1	32	83.2	59.13	37.68	
1	31	103.17	89.45	79.11	
1	30	53.56	93.42	133.29	
1	29	50.59	55.01	63.35	
1	28	75.14	54.07	33.31	
1	27	68.72	67.43	66.16	
1	26	72.48	81.09	89.73	
1	25	40.55	51.38	63.33	
1	24	86.4	49.59	15.26	
1	23	81.4	49.08	21.02	
1	22	75.86	73.42	71.06	
1	21	26.05	52.05	80.03	
1	20	37.88	47.76	59.41	
1	19	68.27	54	48.11	
1	18	58.45	65.3	72.32	
1	17	15.53	45.33	76.22	
1	16	86.05	67.06	48.8	
1	15	49.38	52.42	57.08	
1	14	38.3	25.18	23.92	
1	13	21.93	20.74	25.22	
1	12	7.78	31.35	65.69	
1	11	82.54	38.42	106.22	
1	10	17.57	30.54	47.29	
1	9	16.87	24.46	37.78	
1	8	22.63	22.38	42.06	
1	7	54.04	42.15	38.59	
1	6	67.58	51.69	35.85	
1	5	43.43	43.43	43.43	
1	4	74	60.96	49.06	
1	3	56.7	51.1	45.53	
1	2	66.59	52.88	39.18	
1	1	0	0	0	

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

Reach	River Sta.	Contr.	Expan.
1	51	.1	.3
1	50	.1	.3
1	49	.1	.3
1	48	.1	.3
1	47	.1	.3
1	46	.1	.3
1	45	.1	.3
1	44	.1	.3
1	43	.1	.3
1	42	.1	.3
1	41	.1	.3

```
* 1          *     40     *      .1*       .3*
* 1          *     39     *      .1*       .3*
* 1          *     38     *      .1*       .3*
* 1          *     37     *      .1*       .3*
* 1          *     36     *      .1*       .3*
* 1          *     35     *      .1*       .3*
* 1          *     34     *      .1*       .3*
* 1          *     33     *      .1*       .3*
* 1          *     32     *      .1*       .3*
* 1          *     31     *      .1*       .3*
* 1          *     30     *      .1*       .3*
* 1          *     29     *      .1*       .3*
* 1          *     28     *      .1*       .3*
* 1          *     27     *      .1*       .3*
* 1          *     26     *      .1*       .3*
* 1          *     25     *      .1*       .3*
* 1          *     24     *      .1*       .3*
* 1          *     23     *      .1*       .3*
* 1          *     22     *      .1*       .3*
* 1          *     21     *      .1*       .3*
* 1          *     20     *      .1*       .3*
* 1          *     19     *      .1*       .3*
* 1          *     18     *      .1*       .3*
* 1          *     17     *      .1*       .3*
* 1          *     16     *      .1*       .3*
* 1          *     15     *      .1*       .3*
* 1          *     14     *      .1*       .3*
* 1          *     13     *      .1*       .3*
* 1          *     12     *      .1*       .3*
* 1          *     11     *      .1*       .3*
* 1          *     10     *      .1*       .3*
* 1          *     9      *      .1*       .3*
* 1          *     8      *      .1*       .3*
* 1          *     7      *      .1*       .3*
* 1          *     6      *      .1*       .3*
* 1          *     5      *      .1*       .3*
* 1          *     4      *      .1*       .3*
* 1          *     3      *      .1*       .3*
* 1          *     2      *      .1*       .3*
* 1          *     1      *      .1*       .3*
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Profile Output Table - Standard Table 1

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*****************************************************************************************************
*******************************
* River Sta. *  Q Total *Min Ch El *W.S. Elev *Crit W.S. *E.G. Elev *E.G. Slope * Vel Chnl *Flow
Area *Top Width *Froude # Chl *
*            *    (cfs) *     (ft) *     (ft) *     (ft) *     (ft) *   (ft/ft) *   (ft/s) *
(sq ft) *     (ft) *            *
*****************************************************************************************************
*******************************
* 51         *   104.70 *   678.18 *   679.24 *   679.24 *   679.63 *  0.018874 *     4.33 *
20.98 *    27.34 *        0.95 *
* 50         *   104.70 *   675.35 *   675.81 *   676.12 *   676.98 *  0.132530 *     6.85 *
12.17 *    30.28 *        2.22 *
* 49         *   104.70 *   672.98 *   672.71 *   672.87 *   673.37 *  0.031906 *          *
16.06 *    18.64 *        0.00 *
```

* 48	*	104.70 *	667.00 *	669.21 *	669.82 *	671.05 *	0.058862 *	12.15 *	10.36 *	11.22 *	1.63 *
* 47	*	104.70 *	664.21 *	666.23 *	666.90 *	668.06 *	0.063073 *	13.71 *	10.40 *	11.27 *	1.89 *
* 46	*	104.70 *	660.00 *	662.39 *	662.94 *	664.09 *	0.045936 *	12.40 *	10.34 *	7.75 *	1.50 *
* 45	*	104.70 *	658.30 *	657.36 *	658.15 *	659.70 *	0.078357 *	*	8.53 *	6.19 *	0.00 *
* 44	*	104.70 *	656.00 *	655.83 *	655.94 *	656.43 *	0.026692 *	*	16.87 *	18.84 *	0.00 *
* 43	*	104.70 *	654.00 *	651.67 *	652.43 *	654.13 *	0.094930 *	*	8.32 *	7.23 *	0.00 *
* 42	*	104.70 *	650.27 *	650.41 *	650.76 *	651.40 *	0.028930 *	1.65 *	13.16 *	11.54 *	0.87 *
* 41	*	104.70 *	646.00 *	647.00 *	647.66 *	649.03 *	0.064617 *	7.91 *	9.34 *	8.57 *	1.64 *
* 40	*	104.70 *	645.00 *	644.35 *	644.62 *	645.38 *	0.033304 *	*	12.83 *	10.91 *	0.00 *
* 39	*	104.70 *	642.00 *	643.30 *	643.36 *	643.85 *	0.019551 *	7.01 *	18.09 *	19.03 *	1.09 *
* 38	*	104.70 *	643.88 *	640.11 *	640.56 *	641.57 *	0.086034 *	*	10.81 *	15.38 *	0.00 *
* 37	*	104.70 *	635.95 *	636.04 *	636.14 *	636.56 *	0.028027 *	1.37 *	18.22 *	25.19 *	0.83 *
* 36	*	104.70 *	633.31 *	634.05 *	634.23 *	634.66 *	0.048784 *	5.04 *	17.20 *	36.60 *	1.41 *
* 35	*	104.70 *	631.55 *	631.80 *	631.94 *	632.30 *	0.040107 *	2.12 *	18.81 *	38.40 *	1.06 *
* 34	*	104.70 *	628.00 *	628.70 *	628.98 *	629.57 *	0.068239 *	8.78 *	14.42 *	28.56 *	1.84 *
* 33	*	104.70 *	627.36 *	627.36 *	627.52 *	627.96 *	0.034591 *	*	16.78 *	23.69 *	0.00 *
* 32	*	228.00 *	624.28 *	625.12 *	625.35 *	625.89 *	0.041922 *	7.59 *	33.95 *	54.22 *	1.48 *
* 31	*	228.00 *	621.14 *	622.08 *	622.32 *	622.86 *	0.051807 *	9.23 *	32.80 *	54.85 *	1.68 *
* 30	*	228.00 *	616.14 *	617.60 *	617.97 *	618.76 *	0.038959 *	10.12 *	28.15 *	32.07 *	1.55 *
* 29	*	228.00 *	613.12 *	613.67 *	614.02 *	614.81 *	0.079765 *	7.47 *	26.83 *	45.92 *	1.88 *
* 28	*	228.00 *	610.00 *	611.25 *	611.44 *	611.97 *	0.035151 *	9.26 *	33.69 *	42.98 *	1.46 *
* 27	*	228.00 *	607.33 *	608.30 *	608.63 *	609.38 *	0.046043 *	8.47 *	28.24 *	35.85 *	1.58 *
* 26	*	228.00 *	605.00 *	605.95 *	606.12 *	606.66 *	0.032167 *	7.34 *	34.04 *	41.57 *	1.33 *
* 25	*	228.00 *	601.00 *	601.82 *	602.20 *	603.06 *	0.074221 *	10.16 *	25.53 *	37.56 *	1.97 *
* 24	*	228.00 *	598.01 *	598.92 *	599.19 *	599.82 *	0.049174 *	8.85 *	30.01 *	41.28 *	1.63 *
* 23	*	228.00 *	595.36 *	596.23 *	596.56 *	597.32 *	0.042765 *	7.73 *	28.25 *	34.44 *	1.50 *
* 22	*	228.00 *	592.70 *	593.49 *	593.78 *	594.45 *	0.034441 *	6.42 *	30.01 *	34.36 *	1.32 *
* 21	*	228.00 *	589.53 *	590.50 *	590.85 *	591.59 *	0.041675 *	7.59 *	28.30 *	35.05 *	1.47 *
* 20	*	228.00 *	586.04 *	587.21 *	587.82 *	589.38 *	0.110123 *	12.41 *			

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19.74 *    28.67 *        2.40 *
* 19         *   228.00 *   584.19 *   585.22 *   585.55 *   586.29 *  0.044978 *     8.83 *
28.10 *    34.04 *        1.58 *
* 18         *   247.00 *   582.34 *   583.53 *   583.65 *   584.21 *  0.026043 *     7.53 *
37.47 *    39.53 *        1.24 *
* 17         *   247.00 *   579.52 *   579.38 *   579.96 *   581.31 *  0.090919 *          *
22.14 *    27.02 *        0.00 *
* 16         *   247.00 *   576.29 *   577.10 *   577.72 *   579.34 *  0.133431 *    12.81 *
20.69 *    30.75 *        2.60 *
* 15         *   247.00 *   573.96 *   575.31 *   575.32 *   575.86 *  0.016547 *     6.63 *
41.91 *    37.85 *        1.01 *
* 14         *   247.00 *   570.30 *   570.88 *   571.56 *   573.71 *  0.173680 *     7.73 *
18.55 *    29.39 *        2.52 *
* 13         *   247.00 *   568.68 *   569.92 *   570.21 *   570.97 *  0.029483 *     7.57 *
30.54 *    27.15 *        1.28 *
* 12         *   247.00 *   566.41 *   568.61 *   569.13 *   570.22 *  0.036813 *    11.55 *
24.65 *    16.80 *        1.43 *
* 11         *   247.00 *   562.99 *   566.46 *   567.32 *   568.98 *  0.049556 *    19.02 *
21.01 *    14.39 *        1.84 *
* 10         *   247.00 *   563.00 *   565.47 *   565.65 *   566.52 *  0.020476 *    10.29 *
30.64 *    19.50 *        1.18 *
* 9          *   247.00 *   565.00 *   563.04 *   563.87 *   565.69 *  0.072837 *          *
18.88 *    14.75 *        0.00 *
* 8          *   247.00 *   566.00 *   563.05 *          *   563.29 *  0.002534 *          *
62.50 *    22.82 *        0.00 *
* 7          *   247.00 *   561.45 *   562.80 *          *   563.20 *  0.004141 *     2.28 *
48.81 *    17.67 *        0.39 *
* 6          *   247.00 *   559.00 *   561.76 *   561.76 *   562.80 *  0.014856 *     8.86 *
31.02 *    15.23 *        0.99 *
* 5          *   247.00 *   558.11 *   558.32 *   559.29 *   561.49 *  0.087303 *     2.65 *
17.32 *    13.91 *        1.43 *
* 4          *   247.00 *   559.55 *   557.26 *   557.67 *   558.60 *  0.036601 *          *
26.57 *    20.98 *        0.00 *
* 3          *   247.00 *   557.00 *   557.40 *          *   557.76 *  0.006062 *     1.51 *
51.70 *    29.39 *        0.45 *
* 2          *   247.00 *   556.00 *   556.54 *   556.54 *   557.30 *  0.015569 *     2.85 *
35.36 *    23.61 *        0.77 *
* 1          *   247.00 *   554.00 *   554.50 *   552.95 *   554.75 *  0.002472 *     1.33 *
62.20 *    22.96 *        0.33 *
*****************************************************************************************************
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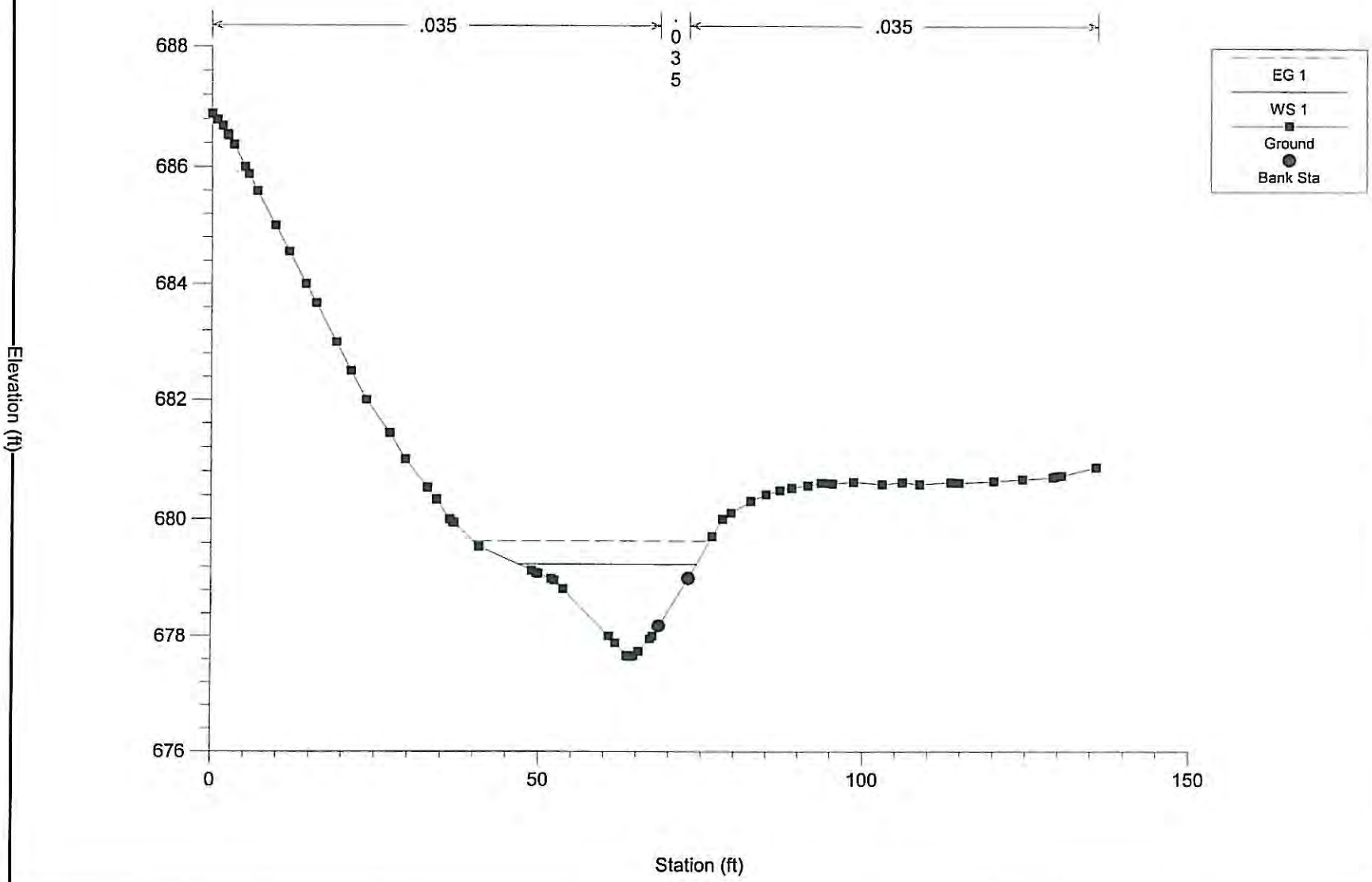
100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
51



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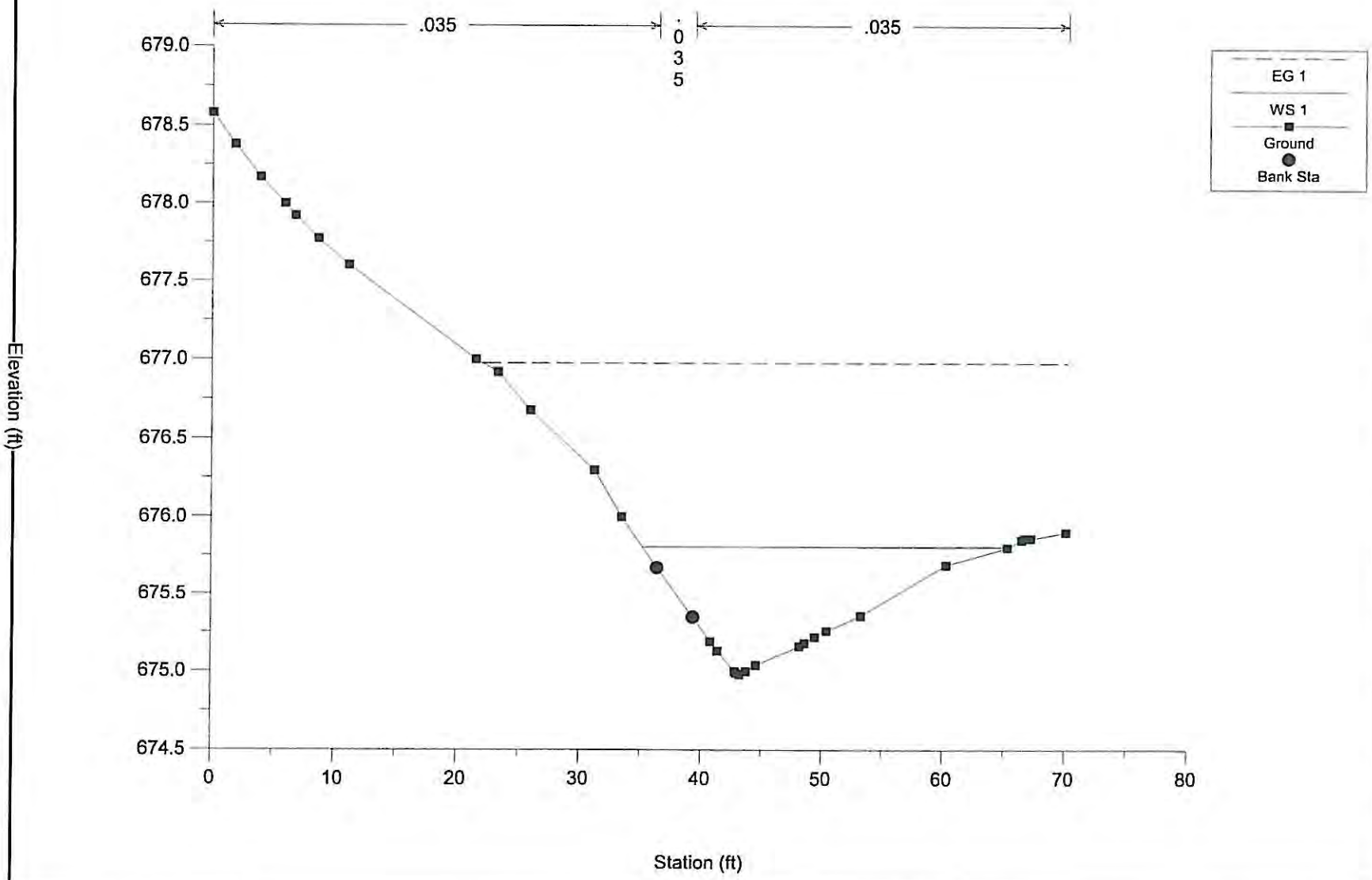

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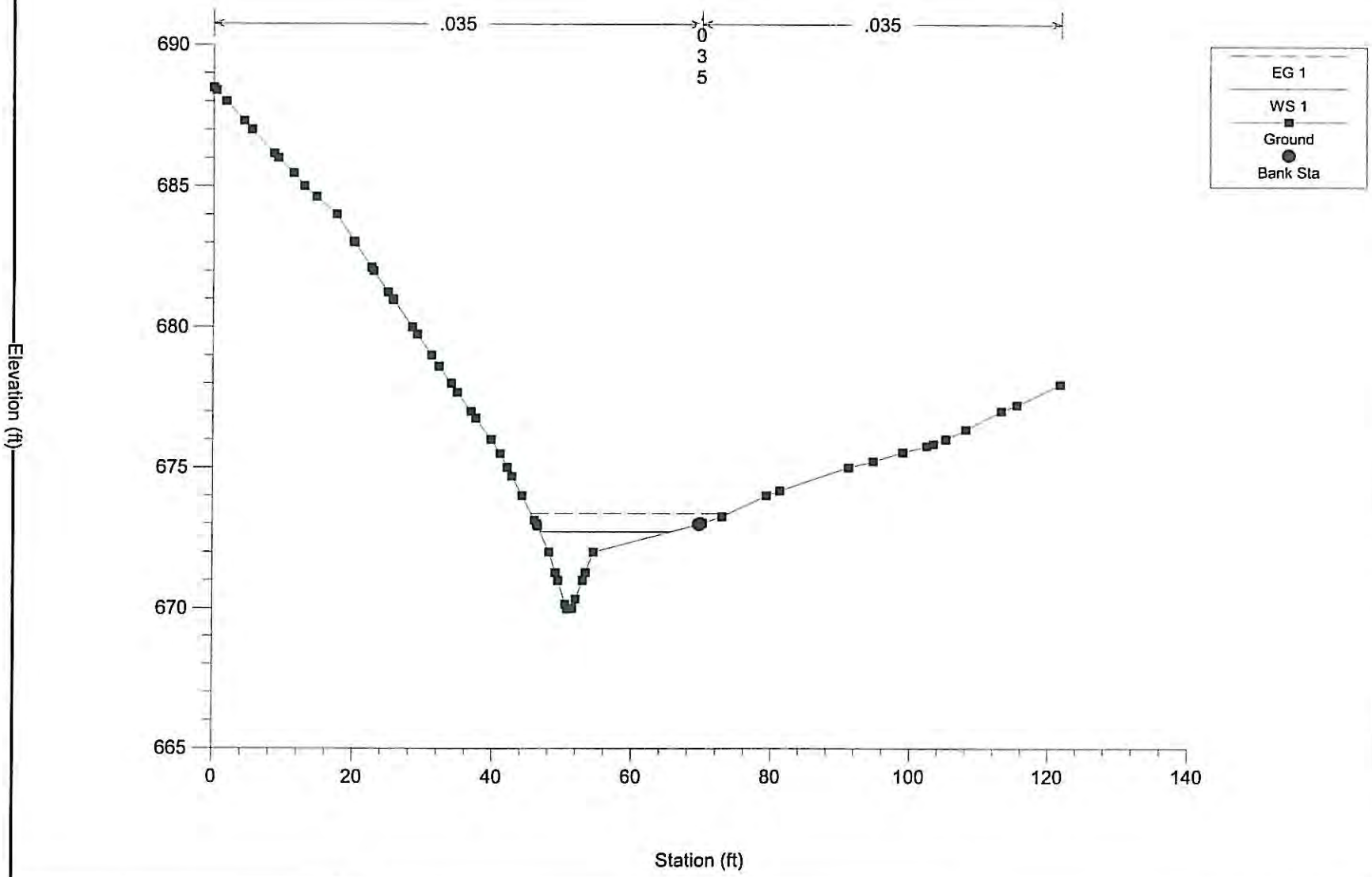

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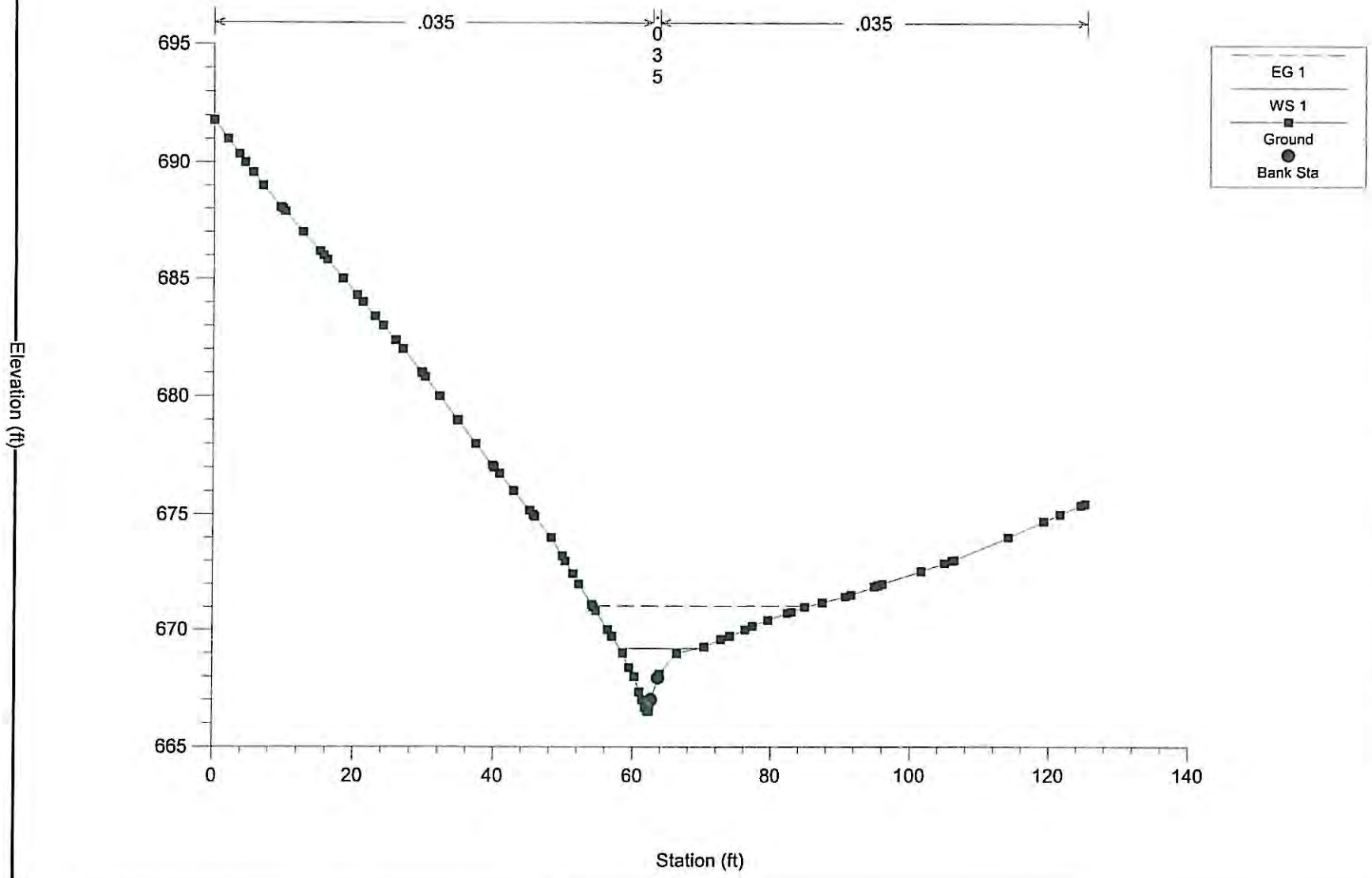

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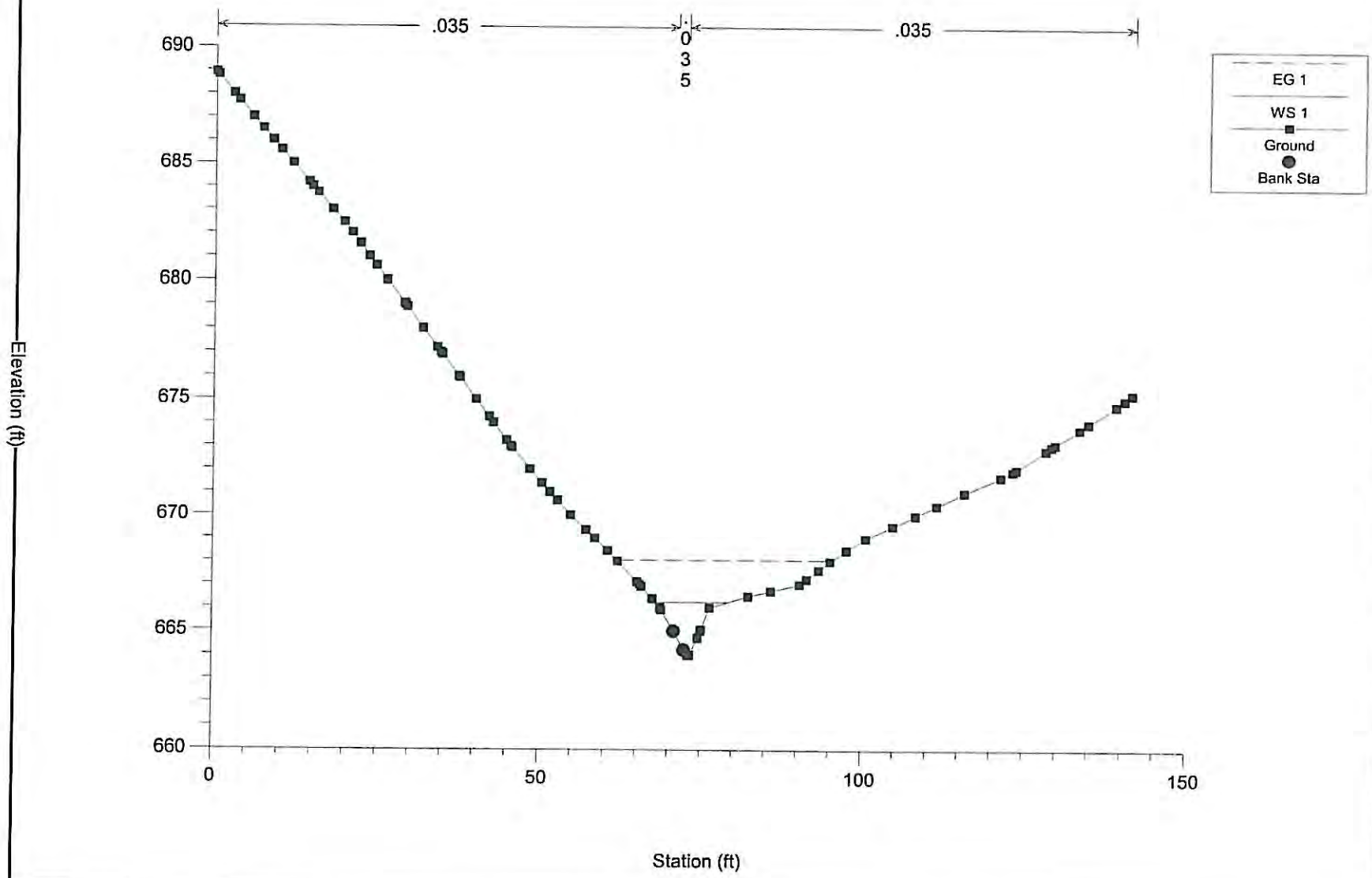

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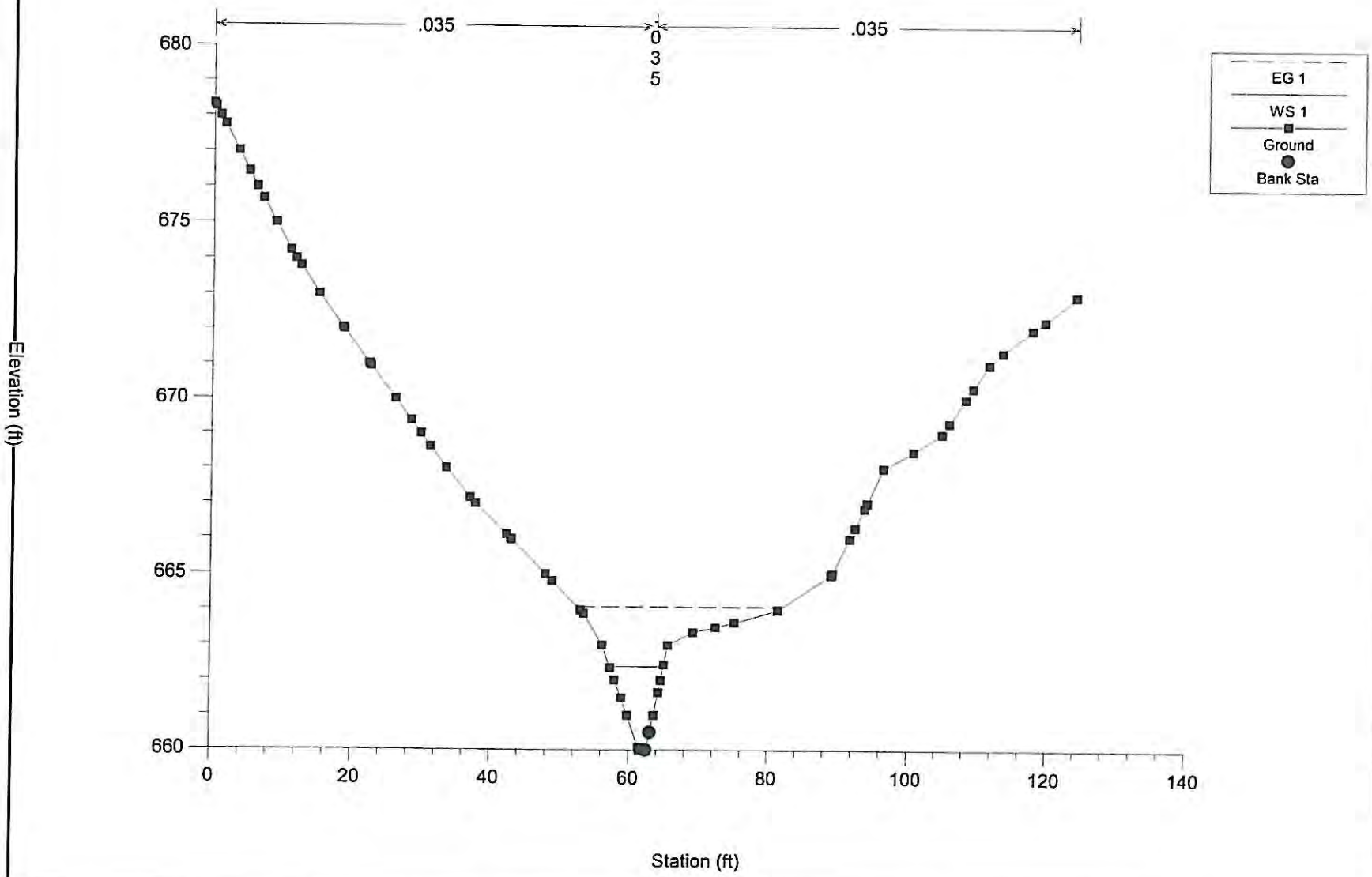
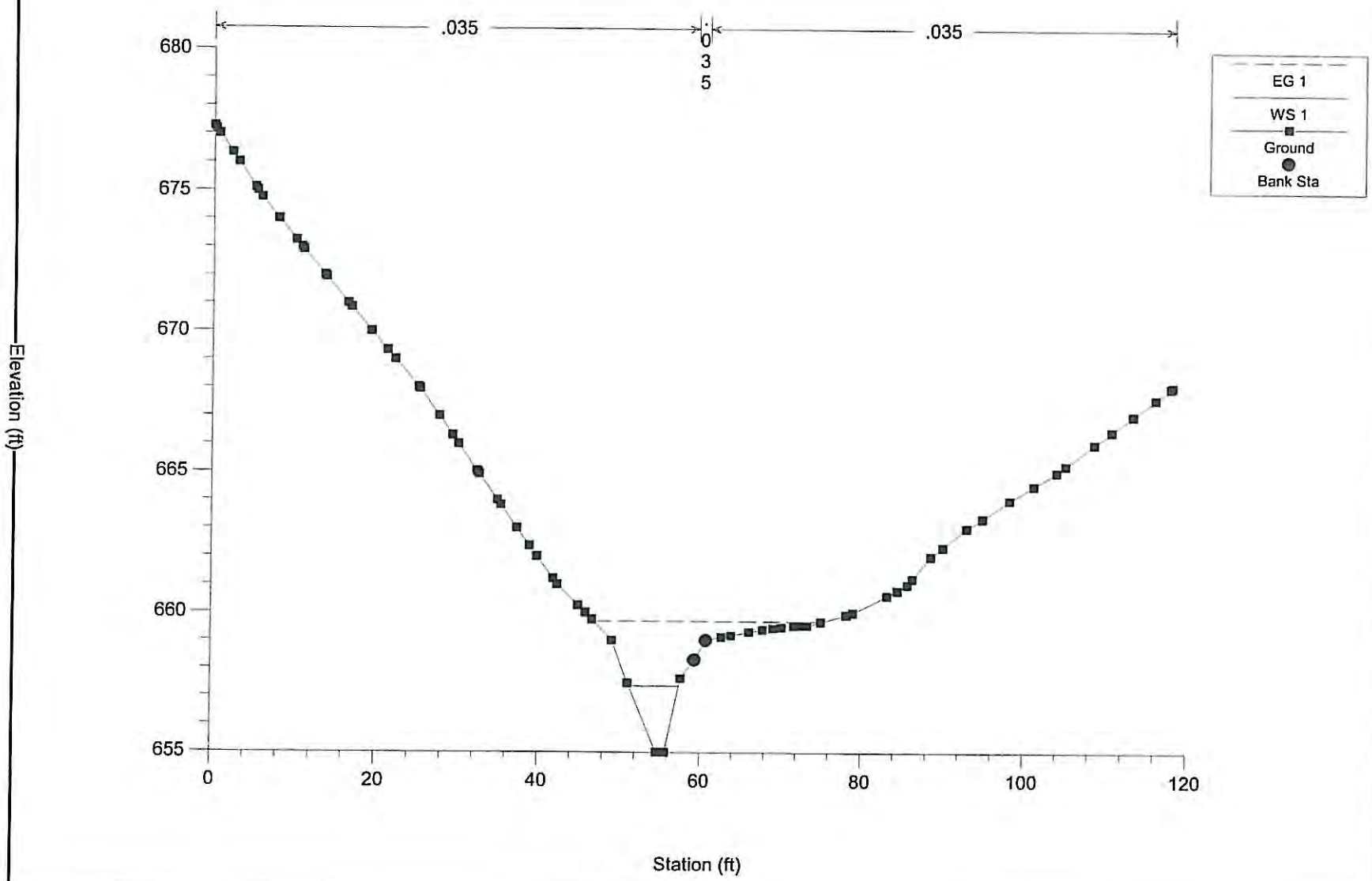
46



100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005



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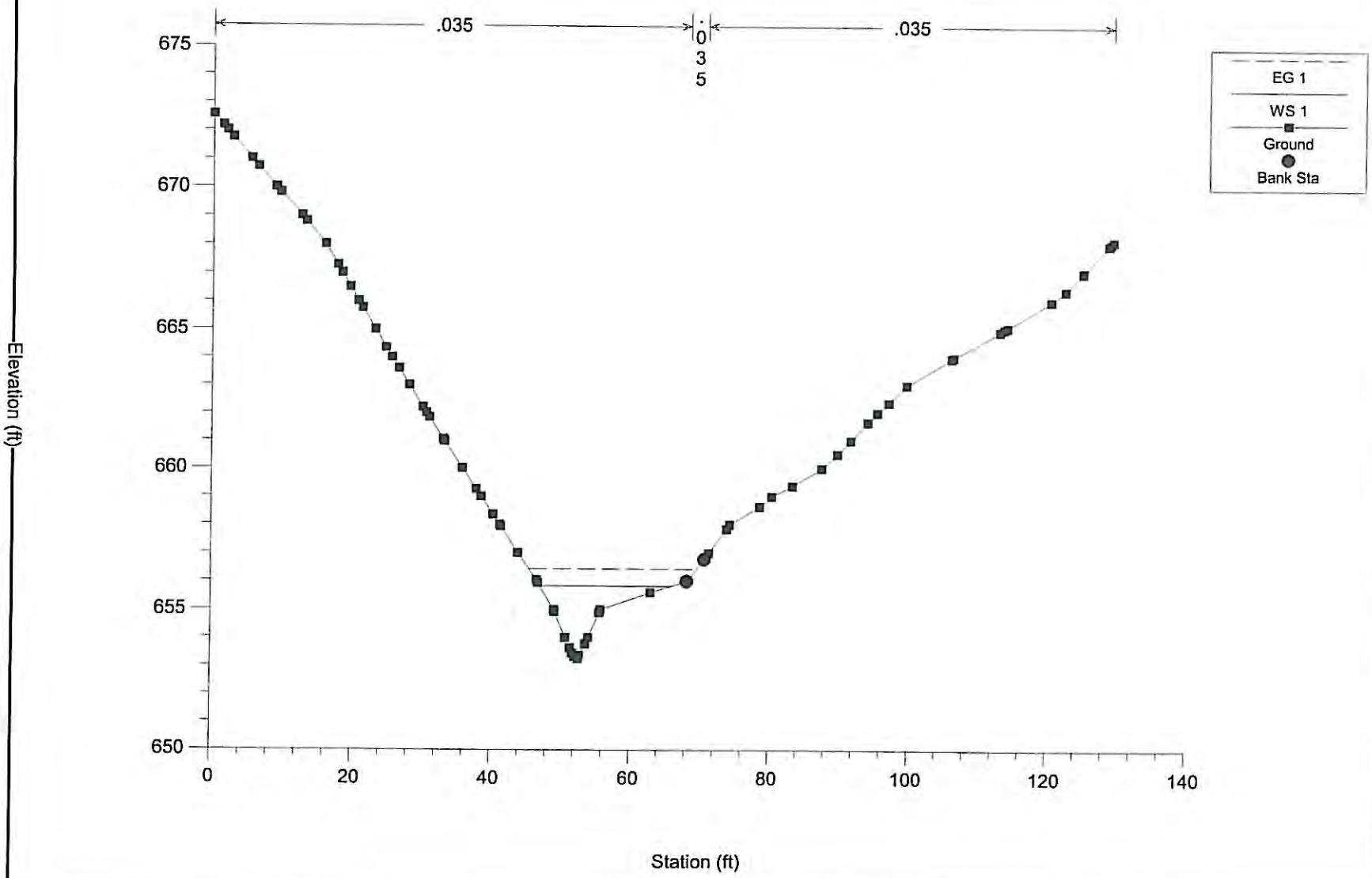
44



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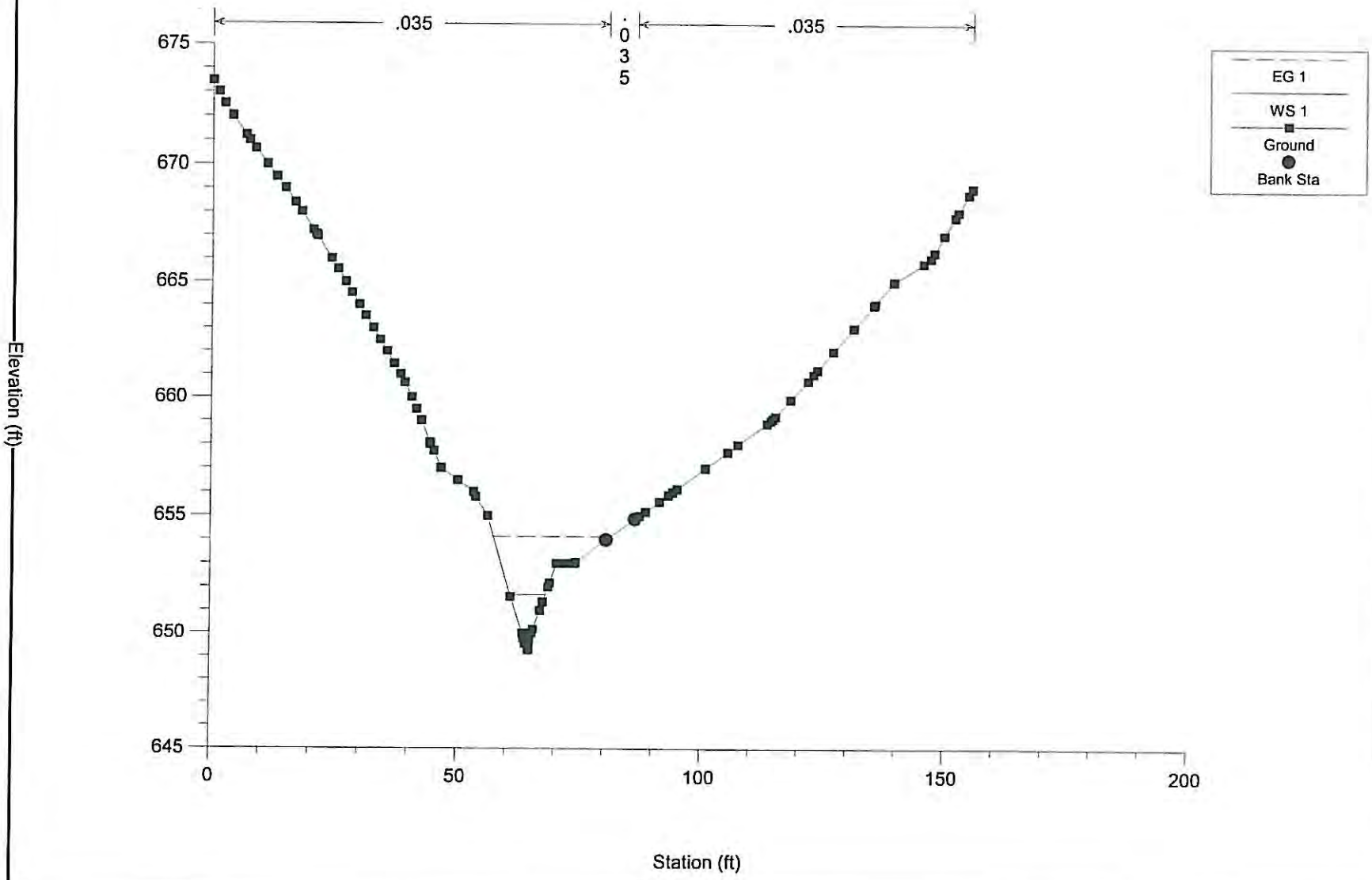
43



