FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA

10TH STREET WASH
REQUEST FOR LOMR
FCD 96-12

TECHNICAL DATA NOTEBOOK

WEST CONSULTANTS, INC.
PHOENIX, ARIZONA

JUNE 1997

Federal Emergency Management Agency

Washington, D.C. 20472

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 97-09-1212P

The Honorable Skip Rimsza
Mayor, City of Phoenix
200 West Washington Street
Phoenix, Arizona 85003-1611

Community: City of Phoenix, Arizona
Community No.: 040051
Panels Affected: 04013C1655 H, 1660 F, 1665 G, and 1670 E

Effective Date of This Revision: FEB 03 1998

102-I-A-C

Dear Mayor Rimsza:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated September 24, 1997, Kofi Awumah, Ph.D., P.E., Engineering Division, Flood Control District of Maricopa County, requested that FEMA revise the FIRM and FIS report to show the effects of revised hydrology as a result of construction of two detention basins and updated topographic information along Tenth Street Wash from just upstream of the Arizona Canal Diversion Channel to just downstream of Cheryl Drive.

All data required to complete our review of this request were submitted with letters from Dr. Awumah.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and FIS report. We have revised the FIRM and FIS report to modify the elevations and floodplain and floodway boundary delineations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) along Tenth Street Wash. As a result of the modifications, the base flood elevations (BFEs) for Tenth Street Wash increased in some areas and decreased in other areas; the width of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, increased in some areas and decreased in other areas; and the width of the regulatory floodway increased in some areas and decreased in other areas. The modifications are shown on the enclosed annotated copies of FIRM Panel(s) 04013C1655 H, 04013C1660 F, 04013C1665 G, and 04013C1670 E; Profile Panel(s) 336P and 337P; and affected portions of the Summary of Discharges Table and Floodway Data Table. This Letter of Map Revision (LOMR) hereby revises the above-referenced panel(s) of the effective FIRM and the affected portions of the FIS report, both dated September 30, 1995.

The modifications are effective as of the date shown above. The map panel(s) as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Just upstream of Arizona Canal Diversion Channel	1,242	1,237
Just downstream of Cheryl Drive	1,309	1,311

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

Public notification of the proposed modified BFEs will be given in *The Arizona Republic* on or about February 20 and February 27, 1998. A copy of this notification is enclosed. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in *The Arizona Republic*, a citizen may request that FEMA reconsider the determination made by this LOMR. Any request for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs presented in this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

We are processing a revised FIRM and FIS report for Maricopa County; therefore, we will not physically revise and republish the FIRM and FIS report for your community to incorporate the modifications made by this LOMR at this time. Preliminary copies of the FIRM and FIS report were submitted to your community for review on December 24, 1997. We will incorporate the modifications made by this LOMR into the FIRM and FIS report before they become effective.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development, and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C.

4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

A Consultation Coordination Officer (CCO) has been designated to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Dorothy M. Lacey
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
The Presidio of San Francisco, Building 105
San Francisco, California 94129-1250
(415) 923-7177

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the CCO for your community at the telephone number cited above. If you have any technical questions regarding this LOMR, please contact Mr. Mike Grimm of our staff in Washington, DC, either by telephone at (202) 646-2878 or by facsimile at (202) 646-4596.

Sincerely,

Frederick H. Sharrocks, Jr., Chief
Hazard Identification Branch
Mitigation Directorate

Enclosure(s)

cc: Mr. Raymond U. Acuña, P.E.
Floodplain Manager
City of Phoenix Street
Transportation Department

Kofi Awumah, Ph.D., P.E.
Engineering Division
Flood Control District of
Maricopa County

CHANGES ARE MADE IN DETERMINATIONS OF BASE FLOOD ELEVATIONS FOR THE CITY OF PHOENIX, MARICOPA COUNTY, ARIZONA, UNDER THE NATIONAL FLOOD INSURANCE PROGRAM

On September 30, 1995, the Federal Emergency Management Agency identified Special Flood Hazard Areas (SFHAs) in the City of Phoenix, Maricopa County, Arizona, through issuance of a Flood Insurance Rate Map (FIRM). The Mitigation Directorate has determined that modification of the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for certain locations in this community is appropriate. The modified base flood elevations (BFEs) revise the FIRM for the community.

The changes are being made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65.

A hydraulic analysis was performed to incorporate revised hydrology as a result of construction of two detention basins and updated topographic information and has resulted in a revised delineation of the regulatory floodway, increases and decreases in SFHA width, and increased and decreased BFEs for Tenth Street Wash from just upstream of the Arizona Canal Diversion Channel to just downstream of Cheryl Drive. The table below indicates existing and modified BFEs for selected locations along the affected lengths of the flooding source(s) cited above.

Location	Existing BFE (feet)*	Modified BFE (feet)*
Just upstream of Arizona Canal Diversion Channel	1,242	1,237
Just downstream of Cheryl Drive	1,309	1,311

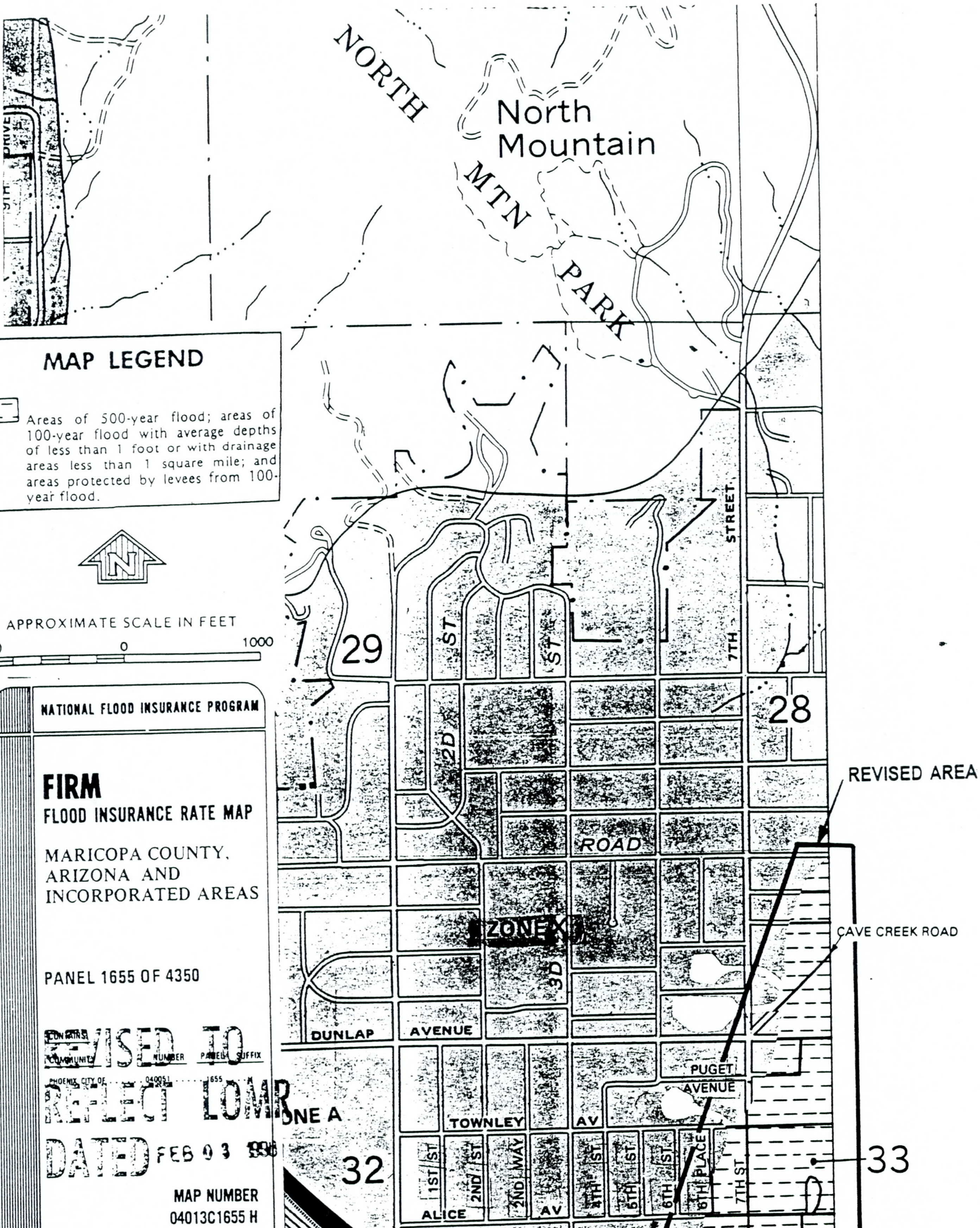
*National Geodetic Vertical Datum, rounded to nearest whole foot

Under the above-mentioned Acts of 1968 and 1973, the Mitigation Directorate must develop criteria for floodplain management. To participate in the National Flood Insurance Program (NFIP), the community must use the modified BFEs to administer the floodplain management measures of the NFIP. These modified BFEs will also be used to calculate the appropriate flood insurance premium rates for new buildings and their contents and for the second layer of insurance on existing buildings and contents.

Upon the second publication of notice of these changes in this newspaper, any person has 90 days in which he or she can request, through the Chief Executive Officer of the community, that the Mitigation Directorate reconsider the determination. Any request for reconsideration must be based on knowledge of changed conditions or new scientific or technical data. All interested parties are on notice that until the 90-day period elapses, the Mitigation Directorate's determination to modify the BFEs may itself be changed.

Any person having knowledge or wishing to comment on these changes should immediately notify:

The Honorable Skip Rimsza
Mayor, City of Phoenix
200 West Washington Street
Phoenix, Arizona 85003-1611



MAP LEGEND

Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

N

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1655 OF 4350

CONTAINS:

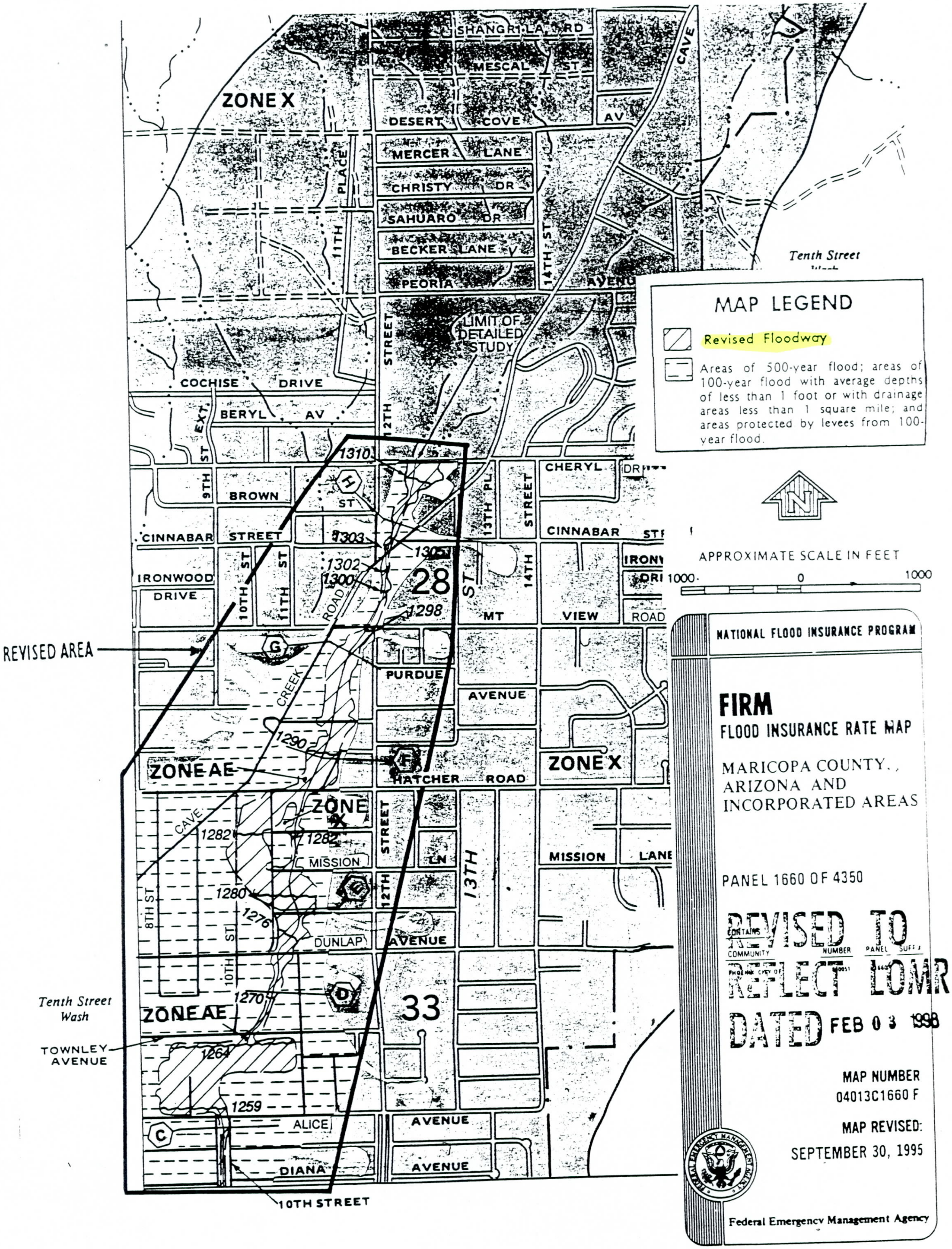
COMMUNITY	NUMBER	PANEL	SUFFIX
PHOENIX, CITY OF	040051	1655	H

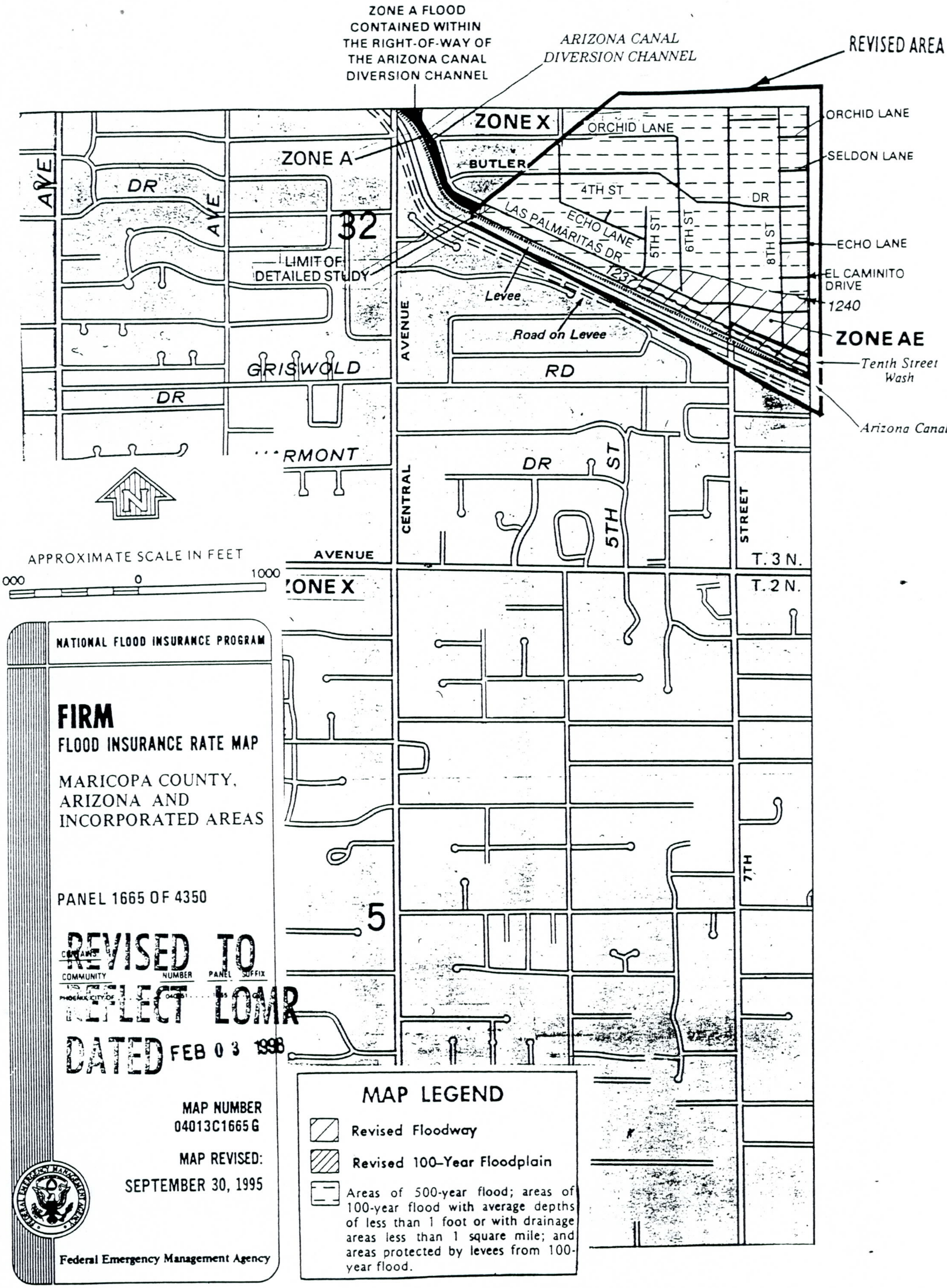
REVISED TO REFLECT LOMR DATED FEB 03 1996

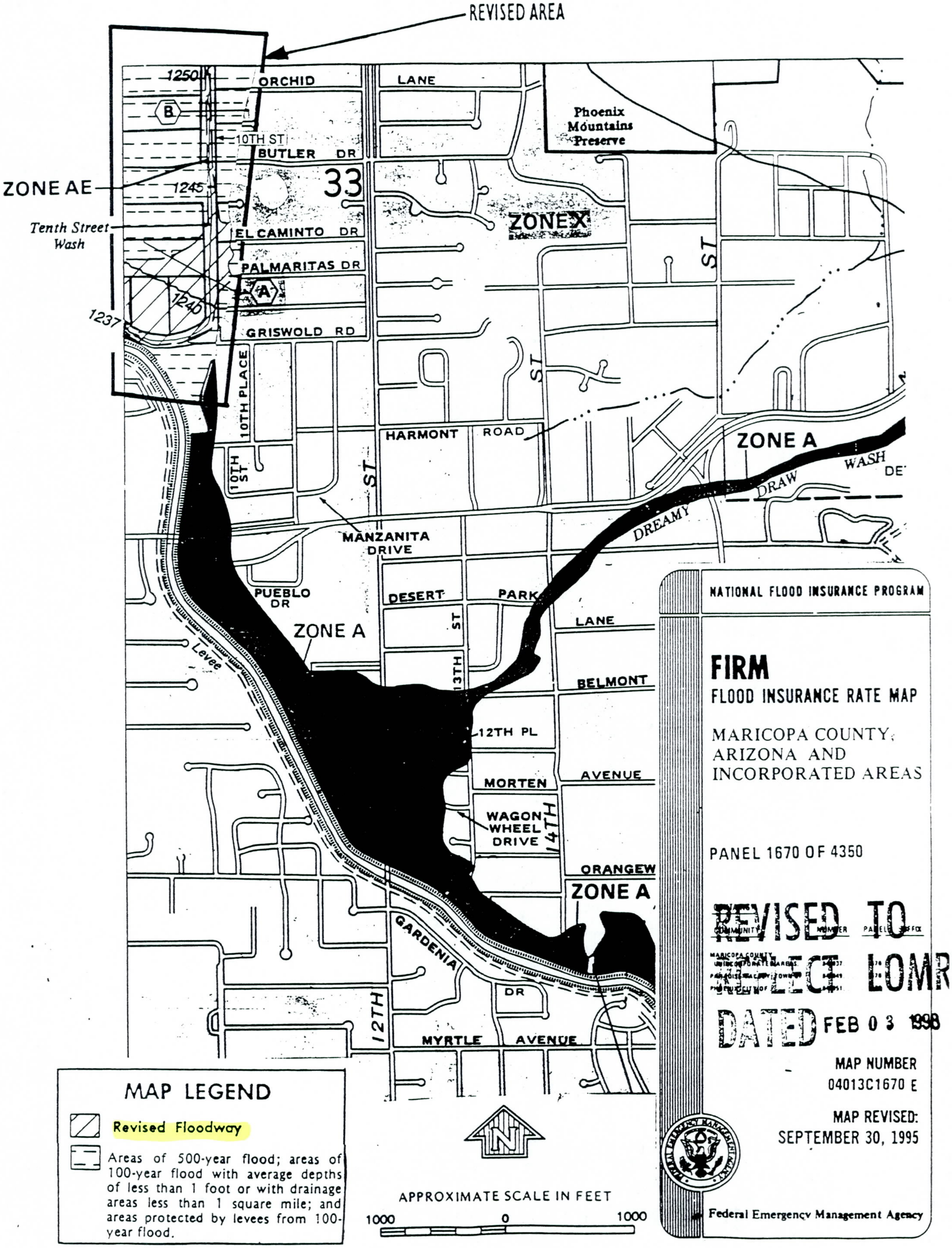
MAP NUMBER
04013C1655 H

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency


ZONE X
SHANGRI-LA RD
MESCAL ST
DESERT COVE AV
MERCER LANE
CHRISTY DR
SAHUARO DR
BECKER LANE
PEORIA AVENUE
11TH PLACE
12TH STREET
14TH ST
CAVE
Tenth Street Wash
LIMIT OF DETAILED STUDY
COCHISE DRIVE
BERYL AV
9TH ST EXT.
CHERYL DR
BROWN ST
CINNABAR STREET
IRONWOOD DRIVE
10TH ST
11TH ST
13TH PL.
14TH STREET
28
MT VIEW ROAD
CAVE CREEK ROAD
1310
1303
1305
1302
1300
1298
1290
1282
1280
1276
1270
1264
1259
REVISED AREA
PURDUE AVENUE
ZONE AE
HATCHER ROAD
ZONE X
MISSION LN
MISSION LANE
8TH ST
13TH
DUNLAP AVENUE
33
Tenth Street Wash
TOWNLEY AVENUE
ALICE AVENUE
DIANA AVENUE
10TH STREET
MAP LEGEND
Revised Floodway
Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.
APPROXIMATE SCALE IN FEET
1000 0 1000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS
PANEL 1660 OF 4350
REVISED TO REFLECT LOMR
DATED FEB 03 1998
MAP NUMBER
04013C1660 F
MAP REVISED:
SEPTEMBER 30, 1995
Federal Emergency Management Agency


ZONE A FLOOD CONTAINED WITHIN THE RIGHT-OF-WAY OF THE ARIZONA CANAL DIVERSION CHANNEL
ARIZONA CANAL DIVERSION CHANNEL
REVISED AREA
ZONE X
ORCHID LANE
ZONE A
BUTLER
SELDON LANE
4TH ST
DR
ECHO LANE
LAS PALMARITAS DR
5TH ST
6TH ST
8TH ST
ECHO LANE
EL CAMINITO DRIVE
1237
1240
LIMIT OF DETAILED STUDY
Levee
Road on Levee
ZONE AE
Tenth Street Wash
Arizona Canal
32
AVE
DR
AVE
GRISWOLD
RD
DR
RMONT
DR
ST
5TH
AVENUE
CENTRAL
AVENUE
STREET
7TH
T. 3 N.
T. 2 N.
APPROXIMATE SCALE IN FEET
1000
0
1000
ZONE X
5
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS
PANEL 1665 OF 4350
REVISED TO REFLECT LOMR DATED FEB 03 1998
MAP NUMBER 04013C1665 G
MAP REVISED: SEPTEMBER 30, 1995
Federal Emergency Management Agency
MAP LEGEND
Revised Floodway
Revised 100-Year Floodplain
Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.


REVISED AREA
ORCHID
LANE
10TH ST
BUTLER DR
33
ZONE AE
Tenth Street Wash
ZONE X
Phoenix Mountains Preserve
EL CAMINTO DR
PALMARITAS DR
GRISWOLD RD
10TH PLACE
HARMONT ROAD
10TH ST
ST
ZONE A
DREAMY DRAW WASH
MANZANITA DRIVE
PUEBLO DR
DESERT PARK LANE
ZONE A
Levee
13TH ST
BELMONT
12TH PL
MORTEN AVENUE
WAGON WHEEL DRIVE
14TH
ORANGEW
ZONE A
GARDENIA DR
12TH
MYRTLE AVENUE
MAP LEGEND
Revised Floodway
Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.
N
APPROXIMATE SCALE IN FEET
1000 0 1000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS
PANEL 1670 OF 4350
REVISED TO REFLECT LOMR
DATED FEB 0 3 1998
MAP NUMBER
04013C1670 E
MAP REVISED:
SEPTEMBER 30, 1995
Federal Emergency Management Agency

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA

FLOOD CONTROL DISTRICT of MARICOPA COUNTY 1959

10TH STREET WASH
REQUEST FOR LOMR
FCD 96-12

TECHNICAL DATA NOTEBOOK

WEST CONSULTANTS, INC.
PHOENIX, ARIZONA

JUNE 1997

Registered Professional Engineer (Civil)
CERTIFICATE 24349
DAVID W. WILLIAMS
Date Signed 2/23/98
ARIZONA U.S.A.

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TECHNICAL DATA NOTEBOOK

LIST OF APPENDICES
(following text)

LIST OF EXHIBITS

SECTION 1: GENERAL DOCUMENTATION AND CORRESPONDENCE

1.2 Contact (Telephone) Reports

Enclosed in Appendix A.

1.3 Meeting Minutes or Reports

Enclosed in Appendix B.

1.4 General Correspondence

1.4.7 Copy of public notices

Enclosed in Appendix C.

1.5 Contract Documents (Scope of Work, not financial documents).

Enclosed in Appendix D.

SECTION 2: MAPPING AND SURVEY INFORMATION

2.1 Description of mapping, map control and any other survey information used in study.

Mapping for this study came from two different sources, herein referred to as ACDC topo and DMJM topo. The ACDC topo is 1" = 400' scale with a 2' contour interval and was developed from aerial mapping flown on November 15, 1990. This topography was developed for the hydrology study by Kaminski-Hubbard Engineering, Inc. (see report in Appendix L). Horizontal and vertical control for this mapping was surveyed by Kaminski-Hubbard Engineering, Inc. on January 9, 1991. The DMJM topo is 1" = 200' scale with a 1' contour interval and was developed from aerial mapping flown on February 15, 1994. This topography was developed for the 10th Street Wash Feasibility Study by Daniel, Mann, Johnson, & Mendenhall (DMJM). Horizontal and vertical control for this mapping was surveyed by Collins-Pina Consulting Engineers, Inc. on March 10, 1994.

The two topography files were provided by the Flood Control District of Maricopa County (DISTRICT) in digital format for use in this study.

2.2 Index of maps.

Not included.

2.3 Survey field notes.

Enclosed in Appendix E.

2.4 Watershed maps, hydrologic analysis maps.

A map showing revisions by WEST to the watershed boundaries for basin 143 is enclosed in Appendix F. For further data under this section please refer to Appendix L.

2.5 Hydraulic analysis maps.

Enclosed in Appendix G.

2.6 FIRM, FHBM draft maps.

Enclosed in Appendix H.

2.7 Community maps.

Copies of the current effective FIRM panels are included in Appendix I.

SECTION 3: HYDROLOGIC ANALYSIS

3.1 Method description.

The hydrology for this study was developed using the U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package, Version 4.0.3E dated June 1992. The effective FIS was developed by Yost and Gardner Engineers for FEMA in 1975. This study considered Detention Basin No. 3 in Phoenix Mountain Preserve. A new HEC-1 model was developed by Kaminski-Hubbard Engineering, Inc. as part of the Arizona Canal Diversion Channel Area Drainage Master Study in June 1992. It was then modified to include Detention Basin No. 1 by Stanley Consultants, Inc. in March 1995. Then, in June 1995, Rust Environment & Infrastructure modified the model used by Stanley Consultants, Inc. to include Detention Basin No. 2. Pertinent sections from the studies by Stanley Consultants, Inc. and Rust Environment & Infrastructure are included in Appendicies J and K, respectively. The entire report by Kaminski-Hubbard Engineering, Inc. is included in Appendix L.

3.2 Parameter estimation.

Refer to Appendix L, pages 8 through 13, for responses to the following sections: 3.2.1 Drainage area boundaries, 3.2.2 Physical parameters, and 3.2.4 Precipitation.

3.2.1 Drainage area boundaries

A vicinity map showing the entire watershed is shown in Appendix L, page 3. A drainage area map for the subbasins is displayed in Appendix L, Section VII of the report's appendix, plate 1. The only change made to the existing hydrology for the current study was to subdivide basin 143 into four subbasins: 143A, 143B, 143C, and 143D. The drainage area boundaries for these subbasins are shown in Appendix F.

3.2.2 Physical parameters

Green-Ampt & land use parameters, hydrologic subbasin characteristics, and hydrograph routing parameters are included in Appendix L, Sections II through IV of the report's appendix.

3.2.3 Statistical parameters

3.2.4 Precipitation

3.5 Final results/computer runs.

HEC-1 input and output files are included in Appendix M.

3.6 Final modeling results on diskette(s).

SECTION 4: HYDRAULIC ANALYSIS

4.1 Method description.

10th Street Wash, located in Phoenix, Arizona, is a natural stream that drains a 2.84 mi^2 watershed. The length of 10th Street Wash between the study limits of the Arizona Canal Diversion Channel (ACDC) in the south and Cheryl Drive in the north is about 1.66 miles. Detention Basin No. 1 is just upstream of the Cheryl Drive, the northern limit of this study. Detention Basin No. 2 is located along 10th Street Wash between Alice Avenue in the south at river mile 0.57 and Townley Avenue in the north at river mile 0.72. The detention basin is a two basin design with Detention Basin No. 2a on the east side of the wash and Detention Basin No. 2b on the west, which is designed to function only when the east basin is full. Basin No 3 further upstream, in the Phoenix Mountain Preserve has already been accounted in the Effecive FIS and the hydrology by Kaminski-Hubbard Engineering, Inc. as part of the Arizona Canal Diversion Channel Area Drainage Master Study in June 1992.

The scope of this study specifies the use of the U.S. Army Corps of Engineers HEC-RAS River Analysis System, Version 1.2 dated April 1996. However, after digitizing cross sections and making preliminary hydraulics runs, it was determined that split flow was a factor to be considered. Since split flow is not supported by HEC-RAS, the following programs were also used in the hydraulic analysis to supplement the HEC-RAS analysis,: U.S. Army Corps of Engineers HEC-2 Water Surface Profiles, Version 4.6.2 dated May 1991, and U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package, Version 4.0.3E dated June 1992. The following sections describe each of the three models in further detail.

4.1.1 HEC-RAS

4.1.1.1 Cross Section Geometry

Cross sections were developed from digital topography provided by the DISTRICT. Two topo files were combined in AutoCAD such that the DMJM topo (1"=200' scale with 1' contours) was used upstream of Alice Avenue, and the ACDC topo (1"=400' scale with 2' contours) was used downstream of Alice Avenue. The DMJM topo did not extend far enough into the overbank, so it was supplemented with the ACDC topo. The topography match lines are shown on the work maps in Appendix G.

The split flow analysis was very sensitive to top of bank elevations, so an elevation was interpolated between contours for some cross sections.

The construction of Detention Basin No. 2 created a unique hydraulic condition just downstream of Alice Avenue that is not reflected in the topo. There are two outlets, a 48" culvert that is located about 1 block downstream of Alice Avenue, and a double box culvert right at Alice Avenue. Flows exiting the double box culvert are delivered on top of the 48" culvert, which is encased in grouted riprap. This condition extends for one block until the 48" culvert outfall is reached, at which point natural channel conditions are restored. Refer to photos 19-23 in Appendix N. Since cross section 0.57 is located just downstream of Alice Avenue, the channel bottom was raised 48" to account for the reduced channel capacity.

4.1.1.2 Boundary Conditions

The downstream cross section 0.00 is along the rim of the Arizona Canal Diversion Channel (ACDC), therefore critical depth was specified as the downstream boundary condition.

A second boundary condition was entered just upstream of Detention Basin No. 2. This second boundary condition was necessary because it was not possible to compute backwater through Detention Basin No. 2 due to the complexity of the flood routings. Computations were halted at Alice Avenue (cross section 0.57), which is the downstream boundary of Detention Basin No. 2, and resumed at Townley Avenue (cross section 0.72), the upstream boundary of the detention basin. A level pool condition was initially assumed through the detention basin such that the water surface elevation computed at Alice Avenue could be transferred to Townley Avenue, which would then be used as the starting condition for the backwater computations. However, the transferred water surface ended up below the thalweg at Townley Avenue due to the steep slope. Further investigation showed that the reach just upstream of Townley Avenue was on a supercritical slope, so the starting condition at cross section 0.72 was specified as critical depth. This was accomplished in HEC-RAS by specifying a known water surface elevation at cross section 0.72 that was below critical depth (similar to using the X5 record in HEC-2). A value of 1264 feet was entered, and critical depth for the 100-year profile was computed as 1264.37 feet.

4.1.1.3 Effective Flow Limit Assumptions

Most of the effective flow limits in the HEC-RAS model (especially on the right overbank looking downstream) are coincident with the watershed boundary and were a part of the split flow analysis. After performing the split flow analysis, the cross sections still showed overtopping at the effective flow limit as expected. The lateral orientation of the breakout flow and the timing of the main stem hydrograph would make it impossible for all of the water above the breakout elevation to escape. Therefore, once the discharges were reduced by the split flow analysis, the computed water surface elevations were above the breakout elevation--but not more than 1 foot.

Effective flow limits were also used at road crossing dip sections and in the vicinity of geomorphic controls. See the table entitled "Description of Effective Flow Limits" in Appendix O for a detailed description of effective flow limit selection.

4.1.2 HEC-2

4.1.2.1 General

An HEC-2 model was created from HEC-RAS geometry upstream of Detention Basin No. 2 for the purpose of running a split flow analysis. The translation of columnar data from HEC-RAS into the GR format of HEC-2 was accomplished using BOSS RMS (River Modeling System) for AutoCAD. To minimize the effects of computational differences between HEC-RAS and HEC-2, the following were performed:

1) Bridge hydraulics computed in HEC-RAS were represented with a discharge-elevation rating curve at cross sections upstream and downstream of the bridges using the RC record in HEC-2.
2) The critical depth computation was set to an allowable error of 0.5% of the depth, which is similar to the default tolerance in HEC-RAS of 0.01 feet.
3) Split flow results were rounded to the nearest 20 cfs.

4.1.2.2 Split Flow Records

The normal depth split flow option was used instead of the weir flow option because the nature of the breakouts was not a sharp crest like an overtopped levee, but more of a gradual transition. Input for the normal depth option entailed an estimate of the energy grade slope, Manning's n, and cross section geometry. To estimate the energy grade slope, the ground slope was measured in the right overbank about 500 to 1000 feet downstream of the breakouts. A slope value of 0.08 was found to be a good estimate in both the upstream reaches and the downstream reaches. Manning's n equal to 0.1 was used in the overbanks, unless the breakout was along a road, in which case Manning's n equal to 0.02 was applied. The breakout reaches were measured generally parallel to the main stem flow, along either the watershed boundary or the top of bank. Additional cross sections were added in breakout reaches greater than 200 feet in length, or, if appropriate, interpolated cross sections were added. Since HEC-RAS has a unique interpolation scheme that allows for a true interpolation between cross sections, the cross sections were interpolated in HEC-RAS. If interpolated cross sections were created in HEC-RAS for use in the HEC-2 split flow model, they were later deleted from the HEC-RAS model.

4.1.2.3 Split Flow Analysis Procedure

The split flow analysis involved a number of steps and iterations as summarized below:

1) Split flow records were entered in HEC-2 for the first breakout (1.244 - 1.35).

2) HEC-2 was executed and the resulting table of main stem flow versus breakout flow was entered in HEC-1.

3) HEC-1 was executed and the resulting peak flows downstream of the breakout were compared with the peak flow reductions from HEC-2. The reductions were identical. Therefore, there was no need to iterate between HEC-1 and HEC-2 to zero in on the peak flow reduction. In addition, there was no need to enter a "table" of main stem flow versus breakout flow as described in step 3. Only the accumulated breakout flows from HEC-2 between concentration points needed to be entered in order to route the reduced flood hydrograph through Detention Basin No. 2.

4) Steps 1 and 2 were repeated for the second breakout (1.138 - 1.242).

5) Once again, the flow reductions between HEC-1 and HEC-2 were the same.

6) Steps 1 and 2 were repeated for the last breakout (0.89 - 1.136).

7) The flow reductions were the same.

8) The largest breakout flow of 580 cfs occurred between cross sections 1.07 and 1.136, in the vicinity of Cave Creek Road and Hatcher Road. An HEC-RAS model with cross sections oriented perpendicular to the breakout flowlines was created at this lateral flow area. The average flow depths (hydraulic depths) for the breakout flow from this model were found to be less than 0.5 feet. Another HEC-RAS model was created for breakout flows at cross section 0.96, due to depths greater than 1 foot at the brink. After running HEC-RAS, the average flow depths for this model were less than 0.5 feet. Details of both HEC-RAS breakout flow models are included in Appendix P.

9) 100-year flows were entered in HEC-RAS using either HEC-1 output or the split flow HEC-2 output, depending on whether there were breakouts between HEC-1 concentration points for a given reach. If there were, flows were determined from the HEC-2 ouput because it was already established in step 3 above that HEC-1 did not contribute an additional reduction in flow. Running a SUMPO table of SECNO and Q from the HEC-2 output provided a list of flows that remained in the channel at each cross section as a result of the split flow analysis. These flows were then accumulated in increments of 20 cfs, and the rounded values were entered at the appropriate cross sections in HEC-RAS. A table of the final flows used in HEC-RAS are shown in Appendix O in the table entitled "10th Street Wash Breakout Flow Summary." Downstream of Alice Avenue split flows did not occur, so HEC-RAS flows were detemined using the HEC-1 output. Flows at concentration points HC145A (El Caminito Drive) and HC145 (ACDC) were input to HEC-RAS.

10) HEC-RAS was executed and the depths at all the breakout limits on the main stem were less than 1 foot deep (see exceptions noted in step 8). Therefore, the depths outside of the breakout areas will also be less than 1 foot deep since there are no depressions to concentrate flow.

11) Proceeding downstream of the detention basin, flows were contained in bank until they reached cross section 0.16, downstream of Butler Drive. Flows at this location were overtopping the banks but not leaving the system, so the split flow option was not needed. Instead, flows were confined within effective flow limits at a maximum expansion of 2.5 to 1. The use of effective flow limits was necessary because the right overbank cross sections are aligned parallel to a given contour for over a mile. The effective flow limits at cross sections 0.01 and 0.08 were set so that the depth of flow in the overbanks for cross sections 0.01 through 0.16 did not exceed 1 foot.

12) The 100-year floodplain was delineated on a combination of 1"=200' and 1"=400' scale topography. In the right overbank where flows were breaking out as split flow and in the area downstream of Butler Drive (see step 11), the floodplain was mapped to the effective flow limit. Everywhere else, the floodplain extends to the edge of water. A table decribing such mapping decisions entitled "Decription of Floodplain Mapping Limits" is included in Appendix O.

4.1.3 HEC-1

4.1.3.1 General

The HEC-1 model used for 10th Street Wash was created by Kaminski-Hubbard Engineering, Inc., and later modified by 1) Stanley Consultants, Inc. and 2) Rust Environment & Infrastructure to add detention basins 1 and 2, respectively. To model breakout flows, it was necessary to make one more modification to the hydrology. Basin 143, which contains all cross sections upstream of Detention Basin No. 2, was divided into more than one reach so that a hydrograph would be computed at multiple locations along the basin rather than just at the outlet. Four subbasins were created: 143A, 143B, 143C, and 143D. The unit hydrograph for each subbasin (143A, 143B, etc.) was determined by applying an area weighting to the original unit hydrograph of basin 143. The "throw away volume" was also area weighted for each subbasin, and routing lengths were updated. This revised HEC-1 model reproduced the peak flows of the original model prior to the split flow analysis.

4.1.3.2 Diversions

A table of main stem flow versus breakout flow from HEC-2 was entered on DI and DQ records. Breakouts within a given subbasin, such as 143A, were accumulated to the subbasin node where they were diverted as one large flow. After learning that HEC-1 did not reduce flows any more than the HEC-2 split flow analysis, the "table" of main stem flow versus breakout flow was not necessary. To simplify, only two diversion flow values were entered in the table: 1) 0 cfs and 2) the accumulated breakout flow for the HEC-1 subbasin (143A, 143B, 143C, or 143D).

4.2 Parameter estimation.

4.2.1 Manning's N-value

Refer to the "Field Reconnaissance Report" included in Appendix N for a description of how Manning's n was selected.

4.2.2 Expansion and contraction coefficients.

The expansion and contraction coeffiecients were set at 0.1 and 0.3, respectively. These values were not changed at the bridges because neither expansion nor contraction were a factor.

4.3 Cross-section description.

4.3.1 Channel and Overbank

See section 4.1.1.1 above. Cross section plots are included in Appendix Q.

4.3.2 Bridge or Constriction

There are three bridges along 10th Street Wash within the study limits: Butler Drive at cross section 0.35, Moutain View Road at cross section 1.40, and Cave Creek Road at cross section 1.527. The structures at Mountain View Road and Cave Creek Road are double box culverts, and the structure at Butler Drive is a triple box culvert. All three structures were modeled using culvert routines in HEC-RAS. Results show that none of the structures experience weir flow, but two of the bridges, Moutain View Road and Cave Creek Road, experience pressure flow. Flows at all three structures are contained within the channel limits so there are not any contraction or expansion effects. Due to their size, as-built drawings for the bridges are included as a separate attachment to this report.

4.4 Calibration.

10th Street Wash is an ungaged watershed, therefore calibration to historic events is not possible.

4.5 Special problems/solutions.

4.5.1 Detention Basin Hydraulics

Modeling the hydraulics through Detention Basin No. 2 was not within the capabilities of HEC-RAS. Therefore, the upstream water surface elevation was based on a level pool transfer of the downstream water surface. See section 4.1.1.2 above for details.

4.5.2 Contours Parallel to Cross Sections

In the right overbank (looking downstream) of 10th Street Wash, the overbanks are predominately sloping in the downstream direction rather than toward the channel. The result is that cross sections are aligned parallel to contours in the right overbank. In a one dimensional model such as HEC-RAS, cross section plots showing the water surface elevation for such a condition need to be interpreted with caution. The cross section shows water extending out to station infinity, but obviously, the flood wave has a limited volume and duration, so the actual inundation would be much less. For 10th Street Wash, determining the actual extent of the inundation was not necessary due to a unique condition. The watershed boundry is located very close to the channel in the right overbank for many of the cross sections upstream of the detention basin. Consequently, flows overtopping this boundary take on a new flow path towards ACDC, not contributing to conveyance for 10th Street Wash. In other words, there is a split flow condition where flows do not return to the system. At a meeting with the DISTRICT, it was decided to use the split flow option in HEC-2 to quantify the flows leaving the system and in turn reduce the flow being carried downstream in the channel. In a telephone conversation with Massoud Rezakhani, FEMA Technical Advisor, we were told that areas in the overbank subject to flooding from the split flows could be designated Zone X if we could track the breakout flows and show that they were less than 1 foot deep.

Downstream of the detention basin, the contours in the right overbank were also oriented parallel to the cross section, and near the downstream end of the model the 100-year discharge was overtopping the banks. However, these overtopping flows were not leaving the system. The effective flow limits at cross sections 0.01 and 0.08 were set so that the depth of flow in the overbanks for cross sections 0.01 through 0.16 did not exceed 1 foot.

4.6 Floodway modeling.

The City of Phoenix agreed that a floodway analysis was not necessary because the areas adjacent to 10th Street Wash are fully developed.

4.7 Final results/computer runs.

HEC-RAS does not lend itself to the printing of input and output files. Therefore, the computer model itself should be consulted for such information. In its place, a Summary Printout Table is included in Appendix R. Also included are input and output listings for the split flow HEC-2 model.

4.8 Final modeling run on diskettes should include all input files.

SECTION 5: EROSION/SEDIMENT TRANSPORT ANALYSIS.

Fixed bed hydraulic modeling is used throughout the study area. Erosion along the washes is not considered, and sediment transport is not analyzed. These issues are outside the Scope of Work for this Study and are not part of this report.

SECTIONS 6: REFERENCE MATERIALS

6.1 Other published flood studies.

A study by Yost and Gardner Engineers was completed in July, 1975. However, there were no other published flood studies for 10th Street Wash taking into account the three detention basins.

6.2 Previous FEMA studies.

The effective FIS is based upon the study by Yost and Gardner Engineers in July, 1975.

6.5 References

Boss International. BOSS RMS for AutoCAD. December 1996.

Daniel, Mann, Johnson, & Mendenhall (DMJM). 10th Steet Wash Feasibility Study. August 1995.

Federal Emergency Management Agency. FEMA 37, Flood Insurance Study Guidelines and Specifications for Study Contractors. January 1995.

Kaminski-Hubbard Engineering Inc. 10th Street Wash Watershed Volume 1.9, Arizona Canal Diversion Channel Area Drainage Master Study. June 1992.

Stanley Consultants, Inc. 10th Street Wash Detention Basin No. 1 Final Design Concept Report. March 1995.

U. S. Army Corps of Engineers. HEC-1, Flood Hydrograph Package, version 4.0.3E. Hydrologic Engineering Center. Davis, CA. June 1992.

U. S. Army Corps of Engineers. HEC-2, Water Surface Profiles, version 4.6.2. Hydrologic Engineering Center. Davis, CA. May 1991.

U. S. Army Corps of Engineers. HEC-RAS, River Analysis System, version 1.2. Hydrologic Engineering Center. Davis, CA. April 1996.

U. S. Geological Survey, Water Resources Division. Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona. April 1991.

Yost and Gardner Engineers. Untitled (re: 10th Street Wash FIS). City of Phoenix Project No. ST-74248.00. July 1975.

SECTION 7: CROSS-REFERENCING AND LABELING INFORMATION

7.1 Other studies impacted.

7.2 Key to cross-section labeling.

Assignment of lettered cross sections will be left to the discretion of FEMA. The work map and profiles show all of the cross sections used in the study, measured along the channel certerline in river miles.

SECTION 8: DRAFT FIS REPORT - REVISED TEXT

A draft FIS report in the form of a data checklist per FEMA 37, Figure C, is included in Appendix S. The forms suitable for requesting a LOMR are included in Appendix T.

TELEPHONE LOG

Date: 1/8/97 Time: 8:55 AM

To: Dave Smith Firm:

From: Kofi Awumah Firm:

Phone #:

WCI:

Follow Up Date/Time

He mentioned that he located the Rust hydrology and will give it to us on Monday.

Also, he talked w/ City of Phoenix officials about a maintenance plan. They told him that they don't have a regular maintenance schedule due to difficulty in obtaining right of way permits.

He agreed that we would model the wash for existing conditions, for lack of other information.

WEST Consultants, Inc.
2111 Palomar Airport Rd., Suite 180
Carlsbad, CA 92009-1419

FAX

TO:

Kofi Awumah, Ph.D., P.E.

(602) 506-1501
(602) 506-4601 fax

DATE TIME
2/5/97 9:01

FROM:

Dave Smith

REMARKS:

Kofi,

The following table outlines our understanding of HEC-1 node locations based on Rust Environmentals latest hydrology run. Please review for accuracy--especially the location of node HC145A.

I noticed that there doesn't seem to be a flow change between Dunlap Avenue and Cheryl Drive, the upstream study limit. This means the flow of 1221 cfs at Dunlap Avenue would apply all the way to Cheryl Drive. You may want to look into splitting this reach into more than one segment.

Please advise.

Regards,
Dave Smith

If there are problems receiving this transmission please call (619) 431-8113

Number of pages including cover:	2

10th Street Wash Flow Change Locations

HEC-1 Node	Description	Q100 from HEC-1 (cfs)
HC145	ACDC	1548
HC145A	Butler Drive	1147
HC144	Alice Avenue	922
HC143	Dunlap Avenue	1221

FAX

WEST Consultants, Inc.
2111 Palomar Airport Rd., Suite 180
Carlsbad, CA 92009-1419

TO:

Kofi Awumah, Ph.D., P.E.

(602) 506-1501
(602) 506-4601 fax

DATE TIME
3/5/97 12:24

FROM:

Dave Smith

REMARKS:

Kofi,

As discussed, here is the telephone memo from our conversation with Massoud Rezakhani from FEMA.

Regards,
Dave Smith

If there are problems receiving this transmission please call (619) 431-8113

Number of pages including cover:	2

WEST Consultants, Inc.
Telephone Memorandum

Date: 3/4/97

To: Massoud Rezakhani, FEMA Technical Advisor
Michael Baker Jr. Engineers, Alexandria, VA

From: David Williams, Dave Smith
WEST Consultants, Inc.

Subject: 10th Street Wash, reduction of discharges

The purpose of this phone call was to ask if FEMA would:

1) approve a reduction in the 100-year peak discharges due to flows leaving the system, and
2) require us to map the flows leaving the system.

We explained that we have identified flow breakout areas along 10th Street Wash. When water breaks out at these locations, it will not return to the channel. Instead, the breakout flows will probably drain in the direction of the Arizona Canal Diversion Channel (ACDC) as shallow sheet flow, probably at depths less than 1 foot.

Our modeling approach would proceed as follows:

Step 1) At the furthest upstream reach where flows overtop the banks and escape the system, use the split flow option in HEC-2 to quantify the discharge leaving the channel for various input discharges.

Step 2) Input a table of inflow versus breakout flow for the overtopping reach in HEC-1.

Step 3) Re-run HEC-2 with the revised peak flows from HEC-1. Is flow still overtopping at the breakout point for the current iteration? If so, return to Step 1, otherwise proceed to Step 4.

Step 4) Define three or four typical cross sections perpendicular to the breakout flow, a typical slope, and a typical Manning's n, and run HEC-2 to compute normal depth for the breakout flows. Verify that flow depths are generally less than 1 foot.

Step 5) Proceed to the next downstream breakout point, and repeat Steps 1 through 4. Note: When the downstream detention basin is reached (Detention Basin #2), the inflow hydrograph will be routed through the basin using HEC-1, resulting in a revised peak flow downstream of the basin.

Mr. Rezakhani said the above discussed appears to be reasonable. He also said that we would not need to trace the overflow areas if we could show that the depth of breakout flows doesn't exceed 1 foot per step 4 above. In addition, the Flood Control District of Maricopa County would have the option of either leaving the overbanks as the existing Zone A or dropping Zone A completely. There would be no need to map breakout flows with depths less than 1 foot.

WEST Consultants, Inc.
2111 Palomar Airport Rd., Suite 180
Carlsbad, CA 92009-1419
619-431-8113 619-431-8220 fax

TELEPHONE

DATE	TIME
5/7/97	2:30

TO: Kofi Awumah
FIRM: FCDMC
PHONE #: (602) 506-1501

FROM: Dave Smith
FIRM: WEST

FOLLOW UP DATE / TIME:

COMMENTS

Project schedule

The District agreed to shift the submittal date to Fri, May 30.

Report

The report is to include hydraulics, hydrology, maps & construction drawings, survey notes, FEMA forms. We need to be sure to describe the changes we made to the hydrology.

Mapping

The City of PHX agreed that no floodway is required therefore, we need to modify the base maps to show the floodway elevations on the cross section leaders equal to the floodplain elevations. Also change the description in the legend to both floodplain / floodway. We need to remove the "old" floodplain line from the drawing. Instead of overlaying the new line on FIRM panels, just print out the base map at 1" = 1000' showing roads for reference.

May 5, 1997

Kofi Awumah, Ph.D., P.E.
Flood Control District of Maricopa County
2801 West Durango
Phoenix, AZ 85009

Subject: 10th Street Wash, FCD Contract No. 96-12, Assignment #2
Floodplain Base Maps

Dear Dr. Awumah:

Attached are the base maps for your meeting with the City of Phoenix. There are about 18 cross sections where the new floodplain limits are outside of the previous study floodplain limits (see cross sections 0.24, 1.12, 1.13, 1.132, 1.17, 1.21, 1.22, 1.226, 1.233, 1.26, 1.34, 1.37, 1.39, 1.56, 1.59, 1.62, 1.64, and 1.65). These overlaps are unfortunate, but there is not much that can be done to correct them without compromising the integrity of our analysis. Many of the overlaps listed above are due to the old floodplain crisscrossing the actual channel. If you look carefully at the old floodplain boundary between sections 1.34 - 1.44 and 1.55 - 1.64, you will see that the floodplain in the left overbank (looking downstream) crosses the channel to the right overbank, then crosses back to the left overbank again. I am confident that the old floodplain boundaries were placed in the correct position in the AutoCAD drawing, so either the channel has shifted its location (not very likely at Mountain View Road bridge), or the floodplain was inaccurate.

These maps are not quite finalized. Besides the cosmetic details, the major element missing is the base flood elevations, which will be added ASAP.

Sincerely yours,

David T. Williams, Ph.D., P.E.
Project Manager

Enclosures

FAX

WEST Consultants, Inc.
111 Palomar Airport Rd., Suite 180
Carlsbad, CA 92009-1419

TO:	DATE TIME	FROM:
Kofi Awumah, Ph.D., P.E. (602) 506-1501 (602) 506-4601 fax	5/8/97 10:39	Dave Smith (760) 431-8113 (760) 431-8220 fax

REMARKS:

Kofi,

When plotting the profile, I realized that the geometry just downstream of the detention basin did not reflect current conditions. The ACDC topo does not include the 42" pipe that was constructed in the channel between Alice Ave. and one block downstream.

The only cross seciton affected by this geometry is 0.57. I revised HEC-RAS by raising the invert of section 0.57 in the amount of 42" (3.5'). After running HEC-RAS with this revision, the only cross section affected was 0.57. As shown on the page that follows, this change caused the floodplain to leave the channel, but no strucures will be affected. Split flow was not performed in this reach, so the hydrology will not change.

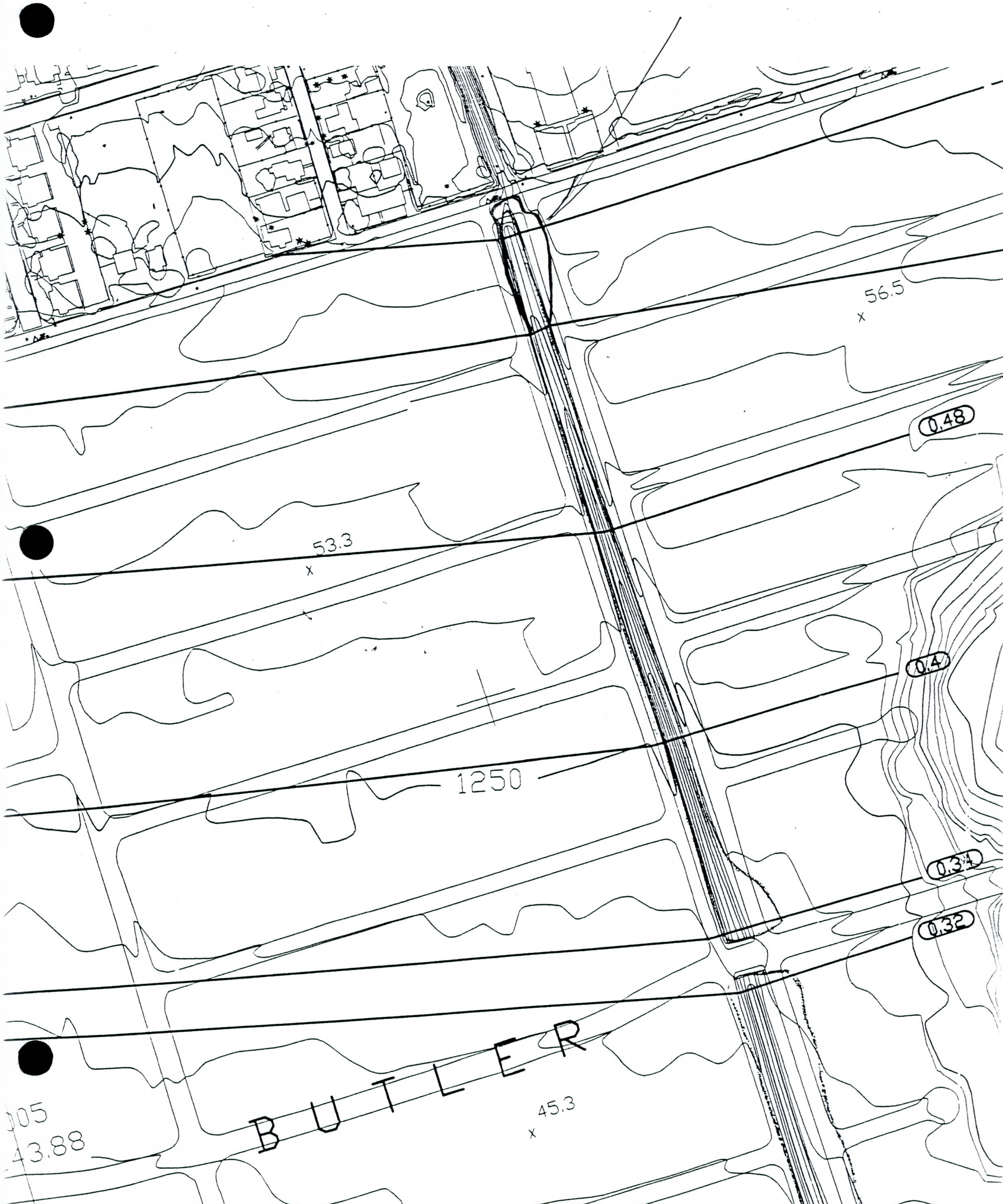
Please call me with any comments, and I will proceed to make the necessary revisions.

Dave Smith

If there are problems receiving this transmission please call (619) 431-8113

Number of pages including	2

revised floodplain



MEETING MINUTES
for
CLOMR Application for 10th Street Wash and Detention Basins 1 & 2

Date: 11/14/96
Location: Maricopa County Flood Control District
Attending: Pedro, Kofi, Michael, David Williams, Dave Smith
Subject: Kick-Off Meeting

General:

- The purpose of this study is to redelineate the floodplain and floodway of 10th Street Wash, as a result of detention basin construction.

- Flows may breakout at Butler due to a change in slope from steep to mild.

- Kofi will advise the Citizens Advisory Committee that a FEMA study is in process.

- Legal advertisements should be placed in the Phoenix Business Gazette and Capitol Times. Affidavits of publication from the papers, as well a clipping of the articles will be collected.

- Mutual evaluations will take place (3) three times during the course of the project in which CONSULTANT will evaluate the DISTRICT and the DISTRICT will evaluate CONSULTANT.

- The meeting with public officials and field trip are scheduled for December 9, 1996.

Mapping:

- Topography for the reach downstream of Basin No.2 shouldn't have changed from the first analysis, but CONSULTANT will cut new sections to be sure. Also, this will circumvent a discontinuity in mapping sources.

- From ACDC to Basin No.2, CONSULTANT is to use Kaminski Hubbard mapping, which is 2' contour.

- Kaminski Hubbard mapping will be used downstream of Alice Avenue, and DMJM mapping will be used upstream.

- A drainage corridor = 0 probably means private property.

- As-builts will be provided for all bridges and culverts.

- Copies of photos will be provided upstream of Dunlap. The project reach from previous rights of entry downstream of Dunlap will be checked during field reconnaissance.

- The DISTRICT will provide a list of ELM's to be included on panels generated by the CONSULTANT.

- Mapping files will be provided in DXF and DWG format.

Hydraulics & Hydrology:

- The only location a floodway analysis is required for is between Basin No.1 and Basin No.2.

- The maximum spacing between cross-sections is 500 feet.

- CONSULTANT will use the HEC-2 style conveyance method in HEC-RAS (rather than HEC-RAS style).

- Prior to the field trip, the CONSULTANT will cut cross-sections everywhere, except at bridges. After field verification, bridges will be added.

- CONSULTANT is responsible for filling out forms for downstream Basin No.1.

- CONSULTANT will use Rust's latest hydrology run, to be provided by the DISTRICT. This hydrology will be approved by the CONSULTANT, but stamped by Russ.

MEETING MINUTES
for
CLOMR Application for 10th Street Wash and Detention Basins 1 & 2

Date:	12/12/96	
Location:	Maricopa County Flood Control District	
Attending:	Pedro Calza	Maricopa County Flood Control District
	Kofi Awumah	Maricopa County Flood Control District
	Michael Lopez	Maricopa County Flood Control District
	Earl Lucas	City of Phoenix Street Transportation Department
	David Williams	WEST Consultants, Inc.
	Dave Smith	WEST Consultants, Inc.

Subject: Meeting with City of Phoenix official

- The City of Phoenix (CITY) was officially notified of the CLOMR application in progress for 10th Street Wash due to the construction of Detention Basins #1 & #2.

- The following were requested from the CITY by the Maricopa County Flood Control District (COUNTY): Maintenance plans for Basins #2 and #3, and as-built drawings for Basin #3.

- Since the 10th Street Wash project has been going on for some time, it was decided that a public meeting announcing the start of the CLOMR application study was not required.

- Near project completion, after review by the COUNTY but before submitting results to FEMA, the CITY will hold a public meeting to disclose the study results. The COUNTY is invited to attend if desired. This meeting will take place sometime in late April.

- Since a floodway is not required, the CITY will determine whether they want to establish a floodway for 10th Street Wash.

- Kofi will provide Earl with a copy of the project schedule and meeting minutes from the November 14, 1996 meeting, which describes the areas where a floodway might be provided. This information can then be used by the CITY in their decision of whether or not a floodway is required.

faxed 1/14

FAX

WEST Consultants, Inc.
2111 Palomar Airport Rd., Suite 180
Carlsbad, CA 92009-1419

TO:	DATE TIME	FROM:
Kofi Awumah, Ph.D., P.E. (602) 506-1501 (602) 506-4601 fax	1/14/97 16:34	Dave Smith

REMARKS:

Kofi,

Here are the meeting minutes from our meeting yesterday, January 13, 1997.

You will recall that I agreed to send you a description of any topographic problem spots for the surveyors to verify. At the meeting yesterday, we discussed the sharp right turn downstream of Eva Street and the high spot near Cave Creek Road. These are the only "problem spots" I've identified so far. We can discuss this, but I don't think it's necessary for the surveyors to investigate either of these locations. After a second look at the field trip photos, the sharp right turn downstream of Eva Street is probably not a bust in the topo. This turn can also be viewed from Photo #34, where it does not appear to be a 90 degree turn. The sharpness of the turn apparent in Photo #36 can probably be attributed to a dramatic reduction in channel width. As for the high spot near Cave Creek Road, Photo #49 shows a building on the right side of the photo. This building can be located on the topo between the channel and the high spot, so even if flows get out of bank (which they probably won't) the high spot will not be a factor.

As discussed in our meeting, the aerial topo needs to be field verified according to FEMA 37 specifications (see Appendix 4). It is possible that DMJM and Kaminski Hubbard have already completed the field verification, but FEMA may have special requirements that need to be addressed.

If you have any questions, don't hesitate to call.

Regards,
Dave Smith

If there are problems receiving this transmission please call (619) 431-8113

Number of pages including cover:	3

MEETING MINUTES
for
CLOMR Application for 10th Street Wash and Detention Basins 1 & 2

Date: 1/13/97

Location: Maricopa County Flood Control District

Attending:
- Dr. Kofi Awumah — Maricopa County Flood Control District
- Dr. David Williams — WEST Consultants, Inc.
- Mr. Dave Smith — WEST Consultants, Inc.

Subject: Monthly coordination and milestone meeting

- The following items were exchanged:
  1) The draft field reconnaissance report was delivered to Dr. Awumah.
  2) Rust Environmental's latest hydrology run was provided to Mr. Smith
  3) The AutoCAD lisp routine for HIS compliance was provided to Mr. Smith

- The cross section layout for HEC-RAS modeling was approved by Dr. Awumah.

- A strategy for delineating the floodplain in the vicinity of detention basin #2 was discussed. Dr. Awumah agreed to the following approach:
  1) Run the HEC-RAS backwater analysis up to the 42" outfall at Ruth Avenue.
  2) Change the discharge to the maximum flow possible in the double box culvert (controlled by the side spill weir elevation) per Rust's hydraulic calculations, and continue backwater analysis to Alice Avenue.
  3) Stop the backwater analysis at Alice Avenue, and map the floodplain between Alice Avenue and Townley Avenue based on a level pool assumption, using the water surface elevation that was computed at Alice Avenue.
  4) Resume backwater analysis at Townley Avenue using appropriate starting conditions, and continue upstream to end of study.

- The Design Concept Report for detention basin #2 by Rust Environmental mentions that the dip section at Townley Avenue will be replaced by a double box culvert. After consulting the construction drawings, Dr. Awumah determined that the dip section is not going to be replaced. Therefore, the HEC-RAS model will reflect a dip section at Townley Avenue, as observed in the field.

- Dr. Awumah asked whether WEST would require field surveys to supplement the aerial topography. Dr. Williams mentioned that FEMA 37 requires check surveys to verify horizontal and vertical accuracy for aerial topo. At a minimum, this will be required. Mr. Smith will fax Dr. Awumah a description of problem spots that may or may not require additional field surveys.

- Dr. Williams mentioned that in order to submit topography to FEMA, the aerial mapping subcontractor needs to complete FEMA specifications in regards to ERM's, etc. and stamp it.

- The following topographic inconsistencies were discussed:

  1) Downstream of Eva Street, the field trip photos show a sharp right turn, but the topography shows a more gradual turn. This was probably due to the addition of concrete walls that can be seen in the photos.

  2) The high spot in the left overbank near Cave Creek was probably a mapping error. The roof of a building must have been interpreted as a ground point, distorting the contours. When digitizing the cross sections in this vicinity, the building will be coded in by hand and the contours around the building will be ignored.

- Since a floodway analysis is not very likely, Dr. Williams and Mr. Smith requested that the January 27th milestone for submittal of floodplain results be extended to February 14th, which was the milestone for submittal of floodway results. The approval milestones would also move from January 31st to February 21st. These changes would not affect any subsequent milestones.

FAX

WEST Consultants, Inc.
2111 Palomar Airport Rd., Suite 180
Carlsbad, CA 92009-1419

TO:

Kofi Awumah, Ph.D., P.E.

(602) 506-1501
(602) 506-4601 fax

DATE TIME
2/12/97 15:30

FROM:

Dave Smith

REMARKS:

Kofi,

Here are some options for floodplain boundry delineation for you to consider prior to our meeting next Tuesday.

Regards,
Dave Smith

If there are problems receiving this transmission please call (619) 431-8113

Number of pages including cover:	4

WEST Consultants, Inc.

Water • Environmental • Sedimentation • Technology
2017 E. Orangewood Avenue, Phoenix, AZ 85020
(602) 395-1970 Phone/Fax

February 12, 1997

Kofi Awumah, Ph.D., P.E.
Flood Control District of Maricopa County
2801 West Durango
Phoenix, AZ 85009

Subject: Floodplain boundary delineation options for 10th Street Wash

Dear Dr. Awumah:

Based on preliminary HEC-RAS results, we have found that the 10th Street Wash channel banks are being overtopped at virtually every cross section using the hydrology developed by Rust Environmental. The only reach where the 100-year flood is confined to the channel is between Butler Drive and Alice Avenue.

Last week we discussed modifying the discharge for basin 143 by subdividing the drainage basin into three subbasins. The flow from each subbasin would then be computed by multiplying the discharge for basin 143 by the ratio of each subbasin's drainage area to the total area for basin 143. This was not completed for two reasons: 1) Since the drainage area of basin 143 is less than 1 square mile and there are no significant inflows, there is no physical reason to subdivide the basin further, and 2) The resulting flow reductions for basin 143 would not be accepted by FEMA if Rust Environmental completes the hydrology section of the final report with one flow for basin 143.

After discussion of the overtopping situation with Dr. David Williams and Mr. Martin Teal, we were able to identify three possible approaches for delineating the floodplain.

<u>Option 1</u>

Using the flows provided by Rust Environmental, proceed with the hydraulic modeling in HEC-RAS. At cross sections where flow overtopping the banks would leave the system, do not reduce the flow for the next downstream cross section. Delineate the floodplain boundary at the water surface elevations computed by HEC-RAS and where applicable, as shallow flooding where it leaves the channel. This method will result in a wide floodplain all the way from Cheryl Drive to ACDC.

Option 2

At the furthest upstream reach where flows overtop the banks and escape the system, use the split flow option in HEC-2 to quantify the discharge leaving the channel. Develop a table of inflow versus diverted flow for this overtopping reach, and use this information in HEC-1 to model the diversion. Re-run HEC-2 with the revised peak flows, and continue modeling downstream through the detention basin and to the next overtopping reach. Update the table of inflow versus diverted flow, re-run HEC-1, re-run HEC-2, and so on. In reaches where overtopping occurs and leaves the channel system, designate shallow flooding zones in the overbanks.

Due to the additional work of converting HEC-RAS to HEC-2 and modeling split flow in HEC-2, we would require an additional fee to complete this option.

Option 3

Between the upstream cross section and detention basin #2, reduce the flow at each cross section to the bankfull flow. If channel capacity decreases in the downstream direction, cross sections will be grouped into reaches with the smallest flow applied to the entire reach. This way, oscillations in flow magnitude will be avoided. When detention basin #2 is reached, HEC-1 will be used. The inflowing hydrograph to the detention basin will be generated externally by modifying the existing hydrograph. All discharges on the existing hydrograph greater than the bankfull flow at the cross section just upstream of the basin will be lowered to the bankfull flow. In other words, the top of the original hydrograph will be chopped off, but the shape below the bankfull flow will remain the same. This is a simplification that we believe will produce a hydrograph shape very close to the actual result if HEC-1 was re-run for the entire watershed using flow diversions to account for the escaping flow. Once HEC-1 generates the outflow hydrograph just downstream of the detention basin, the HEC-1 modeling can stop. The peak of the outflow hydrograph would be input to HEC-2, and the flow reduction procedure would continue downstream to ACDC.

Option 2 would require HEC-2 modeling, and options 2 and 3 would require additional HEC-1 modeling. If we were to complete this modeling, a fee increase would be necessary to cover our modeling efforts as well as completion of the hydrology section for the final report. As an alternative to performing the additional HEC-1 work ourselves, we could provide Rust Environmental with the data they need to complete this task, since they are currently responsible for the hydrology section of the final report.

We would like you to give these options consideration prior to our meeting next Tuesday, February 18th, so we can make a decision at that time. Please call Dr. Williams or myself if you need further clarification or if you have any questions.

Sincerely yours,

David S Smith

David S. Smith
Assistant Project Engineer

MEETING MINUTES
for
CLOMR Application for 10th Street Wash and Detention Basins 1 & 2

Date:	2/18/97	
Location:	Flood Control District of Maricopa County	
Attending:	Dr. Kofi Awumah	Flood Control District of Maricopa County
	Mr. Ed Raleigh	Flood Control District of Maricopa County
	Mr. Michael Lopez	Flood Control District of Maricopa County
	Mr. Pedro Calza	Flood Control District of Maricopa County
	Mr. Greg Rodzenko	Flood Control District of Maricopa County
	Dr. David Williams	WEST Consultants, Inc.
	Mr. Martin Teal	WEST Consultants, Inc.
	Mr. Dave Smith	WEST Consultants, Inc.
Subject:	Monthly coordination and milestone meeting	

- Dr. Awumah summarized channel capacity and HEC-1 flows as follows:

			Capacity	Q
Basin #1	to	Basin #2	140-360 cfs	1221 cfs
Basin #2	to	Butler	800	1147
Butler	to	ACDC	402	1548

- The reason for this meeting was to discuss options for delineating the floodplain, which may be bigger than originally thought.

- Dr. Williams explained that we are proposing to use the split flow option in HEC-2 to reduce the flow downstream. Where flow escapes from the wash, adjacent areas will be designated as shallow flooding zones.

- Mr. Calza described the history of the previous HEC-2 model. He said that Kathy Regester (DISTRICT employee) reconstructed the model from hardcopy, made a few changes, and more or less reproduced the FEMA results. However, she disagreed with the overbank "n" value of 0.035 or so.

- When the discussion shifted to realistic overbank "n" values, Dr. Williams mentioned that continuous walls perpendicular to flow were observed during field reconnaissance.

- Mr. Calza asked how the floodplain would be delineated with breakouts modeled. Right now, much of 10th Street wash is designated Zone A. FEMA won't change a Zone A to something less (Zone AO) unless the model reports water surface elevations.

- Mr. Lopez felt that the breakouts are not a good idea because the upstream breakout areas may eventually be improved to handle 100-year flows. This being the case, the reach downstream of Butler would still breakout, which in turn might motivate residents to agree to channel improvements that have already been proposed.

- After discussion, Mr. Raleigh explained that this FEMA study should reflect existing conditions, not future conditions. Although preventing flow from breaking out would be conservative, allowing water to escape the system may provide a better estimation of the 100-year floodplain right now.

- A consensus was reached that the consultant will pursue Option 2b (see letter dated 2/12/97), which applies HEC-2's split flow option to account for breakout flows. The consultant will also make changes to the hydrology section of the final report.

- Dr. Williams mentioned that we will convert the HEC-RAS model to HEC-2 only in the areas of breakout.

COPY

Arizona Capitol Times

P.O. Box 2260 Phoenix, AZ 85002

AFFIDAVIT OF PUBLICATION

STATE OF ARIZONA)
County of Maricopa) ss

DIANA CREIGHTON, being duly sworn, deposes and says: I am the President of the ARIZONA CAPITOL TIMES, a weekly newspaper of general circulation published at Phoenix, Maricopa County, Arizona, and that the

PUBLIC NOTICE

of

THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCDMC)

was published in said newspaper once a week for two consecutive weeks with publication dates as follows: December 13 and 20, 1996.

[signature]

Subscribed and sworn to before me this 23rd day of December, 1996.

[signature]

OFFICIAL SEAL
LAURA M. KAMINSKI
Notary Public - State of Arizona
MARICOPA COUNTY
My Comm. Exp. Jan. 6, 1997

PUBLIC NOTICE

PUBLIC NOTICE YOUR RIGHT TO KNOWN ANNOUNCEMENT OF FLOOD HAZARD STUDY

The Flood Control District of Maricopa County (FCDMC), under the authority of the National Flood Insurance Act of 1968 (P.L 90448), as amended, and the Flood Control Disaster Protection Act of 1973 (P.L 234), is funding a detailed re-study of Flood Hazard for the 10th Street Wash between Cheryl Drive in the north and the Arizona Canal Diversion Channel in the south. The study is being performed for Flood Control District by WEST Consultants, Inc. of Phoenix.

This study will examine and evaluate the flood hazard areas in the communities to determine the flood elevation for this area. Those elevations will then be used to determine the flood insurance rates used by the Federal Emergency Management Agency (FEMA). The re-study is to evaluate the effect of the reduced flows in the 10th Street Wash, due to the recent completion of a flood detention basin, as well as the future completion of a second detention basin.

This announcement is intended to inform all interested persons and communities of the commencement of this study so that they may have an opportunity to bring any relevant technical information to the attention of FCDMC/FEMA, so that it could be considered during the course of the study. Your comments should be addressed to Dr. Kofi Awumah or Mr. Pedro Calza, hydrologists at the Flood Control District of Maricopa County, 2801 West Durango, Phoenix, AZ 85009.

Published December 13 and 20, 1996 editions ARIZONA CAPITOL TIMES.

PUBLIC NOTICE
YOUR RIGHT TO KNOW
ANNOUNCEMENT OF FLOOD HAZARD STUDY

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Published: December 12,19, 1996

AFFIDAVIT OF PUBLICATION

ANNOUNCEMENT OF FLOOD HAZARD STUDY

19

ARIZONA **BUSINESS** GAZETTE

PO BOX 194
Phoenix, Arizona 85001-0194
(602) 271-7300

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

TOM BIANCO, being first duly sworn, upon oath deposes and says: That he is the legal advertising manager of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates indicated.

12/12/96
12/19/96

Sworn to before me this
19TH day of
DECEMBER A.D. 1996

OFFICIAL SEAL
MARY LEE BOOHER
Notary Public - State of Arizona
MARICOPA COUNTY
My Comm. Expires March 17, 1999

Notary Public

SCOPE OF WORK
CONDITIONAL LETTER OF MAP REVISION APPLICATION FOR 10TH STREET WASH DETENTION BASINS 1 & 2.
FCD 96-12

GENERAL

The objective of this project is the preparation of the necessary documentation for a Letter of Map Revision application towards the removal of portions of Tenth Street Wash from the Federal Emergency Management Agency's (FEMA's) Special Flood Hazard Zone. This follows the design and construction of two Detention Basins that reduced peak discharges of this wash. The 10th Street Wash is located in north central Phoenix on the eastern edge of the Sunnyslope Community. The area of interest is between Cheryl Drive in the north and Arizona Canal Diversion Channel (ACDC) in the south. The wash drains 2.8 square miles of watershed and is about 2.3 miles long. All work must meet Arizona Department of Water Resources (ADWR) and FEMA requirements for floodplain delineations. The results of this study must be reviewed and accepted by FEMA prior to the finalization of this contract. All work under this Scope will be completed within 180 calendar days from the date of Notice to Proceed, including 30 days for District reviews.

TASK 1 - COORDINATION

1.1 The consultant shall submit a project schedule showing coordination meetings and completion dates for each of the tasks in the scope within 14 days of Notice To Proceed. The consultant shall update this project schedule when appropriate.

1.2 The consultant shall participate in regular coordination meetings (at least once every four weeks) with the District's Project Manager and in milestone coordination meetings in the development of the hydrologic and hydraulic analyses. The consultant is responsible for the minutes of any meetings. Whenever possible, coordination and milestone meetings should be combined.

1.3 The consultant shall submit a quarterly estimation of the projected billing within 14 days of Notice to Proceed. Thereafter, this estimation will be updated and submitted to the District's project manager at least 10 days prior to the end of each quarter.

1.4 The consultant shall submit monthly progress reports at least 5 days before submittal of monthly invoices. The report shall be brief and should be no longer than two typed pages. At a minimum, the monthly report shall contain the following:

a. A description of the work accomplished by task during the reporting month.

b. Percent (%) completed for the month and percent (%) cumulative completed for each task.

c. A brief description of the work to be accomplished the following month.

d. A description of any problems encountered.

1.5 The consultant is responsible for placing the legal advertising at the beginning of the study, notifying the public of the study. The ad will be run in a widely circulated newspaper two times, with approximately one week between runs. The ad must also be run two times in a local newspaper that serves the area being studied. After the ad is run the consultant will supply the District with the original affidavit of publication from each of the newspapers for each day that the ad ran.

1.6 The District shall notify all property owners and obtain any necessary Rights of Entry for the study area. The District shall furnish the consultant with a list of all the property owners notified and a sample Right of Entry letter.

1.7 The consultant shall meet with officials from the local public works department. The purpose of this meeting is to identify local flooding problems and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and corporate limits.

TASK 2 - DATA COLLECTION

2.1 The consultant will collect and review pertinent data from the District and other outside sources. Data to be collected will include previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; as-built plans for existing structures; geotechnical data on the fill such as soil parameters and compaction test results; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.

TASK 3 - TOPOGRAPHIC MAPPING

3.1 Topographic mapping will be provided by the District

3.2 "As-built" plans for the Basin # 1 and Construction Plans for Basin # 2 will be provided by the DISTRICT.

TASK 4 - FIELD SURVEY

4.1 The consultant shall NOT verify the accuracy of the mapping by the procedures called for in FEMA Document 37 or other methods approved by FEMA. The verification of cross sections used in the floodplain delineation will be conducted by the DISTRICT.

4.2 Field surveys of all bridges, culverts, and hydraulic structures are to be conducted by the DISTRICT with guidance from the CONSULTANT. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the final report.

TASK 5 - HYDROLOGY

5.1 The original hydrology for this location was part of the ACDC ADMS study for the District by Kaminski-Hubbard Engineers in 1992. This has subsequently been modified by the District and then by other project design Consultants to reflect project condition. The hydrology of the project condition would be the basis for this delineation and would be provided by the DISTRICT

5.2 The CONSULTANT will conduct any additional supplementary hydraulic analyses, if required, and use this for the preparation of the floodplain map exhibit.

TASK 6 - FLOODPLAIN DELINEATION

6.1 Floodplain delineations must be obtained using the U.S. Army Corps of Engineers HEC-RAS Water Surface Profiles computer model, version 1.2, April 1996, and methodology acceptable to FEMA. This model will simulate the effects of floodplain geomorphology, flow changes, bridges, culverts, hydraulic roughness factors, effective flow limitations, split-flows, and other considerations. The consultant shall prepare the study using the guidelines established in FEMA Document 37, Flood Insurance Study Guidelines and Specification for Study Contractors, January 1995, and FIA Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, January 1990.

6.2 The delineation work shall meet requirements for floodplain and floodway delineations as prescribed by FEMA and the Arizona Department of Water Resources.

6.3 The delineation study shall be based on the final results of the hydrologic study as directed by the District.

6.4 The consultant is to make refinements to the HEC-RAS model based on review of the model results by the District, ADWR, FEMA, and the Technical Evaluation Contractor. The consultant shall review the HEC-RAS model results for reasonableness. Adjustments to the input parameters for obtaining the most realistic results is normal to the scope.

6.5 Floodways are to be determined using equal conveyance encroachment method 4 to start with, but only encroachment method 1 will be used in the final analysis. The floodway encroachment is to be as near the one foot maximum rise in elevation as possible.

6.6 The consultant must obtain District approval at each of the following steps:

a. Field reconnaissance report and estimation of Manning's "n" values.

b. Proposed location and alignment of the cross sections and channel centerline.

c. Floodplain (natural) delineation.

d. Floodway delineation using equal conveyance encroachment.

e. Floodway delineation using encroachment method 1.

f. Final Hydraulics Report.

6.7 Field Reconnaissance

6.7.1 The consultant shall conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of Manning's "n" values; photographic documentation of floodplain characteristics; determination of channel bank stations; observation of possible overflow areas; inspection of levees or other flood control structures; and measurement of bridge dimensions.

6.7.2 Mannings "n" values are to be determined using the methodology in the USGS report, Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, April 1991. Copies of the report are available through the District.

6.7.3 A draft report on the field reconnaissance shall be submitted to the District for review and approval prior to beginning the HEC-RAS modeling. The report shall present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The report shall also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. Photo locations, structures, and "n" values shall be displayed on reduced scale mapping and included in the Final Report.

6.8 Cross Sections

6.8.1 The location and alignment of cross sections and channel centerline shall be submitted for the District's review and approval prior to digitizing the cross section data. Cross section stationing shall be from left to right looking downstream with the thalweg as station 10,000. Cross sections will be spaced approximately every 500 feet, unless geographic or structural constraints dictate otherwise, and shall extend the full width of the area inundated by 100-year flood waters. Identification of cross sections shall be in river miles, increasing upstream. The stationing shall tie into the specified river mile of the existing FEMA studies. Cross section orientation may need to be altered after running of

HEC-2 model to ensure that sections are perpendicular to flow per FEMA criteria.

6.8.2 All cross sections shall be plotted using a pen, laser, or electrostatic plotter. The cross section plots shall show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information. All plots are to be accompanied by a legend. These plots are to be available at all reviews.

6.8.3 Cross section plots are limited to one plot at the following three stages of work: (a.) a plot of digitized "GR", STCHL, STCHR, centerline (station 10,000) to be used as a check of input data and for working sections during compilation of the floodplain model; (b.) a plot of the cross section for the completed floodplain run which shows the floodplain water surface elevation, ineffective flow areas, "n" factor, and encroachments to be used as working sections for development of the floodway model; (c.) a plot of the final floodway model cross sections which will show Type 1 encroachments and encroached water surface, in addition to data covered in items (a.) and (b.). These cross sections, generated under (c.), will be submitted as part of the Final Report.

6.9 Bridges and culverts must be modeled in compliance with HEC-RAS modeling requirements for the selected routine. Where multiple bridges occur, each bridge shall be modeled separately. The HEC-RAS modeling results for bridges, culverts, and other hydraulic structures must be checked by using an independent method approved by the District to analyze these structures.

6.10 For floodplains identified as ponding areas, it is preferable to analyze the area by using the HEC-RAS model, which shall provide the District with water surface elevations. If appropriate, the consultant shall identify in the ponded floodplains a floodway. The purpose of this floodway is to allow the pond to seek a constant stage throughout the areal extent of the ponds, versus the creation of two independent ponds.

6.11 Flood zones must be determined according to FEMA criteria and clearly labelled on the final drawings.

6.12 The total area of the floodplain and floodway must be determined for each reach in square miles and acres.

6.13 The findings of the floodplain/floodway delineation study shall be presented in Section 4 of the Technical Data Notebook and shall be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The report shall be organized as specified by the District standards, following SSA 1-90 format.

7.0 FEMA Submittal for CLOMR

Utilizing data developed for the 10th Street Wash, the CONSULTANT shall prepare documentation suitable for submittal to FEMA to request a CLOMR based upon the existing improvements. A FEMA Letter of Map Revision is to be requested by the DISTRICT from FEMA. CONSULTANT shall prepare documentation of the recommended project alternative in sufficient detail to document the resulting changes in the floodplain delineation due to the proposed projects. The CONSULTANT will prepare the study documentation using the guidelines established in FEMA documents:

- Flood Insurance Study Guidelines and Specification for Study Contractors, Document 37, January 1995,
- Appeals, Revisions, and Amendments to Flood Insurance Maps, FIA Document 12, December 1993
- Revisions to National Flood Insurance Program Maps, Application/Certification Forms and Instructions.

TASK 8 - DELIVERABLES

8.1 FEMA Submittal: The consultant will submit the following items to the District for review by FEMA and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:

8.1.1 Original Affidavits of Publication.

8.1.2 Two (2) complete sets of blueline topographic base maps with the floodplain/floodway delineations shown. All drawings shall be signed and sealed by persons of appropriate professional registration(s). Each registrant shall provide a specific statement as to what service they performed.

8.1.3 Two (2) complete copies of the Technical Data Notebook, including HEC-RAS input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The notebook shall be organized as specified by the District, following SSA 1-90 format.

8.1.4 Two (2) sets of completed FEMA forms shall be submitted in a notebook separate from the Final Report.

~~8.1.5 Three (3) sets of complete survey notes shall be submitted in a notebook separate from the Final Report~~

8.1.6 Two (2) copies of the current FIRM panels showing the proposed delineation.

8.2 Final Submittal: The following products are considered deliverables for the final submittal to the District after FEMA approval is issued:

8.2.1 One (1) complete set of non-erasable topographic mylars of the work study drawings. Sheets shall be 24" X 36" in size and numbered to correspond to the delineation maps.

8.2.2 One (1) complete sets of mylars and four (4) complete sets of sealed blueline topographic base maps with the floodplain/floodway delineations shown. All drawings shall be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.

~~8.2.3 One (1) complete set of transparent overlays of photo-mylars. Sheet size, numbering, and layout shall correspond to the delineation work maps.~~

8.2.4 Digital data of floodplain/floodway boundaries in conformance with the District's HIS Specifications. The data should be in Auto Cad format to the DISTRICT's specifications so that conversion to GIS format could be performed by DISTRICT STAFF.

8.2.5 Four (4) complete copies of the Technical Data Notebook including HEC-RAS input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1-90 (SSA 1-90). The notebook shall be organized as specified by the District, following SSA 1-90 format. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, modifications to the delineation maps, the HEC-RAS model, and/or the Final Report.

GIS COVERAGES

His Data:
Digital data will be prepared in conformance with the district's HIS data Delivery Specifications, Rev 2.1 from Feb,14 1996 for the following themes:

Name	Page No.	Description
NDXPRJ	LP-40	Shows the map sheet boundaries of the project.
PRJ	LP-60	Defines the boundary of the project
CARTO	LP-110	Planimetric features captured but not used by HIS. (Fences, tree lines, etc)(If any)
CORNERS	LP-210	Section corners as defined by the PLSS.(Public land surcey System)
CTRL	LP-215	Other control points that are not corners
AGRCLTR	LP-305	Dairy and Agricultural Areas
STRCT	LP-360	Structures like building footprints, culverts, bridges. (If any)
DQ	LP-410	Data Quality of Data: Scale, date, Vertical Datum, Projection
PRJ.REL	LP-430	Contractor name, Project Name, Project Id
FPBLN	LP-520	Floodway center line
FPCTLFCD	LP-523	Elevation Reference Marks
FPSRFFCD	LP-535	Surface Water Elevation
FPXFCD	LP-540	Cross sections used in Hec 2
FPZNFCD	LP-550	Floodplain Zones
FPZNHZ	LP-560	Floodplain Hazard Zones
CNL	LP-610	Canals (If any)
FLTY	LP-620	FCD Project in the area. (If any)
RR	LP-650	Railroads in the area. (If any)
STRTCLN	LP-655	Street Centerlines
STRTDTL	LP-660	Edge of Pavement (if any)
UTLTY	LP-670	Utilities, Power poles, etc (If any)
ELV	LP-710	Contours and spot elevations
VEG	LP-775	Areas of similar vegetative mix
DRNBSN	LP-920	Drainage basins
DRNPTH	LP-930	Drainage Path
LAKE	LP-950	Lakes are in the area (If any)
RIVER	LP-960	Washes or streams in the area. (If any)

This is a comprehensive listing of possible features. If there are no features collected under one of the categories mentioned, then the theme does not need to be delivered.
Mapping should be done according to the DTM manual: "Digital Terrain Model Mapping - Data Collection & Delivery Specifications" Rev 1.0 / May 1994. This book is available at the front desk.

SEGMENT DESCRIPTION OF 10TH STREET WASH

Segments	Available Corr. Width	Natural Slope	Length	Comments
1. Along Griswold Rd from ACDC to 10th St	45 ft. to 100 ft.	0.78%	550 ft	70-ft-wide, 2 ft-deep spillway @ ACDC w/10:1 sideslopes with picket fence @ ACDC acting as a trash rack. Griswold Rd. on the north. Rock outcrops within the channel.
2. Griswold Rd to Las Palmaritas Dr	76 ft.	0.23%	400 ft	In between two parallel roadways of 10th Street. Wash crosses a 10-inch sanitary sewer, 90° bend @ Griswold Rd. Side inlet spillways from the east.
3. Las Palmaritas Dr to Butler Ave	54 ft.	0.41%	855 ft	In between two parallel roadways of 10th Street. 60-inch storm drain outletting @ El Caminito Dr. (below channel invert) 3-8 ft. x 10 ft. RCBC at Butler Ave.
4. Butler Ave to Alice Ave	55 ft.	0.97%	1300 ft	In between two parallel roadways of 10th Street. Dip x-ing @ Alice Avenue.
5. Alice Ave to Dunlap Ave	30 ft. drainage easement from Alice Ave to Townley Ave. 50 ft. to 10 ft. drainage easement from Townley Ave north approx 480 ft.	0.90%	1400 ft	Adjacent and west of Baptist Church. Makes 30° bend at Lawrence Avenue (accumulated debris & sediment). Meanders through residential properties w/thick undergrowth and vegetation. Dip x-ings at street x-ings.
6. Dunlap Avenue to Hatcher Road	0 ft.	0.95%	1360 ft	Meanders through residential property w/thick undergrowth & vegetation. Dip x-ings at street x-ings. No ROW or easements. APS power poles on east side.
7. Hatcher Road to Mountain View Road	16 ft. to 20 ft. drainage easement from Hatcher Rd to approx 110 ft. north of Vogel Ave. 0 ft. from 100 ft. north of Vogel Ave to Mountain View Rd.	0.98%	1360 ft	Meanders between commercial and residential properties. 2- 8 ft. x 15 ft. RCBC at Mountain View Rd. with 1 ft. of sediment thru structure. Heavy vegetation at outlet. Channel is well defined. Dip x-ing at Vogel Ave.
8. Mountain View Road to Cave Creek Road	30 ft. to 80 ft. drainage easement	0.19%	520 ft	Meanders behind commercial properties. Wash is severely encroached. 2- 8 ft. x 15 ft. RCBC at Cave Creek Rd at 45° skew with 2 ft. of sediment thru structure.
9. Cave Creek Road to Cheryl Drive	35 ft. drainage easement from Cave Creek Rd to approx 335 ft. north of Cave Creek Rd. 0 ft. for remainder.	1.22%	760 ft	Meanders thru commercial properties. Narrow channel approx. 10 ft. deep with 1:1 side slopes. Heavy vegetation. APS power poles along west side. Dip x-ing at Cheryl Dr.

Table 1 - Segment Description

10th STREET

NATIONAL

INDEX PAGE

JOB NO.	PROJECT	PAGE NUMBER
3467	10TH STREET WASH	
	BENCH LOOPS	2-9
	TRAVERSE RUNS & SIDE TIES	12-24
	CULVERT DETAIL	25-27
	X-SECTIONS	28-32

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
29412
ARTHUR A.
WITZELL
Date Signed
ARIZONA, U.S.A.

2-7-94
OVERCAST
A. WITZELL
R. JONES
M. SCHLOSMAN

STA	BS	HI	FS	ELEV.	ADJ.
				1224.323 ~~1224.99~~	
	6.825				
TP1			4.465	~~27.35~~ ~~4.465~~	
	7.30				
TP2			3.65	~~1231.00~~	
	7.05				
TP3			0.48	~~1237.57~~	
	5.37				
TP4			7.89	1234.383 ~~1235.05~~	
	8.235				
1601			5.795	1236.813 ~~1237.48~~	1236.808
	7.38				
TP5			5.15	~~1239.71~~	
	8.775				
1602			5.87	1241.948 ~~1242.615~~	1241.941
	5.865				
TP6			6.50	~~1241.98~~	
	5.325				
1603			4.07	1242.568 ~~1243.235~~	1242.559
	8.08				
TP7			1.85	1248.798 ~~1249.465~~	1248.787
	5.15				
TP8			0.24	~~1254.375~~	
	9.87				
TP9			0.745	~~1263.50~~	
	10.49				

#495 B.C. IN H.H. @ NORTHERN & 7TH STREET
ELEVETATION = ~~1224.99~~ 1224.323

8TH STREET CUL-DE-SAC @ DIVERSION CANAL

CORNER OF GRISWOLD & 10TH STREET

ALONG 10TH STREET

@ STOP SIGN @ BUTLER & 10TH ×. (TOP CURB)

STA	BS	HI	FS	ELEV.	ADJ.		
TP10			3.235	~~1270.755~~			
	0.155						
TP11			10.28	~~1260.63~~			
	0.76						
TP12			6.69	~~1254.70~~			
	5.065	1259.765					
#496			4.72	1255.05		1/2" REBAR	{ NO [illegible]
#496A			4.43	~~1255.335~~ 1254.668		R.R. SPIKE 1254.651	
TP7	4.22				1248.787 ~~49.465~~		
1604			4.115	1248.892 ~~49.57~~	1248.89		
	3.99						
1611			3.31	1249.572 ~~50.25~~	1249.568		
	7.38						
TP13			3.18	~~54.45~~			
	7.725						
1605			3.885	1257.612 ~~58.29~~	1257.603		
	6.285						
TP14			5.93	~~58.645~~			
	4.85						
1607			5.535	1257.282 ~~57.96~~	1257.269		
	7.88						
1608			3.38	1261.782 ~~62.46~~	1261.766		
	8.21						
TP 15			4.05	~~60.62~~			
	5.045						
1609			8.06	1262.927 ~~63.605~~	1262.907		
	9.935						
TP16			4.73	~~68.81~~			
	4.86						
1610			0.18	1272.812 ~~73.49~~	1272.787		
	5.73						

B.C. IN H.H. @ 12TH ST. & BUTLER, ELEV. = ~~1254.64~~ 1254.651
(FROM DMIM DATA)

TP7 ELEV. = ~~1249.465~~ 1248.787

#611 10TH STREET & SELDON, N SIDE OF 10TH ST N/WASH

(3.11 TO PANEL)

8TH STREET & TOWNLEY PK NAIL

STA	BS	HI	FS	ELEV.	ADJ.
1612 ~~TP17~~			2.75	1275.792 ~~76.47~~	1275.745
	6.40				
TP17			5.075	~~77.805~~	
	2.[illegible]				
1613			8.79	1270.82 ~~1270.847~~ ~~71.525~~	1270.~~832~~ 808
	6.835				
[illegible] 919			6.13	~~73.23~~	
	4.14				
TP19			6.92	~~69.45~~	
	3.95				
TP20 ~~#16~~			6.72	~~66.68~~	
	5.325				
#16			5.85	+.185 ~~1266.155~~ ~~1265.477~~ 1265.45	1265.415
	5.605				
TP 21			4.125	~~67.635~~	
1613				1270.808 ~~71.525~~	
	10.59				
TP			2.965	79.15	
	5.71				
1614			3.70	1280.443 ~~81.16~~	1280.442 ~~1280.428~~
	4.285				
1615			7.88	1276.848 ~~77.565~~	1276.846 ~~1276.826~~
	7.82				
1616			3.9[illegible]	1280.708 ~~31.425~~	1280.706 ~~1280.699~~
	3.895				
1614			4.1[illegible]	1280.443 ~~81.16~~	~~1280.406~~

STA
TP1[illegible]
TP11
TP1[illegible]
#49[illegible]
#49[illegible]
TP7
1604
1611
TP13
160[illegible]
TP1[illegible]
160[illegible]
160[illegible]
TP
160[illegible]
TP
161[illegible]

(+1.99 TO PANEL) 1612 - B.C. IN H.H. @ 15TH ST.
& DUNLAP. ELEV = ~~1276.52~~ (DMJM DATA)
1275.765

PK NAIL, 11TH STREET & DUNLAP IN WASH.

~~#16.~~
~~ELEV. = 1265.97~~
(ADD 0.54 TO RIM) 7TH ST, DUNLAP, CAVE CREEK
ELEV. = ~~1265.97~~ (DMJM DATA)
1265.415

PANEL, 11TH STREET & DUNLAP

BCSM FLUSH @ 11TH & MISSION

PK NAIL FLUSH @ WASH & MISSION

PK NAIL FLUSH 150'± EAST OF WASH ON MISSION

STA	BS	HI	FS	ELEV.	ADJ
1614				~~81.16~~	~~1280.406~~
	7.445				
TP			5.11	~~83.495~~	
	6.87			1282.828	1282.824
1617			6.82	~~83.545~~	~~1282.777~~
	11.79				
TP			2.9[illegible]	92.375	
	11.31				
TP			8.83	94.855	
	5.67			1295.118	1295.112
1618			4.69	95.835	~~1295.044~~
	4.30			1292.883	1292.876
1619			6.535	~~93.60~~	~~1292.803~~
	6.455				
TP			4.355	95.70	
	4.57			~~1293.823~~	1293.815
1620			5.73	~~94.54~~	~~1293.727~~
	9.01			+0.34	
BM (497)			3.24	~~100.31~~	~~1299.49~~
	2.87			1299.593	
TP			2.615	~~100.565~~	
	8.03			1305.029	
				~~1304.925~~	1305.018
1621			2.85	~~05.745~~	~~1304.940~~
	7.43				
TP			2.705	~~10.47~~	
	10.81			1317.923	
				~~1317.82~~	1317.912
1622			2.64	~~18.64~~	~~1317.949~~
	0.295				
TP			7.94	~~10.995~~	
	2.97			~~1304.848~~	
				~~1304.745~~	1304.836
1623			8.40	~~05.565~~	~~1304.787~~

BRASS CAP FLUSH, VOGEL & 12TH ST.

PK NAIL (PANEL) SW. CORNER PKG LOT. (APARTMENTS)

60D NAIL SET IN ASPHALT (SUICIDE LANE)

{BCSM FLUSH @ 12TH AVE + MOUNTAIN VIEW #497
{(DMJM DATA) ELEV. =1299.49

B.C. FLUSH

~~BC~~

B.C. FLUSH

60D NAIL SET

1623				05.565	
	6.295				
TP			3.005	8.855	
	7.04				
TP			3.58	12.315	
	6.265			1315.413 ~~1315.31~~	1315.399
1624			2.40	~~16.13~~	~~1315.375~~
	3.51				
TP			4.22	~~17.42~~	
	16.78			1323.173 ~~1328.07~~	1328.158
1625			5.31	~~28.89~~	~~1328.150~~
	6.135			~~.735~~ ~~1328.048~~	
BM			6.26	~~28.765~~ ~~1327.945~~	1328.032

				1328.158 ~~28.89~~	
1625 (over ~~1624~~)				~~16.13~~	
	4.62				
TP			1.75	~~19.00~~	
	6.05			1333.378 ~~34.11~~	1333.361
1626 (over ~~1625~~)			3.70	~~21.05~~	~~1333.353~~
	3.525				
TP			6.74	18.135	
	2.26				
1625 (over ~~1624~~)			4.235	~~28.925~~ ~~16.165~~	
				~~1328.185~~ 1328.193	1328.158

PK NAIL SET

BCSM IN HANDHOLE (PANEL + 0.65)

BCSM FLUSH 12th & PEORIA (DMJM DATA)

BCSM IN HANDHOLE CAVE CREEK & PEORIA (PANEL - .61)

STA	+	HI	−	ELEV.
				1275.765 ~~1276.47~~
	7.60			
TP			5.32	~~1278.75~~
	2.07			1270.305
1613			9.31	~~1271.51~~
	11.03			
TP			2.75	~~1279.79~~
	6.28			1280.545
1614			4.82	~~1281.25~~
	7.41			
TP			4.99	~~1283.67~~
	6.865			1282.92
1617			6.91	~~1283.625~~
	11.645			
TP			3.045	~~1292.225~~
	11.435			
TP			8.73	~~1294.93~~
	6.375			1295.22 ~~1295.925~~
1613			5.38	~~1300.925~~
	6.29			
TP			4.005	1298.21
	7.33			1299.69
#497			5.145	~~1300.395~~

2-9-94

1612 PANEL ELEV = ~~1256.47~~

#497

STA	BS	HI	FS	ELEV
				1234.11
	7.775			
TP			10.26	31.625
	13.13			
TP			0.865	[illegible]
	13.715			
TP			[illegible]	[illegible]
	7.87			
#516			[illegible]	[illegible]

BM				00.31
	3.755			
			6.31	97.255
	6.735			
			3.675	00.315

1613				71.535
	11.385			
~~TP~~ 1614			1.76	81.5

1626

~~625~~ BC IN H.H. CAVE CREEK @ PEORIA

#516 ELEV. = 1353.19 (DMJM DATA)

BCSN @ 2nd & MT VIEW (FLUSH)

BC IN H.H. @ CAVE CREEK & MT VIEW

1613 PANEL

2-16-94

A. WITZELL P.C.
K. PERRY R.M.

STA	BS	HI	FS	ELEV	ADJ
				1261.766	
	3.23				
TP			3.555	60.441	
	5.20				
1609			3.73	62.911	62.907
1609				62.907	
	8.135				
TP			7.525	63.517	
	3.13				
1606			6.365	60.282	60.285
	6.055				
TP			3.32	[illegible]	
	7.36				
1609			7.975	62.902	62.907

#1608, 32nd St. & Townley Panel

#1609, Townley & Wall Panel

2-16-[illegible]

A. W[illegible] P.C.

K. PERRY R.M.

STA	BS	HI	FS	ELEV	ADJ
				1261.766	
	8.23				
TP			3.555	60.441	
	5.20				
1609			8.73	62.911	62.907

STA	BS	HI	FS	ELEV	ADJ
1609				62.907	
	8.135				
TP			7.525	63.517	
	3.13				
1606			6.365	60.282	60.285
	6.055				
TP			2.32	63.517	
	7.36				
1609			7.975	62.902	62.907

#1608, 8th St. & Townley Panel

#1609, Townley & Wall - Panel

⊼ @ 1600 , BS 1601
BS DIST. = 272.36

FS 1602

DIR	158-19-22	REV.	338-19-11
			179-59-39
	158-19-22		158-19-32

AVG = 158-19-27
DIST. = 464.90

⊼ @ 1602 , BS 1600
BS DIST = 464.86

FS 1603

DIR	85-48-08	REV.	265-47-40
			179-59-40
	85-48-08		85-48-00

AVG. = 85-48-04
DIST. = 907.03

⊼ @ 1603 , BS 1602
BS DIST. = 907.02

FS 1604

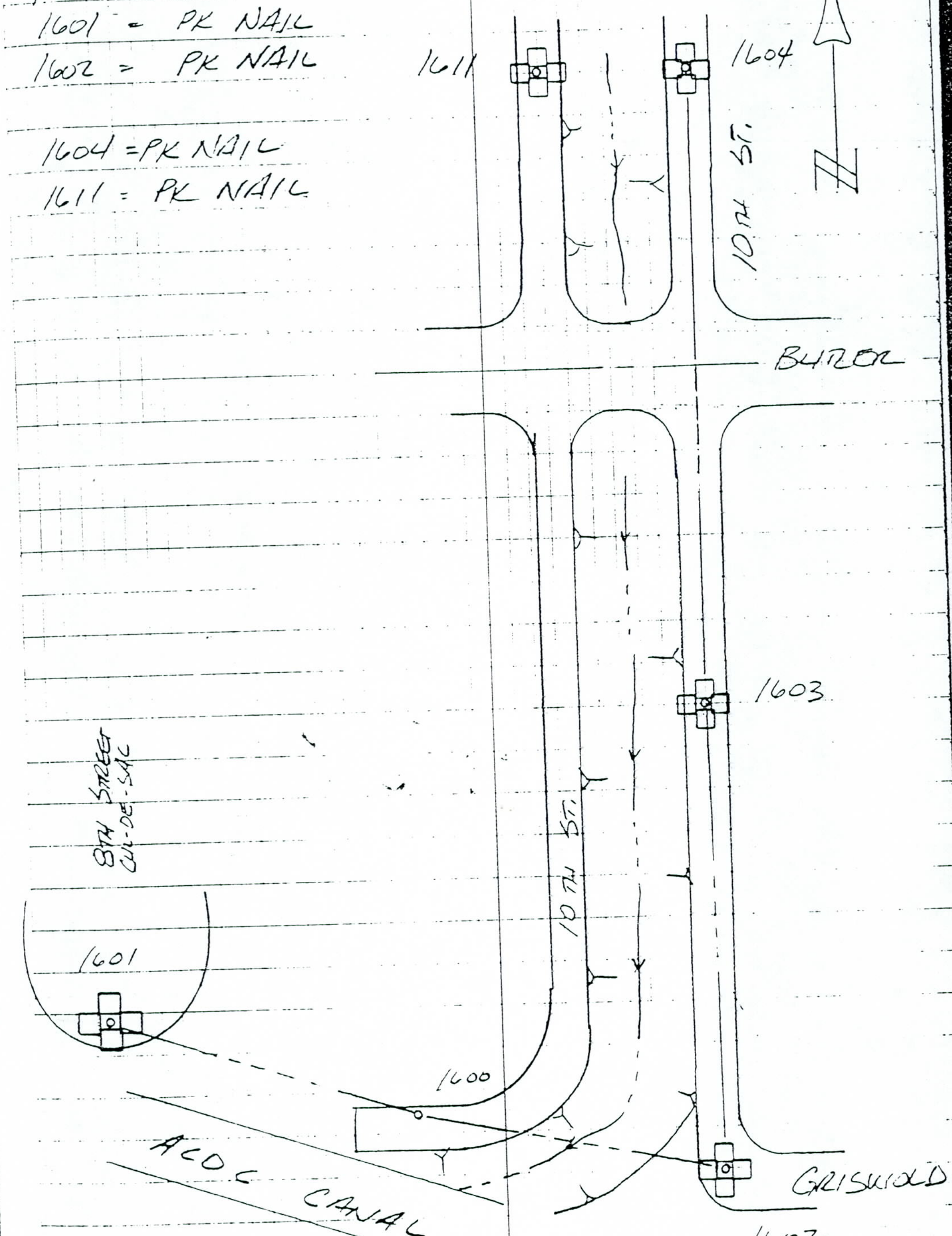
DIR	180-16-14	REV	00-16-01
			179-59-35
	180-16-14		180-16-26

AVG. = 180-16-20
DIST. = 773.51

1600 = PK NAIL
1601 = PK NAIL
1602 = PK NAIL

1604 = PK NAIL
1611 = PK NAIL

1603 = PK NAIL



⊼ @ 1604, BS 1603
BS DIST. = 773.50

FS 1605

DIR	176-35-27	REV	356-35-10
			179-59-34
	176-35-27		176-35-36

AVG. = 176-35-31.5
DIST. = 1023.86

⊼ @ 1605, BS 1604
BS DIST. = 1023.85

FS 1606

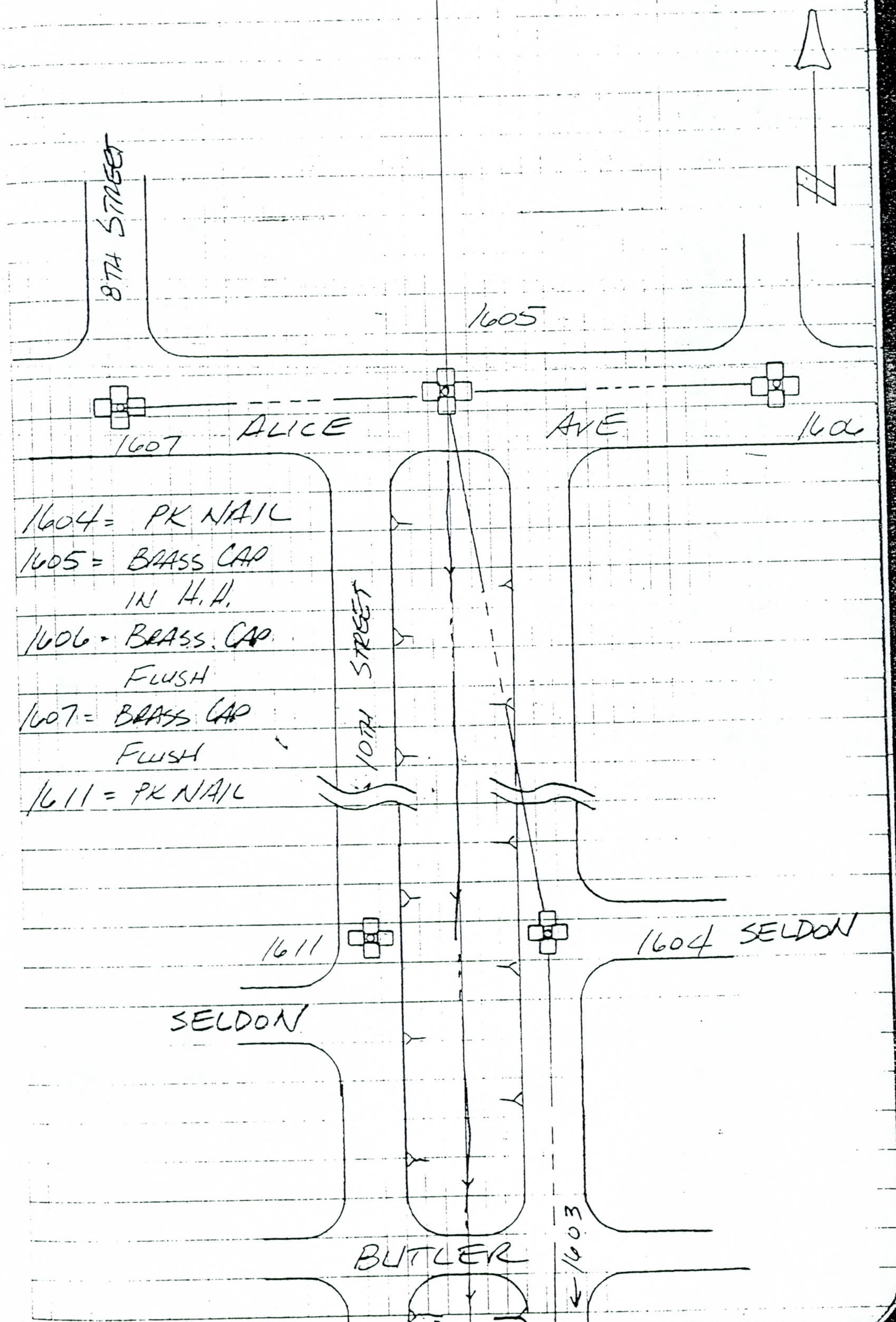
DIR	273-37-58	REV	93-37-38
			179-59-41
	273-37-58		273-37-57

AVG. = 273-37-57.5
DIST. = 672.90

FS 1607

			278-38-34
DIR	93-38-53	REV.	~~93-37-38~~
			179-59-41
	93-38-53		93-38-53

AVG. = 93-38-53
DIST. = 772.84


8TH STREET
1605
ALICE
AVE
1607
1606
1604 = PK NAIL
1605 = BRASS CAP
IN H.H.
1606 = BRASS CAP
FLUSH
1607 = BRASS CAP
FLUSH
1611 = PK NAIL
10TH STREET
1611
1604
SELDON
SELDON
BUTLER
1603

⊼@ 1607, BS 1605
BS DIST = 772.84

FS 1608

DIR	270-19-54	REV.	90-19-37
			179-59-44
	270-19-54		270-19-53

AVG. = 270-19-53.5
DIST. = 658.32

⊼@ 1608, BS 1607
BS DIST. = 658.33

FS 1609

DIR	269-51-35	REV.	89-51-18
			179-59-35
	269-51-35		269-51-43

AVG. = 269-51-39
DIST. = 1037.07

⊼@ 1609, BS 1608
BS DIST. = 1037.07

FS 1606

DIR	238-04-12	REV	58-03-49
			179-59-35
	238-04-12		238-04-14

AVG. = 238-04-13
DIST = 769.67

SAME SET-UP CONTINUED

FS 1610

DIR 179-59-40 REV 359-59-19

179-59-34

179-59-40 179-59-45

AVG. = 179-59-42.5

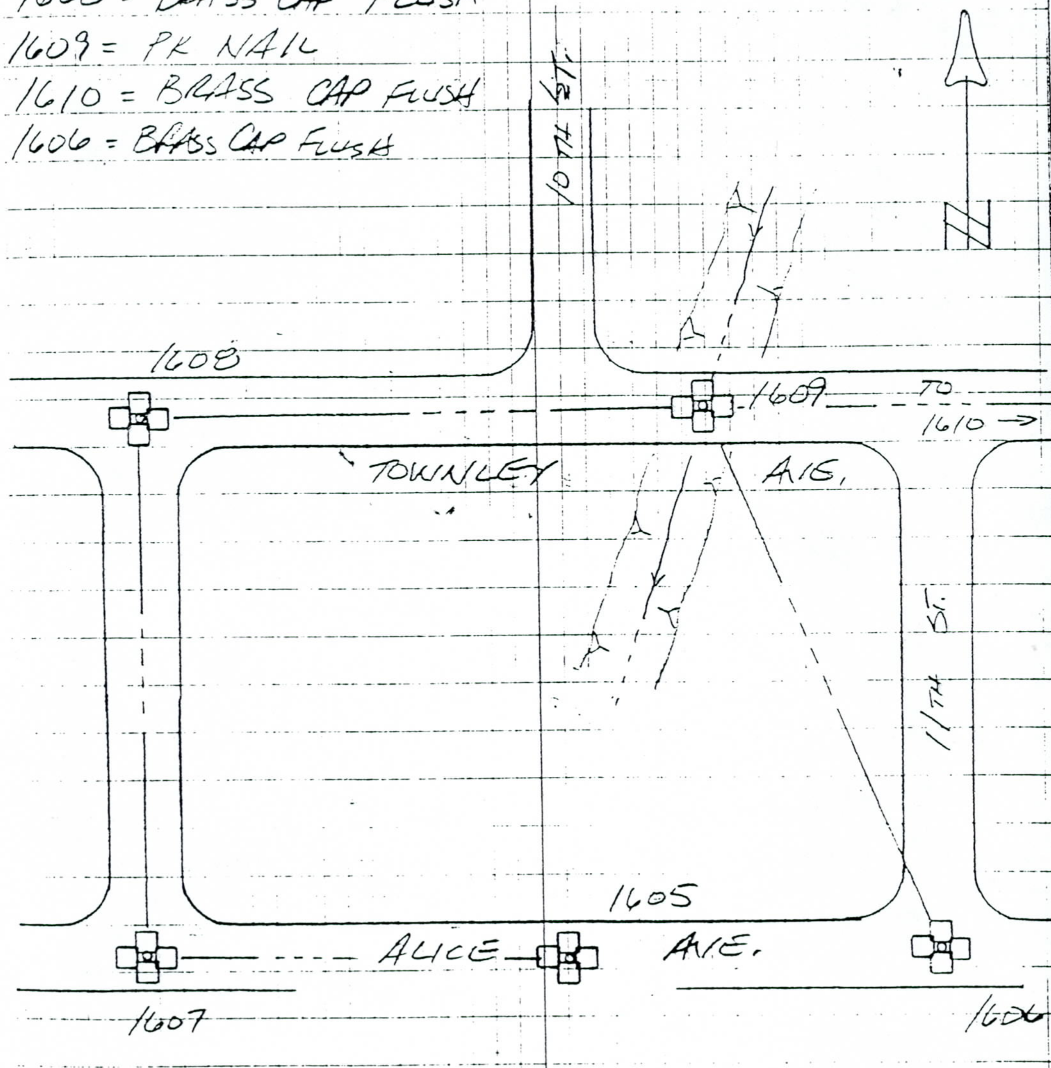
DIST. = 1057.215

1608 = BRASS CAP FLUSH

1609 = PK NAIL

1610 = BRASS CAP FLUSH

1606 = BRASS CAP FLUSH



⊼ @ 1612, BS 1610
BS DIST. = 653.61

FS 1613

DIR	94-45-11	REV	274-44-44
			179-59-29
	94-45-11		94-45-15

AVG. = 94-45-13
DIST. = 809.63

⊼ @ 1613, BS 1612
BS DIST. = 809.64

FS 1614

DIR	270-31-25	REV	90-31-05
			179-59-43
	270-31-25		270-31-22

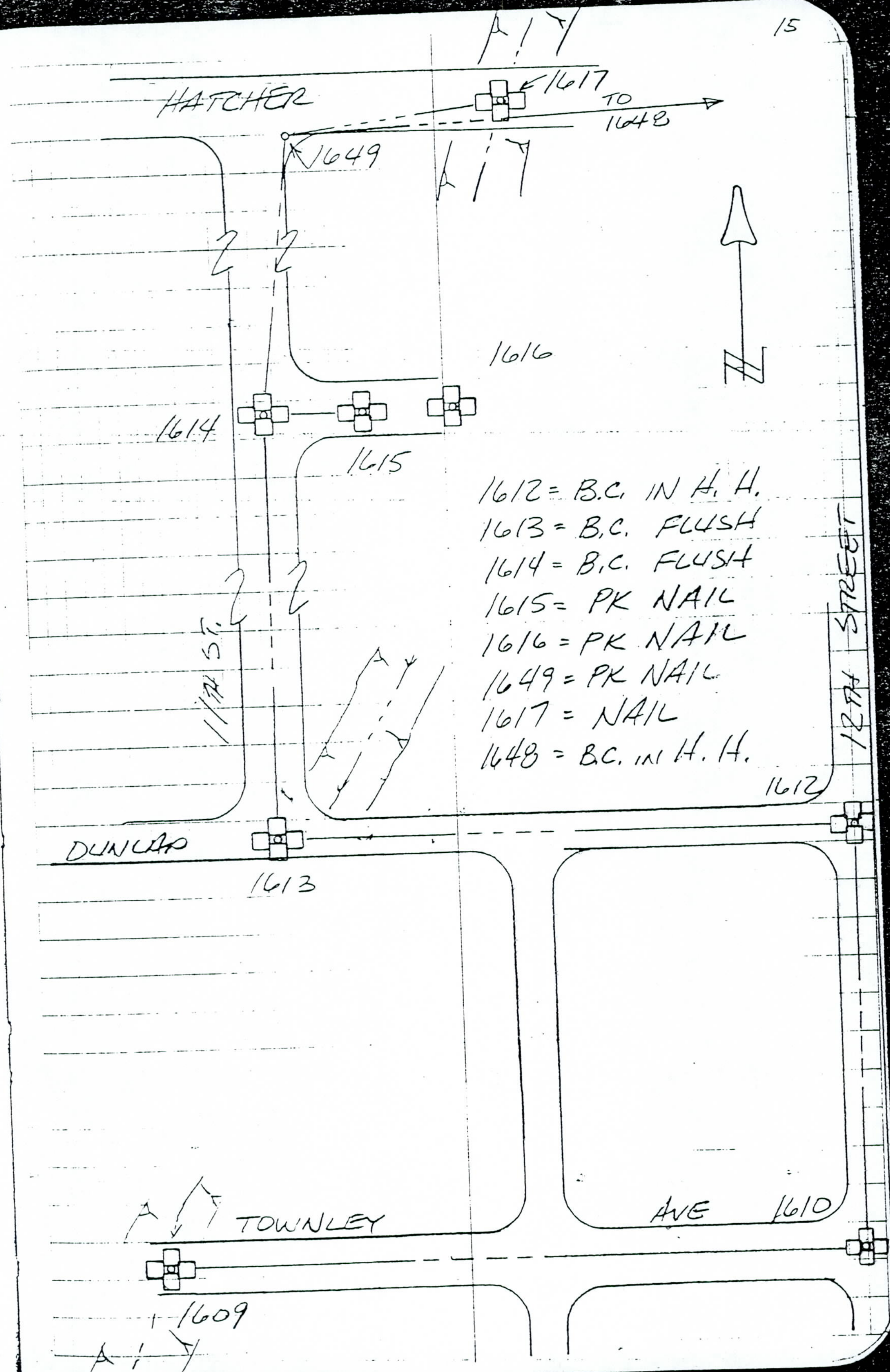
AVG. = 270-31-23.5
DIST. = 655.12

⊼ @ 1614, BS 1613
BS DIST. = 655.12

FS 1615

DIR	270-07-59	REV	90-07-41
			179-59-40
	270-07-59		270-08-01

AVG. = 270-08-00
DIST. = 98.63


HATCHER
1617
TO 1648
1649
1616
1614
1615
11TH ST.
12TH STREET
DUNLAP
1613
1612
TOWNLEY
AVE
1610
1609
1612 = B.C. IN H. H.
1613 = B.C. FLUSH
1614 = B.C. FLUSH
1615 = PK NAIL
1616 = PK NAIL
1649 = PK NAIL
1617 = NAIL
1648 = B.C. IN H. H.

