Request for
Letter of Map Revision

Re-delineation of Grand Canal Floodplain between 7th Avenue and 19th Avenue, Phoenix Arizona

Prepared for:

City of Phoenix
200 West Washington Street
Phoenix, Arizona 85003

C.O.P. Project No. ST83130143

November 2002

EEC Job Number 302013.03

Prepared by:

Engineering and Environmental Consultants, Inc.
3003 N. Central Avenue, Suite 600
Phoenix Arizona 85012-2905
Phone: (602) 248-7702
FAX: (602) 248-7851

Registered Professional Engineer (Civil)
CERTIFICATE NO. 37890
LLOYD A. VICK
Date Signed 11/25/02
ARIZONA, U.S.A.
Lloyd A. Vick

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Exhibit 1	Letter of Map Revision Work Map	Map Pocket A
Exhibit 2	FEMA FIRM Map 04013C1665 H	Map Pocket B

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Appendix B	Cella Barr Re-study HEC-1 Model
Appendix C	New HEC-RAS Model
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Appendix E	FEMA Forms
Appendix F	Wash Cross Sections

FEMA Case No.: 03-09-0290P
Effective Date: May 29 2003

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1.0 INTRODUCTION

This floodplain was originally delineated in the "*Cave Creek Wash FIS*" by Cella Barr and Associates in 1980 (reference 1). In 1989, after the Arizona Canal Diversion Channel (ACDC) was constructed, a restudy entitled "*Cave Creek Wash Flood Insurance Re-Study*" (reference 2) was also prepared by Cella Barr.

This document was prepared to request a Letter of Map Revision (LOMR) revising the floodplain upstream of the Grand Canal between 7th Avenue and 19th Avenue. The current floodplain, defined with the 1989 re-study, was developed with mapping having a two foot contour interval and used normal depth calculations to determine the floodplain widths. This request for LOMR is based upon better information using newer, one foot contour mapping as well as the Hydraulic Engineering Center's River Analysis System (HEC-RAS) computer modeling program to redefine the floodplain (reference 3).

The location of the study area is shown below in Figure 1.0.

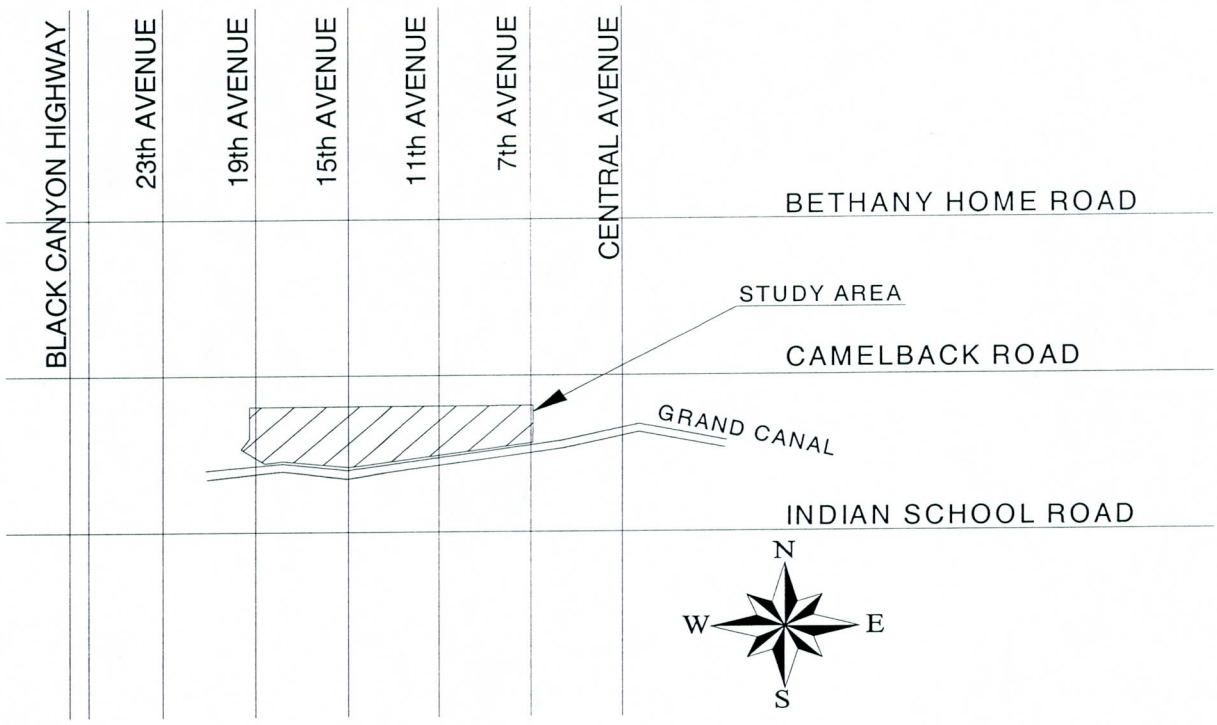


Figure 1.0 Location Map

2.0 MAPPING

The digital mapping used for this LOMR request was received from the Flood Control District of Maricopa County. It is on the NGVD 1929 datum with one-foot contours.

2.1 Survey

New survey was performed along the canal bank and along roadways that intersect the canal within the study area. The field survey was based upon NGVD 1929 datum using City of Phoenix benchmarks. The purpose of the field survey was 1) to better define the top of the canal embankment, and 2) to conduct check cross sections of the mapping provided by the Flood Control District.

2.2 Verifying the Mapping

Three check cross sections were surveyed along the centerlines of three roadways that are aligned perpendicular to the floodplain. The cross sections were surveyed in 7th Avenue, 11th Avenue and 15th Avenue. The difference between the surveyed elevations and the contours were calculated. Of the 35 surveyed points 32 of the points fell within 0.50 feet of the contours from the Flood Control District's map. The results of the check sections shows that 91.4 percent of the points were within the accuracy of the mapping. See Appendix A for the survey calculations.

3.0 HYDROLOGY

The hydrology developed in the "*Cave Creek Wash – Flood Insurance Re-Study*" (reference 2) was used, unedited, for the starting conditions in this LOMR request.

The original hydrology was based on no overtopping of the canal between 7th Avenue and the ponding area at 18th Avenue. This study, however, found that the canal banks are at relatively low elevations and that runoff overtops the banks and spills over the canal in numerous locations between 7th Avenue and 19th Avenue. Therefore, the peak discharges were reduced to account for the breakout flows.

The HEC-RAS program calculates the lateral weir flow (breakout) that overtops the canal. Those overtopping flows are shown on the enclosed floodplain delineation map. The following table summarizes the peak discharges that are taken from the Cella Barr model and used in the LOMR request. The summary output and a schematic diagram of the Cella Barr HEC-1 model can be found in Appendix B.

Table 3.0 Hydrology Summary Table

Concentration Point [short ID]	Description	100-year Peak Inflow [cfs]
GRCA7A	Starting Flow at Grand Canal and 7th Avenue	515
GRCA11	Inflow at Grand Canal and 11th Avenue	337
GRCA15	Inflow at Grand Canal and 15th Avenue	294

4.0 HYDRAULICS

4.1 Study Limits

The study area is bounded on the north by Highland Avenue, on the east by 7th Avenue, on the west by 19th Avenue and on the south by the Grand Canal.

4.2 Description of the Flooding

Storm water runoff flows southerly through the city in street corridors. When it reaches the elevated banks of the Grand Canal, runoff is conveyed laterally to a low point at about 18th Avenue where runoff ponds. Once the storage volume of the pond is exceeded, the runoff overtops the canal banks and spills over the canal. Storm water, downstream of the canal, resumes its southerly direction. The flooded area that is the subject of this LOMR request is limited to the conveyance corridor along the canal and the ponding area at about 18th Avenue.

4.3 Modeling Software

The current floodplain delineation was defined using normal depth calculations. This revision uses the "*River Analysis System, HEC-RAS*" computer modeling software which is published by the U.S. Army Corps of Engineers (reference 3).

4.4 Methodology

A HEC-RAS model was created with cross sections placed perpendicular to the canal, and thus perpendicular to the direction of flow. The cross sections begin at the ponding area near 18th Avenue and continue upstream, to the east, to 7th Avenue. The digital files for the model can be found in the disk accompanying this report and a hard copy of the model can be found in Appendix C.

4.4.1 Manning's "n" Value

Since the floodplain is located within an urban area Manning's "n" value was adjusted to account for the structures located in the floodplain. The method used to adjust "n" values was developed by Hejl and published in the U.S. Geological Survey journal in September of 1977. This method was later adopted by the Flood Control District of Maricopa County and incorporated into their Drainage Design Manual (reference 4).

Using the method outlined by the Flood Control District, the first step is to determine the roughness coefficient for the conveyance areas between the buildings. These values of the roughness coefficient (n_o) range from 0.026 to 0.030. Next, the adjusted urban roughness coefficient is calculated based upon the length and width of the longitudinal and lateral open spaces between the buildings within the floodplain. The adjusted values of the roughness coefficient (n_u) used in the HEC-RAS model range from 0.038 to 0.110. Excerpts of the procedure and calculations can be found in Appendix D.

4.4.2 Inline Weir

An inline weir was added along the canal to determine the location and depth of runoff spilling over the low point in the canal bank at 18th Avenue. The weir is modeled along the canal from 17th Avenue to 19th Avenue. The spill elevation along the canal is 1119.75 and the flow depth varies between 0 and 0.54 feet having a water surface elevation of 1120.29.

4.4.3 Lateral Weir

After running the initial HEC-RAS model, it was evident that the storm water being conveyed along the canal, between 7th Avenue and 17th Avenue, would exceed the canal bank elevations. Using the new one-foot contour mapping, along with new field survey points taken along the canal, two lateral weirs were modeled to remove storm water that flows over the canal (see Exhibit 1).

One wier is located at 7th Avenue and is approximately 110 feet in length, has an average depth over the canal of 1.04 feet, and releases approximately 307 cfs south along 7th Avenue. The second lateral weir is located between cross sections 2 and 10 along the canal having an approximate length of 2630 feet, an average depth of 0.20 feet, and overtops the canal at various locations with discharges ranging from 5 cfs to 209 cfs (total overtopping discharge is 698 cfs).

Once storm water splits out over the canal bank, it will not recombine with the main flow along the Grand Canal. The general direction of relief is to the south away from the canal. The split flows are conveyed southerly and recombine at the next downstream concentration point at Indian School Road and 17th Avenue.

4.5 Revisions

This request for LOMR revises the floodplain boundary in the study area but maintains the special flood hazard Zone AH designation (see the revised FIRM Map, Exhibit 2).

4.6 Floodways

Floodways were not calculated for this area.

4.7 Base Flood Elevations

New BFEs were located based upon criteria found in *FEMA 37* (reference 5). These new BFEs are shown on the enclosed Floodplain Delineation Map.

4.8 Workmaps

A new work map, with the revised floodplain delineation, was created at 1"=200' scale and can be found in the map pocket (Exhibit 1). Also included is a copy of the FIRM map 04013C1665H showing the proposed changes to the floodplain (Exhibit 2).

4.9 Results

This study results in a significant reduction in the size of the floodplain upstream of the Grand Canal. In terms of area, the existing floodplain is approximately 131.9 acres and the revised floodplain is 63.3 acres. In regard to property, the existing floodplain impacts approximately 401 structures whereas the revised floodplain only impacts 225 structures.

5.0 REFERENCES

1. "Cave Creek Wash - Flood Insurance Study, FCD". Cella Barr and Associates, 1980.

2. "Cave Creek Wash – Flood Insurance Re-Study. FCD". Cella Barr and Associates, 1989.

3. "HEC-RAS User's Guide, v3.0.1". U.S. Army Corps of Engineers Hydraulic Engineering Center. March 2001.

4. "Drainage Design Manual for Maricopa County, Arizona – Volume II Hydraulics". Flood Control District of Maricopa County. January 1996.

5. "FEMA 37 – Guidelines and Specifications for Study Contractors". January 1995.

6. "Flood Insurance Rate Map". Map number 04013C1665H. July 19, 2001.

Appendix A
MAPPING VERIFICATION

City of Phoenix
STREET TRANSPORTATION DEPARTMENT

December 17, 2002

Michael Baker, Jr., Inc.
3601 Eisenhower Avenue, #600
Alexandria, Va. 22304-6465

Gentlemen:

RE: LETTER OF MAP REVISION FOR THE RE-DELINEATION OF GRAND CANAL FLOODPLAIN BETWEEN 7TH AVENUE AND 19TH AVENUE
PANEL 04013C1665H

Enclosed are the materials for this Letter of Map Revision application. Submitted are the following items:

1- Introduction
2- Mapping
3- Hydrology
4- Hydraulics
5- Elevation Information
6- Revision Requester and Community Official (MT-2, Form M-1)
7- Riverine Hydraulic Analysis (MT-2, Form 4)
8- Riverine/Coastal Mapping (MT-2, Form 5)
9- Wash Cross Sections (Appendix F)
10- Floodplain Delineation (Exhibit1)
11- Annotated FIRM Map (Exhibit 2)

If you have any technical questions concerning this project please contact Mr. Lloyd A. Vick, P. E., Engineering and Environmental Consultants, Inc., 3003 North Central Avenue, Suite 600, Phoenix, Arizona 85012-2905, phone (602) 248-7702, fax (602-248-7851. If you have any other questions please contact this office at 602-262-4960.

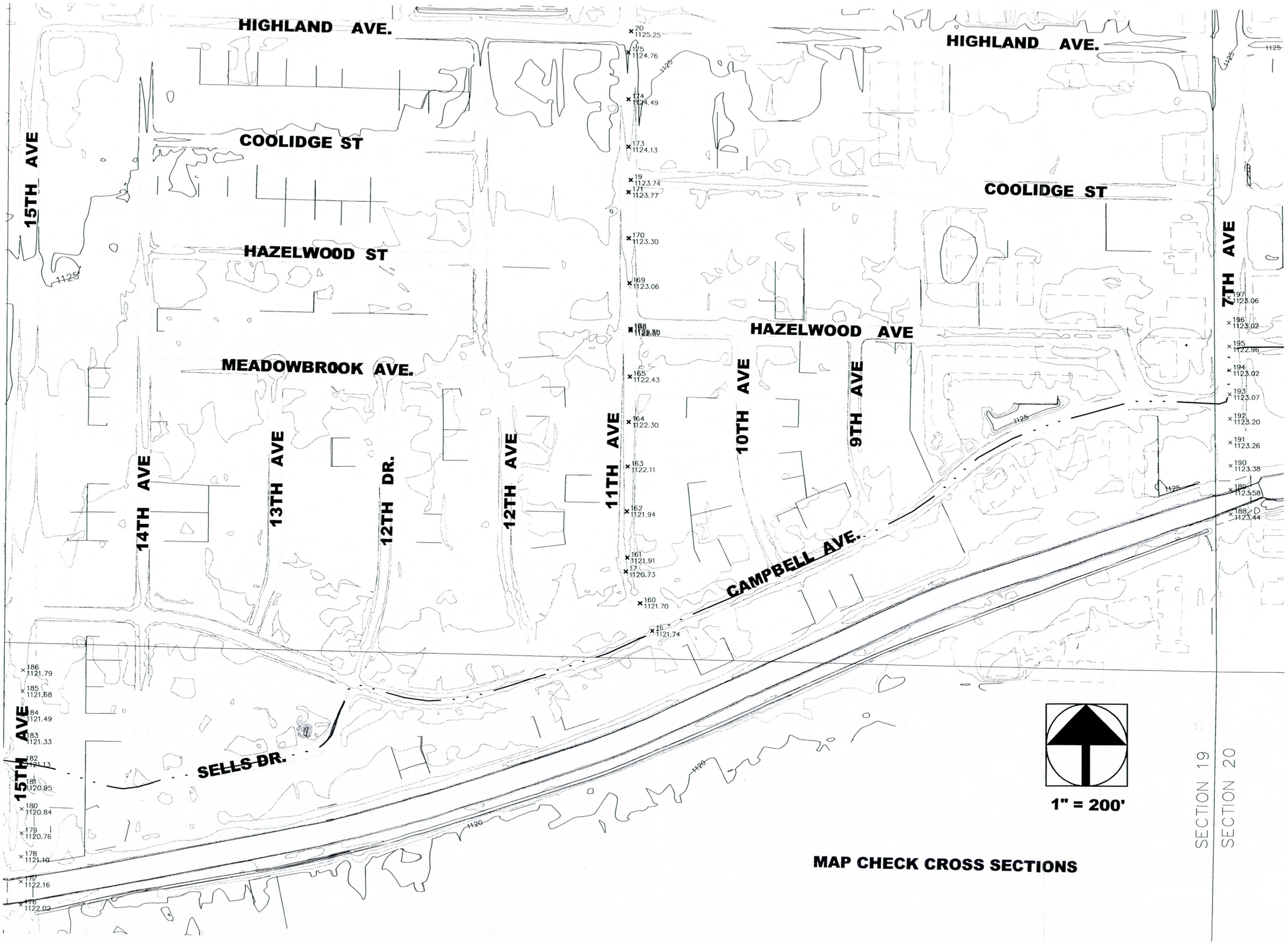
Sincerely,

Hasan Mushtaq, Ph. D., P.E., C.F.M.
Floodplain Manager

HM/DW/aff/grand canal.doc

Attachments

c: Mr. Vick, Engineering and Environmental Consultants



MAP CHECK CROSS SECTIONS

ID	NORTHING	EASTING	ELV	DESC	DTM_Elev	ERROR
160	910349.9945	448396.9998	1121.70	CLPAVEON11AVE	1122.00	-0.30
161	910450.9263	448368.1774	1121.91	CLPAVEON11AVE	1122.00	-0.09
162	910553.4652	448366.6178	1121.94	CLPAVEON11AVE	1122.00	-0.06
163	910652.8523	448368.2140	1122.11	CLPAVEON11AVE	1122.00	0.11
164	910751.6681	448370.4470	1122.30	CLPAVEON11AVE	1122.00	0.30
165	910852.3831	448372.7141	1122.43	CLPAVEON11AVE	1122.47	-0.04
166	910954.7886	448374.4605	1122.37	CLPAVEON11AVE	1123.00	-0.63
168	910957.3684	448374.4938	1122.50	CLPAVEON11AVE	1123.00	-0.50
169	911059.1849	448371.3706	1123.06	CLPAVEON11AVE	1123.00	0.06
170	911158.9466	448369.3067	1123.30	CLPAVEON11AVE	1123.00	0.30
171	911261.1105	448368.8419	1123.77	CLPAVEON11AVE	1124.00	-0.23
173	911362.0332	448368.4116	1124.13	CLPAVEON11AVE	1124.00	0.13
174	911467.4145	448368.1584	1124.49	CLPAVEON11AVE	1124.00	0.49
175	911571.1568	448367.4893	1124.76	CLPAVEON11AVE	1125.00	-0.24
176	909668.2849	447023.0872	1122.02	CL15THAVEPAV	1122.00	0.02
178	909776.3396	447023.6229	1121.10	CL15THAVEPAV	1121.33	-0.23
179	909828.5065	447024.0813	1120.76	CL15THAVEPAV	1121.00	-0.24
180	909882.9728	447024.6648	1120.84	CL15THAVEPAV	1121.00	-0.16
181	909936.7612	447024.8914	1120.95	CL15THAVEPAV	1121.00	-0.05
182	909988.5018	447024.7494	1121.13	CL15THAVEPAV	1121.00	0.13
183	910039.5915	447025.4389	1121.33	CL15THAVEPAV	1121.20	0.13
184	910090.0493	447025.9501	1121.49	CL15THAVEPAV	1121.73	-0.24
185	910143.9018	447025.8312	1121.68	CL15THAVEPAV	1122.00	-0.32
186	910191.3455	447026.3005	1121.79	CL15THAVEPAV	1122.00	-0.21
187	909818.3504	445687.6850	1120.43	CP	1120.87	-0.44
188	910554.1793	449717.8387	1123.44	CLPAVE7THAVE	1122.00	1.44
189	910608.1701	449717.5040	1123.58	CLPAVE7THAVE	1123.18	0.40
190	910661.4977	449717.4858	1123.38	CLPAVE7THAVE	1124.00	-0.62
191	910713.0395	449717.0523	1123.26	CLPAVE7THAVE	1123.53	-0.27
192	910765.4371	449716.7258	1123.20	CLPAVE7THAVE	1123.10	0.10
193	910819.8860	449716.1718	1123.07	CLPAVE7THAVE	1123.00	0.07
194	910872.9892	449715.6413	1123.02	CLPAVE7THAVE	1123.40	-0.38
195	910925.6838	449715.4652	1122.96	CLPAVE7THAVE	1123.34	-0.38
196	910978.4121	449714.8757	1123.02	CLPAVE7THAVE	1123.32	-0.30
197	911034.1873	449714.8769	1123.06	CLPAVE7THAVE	1123.36	-0.30

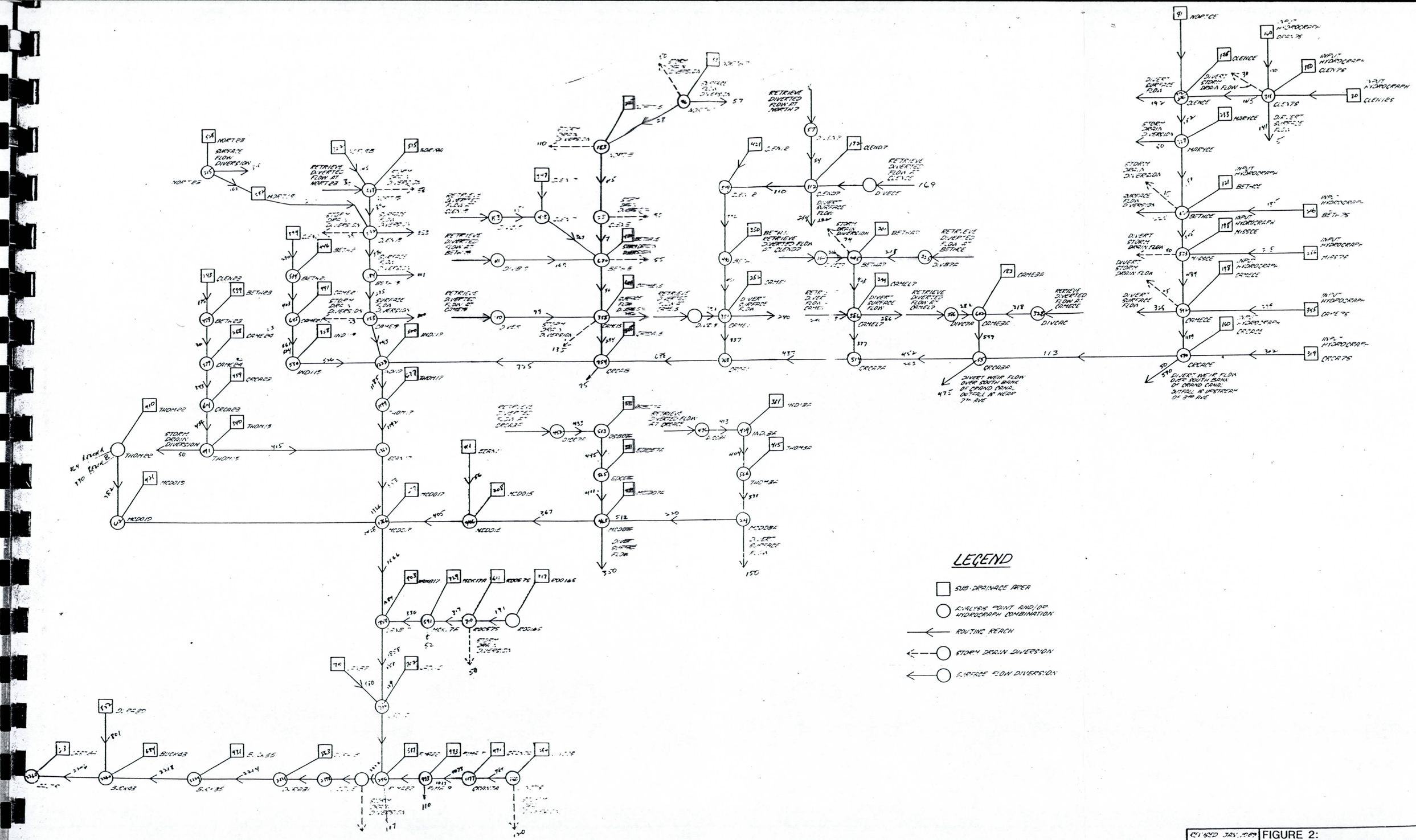
Total Number of points = 35

Number of Points within 0.5 feet (+/-) = 32
Number of Points outside of 0.5 feet (+/-) = 3

Percentage of points within 1/2 a contour interval = 91.4

Appendix B

CELLA BARR RE-STUDY HEC-1 MODEL



REVISED JAN. 1989

FIGURE 2:
SCHEMATIC DIAGRAM OF DRAINAGE MODEL CAVE CREEK WASH

JOB NO. 04851

CELLA BARR ASSOCIATES
5062 N. 19th Avenue, Phoenix, Arizona 85015
(602) 242-2999

```
*****************************************
*****************************************
*                                       *                                       *
*
   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                                       *    U.S. ARMY CORPS OF
ENGINEERS      *
                MAY   1991              *                                       *    HYDROLOGIC ENGINEERING
CENTER     *
*             VERSION 4.0.1E            *                                       *          609 SECOND
STREET           *
      Lahey F77L-EM/32 version 5.01     *                                       *       DAVIS, CALIFORNIA
95616        *
*        Dodson & Associates, Inc.      *                                       *           (916) 551-1748
*
   RUN DATE  08/01/02  TIME  16:05:38   *                                       *
*****************************************
*****************************************
```

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

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


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

  1           ID         FEMA FLOOD INSURANCE         CAVE CREEK WASH       MODIFIED PULS
  2           ID         RE-STUDY FOR MARICOPA        JOB NO. 04856-05-74
  3           ID         COUNTY ARIZONA 1988          100- YEAR PEAK
              *DIAGRAM
  4           IT      10 16MAR88    1200     300
  5           IN      30 16MAR88    1200
  6           IO       5       0       0

  7           KK  NORTCE   BASIN COMPUTATION
  8           KM           SCS METHOD
  9           BA    0.05
 10           PB    4.04
 11           PC     0.0   0.004   0.008   0.013   0.018   0.022   0.026   0.031   0.035   0.040
 12           PC   0.044   0.048   0.053   0.057   0.062   0.066   0.071   0.075   0.080   0.093
 13           PC   0.107   0.120   0.140   0.170   0.500   0.830   0.860   0.880   0.893   0.907
 14           PC   0.920   0.924   0.928   0.933   0.937   0.942   0.947   0.951   0.956   0.960
 15           PC   0.964   0.969   0.973   0.978   0.982   0.987   0.991   0.995   1.000   1.000
 16           LS   0.105    95.0    00.0
 17           UD    0.27

 18           KK  GLENCE
 19           KM           ROUTING SURFACE FLOW FROM CENTRAL/NORTHERN TO CENTRAL/GLENDAL
 20           RS       1    ELEV       1       0
 21           RC   0.150   0.020   0.150  5280.0   0.005
 22           RX     0.0    0.01   100.0  100.01   140.0  140.01  239.99   240.0
 23           RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 24           KK  GLENCE   BASIN COMPUTATION
 25           KM           SCS METHOD
 26           BA    0.12
 27           LS   0.105    95.0       0
 28           UD    0.42

 29           KK  GLENCE
 30           KM           COMBINE ROUTED FLOW WITH BASIN COMPUTATION
 31           HC       2
```

```
  32          KK  ORAN7S
  33          KM            INPUT HYDROGRAPH
  34          BA        0
  35          IN       10 16MAR88    1200
  36          QI        0        0        0        0        0        0        0        0        0
  37          QI        0        0        0        0        0        0        0        0        0
  38          QI        0        0        0        0        0        0        0        0        0
  39          QI        0        0        0        0        0        0        0        0        0
  40          QI        0        0        0        0        0        0        0      2.1      2.1
  41          QI      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      4.1      4.1
  42          QI      4.1      4.1      4.1      4.1      4.1      6.2      6.2      8.3      8.3     10.4
  43          QI     24.9     66.5    108.0    135.1    149.6    160.0    147.5    103.0     62.3     39.5
  44          QI     24.9     18.7     14.5      8.3      8.3      8.3      8.3      8.3      8.3      6.2
  45          QI      6.2      6.2      4.1      4.1      2.1      2.1      2.1      2.1      2.1      2.1
  46          QI      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1
  47          QI      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1
  48          QI      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1
  49          QI      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1
1                                                HEC-1 INPUT                                                PAGE  2

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

  50          QI      2.1      2.1      2.1      2.1      2.1      2.1      2.1      2.1        0        0

  51          KK  ORAN7S
  52          KM            DIVERT STORM DRAIN FLOW
  53          DT  SDFO7S
  54          DI       30      100     1500
  55          DQ       30       30       30

  56          KK  GLEN7S
  57          KM            ROUTING SURFACE FLOW FROM ORANGEWOOD/7ST. TO GLENDALE/7ST.
  58          RS        1     ELEV        1        0
  59          RC    0.150    0.020    0.150   2640.0    0.005
  60          RX      0.0     0.01    100.0   100.01    164.0   164.01   263.99   264.00
  61          RY      4.0     2.25     1.25      1.0      1.0     1.25     2.25      4.0

  62          KK  GLEN7S
  63          KM            INPUT HYDROGRAPH
  64          BA        0
  65          QI        0        0        0        0        0        0        0        0        0
  66          QI        0        0        0        0        0        0        0        0        0
  67          QI        0        0        0        0        0        0        0        0        0
  68          QI        0        0        0        0        0        0        0        0        0
  69          QI        0        0        0        0        0        0        0      1.6      1.6
  70          QI      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      3.3      3.3
  71          QI      3.3      3.3      3.3      3.3      5.1      5.1      5.1      6.8      8.5      8.5
  72          QI     16.9     44.5     83.2    122.2    154.5    174.9    180.0    161.3    122.2     84.9
  73          QI     57.7     40.7     30.6     23.7     18.7     15.3     13.6     11.8     11.8     11.8
  74          QI     10.2     10.2      8.4      8.4      6.7      6.7      5.9      3.3      3.3      3.3
  75          QI      3.3      3.3      3.3      3.3      3.3      3.3      3.3      3.3      3.3      3.3
  76          QI      3.3      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6
  77          QI      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6
  78          QI      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6
  79          QI      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6      1.6

  80          KK  GLEN7S
  81          KM            COMBINE ROUTED FLOW WITH INPUT HYDROGRAPH
  82          HC        2

  83          KK  GLEN12
  84          KM            INPUT HYDROGRAPH AT GLENDALE/12ST.
  85          BA        0
  86          QI        0        0        0        0        0        0        0        0        0        0
  87          QI        0        0        0        0        0        0        0        0        0        0
  88          QI        0        0        0        0        0        0        0        0        0        0
  89          QI        0        0        0        0        0        0        0        0        0        0
  90          QI        0        0        0        0        0        0        0        0        0        0
  91          QI        0        0        0        0        0        0        0        0        0        0
  92          QI        0        0        0        0        0        0        0        1        1        1
  93          QI      3.1      8.3     13.5     17.0     19.0     20.0     18.0     13.0        8        5
  94          QI        3      2.3      1.8      1.0        0        0        0        0        0        0
  95          QI        0        0        0        0        0        0        0        0        0        0
1                                                HEC-1 INPUT                                                PAGE  3

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

  96          KK  GLEN7S
  97          KM            ROUTING INPUT HYDROGRAPH TO GLENDALE/7TH. STREET
  98          RS        1     ELEV        1        0
  99          RC    0.150    0.020    0.150   2640.0    0.004
 100          RX      0.0     0.01    100.0   100.01    164.0   164.01   263.99    264.0
 101          RY      4.0     2.25     1.25      1.0      1.0     1.25     2.25      4.0

 102          KK  GLEN7S
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103          KM            COMBINE ROUTED FLOW
104          HC        2

105          KK   GLEN7S
106          KM            DIVERT STORM DRAIN FLOW
107          DT   SDFG7S
108          DI        5     100    1500
109          DQ        5       5       5

110          KK   GLEN7S
111          KM            DIVERT SURFACE FLOW
112          DT   SFG7SS
113          DI    180.0   299.0   629.0  1071.0
114          DQ     75.0   137.0   331.0   613.8

115          KK   GLENCE
116          KM            ROUTING FLOW FROM GLENDALE/7ST. TO GLENDALE/CENTRAL
117          RS        1    ELEV       1       0
118          RC    0.150   0.020   0.150  2640.0   0.004
119          RX      0.0    0.01   100.0  100.01   164.0  164.01  263.99   264.0
120          RY      4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

121          KK   GLENCE
122          KM            COMBINE ROUTED FLOW
123          HC        2

124          KK   GLENCE
125          KM            DIVERT SURFACE FLOW
126          DT   SFGLCW
127          DI       28     189     299     629    1071
128          DQ       20     105     162     297     459

129          KK   MARYCE
130          KM            ROUTING FLOW FROM GLENDALE/CENTRAL TO MARYLAND/CENTRAL
131          RS        1    ELEV       1       0
132          RC    0.150   0.020   0.150  2640.0   0.005
133          RX      0.0    0.01   100.0  100.01   140.0  140.01  239.99   240.0
134          RY      4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

135          KK   MARYCE
136          KM            INPUT HYDROGRAPH
137          BA        0
138          QI        0       0       0       0       0       0       0       0       0       0
139          QI        0       0       0       0       0       0       0       0       0       0
140          QI        0       0       0       0       0       0       0       0       0       0
141          QI        0       0       0       0       0       0       0       0       0       0
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