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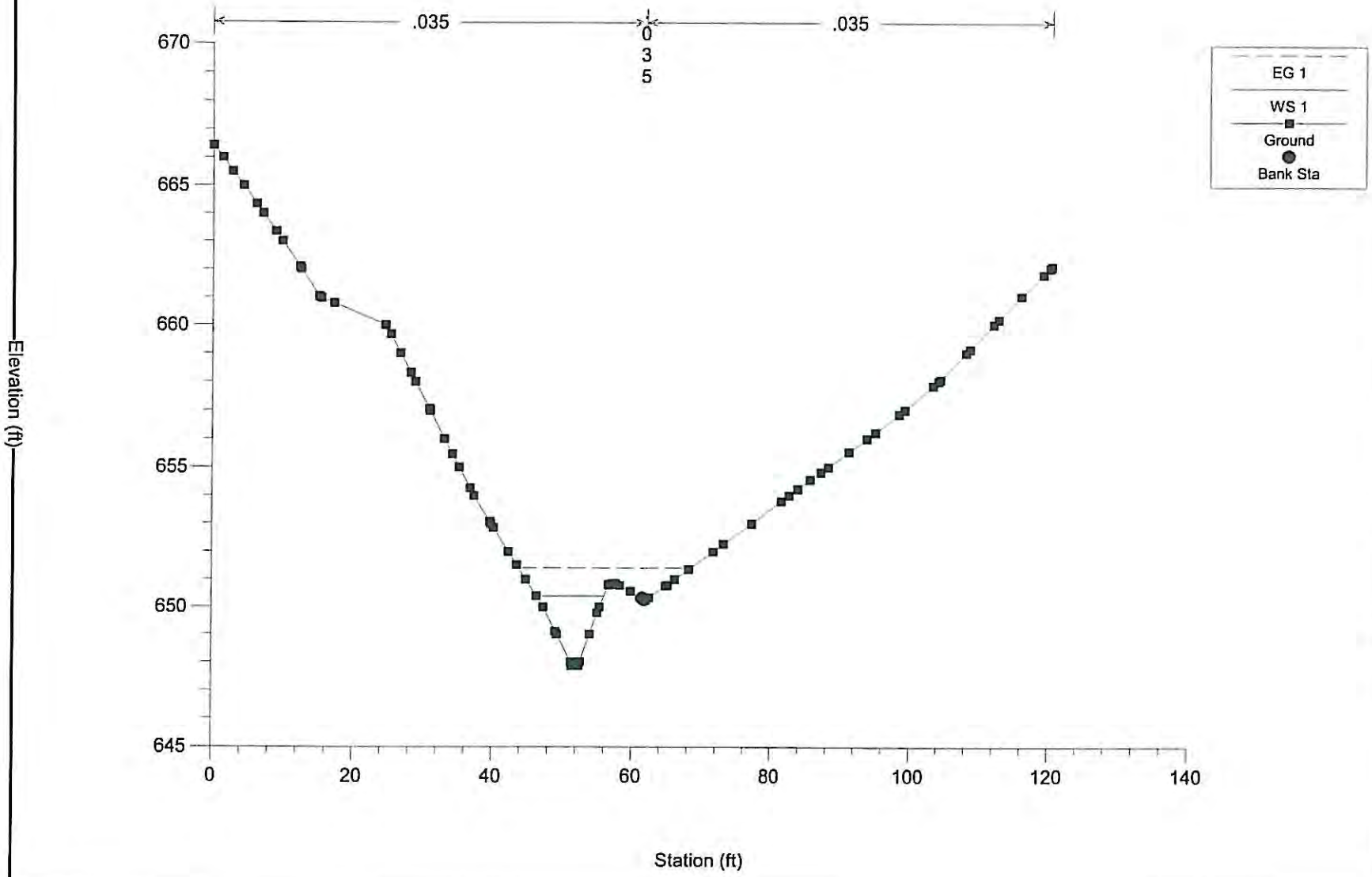
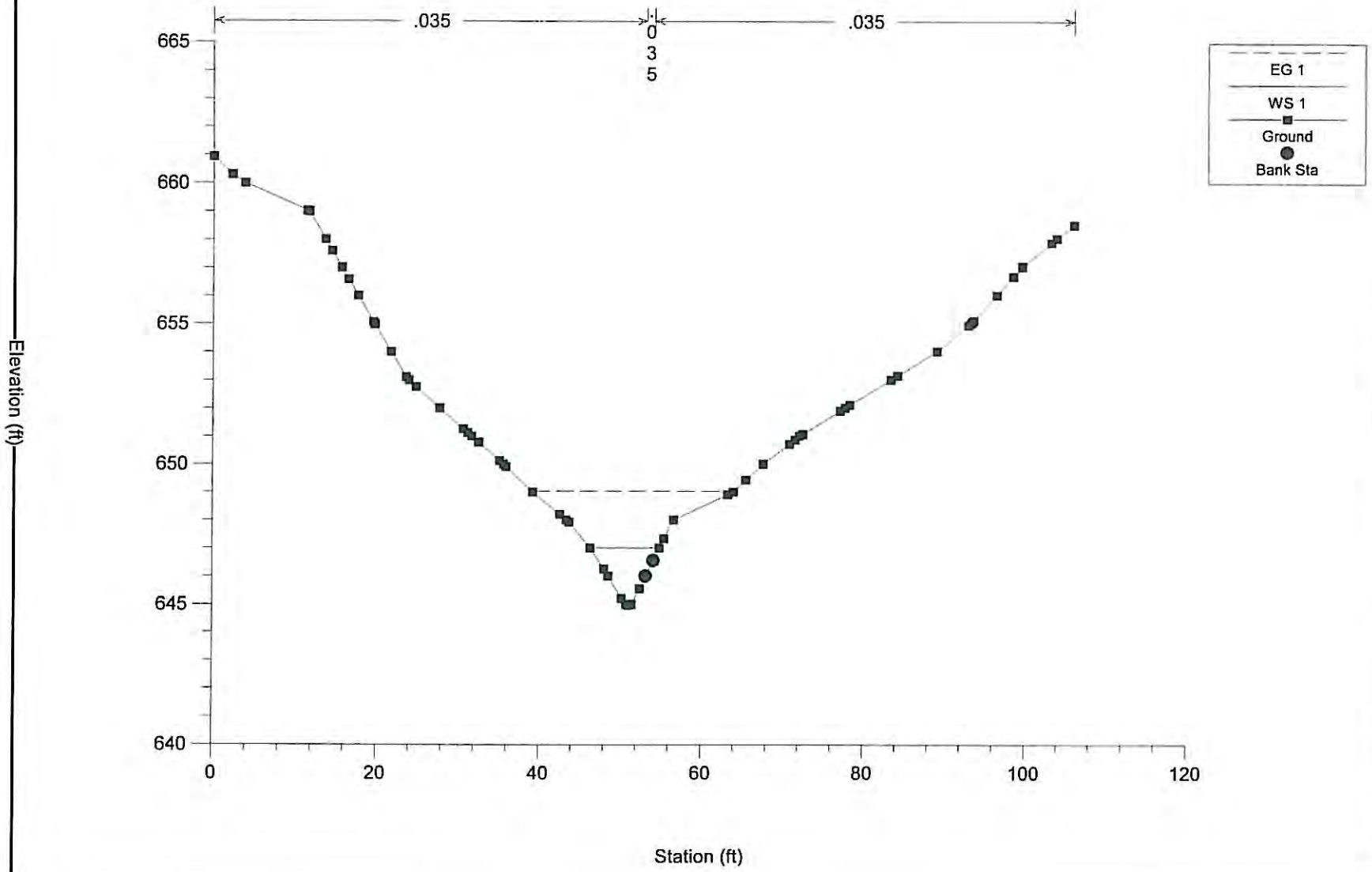
42



100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
41



100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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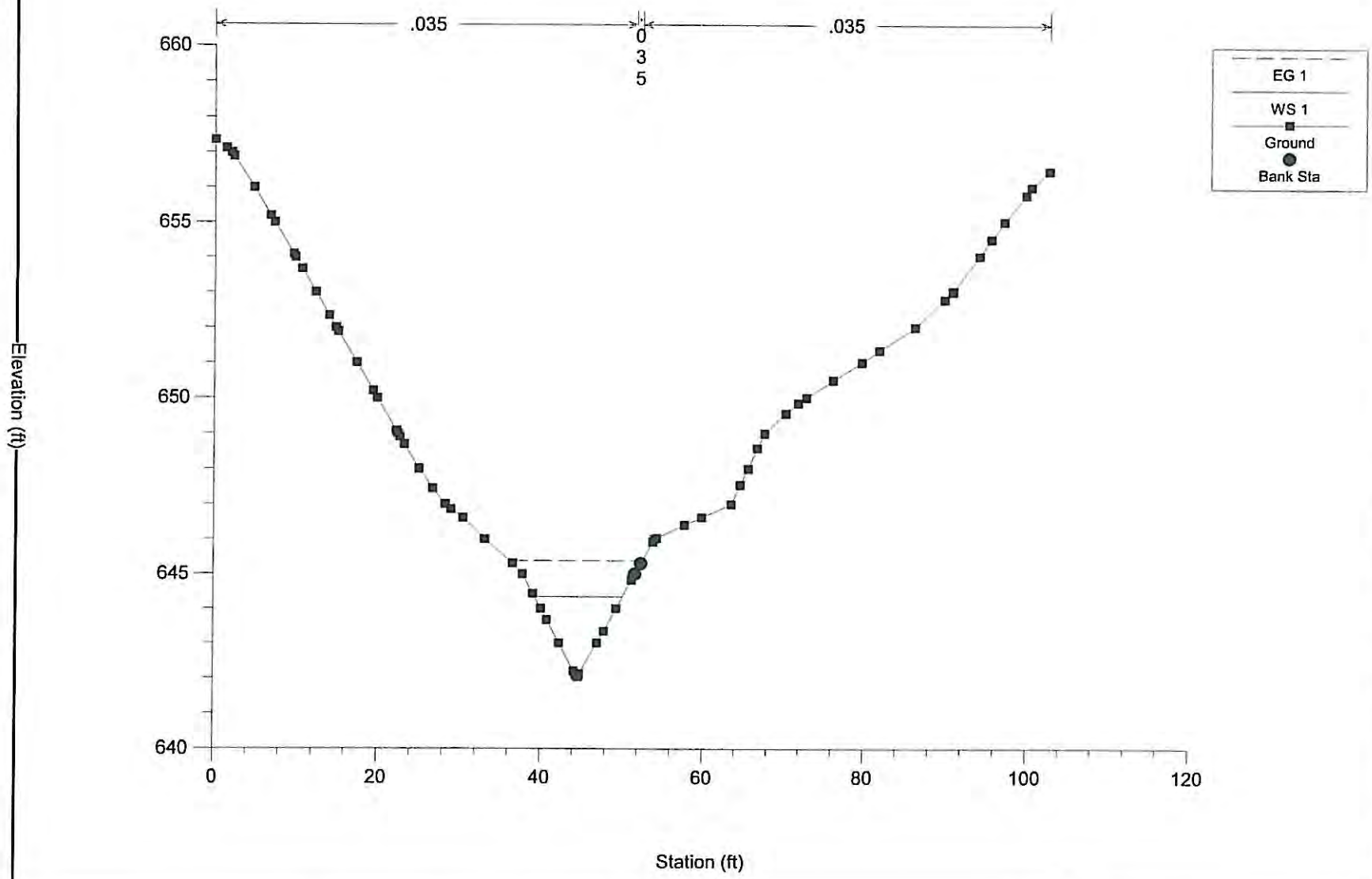

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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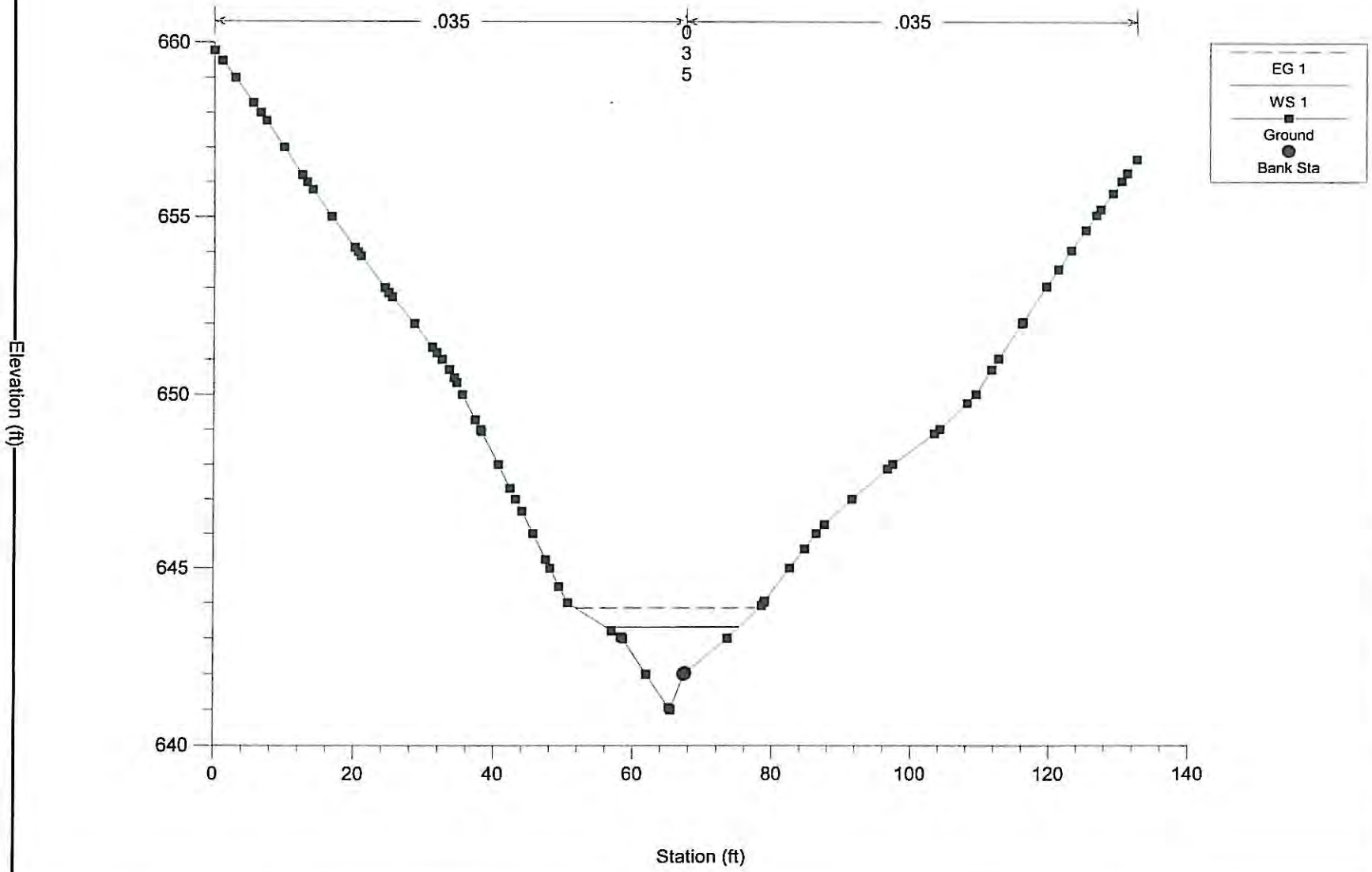

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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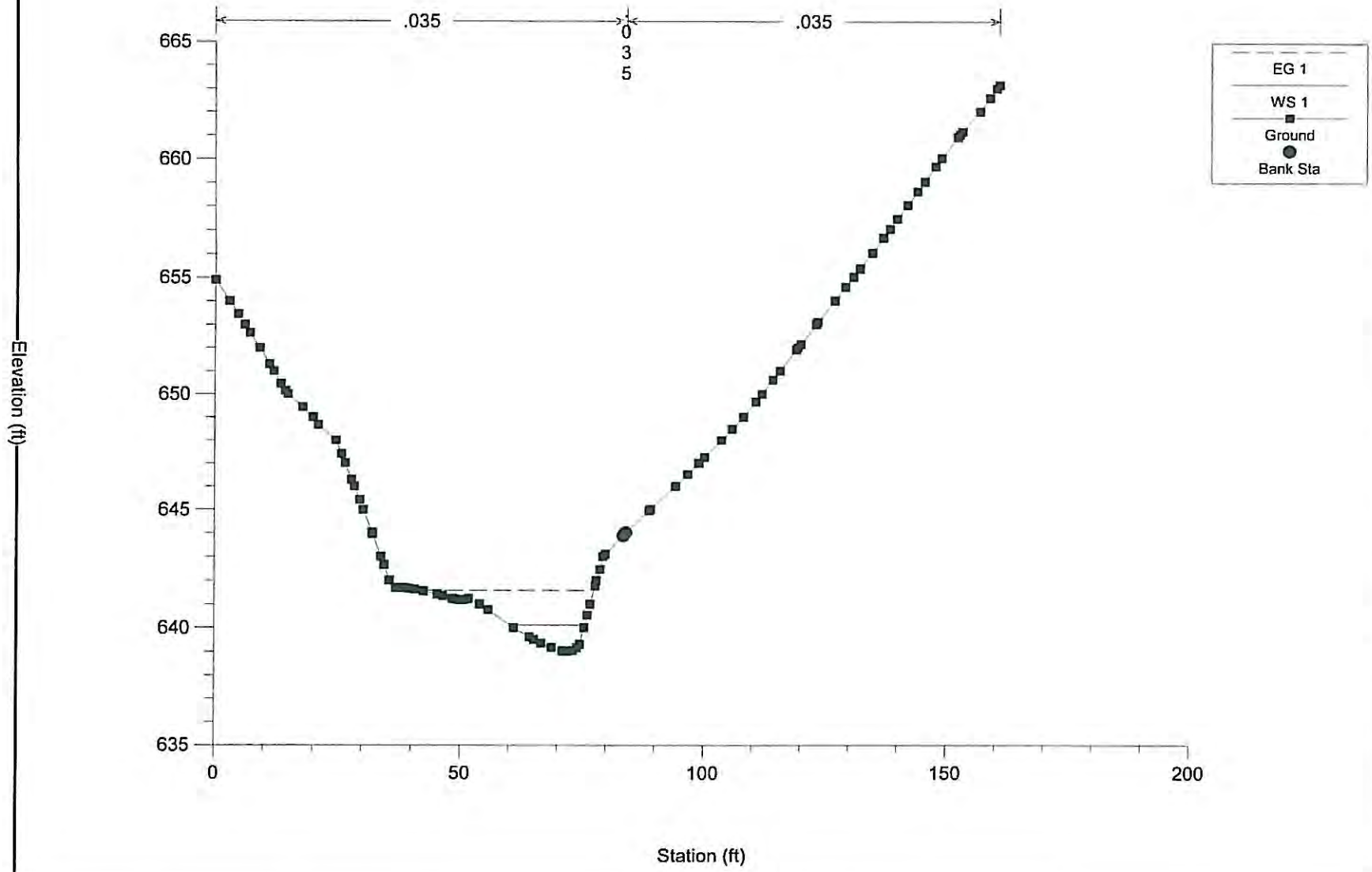

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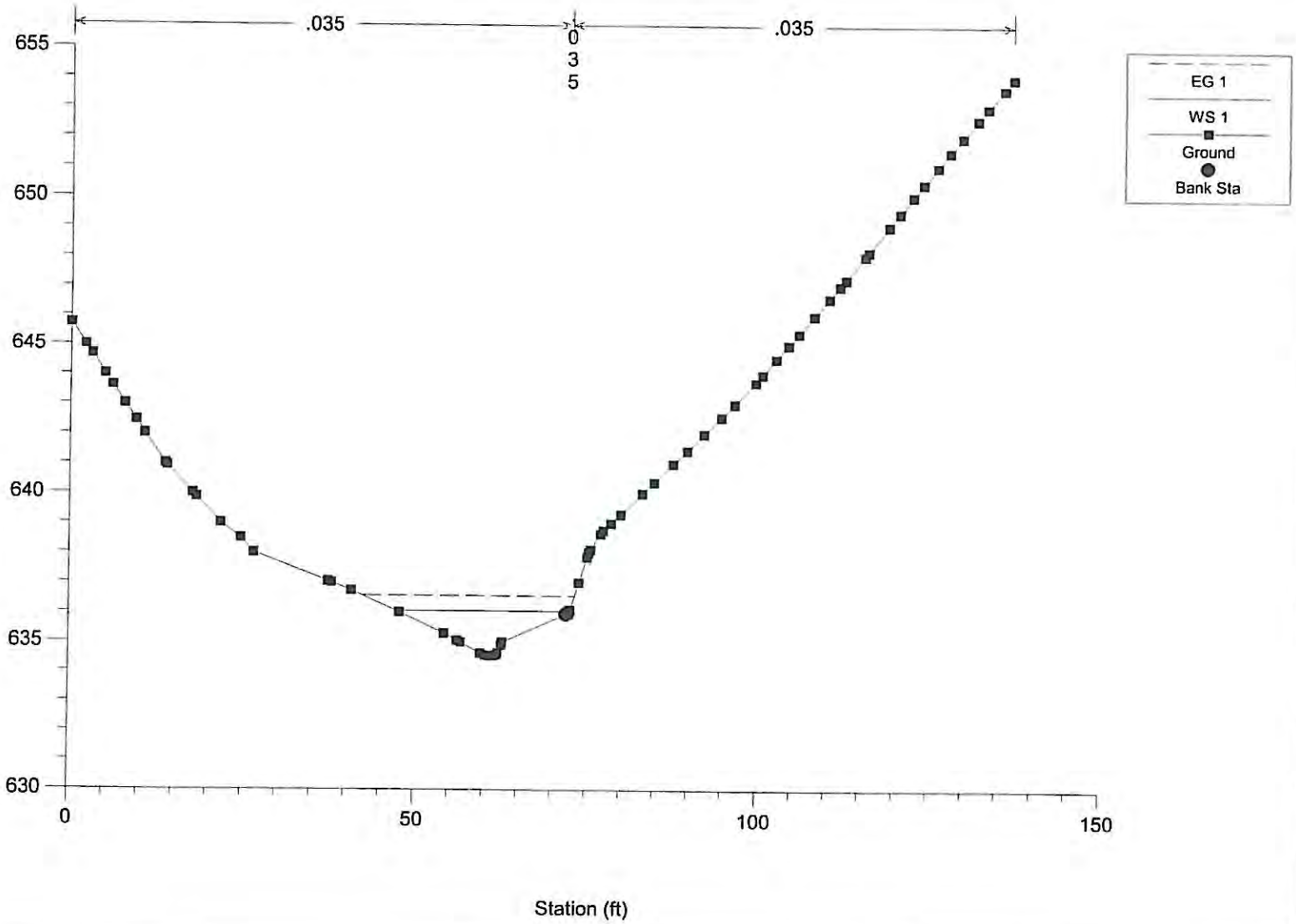

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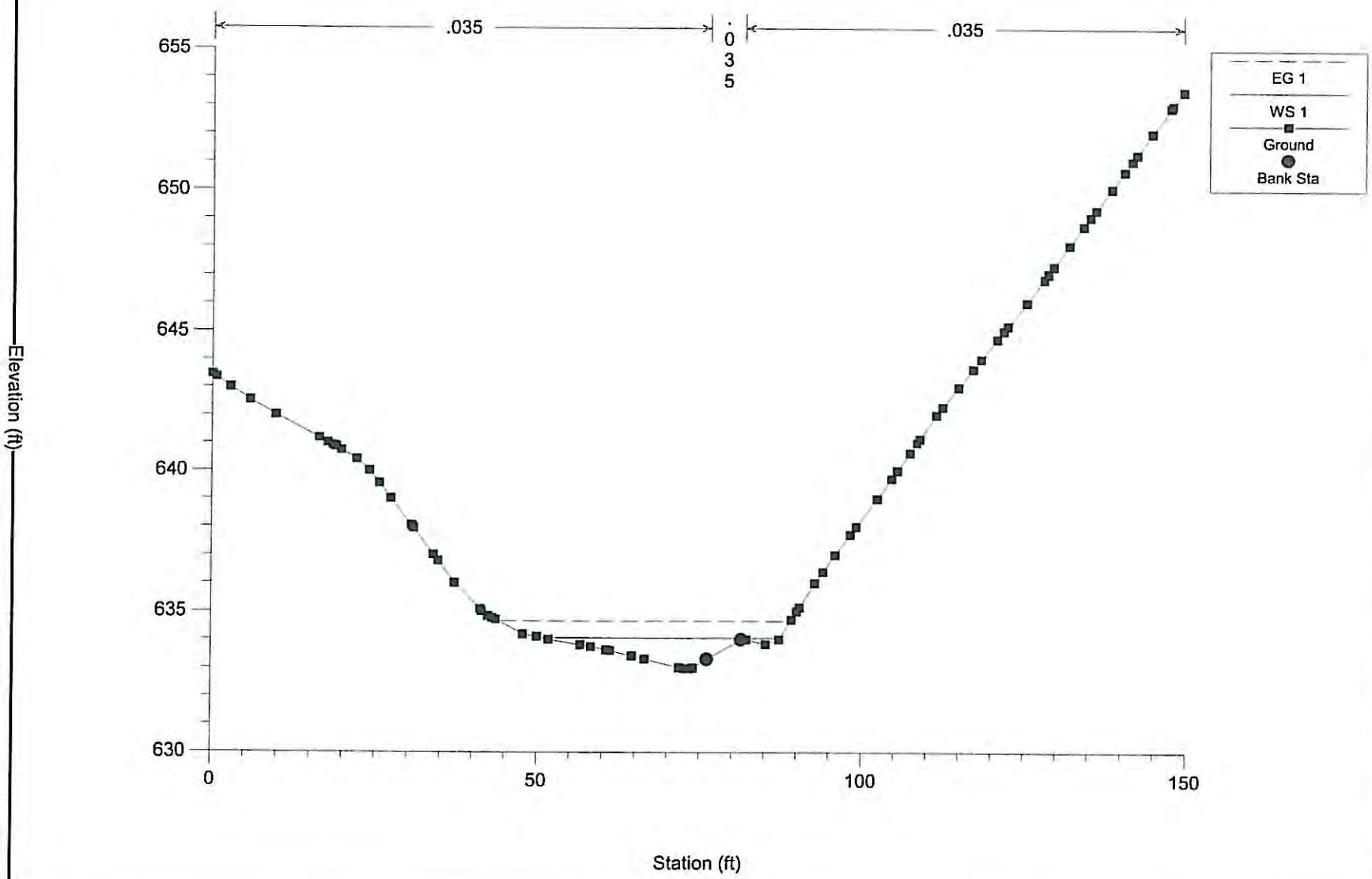
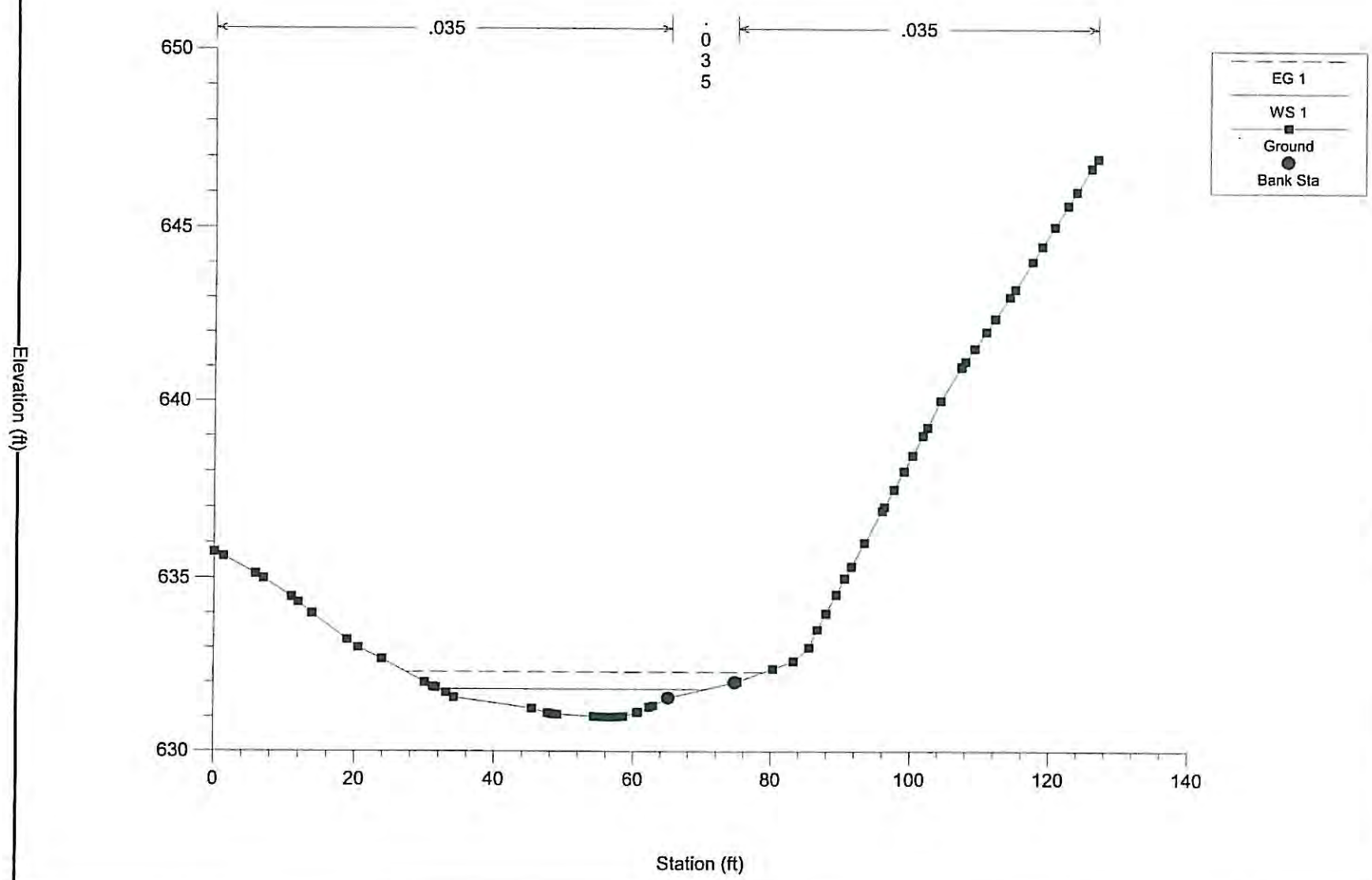


100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005



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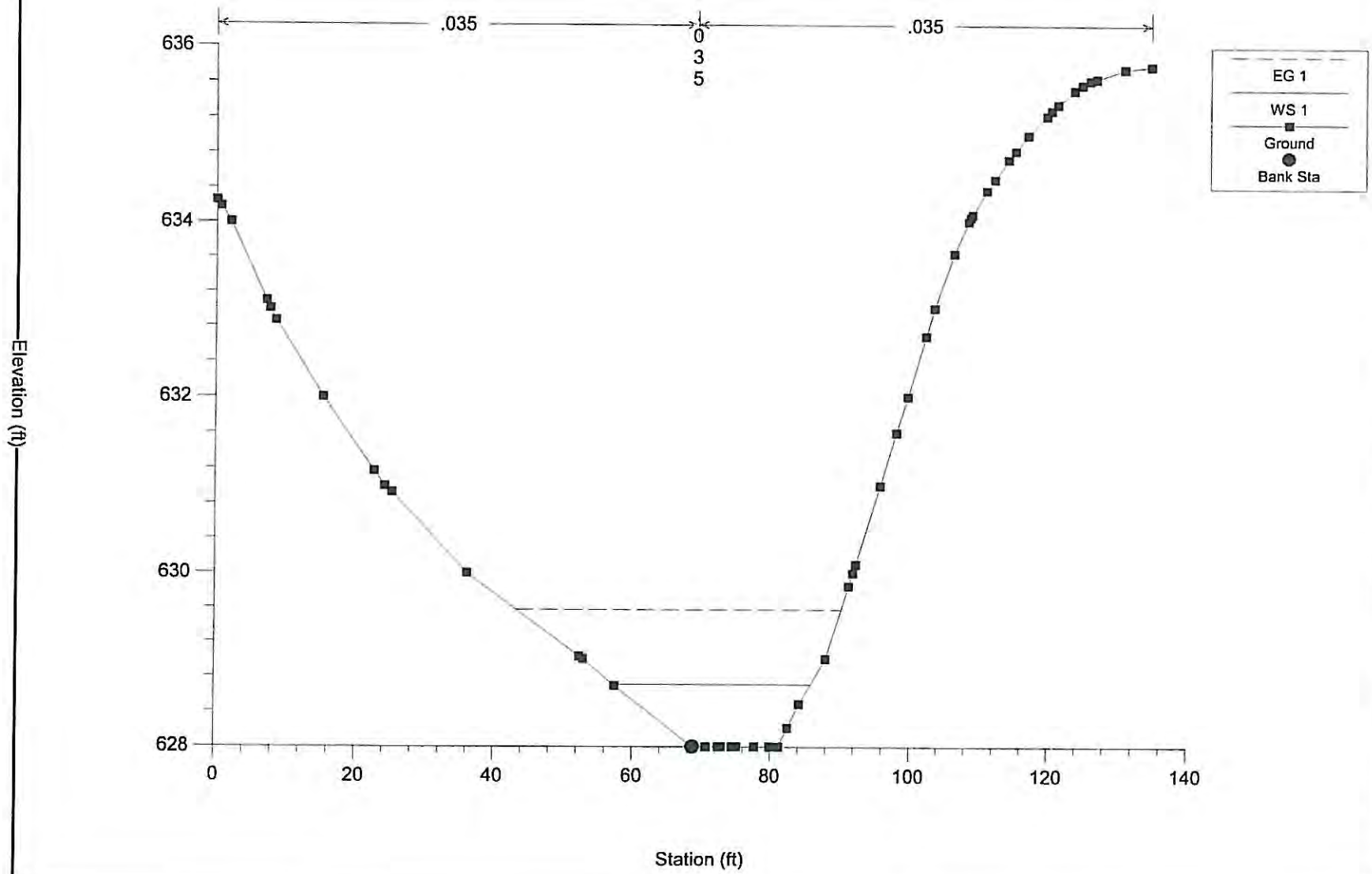

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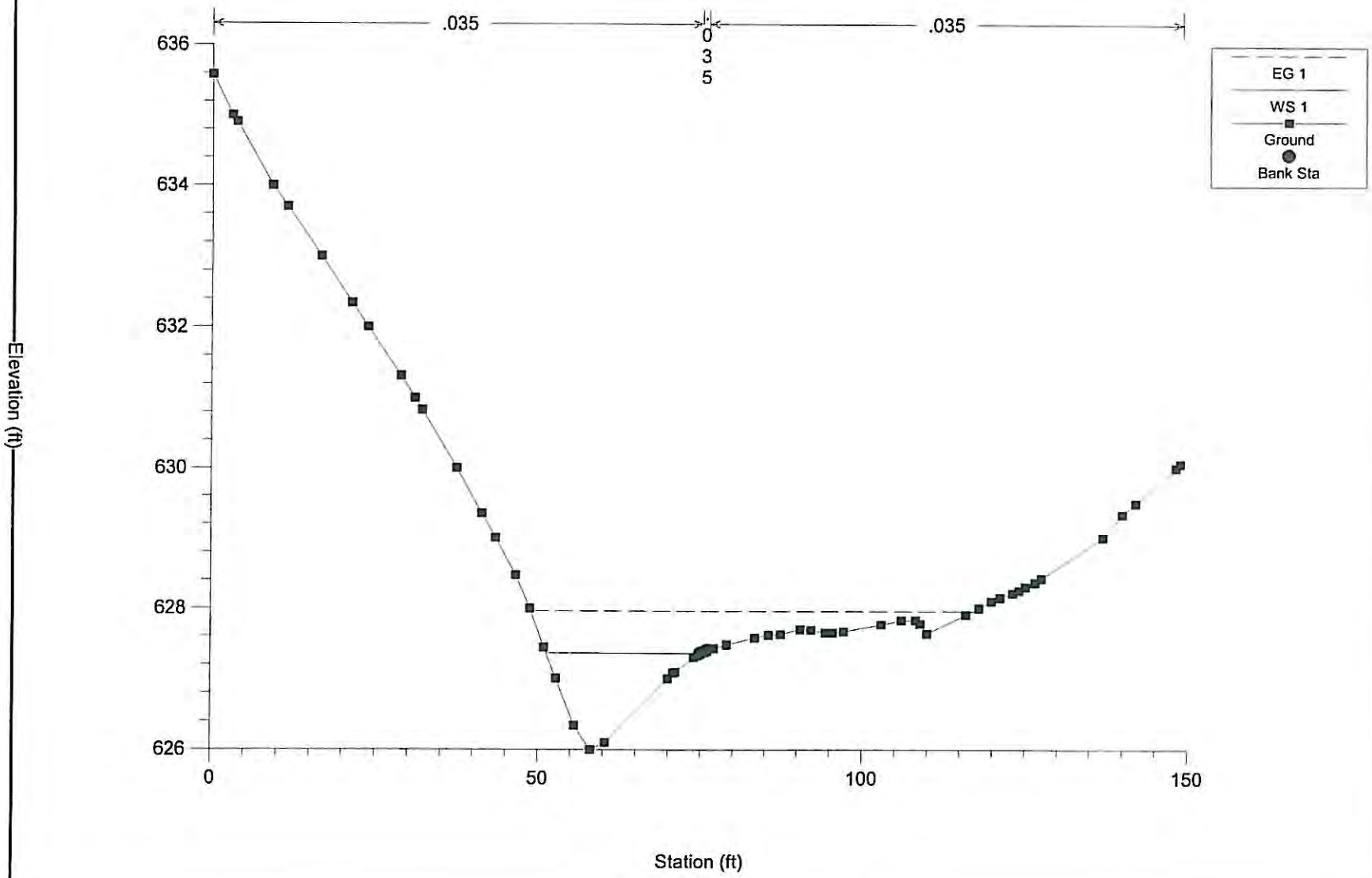

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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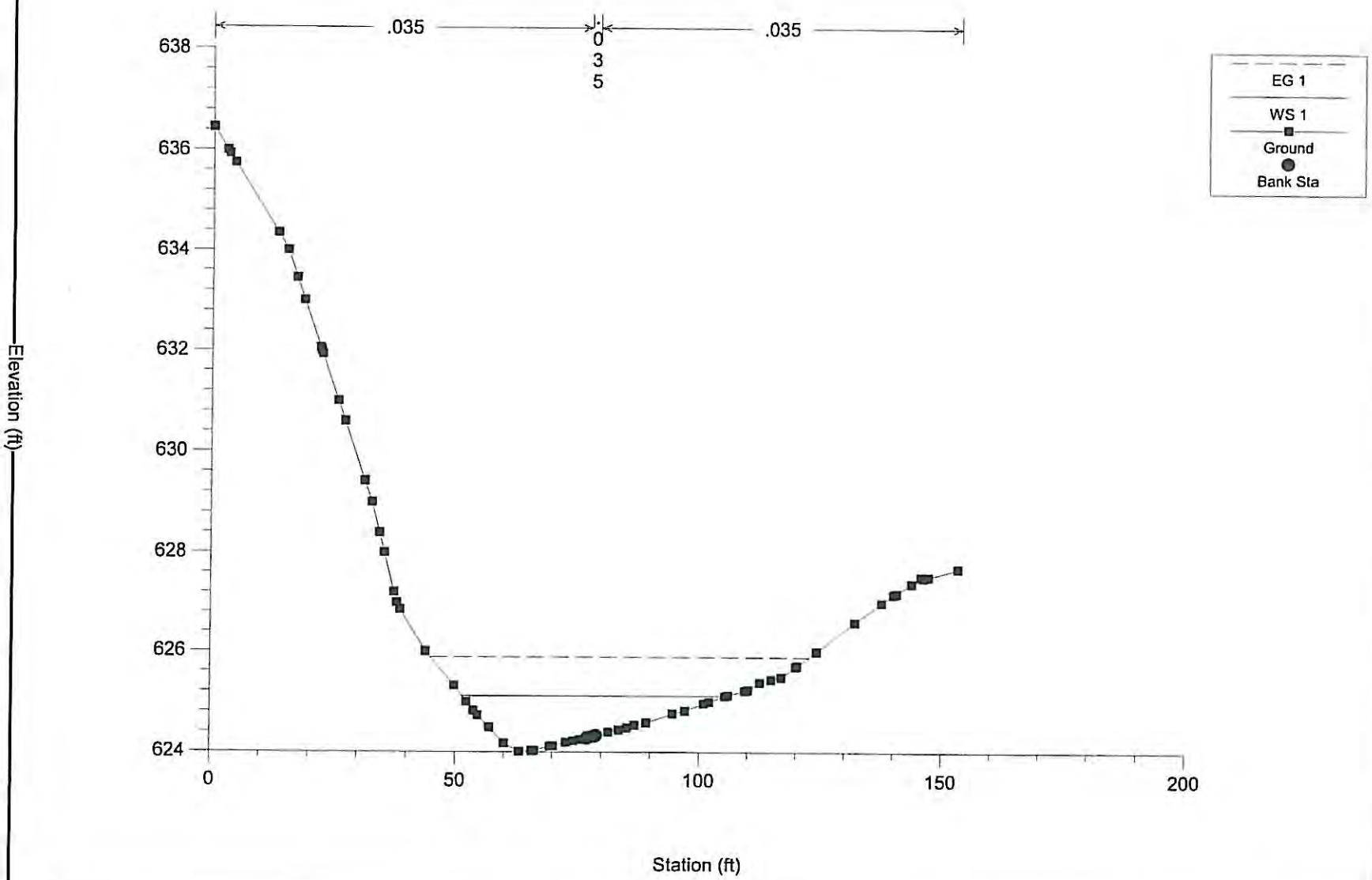

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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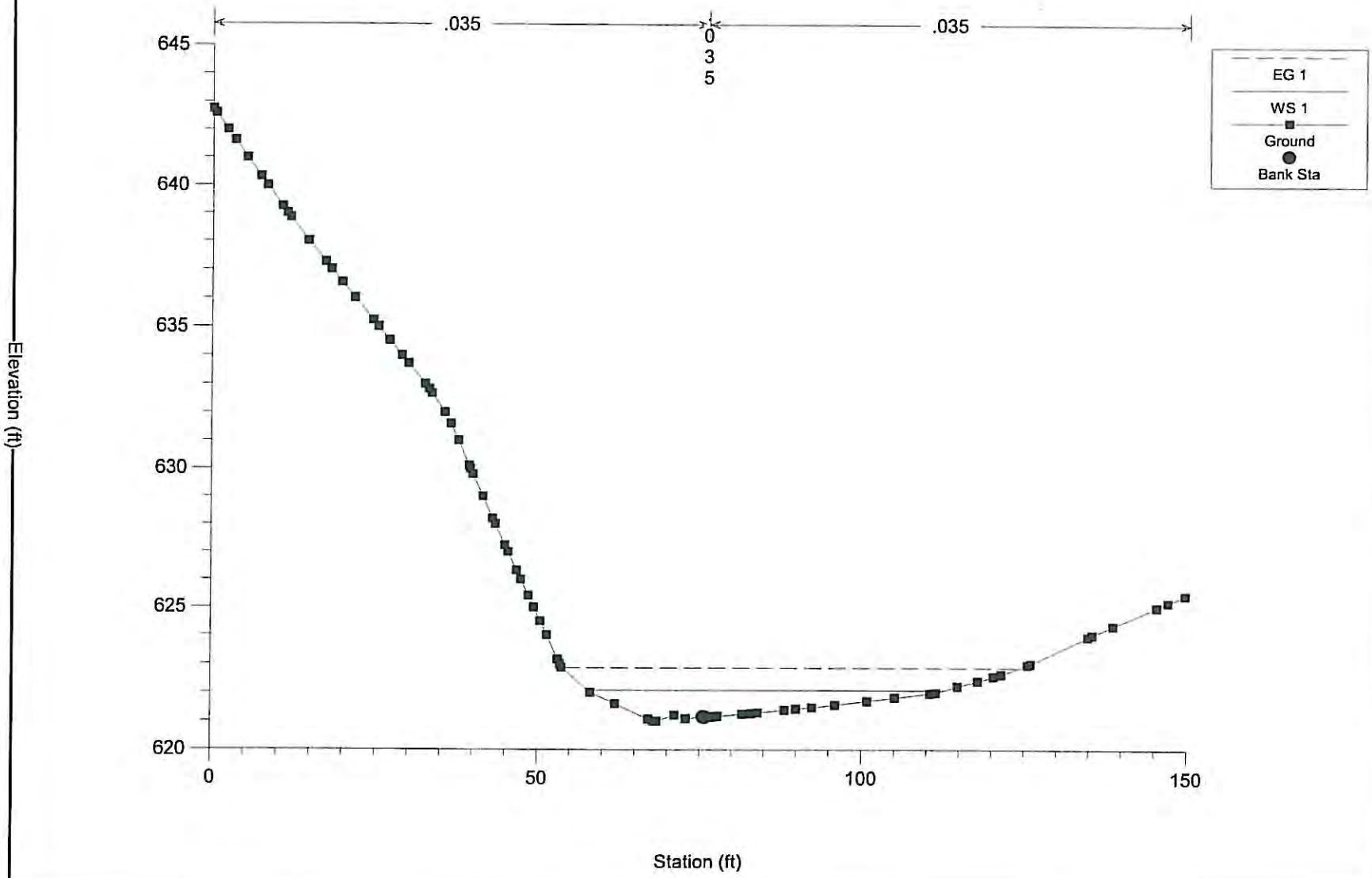

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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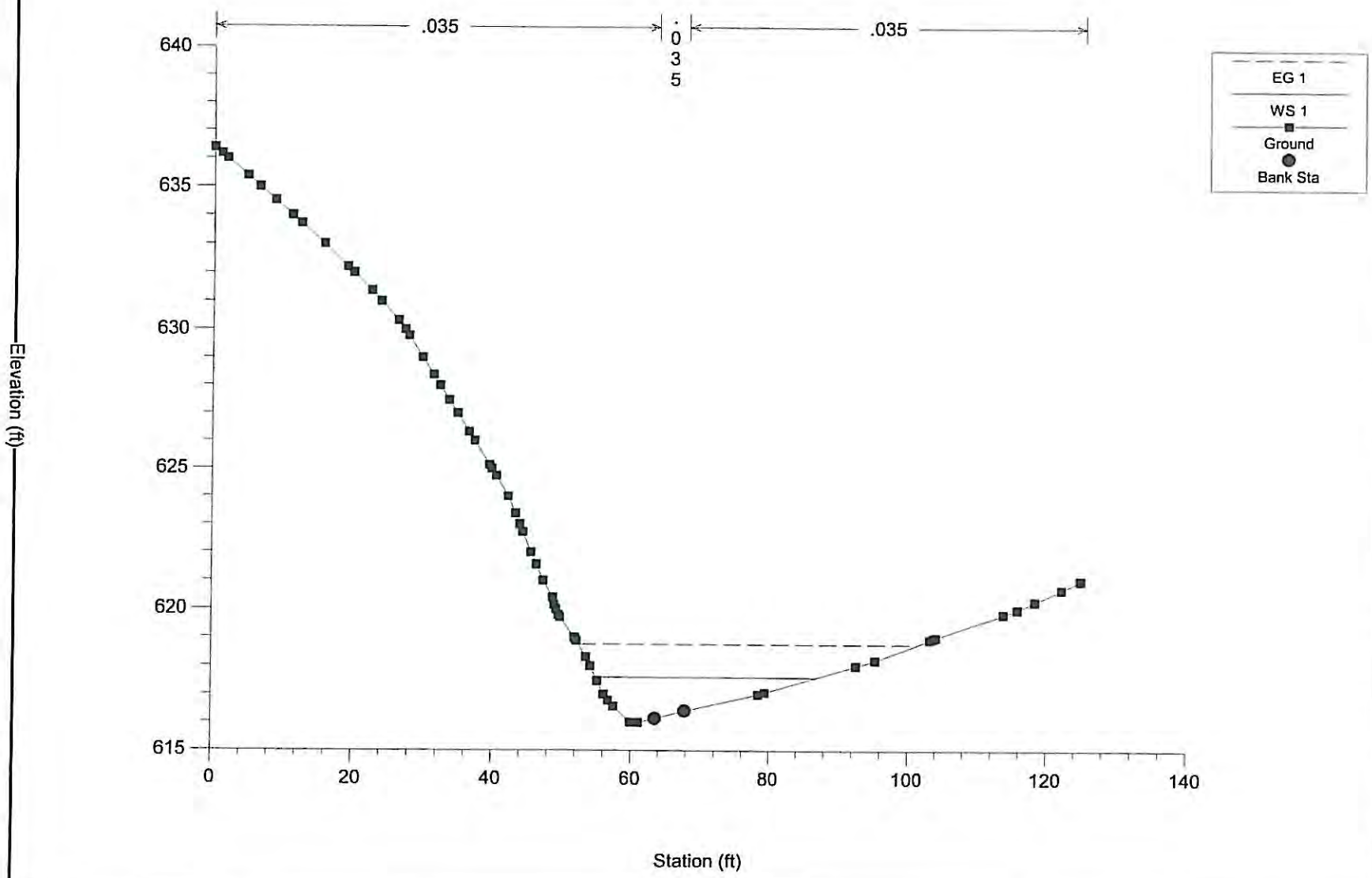

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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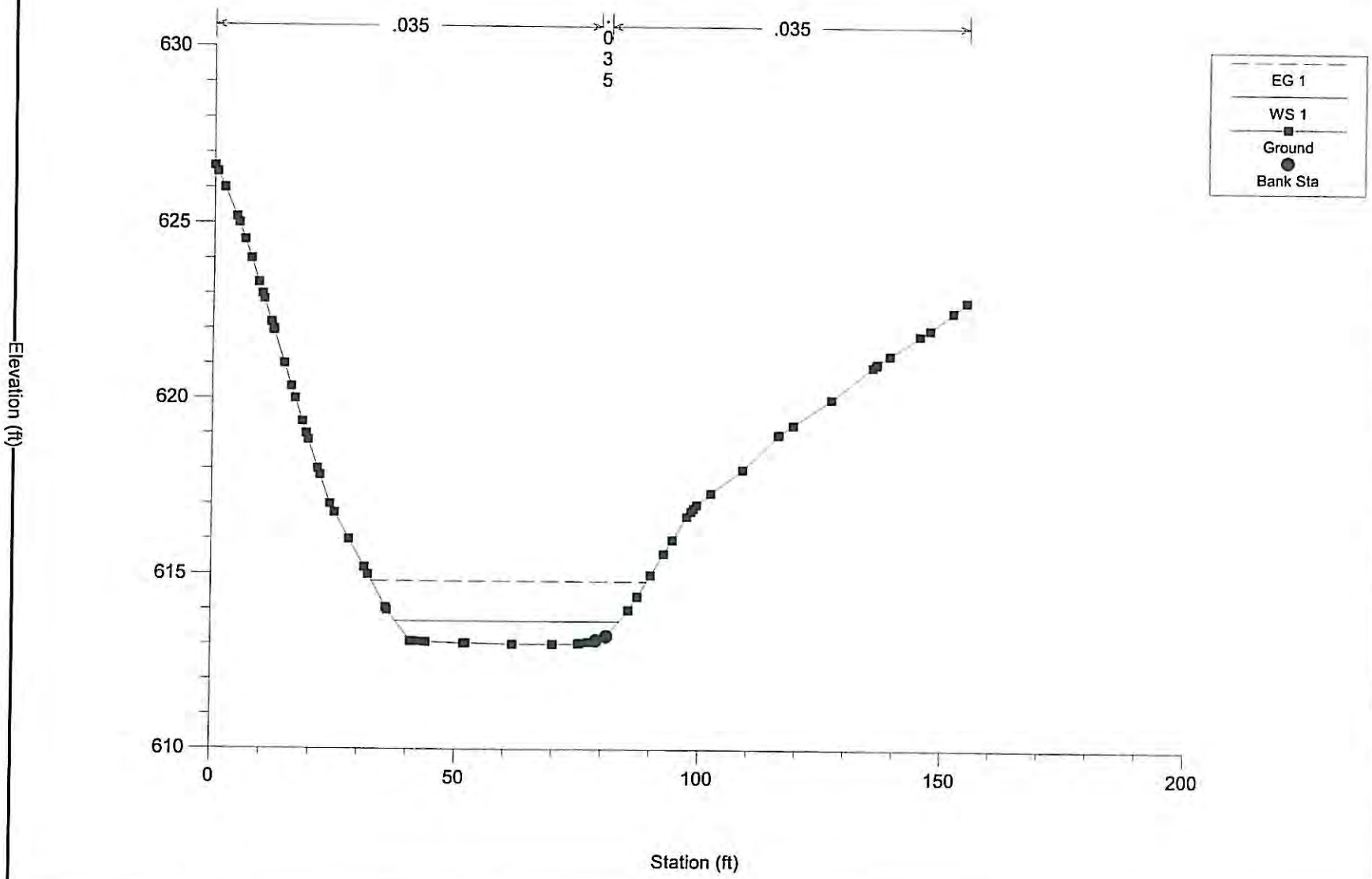

