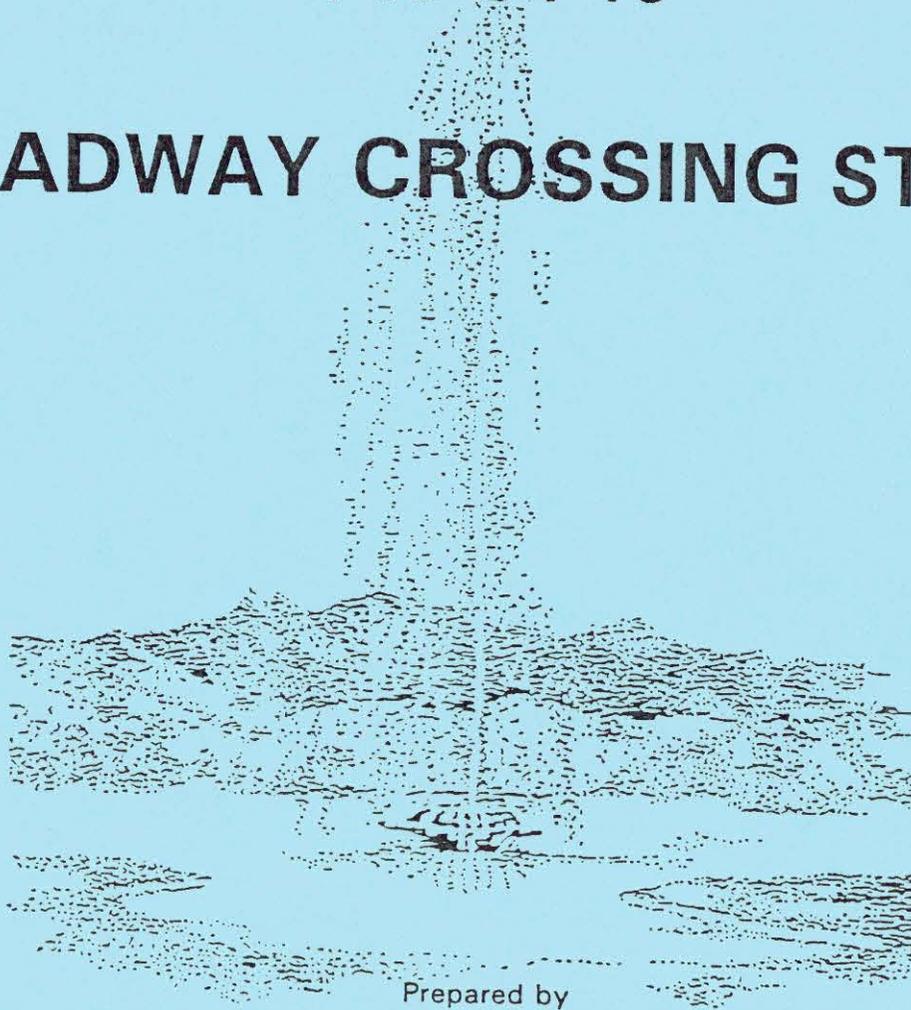


FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
PHOENIX, ARIZONA

**FOUNTAIN HILLS  
AREA DRAINAGE MASTER PLAN  
FCD 94-16**

**ROADWAY CROSSING STUDY**



Prepared by

McLaughlin Kmetty Engineers, Ltd.

and

Entellus

for

*George V. Sabol Consulting Engineers, Inc.*

Scottsdale, Arizona

JUNE 1997

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
PHOENIX, ARIZONA

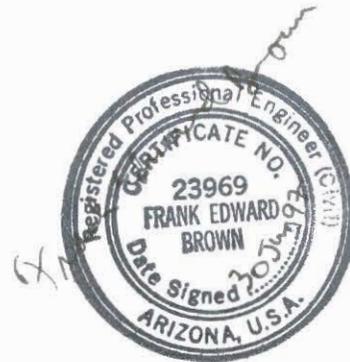
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# FOUNTAIN HILLS AREA DRAINAGE MASTER PLAN FCD 94-16

## ROADWAY CROSSING STUDY

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Scottsdale, Arizona

JUNE 1997

FLOOD CONTROL DISTRICT OF  
MARICOPA COUNTY  
FOUNTAIN HILLS ADMP  
FCD 94-16

ROADWAY CROSSING STUDY

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## FOUNTAIN HILLS ADMP FCD 94-16

### ROADWAY CROSSING STUDY

#### 1. INTRODUCTION

On February 7, 1996, the Flood Control District of Maricopa County (District) entered a contract (FCD 94-16) with George V. Sabol Consulting Engineers, Inc. (GVSCE) to perform the Fountain Hills Drainage Master Plan (ADMP). The scope of the ADMP consists of the following major tasks:

- Floodplain Delineation for Laser Drain
- Evaluation of Golden Eagle Park Dam
- Roadway Crossing Studies
- Evaluation of Flood Accessibility and Emergency Routes

The roadway crossing studies consist of culvert modification and roadway crossing improvement at 26 sites. The location of each site is summarized in **Table 1**. The existing drainage problems at these roadway crossings were identified during the North and South Floodplain Delineation Studies at Fountain Hills (FCD 92-04 and 92-05). Since McLaughlin Kmetty Engineers, Ltd. (MKE) and Entellus, Inc. (Formerly known as AGK Engineers, Inc.) were heavily involved in those two floodplain delineation studies, they were retained by GVSCE to perform the required work for the roadway crossing studies. The work for Sites 1 through 14 (which are within the north portion of Fountain Hills) was performed by MKE; while the work for Sites 15 through 26 (which are within the south portion of Fountain Hills) was performed by Entellus.

The purpose of the roadway crossing studies is to evaluate and recommend alternatives to improve existing drainage problems at the designated roadway crossing locations. The recommended alternatives were evaluated at a feasibility level of detail.

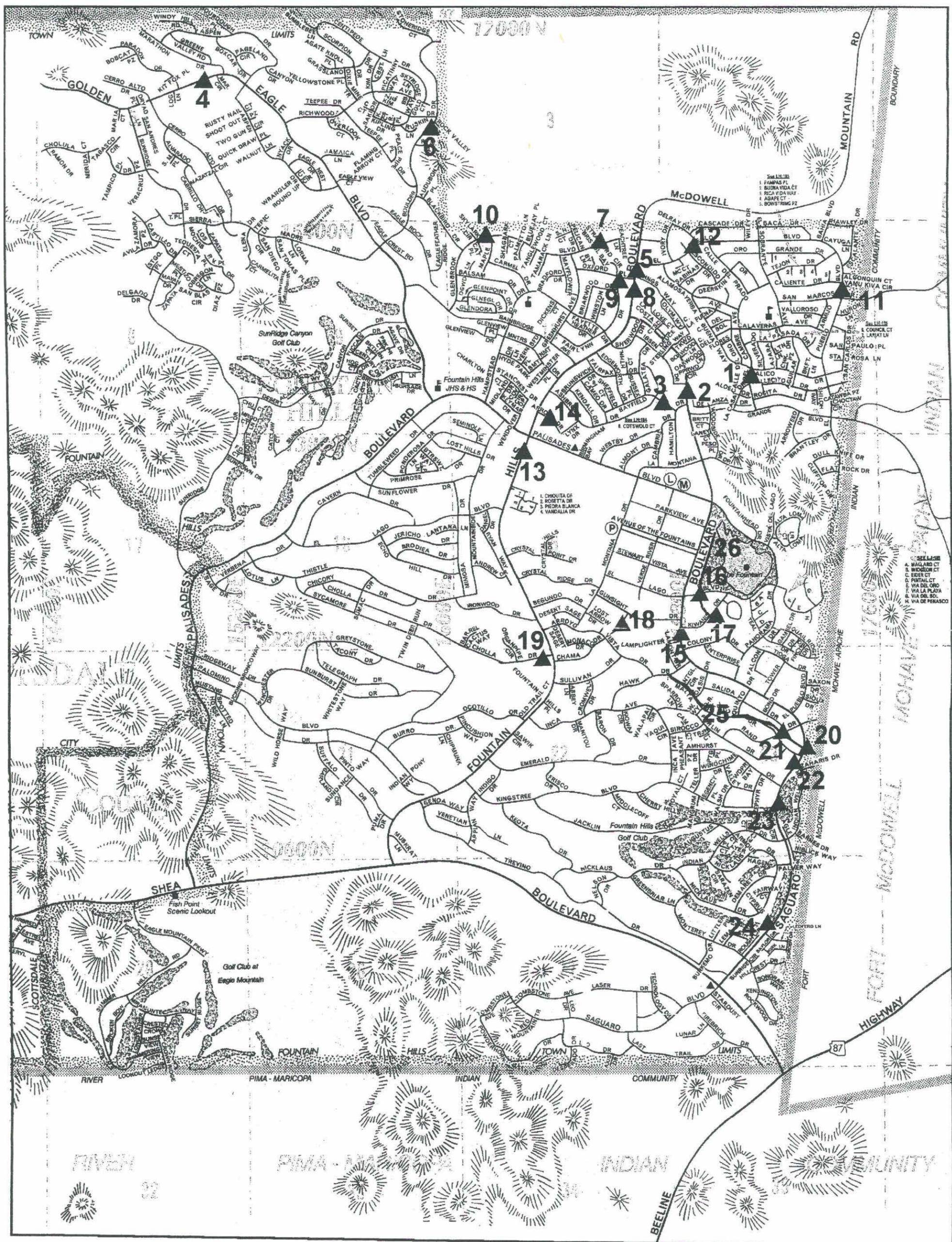
Refinement on structural dimensions, elevations, grades, scour protection lengths and geometry, and cost estimates will be required during the design phase of this project.

## **2. PROJECT LOCATION**

The project area is located at the Town of Fountain Hills, within Sections 4, 5, 10, 11, 14, 15, 22 and 23, Township 3 North, Range 6 East, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

The Town of fountain Hills is an incorporated community with a population of approximately 20,000 people. The Town is surrounded by the McDowell Mountains on the west, Fort McDowell Indian Community on the north and east, and the Salt River Pima Maricopa Indian Community on the south. Topography of the study area is generally desert hill slopes in various phases of urbanization.

Climate of the study area is characterized by hot summers, mild winters and infrequent rainfall. The mean annual rainfall is about 8.5 inches, falling normally in two seasons. One season, primarily resulting from local convective storms, lasts from July to mid-September; the other season, mainly formed by cyclonic (frontal) storms, extends from December through March. Of the two types of storms, the summer convective storm is considered to be the more critical flood producing event in this area.



**Fountain Hills ADMP**  
Site map

**TABLE 1**  
**LOCATIONS FOR ROADWAY CROSSING STUDIES**

<b>SITE NO.</b>	<b>STREET LOCATION</b>	<b>WASH NAME</b>	<b>EXISTING STRUCTURE</b>
1	Del Cambre Avenue	Ashbrook	Dip
2	Saguaro Boulevard	Ashbrook	Culvert
3	Bayfield Drive	Ashbrook	Culvert
4	Golden Eagle Boulevard	Ashbrook	Culvert
5	Fountain Hills Boulevard	Balboa	Culvert
6	Boulder Drive	Hesperus	Culvert
7	Glenbrook Boulevard	Balboa	Dip
8	Fountain Hills Boulevard	Oxford	Dip
9	Fairlynn Drive	Oxford	Dip
10	Glenbrook Boulevard	Oxford	Dip
11	El Pueblo Boulevard	Caliente	Dip
12	El Pueblo Boulevard	Caliente	Dip
13	Fountain Hills Boulevard	Arrow	Culvert
14	Arrow Drive	Arrow	Culvert
15	Saguaro Boulevard	Colony	Culvert
16	El Lago Boulevard	Fountain Channel	Culvert
17	Kiwanis Drive	Fountain Channel	Dip
18	Chama Drive	North Colony	Culvert
19	Cholla Drive	Ironwood	Culvert
20	Saguaro Boulevard	Malta	Culvert
21	Rand Drive	Malta	Dip
22	Saguaro Boulevard	Emerald	Culvert
23	Kingstree Boulevard	Kingstree	N/A
24	Saguaro Boulevard	Cyprus Point	Culvert
25	Channel Improvement from Hawk Drive to Rand Drive	Malta	N/A
26	Channel Improvement	Fountain Channel	N/A

### 3. SITE DESCRIPTION

#### ADMP 1 - Del Cambre Avenue at Ashbrook Wash

ADMP 1 is a wide, shallow roadway dip section located at the crossing of Ashbrook Wash and Del Cambre Avenue, just east of the confluence of Ashbrook Wash and Balboa Wash. Del Cambre Avenue is a minor collector street extending north from Casa Grande Boulevard to Sobrante Avenue.

Five major washes draining into Ashbrook Wash contribute to the flow at this roadway crossing. While the existing wide, shallow roadway dip section is able to contain much of the existing 100-year flow, street flooding does extend south down Del Cambre Avenue to the intersection of La Casa Drive. In addition, the lack of culverts hinders traffic and creates unsafe conditions during flooding.

#### ADMP 2 - Saguaro Boulevard at Ashbrook Wash

ADMP 2 is a 3-60" CMP culvert located at the crossing of Ashbrook Wash and Saguaro Boulevard, just east of the confluence of Ashbrook Wash and Legend Wash. Saguaro Boulevard is an arterial road extending north from Shea Boulevard to an intersection with Fountain Hills Boulevard.

Three major washes contribute to the flow at this road crossing. The existing culvert is inadequate to convey the existing 100-year flow without overtopping and floods Saguaro Boulevard both north and south of the wash, hindering traffic. Split flow from an upstream culvert on Bayfield Drive, ADMP 3, contributes to flooding problems by flooding Bayfield Drive south of ADMP 3 and a section of Hamilton Drive from Bayfield Drive to Saguaro Boulevard. The result is significant local street flooding which, if not corrected, could extend flooding in the future to nearby property and structures.

### ADMP 3 - Bayfield Drive at Ashbrook Wash

ADMP 3 is a 3-60" CMP culvert located at the crossing of Ashbrook Wash and Bayfield Drive, just west of the confluence of Ashbrook Wash and Legend Wash. Bayfield Drive is a local street extending west from Hamilton Drive to Cameo Drive.

The existing culvert is inadequate to convey the existing 100-year flow without overtopping. Flow overtopping the culvert leaves the channel and proceeds west along Bayfield Drive and then proceeds west along Hamilton Drive. The flow eventually returns to the channel at the crossing of Ashbrook Wash and Saguaro Boulevard (ADMP 2). The split flow and street flooding it causes have resulted in the designation of a Zone X and Zone A floodplain along Hamilton Drive. Presently, street flooding along Bayfield Drive and Hamilton Drive creates unsafe driving conditions and, if not corrected, this local street flooding would worsen and could extend to other nearby property and structures.

### ADMP 4 - Golden Eagle Boulevard at Ashbrook Wash

ADMP 4 is a 60" CMP culvert located at the crossing of Ashbrook Wash and Golden Eagle Boulevard. Golden Eagle Boulevard is an arterial road extending from Shea Boulevard north to an intersection with Palisades Boulevard.

The existing culvert is inadequate to convey the existing 100-year flow without overtopping. Flow overtopping the culvert floods Golden Eagle Boulevard hinders traffic and floods Marathon Circle on the east side of Ashbrook Wash. If not corrected, flooding would worsen and could extend to other nearby property and structures.

#### ADMP 5 - Fountain Hills Boulevard at Balboa Wash

ADMP 5 is a 2-54" CMP culvert located at the crossing of Balboa Wash and Fountain Hills Boulevard. Fountain Hills is a major arterial road extending north from Shea Boulevard, eventually becoming McDowell Mountain Road.

The existing culvert is inadequate to convey the existing conditions 100-year flow without overtopping. Flow overtopping the culvert floods Fountain Hills Boulevard from Balboa Wash south to Oxford Wash. Overtopping flow also floods Kings Way, which runs parallel to Balboa Wash. Inadequate dip crossings along Oxford Wash (ADMP 8 and ADMP 9) also contribute to street flooding in the area. The combined flooding creates unsafe driving conditions on the flooded roads and places a number of structures at risk of flooding. If not corrected, flooding would get worse in the future.

#### ADMP 6 - Boulder Drive at Hesperus Wash

ADMP 6 is a 60" CMP culvert located at the crossing of Hesperus Wash and Boulder Drive. Boulder Drive is a minor collector street extending north from Golden Eagle Boulevard.

The existing culvert is inadequate to convey the existing 100-year flow without overtopping. Flow overtopping the culvert floods Boulder Drive, creating unsafe driving conditions. Overtopping flow also floods a nearby structure which is a sanitary sewer lift station. Overtopping flow returns to the wash immediately downstream of the culvert. If not corrected, street flooding would worsen in the future and overtopping flow may not return to the channel and could flood adjacent properties.

#### ADMP 7 - Glenbrook Boulevard at Balboa Wash

ADMP 7 is a roadway dip section located at the crossing of Balboa Wash and Glenbrook Boulevard. Glenbrook Boulevard is major collector street extending east from Bainbridge Avenue and terminating at Ivory Drive.

The existing roadway dip section is able to convey existing 100-year flow within the limits of the channel but the lack of culverts hinders traffic and creates unsafe conditions during flooding.

#### ADMP 8 - Fountain Hills Boulevard at Oxford Wash

ADMP 8 is a shallow dip section located at the crossing of Oxford Wash and Fountain Hills Boulevard. Fountain Hills Boulevard is a major arterial road extending north from Shea Boulevard, eventually becoming McDowell Mountain Road.

The existing roadway dip section is part of a local street flooding problem involving ADMP 8, ADMP 9, and ADMP 5. Split flows from ADMP 5 and ADMP 9 combine at this dip section, resulting in extensive flooding in the area. The flooding creates unsafe driving conditions along Fountain Hills Boulevard and floods nearby property and endangers structures. If not corrected, flooding would worsen in the future.

#### ADMP 9 - Fairlynn Drive at Oxford Wash

ADMP 9 is a shallow dip section located at the crossing of Oxford Wash and Fairlynn Drive. Fairlynn Drive is a local road extending east from Greenhurst Avenue and terminating at Oxford Drive.

The existing roadway dip section is inadequate to contain the existing 100-year flow within the limits of the channel. Flow splits from the channel, flows north along Fairlynn Drive, east along Oxford Drive, and then south along Fountain Hills Boulevard until it returns to Oxford Wash at ADMP 8. The flooding creates unsafe driving conditions along Fairlynn Drive, Oxford Drive, and Fountain Hills Boulevard and is part of a local drainage problem involving ADMP 5, ADMP 8 and ADMP 9. If not corrected, flooding would worsen in the future, possibly damaging nearby structures.

#### ADMP 10 - Glenbrook Boulevard at Oxford Wash

ADMP 10 is a shallow dip section located at the crossing of Oxford Wash and Glenbrook Boulevard. Glenbrook Boulevard is major collector street extending east from Bainbridge Avenue and terminating at Ivory Drive.

The existing roadway dip section is able to convey existing 100-year flow within the limits of the channel but the lack of culverts hinders traffic and creates unsafe conditions during flooding.

#### ADMP 11 - El Pueblo Boulevard at Caliente Wash

ADMP 11 is a shallow dip section located at the easternmost crossing of Caliente Wash and El Pueblo Boulevard. El Pueblo Boulevard is a major collector street extending east from Fountain Hills Boulevard and terminating at just south of Flat Rock Drive.

The existing roadway dip section is inadequate to contain the existing 100-year flow within the limits of the channel and flow from the channel floods El Pueblo Boulevard from San Marcos Drive to Algonquin Court. Yamu Kiva Circle, just north of ADMP 11, is almost completely flooded during the existing 100-year flow. In addition, the lack of culverts hinders traffic and creates unsafe conditions along this

portion of El Pueblo Boulevard during flooding. If not corrected, flooding would worsen and could begin flooding properties and structures along El Pueblo Boulevard, Yamu Kiva Circle and Algonquin Court. The flow rate at this location is expected to increase significantly in the future from 589 cfs to 987 cfs.

#### ADMP 12 - El Pueblo Boulevard at Caliente Wash

ADMP 12 is a shallow dip section located at the westernmost crossing of Caliente Wash and El Pueblo Boulevard. El Pueblo Boulevard is a major collector street extending east from Fountain Hills Boulevard and terminating at just south of Flat Rock Drive.

The existing roadway dip section is able to convey the existing 100-year flow with minor street flooding outside the limits of the channel, but the lack of culverts hinders traffic and creates unsafe conditions during flooding.

#### ADMP 13 - Fountain Hills Boulevard at Arrow Wash

ADMP 13 is a 60" CMP storm drain combined with a roadway dip section located at the crossing of Arrow Wash and Fountain Hills Boulevard. The storm drain runs across Fountain Hills Boulevard, under the Palisades Plaza parking lot, continues across Palisades Boulevard and outlets to Arrow Wash, just north of Palisades Boulevard. Both Fountain Hills Boulevard and Palisades Boulevard are major arterial roads. Fountain Hills Boulevard extends north from Shea Boulevard, eventually becoming McDowell Mountain Road. Palisades Boulevard extends north from Shea Boulevard and continues west, terminating at Saguaro Boulevard.

The existing storm drain and upstream portion of Arrow Wash is inadequate to convey the existing 100-year flow without significant roadway overtopping. The overtopping flow continues north along Fountain Hills Boulevard, then east along Palisades Boulevard until it returns to Arrow Wash at the outlet of the storm drain.

Street flooding along Fountain Hills Boulevard and Palisades Boulevard greatly hinders traffic flow and creates unsafe driving conditions in a major business area.

#### ADMP 14 - Arrow Drive at Arrow Wash

ADMP 14 is a 3-54" CMP culvert located at the crossing of Arrow Wash and Arrow Drive. Arrow Drive is a local street extending from Fountain Hills Boulevard east to Lynx Drive.

The existing culvert is inadequate to convey the existing 100-year flow without overtopping. Flow overtopping the culvert does not return to Arrow Wash, but flows east along Arrow Drive to a small drainage channel which conveys the flow to Ashbrook Wash. Currently, this creates unsafe driving conditions along Arrow Drive, but in the future, the overtopping flow may continue down Arrow Drive to Lynx Drive, creating more serious flooding conditions.

#### ADMP 15- Saguaro Boulevard at Colony Wash

ADMP 15 is a 72" CMP located at the crossing of Colony wash and Saguaro Boulevard. This crossing is located approximately a third of a mile south of Fountain Lake. Saguaro Boulevard is an arterial road which extends from Shea Boulevard north to Fountain Hills Boulevard.

One major wash and five smaller tributaries contribute to the flow at this roadway crossing. The existing structure is inadequate to convey the existing 100-year flow. The insufficient capacity hinders traffic and creates unsafe conditions during flooding.

#### ADMP 16- El Lago Boulevard at Fountain Channel

ADMP 16 is a 2-10' x 4' CBC Located at the crossing of the Fountain Channel and El Lago Boulevard just south of Fountain Lake. El Lago Boulevard is an arterial road extending easterly from La Montana Drive to Panorama Drive along the south shore of Fountain Lake.

Fountain Channel is located along the west shore of the lake to prevent storm runoff from flowing into Fountain Lake because the lake was intended to receive treated effluent alone. Several reaches of the existing channel do not have enough capacity to convey the existing 100-year flow. This issue is further analyzed under ADMP 26. Presently, the capacity of the culvert at El Lago Boulevard is adequate because a portion of the 100-year flow would overtop the channel bank and discharge to the lake. However, if spillage to the lake is corrected, this culvert would not be able to handle the entire 100-year flow without overtopping the road. The overtopped runoff from this structure would flow easterly along El Lago Boulevard for a considerable length, hindering traffic and creating unsafe conditions.

#### ADMP 17- Kiwanis Drive at Fountain Channel

ADMP 17 is a shallow dip section located at the intersection of Fountain Channel and Kiwanis Drive, approximately 500 feet from the confluence of Colony Wash. Kiwanis Drive is a local street extending southwesterly from El Lago Boulevard to Saguaro Boulevard.

Flow depth and velocity in the channel would make this roadway crossing unpassable during a 100-year storm and would create unsafe conditions for vehicles and pedestrians. This situation would be worsened by the increased

amount of flow resulting from the proposed channel improvements in the upstream reaches (ADMP 26).

#### ADMP 18- Chama Drive at North Colony Wash

ADMP 18 is a 60" CMP culvert located at the crossing of North Colony Wash and Chama Drive, approximately 1000 feet northwest of the confluence of Colony Wash. Chama Drive is a local street extending easterly from Fountain Hills Boulevard to Gunsight Drive.

The existing culvert is inadequate to convey the existing 100-year flow without overtopping. The overtopped runoff would flow southwesterly along Chama Drive and thence southeasterly along Arroyo Vista Drive, and eventually enter Colony Wash at Arroyo Vista Drive. This street flooding was the main reason for the designation of a Zone A floodplain along Chama Drive and Arroyo Vista Drive. It would hinder traffic in the two local streets and the situation would be worsened as more development would occur in the future.

#### ADMP 19- Cholla Drive at Ironwood Wash

ADMP 19 is a long 48" CMP at the crossing of Ironwood Wash and Cholla Drive, just north of the confluence with Colony Wash. Cholla Drive is a local street that extends westerly from Fountain Hills Boulevard.

The existing culvert is inadequate to convey the existing 100-year flow. Extensive ponding has been experienced upstream from the culvert. Most of the ponding area is currently undeveloped. However, as development in the area increases, the available storage volume would decrease and the level of ponding would increase, possibly inundating some of the adjacent properties.

ADMP 20- Saguaro Boulevard at Malta Drain

ADMP 20 is 2-48" CMP located at the crossing of Malta Drain and Saguaro Boulevard, just north of the intersection of Saguaro Boulevard and Malta Drive.

The existing culvert is inadequate to convey the existing 100-year flow without overtopping. This situation would be worsened by the additional overtopping flow from Emerald Wash (ADMP 22). The combined effect of overtopping from the two washes would result in flooding of approximately 400-ft section of Saguaro Boulevard and a portion of Malta Drive. Under these conditions, traffic through this major arterial road would be impeded during a major storm event.

ADMP 21-Rand Drive at Malta Drain

ADMP 21 is a shallow dip section at the crossing of Malta Drain and Rand Drive approximately 500 feet northwest of Saguaro Boulevard. Rand Drive is a local street extending west from Saguaro Boulevard to Parlin Drive.

Flow depth and velocity in the wash would make this roadway crossing unpassable during an 100-year storm. In addition, the area between Malta Drive and Malta Drain was designated as a Community Designated Special Hazard Zone due to storm runoff from Malta Drive. This condition was analyzed under ADMP 25.

ADMP 22- Saguaro Boulevard at Emerald Wash

ADMP 22 is a 2-60" CMP at the crossing of Emerald Wash and Saguaro Boulevard, approximately 200 feet south of the intersection of Saguaro Boulevard and Malta Drive.

The existing structure is inadequate to convey the existing 100-year flow without overtopping Saguaro Boulevard. This overtopped flow combined with the overtopped flow from Malta Drain (ADMP 20) would flood approximately 400 feet of Saguaro Boulevard and a portion of Malta Drive, hindering traffic and creating unsafe conditions for pedestrians and motorists.

#### ADMP 23-Kingstree Boulevard at Kingstree Wash

ADMP 23 is a spillway from Kingstree Boulevard to Jacklin Wash. The spillway is located just upstream of the crossing of Jacklin Wash and Saguaro Boulevard, approximately 100 feet west of Saguaro Boulevard. It consists of a concrete apron, beginning at Kingstree Boulevard and extending to the flow line of Jacklin Wash, just upstream of the culvert inlet.

Kingstree Boulevard acts as a drainage channel. For the existing 100-year flow, the roadway section conveys approximately 480 cfs. The cross slope of the roadway is inadequate to direct the flow to the spillway. A significant amount of flow would bypass the spillway and flood Saguaro Boulevard. While flow depth may not be significant, flow velocity and turbulence at Saguaro Boulevard would hinder traffic and create unsafe conditions for pedestrians and motorists.

#### ADMP 24- Saguaro Boulevard at Cypress Point Wash

ADMP 24 is a 48" CMP with a catch basin inlet located at the crossing of Cyprus Point Wash and Saguaro Boulevard. The crossing is approximately 1000 feet northeast of the intersection of Monterrey Drive and Saguaro Boulevard.

The existing culvert is inadequate to convey the existing 100-years flow without overtopping the road. Split flow from this crossing runs northeasterly along Saguaro Boulevard for approximately 1000 feet, spills over the east side of the road, and rejoins Cyprus Point Wash downstream of the culvert. This split flow and the

resulting flooding were the cause of the designation of a Zone A floodplain along Saguaro Boulevard as well as in the area between Saguaro Boulevard and Cyprus Point Wash. This overtopping results in significant street flooding along Saguaro Boulevard and flooding of the buildings downstream from the road.

#### ADMP 25- Channel Improvement at Malta Wash

ADMP 25 consists of approximately 4,000 feet of open channel, known as Malta Drain. The channel runs along the north edge of Malta Drive from the intersection of Hawk Drive to Rand Drive. From Rand Drive to Saguaro Boulevard, the channel runs parallel to Malta Drive, approximately 200 feet north of the roadway. It crosses seven streets, including Saguaro Boulevard (ADMP 20) and Rand Drive (ADMP 21) that were analyzed separately under this study.

The roadway crossing structures along Malta Drain are inadequate to convey the existing 100-year flow without overtopping the roads. While the channel has enough capacity to convey the flow, split flows from the roadway crossings have created street flooding and caused the designation of a Community Designated Special Hazard Zone along Malta Drive. This zone includes the roadway as well as a strip on the south side of the road. The split flows run easterly along Malta Drive to the vicinity of Rand Drive where they return to the channel through a number of roadside spillways. These spillways may work well for low flows. However, their effectiveness would be drastically reduced when flooding conditions are severe. Significant erosion at the downstream end of the culverts suggests that grade control structures may be required to stabilize the channel and prevent further erosion problems.

#### ADMP 26- Channel Improvement at Fountain Channel

ADMP 26 is a portion of an open channel known as Fountain Channel. It starts at the west shore of Fountain Lake and extends southerly along the west shore of

Fountain Lake. After passing El Lago Boulevard (ADMP 16), the channel turns southeasterly crossing Kiwanis Drive (ADMP 17) and continues in this direction to the confluence of Colony Wash.

Fountain Channel is a drainage diversion channel along the west shore of Fountain Lake to prevent storm runoff from entering the lake. The capacity of certain reaches of the channel is inadequate to convey the existing 100-year flow. Significant amount of flow would spill into the lake.

#### 4. TOPOGRAPHIC INFORMATION

The topographic information for each site was based on the topographic mapping and supplement by field survey. The topographic mapping has a scale of 1" = 200' with a contour interval of 2 feet. It was prepared by Kenney Aerial Mapping, Inc. in 1991 under a subcontract with Anderson-Nelson, Inc. who was under contract with the Town of Fountain Hills (**Reference 1**).

Field survey was performed by Alcocer Land Surveyors. The survey included spot elevations, as-built data on existing hydraulic structures, and miscellaneous surveying sufficient to locate roads, utilities and other local structures.

The horizontal control of the topographic mapping and field survey was based on the NAD 1983 system. The vertical control was based on the 1929 NGVD datum, which is 1.26 feet lower than the Fountain Hills local vertical control datum. The horizontal and vertical controls used in this project were used in the North and South Floodplain Delineation Studies.

## 5. DESIGN FLOWS

The following criteria of design flows were established in accordance with Contract requirements and conclusions from various coordination meetings with the District and the Town of Fountain Hills:

- (1) Culverts or bridges shall be sized to convey the 10-year peak discharge without overtopping the roadway crossing.
- (2) The overtopping of a roadway crossing during a 100-year peak discharge shall be less than 6 inches in depth.
- (3) Peak flows shall be estimated according to the future land use conditions within the watershed.

The design flows for Sites 1 through 14 were obtained from *Fountain Hills North Floodplain Delineation Study, Technical Data Notebook - Hydrology, Future Condition*. (**Reference 2**), while the design flows for Sites 15 through 26 were obtained from *Fountain Hills South Floodplain Delineation Study, Technical Data Notebook, Hydrology* (**Reference 3**).

## 6. RIGHT-OF-WAY AND UTILITIES

Information on right-of-way was obtained from various subdivision plats furnished by the Town of Fountain Hills.

Information on utilities was obtained from various utility companies, as-built plans as well as field survey of manhole and valve locations. The depths of existing sewers were determined from the as-built plans.

## 7. EVALUATION OF ALTERNATIVES

### 7.1 Criteria for Alternatives

The alternative structures at each roadway crossing site were sized according to the following criteria:

- (1) Crossroad culverts or bridges were sized to pass the future 10-year peak discharge without over topping the road; while for a future 100-year peak discharge, the flow depth over the roadway would be less than 6 inches. The high point of the roadway was considered to be the centerline (crown) of the road. In the case of a super-elevated roadway, the control point was considered as the top of curb on the low side, unless noted otherwise.
- (2) Minimum design speeds for vertical curves at roadway sags were based on the following requirements obtained from the MCDOT Roadway Design Manual (**Reference 4**):
  - ▶ Minor arterial - 45 mph
  - ▶ Major collector - 35 mph
  - ▶ Minor collector - 30 mph
  - ▶ Local street - 25 mph
  - ▶ Hillside local- 20 mph
- (3) Uniform pipe size was recommended at each site. For example, if 2-48 CMP plus 1-24 CMP would carry the 10-year flow without overtopping the roadway, then 3-48 CMP would be recommended to keep a uniform pipe size at each site.

- (4) The Town of Fountain Hills has about 250 feet of 120-inch diameter pipe that is available for culvert construction. Wherever possible, this size of pipe was considered as one of the alternatives. The bottom 1 or 2 feet (depending on location) was assumed to be filled with concrete to provide a flat floor for pedestrian walkway or bicycle passage as part of a future recreational trail system along the washes.

## 7.2 Hydraulic Analysis

Hydraulic analysis for alternative structures at each roadway site was performed in accordance with the procedures outlined in the District's Drainage Design Manual (**Reference 5**).

Culvert hydraulics was analyzed by use of HY-8 Version 4.0 (**Reference 6**), which is a computer program based on *Federal Highway Administration Hydraulic Design Series No. 5* (**Reference 7**). A weir coefficient of 2.67 was used for the computation of weir flow over the roadway section. The same Manning's n values used in the Fountain Hills Floodplain Delineation Studies were used for this project.

## 7.3 Development of Alternatives

One or more alternatives were analyzed and evaluated at each site. Ordinarily, a large number of alternatives could be derived at each site. However, in order to reduce the number of alternatives to a manageable size, a preliminary screening process was used to eliminate the less desirable ones. This preliminary screening was performed, based on engineering judgement, to a level of detail just sufficient to identify those

alternatives that appeared to be feasible and those that were clearly infeasible.

Where a clearly preferred choice for the roadway crossing was evident, only that alternative was considered. In addition, a "No Action" alternative was considered for all sites.

In general, the proposed alternatives would not only meet the aforementioned criteria, but also minimize, whenever possible, the extent of disturbance at various sites. In locations where existing adjacent structures are expected to be flooded under future conditions, the proposed alternatives would eliminate flooding of those structures. The extent of flooding under future conditions was determined on the basis of engineering judgement since a future-condition floodplain analysis and surveys of finished floor elevations have not been performed by any agency.

#### **7.4 The Proposed Alternatives**

The proposed alternatives for conceptual drainage improvements at each site are presented below:

##### ADMP 1 - Del Cambre Avenue at Ashbrook Wash

**General.** Due to the magnitude of the expected future 100-year flow and the wide, shallow dip section, a bridge structure is recommended as the most viable alternative. A wide, shallow multi-barrel concrete box culvert would be hydraulically feasible, but, would be considerably more expensive. Round or Arch culverts are not considered economically nor hydraulically feasible because the existing channel width and depth would severely increase the number of pipes and the size of the pipe diameters.

**Alternative 1 - Bridge.** A bridge would allow for continual, unhindered traffic, across the wash. The bridge should require little maintenance but would have a high construction cost. It would require a grade control structure upstream to lower the channel. It would also require extensive channel improvements both upstream and downstream of the bridge. Much of the existing vegetation of trees and shrubs both upstream and downstream of the bridge would be removed to accommodate channel improvements and the upstream drop structure. **Appendix 1** contains pertinent data for this alternative.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future. It is possible that future flows could overtop the dip section crown, leave the channel completely and flood adjacent streets. Nearby structures and property adjacent to the wash would be at risk of flooding.

#### ADMP 2 - Saguaro Boulevard at Ashbrook Wash

**General.** Due to the magnitude of the expected future 100-year flow and the limited channel capacity, a shallow concrete box culvert is recommended as the most viable alternative. Round or arch culverts could not reasonably fit within the existing channel nor could be placed under the existing road profile without major reconstruction of the roadway.

**Alternative 1 - Concrete Box Culvert (6-10'x4'x110').** Based on the hydraulic analysis documented in **Appendix 2**, the CBC would convey the future conditions 10-year flow with no overtopping and the future conditions 100-year flow with only 1 cubic feet per second (cfs) overtopping the culvert. The water depth on the overtopping weir is calculated to be 0.07 feet, well within the established maximum depth criteria of 0.5 feet. The CBC would

essentially eliminate street flooding arising out of culvert inadequacies at ADMP 2, however, it would not alleviate street flooding on Hamilton Drive which is a result of split flows at ADMP 3. The low culvert height would fit within the existing road profile and help minimize the amount of channel improvements. The channel upstream and downstream of the culvert, however, would need to be widened and some large trees and shrubs removed. A pressure effluent line located above an existing sewer line along Saguaro Boulevard would have to be relocated. The CBC may impact the existing sewer line and other utilities crossing the wash within the channel and along Saguaro Boulevard. This alternative is also relatively expensive to construct and the low culvert height may make maintenance more difficult.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future. It is possible that structures and property adjacent to the wash would be at risk of flooding, particularly structures and property in a designated Zone X floodplain located southwest of ADMP 2.

#### ADMP 3 - Bayfield Drive at Ashbrook Wash

**General.** Due to the magnitude of the expected future 100-year flow, the limited channel width, and the limited ability to raise the existing road profile, a shallow concrete box culvert is recommended as the most viable alternative. The number of CMP's required to adequately convey the expected future conditions 100-year flow do not fit within the existing channel nor could the existing road profile be raised to merit consideration of CMP's as a viable alternative.

**Alternative 1 - Concrete Box Culvert (6-8'x4'x84').** Based on the hydraulic analysis documented in **Appendix 3**, the CBC would convey the future

conditions 10-year flow and 100-year flow with no overtopping. The CBC would eliminate street flooding due to overtopping along Bayfield and Hamilton Drives. The Zone A and Zone X floodplain designations along Hamilton Drive could be removed. The low culvert height would fit within the existing road profile and help minimize the amount of channel improvements. The channel upstream and downstream of the culvert, however, would need to be widened and some vegetation removed. The 8-inch water line along Bayfield Drive probably would not need to be relocated, depending upon its exact location. This alternative is relatively expensive to construct and the low culvert rise may make maintenance more difficult.

**Alternative 2 - Concrete Box Culvert (5-8'x5'x84').** Based on the hydraulic analysis documented in **Appendix 3**, the CBC would convey the future conditions 10-year flow with no overtopping and the future conditions 100-year flow without overtopping the culvert. The CBC would eliminate street flooding due to overtopping along Bayfield and Hamilton Drives. The area along Hamilton Drive presently designated as a Zone X floodplain could be removed along with the Zone A along Hamilton Drive. The Alternative 2 culvert is narrower than Alternative 1 and would fit within the existing road profile but the upstream and downstream channel improvements would be more significant than those required by Alternative 1 due to lower invert elevations. As with Alternative 1, some vegetation would still need to be removed. The 8-inch water line along Bayfield Drive would need to be relocated. This alternative is less expensive than Alternative 1 but it is still relatively expensive to construct. The 5 foot height would make maintenance less difficult than for Alternative 1.

**Alternative 3 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future. The future flow rate would expand the existing floodplain, and may include the existing

area designated as Zone X. Other property and structures in the surrounding area would also be in greater risk of flooding.

#### ADMP 4 - Golden Eagle Boulevard at Ashbrook Wash

**General.** The depth and width of the existing channel allow for the consideration of large diameter culverts without significant impact to the existing road profile and without need for extensive channel improvements.

**Alternative 1 - Corrugated Metal Pipe (3-120"x136' CMP).** Based on the hydraulic analysis documented in **Appendix 4**, the CMP's would convey the future conditions 10-year flow with no overtopping and the future conditions 100-year flow with an estimated 27 cfs overtopping the culvert. The water depth on the overtopping weir is estimated to be 0.4 feet. The CMP's would reduce street flooding along Golden Eagle Boulevard and reduce the risk of flooding downstream of the culvert. There are several advantages to using 120" CMP's: ease of maintenance, reduced street flooding, reduced risk of downstream flooding, utilization as a pedestrian/bicycle road crossing during periods of no flow, cost, and the fact that the Town of Fountain Hills currently owns a supply of 120" CMP's. However, the placement of the CMP's would require extensive excavation of the road due to the depth of the wash. Also, for use as a pedestrian/bicycle roadway crossing, the bottom 1 foot of one of the CMP's would need to be paved to provide an adequate passageway.

**Alternative 2 - Concrete Box Culvert (2-12'x8'x136').** Based on the hydraulic analysis documented in **Appendix 4**, the CBC would convey the future conditions 10-year flow with no overtopping and the future conditions 100-year flow with 34 cfs overtopping the culvert. The water depth on the overtopping weir is calculated to be 0.43 feet. The CBC would reduce street flooding along Golden Eagle Boulevard and reduce the risk of flooding

downstream of the culvert. Alternative 2 offers several advantages including ease of maintenance, utilization as pedestrian/bicycle roadway crossing during periods of no flow, and a narrower culvert. However, as with Alternative 1, a CBC would require extensive excavation of the road due to the depth of the wash. Alternative 2 is also more expensive than Alternative 1.

**Alternative 3 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future. The future flow rate could expand the existing floodplain to include the area presently designated as Zone A. Other property and structures in the surrounding area would also be in greater risk of flooding.

#### ADMP 5 - Fountain Hills Boulevard at Balboa Wash

**General.** The depth and width of the existing channel allow for the consideration of large diameter culverts but would require significant upstream channel improvements and may require the relocation of an existing sewer line.

**Alternative 1 - Corrugated Metal Pipe (6-54"x120' CMP, 2-Existing & 4-New).** Based on the hydraulic analysis documented in **Appendix 5**, the CMP's would convey the future conditions 10-year and 100-year flow with no overtopping. The addition of four more 54" CMP's would eliminate overtopping flooding along Fountain Hills Boulevard and Kings Way arising from existing culvert inadequacies at ADMP 5. It would also reduce the risk of flooding property and structures along Fountain Hills Boulevard and Kings Way. This alternative minimizes the impact of improvements on the channel, road profile, surrounding vegetation, and existing utility lines. However, a grouted boulder energy dissipator would be required at the culvert outlet.

Maintenance costs for these culverts could be more expensive than larger diameter culverts and the construction cost is about the same as the other alternative.

**Alternative 2 - Corrugated Metal Pipe (Existing 2-54" CMP, New 1-120"x145' CMP).** Based on a hydraulic analysis documented in **Appendix 5**, the CMP's would convey the future conditions 10-year and 100-year flow without overtopping the culvert. The addition of a 120" CMP would eliminate overtopping flooding along Fountain Hills Boulevard and Kings Way. That flooding is due to the existing culvert inadequacies at ADMP 5. It would also reduce the risk of flooding property and structures along Fountain Hills Boulevard and Kings Way. This alternative would require extensive upstream channel improvements and would require erosion protection upstream and downstream. This alternative would also require the relocation of an existing sewer line which runs along Fountain Hills Boulevard. The major advantage of this alternative is the use of the culvert as a pedestrian/bicycle crossing during dry periods.

**Alternative 3 - Corrugated Metal Pipe (2-120"x145' CMP).** Based on the hydraulic analysis documented in **Appendix 5**, the CMP's would convey the future conditions 10-year and 100-year flow without overtopping the culvert. The new CMP's would eliminate street flooding along Fountain Hills Boulevard and Kings Way arising from existing culvert inadequacies at ADMP 5. It would also reduce the risk of flooding properties and structures along Fountain Hills Boulevard and Kings Way. This alternative would require extensive upstream channel improvements and would require erosion protection upstream and downstream. This alternative would also require the relocation of an existing sewer line which runs along Fountain Hills Boulevard. The major advantage of this alternative is the staggered CMP

invert elevations that would permit pedestrian/bicycle crossing during periods of low flows.

**Alternative 4 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future and the increased risk of flooding to nearby properties and structures.

#### ADMP 6 - Boulder Drive at Hesperus Wash

**General.** The depth and width of the existing channel offers adequate room for large diameter culverts without significant impact to the existing road profile and without need for extensive channel improvements. If larger diameter pipes are used, an existing sewer line would need to be relocated.

**Alternative 1 - Corrugated Metal Pipe (3-60"x170' CMP, 1-Existing & 2-New).** Based on the hydraulic analysis documented in **Appendix 6**, the CMP's would convey the future conditions 10-year and 100-year flow without overtopping. The addition of two more 60" CMP's would eliminate street flooding due to overtopping and reduce the risk of flooding nearby property and structures. This alternative minimizes the impact on the channel, surrounding vegetation, and existing sewer lines. Maintenance costs for these culverts may be more expensive than larger diameter culverts but the construction cost is less expensive than Alternative 2.

**Alternative 2 - Corrugated Metal Pipe (1-120"x185' CMP).** Based on the hydraulic analysis documented in **Appendix 6**, the CMP's would convey the future conditions 10-year flow and the future conditions 100-year flow without overtopping the culvert. The new CMP would eliminate overtopping flooding and prevent the flooding of nearby property and structures. This alternative would require upstream channel improvements and the relocation of an

existing sewer line and 8-inch water line. The major advantage of this alternative is the potential use of the culvert for pedestrian/bicycle crossing during periods of no flow.

**Alternative 3 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding and possibly more structural flooding in the future.

ADMP 7 - Glenbrook Boulevard at Balboa Wash

**General.** Due to the limited width of the existing channel and limited ability to raise the road profile, only an appropriately sized CMP is considered a viable alternative. A wide, shallow multi-barrel concrete box culvert is hydraulically feasible but the cost relative to a CMP culvert makes it an unreasonable solution.

**Alternative 1 - Corrugated Metal Pipe (6-48"x115').** Based on the hydraulic analysis documented in **Appendix 7**, the CMP's would convey the future conditions 10-year flow without overtopping and the future conditions 100-year flow with 23 cfs overtopping the culvert. The water depth on the overtopping weir is estimated to be 0.25 feet. The primary advantage of this alternative is that it would improve the flow of traffic along Glenbrook Boulevard when Balboa Wash is flowing and allow for safe crossing of Balboa Wash during periods of high flow. This alternative, however, would require significant raising of the road profile and may impact driveways at adjacent residential properties.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean the crossing would remain hazardous during periods of high flow.

ADMP 8 - Fountain Hills Boulevard at Oxford Wash

**General.** Due to the magnitude of the expected future flow, the limited width of the existing channel and inability to raise the road profile, a shallow concrete box culvert is recommended as the most viable alternative.

**Alternative 1 - Concrete Box Culvert (2-10'x4'x171').** Based on the hydraulic analysis documented in **Appendix 8**, the CBC would convey the future conditions 10-year flow and the future conditions 100-year flow without overtopping. The CBC would improve flooding conditions along Fountain Hills Boulevard. However, split flows from ADMP 9 (if not corrected) and ADMP 5 (if not corrected) would continue to create flooding problems at this location. The CBC would also reduce the amount of flooding to nearby properties and structures. This alternative, however, would be expensive to construct and maintain. It would require extensive channel improvements and roadway excavation.

An alternative that was investigated but eliminated from further consideration was shortening the culvert to end nearer to Fountain Hills Boulevard, a culvert length of about 110 feet. Due to the channel depth, and the proximity to the Club Mirage parking lot to the south and the Mirage Resort Casitas residential building to the north, retaining walls would be required on each side of the channel, ending where Alternative 1 ends. There is frequent pedestrian traffic between the Club Mirage and the Casitas. Shortening the culvert would impact this traffic, and may be a design consideration if shortening the culvert is deemed desirable during final design.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future and the increased risk of flooding nearby property and structures.

### ADMP 9 - Fairlynn Drive at Oxford Wash

**General.** Due to the limited width of the existing channel and limited ability to raise the road profile, a shallow concrete box culvert is recommended as the most viable alternative.

**Alternative 1 - Concrete Box Culvert (2-10'x4'x65').** Based on the hydraulic analysis documented in **Appendix 9**, the CBC would convey the future conditions 10-year flow with no overtopping and the future conditions 100-year flow with 3 cfs overtopping the culvert. The water depth on the overtopping weir is calculated to be 0.05 feet. The CBC would eliminate flooding along Fairlynn Drive and Oxford Drive and improve flooding conditions along Fountain Hills Boulevard. This alternative, however, would be expensive to construct and maintain. It would require extensive channel improvements, a grade control structure and careful analysis of sedimentation potential. Also, there will be extensive roadway excavation and removal of significant amounts of vegetation. It would also require the relocation of two sewer lines, one along Oxford Wash and one along Fairlynn Drive. Additionally, this alternative is dependent upon the construction of a concrete box culvert crossing Fountain Hills Boulevard (ADMP 8, Alternative 1).

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future and the increased risk of flooding to nearby property and structures.

### ADMP 10 - Glenbrook Boulevard at Oxford Wash

**General.** Due to the limited width of the existing channel and limited ability to raise the road profile, only an appropriately sized CMP is considered a

viable and recommended alternative. A wide, shallow multi-barrel concrete box culvert is hydraulically feasible but the cost relative to a CMP culvert makes it an unreasonable solution.

**Alternative 1 - Corrugated Metal Pipe (7-30"x115').** Based on the hydraulic analysis documented in **Appendix 10**, the CMP's would convey the future conditions 10-year flow with no overtopping and the future conditions 100-year flow with 23 cfs overtopping the culvert. The water depth on the overtopping weir is calculated to be 0.96 feet based on an HY-8 analysis. Further analysis of Glenbrook Boulevard flowing at 0.5 feet of curb depth determined the capacity to be approximately 44 cfs, thus, 23 cfs overtopping at the culvert would flow less than 0.5 feet deep down the street. Overtopping flow, however, would split from the channel and flow east along Glenbrook Boulevard. A portion of the flow would return to the wash at the crossing of Oxford Wash and Maple Drive, but the remaining flow would continue east along Glenbrook Boulevard. The split flow from Oxford Wash should not significantly affect local street drainage due to the amount of flow and the fact that a portion would return almost immediately to Oxford Wash. The primary advantage of this alternative is that it would improve the flow of traffic along Glenbrook Boulevard when Oxford Wash is flowing and allow for a safer crossing of Oxford Wash during periods of high flow. This alternative, however, would require significant raising of the road profile and would not completely eliminate street flooding along Glenbrook Boulevard.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean the crossing would remain hazardous during periods of high flow.

ADMP 11 - El Pueblo Boulevard at Caliente Wash (Downstream Crossing)

**General.** Due to magnitude of expected future conditions flow, the limited width of the existing channel and limited ability to raise the road profile, a wide, shallow concrete box culvert is recommended as the most viable alternative.

**Alternative 1 - Concrete Box Culvert (7-6'x3'x88').** Based on the hydraulic analysis documented in **Appendix 11**, the CBC would convey the future conditions 10-year flow with no overtopping and the future conditions 100-year flow with 35 cfs overtopping the culvert. The water depth on the overtopping weir is calculated to be 0.41 feet. The CBC would improve traffic flow conditions along El Pueblo Boulevard during periods when Caliente Wash is flowing. However, there are a number of disadvantages to this alternative. This alternative would be expensive to construct, expensive to maintain, require extensive channel improvements including a grade control structure, extensive road excavation, relocation of an existing sewer line, the removal of significant amounts of wash vegetation and, because of the low roadway profile, the top of the concrete box culvert must be used as the roadway driving surface.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean the crossing would remain hazardous during periods of high flow.

ADMP 12 - El Pueblo Boulevard at Caliente Wash (Upstream Crossing)

**General.** Due to magnitude of expected future conditions flow and limited ability to raise the road profile, only small diameter pipe and shallow concrete box culverts are considered viable alternatives.

**Alternative 1 - Concrete Box Culvert (2-12'x3'x80').** Based on the hydraulic analysis documented in **Appendix 12**, the CBC would convey the future conditions 10-year flow without overtopping and the future conditions 100-year flow with 10 cfs overtopping the culvert. The water depth on the overtopping weir is calculated to be 0.17 feet. The CBC would improve traffic flow conditions along El Pueblo Boulevard during periods when Caliente Wash is flowing; however, there are several disadvantages to this alternative. This alternative would be expensive to construct and require significant raising of the road profile as well as the relocation of an existing sewer line. Also, the top of the concrete box culvert must be used as the roadway driving surface.

**Alternative 2 - Corrugated Metal Pipe (11-36"x90').** Based on the hydraulic analysis documented in **Appendix 12**, the CBC would convey the future conditions 10-year flow without overtopping and the future conditions 100-year flow with 40 cfs overtopping the culvert. The water depth on the overtopping weir is calculated to be 0.44 feet. Alternative 2 would improve traffic flow conditions along El Pueblo Boulevard during periods when Caliente Wash is flowing and is less expensive to construct; however, there are several disadvantages to this alternative. This alternative would require significant raising of the roadway profile and the relocation of an existing sewer line. It would be more expensive to maintain and, because of the lack of sufficient cover on the pipes, a 6-inch thick slab of reinforced concrete paving must be placed to help protect the CMP's and prevent deflection cracking in the asphalt.

**Alternative 3 - No Action.** Not taking any action to resolve the flooding problem would mean the crossing would remain hazardous during periods of high flow.

ADMP 13 - Fountain Hills Boulevard at Arrow Wash

**General.** Due to the length and location of the existing storm drain, the proximity of local businesses, the presence of two major arterial roads and the land development patterns in the area, the construction of a detention basin is recommended as the most viable alternative.

**Alternative 1 - Detention Basin (14 acre-feet).** Based on the hydrologic and hydraulic analysis documented in **Appendix 13**, the detention basin would sufficiently detain the future conditions 100-year flow with 21 cfs overtopping into the roadway. The overtopping flow depth is minimal and would not exceed established criteria. The detention basin would greatly improve local traffic conditions and change the hydrologic peak sufficiently to eliminate the need for downstream improvements at the crossing of Arrow Wash and Arrow Drive (ADMP 14). By avoiding replacement of the existing storm drain or construction of another storm drain along a new alignment, several costly obstacles are avoided such as the relocation of numerous utility lines, disruption of local businesses and the disruption of traffic along arterial roads. The construction of a detention basin would also be considerably less expensive than the design and construction of a new storm drain. In addition, the land upstream of the storm drain is well suited for a detention basin and is currently undeveloped. The major disadvantage of this alternative is the environmental impact on the wash and the need to remove most of the existing vegetation within the limits of the proposed detention basin. This would be mitigated by landscape plantings within the basin.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future and the increased risk of flooding nearby property and structures. It would result in

more local traffic disruption, more hazardous driving conditions and continued interference with local businesses.

#### ADMP 14 - Arrow Drive at Arrow Wash

**General.** Due to the magnitude of the expected future 100-year flow, the limited channel width, and the inability to raise the existing road profile, a concrete box culvert is recommended as the most viable alternative which could be constructed at this location. However, an upstream detention basin, as described in ADMP 13 - Alternative 1, would eliminate the need for any improvements at this road crossing. Therefore, ADMP 13 - Alternative 1 is considered to be the best and most reasonable alternative which resolves the existing flooding problem.

**Alternative 1 - Detention Basin (14 acre-feet).** Based on the hydrologic and hydraulic analysis documented in **Appendix 13**, an upstream detention basin would reduce the expected future conditions 100-year flow from 741 cfs to 396 cfs. The existing culvert capacity without overtopping is 455 cfs, based on a previous analysis in the *Fountain Hills North Floodplain Delineation Study Technical Data Notebook - Hydraulics* (**which is included in Appendix 14**) for existing conditions hydraulics. Therefore, a detention basin, as described in ADMP 13 - Alternative 1, would change the hydrologic peak sufficiently to eliminate the need for downstream improvements at the crossing of Arrow Wash and Arrow Drive (ADMP 14). The major advantage of this alternative is that the funds which would be required for any structural improvements to resolve the flooding problem at this location could be used to offset construction costs of the ADMP 13 detention basin. The only disadvantage of this alternative is that it is dependent upon the adoption of ADMP 13 - Alternative 1.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future and the increased risk of flooding to nearby property and structures.

ADMP 15-Saguaro Boulevard at Colony Wash

**General.** The depth and width of the existing channel allows for the consideration of a large diameter culvert without a significant impact to the existing road profile nor the need for extensive channel improvements. However, the existing sewer line may require to be relocated if the new structure extends below the existing invert of the 72" CMP.

**Alternative 1 - Corrugated Metal Pipe (2-72"x 167' CMP, 1-Existing & 1-New).** Based on the hydraulic analysis included in **Appendix 15**, this alternative would convey the future 10-year flow without overtopping, and the future 100-year with 28 cfs overtopping the road. The depth of flow over the road was estimated to be 0.41'. This alternative would minimize the impact of improvements to the channel, surrounding vegetation and existing utilities. However, the existing 12" water line may require to be lowered.

**Alternative 2 - Corrugated Metal Pipe (1-120"x 146' CMP with 8' walkway)** Based on the hydraulic calculations included in **Appendix 15**, this alternative would convey the future 10-year and 100-year flows without overtopping the road. However, it would require more earthwork, and vegetation removal as well as the relocation of a sewer line and a water main. The advantages of using a 120" CMP include easiness of maintenance, reducing street flooding, and providing pedestrian and bicycle crossing.

**Alternative 3 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding at Saguaro Boulevard in the future.

#### ADMP 16- El Lago Boulevard at Fountain Channel

**General.** Considering the magnitude of the expected future 100-year flow and the constraint of raising the existing road profile or lowering the culvert; the addition of another barrel of concrete box appeared to be the most viable alternative.

**Alternative 1 - Concrete Box Culvert (3-10' x 4'x 74' CBC, 2-Existing & 1-New).** Based on the hydraulic calculations included in **Appendix 16**, this alternative would convey the future 10-year and 100-year flows without overtopping the road. The addition of the new barrel would reduce the backwater effect upstream from the culvert and in turn reduce the extent of channel improvements on Fountain Channel (ADMP 26). It would also prevent split flow along El Lago Boulevard to the Spillway Channel. In addition, this alternative would minimize the impact of improvements to the channel and surrounding vegetation. However, a 6" water line may require to be relocated.

**Alternative 2 - No Action.** Not taking any action would most likely result in storm water flowing into Fountain Lake, or more extensive Fountain Channel improvement along the west shore of the lake. If spillage to the lake is stopped as a result of Fountain Channel improvement, the increased channel flow would overtop the existing culvert and flood El Lago Boulevard and Spillway Channel.

### ADMP 17-Kiwanis Drive at Fountain Channel

**General.** Considering the magnitude of the future 100-year flow, the limited channel width and the constraint of raising the existing road profile, a shallow concrete box appeared to be the most viable alternative. The number of CMPs required to adequately convey the future 100-year flow could not be reasonably fit within the existing channel.

**Alternative 1 - Concrete Box Culvert (3-10'x 4'x 64')** Based on the hydraulic calculations included in **Appendix 17**, this alternative would convey the future 10-year flow without overtopping the road and the future 100-year flow with 57 cfs overtopping the road. The depth of flow over the road was estimated to be 0.38'. The new culvert would reduce street flooding and allow the road to remain open during a 100-year storm. Special precautions need to be taken during construction to avoid any impact on the existing sewer and water lines. This alternative would require raising the profile of Kiwanis Drive for a length of approximately 450 feet.

**Alternative 2 - No Action** Not taking any action to resolve the flooding problem would mean more extensive street flooding at Kiwanis Drive. In addition, the backwater at this crossing may affect the capacity of the upstream culvert at El Lago Boulevard (ADMP 16).

### ADMP 18- Chama Drive at North Colony Wash

**General.** Considering the magnitude of the future 100-year flow, the width of the channel and the roadway profile, many alternatives were feasible, but only the least-cost ones were considered. Also, only those alternatives with little or no overflow were considered since split flows are unavoidable once overtopping occurs. The downstream end of the existing culvert shows signs

of significant erosion, therefore grade control was included for both "action" alternatives to stabilize the downstream channel.

**Alternative 1 - Corrugated Metal Pipe (2-60"x 73' CMP, 1-Existing & 1-New)** Based on the hydraulic calculations included in **Appendix 18**, this alternative would convey the future 10-year and 100-year flows without overtopping the road. The site improvements would reduce street flooding along Chama and Arroyo Vista Drives. The presently designated Zone A would possibly be removed. An 8-foot high grouted riprap drop structure with minor grading work would be required at the downstream end of the culvert. Special precautions need to be taken during construction to avoid any impact on the existing sewer and water lines. A significant amount of vegetation would be disturbed due to the construction of the drop structure.

**Alternative 2 - Corrugated Metal Pipe (1-72"x 78' CMP)** Based on the hydraulic calculations included in **Appendix 18**, this alternative would convey the future 10-year flow without overtopping the road and the future 100-year flow with 4 cfs overtopping the road. The depth of flow over the road was estimated to be 0.19', which is well within the established criteria. Street flooding would be essentially reduced. A 7-ft high grouted riprap drop structure would be needed at the downstream end of the culvert. The new culvert would be 1 foot below the existing culvert invert, thus some utilities would need to be protected or relocated during the construction. A significant amount of vegetation would be disturbed due to the construction of the drop structure.

**Alternative 3 - No Action** Not taking any action to resolve the flooding problem would mean more extensive street flooding in the future. Structures and property along Chama Drive and Arroyo Vista Drive would possibly be subject to flooding. In addition, future floodplain delineation studies may

extend the limits of the floodplain to include the existing area that is designated as Zone A. The potential erosion at the downstream end of the culvert may result in roadway maintenance problems and may affect the integrity of the roadway embankment.

#### ADMP 19- Cholla Drive at Ironwood Wash

**General.** Considering the magnitude of the future 100-year flow, the topography of the area, the availability of land and the location of a sewer line; additional CMPs appeared to be the most effective solution for this site. The alternative of an open channel from the existing inlet to the road was eliminated because it would require lined steep banks that are hazardous to environment and public safety. The alternative of a retention basin was also eliminated due to the cost and maintenance concerns. The invert of the culvert was planned to match the existing culvert to avoid any potential conflicts with sewer and other utilities.

**Alternative 1 - Corrugated Metal Pipe (3-48"x 133' CMP, 1-Existing & 2-New)** Based on the hydraulic calculations included in **Appendix 19**, this alternative would convey the future 10-year and 100-year flows without overtopping the road. The 100-year water surface elevation upstream from the culvert would be 1668.22, preventing the adjacent properties from flooding. This alternative would minimize the impact on the upstream channel, road profile, surrounding vegetation and existing utilities. However, the main disadvantage of this alternative is the small increase of the 100-year flows in the downstream area because flow from this culvert discharges into Colony Wash at the upstream end of Fountain Hills Boulevard.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive property and possible flooding of

structures upstream from the culvert. In addition, the existing culvert does not provide adequate drainage for this area. The stagnant water may create a health hazard.

#### ADMP 20- Saguaro Boulevard at Malta Drain

**General.** Considering the magnitude of the future 100-year flow, the width of the channel and the road profile, many alternatives were feasible but only the least-cost ones were considered.

**Alternative 1 - Corrugated Metal Pipe (1-120"x 131' CMP with 8' walkway)** Based on the hydraulic calculations included in **Appendix 20**, this alternative would convey the future 10-year and 100-year flows without overtopping the road. The new culvert would significantly reduce street flooding at Saguaro Boulevard, and in conjunction with the improved structure at the Emerald Wash crossing (ADMP 22), it would reduce street flooding at both locations. In addition, the designated Zone AE area at Saguaro Boulevard between the crossings of Malta Drain and Emerald Wash would probably be eliminated. Implementation of this alternative would require the relocation of a 12" water line, extensive excavation at the roadway as well as channel improvement upstream and downstream of the culvert. The advantages of using the 120" CMP include easiness of maintenance, reduction of street flooding, and providing pedestrian and bicycle crossing.

**Alternative 2 - Corrugated Metal Pipe (4-48"x 132' CMPs, 2-Existing & 2-New)** Based on the hydraulic calculations included in **Appendix 20**, this alternative would convey the future 10-year and 100-year flows without overtopping the road. This alternative would minimize the impact to the channel, surrounding vegetation and existing utilities. It would also reduce

flooding from Malta Drain with less earthwork and virtually no channel modification. The disadvantage of this alternative is that it would require more maintenance effort.

**Alternative 3 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive property and possible structure flooding upstream from the culvert as well severe street flooding along Saguaro Boulevard in the future.

#### ADMP 21- Rand Drive at Malta Drain

**General.** Considering the magnitude of the future 100-year flow, the limited channel width and the constraint of raising the existing road profile, a shallow concrete box and small CMPs appeared to be the most viable alternatives. Significant amount of erosion was observed at the downstream end of the crossing, therefore grade control was considered at this site.

**Alternative 1 - Concrete Box Culver (2-6' x 3'x 66')** Based on the hydraulic calculations included in **Appendix 21**, this alternative would convey the future 10-year flow without overtopping the road and the future 100-year flow with 35 cfs overtopping the road. The depth of flow over the road was estimated to be 0.50'. The new culvert would reduce street flooding and allow Rand Drive to remain open during a 100-year storm. The inlet of the culvert would act as a grade control to stabilize the upstream channel. This alternative would require the relocation of a 6-inches water line and a significant amount of vegetation removal. In addition, it would require vertical realignment of 300 feet of roadway. Pavement replacement would also be required for the side streets.

**Alternative 2 - Corrugated Metal Pipe (4-48"x 94' CMPs)** Based on the hydraulic calculations included in **Appendix 21**, this alternative would convey the future 10-year flow without overtopping the road and the future 100-year flow with 26 cfs over the road. The depth of flow over the road was estimated to be 0.36'. The new culvert would reduce street flooding and allow Rand Drive to remain open during a 100-year storm. The cost of the culvert for this alternative would be less than that for Alternative 1. However, it would require more maintenance effort. This alternative would also require the same amount of vertical realignment and pavement replacement as Alternative 1.

**Alternative 3 - No Action** Not taking any action to resolve the flooding problem would mean more extensive street flooding at Rand Drive, hindering traffic along this local road during a storm, frequent maintenance for debris and sediment removal at the dip section, and stabilization of the downstream road embankment after a major storm.

#### ADMP 22- Saguaro Boulevard at Emerald Wash

**General.** Considering the magnitude of the future 100-year flow, the width of the channel and the road profile, many alternatives were feasible but only the least-cost ones were considered.

**Alternative 1 - Corrugated Metal Pipe (3-60"x 193' CMPs, 2-Existing & 1-New)** Based on the hydraulic calculations included in **Appendix 22**, this alternative would convey the future 10-year flow without overtopping the road and the future 100-year flow with 11 cfs overtopping the road. The depth of flow over the road was estimated to be 0.09'. The additional barrels would significantly reduce the amount of street flooding at Saguaro Boulevard, and in conjunction with the improved structure at the Malta Drain crossing (ADMP

20), it would reduce street flooding at both locations. In addition, the designated Zone AE area at Saguaro Boulevard between the crossings of Malta Drain and Emerald Wash would probably be eliminated. This alternative would also minimize impact on the channel since only minor grading would be required on the upstream and downstream ends of the culvert.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive property and possible structure flooding upstream from the culvert as well as more severe street flooding along Saguaro Boulevard in the future.

#### ADMP 23- Kingstree Boulevard at Kingstree Wash

**General.** Considering the magnitude of the future 100-year flow, the width and the slope of Kingstree Boulevard, a side spillway structure appeared to be the most viable alternative.

**Alternative 1 - Improved Spillway** Based on the hydraulic calculations included in **Appendix 23**, a 50-foot long spillway would be required to pass the future 100-year flow. This alternative would direct the flow towards the south side of the street and allow for extra conveyance before discharging into Jacklin Wash. It would minimize the flooding impact to Kingstree Boulevard, but would require some pavement replacement. Also, the south bank would need to be regraded and a small portion of the lawn would need to be restored.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding at Saguaro Boulevard in the future.

#### ADMP 24- Saguaro Boulevard at Cypress Point Wash

**General.** Considering the magnitude of the future 100-year flow, the limited channel width, the existing sewer lines, and the constraint of raising the existing road profile, a shallow concrete box and small CMPs appeared to be the most viable alternatives. The 120" CMP was not considered because it would be in conflict with a sewer line.

**Alternative 1 - Concrete Box Culvert (1-8' x4'x 181')** Based on the hydraulic calculations included in **Appendix 24**, this alternative would convey the future 10-year flow without overtopping the road and the future 100-year flow with 6 cfs overtopping the road. The overtopping flow would travel along Saguaro Boulevard at a depth of less than 0.5 feet. The new culvert would reduce flooding potential on property and structures along Saguaro Boulevard. The presently designated Zone A area east of Saguaro Boulevard would probably be removed. The inlet of the culvert would need to be improved to match the landscape of the golf course.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding at Saguaro Boulevard, hindering traffic along this major arterial road, as well as more flooding potential to property and structures. It is possible that future floodplain delineation studies may extend the limits of the floodplain to include the area currently designated as Zone A.

#### ADMP 25- Channel Improvement at Malta Drain

**General.** Considering the magnitude of the future 100-year flow, the capacity of Malta Drain appeared to be adequate except at the roadway crossings. Therefore, the improvement of roadway crossings was apparently

the most viable alternative. Malta Drain has seven roadway crossings. The two downstream crossings (Saguaro Boulevard and Rand Drive) were analyzed separately under ADMP 20 and ADMP 21. The remaining five crossings are similar and their constraints are almost identical, thus they are discussed together in this section. Considering limited channel width, existing sewer lines and the constraint of raising the existing road profiles, a shallow concrete box appeared to be the most viable alternative at each of these five sites.

**Alternative 1 - Crossing Improvements (1-10'x 3'x 47' RCB at five locations)** Based on the hydraulic calculations included in **Appendix 25**, this alternative would convey the future 10-year and 100-year flows without overtopping the road. The proposed headwall was planned to be one foot above the expected water surface and the south bank be raised to the same level as the head wall. This alternative would also include grade control structures at both ends of the culvert to stabilize the channel. The area along Malta Drive presently designated as a Community Designated Special Hazard would probably be relieved.

**Alternative 2 - No Action.** Not taking any action to resolve the flooding problem would mean more extensive street flooding at these crossings and more severe flooding of property and structures along Malta Drive. Future floodplain delineation studies may possibly extend the limits of the floodplain to include the area presently designated as a Community Designated Special Hazard.

#### ADMP 26- Channel Improvement at Fountain Channel

**General.** Considering the magnitude of the future 100-year flow, the capacity of Fountain Channel needs to be increased to prevent overflow into

Fountain Lake. The area is a local attraction, aesthetics and the disturbance of existing landscaping were taken into consideration. Lowering the channel flowline would cause significant amount of disturbance, and hence, would not be a viable option. The raise of the east bank appeared to be the most viable alternative. This solution was analyzed in conjunction with ADMP 16 with the assumption that the improvements recommended for ADMP 16 would be implemented concurrently.

**Alternative 1 - East Bank Improvement** Based on the HEC-2 output included in **Appendix 26**, the raised channel embankment would be able to convey the future 100-year flow without spilling into the lake. This alternative would work in conjunction with the proposed crossing improvement at El Lago Boulevard (ADMP 16).

**Alternative 2 - No Action.** Not taking any action to resolve the overflow problem would mean more extensive spillage into the lake, creating operational problems and decreasing the amount of usefully storage available for treated sanitary effluent in the lake.

## 7.5 Estimation of Costs

The construction cost for each alternative was estimated by applying a unit cost to the approximate quantity of that particular item. Unit costs were derived from the recent bid prices on similar projects that were obtained from Arizona Department of Transportation and various contractors in the Phoenix metropolitan area. The price figures were based on the Construction Cost Index of 5708, which was estimated by *Engineering News Record* in October 1996.

Quantities for trench excavation and pavement replacement were estimated based on the following criteria:

Street Classification	Width	Asphalt Thickness	ABC Thickness
Arterial Roads	80'	4"	6"
Major Collector	64' or 52'	3"	6"
Minor Collector	40'	3"	6'
Local Streets	32' or 36'	2"	6"

The estimated cost for each site is presented in **Table 2**. These cost figures were estimated at a feasibility level of detail. Refinement will be required during the design phase of this project. For construction budget estimation, an additional ten (10) percent of contingency should be added to these figures to account for construction management costs. The scour protection length and geometry at this feasibility study level were selected based on engineering judgment. Analysis for sizing the appropriate lengths and geometry for the protection will be required during the design phase of this project. Therefore, modification of design and cost for scour protection may be required at that time.

## 7.6 Summary of Recommended Alternatives

Based on the reasons presented in Section 7.4, the recommended alternatives for drainage solution at each site are summarized in **Table 3**.

**TABLE 2  
SUMMARY OF COST ESTIMATES**

SITE NO.	STREET LOCATION	WASH NAME	ESTIMATED COSTS		
			ALT. 1	ALT. 2	ALT. 3
1	Del Cambre Avenue	Ashbrook	\$729,000		
2	Saguaro Boulevard	Ashbrook	\$352,000		
3	Bayfield Drive	Ashbrook	\$185,000	\$175,000	
4	Golden Eagle Boulevard	Ashbrook	\$198,000	\$266,000	
5	Fountain Hills Boulevard	Balboa	\$133,000	\$132,000	\$190,000
6	Boulder Drive	Hesperus	\$82,000	\$120,000	
7	Glenbrook Boulevard	Balboa	\$156,000		
8	Fountain Hills Boulevard	Oxford	\$236,000		
9	Fairlynn Drive	Oxford	\$139,000		
10	Glenbrook Boulevard	Oxford	\$127,000		
11	El Pueblo Boulevard	Caliente	\$223,000		
12	El Pueblo Boulevard	Caliente	\$253,000	\$248,000	
13	Fountain Hills Boulevard	Arrow	\$186,000		
14	Arrow Drive	Arrow	See Site 13		
15	Saguaro Boulevard	Colony	\$83,000	\$141,000	
16	El Lago Boulevard	Fountain Channel	\$54,000		
17	Kiwanis Drive	Fountain Channel	\$154,000		
18	Chama Drive	North Colony	\$47,000	\$57,000	
19	Cholla Drive	Ironwood	\$81,000		
20	Saguaro Boulevard	Malta	\$131,000	\$59,000	
21	Rand Drive	Malta	\$109,000	\$96,000	
22	Saguaro Boulevard	Emerald	\$83,000		
23	Kingstree Boulevard	Kingstree	\$36,000		
24	Saguaro Boulevard	Cypress Point	\$116,000		
25	Channel Improvement from Hawk Drive to Rand Drive	Malta	\$225,000		
26	Channel Improvement	Fountain Channel	\$26,000		

**TABLE 3  
SUMMARY OF RECOMMENDED ALTERNATIVES**

<b>SITE NO.</b>	<b>RECOMMENDED ALTERNATIVE</b>	<b>REASON OF RECOMMENDATION</b>	<b>ESTIMATED COST</b>
1	No Action	Due to the expense of bridge construction, "No Action" Alternative is recommended	\$0
2	New Concrete Box Culvert (6 - 10' x 4' x 110') (Alt. 1)	Improvement of traffic flow during flooding	\$352,000
3	New Concrete Box Culvert (5 - 8' x 5' x 84') (Alt. 2)	The most cost effective alternative	\$175,000
4	New Corrugated Metal Pipe (3 - 120" x 136') (Alt. 1)	The most cost effective alternative	\$198,000
5	Additional Corrugated Metal Pipe (4 - 54" x 120') (Alt. 1)	The least impact alternative	\$133,000
6	Additional Corrugated Metal Pipe (2 - 60" x 170') (Alt. 1)	The most cost effective alternative	\$82,000
7	New Corrugated Metal Pipe (6 - 48" x 115') (Alt. 1)	Improvement of traffic flow during flooding	\$156,000
8	New Concrete Box Culvert (2 - 10' x 4' x 171') (Alt. 1)	Improvement of traffic flow during flooding and protection of adjacent properties from flooding	\$236,000
9	New Concrete Box Culvert (2 - 10' x 4' x 65') (Alt. 1)	Improvement of traffic flow during flooding and protection of adjacent properties from flooding	\$139,000
10	New Corrugated Metal Pipe (7 - 30" x 115') (Alt. 1)	Improvement of traffic flow during flooding	\$127,000
11	New Concrete Box Culvert (7 - 6' x 3' x 88') (Alt. 1)	Improvement of traffic flow during flooding	\$223,000
12	New Concrete Box Culvert (2 - 12' x 3' x 80') (Alt. 1)	Improvement of traffic flow during flooding	\$253,000
13	Detention Basin (Alt. 1)	Improvement of traffic flow during flooding	\$186,000

SITE NO.	RECOMMENDED ALTERNATIVE	REASON OF RECOMMENDATION	ESTIMATED COST
14	Included under Site 13	Improvement of traffic flow during flooding	---
15	Additional Corrugated metal Pipe (1 - 72" x 167') (Alt. 1)	The most cost effective alternative	\$83,000
16	Additional Concrete Box Culvert (1 - 10' x 4' x 74') (Alt. 1)	Improvement of traffic flow during flooding and preventing storm runoff from flowing to the lake	\$54,000
17	New Concrete Box Culvert (3 - 10' x 4' x 64') (Alt. 1)	Improvement of traffic flow during flooding	\$154,000
18	Additional Corrugated Metal Pipe (1 - 60" x 73') (Alt. 1)	The most cost effective alternative	\$47,000
19	Additional Corrugated Metal Pipe (2 - 48" x 133') (Alt. 1)	Reducing ponding area and protect adjacent property form flooding	\$81,000
20	Additional Corrugated Metal Pipe (2 - 48" x 132') (Alt. 2)	The most cost effective alternative	\$59,000
21	New Corrugated Metal Pipe (4 - 48" x 94') (Alt. 2)	The most cost effective alternative	\$96,000
22	Additional Corrugated Metal Pipe (1 - 60" x 193') (Alt. 1)	The most cost effective alternative	\$83,000
23	Improved Spillway (Alt. 1)	Improvement of traffic flow during flooding	\$36,000
24	New Concrete Box Culvert (1 - 8' x 4' x 181') (Alt. 1)	Improvement of traffic flow during flooding	\$116,000
25	New Concrete Box Culvert (5 - 10' x 3' x 47') (Alt. 1)	Improvement of traffic flow during flooding	\$225,000
26	East Bank Improvement (Alt. 1)	Preventing storm runoff from flowing to the lake	\$26,000

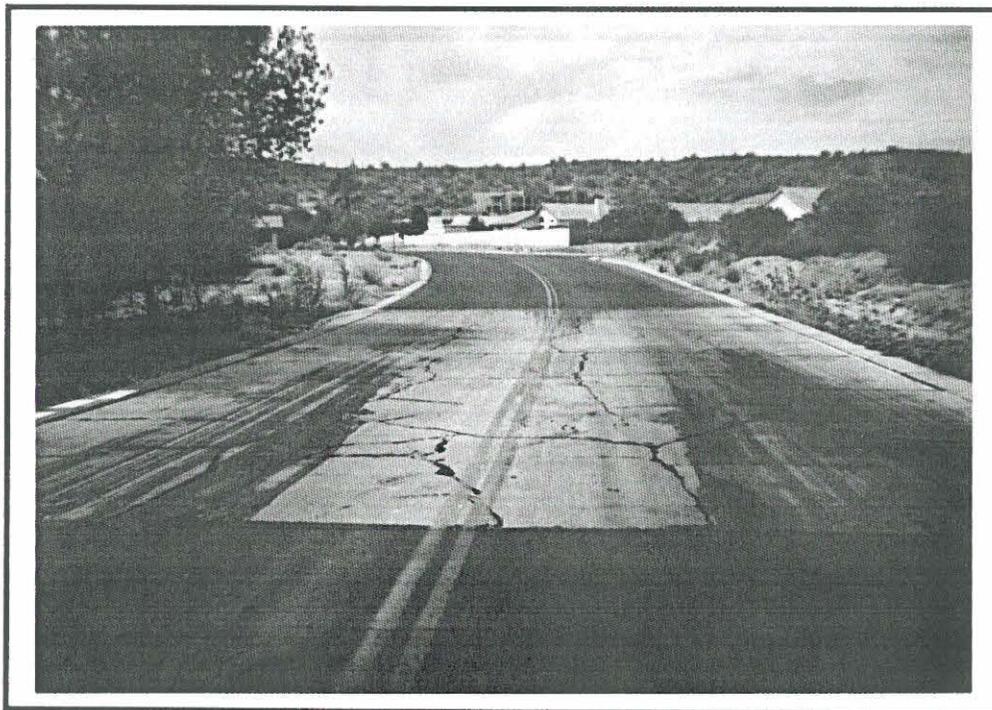
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4. Maricopa County Department of Transportation (MCDOT), November 1993. *Roadway Design Manual.*
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13. U. S. Geological Survey, 1991. *Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona.*

ADMP 1: Del Cambre Avenue / Ashbrook Wash



Ashbrook Wash  
*Looking Downstream Across Dip Section*



Ashbrook Wash  
*Looking Southerly Down Road Profile*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:

REL 6-20-96

CLS 6-20-96

Inits. Date

### Field Reconnaissance Sheet

Site No.: ADMP 1

Roadway: Del Cumbre Blvd.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Ash brook Wash	3100	4010	dip section

Reason for Analysis / Existing Deficiency: Culvert desired at location.  
100 year runoff not contained within dip section.  
Potentially dangerous crossing.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: — ft. Downstream: — ft.
- 2) Can the culvert be lowered: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Telephone, TV Cable Electric and Water utilities  
extend along Del Cumbre across the wash
- 5) Structures: Alot of brush and trees
- 6) Right-of-Way: \_\_\_\_\_

#### 7) Miscellaneous field notes, comments, or design ideas:

Road profile will have to be raised but the  
dip is wide and shallow, therefore, the ability  
to raise road profile is extremely limited. Also  
will need to put in a grade check structure to  
lower channel.

# ALTERNATE 1

1/4

Ashbrook Wash & Del Cambre Blvd. (bridge modeled as CBC with no overtopping)

CURRENT DATE: 10-09-1996

FILE DATE: 10-09-1996

CURRENT TIME: 16:48:22

FILE NAME: FH01-#1

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.3

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1549.50	1548.60	54.01	4 RCB	29.00	3.50	.010	CONVENTIONAL
2	1549.50	1548.60	54.01	2 RCB	28.50	4.00	.010	CONVENTIONAL
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: FH01-#1 DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1549.50	0	0	0	0	0	0	0	0	0
1550.43	401	267	132	0	0	0	0	0	3
1550.97	803	535	264	0	0	0	0	0	3
1551.43	1204	805	396	0	0	0	0	0	3
1551.82	1605	1078	525	0	0	0	0	0	3
1552.20	2007	1347	659	0	0	0	0	0	3
1552.54	2408	1606	790	0	0	0	0	0	2
<b>1552.57 10YR</b>	<b>2432</b>	<b>1630</b>	<b>801</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
1553.22	3210	2144	1069	0	0	0	0	0	2
1553.56	3612	2405	1207	0	0	0	0	0	3
<b>1553.91 100YR</b>	<b>4013</b>	<b>2662</b>	<b>1351</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
1555.60	5701	3730	1971	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH01-#1 DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1549.50	0.00	0	0	0.00
1550.43	-0.00	401	1	0.35
1550.97	-0.00	803	3	0.41
1551.43	-0.00	1204	3	0.28
1551.82	-0.00	1605	2	0.09
1552.20	-0.00	2007	1	0.03
1552.54	-0.01	2408	12	0.49
1552.57	-0.00	2432	0	0.02
1553.22	0.00	3210	-3	-0.08
1553.56	0.00	3612	-0	-0.01
1553.91	0.00	4013	-0	-0.01

<1> TOLERANCE (FT) = 0.010

<2> TOLERANCE (%) = 1.000

Conclusions: 10-yr O.K. 100-yr O.K.





CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:48:22

FILE DATE: 10-09-1996  
FILE NAME: FH01-#1

-----  
TAILWATER  
-----

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
BOTTOM WIDTH (FT) 176.50  
SIDE SLOPE H/V (X:1) 2.0  
CHANNEL SLOPE V/H (FT/FT) 0.017  
MANNING'S N (.01-0.1) 0.040  
CHANNEL INVERT ELEVATION (FT) 1548.60  
CULVERT NO.1 OUTLET INVERT ELEVATION 1548.60 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1548.60	0.000	0.00	0.00	0.00
401.30	1549.24	0.780	0.64	3.54	0.66
802.60	1549.57	0.833	0.97	4.65	1.01
1203.90	1549.83	0.866	1.23	5.45	1.28
1605.20	1550.07	0.889	1.47	6.11	1.52
2006.50	1550.27	0.907	1.67	6.66	1.74
2407.80	1550.47	0.922	1.87	7.15	1.94
2432.00	1550.48	0.923	1.88	7.18	1.95
3210.40	1550.82	0.946	2.22	8.00	2.31
3611.70	1550.98	0.956	2.38	8.37	2.48
4013.00	1551.13	0.965	2.53	8.72	2.64

-----  
ROADWAY OVERTOPPING DATA  
-----

ROADWAY SURFACE PAVED  
EMBANKMENT TOP WIDTH (FT) 54.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	70.00	1558.50
2	120.00	1557.50
3	170.00	1556.90
4	230.00	1556.50
5	290.00	1556.10
6	360.00	1555.80
7	420.00	1555.75
8	470.00	1555.60

-----

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Locati Fountain Hills, Arizona  
 Del Cambre Boulevard & Ashbrook Wash  
 ADMP- 01, Alternate 1

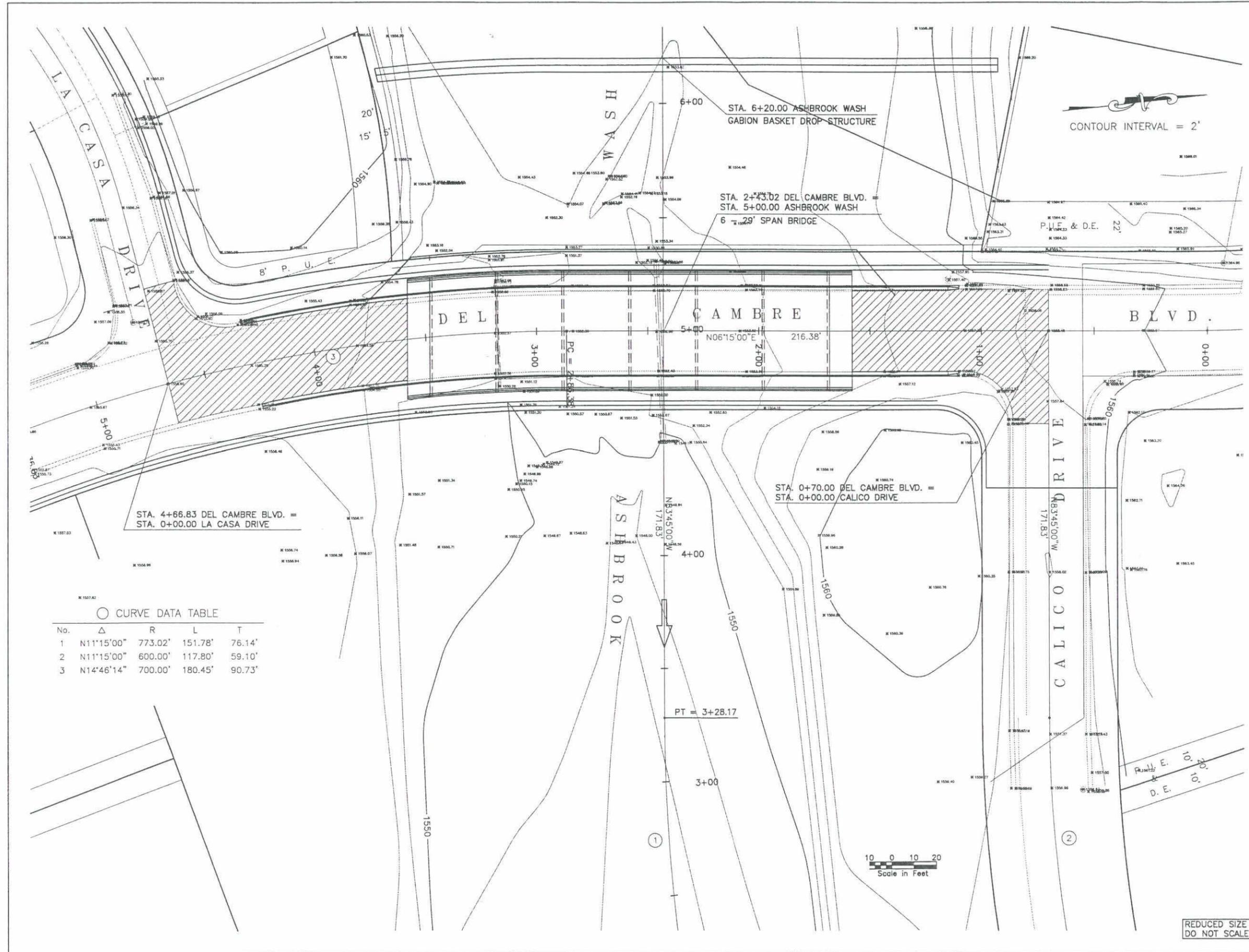
ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing	L.SUM	\$14,385.00	1	\$14,385
2020001	Removal of Structures and Obstructions	L.SUM	\$1,200.00	1	\$1,200
2020020	Removal of Concrete Curb	L.FT.	\$2.00	638	\$1,276
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1692	\$2,369
2020055	Remove and Salvage (12" C.M.P.)	L.FT.	\$14.00	46	\$644
2020057	Remove and Salvage (24" C.M.P.)	L.FT.	\$18.00	80	\$1,440
2020201	Saw Cutting	L.FT.	\$6.00	151	\$906
2030401	Drainage Excavation	CU.YD.	\$5.00	1917	\$9,585
2030501	Structural Excavation	CU.YD.	\$12.00	492	\$5,904
2030506	Structural Backfill	CU.YD.	\$35.00	371	\$12,985
2050001	Grading Roadway For Pavement	SQ.YD.	\$2.50	892	\$2,230
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
2080001	Separation Geotextile Fabric	SQ.YD.	\$4.50	1494	\$6,723
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	150	\$5,250
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	198	\$8,910
6010002	Structural Concrete (Class S) (F'C = 3,000)	CU.YD.	\$150.00	98	\$14,700
6010005	Structural Concrete (Class S) (F'C = 4,500)	CU.YD.	\$350.00	780	\$273,000
6011001	Bridge Approach Slab	SQ.YD.	\$150.00	81	\$12,150
6050002	Reinforcing Steel	LB.	\$0.55	53980	\$29,689
7010001	Maintenance and Protection of Traffic	L.SUM	\$19,180.00	1	\$19,180
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$2,877.00	1	\$2,877
7080011	Permanent Pavement Marking (Painted)(Yellow)	L.FT.	\$0.20	319	\$64
8081012	Water Main (12")	L.FT.	\$85.00	260	\$22,100
9010001	Mobilization (10%)	L.SUM	\$47,949.00	1	\$47,949
9080140	Concrete Gutter	L.FT.	\$10.00	237	\$2,370
9130005	Riprap (Gabions)	CU.YD.	\$150.00	187	\$28,050
9130051	Riprap (Dumped) (24" Dia., D50)	CU.YD.	\$45.00	841	\$37,845
9240170	Contractor Quality Control (2%)	L.SUM	\$9,590.00	1	\$9,590
9250001	Construction Surveying and Layout (2%)	L.SUM	\$9,590.00	1	\$9,590
Sub-Total					\$583,061
Engineering and Contingencies (25%)					\$145,770
<b>TOTAL</b>					<b>\$728,831</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$729,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.



○ CURVE DATA TABLE

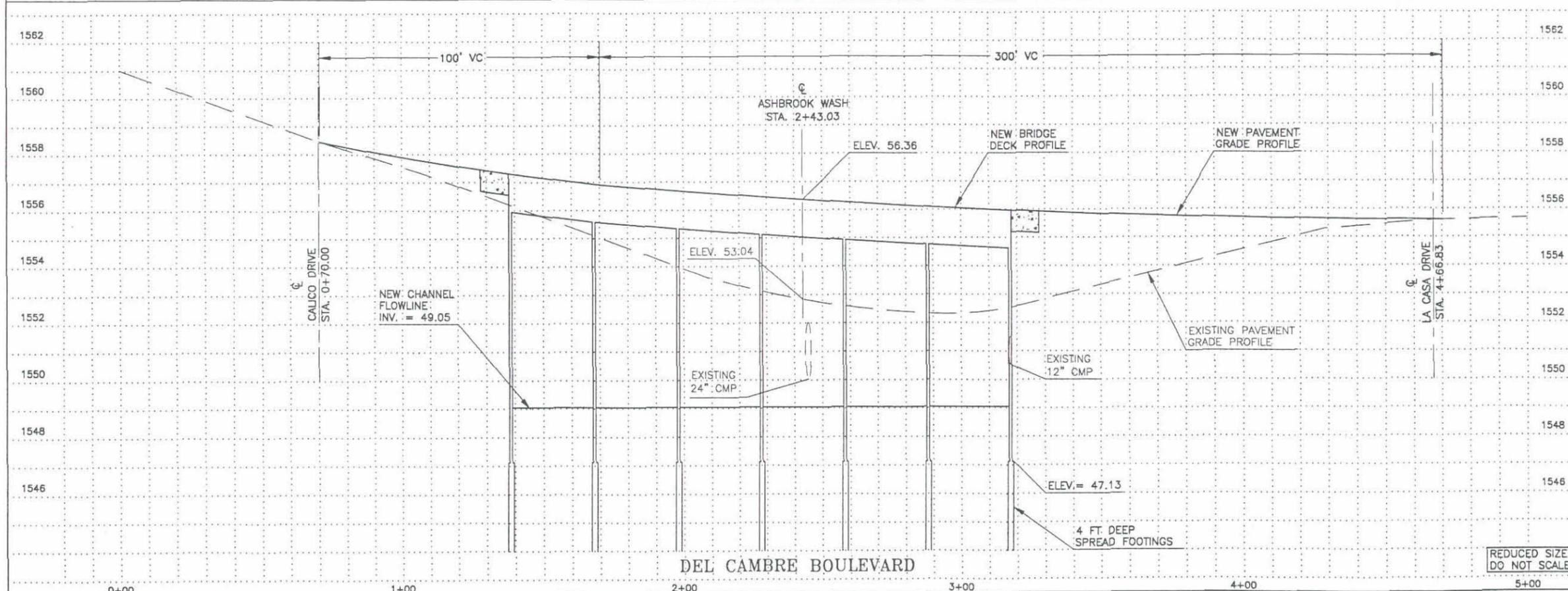
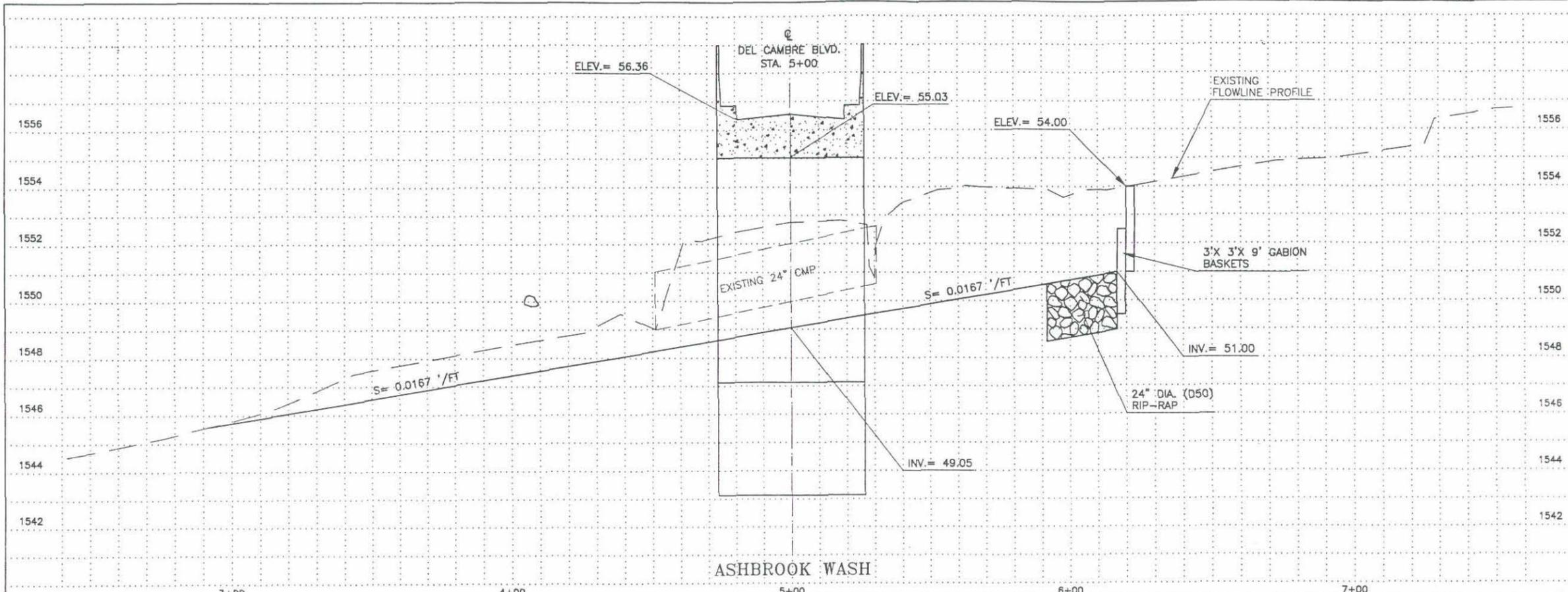
No.	Δ	R	L	T
1	N11°15'00"	773.02'	151.78'	76.14'
2	N11°15'00"	600.00'	117.80'	59.10'
3	N14°46'14"	700.00'	180.45'	90.73'

3			
2			
1			
NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION FOUNTAIN HILLS ADMP DEL CAMBRE BLVD. & ASHBROOK WASH PROJECT NO. 94-16			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE</b> McLAUGHLIN KMETTY ENGINEERS, LTD.		
PLAN SHEET ADMP 1 - ALTERNATE 1			SHEET OF 1 2

REDUCED SIZE  
DO NOT SCALE

### REQUIREMENTS

EXISTING CONDITION Q100= 3095 CFS (1995)  
 FUTURE CONDITION Q100= 4013 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 ASHBROOK WASH & DEL CAMBRE BLVD.  
 PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION

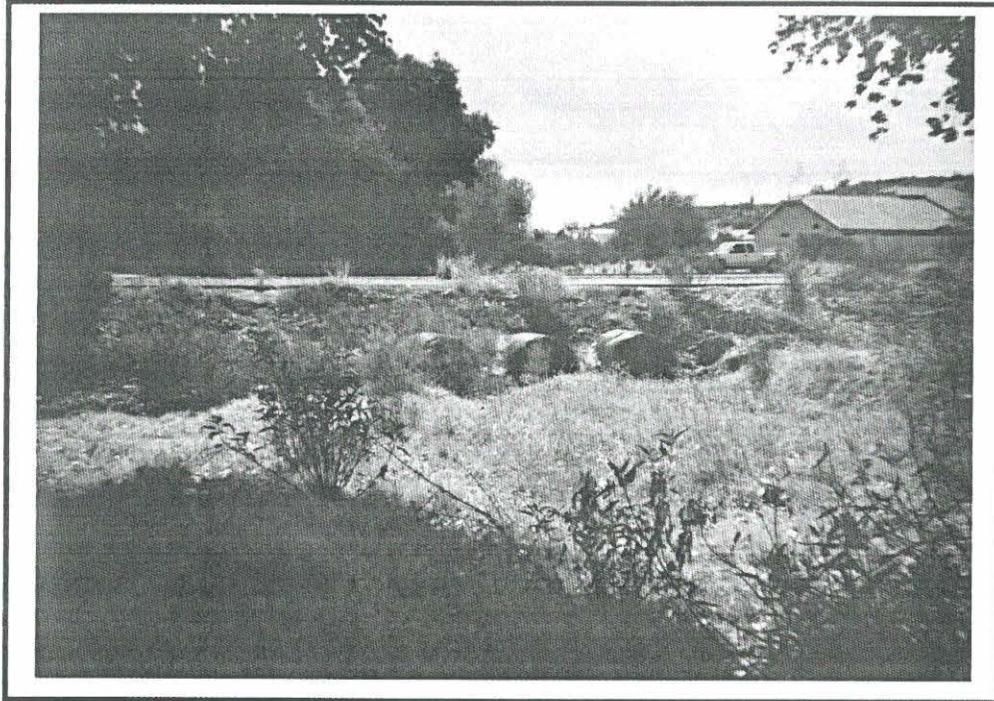
GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
 in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

PROFILE SHEET  
 ADMP 1 - ALTERNATE 1

SHEET OF 2 2

REDUCED SIZE  
 DO NOT SCALE

ADMP 2: Saguaro Boulevard / Ashbrook Wash



Ashbrook Wash Culvert Inlet  
*Looking Downstream Toward Saguaro Boulevard*



Ashbrook Wash Culvert Outlet  
*Looking Upstream Towards Saguaro Boulevard*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:

REC 6-20-96

CLJ 6-20-96

Initials: Date

### Field Reconnaissance Sheet

Site No.: ADMP2

Roadway: Saguaro Blvd.