142          QI        0       0       0       0       0       0       0       0       0       0
143          QI        0       0       0       0       0     3.1     3.1     3.1     3.1     3.1
144          QI      3.1     6.2     6.2     6.2     6.2     6.2     6.2     9.3     9.3    11.7
145          QI     20.2    42.8    87.1   136.1   180.0   216.0   233.0   227.0   199.0   161.7
146          QI    131.4   105.7    87.1    68.4    55.9    46.6    37.3    31.1    28.8    24.9
147          QI     21.8    21.8    18.7    12.4    12.4    12.5     9.3     9.3     9.3     9.3
148          QI      9.3     9.3     6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2
149          QI      6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2
150          QI      6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2
151          QI      6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2     6.2
152          QI      3.1     3.1     3.1     3.1     3.1     3.1     3.1     3.1     3.1     3.1

153          KK   MARYCE
154          KM            COMPINE INPUT HYDROGRAPH WITH ROUTED FLOW
155          HC        2

156          KK   MARYCE
157          KM            DIVERT STORM DRAIN FLOW
158          DT   SDFMAC
159          DI       50     100    1500
160          DQ       50      50      50

161          KK   BETHCE
162          KM            ROUTING SURFACE FLOW FROM MARYLAND/CENTRAL TO BETHANY/CENTRAL
163          RS        1    ELEV       1       0
164          RC    0.150   0.020   0.150  2640.0   0.005
165          RX      0.0    0.01   100.0  100.01   140.0  140.01  239.99   240.0
166          RY      4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

167          KK   BETHCE
168          KM            INPUT HYDROGRAPH
169          BA        0
170          QI        0       0       0       0       0       0       0       0       0       0
171          QI        0       0       0       0       0       0       0       0       0       0
172          QI        0       0       0       0       0       0       0       0       0       0
173          QI        0       0       0       0       0       0       0       0       0       (
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174          QI       0       0       0       0       0       0       0       0     1.6     1.6
175          QI     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     3.1     3.1
176          QI     3.1     3.1     3.1     3.1     3.1     4.7     4.7     6.3     6.3     7.8
177          QI    18.8    50.3    81.7   102.0   113.0   121.0   111.6    78.6    47.1    29.9
178          QI    18.8    14.1    11.0     6.3     6.3     6.3     6.3     6.3     6.3     4.7
179          QI     4.7     4.7     3.1     3.1     1.6     1.6     1.6     1.6     1.6     1.6
180          QI     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6
181          QI     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6
182          QI     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6
183          QI     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6     1.6
184          QI     1.6     1.6     1.6     1.6     1.6     1.6     1.6       0       0       0

185          KK  BETHCE
186          KM           COMBINE INPUT HYDROGRAPH WITH ROUTED FLOW
187          HC       2
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

188          KK  BETH7S
189          KM           INPUT HYDROGRAPH AT BETHANY/7TH. STREET
190          BA       0
191          QI       0       0       0       0       0       0       0       0       0       0
192          QI       0       0       0       0       0       0       0       0       0       0
193          QI       0       0       0       0       0       0       0       0       0       0
194          QI       0       0       0       0       0       0       0       0       0       0
195          QI       0       0       0     1.9     1.9     1.9     1.9     1.9     1.9     1.9
196          QI     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9     3.8     3.8
197          QI     3.8     3.8     3.8     3.8     5.8     5.8     5.8     7.7     9.7     9.7
198          QI    19.4    50.5    95.2   139.9   176.8   200.1   206.0   184.6   139.9    97.2
199          QI    66.1    46.6    35.0    27.2    21.3    17.5    15.5    13.6    13.6    11.6
200          QI    11.6     9.7     9.7     7.7     7.7     5.8     3.8     3.8     3.8     3.8
201          QI     3.8     3.8     3.8     3.8     3.8     3.8     3.8     3.8     3.8     3.8
202          QI     3.8     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9
203          QI     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9
204          QI     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9
205          QI     1.9     1.9     1.9     1.9     1.9     1.9     1.9     1.9       0       0

206          KK  BETHCE
207          KM           ROUTING INPUT HYDROGRAPH TO BETHANY/CENTRAL
208          RS       1    ELEV       1       0
209          RC   0.150   0.020   0.150  2640.0   0.004
210          RX     0.0    0.01   100.0  100.01   164.0  164.01  263.99   264.0
211          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

212          KK  BETHCE
213          KM          COMBINE ROUTED FLOW
214          HC       2

215          KK  BETHCE
216          KM           DIVERT STORM DRAIN FLOW
217          DT  SDFBEC
218          DI      15     100    1500
219          DQ      15      15      15

220          KK  BETHCE
221          KM           DIVERT SURFACE FLOW
222          DT  SFBECW
223          DI     201     334     703    1198
224          DQ     105     162     297     458

225          KK  MISSCE
226          KM           ROUTING FLOW FROM BETHANY/CENTRAL TO MISS/CENTRAL
227          RS       1    ELEV       1       0
228          RC   0.150   0.020   0.150  2640.0   0.005
229          RX     0.0    0.01   100.0  100.01   140.0  140.01  239.99   240.0
230          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

231          KK  MISSCE
232          KM           INPUT HYDROGRAPH
233          BA       0
234          QI       0       0       0       0       0       0       0       0       0       0
235          QI       0       0       0       0       0       0       0       0       0       0
236          QI       0       0       0       0       0       0       0       0       0       0
237          QI       0       0       0       0       0       0       0       0       0       0
238          QI       0       0       0       0       0       0       0       0     1.8     1.8
239          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     3.7     3.7
240          QI     3.7     3.7     3.7     3.7     5.5     5.5     5.5     7.4     9.3     9.3
241          QI    18.6    48.4    91.3   134.1   169.5   192.0   197.5   177.7   134.1    93.3
242          QI    63.3    44.7    33.5    26.1    20.4    16.7    14.9    13.0    13.0    11.1
243          QI    11.1     9.3     9.3     7.4     7.4     5.5     3.7     3.7     3.7     3.
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244          QI     3.7     3.7     3.7     3.7     3.7     3.7     3.7     3.7     3.7     3.7
245          QI     3.7     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8
246          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8
247          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8
248          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8       0       0

249          KK  MISSCE
250          KM           COMBINE INPUT HYDROGRAPH WITH ROUTED FLOW
251          HC       2

252          KK  MISS7S
253          KM           INPUT HYDROGRAPH AT MISSIOURI/7TH. STREET
254          BA       0
255          QI       0       0       0       0       0       0       0       0       0       0
256          QI       0       0       0       0       0       0       0       0       0       0
257          QI       0       0       0       0       0       0       0       0       0       0
258          QI       0       0       0       0       0       0       0       0       0       0
259          QI       0       0       0       0       0       0       0       0       0       0
260          QI       0       0       0       0       0     3.4     3.4     3.4     3.4     3.4
261          QI     3.4     6.8     6.8     6.8     6.8     6.8     6.8    10.3    10.3    12.9
262          QI    22.3    47.3    96.3   150.5   199.5   239.1   256.0   251.1   220.6   178.9
263          QI   145.3   116.9    96.3    75.7    61.9    51.6    41.3    34.4    31.8    27.5
264          QI    24.1    24.1    20.6    13.7    13.7    13.7    10.3    10.3    10.3    10.3
265          QI    10.3    10.3     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8
266          QI     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8
267          QI     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8
268          QI     6.8     6.8     6.8     6.8     6.8     6.8     6.8     6.8     3.4     3.4
269          QI     3.4     3.4     3.4     3.4     3.4     3.4     3.4     3.4     3.4     3.4

270          KK  MISSCE
271          KM           ROUTING INPUT HYDROGRAPH TO MISS/CENTRAL
272          RS       1    ELEV       1       0
273          RC   0.150   0.020   0.150  2640.0   0.002
274          RX     0.0    0.01   100.0  100.01   164.0  164.01  263.99   264.0
275          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

276          KK  MISSCE
277          KM           COMBINE ROUTED FLOW
278          HC       2

279          KK  MISSCE
280          KM           DIVERT STORM DRAIN FLOW
281          DT  SDFMIC
282          DI      40     100    1500
283          DQ      40      40      40

284          KK  CAMECE
285          KM           ROUTING FLOW FROM MISS/CENTRAL TO CAMELBACK/CENTRAL
286          RS       1    ELEV       1       0
287          RC   0.150   0.020   0.150  2640.0   0.005
288          RX     0.0    0.01   200.0  200.01   264.0  264.01  463.99   464.0
289          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

290          KK  CAMECE
291          KM           INPUT HYDROGRAPH
292          BA       0
293          QI       0       0       0       0       0       0       0       0       0       0
294          QI       0       0       0       0       0       0       0       0       0       0
295          QI       0       0       0       0       0       0       0       0       0       0
296          QI       0       0       0       0       0       0       0       0       0       0
297          QI       0       0       0       0       0       0       0       0     1.8     1.8
298          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     3.7     3.7
299          QI     3.7     3.7     3.7     3.7     5.5     5.5     5.5     7.4     9.3     9.3
300          QI    18.6    48.4    91.3   134.1   169.5   192.0   197.5   177.7   134.1    93.3
301          QI    63.3    44.7    33.5    26.1    20.4    16.7    14.9    13.0    13.0    11.1
302          QI    11.1     9.3     9.3     7.4     7.4     5.5     3.7     3.7     3.7     3.7
303          QI     3.7     3.7     3.7     3.7     3.7     3.7     3.7     3.7     3.7     3.7
304          QI     3.7     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8
305          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8
306          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8
307          QI     1.8     1.8     1.8     1.8     1.8     1.8     1.8     1.8       0       0

308          KK  CAMECE
309          KM           COMBINE INPUT HYDROGRAPH WITH ROUTED FLOW
310          HC       2

311          KK  CAME7S
312          KM           INPUT HYDROGRAPH
313          BA       0
314          QI       0       0       0       0       0       0       0       0       0       0
315          QI       0       0       0       0       0       0       0       0       0       0
316          QI       0       0       0       0       0       0       0       0       0       (
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317          QI       0       0       0       0       0       0       0       0       0       0
318          QI       0       0       0       0       0       0       0       0       0       0
319          QI       0       0       0       0       0     4.6     4.6     4.6     4.6     4.6
320          QI     4.6     9.2     9.2     9.2     9.2     9.2     9.2    13.5    13.5    17.3
321          QI    17.3    29.9    63.4   129.2   201.8   267.5   320.6   346.0   336.7   295.2
322          QI   239.8   194.9   156.8   129.2   101.5    83.0    69.2    55.4    46.1    42.7
323          QI    36.9    32.2    32.2    27.7    18.4    18.4    13.8    13.8    13.8    13.8
324          QI    13.8    13.8     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2
1                                          HEC-1 INPUT                                          PAGE  8

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

325          QI     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2
326          QI     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2
327          QI     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2     9.2     4.6
328          QI     4.6     4.6     4.6     4.6     4.6     4.6     4.6     4.6     4.6     4.6

329          KK  CAMECE
330          KM           ROUTING INPUT HYDROGRAPH TO CAMELBACK/CENTRAL
331          RS       2    ELEV       1       0
332          RC   0.150   0.020   0.150  2640.0   0.002
333          RX     0.0    0.01   200.0  200.01   264.0  264.01  463.99   464.0
334          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

335          KK  CAMECE
336          KM           COMBINE ROUTED HYDROGRAPH
337          HC       2

338          KK  CAMECE
339          KM           DIVERT STROM DRAIN FLOW
340          DT  SDFCAC
341          DI      45     100    1500
342          DQ      45      45      45

343          KK  CAMECE
344          KM           DIVERT SURFACE FLOW
345          DT  SFCACW
346          DI     201     334     703    1198
347          DQ     105     162     297     458

348          KK  GRCACE
349          KM           ROUTING FLOW FROM CAMELBACK/CENTRAL TO GRAND CANAL/CENTRAL
350          RS       1    ELEV       1       0
351          RC   0.150   0.020   0.150  1800.0   0.003
352          RX     0.0    0.01   200.0  200.01   284.0  284.01  483.99   484.0
353          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

354          KK  GRCACE
355          KM           INPUT HYDROGRAPH
356          BA       0
357          QI       0       0       0       0       0       0       0       0       0       0
358          QI       0       0       0       0       0       0       0       0       0       0
359          QI       0       0       0       0       0       0       0       0       0       0
360          QI       0       0       0       0       0       0       0       0       0       0
361          QI       0       0       0       0       0       0       0       0     2.1     2.1
362          QI     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     4.1     4.1
363          QI     4.1     4.1     4.1     4.1     4.1     6.2     6.2     8.3     8.3    10.4
364          QI    24.9    66.5   108.0   135.1   149.6   160.0   147.5   103.0    62.3    39.5
365          QI    24.9    18.7    14.5     8.3     8.3     8.3     8.3     8.3     8.3     6.2
366          QI     6.2     6.2     4.1     4.1     2.1     2.1     2.1     2.1     2.1     2.1
367          QI     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1
368          QI     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1
369          QI     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1
370          QI     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1
371          QI     2.1     2.1     2.1     2.1     2.1     2.1     2.1     2.1       0       0
1                                          HEC-1 INPUT                                          PAGE  9

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

372          KK  GRCACE
373          KM           COMBINE INPUT HYDROGRAPH WITH ROUTED FLOW
374          HC       2

375          KK  GRCACE
376          KM           DIVERT STORM DRAIN FLOW
377          DT  SDGRCE
378          DI      20     100    1500
379          DQ      50      50      50

380          KK  GRCA7S
381          KM           INPUT HYDROGRAPH
382          BA       0
383          QI       0       0       0       0       0       0       0       0       0       0
384          QI       0       0       0       0       0       0     4.5     4.5     4.5     4.5
385          QI     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5
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386          QI     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5
387          QI     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5
388          QI     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5     4.5
389          QI     4.5     4.5     4.5     4.5     4.5     8.9     8.9     8.9     8.9    13.5
390          QI    18.0    44.9    80.9   121.4   166.2   215.6   256.0   274.0   283.0   296.0
391          QI   310.0   314.0   319.0   314.0   310.0   301.0   292.0   278.0   269.0   256.0
392          QI   247.0   233.0   224.0   211.0   197.0   188.7   175.2   161.7   148.3   134.0
393          QI   125.8   112.3   103.0    94.0    85.0    80.0    76.0    67.0    63.0    58.0
394          QI    54.0    49.4    49.4    44.9    40.4    40.4    35.9    35.9    31.4    31.4
395          QI    27.0    27.0    27.0    27.0    22.4    22.4    22.4    22.4    17.9    17.9
396          QI    17.9    17.9    17.9    17.9    17.9    17.9    13.4    13.4    13.4    13.4
397          QI    13.4    13.4    13.4    13.4    13.4    13.4    13.4     8.9     8.9     8.9

398          KK  GRCACE
399          KM           ROUT INPUT HYDROGRAPH TO GRAND CANAL/ CENTRAL
400          RS       4    ELEV       1       0
401          RC   0.045   0.045   0.045  2640.0  0.0002
402          RX     0.0    15.0    95.0   205.0   390.0   460.0   500.0   610.0
403          RY    25.0    24.0    23.5    23.5    24.0    26.0    26.0    26.0

404          KK  GRCACE
405          KM           COMBINE ROUTED FLOW
406          HC       2

407          KK  GRCACE
408          KM           DIVERT TOTAL HYDROGRAPH TO BE RECALLED LATTER
409          DT   TOTAL
410          DI     100     500    1000    1500    2000
411          DQ     100     500    1000    1500    2000

412          KK  GLEN23   BASIN COMPUTATION
413          KM           SCS METNOD
414          BA   0.203
415          LS   0.353    85.0       0
416          UD    0.35
```



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

417          KK  BETH23
418          KM            ROUTING FROM GLEN/23 TO BETH/23
419          RS       2    ELEV       1       0
420          RC   0.150   0.020   0.150  5280.0  0.0044
421          RX     0.0    0.01   100.0  100.01  139.99  140.00  239.99   240.0
422          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

423          KK  BETH23   BASIN COMPUTATION
424          KM           SCS METHOD
425          BA    0.27
426          LS   0.353    85.0       0
427          UD   0.303

428          KK  BETH23
429          KM           COMBINING ROUTED FLOW TO BETH23
430          HC       2

431          KK  CAME24
432          KM           ROUTING FROM BETH/23 TO CAME/24
433          RS       4    ELEV       1       0
434          RC   0.150   0.020   0.150  5600.0   0.004
435          RX     0.0    0.01   200.0  200.01  239.99  240.00  439.99   440.0
436          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

437          KK  CAME24   BASIN COMPUTTION
438          KM           SCS METHOD
439          BA   0.235
440          LS   0.381    84.0       0
441          UD    0.40

442          KK  CAME24
443          KM           COMBINING ROUTED FLOW TO CAME/24
444          HC       2

445          KK  GRCA23
446          KM           ROUTING FROM CAMELBACK/24 AVE. TO GRAND CANAL/23 AVE.
447          RS       4    ELEV       1       0
448          RC   0.150   0.020   0.150  3000.0  0.0032
449          RX     0.0    0.01   200.0  200.01  239.99  240.00  439.99   440.0
450          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

451          KK  GRCA23   BASIN COMPUTATION
452          KM           SCS METHOD
453          BA   0.392
454          LS   0.353    85.0       0
455          UD    0.36
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 456          KK  GRCA23
 457          KM           COMBINING ROUTED FLOW TO GRAND CANAL/23 AVE.
 458          HC       2
```



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

 459          KK  OSBORN
 460          KM           ROUTING FROM GRAND CANAL/23 AVE. TO OSBORN
 461          RS       4    ELEV       1       0
 462          RC   0.060   0.060   0.060  3100.0  0.0021
 463          RX     0.0    0.01   200.0   310.0   510.0   620.0   920.0  920.01
 464          RY     2.5     2.5     1.0     1.0     1.0     1.0     2.5     2.5

 465          KK  THOM19
 466          KM           ROUTING FROM OSBORN TO THOMAS/19 AVE.
 467          RS       4    ELEV       1       0
 468          RC   0.060   0.060   0.060  3000.0  0.0033
 469          RX     0.0    0.01   280.0   570.0  1000.0  1120.0  1250.0 1250.01
 470          RY     3.0     3.0     2.5     2.0     1.0     2.0     3.0     3.0

 471          KK  THOM19   BASIN COMPUTATION
 472          KM           SCS METHOD
 473          BA   0.325
 474          LS   0.381    84.0       0
 475          UD    0.51

 476          KK  THOM19
 477          KM           COMBINING ROUTED FLOW TO THOMAS/19 AVE.
 478          HC       2

 479          KK  THOM19
 480          KM           DIVERT STROM DRAIN FLOW
 481          DT  SDFT19       0      60
 482          DI      60     100    3000
 483          DQ      60      60      60

 484          KK  ECAN17
 485          KM           ROUTING FROM THOMAS /19 AVE. THROUGH ENCANTO PARK
 486          RS       1    ELEV       1       0
 487          RC   0.035   0.035   0.035  3000.0  0.0036
 488          RX     0.0    0.01   400.0   401.0   600.0   601.0  799.99   800.0
 489          RY     2.6     2.5     2.0     1.0     1.0     2.0     2.5     2.6

 490          KK  GLEN21   BASIN COMPUTATION
 491          KM           SCS METHOD
 492          BA   0.320
 493          LS   0.353    85.0       0
 494          UD    0.35

 495          KK  BETH21
 496          KM           ROUTING FROM GLEN/21 TO BETH/21
 497          RS       2    ELEV       1       0
 498          RC   0.150   0.020   0.150  5280.0  0.0044
 499          RX     0.0    0.01   100.0  100.01  139.99   140.0  239.99  240.00
 500          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 501          KK  BETH21   BASIN COMPUTATION
 502          KM           SCS METHOD
 503          BA   0.366
 504          LS   0.381    84.0       0
 505          UD   0.303

 506          KK  BETH21
 507          KM            COMBINING ROUTED FLOW TO BETH/21
 508          HC       2

 509          KK  CAME21
 510          KM           ROUTING BETH/21 TO CAME/21
 511          RS       3    ELEV       1       0
 512          RC   0.150   0.020   0.150  5280.0  0.0035
 513          RX     0.0    0.01   200.0  200.01  239.99  240.00  439.99   440.0
 514          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 515          KK  CAME21   BASIN COMPUTATION
 516          KM           SCS METHOD
 517          BA    0.43
 518          LS   0.381    84.0       0
 519          UD    0.40
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 520          KK  CAME21
 521          KM           COMBINING ROUTED FLOW TO CAME/21
 522          HC       2

 523          KK  INDI19
 524          KM           ROUTING FROM CAMELBACK/21 AVE. TO INDIAN SCHOOL/19 AVE.
 525          RS       4    ELEV       1       0
 526          RC   0.100   0.020   0.150  2600.0  0.0024
 527          RX     0.0    0.01   300.0  300.01  339.99   340.0  639.99  640.00
 528          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 529          KK  INDI19
 530          KM           ROUTING 2ND. REACH TO INDIAN SCHOOL/19 AVE.
 531          RS       7    ELEV       1       0
 532          RC   0.130   0.130   0.130  2900.0  0.0033
 533          RX     0.0    0.01   600.0  650.01  675.99  700.00 1200.00 1200.01
 534          RY     4.0     3.0     1.0     1.0     1.0     1.0     3.0     4.0

 535          KK  INDI19
 536          KM           BASIN COMPUTATION
 537          BA   0.333
 538          LS   0.326    86.0       0
 539          UD   0.522

 540          KK  INDI19
 541          KM           COMBINING ROUTED FLOW TO INDIAN SCHOOL/ 19 AVE.
 542          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 543          KK  INDI17
 544          KM           ROUTING TO INDIAN SCHOOL/ 17 AVE.
 545          RS       2    ELEV       1       0
 546          RC   0.060   0.020   0.060  1340.0  0.0037
 547          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 548          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 549          KK  NOR19A   BASIN COMPUTATION
 550          KM           SCS METHOD
 551          BA   0.519
 552          LS   0.353    85.0       0
 553          UD   0.620

 554          KK  NORT23
 555          KM           BASIN COMPUTATION
 556          BA    0.76
 557          BF      15       1     100
 558          LS    0.38    84.0       0
 559          UD    1.08

 560          KK  NORT23
 561          KM           SURFACE FLOW DIVERSION
 562          DT  SFN23S
 563          DI      46     150     305     512     863
 564          DQ      38     108     198     305     426

 565          KK  NORT19
 566          KM          ROUT TO NORTHERN/19TH
 567          RS       2    ELEV       1
 568          RC   0.060   0.020   0.060  2640.0  0.0024
 569          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 570          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 571          KK  NOR19B   BASIN COMPUTATION
 572          KM           SCS METHOD
 573          BA    0.39
 574          BF       0       0       1
 575          LS   0.381    84.0       0
 576          UD    0.83

 577          KK  NORTDE
 578          KM           ROUT FLOW FROM NOR19B THROUGH DETENTION BASIN
 579          RS       1    ELEV  1190.5       0
 580          SA     1.8     9.7    26.9
 581          SE  1190.5  1196.0  1200.0
 582          SS  1196.0  1200.0     2.3     1.5

 583          KK  NORT19
 584          KM          ROUT TO NORTHERN/19TH
 585          RS       2    ELEV       1
 586          RC   0.060   0.020   0.060  1400.0  0.0024
 587          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 588          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 589          KK  NORT19
 590          KM           COMBINING NORTHERN AND 19TH AVE. (A) TO (B)
 591          HC       3

 592          KK  NORT19
 593          KM           DIVERT STORM DRAIN FLOW
 594          DT  SDFN19       0      68
 595          DI      68     100    3000
 596          DQ      68      68      68

 597          KK  GLEN19
 598          KM           ROUTING FROM NORTHERN/19TH AVE. TO GLENDALE/19TH
 599          RS       3    ELEV       1       0
 600          RC   0.130   0.020   0.130  5280.0  0.0034
 601          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 602          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 603          KK  DIVN23
 604          KM           RETRIEVE DIVERTED FLOW AT NORTHERN/23RD. AVE
 605          DR  SFN23S

 606          KK  MORT19
 607          KM          ROUT DIVERTED FLOW TO  MORTEN /19 AVE. 1ST REACH
 608          RS       2    ELEV       1
 609          RC   0.130    0.02   0.130   550.0  0.0044
 610          RX       0    0.01   200.0  200.01   240.0  240.01   440.0  440.01
 611          RY       3    2.25    1.25     1.0     1.0    1.25    2.25     3.0

 612          KK  GLEN19
 613          KM          ROUT DIVERTED FLOW TO  MORTEN /19 AVE. 2ND REACH
 614          RS       2    ELEV       1
 615          RC   0.130    0.02   0.130  1240.0   0.002
 616          RX       0    0.01   200.0  200.01   240.0  240.01   440.0  440.01
 617          RY       3    2.25    1.25     1.0     1.0    1.25    2.25     3.0

 618          KK  MORT19
 619          KM          ROUT DIVERTED FLOW TO  MORTEN /19 AVE. 3RD REACH
 620          RS       2    ELEV       1
 621          RC   0.130    0.02   0.130  1200.0  0.0044
 622          RX       0    0.01   200.0  200.01   240.0  240.01   440.0  440.01
 623          RY       3    2.25    1.25     1.0     1.0    1.25    2.25     3.0

 624          KK  MORT19
 625          KM          ROUT DIVERTED FLOW TO  MORTEN /19 AVE. 4TH REACH
 626          RS       2    ELEV       1
 627          RC   0.130    0.02   0.130  1340.0   0.002
 628          RX       0    0.01   200.0  200.01   240.0  240.01   440.0  440.01
 629          RY       3    2.25    1.25     1.0     1.0    1.25    2.25     3.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 630          KK  MORT19
 631          KM          BASIN COMPUTATION
 632          BA    0.13
 633          LS   0.381    84.0       0
 634          UD     .36

 635          KK  MORT19
 636          KM          COMBINE FLOWS
 637          HC       2

 638          KK  GLEN19
 639          KM           ROUTING FROM  MORTEN /19TH AVE. TO GLENDALE/19TH
 640          RS       2    ELEV       1       0
 641          RC   0.130   0.020   0.130  4000.0  0.0034
 642          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 643          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 644          KK  GLEN19
 645          KM          COMBINE ROUTED FLOW
 646          HC       2

 647          KK  GLEN19
 648          KM          DIVERT STORM DRAIN FLOW
 649          DT  SDFG19       0      29
 650          DI      29     100    3000
 651          DQ      29      29      29

 652          KK  GLEN19
 653          KM          DIVERT SURFACE FLOW
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 654          DT  SFG19E
 655          DI     364     864    1140    1771
 656          DQ     105     226     274     375

 657          KK  BETH19
 658          KM           ROUTING FROM GLENDALE/19 AVE. TO BETHANY/19 AVE.
 659          RS       4    ELEV       1       0
 660          RC   0.130   0.020   0.130  5280.0  0.0044
 661          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 662          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 663          KK  BETH19
 664          KM           DIVERT SURFACE FLOW
 665          DT  SFB19E
 666          DI     364     860     983    2015
 667          DQ     105     205     226     375

 668          KK  CAME19
 669          KM           ROUTING FROM BETHANY/19 AVE. TO CAMELBACK/19 AVE.
 670          RS       4    ELEV       1       0
 671          RC   0.060   0.020   0.130  5280.0  0.0035
 672          RX     0.0    0.01   200.0  200.01  263.99   264.0  363.99   364.0
 673          RY     4.0    2.25    1.25     1.0     1.25    1.25    2.25     4.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 674          KK  CAME19
 675          KM           DIVERT STROM DRAIN FLOW
 676          DT  SDFC19       0      23
 677          DI      23     100    3000
 678          DQ      23      23      23

 679          KK  CAME19
 680          KM           DIVERT SURFACE FLOW
 681          DT  SFC19E
 682          DI     167     317     780     830    1651
 683          DQ      93     105     215     226     375

 684          KK  INDI17
 685          KM           ROUTING FROM CAMELBACK/19 AVE TO INDIAN SCHOOL/17 AVE.
 686          RS       2    ELEV       1       0
 687          RC   0.060   0.020   0.060  2650.0  0.0041
 688          RX     0.0    0.01  200.00  200.01  263.99  264.00  463.99   464.0
 689          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 690          KK  INDI17
 691          KM           ROUTING 2ND. REACH TO INDIAN SCHOOL/17 AVE.
 692          RS       3    ELEV       1       0
 693          RC   0.130   0.020   0.130  2850.0  0.0039
 694          RX     0.0    0.01   200.0  200.01  229.99   230.0  429.99   430.0
 695          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 696          KK  INDI17   BASIN COMPUTATION
 697          KM           SCS METHOD
 698          BA     .56
 699          LS   0.381    84.0       0
 700          UD   0.486

 701          KK  INID17
 702          KM           COMBINE ROUTED FLOW TO INDIAN SCHOOL/17 AVE.
 703          HC       3

 704          KK  NORTH7   BASIN COMPUTATION
 705          KM           SCS METHOD
 706          BA   0.097
 707          LS   0.105    95.0       0
 708          UD   0.317

 709          KK  NORTH7
 710          KM           DIVERT STRORM DRAIN FLOW
 711          DT  SDFNO7       0      50
 712          DI      50     100    3000
 713          DQ      50      50      50

 714          KK  NORTH7
 715          KM           DIVERT SURFACE FLOW
 716          DT  SFNO7S
 717          DI     140     510    1180
 718          DQ    57.3     162     243
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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 719          KK  NORT15
 720          KM           ROUTING FROM NOTHERN AND 7TH AVE. TO NORTHERN AND 15TH AVE.
 721          RS       1    ELEV       1       0
 722          RC   0.100   0.020   0.100  2640.0  0.0023
 723          RX     0.0    0.01   100.0  100.01  163.99  164.00  263.99  264.00
 724          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 725          KK  NORT15   BASIN COMPUTATION
 726          BA   0.208
 727          LS   0.247    89.0       0
 728          UD   0.453

 729          KK  NORT15
 730          KM           COMBINING NORTHERN AND 7TH AVE TO NORTHERN AND 15 AVE.
 731          HC       2

 732          KK  NORT15
 733          KM           DIVERT STORM DRAIN FLOW
 734          DT  SDFN15       0     110
 735          DI     110     200    3000
 736          DQ     110     110     110

 737          KK  GLEN15
 738          KM          ROUTING FROM NORTHERN AND 15TH AVE TO GLENDALE AND 15 AVE.
 739          RS       2    ELEV       1       0
 740          RC   0.100   0.020   0.100  5280.0  0.0044
 741          RX     0.0    0.01   100.0  100.01  139.99  140.00  239.99  240.00
 742          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 743          KK  GLEN15
 744          KM          DIVERT STROM DRAIN FLOW
 745          DT  SDFG15       0      90
 746          DI      90     200    3000
 747          DQ      90      90      90

 748          KK  BETH15
 749          KM          ROUTING FROM GLENDALE/15 AVE. TO BETH/15 AVE.
 750          RS       1    ELEV       1       0
 751          RC   0.060   0.020   0.060  5280.0  0.0042
 752          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 753          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 754          KK  DIVG19
 755          KM          RETRIEVE DIVERTED FLOW AT GLENDALE/19 AVE.
 756          DR  SFG19E

 757          KK  GLEN17
 758          KM          ROUT DIVERTED FLOW TO GLENDALE/17 AVE.
 759          RS       1    ELEV       1       0
 760          RC   0.035   0.020   0.035  1320.0   0.001
 761          RX     0.0    0.01   200.0  200.01  263.59   264.0  463.99   464.0
 762          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 763          KK  GLEN17  BASIN COMPUTATION
 764          KM          SCS METHOD
 765          BA    0.32
 766          LS   0.410    83.0       0
 767          UD    0.43

 768          KK  GLEN17
 769          KM           COMBINE ROUTED FLOW WITH GLENDALE/7TH AVE.
 770          HC       2

 771          KK  BETH15
 772          KM           ROUT FIRST REACH TO BETH/ 15 AVE.
 773          RS       1    ELEV       1       0
 774          RC   0.150   0.020   0.150  2640.0  0.0038
 775          RX     0.0    0.01   100.0  100.01  199.99   200.0  299.99   300.0
 776          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 777          KK  BETH15
 778          KM           ROUT SECOND REACH TO BETH / 15 AVE.
 779          RS       3    ELEV       1       0
 780          RC    0.15   0.020   0.150  2640.0  0.0038
 781          RX     0.0    0.01   200.0  200.01  229.99   230.0  429.99   430.0
 782          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 783          KK  BETH15
 784          KM           ROUT LAST REACH TO BETH 15
 785          RS       2    ELEV       1       0
 786          RC    0.15   0.020   0.013  1320.0  0.0009
 787          RX     0.0    0.01   200.0  200.01  289.99   290.0  439.99   499.(
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 788          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 789          KK  BETH15   BASIN COMPUTATION
 790          KM           SCS METHOD
 791          BA   0.412
 792          LS   0.353    85.0       0
 793          UD    0.44

 794          KK  BETH15
 795          KM          COMBINE ROUTED FLOW BETH /15 AVE.
 796          HC       3

 797          KK  DIVB19
 798          KM           RETRIEVE DIVERTED FLOW AT BETHANY /19 AVE.
 799          DR  SFB19E

 800          KK  BETH15
 801          KM           ROUT RETRIEVED FLOW
 802          RS       3    ELEV       1       0
 803          RC   0.150   0.020    0.15  2640.0  0.0009
 804          RX     0.0    0.01   200.0  200.01  289.99   290.0  489.99   499.0
 805          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0
1                                          HEC-1 INPUT                                                              PAGE 19

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


 806          KK  BETH15
 807          KM           COMBINE ROUTED FLOW WITH BETH /15 AVE.
 808          HC       2

 809          KK  BETH15
 810          KM           DIVERT STORM DRAIN FLOW
 811          DT  SDFB15       0      55
 812          DI      55    1000    2000
 813          DQ      55      55      55