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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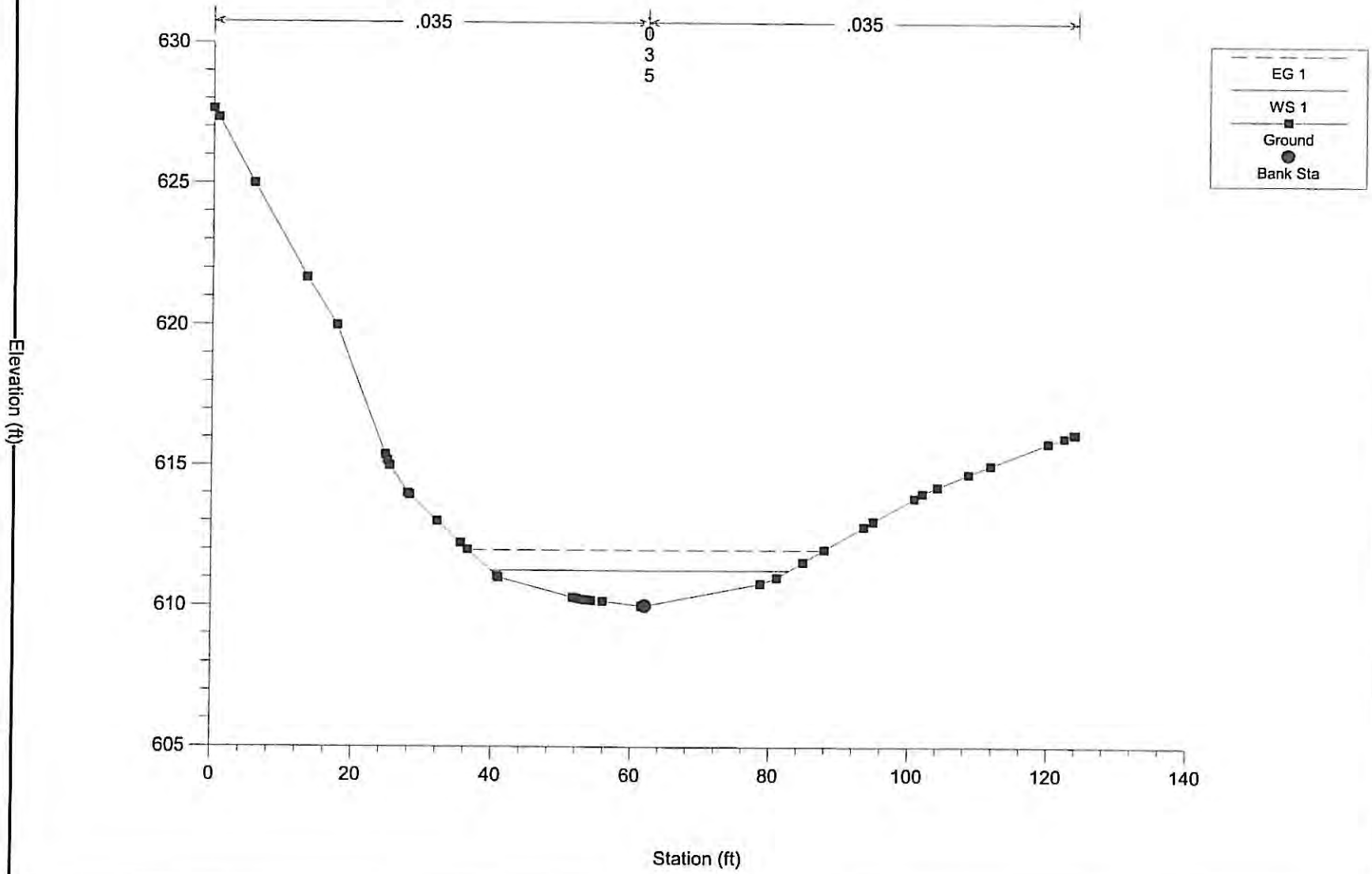

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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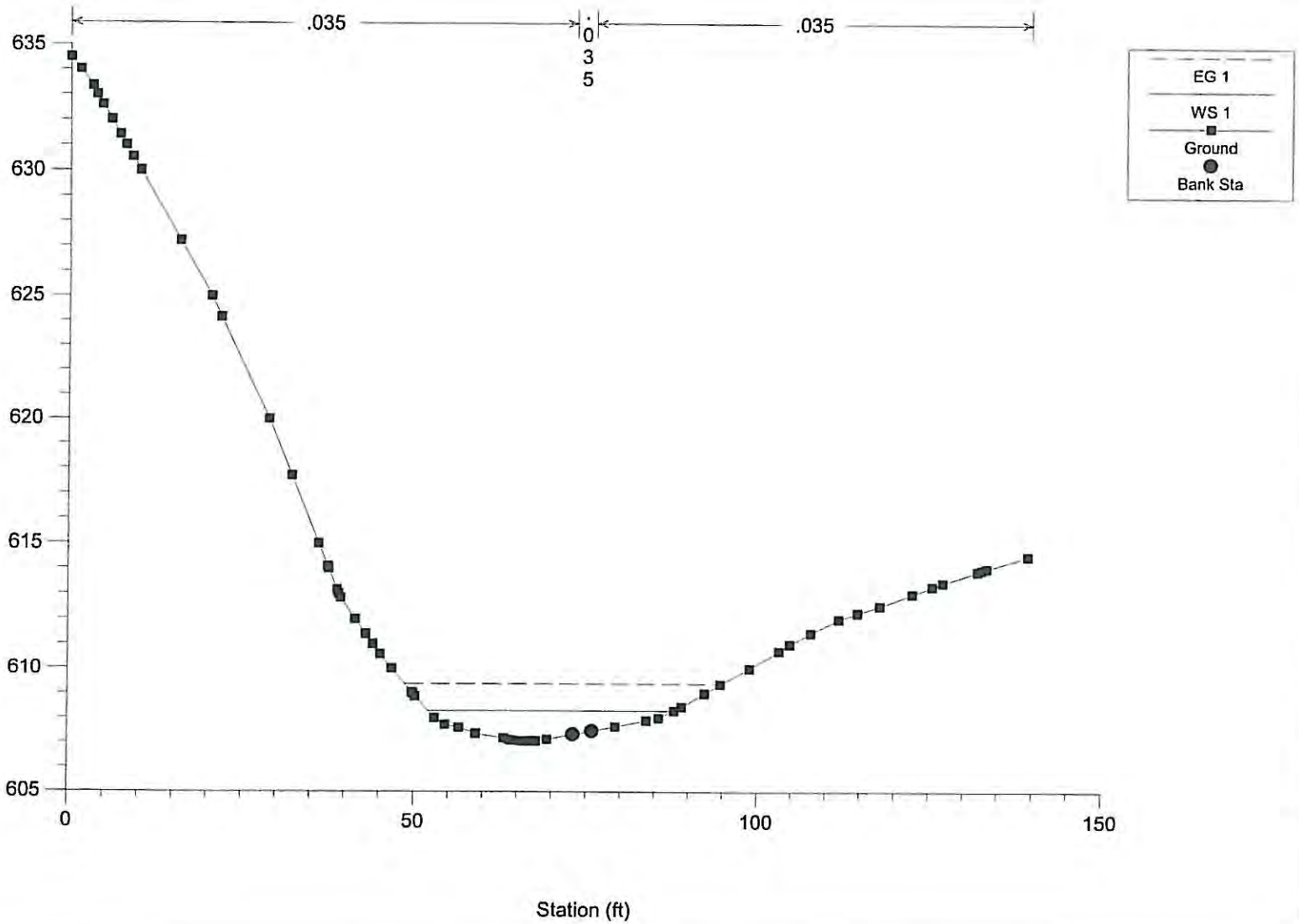

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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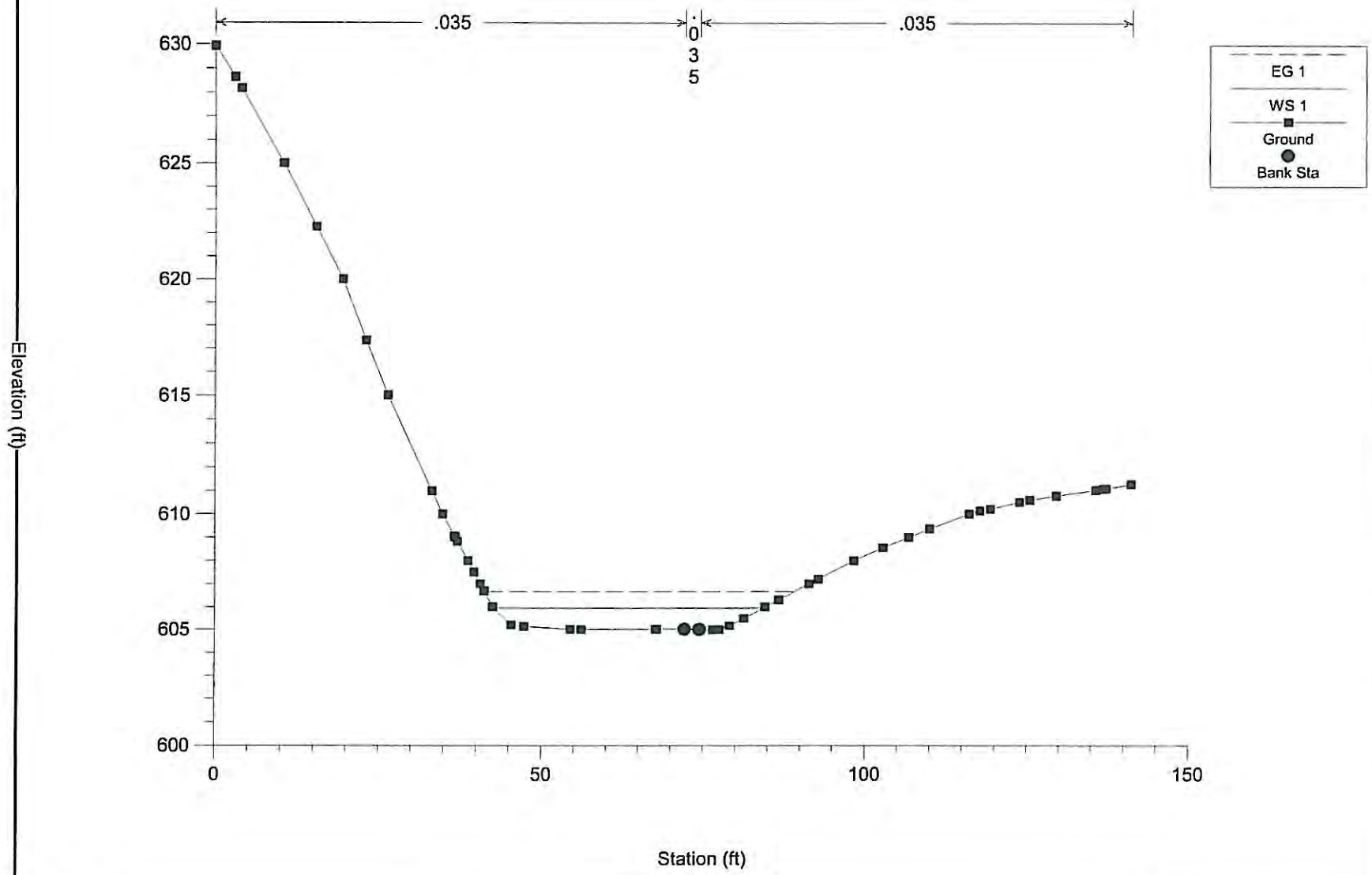

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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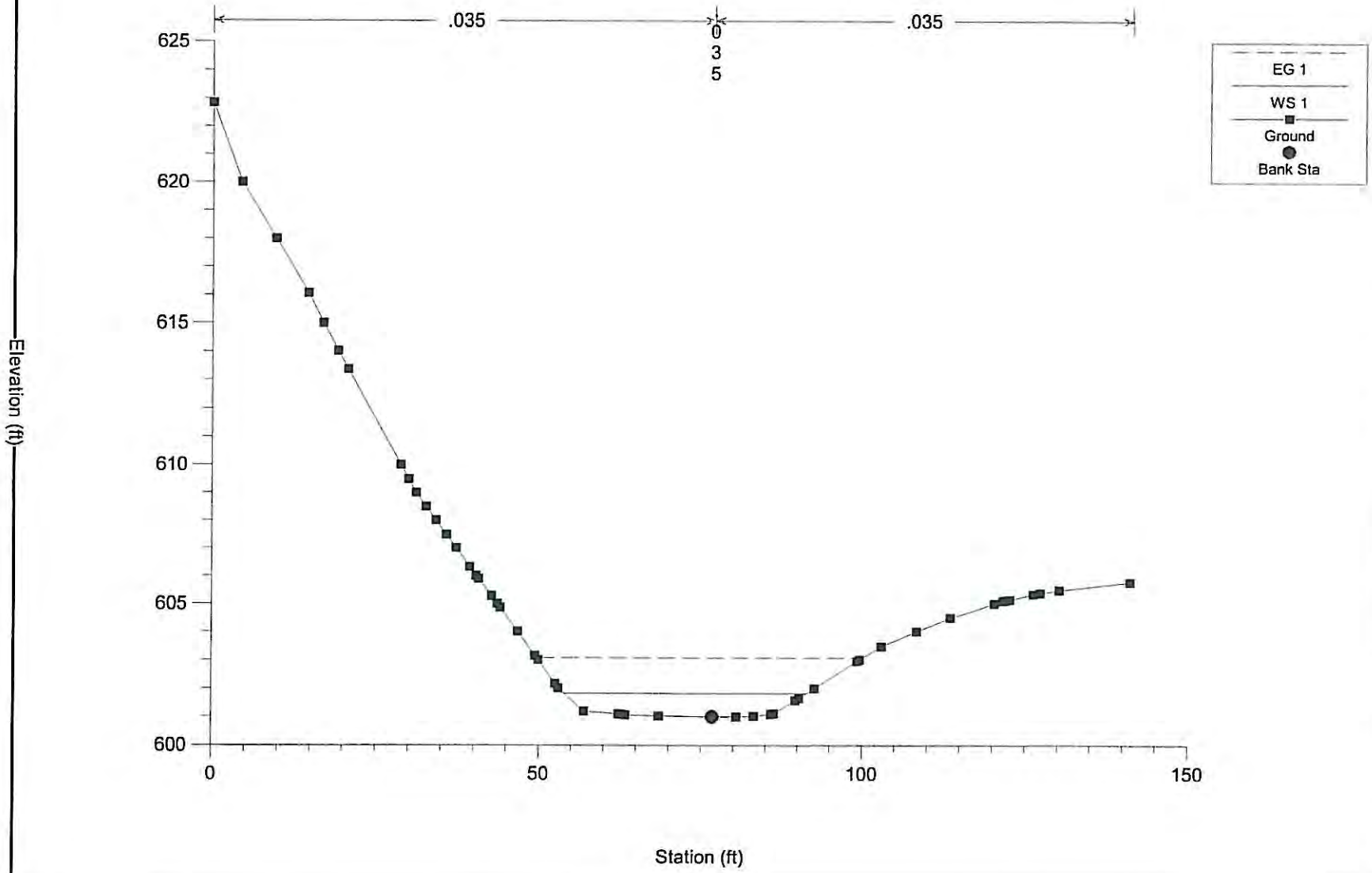

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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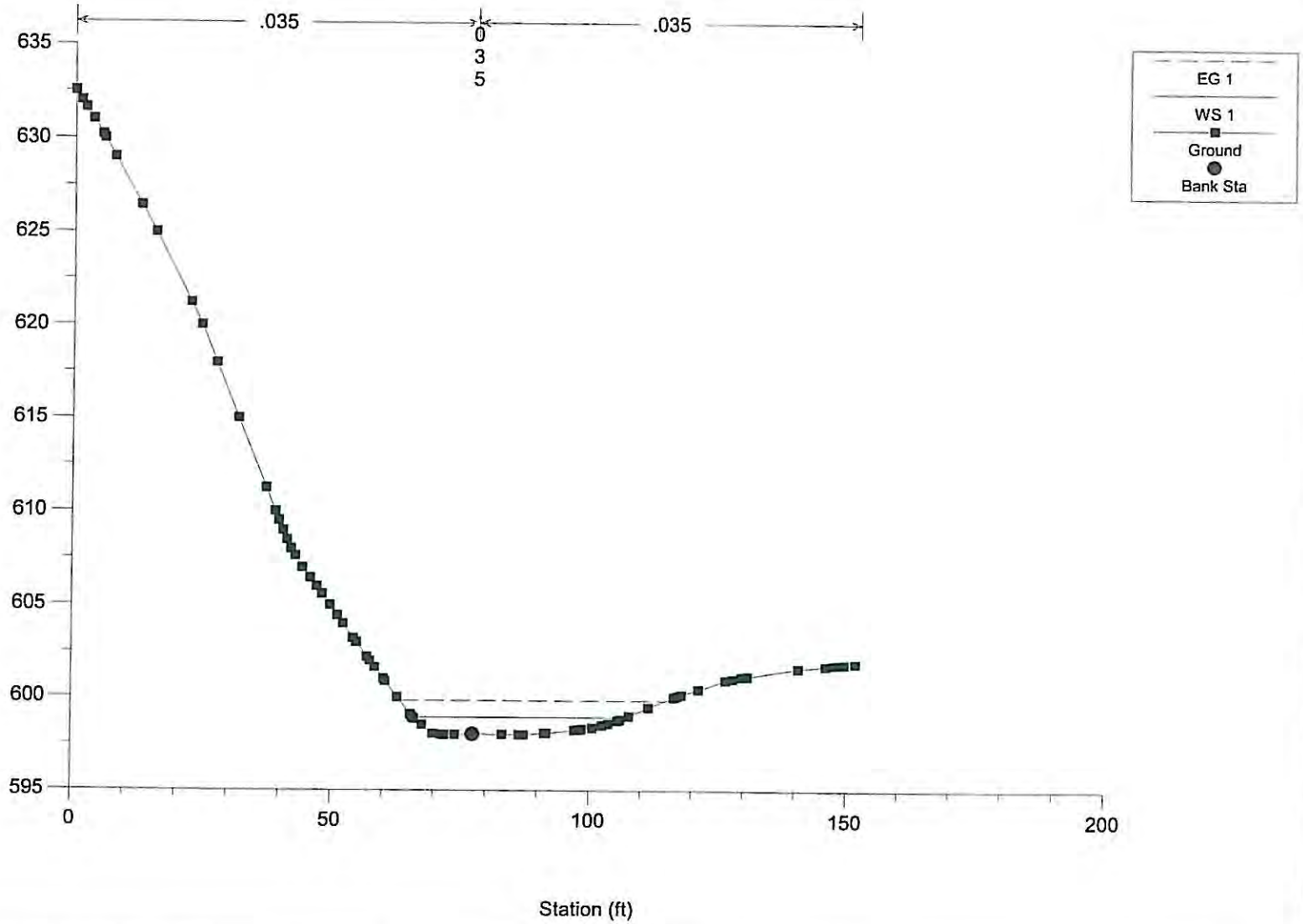

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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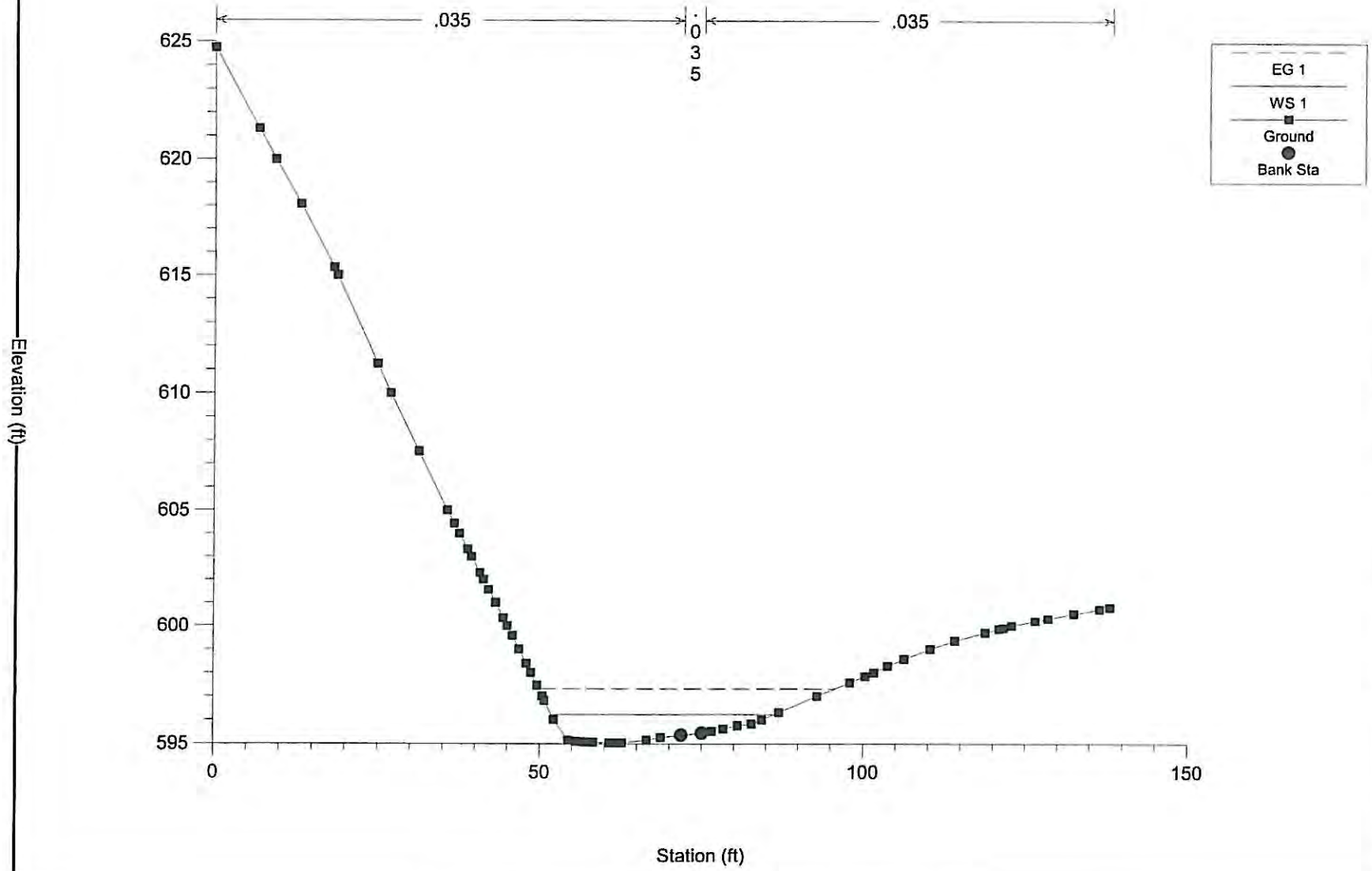

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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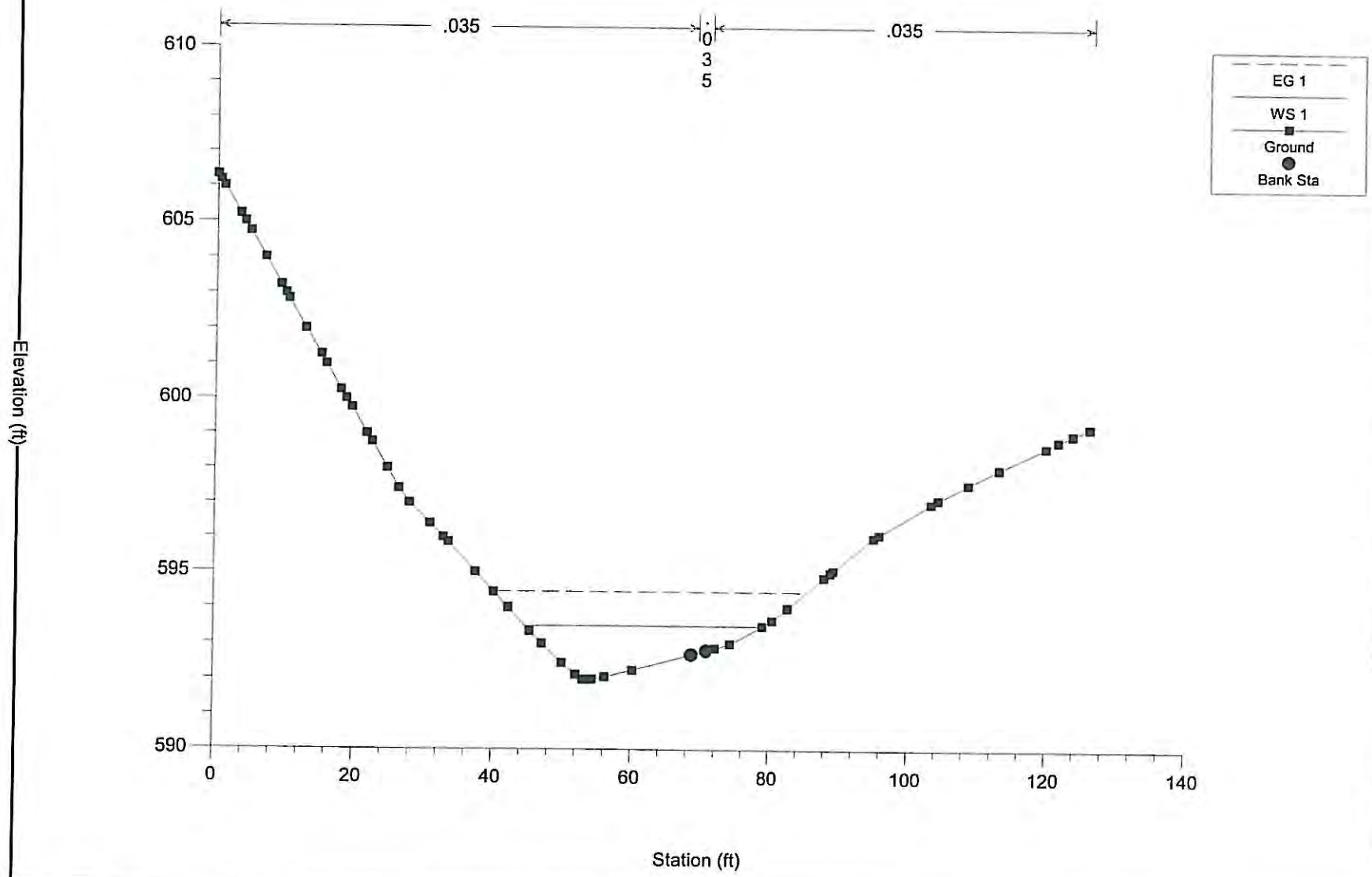

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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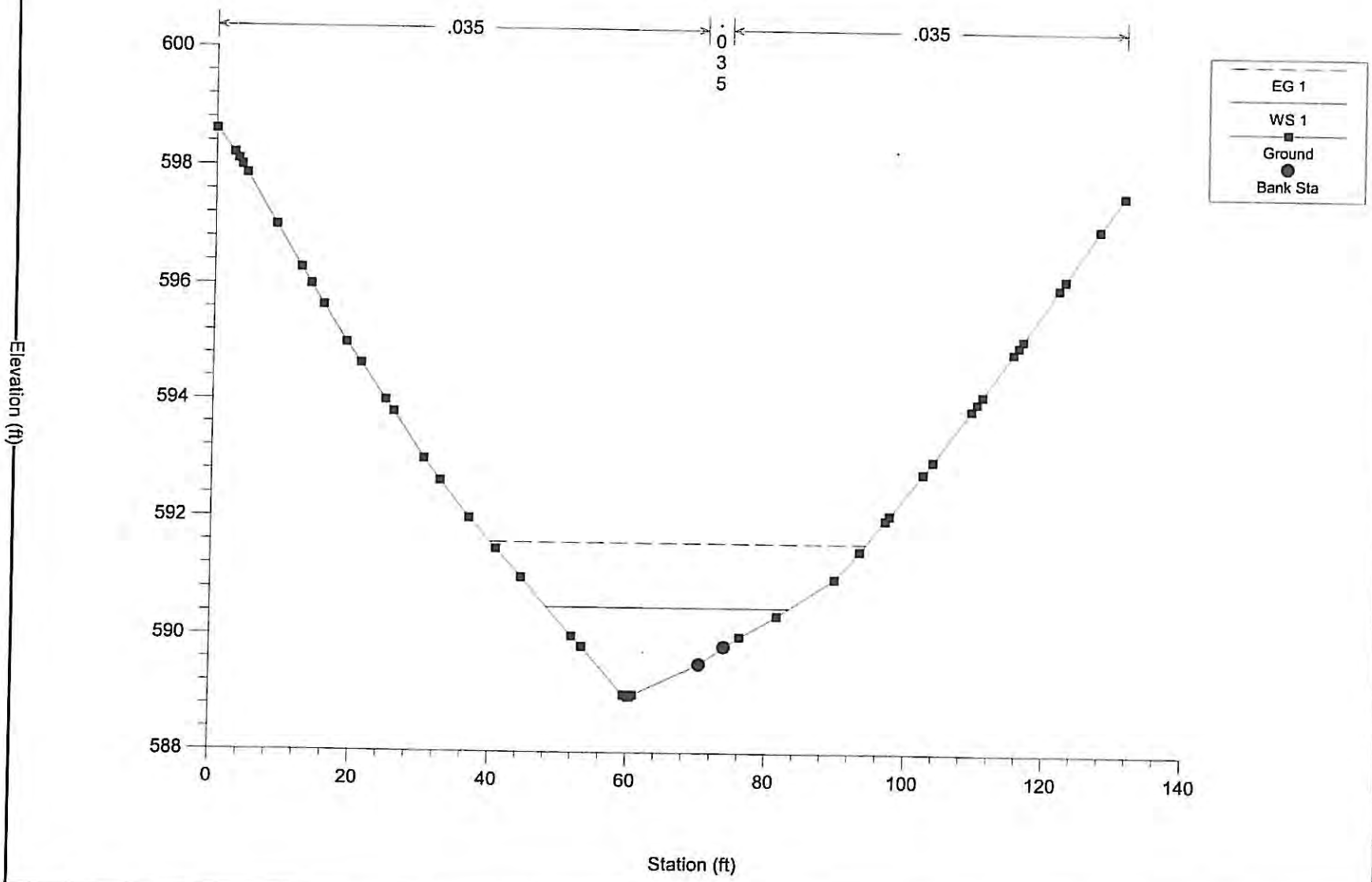

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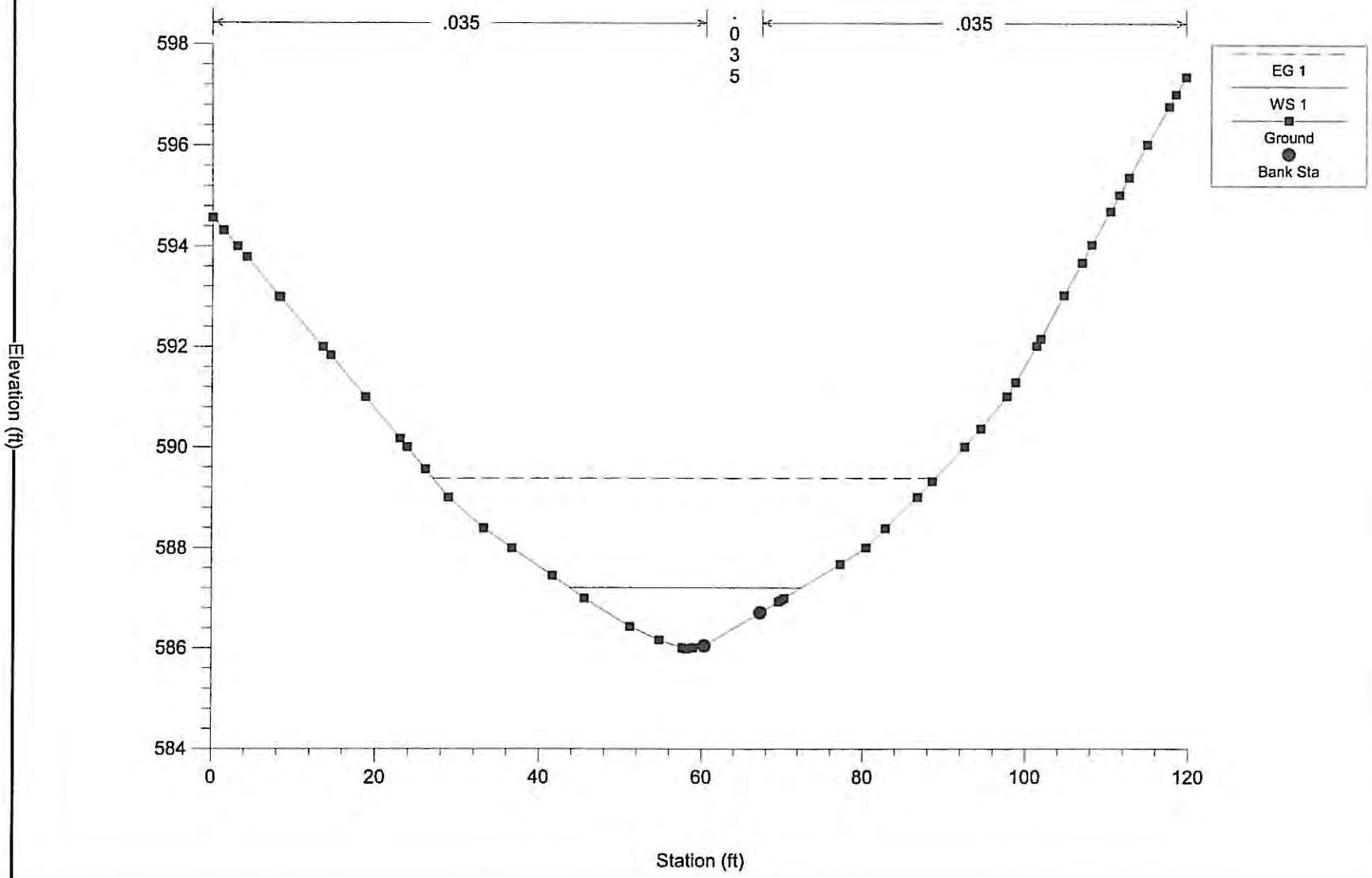

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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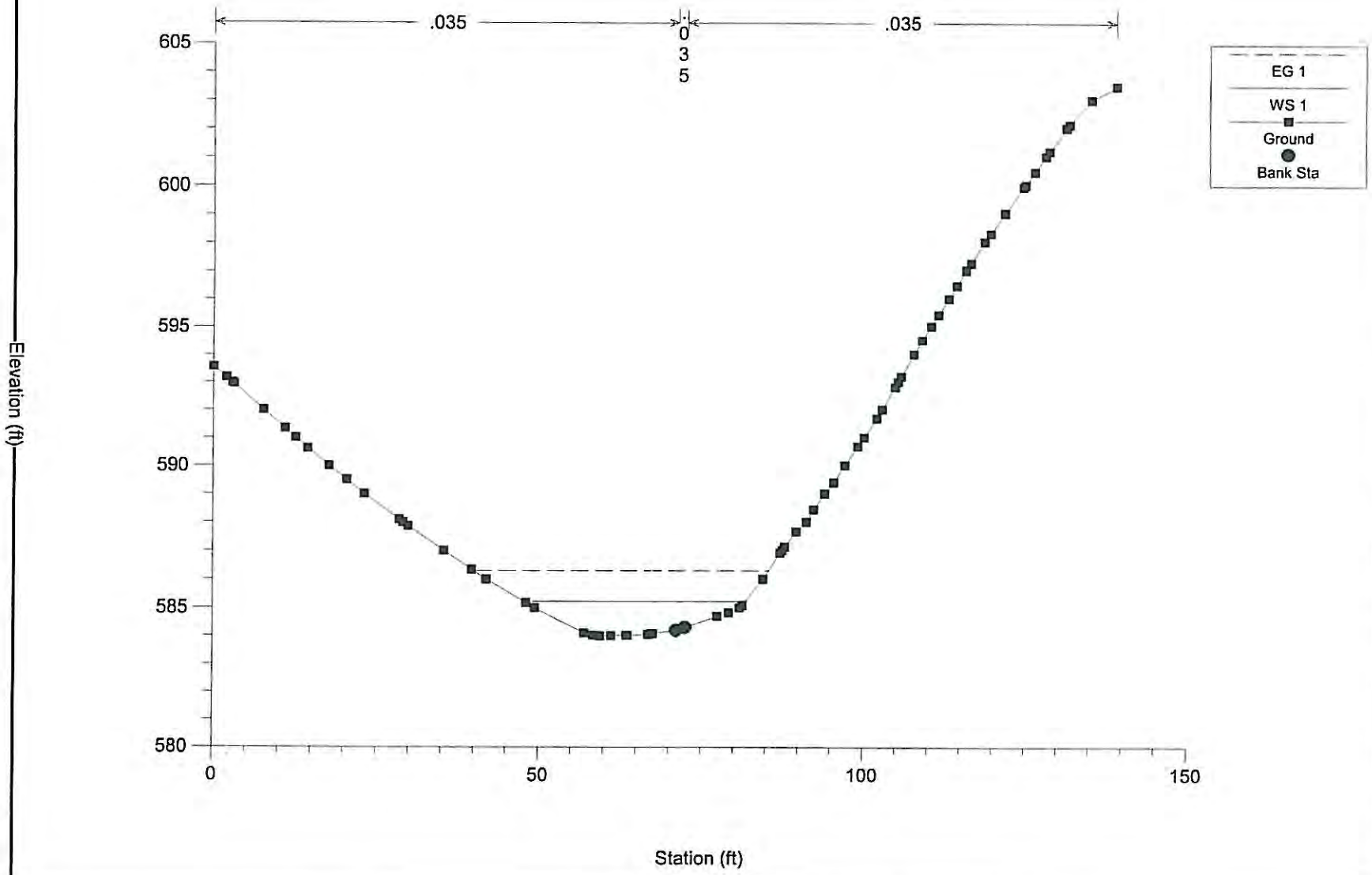

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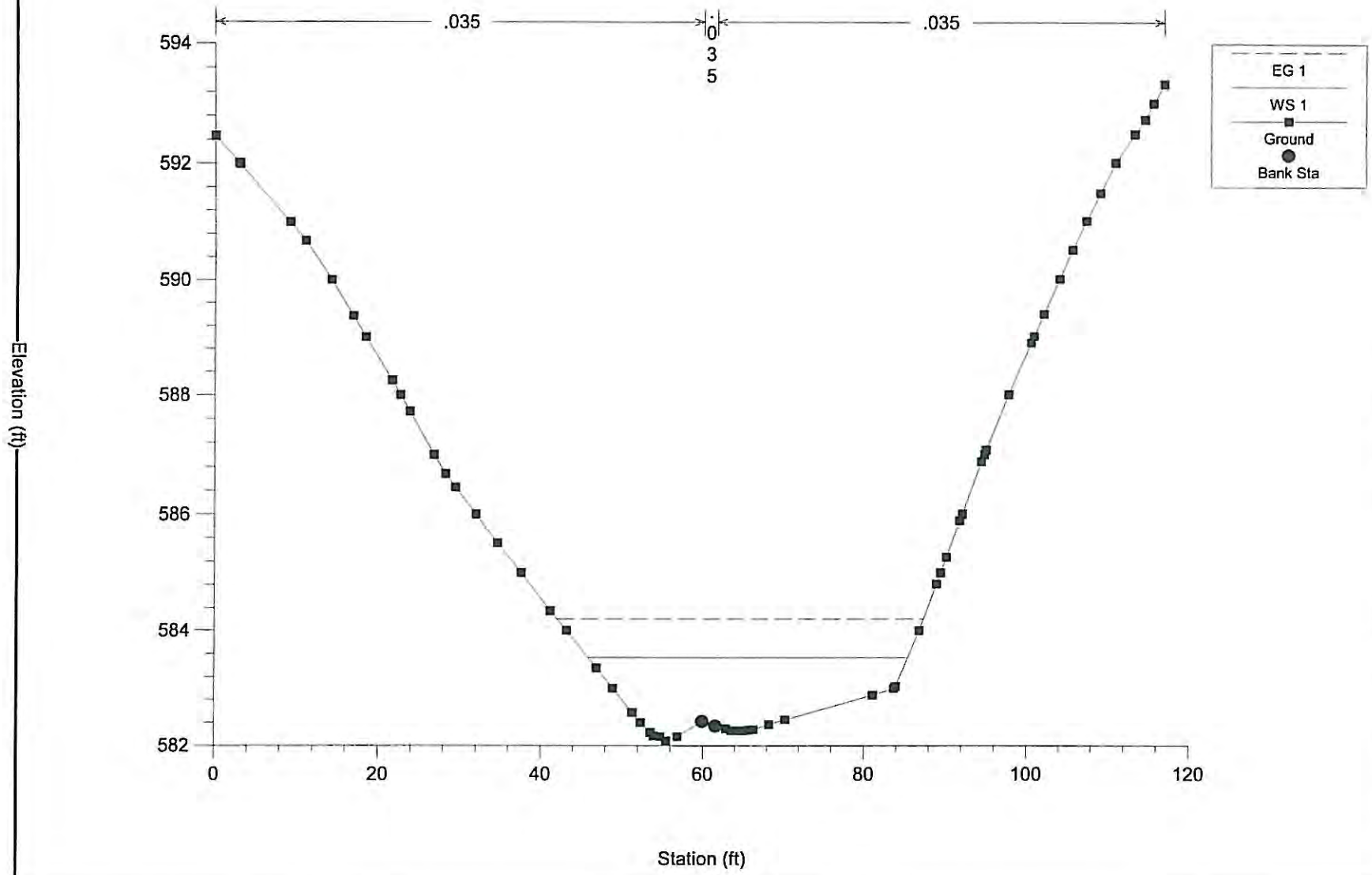

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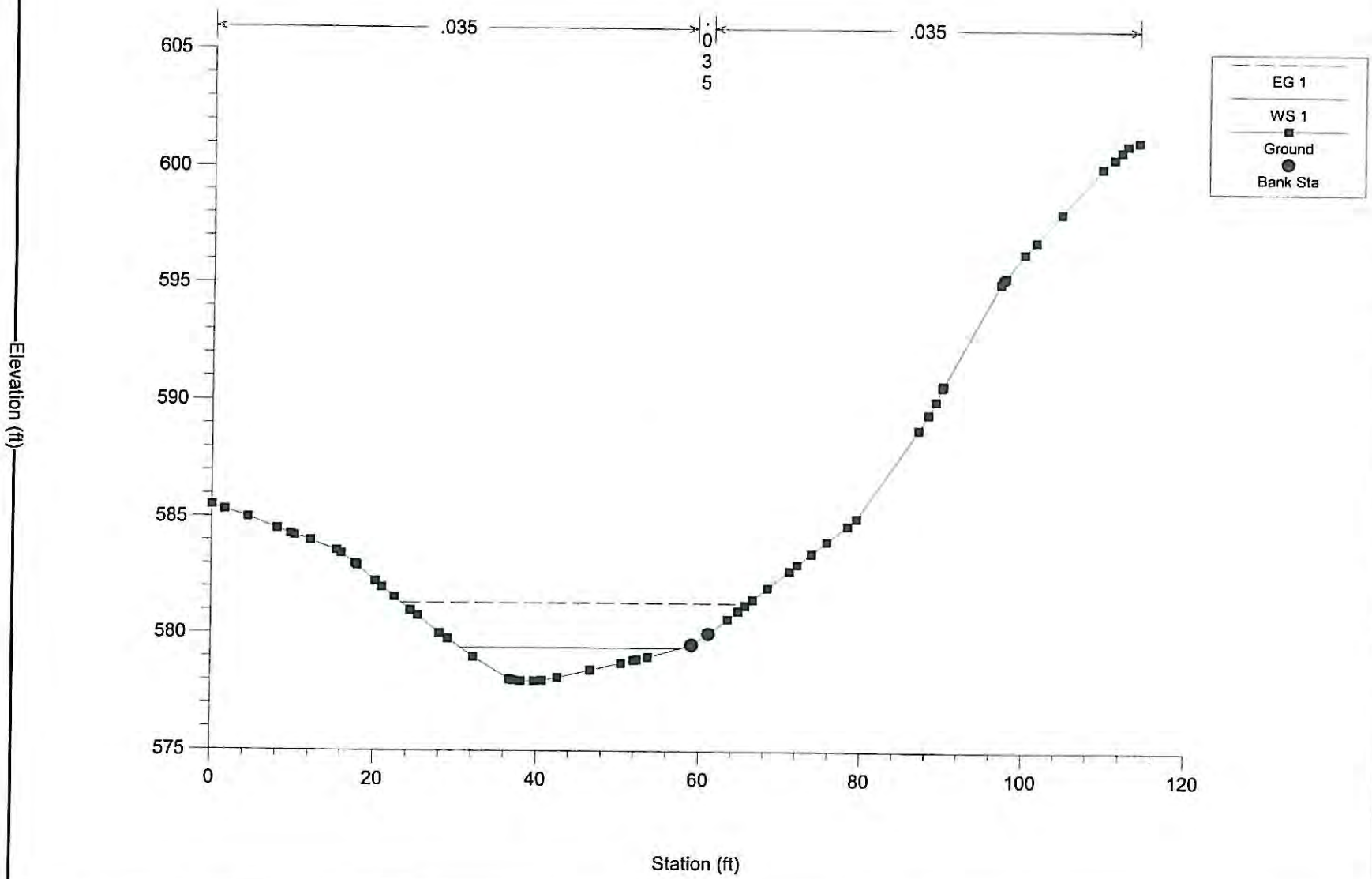

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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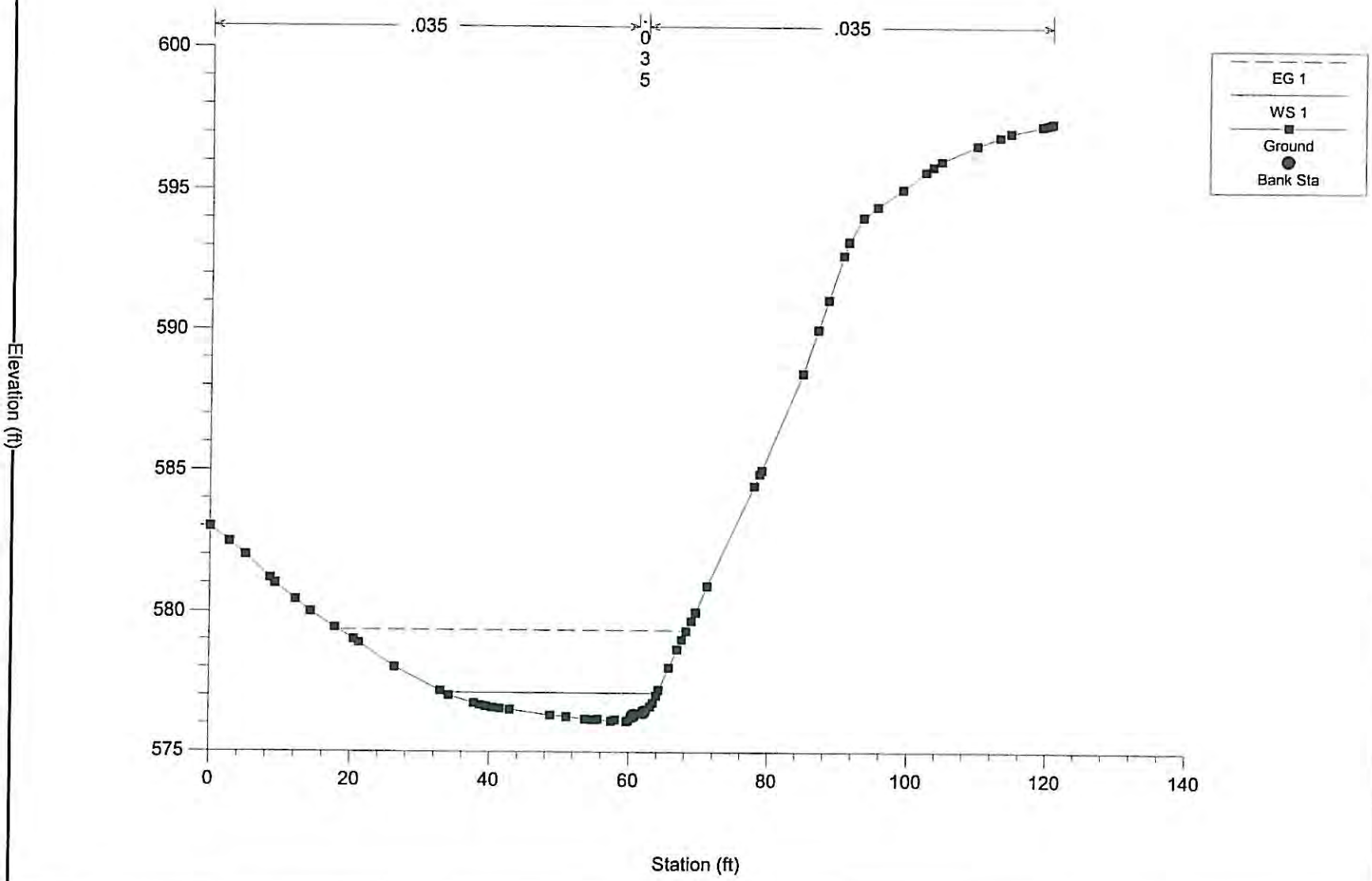