Name of Drainageway	Q <sub>100, FS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Ashbrook Wash</u>	<u>2050</u>	<u>2700</u>	<u>3-60" CMPs</u>

Reason for Analysis / Existing Deficiency: 100 year floodplain extends outside channel limits. Existing culverts inadequate to convey high flow rates.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 2-3 ft. Downstream: 2-3 ft.
- 2) Can the culvert be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, 1 ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, (minor) ft.  No  
Downstream?  Yes, (minor) ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer line crosses wash along east side of road. Telephone, TV Cable, Electric and water utilities also cross wash. Pressure effluent line also present.
- 5) Structures: WWTP located nearby. Numerous sewer lines and man holes in the area. A number of trees immediately downstream of culvert

6) Right-of-Way: \_\_\_\_\_

#### 7) Miscellaneous field notes, comments, or design ideas:

Larger diameter pipes don't seem feasible without extensive reconstruction of the road and channel.  
Shallow CAC may be only/best option. Debris has been dumped in channel, partially covering one CMP. Can fit 2-3 more pipes (the same size as existing) within the channel fairly easy.

ALTERNATE 1

Ashbrook Wash & Saguaro Blvd. (6-10'x4'x110' CBCs)  
 CURRENT DATE: 10-09-1996  
 CURRENT TIME: 16:47:46

FILE DATE: 10-09-1996  
 FILE NAME: FH02-#1

-----  
 FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3  
 -----

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET					
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE	
1	1576.00	1575.00	110.00	6 RCB	10.00	4.00	.012	CONVENTIONAL	
2									
3									
4									
5									
6									

-----

SUMMARY OF CULVERT FLOWS (CFS)                      FILE: FH02-#1                      DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1576.00	0	0	0	0	0	0	0		1
1577.30	270	270	0	0	0	0	0		1
1578.07	539	539	0	0	0	0	0		1
1578.73	809	809	0	0	0	0	0		1
1579.32	1079	1079	0	0	0	0	0		1
1579.88	1349	1349	0	0	0	0	0		1
1580.46	1618	1618	0	0	0	0	0		1
<b>1580.72</b>	<b>1731</b>	<b>1731</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>		<b>1</b>
1581.80	2158	2158	0	0	0	0	0		1
1582.59	2427	2427	0	0	0	0	0		1
<b>1583.47</b>	<b>2697</b>	<b>2696</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>		<b>1 3</b>
1583.40	2674	2674	0	0	0	0	0	OVERTOPPING	

-----

SUMMARY OF ITERATIVE SOLUTION ERRORS                      FILE: FH02-#1                      DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1576.00	0.00	0	0	0.00
1577.30	0.00	270	0	0.00
1578.07	0.00	539	0	0.00
1578.73	0.00	809	0	0.00
1579.32	0.00	1079	0	0.00
1579.88	0.00	1349	0	0.00
1580.46	0.00	1618	0	0.00
1580.72	0.00	1731	0	0.00
1581.80	0.00	2158	0	0.00
1582.59	0.00	2427	0	0.00
1583.47	-0.00	2697	0	0.01

-----

<1> TOLERANCE (FT) = 0.010                      <2> TOLERANCE (%) = 1.000

-----

Conclusions: 10-yr O.K. 100-yr overtops.

CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:47:46

FILE DATE: 10-09-1996  
FILE NAME: FH02-#1

PERFORMANCE CURVE FOR CULVERT # 1 - 6 ( 10 BY 4 ) RCB

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	DEPTH (ft)	TAILWATER VEL. (fps)	DEPTH (ft)
0	1576.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-3.00
270	1577.30	1.30	1.30	1-S2n	0.57	0.86	7.59	0.59	2.76	-0.36
539	1578.07	2.07	2.07	1-S2n	0.90	1.36	9.52	0.94	3.32	0.76
809	1578.73	2.73	2.73	1-S2n	1.18	1.78	10.71	1.26	3.79	1.52
1079	1579.32	3.32	3.32	1-S2n	1.41	2.16	11.59	1.55	4.18	2.16
1349	1579.88	3.88	3.88	1-S2n	1.64	2.51	12.29	1.83	4.50	2.72
1618	1580.46	4.46	4.46	5-S2n	1.86	2.83	12.90	2.09	4.78	3.23
1731	1580.72	4.72	4.72	5-S2n	1.95	2.96	13.13	2.20	4.89	3.44
2158	1581.80	5.80	5.27	4-FFt	2.26	3.43	8.99	4.00	5.25	4.16
2427	1582.59	6.59	6.26	4-FFt	2.45	3.71	10.11	4.00	5.45	4.58
2696	1583.47	7.47	7.28	4-FFt	2.64	3.98	11.23	4.00	5.63	4.98
El. inlet face invert					1576.00 ft	El. outlet invert		1575.00 ft		
El. inlet throat invert					0.00 ft	El. inlet crest		0.00 ft		

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION (FT) 0.00  
 INLET ELEVATION (FT) 1576.00  
 OUTLET STATION (FT) 110.00  
 OUTLET ELEVATION (FT) 1575.00  
 NUMBER OF BARRELS 6  
 SLOPE (V-FT/H-FT) 0.0091  
 CULVERT LENGTH ALONG SLOPE (FT) 110.00

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*

BARREL SHAPE BOX  
 BARREL SPAN 10.00 FT  
 BARREL RISE 4.00 FT  
 BARREL MATERIAL CONCRETE  
 BARREL MANNING'S N 0.012  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL SQUARE EDGE (30-75 DEG. FLARE)  
 INLET DEPRESSION NONE

CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:47:46

FILE DATE: 10-09-1996  
FILE NAME: FH02-#1

3/3

-----  
TAILWATER  
-----

\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL ONLY  
LEFT CHANNEL BOUNDARY 0  
RIGHT CHANNEL BOUNDARY 0  
MANNING N LEFT OVER BANK 0.000  
MANNING N MAIN CHANNEL 0.125  
MANNING N RIGHT OVER BAN 0.000  
SLOPE OF CHANNEL (FT/FT) 0.0230

FILE NAME: FH02TWER  
FILE DATE: 07-19-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1583.04
2	2.00	1582.00
3	17.00	1576.00
4	30.00	1574.00
5	46.00	1572.00
6	56.00	1572.00
7	69.00	1572.00
8	76.00	1574.46
9	84.00	1576.00
10	95.00	1582.00
11	103.00	1584.00
12	110.00	1584.25

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1572.00	0.000	-3.00	0.00	0.00
269.70	1574.64	0.351	-0.36	2.76	2.72
539.40	1575.76	0.368	0.76	3.32	3.59
809.10	1576.52	0.379	1.52	3.79	4.37
1078.80	1577.16	0.388	2.16	4.18	5.07
1348.50	1577.72	0.395	2.72	4.50	5.66
1618.20	1578.23	0.401	3.23	4.78	6.20
1731.00	1578.44	0.403	3.44	4.89	6.41
2157.60	1579.16	0.409	4.16	5.25	7.12
2427.30	1579.58	0.413	4.58	5.45	7.54
2697.00	1579.98	0.416	4.98	5.63	7.92

-----  
ROADWAY OVERTOPPING DATA  
-----

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 130.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	350.00	1584.00
2	435.00	1583.40
3	500.00	1583.57
4	630.00	1583.90
5	690.00	1585.00

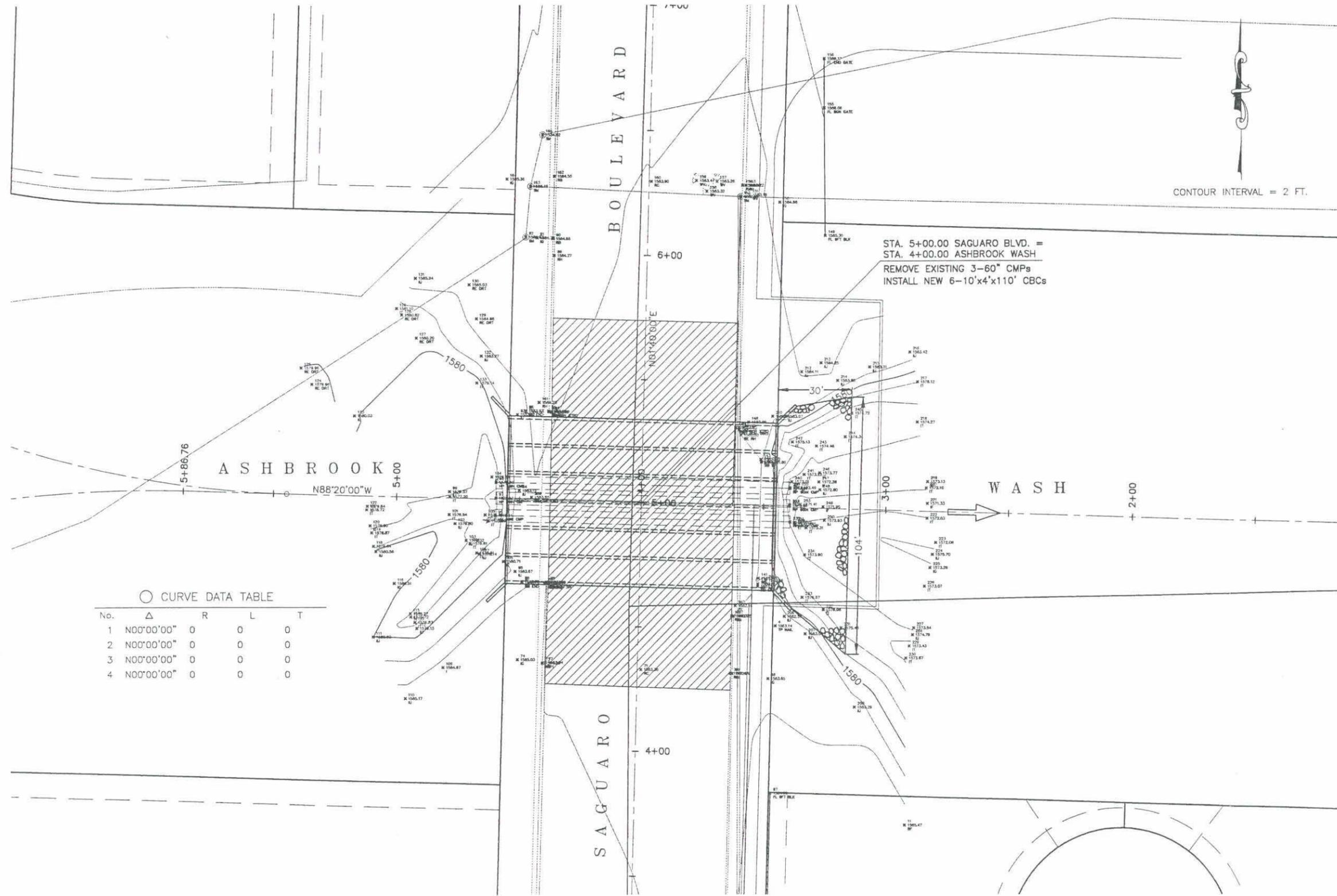
**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Ashbrook Wash  
 ADMP- 02, Alternate 1: Remove Existing 3-60" CMP, Install 6-10'x4'x110' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$2,557.00	1	\$2,557
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	3	\$2,400
2020020	Removal of Concrete Curb	LFT.	\$2.00	205	\$410
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1247	\$1,746
2020201	Saw Cutting	L.FT.	\$5.00	152	\$760
2030401	Drainage Excavation	CU.YD.	\$5.00	509	\$2,545
2030501	Structural Excavation	CU.YD.	\$8.00	3430	\$27,440
2030506	Structural Backfill	CU.YD.	\$25.00	346	\$8,650
2030902	Borrow (Roadway Fill)	CU.YD.	\$7.50	1280	\$9,600
2050001	Grading For Pavement	SQ.YD.	\$2.50	1247	\$3,118
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	208	\$7,280
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	274	\$12,330
6010002	Structural Concrete (Class S) (f'c = 3,000 psi)	CU. YD.	\$150.00	679	\$101,850
6050002	Reinforcing Steel	LB.	\$0.50	96106	\$48,053
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$10,229.00	1	\$10,229
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,534.00	1	\$1,534
8081008	Water Main (8")	L.FT.	\$65.00	148	\$9,620
808293	Pipe (PVC) (12")	L.FT.	\$35.00	148	\$5,180
9010001	Mobilization (10%)	L.SUM	\$25,571.00	1	\$25,571
9080140	Concrete Gutter	L.FT.	\$10.00	196	\$1,960
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	198	\$12,672
9240170	Contractor Quality Control (2%)	L.SUM	\$5,114.00	1	\$5,114
9250001	Construction Surveying and Layout (2%)	L.SUM	\$5,114.00	1	\$5,114
Sub-Total					\$305,832
Engineering and Contingencies (15%)					\$45,870
<b>TOTAL</b>					<b>\$351,702</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE \$352,000**

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N00°00'00"	0	0	0
2	N00°00'00"	0	0	0
3	N00°00'00"	0	0	0
4	N00°00'00"	0	0	0

REMOVALS

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

NEW CONSTRUCTION

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXX
- 7 XXXX  
XXXXX
- 8 XXXX
- 9 XXXX  
XXXX

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
SAGUARO BLVD. & ASHBROOK WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION  
GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

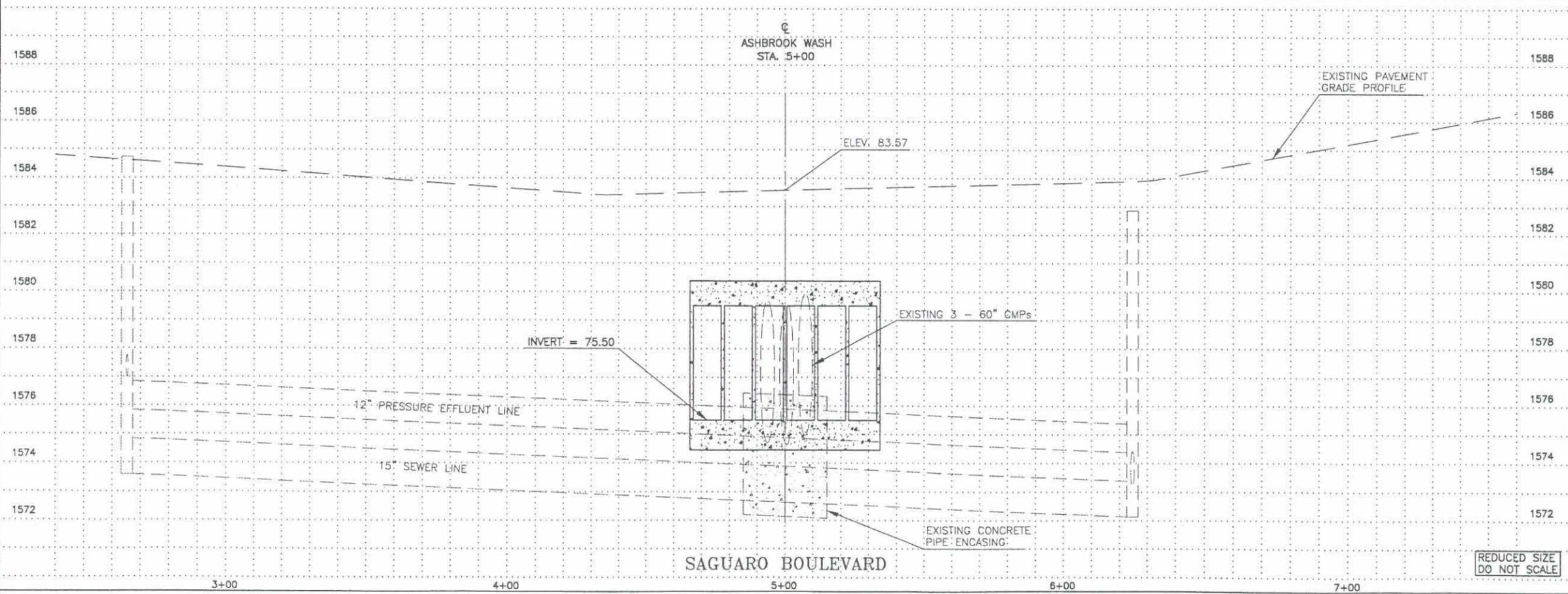
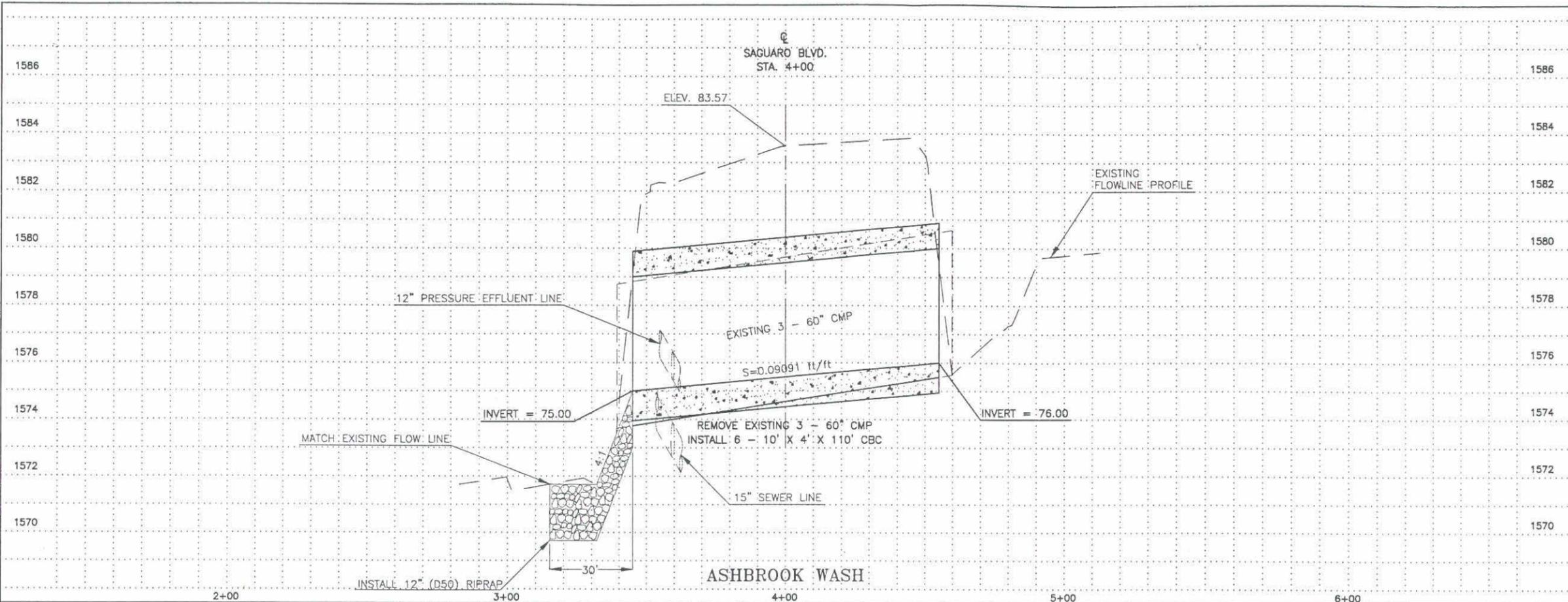
PLAN SHEET ADMP 2 - ALTERNATE 1 SHEET OF 1 2

REDUCED SIZE  
DO NOT SCALE

CALL TWO WORKING DAYS BEFORE YOU DIG  
 1-802-263-1100  
 1-800-STAKE-IT  
 (OUTSIDE MARICOPA COUNTY)

**REQUIREMENTS**

EXISTING CONDITION Q100= 2053 CFS (1995)  
 FUTURE CONDITION Q100= 2697 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP SAGUARO BLVD. & ASHBROOK WASH PROJECT NO. 94-16

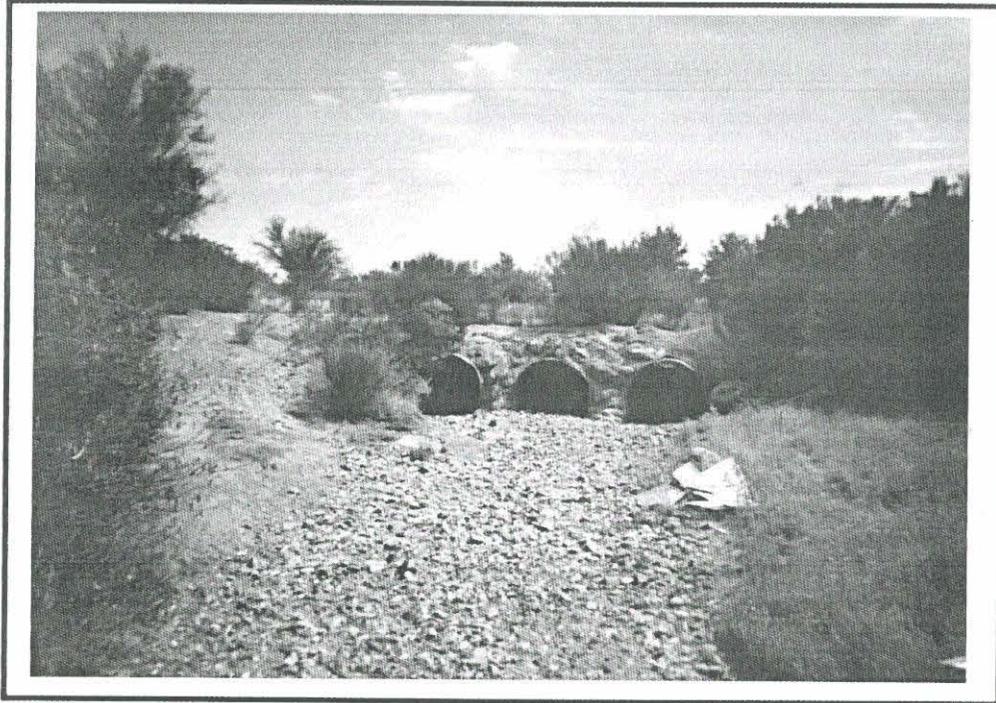
	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION  
 GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

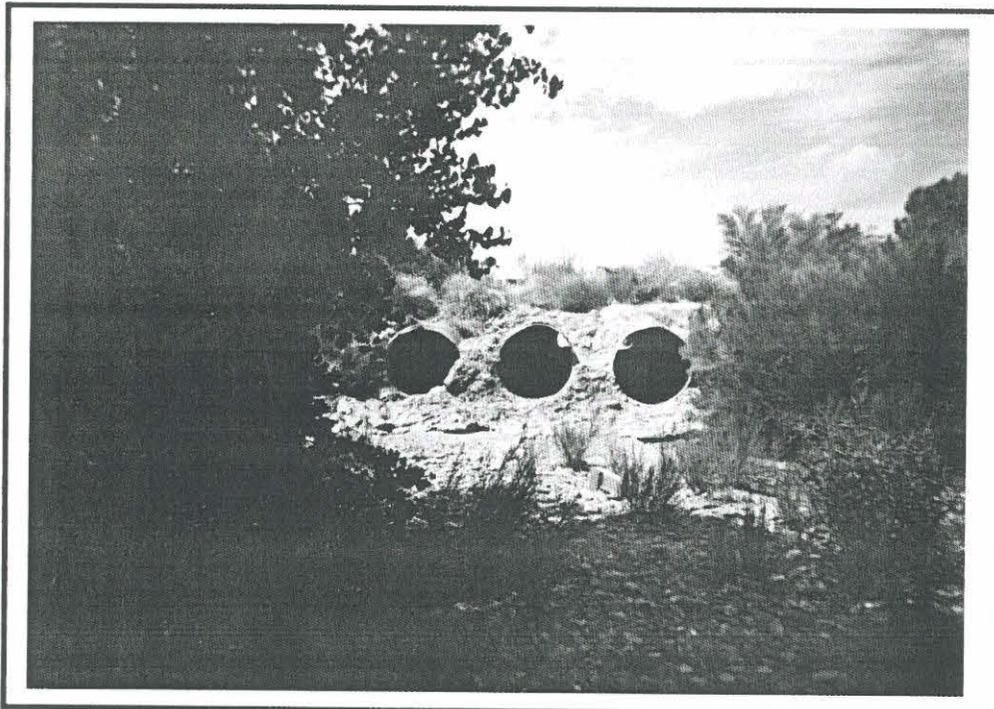
PROFILE SHEET ADMP 2 - ALTERNATE 1 SHEET OF 2 2

REDUCED SIZE DO NOT SCALE

ADMP 3: Bayfield Drive / Ashbrook Wash



Ashbrook Wash Culvert Inlet  
*Looking Downstream Towards Bayfield Drive*



Ashbrook Wash Culvert Outlet  
*Looking Upstream Towards Bayfield Drive*



Job No.: 92-404.004  
 Job Name: Fountain Hills

Reconnaissance by:  
 REC 6-20-96  
 CES 6-20-96  
 Inits. Date

### Field Reconnaissance Sheet

Site No.: ADMP 3

Roadway: Bayfield Drive

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Ashbrook Wash	1380	1880	3-60" CMP

Reason for Analysis / Existing Deficiency: Inadequate culvert capacity. Unable to contain 100 year runoff within the drainageway. Overtopping flow leaves channel & continues down street.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 1 ft. Downstream: 1 ft.
- 2) Can the culvert be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, 1 ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, (minor) ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer line runs down wash. Water line appears to be only utility crossing wash on Bayfield Dr.
- 5) Structures: \_\_\_\_\_  
\_\_\_\_\_
- 6) Right-of-Way: \_\_\_\_\_  
\_\_\_\_\_

- 7) Miscellaneous field notes, comments, or design ideas:  
Could possibly raise road 1 1/2 - 2'. Existing pipes do not have enough slope for adequate cleaning velocity. Room for 2 more CMPs (same size as existing) easy. Best option is to possibly raise road and install a CIBC.

ALTERNATE 1

shbrook Wash & Bayfield Dr. This Alt. 1 assumes Alt. 1 @ AOMP 2  
 1 will be constructed.

1/4

CURRENT DATE: 02-28-1997  
 CURRENT TIME: 12:13:46

FILE DATE: 10-09-1996  
 FILE NAME: FH03-#1

.....  
 :  
 : FHWA CULVERT ANALYSIS :  
 :  
 : HY-8, VERSION 4.3 :  
 :  
 :  
 :

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
U	-----							
L	INLET	OUTLET	CULVERT	BARRELS				
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE
	-----							
1	1585.50	1584.50	84.01	6 RCB	8.00	4.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

.....  
 :

SUMMARY OF CULVERT FLOWS (CFS)                      FILE: FH03-#1                      DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1588.68	0	0	0	0	0	0	0	0	1
1588.70	188	188	0	0	0	0	0	0	1
1588.78	375	375	0	0	0	0	0	0	1
1588.90	563	563	0	0	0	0	0	0	1
1589.07	751	751	0	0	0	0	0	0	1

Conclusion : Not overtopped by 10-year or 100-year

2/4

1589.29	939	939	0	0	0	0	0	0	0	1
1589.56	1126	1126	0	0	0	0	0	0	0	1
1589.72	1048 1208	1208	0	0	0	0	0	0	0	1
1590.56	1502	1502	0	0	0	0	0	0	0	1
1591.16	1689	1689	0	0	0	0	0	0	0	1
1591.83	10048 1877	1877	0	0	0	0	0	0	0	1
1592.21	1974	1974	0	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH03-#1 DATE: 10-09-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1588.68	0.00	0	0	0.00
1588.70	0.00	188	0	0.00
1588.78	0.00	375	0	0.00
1588.90	0.00	563	0	0.00
1589.07	0.00	751	0	0.00
1589.29	0.00	939	0	0.00
1589.56	0.00	1126	0	0.00
1589.72	0.00	1208	0	0.00
1590.56	0.00	1502	0	0.00
1591.16	0.00	1689	0	0.00
1591.83	0.00	1877	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

2

CURRENT DATE: 02-28-1997 FILE DATE: 10-09-1996  
 CURRENT TIME: 12:13:46 FILE NAME: FH03-#1

PERFORMANCE CURVE FOR CULVERT # 1 - 6 ( 8 BY 4 ) RCB

DIS-CHARGE FLOW (cfs)	HEAD- ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1588.68	0.00	3.18	0-NF	0.00	0.00	0.00	0.00	0.00	4.18
188	1588.70	1.19	3.20	1-S1f	0.48	0.78	0.98	4.00	0.00	4.18
375	1588.78	1.88	3.28	1-S1f	0.77	1.24	1.96	4.00	0.00	4.18



CONSTANT WATER SURFACE ELEVATION \*  
1588.68

.....  
:  
..... ROADWAY OVERTOPPING DATA .....  
:  
.....  
:

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 60.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION	X	Y
COORD. NO.	(FT)	(FT)
1	0.00	1594.00
2	21.00	1592.93
3	74.00	1592.21
4	131.00	1594.00

.....  
:  
.....

\* Tailwater based on flow depth at culvert outlet cross section (Cross Section 2.529, File ADMP2T03.012 - which is based on Alternate 1 at ADMP2 being constructed.) added to outlet invert elevation as shown below:

$$\text{Invert} + \text{water depth} = \text{Tailwater}$$

$$1584.50 + 4.18 = 1588.68$$

```

*****
* HEC-2 WATER SURFACE PROFILES *
* *
* Version 4.6.2; May 1991 *
* *
* RUN DATE 27SEP96 TIME 12:29:14 *
*****

```

```

*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET, SUITE D *
* DAVIS, CALIFORNIA 95616-4687 *
* (916) 756-1104 *
*****

```

Note: This run determines the tailwater @ ADMP 3, based on A1+1 @ ADMP 2 being constructed.

```

X X XXXXXXX XXXXX XXXXX
X X X X X X X
X X X X X X
XXXXXXXX XXXX X XXXXX XXXXX
X X X X X X
X X X X X X
X X XXXXXXX XXXXX XXXXXXX

```

1 27SEP96 12:29:14

PAGE 1

THIS RUN EXECUTED 27SEP96 12:29:14

```

*****
HEC-2 WATER SURFACE PROFILES
Version 4.6.2; May 1991
*****

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T1 * Fountain Hills North FIS File: ADMP2T03.IH2
T2 * For: FCDMC #92-04 By: GVSCE #35 DTP & FB 03-17-94
T3 * Ashbrook Wash 100 Year F.P., Future Conditions Revised: 09-27-96
T4 * GR data taken from stereo model; received 19 Oct 93 from KAM.
T4 * Extended section GR data received 19 Oct 93 from KAM.
T5 * 200 scale 2 ft CI mapping flown by Kenny Aerial Mapping on 8/29/91,
T6 * with survey control by Anderson Nelson 12-11-92.
T7 * Supplemental cross section data (GR & BT) surveyed by ALS as noted.
T8 * Source of 100-yr Flowrate from HEC-1 Analysis By GVSCE.
T8 * Files: EX100-6.OH1 and EX100-24.OH1
T8 * X5 Records are from Hydrology Report, Section 3.5, Table F8.
T9 * Special culvert routine used. Sub Critical Analysis.

```

J1	ICHECK	INQ	NINW	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0	0	0	0	1583.48	
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1	0	0	0	-1	0	0	0

from H7-8  
FH02-#1

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

150

HEC-1 Concentration Point C622

QT	2	2700	2700
NC	0.113	0.120	0.125
NH	3	0.113	9951.1
		0.1	0.125
		10036.5	0.120
			10339.6

100 Year, Future Conditions, HEC 2 Analysis from ADMP 2 to ADMP 3  
Alternative #1 Accepted at ADMP 2  
Fountain Hills ADMP

Input File = ADMP2T03.IH2

Page 1

HEC-1 Concentration Point C622: 24-Hr storm controls.  
 CULVERT 622: ASHBROOK WASH and SAGUARO BOULEVARD  
 Culvert 622 Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)  
 Culvert 622 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)  
 Photogrammetric x-sec. located 28' Downstream. (No Elev. Adjust.)  
 Base Channel Elevations were raised to Culvert Invert EL 1574.0

1

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PAGE 2

Culvert 622 Inlet. 3-60" CMP's (SECTION 3 OF SC ROUTINE)  
 Photogrammetric x-sec. located 10' Upstream. (No Elev. Adjust.)  
 Base Channel Elevations were lowered to Culvert Invert EL 1575.82  
 Culvert 622 BT information surveyed by ALS. West top of curb.  
 Culvert 622 BT information coded per figure 3.16 (HEC-2, Sept 90)  
 Right overbank is non effective flow area: Hard coded GR's  
 from STA 10194.7 to STA 10308.4 @ EL 1587.6

X1	2.428	32	9995	10012.2	121	121			
GR	1588.8	9684.3	1587.9	9704.9	1589.3	9720.8	1589.1	9739.1	1588.2
GR	1587.5	9815.4	1586.7	9842.7	1586.1	9885.4	1584.9	9927.0	1583.9
GR	1580.4	9951.1	1578.2	9974.5	1578.3	9994.3	1575.82	9995	1575.82
GR	1575.8	10004.3	1575.82	10012.2	1576.6	10024.8	1580.2	10036.5	1585.6
GR	1586.9	10103.1	1586.7	10121.0	1588.1	10138.5	1588.2	10179.4	1587.6
GR	1587.6	10209.6	1587.6	10223.3	1587.6	10240.6	1587.6	10254.4	1587.6
GR	1587.6	10308.4	1587.9	10339.6					10276.8

NH 3 .113 9987 .125 10037.3 .12 10256.5

Culvert 622 Upstream: expanded flow. (SECTION 4 OF SC ROUTINE)  
 LEGEND WASH Tributary

X1	2.448	21	9987	10037.3	105	110	104.6		
GR	1588.2	9881.6	1584.5	9896.3	1580.2	9905.4	1580.5	9927.7	1580.7
GR	1579.7	10000.0	1579.3	10023.3	1581.4	10037.3	1581.5	10070.4	1578.8
GR	1580.7	10084.0	1582.0	10090.7	1585.8	10099.6	1586.9	10122.3	1587.8
GR	1588.1	10191.4	1587.9	10205.6	1586.9	10215.9	1587.1	10233.5	1586.8
GR	1587.3	10256.5							10248.9

START Hydraulically Similar Reach AS3  
 See Exhibit 1, Manning's n Value Map.

LEGEND WASH Tributary  
 HEC-1 Concentration Point C622R

QT 2 1880 1880  
 NH 3 .1 9973.9 .045 10050.6 .1 10236

HEC-1 Concentration Point C622R: 24-hr storm controls.  
 START Hydraulically Similar Reach AS3  
 See Exhibit 1, Manning's n Value Map.

CULVERT M7 : ASHBROOK WASH and BAYFIELD DRIVE

X1	2.494	19	9973.9	10050.6	260	220	245.9		
GR	1593.7	9831.1	1593.1	9860.6	1592.1	9894.6	1591.5	9922.3	1587.6
GR	1583.1	9948.0	1583.0	9973.9	1582.7	9990.8	1582.4	10000.0	1581.7
GR	1581.2	10039.0	1584.0	10050.6	1589.6	10065.5	1589.7	10103.0	1590.1
GR	1590.5	10179.7	1591.0	10217.4	1589.8	10228.5	1589.0	10236.0	10140.4

1

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PAGE 3

NH 3 0.100 9975.4 0.045 10029.2 0.100 10246

Culvert M7 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)  
 Photogrammetric x-sec. located 12' Downstream. (No Elev. Adjust.)

100 Year, Future Conditions, HEC 2 Analysis from ADMP 2 to ADMP 3  
 Alternative #1 Accepted at ADMP 2  
 Fountain Hills ADMP

X1	2.529	23	9991	10009.7	195	170	180.7			
GR	1599.3	9738.5	1599.3	9742.0	1599.7	9753.7	1599.8	9774.5	1598.6	9855.8
GR	1596.9	9878.6	1595.1	9919.4	1593.9	9939.3	1585.5	9960.4	1585.4	9975.4
GR	1583.1	9982.0	1583.25	9991.00	1583.4	10000.0	1583.15	10009.70	1582.9	10019.4
GR	1584.9	10029.2	1591.0	10046.7	1592.2	10061.9	1591.8	10083.1	1591.0	10119.4
GR	1590.8	10162.4	1591.0	10209.0	1591.2	10246.0				

1  
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	VLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

\*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

0

CCHV= .100 CEHV= .300

1490 NH CARD USED

\*SECNO 2.428

HEC-1 Concentration Point C622: 24-Hr storm controls.

CULVERT 622: ASHBROOK WASH and SAGUARO BOULEVARD

Culvert 622 Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)

Culvert 622 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)

Photogrammetric x-sec. Located 28' Downstream. (No Elev. Adjust.)

Base Channel Elevations were raised to Culvert Invert EL 1574.0

Culvert 622 Inlet. 3-60" CMP's (SECTION 3 OF SC ROUTINE)

Photogrammetric x-sec. Located 10' Upstream. (No Elev. Adjust.)

Base Channel Elevations were lowered to Culvert Invert EL 1575.82

Culvert 622 BT information surveyed by ALS. West top of curb.

Culvert 622 BT information coded per figure 3.16 (HEC-2, Sept 90)

Right overbank is non effective flow area: Hard coded GR's

from STA 10194.7 to STA 10308.4 @ EL 1587.6

2.428	7.68	1583.48	1581.13	1583.48	1583.91	.43	.00	.00	1575.82
2700.0	967.7	836.9	895.3	220.8	131.9	175.4	.0	.0	1575.82
.00	4.38	6.35	5.10	.125	.125	.125	.000	1575.80	9941.42
.018849	121.	121.	121.	0	18	0	.00	109.96	10051.38

1490 NH CARD USED

\*SECNO 2.448

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.51

Culvert 622 Upstream: expanded flow. (SECTION 4 OF SC ROUTINE)

LEGEND WASH Tributary

2.448	6.26	1585.06	1582.41	.00	1585.21	.15	1.27	.03	1580.70
2700.0	1257.9	827.3	614.8	394.4	258.5	223.7	1.7	.4	1581.40
.01	3.19	3.20	2.75	.113	.125	.120	.000	1578.80	9894.09
.008218	105.	105.	110.	2	15	0	.00	203.77	10097.86

1490 NH CARD USED

\*SECNO 2.494

HEC-1 Concentration Point C622R: 24-hr storm controls.

1

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START Hydraulically Similar Reach AS3

100 Year, Future Conditions, HEC 2 Analysis from ADMP 2 to ADMP 3

Alternative #1 Accepted at ADMP 2

Fountain Hills ADMP

Input File = ADMP2TO3.IH2

Page 3

See Exhibit 1, Manning's n Value Map.  
 CULVERT M7 : ASHBROOK WASH and BAYFIELD DRIVE

Culvert M7 Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)									
2.494	5.14	1586.34	1584.77	.00	1586.74	.40	1.46	.07	1583.00
1880.0	196.5	1676.2	7.3	101.0	315.2	7.3	5.4	1.3	1584.00
.02	1.95	5.32	1.00	.100	.045	.100	.000	1581.20	9938.40
.003965	260.	246.	220.	3	11	0	.00	118.45	10056.85

1490 NH CARD USED  
 \*SECNO 2.529

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .53

Culvert M7 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)									
Photogrammetric x-sec. Located 12' Downstream. (No Elev. Adjust.)									
2.529	4.18	1587.08	1586.76	.00	1588.18	1.10	1.23	.21	1583.25
1880.0	545.8	670.9	663.3	81.6	70.8	77.5	6.8	1.7	1583.15
.03	6.69	9.47	8.56	.051	.045	.046	.000	1582.90	9956.42
.013937	195.	181.	170.	2	15	0	.00	79.06	10035.47

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*input to HY-8, see page 4/4 of file FH03-#1.*

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THIS RUN EXECUTED 27SEP96 12:29:15

\*\*\*\*\*  
 HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

\*\*\*\*\*

NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Ashbrook Wash 100 Year

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10*KS	VCH	AREA	.01K
2.428	.00	.00	.00	1575.80	2700.00	1583.48	1581.13	1583.91	188.49	6.35	528.09	196.66
* 2.448	104.60	.00	.00	1578.80	2700.00	1585.06	1582.41	1585.21	82.18	3.20	876.60	297.85
2.494	245.90	.00	.00	1581.20	1880.00	1586.34	1584.77	1586.74	39.65	5.32	423.51	298.56
* 2.529	180.70	.00	.00	1582.90	1880.00	1587.08	1586.76	1588.18	139.37	9.47	229.95	159.25

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Ashbrook Wash 100 Year

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
2.428	2700.00	1583.48	.00	.00	.00	109.96	.00

100 Year, Future Conditions, HEC 2 Analysis from ADMP 2 to ADMP 3  
 Alternative #1 Accepted at ADMP 2  
 Fountain Hills ADMP

Input File = ADMP2T03.IH2

*	2.448	2700.00	1585.06	.00	1.58	.00	203.77	104.60
	2.494	1880.00	1586.34	.00	1.28	.00	118.45	245.90
*	2.529	1880.00	1587.08	.00	.73	.00	79.06	180.70

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PAGE 8

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.448 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 2.529 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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*****
* HEC-2 WATER SURFACE PROFILES *
* * *
* Version 4.6.2; May 1991 *
* * *
* RUN DATE 11OCT96 TIME 14:28:31 *
*****

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*****
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET, SUITE D *
* DAVIS, CALIFORNIA 95616-4687 *
* (916) 756-1104 *
*****

```

Note: This run determines the tailwater @ ADMP 3, based on the No action alternative @ ADMP 2.

```

X X XXXXXXX XXXXX XXXXX
X X X X X X X
X X X X X X
XXXXXXXX XXXX X XXXXX XXXXX
X X X X X X
X X X X X X
X X XXXXXXX XXXXX XXXXXXX

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PAGE 1

THIS RUN EXECUTED 11OCT96 14:28:31

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*****
HEC-2 WATER SURFACE PROFILES
Version 4.6.2; May 1991
*****

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T1 * Fountain Hills North FIS File: admp2-3x.IH2
T2 * For: FCDMC #92-04 By: GVSCE #35 DTP & FB 03-17-94
T3 * Ashbrook Wash 100 Year F.P., Future Conditions Revised: 10-11-96
T4 * GR data taken from stereo model; received 19 Oct 93 from KAM.
T4 * Extended section GR data received 19 Oct 93 from KAM.
T5 * 200 scale 2 ft CI mapping flown by Kenny Aerial Mapping on 8/29/91,
T6 * with survey control by Anderson Nelson 12-11-92.
T7 * Supplemental cross section data (GR & BT) surveyed by ALS as noted.
T8 * Source of 100-yr Flowrate from HEC-1 Analysis By GVSCE.
T8 * Files: EX100-6.OH1 and EX100-24.OH1
T8 * X5 Records are from Hydrology Report, Section 3.5, Table F8.
T9 * Special culvert routine used. Sub Critical Analysis.
T9 *
T9 * HEC-2 based on existing culverts at ADMP 2. This run is used to
T9 * determine the effect of ADMP 2 on the tailwater elevation of ADMP 3.
T9 * HEC-2 file ADMP2TO2.IH2 is based upon improved conditions at ADMP 2.
T9 * Starting WSEL has been changed according to HY-8 file FH02EXST.INP.

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J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0	0	0	0	1585.53	
J2	NPROF	IPLT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	-1	0	0	0	-1	0	0	0

from HY-8  
FH02 EXST, (output following).

```

J3 VARIABLE CODES FOR SUMMARY PRINTOUT
150
HEC-1 Concentration Point C622
QT 2 2700 2700

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NC 0.113 0.120 0.125 0.1 0.3  
 NH 3 0.113 9951.1 0.125 10036.5 0.120 10339.6

HEC-1 Concentration Point C622: 24-Hr storm controls.  
 CULVERT 622: ASHBROOK WASH and SAGUARO BOULEVARD

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PAGE 2

Culvert 622 Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)  
 Culvert 622 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)  
 Photogrammetric x-sec. Located 28' Downstream. (No Elev. Adjust.)  
 Base Channel Elevations were raised to Culvert Invert EL 1574.0  
 Culvert 622 Inlet. 3-60" CMP's (SECTION 3 OF SC ROUTINE)  
 Photogrammetric x-sec. Located 10' Upstream. (No Elev. Adjust.)  
 Base Channel Elevations were Lowered to Culvert Invert EL 1575.82  
 Culvert 622 BT information surveyed by ALS. West top of curb.  
 Culvert 622 BT information coded per figure 3.16 (HEC-2, Sept 90)  
 Right overbank is non effective flow area: Hard coded GR's  
 from STA 10194.7 to STA 10308.4 @ EL 1587.6

X1	2.428	32	9995	10012.2	121	121	121			
GR	1588.8	9684.3	1587.9	9704.9	1589.3	9720.8	1589.1	9739.1	1588.2	9769.2
GR	1587.5	9815.4	1586.7	9842.7	1586.1	9885.4	1584.9	9927.0	1583.9	9940.1
GR	1580.4	9951.1	1578.2	9974.5	1578.3	9994.3	1575.82	9995	1575.82	10000
GR	1575.8	10004.3	1575.82	10012.2	1576.6	10024.8	1580.2	10036.5	1585.6	10061.0
GR	1586.9	10103.1	1586.7	10121.0	1588.1	10138.5	1588.2	10179.4	1587.6	10194.7
GR	1587.6	10209.6	1587.6	10223.3	1587.6	10240.6	1587.6	10254.4	1587.6	10276.8
GR	1587.6	10308.4	1587.9	10339.6						

NH 3 .113 9987 .125 10037.3 .12 10256.5

Culvert 622 Upstream: expanded flow. (SECTION 4 OF SC ROUTINE)  
 LEGEND WASH Tributary

X1	2.448	21	9987	10037.3	105	110	104.6			
GR	1588.2	9881.6	1584.5	9896.3	1580.2	9905.4	1580.5	9927.7	1580.7	9987.0
GR	1579.7	10000.0	1579.3	10023.3	1581.4	10037.3	1581.5	10070.4	1578.8	10079.3
GR	1580.7	10084.0	1582.0	10090.7	1585.8	10099.6	1586.9	10122.3	1587.8	10158.4
GR	1588.1	10191.4	1587.9	10205.6	1586.9	10215.9	1587.1	10233.5	1586.8	10248.9
GR	1587.3	10256.5								

START Hydraulically Similar Reach AS3  
 See Exhibit 1, Manning's n Value Map.

LEGEND WASH Tributary  
 HEC-1 Concentration Point C622R

QT 2 1880 1880

NH 3 .1 9973.9 .045 10050.6 .1 10236

HEC-1 Concentration Point C622R: 24-hr storm controls.  
 START Hydraulically Similar Reach AS3  
 See Exhibit 1, Manning's n Value Map.

CULVERT M7 : ASHBROOK WASH and BAYFIELD DRIVE

X1	2.494	19	9973.9	10050.6	260	220	245.9			
GR	1593.7	9831.1	1593.1	9860.6	1592.1	9894.6	1591.5	9922.3	1587.6	9934.7
GR	1583.1	9948.0	1583.0	9973.9	1582.7	9990.8	1582.4	10000.0	1581.7	10022.3
GR	1581.2	10039.0	1584.0	10050.6	1589.6	10065.5	1589.7	10103.0	1590.1	10140.4
GR	1590.5	10179.7	1591.0	10217.4	1589.8	10228.5	1589.0	10236.0		

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PAGE 3

NH 3 0.100 9975.4 0.045 10029.2 0.100 10246

Culvert M7 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)										
Photogrammetric x-sec. Located 12' Downstream. (No Elev. Adjust.)										
X1	2.529	23	9991	10009.7	195	170	180.7			
GR	1599.3	9738.5	1599.3	9742.0	1599.7	9753.7	1599.8	9774.5	1598.6	9855.8
GR	1596.9	9878.6	1595.1	9919.4	1593.9	9939.3	1585.5	9960.4	1585.4	9975.4
GR	1583.1	9982.0	1583.25	9991.00	1583.4	10000.0	1583.15	10009.70	1582.9	10019.4
GR	1584.9	10029.2	1591.0	10046.7	1592.2	10061.9	1591.8	10083.1	1591.0	10119.4
GR	1590.8	10162.4	1591.0	10209.0	1591.2	10246.0				

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

\*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

0

CCHV= .100 CEHV= .300  
1490 NH CARD USED  
\*SECNO 2.428

HEC-1 Concentration Point C622: 24-Hr storm controls.  
CULVERT 622: ASHBROOK WASH and SAGUARO BOULEVARD  
Culvert 622 Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)  
Culvert 622 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)  
Photogrammetric x-sec. Located 28' Downstream. (No Elev. Adjust.)  
Base Channel Elevations were raised to Culvert Invert EL 1574.0  
Culvert 622 Inlet. 3-60" CMP's (SECTION 3 OF SC ROUTINE)  
Photogrammetric x-sec. Located 10' Upstream. (No Elev. Adjust.)  
Base Channel Elevations were Lowered to Culvert Invert EL 1575.82  
Culvert 622 BT information surveyed by ALS. West top of curb.  
Culvert 622 BT information coded per figure 3.16 (HEC-2, Sept 90)  
Right overbank is non effective flow area: Hard coded GR's

2.428	9.73	1585.53	1581.15	1585.53	1585.72	.19	.00	.00	1575.82
2700.0	1089.4	717.9	892.6	354.7	167.1	265.3	.0	.0	1575.82
.00	3.07	4.30	3.36	.124	.125	.124	.000	1575.80	9905.16
.006296	121.	121.	121.	0	10	0	.00	155.52	10060.68

1490 NH CARD USED  
\*SECNO 2.448

Culvert 622 Upstream: expanded flow. (SECTION 4 OF SC ROUTINE)  
LEGEND WASH Tributary

2.448	7.36	1586.16	1582.38	.00	1586.25	.09	.52	.01	1580.70
2700.0	1265.1	789.8	645.1	499.4	314.0	293.2	2.3	.5	1581.40
.01	2.53	2.52	2.20	.113	.125	.120	.000	1578.80	9889.70
.003915	105.	105.	110.	2	22	0	.00	217.33	10107.03

1490 NH CARD USED  
\*SECNO 2.494

HEC-1 Concentration Point C622R: 24-hr storm controls.  
START Hydraulically Similar Reach AS3  
See Exhibit 1, Manning's n Value Map.  
CULVERT M7 : ASHBROOK WASH and BAYFIELD DRIVE

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Culvert M7 Downstream: expanded flow. (SECTION 1 OF SC ROUTINE)									
2.494	5.63	1586.83	1584.77	.00	1587.14	.31	.82	.07	1583.00
1880.0	206.5	1663.6	9.9	118.4	352.0	10.6	6.8	1.4	1584.00
.03	1.74	4.73	.93	.100	.045	.100	.000	1581.20	9936.98
.002703	260.	246.	220.	2	11	0	.00	121.14	10058.12

1490 NH CARD USED  
\*SECNO 2.529

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .48

Culvert M7 Outlet. 3-60" CMP's (SECTION 2 OF SC ROUTINE)									
Photogrammetric x-sec. located 12' Downstream. (No Elev. Adjust.)									
2.529	4.36	1587.26	1586.75	.00	1588.24	.98	.90	.20	1583.25
1880.0	551.7	666.2	662.1	87.8	74.1	82.1	8.3	1.8	1583.15
.03	6.28	8.99	8.07	.052	.045	.046	.000	1582.90	9955.97
.011803	195.	181.	170.	2	19	0	.00	80.01	10035.98

1  
11OCT96 14:28:31

PAGE 6

THIS RUN EXECUTED 11OCT96 14:28:32

\*\*\*\*\*  
HEC-2 WATER SURFACE PROFILES  
Version 4.6.2; May 1991  
\*\*\*\*\*

NOTE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Ashbrook Wash 100 Year

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
2.428	.00	.00	.00	1575.80	2700.00	1585.53	1581.15	1585.72	62.96	4.30	787.16	340.29
2.448	104.60	.00	.00	1578.80	2700.00	1586.16	1582.38	1586.25	39.15	2.52	1106.67	431.53
2.494	245.90	.00	.00	1581.20	1880.00	1586.83	1584.77	1587.14	27.03	4.73	480.98	361.60
* 2.529	180.70	.00	.00	1582.90	1880.00	1587.26	1586.75	1588.24	118.03	8.99	244.03	173.04

1  
11OCT96 14:28:31

PAGE 7

Ashbrook Wash 100 Year

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
2.428	2700.00	1585.53	.00	.00	.00	155.52	.00
2.448	2700.00	1586.16	.00	.63	.00	217.33	104.60
2.494	1880.00	1586.83	.00	.67	.00	121.14	245.90

\* 2.529 1880.00 1587.26 .00 .43 .00 80.01 180.70

11OCT96 14:28:31

PAGE 8

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 2.529 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CURRENT DATE: 10-11-1996  
 CURRENT TIME: 14:15:59

FILE DATE: 10-11-1996  
 FILE NAME: FH02EXST

-----  
 FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3  
 -----

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1576.30	1573.99	121.02	1 CSP	5.00	5.00	.024	CONVENTIONAL
2	1575.57	1573.68	121.01	1 CSP	5.00	5.00	.024	CONVENTIONAL
3	1575.61	1573.76	121.01	1 CSP	5.00	5.00	.024	CONVENTIONAL
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS)

FILE: FH02EXST

DATE: 10-11-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1576.30	0	0	0	0	0	0	0	0	0
1580.02	270	79	96	94	0	0	0	0	5
1583.34	539	175	182	181	0	0	0	0	12
1584.11	809	190	196	196	0	0	0	224	4
1584.39	1079	196	202	201	0	0	0	477	4
1584.62	1349	200	206	205	0	0	0	726	3
1584.83	1618	204	210	209	0	0	0	986	3
1584.91 <i>10 YR</i>	1731	206	211	210	0	0	0	1099	3
1585.20	2158	211	205	205	0	0	0	1528	3
1585.37	2427	208	201	201	0	0	0	1811	3
1585.53 <i>100 YR</i>	2697	208	197	197	0	0	0	2091	3
1583.40	540	176	183	182	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: FH02EXST

DATE: 10-11-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1576.30	0.00	0	0	0.00
1580.02	-0.00	270	0	0.11
1583.34	-0.01	539	3	0.49
1584.11	-0.00	809	3	0.35
1584.39	-0.00	1079	3	0.27
1584.62	-0.01	1349	11	0.81

Path: C:\P\92404004\HY8

File: FH02EXST.LST 16.199 .a.. 10-11-96 2:15:58 pm

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Page 2

1584.83	-0.01	1618	10	0.60
1584.91	-0.00	1731	5	0.30
1585.20	-0.00	2158	8	0.37
1585.37	-0.00	2427	7	0.27
1585.53	-0.00	2697	5	0.19

---

<1> TOLERANCE (FT) = 0.010

<2> TOLERANCE (%) = 1.000

---

CURRENT DATE: 10-11-1996  
CURRENT TIME: 14:15:59

FILE DATE: 10-11-1996  
FILE NAME: FH02EXST

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 5 BY 5 ) CSP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1576.30	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-1.99
79	1580.03	3.73	3.73	1-S2n	2.21	2.52	9.45	2.21	2.66	1.09
175	1583.33	7.03	7.03	5-S2n	3.70	3.77	11.23	3.70	3.26	2.12
190	1584.10	7.80	7.35	2-M2c	3.99	3.94	11.48	3.94	3.76	2.84
196	1584.39	8.09	7.51	2-M2c	4.15	4.00	11.64	4.00	4.15	3.47
200	1584.62	8.32	7.63	2-M2c	4.27	4.03	11.80	4.03	4.47	4.02
204	1584.83	8.53	7.70	3-M1t	4.39	4.06	10.92	4.53	4.75	4.53
206	1584.91	8.61	7.80	3-M1t	4.43	4.07	10.78	4.73	4.86	4.73
211	1585.20	8.90	8.87	4-FFt	5.00	4.11	10.74	5.00	5.22	5.44
208	1585.43	8.74	9.13	4-FFt	4.75	4.09	10.60	5.00	5.42	5.86
208	1585.83	8.74	9.53	4-FFt	4.75	4.09	10.60	5.00	5.60	6.25
El. inlet face invert					1576.30 ft	El. outlet invert		1573.99 ft		
El. inlet throat invert					0.00 ft	El. inlet crest		0.00 ft		

\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION (FT) 0.00  
 INLET ELEVATION (FT) 1576.30  
 OUTLET STATION (FT) 121.00  
 OUTLET ELEVATION (FT) 1573.99  
 NUMBER OF BARRELS 1  
 SLOPE (V-FT/H-FT) 0.0191  
 CULVERT LENGTH ALONG SLOPE (FT) 121.02

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*

BARREL SHAPE CIRCULAR  
 BARREL DIAMETER 5.00 FT  
 BARREL MATERIAL CORRUGATED STEEL  
 BARREL MANNING'S N 0.024  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL MITERED TO CONFORM TO SLOPE  
 INLET DEPRESSION NONE





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CURRENT DATE: 10-11-1996  
CURRENT TIME: 14:15:59

FILE DATE: 10-11-1996  
FILE NAME: FH02EXST

-----  
TAILWATER  
-----

\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION

FILE NAME: FH02TWE  
FILE DATE: 07-18-1996

MAIN CHANNEL ONLY  
LEFT CHANNEL BOUNDARY 0  
RIGHT CHANNEL BOUNDARY 0  
MANNING N LEFT OVER BANK 0.000  
MANNING N MAIN CHANNEL 0.125  
MANNING N RIGHT OVER BAN 0.000  
SLOPE OF CHANNEL (FT/FT) 0.0230

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1583.04
2	2.00	1582.00
3	17.00	1576.00
4	30.00	1574.00
5	46.00	1572.00
6	56.00	1572.00
7	69.00	1574.00
8	76.00	1574.46
9	84.00	1576.00
10	95.00	1582.00
11	103.00	1584.00
12	110.00	1584.25

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1572.00	0.000	-1.99	0.00	0.00
269.70	1575.08	0.349	1.09	2.66	2.58
539.40	1576.11	0.367	2.12	3.26	3.49
809.10	1576.83	0.379	2.84	3.76	4.32
1078.80	1577.46	0.388	3.47	4.15	5.02
1348.50	1578.01	0.395	4.02	4.47	5.61
1618.20	1578.52	0.400	4.53	4.75	6.14
1731.00	1578.72	0.402	4.73	4.86	6.35
2157.60	1579.43	0.409	5.44	5.22	7.07
2427.30	1579.85	0.413	5.86	5.42	7.48
2697.00	1580.24	0.416	6.25	5.60	7.87

-----  
ROADWAY OVERTOPPING DATA  
-----

WEIR COEFFICIENT

2.67

Path: C:\P\92404004\HY8

File: FH02EXST.LST 16.199 .a.. 10-11-96 2:15:58 pm

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EMBANKMENT TOP WIDTH (FT) 130.00

\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	350.00	1584.00
2	435.00	1583.40
3	500.00	1583.57
4	630.00	1583.90
5	690.00	1585.00

---

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16

Project Nam FOUNTAIN HILLS ADMP

Project Locat Fountain Hills, Arizona

Saguaro Boulevard & Ashbrook Wash

ADMP- 03, Alternate 1: Remove Existing 3-60" CMP, Install 6-8'x4'x84' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,348.00	1	\$1,348
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	3	\$2,400
2020020	Removal of Concrete Curb	LFT.	\$2.00	270	\$540
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	478	\$669
2020201	Saw Cutting	L.FT.	\$5.00	64	\$320
2030401	Drainage Excavation	CU.YD.	\$5.00	723	\$3,615
2030501	Structural Excavation	CU.YD.	\$8.00	1552	\$12,416
2030506	Structural Backfill	CU.YD.	\$25.00	75	\$1,875
2030902	Borrow (Roadway Fill)	CU.YD.	\$7.50	465	\$3,488
2050001	Grading For Pavement	SQ.YD.	\$2.50	478	\$1,195
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	80	\$2,800
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	54	\$2,430
6010002	Structural Concrete (Class S) (f'c = 3,000 psi)	CU. YD.	\$150.00	392	\$58,800
6050002	Reinforcing Steel	LB.	\$0.50	61758	\$30,879
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$5,391.00	1	\$5,391
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$809.00	1	\$809
9010001	Mobilization (10%)	L.SUM	\$12,423.00	1	\$12,423
9080140	Concrete Gutter	L.FT.	\$10.00	270	\$2,700
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	165	\$10,560
9240170	Contractor Quality Control (2%)	L.SUM	\$2,696.00	1	\$2,696
9250001	Construction Surveying and Layout (2%)	L.SUM	\$2,696.00	1	\$2,696
Sub-Total					\$160,150
Engineering and Contingencies (15%)					\$24,020
<b>TOTAL</b>					<b>\$184,170</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$185,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX  
XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX

STA. 3+00.00 BAYFIELD DRIVE =  
STA. 54+00.00 ASHBROOK WASH  
REMOVE EXISTING 3 - 60" x 84" CMPs  
INSTALL 6 - 8" x 4' x 84" CBCs

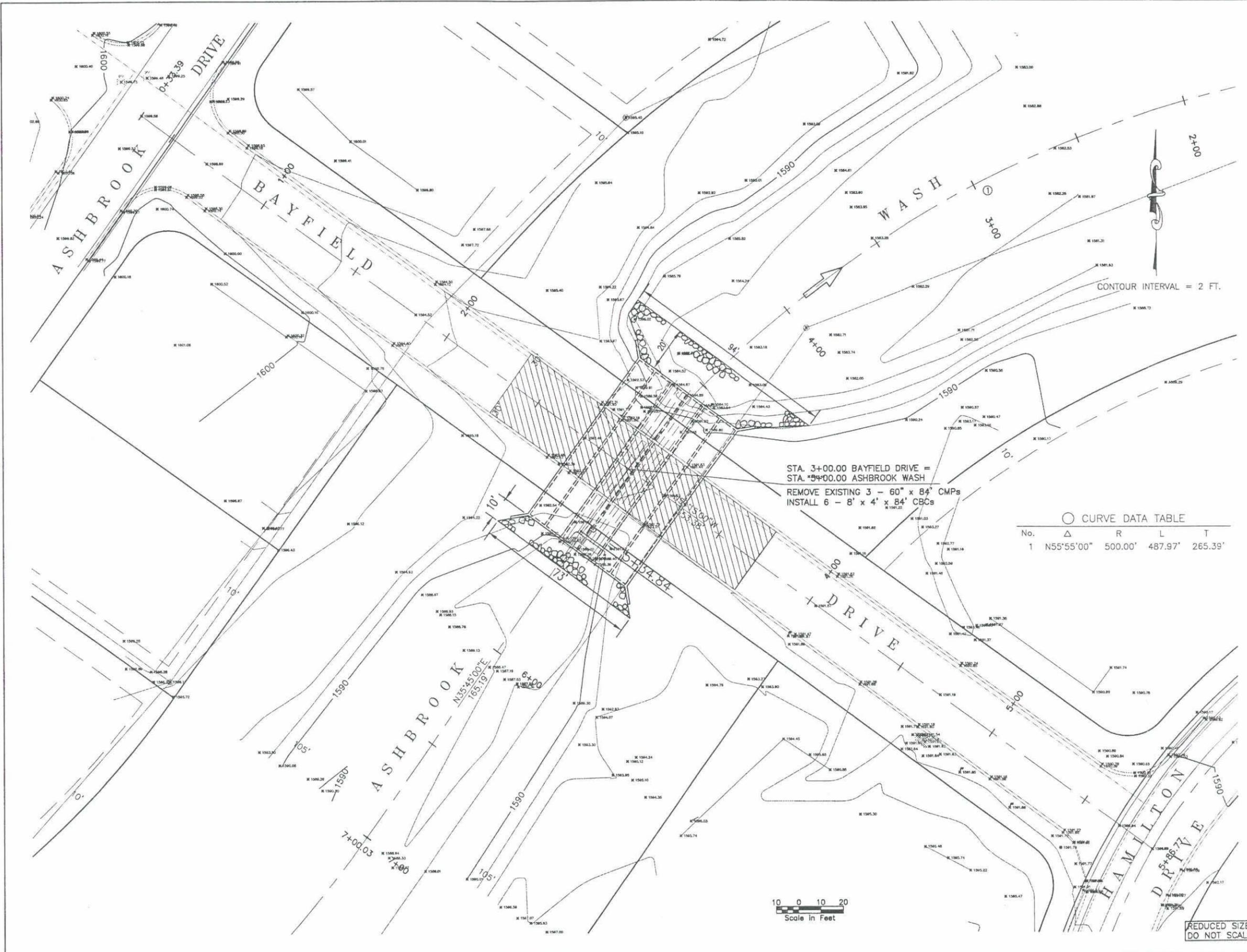
○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N55°55'00"	500.00'	487.97'	265.39'

10 0 10 20  
Scale in Feet

REDUCED SIZE  
DO NOT SCALE

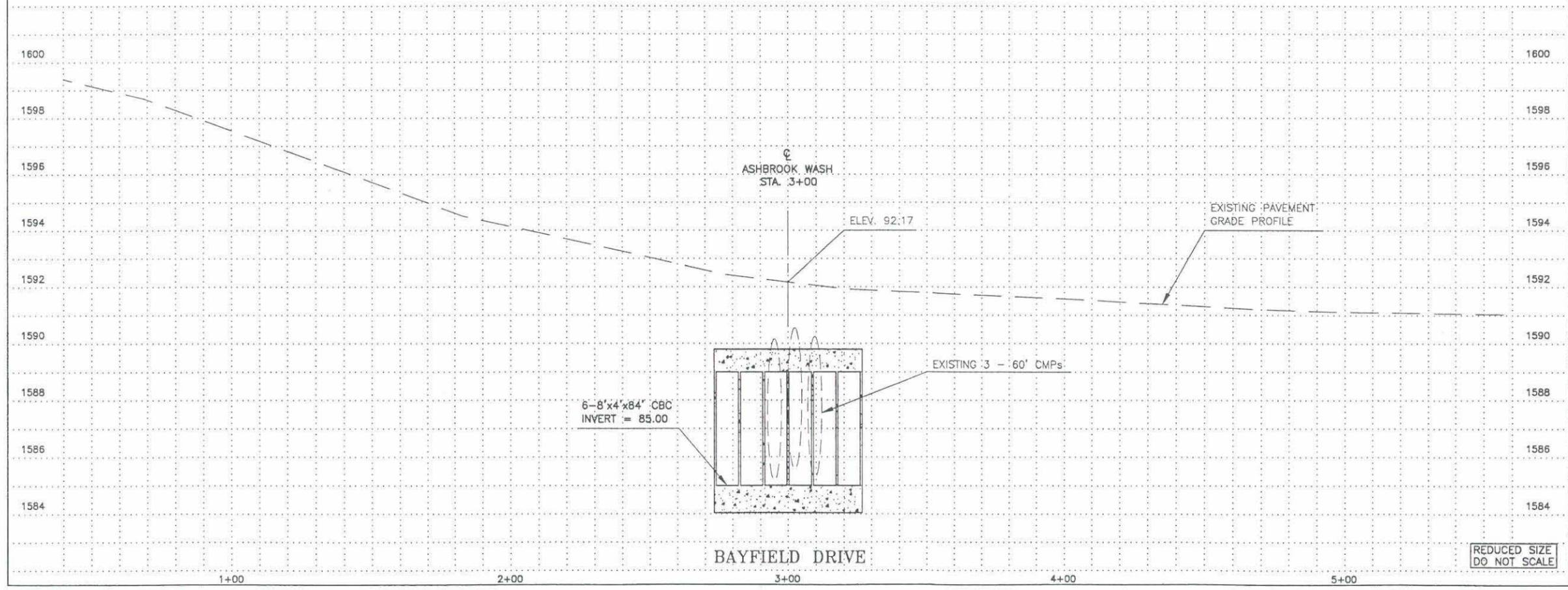
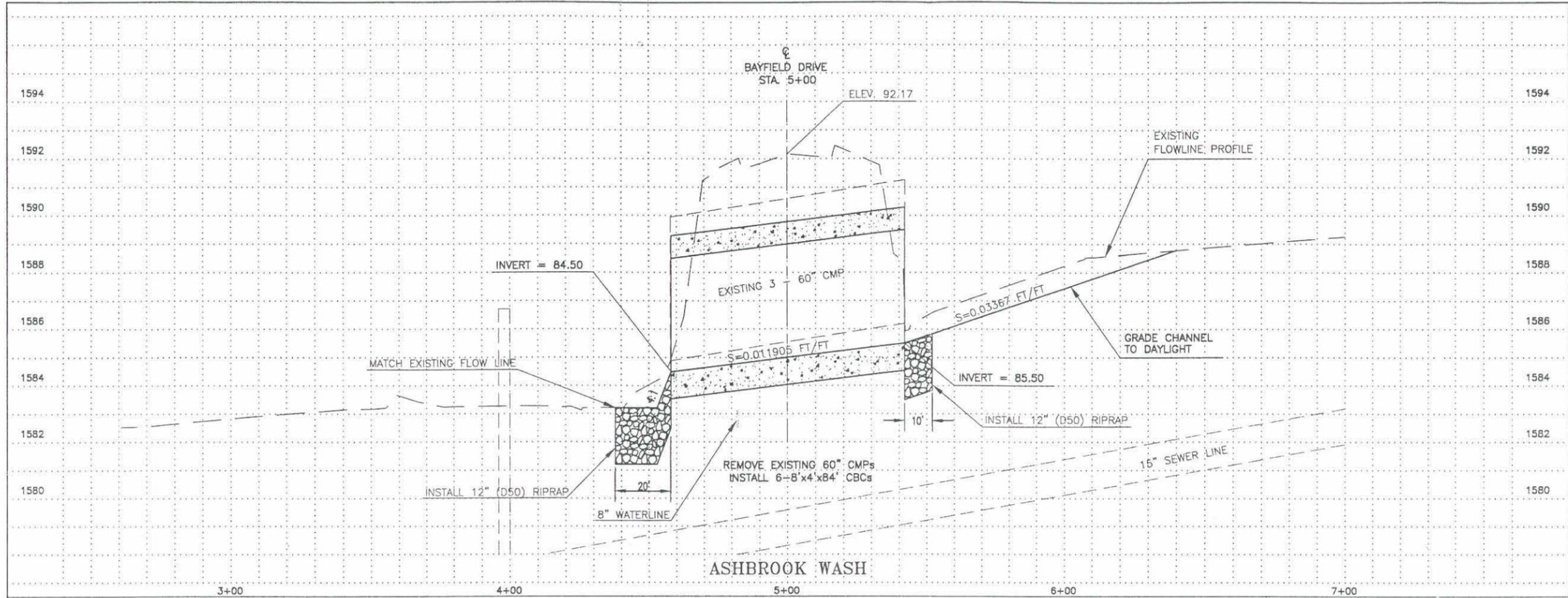
3				
2				
1				
NO.	REVISION	BY	DATE	
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b>				
<b>FOUNTAIN HILLS ADMP BAYFIELD DRIVE &amp; ASHBROOK WASH PROJECT NO. 94-16</b>				
		BY	DATE	
	DESIGNED	R. CONSONI	6/3/96	
	DRAWN	C. JOY	6/3/96	
	CHECKED	F. BROWN	6/3/96	
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETZ ENGINEERS, LTD.</b>			
PLAN SHEET ADMP 3 - ALTERNATE 1				SHEET OF 1 2



CALL THE WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 1384 CFS (1995)  
FUTURE CONDITION Q100= 1877 CFS (BUILD OUT)



3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b> <b>FOUNTAIN HILLS ADMP BAYFIELD DRIVE &amp; ASHBROOK WASH PROJECT NO. 94-16</b>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETTY ENGINEERS, LTD.</b>		
PROFILE SHEET ADMP 3 - ALTERNATE 1			SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

# ALTERNATE 2

1/4

shbrook Wash and Bayfield Dr.  
1

CURRENT DATE: 02-28-1997  
CURRENT TIME: 12:15:24

FILE DATE: 10-09-1996  
FILE NAME: FH03-#2

.....  
:  
..... FHWA CULVERT ANALYSIS .....  
:  
..... HY-8, VERSION 4.3 .....  
:  
.....

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET					
U	-----			-----					
L	INLET	OUTLET	CULVERT	BARRELS					
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET	
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE	
	-----			-----					
1	1584.50	1583.50	84.01	5 RCB	8.00	5.00	.012	CONVENTIONAL	
2									
3									
4									
5									
6									

.....  
:  
.....

.....  
:  
SUMMARY OF CULVERT FLOWS (CFS)                      FILE: FH03-#2                      DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1588.68	0	0	0	0	0	0	0	0	1
1588.70	188	188	0	0	0	0	0	0	1
1588.77	375	375	0	0	0	0	0	0	1
1588.88	563	563	0	0	0	0	0	0	1
1589.03	751	751	0	0	0	0	0	0	1

Conclusion: Not overtopped by 10-year or 100-year.

2/4

1589.23	939	939	0	0	0	0	0	0	0	1
1589.47	1126	1126	0	0	0	0	0	0	0	1
1589.58 <i>10 yr</i>	1208	1208	0	0	0	0	0	0	0	1
1590.08	1502	1502	0	0	0	0	0	0	0	1
1590.63	1689	1689	0	0	0	0	0	0	0	1
1591.26 <i>100 yr</i>	1877	1877	0	0	0	0	0	0	0	1
1592.21	2132	2132	0	0	0	0	0	0	0	OVERTOPPING

.....

.....

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH03-#2 DATE: 10-09-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1588.68	0.00	0	0	0.00
1588.70	0.00	188	0	0.00
1588.77	0.00	375	0	0.00
1588.88	0.00	563	0	0.00
1589.03	0.00	751	0	0.00
1589.23	0.00	939	0	0.00
1589.47	0.00	1126	0	0.00
1589.58	0.00	1208	0	0.00
1590.08	0.00	1502	0	0.00
1590.63	0.00	1689	0	0.00
1591.26	0.00	1877	0	0.00

.....

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

.....

2

CURRENT DATE: 02-28-1997 FILE DATE: 10-09-1996  
 CURRENT TIME: 12:15:24 FILE NAME: FH03-#2

.....

PERFORMANCE CURVE FOR CULVERT # 1 - 5 ( 8 BY 5 ) RCB

.....

DIS-CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1588.68	0.00	4.18	0-NF	0.00	0.00	0.00	0.00	0.00	5.18
188	1588.70	1.34	4.20	1-S1f	0.55	0.88	0.94	5.00	0.00	5.18
375	1588.77	2.13	4.27	1-S1f	0.85	1.40	1.88	5.00	0.00	5.18



CONSTANT WATER SURFACE ELEVATION \*  
1588.68

4/4

.....  
:  
..... ROADWAY OVERTOPPING DATA .....  
:  
.....  
:

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 60.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION	X	Y
COORD. NO.	(FT)	(FT)
1	0.00	1594.00
2	21.00	1592.93
3	74.00	1592.21
4	131.00	1594.00

.....  
:  
.....

\* Tailwater is same as Alternative #1 (Refer to FH03-#1 HY8 file). This is a conservative estimate since the outlet invert of this alternative is 1' lower than alternative #1. Lowering the tailwater 1' to 1587.68' should have no impact on the HY8 results because the culvert at the future 100 year Q is at inlet control.

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Ashbrook Wash  
 ADMP- 03, Alternate 2: Remove Existing 3-60" CMP, Install 5-8'x5'x84' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,274.00	1	\$1,274
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	3	\$2,400
2020020	Removal of Concrete Curb	LFT.	\$2.00	250	\$500
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	442	\$619
2020201	Saw Cutting	L.FT.	\$5.00	64	\$320
2030401	Drainage Excavation	CU.YD.	\$5.00	1061	\$5,305
2030501	Structural Excavation	CU.YD.	\$8.00	1476	\$11,808
2030506	Structural Backfill	CU.YD.	\$25.00	97	\$2,425
2030902	Borrow (Roadway Fill)	CU.YD.	\$7.50	408	\$3,060
2050001	Grading For Pavement	SQ.YD.	\$2.50	442	\$1,105
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	74	\$2,590
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	50	\$2,250
6010002	Structural Concrete (Class S) (f'c = 3,000 psi)	CU. YD.	\$150.00	351	\$52,650
6050002	Reinforcing Steel	LB.	\$0.50	53588	\$26,794
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$5,097.00	1	\$5,097
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$765.00	1	\$765
8081008	Water Main (8")	L.FT.	\$65.00	60	\$3,900
9010001	Mobilization (10%)	L.SUM	\$11,833.00	1	\$11,833
9080140	Concrete Gutter	L.FT.	\$10.00	250	\$2,500
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	142	\$9,088
9240170	Contractor Quality Control (2%)	L.SUM	\$2,548.00	1	\$2,548
9250001	Construction Surveying and Layout (2%)	L.SUM	\$2,548.00	1	\$2,548
Sub-Total					\$151,479
Engineering and Contingencies (15%)					\$22,720
<b>TOTAL</b>					<b>\$174,199</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE \$175,000**

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX  
XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX  
XXXX
- 7 XXXX  
XXXX
- 8 XXXX  
XXXX
- 9 XXXX  
XXXX

○ CURVE DATA TABLE

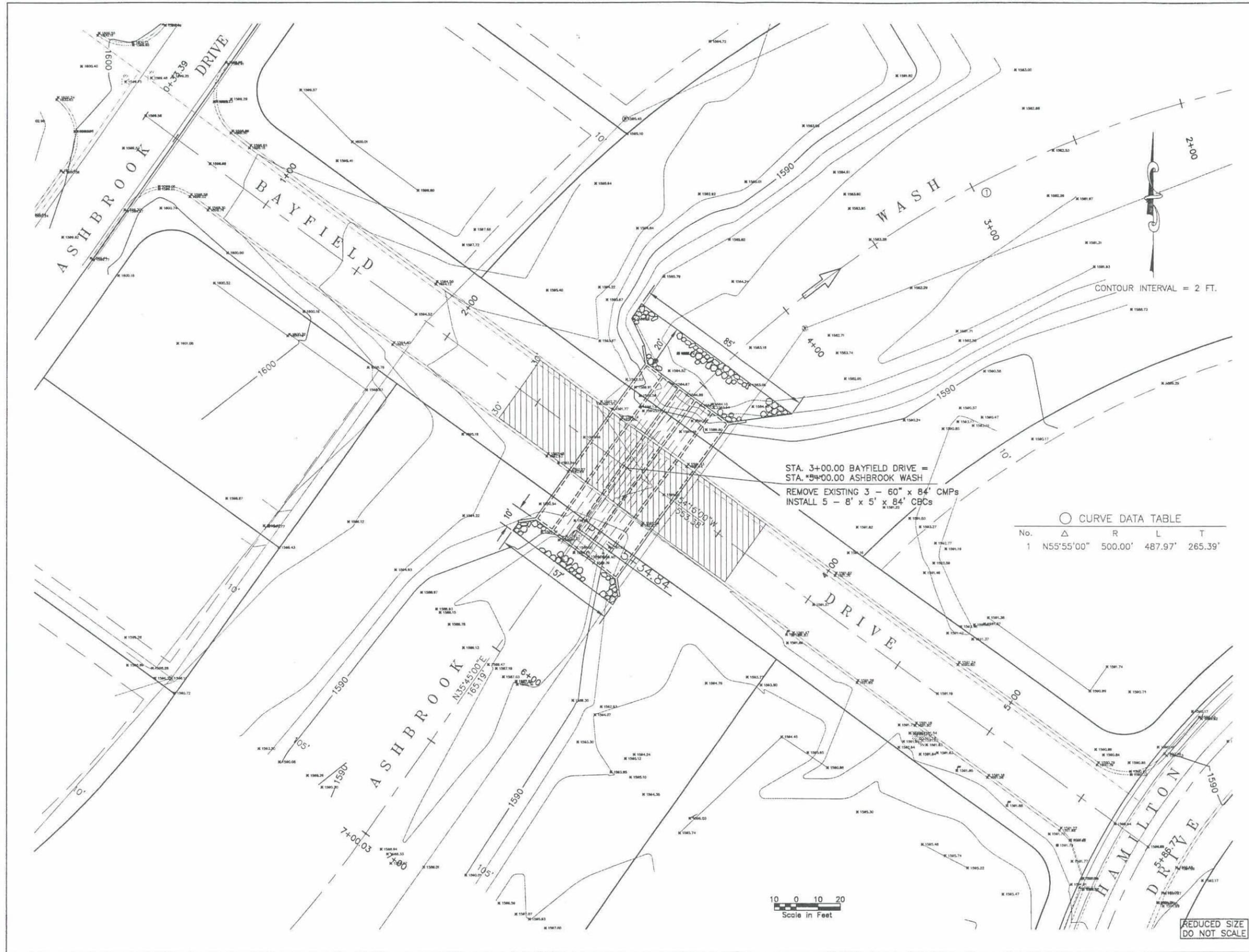
No.	Δ	R	L	T
1	N55°55'00"	500.00'	487.97'	265.39'

STA. 3+00.00 BAYFIELD DRIVE =  
STA. 5+00.00 ASHBROOK WASH  
REMOVE EXISTING 3 - 60" x 84' CMPs  
INSTALL 5 - 8' x 5' x 84' CBCs

Scale in Feet  
0 10 20

REDUCED SIZE  
DO NOT SCALE

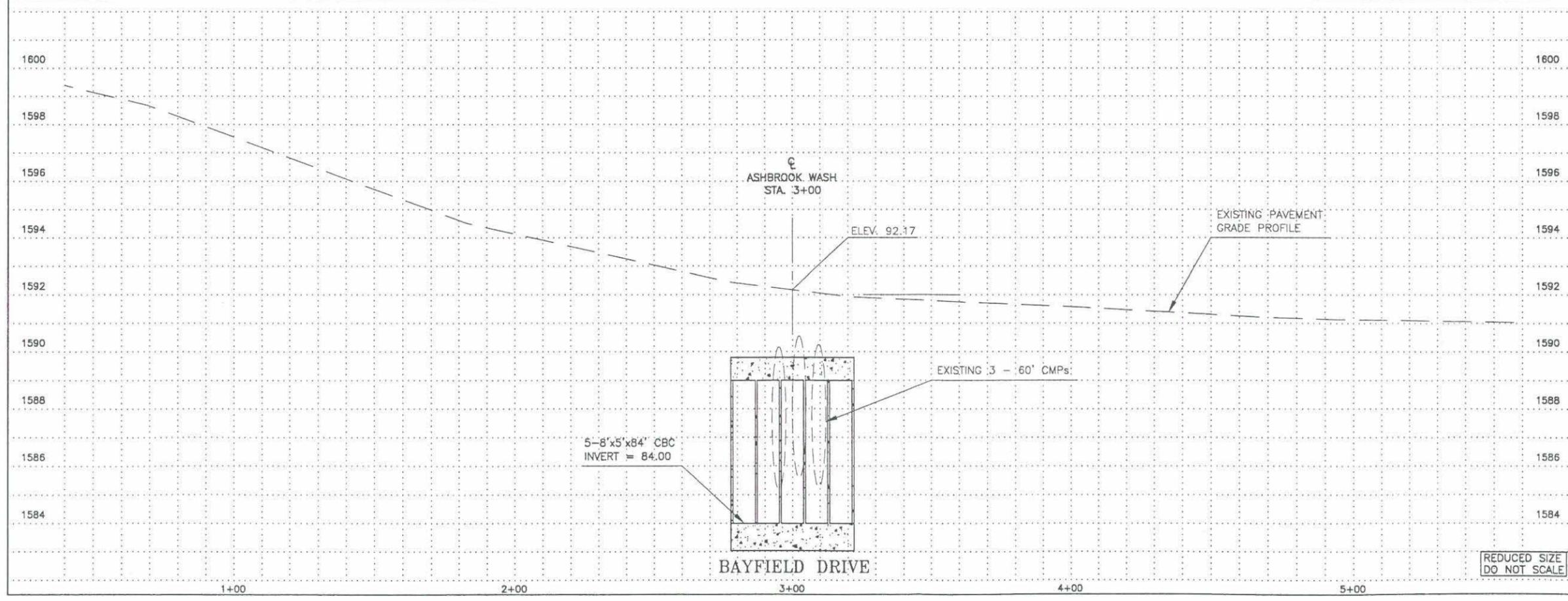
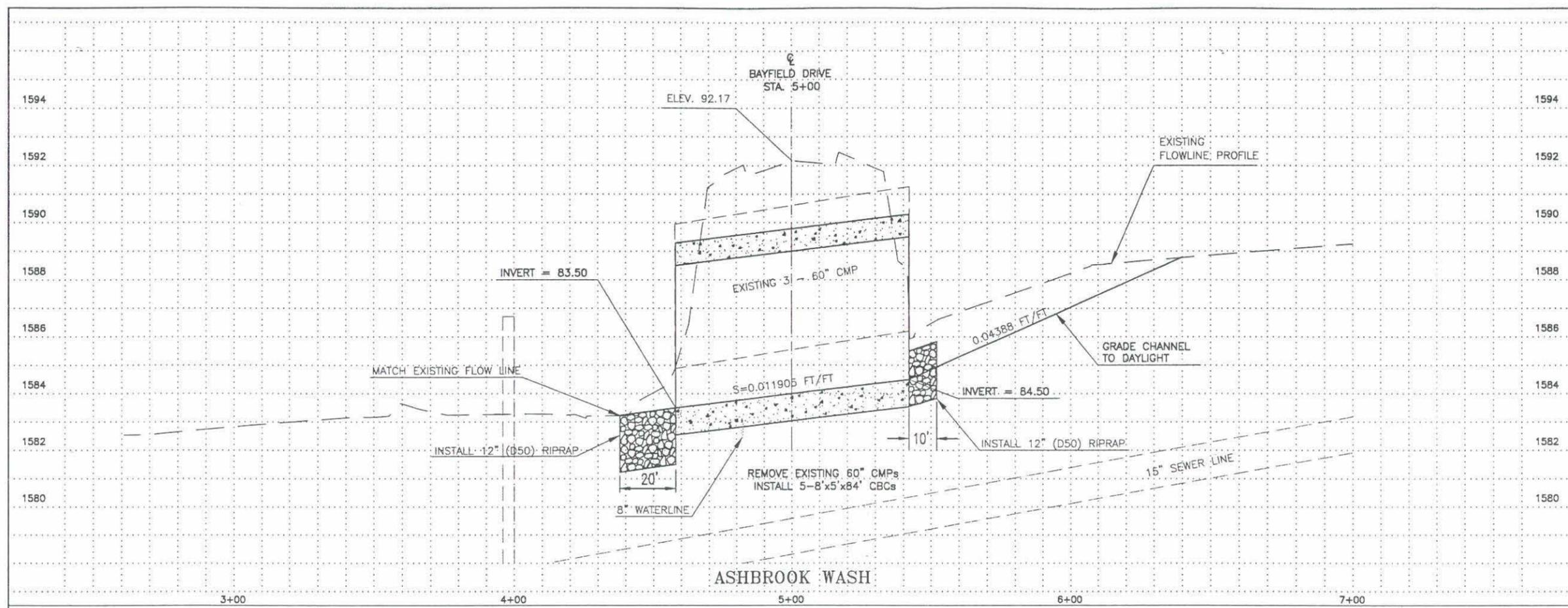
3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b> <b>FOUNTAIN HILLS ADMP BAYFIELD DRIVE &amp; ASHBROOK WASH PROJECT NO. 94-16</b>			
PRELIMINARY NOT FOR CONSTRUCTION		BY	DATE
	DESIGNED	R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
		GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE</b> McLAUGHLIN KMETZ ENGINEERS, LTD.	
PLAN SHEET ADMP 3 - ALTERNATE 2		SHEET OF 1 2	



CALL TWO WORKING DAYS BEFORE YOU DIG  
 1-602-263-1100  
 1-800-STAKE-IT  
 (OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 1384 CFS (1995)  
 FUTURE CONDITION Q100= 1877 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION**

**FOUNTAIN HILLS ADMP BAYFIELD DRIVE & ASHBROOK WASH PROJECT NO. 94-16**

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION

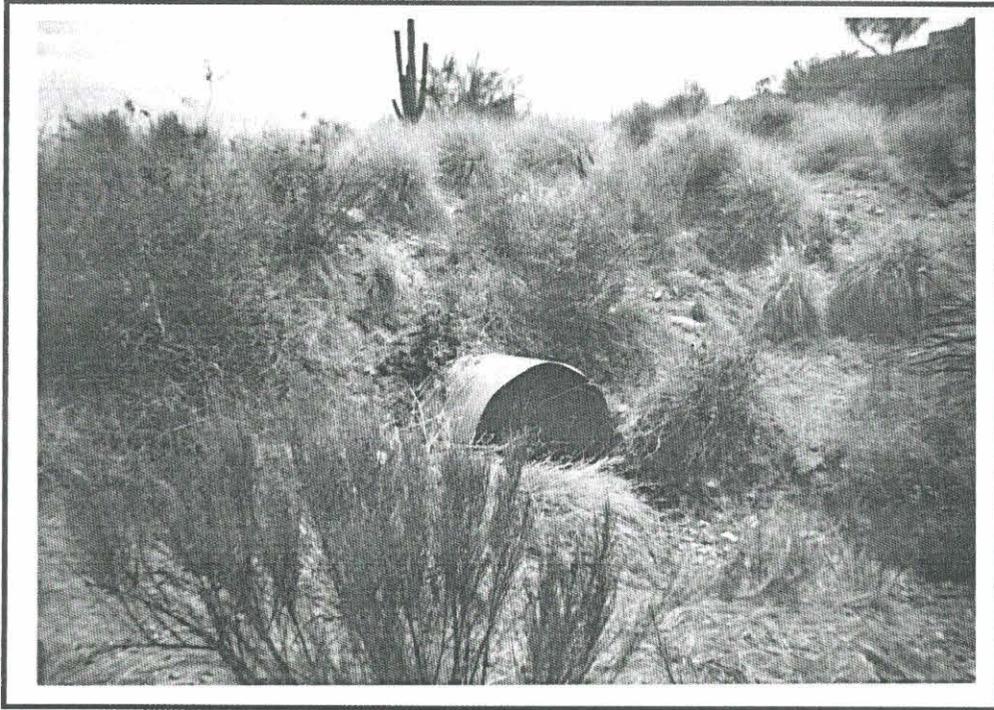
GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
 in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PROFILE SHEET ADMP 3 - ALTERNATE 2

SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

## ADMP 4: Golden Eagle Boulevard / Ashbrook Wash



Ashbrook Wash Culvert Inlet  
*Looking Downstream Towards Golden Eagle Boulevard*



Ashbrook Wash  
*Looking Upstream Towards Golden Eagle Boulevard*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:  
REC 6-20-96  
CLJ 6-20-96  
Inits. Date

### Field Reconnaissance Sheet

Site No.: ADMP 4

Roadway: Golden Eagle Boulevard

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Ashbrook Wash</u>	<u>1880</u>	<u>2070</u>	<u>1-60" CMP</u>

Reason for Analysis / Existing Deficiency: Inadequate culvert. Over topping flow floods street and downstream property adjacent to the wash.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 6-7 ft. Downstream: 6 ft.
- 2) Can the culvert be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, \_\_\_\_\_ ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, (minor) ft.  No  
Downstream?  Yes, (minor) ft.  No

#### Structure Modification Constraints:

4) Utilities: Sewer line runs down wash and across wash on Golden Eagle Blvd. Water lines, TV Cable, Electric & Phone lines also cross wash along Golden Eagle Blvd.

5) Structures: Downstream channel lined with riprap for erosion protection

6) Right-of-Way: \_\_\_\_\_

7) Miscellaneous field notes, comments, or design ideas:  
May be able to raise road 2-3' if needed. Large diameter CMPs possible here. Sewer lines may be a problem.

ALTERNATE 1

1/6

1

Ashbrook Wash + Golden Eagle Blvd (3-120" x 138' CMP)

CURRENT DATE: 02-27-1997  
 CURRENT TIME: 16:06:24

FILE DATE: 10-22-1996  
 FILE NAME: FH04-#1X

.....  
 :  
 : FHW A CULVERT ANALYSIS :  
 :  
 : HY-8, VERSION 4.3 :  
 :  
 :  
 :

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET					
U	-----			-----					
L	INLET	OUTLET	CULVERT	BARRELS					
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET	
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE	
	-----			-----					
1	1908.44	1906.16	138.02	1 ICMP	10.00	9.00	.024	CONVENTIONAL	
2	1908.44	1906.16	138.02	2 CSP	10.00	10.00	.024	CONVENTIONAL	
3									
4									
5									
6									

.....  
 :  
 :  
 :

SUMMARY OF CULVERT FLOWS (CFS)                      FILE: FH04-#1X                      DATE: 10-22-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1908.44	0	0	0	0	0	0	0	0	0
1911.13	207	54	152	0	0	0	0	0	5
1912.45	413	108	305	0	0	0	0	0	4
1913.54	620	159	459	0	0	0	0	0	3
1914.44	827	213	612	0	0	0	0	0	2
1914.67 10yr	886	230	656	0	0	0	0	0	3

Conclusion: 10-year ok, 100-year overtops by 0.40 feet

2/6

1915.95	1240	334	906	0	0	0	0	0	3
1916.67	1447	395	1053	0	0	0	0	0	2
1917.43	1654	454	1201	0	0	0	0	0	2
1918.23	1860	510	1351	0	0	0	0	0	3
1918.99	2067	557	1482	0	0	0	0	27	4
1918.60	1948	534	1414	0	0	0	0	OVERTOPPING	

.....

.....

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH04-#1X DATE: 10-22-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1908.44	0.00	0	0	0.00
1911.13	-0.00	207	0	0.05
1912.45	-0.00	413	0	0.04
1913.54	-0.01	620	2	0.25
1914.44	-0.01	827	2	0.23
1914.67	-0.00	886	0	0.01
1915.95	-0.00	1240	0	0.03
1916.67	0.01	1447	-2	-0.11
1917.43	0.00	1654	-1	-0.08
1918.23	0.00	1860	-0	-0.01
1918.99	-0.00	2067	1	0.06

.....

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

.....

2

CURRENT DATE: 02-27-1997 FILE DATE: 10-22-1996  
 CURRENT TIME: 16:06:24 FILE NAME: FH04-#1X

.....

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 10 BY 9 ) ICMP

.....

DIS-CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1908.44	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.23
54	1911.14	2.70	2.70	1-S2n	1.04	1.21	7.33	1.04	5.14	3.15
108	1912.46	4.02	4.02	1-S2n	1.57	1.90	9.07	1.57	6.10	4.00
159	1913.55	5.11	5.11	1-S2n	2.00	2.38	10.15	2.00	6.75	4.62

3/6

213	1914.44	6.00	6.00	1-S2n	2.38	2.86	11.09	2.38	7.24	5.10
230	1914.68	6.24	6.24	1-S2n	2.50	2.99	11.31	2.50	7.37	5.23
334	1915.95	7.51	7.51	1-S2n	3.16	3.75	12.44	3.19	8.02	5.89
395	1916.67	8.23	8.23	1-S2n	3.53	4.13	13.10	3.53	8.37	6.21
454	1917.42	8.98	8.98	1-S2n	3.85	4.50	13.64	3.85	8.68	6.51
510	1918.22	9.78	9.78	5-S2n	4.15	4.80	14.06	4.15	8.96	6.79
557	1918.99	10.55	10.55	5-S2n	4.41	5.05	14.36	4.41	9.22	7.05

.....

El. inlet face invert 1908.44 ft El. outlet invert 1906.16 ft  
 El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

.....

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION (FT) 0.00  
 INLET ELEVATION (FT) 1908.44  
 OUTLET STATION (FT) 138.00  
 OUTLET ELEVATION (FT) 1906.16  
 NUMBER OF BARRELS 1  
 SLOPE (V-FT/H-FT) 0.0165  
 CULVERT LENGTH ALONG SLOPE (FT) 138.02

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*

BARREL SHAPE USER DEFINED  
 BARREL SPAN 10.00 FT  
 BARREL RISE 9.00 FT  
 BARREL MATERIAL STEEL OR ALUMINUM  
 BARREL MANNING'S N 0.024 FOR SIDES AND TOP  
 0.018 FOR BOTTOM  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL MITERED  
 INLET DEPRESSION NONE

.....



CURRENT DATE: 02-27-1997  
 CURRENT TIME: 16:06:24

FILE DATE: 10-22-1996  
 FILE NAME: FH04-#1X

.....

\*\*\*\*\* USER DEFINED CULVERT CROSS-SECTION - CULVERT # 1

COORDINATE NUMBER	X (FT)	Y-TOP (FT)	Y-BOTTOM (FT)
1	0.00	5.00	5.00
2	0.50	7.18	2.82

3	1.00	8.00	2.00
4	1.50	8.57	1.43
5	2.00	9.00	1.00
6	2.50	9.33	1.00
7	3.00	9.59	1.00
8	3.50	9.77	1.00
9	4.00	9.90	1.00
10	5.00	10.00	1.00
11	6.00	9.90	1.00
12	6.50	9.77	1.00
13	7.00	9.59	1.00
14	7.50	9.33	1.00
15	8.00	9.00	1.00
16	8.50	8.57	1.43
17	9.00	8.00	2.00
18	9.50	7.18	2.82
19	10.00	5.00	5.00

.....  
 :  
 .....

CURRENT DATE: 02-27-1997  
 CURRENT TIME: 16:06:24

FILE DATE: 10-22-1996  
 FILE NAME: FH04-#1X

.....

PERFORMANCE CURVE FOR CULVERT # 2 - 2 ( 10 BY 10 ) CSP

.....

:

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1908.44	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.23
152	1911.14	2.70	2.70	1-S2n	1.68	2.01	8.57	1.68	5.14	3.15
305	1912.46	4.02	4.02	1-S2n	2.41	2.86	10.35	2.41	6.10	4.00
459	1913.54	5.10	5.10	1-S2n	3.02	3.52	11.47	3.02	6.75	4.62
612	1914.44	6.00	6.00	1-S2n	3.49	4.12	12.49	3.49	7.24	5.10
656	1914.68	6.24	6.24	1-S2n	3.63	4.26	12.72	3.63	7.37	5.23
906	1915.95	7.51	7.51	1-S2n	4.34	5.06	13.66	4.38	8.02	5.89
1053	1916.67	8.23	8.23	1-S2n	4.73	5.46	14.24	4.77	8.37	6.21
1201	1917.42	8.98	8.98	1-S2n	5.12	5.86	14.84	5.12	8.68	6.51
1351	1918.23	9.79	9.79	1-S2n	5.50	6.23	15.12	5.54	8.96	6.79
1482	1918.99	10.55	10.55	5-S2n	5.83	6.53	15.47	5.87	9.22	7.05

.....

:

El. inlet face invert      1908.44 ft      El. outlet invert      1906.16 ft  
 El. inlet throat invert      0.00 ft      El. inlet crest      0.00 ft

.....



6/6

6	50.00	1908.00
7	105.00	1918.00
8	111.00	1919.47

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1906.39	0.000	0.23	0.00	0.00
206.70	1909.31	0.756	3.15	5.14	1.35
413.40	1910.16	0.789	4.00	6.10	1.74
620.10	1910.78	0.809	4.62	6.75	2.03
826.80	1911.26	0.824	5.10	7.24	2.26
886.00	1911.39	0.827	5.23	7.37	2.32
1240.20	1912.05	0.845	5.89	8.02	2.63
1446.90	1912.37	0.854	6.21	8.37	2.80
1653.60	1912.67	0.862	6.51	8.68	2.96
1860.30	1912.95	0.868	6.79	8.96	3.11
2067.00	1913.21	0.874	7.05	9.22	3.25

.....  
:  
..... ROADWAY OVERTOPPING DATA .....  
:  
.....  
:

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 84.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	670.00	1920.40
2	700.00	1919.85
3	735.00	1918.60
4	840.00	1919.00

.....  
:  
.....

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16

Project Name: FOUNTAIN HILLS ADMP

Project Location Fountain Hills, Arizona

Golden Eagle Boulevard & Hesperus Wash

ADMP-04, Alternate 1: Remove Existing 60" CMP, Install 3-120"x136' CMPs

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,435.00	1	\$1,435
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	1	\$800
2020020	Removal of Concrete Curb	LFT.	\$2.00	180	\$360
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	599	\$839
2020201	Saw Cutting	L.FT.	\$5.00	120	\$600
2030401	Drainage Excavation	CU.YD.	\$5.00	91	\$455
2050001	Grading For Pavement	SQ.YD.	\$2.50	599	\$1,498
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	100	\$3,500
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	224	\$10,080
5010079	Pipe, Corrugated Metal, 108"	L.FT.	\$230.00	408	\$93,840
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	3	\$7,200
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$5,739.00	1	\$5,739
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$861.00	1	\$861
8081008	Water Main (8")	L.FT.	\$65.00	90	\$5,850
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	240	\$8,400
9010001	Mobilization (10%)	L.SUM	\$14,347.00	1	\$14,347
9080140	Concrete Gutter	L.FT.	\$10.00	180	\$1,800
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	123	\$7,872
9240170	Contractor Quality Control (2%)	L.SUM	\$2,869.00	1	\$2,869
9250001	Construction Surveying and Layout (2%)	L.SUM	\$2,869.00	1	\$2,869
Sub-Total					\$171,588
Engineering and Contingencies (15%)					\$25,740
<b>TOTAL</b>					<b>\$197,328</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

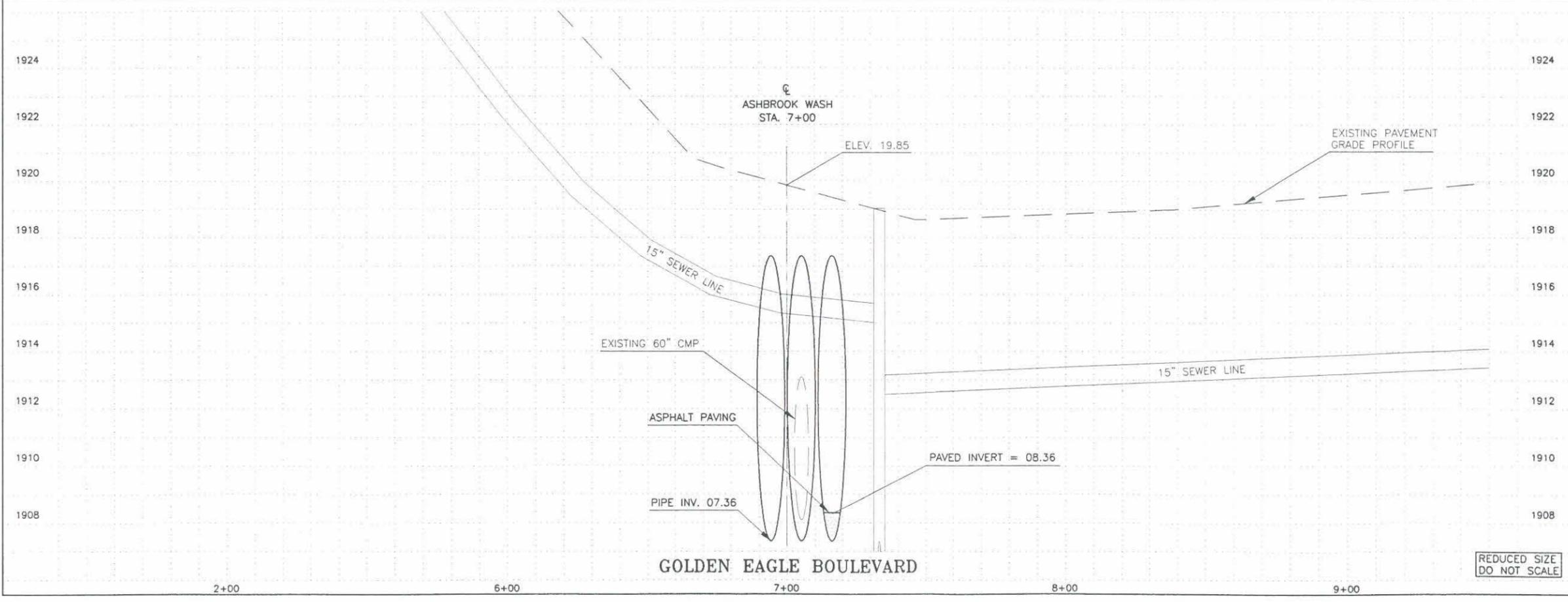
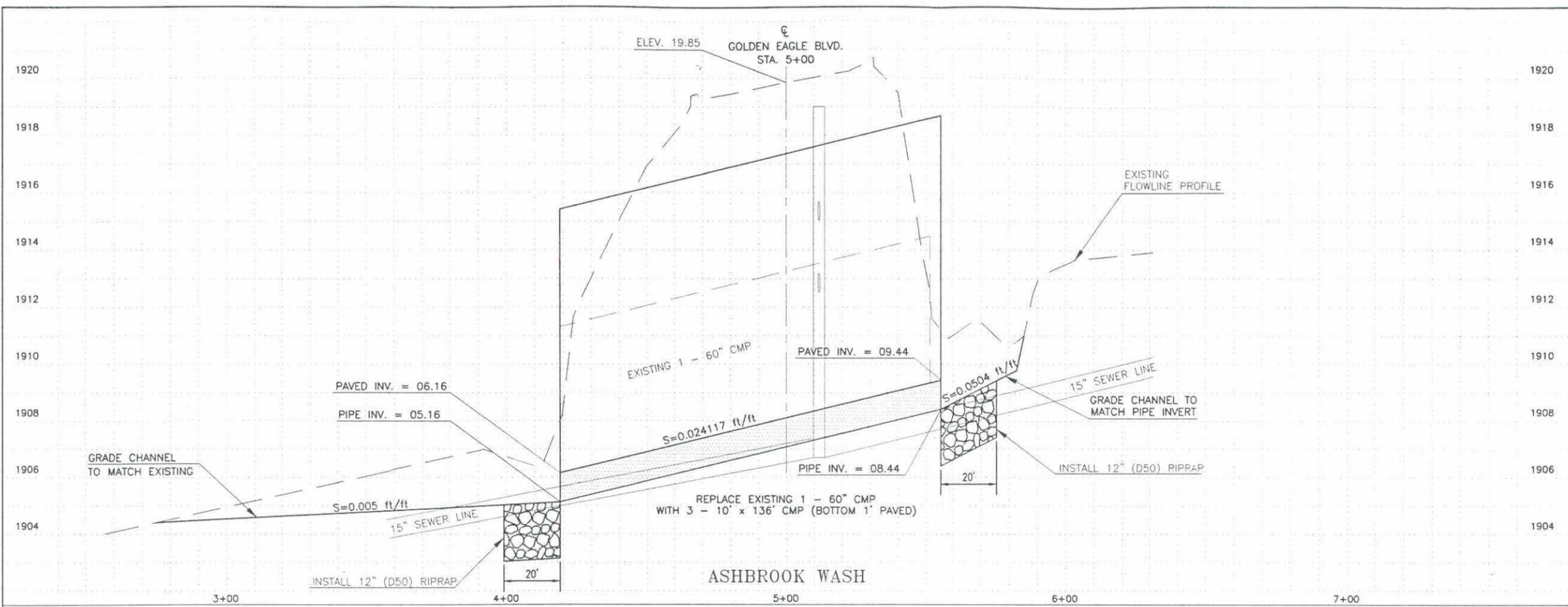
**\$198,000**





### REQUIREMENTS

EXISTING CONDITION Q100= 1879 CFS (1995)  
 FUTURE CONDITION Q100= 2067 CFS (BUILD OUT)



3			
2			
1			
NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION FOUNTAIN HILLS ADMP GOLDEN EAGLE BLVD. & ASHBROOK WASH PROJECT NO. 94-16			
		BY	DATE
DESIGNED	R. CONSONI		6/3/96
DRAWN	C. JOY		6/3/96
CHECKED	F. BROWN		6/3/96
PRELIMINARY NOT FOR CONSTRUCTION GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE</b> McLAUGHLIN KMETZ ENGINEERS, LTD.			
PROFILE SHEET ADMP 4 - ALTERNATE 1			SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

# ALTERNATE 2

Ashbrook Wash & Golden Eagle Blvd. (2-12'x8'x138' CBCs)  
 CURRENT DATE: 10-09-1996  
 CURRENT TIME: 16:45:44

FILE DATE: 10-09-1996  
 FILE NAME: FH04-#2

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1909.34	1906.16	138.04	2 RCB	12.00	8.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: FH04-#2 DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1909.34	0	0	0	0	0	0	0	0	1
1911.33	207	207	0	0	0	0	0	0	1
1912.49	413	413	0	0	0	0	0	0	1
1913.48	620	620	0	0	0	0	0	0	1
1914.39	827	827	0	0	0	0	0	0	1
<b>1914.63</b>	<b>886</b>	<b>886</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
1916.00	1240	1240	0	0	0	0	0	0	1
1916.76	1447	1447	0	0	0	0	0	0	1
1917.53	1654	1654	0	0	0	0	0	0	1
1918.33	1860	1860	0	0	0	0	0	0	1
<b>1919.03</b>	<b>2067</b>	<b>2032</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>34</b>	<b>4</b>
1918.60	1927	1927	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH04-#2 DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1909.34	0.00	0	0	0.00
1911.33	0.00	207	0	0.00
1912.49	0.00	413	0	0.00
1913.48	0.00	620	0	0.00
1914.39	0.00	827	0	0.00
1914.63	0.00	886	0	0.00
1916.00	0.00	1240	0	0.00
1916.76	0.00	1447	0	0.00
1917.53	0.00	1654	0	0.00
1918.33	0.00	1860	0	0.00
1919.03	-0.00	2067	1	0.06

<1> TOLERANCE (FT) = 0.010                      <2> TOLERANCE (%) = 1.000

Conclusions: 10-yr O.K. 100-yr overtops, by 0.43 feet.



CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:45:44

FILE DATE: 10-09-1996  
FILE NAME: FH04-#2

-----  
TAILWATER  
-----

\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL ONLY  
LEFT CHANNEL BOUNDARY 0  
RIGHT CHANNEL BOUNDARY 0  
MANNING N LEFT OVER BANK 0.000  
MANNING N MAIN CHANNEL 0.045  
MANNING N RIGHT OVER BAN 0.000  
SLOPE OF CHANNEL (FT/FT) 0.0154

FILE NAME: FH04TWE  
FILE DATE: 07-18-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1918.39
2	6.00	1916.00
3	17.00	1912.00
4	35.00	1908.00
5	40.00	1906.39
6	50.00	1908.00
7	105.00	1918.00
8	111.00	1919.47

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1906.39	0.000	0.23	0.00	0.00
206.70	1909.31	0.756	3.15	5.14	1.35
413.40	1910.16	0.789	4.00	6.10	1.74
620.10	1910.78	0.809	4.62	6.75	2.03
826.80	1911.26	0.824	5.10	7.24	2.26
886.00	1911.39	0.827	5.23	7.37	2.32
1240.20	1912.05	0.845	5.89	8.02	2.63
1446.90	1912.37	0.854	6.21	8.37	2.80
1653.60	1912.67	0.862	6.51	8.68	2.96
1860.30	1912.95	0.868	6.79	8.96	3.11
2067.00	1913.21	0.874	7.05	9.22	3.25

-----  
ROADWAY OVERTOPPING DATA  
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WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 84.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE  
CROSS-SECTION X Y  
COORD. NO. (FT) (FT)  
1 670.00 1920.40  
2 700.00 1919.85  
3 735.00 1918.60  
4 840.00 1919.00

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Golden Eagle Boulevard & Hesperus Wash  
 ADMP- 04, Alternate 2: Remove Existing 1-60" CMP, Install 2-12'x8'x136' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,934.00	1	\$1,934
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	1	\$800
2020020	Removal of Concrete Curb	LFT.	\$2.00	180	\$360
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	599	\$839
2020201	Saw Cutting	L.FT.	\$5.00	120	\$600
2030401	Drainage Excavation	CU.YD.	\$5.00	66	\$330
2030501	Structural Excavation	CU.YD.	\$8.00	3049	\$24,392
2030506	Structural Backfill	CU.YD.	\$25.00	567	\$14,175
2030902	Borrow (Roadway Fill)	CU.YD.	\$7.50	640	\$4,800
2050001	Grading For Pavement	SQ.YD.	\$2.50	599	\$1,498
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	100	\$3,500
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	100	\$4,500
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	3	\$7,200
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
6010002	Structural Concrete (Class S) (f'c = 3,000 psi)	CU. YD.	\$150.00	490	\$73,500
6050002	Reinforcing Steel	LB.	\$0.50	64914	\$32,457
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$7,735.00	1	\$7,735
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,160.00	1	\$1,160
8081008	Water Main (8")	L.FT.	\$65.00	90	\$5,850
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	240	\$8,400
9010001	Mobilization (10%)	L.SUM	\$19,338.00	1	\$19,338
9080140	Concrete Gutter	L.FT.	\$10.00	180	\$1,800
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	125	\$8,000
9240170	Contractor Quality Control (2%)	L.SUM	\$3,868.00	1	\$3,868
9250001	Construction Surveying and Layout (2%)	L.SUM	\$3,868.00	1	\$3,868
Sub-Total					\$231,278
Engineering and Contingencies (15%)					\$34,690
<b>TOTAL</b>					<b>\$265,968</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$266,000**

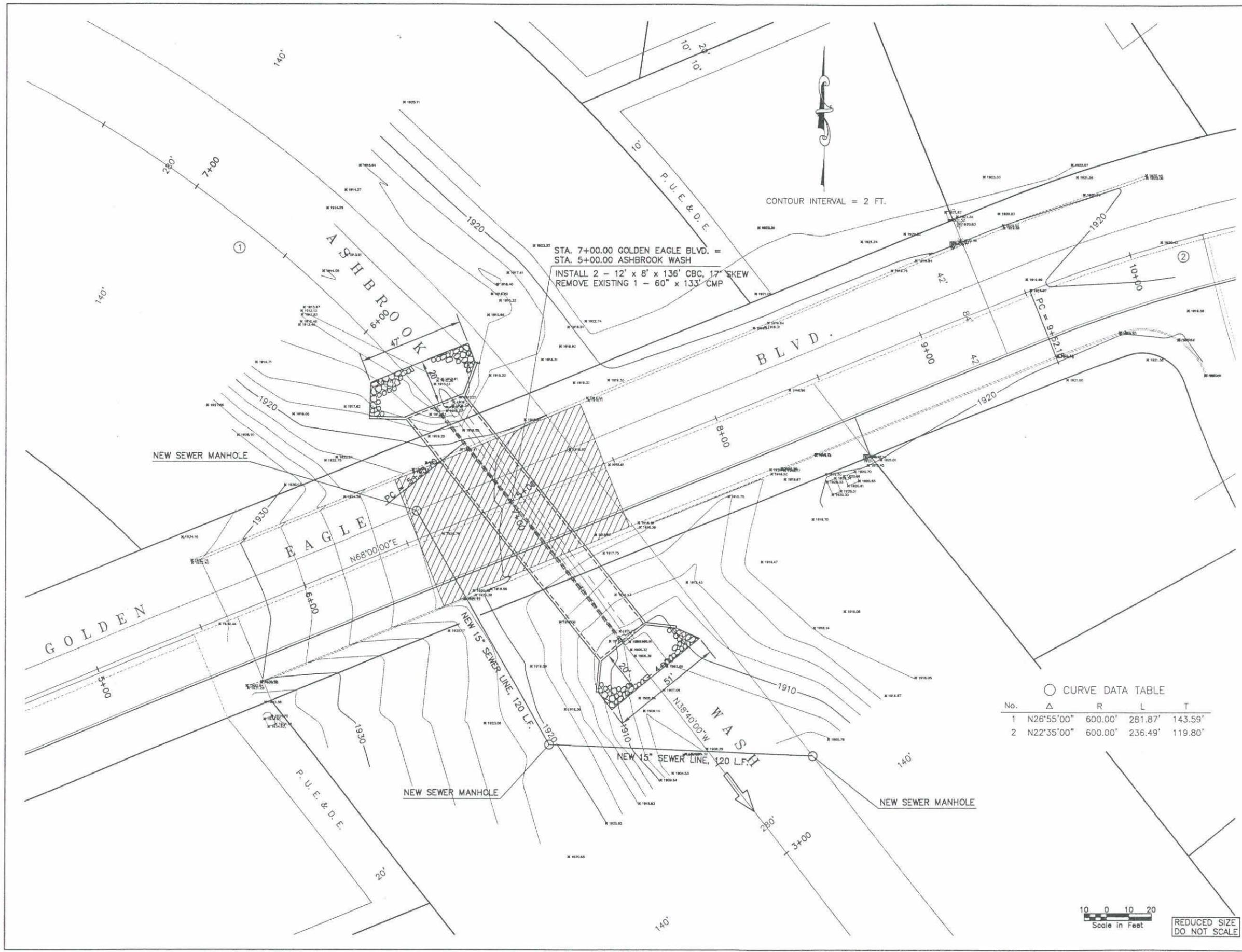
NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXX
- 7 XXXX  
XXXXX
- 8 XXXX
- 9 XXXX  
XXXX



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N26°55'00"	600.00'	281.87'	143.59'
2	N22°35'00"	600.00'	236.49'	119.80'

Scale in Feet  
0 10 20

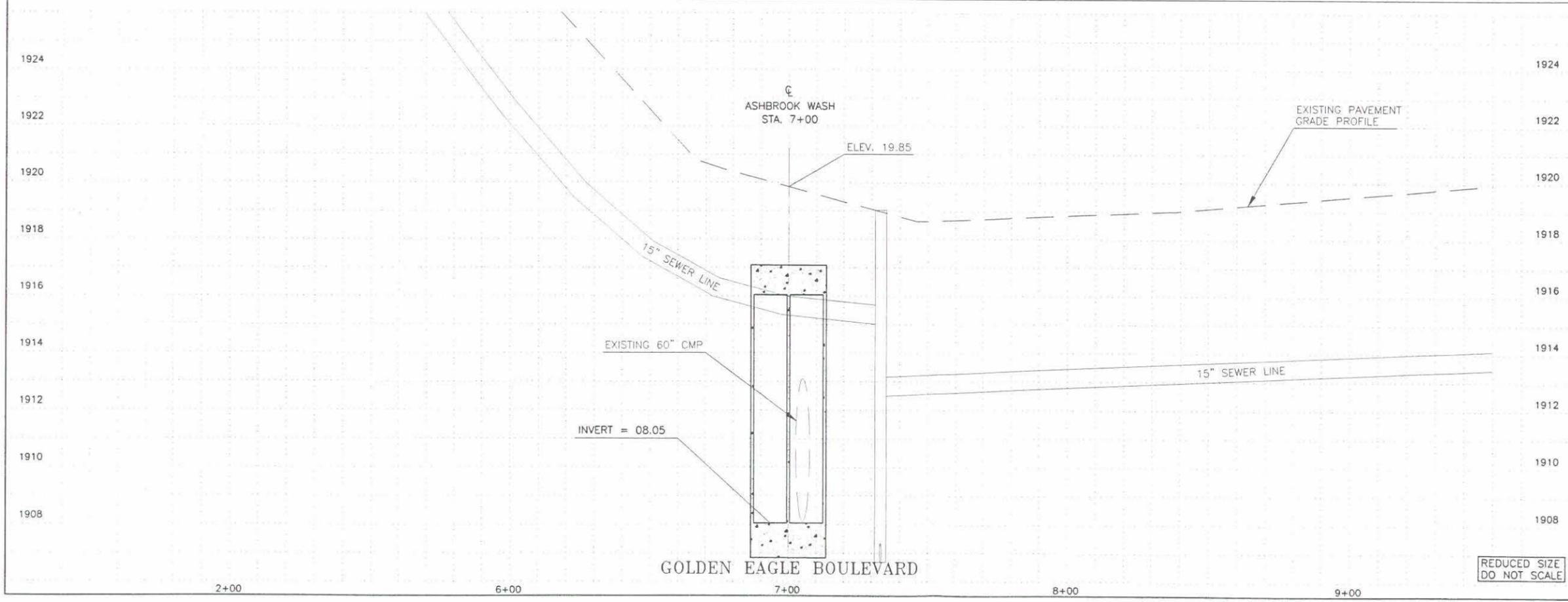
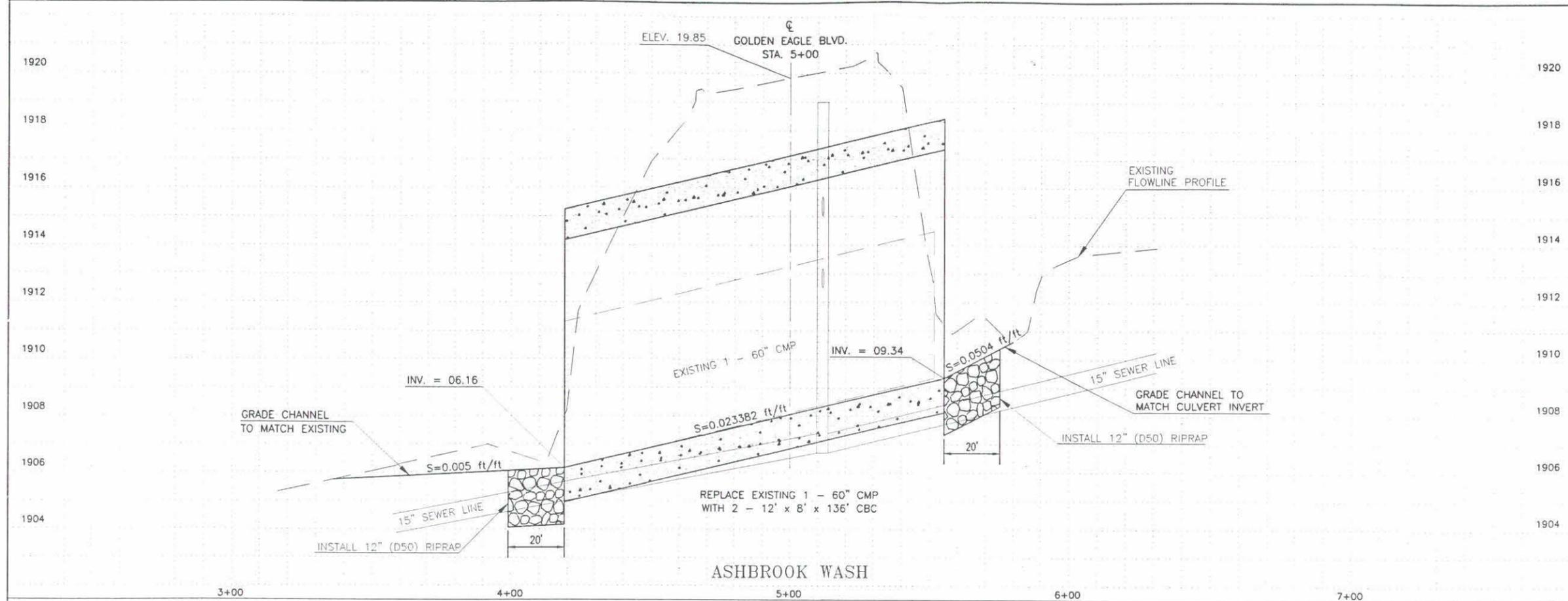
REDUCED SIZE  
DO NOT SCALE

3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b> <b>FOUNTAIN HILLS ADMP</b> <b>GOLDEN EAGLE BLVD. &amp; ASHBROOK WASH</b> <b>PROJECT NO. 94-16</b>			
		BY	DATE
DESIGNED	R. CONSONI		6/3/96
DRAWN	C. JOY		6/3/96
CHECKED	F. BROWN		6/3/96
PRELIMINARY NOT FOR CONSTRUCTION GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETZ ENGINEERS, LTD.</b>			
PLAN SHEET ADMP 4 - ALTERNATE 2			SHEET OF 1 2

CALL TWO WORKING DAYS BEFORE YOU DIG  
 1-802-263-1100  
 1-800-STAKE-IT  
 (OUTSIDE MARICOPA COUNTY)

**REQUIREMENTS**

EXISTING CONDITION Q100= 1879 CFS (1995)  
 FUTURE CONDITION Q100= 2067 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION

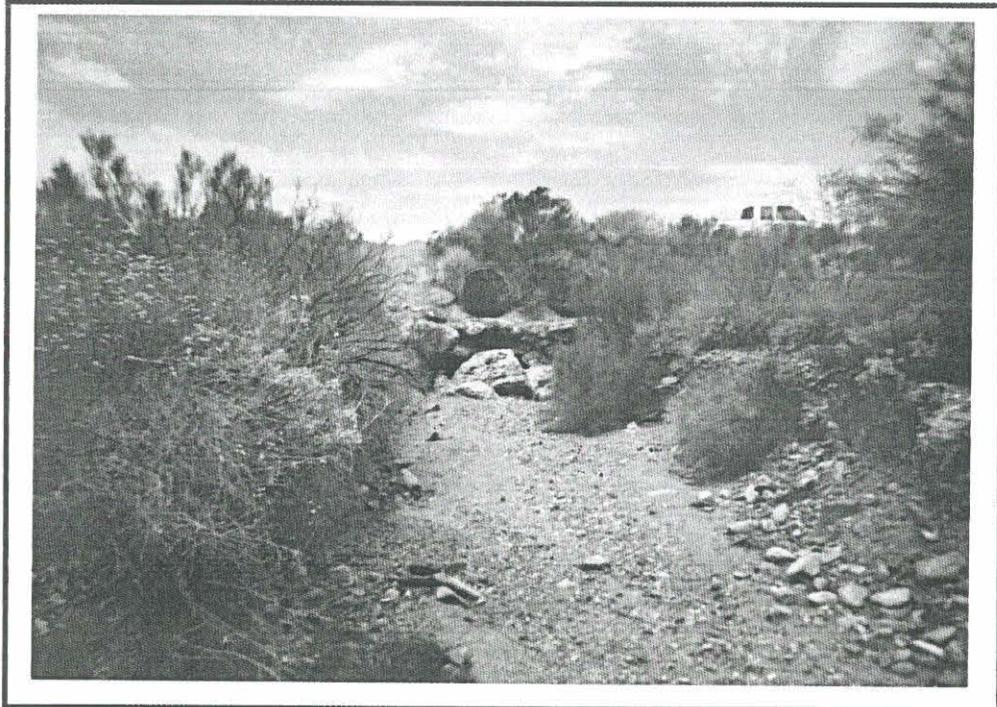
FOUNTAIN HILLS ADMP  
 GOLDEN EAGLE BLVD. & ASHBROOK WASH  
 PROJECT NO. 94-16

	BY	DATE
DESIGNED	P. CONSTY	6/1/94
DRAWN	C. JOY	6/3/94
CHECKED	F. BROWN	6/3/94
IN ASSOCIATION WITH		

**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.  
 PROFILE SHEET  
 ADMP 4 ALTERNATE 2

REDUCED SIZE  
 DO NOT SCALE

ADMP 5: Fountain Hills Boulevard / Balboa Wash



Balboa Wash Culvert Outlet  
*Looking Upstream Towards Fountain Hills Boulevard*



Balboa Wash  
*Looking Upstream From Fountain Hills Boulevard*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:

REC 6-20-96

CLT 6-20-96

Units. Date

### Field Reconnaissance Sheet

Site No.: ADMP 5

Roadway: Fountain Hills Blvd.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Balboa Wash	720	750	2-54" CMP

Reason for Analysis / Existing Deficiency: Inadequate culvert capacity.  
100 year runoff not adequately contained within drainageway  
Excessive flows over road travels down Ftn Hills Blvd. towards  
Oxford Wash and also travels along Kings Way, which is parallel to Balboa Was

Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 2.5 ft. Downstream: 2 ft.
- 2) Can the culvert be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, 4' ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, (minor) ft.  No  
Downstream?  Yes, 4' ft.  No

Structure Modification Constraints:

4) Utilities: Sewer lines run across the wash and along  
the wash. Electric, Phone, TV Cable run down both sides  
of street across wash. Water line crosses wash on  
west side of street

5) Structures: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

6) Right-of-Way: \_\_\_\_\_  
 \_\_\_\_\_

7) Miscellaneous field notes, comments, or design ideas:

Cemented material down stream of culvert offers  
erosion protection. Improvements seem possible  
without changing road profile. Room for 3-4  
more pipes (same size as existing). Also possible  
to use larger diameter pipes. Sewer line may  
be a problem

ALTERNATE 1

alboa Wash & Fountain Hills Blvd. (6-54"x120' CMPs)

CURRENT DATE: 02-28-1997  
 CURRENT TIME: 09:33:35

FILE DATE: 10-09-1996  
 FILE NAME: FH05-#1

FHWA CULVERT ANALYSIS

HY-8, VERSION 4.3

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET					
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE	
1	1625.10	1624.10	120.00	4 CSP	4.50	4.50	.024	CONVENTIONAL	
2	1625.40	1624.01	120.01	1 CSP	4.50	4.50	.024	CONVENTIONAL	
3	1625.09	1624.15	120.00	1 CSP	4.50	4.50	.024	CONVENTIONAL	
4									
5									
6									

SUMMARY OF CULVERT FLOWS (CFS)

FILE: FH05-#1

DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1625.10	0	0	0	0	0	0	0	0	0
1626.75	75	53	8	13	0	0	0	0	3
1627.43	149	100	23	26	0	0	0	0	2
1628.05	224	155	30	39	0	0	0	0	3
1628.56	299	206	41	52	0	0	0	0	3
1629.03	374	256	53	65	0	0	0	0	3

Conclusion: Not overtopped by 10-year or 100-year

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1629.28	10 YR	417	286	61	72	0	0	0	0	2
1629.90		523	356	77	89	0	0	0	0	2
1630.35		598	406	91	101	0	0	0	0	5
1631.33		672	443	119	110	0	0	0	0	3
1632.04	100 YR	747	498	126	124	0	0	0	0	2
1632.70		816	544	137	135	0	0	0	0	OVERTOPPING

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SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH05-#1 DATE: 10-09-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1625.10	0.00	0	0	0.00
1626.75	-0.00	75	0	0.07
1627.43	-0.01	149	1	0.49
1628.05	0.00	224	-0	-0.05
1628.56	-0.00	299	0	0.02
1629.03	0.00	374	-1	-0.29
1629.28	0.01	417	-1	-0.29
1629.90	-0.01	523	1	0.20
1630.35	0.00	598	-0	-0.07
1631.33	0.00	672	-0	-0.00
1632.04	0.00	747	-0	-0.07

.....

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

.....



2

CURRENT DATE: 02-28-1997 FILE DATE: 10-09-1996  
 CURRENT TIME: 09:33:35 FILE NAME: FH05-#1

.....

PERFORMANCE CURVE FOR CULVERT # 1 - 4 ( 4.5 BY 4.5 ) CSP

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.....

DIS-CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1625.10	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-4.10
53	1626.75	1.55	1.65	2-M2c	1.10	1.01	4.90	1.01	4.50	-3.14
100	1627.43	2.11	2.33	2-M2c	1.54	1.42	5.80	1.42	5.78	-2.63
155	1628.05	2.70	2.95	2-M2c	1.97	1.79	6.57	1.79	6.67	-2.22



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8	1626.75	1.29	1.35	2-M2c	0.80	0.79	4.36	0.79	4.50	-3.05
23	1627.42	2.02	2.02	1-S2n	1.37	1.37	5.68	1.37	5.78	-2.54
30	1628.05	2.31	2.65	2-M2c	1.55	1.55	6.13	1.55	6.67	-2.13
41	1628.57	2.78	3.17	2-M2c	1.86	1.84	6.71	1.84	6.75	-1.63
53	1629.04	3.25	3.64	2-M2c	2.15	2.11	7.30	2.11	6.83	-1.25
61	1629.29	3.53	3.89	2-M2c	2.33	2.27	7.59	2.27	6.91	-1.08
77	1629.89	4.14	4.49	2-M2c	2.70	2.56	8.27	2.56	7.15	-0.72
91	1630.35	4.70	4.95	2-M2c	3.04	2.80	8.80	2.80	7.31	-0.51
119	1631.32	5.92	5.85	2-M2c	3.90	3.21	9.83	3.21	7.47	-0.32
126	1632.04	6.28	6.64	6-FFn	4.50	3.30	7.94	4.50	7.62	-0.15

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:
El. inlet face invert      1625.40 ft   El. outlet invert  1624.01 ft
El. inlet throat invert   0.00 ft     El. inlet crest    0.00 ft
.....
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***** SITE DATA ***** CULVERT INVERT *****
INLET STATION (FT)                0.00
INLET ELEVATION (FT)              1625.40
OUTLET STATION (FT)               120.00
OUTLET ELEVATION (FT)            1624.01
NUMBER OF BARRELS                  1
SLOPE (V-FT/H-FT)                0.0116
CULVERT LENGTH ALONG SLOPE (FT)   120.01

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**** CULVERT DATA SUMMARY *****
BARREL SHAPE                       CIRCULAR
BARREL DIAMETER                     4.50 FT
BARREL MATERIAL                     CORRUGATED STEEL
BARREL MANNING'S N                  0.024
INLET TYPE                          CONVENTIONAL
INLET EDGE AND WALL                 THIN EDGE PROJECTING
INLET DEPRESSION                    NONE

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CURRENT DATE: 02-28-1997                FILE DATE: 10-09-1996
CURRENT TIME: 09:33:35                  FILE NAME: FH05-#1
.....
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PERFORMANCE CURVE FOR CULVERT # 3 - 1 ( 4.5 BY 4.5 ) CSP

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DIS-      HEAD-  INLET   OUTLET
CHARGE    WATER CONTROL CONTROL FLOW  NORMAL CRITICAL  OUTLET  TAILWATER
FLOW      ELEV.  DEPTH  DEPTH  TYPE  DEPTH  DEPTH  VEL. DEPTH  VEL. DEPTH
(cfs)     (ft)   (ft)   (ft)   <F4> (ft)   (ft)   (fps) (ft)   (fps) (ft)

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.....
0 1625.09 0.00 0.00 0-NF 0.00 0.00 0.00 0.00 0.00 -4.15
13 1626.75 1.56 1.66 2-M2c 1.12 1.02 4.92 1.02 4.50 -3.19
26 1627.44 2.15 2.35 2-M2c 1.60 1.44 5.87 1.44 5.78 -2.68
39 1628.06 2.71 2.97 2-M2c 2.01 1.80 6.59 1.80 6.67 -2.27
52 1628.57 3.21 3.48 2-M2c 2.38 2.08 7.24 2.08 6.75 -1.77
65 1629.04 3.69 3.95 2-M2c 2.74 2.34 7.78 2.34 6.83 -1.39
72 1629.29 3.95 4.20 2-M2c 2.94 2.46 8.07 2.46 6.91 -1.22
89 1629.90 4.61 4.81 2-M2c 3.49 2.76 8.70 2.76 7.15 -0.86
101 1630.32 5.10 5.23 2-M2c 4.07 2.94 9.16 2.94 7.31 -0.65
110 1631.32 5.50 6.23 6-FFn 4.50 3.08 6.90 4.50 7.47 -0.46
124 1632.03 6.15 6.94 6-FFn 4.50 3.26 7.77 4.50 7.62 -0.29
.....

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El. inlet face invert 1625.09 ft El. outlet invert 1624.15 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft
.....

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***** SITE DATA ***** CULVERT INVERT *****
INLET STATION (FT) 0.00
INLET ELEVATION (FT) 1625.09
OUTLET STATION (FT) 120.00
OUTLET ELEVATION (FT) 1624.15
NUMBER OF BARRELS 1
SLOPE (V-FT/H-FT) 0.0078
CULVERT LENGTH ALONG SLOPE (FT) 120.00

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***** CULVERT DATA SUMMARY *****
BARREL SHAPE CIRCULAR
BARREL DIAMETER 4.50 FT
BARREL MATERIAL CORRUGATED STEEL
BARREL MANNING'S N 0.024
INLET TYPE CONVENTIONAL
INLET EDGE AND WALL THIN EDGE PROJECTING
INLET DEPRESSION NONE

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CURRENT DATE: 02-28-1997
CURRENT TIME: 09:33:35

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FILE DATE: 10-09-1996
FILE NAME: FH05-#1

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.....
:
: TAILWATER :
:
:
.....

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6/7

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***** USER DEFINED CHANNEL CROSS-SECTION
MAIN CHANNEL ONLY
LEFT CHANNEL BOUNDARY          0
RIGHT CHANNEL BOUNDARY         0
MANNING N LEFT OVER BANK       0.000
MANNING N MAIN CHANNEL         0.045
MANNING N RIGHT OVER BAN       0.000
SLOPE OF CHANNEL (FT/FT)      0.0220
    
```

