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*Oak Street Alternative CLOMR*

# STP Papago
## Regional Flood Control Project

## Watershed Study (FCD 95-46)

Prepared for:
Flood Control District of Maricopa County

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091131.00

Kimley-Horn
and Associates, Inc.
*Engineering, Planning, and Environmental Consultants*

*Oak Street Alternative CLOMR*

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
24426
DOUGLAS J.
PLASENCIA
Date Signed 10/7/97
ARIZONA, U.S.A.

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# 1. INTRODUCTION

## 1.1 Purpose

The purpose of this submittal is to obtain comments and if feasible a CLOMR for a proposed revision to a mapped floodplain in Scottsdale, Arizona. Drainage improvements have been proposed that will reduce the extent of the floodplain, through a joint project of the City and the Flood Control District of Maricopa County. The proposed improvements are part of the recently completed STP Papago Watershed Study, which developed design concepts and preliminary plans for the area. Through a subsequent contract final design plans will be prepared over the next two years to support a subsequent CLOMR or LOMR.

## 1.2 Background

The Cross Cut Canal is an irrigation facility running from North to South through a portion of Scottsdale, Arizona. The Canal begins approximately at Indian School Road as a turn out from the Arizona Canal, and proceeds to the south where excess water would ultimately discharge to the Salt River. The canal parallels the 64th Street and 66th Street Alignment through Scottsdale, prior to entering the Papago Park Complex in the City of Phoenix.

Immediately to the West of the Cross Cut Canal an unnumbered A Zone was designated between Thomas Road to the North and McDowell Road to the South. The existing floodplain is shown on FIRM Panel 2155, adopted September 30, 1995, and is shown in this report as an existing condition on the Existing Conditions Work Map in Appendix A. This floodplain was designated to reflect the potential for easterly flows to become trapped by the Cross Cut Canal, causing a ponded floodplain immediately to the west of the Canal. At the time of mapping it was a common practice in Maricopa County to designate an approximate floodplain based on an assumed ponding elevation to the top of the canal bank.

### 1.2.1 Approach

The mapped floodplain in this case is reflective of ponded or trapped water behind the irrigation canal, with stage being dependent on volume/outfall relationships versus a conveyance based approach. As such the floodplain was analyzed utilizing reservoir routing tools contained in HEC-1.

Standard step backwater hydraulics such as HEC-2 were not necessary based on the physical situation. However. STORMPlus was utilized to design proposed storm drains, and associated rating curves, sized to reduce the extent of the floodplain.

### 1.2.2 STP project

In September 1995, heavy rainfall caused extensive street drainage problems and led to the flooding of homes in several neighborhoods in southwest Scottsdale. The STP Papago Watershed Study was initiated by the Flood Control District of Maricopa County (FCMCD) in response to these problems and in response to a request by the City of Scottsdale to evaluate and resolve drainage issues in the area.

During the project formulation phase, one of the key objectives identified for the project was to reduce or eliminate the limits of an existing unnumbered Zone A floodplain. This existing floodplain is located along the west side of the Cross Cut Canal, between Thomas Road and McDowell Road. Under existing conditions, runoff from Papago Park, the Scottsdale Auto Park, and the Hy-View neighborhood collects in the Scottsdale Auto Park basin at the south end of 66th Street. The basin does not discharge properly causing runoff to pond during a storm event. After the storm event, the standing water must be pumped out of the basin. During a large storm event in September 1995, 14 homes were inundated due to standing water which flooded 66th Street.

Several alternatives were analyzed to alleviate this flooding and a recommended plan was developed and submitted to the Flood Control District. This recommended plan will provide a gravity outfall for the Scottsdale Auto Park basin and eliminate standing water in the Hy-View neighborhood. It is designed to

contain the 100 year event in the Scottsdale Auto Park basin. It is also designed to provide diversions of runoff away from the residential neighborhoods without storm drain systems in place. Finally, it provides an outfall sized to contain the 10 year event for the entire tributary basin. Specific components are as follows:

- Runoff from Papago Park and the Arizona National Guard facility is collected along Oak Street in a 10 year storm drain and diverted east to 64th Street. During a 100 year event, Oak Street will be overtopped and some runoff will flow through the neighborhood north of Oak Street to Thomas Road.
- Runoff from Papago Park and the Armory is collected along 64th Street in a 100 year storm drain and diverted north to Oak Street.
- Runoff from the Hy-View neighborhood is conveyed south along 66th Street to the Scottsdale Auto Park basin. Flows from the area between Hubbell St. and Oak St. are collected along 66th Street in a 100 year storm drain and diverted north to Oak Street.
- The Scottsdale Auto Park basin outfalls to the storm drain in 66th Street which conveys 100 year basin discharge north to Oak Street.
- Runoff is combined at Oak Street in a 100 year storm drain and is conveyed east under the Cross Cut Canal along Oak Street to Indian Bend Wash.
- The Oak Street Outfall is sized to provide, at a minimum, 10 year protection for the entire tributary basin.
- The drainage system south of McDowell Road has not been modified, except by eliminating the flow currently crossing McDowell Road at the Scottsdale Auto Park. This will be accomplished by installing pipe plugs at both ends of the existing culvert.

## 2. MAPPING AND SURVEY INFORMATION

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

Two sources of aerial photography were provided for use in the study. The aerial topography for the City of Scottsdale was flown from September to November 1993 and has a one foot contour interval.

### 2.2 Watershed maps, hydrologic analysis maps

See Appendix C.

### 2.3 Hydraulic analysis maps

See attached plans. The hydraulic analysis was done to design a storm drain to alleviate the Zone A ponding on the west side of the Cross Cut Canal.

### 2.4 FIRM, FHBM draft maps

See Appendix B for a copy of the FIRM Map number 04013C2155 E.

### 2.5 Community maps

See attached Work Maps (Appendix A), community information provided from the City of Scottsdale GIS system.

### 2.6 Miscellaneous maps

The runoff zones, soil groups and land use maps used in the hydrologic analysis follow.

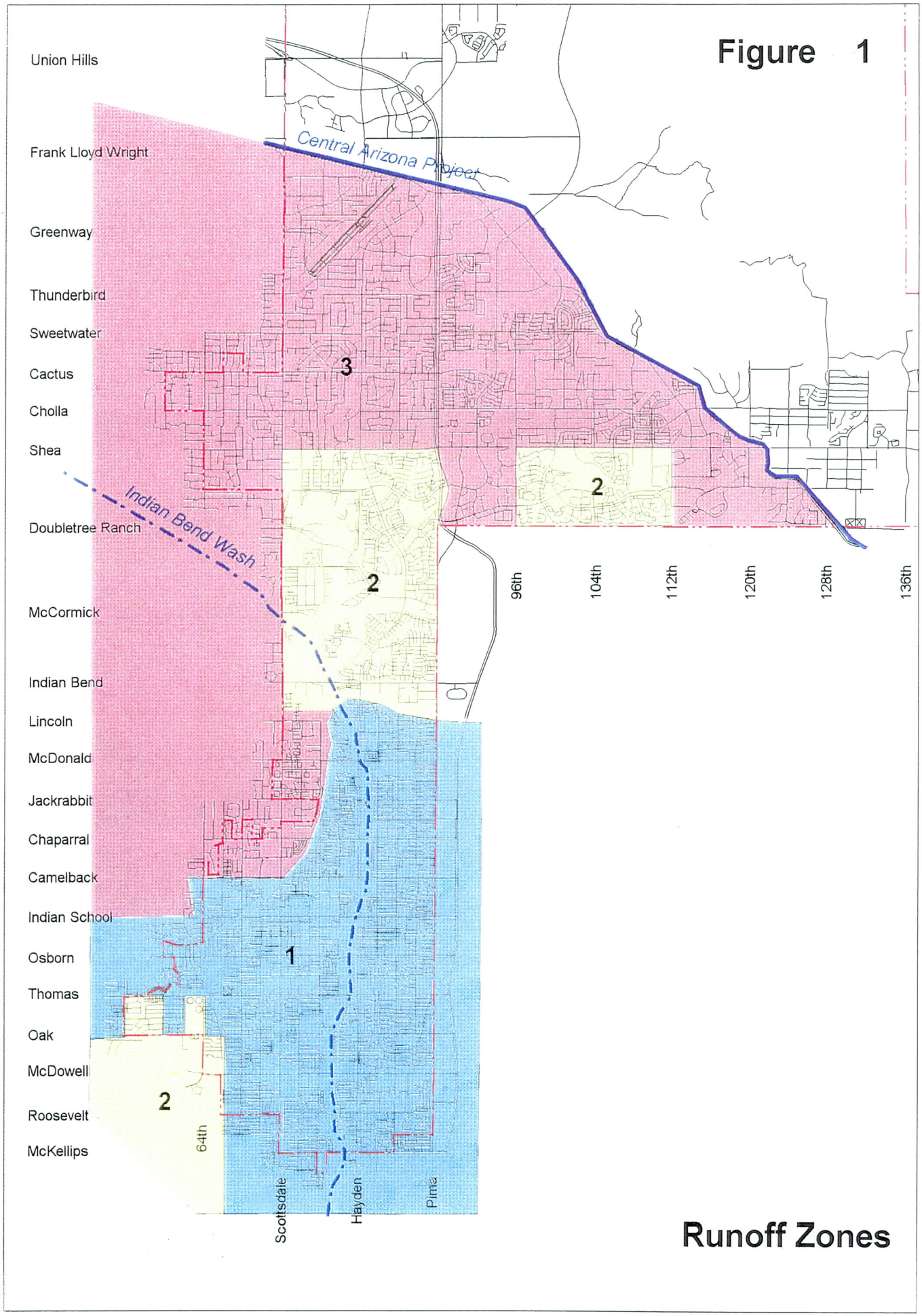
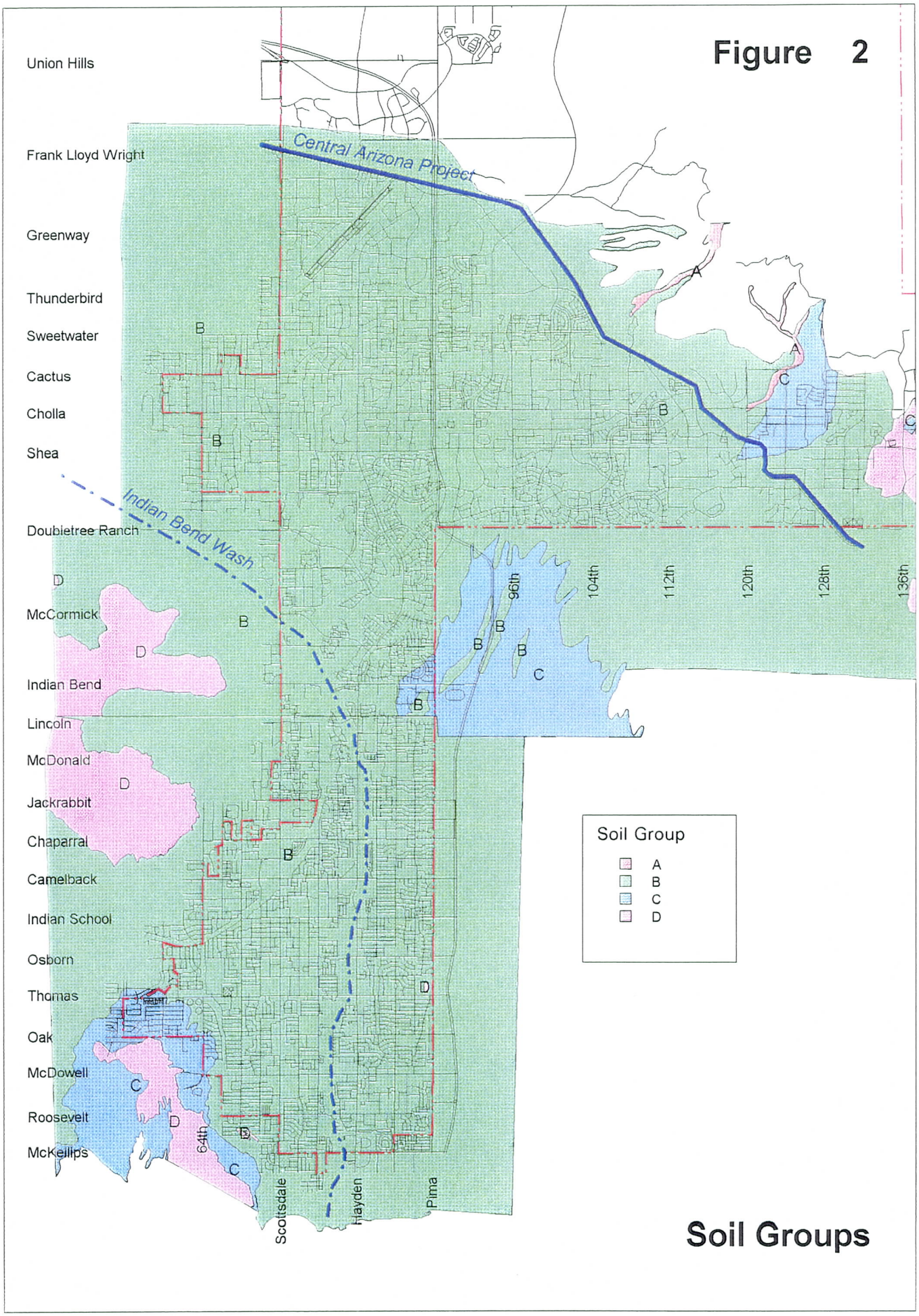


Figure 1
Union Hills
Frank Lloyd Wright
Greenway
Thunderbird
Sweetwater
Cactus
Cholla
Shea
Doubletree Ranch
McCormick
Indian Bend
Lincoln
McDonald
Jackrabbit
Chaparral
Camelback
Indian School
Osborn
Thomas
Oak
McDowell
Roosevelt
McKellips
Central Arizona Project
Indian Bend Wash
3
2
2
1
2
64th
Scottsdale
Hayden
Pima
96th
104th
112th
120th
128th
136th
Runoff Zones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Union Hills
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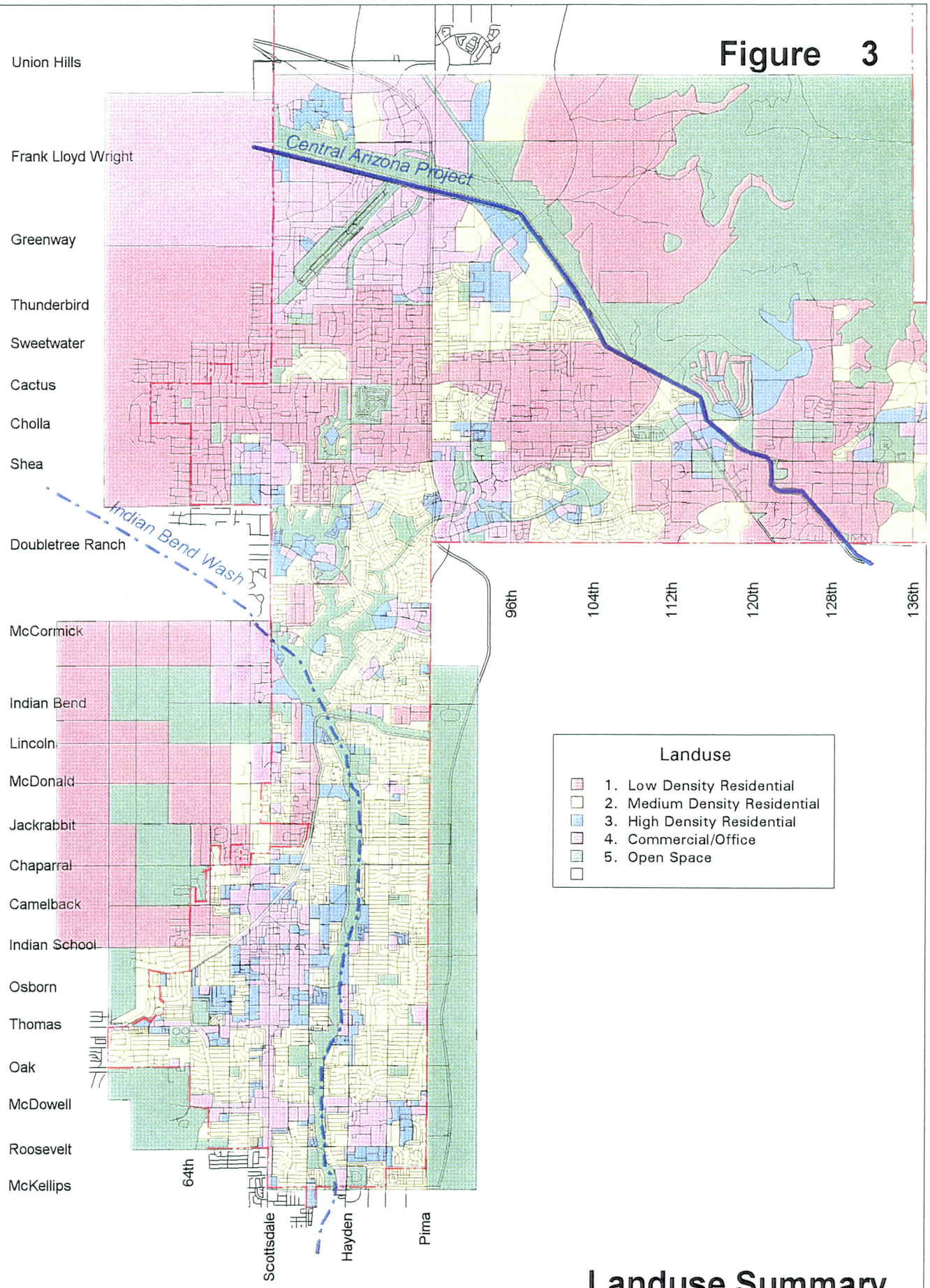
Thomas
Oak
McDowell
Roosevelt
McKellips
Central Arizona Project
Indian Bend Wash
64th
Scottsdale
Hayden
Pima
96th
104th
112th
120th
128th
136th
Soil Group
A
B
C
D
Soil Groups

# Figure 3




## Landuse Summary

# 3. HYDROLOGIC ANALYSIS

## 3.1 Method description

Hydrologic modeling of the study area was performed using the U.S. Army Corps of Engineers Flood Hydrograph Package (HEC-1) for a 100-year, 6-hour rainfall. The modeling was based on the HEC-1 files developed as part of the City of Scottsdale Stormwater Master Plan and Management Program. The results were reviewed and modified as needed for this project. In performing these revisions, care was taken to use the same methodology and sources as were used in the original HEC-1 files.

The City of Scottsdale Stormwater Master Plan and Management Program is based on the City of Scottsdale's Facility Management System (FMS). The FMS is a computerized database which uses spatial analysis techniques and computer programming to link the data and automate some of the hydrologic modeling.

## 3.2 Parameter estimation

The parameters for the hydrologic analysis were initially based on the City of Scottsdale's HEC-1 files in the Stormwater Master Plan and Management Program. They include drainage area boundaries, precipitation depth, curve numbers, runoff zones, hydrologic soil conditions, percent impervious cover, land use, and overland flow parameters.

### 3.2.1 Drainage area boundaries

The drainage area boundaries were initially based on the City of Scottsdale's drainage area maps in the Stormwater Master Plan and Management Program. The boundaries were then verified and revised as described below.

### 3.2.2 Physical parameters

The Natural Resource Conservation Service (formerly the Soil Conservation Service) curve number (CN) approach was used to estimate rainfall losses. This approach requires the determination of a curve number and a percentage of impervious surface for each subbasin. Curve numbers were selected based on the runoff zone (Figure 2), hydrologic soil group (Figure 3), and Table 1 for each subbasin. The percentage of impervious surface was determined based on the land use (Figure 4) and Table 2 for each subbasin.

The determination of each CN was made in the FMS by programming it to calculate a composite value based on the runoff zones (undeveloped land use) and hydrologic soil groups in each subbasin. Each value was checked and if necessary overridden to better reflect the hydrologic conditions. Utilizing standard modeling practices, the CN values were not adjusted to reflect urban use, rather an estimate of the percentage of impervious area was grouped to the CN value on the HEC-1 LS record. It has been demonstrated that this approach is a better method of reflecting urban land uses.