 814          KK  CAME15
 815          KM           ROUTING FLOW FROM BETHANY/15 AVE TO CAMELBACK/15 AVE.
 816          RS       3    ELEV       1       0
 817          RC   0.150   0.020   0.035  5280.0  0.0038
 818          RX     0.0    0.01   200.0  200.01  239.99   240.0  439.99   440.0
 819          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 820          KK  DIVE19
 821          KM           RETRIEVE DIVERTED FLOW
 822          DR  SFC19E

 823          KK  CAME15
 824          KM           ROUT DIVERTED FLOW TO CAME / 15 AVE.
 825          RS       2    ELEV       1       0
 826          RC    0.06   0.020    0.60  1320.0  0.0006
 827          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 828          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 829          KK  CAME15   BASIN COMPUTATION
 830          KM           SCS METHOD
 831          BA     .50
 832          LS   0.299    87.0       0
 833          UD    0.45

 834          KK  CAME15
 835          KM           COMBINE ROUTED FLOW TO CAMELBACK/15 AVE.
 836          HC       3

 837          KK  CAME15
 838          KM           DIVERT STROM DRAIN FLOW
 839          DT  SDFC15       0     135
 840          DI      95     150    3000
 841          DQ     135     135     135

 842          KK  CAME15
 843          KM           DIVERT SURFACE FLOW
 844          DT  SFC15E
 845          DI      73     263     605
 846          DQ    57.3     162     243
1                                          HEC-1 INPUT                                                              PAGE 20

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


 847          KK  GRCA15
 848          KM           ROUTING FROM CAMELBACK/15 AVE. TO GRAND CANAL/15 AVE.
 849          RS       2    ELEV       1       0
 850          RC   0.060   0.020   0.060  3200.0  0.0047
 851          RX     0.0    0.01   200.0  200.01  239.99   240.0  439.99   440.(
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852          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

853          KK  DIVEN7
854          KM           RETRIVE DIVERTED FLOW AT NORTHERN AND 7TH AVE.
855          DR  SFNO7S

856          KK  GLEND7
857          KM           ROUTING DIVERTED FLOW FROM NOTHERN/7TH AVE. TO GLEN/7TH AVE.
858          RS       4    ELEV       1       0
859          RC   0.100   0.020   0.100  5280.0   0.004
860          RX     0.0    0.01   100.0  100.01  163.99  164.00  263.99  264.00
861          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

862          KK  GLEND7   BASIN COMPUTATIION
863          KM           SCS METHOD
864          BA   0.117
865          LS   0.105    95.0       0
866          UD   0.422

867          KK  GLEND7
868          KM           COMBINE ROUTED FLOW TO GLENDALE/7 AVE.
869          HC       2

870          KK  DIVG7A
871          KM           RETRIEVE DIVERTED FLOW AT GLENDALE/CENTRAL
872          DR  SFGLCW

873          KK  GLEND7
874          KM          ROUTING DIVERTED FLOW FROM GLENDALE/CENTRAL TO GLENDALE/7 AVE.
875          RS       1    ELEV       1       0
876          RC   0.150   0.020   0.150  2640.0   0.003
877          RX     0.0    0.01   100.0  100.01   164.0  164.01  263.99   264.0
878          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

879          KK  GLEND7
880          KM            COMBINE ROUTED FLOW TO GLENDALE/7 AVE.
881          HC       2

882          KK  GLEND7
883          KM           DIVERT SURFACE FLOW
884          DT  SFGL7S
885          DI     153     559    1293
886          DQ    95.7     397    1050
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

887          KK  GLEN12
888          KM          ROUTING FROM GLENDAL/7 AVE. TO GLENDAL/12 AVE.
889          RS       3    ELEV       1       0
890          RC   0.035   0.020   0.035  1830.0   0.003
891          RX     0.0    0.01   100.0  100.01  163.99   164.0  263.99   264.0
892          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

893          KK  GLEN12   BASIN COMPUTATION
894          KM           SCS METHOD
895          BA   0.390
896          LS   0.439    82.0       0
897          UD   0.390

898          KK  GLEN12
899          KM           COMBINE ROUTED FLOW GLENDALE/ 12 AVE.
900          HC       2

901          KK  BETH11
902          KM           ROUT TO BETHANY / 11 AVE.
903          RS       3    ELEV       1       0
904          RC    0.06   0.020    0.06  5600.0  0.0037
905          RX     0.0    0.01   200.0  200.01  229.99   230.0  429.99   430.0
906          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

907          KK  BETH11  BASIN COMPUTATION
908          KM          SCS METHOD
909          BA    0.28
910          LS   0.273    88.0       0
911          UD    0.44

912          KK  BETH11
913          KM           COMBINE ROUTED FLOW WITH BETHANY /11 AVE.
914          HC       2

915          KK  CAME11
916          KM           ROUT FLOW TO CAMELBACK / 11 AVE.
917          RS       4    ELEV       1       0
918          RC    0.15   0.020    0.15  5280.0  0.0044
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 919          RX     0.0    0.01   200.0  200.01  229.99   230.0  429.99   430.0
 920          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 921          KK  CAME11   BASIN COMPUTATION
 922          KM           SCS METHOD
 923          BA    0.20
 924          LS   0.353    85.0       0
 925          UD   0.300

 926          KK  DIVC15
 927          KM           RETRIEVE DIVERTED FLOW AT CAMELBACK / 15 AVE.
 928          DR  SFC15E
1                                      HEC-1 INPUT                                                          PAGE 22

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


 929          KK  CAME11
 930          KM          ROUTING DIVERTED FLOW TO CAMELBACK /11 AVE.
 931          RS       2   ELEV       1       0
 932          RC   0.035  0.020   0.035  1340.0  0.0009
 933          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 934          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 935          KK  CAME11
 936          KM          COMBINE FLOWS
 937          HC       3

 938          KK  CAME11
 939          KM           DIVERT SURFACE FLOW
 940          DT  SFC11E
 941          DI      73     263     605
 942          DQ    57.3     162     243

 943          KK  GRCA11
 944          KM           ROUT TO GRAND CANAL /11 AVE.
 945          RS       3   ELEV       1       0
 946          RC    0.13  0.020    0.13  2700.0  0.0031
 947          RX     0.0    0.01   200.0  200.01  229.99   230.0  429.99  430.99
 948          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 949          KK  DIVEG7
 950          KM           RETRIEVE DIVERTED SURFACE FLOW AT GLENDALE/7 AVE.
 951          DR  SFGL7S

 952          KK  BETHA7
 953          KM           ROUTING DIVERTED SURFACE FLOW TO BETHANY/7 AVE.
 954          RS       2   ELEV       1       0
 955          RC   0.120  0.020   0.120  5280.0  0.0048
 956          RX     0.0    0.01   100.0  100.01  163.99   164.0  263.99   264.0
 957          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 958          KK  BETHA7   BASIN COMPUTATION
 959          KM           SCS METHOD
 960          BA   0.150
 961          LS   0.174    92.0       0
 962          UD    0.49

 963          KK  BETHA7
 964          KM           COMBINE ROUTED FLOW TO BETHANY/7 AVE.
 965          HC       2

 966          KK  DIVB7A
 967          KM           RETRIEVE DIVERTED FLOW AT BETHANY/CENTRAL
 968          DR  SFBECW
1                                      HEC-1 INPUT                                                          PAGE 23

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


 969          KK  BETHA7
 970          KM           ROUT RETRIEVED FLOW TO BETHANY/7 AVE.
 971          RS       2   ELEV       1       0
 972          RC   0.015  0.020   0.015  2640.0   0.002
 973          RX     0.0    0.01   100.0  100.01   164.0  164.01  263.99   264.0
 974          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 975          KK  BETHA7
 976          KM          COMBINE ROUTED FLOW
 977          HC       2

 978          KK  BETHA7
 979          KM           DIVERT STORM DRAIN FLOW
 980          DT  SDFBE7       0      74
 981          DI      74    1000    2000
 982          DQ      74      74      74
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 983          KK  CAMEL7
 984          KM           ROUTING FLOW TO CAMELBACK /7 AVE.
 985          RS       4    ELEV       1       0
 986          RC   0.120   0.020   0.120  5280.0  0.0044
 987          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
 988          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

 989          KK  CAMEL7   BASIN COMPUTATION
 990          KM           SCS METHOD
 991          BA   0.203
 992          LS   0.198    91.0       0
 993          UD   0.300

 994          KK  CAMEL7
 995          KM           COMBINE ROUTED FLOW TO CAMELBACK/ 7 AVE.
 996          HC       2

 997          KK  DIVE11
 998          KM          RETRIEVE DIVERTED FLOW AT CAMBELBACK /11 AVE
 999          DR  SFC11E

1000          KK  CAMEL7
1001          KM           ROUTING DIVERETED FLOW TO CAMELBACK / 7 AVE.
1002          RS       3    ELEV       1       0
1003          RC   0.035   0.020   0.035  1320.0  0.0009
1004          RX     0.0    0.01   200.0  200.01  263.99   264.0  463.99   464.0
1005          RY     4.0    2.25    1.25     1.0     1.25    2.25     4.0

1006          KK  CAMEL7
1007          KM          COMBINE ROUTED FLOW CAMELBACK / 7 AVE.
1008          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1009          KK  CAMEL7
1010          KM          DIVERT SURFACE FLOW FROM CAMELBACK/7AVE. TO CAMELBACK/ 3RD. AVE.
1011          DT  SFCA7A
1012          DI     201     334     703    1198
1013          DQ     105     162     297     458

1014          KK  GRCA7A
1015          KM            ROUTING TO GRAND CANAL/7 AVE.
1016          RS       2    ELEV       1       0
1017          RC   0.060   0.020   0.060  2100.0  0.0031
1018          RX     0.0    0.01   300.0  300.01  363.99   364.0  663.99   664.0
1019          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

1020          KK  DIVCAC
1021          KM          RETRIEVE DIVERTED FLOW AT CAMELBACK/CENTRAL
1022          DR  SFCACW

1023          KK  CAME3A
1024          KM          ROUT RETRIEVED FLOW FROM CAMELBACK/CENTRAL TO CAMELBACK/ 3RD. AVE.
1025          RS       1    ELEV       1       0
1026          RC   0.150   0.020   0.150  1320.0  0.0018
1027          RX     0.0    0.01   100.0  100.01   164.0  164.01  263.99   264.0
1028          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

1029          KK  CAME3A  BASIN COMPUTATION
1030          KM          SCS METNOD
1031          BA   0.130
1032          LS   0.247    89.0       0
1033          UD    0.30

1034          KK  CAME3A
1035          KM          COMBINE ROUTED FLOW WITH COMPUTED FLOW
1036          HC       2

1037          KK  DIVC7A
1038          KM          RETRIEVE DIVERTED FLOW AT CAMELBACK/7TH. AVE.
1039          DR  SFCA7A

1040          KK  CAME3A
1041          KM          ROUT RETRIEVED FLOW FROM CAMELBACK/7TH. AVE. TO CAMELBACK/3RD. AVE.
1042          RS       4    ELEV       1       0
1043          RC   0.150   0.020   0.150  1320.0  0.0015
1044          RX     0.0    0.01   200.0  200.01   264.0  264.01  463.99   464.0
1045          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

1046          KK  CAME3A
1047          KM          COMBINE ROUTED FLOW TO CAMELBACK/3RD. AVE.
1048          HC       2
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1049          KK  GRCA3A
1050          KM          ROUT FLOW TO GRAND CANAL/3RD. AVE.
1051          RS       5   ELEV       1       0
1052          RC   0.150   0.020   0.150  2000.0  0.0034
1053          RX     0.0    0.01   300.0  300.01   340.0  340.01  639.99   640.00
1054          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

1055          KK  DIVGCC
1056          KM          RETRIEVE DIVERTED FLOW AT GRAND CANAL/CENTRAL
1057          DR   TOTAL

1058          KK  GRCA3A
1059          KM          DIVERT SURFACE FLOW OVER GRAND CANAL
1060          DT  SFGC3A
1061          DI     114     300     400     500
1062          DQ       0     186     286     386

1063          KK  GRCA3A
1064          KM          ROUT DIVERTED FLOW FROM GRAND CANAL/CENTRAL TO GRAND CANAL/3RD. AVE.
1065          RS       2   ELEV    22.8       0
1066          RC   0.130   0.020   0.130  1370.0  0.0001
1067          RX     0.0    85.0   380.0  380.01   420.0  420.01   560.0   710.0
1068          RY    24.0    22.0    23.3    22.8    22.8    23.3    23.4    24.0

1069          KK  GRCA3A
1070          KM          COMBINE ROUTED FLOWS
1071          HC       2

1072          KK  GRCA3A
1073          KM          DIVERT SURFACE FLOW OVER GRAND CANAL
1074          DT  SFGC7A
1075          DI     203     300     500     700     900
1076          DQ       0      97     297     497     697

1077          KK  GRCA7A
1078          KM          ROUT FLOW FROM GRAND CANAL/3RD. TO GRAND CANAL/ 7TH AVE.
1079          RS       2   ELEV    21.5       0
1080          RC    0.13   0.020   0.130  1320.0  0.0001
1081          RX     0.0    80.0   270.0  270.01   300.0  300.01   860.0  1100.0
1082          RY    24.0    23.6    21.5    21.5    21.5    21.5    24.1    24.9

1083          KK  GRCA7A
1084          KM          COMBINE ROUTED FLOWS
1085          HC       2

1086          KK  GRCA11
1087          KM           ROUTING FLOW TO GRAND CANAL /11 AVE.
1088          RS       1   ELEV    22.5       0
1089          RC   0.130   0.020   0.130  1450.0  0.0006
1090          RX     0.0    70.0   150.0  150.01   180.0  180.01  1150.0 1300.00
1091          RY    24.5    23.0    22.5    22.5    22.5    22.5    24.5    25.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1092          KK  GRCA11
1093          KM           COMBINE ROUTED FLOWS
1094          HC       2

1095          KK  GRCA15
1096          KM           ROUTING FLOW TO GRAND CANAL /15 AVE.
1097          RS       1   ELEV    22.5       0
1098          RC   0.130   0.020   0.130  1450.0  0.0006
1099          RX     0.0    70.0   150.0  150.01   180.0  180.01  1150.0 1300.00
1100          RY    24.5    23.0    22.5    22.5    22.5    22.5    24.5    25.0

1101          KK  GRCA15
1102          KM           COMBINING ROUTED FLOWS
1103          HC       2

1104          KK  GRCA15   BASIN COMPUTATION
1105          KM           SCS METHOD
1106          BA    0.43
1107          LS   0.381    84.0       0
1108          UD   0.340

1109          KK  GRCA15
1110          KM           COMBINE ROUTED FLOW WITH GRAND CANAL/15 AVE
1111          HC       2

1112          KK  GRCA15
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1113          KM            DIVERT STORM DRAIN FLOW
1114          DT   SDFG15       0       75
1115          DI                75     1000     2000
1116          DQ                75       75       75

1117          KK   INDI17
1118          KM            ROUTING TO INDIAN SCHOOL 17/AVE
1119          RS        4    ELEV        1        0
1120          RC    0.160   0.160    0.160   2430.0   0.0040
1121          RX      0.0   400.0    990.0   1200.0   1400.0   1550.0   1900.0   2030.0
1122          RY      3.5     2.5      1.0      1.0      1.0      1.0      2.5      3.5

1123          KK   INDI17
1124          KM            COMBINE WITH INDIAN SCHOOL/17 AVE.
1125          HC        2

1126          KK   THOM17
1127          KM            ROUTING FLOW FROM INDIAN SCHOOL/17 AVE. TO THOMAS/17.AVE
1128          RS        4    ELEV        1        0
1129          RC    0.130   0.020    0.130   5280.0    0.006
1130          RX      0.0  1240.0   1780.0   1780.1   1900.0   1900.1   2500.0   3600.0
1131          RY      2.5     2.0      1.0      1.0      1.0      1.0      1.0      2.5
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1132          KK   THOM17   BASIN COMPUTATION
1133          KM            SCS METHOD
1134          BA     0.64
1135          LS    0.381    84.0        0
1136          UD    0.500

1137          KK   THOM17
1138          KM            COMBINE ROUTED FLOW WITH THOMAS/17 AVE.
1139          HC        2

1140          KK   ECAN17
1141          KM            ROUTING FROM THOMAS/17 AVE. TO ECANTO/17 AVE.
1142          RS        2    ELEV        1        0
1143          RC    0.130   0.035    0.035   2640.0   0.0032
1144          RX      0.0   690.0   1200.0   1600.0   2000.0   2300.0   2500.0   2600.0
1145          RY      4.0     2.5      1.5      1.5     1.25      1.0      3.0      4.0

1146          KK   ECAN17
1147          KM            COMBINE ROUTED FLOWS  THOMAS/19 AVE + THOMAS/17 AVE.
1148          HC        2

1149          KK   MCDO17
1150          KM            ROUTING FROM ECANTO RD. TO MCDOWELL/17 AVE.
1151          RS        3    ELEV        1        0
1152          RC    0.130   0.020    0.020   2640.0   0.0011
1153          RX      0.0   480.0   1600.0   1970.0   2420.0   3000.0   3150.0   3290.0
1154          RY      2.0     1.5      1.5      1.5      1.0      1.0      1.5      2.0

1155          KK   MCDO17   BASIN COMPUTATION
1156          KM            SCS METHOD
1157          BA     0.64
1158          LS     .381    84.0        0
1159          UD      0.5

1160          KK   MCDO17
1161          KM            COMBINING ROUTED FLOW WITH MCDOWELL/17 AVE
1162          HC        2

1163          KK   THOM22   BASIN COMPUTATION
1164          KM            SCS METHOD
1165          BA     0.35
1166          LS    0.381    84.0        0
1167          UD    0.342

1168          KK   REACHA
1169          KM            ROUTING REACH A TO MCDOWELL/ 19 AVE.
1170          RS        2    ELEV        1        0
1171          RC    0.060   0.020    0.060   2100.0   0.0037
1172          RX      0.0    0.01    200.0   200.01   229.99    230.0   429.99    430.0
1173          RY      4.0    2.25     1.25      1.0      1.0     1.25     2.25      4.0
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1174          KK   REACHB
1175          KM            ROUTING REACH B TO MCDOWELL/19 AVE.
1176          RS        1    ELEV        1        0
1177          RC    0.035   0.035    0.060   1000.0   0.0035
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1178          RX     0.0   400.0   570.0   650.0   800.0  1000.0  1200.0  1430.0
1179          RY     1.5     1.0     1.0     1.0     1.0     1.0     1.0     1.5

1180          KK  MCDO19
1181          KM            ROUTING LAST REACH TO MCDOWELL/19 AVE.
1182          RS       2     ELEV       1       0
1183          RC   0.035   0.020   0.130  2750.0  0.0023
1184          RX     0.0   140.0   350.0   410.0   500.0   630.0  1130.0 1130.01
1185          RY     2.5     1.5     1.0     1.0     1.5     2.0     3.0     3.0

1186          KK  MCDO19   BASIN COMPUTATION
1187          KM            SCS METHOD
1188          BA    0.48
1189          LS   0.381    84.0       0
1190          UD   0.734

1191          KK  MCDO19
1192          KM            COMBINE ROUTED FLOW WITH MCDOWELL/19 AVE. AND MCDOWELL/17 AVE.
1193          HC       2

1194          KK  MCDO17
1195          KM            COMBINE FLOW AT MCDOWELL/19TH WITH FLOW AT MCDOWELL/17TH. AVE.
1196          HC       2

1197          KK  DIGC3A
1198          KM            RETRIEVE DIVERTED FLOW
1199          DR  SFGC3A

1200          KK  INDI3A
1201          KM            ROUT FLOW TO INDIAN SCHOOL/ 3RD. AVE.
1202          RS       1     ELEV       1       0
1203          RC    0.13     0.02    0.13  3100.0  0.0032
1204          RX       0     0.01   200.0  200.01   260.0  260.01  459.99   460.0
1205          RY       4     2.25    1.25       1       1    1.25    2.25       4

1206          KK  INDI3A   BASIN COMPUTATION
1207          KM            SCS METHOD
1208          BA   0.242
1209          LS   0.353    85.0       1
1210          UD   0.200

1211          KK  INDI3A
1212          KM            COMBINE ROUTED FLOW WITH INDI3A
1213          HC       2
```



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

1214          KK  THOM3A
1215          KM            ROUT FLOW TO THOMAS/3RD. AVE.
1216          RS       4     ELEV       1
1217          RC   0.035     0.02   0.060  5280.0  0.0032
1218          RX       0     0.01   300.0  300.01   360.0  360.01  659.99   660.0
1219          RY       4     2.25    1.25       1       1    1.25    2.25       4

1220          KK  THOM3A   BASIN COMPUTATION
1221          KM            SCS METHOD
1222          BA   0.292
1223          LS   0.198    91.0       0
1224          UD   0.350

1225          KK  THOM3A
1226          KM            COMBINE ROUTED FLOW WITH THOMAS/3A
1227          HC       2

1228          KK  MCDO3A
1229          KM            ROUT FLOW TO MCDOWELL/ 3RD. AVE
1230          RS       3     ELEV       1
1231          RC    0.13     0.02    0.13  5280.0  0.0018
1232          RX       0     0.01   400.0  400.01   440.0  440.01  839.99   840.0
1233          RY       4     2.25    1.25       1       1    1.25    2.25       4

1234          KK  MCDO3A
1235          KM            DIVERT SURFACE FLOW
1236          DT  SFMC3A
1237          DI      41      154     242     315
1238          DQ       0        0      46     105

1239          KK  MCDO7A
1240          KM            ROUT FLOW TO MCDOWELL/ 7TH. AVE.
1241          RS       4     ELEV       1
1242          RC    0.13     0.02    0.13  1320.0  0.0007
1243          RX       0     0.01   300.0  300.01   360.0  360.01  659.99   660.0
1244          RY       4     2.25    1.25       1       1    1.25    2.25       4
```

```
1245          KK  MCDO7A   BASIN COMPUTATION
1246          KM           SCS METHOD
1247          BA   0.490
1248          LS   0.381    84.0
1249          UD   0.594

1250          KK  MCDO7A
1251          KM           COMBINE ROUTED FLOW WITH MCDOWELL/7TH. AVE.
1252          HC       2

1253          KK  DIGC7A
1254          KM          RETRIEVE DIVERTED FLOW AT GRAND CANAL /7TH. AVE.
1255          DR  SFGC7A
```



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

1256          KK  OSBO7A
1257          KM           ROUT DIVERTED FLOW TO OSBORN/7TH. AVE
1258          RS       5    ELEV       1
1259          RC    0.13    0.02    0.13  5280.0  0.0037
1260          RX       0    0.01   200.0  200.01   260.0  260.01  459.99   460.0
1261          RY       4    2.25    1.25       1       1    1.25    2.25       4

1262          KK  OSBO7A   BASIN COMPUTATION
1263          KM           SCS METHOD
1264          BA   0.453
1265          LS   0.381    84.0       0
1266          UD   0.414

1267          KK  OSBO7A
1268          KM           COMBINE ROUTED FLOW WITH OSBORN/7TH. AVE
1269          HC       2

1270          KK  EDGE7A
1271          KM           ROUT FLOW TO EDGEMOUNT/7TH. AVE.
1272          RS       2    ELEV       1
1273          RC    0.13    0.02    0.13  2640.0  0.0030
1274          RX       0    0.01   200.0  200.01   260.0  260.01  459.99   460.0
1275          RY       4    2.25    1.25       1       1    1.25    2.25       4

1276          KK  EDGE7A   BASIN COMPUTATION
1277          KM           SCS METHOD
1278          BA   0.289
1279          LS   0.353    85.0       0
1280          UD    0.28

1281          KK  EDGE7A
1282          KM           COMBINE ROUTED FLOW WITH EDGEMOUNT/7 AVE.
1283          HC       2

1284          KK  MCDO7A
1285          KM           ROUT FLOW TO MCDOWELL/7TH. AVE.
1286          RS       1    ELEV       1
1287          RC    0.13    0.02    0.13  5280.0  0.0030
1288          RX       0    0.01   300.0  300.01   360.0  360.01  659.99   660.0
1289          RY       4    2.25    1.25       1       1    1.25    2.25       4

1290          KK  MCDO7A
1291          KM           COMBINE ROUTED FLOW
1292          HC       2

1293          KK  MCDO7A
1294          KM           DIVERT SURFACE FLOW
1295          DT  SFMC7A
1296          DI      64     229     353
1297          DQ       7      67     127
```



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

1298          KK  MCDO15
1299          KM           ROUT FLOW TO MCDOWELL/ 15TH. AVE.
1300          RS       2    ELEV       1
1301          RC    0.13    0.02    0.13  2640.0   0.001
1302          RX       0    0.01   500.0  500.01   560.0  560.01 1059.99  1060.0
1303          RY       4    2.25    1.25       1       1    1.25    2.25       4

1304          KK  ECAN11   BASIN COMPUTATION
1305          KM           SCS METHOD
1306          BA    0.10
1307          LS   0.381    84.0       0
1308          UD    0.44
```

```
1309          KK  MCDO15
1310          KM          ROUT FLOW TO MCDOWELL 15TH FIRST REACH
1311          RS       3   ELEV       1       0
1312          RC    0.13   0.02    0.13  2450.0  0.0004
1313          RX       0    0.1   200.0  200.01   240.0  240.01  439.99   440.0
1314          RY       4   2.25    1.25     1.0     1.0    1.25    2.25       4

1315          KK  MCDO15
1316          KM          ROUT FLOW TO MCDOWELL / 15TH AVE.
1317          RS       3   ELEV       1
1318          RC    0.13   0.02    0.13  1320.0   0.001
1319          RX       0   0.01   400.0  400.01   460.0  460.01  859.99   860.0
1320          RY       4   2.25    1.25       1       1    1.25    2.25       4

1321          KK  MCDO15
1322          KM          COMBINE ROUTED FLOW
1323          HC       2

1324          KK  MCDO15  BASIN COMPUTATION
1325          KM          SCS METHOD
1326          BA   0.207
1327          LS   0.381   84.0       0
1328          UD    0.55

1329          KK  MCDO15
1330          KM          COMBINE ROUTED FLOW WITH MCDOWELL/ 15TH. AVE.
1331          HC       2

1332          KK  MCDO17
1333          KM          ROUT FLOW TO MCDOWELL/ 17TH. AVE.
1334          RS       3   ELEV       1
1335          RC    0.13   0.02    0.13  1320.0  0.0016
1336          RX       0   0.01   400.0  400.01   460.0  460.01  859.99   860.0
1337          RY       4   2.25    1.25       1       1    1.25    2.25       4

1338          KK  MCDO17
1339          KM          COMBINE ROUTED FLOW
1340          HC       2
```



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

1341          KK  VANB17
1342          KM          ROUTING TO VAN BUREN/17 AVE.
1343          RS       2  ELEV       1       0
1344          RC   0.130  0.020   0.130  5280.0   0.002
1345          RX     0.0  270.0   600.0   600.1   660.0   660.1  1240.0  3500.0
1346          RY     3.0    2.0     1.0     1.0     1.0     1.0     2.0     3.0

1347          KK  VANB17  BASIN COMPUTATION
1348          KM          SCS METHOD
1349          BA    0.84
1350          LS   0.299   87.0       0
1351          UD   0.586

1352          KK  VANB17
1353          KM          COMBINE ROUTED FLOW WITH VAN BUREN/19 AVE.
1354          HC       2

1355          KK  ROO16S    BASIN COMPUTATION
1356          KM            SCS METHOD
1357          BA   0.260
1358          LS   0.353   85.0       0
1359          UD   0.336

1360          KK  ROOS7S
1361          KM            ROUTING FLOW TO ROOSEVELT/7 ST.
1362          RS       2   ELEV       1       0
1363          RC   0.060  0.020   0.060  5280.0   0.002
1364          RX     0.0   0.01   100.0  100.01  129.99   130.0  229.99   230.0
1365          RY     4.0   2.25    1.25     1.0     1.0    1.25    2.25     4.0

1366          KK  ROOS7S   BASIN COMPUTATION
1367          KM           SCS METHOD
1368          BA   0.597
1369          LS   0.299   87.0       0
1370          UD   0.674

1371          KK  ROOS7S
1372          KM            COMBINE ROUTED FLOW WITH ROOSEVELT/7 ST.
1373          HC       2

1374          KK  ROOS7S
1375          KM            DIVERT STORM DRAIN FLOW
1376          DT  SDFR7S      0      60
```

```
1377          DI      60    1000    3000
1378          DQ      60      60      60

1379          KK  MCKI7A
1380          KM             ROUTING FLOW TO MCKINLEY/7 AVE.
1381          RS       3    ELEV       1       0
1382          RC   0.060   0.020   0.060  5280.0  0.0015
1383          RX     0.0    0.01   900.0   900.1   960.0   960.1  1500.0  1850.0
1384          RY     2.0     2.0     1.0     1.0     1.0     1.0     1.0     2.0
```



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

1385          KK  MCKI7A     BASIN COMPUTATION
1386          KM             SCS METHOD
1387          BA   0.736
1388          LS   0.223    90.0       0
1389          UD   0.846

1390          KK  MCKI7A
1391          KM             COMBINE ROUTED FLOW WITH MCKINLEY/7 AVE.
1392          HC       2

1393          KK  MCK17A
1394          KM             DIVERT SURFACE FLOW
1395          DT  SDFMI7       0      52
1396          DI      52    1000    3000
1397          DQ      52      52      52

1398          KK  VANB17
1399          KM             ROUTING FLOW TO VAN BUREN/ 17 AVE.
1400          RS       2    ELEV       1       0
1401          RC   0.130   0.020   0.130  4400.0  0.0015
1402          RX     0.0   350.0   650.0   700.0   750.0   780.0  1800.0  2850.0
1403          RY     2.0     1.5     1.0     1.0     1.0     1.0     1.0     2.0

1404          KK  VANB17
1405          KM             COMBINE ROUTED FLOW WITH VAN BUREN/17 AVE.
1406          HC       2

1407          KK  REACHA
1408          KM           ROUTING FIRST REACH TO JACKSON/I10
1409          RS       2    ELEV       1       0
1410          RC   0.035   0.035   0.035  2600.0  0.0025
1411          RX     0.0   780.0  1230.0  1550.0  2000.0  2400.0  2610.0  2850.0
1412          RY     3.5     2.5     1.5     1.0    1.25     1.5     2.5     3.5

1413          KK  JACI10
1414          KM           ROUTING 2ND REACH TO JACKSON /I10
1415          RS       3    ELEV       1       0
1416          RC   0.130   0.020   0.130  2400.0  0.0009
1417          RX     0.0     5.0  319.99   320.0   410.0  410.01   800.0  1200.0
1418          RY   4.175     2.0    1.25    1.00    1.00    1.25    3.75   4.175

1419          KK  JACI10     BASIN COMPUTATION
1420          KM             SCS METHOD
1421          BA   0.763
1422          LS   0.299    87.0       0
1423          UD   0.815

1424          KK  JACI10
1425          KM             COMBINE ROUTED FLOW WITH BASIN
1426          HC       2
```



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

1427          KK  VANB21   BASIN COMPUTTION
1428          KM           SCS METHOD
1429          BA   0.672
1430          LS   0.273    88.0       0
1431          UD   0.672

1432          KK  JACI10
1433          KM           ROUTING FLOW JACKSON / I10
1434          RS       2    ELEV       1       0
1435          RC   0.130   0.020   0.130  2300.0  0.0017
1436          RX     0.0    0.01   200.0  200.01  229.99   230.0  429.99   430.0
1437          RY     4.0    2.25    1.25     1.0     1.0    1.25    2.25     4.0

1438          KK  JACI10
1439          KM           COMBINE TO JACKSON /I10
1440          HC       2
```

```
1441          KK  LINC7S     BASIN COMPUTATION
1442          KM             SCS METHOD
1443          BA     1.8
1444          LS   0.273    88.0        0
1445          UD   1.260

1446          KK  LINC7S
1447          KM            DIVERT SURFACE FLOW
1448          DT  SDFL7S       0      120
1449          DI     120    1000     2000
1450          DQ     120     120      120

1451          KK  GRAN7A
1452          KM            ROUTING TO LINCON /7 AVE.
1453          RS       4    ELEV       1        0
1454          RC   0.060   0.060   0.060   5280.0   0.003
1455          RX     0.0    0.01   200.0    360.0   480.0   600.0   840.0  1000.0
1456          RY     3.0     3.0     2.0      1.5     1.0     1.5     2.0     2.5

1457          KK  GRAN7A    BASIN COMPUTATION
1458          KM            SCS METHOD
1459          BA   1.049
1460          LS   0.247    89.0        0
1461          UD   0.627