FILE NAME: FH05TW05  
 FILE DATE: 07-08-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1633.90
2	10.00	1630.00
3	20.00	1626.00
4	40.00	1624.00
5	50.00	1622.00
6	51.00	1620.00
7	68.00	1620.00
8	69.00	1622.00
9	90.00	1624.00
10	110.00	1628.00
11	131.00	1630.00

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1620.00	0.000	-4.10	0.00	0.00
74.70	1620.96	0.818	-3.14	4.50	1.21
149.40	1621.47	0.859	-2.63	5.78	1.76
224.10	1621.88	0.880	-2.22	6.67	2.18
298.80	1622.38	0.891	-1.72	6.75	2.22
373.50	1622.76	0.901	-1.34	6.83	2.26
417.00	1622.93	0.906	-1.17	6.91	2.30
522.90	1623.29	0.918	-0.81	7.15	2.42
597.60	1623.50	0.925	-0.60	7.31	2.50
672.30	1623.69	0.932	-0.41	7.47	2.59
747.00	1623.86	0.938	-0.24	7.62	2.67

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:
: ROADWAY OVERTOPPING DATA :
:
:
:
    
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WEIR COEFFICIENT 2.67  
 EMBANKMENT TOP WIDTH (FT) 80.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

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CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1634.00
2	12.00	1633.60
3	42.00	1633.00
4	82.00	1632.70
5	116.00	1632.70
6	136.00	1634.00

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**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Fountain Hills Boulevard & Balboa Wash  
 ADMP- 05, Alternate 1: Install Additional 4-54"x120' CMPs

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$961.00	1	\$961
2020020	Removal of Concrete Curb	LFT.	\$2.00	280	\$560
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1183	\$1,656
2020201	Saw Cutting	L.FT.	\$5.00	152	\$760
2030401	Drainage Excavation	CU.YD.	\$5.00	275	\$1,375
2050001	Grading For Pavement	SQ.YD.	\$2.50	1183	\$2,958
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	198	\$6,930
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	197	\$8,865
5010040	Pipe, Corrugated Metal, 54"	L.FT.	\$80.00	480	\$38,400
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$3,843.00	1	\$3,843
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$576.00	1	\$576
8081008	Water Main (8")	L.FT.	\$65.00	140	\$9,100
9010001	Mobilization (10%)	L.SUM	\$9,608.00	1	\$9,608
9080140	Concrete Gutter	L.FT.	\$10.00	280	\$2,800
9130003	Riprap (Grouted)	CU. YD.	\$80.00	74	\$5,920
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	256	\$16,384
9240170	Contractor Quality Control (2%)	L.SUM	\$1,922.00	1	\$1,922
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,922.00	1	\$1,922
Sub-Total					\$114,915
Engineering and Contingencies (15%)					\$17,240
<b>TOTAL</b>					<b>\$132,155</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$133,000**

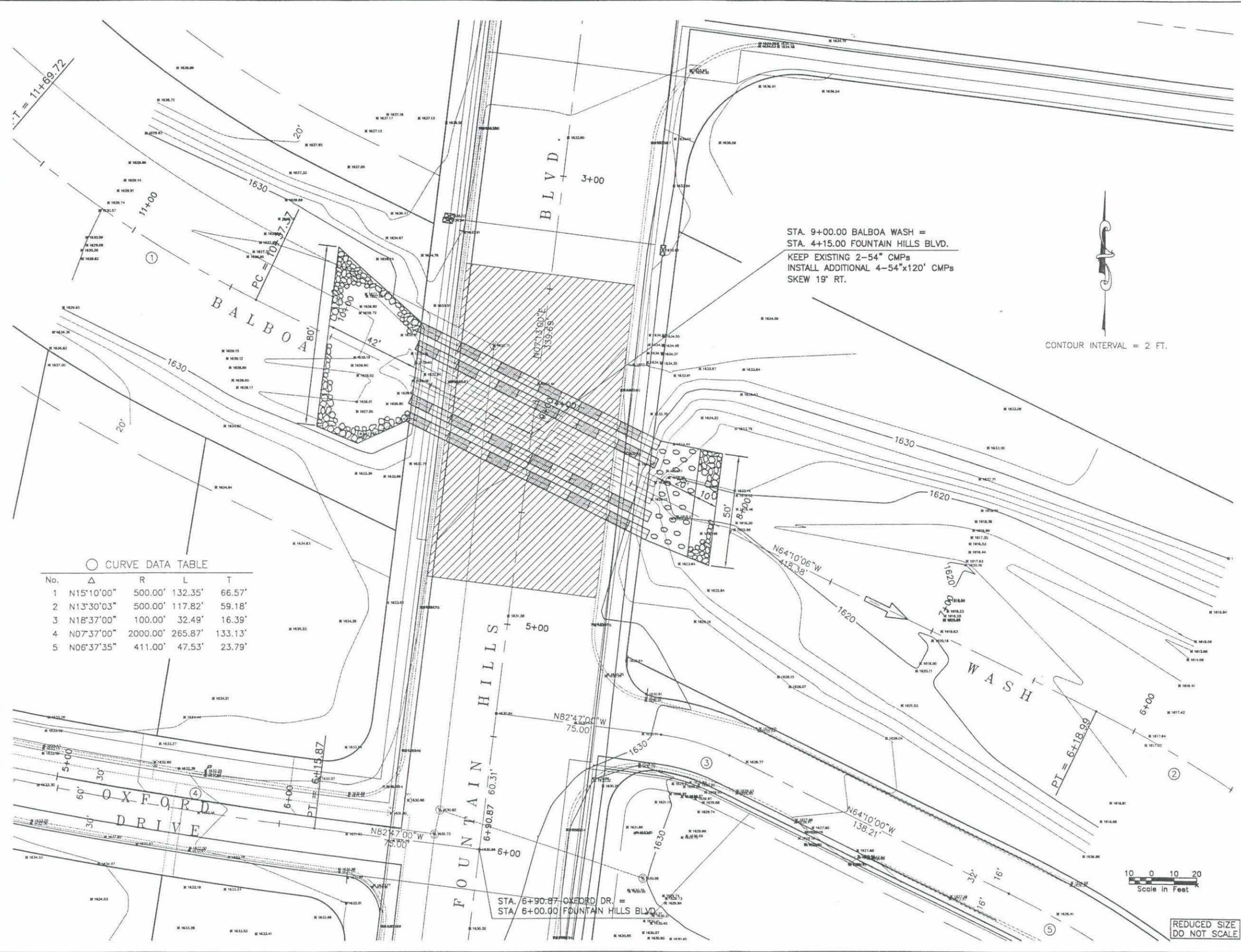
NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

REMOVALS

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

NEW CONSTRUCTION

- 3 XXXX  
XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX  
XXXX
- 7 XXXX  
XXXX
- 8 XXXX  
XXXX
- 9 XXXX  
XXXX



STA. 9+00.00 BALBOA WASH =  
STA. 4+15.00 FOUNTAIN HILLS BLVD.  
KEEP EXISTING 2-54" CMPs  
INSTALL ADDITIONAL 4-54"x120' CMPs  
SKEW 19' RT.

CONTOUR INTERVAL = 2 FT.

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N15°10'00"	500.00'	132.35'	66.57'
2	N13°30'03"	500.00'	117.82'	59.18'
3	N18°37'00"	100.00'	32.49'	16.39'
4	N07°37'00"	2000.00'	265.87'	133.13'
5	N06°37'35"	411.00'	47.53'	23.79'

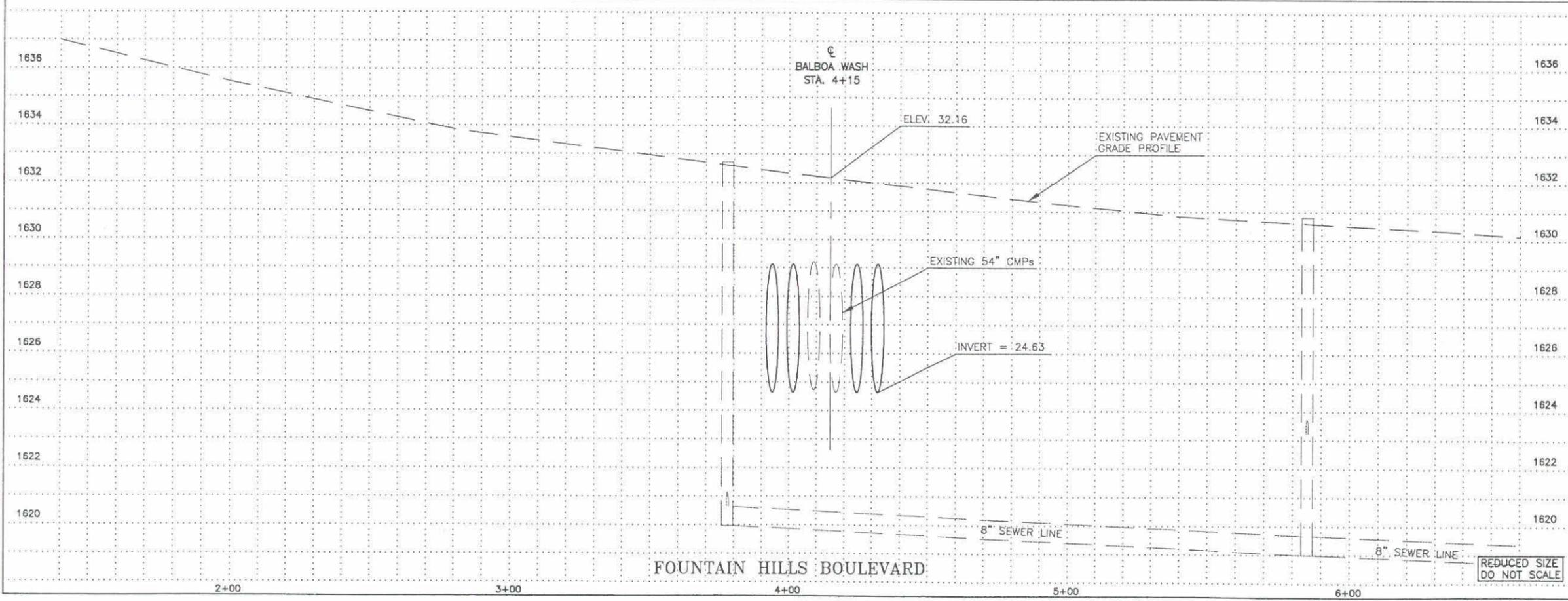
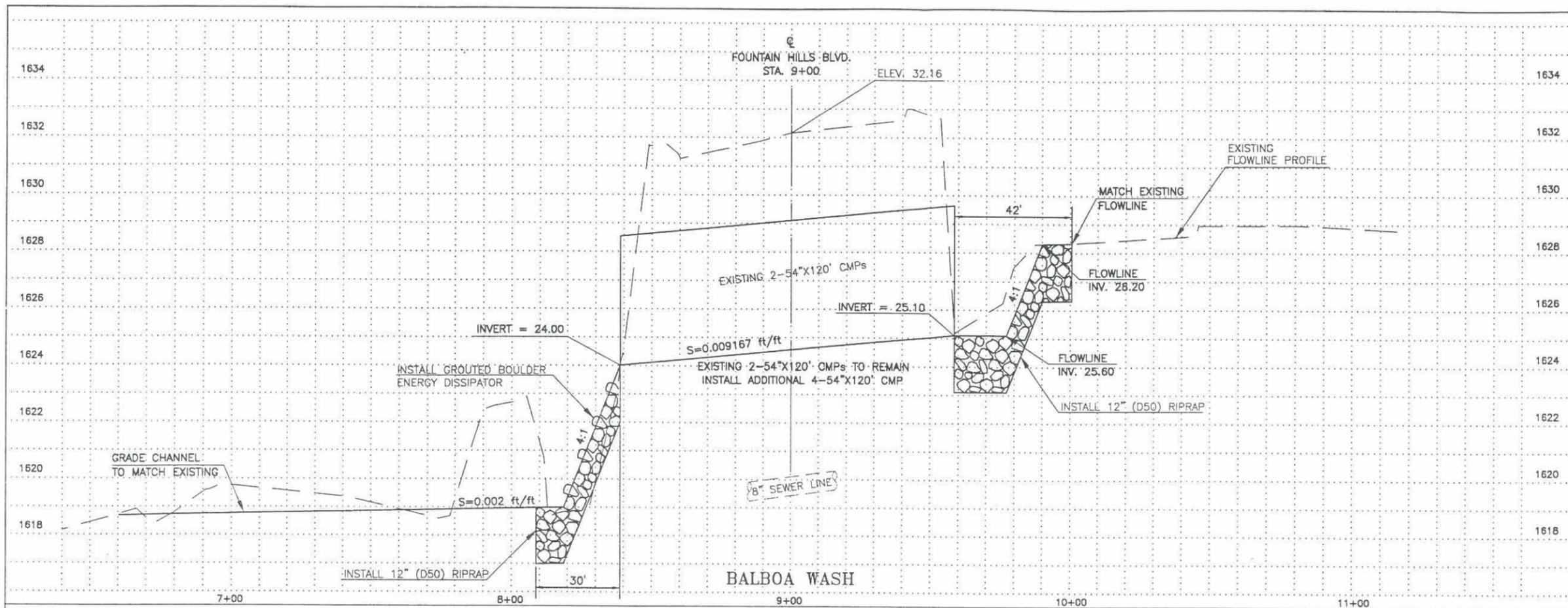
3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b>			
<b>FOUNTAIN HILLS ADMP FOUNTAIN HILLS BLVD. &amp; BALBOA WASH PROJECT NO. 94-16</b>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETTY ENGINEERS, LTD.</b>		
PLAN SHEET ADMP 5 - ALTERNATE 1		BY	DATE
			1 2

REDUCED SIZE  
DO NOT SCALE

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-800-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 721 CFS (1995)  
FUTURE CONDITION Q100= 747 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
FOUNTAIN HILLS BLVD. & BALBOA WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PROFILE SHEET ADMP 5 - ALTERNATE 1 SHEET OF 2 2

REDUCED SIZE DO NOT SCALE

# ALTERNATE 2

1/5

Palboa Wash & Fountain Hills Blvd. (2-54"x120' CMPs, 1-120"x145' CMP)  
1

CURRENT DATE: 02-28-1997  
CURRENT TIME: 09:44:51

FILE DATE: 10-09-1996  
FILE NAME: FH05-#2

.....  
:  
..... FHWA CULVERT ANALYSIS .....  
:  
..... HY-8, VERSION 4.3 .....  
:  
.....

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
U	-----			-----				
L	INLET	OUTLET	CULVERT	BARRELS				
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE
	-----			-----				
1	1619.48	1617.74	145.01	1 ICMP	10.00	9.00	.024	CONVENTIONAL
2	1625.40	1624.01	120.01	1 CSP	4.50	4.50	.024	CONVENTIONAL
3	1625.09	1624.15	120.00	1 CSP	4.50	4.50	.024	CONVENTIONAL
4								
5								
6								

.....  
:  
.....

SUMMARY OF CULVERT FLOWS (CFS)                      FILE: FH05-#2                      DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1620.00	0	0	0	0	0	0	0	0	0
1622.37	75	74	0	0	0	0	0	0	5
1623.87	149	149	0	0	0	0	0	0	4
1625.28	224	224	0	0	0	0	0	0	4
1626.34	299	289	2	8	0	0	0	0	3

Conclusion: Not overtopped by 10-year or 100-year.

2/1

1627.11	374	340	13	19	0	0	0	0	3
1627.48 <i>10 YR</i>	417	367	24	27	0	0	0	0	3
1628.42	523	436	38	49	0	0	0	0	2
1629.01	598	479	53	64	0	0	0	0	2
1629.60	672	522	69	81	0	0	0	0	2
1630.19 <i>100 YR</i>	747	563	87	97	0	0	0	0	3
1632.70	988	716	137	135	0	0	0	0	OVERTOPPING

.....

.....

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH05-#2 DATE: 10-09-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1620.00	0.00	0	0	0.00
1622.37	-0.01	75	0	0.44
1623.87	0.00	149	-0	-0.00
1625.28	-0.00	224	0	0.05
1626.34	0.00	299	-0	-0.13
1627.11	-0.01	374	1	0.30
1627.48	0.00	417	-1	-0.12
1628.42	-0.00	523	0	0.09
1629.01	-0.01	598	1	0.21
1629.60	-0.00	672	0	0.05
1630.19	0.00	747	-0	-0.00

.....

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

.....



2

CURRENT DATE: 02-28-1997 FILE DATE: 10-09-1996  
 CURRENT TIME: 09:44:51 FILE NAME: FH05-#2

.....

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 10 BY 9 ) ICMP

.....

DIS-CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1620.00	0.00	0.52	0-NF	0.00	0.00	0.00	0.00	0.00	2.26
74	1622.37	2.89	2.89	1-S2n	1.36	1.48	7.31	1.36	4.50	3.22
149	1623.87	4.39	4.39	1-S2n	2.11	2.29	8.92	2.11	5.78	3.73



2	0.50	7.18	2.82
3	1.00	8.00	2.00
4	1.50	8.57	1.43
5	2.00	9.00	1.00
6	2.50	9.33	1.00
7	3.00	9.59	1.00
8	3.50	9.77	1.00
9	4.00	9.90	1.00
10	5.00	10.00	1.00
11	6.00	9.90	1.00
12	6.50	9.77	1.00
13	7.00	9.59	1.00
14	7.50	9.33	1.00
15	8.00	9.00	1.00
16	8.50	8.57	1.43
17	9.00	8.00	2.00
18	9.50	7.18	2.82
19	10.00	5.00	5.00

.....  
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 .....

4

CURRENT DATE: 02-28-1997  
 CURRENT TIME: 09:44:51

FILE DATE: 10-09-1996  
 FILE NAME: FH05-#2

.....

PERFORMANCE CURVE FOR CULVERT # 2 - 1 ( 4.5 BY 4.5 ) CSP

.....

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1625.40	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-4.01
0	1625.40	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	4.50	-3.05
0	1625.40	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	5.78	-2.54
0	1625.40	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	6.67	-2.13
2	1626.35	0.95	0.64	2-M2c	0.43	0.40	2.83	0.40	6.75	-1.63
13	1627.12	1.54	1.72	2-M2c	1.01	1.01	4.90	1.01	6.83	-1.25
24	1627.45	2.05	2.05	1-S2n	1.38	1.38	5.72	1.38	6.91	-1.08
38	1628.43	2.66	3.03	2-M2c	1.78	1.77	6.54	1.77	7.15	-0.72
53	1629.02	3.24	3.62	2-M2c	2.14	2.10	7.28	2.10	7.31	-0.51
69	1629.60	3.84	4.20	2-M2c	2.52	2.41	7.96	2.41	7.47	-0.32
87	1630.18	4.51	4.78	2-M2c	2.92	2.73	8.60	2.73	7.62	-0.15

.....

El. inlet face invert      1625.40 ft      El. outlet invert      1624.01 ft  
 El. inlet throat invert      0.00 ft      El. inlet crest      0.00 ft

5/7

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***** SITE DATA ***** CULVERT INVERT *****
INLET STATION (FT)                0.00
INLET ELEVATION (FT)              1625.40
OUTLET STATION (FT)              120.00
OUTLET ELEVATION (FT)            1624.01
NUMBER OF BARRELS                 1
SLOPE (V-FT/H-FT)                0.0116
CULVERT LENGTH ALONG SLOPE (FT)  120.01

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***** CULVERT DATA SUMMARY *****
BARREL SHAPE          CIRCULAR
BARREL DIAMETER      4.50 FT
BARREL MATERIAL      CORRUGATED STEEL
BARREL MANNING'S N   0.024
INLET TYPE           CONVENTIONAL
INLET EDGE AND WALL  THIN EDGE PROJECTING
INLET DEPRESSION     NONE

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CURRENT DATE: 02-28-1997          FILE DATE: 10-09-1996
CURRENT TIME: 09:44:51          FILE NAME: FH05-#2

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PERFORMANCE CURVE FOR CULVERT # 3 - 1 ( 4.5 BY 4.5 ) CSP

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DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1625.09	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-4.15
0	1625.09	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	4.50	-3.19
0	1625.09	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	5.78	-2.68
0	1625.92	0.83	0.00	2-M2c	0.00	0.00	0.00	0.00	6.67	-2.27
8	1626.35	1.26	1.25	2-M2c	0.86	0.75	4.30	0.75	6.75	-1.77
19	1627.11	1.84	2.02	2-M2c	1.37	1.23	5.40	1.23	6.83	-1.39
27	1627.49	2.19	2.40	2-M2c	1.63	1.47	5.94	1.47	6.91	-1.22
49	1628.43	3.08	3.34	2-M2c	2.29	2.00	7.09	2.00	7.15	-0.86
64	1629.02	3.66	3.93	2-M2c	2.72	2.32	7.74	2.32	7.31	-0.65
81	1629.59	4.28	4.50	2-M2c	3.20	2.62	8.38	2.62	7.47	-0.46
97	1630.18	4.93	5.09	2-M2c	3.84	2.88	9.02	2.88	7.62	-0.29

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6/7

El. inlet face invert 1625.09 ft El. outlet invert 1624.15 ft  
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

.....  
:

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
INLET STATION (FT) 0.00  
INLET ELEVATION (FT) 1625.09  
OUTLET STATION (FT) 120.00  
OUTLET ELEVATION (FT) 1624.15  
NUMBER OF BARRELS 1  
SLOPE (V-FT/H-FT) 0.0078  
CULVERT LENGTH ALONG SLOPE (FT) 120.00

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
BARREL SHAPE CIRCULAR  
BARREL DIAMETER 4.50 FT  
BARREL MATERIAL CORRUGATED STEEL  
BARREL MANNING'S N 0.024  
INLET TYPE CONVENTIONAL  
INLET EDGE AND WALL THIN EDGE PROJECTING  
INLET DEPRESSION NONE

.....

6

CURRENT DATE: 02-28-1997  
CURRENT TIME: 09:44:51

FILE DATE: 10-09-1996  
FILE NAME: FH05-#2

.....

..... TAILWATER .....

.....  
:

\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION \*\*\*\*\* FILE NAME: FH05TW05  
MAIN CHANNEL ONLY FILE DATE: 07-08-1996  
LEFT CHANNEL BOUNDARY 0  
RIGHT CHANNEL BOUNDARY 0  
MANNING N LEFT OVER BANK 0.000  
MANNING N MAIN CHANNEL 0.045  
MANNING N RIGHT OVER BAN 0.000  
SLOPE OF CHANNEL (FT/FT) 0.0220

CROSS-SECTION X Y  
COORD. NO. (FT) (FT)  
1 0.00 1633.90

77

2	10.00	1630.00
3	20.00	1626.00
4	40.00	1624.00
5	50.00	1622.00
6	51.00	1620.00
7	68.00	1620.00
8	69.00	1622.00
9	90.00	1624.00
10	110.00	1628.00
11	131.00	1630.00

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1620.00	0.000	2.26	0.00	0.00
74.70	1620.96	0.818	3.22	4.50	1.21
149.40	1621.47	0.859	3.73	5.78	1.76
224.10	1621.88	0.880	4.14	6.67	2.18
298.80	1622.38	0.891	4.64	6.75	2.22
373.50	1622.76	0.901	5.02	6.83	2.26
417.00	1622.93	0.906	5.19	6.91	2.30
522.90	1623.29	0.918	5.55	7.15	2.42
597.60	1623.50	0.925	5.76	7.31	2.50
672.30	1623.69	0.932	5.95	7.47	2.59
747.00	1623.86	0.938	6.12	7.62	2.67

.....  
:  
..... ROADWAY OVERTOPPING DATA .....  
:  
.....  
:

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 80.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1634.00
2	12.00	1633.60
3	42.00	1633.00
4	82.00	1632.70
5	116.00	1632.70
6	136.00	1634.00

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.....

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Fountain Hills Boulevard & Balboa Wash  
 ADMP- 05, Alternate 2: Install 1-120"x145' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$953.00	1	\$953
2020020	Removal of Concrete Curb	LFT.	\$2.00	120	\$240
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1014	\$1,420
2020201	Saw Cutting	L.FT.	\$5.00	152	\$760
2030401	Drainage Excavation	CU.YD.	\$5.00	1062	\$5,310
2050001	Grading For Pavement	SQ.YD.	\$2.50	1014	\$2,535
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	169	\$5,915
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	225	\$10,125
5010079	Pipe, Corrugated Metal, 108"	L.FT.	\$230.00	145	\$33,350
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	3	\$7,200
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$3,813.00	1	\$3,813
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$572.00	1	\$572
8081008	Water Main (8")	L.FT.	\$65.00	120	\$7,800
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	250	\$8,750
9010001	Mobilization (10%)	L.SUM	\$9,532.00	1	\$9,532
9080140	Concrete Gutter	L.FT.	\$10.00	240	\$2,400
9130003	Riprap (Grouted)	CU. YD.	\$80.00	31	\$2,480
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	104	\$6,656
9240170	Contractor Quality Control (2%)	L.SUM	\$1,906.00	1	\$1,906
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,906.00	1	\$1,906
Sub-Total					\$113,998
Engineering and Contingencies (15%)					\$17,100
<b>TOTAL</b>					<b>\$131,098</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE \$132,000**

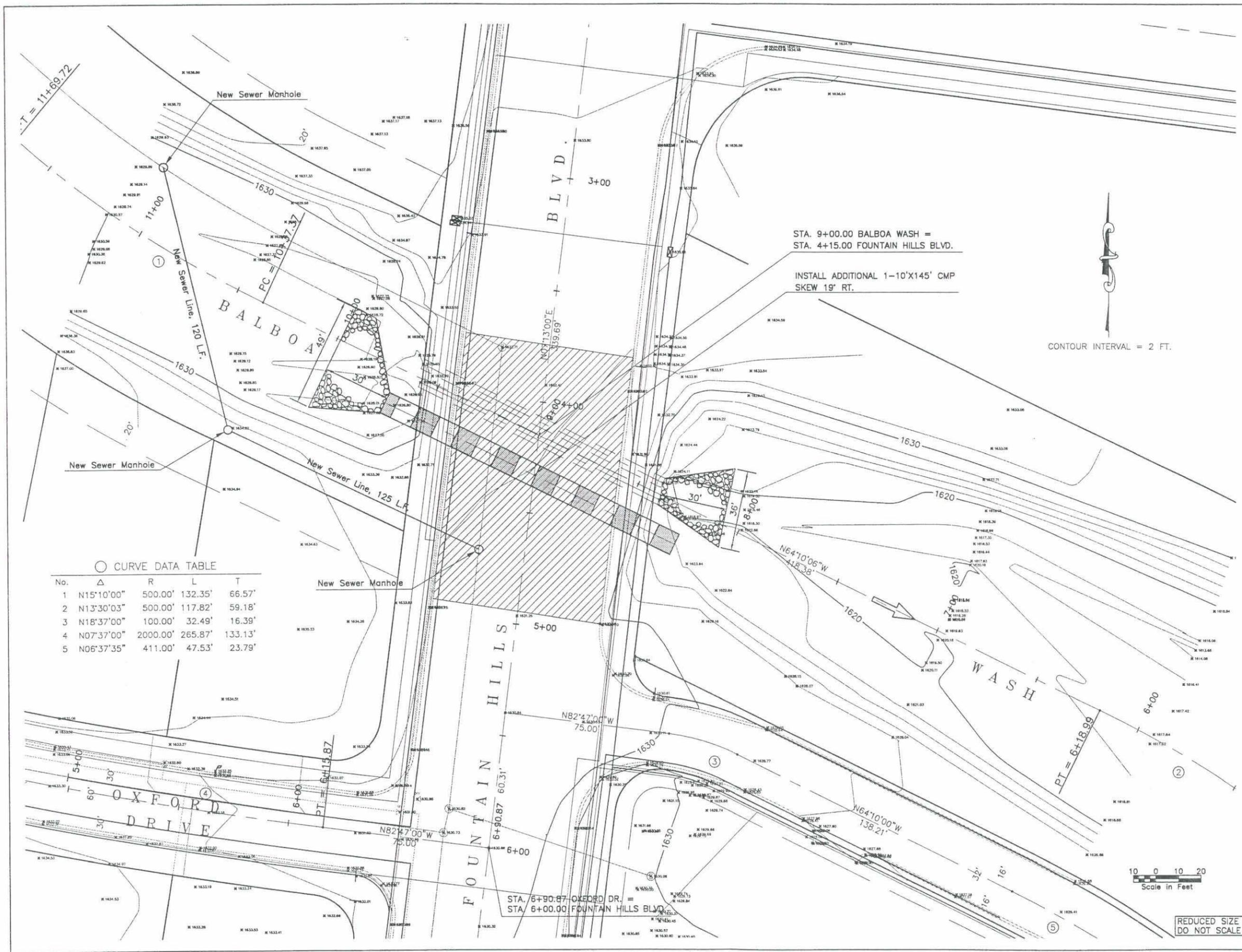
NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

REMOVALS

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

NEW CONSTRUCTION

- 3 XXXX  
XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N15°10'00"	500.00'	132.35'	66.57'
2	N13°30'03"	500.00'	117.82'	59.18'
3	N18°37'00"	100.00'	32.49'	16.39'
4	N07°37'00"	2000.00'	265.87'	133.13'
5	N06°37'35"	411.00'	47.53'	23.79'

STA. 9+00.00 BALBOA WASH =  
STA. 4+15.00 FOUNTAIN HILLS BLVD.  
  
INSTALL ADDITIONAL 1-10'X145' CMP  
SKEW 19° RT.

CONTOUR INTERVAL = 2 FT.

Scale in Feet  
0 10 20

REDUCED SIZE  
DO NOT SCALE

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
FOUNTAIN HILLS BLVD. & BALBOA WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY  
NOT FOR  
CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

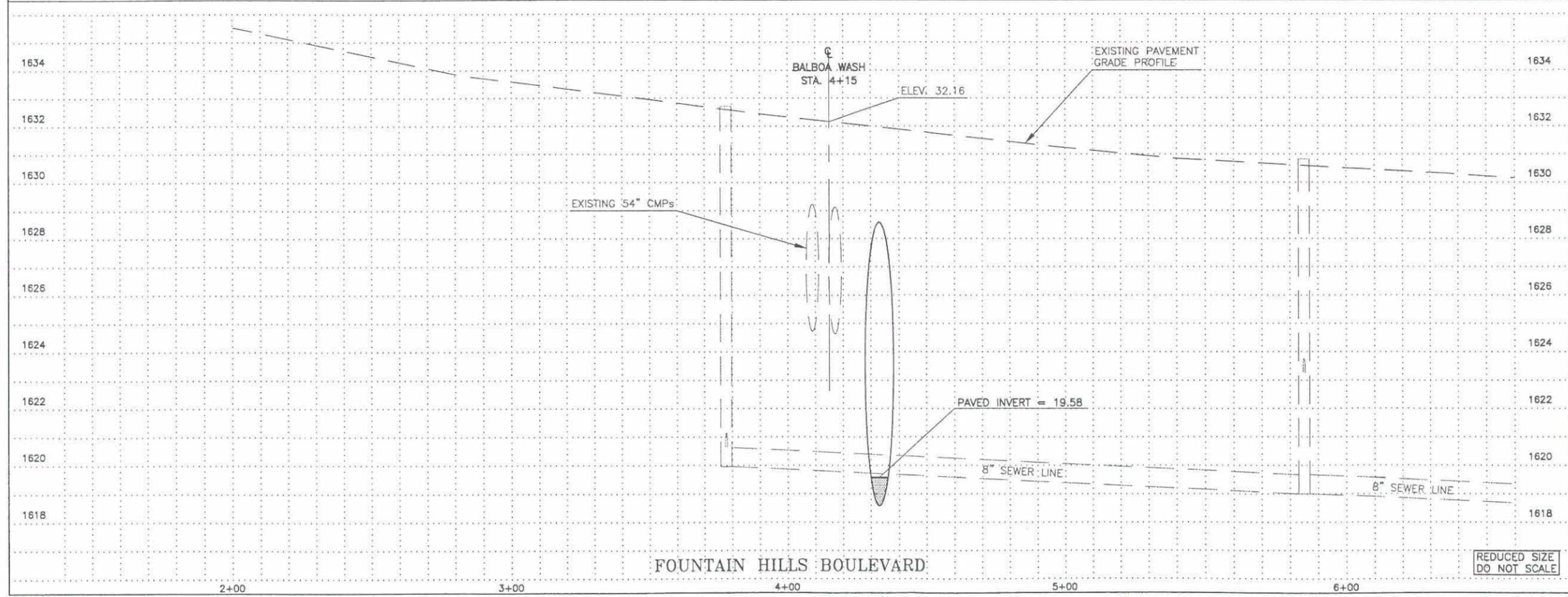
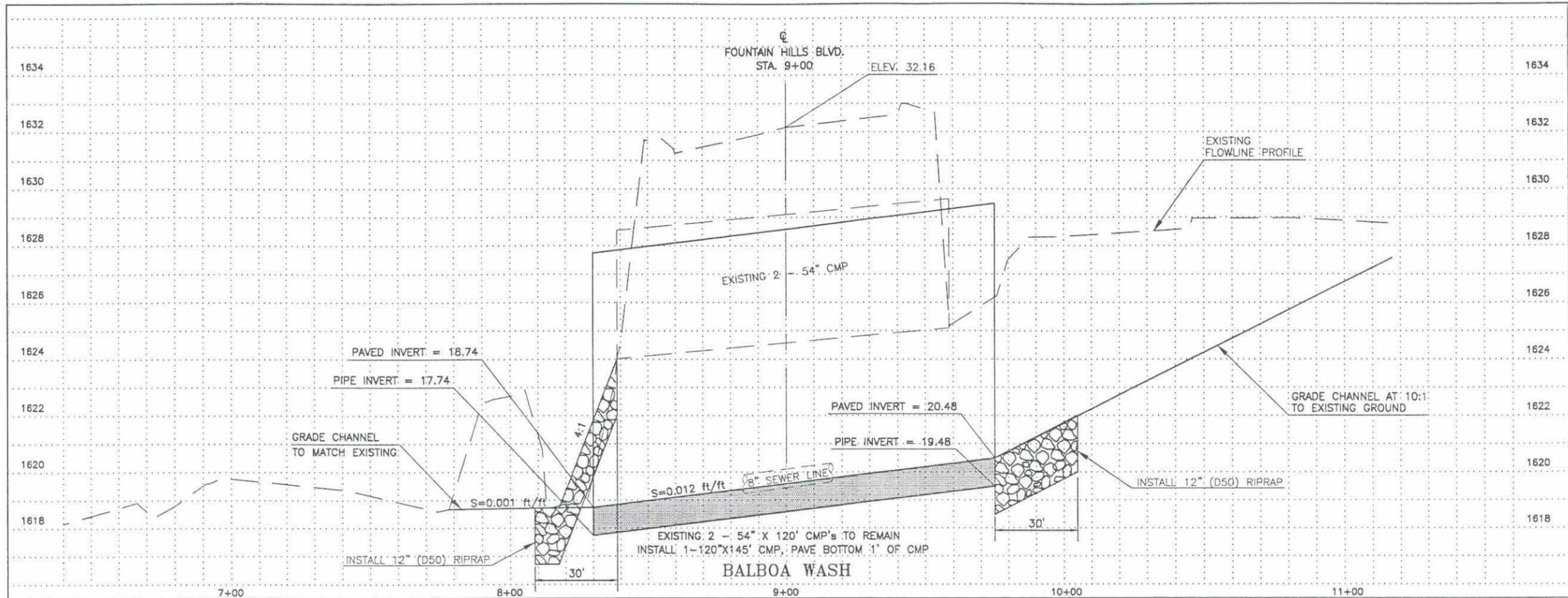
PLAN SHEET  
ADMP 5 - ALTERNATE 2

SHEET OF  
1 2

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 721 CFS (1995)  
FUTURE CONDITION Q100= 747 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION

FOUNTAIN HILLS ADMP  
FOUNTAIN HILLS BLVD. & BALBOA WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY  
NOT FOR  
CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

PROFILE SHEET  
ADMP 5 - ALTERNATE 2

SHEET OF  
2 2

REDUCED SIZE  
DO NOT SCALE

ALTERNATE 3

1/6

Palboa Wash & Fountain Hills Blvd. (2-120"x150' CMPs)  
1

CURRENT DATE: 02-28-1997  
CURRENT TIME: 10:06:15

FILE DATE: 10-09-1996  
FILE NAME: FH05-#3

.....  
:  
..... FHWA CULVERT ANALYSIS .....  
:  
..... HY-8, VERSION 4.3 .....  
:  
.....

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET					
U	-----			-----					
L	INLET	OUTLET	CULVERT	BARRELS					
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET	
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE	
	-----			-----					
1	1620.88	1619.88	150.00	1 ICMP	10.00	9.00	.024	CONVENTIONAL	
2	1619.88	1618.88	150.00	1 CSP	10.00	10.00	.024	CONVENTIONAL	
3									
4									
5									
6									

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SUMMARY OF CULVERT FLOWS (CFS) FILE: FH05-#3 DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1620.88	0	0	0	0	0	0	0	0	0
1622.48	75	30	45	0	0	0	0	0	4
1623.42	149	59	90	0	0	0	0	0	2
1624.19	224	93	131	0	0	0	0	0	2
1624.88	299	126	172	0	0	0	0	0	3

Conclusion : Not overtopped by 10-year or 100-year.

76

1625.49	374	160	213	0	0	0	0	0	2
1625.85	10 YR 417	178	239	0	0	0	0	0	3
1626.67	523	222	301	0	0	0	0	0	3
1627.19	598	252	344	0	0	0	0	0	2
1627.70	672	284	388	0	0	0	0	0	3
1628.19	100 YR 747	317	431	0	0	0	0	0	3
1632.70	1416	634	781	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH05-#3 DATE: 10-09-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1620.88	0.00	0	0	0.00
1622.48	-0.00	75	0	0.10
1623.42	-0.00	149	0	0.17
1624.19	-0.00	224	0	0.11
1624.88	-0.01	299	1	0.26
1625.49	-0.00	374	1	0.14
1625.85	0.00	417	-0	-0.00
1626.67	-0.00	523	0	0.02
1627.19	-0.01	598	1	0.23
1627.70	-0.00	672	0	0.01
1628.19	0.01	747	-1	-0.17

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

2

CURRENT DATE: 02-28-1997 FILE DATE: 10-09-1996  
 CURRENT TIME: 10:06:15 FILE NAME: FH05-#3

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 10 BY 9 ) ICMP

DIS-CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1620.88	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.12
30	1622.48	1.60	1.42	3-M1t	0.97	0.85	3.84	1.08	4.50	1.08
59	1623.42	2.54	2.12	3-M1t	1.41	1.27	4.86	1.59	5.78	1.59



2	0.50	7.18	2.82
3	1.00	8.00	2.00
4	1.50	8.57	1.43
5	2.00	9.00	1.00
6	2.50	9.33	1.00
7	3.00	9.59	1.00
8	3.50	9.77	1.00
9	4.00	9.90	1.00
10	5.00	10.00	1.00
11	6.00	9.90	1.00
12	6.50	9.77	1.00
13	7.00	9.59	1.00
14	7.50	9.33	1.00
15	8.00	9.00	1.00
16	8.50	8.57	1.43
17	9.00	8.00	2.00
18	9.50	7.18	2.82
19	10.00	5.00	5.00

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CURRENT DATE: 02-28-1997  
 CURRENT TIME: 10:06:15

FILE DATE: 10-09-1996  
 FILE NAME: FH05-#3

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PERFORMANCE CURVE FOR CULVERT # 2 - 1 ( 10 BY 10 ) CSP

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:  
 DIS- HEAD- INLET OUTLET  
 CHARGE WATER CONTROL CONTROL FLOW NORMAL CRITICAL OUTLET TAILWATER  
 FLOW ELEV. DEPTH DEPTH TYPE DEPTH DEPTH VEL. DEPTH VEL. DEPTH  
 (cfs) (ft) (ft) (ft) <F4> (ft) (ft) (fps) (ft) (fps) (ft)

0	1620.00	0.00	0.12	0-NF	0.00	0.00	0.00	0.00	0.00	1.12
45	1622.49	2.61	2.42	3-M1t	1.60	1.45	3.74	2.08	4.50	2.08
90	1623.41	3.35	3.53	3-M1t	2.33	2.17	5.57	2.59	5.78	2.59
131	1624.20	3.96	4.32	3-M1t	2.85	2.62	6.63	3.00	6.67	3.00
172	1624.88	4.53	5.00	3-M1t	3.27	3.05	6.99	3.50	6.75	3.50
213	1625.49	5.08	5.61	3-M1t	3.67	3.39	7.57	3.88	6.83	3.88
239	1625.85	5.42	5.97	3-M1t	3.92	3.60	8.00	4.05	6.91	4.05
301	1626.66	6.19	6.78	3-M2t	4.45	4.09	9.00	4.41	7.15	4.41
344	1627.19	6.69	7.31	3-M2t	4.81	4.37	9.70	4.62	7.31	4.62
388	1627.70	7.20	7.82	3-M2t	5.17	4.65	10.38	4.81	7.47	4.81
431	1628.19	7.69	8.31	3-M2t	5.51	4.93	11.03	4.98	7.62	4.98

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El. inlet face invert 1619.88 ft El. outlet invert 1618.88 ft  
 El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

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***** SITE DATA ***** CULVERT INVERT *****
INLET STATION (FT)                0.00
INLET ELEVATION (FT)              1619.88
OUTLET STATION (FT)               150.00
OUTLET ELEVATION (FT)             1618.88
NUMBER OF BARRELS                  1
SLOPE (V-FT/H-FT)                 0.0067
CULVERT LENGTH ALONG SLOPE (FT)   150.00

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***** CULVERT DATA SUMMARY *****
BARREL SHAPE                       CIRCULAR
BARREL DIAMETER                     10.00 FT
BARREL MATERIAL                     CORRUGATED STEEL
BARREL MANNING'S N                  0.024
INLET TYPE                          CONVENTIONAL
INLET EDGE AND WALL                 THIN EDGE PROJECTING
INLET DEPRESSION                    NONE

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CURRENT DATE: 02-28-1997  
CURRENT TIME: 10:06:15

FILE DATE: 10-09-1996  
FILE NAME: FH05-#3

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:                               TAILWATER                               :
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***** USER DEFINED CHANNEL CROSS-SECTION
MAIN CHANNEL ONLY
LEFT CHANNEL BOUNDARY              0
RIGHT CHANNEL BOUNDARY             0
MANNING N LEFT OVER BANK           0.000
MANNING N MAIN CHANNEL             0.045
MANNING N RIGHT OVER BAN           0.000
SLOPE OF CHANNEL (FT/FT)          0.0220

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FILE NAME: FH05TW05  
FILE DATE: 07-08-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1633.90
2	10.00	1630.00
3	20.00	1626.00
4	40.00	1624.00

6/6

5	50.00	1622.00
6	51.00	1620.00
7	68.00	1620.00
8	69.00	1622.00
9	90.00	1624.00
10	110.00	1628.00
11	131.00	1630.00

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1620.00	0.000	0.12	0.00	0.00
74.70	1620.96	0.818	1.08	4.50	1.21
149.40	1621.47	0.859	1.59	5.78	1.76
224.10	1621.88	0.880	2.00	6.67	2.18
298.80	1622.38	0.891	2.50	6.75	2.22
373.50	1622.76	0.901	2.88	6.83	2.26
417.00	1622.93	0.906	3.05	6.91	2.30
522.90	1623.29	0.918	3.41	7.15	2.42
597.60	1623.50	0.925	3.62	7.31	2.50
672.30	1623.69	0.932	3.81	7.47	2.59
747.00	1623.86	0.938	3.98	7.62	2.67

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..... ROADWAY OVERTOPPING DATA .....  
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.....  
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WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 80.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1634.00
2	12.00	1633.60
3	42.00	1633.00
4	82.00	1632.70
5	116.00	1632.70
6	136.00	1634.00

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**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Fountain Hills Boulevard & Balboa Wash  
 ADMP- 05, Alternate 3: Remove Existing 2-54" CMPs, Install 2-120"x150' CMPs

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,382.00	1	\$1,382
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	2	\$1,600
2020020	Removal of Concrete Curb	LFT.	\$2.00	240	\$480
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1014	\$1,420
2020201	Saw Cutting	L.FT.	\$5.00	152	\$760
2030401	Drainage Excavation	CU.YD.	\$5.00	1180	\$5,900
2050001	Grading For Pavement	SQ.YD.	\$2.50	1014	\$2,535
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	169	\$5,915
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	378	\$17,010
5010079	Pipe, Corrugated Metal, 108"	L.FT.	\$230.00	300	\$69,000
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	3	\$7,200
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$5,527.00	1	\$5,527
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$829.00	1	\$829
8081008	Water Main (8")	L.FT.	\$65.00	120	\$7,800
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	250	\$8,750
9010001	Mobilization (10%)	L.SUM	\$13,818.00	1	\$13,818
9080140	Concrete Gutter	L.FT.	\$10.00	240	\$2,400
9130008	Riprap (Dumped) (12"Dia., D50)	CU. YD.	\$64.00	110	\$7,040
9240170	Contractor Quality Control (2%)	L.SUM	\$2,764.00	1	\$2,764
9250001	Construction Surveying and Layout (2%)	L.SUM	\$2,671.00	1	\$2,671
Sub-Total					\$165,176
Engineering and Contingencies (15%)					\$24,780
<b>TOTAL</b>					<b>\$189,956</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE \$190,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

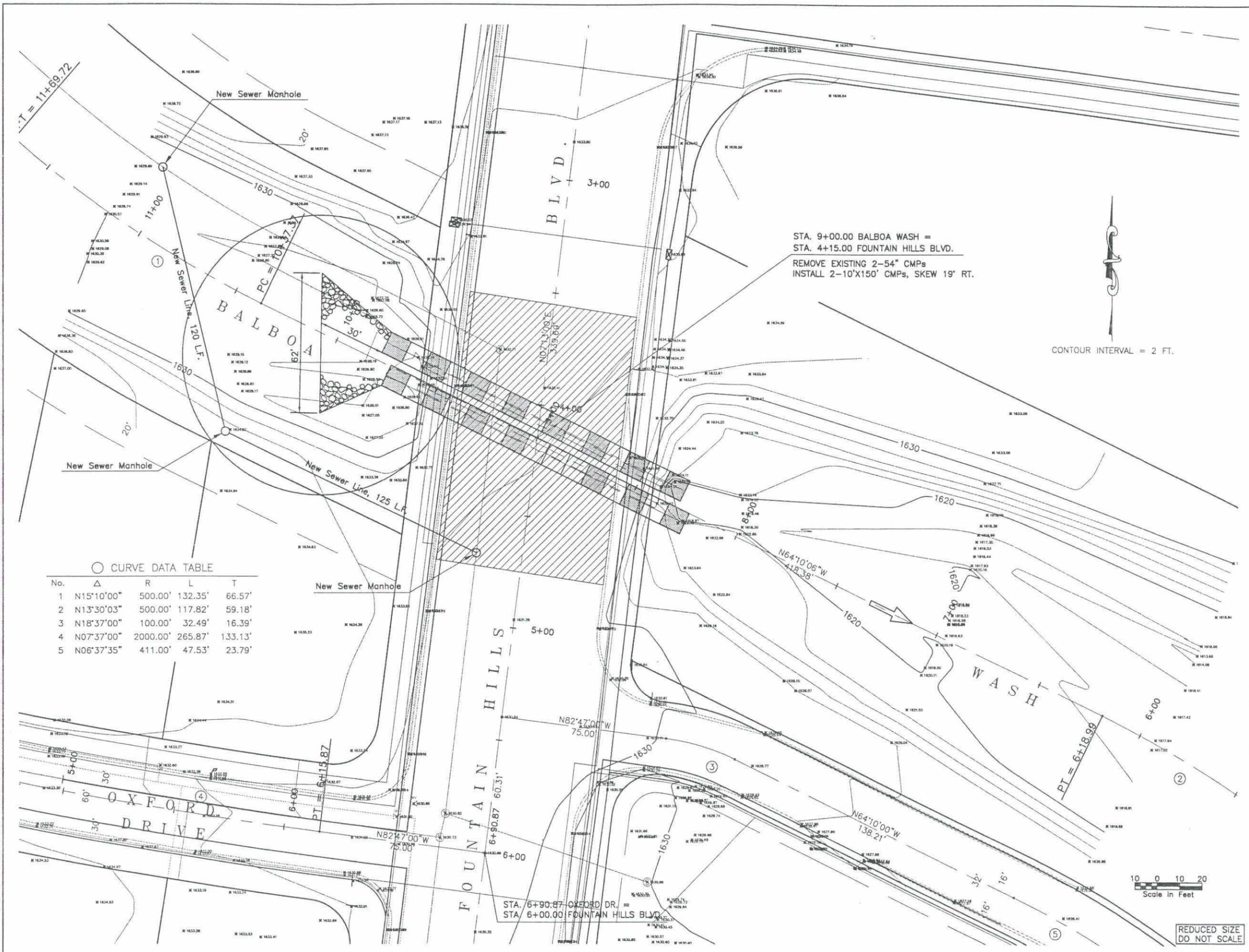
NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N15°10'00"	500.00'	132.35'	66.57'
2	N13°30'03"	500.00'	117.82'	59.18'
3	N18°37'00"	100.00'	32.49'	16.39'
4	N07°37'00"	2000.00'	265.87'	133.13'
5	N06°37'35"	411.00'	47.53'	23.79'

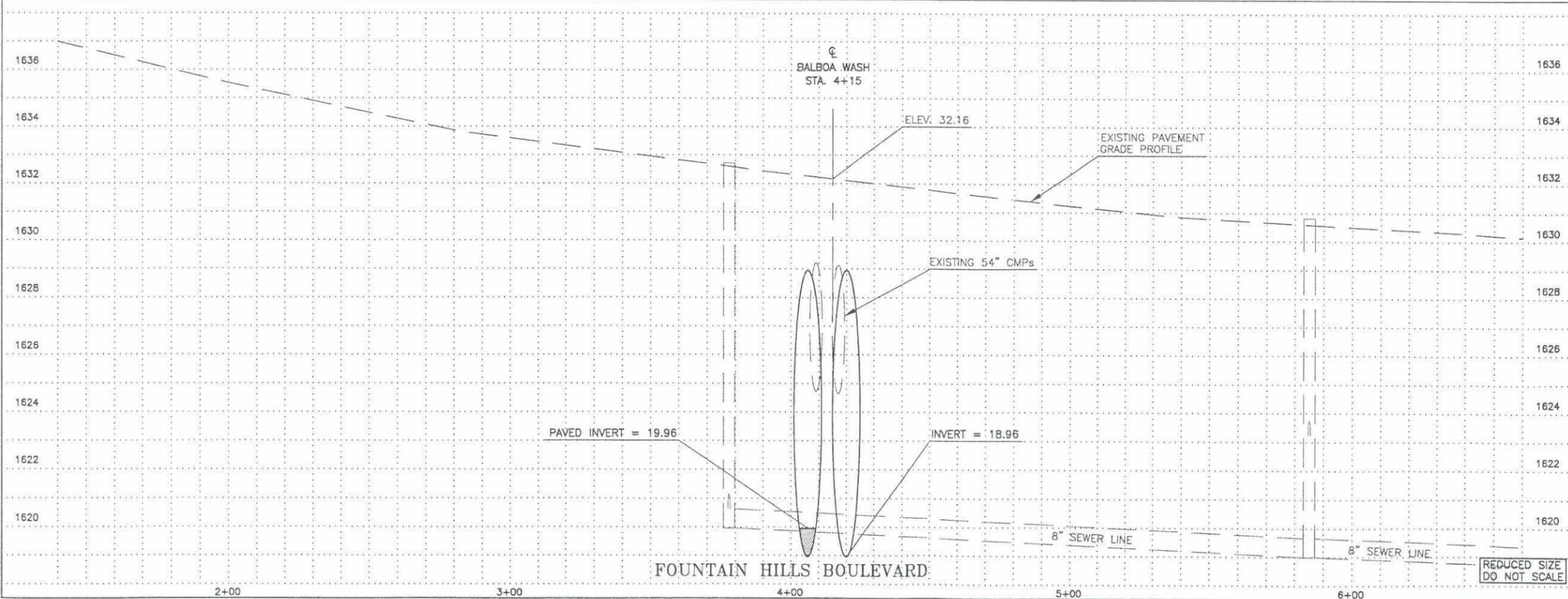
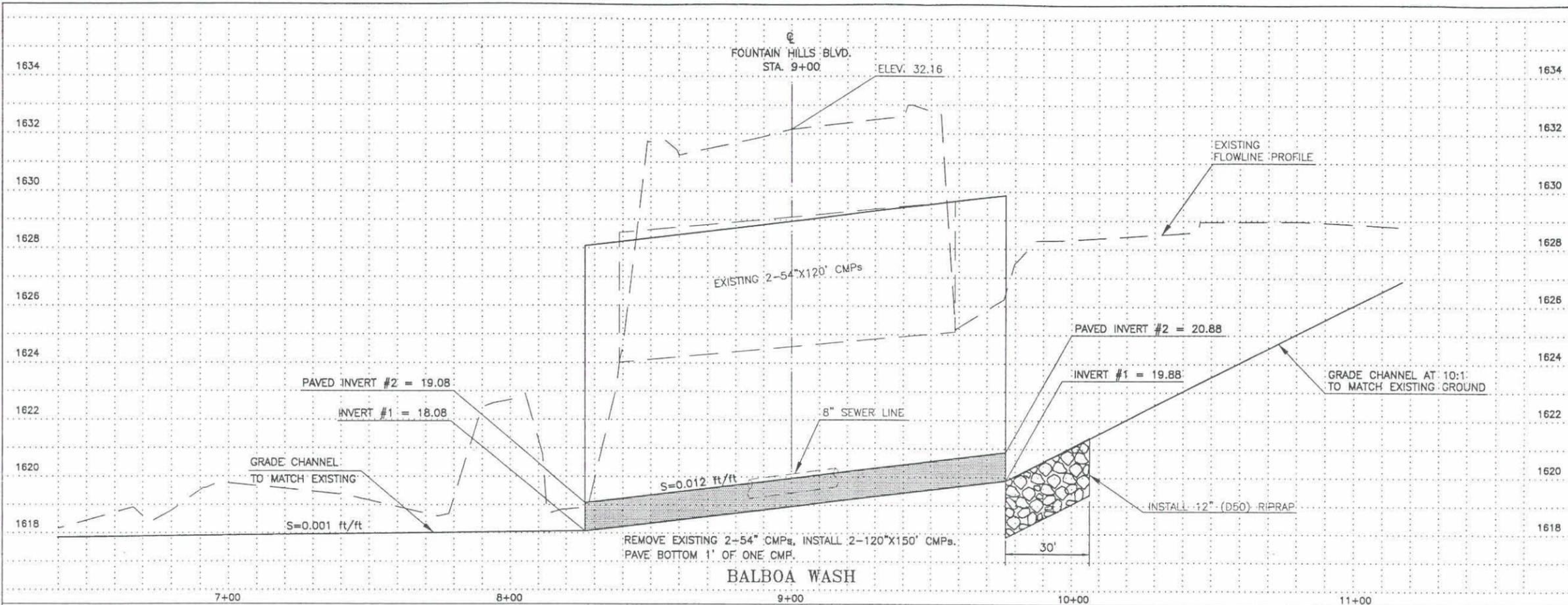
3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY</b> <b>ENGINEERING DIVISION</b> <b>FOUNTAIN HILLS ADMP</b> <b>FOUNTAIN HILLS BLVD. &amp; BALBOA WASH</b> <b>PROJECT NO. 94-16</b>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETTY ENGINEERS, LTD.</b>		
PLAN SHEET ADMP 5 - ALTERNATE 3			SHEET OF 1 2