CONTINUE SAME SET-UP

FS 1649

DIR	181-41-12	REV	01-40-52
			179-59-33
	181-41-12		181-41-19

AVG. = 181-41-15.5
DIST = 631.34

⊼ @ 1649, BS 1614
BS DIST. = 631.35

FS 1617

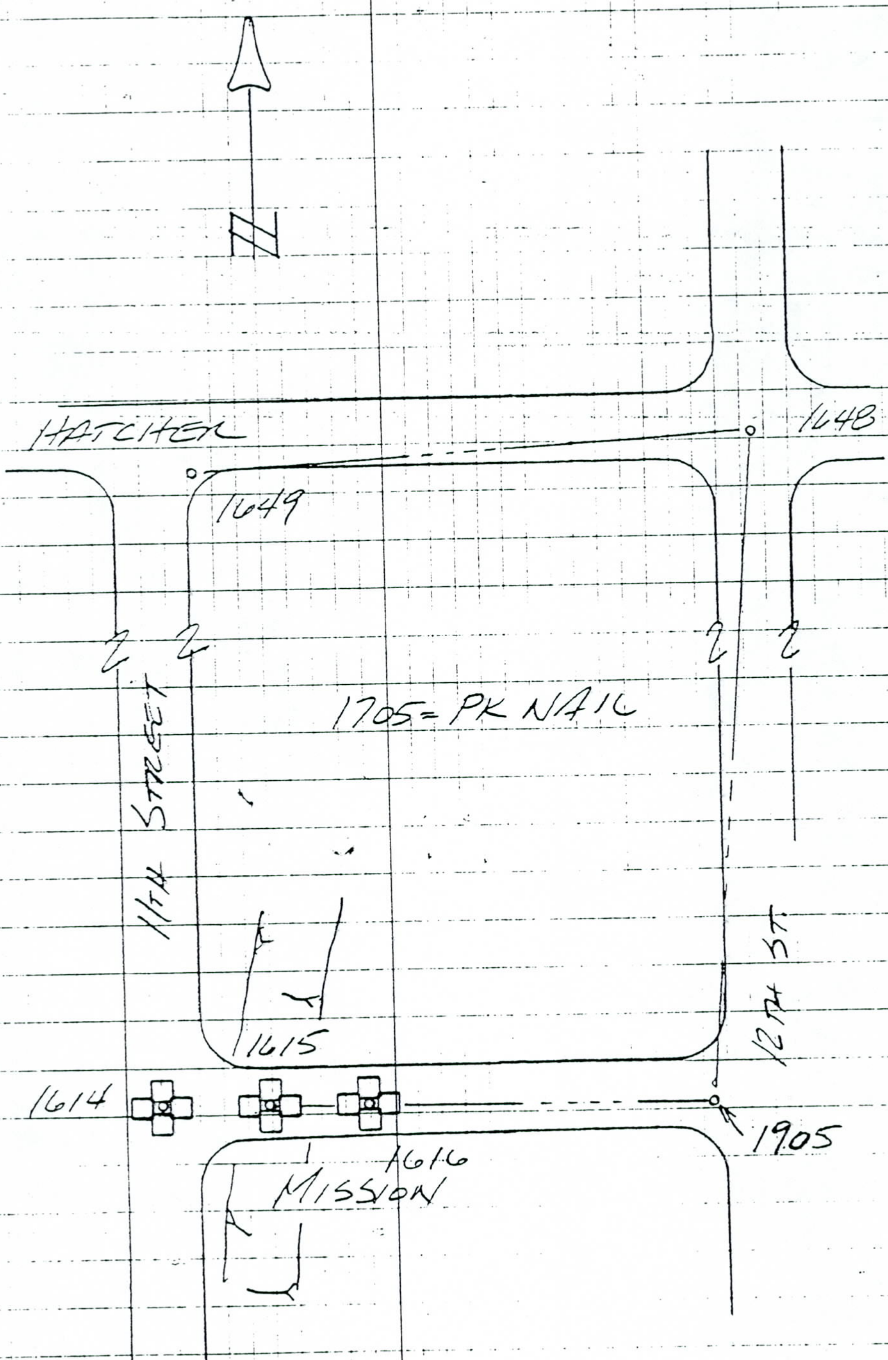
DIR	262-03-41	REV	82-03-11
			179-59-27
	262-03-41		262-03-44

AVG. = 262-03-42.5
DIST. = 232.01

FS 1648

DIR	266-22-10	REV.	86-21-38
			179-59-35
	266-22-10		266-22-03

AVG. = 266-22-06.5
DIST. = 301.00


N
HATCHER
1648
1649
11TH STREET
1705 = PK NAIL
12TH ST
1615
1614
1905
1616
MISSION

Ie 1648, BS 1649
BS DIST. = 800.97

FS 1905

DIR 274-30-15 REV 94-29-43
179-59-27

274-30-15 274-30-16

AVG. = 274-30-15.5
DIST. = 656.775

FS 1617

DIR 01-45-04 REV. 181-44-35
179-59-34

01-45-04 01-45-01

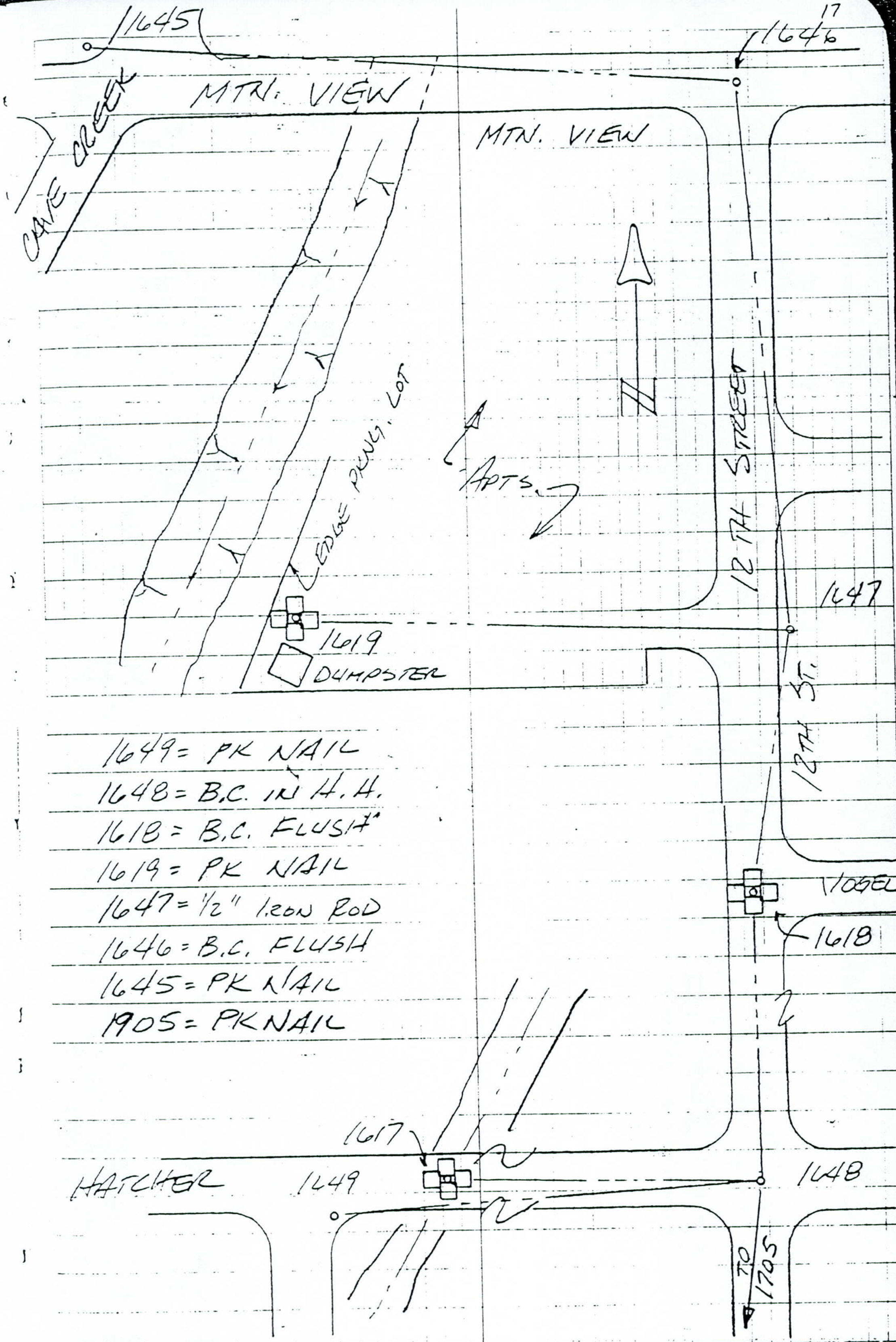
AVG. = 01-45-02.5
DIST. = 569.97

FS 1618

DIR 92-22-46 REV 272-22-21
179-59-27

92-22-46 92-22-54

AVG. = 92-22-50
DIST. = 653.28



1649 = PK NAIL
1648 = B.C. IN H.H.
1618 = B.C. FLUSH
1619 = PK NAIL
1647 = 1/2" IRON ROD
1646 = B.C. FLUSH
1645 = PK NAIL
1905 = PK NAIL

⊼@ 1618, BS 1648
BS DIST. = 653.29

FS 1647

DIR 188-09-49 REV 08-09-19
179-59-38

188-09-49 188-09-41

AVG. = 188-09-45
DIST. = 233.09

⊼ @ 1647, BS 1618
BS DIST. = 233.09

FS 1619

DIR 81-45-55 REV 261-45-22
179-59-28

81-45-55 81-45-54

AVG. = 81-45-54.5
DIST. = 314.73

FS 1646

DIR 167-22-27 REV 347-22-10
179-59-37

167-22-27 167-22-33

AVG. = 167-22-30
DIST. = 424.01

⊼@ 1646, BS 1647
BS DIST. = 424.03

FS 1645

DIR	99-40-52	REV	279-41-03
			180-00-00
	99-40-52		99-41-03

AVG. = 99-40-57.5
DIST. = 382.76

⊼@ 1645, BS 1646
BS DIST. = 382.78

FS 1621

DIR	301-56-11	REV	121-55-55
			179-59-50
	301-56-11		301-56-05

AVG. = 301-56-07.5
DIST. = 630.58

⊼@ 1621, BS 1645
BS DIST. = 630.55

FS 1622

DIR	191-13-08	REV	11-12-52
			179-59-42
	191-13-08		191-13-10

AVG. = 191-13-09
DIST. = 1225.53

⊼ @ 1622, BS 1621
BS DIST. = 1225.53

FS 1623

DIR	41-11-30	REV	221-11-08
			179-59-43
	41-11-30		41-11-25

AVG. = 41-11-27.5
DIST. = 641.37

⊼ @ 1623, BS 1622
BS DIST. = 641.37

FS 1644

DIR	178-57-57	REV	358-57-37
			179-59-49
	178-57-57		178-57-48

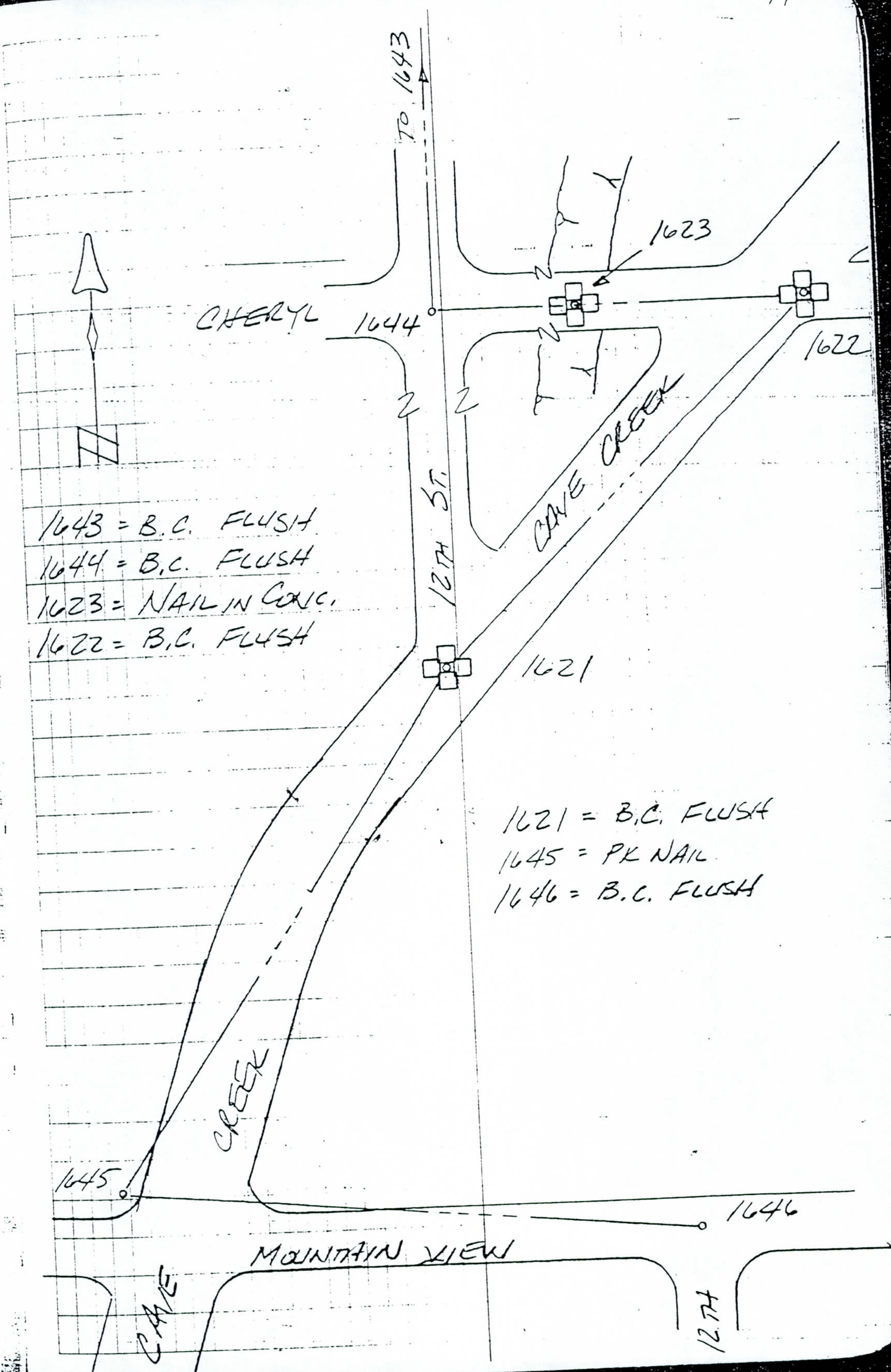
AVG. = 178-57-52.5
DIST. = 275.34

⊼ @ 1644, BS 1623
BS DIST. = 275.35

FS 1643

DIR	271-26-20	REV	91-25-58
			179-59-29
	271-26-20		271-26-29

AVG. = 271-26-24.5
DIST. = 1338.38


TO 1643
1623
CHERYL
1644
1622
CAVE CREEK
12TH ST.
1643 = B.C. FLUSH
1644 = B.C. FLUSH
1623 = NAIL IN CONC.
1622 = B.C. FLUSH
1621
1621 = B.C. FLUSH
1645 = PK NAIL
1646 = B.C. FLUSH
CREEK
1645
1646
MOUNTAIN VIEW
CAVE
12TH

⊼@ 1643, BS 1644
BS DIST. = 1338.37

FS 1625

DIR 268-51-35 REV 88-51-18

179-59-38

268-51-35 268-51-40

AVG. = 268-51-37.5
DIST. = 632.79

⊼@ 1625, BS 1643
BS DIST. = 632.80

FS 1626

DIR 179-59-40 REV 359-59-26

179-59-49

179-59-40 179-59-37

AVG. = 179-59-38.5
DIST. = 806.48

⊼@ 1626, BS 1625
BS DIST. = N/A

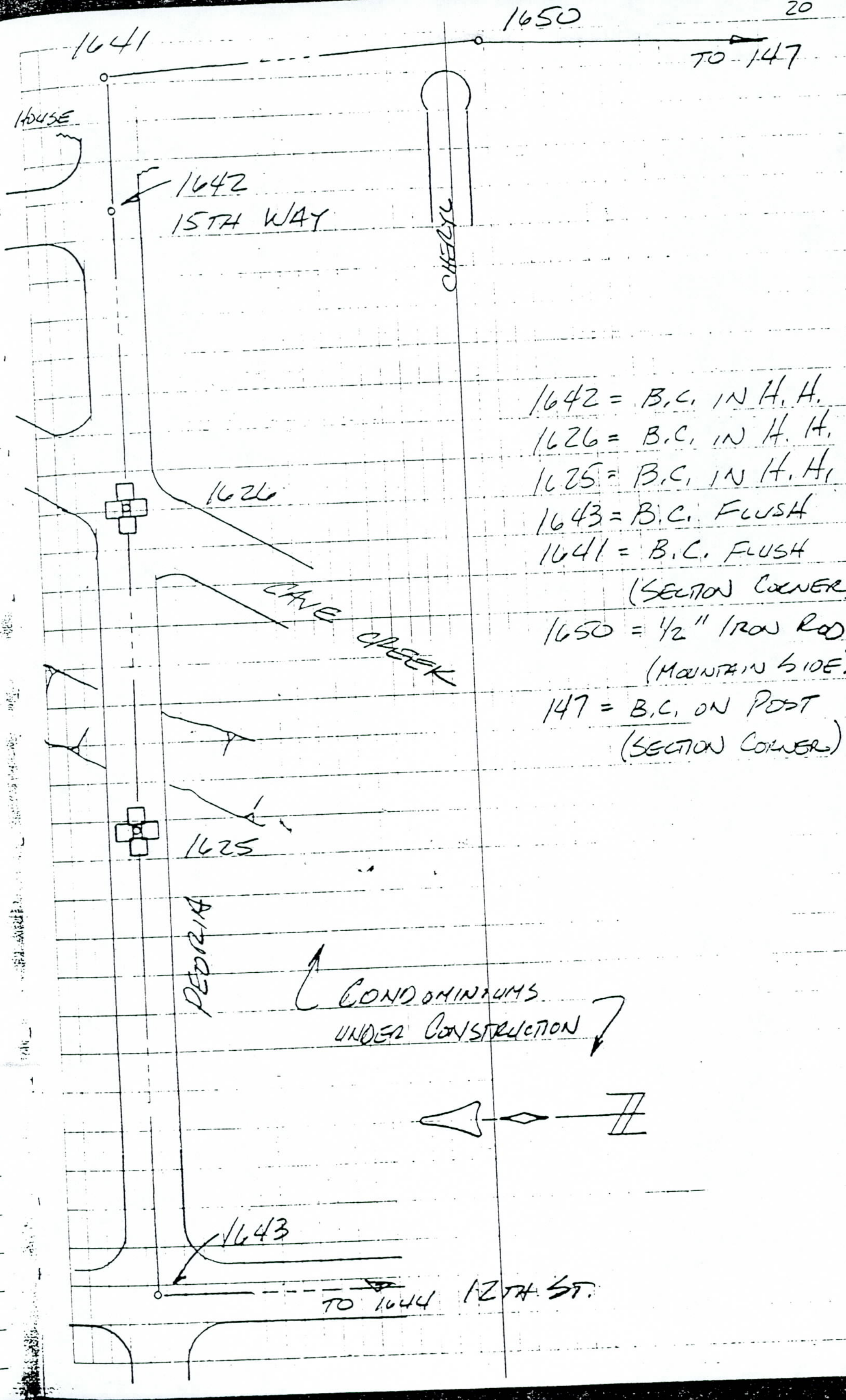
FS 1642

DIR 179-58-10 REV. 359-58-04

179-59-43

179-58-10 179-58-21

AVG. = 179-58-15.5
DIST = 989.81



1642 = B.C. IN H.H.
1626 = B.C. IN H.H.
1625 = B.C. IN H.H.
1643 = B.C. FLUSH
1641 = B.C. FLUSH
(SECTION CORNER)
1650 = 1/2" IRON ROD
(MOUNTAIN SIDE)
147 = B.C. ON POST
(SECTION CORNER)

⊼ @ 1642, BS 1626
BS DIST = 989.82

FS 1641

DIR 179-57-28 REV 359-57-13

179-59-44

179-57-28 179-57-29

AVG. = 179-57-28.5
DIST. = 212.70

⊼ @ 1641, BS 1642
BS DIST. = 212.68

FS 1650

DIR 270-27-11 REV 90-26-58

179-59-44

270-27-11 270-27-14

AVG. = 270-27-12.5
DIST = 1489.15

⊼ @ 1650, BS 1641
BS DIST. = 1489.14

FS 147

DIR 181-19-55 REV 01-19-37

179-59-40

181-19-55 181-19-57

AVG. = 181-19-56
DIST. = 3811.87

⊼ @ 147, BS 1650
BS DIST. = 3811.87

FS 1613
DIR 268-29-16 REV 88-28-49
179-59-35

268-29-16 268-29-14

AVG. = 268-29-15
DIST = 3433.81

⊼ @ 1613, BS 147
BS DIST. = 3433.72

FS 1614
DIR 270-32-00 REV 90-31-43
179-59-36

270-32-00 270-32-07

AVG. = 270-32-03.5
DIST = 655.13

(THIS CLOSES NORTH HALF)

⊼ @ 1613, BS 1614

FS 1640
DIR 269-23-55 REV 89-23-37
179-59-43

269-23-55 269-23-54

AVG. = 269-23-54.5
DIST = 1560.76

FS 1901

~~1701~~ DIR 269-28-25 REV ~~89-28-05~~

~~180-00-13~~

269-28-25 ~~269-27-52~~

AVG. = 269-28-25

DIST. = 1746.58

π @ 1640, BS 1613

BS DIST. = 1560.72

FS 1639

DIR 100-22-56 REV 280-22-36

179-59-50

100-22-56 100-22-46

AVG. = 100-22-51

DIST = 1259.26

π @ 1639, BS 1640

BS DIST. = 1259.27

FS 1901

DIR 351-31-17 REV 171-31-01

179-59-53

351-31-17 351-31-08

AVG = 351-31-12.5

DIST = 1241.63

⊼ @ 1639, BS 1640

FS 1638

DIR	167-35-22	REV	347-35-06
			179-59-41
	167-35-22		167-35-25

AVG. = 167-35-23.5
DIST = 2366.30

⊼ @ 1638, BS 1639
BS DIST = 2366.30

FS 1601

DIR	115-06-37	REV	295-06-28
			179-59-47
	115-06-37		115-06-41

AVG = 115-06-39
DIST. = 679.20

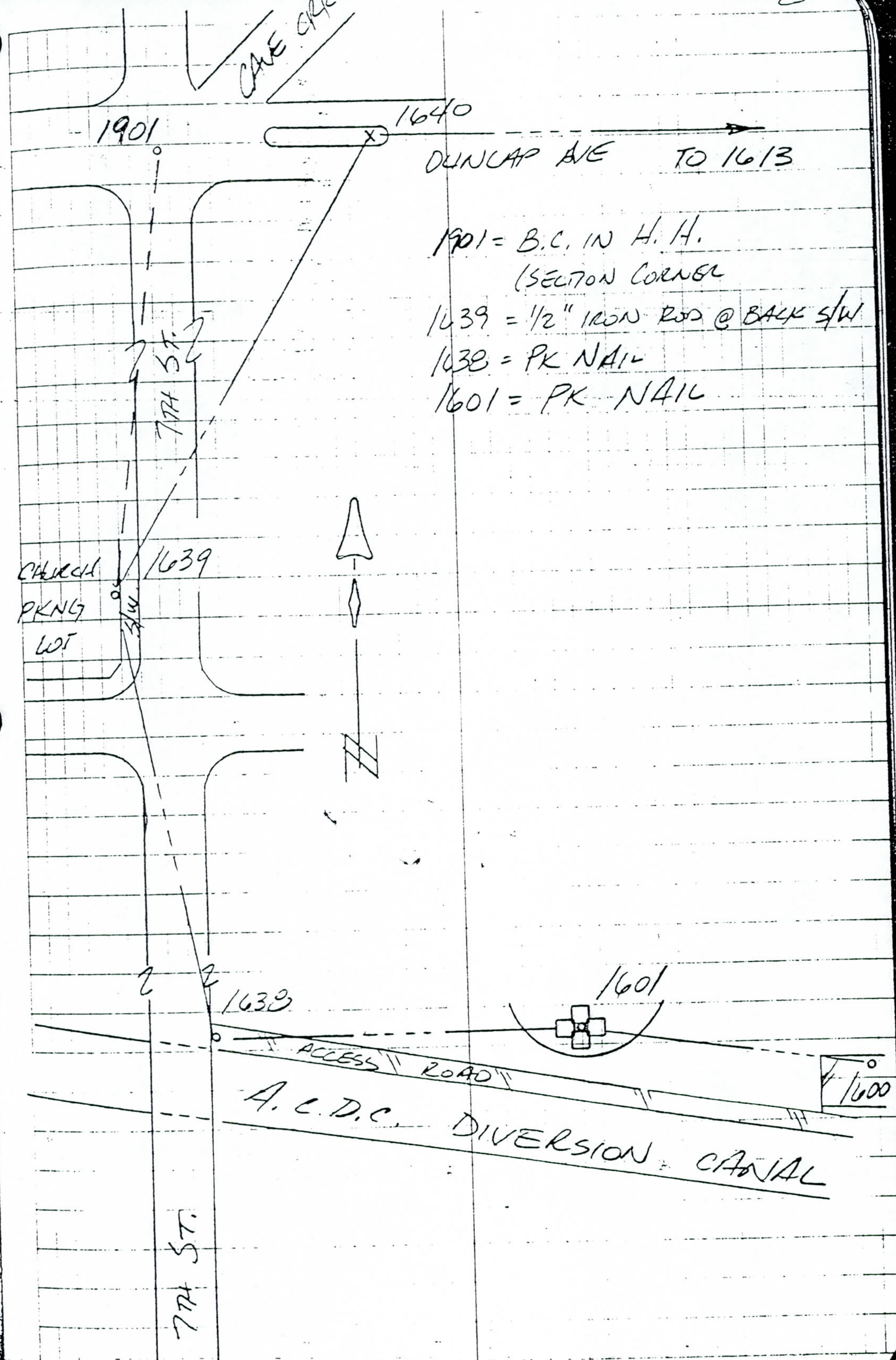
⊼ @ 1601, BS 1638
BS DIST = 679.20

FS 1600

DIR	181-58-46	REV	01-58-19
			179-59-40
	181-58-46		181-58-39

AVG = 181-58-42.5
DIST = 272.35

THIS CLOSES SOUTH HALF



1901 = B.C. IN H. H.
(SECTION CORNER
1639 = 1/2" IRON ROD @ BACK S/W
1638 = PK NAIL
1601 = PK NAIL

MISCELLANEOUS TIES

⊼ @ 1610, BS 1609
BS DIST. = 1057.17

FS 1612

DIR	85-26-08	REV	265-25-50
			179-59-47
	85-26-08		85-26-03

AVG. = 85-26-05.5
DIST. = 653.665

⊼ @ 1638, BS ~~1601~~ 1910
BS DIST = 1870.57

FS 1601

DIR	292-25-08	REV	112-24-52
			179-59-44
	292-25-08		292-25-08

AVG. = 292-25-08
DIST = 679.18

1910 = BC IN HANDHOLE @ 7TH ST & NORTHERN (SECTION CORNER)

CONTINUED

⊼ @ 1910, BS 1911
BS DIST. = 2646.42

FS 1638

DIR	90-08-03	REV	270-07-43
			179-59-29
	90-08-03		90-08-14

AVG. = 90-08-08.5
DIST = 1870.58

⊼ @ 1905, BS 1614
BS DIST. = 789.76

FS 1615

DIR	359-57-35	REV.	179-57-22
			179-59-50
	359-57-35		359-57-32

AVG. = 359-57-33.5
DIST. = 691.21

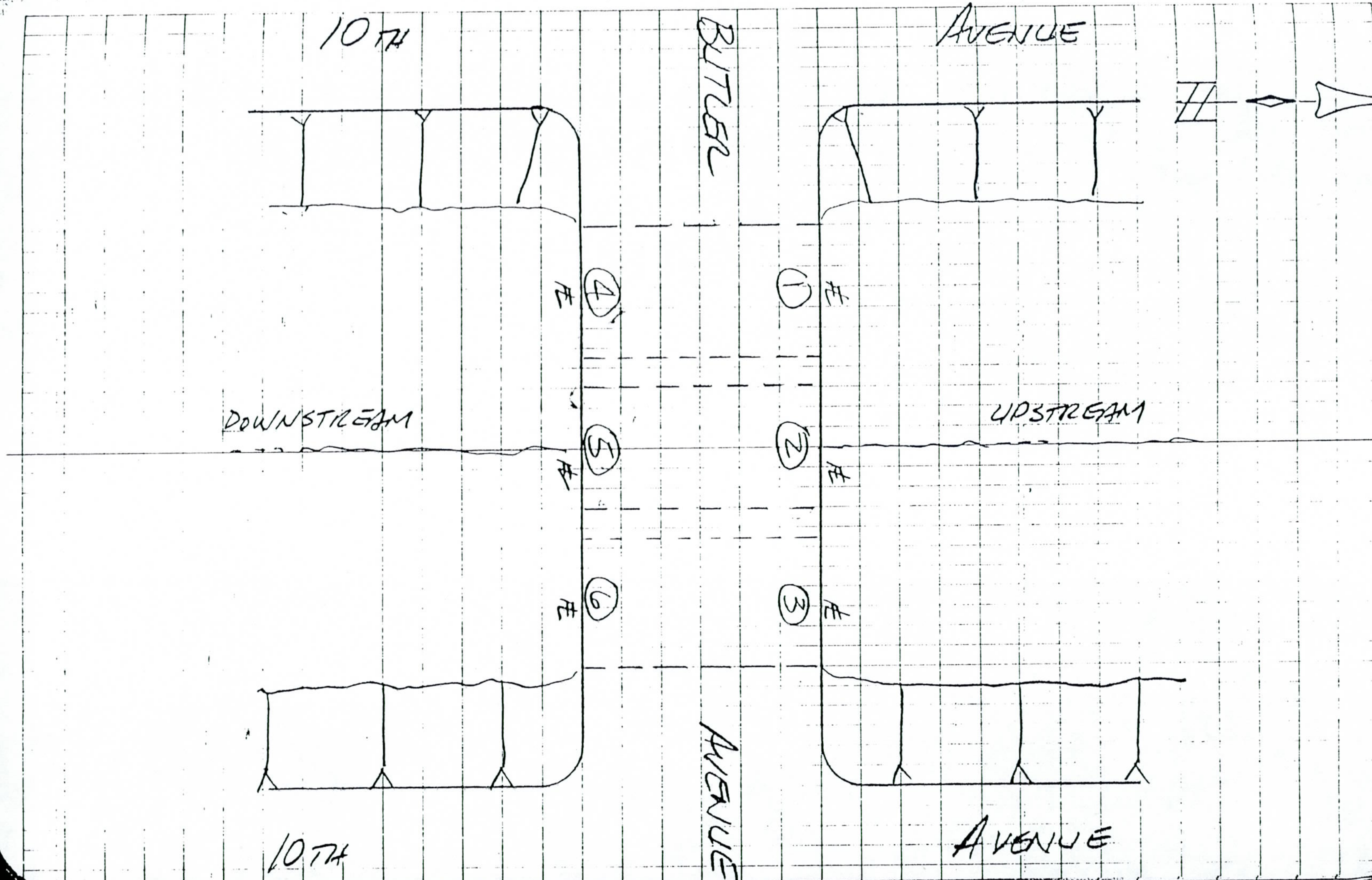
⊼ @ 1644, BS 1623
FS 1651

DIR	93-37-56	REV	273-37-37
			179-59-48
	93-37-56		93-37-49

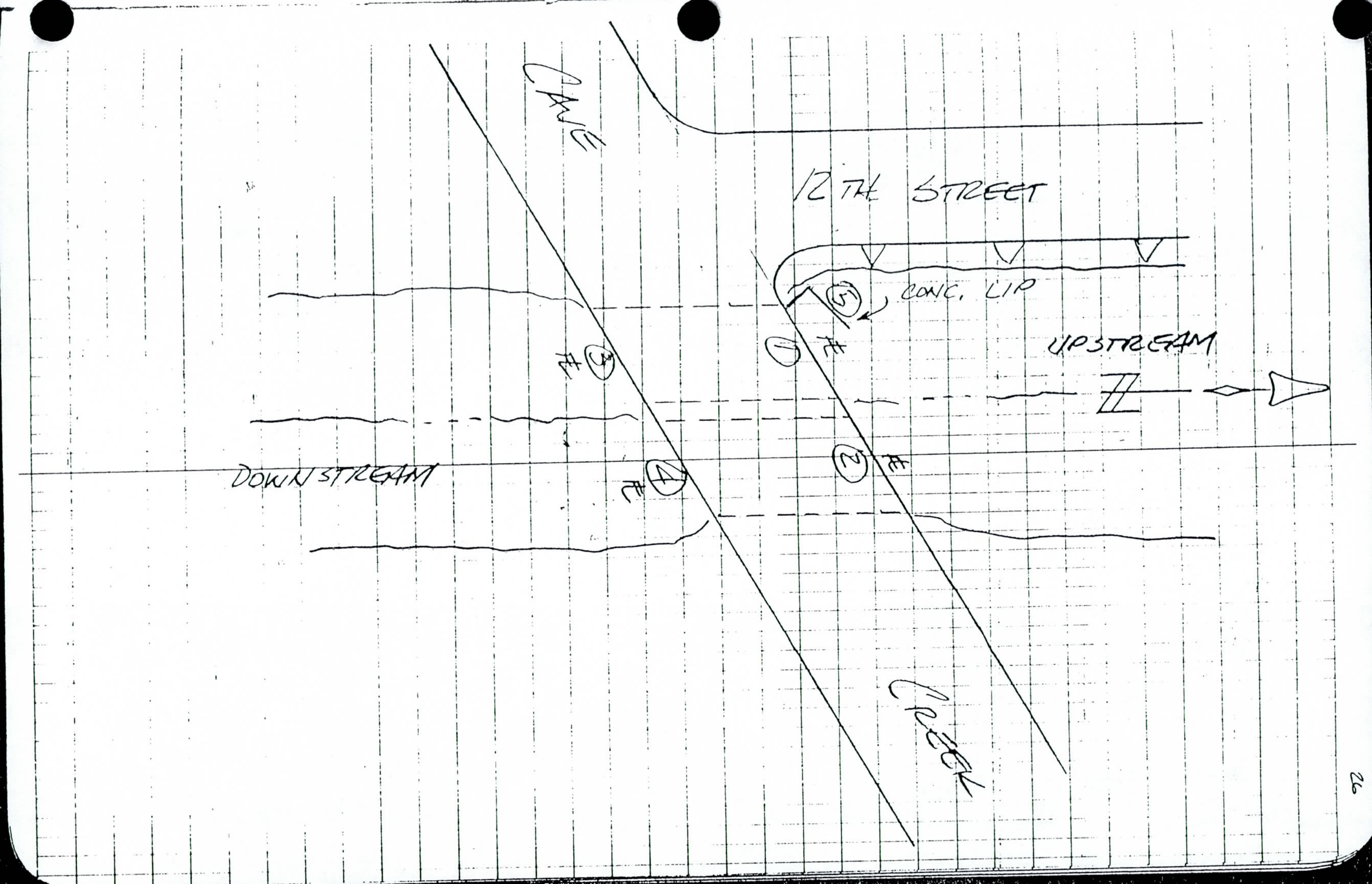
AVG. = 93-37-52.5
DIST = 295.73

2-23-94
A. WITZEL P.G.
K. PERRY R.N.

STA	BS	HI	FS	ELEV	
				1249.568	#1611 PANEL
	4.22				
①			12.61	1241.18	
②			12.50	1241.29	
③			12.60	1241.19	
④			13.02	1240.77	
⑤			12.87	1240.92	
⑥			13.09	1240.70	
TP7			5.00	1248.79	
	4.89				
#1611			4.11	1249.57	

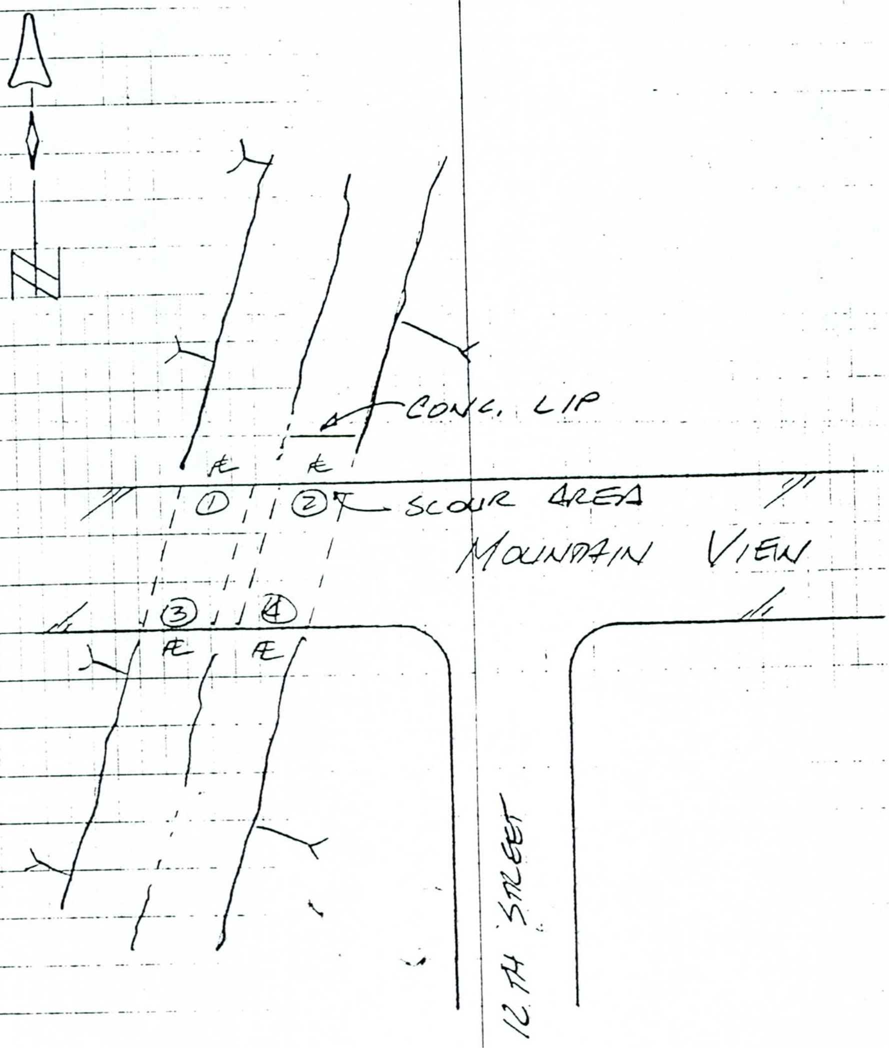

10TH
BUTLER
AVENUE
DOWNSTREAM
UPSTREAM
1
2
3
4
5
6
AVENUE
10TH
AVENUE

STA	BS	HI	FS	ELEV		
				1305.018	#1621	PANEL
	4.94	1309.96				
①			14.06	1295.90		
②			13.61	1296.35		
③			15.05	1294.91		
④			14.43	1295.53		
⑤			13.95	1296.01		
#1621			4.94 ✓			



CANE
12 TH STREET
CONC. LIP
UPSTREAM
DOWNSTREAM
CREEK

STA	BS	HI	FS	ELEV	
					TBM - B.C. FLUSH @
				1299.58	12TH & MTN. VIEW
	5.07	1304.65			
①			14.39	1290.26	
②			15.80	1288.85	
③			14.33	1290.32	
④			14.10	1290.55	
⑤			14.50	1290.15	
TBM			5.07 ✓		


CONC. LIP
℄
℄
①
②
SCOUR AREA
MOUNTAIN VIEW
③
④
℄
℄
12TH STREET

⊼ @ 1600, BS 1601
1601 ELEV = 1236.308, HI = ~~5.95~~ 1242.76

STA	∡ RT	Z ∡	SLOPE	ROD
1700	128-44-57	~~90-13-24~~	100.00	4.39
1701	157-00-40	89-48-04	111.29	"
1702	161-45-55	89-32-18	119.30	"
1703	166-05-51	89-00-34	125.57	"
1704	166-50-43	90-46-52	126.49	7.80
1705	169-02-34	90-13-41	131.50	"
1706	169-31-34	90-24-10	131.74	"
1707	170-25-07	89-46-45	133.10	"
1708	174-21-23	89-44-56	142.35	"
1709	175-50-02	86-58-59	150.85	"
1710	180-21-45	86-47-35	225.24	"
1711	180-59-53	87-08-20	230.16	"
1712	183-30-08	87-07-17	243.20	"
		85-50-33		

⊼ @ 1603, BS 1604
1603 ELEV = 1242.559 HI = +5.15

STA	∡ RT	Z ∡	SLOPE	ROD
1713	168-16-32	90-35-37	140.51	4.89
1714	184-12-58	90-43-35	136.85	"
1715	190-36-25	91-17-12	143.63	"
1716	193-21-37	90-49-03	145.54	7.80
1717	198-~~28~~ 21-47	90-49-54	148.20	"
1718	203-32-16	89-49-55	152.65	4.89
1719	205-21-12	90-02-39	154.64	"
1720	205-32-35	90-11-06	155.02	"
1721	210-19-41	90-23-08	160.71	"
1722	210-56-36	90-16-53	161.73	"
1723	229-55-32	90-15-54	218.16	"

PVMT
E.P.
TOP BANK
GRD BRK
TOE SLOPE
TOE SLOPE
BOTTOM CONC. SPILLWAY
TOE " "
BLK FNC.
E.P.
E.P.
BACK S/W
GRD. BRK.

PVMT
E.P.
GRD. BRK
TOE SLOPE
" "
TOP BANK
BACK CURB (B/C)
GUTTER (G)
"
B/C
GRND.

⊼ @ 1604, BS 1603

1604 ELEV. = 1248.890 HI = 5.16

STA	∡ RT	Z ∡	SLOPE	ROD
1724	271-25-05	89-46-39	187.43	4.89
1725	292-21-24	90-07-03	12.22	"
1726	63-46-33	93-26-52	13.36	"
1727	64-26-19	89-24-53	14.02	"
1728	68-49-58	97-24-15	37.41	7.80
1729	74-06-29	95-53-07	48.15	"
1730	81-40-13	89-04-44	62.27	4.89
1731	81-41-55	89-07-25	67.31	"
1732	81-45-26	89-28-56	67.84	"
1733	82-33-11	90-04-26	85.30	"
1734	82-33-19	89-50-28	87.42	"
1735	86-18-19	90-06-11	235.43	"

⊼ @ ~~1625~~ 1605, BS ~~1643~~ 1607

1605 ELEV. = 1257.603 HI = 5.87

STA	∡ RT	Z ∡	SLOPE	ROD
1736	359-55-11	89-56-00	245.95	4.89
1737	359-31-23	87-58-06	29.39	"
1738	180-46-36	93-47-58	34.12	"
1739	180-56-58	89-54-43	70.95	"
1740	180-20-50	89-47-31	202.25	"
1741	180-25-23	89-48-48	244.12	"

⊼ @ 1625, BS 1643

1625 ELEV. = 1328.158 HI = 5.87

STA	∡ RT	Z ∡	SLOPE	ROD
1742	83-00-39	92-12-12	30.86	4.89
1743	178-56-47	90-57-59	44.31	"
1744	205-14-44	90-21-52	178.23	"
1745	203-36-52	89-58-04	206.72	16.40
1746	203-56-36	89-51-26	212.85	"
1747	203-55-31	89-28-24	213.91	"
1748	206-09-02	88-48-53	235.50	12.40
1749	206-09-40	88-56-59	303.97	"

PVMT
"
E.P.
B/C
GRD. BRK.
TOE SLOPE
TOP SLOPE
B/C
E.P.
"
B/C
GRND.

PVMT
"
"
"
"
"

E.P.
"
TOP BANK
TOE BANK
TOE @ WALL
TOP ~~BANK~~ WALL
TOP BANK
GRND

⊼ @ 1623, BS 1644

1623 ELEV = 1304.836 HI = +5.25

STA	∡ RT	Z ∡	SLOPE	ROD
1750	140-06-34 ~~140~~	87-31-34	292.15	7.80
1751	126-02-44	87-20-30	250.36	"
1752	121-06-58	89-00-12	245.75	"
1753	115-49-01	88-55-11	243.63	"
1754	112-43-03	87-48-41	243.59	"
1755	107-02-36	87-37-04	246.46	"
1756	105-49-40	87-15-16	246.31	"
1757	96-17-09	85-09-47	242.17	15.80

⊼ @ 1651, BS 1644

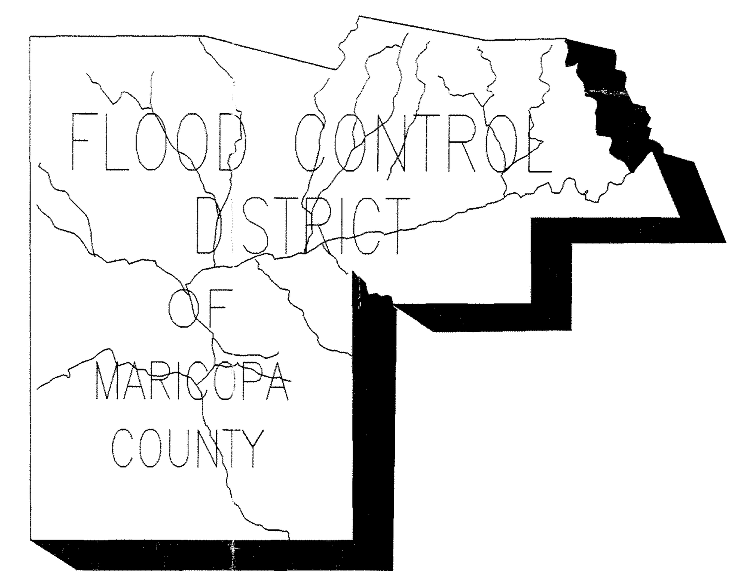
HI = 1313.98

STA	∡ RT	Z ∡	SLOPE	ROD
1758	132-52-31	90-14-16	307.27	4.89
1759	135-36-51	90-16-12	266.46	"
1760	135-40-29	90-18-28	262.83	"
1761	133-17-56	90-14-55	359.55	"
1762	138-34-35	90-59-18	254.95	11.80
1763	138-31-31	90-52-59	247.51	"
1764	139-22-01	90-54-56	240.70	4.89
1765	167-12-07	90-33-41	194.23	"
1766	168-54-09	90-40-46	193.38	"
1767	180-22-56	90-42-42	189.08	"
1768	180-34-23	90-34-09	189.09	"
1769	182-21-04	90-30-25	184.56	"

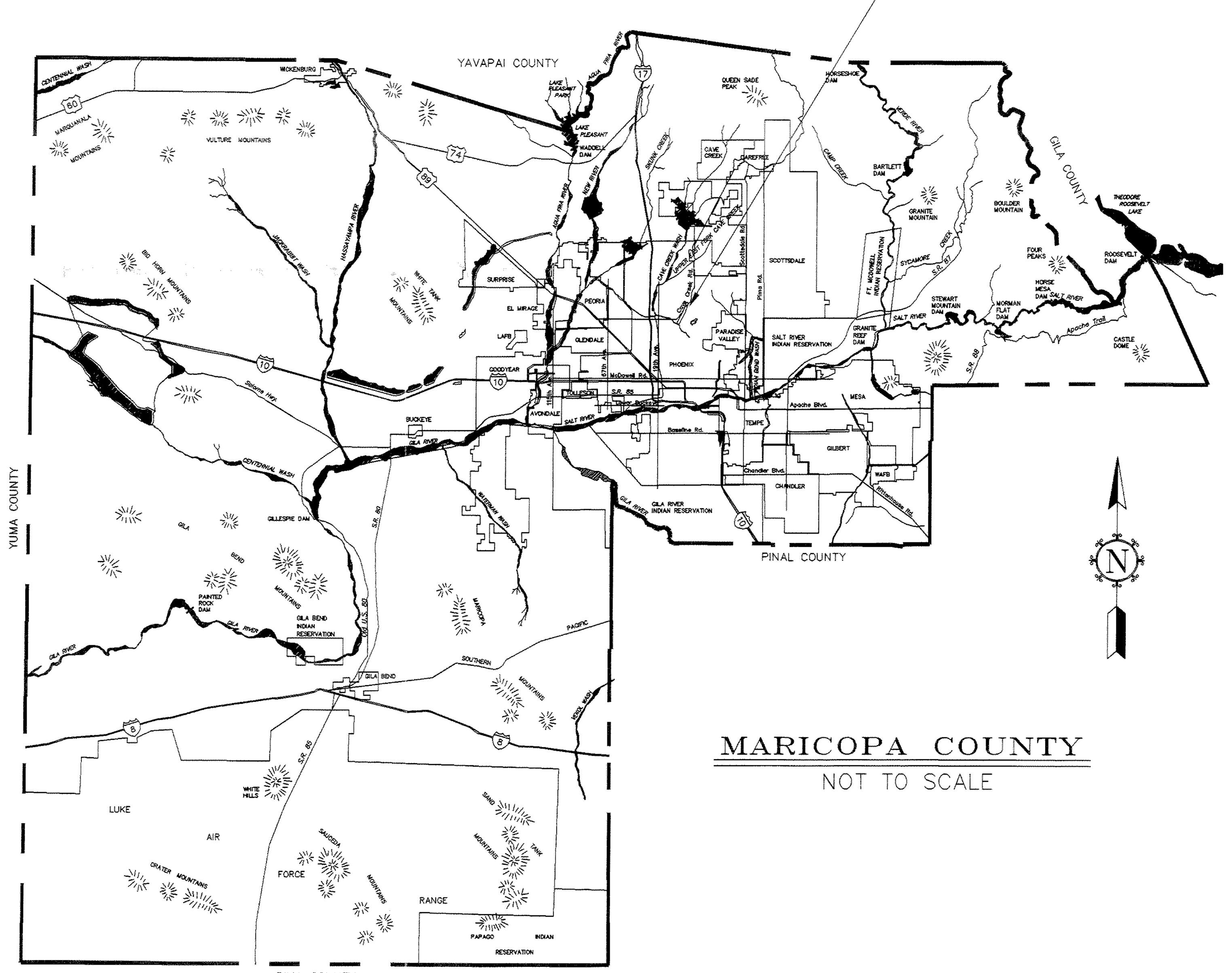
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF 10TH STREET WASH

FCDMC PROJECT NO. 96-12

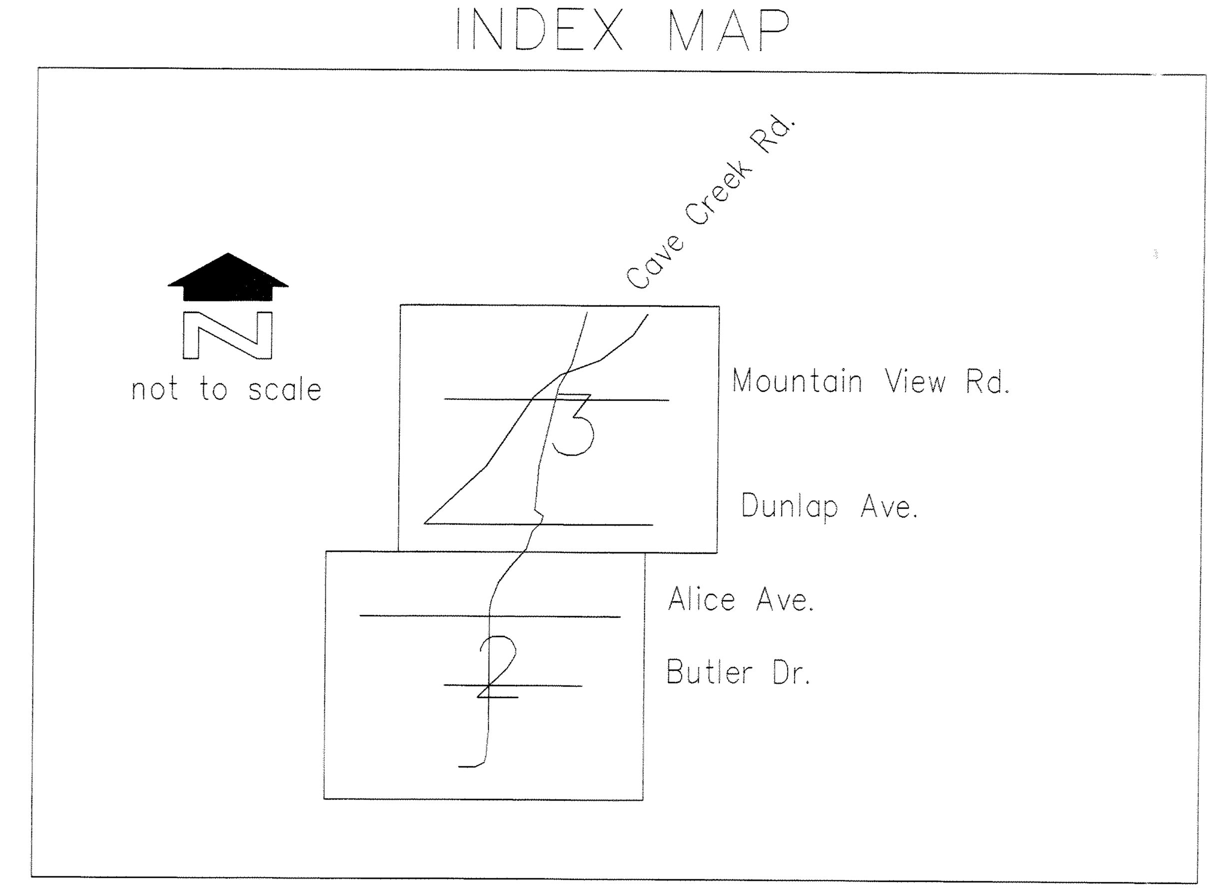


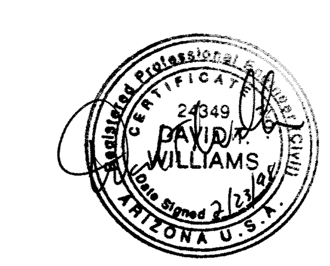
FCD CONTRACT NO. 96-12



MARICOPA COUNTY
NOT TO SCALE

INDEX MAP

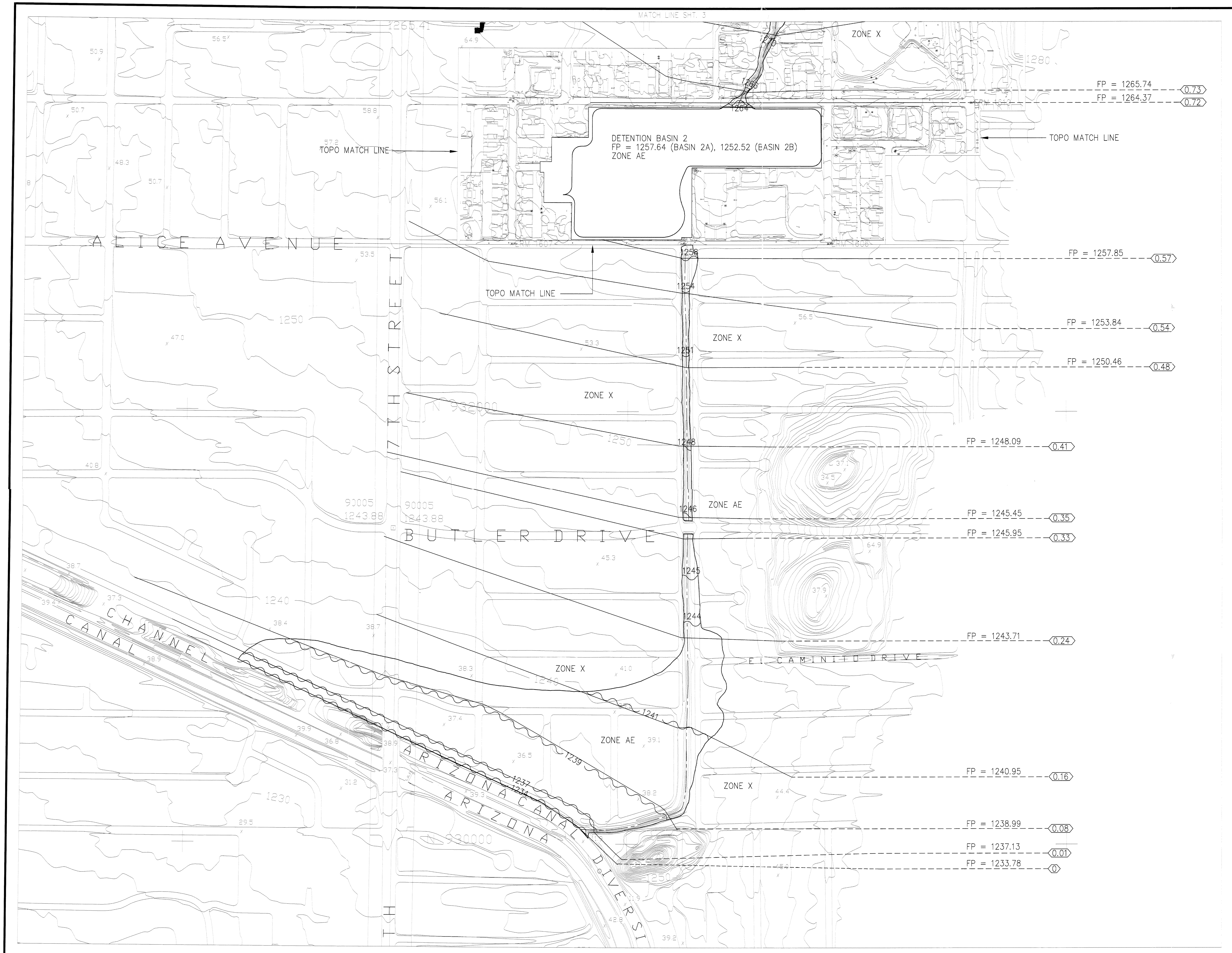




WEST CONSULTANTS, INC.

	BY	DATE	
DESIGN	DS	5/97	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	DW	5/97	RECOMMENDED BY: DATE
PLANS	DS	5/97	APPROVED BY: DATE
PLANS CHK.	DW	5/97	CHIEF ENGINEER AND GENERAL MANAGER
SUBMITTED BY:		DATE:	SHEET 1 OF 3

F.C.D. CONTRACT NO. 96-12



PHOTOGRAMMETRY BY KENNEY AERIAL MAPPING, INC. FOR DMJM AND ACDC TOPO (SEE NOTES).
SURVEYING BY COLLINS-PINA CONSULTING ENGINEERS, INC. ON MARCH 10, 1994 (DMJM), AND BY KAMINSKI-HUBBARD ENGINEERING, INC. ON JANUARY 9, 1991 (ACDC)
FLIGHT DATES: FEBRUARY 15, 1994 (DMJM), NOVEMBER 15, 1990 (ACDC)

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1" = 400' (ACDC) AND 1" = 200' (DMJM) HORIZONTAL SCALE AND 2' (ACDC) AND 1' (DMJM) CONTOUR INTERVAL
DATA PROVIDED BY KAMINSKI-HUBBARD ENGINEERING, INC. (ACDC) AND COLLINS-PINA CONSULTING ENGINEERS, INC. (DMJM)

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF 10TH STREET WASH

F.C.D. CONTRACT NO. 96-12

LEGEND

100-YR FLOODPLAIN BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	FP=100 Yr WSE (0.54)
ELEVATION REFERENCE MARK	X ERM 1613
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary

ELEVATION REFERENCE MARKS

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

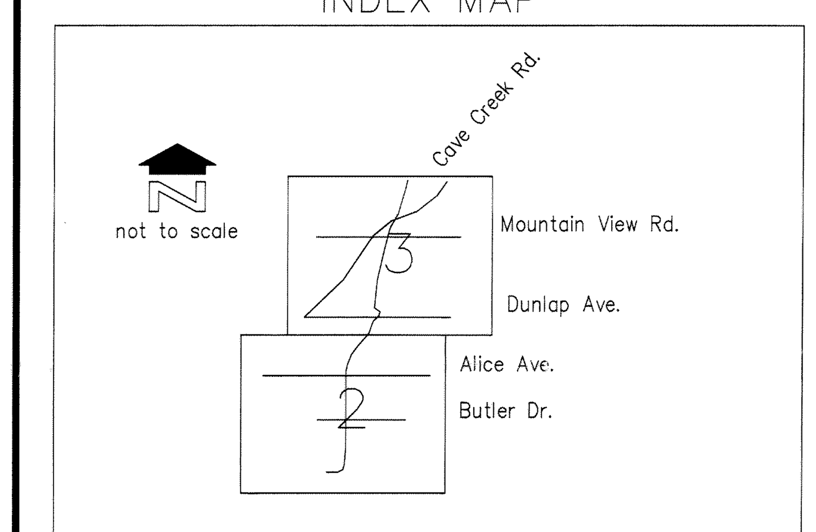
I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 1606	1260.29	Brass cap flush at 11th St. and Alice Ave.
ERM 1607	1257.27	Brass cap flush at 8th St. and Alice Ave.
ERM 1608	1261.77	Brass cap flush at 8th St. and Townley Ave.
ERM 1610	1272.79	Brass cap flush at 12th St. and Townley Ave.

NOTES

DMJM topo is upstream of Alice Ave., closest to the channel. ACDC topo is 1) downstream of Alice Ave., and 2) upstream of Alice Ave. to supplement DMJM topo in the overbanks.

Refer to topo match lines in the drawing.

INDEX MAP



DAVID W. WILLIAMS 24349

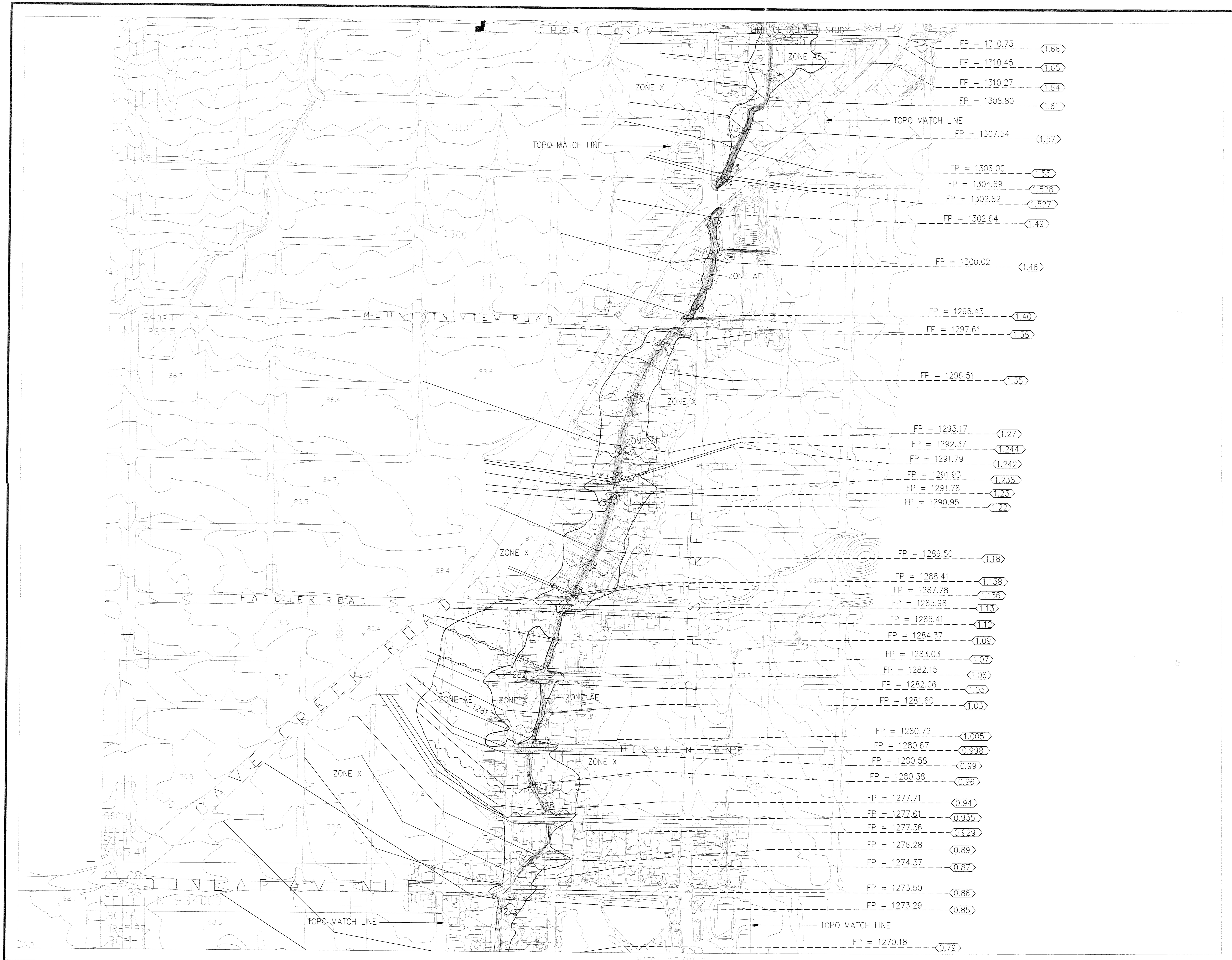
200 0' 200 400

SCALE: 1"= 200'

DMJM TOPO CONTOUR INTERVAL = 1 FEET
ACDC TOPO CONTOUR INTERVAL = 2 FEET

WEST Consultants, Inc.

	BY	DATE	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN	DS	5/97	RECOMMENDED BY: DATE
DESIGN CHK.	DW	5/97	APPROVED BY: DATE
PLANS	DS	5/97	CHIEF ENGINEER AND GENERAL MANAGER
PLANS CHK.	DW	5/97	
SUBMITTED BY: DATE:			SHEET 2 of 3



PHOTOGRAMMETRY BY KENNEY AERIAL MAPPING, INC. FOR DMJM AND ACDC TOPO (SEE NOTES).
SURVEYING BY COLLINS–PINA CONSULTING ENGINEERS, INC. ON MARCH 10, 1994 (DMJM), AND BY KAMINSKI–HUBBARD ENGINEERING, INC. ON JANUARY 9, 1991 (ACDC)
FLIGHT DATES: FEBRUARY 15, 1994 (DMJM), NOVEMBER 15, 1990 (ACDC)

MATCH LINE SHT. 2

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS
1" = 400' (ACDC) AND 1" = 200' (DMJM) HORIZONTAL SCALE AND 2' (ACDC) AND 1' (DMJM) CONTOUR INTERVAL
DATA PROVIDED BY KAMINSKI–HUBBARD ENGINEERING, INC. (ACDC) AND COLLINS–PINA CONSULTING ENGINEERS, INC. (DMJM)

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF 10TH STREET WASH

F.C.D. CONTRACT NO. 96–12

LEGEND

100–YR FLOODPLAIN BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
CROSS SECTION	FP=100 Yr WSE 0.54
ELEVATION REFERENCE MARK	X ERM 1613
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
CORPORATE LIMITS	Corporate Limits
COUNTY, PARISH, STATE OR INTERNATIONAL BOUNDARY	County Boundary

ELEVATION REFERENCE MARKS

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

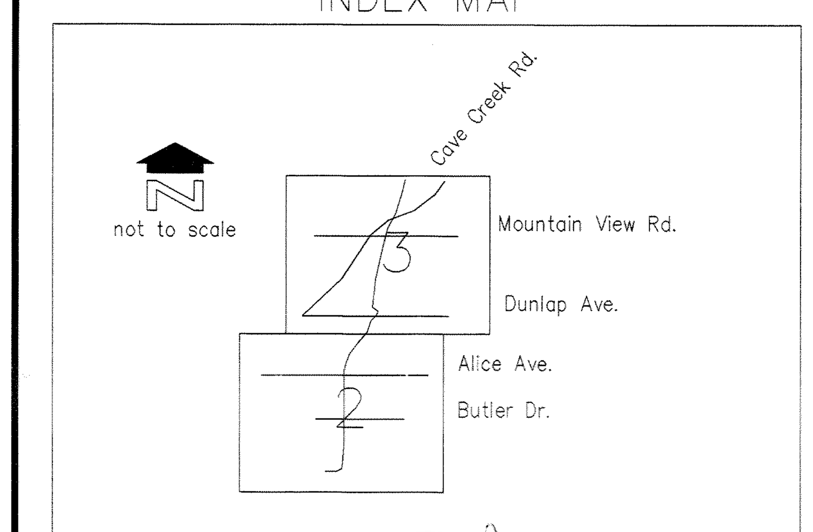
I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
ERM 1613	1270.81	Brass cap flush at 11th St. and Dunlap Ave.
ERM 1614	1280.44	Brass cap SM in HH at 11th St. and Mission Ln.
ERM 1618	1295.11	Brass cap flush at 12th St. and Vogel Ave.
ERM 1622	1317.91	Brass cap flush at Cave Creek Rd. and Cheryl Dr.
ERM 1626	1333.97	Brass cap SM in HH at Cave Cave Creek Rd. and Peoria Ave.
ERM 1646	1299.49	Brass cap SM in flush at 12th St. and Mountain View Rd.

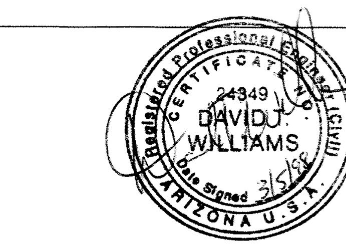
NOTES

DMJM topo is upstream of Alice Ave., closest to the channel. ACDC topo is 1) downstream of Alice Ave., and 2) upstream of Alice Ave. to supplement DMJM topo in the overbanks.

Refer to topo match lines in the drawing.

INDEX MAP



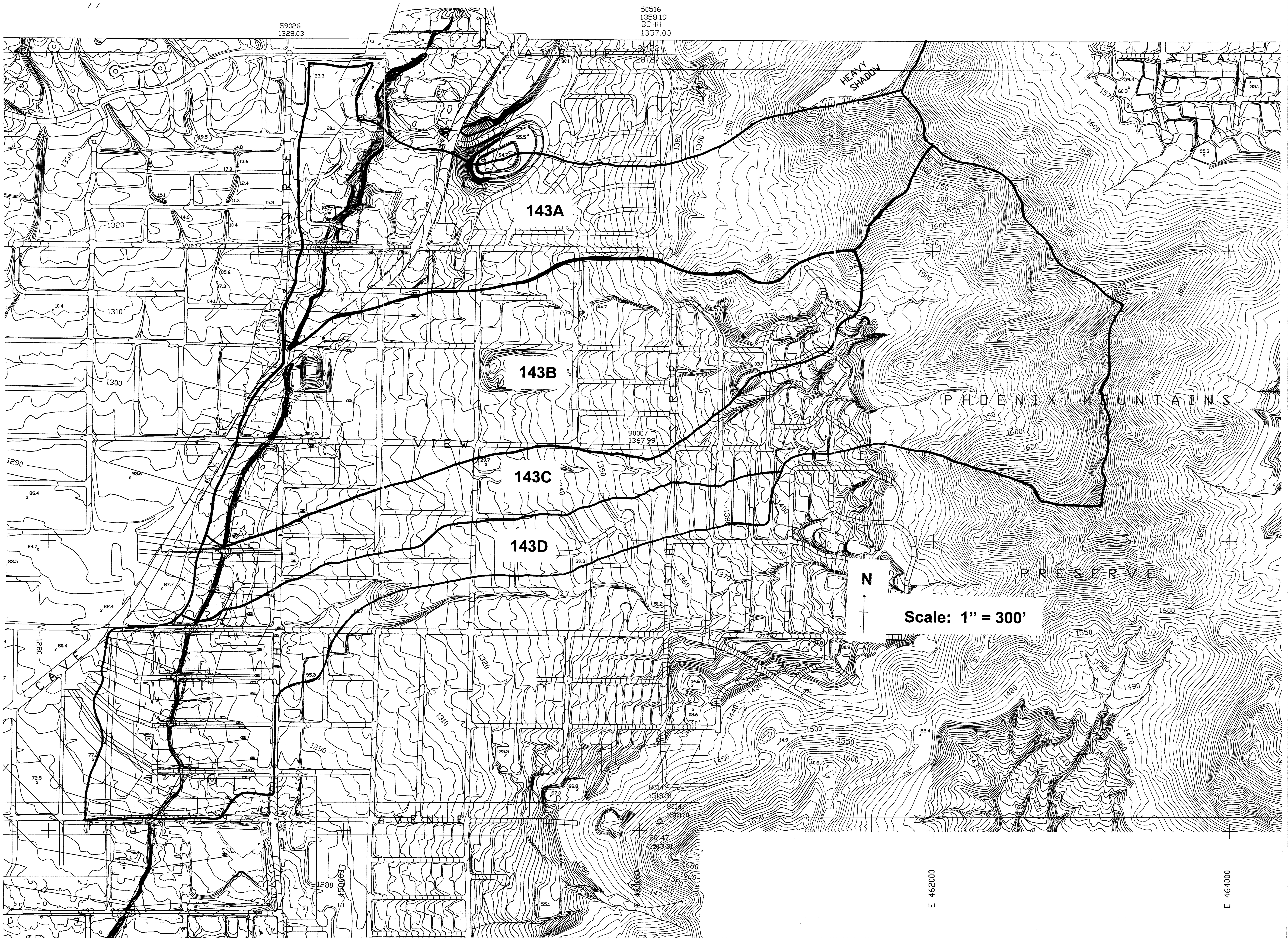


200 0' 200 400
SCALE: 1"= 200'
DMJM TOPO CONTOUR INTERVAL = 1 FEET
ACDC TOPO CONTOUR INTERVAL = 2 FEET

WEST Consultants, Inc.

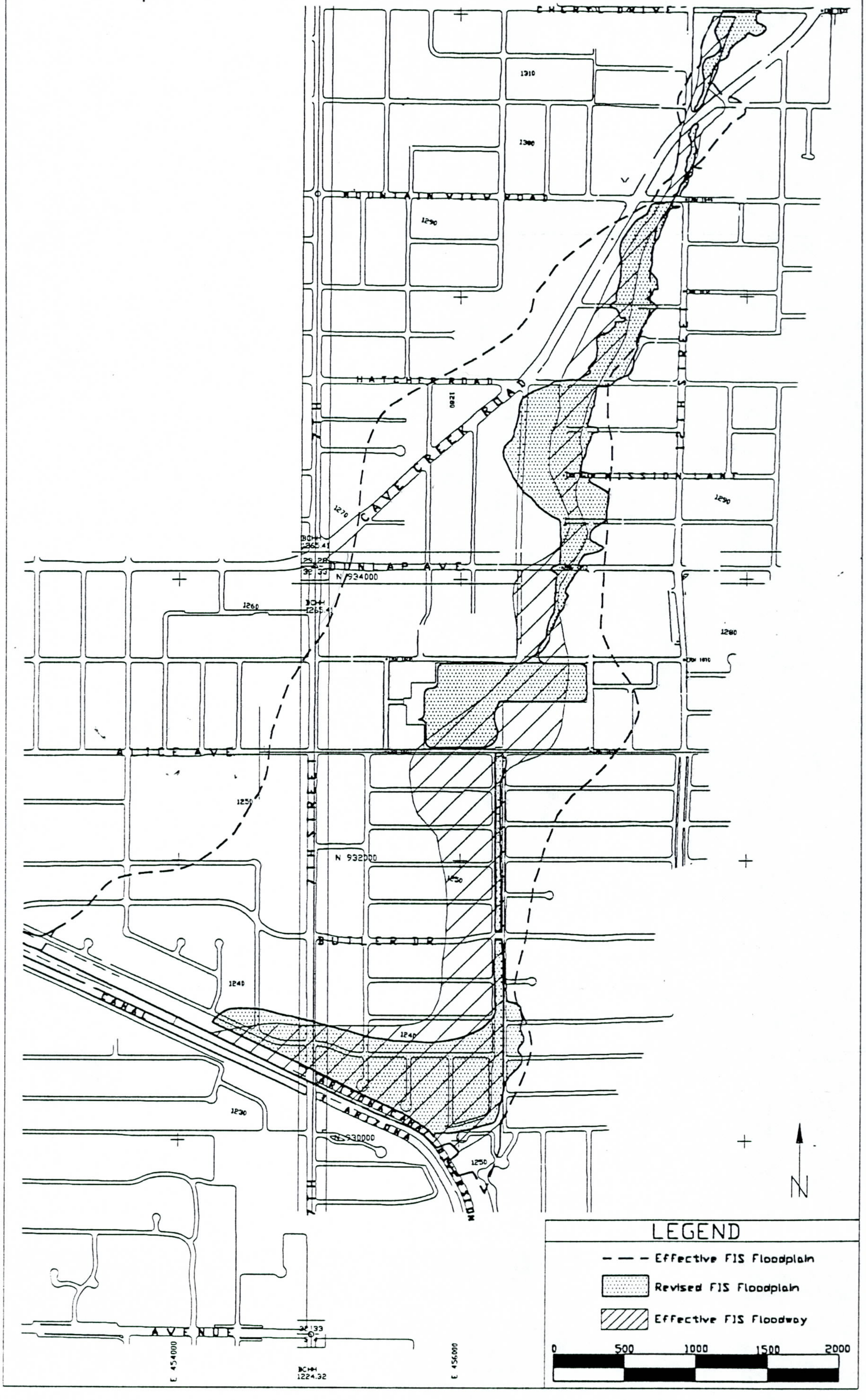
	BY	DATE	
DESIGN	DS	5/97	FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
DESIGN CHK.	DW	5/97	RECOMMENDED BY: DATE
PLANS	DS	5/97	APPROVED BY: DATE
PLANS CHK.	DW	5/97	CHIEF ENGINEER AND GENERAL MANAGER
SUBMITTED BY:	DATE:		SHEET 3 OF 3

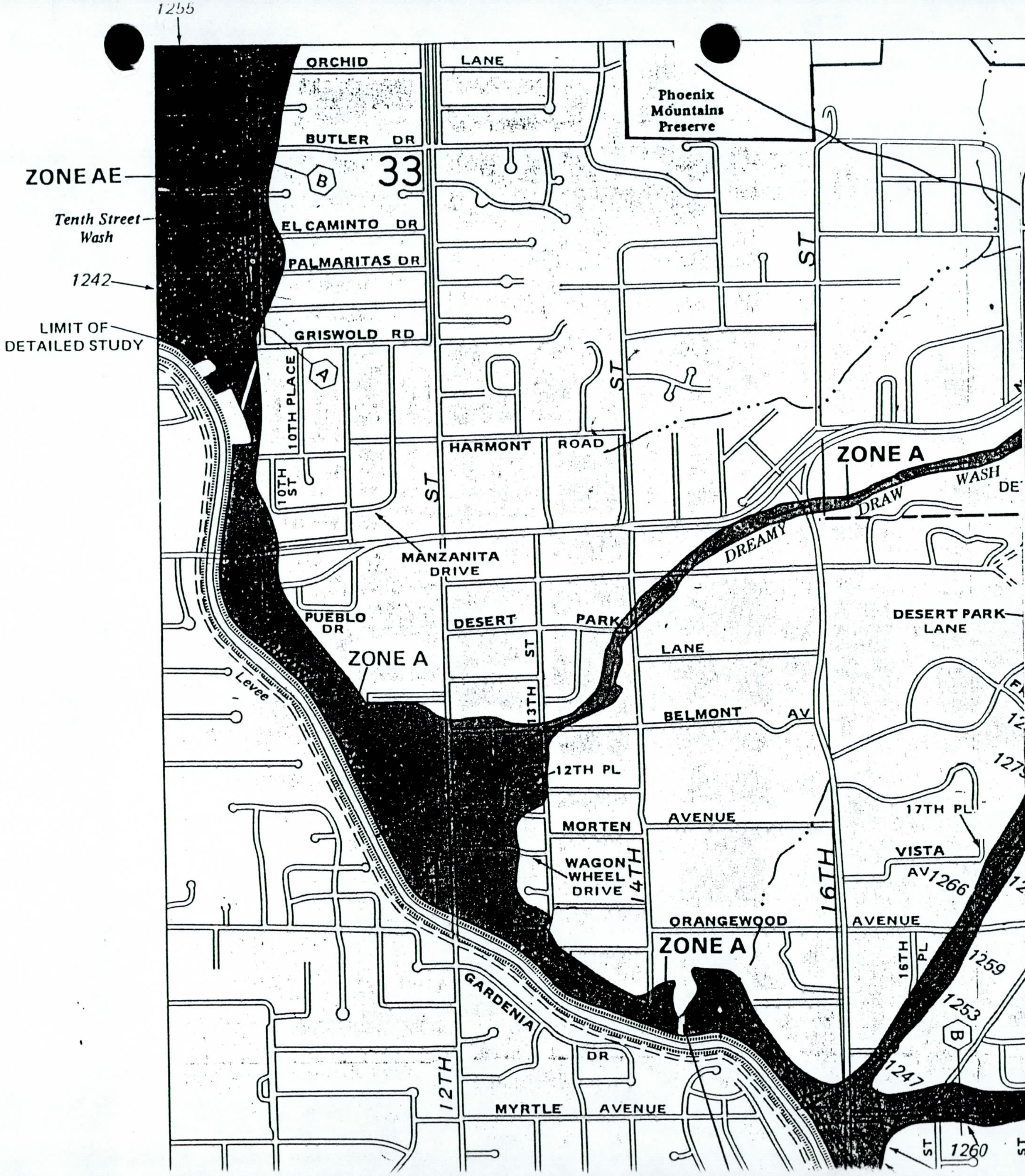
10th Street Wash HEC-1 Basin 143
Subdivision Boundaries



10th Street Wash

Comparison of Effective FIS and Revised FIS





NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1670 OF 4350

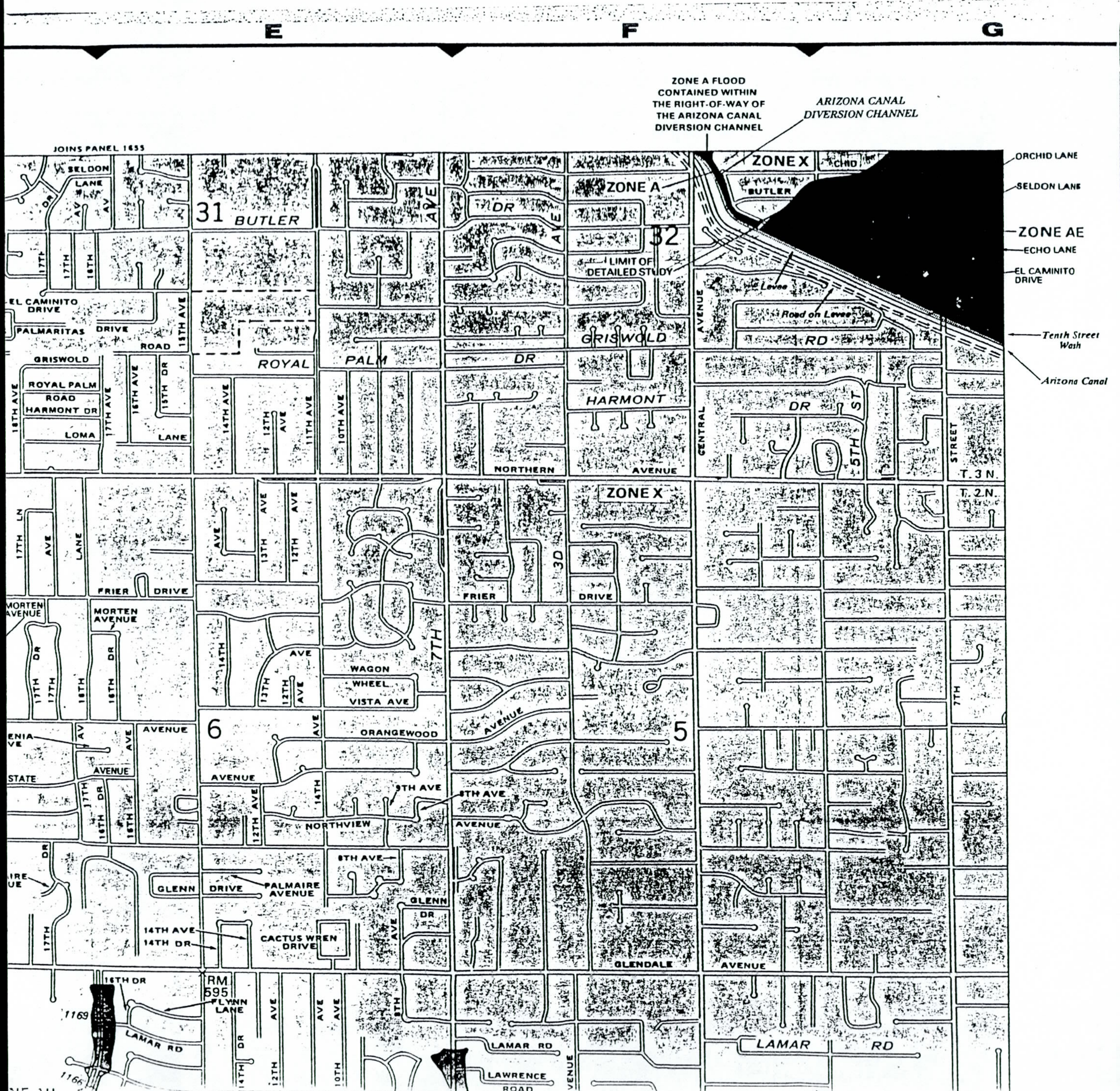
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	1670	E
PARADISE VALLEY, TOWN OF	040049	1670	E
PHOENIX, CITY OF	040051	1670	E

MAP NUMBER
04013C1670 E

MAP REVISED:
SEPTEMBER 30, 1995

FEDERAL EMERGENCY MANAGEMENT AGENCY



NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1665 OF 4350

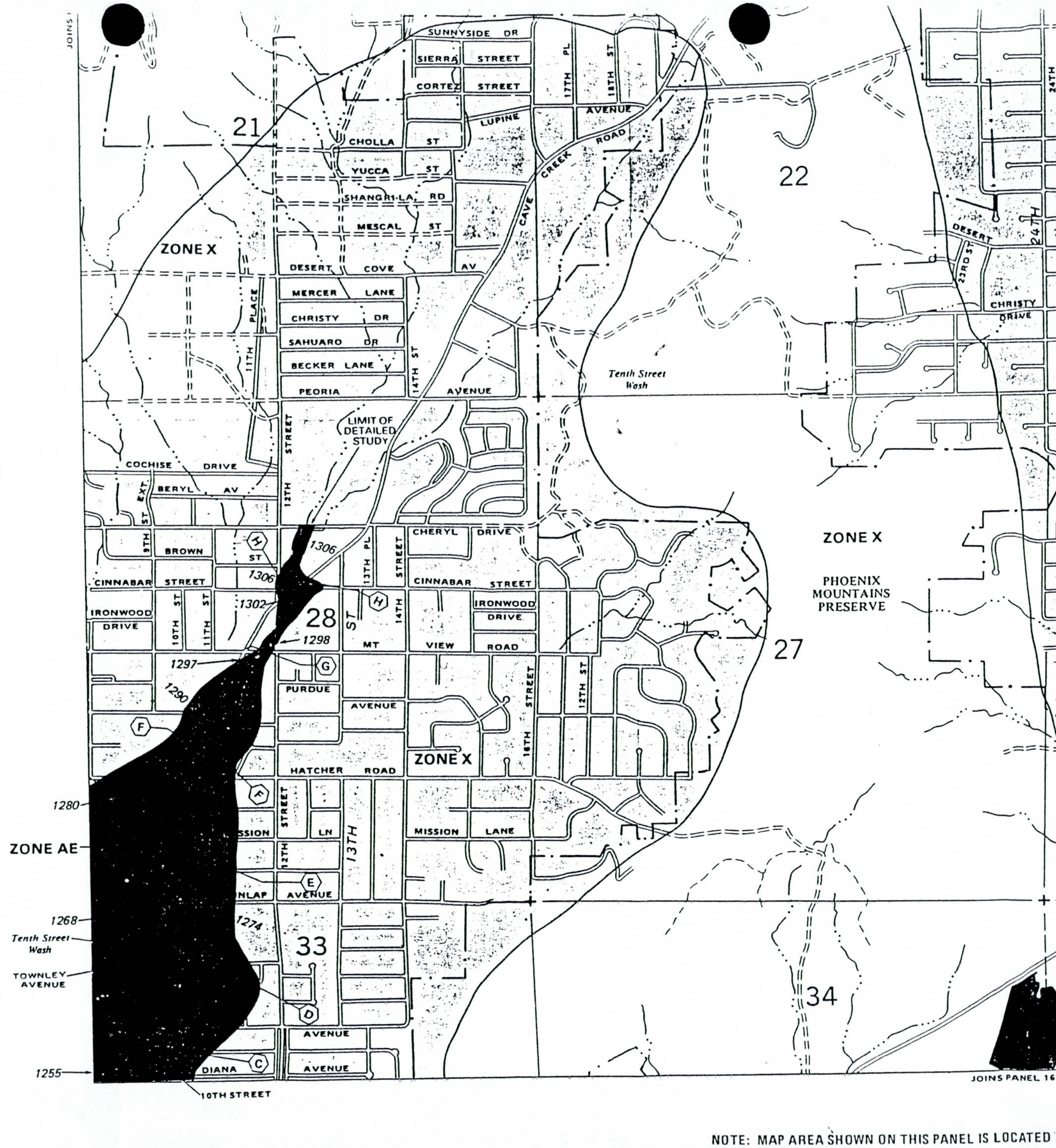
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PHOENIX, CITY OF	040051	1665	G

MAP NUMBER
04013C1665 G

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1660 OF 4350

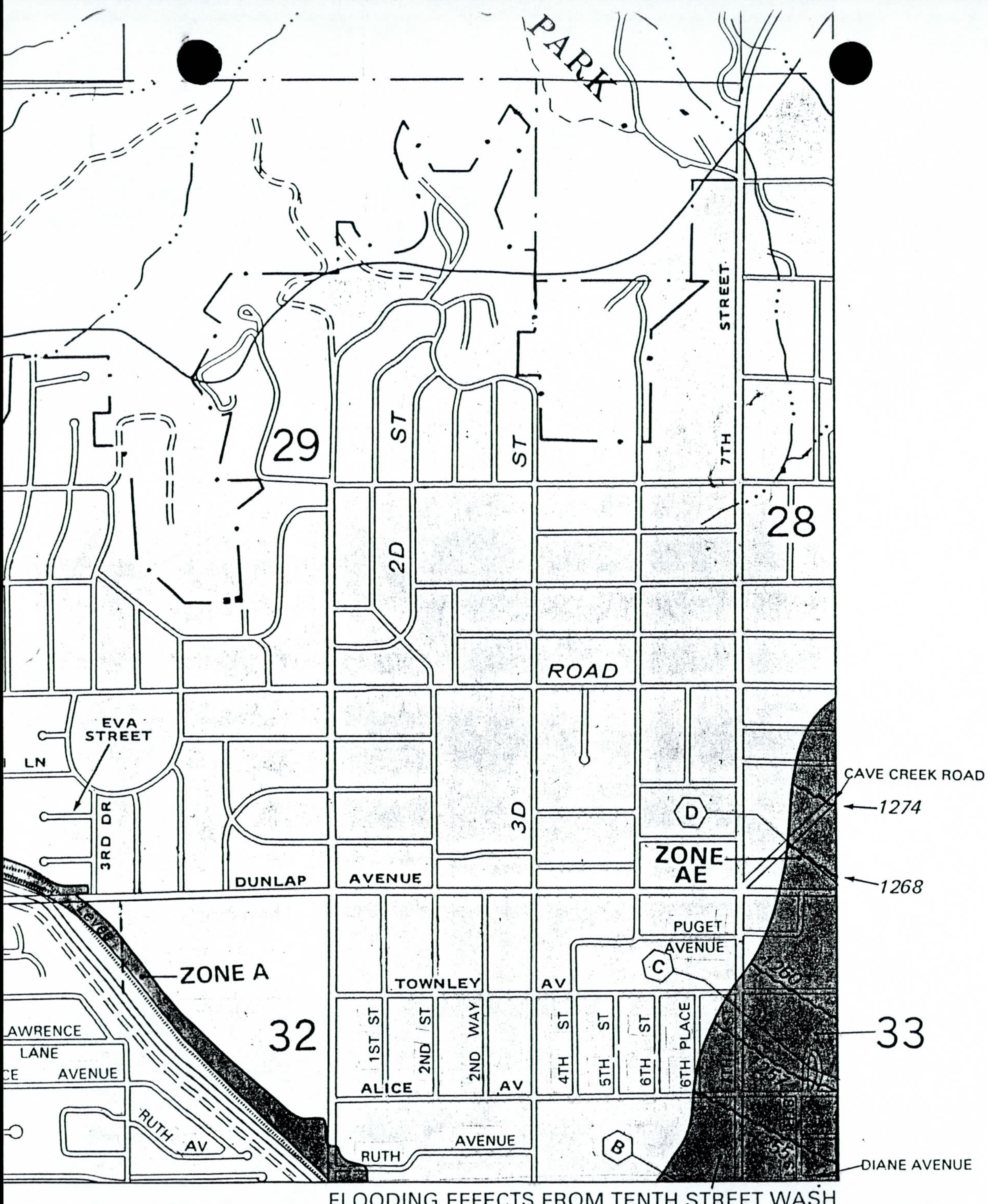
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PHOENIX, CITY OF	040051	1660	F

MAP NUMBER
04013C1660 F

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 1655 OF 4350

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PHOENIX, CITY OF	040051	1655	H

MAP NUMBER
04013C1655 H

MAP REVISED:
SEPTEMBER 30, 1995

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

10TH STREET WASH
DETENTION BASIN NO. 1
(FCD 93-31)

DRAFT FINAL DESIGN CONCEPT REPORT

PREPARED FOR

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
2801 West Durango Street
Phoenix, Arizona 85009

PREPARED BY

STANLEY CONSULTANTS, INC.
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PREPARED SEPTEMBER 1994
SCI #12183

EXISTING HYDROLOGY AND HYDRAULICS

As mentioned in the introduction, hydrology for 10th Street Wash and its tributaries has been analyzed by Kaminski-Hubbard Engineers in a previous study. This hydrology was then modified by the District to reflect proposed 10th Street Wash Detention Basins Nos. 1 and 2. This HEC-1 model was provided to Stanley Consultants by the District. The District model was then modified by Stanley to refine the proposed Detention Basin No. 1 and to reflect the as-built conditions of the existing North Mountain Detention Dam No. 3. The resulting HEC-1 model will serve as the base model for evaluation and comparison of all alternatives in this report. Table 1 on the following page provides a summary of existing runoff data from the base HEC-1 model. The Kaminksi-Hubbard ACDC ADMS HEC-1 sub-basin and routing schematic for 10th Street Wash which was used as the basis for Table 1 is located in the Appendix A pocket. The base existing condition HEC-1 input model is found on diskette in the Appendix A pocket. The output printout is found in Appendix B . All hydrologic analysis in this report is based on a 100-year storm with a 6-hour duration/distribution. Peak discharges from the East and West Tributaries occur at hour 4.10 and 4.15 respectively.

An existing condition HEC-2 backwater analysis was done for this report on 10th Street Wash and the West Tributary from Cheryl Drive to Peoria Avenue. This analysis was based on 1-ft. contour aerial topo provided by DMJM Engineers. This topo was done in conjunction with their 10th Street Wash Feasibility Study. In addition to the 100-year peak discharges from the existing condition HEC-1 base model mentioned previously, this HEC-2 model also contains the 10, 25 and 50-year discharges. The purpose of the backwater analysis is to provide an existing condition "baseline" water surface profile for the wash in order to evaluate the proposed alternatives and their potential impacts on flow in the wash. The location of HEC-2 cross sections is illustrated on Exhibit 15 in Appendix B. The HEC-2 input model is found on diskette in the Appendix A pocket. The output printout is found in Appendix B.

TABLE 1
EXISTING RUNOFF DATA, 100-YR 6-HR EVENT

Location	Accumulated Contributing Area (mi^2)	Estimated Peak Discharge, Q (cfs)	Estimated Time to Peak, T (hr)	Estimated Peak Volume, V (acre-ft)
East Tributary Upstream of Detention Basin No. 1 (HC141)	0.70	275	4.10	37
West Tributary Upstream of Detention Basin No. 1 (DT142)	0.51	671	4.15	46
Detention Basin No. 1 (HC142)	1.21	943	4.15	84
Detention Basin No. 2 (HC144)	2.29	2334	4.30	192
ACDC Confluence (HC145)	2.84	2965	4.25	252

Existing condition 100-year flow within 10th Street Wash and the West Tributary ranges from about 2 to 7 feet in depth. Existing condition 100-year flow velocities range from about 4 to 9 feet per second in this reach. The average depth and velocity adjacent to the 10th Street Wash Detention Basin No.1 parcel are 5 feet and 7 feet per second respectively. Despite the average flow velocity, there is no significant evidence of erosion or scour of the channel bed or banks adjacent to the Detention Basin No. 1 parcel. The backwater analysis indicates that 100-year discharges are contained within the channel and that adjacent residential floors are above the 100-year water surface.

Existing condition hydraulic analysis was also performed for the East Tributary of 10th Street Wash. Inlet control hydraulics were performed for the existing 30-inch CMP and normal depth open channel hydraulics were performed for the inverted crown driveway. A culvert performance evaluation for the existing 3-barrel concrete box culvert under Cave Creek Road was done. Preliminary hydraulic analysis of flow in Cave Creek Road was also done along with an estimate of the interception capability of existing catch basins in Cave Creek Road.

This analysis indicates that, of the 275 cfs total discharge for the East Tributary, there is potential for approximately 10 cfs to bypass the East Tributary and continue flowing south in Cave Creek Road past the Detention Basin No. 1 parcel. The remaining 265 cfs will pass through the existing 3-barrel concrete box culvert. Approximately 22 cfs of the 265 cfs will enter the existing 30-inch CMP. The remaining 243 cfs will be carried in the inverted crown driveway. The average flow depth and velocity for the driveway flow are 1.5 feet (measured relative to the invert) and 10 feet per second respectively. This driveway flow is significant and may present difficulties for emergency access but it does not appear that any adjacent residential floors are in danger of flooding. Supporting calculations and analysis for existing condition hydrology and hydraulics can be found in Appendix B.

APPROACH

There are numerous potential configurations and combinations of inlet, basin and outlet possible for this project. Each scenario has its own special considerations, impacts and merits. Several potential configurations and combinations were envisioned when the scope of work for this project was written. According to the scope of work, there are three alternatives presented in this report. However, throughout the development of alternatives, there were numerous inlet, outlet, and basin configurations considered. Combinations of options were assembled to form the best or most feasible alternatives and each of these alternatives were analyzed in preliminary fashion. These alternatives were submitted to and reviewed by the District at several stages of development. If an alternative did not appear feasible from a design or hydraulic standpoint, it was dropped from further consideration. This process was followed until there emerged three basic alternatives that best represented the original concept alternatives envisioned for this project. Information regarding the investigation of preliminary configurations and combinations of options can be found in a draft report dated June 1994 which was submitted to and reviewed by the District.

Initial inlet concepts involved: a) an inlet that would be located within the existing Detention Basin No. 1 Parcel; b) an inlet that would extend upstream from the parcel in 10th Street Wash or the West Tributary in order to provide greater inlet head and more fully utilize the potential storage volume provided by the proposed basin; and c) an inlet from the East Tributary at the discharge end of the existing 3-barrel concrete box culvert under Cave Creek Road.

Initial concept a) above was eliminated from the alternatives because of the limited head or water surface elevation adjacent to the basin. At peak flow, the basin could have only been filled to an elevation of 1315 instead of the 1319 elevation provided by inlet concepts b) and c) above. Inlet concepts b) and c) were carried over from the initial draft report into this concept report as the two preferred alternatives. The West Tributary inlet is considered individually and also in combination with the East Tributary inlet. The East Tributary inlet is considered only in combination with the West Tributary inlet. The East Tributary does not contribute enough volume by itself to fully utilize the potential basin storage volume. Both of these inlet alternatives are intended to maximize the detention basin storage volume by "skimming" the peak volume from the respective inflow hydrographs.

In order to skim just the peak volume from the inflow hydrographs, the inlets were designed to bypass low flows. This was done by using side weir inlets and setting the weir crest elevations and weir lengths to produce the best scenario in optimizing the amount of bypass flow and basin inflow. The inlet alternatives are similar for each concept alternative. The individual design parameters and advantages and disadvantages are discussed in their respective sections.

There are two basic detention basin configurations considered. Numerous basin configurations were evaluated throughout the development of the three concept alternatives. However, due to constraints, storage potential, costs and other considerations, the two basins presented in this report represent the most effective and efficient means to provide the desired storage volume. Neither of the basin options utilize 10th Street Wash itself. The wash channel will essentially remain in its present alignment.

As a result of recommendations from the initial draft report, an additional 25-foot strip of land has been acquired by the District from the North Mountain Baptist Church along the south boundary of the original 3-acre parcel. This was added as an effective means of increasing the basin's storage volume. Both basins utilize the new parcel in the elevation-storage data. The 25-foot additional parcel added approximately 3 acre-feet to the available storage volume.

Both of the proposed detention basin alternatives utilize concrete retaining walls along one or two of the basin boundaries. The west side boundary of the basin (or the east bank of 10th Street Wash) adjacent to the basin will be replaced with a vertical concrete retaining wall. The use of the retaining wall will ensure that the west end of the basin will be adequate in terms of erosion resistance, structural stability and emergency overflow. The vertical wall also provides additional storage capacity. The embankment placed on the wash side of the retaining wall will be subject to some degree of erosion and scour potential from flow in the wash. This situation will be addressed in final design.

At one time, a vertical retaining wall was considered along the north boundary of the detention basin. However, upon further investigation of the type of soils and soil profiles contained in the Geotechnical Report for 10th Street Wash Detention Basin No. 1 prepared by Huntingdon Engineering, the necessary excavation width required to construct the wall encroached significantly into TPV. The primary purpose of utilizing a vertical wall on the north side was to increase the available storage volume. The excavation width and existing improvements in TPV reduced the effectiveness of a retaining wall in this location. Very little additional storage volume was generated. For this reason and the high cost of installing vertical concrete retaining walls, it was established that the north boundary will only consider 3:1 sloped sides for both detention basin alternatives.

The east side was also considered as a potential location for a vertical retaining wall to increase the available storage volume. However, for the same reasons involving excavation width, improvements located immediately outside the District's parcel, minimal increase in volume compared to 3:1 sloped sides, and high costs, the east side also considers only 3:1 sloped sides for both detention basin alternatives.

The south side is the only side which can and has been evaluated as both 3:1 sloped sides and a vertical retaining wall. The evaluation for this side will consist of comparing the relative effectiveness of reducing the peak discharge and the additional cost of construction.

According to the Phase 1 Scope of Work, the minimum desired volume for Detention Basin No. 1 is 20 acre feet. It is also desired to have a basin maximum stage that is as high as possible without having to raise the land surface of the detention basin parcel above its present elevation. This maximum desired stage would be on the order of 1319 in elevation.

All detention basin options have the following common features:

1. All proposed sloping sides utilize a 3 to 1 slope;

2. The top elevation of all basins is assumed to be 1320 for purposes of estimating storage and earthwork volumes. Elevation 1320 is the approximate lowest elevation of the basin parcel along its southern boundary;

3. The top of all excavated slopes or retaining walls will be set back a minimum of 5 feet from the property line, adjacent fill slope or 10th Street Wash channel bank;

4. The bottom of all basins will be sloped at 0.5% grade to the lowest point in the basin;

5. Both basins assume that there is recreational co-use that does not alter the bottom or sides, occupy storage volume or reduce excavation by any measurable amount;

6. Both basins assume a single maintenance access ramp 14 feet wide minimum width and 10% maximum grade at the southwest corner of the basin parcel. In addition to the 25-foot strip mentioned previously to be acquired for the basin, the District is also acquiring a permanent access corridor from the North Mountain Baptist Church which will connect the southwest corner of the detention basin to Cheryl Drive.

7. Low flow channels will be constructed to direct flows from the inlets to the basin drain. This should prevent low flows from spreading out along the basin bottom. The low flow channel will be designed to convey flows up to a frequency at which the basin bottom will be inundated due to the outlet hydraulics. In effect, the channel will be drowned out before its capacity is exceeded.

The two basic detention basin options are as follows. These options are depicted in Exhibits 7 through 9.

Option 1 - Reinforced concrete retaining wall along the west side; excavated 3:1 slopes on the north, south and east sides; lowest outfall elevation of 1306; maintenance access from the southwest corner of the parcel.

Option 2 - Reinforced concrete retaining walls along the west and south sides; excavated 3:1 slopes on the north and east sides; lowest outfall elevation of 1306; maintenance access from the southwest corner of the parcel.

Each alternative includes a gravity drain outlet. The initial Draft Design Concept Report considered outlets at elevations of 1300, 1306 and 1308. In this report, each alternative considers only one low outfall elevation of 1306 which requires an outfall pipe that will extend downstream along 10th Street Wash approximately 200 feet where the channel bottom elevation is about 1305.5. This pipe would be at a minimum slope of 0.25%. The outfall of this pipe is located outside the District's parcel but may be contained within an existing drainage easement. Further investigation of the recorded easement will be required in order to determine its prescribed use and limits. Each alternative is capable of discharging the maximum stored runoff volume from the basin within a 36-hour period. The minimum size of pipe considered for the outlet is 24" based on the District's concern for maintenance. However, the minimum diameter outlet pipe used for hydrologic modeling in this report is 30". The final outlet pipe configuration will probably be 30" diameter and may need some type of restrictor plate orifice opening. This will be addressed in final design.

To simplify hydrologic analysis, all basin inlets and outlets are assumed to be located at HEC-1 concentration point HC142 which is at the confluence of East and West Tributaries. The difference in contributing area between HC142 and the actual inlet/outlet location is insignificant. In addition, the outlet pipe is assumed for this report to operate under inlet hydraulic control. This assumption will be further evaluated in final design.

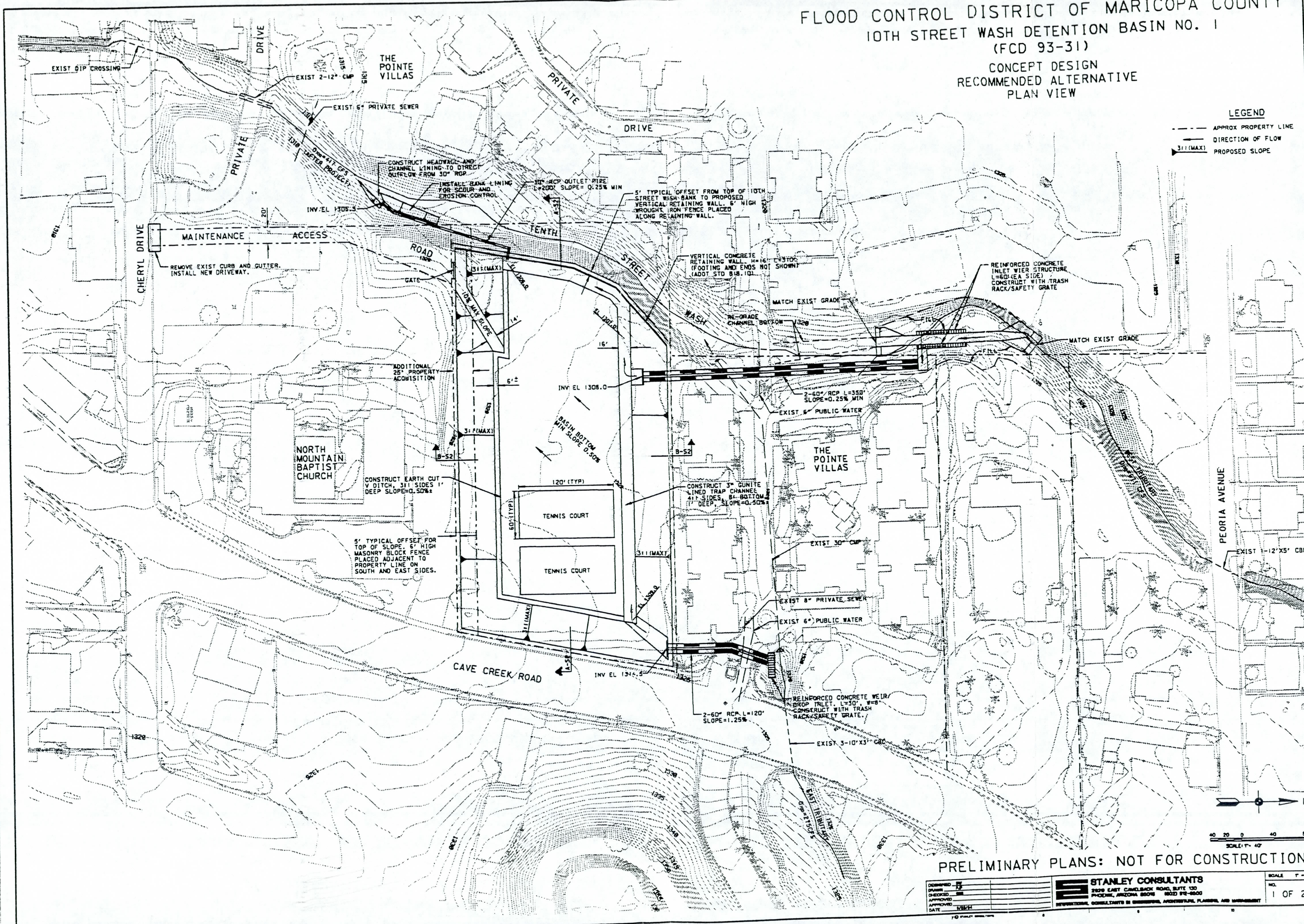
HEC-1 models have been constructed to represent each of the three alternative combinations of inlet, basin and outlet. Input files for these models are found in Appendix A of this report on diskette. HEC-1 printout and other supporting technical documentation is found in Appendices C, D and E. A description of each of the three alternatives along with a discussion of the merits and special considerations involved with each one and a summary of the estimated costs is contained in the next three sections of this report.

A number of simple assumptions have been incorporated into the preliminary cost estimates for this report. Excavation volumes for each detention basin option are estimated based on HEC-1 detention routing tables. For now, it is assumed that the east bank of the existing 10th Street Wash channel adjacent to the detention basin will need to be excavated and replaced. The cost of this is included in each cost estimate. Any inlet or outlet features located outside of the presently acquired parcel are assumed to require some form of permanent easement or full fee right-of-way. Exhibit 6 in reduced size indicates potential additional right-of-way or temporary construction easements. All cost estimates include the cost of the original basin parcel plus the additional land acquired from North Mountain Baptist Church which has been estimated on the basis of $2.00 per square foot. At this time, the only additional right-of-way costs for inlets or outlets will be for areas which lie outside the TPV property lines.

All landscaping treatment is assumed to be the basic minimum according to the District Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects. Both basin options assume a 6 foot high perimeter masonry block fence with stucco finish. A wrought iron fence may be utilized along the west side of the basin but it is assumed to have the same cost as masonry. For now, no perimeter landscape screening is assumed for any basin.

No evaluation or cost estimate for long term maintenance of the basin itself is included in this report. This cost would depend on the outcome of recreation/maintenance negotiations between the District and TPV. None of the cost estimate in this report includes any recreational amenities or associated facilities.

There are potential improvements that may be required for existing dip crossings. The northernmost TPV private drive may need to be raised to provide clearance for the West Tributary inlet. The southernmost TPV private drive and Cheryl Drive may need to be improved to provide low flow culverts that will pass a more sustained discharge that will result from the new basin. The cost of these improvements is not reflected in any of the cost estimates in this report. They may add $25,000.00 to $30,000.00 to the total project cost.


FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
10TH STREET WASH DETENTION BASIN NO. 1
(FCD 93-31)
CONCEPT DESIGN
RECOMMENDED ALTERNATIVE
PLAN VIEW
LEGEND
APPROX PROPERTY LINE
DIRECTION OF FLOW
3:1 (MAX) PROPOSED SLOPE
EXIST DIP CROSSING
EXIST 2-12" CMP
THE POINTE VILLAS
PRIVATE DRIVE
EXIST 6" PRIVATE SEWER
CONSTRUCT HEADWALL AND CHANNEL LINING TO DIRECT OUTFLOW FROM 30" RCP
INSTALL BANK LINING FOR SCOUR AND EROSION CONTROL
30" RCP OUTLET PIPE L=200' SLOPE= 0.25% MIN
5' TYPICAL OFFSET FROM TOP OF 10TH STREET WASH BANK TO PROPOSED VERTICAL RETAINING WALL. 6' HIGH WROUGHT IRON FENCE PLACED ALONG RETAINING WALL.
INV EL 1306.5
MAINTENANCE ACCESS
CHERYL DRIVE
REMOVE EXIST CURB AND GUTTER. INSTALL NEW DRIVEWAY.
TENTH STREET WASH ROAD
VERTICAL CONCRETE RETAINING WALL. H=16' C=3105 (FOOTING AND ENDS NOT SHOWN) (ADOT STD B18.10)
REINFORCED CONCRETE INLET WIER STRUCTURE L=60' (EA SIDE) CONSTRUCT WITH TRASH RACK/SAFETY GRATE
MATCH EXIST GRADE
RE-GRADE CHANNEL BOTTOM
GATE
10% MAX SLOPE
ADDITIONAL 25' PROPERTY ACQUISITION
INV EL 1308.0
2-60" RCP L=350' SLOPE=0.25% MIN
EXIST 6" PUBLIC WATER
BASIN BOTTOM MIN SLOPE 0.50%
3:1 (MAX)
NORTH MOUNTAIN BAPTIST CHURCH
CONSTRUCT EARTH CUT V DITCH, 3:1 SIDES 1' DEEP SLOPE=0.50%±
120' (TYP)
60' (TYP)
TENNIS COURT
TENNIS COURT
CONSTRUCT 3" GUNITE LINED TRAP CHANNEL 4:1 SIDES, 8' BOTTOM 1' DEEP, SLOPE=0.50%±
5' TYPICAL OFFSET FOR TOP OF SLOPE. 6' HIGH MASONRY BLOCK FENCE PLACED ADJACENT TO PROPERTY LINE ON SOUTH AND EAST SIDES.
EXIST 30" CMP
EXIST 8" PRIVATE SEWER
EXIST 6" PUBLIC WATER
PEORIA AVENUE
EXIST 1-12'X5' CBC
CAVE CREEK ROAD
INV EL 1314.5
REINFORCED CONCRETE WEIR/DROP INLET. L=30', W=8' CONSTRUCT WITH TRASH RACK/SAFETY GRATE.
2-60" RCP L=120' SLOPE=1.25%
EXIST 3-10'X3' CBC
EAST TRIBUTARY
WEST TRIBUTARY
SCALE: 1"=40'
PRELIMINARY PLANS: NOT FOR CONSTRUCTION
STANLEY CONSULTANTS
2929 EAST CAMELBACK ROAD, SUITE 130
PHOENIX, ARIZONA 85016
SCALE 1" = 40'
1 OF 2

Design Concept Report for the

Tenth Street Wash

Detention Basin No. 2

Prepared for:

Flood Control District of Maricopa County
2801 W. Durango
Phoenix, Arizona 85009

June 1995

QUALITY

INTEGRITY

CREATIVITY

RESPONSIVENESS

Registered Professional Engineer
Certificate No. 26940
FRANK E. HENDERSON III
6/27/95
ARIZONA, U.S.A.

RUST ENVIRONMENT & INFRASTRUCTURE

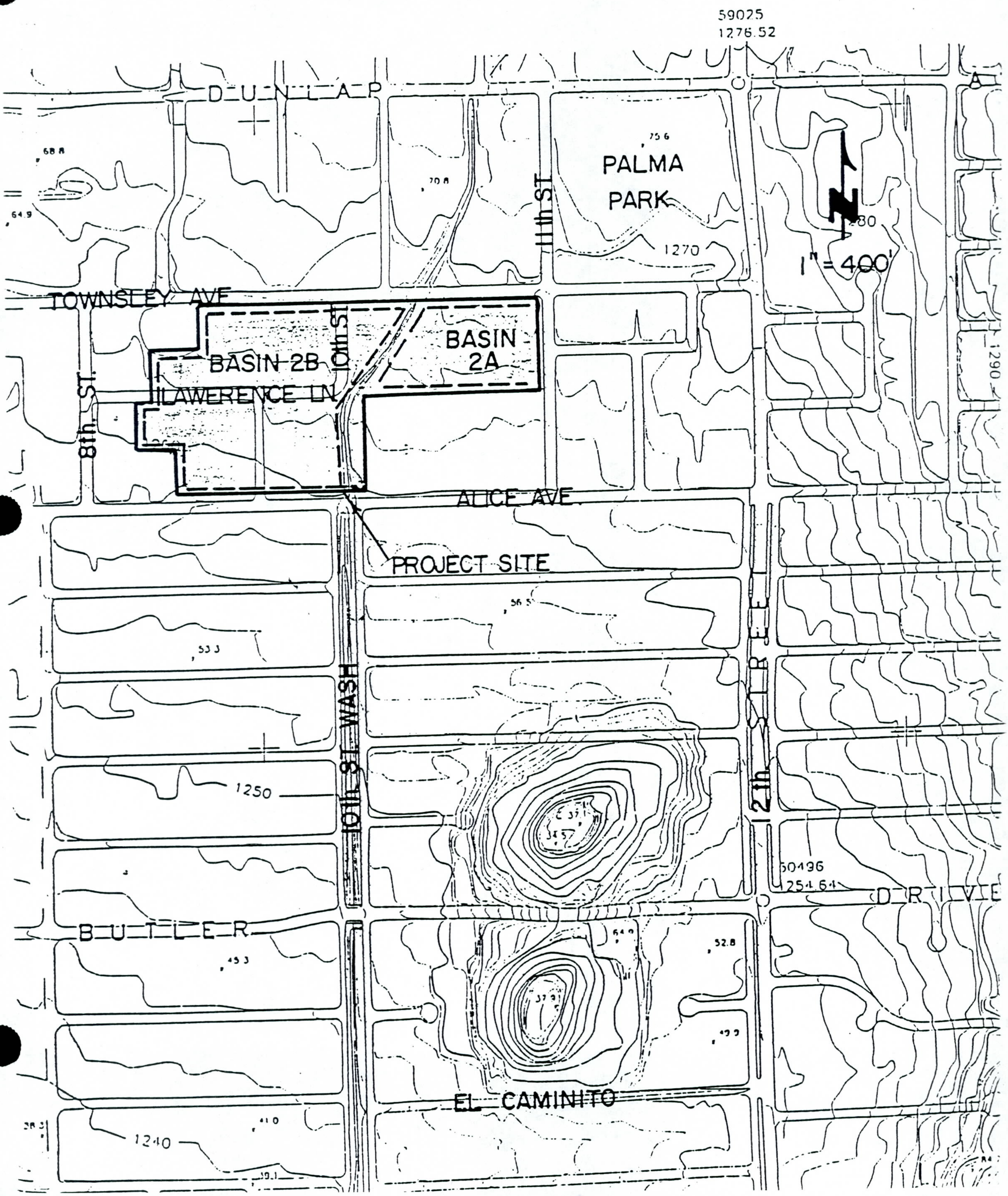
CHAPTER 1

INTRODUCTION

This report presents the results of a design concept study for the Tenth Street Wash Detention Basin No. 2. Rust Environment & Infrastructure (Rust E&I) was contracted by the Flood Control District of Maricopa County (FCDMC) to develop and evaluate alternative plans for the Tenth Street Wash Detention Basin No. 2 drainage improvement facilities. The scope of work for this study included hydrologic and hydraulic modeling of the Tenth Street Wash watershed to evaluate the impacts of various alternatives upon downstream flooding conditions. Results of these analyses were presented to the FCDMC and the Citizen's Advisory Committee (CAC) for selection of a preferred plan. The design concept report investigates basin alternatives which maximize the detention storage in accordance with FCDMC's design requirements and, at the same time, addressing the long-term interests of the neighborhood community who hope to use the basin for recreational facilities. The FCDMC is working closely with the City of Phoenix and community representatives to develop a plan that will facilitate future use of the basin as a recreational facility. Two public meetings were held during the course of this study to present alternatives to the Citizen's Advisory Committee and to incorporate their input.

The Tenth Street Wash Detention Basin No. 2 site is located on a parcel of land bounded on the north by Townley Avenue, on the south by Alice Avenue, on the west by Eighth Street, and the east by Eleventh Street. The site was previously occupied by a residential subdivision which experienced periodic flooding during large flows from the Tenth Street Wash. These homes have been acquired and removed by the FCDMC for construction of the detention basin facilities. A location map is given on **Figure 1**.

FIGURE I - LOCATION MAP



CHAPTER 4

EXISTING WATERSHED HYDROLOGY

The existing conditions hydrologic analysis of the Tenth Street Wash watershed area was prepared by Kaminski-Hubbard Engineering Inc. (KHE) for the FCDMC as a part of the *Arizona Canal Diversion Channel (ACDC) Area Drainage Master Study, Phase I*. The procedure used in this study for determination of peak flow rates was the U.S. Army Corps of Engineers' flood hydrograph package, HEC-I, Version 4.0, September 1990. A detailed description of the methodology and results is presented in reference 1.

The HEC-I model prepared by KHE was subsequently modified by Stanley Consultants, Inc. Tenth Street Wash Detention Basin No. 1 design. The revisions incorporated into the model by Stanley Consultants, Inc. included a routine for routing the Tenth Street Wash hydrograph through Detention Basin No. 1. The model utilized by Rust E&I for evaluation of the Detention Basin No. 2 alternatives is based upon the original KHE model with the revisions/additions made by Stanley Consultants, Inc. include Detention Basin No. 1. **Table 1** of this report summarizes the results of the previously-completed hydrologic modeling for Tenth Street Wash at the points of concentration immediately upstream and downstream of the Detention Basin No. 2 site. The two primary points of concentration affecting the Tenth Street Wash Detention Basin No. 2 are located on the main stem Tenth Street Wash channel at Townley Avenue and at the intersection of Townley Avenue with Eleventh Street. The 100-year discharge for the main stem Tenth Street Wash channel at Townley Avenue was determined to be 1220 cfs. The tributary flows arriving at the intersection of Townley Avenue and Eleventh Street originate from the Palma Park tributary. The drainage area and 100-year peak discharge for this tributary are 0.47 sq.mi. and 615 cfs, respectively. A very small portion of the Palma Park tributary flow drains through an existing 18-inch pipe at the southeast corner of Palma Park to the Tenth Street Wash. The remainder of the flow drains within the public streets and through the adjoining subdivision areas to Alice Avenue where it then drains to the Tenth Street Wash channel. The drainage area and 100-year peak discharge for Tenth Street Wash at a point downstream of the Palma Park tributary are 2.29 sq.mi. and 1835 cfs, respectively.

There is an additional point of concentration for tributary flows at the ACDC confluence. A tributary watershed area of 0.55 sq.mi. drains to the Tenth Street Wash channel between El Caminito Street and the ACDC confluence. This tributary adds an additional 786 cfs, bringing the total Tenth Street Wash flow at the ACDC confluence to 2621 cfs. Runoff originating from this tributary area south of Alice Avenue will not be regulated by the proposed Tenth Street Wash Detention Basin No. 2.

A map showing the overall watershed boundaries for the Tenth Street Wash watershed is provided on **Figure 3** of this report. **Appendix A** contains a copy of the input and output for the existing conditions HEC-I model which was used as a basis of evaluating the Tenth Street Wash Detention Basin No. 2 alternatives.

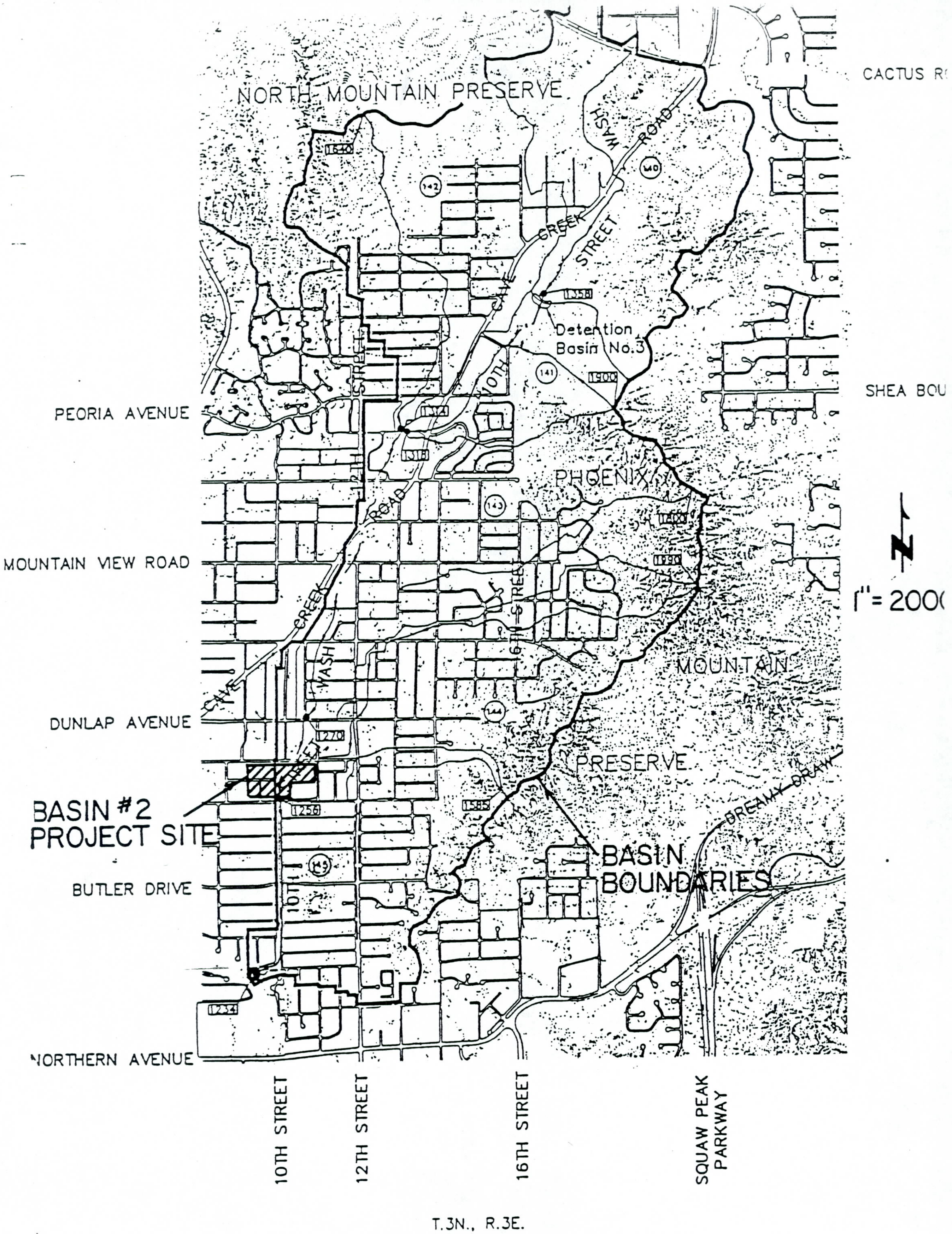


FIGURE 3 - WATERSHED BOUNDARY MAP

TABLE 1

SUMMARY OF EXISTING CONDITIONS PEAK DISCHARGE RATES

HEC-1 ID. Point	LOCATION	Drainage Area	100 Year Discharge (cfs)
RM 143	10th St. Wash & Townley Avenue	1.82 sq.mi.	1220
144S	Palma Park Tributary	0.47 sq.mi.	615
HC144	10th St. Wash @ Alice Avenue	2.29 sq.mi.	1835
145S	ACDC Tributary	0.55 sq.mi.	786
HC145	10th St. Wash @ ACDC	2.84 sq.mi.	2621

184/TBL110TH

10TH STREET WASH WATERSHED

VOLUME 1.9

ARIZONA CANAL DIVERSION CHANNEL
AREA DRAINAGE MASTER STUDY

ACDC/ADMS PHASE 1

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

HYDROLOGY REPORT

JUNE 1992

KAMINSKI HUBBARD engineering, inc.

SURVEYING * CIVIL * HYDROLOGY

10TH STREET WASH WATERSHED

Volume 1.9

Arizona Canal Diversion Channel
Area Drainage Master Study
ACDC/ADMS Phase I

HYDROLOGY REPORT

June 11, 1992

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-8061

10TH STREET WASH WATERSHED
HYDROLOGY REPORT

TABLE OF CONTENTS

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JAMES O.
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LIST OF TABLES

LIST OF PLATES & FIGURES

APPENDIX

1.0 SYNOPSIS

Kaminski-Hubbard Engineering, Inc. (KHE) was retained by the Flood Control District of Maricopa County (FCDMC) to prepare a comprehensive hydrologic analysis of the 10th Street Wash as part of the Arizona Canal Diversion Channel (ACDC) Area Drainage Master Study (ADMS), Phase I. The 10th Street Wash watershed is located in north central Phoenix on the eastern portion of an area commonly referred to a Sunnyslope (See Figure 1). This watershed has an approximate area of 2.8 square miles and is subject to relatively high rates of runoff because of the surrounding steep mountains.

Presently, the watershed is fully developed having 58 percent urbanized area with the remaining 42 percent predominantly located within the Phoenix Mountain Preserve. The watershed is comprised mostly of residential neighborhoods with commercial and industrial developments bordering Cave Creek Road. Residential neighborhoods are predominantly located along the 10th Street Wash channel, which flows southerly to Griswold Road, then proceeds westerly to the ACDC.

Currently, one major flood control structure is in place which collects runoff from a 0.52 square mile area and limits the 100-year flow through a 14-inch by 14-inch orifice plate covering a 30-inch principal spillway pipe. This structure, hereinafter called Detention Basin No. 3, was constructed in 1974 by the City of Phoenix. However, previous hydrologic studies by the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers (COE) did not include the modelling of Detention Basin No. 3 (Ref. 4 & 10).

This report presents the hydrologic analysis developed for 10th Street Wash at its confluence with the ACDC. Table 1 summarizes the controlling peak discharges at specific locations along the 10th Street Wash Channel.