Runoff was computed using the kinematic overland flow option in HEC-1 to be consistent with the City of Scottsdale approved hydrologic methods. This methodology uses overland flow planes to simulate watershed response. Pervious surface and impervious surface overland flow planes were utilized to represent runoff from each subbasin. Modeling was based on the assumption that the overland flow from both pervious and impervious surfaces has a uniform slope. The overland flow parameters for a specific subbasin were then selected in the FMS by programming it to calculate a composite value based on the land uses within the subbasin (Table 2).

## Table 1 SCS Curve Numbers

| Runoff Zone | Description of Vegetative Cover | Hydrologic Soil Group A | B | C | D |
|---|---|---|---|---|---|
| 1 | Open space with grass cover < 50% | 68 | 79 | 86 | 89 |
| 2 | Open space with grass cover 50-75% | 49 | 69 | 79 | 84 |
| 3 | Desert shrub in poor condition | 63 | 77 | 85 | 88 |

## Table 2 Percent Impervious and Overland Flow Parameters

| Land Use | Code | Percent Impervious | OVERLAND FLOW PARAMETERS Pervious Length | Pervious Slope | Pervious Rough's | Impervious Length | Impervious Slope | Impervious Rough's |
|---|---|---|---|---|---|---|---|---|
| 1. RESIDENTIAL | | | | | | | | |
| 1 DU PER 5 ACRES | 10 | 7 | 300 | 0.0100 | 0.200 | 100 | 0.0100 | 0.100 |
| 1 DU PER 2-3 ACRES | 11 | 15 | 300 | 0.0100 | 0.200 | 100 | 0.0100 | 0.100 |
| 1 DU PER 1-2 ACRES | 12 | 15 | 300 | 0.0100 | 0.200 | 100 | 0.0100 | 0.100 |
| 1-2 DU PER ACRE | 13 | 24 | 150 | 0.0100 | 0.300 | 50 | 0.0100 | 0.100 |
| 2-4 DU PER ACRE | 14 | 35 | 150 | 0.0100 | 0.300 | 50 | 0.0100 | 0.100 |
| 4-8 DU PER ACRE | 15 | 54 | 150 | 0.0100 | 0.300 | 50 | 0.0100 | 0.100 |
| 8-12 DU PER ACRE | 16 | 74 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| 12-22 DU PER ACRE | 17 | 94 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| TOURIST ACCOMMODATIONS | 18 | 85 | 150 | 0.0100 | 0.300 | 50 | 0.0100 | 0.100 |
| LOW INTENSITY RESORT | 19 | 85 | 150 | 0.0100 | 0.300 | 50 | 0.0100 | 0.100 |
| RESIDENTIAL/HIGH DENSITY | RHD-2 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| RESIDENTIAL/HOTEL | RH-2 | 85 | 150 | 0.0100 | 0.300 | 50 | 0.0100 | 0.100 |
| 2. COMMERCIAL/OFFICE | | | | | | | | |
| NEIGHBORHOOD COMMERCIAL | 21 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| GENERAL COMMERCIAL | 22 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| MINOR OFFICE | 31 | 85 | 150 | 0.0100 | 0.300 | 50 | 0.0100 | 0.100 |
| MAJOR OFFICE | 32 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| MINOR EMPLOYMENT | 33 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| GENERAL EMPLOYMENT | 34 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| RESEARCH AND DEVELOPMENT | 36 | 72 | 200 | 0.0100 | 0.300 | 200 | 0.0100 | 0.100 |
| OFFICE/COMMERCIAL | OC-1 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| | OC-2 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| OFFICE/RESIDENTIAL | OR-2 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| MEDICAL | M-2 | 72 | 200 | 0.0100 | 0.300 | 200 | 0.0100 | 0.100 |
| CIVIC CENTER | CC-2 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| RETAIL/SPECIALTY | RS-1 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| REGIONAL COMMERCIAL/OFFICE | RCO-2 | 85 | 20 | 0.0100 | 0.400 | 200 | 0.0100 | 0.100 |
| 3. OPEN SPACE | | | | | | | | |
| NATURAL OPEN SPACE | 41 | 1 | 300 | 0.0100 | 0.200 | 100 | 0.0100 | 0.100 |
| LIMITED USE AREA | 42 | 1 | 300 | 0.0100 | 0.200 | 100 | 0.0100 | 0.100 |
| DEVELOPED OPEN SPACE | 42 | 80 | 300 | 0.0100 | 0.200 | 100 | 0.0100 | 0.100 |
| CULTURAL/INSTITUTIONAL | 44 | 85 | 200 | 0.0100 | 0.300 | 200 | 0.0100 | 0.100 |
| UTILITIES | 45 | 72 | 200 | 0.0100 | 0.300 | 200 | 0.0100 | 0.100 |

### 3.2.3 Precipitation

Precipitation depths used in this study were determined based on the location of the study area and the isohyetal maps contained in the National Weather Service manual. Different values were considered for each of the major basins in the study area, however, the entire study area had the same results. Weighted average rainfall depths for the 2 yr, 6 hr; 2 yr, 24 hr; 100 yr, 6 hr; and 100 yr, 24 hr were then entered into the FMS for each major basin. The PREFRE model was run through the FMS and all of the other rainfall depths required by the HEC-1 models for the 2, 5, 10, 25, 50 and 100 year return periods were automatically calculated.

The PREFRE model calculates precipitation depth-duration-frequency values for the Western United States. It was developed by the National Weather Service and was later revised by the Bureau of Reclamation. For this project, a Primary Zone number of 7 and a Short Duration Zone number of 8 was used for all major basins. The rainfall depths used in the HEC-1 models are shown in Table 3.

**Table 3 Depth - Duration - Frequency Values**

| Storm Duration | 10 year depth [in] | 100 year depth [in] |
|---|---|---|
| 5 min | 0.50 | 0.76 |
| 15 min | 0.97 | 1.50 |
| 1 hour | 1.61 | 2.55 |
| 2 hour | 1.76 | 2.81 |
| 3 hour | 1.86 | 2.98 |
| 6 hour | 2.05 | 3.30 |

### 3.3 Calibration

The City of Scottsdale Stormwater Master Plan and Management Program HEC-1 models were verified to validate the reliability of the hydrologic modeling for use in this project. The verification objectives were undertaken as follows:

- All major basins were visually inspected to verify reasonableness of the hydrologic variables, drainage area boundaries, and flow paths.
- Topographic mapping was reviewed as provided by the City of Scottsdale to verify drainage area boundaries and flow paths.
- New topographic mapping was developed for the project for the City of Phoenix portion of the study area which affected Basin 03. The drainage area boundaries and flow paths in the new mapping area were then revised as necessary.

Other parameters were qualitatively reviewed for reasonableness based on the selection criteria and methodology employed by the FMS.

### 3.4 Special problems / solutions

The Auto Park detention basin outlets into a proposed storm drain in 66th Street This storm drain runs north and joins the proposed Oak Street outfall storm drain. To complete the analysis it was necessary to develop a rating curve at the Auto Park to be incorporated into the HEC-1 analysis, that was reflective of the backwater in the proposed storm drain system. The rising and falling limb of the outflow hydrograph for the Auto Park was compared in time to the rising and falling limb hydrograph in the proposed Oak Street outfall storm drain. For a given flow value from the Auto Park, the most conservative outfall flow rate at Oak Street was utilized to conduct backwater calculations. Through this process pipe sizes were adjusted and a final rating curve established for the Auto Park that was reflective of backwater conditions

in the storm drain.

**Table 4 Rating Curve Calculation for Auto Park**

| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|
| | **Auto Park** | | **66th & Oak** | | | |
| Auto Park Q | Time rising limb | Time receding limb | $Q_{rising}$ | $Q_{receding}$ | HGL Oak | WS Auto Park |
| [cfs] | [hr] | [hr] | [cfs] | [cfs] | [ft] | [ft] |
| 20 | 0248 | 0402 | 40 | **200** | 1255.11 | 1259.09 |
| 40 | 0254 | 0400 | 105 | **210** | 1255.17 | 1259.61 |
| 60 | 0301 | 0358 | 175 | **230** | 1255.29 | 1260.09 |
| 80 | 0302 | 0356 | 200 | **270** | 1255.52 | 1260.56 |
| 100 | 0303 | 0355 | 245 | **280** | 1255.58 | 1261.05 |
| 120 | 0305 | 0353 | **310** | 300 | 1255.74 | 1261.65 |
| 140 | 0308 | 0349 | **422** | 342 | 1256.3 | 1262.55 |
| 160 | 0312 | 0341 | **484** | 440 | 1256.6 | 1263.32 |
| 180 | 0318 | | **580** | | 1260.46 | 1266.89 |
| 190 | 0319 | | **600** | | 1262.62 | 1269.62 |

Denotes Q used in Oak Street STORMPlus model

### 3.5 Final results/computer runs

The HEC-1 output file and a digital copy of the input file is included in Appendix D.

## 4. HYDRAULIC ANALYSIS

### 4.1 Method description

The recommended plan hydraulics were discussed with the District staff prior to preliminary design to develop a consensus on the details of the design. Based on these decisions, the hydraulics were designed using the STORMPlus software. The hydraulics design for this study consisted of a storm drain to alleviate the historical flooding in the HY - View neighborhood due to ponding on the west side of the Cross Cut Canal. The starting tailwater for this analysis was provided by the Flood Control District of Maricopa County.

### 4.2 Parameter estimation

#### 4.2.1 Manning's n-value

Concrete pipes were used with a Manning's n-value = 0.013.

### 4.3 Final results/computer runs

Copies of the STORMPlus output files and digital copies of the input files are provided in Appendix E. The storm drain layout and the hydraulic grade line for the design event are also shown on the attached plans to demonstrate performance.

## 5. CONCLUSION

Based on the above described analysis, if the recommended plan is built as proposed on the attached plan sheets the historic flooding on 66th Street could be eliminated in the 100 year event. The Auto Park detention basin has been sized to accommodate runoff from the HY-View neighborhood and a storm drain has been designed to carry the 100 year outflow to a proposed storm drain in Oak Street which outfalls at Indian Bend Wash.

The impact to the floodplain Zone A currently mapped on FIRM Panel #2155 will be to reduce the floodplain significantly to that shown on the Work Map (with project condition) (Appendix A). This should remove all of the homes in the Hy-View neighborhood from the floodplain upon construction of the Oak Street Outfall. Once construction is completed and reviewed by FEMA, all 160 homes could be removed from the floodplain, for up to an $80,000 annual savings to the residents of the Hy-View neighborhood.

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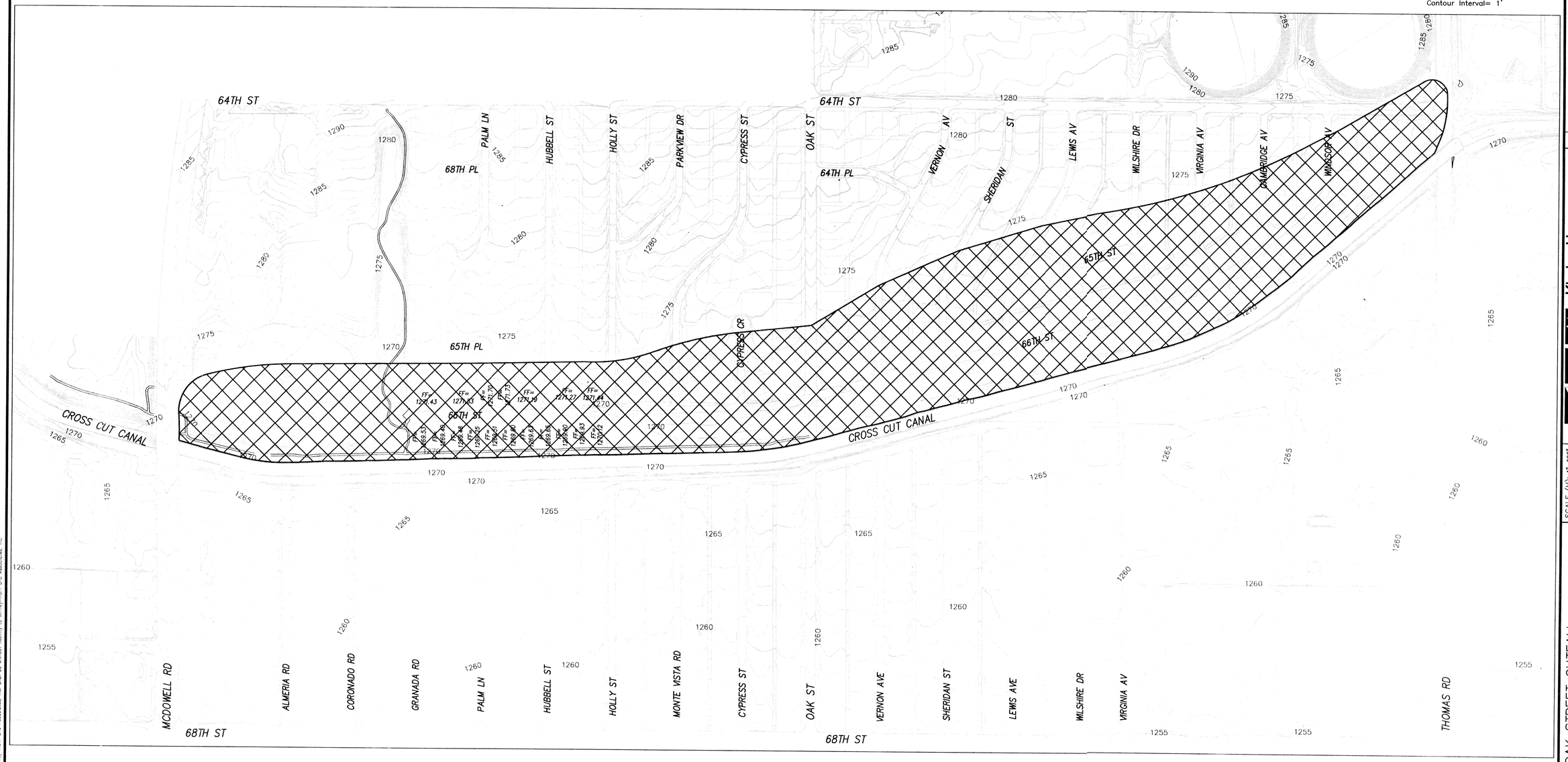
# Appendix A Work Maps




## DATUM INFORMATION

THE BASIS OF ELEVATION WAS OBTAINED FROM THE CITY OF SCOTTSDALE VERTICAL CONTROL SYSTEM, USING CITY OF SCOTTSDALE STATION NO. 4333, A CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE AT THE INTER-SECTION OF 64TH STREET AND OAK STREET.

STATION NO. 4333 (NAVD 88) ELEVATION= 1283.898

CONVERSION FACTORS:
CITY OF SCOTTSDALE (NGVD 29)= CITY OF SCOTTSDALE (NAVD 88) MINUS 1.773
CITY OF PHOENIX= CITY OF SCOTTSDALE (NAVD 88) MINUS 1.925
CITY OF TEMPE= CITY OF SCOTTSDALE (NAVD 88) MINUS 1.055

(CITY OF SCOTTSDALE, ARIZONA COMMUNITY # 04013C)

APPROXIMATE EXISTING CONDITION PER F.E.M.A. MAP # 04013C2155E
NOT TO BE USED FOR FLOODPLAIN DETERMINATIONS.

TWO WORKING DAYS BEFORE YOU DIG CALL FOR THE BLUE STAKES
263-1100
BLUE STAKE CENTER CALL COLLECT

PRELIMINARY
FOR REVIEW ONLY
Not for construction purposes.
Kimley-Horn and Associates, Inc.
Engineer D. PLASENCIA
P.E. No. 24426 Date 10/31/97

| NO. | REVISIONS | BY | DATE | APPR. |
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Engineering, Planning, and Environmental Consultants
7600 North 15th Street, Suite 250
Phoenix, Arizona 85020 (602) 944-5500

SCALE (H): 1"=200'
SCALE (V): NONE
DRAWN BY: PDO
DESIGNED BY: RTJ
CHECKED BY: DJP
DATE: 10-28-97

# OAK STREET OUTFALL
# CONDITIONAL LETTER OF MAP REVISION WORK MAP
## EXISTING CONDITION

Registered Professional Engineer (Civil) CERTIFICATE NO. 24426 DOUGLAS J. PLASENCIA Date Signed 10/31/97 ARIZONA, U.S.A.

PROJECT NO. 091131.00
DWG. NAME 3100WM01

1

K:\-CIVIL\091131001\DWG\IMP\CLOMR\CLOMR1 Tue Oct 28 10:04:07 1997
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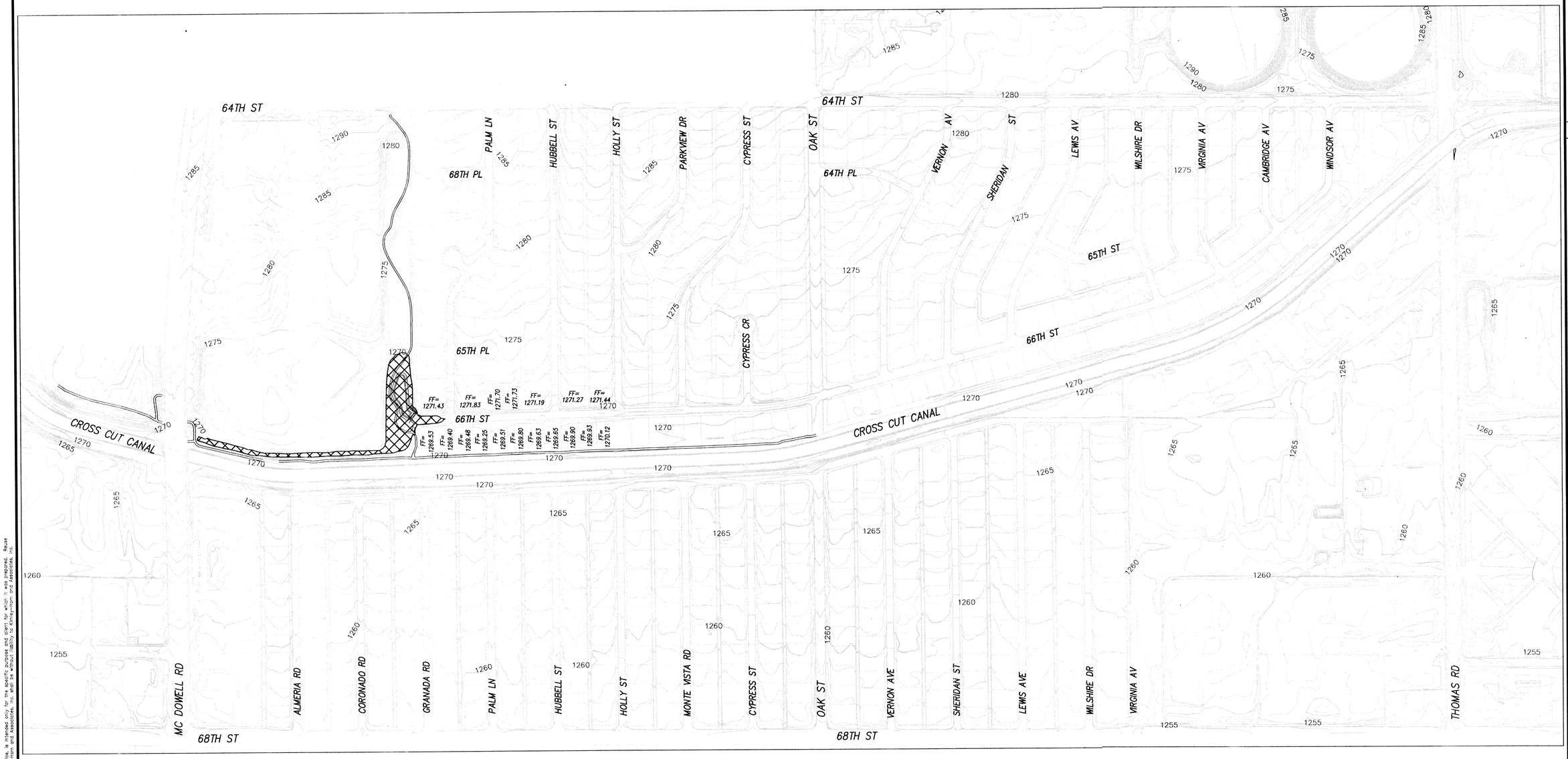


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(CITY OF SCOTTSDALE, ARIZONA COMMUNITY # 04013C)

PROPOSED 100-YEAR FLOODPLAIN PER STP PAPAGO WATERSHED STUDY, PROJECT NO. 95-46.
REVISION TO FIRM PANEL 04013C2155E, ELEV.=1267.80

TWO WORKING DAYS BEFORE YOU DIG CALL FOR THE BLUE STAKES
263-1100
BLUE STAKE CENTER CALL COLLECT

PRELIMINARY
FOR REVIEW ONLY
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SCALE (H): 1"=200'
SCALE (V): NONE
DRAWN BY: PDO
DESIGNED BY: RTJ
CHECKED BY: DJP
DATE: 10-31-97

OAK STREET OUTFALL
# CONDITIONAL LETTER OF MAP REVISION WORK MAP
WITH PROJECT CONDITION

Registered Professional Engineer (Civil) CERTIFICATE NO. 24426 DOUGLAS J. PLASENCIA Date Signed 10/31/97 ARIZONA, U.S.A.