REDUCED SIZE  
DO NOT SCALE

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

**REQUIREMENTS**

EXISTING CONDITION Q100= 721 CFS (1995)  
FUTURE CONDITION Q100= 747 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
FOUNTAIN HILLS BLVD. & BALBOA WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

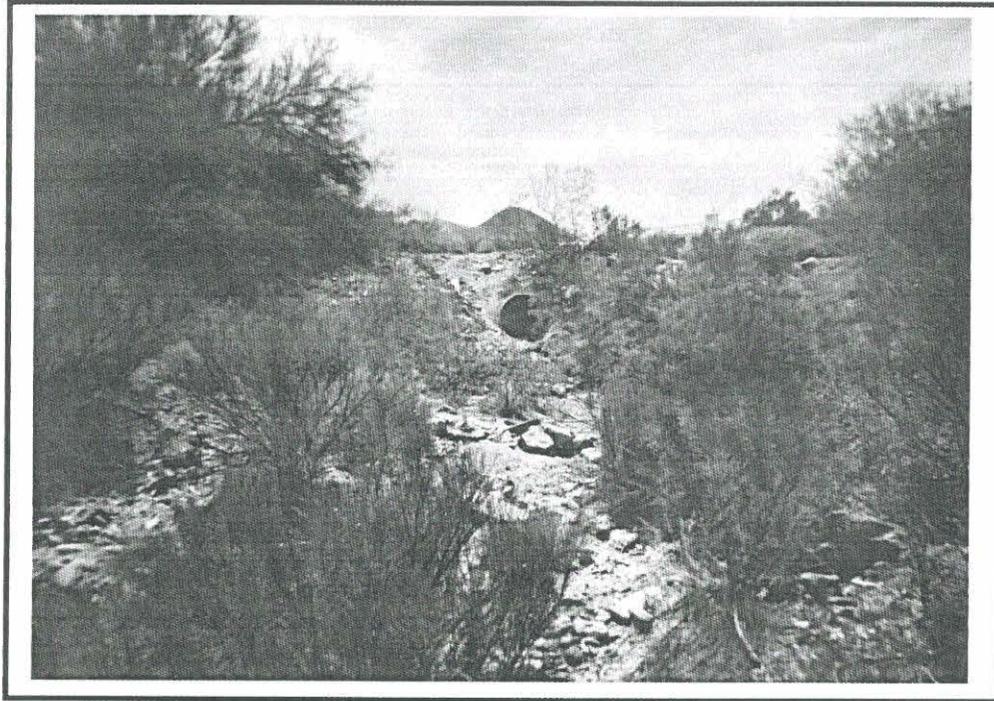
PRELIMINARY NOT FOR CONSTRUCTION  
GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PROFILE SHEET ADMP 5 - ALTERNATE 3

SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

ADMP 6: Boulder Drive / Hesperus Wash



Hesperus Wash Culvert Outlet  
*Looking Towards Boulder Drive*



Hesperus Wash  
*Looking Downstream From Boulder Drive*



Job No.: 92-404:004

Job Name: Fountain Hills

Reconnaissance by:  
REC 6-20-96  
CLJ 6-20-96  
Inits. Date

### Field Reconnaissance Sheet

Site No.: ADMPC6

Roadway: Boulder Dr.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Hesperus Wash	490	500	1-60" CMP

Reason for Analysis / Existing Deficiency: Existing culvert inadequate, 100 year flow over top culvert and floods street before returning to channel.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 6 ft. Downstream: 5 ft.
- 2) Can the culvert be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, 2 ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, (minor) ft.  No  
Downstream?  Yes, 2 ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer lines run both down the wash and across it on Boulder Dr. Electric, TV Cable, Phone and water lines cross wash along Boulder Dr.
- 5) Structures: Lift station (?) adjacent to culvert crossing. Lots of sewer lines & manholes in the area.
- 6) Right-of-Way: \_\_\_\_\_
- 7) Miscellaneous field notes, comments, or design ideas:  
Culvert has lots of cover. Larger diameter pipes possible. No need to change existing road profile. Sewer lines may be a problem. Lift station may be a problem. Possible to add 2-3 more pipes (same size as existing)

ALTERNATE 1

1/4

Hesperus Wash + Boulder Drive (3-60" x 168' CMP)

1

CURRENT DATE: 02-28-1997  
 CURRENT TIME: 10:59:43

FILE DATE: 10-09-1996  
 FILE NAME: FH06-#1

FHWA CULVERT ANALYSIS

HY-8, VERSION 4.3

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	U	-----			-----			
L	INLET	OUTLET	CULVERT	BARRELS				
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE
-----								
1	1778.23	1775.77	168.52	3 CSP	5.00	5.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS)

FILE: FH06-#1

DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1778.23	0	0	0	0	0	0	0	0	1
1779.91	50	50	0	0	0	0	0	0	1
1780.59	100	100	0	0	0	0	0	0	1
1781.19	150	150	0	0	0	0	0	0	1
1781.74	200	200	0	0	0	0	0	0	1
1782.28	250	250	0	0	0	0	0	0	1

Conclusion: Not overtopped by 10-year or 100-year

2/4

1782.58	10.4R	278	278	0	0	0	0	0	0	0	1
1783.36		349	349	0	0	0	0	0	0	0	1
1784.31		399	399	0	0	0	0	0	0	0	1
1784.72		449	449	0	0	0	0	0	0	0	1
1785.29	100.4R	499	499	0	0	0	0	0	0	0	1
1789.30		691	691	0	0	0	0	0	0	0	1

0 OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH06-#1 DATE: 10-09-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1778.23	0.00	0	0	0.00
1779.91	0.00	50	0	0.00
1780.59	0.00	100	0	0.00
1781.19	0.00	150	0	0.00
1781.74	0.00	200	0	0.00
1782.28	0.00	250	0	0.00
1782.58	0.00	278	0	0.00
1783.36	0.00	349	0	0.00
1784.31	0.00	399	0	0.00
1784.72	0.00	449	0	0.00
1785.29	0.00	499	0	0.00

<1> TOLERANCE (FT) = 0.010

<2> TOLERANCE (%) = 1.000

CURRENT DATE: 02-28-1997  
 CURRENT TIME: 10:59:43

FILE DATE: 10-09-1996  
 FILE NAME: FH06-#1

PERFORMANCE CURVE FOR CULVERT # 1 - 3 ( 5 BY 5 ) CSP

DIS-CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1778.23	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-2.60
50	1779.91	1.68	1.68	1-S2n	1.05	1.11	5.63	1.05	3.15	-1.58
100	1780.59	2.36	2.36	1-S2n	1.50	1.59	6.74	1.50	4.05	-1.27
150	1781.19	2.96	2.96	1-S2n	1.84	1.98	7.59	1.84	4.67	-1.02



4/4

MANNING N LEFT OVER BANK 0.000  
 MANNING N MAIN CHANNEL 0.050  
 MANNING N RIGHT OVER BAN 0.000  
 SLOPE OF CHANNEL (FT/FT) 0.0230

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1784.43
2	6.00	1782.00
3	30.00	1774.00
4	55.00	1773.17
5	60.00	1776.00
6	66.00	1778.00
7	72.00	1780.00
8	75.00	1782.00

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1773.17	0.000	-2.60	0.00	0.00
49.90	1774.19	0.722	-1.58	3.15	0.84
99.80	1774.50	0.767	-1.27	4.05	1.22
149.70	1774.75	0.794	-1.02	4.67	1.51
199.60	1774.97	0.813	-0.80	5.16	1.76
249.50	1775.16	0.828	-0.61	5.57	1.97
278.00	1775.27	0.836	-0.50	5.78	2.09
349.30	1775.50	0.851	-0.27	6.24	2.34
399.20	1775.66	0.860	-0.11	6.53	2.50
449.10	1775.81	0.867	0.04	6.78	2.65
499.00	1775.94	0.874	0.17	7.01	2.78

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 ..... ROADWAY OVERTOPPING DATA .....  
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 .....  
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WEIR COEFFICIENT 2.67  
 EMBANKMENT TOP WIDTH (FT) 130.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1790.00
2	16.00	1789.77
3	32.00	1789.30
4	45.00	1789.70
5	71.00	1790.00

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**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Boulder Drive & Hesperus Wash  
 ADMP- 06, Alternate 1: Install Additional 2-60"x170' CMPs

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$595.00	1	\$595
2020020	Removal of Concrete Curb	LFT.	\$2.00	300	\$600
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	592	\$829
2020201	Saw Cutting	L.FT.	\$5.00	72	\$360
2030401	Drainage Excavation	CU.YD.	\$5.00	153	\$765
2050001	Grading For Pavement	SQ.YD.	\$2.50	592	\$1,480
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	99	\$3,465
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	74	\$3,330
5010045	Pipe, Corrugated Metal, 60"	L.FT.	\$120.00	340	\$40,800
5016060	Relocate Corrugated Metal Pipe, 60"	L.FT.	\$18.00	170	\$3,060
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	2	\$550
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$2,379.00	1	\$2,379
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$357.00	1	\$357
9010001	Mobilization (10%)	L.SUM	\$5,948.00	1	\$5,948
9080140	Concrete Gutter	L.FT.	\$10.00	200	\$2,000
9130003	Riprap (Grouted)	CU. YD.	\$80.00	18	\$1,440
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	11	\$704
9240170	Contractor Quality Control (2%)	L.SUM	\$1,190.00	1	\$1,190
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,190.00	1	\$1,190
Sub-Total					\$71,142
Engineering and Contingencies (15%)					\$10,670
<b>TOTAL</b>					<b>\$81,812</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$82,000**

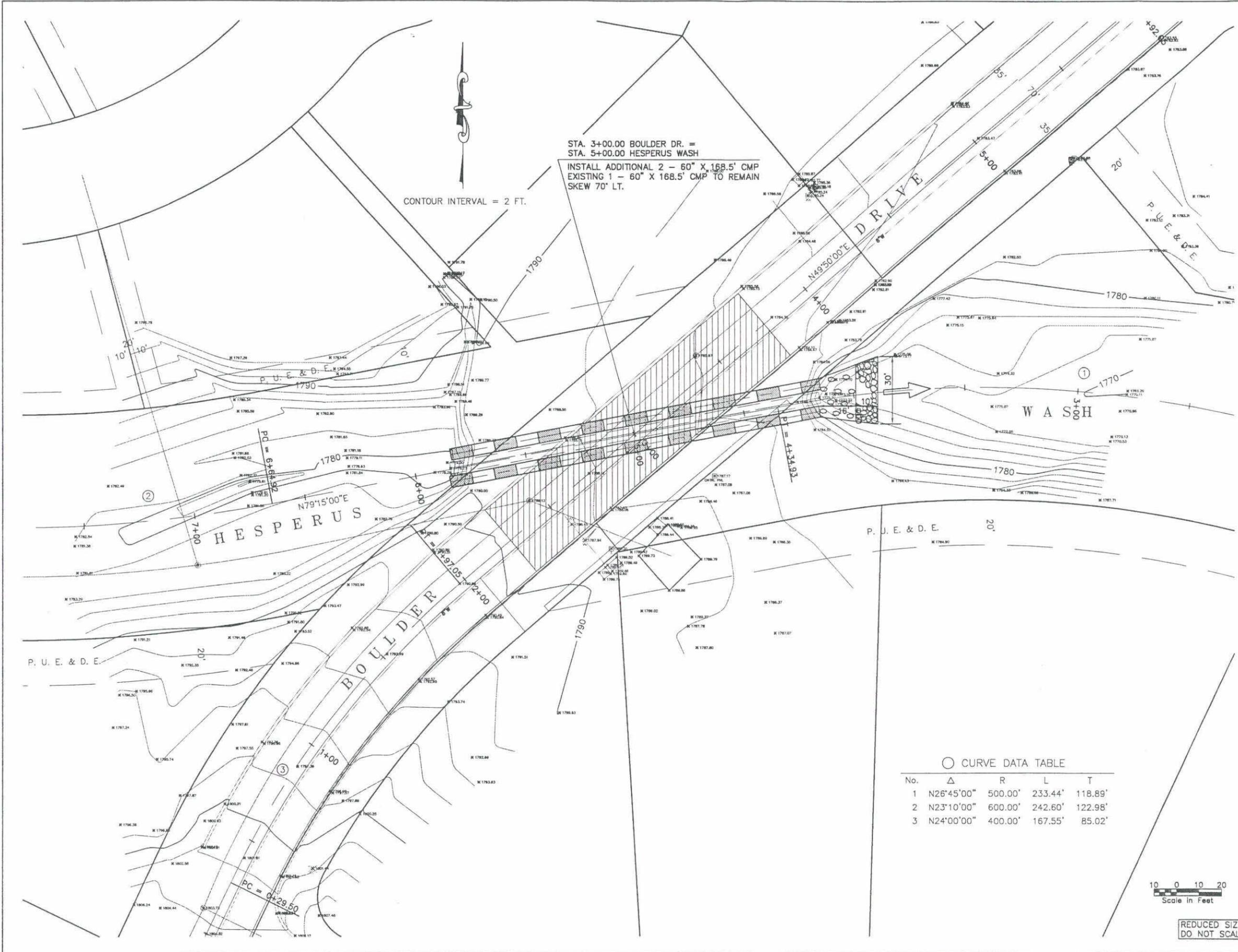
NOTE:  
 PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXX
- 7 XXXX  
XXXXX
- 8 XXXX
- 9 XXXX  
XXXX



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION

FOUNTAIN HILLS ADMP BOULDER DRIVE & HESPERUS WASH PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/98
DRAWN	C. JOY	6/3/98
CHECKED	F. BROWN	6/3/98

PRELIMINARY NOT FOR CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with

**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

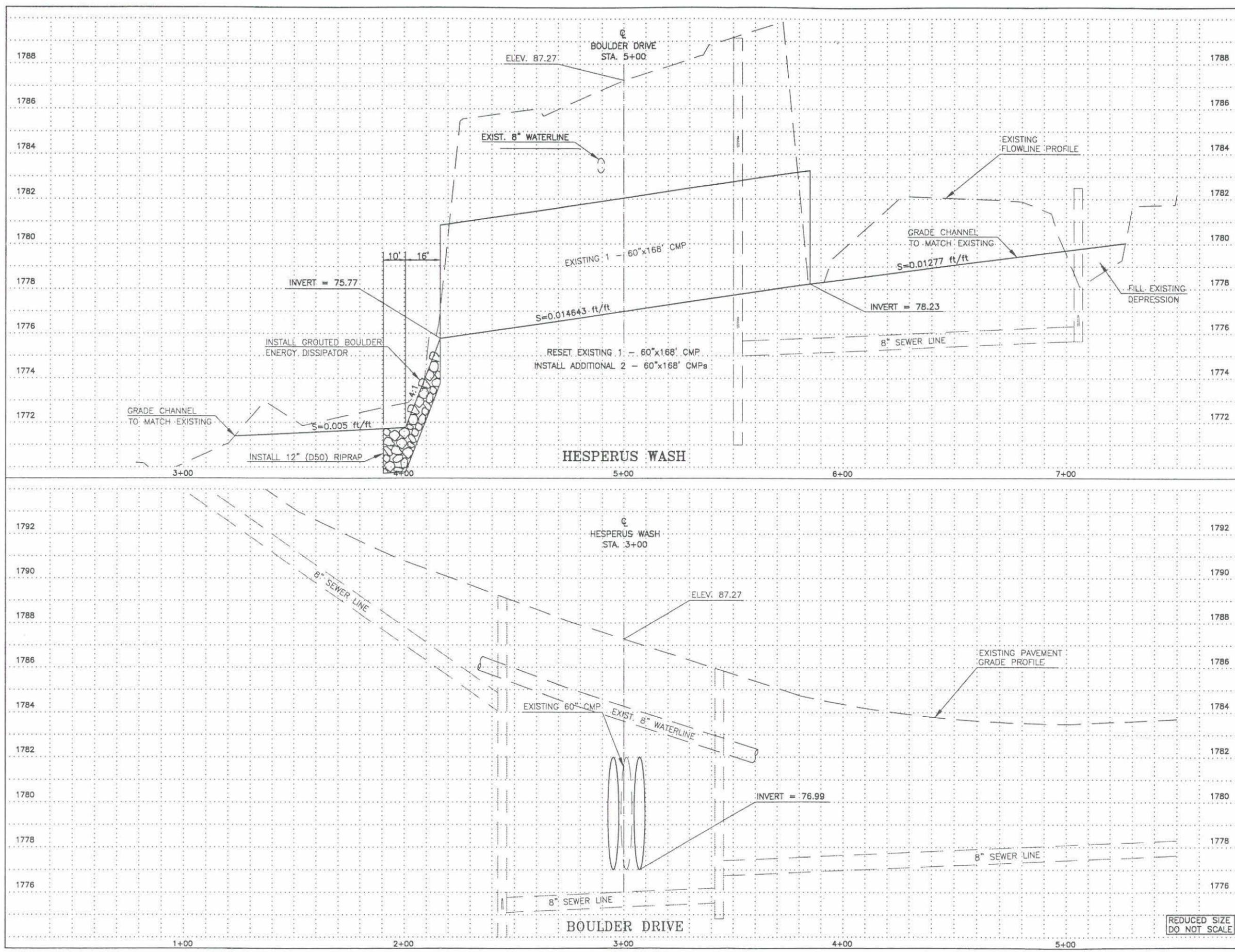
PLAN SHEET ADMP 6 - ALTERNATE 1

SHEET OF 1 2

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-802-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 489 CFS (1995)  
FUTURE CONDITION Q100= 499 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
BOULDER DRIVE & HESPERUS WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY  
NOT FOR  
CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PROFILE SHEET  
ADMP 6 - ALTERNATE 1

SHEET OF  
2 2

REDUCED SIZE  
DO NOT SCALE

# ALTERNATE 2

CURRENT DATE: 02-28-1997  
 CURRENT TIME: 13:31:55

FILE DATE: 10-09-1996  
 FILE NAME: FH06-#2

```

    .....
    :
    .....      FHWA CULVERT ANALYSIS      .....
    :
    .....      HY-8, VERSION 4.3          .....
    :
    .....
    
```

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET					
U	-----								
L	INLET	OUTLET	CULVERT	BARRELS					
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET	
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE	
	-----								
1	1776.40	1773.13	185.03	1 ICMP	10.00	9.00	.024	CONVENTIONAL	
2									
3									
4									
5									
6									

SUMMARY OF CULVERT FLOWS (CFS)

FILE: FH06-#2

DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1776.40	0	0	0	0	0	0	0	0	1
1778.96	50	50	0	0	0	0	0	0	1
1780.22	100	100	0	0	0	0	0	0	1
1781.32	150	150	0	0	0	0	0	0	1
1782.19	200	200	0	0	0	0	0	0	1
1782.90	250	250	0	0	0	0	0	0	1

CONCLUSION: Not overtopped by 10-year or 100-year.

2/5

1783.26	10-yr	278	278	0	0	0	0	0	0	1
1784.09		349	349	0	0	0	0	0	0	1
1784.68		399	399	0	0	0	0	0	0	1
1785.31		449	449	0	0	0	0	0	0	1
1786.02	100-yr	499	499	0	0	0	0	0	0	1
1789.70		695	695	0	0	0	0	0	0	OVERTOPPING

.....

.....

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH06-#2 DATE: 10-09-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1776.40	0.00	0	0	0.00
1778.96	0.00	50	0	0.00
1780.22	0.00	100	0	0.00
1781.32	0.00	150	0	0.00
1782.19	0.00	200	0	0.00
1782.90	0.00	250	0	0.00
1783.26	0.00	278	0	0.00
1784.09	0.00	349	0	0.00
1784.68	0.00	399	0	0.00
1785.31	0.00	449	0	0.00
1786.02	0.00	499	0	0.00

.....

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

.....

CURRENT DATE: 02-28-1997 FILE DATE: 10-09-1996  
 CURRENT TIME: 13:31:55 FILE NAME: FH06-#2

.....

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 10 BY 9 ) ICMP

.....

DIS-CHARGE FLOW (cfs)	HEAD- ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1776.40	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.04
50	1778.96	2.56	2.56	1-S2n	0.98	1.15	7.22	0.98	3.15	1.06
100	1780.22	3.82	3.82	1-S2n	1.45	1.82	9.12	1.45	4.05	1.37
150	1781.32	4.92	4.92	1-S2n	1.90	2.29	10.15	1.90	4.67	1.62



4/5

3	1.00	8.00	2.00
4	1.50	8.57	1.43
5	2.00	9.00	1.00
6	2.50	9.33	1.00
7	3.00	9.59	1.00
8	3.50	9.77	1.00
9	4.00	9.90	1.00
10	5.00	10.00	1.00
11	6.00	9.90	1.00
12	6.50	9.77	1.00
13	7.00	9.59	1.00
14	7.50	9.33	1.00
15	8.00	9.00	1.00
16	8.50	8.57	1.43
17	9.00	8.00	2.00
18	9.50	7.18	2.82
19	10.00	5.00	5.00

.....

:  
█

4

CURRENT DATE: 02-28-1997  
CURRENT TIME: 13:31:55

FILE DATE: 10-09-1996  
FILE NAME: FH06-#2

.....

..... TAILWATER .....

:  
:  
:

\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL ONLY  
LEFT CHANNEL BOUNDARY 0  
RIGHT CHANNEL BOUNDARY 0  
MANNING N LEFT OVER BANK 0.000  
MANNING N MAIN CHANNEL 0.050  
MANNING N RIGHT OVER BAN 0.000  
SLOPE OF CHANNEL (FT/FT) 0.0230

FILE NAME: FH06TWE  
FILE DATE: 07-18-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1784.43
2	6.00	1782.00
3	30.00	1774.00
4	55.00	1773.17
5	60.00	1776.00
6	66.00	1778.00
7	72.00	1780.00
8	75.00	1782.00



**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Boulder Drive & Hesperus Wash  
 ADMP- 06, Alternate 2: Remove Existing 60" CMP, Install 1-120"x185' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$865.00	1	\$865
2020001	Removal of Structures and Obstructions	L.SUM	\$1,850.00	1	\$1,850
2020020	Removal of Concrete Curb	LFT.	\$2.00	300	\$600
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	592	\$829
2020201	Saw Cutting	L.FT.	\$5.00	72	\$360
2030401	Drainage Excavation	CU.YD.	\$5.00	377	\$1,885
2050001	Grading For Pavement	SQ.YD.	\$2.50	592	\$1,480
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	99	\$3,465
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	130	\$5,850
5010079	Pipe, Corrugated Metal, 108"	L.FT.	\$230.00	185	\$42,550
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	1	\$2,400
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	2	\$550
5050221	Reconstruct Manhole	EACH	\$800.00	1	\$800
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$3,461.00	1	\$3,461
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$519.00	1	\$519
8081008	Water Main (8")	L.FT.	\$65.00	150	\$9,750
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	99	\$3,465
8095101	Drop Sewer Connection (C-22.35)	L.SUM	\$3,500.00	1	\$3,500
9010001	Mobilization (10%)	L.SUM	\$8,653.00	1	\$8,653
9080140	Concrete Gutter	L.FT.	\$10.00	300	\$3,000
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	64	\$4,096
9240170	Contractor Quality Control (2%)	L.SUM	\$1,731.00	1	\$1,731
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,731.00	1	\$1,731
Sub-Total					\$103,490
Engineering and Contingencies (15%)					\$15,520
<b>TOTAL</b>					<b>\$119,010</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$120,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXX
- 7 XXXX  
XXXXX
- 8 XXXX
- 9 XXXX  
XXXX

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N26°45'00"	500.00'	233.44'	118.89'
2	N23°10'00"	600.00'	242.60'	122.98'
3	N24°00'00"	400.00'	167.55'	85.02'



REDUCED SIZE  
DO NOT SCALE

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION

FOUNTAIN HILLS ADMP  
BOULDER DRIVE & HESPERUS WASH  
PROJECT NO. 94-16

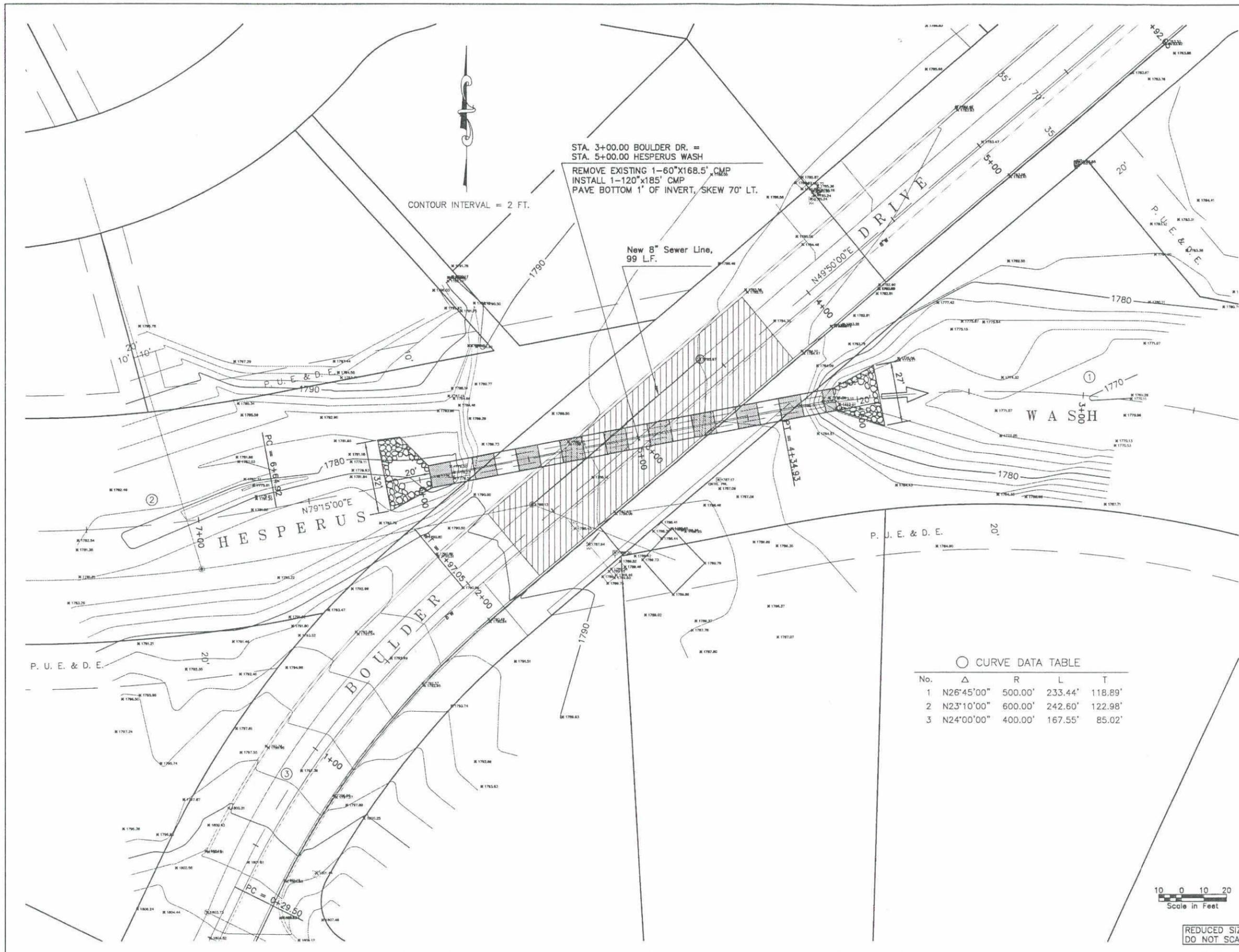
	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY  
NOT FOR  
CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

PLAN SHEET  
ADMP 6 - ALTERNATE 2

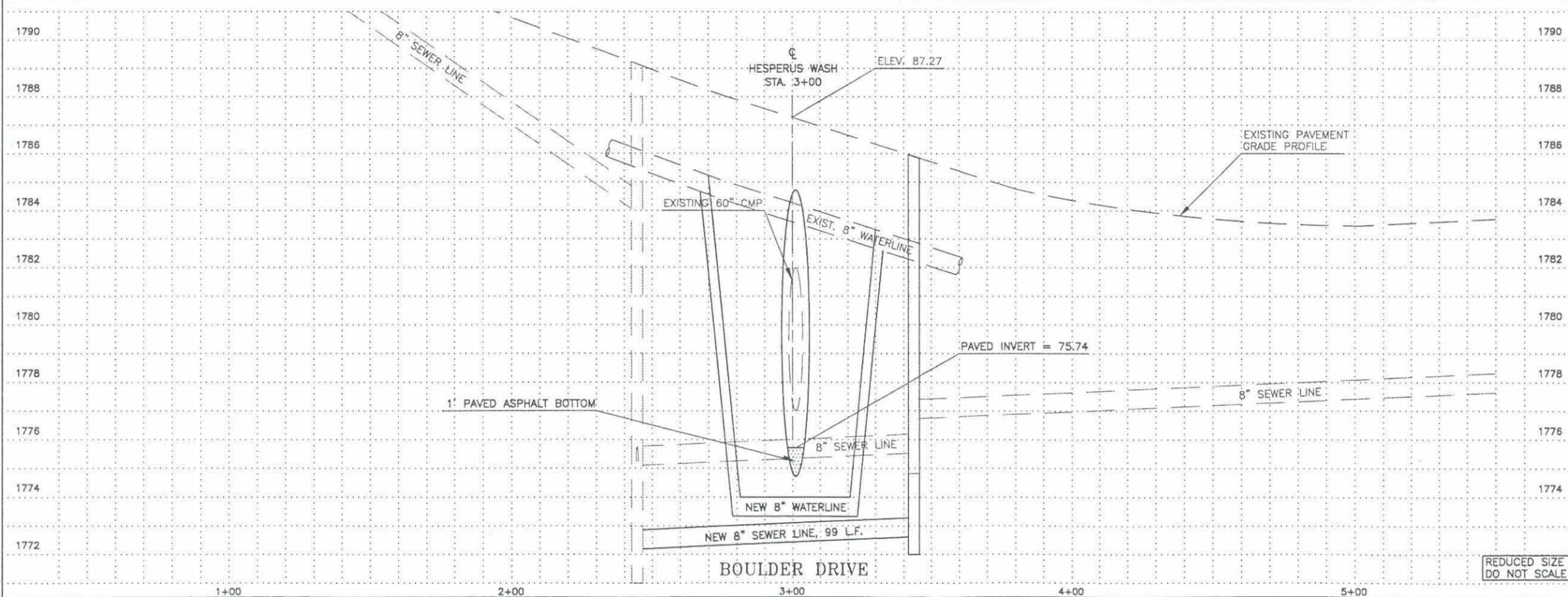
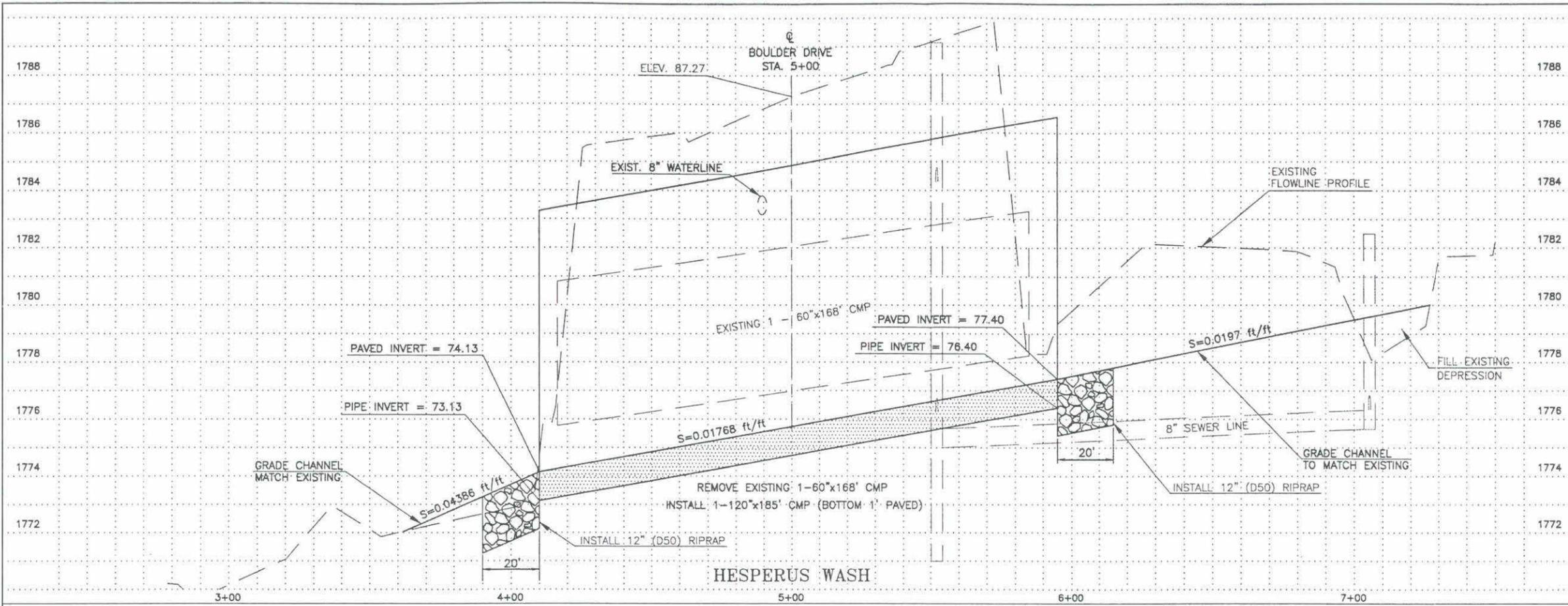
SHEET OF  
1 2



CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

**REQUIREMENTS**

EXISTING CONDITION Q100= 489 CFS (1995)  
FUTURE CONDITION Q100= 499 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
BOULDER DRIVE & HESPERUS WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	F. BROWN, R. CONSONI	6/3/95
DRAWN	C. JOY	6/3/95
CHECKED	F. BROWN	6/3/95

PRELIMINARY NOT FOR CONSTRUCTION

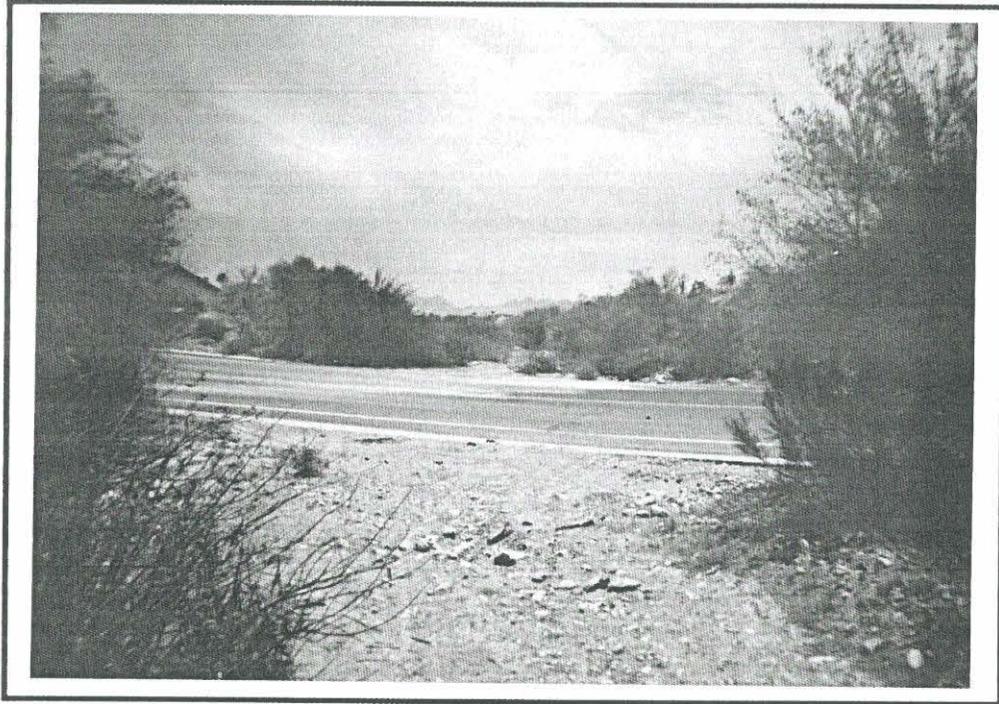
GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

PROFILE SHEET  
ADMP 6 - ALTERNATE 2

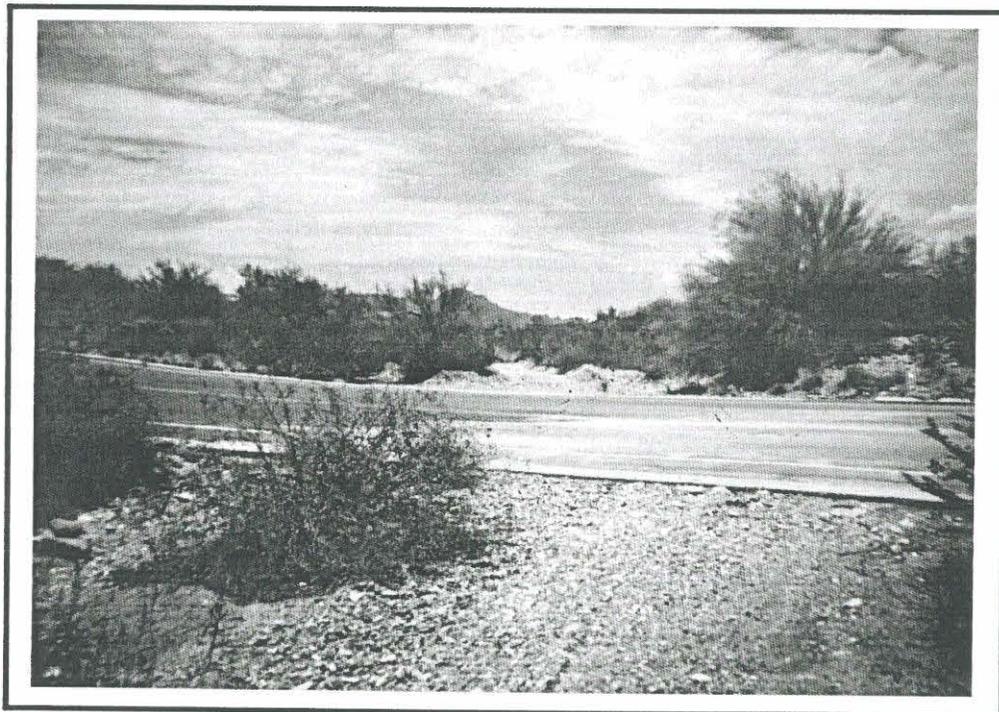
SHEET OF  
2 2

REDUCED SIZE  
DO NOT SCALE

ADMP 7: Glenbrook Boulevard / Balboa Wash



Balboa Wash  
*Looking Downstream Across Dip Section*



Balboa Wash  
*Looking Upstream Across Dip Section*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:

REL 6-20-96

CLT 6-20-96

Units: Date

### Field Reconnaissance Sheet

Site No.: ADMP 7

Roadway: Glenbrook Blvd.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Balboa Wash	660	660	dip section

Reason for Analysis / Existing Deficiency: Culvert desired at location to provide safe local access during 100 year storm event

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: — ft. Downstream: — ft.
- 2) Can the culvert be lowered: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No

#### Structure Modification Constraints:

4) Utilities: Sewer lines run both down the wash and across the wash on Glenbrook Blvd. Cable TV, Electric and waterlines cross wash along Glenbrook.

5) Structures: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6) Right-of-Way: \_\_\_\_\_  
\_\_\_\_\_

7) Miscellaneous field notes, comments, or design ideas:

Will be necessary to raise road profile. May need a grade check structure to lower wash. Possible to raise road 4'-5'. Raising road may impact driveways of local residents.

ALTERNATE 1







4/4

MANNING N LEFT OVER BANK 0.000  
 MANNING N MAIN CHANNEL 0.045  
 MANNING N RIGHT OVER BAN 0.000  
 SLOPE OF CHANNEL (FT/FT) 0.0150

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1649.44
2	8.00	1648.00
3	16.00	1644.00
4	47.50	1642.48
5	77.50	1642.48
6	103.00	1644.00
7	118.00	1652.00

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1642.48	0.000	-0.12	0.00	0.00
66.00	1643.11	0.633	0.51	2.53	0.46
132.00	1643.39	0.666	0.79	3.09	0.63
198.00	1643.60	0.686	1.00	3.47	0.74
264.00	1643.78	0.699	1.18	3.76	0.84
330.00	1643.93	0.710	1.33	3.99	0.92
370.00	1644.01	0.716	1.41	4.13	0.97
462.00	1644.16	0.731	1.56	4.50	1.10
528.00	1644.26	0.740	1.66	4.74	1.19
594.00	1644.36	0.749	1.76	4.95	1.27
660.00	1644.45	0.756	1.85	5.16	1.35

.....  
 :  
 : ROADWAY OVERTOPPING DATA :  
 :  
 :  
 :  
 :

WEIR COEFFICIENT 2.67  
 EMBANKMENT TOP WIDTH (FT) 84.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	490.00	1653.13
2	560.00	1650.99
3	600.00	1650.56
4	640.00	1650.56
5	700.00	1650.79
6	750.00	1651.16
7	840.00	1652.28

.....

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Glenbrook Boulevard & Balboa Wash  
 ADMP-07, Alternate 1: Install 6-48"x115' CMPs

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,128.00	1	\$1,128
2020020	Removal of Concrete Curb	LFT.	\$2.00	960	\$1,920
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	3142	\$4,399
2020201	Saw Cutting	L.FT.	\$5.00	120	\$600
2030401	Drainage Excavation	CU.YD.	\$5.00	175	\$875
2030902	Borrow (Roadway Fill)	CU.YD.	\$7.50	1898	\$14,235
2050001	Grading For Pavement	SQ.YD.	\$2.50	3142	\$7,855
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	118	\$4,130
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	524	\$23,580
5010035	Pipe, Corrugated Metal, 48"	L.FT.	\$55.00	690	\$37,950
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
7010001	Maintenance and Protection of Traffic (4%)	L.SUM	\$4,510.00	1	\$4,510
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$677.00	1	\$677
9010001	Mobilization (10%)	L.SUM	\$11,276.00	1	\$11,276
9080140	Concrete Gutter	L.FT.	\$10.00	960	\$9,600
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	105	\$6,720
9090034	Reset Frame & Cover for Valve Box Type B/A (MAG Det.	EACH	\$130.00	4	\$520
9240170	Contractor Quality Control (2%)	L.SUM	\$2,255.00	1	\$2,255
9250001	Construction Surveying and Layout (2%)	L.SUM	\$2,255.00	1	\$2,255
Sub-Total					\$134,860
Engineering and Contingencies (15%)					\$20,230
<b>TOTAL</b>					<b>\$155,090</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE \$156,000**

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N11°40'00"	1400.00'	285.07'	143.03'

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

CONTOUR INTERVAL = 2 FT.

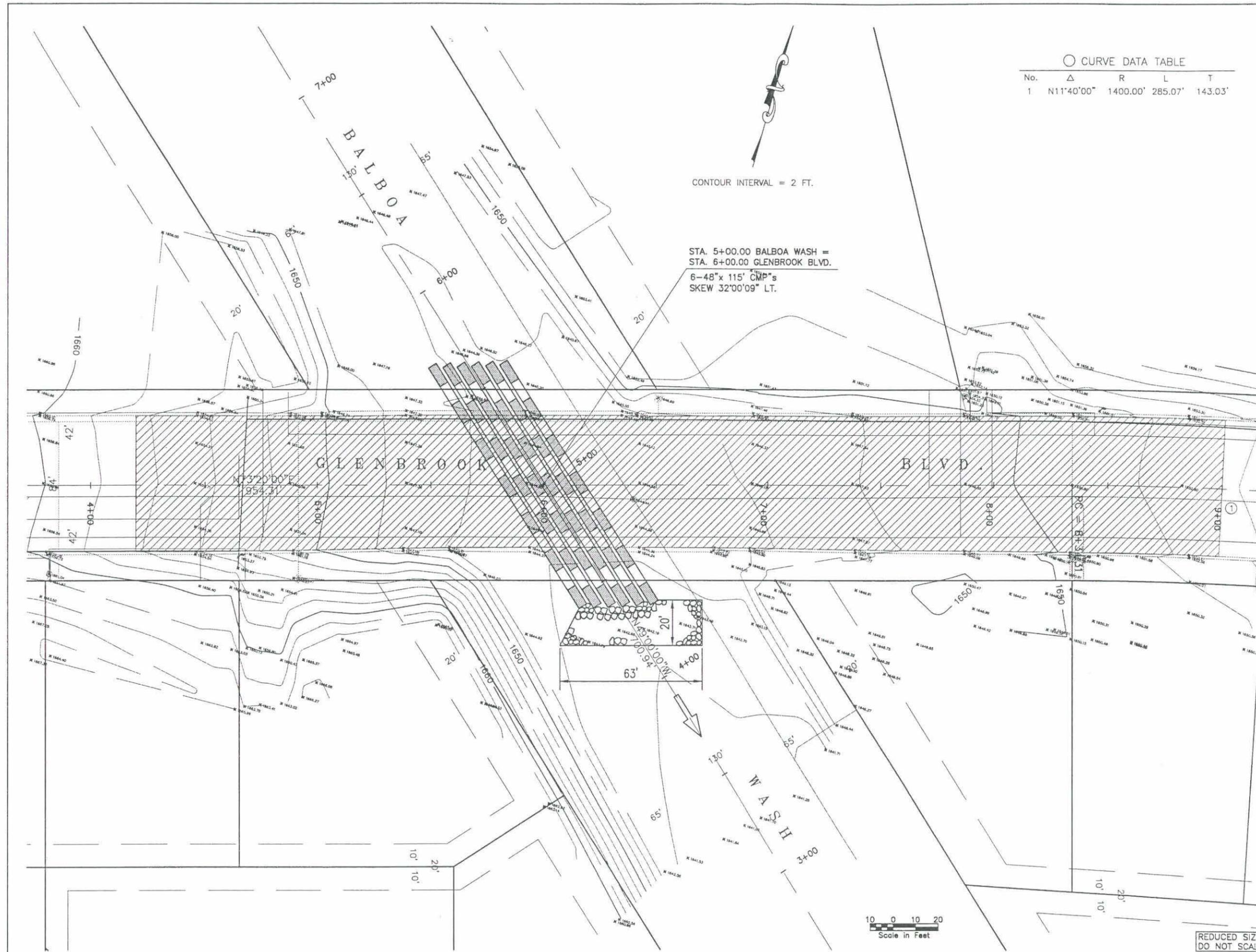
STA. 5+00.00 BALBOA WASH =  
STA. 6+00.00 GLENBROOK BLVD.  
6-48" x 115' CMP's  
SKEW 32°00'09" LT.

REMOVALS

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

NEW CONSTRUCTION

- 3 XXXX  
XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
GLENBROOK BOULEVARD & BALBOA WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/98
DRAWN	C. JOY	6/3/98
CHECKED	F. BROWN	6/3/98

PRELIMINARY  
NOT FOR  
CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

PLAN SHEET  
ADMP 7 - ALTERNATE 1

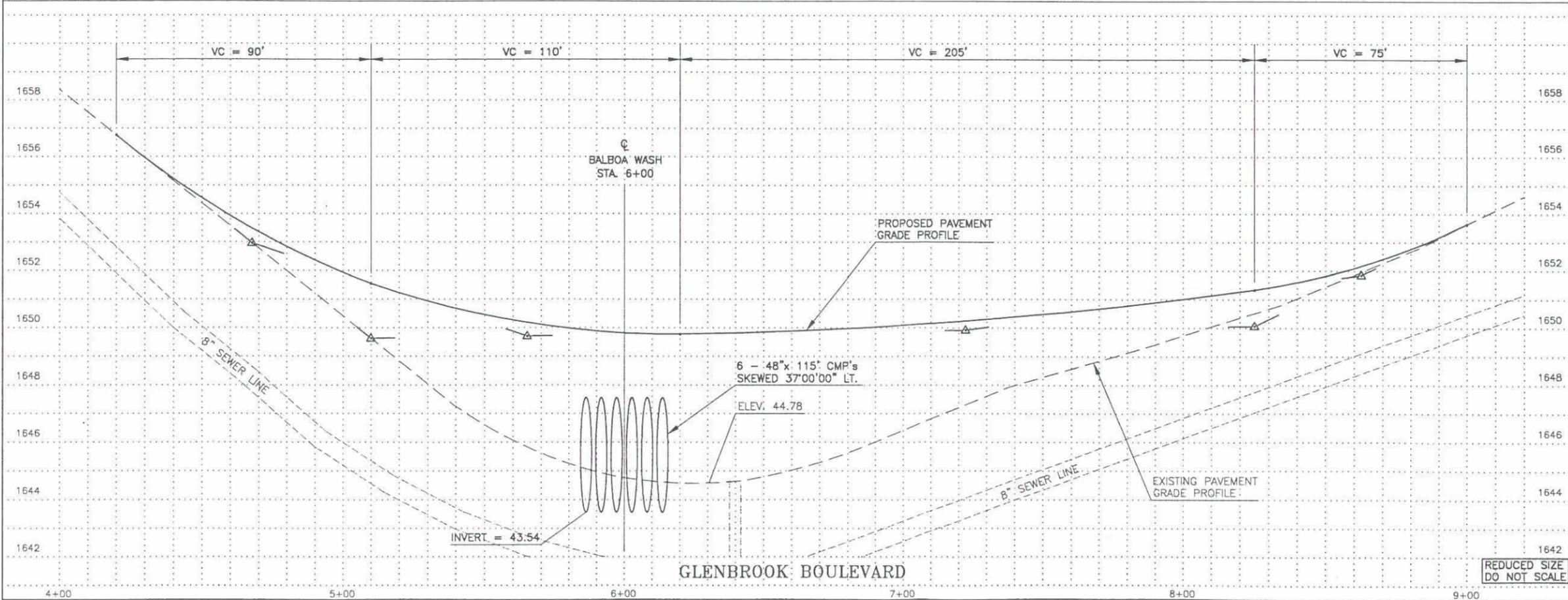
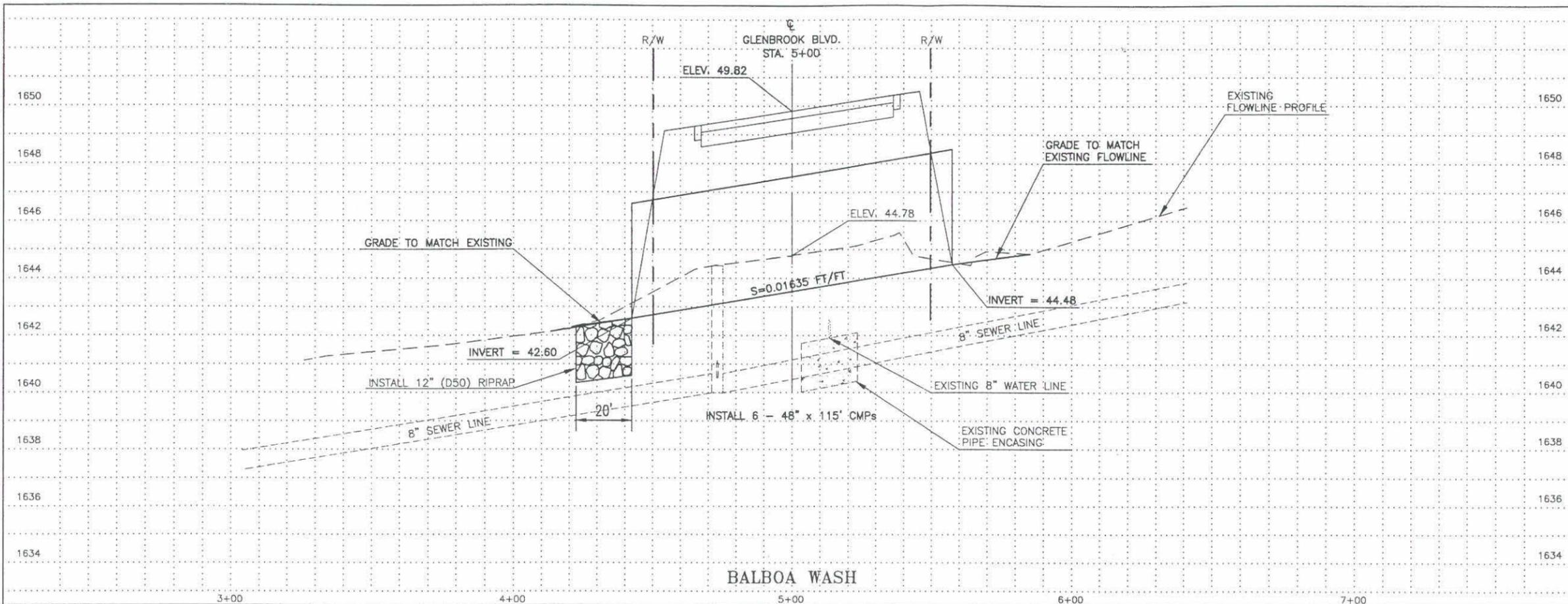
SHEET OF  
1 2

REDUCED SIZE  
DO NOT SCALE

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-800-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 366 CFS (1995)  
FUTURE CONDITION Q100= 658 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
GLENBROOK BOULEVARD & BALBOA WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION

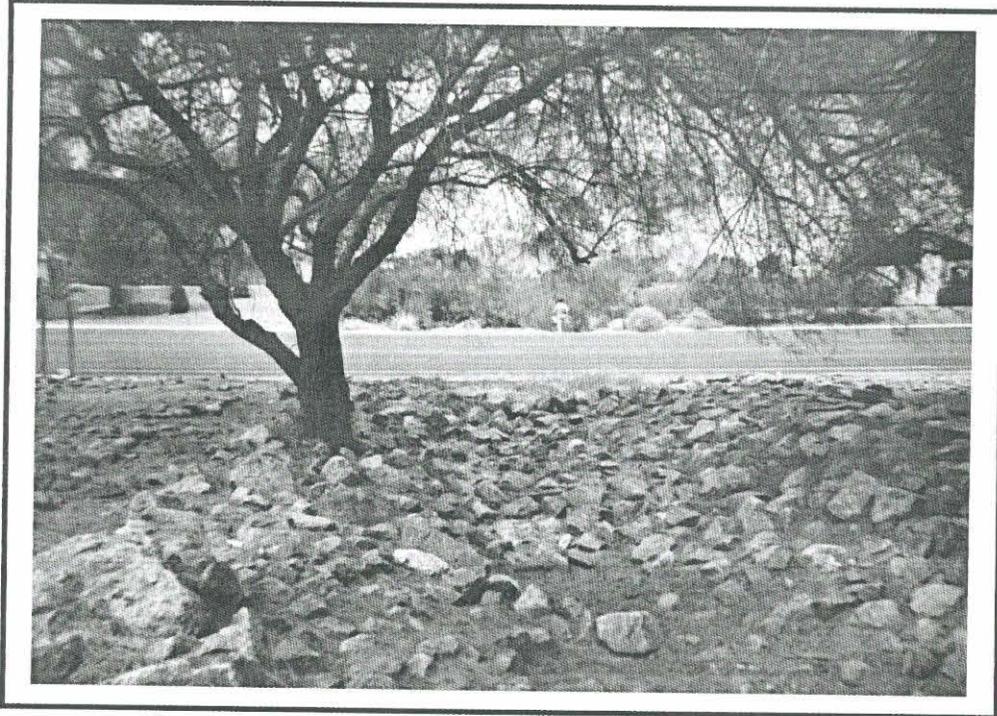
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PROFILE SHEET ADMP 7 - ALTERNATE 1

SHEET OF 2 2

REDUCED SIZE DO NOT SCALE

ADMP 8: Fountain Hills Boulevard / Oxford Wash



Oxford Wash Dip Section  
*Looking Upstream Across Fountain Hills Boulevard*



Oxford Wash  
*Looking Downstream 100' Downstream of Fountain Hills Boulevard*



Job No.: 92-404,004

Job Name: Fountain Hills

Reconnaissance by:  
REC 6-20-96  
CLS 6-20-96  
Inits. Date

### Field Reconnaissance Sheet

Site No.: ADWP 8

Roadway: Fountain Hills Blvd.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Oxford Wash</u>	<u>640</u>	<u>880</u>	<u>dip section</u>

Reason for Analysis / Existing Deficiency: Culvert desired at location.  
100 year runoff not contained with drainageway  
Breakout flow drains down road.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: — ft. Downstream: — ft.
- 2) Can the culvert be lowered: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer line crosses wash along Fountain Hills Blvd. Phone, TV Cable, Electric and water lines cross wash along Fountain Hills Blvd.
- 5) Structures: Buildings, parking lot, tennis/basketball courts very close to wash.
- 6) Right-of-Way: Very limited. Probably cannot adequately convey flow in channel within easement limits.
- 7) Miscellaneous field notes, comments, or design ideas:  
Down stream channel is small, riprap lined, and runs between some buildings and some paved surfaces (parking lot & tennis courts)  
Ability to raise road profile limited. Extensive channel excavation required. CBCs appear to be only/best option  
Buildings and parking lot/tennis courts very close to channel.  
Right of way limited. Not much of a road cross and not much of a channel. Sewer line may be a problem.

ALTERNATE 1

Mountain Hills ADMP #8, Alt. 21 (shorter culvert)

1/4

CURRENT DATE: 06-18-1997  
 CURRENT TIME: 15:13:09

FILE DATE: 06-18-1997  
 FILE NAME: FH08-#2

```

    .....
    :
    ..... FHWA CULVERT ANALYSIS .....
    :
    ..... HY-8, VERSION 4.3 .....
    :
    .....
    
```

C	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
U	-----							
L	INLET	OUTLET	CULVERT	BARRELS				
V	ELEV.	ELEV.	LENGTH	SHAPE	SPAN	RISE	MANNING	INLET
#	(FT)	(FT)	(FT)	MATERIAL	(FT)	(FT)	n	TYPE
	-----							
1	1622.00	1619.25	171.02	2 RCB	10.00	4.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

```

    .....
    :
    .....
    
```

FILE: FH08-#2                      CULVERT HEADWATER ELEVATION (FT)                      DATE: 06-18-1997

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	1622.00	0.00	0.00	0.00	0.00	0.00	1629.62
88	1623.28	0.00	0.00	0.00	0.00	0.00	1629.92
177	1624.03	0.00	0.00	0.00	0.00	0.00	1630.10
265	1624.69	0.00	0.00	0.00	0.00	0.00	1630.24
353	1625.27	0.00	0.00	0.00	0.00	0.00	1630.38
442	1625.82	0.00	0.00	0.00	0.00	0.00	1630.50

CONCLUSIONS: 10 YR OK, 100-yr OK.

2/4

518	1626.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1630.60
618	1627.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1630.72
706	1627.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1630.82
795	1628.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1630.92
883	1629.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1631.01
1060	1631.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

2

CURRENT DATE: 06-18-1997  
CURRENT TIME: 15:13:09

FILE DATE: 06-18-1997  
FILE NAME: FH08-#2

PERFORMANCE CURVE FOR CULVERT # 1 - 2 ( 10 BY 4 ) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1622.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-0.80
88	1623.28	1.28	1.28	1-S2n	0.47	0.85	9.37	0.47	3.73	0.27
177	1624.03	2.03	2.03	1-S2n	0.74	1.35	11.54	0.77	4.80	0.83
265	1624.69	2.69	2.69	1-S2n	0.96	1.76	13.06	1.01	5.54	1.27
353	1625.27	3.27	3.27	1-S2n	1.16	2.14	14.13	1.25	6.12	1.66
442	1625.82	3.82	3.82	1-S2n	1.34	2.48	15.02	1.47	6.59	2.01
518	1626.31	4.31	4.31	5-S2n	1.49	2.76	15.59	1.66	6.95	2.29
618	1627.00	5.00	5.00	5-S2n	1.68	3.10	16.28	1.90	7.37	2.63
706	1627.68	5.68	5.68	5-S2n	1.84	3.39	16.78	2.11	7.69	2.91
795	1628.44	6.44	6.44	5-S2n	1.99	3.67	17.26	2.30	7.99	3.18
883	1629.30	7.30	7.30	5-S2n	2.14	3.93	17.68	2.50	8.26	3.44

El. inlet face invert 1622.00 ft El. outlet invert 1619.25 ft  
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION (FT) 0.00  
 INLET ELEVATION (FT) 1622.00  
 OUTLET STATION (FT) 171.00  
 OUTLET ELEVATION (FT) 1619.25  
 NUMBER OF BARRELS 2  
 SLOPE (V-FT/H-FT) 0.0161  
 CULVERT LENGTH ALONG SLOPE (FT) 171.02



4/4

..... ROADWAY OVERTOPPING DATA .....

:  
:  
:

WEIR COEFFICIENT	2.67
EMBANKMENT TOP WIDTH (FT)	80.00
CREST LENGTH (FT)	200.00
OVERTOPPING CREST ELEVATION (FT)	1629.62

.....  
:  
:  
:

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location Fountain Hills, Arizona  
 Fountain Hills Boulevard & Oxford Wash  
 ADMP- 08, Alternate 1: Install 2- 10' x 4' x 171' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing	L.SUM	\$1,504.00	1	\$1,504
2020020	Removal of Concrete Curb	LFT.	\$2.00	160	\$320
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	676	\$946
2020201	Saw Cutting	L.FT.	\$5.00	152	\$760
2030401	Drainage Excavation	CU.YD.	\$5.00	1150	\$5,750
2030501	Structural Excavation	CU.YD.	\$8.00	1556	\$12,448
2030506	Structural Backfill	CU.YD.	\$25.00	446	\$11,150
2030941	Remove and Replace (Rip-Rap)	CU.YD.	\$8.50	341	\$2,899
2050001	Grading For Pavement	SQ.YD.	\$2.50	676	\$1,690
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
2080001	Separation Geotextile Fabric	SQ.YD.	\$4.50	412	\$1,854
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	115	\$4,025
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	150	\$6,750
5030352	Catch Basin, Type D, Two 10' Wings (MAG Det. 533-1)	EACH	\$2,700.00	2	\$5,400
6040002	Structural Concrete (Class S) (F'C = 3.000)	CU.YD.	\$150.00	372	\$55,800
6050002	Reinforcing Steel	LB.	\$0.50	54500	\$27,250
7010001	Maintenance and Protection of Traffic	L.SUM	\$6,015.00	1	\$6,015
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$902.00	1	\$902
7080001	Permanent Pavement Marking (Painted)(White)	L.FT.	\$0.20	240	\$48
7080011	Permanent Pavement Marking (Painted)(Yellow)	L.FT.	\$0.20	240	\$48
8080708	Encased Pipe (12")	L.FT.	\$45.00	16	\$720
8081012	Water Main (12")	L.FT.	\$85.00	60	\$5,100
9010001	Mobilization (10%)	L.SUM	\$15,039.00	1	\$15,039
9020004	Chain Link Fence, Type I (72")	L.FT.	\$12.00	44	\$528
9080140	Concrete Gutter	L.FT.	\$10.00	112	\$1,120
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	97	\$6,208
9130004	Riprap (Slope Mattress)	CU. YD.	\$85.00	190	\$16,150
9240170	Contractor Quality Control (2%)	L.SUM	\$3,008.00	1	\$3,008
9250001	Construction Surveying and Layout (2%)	L.SUM	\$3,008.00	1	\$3,008
Sub-Total					\$196,540
Engineering and Contingencies (20%)					\$39,310
<b>TOTAL</b>					<b>\$235,850</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$236,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

REMOVALS

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

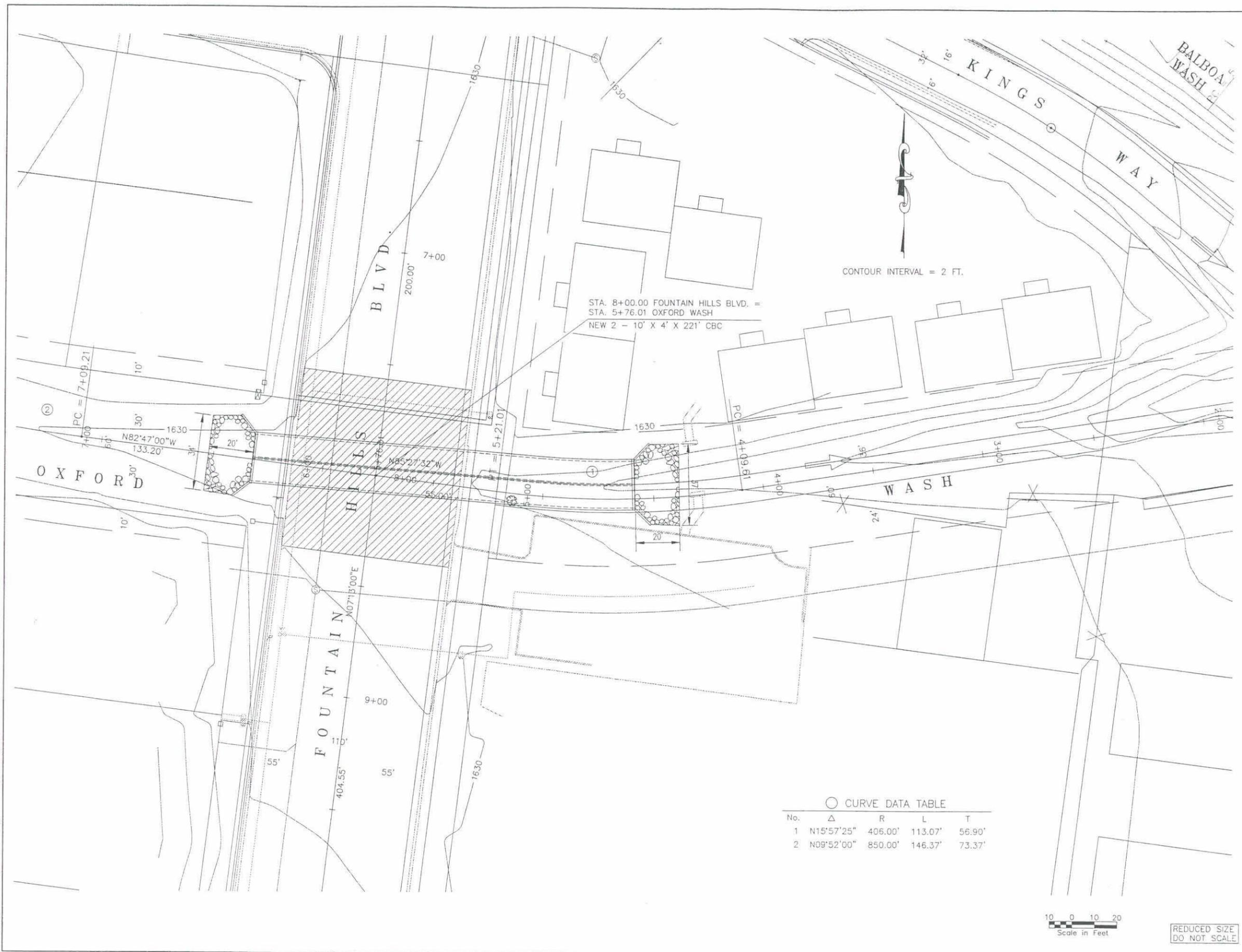
NEW CONSTRUCTION

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX

3			
2			
1	CBC SHORTENED 50'	F.B.	6/23/97
NO.	REVISION	BY	DATE

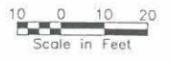
FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
FOUNTAIN HILLS BLVD. & OXFORD WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96
PRELIMINARY NOT FOR CONSTRUCTION	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE</b> McLAUGHLIN KMETZTY ENGINEERS, LTD.	



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N15°57'25"	406.00'	113.07'	56.90'
2	N09°52'00"	850.00'	146.37'	73.37'

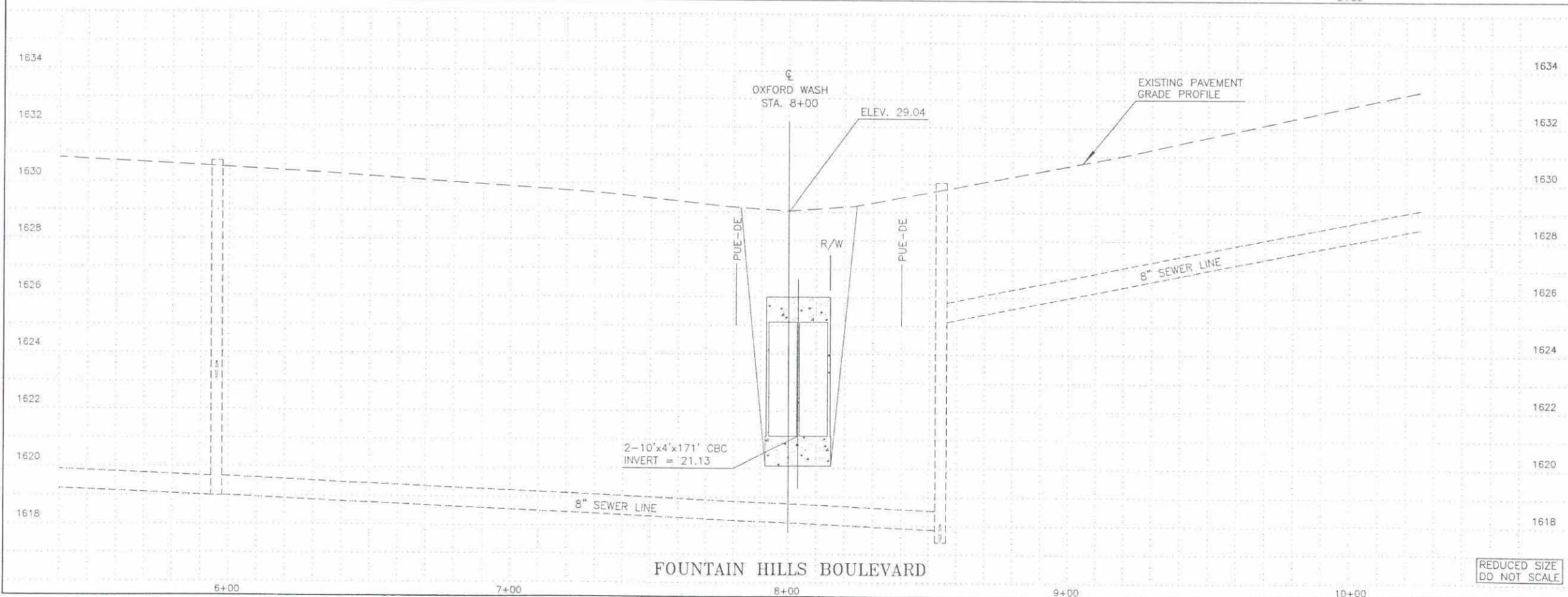
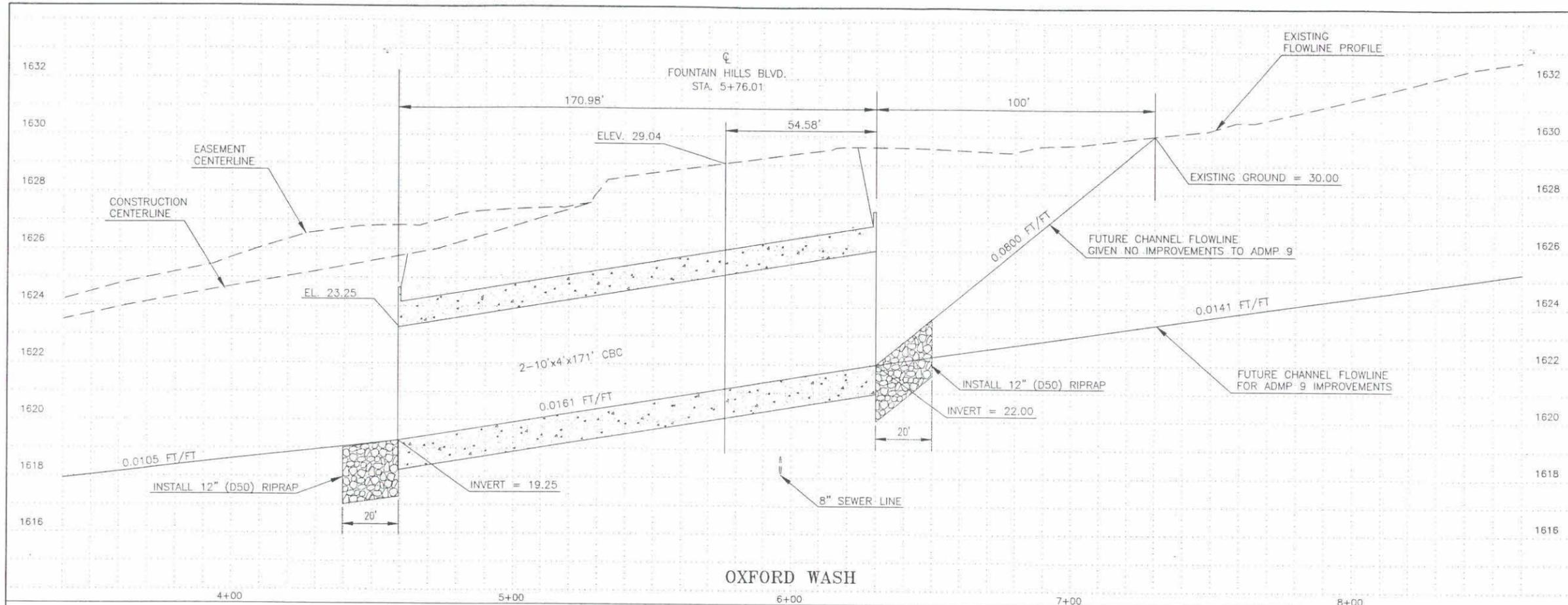


REDUCED SIZE  
DO NOT SCALE

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

**REQUIREMENTS**

EXISTING CONDITION Q100= 635 CFS (1995)  
FUTURE CONDITION Q100= 883 CFS (BUILD OUT)



3			
2			
1	CBC SHORTENED 50"	F.B.	6/23/97
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b>			
FOUNTAIN HILLS ADMP FOUNTAIN HILLS BLVD. & OXFORD WASH PROJECT NO. 94-16			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	F. BROWN, R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETTY ENGINEERS, LTD.</b>		
PROFILE SHEET ADMP 8 - ALTERNATE 1			SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

ADMP 9 : Fairlynn Drive / Oxford Wash



Oxford Wash Dip Section  
*Looking Downstream Across Dip Section*



Oxford Wash Dip Section  
*Looking Upstream From Fairlynn Drive*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:  
REC 6-20-96  
CES 6-20-96  
Inits. Date

### Field Reconnaissance Sheet

Site No.: ADMP9

Roadway: Fairlynn Dr.

Name of Drainageway	Q <sub>100, FS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Oxford Wash</u>	<u>640</u>	<u>880</u>	<u>dip section</u>

Reason for Analysis / Existing Deficiency: Culvert desired at location.  
100 year runoff not contained within drainageway.  
Breakout flow drains down road.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: — ft. Downstream: — ft.
- 2) Can the culvert be lowered: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer lines run down wash and across wash  
along Fairlynn Dr. Electric and water lines  
appear to be only other utilities crossing wash
- 5) Structures: Culvert located on local street. Residential  
property adjacent to wash is not well  
protected in some areas.
- 6) Right-of-Way: Narrow, channel is small with  
relatively low banks.
- 7) Miscellaneous field notes, comments, or design ideas:  
Sewer lines may be a problem. Need to raise road  
profile and/or lower channel (both upstream  
and downstream). Shallow CBE appears to be  
only/best option. Extensive channel improvements  
required.

# ALTERNATE 1

Oxford Wash & Fairlynn Dr. (2-10'x4' CBCs)  
 CURRENT DATE: 10-09-1996  
 CURRENT TIME: 16:50:51

FILE DATE: 10-09-1996  
 FILE NAME: FH09-#1

-----  
 FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3  
 -----

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1627.10	1625.95	65.01	2 RCB	10.00	4.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

-----  
 SUMMARY OF CULVERT FLOWS (CFS) FILE: FH09-#1 DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1627.10	0	0	0	0	0	0	0	0	1
1628.38	88	88	0	0	0	0	0	0	1
1629.13	177	177	0	0	0	0	0	0	1
1629.78	265	265	0	0	0	0	0	0	1
1630.36	353	353	0	0	0	0	0	0	1
1630.92	442	442	0	0	0	0	0	0	1
<b>1631.40</b>	<b>518</b>	<b>518</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
1632.09	618	618	0	0	0	0	0	0	1
1632.77	706	706	0	0	0	0	0	0	1
1633.54	795	795	0	0	0	0	0	0	1
<b>1634.36</b>	<b>883</b>	<b>879</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>5</b>
1634.31	874	874	0	0	0	0	0	0	OVERTOPPING

-----  
 SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH09-#1 DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1627.10	0.00	0	0	0.00
1628.38	0.00	88	0	0.00
1629.13	0.00	177	0	0.00
1629.78	0.00	265	0	0.00
1630.36	0.00	353	0	0.00
1630.92	0.00	442	0	0.00
1631.40	0.00	518	0	0.00
1632.09	0.00	618	0	0.00
1632.77	0.00	706	0	0.00
1633.54	0.00	795	0	0.00
1634.36	-0.00	883	1	0.06

<1> TOLERANCE (FT) = 0.010

<2> TOLERANCE (%) = 1.000

-----  
 Conclusions: 10-yr O.K. 100-yr overtops.



CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:50:51

FILE DATE: 10-09-1996  
FILE NAME: FH09-#1

-----  
----- TAILWATER -----  
-----

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
BOTTOM WIDTH (FT) 21.00  
SIDE SLOPE H/V (X:1) 2.0  
CHANNEL SLOPE V/H (FT/FT) 0.014  
MANNING'S N (.01-0.1) 0.040  
CHANNEL INVERT ELEVATION (FT) 1625.95  
CULVERT NO.1 OUTLET INVERT ELEVATION 1625.95 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1625.95	0.000	0.00	0.00	0.00
88.30	1626.91	0.723	0.96	4.02	0.84
176.60	1627.39	0.753	1.44	5.13	1.27
264.90	1627.78	0.768	1.83	5.89	1.61
353.20	1628.10	0.777	2.16	6.48	1.90
441.50	1628.40	0.785	2.45	6.97	2.15
518.00	1628.63	0.789	2.68	7.33	2.36
618.10	1628.91	0.794	2.96	7.75	2.61
706.40	1629.14	0.797	3.19	8.08	2.81
794.70	1629.36	0.800	3.41	8.38	3.00
883.00	1629.56	0.802	3.61	8.65	3.18

-----  
----- ROADWAY OVERTOPPING DATA -----  
-----

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 35.00  
CREST LENGTH (FT) 100.00  
OVERTOPPING CREST ELEVATION (FT) 1634.31

-----

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract N FCDMC 94-16  
 Project Na FOUNTAIN HILLS ADMP  
 Project Lo Fountain Hills, Arizona  
 Fairlynn Drive & Oxford Wash  
 ADMP- 09, Alternate 1: Install 2 - 10' x 4' x 65' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$976.00	1	\$976
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	1	\$800
2020020	Removal of Concrete Curb	LFT.	\$2.00	120	\$240
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	214	\$300
2020201	Saw Cutting	L.FT.	\$5.00	64	\$320
2030401	Drainage Excavation	CU.YD.	\$5.00	2300	\$11,500
2030501	Structural Excavation	CU.YD.	\$8.00	610	\$4,880
2030506	Structural Backfill	CU.YD.	\$25.00	195	\$4,875
2050001	Grading For Pavement	SQ.YD.	\$2.50	214	\$535
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	36	\$1,260
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	24	\$1,080
5030350	Catch Basin, Type D, Two 3' Wings (MAG Det. 533-	EACH	\$1,800.00	2	\$3,600
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	3	\$7,200
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	3	\$825
6010002	Structural Concrete (Class S) (F'C = 3,000)	CU.YD.	\$150.00	153	\$22,950
6050002	Reinforcing Steel	LB.	\$0.50	21637	\$10,819
7010001	Maintenance and Protection of Traffic	L.SUM	\$3,906.00	1	\$3,906
7010006	Furnish And Install Temporary Traffic Control Device	L.SUM	\$586.00	1	\$586
8081008	Water Main (6")	L.FT.	\$65.00	16	\$1,040
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	483	\$16,905
8080708	Encased Pipe (6")	L.FT.	\$35.00	16	\$560
9010001	Mobilization (10%)	L.SUM	\$9,764.00	1	\$9,764
9080140	Concrete Gutter	L.FT.	\$10.00	120	\$1,200
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	104	\$6,656
9240170	Contractor Quality Control (2%)	L.SUM	\$1,950.00	1	\$1,950
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,950.00	1	\$1,950
Sub-Total					\$115,800
Engineering and Contingencies (20%)					\$23,160
<b>TOTAL</b>					<b>\$138,960</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$139,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
 1-802-263-1100  
 1-800-STAKE-IT  
 (OUTSIDE SARASOTA COUNTY)

NOTE:  
 PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

REMOVALS

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

NEW CONSTRUCTION

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX

NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 FAIRLYNN DRIVE & OXFORD WASH  
 PROJECT NO. 94-16

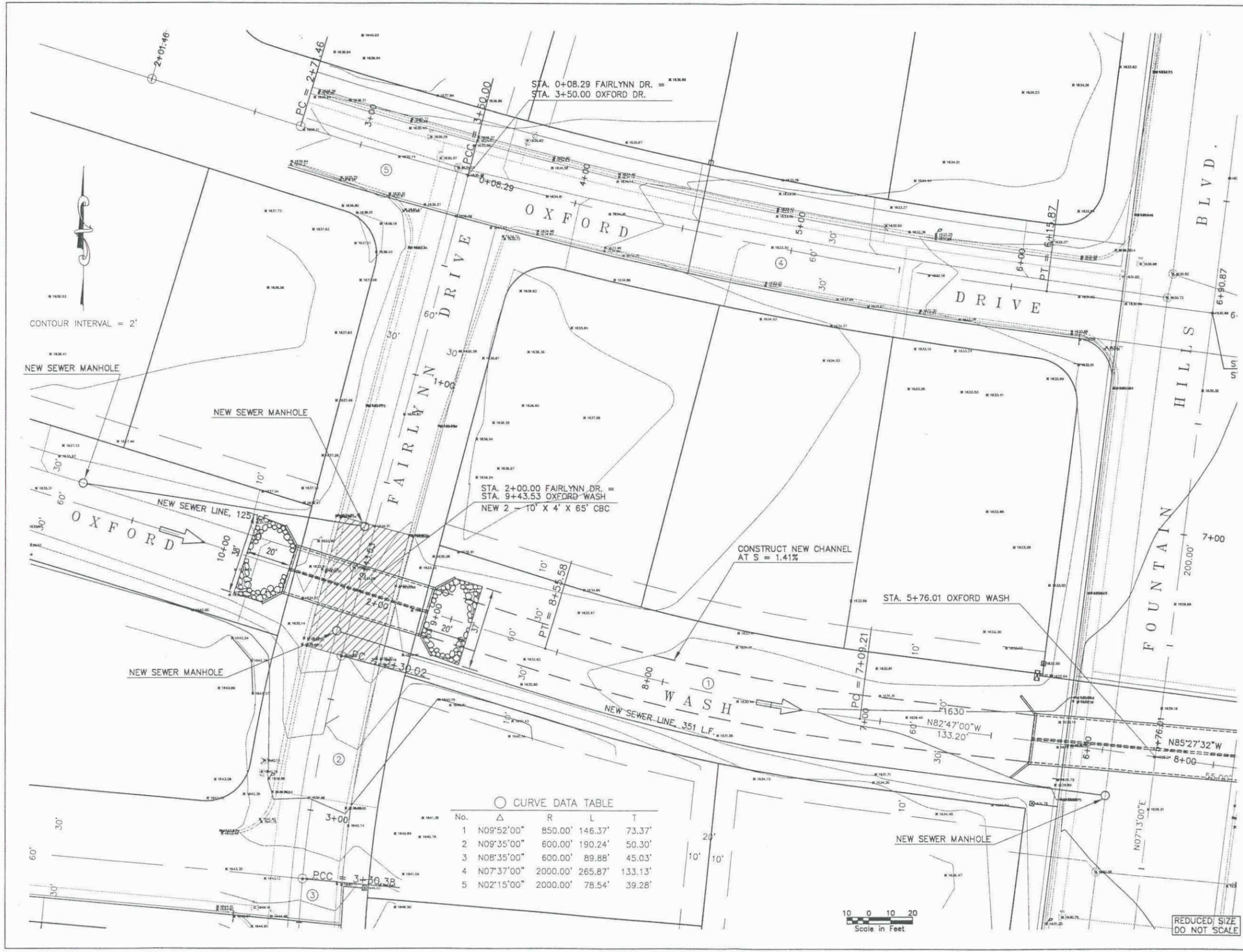
	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY  
 NOT FOR  
 CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
 in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PLAN SHEET  
 ADMP 9 - ALTERNATE 1

SHEET OF  
 1 2



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N09°52'00"	850.00'	146.37'	73.37'
2	N09°35'00"	600.00'	190.24'	50.30'
3	N08°35'00"	600.00'	89.88'	45.03'
4	N07°37'00"	2000.00'	265.87'	133.13'
5	N02°15'00"	2000.00'	78.54'	39.28'

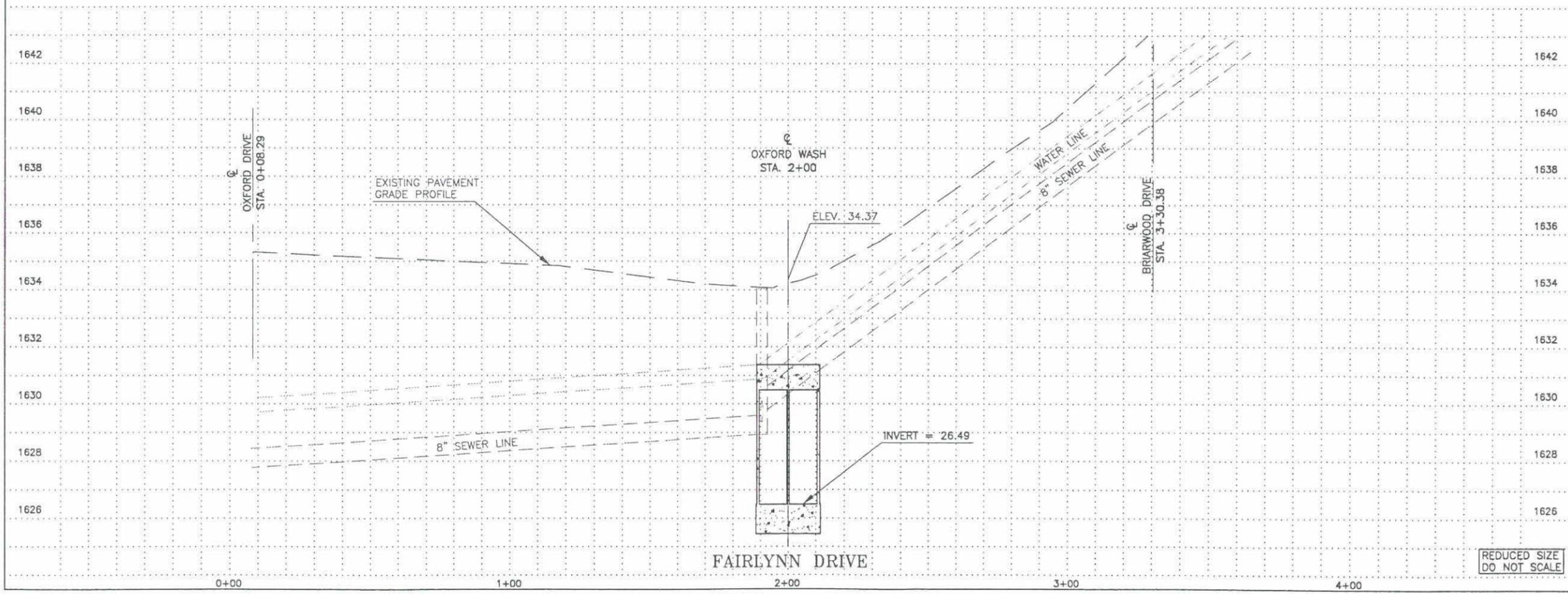
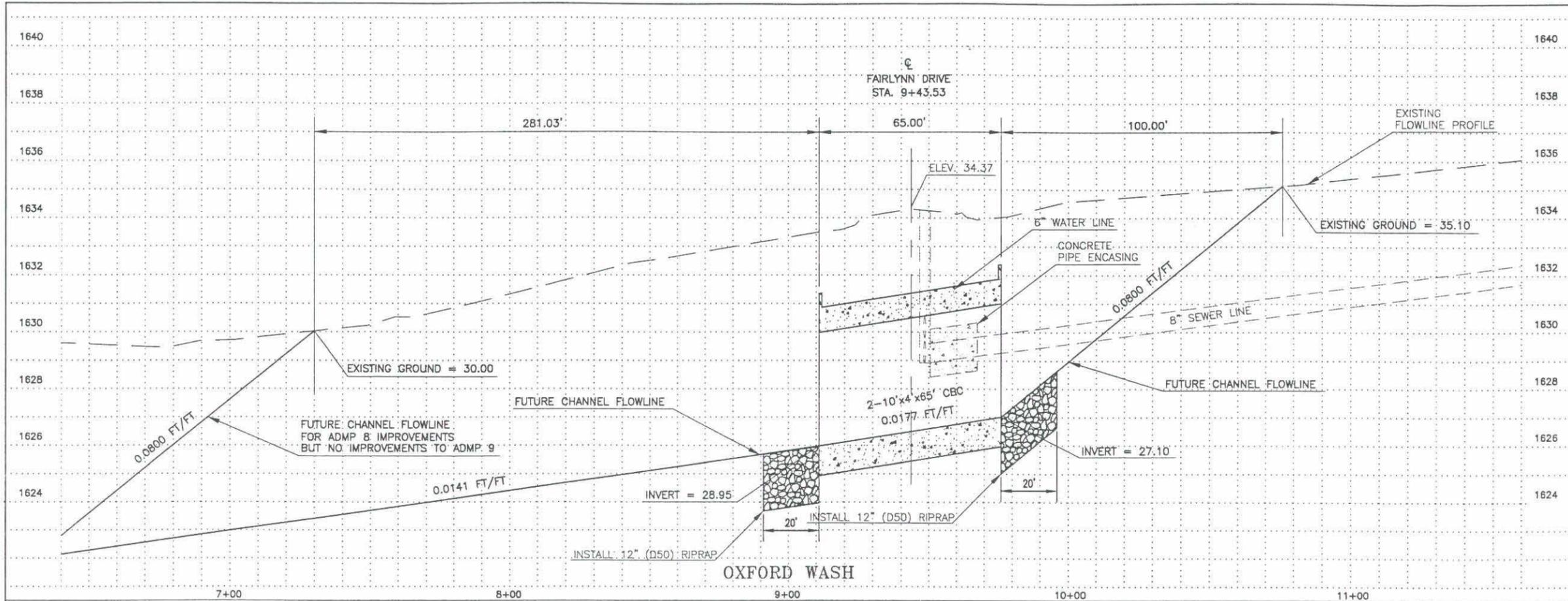
10 0 10 20  
 Scale in Feet

REDUCED SIZE  
 DO NOT SCALE

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

**REQUIREMENTS**

EXISTING CONDITION Q100 = 635 CFS (1995)  
FUTURE CONDITION Q100 = 883 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION**  
**FOUNTAIN HILLS ADMP FAIRLYNN DRIVE & OXFORD WASH PROJECT NO. 94-16**

	BY	DATE
DESIGNED	R. CONSONI	6/3/95
DRAWN	C. JOY	6/3/95
CHECKED	F. BROWN	6/3/95

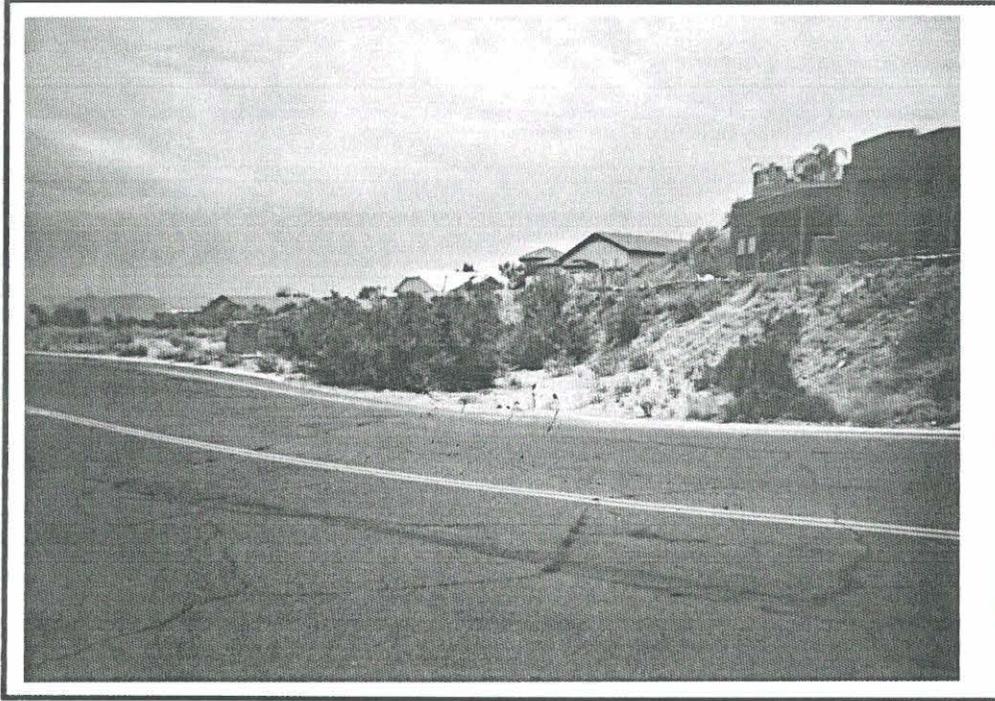
PRELIMINARY NOT FOR CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with  
**MKE McLAUGHLIN KMETZ ENGINEERS, LTD.**

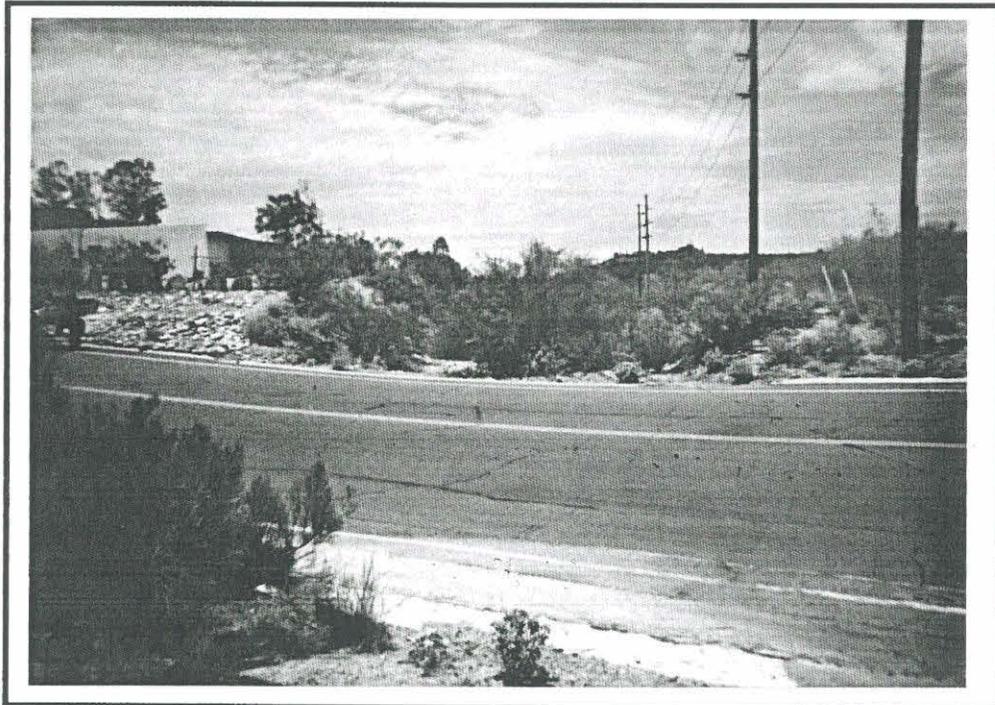
PROFILE SHEET ADMP 9 - ALTERNATE 1 SHEET OF 2 2

REDUCED SIZE DO NOT SCALE

ADMP 10 : Glenbrook Boulevard / Oxford Wash



Oxford Wash Dip Section  
*Looking Downstream Across Glenbrook Boulevard*



Oxford Wash Dip Section  
*Looking Upstream From Glenbrook Boulevard*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:  
REC 6-20-96  
CLS 6-20-96  
Inits. Date

### Field Reconnaissance Sheet

Site No.: ADMP 10

Roadway: Glenbrook Blvd.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Oxford Wash</u>	<u>210</u>	<u>250</u>	<u>dip section</u>

Reason for Analysis / Existing Deficiency: Culvert desired at location to provide safe local access when wash is flowing.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: — ft. Downstream: — ft.
- 2) Can the culvert be lowered: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, — ft.  No  
Downstream?  Yes, — ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer line running along road curves at dip crossing and continues down the wash. Phone, TV Cable, Electric, and water lines cross wash along Glenbrook.
- 5) Structures: Driveway of local resident may be impacted by any raise (significant) in the road profile.
- 6) Right-of-Way: \_\_\_\_\_
- 7) Miscellaneous field notes, comments, or design ideas:  
Channel slope is very mild. Will have to raise road profile. Ability to raise road profile limited by crown at intersection east of wash. Small CMPs or shallow CBKs are only options. Channel reconstruct/improvements limited. Sewer line may be a problem. Any overtopping flow will probably travel down the road.