TABLE 1

Controlling Peak Discharge

Location	Drainage Area (Sq. Mi.)	6-Hr. 2-Yr. (CFS)	6-Hr. 10-Yr. (CFS)	24-Hr. 100-Yr. (CFS)
Detention Basin No. 3 Outflow	0.5	17	21	26
10th Street Wash Above Confluence w/Main Tributary	0.7	47	145	293
10th Street Wash Below Confluence w/Main Tributary	1.2	139	501	1014
Dunlap Avenue	1.8	246	948	1828
Alice Avenue	2.3	327	1280	2444
ACDC	2.8	390	1621	3069

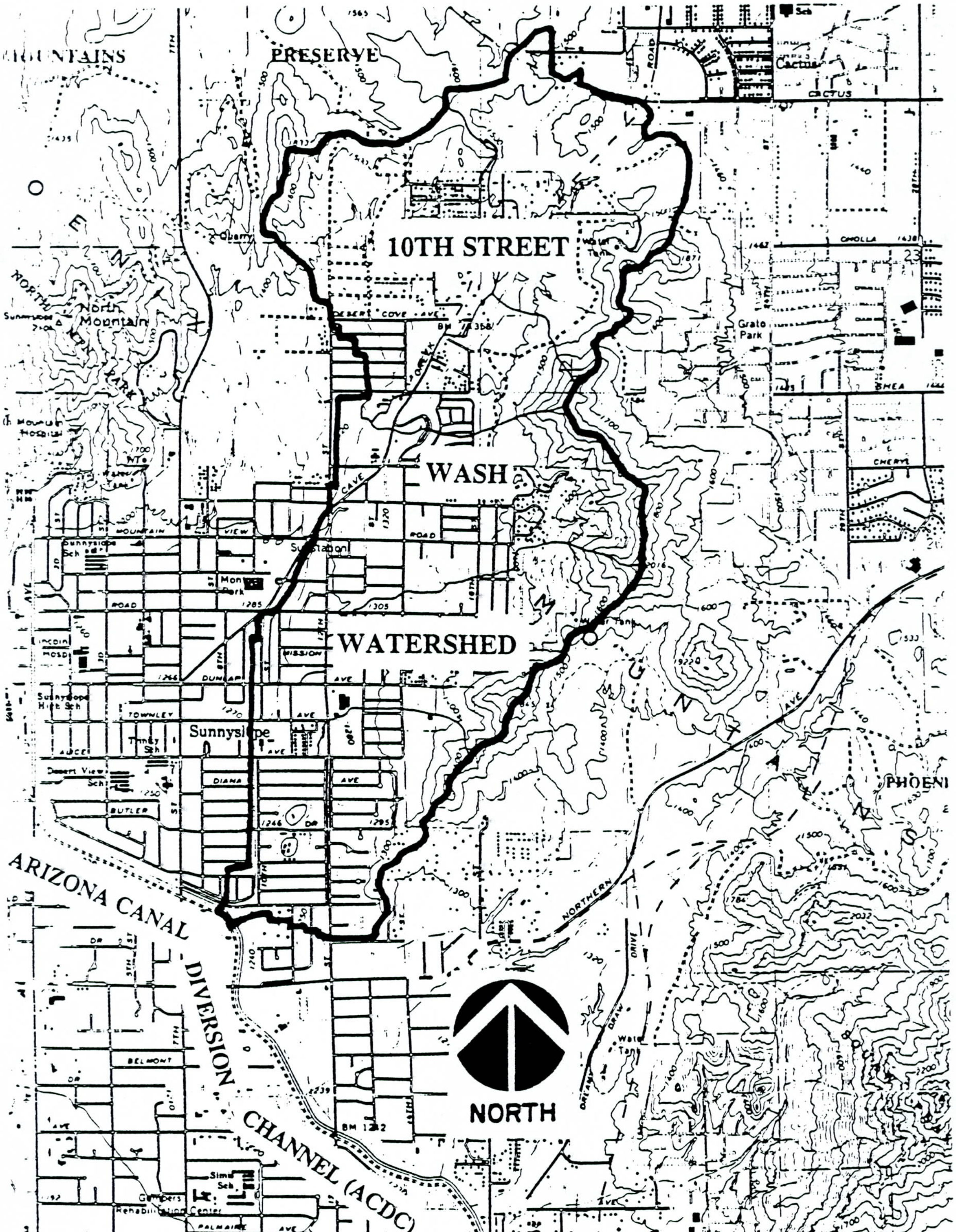

FIGURE 1 - VICINITY MAP

2.0 INTRODUCTION

A hydrologic analysis of the 10th Street Wash was prepared by Kaminski-Hubbard Engineering, Inc. (KHE) for the Flood Control District of Maricopa County (FCDMC) as part of the Arizona Canal Diversion Channel (ACDC) Area Drainage Master Study (ADMS), Phase I. Previous hydrologic investigations of the watershed were reviewed for historical, as well as, hydrological information which could be used in our analysis.

The purpose of this report is to present the revised hydrology for 10th Street Wash based on the FCDMC's new hydrologic design criteria, increased urbanization, and the modelling of Detention Basin No. 3. This report also presents the assumptions and methodology for the hydrologic analysis of 10th Street Wash.

3.0 STUDY PARAMETERS

3.1 Study Area

The 10th Street Wash watershed has an approximate drainage area of 2.8 square miles. The watershed is bounded to the west by the Sunnyslope Drainage Area (roughly 9th Street), to the north and east by the Phoenix Mountains, and to the south by Harmont Drive and Griswold Road. The watershed area is subject to relatively high rates of runoff due to the surrounding steep mountains and the high degree of development at the mountain base.

Presently, the watershed is fully developed with approximately 58 percent urbanized area. The remaining 42 percent is predominantly located within the Phoenix Mountain Preserve and probably will not be developed. The areas adjacent to the 10th Street Wash are comprised of commercial and industrial developments along the west bank and primarily residential developments along the east bank extending eastward to the base of the Phoenix Mountains.

The North Mountain Flood Detention Dam No. 3 is a significant drainage structure that control the contributing runoff from the northeastern portion of the watershed. The detention basin has a 14-inch by 14-inch orifice plate covering a 30-inch pipe for a low level outlet and a 100-foot wide emergency spillway. The outflow from Detention Basin No. 3 also coincides with the beginning of the 10th Street Wash.

The 10th Street Wash proceeds southwesterly from Detention Basin No. 3 along an alignment that parallels Cave Creek Road to Hatcher Road. The wash crosses under Cave Creek Road through 3 - 10'x3' CBC between Peoria Avenue and Cheryl Drive and through 2 - 15'x8' CBC at 12th Street. The wash crosses under Mountain View Road through 2 - 15'x8' CBC. The wash then proceeds southerly from Hatcher Road along an alignment that parallels 10th Street to Griswold Road. At Griswold Road, the wash makes an approximate 90 degree turn and proceeds westerly to the ACDC.

3.2 Mapping

The available mapping utilized in this study are as follows:

1. **FCDMC Mapping:** The 10th Street Wash watershed was flown as part of this study for the purpose of obtaining 1 inch = 400 foot contour and aerial mapping. The contour interval is 2 feet. These maps were flown in November, 1990. These maps were used to establish the sub-basin drainage delineations, flow patterns, and storage volume calculations for detention facilities. The aerial maps were also utilized to provide land use information.

2. **USGS Quadrangle Maps:** Sunnyslope, Arizona, 7.5 minute series. The horizontal scale is 1 inch = 2000 feet. The contour interval is 20 feet. These maps were photo revised in 1982.

3. **City of Phoenix Storm Drain Maps:** These maps are at a scale of 1 inch = 400 feet and provide a schematic location of storm drains and culverts in the area.

4. **City of Phoenix Zoning Maps:** These maps are at a scale of 1 inch = 400 feet and provide zoning designations and boundaries in the area.

5. **As-Built Plans:** As-built plans for drainage structures associated with Cave Creek Road and Detention Basin No. 3 were used for flow routing purposes.

6. **Field Reconnaissance:** Field investigations were undertaken to verify hydrologic information obtained from aerial and topographic mapping. Areas of new development or developments under construction and existing on-site retention areas were identified. All major drainage structures within the watershed were identified. The flow paths of all major mile and half-mile streets were identified. Some drainage patterns were documented for local streets.

3.3 Study Criteria

The following criteria and guidelines were set forth by the FCDMC prior to and during the drainage study:

1. Hydrology calculations will be completed for the 2-, 10-, and 100-year storms.

2. Storm durations of 6- and 24-hours will be evaluated for all three storms.

3. The U.S. Army Corps of Engineers (COE) HEC-1 computer program will be used for hydrograph computations.

4. Sub-basins will be limited to a maximum of five square miles in area;

5. The S-Graph Method will be utilized;

6. The Green-Ampt Loss Method will be utilized for estimation of precipitation losses.

7. The S-Graph basin lag equation as documented in the FCDMC's Drainage Design Manual (Ref. 6) will be utilized. The estimated mean Manning's "n" for all channels within a sub-basin will be determined using the U.S. Geological Survey Method (Ref. 16).

8. The Maricopa County Unit Hydrograph Procedure 2 (MCUHP2) computer program, as provided by the FCDMC, will be used to convert an S-Graph into a unit-graph and generate the necessary basin HEC-1 input file with the appropriate rainfall pattern distribution.

9. Rainfall distributions and depth-area relations for the 6-hour storm duration will be based on NOAA HYDRO-40 (Ref. 14) and COE (Ref. 9) data, as presented in the FCDMC's Drainage Design Manual (Ref. 6). This data is included in the MCUHP2 program to develop areal reduction for the watershed.

10. The SCS Type II rainfall distribution will be used for the 24-hour storm, with corresponding depth-area ratios based on NOAA HYDRO-40 (Ref. 14). This data is included in the MCUHP2 Program.

11. Stage-storage data for Detention Basin No. 3 was obtained from 1 inch to 400 feet topographic mapping. The reservoir storage routing method in HEC-1 will be used to determine a stage-discharge relationship.

12. Transmission losses will be estimated based on existing field data or literature. Existing field data or literature was not available to estimate infiltration losses. Based on the watershed topography and this study's detail for the watershed roughness coefficient (Manning's "n"), not including transmission losses has little impact on the flow peaks and volumes.

4.0 HYDROLOGY

4.1 General

The hydrology for the 10th Street Wash watershed was analyzed for the 2-, 10-, and 100- year storms. The 6- and 24-hour storm durations were evaluated for all three storms. The 10th Street Wash watershed was modeled using the COE HEC-1 computer program. The May 1991 version of HEC-1 was used for this study. The S-graph method was used to represent runoff characteristics for the watershed and converted to a Unit-graph using the FCDMC's MCUHP2 program for input into the HEC-1 computer model. The HEC-1 modeling also included allowances for Green-Ampt infiltration losses, Muskingum-Cunge channel routing, storage routing, and combining and diversion of sub-basin hydrographs. This section describes the assumptions and methodologies used to develop the HEC-1 computer model for the 10th Street Wash watershed.

4.2 Parameter Estimation

4.2.1 Drainage Area Boundaries

The watershed area was delineated into six sub-basins using 1 inch to 400 feet topographic and aerial mapping. Particular attention was given to existing drainage structures and their conveyance effects within the watershed. In-house drainage delineation was also supplemented by as-built drawings of major collector streets and drainage structures.

The initial delineation was then verified or revised based on field investigations. This field investigation included driving major mile and half-mile streets to distinguish flow patterns and possible flow split locations. These flow patterns were recorded and later referred to in determining lag times for each sub-basin. The field investigations also included the determination of on-site retention locations within the watershed. Observations were also made to determine non-contributing areas within the watershed that occur during the 2-year storm analysis.

The sub-basins were delineated such that concentration points were provided at major streets, detention basins, and stream confluences. The major concentration points are located at the North Mountain Detention Basin No. 3, at the confluence of 10th Street Wash and a unnamed main tributary wash located southwest of the Peoria Avenue - Cave Creek Road intersection, at Dunlap Avenue west of 12th Street, at Alice Avenue, and at the ACDC.

4.2.2 Rainfall Parameters

Rainfall Distributions

The rainfall distribution used for the 6-hour storm duration are as documented in the FCDMC's Drainage Design Manual (Ref. 6) and contained in the MCUHP2 Program. The SCS Type II distribution was used for the 24-hour storm. The rainfall distributions are presented in Tables 6 and 7 in Section I of the Appendix.

Precipitation Data

The point precipitation values used in this analysis were obtained from isopluvial maps for Maricopa County as published in the FCDMC's Drainage Design Manual (Ref. 6). The point precipitation values are presented in Table 4 in Section I of the Appendix.

Areal Reduction Factors

The point precipitation values used for this study were adjusted to account for the reduction in precipitation depth over a very large area. Reduction factors for the 6-hour duration storms were obtained from the FCDMC's Drainage Design Manual (Ref. 6). This information was also included in the FCDMC's MCUHP2 Program. The 24-hour storm reduction factors were obtained from the NOAA Technical Memorandum NWS HYDRO-40 (Ref. 14). These factors are presented in Table 5 in Section I of the Appendix.

4.2.3 Physical Parameters

Loss Rate Estimation

The Green-Ampt loss rate method in HEC-1 was used to estimate rainfall losses. This method involves a two phase process in simulating rainfall losses. The first phase involves no infiltration of rainfall until the accumulated rainfall equals the initial loss (IA). Recommended IA values are presented in Table 4.1 in the Drainage Design Manual (Ref. 6).

The second phase is the infiltration of rainfall into the soil immediately after IA is completely satisfied. The three Green-Ampt infiltration parameters as coded in HEC-1 are: hydraulic conductivity at natural saturation (XKSAT); wetting front capillary suction (PSIF); and volummetric soil moisture deficit at the start of rainfall (DTHETA).

The Green-Ampt parameters were determined using a spreadsheet provided by the FCDMC, Watershed Management Branch. The XKSAT values were determined by the FCDMC for all map units contained in the SCS Soil Surveys (Ref. 11 & 12) using log averaging of major and minor soil XKSAT values. These map units along with their corresponding XKSAT and percent rock outcrop values are presented in lookup tables within the Green-Ampt Spreadsheet.

The area of each soil unit within each sub-basin was determined and used as input into the Green-Ampt Loss Parameter spreadsheet. These area calculations were determined using ARC INFO GIS. The spreadsheet subsequently computed average sub-basin XKSAT values using log averaging methods. Next, values for PSIF and each DTHETA condition (i.e. dry, normal, wet) were interpolated using the computed XKSAT. These tables were contained within the spreadsheet and were similar to Table 4.2 (Ref. 6).

The Green-Ampt parameters computed above were based strictly on soil characteristics and adjustments were necessary to account for vegetative cover and land use. These guidelines are presented in the FCDMC's Drainage Design Manual (Ref. 6) and are incorporated in the Green-Ampt Loss Parameter Spreadsheet. The area of each land use within each sub-basin was also determined and used as input into the spreadsheet. Again, these area calculations were performed using ARC INFO GIS.

The "percent impervious" for each sub-basin was computed as a function of both natural rock outcrop and land use. The percentage of impervious rock outcrop within each sub-basin was estimated from soil unit data provided in the SCS Soil Surveys (Ref. 11 & 12). A factor of 0.6 was used to convert the "percentage of rock outcrops" to the "percent impervious" for each sub-basin.

Next, the impervious areas associated with various land use categories were determined for each sub-basin. The City of Phoenix zoning designations were classified into land use categories based on aerial mapping are presented in Table 9 in Section II of the Appendix.

The total "percent impervious" value for each sub-basin was computed as a summation of the above two "percent impervious" values. The computation was also incorporated into the Green-Ampt Loss Parameter spreadsheet. The average Green-Ampt parameters for each sub-basin are presented in Table 8 in Section II of the Appendix.

Estimation Of Lag Time

The S-Graph Method requires the estimation of the basin lag parameter. The following empirical equation was used to compute basin lag as a function of watershed characteristics (Ref. 6 & 7):

$$Lag = 24K_n\left(\frac{LL_{ca}}{S^{0.5}}\right)^{0.38}$$

where

Lag	=	basin lag, in hours.
L	=	length of the longest watercourse, in miles.
L_{ca}	=	length along the watercourse to a point opposite the basin centroid, in miles.
S	=	watercourse slope, in feet/mile.
K_n	=	estimated mean Manning's roughness coefficient for all channels within a basin

The length of the longest watercourse within each sub-basin and its corresponding slope were determined using 1 inch to 400 feet topographic mapping and from street flow patterns observed from field investigations. The centroid of each sub-basin was determined using ARC INFO GIS and located along the watercourse to determine L_{ca}.

A major disadvantage of the Lag equation is that the roughness coefficient must be selected which is very subjective and introduces significant uncertainty into the lag prediction. Also, the roughness coefficient is not necessarily a constant for each sub-basin for all rainfall depths and requires some adjustment to account for the different storm frequencies. Therefore, Manning's roughness coefficients were estimated for each sub-basin using the guidelines established in Reference 16.

Five categories were developed to reflect the diversity in sub-basin runoff characteristics. These categories are mountain area, hillslope area, valley area, urbanized hillslope area, and urbanized valley area. Manning roughness coefficients were computed for the 2-, 10-, and 100-year storm frequency for each category and are presented in Section III of the Appendix. Based on land use information, a representative roughness coefficient was computed for each sub-basin using linear area averaging. The hydrologic sub-basin characteristics are presented in Tables 10, 11, and 12 in Section III of the Appendix.

4.2.4 Routing Parameters

Channel Routing

For this study, the Muskingum-Cunge method was used to route a hydrograph through a downstream sub-basin. Channel cross-section information, slopes, and Manning's roughness coefficients were estimated using topographic mapping and observations made during the field investigation. Channel routing flow paths are presented in Plate 4 and channel routing work sheets are presented in Section IV of the Appendix.

Existing field data or literature was not available to estimate infiltration losses. Based on the watershed topography and this study's detail for the watershed roughness coefficient (Manning's "n"), not including transmission losses has little impact on the flow peaks and volumes.

Reservoir Routing

The upstream watershed hydrograph contributing to Detention Basin No. 3 was routed using the Modified Puls method. New storage volume calculations for Detention Basin No. 3 were determined from 1 inch to 400 feet topographic mapping. Field surveys were made to determine pipe culvert sizes and inverts, including spot elevations for overflow spillway calculations. The volume calculations are presented in Section IV of the Appendix.

4.3 Special Considerations

Storm Drain Pipes

The only storm drain pipe systems within the watershed were found along Cave Creek Road. The storm drain pipes were predominantly less than 48-inches in diameter and did not divert flows out of the watershed area or from one-sub-basin to another. Therefore, all storm drains were ignored in the HEC-1 model.

On-Site Retention

The City of Phoenix requires that all new developments retain the 100-year 2-hour duration storm volume that falls on-site. Field investigations within the watershed found that a majority of lots had no on-site retention or minimal retention at best. A few commercial and industrial sites constructed in the last few years had complied with the on-site retention requirements. However, there was no detailed mapping available to accurately determine the retention volume for a given site, much less whether they were 10- or 100-year volumes. Therefore, as a conservative approach, the retention volume for the parcels in questions were assumed to retain the 10-year 2-hour storm volume. The total estimated retention volume for each sub-basin was subtracted from the bottom of the hydrograph by diverting the estimated volume. These computations are presented in Section V of the Appendix.

Particular attention was placed on determining the non-contributing areas associated with a 2-year storm. Those areas that required on-site volume computations were automatically labeled as non-contributing. Next, impervious area associated with land use were assumed to contribute 100% of their areas. The remaining pervious areas were assumed to be non-contributing. These computations are presented in Section V of the Appendix.

5.0 RESULTS AND CONCLUSIONS

The HEC-1 computer model was used to compute the 2-, 10-, and 100-year peak discharges for the 10th Street Wash above its confluence with the ACDC. The existing condition model reflects a fully developed watershed and therefore negates the need for developing a future condition model. This hydrologic analysis has been a synthesis of new topographic mapping observations, completed drainage improvements and increased urbanization. The results of sub-basin peak discharges for the above storm frequencies are presented in Table 2 for both the 6-hour and 24-hour events.

The hydrologic analysis has computed a peak discharge of 390 CFS, 1621 CFS, and 3069 CFS for the 2-, 10-, and 100-year runoff event, respectively, at the 10th Street Wash and ACDC confluence. The total contributing drainage area for the 10th Street Wash watershed is 2.84 square miles. These computed flows vary from previous hydrologic studies and will be discussed below.

A hydrologic analysis of the 10th Street Wash watershed was prepared for the City of Phoenix in 1965 to determine the 10-, 25-, and 50-year peak discharges (Ref. 17). A 10-year peak discharge of 1785 CFS was developed from a 3.21 square mile drainage area. The drainage area is larger because a tributary wash having an approximate confluence at the Mountain View Road - Cave Creek Road intersection and extending northwesterly to the Phoenix Mountains was included as contributing to the 10th Street Wash. Due to the urbanization and street improvements to Cave Creek Road, this tributary wash was directed westward to 7th Street and out of the 10th Street Wash watershed.

A comparison of previous hydrology results with the results of this study are presented in Table 3. The study's use of more refined topographic mapping, the FCDMC's Drainage Design Manual (Ref. 6), and the modelling of Detention Basin No. 3 were all factors in arriving at lower peak discharges for the 10th Street Wash watershed. Detention Basin No. 3 was found to collect runoff from a 0.52 square mile area and limit the 100-year flow through a 14-inch by 14-inch orifice plate covering a 30-inch principal spillway pipe to 26 CFS.

TABLE 2

SUMMARY OF SUB-BASIN PEAK DISCHARGES

Sub-Basin I.D.	2-Year		10-Year		100-Year	
	6 Hr.	24 Hr.	6 Hr.	24 Hr.	6 Hr.	24 Hr.
140	57	50	184	172	496	551
141	38	36	145	139	263	281
142	92	85	362	337	671	720
143	126	117	484	450	841	890
144	84	75	341	310	615	645
145	99	95	457	436	786	844

TABLE 3

COMPARISON OF 100-YEAR PEAK DISCHARGES FOR 10TH STREET WASH W/PREVIOUS STUDIES

Location	Existing Condition					
	COE-1982* (Ref. No. 10)		FEMA-1989* (Ref. No. 4)		KHE-1992	
	DA (SQ. MI.)	Q (CFS)	DA (SQ. MI.)	Q (CFS)	DA (SQ. MI.)	Q (CFS)
10th Street Wash Above Confluence w/ACDC	2.74	3900	2.69	4740	2.84	3069

* Does not include modelling of Detention Basin No. 3

6.0 REFERENCES

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9. U.S. Army Corps of Engineers, Los Angeles District. Gila River Basin, New River, and Phoenix City Streams, Arizona, Design Memorandum No. 2, Hydrology Part 1. October 1974.

10. U.S. Army Corps of Engineers, Los Angeles District. Gila River Basin, New River, and Phoenix City Streams, Arizona, Design Memorandum No. 2, Hydrology Part 2. 1982.

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12. U.S. Department of Agriculture, Soil Conservation Service. Soil Survey of Aguila - Carefree Area, Parts of Maricopa and Pinal Counties, Arizona. April 1986.

13. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service. NOAA Atlas 2, Precipitation - Frequency Atlas at the Western United States, Volume III - Arizona. Silver Springs, MD. 1973.

14. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service. NOAA Technical Memorandum NWS HYDRO-40, Depth-Area Ratios in the Semi-Arid Southwest United States. Silver Springs, MD. August 1984.

15. U.S. Department of Transportation, Federal Highway Administration. Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5. September 1985.

16. U.S. Geological Survey, Water Resources Division. Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona. April 1991.

17. Yost & Gardner Engineers. 10th Street Wash Tributaries, City of Phoenix Project No. ST-64336. November 1965.

APPENDIX

SECTION I

Rainfall Hydrologic Parameters

TABLE 4

Point Precipitation Values For Tenth Street Wash Study Area (Inches)

Return Period (Years)	Storm Duration	
	6-Hr.	24-Hr.
2	1.20	1.40
10	2.00	2.30
100	3.00	3.80

Source: NOAA Atlas Isopluvial Maps For Arizona

TABLE 5

Areal Precipitation Reduction Data

Watershed Area (Sq. Mi.)	Storm Duration	
	6-Hr[1]	24-Hr[2]
0	1.00	1.00
1	0.99	---
3	---	0.98
5	0.96	---
10	0.94	0.96
20	0.91	0.92
30	0.89	0.90

[1] Drainage Design Manual For Maricopa County, (Ref. 6)
[2] NOAA Technical Memorandum NWS HYDRO-40, (Ref. 14)

TABLE 6

6-HOUR STORM RAINFALL DISTRIBUTIONS
(Furnished by FCDMC's Maricopa County Unit Hydrograph Procedure 2)
Cumulative Rainfall Table

Storm Time (Hours)	Watershed Area (Sq. Mi.)				
	≤0.5	2.8	16	90	500
0.00	0.000	0.000	0.000	0.000	0.000
0.25	0.008	0.009	0.015	0.021	0.024
0.50	0.016	0.016	0.020	0.035	0.043
0.75	0.025	0.025	0.030	0.051	0.059
1.00	0.033	0.034	0.048	0.071	0.078
1.25	0.041	0.042	0.063	0.087	0.098
1.50	0.050	0.051	0.076	0.105	0.119
1.75	0.058	0.059	0.090	0.125	0.141
2.00	0.066	0.067	0.105	0.143	0.162
2.25	0.074	0.076	0.119	0.160	0.186
2.50	0.087	0.087	0.135	0.179	0.212
2.75	0.099	0.100	0.152	0.201	0.239
3.00	0.118	0.120	0.175	0.232	0.271
3.25	0.138	0.163	0.222	0.281	0.321
3.50	0.216	0.252	0.304	0.364	0.408
3.75	0.377	0.451	0.472	0.500	0.515
4.00	0.834	0.694	0.670	0.658	0.627
4.25	0.911	0.837	0.796	0.773	0.735
4.50	0.931	0.900	0.868	0.841	0.814
4.75	0.950	0.938	0.912	0.888	0.864
5.00	0.962	0.950	0.946	0.927	0.907
5.25	0.972	0.963	0.960	0.945	0.930
5.50	0.983	0.975	0.973	0.964	0.954
5.75	0.991	0.988	0.987	0.982	0.977
6.00	1.000	1.000	1.000	1.000	1.000

TABLE 7

24-HOUR STORM RAINFALL DISTRIBUTION
(Standard SCS 24-Hour, Type II Distribution
Cumulative Rainfall Table)

Storm Time (Hours)	Precipitation Ratio
0.0	0.000
0.5	0.005
1.0	0.011
1.5	0.016
2.0	0.022
2.5	0.028
3.0	0.035
3.5	0.041
4.0	0.048
4.5	0.056
5.0	0.063
5.5	0.071
6.0	0.080
6.5	0.089
7.0	0.098
7.5	0.109
8.0	0.120
8.5	0.133
9.0	0.147
9.5	0.163
10.0	0.181
10.5	0.204
11.0	0.235
11.5	0.283
12.0	0.663

Storm Time (Hours)	Precipitation Ratio
12.5	0.735
13.0	0.772
13.5	0.799
14.0	0.820
14.5	0.838
15.0	0.854
15.5	0.868
16.0	0.880
16.5	0.891
17.0	0.902
17.5	0.912
18.0	0.921
18.5	0.929
19.0	0.937
19.5	0.945
20.0	0.952
20.5	0.959
21.0	0.965
21.5	0.972
22.0	0.978
22.5	0.984
23.0	0.989
23.5	0.995
24.0	1.000

SECTION II

Green-Ampt & Land Use Parameters

TABLE 8

AVERAGE GREEN-AMPT PARAMETERS BY SUB-BASIN

Sub-Basin	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
140	0.145	0.339	4.25	0.488	20.44
141	0.126	0.303	3.61	0.313	38.57
142	0.127	0.309	4.12	0.267	34.03
143	0.115	0.279	4.12	0.269	49.66
144	0.118	0.280	3.61	0.320	43.17
145	0.105	0.265	5.67	0.210	44.60

TABLE 9

Percent Impervious Estimates For Zoning/Land Use Classifications

Zoning Unit	Zoning Description	Land Use Description	Land Use Unit	Percent Impervious
S-1	Ranch or Farm Res.	Very Low Density Residential	V.L.D.R. or VLO Res	15
S-2	Ranch Or Farm Commercial			
RE-43	Single Family, 1 acre min.			
RE-35	Single Family, 35000 S.F. min.	Low Density Residential	L.D.R. or LO RES	25
RE-24	Single Family, 24000 S.F. min			
R1-18	Single Family, 18000 S.F. min			
R1-14	Single Family, 14000 S.F. min.			
RI-10	Single Family, 10000 S.F. min.	Medium Density Residential	M.D.R. or MED RES	45
RI-8	Single Family, 8000 S.F. min			
RI-6	Single Family, 6000 S.F. min			
R-0	Residential Office			
R-2	Multi-Family, 4000 S.F. per unit	Multiple Family Residential	M.F.R. or. MF RES	65
R-3	Multi-Family, 3000 S.F. per unit			
R-3A	Multi Family			
R-4	Multi-Family, 1500 S.F. per unit			
R-4A	Multi-Family, 1000 S.F. per unit			
R-5	Multi-Family, 1000 S.F. per unit			
CP/BP	Business Park			
R-H	Resort District			
C-1	Neighborhood Commercial	Commercial	COMM or COMM.	90
C-2	Intermediate Commercial			
C-3	General Commercial			
C-O	Commercial Office/Restricted Comm.			
H-R	High Rise District			
CP/GCP	General Commerce Park			
IND PARK	Industrial Park	Industrial	IND or INDUST.	75
A-1	Light Industrial			
A-2	Heavy Industrial			
PAD	Planned Area Development	Variable	---	Variable
PSC	Planned Shopping Center	Planned Shopping Center	PSC or PLND.SHP	85
P-1	Parking (Open)	Parking	PARKING	Variable
P-2	Parking (Structure)	Parking	PARKING	85
MISCELLANEOUS CATEGORIES: Evaluated On A Case By Case Basis				
		Desert Cover	DESERT	0
		Undeveloped Parcel	VACANT or OPEN	0
		Golf Course	GC	0
		Park	PARK	0
		School	SCHOOL	Variable
		Airport	AIRPORT	Variable

LOSS PARAMETERS FOR SUBBASIN: 140

Soil Survey Used AGUILA & CENTRAL

XKSAT

Map Unit	AREA SQ.MI.	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
109	0.291	56.36	0.35	-0.257	35.00	19.73
68	0.168	32.56	0.63	-0.065	0.00	0.00
18	0.031	6.01	0.33	-0.029	15.00	0.90
21	0.018	3.53	0.38	-0.015	0.00	0.00
TrB	0.008	1.48	0.13	-0.013	0.00	0.00
RS	0.000	0.06	0.4	-0.000	65.00	0.04
TOTAL =	0.516 SQ.MI.		XKSAT =	0.42	%ROCK=	20.67

DTHETA

Dry = 0.35
Normal = 0.25
Wet = 0

PSIF

= 4.25

LAND USE

AREA SQ.MI.	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ.MI.	IA in.	Wgtd.IA in.
0.459	DESERT	89.02	DRY	25.00	0.00	0.00	0.15	0.134
0.017	M.D.R.	3.29	NORMAL	25.00	45.00	0.01	0.10	0.003
0.007	M.F.R.	1.44	NORMAL	25.00	65.00	0.00	0.10	0.001
0.032	COMM	6.25	NORMAL	20.00	90.00	0.03	0.10	0.006
0.516	=TOTAL AREA	OK	AVERAGE =	24.69	TOTAL =	0.04	AVG. =	0.145
					% =	8.04		

PERCENT OF SUBBASIN
DRY = 89.02 %
NORMAL = 10.98 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.339

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.488

IMPERVIOUS AREA:
URBAN @ 100 % effective = 8.04
ROCK OUTCROP @ 60 % effective = 12.40

% EFFECTIVE IMP. = 20.44

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	LENGTH miles	Lca miles	SLOPE ft/mile	IA inches	DTHETA	PSIF	XKSAT	RTIMP %
140	0.516	1.220	0.510	162.00	0.145	0.339	4.25	0.488	20.44

LOSS PARAMETERS FOR SUBBASIN: 141

Soil Survey Used AGUILA & CENTRAL

XKSAT

Map Unit	AREA SQ.MI.	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
TrB	0.072	38.62	0.13	-0.342	0.00	0.00
68	0.042	22.61	0.63	-0.045	0.00	0.00
18	0.039	20.65	0.33	-0.099	15.00	3.10
109	0.034	18.12	0.35	-0.083	35.00	6.34
TOTAL =	0.187	SQ.MI.	XKSAT =	0.27	%ROCK=	9.44

DTHETA

Dry = 0.35
Normal = 0.25
Wet = 0

PSIF

= 3.61

LAND USE

AREA SQ.MI.	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ.MI.	IA in.	Wgtd.IA in.
0.099	DESERT	52.96	DRY	25.00	0.00	0.00	0.15	0.079
0.006	M.D.R.	3.16	NORMAL	25.00	45.00	0.00	0.10	0.003
0.060	M.F.R.	32.04	NORMAL	25.00	65.00	0.04	0.10	0.032
0.022	COMM	11.84	NORMAL	20.00	90.00	0.02	0.10	0.012
0.187	=TOTAL AREA	OK	AVERAGE =	24.41	TOTAL =	0.06	AVG. =	0.126
					% =	32.90		

PERCENT OF SUBBASIN
DRY = 52.96 %
NORMAL = 47.04 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.303

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.313

IMPERVIOUS AREA:
URBAN @ 100 % effective = 32.90
ROCK OUTCROP @ 60 % effective = 5.66

% EFFECTIVE IMP. = 38.57

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	LENGTH miles	Lca miles	SLOPE ft/mile	IA inches	DTHETA	PSIF	XKSAT	RTIMP %
141	0.187	0.830	0.570	315.00	0.126	0.303	3.61	0.313	38.57

LOSS PARAMETERS FOR SUBBASIN: 142

Soil Survey Used AGUILA & CENTRAL

XKSAT

Map Unit	AREA SQ.MI.	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
18	0.225	43.95	0.33	-0.212	15.00	6.59
TrB	0.214	41.87	0.13	-0.371	0.00	0.00
RS	0.037	7.23	0.4	-0.029	65.00	4.70
109	0.022	4.24	0.35	-0.019	35.00	1.48
CO	0.010	1.96	0.29	-0.011	20.00	0.39
68	0.004	0.75	0.63	-0.002	0.00	0.00
TOTAL =	0.512 SQ.MI.		XKSAT =	0.23	%ROCK=	13.17

DTHETA

Dry = 0.36
Normal = 0.25
Wet = 0

PSIF

= 4.12

LAND USE

AREA SQ.MI.	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ.MI.	IA in.	Wgtd.IA in.
0.275	DESERT	53.73	DRY	25.00	0.00	0.00	0.15	0.081
0.165	M.D.R.	32.29	NORMAL	25.00	45.00	0.07	0.10	0.032
0.020	M.F.R.	3.92	NORMAL	25.00	65.00	0.01	0.10	0.004
0.052	COMM	10.06	NORMAL	20.00	90.00	0.05	0.10	0.010
0.512	=TOTAL AREA	OK	AVERAGE =	24.50	TOTAL =	0.13	AVG. =	0.127
					% =	26.13		

PERCENT OF SUBBASIN DRY = 53.73 %
NORMAL = 46.27 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.309

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.267

IMPERVIOUS AREA: URBAN @ 100 % effective = 26.13
ROCK OUTCROP @ 60 % effective = 7.90

% EFFECTIVE IMP. = 34.03

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	LENGTH miles	Lca miles	SLOPE ft/mile	IA inches	DTHETA	PSIF	XKSAT	RTIMP %
142	0.512	1.160	0.750	257.00	0.127	0.309	4.12	0.267	34.03

`‡0‡‡0

LOSS PARAMETERS FOR SUBBASIN: 143

Soil Survey Used AGUILA & CENTRAL

XKSAT

Map Unit	AREA SQ.MI.	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
TrB	0.283	46.81	0.13	-0.415	0.00	0.00
109	0.149	24.69	0.35	-0.113	35.00	8.64
AdA	0.072	11.86	0.4	-0.047	0.00	0.00
18	0.050	8.22	0.33	-0.040	15.00	1.23
68	0.046	7.55	0.63	-0.015	0.00	0.00
CO	0.004	0.65	0.29	-0.003	20.00	0.13
CrB	0.001	0.22	0.4	-0.001	0.00	0.00
TOTAL =	0.604 SQ.MI.		XKSAT =	0.23	%ROCK=	10.00

DTHETA

Dry = 0.36
Normal = 0.25
Wet = 0

PSIF

= 4.12

LAND USE

AREA SQ.MI.	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ.MI.	IA in.	Wgtd.IA in.
0.158	DESERT	26.23	DRY	25.00	0.00	0.00	0.15	0.039
0.158	M.D.R.	26.19	NORMAL	25.00	45.00	0.07	0.10	0.026
0.234	M.F.R.	38.77	NORMAL	25.00	65.00	0.15	0.10	0.039
0.045	COMM	7.41	NORMAL	20.00	90.00	0.04	0.10	0.007
0.008	PARK	1.40	NORMAL	90.00	0.00	0.00	0.20	0.003
0.604	=TOTAL AREA	OK	AVERAGE =	25.54	TOTAL =	0.26	AVG. =	0.115
					% =	43.66		

PERCENT OF SUBBASIN
DRY = 26.23 %
NORMAL = 73.77 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.279

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.269

IMPERVIOUS AREA:
URBAN @ 100 % effective = 43.66
ROCK OUTCROP @ 60 % effective = 6.00

% EFFECTIVE IMP. = 49.66

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	LENGTH miles	Lca miles	SLOPE ft/mile	IA inches	DTHETA	PSIF	XKSAT	RTIMP %
143	0.604	1.640	0.880	273.00	0.115	0.279	4.12	0.269	49.66

LOSS PARAMETERS FOR SUBBASIN: 144

Soil Survey Used AGUILA & CENTRAL

XKSAT

Map Unit	AREA SQ.MI.	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
TrB	0.147	31.04	0.13	-0.275	0.00	0.00
109	0.116	24.50	0.35	-0.112	35.00	8.57
18	0.079	16.65	0.33	-0.080	15.00	2.50
AdA	0.074	15.57	0.4	-0.062	0.00	0.00
RS	0.034	7.22	0.4	-0.029	65.00	4.69
68	0.024	5.02	0.63	-0.010	0.00	0.00
TOTAL =	0.475 SQ.MI.		XKSAT =	0.27	%ROCK=	15.77

DTHETA

Dry = 0.35
Normal = 0.25
Wet = 0

PSIF

= 3.61

LAND USE

AREA SQ.MI.	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ.MI.	IA in.	Wgtd.IA in.
0.141	DESERT	29.70	DRY	25.00	0.00	0.00	0.15	0.045
0.255	M.D.R.	53.75	NORMAL	25.00	45.00	0.11	0.10	0.054
0.048	M.F.R.	10.16	NORMAL	25.00	65.00	0.03	0.10	0.010
0.004	CHURCH	0.82	NORMAL	20.00	90.00	0.00	0.10	0.001
0.011	COMM	2.42	NORMAL	20.00	90.00	0.01	0.10	0.002
0.015	PARK	3.15	NORMAL	90.00	0.00	0.00	0.20	0.006
0.475	=TOTAL AREA	OK	AVERAGE =	26.89	TOTAL =	0.16	AVG. =	0.118
					% =	33.71		

PERCENT OF SUBBASIN
DRY = 29.70 %
NORMAL = 70.30 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.280

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.320

IMPERVIOUS AREA:
URBAN @ 100 % effective = 33.71
ROCK OUTCROP @ 60 % effective = 9.46

% EFFECTIVE IMP. = 43.17

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	LENGTH miles	Lca miles	SLOPE ft/mile	IA inches	DTHETA	PSIF	XKSAT	RTIMP %
144	0.475	1.800	1.110	291.00	0.118	0.280	3.61	0.320	43.17

LOSS PARAMETERS FOR SUBBASIN: 145

Soil Survey Used AGUILA & CENTRAL

XKSAT

Map Unit	AREA SQ.MI.	% Area	XKSAT	log(XKSAT) *(% Area)	% ROCK OUTCROP	% Area * %R.O.
TrB	0.381	69.45	0.13	-0.615	0.00	0.00
AdA	0.071	13.02	0.4	-0.052	0.00	0.00
18	0.042	7.75	0.33	-0.037	15.00	1.16
RS	0.033	5.96	0.4	-0.024	65.00	3.88
CO	0.021	3.82	0.29	-0.021	20.00	0.76
TOTAL =	0.548 SQ.MI.		XKSAT =	0.18	%ROCK=	5.80

DTHETA

Dry = 0.39
Normal = 0.25
Wet = 0

PSIF

= 5.67

LAND USE

AREA SQ.MI.	LAND USE type	% Area	DTHETA condition	% veg. cover	% Imp. Inc.ROW	ImpArea SQ.MI.	IA in.	Wgtd.IA in.
0.059	DESERT	10.71	DRY	25.00	0.00	0.00	0.15	0.016
0.466	M.D.R.	84.95	NORMAL	25.00	45.00	0.21	0.10	0.085
0.022	M.F.R.	4.07	NORMAL	25.00	65.00	0.01	0.10	0.004
0.001	CHURCH	0.27	NORMAL	20.00	90.00	0.00	0.10	0.000
0.548	=TOTAL AREA	OK	AVERAGE =	24.99	TOTAL =	0.23	AVG. =	0.105
					% =	41.12		

PERCENT OF SUBBASIN
DRY = 10.71 %
NORMAL = 89.29 %
WET = 0.00 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.265

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.210

IMPERVIOUS AREA:
URBAN @ 100 % effective = 41.12
ROCK OUTCROP @ 60 % effective = 3.48

% EFFECTIVE IMP. = 44.60

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	AREA sq.mi.	LENGTH miles	Lca miles	SLOPE ft/mile	IA inches	DTHETA	PSIF	XKSAT	RTIMP %
145	0.548	1.370	0.860	242.00	0.105	0.265	5.67	0.210	44.60

SECTION III

Hydrologic Sub-Basin Characteristics

TABLE 10

HYDROLOGIC SUB-BASIN CHARACTERISTICS
2-YEAR STORM

Sub-Basin	Area (Sq. Mile)	Length (Miles)	Lca (Miles)	Slope (Ft./Mile)	Kn	Lag (Hours)
140	0.478	1.22	0.51	162	0.064	0.488
141	0.132	0.83	0.57	315	0.052	0.315
142	1.367	1.16	0.75	257	0.053	0.420
143	0.364	1.64	0.88	273	0.044	0.418
144	0.292	1.80	1.11	291	0.045	0.478
145	0.284	1.37	0.86	242	0.039	0.351

TABLE 11

HYDROLOGIC SUB-BASIN CHARACTERISTICS
10-YEAR STORM

Sub-Basin	Area (Sq. Mi.)	Length (Miles)	Lca (Miles)	Slope (Ft./Mile)	Kn	Lag (Hours)
140	0.516	1.22	0.51	162	0.060	0.457
141	0.187	0.83	0.57	315	0.048	0.291
142	1.512	1.16	0.75	257	0.049	0.389
143	0.604	1.64	0.88	273	0.040	0.380
144	0.475	1.80	1.11	291	0.041	0.436
145	0.548	1.37	0.86	242	0.035	0.315

TABLE 12

HYDROLOGIC SUB-BASIN CHARACTERISTICS
100-YEAR STORM

Sub-Basin	Area (Sq. Mile)	Length (Miles)	Lca (Miles)	Slope (Ft./Mile)	Kn	Lag (Hours)
140	0.516	1.22	0.51	162	0.050	0.381
141	0.187	0.83	0.57	315	0.042	0.254
142	1.512	1.16	0.75	257	0.042	0.333
143	0.604	1.64	0.88	273	0.035	0.333
144	0.475	1.80	1.11	291	0.036	0.382
145	0.548	1.37	0.86	242	0.032	0.288

KAMINSKI HUBBARD engineering inc. • Surveying • Civil • Hydrology	Made by DLB	Date 4-9-92	Job No. 014
	Checked by	Date	Sheet No. 1
	For		

Estimated Manning's Roughness Coefficients

1. Mountain Area

(a) 100-Year Storm

n_b = 0.030 (Coarse Sand)
n_1 = 0.008 (Moderate)
n_2 = – –
n_3 = 0.015 (Medium)
n = 0.053

(b) 10-Year Storm

n_b = 0.030
n_1 = 0.008
n_2 = – –
n_3 = 0.025
n = 0.063

(c) 2-Year Storm

n_b = 0.030
n_1 = 0.008
n_2 = – –
n_3 = 0.030
n = 0.068

2. Hillslope Area

(a) 100-Year Storm

n_b = 0.030 (Coarse Sand)
n_1 = 0.005 (Minor)
n_2 = – –
n_3 = 0.010 (Medium)
n = 0.045

(b) 10-Year Storm

n_b = 0.030
n_1 = 0.005
n_2 = – –
n_3 = 0.018
n = 0.053

(c) 2-Year Storm

n_b = 0.030
n_1 = 0.005
n_2 = – –
n_3 = 0.025
n = 0.060

KAMINSKI HUBBARD engineering inc. • Surveying • Civil • Hydrology	Made by DLB	Date 4-9-92	Job No. 014
	Checked by	Date	Sheet No. 2
	For		

Estimated Manning's Roughness Coefficients (Cont'd.)

3. Valley Area

(a) 100-Year Storm

$n_b = 0.025$ (Sand & Gravel)
$n_1 = 0.005$ (Moderate)
$n_2 = --$
$n_3 = 0.008$ (Small)
$n = 0.038$

(b) 10-Year storm

$n_b = 0.025$
$n_1 = 0.005$
$n_2 = --$
$n_3 = 0.015$ (Medium)
$n = 0.045$

(c) 2-Year storm

$n_b = 0.025$
$n_1 = 0.005$
$n_2 = --$
$n_3 = 0.025$
$n = 0.055$

4. Urbanized Hillslope Area — Flow is 40% Hillslope & 60% streets

(a) 100-Year storm

Hillslope	Street
$n_b = 0.030$	$n_b = 0.018$
$n_1 = 0.005$	$n_1 = --$
$n_2 = --$	$n_2 = --$
$n_3 = 0.010$	$n_3 = --$
$n = 0.045$	$n = 0.018$

$$n = (0.40)(0.045) + (0.60)(0.018) = 0.029$$

(b) 10-Year Storm

Hillslope	Street
$n_b = 0.030$	$n_b = 0.018$
$n_1 = 0.005$	$n_1 = -$
$n_2 = --$	$n_2 = -$
$n_3 = 0.018$	$n_3 = -$
$n = 0.053$	$n = 0.018$

$$n = (0.40)(0.053) + (0.60)(0.018) = 0.032$$

KAMINSKI HUBBARD engineering inc. • Surveying • Civil • Hydrology	Made by DLB	Date 4-9-92	Job No. 0146
	Checked by	Date	Sheet No. 3
	For		

Estimated Mannings Roughness Coefficient (Cont'd)

4. (c) 2-Year Storm

Mountain	Street
$n_b = 0.030$	$n_b = 0.018$
$n_1 = 0.005$	$n_1 = -$
$n_2 = --$	$n_2 = -$
$n_3 = 0.025$	$n_3 = -$
$n = 0.060$	$n = 0.018$

$$n = (0.40)(0.060) + (0.60)(0.018) = 0.035$$

5. Urbanized Valley Area — Assume 85% street Flow and 15% Outside of Roadway Prism.

(a) 100-Year Storm

Street	Outside street
$n_b = 0.018$	$n_b = 0.025$
$n_1 = -$	$n_1 = 0.003$
$n_2 = -$	$n_2 = 0.004$
$n_3 = -$	$n_3 = -$
$n = 0.018$	$n = 0.032$

$$n = (0.85)(0.018) + (0.15)(0.032) = 0.020$$

(b) 10-Year Storm

$n = 0.025$

(c) 2-Year Storm

$n = 0.025$

KAMINSKI HUBBARD engineering inc.	• Surveying • Civil • Hydrology	Made by DB	Date 4-9-92	Job No. 0146
		Checked by	Date	Sheet No. 1
		For Mean Manning's "n" - 10th Street Wash		

2-YEAR STORM

10TH4.WK3

Sub-Basin 140

$$K_n = (0.890)(0.068) + (0.110)(0.035) = 0.064$$

Sub-Basin 141

$$K_n = (0.530)(0.068) + (0.470)(0.035) = 0.052$$

Sub-Basin 142

$$K_n = (0.537)(0.068) + (0.463)(0.035) = 0.053$$

Sub-Basin 143

$$K_n = (0.262)(0.068) + (0.738)(0.035) = 0.044$$

Sub-Basin 144

$$K_n = (0.297)(0.068) + (0.703)(0.035) = 0.045$$

Sub-Basin 145

$$K_n = (0.107)(0.068) + (0.893)(0.035) = 0.039$$

10-YEAR STORM

10TH5.WK3

Sub-Basin 140

$$K_n = (0.890)(0.063) + (0.110)(0.032) = 0.060$$

Sub-Basin 141

$$K_n = (0.530)(0.063) + (0.470)(0.032) = 0.048$$

Sub-Basin 142

$$K_n = (0.537)(0.063) + (0.463)(0.032) = 0.049$$

Sub-Basin 143

$$K_n = (0.262)(0.063) + (0.738)(0.032) = 0.040$$

KAMINSKI HUBBARD engineering inc. • Surveying • Civil • Hydrology	Made by DLB	Date 4-10-92	Job No. 0146
	Checked by	Date	Sheet No. 2
	For Mean Manning's "n" – 10th Street Wash		

10-YEAR STORM (Cont'd)

Sub-Basin 144

$$K_n = (0.297)(0.063) + (0.703)(0.032) = 0.041$$

Sub-Basin 145

$$K_n = (0.107)(0.063) + (0.893)(0.032) = 0.035$$

100-YEAR STORM

10TH2.WK3

Sub-Basin 140

$$K_n = (0.890)(0.053) + (0.110)(0.029) = 0.050$$

Sub-Basin 141

$$K_n = (0.530)(0.053) + (0.470)(0.029) = 0.042$$

Sub-Basin 142

$$K_n = (0.537)(0.053) + (0.463)(0.029) = 0.042$$

Sub-Basin 143

$$K_n = (0.262)(0.053) + (0.738)(0.029) = 0.035$$

Sub-Basin 144

$$K_n = (0.297)(0.053) + (0.703)(0.029) = 0.036$$

Sub-Basin 145

$$K_n = (0.107)(0.053) + (0.893)(0.029) = 0.032$$

LAG TIME CALCULATIONS FOR: TENTH STREET WASH
STORM FREQUENCY - 2 YEAR

SUBBASIN	S-GRAPH SELECTED	24	Kn	L (miles)	Lca (miles)	S (ft/mile)	S^1/2	LAG (hours)	LAG (min.)
140	PV	24	0.064	1.22	0.51	162	12.73	0.488	29.27
141	PV	24	0.052	0.83	0.57	315	17.75	0.315	18.89
142	PV	24	0.053	1.16	0.75	257	16.03	0.420	25.22
143	PV	24	0.044	1.64	0.88	273	16.52	0.418	25.09
144	PV	24	0.045	1.8	1.11	291	17.06	0.478	28.69
145	PV	24	0.039	1.37	0.86	242	15.56	0.351	21.07

LAG TIME CALCULATIONS FOR: TENTH STREET WASH
STORM FREQUENCY - 10 YEAR

SUBBASIN	S-GRAPH SELECTED	24	Kn	L (miles)	Lca (miles)	S (ft/mile)	S^1/2	LAG (hours)	LAG (min.)
140	PV	24	0.06	1.22	0.51	162	12.73	0.457	27.44
141	PV	24	0.048	0.83	0.57	315	17.75	0.291	17.43
142	PV	24	0.049	1.16	0.75	257	16.03	0.389	23.32
143	PV	24	0.04	1.64	0.88	273	16.52	0.380	22.81
144	PV	24	0.041	1.8	1.11	291	17.06	0.436	26.14
145	PV	24	0.035	1.37	0.86	242	15.56	0.315	18.90

LAG TIME CALCULATIONS FOR: TENTH STREET WASH
STORM FREQUENCY - 100 YEAR

SUBBASIN	S-GRAPH SELECTED	24	Kn	L (miles)	Lca (miles)	S (ft/mile)	S^1/2	LAG (hours)	LAG (min.)
140	PV	24	0.05	1.22	0.51	162	12.73	0.381	22.87
141	PV	24	0.042	0.83	0.57	315	17.75	0.254	15.26
142	PV	24	0.042	1.16	0.75	257	16.03	0.333	19.99
143	PV	24	0.035	1.64	0.88	273	16.52	0.333	19.96
144	PV	24	0.036	1.8	1.11	291	17.06	0.382	22.95
145	PV	24	0.032	1.37	0.86	242	15.56	0.288	17.28

SECTION IV

Hydrograph Routing Parameters

KAMINSKI HUBBARD engineering inc. • Surveying • Civil • Hydrology	Made by DLB	Date 1-16-92	Job No. 0146
	Checked by	Date	Sheet No.
	For HEC-1 I.D. 140RR		

STAGE - STORAGE VALUES FOR NORTH MOUNTAIN DETENTION BASIN NO. 3

Stage (Ft.)	Planimeter Reading (in²)	Average Reading (in²)	Area (Ac.)	Volume (Ac-Ft.)	Storage Volume (Ac-Ft.)
1355.9	0	0	0		0
				0.06	
1358	0.02 0.035 0.05	0.017	0.06		0.06
				1.46	
1362	0.19 0.365 0.545	0.182	0.67		1.52
				4.80	
1366	0.48 0.94 1.41	0.47	1.73		6.32
				11.10	
1370	1.05 2.09 3.12	1.04	3.82		17.42
				18.04	
1374	1.42 2.82 4.25	1.417	5.20		35.46
				24.88	
1378	1.98 3.97 5.91	1.97	7.24		60.34
				35.30	
1382	2.84 5.66 8.50	2.833	10.41		95.64

LOW LEVEL OUTLET

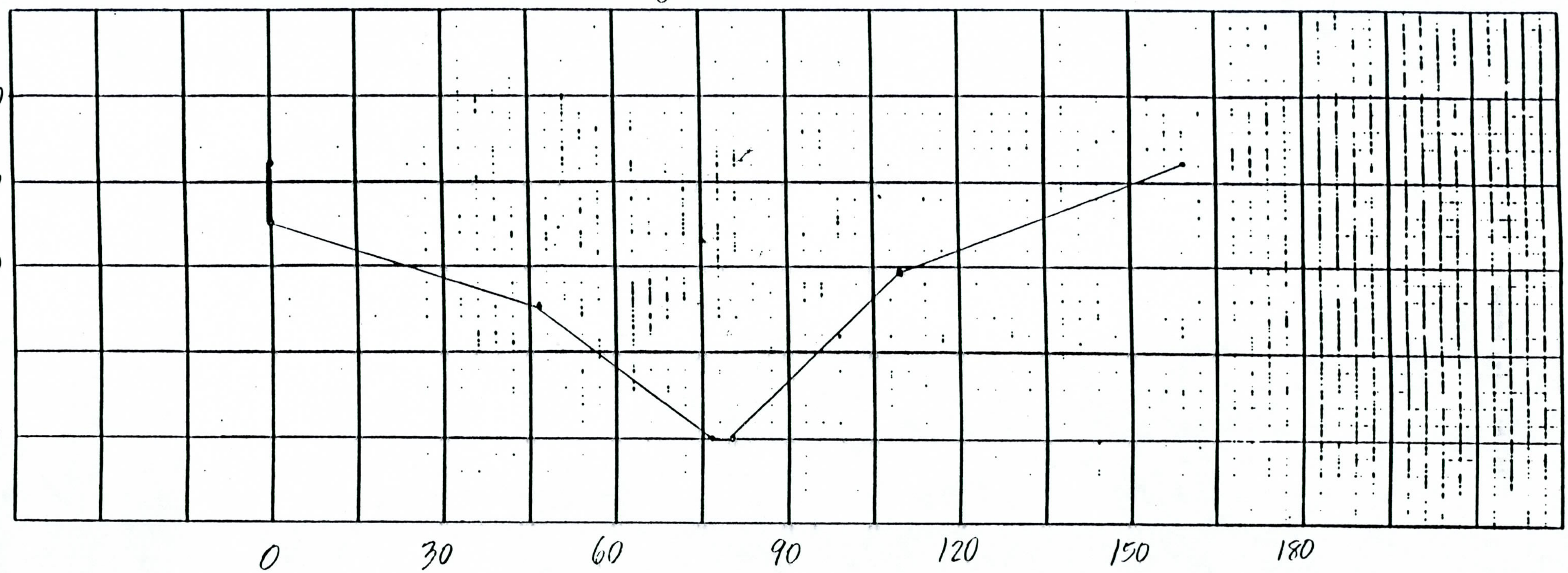
Diameter = 30" Conc. Pipe with 14"x14" Orifice Openi[ng]
Area = 1.36 ft^2
Outlet ℄ Elevation = 1356.48
Coef. of Discharge = 0.6
Exponent of Head = 0.5

SPILLWAY

Crest Elevation = 1380.00
Length = 100 ft.
Weir Coefficient = 3.0
Exponent of Head = 1.5

ROUTE IDENTIFICATION NUMBER RM140

Route 140RR through 141

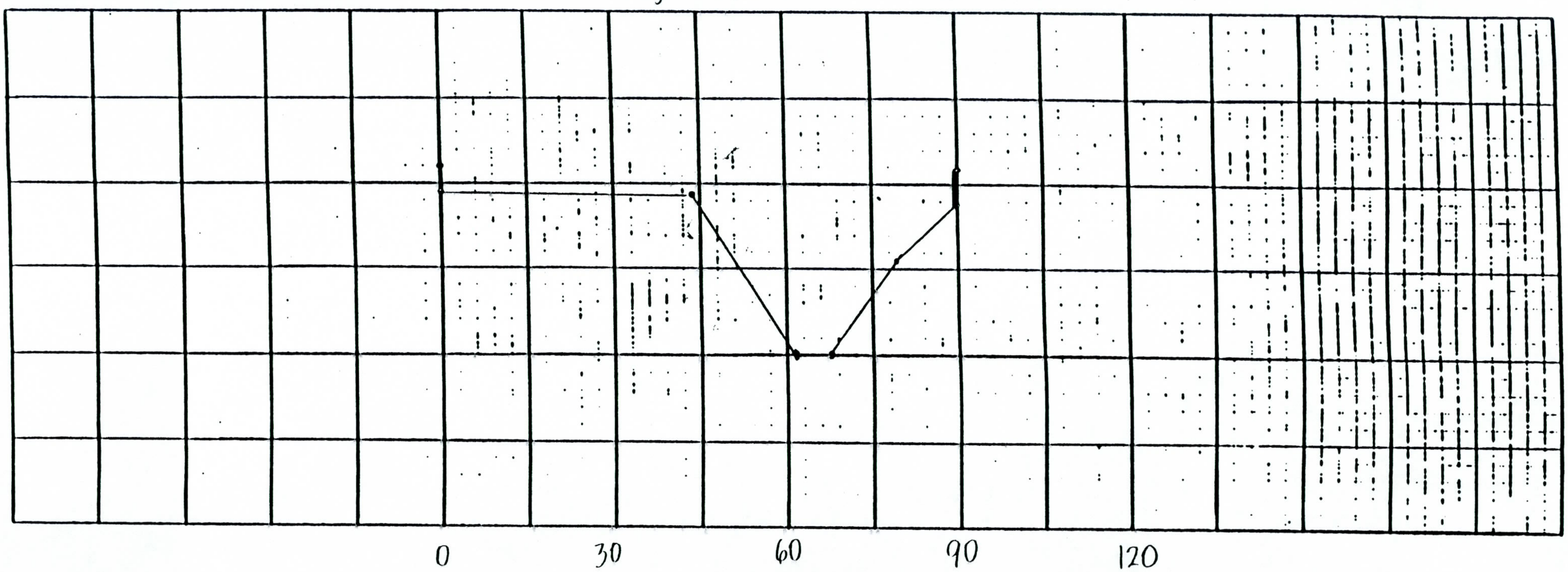


RSD								
RC	0.045	0.045	0.045	3600	0.0108			
RX	0	0	46.5	76.4	79.9	110.2	160.2	160.2
RY	16	12.6	7.3	0	0	9.9	15.9	16

CALCULATED BY: DLB 5/4/92

ROUTE IDENTIFICATION NUMBER RM 142

Route HC 142 through 143

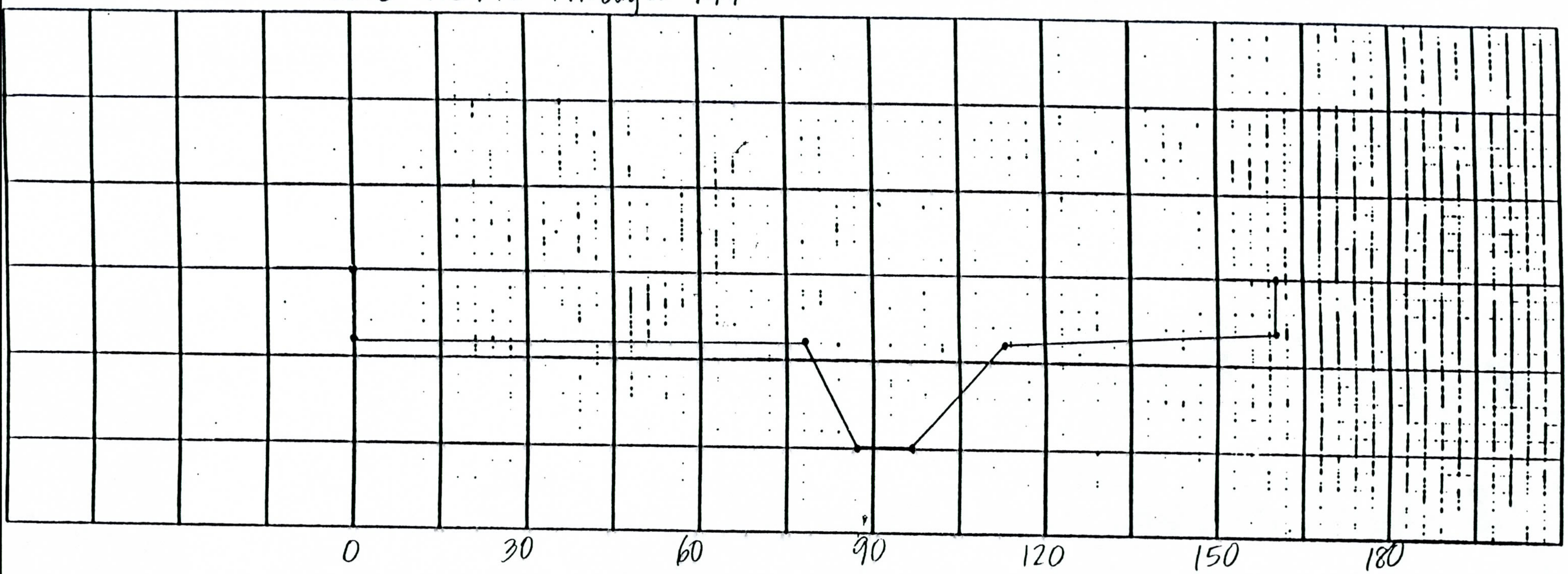


RSD								
RC	.0.050	0.045	0.050	5140	0.0086			
RX	0	0	43.8	61.3	67.4	78.3	89.8	89.8
RY	10.8	9.4	9.4	0	0	5.4	8.8	10.8

CALCULATED BY: DLB 5/4/92

ROUTE IDENTIFICATION NUMBER RM143

Route HC143 through 144

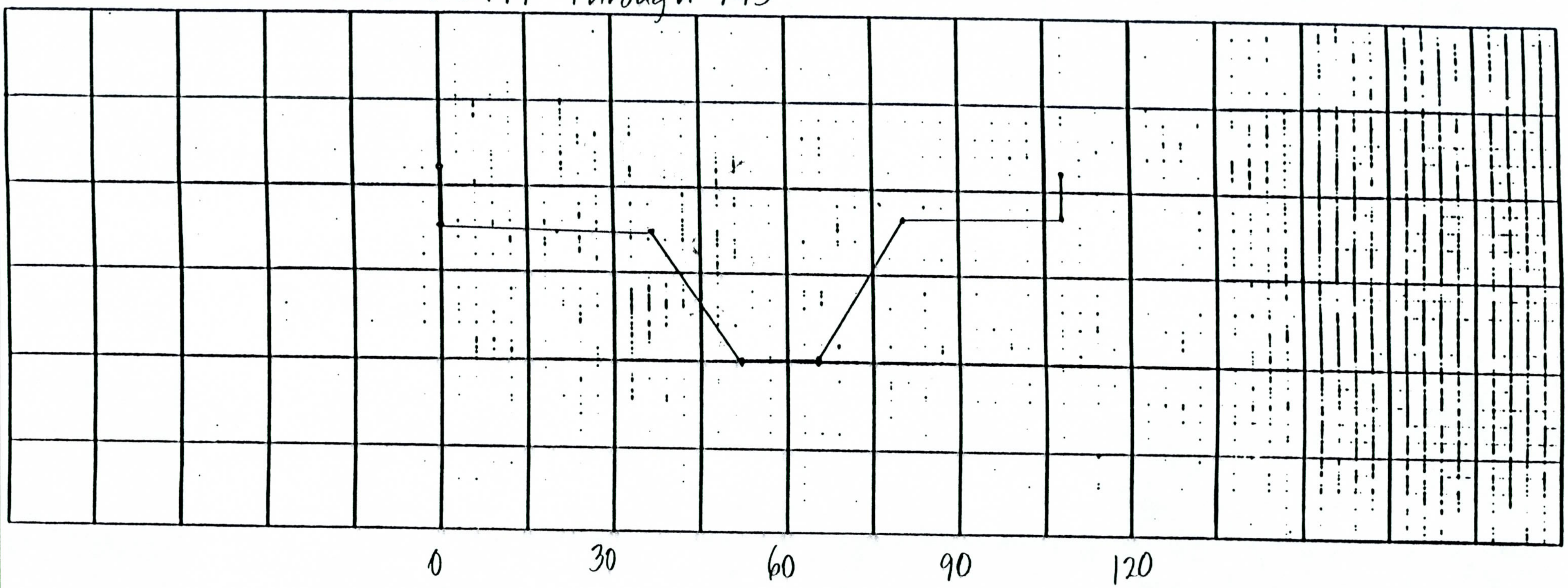


RSD								
RC	0.040	0.035	0.030	1400	0.0100			
RX	0	0	77.8	88.3	96.6	112.8	161.3	161.3
RY	10	6.2	6.2	0	0	6.3	6.9	10

CALCULATED BY: DLB 5/4/92

ROUTE IDENTIFICATION NUMBER RM 144

Route HC144 through 145



RSD								
RC	0.035	0.035	0.030	3000	0.0073			
RX	0	0	36.6	52	64.9	79.8	107.8	107.8
RY	11	7.7	7.4	0	0	8.3	8.5	11

CALCULATED BY: DLB 5/4/92

SECTION V

Divert & Onsite Retention Parameters

KAMINSKI HUBBARD engineering inc.	• Surveying • Civil • Hydrology	Made by DLB	Date 3-24-92	Job No. 014[illegible]
		Checked by	Date	Sheet No.
		For		

ONSITE RETENTION FOR 10TH STREET WASH WATERSHED

Assume retention volume on parcels in question to be based on 10-year 2-hour storm.

Determine the 10-year 2-hour intensity from page 32 of the City of Phoenix "Storm Drain Design Manual", September 1985:

$i = 0.80$ in/hr.

Determine peak discharge using $Q = CIA$ (Rational Method)

Storage Volume $= 7200\,Q\ (ft^3) = \frac{7200}{43560}\,Q$ (Ac-Ft.)

Sub-Basin	Land Use	C	Area (Ac.)	Peak Q (cfs)	Volume (Ac-Ft.)	Total Volume (Ac-Ft)
140	MF RES	0.65	4.70	2.44	0.40	
	COMM	0.90	13.59	9.78	1.62	2.02
141	MF RES	0.65	12.75	6.63	1.10	
	COMM	0.90	10.71	7.71	1.27	2.37
142	MF RES	0.65	6.80	3.54	0.58	
	COMM	0.90	25.25	18.18	3.00	3.58
143	MF RES	0.65	40.51	21.07	3.48	
	COMM	0.90	18.77	13.51	2.23	5.71
144	MF RES	0.65	13.70	7.12	1.18	
	COMM	0.90	7.38	5.31	0.88	2.06
145	No ONSITE RETENTION CALCULATIONS					

CONTRIBUTING AREA FOR 10TH STREET WASH - 2 YEAR STORM

The following assumptions were made:

(1) Undeveloped areas and desert areas contribute 100%.
(2) 100% of Land Use Impervious Areas contribute with remaining pervious areas as non contributing with the exception of those areas in which storage volumes were computed. Areas with storage volume calculations are assumed as non-contributing.

Sub Basin 140

$$\text{Contributing Area} = 0.516 - \underset{\text{SV MF RES}}{0.007} - \underset{\text{SV COMM}}{0.021} - (0.10)\underset{\text{COMM}}{(0.011)} - (0.55)(0.017)$$
$$= 0.478 \text{ sq. mi.}$$

Sub-Basin 141

$$\text{Contributing Area} = 0.187 - \underset{\text{SV MF RES}}{0.020} - (0.35)\underset{\text{MF RES}}{(0.040)} - \underset{\text{SV COMM}}{0.017} - (0.10)\underset{\text{COMM}}{(0.00}$$
$$- (0.55)(0.006)$$
$$= 0.132 \text{ sq. mi.}$$

Sub-Basin 142

$$\text{Contributing Area} = 0.512 - \underset{\text{SV MF RES}}{0.011} - (0.35)\underset{\text{MF RES}}{(0.009)} - \underset{\text{SV COMM}}{0.039} - (0.10)\underset{\text{COMM}}{(0.01}$$
$$- (0.55)(0.165)$$
$$= 0.367 \text{ sq. mi.}$$

Sub-Basin 143

$$\text{Contributing Area} = 0.604 - \underset{\text{SV MF RES}}{0.063} - (0.35)(0.171) - \underset{\text{SV COMM}}{0.029} - (0.10)\underset{\text{COMM}}{(0.01}$$
$$- (0.55)(0.158)$$
$$= 0.364 \text{ Sq. Mi.}$$

Sub-Basin 144

$$\text{Contributing Area} = 0.475 - \underset{\text{SV MF RES}}{0.021} - (0.35)\underset{\text{MF RES}}{(0.027)} - \underset{\text{SV COMM}}{0.012} - (0.55)(0.25$$
$$- (0.10)(0.004)$$
$$= 0.292 \text{ Sq. Mi.}$$

Sub-Basin 145

SECTION VI

HEC-1 Hydrology Results

100-Year 24-Hour Storm

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             MAY   1991               *
*          VERSION 4.0.1E              *
*                                      *
* RUN DATE  01/03/94  TIME  11:32:11   *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*        609 SECOND STREET             *
*    DAVIS, CALIFORNIA 95616           *
*        (916) 551-1748                *
*                                      *
****************************************
```

```
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   ACDC AREA DRAINAGE MASTER STUDY
  2         ID   10TH STREET WASH WATERSHED
  3         ID   FILENAME:  TEN324.DAT      KHE JOB NO. 0146
  4         ID   100-YEAR 24-HOUR DURATION STORM
            *
            *  Based on FCDMC comments dated March 17,1992 we adjusted the Mannings "n"
            *  coefficient to reflect weighted averaging in lieu of log averaging.
            *  We also changed the S-graph from Phoenix Mountain to Phoenix Valley.
            *
            *DIAGRAM
  5         IT        4                    500
  6         IO        3

  7         KK     140S
  8         KM   RUNOFF GENERATED ON SUB-BASIN 140
  9         KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 10         KM     L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
 11         KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 12         BA     .516
 13         IN       30
 14         KM    RAINFALL DEPTH OF 3.80 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 15         KM    AN AREAL REDUCTION COEFFICIENT OF .980 WAS USED
 16         PB     3.72
 17         KM    THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 18         PC     .000    .005    .011    .016    .022    .028    .035    .041    .048    .056
 19         PC     .063    .071    .080    .089    .098    .109    .120    .133    .147    .163
 20         PC     .181    .204    .235    .283    .663    .735    .772    .799    .820    .838
 21         PC     .854    .868    .880    .891    .902    .912    .921    .929    .937    .945
 22         PC     .952    .959    .965    .972    .978    .984    .989    .995   1.000
 23         LG     .145    .339    4.25    .488   20.44
 24         UI      76.    207.    377.    486.    666.    923.    690.    529.    397.    254.
 25         UI     131.     99.     65.     23.     23.     23.     23.      0.      0.      0.
 26         UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 27         KK    DT140
 28         KM    THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
 29         KM                                                (Hydrograph identified as OR140)
 30         KM                                             2) Balance of runoff continues on.
 31         KM                                                (Hydrograph identified as DT140)
 32         DT    OR140     2.0
 33         DI        0   10000
 34         DQ        0   10000

 35         KK    140RR
 36         KM    ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 37         RS        1    ELEV    55.9
 38         SV        0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 39         SE     55.9      58      62      66      70      74      78      82
 40         SL    56.48    1.36      .6      .5
 41         SS    80.00     100     3.0     1.5
```

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

 42       KK   RM140
 43       KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
 44       KM             1) Reach Length = 3600 ft.
 45       RD
 46       RC    .045    .045    .045    3600   .0108
 47       RX       0       0    46.5    76.4    79.9   110.2   160.2   160.2
 48       RY      16    12.6     7.3       0       0     9.9    15.9      16

 49       KK    141S
 50       KM   RUNOFF GENERATED ON SUB-BASIN 141
 51       KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 52       KM    L= 0.83 mi.  Lca= 0.57 mi.  S= 315 ft/mi.  Kn= .042  LAG= 15.26 min.
 53       KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 54       BA    .187
 55       LG    .126    .303    3.61    .313   38.57
 56       UI     53.    186.    283.    468.    354.    233.    117.     59.     28.     13.
 57       UI     13.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 58       UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 59       KK   DT141
 60       KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.4 AC-FT FROM SUB-BASIN 141
 61       KM                                              (Hydrograph identified as OR141)
 62       KM                                            2) Balance of runoff continues on.
 63       KM                                              (Hydrograph identified as DT141)
 64       DT   OR141     2.4
 65       DI       0   10000
 66       DQ       0   10000

 67       KK   HC141
 68       KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION
 69       HC       2

 70       KK    142S
 71       KM   RUNOFF GENERATED ON SUB-BASIN 142
 72       KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 73       KM    L= 1.16 mi.  Lca= 0.75 mi.  S= 257 ft/mi.  Kn= .042  LAG= 19.99 min.
 74       KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 75       BA    .512
 76       LG    .127    .309    4.12    .267   34.03
 77       UI     86.    291.    470.    634.   1000.    835.    612.    442.    240.    145.
 78       UI     88.     37.     26.     26.      0.      0.      0.      0.      0.      0.
 79       UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 80       KK   DT142
 81       KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 3.6 AC-FT FROM SUB-BASIN 142
 82       KM                                              (Hydrograph identified as OR142)
 83       KM                                            2) Balance of runoff continues on.
 84       KM                                              (Hydrograph identified as DT142)
 85       DT   OR142     3.6
 86       DI       0   10000
 87       DQ       0   10000
```

HEC-1 INPUT

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

       KK   HC142
       KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 142 WITH 141
       HC       2

       KK   RM142
       KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143
       KM             1) Reach Length = 5140 ft.
       RD
       RC   .050    .045    .050    5140   .0086
       RX      0       0    43.8    61.3    67.4    78.3    89.8    89.8
       RY   10.8     9.4     9.4       0       0     5.4     8.8    10.8

       KK    143S
       KM   RUNOFF GENERATED ON SUB-BASIN 143
       KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
       KM    L= 1.64 mi.  Lca= 0.88  S= 273 ft/mi.  Kn= .035  LAG= 19.96 min.
       KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
       BA    .604
       LG    .115    .279    4.12    .269   49.66
       UI    102.    344.    556.    750.   1183.    984.    721.    519.    281.    171.
       UI    103.     42.     31.     31.      0.      0.      0.      0.      0.      0.
       UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

       KK   DT143
       KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 5.7 AC-FT FROM SUB-BASIN 143
       KM                                               (Hydrograph identified as OR143)
       KM                                            2) Balance of runoff continues on.
       KM                                               (Hydrograph identified as DT143)
       KM
       DT   OR143     5.7
       DI       0   10000
       DQ       0   10000

       KK   HC143
       KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142
       HC       2

       KK   RM143
       KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144
       KM             1) Reach Length = 1400 ft.
       RD
       RC   .040    .035    .030    1400   .0100
       RX      0       0    77.8    88.3    96.6   112.8   161.3   161.3
       RY     10     6.2     6.2       0       0     6.3     6.9      10

       KK    144S
       KM   RUNOFF GENERATED ON SUB-BASIN 144
       KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
       KM    L= 1.80 mi.  Lca= 1.11 mi.  S= 291 ft/mi.  Kn= .036  LAG= 22.95 min.
       KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
       BA    .475
       LG    .118    .280    3.61     .32   43.17
       UI     70.    189.    345.    445.    605.    850.    637.    489.    368.    239.
       UI    121.     93.     61.     21.     21.     21.     21.      0.      0.      0.
       UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

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

KK   DT144
KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.1 AC-FT FROM SUB-BASIN 144
KM                                              (Hydrograph identified as OR144)
KM                                            2) Balance of runoff continues on.
KM                                              (Hydrograph identified as DT144)
DT   OR144     2.1
DI       0   10000
DQ       0   10000

KK   HC144
KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 144 WITH ROUTED FLOW FROM 143
HC       2

KK   RM144
KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145
KM              1) Reach Length = 3000 ft.
RD
RC    .035    .035    .030    3000   .0073
RX       0       0    36.6      52    64.9    79.8   107.8   107.8
RY      11     7.7     7.4       0       0     8.3     8.5      11

KK    145S
KM   RUNOFF GENERATED ON SUB-BASIN 145
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L= 1.37 mi.  Lca= 0.86 mi.  S= 242 ft/mi.  Kn= .032  LAG= 17.28 min.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA    .548
LG    .105    .265    5.67    .210   44.60
UI    108.    437.    654.   1010.   1170.    790.    540.    264.    153.     82.
UI     33.     33.      0.      0.      0.      0.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

KK    HC145
KM    COMBINE HYDROGRAPHS FROM SUB-BASIN 145 WITH ROUTED FLOW FROM 144
KM    ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC
HC       2
ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

   7        140S
              .
              .
  32          .-------->   OR140
  27       DT140
              V
              V
  35       140RR
              V
              V
  42       RM140
              .
              .
  49          .         141S
              .            .
              .            .
  64          .            .-------->   OR141
  59          .         DT141
              .            .
              .            .
  67       HC141...............
              .
              .
 [illegible]  .         142S
              .            .
              .            .
  85          .            .-------->   OR142
  80          .         DT142
              .            .
              .            .
  88       HC142...............
              V
              V
  91       RM142
              .
              .
  98          .         143S
              .            .
              .            .
 113          .            .-------->   OR143
 108          .         DT143
              .            .
              .            .
 116       HC143...............
              V
              V
 119       RM143
              .
              .
 126          .         144S
              .            .
              .            .
 141          .            .-------->   OR144
```

```
136          .        DT144
             .            .
             .            .
144     HC144.............
             V
             V
147     RM144
             .
             .
154          .         145S
             .            .
             .            .
164     HC145.............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************                    *********************************
*                                      *                    *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *  U.S. ARMY CORPS OF ENGINEERS
*            MAY  1991                 *                    *  HYDROLOGIC ENGINEERING CENTE
*         VERSION 4.0.1E               *                    *       609 SECOND STREET
*                                      *                    *    DAVIS, CALIFORNIA 95616
*  RUN DATE  01/03/94  TIME  11:32:11  *                    *        (916) 551-1748
*                                      *                    *
****************************************                    *********************************
```

```
                     ACDC AREA DRAINAGE MASTER STUDY
                     10TH STREET WASH WATERSHED
                     FILENAME:  TEN324.DAT     KHE JOB NO. 0146
                     100-YEAR 24-HOUR DURATION STORM

  6 IO         OUTPUT CONTROL VARIABLES
                    IPRNT          3  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT         HYDROGRAPH TIME DATA
                     NMIN          4  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME       0000  STARTING TIME
                       NQ        500  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      2   0  ENDING DATE
                   NDTIME       0916  ENDING TIME
                    ICENT         19  CENTURY MARK

                COMPUTATION INTERVAL   0.07 HOURS
                     TOTAL TIME BASE  33.27 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
```

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

              ***************
              *             *
  7 KK        *     140S    *
              *             *
              ***************
                     RUNOFF GENERATED ON SUB-BASIN 140
                      THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                      L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
                      PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                     RAINFALL DEPTH OF 3.80 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
```

AN AREAL REDUCTION COEFFICIENT OF .980 WAS USED
THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL

13 IN   TIME DATA FOR INPUT TIME SERIES
JXMIN   30   TIME INTERVAL IN MINUTES
JXDATE   1   0   STARTING DATE
JXTIME   0   STARTING TIME

SUBBASIN RUNOFF DATA

12 BA   SUBBASIN CHARACTERISTICS
TAREA   0.52   SUBBASIN AREA

PRECIPITATION DATA

17 PB   STORM   3.72   BASIN TOTAL PRECIPITATION

17 PI   INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3 LG   GREEN AND AMPT LOSS RATE
STRTL   0.14   STARTING LOSS
DTH   0.34   MOISTURE DEFICIT
PSIF   4.25   WETTING FRONT SUCTION
XKSAT   0.49   HYDRAULIC CONDUCTIVITY

```
                    RTIMP        20.44  PERCENT IMPERVIOUS AREA

23 UI          INPUT UNITGRAPH,  17 ORDINATES,  VOLUME = 1.00
                   76.0      207.0      377.0      486.0      666.0      923.0      690.0      529.0      397.0      254.0
                  131.0       99.0       65.0       23.0       23.0       23.0       23.0

                                                         ***

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

                     HYDROGRAPH AT STATION      140S

   TOTAL RAINFALL =     3.72, TOTAL LOSS =     2.29, TOTAL EXCESS =     1.43

  PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
    (CFS)        (HR)                 6-HR        24-HR        72-HR      33.27-HR
     551.       12.13       (CFS)       67.          20.          14.          14.
                         (INCHES)     1.210        1.432        1.433        1.433
                          (AC-FT)       33.          39.          39.          39.

                        CUMULATIVE AREA =     0.52 SQ MI


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

            ***************
            *             *
  KK        *    DT140    *
            *             *
            ***************
                     THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
                                                                (Hydrograph identified as OR140)
                                                              2) Balance of runoff continues on.
                                                                (Hydrograph identified as DT140)

  DT          DIVERSION
                     ISTAD        OR140  DIVERSION HYDROGRAPH IDENTIFICATION
                    DSTRMX         2.00  MAXIMUM VOLUME TO BE DIVERTED

  DI                INFLOW         0.00  10000.00

  DQ        DIVERTED FLOW          0.00  10000.00

                                                         ***

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

                     DIVERSION HYDROGRAPH     OR140

  PEAK FLOW      TIME                          MAXIMUM AVERAGE FLOW
    (CFS)        (HR)                 6-HR        24-HR        72-HR      33.27-HR
       5.        7.20       (CFS)        4.           1.           1.           1.
                         (INCHES)     0.065        0.073        0.073        0.073
                          (AC-FT)        2.           2.           2.           2.

                        CUMULATIVE AREA =     0.52 SQ MI
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HYDROGRAPH AT STATION DT140

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	33.27-HR
(CFS)	(HR)					
551.	12.13	(CFS)	67.	19.	14.	14.
		(INCHES)	1.210	1.360	1.360	1.360
		(AC-FT)	33.	37.	37.	37.

CUMULATIVE AREA = 0.52 SQ MI

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              ***************
              *             *
35 KK         *    140RR    *
              *             *
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ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3

HYDROGRAPH ROUTING DATA

37 RS STORAGE ROUTING

NSTPS	1	NUMBER OF SUBREACHES
ITYP	ELEV	TYPE OF INITIAL CONDITION
RSVRIC	55.90	INITIAL CONDITION
X	0.00	WORKING R AND D COEFFICIENT

38 SV	STORAGE	0.0	0.1	1.5	6.3	17.4	35.5	60.3	95.6
39 SE	ELEVATION	55.90	58.00	62.00	66.00	70.00	74.00	78.00	82.00

40 SL LOW-LEVEL OUTLET

ELEVL	56.48	ELEVATION AT CENTER OF OUTLET
CAREA	1.36	CROSS-SECTIONAL AREA
COQL	0.60	COEFFICIENT
EXPL	0.50	EXPONENT OF HEAD

41 SS SPILLWAY

CREL	80.00	SPILLWAY CREST ELEVATION
SPWID	100.00	SPILLWAY WIDTH
COQW	3.00	WEIR COEFFICIENT
EXPW	1.50	EXPONENT OF HEAD

***

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	0.00	0.00	5.46	6.19	7.15	8.46	10.36	13.36	18.80	31.74
ELEVATION	55.90	56.48	57.18	57.37	57.67	58.15	58.99	60.65	64.74	80.00
OUTFLOW	32.63	38.67	54.94	86.52	138.48	215.89	323.84	467.38	651.61	881.59
ELEVATION	80.02	80.08	80.18	80.32	80.50	80.72	80.98	81.28	81.62	82.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.02	0.04	0.04	0.05	0.06	0.12	0.42	1.03	1.52
OUTFLOW	0.00	0.00	5.46	6.19	7.15	8.07	8.46	10.36	13.36	15.38
ELEVATION	55.90	56.48	57.18	57.37	57.67	58.00	58.15	58.99	60.65	62.00
STORAGE	4.80	6.32	17.42	35.46	60.34	77.99	78.17	78.70	79.59	80.82
OUTFLOW	18.80	20.19	24.06	27.39	30.36	31.74	32.63	38.67	54.94	86.52
ELEVATION	64.74	66.00	70.00	74.00	78.00	80.00	80.02	80.08	80.18	80.32
STORAGE	82.41	84.35	86.65	89.29	92.29	95.64				
OUTFLOW	138.48	215.89	323.83	467.38	651.61	881.59				
ELEVATION	80.50	80.72	80.98	81.28	81.62	82.00				

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

HYDROGRAPH AT STATION 140RR

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	33.27-HR
26.	13.07	(CFS)	25.	19.	14.	14.
		(INCHES)	0.455	1.359	1.359	1.359
		(AC-FT)	13.	37.	37.	37.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)	6-HR	24-HR	72-HR	33.27-HR
27.	13.07	24.	11.	8.	8.

'AK STAGE	TIME	MAXIMUM AVERAGE STAGE			
(FEET)	(HR)	6-HR	24-HR	72-HR	33.27-HR
72.07	13.07	71.40	65.90	63.15	63.15

CUMULATIVE AREA = 0.52 SQ MI

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          ***************
          *             *
42 KK     *    RM140    *
          *             *
          ***************
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MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
1) Reach Length = 3600 ft.

HYDROGRAPH ROUTING DATA

45 RD MUSKINGUM-CUNGE CHANNEL ROUTING

46 RC NORMAL DEPTH CHANNEL

ANL	0.045	LEFT OVERBANK N-VALUE
ANCH	0.045	MAIN CHANNEL N-VALUE
ANR	0.045	RIGHT OVERBANK N-VALUE
RLNTH	3600.	REACH LENGTH
SEL	0.0108	ENERGY SLOPE
ELMAX	0.0	MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

		--- LEFT OVERBANK ---		+ ------ MAIN CHANNEL	-------	+ --- RIGHT OVERBANK ---			
48 RY	ELEVATION	16.00	12.60	7.30	0.00	0.00	9.90	15.90	16.00
RX	DISTANCE	0.00	0.00	46.50	76.40	79.90	110.20	160.20	160.20

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.45	1.33	2.62	4.33	6.46	9.01	11.98	15.37	19.19
OUTFLOW	0.00	12.85	55.26	137.82	270.21	461.31	719.33	1052.03	1466.80	1994.95
ELEVATION	0.00	0.84	1.68	2.53	3.37	4.21	5.05	5.89	6.74	7.58
STORAGE	23.65	28.80	34.65	41.42	49.19	57.96	67.46	77.44	87.92	98.88
OUTFLOW	2672.82	3469.46	4426.92	5627.41	7015.97	8616.91	10510.34	12619.84	14945.32	17498.36
ELEVATION	8.42	9.26	10.11	10.95	11.79	12.63	13.47	14.32	15.16	16.00

COMPUTED MUSKINGUM-CUNGE PARAMETERS
COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN			4.00	300.00	25.78	804.00	1.36	2.34

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN			4.00		25.78	804.00	1.36	

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3741E+02 EXCESS=0.0000E+00 OUTFLOW=0.3740E+02 BASIN STORAGE=0.6616E-03 PERCENT ERROR=

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

HYDROGRAPH AT STATION RM140

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
26.	13.40	(CFS)	25.	19.	14.	14.
		(INCHES)	0.455	1.359	1.359	1.359
		(AC-FT)	13.	37.	37.	37.

CUMULATIVE AREA = 0.52 SQ MI

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              **************
              *            *
49 KK         *    141S    *
              *            *
              **************
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RUNOFF GENERATED ON SUB-BASIN 141
THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
L= 0.83 mi. Lca= 0.57 mi. S= 315 ft/mi. Kn= .042 LAG= 15.26 min.
PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN

SUBBASIN RUNOFF DATA

54 BA SUBBASIN CHARACTERISTICS
TAREA 0.19 SUBBASIN AREA

PRECIPITATION DATA

17 PB STORM 3.72 BASIN TOTAL PRECIPITATION

17 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

55 LG GREEN AND AMPT LOSS RATE

STRTL	0.13	STARTING LOSS
DTH	0.30	MOISTURE DEFICIT
PSIF	3.61	WETTING FRONT SUCTION
XKSAT	0.31	HYDRAULIC CONDUCTIVITY
RTIMP	38.57	PERCENT IMPERVIOUS AREA

50 UI INPUT UNITGRAPH, 11 ORDINATES, VOLUME = 1.00

53.0 186.0 283.0 468.0 354.0 233.0 117.0 59.0 28.0 13.0
13.0

***

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

HYDROGRAPH AT STATION 141S

TOTAL RAINFALL = 3.72, TOTAL LOSS = 1.62, TOTAL EXCESS = 2.10

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	33.27-HR
(CFS)	(HR)					
281.	12.00	(CFS)	34.	11.	8.	8.
		(INCHES)	1.680	2.099	2.100	2.100
		(AC-FT)	17.	21.	21.	21.

CUMULATIVE AREA = 0.19 SQ MI

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               ***************
               *             *
59 KK          *    DT141    *
               *             *
               ***************
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THROW AWAY 10-YR 2-HR RETENTION VOLUME: 1) 2.4 AC-FT FROM SUB-BASIN 141
(Hydrograph identified as OR141)
2) Balance of runoff continues on.
(Hydrograph identified as DT141)

```
DT          DIVERSION
                 ISTAD        OR141  DIVERSION HYDROGRAPH IDENTIFICATION
                 DSTRMX        2.40  MAXIMUM VOLUME TO BE DIVERTED

DI               INFLOW        0.00  10000.00

DQ        DIVERTED FLOW        0.00  10000.00
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*** *** *** *** ***

DIVERSION HYDROGRAPH OR141

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	33.27-HR
(CFS)	(HR)					
6.	9.87	(CFS)	4.	1.	1.	1.
		(INCHES)	0.178	0.241	0.241	0.241
		(AC-FT)	2.	2.	2.	2.

CUMULATIVE AREA = 0.19 SQ MI

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

HYDROGRAPH AT STATION DT141

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
281.	12.00	(CFS)	34.	9.	7.	7.
		(INCHES)	1.675	1.860	1.860	1.860
		(AC-FT)	17.	19.	19.	19.

CUMULATIVE AREA = 0.19 SQ MI

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            ***************
            *             *
67 KK       *    HC141    *
            *             *
            ***************
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COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION

69 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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HYDROGRAPH AT STATION HC141

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
293.	12.07	(CFS)	56.	28.	20.	20.
		(INCHES)	0.734	1.492	1.492	1.492
		(AC-FT)	28.	56.	56.	56.

CUMULATIVE AREA = 0.70 SQ MI

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            ***************
            *             *
70 KK       *     142S    *
            *             *
            ***************
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RUNOFF GENERATED ON SUB-BASIN 142
THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
L= 1.16 mi. Lca= 0.75 mi. S= 257 ft/mi. Kn= .042 LAG= 19.99 min.
PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN

SUBBASIN RUNOFF DATA

75 BA SUBBASIN CHARACTERISTICS
TAREA 0.51 SUBBASIN AREA

PRECIPITATION DATA

17 PB STORM 3.72 BASIN TOTAL PRECIPITATION

17 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

76 LG GREEN AND AMPT LOSS RATE

STRTL	0.13	STARTING LOSS
DTH	0.31	MOISTURE DEFICIT
PSIF	4.12	WETTING FRONT SUCTION
XKSAT	0.27	HYDRAULIC CONDUCTIVITY
RTIMP	34.03	PERCENT IMPERVIOUS AREA

71 UI INPUT UNITGRAPH, 14 ORDINATES, VOLUME = 1.00

86.0	291.0	470.0	634.0	1000.0	835.0	612.0	442.0	240.0	145.0
88.0	37.0	26.0	26.0						

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

HYDROGRAPH AT STATION 142S

TOTAL RAINFALL = 3.72, TOTAL LOSS = 1.71, TOTAL EXCESS = 2.01

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
720.	12.07	(CFS)	90.	27.	20.	20.
		(INCHES)	1.626	1.994	1.996	1.996
		(AC-FT)	44.	54.	54.	54.

CUMULATIVE AREA = 0.51 SQ MI

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               **************
               *            *
80 KK          *    DT142   *
               *            *
               **************
```

THROW AWAY 10-YR 2-HR RETENTION VOLUME: 1) 3.6 AC-FT FROM SUB-BASIN 142
(Hydrograph identified as OR142)
2) Balance of runoff continues on.
(Hydrograph identified as DT142)

DT DIVERSION
ISTAD OR142 DIVERSION HYDROGRAPH IDENTIFICATION
DSTRMX 3.60 MAXIMUM VOLUME TO BE DIVERTED

DI INFLOW 0.00 10000.00

DQ DIVERTED FLOW 0.00 10000.00

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

DIVERSION HYDROGRAPH OR142

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
9.	7.60	(CFS)	6.	2.	1.	1.
		(INCHES)	0.114	0.132	0.132	0.132
		(AC-FT)	3.	4.	4.	4.

CUMULATIVE AREA = 0.51 SQ MI

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HYDROGRAPH AT STATION DT142

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
720.	12.07	(CFS)	90.	26.	19.	19.
		(INCHES)	1.626	1.864	1.864	1.864
		(AC-FT)	44.	51.	51.	51.

CUMULATIVE AREA = 0.51 SQ MI

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                ***************
                *             *
88 KK           *    HC142    *
                *             *
                ***************
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COMBINE HYDROGRAPHS FROM SUB-BASIN 142 WITH 141

90 HC HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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

HYDROGRAPH AT STATION HC142

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	33.27-HR
1014.	12.07	(CFS)	143.	54.	39.	39.
		(INCHES)	1.094	1.648	1.649	1.649
		(AC-FT)	71.	107.	107.	107.

CUMULATIVE AREA = 1.21 SQ MI

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                ***************
                *             *
91 KK           *    RM142    *
                *             *
                ***************
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MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143

1) Reach Length = 5140 ft.

HYDROGRAPH ROUTING DATA

94 RD MUSKINGUM-CUNGE CHANNEL ROUTING

95 RC NORMAL DEPTH CHANNEL

ANL	0.050	LEFT OVERBANK N-VALUE
ANCH	0.045	MAIN CHANNEL N-VALUE
ANR	0.050	RIGHT OVERBANK N-VALUE
RLNTH	5140.	REACH LENGTH
SEL	0.0086	ENERGY SLOPE
ELMAX	0.0	MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

		--- LEFT OVERBANK ---		+ ------ MAIN CHANNEL -------			+ --- RIGHT OVERBANK ---		
97 RY	ELEVATION	10.80	9.40	9.40	0.00	0.00	5.40	8.80	10.80

96 RX DISTANCE 0.00 0.00 43.80 61.30 67.40 78.30 89.80 89.80

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.48	1.11	1.89	2.82	3.89	5.12	6.49	8.01	9.67
OUTFLOW	0.00	7.68	26.09	55.15	95.78	149.06	216.05	297.83	395.45	509.93
ELEVATION	0.00	0.57	1.14	1.71	2.27	2.84	3.41	3.98	4.55	5.12
STORAGE	11.49	13.51	15.72	18.14	20.75	23.57	26.56	31.00	37.02	43.04
OUTFLOW	650.49	818.44	1007.41	1218.94	1454.47	1715.29	2005.41	2355.87	2815.24	3342.27
ELEVATION	5.68	6.25	6.82	7.39	7.96	8.53	9.09	9.66	10.23	10.80

COMPUTED MUSKINGUM-CUNGE PARAMETERS

COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN			4.00	1028.00	996.40	732.00	1.65	8.09

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN			4.00		996.40	732.00	1.65	

TINUITY SUMMARY (AC-FT) - INFLOW=0.1068E+03 EXCESS=0.0000E+00 OUTFLOW=0.1069E+03 BASIN STORAGE=0.7056E-03 PERCENT ERROR=

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

HYDROGRAPH AT STATION RM142

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
996.	12.20	(CFS)	143.	54.	39.	39.
		(INCHES)	1.094	1.647	1.649	1.649
		(AC-FT)	71.	107.	107.	107.

CUMULATIVE AREA = 1.21 SQ MI

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          ***************
          *             *
98 KK     *     143S    *
          *             *
          ***************
```

RUNOFF GENERATED ON SUB-BASIN 143

THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN

L= 1.64 mi. Lca= 0.88 S= 273 ft/mi. Kn= .035 LAG= 19.96 min.

PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN

SUBBASIN RUNOFF DATA

103 BA SUBBASIN CHARACTERISTICS

TAREA 0.60 SUBBASIN AREA

PRECIPITATION DATA

17 PB STORM 3.72 BASIN TOTAL PRECIPITATION

17 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

104 LG GREEN AND AMPT LOSS RATE

STRTL 0.12 STARTING LOSS

DTH 0.28 MOISTURE DEFICIT

PSIF 4.12 WETTING FRONT SUCTION

XKSAT 0.27 HYDRAULIC CONDUCTIVITY

RTIMP 49.66 PERCENT IMPERVIOUS AREA

UI INPUT UNITGRAPH, 14 ORDINATES, VOLUME = 1.00

102.0	344.0	556.0	750.0	1183.0	984.0	721.0	519.0	281.0	171.0
103.0	42.0	31.0	31.0						

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

HYDROGRAPH AT STATION 143S

TOTAL RAINFALL = 3.72, TOTAL LOSS = 1.30, TOTAL EXCESS = 2.42

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
890.	12.07	(CFS)	122.	39.	28.	28.
		(INCHES)	1.872	2.409	2.412	2.412
		(AC-FT)	60.	78.	78.	78.

CUMULATIVE AREA = 0.60 SQ MI

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          ***************
          *             *
108 KK    *    DT143    *
          *             *
          ***************
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THROW AWAY 10-YR 2-HR RETENTION VOLUME: 1) 5.7 AC-FT FROM SUB-BASIN 143
(Hydrograph identified as OR143)
2) Balance of runoff continues on.
(Hydrograph identified as DT143)

DT DIVERSION
ISTAD OR143 DIVERSION HYDROGRAPH IDENTIFICATION
DSTRMX 5.70 MAXIMUM VOLUME TO BE DIVERTED

DI INFLOW 0.00 10000.00

DQ DIVERTED FLOW 0.00 10000.00

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DIVERSION HYDROGRAPH OR143

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
13.	7.20	(CFS)	10.	3.	2.	2.
		(INCHES)	0.158	0.177	0.177	0.177
		(AC-FT)	5.	6.	6.	6.

CUMULATIVE AREA = 0.60 SQ MI

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HYDROGRAPH AT STATION DT143

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR

890.	12.07	(CFS)	122.	36.	26.	26.
		(INCHES)	1.872	2.235	2.235	2.235
		(AC-FT)	60.	72.	72.	72.

CUMULATIVE AREA = 0.60 SQ MI

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              ***************
              *             *
116 KK        *    HC143    *
              *             *
              ***************
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COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142

118 HC HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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

HYDROGRAPH AT STATION HC143

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	33.27-HR
1828.	12.13	(CFS)	263.	90.	65.	65.
		(INCHES)	1.343	1.836	1.844	1.844
		(AC-FT)	130.	178.	179.	179.

CUMULATIVE AREA = 1.82 SQ MI

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              ***************
              *             *
119 KK        *    RM143    *
              *             *
              ***************
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MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143 THROUGH 144

1) Reach Length = 1400 ft.

HYDROGRAPH ROUTING DATA

122 RD MUSKINGUM-CUNGE CHANNEL ROUTING

3 RC NORMAL DEPTH CHANNEL

ANL	0.040	LEFT OVERBANK N-VALUE
ANCH	0.035	MAIN CHANNEL N-VALUE
ANR	0.030	RIGHT OVERBANK N-VALUE
RLNTH	1400.	REACH LENGTH
SEL	0.0100	ENERGY SLOPE

ELMAX 0.0 MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

		--- LEFT OVERBANK --- +		------ MAIN CHANNEL		------- +		--- RIGHT OVERBANK ---	
RY	ELEVATION	10.00	6.20	6.20	0.00	0.00	6.30	6.90	10.00
124 RX	DISTANCE	0.00	0.00	77.80	88.30	96.60	112.80	161.30	161.30

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.16	0.36	0.59	0.87	1.18	1.53	1.91	2.34	2.80
OUTFLOW	0.00	12.58	41.94	87.02	148.56	227.67	325.56	443.47	582.63	744.26
ELEVATION	0.00	0.53	1.05	1.58	2.11	2.63	3.16	3.68	4.21	4.74
STORAGE	3.30	3.84	4.71	7.00	9.72	12.45	15.18	17.91	20.64	23.36
OUTFLOW	929.56	1139.70	1390.17	1866.93	2579.43	3481.11	4542.46	5746.71	7081.82	8538.41
ELEVATION	5.26	5.79	6.32	6.84	7.37	7.89	8.42	8.95	9.47	10.00

COMPUTED MUSKINGUM-CUNGE PARAMETERS

COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN			1.97	700.00	1822.06	731.83	1.84	11.83

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN			4.00		1821.47	732.00	1.84	

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1789E+03 EXCESS=0.0000E+00 OUTFLOW=0.1789E+03 BASIN STORAGE=0.1456E-03 PERCENT ERROR=

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

HYDROGRAPH AT STATION RM143

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
1821.	12.20	(CFS)	263.	90.	65.	65.
		(INCHES)	1.344	1.837	1.845	1.845
		(AC-FT)	130.	178.	179.	179.

CUMULATIVE AREA = 1.82 SQ MI

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          ***************
          *             *
126 KK    *     144S    *
          *             *
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RUNOFF GENERATED ON SUB-BASIN 144
THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
L= 1.80 mi. Lca= 1.11 mi. S= 291 ft/mi. Kn= .036 LAG= 22.95 min.
PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN

SUBBASIN RUNOFF DATA

131 BA SUBBASIN CHARACTERISTICS
TAREA 0.47 SUBBASIN AREA

PRECIPITATION DATA

17 PB STORM 3.72 BASIN TOTAL PRECIPITATION

17 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

132 LG GREEN AND AMPT LOSS RATE
STRTL 0.12 STARTING LOSS
DTH 0.28 MOISTURE DEFICIT
PSIF 3.61 WETTING FRONT SUCTION
XKSAT 0.32 HYDRAULIC CONDUCTIVITY
RTIMP 43.17 PERCENT IMPERVIOUS AREA

127 UI INPUT UNITGRAPH, 17 ORDINATES, VOLUME = 1.00

70.0	189.0	345.0	445.0	605.0	850.0	637.0	489.0	368.0	239.0
121.0	93.0	61.0	21.0	21.0	21.0	21.0			

***

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

HYDROGRAPH AT STATION 144S

TOTAL RAINFALL = 3.72, TOTAL LOSS = 1.49, TOTAL EXCESS = 2.23

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	33.27-HR
645.	12.13	(CFS)	90.	28.	21.	21.
		(INCHES)	1.756	2.225	2.228	2.228
		(AC-FT)	44.	56.	56.	56.

CUMULATIVE AREA = 0.47 SQ MI

*** ***

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        ***************
        *             *
136 KK  *    DT144    *
        *             *
        ***************
```

THROW AWAY 10-YR 2-HR RETENTION VOLUME: 1) 2.1 AC-FT FROM SUB-BASIN 144
(Hydrograph identified as OR144)
2) Balance of runoff continues on.
(Hydrograph identified as DT144)

DT DIVERSION
ISTAD OR144 DIVERSION HYDROGRAPH IDENTIFICATION
DSTRMX 2.10 MAXIMUM VOLUME TO BE DIVERTED

DI INFLOW 0.00 10000.00

DQ DIVERTED FLOW 0.00 10000.00

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

DIVERSION HYDROGRAPH OR144

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	33.27-HR
8.	4.53	(CFS)	4.	1.	1.	1.
		(INCHES)	0.083	0.083	0.083	0.083
		(AC-FT)	2.	2.	2.	2.

CUMULATIVE AREA = 0.47 SQ MI

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

HYDROGRAPH AT STATION DT144

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	33.27-HR
645.	12.13	(CFS)	90.	27.	20.	20.
		(INCHES)	1.756	2.145	2.145	2.145
		(AC-FT)	44.	54.	54.	54.

CUMULATIVE AREA = 0.47 SQ MI

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             ***************
             *             *
144 KK       *    HC144    *
             *             *
             ***************
```

COMBINE HYDROGRAPHS FROM SUB-BASIN 144 WITH ROUTED FLOW FROM 143

146 HC HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

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

HYDROGRAPH AT STATION HC144

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	33.27-HR
2444.	12.20	(CFS)	352.	116.	85.	85.
		(INCHES)	1.427	1.885	1.907	1.907
		(AC-FT)	175.	231.	233.	233.

CUMULATIVE AREA = 2.29 SQ MI

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             ***************
             *             *
147 KK       *    RM144    *
             *             *
             ***************
```

MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145

1) Reach Length = 3000 ft.

HYDROGRAPH ROUTING DATA

150 RD MUSKINGUM-CUNGE CHANNEL ROUTING

151 RC NORMAL DEPTH CHANNEL

ANL	0.035	LEFT OVERBANK N-VALUE
ANCH	0.035	MAIN CHANNEL N-VALUE
ANR	0.030	RIGHT OVERBANK N-VALUE
RLNTH	3000.	REACH LENGTH
SEL	0.0073	ENERGY SLOPE
ELMAX	0.0	MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA

		--- LEFT OVERBANK --- +		------ MAIN CHANNEL	------- +		--- RIGHT OVERBANK ---		
153 RY	ELEVATION	11.00	7.70	7.40	0.00	0.00	8.30	8.50	11.00
152 RX	DISTANCE	0.00	0.00	36.60	52.00	64.90	79.80	107.80	107.80

***

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	0.56	1.21	1.95	2.77	3.69	4.70	5.79	6.98	8.25
OUTFLOW	0.00	19.25	62.79	127.35	212.72	319.47	448.41	600.52	776.80	978.32
ELEVATION	0.00	0.58	1.16	1.74	2.32	2.89	3.47	4.05	4.63	5.21
STORAGE	9.62	11.07	12.61	14.31	17.33	21.06	25.36	29.66	33.96	38.25
OUTFLOW	1206.13	1461.28	1744.84	2066.92	2497.32	3063.19	3780.80	4608.87	5532.46	6541.96
ELEVATION	5.79	6.37	6.95	7.53	8.11	8.68	9.26	9.84	10.42	11.00

COMPUTED MUSKINGUM-CUNGE PARAMETERS

COMPUTATION TIME STEP

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	MAXIMUM CELERITY (FPS)
MAIN			4.00	1500.00	2436.31	736.00	1.91	11.54

INTERPOLATED TO SPECIFIED COMPUTATION INTERVAL

MAIN			4.00		2436.31	736.00	1.91	

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2333E+03 EXCESS=0.0000E+00 OUTFLOW=0.2333E+03 BASIN STORAGE=0.5826E-03 PERCENT ERROR=

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

HYDROGRAPH AT STATION RM144

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
2436.	12.27	(CFS)	352.	116.	85.	85.
		(INCHES)	1.427	1.885	1.907	1.907
		(AC-FT)	175.	231.	233.	233.

CUMULATIVE AREA = 2.29 SQ MI

*** ***

KK

145S

RUNOFF GENERATED ON SUB-BASIN 145
THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
L= 1.37 mi. Lca= 0.86 mi. S= 242 ft/mi. Kn= .032 LAG= 17.28 min.
PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN

SUBBASIN RUNOFF DATA

159 BA SUBBASIN CHARACTERISTICS
TAREA 0.55 SUBBASIN AREA

PRECIPITATION DATA

17 PB STORM 3.72 BASIN TOTAL PRECIPITATION

17 PI INCREMENTAL PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.03	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

160 LG GREEN AND AMPT LOSS RATE
STRTL 0.10 STARTING LOSS

DTH	0.26	MOISTURE DEFICIT
PSIF	5.67	WETTING FRONT SUCTION
XKSAT	0.21	HYDRAULIC CONDUCTIVITY
RTIMP	44.60	PERCENT IMPERVIOUS AREA

1ↄ5 UI INPUT UNITGRAPH, 12 ORDINATES, VOLUME = 0.99

108.0 437.0 654.0 1010.0 1170.0 790.0 540.0 264.0 153.0 82.0
33.0 33.0

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

HYDROGRAPH AT STATION 145S

TOTAL RAINFALL = 3.72, TOTAL LOSS = 1.40, TOTAL EXCESS = 2.32

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
844.	12.07	(CFS)	108.	34.	25.	25.
		(INCHES)	1.824	2.306	2.308	2.308
		(AC-FT)	53.	67.	67.	67.

CUMULATIVE AREA = 0.55 SQ MI

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          ***************
          *             *
164 KK    *    HC145    *
          *             *
          ***************
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COMBINE HYDROGRAPHS FROM SUB-BASIN 145 WITH ROUTED FLOW FROM 144
ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC

167 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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

HYDROGRAPH AT STATION HC145

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	33.27-HR
3069.	12.20	(CFS)	459.	148.	109.	109.
		(INCHES)	1.501	1.939	1.984	1.984
		(AC-FT)	227.	294.	301.	301.

CUMULATIVE AREA = 2.84 SQ MI

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	140S	551.	12.13	67.	20.	14.	0.52		
DIVERSION TO	OR140	5.	12.13	4.	1.	1.	0.52		
HYDROGRAPH AT	DT140	551.	12.13	67.	19.	14.	0.52		
ROUTED TO	140RR	26.	13.07	25.	19.	14.	0.52	72.07	13.07
ROUTED TO	RM140	26.	13.40	25.	19.	14.	0.52		
HYDROGRAPH AT	141S	281.	12.00	34.	11.	8.	0.19		
DIVERSION TO	OR141	6.	12.00	4.	1.	1.	0.19		
HYDROGRAPH AT	DT141	281.	12.00	34.	9.	7.	0.19		
2 COMBINED AT	HC141	293.	12.07	56.	28.	20.	0.70		
HYDROGRAPH AT	142S	720.	12.07	90.	27.	20.	0.51		
DIVERSION TO	OR142	9.	12.07	6.	2.	1.	0.51		
HYDROGRAPH AT	DT142	720.	12.07	90.	26.	19.	0.51		
2 COMBINED AT	HC142	1014.	12.07	143.	54.	39.	1.21		
ROUTED TO	RM142	996.	12.20	143.	54.	39.	1.21		
HYDROGRAPH AT	143S	890.	12.07	122.	39.	28.	0.60		
DIVERSION TO	OR143	13.	12.07	10.	3.	2.	0.60		
HYDROGRAPH AT	DT143	890.	12.07	122.	36.	26.	0.60		
2 COMBINED AT	HC143	1828.	12.13	263.	90.	65.	1.82		
ROUTED TO	RM143	1821.	12.20	263.	90.	65.	1.82		
HYDROGRAPH AT	144S	645.	12.13	90.	28.	21.	0.47		
DIVERSION TO	OR144	8.	12.13	4.	1.	1.	0.47		
HYDROGRAPH AT	DT144	645.	12.13	90.	27.	20.	0.47		
2 COMBINED AT	HC144	2444.	12.20	352.	116.	85.	2.29		
ROUTED TO	RM144	2436.	12.27	352.	116.	85.	2.29		
HYDROGRAPH AT	145S	844.	12.07	108.	34.	25.	0.55		
2 COMBINED AT	HC145	3069.	12.20	459.	148.	109.	2.84		

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RM140	MANE	4.00	25.78	804.00	1.36	4.00	25.78	804.00	1.36

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3741E+02 EXCESS=0.0000E+00 OUTFLOW=0.3740E+02 BASIN STORAGE=0.6616E-03 PERCENT ERROR=

RM142	MANE	4.00	996.40	732.00	1.65	4.00	996.40	732.00	1.65

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1068E+03 EXCESS=0.0000E+00 OUTFLOW=0.1069E+03 BASIN STORAGE=0.7056E-03 PERCENT ERROR=

RM143	MANE	1.97	1822.06	731.83	1.84	4.00	1821.47	732.00	1.84

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1789E+03 EXCESS=0.0000E+00 OUTFLOW=0.1789E+03 BASIN STORAGE=0.1456E-03 PERCENT ERROR=

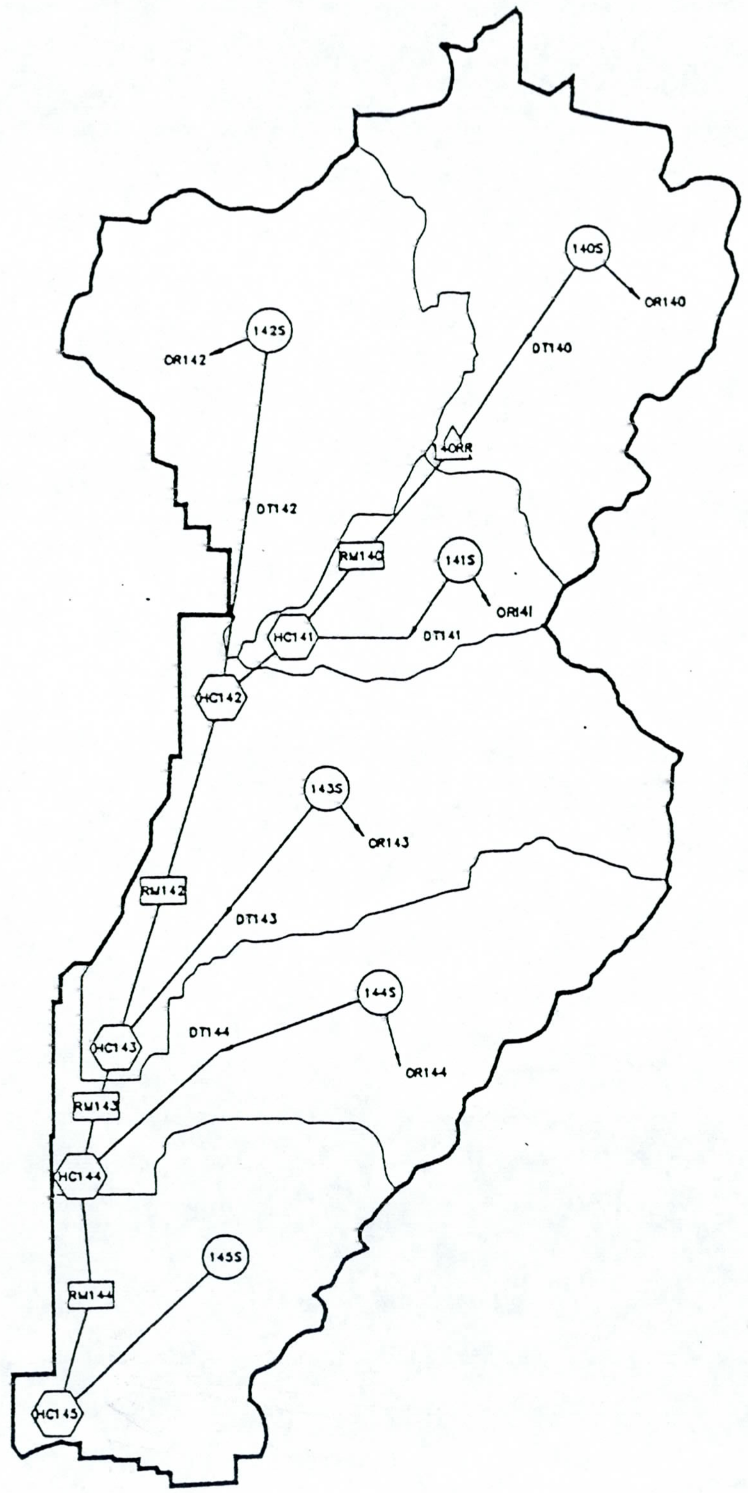
RM144	MANE	4.00	2436.31	736.00	1.91	4.00	2436.31	736.00	1.91

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2333E+03 EXCESS=0.0000E+00 OUTFLOW=0.2333E+03 BASIN STORAGE=0.5826E-03 PERCENT ERROR=

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

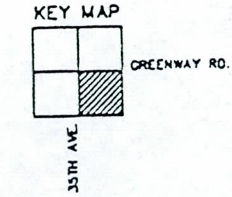
SECTION VII

PLATES



T.3N., R.3E.

KEY MAP



INDEX

GREENWAY RD.

	35TH AVE.	27TH AVE.	19TH AVE.	7TH AVE.	7TH ST.	16TH ST.	24TH ST.	32ND ST.	40TH ST.	48TH ST.	56TH ST.
THUNDERBIRD RD.	11	12	7	8	9	10	11	12	7	8
CACTUS RD.	14	13	18	17	16	15	14	13	18	17
PEORIA AVE. / SHEA BLVD.	23	24	19	20	21	22	23	24	19	20
DUNLAP AVE. / DOUBLE TREE RANCH RD.	26	25	30	29	28	27	26	25	30	29
NORTHERN AVE.	35	36	31	32	33	34	35	36	31	32
GLENDALE AVE. / INDIAN BEND RD.	2	1	6	5	4	3	2	1	6	5
BETHANY HOME RD. / MC DONALD DR.	11	12	7	8	9	10	11	12	7	8
CAMELBACK RD. / CHAPARRAL RD.	14	13	18	17	16	15	14	13	18	17

DATE FLOWN: 11-15-1990

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ACDC/ADMS PHASE 1 10TH STREET WASH HYDROLOGY STUDY

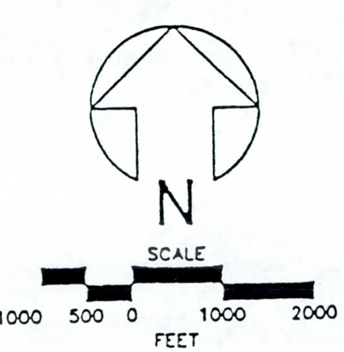
LEGEND

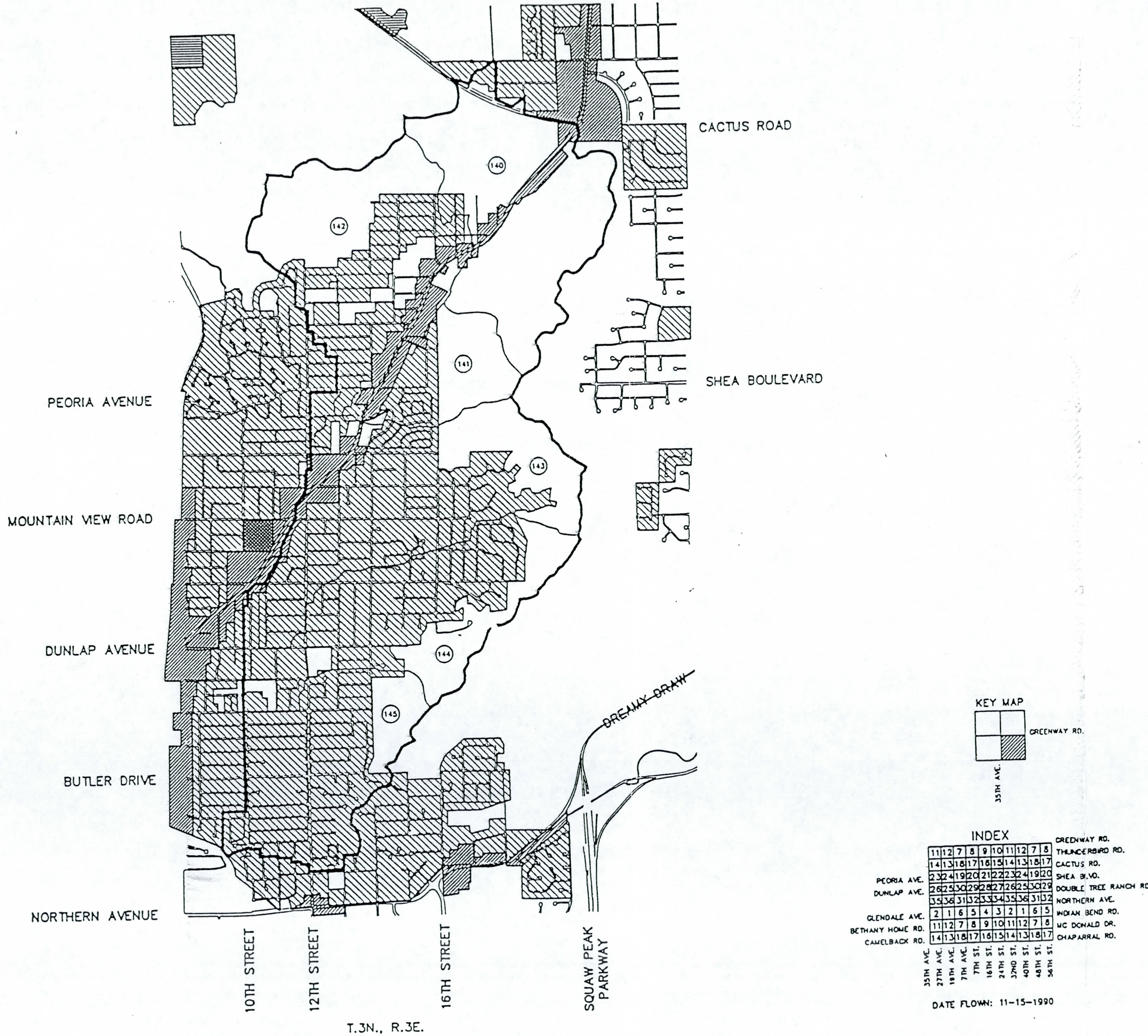
- Major Drainage Basin Boundary
- Drainage Sub-Basin Boundary
- (A) Compute Runoff from Sub-Basin A
- (B) Compute Runoff from Sub-Basin B
- (C) Combine Hydrographs
- [D] Route Hydrograph
- (E) Route Hydrograph through Retention Basin E
- G/F Divide Hydrograph into F and G

DRAINAGE AREA MAP & HEC-1 SCHEMATIC

PLATE 1
JUNE 11, 1992

KAMINSKI HUBBARD engineering, inc.
SURVEYING • CIVIL • HYDROLOGY
4550 N. BLACK CANYON HWY, SUITE C
PHOENIX, ARIZONA 85017
(602) 242-5588





FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ACDC/ADMS PHASE 1 10TH STREET WASH HYDROLOGY STUDY

LEGEND

- Major Drainage Basin Boundary
- Drainage Sub-Basin Boundary
- Residential Land Use
- Commercial Land Use
- Golf Course
- Utility Land Use
- Vacant Land Use
- (140) Drainage Sub-Basin Number

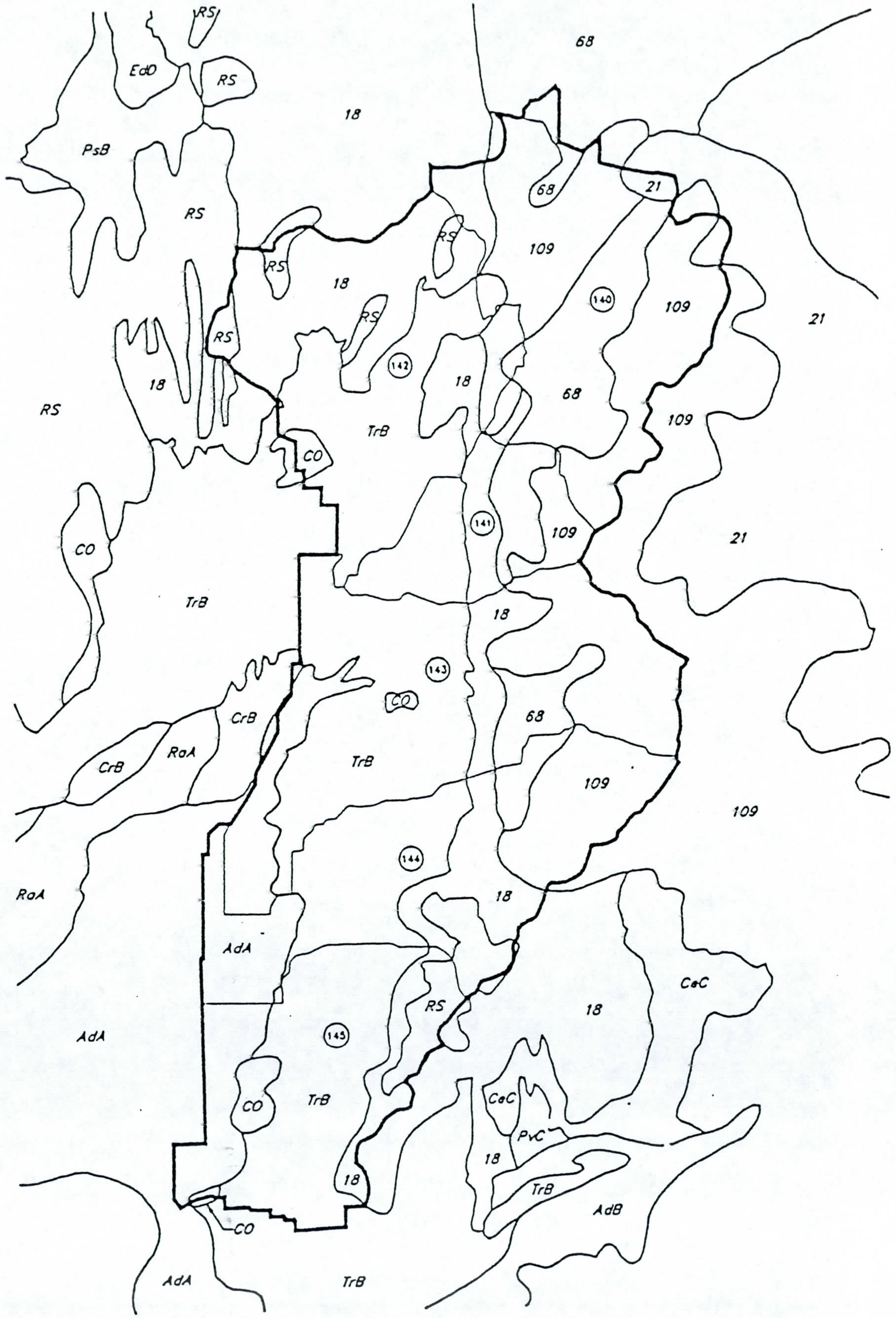
LAND USE MAP

PLATE 2
JUNE 11, 1992

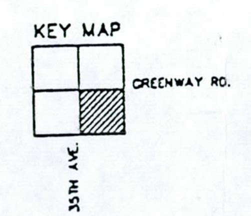
KAMINSKI HUBBARD engineering, inc.
SURVEYING • CIVIL • HYDROLOGY
4550 N. BLACK CANYON HWY., SUITE C
PHOENIX, ARIZONA 85017
(602) 242-5588

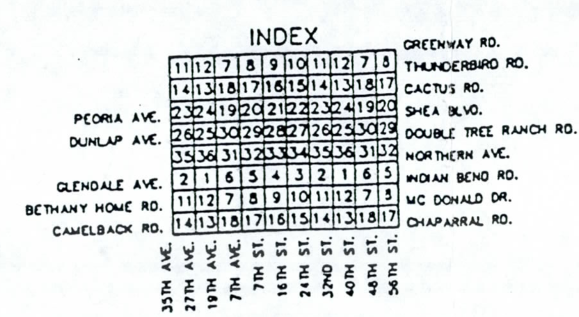
N

SCALE
1000 500 0 1000 2000
FEET



T.3N., R.3E.



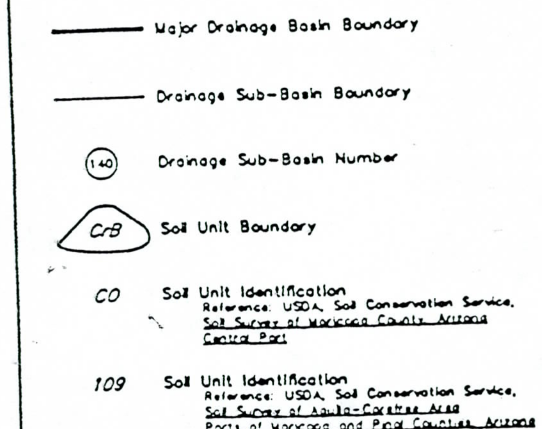


DATE FLOWN: 11-15-1990

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ACDC/ADMS PHASE 1
10TH STREET WASH
HYDROLOGY STUDY

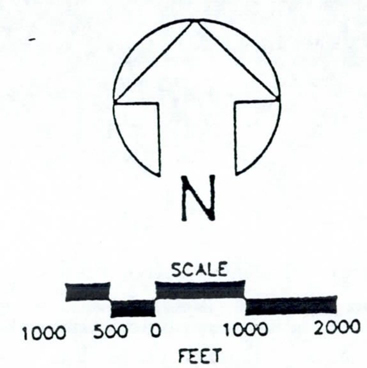
LEGEND

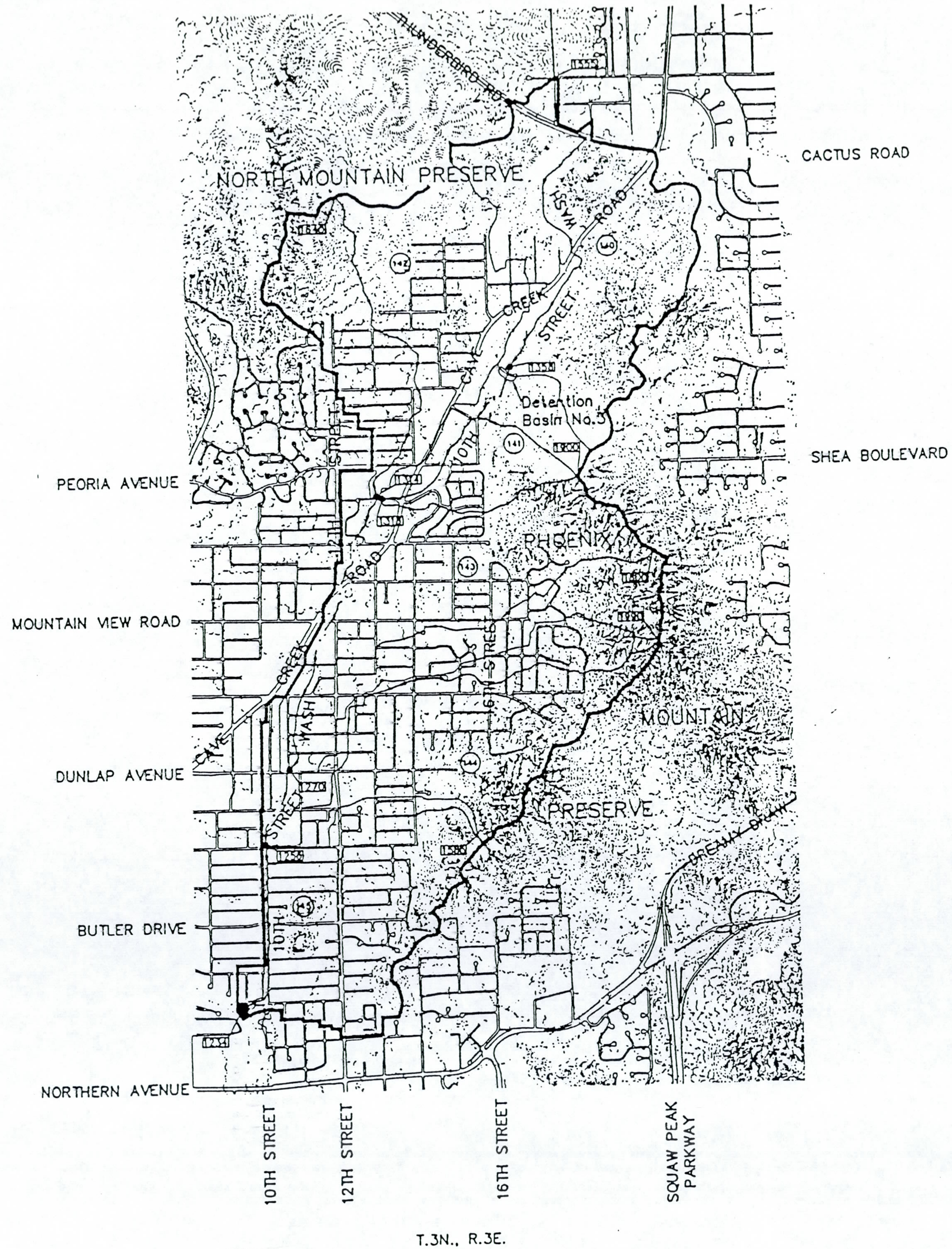


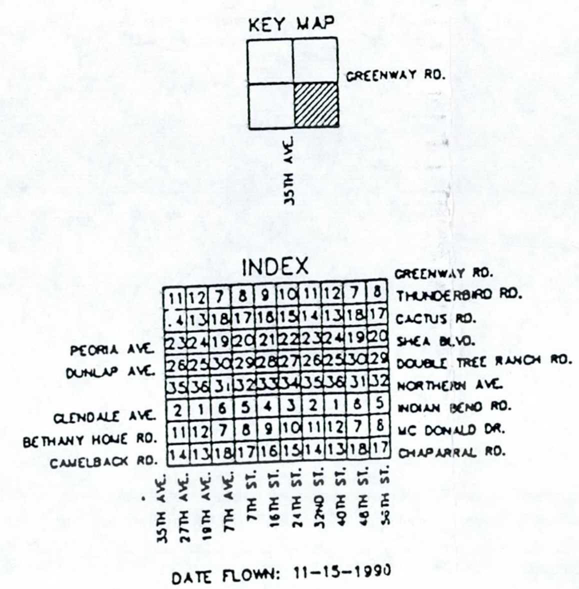
SOILS MAP

PLATE 3
JUNE 11, 1992

KAMINSKI HUBBARD engineering, inc.
SURVEYING • CIVIL • HYDROLOGY
4550 N. BLACK CANYON HWY., SUITE C
PHOENIX, ARIZONA 85017
(602) 242-5588







FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ACDC/ADMS PHASE 1 10TH STREET WASH HYDROLOGY STUDY

LEGEND

- Major Drainage Basin Boundary
- Drainage Sub-Basin Boundary
- Drainage Sub-Basin Number
- Major Drainage Basin Concentration Point
- Drainage Sub-Basin Concentration Point
- Routing Flow Path
- Length of Longest Watercourse
- Elevation Along Flow Path

FLOW ROUTING MAP

PLATE 4
JUNE 11, 1992

KAMINSKI HUBBARD engineering, inc.
SURVEYING • CIVIL • HYDROLOGY
4550 N. BLACK CANYON HWY., SUITE C
PHOENIX, ARIZONA 85017
(602) 242-5588

N

SCALE
1000 500 0 1000 2000
FEET

CONTOUR INTERVAL 10 FEET

HEC-1 Input and Output

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN 09 1992              *
 *            VERSION 4.0.3E             *
 *                                       *
 * RUN DATE  05/27/97  TIME  17:50:39    *
 *                                       *
 *****************************************

 *****************************************
 *                                       *
 *   U.S. ARMY CORPS OF ENGINEERS        *
 *   HYDROLOGIC ENGINEERING CENTER       *
 *         609 SECOND STREET             *
 *     DAVIS, CALIFORNIA 95616           *
 *         (916) 551-1748                *
 *                                       *
 *****************************************
```