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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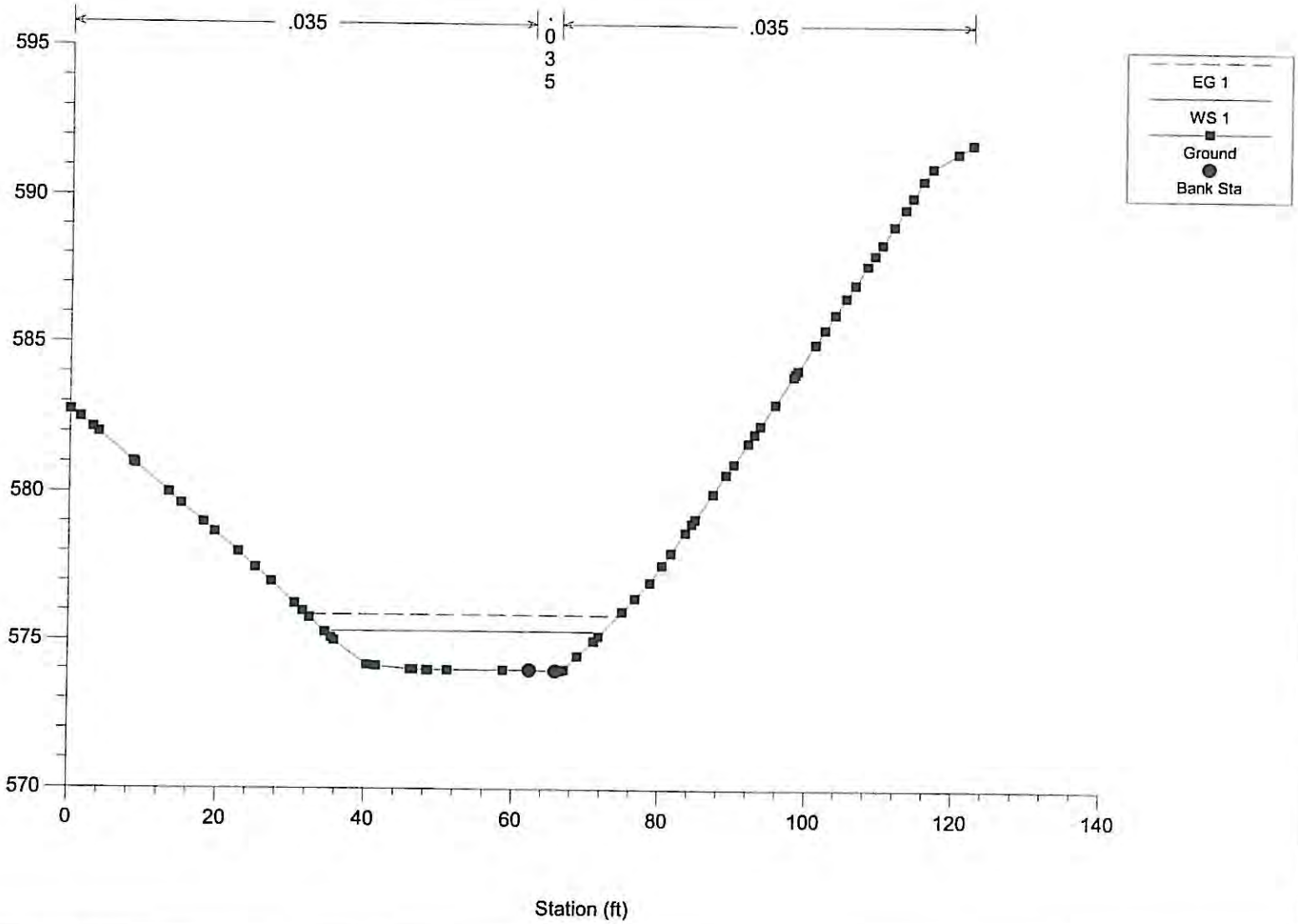

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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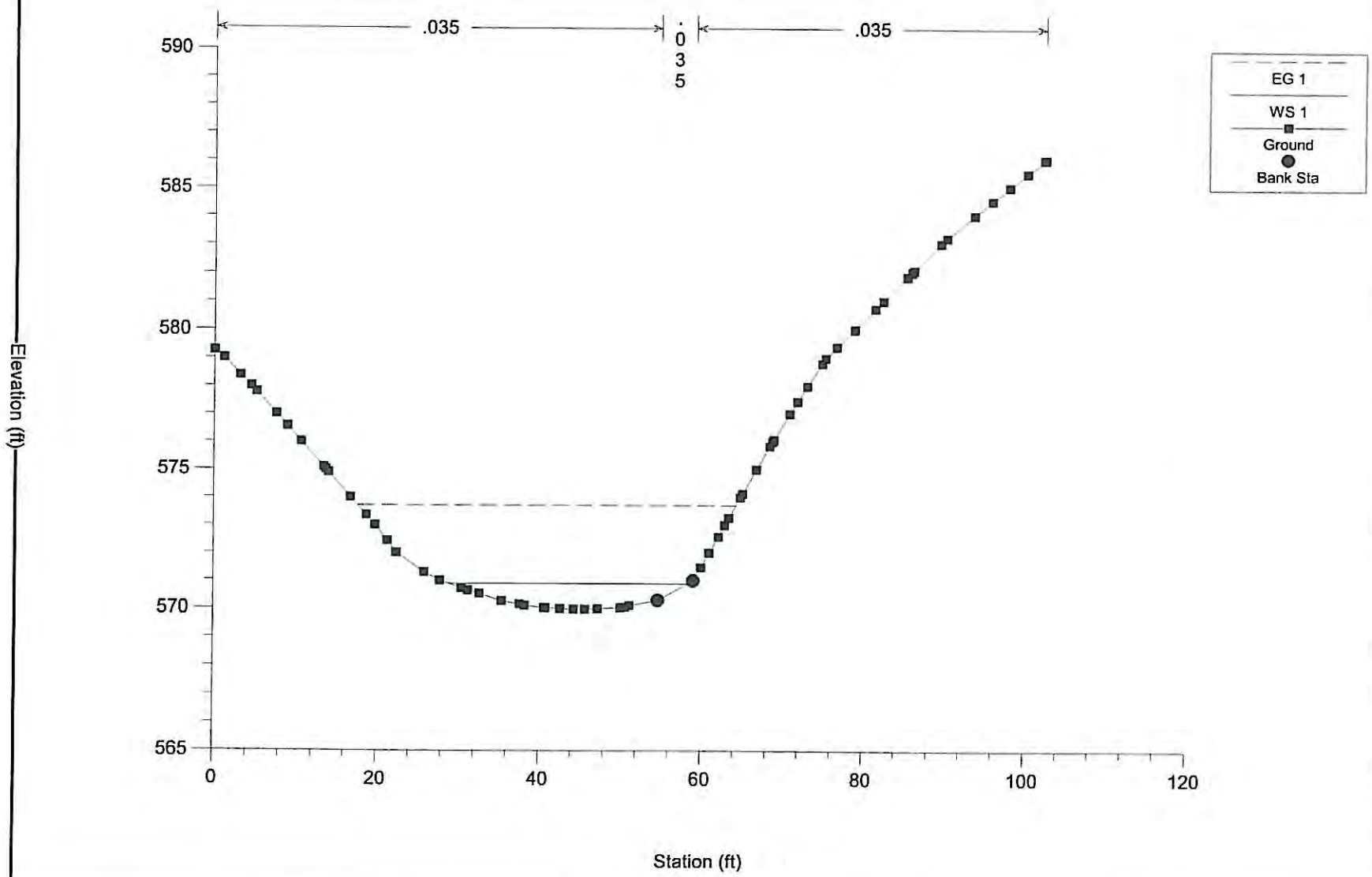

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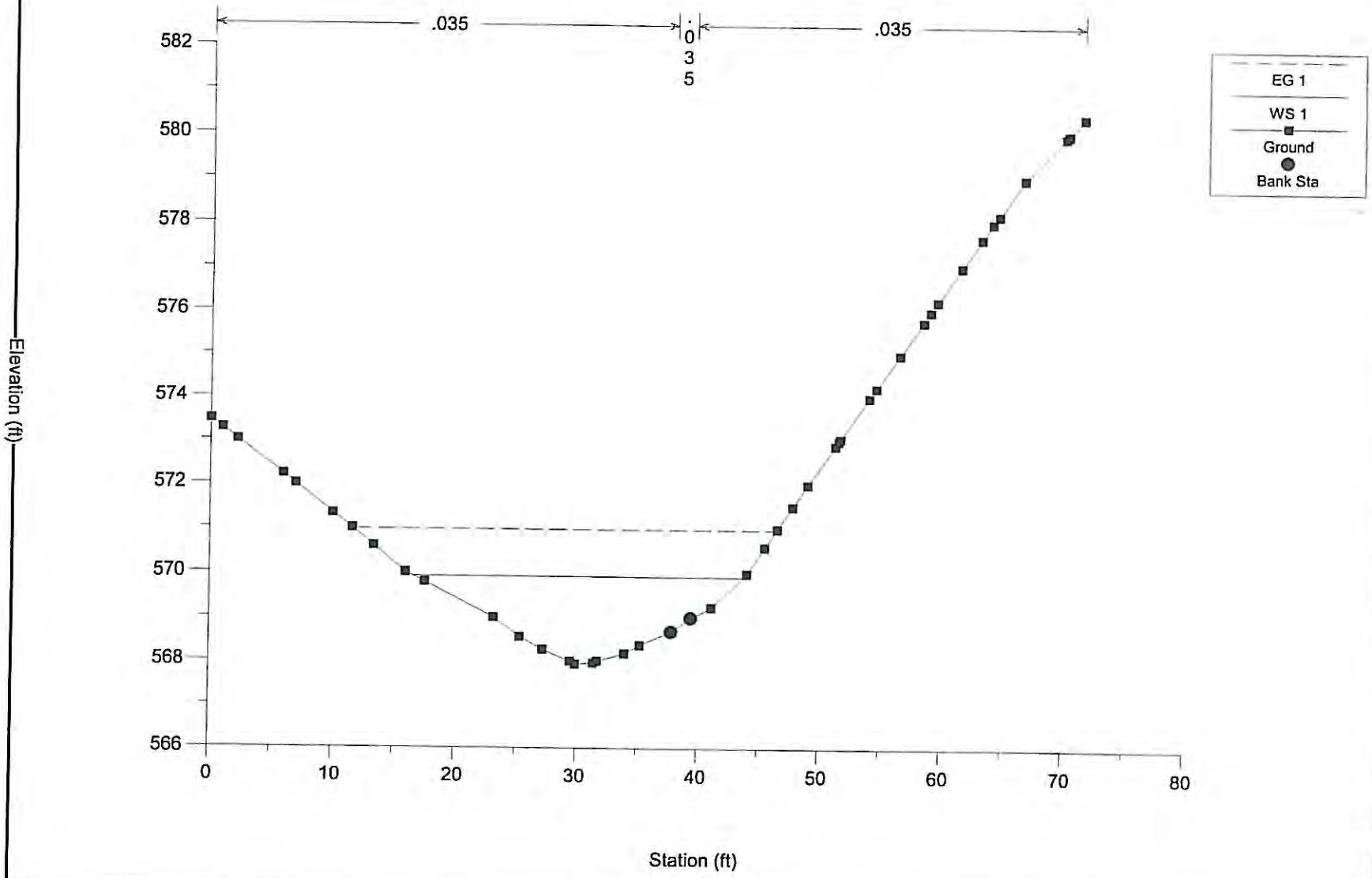

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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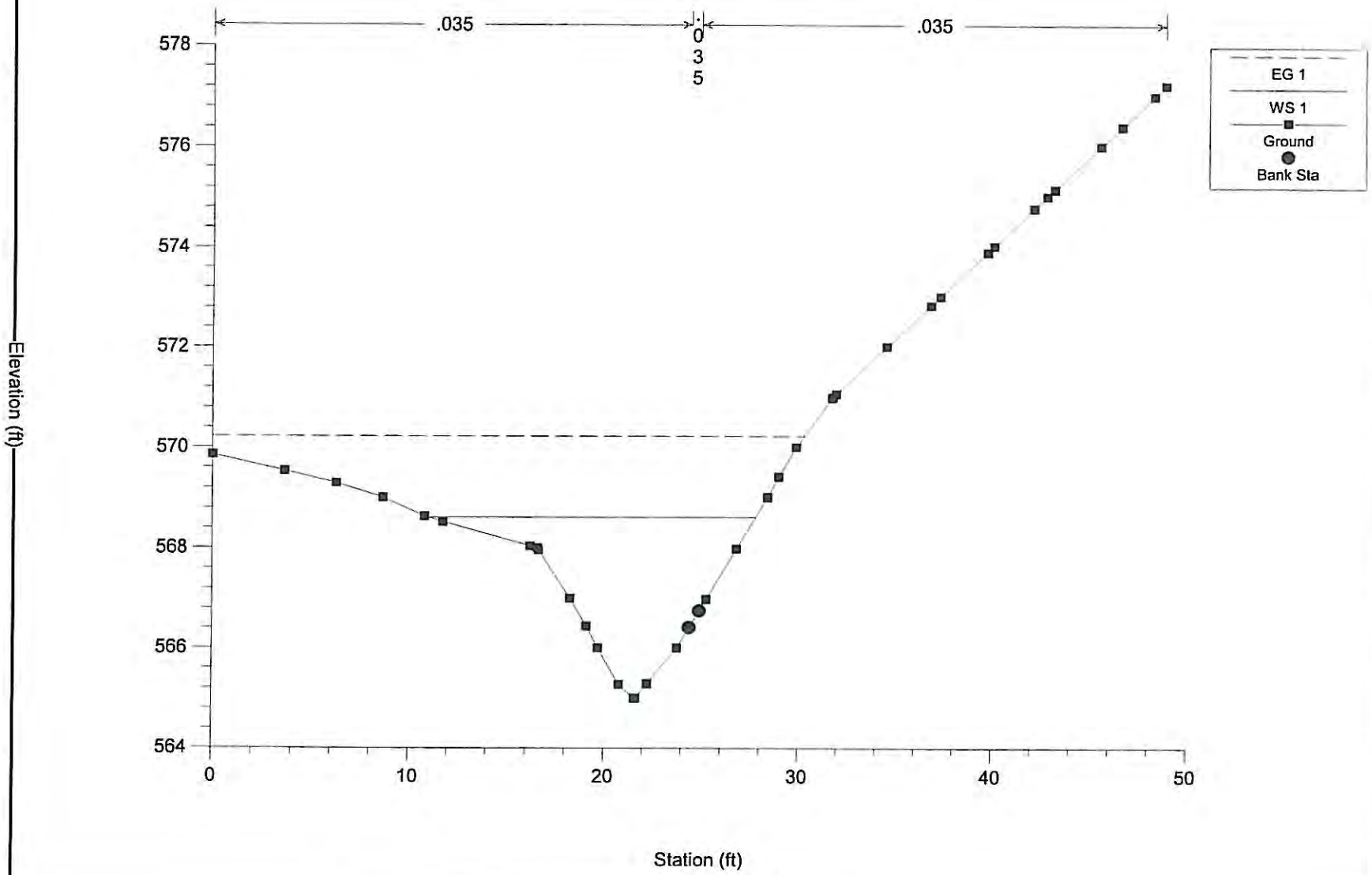

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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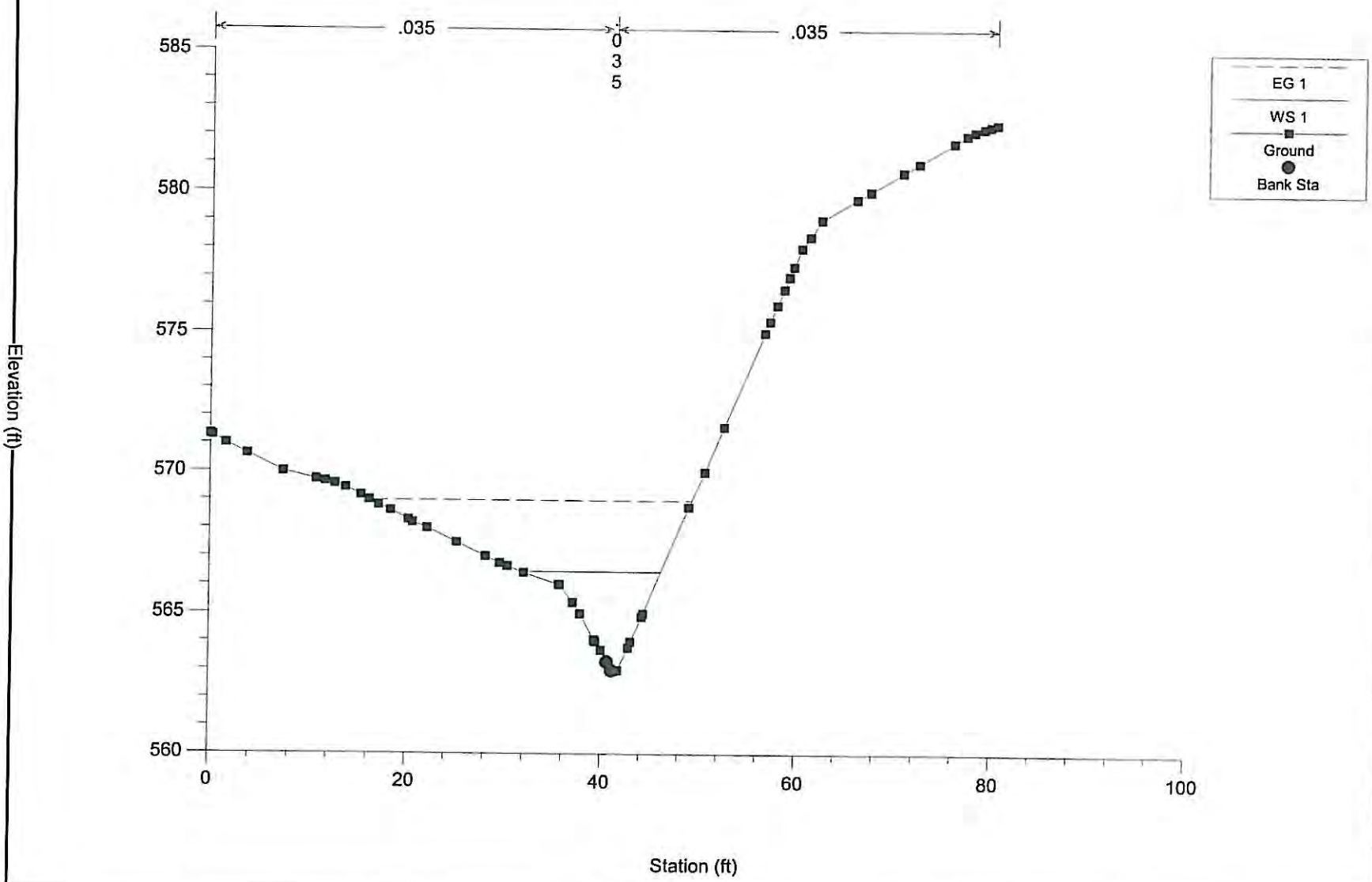

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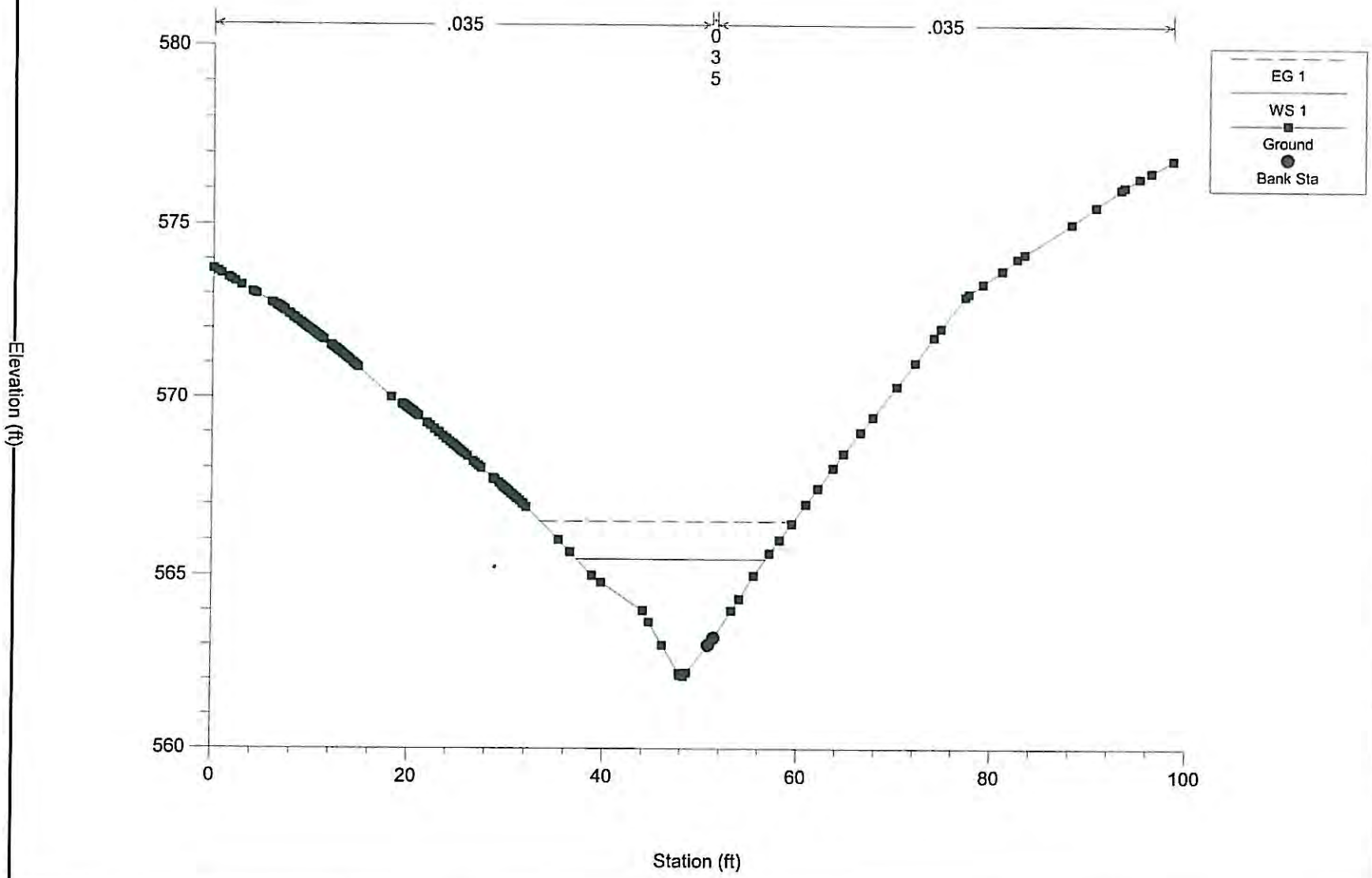

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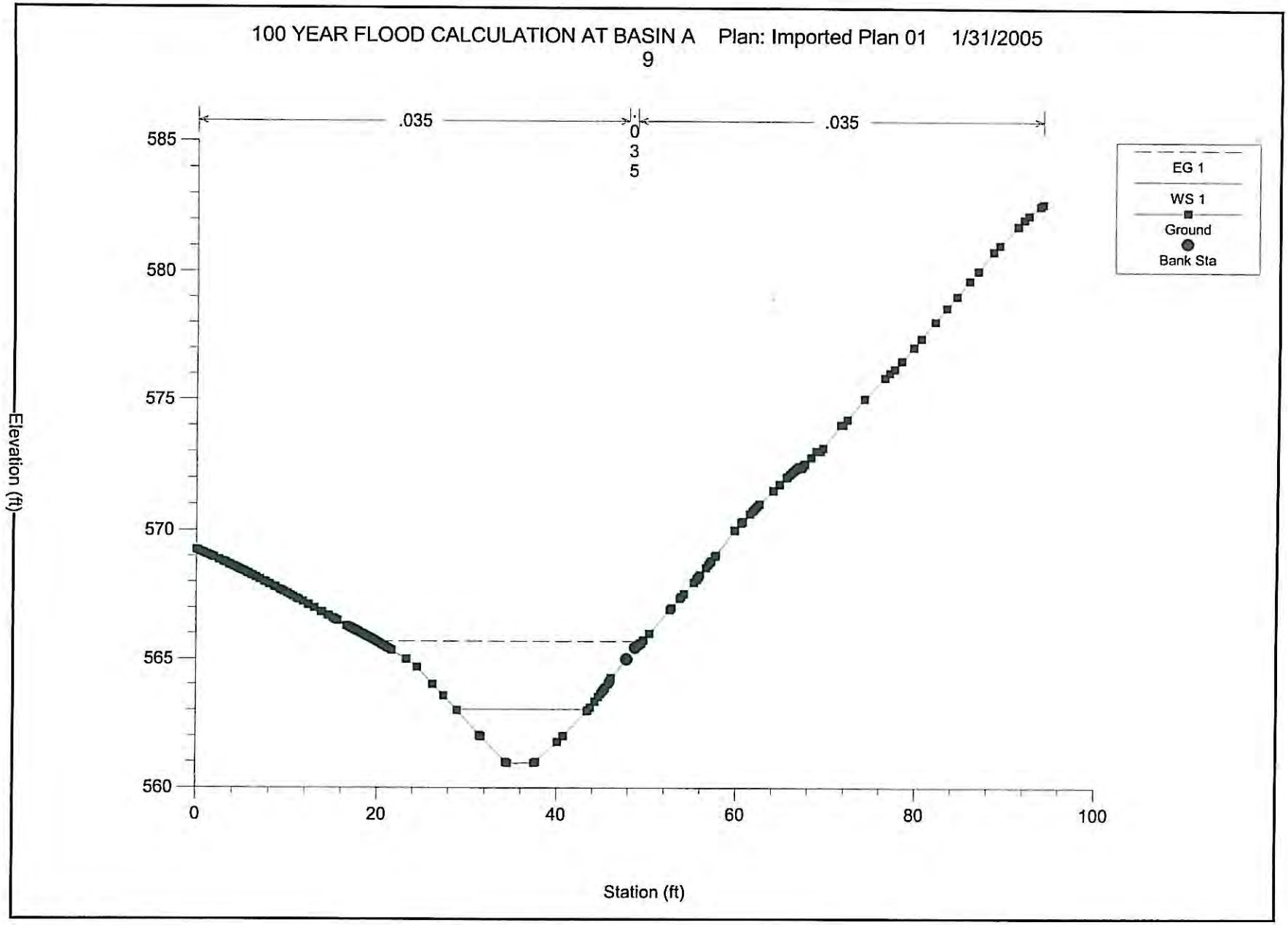
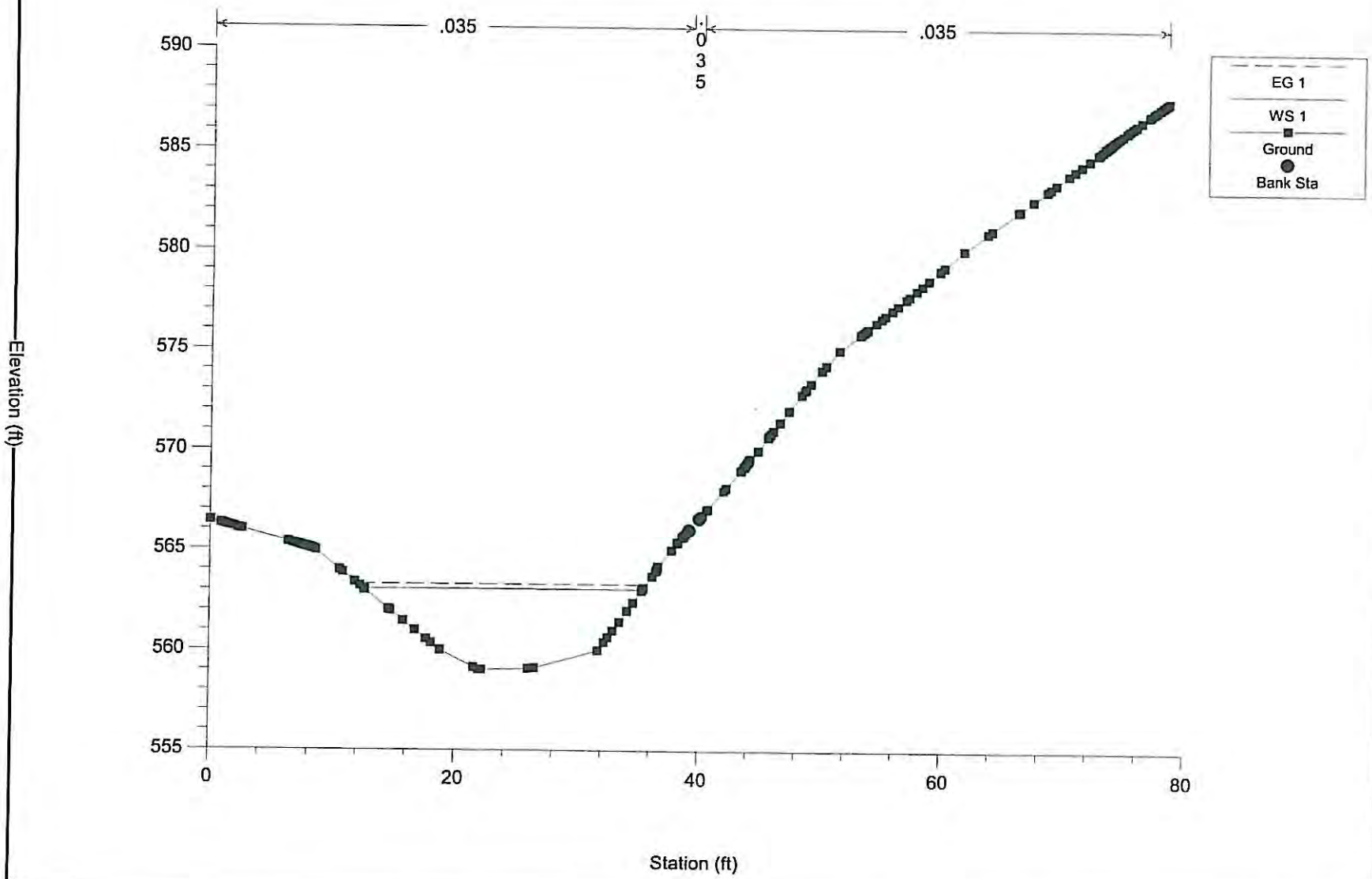


100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005



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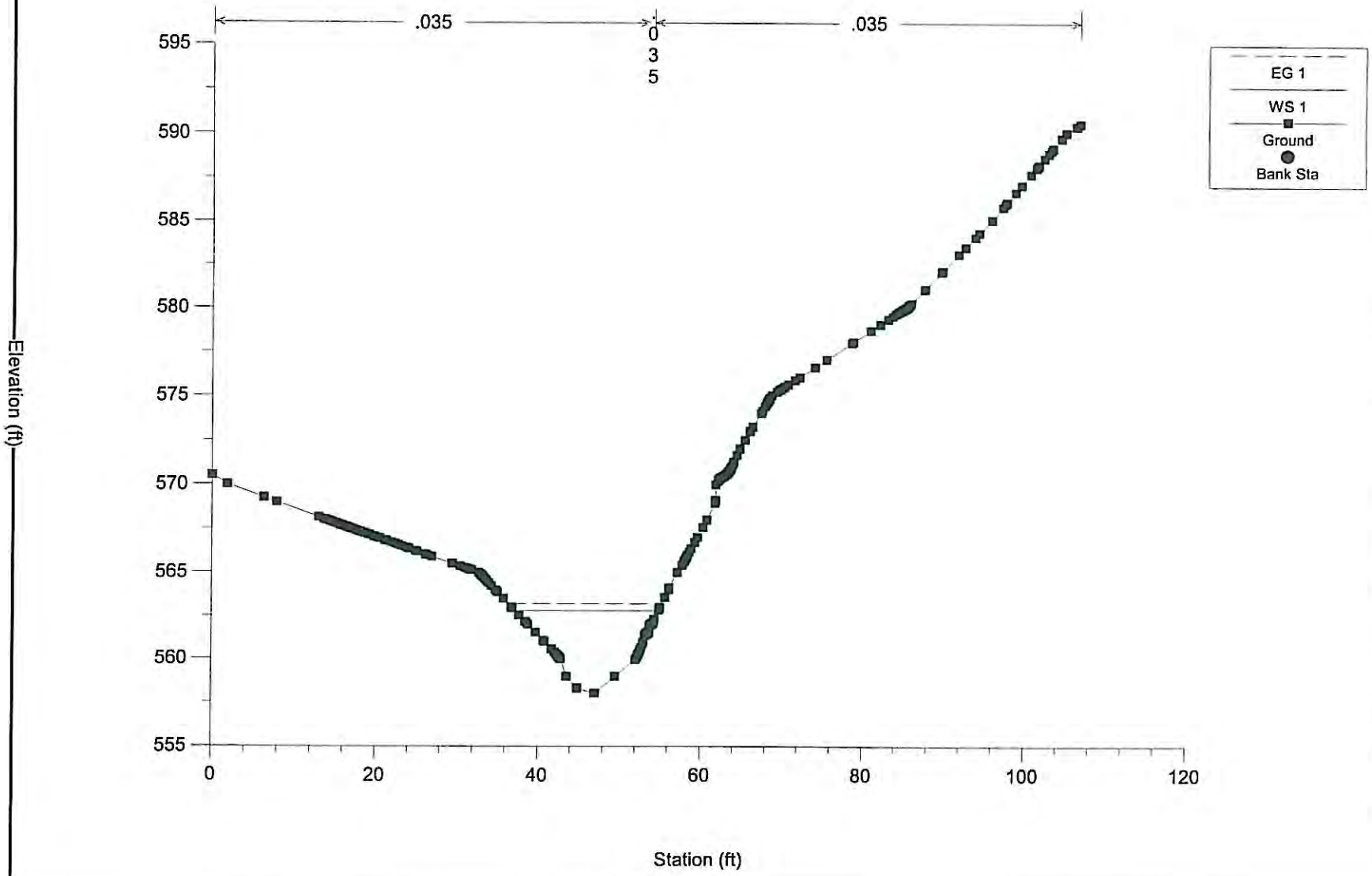

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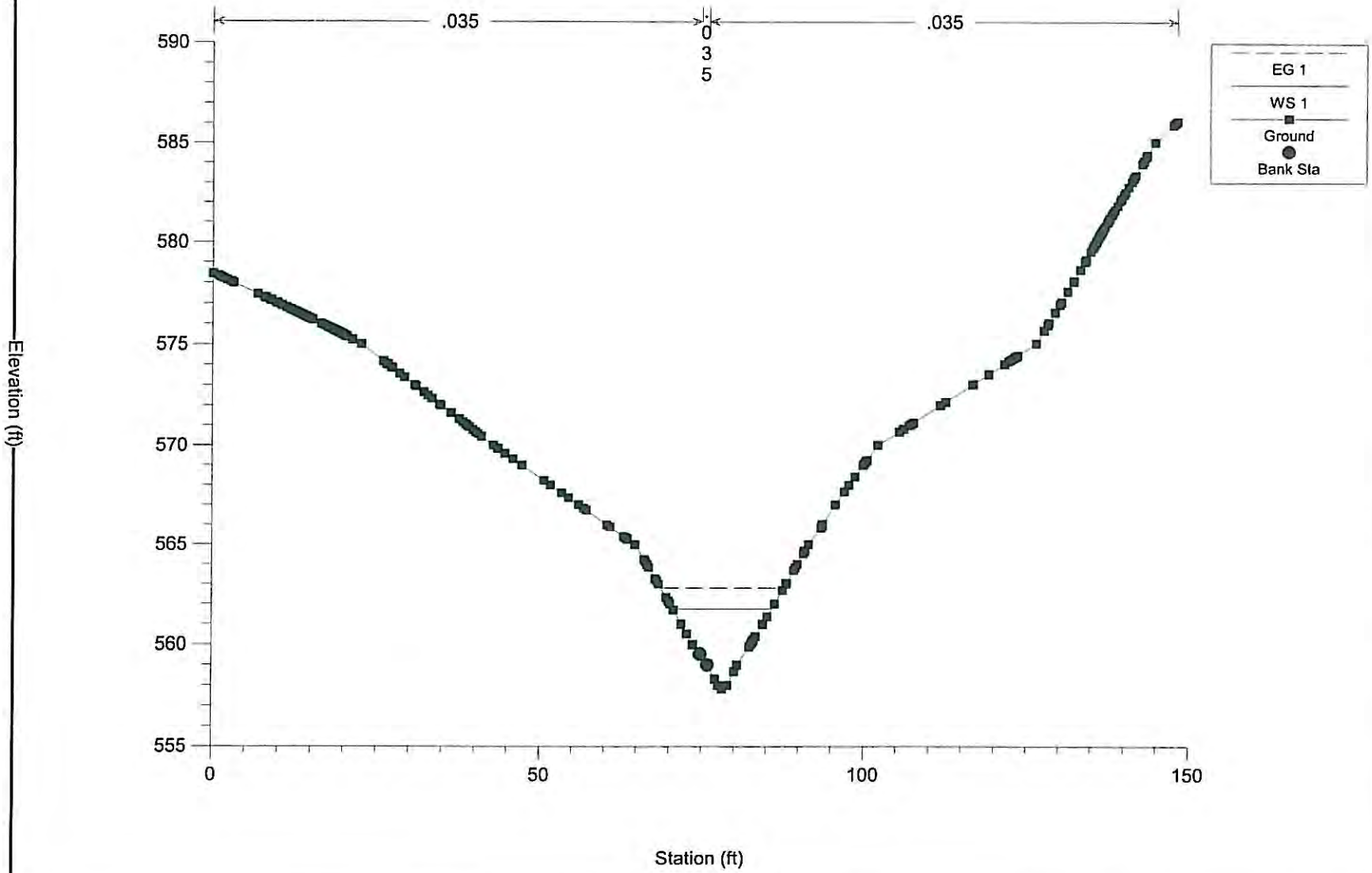

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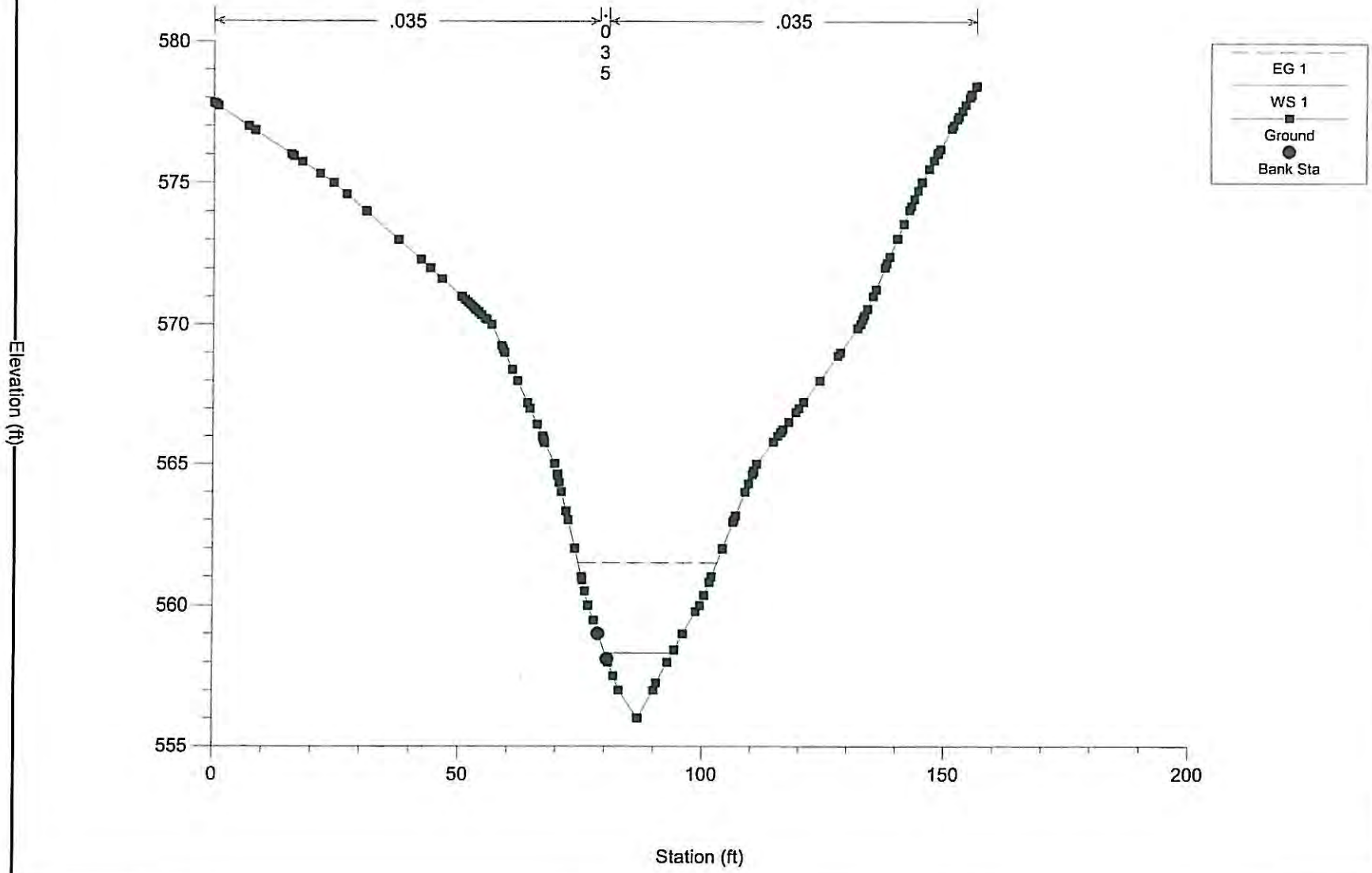

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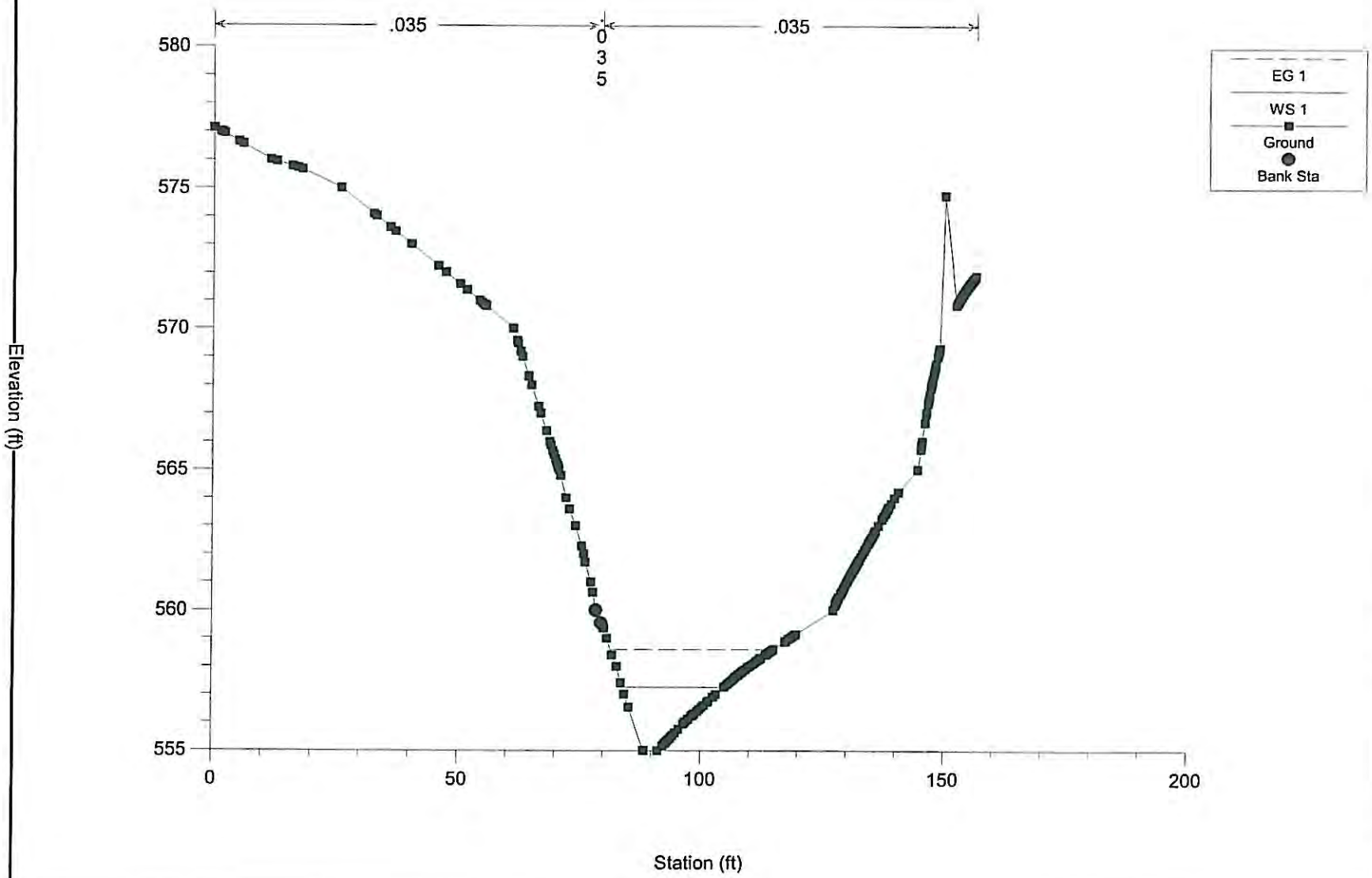

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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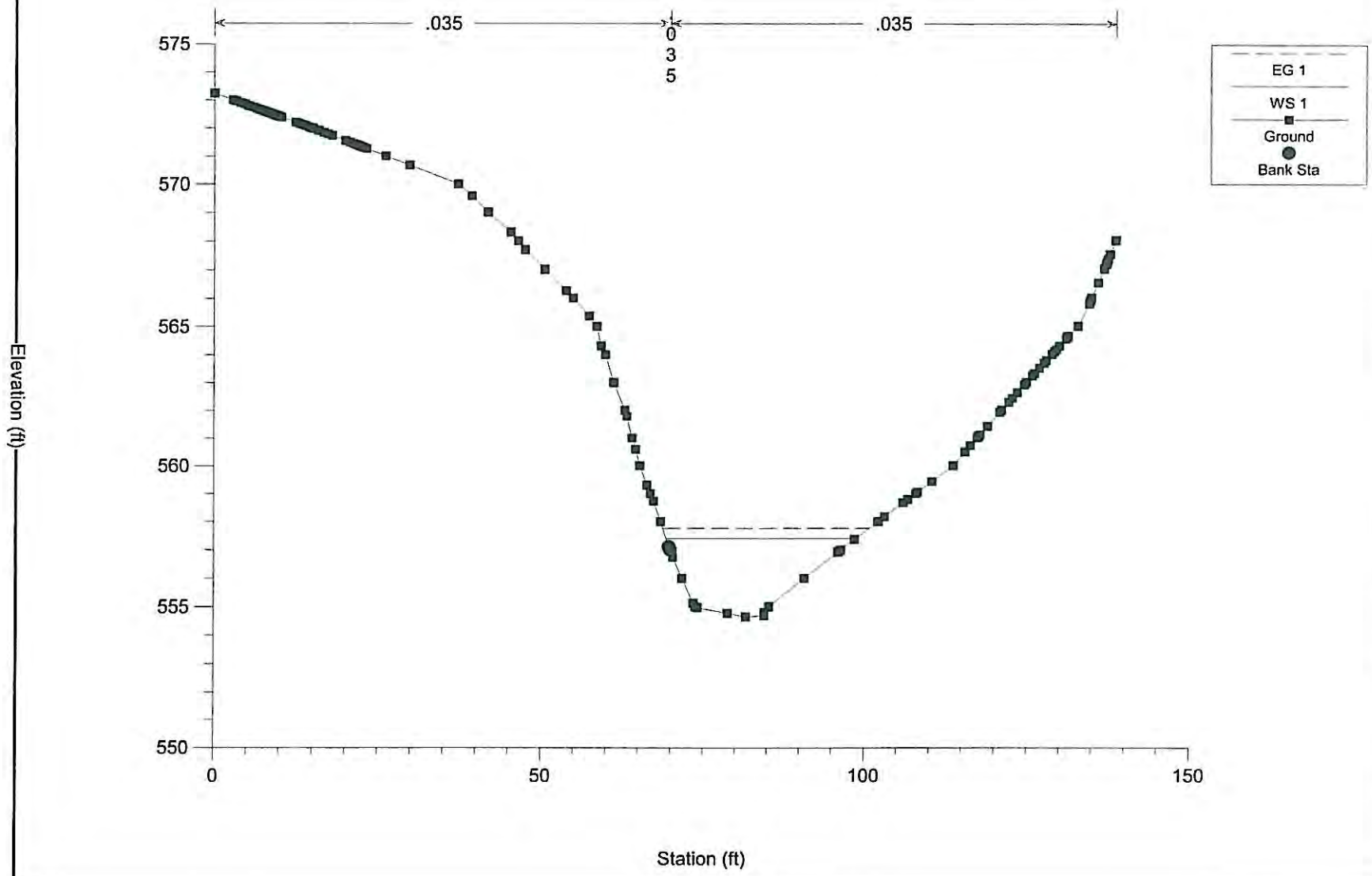