# ALTERNATE 1

Oxford Wash & Glenbrook Blvd. (7-30"x115' CMPs)  
 CURRENT DATE: 10-09-1996  
 CURRENT TIME: 16:51:41

FILE DATE: 10-09-1996  
 FILE NAME: FH10-#1

-----  
 FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3  
 -----

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1716.50	1715.49	115.00	7 CSP	2.50	2.50	.024	CONVENTIONAL
2								
3								
4								
5								
6								

-----  
 SUMMARY OF CULVERT FLOWS (CFS) FILE: FH10-#1 DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1716.50	0	0	0	0	0	0	0	0	1
1717.50	25	25	0	0	0	0	0	0	1
1717.96	50	50	0	0	0	0	0	0	1
1718.32	76	76	0	0	0	0	0	0	1
1718.65	101	101	0	0	0	0	0	0	1
1718.96	126	126	0	0	0	0	0	0	1
<b>1719.27</b>	<b>150</b>	<b>150</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
1720.24	176	176	0	0	0	0	0	0	1
1720.92	202	201	0	0	0	0	0	0	3
1721.42	227	218	0	0	0	0	0	8	4
<b>1721.73</b>	<b>252</b>	<b>228</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>23</b>	<b>4</b>
1720.77	196	196	0	0	0	0	0	0	OVERTOPPING

-----  
 SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH10-#1 DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1716.50	0.00	0	0	0.00
1717.50	0.00	25	0	0.00
1717.96	0.00	50	0	0.00
1718.32	0.00	76	0	0.00
1718.65	0.00	101	0	0.00
1718.96	0.00	126	0	0.00
1719.27	0.00	150	0	0.00
1720.24	0.00	176	0	0.00
1720.92	-0.00	202	0	0.06
1721.42	-0.01	227	1	0.32
1721.73	-0.01	252	1	0.56

<1> TOLERANCE (FT) = 0.010                      <2> TOLERANCE (%) = 1.000

Conclusions: 10-yr O.K. 100-yr overtops.



CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:51:41

FILE DATE: 10-09-1996  
FILE NAME: FH10-#1

-----  
TAILWATER  
-----

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
BOTTOM WIDTH (FT) 27.00  
SIDE SLOPE H/V (X:1) 1.5  
CHANNEL SLOPE V/H (FT/FT) 0.887  
MANNING'S N (.01-0.1) 0.040  
CHANNEL INVERT ELEVATION (FT) 1715.49  
CULVERT NO.1 OUTLET INVERT ELEVATION 1715.49 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1715.49	0.000	0.00	0.00	0.00
25.20	1715.60	4.263	0.11	8.16	6.29
50.40	1715.66	4.556	0.17	10.73	9.54
75.60	1715.71	4.734	0.22	12.59	12.16
100.80	1715.75	4.862	0.26	14.10	14.45
126.00	1715.79	4.963	0.30	15.38	16.52
150.00	1715.82	5.042	0.33	16.47	18.34
176.40	1715.86	5.116	0.37	17.54	20.21
201.60	1715.89	5.177	0.40	18.47	21.89
226.80	1715.91	5.231	0.42	19.34	23.49
252.00	1715.94	5.280	0.45	20.14	25.02

-----  
ROADWAY OVERTOPPING DATA  
-----

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 100.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE  
CROSS-SECTION X Y  
COORD. NO. (FT) (FT)  
1 300.00 1726.20  
2 380.00 1721.95  
3 400.00 1721.17  
4 404.63 1720.77  
5 417.74 1722.00  
6 427.60 1723.76  
-----

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Glenbrook Boulevard & Oxford Wash  
 ADMP- 10, Alternate 1 : Install 7-36"x115' CMPs

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTI	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$882.00	1	\$882
2020020	Removal of Concrete Curb	LFT.	\$2.00	420	\$840
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1398	\$1,957
2020201	Saw Cutting	L.FT.	\$5.00	120	\$600
2030401	Drainage Excavation	CU.YD.	\$5.00	153	\$765
2030902	Borrow (Roadway Fill)	CU.YD.	\$7.50	765	\$5,738
2050001	Grading For Pavement	SQ. YD.	\$2.50	1398	\$3,495
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	233	\$8,155
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	233	\$10,485
5010017	Pipe, Corrugated Metal, 30"	L.FT.	\$57.00	805	\$45,885
7010001	Maintenance and Protection of Traffic	L.SUM	\$3,529.00	1	\$3,529
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$529.00	1	\$529
8081012	Water Main (12")	L.FT.	\$65.00	85	\$5,525
9010001	Mobilization (10%)	L.SUM	\$8,822.00	1	\$8,822
9080140	Concrete Gutter	L.FT.	\$10.00	420	\$4,200
9080303	Concrete Driveway	SQ.FT.	\$3.00	160	\$480
9240170	Contractor Quality Control (2%)	L.SUM	\$1,764.00	1	\$1,764
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,764.00	1	\$1,764
Sub-Total					\$105,515
Engineering and Contingencies (20%)					\$21,100
<b>TOTAL</b>					<b>\$126,615</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$127,000**

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

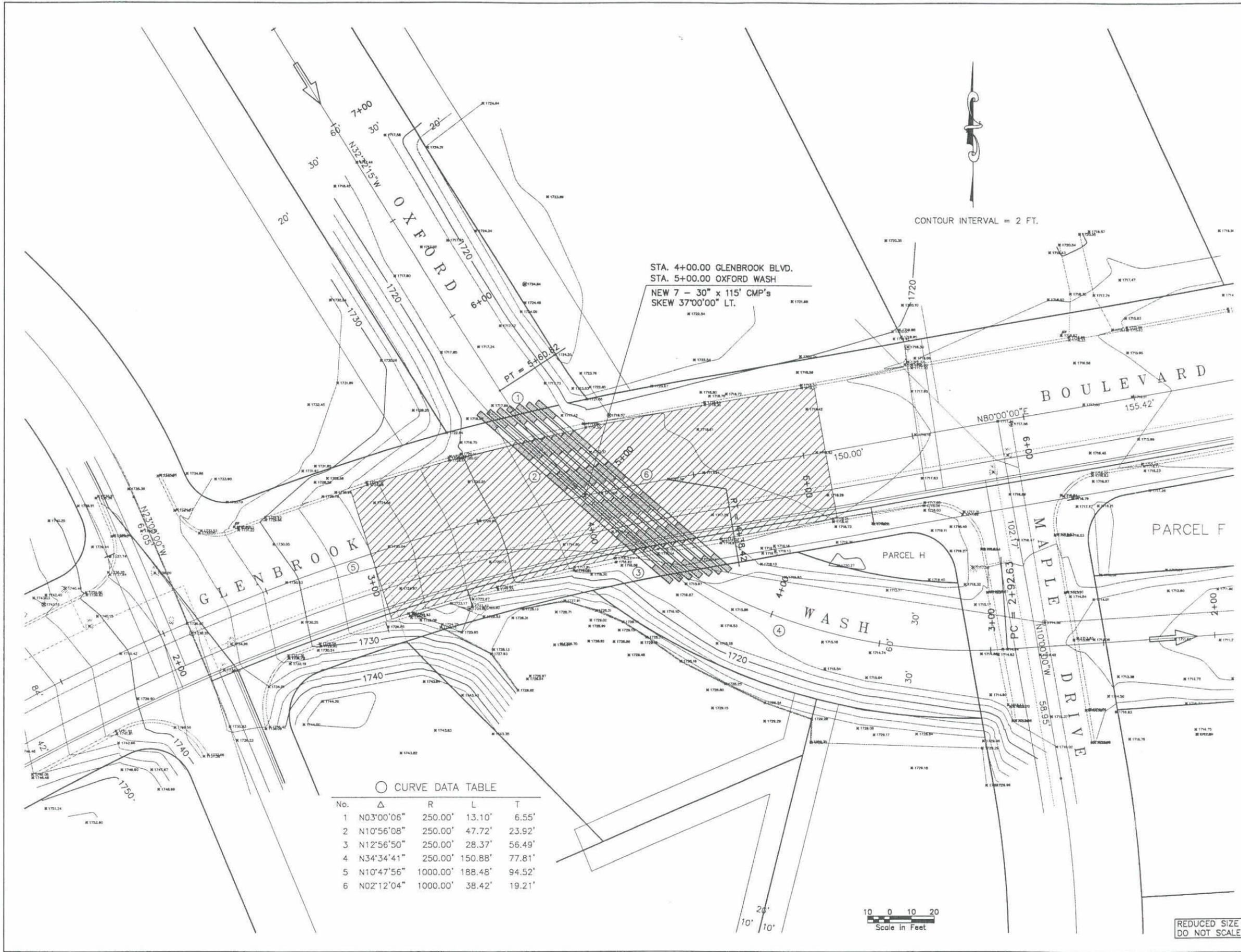
**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX

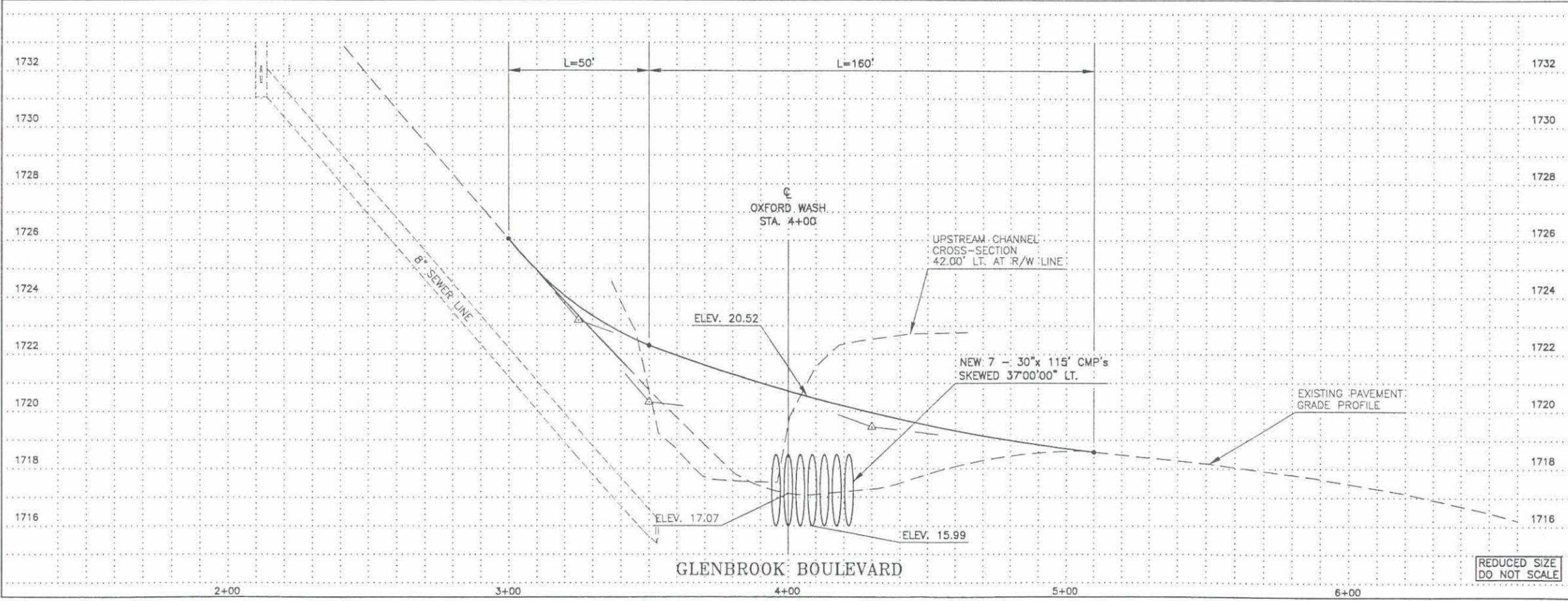
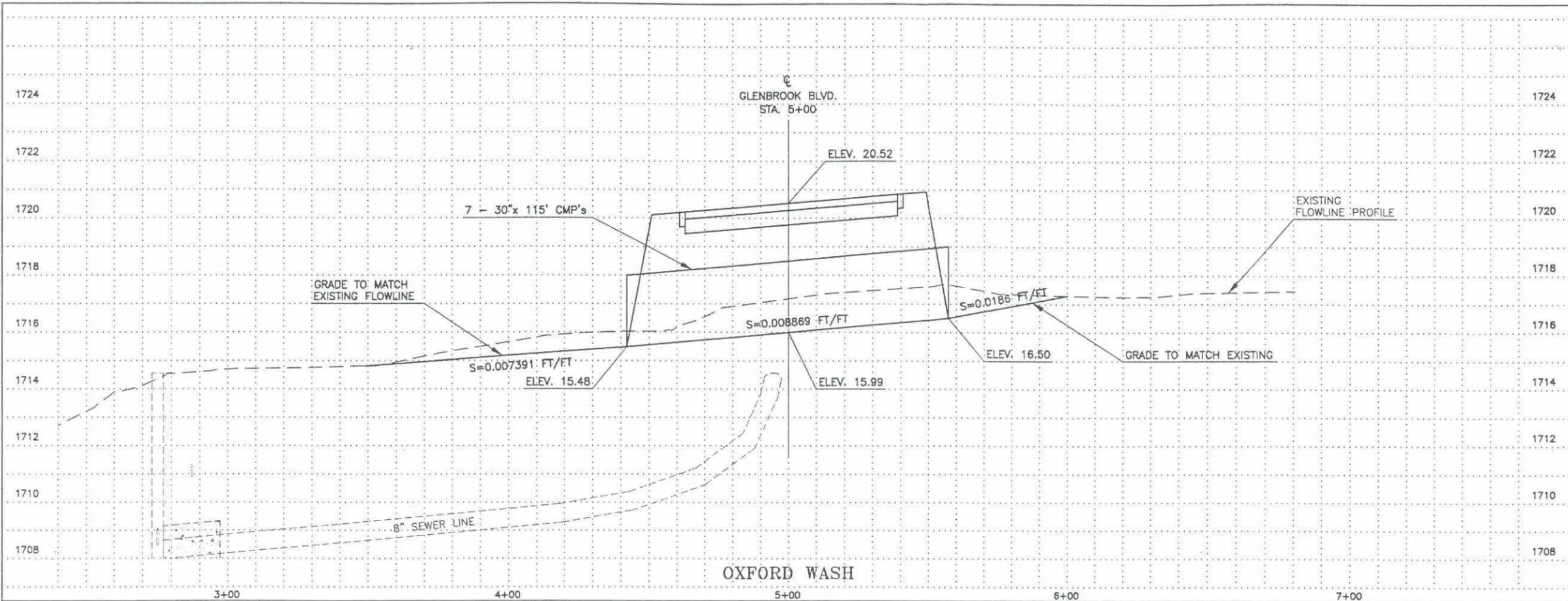
3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b>			
FOUNTAIN HILLS ADMP GLENBROOK BOULEVARD & OXFORD WASH PROJECT NO. 94-16			
		BY	DATE
DESIGNED	R. CONSONI		6/3/96
DRAWN	C. JOY		6/3/96
CHECKED	F. BROWN		6/3/96
PRELIMINARY NOT FOR CONSTRUCTION	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETTY ENGINEERS, LTD.</b>		
PLAN SHEET ADMP 10 - ALTERNATE 1			SHEET OF 1 2



CALL TWO WORKING DAYS BEFORE YOU DIG  
1-800-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

**REQUIREMENTS**

EXISTING CONDITION Q100= 210 CFS (1995)  
FUTURE CONDITION Q100= 252 CFS (BUILD-OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
GLENBROOK BOULEVARD & OXFORD WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	F. BROWN, R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PROFILE SHEET ADMP 10 - ALTERNATE 1

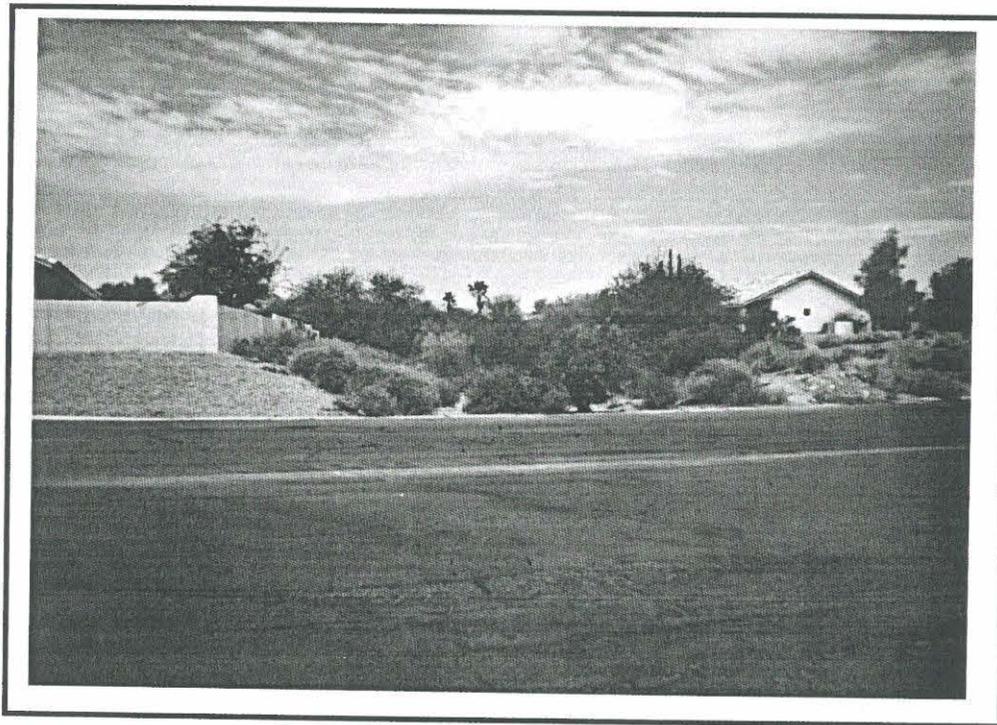
SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

ADMP 11 : El Pueblo Boulevard / Caliente Wash



Caliente Wash Dip Section  
*Looking Downstream Across El Pueblo Boulevard*



Caliente Wash  
*Looking Upstream Across El Pueblo Boulevard*



Job No.: 92-464,004  
 Job Name: Fountain Hills

Reconnaissance by:  
 REC 6-20-96  
 CLS 6-20-96  
 Inits. Date

### Field Reconnaissance Sheet

Site No.: ADM P 11

Roadway: El Pueblo Blvd.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Caliente Wash</u>	<u>670</u>	<u>990</u>	<u>dip section</u>

Reason for Analysis / Existing Deficiency: Desire a culvert to provide safe local access during periods when wash is flowing.

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream:      ft. Downstream:      ft.
- 2) Can the culvert be lowered: Upstream?  Yes,      ft.  No  
 Downstream?  Yes,      ft.  No
- 3) Is there any erosion visible: Upstream?  Yes,      ft.  No  
 Downstream?  Yes,      ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer lines run both down the wash and across the wash along El Pueblo Blvd. Electric, TV Cable, Phone & water lines cross wash along El Pueblo Blvd.
- 5) Structures: wash is well vegetated
- 6) Right-of-Way: Channel is mildly sloped with low banks.

- 7) Miscellaneous field notes, comments, or design ideas:  
Wash slope and dip crossing is mild. Probably need a grade check structure to lower channel. Ability to raise road profile limited. Shallow CIBC seems to be only/best option. Sewer lines may be a problem. Downstream and upstream channels will require extensive excavation.

ALTERNATE 1

Caliente Wash & El Pueblo Blvd. (7-6'x3'x88' CBCs)  
 CURRENT DATE: 10-09-1996  
 CURRENT TIME: 16:52:00

FILE DATE: 10-09-1996  
 FILE NAME: FH11-#1

-----  
 FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3  
 -----

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1530.40	1529.52	88.00	7 RCB	6.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

-----  
 SUMMARY OF CULVERT FLOWS (CFS)                      FILE: FH11-#1                      DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1530.40	0	0	0	0	0	0	0	0	1
1531.25	99	99	0	0	0	0	0	0	1
1531.74	197	197	0	0	0	0	0	0	1
1532.17	296	296	0	0	0	0	0	0	1
1532.55	395	395	0	0	0	0	0	0	1
1532.90	494	494	0	0	0	0	0	0	1
<b>1533.23</b>	<b>589</b>	<b>589</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
1533.58	691	691	0	0	0	0	0	0	1
1533.95	790	790	0	0	0	0	0	0	1
1534.32	888	883	0	0	0	0	0	6	4
<b>1534.61</b>	<b>987</b>	<b>951</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>35</b>	<b>3</b>
1534.20	853	853	0	0	0	0	0	0	OVERTOPPING

-----  
 SUMMARY OF ITERATIVE SOLUTION ERRORS                      FILE: FH11-#1                      DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1530.40	0.00	0	0	0.00
1531.25	0.00	99	0	0.00
1531.74	0.00	197	0	0.00
1532.17	0.00	296	0	0.00
1532.55	0.00	395	0	0.00
1532.90	0.00	494	0	0.00
1533.23	0.00	589	0	0.00
1533.58	0.00	691	0	0.00
1533.95	0.00	790	0	0.00
1534.32	0.00	882	-0	-0.02
1534.61	-0.00	987	1	0.06

<1> TOLERANCE (FT) = 0.010

<2> TOLERANCE (%) = 1.000

-----  
 Conclusions: 10-yr O.K. 100-yr overtops.

CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:52:00

FILE DATE: 10-09-1996  
FILE NAME: FH11-#1

PERFORMANCE CURVE FOR CULVERT # 1 - 7 ( 6 BY 3 ) RCB

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1530.40	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
99	1531.25	0.85	0.85	1-S2n	0.38	0.56	6.05	0.39	2.91	0.72
197	1531.74	1.34	1.34	1-S2n	0.60	0.88	7.67	0.61	3.80	1.09
296	1532.17	1.77	1.77	1-S2n	0.77	1.16	8.69	0.81	4.43	1.39
395	1532.55	2.15	2.15	1-S2n	0.94	1.40	9.48	0.99	4.93	1.65
494	1532.90	2.50	2.50	1-S2n	1.09	1.63	10.04	1.17	5.36	1.89
589	1533.23	2.83	2.83	1-S2n	1.23	1.83	10.57	1.33	5.72	2.10
691	1533.58	3.18	3.18	5-S2n	1.37	2.04	10.99	1.50	6.06	2.30
790	1533.95	3.55	3.55	5-S2n	1.51	2.23	11.37	1.65	6.36	2.50
883	1534.32	3.92	3.92	5-S2n	1.63	2.40	11.72	1.79	6.64	2.68
951	1534.61	4.21	4.21	5-S2n	1.72	2.52	11.94	1.90	6.89	2.85

El. inlet face invert 1530.40 ft El. outlet invert 1529.52 ft  
 El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION (FT) 0.00  
 INLET ELEVATION (FT) 1530.40  
 OUTLET STATION (FT) 88.00  
 OUTLET ELEVATION (FT) 1529.52  
 NUMBER OF BARRELS 7  
 SLOPE (V-FT/H-FT) 0.0100  
 CULVERT LENGTH ALONG SLOPE (FT) 88.00

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*

BARREL SHAPE BOX  
 BARREL SPAN 6.00 FT  
 BARREL RISE 3.00 FT  
 BARREL MATERIAL CONCRETE  
 BARREL MANNING'S N 0.012  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL SQUARE EDGE (30-75 DEG. FLARE)  
 INLET DEPRESSION NONE

CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:52:00

FILE DATE: 10-09-1996  
FILE NAME: FH11-#1

-----  
TAILWATER  
-----

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
BOTTOM WIDTH (FT) 46.00  
SIDE SLOPE H/V (X:1) 1.5  
CHANNEL SLOPE V/H (FT/FT) 0.010  
MANNING'S N (.01-0.1) 0.040  
CHANNEL INVERT ELEVATION (FT) 1529.52  
CULVERT NO.1 OUTLET INVERT ELEVATION 1529.52 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1529.52	0.000	0.00	0.00	0.00
98.70	1530.24	0.604	0.72	2.91	0.45
197.40	1530.61	0.641	1.09	3.80	0.67
296.10	1530.91	0.662	1.39	4.43	0.86
394.80	1531.17	0.676	1.65	4.93	1.02
493.50	1531.41	0.687	1.89	5.36	1.17
589.00	1531.62	0.696	2.10	5.72	1.29
690.90	1531.82	0.704	2.30	6.06	1.42
789.60	1532.02	0.710	2.50	6.36	1.54
888.30	1532.20	0.715	2.68	6.64	1.65
987.00	1532.37	0.720	2.85	6.89	1.76

-----  
ROADWAY OVERTOPPING DATA  
-----

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 64.00  
CREST LENGTH (FT) 50.00  
OVERTOPPING CREST ELEVATION (FT) 1534.20  
-----

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No. FCDMC 94-16  
 Project Nam FOUNTAIN HILLS ADMP  
 Project Loca Fountain Hills, Arizona  
 El Pueblo Boulevard & Caliente Wash  
 ADMP- 11, Alternate 1: Install 7-6'x3'x88' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,563.00	1	\$1,563
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	1	\$800
2020020	Removal of Concrete Curb	LFT.	\$2.00	410	\$820
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1367	\$1,914
2020201	Saw Cutting	L.FT.	\$5.00	120	\$600
2030401	Drainage Excavation	CU.YD.	\$5.00	1272	\$6,360
2030501	Structural Excavation	CU.YD.	\$8.00	843	\$6,744
2030506	Structural Backfill	CU.YD.	\$25.00	160	\$4,000
2050001	Grading For Pavement	SQ. YD.	\$2.50	1367	\$3,418
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	172	\$6,020
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	171	\$7,695
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	3	\$7,200
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	2	\$550
6010002	Structural Concrete (Class S) (F'C = 3,000)	CU.YD.	\$150.00	371	\$55,650
6050002	Reinforcing Steel	LB.	\$0.50	36743	\$18,372
7010001	Maintenance and Protection of Traffic	L.SUM	\$6,254.00	1	\$6,254
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$938.00	1	\$938
8050111	Fabric Filter Material (High Survivability Geotextile Fabric)	SQ.YD.	\$1.60	5	\$8
8081009	Water Main (8")	L.FT.	\$65.00	90	\$5,850
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	282	\$9,870
8080708	Encased Pipe (6")	L.FT.	\$35.00	90	\$3,150
9010001	Mobilization (10%)	L.SUM	\$15,634.00	1	\$15,634
9080140	Concrete Gutter	L.FT.	\$10.00	309	\$3,090
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	159	\$10,176
9130005	Riprap, Gabions	CU. YD.	\$110.00	36	\$3,960
9240170	Contractor Quality Control (2%)	L.SUM	\$3,130.00	1	\$3,130
9250001	Construction Surveying and Layout (2%)	L.SUM	\$3,130.00	1	\$3,130
Sub-Total					\$185,432
Engineering and Contingencies (20%)					\$37,090
<b>TOTAL</b>					<b>\$222,522</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$223,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
 1-602-263-1100  
 1-800-STAKE-IT  
 (OUTSIDE MARICOPA COUNTY)

NOTE:  
 PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

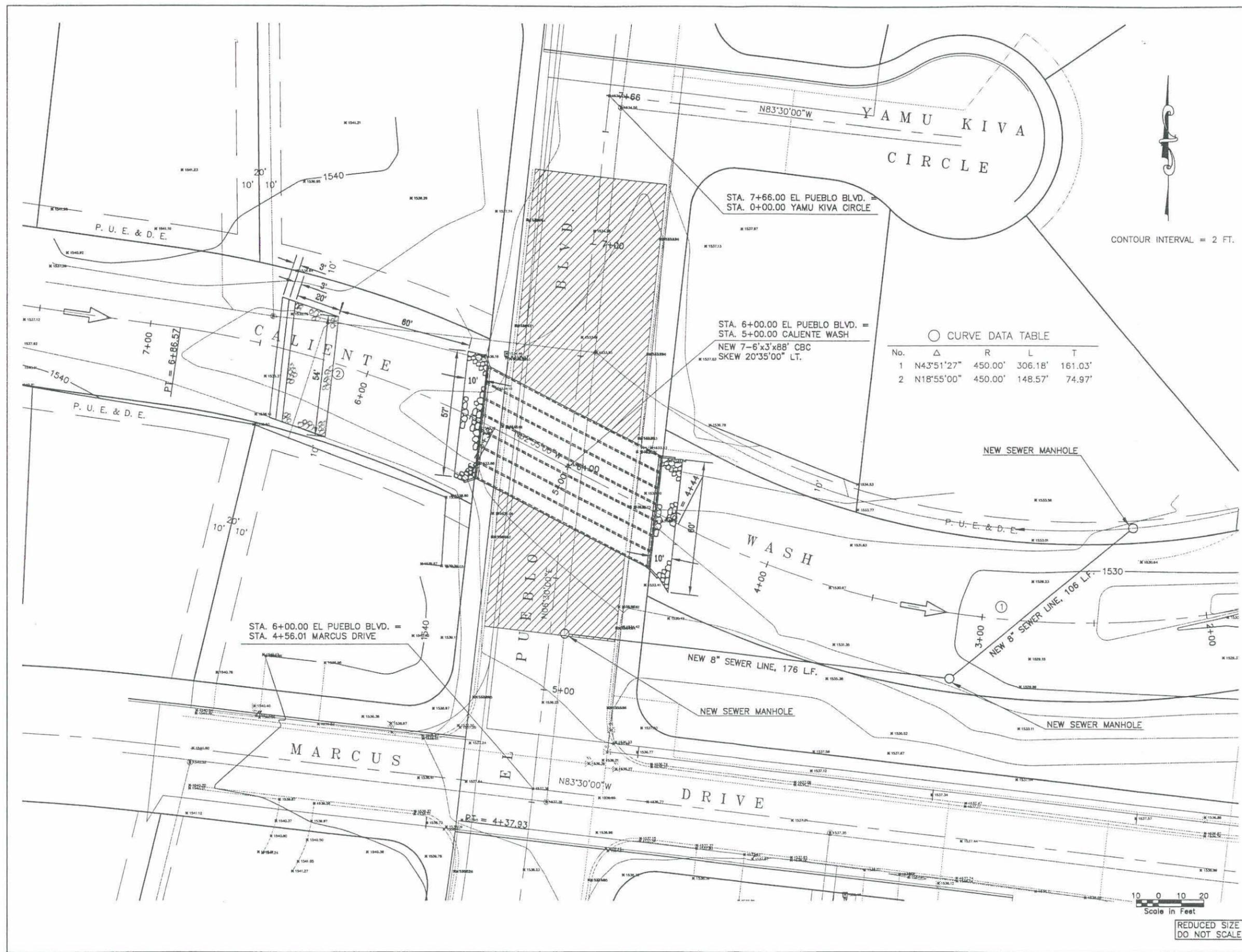
- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXX
- 7 XXXX  
XXXXX
- 8 XXXX
- 9 XXXX  
XXXX

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N43°51'27"	450.00'	306.18'	161.03'
2	N18°55'00"	450.00'	148.57'	74.97'



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION

FOUNTAIN HILLS ADMP  
 EL PUEBLO BOULEVARD & CALIENTE WASH  
 PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY  
 NOT FOR  
 CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
 in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

PLAN SHEET  
 ADMP 11 - ALTERNATE 1

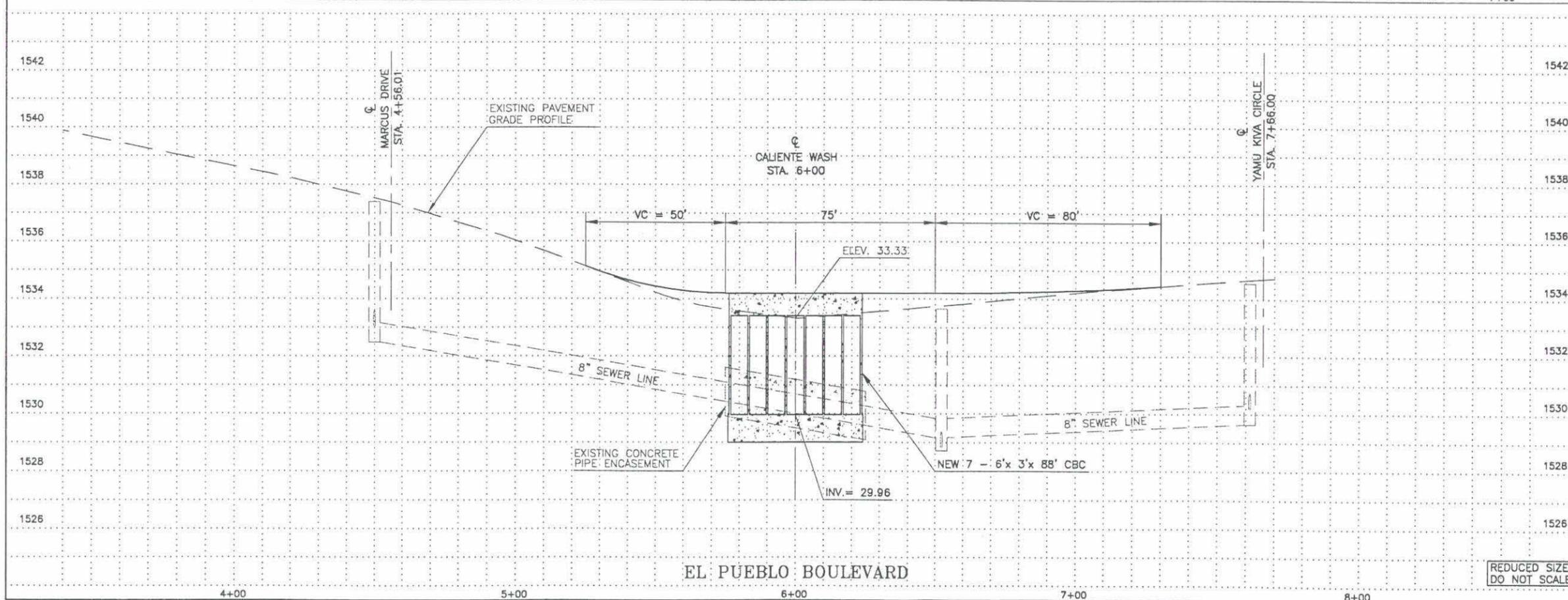
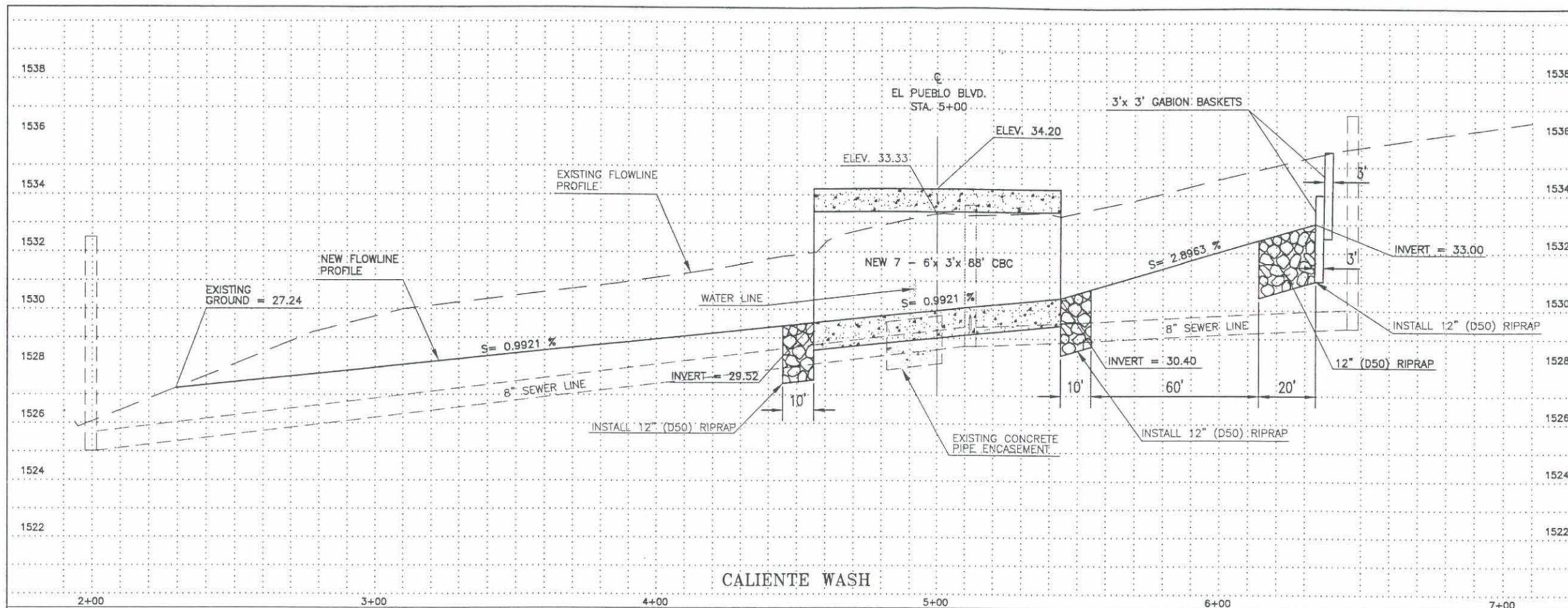
SHEET OF  
 1 2

REDUCED SIZE  
 DO NOT SCALE

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-802-263-1100  
1-800-STAKE-IT  
(EXCEPT MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 665 CFS (1995)  
FUTURE CONDITION Q100= 987 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
EL PUEBLO BLVD. & CALIENTE WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

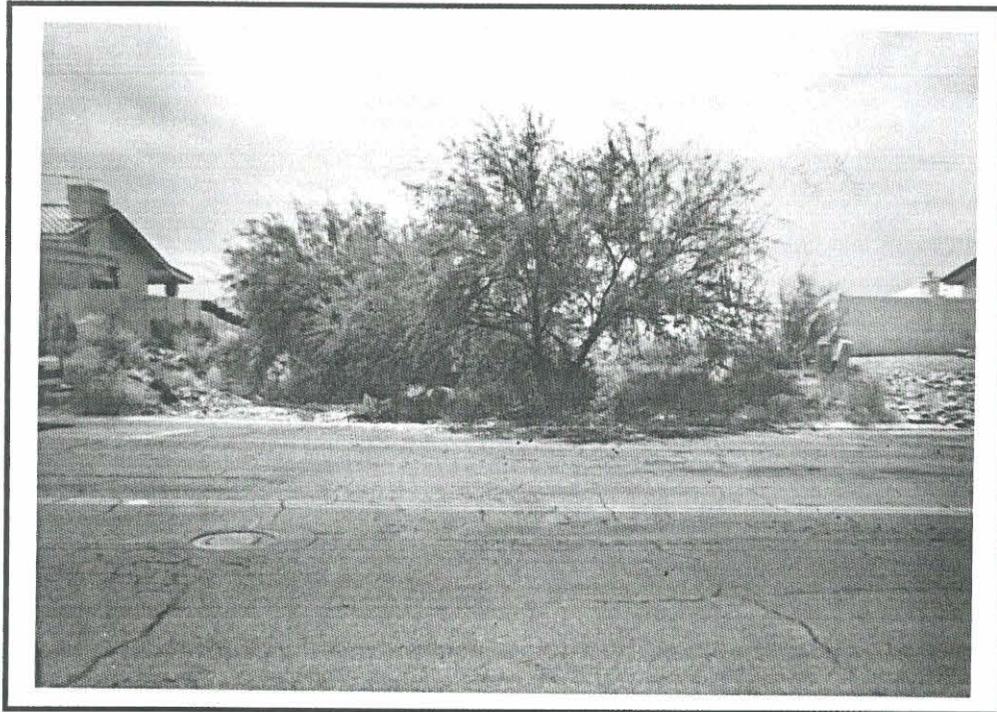
PRELIMINARY NOT FOR CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

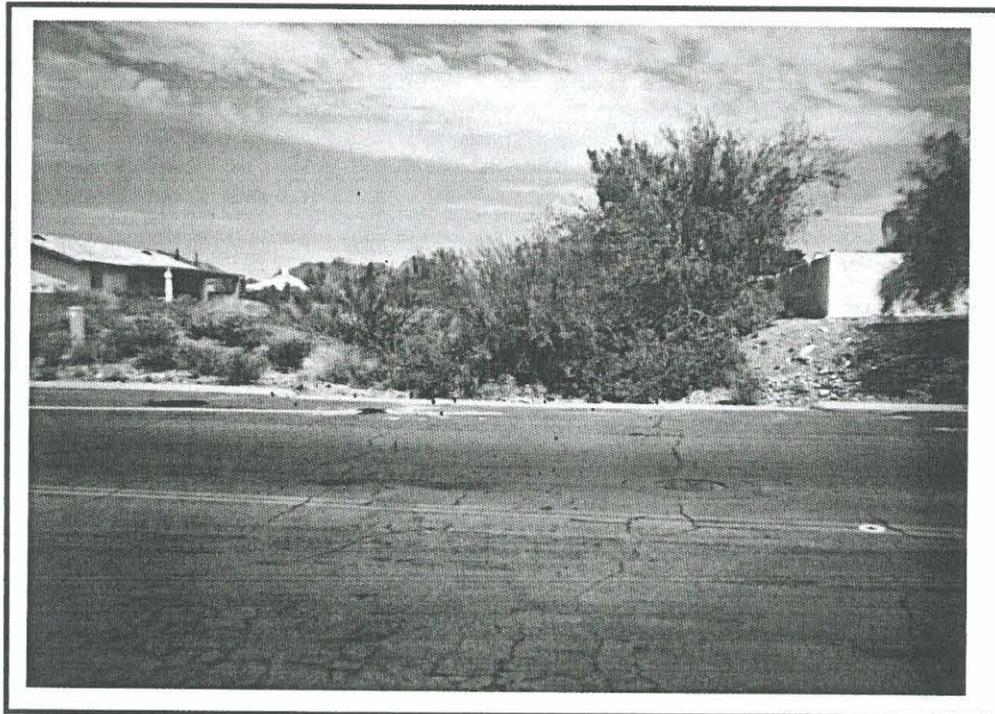
REDUCED SIZE DO NOT SCALE

PROFILE SHEET ADMP 11 - ALTERNATE 1 SHEET OF 2 2

ADMP 12 : El Pueblo Boulevard / Caliente Wash



Caliente Wash Dip Section  
*Looking Downstream Across El Pueblo Boulevard*



Caliente Wash Dip Section  
*Looking Upstream Across El Pueblo Boulevard*



# ALTERNATE 1

Caliente Wash & El Pueblo Blvd. (2-12'x3'x80' CBCs)  
 CURRENT DATE: 10-09-1996  
 CURRENT TIME: 16:52:47

FILE DATE: 10-09-1996  
 FILE NAME: FH12-#1

-----  
 FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3  
 -----

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1619.82	1618.56	80.01	2 RCB	12.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

-----  
 SUMMARY OF CULVERT FLOWS (CFS)                      FILE: FH12-#1                      DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1619.82	0	0	0	0	0	0	0	0	1
1620.65	56	56	0	0	0	0	0	0	1
1621.14	111	111	0	0	0	0	0	0	1
1621.56	167	167	0	0	0	0	0	0	1
1621.94	222	222	0	0	0	0	0	0	1
1622.28	278	278	0	0	0	0	0	0	1
<b>1622.35</b>	<b>288</b>	<b>288</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
1622.96	389	389	0	0	0	0	0	0	1
1623.31	444	444	0	0	0	0	0	0	1
1623.69	500	500	0	0	0	0	0	0	1
<b>1624.03</b>	<b>555</b>	<b>545</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>4</b>
1623.86	521	521	0	0	0	0	0	0	OVERTOPPING

-----  
 SUMMARY OF ITERATIVE SOLUTION ERRORS                      FILE: FH12-#1                      DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1619.82	0.00	0	0	0.00
1620.65	0.00	56	0	0.00
1621.14	0.00	111	0	0.00
1621.56	0.00	167	0	0.00
1621.94	0.00	222	0	0.00
1622.28	0.00	278	0	0.00
1622.35	0.00	288	0	0.00
1622.96	0.00	389	0	0.00
1623.31	0.00	444	0	0.00
1623.69	0.00	500	0	0.00
1624.03	-0.00	555	1	0.13

<1> TOLERANCE (FT) = 0.010

<2> TOLERANCE (%) = 1.000

-----  
 Conclusions: 10-yr O.K. 100-yr overtops.



CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:52:47

FILE DATE: 10-09-1996  
FILE NAME: FH12-#1

-----  
-----  
TAILWATER  
-----  
-----

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
BOTTOM WIDTH (FT) 25.00  
SIDE SLOPE H/V (X:1) 1.0  
CHANNEL SLOPE V/H (FT/FT) 0.016  
MANNING'S N (.01-0.1) 0.040  
CHANNEL INVERT ELEVATION (FT) 1618.56  
CULVERT NO.1 OUTLET INVERT ELEVATION 1618.56 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1618.56	0.000	0.00	0.00	0.00
55.50	1619.20	0.742	0.64	3.37	0.63
111.00	1619.53	0.784	0.97	4.39	0.96
166.50	1619.80	0.807	1.24	5.11	1.22
222.00	1620.04	0.823	1.48	5.68	1.46
277.50	1620.25	0.835	1.69	6.16	1.67
288.00	1620.29	0.837	1.73	6.24	1.70
388.50	1620.63	0.851	2.07	6.95	2.04
444.00	1620.80	0.858	2.24	7.28	2.21
499.50	1620.96	0.863	2.40	7.59	2.37
555.00	1621.12	0.867	2.56	7.87	2.52

-----  
-----  
ROADWAY OVERTOPPING DATA  
-----  
-----

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 62.00  
CREST LENGTH (FT) 50.00  
OVERTOPPING CREST ELEVATION (FT) 1623.86  
-----  
-----

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16

Project Nam FOUNTAIN HILLS ADMP

Project Locat Fountain Hills, Arizona

Del Cambre Boulevard & Caliente Wash

ADMP- 12, Alternate 1: Install 2-12'x3'x80' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,773.00	1	\$1,773
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	1	\$800
2020020	Removal of Concrete Curb	LFT.	\$2.00	689	\$1,378
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	3293	\$4,610
2020201	Saw Cutting	L.FT.	\$5.00	196	\$980
2030401	Drainage Excavation	CU.YD.	\$5.00	95	\$475
2030501	Structural Excavation	CU.YD.	\$8.00	708	\$5,664
2030506	Structural Backfill	CU.YD.	\$25.00	700	\$17,500
2030902	Borrow (Roadway Fill)	CU.YD.	\$8.00	447	\$3,576
2050001	Grading For Pavement	SQ. YD.	\$2.50	3391	\$8,478
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	978	\$34,230
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	565	\$25,425
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	2	\$4,800
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
6010002	Structural Concrete (Class S) (F'C = 3,000)	CU.YD.	\$150.00	240	\$36,000
6050002	Reinforcing Steel	LB.	\$0.50	27400	\$13,700
7010001	Maintenance and Protection of Traffic	L.SUM	\$7,094.00	1	\$7,094
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,064.00	1	\$1,064
8081012	Water Main (12")	L.FT.	\$65.00	75	\$4,875
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	74	\$2,590
9010001	Mobilization (10%)	L.SUM	\$17,735.00	1	\$17,735
9080140	Concrete Gutter	L.FT.	\$10.00	901	\$9,010
9130008	Riprap (Dumped) (12"Dia., D50)	CU. YD.	\$64.00	45	\$2,880
9240170	Contractor Quality Control (2%)	L.SUM	\$3,547.00	1	\$3,547
9250001	Construction Surveying and Layout (2%)	L.SUM	\$3,547.00	1	\$3,547
Sub-Total					\$210,333
Engineering and Contingencies (20%)					\$42,070
<b>TOTAL</b>					<b>\$252,403</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$253,000**

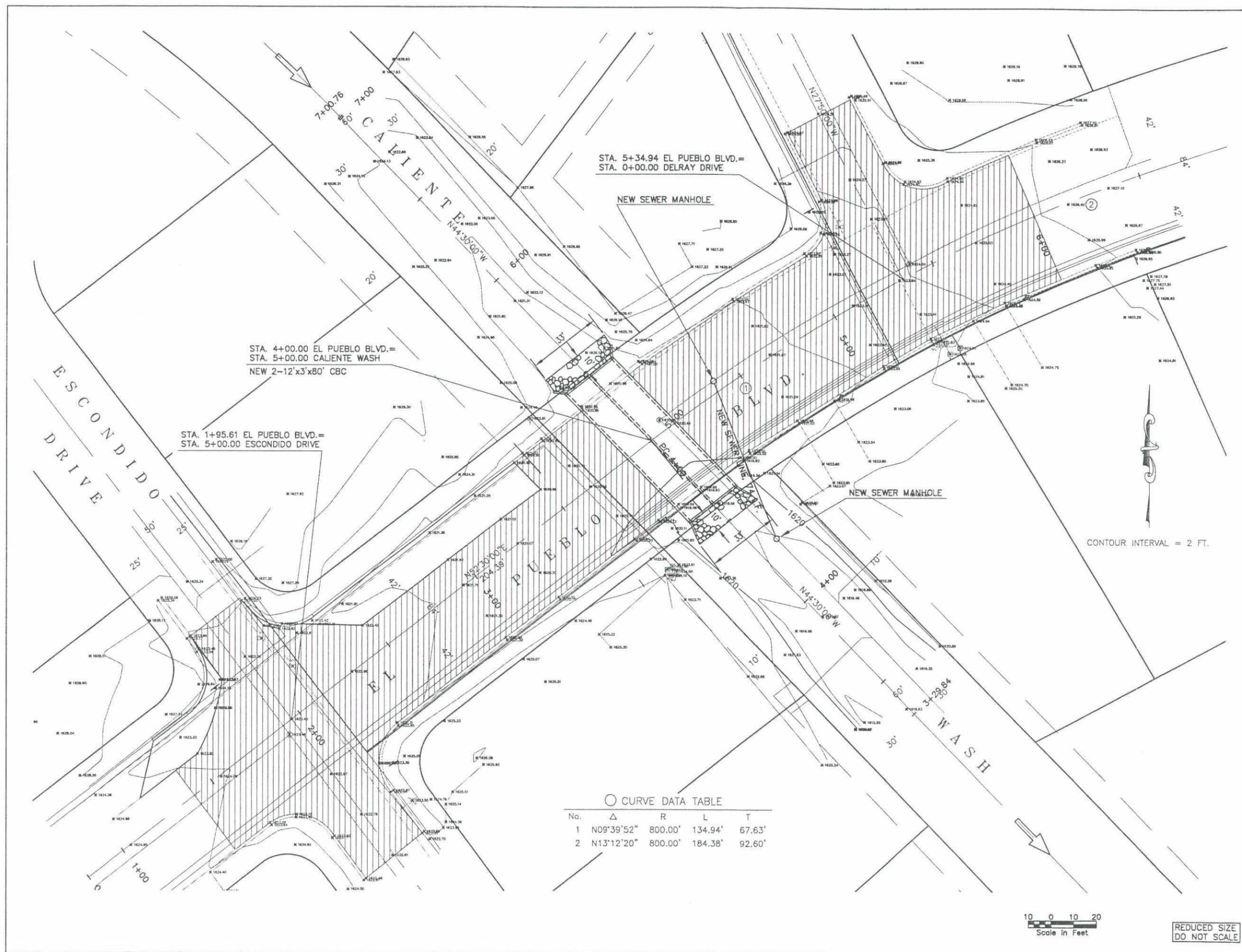
NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX

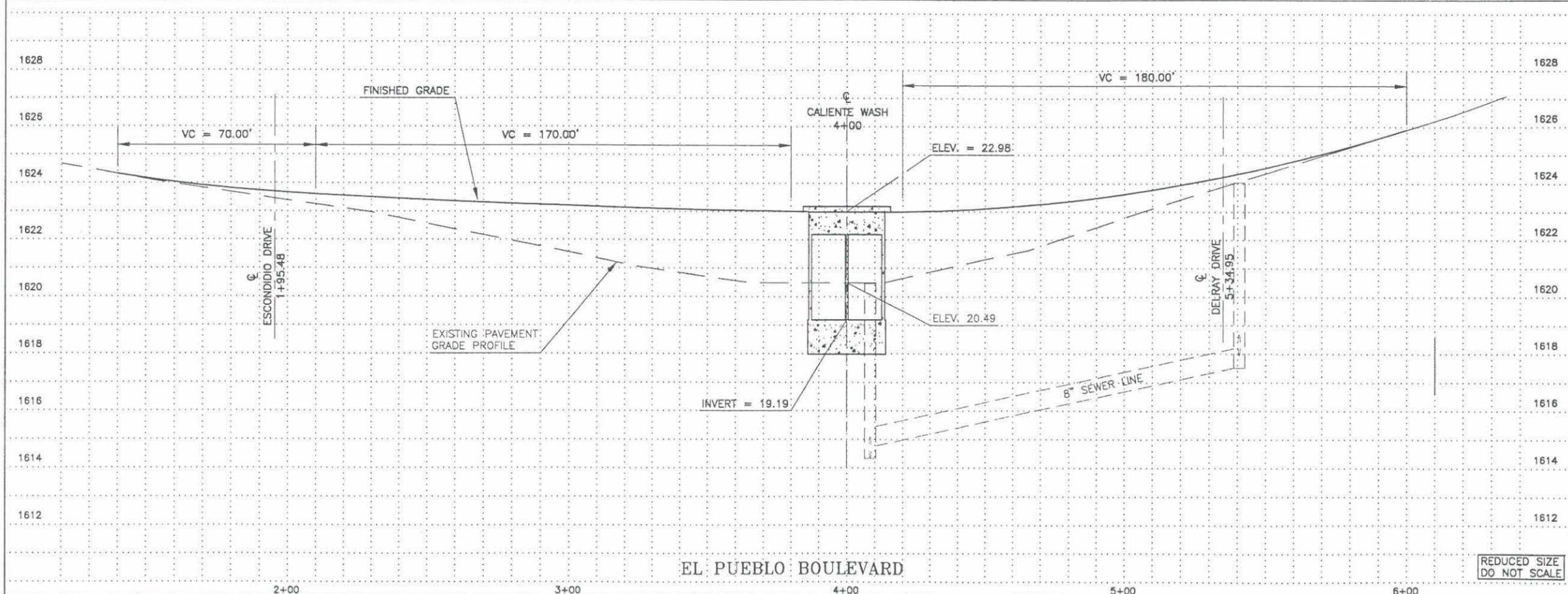
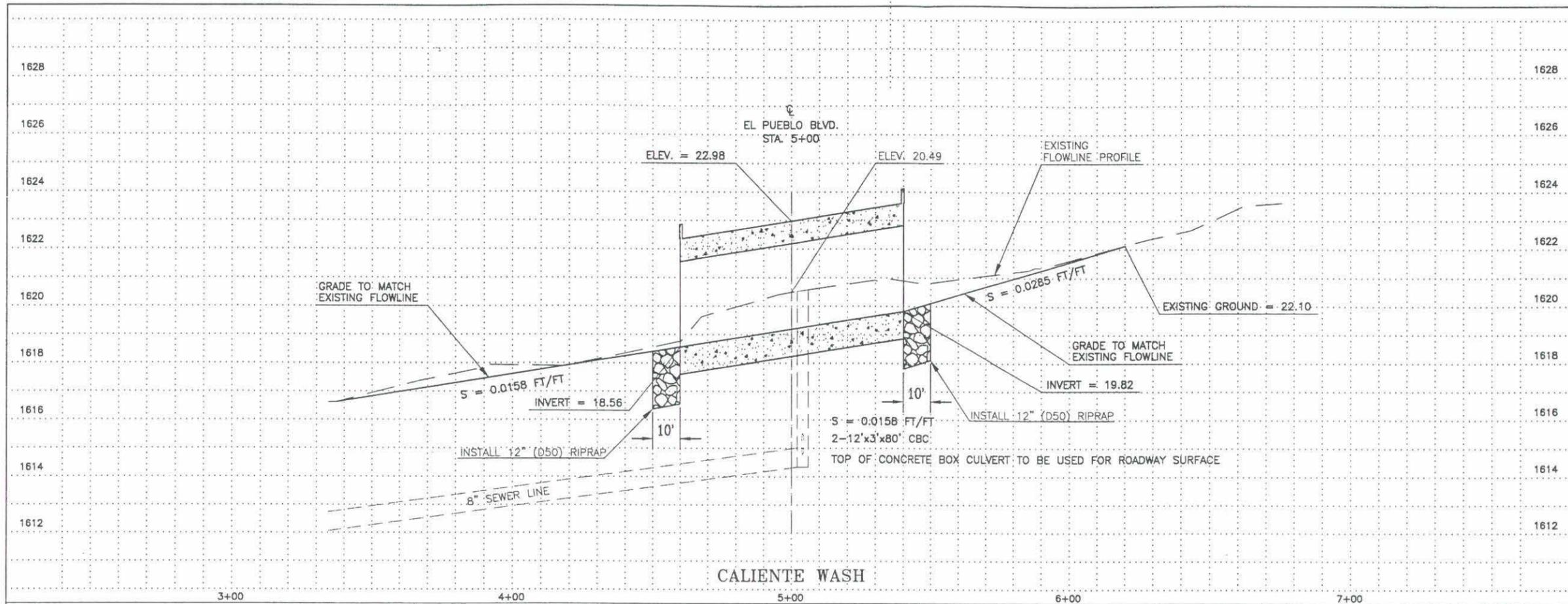


3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b>			
<b>FOUNTAIN HILLS ADMP EL PUEBLO BOULEVARD &amp; CALIENTE WASH PROJECT NO. 94-16</b>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE</b> McLAUGHLIN KMETTY ENGINEERS, LTD.		
PLAN SHEET ADMP 12 ALTERNATE 1			SHEET OF 1 2

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

EXISTING CONDITION Q100= 282 CFS (1995)  
FUTURE CONDITION Q100= 555 CFS (BUILD OUT)



NO.	REVISION	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
EL PUEBLO BLVD. & CALIENTE WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/95
DRAWN	C. JOY	6/3/95
CHECKED	F. BROWN	6/3/95

PRELIMINARY NOT FOR CONSTRUCTION

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETZ ENGINEERS, LTD.

REDUCED SIZE DO NOT SCALE

PROFILE SHEET ADMP 12 - ALTERNATE 1 SHEET OF 2

# ALTERNATE 2

Caliente Wash & El Pueblo Blvd. (11-36"x90' CMPs)  
 CURRENT DATE: 10-09-1996  
 CURRENT TIME: 16:53:07

FILE DATE: 10-09-1996  
 FILE NAME: FH12-#2

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.3

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1619.90	1618.48	90.01	11 CSP	3.00	3.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: FH12-#2 DATE: 10-09-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1619.90	0	0	0	0	0	0	0	0	1
1620.94	56	56	0	0	0	0	0	0	1
1621.38	111	111	0	0	0	0	0	0	1
1621.76	167	167	0	0	0	0	0	0	1
1622.12	222	222	0	0	0	0	0	0	1
1622.47	278	278	0	0	0	0	0	0	1
<b>1622.53</b>	<b>288</b>	<b>288</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
1623.36	389	389	0	0	0	0	0	0	1
1623.68	444	444	0	0	0	0	0	0	1
1623.94	500	487	0	0	0	0	0	12	3
<b>1624.18</b>	<b>555</b>	<b>515</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>3</b>
1623.74	461	461	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: FH12-#2 DATE: 10-09-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1619.90	0.00	0	0	0.00
1620.94	0.00	56	0	0.00
1621.38	0.00	111	0	0.00
1621.76	0.00	167	0	0.00
1622.12	0.00	222	0	0.00
1622.47	0.00	278	0	0.00
1622.53	0.00	288	0	0.00
1623.36	0.00	389	0	0.00
1623.68	0.00	444	0	0.00
1623.94	-0.00	500	0	0.09
1624.18	-0.00	555	0	0.05

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

Conclusions: 10-yr O.K. 100-yr overtops.



CURRENT DATE: 10-09-1996  
CURRENT TIME: 16:53:07

FILE DATE: 10-09-1996  
FILE NAME: FH12-#2

-----  
----- TAILWATER -----  
-----

\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
BOTTOM WIDTH (FT) 43.00  
SIDE SLOPE H/V (X:1) 1.0  
CHANNEL SLOPE V/H (FT/FT) 0.016  
MANNING'S N (.01-0.1) 0.040  
CHANNEL INVERT ELEVATION (FT) 1618.56  
CULVERT NO.1 OUTLET INVERT ELEVATION 1618.48 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1618.56	0.000	0.00	0.00	0.00
55.50	1619.02	0.714	0.46	2.76	0.46
111.00	1619.26	0.761	0.70	3.62	0.69
166.50	1619.46	0.788	0.90	4.23	0.88
222.00	1619.62	0.808	1.06	4.73	1.05
277.50	1619.78	0.823	1.22	5.15	1.20
288.00	1619.81	0.826	1.25	5.23	1.23
388.50	1620.05	0.845	1.49	5.86	1.47
444.00	1620.18	0.854	1.62	6.16	1.59
499.50	1620.29	0.862	1.73	6.44	1.71
555.00	1620.41	0.869	1.85	6.70	1.82

-----  
----- ROADWAY OVERTOPPING DATA -----  
-----

WEIR COEFFICIENT 2.67  
EMBANKMENT TOP WIDTH (FT) 62.00  
CREST LENGTH (FT) 50.00  
OVERTOPPING CREST ELEVATION (FT) 1623.74  
-----

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16

Project Name: FOUNTAIN HILLS ADMP

Project Locati Fountain Hills, Arizona

Del Cambre Boulevard & Caliente Wash

ADMP- 12, Alternate 2: Install 11-36"x90' CMPs

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,726.00	1	\$1,726
2020001	Removal of Structures and Obstructions	L.SUM	\$800.00	1	\$800
2020020	Removal of Concrete Curb	LFT.	\$2.00	689	\$1,378
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	3293	\$4,610
2020201	Saw Cutting	L.FT.	\$5.00	196	\$980
2030401	Drainage Excavation	CU.YD.	\$5.00	153	\$765
2030902	Borrow (Roadway Fill)	CU.YD.	\$7.50	765	\$5,738
2050001	Grading For Pavement	SQ. YD.	\$2.50	3037	\$7,593
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	919	\$32,165
4010006	Portland Cement Concrete Pavement (6")	SQ.YD.	\$20.00	536	\$10,720
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	506	\$22,770
5010025	Pipe, Corrugated Metal, 36"	L.FT.	\$57.00	990	\$56,430
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	2	\$4,800
5050201	Reset Frame And Cover For Manhole	EACH	\$275.00	1	\$275
7010001	Maintenance and Protection of Traffic	L.SUM	\$6,903.00	1	\$6,903
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,035.00	1	\$1,035
8081012	Water Main (12")	L.FT.	\$65.00	85	\$5,525
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	81	\$2,835
9010001	Mobilization (10%)	L.SUM	\$17,257.00	1	\$17,257
9080140	Concrete Gutter	L.FT.	\$10.00	901	\$9,010
9080303	Concrete Driveway	SQ.FT.	\$3.00	575	\$1,725
9130008	Riprap (Dumped) (12" Dia., D50)	CU. YD.	\$64.00	68	\$4,352
9240170	Contractor Quality Control (2%)	L.SUM	\$3,451.00	1	\$3,451
9250001	Construction Surveying and Layout (2%)	L.SUM	\$3,451.00	1	\$3,451
Sub-Total					\$206,393
Engineering and Contingencies (20%)					\$41,279
<b>TOTAL</b>					<b>\$247,672</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$248,000**

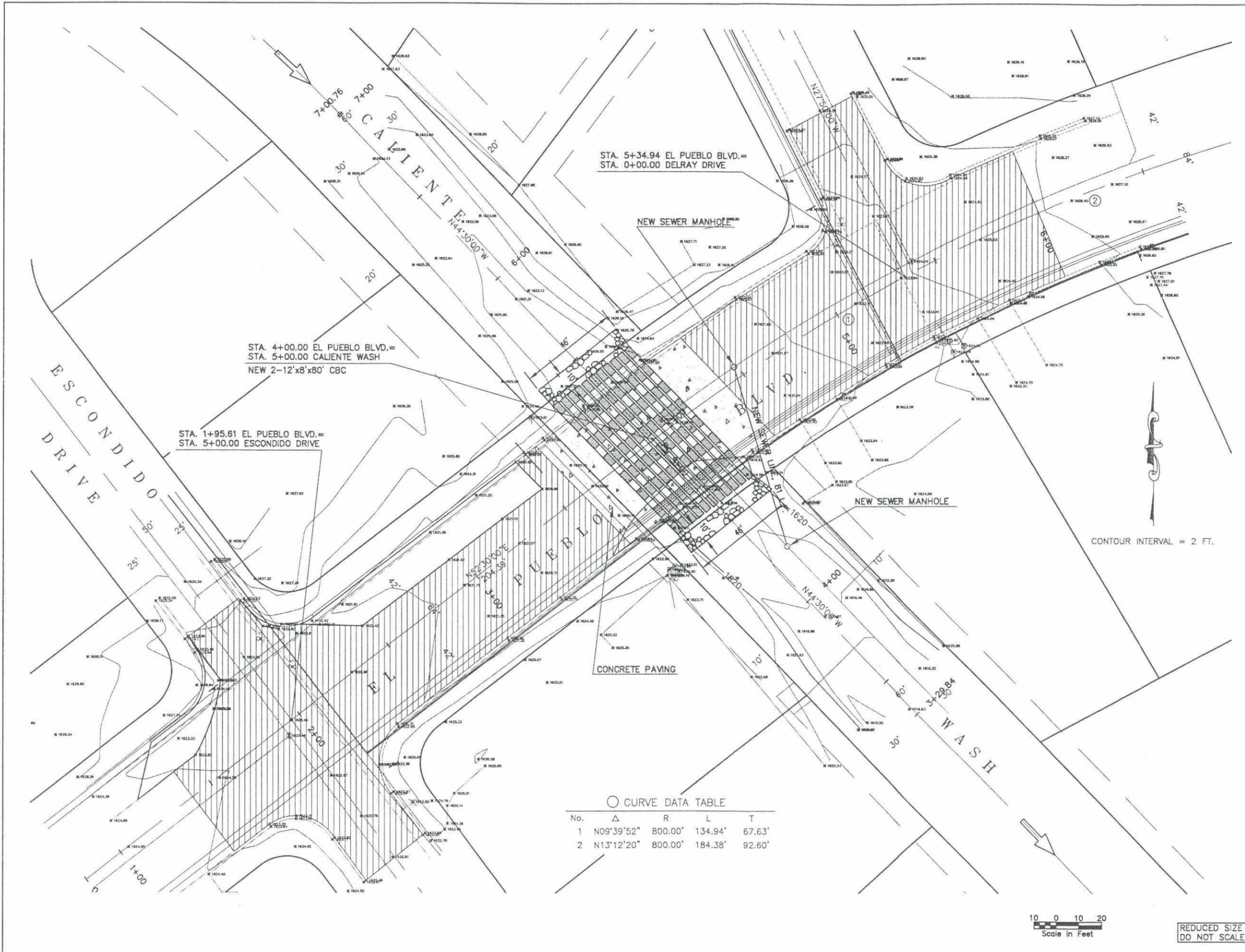
NOTE:  
 PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	N09°39'52"	800.00'	134.94'	67.63'
2	N13°12'20"	800.00'	184.38'	92.60'

NO.	REVISION	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION**

**FOUNTAIN HILLS ADMP EL PUEBLO BOULEVARD & CALIENTE WASH PROJECT NO. 94-16**

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

PRELIMINARY NOT FOR CONSTRUCTION

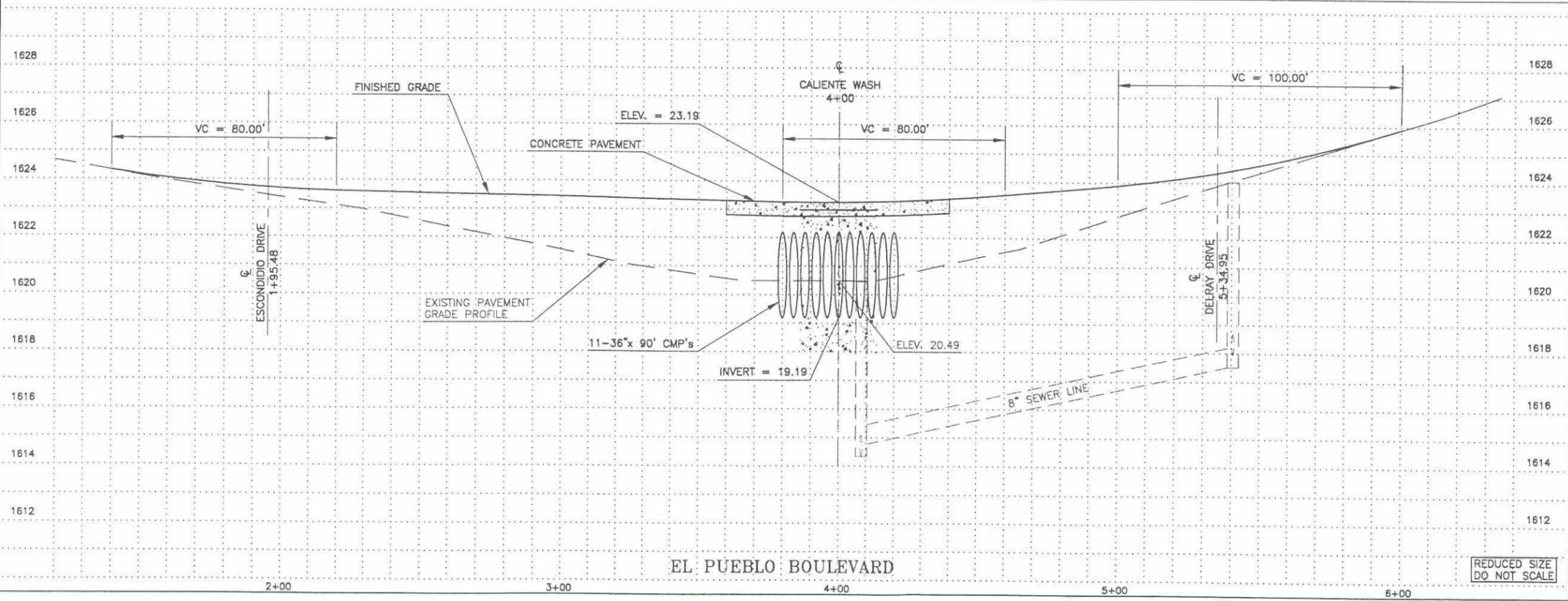
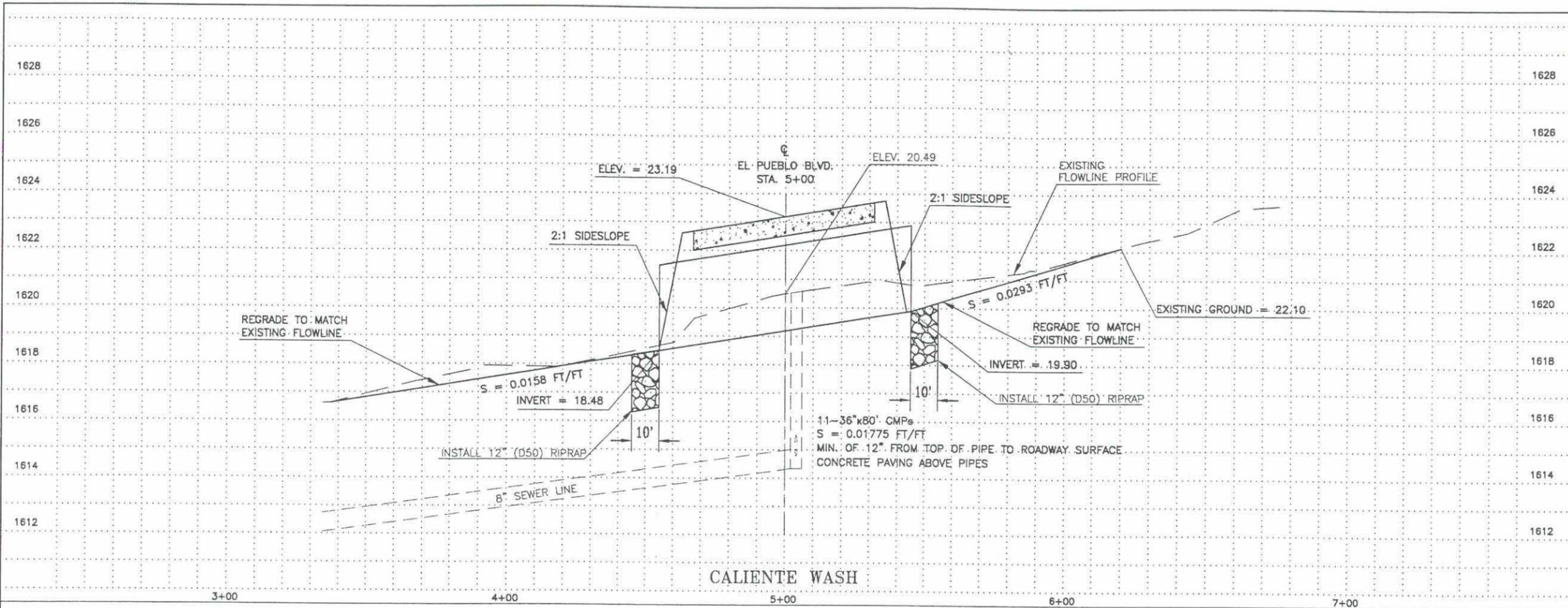
GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with **MKE McLAUGHLIN KMETTY ENGINEERS, LTD.**

PLAN SHEET ADMP 12 ALTERNATE 2

SHEET OF 1 2

**REQUIREMENTS**

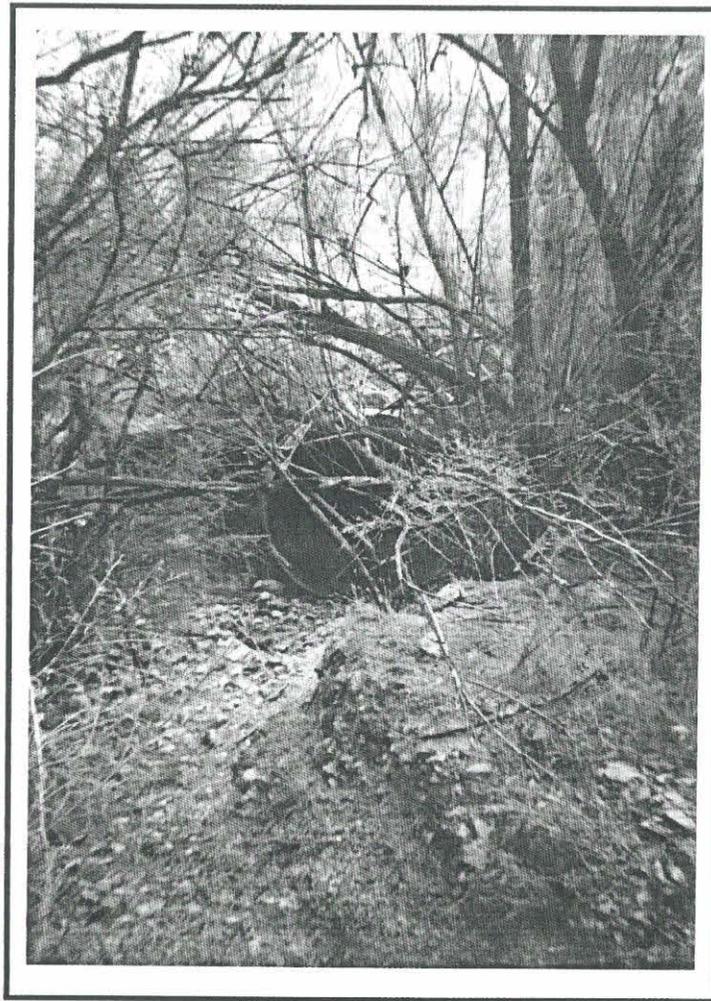
EXISTING CONDITION Q100= 282 CFS (1995)  
FUTURE CONDITION Q100= 555 CFS (BUILD OUT)



3			
2			
1			
NO.	REVISION	BY	DATE
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION FOUNTAIN HILLS ADMP EL PUEBLO BLVD. & CALIENTE WASH PROJECT NO. 94-16			
PRELIMINARY NOT FOR CONSTRUCTION		BY	DATE
	DESIGNED	R. CONSONI	6/3/95
	DRAWN	C. JOY	6/3/95
	CHECKED	F. BROWN	6/3/95
GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE</b> McLAUGHLIN KMETZ ENGINEERS, LTD.			
PROFILE SHEET ADMP 12 - ALTERNATE 2			SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

ADMP 13 : Fountain Hills Boulevard / Arrow Wash



Arrow Wash Culvert Inlet  
*Looking Downstream At Culvert Inlet*



Arrow Wash  
*Looking Easterly Across Arrow Wash At Fountain Hills Boulevard and Palisades Plaza Shopping Center*



Job No.: 92-404.004  
 Job Name: Fountain Hills

Reconnaissance by:  
RFG 6-20-96  
CLJ 6-20-96  
 Inits. Date

## Field Reconnaissance Sheet

Site No.: ADMP 13

Roadway: Fountain Hills and Palisades Blvd.

Name of Drainageway	Q <sub>100, FS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Arrow Wash</u>	<u>520</u>	<u>660</u>	<u>1-60" Storm Drain</u>

Reason for Analysis / Existing Deficiency: 100 year flow overtops culvert structure and floods road. Flow returns to channel at storm drain outlet much farther downstream.

### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 8' ft. Downstream: 3' ft.
- 2) Can the culvert be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, \_\_\_\_\_ ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, (minor) ft.  No  
Downstream?  Yes, (minor) ft.  No

### Structure Modification Constraints:

- 4) Utilities: Deep excavation of pipe under 2 major roads and a well paved and lighted parking will mean serious utility conflicts much of which will only be seen during construction
- 5) Structures: Storm drain passes under 2 major streets and a large shopping center parking lot. Upstream area void of any structures.
- 6) Right-of-Way: Storm drain passes under a large shopping center parking lot
- 7) Miscellaneous field notes, comments, or design ideas:  
Detention basin is best alternative. Any pipe improvements (significant) will be very expensive. Another possibility might be running another storm drain parallel to Ftn. Hills Blvd. the along Palisades Blvd. to the existing outlet. This also will be very expensive. Upstream area seems well suited for detention basin

ALTERNATE 1

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No. FCDMC 94-16  
 Project Nam FOUNTAIN HILLS ADMP  
 Project Loca Fountain Hills, Arizona  
 Fountain Hills Boulevard & Arrow Wash  
 ADMP- 13, Alternate 1: Construct Detention Basin

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTIT	AMOUNT
2010011	Clearing And Grubbing	ACRES	\$2,500.00	2	\$5,000
2030451	Channel Excavation	CU.YD.	\$6.00	19445	\$116,670
2070001	Dust Palliative	M.GAL.	\$100.00	10	\$1,000
7010001	Maintenance and Protection of Traffic (2%)	L.SUM	\$2,773.00	1	\$2,773
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$416.00	1	\$416
8060011	Transplanting Trees, Shrubs and Plants	L.SUM	\$6,000.00	1	\$6,000
8061641	Transplant Cactus	EACH	\$500.00	20	\$10,000
9010001	Mobilization (10%)	L.SUM	\$13,867.00	1	\$13,867
9240170	Contractor Quality Control (2%)	L.SUM	\$2,773.00	1	\$2,773
9250001	Construction Surveying and Layout (2%)	L.SUM	\$2,773.00	1	\$2,773
Sub-Total					\$161,272
Engineering and Contingencies (15%)					\$24,190
<b>TOTAL</b>					<b>\$185,462</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$186,000**

Excerpt from Fountain Hills Future Conditions  
Hydrology

Table F-5

Future Condition  
100-year Peak Discharges  
In Numerical Order by Type

A1+1:  
runoff with larger  
Storage Volume at  
ADMP 13  
↓  
24-hr

↓  
6-hr

HEC-1 ID	Discharge, in cfs		Control
	6-hr	24-hr	
C524	555	329	6-hour controls
C525	596	399	6-hour controls
C526	798	512	6-hour controls
C527	987	627	6-hour controls
C528	548	361	6-hour controls
C529	917	596	6-hour controls
C530	1340	1005	6-hour controls
C530R	629	417	6-hour controls
C531	1504	1172	6-hour controls
C532	1854	1578	6-hour controls
C532L	1661	1344	6-hour controls
C533	2132	1920	6-hour controls
C534	2427	2310	6-hour controls
C534R	2306	2142	6-hour controls
C535	2441	2346	6-hour controls
C536I	2496	2430	6-hour controls
C536O	326	321	6-hour controls
C536R	2427	2354	6-hour controls
C537	346	358	24-hour control
C538I	473	499	24-hour control
C538O	442	456	24-hour control
C540	560	561	24-hour control
C540L	254	147	6-hour controls
C540R	464	468	24-hour control
C541	658	633	6-hour controls
C543	252	143	6-hour controls
C544	171	96	6-hour controls
C546	271	152	6-hour controls
C547	758	443	6-hour controls
C548	1172	1241	24-hour control
C548L	747	726	6-hour controls
C548R	883	535	6-hour controls
C549	3524	4013	24-hour control
C549L	1331	1370	24-hour control
C549R	2508	2760	24-hour control
C550	687	455	6-hour controls
C552	1312	1001	6-hour controls
C552L	878	617	6-hour controls
C552R	679	420	6-hour controls
C553	1440	1127	6-hour controls
C555	489	289	6-hour controls
C556	1906	1626	6-hour controls
C556L	1601	1309	6-hour controls
C556R	682	404	6-hour controls
C557	2067	1780	6-hour controls
C557R	2002	1720	6-hour controls
C558	2110	1821	6-hour controls

3968      2468

24 hr      6 hr  
↑            |

Del Cambre Blvd,  
Ashbrook Wash

Excerpt from Fountain Hills Future Conditions Hydrology

Table F-5

Alt. 1:  
runoff with larger  
storage volume at  
AOMP 13

Future Condition  
100-year Peak Discharges  
In Numerical Order by Type

↓  
24-HR

↓  
6-HR

CONCLUSION for 24-hour storm:  
there is a minor decrease in flow

CONCLUSION for 6-hour storm:  
There is a definite advantage to this alternative.

↑  
24-HR

↑  
6-HR

HEC-1 ID	Discharge, in cfs		Control
	6-hr	24-hr	
C595R	1764	1082	6-hour controls
C596	1679	1696	24-hour control
C597	900	483	6-hour controls
C598	884	691	6-hour controls
C599I	2474	2655	24-hour control
C599O	1631	1143	6-hour controls
C600O	373	241	6-hour controls
C601	663	419	6-hour controls
C602	950	589	6-hour controls
C602L	769	487	6-hour controls
C603	1313	833	6-hour controls
C605O	129	107	6-hour controls
C606	256	184	6-hour controls
C606R	131	78	6-hour controls
C607	295	207	6-hour controls
C608	1642	1161	6-hour controls
C608L	1629	1147	6-hour controls
C609O	69	56	6-hour controls
C611I	402	242	6-hour controls
C611O	201	143	6-hour controls
C611R	338	190	6-hour controls
C612	119	64	6-hour controls
C613	1639	1162	6-hour controls
C615	55	34	6-hour controls
C617	372	204	6-hour controls
C617L	355	193	6-hour controls
C618	518	302	6-hour controls
C618I	499	282	6-hour controls
C618O	482	280	6-hour controls
C619I	655	408	6-hour controls
C619L	637	399	6-hour controls
C619O	596	185	6-hour controls
C620	741	355	6-hour controls
C620R	573	223	6-hour controls
C621	1866	1484	6-hour controls
C621L	1633	1169	6-hour controls
C622	2429	2697	24-hour control
C622L	1474	979	6-hour controls
C622R	1877	1761	6-hour controls
C624	238	130	6-hour controls
C626	3692	4117	24-hour control
C626C	3561	4012	24-hour control
C626R	367	207	6-hour controls
C627	3714	4130	24-hour control
CLEAR	2109	2017	6-hour controls
CLEAR	1610	1464	6-hour controls
D503L	344	298	6-hour controls

171  
333  
1,445  
2,652  
4,071  
4,084

210  
396  
1,855  
2,389  
3,651  
3,674

Res. Route outflow  
← AOMP 14

AR Wash after AS Wash

Saguaro Blvd (AOMP 2)  
Ashbrook Wash

El Pueblo Blvd, Ashbrook Wash

Downstream end of Project, Ashbrook Wash

Excerpt from Fountain Hills Future Conditions Hydrology  
Table F-5

A17.1:  
runoff with larger  
Storage Volume at  
ADMP 13

Future Condition  
100-year Peak Discharges  
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs		Control
	6-hr	24-hr	
D503R	0	0	6-hour controls
D504L	23	22	6-hour controls
D504R	41	12	6-hour controls
D505L	16	14	6-hour controls
D505R	56	21	6-hour controls
D506L	0	0	6-hour controls
D506R	74	34	6-hour controls
D508L	232	111	6-hour controls
D508R	95	71	6-hour controls
D512L	145	110	6-hour controls
D512R	131	80	6-hour controls
D523L	502	262	6-hour controls
D523R	68	18	6-hour controls
D543L	0	0	6-hour controls
D543R	252	143	6-hour controls
D545L	84	48	6-hour controls
D545R	84	48	6-hour controls
D611L	32	0	6-hour controls
D611R	169	143	6-hour controls
D614L	18	11	6-hour controls
D614R	43	26	6-hour controls
D615L	36	22	6-hour controls
D615R	19	12	6-hour controls
D619L	402	0	6-hour controls
D619R	194	185	6-hour controls
501502	511	327	6-hour controls
502503	687	453	6-hour controls
503504	0	0	6-hour controls
508507	224	108	6-hour controls
511512	472	258	6-hour controls
513514	366	234	6-hour controls
515517	590	400	6-hour controls
516517	495	333	6-hour controls
517518	1163	931	6-hour controls
518519	1192	992	6-hour controls
519591	1254	1060	6-hour controls
520591	119	70	6-hour controls
522523	309	181	6-hour controls
523524	484	259	6-hour controls
523548	60	15	6-hour controls
524525	550	325	6-hour controls
525526	586	395	6-hour controls
526527	776	505	6-hour controls
528530	545	360	6-hour controls
530531	1326	996	6-hour controls
531532	1490	1162	6-hour controls
532533	1850	1575	6-hour controls

↓  
24-HR

↓  
6-HR

0  
171

21  
189

↑  
24-HR

↑  
6-HR

Street overtopping  
into Ftn Hills Blvd  
6-hr controls  
Pipe flows in 60" CMP

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* Lahey F77L-EM/32 version 5.01 *
* Dodson & Associates, Inc. *
* RUN DATE 09/19/96 TIME 15:07:31 *
*****

```

```

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

```

6-Hour STORM

```

X X XXXXXXX XXXXX X
X X X X X XX
X X X X X
XXXXXXXX XXXX X XXXXX X
X X X X X
X X X X X
X X XXXXXXX XXXXX XXXX

```

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 -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION  
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,  
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION  
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1 HEC-1 page numbering

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID Fountain Hills Area Drainage Master Plan
2 ID This information is modified from the
3 ID Fountain Hills North Floodplain Delineation Study. Original filename FU100-6.
4 ID Original FCD 92-04. New ADMP is FCD 94-16
5 ID Modified by McLaughlin Kmetty Engineers, for GVSCE File: 1006R1FH.IH1
6 ID Future Condition Model Date: 07-19-94 dtp
7 ID 100-Year 6-Hour Storm, Clark Unit Hydrograph Revised: 9-20-96 cj/fb
8 ID *****
9 ID The future conditions model is revised to add a reservoir route at C619
10 ID This location is Arrow Wash at Fountain Hills Blvd (aka ADMP 13)
11 ID as part of the Fountain Hills Area Drainage Master Plan.
12 ID *****
*
13 IT 1 1080
14 IO 5
15 IN 15
*DIAGRAM
*
16 JD 3.30 0.01
17 PC 0.000 0.008 0.016 0.025 0.033 0.041 0.050 0.058 0.066 0.074
18 PC 0.087 0.099 0.118 0.138 0.216 0.377 0.834 0.911 0.931 0.950
19 PC 0.962 0.972 0.983 0.991 1.000
20 JD 3.28 0.50
21 JD 3.23 2.80
22 PC 0.000 0.009 0.016 0.025 0.034 0.042 0.051 0.059 0.067 0.076
23 PC 0.087 0.100 0.120 0.163 0.252 0.451 0.694 0.837 0.900 0.938
24 PC 0.950 0.963 0.975 0.988 1.000
25 JD 3.04 16.0
26 PC 0.000 0.015 0.020 0.030 0.048 0.063 0.076 0.090 0.105 0.119
27 PC 0.135 0.152 0.175 0.222 0.304 0.472 0.670 0.796 0.868 0.912
28 PC 0.946 0.960 0.973 0.987 1.000
29 JD 2.67 90.0

```

(actually just larger storage volume, in addition to existing storage volume)

100-Year HEC-1, Future Conditions, 6-hour

File = 1006R1FH.0H1

Fountain Hills ADMP

.0H1 applies to all sheets.

Output printout pages (numbered consecutively) Page 1

30	PC	0.000	0.021	0.035	0.051	0.071	0.087	0.105	0.125	0.143	0.160
31	PC	0.179	0.201	0.232	0.281	0.364	0.500	0.658	0.773	0.841	0.888
32	PC	0.927	0.945	0.964	0.982	1.000					
33	JD	1.88	500.0								
34	PC	0.000	0.024	0.043	0.059	0.078	0.098	0.119	0.141	0.162	0.186
35	PC	0.212	0.239	0.271	0.321	0.408	0.515	0.627	0.735	0.814	0.864
36	PC	0.907	0.930	0.954	0.977	1.000					

\*

37 KK 201A  
 38 KM Sub-Basin 201A  
 39 KM  
 40 KM The Clark Unit Hydrograph is used for this basin.  
 41 KM The HEC-1 time-area relation is used for this basin.  
 42 KM  
 43 KM Time of Concentration for this sub-basin is based on the following:  
 44 KM 6-Hour Rainfall, Pattern No. 1.00  
 45 KM An rainfall areal reduction factor of 0.997  
 46 KM  
 47 KM EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS  
 48 KM 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90  
 49 KM .46 .45 .45 .14 .11 .10 .04 .04 .04 .02 .01 .01 .00 .00 .00 .00 .00 .00  
 50 KM

HEC-1 INPUT

1

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

51 KM L= 1.269 miles, S= 208 feet/mile, Kb= .07  
 52 KM  
 53 BA 0.217  
 54 LG 0.13 0.35 5.70 0.19 7.94  
 55 UC 0.354 0.338  
 \*

56 KK 201B  
 57 KM Sub-Basin 201B  
 58 KM  
 59 KM The Clark Unit Hydrograph is used for this basin.  
 60 KM The HEC-1 time-area relation is used for this basin.  
 61 KM  
 62 KM Time of Concentration for this sub-basin is based on the following:  
 63 KM 6-Hour Rainfall, Pattern No. 1.00  
 64 KM An rainfall areal reduction factor of 0.999  
 65 KM  
 66 KM EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS  
 67 KM 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90  
 68 KM .45 .44 .44 .13 .10 .09 .04 .03 .03 .00 .00 .00 .00 .00 .00 .00 .00 .00  
 69 KM  
 70 KM L= 0.680 miles, S= 223 feet/mile, Kb= .10  
 71 KM  
 72 BA 0.081  
 73 LG 0.15 0.38 5.70 0.20 1.84  
 74 UC 0.292 0.291  
 \*

75 KK C501  
 76 KM Hydrograph combine 201A + 201B at C501  
 77 HC 2  
 \*

78 KK 501502  
 79 KM Normal depth channel route from C501 to C502  
 80 KM Source: 200 Scale Mapping  
 81 RS 6 FLOW -1  
 82 RC 0.055 0.045 0.055 3000.0 0.0203  
 83 RX 1000.0 1010.0 1025.0 1045.0 1075.0 1105.0 1125.0 1155.0  
 84 RY 1624.0 1622.0 1620.0 1618.0 1618.0 1620.0 1622.0 1624.0  
 \*

85 KK 201C

100-Year HEC-1, Future Conditions, 6-hour

Note: input pages omitted until area of interest.

```

4182 LG 0.06 0.25 5.80 0.18 90.00
4183 UC 0.096 0.170
4184 UA 0 5 16 30 65 77 84 90 94 97
4185 UA 100
*

4186 KK C615
4187 KM Hydrograph combine 614615 + 211V at C615
4188 HC 2 0.03
*

4189 KK D615L
4190 KM Hydrograph diversion at C615. Main flow continues in the left branch.
4191 KM Diverted flow is in the right branch.
4192 DT D615R
4193 DI 0 1.3 2.5 5.3 8.6 14.2 23.0 36.8 55.5 77.5
4194 DQ 0 0 0 1.3 2.6 4.2 7.0 12.8 19.5 29.5
*

4195 KK 615618
4196 KM Normal depth channel route from C615 to C618
4197 KM Source: Hydrology Field Reconnaissance
4198 RS 1 FLOW -1
4199 RC 0.040 0.018 0.040 499.0 0.1338
4200 RX 1000.0 1008.0 1009.2 1013.2 1027.2 1028.4 1036.4 1045.4
4201 RY 1800.4 1799.6 1799.2 1798.8 1798.3 1798.7 1798.9 1800.4
*

```

HEC-1 INPUT

PAGE 98

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

```

4202 KK C618
4203 KM Hydrograph combine C6180 + 615618 at C618
4204 HC 2 0.19
*

4205 KK 618619
4206 KM Normal depth channel route from C618 to C619
4207 KM Source: HEC-2 Cross Section: AR 0.441
4208 RS 3 FLOW -1
4209 RC 0.070 0.060 0.070 1837.0 0.0285
4210 RX 9870.6 9928.6 9957.1 9996.9 10004.9 10022.1 10062.0 10116.4
4211 RY 1709.2 1700.9 1698.8 1690.0 1689.8 1699.6 1700.3 1711.3
*

4212 KK 211T
4213 KM Sub-Basin 211T
4214 KM
4215 KM The Clark Unit Hydrograph is used for this basin.
4216 KM The Urban time-area relation is used for this basin.
4217 KM
4218 KM Time of Concentration for this sub-basin is based on the following:
4219 KM 6-Hour Rainfall, Pattern No. 1.00
4220 KM An rainfall areal reduction factor of 0.999
4221 KM
4222 KM EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS
4223 KM 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
4224 KM .49 .49 .49 .18 .15 .15 .07 .07 .07 .07 .06 .06 .01 .01 .01 .01 .01
4225 KM
4226 KM L= 0.488 miles, S= 250 feet/mile, Kb= .03
4227 KM
4228 BA 0.066
4229 LG 0.07 0.25 5.70 0.18 64.25
4230 UC 0.117 0.090
4231 UA 0 5 16 30 65 77 84 90 94 97
4232 UA 100
*

4233 KK C619L

```

100-Year HEC-1, Future Conditions, 6-hour

Note: previous input pages omitted.