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

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
1                                    HEC-1 INPUT                                          PAGE  1

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

   1           ID        FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
   2           ID        TENTH STREET WASH DETENTION BASIN NO 2  (FCD 95-18)
   3           ID        PREPARED BY Rust Environment & Infrastructure Inc.
   4           ID        LAST REVISED: JANUARY 9, 1996
   5           ID        DCR ALTTERNATIVE C1A
   6           ID        HEC-1 INPUT FILENAME : ALTC1AR2.HC1
   7           ID
   8           ID        HEC-1 MODEL REPRESENTS THE PROPOSED TENTH STREET WASH DETENTION
   9           ID        BASINS 2A AND 2B. THESE ARE CONFIGURED AS FOLLOWS:
  10           ID            SIDE FLOW WEIR INLET TO BASIN 2A LENGTH: 142 FEET
```

```
ID                              CREST ELEVATION: 1260.3 FT
ID         FLOW TO BASIN 2B VIA TWIN 60-INCH EQUALIZER PIPES
ID         WITH 18 x 16 FT. DROP INLET AT ELEV, 1256.0
ID         EFF. FLOW AREA OF GRATE IS 192 SQ FEET
ID
ID  *************************************************************************
ID
ID      EXISTING CONDITIONS MODEL PROVIDED BY STANLEY CONSULTANTS (SCI)
ID **** THE FOLLOWING COMMENTS WERE PRESENT IN THE MODEL DELIVERED BY SCI ****
ID
ID       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
ID       TENTH STREET WASH DETENTION BASIN NO 1  (FCD 93-31)
ID       STANLEY CONSULTANTS, INC.  (SCI JOB # 12183)
ID
ID       ***********************************************************************
ID       THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
ID       THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
ID         1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
ID            CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
ID            AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
ID            INLET CONTROL CONDITIONS ASSUMED.
ID         2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
ID            RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
ID            25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
ID         3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
ID            LOW FLOW AND PRINCIPAL OUTLET.
ID       ************************************************************************
ID
ID       ***********************************************************************
ID       THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
ID       BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
ID       THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
ID       BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
ID         1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
ID         2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
ID         3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
ID            THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
ID            4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
ID            1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
ID            WAS ORIGINALLY DESIGNED AND INSTALLED.
ID       ***********************************************************************
ID
ID  ***** THE FOLLOWING COMMENTS WERE WRITTEN BY KAMINSKI HUBBARD ENGINEERS ****
ID
ID  ACDC AREA DRAINAGE MASTER STUDY
```



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

ID  10TH STREET WASH WATERSHED
ID  FILENAME:  TEN36.DAT     KHE JOB NO. 0146
```

```
ID   100-YEAR 6-HOUR DURATION STORM
*
*  Based on FCDMC comments dated March 17,1992 we adjusted the Mannings "n"
*  coefficient to reflect weighted averaging in lieu of log averaging.
*  We also changed the S-graph from Phoenix Mountain to Phoenix Valley.
*
*DIAGRAM
IT       3                     300
IO       5

KK    140S
KM   RUNOFF GENERATED ON SUB-BASIN 140
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L= 1.22 mi.  Lca= 0.51 mi.  S= 162 ft/mi.  Kn= .050  LAG= 22.87 min.
KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
BA    .516
IN      15
KM   RAINFALL DEPTH OF 3.00 WAS SPATIALLY REDUCED AS SHOWN BY THE PB RECORD
KM   AN AREAL REDUCTION COEFFICIENT OF .975 WAS USED
PB  2.9200
KM   THE FOLLOWING PC RECORD USED A 6-HOUR RAINFALL WITH PATTERN NO. 2.01
PC    .000    .009    .016    .025    .034    .042    .051    .059    .067    .076
PC    .087    .100    .120    .163    .252    .451    .694    .837    .900    .938
PC    .950    .963    .975    .988   1.000
LG    .145    .339    4.25    .488   20.44
UI     76.    119.    294.    391.    468.    577.    793.    930.    712.    588.
UI    474.    381.    274.    154.    127.     90.     76.     26.     23.     23.
UI     23.     23.      0.      0.      0.      0.      0.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

KK   DT140
KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.0 AC-FT FROM SUB-BASIN 140
KM                                              (Hydrograph identified as OR140)
KM                                            2) Balance of runoff continues on.
KM                                              (Hydrograph identified as DT140)
DT   OR140     2.0
DI       0   10000
DQ       0   10000
KM   ****************************************************************************
KM      KK 140RR
KM      KM ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
KM      RS      1    ELEV    55.9
KM      SV      0     .06    1.52    6.32   17.42   35.46   60.34   95.64
KM      SE   55.9      58      62      66      70      74      78      82
KM      SL  57.15    4.91      .6      .5
KM         **********************************************************************
KM      THE SL RECORD (LOW-LEVEL OUTLET) SECOND FIELD (ORIFICE AREA) VALUE HAS
KM      BEEN CHANGED BY  SCI FROM 4.91 sq.ft. TO 1.36 sq.ft. (14"x14" INLET)
KM         **********************************************************************
KM      SS 79.66     100     3.0     1.5
KM   ****************************************************************************
```

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

 101          KK   140RR
 102          KM   ROUTE FLOW THROUGH NORTH MOUNTAIN DETENTION NO.3
 103          RS       1    ELEV    55.9
 104          SV       0     .06    1.52    6.32   17.42   35.46   60.34   95.64
 105          SE    55.9      58      62      66      70      74      78      82
 106          SL   56.43    1.36      .6      .5
 107          SS   80.00     100     3.0     1.5

 108          KK   RM140
 109          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM DETENTION BASIN THROUGH SUB-BASIN 141
 110          KM            1) Reach Length = 3600 ft.
 111          RD
 112          RC    .045    .045    .045    3600   .0108
 113          RX       0       0    46.5    76.4    79.9   110.2   160.2   160.2
 114          RY      16    12.6     7.3       0       0     9.9    15.9      16

 115          KK    141S
 116          KM   RUNOFF GENERATED ON SUB-BASIN 141
 117          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 118          KM    L= 0.83 mi.  Lca= 0.57 mi.  S= 315 ft/mi.  Kn= .042  LAG= 15.26 min.
 119          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 120          BA    .187
 121          LG    .126    .303    3.61    .313   38.57
 122          UI     41.    136.    222.    297.    467.    414.    304.    220.    131.     70.
 123          UI     47.     23.     13.     13.     13.      0.      0.      0.      0.      0.
 124          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 125          KK   DT141
 126          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.4 AC-FT FROM SUB-BASIN 141
 127          KM                                              (Hydrograph identified as OR141)
 128          KM                                            2) Balance of runoff continues on.
 129          KM                                              (Hydrograph identified as DT141)
 130          DT   OR141     2.4
 131          DI       0   10000
 132          DQ       0   10000

 133          KK   HC141
 134          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 141 WITH ROUTED FLOW FROM DETENTION
 135          HC       2
 136          KM   ****************************************************************************

 137          KK  DVT141   SPLIT HYDROGRAPH 141 TO DET142 AND HC142
 138          KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
 139          KM           EXISTING 30" PIPE.  WEIR LENGTH IS 30' WEIR CREST IS ELEV 1321.
 140          KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
 141          KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
```

```
 142      DT  DVT141
 143      DI       0      12      50     114     196     294
 144      DQ       0      12      15      18      20      22
 145      KM   ***************************************************************************
```



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

 146      KK    142S
 147      KM   RUNOFF GENERATED ON SUB-BASIN 142
 148      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 149      KM    L= 1.16 mi.  Lca= 0.75 mi.  S= 257 ft/mi.  Kn= .042  LAG= 19.99 min.
 150      KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 151      BA    .512
 152      LG    .127    .309    4.12    .267   34.03
 153      UI     86.    178.    377.    488.    608.    839.   1049.    795.    637.    498.
 154      UI    380.    210.    146.    107.     80.     26.     26.     26.     26.      0.
 155      UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 156      UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 157      KK   DT142
 158      KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 3.6 AC-FT FROM SUB-BASIN 142
 159      KM                                              (Hydrograph identified as OR142)
 160      KM                                            2) Balance of runoff continues on.
 161      KM                                              (Hydrograph identified as DT142)
 162      DT   OR142     3.6
 163      DI       0   10000
 164      DQ       0   10000
 165      KM   ***************************************************************************

 166      KK  DVT142   SPLIT HYDROGRAPH DVT142 TO DET142 AND HC142
 167      KM           DI-DQ BASED ON HYDRAULIC RATING CURVE FOR PROPOSED INLET AND
 168      KM           IMPROVED WASH CROSS SECTION.  WEIR LENGTH IS 100' WEIR CREST ELEV IS
 169      KM           3.34' ABOVE WASH FLOWLINE.
 170      KM           DQ IS AMOUNT DIVERTED AROUND DETENTION BASIN DOWNSTREAM.
 171      KM           DI-DQ DIFFERENCE IS ROUTED THRU THE PROPOSED DETENTION BASIN
 172      DT  DVT142
 173      DI       0     280     300     350     400     450     500     550     600     672
 174      DQ       0     280     295     312     317     319     318     317     313     307

 175      KK  ADD142
 176      KM   COMBINE HYDROGRAPHS FROM (DI-DQ) FROM DVT141 WITH (DI-DQ) FROM DVT142
 177      HC       2

 178      KK  DET142   ROUTE HYDROGRAPH ADD142 THRU DET BASIN 142
 179      KM           1-30" RCP  AS LOW FLOW AND PRINCIPAL OUTLET (INV. EL. 1306)
 180      RS       1    STOR      -1
 181      SV     .00   0.060   0.460   1.470   3.040   4.890   6.850   8.910   11.08   13.36
 182      SV   15.74   18.23   20.83   23.53   26.33
 183      SQ       0     4.5    15.9    29.0    37.0    44.0    50.0    55.0    60.0    65.0
```

```
184          SQ      70      72      78      80      84
185          SE    1306    1307    1308    1309    1310    1311    1312    1313    1314    1315
186          SE    1316    1317    1318    1319    1320

187          KK  DVT141    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 141
188          DR  DVT141
1                                        HEC-1 INPUT                                        PAGE  5

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


189          KK  DVT142    RETRIEVE PREVIOUSLY SPLIT HYDROGRAPH FROM SUB-BASIN 142
190          DR  DVT142

191          KK   HC142
192          KM   COMBINE HYDROGRAPHS (DQ) FROM DVT142, (DQ) FROM DVT141 AND DET142 OUTFLOW
193          HC       3
194          KM   ****************************************************************************
             *
             * Modifed by WEST Consultants on 3/14/97:
             * Basin 143S was subdivided into 4 segments. The unit hydrograph for the
             * whole basin was area weighted for the subbasins.  The throw away
             * volume was also area weighted.  Routing lengths were updated.
             *
             * KK RM142
             * KM MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143
             * KM           1) Reach Length = 5140 ft.
             * RD
             * RC  .050     .045    .050    5140    .0086
             * RX     0        0    43.8    61.3     67.4    78.3    89.8    89.8
             * RY  10.8      9.4     9.4       0        0     5.4     8.8    10.8
             * KK  143S
             * KM RUNOFF GENERATED ON SUB-BASIN 143
             * KM  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
             * KM  L= 1.64 mi.  Lca= 0.88  S= 273 ft/mi.  Kn= .035  LAG= 19.96 min.
             * KM  PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
             * BA  .604
             * LG  .115     .279    4.12    .269    49.66
             * UI102.     212.    446.    577.    720.    994.   1238.    937.    750.    586.
             * UI447.     244.    173.    125.     93.     31.     31.     31.     31.      0.
             * UI  0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
             * UI  0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
             * KK DT143
             * KM THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 5.7 AC-FT FROM SUB-BASIN 143
             * KM                                            (Hydrograph identified as OR143)
             * KM                                          2) Balance of runoff continues on.
             * KM                                            (Hydrograph identified as DT143)
             * DT OR143     5.7
             * DI     0   10000
             * DQ     0   10000
             * KK HC143
```

```
                * KM COMBINE HYDROGRAPHS FROM SUB-BASIN 143 WITH ROUTED FLOW FROM 141/142
                * HC     2
                *
                * BASIN 143A ************************
                *

      195       KK   RM142
      196       KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASINS 141/142 THROUGH 143A
      197       KM            1) Reach Length = 1444 ft.
      198       RD
      199       RC    .050    .045    .050    1444   .0086
      200       RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
      201       RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8
```



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

      202       KK    143A
      203       BA     .15
      204       LG    .115    .279    4.12    .269   49.66
      205       UI   25.50   53.00  111.50  144.25  180.00  248.50  309.50  234.25  187.50  146.50
      206       UI  111.75   61.00   43.25   31.25   23.25    7.75    7.75    7.75    7.75       0
      207       UI       0       0       0       0       0       0       0       0       0       0
      208       UI       0       0       0       0       0       0       0       0       0       0

      209       KK  DT143A
      210       KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 1.4 AC-FT FROM SUB-BASIN 143A
      211       DT  OR143A     1.4
      212       DI       0   10000
      213       DQ       0   10000

      214       KK  HC143A
      215       KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143A WITH ROUTED FLOW FROM 141/142
      216       HC       2
                *
                * BASIN 143B ************************
                *

      217       KK  RM143A
      218       KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143A THROUGH 143B
      219       KM            1) Reach Length = 1531 ft.
      220       RD
      221       RC    .050    .045    .050    1531   .0086
      222       RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
      223       RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

      224       KK    143B
      225       BA     .17
      226       LG    .115    .279    4.12    .269   49.66
      227       UI   28.90   60.07  126.37  163.48  204.00  281.63  350.77  265.48  212.50  166.03
```

```
228         UI  126.65   69.13   49.02   35.42   26.35    8.78    8.78    8.78    8.78       0
229         UI       0       0       0       0       0       0       0       0       0       0
230         UI       0       0       0       0       0       0       0       0       0       0

231         KK  DT143B
232         KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 1.6 AC-FT FROM SUB-BASIN 143B
233         DT  OR143B     1.6
234         DI       0   10000
235         DQ       0   10000

236         KK  HC143B
237         KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143B WITH ROUTED FLOW FROM 143A
238         HC       2
            * Added by WEST Consultants, March 1997 ****

239         KK  143BSF
240         KM   SPLIT FLOW BETWEEN 1.244 AND 1.35
241         DT  BREAK2
242         DI       0     835
243         DQ       0     106
            * ********************************************
            *
            * BASIN 143C ***********************
            *
1                                     HEC-1 INPUT                                         PAGE  7

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


244         KK  RM143B
245         KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143B THROUGH 143C
246         KM            1) Reach Length = 475 FT.
247         RD
248         RC    .050    .045    .050     475   .0086
249         RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
250         RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

251         KK    143C
252         BA     .18
253         LG    .115    .279    4.12    .269   49.66
254         UI   30.60   63.60  133.80  173.10  216.00  298.20  371.40  281.10  225.00  175.80
255         UI  134.10   73.20   51.90   37.50   27.90    9.30    9.30    9.30    9.30       0
256         UI       0       0       0       0       0       0       0       0       0       0
257         UI       0       0       0       0       0       0       0       0       0       0

258         KK  DT143C
259         KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 1.7 AC-FT FROM SUB-BASIN 143C
260         DT  OR143C     1.7
261         DI       0   10000
262         DQ       0   10000
```

```
263          KK  HC143C
264          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143C WITH ROUTED FLOW FROM 143B
265          HC       2
             * Added by WEST Consultants, March 1997 ****

266          KK  143CSF
267          KM   SPLIT FLOW BETWEEN 1.138 AND 1.242
268          DT  BREAK3
269          DI       0      979
270          DQ       0      155
             * ********************************************
             *
             * BASIN 143D ************************
             *

271          KK  RM143C
272          KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143C THROUGH 143D
273          KM            1) Reach Length = 1690 ft.
274          RD
275          RC    .050    .045    .050    1690   .0086
276          RX       0       0    43.8    61.3    67.4    78.3    89.8    89.8
277          RY    10.8     9.4     9.4       0       0     5.4     8.8    10.8

278          KK    143D
279          BA     .10
280          LG    .115    .279    4.12    .269   49.66
281          UI   17.00   35.33   74.33   96.17  120.00  165.67  206.33  156.17  125.00   97.67
282          UI   74.50   40.67   28.83   20.83   15.50    5.17    5.17    5.17    5.17       0
283          UI       0       0       0       0       0       0       0       0       0       0
284          UI       0       0       0       0       0       0       0       0       0       0
1                                       HEC-1 INPUT                                             PAGE  8

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


285          KK  DT143D
286          KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 1.0 AC-FT FROM SUB-BASIN 143D
287          DT  OR143D     1.0
288          DI       0   10000
289          DQ       0   10000

290          KK  HC143D
291          KM   COMBINE HYDROGRAPHS FROM SUB-BASIN 143D WITH ROUTED FLOW FROM 143C
292          HC       2
             * Added by WEST Consultants, March 1997 ****

293          KK  143DSF
294          KM   SPLIT FLOW BETWEEN 0.89 AND 1.13
295          DT  BREAK4
296          DI       0      959
297          DQ       0      618
```

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

   298              KK  RM143D
   299              KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 143D THROUGH 144
                    *
                    * *************************************************************************
   300              KM             1) Reach Length = 1400 ft.
   301              RD
   302              RC    .040    .035    .030    1400    .0100
   303              RX       0       0    77.8    88.3     96.6   112.8   161.3   161.3
   304              RY      10     6.2     6.2       0        0     6.3     6.9      10

   305              KK  BYPASS   IN CHANNEL FLOWS AROUND DETENTION FACILITY NO. 2
   306              KM   DI = FLOW IN 10TH STREET WASH AT TOWNLEY AVENUE
   307              KM   DQ = FLOW DIVERTED OVER SIDE FLOW WEIR INTO BASIN 2A
   308              KM   PEAK FLOW REDUCED TO ACCOUNT FOR WEIR SUBMERGENCE WHEN BASIN FILLS
   309              KM   PEAK BYPASS IS 580 CFS
   310              KM   BYPASS FLOW IN TRAPEZOIDAL OPEN CHANNEL AND TWIN 4X6 BOX CULVERTS
   311              DT   DIV2A
   312              DI       0   260.0     292     318      345     635     858     928    1010    1220
   313              DQ       0       0      32      51       71     298     479     500     555     660

   314              KK  DIV 2A    RETRIEVE DIVERTED FLOW TO BASIN 2A
   315              DR   DIV2A

   316              KK    144S
   317              KM   RUNOFF GENERATED ON SUB-BASIN 144
   318              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
   319              KM    L= 1.80 mi.  Lca= 1.11 mi.  S= 291 ft/mi.  Kn= .036  LAG= 22.95 min.
   320              KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
   321              BA    .475
   322              LG    .118    .280    3.61     .32    43.17
   323              UI     70.    108.    269.    357.    428.    527.    721.    857.    657.    543.
   324              UI    437.    353.    256.    145.    117.     85.     70.     26.     21.     21.
   325              UI     21.     21.      0.      0.      0.      0.      0.      0.      0.      0.
   326              UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1                                              HEC-1 INPUT                                        PAGE  9

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


   327              KK   DT144
   328              KM   THROW AWAY 10-YR 2-HR RETENTION VOLUME:  1) 2.1 AC-FT FROM SUB-BASIN 144
   329              KM                                              (Hydrograph identified as OR144)
   330              KM                                             2) Balance of runoff continues on.
   331              KM                                              (Hydrograph identified as DT144)
   332              DT   OR144     2.1
   333              DI       0   10000
   334              DQ       0   10000

   335              KK   DIV1P    DIVERT PALMA PARK FLOWS OVER 350 CFS
```

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KM   DIVERSION REPRESENTS LOSS OF FLOW NOT ACCEPTED BY THE PALMA PARK INLET
DT   DIV1P
DI       0     350     351     615    1000
DQ       0       0       1     265     650

KK  SITE2A
KM   COMBINE HYDROGRAPH FROM SUB-BASIN 144 WITH FLOW DIVERTED INTO BASIN 2A
HC       2

KK  SITE2A   DETENTION BASIN AT SITE 2A ***************************
KM         FLOW IS CONVEYED TO BASIN 2B THROUGH 2 @ 60-INCH PIPES
KM         DROP INLET TO PIPES HAS CREST ELEVATION AT 1256
KM         LOW FLOW OUTLET THROUGH 36 INCH PIPE
RS       1    STOR       0
SV      .0     1.8     3.7     6.0     8.7    11.8    15.3    19.4    23.9
SE  1247.3    1250    1252    1254    1256    1258    1260    1262    1264
SQ       0    14.1    21.6    37.3    46.1    56.7    65.8    87.5   160.1   296.5
SQ   523.6   619.2   698.5     801
SE  1247.3 1248.70 1249.12 1250.19 1251.54 1253.55 1255.48 1256.17 1256.67 1257.25
SE  1258.0 1259.02 1260.37 1263.15

KK  60INCH     OVERFLOW INTO BASIN 2B THROUGH TWIN 60-INCH PIPES
KM             DIVERT BASIN 2A LOW FLOW OUTLET (36" RCP)
KM             DIVERSION OF BASIN 2A LOW LEVEL OUTLET AWAY FROM BASIN 2B
DT  OUTL2A
DI       0    65.8    87.5   160.1   296.5   523.6   619.2   698.5   801.0
DQ       0    65.8    69.0    70.9    72.9    75.5    78.3    80.7    85.5

KK  SITE2B     DETENTION BASIN AT SITE 2B ***************************
KM             OUTFLOW THROUGH 24 INCH RCP
KM             FLOWS INCREASED ABOVE ELEV 1256 TO ACCOUNT FOR SUBMERGENCE
KM             THAT REDUCES OVERALL INFLOW TO FACILITY NO. 2
KM             STORAGE INCLUDES 0.4 AC-FT IN TWIN 60 INCH PIPES
RS       1    ELEV    1248
SV      .0     6.9    15.3    24.7    35.0    46.3    52.4    58.7
SE    1248    1250    1252    1254    1256    1258    1259    1260
SQ       0    17.7    66.0    84.0   150.0   240.0
SE    1248 1252.00 1256.22 1258.11 1258.70  1259.5
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KK   RET1P     RETRIEVE DIVERTED PALMA PARK FLOW
DR   DIV1P

KK  2A RET     RETRIEVE BASIN 2A OUTFLOW FROM 24" RCP
DR  OUTL2A

KK   HC144   RECOMBINE IN CHANNEL FLOW WITH OUTFLOW FROM DETENTION BASIN 2
KM           AND PALMA PARK FLOW
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 376            HC       4

 377            KK   RM144
 378            KM   MUSKINGUM-CUNGE ROUTE IN CHANNEL FROM SUB-BASIN 144 THROUGH 145
 379            KM            1) Reach Length = 3000 ft.
 380            RD
 381            RC    .035     .035     .030     3000    .0073
 382            RX       0        0     36.6       52     64.9     79.8    107.8    107.8
 383            RY      11      7.7      7.4        0        0      8.3      8.5       11

 384            KK     145A
 385            KM    RUNOFF GENERATED FROM SUB-BASIN 145A
 386            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 387            KM    L-       1.1  Lca=        .7   S=  342.1  Kn= .032  LAG= 13.8
 388            KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 389            BA     .20
 390            LG     .10      .26     5.60      .21    43.44
 391            UI     49.     184.     282.     405.     575.     407.     288.     185.      84.      56.
 392            UI     25.      15.      15.       0.       0.       0.       0.       0.       0.       0.
 393            UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.

 394            KK  HC145A
 395            KM    COMBINE HYDROGRAPHS FROM SUB-BASIN 145A WITH ROUTED FLOW FROM 144
 396            HC       2

 397            KK  RM145A
 398            KM    MUSKINGUM-CUNGE ROUTE INCHANNEL FROM SUB-BASIN 145A THROUGH 145B
 399            KM            1) Reach Length = 1800 ft.
 400            RD
 401            RC    .040     .035     .030    1800.    .0100
 402            RX       0        0     77.8     88.3     96.6    112.8    161.3    161.3
 403            RY      10      6.2      6.2        0        0      6.3      6.9       10

 404            KK     145B
 405            KM    RUNOFF GENERATED FROM SUBBASIN 145B
 406            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 407            KM    L=       1.1  Lca=        .6   S=  407.4  Kn= .032  LAG=  12.8
 408            KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 409            BA     .35
 410            LG     .10      .26     5.60      .21    43.44
 411            UI     95.     376.     564.     882.     983.     664.     450.     212.     126.      64.
 412            UI     28.      28.       0.       0.       0.       0.       0.       0.       0.       0.
 413            UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
1                                         HEC-1 INPUT                                              PAGE 11

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


 414            KK    HC145
 415            KM    COMBINE HYDROGRAPHS FROM SUB-BASIN 145B WITH ROUTED FLOW FROM 145A
 416            KM    ALSO DETERMINES 10TH STREET WASH DISCHARGE INTO ACDC
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          417          HC      2
                       * *******************************************

          418          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE    (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   61        140S
                .
                .
   85           .------->    OR140
   80       DT140
                V
                V
  101       140RR
                V
                V
  108       RM140
                .
                .
  115           .         141S
                .            .
                .            .
  130           .            .------->    OR141
  125           .        DT141
                .            .
                .            .
  133       HC141............
                .
                .
  142           .------->   DVT141
  137      DVT141
                .
                .
  146           .         142S
                .            .
                .            .
  162           .            .------->    OR142
  157           .        DT142
                .            .
                .            .
  172           .            .------->   DVT142
  166           .       DVT142
                .            .
                .            .
  175      ADD142............
                V
                V
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178    DET142
            .
            .
188         .         .<-------  DVT141
187         .    DVT141
            .         .
            .         .
190         .         .         .<-------  DVT142
189         .         .    DVT142
            .         .         .
            .         .         .
191     HC142.....................
            V
            V
195     RM142
            .
            .
202         .      143A
            .         .
            .         .
211         .         .------->  OR143A
209         .    DT143A
            .         .
            .         .
214    HC143A..........
            V
            V
217    RM143A
            .
            .
224         .      143B
            .         .
            .         .
233         .         .------->  OR143B
231         .    DT143B
            .         .
            .         .
236    HC143B..........
            .
            .
241         .------->  BREAK2
239    143BSF
            V
            V
244    RM143B
            .
            .
251         .      143C
            .         .
            .         .
260         .         .------->  OR143C
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258          .      DT143C
             .           .
             .           .
263       HC143C............
             .
             .
268          .------->   BREAK3
266       143CSF
             V
             V
271       RM143C
             .
             .
278          .        143D
             .           .
             .           .
287          .           .------->   OR143D
285          .      DT143D
             .           .
             .           .
290       HC143D............
             .
             .
295          .------->   BREAK4
293       143DSF
             V
             V
298       RM143D
             .
             .
311          .------->    DIV2A
305       BYPASS
             .
             .
315          .           .<-------    DIV2A
314          .      DIV 2A
             .           .
             .           .
316          .           .       144S
             .           .          .
             .           .          .
332          .           .          .------->   OR144
327          .           .       DT144
             .           .          .
             .           .          .
337          .           .          .------->   DIV1P
335          .           .       DIV1P
             .           .          .
             .           .          .
340          .      SITE2A............
             .           V
```

```
                  .        V
343               .     SITE2A
                  .        .
                  .        .
357               .        .-------> OUTL2A
354               .     60INCH
                  .        V
                  .        V
360               .     SITE2B
                  .        .
                  .        .
371               .        .         .<-------   DIV1P
370               .        .       RET1P
                  .        .         .
                  .        .         .
373               .        .         .         .<-------   OUTL2A
372               .        .         .      2A RET
                  .        .         .         .
                  .        .         .         .
374            HC144..............................
                  V
                  V
377            RM144
                  .
                  .
384               .      145A
                  .        .
                  .        .
394           HC145A...........
                  V
                  V
397           RM145A
                  .
                  .
404               .      145B
                  .        .
                  .        .
414            HC145...........

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************
*                                         *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)     *
*            JUN 09 1992                  *
*           VERSION 4.0.3E                *
*                                         *
*  RUN DATE  05/27/97  TIME  17:50:39     *
*                                         *
*******************************************

*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 551-1748              *
*                                       *
*****************************************
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TENTH STREET WASH DETENTION BASIN NO 2  (FCD 95-18)
PREPARED BY Rust Environment & Infrastructure Inc.
LAST REVISED: JANUARY 9, 1996
DCR ALTTERNATIVE C1A
HEC-1 INPUT FILENAME : ALTC1AR2.HC1

HEC-1 MODEL REPRESENTS THE PROPOSED TENTH STREET WASH DETENTION
BASINS 2A AND 2B. THESE ARE CONFIGURED AS FOLLOWS:
    SIDE FLOW WEIR INLET TO BASIN 2A LENGTH: 142 FEET
                           CREST ELEVATION: 1260.3 FT
    FLOW TO BASIN 2B VIA TWIN 60-INCH EQUALIZER PIPES
    WITH 18 x 16 FT. DROP INLET AT ELEV, 1256.0
    EFF. FLOW AREA OF GRATE IS 192 SQ FEET

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

    EXISTING CONDITIONS MODEL PROVIDED BY STANLEY CONSULTANTS (SCI)
**** THE FOLLOWING COMMENTS WERE PRESENT IN THE MODEL DELIVERED BY SCI ****

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
TENTH STREET WASH DETENTION BASIN NO 1  (FCD 93-31)
STANLEY CONSULTANTS, INC.  (SCI JOB # 12183)

**********************************************************************
THIS MODEL REPRESENTS THE PROPOSED 10TH STREET WASH DETENTION BASIN #1.
THE FOLLOWING BASIN CHARACTERISTICS ARE EVALUATED:
  1. INLET CONFIGURATION 1, INLET 1 CONSISTS OF A SIDE OVERFLOW WEIR
     CONFIGURATION (100' WEIR 3.34' ABOVE FLOWLINE) FOR THE WEST TRIB
     AND A WEIR INLET (30' WEIR AT CREST ELEV. 1321) FOR THE EAST TRIB.
     INLET CONTROL CONDITIONS ASSUMED.
  2. BASIN CONFIGURATION 1, 3:1 SIDES ON 3 SIDES AND A VERTICAL
     RETAINING WALL ON THE WEST SIDE, A BOTTOM ELEVATION OF 1306, AND
     25' ADDITIONAL R.O.W. ALONG THE SOUTH BASIN PARCEL BOUNDARY.
  3. OUTLET CONFIGURATION 1, UTILIZING A 30" RCP TO CHASE GRADE AS THE
     LOW FLOW AND PRINCIPAL OUTLET.
***********************************************************************

**********************************************************************
THIS HEC-1 MODEL IS BASED ON THE KAMINSKI-HUBBARD ACDC ADMS AS MODIFIED
BY FCD TO REFLECT TWO HYPOTHETICAL DETENTION BASINS (NUMBERS 1 AND 2).
THE DIFFERENCES BETWEEN THIS MODEL AND THE ORIGINAL MODEL TRANSMITTED
BY FCD TO SCI AT THE PROJECT KICKOFF MEETING ARE AS FOLLOWS:
  1. USE OF THE HEC-1 DATA STORAGE SYSTEM OPTION HAS BEEN DELETED;
  2. THE TWO HYPOTHETICAL DETENTION BASINS 1 AND 2 HAVE BEEN DELETED;
  3. THE CROSS SECTIONAL AREA OF THE PRINCIPAL SPILLWAY OUTLET PIPE OF
     THE EXISTING CITY OF PHOENIX DET BASIN NO. 3 HAS BEEN CHANGED FROM
     4.91 SQFT (WHICH CORRESPONDS TO AN OUTLET PIPE DIAM OF 30") TO
     1.36 SQFT CORRESPONDING TO THE 14" X 14" STEEL ORIFICE PLATE WHICH
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                                WAS ORIGINALLY DESIGNED AND INSTALLED.
                           ***********************************************************************

                      ***** THE FOLLOWING COMMENTS WERE WRITTEN BY KAMINSKI HUBBARD ENGINEERS ****

                      ACDC AREA DRAINAGE MASTER STUDY
                      10TH STREET WASH WATERSHED
                      FILENAME:  TEN36.DAT     KHE JOB NO. 0146
                      100-YEAR 6-HOUR DURATION STORM

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

      IT          HYDROGRAPH TIME DATA
                         NMIN           3  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1    0  ENDING DATE
                       NDTIME        1457  ENDING TIME
                        ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL    0.05 HOURS
                         TOTAL TIME BASE   14.95 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
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
MANE2 NPLAN,NSTM       1      0
1
                                                   RUNOFF SUMMARY
```

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	140S	496.	4.25	69.	28.	28.	0.52		
+	DIVERSION TO	OR140	20.	4.25	4.	2.	2.	0.52		
+	HYDROGRAPH AT	DT140	496.	4.25	65.	26.	26.	0.52		
+	ROUTED TO	140RR	26.	5.10	25.	18.	18.	0.52		
+									72.36	5.15
+	ROUTED TO	RM140	26.	5.45	25.	18.	18.	0.52		
+	HYDROGRAPH AT	141S	263.	4.10	38.	15.	15.	0.19		
+	DIVERSION TO	OR141	57.	4.10	5.	2.	2.	0.19		
+	HYDROGRAPH AT	DT141	263.	4.10	33.	13.	13.	0.19		
+	2 COMBINED AT	HC141	275.	4.10	56.	31.	31.	0.70		
+	DIVERSION TO	DVT141	22.	4.10	14.	10.	10.	0.70		
+	HYDROGRAPH AT	DVT141	253.	4.10	41.	20.	20.	0.70		
+	HYDROGRAPH AT	142S	671.	4.15	100.	40.	40.	0.51		
+	DIVERSION TO	OR142	45.	4.15	7.	3.	3.	0.51		
+	HYDROGRAPH AT	DT142	671.	4.15	93.	37.	37.	0.51		
	DIVERSION TO									

+		DVT142	319.	4.15	65.	26.	26.	0.51		
	HYDROGRAPH AT									
+		DVT142	364.	4.15	28.	11.	11.	0.51		
	2 COMBINED AT									
+		ADD142	614.	4.15	70.	32.	32.	1.21		
	ROUTED TO									
+		DET142	80.	4.60	62.	32.	32.	1.21		
+									1318.97	4.60
	HYDROGRAPH AT									
+		DVT141	22.	4.10	14.	10.	10.	0.00		
	HYDROGRAPH AT									
+		DVT142	319.	4.45	65.	26.	26.	0.00		
	3 COMBINED AT									
+		HC142	417.	4.45	138.	68.	68.	1.21		
	ROUTED TO									
+		RM142	417.	4.50	138.	68.	68.	1.21		
	HYDROGRAPH AT									
+		143A	210.	4.15	34.	14.	14.	0.15		
	DIVERSION TO									
+		OR143A	14.	4.15	3.	1.	1.	0.15		
	HYDROGRAPH AT									
+		DT143A	210.	4.15	31.	13.	13.	0.15		
	2 COMBINED AT									
+		HC143A	601.	4.25	169.	80.	80.	1.36		
	ROUTED TO									
+		RM143A	600.	4.25	168.	80.	80.	1.36		
	HYDROGRAPH AT									
+		143B	238.	4.15	38.	16.	16.	0.17		
	DIVERSION TO									
+		OR143B	16.	4.15	3.	1.	1.	0.17		
	HYDROGRAPH AT									
+		DT143B	238.	4.15	35.	14.	14.	0.17		
	2 COMBINED AT									
+		HC143B	835.	4.20	203.	94.	94.	1.53		

+	DIVERSION TO	BREAK2	106.	4.20	26.	12.	12.	1.53
+	HYDROGRAPH AT	143BSF	729.	4.20	177.	82.	82.	1.53
+	ROUTED TO	RM143B	728.	4.20	177.	82.	82.	1.53
+	HYDROGRAPH AT	143C	252.	4.15	41.	16.	16.	0.18
+	DIVERSION TO	OR143C	17.	4.15	3.	1.	1.	0.18
+	HYDROGRAPH AT	DT143C	252.	4.15	37.	15.	15.	0.18
+	2 COMBINED AT	HC143C	979.	4.20	214.	97.	97.	1.71
+	DIVERSION TO	BREAK3	155.	4.20	34.	15.	15.	1.71
+	HYDROGRAPH AT	143CSF	824.	4.20	180.	82.	82.	1.71
+	ROUTED TO	RM143C	823.	4.25	180.	82.	82.	1.71
+	HYDROGRAPH AT	143D	140.	4.15	23.	9.	9.	0.10
+	DIVERSION TO	OR143D	11.	4.15	2.	1.	1.	0.10
+	HYDROGRAPH AT	DT143D	140.	4.15	21.	8.	8.	0.10
+	2 COMBINED AT	HC143D	960.	4.25	200.	90.	90.	1.81
+	DIVERSION TO	BREAK4	619.	4.25	129.	58.	58.	1.81
+	HYDROGRAPH AT	143DSF	341.	4.25	71.	32.	32.	1.81
+	ROUTED TO	RM143D	341.	4.25	71.	32.	32.	1.81

	DIVERSION TO										
+		DIV2A	68.	4.25	4.	2.	2.	1.81			
	HYDROGRAPH AT										
+		BYPASS	273.	4.25	67.	30.	30.	1.81			
	HYDROGRAPH AT										
+		DIV 2A	68.	4.25	4.	2.	2.	0.00			
	HYDROGRAPH AT										
+		144S	615.	4.20	100.	40.	40.	0.47			
	DIVERSION TO										
+		OR144	14.	4.20	4.	2.	2.	0.47			
	HYDROGRAPH AT										
+		DT144	615.	4.20	96.	38.	38.	0.47			
	DIVERSION TO										
+		DIV1P	265.	3.90	20.	8.	8.	0.47			
	HYDROGRAPH AT										
+		DIV1P	350.	3.90	76.	31.	31.	0.47			
	2 COMBINED AT										
+		SITE2A	418.	4.25	81.	32.	32.	0.47			
	ROUTED TO										
+		SITE2A	413.	4.35	80.	32.	32.	0.47			
+									1257.64	4.35	
	DIVERSION TO										
+		OUTL2A	74.	4.35	41.	17.	17.	0.47			
	HYDROGRAPH AT										
+		60INCH	339.	4.35	39.	16.	16.	0.47			
	ROUTED TO										
+		SITE2B	24.	5.10	17.	10.	10.	0.47			
+									1252.52	5.10	
	HYDROGRAPH AT										
+		RET1P	265.	4.20	20.	8.	8.	0.00			
	HYDROGRAPH AT										
+		2A RET	74.	4.35	41.	17.	17.	0.00			
	4 COMBINED AT										
+		HC144	617.	4.25	141.	65.	65.	2.29			
	ROUTED TO										

+		RM144	615.	4.30	141.	65.	65.	2.29
	HYDROGRAPH AT							
+		145A	299.	4.05	44.	18.	18.	0.20
	2 COMBINED AT							
+		HC145A	841.	4.20	180.	82.	82.	2.49
	ROUTED TO							
+		RM145A	841.	4.25	180.	82.	82.	2.49
	HYDROGRAPH AT							
+		145B	529.	4.05	76.	31.	31.	0.35
	2 COMBINED AT							
+		HC145	1274.	4.20	251.	113.	113.	2.84

1

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

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RM140	MANE	3.00	26.07	330.00	0.79	3.00	26.07	330.00	0.79

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2263E+02 EXCESS=0.0000E+00 OUTFLOW=0.2176E+02 BASIN STORAGE=0.6323E+00 PERCENT ERROR= 1.1

RM142	MANE	3.00	416.51	270.00	1.29	3.00	416.51	270.00	1.29

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.8393E+02 EXCESS=0.0000E+00 OUTFLOW=0.8372E+02 BASIN STORAGE=0.2732E+00 PERCENT ERROR= -0.1

RM143A	MANE	3.00	600.34	255.00	1.36	3.00	600.34	255.00	1.36

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9922E+02 EXCESS=0.0000E+00 OUTFLOW=0.9899E+02 BASIN STORAGE=0.2905E+00 PERCENT ERROR= -0.1

RM143B	MANE	1.07	728.87	253.09	1.24	3.00	727.93	252.00	1.24

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1017E+03 EXCESS=0.0000E+00 OUTFLOW=0.1017E+03 BASIN STORAGE=0.8139E-01 PERCENT ERROR= 0.0

RM143C	MANE	3.00	823.34	255.00	1.10	3.00	823.34	255.00	1.10

```
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1013E+03 EXCESS=0.0000E+00 OUTFLOW=0.1011E+03 BASIN STORAGE=0.2557E+00 PERCENT ERROR=  -0.1

           RM143D  MANE        3.00    340.91    255.00      0.41      3.00    340.91    255.00        0.41

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3960E+02 EXCESS=0.0000E+00 OUTFLOW=0.3954E+02 BASIN STORAGE=0.7360E-01 PERCENT ERROR=   0.0

            RM144  MANE        3.00    615.19    258.00      0.65      3.00    615.19    258.00        0.65

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.8035E+02 EXCESS=0.0000E+00 OUTFLOW=0.8002E+02 BASIN STORAGE=0.4225E+00 PERCENT ERROR=  -0.1

           RM145A  MANE        3.00    840.56    255.00      0.76      3.00    840.56    255.00        0.76

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1017E+03 EXCESS=0.0000E+00 OUTFLOW=0.1016E+03 BASIN STORAGE=0.2238E+00 PERCENT ERROR=  -0.1


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

PHOTO 1	On left bank of ACDC, looking downstream.

PHOTO 2	At brink at ACDC, looking upstream.

PHOTO 3	On right overbank at bend near Griswold Road, looking downstream.

PHOTO 4	In channel at bend near Griswold Road, looking downstream.

PHOTO 5	In channel at bend near Griswold Road, looking upstream.

PHOTO 6	On right overbank at bend near Griswold Road, looking upstream.

PHOTO 7	On left overbank at bend near Griswold Road, looking upstream.

PHOTO 8	On right overbank near Echo Lane, looking downstream.

PHOTO 9	On right overbank near Echo Lane, looking upstream.

PHOTO 10	In channel overbank near Echo Lane, looking downstream.

PHOTO 11	In channel overbank near Echo Lane, looking upstream.

PHOTO 12	On left overbank near Echo Lane, looking downstream.

PHOTO 13	On left overbank near Echo Lane, looking upstream.

PHOTO 14	In channel downstream of Butler Drive, looking upstream.

PHOTO 15	In channel downstream of Butler Drive, looking downstream.

PHOTO 16	On top of Butler Drive, looking downstream.

PHOTO 17	On top of Butler Drive, looking upstream.

PHOTO 18	In channel near Orchid Avenue, looking downstream.

PHOTO 19	In channel near Orchid Avenue, looking upstream.

PHOTO 20	In channel near Diana Avenue, looking upstream.

PHOTO 21	In channel near Diana Avenue on top of basin outfall, looking upstream.

PHOTO 22	In channel near Alice Avenue, looking upstream.

PHOTO 23	In channel near Alice Avenue on top of basin outfall, looking upstream.

PHOTO 24	On top of Alice Avenue, looking upstream at detention basin #2B.

PHOTO 25	Near 11th Street and Eleanore Court, looking west at detention basin #2A.

PHOTO 26	At Townley Avenue dip section, looking downstream at detention basin #2A.

PHOTO 27	At Townley Avenue dip section, looking downstream at detention basin #2A, panning left.

PHOTO 28	At Townley Avenue dip section, looking upstream.

PHOTO 29	Just upstream of Townley Avenue, looking downstream at dip section.

PHOTO 30	About 100 feet upstream of Townley Avenue, looking upstream.

PHOTO 31	About 100 feet downstream of Dunlap Avenue, looking downstream.

PHOTO 32	About 100 feet downstream of Dunlap Avenue, looking upstream.

PHOTO 33	At Dunlap Avenue dip section, looking upstream.

PHOTO 34	About 100 feet upstream of Dunlap Avenue, looking upstream.

PHOTO 35	About 200 feet downstream of Eva Street, looking upstream.

PHOTO 36	At Eva Street dip section, looking downstream.

PHOTO 37	At Eva Street dip section, looking upstream.

PHOTO 38	On right bank about 100 feet upstream of Eva Street, looking upstream.

PHOTO 39	At Mission Road dip section, looking downstream.

PHOTO 40	At Mission Road dip section, looking upstream.

PHOTO 41	At Sunnyslope Lane dip section, looking upstream.

PHOTO 42	At Hatcher Road dip section, looking upstream.

PHOTO 43	At Vogel Avenue dip section, looking downstream.

PHOTO 44	At Vogel Avenue dip section, looking upstream.

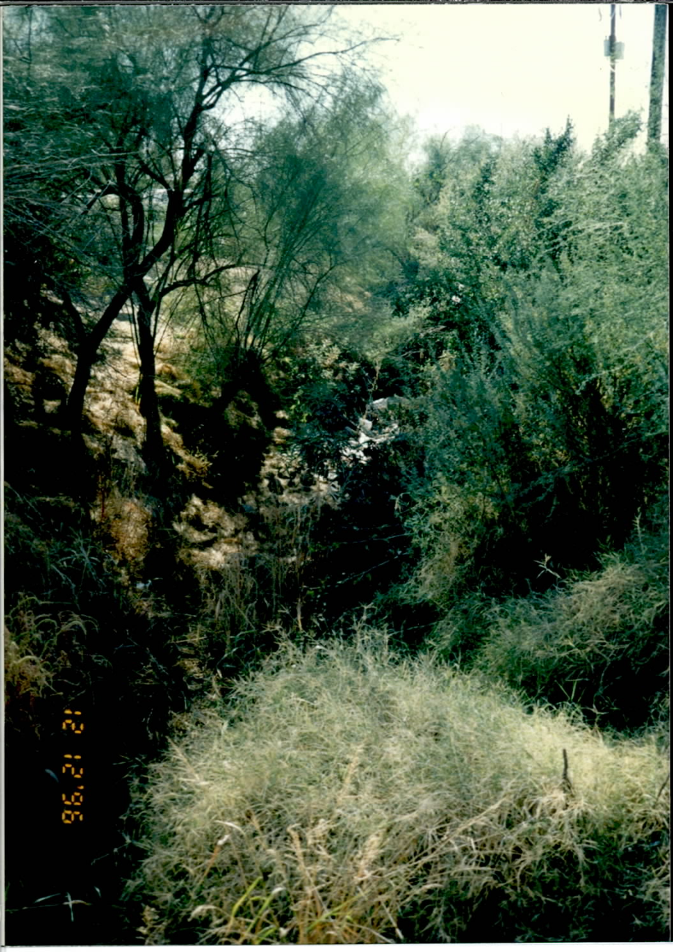


PHOTO 45	On top of Mountain View Road, looking downstream.

PHOTO 46	Just downstream of Mountain View Road, looking upstream.

PHOTO 47	On top of Mountain View Road, looking upstream.

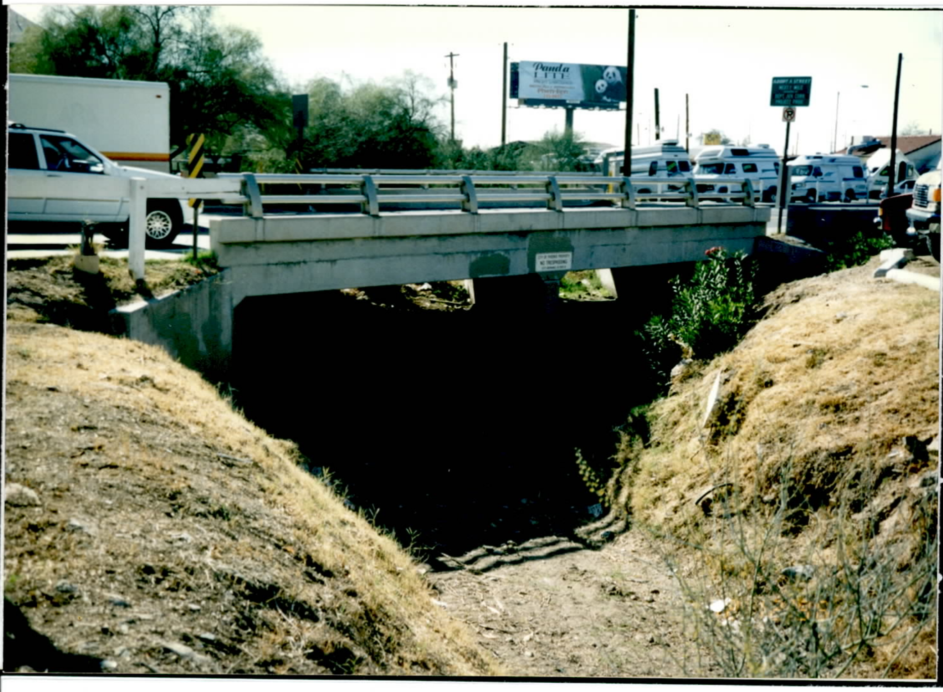


PHOTO 48	Just upstream of Mountain View Road, looking downstream.

PHOTO 49	Just downstream of Cave Creek Road, looking upstream.

PHOTO 50	On the right bank just downstream of Cave Creek Road, looking downstream.

PHOTO 51	In channel just upstream of Cave Creek Road, looking upstream.

PHOTO 52	On the right bank adjacent to Cinnebar Avenue and 12th Street, looking downstream.

PHOTO 53	At Cheryl Drive dip section, looking downstream.

PHOTO 54	At Cheryl Drive dip section, looking upstream (not part of study area).

PHOTO 55	On left bank looking east at detention basin #1 (not part of study area).

Description of Effective Flow Limits

5/22/97

River Station	Left Station Effective Flow Limit	Reason for Left Station Effective Flow Limit	Right Station Effective Flow Limit	Reason for Right Station Effective Flow Limit
0	9950*	Expansion limit from cross section 0.01	none	
0.01	none		11800	Limit defined so depth in overbank is less than 1 foot
0.08	none		11900	Limit defined so depth in overbank is less than 1 foot
0.16	none		10500	Limit defined so depth in overbank is less than 1 foot
0.24	none		10040*	Continuous walls in overbank prevent effective flow
0.33	none		10050*	Continuous walls in overbank prevent effective flow
0.35	none		10050*	Continuous walls in overbank prevent effective flow
0.41	none		10050*	Continuous walls in overbank prevent effective flow
0.48	none		10050*	Continuous walls in overbank prevent effective flow
0.54	none		10050*	Continuous walls in overbank prevent effective flow
0.57	none		10050*	Continuous walls in overbank prevent effective flow
0.72	none		none	
0.73	none		none	
0.79	none		none	
0.85	none		none	
0.86	none		none	
0.87	none		none	
0.89	9920	Expansion limit from a choke point just upstream	10590*	Watershed divide and split flow brink
0.929	none		10610*	Watershed divide and split flow brink
0.935	9950	Expansion limit from cross section 0.94	10020	Expansion limit from cross section 0.94
0.94	none		10630*	Watershed divide and split flow brink
0.96	9850	Contraction limit to cross section 0.94	10650	Watershed divide and split flow brink
0.99	none		10573.85	Watershed divide and split flow brink

* Limit of effective flow does not effect hydraulics

Description of Effective Flow Limits

5/22/97

River Station	Left Station Effective Flow Limit	Reason for Left Station Effective Flow Limit	Right Station Effective Flow Limit	Reason for Right Station Effective Flow Limit
0.998	9930	Expansion limit from cross section 1.005	10570	Watershed divide and split flow brink
1.005	none		10530*	Watershed divide and split flow brink
1.03	none		10530	Watershed divide and split flow brink
1.05	none		10510*	Watershed divide and split flow brink
1.06	9940	Expansion limit from cross section 1.07	10500*	Watershed divide and split flow brink
1.07	none		10490	Watershed divide and split flow brink
1.09	none		10440	Watershed divide and split flow brink
1.12	none		10350	Watershed divide and split flow brink
1.13	9970	Contraction limit to cross section 1.12	10330	Watershed divide and split flow brink
1.136	none		10120*	Watershed divide and split flow brink
1.138	none		10120	Watershed divide and split flow brink
1.18	none		10166.61	Watershed divide and split flow brink
1.22	none		10062.93*	Watershed divide and split flow brink
1.23	none		10076.61	Watershed divide and split flow brink
1.238	9860	Expansion limit from cross section 1.242	10133.77	Watershed divide and split flow brink
1.242	none		10106.91*	Watershed divide and split flow brink
1.244	none		10093.93	Watershed divide and split flow brink
1.27	none		10086.57	Watershed divide and split flow brink
1.35	none		10125	Watershed divide and split flow brink
1.38	none		10180*	Watershed divide
1.4	9982.98*	Defines minimum top of road	10038.11*	Watershed divide
1.46	none		10192.45*	Watershed divide
1.49	none		10108.86*	Watershed divide

* Limit of effective flow does not effect hydraulics

Description of Effective Flow Limits

5/22/97

River Station	Left Station Effective Flow Limit	Reason for Left Station Effective Flow Limit	Right Station Effective Flow Limit	Reason for Right Station Effective Flow Limit
1.527	none		10110.73*	Watershed divide
1.528	none		10116.35*	Watershed divide
1.55	none		10166.72*	Watershed divide
1.57	none		10160*	Watershed divide
1.61	none		10131.94*	Watershed divide
1.64	9830	Contraction limit to cross section 1.61	10180*	Watershed divide
1.65	9860	Expansion limit from choke point upstream of 1.66	10144.68*	Watershed divide
1.66	9900	Expansion limit from choke point upstream of 1.66	10050	Expansion limit from choke point upstream of 1.66

* Limit of effective flow does not effect hydraulics

Description of Floodplain Mapping Limits

5/26/97

River Station	Left Station Floodplain Limit	Reason for Left Station Floodplain Limit	Right Station Floodplain Limit	Reason for Right Station Floodplain Limit
0	9952	Edge of water	12730	Smooth transition from U/S floodplain limit
0.01	9992	Edge of water	11800	Adjusted until overbank depth was less than 1 foot
0.08	9988	Edge of water	11900	Adjusted until overbank depth was less than 1 foot
0.16	9875	Edge of water	10500	Based on a 2.5 to 1 expansion from U/S section
0.24	9845	Edge of water	10019	Edge of water
0.33	9977	Edge of water	10021	Edge of water
0.35	9985	Edge of water	10020	Edge of water
0.41	9980	Edge of water	10014	Edge of water
0.48	9987	Edge of water	10016	Edge of water
0.54	9978	Edge of water	10012	Edge of water
0.57	9942	Edge of water	10021	Edge of water
0.72	9968	Edge of water	10042	Edge of water
0.73	9990	Edge of water	10012	Edge of water
0.79	9990	Edge of water	10023	Edge of water
0.85	9892	Edge of water	10018	Edge of water
0.86	9867	Edge of water	10043	Edge of water
0.87	9919	Edge of water	10070	U/S overbank flows will most likely travel down the street at the floodplain limit
0.89	9829	Edge of water (note that effective flow limits were used)	10160	U/S overbank flows will most likely travel down the street at the floodplain limit
0.929	9958	Edge of water	10210	U/S overbank flows will most likely travel down the street at the floodplain limit
0.935	9886	Edge of water (note that effective flow limits were used)	10405	Low area in overbank causes wide floodplain
0.94	9870	Smooth transition from U/S and D/S floodplain limits	10520	Smooth transition from U/S and D/S floodplain limits

* Floodplain limit is defined by location of split flow brink

Description of Floodplain Mapping Limits

5/26/97

River Station	Left Station Floodplain Limit	Reason for Left Station Floodplain Limit	Right Station Floodplain Limit	Reason for Right Station Floodplain Limit
0.96	9785	Edge of water (note that effective flow limits were used)	10650*	Low area in overbank causes wide floodplain
0.99	9914	Edge of water	10574*	Low area in overbank causes wide floodplain
0.998	9887	Edge of water (note that effective flow limits were used)	10570*	Low area in overbank causes wide floodplain
1.005	9991	Edge of water	10513	Low area in overbank causes wide floodplain
1.03	9987	Edge of water	10530*	Low area in overbank causes wide floodplain
1.05	9946	Edge of water	10487	Low area in overbank causes wide floodplain
1.06	9896	Edge of water (note that effective flow limits were used)	10480	Low area in overbank causes wide floodplain
1.07	9989	Edge of water	10490*	Low area in overbank causes wide floodplain
1.09	9982	Edge of water	10440*	Low area in overbank causes wide floodplain
1.12	9989	Edge of water	10350*	Low area in overbank causes wide floodplain
1.13	9907	Edge of water (note that effective flow limits were used)	10330*	Low area in overbank causes wide floodplain
1.136	9811	Edge of water	10072	Edge of water
1.138	9793	Edge of water	10120*	Edge of water
1.18	9859	Edge of water	10166*	Edge of water
1.22	9865	Edge of water	10060	Edge of water
1.23	9822	Edge of water	10076*	Edge of water
1.238	9796	Edge of water (note that effective flow limits were used)	10133*	Edge of water
1.242	9872	Edge of water	10092	Edge of water
1.244	9847	Edge of water	10093*	Edge of water
1.27	9818	Edge of water	10087*	Edge of water
1.35	9932	Edge of water	10125*	Edge of water
1.38	9950	Edge of water	10106	Edge of water
1.4	9988	Edge of water	10015	Edge of water

* Floodplain limit is defined by location of split flow brink

Description of Floodplain Mapping Limits

5/26/97

River Station	Left Station Floodplain Limit	Reason for Left Station Floodplain Limit	Right Station Floodplain Limit	Reason for Right Station Floodplain Limit
1.46	9986	Edge of water	10030	Effective flow limit was used because flow was contained
1.49	9978	Edge of water	10018	Edge of water
1.527	9986	Edge of water	10011	Edge of water
1.528	9980	Edge of water	10014	Edge of water
1.55	9987	Edge of water	10012	Edge of water
1.57	9986	Edge of water	10091	Edge of water
1.61	9990	Edge of water	10053	Edge of water
1.64	9719	Edge of water (note that effective flow limits were used)	10099	Edge of water
1.65	9746	Edge of water (note that effective flow limits were used)	10071	Edge of water
1.66	9717	Edge of water (note that effective flow limits were used)	10101	Edge of water (note that effective flow limits were used)

* Floodplain limit is defined by location of split flow brink

10th Street Wash
Breakout Flow Summary

5/26/97

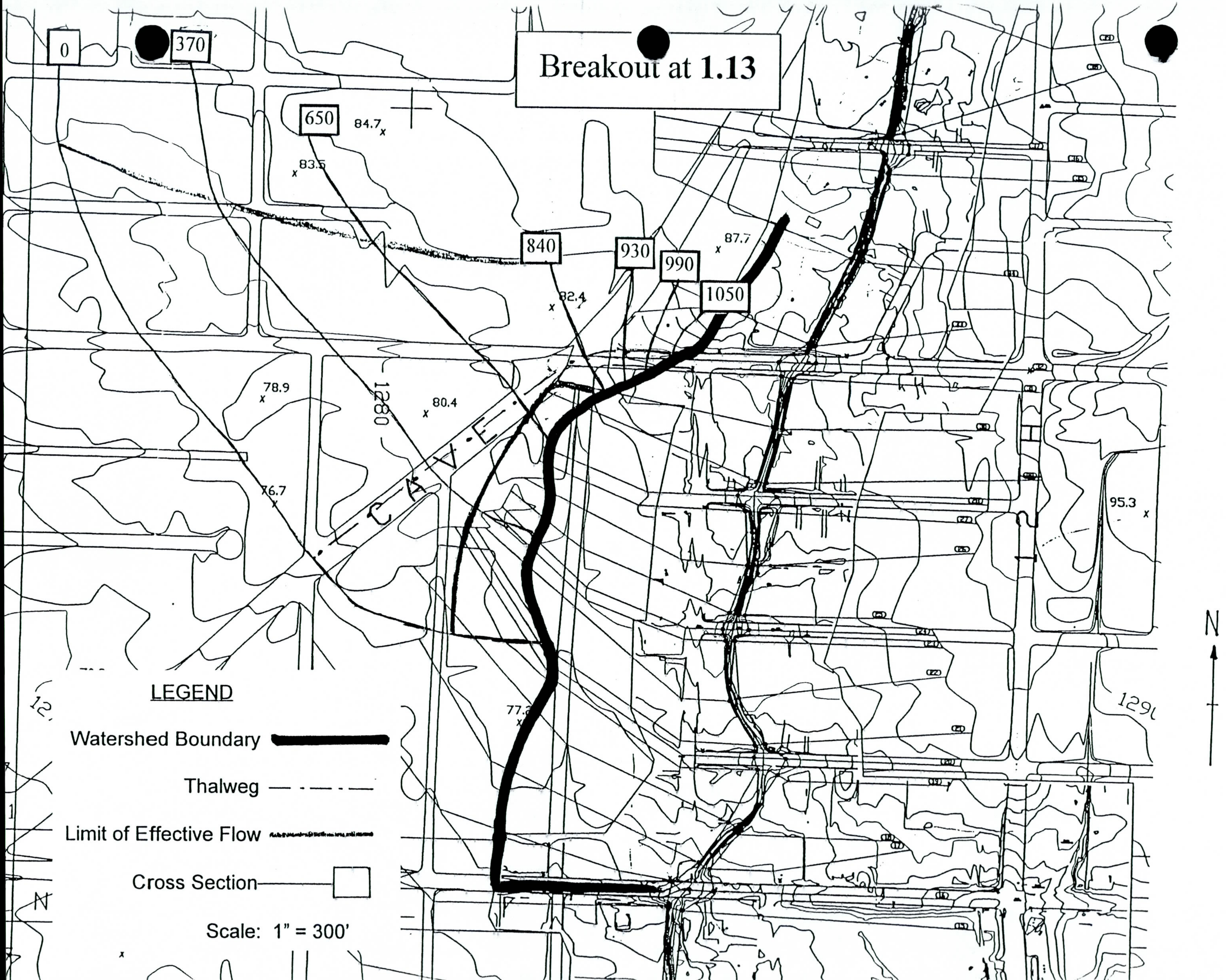
Cross Section	Original HEC-1 Discharge[1] (cfs)	Revised Discharge After Split Flow Analysis[1] (cfs)	Breakout Flows[2] (cfs)	Breakout Flow Fraction
1.66	600	600		
			0	0.00
1.527	840	840		
			80	0.10
1.27		760		
			40	0.05
1.244		720		
			N/A[3]	N/A[3]
1.242	1090	980		
			40	0.04
1.238		940		
			20	0.02
1.23		920		
			40	0.04
1.18		880		
			60	0.07
1.138		820		
			N/A[3]	N/A[3]
1.136	1220	960		
			80	0.08
1.13		880		
			320	0.36
1.12		560		
			140	0.25
1.09		420		
			40	0.10
1.07		380		
			40	0.11
0.96		340		
			0	0.00
0.57	1140	840		
			0	0.00
0.24	1500	1280		
			0	0.00
0.00				
		Total:	900	

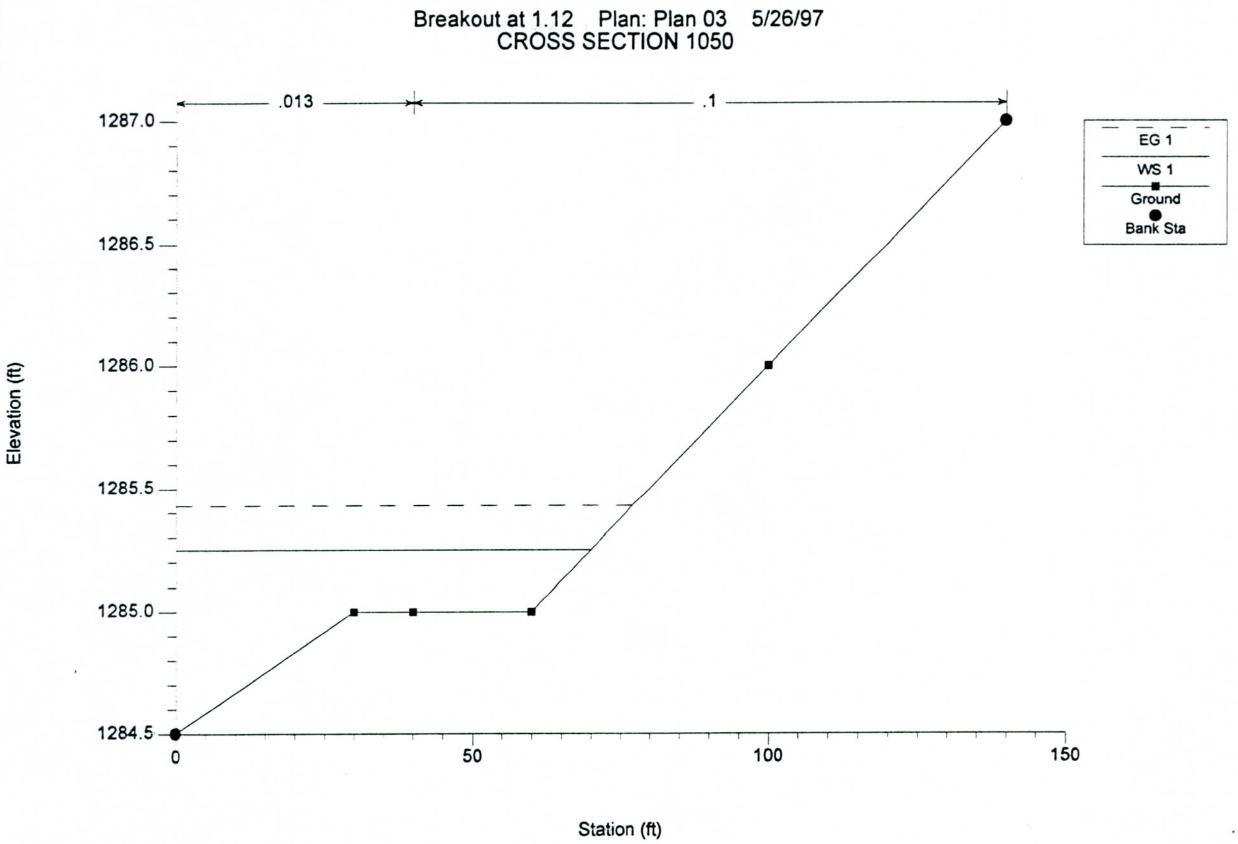
Notes

[1] The discharges are applied to the next downstream flow change. Values are rounded to the nearest 20 cfs.

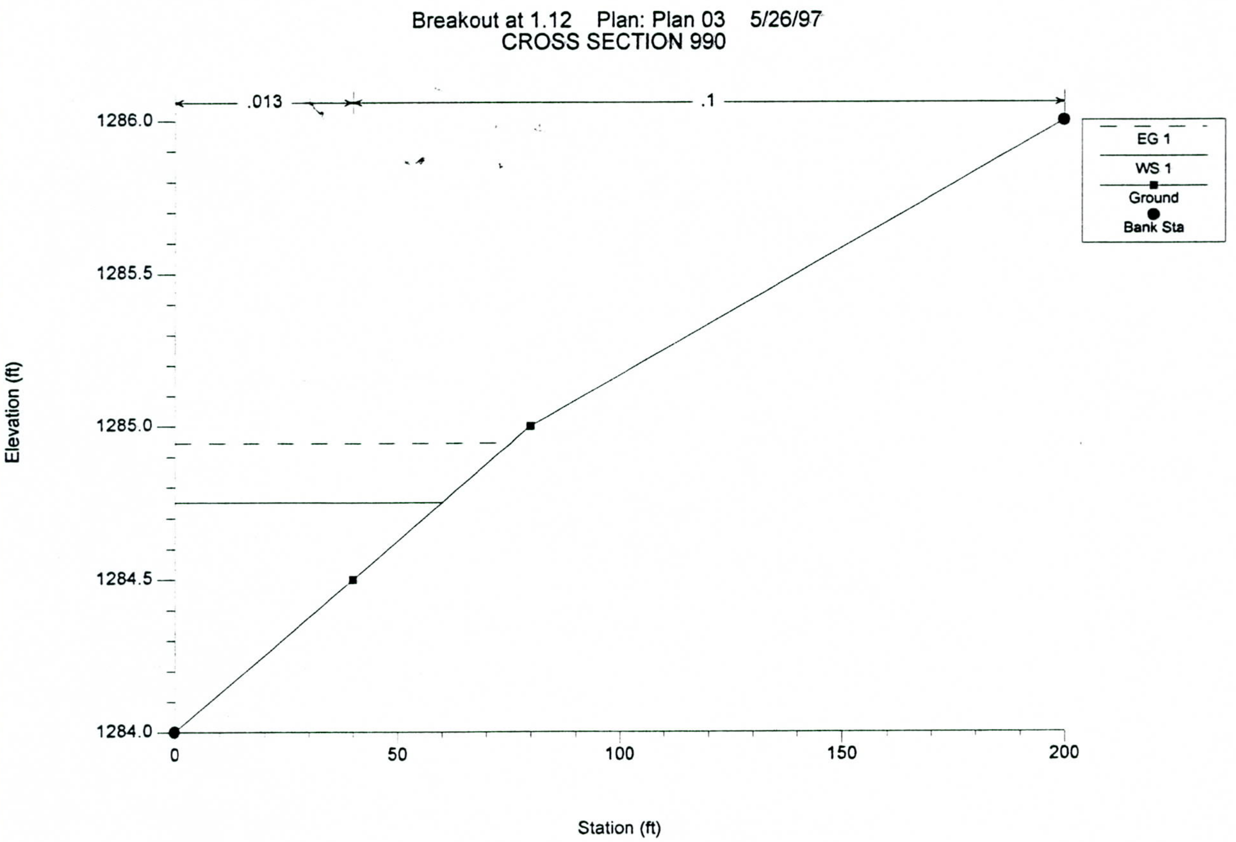
[2] Values shown are accumulated within reach, and are rounded to the nearest 20 cfs.

[3] Not applicable: Split flow was not computed. This reach is for a flow change transition due to an HEC-1 concentration point.

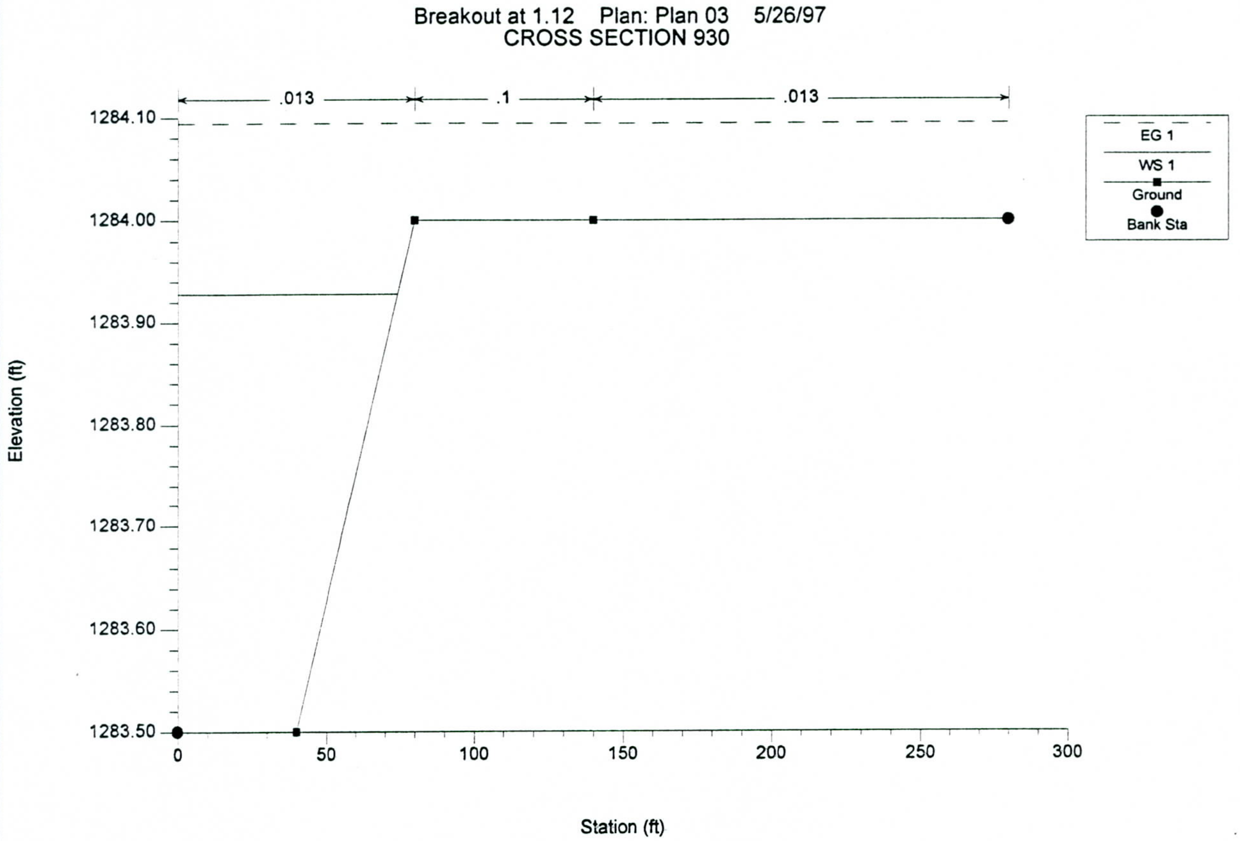

Breakout at 1.13
0
370
650
840
930
990
1050
84.7
83.5
87.7
82.4
78.9
80.4
76.7
77.2
95.3
1280
1290
N
LEGEND
Watershed Boundary
Thalweg
Limit of Effective Flow
Cross Section
Scale: 1" = 300'



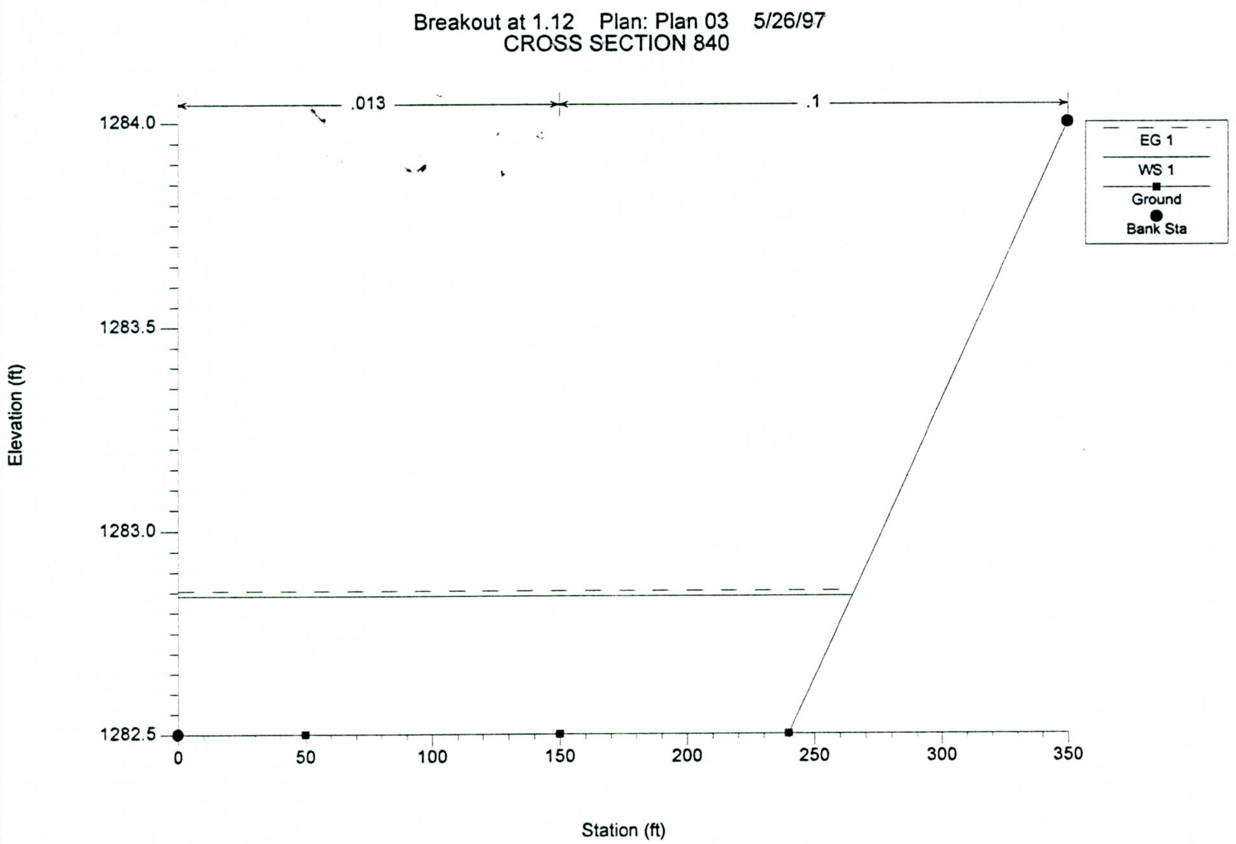
Breakout at 1.12 Plan: Plan 03 5/26/97
CROSS SECTION 1050
.013
.1
EG 1
WS 1
Ground
Bank Sta
Elevation (ft)
1287.0
1286.5
1286.0
1285.5
1285.0
1284.5
0
50
100
150
Station (ft)



Breakout at 1.12 Plan: Plan 03 5/26/97
CROSS SECTION 990
.013
.1
EG 1
WS 1
Ground
Bank Sta
Elevation (ft)
1286.0
1285.5
1285.0
1284.5
1284.0
0
50
100
150
200
Station (ft)

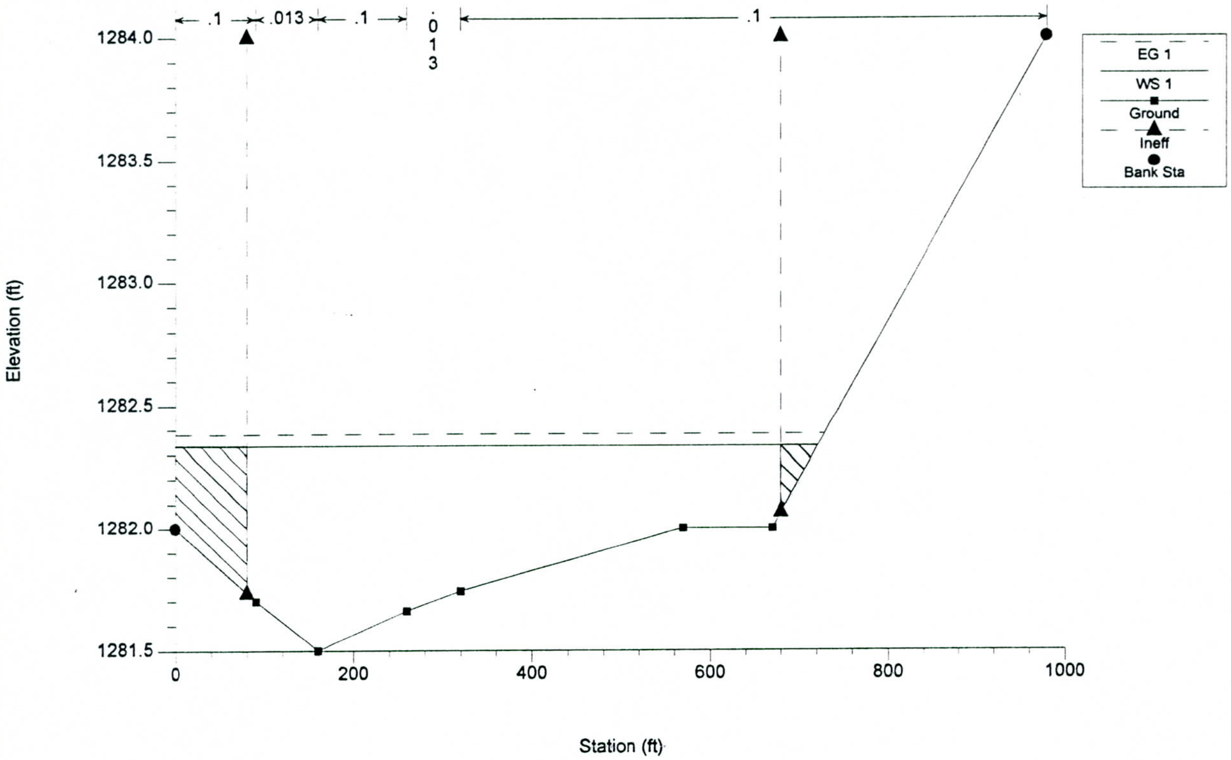


Breakout at 1.12 Plan: Plan 03 5/26/97
CROSS SECTION 930
.013
.1
.013
1284.10
1284.00
1283.90
1283.80
1283.70
1283.60
1283.50
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
EG 1
WS 1
Ground
Bank Sta

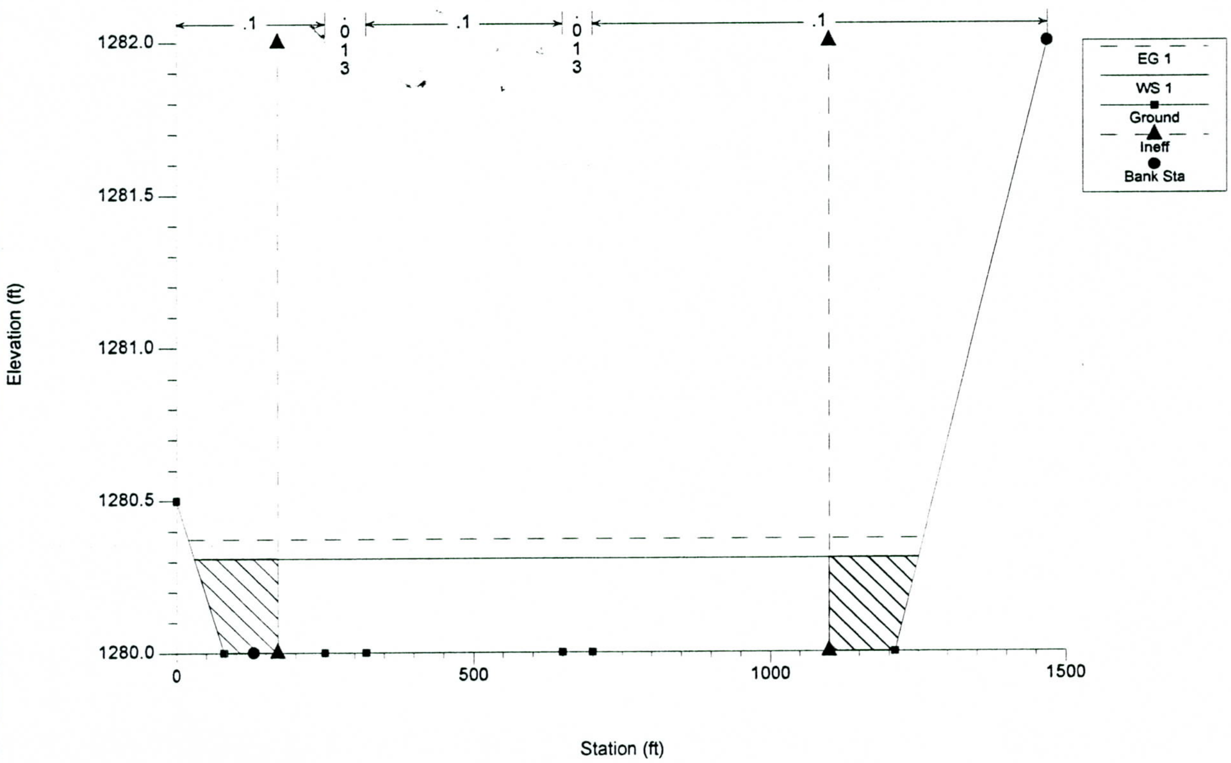


Breakout at 1.12 Plan: Plan 03 5/26/97
CROSS SECTION 840
.013
.1
1284.0
1283.5
1283.0
1282.5
Elevation (ft)
0
50
100
150
200
250
300
350
Station (ft)
EG 1
WS 1
Ground
Bank Sta

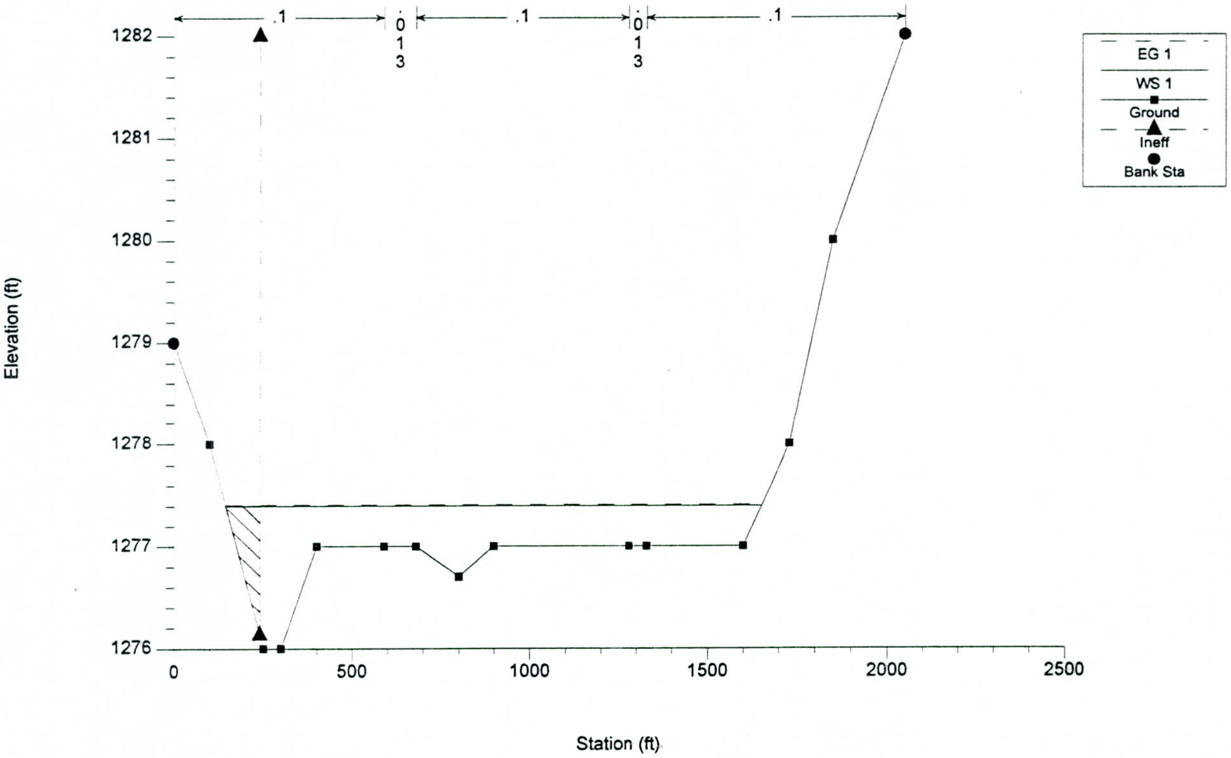
Breakout at 1.12 Plan: Plan 03 5/26/97
CROSS SECTION 650

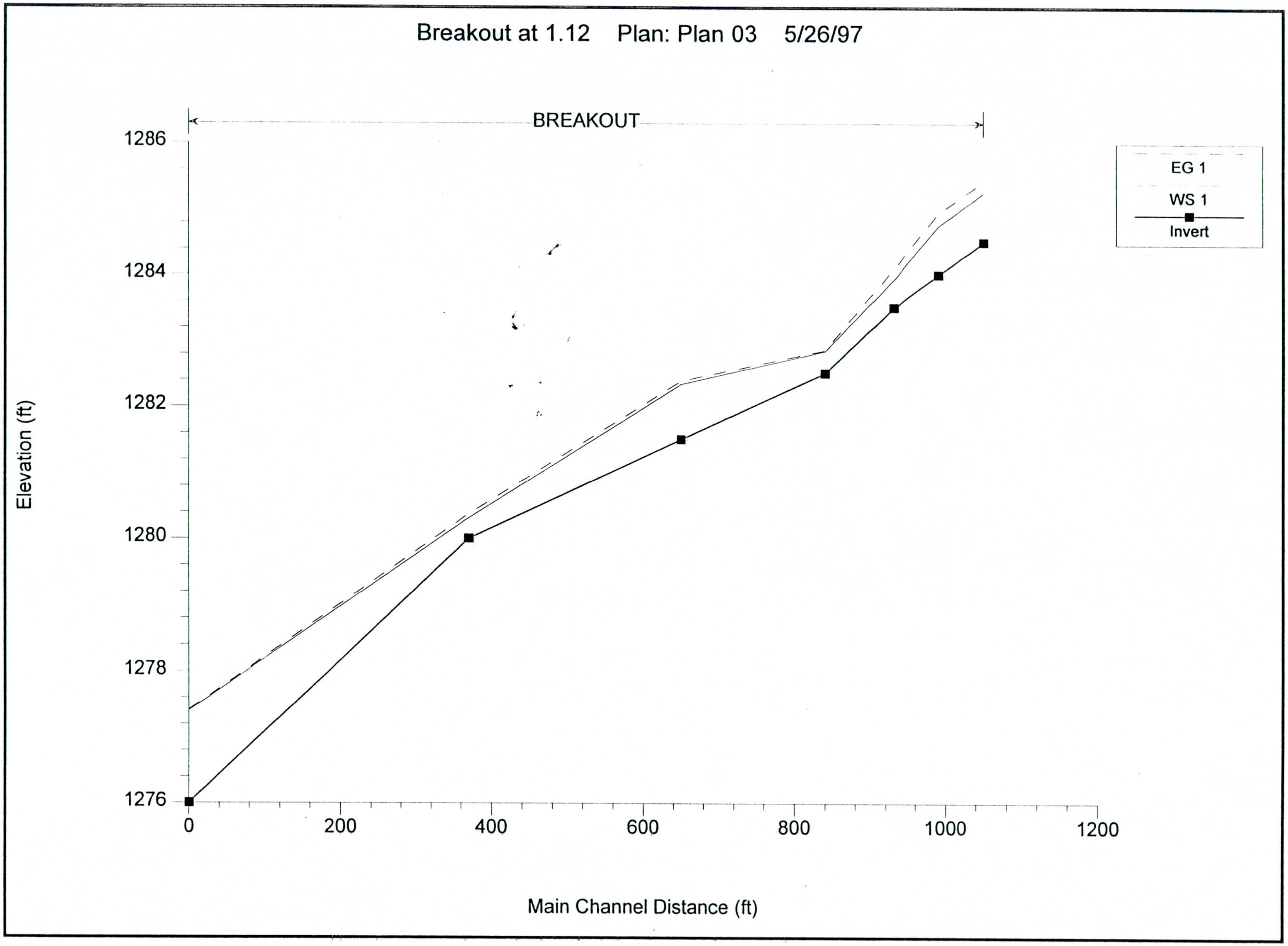


Breakout at 1.12 Plan: Plan 03 5/26/97
CROSS SECTION 370



Breakout at 1.12 Plan: Plan 03 5/26/97
CROSS SECTION 0





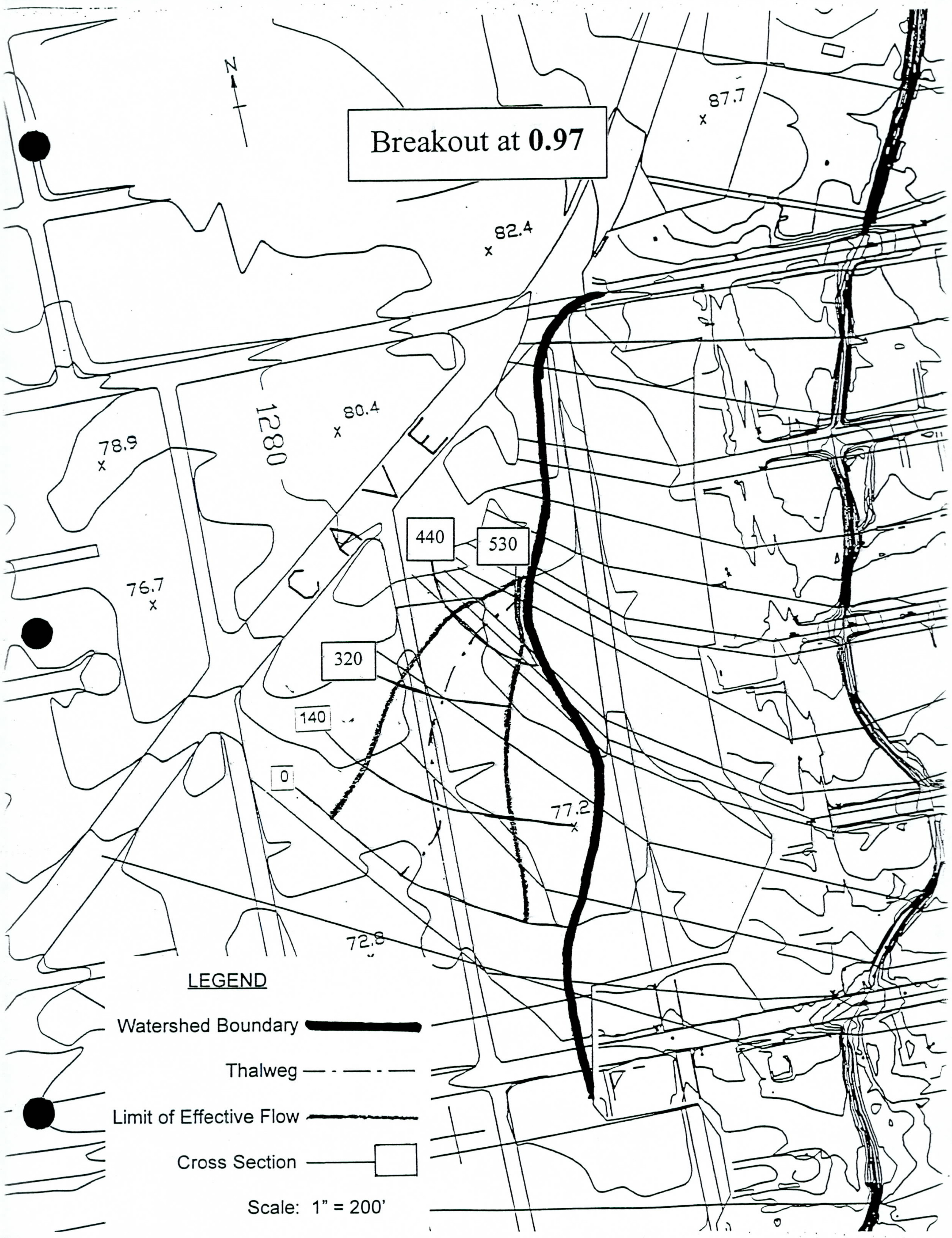
Breakout at 1.12 Plan: Plan 03 5/26/97
BREAKOUT
EG 1
WS 1
Invert
Elevation (ft)
1276
1278
1280
1282
1284
1286
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

HEC-RAS   Plan: Plan 03   Reach: BREAKOUT   5/26/97

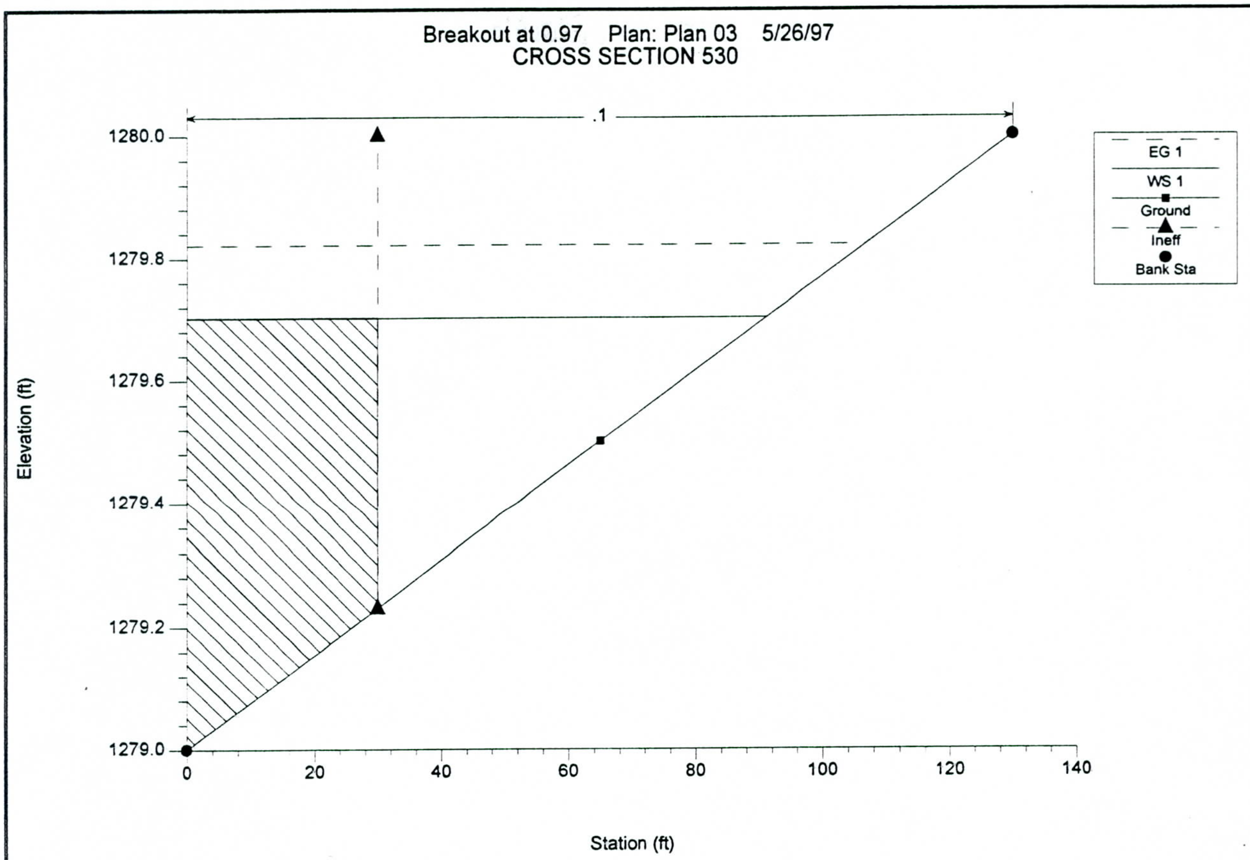
River Sta.	Max Chl Dpth (ft)	Hydr Depth (ft)
0	1.40	0.50
370	0.31	0.31
650	0.83	0.54
840	0.34	0.32
930	0.43	0.33
990	0.75	0.38
1050	0.75	0.34

HEC-RAS Plan: Plan 03 Reach: BREAKOUT 5/26/97

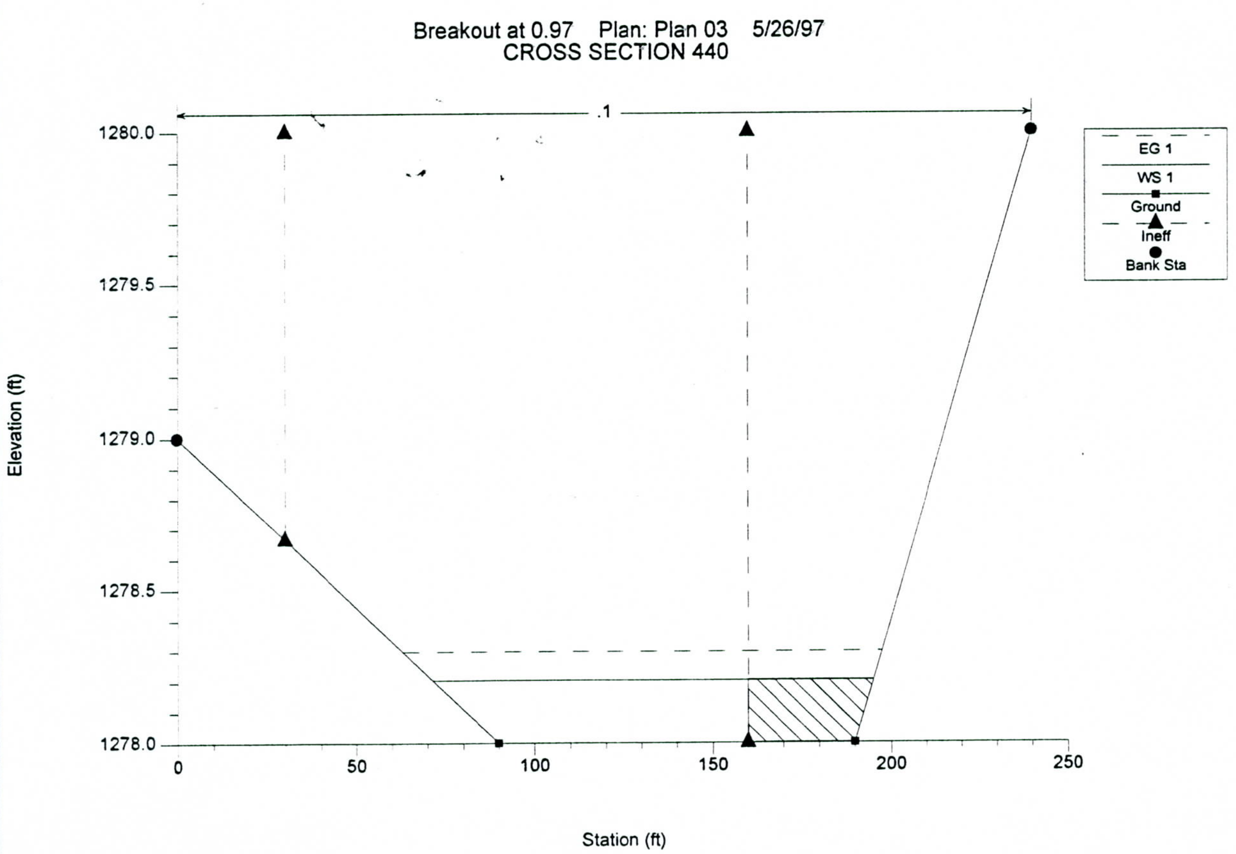
River Sta.	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
0	620.00	1276.00	1277.40	1277.08	1277.41	0.003999	0.89	699.70	1507.43	0.22
370	580.00	1280.00	1280.31	1280.23	1280.37	0.025275	2.01	287.90	1219.78	0.64
650	580.00	1281.50	1282.33	1282.11	1282.38	0.003239	1.80	321.86	721.37	0.43
840	80.00	1282.50	1282.84		1282.85	0.000676	0.93	85.96	264.97	0.29
930	80.00	1283.50	1283.93	1283.93	1284.09	0.003637	3.27	24.44	74.23	1.01
990	80.00	1284.50	1284.75	1284.75	1284.95	0.003069	3.53	22.65	60.21	1.01
1050	80.00	1285.00	1285.25	1285.25	1285.43	0.004627	3.36	23.83	70.04	1.01



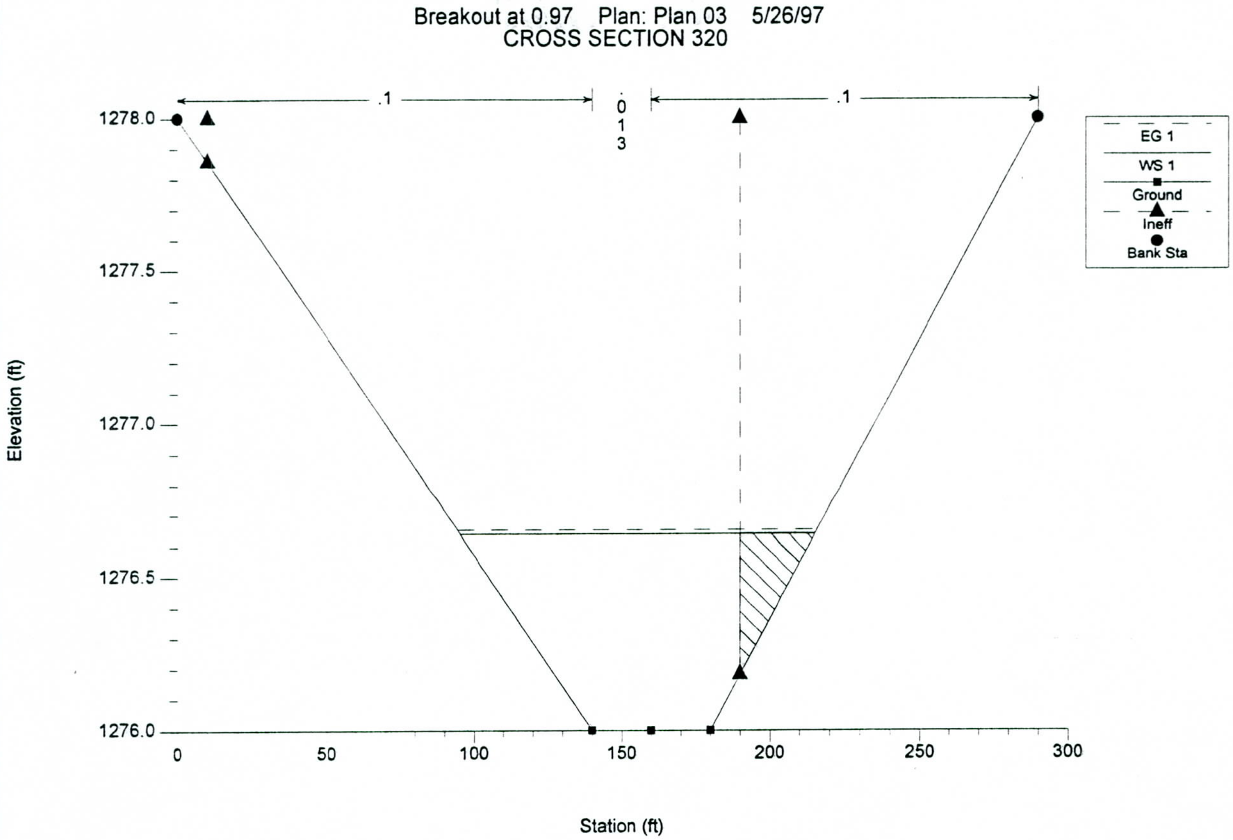
Breakout at **0.97**
N
87.7
82.4
80.4
78.9
76.7
77.2
72.8
1280
AVE
440
530
320
140
0
LEGEND
Watershed Boundary
Thalweg
Limit of Effective Flow
Cross Section
Scale: 1" = 200'

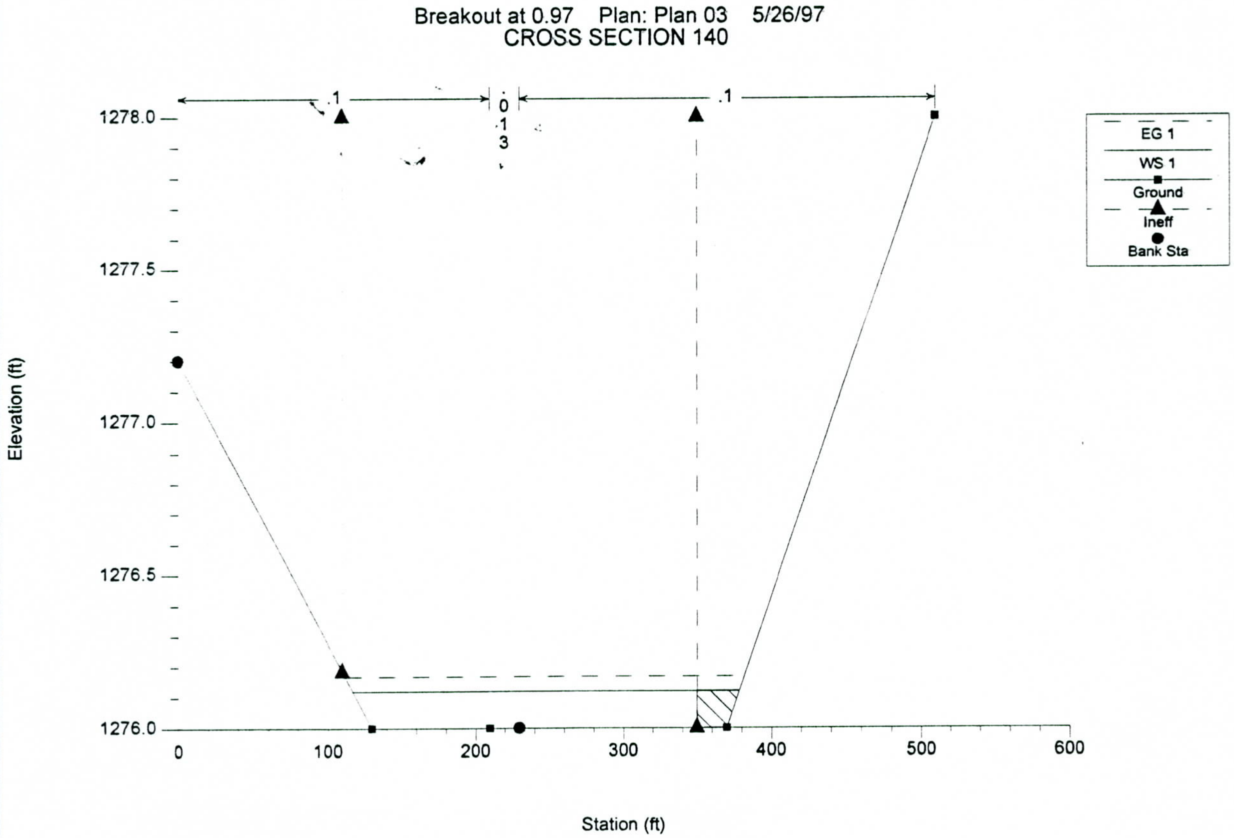


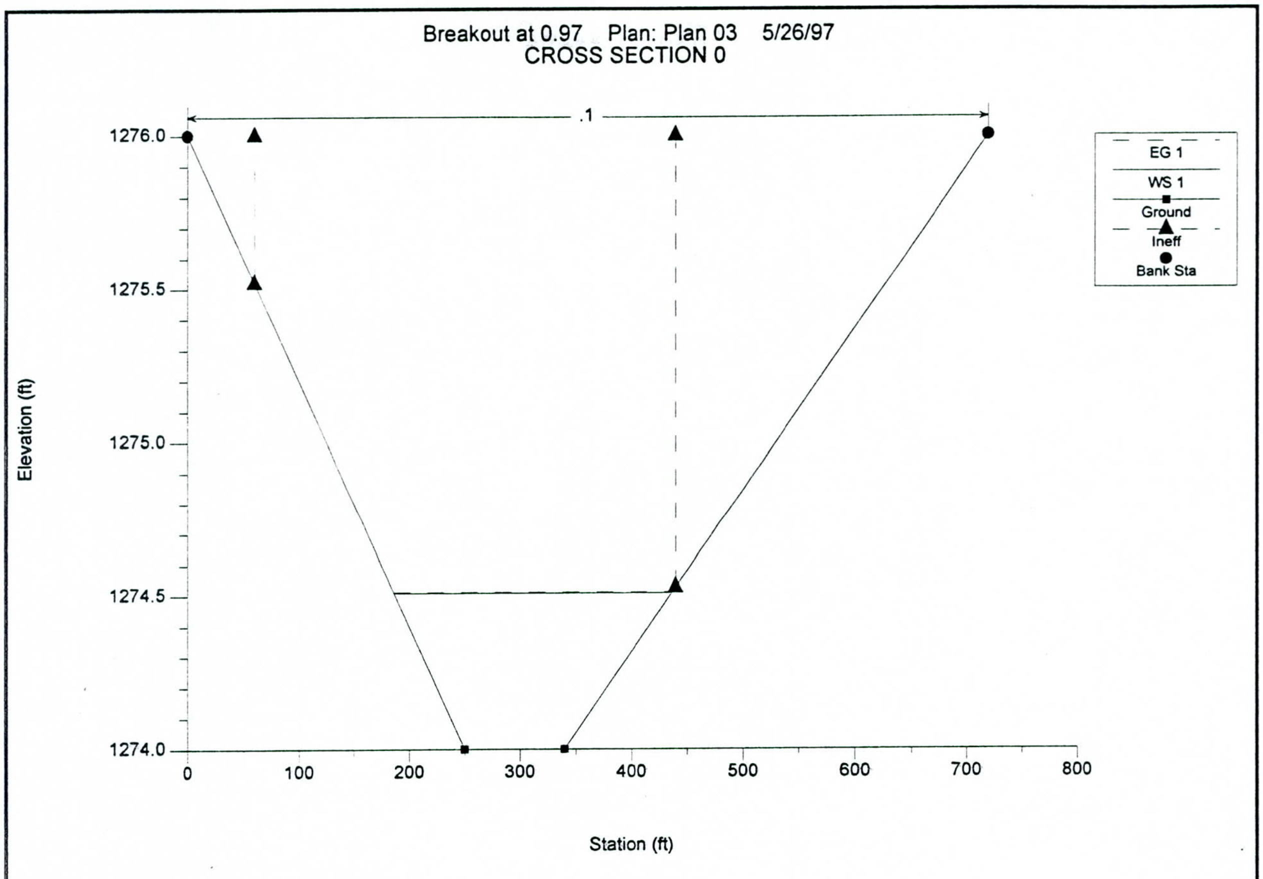
Breakout at 0.97 Plan: Plan 03 5/26/97
CROSS SECTION 530
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1280.0
1279.8
1279.6
1279.4
1279.2
1279.0
Elevation (ft)
0
20
40
60
80
100
120
140
Station (ft)

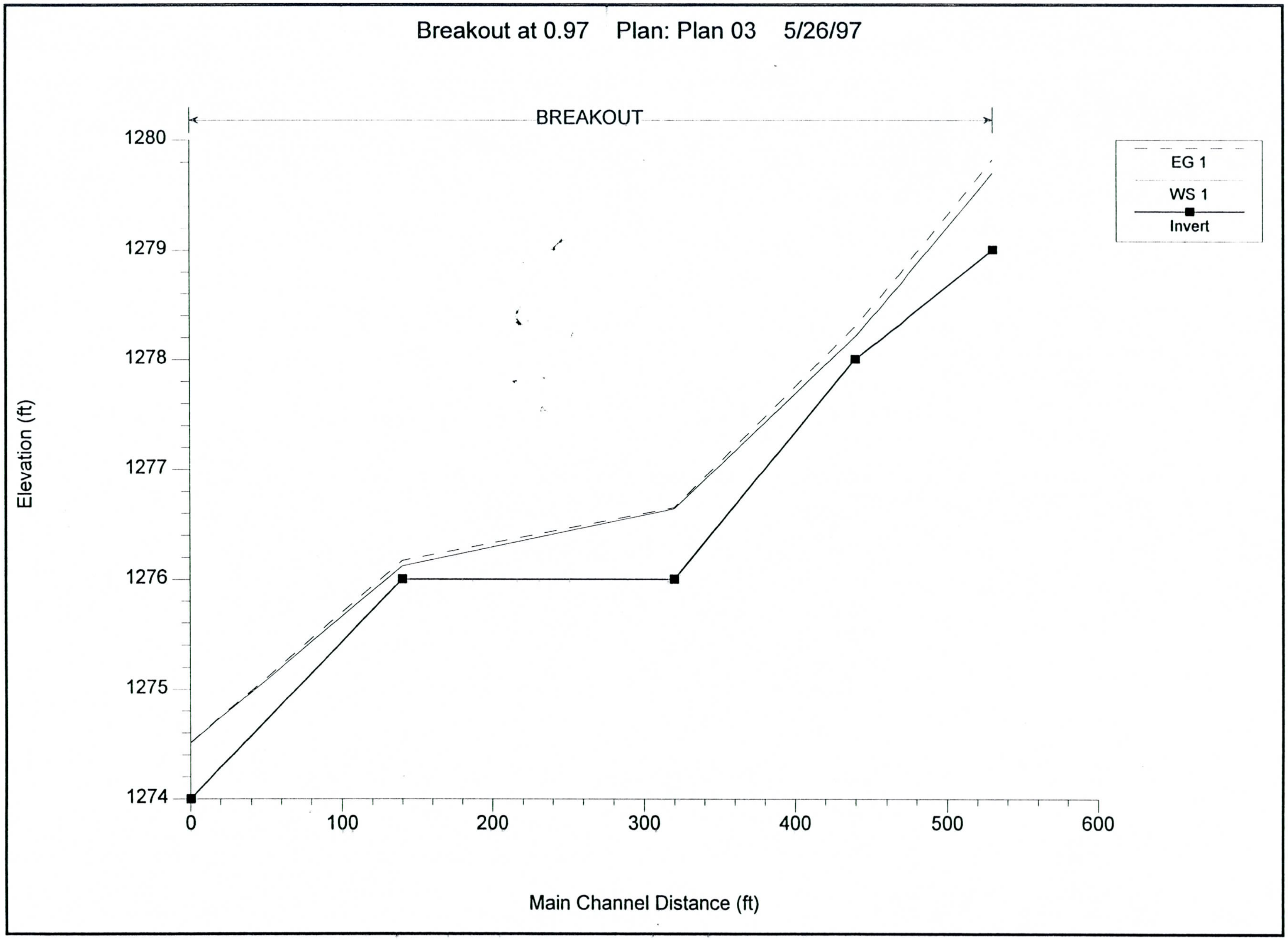


Breakout at 0.97 Plan: Plan 03 5/26/97
CROSS SECTION 440
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1280.0
1279.5
1279.0
1278.5
1278.0
Elevation (ft)
0
50
100
150
200
250
Station (ft)