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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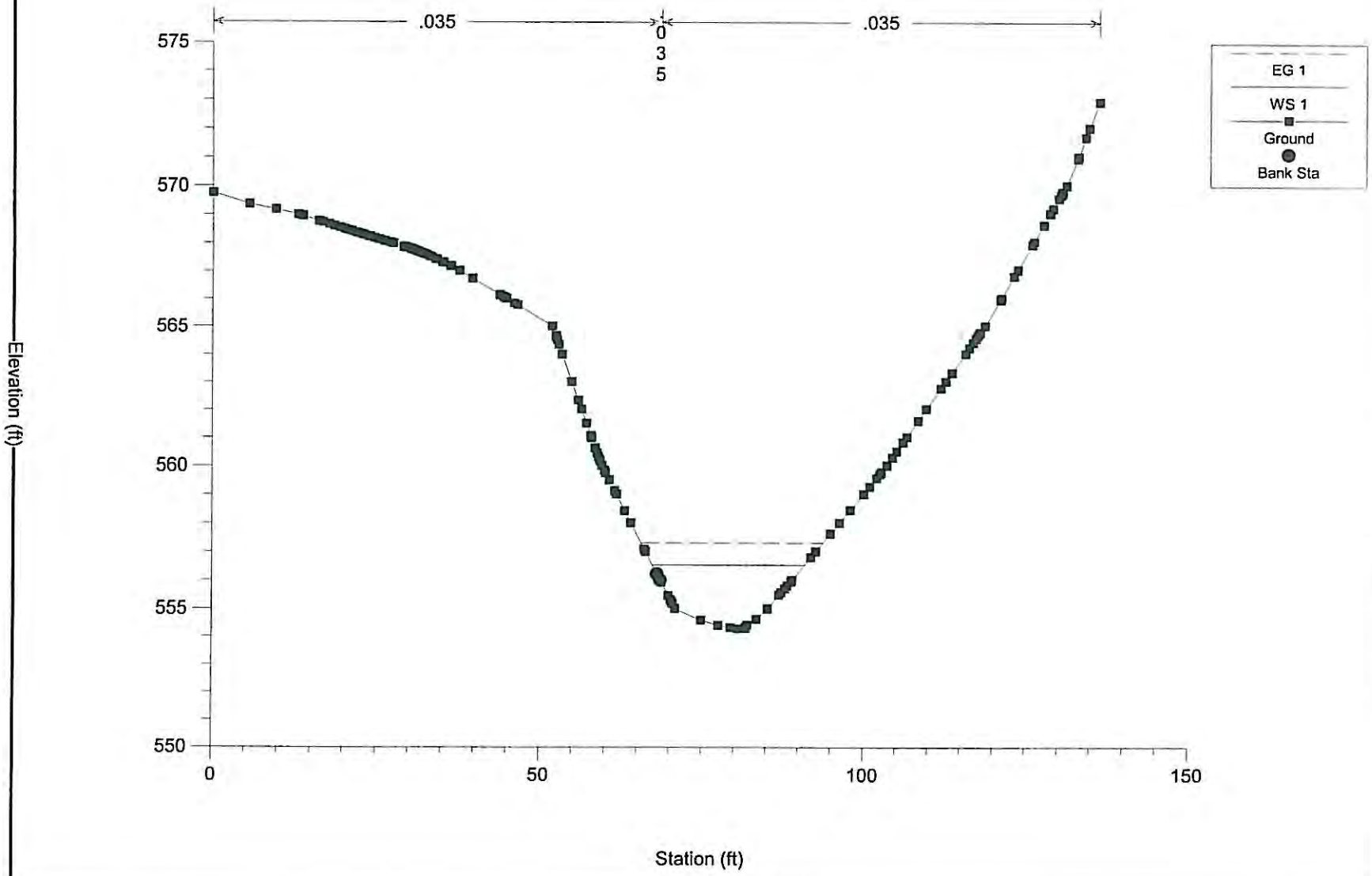

100 YEAR FLOOD CALCULATION AT BASIN A Plan: Imported Plan 01 1/31/2005
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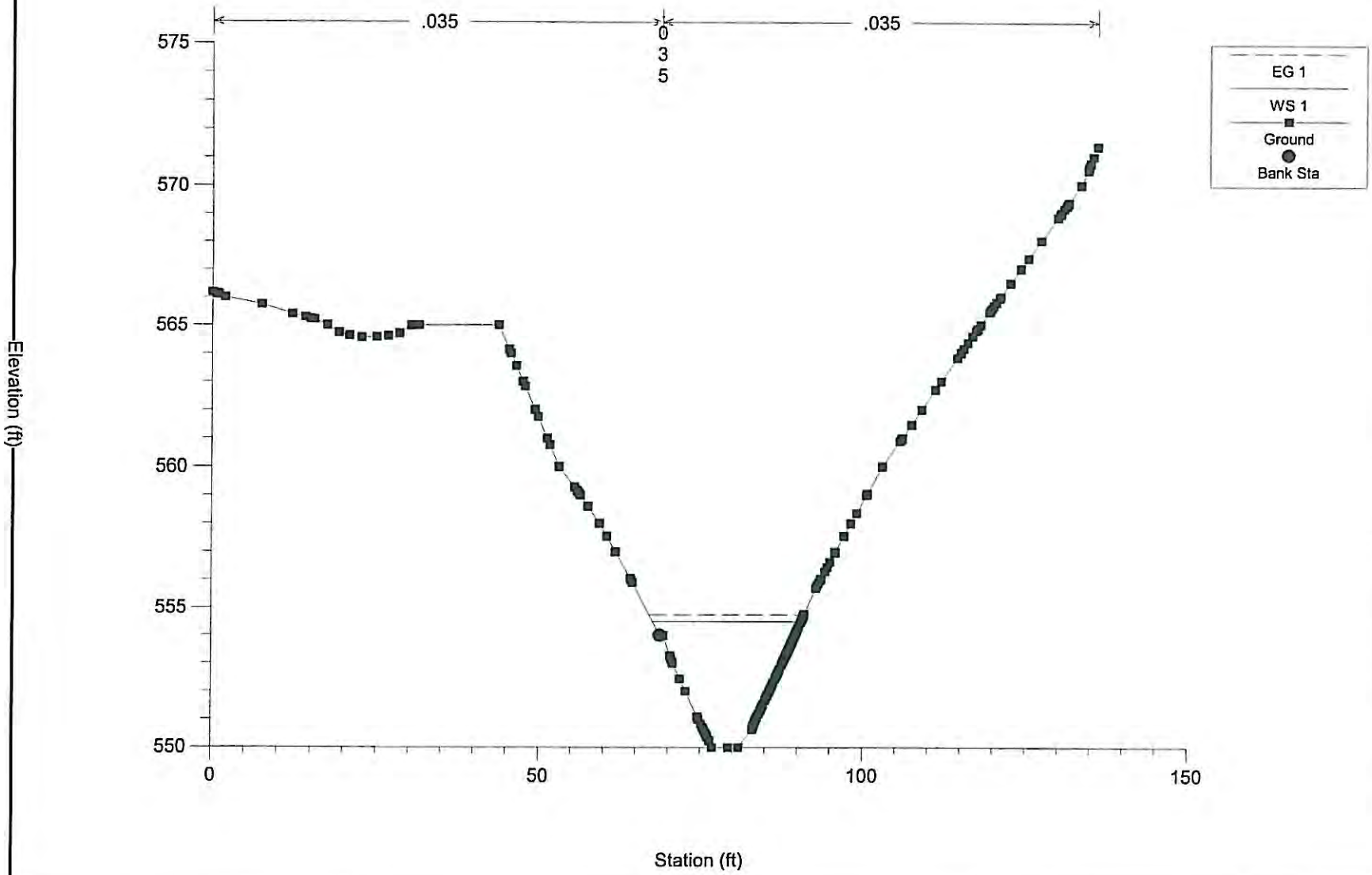
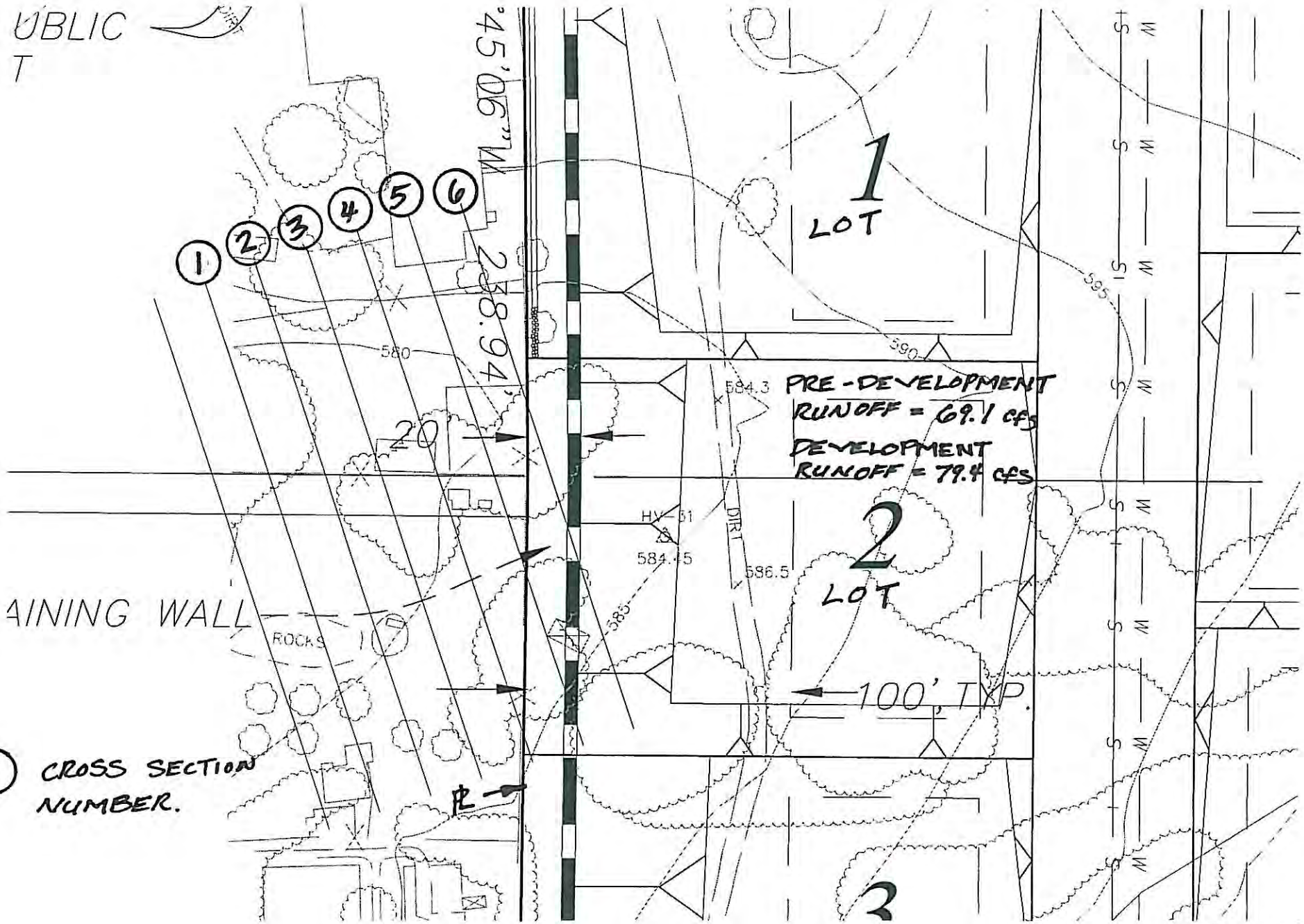


HEC-RAS CALCULATION
FOR
PRE-DEVELOPMENT CONDITION AT BASIN B



HEC-RAS ANALYSIS FOR OFF-SITE CHANNEL AT BASIN B

HEC-RAS Version 1.2 April 1996
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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

PROJECT DATA
Project Title: Pre-Development Condition at Basin B
Project File : ex-b.prj
Run Date and Time: 1/28/2005 4:16:16 PM

Project in English units

****

PLAN DATA

Plan Title: Imported Plan 01
Plan File : k:\landpr~1\600-08~1\hd\ex-b.p01

Geometry Title: Imported Plan 01
Geometry File : k:\landpr~1\600-08~1\hd\ex-b.p01

Flow Title : Imported Plan 01
Flow File : k:\landpr~1\600-08~1\hd\ex-b.p01

Plan Summary Information:

Number of:	Cross Sections =	6	Mulitple Openings =	0
	Culverts =	0	Inline Weirs =	0
	Bridges =	0		

Computational Information

Water surface calculation tolerance	=	.01
Critical depth calculaton tolerance	=	.01
Maximum number of interations	=	20
Maximum difference tolerance	=	.3
Flow tolerance factor	=	.001

Computational Flow Regime: Mixed Flow

Encroachment Data: None

Flow Distribution Locations: None

****

FLOW DATA

Flow Title: Imported Flow 01
Flow File : k:\landpr~1\600-08~1\hd\ex-b.f01

Flow Data (cfs)

Reach	Riv Sta	PF#1
1	6	69.1

Boundary Conditions

Reach	Profile	Upstream	Downstream
1	1	Known WS = 581.71	Known WS = 577.42

****

GEOMETRY DATA

Geometry Title: Imported Geom 01
Geometry File : k:\landpr~1\600-08~1\hd\ex-b.g01

CROSS SECTION INPUT Reach: 1 River Station: 6
Description: 6

Station Elevation Data, num = 75

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	588.23	3.66	588	14.69	587.29	19.89	587	23.77	586.69
33.29	586	34.7	585.72	37.8	585	38.08	584.93	41.9	584
45.71	583.07	45.96	583.01	46.01	583	49.7	582.23	51.43	582
53.28	581.87	58.64	581.55	60.25	581.46	63.67	581.33	64.19	581.31
64.62	581.3	65.38	581.29	66.58	581.3	67.03	581.29	67.47	581.3
69.31	581.29	69.55	581.28	73.44	581.23	73.72	581.22	74.39	581.18
78.6	581.11	78.87	581.1	79.18	581.1	82.23	581.02	82.28	581.02
83.08	581.01	83.14	581.01	84.07	581.03	86.66	581.13	87.13	581.14
87.35	581.14	90.28	581.22	91.64	581.27	94.47	581.35	95.34	581.38
96.33	581.42	97.22	581.47	107.96	582	108.32	582.01	108.38	582.01
113.92	582.18	116.72	582.29	123.79	582.52	135.14	583	141.69	583.26
142.83	583.32	157.18	583.99	157.28	584	157.29	584	157.3	584
157.35	584	170.64	584.77	174.25	585	174.67	585.02	174.89	585.03
181.56	585.33	183.71	585.4	187.3	585.54	189.95	585.64	195.87	585.89
196.93	585.93	198.27	586	202.42	586.31	211.28	587	211.33	587

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	107.96	.035	108.32	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
107.96	108.32	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 6 Profile # 1

W.S. Elev (ft)	581.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.20	Wt. n-Val.	0.035		
E.G. Elev (ft)	581.91	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.023734	Flow Area (sq ft)	19.05		
Q Total (cfs)	69.10	Flow (cfs)	69.10		
Top Width (ft)	46.12	Top Width (ft)	46.12		
Vel Total (ft/s)	3.63	Avg. Vel. (ft/s)	3.63		
Max Chl Dpth (ft)	0.70	Hydr. Depth (ft)	0.41		
Crit W.S. (ft)	581.71	Wetted Per. (ft)	46.15		
Conv. Total (cfs)	448.5	Conv. (cfs)	448.5		

CROSS SECTION INPUT Reach: 1 River Station: 5
Description: 5

Station Elevation Data, num = 73

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	588.27	4.19	588	9.1	587.68	25.26	586.05	25.78	586
29.8	585.34	31.9	585	32.08	584.95	35.67	584	38.38	583.27
39.4	583	40.55	582.69	43.1	582	44.09	581.73	46.91	581
48.35	580.82	50.39	580.59	52.86	580.32	54.87	580.11	56.03	580
56.98	579.96	60.09	579.86	63.92	579.77	65.14	579.73	71.63	579.6
72.95	579.56	74.11	579.53	74.93	579.52	81.3	579.41	81.87	579.41
82.64	579.4	82.95	579.41	84.58	579.5	87.5	579.69	88.39	579.71
89.06	579.73	91.89	580	96.8	580.37	100.64	580.6	107.07	581
110.63	581.16	113.35	581.27	114.75	581.32	116.91	581.38	117.72	581.4
125.31	581.63	128.09	581.69	129.15	581.71	130.06	581.73	137.52	582
139.97	582.11	140.18	582.12	140.84	582.16	142.58	582.25	147.2	582.55
151.34	582.82	151.59	582.84	154.35	583	159.94	583.29	164.36	583.53
167.93	583.71	173.1	584	174.49	584.09	175.83	584.16	180.24	584.42
182.95	584.58	185.28	584.71	189.6	585	193.17	585.19	196.41	585.36
207.1	586	209.11	586.15	211.33	586.3				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	107.07	.035	110.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
107.07	110.63	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 5 Profile # 1

W.S. Elev (ft)	579.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.85	Wt. n-Val.	0.035		
E.G. Elev (ft)	580.77	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.161434	Flow Area (sq ft)	9.33		
Q Total (cfs)	69.10	Flow (cfs)	69.10		
Top Width (ft)	32.62	Top Width (ft)	32.62		
Vel Total (ft/s)	7.40	Avg. Vel. (ft/s)	7.40		
Max Chl Dpth (ft)	0.51	Hydr. Depth (ft)	0.29		
Crit W.S. (ft)	580.15	Wetted Per. (ft)	32.64		
Conv. Total (cfs)	172.0	Conv. (cfs)	172.0		

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

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

CROSS SECTION INPUT Reach: 1 River Station: 4
Description: 4

Station Elevation Data, num = 84

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	587.89	8.29	587.39	13.27	587	15.11	586.77	16.54	586.61
21.9	586.01	21.99	586	22.03	585.99	27.35	585	29.41	584.4
30.78	584	31.88	583.68	34.19	583	37.17	582.28	38.33	582
39.38	581.74	42.34	581	42.61	580.94	47.27	580	51.58	579.49
52.89	579.4	54.71	579.28	55.09	579.24	59.35	579	65.39	578.75
66.61	578.7	71.84	578.47	73.33	578.42	74.38	578.39	75.15	578.37
75.71	578.37	76.07	578.37	77.06	578.38	77.96	578.39	78.32	578.4
78.71	578.42	82.5	578.64	85.58	578.82	86.41	578.84	86.67	578.85
89.13	579	96.69	579.63	99.71	579.8	103.11	579.98	103.12	579.98
103.23	579.98	103.61	580	106.46	580.11	106.63	580.11	109.18	580.18
113.99	580.29	116.03	580.33	118.12	580.37	119.41	580.4	121.61	580.44
123.11	580.48	124.54	580.51	126.44	580.57	127.95	580.61	130.49	580.71
134.54	580.89	135.02	580.9	137.03	581	139.72	581.14	141.97	581.27
148.45	581.63	153.55	581.93	154.69	582	162.06	582.41	165.34	582.59
168.28	582.76	172.56	583	178.29	583.32	184.58	583.58	186.9	583.7
188.17	583.76	194.1	583.99	194.4	584	196.72	584.16	198.6	584.31
199.87	584.42	201.39	584.58	209.46	585	211.33	585.13		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	106.46	.035	106.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
106.46	106.63	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 4 Profile # 1

W.S. Elev (ft)	579.18	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.035		
E.G. Elev (ft)	579.46	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.028843	Flow Area (sq ft)	16.11		
Q Total (cfs)	69.10	Flow (cfs)	69.10		
Top Width (ft)	35.05	Top Width (ft)	35.05		
Vel Total (ft/s)	4.29	Avg. Vel. (ft/s)	4.29		
Max Chl Dpth (ft)	0.81	Hydr. Depth (ft)	0.46		
Crit W.S. (ft)	579.22	Wetted Per. (ft)	35.09		
Conv. Total (cfs)	406.9	Conv. (cfs)	406.9		

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

current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION INPUT Reach: 1 River Station: 3
Description: 3

Station Elevation Data, num = 79

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	587.13	1.32	587.1	2.94	587.03	2.98	587.03	3.44	587
6.27	586.7	13.07	586	14.36	585.86	15	585.78	21.04	585
22.76	584.53	24.58	584	26.26	583.46	27.81	583	29.61	582.47
31.12	582	33.57	581.3	34.52	581	36.54	580.47	38.07	580
44.06	579.19	45.57	579	49.35	578.72	52.69	578.51	56.74	578.24
61.39	578	63.58	577.88	63.68	577.88	63.77	577.88	70.51	577.57
71.91	577.51	73.56	577.54	74.22	577.56	75.65	577.62	84.35	578
85.06	578.04	85.32	578.06	85.5	578.07	86.75	578.15	95.32	578.69
99.18	579	99.81	579.04	100.3	579.06	103.71	579.05	109.97	579
109.99	579	111.24	579	111.25	579	112.88	579.03	113.01	579.03
115.85	579.1	116.15	579.11	116.61	579.12	123.76	579.3	124.95	579.33
126.24	579.37	128.65	579.44	129.84	579.49	130.96	579.54	132.79	579.61
139.7	580	140	580.02	140.5	580.05	146.3	580.4	149.68	580.62
153.01	580.83	153.73	580.88	155.38	581	166.8	581.76	170.3	582
171.22	582.06	171.6	582.08	172.46	582.14	177.8	582.5	184.67	583
189.44	583.25	192.35	583.4	203.31	584	211.33	584.43		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	109.97	.035	109.99	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
109.97	109.99	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 3 Profile # 1

W.S. Elev (ft)	578.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.42	Wt. n-Val.	0.035		
E.G. Elev (ft)	578.68	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.048660	Flow Area (sq ft)	13.31		
Q Total (cfs)	69.10	Flow (cfs)	69.10		
Top Width (ft)	32.22	Top Width (ft)	32.22		
Vel Total (ft/s)	5.19	Avg. Vel. (ft/s)	5.19		
Max Chl Dpth (ft)	0.76	Hydr. Depth (ft)	0.41		
Crit W.S. (ft)	578.39	Wetted Per. (ft)	32.26		
Conv. Total (cfs)	313.3	Conv. (cfs)	313.3		

CROSS SECTION INPUT Reach: 1 River Station: 2
Description: 2

Station Elevation Data, num = 75

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	585.93	.97	585.86	6.11	585.51	11.57	585	16.78	584.29
19.3	584	19.72	583.86	22.21	583	23.38	582.59	25.11	582
27.14	581.3	28	581	29.24	580.56	30.93	580	33.99	579.51
36.97	579	39.59	578.71	41.88	578.48	46.98	578	48.14	577.89
48.97	577.82	54.46	577.34	58.47	577.02	58.69	577	61.82	576.83
61.93	576.84	64.13	576.73	65.45	576.69	66.29	576.66	67.44	576.65

67.96	576.65	68.55	576.65	70.5	576.71	75.01	576.83	75.45	576.85
81.37	577	84.52	577.12	84.71	577.13	84.95	577.13	87.83	577.25
90.6	577.23	91	577.24	91.49	577.25	97.44	577.23	98.45	577.24
101.36	577.24	102.36	577.24	104.39	577.26	104.94	577.26	105.68	577.28
107.3	577.32	108.53	577.36	110.31	577.44	117.76	577.71	119.37	577.77
120.58	577.83	125.16	577.98	125.51	578	127.61	578.13	130.93	578.36
139.27	579	145.75	579.44	150.18	579.73	151.49	579.81	154.12	580
160.63	580.5	164.09	580.77	166.94	581	169.38	581.19	178.98	582
184.37	582.41	192.26	583	199.83	583.49	207.74	584	211.33	584.23

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	105.68	.035	107.3	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
105.68	107.3	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 2 Profile # 1

W.S. Elev (ft)	577.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	577.63	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.049259	Flow Area (sq ft)	15.95	0.07	0.01
Q Total (cfs)	69.10	Flow (cfs)	69.03	0.07	0.00
Top Width (ft)	53.46	Top Width (ft)	51.22	1.62	0.62
Vel Total (ft/s)	4.31	Avg. Vel. (ft/s)	4.33	1.11	0.44
Max Chl Dpth (ft)	0.69	Hydr. Depth (ft)	0.31	0.04	0.01
Crit W.S. (ft)	577.42	Wetted Per. (ft)	51.26	1.62	0.62
Conv. Total (cfs)	311.3	Conv. (cfs)	311.0	0.3	0.0

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 INPUT Reach: 1 River Station: 1
Description: 1

Station Elevation Data, num = 69

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	584.5	5.17	584.08	11.02	583.13	14.94	582.16	19	581.17
23.23	580.15	29.86	579.07	33.7	578.58	37.56	578	39.37	577.78
41.31	577.55	46.2	577	48.93	576.67	51.83	576.32	54.75	576
57.33	575.95	61.7	575.86	64.77	575.82	66.92	575.79	69.38	575.77
69.96	575.77	70.29	575.78	70.56	575.84	70.71	576	73.74	576.09
74.11	576.1	76.75	576.18	78.27	576.21	79.58	576.22	89.96	576.1
90.32	576.09	94.67	576.05	95.04	576.05	97.76	576.02	97.85	576.02
99.82	576.04	99.93	576.04	100.03	576.04	100.16	576.05	100.42	576.05
107.29	576.21	108.73	576.26	115.41	576.44	118.23	576.56	123.45	576.8
124.32	576.83	124.86	576.85	127.62	577	141.57	577.98	141.91	578
141.95	578	141.97	578	141.97	578	141.98	578	142.01	578.01
142.05	578.01	153.62	579	158.12	579.39	163.79	580	169.07	580.54
173.43	581	180.14	581.58	183.55	581.9	184.56	582	193.47	582.64
198.43	583	199.18	583.05	200.53	583.14	211.33	583.86		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value

```
       0    .035  107.29    .035  108.73    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right    Coeff Contr.   Expan.
        107.29  108.73                 0       0       0              .1       .3

CROSS SECTION OUTPUT  Reach: 1              Riv Sta: 1          Profile # 1
*******************************************************************************
* W.S. Elev (ft)    *   577.42 * Element            *  Left OB *  Channel * Right OB *
* Vel Head (ft)     *     0.01 * Wt. n-Val.          *    0.035 *    0.035 *    0.035 *
* E.G. Elev (ft)    *   577.43 * Reach Len. (ft)     *          *          *          *
* E.G. Slope (ft/ft)* 0.000220 * Flow Area (sq ft)   *    81.34 *     1.71 *    17.07 *
* Q Total (cfs)     *    69.10 * Flow (cfs)          *    68.65 *     0.32 *     0.13 *
* Top Width (ft)    *    91.13 * Top Width (ft)      *    64.82 *     1.44 *    24.87 *
* Vel Total (ft/s)  *     0.69 * Avg. Vel. (ft/s)    *     0.73 *     0.71 *     0.49 *
* Max Chl Dpth (ft) *     1.65 * Hydr. Depth (ft)    *     1.25 *     1.18 *     0.69 *
* Crit W.S. (ft)    *   576.41 * Wetted Per. (ft)    *    64.99 *     1.44 *    24.90 *
* Conv. Total (cfs) *   4654.6 * Conv. (cfs)         *   4010.3 *     81.1 *    563.2 *
*******************************************************************************

Warning - The parabolic search method failed to converge on critical depth.
                The program will try the cross section slice/secant method to find
                critical depth.

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

SUMMARY OF MANNING'S N VALUES

*****************************************************
*    Reach    * River Sta. *   n1    *   n2    *   n3    *
*****************************************************
*1           *    6       *    .035*    .035*    .035*
*1           *    5       *    .035*    .035*    .035*
*1           *    4       *    .035*    .035*    .035*
*1           *    3       *    .035*    .035*    .035*
*1           *    2       *    .035*    .035*    .035*
*1           *    1       *    .035*    .035*    .035*
*****************************************************

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

SUMMARY OF REACH LENGTHS

*****************************************************
*    Reach    * River Sta. *  Left   * Channel*  Right *
*1           *    6       *      20*      20*      20*
*1           *    5       *      20*      20*      20*
*1           *    4       *      20*      20*      20*
*1           *    3       *      20*      20*      20*
*1           *    2       *      20*      20*      20*
*1           *    1       *       0*       0*       0*
*****************************************************

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SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

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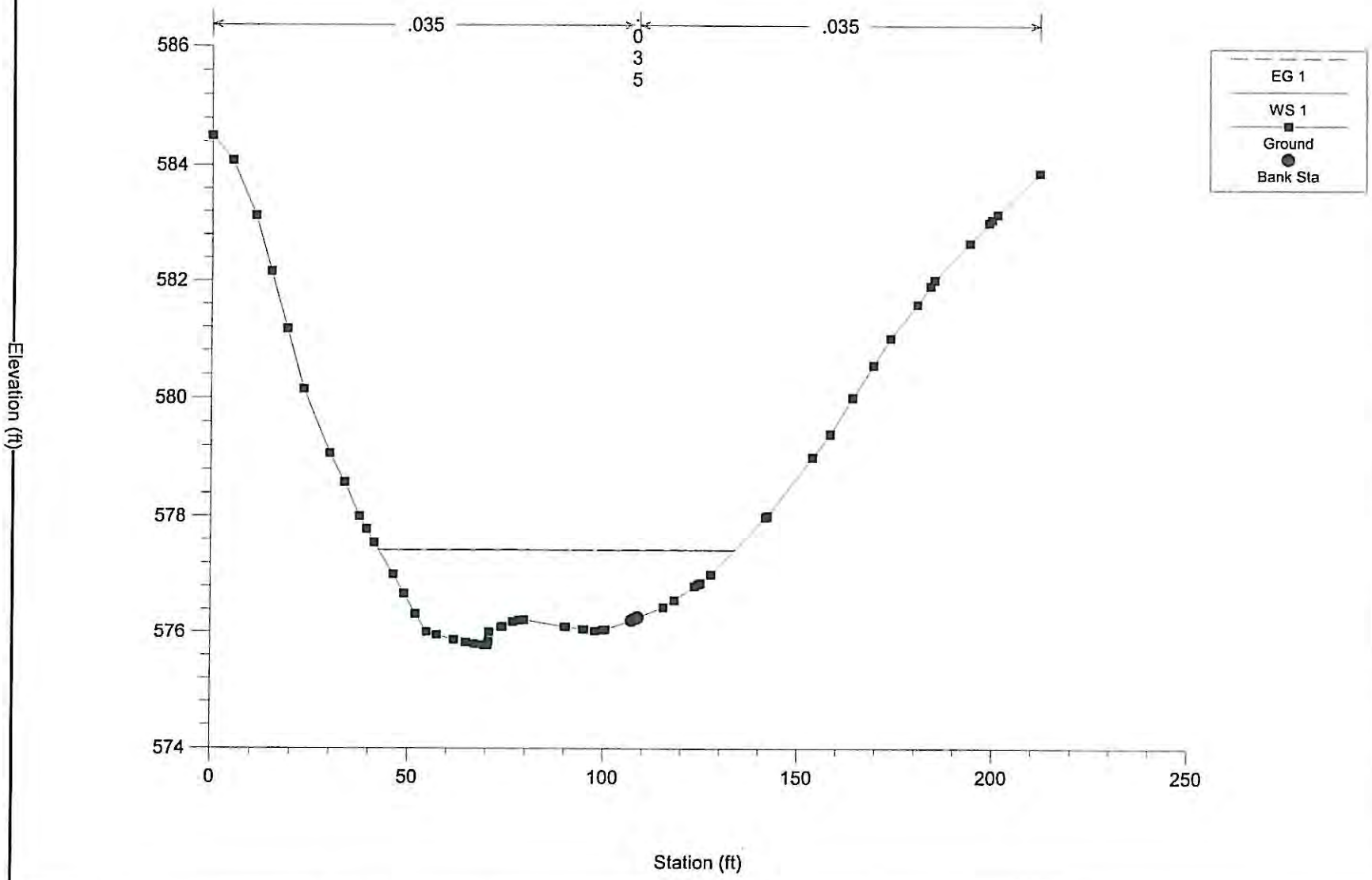
Reach	River Sta.	Contr.	Expan.
1	6	.1	.3
1	5	.1	.3
1	4	.1	.3
1	3	.1	.3
1	2	.1	.3
1	1	.1	.3

Profile Output Table - Standard Table 1

River Sta.	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
6	69.10	582.00	581.71	581.71	581.91	0.023734		19.05	46.12	0.00
5	69.10	581.00	579.91	580.15	580.77	0.161434		9.33	32.62	0.00
4	69.10	580.11	579.18	579.22	579.46	0.028843		16.11	35.05	0.00
3	69.10	579.00	578.27	578.39	578.68	0.048660		13.31	32.22	0.00
2	69.10	577.28	577.34	577.42	577.63	0.049259	1.11	16.02	53.46	0.97
1	69.10	576.21	577.42	576.41	577.43	0.000220	0.71	100.11	91.13	0.11

Pre-Development Condition at Basin B Plan: Imported Plan 01 1/28/2005
1



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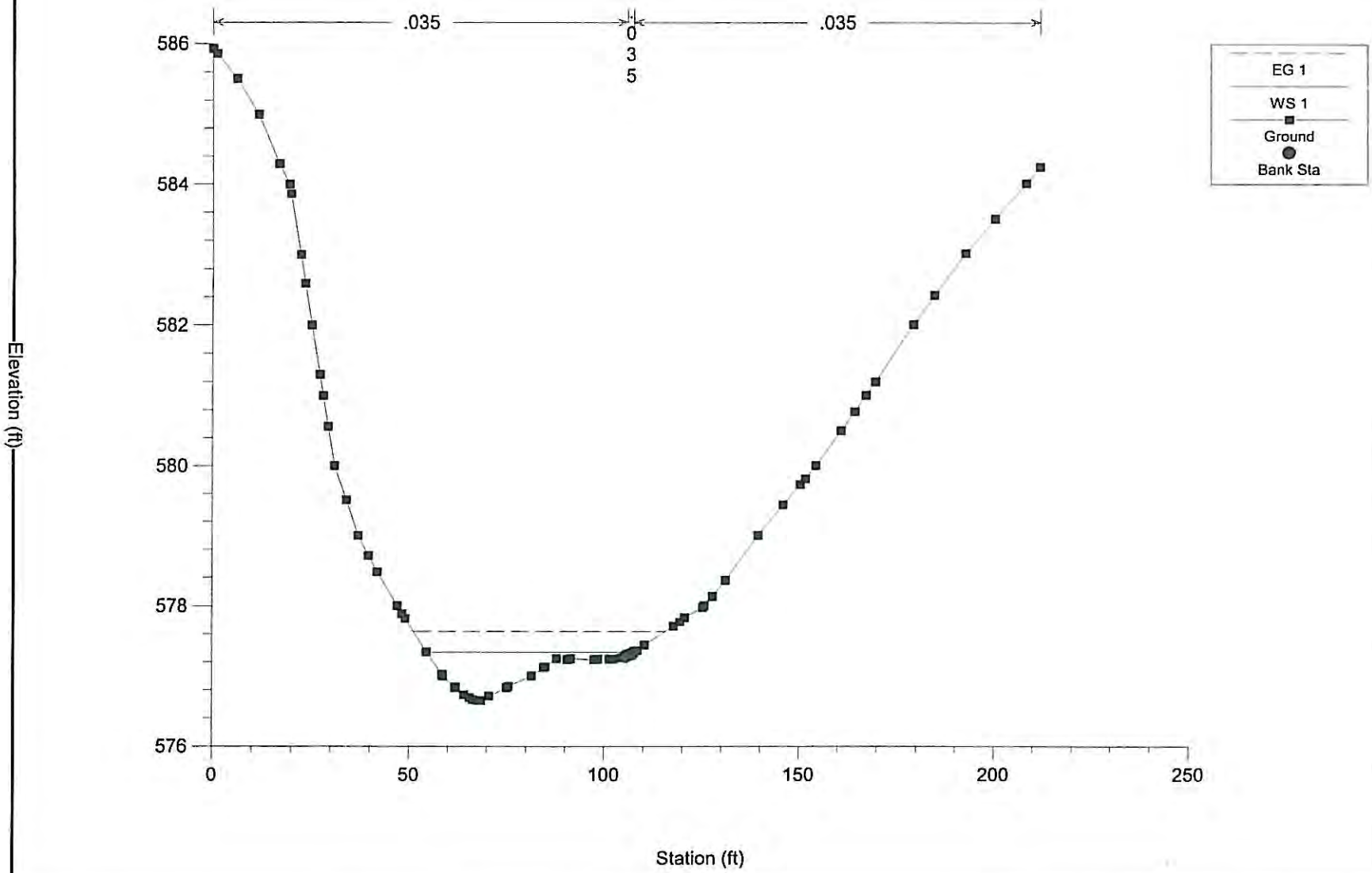
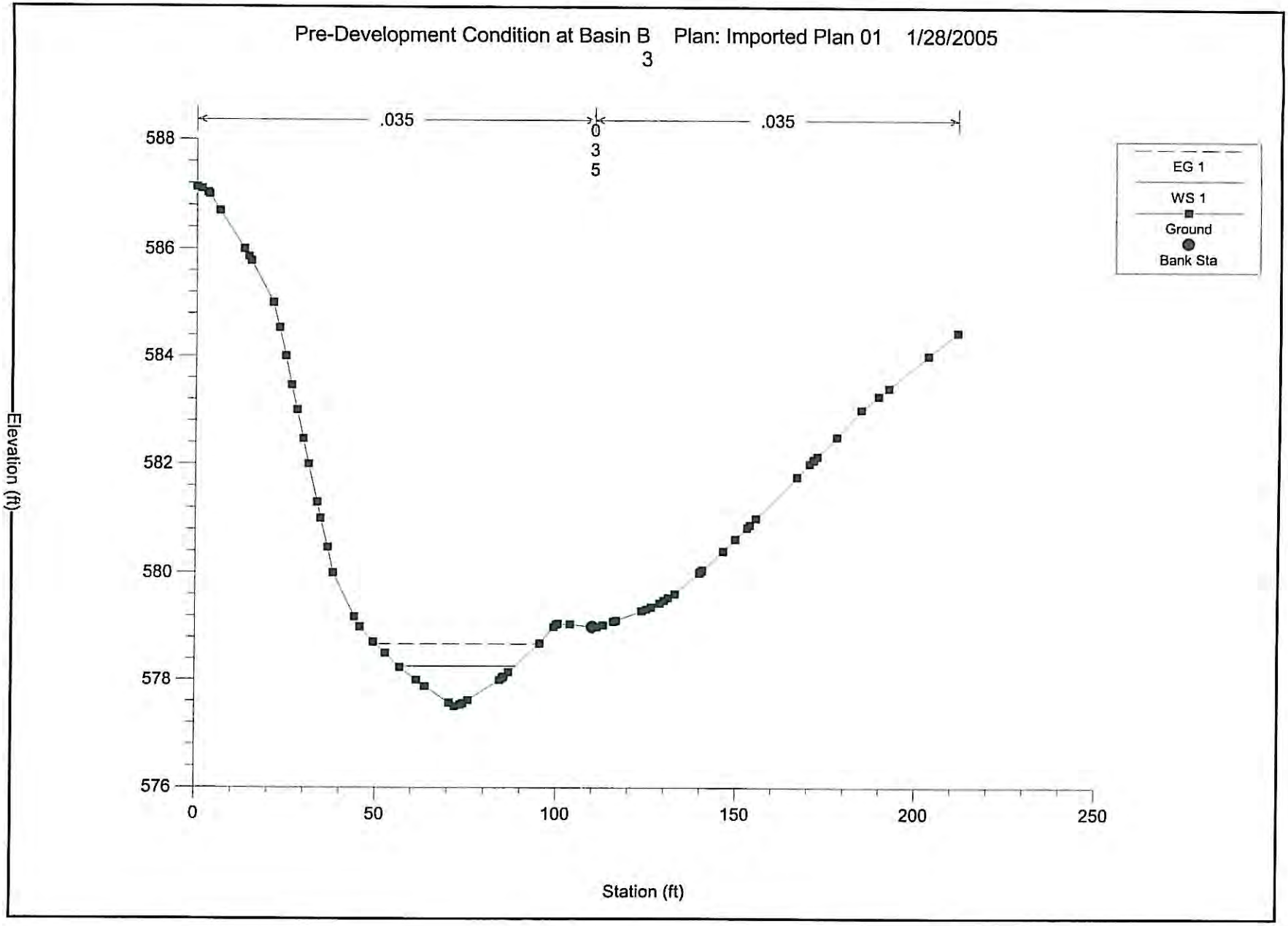


Pre-Development Condition at Basin B 3 Plan: Imported Plan 01 1/28/2005



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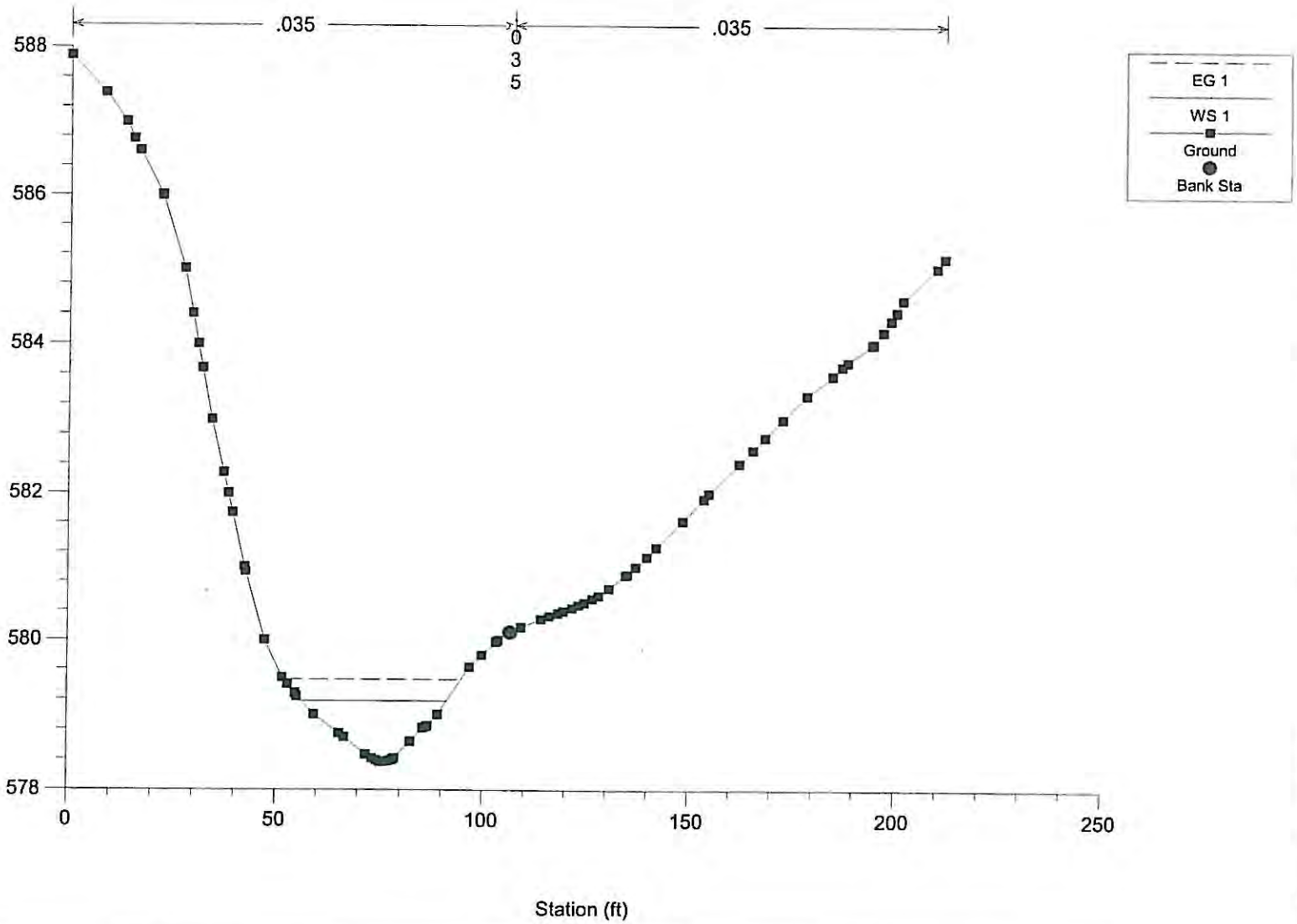
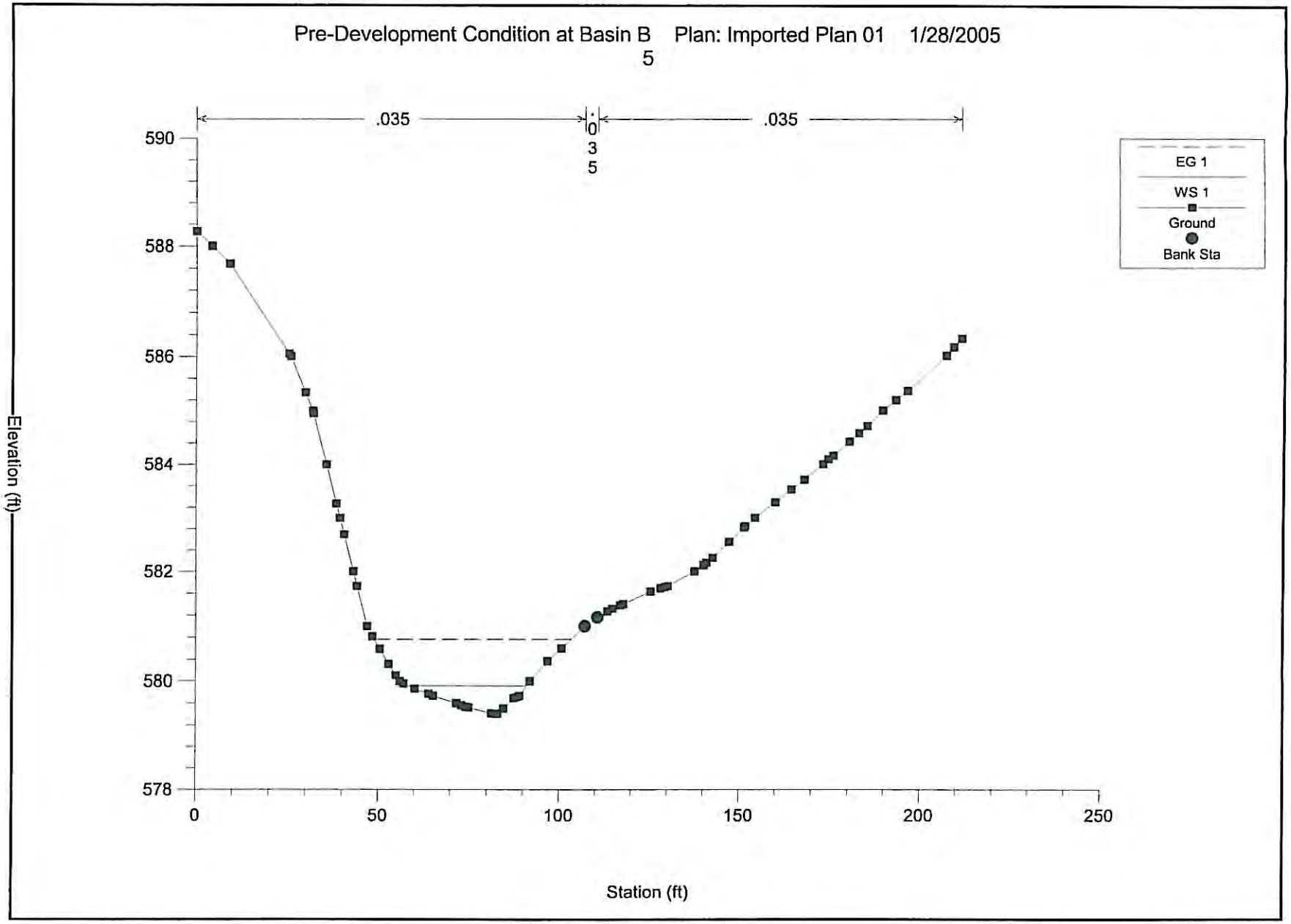


Pre-Development Condition at Basin B Plan: Imported Plan 01 1/28/2005



Pre-Development Condition at Basin B Plan: Imported Plan 01 1/28/2005
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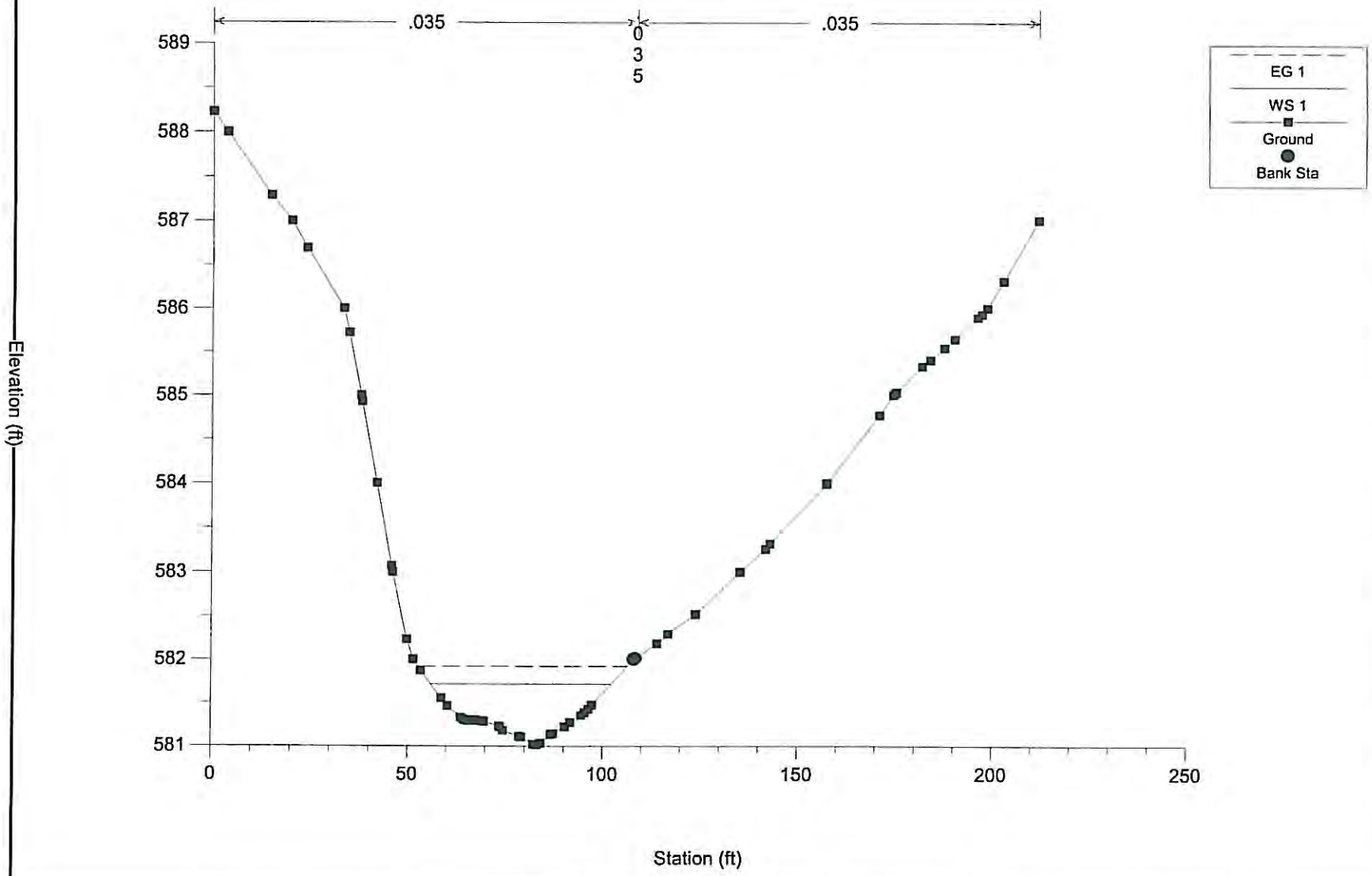

HEC-RAS CALCULATION
FOR
DEVELOPMENT CONDITION AT BASIN B

HEC-RAS Version 1.2 April 1996
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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X     X  X        X           X  X     X    X        X
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PROJECT DATA
Project Title: Development Condition at Basin B
Project File : dev-b.prj
Run Date and Time: 1/30/2005 1:43:18 PM

Project in English units

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PLAN DATA

Plan Title: Imported Plan 01
Plan File : k:\landpr~1\600-08~1\hd\dev-b.p01

Geometry Title: Imported Plan 01
Geometry File : k:\landpr~1\600-08~1\hd\dev-b.p01

Flow Title : Imported Plan 01
Flow File : k:\landpr~1\600-08~1\hd\dev-b.p01

Plan Summary Information:

Number of:	Cross Sections	= 6	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 0			

Computational Information

Water surface calculation tolerance	=	.01
Critical depth calculaton tolerance	=	.01
Maximum number of interations	=	20
Maximum difference tolerance	=	.3
Flow tolerance factor	=	.001

Computational Flow Regime: Mixed Flow

Encroachment Data: None

Flow Distribution Locations: None

****

FLOW DATA

Flow Title: Imported Flow 01
Flow File : k:\landpr~1\600-08~1\hd\dev-b.f01

Flow Data (cfs)

Reach	Riv Sta	PF#1
1	6	79.4

Boundary Conditions

Reach	Profile	Upstream	Downstream
1	1	Known WS = 581.71	Known WS = 577.42

****

GEOMETRY DATA

Geometry Title: Imported Geom 01
Geometry File : k:\landpr~1\600-08~1\hd\dev-b.g01

CROSS SECTION INPUT Reach: 1 River Station: 6
Description: 6

Station Elevation Data, num = 75

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	588.23	3.66	588	14.69	587.29	19.89	587	23.77	586.69
33.29	586	34.7	585.72	37.8	585	38.08	584.93	41.9	584
45.71	583.07	45.96	583.01	46.01	583	49.7	582.23	51.43	582
53.28	581.87	58.64	581.55	60.25	581.46	63.67	581.33	64.19	581.31
64.62	581.3	65.38	581.29	66.58	581.3	67.03	581.29	67.47	581.3
69.31	581.29	69.55	581.28	73.44	581.23	73.72	581.22	74.39	581.18
78.6	581.11	78.87	581.1	79.18	581.1	82.23	581.02	82.28	581.02
83.08	581.01	83.14	581.01	84.07	581.03	86.66	581.13	87.13	581.14
87.35	581.14	90.28	581.22	91.64	581.27	94.47	581.35	95.34	581.38
96.33	581.42	97.22	581.47	107.96	582	108.32	582.01	108.38	582.01
113.92	582.18	116.72	582.29	123.79	582.52	135.14	583	141.69	583.26
142.83	583.32	157.18	583.99	157.28	584	157.29	584	157.3	584
157.35	584	170.64	584.77	174.25	585	174.67	585.02	174.89	585.03
181.56	585.33	183.71	585.4	187.3	585.54	189.95	585.64	195.87	585.89
196.93	585.93	198.27	586	202.42	586.31	211.28	587	211.33	587

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	107.96	.035	108.32	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
107.96	108.32		20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 6 Profile # 1

W.S. Elev (ft)	581.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.27	Wt. n-Val.	0.035		
E.G. Elev (ft)	581.98	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.031336	Flow Area (sq ft)	19.05		
Q Total (cfs)	79.40	Flow (cfs)	79.40		
Top Width (ft)	46.12	Top Width (ft)	46.12		
Vel Total (ft/s)	4.17	Avg. Vel. (ft/s)	4.17		
Max Chl Dpth (ft)	0.70	Hydr. Depth (ft)	0.41		
Crit W.S. (ft)	581.75	Wetted Per. (ft)	46.15		
Conv. Total (cfs)	448.5	Conv. (cfs)	448.5		

CROSS SECTION INPUT Reach: 1 River Station: 5
Description: 5

Station Elevation Data, num = 73

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	588.27	4.19	588	9.1	587.68	25.26	586.05	25.78	586
29.8	585.34	31.9	585	32.08	584.95	35.67	584	38.38	583.27
39.4	583	40.55	582.69	43.1	582	44.09	581.73	46.91	581
48.35	580.82	50.39	580.59	52.86	580.32	54.87	580.11	56.03	580
56.98	579.96	60.09	579.86	63.92	579.77	65.14	579.73	71.63	579.6
72.95	579.56	74.11	579.53	74.93	579.52	81.3	579.41	81.87	579.41
82.64	579.4	82.95	579.41	84.58	579.5	87.5	579.69	88.39	579.71
89.06	579.73	91.89	580	96.8	580.37	100.64	580.6	107.07	581
110.63	581.16	113.35	581.27	114.75	581.32	116.91	581.38	117.72	581.4
125.31	581.63	128.09	581.69	129.15	581.71	130.06	581.73	137.52	582
139.97	582.11	140.18	582.12	140.84	582.16	142.58	582.25	147.2	582.55
151.34	582.82	151.59	582.84	154.35	583	159.94	583.29	164.36	583.53
167.93	583.71	173.1	584	174.49	584.09	175.83	584.16	180.24	584.42
182.95	584.58	185.28	584.71	189.6	585	193.17	585.19	196.41	585.36
207.1	586	209.11	586.15	211.33	586.3				

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	107.07	.035	110.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
107.07	110.63	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 5 Profile # 1

W.S. Elev (ft)	579.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.81	Wt. n-Val.	0.035		
E.G. Elev (ft)	580.78	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.134763	Flow Area (sq ft)	10.97		
Q Total (cfs)	79.40	Flow (cfs)	79.40		
Top Width (ft)	34.61	Top Width (ft)	34.61		
Vel Total (ft/s)	7.24	Avg. Vel. (ft/s)	7.24		
Max Chl Dpth (ft)	0.56	Hydr. Depth (ft)	0.32		
Crit W.S. (ft)	580.20	Wetted Per. (ft)	34.64		
Conv. Total (cfs)	216.3	Conv. (cfs)	216.3		

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

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

CROSS SECTION INPUT Reach: 1 River Station: 4
Description: 4

Station Elevation Data, num = 84

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	587.89	8.29	587.39	13.27	587	15.11	586.77	16.54	586.61
21.9	586.01	21.99	586	22.03	585.99	27.35	585	29.41	584.4
30.78	584	31.88	583.68	34.19	583	37.17	582.28	38.33	582
39.38	581.74	42.34	581	42.61	580.94	47.27	580	51.58	579.49
52.89	579.4	54.71	579.28	55.09	579.24	59.35	579	65.39	578.75
66.61	578.7	71.84	578.47	73.33	578.42	74.38	578.39	75.15	578.37
75.71	578.37	76.07	578.37	77.06	578.38	77.96	578.39	78.32	578.4
78.71	578.42	82.5	578.64	85.58	578.82	86.41	578.84	86.67	578.85
89.13	579	96.69	579.63	99.71	579.8	103.11	579.98	103.12	579.98
103.23	579.98	103.61	580	106.46	580.11	106.63	580.11	109.18	580.18
113.99	580.29	116.03	580.33	118.12	580.37	119.41	580.4	121.61	580.44
123.11	580.48	124.54	580.51	126.44	580.57	127.95	580.61	130.49	580.71
134.54	580.89	135.02	580.9	137.03	581	139.72	581.14	141.97	581.27
148.45	581.63	153.55	581.93	154.69	582	162.06	582.41	165.34	582.59
168.28	582.76	172.56	583	178.29	583.32	184.58	583.58	186.9	583.7
188.17	583.76	194.1	583.99	194.4	584	196.72	584.16	198.6	584.31
199.87	584.42	201.39	584.58	209.46	585	211.33	585.13		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	106.46	.035	106.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
106.46	106.63	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 4 Profile # 1

W.S. Elev (ft)	579.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.	0.035		
E.G. Elev (ft)	579.53	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.029512	Flow Area (sq ft)	17.64		
Q Total (cfs)	79.40	Flow (cfs)	79.40		
Top Width (ft)	36.32	Top Width (ft)	36.32		
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	4.50		
Max Chl Dpth (ft)	0.85	Hydr. Depth (ft)	0.49		
Crit W.S. (ft)	579.26	Wetted Per. (ft)	36.37		
Conv. Total (cfs)	462.2	Conv. (cfs)	462.2		

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 INPUT Reach: 1 River Station: 3
Description: 3

Station Elevation Data, num = 79

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	587.13	1.32	587.1	2.94	587.03	2.98	587.03	3.44	587
6.27	586.7	13.07	586	14.36	585.86	15	585.78	21.04	585
22.76	584.53	24.58	584	26.26	583.46	27.81	583	29.61	582.47
31.12	582	33.57	581.3	34.52	581	36.54	580.47	38.07	580
44.06	579.19	45.57	579	49.35	578.72	52.69	578.51	56.74	578.24
61.39	578	63.58	577.88	63.68	577.88	63.77	577.88	70.51	577.57
71.91	577.51	73.56	577.54	74.22	577.56	75.65	577.62	84.35	578
85.06	578.04	85.32	578.06	85.5	578.07	86.75	578.15	95.32	578.69
99.18	579	99.81	579.04	100.3	579.06	103.71	579.05	109.97	579
109.99	579	111.24	579	111.25	579	112.88	579.03	113.01	579.03
115.85	579.1	116.15	579.11	116.61	579.12	123.76	579.3	124.95	579.33
126.24	579.37	128.65	579.44	129.84	579.49	130.96	579.54	132.79	579.61
139.7	580	140	580.02	140.5	580.05	146.3	580.4	149.68	580.62
153.01	580.83	153.73	580.88	155.38	581	166.8	581.76	170.3	582
171.22	582.06	171.6	582.08	172.46	582.14	177.8	582.5	184.67	583
189.44	583.25	192.35	583.4	203.31	584	211.33	584.43		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	109.97	.035	109.99	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
109.97	109.99	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 3 Profile # 1

W.S. Elev (ft)	578.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.	0.035		
E.G. Elev (ft)	578.75	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.046871	Flow Area (sq ft)	14.90		
Q Total (cfs)	79.40	Flow (cfs)	79.40		
Top Width (ft)	33.71	Top Width (ft)	33.71		
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)	5.33		
Max Chl Dpth (ft)	0.80	Hydr. Depth (ft)	0.44		
Crit W.S. (ft)	578.44	Wetted Per. (ft)	33.75		
Conv. Total (cfs)	366.7	Conv. (cfs)	366.7		

CROSS SECTION INPUT Reach: 1 River Station: 2
Description: 2

Station Elevation Data, num = 75

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	585.93	.97	585.86	6.11	585.51	11.57	585	16.78	584.29
19.3	584	19.72	583.86	22.21	583	23.38	582.59	25.11	582
27.14	581.3	28	581	29.24	580.56	30.93	580	33.99	579.51
36.97	579	39.59	578.71	41.88	578.48	46.98	578	48.14	577.89
48.97	577.82	54.46	577.34	58.47	577.02	58.69	577	61.82	576.83
61.93	576.84	64.13	576.73	65.45	576.69	66.29	576.66	67.44	576.65
67.96	576.65	68.55	576.65	70.5	576.71	75.01	576.83	75.45	576.85
81.37	577	84.52	577.12	84.71	577.13	84.95	577.13	87.83	577.25

90.6	577.23	91	577.24	91.49	577.25	97.44	577.23	98.45	577.24
101.36	577.24	102.36	577.24	104.39	577.26	104.94	577.26	105.68	577.28
107.3	577.32	108.53	577.36	110.31	577.44	117.76	577.71	119.37	577.77
120.58	577.83	125.16	577.98	125.51	578	127.61	578.13	130.93	578.36
139.27	579	145.75	579.44	150.18	579.73	151.49	579.81	154.12	580
160.63	580.5	164.09	580.77	166.94	581	169.38	581.19	178.98	582
184.37	582.41	192.26	583	199.83	583.49	207.74	584	211.33	584.23

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	105.68	.035	107.3	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
105.68	107.3	20	20	20	.1	.3

CROSS SECTION OUTPUT Reach: 1 Riv Sta: 2 Profile # 1

W.S. Elev (ft)	577.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.34	Wt. n-Val.	0.035	0.035	0.035
E.G. Elev (ft)	577.70	Reach Len. (ft)	20.00	20.00	20.00
E.G. Slope (ft/ft)	0.054003	Flow Area (sq ft)	16.88	0.09	0.02
Q Total (cfs)	79.40	Flow (cfs)	79.24	0.14	0.02
Top Width (ft)	54.23	Top Width (ft)	51.43	1.62	1.18
Vel Total (ft/s)	4.67	Avg. Vel. (ft/s)	4.69	1.48	0.71
Max Chl Dpth (ft)	0.71	Hydr. Depth (ft)	0.33	0.06	0.02
Crit W.S. (ft)	577.45	Wetted Per. (ft)	51.46	1.62	1.18
Conv. Total (cfs)	341.7	Conv. (cfs)	341.0	0.6	0.1

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 INPUT Reach: 1 River Station: 1
Description: 1

Station Elevation Data, num = 69

Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.	Sta.	Elev.
0	584.5	5.17	584.08	11.02	583.13	14.94	582.16	19	581.17
23.23	580.15	29.86	579.07	33.7	578.58	37.56	578	39.37	577.78
41.31	577.55	46.2	577	48.93	576.67	51.83	576.32	54.75	576
57.33	575.95	61.7	575.86	64.77	575.82	66.92	575.79	69.38	575.77
69.96	575.77	70.29	575.78	70.56	575.84	70.71	576	73.74	576.09
74.11	576.1	76.75	576.18	78.27	576.21	79.58	576.22	89.96	576.1
90.32	576.09	94.67	576.05	95.04	576.05	97.76	576.02	97.85	576.02
99.82	576.04	99.93	576.04	100.03	576.04	100.16	576.05	100.42	576.05
107.29	576.21	108.73	576.26	115.41	576.44	118.23	576.56	123.45	576.8
124.32	576.83	124.86	576.85	127.62	577	141.57	577.98	141.91	578
141.95	578	141.97	578	141.97	578	141.98	578	142.01	578.01
142.05	578.01	153.62	579	158.12	579.39	163.79	580	169.07	580.54
173.43	581	180.14	581.58	183.55	581.9	184.56	582	193.47	582.64
198.43	583	199.18	583.05	200.53	583.14	211.33	583.86		

Manning's n Values, num = 3

Sta.	Value	Sta.	Value	Sta.	Value
0	.035	107.29	.035	108.73	.035