1462          KK  GRAN7A
1463          KM            COMBINING ROUTED FLOW TO LINCON /7 AVE.
1464          HC       2

1465          KK  REACHA
1466          KM            ROUTING TO PIMA/19 AVE. 1ST. REACH
1467          RS       4    ELEV       1        0
1468          RC   0.060   0.060   0.060   3100.0  0.0021
1469          RX     0.0   700.0  1000.0   1360.0  1680.0  2180.0  2290.0  2800.0
1470          RY     4.0     1.5     1.0      1.0     1.0     1.5     2.0     4.0
```



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

1471          KK  PIMA19
1472          KM            ROUTING TO PIMA/19 AVE. LAST REACH
1473          RS       3    ELEV       1        0
1474          RC   0.060   0.060   0.060   2700.0  0.0012
1475          RX     0.0    0.01   470.0   1240.0  1500.0  1845.0  2160.0 2160.01
1476          RY     4.0     3.0     1.0      1.0     1.0     1.0     3.0     4.0

1477          KK  PIMA19    BASIN COMPUTATION
1478          KM            SCS METHOD
1479          BA   0.979
1480          LS   0.299    87.0        0
1481          UD   0.710

1482          KK  PIMA19
1483          KM            COMBINE ROUTED FLOWS TO BUCKEYE/19 AVE.
1484          HC       2

1485          KK  PIMA19
1486          KM           DIVERT STORM DRAIN FLOW
1487          DT  SDFP19       0      110
1488          DI     110    1000     2000
1489          DQ     110     110      110

1490          KK  PIMA22   BASIN COMPUTATION
1491          KM           SCS METHOD
1492          BA   0.427
1493          LS   0.299    87.0        0
1494          UD   0.370

1495          KK  PIMA22
1496          KM          COMBINE PIMA/19TH. AVE., PIMA/22 AVE., JACKSON/I10
1497          HC       3

1498          KK  PIMA22
1499          KM           DIVERT STROM DRAIN FLOW
1500          DT  SDI10F       0      107
1501          DI       0     117     1000     2000     3000
1502          DQ       0     107      107      107      107

1503          KK  I10DUE
1504          KM
1505          RS       1    ELEV    1041        0
1506          SA     4.4    12.2   21.46    38.31      241
1507          SE    1044    1048    1052     1056     1062
1508          SS  1057.5     500     2.3      1.5
```

```
1509          KK  DURA31
1510          KM            ROUTING FLOW TO DURANGO/ 31 AVE.
1511          RS       5    ELEV       1       0
1512          RC   0.035    0.035   0.060  5800.0  0.0017
1513          RX     0.0    450.0  1120.0  1600.0  2100.0  2650.0  3800.0  3801.0
1514          RY     3.0      1.5     1.0     1.5     2.0     2.0     3.0     4.0
```



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

1515          KK  DURA31    BASIN COMPUTATION
1516          KM            SCS METHOD
1517          BA     1.0
1518          LS   0.326     86.0       0
1519          UD   0.864

1520          KK  DURA31
1521          KM            COMBINE ROUTED FLOW WITH BUCKEYE/ 31 AVE.
1522          HC       2

1523          KK  BUCK35
1524          KM            ROUTING TO BUCKEYE/35 AVE.
1525          RS       5     ELEV       1       0
1526          RC   0.035    0.060   0.060  3400.0   0.002
1527          RX       0     0.01   750.0  1260.0  1570.0  1800.0  2450.0 2450.01
1528          RY     4.0      3.0     1.5     1.5     1.0     2.5     3.0     4.0

1529          KK  BUCK35   BASIN COMPUTATION
1530          KM           SCS METHOD
1531          BA     0.6
1532          LS   0.299     87.0       0
1533          UD     1.2

1534          KK  BUCK35
1535          KM            COMBINE ROUTED FLOW WITH BUCKEYE/35 AVE.
1536          HC       2

1537          KK  BUCK43
1538          KM            ROUTING TO BUCKEYE/43 AVE.
1539          RS       5     ELEV       1       0
1540          RC   0.035    0.035   0.035  5280.0  0.0021
1541          RX     0.0     0.01   800.0  800.01 1199.99  1200.0 1999.99  2040.0
1542          RY     4.0      2.0     1.0     1.0     1.0     1.0     2.0     4.0

1543          KK  BUCK43    BASIN COMPUTATION
1544          KM            SCS
1545          BA    0.75
1546          LS   0.273     88.0       0
1547          UD    0.88

1548          KK  BUCK43
1549          KM             COMBINE ROUTED FLOW WITH BUCKEYE/43 AVE.
1550          HC       2

1551          KK  DURA39    BASIN COMPUTATION
1552          KM            SCS METHOD
1553          BA     1.0
1554          LS   0.326     86.0       0
1555          UD   0.882
```



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

1556          KK  BUCK43
1557          KM             ROUT FLOW TO BUCKEYE/43 AVE.
1558          RS       3     ELEV       1       0
1559          RC   0.035    0.035   0.035  3070.0   0.003
1560          RX     0.0     0.01   200.0   300.0   400.0   600.0  799.99  800.00
1561          RY     4.0      2.0     1.0     1.0     1.0     1.0     2.0     4.0

1562          KK  BUCK43
1563          KM           COMBINE ROUTED FLOW
1564          HC       2

1565          KK  LASTBA
1566          KM           ROUTING TO SALT RIVER
1567          RS       9     ELEV       1       0
1568          RC   0.035    0.035   0.035   10500  0.0025
1569          RX     0.0     0.01   400.0  400.01   800.0  800.01 1200.01 1200.02
1570          RY       4        2       2       1       1       2       2       4

1571          KK  LASTBA    BASIN COMPUTATION
1572          KM            SCS METHOD
1573          BA    0.67
```

```
1574          LS   0.273    88.0        0
1575          UD   0.875

1576          KK  SALTRI
1577          KM            COMBINE ROUTED FLOW WITH LASTBASIN OUTFALL SALT RIVER
1578          HC        2
1579          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
INPUT
LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   7     NORTCE
              V
              V
  18     GLENCE
              .
              .
  24          .      GLENCE
              .           .
              .           .
  29     GLENCE............
              .
              .
  32          .      ORAN7S
              .           .
              .           .
  53          .           .-------> SDFO7S
  51          .      ORAN7S
              .           V
              .           V
  56          .      GLEN7S
              .           .
              .           .
  62          .           .      GLEN7S
              .           .           .
              .           .           .
  80          .      GLEN7S............
              .           .
              .           .
  83          .           .      GLEN12
              .           .           V
              .           .           V
  96          .           .      GLEN7S
              .           .           .
              .           .           .
 102          .      GLEN7S............
              .           .
              .           .
 107          .           .-------> SDFG7S
 105          .      GLEN7S
              .           .
              .           .
 112          .           .-------> SFG7SS
 110          .      GLEN7S
              .           V
              .           V
 115          .      GLENCE
              .           .
              .           .
 121     GLENCE............
              .
              .
 126          .-------> SFGLCW
 124     GLENCE
              V
              V
 129     MARYCE
              .
              .
 135          .      MARYCE
              .           .
              .           .
 153     MARYCE............
              .
              .
 158          .-------> SDFMAC
 156     MARYCE
              V
              V
 161     BETHCE
              .
              .
 167          .      BETHCE
```

```
              .            .
              .            .
185       BETHCE............
              .
              .
188           .       BETH7S
              .            V
              .            V
206           .       BETHCE
              .            .
              .            .
212       BETHCE............
              .
              .
217           .-------> SDFBEC
215       BETHCE
              .
              .
222           .-------> SFBECW
220       BETHCE
              V
              V
225       MISSCE
              .
              .
231           .       MISSCE
              .            .
              .            .
249       MISSCE............
              .
              .
252           .       MISS7S
              .            V
              .            V
270           .       MISSCE
              .            .
              .            .
276       MISSCE............
              .
              .
281           .-------> SDFMIC
279       MISSCE
              V
              V
284       CAMECE
              .
              .
290           .       CAMECE
              .            .
              .            .
308       CAMECE............
              .
              .
311           .       CAME7S
              .            V
              .            V
329           .       CAMECE
              .            .
              .            .
335       CAMECE............
              .
              .
340           .-------> SDFCAC
338       CAMECE
              .
              .
345           .-------> SFCACW
343       CAMECE
              V
              V
348       GRCACE
              .
              .
354           .       GRCACE
              .            .
              .            .
372       GRCACE............
              .
              .
377           .-------> SDGRCE
375       GRCACE
              .
              .
380           .       GRCA7S
              .            V
              .            V
```

```
398          .      GRCACE
             .           .
             .           .
404     GRCACE............
             .
             .
409          .-------->   TOTAL
407     GRCACE
             .
             .
412          .      GLEN23
             .           V
             .           V
417          .      BETH23
             .           .
             .           .
423          .           .      BETH23
             .           .           .
             .           .           .
428          .      BETH23............
             .           V
             .           V
431          .      CAME24
             .           .
             .           .
437          .           .      CAME24
             .           .           .
             .           .           .
442          .      CAME24............
             .           V
             .           V
445          .      GRCA23
             .           .
             .           .
451          .           .      GRCA23
             .           .           .
             .           .           .
456          .      GRCA23............
             .           V
             .           V
459          .      OSBORN
             .           V
             .           V
465          .      THOM19
             .           .
             .           .
471          .           .      THOM19
             .           .           .
             .           .           .
476          .      THOM19............
             .           .
             .           .
481          .           .-------->  SDFT19
479          .      THOM19
             .           V
             .           V
484          .      ECAN17
             .           .
             .           .
490          .           .      GLEN21
             .           .           V
             .           .           V
495          .           .      BETH21
             .           .           .
             .           .           .
501          .           .           .      BETH21
             .           .           .           .
             .           .           .           .
506          .           .      BETH21............
             .           .           V
             .           .           V
509          .           .      CAME21
             .           .           .
             .           .           .
515          .           .           .      CAME21
             .           .           .           .
             .           .           .           .
520          .           .      CAME21............
             .           .           V
             .           .           V
523          .           .      INDI19
             .           .           V
             .           .           V
529          .           .      INDI19
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535                 .           .           .       INDI19
                    .           .           .           .
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540                 .           .       INDI19...........
                    .           .           V
                    .           .           V
543                 .           .       INDI17
                    .           .           .
                    .           .           .
549                 .           .           .       NOR19A
                    .           .           .           .
                    .           .           .           .
554                 .           .           .           .       NORT23
                    .           .           .           .           .
                    .           .           .           .           .
562                 .           .           .           .           .-------> SFN23S
560                 .           .           .           .       NORT23
                    .           .           .           .           V
                    .           .           .           .           V
565                 .           .           .           .       NORT19
                    .           .           .           .           .
                    .           .           .           .           .
571                 .           .           .           .           .       NOR19B
                    .           .           .           .           .           V
                    .           .           .           .           .           V
577                 .           .           .           .           .       NORTDE
                    .           .           .           .           .           V
                    .           .           .           .           .           V
583                 .           .           .           .           .       NORT19
                    .           .           .           .           .           .
                    .           .           .           .           .           .
589                 .           .           .       NORT19......................
                    .           .           .           .
                    .           .           .           .
594                 .           .           .           .-------> SDFN19
592                 .           .           .       NORT19
                    .           .           .           V
                    .           .           .           V
597                 .           .           .       GLEN19
                    .           .           .           .
                    .           .           .           .
605                 .           .           .           .           .<------- SFN23S
603                 .           .           .           .       DIVN23
                    .           .           .           .           V
                    .           .           .           .           V
606                 .           .           .           .       MORT19
                    .           .           .           .           V
                    .           .           .           .           V
612                 .           .           .           .       GLEN19
                    .           .           .           .           V
                    .           .           .           .           V
618                 .           .           .           .       MORT19
                    .           .           .           .           V
                    .           .           .           .           V
624                 .           .           .           .       MORT19
                    .           .           .           .           .
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630                 .           .           .           .           .       MORT19
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                    .           .           .           .           .           .
635                 .           .           .           .       MORT19...........
                    .           .           .           .           V
                    .           .           .           .           V
638                 .           .           .           .       GLEN19
                    .           .           .           .           .
                    .           .           .           .           .
644                 .           .           .       GLEN19...........
                    .           .           .           .
                    .           .           .           .
649                 .           .           .           .-------> SDFG19
647                 .           .           .       GLEN19
                    .           .           .           .
                    .           .           .           .
654                 .           .           .           .-------> SFG19E
652                 .           .           .       GLEN19
                    .           .           .           V
                    .           .           .           V
657                 .           .           .       BETH19
                    .           .           .           .
                    .           .           .           .
665                 .           .           .           .-------> SFB19E
663                 .           .           .       BETH19
                    .           .           .           V
                    .           .           .           V
668                 .           .           .       CAME19
                    .           .           .           .
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676                                  .-------> SDFC19
674                            CAME19
                                     .
                                     .
681                                  .-------> SFC19E
679                            CAME19
                                     V
                                     V
684                            INDI17
                                     V
                                     V
690                            INDI17
                                     .
                                     .
696                                  .      INDI17
                                     .           .
                                     .           .
701                      INID17......................
                                     .
                                     .
704                            NORTH7
                                     .
                                     .
711                                  .-------> SDFNO7
709                            NORTH7
                                     .
                                     .
716                                  .-------> SFNO7S
714                            NORTH7
                                     V
                                     V
719                            NORT15
                                     .
                                     .
725                                  .      NORT15
                                     .           .
                                     .           .
729                            NORT15............
                                     .
                                     .
734                                  .-------> SDFN15
732                            NORT15
                                     V
                                     V
737                            GLEN15
                                     .
                                     .
745                                  .-------> SDFG15
743                            GLEN15
                                     V
                                     V
748                            BETH15
                                     .
                                     .
756                                  .           .<-------  SFG19E
754                                  .      DIVG19
                                     .           V
                                     .           V
757                                  .      GLEN17
                                     .           .
                                     .           .
763                                  .           .      GLEN17
                                     .           .           .
                                     .           .           .
768                                  .      GLEN17............
                                     .           V
                                     .           V
771                                  .      BETH15
                                     .           V
                                     .           V
777                                  .      BETH15
                                     .           V
                                     .           V
783                                  .      BETH15
                                     .           .
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789                                  .           .      BETH15
                                     .           .           .
                                     .           .           .
794                            BETH15......................
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799                                  .           .<-------  SFB19E
797                                  .      DIVB19
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800                                               .      BETH15
                                                  .          .
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806                                         BETH15............
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811                                               .-------> SDFB15
809                                         BETH15
                                                 V
                                                 V
814                                         CAME15
                                                  .
                                                  .
822                                               .          .<-------  SFC19E
820                                               .      DIVE19
                                                  .          V
                                                  .          V
823                                               .      CAME15
                                                  .          .
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829                                               .          .      CAME15
                                                  .          .          .
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834                                         CAME15........................
                                                  .
                                                  .
839                                               .-------> SDFC15
837                                         CAME15
                                                  .
                                                  .
844                                               .-------> SFC15E
842                                         CAME15
                                                 V
                                                 V
847                                         GRCA15
                                                  .
                                                  .
855                                               .          .<-------  SFNO7S
853                                               .      DIVEN7
                                                  .          V
                                                  .          V
856                                               .      GLEND7
                                                  .          .
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862                                               .          .      GLEND7
                                                  .          .          .
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867                                               .      GLEND7............
                                                  .          .
                                                  .          .
872                                               .          .          .<-------  SFGLCW
870                                               .          .      DIVG7A
                                                  .          .          V
                                                  .          .          V
873                                               .          .      GLEND7
                                                  .          .          .
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879                                               .      GLEND7............
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884                                               .          .-------> SFGL7S
882                                               .      GLEND7
                                                  .          V
                                                  .          V
887                                               .      GLEN12
                                                  .          .
                                                  .          .
893                                               .          .      GLEN12
                                                  .          .          .
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898                                               .      GLEN12............
                                                  .          V
                                                  .          V
901                                               .      BETH11
                                                  .          .
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907                                               .          .      BETH11
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912                                               .      BETH11............
                                                  .          V
                                                  .          V
915                                               .      CAME11
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921                                                  CAME11
                                                        .
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928                                                     .<-------  SFC15E
926                                                     .      DIVC15
                                                        .          V
                                                        .          V
929                                                     .      CAME11
                                                        .          .
                                                        .          .
935                                            CAME11.......................
                                                        .
                                                        .
940                                                     .------->  SFC11E
938                                            CAME11
                                                    V
                                                    V
943                                            GRCA11
                                                        .
                                                        .
951                                                     .<-------  SFGL7S
949                                                  DIVEG7
                                                        V
                                                        V
952                                                  BETHA7
                                                        .
                                                        .
958                                                     .      BETHA7
                                                        .          .
                                                        .          .
963                                                  BETHA7............
                                                        .
                                                        .
968                                                     .<-------  SFBECW
966                                                     .      DIVB7A
                                                        .          V
                                                        .          V
969                                                     .      BETHA7
                                                        .          .
                                                        .          .
975                                                  BETHA7............
                                                        .
                                                        .
980                                                     .------->  SDFBE7
978                                                  BETHA7
                                                        V
                                                        V
983                                                  CAMEL7
                                                        .
                                                        .
989                                                     .      CAMEL7
                                                        .          .
                                                        .          .
994                                                  CAMEL7............
                                                        .
                                                        .
999                                                     .<-------  SFC11E
997                                                     .      DIVE11
                                                        .          V
                                                        .          V
1000                                                    .      CAMEL7
                                                        .          .
                                                        .          .
1006                                                 CAMEL7............
                                                        .
                                                        .
1011                                                    .------->  SFCA7A
1009                                                 CAMEL7
                                                        V
                                                        V
1014                                                 GRCA7A
                                                        .
                                                        .
1022                                                    .<-------  SFCACW
1020                                                    .      DIVCAC
                                                        .          V
                                                        .          V
1023                                                    .      CAME3A
                                                        .          .
                                                        .          .
1029                                                    .          .      CAME3A
                                                        .          .          .
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1034                                                    .      CAME3A............
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1039                                                                                  .<-------  SFCA7A
1037                                                                            DIVC7A
                                                                                     V
                                                                                     V
1040                                                                            CAME3A
                                                                                     .
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1046                                                                   CAME3A............
                                                                            V
                                                                            V
1049                                                                   GRCA3A
                                                                            .
                                                                            .
1057                                                                                  .<-------   TOTAL
1055                                                                            DIVGCC
                                                                                     .
                                                                                     .
1060                                                                                  .------->  SFGC3A
1058                                                                            GRCA3A
                                                                                     V
                                                                                     V
1063                                                                            GRCA3A
                                                                                     .
                                                                                     .
1069                                                                   GRCA3A............
                                                                            .
                                                                            .
1074                                                                        .------->  SFGC7A
1072                                                                   GRCA3A
                                                                            V
                                                                            V
1077                                                                   GRCA7A
                                                                            .
                                                                            .
1083                                                         GRCA7A............
                                                                  V
                                                                  V
1086                                                         GRCA11
                                                                  .
                                                                  .
1092                                                   GRCA11............
                                                            V
                                                            V
1095                                                   GRCA15
                                                            .
                                                            .
1101                                            GRCA15............
                                                      .
                                                      .
1104                                                   GRCA15
                                                            .
                                                            .
1109                                            GRCA15............
                                                      .
                                                      .
1114                                                  .------->  SDFG15
1112                                            GRCA15
                                                      V
                                                      V
1117                                            INDI17
                                                      .
                                                      .
1123                                     INDI17............
                                                V
                                                V
1126                                     THOM17
                                                .
                                                .
1132                                            THOM17
                                                      .
                                                      .
1137                                     THOM17............
                                                V
                                                V
1140                                     ECAN17
                                                .
                                                .
1146                            ECAN17............
                                     V
                                     V
1149                            MCDO17
                                     .
                                     .
1155                                     MCDO17
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1160        .     MCDO17............
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            .          .
1163        .          .     THOM22
            .          .          V
            .          .          V
1168        .          .     REACHA
            .          .          V
            .          .          V
1174        .          .     REACHB
            .          .          V
            .          .          V
1180        .          .     MCDO19
            .          .          .
            .          .          .
1186        .          .          .     MCDO19
            .          .          .          .
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1191        .          .     MCDO19............
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            .          .          .
1194        .     MCDO17............
            .          .
            .          .
1199        .          .          .<-------  SFGC3A
1197        .          .     DIGC3A
            .          .          V
            .          .          V
1200        .          .     INDI3A
            .          .          .
            .          .          .
1206        .          .          .     INDI3A
            .          .          .          .
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1211        .          .     INDI3A............
            .          .          V
            .          .          V
1214        .          .     THOM3A
            .          .          .
            .          .          .
1220        .          .          .     THOM3A
            .          .          .          .
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1225        .          .     THOM3A............
            .          .          V
            .          .          V
1228        .          .     MCDO3A
            .          .          .
            .          .          .
1236        .          .          .------->  SFMC3A
1234        .          .     MCDO3A
            .          .          V
            .          .          V
1239        .          .     MCDO7A
            .          .          .
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1245        .          .          .     MCDO7A
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1250        .          .     MCDO7A............
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1255        .          .          .          .<-------  SFGC7A
1253        .          .          .     DIGC7A
            .          .          .          V
            .          .          .          V
1256        .          .          .     OSBO7A
            .          .          .          .
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1262        .          .          .          .      OSBO7A
            .          .          .          .           .
            .          .          .          .           .
1267        .          .          .     OSBO7A............
            .          .          .          V
            .          .          .          V
1270        .          .          .     EDGE7A
            .          .          .          .
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1276        .          .          .          .      EDGE7A
            .          .          .          .           .
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1281        .          .          .     EDGE7A............
            .          .          .          V
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1284        .          .          .     MCDO7A
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1290            .           .     MCDO7A............
                .           .           .
                .           .           .
1295            .           .           .-------> SFMC7A
1293            .           .     MCDO7A
                .           .           V
                .           .           V
1298            .           .     MCDO15
                .           .           .
                .           .           .
1304            .           .           .     ECAN11
                .           .           .           V
                .           .           .           V
1309            .           .           .     MCDO15
                .           .           .           V
                .           .           .           V
1315            .           .           .     MCDO15
                .           .           .           .
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1321            .           .     MCDO15............
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                .           .           .
1324            .           .           .     MCDO15
                .           .           .           .
                .           .           .           .
1329            .           .     MCDO15............
                .           .           V
                .           .           V
1332            .           .     MCDO17
                .           .           .
                .           .           .
1338            .     MCDO17............
                .           V
                .           V
1341            .     VANB17
                .           .
                .           .
1347            .           .     VANB17
                .           .           .
                .           .           .
1352            .     VANB17............
                .           .
                .           .
1355            .           .     ROO16S
                .           .           V
                .           .           V
1360            .           .     ROOS7S
                .           .           .
                .           .           .
1366            .           .           .     ROOS7S
                .           .           .           .
                .           .           .           .
1371            .           .     ROOS7S............
                .           .           .
                .           .           .
1376            .           .           .-------> SDFR7S
1374            .           .     ROOS7S
                .           .           V
                .           .           V
1379            .           .     MCKI7A
                .           .           .
                .           .           .
1385            .           .           .     MCKI7A
                .           .           .           .
                .           .           .           .
1390            .           .     MCKI7A............
                .           .           .
                .           .           .
1395            .           .           .-------> SDFMI7
1393            .           .     MCK17A
                .           .           V
                .           .           V
1398            .           .     VANB17
                .           .           .
                .           .           .
1404            .     VANB17............
                .           V
                .           V
1407            .     REACHA
                .           V
                .           V
1413            .     JACI10
                .           .
                .           .
1419            .           .     JACI10
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                .           .           .
 1424           .      JACI10............
                .           .
                .           .
 1427           .           .      VANB21
                .           .           V
                .           .           V
 1432           .           .      JACI10
                .           .           .
                .           .           .
 1438           .      JACI10............
                .           .
                .           .
 1441           .           .      LINC7S
                .           .           .
                .           .           .
 1448           .           .           .-------> SDFL7S
 1446           .           .      LINC7S
                .           .           V
                .           .           V
 1451           .           .      GRAN7A
                .           .           .
                .           .           .
 1457           .           .           .      GRAN7A
                .           .           .           .
                .           .           .           .
 1462           .           .      GRAN7A............
                .           .           V
                .           .           V
 1465           .           .      REACHA
                .           .           V
                .           .           V
 1471           .           .      PIMA19
                .           .           .
                .           .           .
 1477           .           .           .      PIMA19
                .           .           .           .
                .           .           .           .
 1482           .           .      PIMA19............
                .           .           .
                .           .           .
 1487           .           .           .-------> SDFP19
 1485           .           .      PIMA19
                .           .           .
                .           .           .
 1490           .           .           .      PIMA22
                .           .           .           .
                .           .           .           .
 1495           .      PIMA22........................
                .           .
                .           .
 1500           .           .-------> SDI10F
 1498           .      PIMA22
                .           V
                .           V
 1503           .      I10DUE
                .           V
                .           V
 1509           .      DURA31
                .           .
                .           .
 1515           .           .      DURA31
                .           .           .
                .           .           .
 1520           .      DURA31............
                .           V
                .           V
 1523           .      BUCK35
                .           .
                .           .
 1529           .           .      BUCK35
                .           .           .
                .           .           .
 1534           .      BUCK35............
                .           V
                .           V
 1537           .      BUCK43
                .           .
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 1543           .           .      BUCK43
                .           .           .
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 1548           .      BUCK43............
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551          .          .      DURA39
             .          .          V
             .          .          V
1556         .          .      BUCK43
             .          .          .
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1562         .      BUCK43............
             .          V
             .          V
565          .      LASTBA
             .          .
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1571         .          .      LASTBA
             .          .          .
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576          .      SALTRI............
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1 ****************************************
* ***************************************
                                        *                                    *
*
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                    *    U.S. ARMY CORPS OF
ENGINEERS      *
                MAY   1991              *                                    *    HYDROLOGIC ENGINEERING
CENTER     *
*            VERSION 4.0.1E             *                                    *          609 SECOND
STREET          *
     Lahey F77L-EM/32 version 5.01      *                                    *       DAVIS, CALIFORNIA
9/16        *
*       Dodson & Associates, Inc.       *                                    *           (916) 551-1748
*
*  RUN DATE  08/01/02  TIME  16:05:38   *                                    *
*
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                          FEMA FLOOD INSURANCE        CAVE CREEK WASH       MODIFIED PULS
                          RE-STUDY FOR MARICOPA       JOB NO. 04856-05-74
                          COUNTY ARIZONA 1988         100- YEAR PEAK

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

    IT          HYDROGRAPH TIME DATA
                       NMIN          10  MINUTES IN COMPUTATION INTERVAL
                      IDATE     16MAR88  STARTING DATE
                      ITIME        1200  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     18MAR88  ENDING DATE
                     NDTIME        1350  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL    0.17 HOURS
                      TOTAL TIME BASE   49.83 HOURS

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

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	NORTCE	81.	12.50	17.	5.	2.	0.05		
ROUTED TO	GLENCE	60.	12.67	16.	5.	2.	0.05	1.47	12.67

HYDROGRAPH AT	GLENCE	176.	12.50	40.	11.	5.	0.12		
2 COMBINED AT	GLENCE	236.	12.67	56.	16.	8.	0.17		
HYDROGRAPH AT	ORAN7S	160.	12.50	33.	10.	6.	0.00		
DIVERSION TO	SDFO7S	30.	12.50	14.	5.	3.	0.00		
HYDROGRAPH AT	ORAN7S	130.	12.50	19.	5.	2.	0.00		
ROUTED TO	GLEN7S	116.	12.67	19.	5.	2.	0.00	1.52	12.67
HYDROGRAPH AT	GLEN7S	180.	12.67	41.	12.	6.	0.00		
2 COMBINED AT	GLEN7S	296.	12.67	61.	17.	9.	0.00		
HYDROGRAPH AT	GLEN12	20.	12.50	4.	1.	0.	0.00		
ROUTED TO	GLEN7S	15.	12.83	4.	1.	0.	0.00	1.16	12.83
2 COMBINED AT	GLEN7S	311.	12.67	65.	18.	9.	0.00		
DIVERSION TO	SDFG7S	5.	12.67	5.	3.	2.	0.00		
HYDROGRAPH AT	GLEN7S	306.	12.67	60.	15.	7.	0.00		
DIVERSION TO	SFG7SS	141.	12.67	33.	8.	4.	0.00		
HYDROGRAPH AT	GLEN7S	165.	12.67	26.	7.	3.	0.00		
ROUTED TO	GLENCE	146.	12.83	26.	7.	3.	0.00	1.64	12.83
2 COMBINED AT	GLENCE	372.	12.67	82.	22.	11.	0.17		
DIVERSION TO	SFGLCW	192.	12.67	48.	14.	7.	0.17		
HYDROGRAPH AT	GLENCE	180.	12.67	34.	9.	4.	0.17		
ROUTED TO	MARYCE	152.	13.00	34.	9.	4.	0.17	1.80	13.00
HYDROGRAPH AT	MARYCE	233.	12.67	64.	19.	10.	0.00		
2 COMBINED AT	MARYCE	377.	12.83	98.	28.	14.	0.17		
DIVERSION TO	SDFMAC	50.	12.83	31.	11.	6.	0.17		
HYDROGRAPH AT	MARYCE	327.	12.83	67.	17.	8.	0.17		
ROUTED TO	BETHCE	280.	13.00	67.	17.	8.	0.17	2.11	13.00
HYDROGRAPH AT	BETHCE	121.	12.50	25.	8.	4.	0.00		
2 COMBINED AT	BETHCE	336.	12.83	92.	24.	12.	0.17		

HYDROGRAPH AT	BETH7S	206.	12.67	47.	13.	7.	0.00		
ROUTED TO	BETHCE	185.	12.83	47.	13.	7.	0.00	1.73	12.83
2 COMBINED AT	BETHCE	521.	12.83	139.	38.	19.	0.17		
DIVERSION TO	SDFBEC	15.	12.83	13.	6.	4.	0.17		
HYDROGRAPH AT	BETHCE	506.	12.83	125.	31.	15.	0.17		
DIVERSION TO	SFBECW	225.	12.83	66.	16.	8.	0.17		
HYDROGRAPH AT	BETHCE	281.	12.83	60.	15.	7.	0.17		
ROUTED TO	MISSCE	246.	13.17	60.	15.	7.	0.17	2.04	13.17
HYDROGRAPH AT	MISSCE	198.	12.67	45.	13.	7.	0.00		
2 COMBINED AT	MISSCE	395.	12.83	105.	28.	14.	0.17		
HYDROGRAPH AT	MISS7S	256.	12.67	71.	21.	11.	0.00		
ROUTED TO	MISSCE	218.	13.00	71.	21.	11.	0.00	1.98	13.00
2 COMBINED AT	MISSCE	603.	12.83	175.	49.	25.	0.17		
DIVERSION TO	SDFMIC	40.	12.83	32.	13.	8.	0.17		
HYDROGRAPH AT	MISSCE	563.	12.83	143.	36.	17.	0.17		
ROUTED TO	CAMECE	484.	13.17	143.	36.	17.	0.17	2.14	13.17
HYDROGRAPH AT	CAMECE	198.	12.67	45.	13.	7.	0.00		
2 COMBINED AT	CAMECE	592.	13.00	188.	49.	24.	0.17		
HYDROGRAPH AT	CAME7S	346.	12.83	95.	29.	15.	0.00		
ROUTED TO	CAMECE	279.	13.33	95.	29.	15.	0.00	2.09	13.33
2 COMBINED AT	CAMECE	842.	13.17	283.	77.	39.	0.17		
DIVERSION TO	SDFCAC	45.	13.17	38.	16.	10.	0.17		
HYDROGRAPH AT	CAMECE	797.	13.17	245.	61.	29.	0.17		
DIVERSION TO	SFCACW	328.	13.17	113.	28.	14.	0.17		
HYDROGRAPH AT	CAMECE	469.	13.17	132.	33.	16.	0.17		
ROUTED TO	GRCACE	439.	13.50	132.	33.	16.	0.17	2.09	13.50
HYDROGRAPH AT	GRCACE	160.	12.50	33.	10.	6.	0.0(		

2 COMBINED AT	GRCACE	460.	13.33	165.	43.	21.	0.17		
DIVERSION TO	SDGRCE	50.	13.33	32.	10.	5.	0.17		
HYDROGRAPH AT	GRCACE	410.	13.33	133.	33.	16.	0.17		
HYDROGRAPH AT	GRCA7S	319.	13.67	203.	63.	34.	0.00		
ROUTED TO	GRCACE	302.	14.67	193.	62.	33.	0.00	25.06	14.67
2 COMBINED AT	GRCACE	590.	13.83	310.	95.	49.	0.17		
DIVERSION TO	TOTAL	590.	0.17	310.	95.	49.	0.17		
HYDROGRAPH AT	GRCACE	0.	0.17	0.	0.	0.	0.17		
HYDROGRAPH AT	GLEN23	243.	12.50	49.	14.	7.	0.20		
ROUTED TO	BETH23	175.	13.00	49.	14.	7.	0.20	1.89	13.00
HYDROGRAPH AT	BETH23	339.	12.50	65.	18.	9.	0.27		
2 COMBINED AT	BETH23	459.	12.67	114.	32.	15.	0.47		
ROUTED TO	CAME24	301.	13.67	113.	32.	15.	0.47	2.16	13.67
HYDROGRAPH AT	CAME24	268.	12.67	55.	15.	7.	0.23		
2 COMBINED AT	CAME24	379.	12.67	167.	47.	23.	0.71		
ROUTED TO	GRCA23	343.	13.67	167.	47.	23.	0.71	2.30	13.67
HYDROGRAPH AT	GRCA23	469.	12.67	95.	26.	13.	0.39		
2 COMBINED AT	GRCA23	614.	12.67	261.	73.	35.	1.10		
ROUTED TO	OSBORN	508.	13.33	254.	73.	35.	1.10	1.92	13.33
ROUTED TO	THOM19	456.	14.17	248.	73.	35.	1.10	2.26	14.17
HYDROGRAPH AT	THOM19	340.	12.67	76.	21.	10.	0.32		
2 COMBINED AT	THOM19	491.	14.17	307.	94.	45.	1.42		
DIVERSION TO	SDFT19	60.	14.17	60.	31.	15.	1.42		
HYDROGRAPH AT	THOM19	431.	14.17	247.	63.	30.	1.42		
ROUTED TO	ECAN17	415.	14.50	242.	63.	30.	1.42	1.88	14.50
HYDROGRAPH AT	GLEN21	384.	12.50	77.	21.	10.	0.32		

ROUTED TO	BETH21	270.	13.00	77.	21.	10.	0.32	2.13	13.00
HYDROGRAPH AT	BETH21	446.	12.50	85.	24.	11.	0.37		
2 COMBINED AT	BETH21	634.	12.67	162.	45.	22.	0.69		
ROUTED TO	CAME21	403.	13.67	161.	45.	22.	0.69	2.37	13.67
HYDROGRAPH AT	CAME21	491.	12.67	100.	28.	13.	0.43		
2 COMBINED AT	CAME21	645.	12.67	261.	73.	35.	1.12		
ROUTED TO	INDI19	561.	13.33	260.	73.	35.	1.12	2.56	13.33
ROUTED TO	INDI19	504.	14.67	254.	73.	35.	1.12	2.55	14.67
HYDROGRAPH AT	INDI19	368.	12.67	83.	23.	11.	0.33		
2 COMBINED AT	INDI19	530.	14.67	317.	96.	46.	1.45		
ROUTED TO	INDI17	526.	14.83	316.	96.	46.	1.45	2.17	14.83
HYDROGRAPH AT	NOR19A	516.	12.83	125.	35.	17.	0.52		
HYDROGRAPH AT	NORT23	526.	13.17	176.	49.	24.	0.76		
DIVERSION TO	SFN23S	310.	13.17	116.	34.	17.	0.76		
HYDROGRAPH AT	NORT23	216.	13.17	60.	15.	7.	0.76		
ROUTED TO	NORT19	193.	13.67	60.	15.	7.	0.76	1.80	13.67
HYDROGRAPH AT	NOR19B	322.	13.00	90.	25.	12.	0.39		
ROUTED TO	NORTDE	188.	13.67	35.	11.	5.	0.39	1196.16	13.67
ROUTED TO	NORT19	146.	14.00	35.	11.	5.	0.39	1.69	14.00
3 COMBINED AT	NORT19	595.	12.83	217.	60.	29.	1.67		
DIVERSION TO	SDFN19	68.	12.83	57.	20.	10.	1.67		
HYDROGRAPH AT	NORT19	527.	12.83	160.	40.	19.	1.67		
ROUTED TO	GLEN19	396.	13.83	160.	40.	19.	1.67	2.12	13.83
HYDROGRAPH AT	DIVN23	310.	13.17	116.	34.	17.	0.00		
ROUTED TO	MORT19	310.	13.33	116.	34.	17.	0.00	2.13	13.33
ROUTED TO									

	GLEN19	296.	13.67	116.	34.	17.	0.00	2.33	13.67
ROUTED TO	MORT19	287.	14.00	116.	34.	17.	0.00	2.09	14.00
ROUTED TO	MORT19	274.	14.33	116.	34.	17.	0.00	2.29	14.33
HYDROGRAPH AT	MORT19	151.	12.67	30.	8.	4.	0.13		
2 COMBINED AT	MORT19	282.	14.33	144.	43.	21.	0.13		
ROUTED TO	GLEN19	254.	14.83	143.	43.	21.	0.13	1.89	14.83
2 COMBINED AT	GLEN19	592.	14.33	303.	83.	40.	1.80		
DIVERSION TO	SDFG19	29.	14.33	29.	14.	7.	1.80		
HYDROGRAPH AT	GLEN19	563.	14.33	274.	68.	33.	1.80		
DIVERSION TO	SFG19E	153.	14.33	97.	24.	12.	1.80		
HYDROGRAPH AT	GLEN19	410.	14.33	177.	44.	21.	1.80		
ROUTED TO	BETH19	396.	15.17	177.	44.	21.	1.80	2.05	15.17
DIVERSION TO	SFB19E	111.	15.17	69.	17.	8.	1.80		
HYDROGRAPH AT	BETH19	284.	15.17	108.	27.	13.	1.80		
ROUTED TO	CAME19	276.	15.67	108.	27.	13.	1.80	1.90	15.67
DIVERSION TO	SDFC19	23.	15.67	16.	4.	2.	1.80		
HYDROGRAPH AT	CAME19	253.	15.67	92.	23.	11.	1.80		
DIVERSION TO	SFC19E	100.	15.67	48.	12.	6.	1.80		
HYDROGRAPH AT	CAME19	153.	15.67	44.	11.	5.	1.80		
ROUTED TO	INDI17	148.	16.00	44.	11.	5.	1.80	1.61	16.00
ROUTED TO	INDI17	136.	16.67	44.	11.	5.	1.80	1.87	16.67
HYDROGRAPH AT	INDI17	600.	12.67	130.	36.	17.	0.56		
3 COMBINED AT	INID17	923.	12.67	484.	143.	69.	3.81		
HYDROGRAPH AT	NORTH7	153.	12.50	32.	9.	4.	0.10		
DIVERSION TO	SDFNO7	50.	12.50	18.	6.	3.	0.10		
HYDROGRAPH AT	NORTH7	103.	12.50	14.	3.	2.	0.10		
DIVERSION TO									

	SFNO7S	57.	12.50	10.	2.	1.	0.10		
HYDROGRAPH AT	NORTH7	46.	12.50	4.	1.	0.	0.10		
ROUTED TO	NORT15	28.	12.67	4.	1.	0.	0.10	1.28	12.67
HYDROGRAPH AT	NORT15	265.	12.67	57.	16.	8.	0.21		
2 COMBINED AT	NORT15	293.	12.67	61.	17.	8.	0.31		
DIVERSION TO	SDFN15	110.	12.67	40.	12.	6.	0.31		
HYDROGRAPH AT	NORT15	183.	12.67	21.	5.	3.	0.31		
ROUTED TO	GLEN15	113.	13.17	21.	5.	3.	0.31	1.69	13.17
DIVERSION TO	SDFG15	90.	13.17	20.	5.	2.	0.31		
HYDROGRAPH AT	GLEN15	23.	13.17	2.	0.	0.	0.31		
ROUTED TO	BETH15	7.	13.33	2.	0.	0.	0.31	1.08	13.33
HYDROGRAPH AT	DIVG19	153.	14.33	97.	24.	12.	0.00		
ROUTED TO	GLEN17	151.	14.67	96.	24.	12.	0.00	1.83	14.67
HYDROGRAPH AT	GLEN17	347.	12.67	72.	20.	10.	0.32		
2 COMBINED AT	GLEN17	413.	12.67	166.	44.	21.	0.32		
ROUTED TO	BETH15	367.	12.83	164.	44.	21.	0.32	1.86	12.83
ROUTED TO	BETH15	301.	13.50	163.	44.	21.	0.32	2.30	13.50
ROUTED TO	BETH15	292.	13.83	162.	44.	21.	0.32	2.01	13.83
HYDROGRAPH AT	BETH15	472.	12.67	99.	28.	13.	0.41		
3 COMBINED AT	BETH15	525.	12.67	254.	72.	35.	1.04		
HYDROGRAPH AT	DIVB19	111.	15.17	69.	17.	8.	0.00		
ROUTED TO	BETH15	109.	15.67	69.	17.	8.	0.00	1.68	15.67
2 COMBINED AT	BETH15	525.	12.67	320.	90.	43.	1.04		
DIVERSION TO	SDFB15	55.	12.67	55.	22.	10.	1.04		
HYDROGRAPH AT	BETH15	470.	12.67	265.	68.	33.	1.04		
ROUTED TO	CAME15	361.	13.67	259.	68.	33.	1.04	2.12	13.67

HYDROGRAPH AT	DIVE19	100.	15.67	48.	12.	6.	0.00		
ROUTED TO	CAME15	99.	16.17	48.	12.	6.	0.00	1.84	16.17
HYDROGRAPH AT	CAME15	604.	12.67	129.	36.	17.	0.50		
3 COMBINED AT	CAME15	735.	12.67	420.	116.	56.	1.54		
DIVERSION TO	SDFC15	135.	12.67	135.	44.	21.	1.54		
HYDROGRAPH AT	CAME15	600.	12.67	286.	72.	35.	1.54		
DIVERSION TO	SFC15E	242.	12.67	156.	40.	19.	1.54		
HYDROGRAPH AT	CAME15	358.	12.67	130.	32.	16.	1.54		
ROUTED TO	GRCA15	294.	13.17	129.	32.	16.	1.54	1.98	13.17
HYDROGRAPH AT	DIVEN7	57.	12.17	10.	2.	1.	0.00		
ROUTED TO	GLEND7	54.	13.00	10.	2.	1.	0.00	1.35	13.00
HYDROGRAPH AT	GLEND7	172.	12.67	39.	11.	5.	0.12		
2 COMBINED AT	GLEND7	216.	12.67	49.	13.	6.	0.12		
HYDROGRAPH AT	DIVG7A	192.	12.67	48.	14.	7.	0.00		
ROUTED TO	GLEND7	169.	13.00	48.	14.	7.	0.00	1.76	13.00
2 COMBINED AT	GLEND7	366.	12.67	96.	27.	13.	0.12		
DIVERSION TO	SFGL7S	254.	12.67	72.	21.	10.	0.12		
HYDROGRAPH AT	GLEND7	112.	12.67	24.	6.	3.	0.12		
ROUTED TO	GLEN12	110.	13.00	24.	6.	3.	0.12	1.57	13.00
HYDROGRAPH AT	GLEN12	421.	12.67	84.	23.	11.	0.39		
2 COMBINED AT	GLEN12	519.	12.67	108.	29.	14.	0.51		
ROUTED TO	BETH11	336.	13.50	108.	29.	14.	0.51	2.18	13.50
HYDROGRAPH AT	BETH11	350.	12.67	75.	21.	10.	0.28		
2 COMBINED AT	BETH11	490.	12.83	182.	50.	24.	0.79		
ROUTED TO	CAME11	401.	14.17	182.	50.	24.	0.79	2.42	14.17
HYDROGRAPH AT	CAME11	252.	12.50	48.	13.	6.	0.20		
HYDROGRAPH AT									

	DIVC15	242.	12.67	156.	40.	19.	0.00		
ROUTED TO	CAME11	232.	13.00	155.	40.	19.	0.00	2.02	13.00
3 COMBINED AT	CAME11	591.	14.00	380.	103.	50.	0.99		
DIVERSION TO	SFC11E	240.	14.00	181.	53.	26.	0.99		
HYDROGRAPH AT	CAME11	351.	14.00	199.	50.	24.	0.99		
ROUTED TO	GRCA11	337.	14.67	197.	50.	24.	0.99	2.39	14.67
HYDROGRAPH AT	DIVEG7	254.	12.67	72.	21.	10.	0.00		
ROUTED TO	BETHA7	216.	13.17	72.	21.	10.	0.00	1.76	13.17
HYDROGRAPH AT	BETHA7	201.	12.67	45.	13.	6.	0.15		
2 COMBINED AT	BETHA7	365.	12.83	117.	34.	16.	0.15		
HYDROGRAPH AT	DIVB7A	225.	12.83	66.	16.	8.	0.00		
ROUTED TO	BETHA7	218.	13.00	66.	16.	8.	0.00	1.82	13.00
2 COMBINED AT	BETHA7	569.	13.00	183.	51.	24.	0.15		
DIVERSION TO	SDFBE7	74.	13.00	54.	18.	9.	0.15		
HYDROGRAPH AT	BETHA7	495.	13.00	129.	32.	16.	0.15		
ROUTED TO	CAMEL7	423.	13.67	129.	32.	16.	0.15	2.08	13.67
HYDROGRAPH AT	CAMEL7	299.	12.50	60.	17.	8.	0.20		
2 COMBINED AT	CAMEL7	448.	13.67	189.	49.	24.	0.35		
HYDROGRAPH AT	DIVE11	240.	14.00	181.	53.	26.	0.00		
ROUTED TO	CAMEL7	238.	14.33	181.	53.	26.	0.00	2.04	14.33
2 COMBINED AT	CAMEL7	672.	13.67	364.	102.	49.	0.35		
DIVERSION TO	SFCA7A	286.	13.67	176.	55.	26.	0.35		
HYDROGRAPH AT	CAMEL7	386.	13.67	189.	47.	23.	0.35		
ROUTED TO	GRCA7A	377.	14.00	189.	47.	23.	0.35	1.99	14.00
HYDROGRAPH AT	DIVCAC	328.	13.17	113.	28.	14.	0.00		
ROUTED TO	CAME3A	318.	13.33	113.	28.	14.	0.00	2.25	13.33
HYDROGRAPH AT									

	CAME3A	183.	12.50	36.	10.	5.	0.13		
2 COMBINED AT	CAME3A	377.	12.67	149.	38.	18.	0.13		
HYDROGRAPH AT	DIVC7A	286.	13.67	176.	55.	26.	0.00		
ROUTED TO	CAME3A	282.	14.00	175.	55.	26.	0.00	2.18	14.00
2 COMBINED AT	CAME3A	602.	13.17	321.	93.	45.	0.13		
ROUTED TO	GRCA3A	599.	13.67	319.	93.	45.	0.13	2.55	13.67
HYDROGRAPH AT	DIVGCC	590.	13.83	310.	95.	49.	0.00		
DIVERSION TO	SFGC3A	476.	12.33	196.	49.	24.	0.00		
HYDROGRAPH AT	GRCA3A	114.	12.33	114.	46.	25.	0.00		
ROUTED TO	GRCA3A	113.	18.17	103.	45.	26.	0.00	23.99	18.17
2 COMBINED AT	GRCA3A	655.	14.00	402.	138.	71.	0.13		
DIVERSION TO	SFGC7A	452.	12.67	199.	50.	24.	0.13		
HYDROGRAPH AT	GRCA3A	203.	12.67	203.	88.	47.	0.13		
ROUTED TO	GRCA7A	203.	18.83	193.	88.	46.	0.13	23.87	18.83
2 COMBINED AT	GRCA7A	515.	14.17	340.	135.	69.	0.48		
ROUTED TO	GRCA11	439.	15.00	322.	135.	69.	0.48	24.37	15.00
2 COMBINED AT	GRCA11	769.	14.83	508.	185.	93.	1.47		
ROUTED TO	GRCA15	689.	15.50	484.	184.	93.	1.47	24.76	15.50
2 COMBINED AT	GRCA15	813.	15.50	582.	216.	108.	3.01		
HYDROGRAPH AT	GRCA15	505.	12.50	100.	28.	13.	0.43		
2 COMBINED AT	GRCA15	830.	15.33	642.	244.	122.	3.44		
DIVERSION TO	SDFG15	75.	15.33	75.	60.	33.	3.44		
HYDROGRAPH AT	GRCA15	755.	15.33	567.	184.	88.	3.44		
ROUTED TO	INDI17	726.	16.33	545.	184.	88.	3.44	2.28	16.33
2 COMBINED AT	INDI17	1224.	16.00	961.	327.	157.	7.24		
ROUTED TO	THOM17	1187.	17.00	922.	326.	157.	7.24	1.87	17.00
HYDROGRAPH AT									

	THOM17	677.	12.67	149.	41.	20.	0.64		
2 COMBINED AT	THOM17	1200.	17.00	951.	367.	177.	7.88		
ROUTED TO	ECAN17	1193.	17.33	948.	366.	177.	7.88	1.95	17.33
2 COMBINED AT	ECAN17	1363.	16.83	1158.	429.	208.	9.31		
ROUTED TO	MCDO17	1355.	17.33	1153.	429.	208.	9.31	1.74	17.33
HYDROGRAPH AT	MCDO17	677.	12.67	149.	41.	20.	0.64		
2 COMBINED AT	MCDO17	1368.	17.33	1177.	469.	228.	9.95		
HYDROGRAPH AT	THOM22	410.	12.50	81.	23.	11.	0.35		
ROUTED TO	REACHA	364.	12.83	81.	23.	11.	0.35	2.22	12.83
ROUTED TO	REACHB	330.	13.00	81.	23.	11.	0.35	1.34	13.00
ROUTED TO	MCDO19	282.	13.50	80.	23.	11.	0.35	1.69	13.50
HYDROGRAPH AT	MCDO19	421.	12.83	111.	31.	15.	0.48		
2 COMBINED AT	MCDO19	612.	13.17	190.	54.	26.	0.83		
2 COMBINED AT	MCDO17	1428.	13.17	1299.	523.	254.	10.78		
HYDROGRAPH AT	DIGC3A	476.	13.83	196.	49.	24.	0.00		
ROUTED TO	INDI3A	413.	14.33	195.	49.	24.	0.00	2.20	14.33
HYDROGRAPH AT	INDI3A	331.	12.50	59.	16.	8.	0.24		
2 COMBINED AT	INDI3A	429.	14.33	250.	65.	32.	0.24		
ROUTED TO	THOM3A	404.	15.00	246.	65.	32.	0.24	1.98	15.00
HYDROGRAPH AT	THOM3A	415.	12.50	86.	24.	12.	0.29		
2 COMBINED AT	THOM3A	566.	12.67	324.	89.	43.	0.53		
ROUTED TO	MCDO3A	371.	16.17	290.	89.	43.	0.53	2.34	16.17
DIVERSION TO	SFMC3A	150.	16.17	88.	22.	11.	0.53		
HYDROGRAPH AT	MCDO3A	221.	16.17	202.	67.	33.	0.53		
ROUTED TO	MCDO7A	220.	16.83	201.	67.	33.	0.53	2.23	16.83
HYDROGRAPH AT	MCDO7A	479.	12.83	114.	32.	15.	0.49		
2 COMBINED AT									

	MCDO7A	512.	12.83	268.	99.	48.	1.02		
HYDROGRAPH AT	DIGC7A	452.	14.00	199.	50.	24.	0.00		
ROUTED TO	OSBO7A	433.	14.83	198.	50.	24.	0.00	2.18	14.83
HYDROGRAPH AT	OSBO7A	513.	12.67	105.	29.	14.	0.45		
2 COMBINED AT	OSBO7A	513.	12.67	299.	79.	38.	0.45		
ROUTED TO	EDGE7A	446.	15.33	298.	79.	38.	0.45	2.27	15.33
HYDROGRAPH AT	EDGE7A	371.	12.50	70.	19.	9.	0.29		
2 COMBINED AT	EDGE7A	665.	12.67	365.	99.	48.	0.74		
ROUTED TO	MCDO7A	412.	15.83	336.	99.	48.	0.74	2.17	15.83
2 COMBINED AT	MCDO7A	813.	12.83	603.	198.	95.	1.77		
DIVERSION TO	SFMC7A	350.	12.83	248.	76.	37.	1.77		
HYDROGRAPH AT	MCDO7A	463.	12.83	355.	121.	58.	1.77		
ROUTED TO	MCDO15	367.	16.67	331.	121.	58.	1.77	2.32	16.67
HYDROGRAPH AT	ECAN11	111.	12.67	23.	6.	3.	0.10		
ROUTED TO	MCDO15	56.	13.83	23.	6.	3.	0.10	1.87	13.83
ROUTED TO	MCDO15	53.	14.50	23.	6.	3.	0.10	1.53	14.50
2 COMBINED AT	MCDO15	391.	14.83	352.	128.	62.	1.87		
HYDROGRAPH AT	MCDO15	208.	12.67	48.	13.	6.	0.21		
2 COMBINED AT	MCDO15	406.	14.67	371.	141.	68.	2.07		
ROUTED TO	MCDO17	405.	15.17	369.	141.	68.	2.07	2.29	15.17
2 COMBINED AT	MCDO17	1769.	17.17	1663.	664.	322.	12.85		
ROUTED TO	VANB17	1668.	18.67	1508.	662.	322.	12.85	2.95	18.67
HYDROGRAPH AT	VANB17	903.	12.83	217.	60.	29.	0.84		
2 COMBINED AT	VANB17	1686.	18.67	1528.	721.	351.	13.69		
HYDROGRAPH AT	ROO16S	317.	12.50	63.	17.	8.	0.26		
ROUTED TO	ROOS7S	191.	13.17	62.	17.	8.	0.26	2.18	13.17

HYDROGRAPH AT	ROOS7S	611.	12.83	154.	43.	21.	0.60		
2 COMBINED AT	ROOS7S	770.	12.83	216.	60.	29.	0.86		
DIVERSION TO	SDFR7S	60.	12.83	48.	18.	9.	0.86		
HYDROGRAPH AT	ROOS7S	710.	12.83	168.	42.	20.	0.86		
ROUTED TO	MCKI7A	317.	14.50	151.	42.	20.	0.86	1.54	14.50
HYDROGRAPH AT	MCKI7A	729.	13.00	209.	59.	28.	0.74		
2 COMBINED AT	MCKI7A	743.	13.00	351.	100.	48.	1.59		
DIVERSION TO	SDFMI7	52.	13.00	52.	25.	12.	1.59		
HYDROGRAPH AT	MCK17A	691.	13.00	299.	75.	36.	1.59		
ROUTED TO	VANB17	330.	15.67	233.	74.	36.	1.59	1.54	15.67
2 COMBINED AT	VANB17	1861.	18.00	1723.	795.	387.	15.29		
ROUTED TO	REACHA	1860.	18.33	1721.	794.	387.	15.29	2.06	18.33
ROUTED TO	JACI10	1855.	18.83	1716.	794.	387.	15.29	3.94	18.83
HYDROGRAPH AT	JACI10	702.	13.00	197.	55.	26.	0.76		
2 COMBINED AT	JACI10	1871.	18.83	1735.	847.	413.	16.05		
HYDROGRAPH AT	VANB21	710.	12.83	179.	50.	24.	0.67		
ROUTED TO	JACI10	580.	13.33	179.	50.	24.	0.67	3.03	13.33
2 COMBINED AT	JACI10	1887.	18.83	1757.	896.	437.	16.72		
HYDROGRAPH AT	LINC7S	1286.	13.33	477.	134.	64.	1.80		
DIVERSION TO	SDFL7S	120.	13.33	110.	42.	20.	1.80		
HYDROGRAPH AT	LINC7S	1166.	13.33	367.	92.	44.	1.80		
ROUTED TO	GRAN7A	984.	14.33	360.	92.	44.	1.80	2.60	14.33
HYDROGRAPH AT	GRAN7A	1171.	12.83	289.	81.	39.	1.05		
2 COMBINED AT	GRAN7A	1177.	12.83	638.	172.	83.	2.85		
ROUTED TO	REACHA	1078.	14.83	620.	172.	83.	2.85	1.90	14.83
ROUTED TO	PIMA19	1033.	15.33	590.	172.	83.	2.85	1.88	15.33

HYDROGRAPH AT	PIMA19	973.	12.83	253.	70.	34.	0.98		
2 COMBINED AT	PIMA19	1103.	15.33	779.	242.	117.	3.83		
DIVERSION TO	SDFP19	110.	15.33	110.	63.	30.	3.83		
HYDROGRAPH AT	PIMA19	993.	15.33	669.	179.	86.	3.83		
HYDROGRAPH AT	PIMA22	537.	12.67	110.	31.	15.	0.43		
3 COMBINED AT	PIMA22	2523.	13.00	2281.	1105.	538.	20.98		
DIVERSION TO	SDI10F	107.	13.00	107.	102.	54.	20.98		
HYDROGRAPH AT	PIMA22	2416.	13.00	2174.	1004.	484.	20.98		
ROUTED TO	I10DUE	2222.	16.50	2008.	853.	411.	20.98	1059.05	16.50
ROUTED TO	DURA31	2199.	17.50	1983.	851.	414.	20.98	2.24	17.50
HYDROGRAPH AT	DURA31	863.	13.00	249.	69.	33.	1.00		
2 COMBINED AT	DURA31	2221.	17.50	2006.	916.	447.	21.98		
ROUTED TO	BUCK35	2214.	18.17	1999.	914.	447.	21.98	2.73	18.17
HYDROGRAPH AT	BUCK35	431.	13.33	154.	43.	21.	0.60		
2 COMBINED AT	BUCK35	2230.	18.17	2013.	955.	468.	22.58		
ROUTED TO	BUCK43	2218.	18.83	1997.	952.	467.	22.58	2.09	18.83
HYDROGRAPH AT	BUCK43	684.	13.00	200.	56.	27.	0.75		
2 COMBINED AT	BUCK43	2235.	18.83	2014.	1001.	494.	23.33		
HYDROGRAPH AT	DURA39	852.	13.00	249.	69.	33.	1.00		
ROUTED TO	BUCK43	801.	13.33	246.	69.	33.	1.00	1.80	13.33
2 COMBINED AT	BUCK43	2260.	18.83	2037.	1071.	528.	24.33		
ROUTED TO	LASTBA	2246.	19.83	2013.	1065.	527.	24.33	2.51	19.83
HYDROGRAPH AT	LASTBA	613.	13.00	179.	50.	24.	0.67		
2 COMBINED AT	SALTRI	2260.	19.83	2027.	1107.	551.	25.00		

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

Appendix C

NEW HEC-RAS MODEL

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

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   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: Grand Canal
Project File : Gcanal.prj
Run Date and Time: 11/11/02 9:39:57 AM

Project in English units

Project Description:
Client: City of Phoenix, Arizona
Project: Grand Canal Floodplain
Re-delineation
(between 7th Avenue and 19th Avenue)

Request Letter of Map
Revision from FEMA

PLAN DATA

Plan Title: Grand Canal 4
Plan File : q:\B30021.07\HEC-RAS\delivery to FEMA\Gcanal.p04

Geometry Title: Grand Canal 4
Geometry File : q:\B30021.07\HEC-RAS\delivery to FEMA\Gcanal.g04

Flow Title : Grand Canal2
Flow File : q:\B30021.07\HEC-RAS\delivery to FEMA\Gcanal.f04

Plan Description:
Adjusted n values & lateral weir flow over canal

Plan Summary Information:

Number of:	Cross Sections	= 14	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	1
	Bridges	= 0			

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Grand Canal2
Flow File : q:\B30021.07\HEC-RAS\delivery to FEMA\Gcanal.f04

Flow Data (cfs)

River	Reach	RS	PF 1
river 1	reach 1	13	515
river 1	reach 1	8	852
river 1	reach 1	4	1146

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
river 1	reach 1	PF 1	Critical	Normal S = .0025

GEOMETRY DATA

Geometry Title: Grand Canal 4
Geometry File : q:\B30021.07\HEC-RAS\delivery to FEMA\Gcanal.g04

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 13

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9712	1124.1	9734	1124	9919	1123	9981	1122.7	9981.1	1122.2
10000	1122.6	10018.9	1122.2	10019	1122.7	10029	1123	10069	1123
10177	1124	10317	1124	10317.1	1123.5	10335	1123.9	10352.9	1123.5
10353	1124	10450	1124	10648	1125				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9712	.04	9981	.04	10019	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9981	10019	130	120	110	.1	.3

LATERAL WEIR RIVER: river 1
REACH: reach 1 RS: 12.99

INPUT
Description: split flow at 7th Ave and Grand Canal
Lateral weir position = Left overbank
Distance from Upstream XS = 20
Deck/Roadway Width = 20
Weir Coefficient = 2.63
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1124	10	1123.1	55	1123.4	90	1122.9	110	1123

Weir crest shape = Broad Crested