Breakout at 0.97 Plan: Plan 03 5/26/97
CROSS SECTION 320
.1
0
1
3
.1
1278.0
1277.5
1277.0
1276.5
1276.0
Elevation (ft)
0
50
100
150
200
250
300
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta


Breakout at 0.97 Plan: Plan 03 5/26/97
CROSS SECTION 140
.1
0
.1
3
.1
1278.0
1277.5
1277.0
1276.5
1276.0
Elevation (ft)
0
100
200
300
400
500
600
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta


Breakout at 0.97 Plan: Plan 03 5/26/97
CROSS SECTION 0
.1
1276.0
1275.5
1275.0
1274.5
1274.0
Elevation (ft)
0
100
200
300
400
500
600
700
800
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta



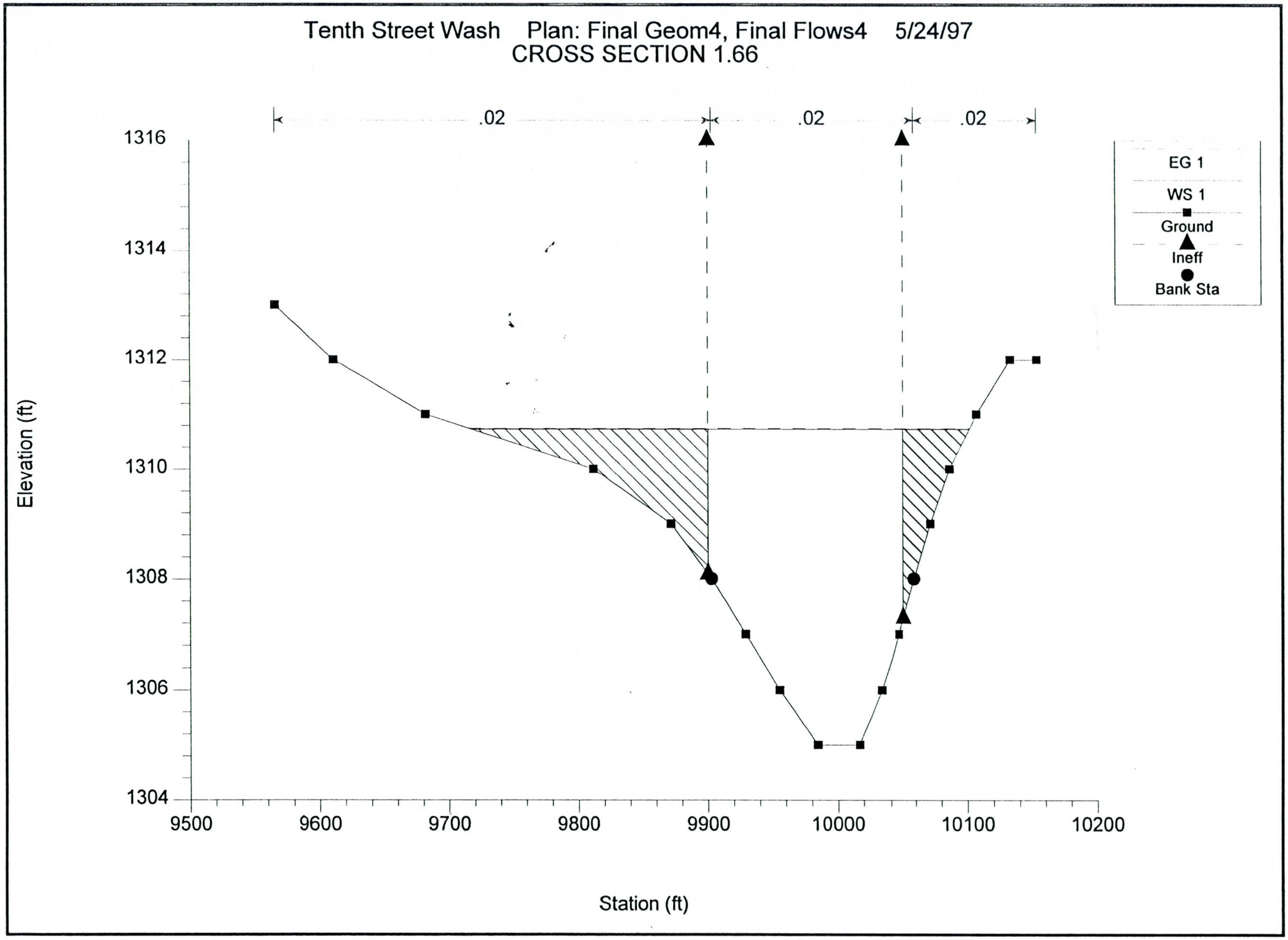
Breakout at 0.97 Plan: Plan 03 5/26/97
BREAKOUT
EG 1
WS 1
Invert
Elevation (ft)
1274
1275
1276
1277
1278
1279
1280
0
100
200
300
400
500
600
Main Channel Distance (ft)

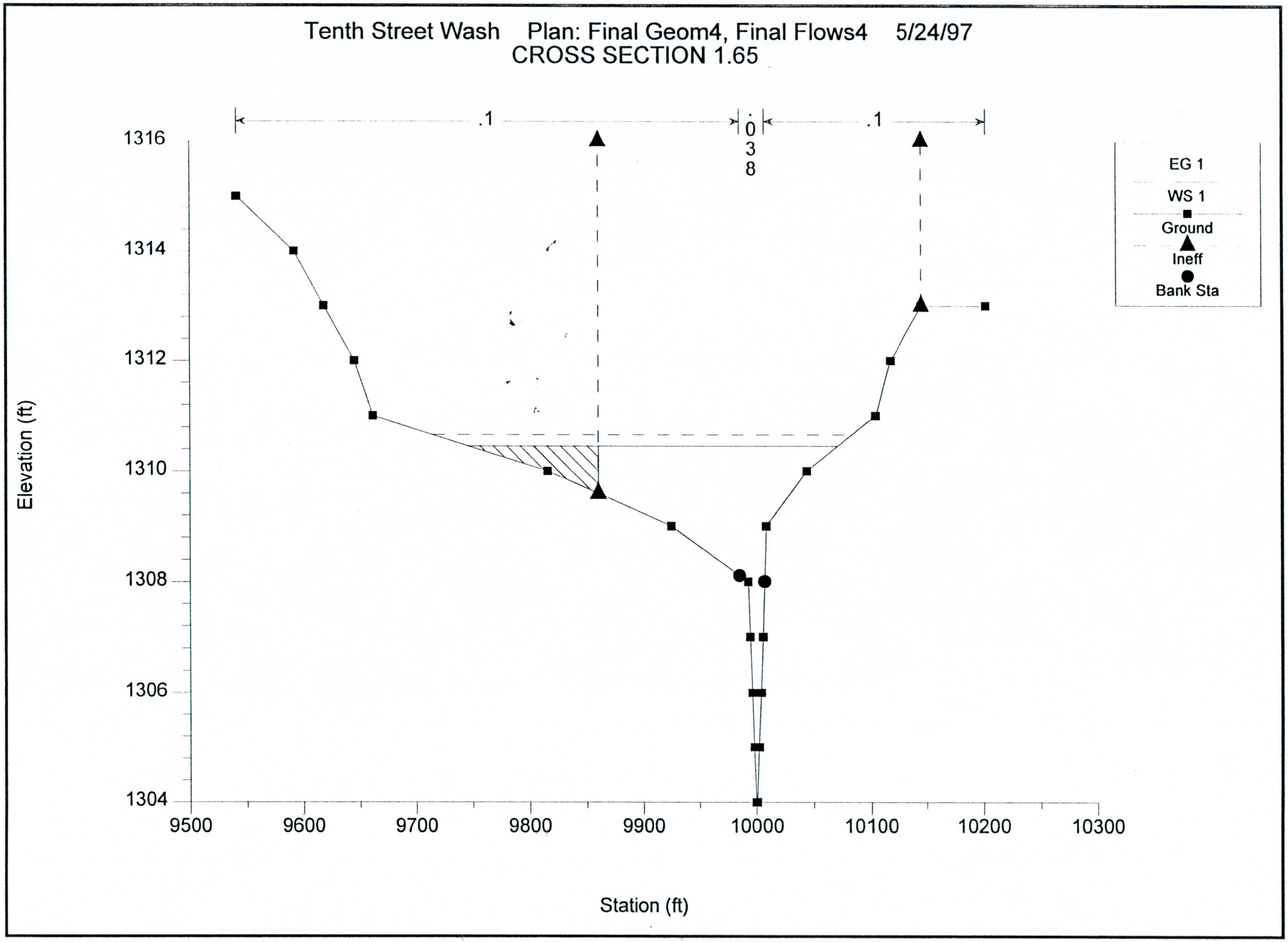
HEC-RAS Plan: Plan 03 Reach: BREAKOUT 5/26/97

River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
0	40.00	1274.00	1274.51	1274.17	1274.51	0.004003	0.46	86.41	250.08	0.14
140	40.00	1276.00	1276.12	1276.12	1276.17	0.067452	2.08	27.12	261.36	1.09
320	40.00	1276.00	1276.64	1276.27	1276.65	0.000846	0.88	45.27	119.79	0.23
440	40.00	1278.00	1278.21	1278.21	1278.30	0.258099	2.45	16.35	123.71	1.00
530	40.00	1279.50	1279.70	1279.70	1279.82	0.239563	2.77	14.42	91.23	3.22

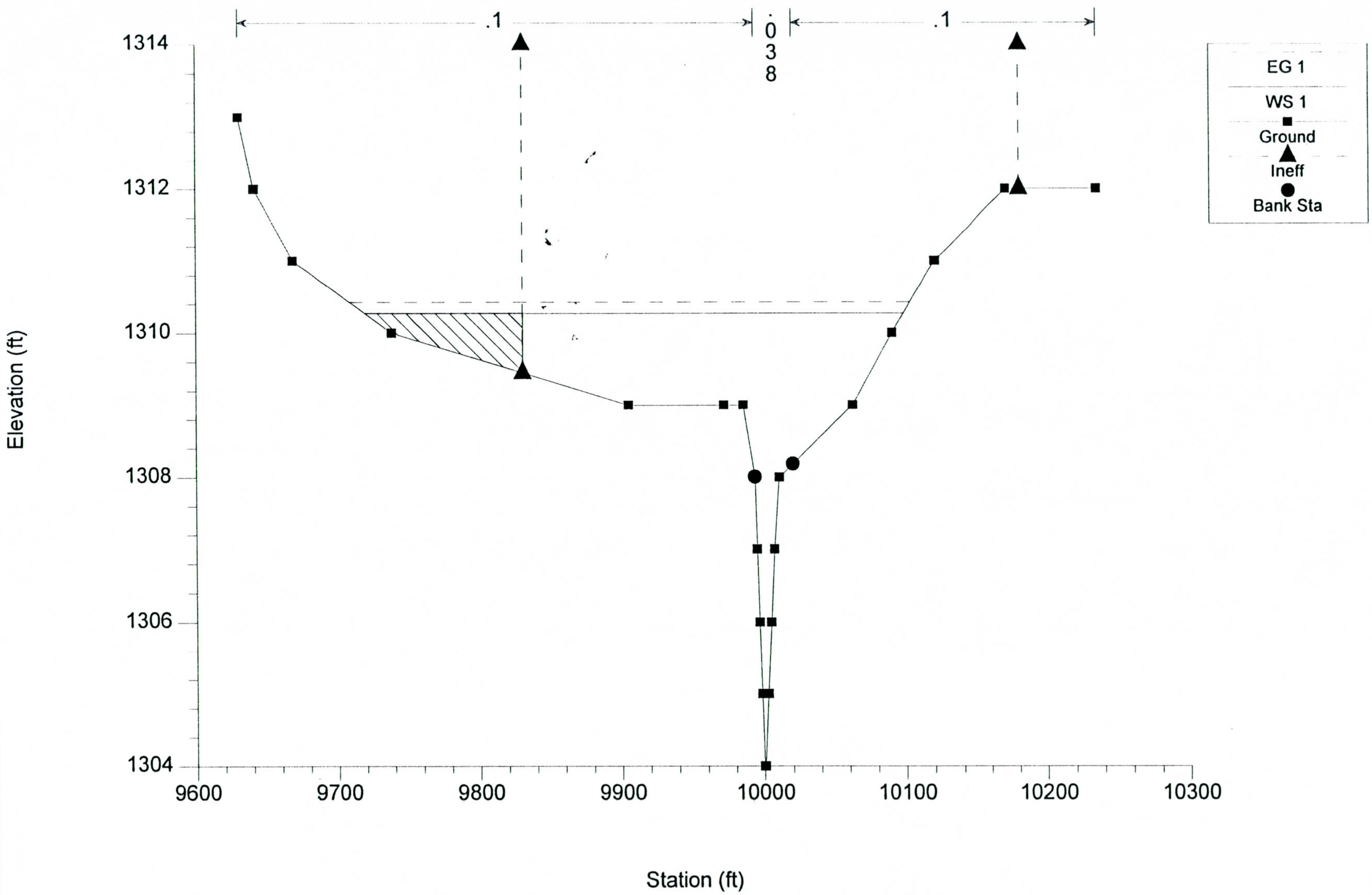
HEC-RAS Plan: Plan 03 Reach: BREAKOUT 5/26/97

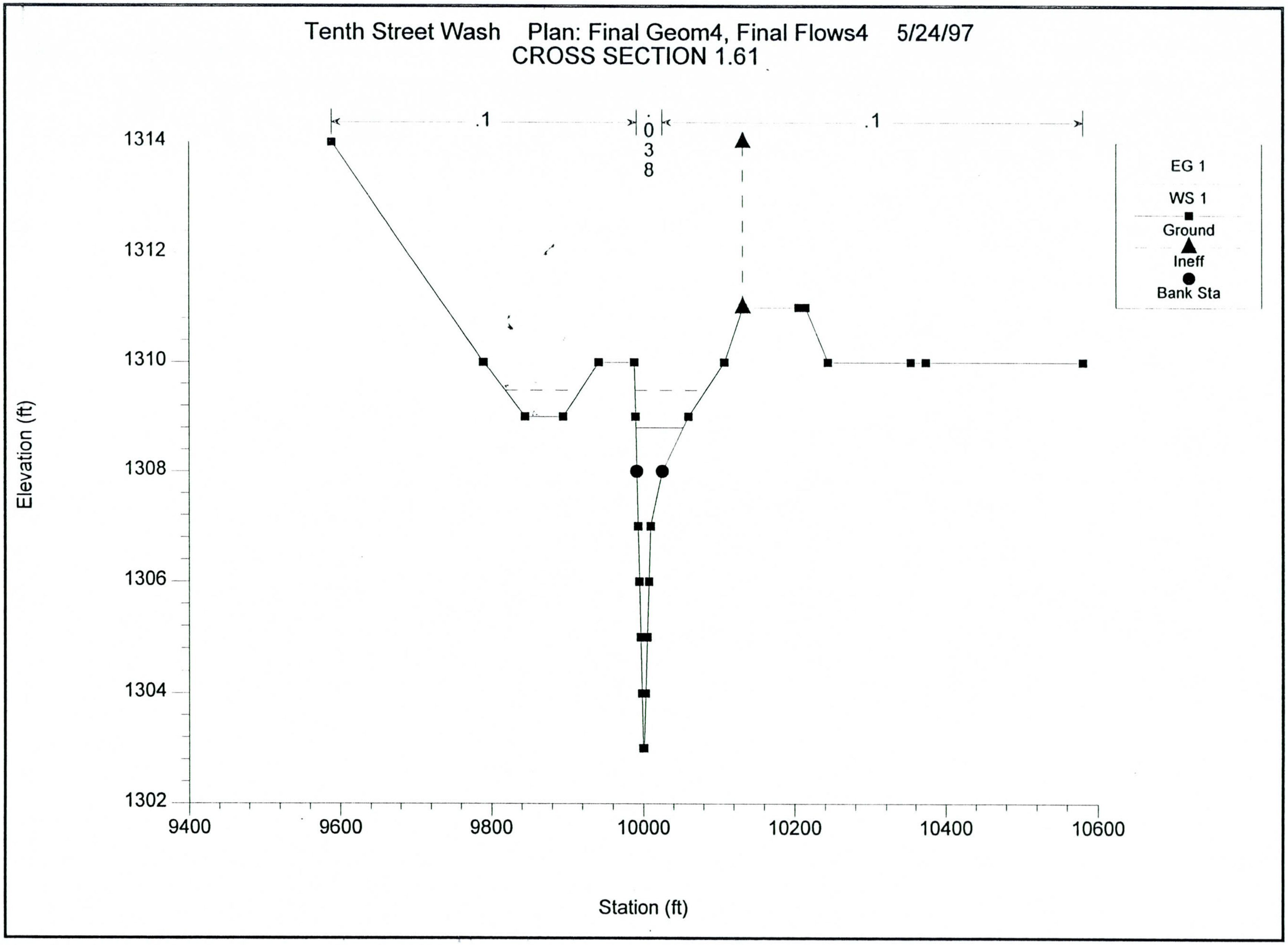
River Sta	Max Chl Dpth	Hydr Depth
	(ft)	(ft)
0	0.51	0.35
140	0.12	0.12
320	0.64	0.48
440	0.21	0.18
530	0.70	0.24


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.66
.02
.02
.02
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1316
1314
1312
1310
1308
1306
1304
9500
9600
9700
9800
9900
10000
10100
10200
Station (ft)

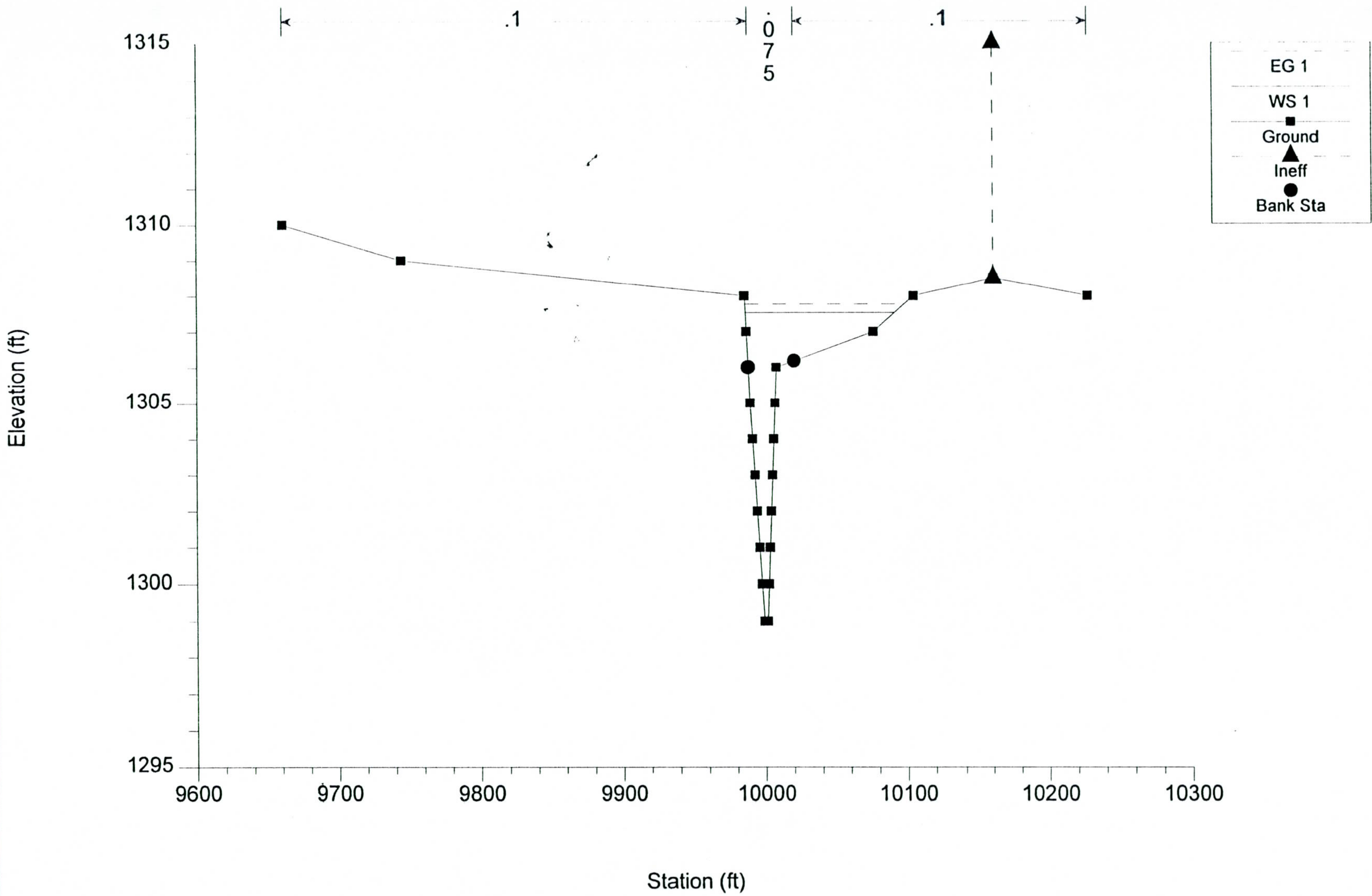

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.65
.1
.038
.1
Elevation (ft)
1316
1314
1312
1310
1308
1306
1304
Station (ft)
9500
9600
9700
9800
9900
10000
10100
10200
10300
EG 1
WS 1
Ground
Ineff
Bank Sta

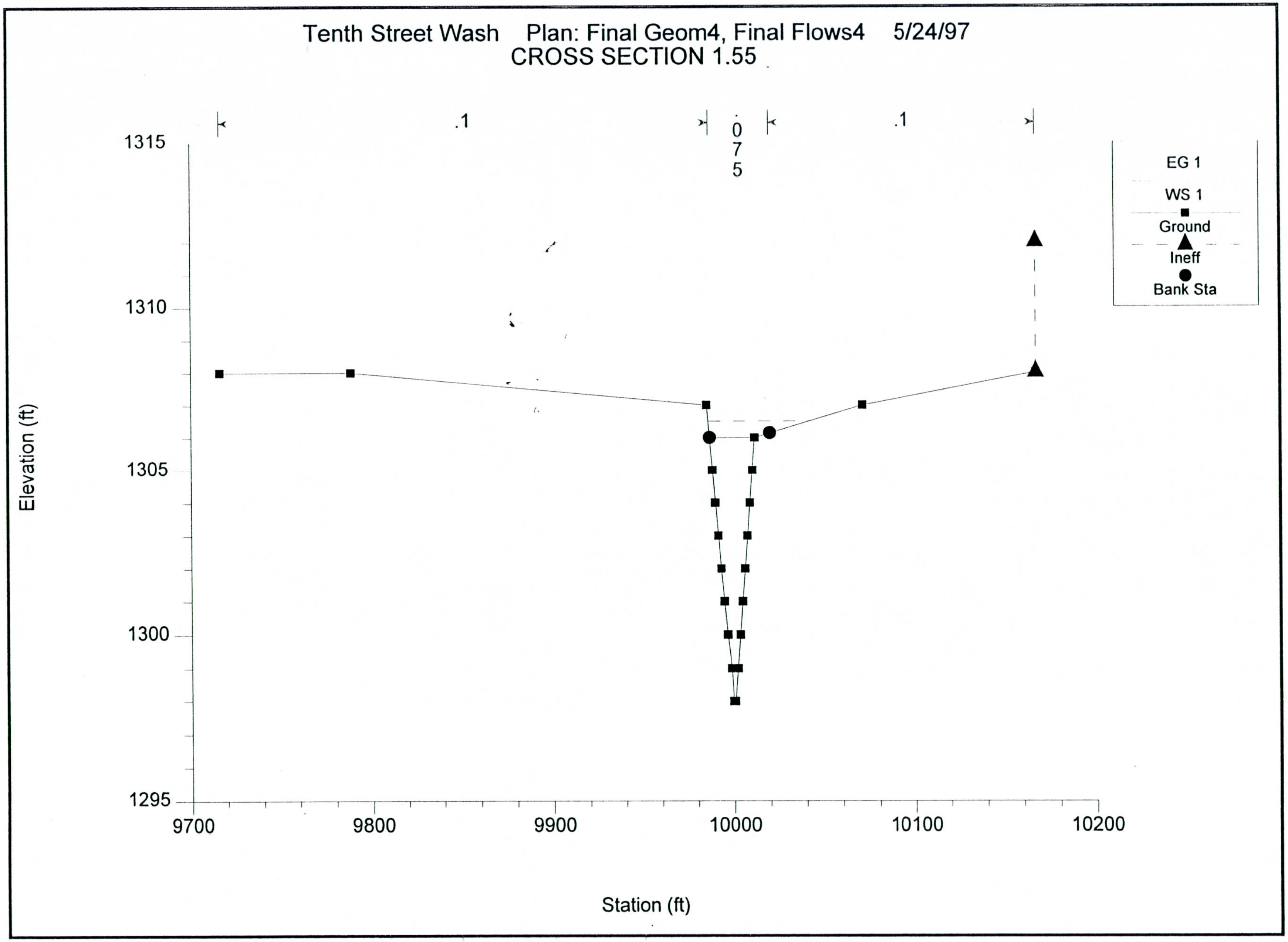
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.64



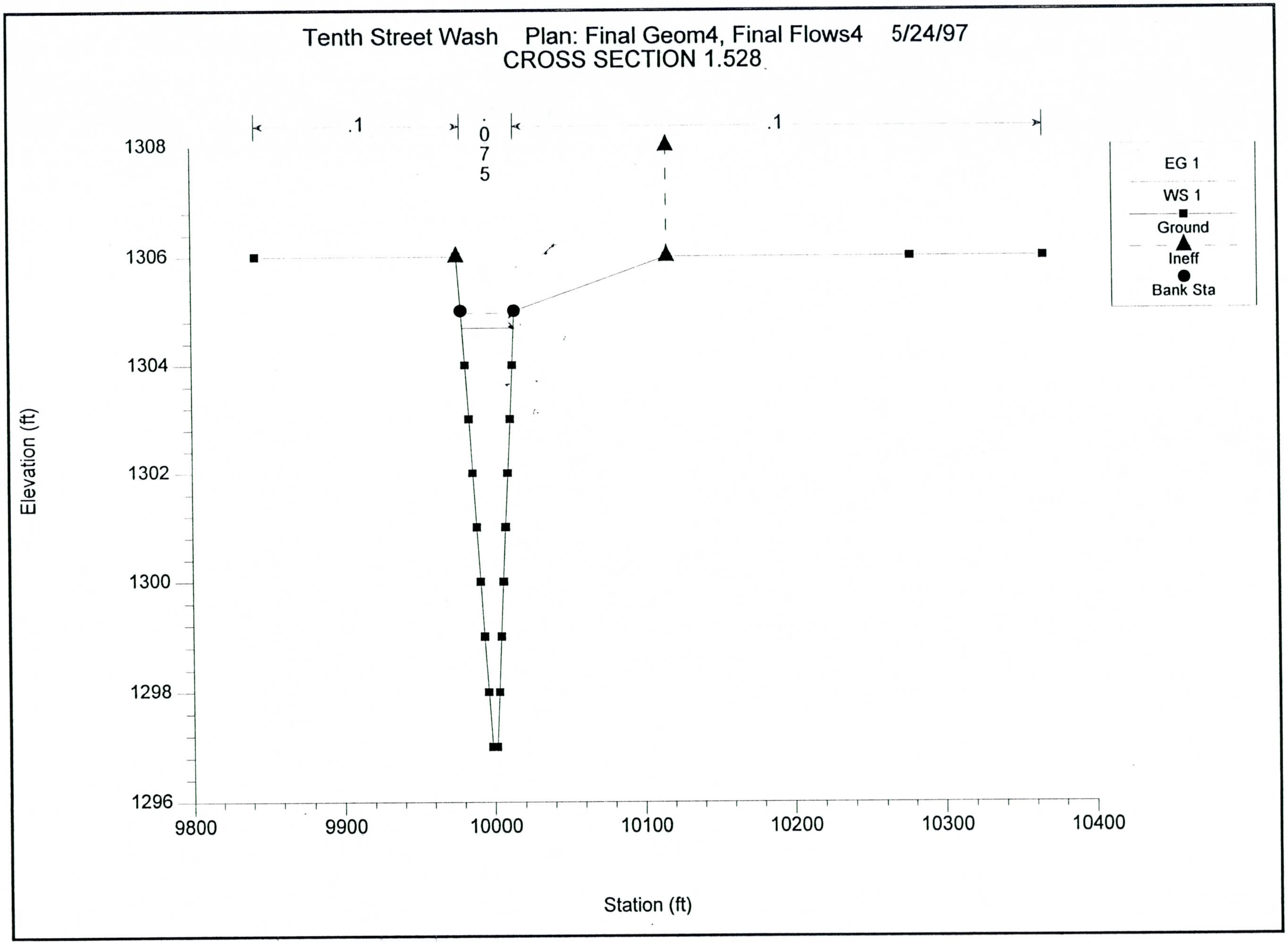

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.61
.1
.038
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1314
1312
1310
1308
1306
1304
1302
9400
9600
9800
10000
10200
10400
10600
Station (ft)

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.57



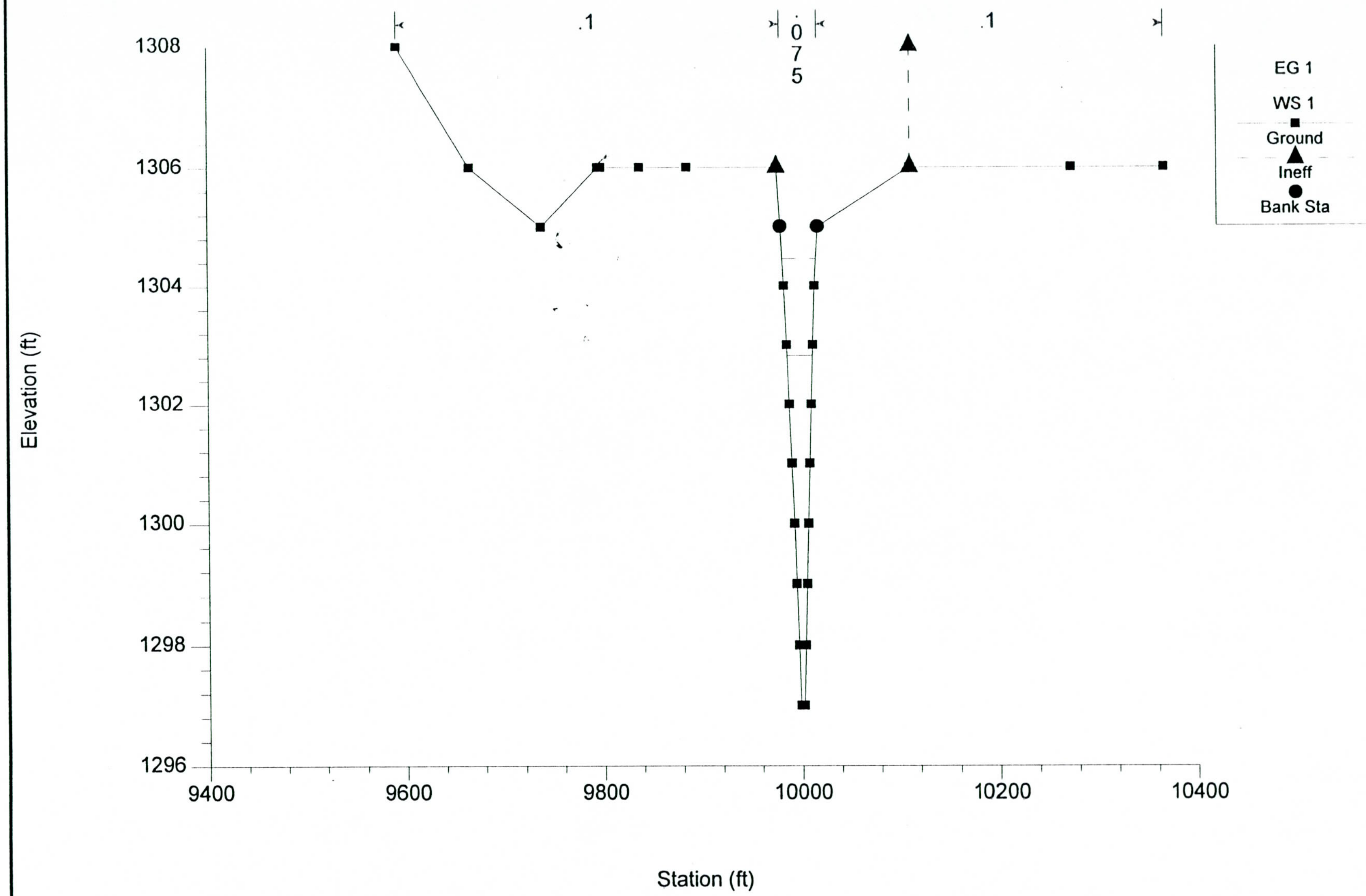


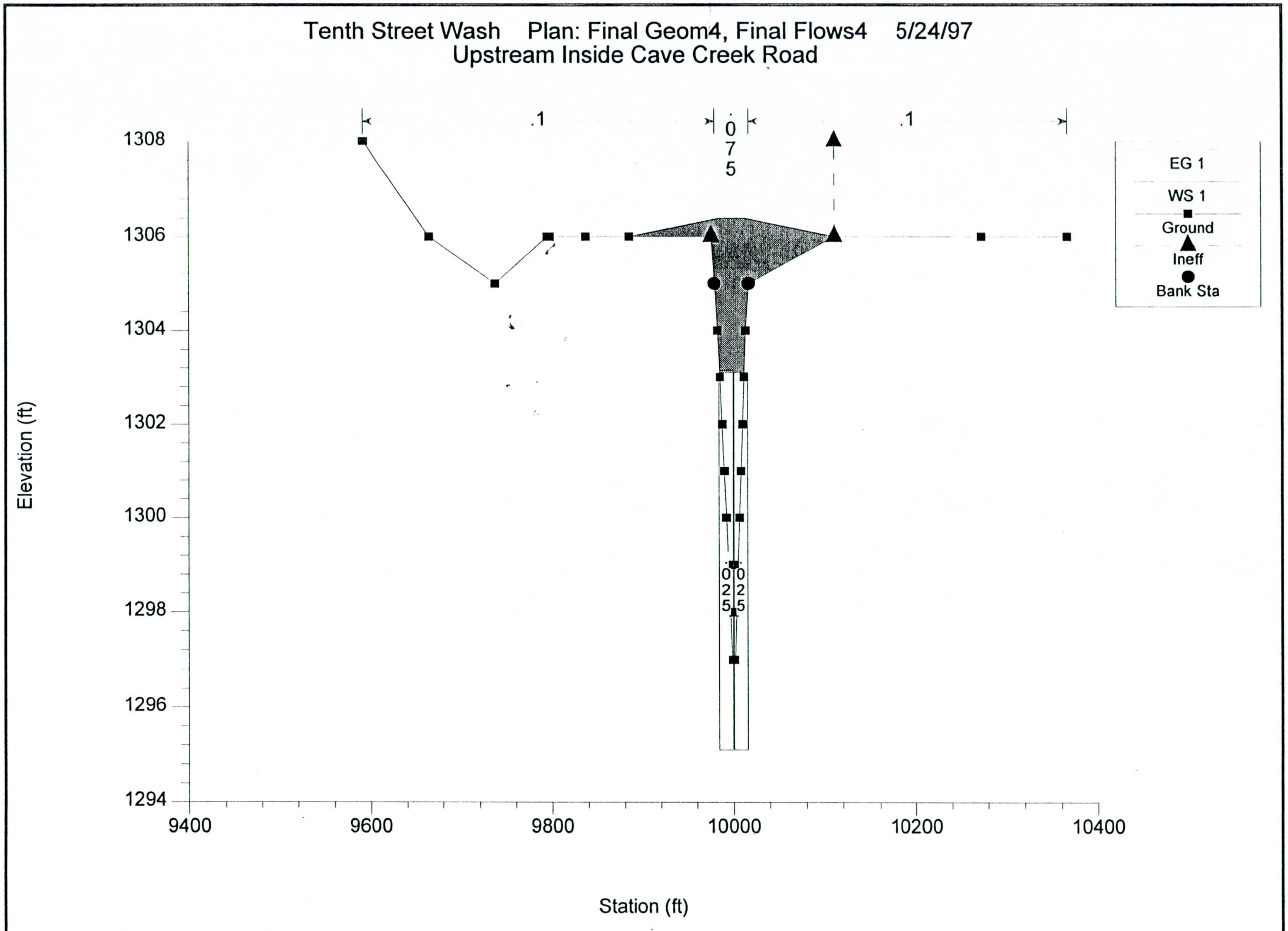
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.55
.1
.075
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1315
1310
1305
1300
1295
Elevation (ft)
9700
9800
9900
10000
10100
10200
Station (ft)



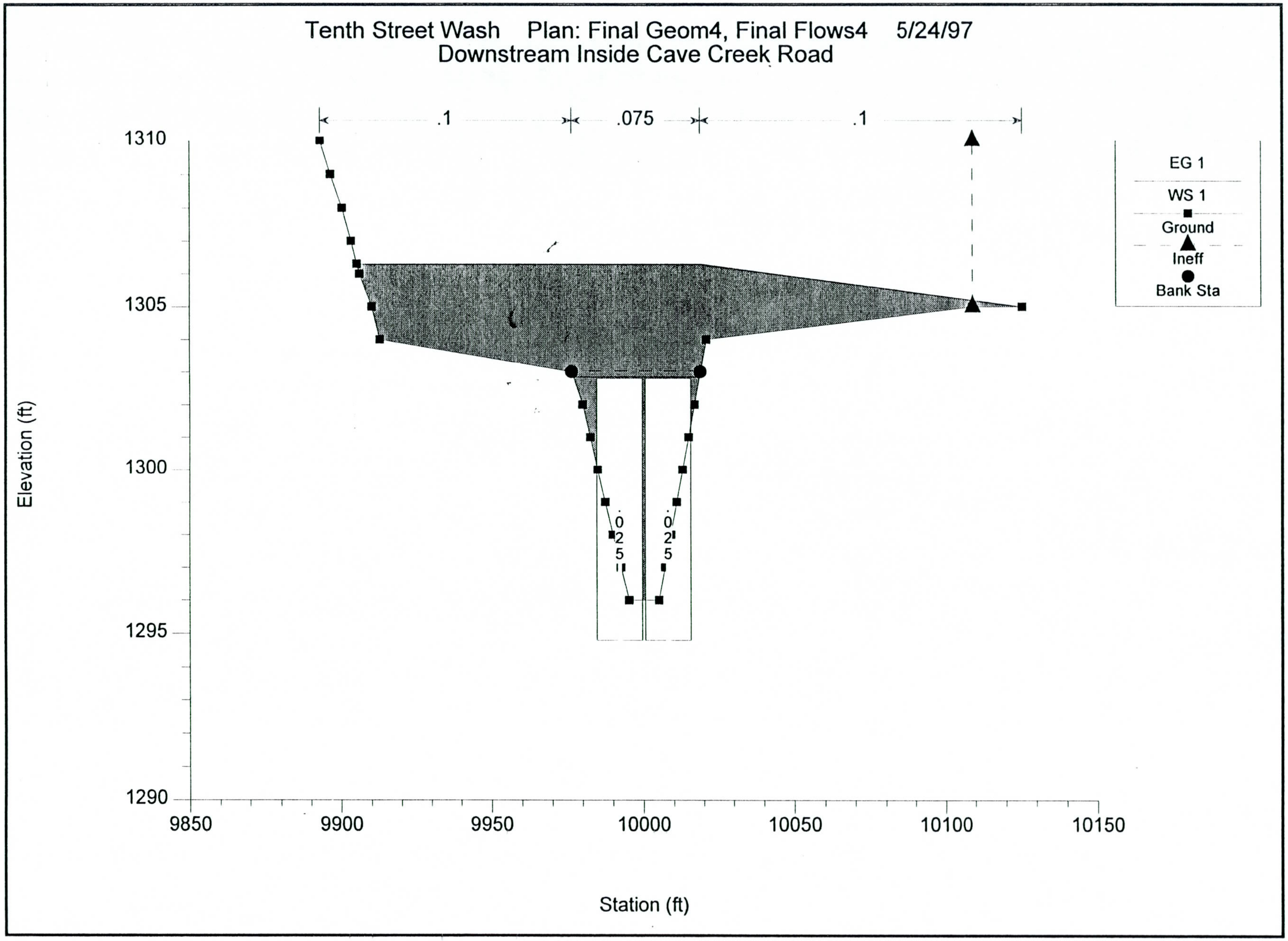
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.528
.1
.075
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1308
1306
1304
1302
1300
1298
1296
Elevation (ft)
9800
9900
10000
10100
10200
10300
10400
Station (ft)

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.527

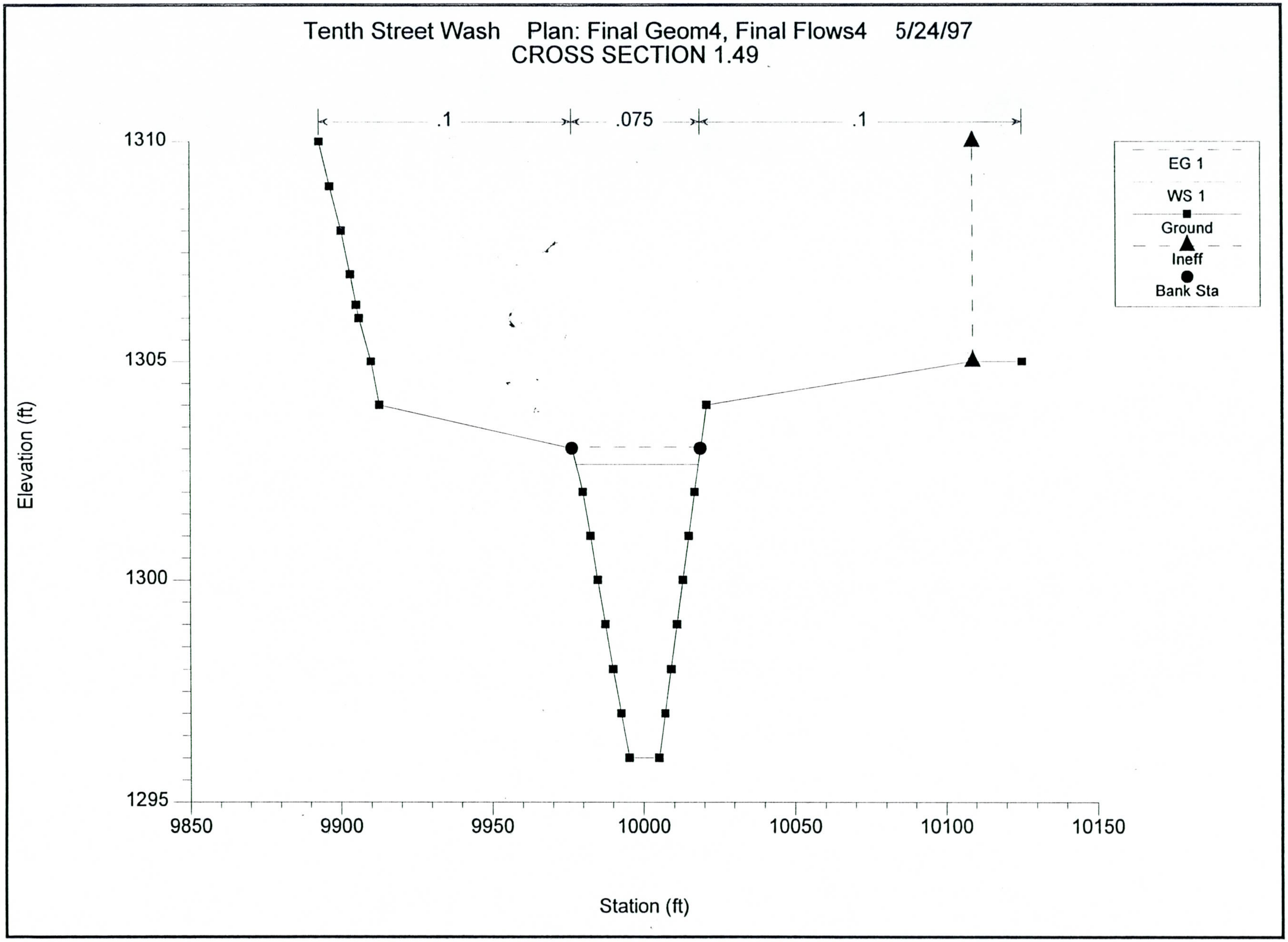


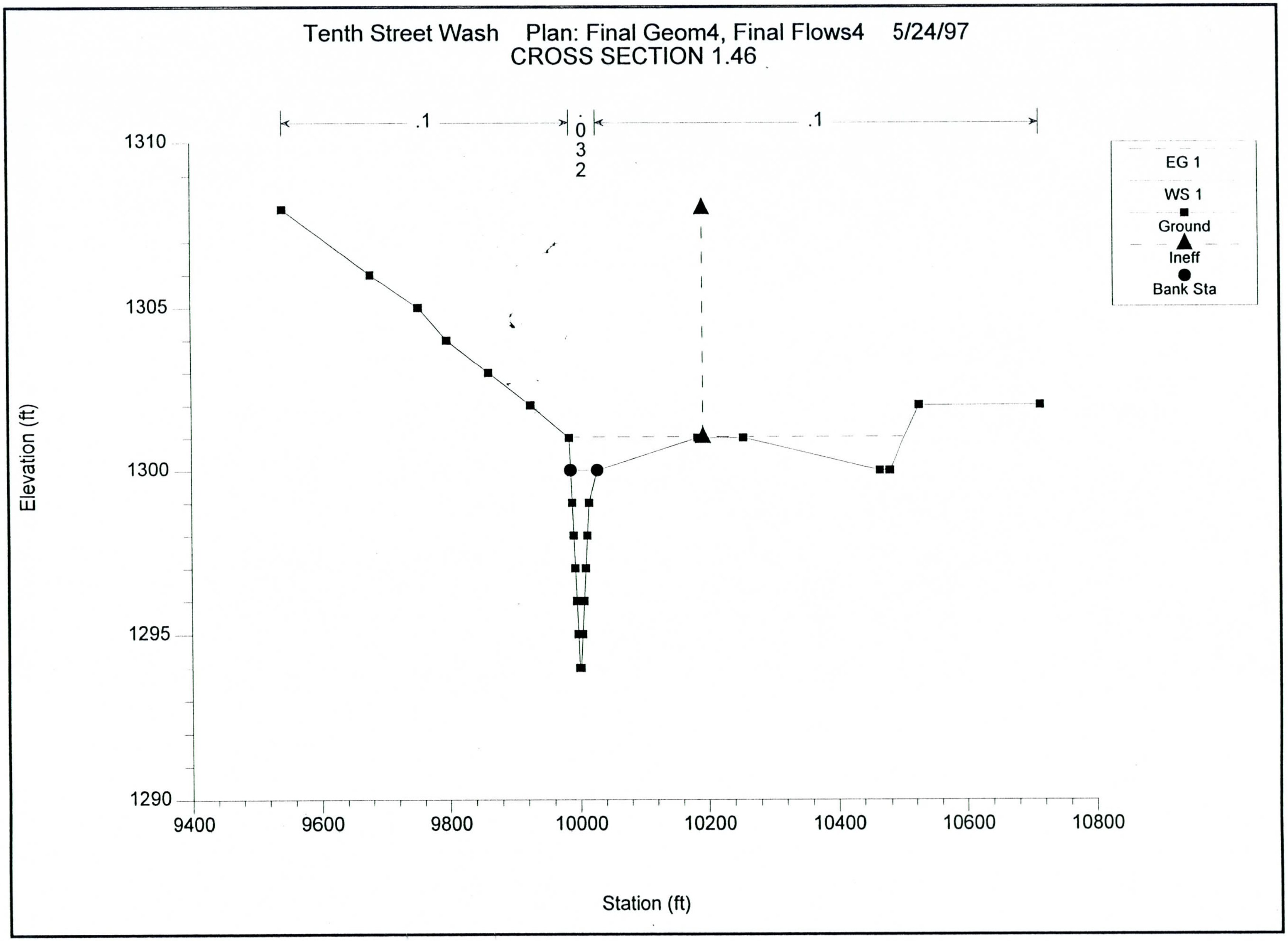


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
Upstream Inside Cave Creek Road
.1
0
7
5
.1
0 0
2 2
5 5
1308
1306
1304
1302
1300
1298
1296
1294
Elevation (ft)
9400
9600
9800
10000
10200
10400
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta

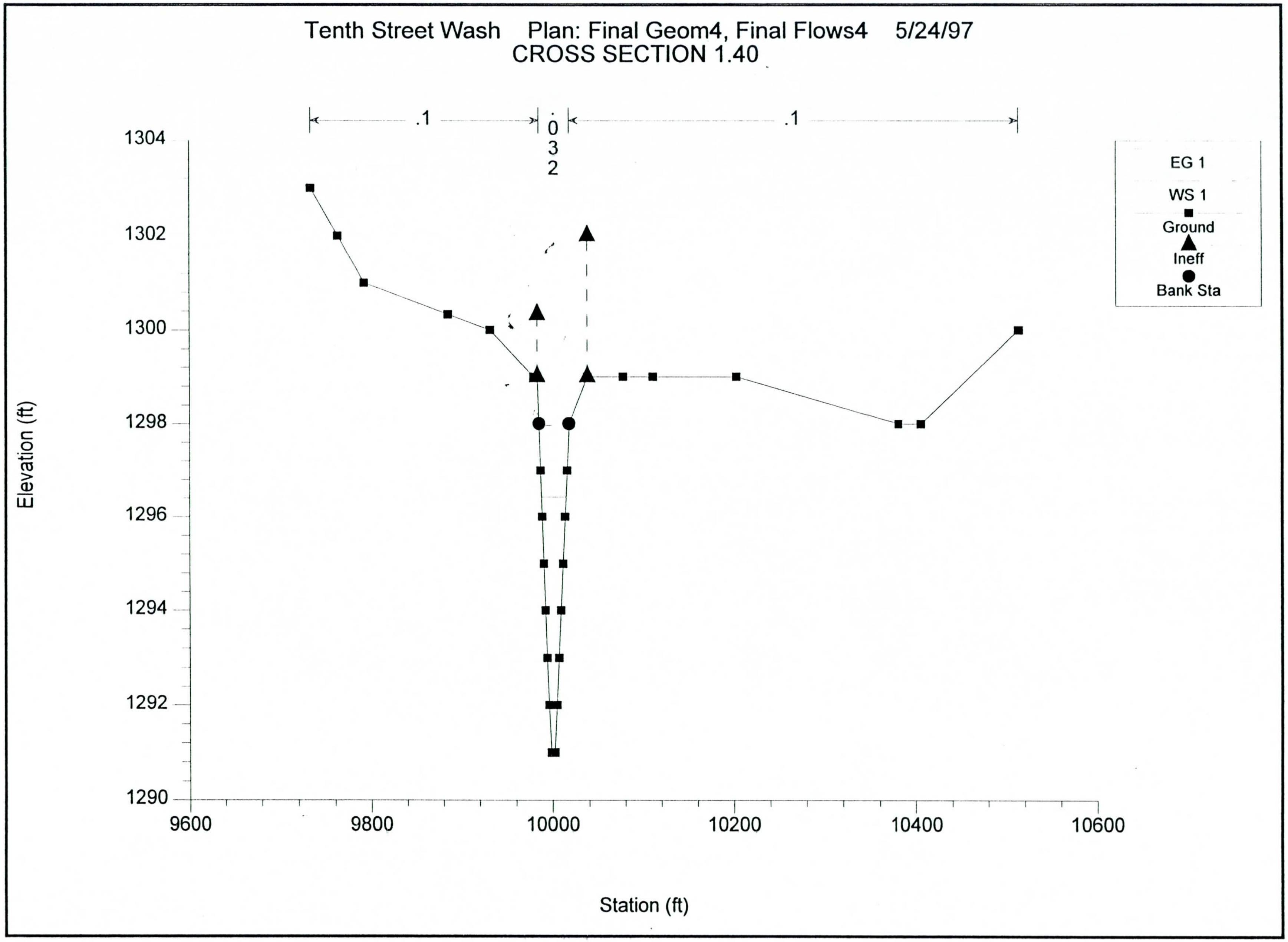


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
Downstream Inside Cave Creek Road
.1
.075
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
.025
.025
Elevation (ft)
1310
1305
1300
1295
1290
9850
9900
9950
10000
10050
10100
10150
Station (ft)

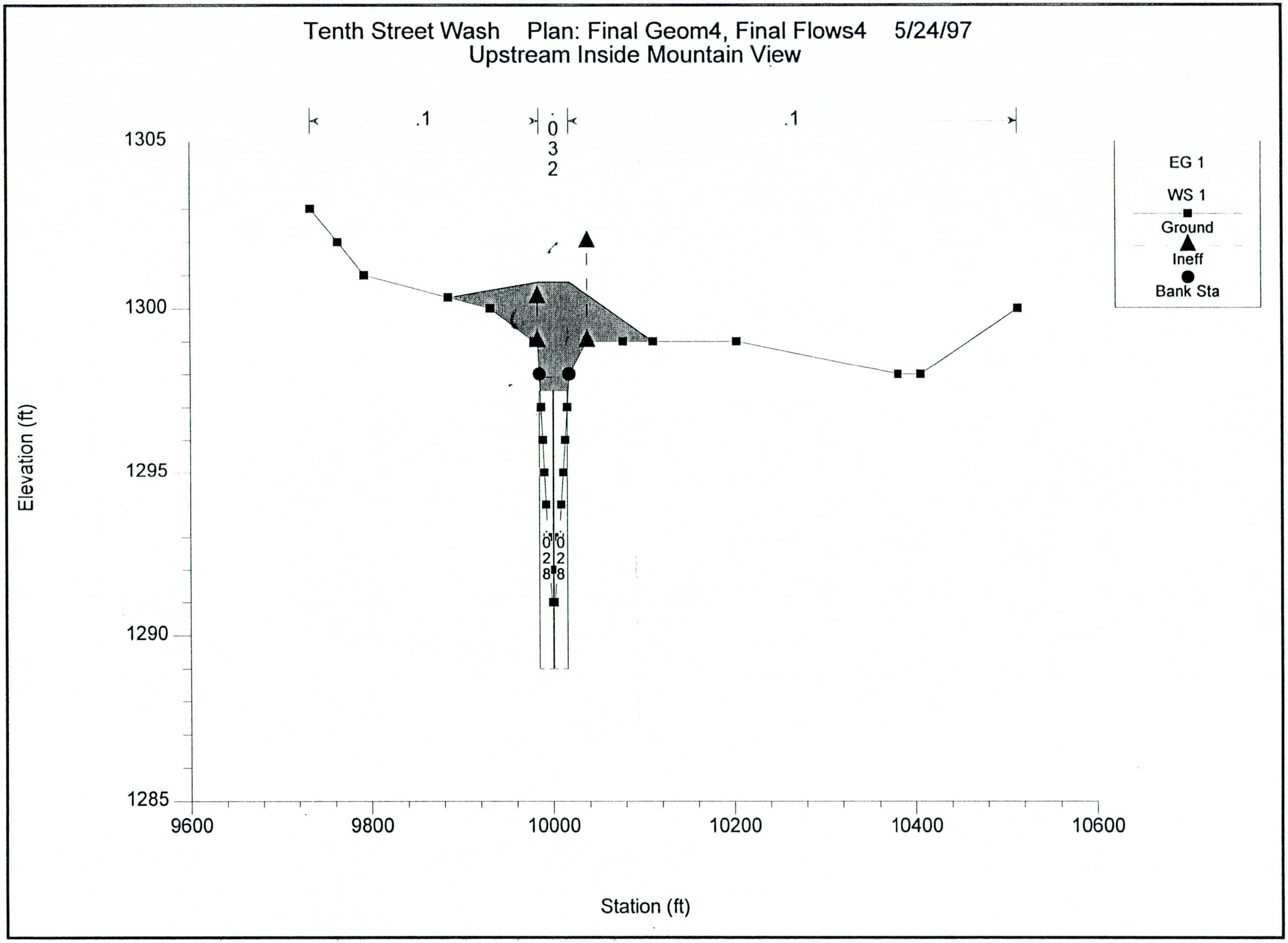

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.49
.1
.075
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1310
1305
1300
1295
9850
9900
9950
10000
10050
10100
10150
Station (ft)



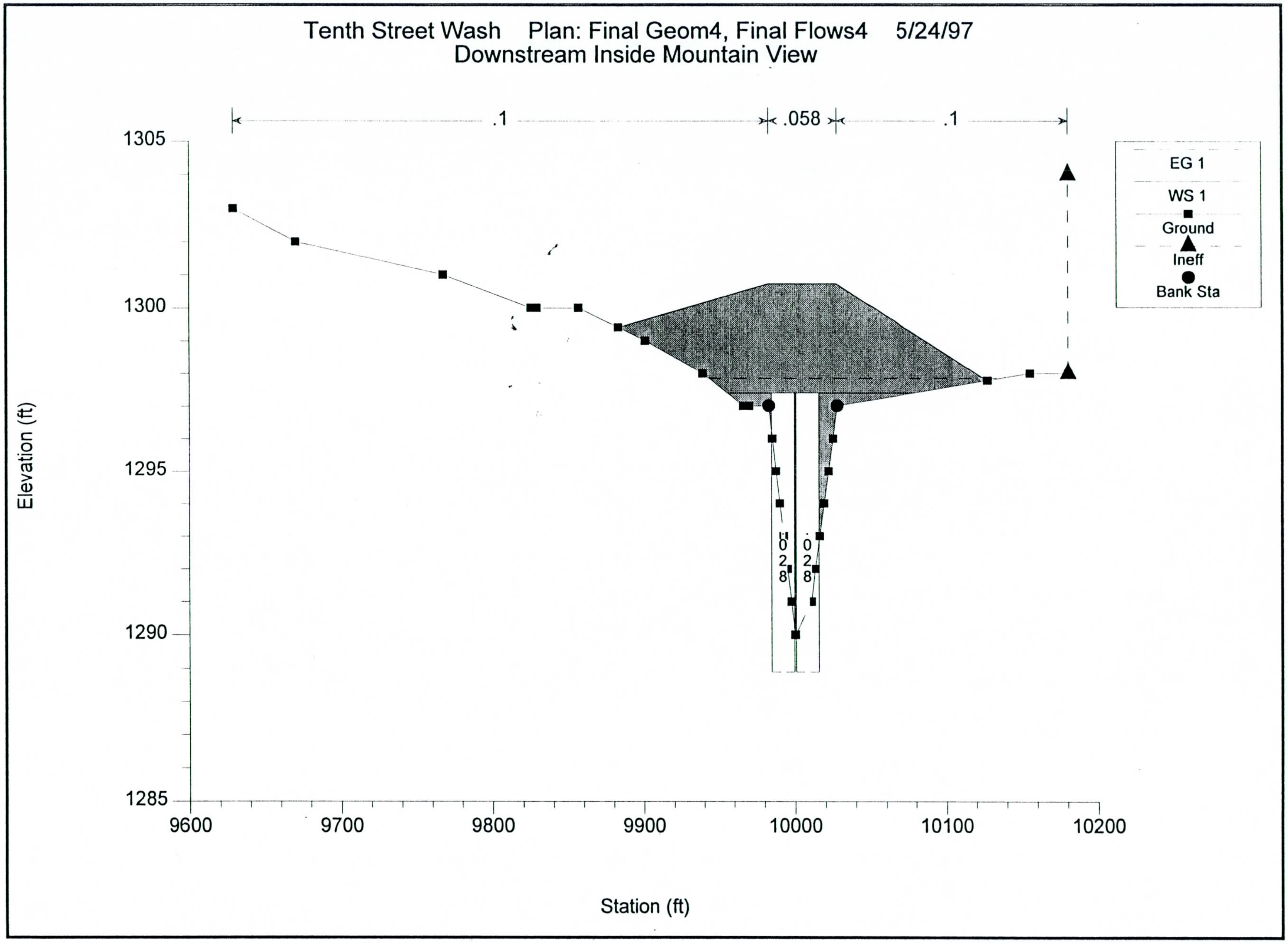
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.46
.1
.032
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1290
1295
1300
1305
1310
Station (ft)
9400
9600
9800
10000
10200
10400
10600
10800



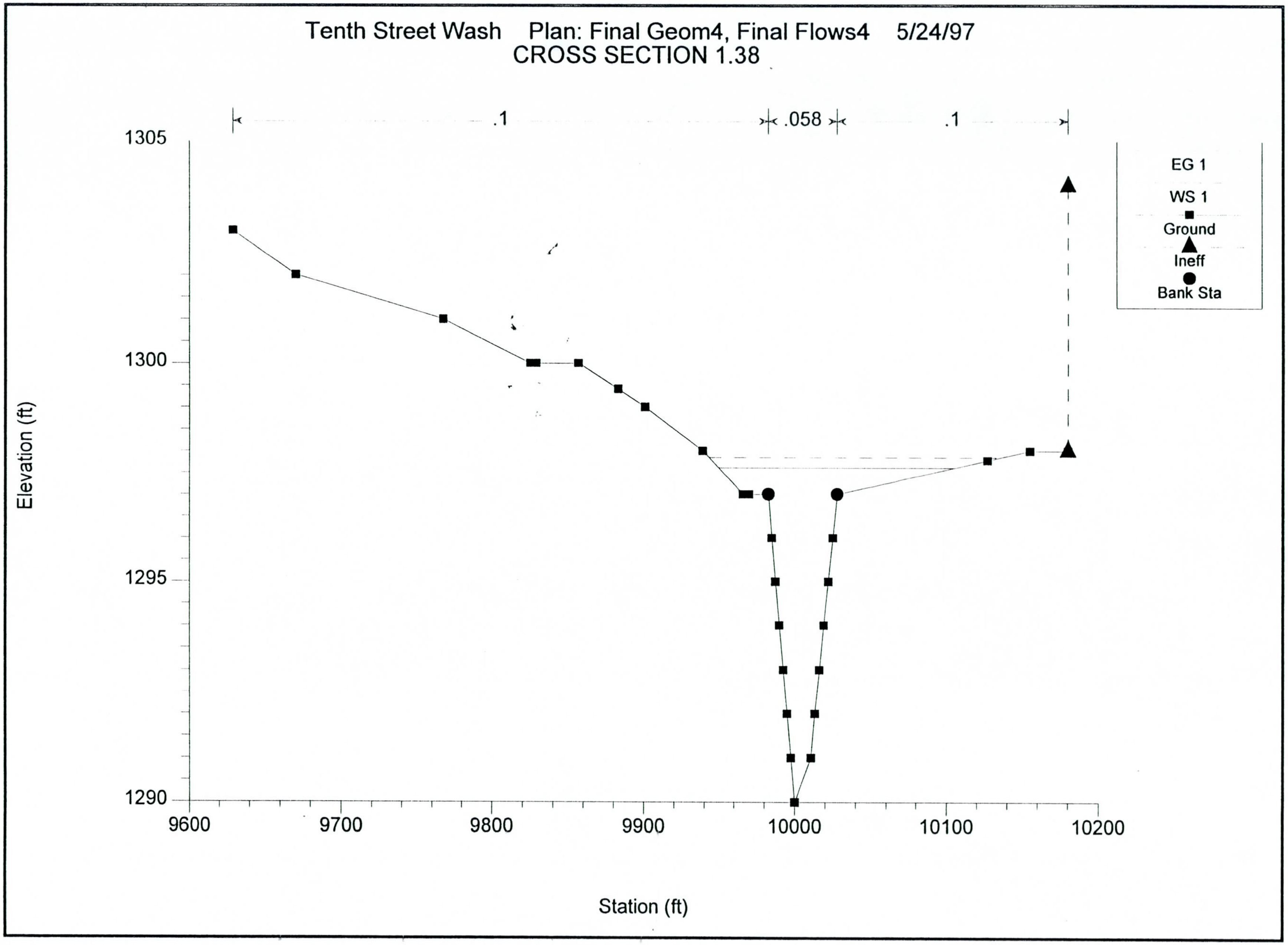
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.40
.1
.032
.1
1304
1302
1300
1298
1296
1294
1292
1290
Elevation (ft)
9600
9800
10000
10200
10400
10600
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta



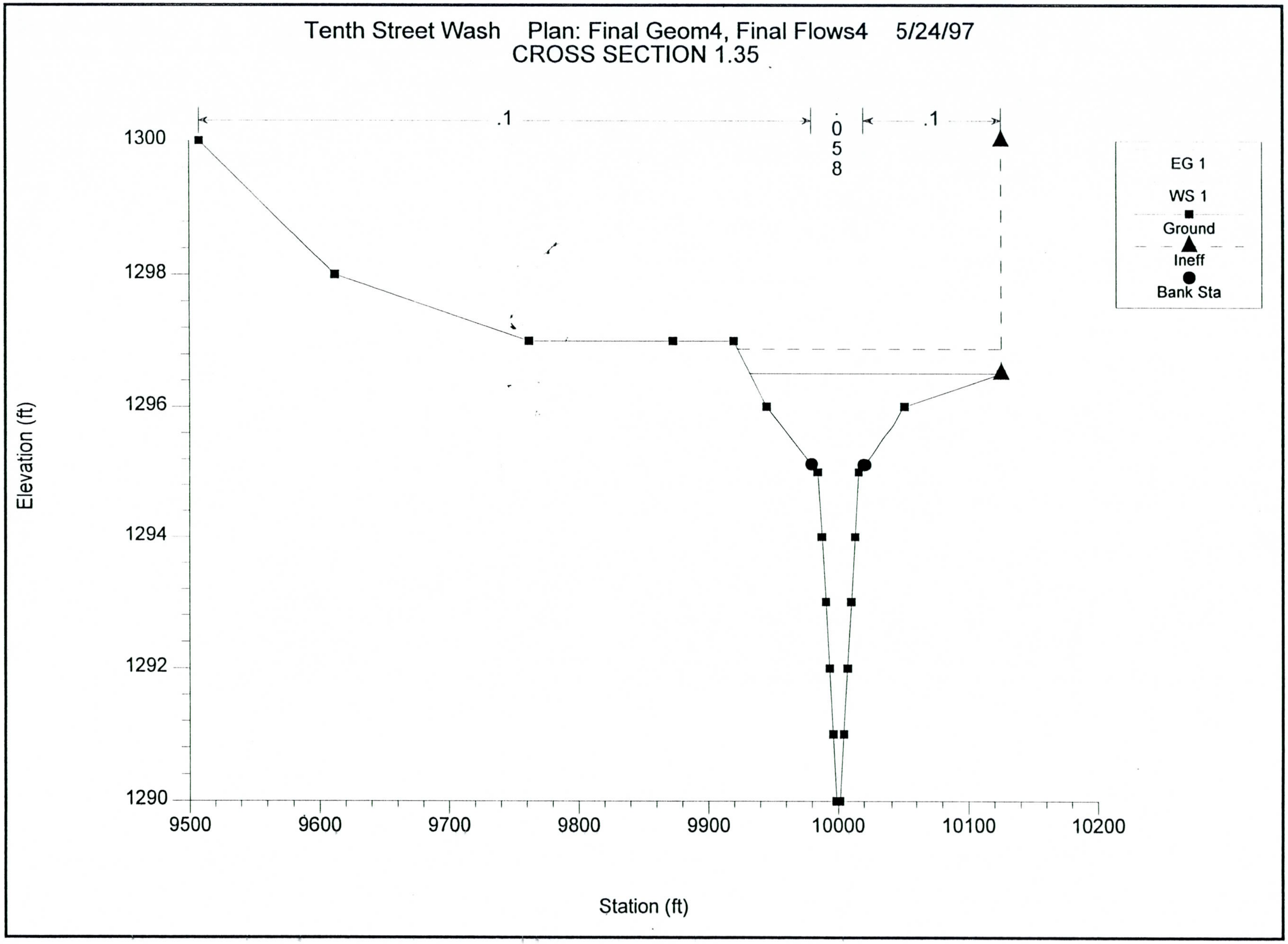
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
Upstream Inside Mountain View
.1
0
3
2
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1305
1300
1295
1290
1285
Elevation (ft)
0
2
8
0
2
8
9600
9800
10000
10200
10400
10600
Station (ft)



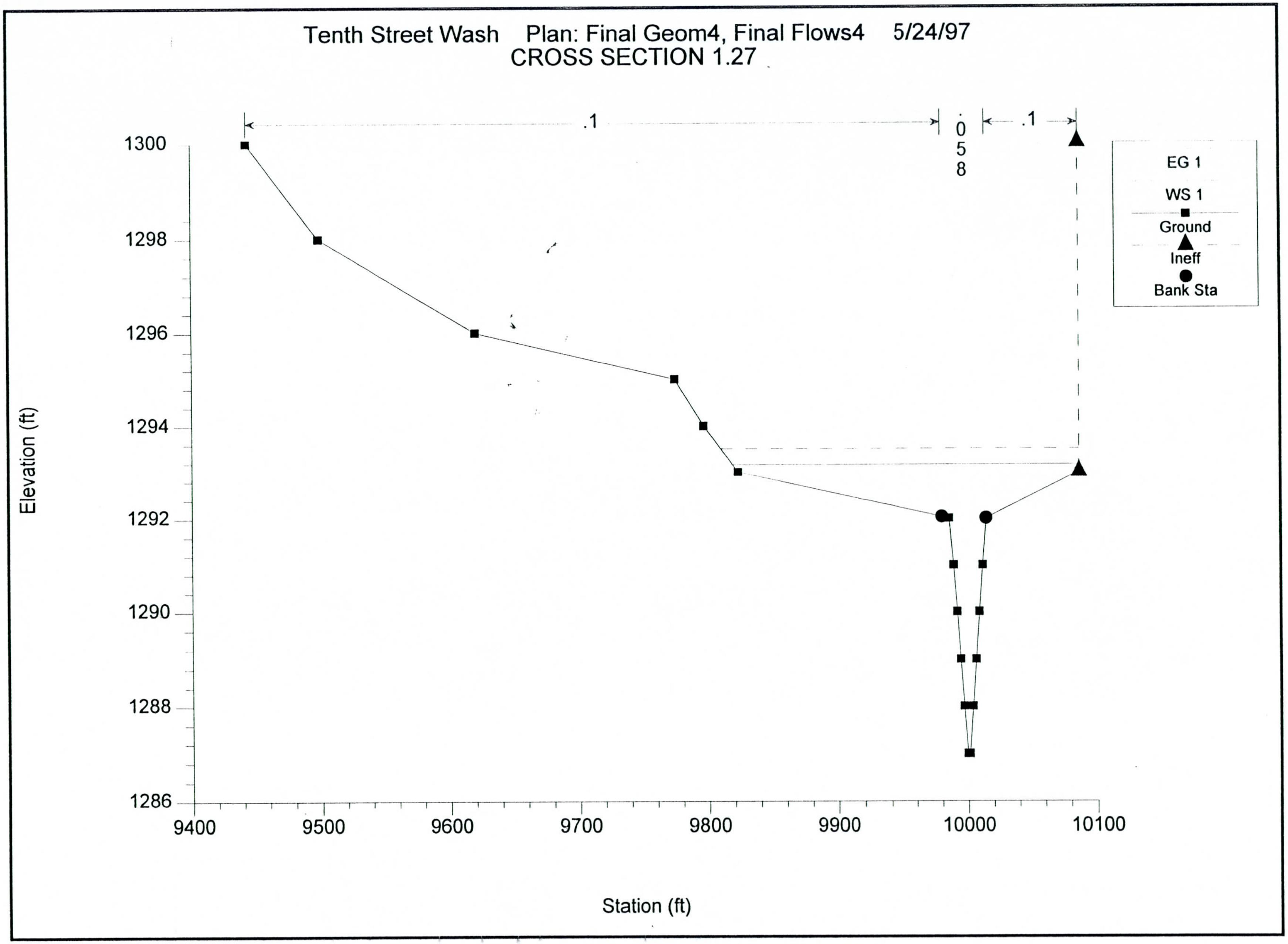
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
Downstream Inside Mountain View
.1
.058
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
.028
.028
1305
1300
1295
1290
1285
Elevation (ft)
9600
9700
9800
9900
10000
10100
10200
Station (ft)



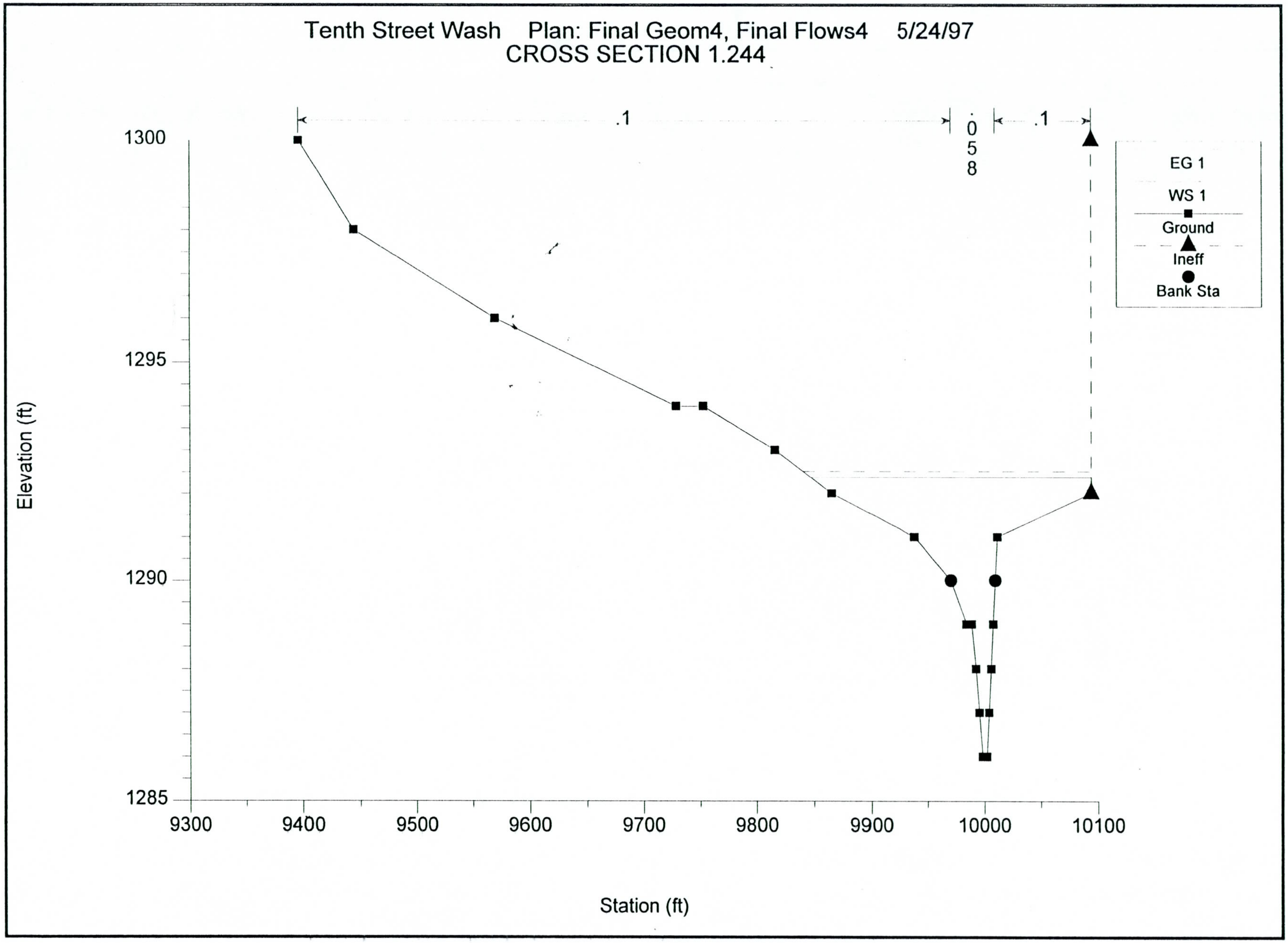
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.38
.1
.058
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1305
1300
1295
1290
Elevation (ft)
9600
9700
9800
9900
10000
10100
10200
Station (ft)

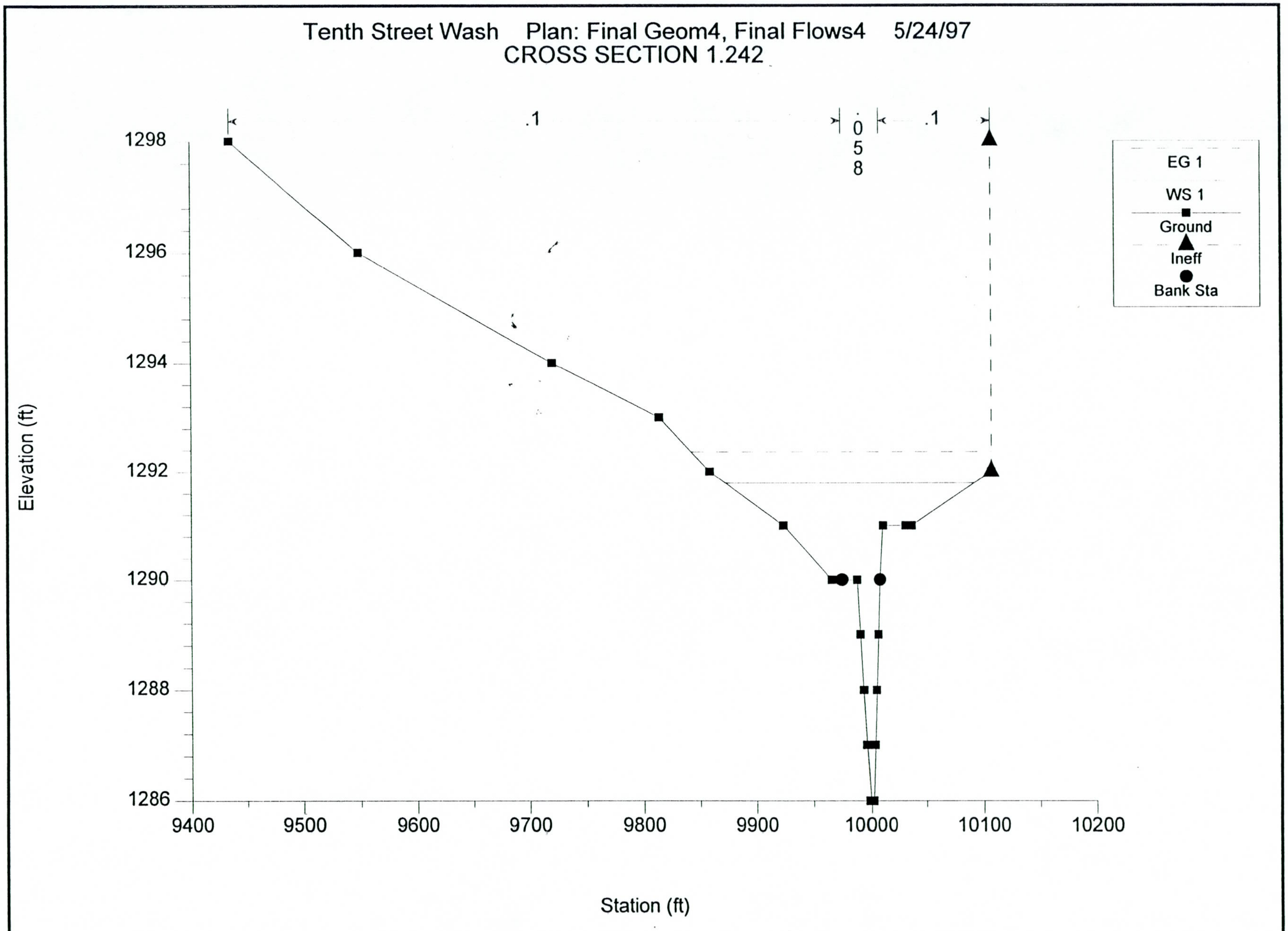


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.35
.1
.058
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1300
1298
1296
1294
1292
1290
9500
9600
9700
9800
9900
10000
10100
10200
Station (ft)



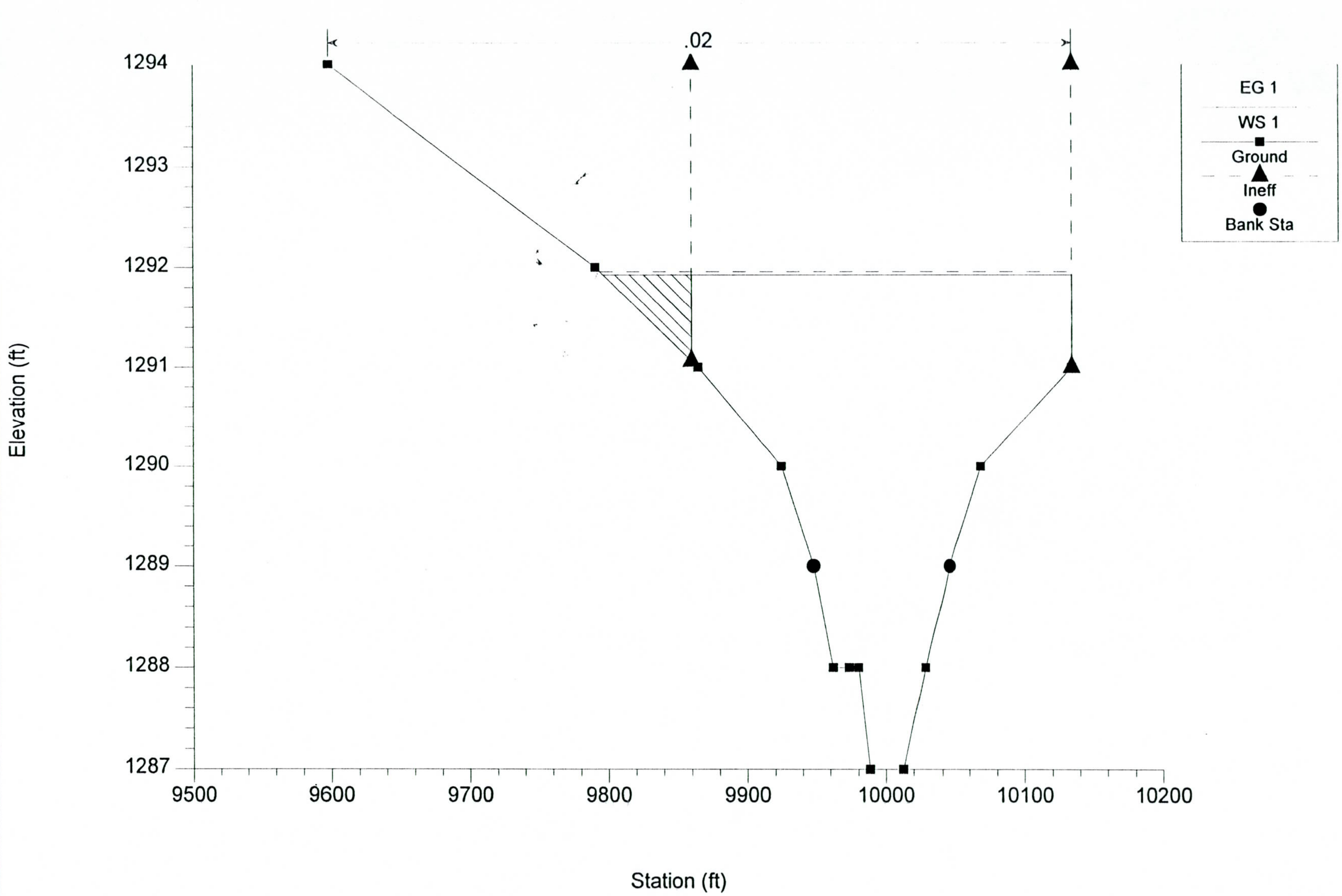
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.27
.1
.058
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1300
1298
1296
1294
1292
1290
1288
1286
Elevation (ft)
9400
9500
9600
9700
9800
9900
10000
10100
Station (ft)

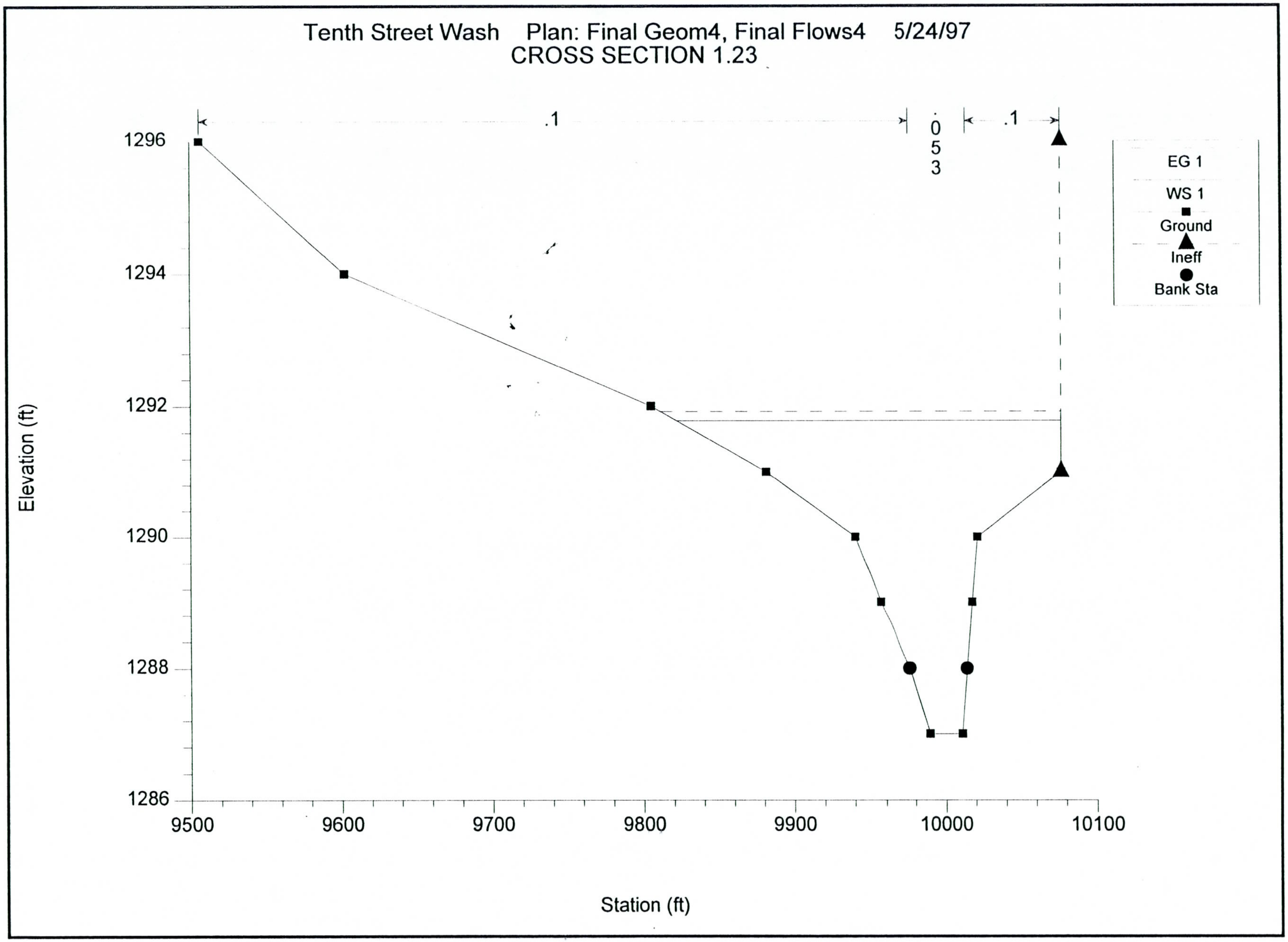

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.244
.1
.058
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1300
1295
1290
1285
9300
9400
9500
9600
9700
9800
9900
10000
10100
Station (ft)



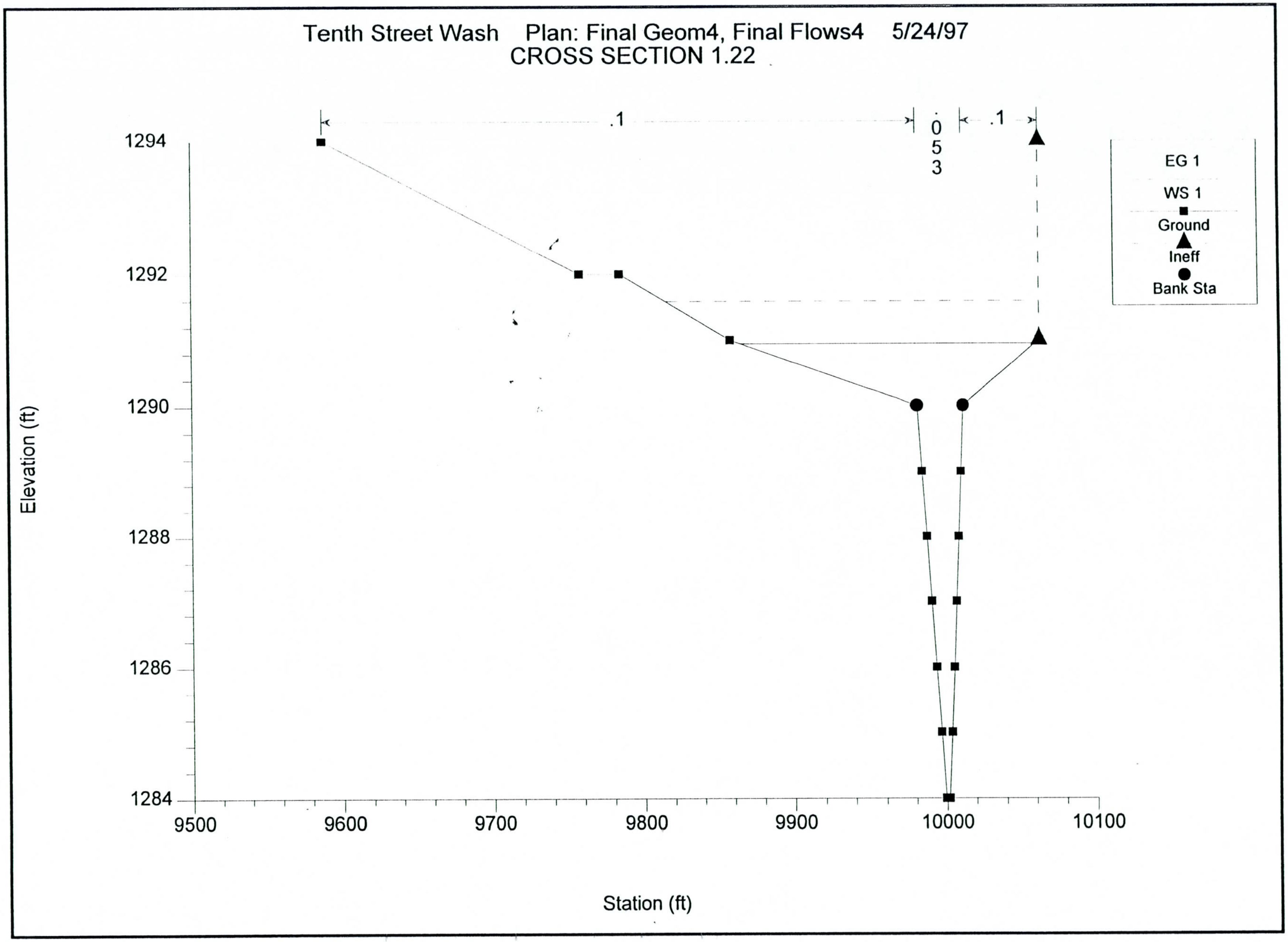
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.242
.1
.058
.1
Elevation (ft)
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta
1298
1296
1294
1292
1290
1288
1286
9400
9500
9600
9700
9800
9900
10000
10100
10200

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.238

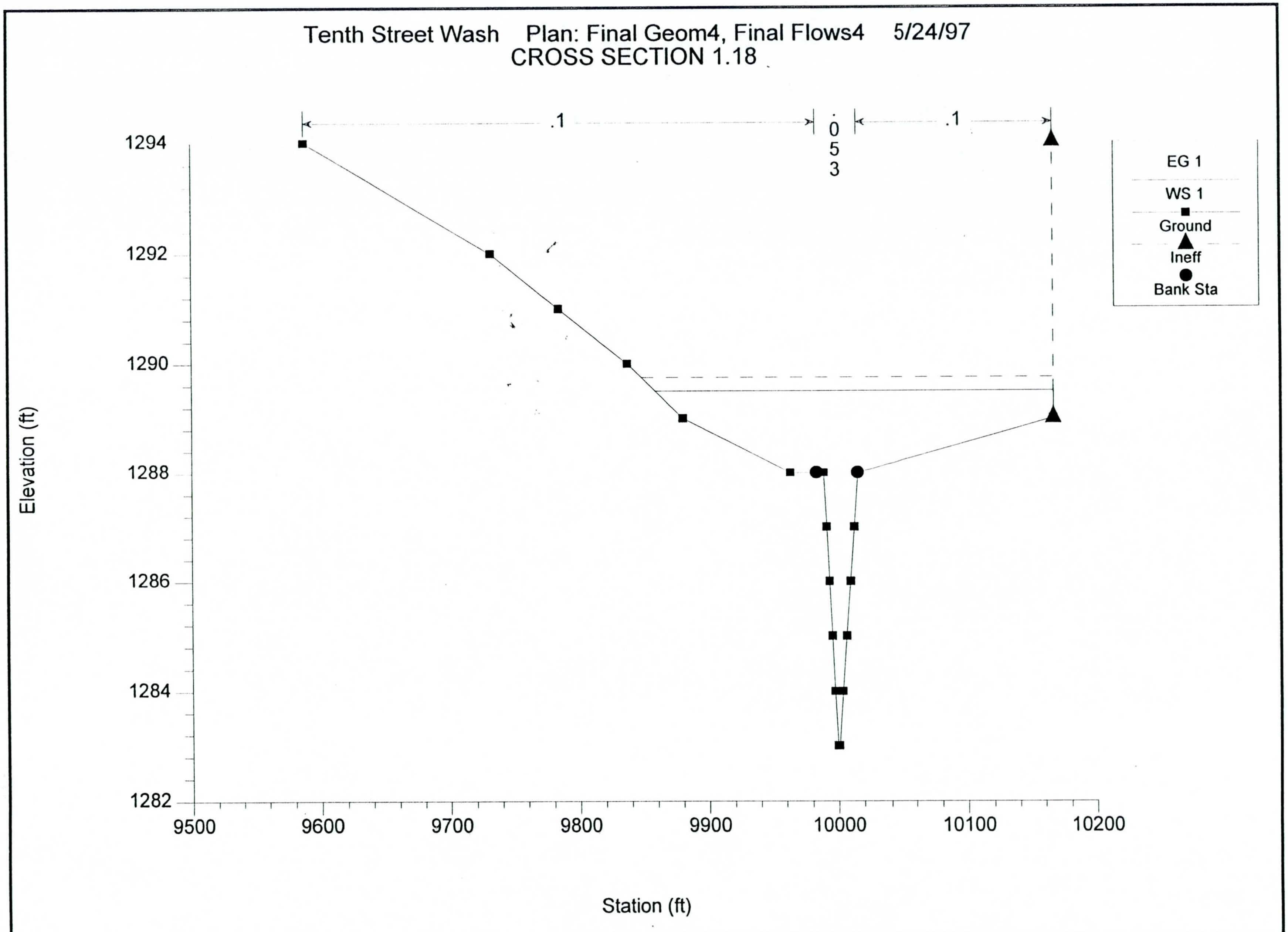




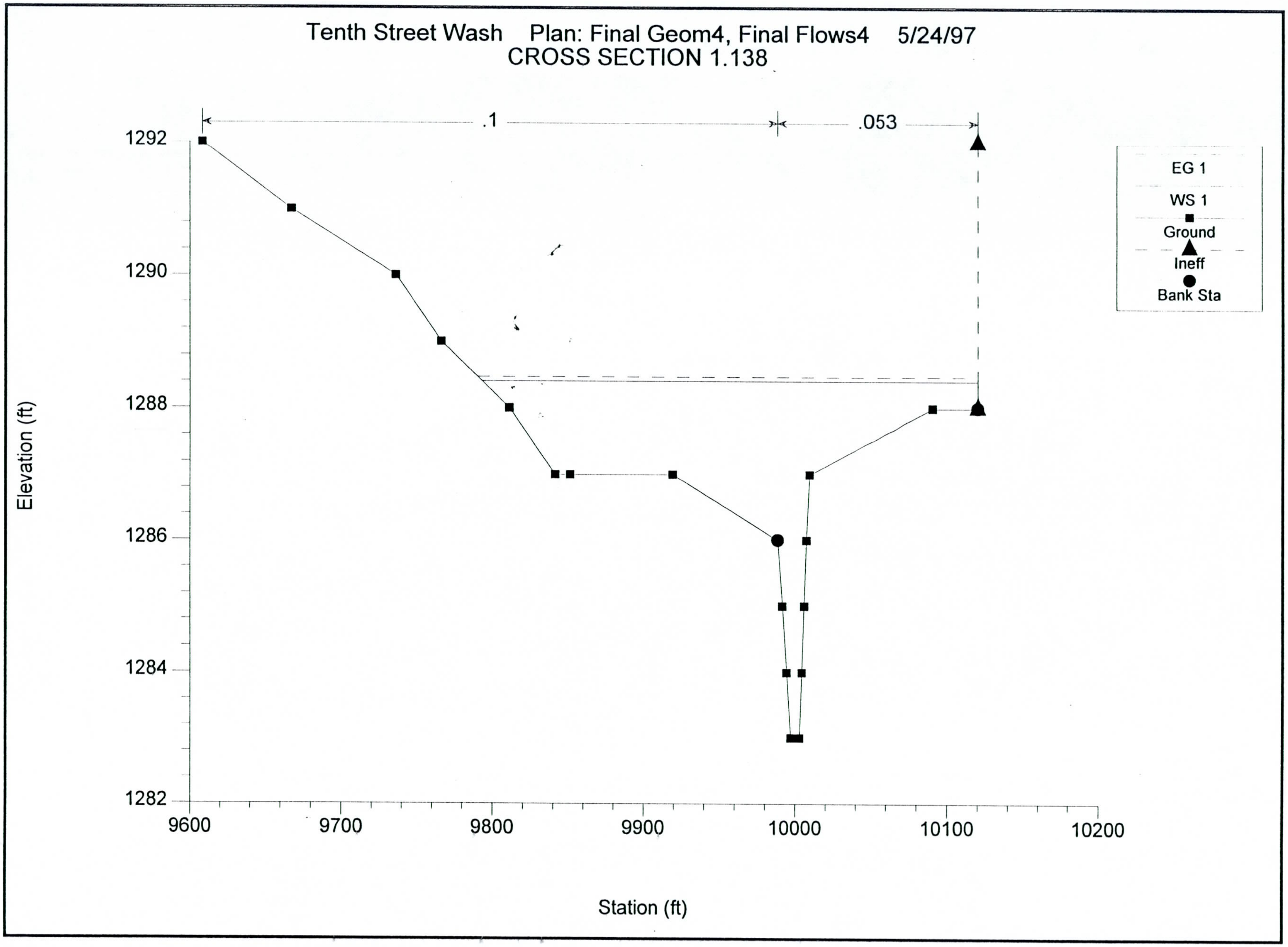
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.23
.1
.053
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1296
1294
1292
1290
1288
1286
9500
9600
9700
9800
9900
10000
10100
Station (ft)

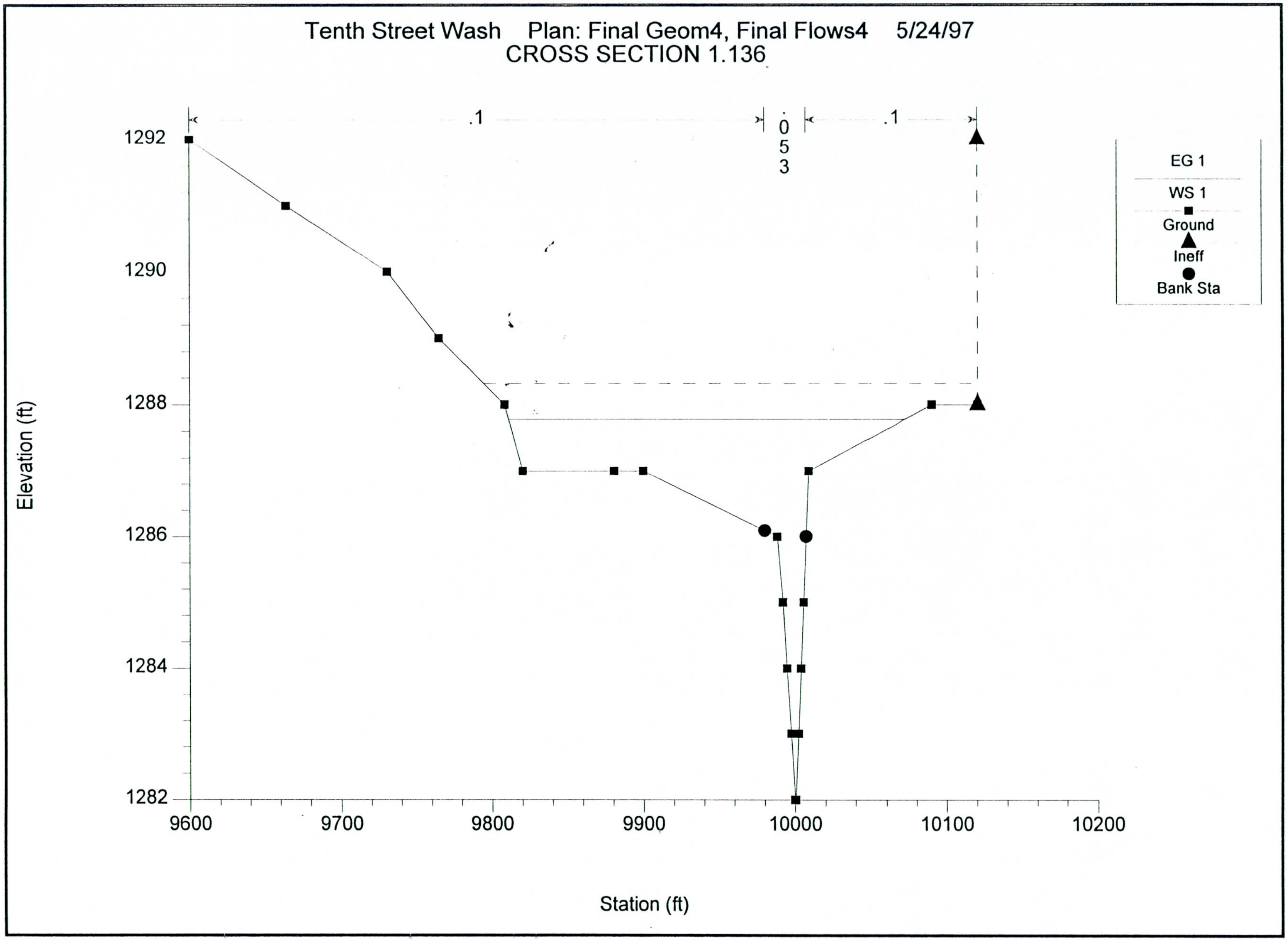


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.22
.1
.053
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1294
1292
1290
1288
1286
1284
Elevation (ft)
9500
9600
9700
9800
9900
10000
10100
Station (ft)

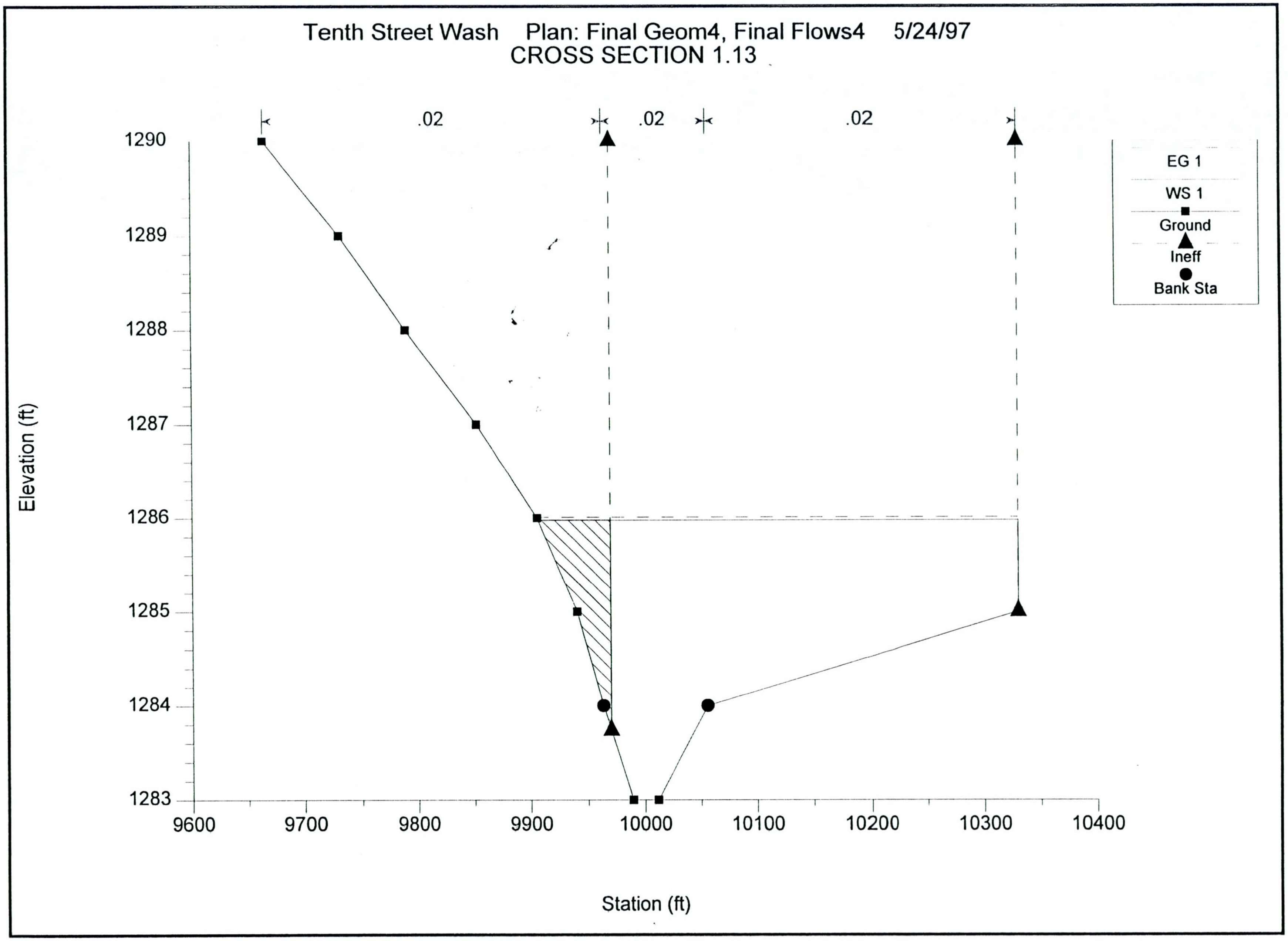


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.18
.1
.053
.1
1294
1292
1290
1288
1286
1284
1282
Elevation (ft)
9500
9600
9700
9800
9900
10000
10100
10200
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta

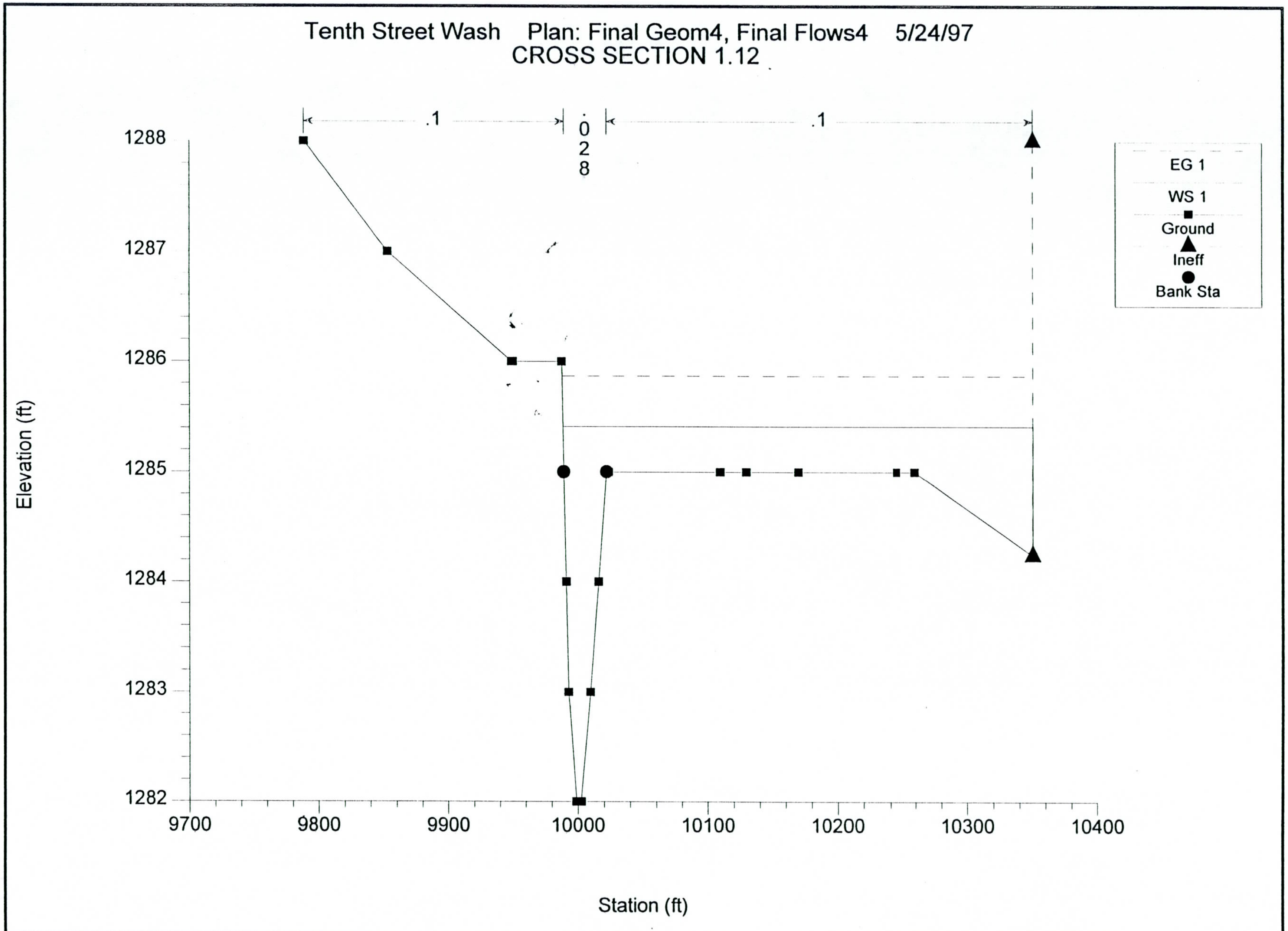

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.138
.1
.053
1292
1290
1288
1286
1284
1282
Elevation (ft)
9600
9700
9800
9900
10000
10100
10200
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta



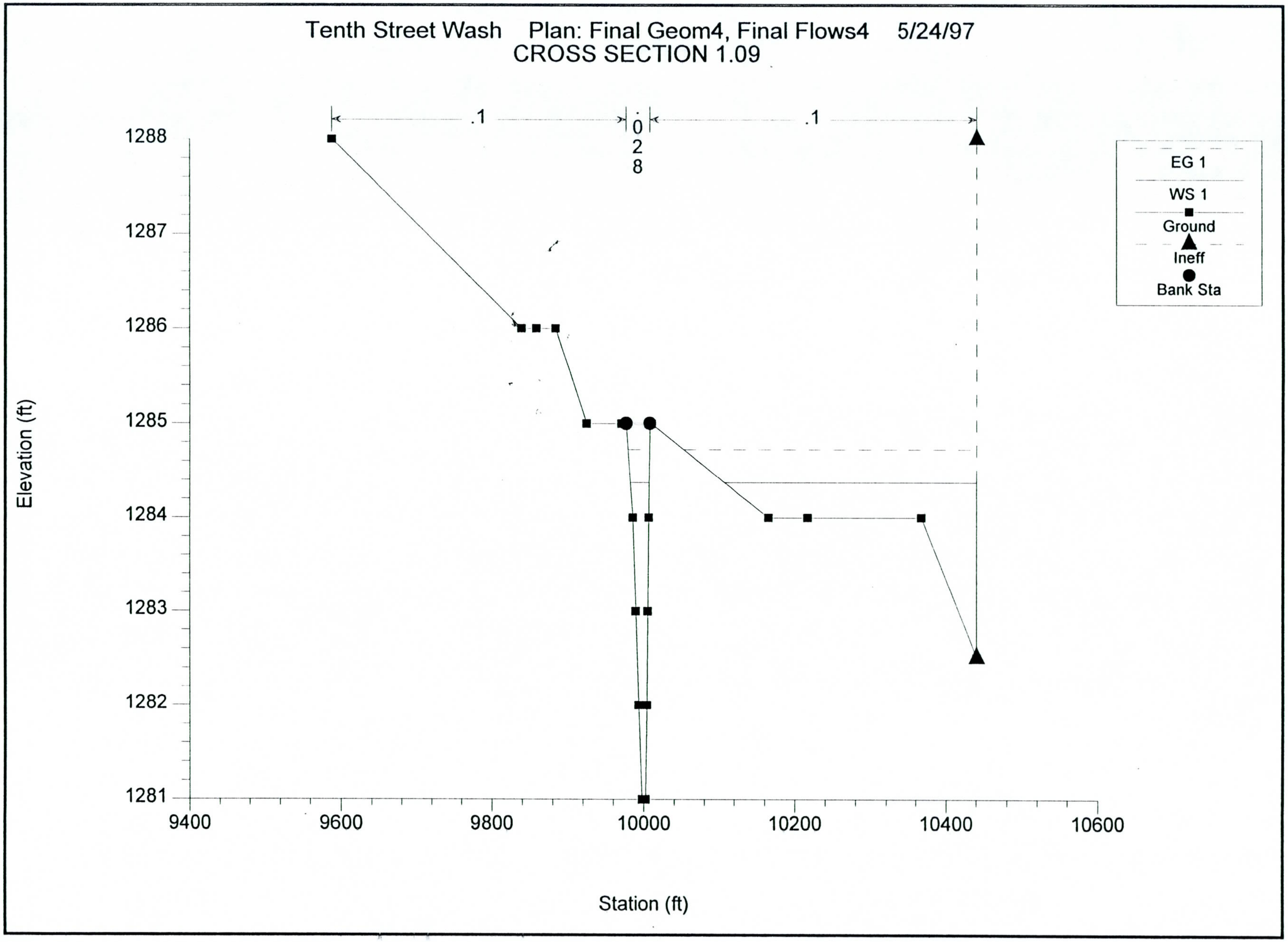
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.136
.1
.053
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1292
1290
1288
1286
1284
1282
9600
9700
9800
9900
10000
10100
10200
Station (ft)



Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.13
.02
.02
.02
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1290
1289
1288
1287
1286
1285
1284
1283
9600
9700
9800
9900
10000
10100
10200
10300
10400
Station (ft)

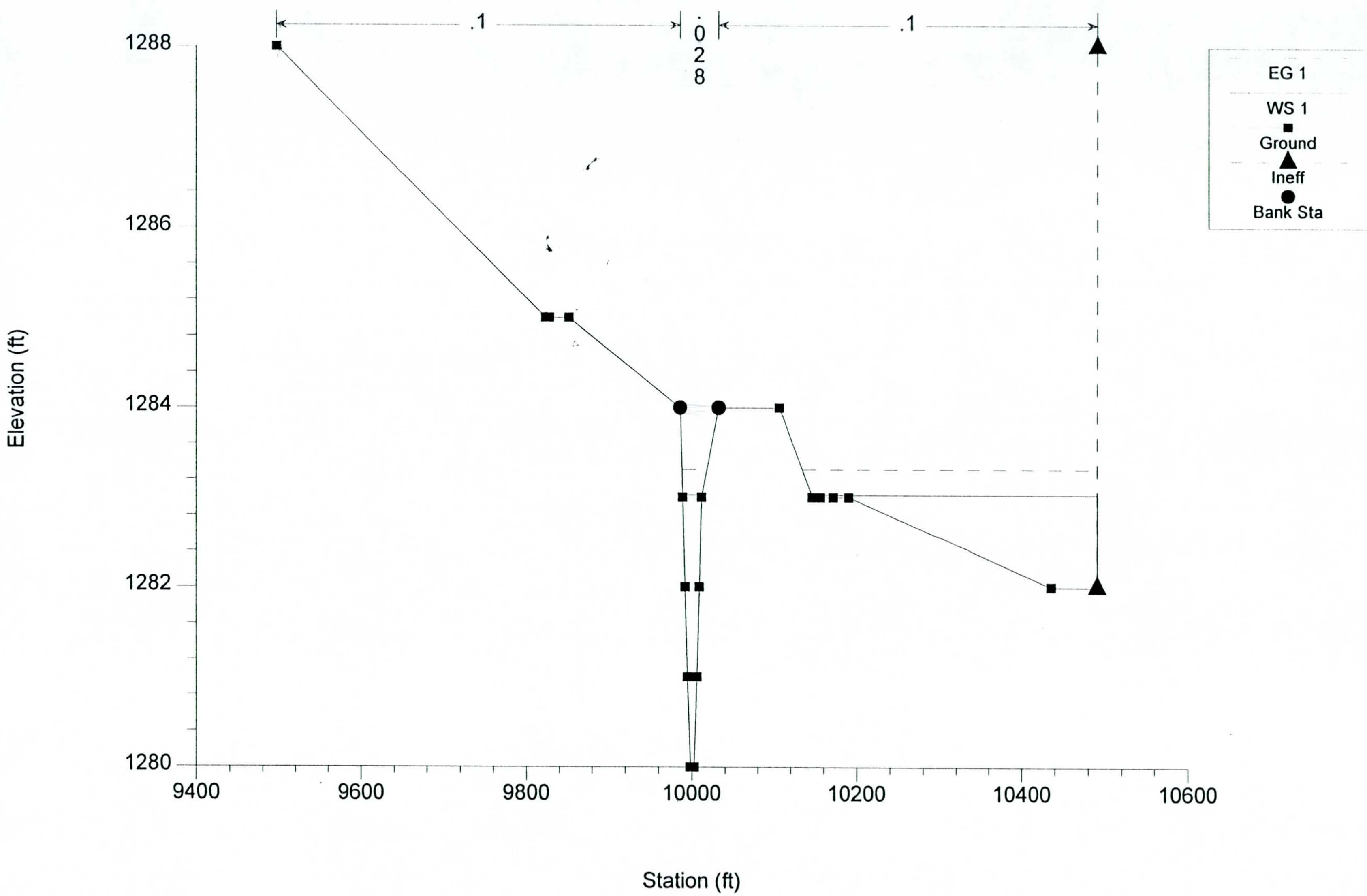


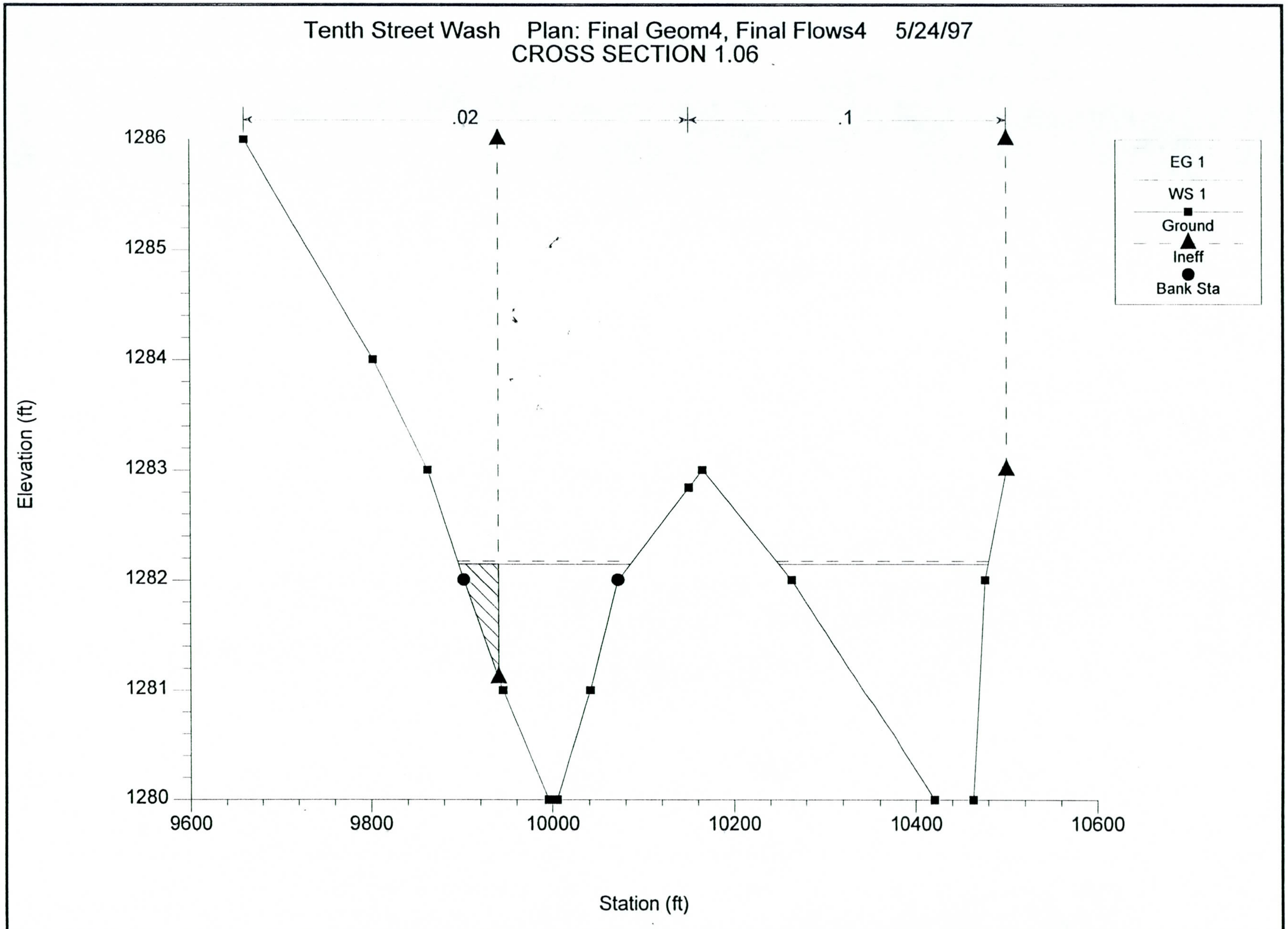
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.12
.1
.028
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1288
1287
1286
1285
1284
1283
1282
9700
9800
9900
10000
10100
10200
10300
10400
Station (ft)



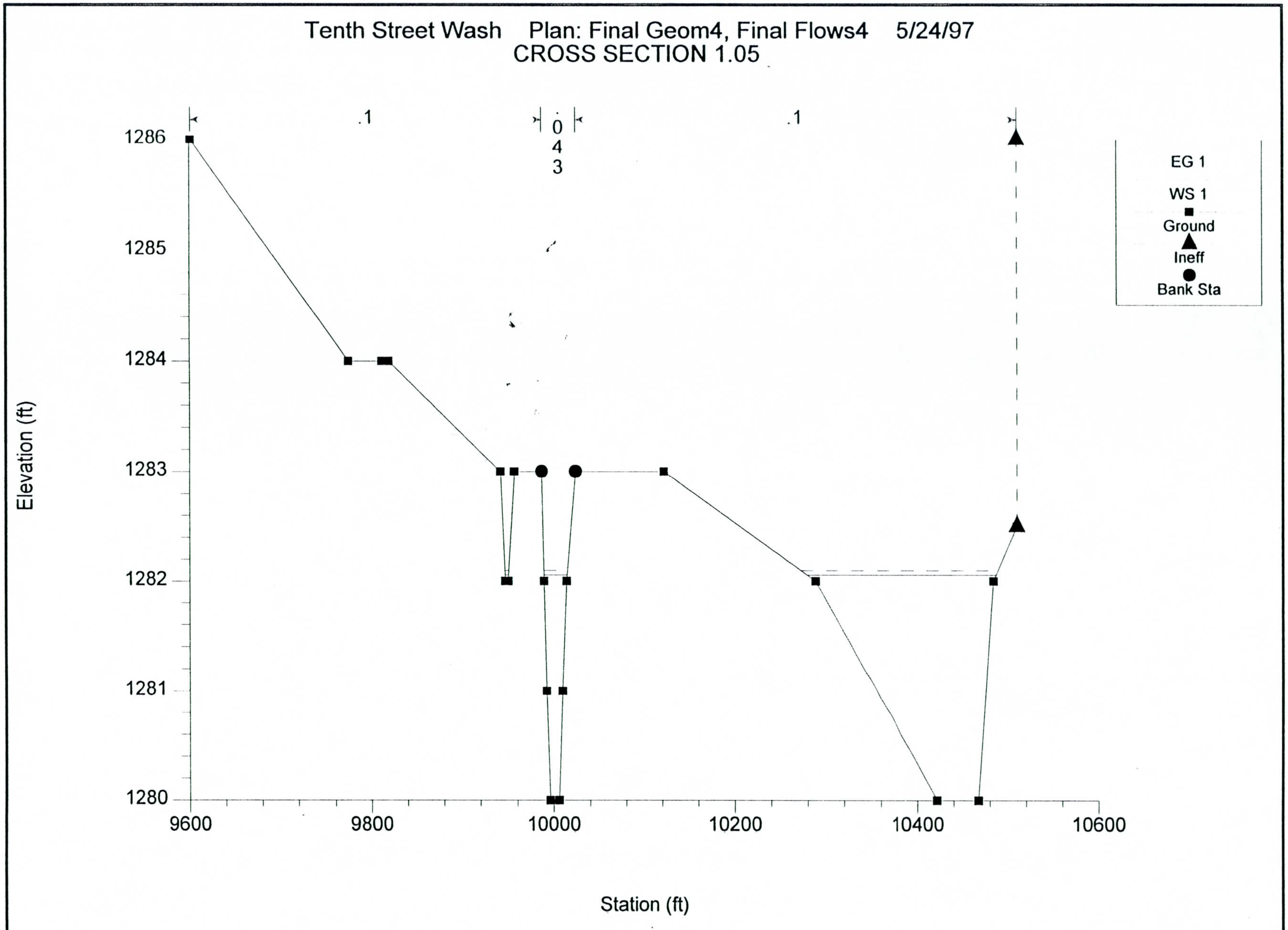
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.09
.1
.028
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1288
1287
1286
1285
1284
1283
1282
1281
9400
9600
9800
10000
10200
10400
10600
Station (ft)