PROJECT NO. 091131.00
DWG. NAME 3100WM02
2 of 2

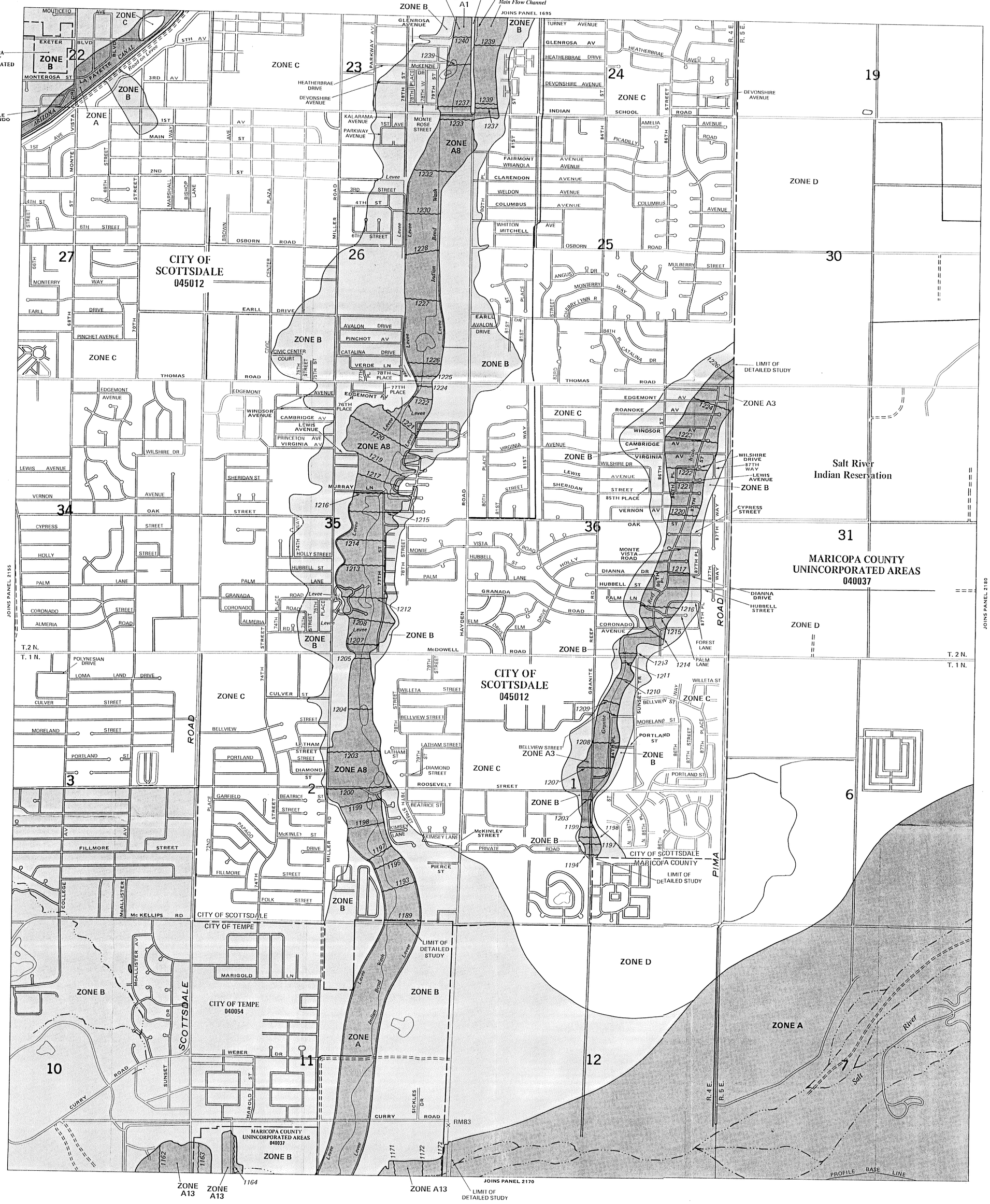
STPBAS12
Together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

K:\-CIVIL\091131000\DWG\LOMR\3100WM02 Mon Oct 20 16:40:48 1997 rj

Appendix B FIRM Maps

ELEVATION REFERENCE MARKS

| REFERENCE MARK | ELEVATION (FT. NGVD) | DESCRIPTION OF LOCATION |
|---|---|---|
| RM83 | 1174.96 | Top of pavement at centerline intersection of Hayden Road and Princess Drive West. |




## KEY TO MAP

| | |
|---|---|
| 500-Year Flood Boundary | |
| 100-Year Flood Boundary | ZONE B |
| Zone Designations | ZONE A1 / ZONE A5 |
| 100-Year Flood Boundary | |
| 500-Year Flood Boundary | ZONE B |
| Base Flood Elevation Line With Elevation In Feet** | 513 |
| Base Flood Elevation in Feet Where Uniform Within Zone** | (EL 987) |
| Elevation Reference Mark | RM7× |
| Zone D Boundary | |
| River Mile | •M1.5 |

**Referenced to the National Geodetic Vertical Datum of 1929

## EXPLANATION OF ZONE DESIGNATIONS

| ZONE | EXPLANATION |
|---|---|
| A | Areas of 100-year flood; base flood elevations and flood hazard factors not determined. |
| A0 | Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined. |
| AH | Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined. |
| A1-A30 | Areas of 100-year flood; base flood elevations and flood hazard factors determined. |
| A99 | Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined. |
| B | Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading) |
| C | Areas of minimal flooding. (No shading) |
| D | Areas of undetermined, but possible, flood hazards. |
| V | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined. |
| V1-V30 | Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined. |

## NOTES TO USER

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Certain areas not in the Special Flood Hazard Areas (zones A and V) may be protected by flood control structures.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 5.4 of the Flood Insurance Study Report

For adjoining map panels, see separately printed Map Index.

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:

APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

# FIRM
## FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2160 OF 4350

CONTAINS

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| MARICOPA COUNTY, UNINCORPORATED AREAS | 040037 | 2160 | D |
| SCOTTSDALE, CITY OF | 045012 | 2160 | D |
| TEMPE, CITY OF | 040054 | 2160 | D |

MAP NUMBER
04013C2160 D

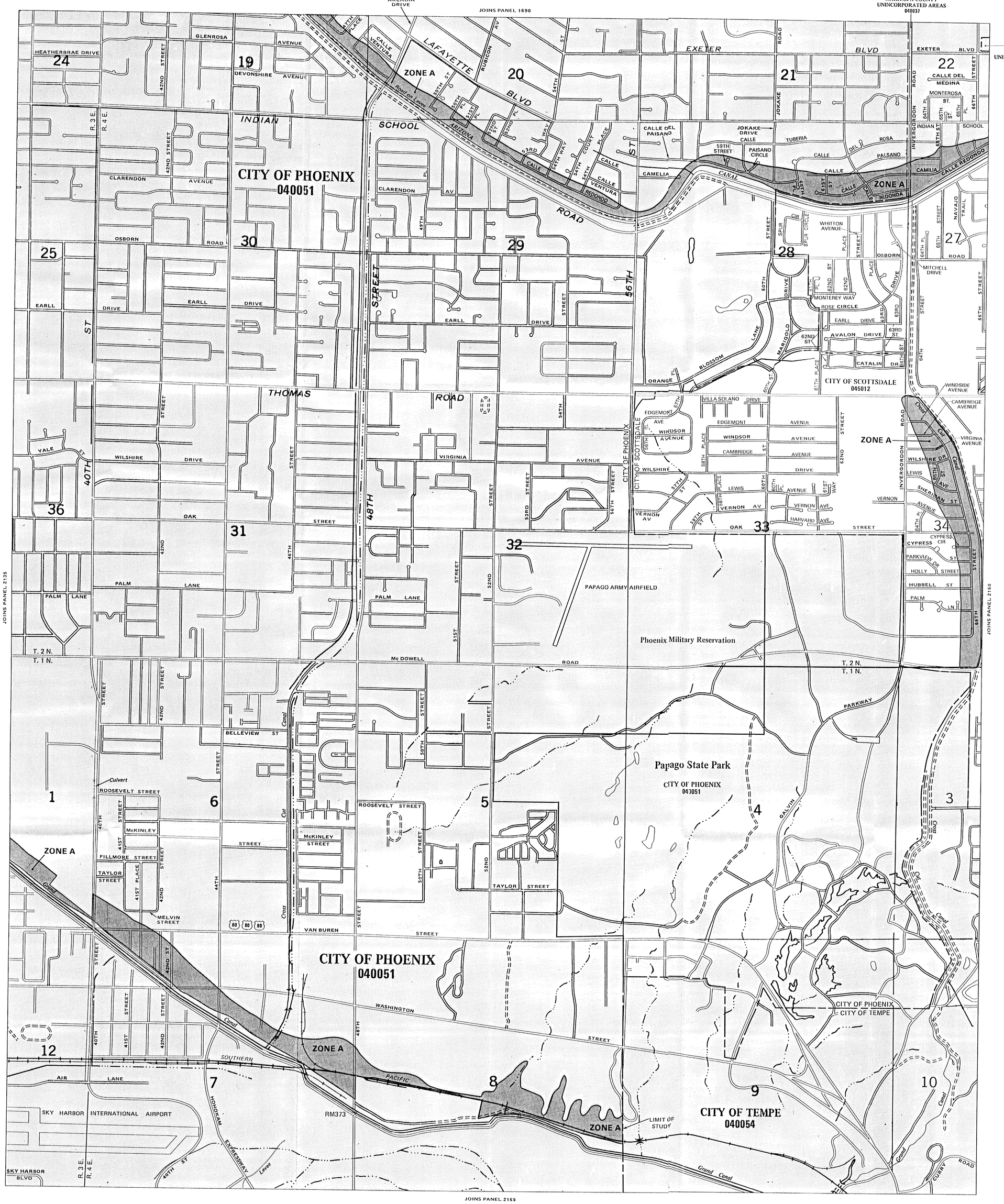
EFFECTIVE DATE:
APRIL 15, 1988

Federal Emergency Management Agency

Appendix C Watershed Maps

ELEVATION REFERENCE MARKS

| REFERENCE MARK | ELEVATION (FT. NGVD) | DESCRIPTION OF LOCATION |
|---|---|---|
| RM373 | 1143.37 | Top west bolt on south pier steel holder for 12-inch pipeline along east side of 48th Street Bridge over Grand Canal. |




# LEGEND

**SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD**

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

**FLOODWAY AREAS IN ZONE AE**

**OTHER FLOOD AREAS**

- **ZONE X** 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.

**OTHER AREAS**

- **ZONE X** Areas determined to be outside 500-year flood plain.
- **ZONE D** Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

~~513~~ Base Flood Elevation Line; Elevation in Feet*

(D)———(D) Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*

RM7 X Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

## NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:

APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Map revised SEPTEMBER 30, 1995 to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to add and update roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision, and to incorporate previously issued letters of map amendment.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

N

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

# FIRM

## FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2155 OF 4350

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| MARICOPA COUNTY, UNINCORPORATED AREAS | 040037 | 2155 | E |
| PHOENIX, CITY OF | 040051 | 2155 | E |
| SCOTTSDALE, CITY OF | 045012 | 2155 | E |
| TEMPE, CITY OF | 040054 | 2155 | E |

MAP NUMBER
04013C2155 E

MAP REVISED:
SEPTEMBER 30, 1995

Federal Emergency Management Agency

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MATCHLINE SHEET 2

GRAPHIC SCALE
( IN FEET )
1 inch = 300 ft.
300 0 150 300 600

N

STP PAPAGO

# DRAINAGE BASIN WORK MAP

CLOMR

SCALE (H): 1"=300'
SCALE (V): NONE
DRAWN BY: LSM
DESIGNED BY: LSM
CHECKED BY: DJP
DATE: 10-27-97

Kimley-Horn and Associates, Inc.

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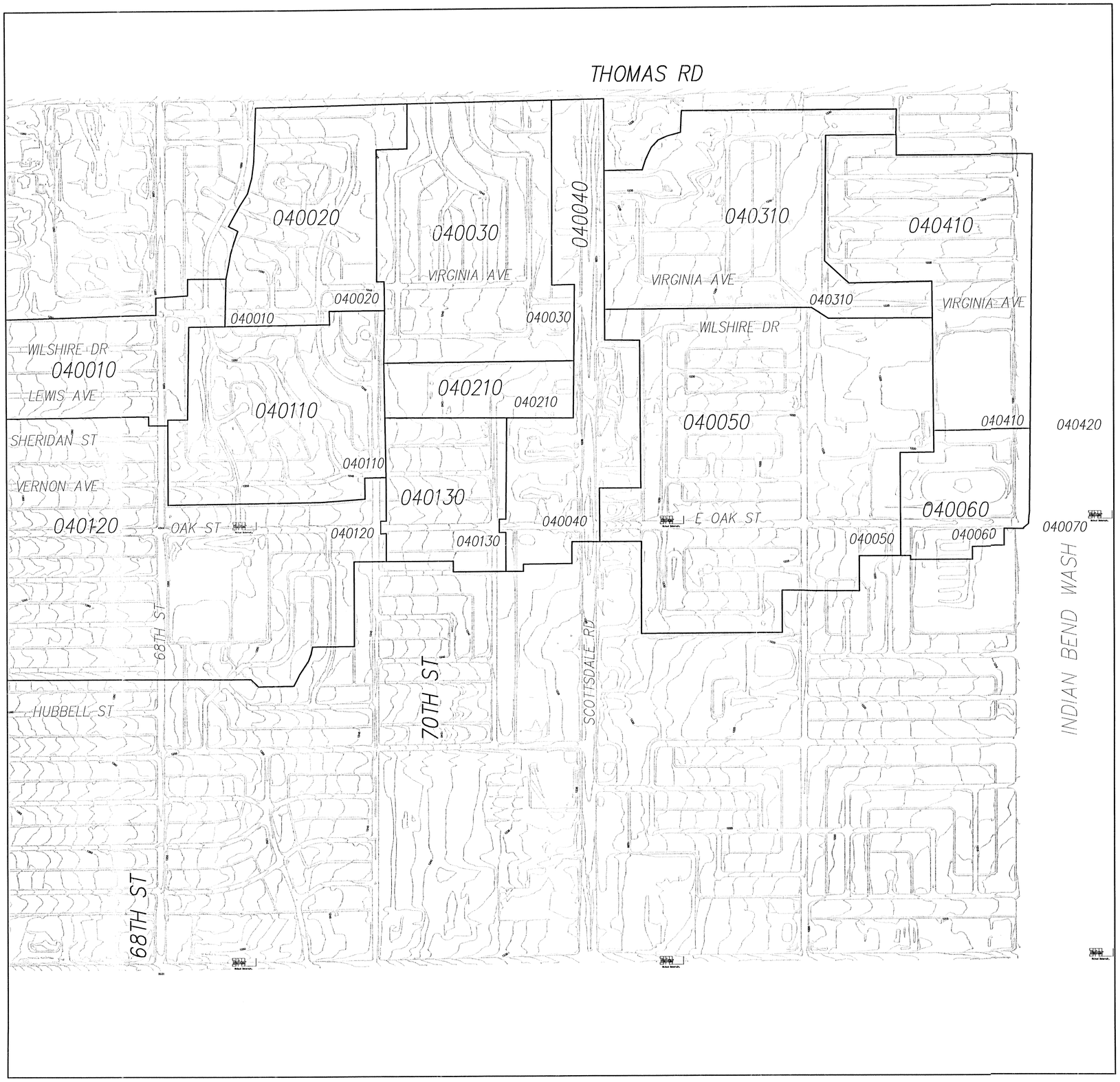
Engineering, Planning, and Environmental Consultants
7600 North 15th Street, Suite 250
Phoenix, Arizona 85020 (602) 944-5500

| NO. | REVISIONS | BY | DATE | APPR. |
|---|---|---|---|---|

PROJECT NO. 09113.00
DWG. NAME: 310OCLBD

1 of 2




N

GRAPHIC SCALE

300 0 150 300 600

( IN FEET )
1 inch = 300 ft.

| NO. | REVISIONS | BY | DATE | APPR. |
|---|---|---|---|---|

Kimley-Horn and Associates, Inc.