```
Bank Sta: Left   Right    Lengths: Left Channel   Right    Coeff Contr.   Expan.
        107.29  108.73                 0       0       0              .1       .3

CROSS SECTION OUTPUT  Reach:  1            Riv Sta:  1        Profile # 1
*******************************************************************************
* W.S. Elev (ft)     *   577.42 * Element            *  Left OB *  Channel * Right OB *
* Vel Head (ft)      *     0.01 * Wt. n-Val.         *    0.035 *    0.035 *    0.035 *
* E.G. Elev (ft)     *   577.43 * Reach Len. (ft)    *          *          *          *
* E.G. Slope (ft/ft)* 0.000291 * Flow Area (sq ft) *    81.34 *     1.71 *    17.07 *
* Q Total (cfs)      *    79.40 * Flow (cfs)         *    78.56 *     0.50 *     0.34 *
* Top Width (ft)     *    91.13 * Top Width (ft)     *    64.82 *     1.44 *    24.87 *
* Vel Total (ft/s)   *     0.79 * Avg. Vel. (ft/s)   *     0.84 *     0.81 *     0.56 *
* Max Chl Dpth (ft)  *     1.65 * Hydr. Depth (ft)   *     1.25 *     1.18 *     0.69 *
* Crit W.S. (ft)     *   576.45 * Wetted Per. (ft)   *    64.99 *     1.44 *    24.90 *
* Conv. Total (cfs)  *   4654.6 * Conv. (cfs)        *   4010.3 *     81.1 *    563.2 *
*******************************************************************************

Warning - The parabolic search method failed to converge on critical depth.
                The program will try the cross section slice/secant method to find
                critical depth.

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

SUMMARY OF MANNING'S N VALUES

*****************************************************
*    Reach    * River Sta. *   n1    *   n2    *   n3    *
*****************************************************
* 1           *     6      *    .035*    .035*    .035*
* 1           *     5      *    .035*    .035*    .035*
* 1           *     4      *    .035*    .035*    .035*
* 1           *     3      *    .035*    .035*    .035*
* 1           *     2      *    .035*    .035*    .035*
* 1           *     1      *    .035*    .035*    .035*
*****************************************************

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

SUMMARY OF REACH LENGTHS

*****************************************************
*    Reach    * River Sta. *  Left   * Channel*  Right *
* 1           *     6      *      20*      20*      20*
* 1           *     5      *      20*      20*      20*
* 1           *     4      *      20*      20*      20*
* 1           *     3      *      20*      20*      20*
* 1           *     2      *      20*      20*      20*
* 1           *     1      *       0*       0*       0*
*****************************************************

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

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

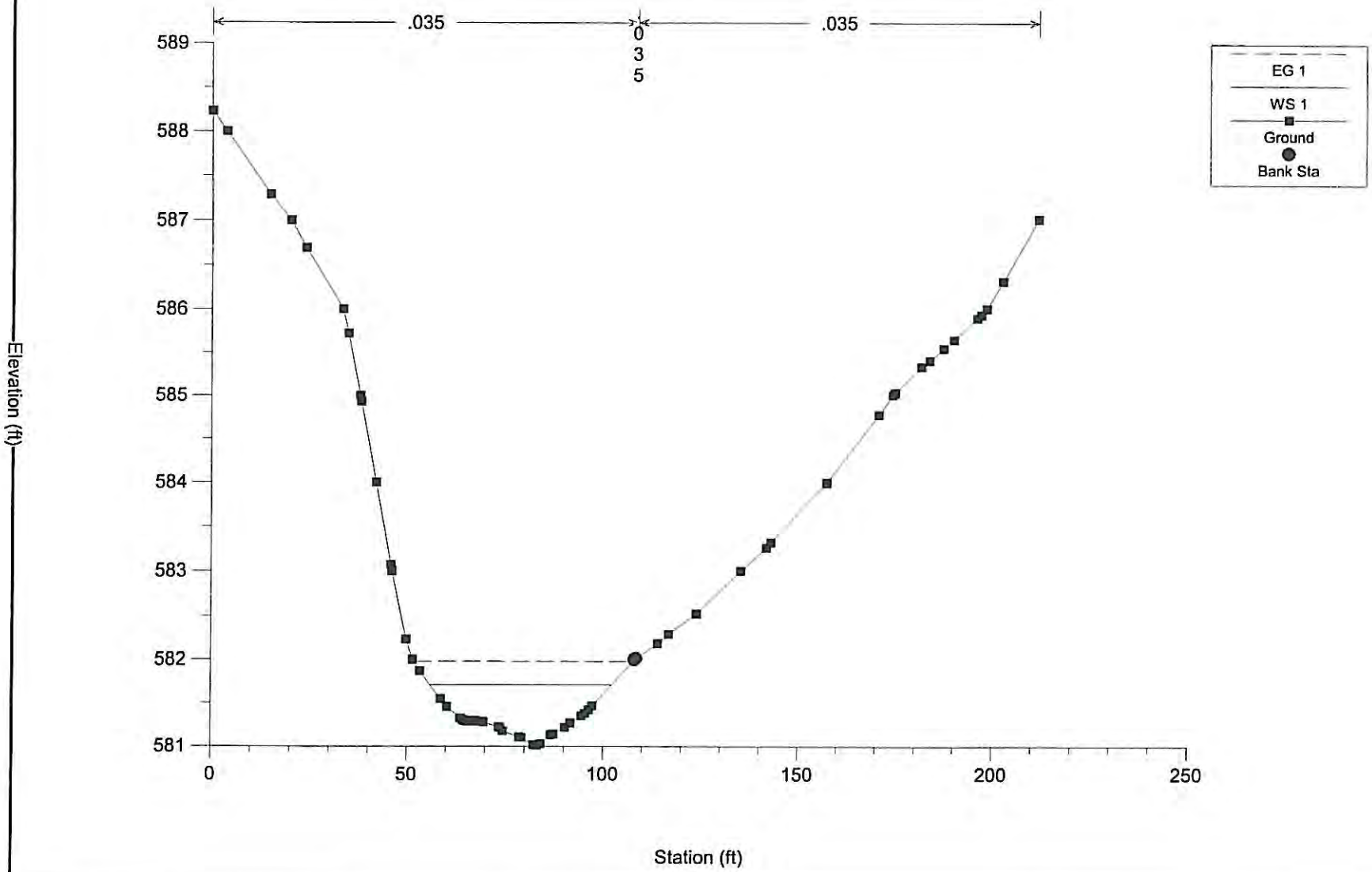
*********************************************
*    Reach    * River Sta. *  Contr.* Expan. *
*********************************************
```

```
* 1          *     6      *      .1*      .3*
* 1          *     5      *      .1*      .3*
* 1          *     4      *      .1*      .3*
* 1          *     3      *      .1*      .3*
* 1          *     2      *      .1*      .3*
* 1          *     1      *      .1*      .3*
*******************************************
```

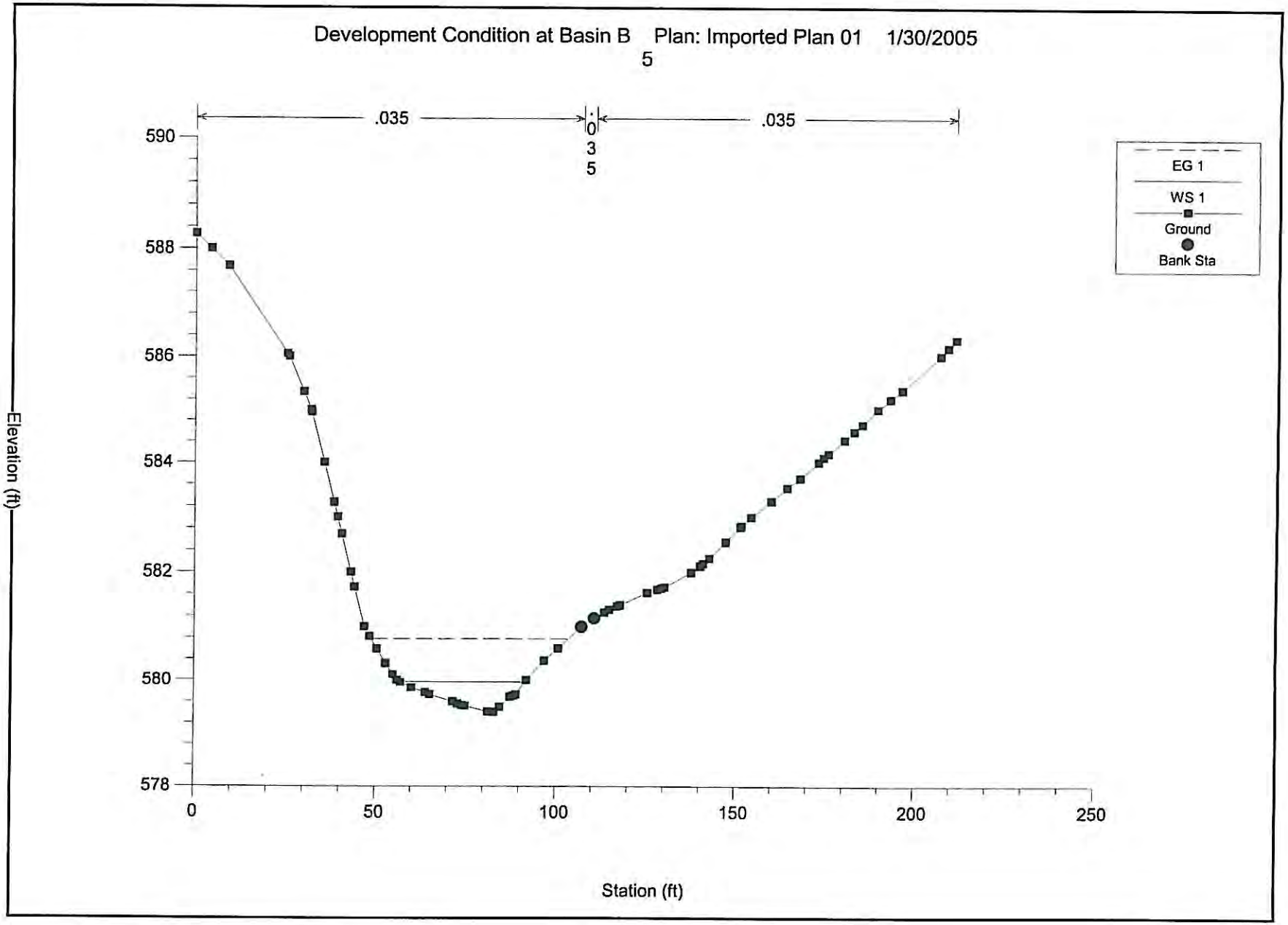
Profile Output Table - Standard Table 1