Tenth Street Wash   Plan: Final Geom4, Final Flows4   5/24/97
CROSS SECTION 1.07

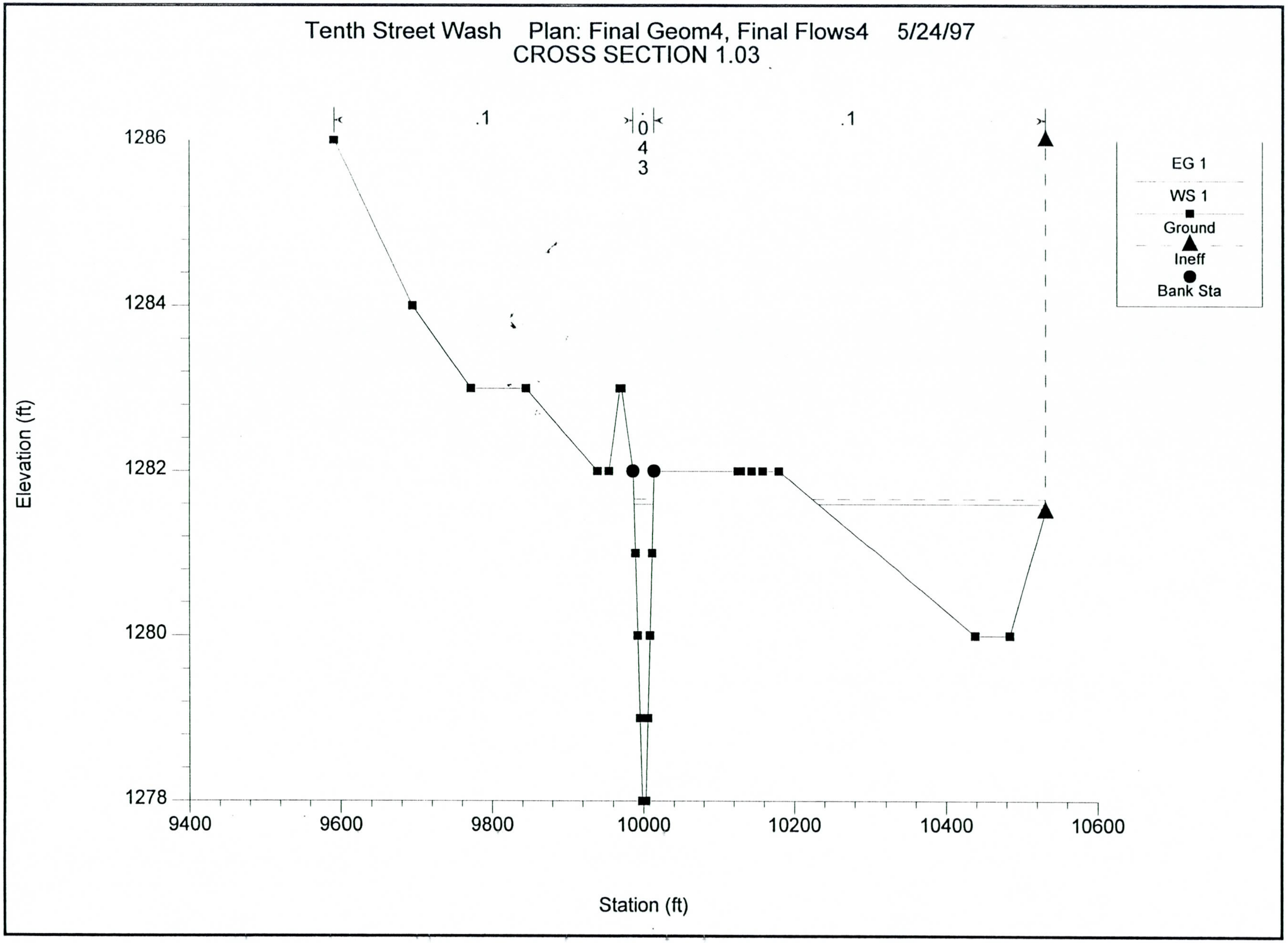




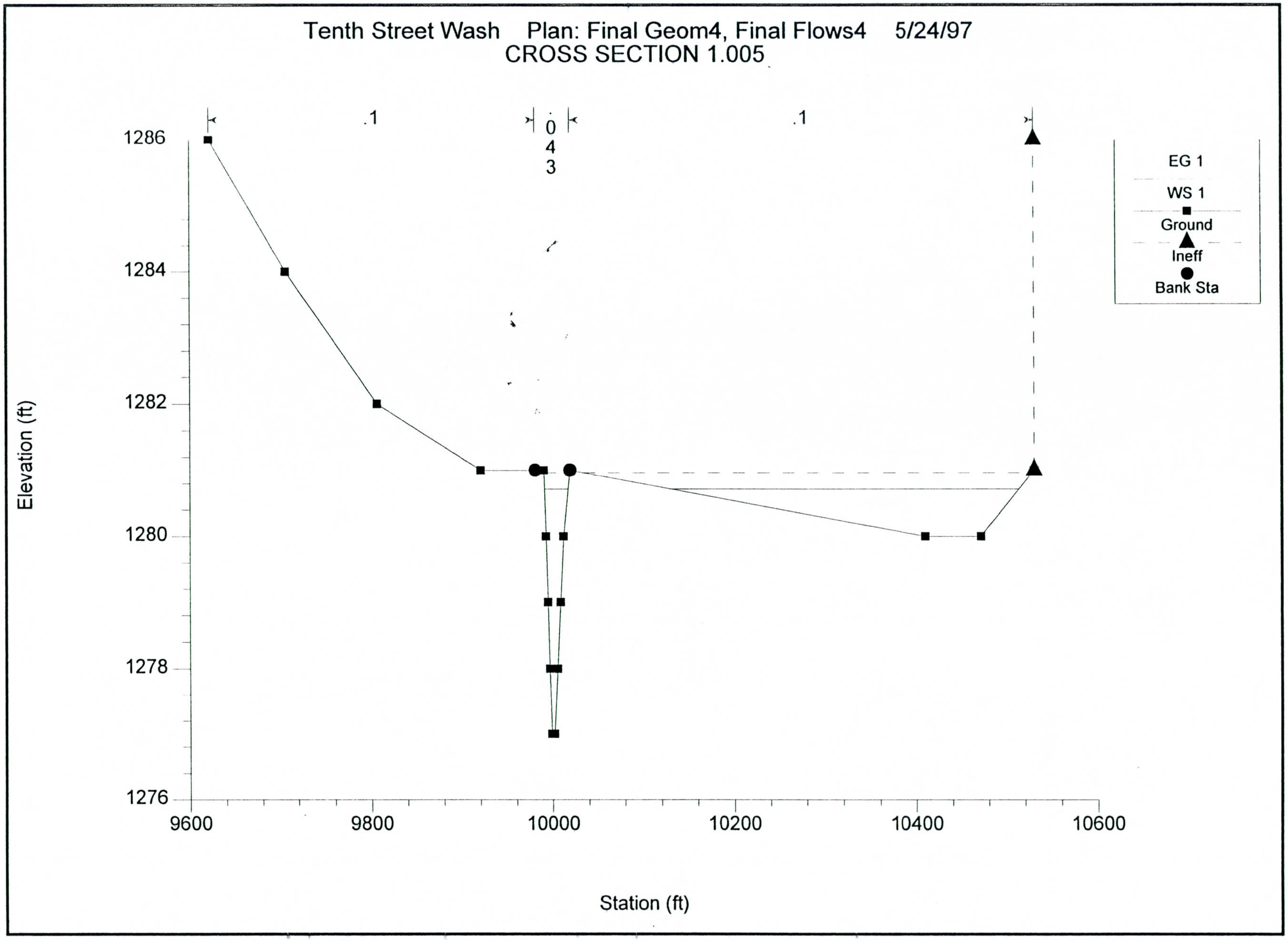
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.06
.02
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1286
1285
1284
1283
1282
1281
1280
Elevation (ft)
9600
9800
10000
10200
10400
10600
Station (ft)

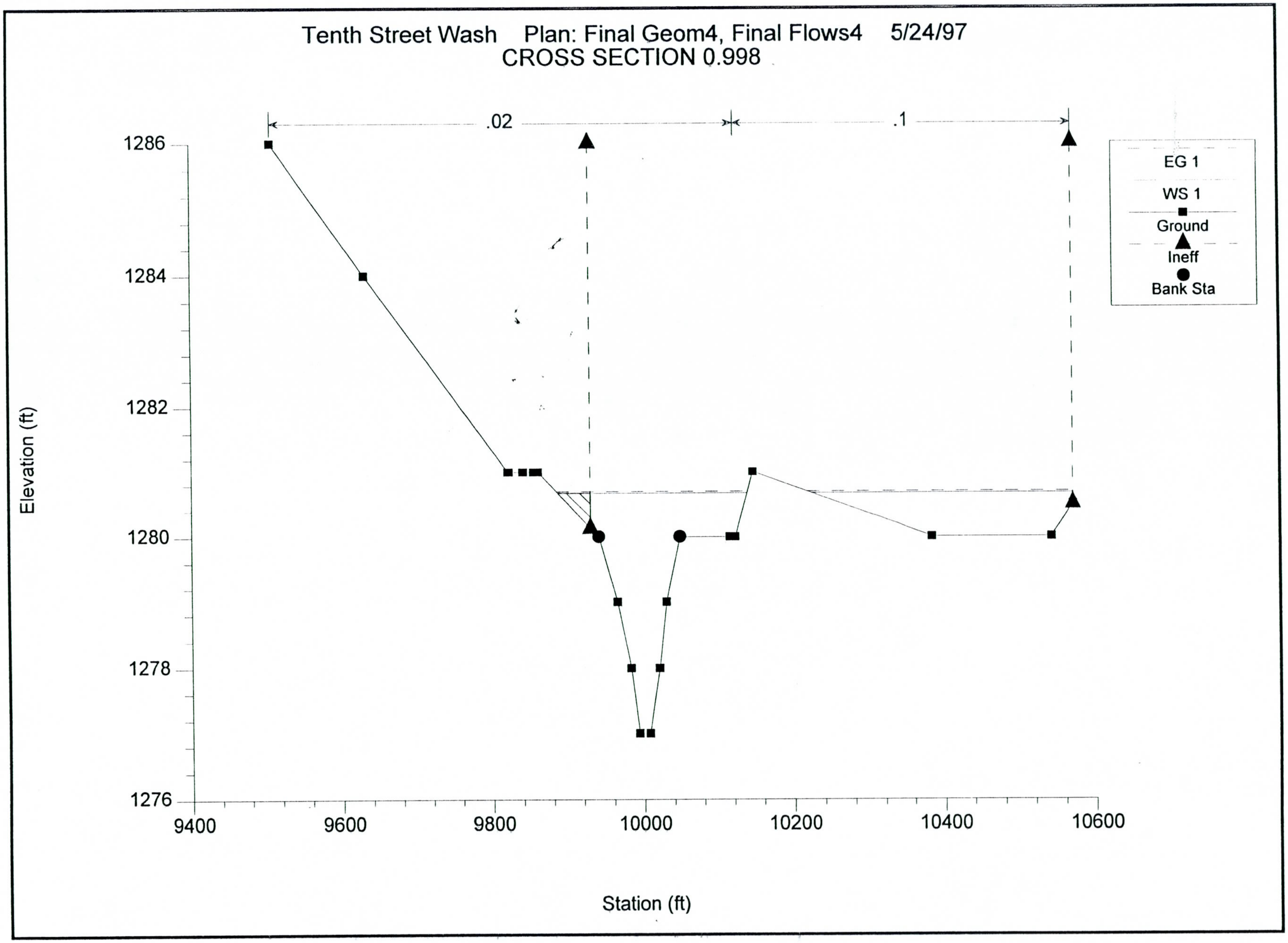


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.05
.1
.043
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1286
1285
1284
1283
1282
1281
1280
9600
9800
10000
10200
10400
10600
Station (ft)

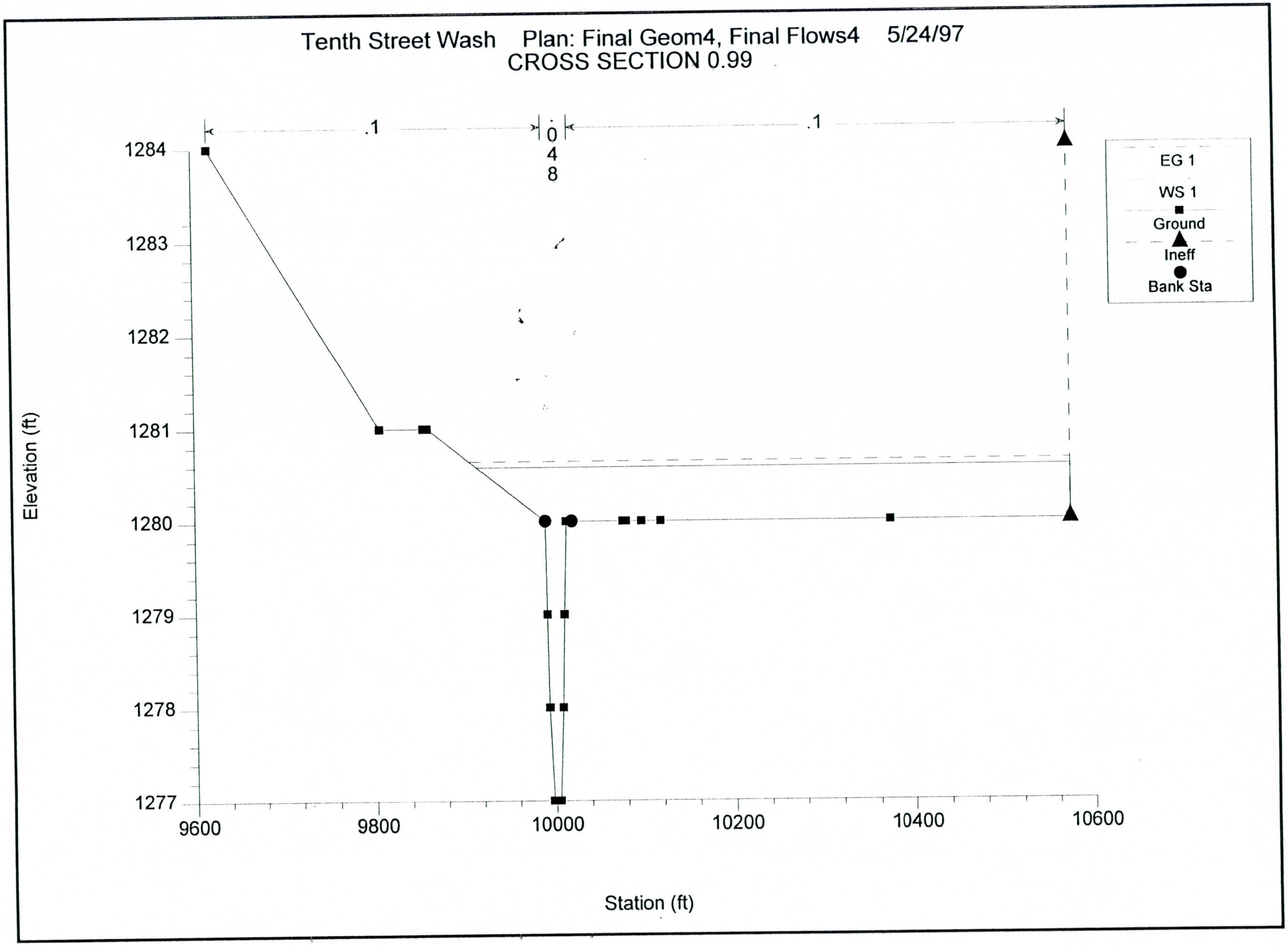


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.03
.1
0
4
3
.1
1286
1284
1282
1280
1278
Elevation (ft)
9400
9600
9800
10000
10200
10400
10600
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta

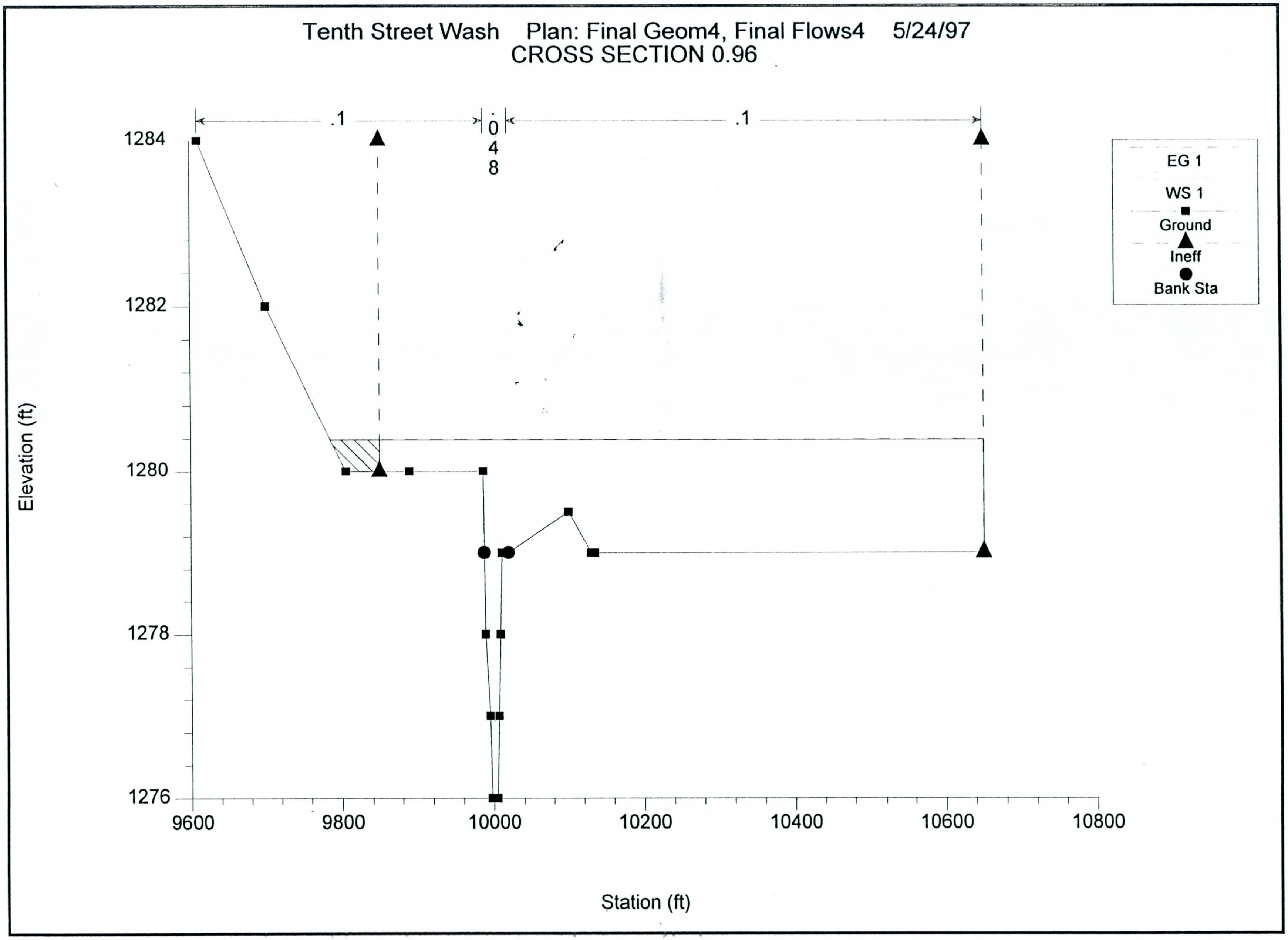

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 1.005
.1
0
4
3
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1286
1284
1282
1280
1278
1276
9600
9800
10000
10200
10400
10600
Station (ft)



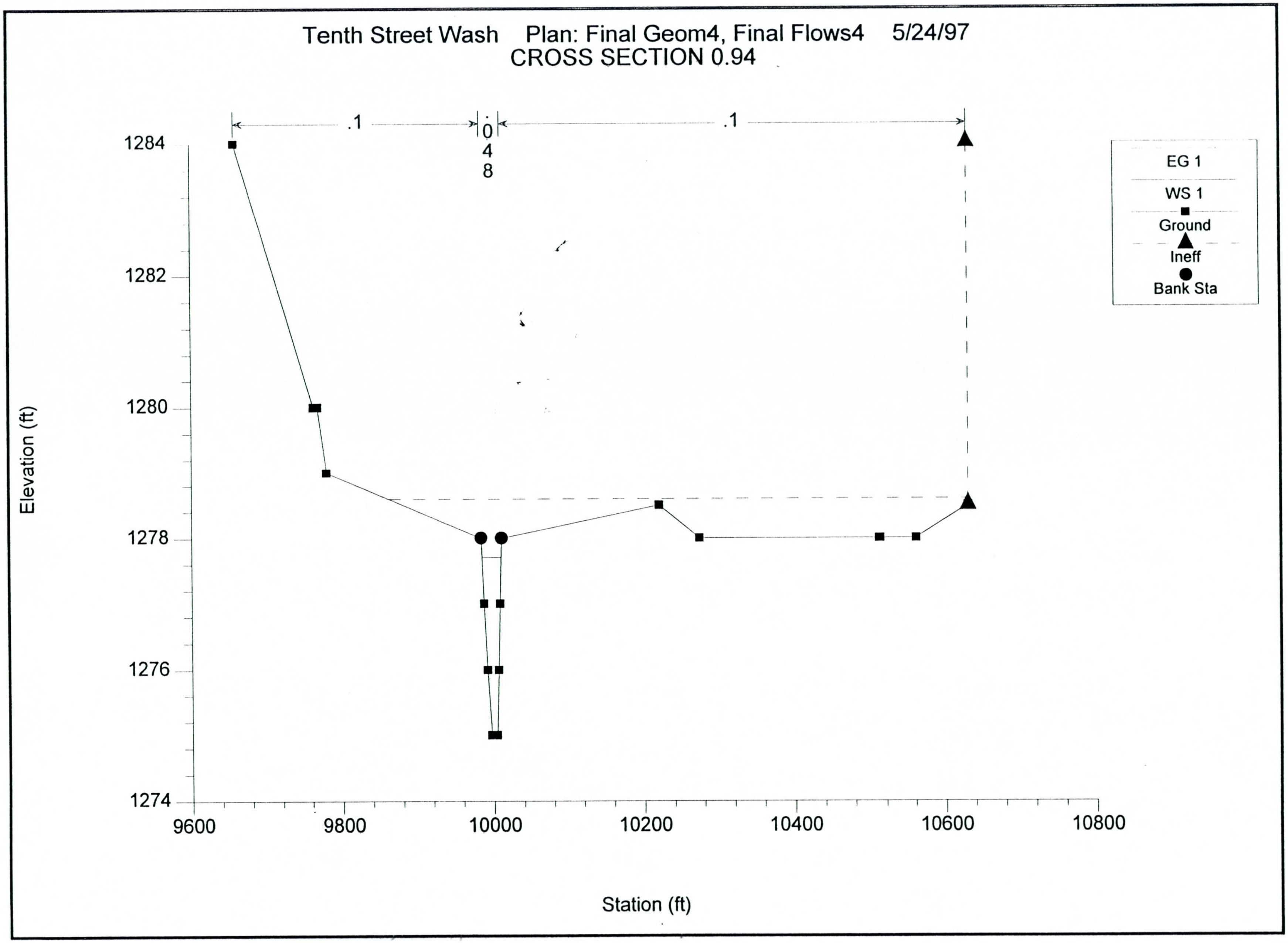
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.998
.02
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1286
1284
1282
1280
1278
1276
9400
9600
9800
10000
10200
10400
10600
Station (ft)



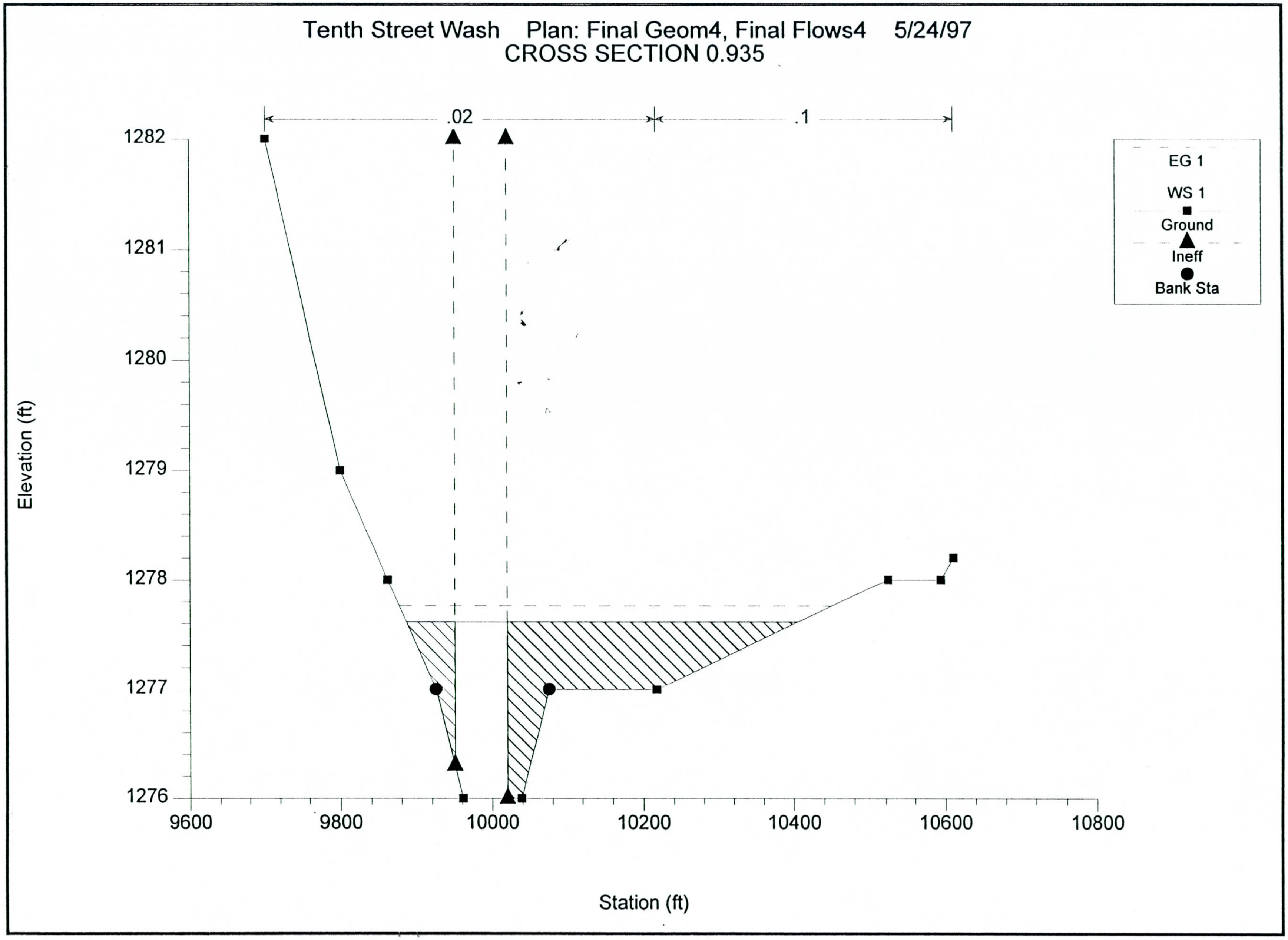
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.99
.1
.048
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1284
1283
1282
1281
1280
1279
1278
1277
9600
9800
10000
10200
10400
10600
Station (ft)



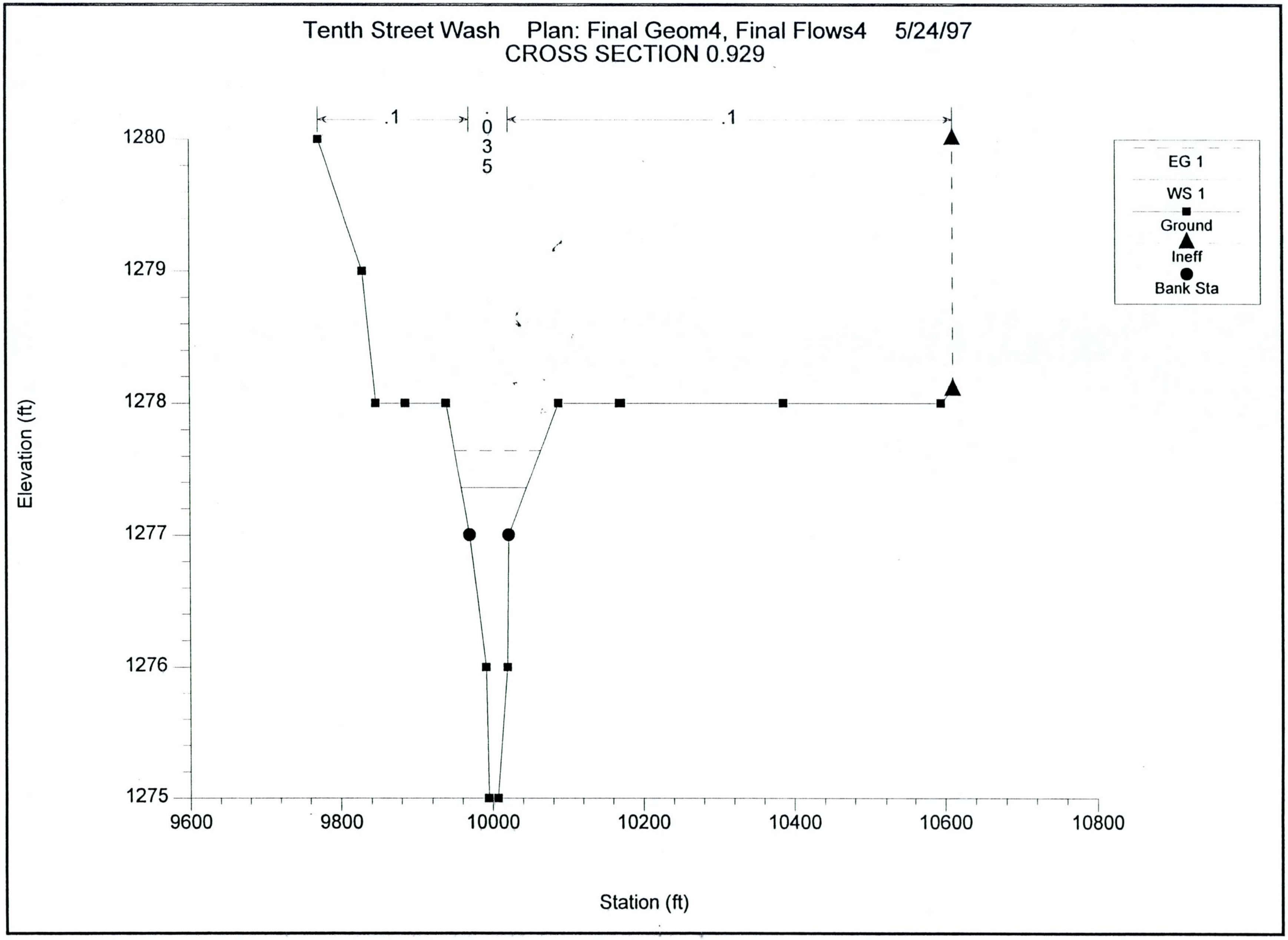
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.96
.1
.048
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1284
1282
1280
1278
1276
Elevation (ft)
9600
9800
10000
10200
10400
10600
10800
Station (ft)

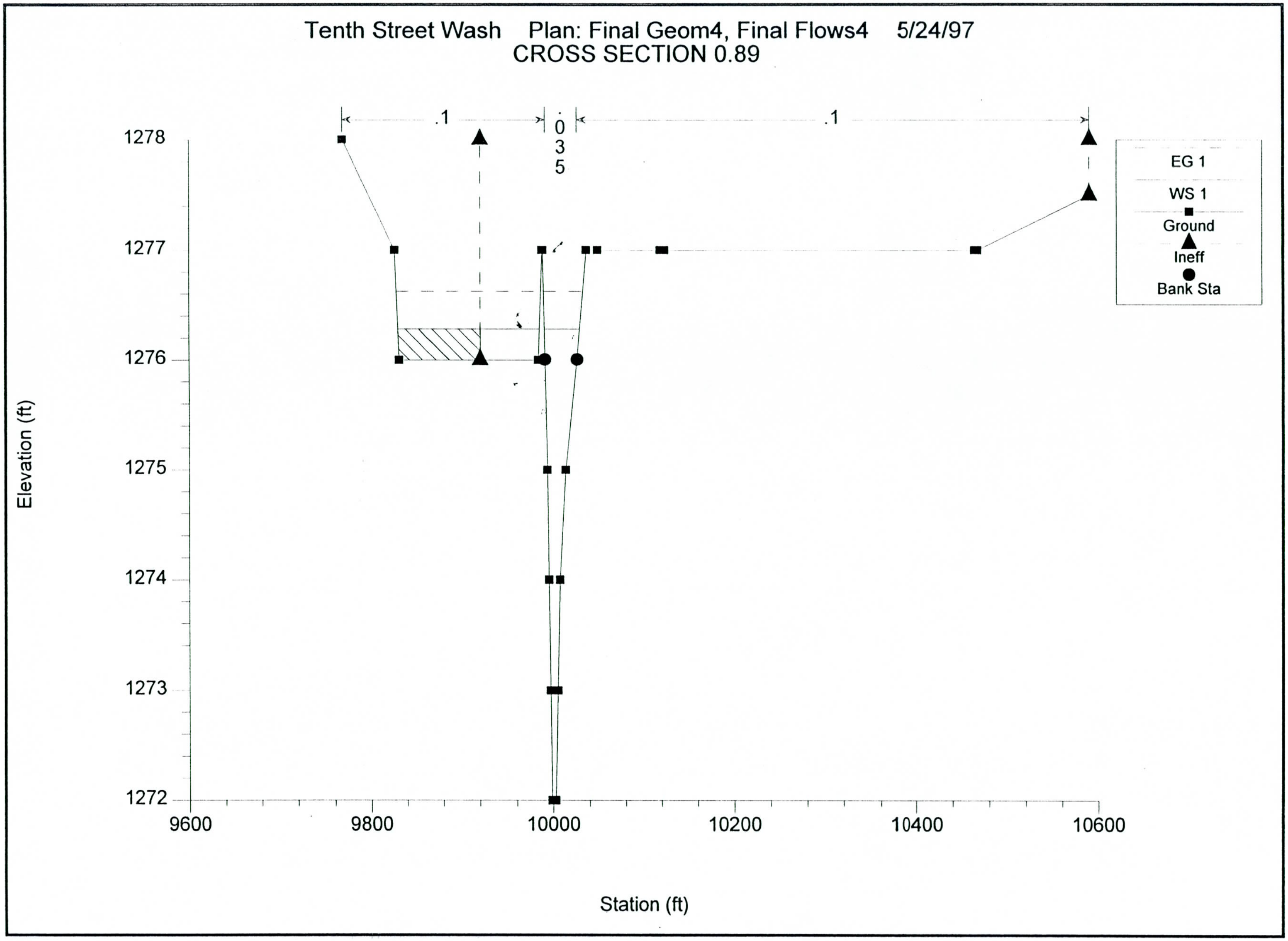


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.94
.1
.048
.1
1284
1282
1280
1278
1276
1274
Elevation (ft)
9600
9800
10000
10200
10400
10600
10800
Station (ft)
EG 1
WS 1
Ground
Ineff
Bank Sta



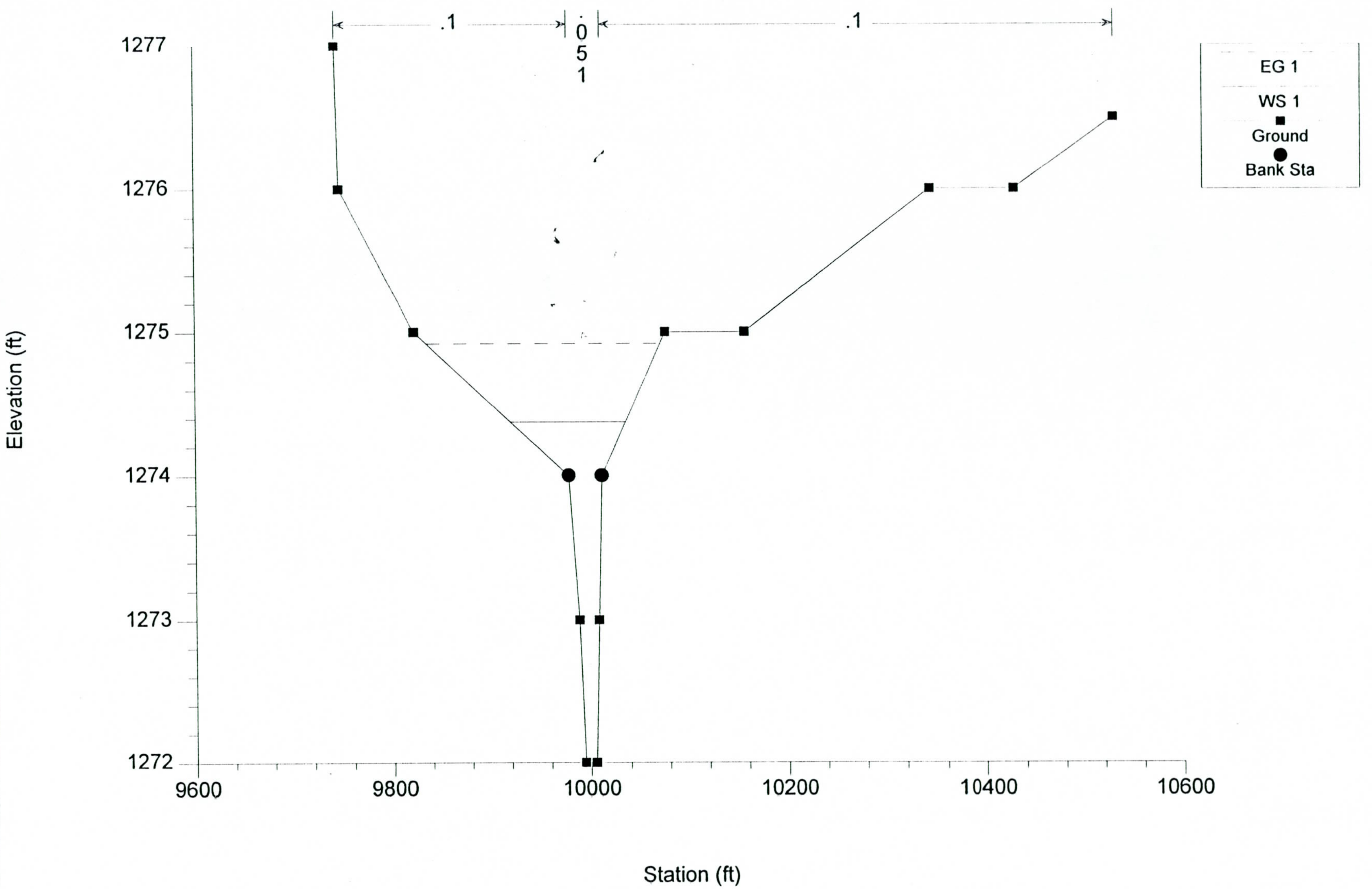
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.935
.02
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1282
1281
1280
1279
1278
1277
1276
9600
9800
10000
10200
10400
10600
10800
Station (ft)

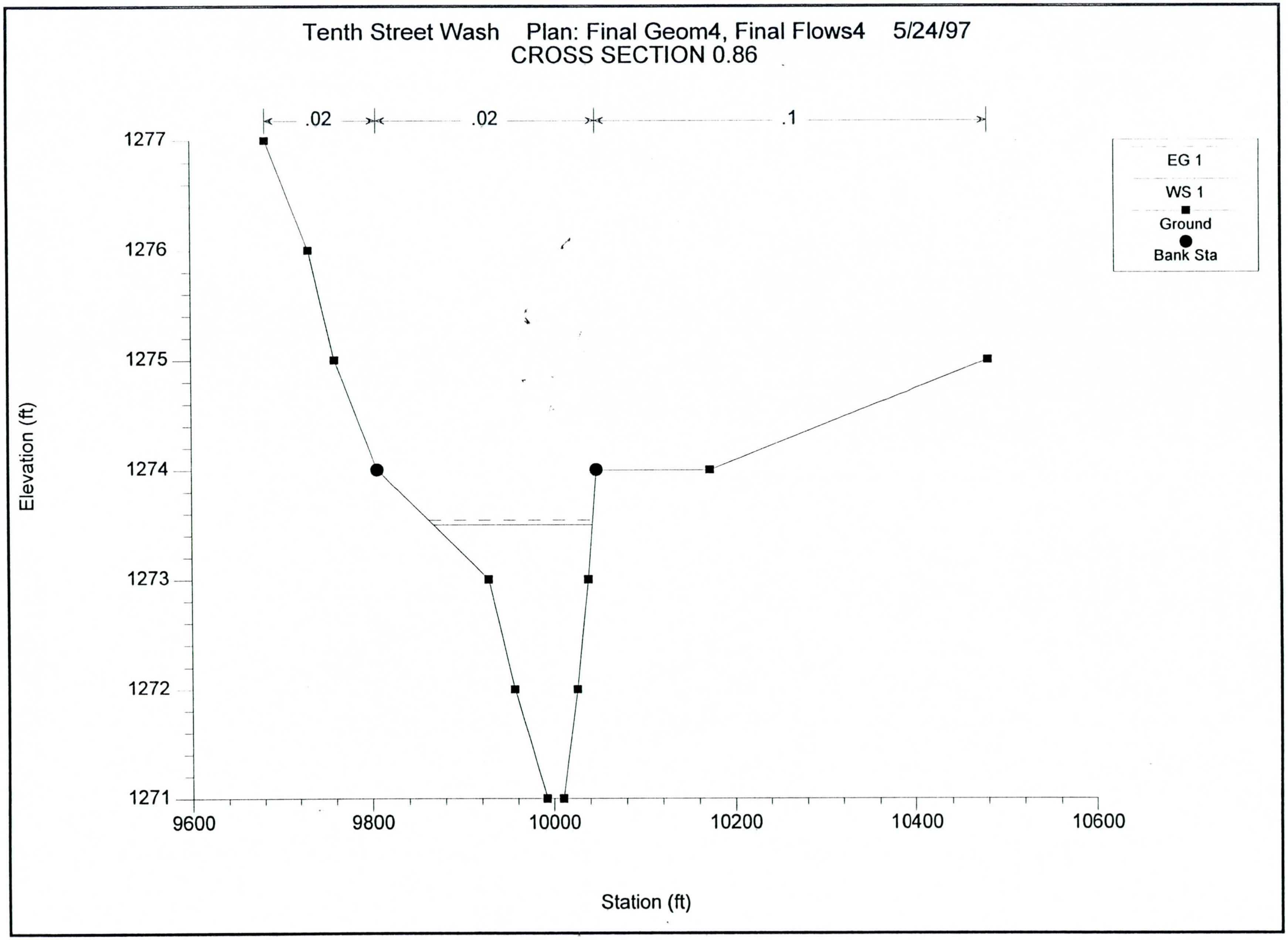

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.929
.1
.035
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1280
1279
1278
1277
1276
1275
9600
9800
10000
10200
10400
10600
10800
Station (ft)

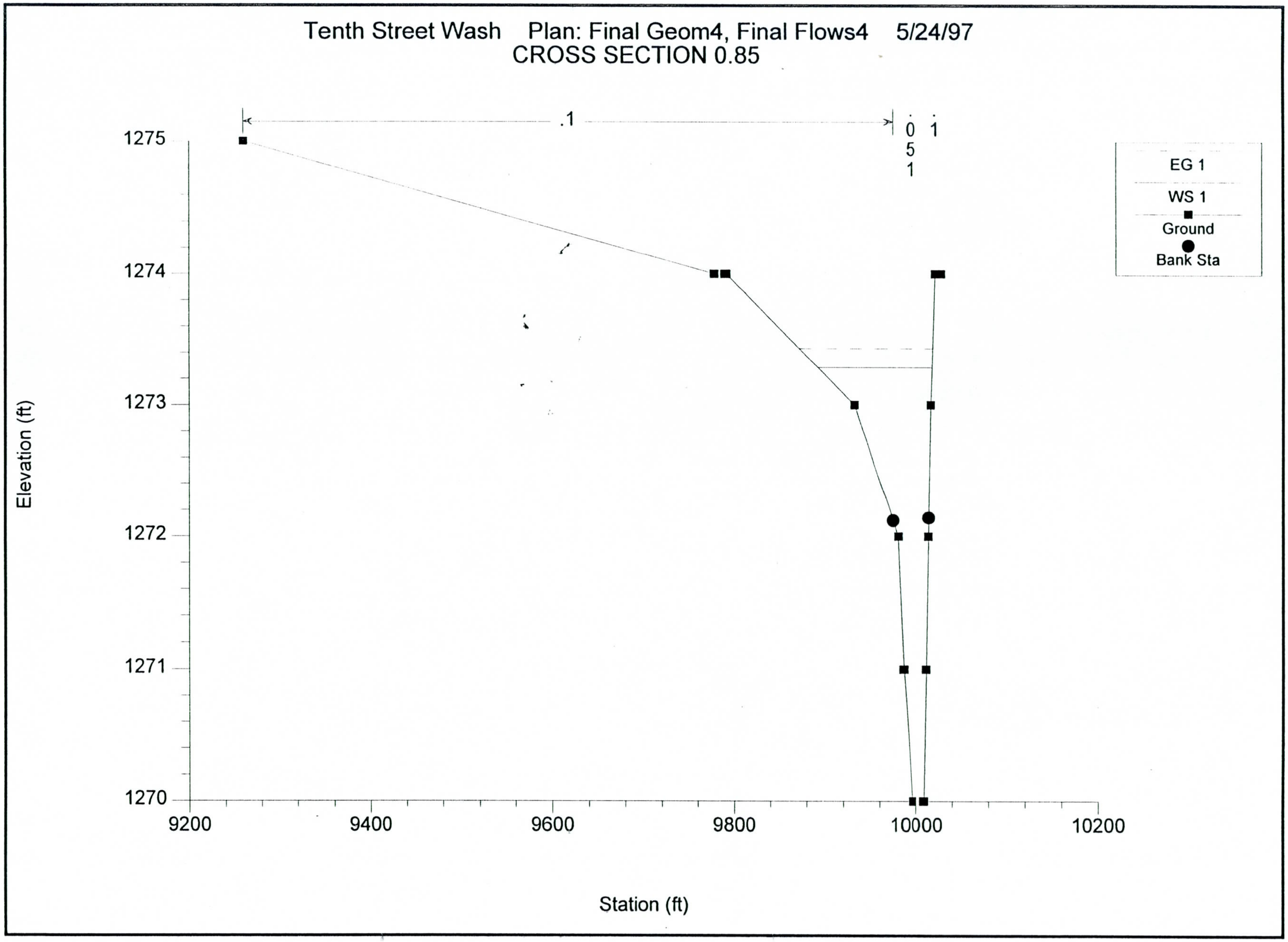


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.89
.1
.035
.1
Elevation (ft)
1278
1277
1276
1275
1274
1273
1272
Station (ft)
9600
9800
10000
10200
10400
10600
EG 1
WS 1
Ground
Ineff
Bank Sta

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.87

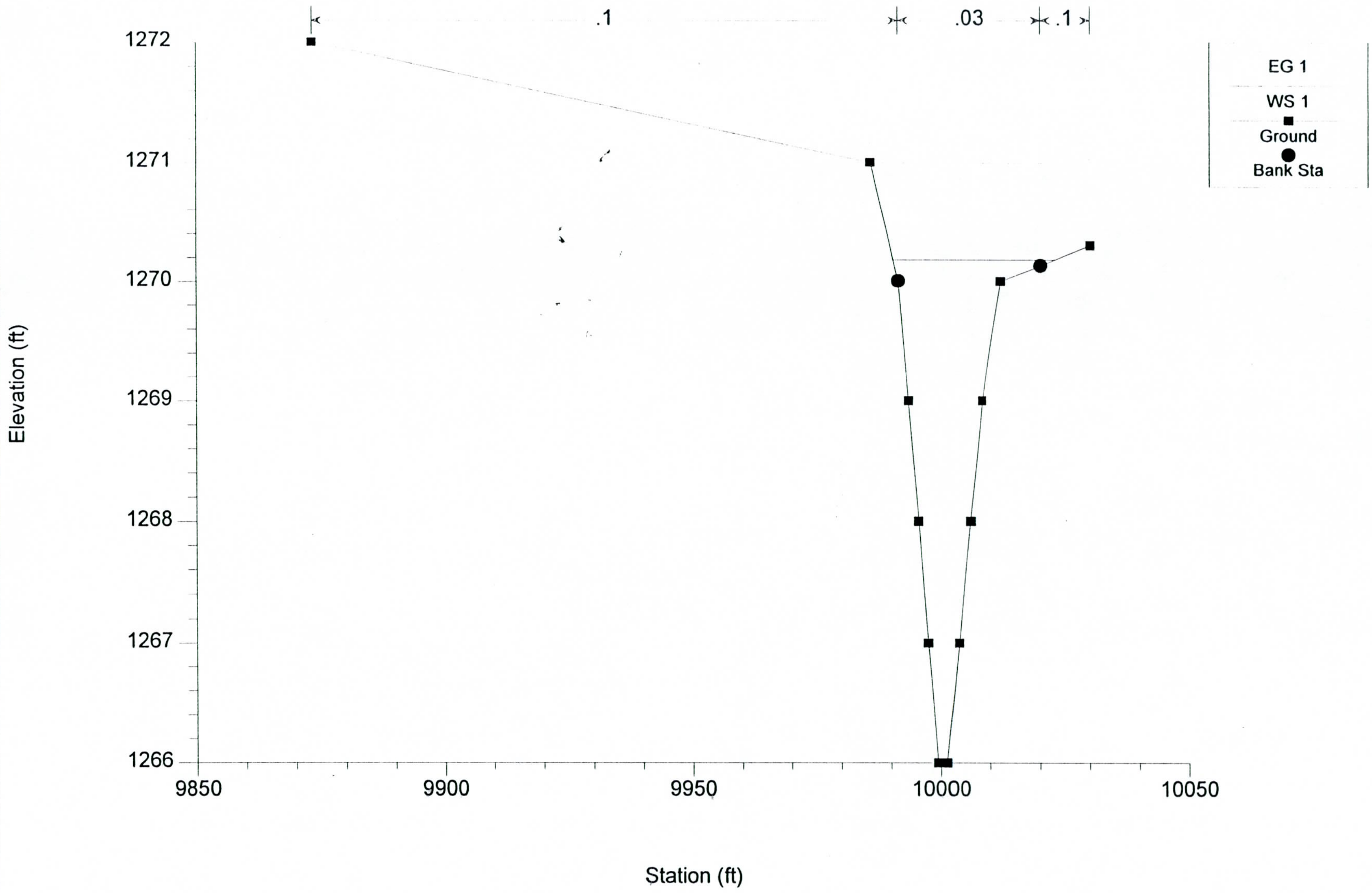


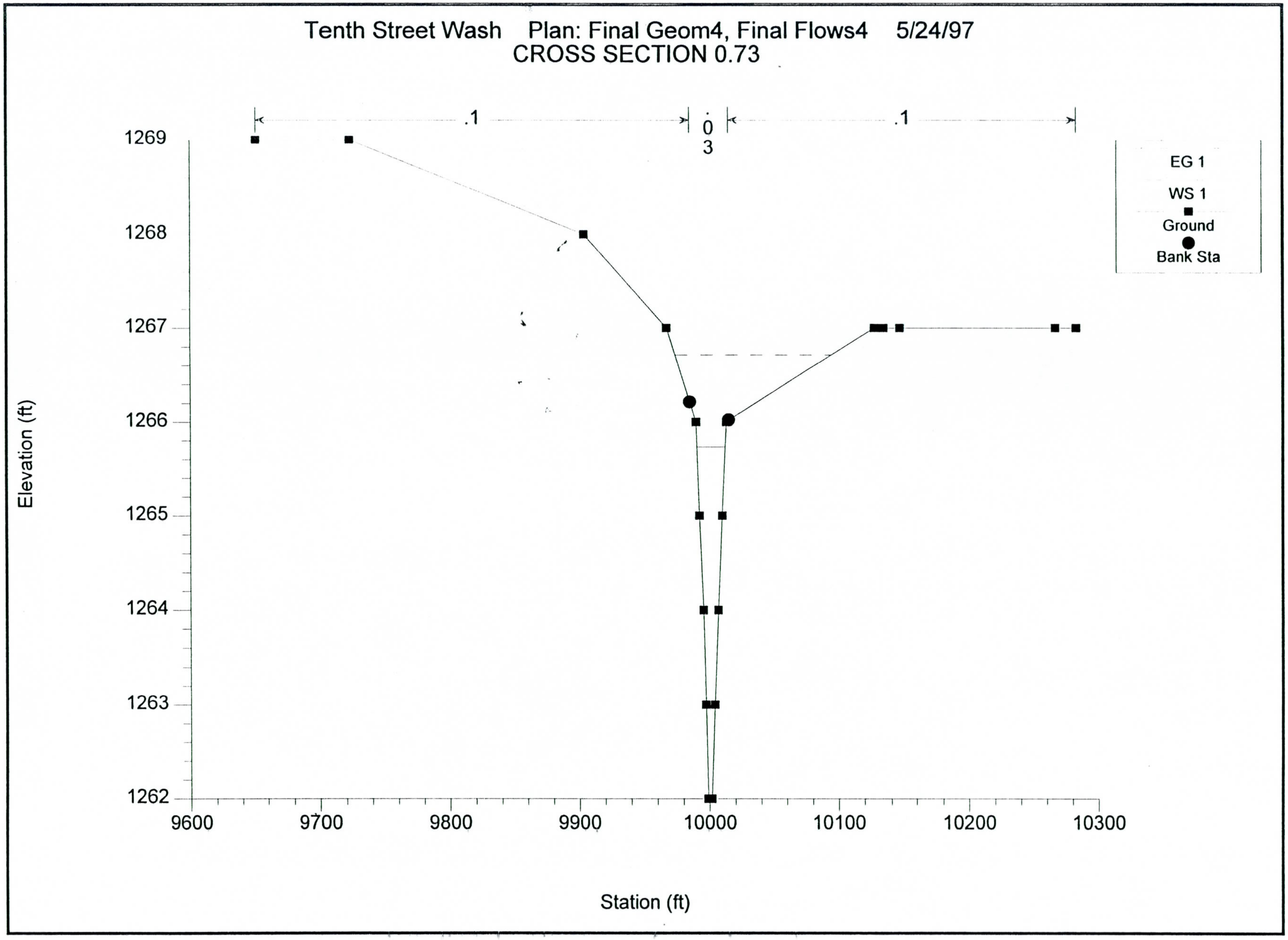

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.86
.02
.02
.1
EG 1
WS 1
Ground
Bank Sta
Elevation (ft)
1277
1276
1275
1274
1273
1272
1271
9600
9800
10000
10200
10400
10600
Station (ft)



Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.85
.1
0
5
1
1
EG 1
WS 1
Ground
Bank Sta
1275
1274
1273
1272
1271
1270
Elevation (ft)
9200
9400
9600
9800
10000
10200
Station (ft)

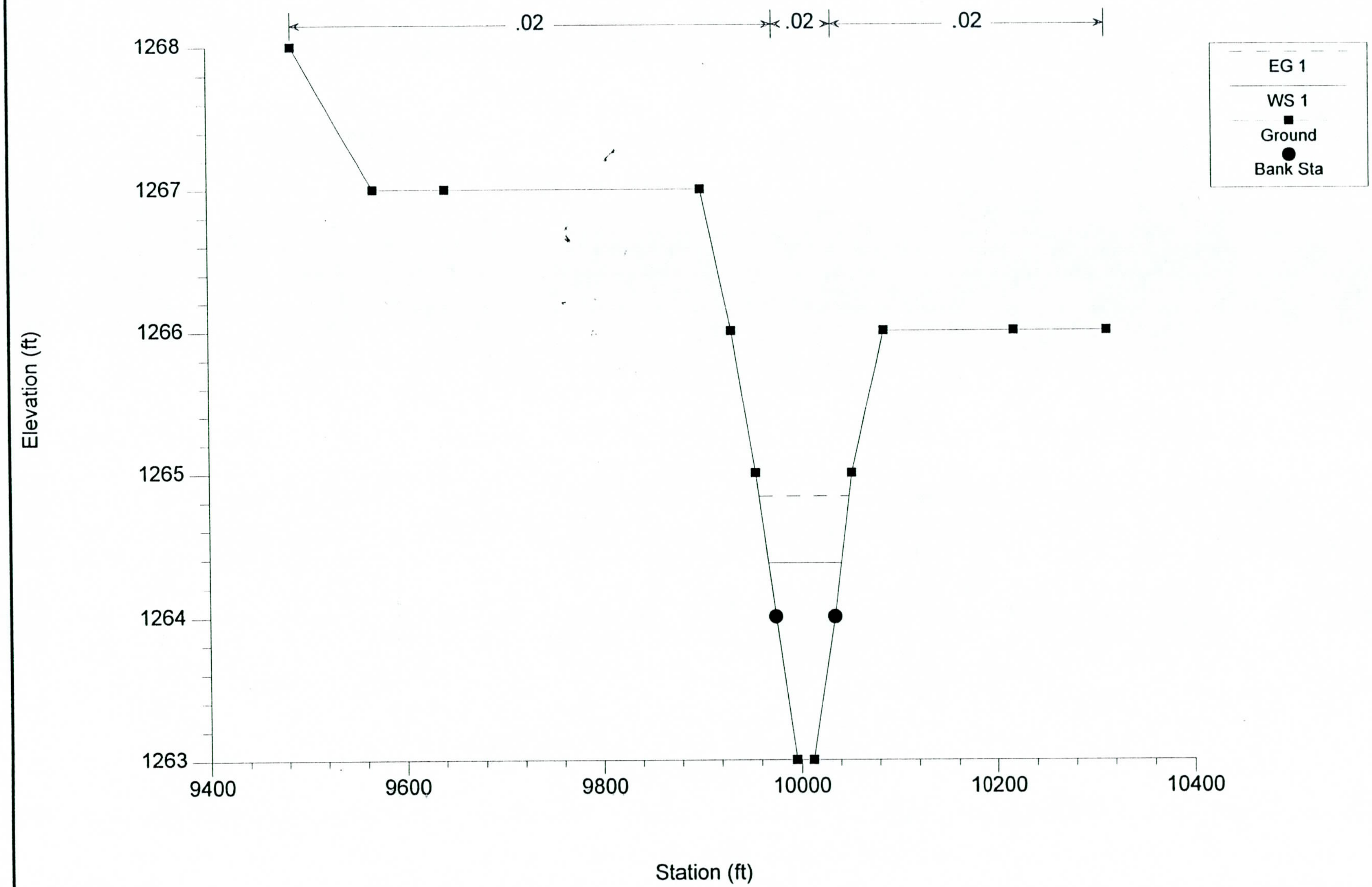
Tenth Street Wash   Plan: Final Geom4, Final Flows4   5/24/97
CROSS SECTION 0.79



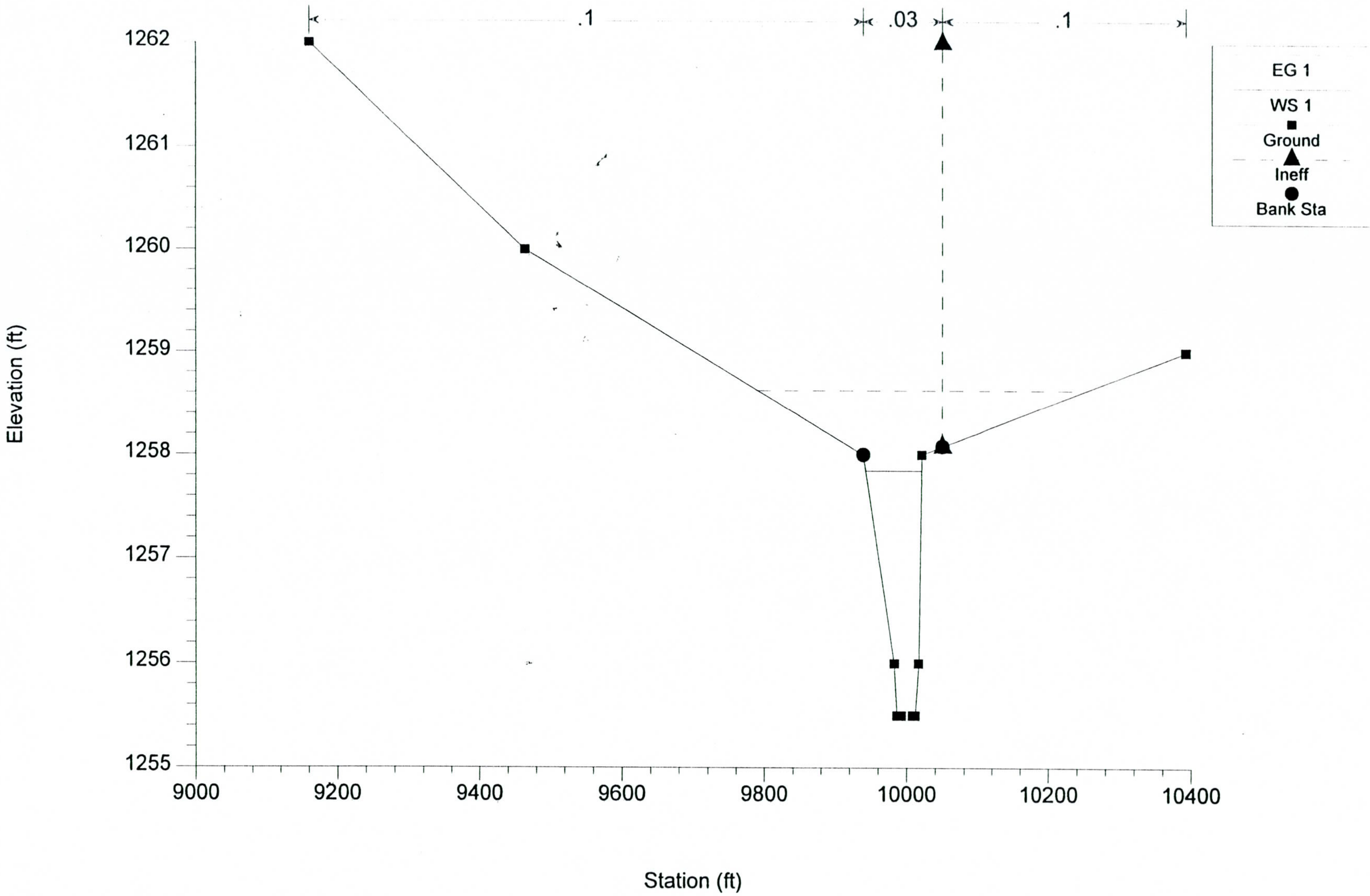


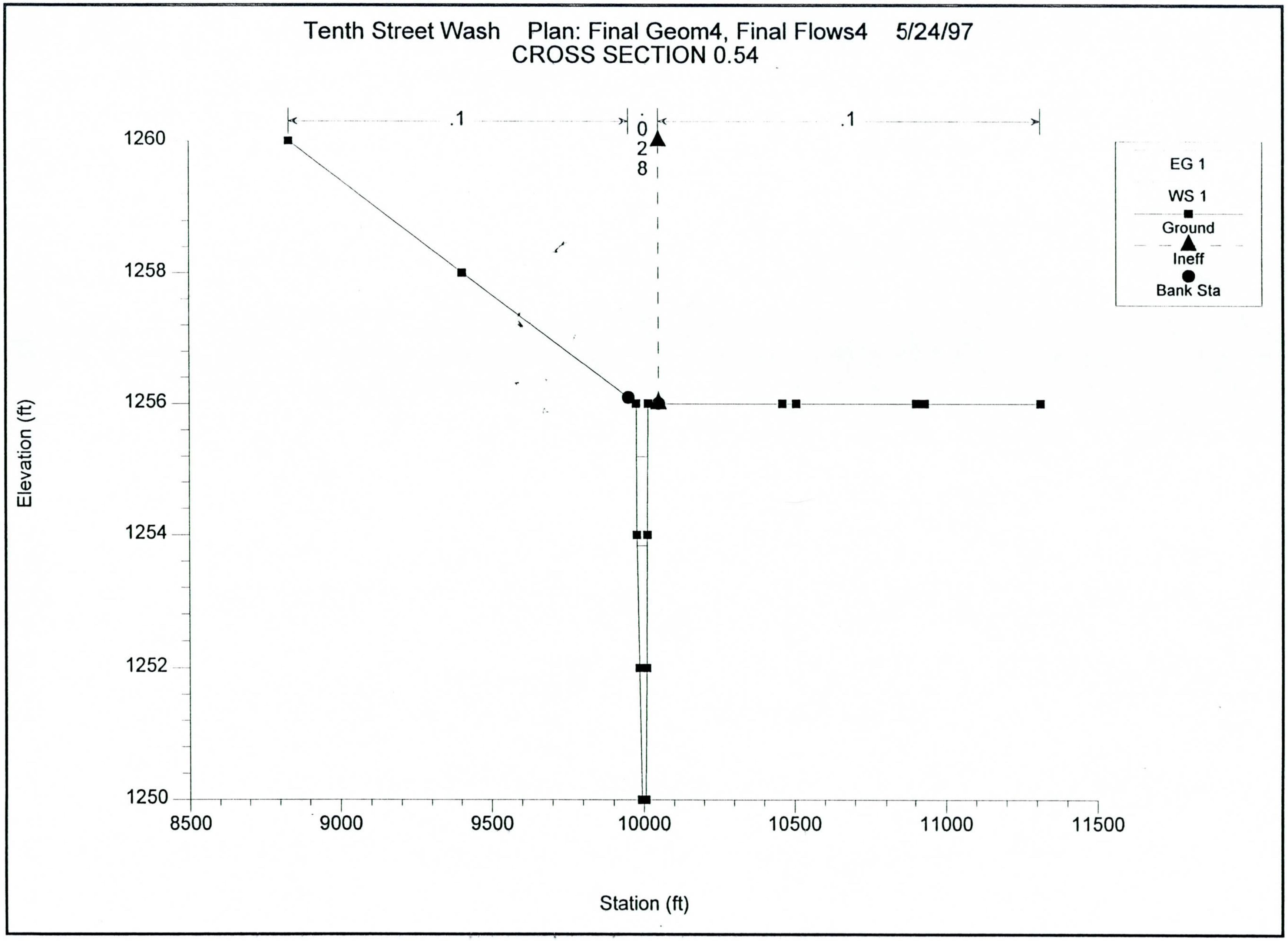
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.73
.1
.03
.1
EG 1
WS 1
Ground
Bank Sta
Elevation (ft)
1269
1268
1267
1266
1265
1264
1263
1262
9600
9700
9800
9900
10000
10100
10200
10300
Station (ft)

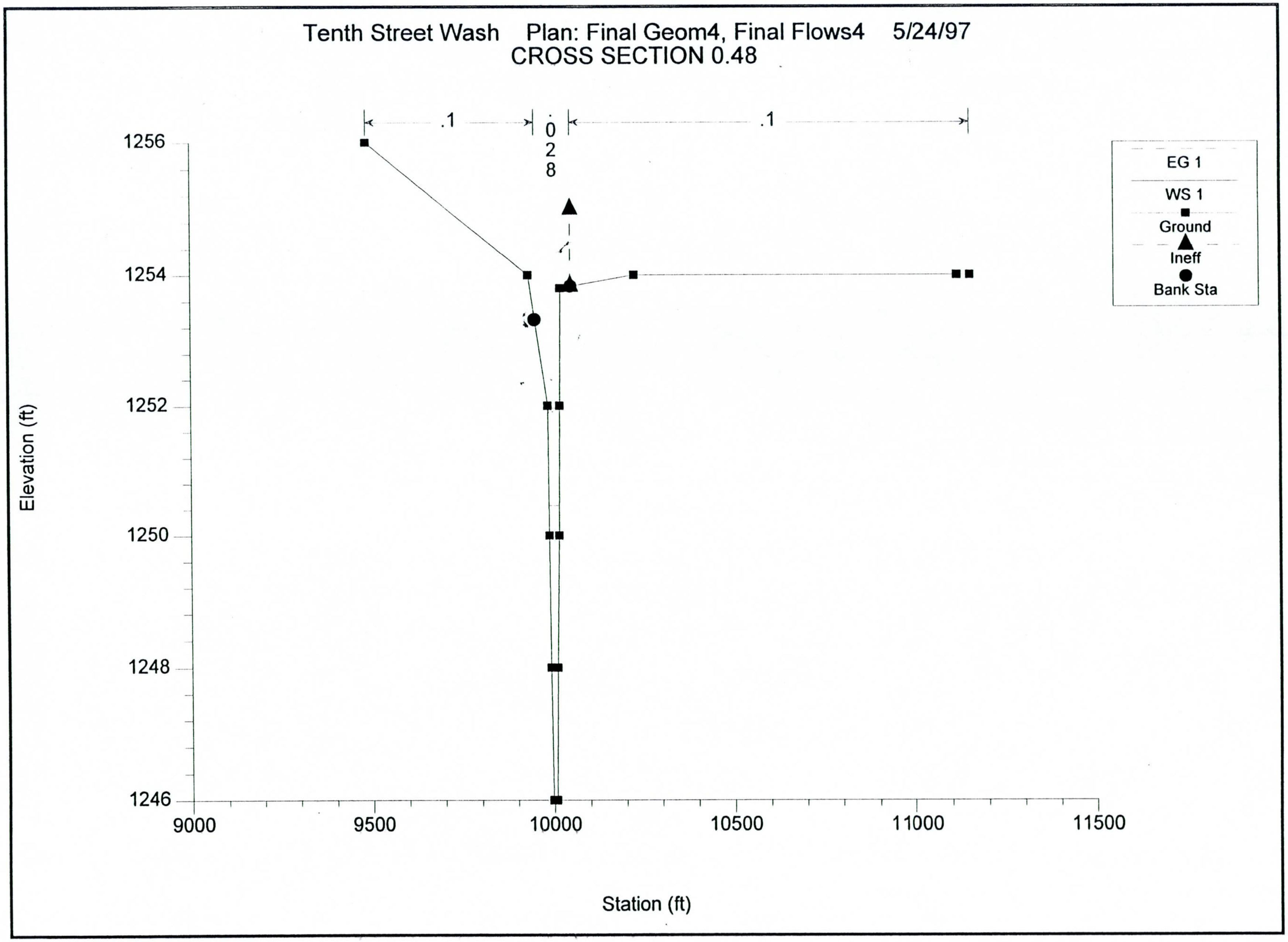
Tenth Street Wash   Plan: Final Geom4, Final Flows4   5/24/97
CROSS SECTION 0.72



Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.57

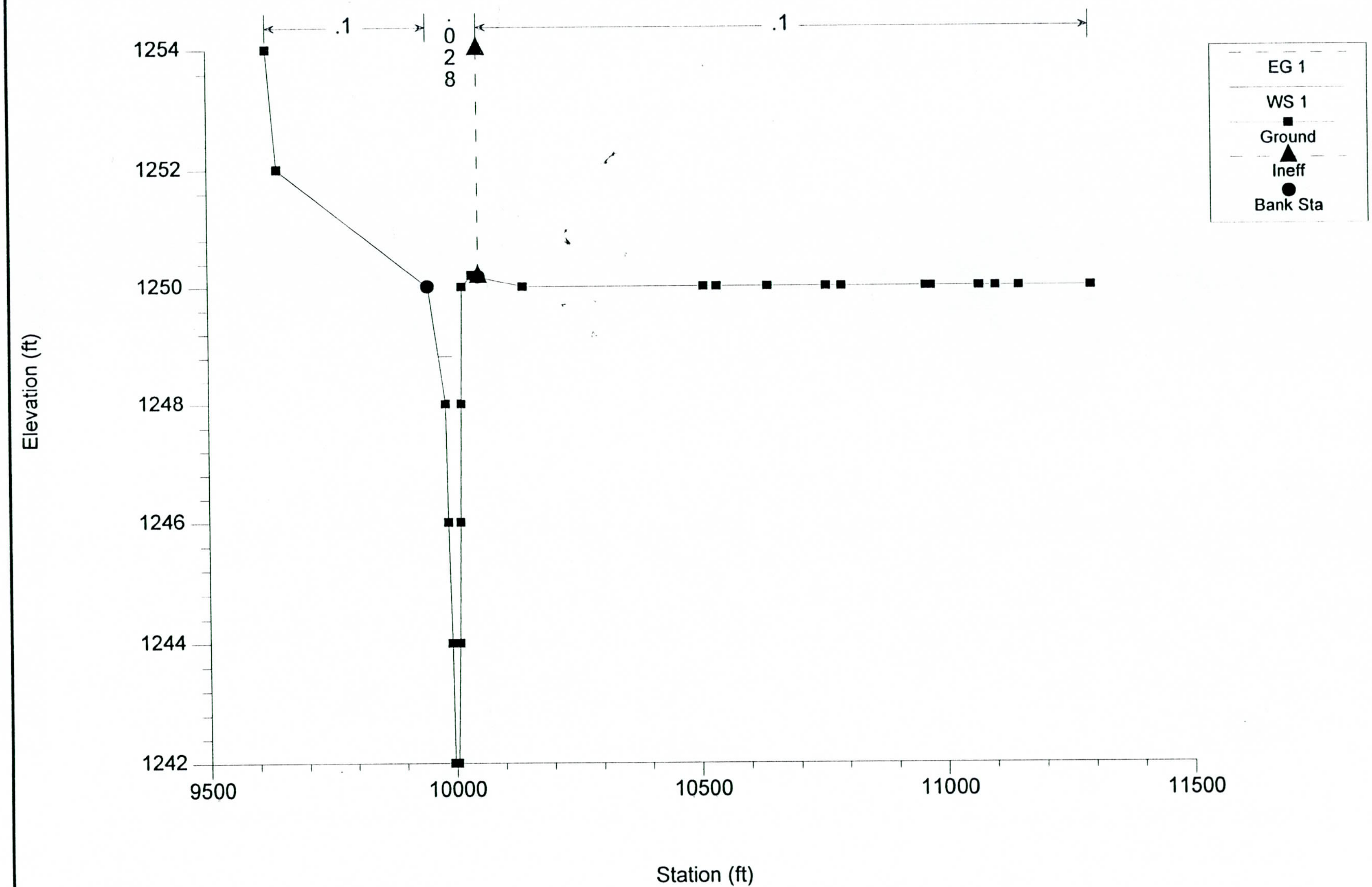


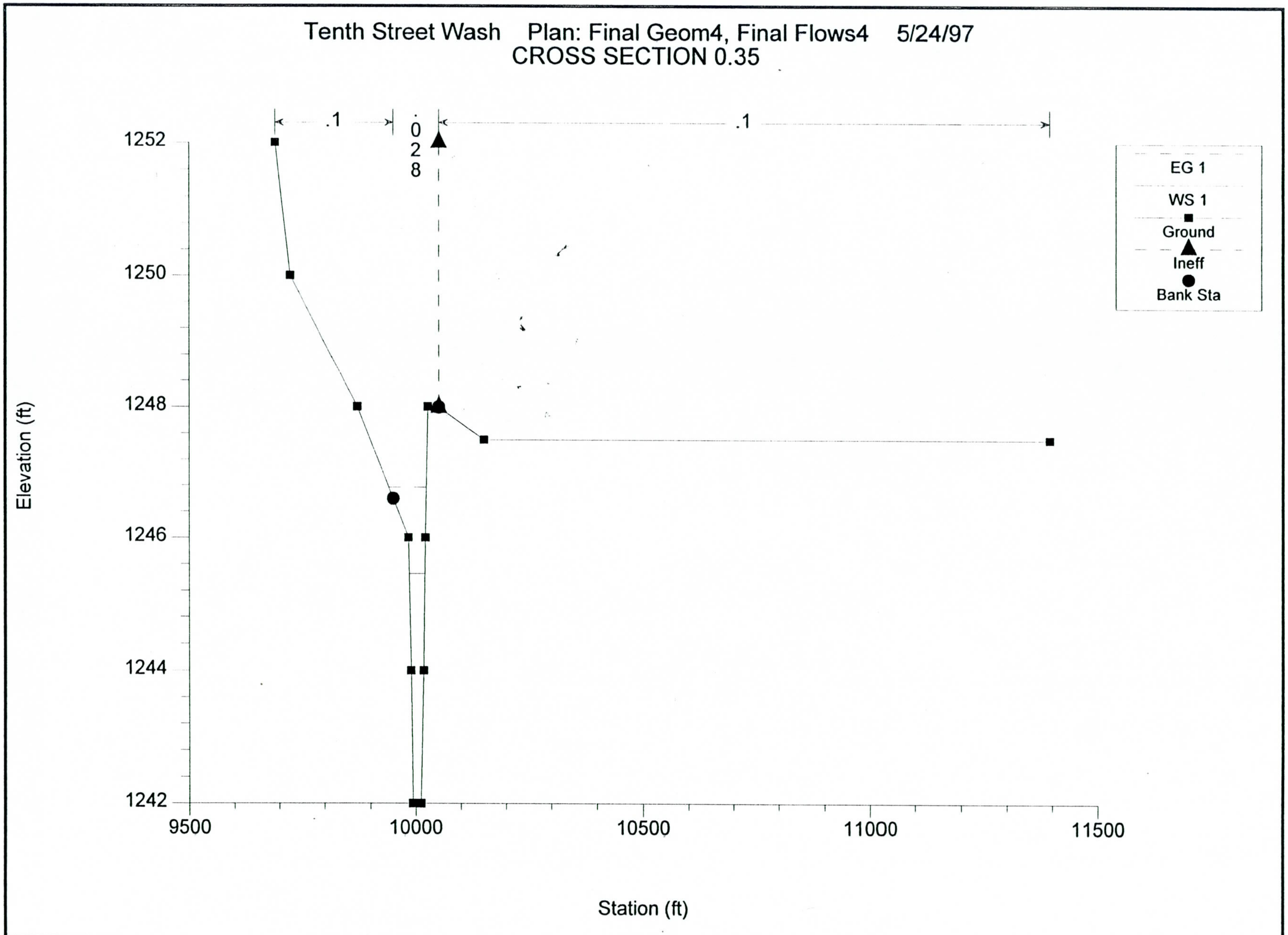

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.54
.1
.028
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1260
1258
1256
1254
1252
1250
8500
9000
9500
10000
10500
11000
11500
Station (ft)

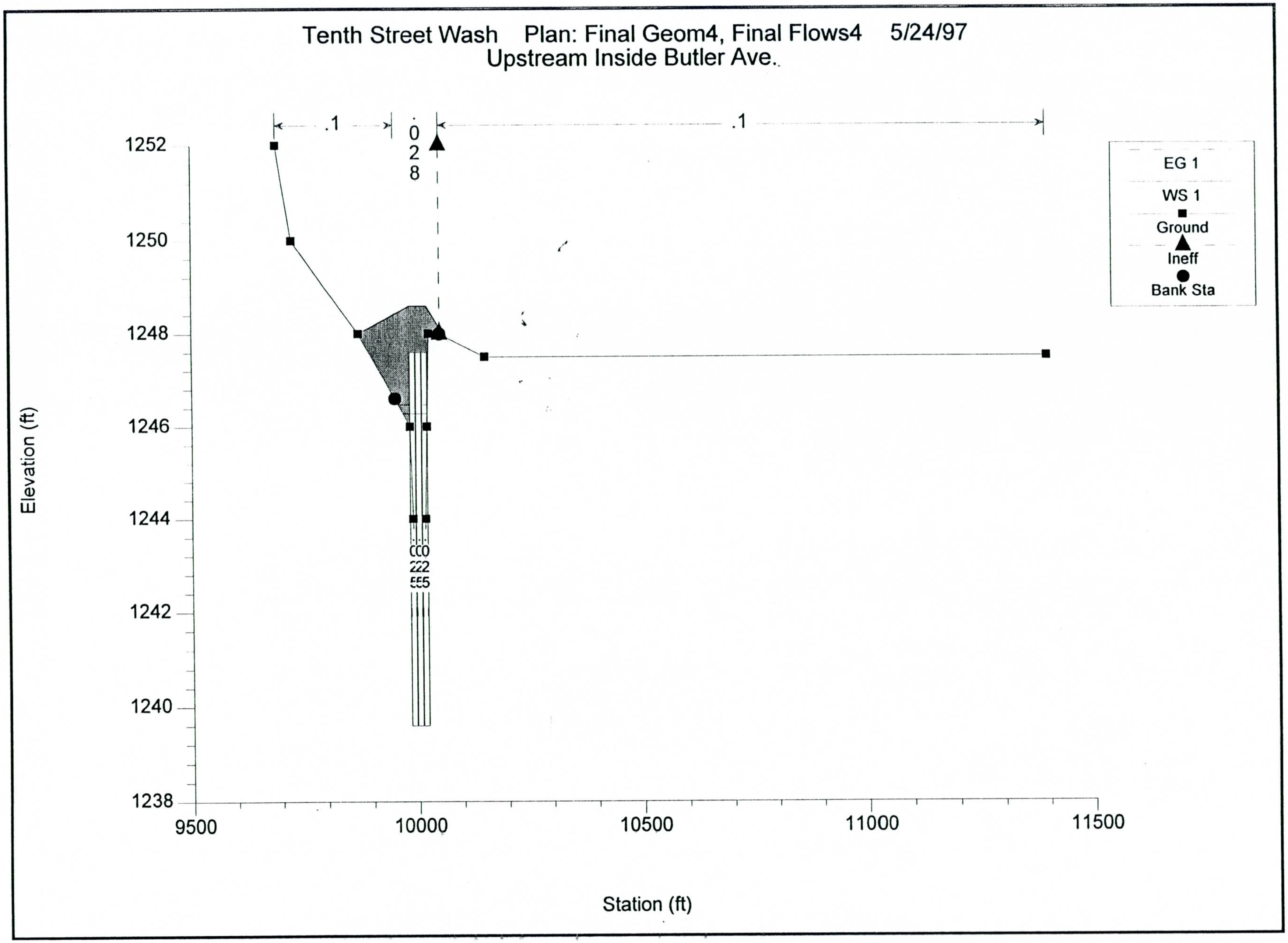


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.48
.1
0
2
8
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1256
1254
1252
1250
1248
1246
9000
9500
10000
10500
11000
11500
Station (ft)

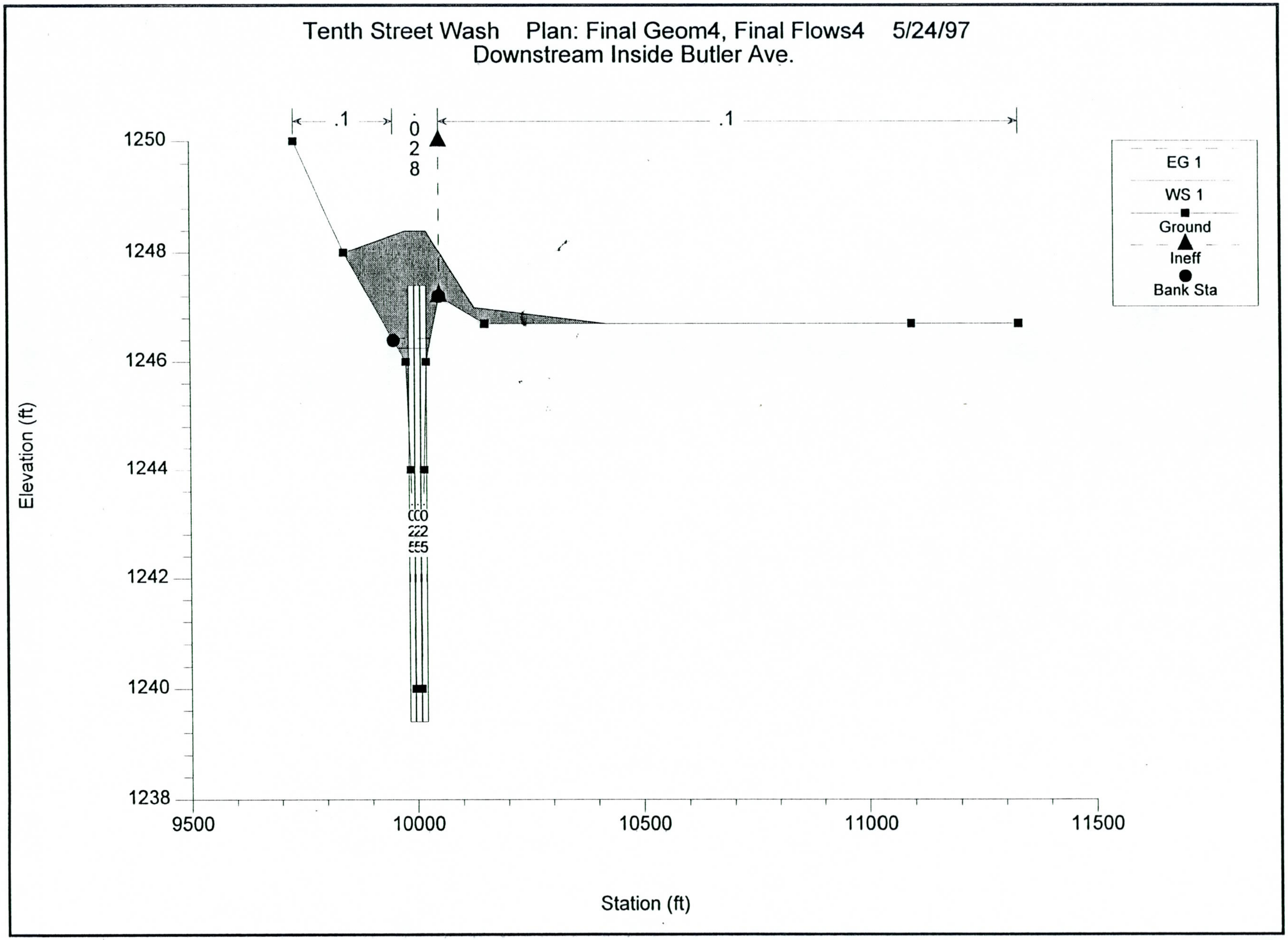
Tenth Street Wash   Plan: Final Geom4, Final Flows4   5/24/97
CROSS SECTION 0.41



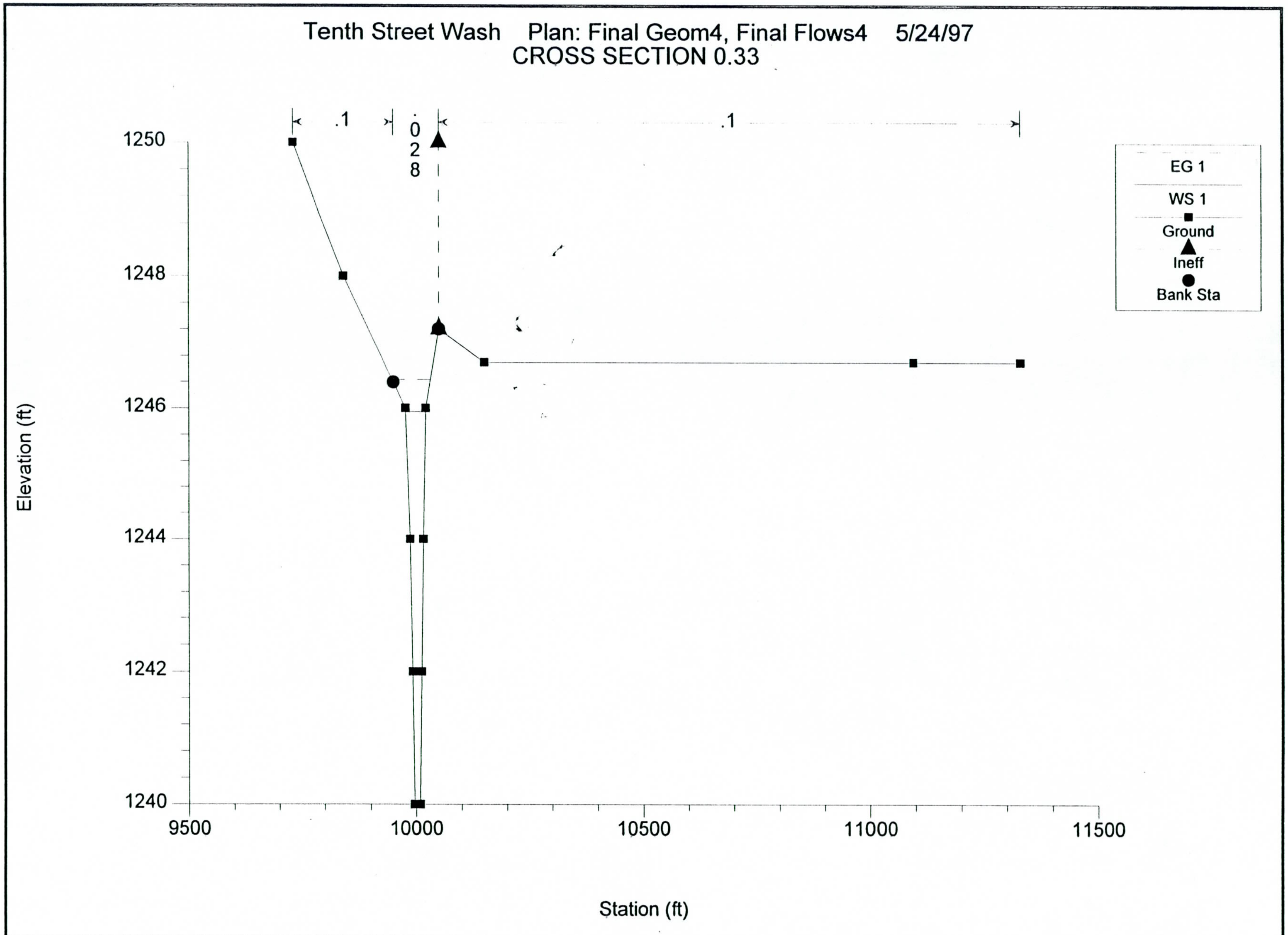

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.35
.1
.028
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1252
1250
1248
1246
1244
1242
9500
10000
10500
11000
11500
Station (ft)



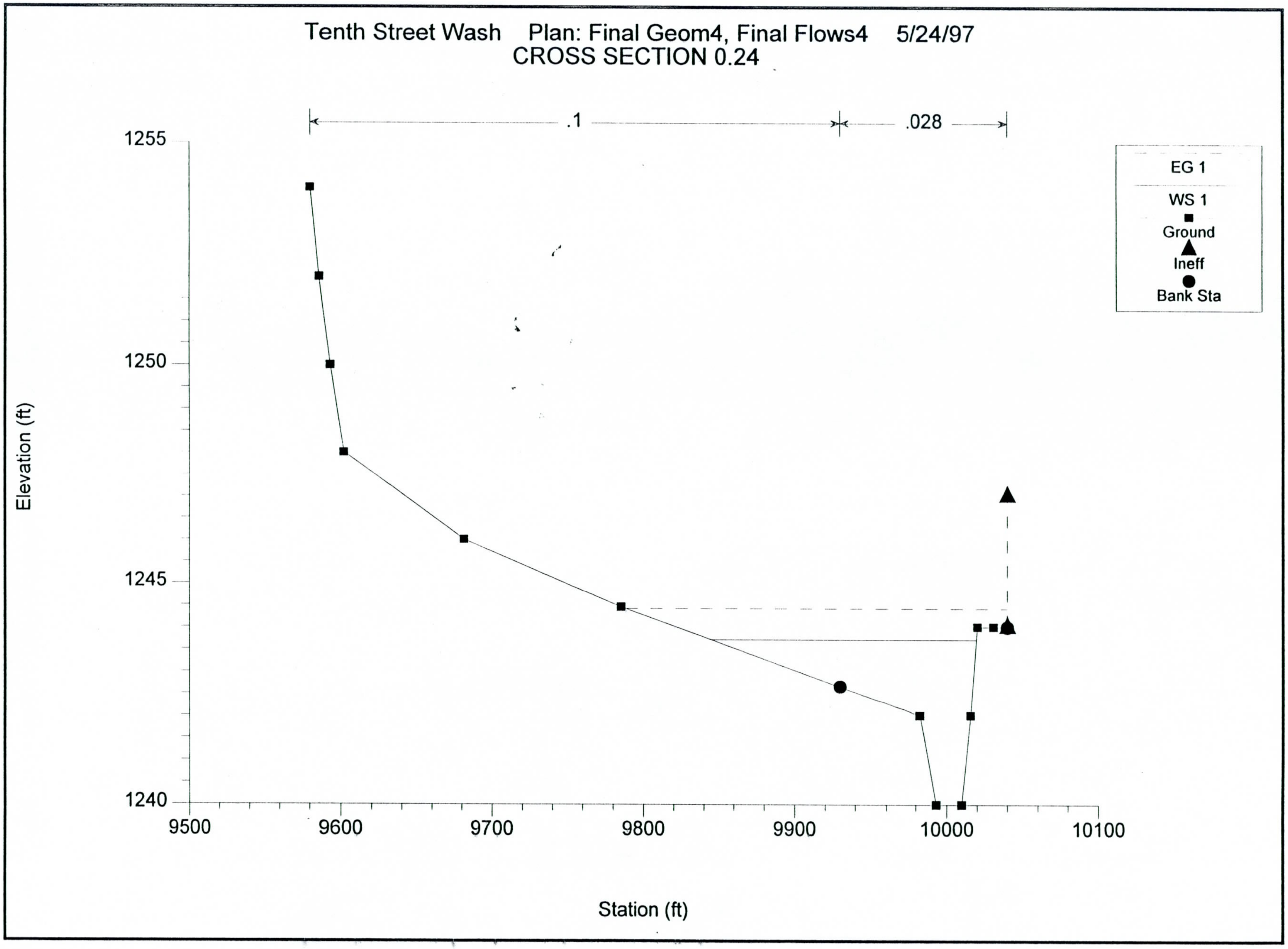
Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
Upstream Inside Butler Ave.
.1
.028
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1252
1250
1248
1246
1244
1242
1240
1238
Station (ft)
9500
10000
10500
11000
11500

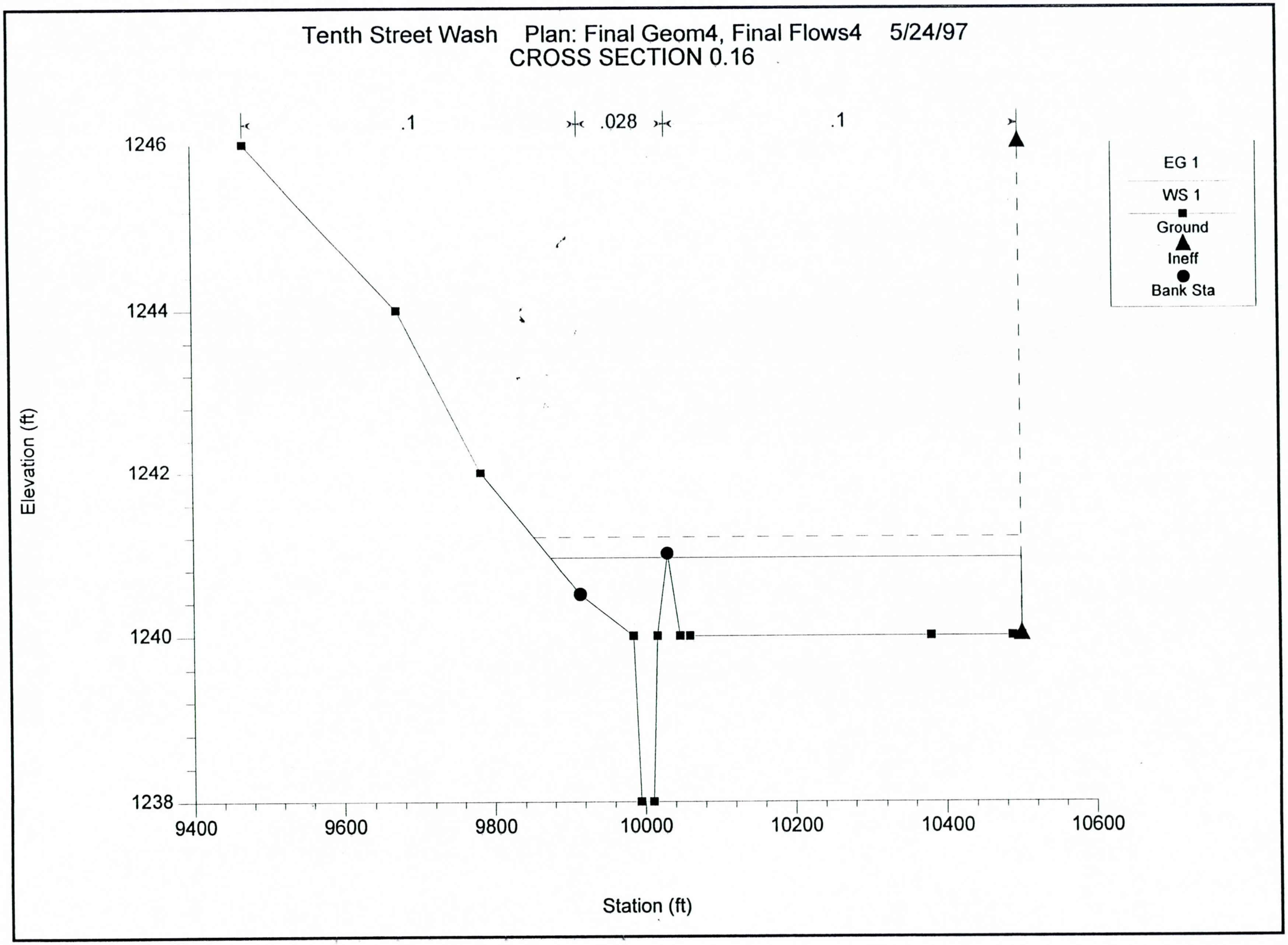


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
Downstream Inside Butler Ave.
.1
.028
.1
.025
.025
.025
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1250
1248
1246
1244
1242
1240
1238
Station (ft)
9500
10000
10500
11000
11500

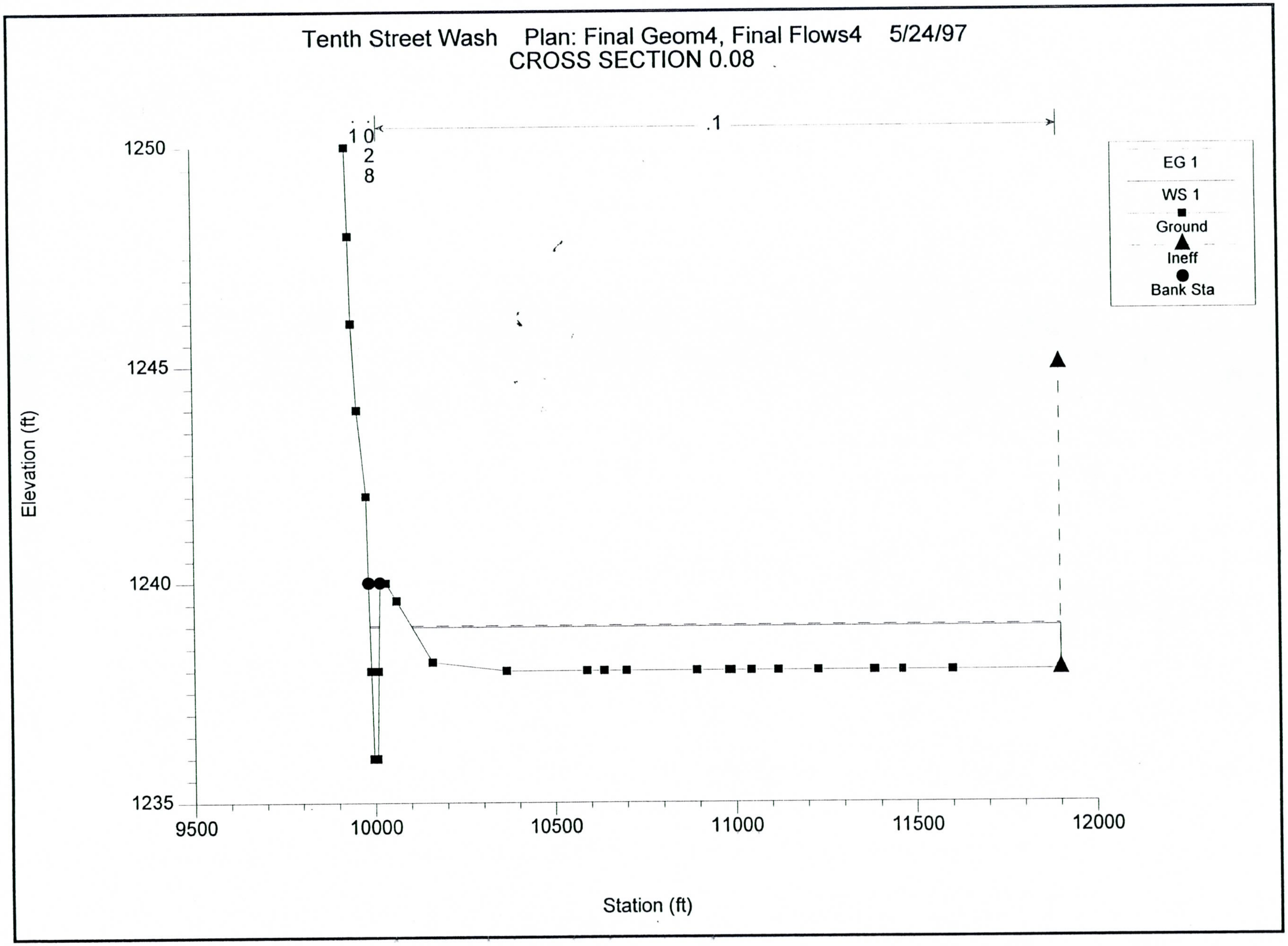


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.33
.1
.028
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1250
1248
1246
1244
1242
1240
9500
10000
10500
11000
11500
Station (ft)


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.24
.1
.028
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1255
1250
1245
1240
9500
9600
9700
9800
9900
10000
10100
Station (ft)

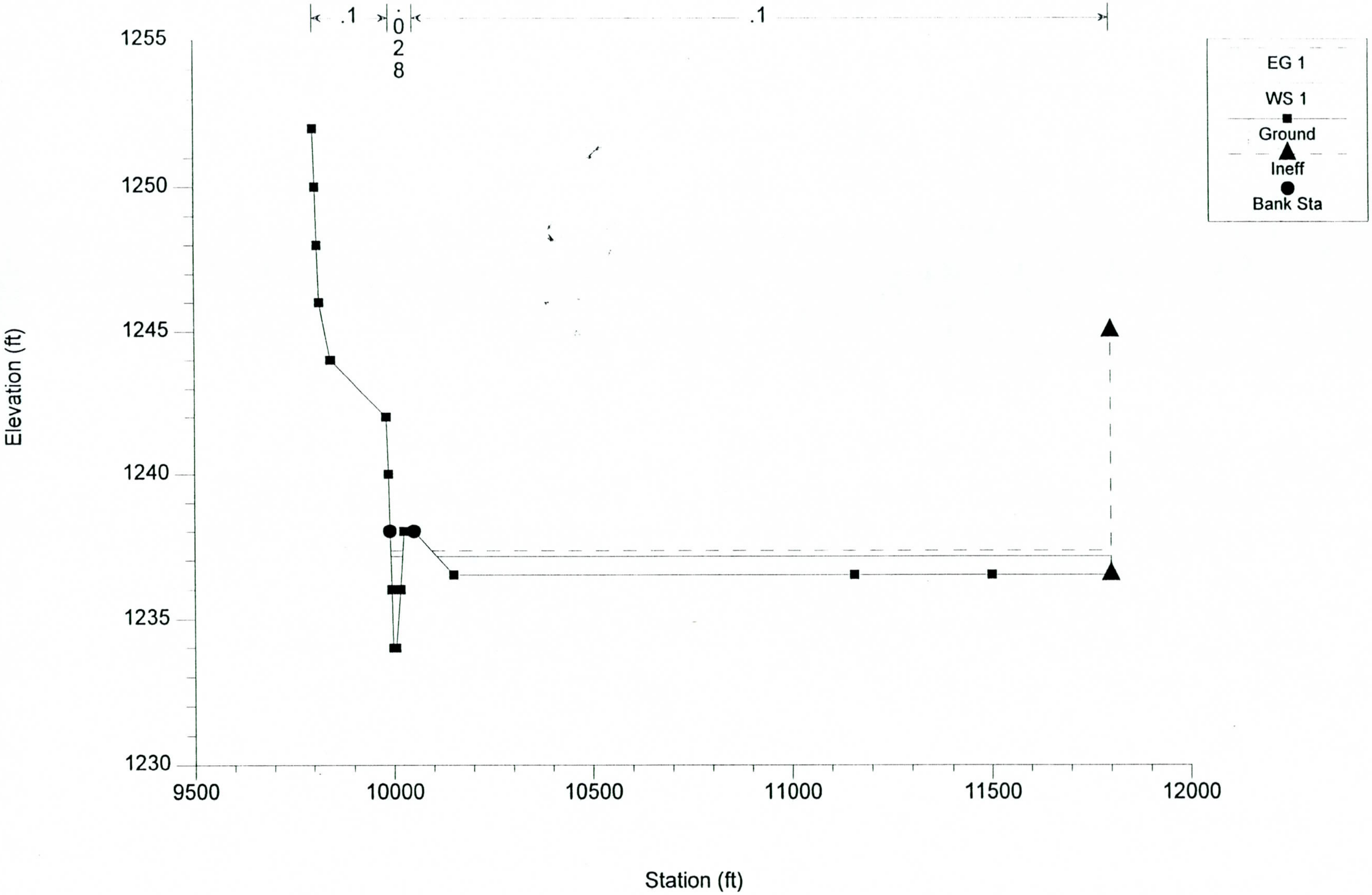


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.16
.1
.028
.1
EG 1
WS 1
Ground
Ineff
Bank Sta
1246
1244
1242
1240
1238
Elevation (ft)
9400
9600
9800
10000
10200
10400
10600
Station (ft)

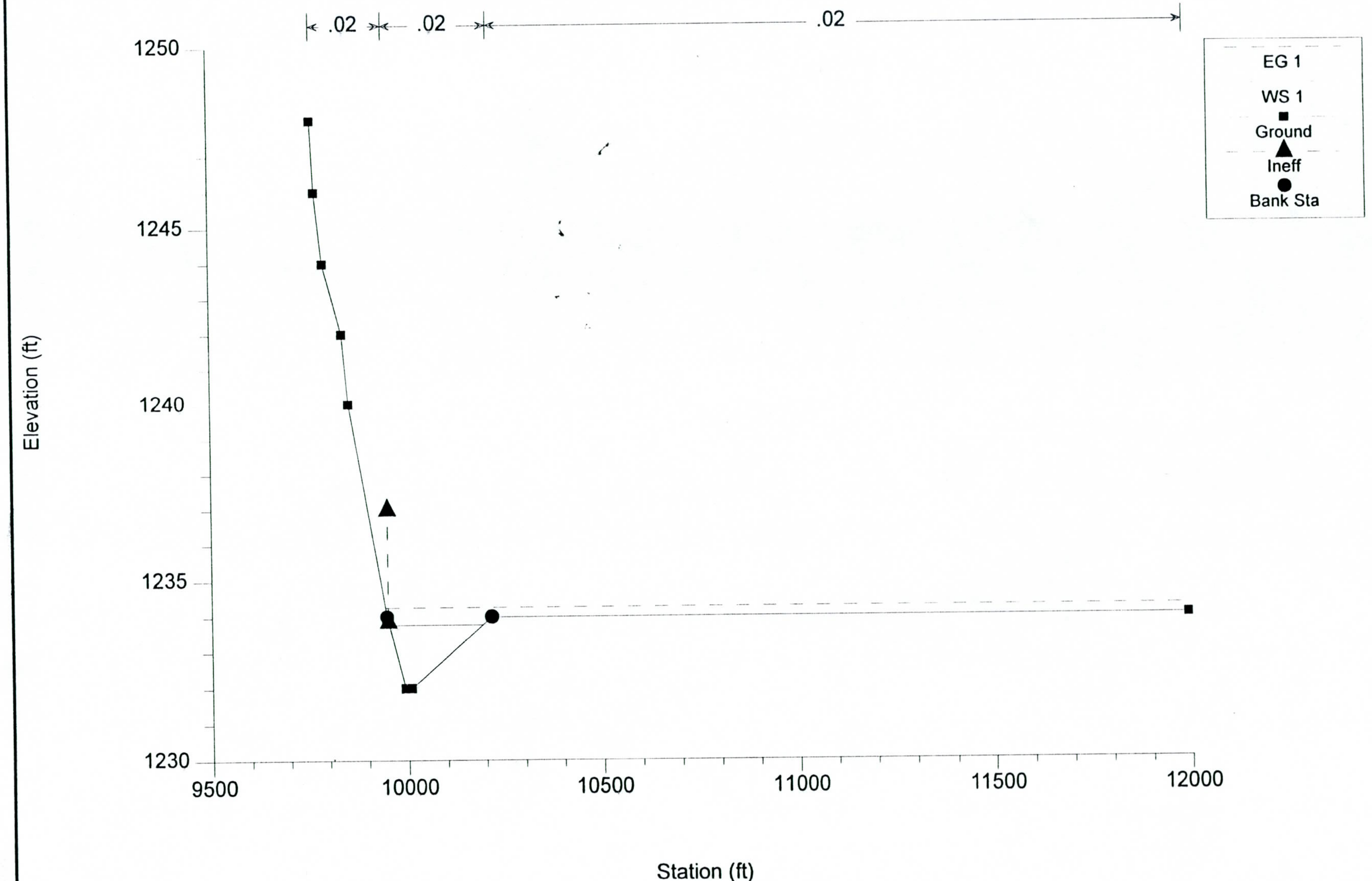


Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.08
.1
1
0
2
8
EG 1
WS 1
Ground
Ineff
Bank Sta
Elevation (ft)
1250
1245
1240
1235
9500
10000
10500
11000
11500
12000
Station (ft)

Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.01



Tenth Street Wash Plan: Final Geom4, Final Flows4 5/24/97
CROSS SECTION 0.00



Standard Table

HEC-RAS Plan: Plan 05 Reach: Job1 5/22/97

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
0.00	1280.00	1232.00	1233.78	1233.78	1234.27	0.006059	5.60	228.73	240.25	1.01
0.01	1280.00	1234.00	1237.13	1237.13	1237.33	0.006099	6.42	1115.88	1721.90	0.85
0.08	1280.00	1236.00	1238.99	1238.59	1239.02	0.001893	3.63	1773.23	1821.35	0.45
0.16	1280.00	1238.00	1240.95	1240.77	1241.20	0.008191	5.29	581.15	623.15	0.87
0.24	1280.00	1240.00	1243.71	1243.54	1244.41	0.006466	6.82	227.90	174.93	0.84
0.33	1280.00	1240.00	1246.51	1245.37	1247.24	0.005908	6.86	186.95	90.99	0.81
0.34	Culvert									
0.35	840.00	1242.00	1246.94	1245.45	1247.32	0.002963	4.97	172.26	92.75	0.81
0.41	840.00	1242.00	1247.76	1246.82	1248.63	0.004065	7.51	111.82	30.95	0.70
0.48	840.00	1246.00	1250.46	1250.46	1251.97	0.008721	9.84	85.36	28.39	1.00
0.54	840.00	1250.00	1253.84	1253.84	1255.19	0.008840	9.34	89.96	33.48	1.00
0.57	840.00	1255.50	1257.85	1257.85	1258.63	0.011881	7.09	118.55	78.37	1.02
0.72	340.00	1263.00	1264.37	1264.37	1264.84	0.005396	5.51	63.48	73.95	1.93
0.73	340.00	1262.00	1265.74	1265.74	1266.71	0.011449	7.94	42.83	21.89	1.00
0.79	340.00	1266.00	1270.18	1270.18	1271.00	0.011970	7.25	47.08	32.62	1.00
0.85	340.00	1270.00	1273.29	1272.08	1273.43	0.003549	3.16	137.61	125.69	0.35
0.86	340.00	1271.00	1273.50	1272.29	1273.54	0.000403	1.65	205.64	176.06	0.27
0.87	340.00	1272.00	1274.37	1274.37	1274.92	0.022778	6.02	70.05	116.39	0.83
0.89	340.00	1272.00	1276.28	1275.62	1276.63	0.005353	4.75	88.38	194.60	0.60
0.929	340.00	1275.00	1277.36	1276.93	1277.64	0.005892	4.28	85.22	86.94	0.61
0.935	340.00	1276.00	1277.61	1276.92	1277.76	0.000909	3.05	111.37	519.15	0.43
0.94	340.00	1275.00	1277.71	1277.71	1278.60	0.029058	7.57	44.90	25.26	1.01
0.96	340.00	1276.00	1280.38	1278.85	1280.39	0.000257	0.97	989.06	864.69	0.10
0.99	380.00	1277.00	1280.58	1279.83	1280.65	0.003042	2.85	410.88	659.67	0.33
0.998	380.00	1277.00	1280.67	1278.79	1280.70	0.000121	1.38	470.27	597.90	0.16
1.005	380.00	1277.00	1280.72	1280.70	1280.96	0.009074	4.90	210.43	410.54	0.63
1.03	380.00	1278.00	1281.60	1280.93	1281.66	0.002857	2.97	331.27	324.04	0.36
1.05	380.00	1280.00	1282.06	1281.02	1282.10	0.003695	2.61	288.85	237.33	0.39
1.06	380.00	1280.00	1282.15	1281.00	1282.17	0.000270	1.55	476.08	419.56	0.23
1.07	380.00	1280.00	1283.03	1283.03	1283.31	0.004878	5.41	230.40	368.73	0.71
1.09	420.00	1281.00	1284.37	1284.37	1284.73	0.005407	5.81	215.93	357.81	0.74
1.12	560.00	1282.00	1285.41	1285.41	1285.87	0.004619	6.07	243.18	361.46	0.71
1.13	880.00	1283.00	1285.98	1284.80	1286.01	0.000154	1.76	631.22	423.32	0.19
1.136	960.00	1282.00	1287.78	1287.78	1288.32	0.015497	7.19	278.53	261.74	0.71

Standard Table 1

HEC-RAS Plan: Plan 05 Reach: Job1 5/22/97 (continued)

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
1.138	820.00	1283.00	1288.41	1287.61	1288.47	0.005357	2.44	445.36	327.28	0.37
1.18	880.00	1283.00	1289.50	1289.11	1289.75	0.005797	4.87	386.73	307.87	0.45
1.22	920.00	1284.00	1290.95	1289.77	1291.59	0.009303	6.66	206.20	195.76	0.57
1.23	920.00	1287.00	1291.78	1289.81	1291.92	0.002195	3.60	462.95	254.47	0.30
1.238	940.00	1287.00	1291.93	1289.23	1291.96	0.000074	1.64	698.82	337.91	0.14
1.242	980.00	1286.00	1291.79	1291.73	1292.37	0.017786	7.02	239.54	220.13	0.70
1.244	720.00	1286.00	1292.37	1290.58	1292.51	0.002922	3.43	361.46	247.17	0.30
1.27	760.00	1287.00	1293.17	1292.77	1293.51	0.009159	5.27	264.76	268.13	0.51
1.35	840.00	1290.00	1296.51	1295.35	1296.88	0.007937	5.21	228.37	192.74	0.48
1.38	840.00	1290.00	1297.61	1294.62	1297.85	0.003266	3.93	248.40	156.30	0.32
1.39	Culvert									
1.40	840.00	1291.00	1296.43	1296.39	1297.97	0.011180	9.96	84.37	26.78	0.32
1.46	840.00	1294.00	1300.02	1299.77	1301.03	0.009587	8.09	103.89	63.21	0.90
1.49	840.00	1296.00	1302.64	1300.36	1303.04	0.010928	5.07	165.81	40.53	0.44
1.509	Culvert									
1.527	840.00	1297.00	1302.82	1302.82	1304.46	0.065358	10.28	81.73	25.33	0.44
1.528	600.00	1297.00	1304.69	1301.90	1304.96	0.007568	4.18	143.49	34.27	0.36
1.55	600.00	1298.00	1306.00	1303.95	1306.51	0.015796	5.74	104.54	24.94	0.49
1.57	600.00	1299.00	1307.54	1304.93	1307.78	0.008792	4.17	184.21	105.28	0.37
1.61	600.00	1303.00	1308.80	1308.34	1309.48	0.008863	6.66	100.51	63.34	0.73
1.64	600.00	1304.00	1310.27	1309.57	1310.43	0.002126	3.95	381.98	379.72	0.37
1.65	600.00	1304.00	1310.45	1309.65	1310.66	0.002510	4.51	316.18	325.48	0.41
1.66	600.00	1305.00	1310.73	1306.54	1310.74	0.000017	0.86	695.96	384.33	0.07

Standard Table 2

HEC-RAS Plan: Plan 05 Reach: Job1 5/22/97

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)
0.00	1234.27	1233.78	0.49	0.00	0.00		1280.00		240.25
0.01	1237.33	1237.13	0.20				381.40	898.60	1721.90
0.08	1239.02	1238.99	0.04	1.68	0.02		191.68	1088.32	1821.35
0.16	1241.20	1240.95	0.25	2.11	0.06	4.45	709.89	565.65	623.15
0.24	1244.41	1243.71	0.70	3.07	0.13	35.59	1244.41		174.93
0.33	1247.24	1246.51	0.73	2.81	0.01	0.08	1279.92		90.99
0.34	Culvert								
0.35	1247.32	1246.94	0.38	0.00	0.00	0.87	839.13		92.75
0.41	1248.63	1247.76	0.88	1.16	0.15		840.00		30.95
0.48	1251.97	1250.46	1.50				840.00		28.39
0.54	1255.19	1253.84	1.35	3.03	0.01		840.00		33.48
0.57	1258.63	1257.85	0.78	1.71	0.06		840.00		78.37
0.72	1264.84	1264.37	0.47			2.37	335.42	2.21	73.95
0.73	1266.71	1265.74	0.98	0.51	0.15		340.00		21.89
0.79	1271.00	1270.18	0.82	3.45	0.02	0.03	339.96	0.01	32.62
0.85	1273.43	1273.29	0.14	2.37	0.07	22.98	315.85	1.17	125.69
0.86	1273.54	1273.50	0.04	0.10	0.01		340.00		176.06
0.87	1274.92	1274.37	0.54	0.87	0.15	8.06	328.63	3.32	116.39
0.89	1276.63	1276.28	0.34	1.69	0.02	8.50	331.38	0.12	194.60
0.929	1277.64	1277.36	0.28	1.01	0.01	0.73	337.71	1.56	86.94
0.935	1277.76	1277.61	0.14	0.10	0.01		340.00		519.15
0.94	1278.60	1277.71	0.89				340.00		25.26
0.96	1280.39	1280.38	0.00	1.70	0.09	6.83	88.14	245.02	864.69
0.99	1280.65	1280.58	0.06	0.24	0.02	8.03	187.60	184.37	659.67
0.998	1280.70	1280.67	0.03	0.05	0.00	3.79	325.82	50.39	597.90
1.005	1280.96	1280.72	0.25	0.20	0.07		247.01	132.99	410.54
1.03	1281.66	1281.60	0.06	0.68	0.02		160.03	219.97	324.04
1.05	1282.10	1282.06	0.04	0.44	0.00	0.03	94.74	285.23	237.33
1.06	1282.17	1282.15	0.03	0.07	0.00		290.86	89.14	419.56
1.07	1283.31	1283.03	0.28				233.02	146.98	368.73

BUT 278.77

@ 1.09

FLOW AROUND ISLAND PROBLEM

Standard Table 2, cont.

HEC-RAS Plan: Plan 05 Reach: Job1 5/22/97 (continued)

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)
1.09	1284.73	1284.37	0.35				278.77	141.23	357.81
1.12	1285.87	1285.41	0.45	0.62	0.03	0.05	443.33	116.62	361.46
1.13	1286.01	1285.98	0.03	0.10	0.04		396.67	483.33	423.32
1.136	1288.32	1287.78	0.53	0.53	0.15	314.24	616.72	29.04	261.74
1.138	1288.47	1288.41	0.06	0.10	0.05	399.38	420.62		327.28
1.18	1289.75	1289.50	0.25	1.22	0.05	141.70	567.41	170.89	307.87
1.22	1291.59	1290.95	0.64	1.72	0.12	48.23	851.82	19.95	195.76
1.23	1291.92	1291.78	0.14	0.28	0.05	213.32	621.92	84.76	254.47
1.238	1291.96	1291.93	0.03	0.03	0.01	137.08	665.72	137.19	337.91
1.242	1292.37	1291.79	0.58	0.24	0.16	197.17	715.71	67.12	220.13
1.244	1292.51	1292.37	0.14	0.10	0.04	121.81	541.44	56.75	247.17
1.27	1293.51	1293.17	0.34	0.93	0.06	109.94	597.62	52.43	268.13
1.35	1296.88	1296.51	0.38	3.36	0.01	43.78	748.34	47.88	192.74
1.38	1297.85	1297.61	0.24	0.95	0.01	8.24	822.52	9.24	156.30
1.39	Culvert								
1.40	1297.97	1296.43	1.54	0.00	0.00		840.00		26.78
1.46	1301.03	1300.02	1.02	3.01	0.05	0.00	840.00	0.00	63.21
1.49	1303.04	1302.64	0.40	1.94	0.06		840.00		40.53
1.509	Culvert								
1.527	1304.46	1302.82	1.64	0.00	0.00		840.00		25.33
1.528	1304.96	1304.69	0.27	0.36	0.14		600.00		34.27
1.55	1306.51	1306.00	0.51	1.48	0.07		600.00		24.94
1.57	1307.78	1307.54	0.24	1.24	0.03	1.79	524.97	73.25	105.28
1.61	1309.48	1308.80	0.68	1.57	0.13	0.38	591.14	8.48	63.34
1.64	1310.43	1310.27	0.15	0.89	0.05	152.36	365.81	81.83	379.72
1.65	1310.66	1310.45	0.20	0.22	0.02	191.93	379.08	28.99	325.48
1.66	1310.74	1310.73	0.01	0.06	0.02	4.35	595.65		384.33

Culvert Only

HEC-RAS Plan: Plan 05 Reach: Job1 5/22/97

River Sta.	E.G. US. (ft)	W.S. US. (ft)	E.G. IC (ft)	E.G. OC (ft)	Min Top Rd (ft)	Culv Q (cfs)	Q Weir (cfs)	Delta WS (ft)	Culv Vel In (ft/s)	Culv Vel Out (ft/s)
0.34	1247.32	1246.94	1243.65	1247.32	1248.00	840.00		0.43	3.10	3.03
1.39	1297.98	1296.43	1293.59	1297.98	1300.33	840.00		-1.18	3.29	3.29
1.509	1303.23	1302.82	1299.69	1303.23	1306.00	840.00		0.18	3.50	3.50

User defined for mapping

HEC-RAS Plan: Plan 05 Reach: Job1 5/22/97

River Sta.	Q Total (cfs)	W.S. Elev (ft)	Sta W.S. Lft (ft)	Left Sta Eff (ft)	Rght Sta Eff (ft)	Sta W.S. Rgt (ft)	Top Width (ft)	Top Wdth Act (ft)
0.00	1280.00	1233.78	9951.75	9951.75	10192.00	10192.00	240.25	240.25
0.01	1280.00	1237.13	9991.71	9991.71	11800.00	11800.00	1721.90	1721.90
0.08	1280.00	1238.99	9988.01	9988.01	11900.00	11900.00	1821.35	1821.35
0.16	1280.00	1240.95	9875.39	9875.39	10500.00	10500.00	623.15	623.15
0.24	1280.00	1243.71	9844.53	9844.53	10019.46	10019.46	174.93	174.93
0.33	1280.00	1246.51	9942.09	9942.09	10033.08	10033.08	90.99	90.99
0.34	840.00							
0.35	840.00	1246.94	9930.22	9930.22	10022.97	10022.97	92.75	92.75
0.41	840.00	1247.76	9982.31	9982.31	10013.26	10013.26	30.95	30.95
0.48	840.00	1250.46	9987.45	9987.45	10015.85	10015.85	28.39	28.39
0.54	840.00	1253.84	9978.25	9978.25	10011.73	10011.73	33.48	33.48
0.57	840.00	1257.85	9942.28	9942.28	10020.65	10020.65	78.37	78.37
0.72	340.00	1264.37	9967.57	9967.57	10041.52	10041.52	73.95	73.95
0.73	340.00	1265.74	9990.46	9990.46	10012.35	10012.35	21.89	21.89
0.79	340.00	1270.18	9990.35	9990.35	10022.97	10022.97	32.62	32.62
0.85	340.00	1273.29	9892.02	9892.02	10017.70	10017.70	125.69	125.69
0.86	340.00	1273.50	9867.18	9867.18	10043.24	10043.24	176.06	176.06
0.87	340.00	1274.37	9919.36	9919.36	10035.75	10035.75	116.39	116.39
0.89	340.00	1276.28	9829.06	9920.00	10029.07	10029.07	194.60	103.66
0.929	340.00	1277.36	9958.19	9958.19	10045.13	10045.13	86.94	86.94
0.935	340.00	1277.61	9886.04	9950.00	10020.00	10405.19	519.15	70.00
0.94	340.00	1277.71	9984.93	9984.93	10010.18	10010.18	25.26	25.26
0.96	340.00	1280.38	9785.31	9850.00	10650.00	10650.00	864.69	800.00
0.99	380.00	1280.58	9914.18	9914.18	10573.85	10573.85	659.67	659.67
0.998	380.00	1280.67	9886.88	9930.00	10570.00	10570.00	597.90	554.78
1.005	380.00	1280.72	9990.87	9990.87	10513.48	10513.48	410.54	410.54
1.03	380.00	1281.60	9987.35	9987.35	10530.00	10530.00	324.04	324.04
1.05	380.00	1282.06	9946.36	9946.36	10486.97	10486.97	237.33	237.33
1.06	380.00	1282.15	9896.05	9940.00	10479.68	10479.68	419.56	375.60
1.07	380.00	1283.03	9988.67	9988.67	10490.00	10490.00	368.73	368.73

User defined, cont.