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Engineering, Planning, and Environmental Consultants
7600 North 15th Street, Suite 250
Phoenix, Arizona 85020
(602) 944-5500

SCALE (H): 1"=300'
SCALE (V): NONE
DRAWN BY: LSM
DESIGNED BY: LSM
CHECKED BY: DJP
DATE: 10-27-97

STP PAPAGO
# DRAINAGE BASIN WORK MAP
CLOMR

PROJECT NO.
091131.00

DWG. NAME
3100CLDB



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D:\091181001\TOPO\CLOMR.DB Mon Oct 27 16:48:08 1997 lm

Appendix D HEC-1 Results

HEC1 S/N: 1343001471 HMVersion: 6.33 Data File: a-6100c.hc1

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             MAY   1991               *
*          VERSION 4.0.1E              *
*                                      *
* RUN DATE  10/21/1997  TIME  15:11:17 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
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
```

```
::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::
:::                                  :::
:::  Full Microcomputer Implementation :::
:::                by                :::
:::        Haestad Methods, Inc.     :::
:::                                  :::
::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

              * ******************************************************************************
              * This is the hydrology for the FEMA Conditional Letter of Map Revision (CLOMR).
              *
              * - This model originated as the Oak Street outfall portion of the Recommended
              *     Plan hydrology for the STP Papago Watershed Study
              * ******************************************************************************
              *
              * - This file contains updated stage storage information from the Recommended
              *     Plan Design.
              *
              *     The following are changes made in the original HEC-1 study done for
              *     the City of Scottsdale (the Existing Conditions Model).  These changes
              *     were part of the Alternative Analysis Phase of the STP Papago Project
              *
              * - Combined Basins 03 and 04, as well as the following subbasins:
              *     From Basin 05 - 050005
              *     From Basin 07 - 070209, 070210, 070010, 070508, 070610, 070808
              * - Added natural storage in at the Desert Botanical Gardens (DBG)
              * - Basin 07 flow was diverted to Oak Street, and combined w/flow from Basin 05
              *     and Basin 03.
              *     Upstream of CP 030510 Basin 07 10 year flows are diverted into a pipe
              *     along Oak Street.  The 100 year flow from Basins 030809 and 030810 is
              *     diverted into a pipe along 64th St north to Oak St due to a proposed
              *     sound wall to be built by others.  The flow in the pipes is combined at
              *     CP 030510 and routed in the pipe to 030520.  The 100 year flow from the
              *     Auto Park is routed north in a pipe along 66th Street to CP 030520 where
              *     all of the flow is combined and routed east along Oak St. to the IBW.
              * - Diversions along 64th Street and Oak Street allow for 10 yr flow in the
              *     pipes.  The overflows go to the Auto Park basin or the adjacent
              *     neighborhoods.
              * - Flows into the HyView neighborhood were diverted at CP 030530 to
              *     Oak Street (CP 030520)
              * - Stage-Storage at the Auto Park was revised to reflect existing topography,
              *     with the storage augmented by excavating a deeper invert near the outlet
              * - A water surface elevation less than 1268 ft was maintained at the Auto Park
              *     to keep the homes dry on 66th Street
              * - The outflow from the Auto Park Basin was routed to CP 030530 and combined
              *     with the above flows and then routed to Oak Street
              * - Weir Elev. at the Desert Botanical Gardens was set to 1267.8 ft, based on
              *     topo
              * - Basin 05 was combined with subbasins from the eastern part of Basin 07.  A
              *     new subbasin, 210005 was created from part of the existing subbasin 210010
              * - A detention basin was inserted into subbasin 030060 after storage at 050065
              * - The flows from basin 070080 and 070420 were combined at CP 070420 and routed
              *     to CP 210005
              * - A storm drain was added from CP 210005 to 050305 picking up flow from 050030
              * - The flows from CP 050210 were routed to 050020 then to 050030 then to 050305
              * - Subbasin 050065 was split into two such that the area north of Osborn Rd.
              *     drains into the storm drain - the new basin is 050062
              * - A storm drain was added from the outlet of the Paiute Park detention basin
              *     to CP 051570
              * - All subbasins north of Osborn Rd. were re-routed in the Osborn Rd. storm
              *     drain, no flows cross to the south
              * - The area for Subbasin 050040 was adjusted based on topo flown for the area
              * - Storage was added at CP 050040
              *
```

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

  1           ID    ***************************************************************************
  2           ID    STP-PAPAGO REGIONAL FLOOD CONTROL PROJECT
  3           ID    SCOTTSDALE - TEMPE - PHOENIX
  4           ID    ***************************************************************************
  5           ID
  6           ID    Kimley-Horn and Associates, Inc.
  7           ID    KVL Consultants, Inc.
  8           ID
  9           ID    100-Year, 6-Hour Storm Event
 10           ID    10/97
              *
              *DIAGRAM
 11           IT       2                     300
 12           IO       5

 13           KK  070808   BASIN
 14           BA   0.017
 15           PH       0       0    0.76    1.50    2.55    2.81    2.98    3.30
 16           LS       0      88       0       0      98       0
 17           UK     300  0.0100    0.20      99
 18           UK     100  0.0100    0.10       1
 19           RK    1600   0.214    0.03            TRAP       2     3.5
              *
              * The 10 year flows are diverted into a proposed storm drain along Oak Street.
              * In storm events greater than the 10 yr, the remaining flow will follow its
              * natural course across and sheet flow across Oak Street to the north.
              *

 20           KK   808PP  Divert 10-year flows into storm drain
 21           DT  808OUT
 22           DI       0      12      13      15      50     100
 23           DQ       0    0.01       1       3      38      88

 24           KK  070610 FROM  070808
 25           RK     240  0.0066   0.013            CIRC    3.00

 26           KK  070610   BASIN
 27           BA   0.007
 28           LS       0      88       0       0      98       0
 29           UK     300  0.0100    0.20      99
 30           UK     100  0.0100    0.10       1
 31           RK     500   0.054    0.03            TRAP       2     3.5

 32           KK   610PP  Divert 10-year flows into storm drain
 33           DT  610OUT
 34           DI       0       5       6      10      50     100
 35           DQ       0     .01       1       5      45      95

 36           KK  070610 COMBINE
 37           HC       2
```

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

  38          KK  070508    FROM  070610
  39          RK     420  0.0066   0.013            CIRC    3.00

  40          KK  070508   BASIN
  41          BA   0.008
  42          LS       0      85       0       0      98       0
  43          UK     300  0.0100    0.20      99
  44          UK     100  0.0100    0.10       1
  45          RK     600   0.048    0.03            TRAP       9     1.0

  46          KK   508PP  Divert 10-year flows into storm drain
  47          DT  508OUT
  48          DI       0       4       5      15      50     100
  49          DQ       0     .01       1      11      46      96

  50          KK  070508 COMBINE
  51          HC       2

  52          KK  070010    FROM  070508
  53          RK     270  0.0066   0.013            CIRC    3.00

  54          KK  070010   BASIN
  55          BA   0.009
  56          LS       0      88       0       0      98       0
  57          UK     300  0.0100    0.20      99
  58          UK     100  0.0100    0.10       1
  59          RK    1200   0.042    0.03            TRAP       2     3.5

  60          KK   010PP  Divert 10-year flows into storm drain
  61          DT  010OUT
  62          DI       0       7      10      15      50     100
  63          DQ       0     .01       3       8      43      93

  64          KK  070010 COMBINE
  65          HC       2

  66          KK  070210    FROM  070010
  67          RK     120  0.0066   0.013            CIRC    3.00

  68          KK  070209   BASIN
  69          BA   0.018
  70          LS       0      87       0       0      98       0
  71          UK     300  0.0100    0.20      99
  72          UK     100  0.0100    0.10       1
  73          RK    1200   0.252    0.03            TRAP       2     3.5

  74          KK  070210    FROM  070209
  75          RK     750   0.252   0.013            TRAP      10       1
```

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

  76          KK  070210   BASIN
  77          BA   0.008
  78          LS       0      87       0       0      98       0
  79          UK     300  0.0100    0.20      99
  80          UK     100  0.0100    0.10       1
  81          RK     600   0.043    0.03            TRAP       2     3.5

  82          KK  070210 COMBINE
  83          HC       2

  84          KK   210PP  Divert 10-year flows into storm drain
  85          DT  210OUT
  86          DI       0      17      20      30      50     100
  87          DQ       0     .01       3      13      33      83

  88          KK  070210 COMBINE
  89          HC       2

  90          KK  050005   FROM 070210
  91          RK     950  0.0066   0.013            CIRC    3.00

  92          KK  050005   BASIN
  93          BA   0.038
  94          LS       0      85       0       0      98       0
  95          UK     300  0.0100    0.20      99
  96          UK     100  0.0100    0.10       1
  97          RK    1650    0.09    0.03            TRAP      30     1.0

  98          KK   005PP  Divert 10-year flows into storm drain
  99          DT  005OUT
 100          DI       0      21      22     100     150     200
 101          DQ       0     .01       1      79     129     179

 102          KK  050005 COMBINE
 103          HC       2
              *
              * Flows are combined with Basin 03 flows at 64th St and Oak St (CP 030510)
              *

 104          KK  030510   FROM 050005
 105          RK    1650  0.0066   0.013            CIRC       3

 106          KK  030509   BASIN
 107          BA   0.016
 108          LS       0      86       0
 109          UK     300   0.029    0.20     100
 110          RK    1300   0.014    0.03            TRAP      30     2.0

 111          KK  030510    FROM  030509
 112          RK    1900    .014     .03            TRAP      30       2
```

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

 113          KK  030510   BASIN
 114          BA   0.070
 115          LS       0      85       0       0      98       0
 116          UK     300  0.0140    0.20      75
 117          UK     100  0.0100    0.10      25
 118          RK    1500   0.014    0.03            TRAP      30       2

 119          KK  030510
 120          HC       2
              *
              * At this point flows are routed two ways: in the storm drain and overland
              * For the following diversions, the ID's ending in PP is for storm drain flow
              * and the ID's ending in RD is for overland (roadway) flow
              *

 121          KK   510PP  Divert 10-year flows into storm drain
 122          DT   510RD
 123          DI       0      62      63     100     140     180
 124          DQ       0     .01       1      38      78     118

 125          KK  030809   BASIN
 126          BA   0.012
 127          LS       0      86       0
 128          UK     300   0.029    0.20     100
 129          RK     800   0.024    0.03            TRAP      60     1.0

 130          KK  030810    FROM  030809
 131          RK    1350   0.015    0.03            TRAP    60.0       1

 132          KK  030810   BASIN
 133          BA   0.072
 134          LS       0      85       0       0      98       0
 135          UK     300  0.0100    0.20      99
 136          UK     100  0.0100    0.10       1
 137          RK     539  0.0034    0.02            TRAP      60     1.0
 138          RK    3226  0.0207    0.02            TRAP      60     1.0

 139          KK  030810 COMBINE
 140          HC       2
              *
              * The proposed storm drain in 64th St is designed to carry the 100 yr flow.
              * The flow in the pipe is carried north to CP 030510 where it outfalls into the
              * Oak St storm drain.
              * In events greater than the 100 yr, the overflow will follow its historical
              * flow path and sheet flow down Hubbell St to the Auto Park detention basin.
              *

 141          KK   810PP Divert the 100-year flow into the storm drain
 142          DT   810RD
 143          DI       0     140     141     210
 144          DQ       0     .01       1      70
```

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

 145          KK  030510    FROM  030810
 146          RK    1000  0.0019   0.013            CIRC    5.50

 147          KK  030510 COMBINE
 148          HC       3

 149          KK  030520    FROM  030510
 150          RK    1250   0.011   0.017            CIRC    4.75

 151          KK  030710   BASIN
 152          BA   0.021
 153          LS       0      79       0       0      98       0
 154          UK     150  0.0100    0.30      59
 155          UK      50  0.0100    0.10      41
 156          RK     392  0.0143    0.02            TRAP      38     1.0
 157          RK     695  0.0034    0.02            TRAP      38     1.0

 158          KK  030720    FROM  030710
 159          RK     900  0.0034   0.017            TRAP    37.5       1

 160          KK  030720   BASIN
 161          BA   0.027
 162          LS       0      79       0       0      98       0
 163          UK     150  0.0100    0.30      65
 164          UK      50  0.0100    0.10      35
 165          RK     970  0.0143    0.02            TRAP      38     1.0
 166          RK     890  0.0034    0.02            TRAP      38     1.0

 167          KK  030720 COMBINE
 168          HC       2

 169          KK  030520    FROM  030720
 170          RK     776  0.0034   0.017            TRAP    37.5       1

 171          KK  030520   BASIN
 172          BA   0.041
 173          LS       0      80       0       0      98       0
 174          UK     151  0.0100    0.30      65
 175          UK      50  0.0100    0.10      35
 176          RK    1117  0.0143    0.02            TRAP      38     1.0
 177          RK     776  0.0034    0.02            TRAP      38     1.0

 178          KK  030520 COMBINE
 179          HC       2

 180          KK   520PP  Divert 10 yr flow into storm drain
 181          KM    Pipe carries 10-year flows from CP 030520, 030720, & 030710
 182          DT   520RD
 183          DI       0      90     100     180     200     250
 184          DQ       0     0.1      10      90     110     160
              *
              * Flows left in the roadway from the above diversions are now retrieved and
              * routed along their natural paths to the Auto Park detention basin
              *
              *
              * Retrieve roadway portion of diverted flows at CP 030510
              *
```

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

 185          KK  030510
 186          DR   510RD

 187          KK  030520 From 030510
 188          RK    1250   .0143    .017            TRAP      60       1
              *
              * Retrieve roadway portion of diverted flows at CP 030520
              *

 189          KK  030520
 190          DR   520RD

 191          KK  030520 Combine
 192          HC       2

 193          KK  030540 From 030520
 194          RK    1600  0.0034   0.017            TRAP      40       1
              *
              * Retrieve roadway portion of diverted flows at CP 030810
              *

 195          KK  030810
 196          DR   810RD

 197          KK  030540 From 030810
 198          RK    1250   .0143    .017            TRAP      40       1

 199          KK  030540   BASIN
 200          BA   0.041
 201          LS       0      82       0       0      98       0
 202          UK     156     .01    0.30      65
 203          UK      56  0.0100    0.10      35
 204          RK    2079  0.0143    0.02            TRAP      38     1.0
 205          RK     574  0.0034    0.02            TRAP      38     1.0

 206          KK  030550   Auto Park Basin
 207          BA   0.043
 208          LS       0      80       0       0      98       0
 209          UK      65  0.0100    0.37      16
 210          UK     184  0.0100    0.10      84
 211          RK    1232  0.0034    0.02            TRAP      57     1.0

 212          KK  030550 COMBINE
 213          HC       4
              *   Stage - Discharge is based on hydraulics for 66" RCP @ .002 ft/ft as well
              *    as an analysis of hydrographs - the outflow hydrograph at the Auto Park
              *    and the combination hydrograph at CP 030520
              *   Stage - Storage Based on Minimal Impact to Exist. Auto Park Basin
```

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

 214          KK    AUTO  Detention Basin is located on the north side of the Auto Park
 215          RS       1    STOR
 216          SV       0    0.13    0.51    0.97    1.83    2.88    4.45    7.11
 217          SE      61      62      64      65      66      67      68      69
 218          SQ     100     137     161     168     174     180     184     188
              *
              * Outflow from the Auto Park outlets into a storm drain and is routed to 030530
              *

 219          KK  030530    FROM AUTO Park BASIN
 220          RK     700   0.003   0.013            CIRC    5.50

 221          KK  030530   BASIN
 222          BA   0.044
 223          LS       0      82       0       0      98       0
 224          UK     154  0.0100    0.30      66
 225          UK      51  0.0100    0.10      34
 226          RK    1390  0.0143    0.02            TRAP      38     1.0
 227          RK    1067  0.0034    0.02            TRAP      38     1.0

 228          KK  030530 Combine flows from Auto Park Basin (AUTO) and sub-basin 030530
 229          HC       2

 230          KK  030520 from 030530
 231          RK    1100    .003    .013            CIRC    6.00

 232          KK  030520 Combine pipe flows from 030520 and pipe flows from 030510
 233          HC       3
              *
              * Flows are routed under the Cross Cut Canal to Basin 04 along Oak Street
              *

 234          KK  040120    FROM  030520
 235          RK    2700  0.0096   0.013            CIRC    7.50
              *

 236          KK  040110   BASIN
 237          BA   0.054
 238          LS       0      79       0       0      98       0
 239          UK     146  0.0100    0.30      63
 240          UK      55  0.0100    0.10      37
 241          RK    1275  0.0004    0.02            TRAP      38     1.0
 242          RK    1266  0.0072    0.02            TRAP      38     1.0

 243          KK  040120    FROM  040110
 244          RK     351  0.0069   0.013            CIRC     3.0

 245          KK  040120   BASIN
 246          BA   0.112
 247          LS       0      79       0       0      98       0
 248          UK     160   0.010    0.30      57
 249          UK      75   0.010    0.10      43
 250          RK    1600   0.001    0.02            TRAP      40     1.0
 251          RK    2356   0.007    0.02            TRAP      60     1.0
```

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

 252          KK  040120 COMBINE
 253          HC       3

 254          KK  040130    FROM  040120
 255          RK     730  0.0086   0.013            CIRC    7.50

 256          KK  040130   BASIN
 257          BA   0.023
 258          LS       0      79       0       0      98       0
 259          UK     122  0.0100    0.32      52
 260          UK      82  0.0100    0.10      48
 261          RK     642  0.0072    0.02            TRAP      41     1.0

 262          KK  040130 COMBINE
 263          HC       2

 264          KK  040040    FROM  040130
 265          RK     625  0.0038   0.013            CIRC    7.50

 266          KK  040010   BASIN
 267          BA   0.038
 268          LS       0      79       0       0      98       0
 269          UK     148  0.0100    0.30      64
 270          UK      53  0.0100    0.10      36
 271          RK    1275  0.0072    0.02            TRAP      38     1.0
 272          RK     877  0.0072    0.02            TRAP      64     1.0

 273          KK  040020    FROM  040010
 274          RK    1136  0.0072   0.017            TRAP    37.5       1

 275          KK  040020   BASIN
 276          BA   0.041
 277          LS       0      79       0       0      98       0
 278          UK     150  0.0100    0.30      62
 279          UK      50  0.0100    0.10      38
 280          RK    1251  0.0004    0.03            TRAP      38     1.0

 281          KK  040020 COMBINE
 282          HC       2

 283          KK  040030    FROM  040020
 284          RK    1137  0.0072   0.017            TRAP    37.5       1

 285          KK  040030   BASIN
 286          BA   0.061
 287          LS       0      79       0       0      98       0
 288          UK     123  0.0100    0.32      53
 289          UK      81  0.0100    0.10      47
 290          RK    1760  0.0004    0.02            TRAP      41     1.0
```

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

 291          KK  040030 COMBINE
 292          HC       2

 293          KK  040040    FROM  040030
 294          RK    1636  0.0003   0.013            CIRC     1.0

 295          KK  040210   BASIN
 296          BA   0.011
 297          LS       0      79       0       0      98       0
 298          UK      97  0.0100    0.34      45
 299          UK     111  0.0100    0.10      55
 300          RK     696  0.0072    0.02            TRAP       6     1.0

 301          KK  040040    FROM  040210
 302          RK     990  0.0004   0.017            TRAP      80       1

 303          KK  040040   BASIN
 304          BA   0.044
 305          LS       0      79       0       0      98       0
 306          UK      22   0.010    0.40      16
 307          UK     197   0.010    0.10      84
 308          RK    2600   0.004    0.02            TRAP      50       1

 309          KK  040040 COMBINE
 310          HC       4

 311          KK  040050    FROM  040040
 312          RK    1869   0.006   0.013            TRAP      14

 313          KK  040310   BASIN
 314          BA   0.062
 315          LS       0      79       0       0      98       0
 316          UK     125   0.010    0.32      52
 317          UK      87   0.010    0.10      48
 318          RK    1761  0.0072    0.02            TRAP      38       1

 319          KK  040050    FROM  040310
 320          RK    1912   0.004   0.017            TRAP      45       1

 321          KK  040050   BASIN
 322          BA   0.113
 323          LS       0      79       0       0      98       0
 324          UK     158   0.010    0.30      49
 325          UK      99   0.010    0.10      51
 326          RK    1202  0.0004    0.02            TRAP      45     1.0
 327          RK    1869  0.0072    0.02            TRAP      60     1.0

 328          KK  040050 COMBINE
 329          HC       3
```

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

 330          KK  040060    FROM  040050
 331          RK     633  0.0033   0.013            TRAP      19

 332          KK  040060   BASIN
 333          BA   0.022
 334          LS       0      79       0       0      98       0
 335          UK     206  0.0100    0.29      22
 336          UK     190  0.0100    0.10      78
 337          RK     633  0.0072    0.02            TRAP      60     1.0

 338          KK  040060 COMBINE
 339          HC       2
              *
              * Oak St Outfall to Indian Bend Wash
              *

 340          KK  040070    FROM  040060
 341          RK     619  0.0033   0.013            TRAP      19
              *
              * Notice:
              * This document, together with the concepts and designs presented herein, as an
              * instrument of service, is intended for the specific purpose and client for
              * which it was prepared.  Reuse of and improper reliance on this document
              * without written authorization and adaptation by Kimley-Horn and Associates,
              * Inc. shall be without liability to Kimley-Horn and Associates, Inc.
              *
 342          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
PUT
INE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

 13      070808
              .
              .
 21           .-------> 808OUT
 20       808PP
              V
              V
 24      070610
              .
              .
 26           .      070610
              .           .
              .           .
 33           .           .-------> 610OUT
 32           .       610PP
              .           .
              .           .
 36      070610............
              V
              V
 38      070508
              .
              .
 40           .      070508
              .           .
              .           .
 47           .           .-------> 508OUT
 46           .       508PP
              .           .
              .           .
 50      070508............
              V
              V
 52      070010
              .
              .
 54           .      070010
              .           .
              .           .
 61           .           .-------> 010OUT
 60           .       010PP
              .           .
              .           .
 64      070010............
              V
              V
 66      070210
              .
              .
 68           .      070209
              .           V
              .           V
 74           .      070210
              .           .
              .           .
 76           .           .      070210
              .           .           .
              .           .           .
 82           .      070210............
```