```
CROSS SECTION           RIVER: river 1
REACH: reach 1             RS: 12

INPUT
Description:
Station Elevation Data     num=      28
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
    9792   1122.9     9796     1123     9822     1124     9844   1124.2     9884   1124.2
    9906     1124     9984     1123   9984.1   1122.5    10000   1123.1  10015.9   1122.5
   10016     1123    10066   1123.8    10122     1124    10131   1124.1    10141     1124
   10174   1123.7    10340   1123.8    10434     1124    10444     1124  10444.1   1123.5
   10460   1123.9  10475.9   1123.5    10476     1124    10536   1124.2    10596     1124
   10616   1123.9    10636     1124    10684     1125

Manning's n Values         num=       3
     Sta    n Val      Sta    n Val      Sta    n Val
    9792     .049     9984     .049    10016     .049

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9984   10016               290     330     370              .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
888        F

CROSS SECTION           RIVER: river 1
REACH: reach 1             RS: 11

INPUT
Description:
Station Elevation Data     num=      28
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
    9736  1123.75     9784     1124     9820   1123.3  9880.65   1123.8     9900   1123.8
    9972     1123     9984   1122.7   9984.1   1122.2    10000   1122.6  10015.9   1122.2
   10016   1122.7    10024     1123    10030     1124    10036     1125    10052     1125
   10053     1124    10054     1123    10094   1122.7    10124     1123    10153   1123.3
   10182     1123    10188   1122.9  10188.1   1122.5    10204     1123  10219.9   1122.5
   10220     1123    10284   1123.2    10386     1124

Manning's n Values         num=       3
     Sta    n Val      Sta    n Val      Sta    n Val
    9736     .048     9984     .048    10016     .048

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9984   10016               350     390     360              .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
 9880.65 9970.97 1123.01

LATERAL WEIR            RIVER: river 1
REACH: reach 1             RS: 10.4

INPUT
Description:
Lateral weir position      = Left overbank
Distance from Upstream XS =      200
Deck/Roadway Width         =       20
Weir Coefficient           =     2.63
Weir Flow Reference        = Water Surface
 Weir Embankment Coordinates    num =       23
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0  1122.98      150  1123.17      300  1123.39      500  1122.66      800  1122.41
    1000  1122.46     1200  1122.08     1400  1122.05     1600   1122.1     1800  1122.12
    2100  1122.25     2270  1122.16     2400  1121.73     2500  1121.83     2600  1122.35
    2700  1121.93     2800  1121.82     2900   1121.2     3000  1121.17     3100   1120.9
    3200  1120.85     3300  1120.64     3400  1120.51

Weir crest shape                            = Broad Crested


CROSS SECTION           RIVER: river 1
REACH: reach 1             RS: 10
```

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9836	1123.15	9856	1123	9864	1122	9876	1121.8	9942	1121.8
9954	1122	9984	1122.2	9984.1	1121.7	10000	1122.1	10015.9	1121.7
10016	1122.2	10020	1122	10124	1122.1	10400	1123	10406	1123.1
10406.1	1122.6	10422	1122.9	10437.9	1122.6	10438	1123.1	10458	1123
10584	1123	10728	1124.25	10728.1	1123.75	10746	1124.1	10763.9	1123.75
10764	1124.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9836	.067	9984	.067	10016	.067

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9984	10016	500	500	510	.1	.3

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 9

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9830	1122.5	9850	1122.5	9860	1121.5	9890	1121.5	9900	1122
9976	1122	9984	1122.2	9984.1	1121.7	10000	1122.1	10015.9	1121.7
10016	1122.2	10026	1122	10164	1122	10560	1123	10618	1123
10626	1123.2	10626.1	1122.7	10644	1122.95	10659.9	1122.7	10660	1123.2
10860	1123.7	10950	1124.1	10950.1	1123.6	10966	1124	10983.9	1123.6
10984	1124.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9830	.066	9984	.066	10016	.066

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9984	10016	300	280	250	.1	.3

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 8

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9842	1122.45	9852	1122.4	9862	1122	9880	1121.2	9958	1121.3
9976	1122	9984	1122.4	9984.1	1121.9	10000	1122.3	10015.9	1121.9
10016	1122.4	10044	1122	10224	1122	10324	1122.8	10640	1123
10758	1123	10796	1124						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9842	.059	9984	.059	10016	.059

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9984	10016	400	390	380	.1	.3

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 7

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9792	1122	9808	1122	9822	1121	9896	1121	9978	1122
9984	1122.4	9984.1	1121.9	10000	1122.3	10015.9	1121.9	10016	1122.4
10026	1122	10170	1122	10476	1123	10728	1123.15	10728.1	1122.65
10746	1123.05	10763.9	1122.65	10764	1123.15	10864	1124		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9792	.063	9984	.063	10016	.063

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9984	10016	390	430	400	.1	.3

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 6

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9844	1122	9854	1122	9874	1121	9984	1121.1	9984.1	1120.6
10000	1121	10015.9	1120.6	10016	1121.1	10018	1121	10060	1121
10238	1122	10282	1122.2	10282.1	1121.8	10298	1122.2	10313.9	1121.8
10314	1122.2	10346	1122	10410	1122	10632	1123	10868	1123.2
10868.1	1122.7	10886	1123.1	10901.9	1122.7	10902	1123.2	10992	1124

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9844	.068	9984	.068	10016	.068

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9984	10016	390	370	340	.1	.3

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 5

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9806	1122.05	9825	1122.05	9874	1121.35	10000	1121.2	10132	1121.6
10262	1122	10354	1122.2	10354.1	1121.7	10370	1122.1	10385.9	1121.7
10386	1122.2	10474	1123	10544	1123	10852	1124		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9806	.11	9874	.11	10132	.11

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9874	10132	290	280	260	.1	.3

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 4

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9724	1121.73	9738	1122	9820	1121	9879	1120.85	9938	1121
9984	1121.3	9984.1	1120.8	10000	1121.2	10015.9	1120.8	10016	1121.3
10018	1121	10242	1122	10304	1122.6	10304.1	1122.1	10320	1122.6
10335.9	1122.25	10336	1122.75	10342	1123	10608	1124	10796	1124.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9724	.04	9984	.04	10016	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9984	10016	490	490	490	.1	.3

CROSS SECTION RIVER: river 1
REACH: reach 1 RS: 3

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
    9758  1121.1    9776  1121.1    9846  1120.1    9916  1120.3    9984  1120.9
  9984.1  1120.4   10000  1120.8 10015.9  1120.4   10016  1120.9   10080    1121
   10302    1122 10302.1  1121.5   10320  1121.9 10337.9  1121.5   10338    1122
   10350    1123   10576    1123   10904    1124

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    9758    .038    9984    .038   10016    .038

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9984   10016              490     490     490             .1       .3

CROSS SECTION          RIVER: river 1
REACH: reach 1            RS: 2

INPUT
Description:
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    9788 1120.21    9798  1120.2    9799    1120    9817    1120    9863  1119.7
    9898    1120    9984 1120.45  9984.1 1119.95   10000 1120.25 10015.9 1119.95
   10016 1120.45   10065  1120.5   10115  1120.7   10150    1121   10248  1121.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    9788    .039    9984    .039   10016    .039

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9984   10016              660    1140    1320             .1       .3

CROSS SECTION          RIVER: river 1
REACH: reach 1            RS: 1.2

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    9100 1120.51    9165    1120    9297 1120.15  9297.1 1119.65    9315 1119.95
  9332.9 1119.65    9333 1120.15    9475    1120    9655  1120.2    9835    1120
    9965  1119.9    9985    1120  9985.1  1119.5   10000 1119.85 10014.9  1119.5
   10015    1120   10295 1120.25   10315    1121

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
    9100    .064    9985    .064   10015    .064

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          9985   10015              130     175     250             .1       .3

INLINE WEIR            RIVER: river 1
REACH: reach 1            RS: 1.1

INPUT
Description: Weir over Grand Canal
Distance from Upstream XS =      50
Deck/Roadway Width        =      20
Weir Coefficient          =       3
 Weir Embankment Coordinates    num =       15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
    9040 1120.64    9140 1120.51    9240 1120.18    9340 1120.45    9440 1120.55
    9540 1120.68    9640 1120.62    9740 1120.25    9840 1119.75    9940 1119.99
   10000  1120.1   10040 1120.19   10140 1120.18   10240 1120.29   10340  1120.1

Upstream Embankment side slope              =       3 horiz. to 1.0 vertical
Downstream Embankment side slope            =       3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Weir crest shape                            = Broad Crested


CROSS SECTION          RIVER: river 1
```