HEC-RAS Plan: Plan 05 Reach: Job1 5/22/97 (continued)

River Sta.	Q Total (cfs)	W.S. Elev (ft)	Sta W.S. Lft (ft)	Left Sta Eff (ft)	Rght Sta Eff (ft)	Sta W.S. Rgt (ft)	Top Width (ft)	Top Wdth Act (ft)
1.09	420.00	1284.37	9982.08	9982.08	10440.00	10440.00	357.81	357.81
1.12	560.00	1285.41	9988.54	9988.54	10350.00	10350.00	361.46	361.46
1.13	880.00	1285.98	9906.68	9970.00	10330.00	10330.00	423.32	360.00
1.136	960.00	1287.78	9810.68	9810.68	10072.42	10072.42	261.74	261.74
1.138	820.00	1288.41	9792.72	9792.72	10120.00	10120.00	327.28	327.28
1.18	880.00	1289.50	9858.74	9858.74	10166.61	10166.61	307.87	307.87
1.22	920.00	1290.95	9864.50	9864.50	10060.25	10060.25	195.76	195.76
1.23	920.00	1291.78	9822.14	9822.14	10076.61	10076.61	254.47	254.47
1.238	940.00	1291.93	9795.86	9860.00	10133.77	10133.77	337.91	273.77
1.242	980.00	1291.79	9872.16	9872.16	10092.29	10092.29	220.13	220.13
1.244	720.00	1292.37	9846.76	9846.76	10093.93	10093.93	247.17	247.17
1.27	760.00	1293.17	9818.44	9818.44	10086.57	10086.57	268.13	268.13
1.35	840.00	1296.51	9932.26	9932.26	10125.00	10125.00	192.74	192.74
1.38	840.00	1297.61	9949.56	9949.56	10105.86	10105.86	156.30	156.30
1.39	840.00							
1.40	840.00	1296.43	9987.81	9987.81	10014.59	10014.59	26.78	26.78
1.46	840.00	1300.02	9986.28	9986.28	10030.47	10480.09	63.21	44.18
1.49	840.00	1302.64	9977.64	9977.64	10018.17	10018.17	40.53	40.53
1.509	840.00							
1.527	840.00	1302.82	9985.70	9985.70	10011.03	10011.03	25.33	25.33
1.528	600.00	1304.69	9979.75	9979.75	10014.02	10014.02	34.27	34.27
1.55	600.00	1306.00	9986.65	9986.65	10011.59	10011.59	24.94	24.94
1.57	600.00	1307.54	9985.72	9985.72	10091.00	10091.00	105.28	105.28
1.61	600.00	1308.80	9989.90	9989.90	10053.25	10053.25	63.34	63.34
1.64	600.00	1310.27	9718.81	9830.00	10098.53	10098.53	379.72	268.53
1.65	600.00	1310.45	9745.54	9860.00	10071.02	10071.02	325.48	211.02
1.66	600.00	1310.73	9716.86	9900.00	10050.00	10101.19	384.33	150.00

HEC-2 Input File for Split Flow Analysis

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* After adding interpolated section 1.528, flow was not overtopping in
* breakout zone #1
SF      SPLIT FLOW ANALYSIS FOR 10TH STREET WASH
TN      BREAKOUT #1, SEGMENT 1: BETWEEN 1.57 AND 1.61
NS     4    1.57     1.61       -1     .08     .013
NG721.35  1308.4    787.5     1309  823.87    1310    874.4     1311
TN      BREAKOUT #1, SEGMENT 2: BETWEEN 1.55 AND 1.57
NS     3    1.55     1.57       -1     .08     .013
NG590.21    1307  686.35     1308  721.35  1308.4
TN      BREAKOUT #1, SEGMENT 3: BETWEEN 1.527 AND 1.55
NS     3   1.527     1.55       -1     .08     .013
NG449.69  1305.4  492.59     1306  590.21    1307
TN      BREAKOUT #2, SEGMENT 1: BETWEEN 1.327* AND 1.35
NS     2   1.327     1.35       -1      .1     .008
NG     0  1294.6      120  1296.5
TN     BREAKOUT #2, SEGMENT 2: BETWEEN 1.30 AND 1.327*
NS     2    1.30    1.327       -1      .1     .008
NG     0  1293.8      120  1294.6
TN      BREAKOUT #2, SEGMENT 3: BETWEEN 1.27 AND 1.30
NS     2    1.27     1.30       -1      .1     .008
NG     0    1293      170  1293.8
TN      BREAKOUT #2, SEGMENT 4: BETWEEN 1.259* AND 1.27
NS     2   1.259     1.27       -1      .1     .008
NG     0  1292.5       85    1293
TN      BREAKOUT #2, SEGMENT 5: BETWEEN 1.244* AND 1.259*
NS     2   1.244    1.259       -1      .1     .008
NG     0    1292       85  1292.5
TN      BREAKOUT #3, SEGMENT 1: BETWEEN 1.238 AND 1.242
NS     2   1.238    1.242       -1     .02     .008
NG     0    1291       40    1292
TN      BREAKOUT #3, SEGMENT 2: BETWEEN 1.23 AND 1.238
NS     2    1.23    1.238       -1      .1     .008
NG     0    1291       25    1291
TN      BREAKOUT #3, SEGMENT 3: BETWEEN 1.22 AND 1.23
NS     2    1.22     1.23       -1      .1     .008
NG     0    1291       35    1291
TN      BREAKOUT #3, SEGMENT 4: BETWEEN 1.20* AND 1.22
NS     2    1.20     1.22       -1      .1     .008
NG     0    1290       90    1291
TN      BREAKOUT #3, SEGMENT 5: BETWEEN 1.18 AND 1.20*
NS     2    1.18     1.20       -1      .1     .008
NG     0    1289       90    1290
TN      BREAKOUT #3, SEGMENT 6: BETWEEN 1.159* AND 1.18
NS     2   1.159     1.18       -1      .1     .008
NG     0  1288.5      120    1289
TN      BREAKOUT #3, SEGMENT 7: BETWEEN 1.138* AND 1.159*
NS     2   1.138    1.159       -1      .1     .008
NG     0    1288      110  1288.5
TN      BREAKOUT #4, SEGMENT 1: BETWEEN 1.13 AND 1.136
NS     2    1.13    1.136       -1     .03     .008
NG     0    1285       90    1288
TN      BREAKOUT #4, SEGMENT 2: BETWEEN 1.12 AND 1.13
NS     2    1.12     1.13       -1     .03     .008
NG     0    1283       30    1285
TN      BREAKOUT #4, SEGMENT 3: BETWEEN 1.09 AND 1.12
NS     2    1.09     1.12       -1      .1     .008
NG     0    1283       40    1283
TN      BREAKOUT #4, SEGMENT 4: BETWEEN 1.07 AND 1.09
NS     2    1.07     1.09       -1      .1     .008
NG     0    1283       40    1283
TN      BREAKOUT #4, SEGMENT 5: BETWEEN 1.06 AND 1.07
NS     2    1.06     1.07       -1      .1     .008
NG     0    1283      130    1283
TN      BREAKOUT #4, SEGMENT 6: BETWEEN 1.05 AND 1.06
NS     2    1.05     1.06       -1      .1     .008
NG     0  1282.5       40    1283
TN      BREAKOUT #4, SEGMENT 7: BETWEEN 1.03 AND 1.05
NS     2    1.03     1.05       -1      .1     .008
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NG     0  1281.5       60  1282.5
TN       BREAKOUT #4, SEGMENT 8: BETWEEN 1.005 AND 1.03
NS     2   1.005     1.03       -1      .1     .008
NG     0    1281       70  1281.5
TN       BREAKOUT #4, SEGMENT 9: BETWEEN 0.998 AND 1.005
NS     2    .998    1.005       -1      .1     .008
NG     0  1280.5       50    1281
TN       BREAKOUT #4, SEGMENT 10: BETWEEN 0.99 AND 0.998
NS     2     .99     .998       -1      .1     .008
NG     0    1280       30  1280.5
TN       BREAKOUT #4, SEGMENT 11: BETWEEN 0.96 AND 0.99
NS     2     .96      .99       -1      .1     .008
NG     0    1279      100    1280
TN       BREAKOUT #4, SEGMENT 12: BETWEEN 0.94 AND 0.96
NS     2     .94      .96       -1      .1     .008
NG     0  1278.5      130    1279
TN       BREAKOUT #4, SEGMENT 13: BETWEEN 0.935 AND 0.94
NS     2    .935      .94       -1      .1     .008
NG     0  1278.2       50  1278.5
TN       BREAKOUT #4, SEGMENT 14: BETWEEN 0.929 AND 0.935
NS     2    .929     .935       -1      .1     .008
NG     0  1278.1       30  1278.2
TN       BREAKOUT #4, SEGMENT 15: BETWEEN 0.89 AND 0.929
NS     2     .89     .929       -1      .1     .008
NG     0  1277.5      110  1278.1
EE
T1       FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
T2       SPLIT FLOW ANALYSIS BY WEST CONSULTANTS, INC., MARCH 1997
T3       10TH STREET WASH
J1             2                          15
JR    50 1263.51      100 1263.74      125 1263.84      150 1263.93      200 1264.05
JR   250 1264.17      300 1264.28      350 1264.39      400 1264.49      600 1264.83
JR   800 1265.15      900 1265.27     1000 1265.39     1100 1265.50     1220 1265.62
J2     1                -1                                 -.5
J6                                 .72       1
QT     1    1220
NC   .02     .02      .02       .1      .3
X1  0.72      22   4974.8   5034.8       0       0       0
X3                          4641.8    1270
GR1270.0  4075.0   1269.0   4116.2  1268.0  4163.4  1267.0  4258.0  1267.0  4306.9
GR1268.0  4393.8   1268.0   4485.9  1267.0  4568.7  1267.0  4641.8  1267.0  4901.6
GR1266.0  4931.6   1265.0   4955.3  1264.0  4974.8  1263.0  4995.0  1263.0  5012.3
GR1264.0  5034.8   1265.0   5052.9  1266.0  5086.3  1266.0  5218.4  1266.0  5312.7
GR1266.0  5495.2   1265.0   5683.4
NC    .1      .1      .03
X1  0.73      36   4985.0   5015.0      60      60      60
X3                          4650.7    1272   10180
GR1271.0  4023.0   1270.0   4033.8  1269.0  4046.4  1268.0  4099.3  1268.0  4115.3
GR1268.0  4124.8   1267.0   4527.6  1267.0  4544.6  1268.0  4596.6  1268.0  4611.3
GR1268.0  4641.9   1269.0   4650.7  1269.0  4722.7  1269.0  4722.7  1268.0  4903.8
GR1267.0  4967.4   1266.2   4985.0  1266.0  4989.8  1265.0  4992.3  1264.0  4995.4
GR1263.0  4997.1   1262.0   4998.8  1262.0  5001.5  1263.0  5003.9  1264.0  5006.8
GR1265.0  5009.9   1266.0   5013.2  1266.0  5015.0  1267.0  5127.5  1267.0  5133.8
GR1267.0  5146.4   1267.0   5146.4  1267.0  5266.6  1267.0  5282.8  1268.0  5363.3
GR1268.0  6285.0
X1  0.79      29   4991.4   5020.0     295     295     295
X3                                          5030
GR1275.0  4444.0   1274.0   4595.0  1273.0  4703.5  1272.0  4710.0  1271.0  4760.1
GR1271.0  4767.2   1272.0   4777.8  1272.0  4873.2  1271.0  4985.8  1270.0  4991.4
GR1269.0  4993.4   1268.0   4995.5  1267.0  4997.4  1266.0  4999.4  1266.0  5001.1
GR1267.0  5003.4   1268.0   5005.8  1269.0  5008.1  1270.0  5012.0  1270.1  5020.0
GR1270.3  5030.0   1270.0   5161.0  1270.0  5258.0  1270.0  5270.4  1270.0  5758.9
GR1270.0  5825.1   1270.0   6015.4  1270.0  6096.5  1270.0  6475.9
NC    .1      .1     .051
X1  0.85      19   4974.0   5014.0     315     305     305
X3                                        5021.2
GR1275.0  4260.0   1274.0   4778.1  1274.0  4789.6  1274.0  4791.3  1273.0  4932.5
GR1272.1  4974.0   1272.0   4979.8  1271.0  4985.6  1270.0  4995.6  1270.0  5008.4
GR1271.0  5011.0   1272.0   5013.6  1272.1  5014.0  1273.0  5016.3  1274.0  5021.2
GR1274.0  5021.8   1274.0   5028.0  1273.0  5147.0  1273.0  6320.0
NC   .02      .1      .02
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X1	0.86	21	4806	5047.9	50	50	50			
X3	0	0	0	0	0	5480	0	0	0	
GR	1277	4333	1278	4416.1	1278	4510.3	1277	4682.9	1276	4731.1
GR	1275	4759.4	1274	4806	1273	4928	1272	4956.6	1271	4991.8
GR	1271	5010.2	1272	5026.3	1273	5038.6	1274	5047.9	1274	5172.5
GR	1275	5480	1274	5636.6	1274	5693.3	1274	5765.9	1274	5902.3
GR	1274	6161.7								
NC	.1	.1	.051							
X1	0.87	19	4978	5011.6	55	80	75			
X3	0	0	0	0	0	5530	0	0	0	
GR	1280	4480	1279	4563.1	1278	4678.6	1277	4742.5	1276	4746
GR	1275	4821.4	1274	4978	1273	4988.3	1272	4994.2	1272	5005
GR	1273	5008.1	1274	5011.6	1275	5076.1	1275	5156.3	1276	5344.7
GR	1276	5428.9	1276.5	5530	1276	5577.2	1276	5930.5		
NC	.1	.1	.035							
X1	0.89	28	4990.9	5026.2	110	125	120			
X3	0	0	0	4920	0	5590	0	0	0	
GR	1280	4588	1279	4656.6	1278	4767.6	1277	4825.5	1276	4830.5
GR	1276	4983.5	1277	4987.6	1277	4988.2	1276	4990.9	1275	4993.6
GR	1274	4995.3	1273	4997	1272	4998.6	1272	5002.4	1273	5004.9
GR	1274	5007.4	1275	5013.8	1276	5026.2	1277	5036.4	1277	5048.9
GR	1277	5118	1277	5122.9	1277	5463.7	1277	5466.8	1277.5	5590
GR	1277	5928.8	1277	5988.2	1277	6051.1				
X1	0.929	24	4969.3	5021.3	180	180	180			
X3	0	0	0	0	0	5610	0	0	0	
GR	1283	4545	1282	4646.8	1281	4768.5	1280	4771.2	1279	4829
GR	1278	4846.1	1278	4885.2	1278	4938.5	1277	4969.3	1276	4991.1
GR	1275	4994.6	1275	5006.5	1276	5019.3	1277	5021.3	1278	5087.3
GR	1278	5168.8	1278	5170.8	1278	5171	1278	5385.6	1278	5594.3
GR	1278.1	5610	1278	5876	1278	5981.8	1278	6043.8		
NH	2	.02	5216.9	.1	6008.1					
X1	0.935	16	4925	5075.1	30	35	30			
X3	0	0	0	4950	0	5020	0	0	0	
GR	1284	4531	1282	4701.1	1279	4799.5	1278	4861.6	1277	4925
GR	1276	4960.8	1276	5038.7	1277	5075.1	1277	5216.9	1277	5217.7
GR	1278	5523	1278	5593.4	1278.2	5610	1278	5889.4	1278	5944.3
GR	1278	6008.1								
NC	.1	.1	.048							
X1	0.94	22	4983.9	5010.9	35	50	35			
X3	0	0	0	0	0	5630	0	0	0	
GR	1286	4477	1284	4658.5	1280	4762.5	1280	4767.1	1280	4767.5
GR	1279	4779	1278	4983.9	1277	4987.5	1276	4991.8	1275	4997
GR	1275	5004	1276	5006.3	1277	5008.5	1278	5010.9	1278.5	5220
GR	1278	5273.7	1278	5511.7	1278	5560.6	1278.5	5630	1278	5847.6
GR	1278	5873.4	1278	5940						
X1	0.96	20	4988.3	5020	130	100	125			
X3				4850						
GR	1286	4475	1284	4609.6	1282	4700.2	1280	4805.5	1280	4889.5
GR	1280	4987	1279	4988.3	1278	4989.4	1277	4994.9	1276	4997.4
GR	1276	5004.4	1277	5006.8	1278	5009.1	1279	5011.4	1279	5020
GR	1279	5089.9	1279.5	5100	1279	5129.9	1279	5134.7	1279	5650
X1	0.99	20	4990.7	5020.0	150	150	145			
GR	1286.0	4477.0	1284.0	4618.1	1281.0	4806.6	1281.0	4854.8	1281.0	4859.4
GR	1280.0	4990.7	1279.0	4991.9	1278.0	4993.3	1277.0	4997.1	1277.0	5004.3
GR	1278.0	5008.1	1279.0	5010.7	1280.0	5013.8	1280.0	5020.0	1280.0	5076.7
GR	1280.0	5080.4	1280.0	5097.4	1280.0	5118.4	1280.0	5373.0	1280.0	5573.9
NH	2	.02	5122.4	.1	5670.6					
X1	0.998	23	4940.7	5048.6	30	30	30			
X3	0	0	0	4930	0	5550	0	0	0	
GR	1286	4507	1284	4630.4	1281	4821.3	1281	4821.9	1281	4840.8
GR	1281	4854.6	1281	4860.8	1280	4940.7	1279	4965	1278	4982.5
GR	1277	4993.4	1277	5007.2	1278	5020.4	1279	5030.1	1280	5048.6
GR	1280	5115.4	1280	5122.4	1281	5146.1	1280	5383.2	1280	5541.1
GR	1280.5	5550	1280	5653.8	1280	5670.6				
NC	.1	.1	.043							
X1	1.005	20	4980.6	5019.4	35	70	35			
X3	0	0	0	0	0	5530	0	0	0	
GR	1286	4621	1284	4705.6	1282	4806	1281	4920.5	1281	4980.6
GR	1281	4990.2	1280	4992.6	1279	4994.6	1278	4996.6	1277	4998.8
GR	1277	5001.7	1278	5005.3	1279	5008.7	1280	5012	1281	5019.4
GR	1280	5409.9	1280	5471.3	1281	5530	1280	5570.3	1280	5638.9

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X1  1.03       27  4986.1  5013.6     125     100     125
GR1288.0   4453.0  1286.0  4590.8  1284.0  4694.2  1283.0  4771.4  1283.0  4844.3
GR1282.0   4939.1  1282.0  4954.3  1283.0  4968.5  1283.0  4970.8  1282.0  4986.1
GR1281.0   4989.2  1280.0  4992.1  1279.0  4995.1  1278.0  4998.0  1278.0  5002.6
GR1279.0   5005.4  1280.0  5008.3  1281.0  5011.1  1282.0  5013.6  1282.0  5124.5
GR1282.0   5129.1  1282.0  5143.2  1282.0  5157.8  1282.0  5179.0  1280.0  5437.6
GR1280.0   5483.5  1281.5    5530
X1  1.05       24  4986.8  5024.3     135     130     140
X3     0        0       0       0       0    5510       0       0       0
GR  1288     4454    1286  4600.9    1284  4774.1    1284  4810.9    1284  4818.3
GR  1283   4941.4    1282  4946.7    1282  4949.9    1283  4956.5    1283  4986.8
GR  1282   4989.4    1281  4992.1    1280    4996    1280  5005.8    1281  5009.6
GR  1282   5014.3    1283  5024.3    1283    5122    1282  5288.8    1280  5421.6
GR  1280   5467.2    1282    5484  1282.5    5510    1282  5554.2
NH     2      .02  5150.0      .1  5541.6
X1  1.06       18  4901.8    5072      40      35      40
X3     0        0       0    4940       0    5500       0       0       0
GR  1288     4424    1286  4660.1    1284  4802.3    1283    4862    1282  4901.8
GR  1281   4944.9    1280  4995.6    1280  5004.8    1281  5041.2    1282    5072
GR1282.8     5150    1283    5165    1282  5263.9    1280  5420.7    1280  5463.2
GR  1282   5476.2    1283    5500    1282  5541.6
NC    .1       .1    .028
X1  1.07       27  4985.8  5032.4      35      70      35
X3     0        0       0       0       0    5490       0       0       0
GR  1292     4303    1290  4399.4    1288  4438.6    1288  4479.1    1288  4496.4
GR  1285   4822.7    1285  4827.2    1285  4851.1    1284  4985.8    1283  4988.8
GR  1282   4991.7    1281  4994.5    1280    4998    1280  5002.5    1281    5006
GR  1282   5008.9    1283  5011.5    1284  5032.4    1284  5105.5    1283  5145.8
GR  1283   5155.2    1283  5171.1    1283  5189.7    1282  5435.1    1282  5499.8
GR  1283     5530    1282  5568.5
X1  1.09       25  4976.6  5007.9     135     120     135
X3     0        0       0       0       0    5440       0       0       0
GR  1290     4461    1288  4587.6    1286  4838.6    1286  4858.4    1286  4883.6
GR  1285   4924.6    1285  4970.5    1285  4976.6    1284  4985.3    1283  4989.4
GR  1282   4993.1    1281  4997.6    1281  5002.1    1282  5003.9    1283  5005.1
GR  1284   5006.5    1285  5007.9    1285  5010.1    1284    5165    1284  5217.1
GR  1284     5367    1282  5464.9    1282  5504.1    1283    5530    1282  5551.7
X1  1.12       29  4989.3  5021.9     125     120     125
X3                                          5350
GR1292.0   4371.0  1290.0  4576.8  1290.0  4593.9  1290.0  4597.5  1290.0  4606.0
GR1289.0   4672.1  1289.0  4689.5  1289.0  4731.7  1288.0  4788.3  1287.0  4852.6
GR1286.0   4948.7  1286.0  4949.8  1286.0  4987.5  1285.0  4989.3  1284.0  4991.0
GR1283.0   4992.8  1282.0  4998.7  1282.0  5002.5  1283.0  5009.4  1284.0  5015.8
GR1285.0   5021.9  1285.0  5023.7  1285.0  5109.5  1285.0  5129.4  1285.0  5169.6
GR1285.0   5244.9  1285.0  5259.1  1284.0  5378.4  1283.0    5530
NC   .02      .02     .02
X1  1.13       14  4963.2  5055.6      70      40      45
X3                           4970            5330
GR  1292     4377    1290  4664.6    1289  4730.8    1288  4789.1    1287    4852
GR  1286   4905.9    1285  4940.5    1284  4963.2    1283  4989.3    1283  5011.5
GR  1284   5055.6    1285  5330.0    1284  5430.4  1283.2    5500
NC    .1       .1    .053
X1 1.136       25  4980.0  5007.3      70     100      50
X3                                          5120
GR1292.0   4600.0  1291.0  4663.5  1290.0  4730.4  1289.0  4764.5  1288.0  4808.1
GR1287.0   4820.2  1287.0  4880.5  1287.0  4899.7  1286.1  4980.0  1286.0  4988.1
GR1285.0   4991.8  1284.0  4994.6  1283.0  4997.4  1282.0  5000.0  1282.0  5000.3
GR1283.0   5002.1  1284.0  5003.9  1285.0  5005.6  1286.0  5007.3  1287.0  5009.0
GR1288.0   5089.8  1288.0  5149.0  1287.0  5154.0  1287.0  5173.9  1286.5    5320
QT     1     1085
X1 1.138       44  4980.2  5007.7      10      10      10
X3                                          5120
GR1292.2   4599.3  1291.5  4637.0  1291.1  4663.0  1290.1  4729.9  1289.8  4740.6
GR1289.1   4764.2  1288.5  4790.5  1288.1  4807.8  1287.2  4820.0  1287.1  4840.9
GR1287.1   4880.4  1287.1  4881.9  1287.1  4899.7  1286.4  4961.0  1286.2  4980.2
GR1286.1   4986.9  1286.1  4988.2  1285.7  4989.7  1285.1  4991.9  1284.9  4992.3
GR1284.1   4994.7  1284.0  4994.8  1283.1  4997.4  1283.0  4997.4  1282.0  4999.9
GR1282.0   5000.3  1282.8  5001.8  1283.1  5002.2  1283.7  5003.3  1284.1  5004.0
GR1284.5   5004.8  1285.1  5005.9  1285.3  5006.3  1286.1  5007.7  1287.0  5009.4
GR1288.0   5091.1  1288.0  5128.8  1288.0  5151.0  1287.1  5156.0  1287.1  5161.2
GR1287.1   5176.1  1286.9  5198.6  1286.6  5272.5  1286.5  5320.0
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X1 1.159      45    4982  5011.6     110     110     110
X3                                          5139.5
GR1294.1  4591.1  1292.8  4629.8  1292.3  4656.5  1291.2  4725.2  1290.9  4736.1
GR1290.3  4760.3  1289.8  4787.4  1289.4  4805.1  1288.8  4817.6  1288.6  4839.1
GR1288.1  4879.6  1288.0  4881.1  1287.9  4899.4  1287.2  4962.3  1287.1  4982.0
GR1287.1  4988.0  1286.8  4989.2  1286.3  4990.5  1285.6  4992.5  1285.5  4992.8
GR1284.6  4995.0  1284.5  4995.1  1283.5  4997.4  1283.5  4997.4  1282.5  4999.7
GR1282.5  5000.4  1283.4  5002.6  1283.7  5003.3  1284.3  5005.0  1284.8  5006.1
GR1285.3  5007.3  1285.9  5008.8  1286.2  5009.5  1287.0  5011.6  1287.5  5013.6
GR1288.4  5105.4  1288.5  5147.7  1288.5  5172.7  1288.0  5178.3  1288.0  5184.1
GR1287.8  5200.9  1287.5  5226.1  1287.3  5309.2  1287.1  5427.8  1287.0  5429.8
X1  1.18      26  4983.8  5015.6     110     110     110
X3                                          5166.6
GR1296.0  4583.0  1294.0  4622.7  1292.0  4731.7  1291.0  4784.2  1290.0  4837.3
GR1289.0  4880.4  1288.0  4963.6  1288.0  4983.8  1288.0  4989.1  1287.0  4991.3
GR1286.0  4993.4  1285.0  4995.4  1284.0  4997.5  1283.0  4999.5  1283.0  5000.5
GR1284.0  5003.5  1285.0  5006.6  1286.0  5009.8  1287.0  5012.7  1288.0  5015.6
GR1289.0  5166.6  1289.0  5207.0  1288.0  5253.7  1288.0  5346.0  1288.0  5477.5
GR1288.0  5479.7
X1  1.20      45  4982.6  5013.7     110     110     115
X3                                          5180.5
GR1296.0  4530.5  1294.6  4575.3  1293.6  4628.9  1292.6  4698.2  1291.7  4757.5
GR1291.3  4781.7  1291.1  4805.5  1290.9  4817.3  1290.0  4865.9  1290.0  4871.8
GR1289.1  4959.8  1289.0  4982.6  1288.5  4985.3  1288.0  4988.2  1288.0  4988.3
GR1287.1  4990.7  1286.9  4991.0  1286.2  4992.9  1285.8  4993.7  1285.3  4995.1
GR1284.7  4996.5  1284.4  4997.2  1283.5  4999.4  1283.5  5001.0  1284.5  5003.3
GR1284.5  5003.5  1285.4  5005.5  1285.7  5006.2  1286.3  5007.6  1286.8  5008.8
GR1287.2  5009.7  1287.9  5011.3  1288.1  5011.7  1289.0  5013.7  1289.6  5060.4
GR1290.0  5180.5  1290.0  5213.5  1289.8  5225.1  1289.4  5238.2  1288.5  5276.6
GR1288.0  5319.0  1288.0  5378.4  1288.0  5419.5  1288.0  5523.7  1288.0  5526.1
X1  1.22      25  4981.4  5011.9     110     110     115
X3                                          5062.9
GR1296.0  4478.0  1294.0  4587.6  1292.0  4757.7  1292.0  4784.3  1291.0  4858.0
GR1290.0  4981.4  1289.0  4984.3  1288.0  4987.4  1287.0  4990.3  1286.0  4993.3
GR1285.0  4996.3  1284.0  4999.3  1284.0  5001.5  1285.0  5003.3  1286.0  5005.1
GR1287.0  5006.9  1288.0  5008.6  1289.0  5010.3  1290.0  5011.9  1291.0  5062.9
GR1291.0  5230.4  1290.0  5257.5  1288.0  5345.9  1288.0  5455.9  1288.0  5572.4
X1  1.23      23  4976.1  5013.9      50      40      50
X3                                          5076.6
GR1296.0  4506.0  1294.0  4602.2  1292.0  4805.3  1291.0  4881.4  1290.0  4940.3
GR1289.0  4956.5  1288.0  4976.1  1287.0  4989.1  1287.0  5010.7  1288.0  5013.9
GR1289.0  5017.5  1290.0  5021.0  1291.0  5076.6  1291.0  5136.6  1291.0  5140.5
GR1291.0  5211.4  1290.0  5253.7  1288.0  5348.7  1288.0  5385.7  1288.0  5415.0
GR1288.0  5427.2  1288.0  5453.6  1288.0  5586.3
NH     2     .02    5415      .1  5582.2
X1 1.238      17  4947.9  5046.0      25      25      25
X3                          4860            5133.8
GR1294.0  4598.0  1292.0  4790.3  1291.0  4864.6  1290.0  4924.4  1289.0  4947.9
GR1288.0  4961.9  1288.0  4973.4  1288.0  4980.1  1287.0  4988.5  1287.0  5012.6
GR1288.0  5027.9  1289.0  5046.0  1290.0  5068.3  1291.0  5133.8  1291.0  5187.1
GR1289.3  5415.0  1288.0  5582.2
NC    .1      .1    .058
X1 1.242      26  4975.0  5007.7      35      30      25
X3                                          5106.9
GR1298.0  4435.0  1296.0  4548.4  1294.0  4719.8  1293.0  4813.9  1292.0  4858.6
GR1291.0  4923.6  1290.0  4966.2  1290.0  4969.9  1290.0  4975.0  1290.0  4988.2
GR1289.0  4990.9  1288.0  4993.7  1287.0  4996.5  1286.0  4999.2  1286.0  5001.6
GR1287.0  5003.0  1288.0  5004.4  1289.0  5006.1  1290.0  5007.7  1291.0  5010.6
GR1291.0  5031.6  1291.0  5036.8  1292.0  5106.9  1292.0  5160.5  1290.0  5296.6
GR1288.0  5591.5
QT     1     835
X1 1.244      43  4975.3  5008.1      10      10      10
X3                                          5110.8
GR1298.1  4435.5  1297.1  4491.2  1296.1  4548.8  1295.3  4613.2  1294.1  4720.1
GR1293.6  4768.5  1293.3  4790.6  1293.0  4814.2  1292.9  4817.4  1292.0  4858.9
GR1291.1  4923.9  1290.1  4966.5  1290.1  4970.2  1290.1  4975.3  1290.1  4981.9
GR1290.1  4986.0  1290.0  4988.4  1289.7  4989.3  1289.0  4991.0  1288.5  4992.5
GR1288.0  4993.7  1287.3  4995.8  1287.1  4996.5  1286.1  4999.2  1286.1  5001.5
GR1286.9  5002.8  1287.1  5003.0  1287.7  5004.0  1288.1  5004.6  1288.5  5005.3
GR1289.1  5006.4  1289.2  5006.6  1290.1  5008.1  1291.1  5011.1  1291.1  5032.8
GR1291.1  5038.2  1291.3  5055.0  1291.6  5071.5  1292.1  5110.8  1292.0  5166.3
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GR1290.6   5268.3   1290.1   5307.1   1288.2   5612.4
X1 1.259       43   4977.6   5011.2       70       75       80
X3                                              5141.7
GR1299.1   4439.3   1297.5   4494.9   1296.6   4552.3   1295.7   4616.5   1294.7   4723.2
GR1294.3   4771.4   1293.7   4793.4   1293.1   4817.0   1293.0   4820.1   1292.4   4861.6
GR1291.7   4926.4   1291.1   4968.8   1291.1   4972.6   1291.1   4977.6   1291.1   4983.6
GR1290.5   4987.4   1290.2   4989.5   1289.8   4990.3   1289.2   4991.9   1288.7   4993.2
GR1288.3   4994.3   1287.7   4996.2   1287.4   4996.8   1286.5   4999.3   1286.5   5001.1
GR1287.4   5003.0   1287.6   5003.4   1288.4   5005.0   1288.8   5005.8   1289.3   5006.9
GR1290.0   5008.5   1290.1   5008.9   1291.1   5011.2   1291.6   5015.0   1291.8   5042.6
GR1291.9   5049.5   1292.2   5070.8   1292.3   5091.8   1292.4   5141.7   1292.3   5212.3
GR1291.3   5341.9   1291.1   5391.3   1290.1   5779.3
X1  1.27       23   4980.0   5014.3       70       75       80
X3                                              5086.6
GR1300.0   4443.1   1298.0   4498.6   1296.0   4619.9   1295.0   4774.3   1294.0   4796.3
GR1293.0   4822.9   1292.0   4980.0   1292.0   4985.3   1291.0   4988.7   1290.0   4991.3
GR1289.0   4993.9   1288.0   4996.6   1287.0   4999.3   1287.0   5000.7   1288.0   5003.3
GR1289.0   5005.9   1290.0   5008.5   1291.0   5011.2   1292.0   5014.3   1293.0   5086.6
GR1293.0   5112.1   1292.0   5415.5   1292.0   5946.3
X1  1.30       24   4986.5   5031.2      140      160      160
X3                                                5140
GR1300.0   4483.0   1298.0   4544.2   1296.0   4649.7   1294.0   4732.7   1294.0   4780.7
GR1293.0   4962.2   1293.0   4965.0   1294.0   4977.6   1294.0   4981.7   1293.0   4986.5
GR1292.0   4989.3   1291.0   4991.9   1290.0   4994.5   1289.0   4997.1   1288.0   4999.5
GR1288.0   5001.4   1289.0   5004.2   1290.0   5007.2   1291.0   5010.2   1292.0   5013.2
GR1293.0   5031.2   1293.5   5140.0   1293.0   5220.0   1293.0   5880.2
X1 1.327       42   4983.3   5025.6      115      125    117.5
X3                                              5100.7
GR1300.0   4490.2   1298.5   4550.1   1297.5   4606.3   1296.8   4653.4   1295.6   4734.7
GR1295.5   4752.7   1295.5   4781.7   1295.2   4873.6   1295.1   4921.6   1294.5   4947.5
GR1294.3   4959.5   1294.3   4962.1   1294.7   4974.5   1294.6   4978.5   1294.1   4983.3
GR1293.5   4986.6   1293.4   4987.3   1292.5   4989.8   1292.5   4989.9   1291.6   4992.4
GR1291.4   4993.1   1290.7   4994.9   1290.2   4996.2   1289.8   4997.1   1289.0   4999.2
GR1289.0   5001.2   1289.8   5003.6   1290.3   5005.2   1290.6   5006.0   1291.4   5008.4
GR1291.6   5009.1   1292.2   5010.9   1292.6   5013.0   1293.2   5017.1   1293.8   5021.1
GR1294.1   5025.6   1294.7   5079.1   1294.8   5100.7   1294.6   5156.0   1294.8   5215.9
GR1294.5   5280.2   1294.5   5611.8
X1  1.35       24   4980.0   5020.0      115      125    117.5
X3                                                5125
GR1300.0   4497.4   1298.0   4611.0   1297.0   4754.3   1297.0   4872.7   1297.0   4919.7
GR1296.0   4945.0   1295.1   4980.0   1295.0   4984.8   1294.0   4987.8   1293.0   4990.8
GR1292.0   4993.7   1291.0   4996.4   1290.0   4998.9   1290.0   5001.1   1291.0   5004.2
GR1292.0   5007.2   1293.0   5010.3   1294.0   5013.4   1295.0   5016.5   1295.1   5020.0
GR1296.0   5049.5   1296.5   5125.0   1296.0   5160.5   1296.0   5343.4
* MOUNTAIN VIEW ROAD
X1  1.38       33   4982.8   5027.9      180      160      170
RC    16        0 1290.00       56 1293.14      111 1294.00      167 1294.63      222
RC1295.1      278 1295.56      333 1296.08      389 1296.33      445 1296.55      500
RC1296.8      556 1296.93      611 1297.08      667 1297.23      722 1297.36      778
RC1297.5      835 1297.60
GR1303.0   4628.9   1302.0   4670.3   1301.0   4767.5   1300.0   4825.4   1300.0   4829.0
GR1300.0   4856.7   1299.4   4883.0   1299.0   4901.0   1298.0   4939.1   1297.0   4966.2
GR1297.0   4969.9   1297.0   4982.8   1296.0   4985.0   1295.0   4987.4   1294.0   4989.9
GR1293.0   4992.4   1292.0   4995.0   1291.0   4997.5   1290.0   4999.9   1290.0   5000.2
GR1291.0   5010.6   1292.0   5013.1   1293.0   5016.1   1294.0   5019.1   1295.0   5022.1
GR1296.0   5025.0   1297.0   5027.9   1297.8   5127.0   1298.0   5155.0   1298.0   5187.9
GR1297.0   5203.5   1297.0   5462.3   1296.0   5595.8
NC    .1       .1     .032
X1  1.40       31   4985.0   5018.1      105      105      105
RC    16        0 1291.00       56 1292.97      111 1293.80      167 1294.39      222
RC1294.9      278 1295.28      333 1295.82      389 1296.03      445 1296.20      500
RC1296.4      556 1296.47      611 1296.55      667 1296.65      722 1296.68      778
RC1296.7      835 1296.46
GR1303.0   4733.0   1302.0   4762.9   1301.0   4792.3   1300.3   4885.0   1300.0   4931.3
GR1299.0   4978.9   1299.0   4982.7   1299.0   4983.0   1298.0   4985.0   1297.0   4986.8
GR1296.0   4988.6   1295.0   4990.3   1294.0   4992.1   1293.0   4994.0   1292.0   4996.1
GR1291.0   4998.6   1291.0   5002.1   1292.0   5004.4   1293.0   5006.7   1294.0   5009.0
GR1295.0   5011.3   1296.0   5013.6   1297.0   5015.9   1298.0   5018.1   1299.0   5038.1
GR1299.0   5077.5   1299.0   5110.5   1299.0   5202.8   1298.0   5380.4   1298.0   5405.6
GR1300.0   5513.1
X1  1.46       28   4986.3   5027.9      290      290      290
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X3                                               5192.5
GR1308.0  4542.0  1306.0  4677.9  1305.0  4752.5  1304.0  4796.7  1303.0  4860.7
GR1302.0  4925.3  1301.0  4984.2  1300.0  4986.3  1299.0  4988.5  1298.0  4990.6
GR1297.0  4992.8  1296.0  4994.9  1295.0  4997.2  1294.0  4999.3  1294.0  5000.8
GR1295.0  5003.6  1296.0  5006.4  1297.0  5009.1  1298.0  5011.9  1299.0  5014.7
GR1300.0  5027.9  1301.0  5184.4  1301.0  5192.5  1301.0  5254.6  1300.0  5464.5
GR1300.0  5479.7  1302.0  5526.7  1302.0  5713.7

NC    .1      .1    .075
X1  1.49      30  4976.3  5018.9     190     190     190
RC    16       0 1296.00      56 1298.15     111 1298.93     167 1299.48     222
RC1299.9     278 1300.33     333 1300.66     389 1300.97     445 1301.25     500
RC1301.5     556 1301.77     611 1302.00     667 1302.22     722 1302.42     778
RC1302.6     835 1302.66
X3                                               5108.8
GR1310.0  4893.0  1309.0  4896.4  1308.0  4900.2  1307.0  4903.3  1306.3  4905.1
GR1306.0  4906.0  1305.0  4910.0  1304.0  4912.7  1303.0  4976.3  1302.0  4980.0
GR1301.0  4982.5  1300.0  4984.9  1299.0  4987.4  1298.0  4990.0  1297.0  4992.6
GR1296.0  4995.2  1296.0  5005.0  1297.0  5007.1  1298.0  5009.0  1299.0  5011.0
GR1300.0  5013.0  1301.0  5014.9  1302.0  5016.9  1303.0  5018.9  1304.0  5020.9
GR1305.0  5108.8  1305.0  5125.2  1304.0  5141.0  1303.0  5181.8  1302.0  5462.6

*
* HEC-RAS will not permit a flow change at section 1.55 because it is part
* of a bridge routine.  Therefore, in RAS this flow change occurs at 1.56 (even
* the Standard Table 1 in HEC-RAS shows the lower Q for section 1.55).
*
QT     1     601
X1 1.527      29  4979.2  5016.7     180     180     180
RC    16       0 1297.00      56 1298.55     111 1299.22     167 1299.72     222
RC1300.1     278 1300.50     333 1300.80     389 1301.10     445 1301.37     500
RC1301.6     556 1301.84     611 1302.04     667 1302.25     722 1302.44     778
RC1302.6     835 1302.81
GR1308.0  4591.0  1306.0  4664.4  1305.0  4736.9  1306.0  4794.3  1306.0  4797.2
GR1306.0  4837.2  1306.0  4885.0  1306.0  4975.6  1305.0  4979.2  1304.0  4982.5
GR1303.0  4985.3  1302.0  4987.7  1301.0  4990.0  1300.0  4992.3  1299.0  4994.3
GR1298.0  4996.2  1297.0  4998.1  1297.0  5001.5  1298.0  5003.1  1299.0  5004.8
GR1300.0  5006.4  1301.0  5008.0  1302.0  5009.7  1303.0  5011.3  1304.0  5013.1
GR1305.0  5016.7  1306.0  5110.7  1306.0  5273.0  1306.0  5366.3
X1 1.528      51  4979.7  5016.9      10      10      10
RC    16       0 1297.00      40 1299.57      80 1300.37     120 1300.98     160
RC1301.5     200 1301.90     240 1302.28     280 1302.62     320 1302.94     360
RC1303.2     400 1303.50     440 1303.76     480 1304.00     520 1304.23     560
RC1304.5     601 1304.67
GR1308.4  4579.4  1308.1  4586.5  1306.3  4655.1  1305.7  4697.2  1305.3  4729.8
GR1306.1  4789.0  1306.1  4789.5  1306.1  4792.0  1306.1  4833.2  1306.1  4840.3
GR1306.1  4882.6  1306.1  4976.0  1305.4  4978.6  1305.1  4979.7  1304.3  4981.9
GR1304.0  4982.9  1303.6  4984.1  1303.0  4985.6  1302.7  4986.5  1302.0  4988.0
GR1301.7  4988.7  1301.0  4990.3  1300.6  4991.1  1300.0  4992.5  1299.5  4993.6
GR1299.1  4994.4  1298.1  4996.4  1297.9  4996.7  1297.1  4998.2  1297.1  5001.4
GR1297.8  5002.6  1298.1  5003.1  1298.5  5003.7  1299.1  5004.8  1299.2  5004.8
GR1299.8  5005.9  1300.2  5006.4  1300.5  5007.0  1301.2  5008.1  1301.2  5008.1
GR1301.9  5009.2  1302.2  5009.8  1302.5  5010.2  1303.2  5011.4  1304.1  5013.3
GR1305.1  5016.9  1305.5  5053.1  1306.1  5113.8  1306.1  5120.8  1306.1  5281.0
GR1306.0  5377.1
X1  1.55      28  4986.6  5020.0     125     125     125
RC    16       0 1298.00      40 1300.78      80 1301.66     120 1302.29     160
RC1302.8     200 1303.23     240 1303.61     280 1303.95     320 1304.26     360
RC1304.6     400 1304.83     440 1305.08     480 1305.32     520 1305.55     560
RC1305.8     601 1305.98
X3                                               5166.7
GR1314.0  4417.1  1312.0  4427.2  1310.0  4584.8  1308.0  4716.1  1308.0  4788.4
GR1307.0  4985.1  1306.0  4986.6  1305.0  4988.2  1304.0  4989.7  1303.0  4991.4
GR1302.0  4992.9  1301.0  4994.6  1300.0  4996.3  1299.0  4998.4  1298.0  4999.5
GR1298.0  5000.5  1299.0  5002.0  1300.0  5003.4  1301.0  5004.8  1302.0  5006.1
GR1303.0  5007.5  1304.0  5008.9  1305.0  5010.3  1306.0  5011.6  1306.1  5020.0
GR1307.0  5071.0  1308.0  5166.7  1306.0  5528.9
X1  1.57      33  4987.7  5020.0     100     110     100
X3                                                 5160
GR1316.0  4246.0  1314.0  4381.0  1312.0  4474.0  1312.0  4538.6  1312.0  4620.7
GR1310.0  4660.3  1309.0  4743.9  1308.0  4985.1  1307.0  4986.4  1306.0  4987.7
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GR1305.0  4989.1  1304.0  4990.8  1303.0  4992.5  1302.0  4994.0  1301.0  4995.7
GR1300.0  4997.3  1299.0  4999.0  1299.0  5001.1  1300.0  5002.0  1301.0  5002.9
GR1302.0  5003.9  1303.0  5004.7  1304.0  5005.7  1305.0  5006.6  1306.0  5007.5
GR1306.2  5020.0  1307.0  5075.8  1308.0  5104.2  1308.5  5160.0  1308.0  5226.5
GR1308.0  5296.4  1308.0  5364.3  1308.0  5558.0
X1   1.61      30  4991.3  5025.5     180     165     180
X3                                 5131.9
GR1316.0  4336.0  1314.0  4588.0  1310.0  4789.3  1309.0  4844.3  1309.0  4894.4
GR1310.0  4941.5  1310.0  4988.0  1309.0  4989.6  1308.0  4991.3  1307.0  4992.9
GR1306.0  4994.5  1305.0  4996.2  1304.0  4997.8  1303.0  4999.4  1303.0  5000.5
GR1304.0  5002.8  1305.0  5005.1  1306.0  5007.4  1307.0  5009.7  1308.0  5025.5
GR1309.0  5060.0  1310.0  5107.5  1311.0  5131.9  1311.0  5205.7  1311.0  5206.5
GR1311.0  5214.7  1310.0  5244.0  1310.0  5353.1  1310.0  5373.6  1310.0  5580.4
X1   1.64      32  4993.5    5020     140     170     165
X3                                   5180
GR1317.0  4437.4  1316.0  4463.3  1315.0  4515.2  1315.0  4532.9  1315.0  4587.1
GR1314.0  4620.6  1313.0  4630.0  1312.0  4640.8  1311.0  4667.9  1310.0  4737.9
GR1309.0  4904.9  1309.0  4971.9  1309.0  4985.4  1308.0  4993.5  1307.0  4995.0
GR1306.0  4996.5  1305.0  4998.1  1304.0  4999.7  1304.0  5000.3  1305.0  5002.3
GR1306.0  5004.5  1307.0  5007.0  1308.0  5010.5  1308.2  5020.0  1309.0  5062.4
GR1310.0  5090.4  1311.0  5120.2  1312.0  5170.5  1312.0  5234.3  1311.0  5250.7
GR1311.0  5316.9  1312.0  5507.0
X1   1.65      33    4985  5006.9      90     100      95
X3                                 5144.7
GR1317.0  4417.5  1317.0  4472.2  1317.0  4473.8  1316.0  4498.6  1315.0  4541.0
GR1314.0  4591.7  1313.0  4617.9  1312.0  4645.0  1311.0  4661.3  1310.0  4815.6
GR1309.0  4924.9  1308.1  4985.0  1308.0  4992.4  1307.0  4994.2  1306.0  4996.0
GR1305.0  4997.8  1304.0  4999.7  1304.0  5000.3  1305.0  5001.9  1306.0  5003.8
GR1307.0  5005.5  1308.0  5006.9  1309.0  5008.3  1310.0  5043.9  1311.0  5103.6
GR1312.0  5116.7  1313.0  5144.7  1313.0  5201.8  1312.0  5241.2  1311.0  5254.7
GR1311.0  5298.0  1312.0  5510.2  1310.0  5692.0
X1   1.66      24  4902.7  5058.7      50      50      50
X3                                 5132.5
GR1317.0  4425.0  1316.0  4468.9  1315.0  4506.6  1314.0  4532.3  1313.0  4565.7
GR1312.0  4610.7  1311.0  4681.8  1310.0  4811.8  1309.0  4871.6  1308.0  4902.7
GR1307.0  4929.1  1306.0  4955.0  1305.0  4984.4  1305.0  5016.7  1306.0  5033.1
GR1307.0  5046.5  1308.0  5058.7  1309.0  5071.5  1310.0  5086.3  1311.0  5106.7
GR1312.0  5132.5  1312.0  5152.7  1311.0  5233.5  1310.0  5591.4
EJ

ER
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HEC-2 Output File for Split Flow Analysis

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1*********************************************                    ****************************************
 *  HEC-2 WATER SURFACE PROFILES             *                    *  U.S. ARMY CORPS OF ENGINEERS        *
 *                                           *                    *  HYDROLOGIC ENGINEERING CENTER      *
 *  Version    4.6.2;  May 1991              *                    *  609 SECOND STREET, SUITE D         *
 *                                           *                    *  DAVIS, CALIFORNIA 95616-4687       *
 *  RUN DATE    22MAY97    TIME    10:34:56  *                    *          (916) 756-1104             *
 *********************************************                    ****************************************


                              X     X  XXXXXXX   XXXXX           XXXXX
                              X     X  X        X     X         X     X
                              X     X  X        X                     X
                              XXXXXXX  XXXX     X        XXXXX   XXXXX
                              X     X  X        X               X
                              X     X  X        X     X         X
                              X     X  XXXXXXX   XXXXX          XXXXXXX
1
    22MAY97       10:34:56                                                                      PAGE     1



                                                                    THIS RUN EXECUTED 22MAY97    10:34:56
 ****************************************
  HEC-2 WATER SURFACE PROFILES

  Version   4.6.2;  May 1991
 ****************************************


   After adding interpolated section 1.528, flow was not overtopping in
   breakout zone #1


 SPLIT FLOW BEING PERFORMED


 SF      SPLIT FLOW ANALYSIS FOR 10TH STREET WASH


 TN      BREAKOUT #1, SEGMENT 1: BETWEEN 1.57 AND 1.61
 NS      4    1.57     1.61       -1      .08     .013
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NG721.35  1308.4   787.5    1309  823.87    1310   874.4    1311

TN      BREAKOUT #1, SEGMENT 2: BETWEEN 1.55 AND 1.57
NS     3     1.55     1.57       -1      .08    .013
NG590.21      1307  686.35     1308  721.35  1308.4

TN      BREAKOUT #1, SEGMENT 3: BETWEEN 1.527 AND 1.55
NS     3   1.527     1.55       -1      .08    .013
NG449.69  1305.4  492.59     1306  590.21     1307

TN      BREAKOUT #2, SEGMENT 1: BETWEEN 1.327* AND 1.35
NS     2   1.327     1.35       -1       .1    .008
NG     0  1294.6      120  1296.5

TN      BREAKOUT #2, SEGMENT 2: BETWEEN 1.30 AND 1.327*
NS     2    1.30   1.327       -1       .1    .008
NG     0  1293.8      120  1294.6

TN      BREAKOUT #2, SEGMENT 3: BETWEEN 1.27 AND 1.30
NS     2    1.27     1.30       -1       .1    .008
NG     0    1293      170  1293.8

TN      BREAKOUT #2, SEGMENT 4: BETWEEN 1.259* AND 1.27
NS     2   1.259     1.27       -1       .1    .008
NG     0  1292.5       85    1293

TN      BREAKOUT #2, SEGMENT 5: BETWEEN 1.244* AND 1.259*
NS     2   1.244    1.259       -1       .1    .008
NG     0    1292       85  1292.5

TN      BREAKOUT #3, SEGMENT 1: BETWEEN 1.238 AND 1.242
NS     2   1.238    1.242       -1      .02    .008
NG     0    1291       40    1292
1
   22MAY97      10:34:56                                                   PAGE    2


TN      BREAKOUT #3, SEGMENT 2: BETWEEN 1.23 AND 1.238
NS     2    1.23    1.238       -1       .1    .008
NG     0    1291       25    1291

TN      BREAKOUT #3, SEGMENT 3: BETWEEN 1.22 AND 1.23
NS     2    1.22     1.23       -1       .1    .008
NG     0    1291       35    1291

TN      BREAKOUT #3, SEGMENT 4: BETWEEN 1.20* AND 1.22
NS     2    1.20     1.22       -1       .1    .008
NG     0    1290       90    1291

TN      BREAKOUT #3, SEGMENT 5: BETWEEN 1.18 AND 1.20*
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NS     2   1.18    1.20      -1       .1     .008
NG     0   1289      90    1290

TN      BREAKOUT #3, SEGMENT 6: BETWEEN 1.159* AND 1.18
NS     2  1.159    1.18      -1       .1     .008
NG     0 1288.5     120    1289

TN      BREAKOUT #3, SEGMENT 7: BETWEEN 1.138* AND 1.159*
NS     2  1.138   1.159      -1       .1     .008
NG     0   1288     110  1288.5

TN      BREAKOUT #4, SEGMENT 1: BETWEEN 1.13 AND 1.136
NS     2   1.13   1.136      -1      .03     .008
NG     0   1285      90    1288

TN      BREAKOUT #4, SEGMENT 2: BETWEEN 1.12 AND 1.13
NS     2   1.12    1.13      -1      .03     .008
NG     0   1283      30    1285

TN      BREAKOUT #4, SEGMENT 3: BETWEEN 1.09 AND 1.12
NS     2   1.09    1.12      -1       .1     .008
NG     0   1283      40    1283

TN      BREAKOUT #4, SEGMENT 4: BETWEEN 1.07 AND 1.09
NS     2   1.07    1.09      -1       .1     .008
NG     0   1283      40    1283

TN      BREAKOUT #4, SEGMENT 5: BETWEEN 1.06 AND 1.07
NS     2   1.06    1.07      -1       .1     .008
NG     0   1283     130    1283

TN      BREAKOUT #4, SEGMENT 6: BETWEEN 1.05 AND 1.06
NS     2   1.05    1.06      -1       .1     .008
NG     0 1282.5      40    1283

TN      BREAKOUT #4, SEGMENT 7: BETWEEN 1.03 AND 1.05
NS     2   1.03    1.05      -1       .1     .008
NG     0 1281.5      60  1282.5
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TN      BREAKOUT #4, SEGMENT 8: BETWEEN 1.005 AND 1.03
NS     2  1.005    1.03      -1       .1     .008
NG     0   1281      70  1281.5

TN      BREAKOUT #4, SEGMENT 9: BETWEEN 0.998 AND 1.005
NS     2   .998   1.005      -1       .1     .008
NG     0 1280.5      50    1281
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TN      BREAKOUT #4, SEGMENT 10: BETWEEN 0.99 AND 0.998
NS    2     .99    .998      -1       .1    .008
NG    0    1280      30  1280.5

TN      BREAKOUT #4, SEGMENT 11: BETWEEN 0.96 AND 0.99
NS    2     .96     .99      -1       .1    .008
NG    0    1279     100    1280

TN      BREAKOUT #4, SEGMENT 12: BETWEEN 0.94 AND 0.96
NS    2     .94     .96      -1       .1    .008
NG    0  1278.5     130    1279

TN      BREAKOUT #4, SEGMENT 13: BETWEEN 0.935 AND 0.94
NS    2    .935     .94      -1       .1    .008
NG    0  1278.2      50  1278.5

TN      BREAKOUT #4, SEGMENT 14: BETWEEN 0.929 AND 0.935
NS    2    .929    .935      -1       .1    .008
NG    0  1278.1      30  1278.2

TN      BREAKOUT #4, SEGMENT 15: BETWEEN 0.89 AND 0.929
NS    2     .89    .929      -1       .1    .008
NG    0  1277.5     110  1278.1
1
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T1      FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
T2      SPLIT FLOW ANALYSIS BY WEST CONSULTANTS, INC., MARCH 1997
T3      10TH STREET WASH

J1   ICHECK    INQ      NINV     IDIR     STRT     METRIC    HVINS    Q       WSEL     FQ

                  2                          15

JR                              **************RATING CURVE DATA**************

     50   1263.51     100   1263.74     125   1263.84     150   1263.93     200   1264.05
    250   1264.17     300   1264.28     350   1264.39     400   1264.49     600   1264.83
    800   1265.15     900   1265.27    1000   1265.39    1100   1265.50    1220   1265.62

J2   NPROF     IPLOT    PRFVS    XSECV    XSECH    FN      ALLDC    IBW     CHNIM    ITRACE

      1                  -1                                 -.5

J6   IHLEQ     ICOPY    SUBDIV   STRTDS   RMILE

                                   .72       1
```

QT	1	1220								
NC	.02	.02	.02	.1	.3					
X1	0.72	22	4974.8	5034.8	0	0	0			
X3				4641.8	1270					
GR	1270.0	4075.0	1269.0	4116.2	1268.0	4163.4	1267.0	4258.0	1267.0	4306.9
GR	1268.0	4393.8	1268.0	4485.9	1267.0	4568.7	1267.0	4641.8	1267.0	4901.6
GR	1266.0	4931.6	1265.0	4955.3	1264.0	4974.8	1263.0	4995.0	1263.0	5012.3
GR	1264.0	5034.8	1265.0	5052.9	1266.0	5086.3	1266.0	5218.4	1266.0	5312.7
GR	1266.0	5495.2	1265.0	5683.4						
NC	.1	.1	.03							
X1	0.73	36	4985.0	5015.0	60	60	60			
X3				4650.7	1272	10180				
GR	1271.0	4023.0	1270.0	4033.8	1269.0	4046.4	1268.0	4099.3	1268.0	4115.3
GR	1268.0	4124.8	1267.0	4527.6	1267.0	4544.6	1268.0	4596.6	1268.0	4611.3
GR	1268.0	4641.9	1269.0	4650.7	1269.0	4722.7	1269.0	4722.7	1268.0	4903.8
GR	1267.0	4967.4	1266.2	4985.0	1266.0	4989.8	1265.0	4992.3	1264.0	4995.4
GR	1263.0	4997.1	1262.0	4998.8	1262.0	5001.5	1263.0	5003.9	1264.0	5006.8
GR	1265.0	5009.9	1266.0	5013.2	1266.0	5015.0	1267.0	5127.5	1267.0	5133.8
GR	1267.0	5146.4	1267.0	5146.4	1267.0	5266.6	1267.0	5282.8	1268.0	5363.3
GR	1268.0	6285.0								
X1	0.79	29	4991.4	5020.0	295	295	295			
X3						5030				
GR	1275.0	4444.0	1274.0	4595.0	1273.0	4703.5	1272.0	4710.0	1271.0	4760.1
GR	1271.0	4767.2	1272.0	4777.8	1272.0	4873.2	1271.0	4985.8	1270.0	4991.4
GR	1269.0	4993.4	1268.0	4995.5	1267.0	4997.4	1266.0	4999.4	1266.0	5001.1
GR	1267.0	5003.4	1268.0	5005.8	1269.0	5008.1	1270.0	5012.0	1270.1	5020.0
GR	1270.3	5030.0	1270.0	5161.0	1270.0	5258.0	1270.0	5270.4	1270.0	5758.9
GR	1270.0	5825.1	1270.0	6015.4	1270.0	6096.5	1270.0	6475.9		

NC	.1	.1	.051							
X1	0.85	19	4974.0	5014.0	315	305	305			
X3						5021.2				
GR	1275.0	4260.0	1274.0	4778.1	1274.0	4789.6	1274.0	4791.3	1273.0	4932.5
GR	1272.1	4974.0	1272.0	4979.8	1271.0	4985.6	1270.0	4995.6	1270.0	5008.4
GR	1271.0	5011.0	1272.0	5013.6	1272.1	5014.0	1273.0	5016.3	1274.0	5021.2
GR	1274.0	5021.8	1274.0	5028.0	1273.0	5147.0	1273.0	6320.0		
NC	.02	.1	.02							
X1	0.86	21	4806	5047.9	50	50	50			
X3	0	0	0	0	0	5480	0	0	0	
GR	1277	4333	1278	4416.1	1278	4510.3	1277	4682.9	1276	4731.1
GR	1275	4759.4	1274	4806	1273	4928	1272	4956.6	1271	4991.8
GR	1271	5010.2	1272	5026.3	1273	5038.6	1274	5047.9	1274	5172.5
GR	1275	5480	1274	5636.6	1274	5693.3	1274	5765.9	1274	5902.3
GR	1274	6161.7								

NC	.1	.1	.051							
X1	0.87	19	4978	5011.6	55	80	75			
X3	0	0	0	0	0	5530	0	0	0	
GR	1280	4480	1279	4563.1	1278	4678.6	1277	4742.5	1276	4746
GR	1275	4821.4	1274	4978	1273	4988.3	1272	4994.2	1272	5005
GR	1273	5008.1	1274	5011.6	1275	5076.1	1275	5156.3	1276	5344.7
GR	1276	5428.9	1276.5	5530	1276	5577.2	1276	5930.5		

NC	.1	.1	.035							
X1	0.89	28	4990.9	5026.2	110	125	120			
X3	0	0	0	4920	0	5590	0	0	0	
GR	1280	4588	1279	4656.6	1278	4767.6	1277	4825.5	1276	4830.5
GR	1276	4983.5	1277	4987.6	1277	4988.2	1276	4990.9	1275	4993.6
GR	1274	4995.3	1273	4997	1272	4998.6	1272	5002.4	1273	5004.9
GR	1274	5007.4	1275	5013.8	1276	5026.2	1277	5036.4	1277	5048.9
GR	1277	5118	1277	5122.9	1277	5463.7	1277	5466.8	1277.5	5590
GR	1277	5928.8	1277	5988.2	1277	6051.1				

X1	0.929	24	4969.3	5021.3	180	180	180			
X3	0	0	0	0	0	5610	0	0	0	
GR	1283	4545	1282	4646.8	1281	4768.5	1280	4771.2	1279	4829
GR	1278	4846.1	1278	4885.2	1278	4938.5	1277	4969.3	1276	4991.1
GR	1275	4994.6	1275	5006.5	1276	5019.3	1277	5021.3	1278	5087.3
GR	1278	5168.8	1278	5170.8	1278	5171	1278	5385.6	1278	5594.3
GR	1278.1	5610	1278	5876	1278	5981.8	1278	6043.8		

NH	2	.02	5216.9	.1	6008.1					
X1	0.935	16	4925	5075.1	30	35	30			
X3	0	0	0	4950	0	5020	0	0	0	
GR	1284	4531	1282	4701.1	1279	4799.5	1278	4861.6	1277	4925
GR	1276	4960.8	1276	5038.7	1277	5075.1	1277	5216.9	1277	5217.7
GR	1278	5523	1278	5593.4	1278.2	5610	1278	5889.4	1278	5944.3
GR	1278	6008.1								

NC	.1	.1	.048							
X1	0.94	22	4983.9	5010.9	35	50	35			
X3	0	0	0	0	0	5630	0	0	0	
GR	1286	4477	1284	4658.5	1280	4762.5	1280	4767.1	1280	4767.5
GR	1279	4779	1278	4983.9	1277	4987.5	1276	4991.8	1275	4997
GR	1275	5004	1276	5006.3	1277	5008.5	1278	5010.9	1278.5	5220
GR	1278	5273.7	1278	5511.7	1278	5560.6	1278.5	5630	1278	5847.6
GR	1278	5873.4	1278	5940						

X1	0.96	20	4988.3	5020	130	100	125			
X3				4850						
GR	1286	4475	1284	4609.6	1282	4700.2	1280	4805.5	1280	4889.5

GR	1280	4987	1279	4988.3	1278	4989.4	1277	4994.9	1276	4997.4
GR	1276	5004.4	1277	5006.8	1278	5009.1	1279	5011.4	1279	5020
GR	1279	5089.9	1279.5	5100	1279	5129.9	1279	5134.7	1279	5650
X1	0.99	20	4990.7	5020.0	150	150	145			
GR	1286.0	4477.0	1284.0	4618.1	1281.0	4806.6	1281.0	4854.8	1281.0	4859.4
GR	1280.0	4990.7	1279.0	4991.9	1278.0	4993.3	1277.0	4997.1	1277.0	5004.3
GR	1278.0	5008.1	1279.0	5010.7	1280.0	5013.8	1280.0	5020.0	1280.0	5076.7
GR	1280.0	5080.4	1280.0	5097.4	1280.0	5118.4	1280.0	5373.0	1280.0	5573.9
NH	2	.02	5122.4	.1	5670.6					
X1	0.998	23	4940.7	5048.6	30	30	30			
X3	0	0	0	4930	0	5550	0	0	0	
GR	1286	4507	1284	4630.4	1281	4821.3	1281	4821.9	1281	4840.8
GR	1281	4854.6	1281	4860.8	1280	4940.7	1279	4965	1278	4982.5
GR	1277	4993.4	1277	5007.2	1278	5020.4	1279	5030.1	1280	5048.6
GR	1280	5115.4	1280	5122.4	1281	5146.1	1280	5383.2	1280	5541.1
GR	1280.5	5550	1280	5653.8	1280	5670.6				
NC	.1	.1	.043							
X1	1.005	20	4980.6	5019.4	35	70	35			
X3	0	0	0	0	0	5530	0	0	0	
GR	1286	4621	1284	4705.6	1282	4806	1281	4920.5	1281	4980.6
GR	1281	4990.2	1280	4992.6	1279	4994.6	1278	4996.6	1277	4998.8
GR	1277	5001.7	1278	5005.3	1279	5008.7	1280	5012	1281	5019.4
GR	1280	5409.9	1280	5471.3	1281	5530	1280	5570.3	1280	5638.9
X1	1.03	27	4986.1	5013.6	125	100	125			
GR	1288.0	4453.0	1286.0	4590.8	1284.0	4694.2	1283.0	4771.4	1283.0	4844.3
GR	1282.0	4939.1	1282.0	4954.3	1283.0	4968.5	1283.0	4970.8	1282.0	4986.1
GR	1281.0	4989.2	1280.0	4992.1	1279.0	4995.1	1278.0	4998.0	1278.0	5002.6
GR	1279.0	5005.4	1280.0	5008.3	1281.0	5011.1	1282.0	5013.6	1282.0	5124.5
GR	1282.0	5129.1	1282.0	5143.2	1282.0	5157.8	1282.0	5179.0	1280.0	5437.6
GR	1280.0	5483.5	1281.5	5530						
X1	1.05	24	4986.8	5024.3	135	130	140			
X3	0	0	0	0	0	5510	0	0	0	
GR	1288	4454	1286	4600.9	1284	4774.1	1284	4810.9	1284	4818.3
GR	1283	4941.4	1282	4946.7	1282	4949.9	1283	4956.5	1283	4986.8
GR	1282	4989.4	1281	4992.1	1280	4996	1280	5005.8	1281	5009.6
GR	1282	5014.3	1283	5024.3	1283	5122	1282	5288.8	1280	5421.6

GR	1280	5467.2	1282	5484	1282.5	5510	1282	5554.2		
NH	2	.02	5150.0	.1	5541.6					
X1	1.06	18	4901.8	5072	40	35	40			
X3	0	0	0	4940	0	5500	0	0	0	
GR	1288	4424	1286	4660.1	1284	4802.3	1283	4862	1282	4901.8

GR	1281	4944.9	1280	4995.6	1280	5004.8	1281	5041.2	1282	5072
GR	1282.8	5150	1283	5165	1282	5263.9	1280	5420.7	1280	5463.2
GR	1282	5476.2	1283	5500	1282	5541.6				
NC	.1	.1	.028							
X1	1.07	27	4985.8	5032.4	35	70	35			
X3	0	0	0	0	0	5490	0	0	0	
GR	1292	4303	1290	4399.4	1288	4438.6	1288	4479.1	1288	4496.4
GR	1285	4822.7	1285	4827.2	1285	4851.1	1284	4985.8	1283	4988.8
GR	1282	4991.7	1281	4994.5	1280	4998	1280	5002.5	1281	5006
GR	1282	5008.9	1283	5011.5	1284	5032.4	1284	5105.5	1283	5145.8
GR	1283	5155.2	1283	5171.1	1283	5189.7	1282	5435.1	1282	5499.8
GR	1283	5530	1282	5568.5						
X1	1.09	25	4976.6	5007.9	135	120	135			
X3	0	0	0	0	0	5440	0	0	0	
GR	1290	4461	1288	4587.6	1286	4838.6	1286	4858.4	1286	4883.6
GR	1285	4924.6	1285	4970.5	1285	4976.6	1284	4985.3	1283	4989.4
GR	1282	4993.1	1281	4997.6	1281	5002.1	1282	5003.9	1283	5005.1
GR	1284	5006.5	1285	5007.9	1285	5010.1	1284	5165	1284	5217.1
GR	1284	5367	1282	5464.9	1282	5504.1	1283	5530	1282	5551.7
X1	1.12	29	4989.3	5021.9	125	120	125			
X3						5350				
GR	1292.0	4371.0	1290.0	4576.8	1290.0	4593.9	1290.0	4597.5	1290.0	4606.0
GR	1289.0	4672.1	1289.0	4689.5	1289.0	4731.7	1288.0	4788.3	1287.0	4852.6
GR	1286.0	4948.7	1286.0	4949.8	1286.0	4987.5	1285.0	4989.3	1284.0	4991.0
GR	1283.0	4992.8	1282.0	4998.7	1282.0	5002.5	1283.0	5009.4	1284.0	5015.8
GR	1285.0	5021.9	1285.0	5023.7	1285.0	5109.5	1285.0	5129.4	1285.0	5169.6
GR	1285.0	5244.9	1285.0	5259.1	1284.0	5378.4	1283.0	5530		
NC	.02	.02	.02							
X1	1.13	14	4963.2	5055.6	70	40	45			
X3				4970		5330				
GR	1292	4377	1290	4664.6	1289	4730.8	1288	4789.1	1287	4852
GR	1286	4905.9	1285	4940.5	1284	4963.2	1283	4989.3	1283	5011.5
GR	1284	5055.6	1285	5330.0	1284	5430.4	1283.2	5500		
NC	.1	.1	.053							
X1	1.136	25	4980.0	5007.3	70	100	50			
X3						5120				
GR	1292.0	4600.0	1291.0	4663.5	1290.0	4730.4	1289.0	4764.5	1288.0	4808.1
GR	1287.0	4820.2	1287.0	4880.5	1287.0	4899.7	1286.1	4980.0	1286.0	4988.1
GR	1285.0	4991.8	1284.0	4994.6	1283.0	4997.4	1282.0	5000.0	1282.0	5000.3
GR	1283.0	5002.1	1284.0	5003.9	1285.0	5005.6	1286.0	5007.3	1287.0	5009.0
GR	1288.0	5089.8	1288.0	5149.0	1287.0	5154.0	1287.0	5173.9	1286.5	5320

QT	1	1085								
X1	1.138	44	4980.2	5007.7	10	10	10			
X3						5120				
GR	1292.2	4599.3	1291.5	4637.0	1291.1	4663.0	1290.1	4729.9	1289.8	4740.6
GR	1289.1	4764.2	1288.5	4790.5	1288.1	4807.8	1287.2	4820.0	1287.1	4840.9
GR	1287.1	4880.4	1287.1	4881.9	1287.1	4899.7	1286.4	4961.0	1286.2	4980.2
GR	1286.1	4986.9	1286.1	4988.2	1285.7	4989.7	1285.1	4991.9	1284.9	4992.3
GR	1284.1	4994.7	1284.0	4994.8	1283.1	4997.4	1283.0	4997.4	1282.0	4999.9
GR	1282.0	5000.3	1282.8	5001.8	1283.1	5002.2	1283.7	5003.3	1284.1	5004.0
GR	1284.5	5004.8	1285.1	5005.9	1285.3	5006.3	1286.1	5007.7	1287.0	5009.4
GR	1288.0	5091.1	1288.0	5128.8	1288.0	5151.0	1287.1	5156.0	1287.1	5161.2
GR	1287.1	5176.1	1286.9	5198.6	1286.6	5272.5	1286.5	5320.0		

X1	1.159	45	4982	5011.6	110	110	110			
X3						5139.5				
GR	1294.1	4591.1	1292.8	4629.8	1292.3	4656.5	1291.2	4725.2	1290.9	4736.1
GR	1290.3	4760.3	1289.8	4787.4	1289.4	4805.1	1288.8	4817.6	1288.6	4839.1
GR	1288.1	4879.6	1288.0	4881.1	1287.9	4899.4	1287.2	4962.3	1287.1	4982.0
GR	1287.1	4988.0	1286.8	4989.2	1286.3	4990.5	1285.6	4992.5	1285.5	4992.8
GR	1284.6	4995.0	1284.5	4995.1	1283.5	4997.4	1283.5	4997.4	1282.5	4999.7
GR	1282.5	5000.4	1283.4	5002.6	1283.7	5003.3	1284.3	5005.0	1284.8	5006.1
GR	1285.3	5007.3	1285.9	5008.8	1286.2	5009.5	1287.0	5011.6	1287.5	5013.6
GR	1288.4	5105.4	1288.5	5147.7	1288.5	5172.7	1288.0	5178.3	1288.0	5184.1
GR	1287.8	5200.9	1287.5	5226.1	1287.3	5309.2	1287.1	5427.8	1287.0	5429.8

X1	1.18	26	4983.8	5015.6	110	110	110			
X3						5166.6				
GR	1296.0	4583.0	1294.0	4622.7	1292.0	4731.7	1291.0	4784.2	1290.0	4837.3
GR	1289.0	4880.4	1288.0	4963.6	1288.0	4983.8	1288.0	4989.1	1287.0	4991.3
GR	1286.0	4993.4	1285.0	4995.4	1284.0	4997.5	1283.0	4999.5	1283.0	5000.5
GR	1284.0	5003.5	1285.0	5006.6	1286.0	5009.8	1287.0	5012.7	1288.0	5015.6
GR	1289.0	5166.6	1289.0	5207.0	1288.0	5253.7	1288.0	5346.0	1288.0	5477.5
GR	1288.0	5479.7								

X1	1.20	45	4982.6	5013.7	110	110	115			
X3						5180.5				
GR	1296.0	4530.5	1294.6	4575.3	1293.6	4628.9	1292.6	4698.2	1291.7	4757.5
GR	1291.3	4781.7	1291.1	4805.5	1290.9	4817.3	1290.0	4865.9	1290.0	4871.8
GR	1289.1	4959.8	1289.0	4982.6	1288.5	4985.3	1288.0	4988.2	1288.0	4988.3
GR	1287.1	4990.7	1286.9	4991.0	1286.2	4992.9	1285.8	4993.7	1285.3	4995.1
GR	1284.7	4996.5	1284.4	4997.2	1283.5	4999.4	1283.5	5001.0	1284.5	5003.3
GR	1284.5	5003.5	1285.4	5005.5	1285.7	5006.2	1286.3	5007.6	1286.8	5008.8
GR	1287.2	5009.7	1287.9	5011.3	1288.1	5011.7	1289.0	5013.7	1289.6	5060.4
GR	1290.0	5180.5	1290.0	5213.5	1289.8	5225.1	1289.4	5238.2	1288.5	5276.6
GR	1288.0	5319.0	1288.0	5378.4	1288.0	5419.5	1288.0	5523.7	1288.0	5526.1

X1	1.22	25	4981.4	5011.9	110	110	115			
X3						5062.9				
GR	1296.0	4478.0	1294.0	4587.6	1292.0	4757.7	1292.0	4784.3	1291.0	4858.0
GR	1290.0	4981.4	1289.0	4984.3	1288.0	4987.4	1287.0	4990.3	1286.0	4993.3
GR	1285.0	4996.3	1284.0	4999.3	1284.0	5001.5	1285.0	5003.3	1286.0	5005.1

GR	1287.0	5006.9	1288.0	5008.6	1289.0	5010.3	1290.0	5011.9	1291.0	5062.9
GR	1291.0	5230.4	1290.0	5257.5	1288.0	5345.9	1288.0	5455.9	1288.0	5572.4

X1	1.23	23	4976.1	5013.9	50	40	50			
X3						5076.6				
GR	1296.0	4506.0	1294.0	4602.2	1292.0	4805.3	1291.0	4881.4	1290.0	4940.3
GR	1289.0	4956.5	1288.0	4976.1	1287.0	4989.1	1287.0	5010.7	1288.0	5013.9
GR	1289.0	5017.5	1290.0	5021.0	1291.0	5076.6	1291.0	5136.6	1291.0	5140.5
GR	1291.0	5211.4	1290.0	5253.7	1288.0	5348.7	1288.0	5385.7	1288.0	5415.0
GR	1288.0	5427.2	1288.0	5453.6	1288.0	5586.3				
NH	2	.02	5415	.1	5582.2					
X1	1.238	17	4947.9	5046.0	25	25	25			
X3				4860		5133.8				
GR	1294.0	4598.0	1292.0	4790.3	1291.0	4864.6	1290.0	4924.4	1289.0	4947.9
GR	1288.0	4961.9	1288.0	4973.4	1288.0	4980.1	1287.0	4988.5	1287.0	5012.6
GR	1288.0	5027.9	1289.0	5046.0	1290.0	5068.3	1291.0	5133.8	1291.0	5187.1
GR	1289.3	5415.0	1288.0	5582.2						
NC	.1	.1	.058							
X1	1.242	26	4975.0	5007.7	35	30	25			
X3						5106.9				
GR	1298.0	4435.0	1296.0	4548.4	1294.0	4719.8	1293.0	4813.9	1292.0	4858.6
GR	1291.0	4923.6	1290.0	4966.2	1290.0	4969.9	1290.0	4975.0	1290.0	4988.2
GR	1289.0	4990.9	1288.0	4993.7	1287.0	4996.5	1286.0	4999.2	1286.0	5001.6
GR	1287.0	5003.0	1288.0	5004.4	1289.0	5006.1	1290.0	5007.7	1291.0	5010.6
GR	1291.0	5031.6	1291.0	5036.8	1292.0	5106.9	1292.0	5160.5	1290.0	5296.6
GR	1288.0	5591.5								
QT	1	835								
X1	1.244	43	4975.3	5008.1	10	10	10			
X3						5110.8				
GR	1298.1	4435.5	1297.1	4491.2	1296.1	4548.8	1295.3	4613.2	1294.1	4720.1
GR	1293.6	4768.5	1293.3	4790.6	1293.0	4814.2	1292.9	4817.4	1292.0	4858.9
GR	1291.1	4923.9	1290.1	4966.5	1290.1	4970.2	1290.1	4975.3	1290.1	4981.9
GR	1290.1	4986.0	1290.0	4988.4	1289.7	4989.3	1289.0	4991.0	1288.5	4992.5
GR	1288.0	4993.7	1287.3	4995.8	1287.1	4996.5	1286.1	4999.2	1286.1	5001.5
GR	1286.9	5002.8	1287.1	5003.0	1287.7	5004.0	1288.1	5004.6	1288.5	5005.3
GR	1289.1	5006.4	1289.2	5006.6	1290.1	5008.1	1291.1	5011.1	1291.1	5032.8
GR	1291.1	5038.2	1291.3	5055.0	1291.6	5071.5	1292.1	5110.8	1292.0	5166.3
GR	1290.6	5268.3	1290.1	5307.1	1288.2	5612.4				
X1	1.259	43	4977.6	5011.2	70	75	80			
X3						5141.7				
GR	1299.1	4439.3	1297.5	4494.9	1296.6	4552.3	1295.7	4616.5	1294.7	4723.2
GR	1294.3	4771.4	1293.7	4793.4	1293.1	4817.0	1293.0	4820.1	1292.4	4861.6
GR	1291.7	4926.4	1291.1	4968.8	1291.1	4972.6	1291.1	4977.6	1291.1	4983.6

GR	1290.5	4987.4	1290.2	4989.5	1289.8	4990.3	1289.2	4991.9	1288.7	4993.2
GR	1288.3	4994.3	1287.7	4996.2	1287.4	4996.8	1286.5	4999.3	1286.5	5001.1
GR	1287.4	5003.0	1287.6	5003.4	1288.4	5005.0	1288.8	5005.8	1289.3	5006.9
GR	1290.0	5008.5	1290.1	5008.9	1291.1	5011.2	1291.6	5015.0	1291.8	5042.6
GR	1291.9	5049.5	1292.2	5070.8	1292.3	5091.8	1292.4	5141.7	1292.3	5212.3
GR	1291.3	5341.9	1291.1	5391.3	1290.1	5779.3				

X1	1.27	23	4980.0	5014.3	70	75	80			
X3						5086.6				
GR	1300.0	4443.1	1298.0	4498.6	1296.0	4619.9	1295.0	4774.3	1294.0	4796.3
GR	1293.0	4822.9	1292.0	4980.0	1292.0	4985.3	1291.0	4988.7	1290.0	4991.3
GR	1289.0	4993.9	1288.0	4996.6	1287.0	4999.3	1287.0	5000.7	1288.0	5003.3
GR	1289.0	5005.9	1290.0	5008.5	1291.0	5011.2	1292.0	5014.3	1293.0	5086.6
GR	1293.0	5112.1	1292.0	5415.5	1292.0	5946.3				

X1	1.30	24	4986.5	5031.2	140	160	160			
X3						5140				
GR	1300.0	4483.0	1298.0	4544.2	1296.0	4649.7	1294.0	4732.7	1294.0	4780.7
GR	1293.0	4962.2	1293.0	4965.0	1294.0	4977.6	1294.0	4981.7	1293.0	4986.5
GR	1292.0	4989.3	1291.0	4991.9	1290.0	4994.5	1289.0	4997.1	1288.0	4999.5
GR	1288.0	5001.4	1289.0	5004.2	1290.0	5007.2	1291.0	5010.2	1292.0	5013.2
GR	1293.0	5031.2	1293.5	5140.0	1293.0	5220.0	1293.0	5880.2		

X1	1.327	42	4983.3	5025.6	115	125	117.5			
X3						5100.7				
GR	1300.0	4490.2	1298.5	4550.1	1297.5	4606.3	1296.8	4653.4	1295.6	4734.7
GR	1295.5	4752.7	1295.5	4781.7	1295.2	4873.6	1295.1	4921.6	1294.5	4947.5
GR	1294.3	4959.5	1294.3	4962.1	1294.7	4974.5	1294.6	4978.5	1294.1	4983.3
GR	1293.5	4986.6	1293.4	4987.3	1292.5	4989.8	1292.5	4989.9	1291.6	4992.4
GR	1291.4	4993.1	1290.7	4994.9	1290.2	4996.2	1289.8	4997.1	1289.0	4999.2
GR	1289.0	5001.2	1289.8	5003.6	1290.3	5005.2	1290.6	5006.0	1291.4	5008.4
GR	1291.6	5009.1	1292.2	5010.9	1292.6	5013.0	1293.2	5017.1	1293.8	5021.1
GR	1294.1	5025.6	1294.7	5079.1	1294.8	5100.7	1294.6	5156.0	1294.8	5215.9
GR	1294.5	5280.2	1294.5	5611.8						

X1	1.35	24	4980.0	5020.0	115	125	117.5			
X3						5125				
GR	1300.0	4497.4	1298.0	4611.0	1297.0	4754.3	1297.0	4872.7	1297.0	4919.7
GR	1296.0	4945.0	1295.1	4980.0	1295.0	4984.8	1294.0	4987.8	1293.0	4990.8
GR	1292.0	4993.7	1291.0	4996.4	1290.0	4998.9	1290.0	5001.1	1291.0	5004.2
GR	1292.0	5007.2	1293.0	5010.3	1294.0	5013.4	1295.0	5016.5	1295.1	5020.0
GR	1296.0	5049.5	1296.5	5125.0	1296.0	5160.5	1296.0	5343.4		

MOUNTAIN VIEW ROAD

X1	1.38	33	4982.8	5027.9	180	160	170			
RC	16	0	1290.00	56	1293.14	111	1294.00	167	1294.63	222
RC	1295.1	278	1295.56	333	1296.08	389	1296.33	445	1296.55	500

RC	1296.8	556	1296.93	611	1297.08	667	1297.23	722	1297.36	778
RC	1297.5	835	1297.60							
GR	1303.0	4628.9	1302.0	4670.3	1301.0	4767.5	1300.0	4825.4	1300.0	4829.0
GR	1300.0	4856.7	1299.4	4883.0	1299.0	4901.0	1298.0	4939.1	1297.0	4966.2
GR	1297.0	4969.9	1297.0	4982.8	1296.0	4985.0	1295.0	4987.4	1294.0	4989.9
GR	1293.0	4992.4	1292.0	4995.0	1291.0	4997.5	1290.0	4999.9	1290.0	5000.2
GR	1291.0	5010.6	1292.0	5013.1	1293.0	5016.1	1294.0	5019.1	1295.0	5022.1
GR	1296.0	5025.0	1297.0	5027.9	1297.8	5127.0	1298.0	5155.0	1298.0	5187.9
GR	1297.0	5203.5	1297.0	5462.3	1296.0	5595.8				

NC	.1	.1	.032							
X1	1.40	31	4985.0	5018.1	105	105	105			
RC	16	0	1291.00	56	1292.97	111	1293.80	167	1294.39	222
RC	1294.9	278	1295.28	333	1295.82	389	1296.03	445	1296.20	500
RC	1296.4	556	1296.47	611	1296.55	667	1296.65	722	1296.68	778
RC	1296.7	835	1296.46							
GR	1303.0	4733.0	1302.0	4762.9	1301.0	4792.3	1300.3	4885.0	1300.0	4931.3
GR	1299.0	4978.9	1299.0	4982.7	1299.0	4983.0	1298.0	4985.0	1297.0	4986.8
GR	1296.0	4988.6	1295.0	4990.3	1294.0	4992.1	1293.0	4994.0	1292.0	4996.1
GR	1291.0	4998.6	1291.0	5002.1	1292.0	5004.4	1293.0	5006.7	1294.0	5009.0
GR	1295.0	5011.3	1296.0	5013.6	1297.0	5015.9	1298.0	5018.1	1299.0	5038.1
GR	1299.0	5077.5	1299.0	5110.5	1299.0	5202.8	1298.0	5380.4	1298.0	5405.6
GR	1300.0	5513.1								
X1	1.46	28	4986.3	5027.9	290	290	290			
X3						5192.5				
GR	1308.0	4542.0	1306.0	4677.9	1305.0	4752.5	1304.0	4796.7	1303.0	4860.7
GR	1302.0	4925.3	1301.0	4984.2	1300.0	4986.3	1299.0	4988.5	1298.0	4990.6
GR	1297.0	4992.8	1296.0	4994.9	1295.0	4997.2	1294.0	4999.3	1294.0	5000.8
GR	1295.0	5003.6	1296.0	5006.4	1297.0	5009.1	1298.0	5011.9	1299.0	5014.7
GR	1300.0	5027.9	1301.0	5184.4	1301.0	5192.5	1301.0	5254.6	1300.0	5464.5
GR	1300.0	5479.7	1302.0	5526.7	1302.0	5713.7				
NC	.1	.1	.075							
X1	1.49	30	4976.3	5018.9	190	190	190			
RC	16	0	1296.00	56	1298.15	111	1298.93	167	1299.48	222
RC	1299.9	278	1300.33	333	1300.66	389	1300.97	445	1301.25	500
RC	1301.5	556	1301.77	611	1302.00	667	1302.22	722	1302.42	778
RC	1302.6	835	1302.66							
X3						5108.8				
GR	1310.0	4893.0	1309.0	4896.4	1308.0	4900.2	1307.0	4903.3	1306.3	4905.1
GR	1306.0	4906.0	1305.0	4910.0	1304.0	4912.7	1303.0	4976.3	1302.0	4980.0
GR	1301.0	4982.5	1300.0	4984.9	1299.0	4987.4	1298.0	4990.0	1297.0	4992.6
GR	1296.0	4995.2	1296.0	5005.0	1297.0	5007.1	1298.0	5009.0	1299.0	5011.0
GR	1300.0	5013.0	1301.0	5014.9	1302.0	5016.9	1303.0	5018.9	1304.0	5020.9
GR	1305.0	5108.8	1305.0	5125.2	1304.0	5141.0	1303.0	5181.8	1302.0	5462.6

HEC-RAS will not permit a flow change at section 1.55 because it is part of a bridge routine. Therefore, in RAS this flow change occurs at 1.56 (even the Standard Table 1 in HEC-RAS shows the lower Q for section 1.55).

```
QT       1       601
X1   1.527        29    4979.2    5016.7       180       180       180
RC      16         0   1297.00        56   1298.55       111   1299.22       167   1299.72       222
RC  1300.1       278   1300.50       333   1300.80       389   1301.10       445   1301.37       500
RC  1301.6       556   1301.84       611   1302.04       667   1302.25       722   1302.44       778
RC  1302.6       835   1302.81
GR  1308.0    4591.0    1306.0    4664.4    1305.0    4736.9    1306.0    4794.3    1306.0    4797.2
GR  1306.0    4837.2    1306.0    4885.0    1306.0    4975.6    1305.0    4979.2    1304.0    4982.5
GR  1303.0    4985.3    1302.0    4987.7    1301.0    4990.0    1300.0    4992.3    1299.0    4994.3
```



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GR  1298.0    4996.2    1297.0    4998.1    1297.0    5001.5    1298.0    5003.1    1299.0    5004.8
GR  1300.0    5006.4    1301.0    5008.0    1302.0    5009.7    1303.0    5011.3    1304.0    5013.1
GR  1305.0    5016.7    1306.0    5110.7    1306.0    5273.0    1306.0    5366.3

X1   1.528        51    4979.7    5016.9        10        10        10
RC      16         0   1297.00        40   1299.57        80   1300.37       120   1300.98       160
RC  1301.5       200   1301.90       240   1302.28       280   1302.62       320   1302.94       360
RC  1303.2       400   1303.50       440   1303.76       480   1304.00       520   1304.23       560
RC  1304.5       601   1304.67
GR  1308.4    4579.4    1308.1    4586.5    1306.3    4655.1    1305.7    4697.2    1305.3    4729.8
GR  1306.1    4789.0    1306.1    4789.5    1306.1    4792.0    1306.1    4833.2    1306.1    4840.3
GR  1306.1    4882.6    1306.1    4976.0    1305.4    4978.6    1305.1    4979.7    1304.3    4981.9
GR  1304.0    4982.9    1303.6    4984.1    1303.0    4985.6    1302.7    4986.5    1302.0    4988.0
GR  1301.7    4988.7    1301.0    4990.3    1300.6    4991.1    1300.0    4992.5    1299.5    4993.6
GR  1299.1    4994.4    1298.1    4996.4    1297.9    4996.7    1297.1    4998.2    1297.1    5001.4
GR  1297.8    5002.6    1298.1    5003.1    1298.5    5003.7    1299.1    5004.8    1299.2    5004.8
GR  1299.8    5005.9    1300.2    5006.4    1300.5    5007.0    1301.2    5008.1    1301.2    5008.1
GR  1301.9    5009.2    1302.2    5009.8    1302.5    5010.2    1303.2    5011.4    1304.1    5013.3
GR  1305.1    5016.9    1305.5    5053.1    1306.1    5113.8    1306.1    5120.8    1306.1    5281.0
GR  1306.0    5377.1

X1    1.55        28    4986.6    5020.0       125       125       125
RC      16         0   1298.00        40   1300.78        80   1301.66       120   1302.29       160
RC  1302.8       200   1303.23       240   1303.61       280   1303.95       320   1304.26       360
RC  1304.6       400   1304.83       440   1305.08       480   1305.32       520   1305.55       560
RC  1305.8       601   1305.98
X3                                                5166.7
GR  1314.0    4417.1    1312.0    4427.2    1310.0    4584.8    1308.0    4716.1    1308.0    4788.4
GR  1307.0    4985.1    1306.0    4986.6    1305.0    4988.2    1304.0    4989.7    1303.0    4991.4
GR  1302.0    4992.9    1301.0    4994.6    1300.0    4996.3    1299.0    4998.4    1298.0    4999.5
GR  1298.0    5000.5    1299.0    5002.0    1300.0    5003.4    1301.0    5004.8    1302.0    5006.1
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GR	1303.0	5007.5	1304.0	5008.9	1305.0	5010.3	1306.0	5011.6	1306.1	5020.0
GR	1307.0	5071.0	1308.0	5166.7	1306.0	5528.9				
X1	1.57	33	4987.7	5020.0	100	110	100			
X3						5160				
GR	1316.0	4246.0	1314.0	4381.0	1312.0	4474.0	1312.0	4538.6	1312.0	4620.7
GR	1310.0	4660.3	1309.0	4743.9	1308.0	4985.1	1307.0	4986.4	1306.0	4987.7
GR	1305.0	4989.1	1304.0	4990.8	1303.0	4992.5	1302.0	4994.0	1301.0	4995.7
GR	1300.0	4997.3	1299.0	4999.0	1299.0	5001.1	1300.0	5002.0	1301.0	5002.9
GR	1302.0	5003.9	1303.0	5004.7	1304.0	5005.7	1305.0	5006.6	1306.0	5007.5
GR	1306.2	5020.0	1307.0	5075.8	1308.0	5104.2	1308.5	5160.0	1308.0	5226.5
GR	1308.0	5296.4	1308.0	5364.3	1308.0	5558.0				
X1	1.61	30	4991.3	5025.5	180	165	180			
X3						5131.9				
GR	1316.0	4336.0	1314.0	4588.0	1310.0	4789.3	1309.0	4844.3	1309.0	4894.4
GR	1310.0	4941.5	1310.0	4988.0	1309.0	4989.6	1308.0	4991.3	1307.0	4992.9
GR	1306.0	4994.5	1305.0	4996.2	1304.0	4997.8	1303.0	4999.4	1303.0	5000.5
GR	1304.0	5002.8	1305.0	5005.1	1306.0	5007.4	1307.0	5009.7	1308.0	5025.5
GR	1309.0	5060.0	1310.0	5107.5	1311.0	5131.9	1311.0	5205.7	1311.0	5206.5
GR	1311.0	5214.7	1310.0	5244.0	1310.0	5353.1	1310.0	5373.6	1310.0	5580.4

X1	1.64	32	4993.5	5020	140	170	165			
X3						5180				
GR	1317.0	4437.4	1316.0	4463.3	1315.0	4515.2	1315.0	4532.9	1315.0	4587.1
GR	1314.0	4620.6	1313.0	4630.0	1312.0	4640.8	1311.0	4667.9	1310.0	4737.9
GR	1309.0	4904.9	1309.0	4971.9	1309.0	4985.4	1308.0	4993.5	1307.0	4995.0
GR	1306.0	4996.5	1305.0	4998.1	1304.0	4999.7	1304.0	5000.3	1305.0	5002.3
GR	1306.0	5004.5	1307.0	5007.0	1308.0	5010.5	1308.2	5020.0	1309.0	5062.4
GR	1310.0	5090.4	1311.0	5120.2	1312.0	5170.5	1312.0	5234.3	1311.0	5250.7
GR	1311.0	5316.9	1312.0	5507.0						
X1	1.65	33	4985	5006.9	90	100	95			
X3						5144.7				
GR	1317.0	4417.5	1317.0	4472.2	1317.0	4473.8	1316.0	4498.6	1315.0	4541.0
GR	1314.0	4591.7	1313.0	4617.9	1312.0	4645.0	1311.0	4661.3	1310.0	4815.6
GR	1309.0	4924.9	1308.1	4985.0	1308.0	4992.4	1307.0	4994.2	1306.0	4996.0
GR	1305.0	4997.8	1304.0	4999.7	1304.0	5000.3	1305.0	5001.9	1306.0	5003.8
GR	1307.0	5005.5	1308.0	5006.9	1309.0	5008.3	1310.0	5043.9	1311.0	5103.6
GR	1312.0	5116.7	1313.0	5144.7	1313.0	5201.8	1312.0	5241.2	1311.0	5254.7
GR	1311.0	5298.0	1312.0	5510.2	1310.0	5692.0				
X1	1.66	24	4902.7	5058.7	50	50	50			
X3						5132.5				
GR	1317.0	4425.0	1316.0	4468.9	1315.0	4506.6	1314.0	4532.3	1313.0	4565.7
GR	1312.0	4610.7	1311.0	4681.8	1310.0	4811.8	1309.0	4871.6	1308.0	4902.7
GR	1307.0	4929.1	1306.0	4955.0	1305.0	4984.4	1305.0	5016.7	1306.0	5033.1

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GR   1307.0     5046.5     1308.0     5058.7     1309.0     5071.5     1310.0     5086.3     1311.0     5106.7
GR   1312.0     5132.5     1312.0     5152.7     1311.0     5233.5     1310.0     5591.4
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     SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
     Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS
ALLOWABLE ERROR FOR CRITICAL DEPTH DETERMINATION (ALLDC) =  .500 PERCENT OF THE DEPTH

CCHV=     .100 CEHV=     .300
*SECNO  .720
2096 WSEL NOT GIVEN, AVG OF MAX, MIN USED
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     4641.8    5683.4  TYPE=      1  TARGET=    -4641.800
 ELENCL=    1270.00  ELENCR= 100000.00
       .720      1.37   1264.37   1264.37       .00   1264.84       .47       .00       .00   1264.00
      341.0       2.4     336.4       2.2       1.4      61.1       1.3        .0        .0   1264.00
        .00      1.78      5.51      1.78      .020      .020      .020      .000   1263.00   4967.51
    .005369        0.        0.        0.         0        21         0       .00     74.06   5041.57


*SECNO  .730

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     4650.7   10180.0  TYPE=      1  TARGET=     5529.300
 ELENCL=    1272.00  ELENCR= 100000.00
       .730      3.74   1265.74   1265.74       .00   1266.72       .98       .45       .16   1266.20
      341.0        .0     341.0        .0        .0      42.9        .0        .1        .1   1266.00
        .00       .00      7.96       .00      .000      .030      .000      .000   1262.00   4990.46
    .011475       60.       60.       60.         0        22         0       .00     21.87   5012.33


*SECNO  .790
3280 CROSS SECTION       .79 EXTENDED       .18 FEET

7185 MINIMUM SPECIFIC ENERGY
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3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=          .0    5030.0  TYPE=       1  TARGET=      5029.999
      .790        4.18    1270.18    1270.18        .00    1271.00        .82       3.47        .02    1270.00
     341.0          .0      341.0         .0         .1       46.9         .2         .4         .3    1270.10
       .01         .02       7.28        .19       .100       .030       .100       .000    1266.00    4990.40
   .012055        295.       295.       295.          0         12          0        .00      33.55    5023.95
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     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


*SECNO   .850
3280 CROSS SECTION        .85 EXTENDED        .10 FEET


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.58


3470 ENCROACHMENT STATIONS=          .0    5021.2  TYPE=       1  TARGET=      5021.199
      .850        3.09    1273.09    1272.09        .00    1273.28        .18       2.21        .06    1272.10
     341.0        16.0      324.3         .8       23.6       92.4        1.3        1.0         .7    1272.10
       .04         .68       3.51        .65       .100       .051       .100       .000    1270.00    4918.30
   .004830        315.       305.       305.          3          8          0        .00      98.50    5016.79

*SECNO   .860

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.89


3470 ENCROACHMENT STATIONS=          .0    5480.0  TYPE=       1  TARGET=      5479.999
      .860        2.29    1273.29    1272.30        .00    1273.35        .06        .06        .01    1274.00
     341.0          .0      341.0         .0         .0      173.2         .0        1.1         .9    1274.00
       .05         .00       1.97        .00       .000       .020       .000       .000    1271.00    4891.48
   .000580         50.        50.        50.          2         19          0        .00     149.90    5041.38

*SECNO   .870
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
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3470 ENCROACHMENT STATIONS=        .0    5530.0  TYPE=      1  TARGET=      5529.999
      .870       2.38    1274.38   1274.38       .00   1274.92       .54       .13       .15   1274.00
     341.0        8.2      329.4       3.4      11.2      54.7       4.6       1.3       1.1   1274.00
       .05        .74       6.02       .74      .100      .051      .100      .000   1272.00   4918.89
   .022714        55.        75.       80.         0         8         0       .00    117.05   5035.95


*SECNO  .890
1
   22MAY97      10:34:56                                                                          PAGE   16


     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


3265 DIVIDED FLOW


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.61


3470 ENCROACHMENT STATIONS=    4920.0    5590.0  TYPE=      1  TARGET=       670.000
      .890       4.04    1276.04   1275.62       .00   1276.52       .48      1.60       .01   1276.00
     341.0         .4      340.6        .0       2.6      61.2        .0       1.5       1.4   1276.00
       .06        .16       5.57       .01      .100      .035      .100      .000   1272.00   4920.00
   .008729       110.       120.      125.         2        15         0       .00     99.50   5026.62


*SECNO  .929

3470 ENCROACHMENT STATIONS=        .0    5610.0  TYPE=      1  TARGET=      5609.999
      .929       2.45    1277.45   1276.93       .00   1277.70       .25      1.15       .02   1277.00
     341.0        1.2      337.3       2.5       3.1      83.4       6.6       1.8       1.8   1277.00
       .07        .38       4.04       .38      .100      .035      .100      .000   1275.00   4955.52
   .004885       180.       180.      180.         4        14         0       .00     95.32   5050.84


1490 NH CARD USED
*SECNO  .935

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.26


3470 ENCROACHMENT STATIONS=    4950.0    5020.0  TYPE=      1  TARGET=        70.000
      .935       1.62    1277.62   1276.92       .00   1277.76       .14       .06       .01 100000.00
     341.0         .0      341.0        .0        .0     111.7        .0       1.9       1.8 100000.00
       .07        .00       3.05       .00      .000      .020      .000      .000   1276.00   4950.00
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   .000956      30.       30.       35.        3        18        0       .00     70.00   5020.00


*SECNO  .940

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
1
   22MAY97     10:34:56                                                                       PAGE    17


    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


3470 ENCROACHMENT STATIONS=          .0    5630.0  TYPE=      1  TARGET=      5629.999
      .940      2.70    1277.70   1277.70       .00   1278.60       .90       .10       .23   1278.00
     341.0        .0      341.0        .0        .0      44.8        .0       2.0       1.9   1278.00
       .07       .00       7.62       .00      .000      .048      .000      .000   1275.00   4984.97
   .029477       35.        35.       50.         0        14         0       .00     25.22   5010.19


*SECNO  .960
3280 CROSS SECTION       .96 EXTENDED       .52 FEET


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.01


3470 ENCROACHMENT STATIONS=     4850.0    5650.0  TYPE=      1  TARGET=     -4850.000
      .960      3.51    1279.51   1279.31       .00   1279.58       .06       .89       .08   1279.00
     348.1        .1      174.8     173.3        .2      63.0     315.3       2.5       2.7   1279.00
       .09       .30       2.77       .55      .100      .048      .100      .000   1276.00   4987.63
   .003386      130.       125.      100.         4        14         0       .00    662.37   5650.00


*SECNO  .990
3280 CROSS SECTION       .99 EXTENDED       .34 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
      .990      3.34    1280.34   1280.34       .00   1280.54       .20       .75       .04   1280.00
     380.3       3.1      254.1     123.1       7.6      58.7     188.0       3.6       4.9   1280.00
```

.10	.41	4.33	.65	.100	.048	.100	.000	1277.00	4946.13
.008199	150.	145.	150.	0	14	0	.00	627.77	5573.90

1490 NH CARD USED
*SECNO .998

3265 DIVIDED FLOW

3280 CROSS SECTION 1.00 EXTENDED .54 FEET

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 7.10

3470 ENCROACHMENT STATIONS= 4930.0 5550.0 TYPE= 1 TARGET= 620.000

.998	3.53	1280.53	1278.80	.00	1280.57	.03	.02	.02	1280.00
382.8	2.8	341.2	38.7	5.0	221.6	164.1	3.8	5.3	1280.00
.11	.56	1.54	.24	.020	.020	.049	.000	1277.00	4930.00
.000165	30.	30.	30.	2	12	0	.00	498.90	5550.00

*SECNO 1.005

3265 DIVIDED FLOW

3280 CROSS SECTION 1.00 EXTENDED .70 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= .0 5530.0 TYPE= 1 TARGET= 5529.999

1.005	3.70	1280.70	1280.70	.00	1280.97	.27	.02	.07	1281.00
382.8	.0	253.5	129.2	.0	49.9	152.1	4.2	5.9	1281.00
.11	.00	5.08	.85	.000	.043	.100	.000	1277.00	4990.93
.009807	35.	35.	70.	0	10	0	.00	400.96	5512.24

*SECNO 1.030

3265 DIVIDED FLOW

3280 CROSS SECTION 1.03 EXTENDED .02 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.69

1.030	3.53	1281.53	1280.93	.00	1281.60	.08	.62	.02	1282.00
382.8	.0	166.8	215.9	.0	52.0	256.1	4.8	6.8	1282.00
.13	.00	3.21	.84	.000	.043	.100	.000	1278.00	4987.58
.003426	125.	125.	100.	2	22	0	.00	314.31	5530.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.050

3265 DIVIDED FLOW

3280 CROSS SECTION 1.05 EXTENDED .05 FEET

3470 ENCROACHMENT STATIONS= .0 5510.0 TYPE= 1 TARGET= 5509.999

1.050	2.04	1282.04	1281.02	.00	1282.09	.04	.48	.00	1283.00
382.8	.0	95.6	287.1	.2	36.1	251.0	5.7	7.6	1283.00
.16	.12	2.65	1.14	.100	.043	.100	.000	1280.00	4946.43
.003802	135.	140.	130.	3	17	0	.00	235.65	5486.64

1490 NH CARD USED
*SECNO 1.060

3265 DIVIDED FLOW

3280 CROSS SECTION 1.06 EXTENDED .08 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.45

3470 ENCROACHMENT STATIONS= 4940.0 5500.0 TYPE= 1 TARGET= 560.000

1.060	2.08	1282.08	1281.00	.00	1282.12	.03	.03	.00	100000.00
382.8	.0	292.8	90.0	.0	180.3	273.6	6.0	7.9	1282.00
.16	.00	1.62	.33	.000	.020	.100	.000	1280.00	4940.00
.000319	40.	40.	35.	2	14	0	.00	362.95	5478.22

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*SECNO 1.070

3265 DIVIDED FLOW

3280 CROSS SECTION      1.07 EXTENDED      1.03 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=          .0    5490.0  TYPE=       1  TARGET=      5489.999
     1.070       3.03   1283.03   1283.03       .00   1283.32       .28       .04       .08   1284.00
     382.8         .0     233.6     149.1        .0      43.0     188.7       6.4       8.4   1284.00
       .17        .00      5.43       .79      .000      .028      .100      .000   1280.00   4988.70
   .004920        35.       35.       70.         0        15         0       .00    368.97   5490.00
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  SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
  Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
  TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
  SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

*SECNO 1.090

3265 DIVIDED FLOW

3280 CROSS SECTION      1.09 EXTENDED      2.36 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=          .0    5440.0  TYPE=       1  TARGET=      5439.999
     1.090       3.36   1284.36   1284.36       .00   1284.71       .35       .66       .02   1285.00
     412.0         .0     275.1     136.9        .0      47.7     164.8       7.1       9.4   1285.00
       .18        .00      5.76       .83      .000      .028      .100      .000   1281.00   4982.13
   .005331       135.      135.      120.         0         9         0       .00    356.26   5440.00

*SECNO 1.120
3280 CROSS SECTION      1.12 EXTENDED      2.43 FEET

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=          .0    5350.0  TYPE=       1  TARGET=      5349.999
     1.120       3.43   1285.43   1285.43       .00   1285.88       .45       .60       .03   1285.00
```

566.4	.1	445.1	121.2	.2	73.6	175.1	7.7	10.4	1285.00
.18	.33	6.05	.69	.100	.028	.100	.000	1282.00	4988.53
.004547	125.	125.	120.	0	9	0	.00	361.47	5350.00

*SECNO 1.130
3280 CROSS SECTION 1.13 EXTENDED 2.70 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 7.80

3470 ENCROACHMENT STATIONS= 4970.0 5330.0 TYPE= 1 TARGET= 360.000

1.130	2.90	1285.90	1284.80	.00	1285.93	.04	.02	.04	100000.00
876.1	.0	400.1	476.0	.0	219.0	384.0	8.1	10.7	1284.00
.19	.00	1.83	1.24	.000	.020	.020	.000	1283.00	4970.00
.000179	70.	45.	40.	2	12	0	.00	360.00	5330.00

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.136
3280 CROSS SECTION 1.14 EXTENDED 1.26 FEET

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= .0 5120.0 TYPE= 1 TARGET= 5119.999

1.136	5.76	1287.76	1287.76	.00	1288.32	.56	.04	.16	1286.10
958.5	306.6	624.7	27.2	160.4	85.1	25.2	8.9	11.3	1286.00
.19	1.91	7.34	1.08	.100	.053	.100	.000	1282.00	4811.05
.016351	70.	50.	100.	0	22	0	.00	259.02	5070.07

*SECNO 1.138
3280 CROSS SECTION 1.14 EXTENDED 1.75 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.48

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3470 ENCROACHMENT STATIONS=          .0    5120.0  TYPE=      1  TARGET=       5119.999
      1.138       6.26    1288.26   1287.69       .00   1288.45       .19       .09       .04   1286.20
      823.5      310.5      450.6      62.5     227.1      97.4      71.0       9.0      11.4   1286.10
        .19       1.37       4.63       .88      .100      .053      .100      .000   1282.00   4801.48
    .005505        10.        10.       10.         4        10         0       .00    318.52   5120.00

*SECNO 1.159
3280 CROSS SECTION      1.16 EXTENDED      1.86 FEET

3470 ENCROACHMENT STATIONS=          .0    5139.5  TYPE=      1  TARGET=       5139.499
      1.159       6.36    1288.86   1288.44       .00   1289.11       .25       .64       .02   1287.10
      843.9      207.5      530.6     105.8     157.8     106.4     100.8       9.9      12.2   1287.00
        .20       1.31       4.99      1.05      .100      .053      .100      .000   1282.50   4816.39
    .006202       110.       110.      110.         2        14         0       .00    323.11   5139.50

*SECNO 1.180
1
   22MAY97      10:34:56                                                                          PAGE   22

    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

3280 CROSS SECTION      1.18 EXTENDED      1.52 FEET

3470 ENCROACHMENT STATIONS=          .0    5166.6  TYPE=      1  TARGET=       5166.599
      1.180       6.52    1289.52   1289.12       .00   1289.76       .24       .65       .00   1288.00
      884.4      144.0      566.6     173.9     121.2     117.0     153.7      10.9      13.0   1288.00
        .21       1.19       4.84      1.13      .100      .053      .100      .000   1283.00   4858.07
    .005679       110.       110.      110.         2        11         0       .00    308.53   5166.60

*SECNO 1.200
3280 CROSS SECTION      1.20 EXTENDED      2.15 FEET

3470 ENCROACHMENT STATIONS=          .0    5180.5  TYPE=      1  TARGET=       5180.499
      1.200       6.65    1290.15   1290.00       .00   1290.63       .48       .80       .07   1289.00
      903.8       91.0      733.1      79.7      79.8     118.9      82.3      11.8      13.8   1289.00
        .22       1.14       6.17       .97      .100      .053      .100      .000   1283.50   4857.62
    .008842       110.       115.      110.         2         5         0       .00    322.88   5180.50

*SECNO 1.220
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3280 CROSS SECTION      1.22 EXTENDED      3.06 FEET


3470 ENCROACHMENT STATIONS=         .0     5062.9  TYPE=      1  TARGET=      5062.899
     1.220       7.06    1291.06   1289.70        .00   1291.60        .55        .95        .02    1290.00
     906.5       62.3      818.4      25.7       69.6     131.4       28.7       12.4       14.5    1290.00
       .22        .90       6.23       .90       .100      .053       .100       .000    1284.00    4853.38
   .007853       110.       115.      110.          2        12          0        .00     209.52    5062.90


*SECNO 1.230
3280 CROSS SECTION      1.23 EXTENDED      3.68 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.82


3470 ENCROACHMENT STATIONS=         .0     5076.6  TYPE=      1  TARGET=      5076.599
     1.230       4.68    1291.68   1289.80        .00   1291.84        .15        .20        .04    1288.00
     915.4      205.5      629.7      80.2      185.4     169.0       85.0       12.8       14.7    1288.00
       .23       1.11       3.73       .94       .100      .053       .100       .000    1287.00    4829.29
   .002414        50.        50.       40.          3        19          0        .00     247.31    5076.60
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 SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
 Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
 TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
 SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


1490 NH CARD USED
*SECNO 1.238
3280 CROSS SECTION      1.24 EXTENDED      3.82 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  5.52


3470 ENCROACHMENT STATIONS=     4860.0     5133.8  TYPE=      1  TARGET=       273.800
     1.238       4.82    1291.82   1289.22        .00   1291.86        .04        .01        .01    1289.00
     936.0      130.7      674.4     131.0      137.0     394.6      138.1       13.1       14.9    1289.00
       .23        .95       1.71       .95       .020      .020       .020       .000    1287.00    4860.00
   .000083        25.        25.       25.          2        15          0        .00     273.80    5133.80


*SECNO 1.242
3280 CROSS SECTION      1.24 EXTENDED      3.69 FEET
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3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=         .0    5106.9  TYPE=       1  TARGET=      5106.899
      1.242       5.69   1291.69   1291.69       .00   1292.36       .68       .01        .19   1290.00
      979.4      184.5     739.1      55.9      80.7      98.5      37.9      13.4       15.0   1290.00
        .23       2.29      7.50      1.47      .100      .058      .100      .000    1286.00   4879.00
    .021268        35.        25.       30.         0         9         0       .00     205.90   5084.90


*SECNO 1.244
3280 CROSS SECTION       1.24 EXTENDED       4.15 FEET


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.65


3470 ENCROACHMENT STATIONS=         .0    5110.8  TYPE=       1  TARGET=      5110.799
      1.244       6.26   1292.36   1291.41       .00   1292.51       .15       .09        .05   1290.10
      729.4      183.9     453.5      92.0     149.1     118.3      92.9      13.5       15.1   1290.10
        .23       1.23      3.83       .99      .100      .058      .100      .000    1286.10   4842.79
    .004344        10.        10.       10.         3        16         0       .00     268.01   5110.80
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     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


*SECNO 1.259
3280 CROSS SECTION       1.26 EXTENDED       2.61 FEET


3470 ENCROACHMENT STATIONS=         .0    5141.7  TYPE=       1  TARGET=      5141.699
      1.259       6.21   1292.71   1292.07       .00   1292.94       .23       .41        .02   1291.10
      743.3      143.0     522.2      78.1     115.7     115.0      80.5      14.0       15.6   1291.10
        .24       1.24      4.54       .97      .100      .058      .100      .000    1286.50   4840.22
    .006523        70.        80.       75.         2        12         0       .00     301.48   5141.70
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*SECNO 1.270
3280 CROSS SECTION      1.27 EXTENDED      1.22 FEET


3470 ENCROACHMENT STATIONS=          .0    5086.6  TYPE=       1  TARGET=      5086.599
      1.270       6.22    1293.22   1292.74       .00   1293.52       .30       .56       .02   1292.00
      752.1      120.5      576.2      55.3     113.2     115.3      51.8      14.5      16.0   1292.00
        .25       1.06       5.00      1.07      .100      .058      .100      .000   1287.00   4817.14
    .008073        70.        80.       75.         1        11         0       .00    269.46   5086.60


*SECNO 1.300
3280 CROSS SECTION      1.30 EXTENDED      1.31 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.42


3470 ENCROACHMENT STATIONS=          .0    5140.0  TYPE=       1  TARGET=      5139.999
      1.300       6.31    1294.31   1293.64       .00   1294.45       .14       .91       .02   1293.00
      794.6      151.6      524.4     118.6     183.2     143.9     115.5      15.8      17.2   1293.00
        .26        .83       3.64      1.03      .100      .058      .100      .000   1288.00   4719.79
    .004462       140.       160.      160.         2        14         0       .00    420.21   5140.00


*SECNO 1.327
3280 CROSS SECTION      1.33 EXTENDED       .40 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .57
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3470 ENCROACHMENT STATIONS=          .0    5100.7  TYPE=       1  TARGET=      5100.699
      1.327       5.90    1294.90   1294.25       .00   1295.47       .57       .89       .13   1294.10
      830.0       19.6      778.5      31.9      19.5     124.7      29.9      16.6      18.0   1294.10
        .27       1.00       6.24      1.07      .100      .058      .100      .000   1289.00   4930.28
    .014727       115.       118.      125.         3        16         0       .00    170.42   5100.70


*SECNO 1.350
3280 CROSS SECTION      1.35 EXTENDED       .40 FEET
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3470 ENCROACHMENT STATIONS= .0 5125.0 TYPE= 1 TARGET= 5124.999

1.350	6.40	1296.40	1295.36	.00	1296.82	.42	1.34	.01	1295.10
835.0	38.9	758.2	37.9	31.9	139.0	37.3	17.2	18.5	1295.10
.27	1.22	5.45	1.02	.100	.058	.100	.000	1290.00	4934.83
.009087	115.	118.	125.	3	12	0	.00	175.35	5110.18

*SECNO 1.380

3265 DIVIDED FLOW

3280 CROSS SECTION 1.38 EXTENDED 1.60 FEET

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.12

1.380	7.60	1297.60	1294.63	.00	1297.72	.12	.63	.03	1297.00
835.0	6.2	643.8	185.0	14.8	208.6	327.2	18.6	19.9	1297.00
.29	.42	3.09	.57	.100	.058	.100	.000	1290.00	4949.94
.002021	180.	170.	160.	0	20	0	.00	553.94	5595.80

*SECNO 1.400

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .43

1.400	5.46	1296.46	1296.39	.00	1297.96	1.50	.41	.41	1298.00
835.0	.0	835.0	.0	.0	85.1	.0	19.4	20.6	1298.00
.30	.00	9.81	.00	.000	.032	.000	.000	1291.00	4987.77
.010799	105.	105.	105.	0	20	0	.00	26.89	5014.66

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 1.460

3470 ENCROACHMENT STATIONS= .0 5192.5 TYPE= 1 TARGET= 5192.499

1.460	5.96	1299.96	1299.74	.00	1301.01	1.04	3.01	.05	1300.00
835.0	.0	835.0	.0	.0	101.9	.0	20.0	20.8	1300.00

.31	.00	8.19	.00	.000	.032	.000	.000	1294.00	4986.37
.009952	290.	290.	290.	2	8	0	.00	41.10	5027.47

*SECNO 1.490
3280 CROSS SECTION 1.49 EXTENDED .66 FEET

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= .0 5108.8 TYPE= 1 TARGET= 5108.799

1.490	6.66	1302.66	1300.35	.00	1303.05	.39	1.96	.07	1303.00
835.0	.0	835.0	.0	.0	166.5	.0	20.6	21.0	1303.00
.32	.00	5.01	.00	.000	.075	.000	.000	1296.00	4977.56
.010681	190.	190.	190.	0	20	0	.00	40.66	5018.22

*SECNO 1.527

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .38

1.527	5.66	1302.66	1302.03	.00	1303.59	.93	2.99	.16	1305.00
601.0	.0	601.0	.0	.0	77.6	.0	21.1	21.1	1305.00
.32	.00	7.75	.00	.000	.075	.000	.000	1297.00	4986.12
.038352	180.	180.	180.	0	20	0	.00	24.64	5010.76

*SECNO 1.528

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.95

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
1.528	7.57	1304.67	1302.15	.00	1304.99	.32	.18	.06	1305.10
601.0	.0	601.0	.0	.0	132.0	.0	21.1	21.1	1305.10
.32	.00	4.55	.00	.000	.075	.000	.000	1297.10	4980.88

.010085	10.	10.	10.	0	11	0	.00	34.47	5015.35

*SECNO 1.550

3470 ENCROACHMENT STATIONS= .0 5166.7 TYPE= 1 TARGET= 5166.699

1.550	7.98	1305.98	1303.98	.00	1306.50	.52	1.57	.06	1306.00
601.0	.0	601.0	.0	.0	104.0	.0	21.4	21.2	1306.10
.33	.00	5.78	.00	.000	.075	.000	.000	1298.00	4986.63
.016095	125.	125.	125.	0	16	0	.00	24.94	5011.57

*SECNO 1.570

3470 ENCROACHMENT STATIONS= .0 5160.0 TYPE= 1 TARGET= 5159.999

1.570	8.49	1307.49	1304.93	.00	1307.74	.26	1.22	.03	1306.00
601.0	1.6	531.6	67.7	1.4	124.1	52.8	21.8	21.3	1306.20
.34	1.15	4.28	1.28	.100	.075	.100	.000	1299.00	4985.77
.009442	100.	100.	110.	2	14	0	.00	103.83	5089.60

*SECNO 1.610

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS= .0 5131.9 TYPE= 1 TARGET= 5131.899

1.610	6.42	1309.42	1308.40	.00	1309.72	.30	1.96	.01	1308.00
601.0	28.5	518.5	54.0	32.4	110.0	36.3	22.5	21.9	1308.00
.35	.88	4.71	1.49	.100	.075	.100	.000	1303.00	4820.84
.012978	180.	180.	165.	3	15	0	.00	184.99	5080.26

*SECNO 1.640

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.26

3470 ENCROACHMENT STATIONS= .0 5180.0 TYPE= 1 TARGET= 5179.999

1.640	6.49	1310.49	1309.44	.00	1310.53	.04	.78	.03	1308.00
601.0	263.2	223.9	113.9	310.7	98.1	111.7	23.7	22.9	1308.20
.38	.85	2.28	1.02	.100	.075	.100	.000	1304.00	4703.38
.002547	140.	165.	170.	1	9	0	.00	401.72	5105.10

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV

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   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*SECNO 1.650
3280 CROSS SECTION      1.65 EXTENDED       .73 FEET


3470 ENCROACHMENT STATIONS=         .0     5144.7  TYPE=      1  TARGET=     5144.699
      1.650      6.73   1310.73   1309.50       .00   1310.78       .05       .25       .00   1308.10
      601.0     317.9     232.4      50.8     307.9      90.3      63.2      24.8      23.8   1308.00
        .40      1.03      2.57       .80      .100      .075      .100      .000   1304.00   4702.25
    .002894       90.       95.      100.         2        10         0       .00    385.51   5087.76


*SECNO 1.660
3280 CROSS SECTION      1.66 EXTENDED       .80 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  4.02


3470 ENCROACHMENT STATIONS=         .0     5132.5  TYPE=      1  TARGET=     5132.499
      1.660      5.80   1310.80   1306.55       .00   1310.81       .01       .02       .00   1308.00
      601.0      47.8     537.7      15.5     191.3     726.8      55.3      25.6      24.2   1308.00
        .42       .25       .74       .28      .100      .075      .100      .000   1305.00   4707.52
    .000179       50.       50.       50.         2        18         0       .00    395.14   5102.66
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 TN      BREAKOUT #1, SEGMENT 1: BETWEEN 1.57 AND 1.61

   TOTAL    AVG     MAX     AVG     TOF     TOP
   AREA  VELOCITY DEPTH    DEPTH   WIDTH   WIDTH
      .0     .00     .00     .00   153.1      .0

    ASQ       QCOMP     ERRAC     TASQ       TCQ      TABER     NITER     DSWS      USWS      DSSNO     USSNO
       .00       .00       .00       .00       .00       .00        13  1307.488  1309.419     1.570     1.610

 TN      BREAKOUT #1, SEGMENT 2: BETWEEN 1.55 AND 1.57

   TOTAL    AVG     MAX     AVG     TOF     TOP
   AREA  VELOCITY DEPTH    DEPTH   WIDTH   WIDTH
      .0     .00     .00     .00   131.1      .0

    ASQ       QCOMP     ERRAC     TASQ       TCQ      TABER     NITER     DSWS      USWS      DSSNO     USSNO
```

.00	.00	.00	.00	.00	.00	13	1305.980	1307.488	1.550	1.570

TN BREAKOUT #1, SEGMENT 3: BETWEEN 1.527 AND 1.55

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.0	.00	.00	.00	140.5	.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	.00	.00	.00	13	1302.660	1305.980	1.527	1.550

TN BREAKOUT #2, SEGMENT 1: BETWEEN 1.327* AND 1.35

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
13.5	.37	.30	.15	120.0	90.3

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
5.04	5.03	.11	5.04	5.03	.11	13	1294.898	1296.402	1.327	1.350

TN BREAKOUT #2, SEGMENT 2: BETWEEN 1.30 AND 1.327*

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
48.6	.73	.51	.40	120.0	120.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
35.35	35.32	.08	40.39	40.35	.09	13	1294.311	1294.898	1.300	1.327

TN BREAKOUT #2, SEGMENT 3: BETWEEN 1.27 AND 1.30

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
62.4	.68	.51	.37	170.0	170.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
42.56	42.54	.04	82.94	82.89	.06	13	1293.223	1294.311	1.270	1.300

TN BREAKOUT #2, SEGMENT 4: BETWEEN 1.259* AND 1.27

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH

18.4	.48	.22	.22	85.0	85.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
8.77	8.79	.21	91.72	91.68	.04	13	1292.709	1293.223	1.259	1.270

TN BREAKOUT #2, SEGMENT 5: BETWEEN 1.244* AND 1.259*

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
24.1	.57	.36	.28	85.0	85.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
13.85	13.84	.09	105.57	105.52	.04	13	1292.359	1292.709	1.244	1.259

TN BREAKOUT #3, SEGMENT 1: BETWEEN 1.238 AND 1.242

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
11.8	3.66	.82	.41	40.0	28.9

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
43.39	43.41	.04	148.96	148.94	.02	13	1291.819	1291.686	1.238	1.242

TN BREAKOUT #3, SEGMENT 2: BETWEEN 1.23 AND 1.238

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
18.8	1.10	.82	.75	25.0	25.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
20.65	20.66	.02	169.61	169.59	.01	13	1291.684	1291.819	1.230	1.238

TN BREAKOUT #3, SEGMENT 3: BETWEEN 1.22 AND 1.23

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
13.0	.69	.68	.37	35.0	35.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
8.89	8.90	.09	178.50	178.49	.01	13	1291.057	1291.684	1.220	1.230

TN BREAKOUT #3, SEGMENT 4: BETWEEN 1.20* AND 1.22

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
9.3	.29	.15	.10	90.0	90.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
2.71	2.72	.39	181.21	181.21	.00	13	1290.150	1291.057	1.200	1.220

TN BREAKOUT #3, SEGMENT 5: BETWEEN 1.18 AND 1.20*

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
30.2	.64	.52	.34	90.0	90.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
19.36	19.38	.06	200.58	200.58	.00	13	1289.521	1290.150	1.180	1.200

TN BREAKOUT #3, SEGMENT 6: BETWEEN 1.159* AND 1.18

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
52.7	.77	.52	.44	120.0	120.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
40.51	40.51	.00	241.09	241.10	.00	13	1288.858	1289.521	1.159	1.180

TN BREAKOUT #3, SEGMENT 7: BETWEEN 1.138* AND 1.159*

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
33.7	.60	.36	.31	110.0	110.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
20.37	20.37	.01	261.46	261.46	.00	13	1288.255	1288.858	1.138	1.159

TN BREAKOUT #4, SEGMENT 1: BETWEEN 1.13 AND 1.136

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
31.8	2.60	.90	.45	90.0	70.8

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
82.44	82.43	.00	343.89	343.90	.00	13	1285.898	1287.756	1.130	1.136

TN BREAKOUT #4, SEGMENT 2: BETWEEN 1.12 AND 1.13

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
49.9	6.21	2.43	1.66	30.0	30.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
309.72	309.73	.00	653.61	653.63	.00	13	1285.428	1285.898	1.120	1.130

TN BREAKOUT #4, SEGMENT 3: BETWEEN 1.09 AND 1.12

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
75.8	2.04	2.43	1.90	40.0	40.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
154.40	154.41	.01	808.02	808.04	.00	13	1284.364	1285.428	1.090	1.120

TN BREAKOUT #4, SEGMENT 4: BETWEEN 1.07 AND 1.09

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
27.9	1.05	1.36	.70	40.0	40.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
29.21	29.21	.00	837.23	837.25	.00	13	1283.032	1284.364	1.070	1.090

TN BREAKOUT #4, SEGMENT 5: BETWEEN 1.06 AND 1.07

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.1	.08	.03	.02	130.0	4.4

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.01	.01	.54	837.23	837.26	.00	13	1282.085	1283.032	1.060	1.070

TN BREAKOUT #4, SEGMENT 6: BETWEEN 1.05 AND 1.06

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.0	.00	.00	.00	40.0	.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	837.23	837.26	.00	13	1282.044	1282.085	1.050	1.060

TN BREAKOUT #4, SEGMENT 7: BETWEEN 1.03 AND 1.05

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.0	.07	.03	.01	60.0	3.3

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.33	837.24	837.26	.00	13	1281.526	1282.044	1.030	1.050

TN BREAKOUT #4, SEGMENT 8: BETWEEN 1.005 AND 1.03

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.1	.07	.03	.01	70.0	5.6

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.01	.01	.00	837.24	837.26	.00	13	1280.698	1281.526	1.005	1.030

TN BREAKOUT #4, SEGMENT 9: BETWEEN 0.998 AND 1.005

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.1	.09	.03	.02	50.0	5.1

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.01	.01	.23	837.25	837.27	.00	13	1280.535	1280.698	.998	1.005

TN BREAKOUT #4, SEGMENT 10: BETWEEN 0.99 AND 0.998

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
5.6	.43	.34	.19	30.0	30.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
2.44	2.44	.11	839.69	839.71	.00	13	1280.339	1280.535	.990	.998

TN BREAKOUT #4, SEGMENT 11: BETWEEN 0.96 AND 0.99

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
42.7	.75	.51	.43	100.0	100.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
32.20	32.20	.02	871.89	871.91	.00	13	1279.515	1280.339	.960	.990

TN BREAKOUT #4, SEGMENT 12: BETWEEN 0.94 AND 0.96

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
13.1	.54	.51	.26	130.0	51.1

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
7.06	7.07	.04	878.96	878.97	.00	13	1277.704	1279.515	.940	.960

TN BREAKOUT #4, SEGMENT 13: BETWEEN 0.935 AND 0.94

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.0	.00	.00	.00	50.0	.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	878.96	878.97	.00	13	1277.619	1277.704	.935	.940

TN BREAKOUT #4, SEGMENT 14: BETWEEN 0.929 AND 0.935

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.0	.00	.00	.00	30.0	.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO
.00	.00	.00	878.96	878.97	.00	13	1277.446	1277.619	.929	.935

TN BREAKOUT #4, SEGMENT 15: BETWEEN 0.89 AND 0.929

TOTAL AREA	AVG VELOCITY	MAX DEPTH	AVG DEPTH	TOF WIDTH	TOP WIDTH
.0	.00	.00	.00	110.0	.0

ASQ	QCOMP	ERRAC	TASQ	TCQ	TABER	NITER	DSWS	USWS	DSSNO	USSNO

.00	.00	.00	878.96	878.97	.00	13	1276.043	1277.446	.890	.929

THIS RUN EXECUTED 22MAY97 10:35:03

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 HEC-2 WATER SURFACE PROFILES

 Version  4.6.2;  May 1991
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

10TH STREET WASH

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.720	.00	.00	.00	1263.00	341.04	1264.37	1264.37	1264.84	53.69	5.51	63.71	46.54
*	.730	60.00	.00	.00	1262.00	341.04	1265.74	1265.74	1266.72	114.75	7.96	42.86	31.84
*	.790	295.00	.00	.00	1266.00	341.04	1270.18	1270.18	1271.00	120.55	7.28	47.11	31.06
*	.850	305.00	.00	.00	1270.00	341.04	1273.09	1272.09	1273.28	48.30	3.51	117.27	49.07
*	.860	50.00	.00	.00	1271.00	341.04	1273.29	1272.30	1273.35	5.80	1.97	173.19	141.60
*	.870	75.00	.00	.00	1272.00	341.04	1274.38	1274.38	1274.92	227.14	6.02	70.43	22.63
*	.890	120.00	.00	.00	1272.00	341.04	1276.04	1275.62	1276.52	87.29	5.57	63.80	36.50
	.929	180.00	.00	.00	1275.00	341.04	1277.45	1276.93	1277.70	48.85	4.04	93.11	48.80
*	.935	30.00	.00	.00	1276.00	341.04	1277.62	1276.92	1277.76	9.56	3.05	111.73	110.31
*	.940	35.00	.00	.00	1275.00	341.04	1277.70	1277.70	1278.60	294.77	7.62	44.77	19.86
*	.960	125.00	.00	.00	1276.00	348.11	1279.51	1279.31	1279.58	33.86	2.77	378.50	59.82
*	.990	145.00	.00	.00	1277.00	380.31	1280.34	1280.34	1280.54	81.99	4.33	254.30	42.00
*	.998	30.00	.00	.00	1277.00	382.75	1280.53	1278.80	1280.57	1.65	1.54	390.73	298.11

*	1.005	35.00	.00	.00	1277.00	382.76	1280.70	1280.70	1280.97	98.07	5.08	201.96	38.65
*	1.030	125.00	.00	.00	1278.00	382.76	1281.53	1280.93	1281.60	34.26	3.21	308.14	65.40
	1.050	140.00	.00	.00	1280.00	382.77	1282.04	1281.02	1282.09	38.02	2.65	287.30	62.08
*	1.060	40.00	.00	.00	1280.00	382.77	1282.08	1281.00	1282.12	3.19	1.62	453.83	214.41

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	1.070	35.00	.00	.00	1280.00	382.77	1283.03	1283.03	1283.32	49.20	5.43	231.76	54.57
*	1.090	135.00	.00	.00	1281.00	411.98	1284.36	1284.36	1284.71	53.31	5.76	212.54	56.43
*	1.120	125.00	.00	.00	1282.00	566.39	1285.43	1285.43	1285.88	45.47	6.05	248.77	83.99
*	1.130	45.00	.00	.00	1283.00	876.11	1285.90	1284.80	1285.93	1.79	1.83	602.96	655.43
*	1.136	50.00	.00	.00	1282.00	958.54	1287.76	1287.76	1288.32	163.51	7.34	270.67	74.96
*	1.138	10.00	.00	.00	1282.00	823.54	1288.26	1287.69	1288.45	55.05	4.63	395.45	111.00
	1.159	110.00	.00	.00	1282.50	843.91	1288.86	1288.44	1289.11	62.02	4.99	365.09	107.16
	1.180	110.00	.00	.00	1283.00	884.42	1289.52	1289.12	1289.76	56.79	4.84	391.94	117.36
	1.200	115.00	.00	.00	1283.50	903.79	1290.15	1290.00	1290.63	88.42	6.17	280.96	96.12
	1.220	115.00	.00	.00	1284.00	906.50	1291.06	1289.70	1291.60	78.53	6.23	229.65	102.29
*	1.230	50.00	.00	.00	1287.00	915.39	1291.68	1289.80	1291.84	24.14	3.73	439.42	186.30
*	1.238	25.00	.00	.00	1287.00	936.04	1291.82	1289.22	1291.86	.83	1.71	669.74	1028.11
*	1.242	25.00	.00	.00	1286.00	979.43	1291.69	1291.69	1292.36	212.68	7.50	217.08	67.16
*	1.244	10.00	.00	.00	1286.10	729.43	1292.36	1291.41	1292.51	43.44	3.83	360.32	110.67
	1.259	80.00	.00	.00	1286.50	743.28	1292.71	1292.07	1292.94	65.23	4.54	311.21	92.03
	1.270	80.00	.00	.00	1287.00	752.06	1293.22	1292.74	1293.52	80.73	5.00	280.33	83.70
*	1.300	160.00	.00	.00	1288.00	794.61	1294.31	1293.64	1294.45	44.62	3.64	442.59	118.96
*	1.327	117.50	.00	.00	1289.00	829.96	1294.90	1294.25	1295.47	147.27	6.24	174.13	68.39

	1.350	117.50	.00	.00	1290.00	835.00	1296.40	1295.36	1296.82	90.87	5.45	208.19	87.59
*	1.380	170.00	.00	.00	1290.00	835.00	1297.60	1294.63	1297.72	20.21	3.09	550.62	185.73
*	1.400	105.00	.00	.00	1291.00	835.00	1296.46	1296.39	1297.96	107.99	9.81	85.08	80.35
	1.460	290.00	.00	.00	1294.00	835.00	1299.96	1299.74	1301.01	99.52	8.19	101.90	83.70
	1.490	190.00	.00	.00	1296.00	835.00	1302.66	1300.35	1303.05	106.81	5.01	166.55	80.79
*	1.527	180.00	.00	.00	1297.00	601.00	1302.66	1302.03	1303.59	383.52	7.75	77.59	30.69
*	1.528	10.00	.00	.00	1297.10	601.00	1304.67	1302.15	1304.99	100.85	4.55	132.01	59.85
	1.550	125.00	.00	.00	1298.00	601.00	1305.98	1303.98	1306.50	160.95	5.78	104.00	47.37

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	1.570	100.00	.00	.00	1299.00	601.00	1307.49	1304.93	1307.74	94.42	4.28	178.32	61.85
	1.610	180.00	.00	.00	1303.00	601.00	1309.42	1308.40	1309.72	129.78	4.71	178.70	52.76
*	1.640	165.00	.00	.00	1304.00	601.00	1310.49	1309.44	1310.53	25.47	2.28	520.54	119.08
	1.650	95.00	.00	.00	1304.00	601.00	1310.73	1309.50	1310.78	28.94	2.57	461.33	111.73
*	1.660	50.00	.00	.00	1305.00	601.00	1310.80	1306.55	1310.81	1.79	.74	973.37	448.70

10TH STREET WASH

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	.720	341.04	1264.37	.00	.00	.00	74.06	.00
*	.730	341.04	1265.74	.00	1.36	.00	21.87	60.00
*	.790	341.04	1270.18	.00	4.44	.00	33.55	295.00
*	.850	341.04	1273.09	.00	2.92	.00	98.50	305.00

*	.860	341.04	1273.29	.00	.20	.00	149.90	50.00
*	.870	341.04	1274.38	.00	1.09	.00	117.05	75.00
*	.890	341.04	1276.04	.00	1.67	.00	99.50	120.00
	.929	341.04	1277.45	.00	1.40	.00	95.32	180.00
*	.935	341.04	1277.62	.00	.17	.00	70.00	30.00
*	.940	341.04	1277.70	.00	.09	.00	25.22	35.00
*	.960	348.11	1279.51	.00	1.81	.00	662.37	125.00
*	.990	380.31	1280.34	.00	.82	.00	627.77	145.00
*	.998	382.75	1280.53	.00	.20	.00	498.90	30.00
*	1.005	382.76	1280.70	.00	.16	.00	400.96	35.00
*	1.030	382.76	1281.53	.00	.83	.00	314.31	125.00
	1.050	382.77	1282.04	.00	.52	.00	235.65	140.00
*	1.060	382.77	1282.08	.00	.04	.00	362.95	40.00
*	1.070	382.77	1283.03	.00	.95	.00	368.97	35.00
*	1.090	411.98	1284.36	.00	1.33	.00	356.26	135.00
*	1.120	566.39	1285.43	.00	1.06	.00	361.47	125.00
*	1.130	876.11	1285.90	.00	.47	.00	360.00	45.00
*	1.136	958.54	1287.76	.00	1.86	.00	259.02	50.00
*	1.138	823.54	1288.26	.00	.50	.00	318.52	10.00
	1.159	843.91	1288.86	.00	.60	.00	323.11	110.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
1.180	884.42	1289.52	.00	.66	.00	308.53	110.00
1.200	903.79	1290.15	.00	.63	.00	322.88	115.00
1.220	906.50	1291.06	.00	.91	.00	209.52	115.00

*	1.230	915.39	1291.68	.00	.63	.00	247.31	50.00
*	1.238	936.04	1291.82	.00	.13	.00	273.80	25.00
*	1.242	979.43	1291.69	.00	-.13	.00	205.90	25.00
*	1.244	729.43	1292.36	.00	.67	.00	268.01	10.00
	1.259	743.28	1292.71	.00	.35	.00	301.48	80.00
	1.270	752.06	1293.22	.00	.51	.00	269.46	80.00
*	1.300	794.61	1294.31	.00	1.09	.00	420.21	160.00
*	1.327	829.96	1294.90	.00	.59	.00	170.42	117.50
	1.350	835.00	1296.40	.00	1.50	.00	175.35	117.50
*	1.380	835.00	1297.60	.00	1.20	.00	553.94	170.00
*	1.400	835.00	1296.46	.00	-1.14	.00	26.89	105.00
	1.460	835.00	1299.96	.00	3.50	.00	41.10	290.00
	1.490	835.00	1302.66	.00	2.70	.00	40.66	190.00
*	1.527	601.00	1302.66	.00	.00	.00	24.64	180.00
*	1.528	601.00	1304.67	.00	2.01	.00	34.47	10.00
	1.550	601.00	1305.98	.00	1.31	.00	24.94	125.00
	1.570	601.00	1307.49	.00	1.51	.00	103.83	100.00
	1.610	601.00	1309.42	.00	1.93	.00	184.99	180.00
*	1.640	601.00	1310.49	.00	1.07	.00	401.72	165.00
	1.650	601.00	1310.73	.00	.24	.00	385.51	95.00
*	1.660	601.00	1310.80	.00	.07	.00	395.14	50.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=       .720  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=       .730  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .730  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=       .790  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .790  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=       .850  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=       .860  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=       .870  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .870  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=       .890  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=       .935  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=       .940  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .940  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=       .960  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=       .990  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=       .990  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=       .998  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      1.005  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.005  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      1.030  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.060  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      1.070  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.070  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      1.090  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.090  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      1.120  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.120  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      1.130  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      1.136  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.136  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      1.138  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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WARNING SECNO=      1.230  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.238  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      1.242  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      1.242  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=      1.244  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.300  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.327  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.380  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.400  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.527  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.528  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.640  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      1.660  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

FIGURE C

FLOOD INSURANCE STUDY REPORT DATA CHECKLIST

10TH STREET WASH
CITY OF PHOENIX, ARIZONA

1.0 INTRODUCTION

1.1 Purpose of Study

Community Name: City of Phoenix
County: Maricopa
State: Arizona

1.2 Authority and Acknowledgments

Study Contractor: WEST Consultants, Inc.
Subcontractor (if applicable): N/A
Inter-Agency Agreement No.: N/A
or Contract No.: 96-12
Completion Date (month and year): June 1997
Provider/Agency of Base Map & Address: Flood Control District of Maricopa County, 2801 West Durango, Phoenix, AZ 85009
Base Map Compilation Source: photogrammetric methods from aerial photographs
Base Map Compilation Scale: 1"=200' and 1"=400'
Base Map Compilation Date: November 1990 (1"=400') and February 1994 (1"=200')
Coordinate System: Unknown
Projection: Unknown
Datum: NGVD 1929

Has base map source been modified? No.