```
            .           .
            .           .
 85         .           .-------> 210OUT
 84         .       210PP
            .           .
            .           .
 88     070210............
            V
            V
 90     050005
            .
            .
 92         .      050005
            .           .
            .           .
 99         .           .-------> 005OUT
 98         .       005PP
            .           .
            .           .
102     050005............
            V
            V
104     030510
            .
            .
106         .      030509
            .           V
            .           V
111         .      030510
            .           .
            .           .
113         .           .      030510
            .           .           .
            .           .           .
119         .      030510............
            .           .
            .           .
122         .           .------->   510RD
121         .       510PP
            .           .
            .           .
125         .           .      030809
            .           .           V
            .           .           V
130         .           .      030810
            .           .           .
            .           .           .
132         .           .           .      030810
            .           .           .           .
            .           .           .           .
139         .           .      030810............
            .           .           .
            .           .           .
142         .           .           .------->   810RD
141         .           .       810PP
            .           .           V
            .           .           V
145         .           .      030510
            .           .           .
            .           .           .
147     030510........................
            V
            V
149     030520
            .
            .
```

```
151          .      030710
             .           V
             .           V
158          .      030720
             .           .
             .           .
160          .           .      030720
             .           .           .
             .           .           .
167          .      030720............
             .           V
             .           V
169          .      030520
             .           .
             .           .
171          .           .      030520
             .           .           .
             .           .           .
178          .      030520............
             .           .
             .           .
182          .           .-------->   520RD
180          .       520PP
             .           .
             .           .
186          .           .           .<-------   510RD
185          .           .      030510
             .           .           V
             .           .           V
187          .           .      030520
             .           .           .
             .           .           .
190          .           .           .           .<-------   520RD
189          .           .           .      030520
             .           .           .           .
             .           .           .           .
191          .           .      030520............
             .           .           V
             .           .           V
193          .           .      030540
             .           .           .
             .           .           .
196          .           .           .           .<-------   810RD
195          .           .           .      030810
             .           .           .           V
             .           .           .           V
197          .           .           .      030540
             .           .           .           .
             .           .           .           .
199          .           .           .           .      030540
             .           .           .           .           .
             .           .           .           .           .
206          .           .           .           .           .      030550
             .           .           .           .           .           .
             .           .           .           .           .           .
212          .           .      030550.................................
             .           .           V
             .           .           V
214          .           .        AUTO
             .           .           V
             .           .           V
219          .           .      030530
             .           .           .
             .           .           .
221          .           .           .      030530
             .           .           .           .
```

```
                .           .           .           .
228             .           .       030530............
                .           .           V
                .           .           V
230             .           .       030520
                .           .           .
                .           .           .
232         030520........................
                V
                V
234         040120
                .
                .
236             .       040110
                .           V
                .           V
243             .       040120
                .           .
                .           .
245             .           .       040120
                .           .           .
                .           .           .
252         040120........................
                V
                V
254         040130
                .
                .
256             .       040130
                .           .
                .           .
262         040130............
                V
                V
264         040040
                .
                .
266             .       040010
                .           V
                .           V
273             .       040020
                .           .
                .           .
275             .           .       040020
                .           .           .
                .           .           .
281             .       040020............
                .           V
                .           V
283             .       040030
                .           .
                .           .
285             .           .       040030
                .           .           .
                .           .           .
291             .       040030............
                .           V
                .           V
293             .       040040
                .           .
                .           .
295             .           .       040210
                .           .           V
                .           .           V
301             .           .       040040
                .           .           .
```

```
            .           .           .
303         .           .           .       040040
            .           .           .            .
            .           .           .            .
309     040040.................................
            V
            V
311     040050
            .
            .
313         .       040310
            .            V
            .            V
319         .       040050
            .            .
            .            .
321         .            .       040050
            .            .            .
            .            .            .
328     040050......................
            V
            V
330     040060
            .
            .
332         .       040060
            .            .
            .            .
338     040060............
            V
            V
340     040070
```

(**) RUNOFF ALSO COMPUTED AT THIS LOCATION

HEC1 S/N: 1343001471 HMVersion: 6.33 Data File: a-6100c.hc1

```
****************************************
*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            MAY   1991                *
*         VERSION 4.0.1E               *
*                                      *
* RUN DATE  10/21/1997  TIME  15:11:17 *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

```
*************************************************************************
STP-PAPAGO REGIONAL FLOOD CONTROL PROJECT
SCOTTSDALE - TEMPE - PHOENIX
*************************************************************************

Kimley-Horn and Associates, Inc.
KVL Consultants, Inc.

100-Year, 6-Hour Storm Event
10/97

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

   IT          HYDROGRAPH TIME DATA
                      NMIN           2  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        0958  ENDING TIME
                     ICENT          19  CENTURY MARK

              COMPUTATION INTERVAL    0.03 HOURS
                   TOTAL TIME BASE    9.97 HOURS

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

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

| OPERATION | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR | 24-HOUR | 72-HOUR | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---|---|---|---|---|---|---|---|---|---|
| HYDROGRAPH AT | 070808 | 34. | 3.27 | 4. | 2. | 2. | 0.02 | | |
| DIVERSION TO | 808OUT | 22. | 3.07 | 1. | 1. | 1. | 0.02 | | |
| HYDROGRAPH AT | 808PP | 12. | 3.07 | 3. | 2. | 2. | 0.02 | | |
| ROUTED TO | 070610 | 12. | 3.10 | 3. | 2. | 2. | 0.02 | | |
| HYDROGRAPH AT | 070610 | 14. | 3.23 | 2. | 1. | 1. | 0.01 | | |
| DIVERSION TO | 610OUT | 9. | 3.07 | 0. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | 610PP | 5. | 3.07 | 1. | 1. | 1. | 0.01 | | |
| 2 COMBINED AT | 070610 | 17. | 3.10 | 4. | 2. | 2. | 0.02 | | |
| ROUTED TO | 070508 | 17. | 3.13 | 4. | 2. | 2. | 0.02 | | |
| HYDROGRAPH AT | 070508 | 14. | 3.30 | 2. | 1. | 1. | 0.01 | | |
| DIVERSION TO | 508OUT | 10. | 3.07 | 1. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | 508PP | 4. | 3.07 | 1. | 1. | 1. | 0.01 | | |
| 2 COMBINED AT | 070508 | 21. | 3.13 | 5. | 3. | 3. | 0.03 | | |
| ROUTED TO | 070010 | 21. | 3.17 | 5. | 3. | 3. | 0.03 | | |
| HYDROGRAPH AT | 070010 | 18. | 3.27 | 2. | 1. | 1. | 0.01 | | |
| DIVERSION TO | 010OUT | 11. | 3.10 | 1. | 0. | 0. | 0.01 | | |
| HYDROGRAPH AT | 010PP | 7. | 3.10 | 1. | 1. | 1. | 0.01 | | |
| 2 COMBINED AT | 070010 | 28. | 3.17 | 6. | 4. | 4. | 0.04 | | |
| ROUTED TO | 070210 | 28. | 3.17 | 6. | 4. | 4. | 0.04 | | |
| HYDROGRAPH AT | 070209 | 34. | 3.27 | 4. | 2. | 2. | 0.02 | | |
| ROUTED TO | 070210 | 34. | 3.27 | 4. | 2. | 2. | 0.02 | | |
| HYDROGRAPH AT | 070210 | 15. | 3.27 | 2. | 1. | 1. | 0.01 | | |
| 2 COMBINED AT | 070210 | 50. | 3.27 | 6. | 3. | 3. | 0.03 | | |
| DIVERSION TO | 210OUT | 33. | 3.07 | 2. | 1. | 1. | 0.03 | | |
| HYDROGRAPH AT | 210PP | 17. | 3.07 | 4. | 2. | 2. | 0.03 | | |
| 2 COMBINED AT | 070210 | 45. | 3.17 | 10. | 6. | 6. | 0.07 | | |
| ROUTED TO | 050005 | 45. | 3.20 | 10. | 6. | 6. | 0.07 | | |
| HYDROGRAPH AT | 050005 | 64. | 3.30 | 7. | 5. | 5. | 0.04 | | |
| DIVERSION TO | 005OUT | 43. | 3.07 | 2. | 1. | 1. | 0.04 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROGRAPH AT | 005PP | 21. | 3.07 | 5. | 3. | 3. | 0.04 |
| 2 COMBINED AT | 050005 | 66. | 3.20 | 15. | 9. | 9. | 0.11 |
| ROUTED TO | 030510 | 66. | 3.23 | 15. | 9. | 9. | 0.11 |
| HYDROGRAPH AT | 030509 | 36. | 3.20 | 3. | 2. | 2. | 0.02 |
| ROUTED TO | 030510 | 35. | 3.30 | 3. | 2. | 2. | 0.02 |
| HYDROGRAPH AT | 030510 | 139. | 3.13 | 16. | 10. | 10. | 0.07 |
| 2 COMBINED AT | 030510 | 159. | 3.27 | 19. | 12. | 12. | 0.09 |
| DIVERSION TO | 510RD | 97. | 3.03 | 5. | 3. | 3. | 0.09 |
| HYDROGRAPH AT | 510PP | 62. | 3.03 | 14. | 8. | 8. | 0.09 |
| HYDROGRAPH AT | 030809 | 28. | 3.20 | 2. | 1. | 1. | 0.01 |
| ROUTED TO | 030810 | 27. | 3.27 | 2. | 1. | 1. | 0.01 |
| HYDROGRAPH AT | 030810 | 116. | 3.33 | 14. | 9. | 9. | 0.07 |
| 2 COMBINED AT | 030810 | 140. | 3.33 | 17. | 10. | 10. | 0.08 |
| DIVERSION TO | 810RD | 0. | 3.33 | 0. | 0. | 0. | 0.08 |
| HYDROGRAPH AT | 810PP | 140. | 3.33 | 17. | 10. | 10. | 0.08 |
| ROUTED TO | 030510 | 138. | 3.37 | 17. | 10. | 10. | 0.08 |
| 3 COMBINED AT | 030510 | 266. | 3.37 | 45. | 27. | 27. | 0.28 |
| ROUTED TO | 030520 | 266. | 3.37 | 45. | 27. | 27. | 0.28 |
| HYDROGRAPH AT | 030710 | 50. | 3.07 | 5. | 3. | 3. | 0.02 |
| ROUTED TO | 030720 | 49. | 3.13 | 5. | 3. | 3. | 0.02 |
| HYDROGRAPH AT | 030720 | 55. | 3.10 | 6. | 3. | 3. | 0.03 |
| 2 COMBINED AT | 030720 | 103. | 3.10 | 10. | 6. | 6. | 0.05 |
| ROUTED TO | 030520 | 103. | 3.13 | 10. | 6. | 6. | 0.05 |
| HYDROGRAPH AT | 030520 | 88. | 3.10 | 9. | 5. | 5. | 0.04 |
| 2 COMBINED AT | 030520 | 184. | 3.13 | 19. | 12. | 12. | 0.09 |
| DIVERSION TO | 520RD | 94. | 3.07 | 3. | 2. | 2. | 0.09 |
| HYDROGRAPH AT | 520PP | 90. | 3.07 | 16. | 10. | 10. | 0.09 |
| HYDROGRAPH AT | 030510 | 97. | 3.27 | 5. | 3. | 3. | 0.00 |
| ROUTED TO | 030520 | 96. | 3.30 | 6. | 3. | 3. | 0.00 |
| HYDROGRAPH AT | 030520 | 94. | 3.13 | 3. | 2. | 2. | 0.00 |
| 2 COMBINED AT | 030520 | 168. | 3.13 | 9. | 5. | 5. | 0.00 |
| ROUTED TO | 030540 | 163. | 3.20 | 9. | 5. | 5. | 0.00 |
| HYDROGRAPH AT | 030810 | 0. | 3.27 | 0. | 0. | 0. | 0.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ROUTED TO | 030540 | 0. | 4.43 | 0. | 0. | 0. | 0.00 | | |
| HYDROGRAPH AT | 030540 | 86. | 3.13 | 9. | 6. | 6. | 0.04 | | |
| HYDROGRAPH AT | 030550 | 167. | 3.10 | 13. | 8. | 8. | 0.04 | | |
| 4 COMBINED AT | 030550 | 374. | 3.17 | 31. | 19. | 19. | 0.08 | | |
| ROUTED TO | AUTO | 181. | 3.43 | 110. | 106. | 106. | 0.08 | 67.20 | 3.43 |
| ROUTED TO | 030530 | 181. | 3.43 | 110. | 106. | 106. | 0.08 | | |
| HYDROGRAPH AT | 030530 | 92. | 3.13 | 10. | 6. | 6. | 0.04 | | |
| 2 COMBINED AT | 030530 | 252. | 3.17 | 119. | 112. | 112. | 0.13 | | |
| ROUTED TO | 030520 | 251. | 3.17 | 119. | 112. | 112. | 0.13 | | |
| 3 COMBINED AT | 030520 | 598. | 3.33 | 181. | 149. | 149. | 0.49 | | |
| ROUTED TO | 040120 | 598. | 3.37 | 181. | 149. | 149. | 0.49 | | |
| HYDROGRAPH AT | 040110 | 97. | 3.17 | 12. | 7. | 7. | 0.05 | | |
| ROUTED TO | 040120 | 96. | 3.20 | 12. | 7. | 7. | 0.05 | | |
| HYDROGRAPH AT | 040120 | 231. | 3.17 | 25. | 15. | 15. | 0.11 | | |
| 3 COMBINED AT | 040120 | 830. | 3.30 | 217. | 171. | 171. | 0.66 | | |
| ROUTED TO | 040130 | 829. | 3.30 | 217. | 171. | 171. | 0.66 | | |
| HYDROGRAPH AT | 040130 | 65. | 3.07 | 5. | 3. | 3. | 0.02 | | |
| 2 COMBINED AT | 040130 | 860. | 3.27 | 223. | 175. | 175. | 0.68 | | |
| ROUTED TO | 040040 | 860. | 3.30 | 223. | 175. | 175. | 0.68 | | |
| HYDROGRAPH AT | 040010 | 77. | 3.10 | 8. | 5. | 5. | 0.04 | | |
| ROUTED TO | 040020 | 76. | 3.13 | 8. | 5. | 5. | 0.04 | | |
| HYDROGRAPH AT | 040020 | 69. | 3.20 | 9. | 5. | 5. | 0.04 | | |
| 2 COMBINED AT | 040020 | 144. | 3.17 | 17. | 10. | 10. | 0.08 | | |
| ROUTED TO | 040030 | 142. | 3.20 | 17. | 10. | 10. | 0.08 | | |
| HYDROGRAPH AT | 040030 | 126. | 3.17 | 14. | 9. | 9. | 0.06 | | |
| 2 COMBINED AT | 040030 | 266. | 3.20 | 31. | 19. | 19. | 0.14 | | |
| ROUTED TO | 040040 | 263. | 3.27 | 31. | 19. | 19. | 0.14 | | |
| HYDROGRAPH AT | 040210 | 35. | 3.07 | 3. | 2. | 2. | 0.01 | | |
| ROUTED TO | 040040 | 33. | 3.23 | 3. | 2. | 2. | 0.01 | | |
| HYDROGRAPH AT | 040040 | 155. | 3.17 | 13. | 8. | 8. | 0.04 | | |
| 4 COMBINED AT | 040040 | 1266. | 3.23 | 270. | 203. | 203. | 0.88 | | |
| ROUTED TO | 040050 | 1261. | 3.23 | 270. | 203. | 203. | 0.88 | | |
| HYDROGRAPH AT | 040310 | 164. | 3.10 | 15. | 9. | 9. | 0.06 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ROUTED TO | 040050 | 159. | 3.13 | 15. | 9. | 9. | 0.06 |
| HYDROGRAPH AT | 040050 | 273. | 3.17 | 27. | 16. | 16. | 0.11 |
| 3 COMBINED AT | 040050 | 1614. | 3.20 | 311. | 228. | 228. | 1.05 |
| ROUTED TO | 040060 | 1608. | 3.23 | 311. | 228. | 228. | 1.05 |
| HYDROGRAPH AT | 040060 | 81. | 3.10 | 6. | 4. | 4. | 0.02 |
| 2 COMBINED AT | 040060 | 1656. | 3.20 | 318. | 232. | 232. | 1.07 |
| ROUTED TO | 040070 | 1651. | 3.23 | 318. | 232. | 232. | 1.07 |

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

| ISTAQ | ELEMENT | DT (MIN) | PEAK (CFS) | TIME TO PEAK (MIN) | VOLUME (IN) | INTERPOLATED TO COMPUTATION INTERVAL DT (MIN) | PEAK (CFS) | TIME TO PEAK (MIN) | VOLUME (IN) |
|---|---|---|---|---|---|---|---|---|---|
| 070808 | MANE | 0.62 | 34.41 | 195.37 | 2.08 | 2.00 | 34.31 | 196.00 | 2.08 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1901E+01 OUTFLOW=0.1883E+01 BASIN STORAGE=0.1037E-01 PERCENT ERROR= 0.4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070610 | MANE | 0.16 | 12.00 | 191.80 | 1.44 | 2.00 | 12.00 | 192.00 | 1.44 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1305E+01 EXCESS=0.0000E+00 OUTFLOW=0.1305E+01 BASIN STORAGE=0.5719E-04 PERCENT ERROR= 0.0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070610 | MANE | 0.38 | 14.19 | 194.83 | 2.08 | 2.00 | 14.13 | 194.00 | 2.08 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.7828E+00 OUTFLOW=0.7753E+00 BASIN STORAGE=0.4218E-02 PERCENT ERROR= 0.4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070508 | MANE | 0.39 | 17.00 | 191.71 | 1.44 | 2.00 | 17.00 | 192.00 | 1.44 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1845E+01 EXCESS=0.0000E+00 OUTFLOW=0.1845E+01 BASIN STORAGE=0.1320E-03 PERCENT ERROR= 0.0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070508 | MANE | 0.58 | 13.56 | 197.61 | 1.84 | 2.00 | 13.54 | 198.00 | 1.84 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.7916E+00 OUTFLOW=0.7834E+00 BASIN STORAGE=0.5102E-02 PERCENT ERROR= 0.4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070010 | MANE | 0.22 | 21.00 | 192.30 | 1.38 | 2.00 | 21.00 | 192.00 | 1.38 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2349E+01 EXCESS=0.0000E+00 OUTFLOW=0.2349E+01 BASIN STORAGE=0.1084E-03 PERCENT ERROR= 0.0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070010 | MANE | 0.85 | 18.16 | 196.04 | 2.08 | 2.00 | 18.15 | 196.00 | 2.08 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1006E+01 OUTFLOW=0.9971E+00 BASIN STORAGE=0.5616E-02 PERCENT ERROR= 0.4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070210 | MANE | 0.17 | 28.00 | 191.58 | 1.40 | 2.00 | 28.00 | 192.00 | 1.40 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3071E+01 EXCESS=0.0000E+00 OUTFLOW=0.3071E+01 BASIN STORAGE=0.5912E-04 PERCENT ERROR= 0.0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070209 | MANE | 0.45 | 34.53 | 195.80 | 2.00 | 2.00 | 34.50 | 196.00 | 2.00 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1933E+01 OUTFLOW=0.1915E+01 BASIN STORAGE=0.9923E-02 PERCENT ERROR= 0.4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 070210 | MANE | 0.28 | 34.42 | 196.15 | 2.00 | 2.00 | 34.38 | 196.00 | 2.00 |

```
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1917E+01 EXCESS=0.0000E+00 OUTFLOW=0.1917E+01 BASIN STORAGE=0.1977E-03 PERCENT ERROR=   0.0

        070210  MANE        0.57     15.34    195.82      2.00      2.00     15.33    196.00        2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8593E+00 OUTFLOW=0.8513E+00 BASIN STORAGE=0.4432E-02 PERCENT ERROR=   0.4

        050005  MANE        0.59     45.00    193.25      1.39      2.00     45.00    194.00        1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4971E+01 EXCESS=0.0000E+00 OUTFLOW=0.4971E+01 BASIN STORAGE=0.7005E-03 PERCENT ERROR=   0.0