REACH: reach 1 RS: 1

INPUT
Description: X-sect d/s of Grand Canal
Station Elevation Data num= 5

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8870	1120	8910	1118	10000	1118	10510	1118	10520	1120

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8870	.03	8910	.03	10510	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
8910	10510	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:river 1

Reach	River Sta.	n1	n2	n3
reach 1	13	.04	.04	.04
reach 1	12.99	Lat. Weir		
reach 1	12	.049	.049	.049
reach 1	11	.048	.048	.048
reach 1	10.4	Lat. Weir		
reach 1	10	.067	.067	.067
reach 1	9	.066	.066	.066
reach 1	8	.059	.059	.059
reach 1	7	.063	.063	.063
reach 1	6	.068	.068	.068
reach 1	5	.11	.11	.11
reach 1	4	.04	.04	.04
reach 1	3	.038	.038	.038
reach 1	2	.039	.039	.039
reach 1	1.2	.064	.064	.064
reach 1	1.1	Inline Weir		
reach 1	1	.03	.03	.03

SUMMARY OF REACH LENGTHS

River: river 1

Reach	River Sta.	Left	Channel	Right
reach 1	13	130	120	110
reach 1	12.99	Lat. Weir		
reach 1	12	290	330	370
reach 1	11	350	390	360
reach 1	10.4	Lat. Weir		
reach 1	10	500	500	510
reach 1	9	300	280	250
reach 1	8	400	390	380
reach 1	7	390	430	400
reach 1	6	390	370	340
reach 1	5	290	280	260
reach 1	4	490	490	490
reach 1	3	490	490	490
reach 1	2	660	1140	1320
reach 1	1.2	130	175	250
reach 1	1.1	Inline Weir		
reach 1	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: river 1

Reach	River Sta.	Contr.	Expan.
reach 1	13	.1	.3
reach 1	12.99	Lat. Weir	
reach 1	12	.1	.3
reach 1	11	.1	.3
reach 1	10.4	Lat. Weir	
reach 1	10	.1	.3
reach 1	9	.1	.3
reach 1	8	.1	.3
reach 1	7	.1	.3
reach 1	6	.1	.3
reach 1	5	.1	.3
reach 1	4	.1	.3
reach 1	3	.1	.3
reach 1	2	.1	.3
reach 1	1.2	.1	.3
reach 1	1.1	Inline Weir	
reach 1	1	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
reach 1	13	515.00	1122.20	1124.29		1124.31	0.000801	1.58	561.19	795.19	0.20
reach 1	12.99	Lat. Weir									
reach 1	12	208.09	1122.50	1124.18	1123.68	1124.20	0.001264	1.32	304.17	799.29	0.20
reach 1	11	208.09	1122.20	1123.46		1123.49	0.003720	1.93	171.06	386.03	0.33
reach 1	10.4	Lat. Weir									
reach 1	10	189.11	1121.70	1122.98		1122.98	0.000686	0.60	391.92	568.00	0.10
reach 1	9	82.57	1121.70	1122.78		1122.78	0.000165	0.26	388.65	652.39	0.05
reach 1	8	222.82	1121.90	1122.62		1122.63	0.001139	0.54	314.13	458.93	0.13
reach 1	7	83.30	1121.90	1122.34		1122.34	0.000273	0.15	261.91	479.65	0.05
reach 1	6	66.54	1120.60	1122.30		1122.30	0.000058	0.21	458.17	632.67	0.03
reach 1	5	66.54	1121.20	1122.26		1122.26	0.000298	0.22	355.59	586.66	0.04
reach 1	4	355.28	1120.80	1122.03		1122.04	0.001015	1.18	367.72	520.62	0.21
reach 1	3	350.43	1120.40	1121.37		1121.40	0.001765	1.36	260.61	404.63	0.27
reach 1	2	140.79	1119.95	1120.92		1120.93	0.000348	0.61	238.27	352.82	0.12
reach 1	1.2	140.79	1119.50	1120.29	1120.12	1120.30	0.003234	0.94	270.99	1168.69	0.21
reach 1	1.1	Inline Weir									
reach 1	1	140.79	1118.00	1118.14	1118.06	1118.14	0.002504	0.65	216.05	1603.37	0.31

Profile Output Table - Standard Table 2

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
reach 1	13	1124.31	1124.29	0.02	0.11	0.00	234.39	113.64	166.97	795.19
reach 1	12.99	Lat. Weir								
reach 1	12	1124.20	1124.18	0.01	0.70	0.00	40.48	58.25	109.35	799.29
reach 1	11	1123.49	1123.46	0.03	0.51	0.01	15.25	65.07	127.76	386.03
reach 1	10.4	Lat. Weir								
reach 1	10	1122.98	1122.98	0.00	0.20	0.00	79.67	20.60	88.85	568.00
reach 1	9	1122.78	1122.78	0.00	0.15	0.00	31.98	7.31	43.28	652.39
reach 1	8	1122.63	1122.62	0.01	0.27	0.00	134.41	8.85	79.56	458.93
reach 1	7	1122.34	1122.34	0.00	0.05	0.00	71.20	1.14	10.97	479.65
reach 1	6	1122.30	1122.30	0.00	0.04	0.00	27.98	10.27	28.28	632.67
reach 1	5	1122.26	1122.26	0.00	0.22	0.00	4.38	52.53	9.63	586.66
reach 1	4	1122.04	1122.03	0.02	0.64	0.00	224.76	38.80	91.72	520.62
reach 1	3	1121.40	1121.37	0.03	0.47	0.01	286.42	33.56	30.45	404.63
reach 1	2	1120.93	1120.92	0.01	0.63	0.00	110.95	16.09	13.76	352.82
reach 1	1.2	1120.30	1120.29	0.01			104.19	17.48	19.12	1168.69
reach 1	1.1	Inline Weir								
reach 1	1	1118.14	1118.14	0.01						

Appendix D

MANNING'S "n" VALUE ADJUSTED FOR URBAN CONDITIONS

Adjusted Manning's Roughness Coefficient for Urban Areas

reference: "Drainage Design Manual for Maricopa County, Arizona - Volume II Hydraulics". Flood Control District of Maricopa County. January 1996.

$$\text{eqn:} \quad n_u = n_o\,[1.5(W_t/\text{sum}W_o) + (1 - W_t/\text{sum}W_o)(\text{sum}L_o/L_t) - 0.5]$$

n_u = Adjusted Manning's "n" value

n_o = "n" for areas between buildings in floodplain (streets, yards, etc..)

W_t = Total width of floodplain including buildings

W_o = Clear width between buildings, measured perpendicular to flow

L_t = Total length of the floodplain

L_o = Individual length between buildings, measured parallel to flow

Cross Scetion No.	Sum of W_o [ft]	W_t [ft]	Sum of L_o [ft]	L_t [ft]	n_o	n_u
1	1600	1600	980	5300	0.030	0.030
1.2	545	1130	980	5300	0.027	0.064
2	240	330	980	5300	0.026	0.039
3	220	295	980	5300	0.026	0.038
4	255	360	980	5300	0.026	0.040
5	140	425	980	5300	0.030	0.110
6	185	410	980	5300	0.026	0.068
7	205	425	980	5300	0.026	0.063
8	235	460	980	5300	0.026	0.059
9	305	655	980	5300	0.026	0.066
10	260	570	980	5300	0.026	0.067
11	210	345	980	5300	0.026	0.048
12	365	615	980	5300	0.026	0.049
13	555	780	980	5300	0.026	0.040

Cave Creek Wash - Below the ACDC
Floodplain behind the Grand Canal between 7th Avenue and 19th Avenue

Weighted Manning's Roughness Coefficients
(only for open areas of each reach - ie. front yards and streets)

Cross Scetion No.	n1	width [ft]	n2	width [ft]	n3	width [ft]	n4	width [ft]	n5	width [ft]	n6	width [ft]	total width [ft]	n_o
1	0.03	500											500	0.030
1.2	0.03	40	0.018	32	0.03	40	0.03	40	0.018	32	0.03	40	224	0.027
2	0.03	35	0.018	36	0.03	35							106	0.026
3	0.03	35	0.018	36	0.03	35							106	0.026
4	0.03	35	0.018	36	0.03	40							111	0.026
5	0.03	65											65	0.030
6	0.03	30	0.018	32	0.03	30	0.03	35	0.018	36	0.03	40	203	0.026
7	0.03	40	0.018	36	0.03	40							116	0.026
8	0.03	35	0.018	36	0.03	40							111	0.026
9	0.03	35	0.018	36	0.03	40							111	0.026
10	0.03	40	0.018	36	0.03	35	0.03	35	0.018	36	0.03	35	217	0.026
11	0.03	35	0.018	36	0.03	40	0.03	40	0.018	36	0.03	35	222	0.026
12	0.03	35	0.018	36	0.03	35	0.03	35	0.018	36	0.03	35	212	0.026
13	0.03	40	0.018	36	0.03	40							116	0.026

6

Open Channels

6.1 Definition of Symbols

The following symbols will be used in equations throughout Chapter 6.

θ	=	The bank angle with the horizon
Φ	=	Angle of repose
Δy	=	Change in water surface elevation, ft
$\Sigma L_o/L_T$	=	Ratio of the summation of the distances between rows of buildings, L_o, to the total length of the reach along a profile parallel to flow, L_T, ft/ft
A	=	Cross section area of flow, ft^2
b	=	Channel bottom width, ft
C	=	Overall correction factor when using a different stability factor or specific gravity
C_{sf}	=	Stability factor correction factor
C_{sg}	=	Correction factor for specific gravity
D	=	Depth of flow, or hydraulic depth, ft
d_i	=	The average diameter of a rock particle for which "i" percent of gradation is finer by weight
E	=	Specific energy, ft
FB	=	Freeboard, ft
F_c	=	Section factor at critical depth, $ft^{3/2}$
F_r	=	Froude number
g	=	Acceleration due to gravity, 32.2 ft/s^2
G	=	Gradation coefficient
h_v	=	Velocity head, ft
K_1	=	Bank angle correction factor
L_o	=	Individual length between buildings measured parallel to flow, ft
L_T	=	Total length of the floodplain, including buildings, ft
n	=	Manning's roughness coefficient (see Table 6-11)
n_o	=	Roughness coefficient for the area between the buildings in the floodplain (i.e., streets, yards, etc.)

n_u	=	Adjusted urban roughness coefficient
P	=	Wetted perimeter, ft
Q	=	Discharge, cfs
R	=	Hydraulic radius = A/P, ft
r_c	=	Radius of channel center-line curvature, ft
SF	=	Stability factor
S_o	=	Channel bottom slope, ft/ft
S_s	=	Specific gravity of the rock riprap
T	=	Channel width along the top of the water surface, ft
V	=	Average velocity of a section, ft/s
W_o	=	Clear width between buildings, measured perpendicular to flow, ft
W_T	=	Total width of the floodplain including buildings, ft
y	=	Distance from water surface to the centroid of the section, ft
Y	=	Depth of flow, ft
Y_c	=	Critical depth of flow, ft
Y_n	=	Normal depth of flow, ft

6.2 General

An open channel is a conveyance in which water flows with a free surface and may be natural or artificial. Natural streams usually consist of a normal or low flow channel and adjacent floodplains. For purposes of this guideline, the term open channel will include the total conveyance facility, floodplain, and stream channel.

Open channel hydraulics is of particular importance to design because of the interrelationship of channels to street and urbanization drainage. In the hydraulic analysis and design of bridges and culverts, open channel hydraulic principles are used to evaluate the effects of proposed structures on water surface profiles, flow and velocity distributions, lateral and vertical stability of the channel, stream regime, flood risk, and the potential reaction of channels to changes in variables such as urbanization; structure type, shape, and location; and scour control measures.

The hydraulic design process for open channels consists of establishing criteria, developing and evaluating alternatives, and selecting the alternative which best satisfies the established criteria. Elements that should be considered in the design process include capital investment and probable future costs, such as maintenance and flood damages to properties; traffic requirements; and impacts on the stream and floodplain environment.

> If the proposed project will impact Waters of the U.S., the designer shall take into account requirements of the Clean Water Act (CWA), Section 404.

Composite Channels: The cross section of a watercourse or a street right-of-way may be composed of several distinct subsections, with each subsection having different hydraulic characteristics, such as hydraulic roughness and average flow depth. For example, an alluvial channel may have a primary, sand-bed channel which is bounded on both sides by densely-vegetated, overbank floodplains, or a flooded street section may be bounded on both sides by landscaped front yards having shallower flood depths and slower flow velocities.

In composite channels like these, the discharge is computed for each sub-section having distinct and different hydraulic characteristics, and the total computed discharge is set equal to the sum of the individual discharges. Similarly, the mean velocity for the entire flow cross section is assumed to be equal to the total discharge divided by the total water area. *Open-Channel Hydraulics* (Chow, 1959), provides an example of computing flow in channels having composite roughness.

Manning's Roughness Coefficients: Manning's roughness coefficients (see Table 6.11, page 6-64), for use in water surface profile calculations, should be carefully estimated by experienced engineers. The estimates should include consideration that roughness may vary with flood stage, depending on such factors as the width-depth ratio of the watercourse; presence of vegetation in the main channel and the overbank areas; the types of materials making up the channel bed; and the degree of meandering. Additional information concerning Manning's roughness coefficients can be found in Thomsen and Hjalmarson (1991), Davidian (1984), and Aldridge and Garret (1973).

In the urban setting, it is not unusual for buildings and other structures to occupy a significant portion of any given hydraulic cross section. Under these circumstances, it is often difficult to estimate both the effective width of the cross-section and the Manning's roughness coefficient for the overbank areas. When faced with such a situation, the engineer should eliminate the portion of the cross section occupied by the building.

Where only an estimate of the computed water surface elevation is needed, a second option may be selected: use the adjusted urban roughness coefficient, n_u, with the total cross-sectional area, (Hejl 1977). See Figure 6.4.

$$n_u = n_o\left(1.5\left(\frac{W_T}{\Sigma W_o}\right) + \left(1 - \frac{W_T}{\Sigma W_o}\right)\frac{\Sigma L_o}{L_T} - 0.5\right) \qquad (6.12)$$

where all coefficients are as defined in Section 6.1.

6.4.1.4 Related Issues:

Maintenance: In many instances, specific maintenance access requirements are required by the local entity and/or the Flood Control District. In planning and designing open channels, the designer should determine these requirements at the outset of the project.

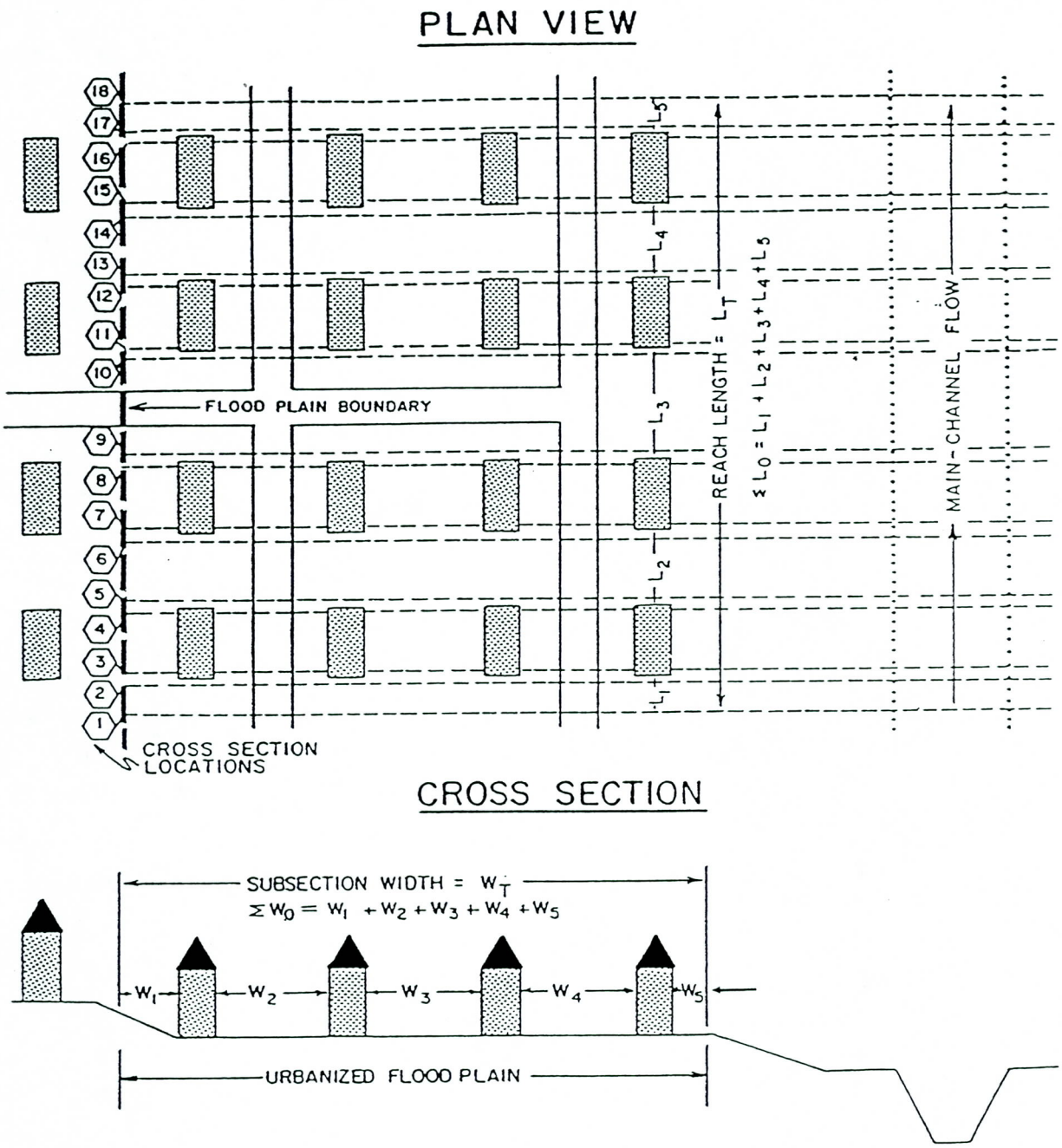


Figure 6.4
Diagram of Idealized Urban Floodplain
(Hejl, 1977, Journal of Research, U.S. Geological Survey)

Appendix E
FEMA FORMS

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

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

☒ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☐ Other Describe:

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☒ Improved Methodology/Data ☐ Floodway Revision

☐ Other Describe:

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Cave Creek Wash below the Arizona Canal Diversion Channel

3. Project Name/Identifier: Grand Canal Floodplain Re-study

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

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

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040051	Phoenix, City of	AZ	04013C	1665H	07/19/01

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

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

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☐ Yes ☒ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☒ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☒ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the N/A (Name) flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☐ **No** ☒ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $3100

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt.
☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

Lloyd A Vick

Signature of Revision Requester

Lloyd A. Vick, P.E.
Printed Name and Title of Revision Requester

Engineering and Environmental Consultants, Inc.
Company Name

Telephone No.: 602-248-7702 Date:

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

Signature of Community Official

Hasan Mushtaq, P.E.
Printed Name and Title of Community Official

City of Phoenix
Community Name

Telephone No.: 602-262-4026 Date: 12/16/02

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Lloyd A Vick

Signature

Lloyd A. Vick, P.E.
Printed Name and Title of Revision Requester

Registr No. 37890 Expires (Date) 09/30/05 State Arizona

Type of License/Expertise: Civil Engineer

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☐ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☒ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: City of Phoenix, Arizona

Flooding Source: Cave Creek Wash below the Arizona Canal Diversion Channel

Project Name/Identifier: Grand Canal Floodplain Re-Study

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: _____

Upstream Limit: _____

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended.
For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☒ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☒ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End 1 within 0 (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End _____ within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☐ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☐ Confluences labeled ☐ Channel Stationing ☐ Streambed profiled ☐ Cross Sections labeled

☐ Horizontal/Vertical Scales indicated ☐ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE / COASTAL MAPPING**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: City of Phoenix, Arizona

Flooding Source: Cave Creek Wash below the Arizona Canal Diversion Channel

Project Name/Identifier: Grand Canal Floodplain Re-study

This is a ☒ Manual ☐ Digital submission. *Digital map submissions may be used to update digital FIRMs (DFIRMs). For updating DFIRMs, these submissions must be coordinated with FEMA Headquarters as far in advance as possible.*

1. MAPPING CHANGES

1. A topographic workmap must be submitted showing the following information (check N/A when not applicable):

a. Revised approximate 100-year floodplain boundaries (Zone A)	☐ Yes	☐ No	☒ N/A
b. Revised detailed 100-~~and 500~~-year floodplain boundaries.	☒ Yes	☐ No	☐ N/A
c. Revised floodway boundaries	☐ Yes	☐ No	☒ N/A
d. Location and alignment of all cross sections with stationing control indicated.	☒ Yes	☐ No	☐ N/A
e. Stream alignments, road alignments and dam alignments.	☒ Yes	☐ No	☐ N/A
f. Current community boundaries.	☐ Yes	☐ No	☒ N/A
g. Effective 100- year floodplain and floodway boundaries from FIRM/FBFM reduced or enlarged to the scale of the topographic workmap	☐ Yes	☒ No	☐ N/A
h. Tie-ins between the effective and revised 100-, 500-year and floodway boundaries	☐ Yes	☐ No	☒ N/A
i. The requester's property boundaries and community easements	☐ Yes	☐ No	☒ N/A
j. The signed certification of a registered professional engineer	☒ Yes	☐ No	☐ N/A
k. Location and description of reference marks	☒ Yes	☐ No	☐ N/A
l. Vertical datum (example: NGVD, NAVD)	☒ Yes	☐ No	☐ N/A
m. Coastal zone designations tie into adjacent areas not being revised	☐ Yes	☐ No	☒ N/A
n. Location and alignment of all coastal transects used to revise the coastal analyze	☐ Yes	☐ No	☒ N/A
o. V-zone has been delineated to extend landward to the heel of the primary frontal dune	☐ Yes	☐ No	☒ N/A

If any items are marked No or N/A please attach an explanation.

2. What is the source and date of the updated topographic information (example: orthophoto maps, July 1985; filed survey, May 1979, beach profile, June 1987 etc.)? Flood Conrtol District of Maricopa County, by Kenny Aerial Mapping Oct 1993.

3. What is the scale and contour interval of the following workmaps?

Effective FIS Scale unknown Contour Interval unknown

Revision Request Scale 1"=200' Contour Interval 1'

NOTE: Revised topographic information must be of equal or greater detail than effective.

4. Attach an annotated FIRM/FBFM at the scale of the effective FIRM/FBFM showing the revised 100- and 500-year floodplain and the floodway boundaries and how they tie into those shown on the effective FIRM/FBFM downstream and upstream of the revisions or adjacent to the area of revision for coastal studies. **FIRM/FBFM attached?** ☒ **Yes** ☐ **No**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. EARTH FILL PLACEMENT N/A

1. The fill is: ☐ Existing ☐ Proposed

2. Has fill been/will be placed in the regulatory floodway? ☐ Yes ☐ No
If Yes, please attach completed Riverine Hydraulic Analysis Form (Form 4).

3. Has fill been/will be placed in floodway fringe (*area between the floodway and 100-year floodplain boundaries*)? ☐ Yes ☐ No

If Yes, then complete A, B, C, and D below.

a. Are fill slopes for granular materials steeper than one vertical on one-and-one-half horizontal? ☐ Yes ☐ No

If Yes, justify steeper slopes _____

b. Is adequate erosion protection provided for fill slopes exposed to moving flood waters? (*Slopes exposed to flows with velocities of up to 5 feet per second (fps) during the 100-year flood must, at a minimum, be protected by a cover of grass, vines, weeds, or similar vegetation; slopes exposed to flows with velocities greater than 5 fps during the 100-year flood must, at a minimum, be protected by stone or rock riprap.)*

☐ Yes ☐ No

If No, describe erosion protection provided _____

c. Has all fill placed in revised 100-year floodplain been compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test Method or acceptable equivalent method? ☐ Yes ☐ No

d. Can structures conceivably be constructed on the fill at any time in the future? ☐ Yes ☐ No

If Yes, attach certification of fill compaction (item 3c. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer in accordance with Subparagraph 65.5(a)(6) of the NFIP regulations.

Fill certification attached ☐ **Yes** ☐ **No**

4. Has fill been/will be placed in a V zone? ☐ Yes ☐ No

If Yes, is the fill protected from erosion by a flood control structure such as a revetment or seawall?

☐ Yes ☐ No

If Yes, attach the Coastal Structures Form (Form 10).

10/11/02

Additional Explanation for FEMA Forms

Form 4, Section 2

Models Submitted

HEC-RAS model Gcanal.prj,p04,g04,f04

This model simulates flow along the Grand Canal with inflows at cross sections 4 and 8, lateral weir flow between cross sections 2-13, and an inline weir between cross sections 1 and 1.2. There isn't an existing effective computer model. The effective FIRM was based on normal depth calculations.

Form 4, Section 3

The starting water surface elevation was established using the slope-area method immediately downstream of the canal. The hydraulic control, however, is the flow that weir flows over the canal where the flow passes through critical depth.

Form 4, Section 4

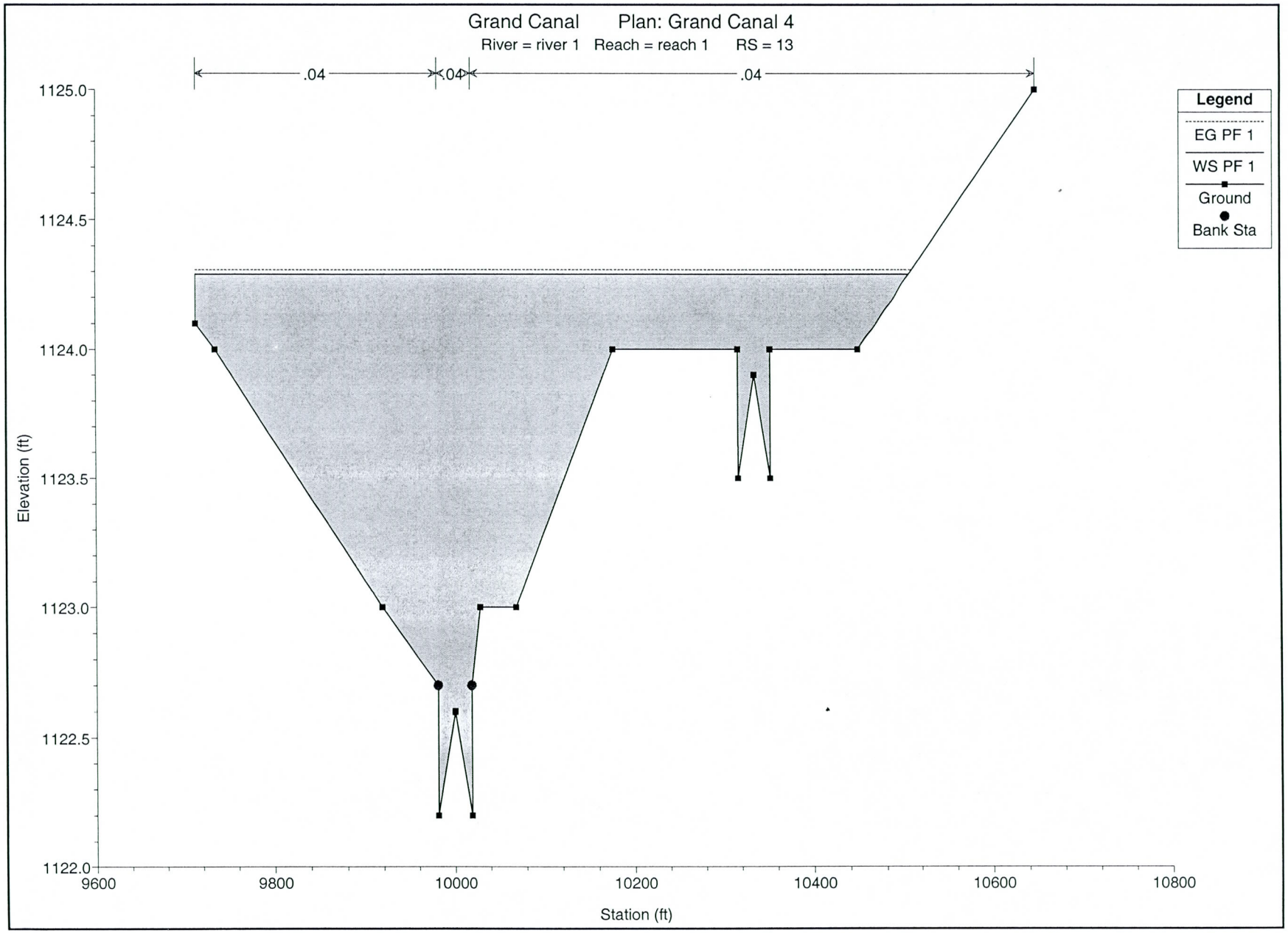
Critical depth was observed as the canal was overtopped at the inline weir.

The HEC-RAS model is represented with the canal along the left overbank. Since this is the location of the lateral weir, the water surface is expected to exceed the end points of the cross sections. The breakout flows are documented in the HEC-RAS model and displayed on the floodplain delineation map.

Form 4, Section 5

The effective firm and this request for LOMR both have a BFE of 1120 for flow over the Grand Canal. Therefore the difference between the two studies at that location is 0 feet.