Any restrictions on release of base map data? Unknown.

1.3 Coordination

Initial Consultation and Coordination Officer's (CCO) meeting date:

N/A

2.0 AREA STUDIED

2.1 Scope of Study

Note areas excluded from study, as well as areas of extraterritorial jurisdiction:

N/A.

List the flooding sources studied in detail (detailed study streams should be listed in the same order as they appear in the profiles). If they are also partially studied by approximate methods, provide the limits of detailed study:

10th Street Wash, river mile 0.0 (Arizona Canal Diversion Channel) to 1.66 (Cheryl Drive)

List the flooding sources studied by approximate methods:

N/A.

2.2 Community Description

Provide a general description of the community's location within the county and state:

10th Street Wash is located in central Maricopa County.

List surrounding communities and their locations with respect to the subject community:

Unknown.

List other nearby large cities and their locations:

Unknown.

Briefly describe the community. This description may include patterns of residential and commercial development; the extent and nature of floodplain development; natural features that affect flood hazards in the community; and sufficient description of climatic, physiographic, and land use factors to support the discussion of flood problems that follows (Section 2.3).

The community surrounding 10th Street Wash is fully developed. Most of the structures lining the wash are residential, but there are some commercial as well, especially in the upstream areas. Many of the private property lines extend right up to the channel banks.

2.3 Principal Flood Problems

Include the discharges and recurrence intervals of major floods:

Cross section	100-year discharge (applied to next downstream section)
1.66	600
1.527	840
1.27	760
1.244	720
1.242	980
1.238	940
1.23	920
1.18	880
1.138	820
1.136	960
1.13	880
1.12	560
1.09	420
1.07	380
0.96	340
0.57	840
0.24	1280

Give the locations (city and state) of all stream gages for studied streams:

None.

Note any factors that aggravate flood problems:

None that are known.

Provide photos of flooding, flood control structures, etc. (with location of photo noted):

Not available.

2.4 Flood Protection Measures

Describe all flood protection structures and floodplain management measures used to reduce potential flood damage:

There are three detention basins in the 10th Street Wash watershed: Detention Basin No. 1, Detention Basin No. 2, and Detention Basin No. 3.

Mention all dams, including those affecting the community that lie outside the community:

None.

Mention dams within the community used for purposes other than flood control:

None.

3.0 ENGINEERING METHODS (Note any digital methodologies used)

3.1 Hydrologic analysis

Describe the hydrologic analyses for all flooding sources studied in detail:

The hydrology for the 10th Street Wash watershed was analyzed for the 100-year storm using the U. S. Army Corps of Engineers HEC-1 computer program, version 4.0.3E dated June 1992. The S-graph method was used to represent runoff characteristics for the watershed and converted to a unit hydrograph using the Flood Control District of Maricopa County's MCUHP2 program for input into the HEC-1 computer model. The HEC-1 modeling also included allowances for Green-Ampt infiltration losses, Muskingum-Cunge channel routing, combining and diversion of subbasin hydrographs, and detention basin routing. In addition to the HEC-1 analysis, the HEC-2 split flow option was also used to develop the 100-year discharges. The split flow condition resulted from the watershed boundary being located so close to the right channel bank (looking downstream). Flows overtopping this watershed boundary would not return to the system, so discharges downstream of the breakout were reduced by the amount that left the channel as split flow.

In a Summary of Discharges table, provide a summary of drainage area-peak discharge relationships for the streams studied by detailed methods. Discharges and drainage areas for each stream should be listed in descending order. Streams should be listed in the same order as flood profiles:

Flooding source and location	Drainage Area (sq mi.)	100-year discharge (cfs)
<u>10th Street Wash</u>		
Cave Creek Road	1.36	600
Vogel Avenue	1.53	740
Hatcher Road	1.71	820
Dunlap Avenue	1.81	340
Alice Avenue	2.29	620
El Caminito Drive	2.49	840
Arizona Canal Diversion Channel	2.84	1280

If applicable, discuss methods used to determine still water elevations and reference the Summary of Still water Elevations table:

N/A

3.2 Hydraulic Analyses

State how cross sections were developed for all streams studied by detailed methods:

Cross sections were cut from digital topography. In some cases, elevations were interpolated between contours to estimate top of bank for the split flow analysis.

Describe how the dimensions of hydraulic structures were determined:

Dimensions of culverts were determined from as-built plans. The dimensions of culvert openings for Butler Driver were field checked.

Explain how channel roughness factors (Manning's "n") were assigned. The "n" values for ALL streams studied by detailed methods (channel and overbank areas) should be given:

Manning's "n" values were assigned following the procedure outlined in the U. S. Geological Survey document "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona." Refer to Appendix N for a list of the "n" values that were estimated.

State how water-surface elevations were obtained for all stream studied by detailed methods.

Water surface elevations were determined using the U. S. Army Corps of Engineers HEC-RAS computer program, version 1.2 dated April 1996.

State how starting water-surface elevations were obtained for all streams studied by detailed methods:

The starting condition at the Arizona Canal Diversion Channel was set to critical depth due to the sharp drop into the diversion channel. Since a backwater computation through Detention Basin No. 2 was not possible, there was a need to specify a second starting condition just upstream of the detention basin. The reach upstream of Detention Basin No. 2 was on a supercritical slope, so the second starting condition was also set to critical depth.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

4.1 Floodplain Boundaries

Identify all maps used. Include the scale, contour interval, and type of map (topographic, compiled from aerial photographs, etc.):

Floodplain boundaries were displayed on a map compiled from aerial photographs. The map was a combination of 1"=200' scale aerial mapping with 1' contours and 1"=400' scale aerial mapping with 2' contours. The 1"=400' scale mapping was used downstream of Alice Avenue and in the overbanks to supplement the 1"=200' scale mapping, which was used upstream of Alice Avenue.

4.2 Floodways

List streams, if any, for which floodway widths extend beyond the corporate limits:

A floodway was not determined for 10th Street Wash because the surrounding areas are fully developed.

7.0 OTHER STUDIES

Identify and reference all other FISs for contiguous communities and any other published reports or available data dealing with related flooding sources. All disagreements and discrepancies must be noted and resolved:

The current effective FIS was developed in 1975 by Yost and Gardner Engineers.

9.0 BIBLIOGRAPHY AND REFERENCES

List references with complete information, including date, place of publication, and scale (as appropriate):

Boss International. BOSS RMS for AutoCAD. December 1996.

Daniel, Mann, Johnson, & Mendenhall (DMJM). 10th Steet Wash Feasibility Study. August 1995.

Federal Emergency Management Agency. FEMA 37, Flood Insurance Study Guidelines and Specifications for Study Contractors. January 1995.

Kaminski-Hubbard Engineering Inc. 10th Street Wash Watershed Volume 1.9, Arizona Canal Diversion Channel Area Drainage Master Study. June 1992.

Stanley Consultants, Inc. 10th Street Wash Detention Basin No. 1 Final Design Concept Report. March 1995.

U. S. Army Corps of Engineers. HEC-1, Flood Hydrograph Package, version 4.0.3E. Hydrologic Engineering Center. Davis, CA. June 1992.

U. S. Army Corps of Engineers. HEC-2, Water Surface Profiles, version 4.6.2. Hydrologic Engineering Center. Davis, CA. May 1991.

U. S. Army Corps of Engineers. HEC-RAS, River Analysis System, version 1.2. Hydrologic Engineering Center. Davis, CA. April 1996.

U. S. Geological Survey, Water Resources Division. Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona. April 1991.

Yost and Gardner Engineers. Untitled (re: 10th Street Wash FIS). City of Phoenix Project No. ST-74248.00. July 1975.

FEDERAL EMERGENCY MANAGEMENT AGENCY
REVISION REQUESTOR AND COMMUNITY OFFICIAL FORM

O.M.B. Burden No. 3067-0148
Expires July 31, 1997

FEMA USE ONLY

PUBLIC BURDEN DISCLOSURE NOTICE

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.

1. OVERVIEW

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

- [X] Physical change
  - [ ] Existing
  - [X] Proposed
- [ ] Improved methodology
- [X] Improved data
- [ ] Floodway revision
- [X] Other
  Explain Two detention basins constructed within the channel thereby reducing the peak discharges

2. Flooding Source: 10 Street Wash
3. Project Name/Identifier: 10 Street Wash with Detention Basins 1 and 2
4. FEMA zone designations affected: AE
   (example: A, AH, AO, A1-A30, A99, AE, V, V1-30, VE, B, C, D, X)
5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	County	State	Map No.	Panel No.	Effective Date
480301	Katy, City	Harris, Fort Bend	TX	480301	0005D	02/08/83
480287	Harris County	Harris	TX	48201C	0220G	09/28/90
040051	Phoenix, City of	Maricopa	AZ	04013C	1655H	09/30/95
040051	Phoenix, City of	Maricopa	AZ	04013C	1660F	09/30/95
040051	Phoenix, City of	Maricopa	AZ	04013C	1665G	09/30/95
040051	Phoenix, City of	Maricopa	AZ	04013C	1670E	09/30/95

6. The area of revision encompasses the following types of flooding, structures, and associated disciplines: *(check all that apply)*

Types of Flooding
- [X] Riverine
- [ ] Coastal
- [ ] Alluvial Fan
- [ ] Shallow Flooding *(e.g. Zones AO and AH*
- [ ] Lakes

Affected by wind/wave action
- [ ] Yes
- [X] No

- [ ] Other *(describe)* ______

Structures
- [ ] Channelization
- [ ] Levee/Floodwall
- [ ] Bridge/Culvert
- [ ] Dam
- [ ] Coastal
- [ ] Fill
- [ ] Pump Station
- [ ] None
- [ ] Channel Relocation
- [ ] Excavation
- [X] Other *(describe)* Detention Basins

Disciplines*
- [X] Water Resources
  - [X] Hydrology
  - [X] Hydraulics
  - [ ] Sediment Transport
  - [ ] Interior Drainage
- [X] Structural
- [X] Geotechnical
- [X] Land Surveying
- [ ] Other *(describe)*

* **Attach completed "Certification by Registered Professional Engineer and/or Land Surveyor" Form for each discipline checked. (Form 2)**

2. FLOODWAY INFORMATION

7. Does the affected flooding source have a floodway designated on the effective FIRM or FBFM? [X] Yes [ ] No
8. Does the revised floodway delineation differ from that shown on the effective FIRM or FBFM? [X] Yes [ ] No
   If yes, give reason: Per Community Request, no Floodway Designation, Reduced Peak Discharges, New Topographic Mapping

Attach copy of either a public notice distributed by the community stating the community's intent to revise the floodway or a statement by the community that it has notified all affected property owners and affected adjacent jurisdictions.

9. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP? [ ] Yes [X] 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.

3. PROPOSED ENCROACHMENTS

10. With floodways:

1A. Does the revision request involve fill, new construction, substantial improvement, or other development in the floodway? [X] Yes [ ] No

1B. If yes, does the development cause the 100-year water surface elevation to increase at any location by more than 0.000 feet? [ ] Yes [X] No (However, water surface elevation does increase at certain locations due to revised topography and higher detail mapping)

11. Without floodways:

2A. Does the revision request involve fill, new construction, substantial improvement, or other development in the 100-year floodplain? [ ] Yes [ ] No

2B. If yes, does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the 100-year water surface elevation to increase at any location by more than one foot *(or other surcharge limit if community or state has adopted more stringent criteria)*? [ ] Yes [ ] No

If the answer to either Items 1B or 2B is yes, please provide 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.

4. REVISION REQUESTOR ACKNOWLEDGEMENT

12. Having read NFIP Regulations, 44 CFR Ch. I, parts 59, 60, 61, and 72, I believe that the proposed revision [X] is [ ] is not in compliance with the requirements of the aforementioned NFIP Regulations.

5. COMMUNITY OFFICIAL ACKNOWLEDGEMENT

Was this revision request reviewed by the community for compliance with the community's adopted floodplain management ordinances? [X] Yes [ ] No

14. Does this revision request have the endorsement of the community? [X] Yes [ ] No

If no to either of the above questions, please explain: ______________________________

Please note that community acknowledgement and/or notification is required for all requests as outlined in Section 65.4 (b) of the NFIP Regulations.

6. OPERATION AND MAINTENANCE

15. Does the physical change involve a flood control structure (e.g. levees, floodwalls, channelization, basins, dams)? [X] Yes [ ] No

If yes, please provide the following information for each of the new flood control structures:

A. Inspection of the flood control project will be conducted periodically by Flood Control District of Maricopa County (entity) ______________ with a maximum interval of 3 months between inspections.

B. Based on the results of scheduled periodic inspections, appropriate maintenance of the flood control facilities will be conducted by Flood Control District of Maricopa County (entity) to ensure the integrity and degree of flood protection of the structure.

C. A formal plan of operation, including documentation of the flood warning system, specific actions and assignments of responsibility by individual name or title, and provisions for testing the plan at intervals not less than one year, [X] has [ ] has not been prepared for the flood control structure. (See Attached)

D. The community is willing to assume responsibility for [X] performing [ ] overseeing compliance with the maintenance and operation plans of the Flood Control District of Maricopa County
(*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.

...ch operation and maintenance plans (See Attached)

7. REQUESTED RESPONSE FROM FEMA

16. After examining the pertinent NFIP regulations and reviewing the document entitled "Appeals, Revisions, and Amendments to Flood Insurance Maps: A Guide for Community Officials," dated January 1990, this request is for a:

____a. CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision *(LOMR or PMR)*, or proposed hydrology changes *(see 44 CFR Ch. I, Parts 60, 65, and 72)*.

X b. LOMR A letter from FEMA officially revising the current NFIP map to show changes to floodplains, floodways, or flood elevations. LOMRs typically depict decreased flood hazards. *(See 44 CFR Ch. 1, Parts 60 and 65.)*

____c. PMR A reprinted NFIP map incorporating changes to floodplains, floodways, or flood elevations. Because of the time and cost involved to change, reprint, and redistribute an NFIP map, a PMR is usually processed when a revision reflects increased flood hazards or large-scope changes. *(See 44 CFR Ch. 1, Parts 60 and 65.)*

____d. Other: Describe ____

8. FORMS INCLUDED

17. Form 2 entitled "Certification by Registered Professional Engineer And/Or Land Surveyor" must be submitted.

The following forms should be included with this request if (check the included forms):

• Hydrologic analysis for flooding source differs from that used to develop FIRM	[X] Hydrologic Analysis Form (Form 3)
• Hydraulic analysis for riverine flooding differs from that used to develop FIRM	[X] Riverine Hydraulic Analysis Form (Form 4)
• The request is based on updated topographic information or a revised floodplain or floodway delineation is requested	[X] Riverine/Coastal Mapping Form (Form 5)
• The request involves any type of channel modification	[ ] Channelization Form (Form 6)
• The request involves new bridge or culvert or revised analysis of an existing bridge or culvert	[X] Bridge/Culvert Form (Form 7)
• The request involves a new revised levee/floodwall system	[ ] Levee/Floodwall System Analysis Form (Form 8)
• The request involves analysis of coastal flooding	[ ] Coastal Analysis Form (Form 9)
• The request involves coastal structures credited as providing protection from the 100-year flood	[ ] Coastal Structures (Form 10)
• The request involves an existing, proposed, or modified dam	[ ] Dam Form (Form 11)
• The request involves structures credited as providing protection from the 100-year flood on an alluvial fan	[ ] Alluvial Fan Flooding Form (Form 12)

9. INITIAL REVIEW FEE

18. The minimum initial review fee for the appropriate request category has been included. ☐ Yes ☒ No

Initial fee amount: $ ___________

Check or money order only. Make check or money order payable to: **National Flood Insurance Program**. If paying by Visa or Mastercard please refer to the credit card information form which follows this form.

or

19. This request is for a project that is for public benefit and is intended to reduce the flood hazard to existing development in identified flood hazard areas as opposed to planned floodplain development. ☒ Yes ☐ No

or

20. This request is to correct an error or to include the effects of natural changes within the areas of special flood hazards. ☐ Yes ☐ No

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

[signature]
Signature of Revision Requestor

Michael S. Ellegood, P.E.

Chief Engineer and General Manager
Printed Name and Title of Revision Requestor

Flood Control District of Maricopa County
Company Name

(602) 506 -1501 — September 09, 1997
Telephone No. — Date

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

[signature]
Signature of Community Official

Raymond Acuña, P.E.

Floodplain Manger, Street Transportation Department
Printed Name and Title of Community Official

City of Phoenix
Community Name

September 09, 1997
Date

Does this request impact any other communities? ☐ Yes ☒ No

If yes, attach letters from all affected jurisdictions acknowledging revision request and approving changes to floodway, if applicable.

Note: Although a photograph of physical changes is not required, it may be helpful for FEMA's review.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Operations and Maintenance Division

Maintenance Procedure

TENTH STREET WASH BASINS I & II

Inspections:

1. Quarterly Operational Inspections:
   a. List any discrepancies.
   b. Review for action required.
   c. Schedule necessary repairs.

2. Annual Maintenance Inspection:
   a. List all needed maintenance and repairs.
   b. Assign work orders for the noted repairs.

3. Formal Annual Inspection:
   a. Inspect project to insure all maintenance and repairs are completed satisfactorily.
   b. Complete annual inspection reports for file.

4. Major Storm Event:
   a. Inspect project during or after a major storm event.
   b. List any problems.
   c. Record impoundment depth.

5. Citizen Complaints/Inquiries:
   a. Investigate area of complaint.
   b. Respond to citizen within 48 hours.
   c. Take action if in-house/refer to proper agency, if not.

O & M Responsibilities:

- All concrete and rip rap flood control structures and associated metal work (repair/refurbish and debris removal).
- Erosion repairs
- Sediment removal from basin and channels
- Debris removal from flows through basins
- Fencing and access gates
- Maintenance and access roads
- Flood Control District signs
- Landscaping and irrigation
- Safety hazards
- Rodent control
- Vandalism

Note: Existing IGA's with the City of Phoenix, Parks Department, and the Pointe Tapatio, Condominium Association (Basin I) define shared maintenance responsibilities for the above.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
Operations and Maintenance Division

Standard Maintenance Procedures
Prepared for the Tenth Street Wash Basins I & II Project

SUBJECT: Maintenance of Channels, Basins and Structures

PURPOSE: To insure the integrity of the project is preserved and will function as designed.

PROCEDURE A:

1. Vegetation
   Remove or destroy woody vegetation within the flow area of the channel/basin, collection ditches, or side inlet basins. Also remove trash or other objects that will impede flows in these areas. If grasses are established, maintain the height to a maximum of six inches.

2. Sediment Deposits
   Remove deposits of loose material to obtain designed grades and cross sections. Loose deposited materials shall not be used within the channel/basin unless tested to meet the earthfill criteria in the construction specifications.

3. Erosion
   Make repairs of eroded areas by replacing lost material with compacted earth, or other suitable erosion resistant material, in accordance with the original construction specifications.

PROCEDURE B: If the project has been landscaped, preserve the integrity of the landscape design.

PROCEDURE C: Rodent Control

1. Gophers can damage the structure by burrowing deep holes with more than one outlet. These can be identified by fresh mounds of soil.

2. Ground squirrels can also damage structures even with insignificant numbers and must be treated.

3. A licensed pesticide applicator shall apply the appropriate pesticide and the MSDS shall be with the licensed applicator.

4. After rodent activity has been controlled, holes are to be filled and compacted.

PROCEDURE C: Graffiti Removal

1. Graffiti needs to be removed as soon as possible to discourage repeated application.

FEDERAL EMERGENCY MANAGEMENT AGENCY **CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM**	*O.M.B. Burden No. 3067-0148* *Expires July 31, 1997*	***FEMA USE ONLY***

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average .23 hour 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.

1. This certification is in accordance with 44 CFR Ch. I, Section 65.2.
2. I am licensed with an expertise in CIVIL ENGINEERING (HYDROLOGY AND HYDRAULICS).
   [example: water resources *(hydrology, hydraulics, sediment transport, interior drainage)**, structural, geotechnical, land surveying.]
3. I have 7 + years experience in the expertise listed above.
4. I have ☒ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☒ have ☐ have not visited and physically viewed the project.
6. In my opinion, the following analyses and/or designs, is/are being certified:
   BASIN NO. 2 HYDRAULICS AND ROUTINGS FOR STAGED STORAGE WERE MODELED USING FEQ.
7. Based upon the following review, the modifications in place have been constructed in general accordance with plans and specifications.

   Basis for above statement: (check all that apply)

   a. ☒ Viewed all phases of actual construction.
   b. ☐ Compared plans and specifications with as-built survey information.
   c. ☐ Examined plans and specifications and compared with completed projects.
   d. ☐ Other

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

Name: FRANK HENDERSON
(please print or type)

Title: PROJECT MANAGER
(please print or type)

Registration No. 28940 Expiration Date: 3/31/98

State ARIZONA

Type of License CIVIL ENGINEER

[signature]
Signature

6/1/97
Date

Registered Professional Engineer (Civil) — Certificate No. 28940 — FRANK E. HENDERSON III — Date Signed 6/1/97 — ARIZONA, U.S.A.

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) when statement does not apply.

FEDERAL EMERGENCY MANAGEMENT AGENCY
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM

FEMA USE ONLY

O.M.B. No. 3067-0148
Expires July 31, 1997

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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. This certification is in accordance with 44 CFR Ch. I, Section 65.2
2. I am licensed with expertise in Land Surveying
   [example: water resources *(hydrology, hydraulics, sediment transport, interior drainage)** structural, geotechnical, land surveying.]
3. I have 33 years experience in the expertise listed above.
4. I have ☐ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☐ have ☒ have not visited and physically viewed the project.
6. In my opinion, the following analyses and /or designs, is/are being certified:
   1"=400', 2' contour interval topographic mapping prepared for the FCD/MC, Project ACDC ADMS Phase I flown 11/15/90, sealed 7/11/94
7. Based on the following review, the modifications in place have been constructed in general accordance with plans and specifications.

   Basis for above statement. (check all that apply)
   - a. ☐ Viewed all phases of actual construction.
   - b. ☐ Compared plans and specifications with as-built survey information.
   - c. ☐ Examined plans and specifications and compared with completed projects.
   - d. ☒ Other *(Specify)* N/A
8. All information submitted in support of this request is correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Daniel L. Kaminski
(please print or type)

Title: Principal / Kaminski-Hubbard Engineering, Inc.
(please print or type)

Registration No. 16559 Expiration Date: 6/30/00

State Arizona

Type of License R.L.S.

Daniel L. Kaminski
Signature

June 10, 1997
Date

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) if statement does not apply.

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

FEDERAL EMERGENCY MANAGEMENT AGENCY
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM

FEMA USE ONLY

O.M.B. No. 3067-0148
Expires July 31, 1997

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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. This certification is in accordance with 44 CFR Ch. I, Section 65.2
2. I am licensed with expertise in Hydrology
   [example: water resources *(hydrology, hydraulics, sediment transport, interior drainage)** structural, geotechnical, land surveying.]
3. I have 18 years experience in the expertise listed above.
4. I have ☐ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☒ have ☐ have not visited and physically viewed the project.
6. In my opinion, the following analyses and /or designs, is/are being certified:
   Hydrology report dated 6-11-92 for 10th Street Wash watershed prepared for FCD/MC Project: ACDC ADMS Phase 1 (The HEC-1 model included Detention Basin #3)
7. Based on the following review, the modifications in place have been constructed in general accordance with plans and specifications.

   Basis for above statement. (check all that apply)
   a. ☐ Viewed all phases of actual construction.
   b. ☐ Compared plans and specifications with as-built survey information.
   c. ☐ Examined plans and specifications and compared with completed projects.
   d. ☒ Other *(Specify)* N/A
8. All information submitted in support of this request is correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: James O. Hubbard
(please print or type)

Title: Principal / Kaminski-Hubbard Engineering, Inc.
(please print or type)

Registration No. 18153 Expiration Date: 3/31/00

State Arizona

Type of License Professional Engineer (Civil)

James O. Hubbard
Signature

6/10/97
Date

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) if statement does not apply.

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

FEDERAL EMERGENCY MANAGEMENT AGENCY
CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM

FEMA USE ONLY

O.M.B. No. 3067-0148
Expires July 31, 1997

PUBLIC BURDEN DISCLOSURE NOTICE

1. This certification is in accordance with 44 CFR Ch. 1, Section 65.2
2. I am licensed with expertise in HYDRAULICS/CIVIL ENGINEERING/HYDROLOGY [example: water resources (*hydrology, hydraulics, sediment transport, interior drainage*)* structural, geotechnical, land surveying.]
3. I have 7+ years experience in the expertise listed above.
4. I have ☐ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☒ have ☐ have not visited and physically viewed the project.
6. In my opinion, the following analyses and /or designs, is/are being certified: BASIN NO. 2 HYDRAULICS AND ROUTINGS FOR STAGED STORAGE WERE MODELED USING FEQ
7. Based on the following review, the modifications in place have been constructed in general accordance with plans and specifications.

   Basis for above statement: (check all that apply)
   - a. ☒ Viewed all phases of actual construction.
   - b. ☐ Compared plans and specifications with as-built survey information.
   - c. ☐ Examined plans and specifications and compared with completed projects.
   - d. ☐ Other (*Specify*) ____________
8. All information submitted in support of this request is correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: FRANK HENDERSON (please print or type)

Title: PROJECT MANAGER (please print or type)

Registration No. 28940 Expiration Date: 3/31/98

State ARIZONA

Type of License CIVIL ENGINEER

Frank Henderson
Signature

6/1/97
Date

Registered Professional Engineer (Civil)
CERTIFICATE NO.
28940
FRANK E. HENDERSON III
Signed 6/1/97
ARIZONA, U.S.A.

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) if statement does not apply.

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

FEDERAL EMERGENCY MANAGEMENT AGENCY **CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR FORM**	*O.M.B. Burden No 3067-0148 Expires July 31, 1994*	*FEMA USE ONLY*

PUBLIC BURDEN DISCLOSURE NOTICE

1. This certification is in accordance with 44 CFR Ch. I, Section 65.2
2. I am licensed with an expertise in HYDROLOGY, HYDRAULICS
   [example: water resources *(hydrology, hydraulics, sediment transport, interior drainage)** structural, geotechnical, land surveying.]
3. I have 22 years experience in the expertise listed above.
4. I have ☒ prepared ☐ reviewed the attached supporting data and analyses related to my expertise.
5. I ☒ have ☐ have not visited and physically viewed the project.
6. In my opinion, the following analyses and /or designs, is/are being certified:
   HYDROLOGIC ANALYSIS, DESIGN 10TH ST WASH DET BASIN NO 1
7. Base upon the following review, the modifications in place have been constructed in general accordance with plans and specifications.

   Basis for above statement: (check all that apply)

   a. ☐ Viewed all phases of actual construction.
   b. ☐ Compared plans and specifications with as-built survey information.
   c. ☐ Examined plans and specifications and compared with completed projects.
   d. ☐ Other: ____________________
8. All information submitted in support of this request is correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: GEORGE SCOTT BUCHANAN
(please print or type)

Title: HYDROLOGIST, PE, PROJECT MANAGER
(please print or type)

Registration No. AZ 26837 Expiration Date: 3-31-99

State ARIZONA

Type of License CIVIL

G Scott Buchanan
Signature

5-24-97
Date

Registered Professional Engineer (Civil)
CERTIFICATE NO. 26837
G. SCOTT BUCHANAN
Date Signed 5-24-97
ARIZONA, U.S.A.

Seal
(Optional)

*Specify Subdiscipline

Note: Insert not applicable (N/A) when statement does not apply.

MEMORANDUM

To:	Kofi Awumah, Ph.D., P.E.	Flood Control District of Maricopa County
cc:	George Scott Buchanan, P.E.	Stanley Consultants, Inc.
	James O. Hubbard, P.E.	Kaminski-Hubbard Engineering, Inc.
	Frank E. Henderson, P.E.	Rust Environment & Infrastructure, Inc.
From:	David S. Smith	WEST Consultants, Inc.
Date:	6/10/97	
Subject:	10th Street Wash LOMR	
RE:	**Hydrologic modeling by others**	

The hydrology that was used to determine the 100-year discharges for 10th Street Wash was developed from an HEC-1 model created by Kaminski-Hubbard Engineering, Inc. The HEC-1 model was then modified by Stanley Consultants, Inc., Rust Environment & Infrastructure, Inc., and finally by WEST Consultants, Inc. The tables below depict the major changes that were made to the HEC-1 model by each party:

Initial Work

Consultant	Date	Description of Work
Kaminski-Hubbard Engineering, Inc.	June 1992	1) Comprehensive hydrologic analysis of 10th Street Wash 2) Modeling of Detention Basin No. 3

Modifications

Consultant	Date	Description of Modification
Stanley Consultants, Inc.	March 1995	1) Modeling of Detention Basin No. 1 2) Revision to the cross sectional area of the principal spillway outlet pipe for Detention Basin No. 3
Rust Environment & Infrastructure, Inc.	June 1995	1) Modeling of Detention Basin No. 2
WEST Consultants, Inc.	May 1997	1) Subdivision of HEC-1 basin 143 into 4 subbasins: 143A, 143B, 143C, and 143D 2) Modeling of split flow diversions for each subbasin (143A, 143B, etc.)

FEDERAL EMERGENCY MANAGEMENT AGENCY
HYDROLOGIC ANALYSIS FORM

FEMA USE ONLY	*O.M.B. No. 3067-0148* *Expires July 31, 1997*

Community Name: City of Phoenix

Flooding Source: 10th Street Wash
(One form for each flooding source)

Project Name /Identifier: 10th Street Wash detention basins

1. HYDROLOGIC ANALYSIS IN FIS

☐ Approximate study stream (Zone A)
☒ Detailed study stream (briefly explain methodology) Modified rational method for Phoenix, AZ.

2. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis
☒ Improved data *(see data revision on page 3)*
☒ Changed physical conditions of watershed *(explain)* Two detention basins were constructed in the watershed since the effective FIS was published.

☒ Alternative methodology *(justify why the revised model is better than model used in the effective FIS)* The revised methodology uses HEC-1, the effective FIS is based on the modified rational method for Phoenix.

☐ Evaluation of proposed conditions (CLOMRs only) (explain)

☐ Other

If a computer program/model was used in revising the hydrologic analysis, please provide a diskette with the input files for the 10-, 50-, 100 - and 500-year recurrence intervals.

Only the 100-year recurrence interval need be included for SFHAs designated as Zone A.

3. APPROVAL OF ANALYSIS

☐ Approval of hydrologic analysis, including the resulting peak discharge value (s) has been provided by the appropriate local, state, or Federal Agency. (i.e.,)

Attach evidence of approval.

☒ Approval of the hydrologic analysis is not required by any local, State, or Federal Agency.

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Stream: 10th Street Wash

Comparison of 100-year Flood Discharges

Location	Drainage area (Sq mi.)	FIS (cfs):	Revised (cfs):
Cheryl Drive	0.81 *	1440	600
Hatcher Road	1.59 *	3400	820
Alice Avenue	2.25 *	4390	620
ACDC Confluence	2.69 *	4740	1280

* Drainage areas have changed in the revised FIS.

Note: When revised discharges are not significantly different than FIS discharges, FEMA may require a confidence limits analysis on attachment D at a later date to complete the review.

As is often the case with revision requests, only a portion of a stream may actually be revised or affected by a revision. Therefore, transition to the unrevised portion is important to maintain the continuity of the study. NFIP regulations stipulate that such a transition must be assured. What is the transition from the proposed discharges to the effective discharges? Please explain how the transition was made *(attach separate sheet if necessary)*

There is no transition to effective discharges because the whole system was studied. The new study uses HEC-1 and split flow to determine the maximum 100-year discharge rather than the modified rational method.

Attach a completed "review of results" page for each flooding source.

Is the new hydrologic analysis being developed solely to revise the flow values presented in the FIS *(i.e. no changed hydraulic conditions)*? ☐ Yes ☒ No

If yes, does the 100-year water surface elevation change by 1.0 foot or more? ☐ Yes ☐ No

Note: FEMA does not normally revise NFIP maps solely due to flow changes when changes in 100-year water surface elevation are less than 1.0 foot.

5. HISTORICAL FLOODING INFORMATION

Is historical data available for the flooding source? ☐ Yes ☒ No

If yes, provide the following:

Location along flooding source: ______________________

Maximum peak discharge: ______________________ cfs

Second highest peak discharge: ______________________ cfs

Source of information: ______________________

6. GAGE RECORD INFORMATION

Location of nearest gage to project site *(along flooding source or similar watershed; specify)*

There are no gages on 10th Street Wash.

Gaging Station: ______________________

Drainage area at gage: ______________________ mi^2

Number of years of data: ______________________

7. DATA REVISION

Please use the following table to list all the data and/or parameters affected by this request and identify them as new data (*New*) or as revising existing data (*Revised*). *(If necessary, attach a separate sheet.)*

Data Parameter	New	Revised	Data Source
N/A due to new hydrology	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	

- The data source can be a Federal, State, or local government agency, or a private source. Some State and local governments may have less strict data requirements than Federal agencies, in which case the hydrologic data may not be accepted by FEMA unless it is demonstrated that the data give a better estimate of the flood discharge.
- Attach documentation corroborating each data source *(i.e., certified statement, report, bibliographical reference to a published document)*. In the case of a published document or a government report, providing copies of the cover and pertinent pages may be helpful.

8. METHODOLOGY FOR NEW ANALYSIS

☐ Statistical Analysis of Gage Records *(use Attachment A)*

☐ Regional Regression Equations *(use Attachment B)*

☒ Precipitation/Runoff Model *(use Attachment C)*

☐ Other *(specify; attach backup computations and supporting data)* ______________________

ATTACHMENT A: STATISTICAL ANALYSIS OF GAGE RECORDS

Gaging Station: ____________________

Gage Location (latitude and longitude): ____________________

	FIS:	Revised:
1. Number of years of data	______	______
Systematic	______	______
Historical	______	______
2. Homogeneous data?	☐ Yes ☐ No	☐ Yes ☐ No
3. Data adjustments?	☐ Yes ☐ No	☐ Yes ☐ No
4. Number of high outliers	______	______
Low outliers	______	______
Zero events	______	______
5. Generalized skew	______	______
6. Station skew	______	______
7. Adopted skew	______	______
8. Probability distribution used (justify if log-Pearson III was not used)	______	______

9. Transfer equations to ungaged sites ☐ Yes ☐ No

If yes, specify method

____

____

____

10. Expected probability* ☐ Yes ☐ No

11. Comparison of results with other analyses ☐ Yes ☐ No

If yes, describe comparison

____

____

____

*FEMA does not accept expected probability analyses for the purpose of reflecting flood hazard information in a FIS.

If any data are not available, indicate with "N/A".

Attach analysis including plot of flood frequency curve.

1. Bibliographical Reference:

____

____

____

(Attach a copy of title page, table of contents, and pertinent pages including equations.)

2. Gaged or ungaged stream: ____________________

3. Hydrologic region(s): ____________________
Attach backup map.

4. Provide parameters, values, and source of data used to define parameters.

____

____

____

	FIS		Revised	
5. Urbanized conditions calculations?	☐ Yes	☐ No	☐ Yes	☐ No
6 Percent of watershed urbanization	______		______	
7. Is the watershed controlled?	☐ Yes	☐ No	☐ Yes	☐ No
8. Comparison with other analyses?	☐ Yes	☐ No	☐ Yes	☐ No

If the answer to questions 5, 7, or 8 is yes, explain methodology in Comments.

If data are not available, indicate with "N/A".

9. Comments

____

____

____

____

Attach computation and supporting maps delineating the watershed boundary and drainage area divides.

		FIS:	Revised
1.	Method or model used:	Phoenix,AZ Modified Rational Method	HEC-1
	Version:	N/A	4.0.3E
	Date:	N/A	June 9, 1992
2.	Source of rainfall depth:	N/A	FCDMC drainage design manual
3.	Source of rainfall distribution:	N/A	FCDMC drainage design manual
4.	Rainfall duration:	N/A	6-h
5.	Areal adjustment to precipitation (%):	N/A	0.975
6.	Maximum overland flow length	N/A	1.80 mi
7.	Hydrograph development method:	N/A	PHX S-graph
8.	Loss rate method:	N/A	Green and Ampt
	Source of soils information:	N/A	SCS soil surveys
	Source of land use information	N/A	aerial mapping
9.	Channel routing method:	N/A	muskingum-Cunge
10.	Reservoir routing:	N/A ☐ Yes ☐ No	☒ Yes ☐ No
11.	Baseflow considerations:	N/A ☐ Yes ☐ No	☐ Yes ☒ No

If yes, explain how baseflow was determined:

		FIS:	Revised
12.	Snowmelt considerations?	N/A ☐ Yes ☐ No	☐ Yes ☒ No
13.	Model calibration?	N/A ☐ Yes ☐ No	☐ Yes ☒ No

If yes, explain how calibration was performed

14. Future land use conditions? ☐ Yes ☒ No

If yes, explain why

NOTE: FEMA policy is to base flooding on existing conditions.
If data are not available, indicate with "N/A".

Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.

tream: ______________________________

Selected location for Confidence Limits Evaluation (*describe location*): ______________________________

____

Discharges for selected location:

Exceedance Probability		FIS	Revised
10%	(10-year)	________ cfs	________ cfs
2%	(50-year)	________ cfs	________ cfs
1%	(100-year)	________ cfs	________ cfs
0.2%	(500-year)	________ cfs	________ cfs

1% (100-year) Flood Confidence Intervals

90% Confidence Interval:	5% limit	________	cfs
	95% limit	________	cfs
50% Confidence Interval:	25% limit	________	cfs
	75% limit	________	cfs

If the value of the 100-year frequency flood in the FIS is beyond the 50% confidence interval but within the 90% confidence interval, does the 100-year water surface elevation change by 1.0 foot or more? ☐ Yes ☐ No

Note: An example of confidence limits analysis can be found in Appendix 9 of Bulletin 17B.

Attach Confidence Limits Analysis.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS FORM**	**FEMA USE ONLY**	*O.M.B. No. 3067-0148* *Expires July 31, 1997*

Community Name: City of Phoenix

Flooding Source: 10th Street Wash
(One form for each flooding source)

Project Name/Identifier: 10th Street Wash detention basins

1. REACH TO BE REVISED

Downstream limit: Arizona Canal Diversion Channel (HEC-RAS section 0.0)

Upstream limit: Cheryl Drive (HEC-RAS section 1.65)

2. EFFECTIVE FIS

☐ Not studied

☐ Studied by approximate methods

Downstream limit of study ________

Upstream limit of study ________

☒ Studied by detailed methods

Downstream limit of detailed study Arizona Canal Diversion Channel

Upstream limit of detailed study Cheryl Drive

☒ Floodway delineated

Downstream limit of Floodway 0.09

Upstream limit of Floodway 1.50

3. HYDRAULIC ANALYSIS

Why is the hydraulic analysis different from that used to develop the FIRM. *(Check all that apply)*

☐ Not studied in FIS

☒ Improved hydrologic data/analysis. Explain: HEC-1 was used instead of Phoenix, AZ modified rational method

☒ Improved hydraulic analysis. Explain: Recent topography was used and a split flow analysis was performed. Also, HEC-RAS, which supersedes HEC-2 update version (Aug 1976) was used.

☒ Flood control structure. Explain: Two detention basins were constructed in the watershed.

☐ Other. Explain: ________

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. Models Submitted

For areas which have detailed flooding:

Full input and output listings along with files on diskette (if available) for each of the models listed below (items 1, 2, 3, 4, and 5) and summary of the source of input parameters used in the models must be provided. The summary must include a <u>complete</u> 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 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 for existing or pre-project conditions and revised or post-project conditions must be submitted. All calculations must be submitted for these analyses. (See Item 6 below.)

1. Duplicate Effective Model

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 requestor's equipment to produce the <u>duplicate effective model</u>. This is required to assure that the effective model input data has been transferred correctly to the requestor'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.

Natural	Floodway
☐ N/A	☐ N/A

2. Corrected Effective Model

The <u>corrected effective model</u> is the model that corrects any errors that occur in the <u>duplicate effective model</u>, adds any additional cross sections to the <u>duplicate effective model</u>, or incorporates more detailed topographic information than that used in the currently effective model. The <u>corrected effective model</u> must <u>not</u> 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.

Natural	Floodway
☐ N/A	☐ N/A

3. Existing or Pre-Project Conditions Model

The <u>duplicate effective model</u> or <u>corrected effective model</u> is modified to produce the <u>existing or pre-project conditions model</u> to reflect any modifications that have occurred within the floodplain since the date of the <u>effective model</u> 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 <u>corrected effective model</u> or <u>duplicate effective model</u>.

Natural	Floodway
☐ N/A	☐ N/A

4. Revised or Post-Project Conditions Model

The <u>existing or pre-project conditions model</u> *(or <u>duplicate effective model</u> or <u>corrected effective model</u>, 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 proposed project this model must reflect proposed conditions.

Natural	Floodway
☒	☐

See Section 4 of the TDN for summary of hydraulic model

5. <u>Other</u>: Please attach a sheet describing all other models submitted.

Natural	Floodway
☒	☐

6. Hydraulic Analyses (Only if Hydraulic Models are not developed)

Attach all calculations for the existing or pre-project conditions and the revised or post-project conditions. Proceed to Form 5, "Riverine/Coastal Mapping Form".

5. **MODEL PARAMETERS** ***(from model used to revise 100-year water surface elevation)***

Discharges:	Upstream Limit	Downstream Limit
10-year ..... Not analyzed	N/A	N/A
50-year ..... Not analyzed	N/A	N/A
100-year	600	1280
500-year ..... Not analyzed	N/A	N/A

Attach diagram showing changes in 100-year discharge

2. Explain how the starting water surface elevations were determined At the downstream limit, Sect.0.0, critical depth was assumed due to a vertical drop into ACDC. Just upstream of Detention Basin No. 2, Sect. 0.72, critical depth was assumed because the reach just upstream is on a supercritical slope.

3. Give range of friction loss coefficients (*Manning's "N"*) Channel .... .02-.075

Overbanks ...... .02-.1

If friction loss coefficients are different anywhere along the revised reach from those used to develop the FIRM, give location, value used in the effective FIS, and revised values and an explanation as to how the revised values were determined.

Location	FIS	Revised
All locations	See attached table	"Mannings n, Effective and Revised"

Explain: Revised values were developed after field reconnaisance and application of procedures defined in USGS report "Estimating Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona."

4. Describe how the cross section geometry data were determined *(e.g., field survey, topographic map, taken from previous study)* and list cross sections that were added.

Cross section geometry were cut from digital topography and in some cases elevations were estimated between contours. All cross sections were added in this manner.

5. Were natural channel banks selected as the location of the left and right channel banks in the model?

☐ Yes ☒ No If no, explain why not: Not always. At dip sections, the bank stations were defined at a change in roughness (e.g. transition from pavement to natural ground).

6. Explain how reach lengths for channel and overbanks were determined:

Channel reach lengths were measured along the hydraulic base line. Overbank reach lengths were measured between the approximate centroid of the overbank flow areas.

6. RESULTS *(from model used to revise 100-year water surface elevations)*

1. Do the results indicate:

a. Water surface elevations higher than end points of cross sections? .... ☒ Yes ☐ No

b. Supercritical depth? .... ☐ Yes ☒ No

c. Critical depth? .... ☒ Yes ☐ No

d. Other unique situations .... ☒ Yes ☐ No

If yes to any of the above, attach an explanation that discusses the situation and how it is presented on the profiles, tables, and maps.

2. What is the maximum change in energy gradient between cross-sections? 0.058

Specify location 1.527-1.528

3. What is the distance between the cross-sections in 2 above? 10

4. What is the maximum distance between cross-sections? .... 455 ft.

Specify location .... 0.24 - 0.33

5. Floodway determination

a. What is the maximum surcharge allowed by the community or State? .... N/A foot

b. What is the maximum surcharge for the revised conditions? .... N/A foot

Specify location .... N/A

c. What is the maximum velocity? .... N/A fps

Specify location .... N/A

d. Are there any negeative surcharge values at any cross-section? ☐ Yes ☐ No

If yes, the floodway may need to be widened. If it is not widened, please explain and indicate the maximum negative surcharge.

Explain:

6. Is the discharge value used to determine the floodway anywhere different from that used to determine the natural 100-year flood elevations? .... ☐ Yes ☐ No

If Yes, explain:

N/A

7. Do 100-year water surface elevations increase at any location? .... ☒ Yes ☐ No

If yes, please attach a list of the locations where the increases occur, state whether or not the increases are located on the requestor's property, and provide an explanation of the reason for the increases. *(For example: State if the increase is due to fill placed within the floodway fringe or placed within the currently adopted floodway limits)*

See attachment

Attach a completed comparison table entitled: Water Surface Elevation Check (see page 6)

7. REVISED FIRM/FBFM AND FLOOD PROFILES

8. The revised water surface elevations tie into those computed by the effective FIS Model *(10-, 50-, 100-, and 500-year)*, downstream of the project at cross-section N/A within ______ feet *(vertical)* and upstream of the project at cross section ______ within ______ feet *(vertical)*.

9. The revised floodway elevations tie into those computed by the effective FIS model, dowstream of the project at cross section N/A within ______ feet *(vertical)* and upstream of the project at cross section ______ within ______ feet *(vertical)*.

10. Attach profiles, at the same vertical and horizontal scale as the profiles in the effective FIS report, showing stream bed and profiles of all floods studied (without encroachment). Also, label all cross sections, road crossings (including low chord and top-of-road data), culverts, tributaries, corporate limits, and study limits. If channel distance has changed, the stationing should be revised for all profile sheets.

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

Proceed to Riverine/Coastal Mapping Form (Form 5)

FEDERAL EMERGENCY MANAGMENT AGENCY

WATER SURFACE ELEVATION CHECK

COMMUNITY NAME	FLOODIND SOURCE	PROJECT NAME /IDENTIFIER

	EFFECTIVE			DUPLICATE EFFECTIVE			CORRECTED EFFECTIVE			EXISTING/PRE-PROJECT			REVISED/PROJECT		
SECNO	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]
0													1233.78		
1.01													1237.13		
0.08													1238.99		
0.09	1241.8	1242.8	1												
0.16													1240.95		
0.24													1243.71		
0.31	1246.5	1247.4	0.9												
0.33													1245.95		
0.35													1245.45		
0.41													1248.09		
0.48													1250.46		
0.54	1257.6	1258.5	0.9										1253.84		
0.57													1257.85		

COMMENTS:

1-100-year (natural) Water Surface Elevation   2-Encroachment (floodway) Water Surface Elevation   3-Surcharge Value

Include all cross sections in the models between tie-in points. Any interpolated values should be indicated in parentheses.

FEDERAL EMERGENCY MANAGMENT AGENCY

WATER SURFAC ATION CHECK

COMMU NAME	FLOODIN URCE	PROJECT NAME /IDENTIFIER

	EFFECTIVE			DUPLICATE EFFECTIVE			CORRECTED EFFECTIVE			EXISTING/PRE-PROJECT			REVISED/PROJECT		
SECNO	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]
0.72													1264.37		
0.73													1265.74		
0.74	1267.7	1268.7	1												
0.79													1270.18		
0.85													1273.29		
0.86													1273.5		
0.87													1274.37		
0.89													1276.28		
0.92	1278.6	1279.6	1												
0.929													1277.36		
0.935													1277.61		
0.94													1277.71		
0.96													1280.38		

COMMENTS.

1-100-year (natural) Water Surface Elevation   2-Encroachment (floodway) Water Surface Elevation   3-Surcharge Value

Include all cross sections in the models between tie-in points. Any interpolated values should be indicated in parentheses.

FEDERAL EMERGENCY MANAGMENT AGENCY

WATER SURFA[illegible]ATION CHECK

COMMUNI[illegible] NAME	FLOODIND S[illegible]RCE	PROJECT NAME /IDENTIFIER

	EFFECTIVE			DUPLICATE EFFECTIVE			CORRECTED EFFECTIVE			EXISTING/PRE-PROJECT			REVISED/PROJECT		
SECNO	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]
0.99													1280.58		
0.998													1280.67		
1.005													1280.72		
1.03													1281.6		
1.05													1282.06		
1.06													1282.15		
1.07													1283.03		
1.09													1284.37		
1.12	1287.5	1288.5	1										1285.41		
1.13													1285.98		
1.136													1287.78		
1.138													1288.41		
1.18													1289.5		

COMMENTS.

1-100-year (natural) Water Surface Elevation

2-Encroachment (floodway) Water Surface Elevation

3-Surcharge Value

Include all cross sections in the models between tie-in points. Any interpolated values should be indicated in parentheses.

FEDERAL EMERGENCY MANAGMENT AGENCY

WATER SURFAC VATION CHECK

COMMUNITY NAME	FLOODING SOURCE	PROJECT NAME /IDENTIFIER

	EFFECTIVE			DUPLICATE EFFECTIVE			CORRECTED EFFECTIVE			EXISTING/PRE-PROJECT			REVISED/PROJECT		
SECNO	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]
1.22													1290.95		
1.23													1291.78		
1.238													1291.93		
1.242													1291.79		
1.244													1292.37		
1.27													1293.17		
1.35													1296.51		
1.37	1297.3	1298.3	1												
1.38													1297.61		
1.4													1296.43		
1.46													1300.02		
1.49													1302.64		
1.5	1306	1306	0												

COMMENTS:

1-100-year (natural) Water Surface Elevation 2-Encroachment (floodway) Water Surface Elevation 3-Surcharge Value

Include all cross sections in the models between tie-in points. Any interpolated values should be indicated in parentheses.

Sheet 4 of 5 MT-2 Form 4 Page 6 of 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

WATER SURFACE ELEVATION CHECK

COMMUNITY NAME	FLOODING SOURCE	PROJECT NAME /IDENTIFIER

	EFFECTIVE			DUPLICATE EFFECTIVE			CORRECTED EFFECTIVE			EXISTING/PRE-PROJECT			REVISED/PROJECT		
SECNO	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]	NCWSEL[1]	FCWSEL[2]	SURC.[3]
1.527													1302.82		
1.528													1304.69		
1.55													1306		
1.57													1307.54		
1.61													1308.8		
1.64													1310.27		
1.65													1310.45		
1.66													1310.73		

COMMENTS.

1-100-year (natural) Water Surface Elevation

2-Encroachment (floodway) Water Surface Elevation

3-Surcharge Value

Include all cross sections in the models between tie-in points. Any interpolated values should be indicated in parentheses.

Sheet 5 of 5

MT-2 Form 4
Section 3: Models Submitted

Item 5. Please attach a sheet describing all other models submitted.

---

1) 10STSFB.DAT--HEC-2 model used for the split flow analysis.

2) BREAK.PRJ--HEC-RAS model used to show that breakouts downstream of cross section 1.13 did not exceed 1 foot.

3) BREAK97.PRJ--HEC-RAS model used to show that breakout at cross section 0.97 did not exceed 1 foot.

Manning's n, Effective and Revised

Effective FIS				Revised FIS			
Cross	Manning's n			Cross	Manning's n		
Section ID	left	right	channel	Section ID	left	right	channel
				0.00	0.02	0.02	0.02
				0.01	0.1	0.1	0.028
				0.08	0.1	0.1	0.028
0.09	0.12	0.13	0.03				
				0.16	0.1	0.1	0.028
0.19	0.12	0.12	0.03				
				0.24	0.1	0.1	0.028
0.31	0.12	0.12	0.03				
0.32	0.12	0.12	0.12				
0.33	0.12	0.12	0.12	0.33	0.1	0.1	0.028
				0.35	0.1	0.1	0.028
				0.41	0.1	0.1	0.028
0.45	0.12	0.11	0.03				
				0.48	0.1	0.1	0.028
0.54	0.12	0.12	0.042	0.54	0.1	0.1	0.028
				0.57	0.1	0.1	0.03
0.64	0.12	0.12	0.042				
				0.72	0.02	0.02	0.02
				0.73	0.1	0.1	0.03
0.74	0.12	0.12	0.042				
				0.79	0.1	0.1	0.03
0.83	0.12	0.12	0.042				
				0.85	0.1	0.1	0.051
				0.86	0.02	0.1	0.02
				0.87	0.1	0.1	0.051
				0.89	0.1	0.1	0.035
0.92	0.15	0.15	0.042				
				0.929	0.1	0.1	0.035
				0.935	0.02	0.1	0.02
				0.94	0.1	0.1	0.048
				0.96	0.1	0.1	0.048
				0.99	0.1	0.1	0.048
				0.998	0.02	0.1	0.02
				1.005	0.1	0.1	0.043
1.03	0.15	0.12	0.042	1.03	0.1	0.1	0.043
				1.05	0.1	0.1	0.043
				1.06	0.02	0.1	0.02
				1.07	0.1	0.1	0.028
				1.09	0.1	0.1	0.028
1.12	0.15	0.045	0.042	1.12	0.1	0.1	0.028
				1.13	0.02	0.02	0.02
				1.136	0.1	0.1	0.053
				1.138	0.1	0.1	0.053
				1.18	0.1	0.1	0.053
1.22	0.15	0.15	0.042	1.22	0.1	0.1	0.053
				1.23	0.1	0.1	0.053
				1.238	0.02	0.02	0.02
				1.242	0.1	0.1	0.058
				1.244	0.1	0.1	0.058
				1.27	0.1	0.1	0.058
				1.35	0.1	0.1	0.058
1.37	0.15	0.043	0.042				
1.38	0.12	0.12	0.012	1.38	0.1	0.1	0.058
1.39	0.12	0.12	0.012				
1.4	0.12	0.12	0.042	1.40	0.1	0.1	0.032
1.46	0.06	0.07	0.042	1.46	0.1	0.1	0.032
1.47	0.04	0.1	0.012				
1.49	0.04	0.1	0.012	1.49	0.1	0.1	0.075
1.5	0.05	0.05	0.042				
				1.527	0.1	0.1	0.075
				1.528	0.1	0.1	0.075
				1.55	0.1	0.1	0.075
1.57	0.12	0.12	0.042	1.57	0.1	0.1	0.075
				1.61	0.1	0.1	0.038
				1.64	0.1	0.1	0.038
				1.65	0.1	0.1	0.038
				1.66	0.02	0.02	0.02
1.67	0.04	0.04	0.042				

MT-2 Form 4
Section 6: Results

Item 1. Do the results indicate:

a. Water surface elevations higher than end points of cross sections?
b. Supercritical depth?
c. Critical depth?
d. Other unique situations?

If yes to any of the above, attach an explanation that discusses the situation and how it is presented on the profiles, tables, and maps.

---

a. YES. Many of the cross sections report water surface elevations higher than the end points because the effective flow limit is at the end point. This condition is a result of the watershed boundary being so close to the channel in the right overbank. The water overtopping the end points was accounted for in the split flow analysis, and discharges were reduced at the next downstream cross section by the appropriate amount. See section 4 of the Technical Data Notebook for further details.

b. NO.

c. YES. Critical depth was computed at many cross sections due to the steep slope of the channel.

d. YES. The watershed boundary was not always located at the end point of the cross sections where split flow was occurring. In these cases, the edge of water on the work map was mapped to the effective flow limit at the watershed boundary.

MT-2 Form 4
Section 6: Results

Item 7. Do 100-year water surface elevations increase at any location? YES.

If yes, please attach a list of the locations where the increases occur, state whether or not the increases are located on the requestor's property, and provide an explanation of the reason for the increases.

Cross section	Reason
1.138	New topography, new analysis method
1.18	New topography, new analysis method
1.23	New topography, new analysis method
1.238	New topography, new analysis method
1.244	New topography, new analysis method
1.27	New topography, new analysis method
1.35	New topography, new analysis method
1.38	New topography, new analysis method
1.57	New topography, new analysis method
1.61	New topography, new analysis method
1.64	New topography, new analysis method
1.65	New topography, new analysis method
1.66	New topography, new analysis method

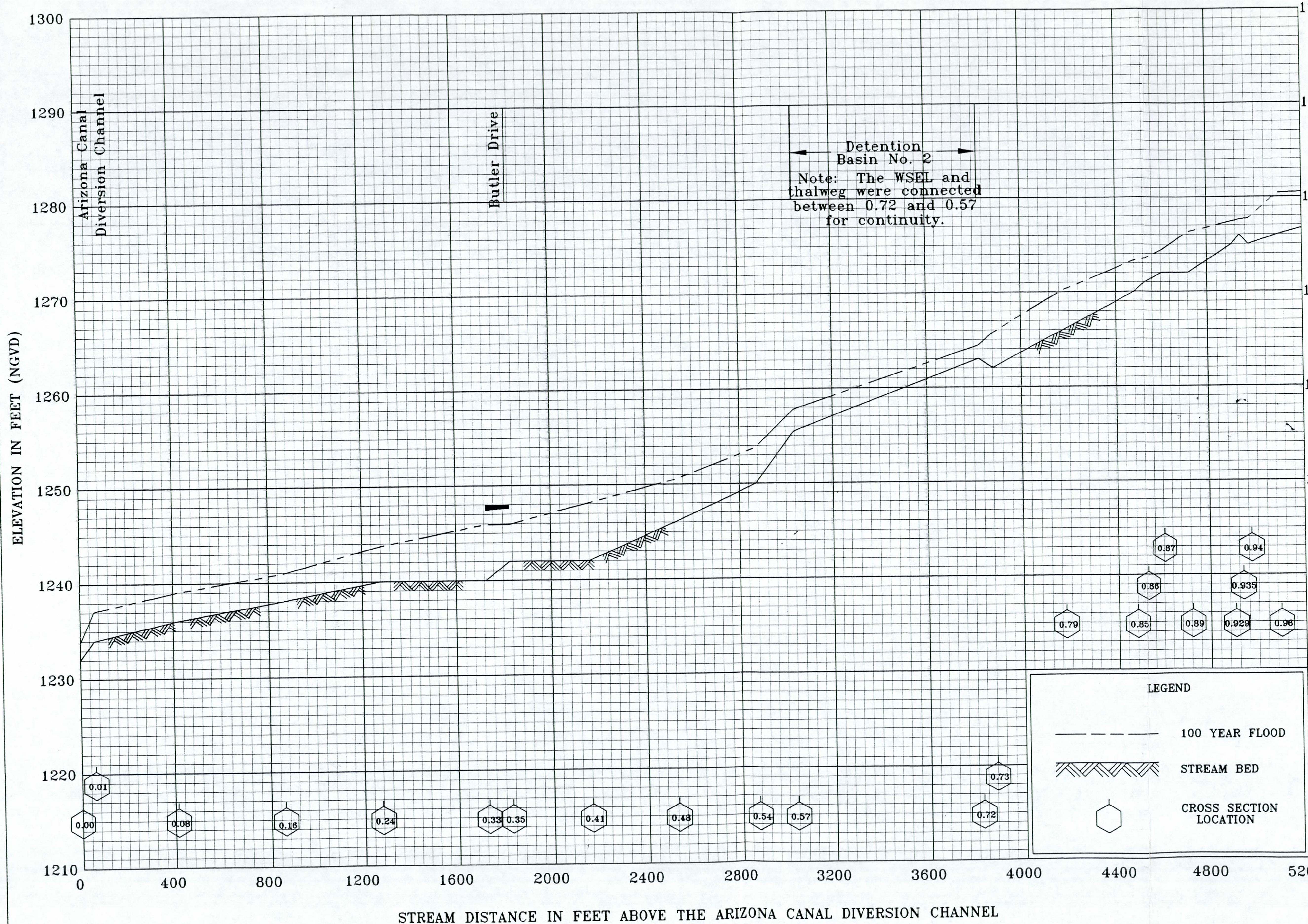
Effective vs. Revised WSEL Comparison

Used to determine where WSEL increases

9/12/97

Effective FIS Cross Section	Effective FIS BFE Station	Revised FIS Cross Section	Effective FIS WSEL	Revised FIS WSEL	WS diff (Eff - Rev)
		0	1241.7	**1233.78**	7.92
		0.01	1241.7	**1237.13**	4.57
		0.08	1241.8	**1238.99**	2.81
0.09			**1241.8**	1239.24	2.57
	0.10		**1242**	1239.42	2.58
		0.16	1242.72	**1240.95**	1.77
	0.18		**1243**	1241.80	1.20
		0.24	1245.25	**1243.71**	1.54
	0.28		**1247**	1244.78	2.22
0.31			**1246.5**	1245.45	1.05
		0.33	1248.23	**1245.95**	2.28
		0.35	1249.95	**1245.45**	4.50
	0.41		**1255**	1248.02	6.98
		0.41	1255.03	**1248.09**	6.94
		0.48	1256.27	**1250.46**	5.81
	0.52		**1257**	1252.77	4.23
0.54		0.54	**1257.6**	**1253.84**	3.76
	0.57		**1260**	1258.40	1.60
		0.57	1260	**1257.85**	1.96
		0.72	1266.77	**1264.37**	2.40
		0.73	1267.24	**1265.74**	1.50
0.74			**1267.7**	1266.48	1.22
	0.75		**1268**	1267.32	0.68
		0.79	1270.66	**1270.18**	0.48
	0.84		**1274**	1272.69	1.31
		0.85	1274.6	**1273.29**	1.36
		0.86	1275.2	**1273.5**	1.71
		0.87	1275.8	**1274.37**	1.41
		0.89	1276.9	**1276.28**	0.63
0.92			**1278.6**	1277.11	1.49
		0.929	1279.0	**1277.36**	1.66
		0.935	1279.3	**1277.61**	1.68
		0.94	1279.5	**1277.71**	1.81
	0.95		**1280**	1279.09	0.91
		0.96	1280.4	**1280.38**	0.03
		0.99	1281.7	**1280.58**	1.09
		0.998	1282.0	**1280.67**	1.34
		1.005	1282.3	**1280.72**	1.59
		1.03	1283.4	**1281.6**	1.76
		1.05	1284.2	**1282.06**	2.14
		1.06	1284.6	**1282.15**	2.48
	1.07		**1285**	1282.93	2.07
		1.07	1285.1	**1283.03**	2.03
		1.09	1286.0	**1284.37**	1.66
1.12		1.12	**1287.5**	**1285.41**	2.09
		1.13	1287.8	**1285.98**	1.85
		1.136	1288.0	**1287.78**	0.25
		1.138	1288.1	**1288.41**	-0.32
		1.18	1289.5	**1289.5**	-0.02
	1.20		**1290**	1290.07	-0.07
		1.22	1291.0	**1290.95**	0.07
		1.23	1291.4	**1291.78**	-0.35
		1.238	1291.8	**1291.93**	-0.16
		1.242	1291.9	**1291.79**	0.15
		1.244	1292.0	**1292.37**	-0.35
		1.27	1293.1	**1293.17**	-0.06
		1.35	1296.5	**1296.51**	-0.05
1.37			**1297.3**	1297.24	0.06
		1.38	1297.1	**1297.61**	-0.51
	1.39		**1297**	1297.31	-0.31
		1.4	1297.9	**1296.43**	1.51
	1.46		**1302**	1300.26	1.74
		1.46	1302.0	**1300.02**	1.98
	1.49	1.49	**1306**	**1302.64**	3.36
1.5			**1306**	1302.69	3.31
		1.527	1306.0	**1302.82**	3.18
		1.528	1306.0	**1304.69**	1.31
		1.55	1306.0	**1306**	0.00
		1.57	1306.0	**1307.54**	-1.54
	1.58		**1306**	1307.84	-1.84
		1.61	1307.3	**1308.8**	-1.50
		1.64	1309	**1310.27**	-1.27
		1.65	1309.3	**1310.45**	-1.15
		1.66	1310	**1310.73**	-0.73

Notes Elevations not shown in bold are interpolated



FEDERAL EMERGENCY MANAGEMENT AGENCY

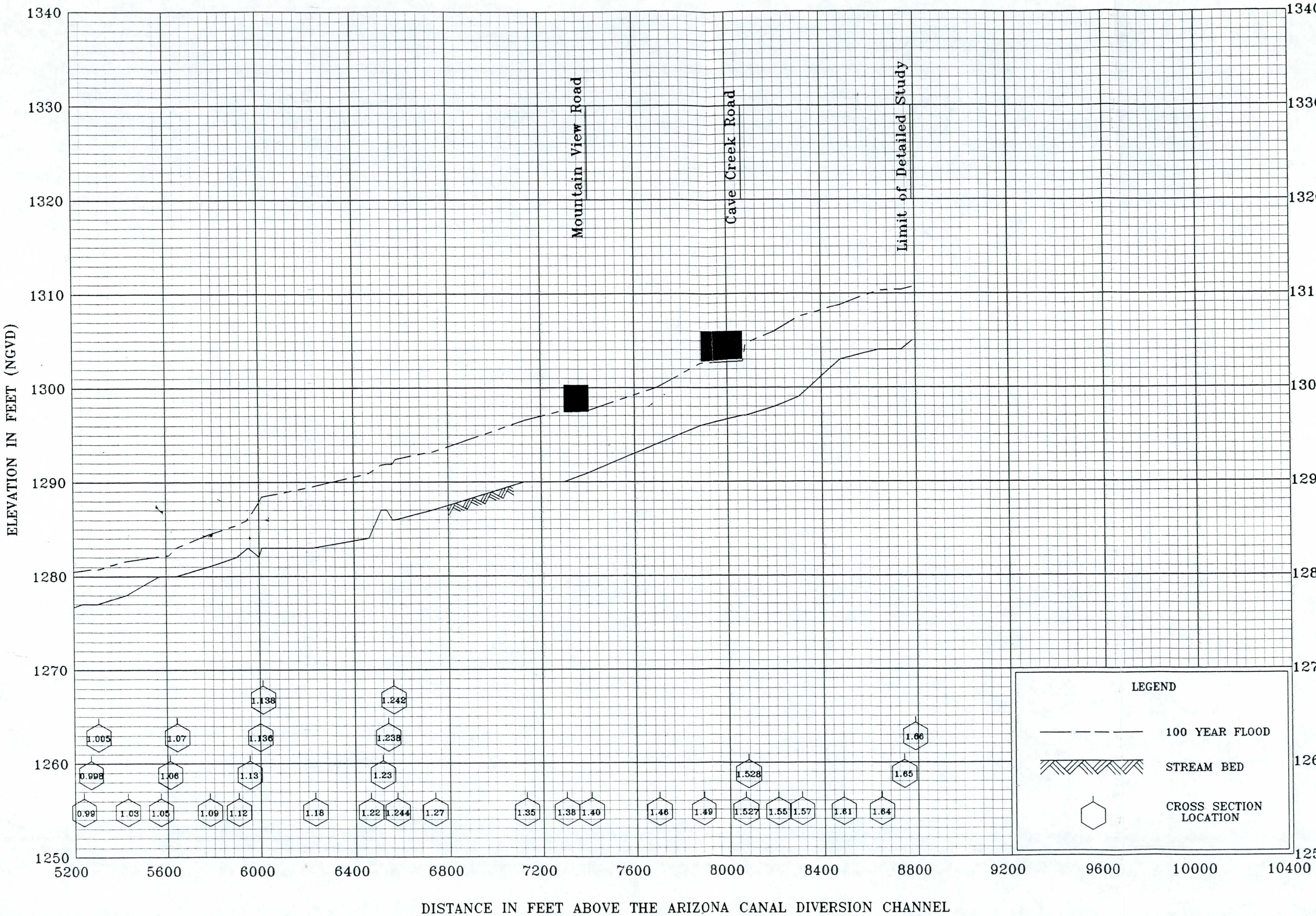
CITY OF PHOENIX, AZ

MARICOPA COUNTY

FLOOD PROFILES

TENTH STREET WASH

01P



FLOOD PROFILES

TENTH STREET WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF PHOENIX, AZ

MARICOPA COUNTY

02P

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE/COASTAL MAPPING FORM**	*FEMA USE ONLY*	*O.M.B. No. 3067-0148* *Expires July 31, 1997*

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.

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.

Community Name: City of Phoenix

Flooding Source: 10th Street Wash

Project Name/Identifier: 10th Street Wash detention basins.

1. MAPPING CHANGES

1. A topographic work map of suitable scale, contour interval, and planimetric definition must be submitted showing *(indicate N/A when not applicable)*:

	Included		
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 100-year floodway boundaries?	☐ Yes	☐ No	☒ N/A
D. Location and alignment of all cross sections used in the revised hydraulic model with stationing control indicated?	☒ Yes	☐ No	☐ N/A
E. Stream alignments, road and dam alignments?	☒ Yes	☐ No	☐ N/A
F. Current community boundaries?	☒ Yes	☐ No	☐ N/A
G. Effective 100- and 500-year floodplain and 100-year floodway boundaries from the FIRM/FBFM reduced or enlarged to the scale of the topographic work map?	☐ Yes	☐ No	☒ N/A
H. Tie-ins between the effective and revised 100- and 500-year floodplains and 100-year floodway boundaries?	☐ Yes	☒ No	☐ N/A
I. The requestor'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 etc.)?	☒ 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 analyses?	☐ Yes	☐ No	☒ N/A

If any of the items above are marked no or N/A, please explain: See attachment.

2. What is the source and date of the updated topographic information *(example: orthophoto maps, July 1985; field survey, May 1979, beach profiles, June 1987, etc.)*? aerial topography, Feb 1994 and Nov. 1990

3. What is the scale and contour interval of the following workmaps?
   a. Effective FIS 1" = 400' scale unknown Contour interval
   b. Revision Request 1" = 200', 400' scale 1' and 2' Contour interval

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

4. Attach an annotated FIRM and FBFM at the scale of the effective FIRM and FBFM showing the revised 100- and 500-year floodplain and the 100-year floodway boundaries and how they tie into those shown on the effective FIRM and FBFM downstream and upstream of the revisions or adjacent to the area of revision for coastal studies Attach additional pages if needed

PLEASE REFER TO THE INSTRUCTION FOR THE APPROPRIATE MAILING ADDRESS

5. Flood Boundaries and 100-year water surface elevations:

a. Has the 100-year floodplain been shifted or increased or the 100-year water surface elevation increased at any location on property other than the requestor's or community's? ☐ Yes ☒ No

If yes, please give the location of shift or increase and an explanation for the increase.

Refer to Form 4, Section 6, Question 7.

b. Have the affected property owners been notified of this shift or increase and the effect it will have on their property? .... N/A ☐ Yes ☐ No

If yes, please attach letters from these property owners stating they have no objections to the revised flood boundaries if a LOMR is being requested.

c. What is the number of insurable structures that will be impacted by this shift or increase? N/A

6. Have the floodway boundaries shifted or increased at any location compared to those shown on the effective FBFM or FIRM? .... ☒ Yes ☐ No

If yes, explain:

A floodway was analyzed for the effective FIS but not for the current study. Therefore, the floodway boundaries have shifted.

7. If a V-zone has been designated, has it been delineated to extend landward to the heel of the primary frontal dune? ☐ Yes ☒ No

If no, explain:

There are no V-zones.

8. Manual or digital map submission:

☒ Manual

☐ Digital

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 of submission as possible.

2. EARTH FILL PLACEMENT

1. The fill is: ☐ Existing ☐ Proposed N/A

2. Has fill been placed/will be placed in the regulatory floodway? .... ☐ Yes ☐ No N/A
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 N/A

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 N/A

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 N/A ______________________________

c. Has all fill placed in the 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 N/A

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

If yes, provide certification of fill compaction (Item c. above) by the community's NFIP permit official, a registered professional engineer, or an accredited soils engineer.

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

If yes, is the fill protected from erosion by a flood control structure such as a revetment or seawall? ☐ Yes ☐ No N/A

If yes, attach the coastal structures form.

MT-2 Form 5
Section 1: Mapping changes

Item 1. If any of the items above are marked no or N/A, please explain.

A topographic work map of suitable scale, contour interval, and planimetric definition must be submitted showing:

A. Revised approximate 100-year floodplain boundaries (Zone A)?
N/A. The revised floodplain was a detailed study, not approximate.

B. Revised detailed 100- and 500-year floodplain boundaries?
N/A. The revised detailed 100-year floodplain boundaries are shown on the work map, but the 500-year floodplain was not studied.

C. Revised 100-year floodway boundaries?
N/A. A floodway analysis was not performed because the adjacent areas to 10th Street Wash are fully developed. This was requested by the City of Phoenix.

G. Effective 100- and 500-year floodplain and 100-year floodway boundaries from the FIRM/FBFM reduced or enlarged to the scale of the topographic work map?
N/A. The effective 500-year floodplain was not mapped on the current effective FIRM. The 100-year floodplain and floodway, however, were superimposed on the topographic work map.

H. Tie-ins between the effective and revised 100- and 500-year floodplains and 100-year floodway boundaries?
No. Tie-ins were not necessary because the entire system covered by the effective FIS was restudied.

I. The requestor's property boundaries and community easements.
No. The entire work map falls under community 040051, City of Phoenix.

M. Costal zone designations tie into adjacent areas not being revised.
N/A. 10th Street Wash is not in a costal zone.

N. Location and alignment of all coastal transects used to revise the coastal analyses?
N/A. 10th Street Wash is not in a costal zone.

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT FORM**	FEMA USE ONLY	O.M.B. No. 3067-0148 Expires July 31, 1997

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 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.

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.

Community Name: City of Phoenix

Flooding Source: 10th Street Wash

Project Name/Identifier: 10th Street Wash Detention Basins

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Butler Drive
2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier): River Station 0.35
3. This revision reflects *(check one of the following)*:

☐ New bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

☒ New analysis of bridge/culvert previously modeled in the FIS

(Explain why new analysis was performed) New geometry upstream and downstream of bridge. Also, HEC-RAS was used instread of HEC-2.

2. BACKGROUND

Provide the following information about the structure:

1 Dimension, material, and shape of structure (e.g. two 10 x 5 feet reinforced concrete box culvert; three 30-foot span bridge with 2 rows of two 3- foot diameter circular piers; 40-foot wide ogee shape spillway) 3 12'x8' reinforced concrete box culverts

2. Entrance geometry of culvert/type of bridge opening (e.g. 30° - 75° wing walls with square top edge, sloping embankments and vertical abutments) 30° - 75° wingwalls with square top edge, vertical abutments

3. Hydraulic model used to analyze the structure (*e.g., HEC-2 with special bridge routine, WSPRO, HY8*) HEC-RAS

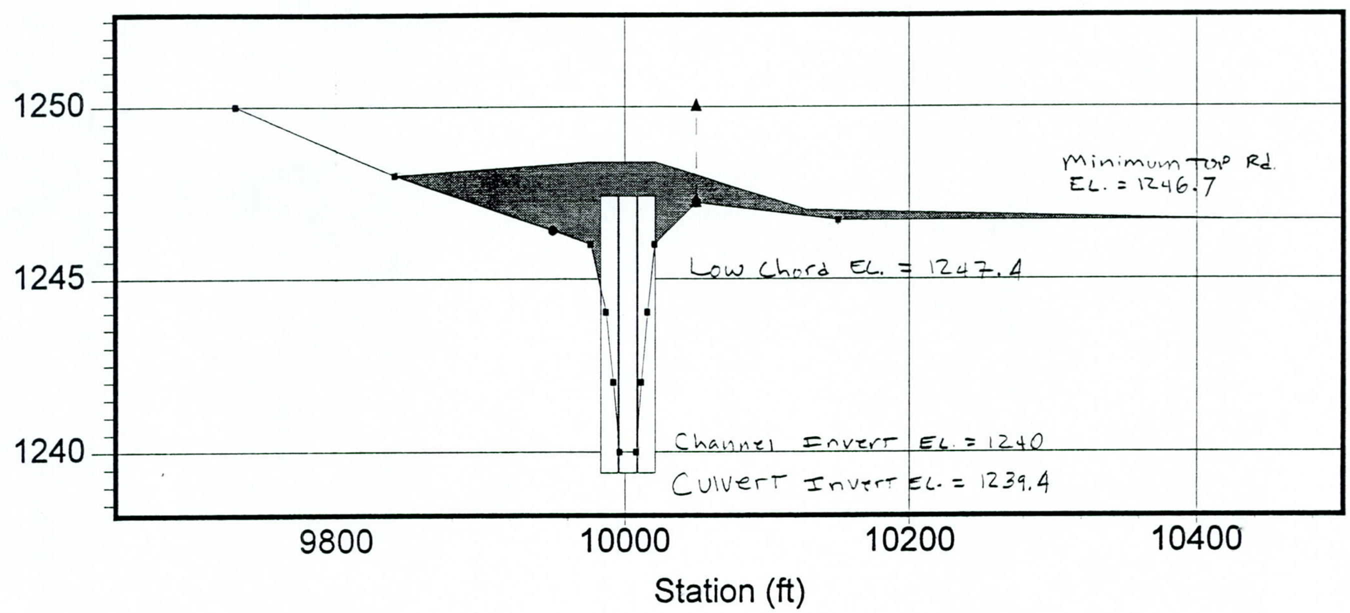
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

Note: If any items do not apply to submitted hydraulic analysis, indicate with "N/A"
*** One form per new/revised bridge/culvert**

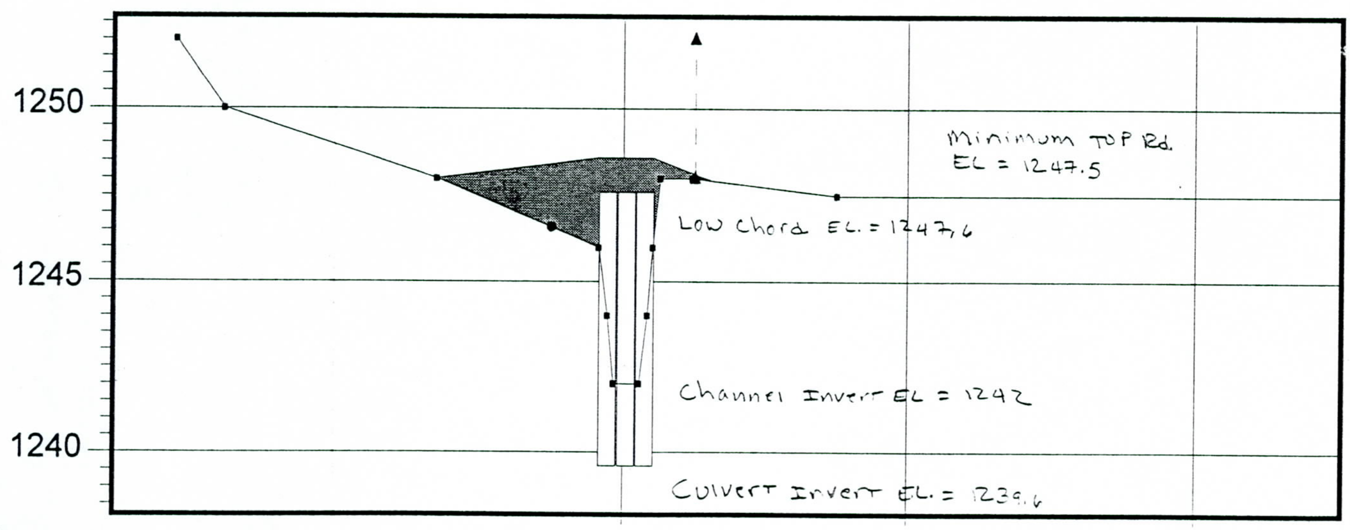
PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. ANALYSIS

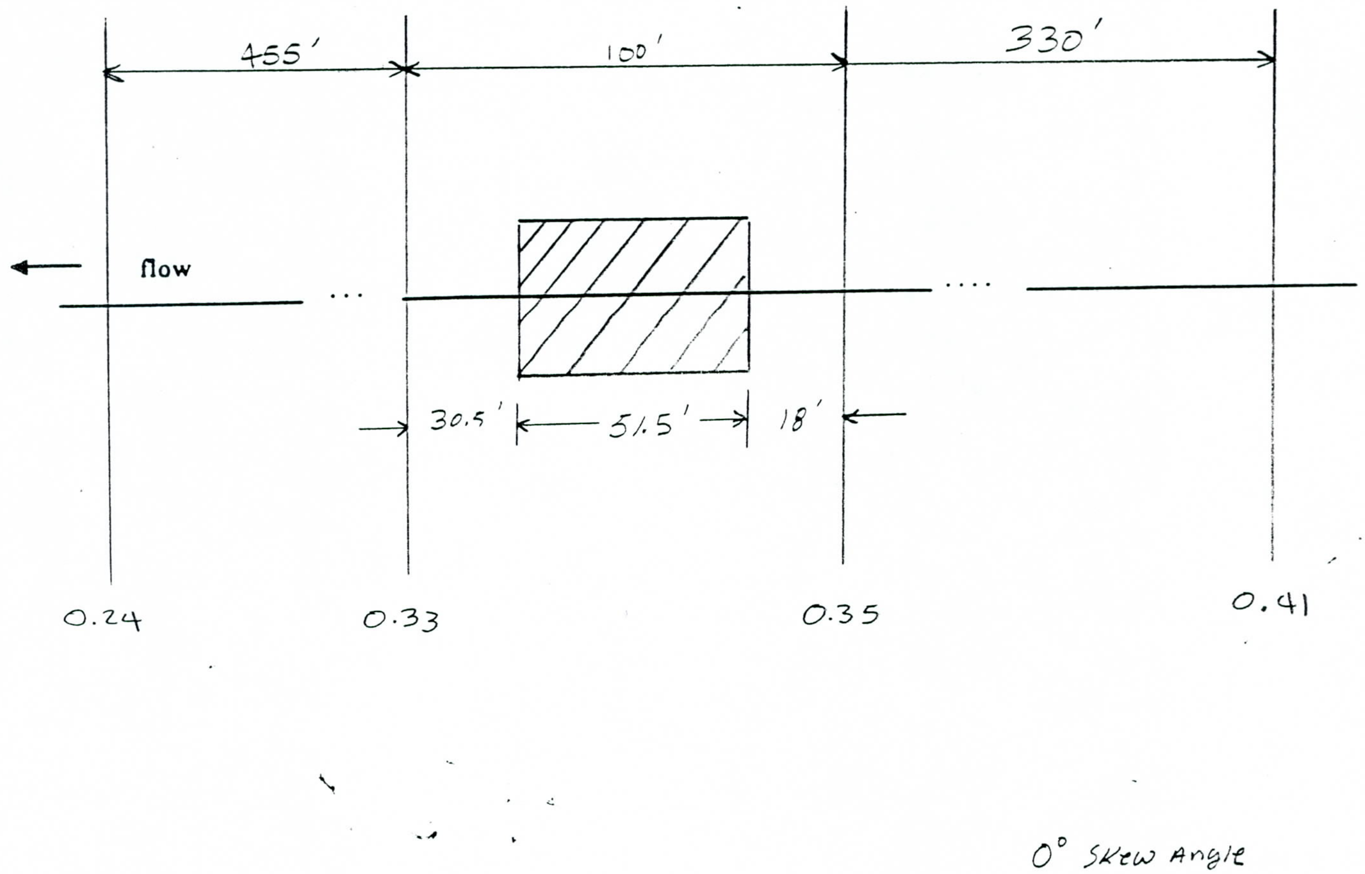
Sketch the downstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, minimum top of road elevation, and ineffective flow widths.



Sketch the upstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, and minimum top of road elevation.



etch the plan view of the structure(s) Show, at a minimum, the skew angle, cross-section locations, distances tween cross sections, and length of structure (s).



Attach plans of the structure (s) certified by a registered professional engineer.

Culvert length or bridge width (ft)	51.5
Calculated culvert/bridge area (ft ^{2}) by the hydraulic model, if applicable	N/A
Total culvert/bridge area (ft ^{2})	288

Elevations Above Which Flow is Effective for Overbanks

	Left Overbank	Right Overbank
Upstream face	1248	1248
Downstream face	1248	1247.2

Minimum Top of Road Elevation

	Left Overbank	Right Overbank
Upstream face	1248	1247.5
Downstream face	1248	1246.7

100-Year flood elevations	Water Surface Elevations	Energy Gradient Elevations
Upstream face	1245.45	1246.77
Downstream face	1245.95	1246.43

Discharge	Low Flow	Pressure Flow	Weir Flow	Total Flow
Amount of flow through/over the structure (s) (cfs)	840	N/A	N/A	840

The maximum depth of flow over the roadway/railroad (ft.) .... N/A

Weir length (ft.) .... N/A

Top Widths	Total Floodplain Width	Total Effective Flow Width	Floodway Width
Upstream face	34.87	34.87	N/A
Downstream face	44.03	44.03	N/A

3. ANALYSIS (Cont'd)

Loss Coefficients

Entrance loss coefficient	0.4
Manning's "n" value assigned to the structure(s)	0.025
Friction loss coefficient through structure (s)	0
Other loss coefficients (e.g., bend manhole, etc.)	0.08
Total loss coefficient	0.08
Weir coefficient	2.6
Pier coefficient	N/A
Contraction loss coefficient	0.1
Expansion loss coefficient	0.3

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. a. Is there any indication from historical records that sediment transport (*including scour and deposition*) can affect the 100-year water surface elevations? .... ☐ Yes ☒ No

   b Based on the conditions (*such as geomorphology, vegetative cover and development of the watershed and stream bed, and bank conditions*), is there a potential for debris and sediment transport (*including scour and deposition*) to affect the 100-year water surface elevations and/or conveyance capacity through the bridge/culvert? .... ☐ Yes ☒ No

2. If the answer to either 1a or 1b is yes:

   a. What is the estimated sediment (*bed material*) load?

   ________ cfs (*attach gradation curve*)

   Explain method used to estimate the sediment transport and the depth of scour and/or deposition________

   b. Will sediment accumulate anywhere through the bridge/culvert? ☐ Yes ☐ No

   If yes, explain the impact on the conveyance capacity through the bridge/culvert?________

5. FLOODWAY ANALYSIS

Explain method of bridge encroachment (floodway run)

N/A

5. FLOODWAY ANALYSIS (Cont'd)

Comments *(explain any unusual situations)*:

Attach analysis.

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT FORM**	FEMA USE ONLY	*O.M.B. No. 3067-0148* *Expires July 31, 1997*

PUBLIC BURDEN DISCLOSURE NOTICE

Community Name: City of Phoenix

Flooding Source: 10th Street Wash

Project Name/Identifier: 10th Street Wash Detention Basins

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Mountain View Road

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier): River Station 1.40

3. This revision reflects (*check one of the following*):

☐ New bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

☒ New analysis of bridge/culvert previously modeled in the FIS

(*Explain why new analysis was performed*) New geometry upstream and downstream of bridge. Also, HEC-RAS was used instead of HEC-2.

2. BACKGROUND

Provide the following information about the structure:

1 Dimension, material, and shape of structure (e.g. two 10 x 5 feet reinforced concrete box culvert; three 30-foot span bridge with 2 rows of two 3- foot diameter circular piers; 40-foot wide ogee shape spillway) 2 15'x 8½'reinforced concrete box culverts

2. Entrance geometry of culvert/type of bridge opening (e.g. 30° - 75° wing walls with square top edge, sloping embankments and vertical abutments) 30° - 75° wingwalls with square top edge, vertical abutments

3. Hydraulic model used to analyze the structure (*e.g., HEC-2 with special bridge routine, WSPRO, HY8*) HEC-RAS

If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

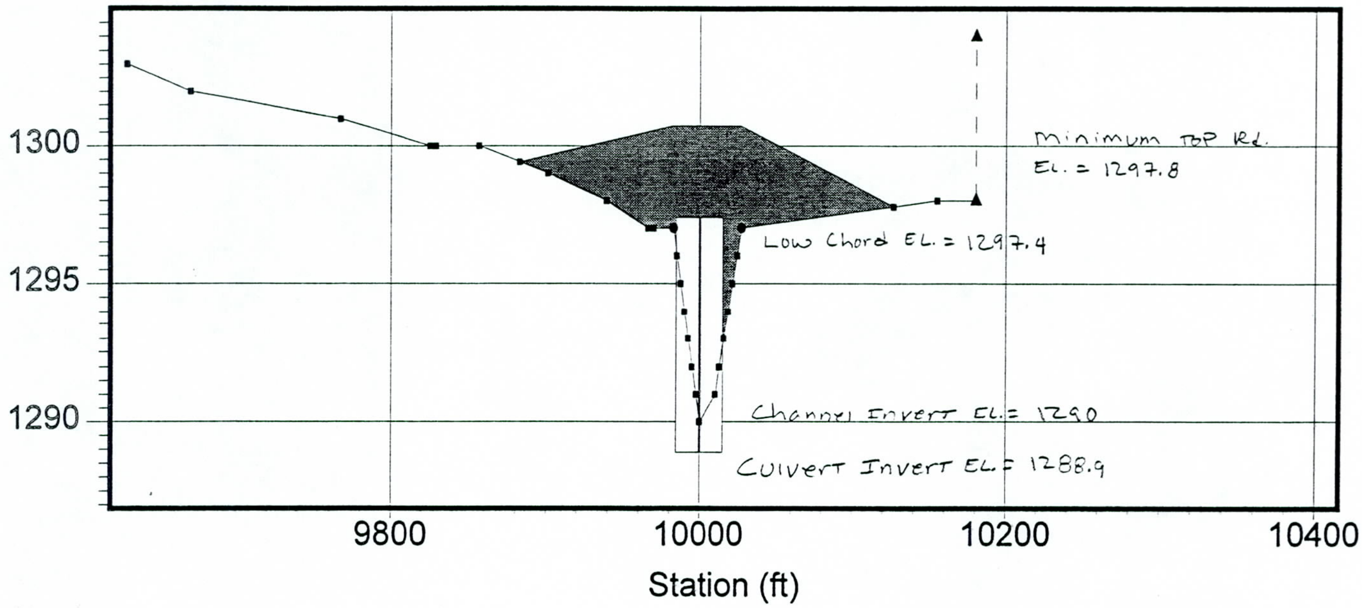
Note: If any items do not apply to submitted hydraulic analysis, indicate with "N/A"

*** One form per new/revised bridge/culvert**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. ANALYSIS

ketch the downstream face of the structure together with the road profile. Show, at a minimum, the maximum low ord elevation, invert elevation, minimum top of road elevation, and ineffective flow widths.



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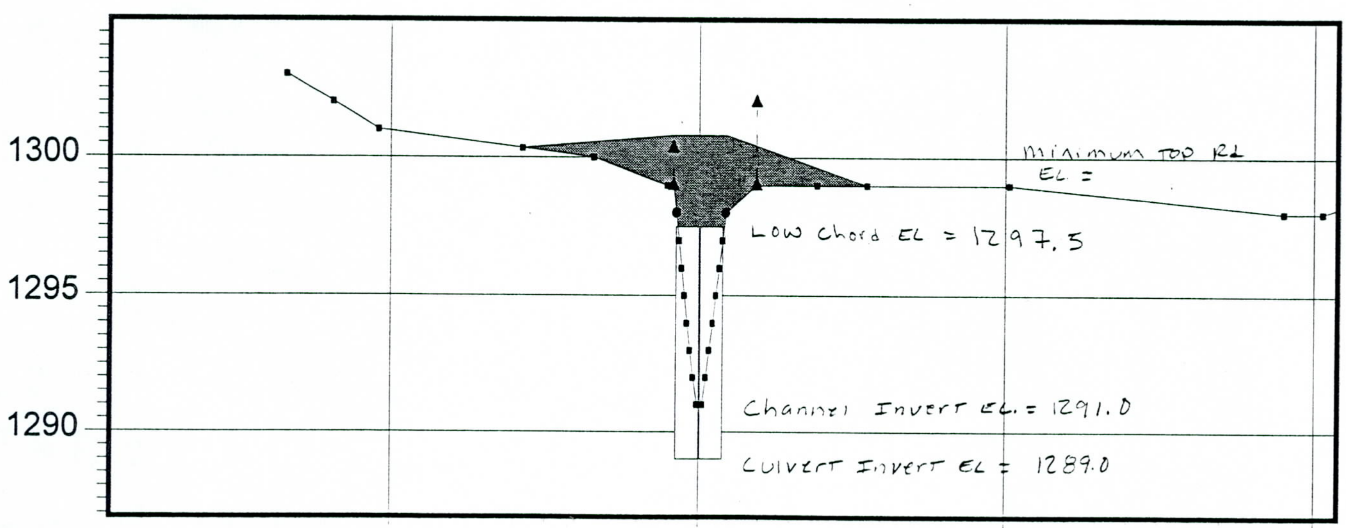
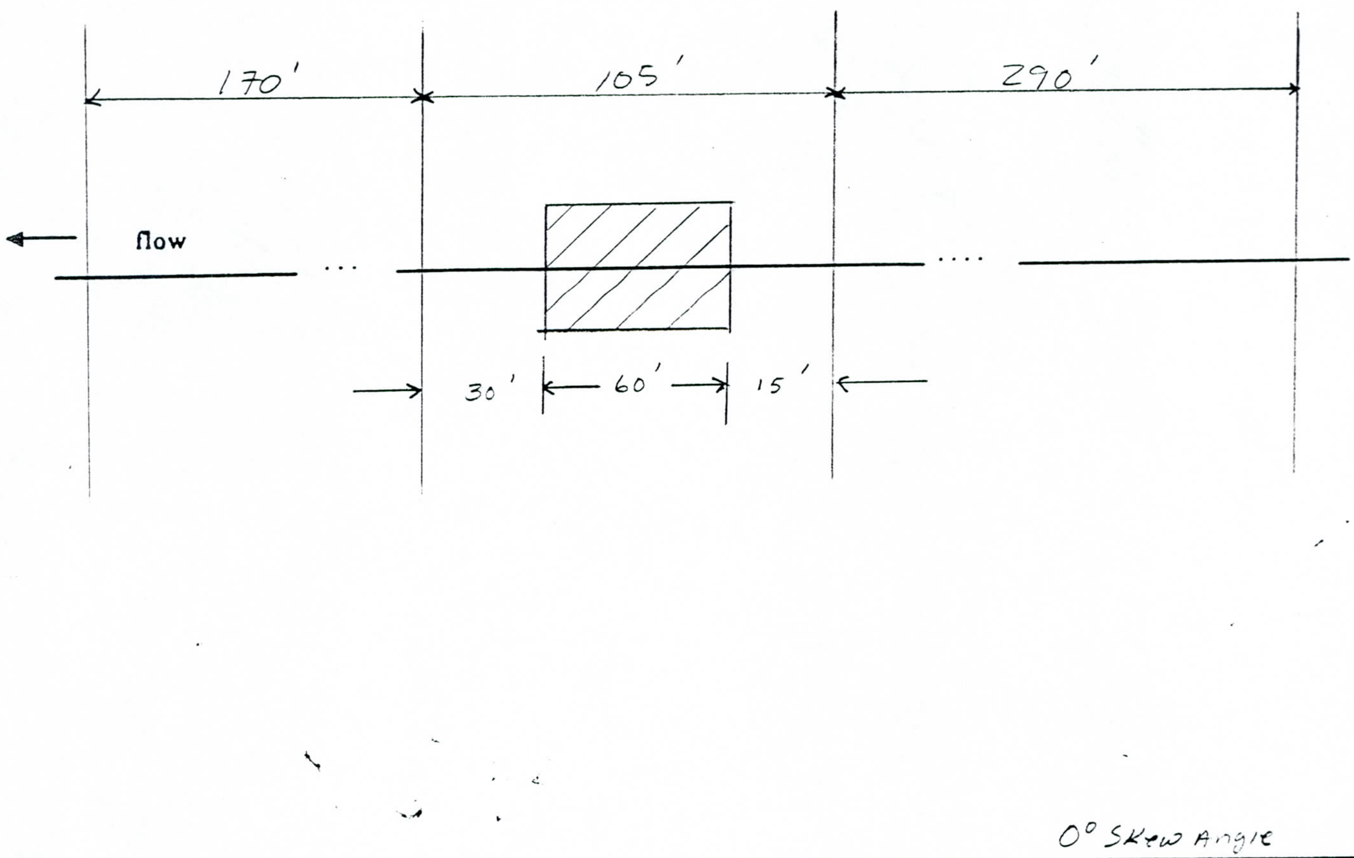


Sketch the plan view of the structure(s) Show, at a minimum, the skew angle, cross-section locations, distances between cross sections, and length of structure (s).



Attach plans of the structure (s) certified by a registered professional engineer.

Culvert length or bridge width (ft)	60.7
Calculated culvert/bridge area (ft²) by the hydraulic model, if applicable	N/A
Total culvert/bridge area (ft²)	255

Elevations Above Which Flow is Effective for Overbanks

	Left Overbank	Right Overbank
Upstream face	1300.33	1299.0
Downstream face	1299.41	1297.78

Minimum Top of Road Elevation

	Left Overbank	Right Overbank
Upstream face	1300.33	1298.00
Downstream face	1299.41	1297.78

100-Year flood elevations	Water Surface Elevations	Energy Gradient Elevations
Upstream face	1296.41	1297.97
Downstream face	1297.61	1297.84

Discharge	Low Flow	Pressure Flow	Weir Flow	Total Flow
Amount of flow through/over the structure (s) (cfs)	N/A	840	N/A	840

The maximum depth of flow over the roadway/railroad (ft.) .... N/A

Weir length (ft.) .... N/A

Top Widths	Total Floodplain Width	Total Effective Flow Width	Floodway Width
Upstream face	26.78	26.78	N/A
Downstream face	156.30	156.30	N/A

3. ANALYSIS (Cont'd)

Loss Coefficients

Entrance loss coefficient	0.4
Manning's "n" value assigned to the structure(s)	0.028
Friction loss coefficient through structure (s)	0.06
Other loss coefficients (e.g., bend manhole, etc.)	0.07
Total loss coefficient	0.13
Weir coefficient	2.6
Pier coefficient	N/A
Contraction loss coefficient	0.1
Expansion loss coefficient	0.3

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. a. Is there any indication from historical records that sediment transport (*including scour and deposition*) can affect the 100-year water surface elevations? .... ☐ Yes ☒ No

   b Based on the conditions (*such as geomorphology, vegetative cover and development of the watershed and stream-bed, and bank conditions*), is there a potential for debris and sediment transport (*including scour and deposition*) to affect the 100-year water surface elevations and/or conveyance capacity through the bridge/culvert? .... ☐ Yes ☒ No

2. If the answer to either 1a or 1b is yes:

   a. What is the estimated sediment (*bed material*) load?

   ________cfs (*attach gradation curve*)

   Explain method used to estimate the sediment transport and the depth of scour and/or deposition________________________________

   b. Will sediment accumulate anywhere through the bridge/culvert? ☐ Yes ☐ No

   If yes, explain the impact on the conveyance capacity through the bridge/culvert?________________________________

5. FLOODWAY ANALYSIS

Explain method of bridge encroachment (floodway run)

N/A

5. FLOODWAY ANALYSIS (Cont'd)

Comments *(explain any unusual situations)*:

Attach analysis.

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT FORM**	FEMA USE ONLY	*O.M.B. No. 3067-0148* *Expires July 31, 1997*

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 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.

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.

Community Name: City of Phoenix

Flooding Source: 10th Street Wash

Project Name/Identifier: 10th Street Wash Detention Basins

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Cave Creek Road

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier): River Station 1.527

3. This revision reflects *(check one of the following)*:

   ☐ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☒ New analysis of bridge/culvert previously modeled in the FIS

   (Explain why new analysis was performed) New geometry upstream and downstream of bridge. Also, HEC_RAS was used instead of HEC-2.

2. BACKGROUND

Provide the following information about the structure:

1 Dimension, material, and shape of structure (e.g. two 10 x 5 feet reinforced concrete box culvert; three 30-foot span bridge with 2 rows of two 3- foot diameter circular piers; 40-foot wide ogee shape spillway) 2 15 x 8 reinforced concrete box culverts

2. Entrance geometry of culvert/type of bridge opening (e.g. 30° - 75° wing walls with square top edge, sloping embankments and vertical abutments) 30°-75° wingwalls with square top edge, vertical abutments

3. Hydraulic model used to analyze the structure (*e.g., HEC-2 with special bridge routine, WSPRO, HY8*) HEC-RAS

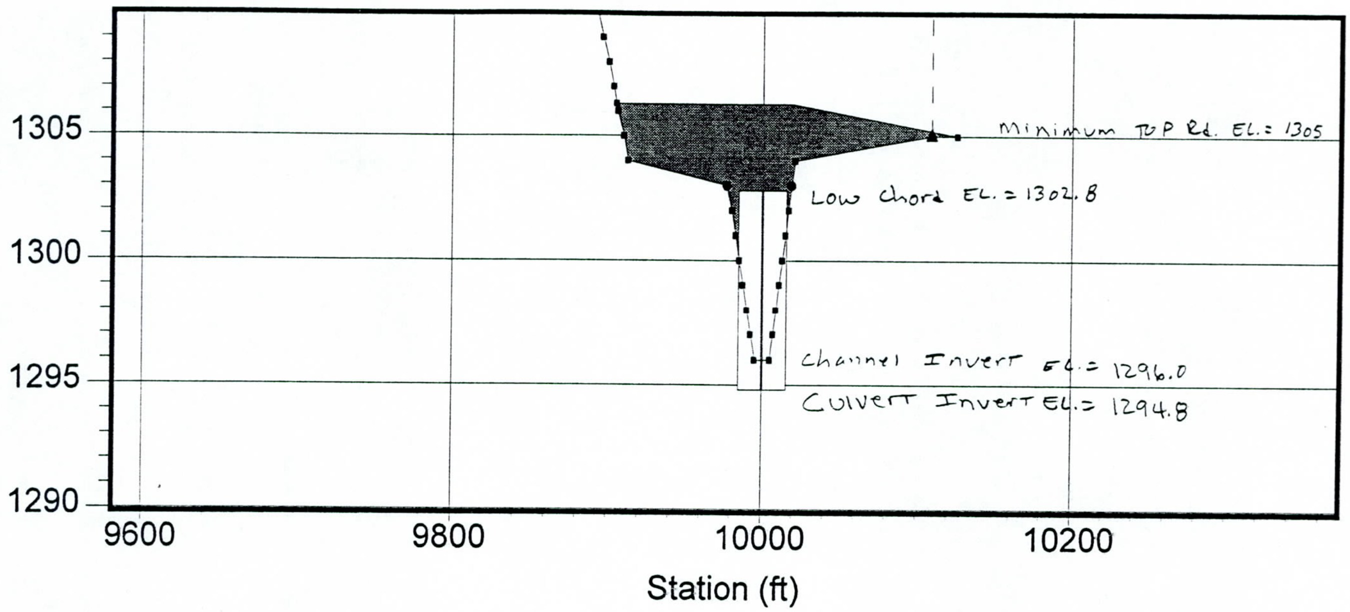
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

Note: If any items do not apply to submitted hydraulic analysis, indicate with "N/A"
*** One form per new/revised bridge/culvert**

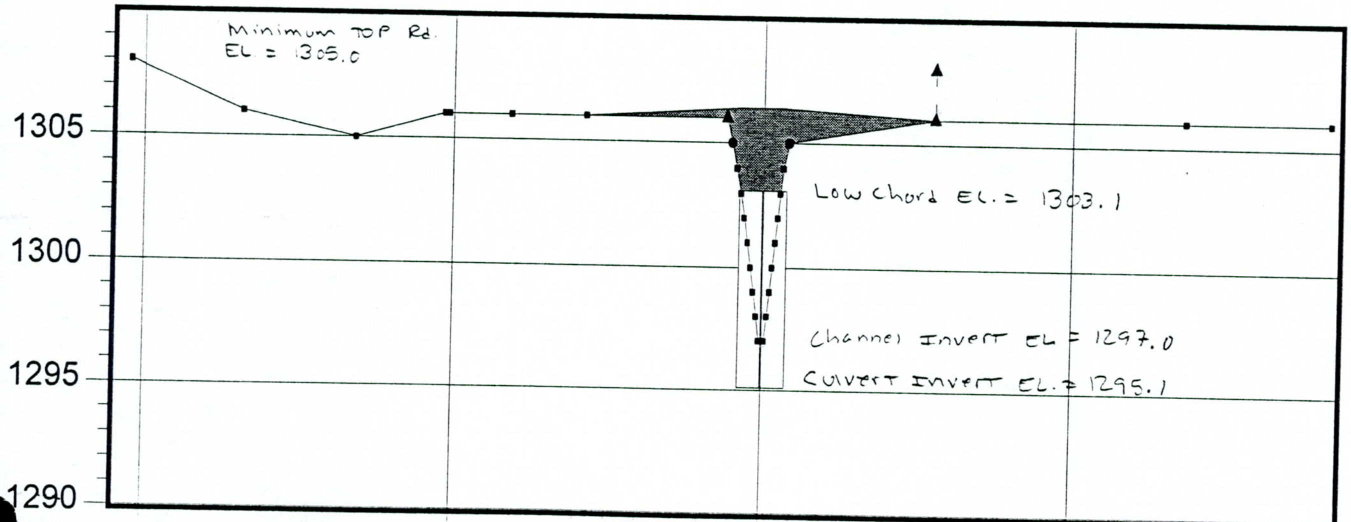
PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

3. ANALYSIS

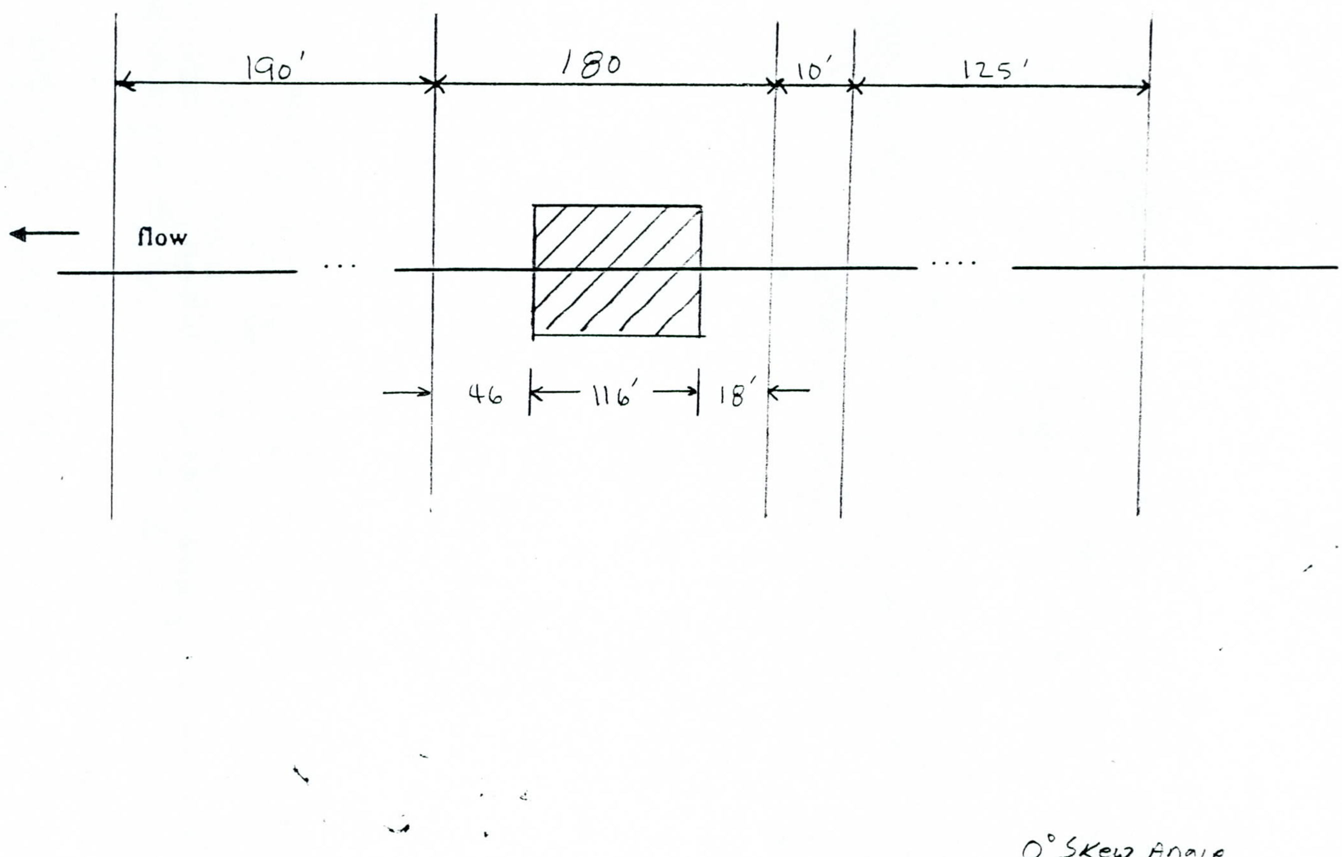
Sketch the downstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, minimum top of road elevation, and ineffective flow widths.



Sketch the upstream face of the structure together with the road profile. Show, at a minimum, the maximum low chord elevation, invert elevation, and minimum top of road elevation.



Sketch the plan view of the structure(s) Show, at a minimum, the skew angle, cross-section locations, distances between cross sections, and length of structure (s).



Attach plans of the structure (s) certified by a registered professional engineer.

Culvert length or bridge width (ft)	116 ft
Calculated culvert/bridge area (ft^2) by the hydraulic model, if applicable	N/A
Total culvert/bridge area (ft^2)	240

Elevations Above Which Flow is Effective for Overbanks

	Left Overbank	Right Overbank
Upstream face	1306	1306
Downstream face	1306.3	1305.0

Minimum Top of Road Elevation

	Left Overbank	Right Overbank
Upstream face	1305	1306
Downstream face	1306.3	1305

100-Year flood elevations	Water Surface Elevations	Energy Gradient Elevations
Upstream face	1302.82	1304.46
Downstream face	1302.64	1303.04

Discharge	Low Flow	Pressure Flow	Weir Flow	Total Flow
Amount of flow through/over the structure (s) (cfs)	N/A	840	N/A	840

The maximum depth of flow over the roadway/railroad (ft.) .... N/A

Weir length (ft.) .... N/A

Top Widths	Total Floodplain Width	Total Effective Flow Width	Floodway Width
Upstream face	25.33	25.33	N/A
Downstream face	40.53	40.53	N/A

3. ANALYSIS (Cont'd)

Loss Coefficients

Entrance loss coefficient	0.4
Manning's "n" value assigned to the structure(s)	0.025
Friction loss coefficient through structure (s)	0.11
Other loss coefficients (e.g., bend manhole, etc.)	0.08
Total loss coefficient	0.19
Weir coefficient	2.6
Pier coefficient	N/A
Contraction loss coefficient	0.1
Expansion loss coefficient	0.3

4. SEDIMENT TRANSPORT CONSIDERATIONS

1. a. Is there any indication from historical records that sediment transport *(including scour and deposition)* can affect the 100-year water surface elevations? .... ☐ Yes ☒ No

   b Based on the conditions *(such as geomorphology, vegetative cover and development of the watershed and stream bed, and bank conditions)*, is there a potential for debris and sediment transport *(including scour and deposition)* to affect the 100-year water surface elevations and/or conveyance capacity through the bridge/culvert? .... ☐ Yes ☒ No

2. If the answer to either 1a or 1b is yes:

   a. What is the estimated sediment *(bed material)* load?

   ________cfs *(attach gradation curve)*

   Explain method used to estimate the sediment transport and the depth of scour and/or deposition________________

   b. Will sediment accumulate anywhere through the bridge/culvert? ☐ Yes ☐ No

   If yes, explain the impact on the conveyance capacity through the bridge/culvert?________________

5. FLOODWAY ANALYSIS

Explain method of bridge encroachment (floodway run)

N/A

5. FLOODWAY ANALYSIS (Cont'd)

Comments *(explain any unusual situations)*:

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Attach analysis.