        050005  MANE        0.86     63.99    197.83      1.84      2.00     63.97    198.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.3760E+01 OUTFLOW=0.3719E+01 BASIN STORAGE=0.2602E-01 PERCENT ERROR=   0.4

        030510  MANE        0.86     66.00    195.85      1.34      2.00     66.00    196.00        1.34

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7483E+01 EXCESS=0.0000E+00 OUTFLOW=0.7484E+01 BASIN STORAGE=0.1826E-02 PERCENT ERROR=   0.0

        030509  MANE        1.51     36.05    191.90      1.90      2.00     36.03    192.00        1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1640E+01 OUTFLOW=0.1625E+01 BASIN STORAGE=0.6589E-02 PERCENT ERROR=   0.5

        030510  MANE        2.00     35.46    197.77      1.90      2.00     35.21    198.00        1.90

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1624E+01 EXCESS=0.0000E+00 OUTFLOW=0.1622E+01 BASIN STORAGE=0.3502E-02 PERCENT ERROR=  -0.1

        030510  MANE        0.99    139.45    187.73      2.14      2.00    139.01    188.00        2.13

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.8021E+01 OUTFLOW=0.7970E+01 BASIN STORAGE=0.3230E-01 PERCENT ERROR=   0.2

        030809  MANE        1.06     27.61    191.16      1.90      2.00     27.54    192.00        1.91

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1230E+01 OUTFLOW=0.1219E+01 BASIN STORAGE=0.4880E-02 PERCENT ERROR=   0.5

        030810  MANE        2.00     27.10    194.80      1.92      2.00     27.02    196.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1219E+01 EXCESS=0.0000E+00 OUTFLOW=0.1231E+01 BASIN STORAGE=0.3685E-02 PERCENT ERROR=  -1.3

        030810  MANE        1.96    116.65    200.56      1.83      2.00    115.72    200.00        1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.7123E+01 OUTFLOW=0.7011E+01 BASIN STORAGE=0.6953E-01 PERCENT ERROR=   0.6

        030510  MANE        0.76    139.19    201.36      1.84      2.00    138.48    202.00        1.84
```

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.8238E+01 EXCESS=0.0000E+00 OUTFLOW=0.8238E+01 BASIN STORAGE=0.1850E-02 PERCENT ERROR= 0.0

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030520 | MANE | 0.49 | 266.35 | 202.09 | 1.54 | 2.00 | 266.34 | 202.00 | 1.54 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2261E+02 EXCESS=0.0000E+00 OUTFLOW=0.2261E+02 BASIN STORAGE=0.3049E-02 PERCENT ERROR= 0.0

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030710 | MANE | 0.82 | 50.88 | 184.53 | 2.08 | 2.00 | 49.62 | 184.00 | 2.08 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2341E+01 OUTFLOW=0.2333E+01 BASIN STORAGE=0.6721E-02 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030720 | MANE | 1.09 | 49.54 | 186.87 | 2.08 | 2.00 | 49.30 | 188.00 | 2.08 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2332E+01 EXCESS=0.0000E+00 OUTFLOW=0.2330E+01 BASIN STORAGE=0.2270E-02 PERCENT ERROR= 0.0

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030720 | MANE | 1.07 | 54.93 | 187.09 | 1.98 | 2.00 | 54.85 | 186.00 | 1.98 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2867E+01 OUTFLOW=0.2852E+01 BASIN STORAGE=0.1110E-01 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030520 | MANE | 0.75 | 102.70 | 187.53 | 2.03 | 2.00 | 102.63 | 188.00 | 2.03 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5185E+01 EXCESS=0.0000E+00 OUTFLOW=0.5185E+01 BASIN STORAGE=0.3580E-02 PERCENT ERROR= -0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030520 | MANE | 0.83 | 88.20 | 185.74 | 2.02 | 2.00 | 87.80 | 186.00 | 2.02 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4449E+01 OUTFLOW=0.4425E+01 BASIN STORAGE=0.1573E-01 PERCENT ERROR= 0.2

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030520 | MANE | 0.98 | 95.96 | 198.07 | -1.00 | 2.00 | 95.92 | 198.00 | -1.00 |
| 030540 | MANE | 1.04 | 166.46 | 191.19 | -1.00 | 2.00 | 162.77 | 192.00 | -1.00 |
| 030540 | MANE | 2.00 | 0.01 | 266.81 | -1.00 | 2.00 | 0.01 | 268.00 | -1.00 |
| 030540 | MANE | 0.63 | 86.70 | 187.05 | 2.11 | 2.00 | 86.02 | 188.00 | 2.11 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4647E+01 OUTFLOW=0.4620E+01 BASIN STORAGE=0.1823E-01 PERCENT ERROR= 0.2

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030550 | MANE | 1.18 | 169.10 | 186.68 | 2.81 | 2.00 | 166.73 | 186.00 | 2.81 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.6450E+01 OUTFLOW=0.6434E+01 BASIN STORAGE=0.9288E-02 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030530 | MANE | 0.37 | 180.81 | 206.72 | 19.44 | 2.00 | 180.78 | 206.00 | 19.44 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.8708E+02 EXCESS=0.0000E+00 OUTFLOW=0.8710E+02 BASIN STORAGE=-.8322E-01 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030530 | MANE | 1.12 | 93.02 | 187.32 | 2.10 | 2.00 | 91.73 | 188.00 | 2.10 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4953E+01 OUTFLOW=0.4926E+01 BASIN STORAGE=0.1966E-01 PERCENT ERROR= 0.2

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030520 | MANE | 0.58 | 251.44 | 190.58 | 13.48 | 2.00 | 251.11 | 190.00 | 13.48 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9201E+02 EXCESS=0.0000E+00 OUTFLOW=0.9204E+02 BASIN STORAGE=-.1186E+00 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040120 | MANE | 0.69 | 597.68 | 201.55 | 4.68 | 2.00 | 597.60 | 202.00 | 4.68 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1227E+03 EXCESS=0.0000E+00 OUTFLOW=0.1227E+03 BASIN STORAGE=-.1753E+00 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040110 | MANE | 0.98 | 97.43 | 191.15 | 2.01 | 2.00 | 96.72 | 190.00 | 2.01 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.5829E+01 OUTFLOW=0.5779E+01 BASIN STORAGE=0.3036E-01 PERCENT ERROR= 0.3

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040120 | MANE | 0.18 | 96.69 | 190.40 | 2.01 | 2.00 | 96.28 | 192.00 | 2.01 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5775E+01 EXCESS=0.0000E+00 OUTFLOW=0.5774E+01 BASIN STORAGE=0.2052E-03 PERCENT ERROR= 0.0

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040120 | MANE | 1.54 | 231.53 | 189.63 | 2.11 | 2.00 | 230.88 | 190.00 | 2.11 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1268E+02 OUTFLOW=0.1259E+02 BASIN STORAGE=0.6479E-01 PERCENT ERROR= 0.2

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040130 | MANE | 0.24 | 829.49 | 198.23 | 4.02 | 2.00 | 829.30 | 198.00 | 4.02 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1411E+03 EXCESS=0.0000E+00 OUTFLOW=0.1411E+03 BASIN STORAGE=-.4943E-01 PERCENT ERROR= 0.0

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040130 | MANE | 0.58 | 64.91 | 184.34 | 2.20 | 2.00 | 64.54 | 184.00 | 2.20 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.2706E+01 OUTFLOW=0.2698E+01 BASIN STORAGE=0.5064E-02 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040040 | MANE | 0.29 | 860.04 | 196.76 | 3.96 | 2.00 | 859.87 | 198.00 | 3.96 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1438E+03 EXCESS=0.0000E+00 OUTFLOW=0.1438E+03 BASIN STORAGE=-.5860E-01 PERCENT ERROR= 0.0

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040010 | MANE | 0.97 | 79.06 | 186.44 | 2.00 | 2.00 | 77.40 | 186.00 | 2.00 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4069E+01 OUTFLOW=0.4046E+01 BASIN STORAGE=0.1655E-01 PERCENT ERROR= 0.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 040020 | MANE | 0.92 | 77.32 | 188.18 | 2.00 | 2.00 | 76.48 | 188.00 | 2.00 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.4045E+01 EXCESS=0.0000E+00 OUTFLOW=0.4045E+01 BASIN STORAGE=0.3721E-02 PERCENT ERROR= -0.1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040020 | MANE | 2.00 | 69.51 | 191.37 | 2.02 | 2.00 | 69.13 | 192.00 | 2.02 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.4462E+01 OUTFLOW=0.4427E+01 BASIN STORAGE=0.2387E-01 PERCENT ERROR= 0.3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040030 | MANE | 0.84 | 142.71 | 191.42 | 2.01 | 2.00 | 141.79 | 192.00 | 2.01 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.8472E+01 EXCESS=0.0000E+00 OUTFLOW=0.8468E+01 BASIN STORAGE=0.6964E-02 PERCENT ERROR= 0.0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040030 | MANE | 2.00 | 127.03 | 190.32 | 2.17 | 2.00 | 125.73 | 190.00 | 2.17 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.7123E+01 OUTFLOW=0.7070E+01 BASIN STORAGE=0.2950E-01 PERCENT ERROR= 0.3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040040 | MANE | 2.00 | 264.89 | 196.68 | 2.08 | 2.00 | 262.57 | 196.00 | 2.08 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1554E+02 EXCESS=0.0000E+00 OUTFLOW=0.1552E+02 BASIN STORAGE=0.9121E-02 PERCENT ERROR= 0.0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040210 | MANE | 0.66 | 34.93 | 184.63 | 2.32 | 2.00 | 34.68 | 184.00 | 2.32 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1362E+01 OUTFLOW=0.1359E+01 BASIN STORAGE=0.1720E-02 PERCENT ERROR= 0.1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040040 | MANE | 2.00 | 33.83 | 193.18 | 2.36 | 2.00 | 32.96 | 194.00 | 2.36 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1359E+01 EXCESS=0.0000E+00 OUTFLOW=0.1385E+01 BASIN STORAGE=0.6528E-02 PERCENT ERROR= -2.4

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040040 | MANE | 2.00 | 159.55 | 188.89 | 2.79 | 2.00 | 154.64 | 190.00 | 2.79 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.6575E+01 OUTFLOW=0.6542E+01 BASIN STORAGE=0.1388E-01 PERCENT ERROR= 0.3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040050 | MANE | 0.43 | 1264.76 | 194.90 | 3.58 | 2.00 | 1260.70 | 194.00 | 3.58 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1672E+03 EXCESS=0.0000E+00 OUTFLOW=0.1673E+03 BASIN STORAGE=-.1662E+00 PERCENT ERROR= 0.0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040310 | MANE | 1.14 | 164.43 | 185.26 | 2.20 | 2.00 | 163.79 | 186.00 | 2.20 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.7295E+01 OUTFLOW=0.7267E+01 BASIN STORAGE=0.1663E-01 PERCENT ERROR= 0.2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040050 | MANE | 1.57 | 159.85 | 189.57 | 2.19 | 2.00 | 159.09 | 188.00 | 2.19 |

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7268E+01 EXCESS=0.0000E+00 OUTFLOW=0.7253E+01 BASIN STORAGE=0.9887E-02 PERCENT ERROR= 0.1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 040050 | MANE | 1.08 | 274.51 | 189.83 | 2.24 | 2.00 | 272.97 | 190.00 | 2.24 |

```
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.1359E+02 OUTFLOW=0.1351E+02 BASIN STORAGE=0.5827E-01 PERCENT ERROR=   0.1

          040060  MANE         0.18   1612.82    192.46      3.35      2.00   1607.58    194.00        3.35

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1880E+03 EXCESS=0.0000E+00 OUTFLOW=0.1880E+03 BASIN STORAGE=-.7574E-01 PERCENT ERROR=   0.0

          040060  MANE         0.60     82.37    185.55      2.70      2.00     81.50    186.00        2.70

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.0000E+00 EXCESS=0.3171E+01 OUTFLOW=0.3163E+01 BASIN STORAGE=0.6108E-02 PERCENT ERROR=   0.1

          040070  MANE         0.17   1655.63    192.34      3.34      2.00   1650.67    194.00        3.34

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1912E+03 EXCESS=0.0000E+00 OUTFLOW=0.1912E+03 BASIN STORAGE=-.7376E-01 PERCENT ERROR=   0.0


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

# Appendix E STORMPlus Results

```
STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
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Version ^@^@^@^@^@
Serial Number ^@^@^@^@^@^@^@^@

Oct 13, 1997  10:22:28

Input file : 64clomr.dat
Output file: 64clomr.out

                                INPUT FILE LISTING


T1 STP Papago - 091131.00 - CLOMR
T2 Oak Street Storm Drain - 64th Street Lateral - STA 94+11.76
T3 6 HR 100 YR Storm
SO   1000.00 270.83  1                        283.33
R    1250.00 274.54  1      .013                                  2.25 1
R    1650.00 275.86  1      .013                                  1.25 1
R    2050.00 277.18  1      .013                                 45.00 1
R    2126.30 277.43  1      .013
SH                   1
1                                                   SP                                                          PAGE    1
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH   DIAMETER  WIDTH                DROP

  CD     1    4                      5.50                                                                   PAGE NO   1
1
0                          WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                            STP Papago - 091131.00 - CLOMR
0HEADING LINE NO 2 IS -
0                            Oak Street Storm Drain - 64th Street Lateral - STA 94+11.76
0HEADING LINE NO 3 IS -
0                            6 HR 100 YR Storm                                                              PAGE NO   2
1
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET        *        *        *                                  W S ELEV
                      U/S DATA   STATION    INVERT   SECT                                        283.33
                                  1000.00   270.83    1
0 ELEMENT NO   2 IS A REACH          *        *        *                N                        RADIUS  ANGLE  ANG PT  MAN H
                      U/S DATA   STATION    INVERT   SECT              .013                        .00    .00    2.20     5
                                  1250.00   274.54    1
0 ELEMENT NO   3 IS A REACH          *        *        *                N                        RADIUS  ANGLE  ANG PT  MAN H
                      U/S DATA   STATION    INVERT   SECT              .013                        .00    .00    1.20     5
                                  1650.00   275.86    1
0 ELEMENT NO   4 IS A REACH          *        *        *                N                        RADIUS  ANGLE  ANG PT  MAN H
                      U/S DATA   STATION    INVERT   SECT              .013                        .00    .00   45.00     0
                                  2050.00   277.18    1
0 ELEMENT NO   5 IS A REACH          *        *        *                N                        RADIUS  ANGLE  ANG PT  MAN H
                      U/S DATA   STATION    INVERT   SECT              .013                        .00    .00     .00     0
                                  2126.30   277.43    1                    *
0 ELEMENT NO   6 IS A SYSTEM HEADWORKS                                                           W S ELEV
                      U/S DATA   STATION    INVERT   SECT                                          .00
                                  2126.30   277.43    1
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
                                                                                                              PAGE    1
1
                                WATER SURFACE PROFILE LISTING
                        STP Papago - 091131.00 - CLOMR
                        Oak Street Storm Drain - 64th Street Lateral - STA 94+11.76
                        6 HR 100 YR Storm
0 STATION    INVERT   DEPTH     W.S.        Q        VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/    BASE/    ZL    NO  AVBPR
0 L/ELEM     ELEV     OF FLOW   ELEV                         HEAD    GRD.EL.  ELEV   DEPTH   NORM DEPTH  DIA     ID NO.   ZR    PIER
                SO                                          SF AVE    HF
*****************************************************************************************************************************
0  1000.00   270.83    12.50   283.33    140.0    5.89     .54    283.87    .00    3.30                5.50     .00    .00    0    .00
0   250.00   .01484                                       .00174     .43                       2.22                          .00
0  1250.00   274.54     9.36   283.90    140.0    5.89     .54    284.44    .00    3.30                5.50     .00    .00    0    .00
0   400.00   .00330                                       .00174     .70                       3.47                          .00
0  1650.00   275.86     8.88   284.74    140.0    5.89     .54    285.28    .00    3.30                5.50     .00    .00    0    .00
0   400.00   .00330                                       .00174     .70                       3.47                          .00
0  2050.00   277.18     8.33   285.51    140.0    5.89     .54    286.05    .00    3.30                5.50     .00    .00    0    .00
0    76.30   .00328                                       .00174     .13                       3.48                          .00
0  2126.30   277.43     8.21   285.64    140.0    5.89     .54    286.18    .00    3.30                5.50     .00    .00    0    .00
1
```

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
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Version ^@^@^@^@^@
Serial Number ^@^@^@^@^@^@^@^@