```
*****************************************************************************************************
*******************************
* River Sta. *  Q Total *Min Ch El *W.S. Elev *Crit W.S. *E.G. Elev *E.G. Slope * Vel Chnl *Flow
Area *Top Width *Froude # Chl *
*            *    (cfs) *     (ft) *     (ft) *     (ft) *     (ft) *   (ft/ft) *   (ft/s) *
(sq ft) *     (ft) *            *
*****************************************************************************************************
*******************************
* 6          *    79.40 *   582.00 *   581.71 *   581.75 *   581.98 *  0.031336 *          *
19.05 *    46.12 *        0.00 *
* 5          *    79.40 *   581.00 *   579.96 *   580.20 *   580.78 *  0.134763 *          *
10.97 *    34.61 *        0.00 *
* 4          *    79.40 *   580.11 *   579.22 *   579.26 *   579.53 *  0.029512 *          *
17.64 *    36.32 *        0.00 *
* 3          *    79.40 *   579.00 *   578.31 *   578.44 *   578.75 *  0.046871 *          *
14.90 *    33.71 *        0.00 *
* 2          *    79.40 *   577.28 *   577.36 *   577.45 *   577.70 *  0.054003 *     1.48 *
17.00 *    54.23 *        1.08 *
* 1          *    79.40 *   576.21 *   577.42 *   576.45 *   577.43 *  0.000291 *     0.81 *
100.11 *    91.13 *        0.13 *
*****************************************************************************************************
*******************************
```

Development Condition at Basin B Plan: Imported Plan 01 1/30/2005
6



Development Condition at Basin B Plan: Imported Plan 01 1/30/2005



Development Condition at Basin B Plan: Imported Plan 01 1/30/2005

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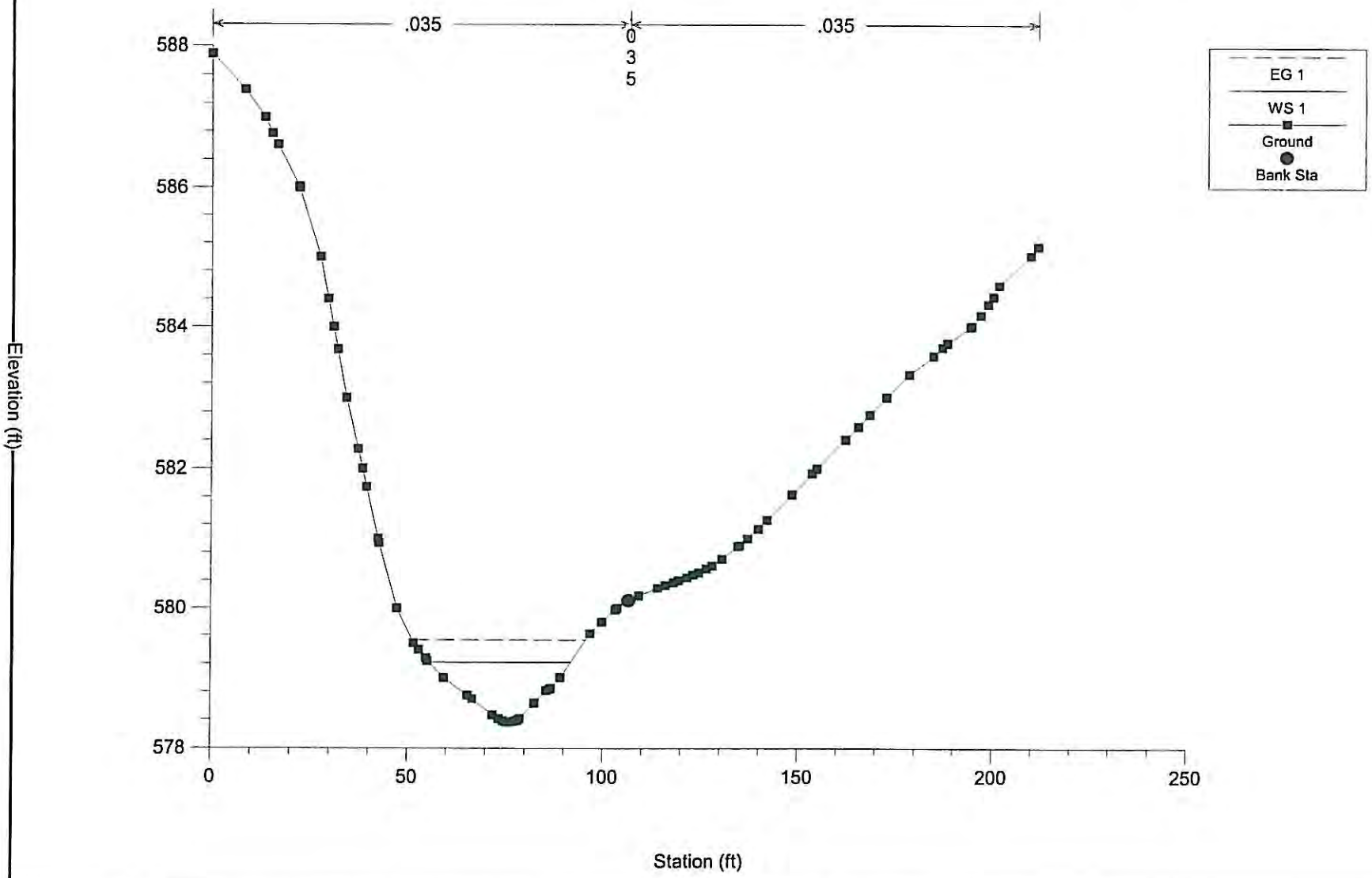

Development Condition at Basin B Plan: Imported Plan 01 1/30/2005

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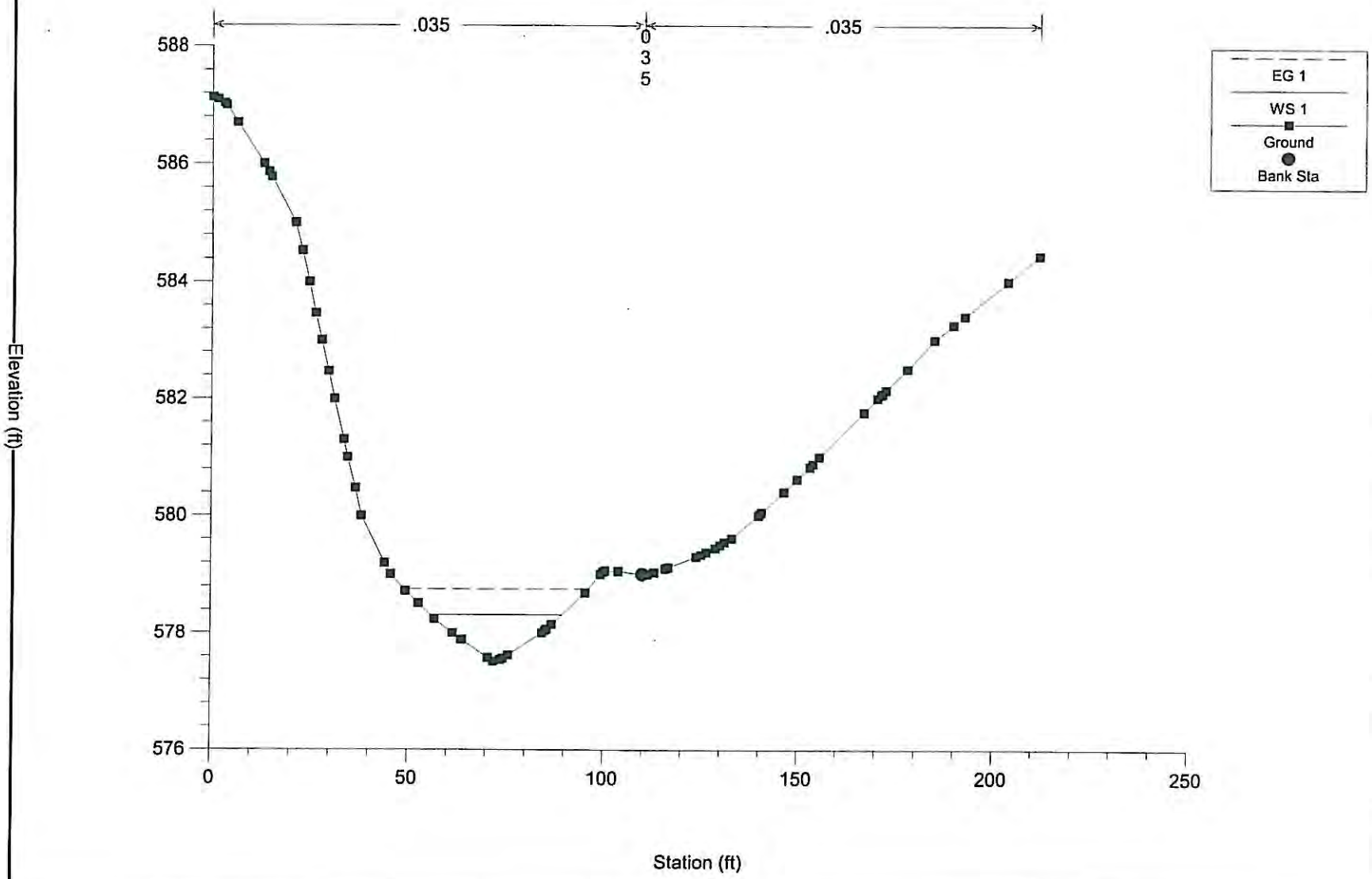

Development Condition at Basin B Plan: Imported Plan 01 1/30/2005
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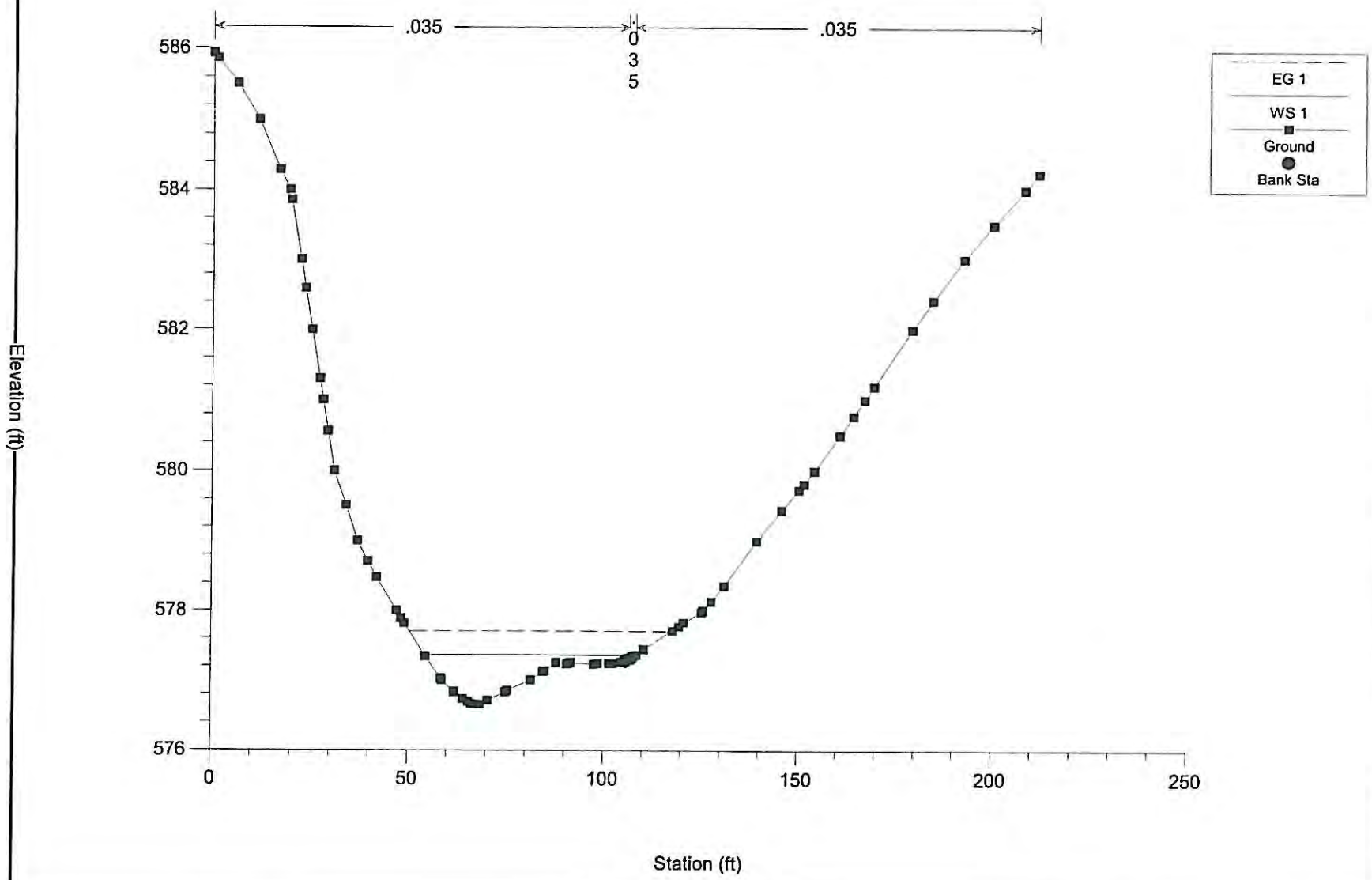
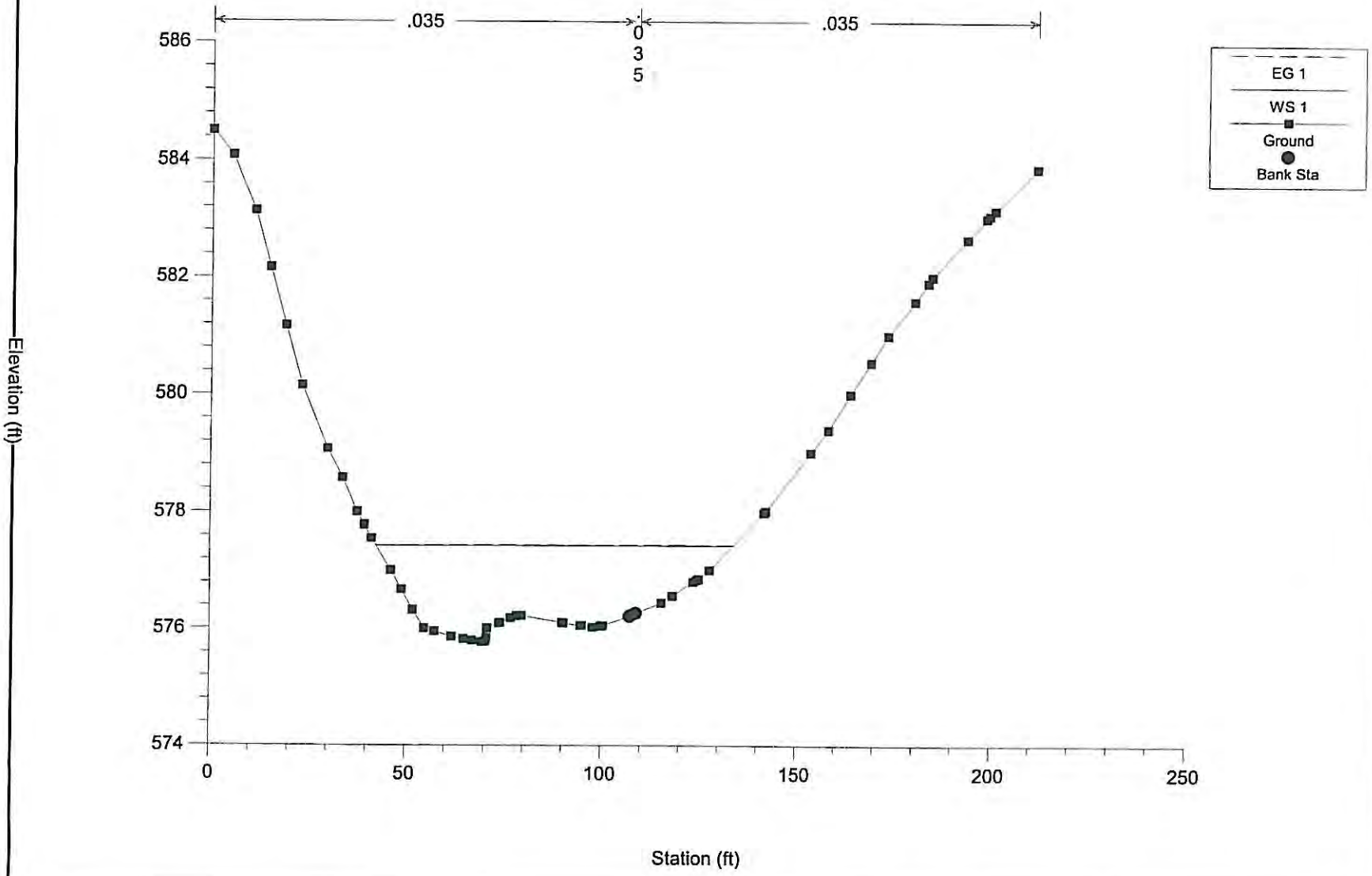


Development Condition at Basin B Plan: Imported Plan 01 1/30/2005

1



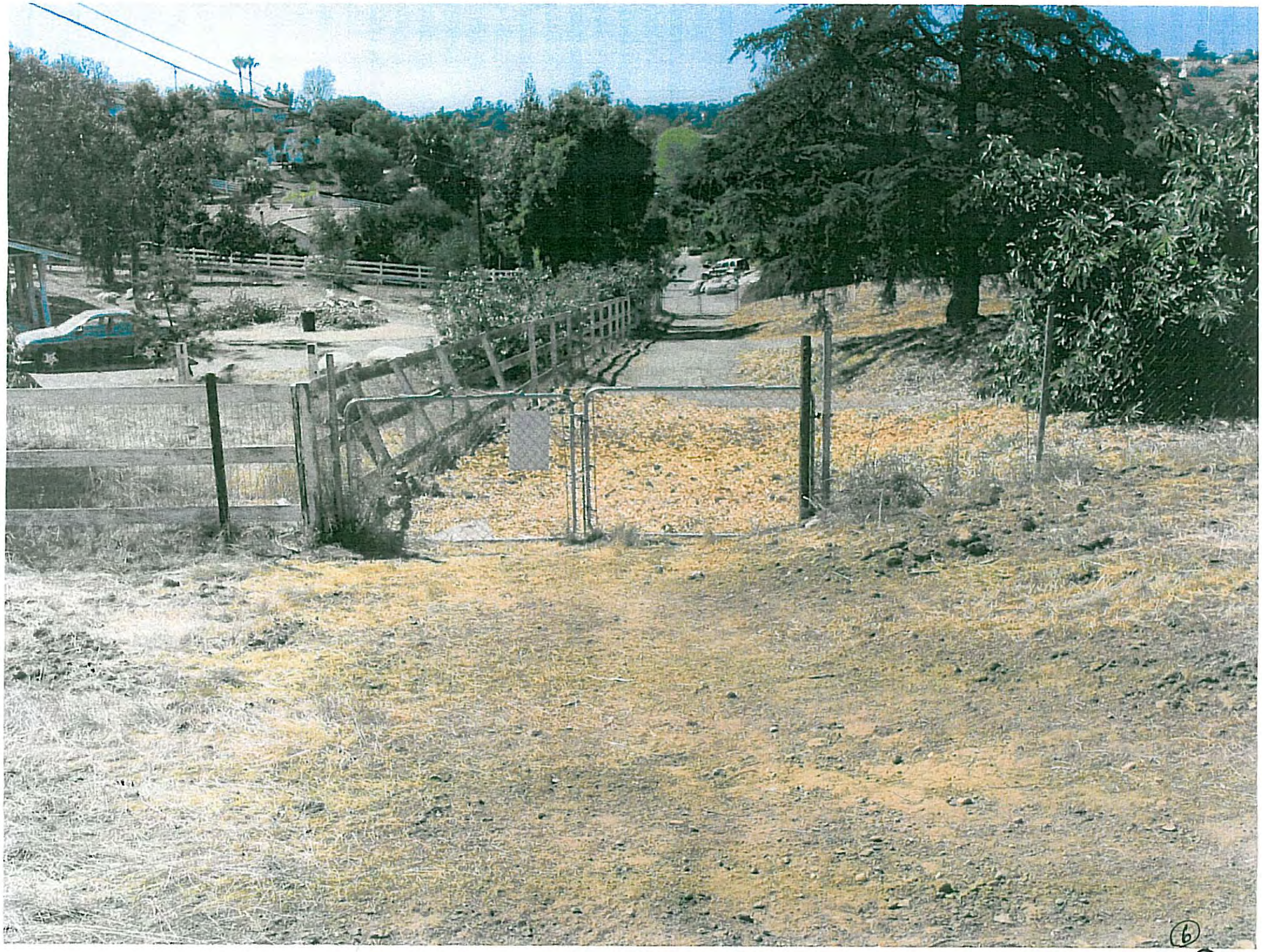
II. CALCULATIONS

D. SITE PHOTO

1

3
(2)

4



(6)

(7)

(a)

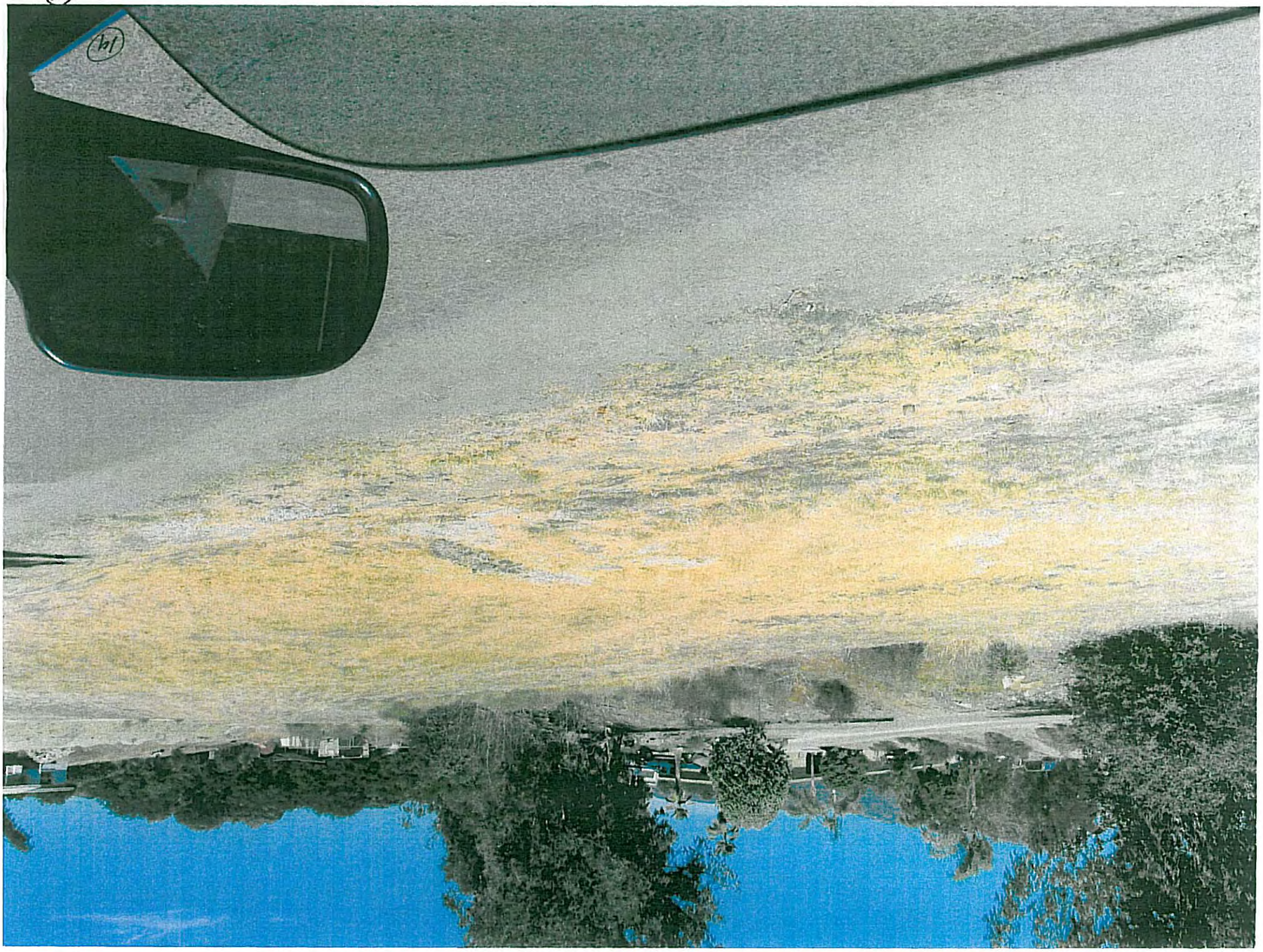
(a)

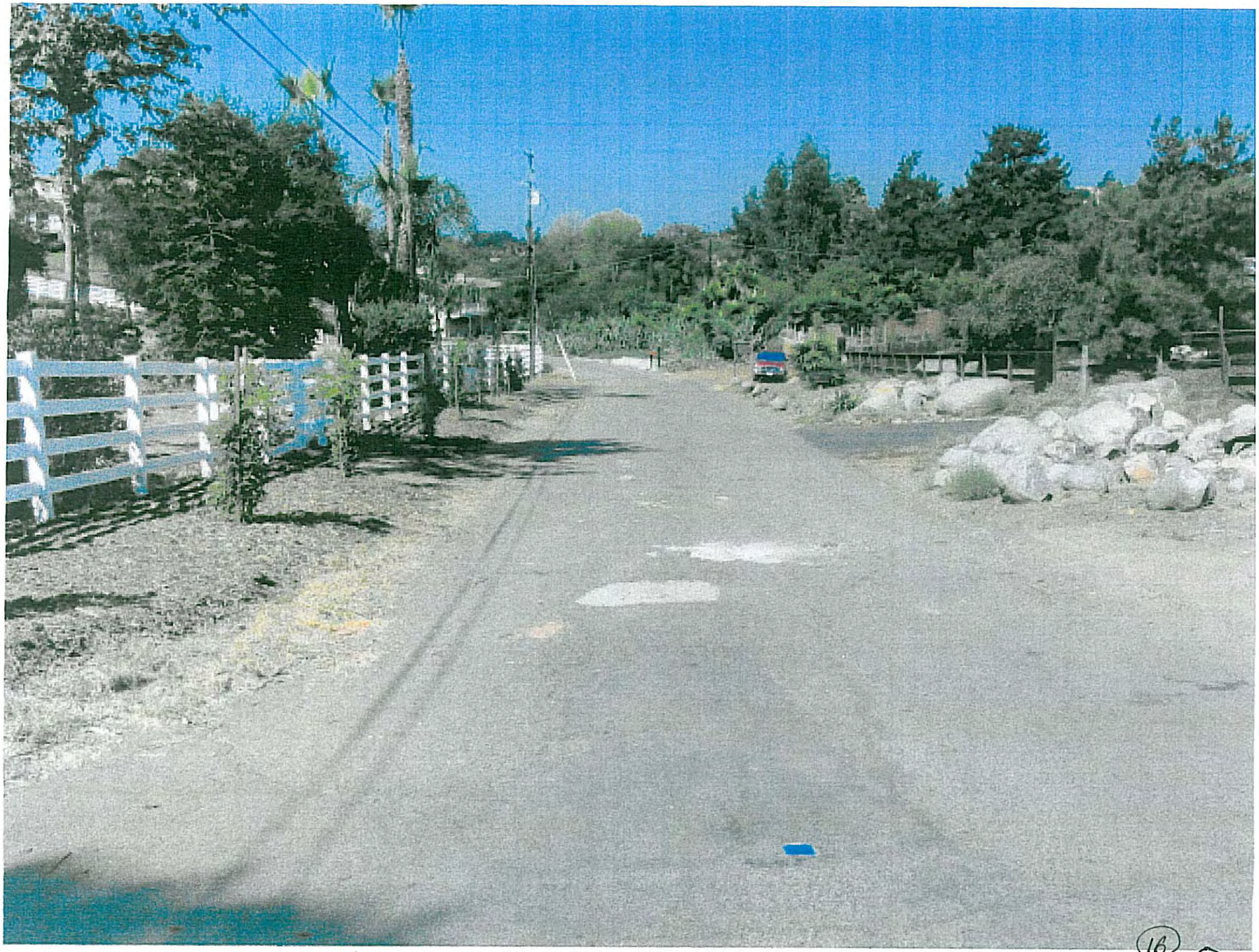
11

12

13

(カ1)





16

III. EXHIBITS

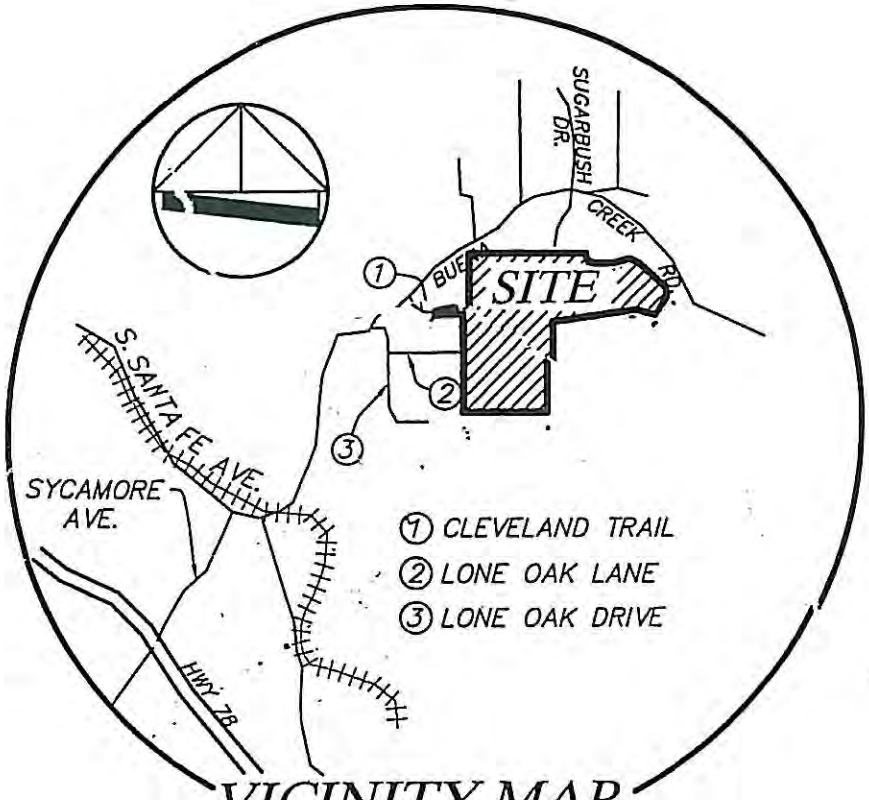
III. EXHIBITS

A. EXISTING HYDROLOGY MAP

III. EXHIBITS

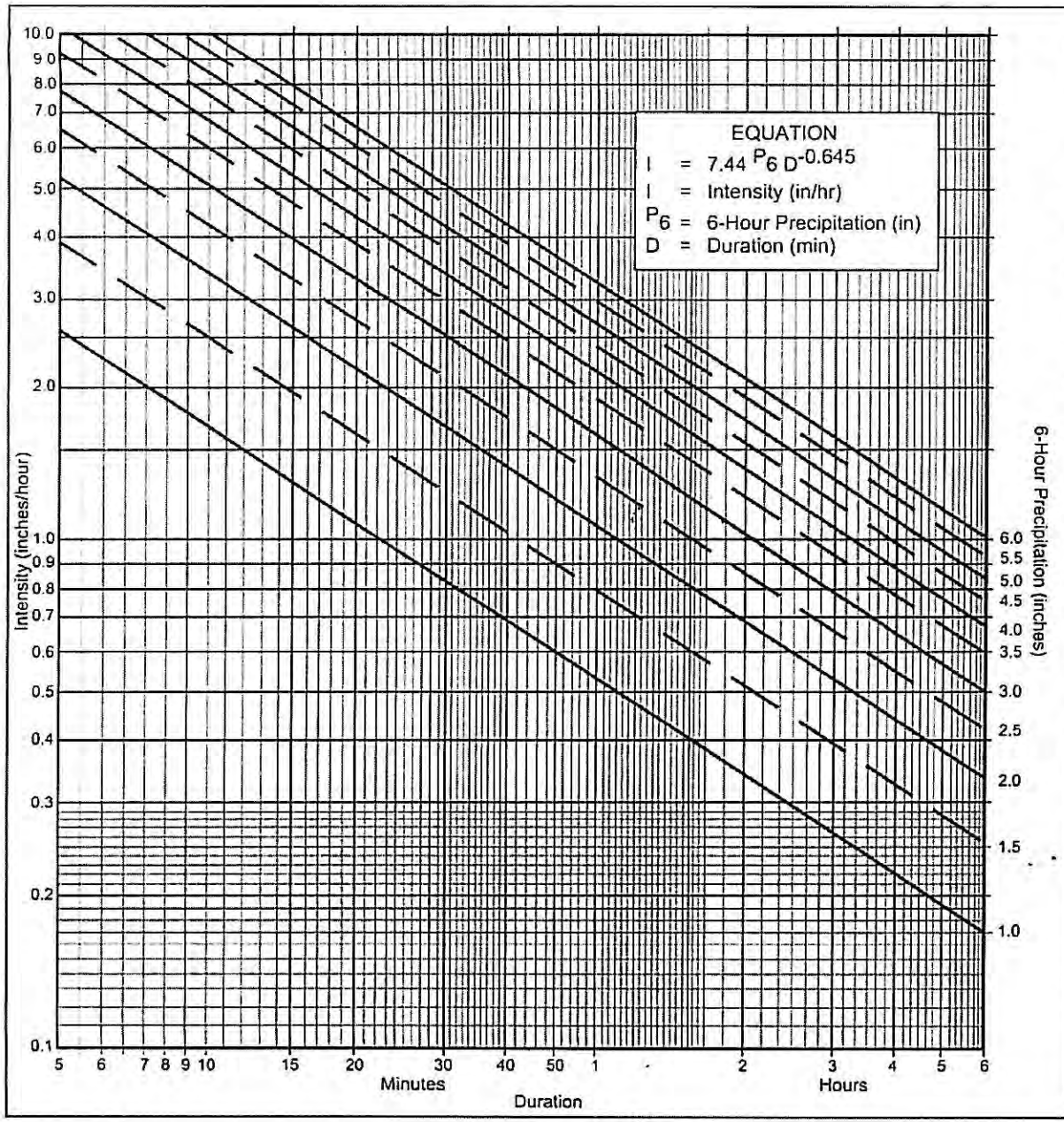
B. DEVELOPED HYDROLOGY MAP

IV. REFERENCES



VICINITY MAP

NTS



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.5 in., P_{24} = 6.0, $\frac{P_6}{P_{24}}$ = 58 %(2)

(c) Adjusted $P_6^{(2)}$ = 3.5 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

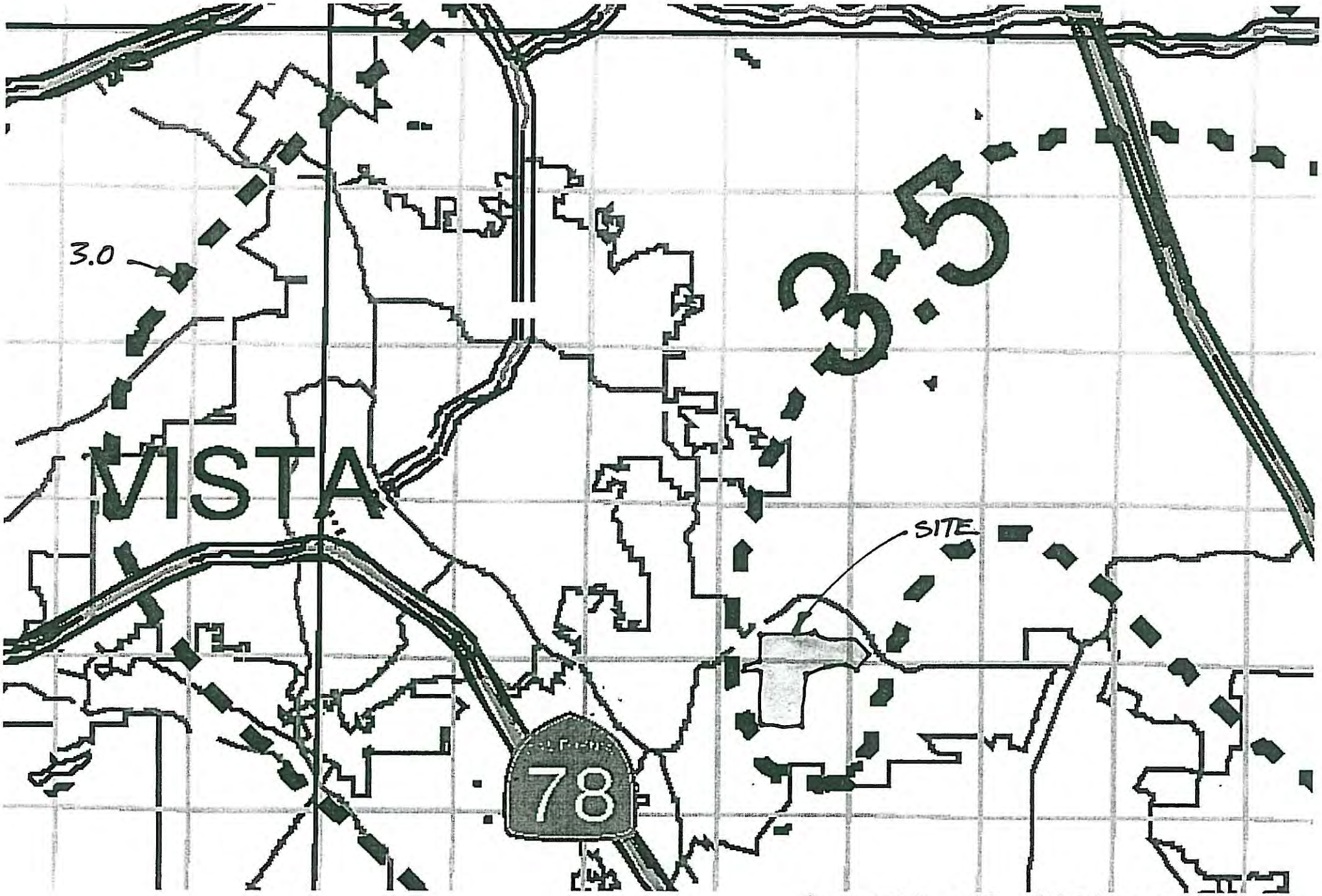
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

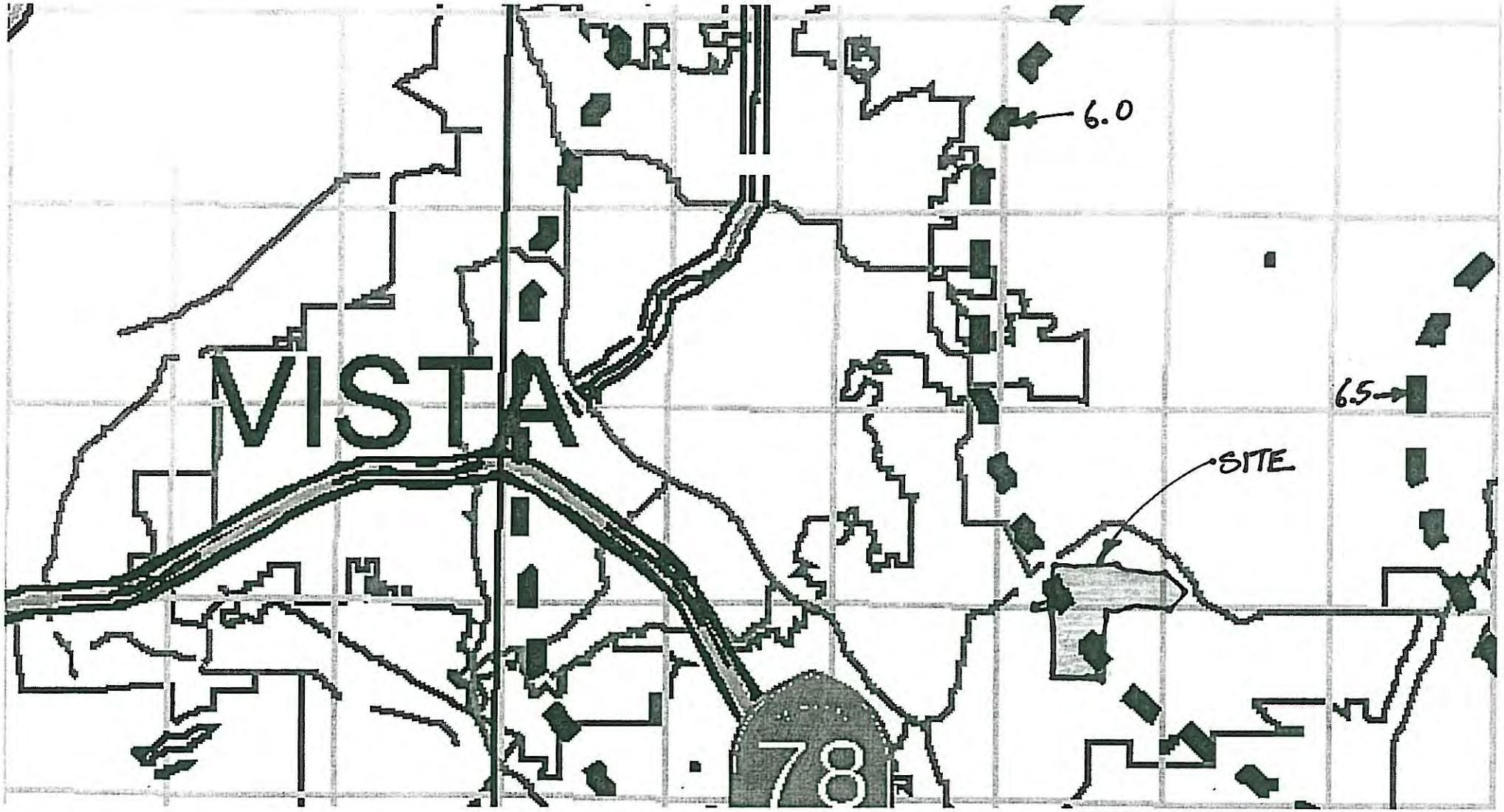
Intensity-Duration Design Chart - Template

FIGURE

3-1



COUNTY OF SAN DIEGO
ISOPLUVIAL MAP



COUNTY OF SAN DIEGO
ISOPLUVIAL MAP

100-YEAR 24-HOURS.

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

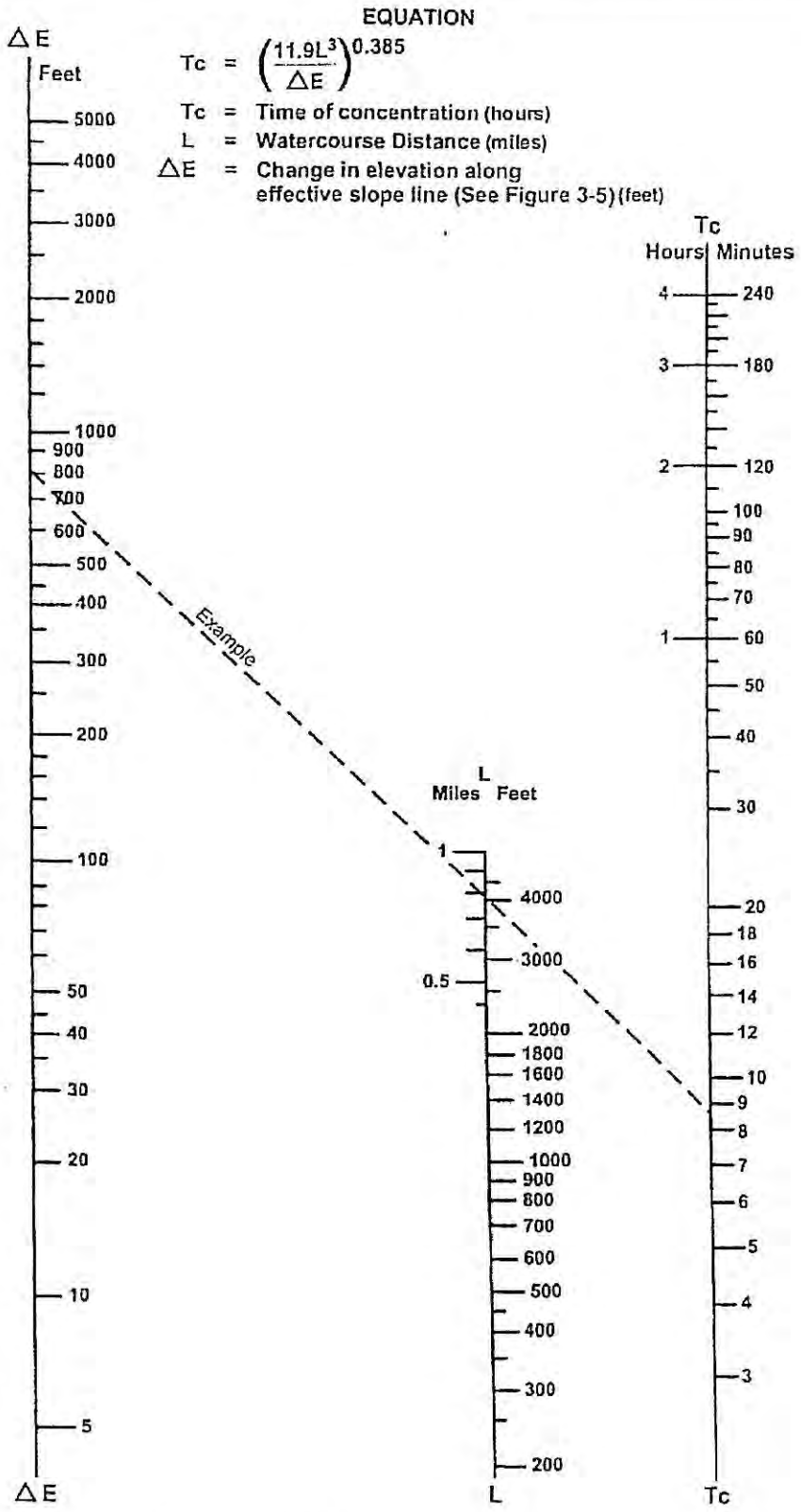
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



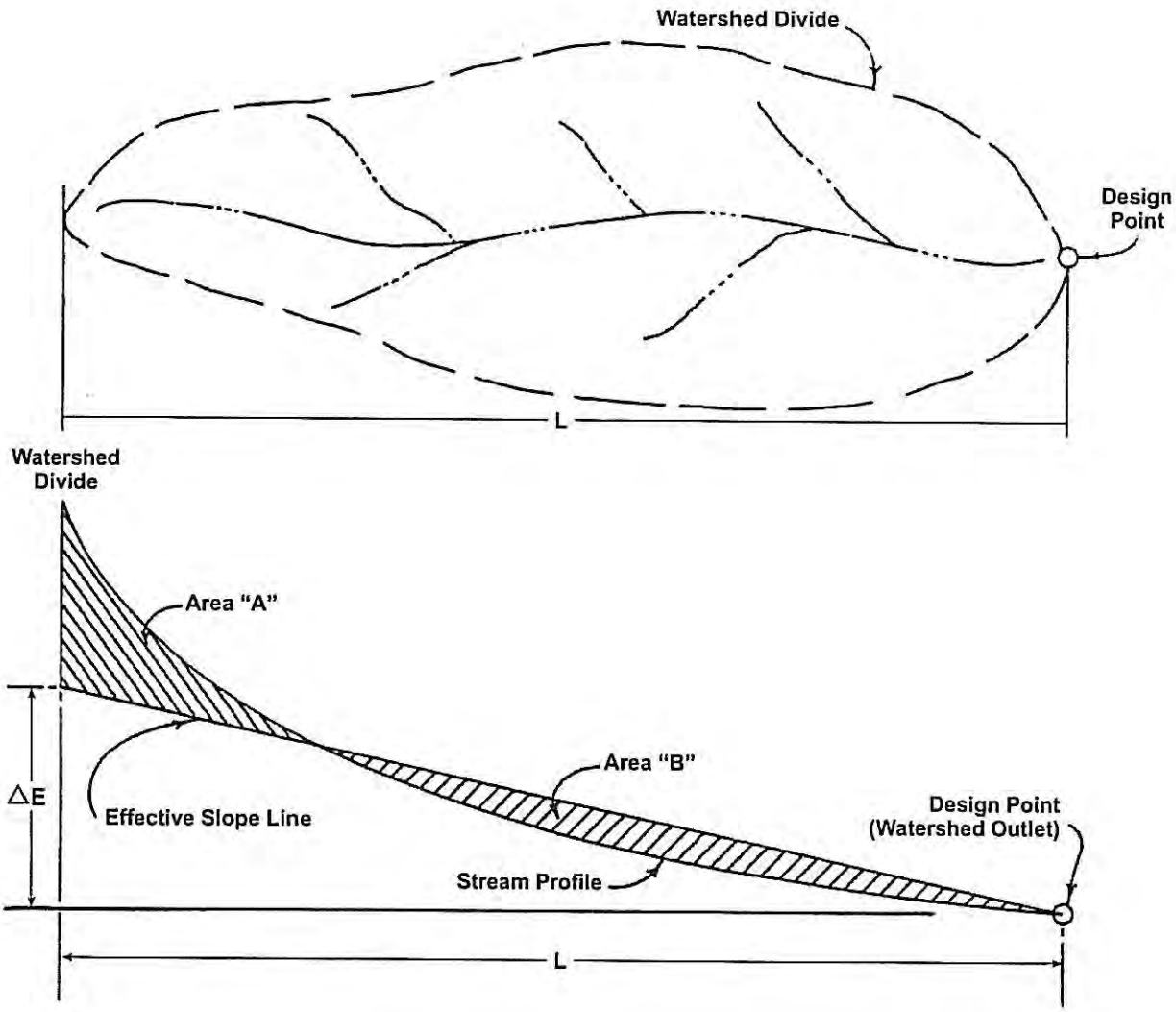
SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

APPENDIX X-A



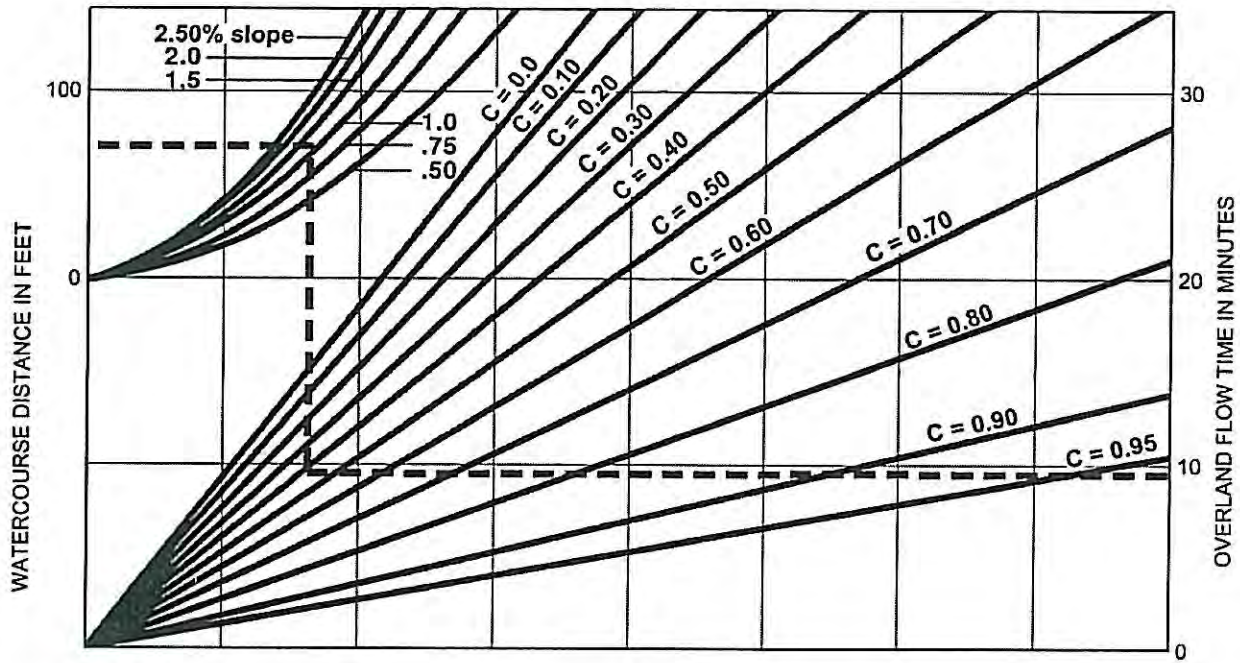
Area "A" = Area "B"

SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

Computation of Effective Slope for Natural Watersheds

3-5



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

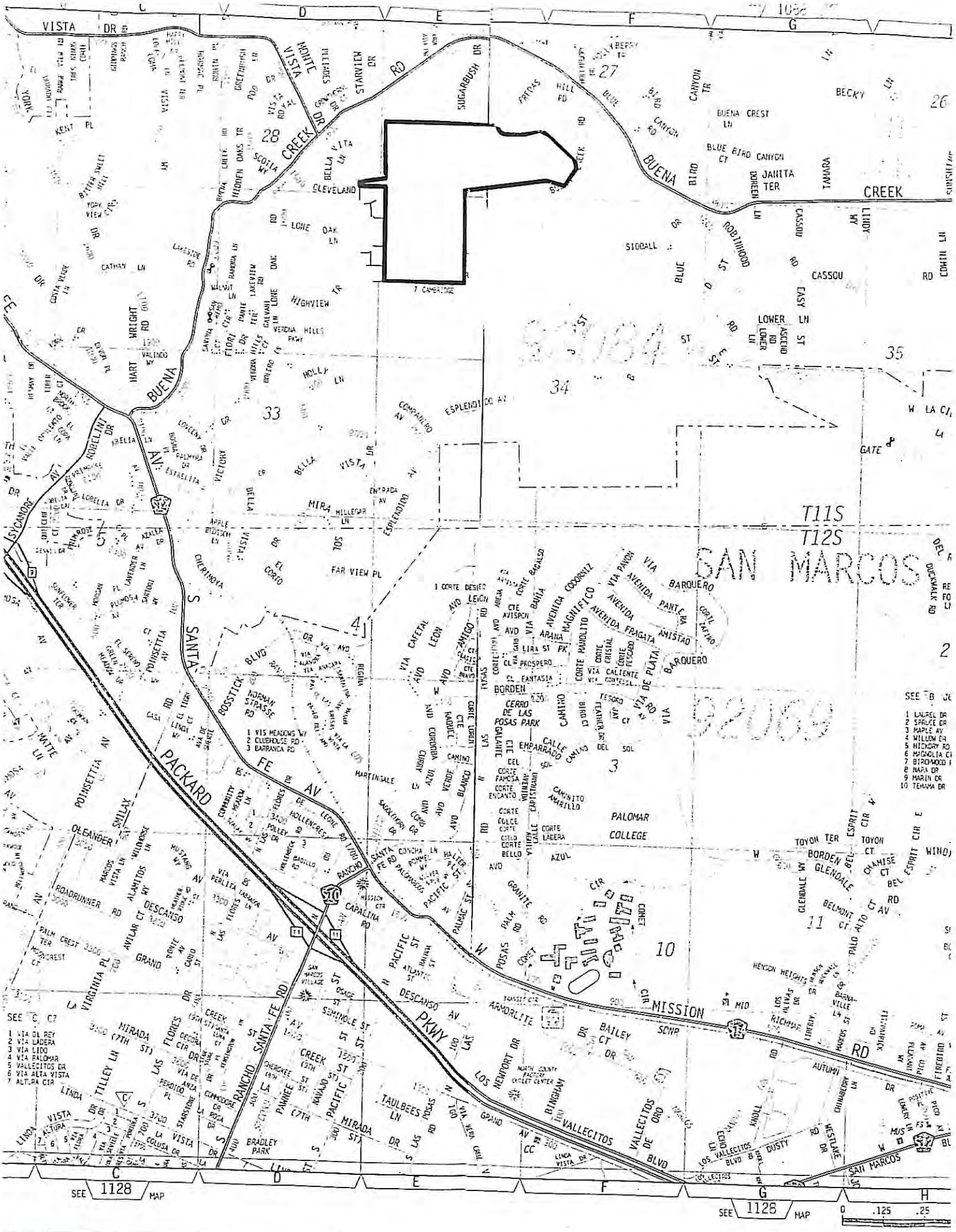
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

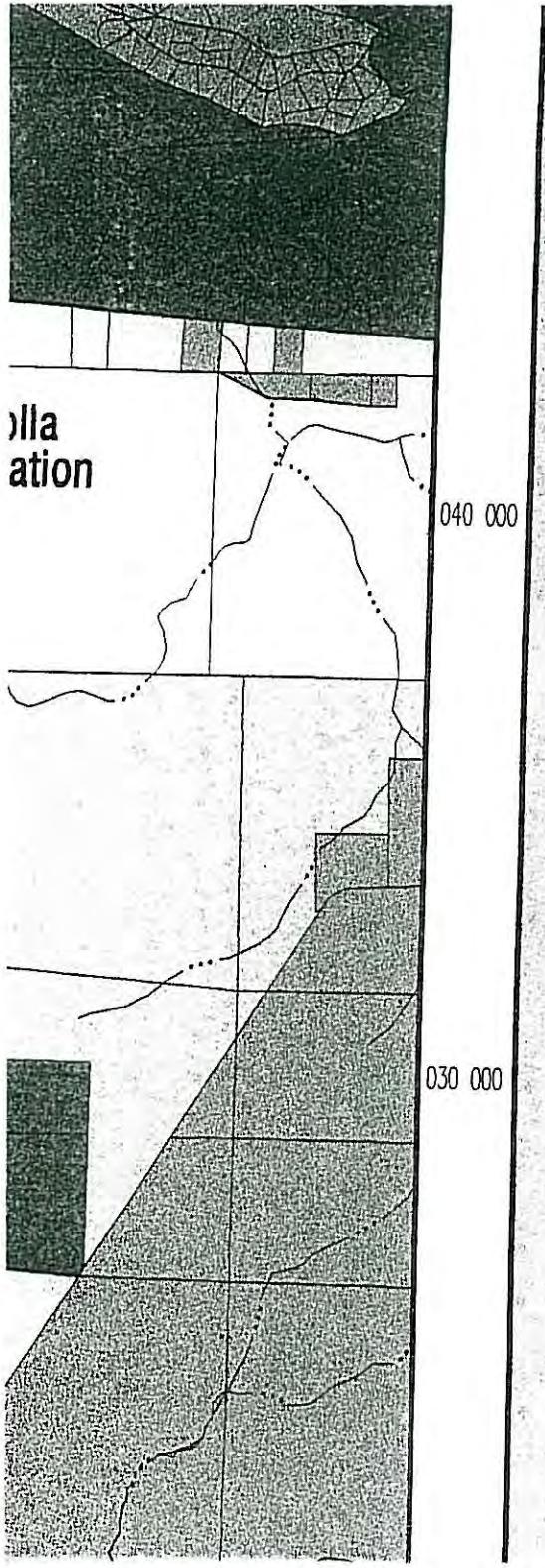
FIGURE

Rational Formula - Overland Time of Flow Nomograph

3-3

< 735 feet >


VISTA DR
MONTE VISTA
STARVIEW DR
SUGARBUSH DR
BUENA CREEK
BUENA VISTA CREEK
CLEVELAND
LONE OAK LN
HIGHVIEW TR
HARTWRIGHT RD
BUENA
ROBLINI DR
SYCAMORE AV
SANTA FE AV
PACKARD
BOSSTICK BLVD
POINSETTIA AV
OLEANDER
SMILAX
ROADRUNNER RD
DESCANSO
AVILAR CT
GRAND
LA VIRGINIA PL
MIRADA
TILLEY LN
LINDA VISTA
RANCHO SANTA FE RD
CAPALINA RD
PACIFIC ST
POSAS
MISSION PKWY
VALLECITOS BLVD
VALLECITOS DE ORO
LOS NEWPORT DR
BINGHAM
BORDEN
CERRO DE LAS POSAS PARK
PALOMAR COLLEGE
SAN MARCOS
T11S
T12S
BARQUERO
AVENIDA PANTOJA
AVENIDA FRAGATA
AMISTAD
VIA DE PLATA
VIA CAFETAL
VIA LEON
AMIGO
VIA MAGNIFICO
AVENIDA COCOSUZ
VIA PAVON
ARANA
CORTE MANOLITO
CORTE CRISTAL
CORTE TESCADO
CALLE EMPARRADO
CAMINO DEL SOL
CORTE FAMOSA
CORTE ENCANTO
CAMINITO AMARILLO
CORTE LADERA
CORTE DULCE
CORTE CIELO
CORTE BELLO
AZUL
GRANITE RD
PALM RD
COMET
TOYON TER
TOYON CT
BORDEN
GLENDALE
CHAMISE CT
ESPRIT CIR
BELMONT CT
PALO ALTO CT
HENSON HEIGHTS
BARNAVILLE LN
RICHMAR
LIBERTY
AUTUMN
FIREBIRD
BAILEY CT
ARMORLITE
DESCANSO AV
SEMINOLE ST
CHEROKEE ST
NAVAJO ST
PAWNEE ST
CREEK (6TH ST)
MIRADA (7TH ST)
LAS FLORES DR
BRADLEY PARK
TAULBEES LN
LOS VALLECITOS BLVD
DUSTY
WESTLAKE DR
KNOLL
CHIMBERGER LN
SAN MARCOS
SEE 1128 MAP
SEE 1128 MAP
0 .125 .25



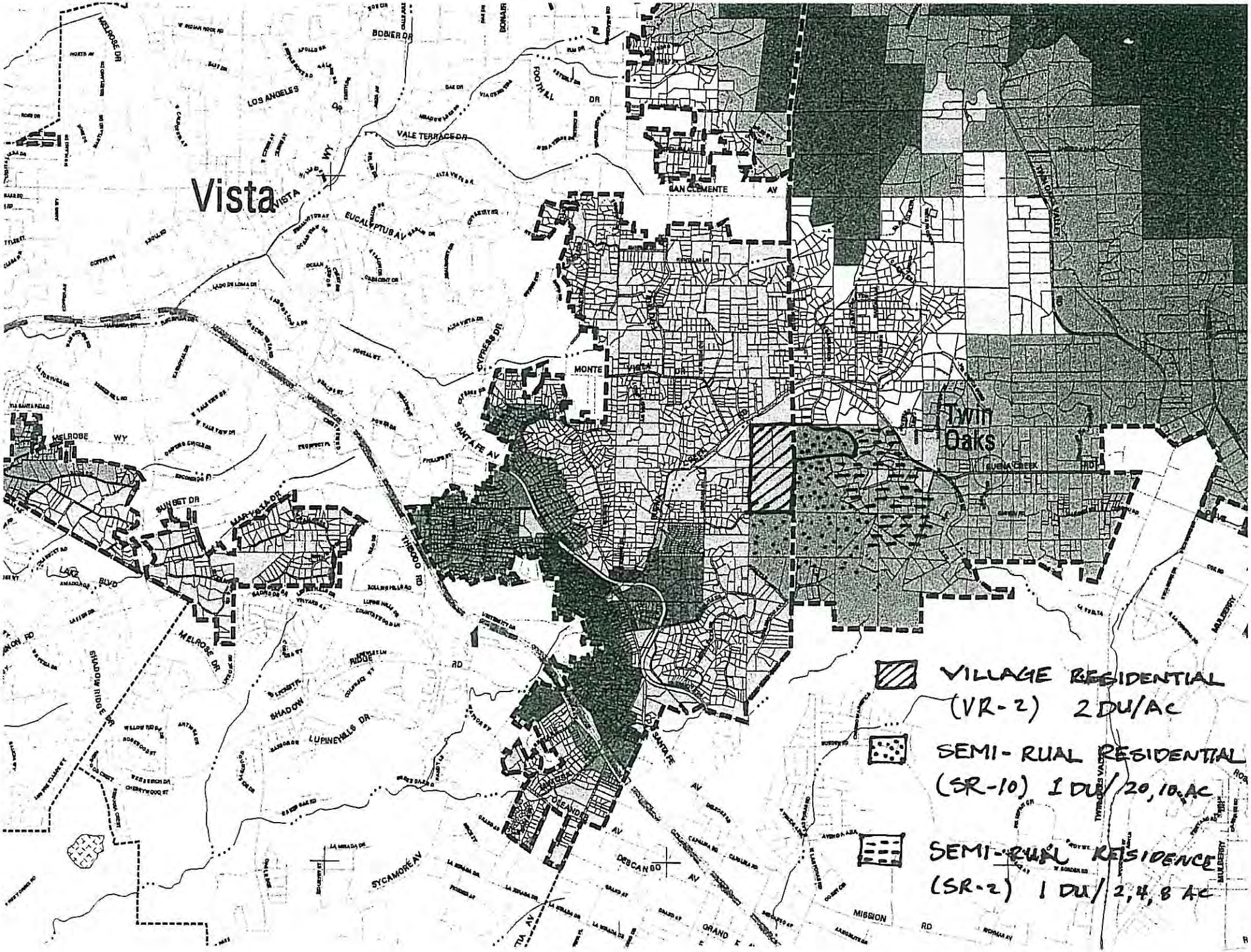
GENERAL PLAN 2020

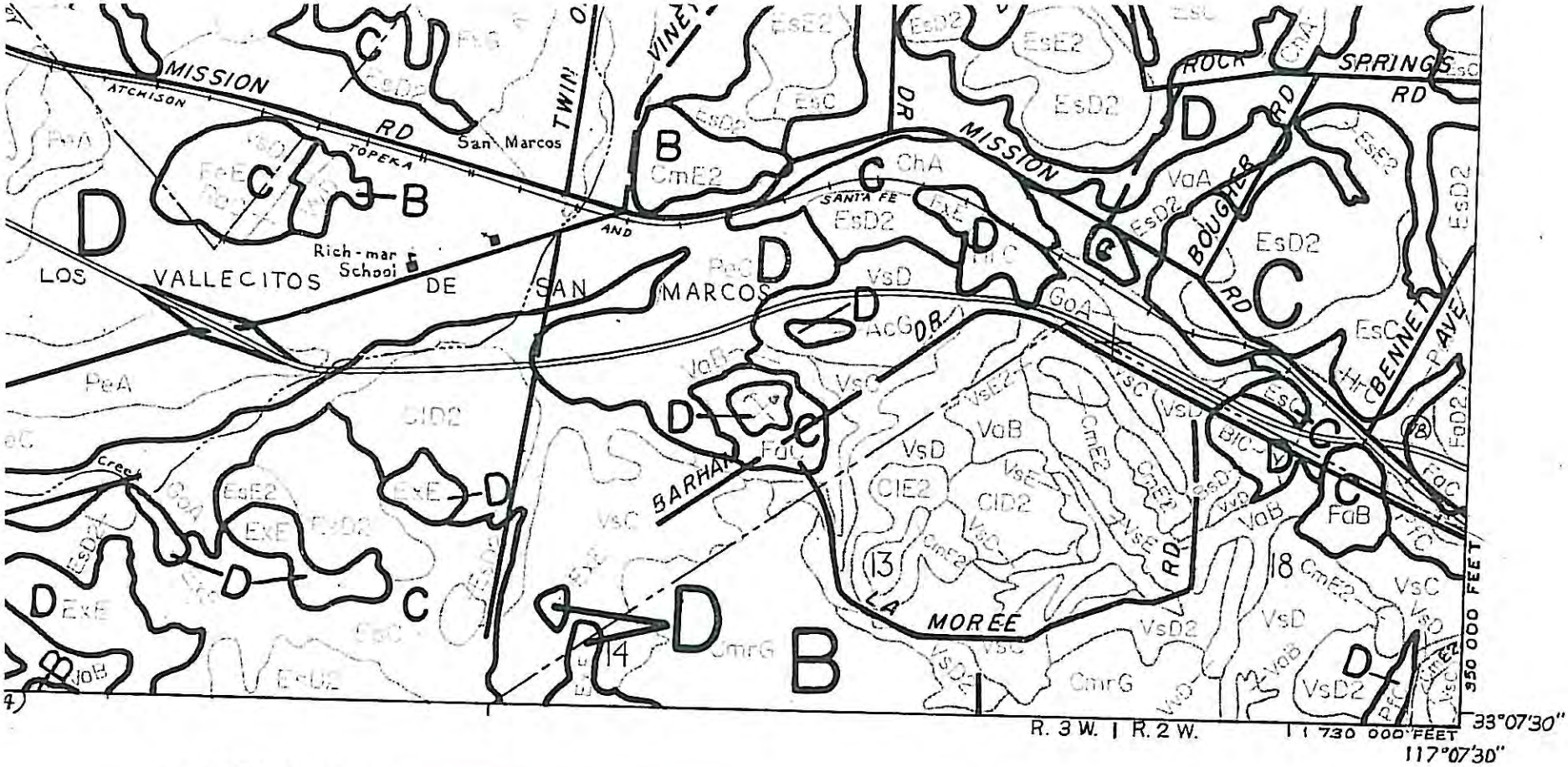
NORTH COUNTY METRO
Community Planning Area

Residential Baseline July 2004

DATED INFORMATION
Information contained on this map has been, or is in the process of being modified and is subject to change

- Village Residential (VR-24), 24 du/ac
- Village Residential (VR-14.5), 14.5 du/ac
- Village Residential (VR-10.9), 10.9 du/ac
- Village Residential (VR-7.3), 7.3 du/ac
- Village Residential (VR-4.3), 4.3 du/ac
- Village Residential (VR-2.9), 2.9 du/ac
- Village Residential (VR-2), 2 du/ac
- Semi-rural Residential (SR-1), 1 du/1,2,4 ac
- Semi-rural Residential (SR-2), 1 du/2,4,8 ac
- Semi-rural Residential (SR-4), 1 du/4,8,16 ac


Vista
Twin Oaks
VILLAGE RESIDENTIAL
(VR-2) 2 DU/AC
SEMI-RUAL RESIDENTIAL
(SR-10) 1 DU/20,10 AC
SEMI-RUAL RESIDENCE
(SR-2) 1 DU/2,4,8 AC
BOBIER DR
LOS ANGELES
VALE TERRACE DR
FOOTHILL DR
SAN CLEMENTE
EUCALYPTUS AV
CYPRESS DR
MONTE VISTA DR
SANTA FE AV
MELROSE WY
SUNSET DR
MARVETA DR
MELROSE DR
SHADOW RIDGE DR