Appendix F
WASH CROSS SECTIONS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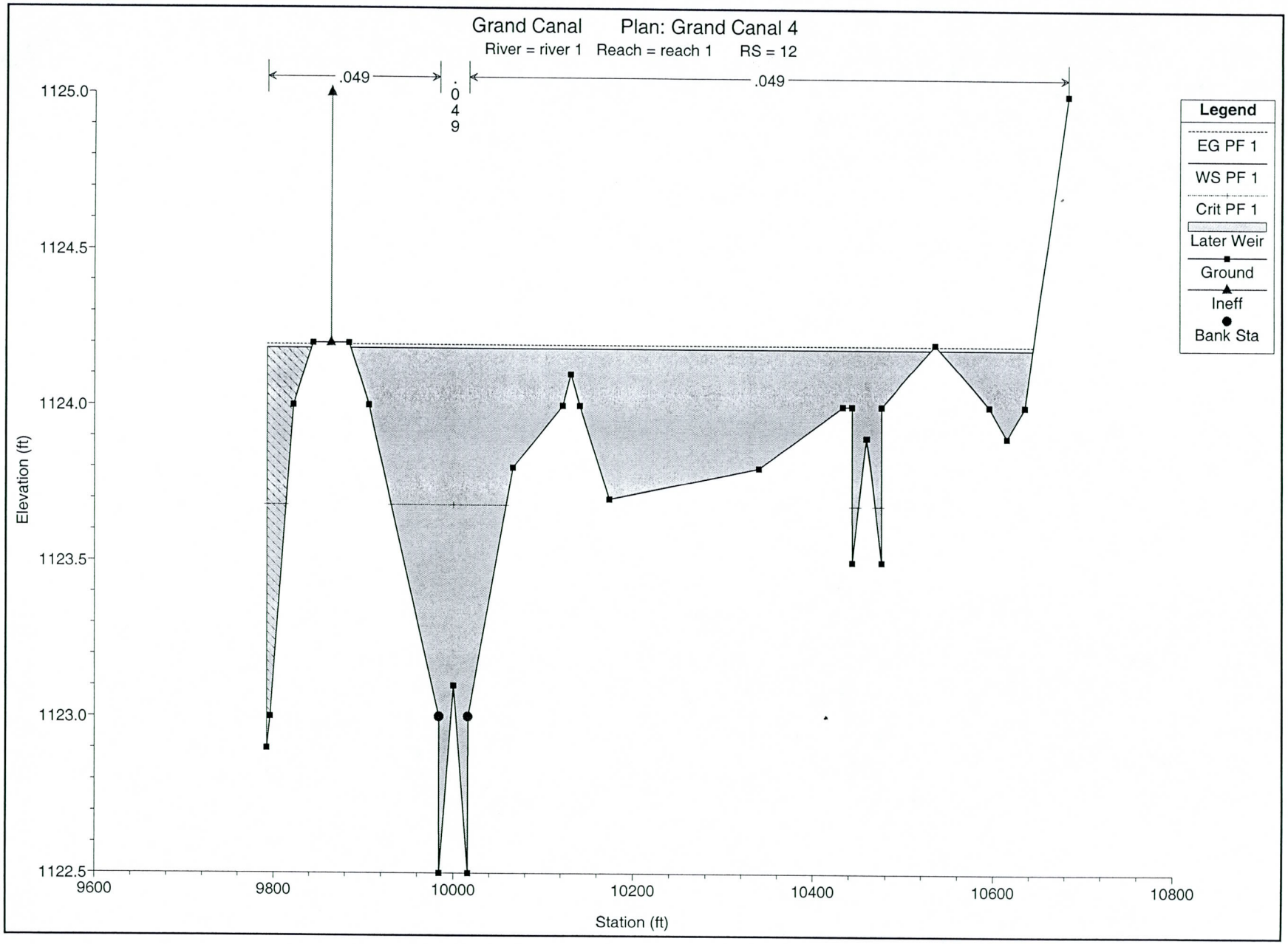
.04
.04
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1125.0
1124.5
1124.0
1123.5
1123.0
1122.5
1122.0
9600
9800
10000
10200
10400
10600
10800
Station (ft)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River = river 1 Reach = reach 1 RS = 12
.049
.049
.049
Legend
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WS PF 1
Crit PF 1
Later Weir
Ground
Ineff
Bank Sta
Elevation (ft)
1125.0
1124.5
1124.0
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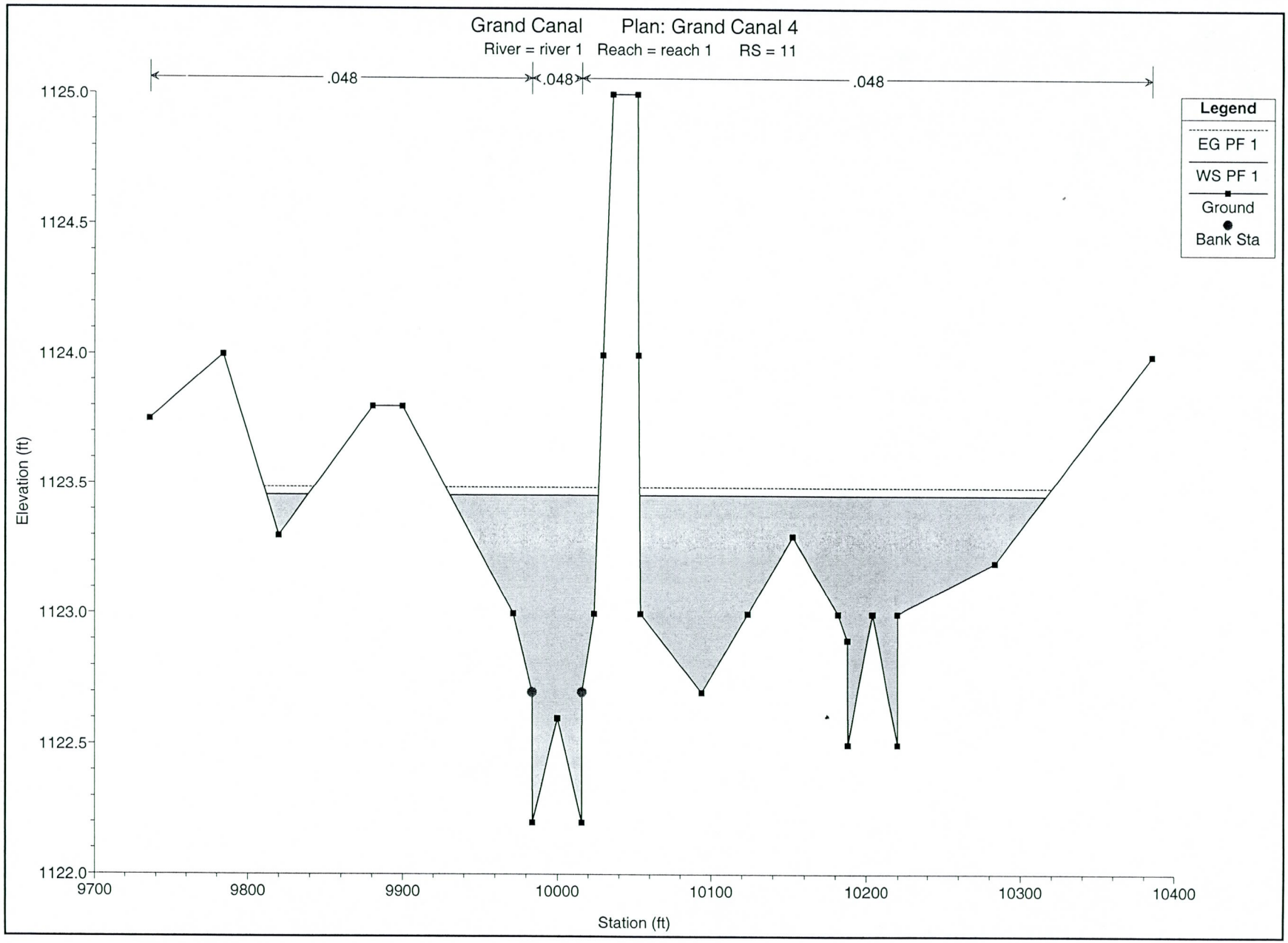
9600
9800
10000
10200
10400
10600
10800
Station (ft)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.048
.048
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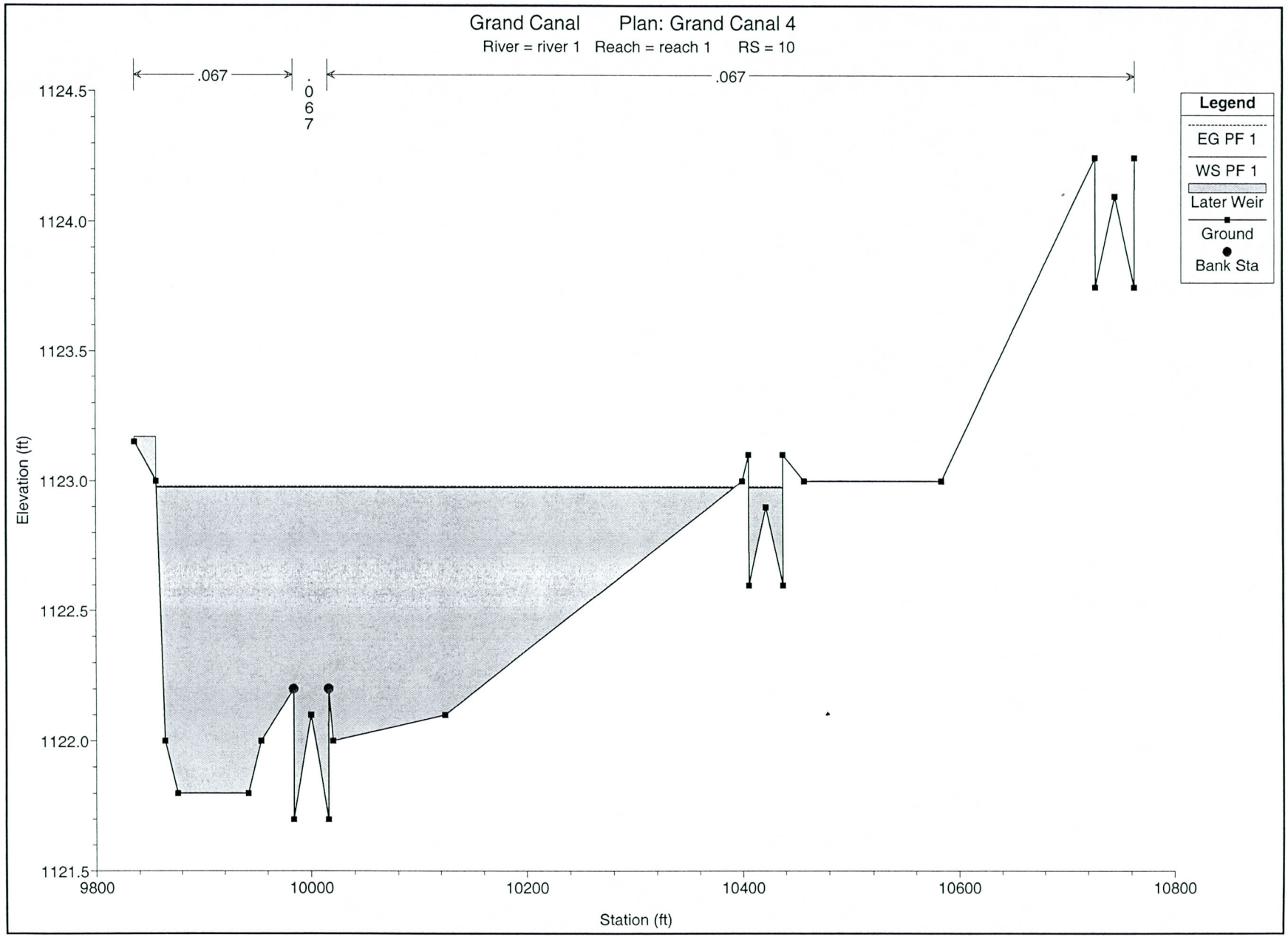
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1125.0
1124.5
1124.0
1123.5
1123.0
1122.5
1122.0
9700
9800
9900
10000
10100
10200
10300
10400
Station (ft)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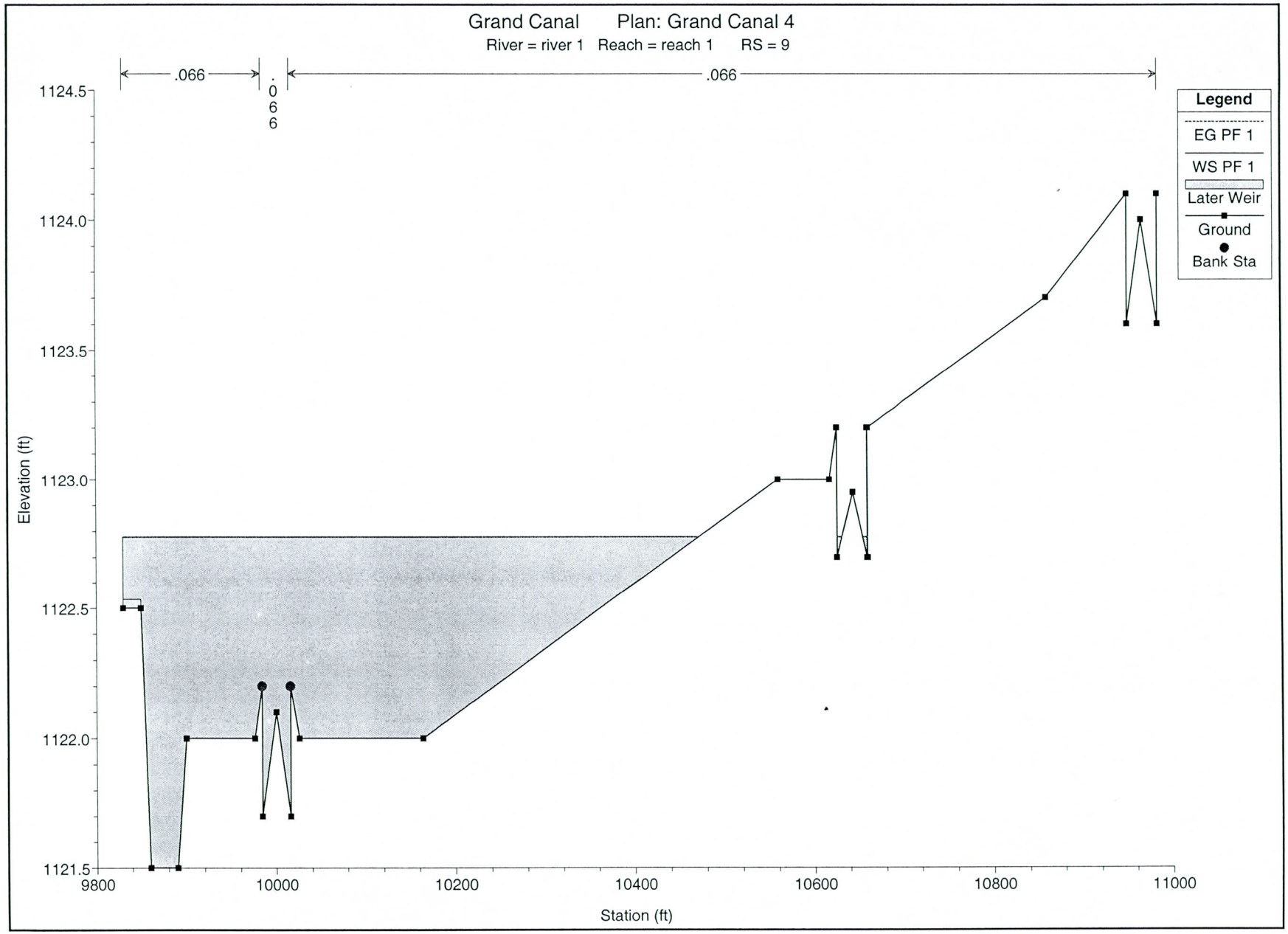
.067
.067
.067
Legend
EG PF 1
WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
1124.5
1124.0
1123.5
1123.0
1122.5
1122.0
1121.5
9800
10000
10200
10400
10600
10800
Station (ft)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.066
.066
Legend
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WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
1124.5
1124.0
1123.5
1123.0
1122.5
1122.0
1121.5
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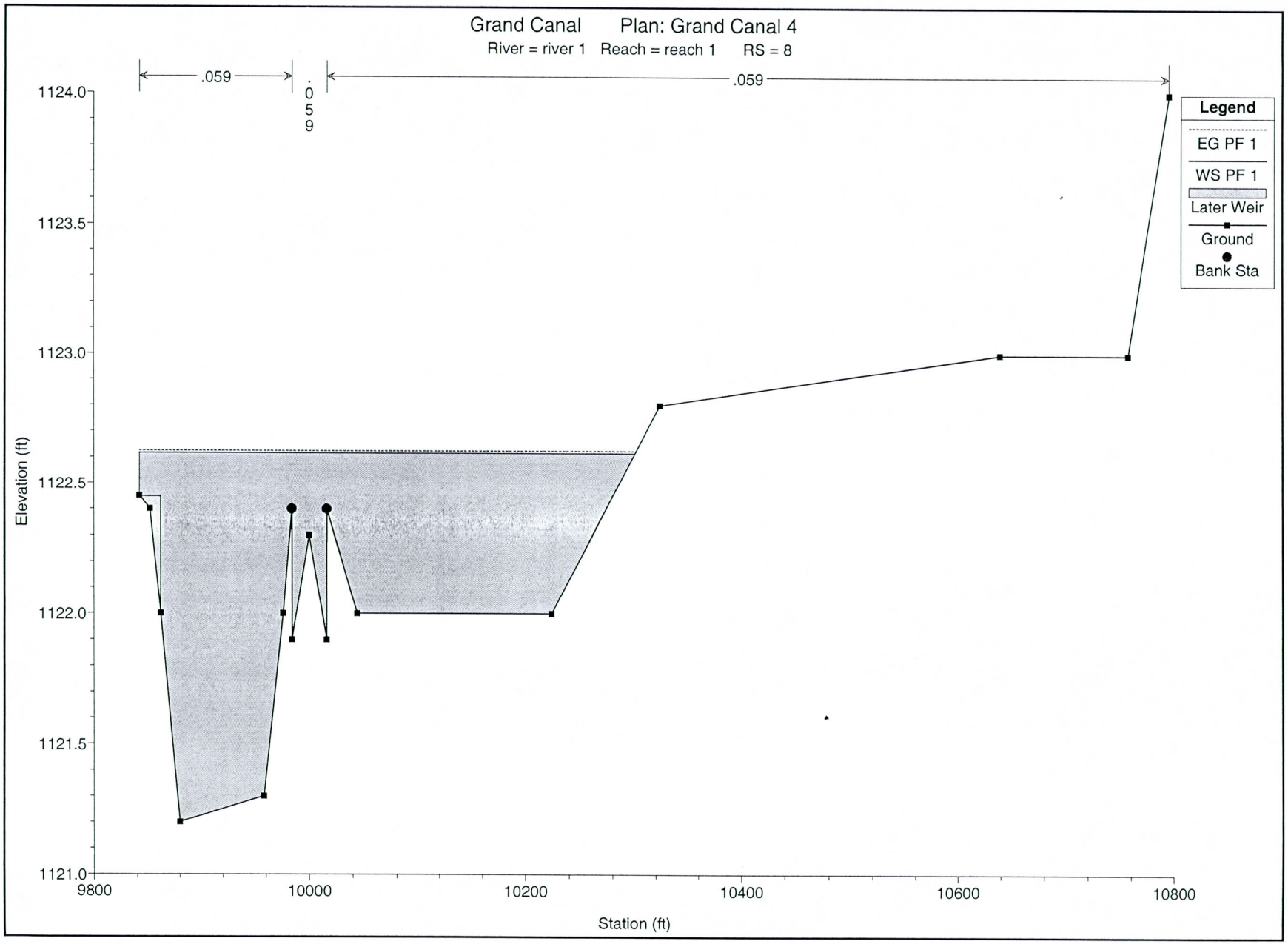
10200
10400
10600
10800
11000
Station (ft)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.059
.059
.059
Legend
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WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
1124.0
1123.5
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1121.0
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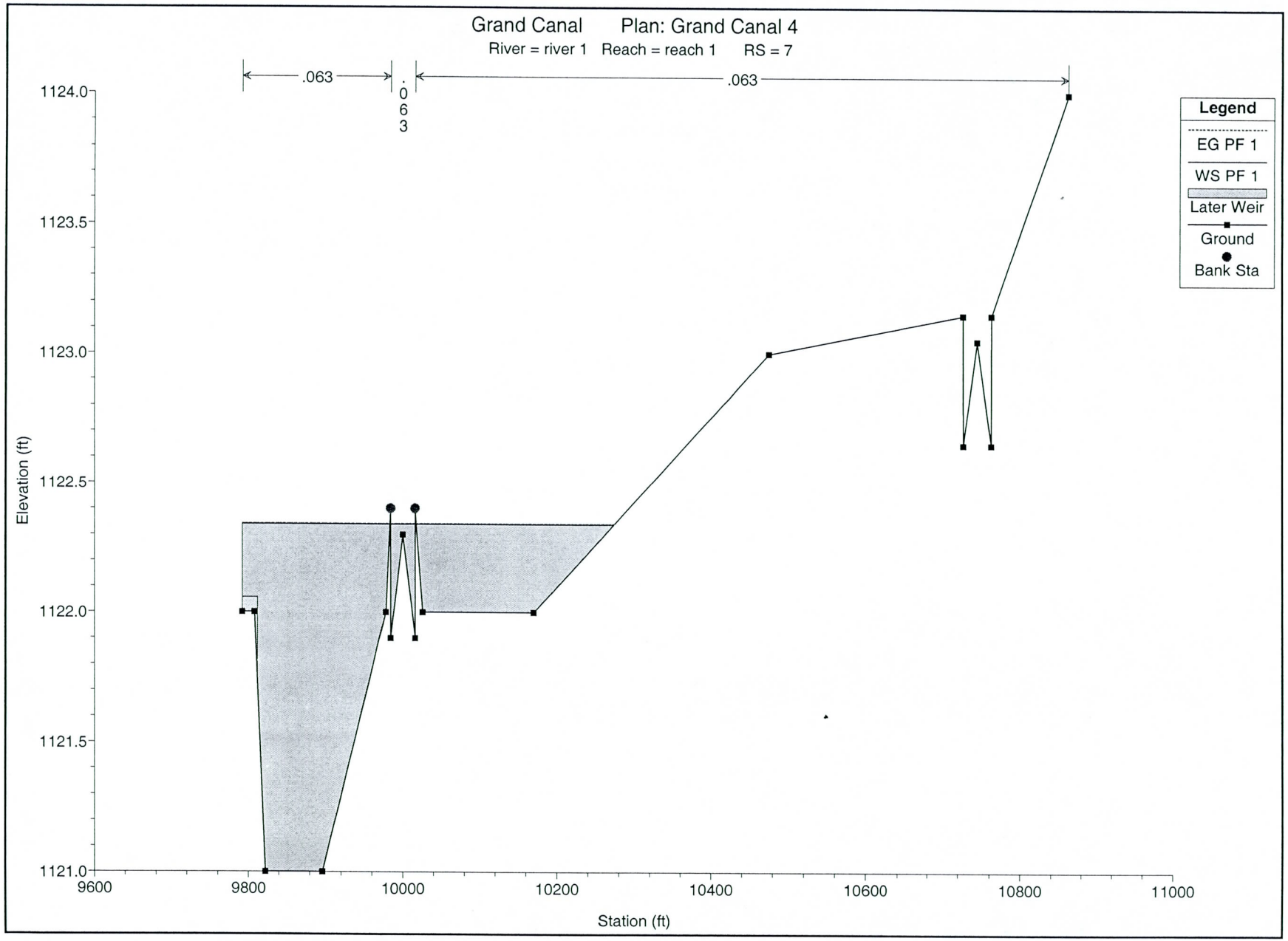
10400
10600
10800
Station (ft)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.063
.063
Legend
EG PF 1
WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
1124.0
1123.5
1123.0
1122.5
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9800
10000
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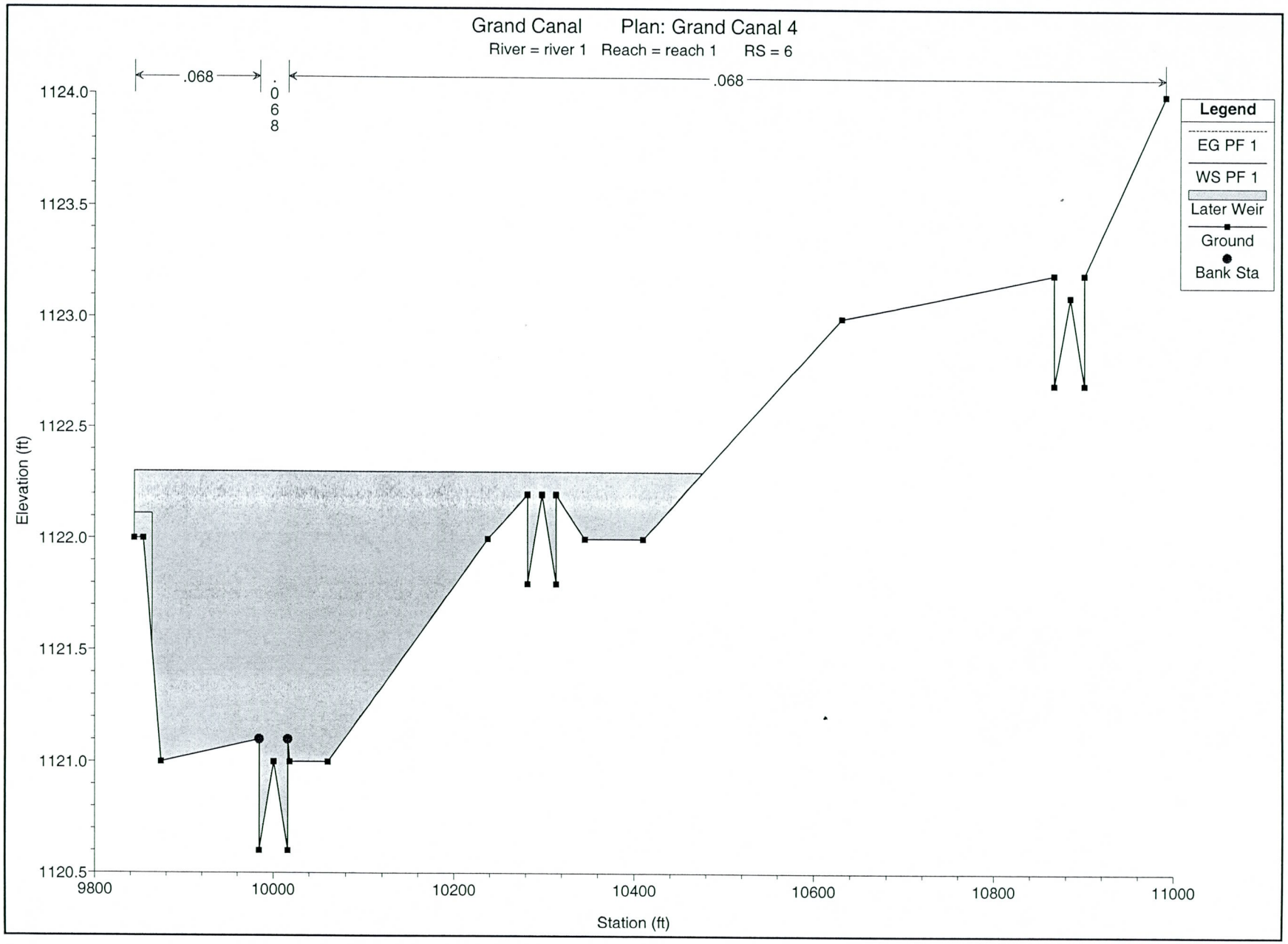
10400
10600
10800
11000
Station (ft)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.068
.068
Legend
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WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
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1123.5
1123.0
1122.5
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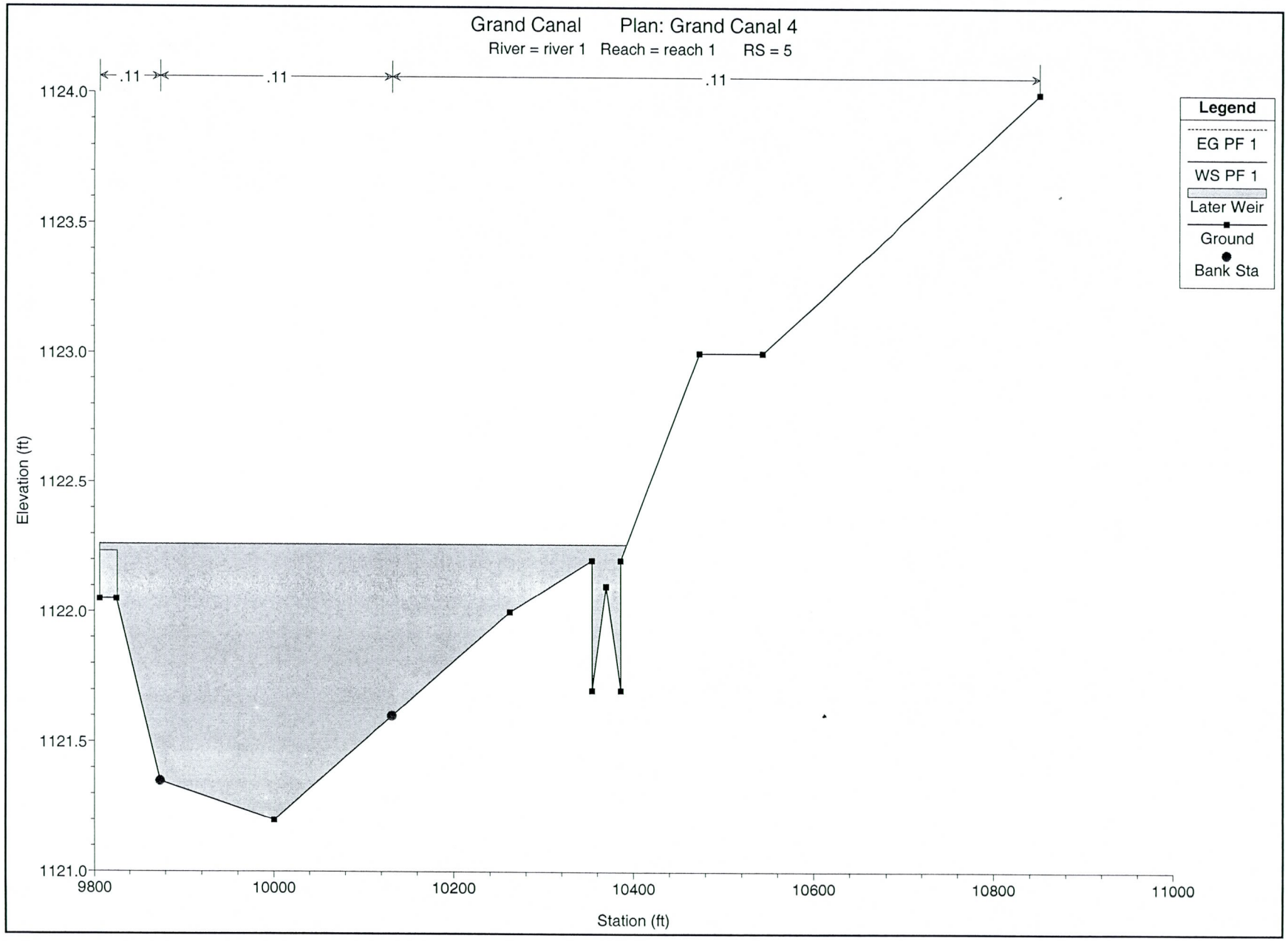
10200
10400
10600
10800
11000
Station (ft)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.11
.11
.11
Legend
EG PF 1
WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
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1123.5
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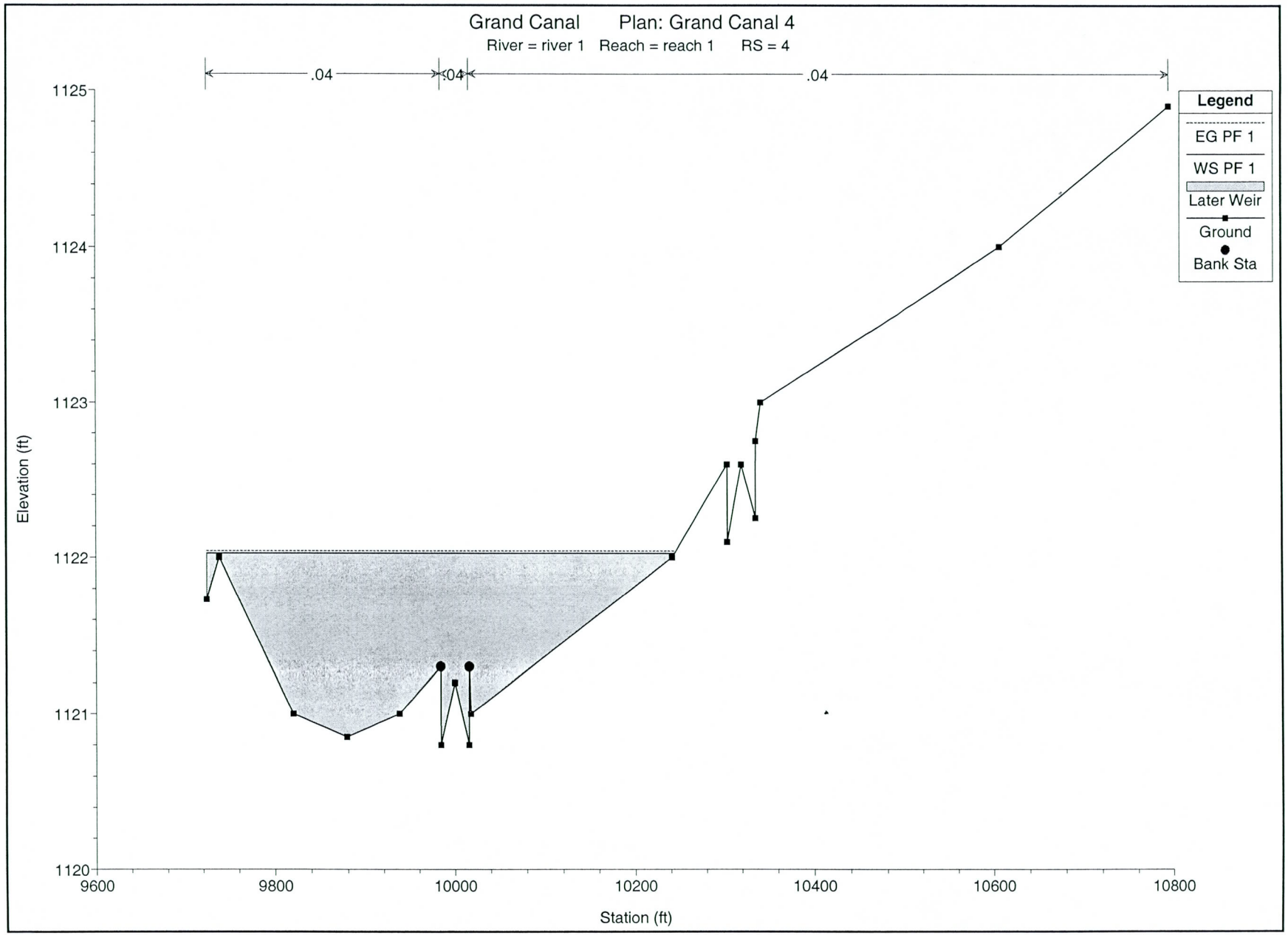
10600
10800
11000
Station (ft)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.04
.04
Legend
EG PF 1
WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
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1123
1122
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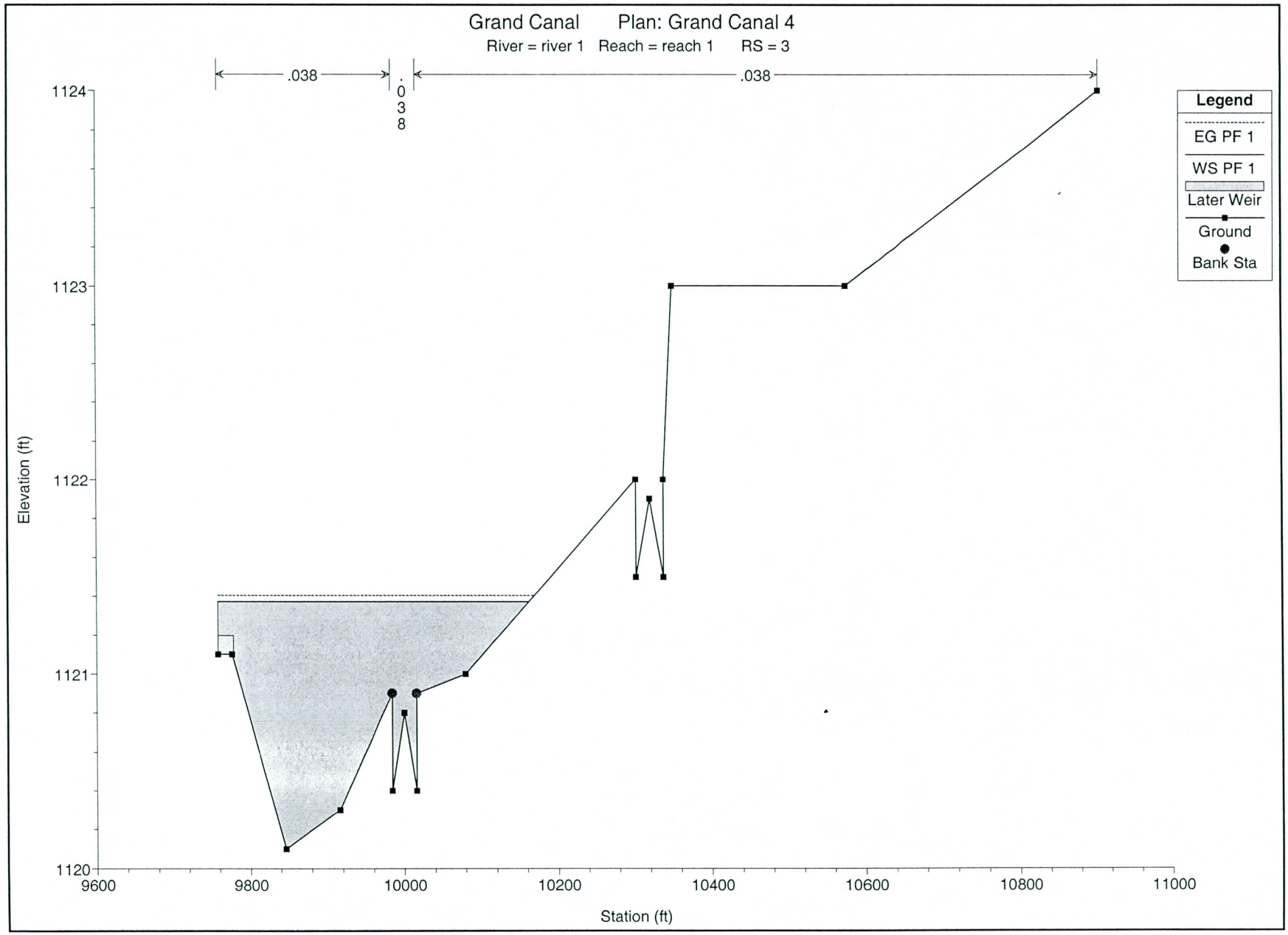
1120
9600
9800
10000
10200
10400
10600
10800
Station (ft)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.038
.038
Legend
EG PF 1
WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
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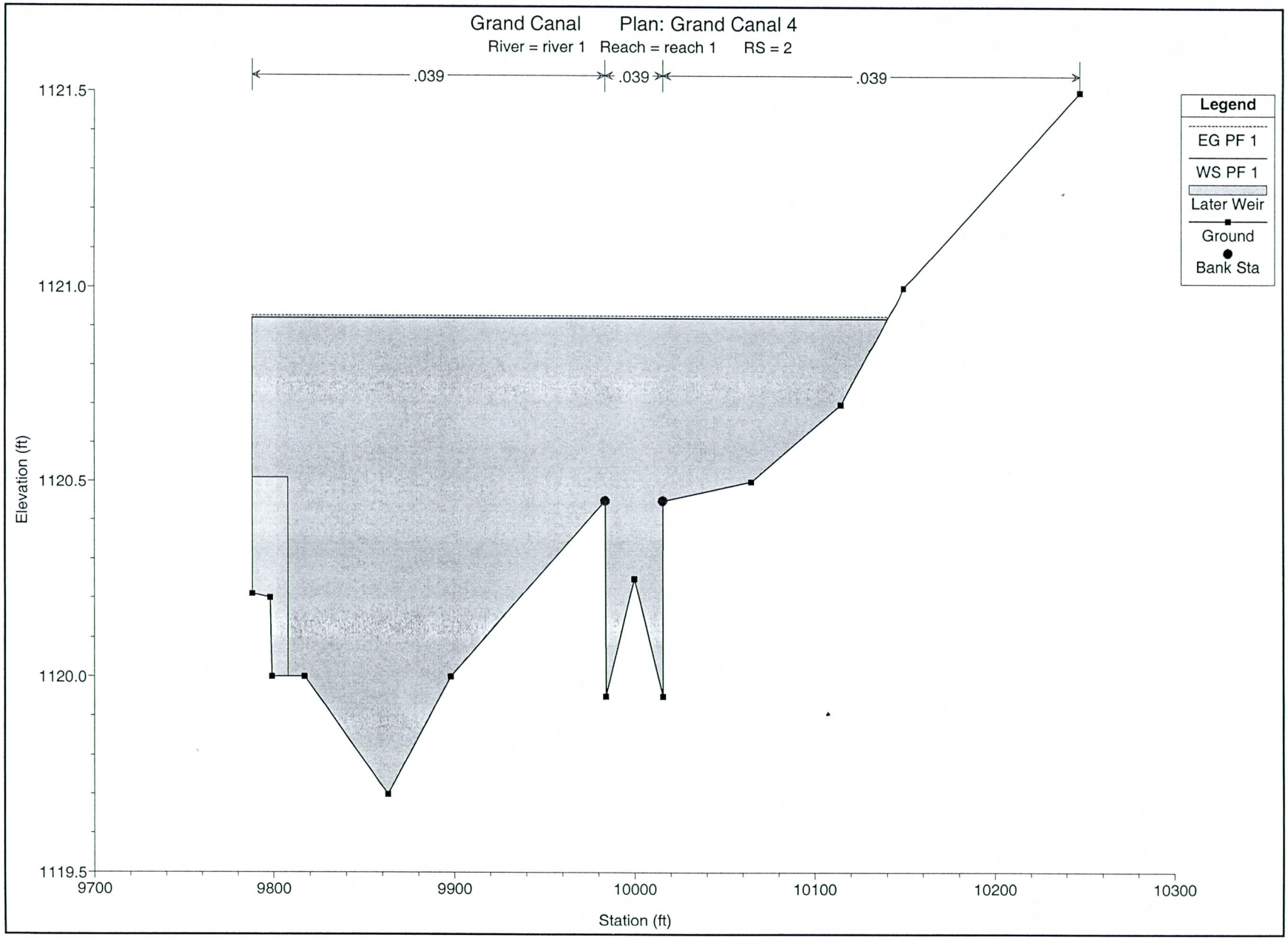
10600
10800
11000
Station (ft)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.039
.039
Legend
EG PF 1
WS PF 1
Later Weir
Ground
Bank Sta
Elevation (ft)
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1121.0
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1120.0
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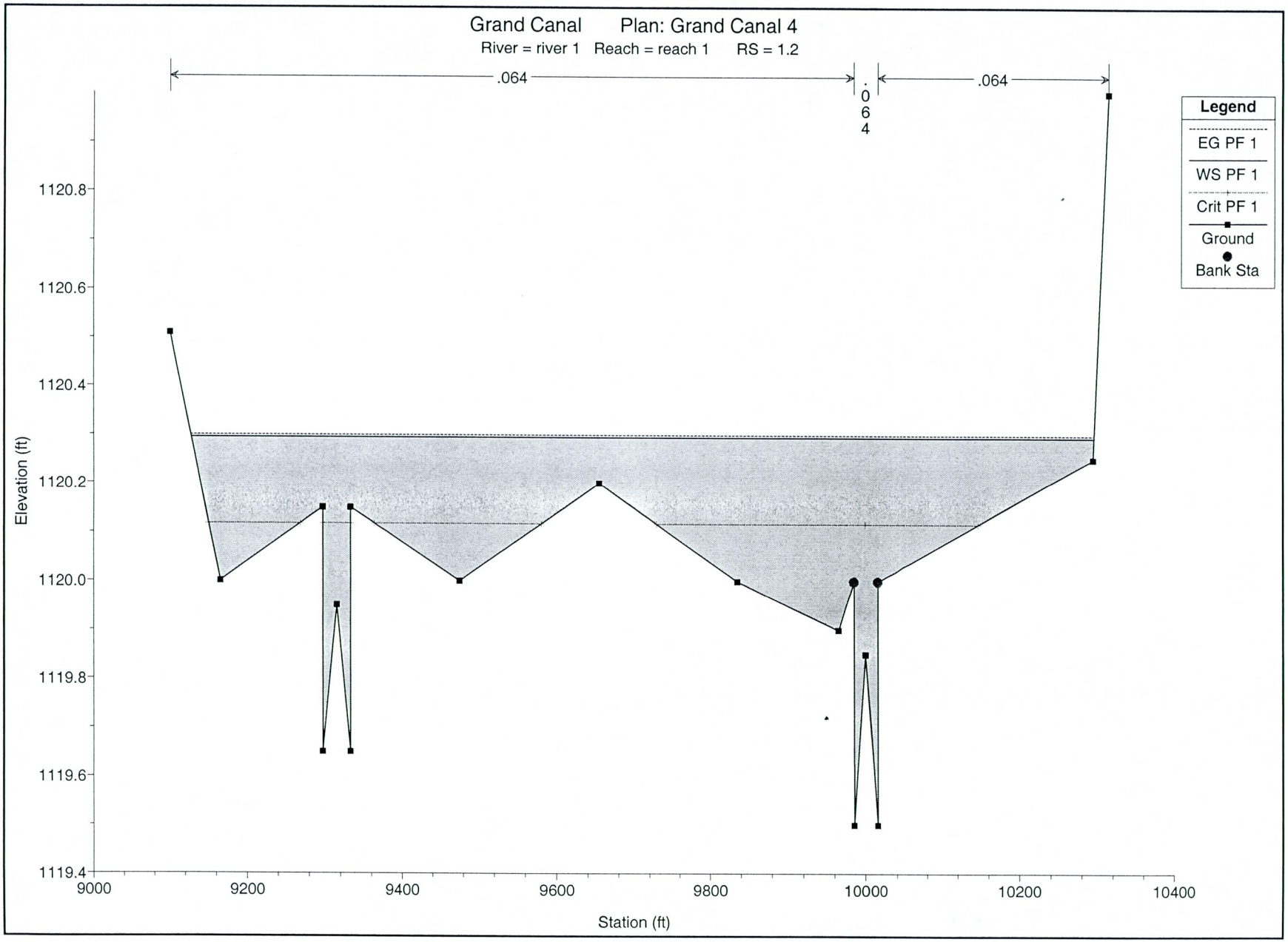
9800
9900
10000
10100
10200
10300
Station (ft)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.064
.064
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
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1120.6
1120.4
1120.2
1120.0
1119.8
1119.6
1119.4
9000
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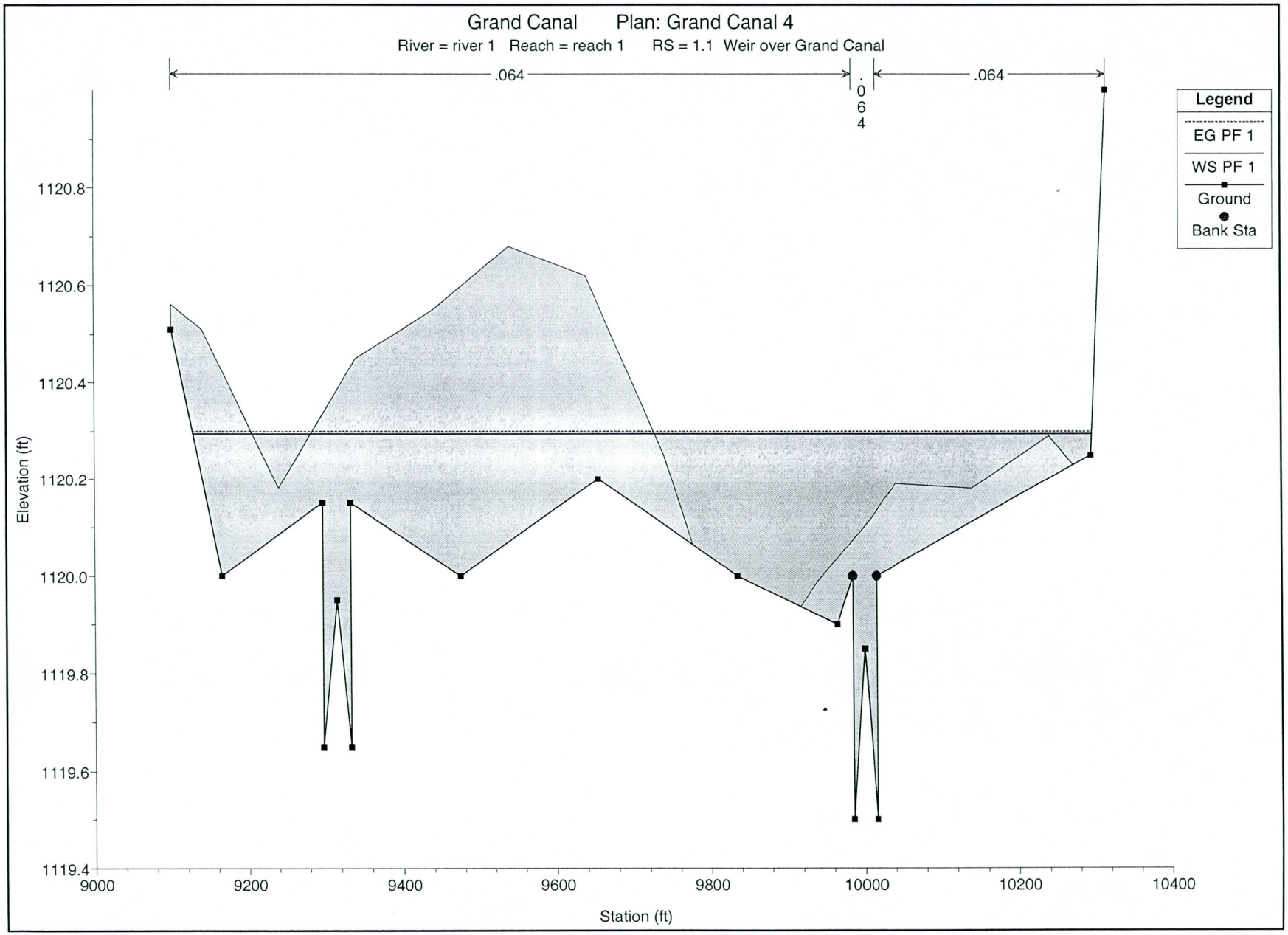
10000
10200
10400
Station (ft)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River = river 1 Reach = reach 1 RS = 1.1 Weir over Grand Canal
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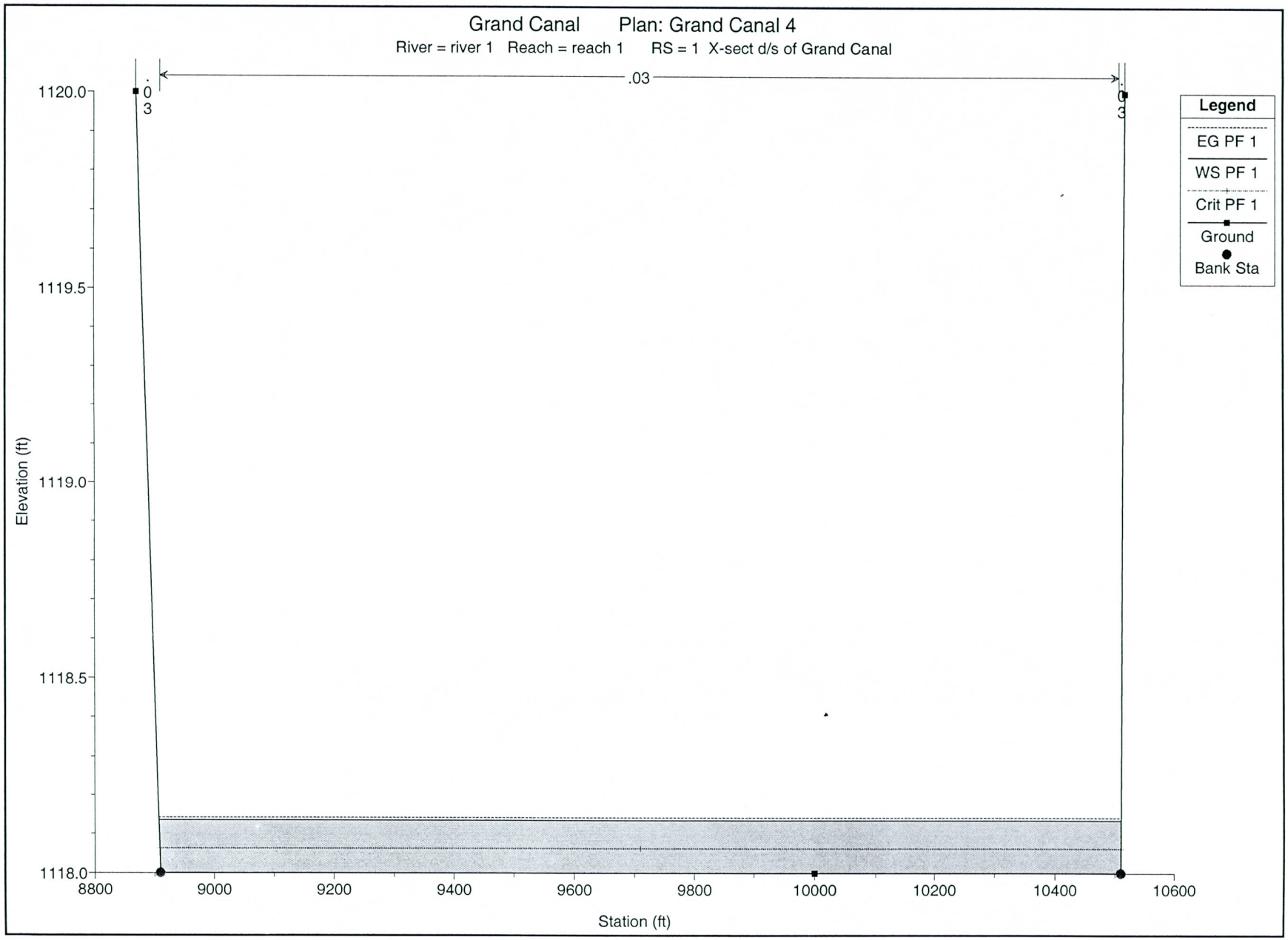
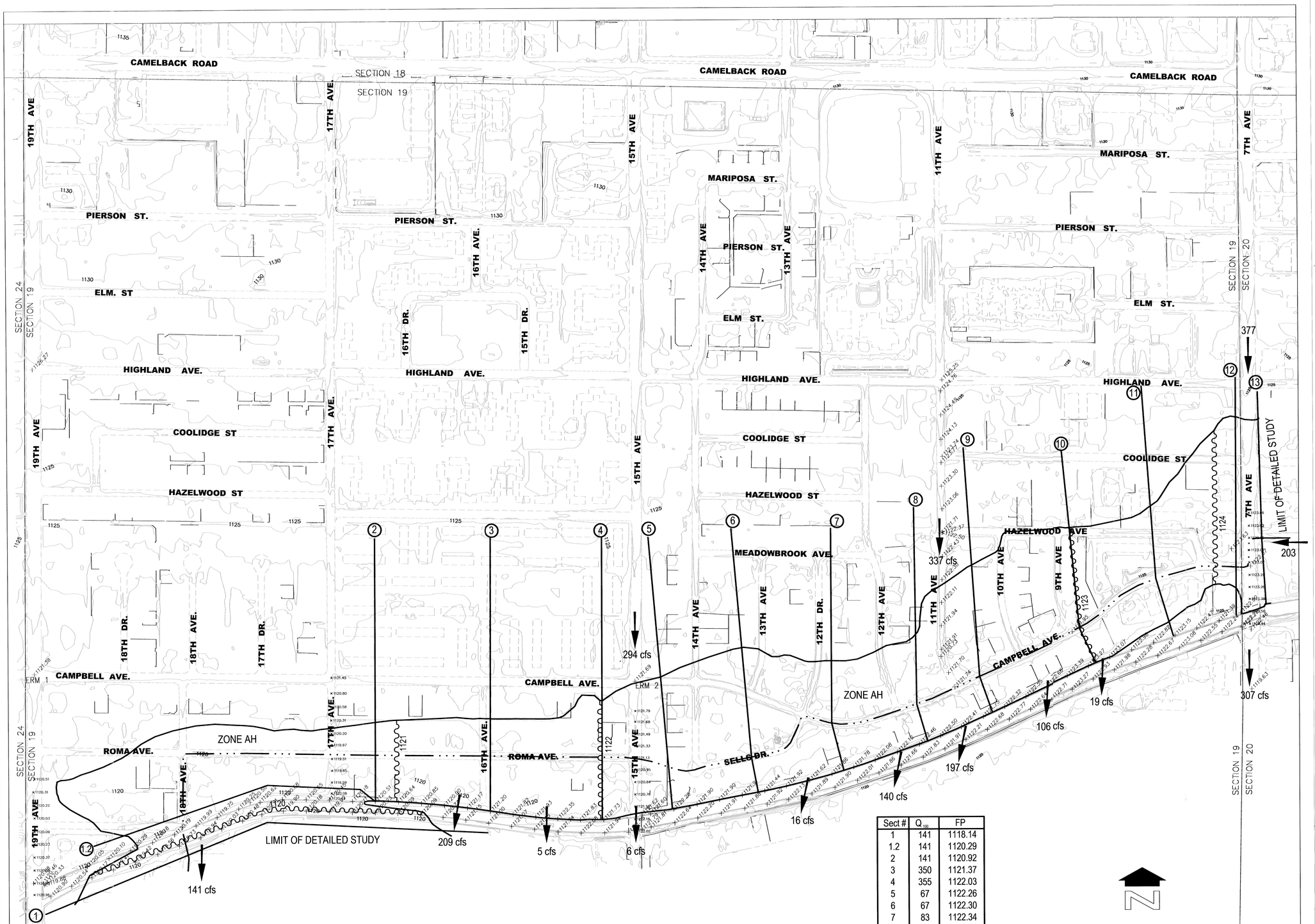
.064
.064
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1120.8
1120.6
1120.4
1120.2
1120.0
1119.8
1119.6
1119.4
9000
9200
9400
9600
9800
10000
10200
10400
Station (ft)