Oct 13, 1997 10: 6: 2

Input file : oakclomr.dat
Output file: oakclomr.out

INPUT FILE LISTING

```
T1 STP Papago - 091131.00 - CLOMR
T2 Oak Street Storm Drain
T3 6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.
SO   1000.00 206.50  1                          213.60
BX   1000.00 206.50  2
R    1154.02 207.12  2      .013
R    1281.05 207.63  2      .013                                55.98
JX   1501.52 208.51  2 13   .013    23.          210.51         33.97
R    1516.60 208.57  2      .013                                          1
R    1565.56 208.76  2      .013                                56.11
R    2750.00 213.50  2      .013                                          2
JX   2800.00 213.70  2 10   .013   174.          216.00         90.00
TS   2835.00 217.77  3      .013
R    2908.65 217.84  3      .013                                       5.00 1
R    3053.65 217.99  3      .013                                       5.00
R    3250.00 218.18  3      .013
R    4100.00 223.28  3      .013                                          2
JX   4152.79 223.60  3 10   .013    99.          223.60         90.00
R    4250.00 224.18  3      .013                                       5.00 1
TS   4300.00 224.38  6      .013
R    4315.03 224.44  6      .013                                       5.00
R    5520.43 229.26  6      .013                                       5.00 2
R    5736.03 230.12  6      .013                                       5.00 1
R    6750.00 236.20  6      .013                                          2
TS   6800.00 236.98  7      .013
R    7300.00 244.82  7      .013                                          1
TS   7350.00 245.33  3      .013
R    7418.13 246.03  3      .013                                       5.00
R    7802.69 249.98  3      .013                                       5.00 1
R    7950.00 251.49  3      .013
R    8100.00 253.03  3      .013                                          1
JX   8122.54 253.26  3  5   .013   217.          253.26         79.56
JX   8179.33 253.84  3 11   .013    87.          254.09         90.00
BE   8179.33 253.84  4
TS   8229.33 254.35  9      .013
R    8230.00 254.36  9      .013                                       5.00
R    8343.99 255.95  9      .013                                       5.00
R    9214.43 268.08  9      .013                                       5.00 2
R    9302.68 269.32  9      .013                                       5.00
R    9400.00 270.67  9      .013                                          1
JX   9411.76 270.84  9 8 11 .013   140.     63.  270.83 271.21 90.00 90.00
R    9502.68 272.11  9      .013                                       5.00 1
R    9574.21 273.09 12      .013                                       5.00
R   10200.00 281.83 12      .013                                          2
R   10850.00 292.89 12      .013                                          2
JX  10860.00 293.06 12 13   .013    20.          293.56         90.00
R   11950.00 301.78 12      .013                                       5.00 2
R   12083.36 302.85 12      .013                                       5.00 1
JX  12100.00 302.98 12 13   .013    17.          303.48         90.00
R   12132.78 303.24 12      .013
R   13025.00 306.18 12      .013                                     45.00 3
R   13095.00 306.41 12      .013
SH                 12
1                                                   SP
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING                                  PAGE    1
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH              DROP

  CD      1    3      0      .00      4.50    19.75   .00   .00   .00
  CD      2    3      1      .75      4.50    19.75   .00   .00   .00
  CD      3    3      1      .75      4.50    14.75   .00   .00   .00
  CD      4    3      0      .00      4.50    14.75   .00   .00   .00
  CD      5    3      0      .00      4.50     7.00   .00   .00   .00
  CD      6    4                      7.50
  CD      7    4                      6.25
  CD      8    4                      5.50
  CD      9    4                      4.75
  CD     10    4                      4.50
  CD     11    4                      4.00
  CD     12    4                      3.00
  CD     13    4                      2.00
1                                                                                                                   PAGE NO    1
0                           WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                             STP Papago - 091131.00 - CLOMR
0HEADING LINE NO 2 IS -
0                             Oak Street Storm Drain
0HEADING LINE NO 3 IS -
0                             6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.
1                                                                                                                   PAGE NO    2
0                           WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   1 IS A SYSTEM OUTLET      *         *      *
                      U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                                   1000.00  206.50    1                                     213.60
0 ELEMENT NO   2 IS A BRIDGE EXIT                     *
                      U/S DATA   STATION    INVERT  SECT
                                   1000.00  206.50    2
0 ELEMENT NO   3 IS A REACH            *         *      *
                      U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                   1154.02  207.12    2             .013                                 .00    .00     .00      0
0 ELEMENT NO   4 IS A REACH            *         *      *
                      U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                   1281.05  207.63    2             .013                                 .00  55.98     .00      0
0 ELEMENT NO   5 IS A JUNCTION         *         *      *      *          *                   *          *
                      U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3       Q4    INVERT-3 INVERT-4  PHI 3   PHI 4
                                   1501.52  208.51    2    13     0  .013    23.0       .0   210.51      .00  33.97     .00
0 ELEMENT NO   6 IS A REACH            *         *      *
                      U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
                                   1516.60  208.57    2             .013                                 .00    .00     .00      1
0 ELEMENT NO   7 IS A REACH            *         *      *
                      U/S DATA   STATION    INVERT  SECT              N                                RADIUS  ANGLE  ANG PT  MAN H
```

```
                                        1565.56  208.76    2                .013                                      .00   56.11      .00      0
0 ELEMENT NO    8 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 2750.00   213.50    2                .013                                      .00     .00      .00      2
0 ELEMENT NO    9 IS A JUNCTION            *              *      *       *              *                  *                *
                     U/S DATA    STATION      INVERT   SECT LAT-1 LAT-2    N      Q3         Q4      INVERT-3 INVERT-4  PHI 3    PHI 4
                                 2800.00   213.70    2    10      0   .013    174.0           .0   216.00       .00  90.00      .00
0 ELEMENT NO   10 IS A TRANSITION          *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N
                                 2835.00   217.77    3                .013
0 ELEMENT NO   11 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 2908.65   217.84    3                .013                                      .00     .00     5.00      1
1                                                                                                                             PAGE NO    3
0                             WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   12 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 3053.65   217.99    3                .013                                      .00     .00     5.00      0
0 ELEMENT NO   13 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 3250.00   218.18    3                .013                                      .00     .00      .00      0
0 ELEMENT NO   14 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 4100.00   223.28    3                .013                                      .00     .00      .00      2
0 ELEMENT NO   15 IS A JUNCTION            *              *      *       *              *                  *                *
                     U/S DATA    STATION      INVERT   SECT LAT-1 LAT-2    N      Q3         Q4      INVERT-3 INVERT-4  PHI 3    PHI 4
                                 4152.79   223.60    3    10      0   .013     99.0           .0   223.60       .00  90.00      .00
0 ELEMENT NO   16 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 4250.00   224.18    3                .013                                      .00     .00     5.00      1
0 ELEMENT NO   17 IS A TRANSITION          *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N
                                 4300.00   224.38    6                .013
0 ELEMENT NO   18 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 4315.03   224.44    6                .013                                      .00     .00     5.00      0
0 ELEMENT NO   19 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 5520.43   229.26    6                .013                                      .00     .00     5.00      2
0 ELEMENT NO   20 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 5736.03   230.12    6                .013                                      .00     .00     5.00      1
0 ELEMENT NO   21 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 6750.00   236.20    6                .013                                      .00     .00      .00      2
0 ELEMENT NO   22 IS A TRANSITION          *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N
                                 6800.00   236.98    7                .013
0 ELEMENT NO   23 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 7300.00   244.82    7                .013                                      .00     .00      .00      1
0 ELEMENT NO   24 IS A TRANSITION          *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N
                                 7350.00   245.33    3                .013
1                                                                                                                             PAGE NO    4
0                             WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   25 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 7418.13   246.03    3                .013                                      .00     .00     5.00      0
0 ELEMENT NO   26 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 7802.69   249.98    3                .013                                      .00     .00     5.00      1
0 ELEMENT NO   27 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 7950.00   251.49    3                .013                                      .00     .00      .00      0
0 ELEMENT NO   28 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 8100.00   253.03    3                .013                                      .00     .00      .00      1
0 ELEMENT NO   29 IS A JUNCTION            *              *      *       *              *                  *                *
                     U/S DATA    STATION      INVERT   SECT LAT-1 LAT-2    N      Q3         Q4      INVERT-3 INVERT-4  PHI 3    PHI 4
                                 8122.54   253.26    3     5      0   .013    217.0           .0   253.26       .00  79.56      .00
0 ELEMENT NO   30 IS A JUNCTION            *              *      *       *              *                  *                *
                     U/S DATA    STATION      INVERT   SECT LAT-1 LAT-2    N      Q3         Q4      INVERT-3 INVERT-4  PHI 3    PHI 4
                                 8179.33   253.84    3    11      0   .013     87.0           .0   254.09       .00  90.00      .00
0 ELEMENT NO   31 IS A BRIDGE ENTRANCE                   *
                     U/S DATA    STATION      INVERT   SECT                 FP
                                 8179.33   253.84    4               1.000
0 ELEMENT NO   32 IS A TRANSITION          *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N
                                 8229.33   254.35    9                .013
0 ELEMENT NO   33 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 8230.00   254.36    9                .013                                      .00     .00     5.00      0
0 ELEMENT NO   34 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 8343.99   255.95    9                .013                                      .00     .00     5.00      0
0 ELEMENT NO   35 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 9214.43   268.08    9                .013                                      .00     .00     5.00      2
1                                                                                                                             PAGE NO    5
0                             WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO   36 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 9302.68   269.32    9                .013                                      .00     .00     5.00      0
0 ELEMENT NO   37 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 9400.00   270.67    9                .013                                      .00     .00      .00      1
0 ELEMENT NO   38 IS A JUNCTION            *              *      *       *              *                  *                *
                     U/S DATA    STATION      INVERT   SECT LAT-1 LAT-2    N      Q3         Q4      INVERT-3 INVERT-4  PHI 3    PHI 4
                                 9411.76   270.84    9     8     11   .013    140.0         63.0   270.83    271.21  90.00    90.00
0 ELEMENT NO   39 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 9502.68   272.11    9                .013                                      .00     .00     5.00      1
 WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS
0 ELEMENT NO   40 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                 9574.21   273.09   12                .013                                      .00     .00     5.00      0
0 ELEMENT NO   41 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                10200.00   281.83   12                .013                                      .00     .00      .00      2
0 ELEMENT NO   42 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                10850.00   292.89   12                .013                                      .00     .00      .00      2
0 ELEMENT NO   43 IS A JUNCTION            *              *      *       *              *                  *                *
                     U/S DATA    STATION      INVERT   SECT LAT-1 LAT-2    N      Q3         Q4      INVERT-3 INVERT-4  PHI 3    PHI 4
                                10860.00   293.06   12    13      0   .013     20.0           .0   293.56       .00  90.00      .00
0 ELEMENT NO   44 IS A REACH               *              *      *
                     U/S DATA    STATION      INVERT   SECT                  N                               RADIUS   ANGLE   ANG PT   MAN H
                                11950.00   301.78   12                .013                                      .00     .00     5.00      2
```

```
0 ELEMENT NO  45 IS A REACH                *           *      *
                       U/S DATA   STATION     INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 12083.36   302.85   12               .013                                  .00    .00    5.00      1
0 ELEMENT NO  46 IS A JUNCTION             *           *      *      *                *           *          *
                       U/S DATA   STATION     INVERT  SECT LAT-1 LAT-2   N       Q3        Q4     INVERT-3 INVERT-4  PHI 3   PHI 4
                                 12100.00   302.98   12    13     0   .013     17.0        .0   303.48       .00  90.00     .00
1                                                                                                                      PAGE NO   6
0                           WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO  47 IS A REACH                *           *      *
                       U/S DATA   STATION     INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 12132.78   303.24   12               .013                                  .00    .00     .00      0
0 ELEMENT NO  48 IS A REACH                *           *      *
                       U/S DATA   STATION     INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 13025.00   306.18   12               .013                                  .00    .00   45.00      3
0 ELEMENT NO  49 IS A REACH                *           *      *
                       U/S DATA   STATION     INVERT  SECT                N                                RADIUS  ANGLE  ANG PT  MAN H
                                 13095.00   306.41   12               .013                                  .00    .00     .00      0
0 ELEMENT NO  50 IS A SYSTEM HEADWORKS                    *                  *
                       U/S DATA   STATION     INVERT  SECT                              W S ELEV
                                 13095.00   306.41   12                                      .00
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
1                                                                                                                          PAGE     1
                                                      WATER SURFACE PROFILE LISTING
                        STP Papago - 091131.00 - CLOMR
                        Oak Street Storm Drain
                        6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.
0 STATION      INVERT   DEPTH      W.S.         Q        VEL      VEL     ENERGY    SUPER  CRITICAL            HGT/   BASE/     ZL    NO  AVBPR
                ELEV   OF FLOW     ELEV                           HEAD    GRD.EL.   ELEV    DEPTH              DIA    ID NO.         PIER
0 L/ELEM        SO                                                SF AVE    HF                      NORM DEPTH                   ZR
*******************************************************************************************************************************************
0  1000.00   206.50     7.10     213.60      867.0     9.78      1.49    215.09     .00     3.91                4.50   19.75    .00    0    .00
0BRIDGE EXIT                                                                                                                     .00
0  1000.00   206.50     7.10     213.60      867.0    10.20      1.62    215.22     .00     4.01                4.50   19.75    .00    1    .75
0   154.02   .00403                                            .00456     .70                       3.82                         .00
0  1154.02   207.12     7.18     214.30      867.0    10.20      1.62    215.92     .00     4.01                4.50   19.75    .00    1    .75
0   127.03   .00402                                            .00456     .58                       3.82                         .00
0  1281.05   207.63     7.51     215.14      867.0    10.20      1.62    216.75     .00     4.01                4.50   19.75    .00    1    .75
0JUNCT STR   .00399                                            .00445     .98                                                    .00
0  1501.52   208.51     7.73     216.24      844.0     9.93      1.53    217.77     .00     3.94                4.50   19.75    .00    1    .75
0    15.08   .00398                                            .00433     .07                       3.76                         .00
0  1516.60   208.57     7.81     216.38      844.0     9.93      1.53    217.91     .00     3.94                4.50   19.75    .00    1    .75
0    48.96   .00388                                            .00433     .21                       3.79                         .00
0  1565.56   208.76     8.07     216.83      844.0     9.93      1.53    218.36     .00     3.94                4.50   19.75    .00    1    .75
0  1184.44   .00400                                            .00433    5.12                       3.75                         .00
0  2750.00   213.50     8.61     222.11      844.0     9.93      1.53    223.64     .00     3.94                4.50   19.75    .00    1    .75
0JUNCT STR   .00400                                            .00353     .18                                                    .00
0  2800.00   213.70     9.72     223.42      670.0     7.88       .97    224.38     .00     3.38                4.50   19.75    .00    1    .75
0TRANS STR   .11629                                            .00429     .15                                                    .00
0  2835.00   217.77     5.14     222.91      670.0    10.72      1.79    224.70     .00     4.14                4.50   14.75    .00    1    .75
0    73.65   .00095                                            .00584     .43                       4.50                         .00
0  2908.65   217.84     5.62     223.46      670.0    10.72      1.79    225.25     .00     4.14                4.50   14.75    .00    1    .75
0   145.00   .00103                                            .00584     .85                       4.50                         .00
1                                                                                                                          PAGE     2
                                                      WATER SURFACE PROFILE LISTING
                        STP Papago - 091131.00 - CLOMR
                        Oak Street Storm Drain
                        6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.
0 STATION      INVERT   DEPTH      W.S.         Q        VEL      VEL     ENERGY    SUPER  CRITICAL            HGT/   BASE/     ZL    NO  AVBPR
                ELEV   OF FLOW     ELEV                           HEAD    GRD.EL.   ELEV    DEPTH              DIA    ID NO.         PIER
0 L/ELEM        SO                                                SF AVE    HF                      NORM DEPTH                   ZR
*******************************************************************************************************************************************
0  3053.65   217.99     6.35     224.34      670.0    10.72      1.79    226.12     .00     4.14                4.50   14.75    .00    1    .75
0   196.35   .00097                                            .00584    1.15                       4.50                         .00
0  3250.00   218.18     7.31     225.49      670.0    10.72      1.79    227.27     .00     4.14                4.50   14.75    .00    1    .75
0   850.00   .00600                                            .00584    4.97                       3.66                         .00
0  4100.00   223.28     7.35     230.63      670.0    10.72      1.79    232.42     .00     4.14                4.50   14.75    .00    1    .75
0JUNCT STR   .00606                                            .00504     .27                                                    .00
0  4152.79   223.60     8.28     231.88      571.0     9.14      1.30    233.17     .00     3.72                4.50   14.75    .00    1    .75
0    97.21   .00597                                            .00424     .41                       3.26                         .00
0  4250.00   224.18     8.19     232.37      571.0     9.14      1.30    233.67     .00     3.72                4.50   14.75    .00    1    .75
0TRANS STR   .00400                                            .00451     .23                                                    .00
0  4300.00   224.38     7.09     231.47      571.0    13.21      2.71    234.18     .00     6.15                7.50     .00    .00    0    .00
0    15.03   .00399                                            .00478     .07                       7.50                         .00
0  4315.03   224.44     7.11     231.55      571.0    13.19      2.70    234.25     .00     6.15                7.50     .00    .00    0    .00
0   250.45   .00400                                            .00513    1.29                       7.50                         .00
0  4565.48   225.44     7.50     232.94      571.0    12.92      2.60    235.54     .00     6.15                7.50     .00    .00    0    .00
0   954.95   .00400                                            .00550    5.25                       7.50                         .00
0  5520.43   229.26     9.17     238.43      571.0    12.92      2.60    241.02     .00     6.15                7.50     .00    .00    0    .00
0      .00   .00400                                            .00553     .00                       7.50                         .00
0  5520.43   229.26     9.17     238.43      571.0    12.92      2.60    241.02     .00     6.15                7.50     .00    .00    0    .00
0   215.60   .00399                                            .00553    1.19                       7.50                         .00
0  5736.03   230.12     9.67     239.79      571.0    12.92      2.60    242.39     .00     6.15                7.50     .00    .00    0    .00
0  1013.97   .00600                                            .00553    5.61                       5.90                         .00
1                                                                                                                          PAGE     3
                                                      WATER SURFACE PROFILE LISTING
                        STP Papago - 091131.00 - CLOMR
                        Oak Street Storm Drain
                        6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.
0 STATION      INVERT   DEPTH      W.S.         Q        VEL      VEL     ENERGY    SUPER  CRITICAL            HGT/   BASE/     ZL    NO  AVBPR
                ELEV   OF FLOW     ELEV                           HEAD    GRD.EL.   ELEV    DEPTH              DIA    ID NO.         PIER
0 L/ELEM        SO                                                SF AVE    HF                      NORM DEPTH                   ZR
*******************************************************************************************************************************************
0  6750.00   236.20     9.46     245.66      571.0    12.92      2.60    248.26     .00     6.15                7.50     .00    .00    0    .00
0TRANS STR   .01560                                            .01008     .50                                                    .00
0  6800.00   236.98     6.95     243.93      571.0    18.61      5.38    249.32     .00     5.94                6.25     .00    .00    0    .00
0   500.00   .01568                                            .01462    7.31                       4.94                         .00
0  7300.00   244.82     6.69     251.51      571.0    18.61      5.38    256.90     .00     5.94                6.25     .00    .00    0    .00
0TRANS STR   .01020                                            .00943     .47                                                    .00
0  7350.00   245.33    11.15     256.48      571.0     9.14      1.30    257.78     .00     3.72                4.50   14.75    .00    1    .75
0    68.13   .01027                                            .00424     .29                       2.67                         .00
0  7418.13   246.03    10.76     256.79      571.0     9.14      1.30    258.09     .00     3.72                4.50   14.75    .00    1    .75
0   384.56   .01027                                            .00424    1.63                       2.67                         .00
0  7802.69   249.98     8.53     258.51      571.0     9.14      1.30    259.81     .00     3.72                4.50   14.75    .00    1    .75
0   147.31   .01025                                            .00424     .63                       2.67                         .00
0  7950.00   251.49     7.64     259.13      571.0     9.14      1.30    260.43     .00     3.72                4.50   14.75    .00    1    .75
0   150.00   .01027                                            .00424     .64                       2.67                         .00
0  8100.00   253.03     6.81     259.84      571.0     9.14      1.30    261.13     .00     3.72                4.50   14.75    .00    1    .75
0JUNCT STR   .01020                                            .00294     .07                                                    .00
0  8122.54   253.26     8.10     261.36      354.0     5.66       .50    261.86     .00     2.71                4.50   14.75    .00    1    .75
0JUNCT STR   .01021                                            .00128     .07                                                    .00
0  8179.33   253.84     8.03     261.87      267.0     4.27       .28    262.15     .00     2.24                4.50   14.75    .00    1    .75
0BRIDGE ENTRANCE                                                                                                                 .00
0  8179.33   253.84     8.07     261.91      267.0     4.04       .25    262.16     .00     2.17                4.50   14.75    .00    0    .00
0TRANS STR   .01020                                            .00721     .36                                                    .00
1                                                                                                                          PAGE     4
                                                      WATER SURFACE PROFILE LISTING
                        STP Papago - 091131.00 - CLOMR
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Oak Street Storm Drain
6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.

| 0 STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |
| 0 8229.33 | 254.35 | 5.30 | 259.65 | 267.0 | 15.07 | 3.53 | 263.18 | .00 | 4.45 | | 4.75 | .00 | .00 | 0 | .00 |
| 0 .67 | .01492 | | | | | .01382 | .01 | | | 3.74 | | | .00 | | |
| 0 8230.00 | 254.36 | 5.36 | 259.72 | 267.0 | 15.07 | 3.53 | 263.25 | .00 | 4.45 | | 4.75 | .00 | .00 | 0 | .00 |
| 0 113.99 | .01395 | | | | | .01382 | 1.57 | | | 3.87 | | | .00 | | |
| 0 8343.99 | 255.95 | 5.40 | 261.35 | 267.0 | 15.07 | 3.53 | 264.88 | .00 | 4.45 | | 4.75 | .00 | .00 | 0 | .00 |
| 0 870.44 | .01393 | | | | | .01382 | 12.03 | | | 3.87 | | | .00 | | |
| 0 9214.43 | 268.08 | 5.71 | 273.79 | 267.0 | 15.07 | 3.53 | 277.32 | .00 | 4.45 | | 4.75 | .00 | .00 | 0 | .00 |
| 0 88.25 | .01405 | | | | | .01382 | 1.22 | | | 3.86 | | | .00 | | |
| 0 9302.68 | 269.32 | 5.75 | 275.07 | 267.0 | 15.07 | 3.53 | 278.60 | .00 | 4.45 | | 4.75 | .00 | .00 | 0 | .00 |
| 0 97.32 | .01387 | | | | | .01382 | 1.34 | | | 3.88 | | | .00 | | |
| 0 9400.00 | 270.67 | 5.92 | 276.59 | 267.0 | 15.07 | 3.53 | 280.12 | .00 | 4.45 | | 4.75 | .00 | .00 | 0 | .00 |
| 0JUNCT STR | .01445 | | | | | .00731 | .09 | | | | | | .00 | | |
| 0 9411.76 | 270.84 | 12.49 | 283.33 | 64.0 | 3.61 | .20 | 283.53 | .00 | 2.29 | | 4.75 | .00 | .00 | 0 | .00 |
| 0 90.92 | .01397 | | | | | .00079 | .07 | | | 1.58 | | | .00 | | |
| 0 9502.68 | 272.11 | 11.30 | 283.41 | 64.0 | 9.05 | 1.27 | 284.69 | .00 | 2.57 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 71.53 | .01370 | | | | | .00921 | .66 | | | 2.07 | | | .00 | | |
| 0 9574.21 | 273.09 | 11.00 | 284.09 | 64.0 | 9.05 | 1.27 | 285.36 | .00 | 2.57 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 625.79 | .01397 | | | | | .00921 | 5.76 | | | 2.05 | | | .00 | | |
| 0 10200.00 | 281.83 | 8.15 | 289.98 | 64.0 | 9.05 | 1.27 | 291.25 | .00 | 2.57 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 650.00 | .01702 | | | | | .00921 | 5.98 | | | 1.91 | | | .00 | | |
| 0 10850.00 | 292.89 | 3.20 | 296.09 | 64.0 | 9.05 | 1.27 | 297.37 | .00 | 2.57 | | 3.00 | .00 | .00 | 0 | .00 |
| 0JUNCT STR | .01700 | | | | | .00678 | .07 | | | | | | .00 | | |

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WATER SURFACE PROFILE LISTING
STP Papago - 091131.00 - CLOMR
Oak Street Storm Drain
6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.

| 0 STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |
| 0 10860.00 | 293.06 | 4.44 | 297.50 | 44.0 | 6.22 | .60 | 298.11 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 404.53 | .00800 | | | | | .00432 | 1.75 | | | 1.91 | | | .00 | | |
| 0 11264.53 | 296.30 | 3.00 | 299.30 | 44.0 | 6.22 | .60 | 299.90 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 55.04 | .00800 | | | | | .00405 | .22 | | | 1.91 | | | .00 | | |
| 0 11319.57 | 296.74 | 2.72 | 299.46 | 44.0 | 6.53 | .66 | 300.12 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 23.34 | .00800 | | | | | .00394 | .09 | | | 1.91 | | | .00 | | |
| 0 11342.91 | 296.92 | 2.56 | 299.48 | 44.0 | 6.85 | .73 | 300.21 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 15.61 | .00800 | | | | | .00426 | .07 | | | 1.91 | | | .00 | | |
| 0 11358.52 | 297.05 | 2.43 | 299.48 | 44.0 | 7.17 | .80 | 300.28 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0HYDRAULIC JUMP | | | | | | | | | | | | | .00 | | |
| 0 11358.52 | 297.05 | 1.91 | 298.96 | 44.0 | 9.24 | 1.33 | 300.29 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 544.30 | .00800 | | | | | .00801 | 4.36 | | | 1.91 | | | .00 | | |
| 0 11902.82 | 301.40 | 1.91 | 303.32 | 44.0 | 9.24 | 1.33 | 304.64 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 47.18 | .00800 | | | | | .00803 | .38 | | | 1.91 | | | .00 | | |
| 0 11950.00 | 301.78 | 1.91 | 303.69 | 44.0 | 9.25 | 1.33 | 305.02 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 12.46 | .00802 | | | | | .00804 | .10 | | | 1.91 | | | .00 | | |
| 0 11962.46 | 301.88 | 1.91 | 303.79 | 44.0 | 9.25 | 1.33 | 305.12 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 94.35 | .00802 | | | | | .00765 | .72 | | | 1.91 | | | .00 | | |
| 0 12056.81 | 302.64 | 1.98 | 304.62 | 44.0 | 8.88 | 1.23 | 305.84 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 22.10 | .00802 | | | | | .00687 | .15 | | | 1.91 | | | .00 | | |
| 0 12078.91 | 302.81 | 2.07 | 304.88 | 44.0 | 8.47 | 1.11 | 306.00 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 4.45 | .00802 | | | | | .00612 | .03 | | | 1.91 | | | .00 | | |

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WATER SURFACE PROFILE LISTING
STP Papago - 091131.00 - CLOMR
Oak Street Storm Drain
6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.

| 0 STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |
| 0 12083.36 | 302.85 | 2.16 | 305.01 | 44.0 | 8.07 | 1.01 | 306.02 | .00 | 2.16 | | 3.00 | .00 | .00 | 0 | .00 |
| 0JUNCT STR | .00781 | | | | | .00370 | .06 | | | | | | .00 | | |
| 0 12100.00 | 302.98 | 3.34 | 306.32 | 27.0 | 3.82 | .23 | 306.55 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 32.78 | .00793 | | | | | .00164 | .05 | | | 1.42 | | | .00 | | |
| 0 12132.78 | 303.24 | 3.14 | 306.38 | 27.0 | 3.82 | .23 | 306.60 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 105.90 | .00329 | | | | | .00163 | .17 | | | 1.86 | | | .00 | | |
| 0 12238.68 | 303.59 | 3.00 | 306.59 | 27.0 | 3.82 | .23 | 306.82 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 144.05 | .00329 | | | | | .00152 | .22 | | | 1.86 | | | .00 | | |
| 0 12382.73 | 304.06 | 2.72 | 306.78 | 27.0 | 4.01 | .25 | 307.03 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 75.11 | .00329 | | | | | .00148 | .11 | | | 1.86 | | | .00 | | |
| 0 12457.84 | 304.31 | 2.56 | 306.87 | 27.0 | 4.20 | .27 | 307.15 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 62.50 | .00329 | | | | | .00161 | .10 | | | 1.86 | | | .00 | | |
| 0 12520.34 | 304.52 | 2.43 | 306.94 | 27.0 | 4.41 | .30 | 307.25 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 56.82 | .00329 | | | | | .00177 | .10 | | | 1.86 | | | .00 | | |
| 0 12577.16 | 304.70 | 2.31 | 307.01 | 27.0 | 4.62 | .33 | 307.35 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 53.82 | .00329 | | | | | .00196 | .11 | | | 1.86 | | | .00 | | |
| 0 12630.98 | 304.88 | 2.21 | 307.09 | 27.0 | 4.85 | .37 | 307.45 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 53.75 | .00329 | | | | | .00219 | .12 | | | 1.86 | | | .00 | | |
| 0 12684.73 | 305.06 | 2.11 | 307.17 | 27.0 | 5.08 | .40 | 307.57 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 57.91 | .00329 | | | | | .00245 | .14 | | | 1.86 | | | .00 | | |
| 0 12742.63 | 305.25 | 2.02 | 307.27 | 27.0 | 5.33 | .44 | 307.71 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 71.85 | .00329 | | | | | .00275 | .20 | | | 1.86 | | | .00 | | |

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WATER SURFACE PROFILE LISTING
STP Papago - 091131.00 - CLOMR
Oak Street Storm Drain
6 HR 10 YR Storm in Mainline - 6 hr 100 YR in 66th & 64th St.

| 0 STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |
| 0 12814.48 | 305.49 | 1.94 | 307.42 | 27.0 | 5.59 | .49 | 307.91 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 148.07 | .00329 | | | | | .00310 | .46 | | | 1.86 | | | .00 | | |
| 0 12962.55 | 305.97 | 1.86 | 307.83 | 27.0 | 5.86 | .53 | 308.37 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 62.45 | .00329 | | | | | .00329 | .21 | | | 1.86 | | | .00 | | |
| 0 13025.00 | 306.18 | 1.86 | 308.04 | 27.0 | 5.86 | .53 | 308.57 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |
| 0 70.00 | .00329 | | | | | .00329 | .23 | | | 1.86 | | | .00 | | |
| 0 13095.00 | 306.41 | 1.86 | 308.27 | 27.0 | 5.86 | .53 | 308.80 | .00 | 1.68 | | 3.00 | .00 | .00 | 0 | .00 |

1

STORM DRAIN ANALYSIS PLUS

Original version by Los Angeles County Public Works
Portions Copyrighted by CIVILSOFT, 1986, 1987, 1989

Version ^@^@^@^@^@
Serial Number ^@^@^@^@^@^@^@^@

Oct 13, 1997 10: 6:28

Input file : 66clomr.dat
Output file: 66clomr.out

INPUT FILE LISTING