4234 KM Hydrograph combine 618619 + 211T at C619 left branch  
 4235 HC 2  
 \*  
 4236 KK BB615R  
 4237 KM Retrieve previously diverted hydrograph at C615 in the right branch.  
 4238 DR D615R  
 \*  
 4239 KK 615619  
 4240 KM Normal depth channel route from C615 to C619  
 4241 KM Source: Hydrology Field Reconnaissance  
 4242 RS 6 FLOW -1  
 4243 RC 0.045 0.024 0.025 2444.0 0.0493  
 4244 RX 1000.0 1009.3 1018.5 1037.0 1039.3 1053.0 1065.0 1065.0  
 4245 RY 1727.2 1726.5 1725.8 1724.4 1724.6 1725.8 1725.9 1725.9  
 \*

1

HEC-1 INPUT

PAGE 99

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

4246 KK C619I  
 4247 KM Hydrograph combine C619L + 615619 at C619I  
 4248 KO 1  
 4249 HC 2 0.25  
 \*

*Note: Area of Interest  
(ADMP 13)*

4250 KK C6190  
 4251 KM Reservoir route at C619.  
 4252 KM \*\*\*\*\*  
 4253 KM The Floodplain Delineation Study reservoir route has been modified.  
 4254 KM This modification is a larger storage volume achieved by excavation.  
 4255 KM \*\*\*\*\*  
 4256 KO 1  
 4257 RS 1 ELEV 1675.6  
 4258 SA 0 0.56 0.66 0.76 0.87 0.98 1.10 1.23 1.53  
 4259 SE 1675.6 1678 1680 1682 1684 1686 1688 1690 1692  
 4260 SQ 0 4 25 72 128 155 163 172 178 187  
 4261 SQ 195 213 238 273 318 374 441 518 606 706  
 4262 SE 1675.6 1676.0 1678.0 1680.0 1682.0 1684.0 1686.0 1688.0 1690.0 1692.0  
 4263 SE 1692.2 1692.4 1692.6 1692.8 1693.0 1693.2 1693.4 1693.6 1693.8 1694.0  
 \*

4264 KK D619R  
 4265 KM Hydrograph diversion at C619. Main flow continues in the right branch.  
 4266 KM Diverted flow is in the left branch.  
 4267 DT D619L  
 4268 DI 0 4 25 72 128 155 163 172 178 187  
 4269 DI 195 213 238 273 318 374 441 518 606 706  
 4270 DQ 0 0 0 0 0 0 0 0 0 0  
 4271 DQ 8 24 49 83 128 182 249 326 412 512  
 \*

4272 KK 619620  
 4273 KM Lag route through Palisades Plaza storm drain  
 4274 RT 0 1  
 \*

4275 KK BB619L  
 4276 KM Retrieve previously diverted hydrograph at C619 in the left branch.  
 4277 DR D619L  
 \*

4278 KK 619620  
 4279 KM Normal depth channel route from C619 to C620 in Fountain Hills Blvd.  
 4280 KM Source: 200 Scale Mapping. Similiar to 523548  
 4281 RS 1 FLOW -1  
 4282 RC 0.040 0.024 0.040 800.0 0.0288  
 4283 RX 918.0 940.0 960.0 1000.0 1040.0 1040.1 1044.1 1088.1

100-Year HEC-1, Future Conditions, 6-hour

4284 RY 1648.0 1645.8 1643.8 1644.7 1644.0 1644.5 1644.5 1648.0  
\*

HEC-1 INPUT

PAGE100

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

4285 KK 211W  
4286 KM Sub-Basin 211W  
4287 KM  
4288 KM The Clark Unit Hydrograph is used for this basin.  
4289 KM The Urban time-area relation is used for this basin.  
4290 KM  
4291 KM Time of Concentration for this sub-basin is based on the following:  
4292 KM 6-Hour Rainfall, Pattern No. 1.00  
4293 KM An rainfall areal reduction factor of 1.000  
4294 KM  
4295 KM EXCESS RAINFALL VALUES EXCEEDED IN 5-MINUTE INTERVALS  
4296 KM 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90  
4297 KM .49 .49 .49 .19 .16 .15 .08 .08 .07 .07 .07 .07 .02 .02 .02 .02 .02  
4298 KM  
4299 KM L= 0.289 miles, S= 173 feet/mile, Kb= .03  
4300 KM  
4301 BA 0.030  
4302 LG 0.06 0.25 5.70 0.18 73.65  
4303 UC 0.100 0.079  
4304 UA 0 5 16 30 65 77 84 90 94 97  
4305 UA 100  
\*

4306 KK C620R  
4307 KM Hydrograph combine 619620 + R619L + 211W at C620 right branch  
4308 HC 3 0.28  
\*

4309 KK BB611R  
4310 KM Retrieve previously diverted hydrograph at C611 in the right branch.  
4311 DR D611R  
\*

4312 KK 611620  
4313 KM Lag route through Palisades Plaza storm drain  
4314 RT 0 1  
\*

4315 KK C620  
4316 KM Hydrograph combine 611620 + C620R at C620  
4317 HC 2 0.42  
\*

4318 KK 620621  
4319 KM Normal depth channel route from C620 to C621  
4320 KM Source: HEC-2 Cross Section: AR 0.081  
4321 RS 1 FLOW -1  
4322 RC 0.050 0.050 0.050 915.0 0.0394  
4323 RX 9790.0 9790.1 9972.2 9994.8 10004.9 10029.7 10048.6 10125.0  
4324 RY 1657.9 1657.5 1656.4 1646.8 1646.8 1657.8 1657.0 1657.9  
\*

HEC-1 INPUT

PAGE101

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

4325 KK C621  
4326 KM Hydrograph combine C621L + 620621 at C621  
4327 HC 2 7.93  
\*

4328 KK 621622  
4329 KM Normal depth channel route from C621 to C622

100-Year HEC-1, Future Conditions, 6-hour

4766	BA	0.053											
4767	LG	0.07	0.25	5.80	0.17	52.43							
4768	UC	0.092	0.058										
4769	UA	0	5	16	30	65	77	84	90	94	97		
4770	UA	100											

\*  
\* \*  
\* \* End Basin 211.  
\* \*  
\*

1 HEC-1 INPUT PAGE111

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10  
4771 ZZ

1 SCHEMATIC DIAGRAM OF STREAM NETWORK  
INPUT LINE (V) ROUTING (—>) DIVERSION OR PUMP FLOW  
NO. (.) CONNECTOR (<—) RETURN OF DIVERTED OR PUMPED FLOW

```

37 201A
   .
56  . 201B
   .
75  c501.....
   V
   V
78  501502
   .
85  . 201C
   .
106 c502R.....
   .
109 . 201D
   .
128 c502.....
   V
   V
131 502503
   .
138 . 201E
   .
157 c503I.....
   V
   V
160 c5030
   .
172 .-----> D503L
169 D503R
   V
   V
177 503504
   .
184 . 202A
   .
205 c504I.....
   V

```

*Note: following pages (logic diagram) omitted. Logic diagram is unaltered. A larger storage volume was added to an existing reservoir route.*  
100-Year HEC-1, Future Conditions, 6-hour

Note: previous pages omitted.

4750

211AF

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   MAY 1991                       *
*   VERSION 4.0.1E                 *
*   Lahey F77L-EM/32 version 5.01 *
*   Dodson & Associates, Inc.     *
* RUN DATE 09/19/96 TIME 15:07:31 *
*****

```

```

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

```

```

Fountain Hills Area Drainage Master Plan
This information is modified from the
Fountain Hills North Floodplain Delineation Study. Original filename FU100-6.
Original FCD 92-04. New ADMP is FCD 94-16
Modified by McLaughlin Kmetty Engineers, for GVSCE   File: 1006R1FH.IH1
Future Condition Model                               Date: 07-19-94 dtp
100-Year 6-Hour Storm, Clark Unit Hydrograph        Revised: 9-20-96 cj/fb
*****
The future conditions model is revised to add a reservoir route at C619
This location is Arrow Wash at Fountain Hills Blvd (aka ADMP 13)
as part of the Fountain Hills Area Drainage Master Plan.
*****

```

14 IO

OUTPUT CONTROL VARIABLES

```

IPRNT      5  PRINT CONTROL
IPLOT      0  PLOT CONTROL
QSCAL      0. HYDROGRAPH PLOT SCALE

```

IT

HYDROGRAPH TIME DATA

```

NMIN      1  MINUTES IN COMPUTATION INTERVAL
IDATE     1  0  STARTING DATE
ITIME     0000 STARTING TIME
NQ        1080 NUMBER OF HYDROGRAPH ORDINATES
NDDATE    1  0  ENDING DATE
NDTIME    1759 ENDING TIME
ICENT     19  CENTURY MARK

```

```

COMPUTATION INTERVAL  0.02 HOURS
TOTAL TIME BASE      17.98 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

```

16 JD

INDEX STORM NO. 1

```

STRM      3.30  PRECIPITATION DEPTH
TRDA      0.01  TRANSPOSITION DRAINAGE AREA

```

17 PI

PRECIPITATION PATTERN

```

0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00

```

100-Year HEC-1, Future Conditions, 6-hour



1	0352	233	73.	*	1	0822	503	4.	*	1	1252	773	3.	*	1	1722	1043	3.
1	0353	234	79.	*	1	0823	504	4.	*	1	1253	774	3.	*	1	1723	1044	3.
1	0354	235	86.	*	1	0824	505	4.	*	1	1254	775	3.	*	1	1724	1045	3.
1	0355	236	93.	*	1	0825	506	4.	*	1	1255	776	3.	*	1	1725	1046	3.
1	0356	237	101.	*	1	0826	507	4.	*	1	1256	777	3.	*	1	1726	1047	3.
1	0357	238	109.	*	1	0827	508	4.	*	1	1257	778	3.	*	1	1727	1048	3.
1	0358	239	120.	*	1	0828	509	4.	*	1	1258	779	3.	*	1	1728	1049	3.
1	0359	240	130.	*	1	0829	510	4.	*	1	1259	780	3.	*	1	1729	1050	3.
1	0400	241	137.	*	1	0830	511	4.	*	1	1300	781	3.	*	1	1730	1051	3.
1	0401	242	146.	*	1	0831	512	4.	*	1	1301	782	3.	*	1	1731	1052	3.
1	0402	243	155.	*	1	0832	513	4.	*	1	1302	783	3.	*	1	1732	1053	3.
1	0403	244	158.	*	1	0833	514	4.	*	1	1303	784	3.	*	1	1733	1054	3.
1	0404	245	161.	*	1	0834	515	4.	*	1	1304	785	3.	*	1	1734	1055	3.
1	0405	246	164.	*	1	0835	516	4.	*	1	1305	786	3.	*	1	1735	1056	3.
1	0406	247	166.	*	1	0836	517	4.	*	1	1306	787	3.	*	1	1736	1057	3.
1	0407	248	169.	*	1	0837	518	4.	*	1	1307	788	3.	*	1	1737	1058	3.
1	0408	249	172.	*	1	0838	519	4.	*	1	1308	789	3.	*	1	1738	1059	3.
1	0409	250	174.	*	1	0839	520	4.	*	1	1309	790	3.	*	1	1739	1060	3.
1	0410	251	175.	*	1	0840	521	4.	*	1	1310	791	3.	*	1	1740	1061	3.
1	0411	252	177.	*	1	0841	522	4.	*	1	1311	792	3.	*	1	1741	1062	3.
1	0412	253	178.	*	1	0842	523	4.	*	1	1312	793	3.	*	1	1742	1063	3.
1	0413	254	180.	*	1	0843	524	4.	*	1	1313	794	3.	*	1	1743	1064	3.
1	0414	255	181.	*	1	0844	525	4.	*	1	1314	795	3.	*	1	1744	1065	3.
1	0415	256	183.	*	1	0845	526	4.	*	1	1315	796	3.	*	1	1745	1066	3.
1	0416	257	184.	*	1	0846	527	4.	*	1	1316	797	3.	*	1	1746	1067	3.
1	0417	258	185.	*	1	0847	528	4.	*	1	1317	798	3.	*	1	1747	1068	3.
1	0418	259	186.	*	1	0848	529	4.	*	1	1318	799	3.	*	1	1748	1069	3.
1	0419	260	187.	*	1	0849	530	4.	*	1	1319	800	3.	*	1	1749	1070	3.
1	0420	261	190.	*	1	0850	531	4.	*	1	1320	801	3.	*	1	1750	1071	3.
1	0421	262	195.	*	1	0851	532	4.	*	1	1321	802	3.	*	1	1751	1072	3.
1	0422	263	201.	*	1	0852	533	4.	*	1	1322	803	3.	*	1	1752	1073	3.
1	0423	264	206.	*	1	0853	534	4.	*	1	1323	804	3.	*	1	1753	1074	3.
1	0424	265	209.	*	1	0854	535	4.	*	1	1324	805	3.	*	1	1754	1075	3.
1	0425	266	210.	*	1	0855	536	4.	*	1	1325	806	3.	*	1	1755	1076	3.
1	0426	267	210.	*	1	0856	537	4.	*	1	1326	807	3.	*	1	1756	1077	3.
1	0427	268	209.	*	1	0857	538	4.	*	1	1327	808	3.	*	1	1757	1078	3.
1	0428	269	207.	*	1	0858	539	4.	*	1	1328	809	3.	*	1	1758	1079	3.
1	0429	270	205.	*	1	0859	540	4.	*	1	1329	810	3.	*	1	1759	1080	3.

\*\*\*\*\*

PEAK FLOW (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	17.98-HR
210.	4.42	62.	23.	23.	23.
		(INCHES) 2.318	2.574	2.574	2.574
		(AC-FT) 31.	34.	34.	34.

CUMULATIVE AREA = 0.25 SQ MI

1

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

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	201A	376.	4.18	44.	15.	15.	0.22		
HYDROGRAPH AT	201B	151.	4.15	15.	5.	5.	0.08		
2 COMBINED AT	C501	524.	4.18	60.	20.	20.	0.30		

ROUTED TO

100-Year HEC-1, Future Conditions, 6-hour

Note: Output pages omitted until area of interest.

+		D611L	32.	4.20	1.	0.	0.	0.14
	ROUTED TO							
+		611612	27.	4.27	1.	0.	0.	0.14
	HYDROGRAPH AT							
+		211P	119.	4.00	10.	3.	3.	0.03
	2 COMBINED AT							
+		C612	119.	4.00	10.	3.	3.	0.17
	2 COMBINED AT							
+		C613	1639.	5.05	1024.	527.	527.	7.55
	ROUTED TO							
+		613621	1632.	5.05	1022.	526.	526.	7.55
	HYDROGRAPH AT							
+		211L	317.	4.02	24.	8.	8.	0.10
	2 COMBINED AT							
+		C621L	1633.	5.05	1035.	532.	532.	7.64
	HYDROGRAPH AT							
+		211Q	74.	4.00	5.	2.	2.	0.02
	ROUTED TO							
+		616617	72.	4.03	5.	2.	2.	0.02
	HYDROGRAPH AT							
+		211R	283.	4.02	22.	7.	7.	0.08
	2 COMBINED AT							
+		C617L	355.	4.02	27.	9.	9.	0.10
	HYDROGRAPH AT							
+		211U	61.	4.05	8.	3.	3.	0.03
	DIVERSION TO							
+		D614R	43.	4.05	5.	2.	2.	0.03
	HYDROGRAPH AT							
+		D614L	18.	4.05	3.	1.	1.	0.03
	2 COMBINED AT							
+		C617	372.	4.02	30.	10.	10.	0.13
	ROUTED TO							
+		617618	359.	4.07	30.	10.	10.	0.13
	HYDROGRAPH AT							
+		211S	144.	4.05	12.	4.	4.	0.05
	2 COMBINED AT							
+		C618I	499.	4.07	42.	14.	14.	0.18
	ROUTED TO							
+		C618O	482.	4.08	36.	14.	14.	0.18
	HYDROGRAPH AT							
+		BB614R	43.	4.05	5.	2.	2.	0.03
	ROUTED TO							
+		614615	43.	4.10	5.	2.	2.	0.03
	HYDROGRAPH AT							
+		211V	16.	4.02	2.	1.	1.	0.00
	2 COMBINED AT							
+		C615	55.	4.07	7.	2.	2.	0.03

100-Year HEC-1, Future Conditions, 6-hour

*Note: Some previous output pages omitted.*

+	DIVERSION TO	D615R	19.	4.07	2.	1.	1.	0.03
	HYDROGRAPH AT	D615L	36.	4.07	5.	2.	2.	0.03
+	ROUTED TO	615618	36.	4.08	5.	2.	2.	0.03
+	2 COMBINED AT	C618	518.	4.08	41.	16.	16.	0.19
+	ROUTED TO	618619	507.	4.13	41.	16.	16.	0.19
+	HYDROGRAPH AT	211T	231.	4.02	20.	7.	7.	0.07
+	2 COMBINED AT	C619L	637.	4.08	60.	22.	22.	0.26
+	HYDROGRAPH AT	BB615R	19.	4.07	2.	1.	1.	0.03
+	ROUTED TO	615619	19.	4.17	2.	1.	1.	0.03
+	2 COMBINED AT	C619I	655.	4.10	62.	23.	23.	0.25
+	ROUTED TO	C6190	210.	4.42	62.	23.	23.	0.25
+	DIVERSION TO	D619L	21.	4.42	1.	0.	0.	0.25
+	HYDROGRAPH AT	D619R	189.	4.43	62.	23.	23.	0.25
+	ROUTED TO	619620	189.	4.45	62.	23.	23.	0.25
+	HYDROGRAPH AT	BB619L	21.	4.42	1.	0.	0.	0.25
+	ROUTED TO	619620	16.	4.48	1.	0.	0.	0.25
+	HYDROGRAPH AT	211W	108.	4.00	9.	3.	3.	0.03
+	3 COMBINED AT	C620R	250.	4.05	72.	26.	26.	0.28
+	HYDROGRAPH AT	BB611R	169.	4.20	38.	13.	13.	0.14
+	ROUTED TO	611620	169.	4.22	38.	13.	13.	0.14
+	2 COMBINED AT	C620	396.	4.05	110.	39.	39.	0.42
+	ROUTED TO	620621	391.	4.07	110.	39.	39.	0.42
+	2 COMBINED AT	C621	1855.	5.00	1118.	566.	566.	7.93
	ROUTED TO							

Based on following calculation sheets, the volume used is about 14.0 A-F, the pipe flow is 189 cfs, the street flow is 21 cfs, at an overtopping depth of 0.40'; the ponded water surface is 1692.4

100-Year HEC-1, Future Conditions, 6-hour

+		621622	1854.	5.10	1117.	565.	565.	7.93
	HYDROGRAPH AT							
		211X	629.	4.05	60.	20.	20.	0.21
	2 COMBINED AT							
+		C622R	1866.	5.10	1153.	582.	582.	8.14
	HYDROGRAPH AT							
+		211A	444.	4.03	35.	12.	12.	0.14
	ROUTED TO							
+		C6000	373.	4.10	35.	12.	12.	0.14
	ROUTED TO							
+		600601	366.	4.15	35.	12.	12.	0.14
	HYDROGRAPH AT							
+		211B	357.	4.02	26.	9.	9.	0.11
	2 COMBINED AT							
+		C601	663.	4.03	60.	20.	20.	0.25
	ROUTED TO							
+		601602	651.	4.08	60.	20.	20.	0.25
	HYDROGRAPH AT							
+		211C	134.	4.03	12.	4.	4.	0.04
	2 COMBINED AT							
+		C602L	769.	4.07	72.	24.	24.	0.30
	HYDROGRAPH AT							
+		211D	184.	4.05	17.	6.	6.	0.07
	2 COMBINED AT							
		C602	950.	4.07	89.	30.	30.	0.37
	ROUTED TO							
+		602603	923.	4.12	89.	30.	30.	0.37
	HYDROGRAPH AT							
+		211E	509.	4.03	41.	14.	14.	0.16
	2 COMBINED AT							
+		C603	1313.	4.07	129.	43.	43.	0.52
	ROUTED TO							
+		603622	1284.	4.13	129.	43.	43.	0.52
	HYDROGRAPH AT							
+		211F	332.	4.05	33.	11.	11.	0.11
	2 COMBINED AT							
+		C622L	1474.	4.12	160.	54.	54.	0.63
	2 COMBINED AT							
+		C622	2389.	4.15	1265.	625.	625.	8.78
	ROUTED TO							
+		622549	2370.	4.25	1264.	624.	624.	8.78
	HYDROGRAPH AT							
+		211Y	271.	4.05	26.	9.	9.	0.09
	2 COMBINED AT							
+		C549R	2468.	4.23	1280.	631.	631.	8.87
	2 COMBINED AT							
+		C549	3483.	4.25	1664.	829.	829.	13.06

100-Year HEC-1, Future Conditions, 6-hour

+	ROUTED TO	549626	3465.	4.33	1662.	829.	829.	13.06
+	HYDROGRAPH AT	211Z	249.	4.03	20.	7.	7.	0.08
+	2 COMBINED AT	C626C	3521.	4.33	1671.	833.	833.	13.14
+	HYDROGRAPH AT	211AA	96.	4.05	9.	3.	3.	0.03
+	ROUTED TO	625626	92.	4.08	9.	3.	3.	0.03
+	HYDROGRAPH AT	211AB	149.	4.00	12.	4.	4.	0.04
+	ROUTED TO	623624	148.	4.02	12.	4.	4.	0.04
+	HYDROGRAPH AT	211AC	90.	4.02	8.	3.	3.	0.03
+	2 COMBINED AT	C624	238.	4.02	20.	7.	7.	0.07
+	ROUTED TO	624626	231.	4.05	20.	7.	7.	0.07
+	HYDROGRAPH AT	211AD	139.	4.02	12.	4.	4.	0.04
+	2 COMBINED AT	C626R	367.	4.03	32.	11.	11.	0.11
+	3 COMBINED AT	C626	3651.	4.32	1694.	845.	845.	13.28
+	ROUTED TO	626627	3649.	4.33	1694.	845.	845.	13.28
+	HYDROGRAPH AT	211AE	114.	4.02	9.	3.	3.	0.03
+	2 COMBINED AT	C627	3674.	4.33	1698.	847.	847.	13.32
+	HYDROGRAPH AT	211AF	194.	4.00	15.	5.	5.	0.05

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



Project Title Fountain Hills ADMP Project No. 92404004 Date 8-15-96  
Subject ADMP 13 - Summary Designed CLJ Page 1/1

Detention Basin Storage Volume

up to elevation 1692' = 13.75 acre-ft. (see attached)

Estimated earthwork

19445 yd<sup>3</sup> cut (see attached)

15 yd<sup>3</sup> fill

Hydrology (attached)

- 6 hr controls at C619
- overtopping flow  $\approx$  21 cfs D619L (future cond Q = 402 cfs)
- 6 hr controls at C620 (ADMP 14)
  - basin reduces Q from 741 cfs to 396 cfs
  - new Q with present culvert capacity at ADMP 14 (455 cfs existing capacity - see attached)

Hydraulics

21 cfs overtopping will not produce adverse traffic conditions and meets specified allowable overtopping conditions (see attached)

Conclusion

Detention basin is a workable alternative for both ADMP 13 and ADMP 14 and may be the only/best alternative for ADMP 13.

STAGE-AREA RELATIONSHIP

ADMP 13 Detention Basin

Area in Acres	Elevation (ft)	Area (ft <sup>2</sup> )	Vertical Distance (ft)	Volume (ft <sup>3</sup> )	Volume (acre-ft)	Total Volume (ft <sup>3</sup> )	Total Volume (acre-ft)
	1675.6	0					
0.56	1678	24388	2.4	19510	0.45	19510	0.45
0.66	1680	28763	2	53091	1.22	72601	1.67
0.76	1682	33323	2	62030	1.42	134631	3.09
0.87	1684	38038	2	71309	1.64	205940	4.73
0.98	1686	42876	2	80866	1.86	286806	6.58
1.10	1688	48070	2	90897	2.09	377703	8.67
1.23	1690	53491	2	101513	2.33	479215	11.00
1.53	1692	66467	2	119723	2.75	598939	13.75

13.76  
check  
ok.

↑ input for HEC-1 SE records.  
↑ input for HEC-1 SA records

Based on 2:1 side slopes



Project Title \_\_\_\_\_ Project No. \_\_\_\_\_ Date 19 Sep 96  
Subject \_\_\_\_\_ Designed AS Page 1/4

STAGE - DISCHARGE VALUES FOR EXISTING PIPE/ROAD @ AOMP 13

Street overtopping begins at elevation 1692.0

Below that elevation, pipe flow data is from THYSYS analysis (page 2)

Above that elevation, data is a summation of pipe and weir flow rates. as follows: (See page 4)

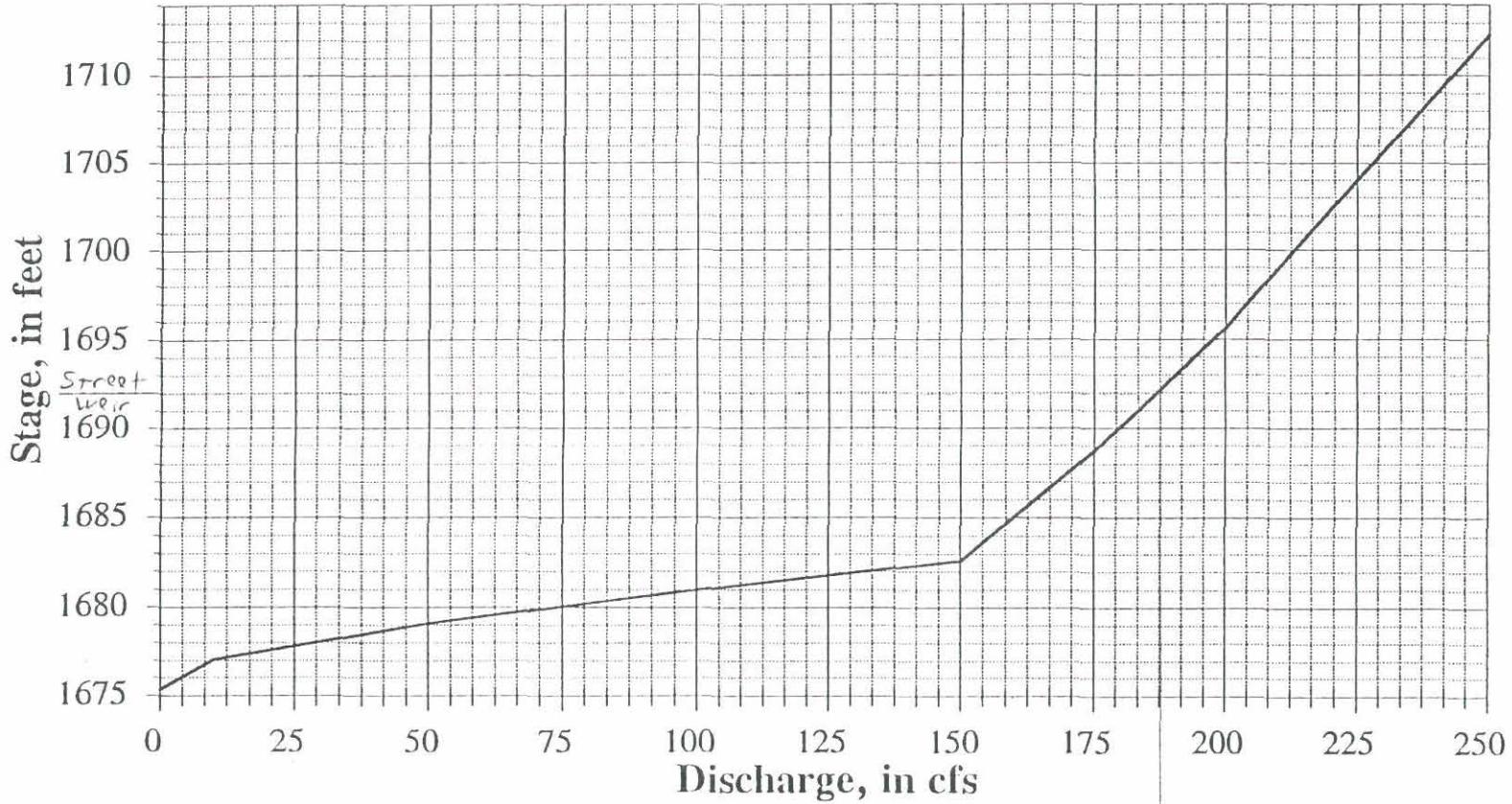
EL. (SE record)	1692.0	1692.2	1692.4	1692.6	1692.8
pipe flow	187.0	187.7	188.4	189.1	189.8
road (weir) flow	0	7.6	24.1	49.2	83.5
total (SQ record)	187	195	213	238	273

EL (SE Record)	1693.0	1693.2	1693.4	1693.6	1693.8	1694.0
pipe flow	190.5	191.2	191.9	192.6	193.3	194.0
road (weir) flow	127.6	182.4	248.7	325.5	412.4	511.7
total (SQ record)	318	374	441	518	606	706

Note: the proposed detention basin at Arrow Wash and Fountain Hills Boulevard uses the existing 60" CMP without a headwall or any other modifications as the principal spillway. The emergency spillway is the existing roadway profile. All elevation data and flow rate data are from the Fountain Hills FDS.

# C619 Stage vs Discharge

## Culvert Flow from THYSYS



Excerpt from Fountain Hills FDS,  
Appendix A, Structure at C619

7/2

# GEORGE V. SABOL CONSULTING ENGINEERS, INC.

SHEET 7 OF 7 <sup>3/4</sup>  
 DATE 6/3  
 BY MG  
 PROJECT NO. 35

CLIENT MCFCD  
 PROJECT FOUNTAIN HILLS  
 SUBJECT CULVERT 619 FIELD SURVEY

RIDGE LINE

WEIR CROSS-SECTION

FOUNTAIN HILLS BLD.

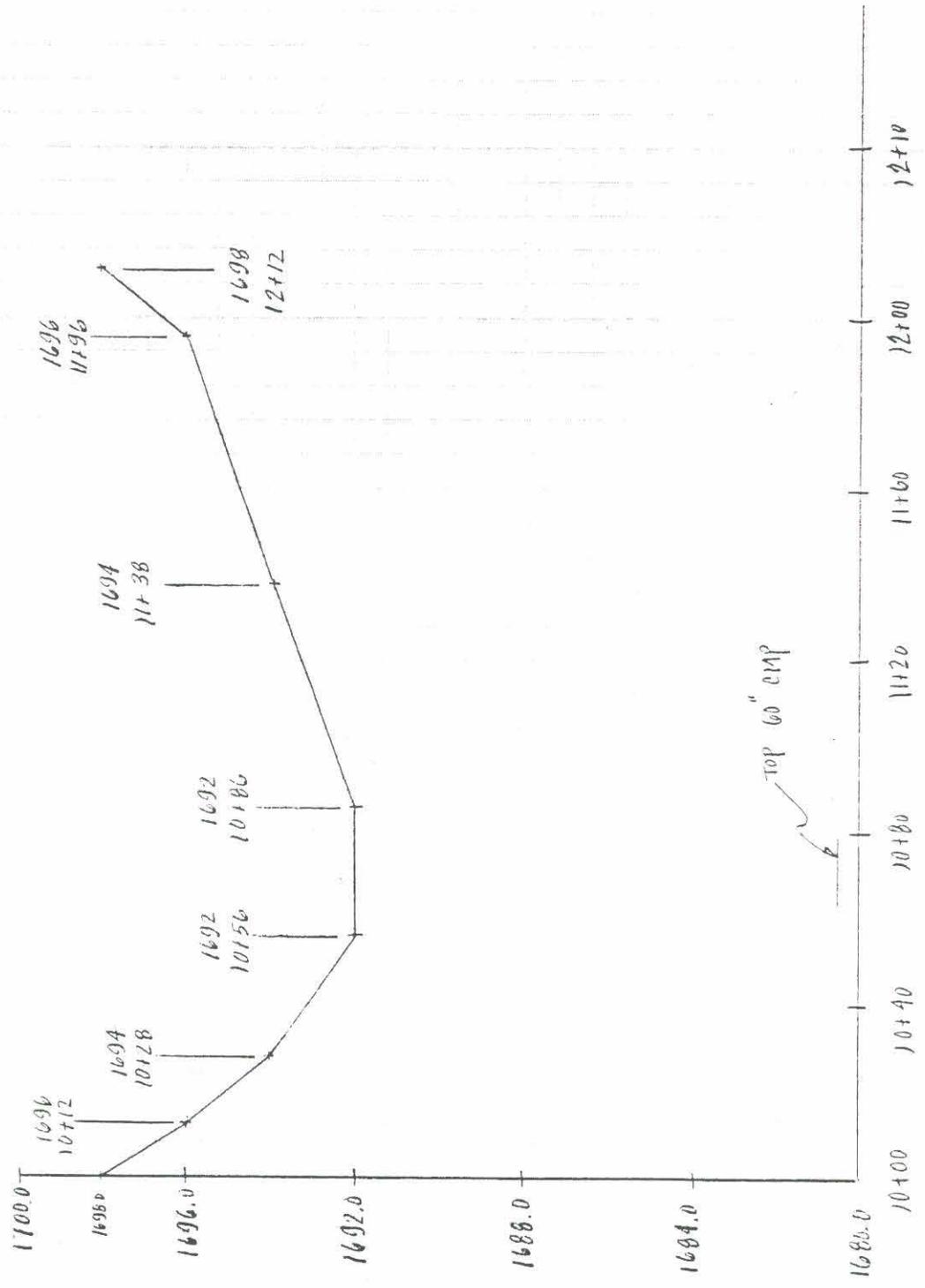
CULVERT 619

1675.57

SCALE  
 HORIZ 1" = 40'  
 VERT 1" = 4'

\* CROSS-SECTION FROM 200 SCALE CONTOUR MAP

10+00	1698.0
10+12	1696.0
10+28	1697.0
10+56	1692.0
10+86	1692.0
11+38	1697.0
11+90	1696.0
12+12	1698.0



Excerpt from Fountain Hills FOS, Appendix A, Structure at C619

4/4

```
*****  
UNEVEN WEIR FLOW PROGRAM  
FORTRAN VERSION 1.0  
PROJECT: Fountain Hills North FIS  
DATE: 10/26/1993  
TIME: 12:32.37  
*****
```

<u>ELEVATION</u>	<u>DISCHARGE (CFS)</u>
1692.00	0.00
1692.20	7.61
1692.40	24.13
1692.60	49.22
1692.80	83.47
1693.00	127.61
1693.20	182.42
1693.40	248.73
1693.60	325.47
1693.80	412.37
1694.00	511.69
1694.20	627.81
1694.40	759.05
1694.60	900.86
1694.80	1051.08
1695.00	1214.53
1695.20	1391.70
1695.40	1583.08
1695.60	1789.19
1695.80	2010.60

Excerpt from Fountain Hills FAS

APPENDIX A

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX

**REQUIREMENTS**

EXISTING CONDITION Q100= 520 CFS (1995)  
FUTURE CONDITION Q100= 655 CFS (BUILD OUT)

NO.	REVISION	BY	DATE
3			
2			
1			

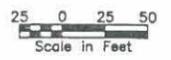
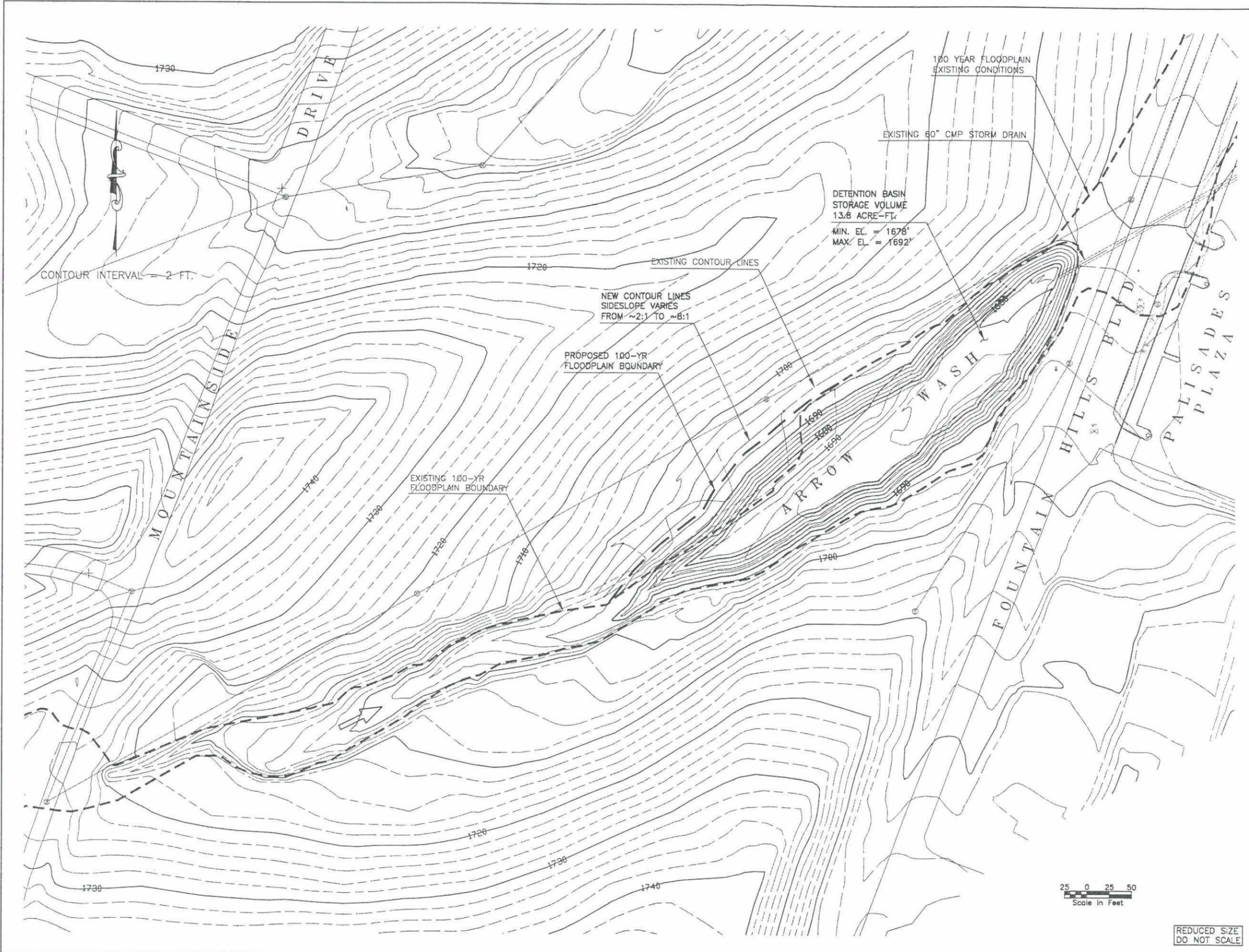
FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
FOUNTAIN HILLS BLVD. & ARROW WASH  
PROJECT NO. 94-16

	BY	DATE
DESIGNED	R. CONSONI	6/3/96
DRAWN	C. JOY	6/3/96
CHECKED	F. BROWN	6/3/96

GEORGE V. SABOL CONSULTING ENGINEERS, INC.  
in association with  
**MKE** McLAUGHLIN KMETTY ENGINEERS, LTD.

PLAN SHEET  
ADMP 13 - ALTERNATE 1

SHEET OF  
1 1



REDUCED SIZE  
DO NOT SCALE



```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* MAY 1991
* VERSION 4.0.1E
* Lahey F77L-EM/32 version 5.01
* Dodson & Associates, Inc.
* RUN DATE 02/07/97 TIME 11:02:36
*****

```

24-HOUR STORM

```

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

```

```

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

```

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1 *HEC-1 page numbering*

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID Fountain Hills Area Drainage Master Plan
2 ID This information is modified from the
3 ID Fountain Hills North Floodplain Delineation Study. Original filename FU100-24
4 ID Original FCD 92-04. New ADMP is FCD 94-16
5 ID Modified by McLaughlin Kmetty Engineers, for GVSCE File: 10024R1.IH1
6 ID Future Condition Model Date: 07-19-94 dtp
7 ID 100-Year 24-Hour Storm, Clark Unit Hydrograph Revised: 2-07-96 FB
8 ID *****
9 ID The future conditions model is revised to add a reservoir route at C619 (larger volume)
10 ID This location is Arrow Wash at Fountain Hills Blvd (aka ADMP 13)
11 ID as part of the Fountain Hills Area Drainage Master Plan.
12 ID *****
*
13 IT 1 1800
14 IO 5
15 IN 15
*
* Point precipitation values are based on Hydro-40 DARF.
* 0.01 5.00 10.00 50.00 80.00 100.00 200.00
* 1.000 0.980 0.949 0.883 0.861 0.850 0.819
*
16 JD 4.20 0.01
* The following PC records are a 24-hour SCS Type II rainfall distribution.
17 PC 0.000 0.002 0.005 0.008 0.011 0.013 0.016 0.019 0.022 0.025
18 PC 0.028 0.032 0.035 0.038 0.041 0.044 0.048 0.053 0.056 0.060
19 PC 0.063 0.067 0.071 0.075 0.080 0.084 0.089 0.093 0.098 0.103
20 PC 0.109 0.114 0.120 0.127 0.133 0.140 0.147 0.155 0.163 0.172
21 PC 0.181 0.192 0.204 0.220 0.235 0.259 0.283 0.473 0.663 0.699
22 PC 0.735 0.754 0.772 0.785 0.799 0.810 0.820 0.829 0.838 0.846
23 PC 0.854 0.861 0.868 0.874 0.880 0.885 0.891 0.900 0.902 0.910
24 PC 0.912 0.920 0.921 0.926 0.929 0.930 0.937 0.941 0.945 0.950
25 PC 0.952 0.957 0.959 0.962 0.965 0.970 0.972 0.973 0.978 0.981

```

100-Year HEC-1, Future Conditions, 24-hour  
Fountain Hills ADMP

File = 10024R1.OH1

*output printout pages (numbered consecutively)*

PAGE 1

*Note: input pages omitted. They are the same as the 6-hour printout, except for rainfall.*

Note: previous pages omitted.

+		211U	37.	12.07	7.	2.	2.	0.03
	DIVERSION TO							
		D614R	26.	12.07	5.	1.	1.	0.03
	HYDROGRAPH AT							
+		D614L	11.	12.07	2.	1.	1.	0.03
	2 COMBINED AT							
+		C617	204.	12.02	25.	8.	6.	0.13
	ROUTED TO							
+		617618	200.	12.07	25.	8.	6.	0.13
	HYDROGRAPH AT							
+		211S	83.	12.03	10.	3.	2.	0.05
	2 COMBINED AT							
+		C618I	282.	12.05	35.	11.	9.	0.18
	ROUTED TO							
+		C618O	280.	12.07	30.	10.	8.	0.18
	HYDROGRAPH AT							
+		BB614R	26.	12.07	5.	1.	1.	0.03
	ROUTED TO							
+		614615	26.	12.10	5.	1.	1.	0.03
	HYDROGRAPH AT							
+		211V	9.	12.02	2.	1.	0.	0.00
	2 COMBINED AT							
+		C615	34.	12.07	6.	2.	2.	0.03
	DIVERSION TO							
		D615R	12.	12.07	2.	0.	0.	0.03
	HYDROGRAPH AT							
+		D615L	22.	12.07	5.	2.	1.	0.03
	ROUTED TO							
+		615618	22.	12.07	5.	2.	1.	0.03
	2 COMBINED AT							
+		C618	302.	12.07	34.	11.	10.	0.19
	ROUTED TO							
+		618619	299.	12.13	34.	11.	10.	0.19
	HYDROGRAPH AT							
+		211T	127.	12.00	17.	6.	5.	0.07
	2 COMBINED AT							
+		C619L	399.	12.07	51.	17.	14.	0.26
	HYDROGRAPH AT							
+		BB615R	12.	12.07	2.	0.	0.	0.03
	ROUTED TO							
+		615619	11.	12.17	2.	0.	0.	0.03
	2 COMBINED AT							
+		C619I	408.	12.07	52.	17.	14.	0.25
	ROUTED TO							
+		C619O	171.	12.43	52.	17.	14.	0.25
	DIVERSION TO							
+		D619L	0.	0.02	0.	0.	0.	0.25

100-Year HEC-1, Future Conditions, 24-hour

+	HYDROGRAPH AT	D619R	171.	12.43	52.	17.	14.	0.25
	ROUTED TO							
+		619620	171.	12.45	52.	17.	14.	0.25
	HYDROGRAPH AT							
+		BB619L	0.	0.02	0.	0.	0.	0.25
	ROUTED TO							
+		619620	0.	0.02	0.	0.	0.	0.25
	HYDROGRAPH AT							
+		211W	59.	12.00	8.	3.	2.	0.03
	3 COMBINED AT							
+		C620R	194.	12.10	60.	20.	17.	0.28
	HYDROGRAPH AT							
+		BB611R	143.	12.20	34.	11.	8.	0.14
	ROUTED TO							
+		611620	143.	12.22	34.	11.	8.	0.14
	2 COMBINED AT							
+		C620	333.	12.10	94.	30.	25.	0.42
	ROUTED TO							
+		620621	332.	12.13	94.	30.	25.	0.42
	2 COMBINED AT							
+		C621	1445.	12.07	1073.	492.	397.	7.93
	ROUTED TO							
+		621622	1419.	12.17	1072.	492.	397.	7.93
	HYDROGRAPH AT							
+		211X	362.	12.05	52.	17.	14.	0.21
	2 COMBINED AT							
+		C622R	1715.	12.12	1110.	507.	409.	8.14
	HYDROGRAPH AT							
+		211A	249.	12.02	28.	8.	6.	0.14
	ROUTED TO							
+		C6000	241.	12.07	28.	8.	6.	0.14
	ROUTED TO							
+		600601	238.	12.12	28.	8.	6.	0.14
	HYDROGRAPH AT							
+		211B	195.	12.02	21.	6.	5.	0.11
	2 COMBINED AT							
+		C601	419.	12.03	49.	14.	11.	0.25
	ROUTED TO							
+		601602	415.	12.08	49.	14.	11.	0.25
	HYDROGRAPH AT							
+		211C	77.	12.02	10.	3.	2.	0.04
	2 COMBINED AT							
+		C602L	487.	12.07	59.	17.	14.	0.30
	HYDROGRAPH AT							
+		211D	103.	12.05	14.	4.	4.	0.07
	2 COMBINED AT							

100-Year HEC-1, Future Conditions, 24-hour

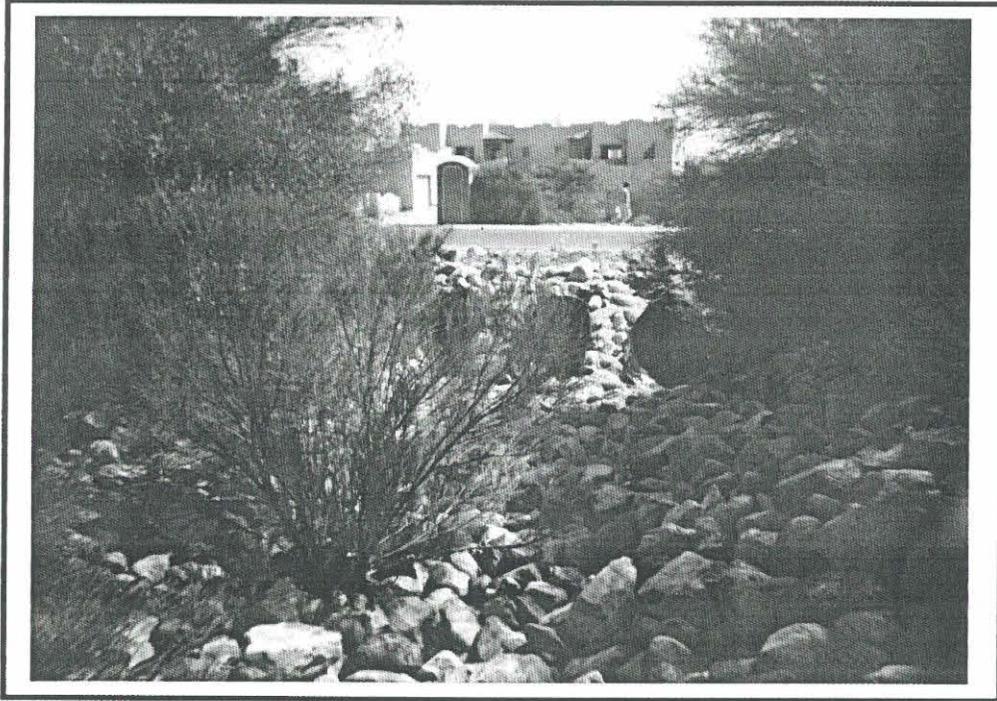
+		C602	589.	12.07	73.	21.	17.	0.37
+	ROUTED TO							
+		602603	581.	12.12	73.	21.	17.	0.37
+	HYDROGRAPH AT							
+		211E	281.	12.02	34.	11.	9.	0.16
+	2 COMBINED AT							
+		C603	833.	12.07	107.	32.	26.	0.52
+	ROUTED TO							
+		603622	816.	12.13	107.	32.	26.	0.52
+	HYDROGRAPH AT							
+		211F	190.	12.03	28.	9.	7.	0.11
+	2 COMBINED AT							
+		C622L	979.	12.12	134.	41.	33.	0.63
+	2 COMBINED AT							
+		C622	2652.	12.12	1227.	544.	440.	8.78
+	ROUTED TO							
+		622549	2618.	12.20	1225.	544.	439.	8.78
+	HYDROGRAPH AT							
+		211Y	158.	12.03	22.	7.	6.	0.09
+	2 COMBINED AT							
+		C549R	2715.	12.20	1240.	551.	444.	8.87
+	2 COMBINED AT							
+		C549	3968.	12.20	1665.	733.	592.	13.06
+	ROUTED TO							
+		549626	3923.	12.28	1663.	733.	592.	13.06
+	HYDROGRAPH AT							
+		211Z	137.	12.02	16.	5.	4.	0.08
+	2 COMBINED AT							
+		C626C	3967.	12.28	1672.	737.	596.	13.14
+	HYDROGRAPH AT							
+		211AA	57.	12.03	8.	2.	2.	0.03
+	ROUTED TO							
+		625626	56.	12.08	8.	2.	2.	0.03
+	HYDROGRAPH AT							
+		211AB	79.	12.00	10.	3.	3.	0.04
+	ROUTED TO							
+		623624	79.	12.00	10.	3.	3.	0.04
+	HYDROGRAPH AT							
+		211AC	51.	12.02	7.	2.	2.	0.03
+	2 COMBINED AT							
+		C624	130.	12.00	17.	5.	4.	0.07
+	ROUTED TO							
+		624626	129.	12.03	17.	5.	4.	0.07
+	HYDROGRAPH AT							
+		211AD	78.	12.02	11.	3.	3.	0.04
+	2 COMBINED AT							
+		C626R	207.	12.02	28.	9.	7.	0.11

100-Year HEC-1, Future Conditions, 24-hour

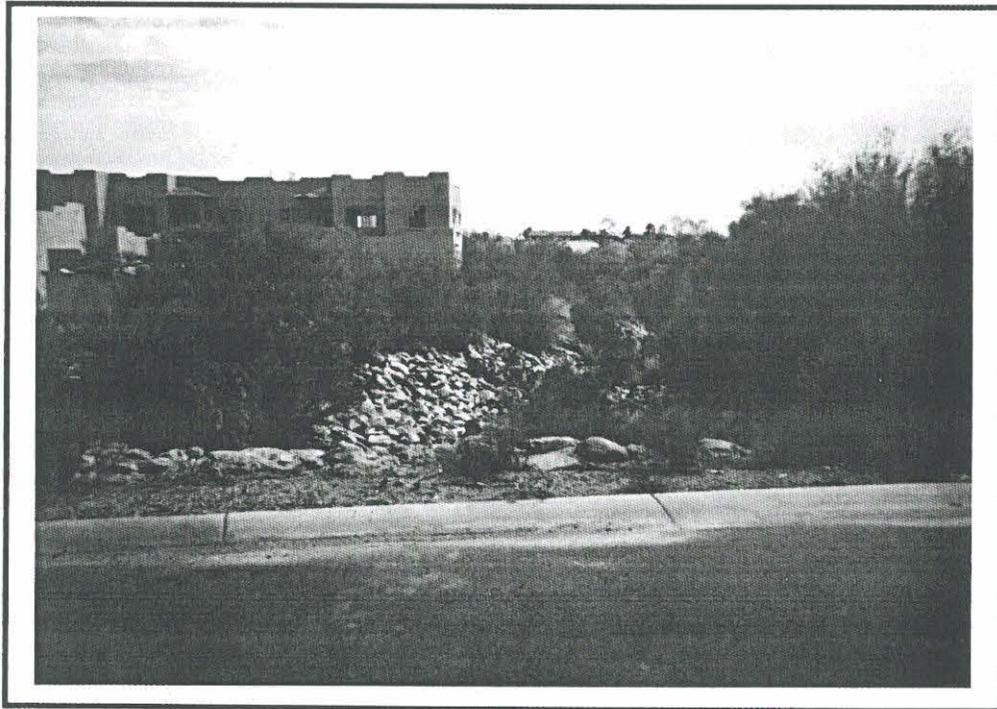
+	3 COMBINED AT	C626	4071.	12.28	1693.	747.	604.	13.28
	ROUTED TO							
+		626627	4067.	12.28	1693.	747.	604.	13.28
	HYDROGRAPH AT							
+		211AE	63.	12.02	8.	2.	2.	0.03
	2 COMBINED AT							
+		C627	4084.	12.28	1697.	749.	605.	13.32
	HYDROGRAPH AT							
+		211AF	102.	12.00	13.	4.	3.	0.05

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

ADMP 14 : Arrow Drive / Arrow Wash



Arrow Wash Culvert Inlet  
*Looking Downstream Towards Arrow Drive*



Arrow Wash  
*Looking Downstream From Arrow Drive*



Job No.: 92-404.004

Job Name: Fountain Hills

Reconnaissance by:  
REC 6-20-96  
CLJ 6-20-96  
Inits. Date

### Field Reconnaissance Sheet

Site No.: ADMP 14

Roadway: Arrow Drive

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Arrow Wash	490	740	3-54" CMP

Reason for Analysis / Existing Deficiency: Inadequate culvert capacity. 100 year runoff not contained within drainageway. Overtopping flow drains down road

#### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 2 ft. Downstream: 2 ft.
- 2) Can the culvert be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, \_\_\_\_\_ ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, \_\_\_\_\_ ft.  No

#### Structure Modification Constraints:

- 4) Utilities: Sewer lines run both down the wash and across the wash along Arrow Dr. Phone, Electric, TV Cables, and water lines cross wash along Arrow Dr.
- 5) Structures: Upstream and downstream channels are well lined with riprap for erosion protection
- 6) Right-of-Way: Narrow 50' easement.

#### 7) Miscellaneous field notes, comments, or design ideas:

A detention basin at ADMP 13 will improve drainage problems at this location. Narrow easement/channel and limited ability to raise road profile may require shallower CBSS to correct drainage problems. Additional CMPs will be hard to fit in channel.

ALTERNATE 1

Excerpt from Fountain Hills Future Conditions Hydrology

Table F-5

Alt. 1:  
runoff with larger  
Storage volume at  
ADMP 13

Future Condition  
100-year Peak Discharges  
In Numerical Order by Type

HEC-1 ID	Discharge, in cfs		Control
	6-hr	24-hr	
C595R	1764	1082	6-hour controls
C596	1679	1696	24-hour control
C597	900	483	6-hour controls
C598	884	691	6-hour controls
C599I	2474	2655	24-hour control
C599O	1631	1143	6-hour controls
C600O	373	241	6-hour controls
C601	663	419	6-hour controls
C602	950	589	6-hour controls
C602L	769	487	6-hour controls
C603	1313	833	6-hour controls
C605O	129	107	6-hour controls
C606	256	184	6-hour controls
C606R	131	78	6-hour controls
C607	295	207	6-hour controls
C608	1642	1161	6-hour controls
C608L	1629	1147	6-hour controls
C609O	69	56	6-hour controls
C611I	402	242	6-hour controls
C611O	201	143	6-hour controls
C611R	338	190	6-hour controls
C612	119	64	6-hour controls
C613	1639	1162	6-hour controls
C615	55	34	6-hour controls
C617	372	204	6-hour controls
C617L	355	193	6-hour controls
C618	518	302	6-hour controls
C618I	499	282	6-hour controls
C618O	482	280	6-hour controls
C619I	655	408	6-hour controls
C619L	637	399	6-hour controls
C619O	596	185	6-hour controls
C620	741	355	6-hour controls
C620R	573	223	6-hour controls
C621	1866	1484	6-hour controls
C621L	1633	1169	6-hour controls
C622	2429	2697	24-hour control
C622L	1474	979	6-hour controls
C622R	1877	1761	6-hour controls
C624	238	130	6-hour controls
C626	3692	4117	24-hour control
C626C	3561	4012	24-hour control
C626R	367	207	6-hour controls
C627	3714	4130	24-hour control
CLEAR	2109	2017	6-hour controls
CLEAR	1610	1464	6-hour controls
D503L	344	298	6-hour controls

↓ 24-HR      ↓ 6-HR

CONCLUSION for 24-hour storm: there is a minor decrease in flow

CONCLUSION for 6-hour storm: There is a definite advantage to this alternative.

171      210  
333      396  
1,445      1,855  
2,652      2,389  
4,071      3,651  
4,084      3,674  
↑ 24-HR      ↑ 6-HR

CONCLUSION at ADMP 14: The reduction in flow at this crossing means the existing culverts are adequate. See Hy-8.

Pos. Route outflow ← ADMP 14

AR Wash after AS Wash Saguro Blvd (ADMP 2)

El Pueblo Blvd, Ashbrook Wash

Downstream end of Project, Ashbrook Wash

CURRENT DATE: 10-05-1994  
 CURRENT TIME: 10:49:40

FILE DATE: 09-13-1994  
 FILE NAME: M02-H2

*Arrow WASH: X-S 0.071*

\*\*\*\*\*  
 \*\*\*\*\* FHWA CULVERT ANALYSIS \*\*\*\*\*  
 \*\*\*\*\* HY-8, VERSION 4.0 \*\*\*\*\*  
 \*\*\*\*\*

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1642.65	1641.71	72.31	3 CSP	4.50	4.50	.024	CONVENTIONAL
2								
3								
4								
5								
6								

\*\*\*\*\*  
 SUMMARY OF CULVERT FLOWS (CFS) FILE: M02-H2 DATE: 09-13-1994

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1644.38	0	0	0	0	0	0	0	0	1
1644.64	40	40	0	0	0	0	0	0	1
1644.74	80	80	0	0	0	0	0	0	1
1645.29	120	120	0	0	0	0	0	0	1
1645.76	160	160	0	0	0	0	0	0	1
1646.65	200	200	0	0	0	0	0	0	1
1647.07	240	240	0	0	0	0	0	0	1
1647.50	280	280	0	0	0	0	0	0	1
1647.89	320	320	0	0	0	0	0	0	1
1648.29	360	360	0	0	0	0	0	0	1
1648.43	371	371	0	0	0	0	0	0	1
1650.00	455	455	0	0	0	0	0	0	OVERTOPPING

*new flowrate is 396 cfs, if ADMP 13-A1-1 is build. New Headwater will be 1648.70 =*

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: M02-H2 DATE: 09-13-1994

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1644.38	0.00	0	0	0.00
1644.64	0.00	40	0	0.00
1644.74	0.00	80	0	0.00
1645.29	0.00	120	0	0.00
1645.76	0.00	160	0	0.00
1646.65	0.00	200	0	0.00
1647.07	0.00	240	0	0.00
1647.50	0.00	280	0	0.00
1647.89	0.00	320	0	0.00
1648.29	0.00	360	0	0.00
1648.43	0.00	371	0	0.00

\*\*\*\*\*  
 <1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000  
 \*\*\*\*\*

Excerpt continued

2/3 2

CURRENT DATE: 10-05-1994  
CURRENT TIME: 10:49:40

FILE DATE: 09-13-1994  
FILE NAME: M02-H2

PERFORMANCE CURVE FOR CULVERT # 1 - 3 ( 4.5 BY 4.5 ) CSP

DIS-CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1644.38	0.00	1.73	0-NF	0.00	0.00	0.00	0.00	0.00	2.67
40	1644.64	1.40	1.99	3-M1t	0.99	1.02	1.36	2.67	0.00	2.67
80	1644.74	2.09	2.09	1-S2n	1.42	1.46	6.16	1.42	0.00	2.67
120	1645.29	2.64	2.64	1-S2n	1.77	1.82	6.86	1.77	0.00	2.67
160	1645.76	3.11	3.11	1-S2n	2.08	2.11	7.42	2.08	0.00	2.67
200	1646.65	3.54	4.00	3-M1t	2.38	2.37	6.78	2.67	0.00	2.67
240	1647.07	3.99	4.42	3-M1t	2.66	2.61	8.14	2.67	0.00	2.67
280	1647.50	4.46	4.85	2-M2c	2.96	2.83	8.88	2.83	0.00	2.67
320	1647.89	5.00	5.24	2-M2c	3.28	3.03	9.38	3.03	0.00	2.67
360	1648.29	5.60	5.64	2-M2c	3.64	3.22	9.87	3.22	0.00	2.67
371	1648.43	5.78	5.77	2-M2c	3.80	3.26	10.03	3.26	0.00	2.67

El. inlet face invert 1642.65 ft El. outlet invert 1641.71 ft  
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	1642.65
OUTLET STATION (FT)	72.30
OUTLET ELEVATION (FT)	1641.71
NUMBER OF BARRELS	3
SLOPE (V-FT/H-FT)	0.0130
CULVERT LENGTH ALONG SLOPE (FT)	72.31

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	4.50 FT
BARREL MATERIAL	CORRUGATED STEEL
BARREL MANNING'S N	0.024
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	MITERED TO CONFORM TO SLOPE
INLET DEPRESSION	NONE

Compare HYS to AEC-2  
@ 371 cfs 48.43 48.33  
D = 0.10 ft

this note part of FDS Hydraulics TDN.

Excerpt continued

CURRENT DATE: 10-05-1994  
RENT TIME: 10:49:40

FILE DATE: 09-13-1994  
FILE NAME: M02-H2

\*\*\*\*\*  
\*\*\*\*\* TAILWATER \*\*\*\*\*  
\*\*\*\*\*  
\*\*\*\*\*

CONSTANT WATER SURFACE ELEVATION  
1644.38

\*\*\*\*\*  
\*\*\*\*\* ROADWAY OVERTOPPING DATA \*\*\*\*\*  
\*\*\*\*\*

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	1.00
CREST LENGTH (FT)	1.00
OVERTOPPING CREST ELEVATION (FT)	1650.00

\*\*\*\*\*

CALL TWO WORKING DAYS BEFORE YOU DIG  
1-602-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

NOTE:  
PROPERTY LINES AND EXISTING UTILITY INFORMATION WERE LOCATED FROM RECORDED PLAT MAPS AND AVAILABLE UTILITY MAPS. SURVEY INFORMATION AND BLUE STAKE DATA WERE NOT OBTAINED.

**REMOVALS**

- 1 XXXX  
XXXX
- 2 XXXX  
XXXX

**NEW CONSTRUCTION**

- 3 XXXX
- 4 XXXX  
XXXX
- 5 XXXX  
XXXX
- 6 XXXX
- 7 XXXX  
XXXX
- 8 XXXX
- 9 XXXX  
XXXX

○ CURVE DATA TABLE

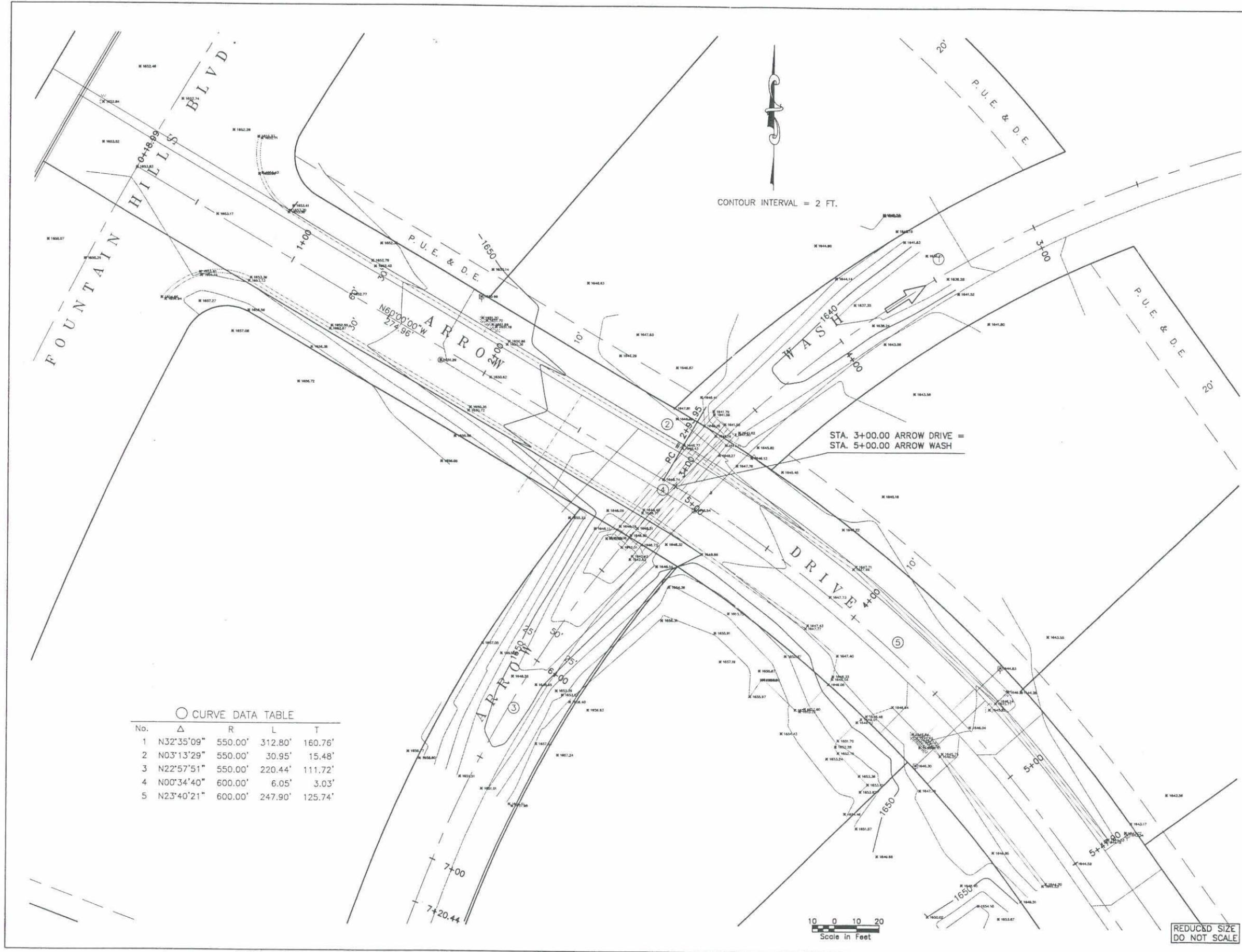
No.	Δ	R	L	T
1	N32°35'09"	550.00'	312.80'	160.76'
2	N03°13'29"	550.00'	30.95'	15.48'
3	N22°57'51"	550.00'	220.44'	111.72'
4	N00°34'40"	600.00'	6.05'	3.03'
5	N23°40'21"	600.00'	247.90'	125.74'

CONTOUR INTERVAL = 2 FT.

Scale in Feet  
0 10 20

REDUCED SIZE  
DO NOT SCALE

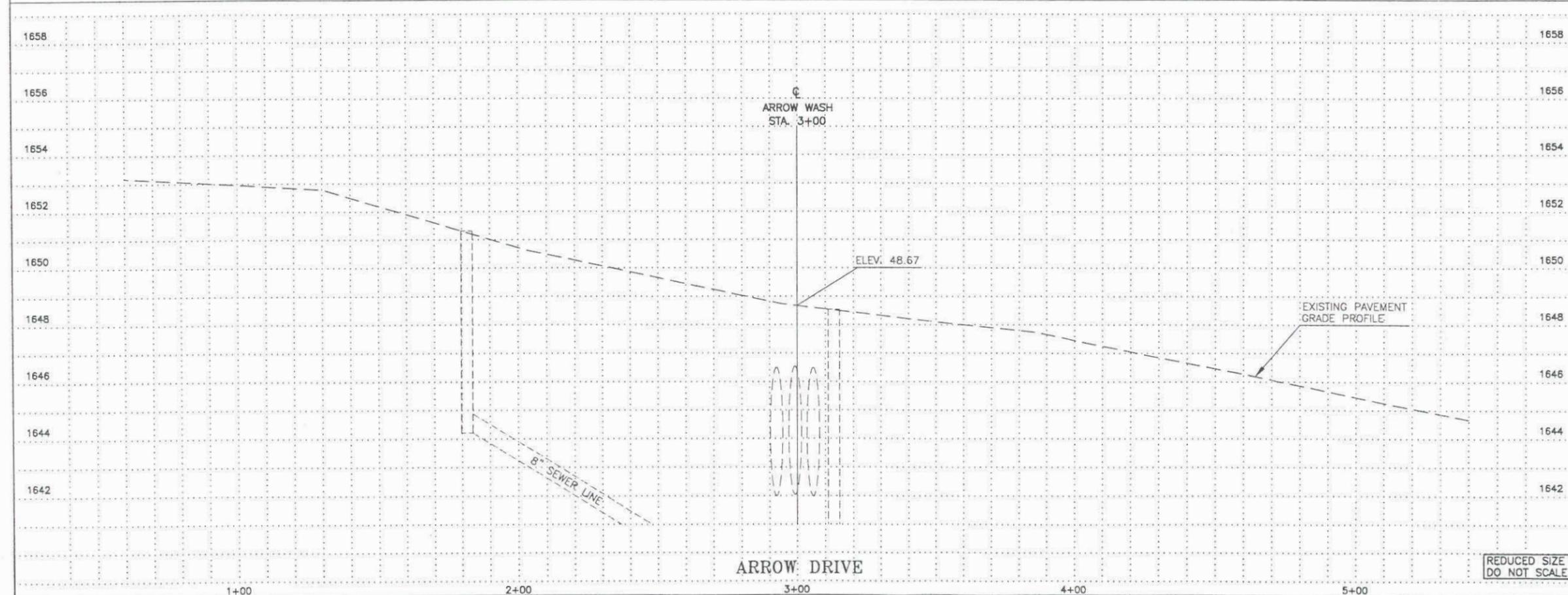
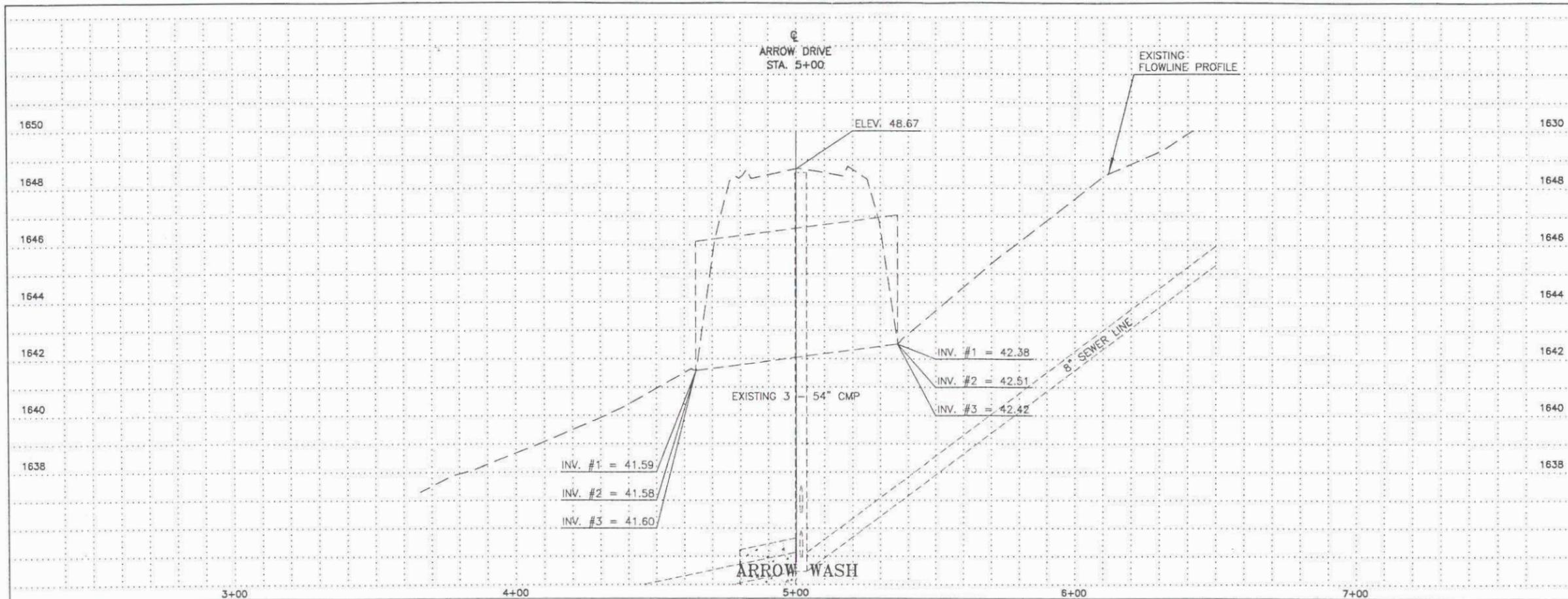
3			
2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY</b> <b>ENGINEERING DIVISION</b> <b>FOUNTAIN HILLS ADMP</b> <b>ARROW DRIVE &amp; ARROW WASH</b> <b>PROJECT NO. 94-16</b>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE McLAUGHLIN KMETTY ENGINEERS, LTD.</b>		
PLAN SHEET ADMP 14 - ALTERNATE 1			SHEET OF 1 2



CALL TWO WORKING DAYS  
BEFORE YOU DIG  
1-800-263-1100  
1-800-STAKE-IT  
(OUTSIDE MARICOPA COUNTY)

### REQUIREMENTS

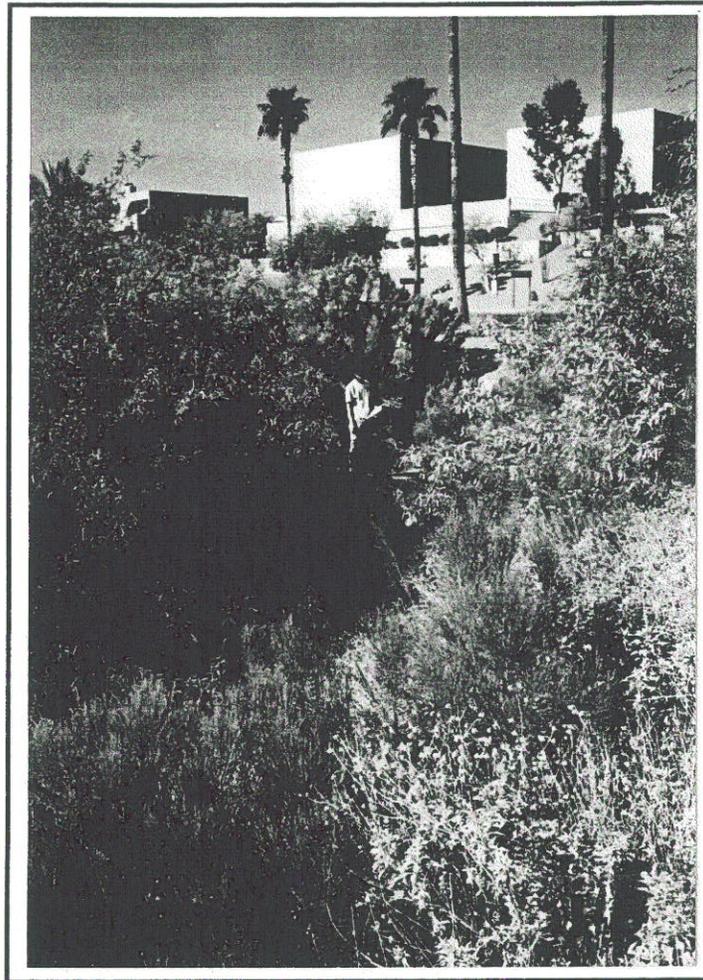
EXISTING CONDITION Q100= 485 CFS (1995)  
FUTURE CONDITION Q100= 741 CFS (BUILD OUT)



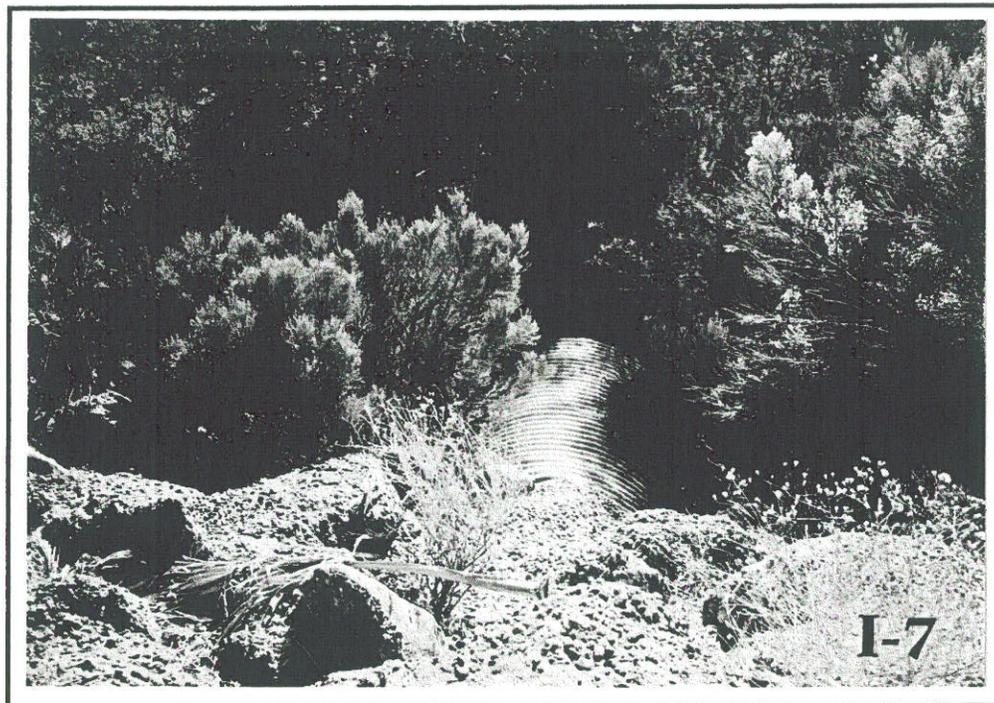
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2			
1			
NO.	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY ENGINEERING DIVISION</b>			
<b>FOUNTAIN HILLS ADMP ARROW DRIVE &amp; ARROW WASH PROJECT NO. 94-16</b>			
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	F. BROWN, R. CONSONI	6/3/96
	DRAWN	C. JOY	6/3/96
	CHECKED	F. BROWN	6/3/96
	GEORGE V. SABOL CONSULTING ENGINEERS, INC. in association with <b>MKE</b> McLAUGHLIN KMETTY ENGINEERS, LTD.		
PROFILE SHEET ADMP 14 - ALTERNATE 1			SHEET OF 2 2

REDUCED SIZE  
DO NOT SCALE

Site 15: Saguaro Blvd. / Colony Wash

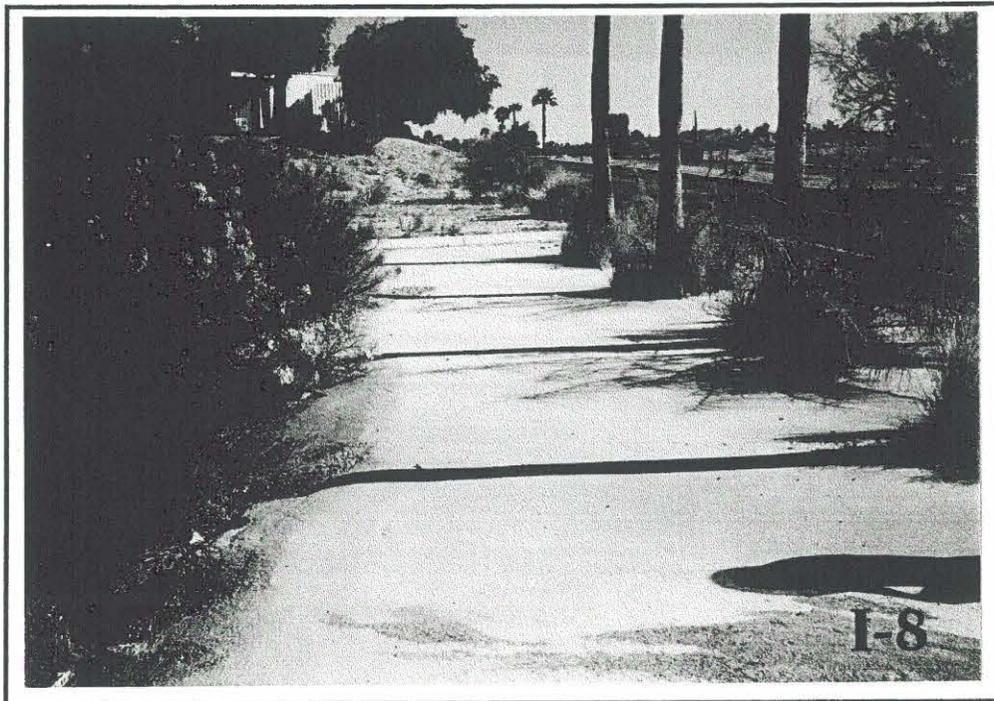


Colony Wash Culvert Outlet  
*Looking Upstream*

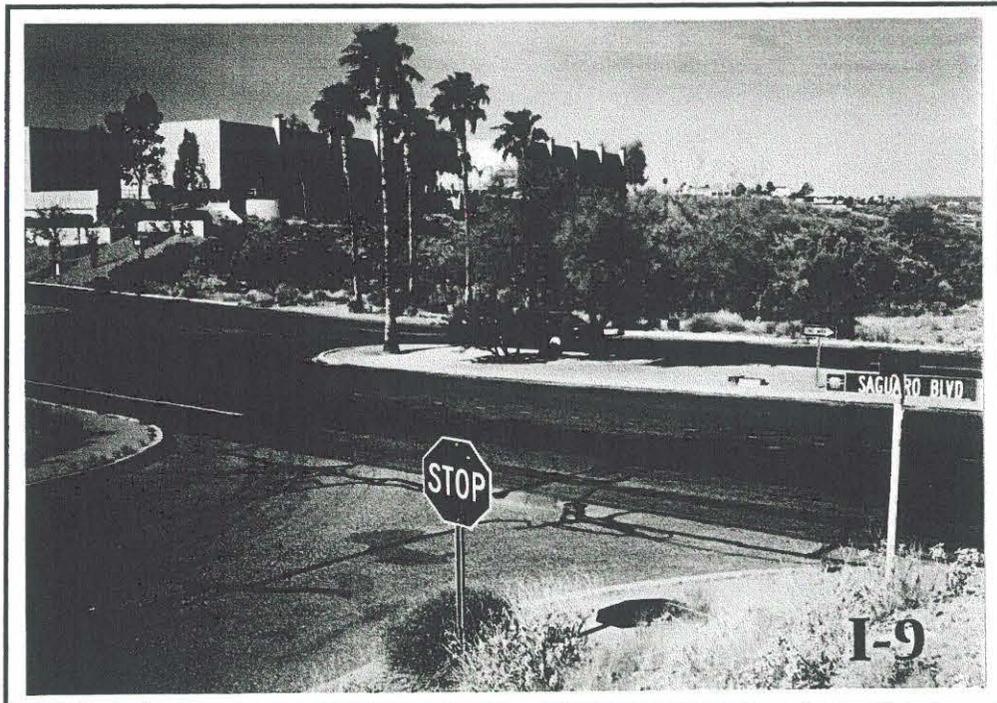


Colony Wash Culvert Outlet  
*Above, Looking Downstream*

**Site 15: Saguaro Blvd. / Colony Wash (Cont'd.)**



Colony Wash Spillway Inlet  
*Looking North*



Colony Wash Spillway  
*Looking Upstream across Saguaro Blvd.*



# ALTERNATE 1

## COLONY WASH @ SAGUARO BLVD. (2-72" CMP)

CURRENT DATE: 10-03-1996

CURRENT TIME: 18:32:15

FILE DATE: 07-21-1996

FILE NAME: STR1-D72

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1585.13	1582.36	167.02	2 CSP	6.00	6.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR1-D72

DATE: 07-21-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1585.13	0	0	0	0	0	0	0	0	1
1587.42	70	70	0	0	0	0	0	0	1
1588.44	140	140	0	0	0	0	0	0	1
1589.34	210	210	0	0	0	0	0	0	1
1590.19	280	280	0	0	0	0	0	0	1
1591.06	350	350	0	0	0	0	0	0	1
1591.99	420	420	0	0	0	0	0	0	1
1592.72	470	470	0	0	0	0	0	0	1
1594.22	560	560	0	0	0	0	0	0	1
1595.57	630	630	0	0	0	0	0	0	1
1596.45	700	671	0	0	0	0	0	28	4
1596.04	652	652	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR1-D72

DATE: 07-21-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1585.13	0.00	0	0	0.00
1587.42	0.00	70	0	0.00
1588.44	0.00	140	0	0.00
1589.34	0.00	210	0	0.00
1590.19	0.00	280	0	0.00
1591.06	0.00	350	0	0.00
1591.99	0.00	420	0	0.00
1592.72	0.00	470	0	0.00
1594.22	0.00	560	0	0.00
1595.57	0.00	630	0	0.00
1596.45	-0.00	700	1	0.09

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** 10-yr ok. 100-yr overtops by (96.45-96.04) 0.41-ft



CURRENT DATE: 10-03-1996  
CURRENT TIME: 18:32:15

FILE DATE: 07-21-1996  
FILE NAME: STR1-D72

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL AND LT & RT OVER BANKS  
LEFT CHANNEL BOUNDARY 3  
RIGHT CHANNEL BOUNDARY 7  
MANNING N LEFT OVER BANK 0.050  
MANNING N MAIN CHANNEL 0.033  
MANNING N RIGHT OVER BAN 0.060  
SLOPE OF CHANNEL (FT/FT) 0.0128

FILE NAME: STR1  
FILE DATE: 06-24-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1596.71
2	21.89	1587.61
3	33.88	1583.24
4	35.66	1582.40
5	39.84	1581.31
6	40.83	1581.31
7	49.75	1582.41
8	90.23	1585.17
9	112.66	1587.91
10	118.22	1588.26
11	128.61	1588.51
12	166.80	1604.55

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1581.31	0.000	-1.05	0.00	0.00
70.00	1582.82	0.879	0.46	4.88	0.75
140.00	1583.29	0.929	0.93	6.14	1.06
210.00	1583.61	0.963	1.26	7.09	1.31
280.00	1583.89	0.988	1.53	7.84	1.52
350.00	1584.13	1.007	1.77	8.46	1.71
420.00	1584.34	1.022	1.98	8.99	1.87
470.00	1584.48	1.032	2.12	9.34	1.98
560.00	1584.70	1.047	2.34	9.89	2.16
630.00	1584.87	1.057	2.51	10.28	2.29
700.00	1585.02	1.066	2.66	10.63	2.41

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
EMBANKMENT TOP WIDTH (FT) 117.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1597.00
2	1.00	1596.50
3	47.00	1596.04
4	93.00	1596.30
5	94.00	1596.80

---

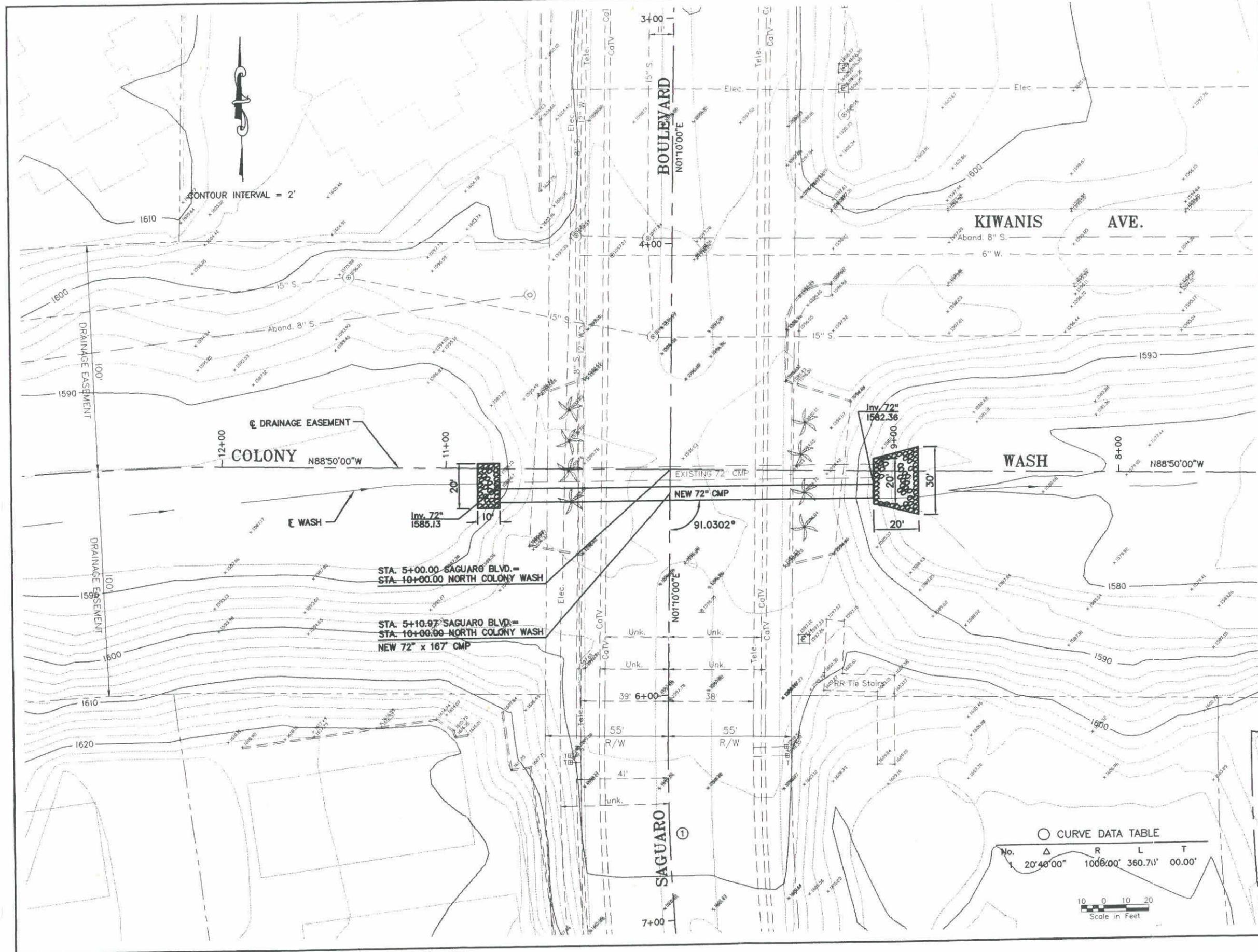
**RELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Colony Wash  
 ADMP- 15, Alternative 1: Install additional 72" x167' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$571.00	1	\$571
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	273	\$382
2020020	Removal of Concrete Curb	LFT.	\$2.00	70	\$140
2020201	Saw Cutting	L.FT.	\$5.00	140	\$700
2030401	Drainage Excavation	CU.YD.	\$5.00	52	\$260
2030501	Structural Excavation	CU.YD.	\$8.00	1670	\$13,360
2030506	Structural Backfill	CU.YD.	\$25.00	320	\$8,000
2050001	Grading For Pavement	SQ. YD.	\$2.50	273	\$683
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	45	\$1,575
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	60	\$2,700
5010055	Pipe, Corrugated Metal, 72"	L.FT.	\$140.00	167	\$23,380
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$2,284.00	1	\$2,284
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,000.00	1	\$1,000
8081417	Water line (6")	L.FT.	\$48.00	20	\$960
9010001	Mobilization (10%)	L.SUM	\$5,711.00	1	\$5,711
9080140	Concrete Gutter	L.FT.	\$10.00	70	\$700
9080201	Concrete Sidewalk	SQ.FT.	\$3.00	280	\$840
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	52	\$3,328
9240170	Contractor Quality Control (2%)	L.SUM	\$1,142.00	1	\$1,142
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,142.00	1	\$1,142
Sub-Total					\$68,958
Engineering and Contingencies (20%)					\$13,790
<b>TOTAL</b>					<b>\$82,748</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$83,000**



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	20°40'00"	1000.00'	360.71'	00.00'

3			
2			
1			
NO.	REVISIONS	BY	DATE

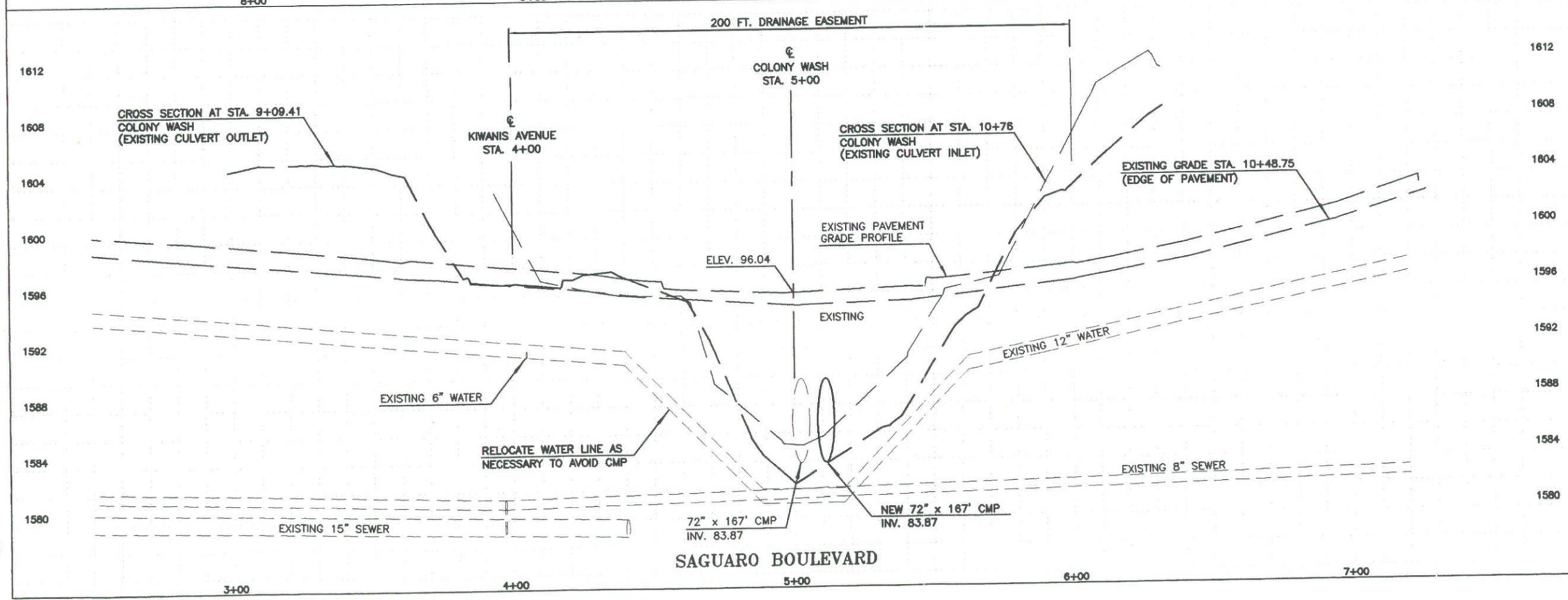
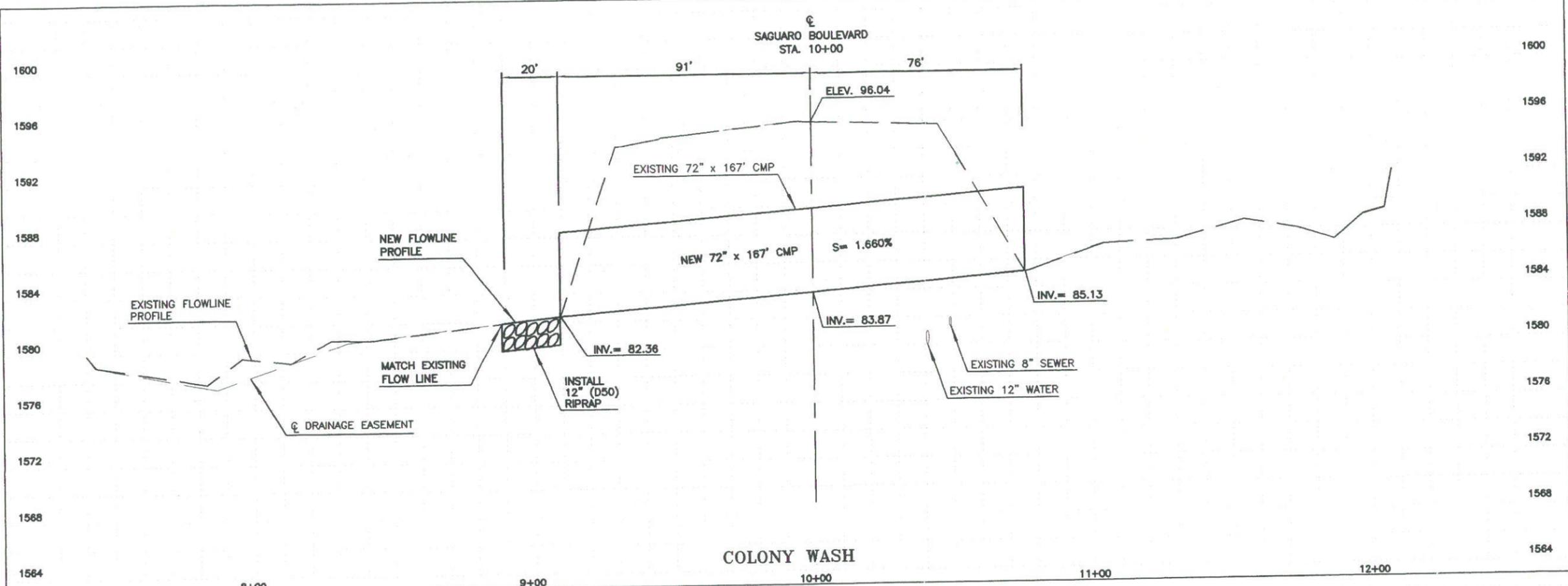
**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 SAGUARO BOULEVARD & COLONY WASH  
 FCD PROJECT NO. 94-16

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96

**Entellus**  
 5500 N 44th Street, Suite 200  
 Phoenix, AZ 85018-3370  
 Tel: 602.944.8888  
 Fax: 602.944.8927

PLAN SHEET  
 ADMP 15- ALTERNATE 1

SHEET OF  
 1 2



NO.	REVISIONS	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION**

**FOUNTAIN HILLS ADMP  
SAGUARO BOULEVARD & COLONY WASH  
FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96

**Entellus**  
2500 N. 44th Street Suite 200  
Phoenix, AZ 85018-2277  
Tel: 602.944.0000  
Fax: 602.944.0047

**PROFILE SHEET  
ADMP 15 - ALTERNATE 1**

SHEET OF **2 2**

# ALTERNATE 2

COLONY WASH @ SAGUARO BLVD. (1-120" CMP, with 8' wide concrete walkway)

CURRENT DATE: 10-03-1996

FILE DATE: 07-21-1996

CURRENT TIME: 18:37:44

FILE NAME: STR1-120

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 FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.1
 

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C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1584.78	1582.36	146.02	1 ICMP	10.00	8.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR1-120

DATE: 07-21-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1584.78	0	0	0	0	0	0	0	0	1
1587.23	70	70	0	0	0	0	0	0	1
1588.56	140	140	0	0	0	0	0	0	1
1589.66	210	210	0	0	0	0	0	0	1
1590.56	280	280	0	0	0	0	0	0	1
1591.34	350	350	0	0	0	0	0	0	1
1592.08	420	420	0	0	0	0	0	0	1
1592.62	470	470	0	0	0	0	0	0	1
1593.65	560	560	0	0	0	0	0	0	1
1594.55	630	630	0	0	0	0	0	0	1
1595.55	700	700	0	0	0	0	0	0	1
1596.04	731	731	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR1-120