Grand Canal Plan: Grand Canal 4
River = river 1 Reach = reach 1 RS = 1 X-sect d/s of Grand Canal
.03
.03
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1120.0
1119.5
1119.0
1118.5
1118.0
8800
9000
9200
9400
9600
9800
10000
10200
10400
10600
Station (ft)



Sect #	Q_{100}	FP
1	141	1118.14
1.2	141	1120.29
2	141	1120.92
3	350	1121.37
4	355	1122.03
5	67	1122.26
6	67	1122.30
7	83	1122.34
8	223	1122.62
9	83	1122.78
10	189	1122.98
11	208	1123.46
12	208	1124.18
13	515	1124.29

THE MAPPING FOR THIS PROJECT WAS RECEIVED IN DIGITAL FORMAT FROM THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY. NGVD 1929 DATUM WITH 1' CONTOUR INTERVAL.

200 0' 200 400

SCALE: 1"= 200 FEET
CONTOUR INTERVAL = 1 FOOT

LEGEND

100-YR FLOODPLAIN BOUNDARY

HYDRAULIC BASE LINE

CROSS SECTION NO. (6) — FP= 1122.30 (FLOODPLAIN WATER SURFACE ELEVATION); Q_{100} = 67 CFS (100 YEAR DISCHARGE)

ELEVATION REFERENCE MARK — ERM 1

BASE FLOOD ELEVATIONS — 1121

ZONE DESIGNATIONS — ZONE AH

100-YR DISCHARGE (cfs) — 377

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NO.	ELEVATION (FT)	DESCRIPTION/LOCATION
1	1121.38	BRASS CAP SURVEY MONUMENT IN HAND HOLE AT THE INTERSECTION OF CAMPBELL AND 19TH AVENUE. NGVD 1929 N: 910,363.75 E: 444,399.97
2	1121.69	BRASS CAP SURVEY MONUMENT IN HAND HOLE AT THE INTERSECTION OF CAMPBELL AND 15TH AVENUE. NGVD 1929 N: 910,319.27 E: 447,025.23

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000.

NO.	REVISION	BY	DATE
2			
1			

Grand Canal Floodplain Delineation

(Between 7th Avenue and 19th Avenue)

C.O.P. PROJECT NO. ST83130143

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 37890 LLOYD A. VICK Date Signed 12/16/02 ARIZONA, U.S.A.

eec
Engineering and Environmental Consultants, Inc.
3003 N. Central Avenue, Suite 600
Phoenix, Arizona 85012-2905
TEL:(602)248-7702 FAX:(602)248-7851

	BY	DATE
DESIGN	LAV	10/11/02
DESIGN CHK.	MTG	10/11/02
PLANS	—	—
PLANS CHK.	—	—

SHEET 1 OF 1

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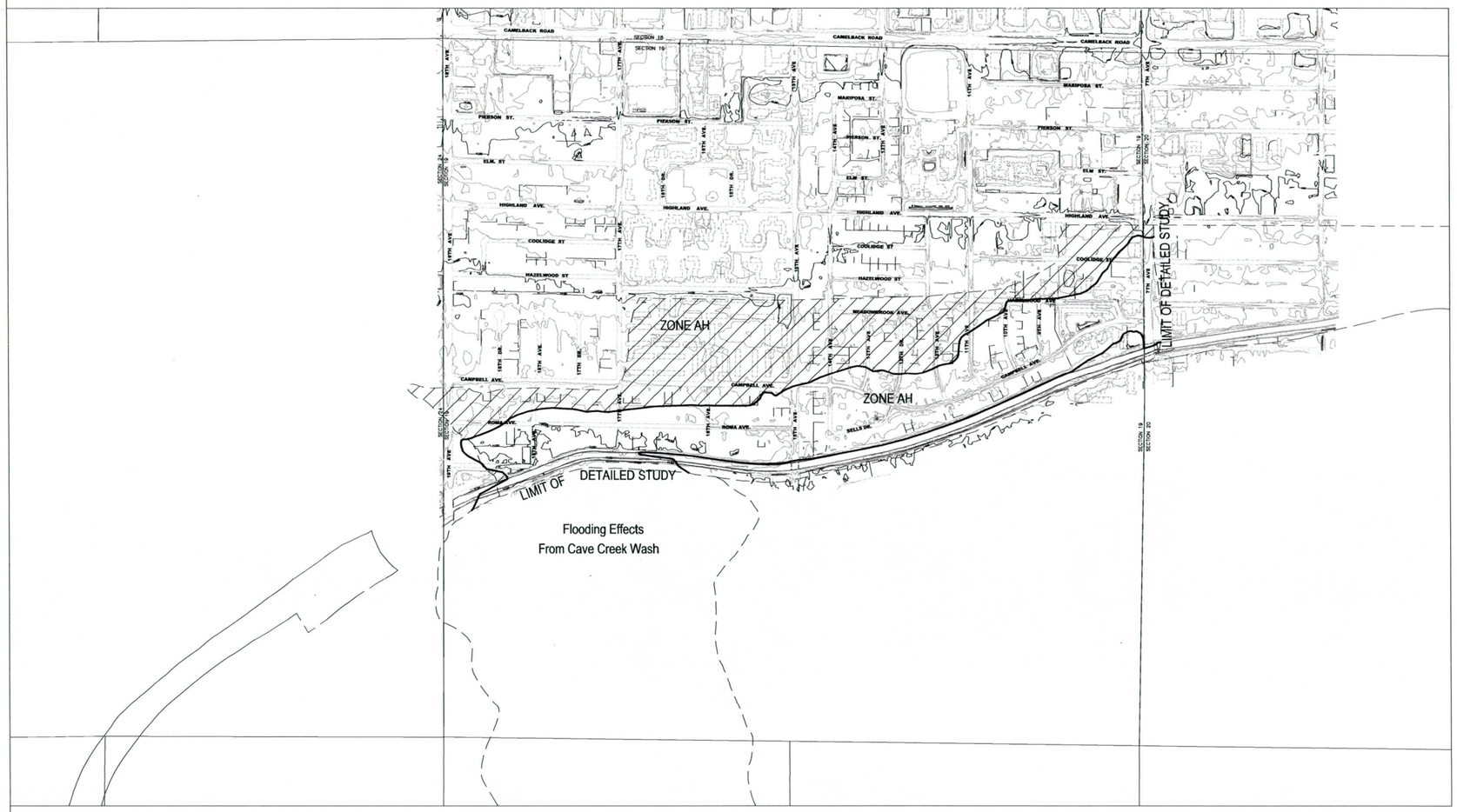
REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM589	1123.[illegible]	Chiseled 3- by 3-inch + back of concrete sidewalk at southwest corner of SRP canal bridge abutment where the canal crosses 7th Avenue, approximately 300 feet north of Campbell Avenue.
RM590	1121.54	Top northeast corner of metal base plate on a 2- by 2-foot concrete pad for a traffic signal light pole, 0.3 foot above concrete walk, at northwest corner of 19th and Campbell Avenues, approximately 50 feet north of the centerline of Campbell Avenue, and approximately 32 feet west of the centerline of 19th Avenue and 8 feet west of the opposite N curb return.
RM591	1129.85	Chiseled 3- by 3-inch + in concrete sidewalk at northeast corner of 5- by 9-foot irrigation box at northwest corner of 7th Avenue and Camelback Road, approximately 55 feet west of the centerline of 7th Avenue and approximately 80 feet north of the centerline of Camelback Road.
RM592	1132.[illegible]	Cross cap stamped S.R.V.W.U.A., benchmark location, Engineering Department, set on the top, center of the 0.5-foot thick, southeast wall of a 4- by 8-foot concrete irrigation box, 1.4 feet above natural ground, at the southwest corner of 15th Avenue and Camelback Road approximately 50 feet south of the centerline of Camelback Road and approximately 40 feet west of the centerline of 15th Avenue.
RM593	1145.5[illegible]	Cross cap stamped S.R.V.W.U.A., benchmark location, Engineering Department, set on the top, center of the 0.5-foot thick, southeast wall of a 4- by 8-foot concrete irrigation box, 1.4 feet above natural ground, at the southwest corner of 19th Avenue and Missouri Avenue, approximately 45 feet south of the centerline of Missouri Avenue and approximately 60 feet west of the centerline of 19th Avenue.
RM594	[illegible]	Top northwest corner of metal base plate on leg of a traffic signal pole on concrete and fa[illegible] concrete pad, 0.3 foot above concrete walk, at southwest corner of North 19th Avenue and Home Road, approximately [illegible] feet south of the centerline of Bethany Home Road and approximately 68 feet west of the centerline of 19th Avenue and 6 feet south of the curb return.
RM595	[illegible]	Cross cap stamped S.R.V.W.U.A., benchmark location, Engineering Department, on the top, center of the 0.5-foot thick south wall of a 4- by 4-foot concrete irrigation box, 1.2 feet above ground, at southwest corner of 19th and Glendale Avenues, approximately 28 feet west of the centerline of 19th Avenue and approximately 62 feet south of the centerline of Glendale Avenue.
RM596	[illegible]	Top of [illegible] head cap on [illegible] at intersection of 7th and [illegible] Avenues, 0.45 foot above grade.
RM597	[illegible]	Chiseled [illegible] by 2-inch + on concrete corner of a 2- by 2-foot concrete pad for a traffic signal pole, that is flush with concrete walk, on northwest corner of 19th and Northern Avenues, approximately 44 feet north of the centerline of Northern Avenue and approximately 63 feet west of the centerline of 19th Avenue and approximately 75 feet north of the curb return.

THE ARIZONA CANAL DIVERSION CHANNEL
ARIZONA CANAL DIVERSION CHANNEL
ZONE AE
Tenth Street Wash
Arizona Canal
CITY OF PHOENIX
040051
ZONE X
ZONE A
ZONE AH
RM589
RM590
RM591
RM592
RM593
RM594
RM595
RM596
RM597
GLENDALE AVENUE
LAMAR RD
MINNEZONA AVE
CAMPBELL
ROSE LANE
OREGON
MEDLOCK DRIVE
PASADENA AVE
CAMELBACK ROAD
COOLIDGE STREET
Remove Hatched Area From 100-yr Floodplain
NEW 100-yr Floodplain Boundary
Grand Canal Loop
FOOTHILL DRIVE
FOOTHILL DRIVE
FOOTHILL DRIVE



LEGEND

EXISTING 100-YR FLOODPLAIN BOUNDARY

NEW 100-YR FLOODPLAIN BOUNDARY

ZONE DESIGNATIONS — ZONE AH

AREA TO BE REMOVED FROM 100-YR FLOODPLAIN

1000 0' 1000 2000

SCALE: 1"= 1000 FEET

CONTOUR INTERVAL = 1 FOOT

Annotated FIRM - Grand Canal

(Between 7th Avenue and 19th Avenue)

MAP NO. 04013C1665 H

C.O.P. PROJECT NO. ST83130143

eec
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	BY	DATE
DESIGN	LAV	12/11/02
DESIGN CHK.	MTG	12/11/02
PLANS	—	—
PLANS CHK.	—	—

SHEET 1 OF 1

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