```
T1 STP Papago - 091131.00 - CLOMR
T2 Oak Street Storm Drain - 66th Street Lateral - STA 81+22.54
T3 6 HR 100 YR Storm
SO   1000.00 253.26  4                          261.36
R    1014.88 253.29  4      .013
TS   1024.33 253.31  1      .013
R    1127.22 253.51  1      .013                                65.50
R    1156.94 253.57  1      .013
R    1197.17 253.65  1      .013                                12.80
R    2050.72 255.36  1      .013                                      5.12 1
JX   2085.17 255.43  1  3   .013    61.          255.98        83.39
R    2136.78 255.53  1      .013                                      5.00 1
TS   2156.22 255.57  2      .013                                     38.00 2
R    2689.03 256.64  2      .013
R    2718.85 256.70  2      .013
SH                   2
1                                                   SP                                                                    PAGE    1
                                WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING
0 CARD  SECT  CHN   NO OF  AVE PIER  HEIGHT 1  BASE    ZL    ZR   INV   Y(1)  Y(2)  Y(3)  Y(4)  Y(5)  Y(6)  Y(7)  Y(8)  Y(9)  Y(10)
  CODE   NO   TYPE  PIERS   WIDTH    DIAMETER  WIDTH                DROP

  CD      1    4                      6.00
  CD      2    4                      5.50
  CD      3    4                      4.50
  CD      4    3      0       .00     4.50    7.00    .00   .00   .00                                                  PAGE NO   1
1
0                          WATER SURFACE PROFILE - TITLE CARD LISTING
0HEADING LINE NO 1 IS -
0                            STP Papago - 091131.00 - CLOMR
0HEADING LINE NO 2 IS -
0                            Oak Street Storm Drain - 66th Street Lateral - STA 81+22.54
0HEADING LINE NO 3 IS -
0                            6 HR 100 YR Storm                                                                            PAGE NO   2
1
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
0 ELEMENT NO    1 IS A SYSTEM OUTLET      *          *      *                                  W S ELEV
                       U/S DATA   STATION    INVERT  SECT                                       261.36
                                   1000.00  253.26    4
0 ELEMENT NO    2 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00    .00    .00     0
                                   1014.88  253.29    4             .013
0 ELEMENT NO    3 IS A TRANSITION     *          *      *
                       U/S DATA   STATION    INVERT  SECT              N
                                   1024.33  253.31    1             .013
0 ELEMENT NO    4 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00   65.50    .00     0
                                   1127.22  253.51    1             .013
0 ELEMENT NO    5 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00    .00    .00     0
                                   1156.94  253.57    1             .013
0 ELEMENT NO    6 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00   12.80    .00     0
                                   1197.17  253.65    1             .013
0 ELEMENT NO    7 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00    .00   5.12     1
0 ELEMENT NO    8 IS A JUNCTION       *          *      *     *     *      *       *       *       *       *       *       *
                       U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3      Q4   INVERT-3 INVERT-4  PHI 3   PHI 4
                                   2085.17  255.43    1     3     0  .013    61.0      .0   255.98     .00   83.39     .00
0 ELEMENT NO    9 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00    .00   5.00     1
                                   2136.78  255.53    1             .013
0 ELEMENT NO   10 IS A TRANSITION     *          *      *
                       U/S DATA   STATION    INVERT  SECT              N
                                   2156.22  255.57    2             .013
0 ELEMENT NO   11 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00    .00  38.00     2
                                   2689.03  256.64    2             .013
0 ELEMENT NO   12 IS A REACH          *          *      *                                                  RADIUS  ANGLE  ANG PT  MAN H
                       U/S DATA   STATION    INVERT  SECT              N                                     .00    .00    .00     0
                                   2718.85  256.70    2             .013
0 ELEMENT NO   13 IS A SYSTEM HEADWORKS                 *                                  W S ELEV
                       U/S DATA   STATION    INVERT  SECT                                        .00
                                   2718.85  256.70    2                                                                   PAGE NO   3
1
0                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

 ** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
                                                                                                                          PAGE    1
1
                                          WATER SURFACE PROFILE LISTING
                          STP Papago - 091131.00 - CLOMR
                          Oak Street Storm Drain - 66th Street Lateral - STA 81+22.54
                          6 HR 100 YR Storm
0 STATION     INVERT   DEPTH     W.S.       Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/    BASE/    ZL    NO  AVBPR
              ELEV   OF FLOW    ELEV                       HEAD    GRD.EL.  ELEV   DEPTH                DIA    ID NO.          PIER
0 L/ELEM      SO                                          SF AVE    HF                     NORM DEPTH                      ZR
*****************************************************************************************************************************
0  1000.00   253.26     8.10   261.36    241.0    7.71     .92   262.28    .00     3.33                 4.50     7.00   .00   0    .00
0    14.88   .00202                                      .00302     .05                        4.32                          .00
0  1014.88   253.29     8.12   261.40    241.0    7.71     .92   262.33    .00     3.33                 4.50     7.00   .00   0    .00
0TRANS STR   .00212                                      .00313     .03                                                      .00
0  1024.33   253.31     7.96   261.27    241.0    8.52    1.13   262.40    .00     4.25                 6.00      .00   .00   0    .00
0   102.89   .00194                                      .00324     .33                        6.00                          .00
0  1127.22   253.51     8.29   261.80    241.0    8.52    1.13   262.93    .00     4.25                 6.00      .00   .00   0    .00
0    29.72   .00202                                      .00324     .10                        6.00                          .00
0  1156.94   253.57     8.32   261.89    241.0    8.52    1.13   263.02    .00     4.25                 6.00      .00   .00   0    .00
0    40.23   .00199                                      .00324     .13                        6.00                          .00
0  1197.17   253.65     8.46   262.11    241.0    8.52    1.13   263.24    .00     4.25                 6.00      .00   .00   0    .00
0   853.55   .00200                                      .00324    2.76                        6.00                          .00
0  2050.72   255.36     9.59   264.95    241.0    8.52    1.13   266.08    .00     4.25                 6.00      .00   .00   0    .00
```

```
0JUNCT STR   .00203                                        .00252      .09                                                  .00
0  2085.17   255.43    10.57    266.00     180.0    6.37     .63    266.63     .00      3.66             6.00     .00    .00    0     .00
0    51.61   .00194                                        .00181      .09                        4.74                       .00
0  2136.78   255.53    10.61    266.14     180.0    6.37     .63    266.77     .00      3.66             6.00     .00    .00    0     .00
0TRANS STR   .00206                                        .00234      .05                                                  .00
0  2156.22   255.57    10.40    265.97     180.0    7.58     .89    266.87     .00      3.75             5.50     .00    .00    0     .00
0   532.81   .00201                                        .00287     1.53                        5.50                       .00
0  2689.03   256.64    11.07    267.71     180.0    7.58     .89    268.60     .00      3.75             5.50     .00    .00    0     .00
0    29.82   .00201                                        .00287      .09                        5.50                       .00
1                                                                                                                                PAGE    2
                                                WATER SURFACE PROFILE LISTING
                          STP Papago - 091131.00 - CLOMR
                          Oak Street Storm Drain - 66th Street Lateral - STA 81+22.54
                          6 HR 100 YR Storm
0 STATION     INVERT   DEPTH     W.S.        Q       VEL     VEL     ENERGY   SUPER  CRITICAL          HGT/    BASE/    ZL   NO  AVBPR
               ELEV   OF FLOW    ELEV                         HEAD   GRD.EL.   ELEV    DEPTH             DIA     ID NO.       PIER
0 L/ELEM       SO                                          SF AVE     HF                     NORM DEPTH                   ZR
*****************************************************************************************************************************
0  2718.85   256.70    11.09    267.79     180.0    7.58     .89    268.68     .00      3.75             5.50     .00    .00    0     .00
1
```

## Appendix F  Study Documentation Abstract

| STUDY DOCUMENTATION ABSTRACT | INITIAL STUDY | | RESTUDY | | LOMR | | OTHER | CLOMR | PAGE 1 |
|---|---|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| SECTION 1: GENERAL INFORMATION | | |
| 1A | COMMUNITY | Scottsdale |
| 1B | COMMUNITY NUMBER | 045012 |
| 1C | COUNTY | Maricopa |
| 1D | STATE | Arizona |
| 1E | DATE STUDY ACCEPTED | |
| 1F | STUDY CONTRACTOR | Kimley-Horn & Associates, Inc. |
| | CONTACT(S) | Doug Plasencia, P.E. (Project Manager) |
| | ADDRESS | 7600 N. 15th St., Suite 250 |
| | | Phoenix, AZ 85020 |
| | PHONE | 602-944-5500 |
| | INTERNAL REF # | Job No. 091131.00 |
| 1G | TECH. REVIEWER (FEMA) | |
| | PHONE | |
| 1H | FEMA REGIONAL REVIEWER | |
| | PHONE | |
| 1I | STATE REVIEWER | |
| | PHONE | |
| 1J | LOCAL REVIEWER | Dave Meinhardt |
| | | City of Scottsdale |
| | PHONE | 602-994-7010 |
| 1K | RIVER OR STREAM NAME | |
| 1L | REACH DESCRIPTION | |
| | (FIRM, PANEL & EPA REACH #) | FIRM Map Number: 04013C2155 E; Panel 2155 of 4350; EPA Reach # - N/A |
| 1M | STUDY TYPE (RIVERINE, ALLUVIAL FAN, ETC) | Ponding Analysis |
| SECTION 2: MAPPING INFORMATION | | |
| 2A | USGS QUAD SHEET(S) | Tempe, AZ (1982); Paradise Valley, AZ (1982) |
| 2B | MAPPING FOR HYDROLOGIC STUDY | |
| | TYPE/SOURCE | Aerial topography/City of Scottsdale (COS) - flown by Michael Baker, Jr. Inc. |
| | SCALE | (COS) 1 ft contours |
| | DATE | (COS) Sept. - Nov. 1993 |
| 2C | MAPPING FOR HYDRAULIC STUDY | |
| | TYPE/SOURCE | Aerial topography/City of Scottsdale (COS) - flown by Michael Baker, Jr. Inc. |
| | SCALE | (COS) 1 ft contours |
| | DATE | (COS) Sept. - Nov. 1993 |
| | SUBCONTRACTOR (AERIAL) | (WP) Wood, Patel & Associates, Inc. - topography flown by Southwest Mapping Company, Inc. |
| | DATE OF AERIAL MAPPING | Dec. 1996 |

STUDY DOCUMENTATION ABSTRACT

| SECTION 3: HYDROLOGY | | |
|---|---|---|
| 3A | MODEL OR METHOD USED (including vendor and version description) | Haestad Methods Program Integrator, HEC-1E, version 2.0<br>vendor: Haestad Methods, Inc. 37 Brookside Rd., Waterbury, CT 06708 |
| 3B | STORM DURATION | 6 hr |
| 3C | HYETOGRAPH TYPE | Weighted average rainfall depths as determined by the Arizona Department of Transportation Drainage Design Manual, Chapter 1 and Appendix B. |
| 3D | FREQUENCIES DETERMINED | 100-yr |
| 3E | LIST OF GAGES USED IN FREQUENCY ANALYSIS OR CALIBRATION (Location, Years of Record, Gage Ownership) | None available in floodplain |
| 3F | RAINFALL AMOUNTS AND REFERENCE | 6-hr storm |
| 3G | UNIQUE CONDITIONS AND PROBLEMS | Floodplain is related to ponding behind the Cross-Cut canal and the McDowell Rd. crossing of the canal. This study is a hydrologic routing through the pool of the floodplain. |
| 3H | COORDINATION OF Q'S (agency, date, comments) | Hydrology approved by Flood Control District of Maricopa County and City of Scottsdale in July 1997 |
| SECTION 4: HYDRAULICS | | |
| 4A | MODEL OR METHOD USED (including vendor and version description) | STORMPlus Advanced Designer Series<br>vendor: Research Industries, Inc.<br>version: 1.21 |
| 4B | REGIME | Mixed |
| 4C | FREQUENCIES FOR WHICH PROFILES WERE COMPUTED | 100 yr |
| 4D | METHOD OF FLOODWAY CALCULATION | N/A |
| 4E | UNIQUE CONDITIONS AND PROBLEMS | Hydraulics were for sizing a proposed storm drain leaving the ponded floodplain. Traditional conveyance based approaches such as HEC-2 were not applicable. Starting water surface elevations were for a 10 year storm in the Indian Bend Wash. |

FEMA Reviewer: Sheila Norline 703-317-3054