DATE: 07-21-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1584.78	0.00	0	0	0.00
1587.23	0.00	70	0	0.00
1588.56	0.00	140	0	0.00
1589.66	0.00	210	0	0.00
1590.56	0.00	280	0	0.00
1591.34	0.00	350	0	0.00
1592.08	0.00	420	0	0.00
1592.62	0.00	470	0	0.00
1593.65	0.00	560	0	0.00
1594.55	0.00	630	0	0.00
1595.55	0.00	700	0	0.00

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** No overtopped by 100-yr flow

CURRENT DATE: 10-03-1996  
CURRENT TIME: 18:37:44

FILE DATE: 07-21-1996  
FILE NAME: STR1-120

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 10 BY 8 ) ICMP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1584.78	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-1.05
70	1587.23	2.45	2.45	1-S2n	1.05	1.25	7.66	1.05	4.88	0.46
140	1588.56	3.78	3.78	1-S2n	1.67	1.98	9.41	1.67	6.14	0.93
210	1589.66	4.88	4.88	1-S2n	2.15	2.57	10.75	2.15	7.09	1.26
280	1590.56	5.78	5.78	1-S2n	2.60	3.09	11.69	2.60	7.84	1.53
350	1591.34	6.56	6.56	1-S2n	3.01	3.54	12.48	3.01	8.46	1.77
420	1592.08	7.30	7.30	1-S2n	3.41	3.98	13.04	3.43	8.99	1.98
470	1592.62	7.84	7.84	1-S2n	3.69	4.25	13.44	3.71	9.34	2.12
560	1593.65	8.87	8.87	5-S2n	4.19	4.74	14.14	4.19	9.89	2.34
630	1594.55	9.77	9.77	5-S2n	4.58	5.08	14.54	4.58	10.28	2.51
700	1595.55	10.77	10.77	5-S2n	4.98	5.41	14.88	4.98	10.63	2.66
El. inlet face invert					1584.78 ft	El. outlet invert		1582.36 ft		
El. inlet throat invert					0.00 ft	El. inlet crest		0.00 ft		

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION (FT) 1055.00  
 INLET ELEVATION (FT) 1584.78  
 OUTLET STATION (FT) 909.00  
 OUTLET ELEVATION (FT) 1582.36  
 NUMBER OF BARRELS 1  
 SLOPE (V-FT/H-FT) 0.0166  
 CULVERT LENGTH ALONG SLOPE (FT) 146.02

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE USER DEFINED  
 BARREL SPAN 10.00 FT  
 BARREL RISE 8.00 FT  
 BARREL MATERIAL STEEL OR ALUMINUM  
 BARREL MANNING'S N 0.024 FOR SIDES AND TOP  
 0.018 FOR BOTTOM  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL HEADWALL  
 INLET DEPRESSION NONE

CURRENT DATE: 10-03-1996  
CURRENT TIME: 18:37:44

FILE DATE: 07-21-1996  
FILE NAME: STR1-120

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\*\*\*\*\* USER DEFINED CULVERT CROSS-SECTION - CULVERT # 1

COORDINATE NUMBER	X (FT)	Y-TOP (FT)	Y-BOTTOM (FT)
1	0.00	5.00	5.00
2	0.20	6.40	3.60
3	0.60	7.37	2.63
4	1.00	8.00	2.00
5	1.88	8.90	2.00
6	2.50	9.33	2.00
7	3.13	9.64	2.00
8	3.75	9.84	2.00
9	4.38	9.96	2.00
10	5.00	10.00	2.00
11	5.63	9.96	2.00
12	6.25	9.84	2.00
13	6.88	9.64	2.00
14	7.50	9.33	2.00
15	8.13	8.90	2.00
16	9.00	8.00	2.00
17	9.40	7.37	2.63
18	9.80	6.40	3.60
19	10.00	5.00	5.00

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CURRENT DATE: 10-03-1996  
CURRENT TIME: 18:37:44

FILE DATE: 07-21-1996  
FILE NAME: STR1-120

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL AND LT & RT OVER BANKS  
LEFT CHANNEL BOUNDARY 3  
RIGHT CHANNEL BOUNDARY 7  
MANNING N LEFT OVER BANK 0.050  
MANNING N MAIN CHANNEL 0.033  
MANNING N RIGHT OVER BAN 0.060  
SLOPE OF CHANNEL (FT/FT) 0.0128

FILE NAME: STR1  
FILE DATE: 06-24-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1596.71
2	21.89	1587.61
3	33.88	1583.24
4	35.66	1582.40
5	39.84	1581.31
6	40.83	1581.31
7	49.75	1582.41
8	90.23	1585.17
9	112.66	1587.91
10	118.22	1588.26
11	128.61	1588.51
12	166.80	1604.55

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1581.31	0.000	-1.05	0.00	0.00
70.00	1582.82	0.879	0.46	4.88	0.75
140.00	1583.29	0.929	0.93	6.14	1.06
210.00	1583.61	0.963	1.26	7.09	1.31
280.00	1583.89	0.988	1.53	7.84	1.52
350.00	1584.13	1.007	1.77	8.46	1.71
420.00	1584.34	1.022	1.98	8.99	1.87
470.00	1584.48	1.032	2.12	9.34	1.98
560.00	1584.70	1.047	2.34	9.89	2.16
630.00	1584.87	1.057	2.51	10.28	2.29
700.00	1585.02	1.066	2.66	10.63	2.41

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
EMBANKMENT TOP WIDTH (FT) 115.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1597.00
2	1.00	1596.50
3	47.00	1596.04
4	93.00	1596.30
5	94.00	1596.80

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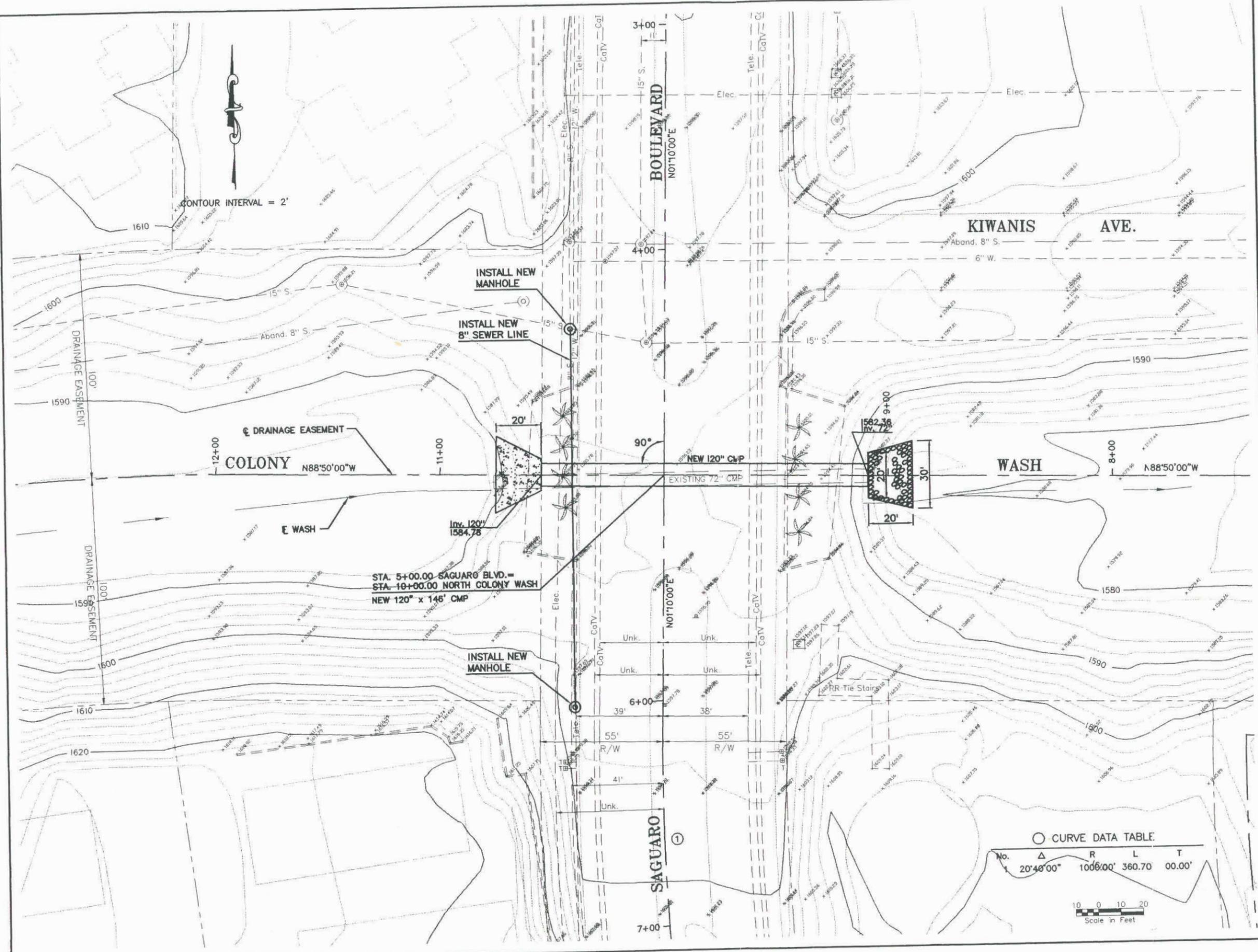
**LIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Colony Wash  
 ADMP- 15, Alternative 2: Install 120" x146' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$975.00	1	\$975
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	330	\$462
2020020	Removal of Concrete Curb	LFT.	\$2.00	155	\$310
2020055	Removal and Savage (72" C.M.P.)	L.FT.	\$24.00	167	\$4,008
2020201	Saw Cutting	L.FT.	\$5.00	140	\$700
2030401	Drainage Excavation	CU.YD.	\$5.00	52	\$260
2030501	Structural Excavation	CU.YD.	\$8.00	2163	\$17,304
2030506	Structural Backfill	CU.YD.	\$25.00	484	\$12,100
2050001	Grading For Pavement	SQ. YD.	\$2.50	330	\$825
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	55	\$1,925
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	72.5	\$3,263
5010079	Pipe, Corrugated Metal, 120"	L.FT.	\$230.00	146	\$33,580
5050068	Manhole (MAG Det. 420 & 424)	EACH	\$2,400.00	2	\$4,800
6010002	Structural Concrete (Class S)(F'C = 3000)	CU.YD.	\$150.00	35	\$5,250
6050002	Reinforcing Steel	LB.	\$0.50	2330	\$1,165
710001	Maintenance and Protection of Traffic 4%	L.SUM	\$3,899.00	1	\$3,899
710006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,000.00	1	\$1,000
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	120	\$4,200
8081417	Water line (6")	L.FT.	\$48.00	30	\$1,440
9010001	Mobilization (10%)	L.SUM	\$9,747.00	1	\$9,747
9080140	Concrete Gutter	L.FT.	\$10.00	155	\$1,550
9080201	Concrete Sidewalk	SQ.FT.	\$3.00	620	\$1,860
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	37	\$2,368
9240170	Contractor Quality Control (2%)	L.SUM	\$1,949.00	1	\$1,949
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,949.00	1	\$1,949
Sub-Total					\$116,989
Engineering and Contingencies (20%)					\$23,400
<b>TOTAL</b>					<b>\$140,389</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$141,000**



○ CURVE DATA TABLE

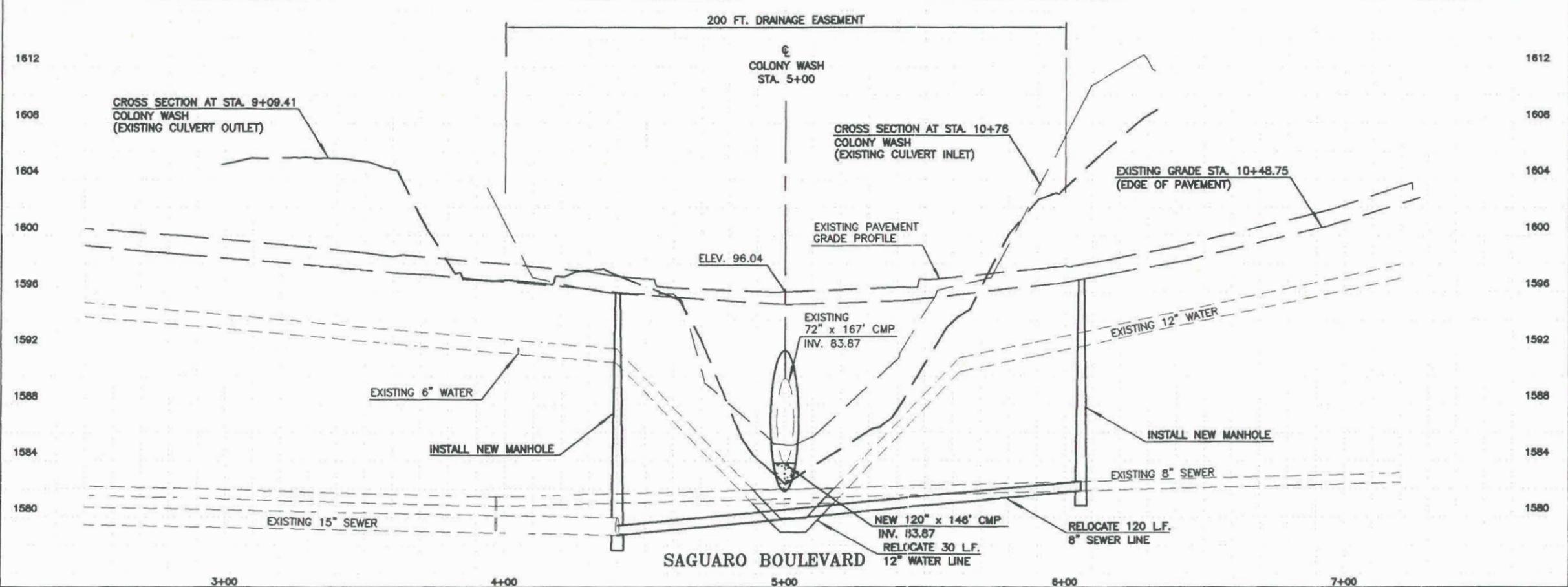
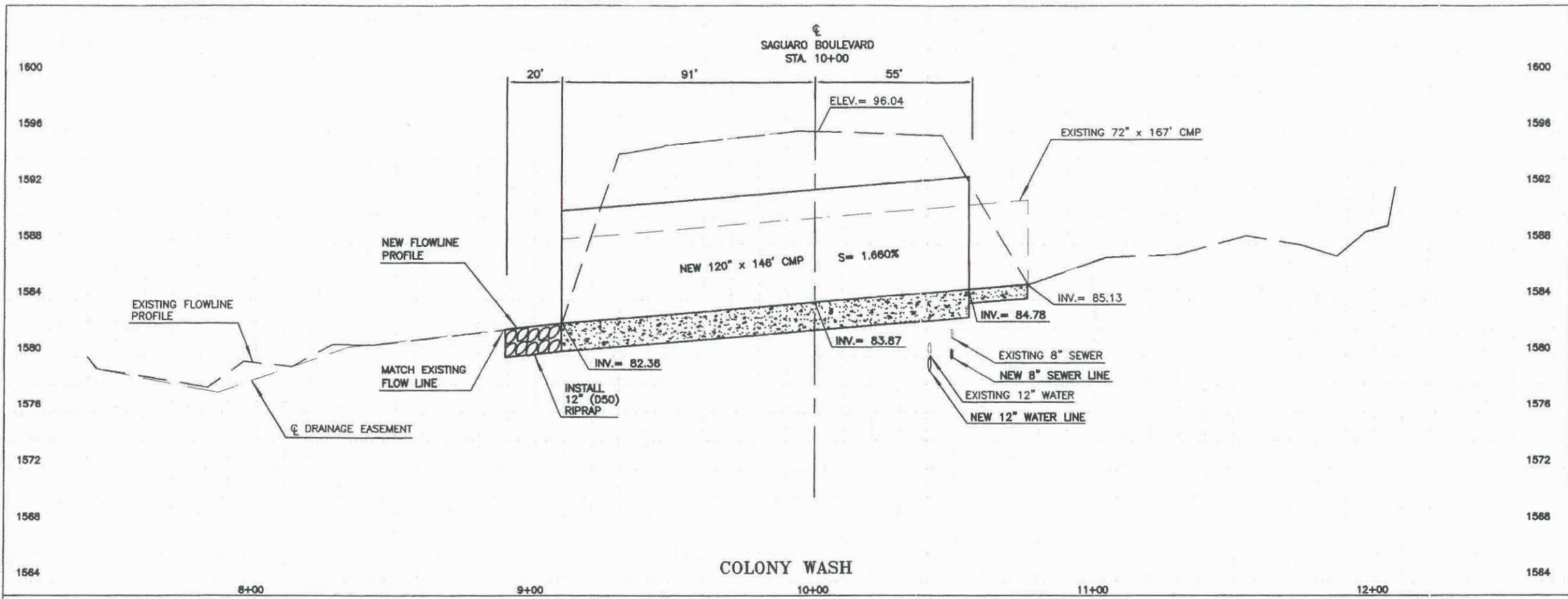
No.	Δ	R	L	T
1	20°40'00"	1006.00'	360.70'	00.00'

NO.	REVISIONS	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 SAGUARO BOULEVARD & COLONY WASH  
 FCD PROJECT NO. 94-16

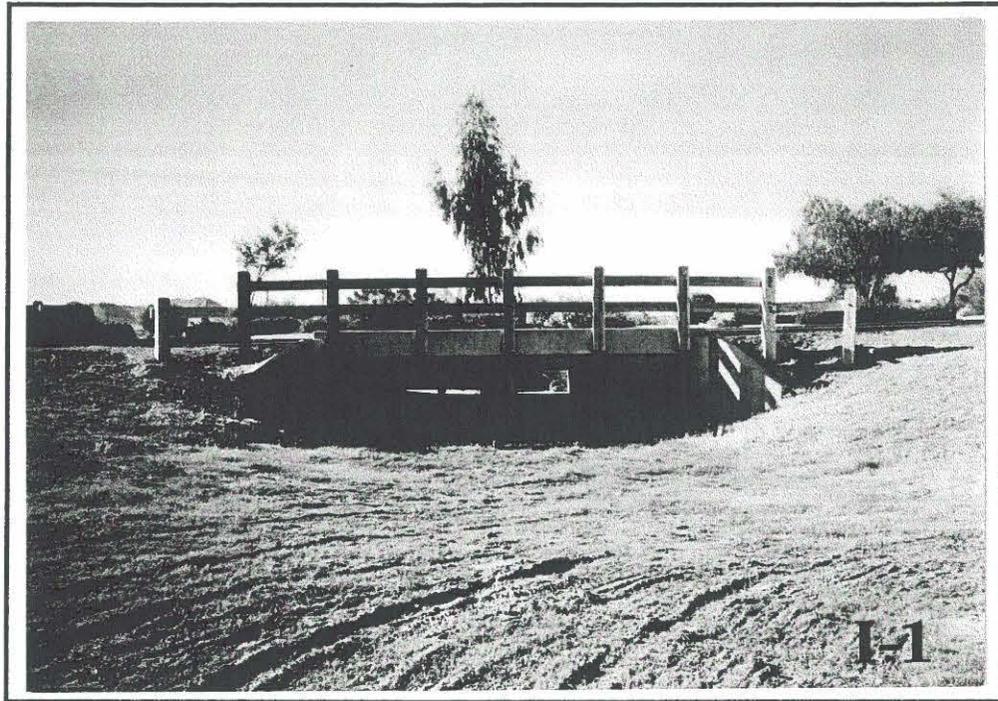
	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96





3			
2			
1			
NO.	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT                  OF MARICOPA COUNTY                  ENGINEERING DIVISION</b>			
<b>FOUNTAIN HILLS ADMP                  SAGUARO BOULEVARD &amp; COLONY WASH                  FCD PROJECT NO. 94-16</b>			
		BY	DATE
	DESIGNED	HAA	11/96
	DRAWN	JDS	11/96
	CHECKED	SEK	11/96
 <b>Entellus™</b> 2500 N. 48th Street Suite 200 Phoenix, AZ 85018 Tel: 602.944.0000 Fax: 602.944.0007			
PROFILE SHEET ADMP 15 - ALTERNATE 2			SHEET OF 2 2

**Site 16: El Lago Blvd. / Fountain Channel**

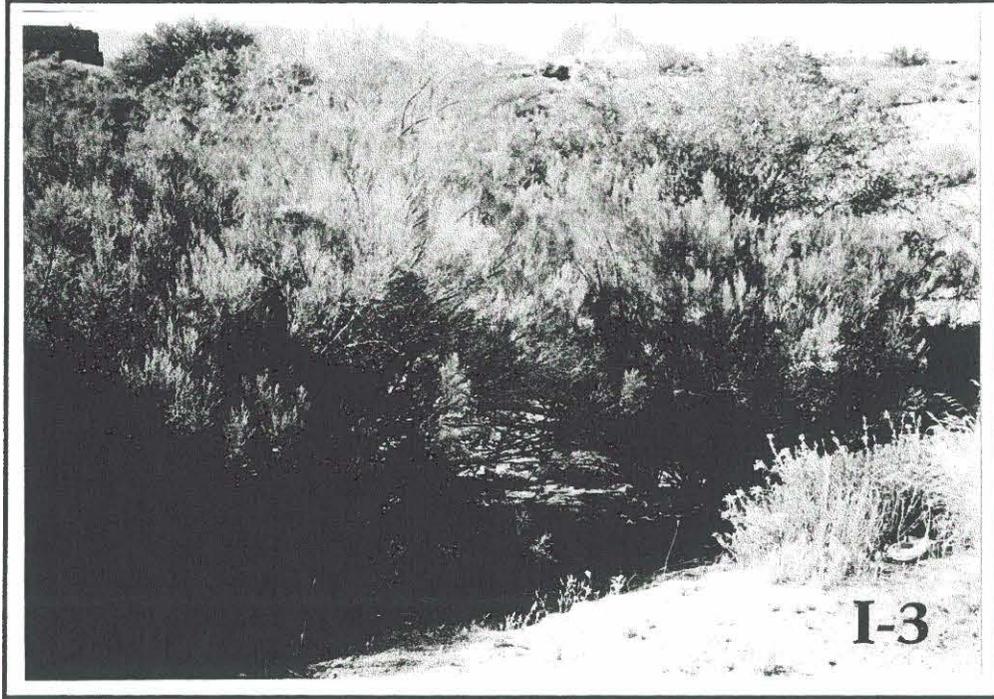


Fountain Channel Box Culvert Inlet  
*Looking Downstream*



Fountain Channel Box Culvert Outlet  
*Looking East across Channel*

**Site 16: El Lago Blvd. / Fountain Channel (Cont'd.)**



Fountain Channel  
*Looking Downstream from El Lago Blvd.*



ALTERNATE 1

**FOUNTAIN CHANNEL@ EL LAGO BLVD. (3-10'X4' CBC)**

CURRENT DATE: 01-31-1997

CURRENT TIME: 14:13:19

FILE DATE: 07-02-1996

FILE NAME: STR2-T

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**FHWA CULVERT ANALYSIS**  
**HY-8, VERSION 4.1**


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C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1577.65	1576.82	74.00	3 RCB	10.00	4.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR2-T

DATE: 07-02-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1577.65	0	0	0	0	0	0	0	0	1
1578.66	92	92	0	0	0	0	0	0	1
1579.25	184	184	0	0	0	0	0	0	1
1579.75	276	276	0	0	0	0	0	0	1
1580.21	368	368	0	0	0	0	0	0	1
1580.63	460	460	0	0	0	0	0	0	1
1580.97	540	540	0	0	0	0	0	0	1
1581.40	644	644	0	0	0	0	0	0	1
1581.79	736	736	0	0	0	0	0	0	1
1582.19	828	828	0	0	0	0	0	0	1
1582.62	920	920	0	0	0	0	0	0	1
1583.78	1138	1138	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR2-T

DATE: 07-02-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1577.65	0.00	0	0	0.00
1578.66	0.00	92	0	0.00
1579.25	0.00	184	0	0.00
1579.75	0.00	276	0	0.00
1580.21	0.00	368	0	0.00
1580.63	0.00	460	0	0.00
1580.97	0.00	540	0	0.00
1581.40	0.00	644	0	0.00
1581.79	0.00	736	0	0.00
1582.19	0.00	828	0	0.00
1582.62	0.00	920	0	0.00

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** No overtopping

CURRENT DATE: 01-31-1997  
CURRENT TIME: 14:13:19

FILE DATE: 07-02-1996  
FILE NAME: STR2-T

PERFORMANCE CURVE FOR CULVERT # 1 - 3 ( 10 BY 4 ) RCB

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1577.65	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
92	1578.66	1.01	1.01	1-S2n	0.43	0.66	7.20	0.43	3.53	0.73
184	1579.25	1.60	1.60	1-S2n	0.65	1.06	8.72	0.70	4.38	1.01
276	1579.75	2.10	2.10	1-S2n	0.86	1.38	9.79	0.94	5.15	1.21
368	1580.21	2.56	2.56	1-S2n	1.02	1.68	10.59	1.16	5.76	1.38
460	1580.63	2.98	2.98	1-S2n	1.19	1.94	11.22	1.37	6.29	1.53
540	1580.97	3.32	3.32	1-S2n	1.32	2.16	11.70	1.54	6.70	1.65
644	1581.40	3.75	3.75	1-S2n	1.48	2.43	12.23	1.75	7.18	1.80
736	1581.79	4.14	4.14	5-S2n	1.63	2.66	12.66	1.94	7.56	1.92
828	1582.19	4.54	4.54	5-S2n	1.76	2.88	13.04	2.12	7.92	2.03
920	1582.62	4.97	4.97	5-S2n	1.89	3.09	13.39	2.29	8.25	2.14

El. inlet face invert 1577.65 ft El. outlet invert 1576.82 ft  
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
INLET STATION (FT) 1038.00  
INLET ELEVATION (FT) 1577.65  
OUTLET STATION (FT) 964.00  
OUTLET ELEVATION (FT) 1576.82  
NUMBER OF BARRELS 3  
SLOPE (V-FT/H-FT) 0.0112  
CULVERT LENGTH ALONG SLOPE (FT) 74.00

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
BARREL SHAPE BOX  
BARREL SPAN 10.00 FT  
BARREL RISE 4.00 FT  
BARREL MATERIAL CONCRETE  
BARREL MANNING'S N 0.012  
INLET TYPE CONVENTIONAL  
INLET EDGE AND WALL SQUARE EDGE (30-75 DEG. FLARE)  
INLET DEPRESSION NONE

CURRENT DATE: 01-31-1997  
 CURRENT TIME: 14:13:19

FILE DATE: 07-02-1996  
 FILE NAME: STR2-T

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
 MAIN CHANNEL AND LT & RT OVER BANKS  
 LEFT CHANNEL BOUNDARY 2  
 RIGHT CHANNEL BOUNDARY 5  
 MANNING N LEFT OVER BANK 0.058  
 MANNING N MAIN CHANNEL 0.031  
 MANNING N RIGHT OVER BAN 0.058  
 SLOPE OF CHANNEL (FT/FT) 0.0132

FILE NAME: STR2  
 FILE DATE: 05-29-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1583.53
2	34.00	1577.85
3	61.57	1576.82
4	77.85	1576.86
5	93.23	1577.27
6	139.82	1586.59

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1576.82	0.000	0.00	0.00	0.00
92.00	1577.55	0.868	0.73	3.53	0.42
184.00	1577.83	0.917	1.01	4.38	0.58
276.00	1578.03	0.954	1.21	5.15	0.74
368.00	1578.20	0.981	1.38	5.76	0.88
460.00	1578.35	1.003	1.53	6.29	1.01
540.00	1578.47	1.019	1.65	6.70	1.10
644.00	1578.62	1.037	1.80	7.18	1.22
736.00	1578.74	1.050	1.92	7.56	1.32
828.00	1578.85	1.062	2.03	7.92	1.42
920.00	1578.96	1.073	2.14	8.25	1.51

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ROADWAY OVERTOPPING DATA

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ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	60.00
CREST LENGTH (FT)	40.00
OVERTOPPING CREST ELEVATION (FT)	1583.78

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**ELIMINARY DETAILED COST ESTIMATE - 30%**

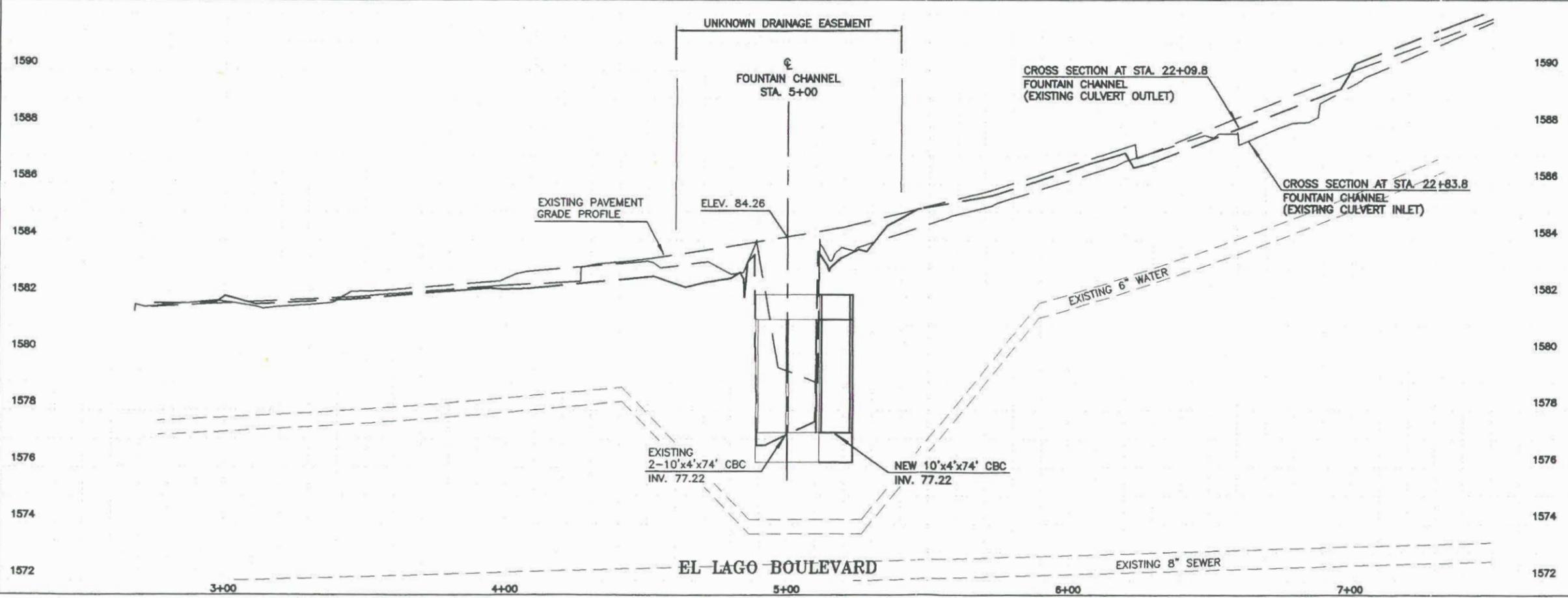
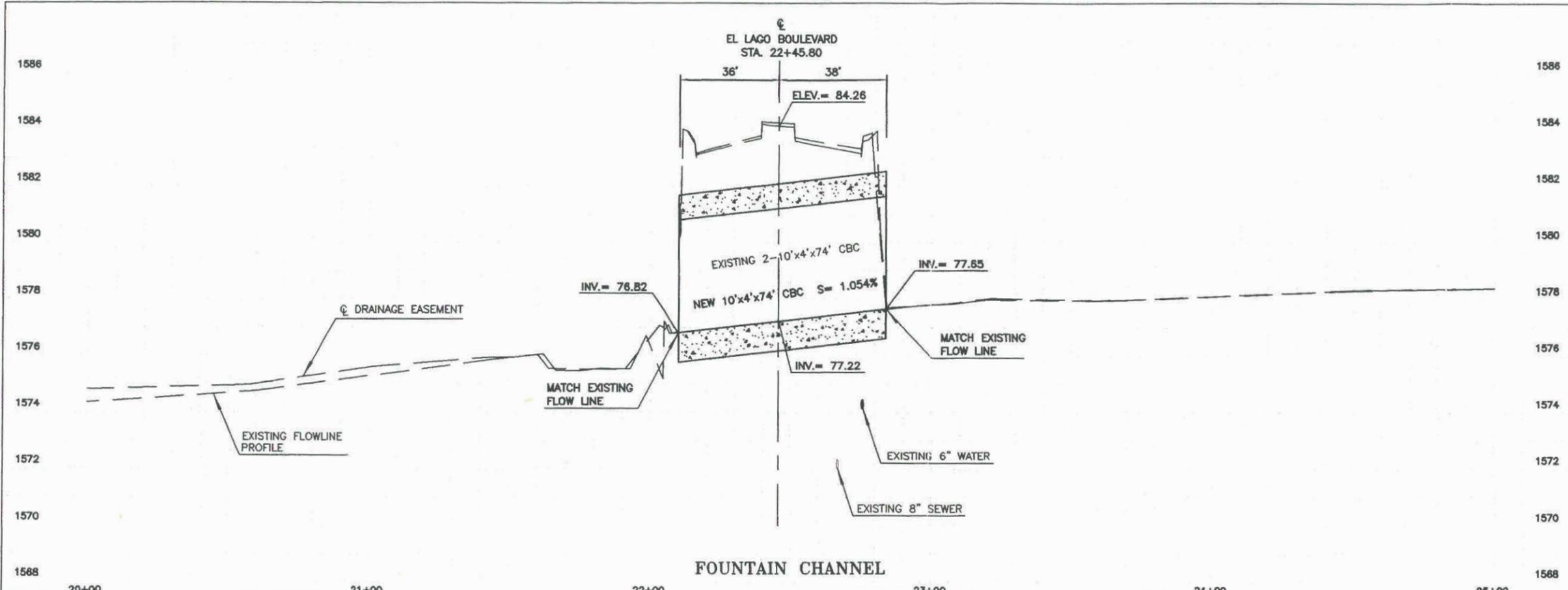
Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 El Lago Boulevard & Fountain Channel  
 ADMP- 16, Alternative 1: Install additional 10'x4'x74' barrel

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$367.00	1	\$367
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	139	\$195
2020020	Removal of Concrete Curb	LFT.	\$2.00	50	\$100
2020201	Saw Cutting	L.FT.	\$5.00	100	\$500
2030401	Drainage Excavation	CU.YD.	\$5.00	55	\$275
2030501	Structural Excavation	CU.YD.	\$8.00	471	\$3,768
2030506	Structural Backfill	CU.YD.	\$25.00	148	\$3,700
2050001	Grading For Pavement	SQ. YD.	\$2.50	139	\$348
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	45.5	\$1,593
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	45.3	\$2,038
6010002	Structural Concrete (Class S)(F'C = 3000)	CU.YD.	\$150.00	107	\$16,050
6050002	Reinforcing Steel	LB.	\$0.50	13722	\$6,861
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$1,470.00	1	\$1,470
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,000.00	1	\$1,000
8050003	Seeding (class II)	ACRE	\$4,000.00	0.03	\$120
9010001	Mobilization (10%)	L.SUM	\$3,675.00	1	\$3,675
9080140	Concrete Gutter	L.FT.	\$10.00	50	\$500
9080201	Concrete Sidewalk	SQ.FT.	\$3.00	200	\$600
9240170	Contractor Quality Control (2%)	L.SUM	\$735.00	1	\$735
9250001	Construction Surveying and Layout (2%)	L.SUM	\$735.00	1	\$735
Sub-Total					\$44,729
Engineering and Contingencies (20%)					\$8,950
<b>TOTAL</b>					<b>\$53,679</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

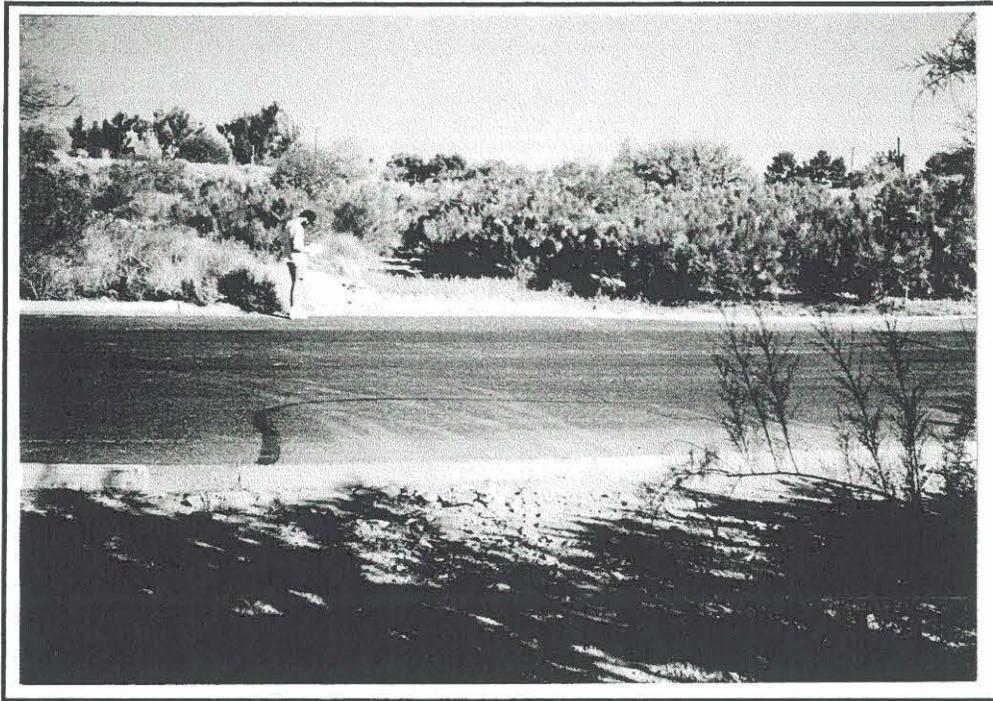
**\$54,000**



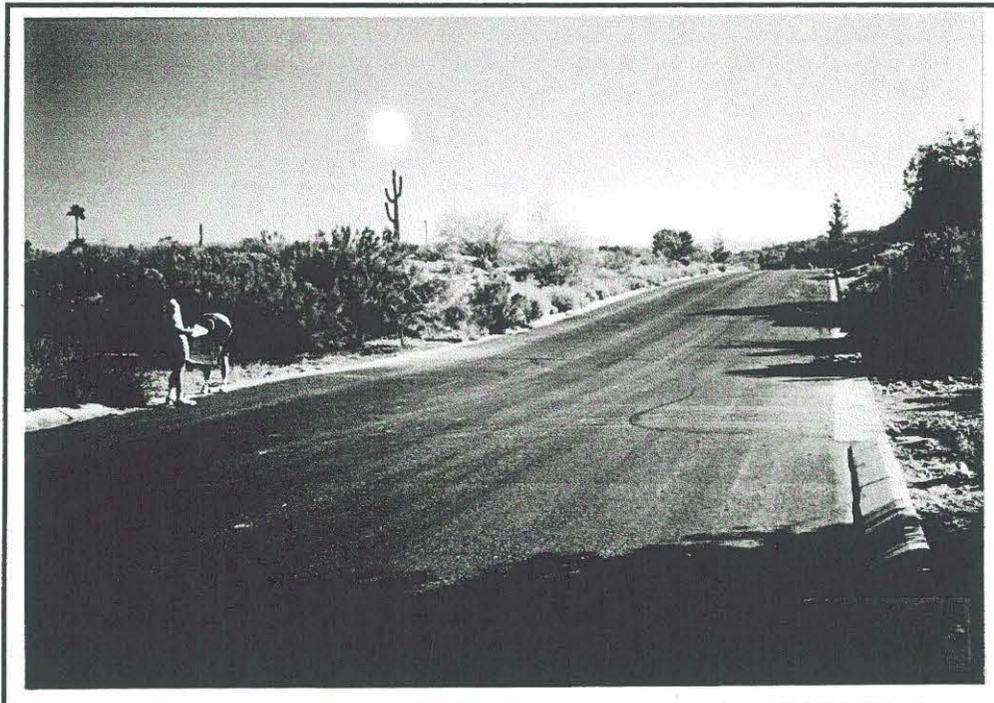


3			
2			
1			
NO.	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY</b> ENGINEERING DIVISION <b>FOUNTAIN HILLS ADMP</b> <b>EL LAGO BLVD. &amp; FOUNTAIN CHANNEL</b> <b>FCD PROJECT NO. 94-16</b>			
	DESIGNED	HAA	11/96
	DRAWN	JDS	11/96
	CHECKED	SEK	11/96
	 <b>Entellus</b> <small>2000 N. 44th Street Suite 200 Phoenix, AZ 85018-0279 Tel: 602.944.2000 Fax: 602.944.2001</small>		
PROFILE SHEET			SHEET OF
ADMP 16 - ALTERNATE 1			2 2

**Site 17: Kiwanis Rd. / Fountain Channel**



Fountain Channel Wet Crossing  
*Looking Upstream from Kiwanis Rd.*



Fountain Channel Wet Crossing  
*Looking Northeast across Channel*



# ALTERNATE 1

## FOUNTAIN CHANNEL @ KIWANIS DR. (3-10'X4' RCB)

CURRENT DATE: 01-31-1997

CURRENT TIME: 14:20:07

FILE DATE: 09-04-1996

FILE NAME: STR3-T3

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1573.20	1572.80	52.00	3 RCB	10.00	4.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR3-T3

DATE: 09-04-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1573.20	0	0	0	0	0	0	0	0	1
1574.26	98	98	0	0	0	0	0	0	1
1574.88	196	196	0	0	0	0	0	0	1
1575.40	294	294	0	0	0	0	0	0	1
1575.88	392	392	0	0	0	0	0	0	1
1576.31	490	490	0	0	0	0	0	0	1
1576.73	588	588	0	0	0	0	0	0	1
1576.86	620	620	0	0	0	0	0	0	1
1577.56	784	784	0	0	0	0	0	0	1
1577.94	882	870	0	0	0	0	0	7	6
1578.17	980	918	0	0	0	0	0	57	6
1577.79	836	836	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR3-T3

DATE: 09-04-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1573.20	0.00	0	0	0.00
1574.26	0.00	98	0	0.00
1574.88	0.00	196	0	0.00
1575.40	0.00	294	0	0.00
1575.88	0.00	392	0	0.00
1576.31	0.00	490	0	0.00
1576.73	0.00	588	0	0.00
1576.86	0.00	620	0	0.00
1577.56	0.00	784	0	0.00
1577.94	-0.01	882	5	0.54
1578.17	-0.01	980	5	0.56

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

Conclusions: 10-yr ok. 100-yr overtops by (78.17-77.79) 0.38ft

CURRENT DATE: 01-31-1997  
 CURRENT TIME: 14:20:07

FILE DATE: 09-04-1996  
 FILE NAME: STR3-T3

PERFORMANCE CURVE FOR CULVERT # 1 - 3 ( 10 BY 4 ) RCB

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1573.20	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
98	1574.26	1.06	1.06	1-S2n	0.49	0.69	6.29	0.52	3.76	0.75
196	1574.88	1.68	1.68	1-S2n	0.78	1.10	7.83	0.83	4.90	1.08
294	1575.40	2.20	2.20	1-S2n	1.00	1.44	8.82	1.11	5.70	1.33
392	1575.88	2.68	2.68	1-S2n	1.22	1.75	9.56	1.37	6.33	1.55
490	1576.31	3.11	3.11	1-S2n	1.40	2.03	10.18	1.60	6.88	1.75
588	1576.73	3.53	3.53	1-S2n	1.59	2.29	10.70	1.83	7.34	1.93
620	1576.86	3.66	3.66	1-S2n	1.64	2.37	10.86	1.90	7.48	1.99
784	1577.56	4.36	4.36	5-S2n	1.92	2.77	11.59	2.26	8.15	2.25
870	1577.94	4.74	4.74	5-S2n	2.07	2.97	11.92	2.43	8.50	2.41
918	1578.17	4.97	4.97	5-S2n	2.14	3.08	12.09	2.53	8.83	2.55
El. inlet face invert					1573.20 ft	El. outlet invert			1572.80 ft	
El. inlet throat invert					0.00 ft	El. inlet crest			0.00 ft	

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION (FT) 1023.00  
 INLET ELEVATION (FT) 1573.20  
 OUTLET STATION (FT) 971.00  
 OUTLET ELEVATION (FT) 1572.80  
 NUMBER OF BARRELS 3  
 SLOPE (V-FT/H-FT) 0.0077  
 CULVERT LENGTH ALONG SLOPE (FT) 52.00

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE BOX  
 BARREL SPAN 10.00 FT  
 BARREL RISE 4.00 FT  
 BARREL MATERIAL CONCRETE  
 BARREL MANNING'S N 0.012  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL SQUARE EDGE (30-75 DEG. FLARE)  
 INLET DEPRESSION NONE

CURRENT DATE: 01-31-1997  
CURRENT TIME: 14:20:07

FILE DATE: 09-04-1996  
FILE NAME: STR3-T3

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL AND LT & RT OVER BANKS  
LEFT CHANNEL BOUNDARY 2  
RIGHT CHANNEL BOUNDARY 8  
MANNING N LEFT OVER BANK 0.058  
MANNING N MAIN CHANNEL 0.031  
MANNING N RIGHT OVER BAN 0.058  
SLOPE OF CHANNEL (FT/FT) 0.0110

FILE NAME: STR3-TL  
FILE DATE: 07-02-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1579.58
2	1.14	1579.62
3	7.00	1576.56
4	9.00	1572.80
5	24.00	1572.80
6	31.00	1572.80
7	32.00	1572.90
8	48.26	1573.14
9	60.80	1573.97
10	62.31	1573.56
11	79.25	1576.37
12	79.25	1579.58

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1572.80	0.000	0.00	0.00	0.00
98.00	1573.55	0.819	0.75	3.76	0.44
196.00	1573.88	0.873	1.08	4.90	0.66
294.00	1574.13	0.905	1.33	5.70	0.83
392.00	1574.35	0.928	1.55	6.33	0.97
490.00	1574.55	0.946	1.75	6.88	1.10
588.00	1574.73	0.960	1.93	7.34	1.21
620.00	1574.79	0.964	1.99	7.48	1.25
784.00	1575.05	0.983	2.25	8.15	1.42
882.00	1575.21	0.993	2.41	8.50	1.51
980.00	1575.35	1.001	2.55	8.83	1.60

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
EMBANKMENT TOP WIDTH (FT) 40.00  
\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1579.25
2	25.00	1578.57
3	50.00	1578.09
4	75.00	1577.84
5	100.00	1577.79
6	440.00	1578.60

**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Kiwanis Drive & Fountain Channel  
 ADMP- 17, Alternative 1: Install additional 3-1'-X4'X64' CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$1,074.00	1	\$1,074
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	1614	\$2,260
2020020	Removal of Concrete Curb	LFT.	\$2.00	908	\$1,816
2020201	Saw Cutting	L.FT.	\$5.00	64	\$320
2030401	Drainage Excavation	CU.YD.	\$5.00	40	\$200
2030501	Structural Excavation	CU.YD.	\$8.00	326	\$2,608
2030506	Structural Backfill	CU.YD.	\$25.00	110	\$2,750
2030902	Borrow (Roadway Fill)	CU.YD.	\$8.00	770	\$6,160
2050001	Grading For Pavement	SQ. YD.	\$2.50	1614	\$4,035
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	269	\$9,415
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	179	\$8,055
6010002	Structural Concrete (Class S)(F'C = 3000)	CU.YD.	\$150.00	227	\$34,050
6050002	Reinforcing Steel	LB.	\$0.50	31375	\$15,688
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$4,297.00	1	\$4,297
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
7010001	Mobilization (10%)	L.SUM	\$10,743.00	1	\$10,743
9080140	Concrete Gutter	L.FT.	\$10.00	908	\$9,080
9080201	Concrete Sidewalk	SQ.FT.	\$3.00	3632	\$10,896
9240170	Contractor Quality Control (2%)	L.SUM	\$2,149.00	1	\$2,149
9250001	Construction Surveying and Layout (2%)	L.SUM	\$2,149.00	1	\$2,149
Sub-Total					\$128,244
Engineering and Contingencies (20%)					\$25,650
<b>TOTAL</b>					<b>\$153,894</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

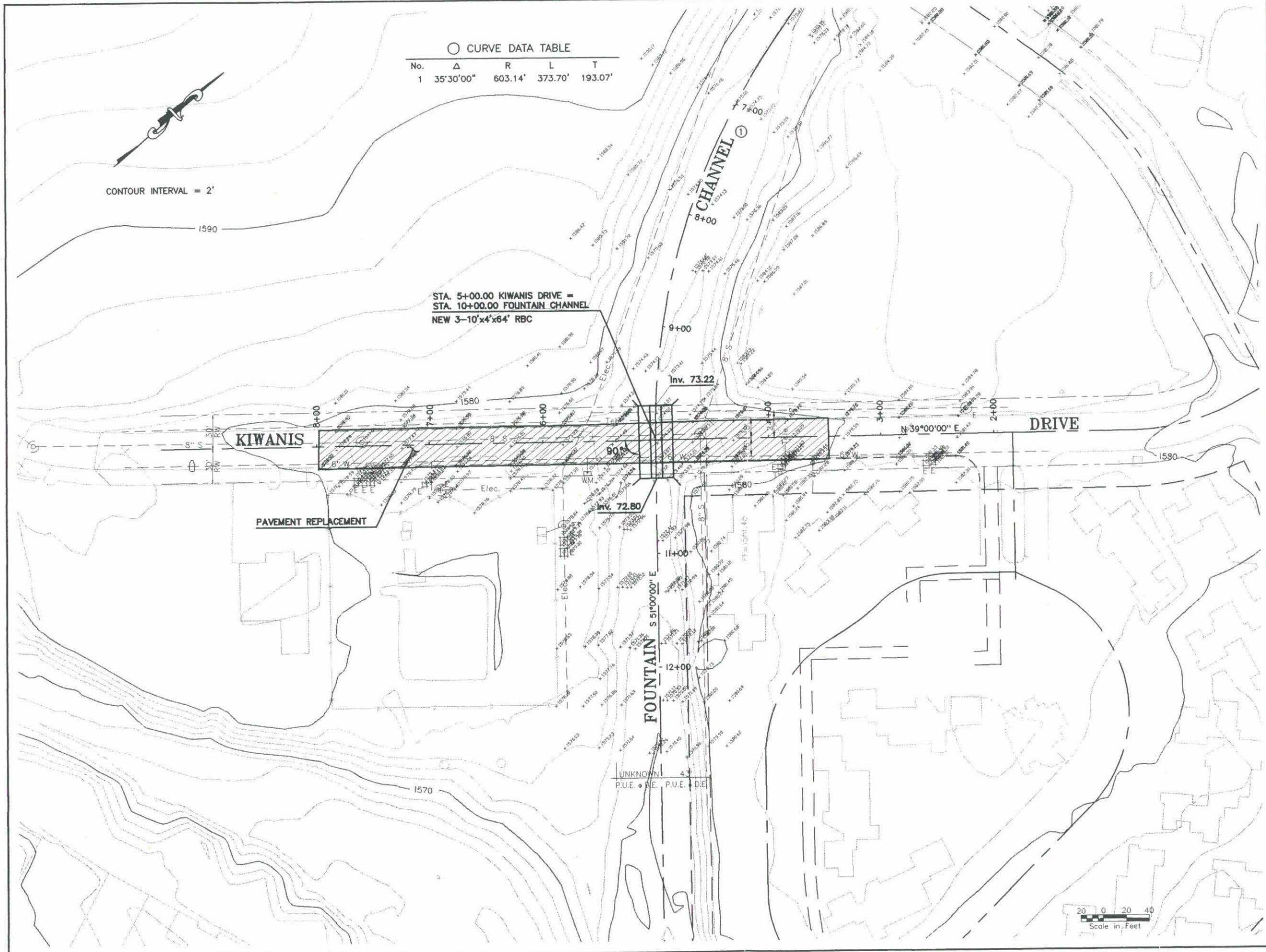
**\$154,000**

CALL TWO WEEKS BEFORE YOU DO  
 1-602-263-1100  
 1-800-STAKE-IT  
 (OFFICE MARICOPA COUNTY)

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	35°30'00"	603.14'	373.70'	193.07'

CONTOUR INTERVAL = 2'



NO.	REVISIONS	BY	DATE
3			
2			
1			

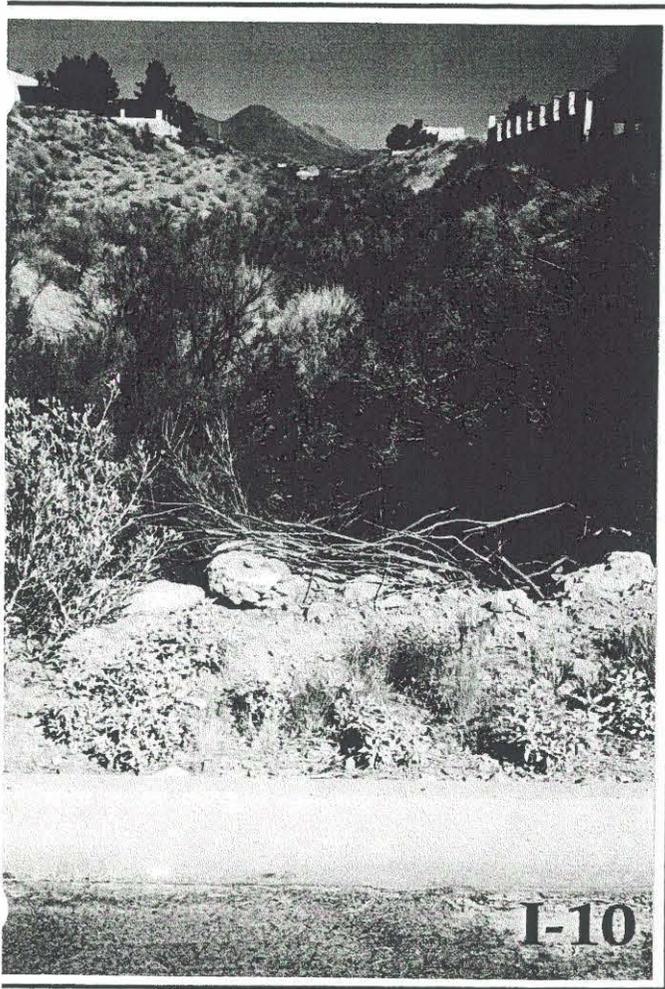
**FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 KIWANIS DRIVE & FOUNTAIN CHANNEL  
 FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96

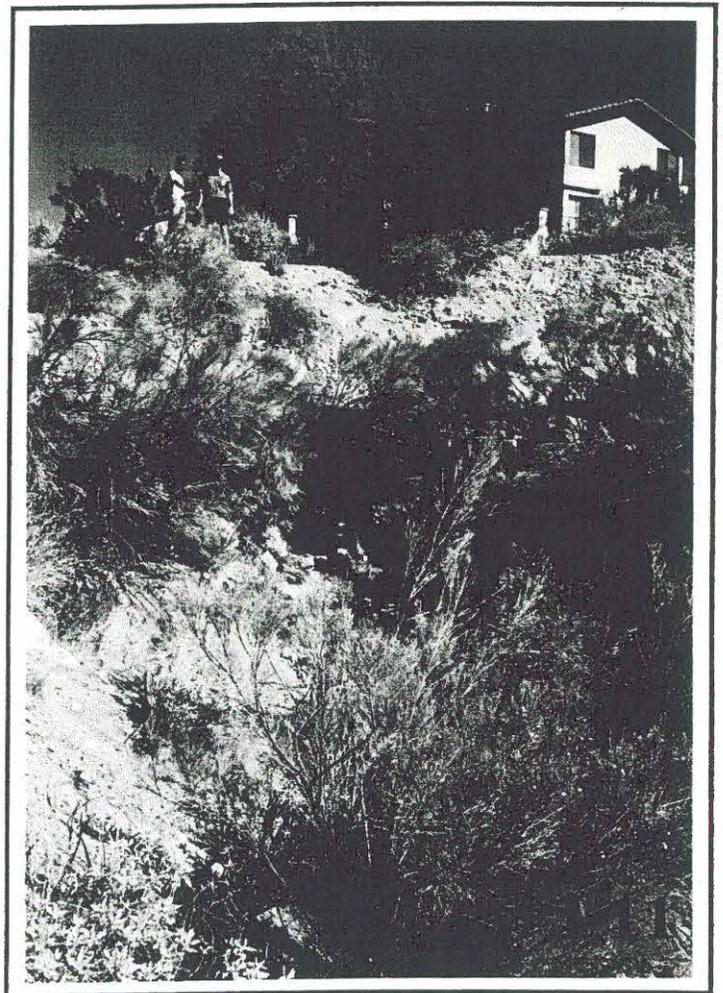




Site 18: Chama Dr. / North Colony Wash

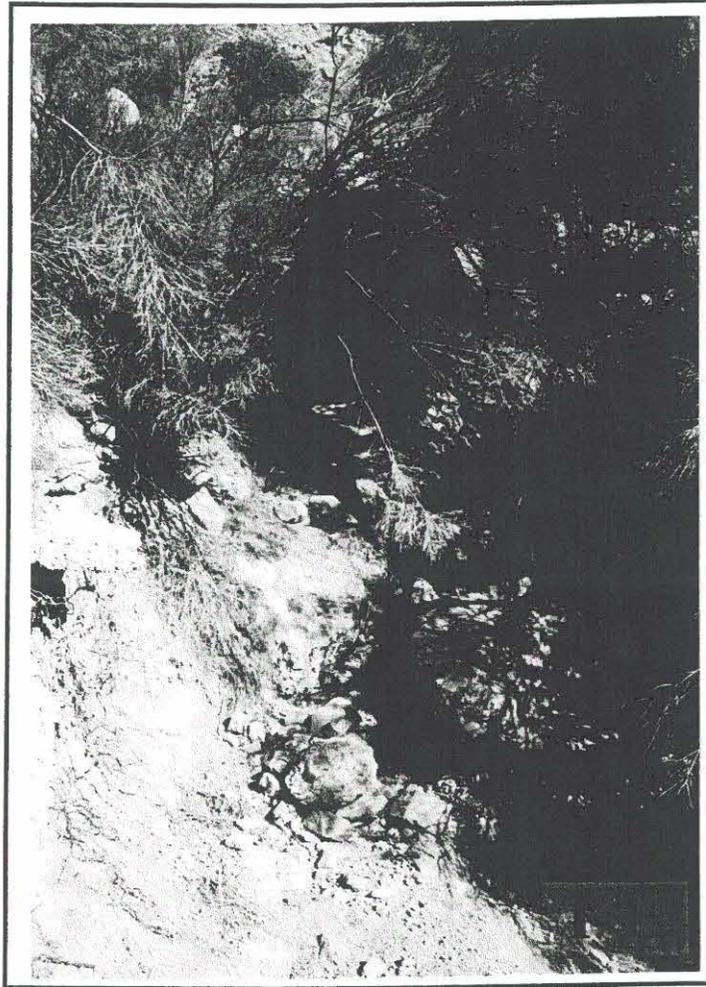


North Colony Wash  
*Looking Upstream from Chama Dr.*



North Colony Wash  
*Looking <sup>toward</sup> Downstream from Chama Dr.  
Upstream*

**Site 18: Chama Dr. / North Colony Wash**



North Colony Wash Culvert Outlet  
*Looking Upstream*



ALTERNATE 1

NORTH COLONY WASH @ CHAMA DR. (2-60" CMP)  
 CURRENT DATE: 10-08-1996  
 CURRENT TIME: 16:50:04

FILE DATE: 09-04-1996  
 FILE NAME: STR4-D60

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1629.18	1623.73	73.20	2 CSP	5.00	5.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR4-D60

DATE: 09-04-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1629.18	0	0	0	0	0	0	0	0	1
1630.64	30	30	0	0	0	0	0	0	1
1631.26	60	60	0	0	0	0	0	0	1
1631.82	90	90	0	0	0	0	0	0	1
1632.33	120	120	0	0	0	0	0	0	1
1632.82	150	150	0	0	0	0	0	0	1
1633.29	180	180	0	0	0	0	0	0	1
1633.78	210	210	0	0	0	0	0	0	1
1634.28	240	240	0	0	0	0	0	0	1
1634.82	270	270	0	0	0	0	0	0	1
1635.40	300	300	0	0	0	0	0	0	1
1637.51	391	391	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR4-D60

DATE: 09-04-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1629.18	0.00	0	0	0.00
1630.64	0.00	30	0	0.00
1631.26	0.00	60	0	0.00
1631.82	0.00	90	0	0.00
1632.33	0.00	120	0	0.00
1632.82	0.00	150	0	0.00
1633.29	0.00	180	0	0.00
1633.78	0.00	210	0	0.00
1634.28	0.00	240	0	0.00
1634.82	0.00	270	0	0.00
1635.40	0.00	300	0	0.00

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** No overtopped by 100-yr

CURRENT DATE: 10-08-1996  
CURRENT TIME: 16:50:04

FILE DATE: 09-04-1996  
FILE NAME: STR4-D60

PERFORMANCE CURVE FOR CULVERT # 1 - 2 ( 5 BY 5 ) CSP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1629.18	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.27
30	1630.64	1.46	1.46	1-S2n	0.63	1.05	10.00	0.63	0.00	0.27
60	1631.26	2.08	2.08	1-S2n	0.93	1.52	11.85	0.93	0.00	0.27
90	1631.82	2.64	2.64	1-S2n	1.13	1.86	13.34	1.13	0.00	0.27
120	1632.33	3.15	3.15	1-S2n	1.31	2.17	14.47	1.31	0.00	0.27
150	1632.82	3.64	3.64	1-S2n	1.49	2.44	14.91	1.52	0.00	0.27
180	1633.29	4.11	4.11	1-S2n	1.63	2.68	16.13	1.63	0.00	0.27
210	1633.78	4.60	4.60	1-S2n	1.77	2.91	16.11	1.83	0.00	0.27
240	1634.28	5.10	5.10	5-S2n	1.91	3.12	16.63	1.97	0.00	0.27
270	1634.82	5.64	5.64	5-S2n	2.04	3.32	17.13	2.11	0.00	0.27
300	1635.40	6.22	6.22	5-S2n	2.16	3.51	17.48	2.25	0.00	0.27

El. inlet face invert 1629.18 ft El. outlet invert 1623.73 ft  
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*

INLET STATION (FT) 1033.00  
INLET ELEVATION (FT) 1629.18  
OUTLET STATION (FT) 960.00  
OUTLET ELEVATION (FT) 1623.73  
NUMBER OF BARRELS 2  
SLOPE (V-FT/H-FT) 0.0747  
CULVERT LENGTH ALONG SLOPE (FT) 73.20

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*

BARREL SHAPE CIRCULAR  
BARREL DIAMETER 5.00 FT  
BARREL MATERIAL CORRUGATED STEEL  
BARREL MANNING'S N 0.024  
INLET TYPE CONVENTIONAL  
INLET EDGE AND WALL THIN EDGE PROJECTING  
INLET DEPRESSION NONE

CURRENT DATE: 10-08-1996  
CURRENT TIME: 16:50:04

FILE DATE: 09-04-1996  
FILE NAME: STR4-D60

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TAILWATER

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CONSTANT WATER SURFACE ELEVATION  
1624.00

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
EMBANKMENT TOP WIDTH (FT) 35.00  
\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1642.50
2	79.40	1638.94
3	134.33	1637.51
4	174.41	1637.69
5	191.06	1637.94
6	244.83	1644.84

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**RELIMINARY DETAILED COST ESTIMATE - 30%**

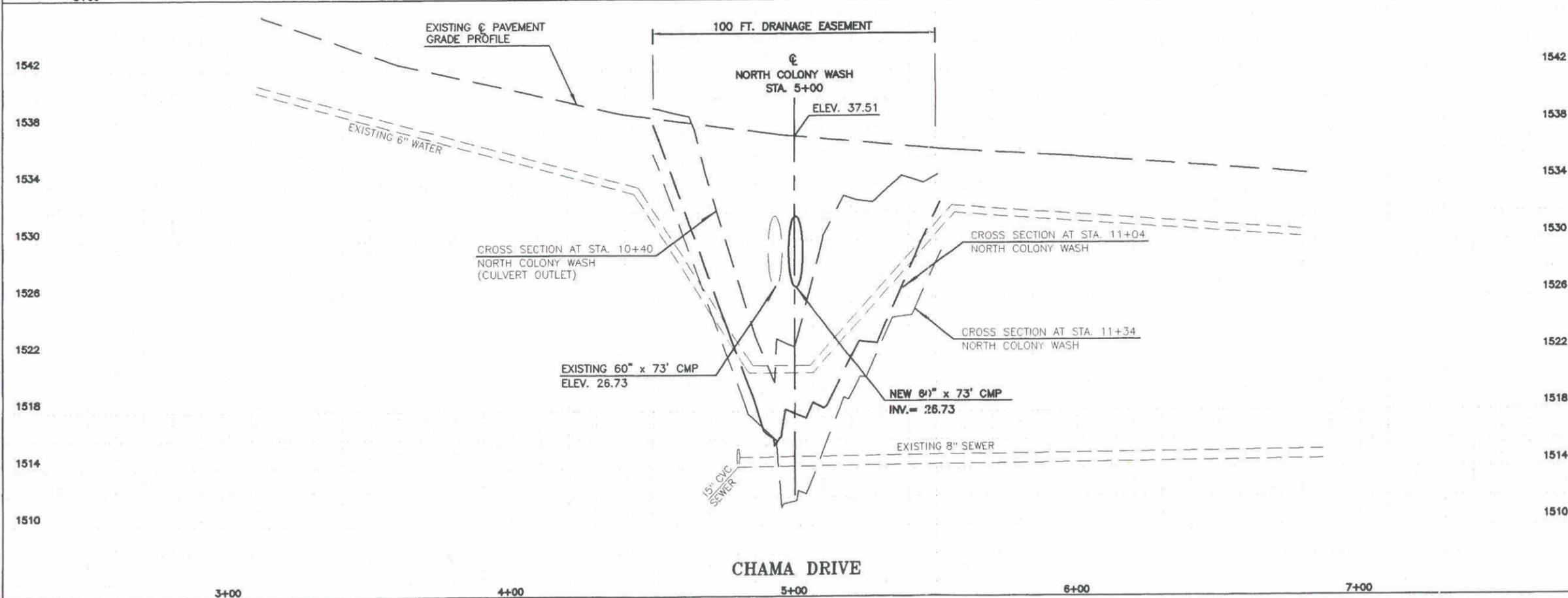
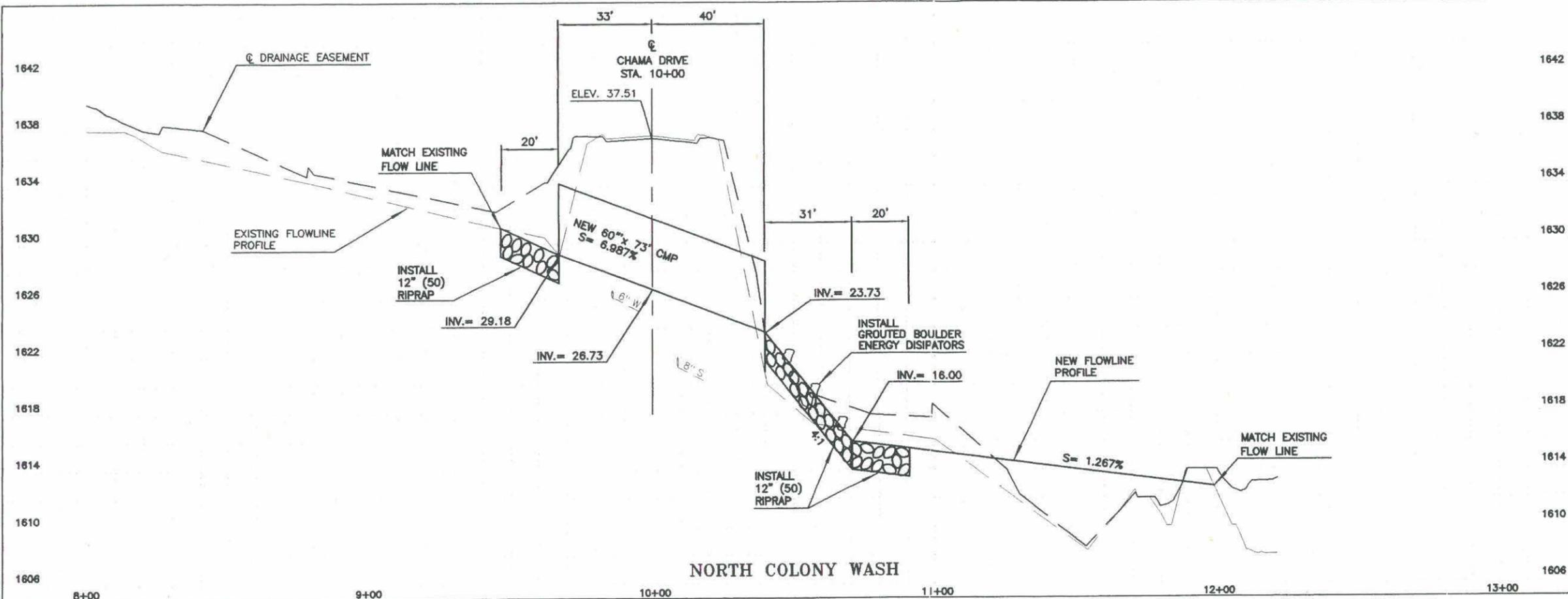
Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Chama Drive & North Colony Wash  
 ADMP- 18, Alternative 1: Install additional 60" x167' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$321.00	1	\$321
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	110	\$154
2020020	Removal of Concrete Curb	LFT.	\$2.00	62	\$124
2020201	Saw Cutting	L.FT.	\$5.00	64	\$320
2030401	Drainage Excavation	CU.YD.	\$5.00	33	\$165
2030501	Structural Excavation	CU.YD.	\$8.00	655	\$5,240
2030506	Structural Backfill	CU.YD.	\$25.00	118	\$2,950
2050001	Grading For Pavement	SQ. YD.	\$2.50	110	\$275
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	19	\$665
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	12.23	\$550
5010045	Pipe, Corrugated Metal, 60"	L.FT.	\$120.00	73	\$8,760
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$1,283.00	1	\$1,283
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
8081417	Water line (6")	L.FT.	\$48.00	20	\$960
9010001	Mobilization (10%)	L.SUM	\$3,208.00	1	\$3,208
9080140	Concrete Gutter	L.FT.	\$10.00	62	\$620
9130003	Riprap (Grouted)	CU.YD.	\$80.00	92	\$7,360
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	60	\$3,840
9240170	Contractor Quality Control (2%)	L.SUM	\$642.00	1	\$642
9250001	Construction Surveying and Layout (2%)	L.SUM	\$642.00	1	\$642
Sub-Total					\$38,579
Engineering and Contingencies (20%)					\$7,720
<b>TOTAL</b>					<b>\$46,299</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$47,000**





NO.	REVISIONS	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY**  
ENGINEERING DIVISION  
**FOUNTAIN HILLS ADMP  
CHAMA DRIVE & NORTH COLONY WASH  
FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96



# ALTERNATE 2

## NORTH COLONY WASH @ CHAMA DR. (1-72" CMP)

CURRENT DATE: 10-08-1996

CURRENT TIME: 17:08:04

FILE DATE: 07-16-1996

FILE NAME: STR4-72

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1628.18	1622.73	78.19	1 CSP	6.00	6.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS) FILE: STR4-74 DATE: 07-16-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1628.18	0	0	0	0	0	0	0	0	1
1630.15	30	30	0	0	0	0	0	0	1
1631.06	60	60	0	0	0	0	0	0	1
1631.86	90	90	0	0	0	0	0	0	1
1632.60	120	120	0	0	0	0	0	0	1
1633.33	150	150	0	0	0	0	0	0	1
1634.08	180	180	0	0	0	0	0	0	1
1634.88	210	210	0	0	0	0	0	0	1
1635.76	240	240	0	0	0	0	0	0	1
1636.75	270	270	0	0	0	0	0	0	1
1637.70	300	296	0	0	0	0	0	4	4
1637.51	291	291	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: STR4-74 DATE: 07-16-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1628.18	0.00	0	0	0.00
1630.15	0.00	30	0	0.00
1631.06	0.00	60	0	0.00
1631.86	0.00	90	0	0.00
1632.60	0.00	120	0	0.00
1633.33	0.00	150	0	0.00
1634.08	0.00	180	0	0.00
1634.88	0.00	210	0	0.00
1635.76	0.00	240	0	0.00
1636.75	0.00	270	0	0.00
1637.70	-0.00	300	0	0.04

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** 10-yr ok. 100-yr overtops by (37.70-37.51) 0.19-ft



CURRENT DATE: 10-08-1996  
CURRENT TIME: 17:08:04

FILE DATE: 07-16-1996  
FILE NAME: STR4-74

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TAILWATER

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CONSTANT WATER SURFACE ELEVATION  
1624.00

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
EMBANKMENT TOP WIDTH (FT) 35.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION	X	Y
COORD. NO.	(FT)	(FT)
1	0.00	1642.50
2	79.40	1638.94
3	134.33	1637.51
4	174.41	1637.69
5	191.06	1637.94
6	244.83	1644.84

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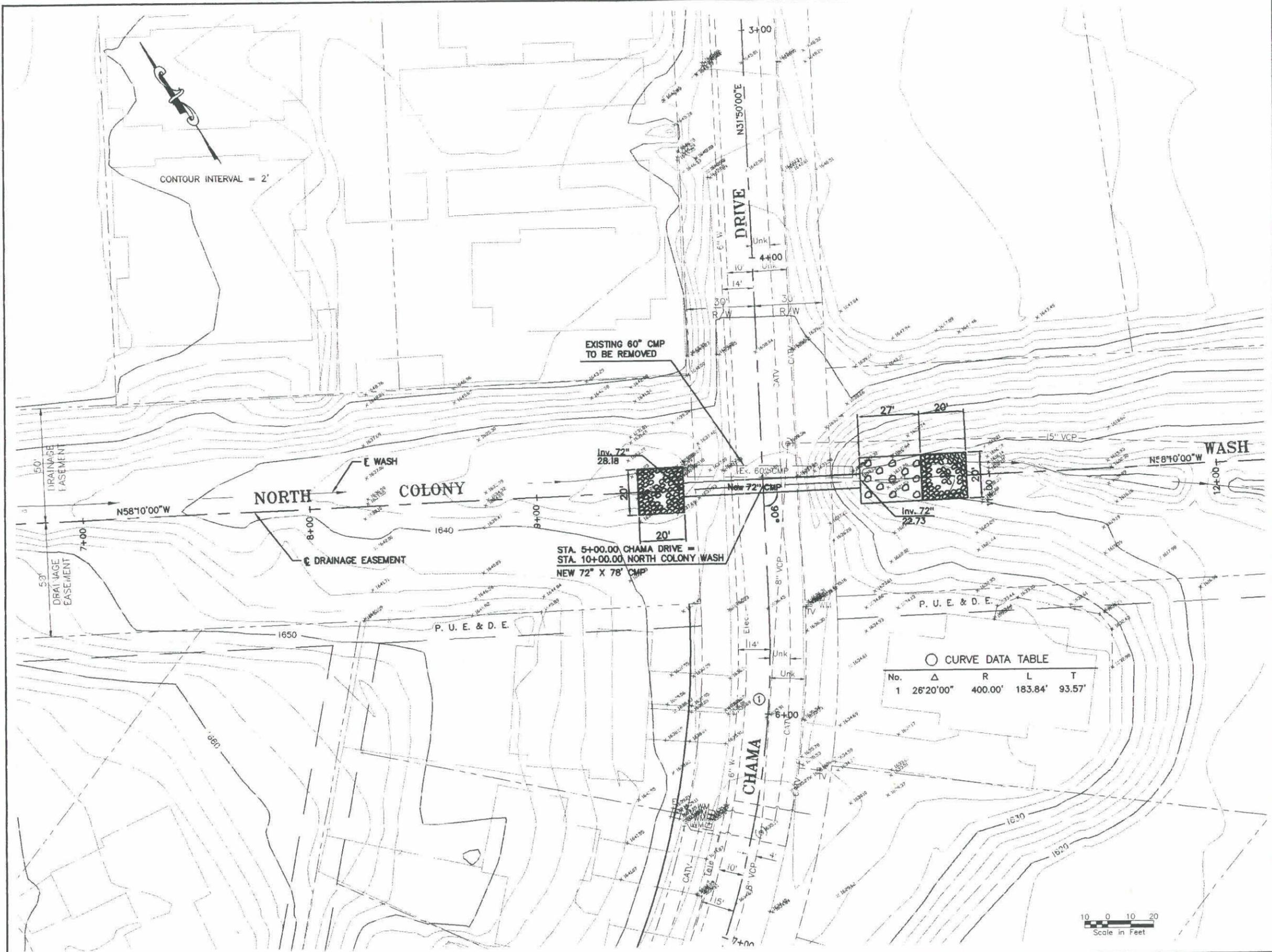
**ELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Chama Drive & North Colony Wash  
 ADMP- 18, Alternative 2: Install New 72"x78' CMP

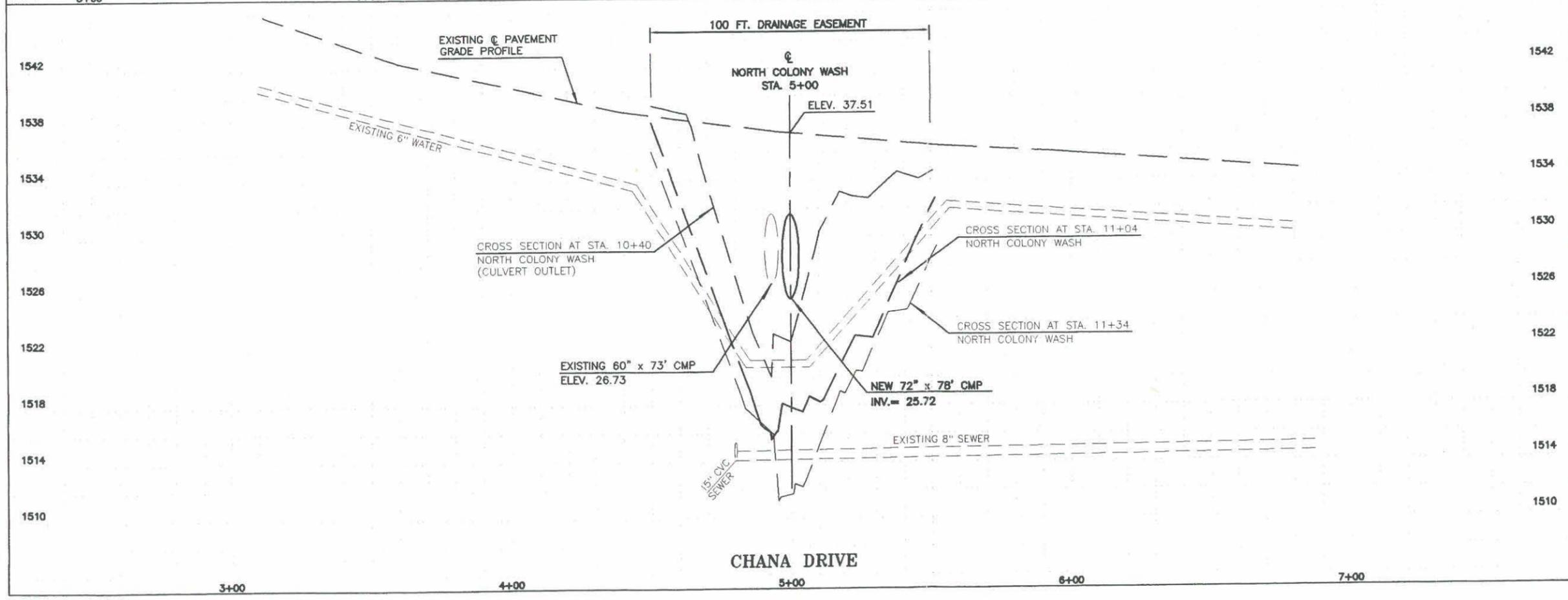
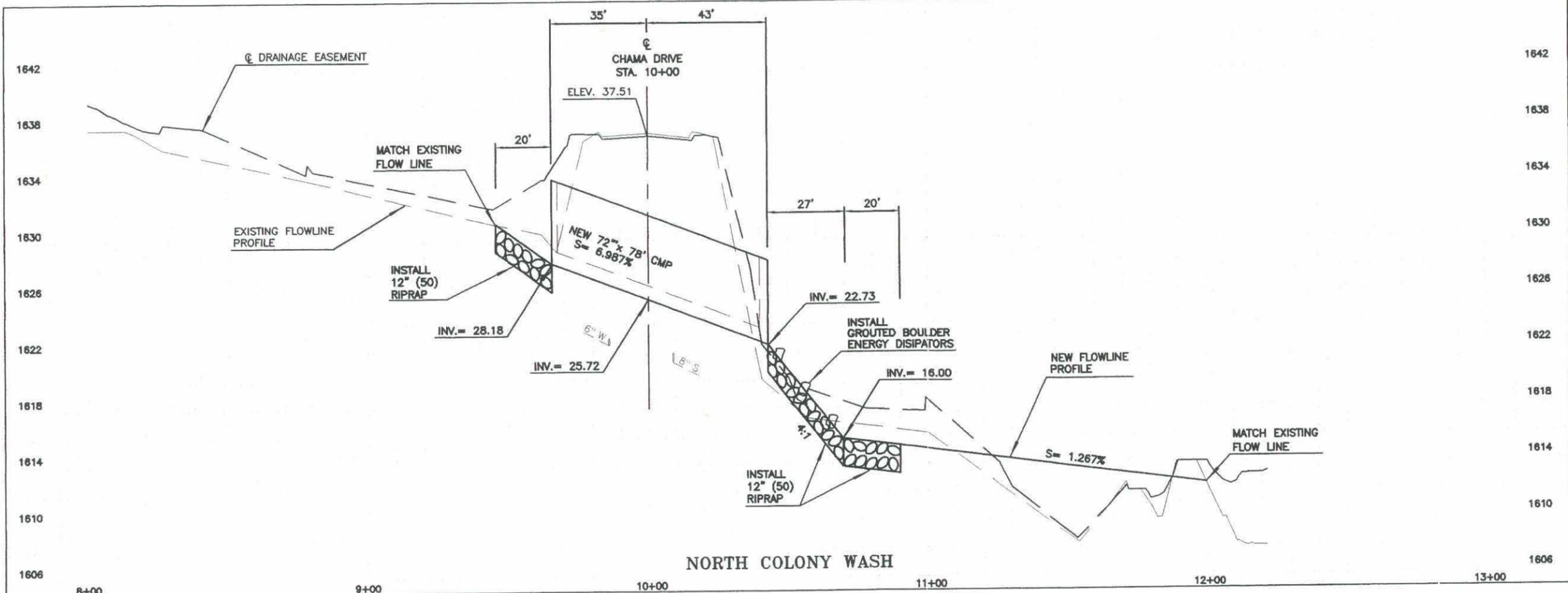
ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$393.00	1	\$393
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	121	\$169
2020020	Removal of Concrete Curb	LFT.	\$2.00	68	\$136
2020055	Removal and Savage (60" C.M.P.)	L.FT.	\$22.00	264	\$5,808
2020201	Saw Cutting	L.FT.	\$5.00	64	\$320
2030401	Drainage Excavation	CU.YD.	\$5.00	46	\$230
2030501	Structural Excavation	CU.YD.	\$8.00	771	\$6,168
2030506	Structural Backfill	CU.YD.	\$25.00	140	\$3,500
2050001	Grading For Pavement	SQ. YD.	\$2.50	121	\$303
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	20	\$700
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	13.4	\$603
5010045	Pipe, Corrugated Metal, 60"	L.FT.	\$120.00	78	\$9,360
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$1,571.00	1	\$1,571
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
8081417	Water line (6")	L.FT.	\$48.00	20	\$960
9010001	Mobilization (10%)	L.SUM	\$3,928.00	1	\$3,928
980140	Concrete Gutter	L.FT.	\$10.00	68	\$680
9130003	Riprap (Grouted)	CU.YD.	\$80.00	80	\$6,400
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	60	\$3,840
9240170	Contractor Quality Control (2%)	L.SUM	\$786.00	1	\$786
9250001	Construction Surveying and Layout (2%)	L.SUM	\$786.00	1	\$786
Sub-Total					\$47,141
Engineering and Contingencies (20%)					\$9,430
<b>TOTAL</b>					<b>\$56,571</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$57,000**



3			
2			
1			
110	REVISION	BY	DATE
<b>FLOOD CONTROL DISTRICT          OF MARICOPA COUNTY</b> ENGINEERING DIVISION FOUNTAIN HILLS ADMP CHAMA DRIVE & NORTH COLONY WASH FCD PROJECT NO. 94-16			
	DESIGNED	HAA	11/96
	DRAWN	JDS	11/96
	CHECKED	SEK	11/96
		<b>Entellus</b> 2225 N. 44th Street Suite 200 Phoenix, AZ 85018-2279 Tel: 602.944.2000 Fax: 602.944.2007	
<b>PLAN SHEET</b> ADMP 18 - ALTERNATE 2			SHEET OF <b>1 2</b>

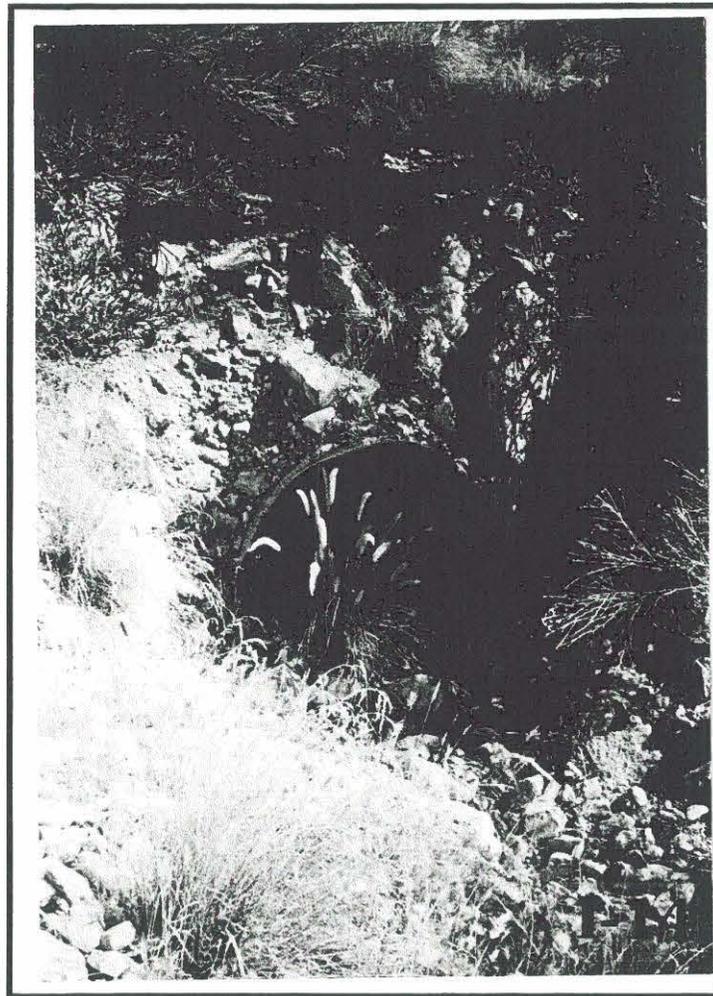


3			
2			
1			
NO.	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT          OF MARICOPA COUNTY</b> ENGINEERING DIVISION <b>FOUNTAIN HILLS ADMP          CHAMA DRIVE &amp; NORTH COLONY WASH          FCD PROJECT NO. 94-16</b>			
	DESIGNED	HAA	11/96
	DRAWN	JDS	11/96
	CHECKED	SEK	11/96
	<b>Entellus</b> 2255 N. 44th Street Suite 200 Phoenix, AZ 85008-5279 Tel: 602.544.2000 Fax: 602.544.2007		
<b>PROFILE SHEET</b> ADMP 18 - ALTERNATE 2			SHEET OF <b>2 2</b>

## Site 19: Cholla Dr. / Ironwood Wash



Cholla Dr. Catch Basin  
*Looking SW across Cholla Dr. toward Colony Wash*



Ironwood Wash Culvert Outlet  
*Looking Upstream (North) from Colony Wash*



# ALTERNATE 1

IRONWOOD WASH @ CHOLLA DR. (3-48" CMP)  
 CURRENT DATE: 10-16-1996  
 CURRENT TIME: 15:12:47

FILE DATE: 10-16-1996  
 FILE NAME: STR5-T4

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1663.23	1658.82	333.03	3 CSP	4.00	4.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR5-T4

DATE: 10-16-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1663.23	0	0	0	0	0	0	0	0	1
1664.50	25	25	0	0	0	0	0	0	1
1664.99	50	50	0	0	0	0	0	0	1
1665.42	75	75	0	0	0	0	0	0	1
1665.83	100	100	0	0	0	0	0	0	1
1666.20	125	125	0	0	0	0	0	0	1
1666.82	140	140	0	0	0	0	0	0	1
1667.25	175	175	0	0	0	0	0	0	1
1667.61	200	200	0	0	0	0	0	0	1
1667.90	225	225	0	0	0	0	0	0	1
1668.22	250	250	0	0	0	0	0	0	1
1674.00	370	370	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR5-T4

DATE: 10-16-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1663.23	0.00	0	0	0.00
1664.50	0.00	25	0	0.00
1664.99	0.00	50	0	0.00
1665.42	0.00	75	0	0.00
1665.83	0.00	100	0	0.00
1666.20	0.00	125	0	0.00
1666.82	0.00	140	0	0.00
1667.25	0.00	175	0	0.00
1667.61	0.00	200	0	0.00
1667.90	0.00	225	0	0.00
1668.22	0.00	250	0	0.00

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

Conclusions: 100-yr pool elevation 1668.22



CURRENT DATE: 10-16-1996  
CURRENT TIME: 15:12:47

FILE DATE: 10-16-1996  
FILE NAME: STR5-T4

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TAILWATER

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CONSTANT WATER SURFACE ELEVATION  
1660.82

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT	2.70
EMBANKMENT TOP WIDTH (FT)	30.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	1674.00

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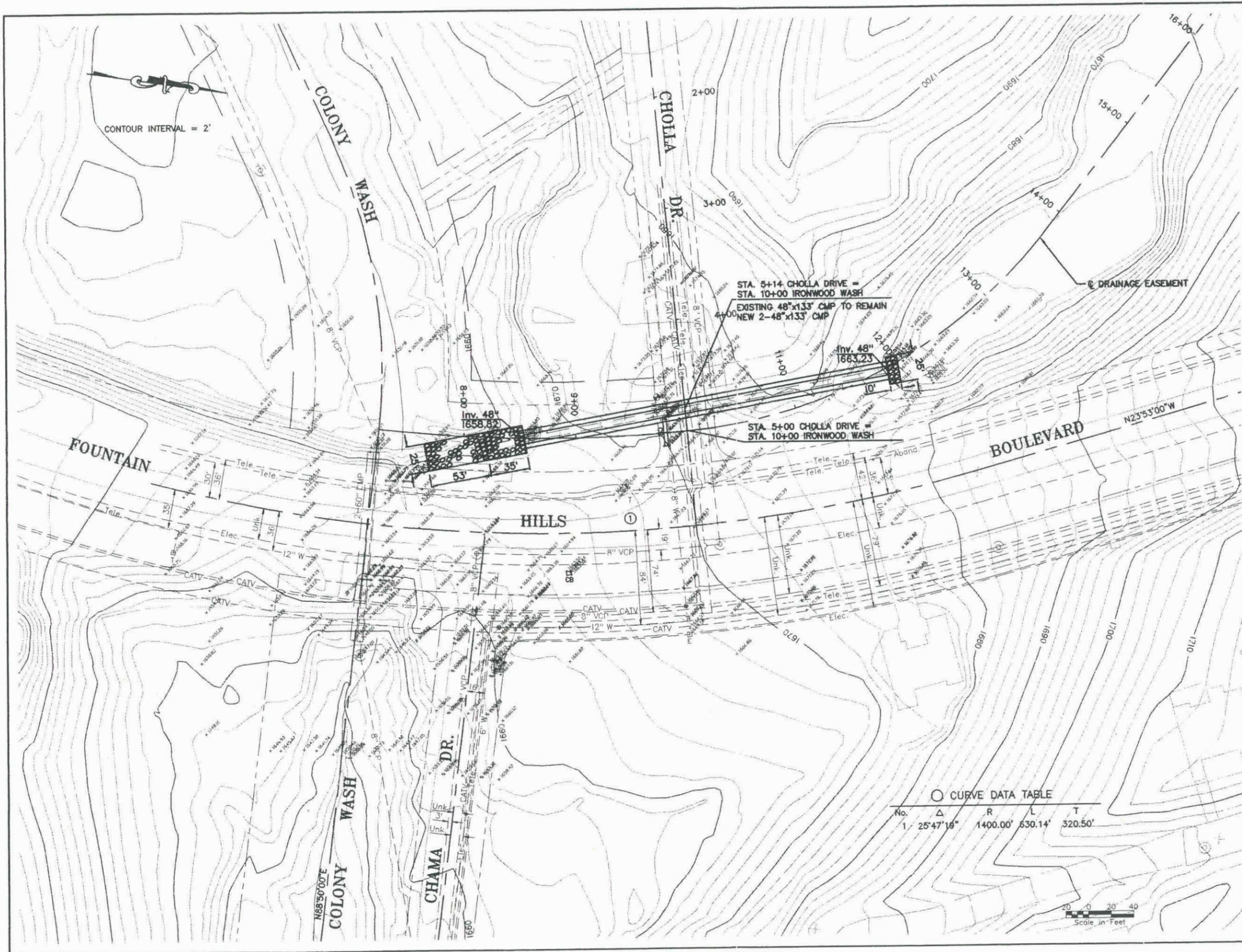
**ELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Cholla Drive & Ironwood Wash  
 ADMP- 19, Alternative 1: Install additional 2-48" x133' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$564.00	1	\$562
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	142	\$199
2020020	Removal of Concrete Curb	LFT.	\$2.00	80	\$160
2020201	Saw Cutting	L.FT.	\$5.00	64	\$320
2030501	Structural Excavation	CU.YD.	\$8.00	2176	\$17,408
2030506	Structural Backfill	CU.YD.	\$25.00	409	\$10,225
2050001	Grading For Pavement	SQ. YD.	\$2.50	142	\$355
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	24	\$840
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	15.8	\$711
5010035	Pipe, Corrugated Metal, 48"	L.FT.	\$55.00	266	\$14,630
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$2,257.00	1	\$2,257
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
9010001	Mobilization (10%)	L.SUM	\$5,643.00	1	\$5,643
9080140	Concrete Gutter	L.FT.	\$10.00	68	\$680
9130003	Riprap (Grouted)	CU.YD.	\$80.00	80	\$6,400
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	60	\$3,840
9240170	Contractor Quality Control (2%)	L.SUM	\$1,129.00	1	\$1,129
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,129.00	1	\$1,129
Sub-Total					\$66,988
Engineering and Contingencies (20%)					\$13,400
<b>TOTAL</b>					<b>\$80,388</b>

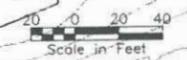
**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$81,000**



○ CURVE DATA TABLE

No.	Δ	R	L	T
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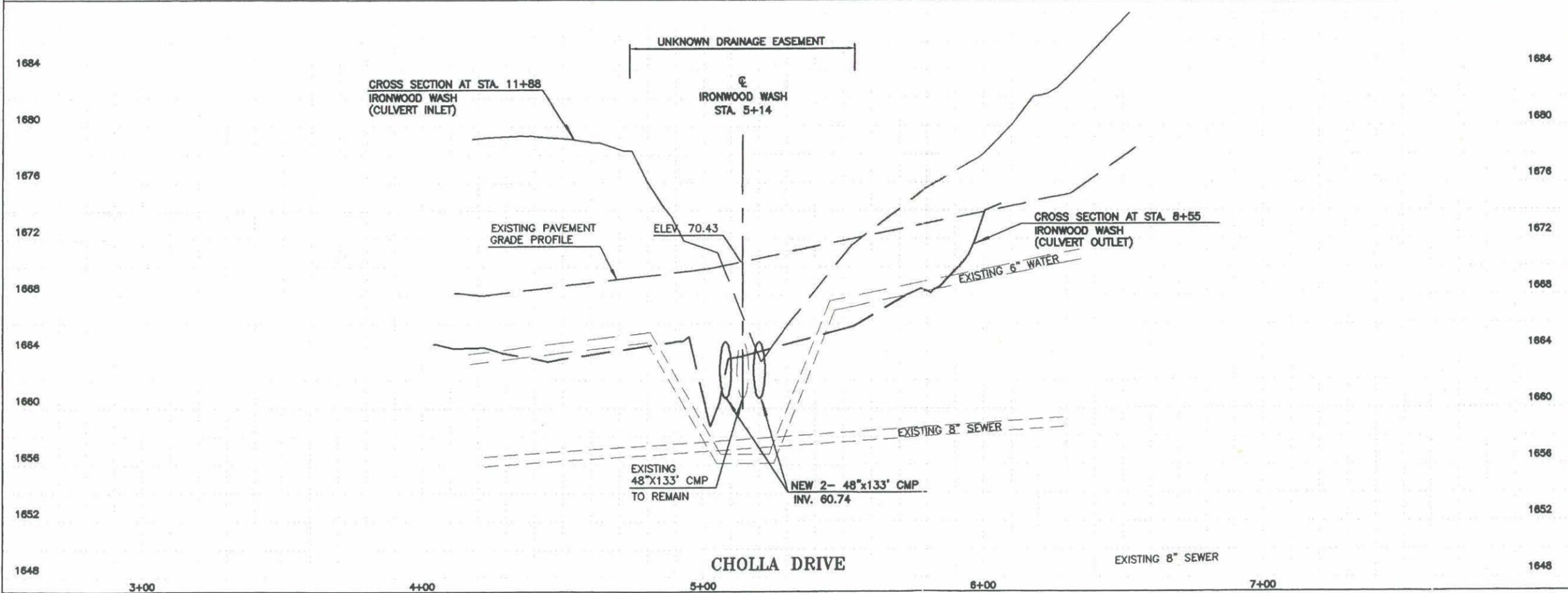
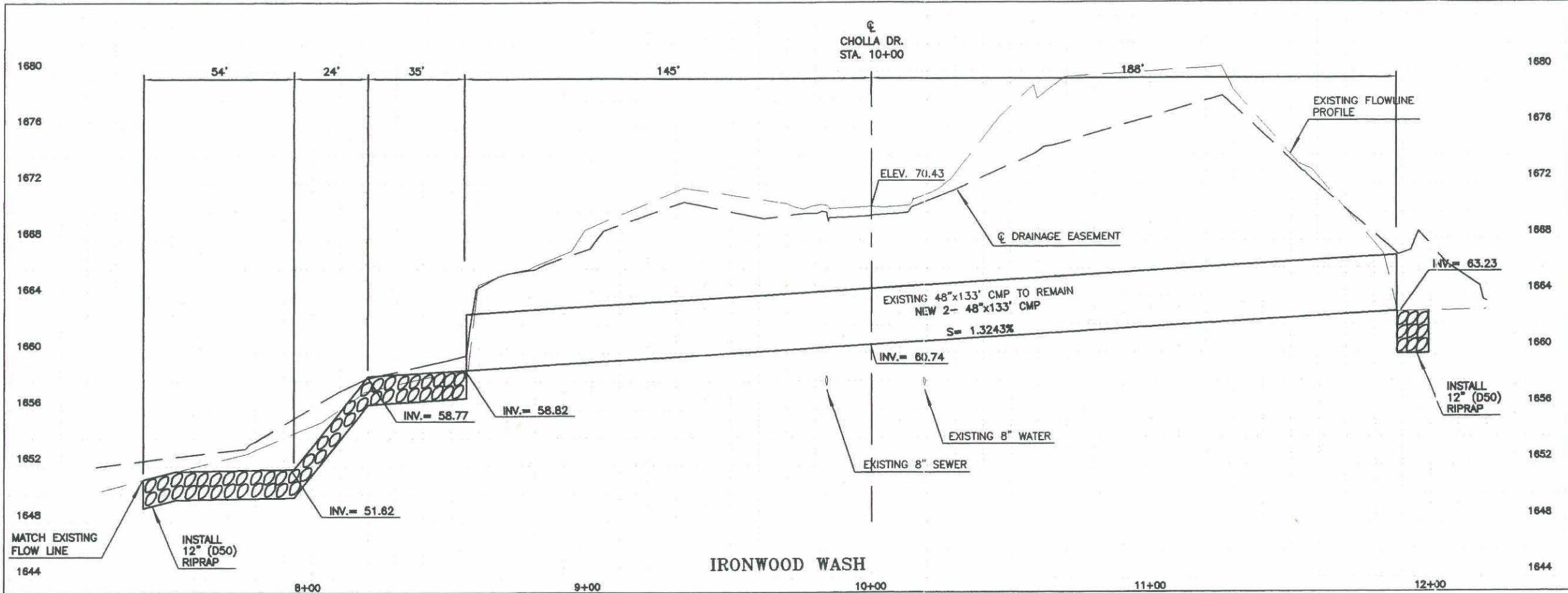


NO.	REVISIONS	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 CHOLLA DRIVE & IRONWOOD WASH  
 FCD PROJECT NO. 94-16

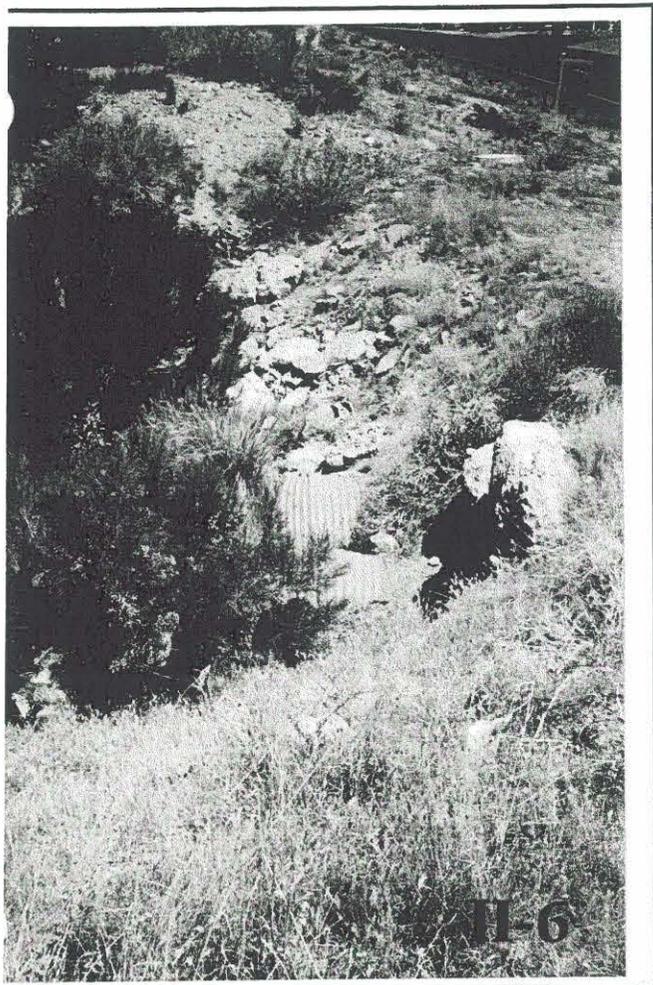
	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96





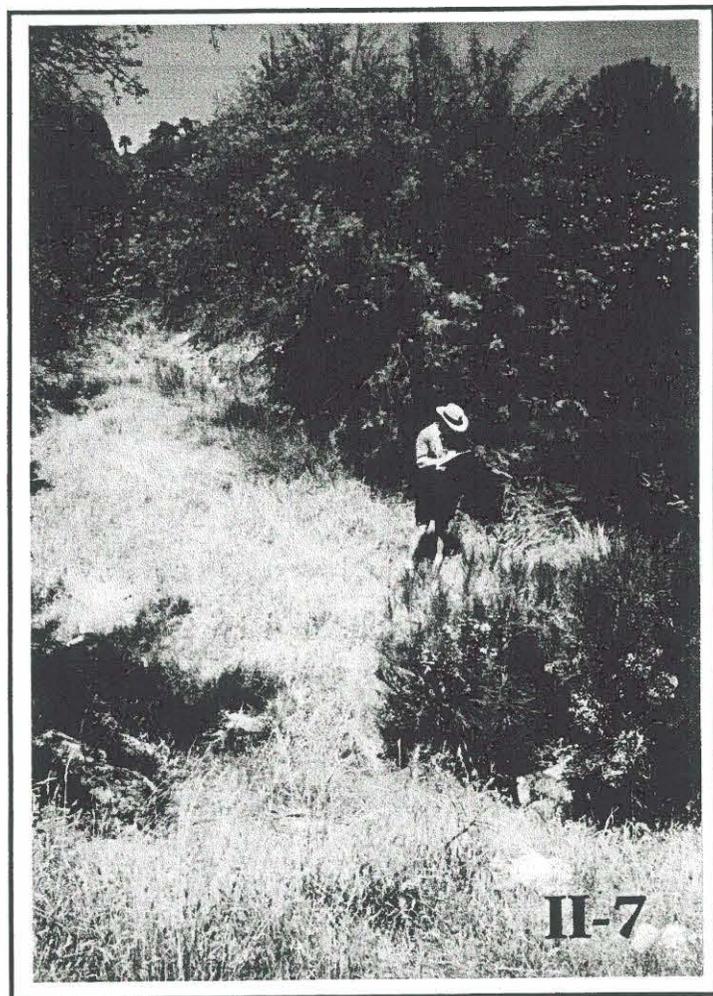
3			
2			
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NO	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT                  OF MARICOPA COUNTY                  ENGINEERING DIVISION</b>			
<b>FOUNTAIN HILLS ADMP                  CHOLLA DRIVE &amp; IRONWOOD WASH                  FCD PROJECT NO. 94-16</b>			
		BY	DATE
DESIGNED	HAA		11/96
DRAWN	JDS		11/96
CHECKED	SEK		11/96
 <b>Entellus</b> <small>2500 N. 44th Street Suite 200                  Phoenix, AZ 85018-2029                  Tel: 602.944.0000                  Fax: 602.944.0007</small>			
<b>PROFILE SHEET</b> ADMP 19 - ALTERNATE 1			SHEET OF <b>2 2</b>

Site 20: Saguaro Blvd. / Malta Drain



Malta Drain Culvert Inlet

Looking North across Channel, Upstream of Saguaro Blvd.