LUPINE HILLS DR
SYCAMORE AV
DESCANSO
MISSION RD
GRAND
MULBERRY



CAUTION NOTES:

1. User is urged to refer to corresponding SUPPLEMENTAL DATA SHEET for assumptions, criteria, map sources, additional legend items, and necessary explanation of ratings shown on map.

2. This map does not eliminate the need for detailed on-site investigation of the soil and site to determine precise soil conditions prior to undertaking any construction, grading, planting, or other soils related activity.

Base Map Source: U. S. Geological Survey with California State Coordinate System, Zone 6 Indicated

Prepared by: U. S. Department of Agriculture, Soil Conservation Service

Published by: San Diego County Planning Department for the Comprehensive Planning Organization — 1969

North

SCALE 1:24000

0 2000 4000 6000 feet

0 ¼ mile ½ mile 1 mile

Represents 40 acres

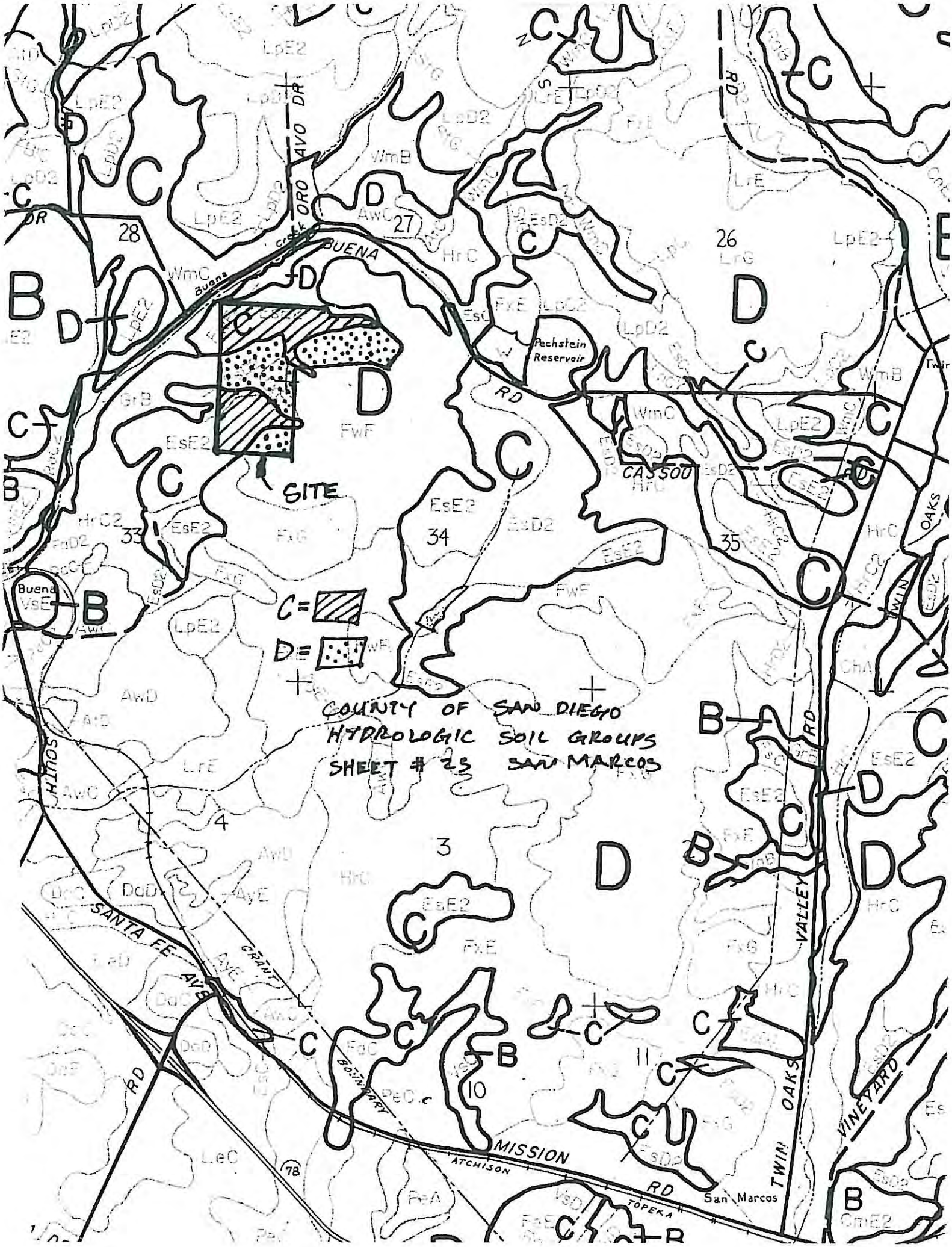
FEDERAL ASSISTANCE — The preparation of this map was financed in part through a comprehensive planning grant from the Department of Housing and Urban Development.

SHEET NAME

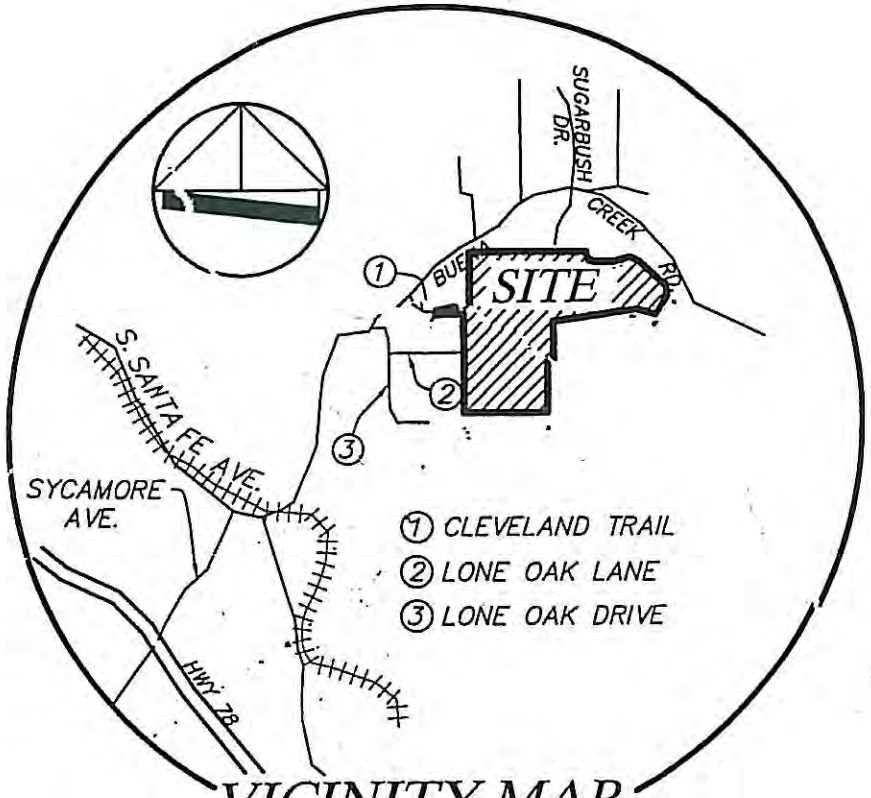
San Marcos

SHEET NUMBER

23

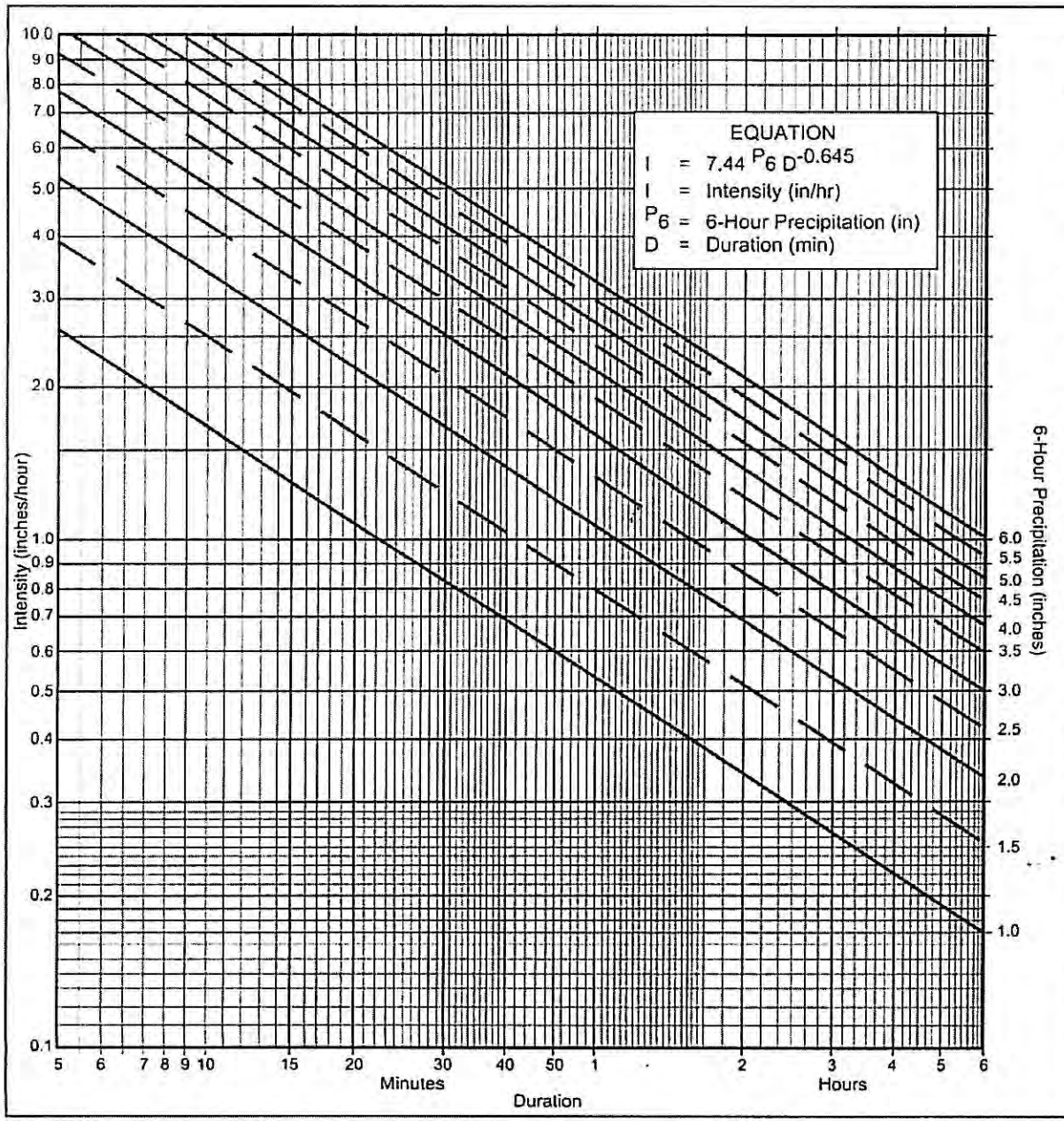

COUNTY OF SAN DIEGO
HYDROLOGIC SOIL GROUPS
SHEET # 23 SAN MARCOS
C=
D=
SITE
Pechstein Reservoir
BUENA
ORO
AVO DR
CASSOU
TWIN OAKS
VALLEY RD
VINEYARD
MISSION RD
SANTA FE AVE
GRANT
BOUNDARY
ATCHISON TOPEKA
San Marcos
78

IV. REFERENCES



VICINITY MAP

NTS



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.5 in., P_{24} = 6.0, $\frac{P_6}{P_{24}}$ = 58 %(2)

(c) Adjusted $P_6^{(2)}$ = 3.5 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

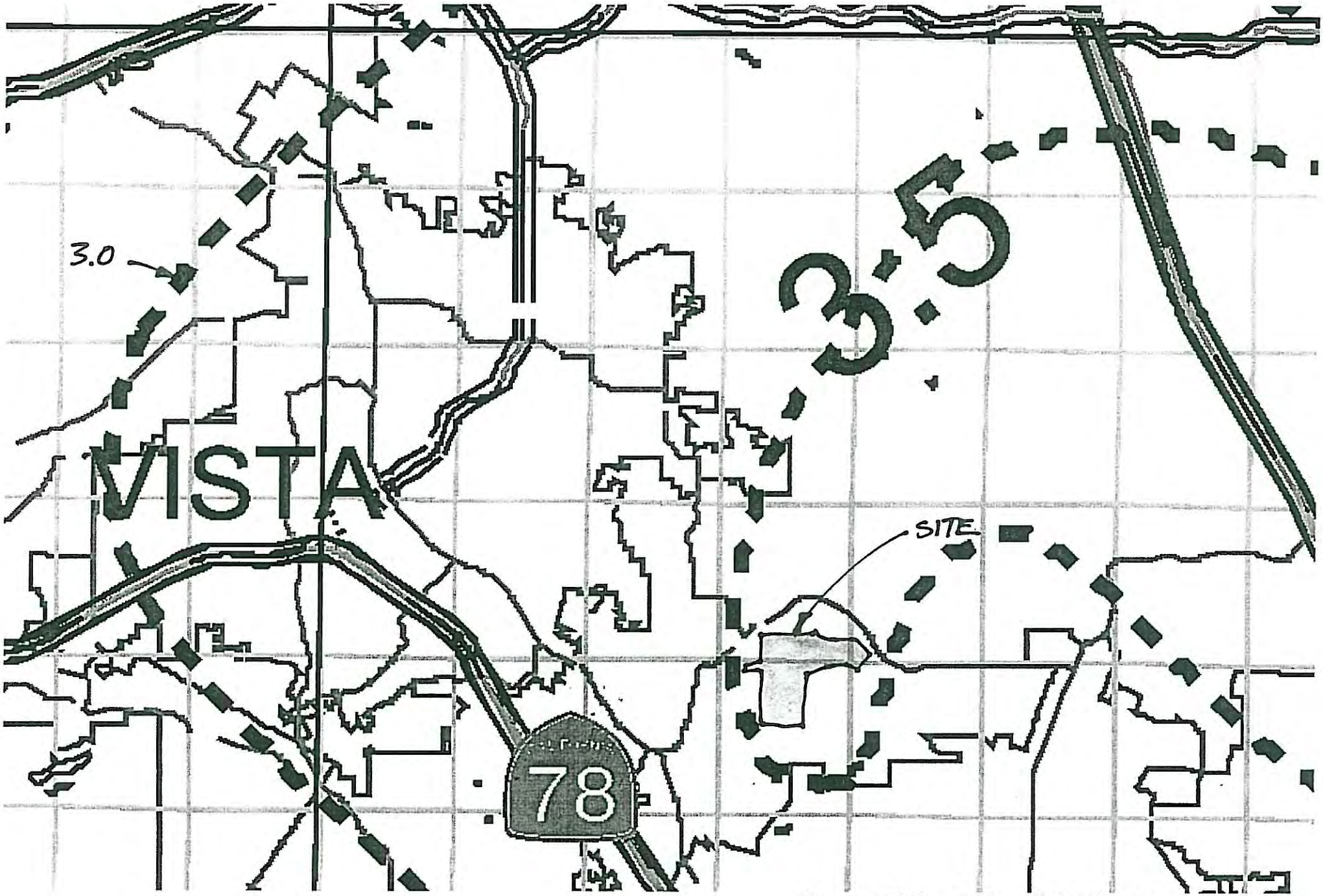
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

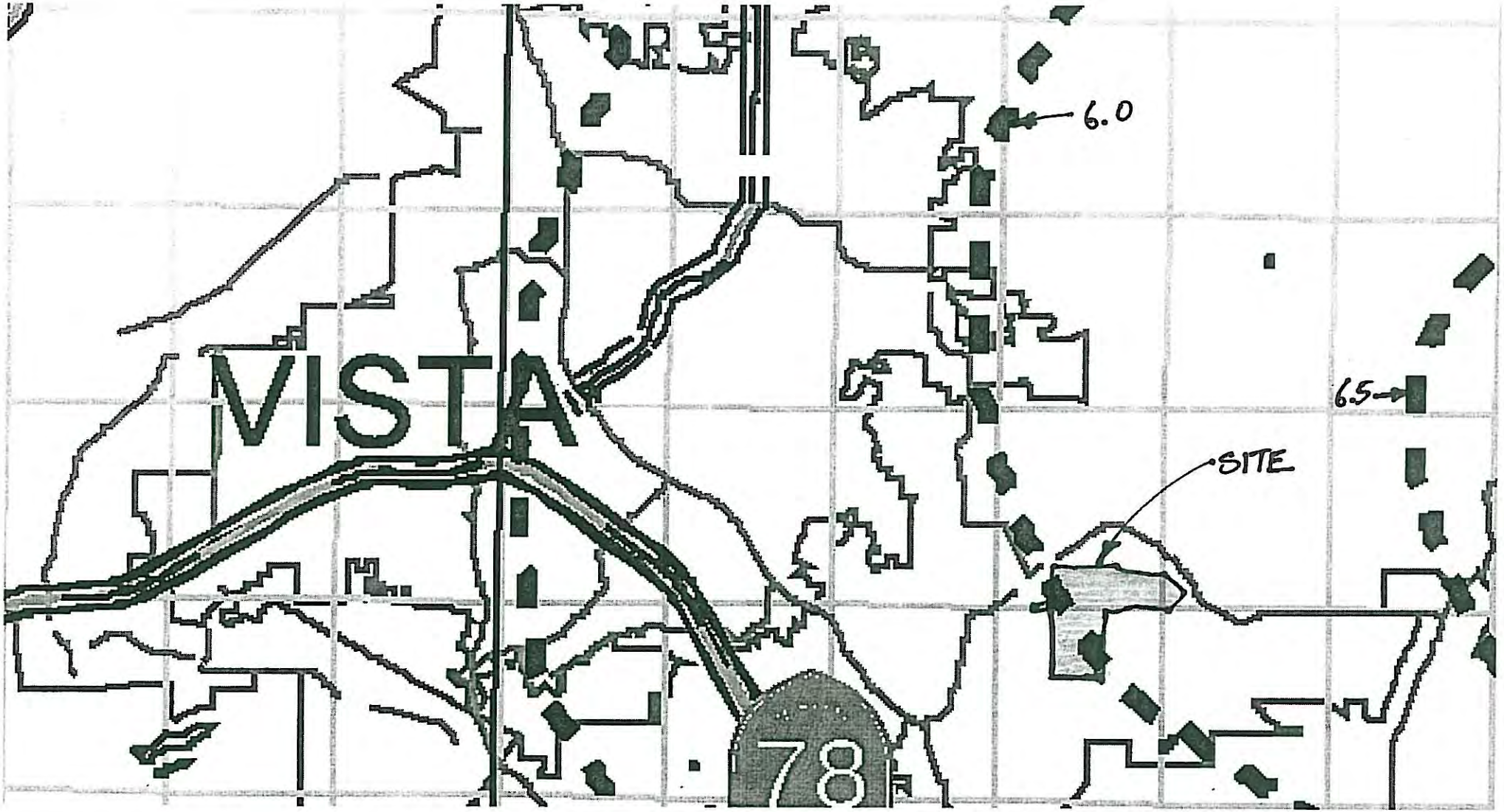
Intensity-Duration Design Chart - Template

FIGURE

3-1



COUNTY OF SAN DIEGO
ISOPLUVIAL MAP



COUNTY OF SAN DIEGO
ISOPLUVIAL MAP

100-YEAR 24-HOURS.

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

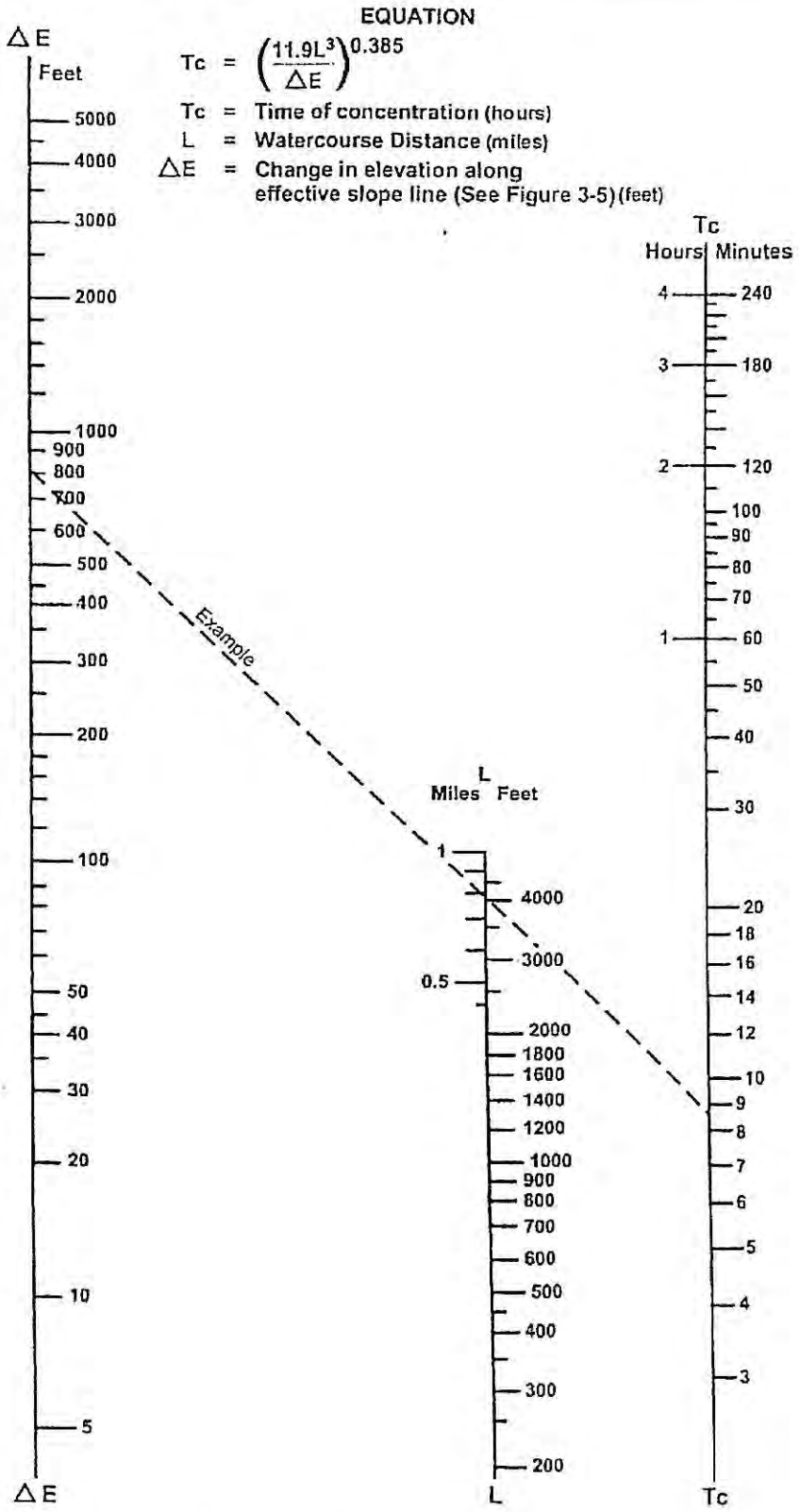
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



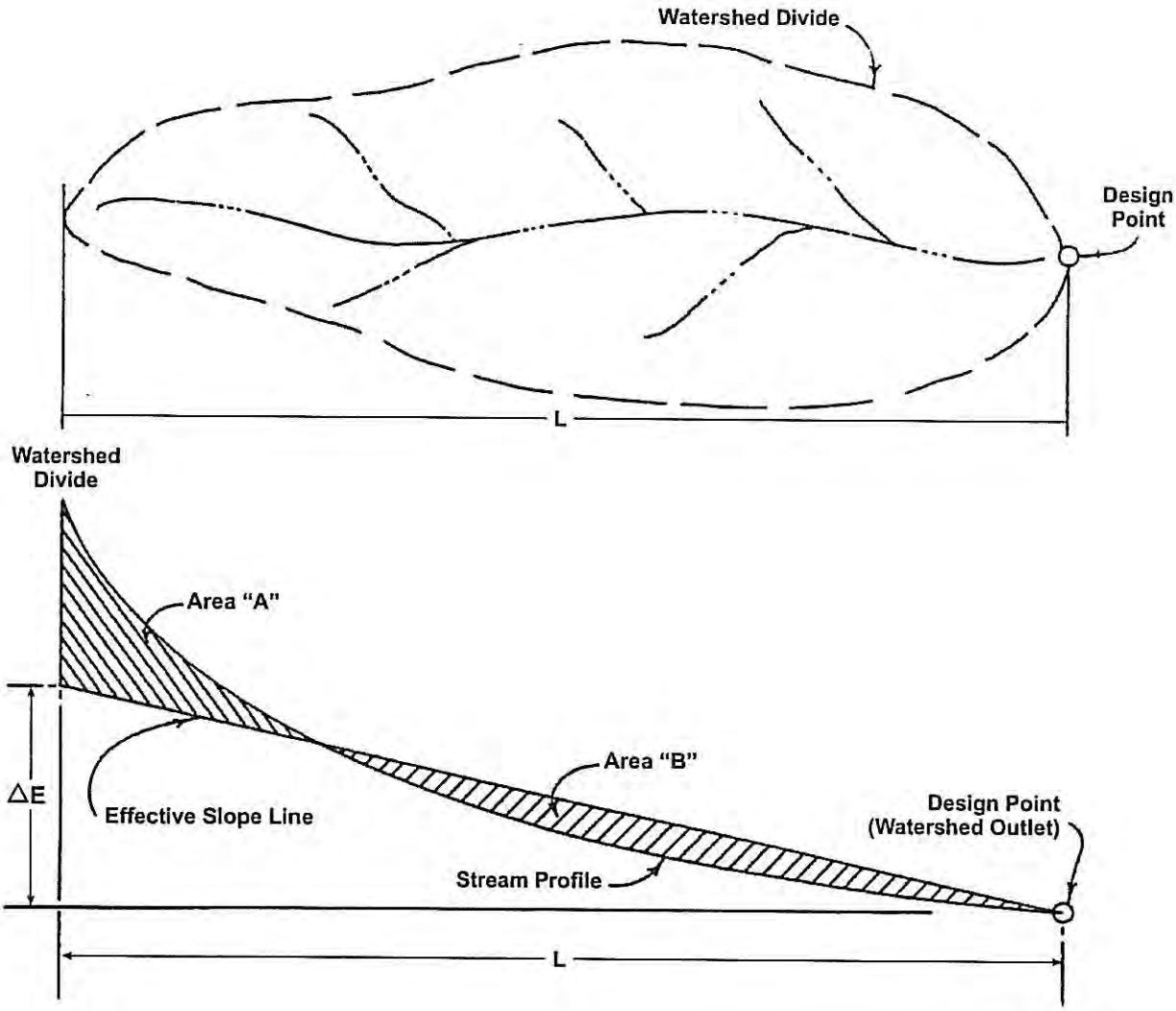
SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

3-4

APPENDIX K-A



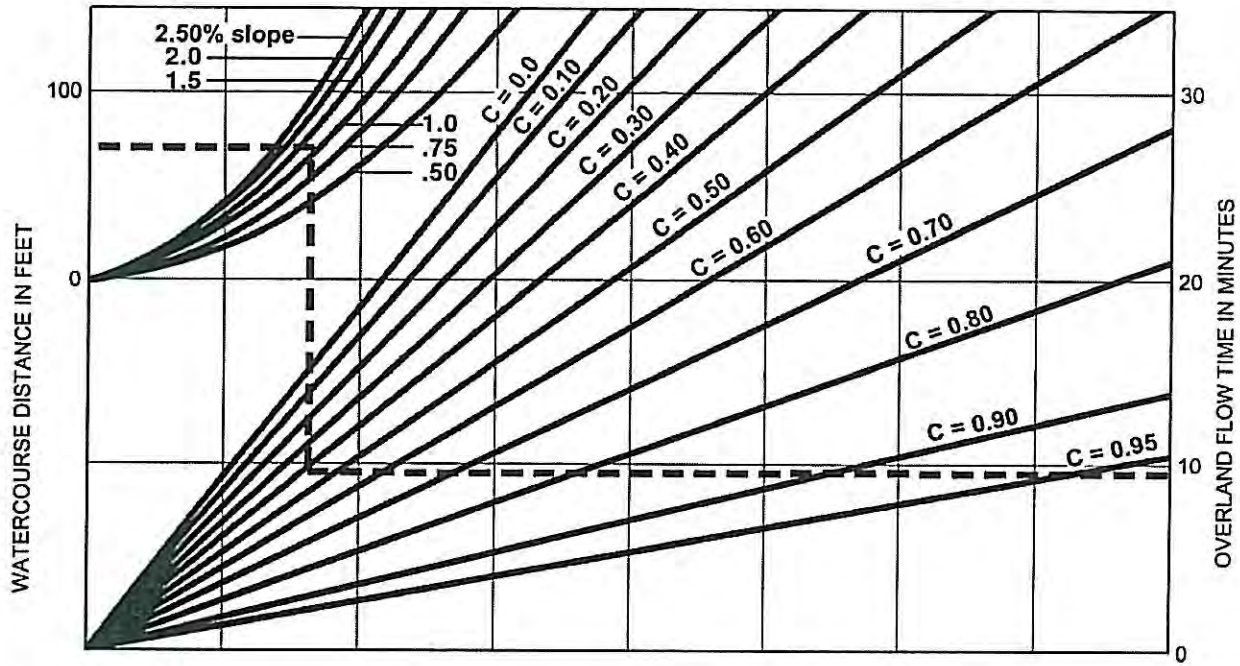
Area "A" = Area "B"

SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

Computation of Effective Slope for Natural Watersheds

3-5



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

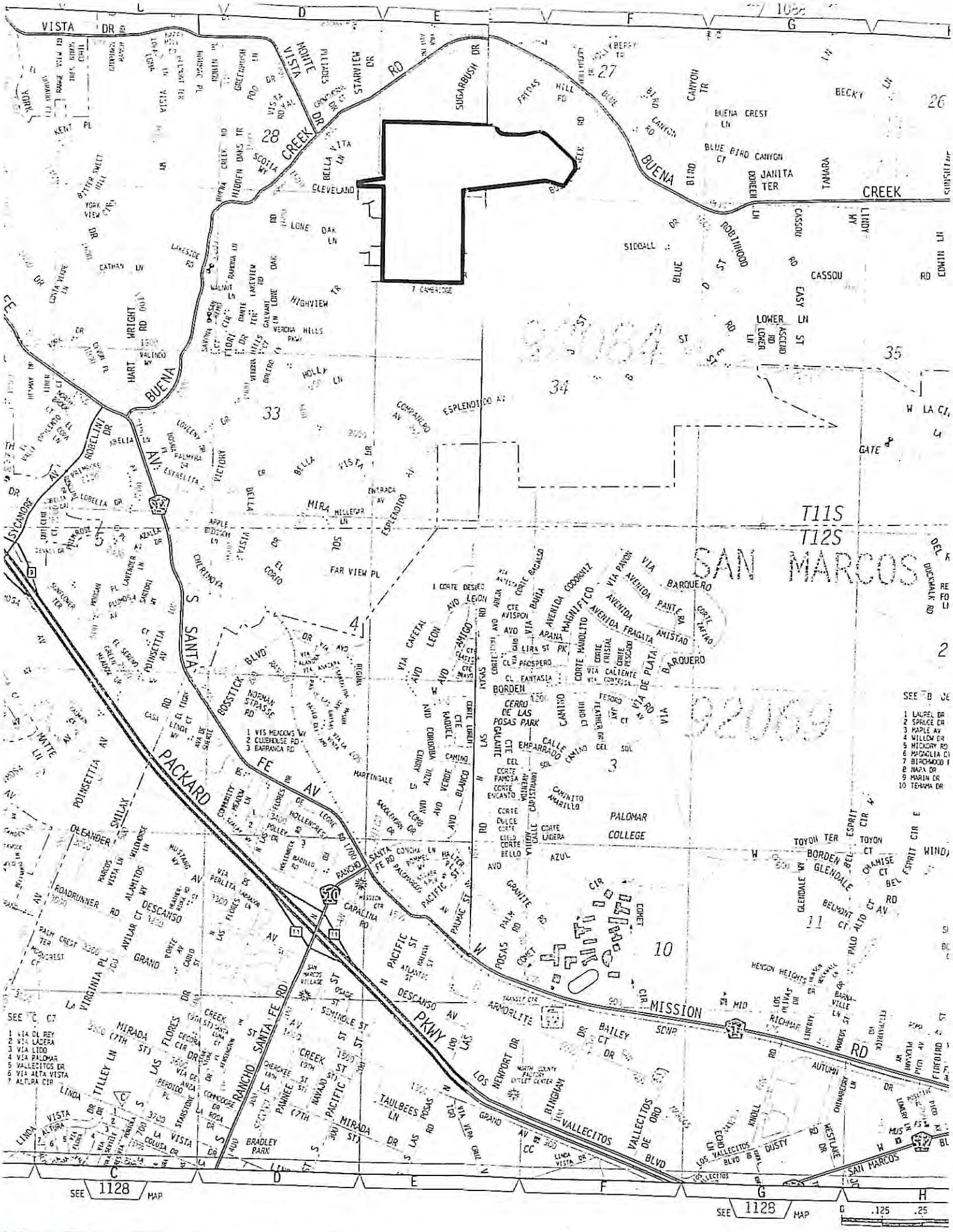
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

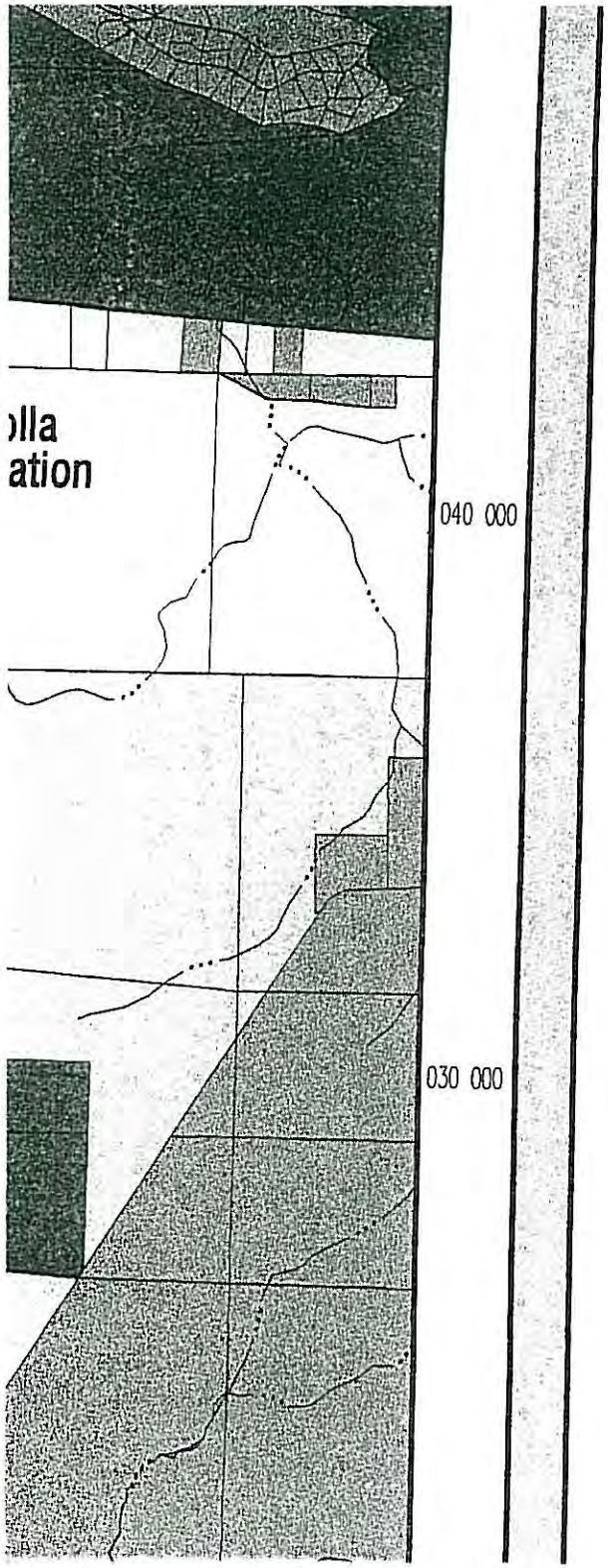
FIGURE

Rational Formula - Overland Time of Flow Nomograph

3-3

< 735 feet >


VISTA DR
MONTE VISTA
STARVIEW DR
SUGARBUSH DR
CREEK DR
BUENA CREEK
BUENA BIRD CANYON
BUENA CREST LN
BLUE BIRD CANYON CT
JANITA TER
TANARA
CLEVELAND
LONE OAK LN
HIGHVIEW TR
VERDIA HILLS PKWY
HART WRIGHT RD
BUENA
ROBELINI DR
SYCAMORE AV
ESPLENDIDO AV
COMPANERO AV
MIRA HILLEDR LN
BELLA VISTA DR
ENTRADA AV
FAR VIEW PL
EL CORTO
CHERIMOYA
SANTA FE AV
BOSSTICK BLVD
NORMAN STRASSE RD
PACKARD
POINSETTIA AV
OLEANDER
SAILAY
ROADRUNNER RD
DESCANSO
AVILAR CT
GRAND
LA VIRGINIA PL
MIRADA (7TH ST)
TILLEY LN
LINDA VISTA
RANCHO SANTA FE RD
SAN MARCOS VILLAGE
BRADLEY PARK
CAPALTIA RD
PACIFIC ST
PALMAR ST
W POSAS
DESCANSO AV
ARMORLITE
MISSION PKWY
LOS VALLECITOS BLVD
VALLECITOS DE ORO
BINGHAM
NEWPORT DR
TAULBEES POSAS LN
BORDEN
CERRO DE LAS POSAS PARK
PALOMAR COLLEGE
GRANITE RD
PALM RD
TOYON TER
BORDEN GLENDALE
BELMONT CT
PALO ALTO CT
HENSON HEIGHTS
BARNAVILLE LN
RICHMAR
LIBERTY
AUTUMN
KNOLL
WESTLAKE DR
DUSTY RD
ECHO LN
LOS VALLECITOS BLVD
SAN MARCOS
SAN MARCOS
T11S
T12S
SEE 1128 MAP
SEE 1128 MAP
0 .125 .25



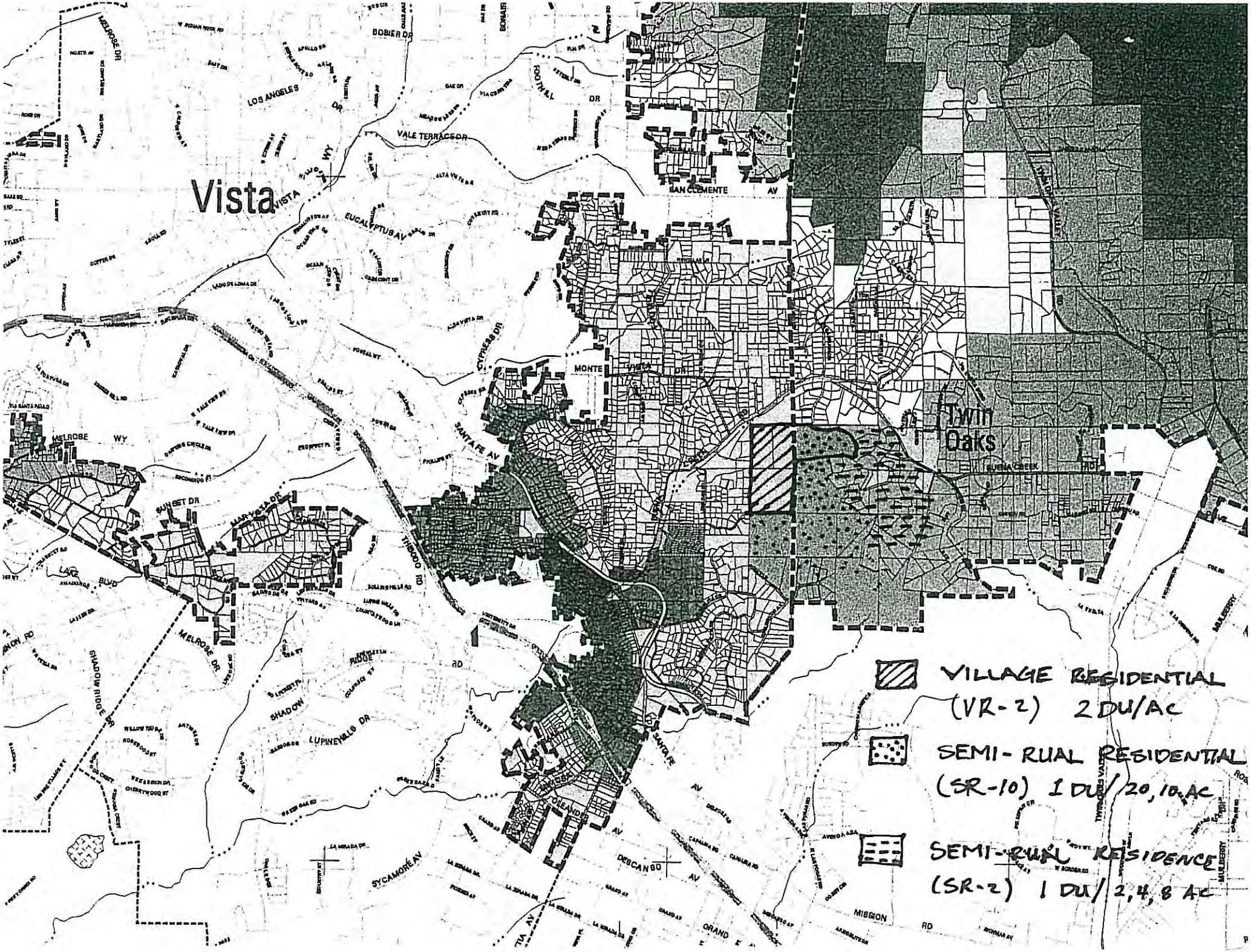
GENERAL PLAN 2020

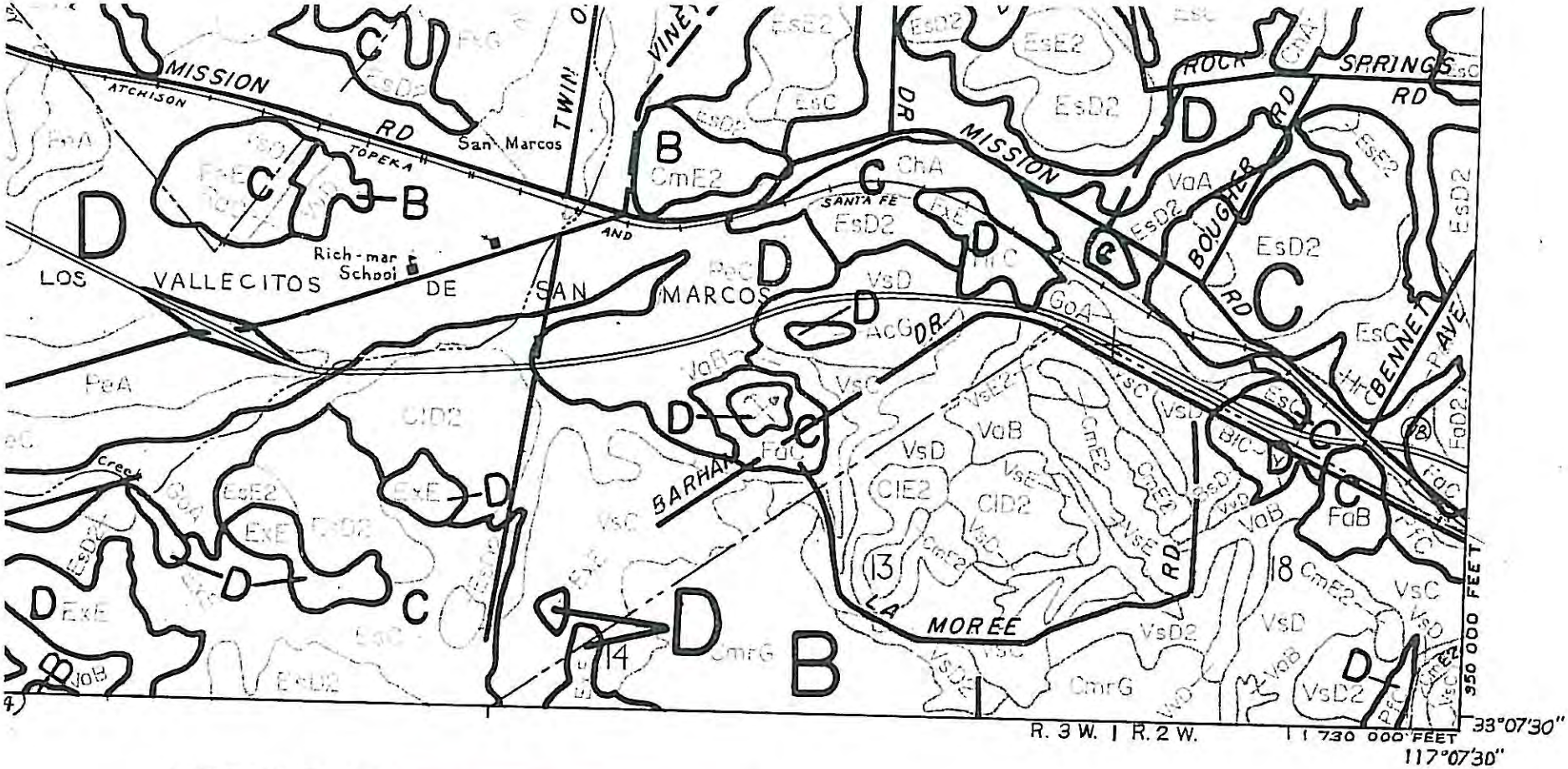
NORTH COUNTY METRO
Community Planning Area

Residential Baseline July 2004

DATED INFORMATION
Information contained on this map has been, or is in the process of being modified and is subject to change

- Village Residential (VR-24), 24 du/ac
- Village Residential (VR-14.5), 14.5 du/ac
- Village Residential (VR-10.9), 10.9 du/ac
- Village Residential (VR-7.3), 7.3 du/ac
- Village Residential (VR-4.3), 4.3 du/ac
- Village Residential (VR-2.9), 2.9 du/ac
- Village Residential (VR-2), 2 du/ac
- Semi-rural Residential (SR-1), 1 du/1,2,4 ac
- Semi-rural Residential (SR-2), 1 du/2,4,8 ac
- Semi-rural Residential (SR-4), 1 du/4,8,16 ac


Vista
Twin Oaks
VILLAGE RESIDENTIAL
(VR-2) 2 DU/AC
SEMI-RUAL RESIDENTIAL
(SR-10) 1 DU/20,10 AC
SEMI-RUAL RESIDENCE
(SR-2) 1 DU/2,4,8 AC
BOBIER DR
LOS ANGELES DR
VALE TERRACE DR
FOOTHILL DR
SAN CLEMENTE AV
EUCALYPTUS AV
CYPRESS DR
MONTE VISTA DR
SANTA FE AV
MELROSE WY
SUNSET DR
MAR VISTA DR
LAKE BLVD
MELROSE DR
SHADOW RIDGE DR
SHADOW RIDGE RD
LUPINE HILLS DR
SYCAMORE AV
DESCANSO AV
MISSION RD
GRAND AV



CAUTION NOTES:

1. User is urged to refer to corresponding SUPPLEMENTAL DATA SHEET for assumptions, criteria, map sources, additional legend items, and necessary explanation of ratings shown on map.

2. This map does not eliminate the need for detailed on-site investigation of the soil and site to determine precise soil conditions prior to undertaking any construction, grading, planting, or other soils related activity.

Base Map Source: U. S. Geological Survey with California State Coordinate System, Zone 6 Indicated

Prepared by: U. S. Department of Agriculture, Soil Conservation Service

Published by: San Diego County Planning Department for the Comprehensive Planning Organization — 1969

North

SCALE 1:24000

0 2000 4000 6000 feet

0 ¼ mile ½ mile 1 mile

Represents 40 acres

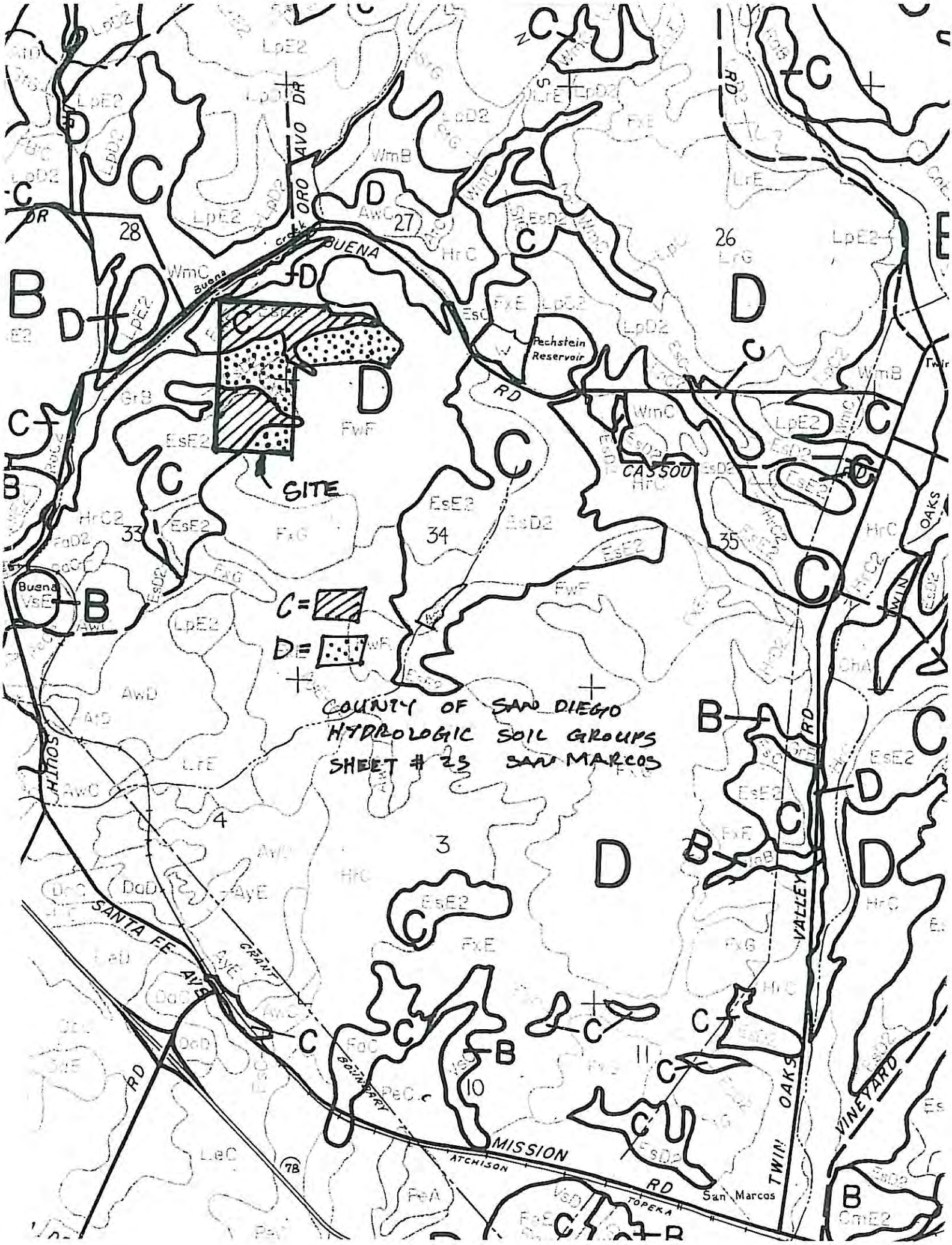
FEDERAL ASSISTANCE — The preparation of this map was financed in part through a comprehensive planning grant from the Department of Housing and Urban Development.

SHEET NAME

San Marcos

SHEET NUMBER

23


SITE
C=
D=
COUNTY OF SAN DIEGO
HYDROLOGIC SOIL GROUPS
SHEET # 23 SAN MARCOS
Pechstein Reservoir
BUENA
ORO
AVO
DR
RD
CASSOU
TWIN OAKS
VALLEY
VINEYARD
SOUTH
SANTA FE
AVE
GRANT
BOUNDARY
MISSION
ATCHISON
TOPEKA
San Marcos
Buena
Buena Creek
78