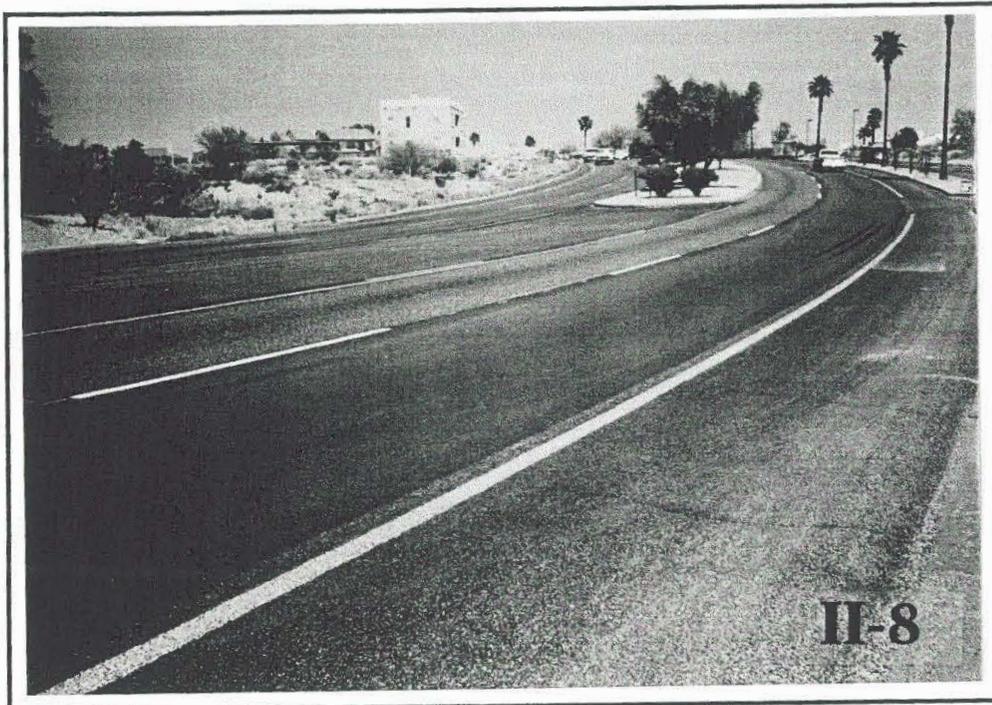


Malta Drain Culvert Outlet

Looking Downstream from Saguaro Blvd.

Up

**Site 20: Saguaro Blvd. / Malta Drain (Cont'd.)**



Malta Drain and Emerald Wash (Site 8) Spillway  
*Looking North along Saguaro Blvd.*



# ALTERNATE 1

## MALTA DRAIN @ SAGUARO BLVD. (4-48" CMP)

CURRENT DATE: 10-16-1996  
CURRENT TIME: 17:51:59

FILE DATE: 07-16-1996  
FILE NAME: STR6-Q4

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1516.62	1514.06	132.30	1 CSP	4.00	4.00	.024	CONVENTIONAL
2	1516.09	1513.75	132.04	3 CSP	4.00	4.00	.024	CONVENTIONAL
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR6-Q4

DATE: 07-16-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1516.62	0	0	0	0	0	0	0	0	0
1517.65	45	5	40	0	0	0	0	0	3
1518.27	90	15	75	0	0	0	0	0	3
1518.82	135	25	110	0	0	0	0	0	3
1519.33	180	36	143	0	0	0	0	0	2
1519.79	220	46	174	0	0	0	0	0	2
1520.37	270	59	211	0	0	0	0	0	3
1520.94	315	71	244	0	0	0	0	0	3
1521.63	360	84	276	0	0	0	0	0	3
1522.26	405	95	310	0	0	0	0	0	3
1523.06	450	107	343	0	0	0	0	0	3
1524.00	493	120	373	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR6-Q4

DATE: 07-16-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1516.62	0.00	0	0	0.00
1517.65	-0.00	45	0	0.61
1518.27	-0.00	90	0	0.12
1518.82	-0.00	135	0	0.01
1519.33	-0.00	180	0	0.20
1519.79	0.01	220	-0	-0.22
1520.37	0.00	270	-0	-0.02
1520.94	0.00	315	-0	-0.04
1521.63	0.01	360	-1	-0.15
1522.26	0.01	405	-0	-0.10
1523.06	0.00	450	-0	-0.01

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** No overtopped by 100-yr flow

CURRENT DATE: 10-16-1996  
CURRENT TIME: 17:51:59

FILE DATE: 07-16-1996  
FILE NAME: STR6-Q4

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 4 BY 4 ) CSP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	DEPTH (ft)	TAILWATER VEL. (fps)	DEPTH (ft)
0	1516.62	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-3.48
5	1517.66	1.04	1.04	1-S2n	0.54	0.60	4.56	0.54	3.13	-2.39
15	1518.28	1.66	1.66	1-S2n	0.99	1.13	6.16	0.99	3.61	-2.07
25	1518.83	2.21	2.21	1-S2n	1.31	1.48	7.09	1.31	3.96	-1.83
36	1519.34	2.72	2.72	1-S2n	1.59	1.78	7.77	1.59	4.23	-1.65
46	1519.79	3.17	3.17	1-S2n	1.82	2.03	8.31	1.82	4.43	-1.51
59	1520.36	3.74	3.74	1-S2n	2.11	2.31	8.82	2.11	4.66	-1.35
71	1520.93	4.31	4.31	5-S2n	2.36	2.54	9.21	2.36	4.83	-1.23
84	1521.63	5.01	5.01	5-S2n	2.66	2.78	9.54	2.66	4.99	-1.12
95	1522.26	5.64	5.64	5-S2n	2.92	2.95	9.72	2.92	5.14	-1.01
107	1523.05	6.43	6.10	2-M2c	3.25	3.12	10.19	3.12	5.27	-0.91
El. inlet face invert					1516.62 ft	El. outlet invert			1514.06 ft	
El. inlet throat invert					0.00 ft	El. inlet crest			0.00 ft	

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION (FT) 1000.00  
 INLET ELEVATION (FT) 1516.62  
 OUTLET STATION (FT) 1132.28  
 OUTLET ELEVATION (FT) 1514.06  
 NUMBER OF BARRELS 1  
 SLOPE (V-FT/H-FT) 0.0194  
 CULVERT LENGTH ALONG SLOPE (FT) 132.30

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE CIRCULAR  
 BARREL DIAMETER 4.00 FT  
 BARREL MATERIAL CORRUGATED STEEL  
 BARREL MANNING'S N 0.024  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL THIN EDGE PROJECTING  
 INLET DEPRESSION NONE

CURRENT DATE: 10-16-1996  
CURRENT TIME: 17:51:59

FILE DATE: 07-16-1996  
FILE NAME: STR6-Q4

PERFORMANCE CURVE FOR CULVERT # 2 - 3 ( 4 BY 4 ) CSP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1516.09	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-3.17
40	1517.65	1.56	1.56	1-S2n	0.95	1.05	5.77	0.95	3.13	-2.08
75	1518.27	2.18	2.18	1-S2n	1.33	1.46	6.83	1.33	3.61	-1.76
110	1518.82	2.73	2.73	1-S2n	1.64	1.79	7.56	1.64	3.96	-1.52
143	1519.33	3.24	3.24	1-S2n	1.90	2.07	8.10	1.90	4.23	-1.34
174	1519.79	3.70	3.70	1-S2n	2.14	2.29	8.50	2.14	4.43	-1.20
211	1520.36	4.27	4.27	5-S2n	2.41	2.53	8.87	2.41	4.66	-1.04
244	1520.93	4.84	4.84	5-S2n	2.67	2.73	9.14	2.67	4.83	-0.92
276	1521.62	5.45	5.53	2-M2c	2.94	2.90	9.45	2.90	4.99	-0.81
310	1522.26	6.17	5.89	2-M2c	3.28	3.07	10.02	3.07	5.14	-0.70
343	1523.05	6.96	6.93	6-FFn	4.00	3.22	9.10	4.00	5.27	-0.60
El. inlet face invert					1516.09 ft	El. outlet invert			1513.75 ft	
El. inlet throat invert					0.00 ft	El. inlet crest			0.00 ft	

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION (FT) 1000.00  
 INLET ELEVATION (FT) 1516.09  
 OUTLET STATION (FT) 1132.02  
 OUTLET ELEVATION (FT) 1513.75  
 NUMBER OF BARRELS 3  
 SLOPE (V-FT/H-FT) 0.0177  
 CULVERT LENGTH ALONG SLOPE (FT) 132.04

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE CIRCULAR  
 BARREL DIAMETER 4.00 FT  
 BARREL MATERIAL CORRUGATED STEEL  
 BARREL MANNING'S N 0.024  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL THIN EDGE PROJECTING  
 INLET DEPRESSION NONE

CURRENT DATE: 10-16-1996  
CURRENT TIME: 17:51:59

FILE DATE: 07-16-1996  
FILE NAME: STR6-Q4

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL AND LT & RT OVER BANKS  
LEFT CHANNEL BOUNDARY 3  
RIGHT CHANNEL BOUNDARY 6  
MANNING N LEFT OVER BANK 0.065  
MANNING N MAIN CHANNEL 0.048  
MANNING N RIGHT OVER BAN 0.065  
SLOPE OF CHANNEL (FT/FT) 0.0217

FILE NAME: STR6-EX  
FILE DATE: 07-03-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1519.48
2	8.80	1518.99
3	33.68	1514.65
4	95.88	1511.15
5	99.11	1510.58
6	103.27	1510.61
7	170.38	1515.61

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1510.58	0.000	-3.48	0.00	0.00
45.00	1511.67	0.730	-2.39	3.13	0.77
90.00	1511.99	0.757	-2.07	3.61	0.95
135.00	1512.23	0.774	-1.83	3.96	1.09
180.00	1512.41	0.787	-1.65	4.23	1.21
220.00	1512.55	0.797	-1.51	4.43	1.30
270.00	1512.71	0.807	-1.35	4.66	1.40
315.00	1512.83	0.814	-1.23	4.83	1.48
360.00	1512.94	0.821	-1.12	4.99	1.55
405.00	1513.05	0.827	-1.01	5.14	1.62
450.00	1513.15	0.832	-0.91	5.27	1.68

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT	2.70
EMBANKMENT TOP WIDTH (FT)	92.00
CREST LENGTH (FT)	20.00
OVERTOPPING CREST ELEVATION (FT)	1524.00

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**ELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Malta Drain  
 ADMP- 20, Alternative 1: Install 120" x131' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$903.00	1	\$903
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	364	\$510
2020020	Removal of Concrete Curb	LFT.	\$2.00	82	\$164
2020055	Removal and Savage (48" C.M.P.)	L.FT.	\$19.00	264	\$5,016
2020201	Saw Cutting	L.FT.	\$5.00	160	\$800
2030401	Drainage Excavation	CU.YD.	\$5.00	39	\$195
2030501	Structural Excavation	CU.YD.	\$8.00	1874	\$14,992
2030506	Structural Backfill	CU.YD.	\$25.00	434	\$10,850
2050001	Grading For Pavement	SQ. YD.	\$2.50	364	\$910
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	61	\$2,135
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	81	\$3,645
5010079	Pipe, Corrugated Metal, 120"	L.FT.	\$230.00	131	\$30,130
6010002	Structural Concrete (Class S)(F'C = 3000)	CU.YD.	\$150.00	35	\$5,250
6050002	Reinforcing Steel	LB.	\$0.50	2330	\$1,165
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$3,613.00	1	\$3,613
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,000.00	1	\$1,000
8080397	Pipe (PVC) (8") (SDR 35)	L.FT.	\$35.00	120	\$4,200
8081012	Water Main (12")	L.FT.	\$65.00	45	\$2,925
9010001	Mobilization (10%)	L.SUM	\$9,033.00	1	\$9,033
9080140	Concrete Gutter	L.FT.	\$10.00	82	\$820
9080201	Concrete Sidewalk	SQ.FT.	\$3.00	328	\$984
9130003	Riprap (Grouted)	CU.YD.	\$80.00	30	\$2,400
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	49	\$3,136
9240170	Contractor Quality Control (2%)	L.SUM	\$1,807.00	1	\$1,807
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,807.00	1	\$1,807
Sub-Total					\$108,490
Engineering and Contingencies (20%)					\$21,700
<b>TOTAL</b>					<b>\$130,190</b>

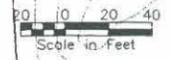
**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$131,000**



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	62°15'03"	1000.00'	1086.47'	603.84'
2	33°16'22"	256.29'	148.83'	76.58'

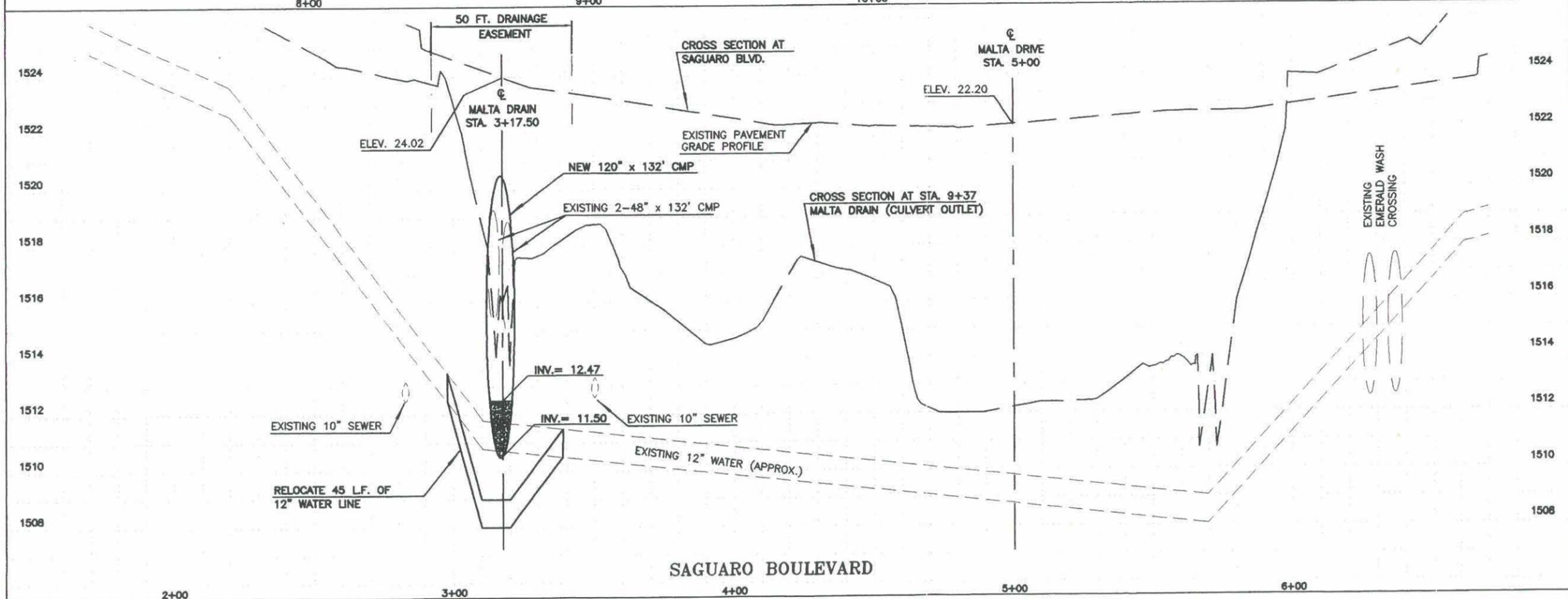
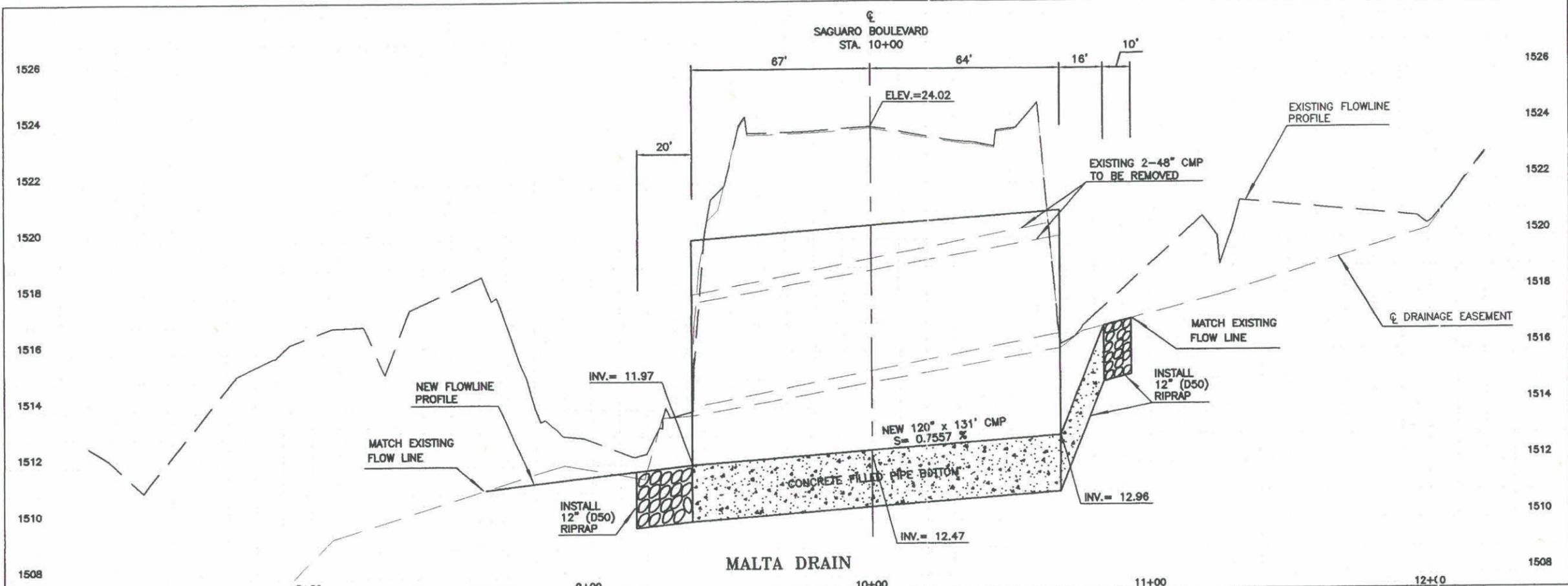


NO.	REVISIONS	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
SAGUARO BOULEVARD & MALTA DRAIN  
FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96





3			
2			
1			
NO.	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY</b> ENGINEERING DIVISION <b>FOUNTAIN HILLS ADMP</b> <b>SAGUARO BOULEVARD &amp; MALTA DRAIN</b> <b>FCD PROJECT NO. 94-16</b>			
	DESIGNED	HAA	11/96
	DRAWN	JDS	11/96
	CHECKED	SEK	11/96
	BY		DATE
 <b>Entellus</b> <small>2505 N. 44th Street Suite 200          Phoenix, AZ 85018-0279          Tel: 602.944.8800          Fax: 602.944.8801</small>			
<b>PROFILE SHEET</b> ADMP 20 - ALTERNATE 1			SHEET OF <b>2 2</b>

# ALTERNATE 2

## MALTA DRAIN @ SAGUARO BLVD. (1-120" CMP with concrete bottom)

CURRENT DATE: 10-16-1996

FILE DATE: 10-16-1996

CURRENT TIME: 16:26:50

FILE NAME: STR6-120

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1512.96	1511.97	131.00	1 ICMP	10.00	8.00	.035	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR6-120

DATE: 10-16-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1512.96	0	0	0	0	0	0	0	0	1
1514.81	45	45	0	0	0	0	0	0	1
1515.81	90	90	0	0	0	0	0	0	1
1516.65	135	135	0	0	0	0	0	0	1
1517.40	180	180	0	0	0	0	0	0	1
1517.98	220	220	0	0	0	0	0	0	1
1518.62	270	270	0	0	0	0	0	0	1
1519.14	315	315	0	0	0	0	0	0	1
1519.63	360	360	0	0	0	0	0	0	1
1520.11	405	405	0	0	0	0	0	0	1
1520.58	450	450	0	0	0	0	0	0	1
1522.12	471	471	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR6-120

DATE: 10-16-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1512.96	0.00	0	0	0.00
1514.81	0.00	45	0	0.00
1515.81	0.00	90	0	0.00
1516.65	0.00	135	0	0.00
1517.40	0.00	180	0	0.00
1517.98	0.00	220	0	0.00
1518.62	0.00	270	0	0.00
1519.14	0.00	315	0	0.00
1519.63	0.00	360	0	0.00
1520.11	0.00	405	0	0.00
1520.58	0.00	450	0	0.00

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** No overtopped by 100-yr flow

CURRENT DATE: 10-16-1996  
CURRENT TIME: 16:26:50

FILE DATE: 10-16-1996  
FILE NAME: STR6-120

PERFORMANCE CURVE FOR CULVERT # 1 - 1 ( 10 BY 8 ) ICMP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1512.96	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	-1.39
45	1514.81	1.85	1.61	2-M2c	1.30	0.94	5.55	0.94	3.13	-0.30
90	1515.81	2.85	2.48	2-M2c	2.04	1.50	6.78	1.50	3.61	0.03
135	1516.65	3.69	3.21	2-M2c	2.67	1.93	7.74	1.93	3.96	0.26
180	1517.40	4.44	3.85	2-M2c	3.24	2.34	8.41	2.34	4.23	0.44
220	1517.98	5.02	4.37	2-M2c	3.72	2.65	9.00	2.65	4.43	0.58
270	1518.62	5.66	4.99	2-M2c	4.32	3.02	9.60	3.02	4.66	0.74
315	1519.14	6.18	5.48	2-M2c	4.86	3.33	10.10	3.33	4.83	0.86
360	1519.63	6.67	6.05	2-M2c	5.45	3.61	10.61	3.61	4.99	0.97
405	1520.11	7.15	6.52	2-M2c	6.14	3.89	11.04	3.89	5.14	1.08
450	1520.58	7.62	7.06	2-M2c	7.19	4.15	11.48	4.15	5.27	1.18
El. inlet face invert					1512.96 ft	El. outlet invert			1511.97 ft	
El. inlet throat invert					0.00 ft	El. inlet crest			0.00 ft	

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION (FT) 1064.00  
 INLET ELEVATION (FT) 1512.96  
 OUTLET STATION (FT) 933.00  
 OUTLET ELEVATION (FT) 1511.97  
 NUMBER OF BARRELS 1  
 SLOPE (V-FT/H-FT) 0.0076  
 CULVERT LENGTH ALONG SLOPE (FT) 131.00

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE USER DEFINED  
 BARREL SPAN 10.00 FT  
 BARREL RISE 8.00 FT  
 BARREL MATERIAL STEEL OR ALUMINUM  
 BARREL MANNING'S N 0.035 FOR SIDES AND TOP  
 0.018 FOR BOTTOM  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL HEADWALL  
 INLET DEPRESSION NONE

CURRENT DATE: 10-16-1996  
CURRENT TIME: 16:26:50

FILE DATE: 10-16-1996  
FILE NAME: STR6-120

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\*\*\*\*\* USER DEFINED CULVERT CROSS-SECTION - CULVERT # 1

COORDINATE NUMBER	X (FT)	Y-TOP (FT)	Y-BOTTOM (FT)
1	0.00	5.00	5.00
2	0.20	6.40	3.60
3	0.60	7.37	2.63
4	1.00	8.00	2.00
5	1.88	8.90	2.00
6	2.50	9.33	2.00
7	3.13	9.64	2.00
8	3.75	9.82	2.00
9	4.38	9.96	2.00
10	5.00	10.00	2.00
11	5.63	9.96	2.00
12	6.25	9.82	2.00
13	6.88	9.64	2.00
14	7.50	9.33	2.00
15	8.13	8.90	2.00
16	9.00	8.00	2.00
17	9.40	7.37	2.63
18	9.80	6.40	3.60
19	10.00	5.00	5.00

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CURRENT DATE: 10-16-1996  
CURRENT TIME: 16:26:50

FILE DATE: 10-16-1996  
FILE NAME: STR6-120

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL AND LT & RT OVER BANKS  
LEFT CHANNEL BOUNDARY 3  
RIGHT CHANNEL BOUNDARY 6  
MANNING N LEFT OVER BANK 0.065  
MANNING N MAIN CHANNEL 0.048  
MANNING N RIGHT OVER BAN 0.065  
SLOPE OF CHANNEL (FT/FT) 0.0217

FILE NAME: STR6-EX  
FILE DATE: 07-03-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1519.48
2	8.80	1518.99
3	33.68	1514.65
4	95.88	1511.15
5	99.11	1510.58
6	103.27	1510.61
7	170.38	1515.61

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1510.58	0.000	-1.39	0.00	0.00
45.00	1511.67	0.730	-0.30	3.13	0.77
90.00	1511.99	0.757	0.03	3.61	0.95
135.00	1512.23	0.774	0.26	3.96	1.09
180.00	1512.41	0.787	0.44	4.23	1.21
220.00	1512.55	0.797	0.58	4.43	1.30
270.00	1512.71	0.807	0.74	4.66	1.40
315.00	1512.83	0.814	0.86	4.83	1.48
360.00	1512.94	0.821	0.97	4.99	1.55
405.00	1513.05	0.827	1.08	5.14	1.62
450.00	1513.15	0.832	1.18	5.27	1.68

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
EMBANKMENT TOP WIDTH (FT) 92.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1525.02
2	37.46	1523.65
3	125.21	1522.28
4	209.62	1522.12
5	294.87	1522.75
6	376.14	1523.82

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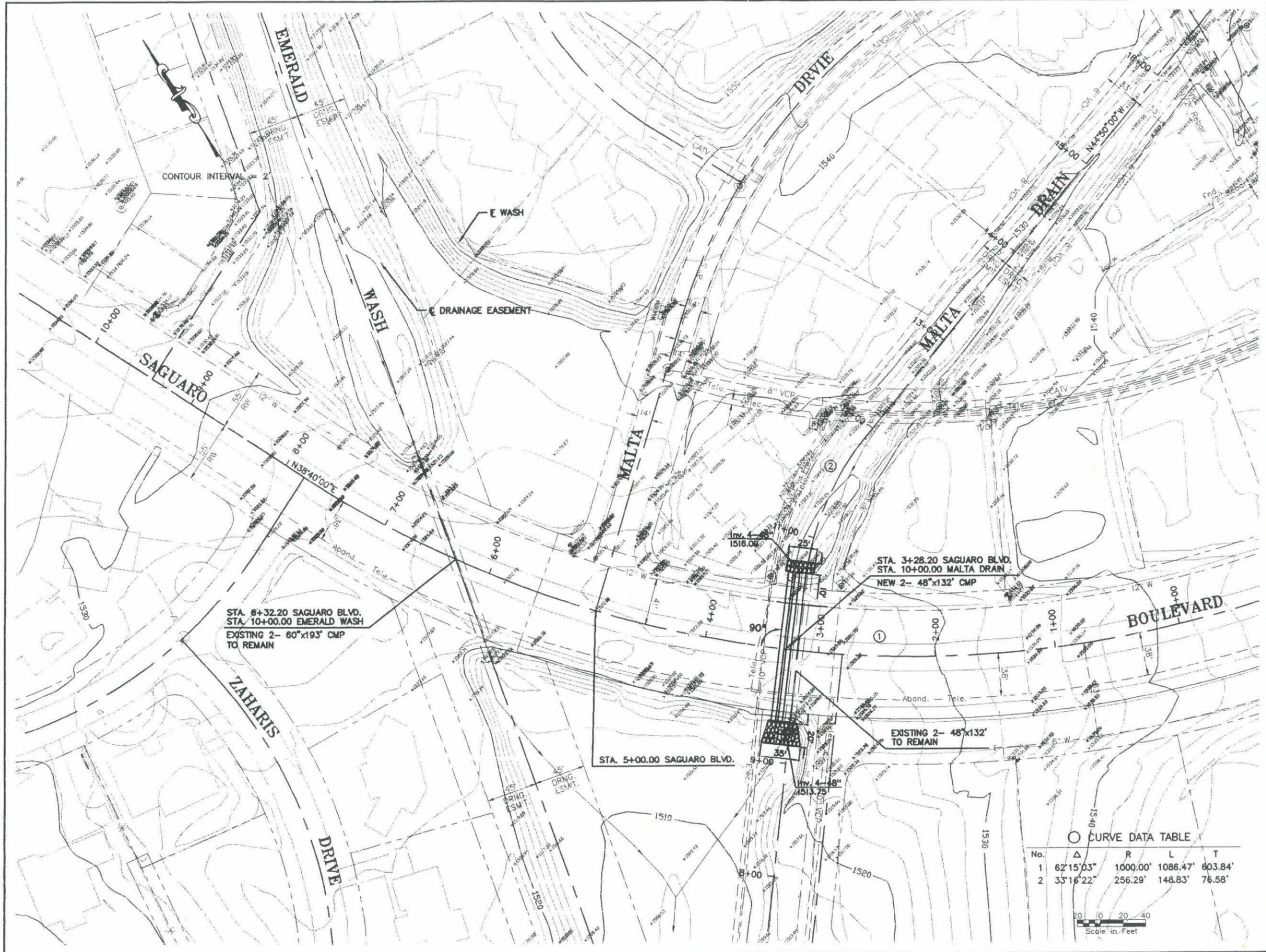
**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Malta Drain  
 ADMP- 20, Alternative 2: Install additional 48" x132' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$399.00	1	\$399
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	293	\$410
2020020	Removal of Concrete Curb	LFT.	\$2.00	66	\$132
2020201	Saw Cutting	L.FT.	\$5.00	160	\$800
2030501	Structural Excavation	CU.YD.	\$8.00	1041	\$8,328
2030506	Structural Backfill	CU.YD.	\$25.00	64	\$1,600
2050001	Grading For Pavement	SQ. YD.	\$2.50	293	\$733
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	49	\$1,715
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	65	\$2,925
5010035	Pipe, Corrugated Metal, 48"	L.FT.	\$55.00	264	\$14,520
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$1,598.00	1	\$1,598
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,000.00	1	\$1,000
9010001	Mobilization (10%)	L.SUM	\$3,994.00	1	\$3,994
9080140	Concrete Gutter	L.FT.	\$10.00	68	\$680
9130003	Riprap (Grouted)	CU.YD.	\$80.00	52	\$4,160
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	60	\$3,840
9240170	Contractor Quality Control (2%)	L.SUM	\$799.00	1	\$799
9250001	Construction Surveying and Layout (2%)	L.SUM	\$799.00	1	\$799
Sub-Total					\$48,532
Engineering and Contingencies (20%)					\$9,710
<b>TOTAL</b>					<b>\$58,242</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$59,000**



STA. 8+32.20 SAGUARO BLVD.  
 STA. 10+00.00 EMERALD WASH  
 EXISTING 2- 60"x193' CMP  
 TO REMAIN

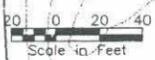
STA. 3+28.20 SAGUARO BLVD.  
 STA. 10+00.00 MALTA DRAIN  
 NEW 2- 48"x132' CMP

STA. 5+00.00 SAGUARO BLVD.

EXISTING 2- 48"x132'  
 TO REMAIN

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	62°15'03"	1000.00'	1086.47'	603.84'
2	35°16'22"	256.29'	148.83'	76.58'

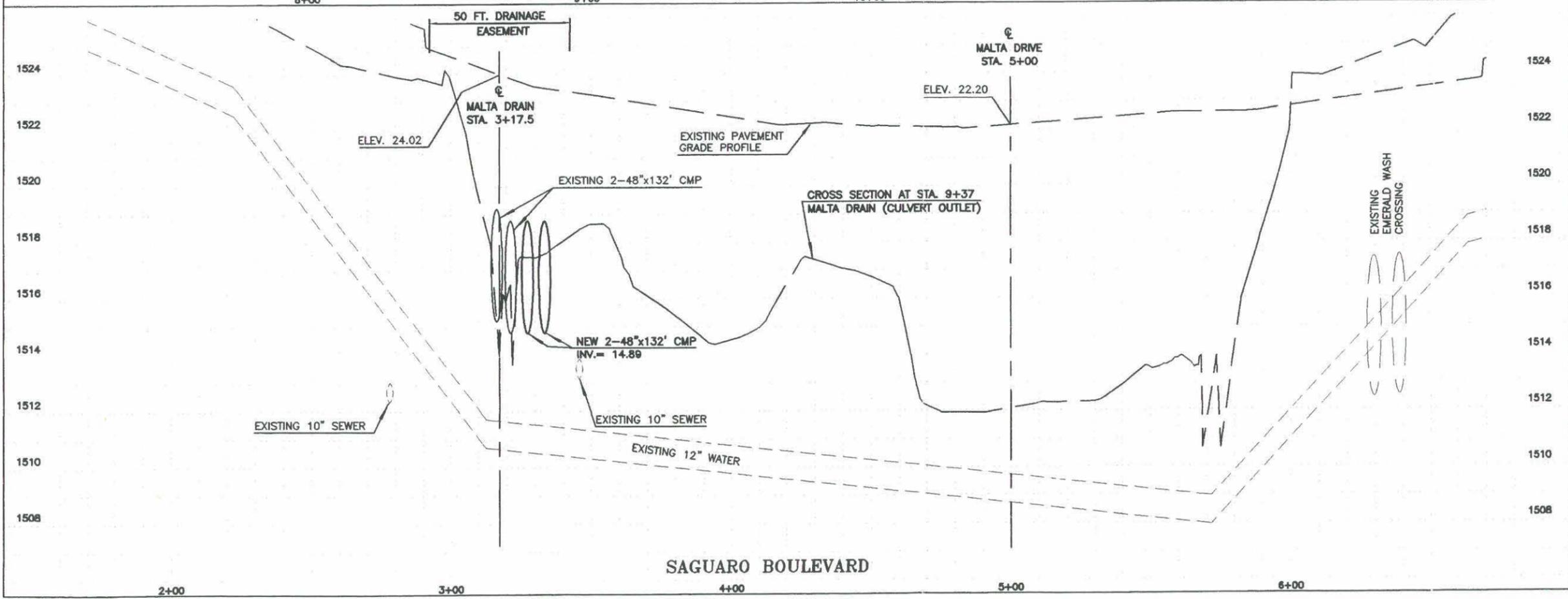
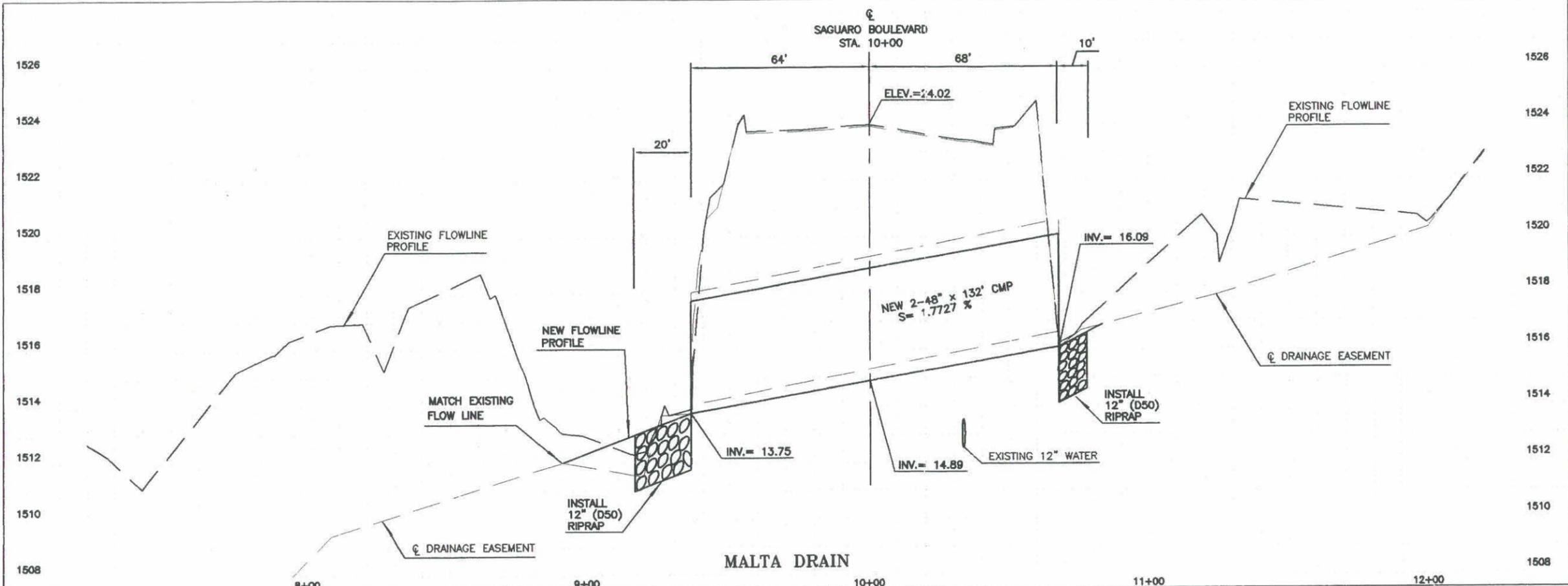


NO.	REVISIONS	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 SAGUARO BOULEVARD & MALTA DRAIN  
 FCD PROJECT NO. 94-16**

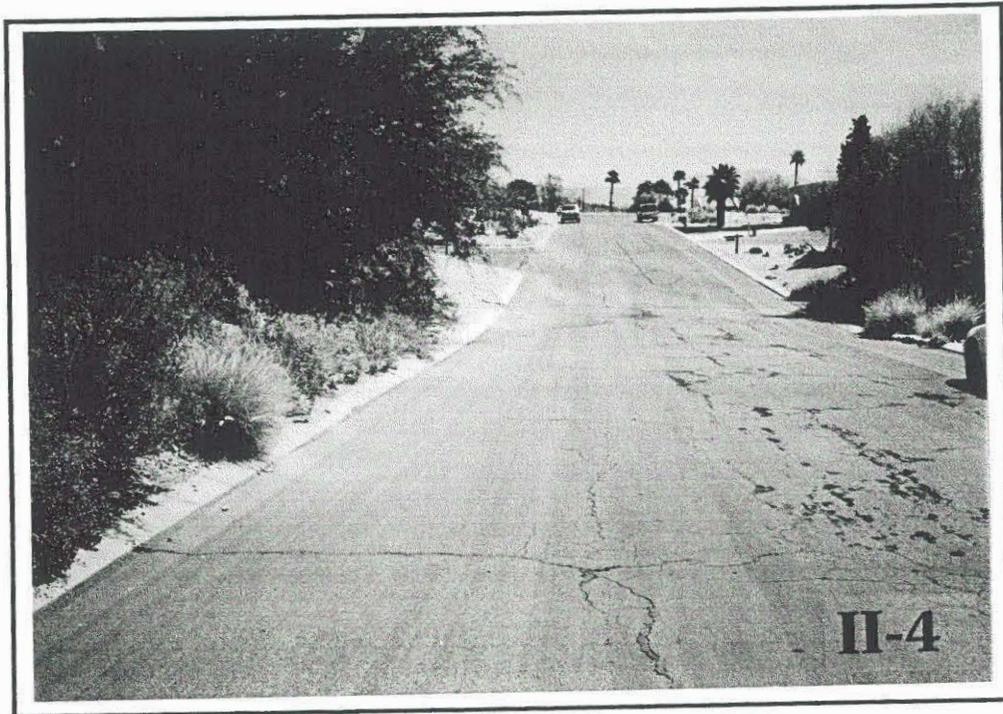
	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96



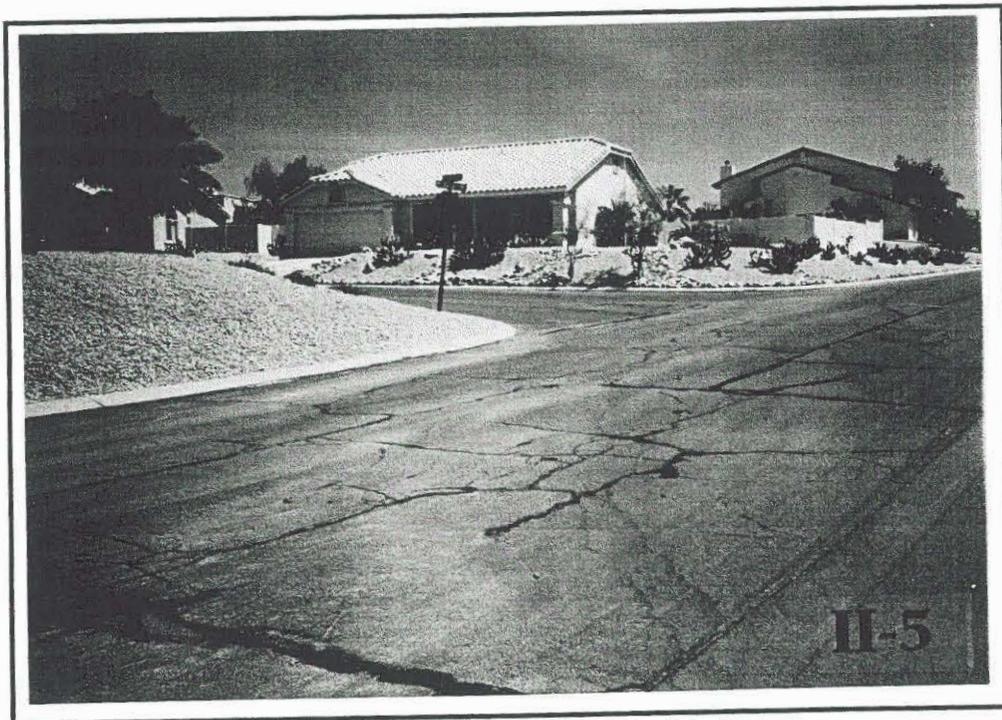


3			
2			
1			
NO.	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY</b> ENGINEERING DIVISION <b>FOUNTAIN HILLS ADMP</b> <b>SAGUARO BOULEVARD &amp; MALTA DRAIN</b> <b>FCD PROJECT NO. 94-16</b>			
	DESIGNED	HAA	11/96
	DRAWN	JDS	11/96
	CHECKED	SEK	11/96
		BY	DATE
 <b>Entellus</b> 2500 N. 44th Street Suite 200 Phoenix, AZ 85018-2299 Tel: 602.944.2000 Fax: 602.944.2001			
PROFILE SHEET ADMP 20 - ALTERNATE 2			SHEET OF 2 2

**Site 21: Rand Dr. / Malta Drain**



Malta Drain Wet Crossing  
*Looking Southeast along Rand Dr.*



Intersection of Rand Dr. and Salida Dr.  
*Looking Southeast from Wet Crossing*



Job No.: \_\_\_\_\_

Job Name: Fountain Hills ADMPReconnaissance by:  
JH/HBSK 9-26-96

Inits. \_\_\_\_\_ Date \_\_\_\_\_

**Field Reconnaissance Sheet**Site No.: 21Roadway: RAND DR.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
<u>Malta Drain</u>	<u>366</u>	<u>378</u>	<u>Wet Crossing</u>

187

Reason for Analysis / Existing Deficiency: Would like to eliminate the wet drain

## Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: N/A ft. Downstream: N/A ft.
- 2) Can the <sup>Flow line</sup> ~~culvert~~ be lowered: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, \_\_\_\_\_ ft.  No
- 3) Is there any erosion visible: Upstream?  Yes, \_\_\_\_\_ ft.  No  
Downstream?  Yes, 2 ft.  No

## Structure Modification Constraints:

- 4) Utilities: 8" sewer along NE side of drain / 8" along Rand, turns down SW side of drain  
6" water crosses drain
- 5) Structures: Salida Dr. is close to the east (intersection)  
Houses close to drain on both sides downstream  
Houses close to Salida & Rand intersection
- 6) Right-of-Way: \_\_\_\_\_
- 7) Miscellaneous field notes, comments, or design ideas:  
  - address drainage along Salida, as dumpsite Rand
  - need grade control downstream
  - tree is near road @ Wet Drain

# ALTERNATE 1

MALTA DRAIN @ RAND DR. (2-6'X3' RCB)  
 CURRENT DATE: 01-31-1997  
 CURRENT TIME: 14:25:57

FILE DATE: 10-01-1996  
 FILE NAME: STR7-B3

FHWA CULVERT ANALYSIS  
 HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1534.50	1534.00	66.00	2 RCB	6.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: STR7-B3 DATE: 10-01-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1534.50	0	0	0	0	0	0	0	0	1
1535.53	38	38	0	0	0	0	0	0	1
1536.15	76	76	0	0	0	0	0	0	1
1536.67	114	114	0	0	0	0	0	0	1
1537.14	152	152	0	0	0	0	0	0	1
1537.60	190	190	0	0	0	0	0	0	1
1538.08	228	228	0	0	0	0	0	0	1
1538.63	266	266	0	0	0	0	0	0	1
1539.24	304	304	0	0	0	0	0	0	1
1539.73	342	331	0	0	0	0	0	10	7
1539.93	380	341	0	0	0	0	0	35	5
1539.43	314	314	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: STR7-B3 DATE: 10-01-1996

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
1534.50	0.00	0	0	0.00
1535.53	0.00	38	0	0.00
1536.15	0.00	76	0	0.00
1536.67	0.00	114	0	0.00
1537.14	0.00	152	0	0.00
1537.60	0.00	190	0	0.00
1538.08	0.00	228	0	0.00
1538.63	0.00	266	0	0.00
1539.24	0.00	304	0	0.00
1539.73	-0.01	342	2	0.45
1539.93	-0.01	380	3	0.83

<1> TOLERANCE (FT) = 0.010

<2> TOLERANCE (%) = 1.000

Conclusions: 10-yr ok. 100-yr overtops (39.93-39.43)0.50f-ft



CURRENT DATE: 01-31-1997  
 CURRENT TIME: 14:25:57

FILE DATE: 10-01-1996  
 FILE NAME: STR7-B3

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TAILWATER

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\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
 BOTTOM WIDTH (FT) 15.00  
 SIDE SLOPE H/V (X:1) 3.0  
 CHANNEL SLOPE V/H (FT/FT) 3.000  
 MANNING'S N (.01-0.1) 0.045  
 CHANNEL INVERT ELEVATION (FT) 1534.00  
 CULVERT NO.1 OUTLET INVERT ELEVATION 1534.00 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1534.00	0.000	0.00	0.00	0.00
38.00	1534.15	7.212	0.15	16.03	28.71
76.00	1534.23	7.647	0.23	20.89	43.39
114.00	1534.29	7.898	0.29	24.34	55.20
152.00	1534.35	8.071	0.35	27.08	65.46
190.00	1534.40	8.203	0.40	29.40	74.69
228.00	1534.44	8.307	0.44	31.42	83.17
266.00	1534.49	8.394	0.49	33.22	91.07
304.00	1534.53	8.467	0.53	34.85	98.50
342.00	1534.56	8.530	0.56	36.34	105.54
380.00	1534.60	8.585	0.60	37.72	112.25

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
 EMBANKMENT TOP WIDTH (FT) 32.00  
 \*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1541.99
2	70.00	1539.93
3	140.00	1539.43
4	210.00	1540.48
5	280.00	1543.10

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**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Rand Drive & Malta Drain  
 ADMP- 21, Alternative 1: Install additional 2-6x3'x66 CBC

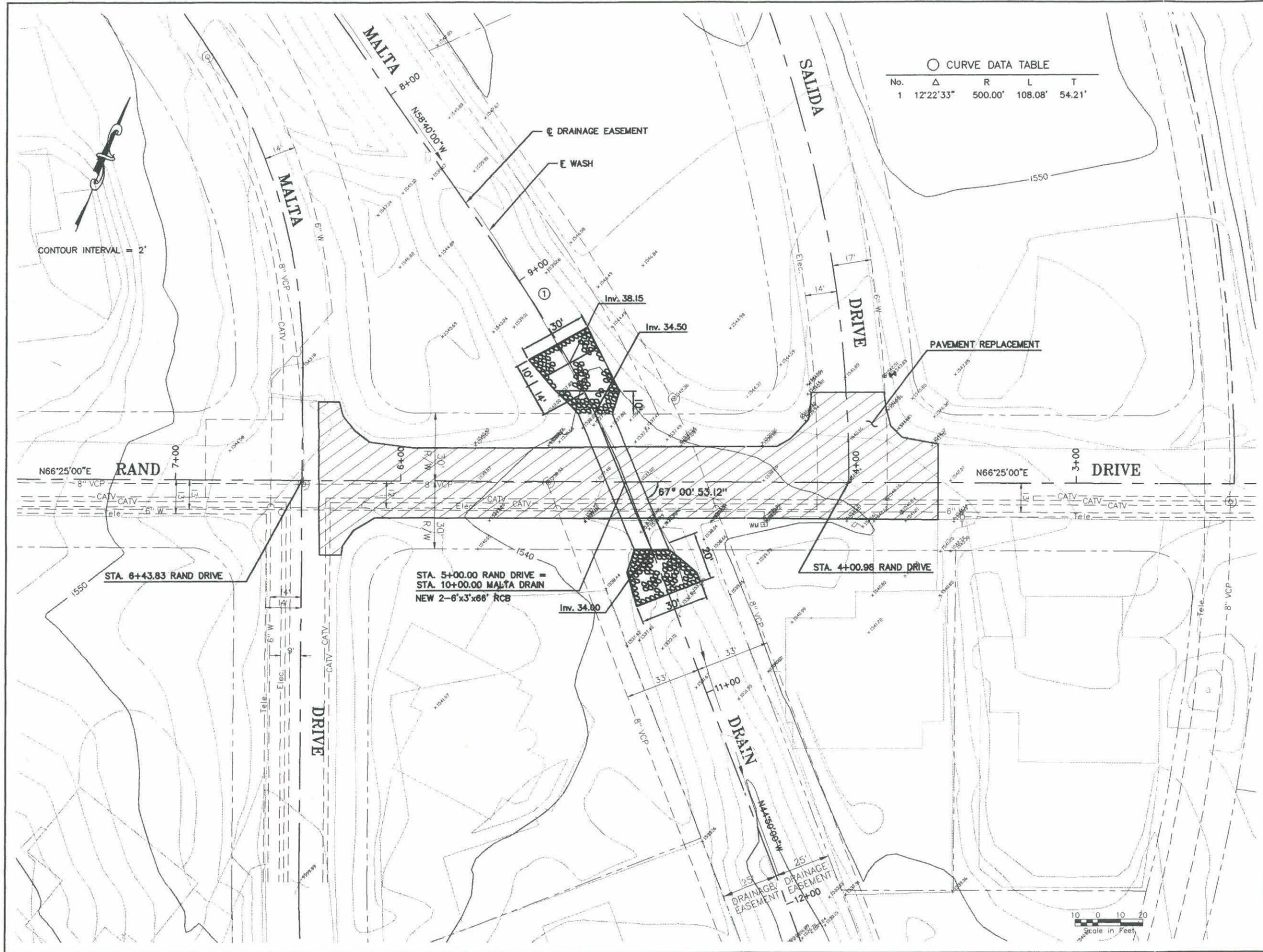
ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$759.00	1	\$759
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	883	\$1,236
2020020	Removal of Concrete Curb	LFT.	\$2.00	530	\$1,060
2020201	Saw Cutting	L.FT.	\$5.00	150	\$750
2030401	Drainage Excavation	CU.YD.	\$5.00	38	\$190
2030501	Structural Excavation	CU.YD.	\$8.00	299	\$2,392
2030506	Structural Backfill	CU.YD.	\$25.00	151	\$3,775
2030902	Borrow (Roadway Fill)	CU.YD.	\$8.00	384	\$3,072
2050001	Grading For Pavement	SQ. YD.	\$2.50	883	\$2,208
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	147	\$5,145
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	196	\$8,820
6010002	Structural Concrete (Class S)(F'C=3000)	CU.YD.	\$150.00	99.38	\$14,907
6050002	Reinforcing Steel	LB.	\$0.50	30775	\$15,388
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$3,065.00	1	\$3,065
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
7010001	Mobilization (10%)	L.SUM	\$7,662.00	1	\$7,662
130003	Concrete Gutter	L.FT.	\$10.00	530	\$5,300
9130003	Riprap (Grouted)	CU.YD.	\$80.00	100	\$8,000
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	55	\$3,520
9240170	Contractor Quality Control (2%)	L.SUM	\$1,532.00	1	\$1,532
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,532.00	1	\$1,532
Sub-Total					\$90,812
Engineering and Contingencies (20%)					\$18,160
<b>TOTAL</b>					<b>\$108,972</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$109,000**

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	12°22'33"	500.00'	108.08'	54.21'



NO.	REVISIONS	BY	DATE
3			
2			
1			

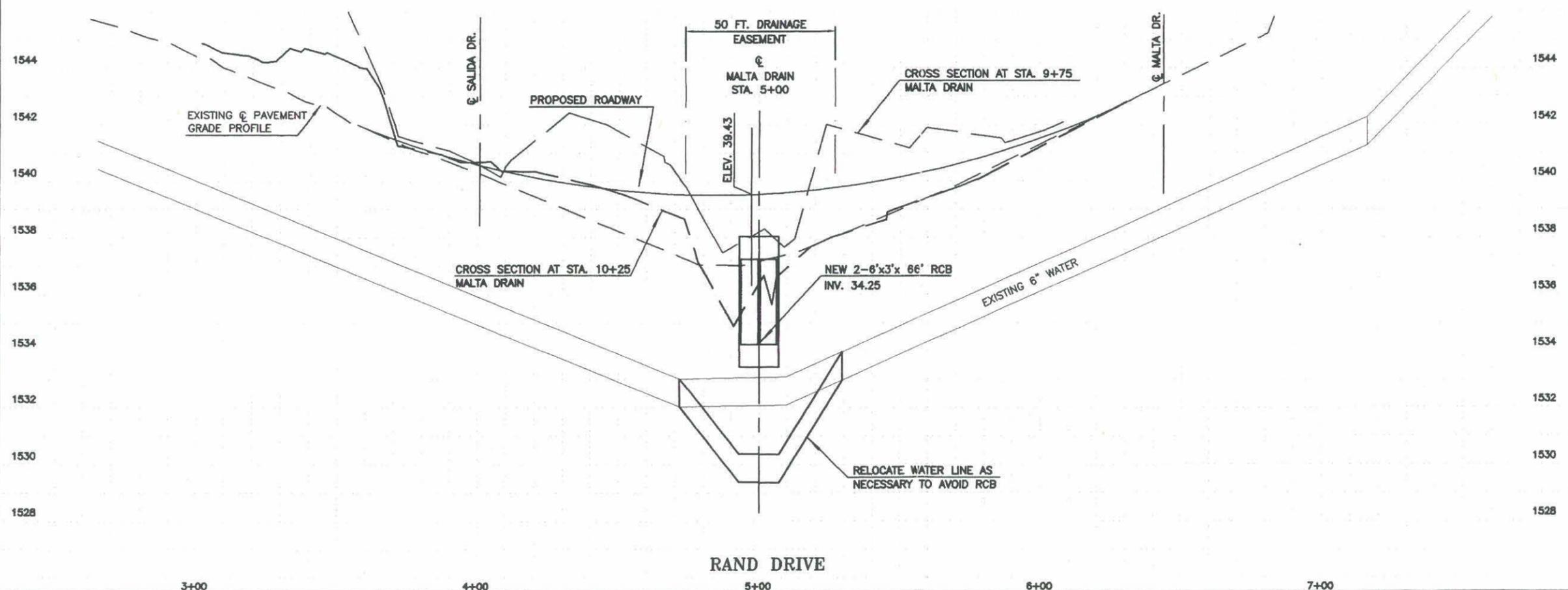
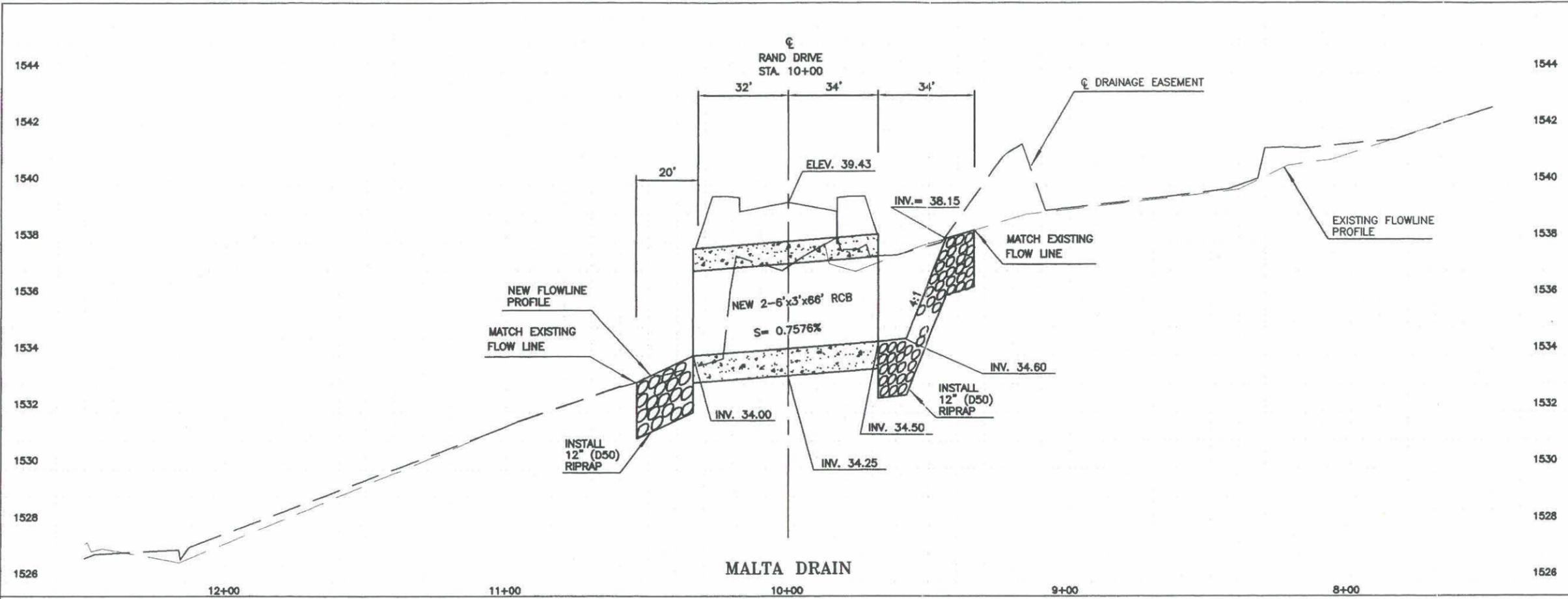
**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**  
 ENGINEERING DIVISION  
**FOUNTAIN HILLS ADMP**  
**RAND DRIVE & MALTA DRAIN**  
**FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96

**Entellus**  
 2500 N. 44th Street, Suite 200  
 Phoenix, AZ 85018-2270  
 Tel: 602-954-2800  
 Fax: 602-954-2847

**PLAN SHEET**  
 ADMP 21 - ALTERNATE 1

SHEET OF  
 1 2



3			
2			
1			
NO.	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY</b> ENGINEERING DIVISION <b>FOUNTAIN HILLS ADMP</b> <b>RAND &amp; MALTA DRAIN</b> <b>FCD PROJECT NO. 94-16</b>			
		BY	DATE
DESIGNED	HAA		11/96
DRAWN	JDS		11/96
CHECKED	SEK		11/96
 <b>Entellus</b> <small>2505 N. 44th Street Suite 200          Phoenix, AZ 85018-2070          Tel: 602.944.8800          Fax: 602.944.8801</small>			
<b>PROFILE SHEET</b> ADMP 21 - ALTERNATE 1			SHEET OF <b>2 2</b>

# ALTERNATE 2

**MALTA DRAIN @ RAND DR. (4-48" CMP)**CURRENT DATE: 01-31-1997  
CURRENT TIME: 14:28:53FILE DATE: 10-01-1996  
FILE NAME: STR7-C4FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1534.00	1533.25	94.00	4 CSP	4.00	4.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR7-C4

DATE: 10-01-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1534.00	0	0	0	0	0	0	0	0	1
1535.44	38	38	0	0	0	0	0	0	1
1536.08	76	76	0	0	0	0	0	0	1
1536.60	114	114	0	0	0	0	0	0	1
1537.05	152	152	0	0	0	0	0	0	1
1537.47	190	190	0	0	0	0	0	0	1
1537.88	228	228	0	0	0	0	0	0	1
1538.28	266	266	0	0	0	0	0	0	1
1539.22	304	304	0	0	0	0	0	0	1
1539.65	342	335	0	0	0	0	0	5	6
1539.87	380	350	0	0	0	0	0	26	5
1539.43	319	319	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR7-C4

DATE: 10-01-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1534.00	0.00	0	0	0.00
1535.44	0.00	38	0	0.00
1536.08	0.00	76	0	0.00
1536.60	0.00	114	0	0.00
1537.05	0.00	152	0	0.00
1537.47	0.00	190	0	0.00
1537.88	0.00	228	0	0.00
1538.28	0.00	266	0	0.00
1539.22	0.00	304	0	0.00
1539.65	-0.01	342	2	0.66
1539.87	-0.01	380	4	1.00

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** 10-yr ok. 100-yr overtops by (39.87-39.43) 0.36-ft



CURRENT DATE: 01-31-1997  
 CURRENT TIME: 14:28:53

FILE DATE: 10-01-1996  
 FILE NAME: STR7-C4

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TAILWATER

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\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
 BOTTOM WIDTH (FT) 15.00  
 SIDE SLOPE H/V (X:1) 3.0  
 CHANNEL SLOPE V/H (FT/FT) 0.011  
 MANNING'S N (.01-0.1) 0.045  
 CHANNEL INVERT ELEVATION (FT) 1533.25  
 CULVERT NO.1 OUTLET INVERT ELEVATION 1533.25 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1533.25	0.000	0.00	0.00	0.00
38.00	1534.05	0.535	0.80	2.72	0.55
76.00	1534.44	0.553	1.19	3.43	0.82
114.00	1534.75	0.561	1.50	3.90	1.03
152.00	1535.01	0.566	1.76	4.26	1.21
190.00	1535.24	0.570	1.99	4.56	1.36
228.00	1535.44	0.573	2.19	4.82	1.51
266.00	1535.63	0.575	2.38	5.04	1.64
304.00	1535.81	0.577	2.56	5.24	1.76
342.00	1535.97	0.579	2.72	5.42	1.87
380.00	1536.13	0.580	2.88	5.59	1.98

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
 EMBANKMENT TOP WIDTH (FT) 32.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1541.99
2	70.00	1539.93
3	140.00	1539.43
4	210.00	1540.48
5	280.00	1543.10

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**\*RELIMINARY DETAILED COST ESTIMATE - 30%**

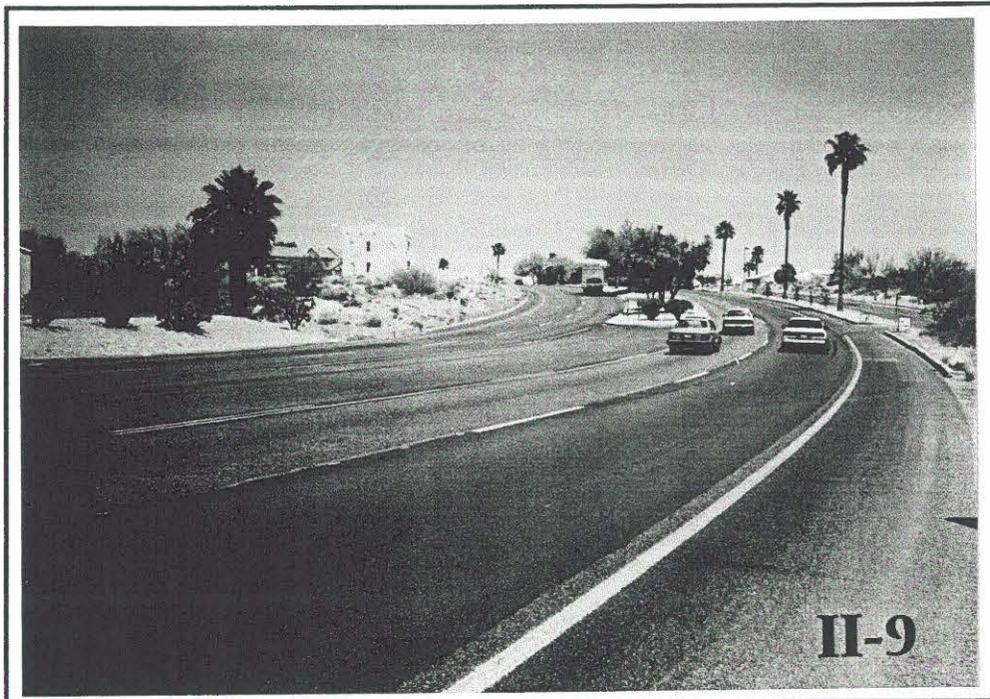
Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Rand Drive & Malta Drain  
 ADMP- 21, Alternative 2: Install additional 4-48"x94' CMP

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$662.00	1	\$662
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	883	\$1,236
2020020	Removal of Concrete Curb	LFT.	\$2.00	530	\$1,060
2020201	Saw Cutting	L.FT.	\$5.00	150	\$750
2030401	Drainage Excavation	CU.YD.	\$5.00	38	\$190
2030501	Structural Excavation	CU.YD.	\$8.00	299	\$2,392
2030506	Structural Backfill	CU.YD.	\$25.00	151	\$3,775
2030902	Borrow (Roadway Fill)	CU.YD.	\$8.00	384	\$3,072
2050001	Grading For Pavement	SQ. YD.	\$2.50	883	\$2,208
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	147	\$5,145
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	196	\$8,820
5010035	Pipe, Corrugated Metal, 48"	L.FT.	\$55.00	376	\$20,680
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$2,676.00	1	\$2,676
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
7010001	Mobilization (10%)	L.SUM	\$6,691.00	1	\$6,691
70100140	Concrete Gutter	L.FT.	\$10.00	530	\$5,300
9130003	Riprap (Grouted)	CU.YD.	\$80.00	100	\$8,000
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	55	\$3,520
9240170	Contractor Quality Control (2%)	L.SUM	\$1,338.00	1	\$1,338
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,338.00	1	\$1,338
Sub-Total					\$79,353
Engineering and Contingencies (20%)					\$15,870
<b>TOTAL</b>					<b>\$95,223</b>

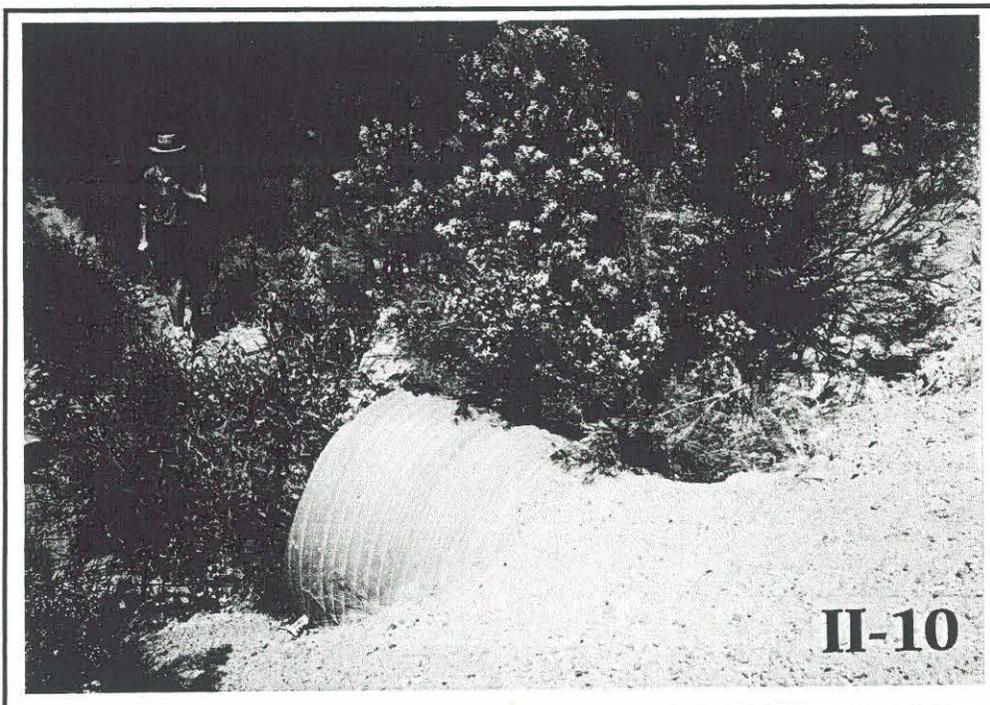
**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$96,000**

**Site 22: Saguaro Blvd. / Emerald Wash**

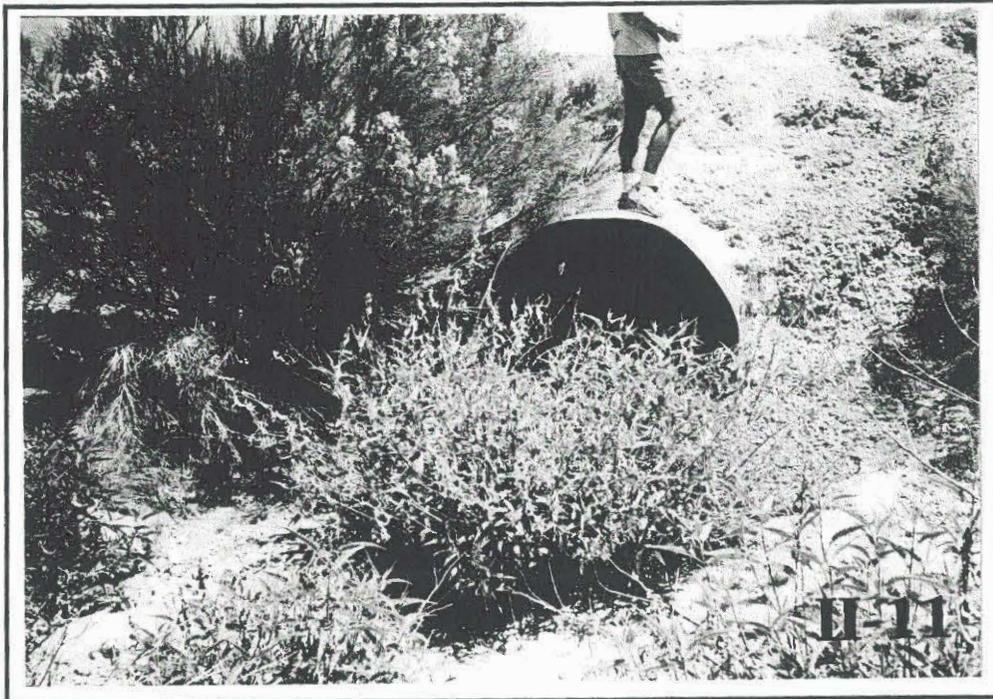


*Emerald Wash and Malta Drain (Site 6) Spillway  
Looking North along Saguaro Blvd.*



*Emerald Wash Culvert Inlet  
Looking Upstream from Saguaro Blvd.*

**Site 22: Saguaro Blvd. / Emerald Wash (Cont'd.)**



Emerald Wash Culvert Inlet  
*Looking Downstream*



# ALTERNATE 1

## EMERALD WASH @ SAGUARO BLVD. (3-60" CMP)

CURRENT DATE: 10-16-1996

CURRENT TIME: 18:18:36

FILE DATE: 07-05-1996

FILE NAME: STR8-EX5

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1514.59	1510.74	193.04	2 CSP	5.00	5.00	.024	CONVENTIONAL
2	1514.67	1510.74	193.04	1 CSP	5.00	5.00	.024	CONVENTIONAL
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR8-EX5

DATE: 07-05-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1514.59	0	0	0	0	0	0	0	0	0
1516.36	56	39	17	0	0	0	0	0	4
1517.11	112	76	36	0	0	0	0	0	3
1517.77	168	113	55	0	0	0	0	0	3
1518.37	224	151	73	0	0	0	0	0	2
1518.98	280	188	92	0	0	0	0	0	2
1519.59	336	226	110	0	0	0	0	0	3
1519.75	350	235	115	0	0	0	0	0	2
1520.95	448	300	148	0	0	0	0	0	4
1521.74	504	337	167	0	0	0	0	0	3
1522.34	560	363	180	0	0	0	0	14	6
1522.12	529	354	175	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR8-EX5

DATE: 07-05-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1514.59	0.00	0	0	0.00
1516.36	-0.00	56	0	0.12
1517.11	-0.00	112	0	0.04
1517.77	0.00	168	-0	-0.07
1518.37	-0.00	224	0	0.03
1518.98	-0.00	280	0	0.00
1519.59	0.00	336	-0	-0.02
1519.75	0.00	350	-0	-0.10
1520.95	0.00	448	-0	-0.00
1521.74	0.00	504	-0	-0.00
1522.34	-0.01	560	3	0.62

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

Conclusions: 10-yr ok. 100-yr overtops road by (22.34-22.12) 0.22-ft



CURRENT DATE: 10-16-1996  
CURRENT TIME: 18:18:36

FILE DATE: 07-05-1996  
FILE NAME: STR8-EX5

PERFORMANCE CURVE FOR CULVERT # 2 - 1 ( 5 BY 5 ) CSP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1514.67	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
17	1516.37	1.70	1.70	1-S2n	0.99	1.13	6.30	0.99	2.71	1.02
36	1517.11	2.44	2.44	1-S2n	1.42	1.66	7.81	1.42	3.29	1.36
55	1517.78	3.11	3.11	1-S2n	1.77	2.07	8.78	1.77	3.69	1.61
73	1518.38	3.71	3.71	1-S2n	2.08	2.41	9.46	2.08	3.99	1.82
92	1518.97	4.30	4.30	1-S2n	2.36	2.71	10.05	2.36	4.24	1.99
110	1519.58	4.91	4.91	1-S2n	2.64	3.00	10.51	2.64	4.46	2.15
115	1519.75	5.08	5.08	5-S2n	2.71	3.06	10.63	2.71	4.51	2.18
148	1520.95	6.28	6.28	5-S2n	3.19	3.49	11.22	3.19	4.82	2.41
167	1521.74	7.07	7.07	5-S2n	3.47	3.69	11.48	3.47	4.97	2.53
180	1522.33	7.66	7.66	5-S2n	3.69	3.82	11.59	3.69	5.11	2.64
El. inlet face invert					1514.67 ft	El. outlet invert		1510.74 ft		
El. inlet throat invert					0.00 ft	El. inlet crest		0.00 ft		

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION (FT) 1098.00  
 INLET ELEVATION (FT) 1514.67  
 OUTLET STATION (FT) 905.00  
 OUTLET ELEVATION (FT) 1510.74  
 NUMBER OF BARRELS 1  
 SLOPE (V-FT/H-FT) 0.0204  
 CULVERT LENGTH ALONG SLOPE (FT) 193.04

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE CIRCULAR  
 BARREL DIAMETER 5.00 FT  
 BARREL MATERIAL CORRUGATED STEEL  
 BARREL MANNING'S N 0.024  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL THIN EDGE PROJECTING  
 INLET DEPRESSION NONE

CURRENT DATE: 10-16-1996  
 CURRENT TIME: 18:18:36

FILE DATE: 07-05-1996  
 FILE NAME: STR8-EX5

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
 MAIN CHANNEL AND LT & RT OVER BANKS  
 LEFT CHANNEL BOUNDARY 2  
 RIGHT CHANNEL BOUNDARY 4  
 MANNING N LEFT OVER BANK 0.065  
 MANNING N MAIN CHANNEL 0.048  
 MANNING N RIGHT OVER BAN 0.065  
 SLOPE OF CHANNEL (FT/FT) 0.0189

FILE NAME: STR8-EX  
 FILE DATE: 07-05-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1519.48
2	8.82	1518.99
3	33.68	1514.65
4	96.00	1510.74
5	103.00	1510.74
6	170.38	1515.61

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1510.74	0.000	0.00	0.00	0.00
56.00	1511.76	0.669	1.02	2.71	0.60
112.00	1512.10	0.703	1.36	3.29	0.80
168.00	1512.35	0.723	1.61	3.69	0.95
224.00	1512.56	0.738	1.82	3.99	1.07
280.00	1512.73	0.749	1.99	4.24	1.17
336.00	1512.89	0.758	2.15	4.46	1.26
350.00	1512.92	0.760	2.18	4.51	1.28
448.00	1513.15	0.773	2.41	4.82	1.42
504.00	1513.27	0.779	2.53	4.97	1.49
560.00	1513.38	0.784	2.64	5.11	1.55

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
 EMBANKMENT TOP WIDTH (FT) 113.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1525.02
2	37.46	1523.65
3	125.21	1522.28
4	209.62	1522.12
5	294.87	1522.75
6	376.14	1523.82

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**PRELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Emerald Wash  
 ADMP- 22, Alternative 1: Install additional 60"X193 CMP

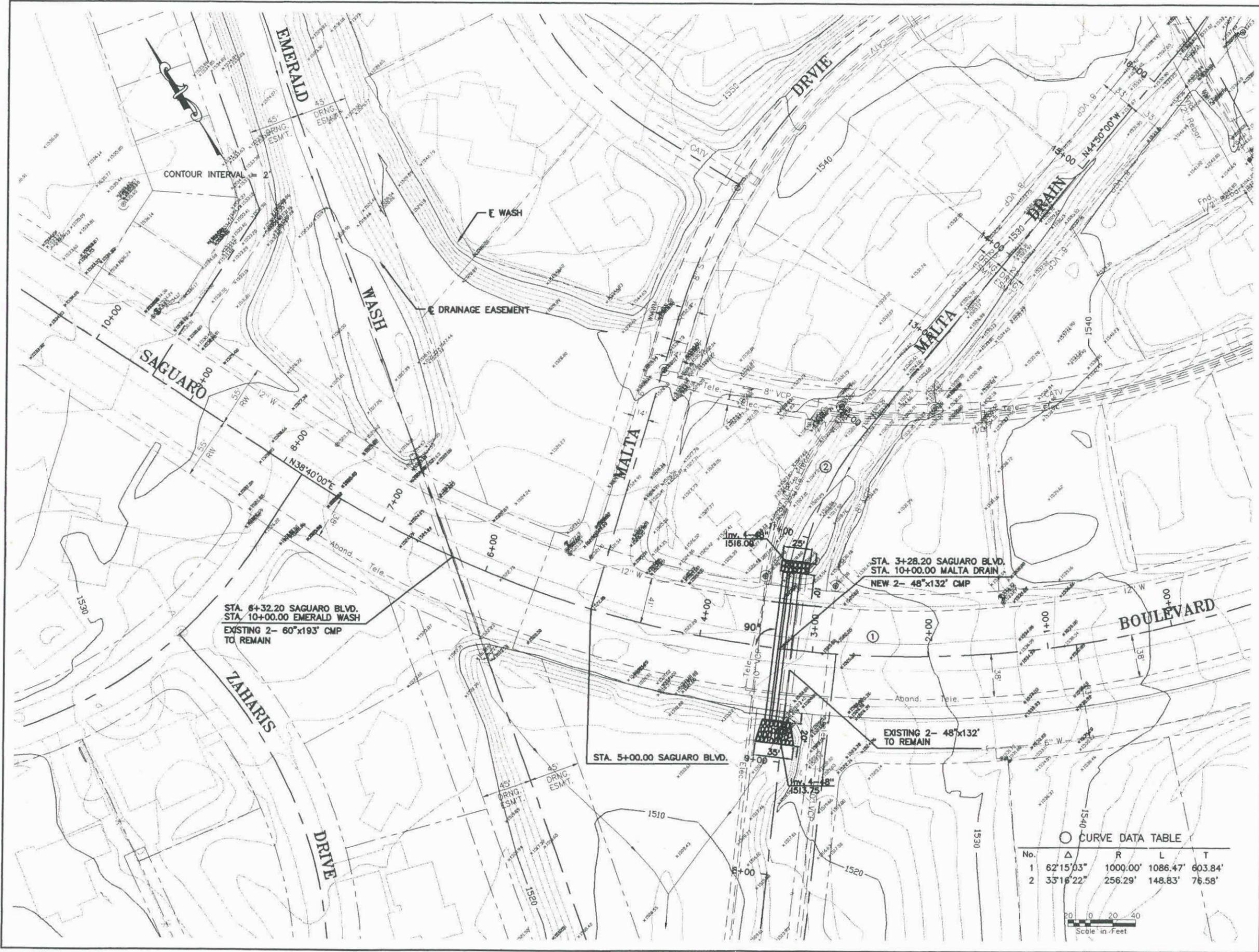
ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$572.00	1	\$572
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	400	\$560
2020020	Removal of Concrete Curb	LFT.	\$2.00	60	\$120
2020201	Saw Cutting	L.FT.	\$5.00	240	\$1,200
2030501	Structural Excavation	CU.YD.	\$8.00	1443	\$11,544
2030506	Structural Backfill	CU.YD.	\$25.00	315	\$7,875
2050001	Grading For Pavement	SQ. YD.	\$2.50	400	\$1,000
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	67	\$2,345
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	89	\$4,005
5010045	Pipe, Corrugated Metal, 60"	L.FT.	\$120.00	193	\$23,160
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$2,287.00	1	\$2,287
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$1,000.00	1	\$1,000
9010001	Mobilization (10%)	L.SUM	\$5,718.00	1	\$5,718
9080140	Concrete Gutter	L.FT.	\$10.00	60	\$600
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	64	\$4,096
9240170	Contractor Quality Control (2%)	L.SUM	\$1,144.00	1	\$1,144
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,144.00	1	\$1,144

Sub-Total	\$68,470
Engineering and Contingencies (20%)	\$13,690
<b>TOTAL</b>	<b>\$82,160</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$83,000**

CALL TWO WORKING DAYS BEFORE YOU DIG  
 1-802-263-1100  
 1-800-STAKE-IT  
 (OFFICE: MARICOPA COUNTY)



STA. 6+32.20 SAGUARO BLVD.  
 STA. 10+00.00 EMERALD WASH  
 EXISTING 2- 60"x193' CMP  
 TO REMAIN

STA. 3+28.20 SAGUARO BLVD.  
 STA. 10+00.00 MALTA DRAIN  
 NEW 2- 48"x132' CMP

EXISTING 2- 48"x132'  
 TO REMAIN

○ CURVE DATA TABLE

No.	Δ	R	L	T
1	62°15'03"	1000.00'	1086.47'	603.84'
2	33°16'22"	256.29'	148.83'	76.58'

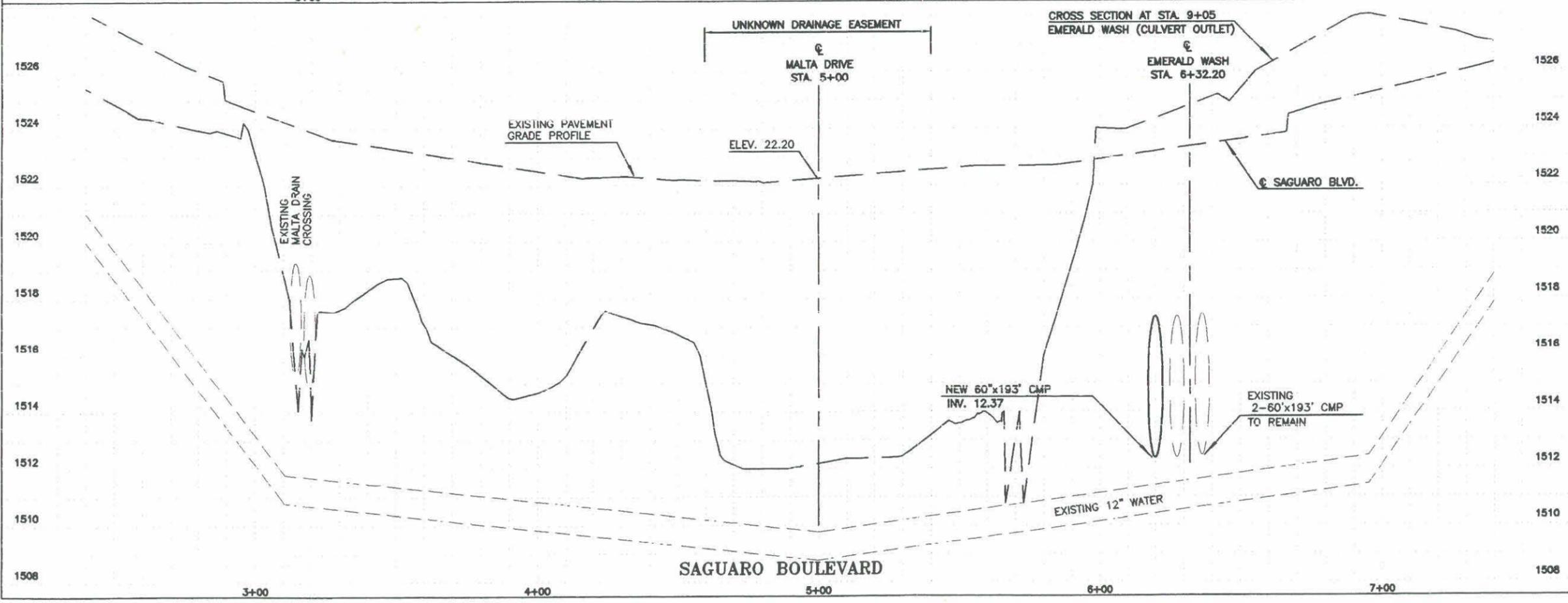
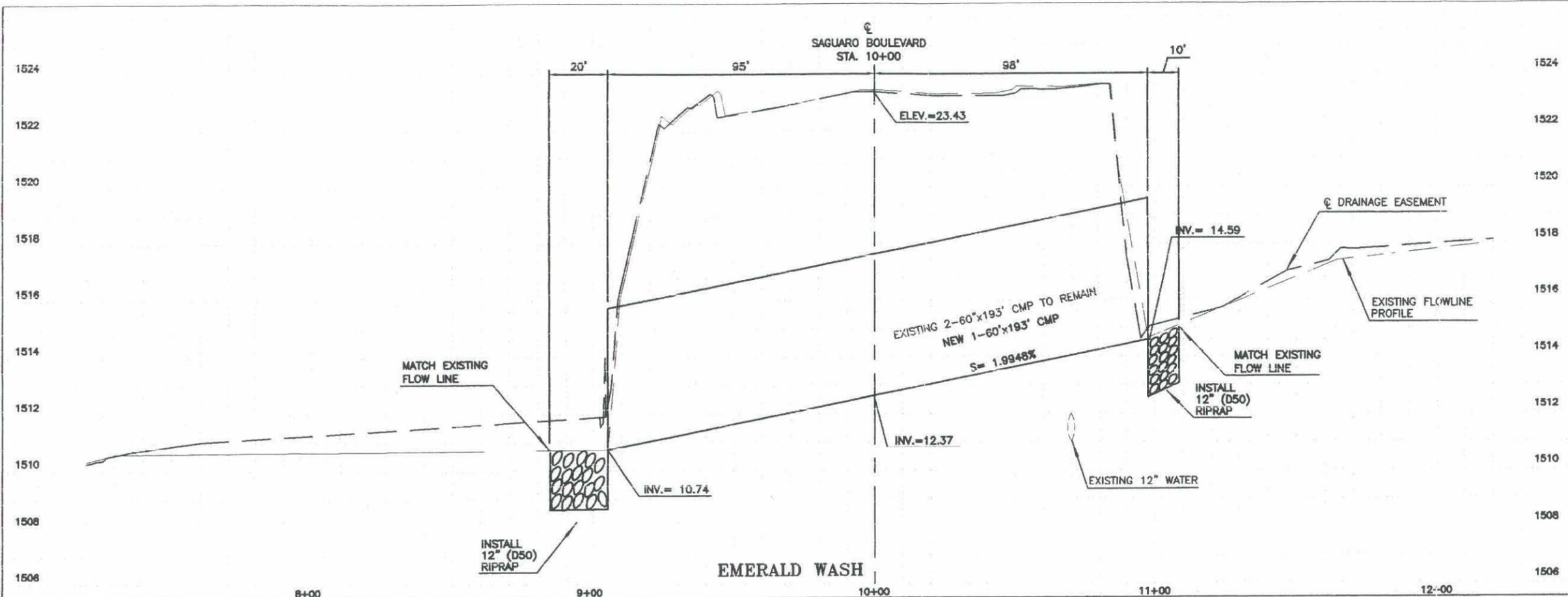
Scale in Feet  
 0 20 40

NO.	REVISIONS	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 SAGUARO BOULEVARD & MALTA DRAIN  
 FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96





NO.	REVISIONS	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**  
 ENGINEERING DIVISION  
**FOUNTAIN HILLS ADMP**  
**SAGUARO BOULEVARD & EMERALD WASH**  
**FCD PROJECT NO. 94-16**

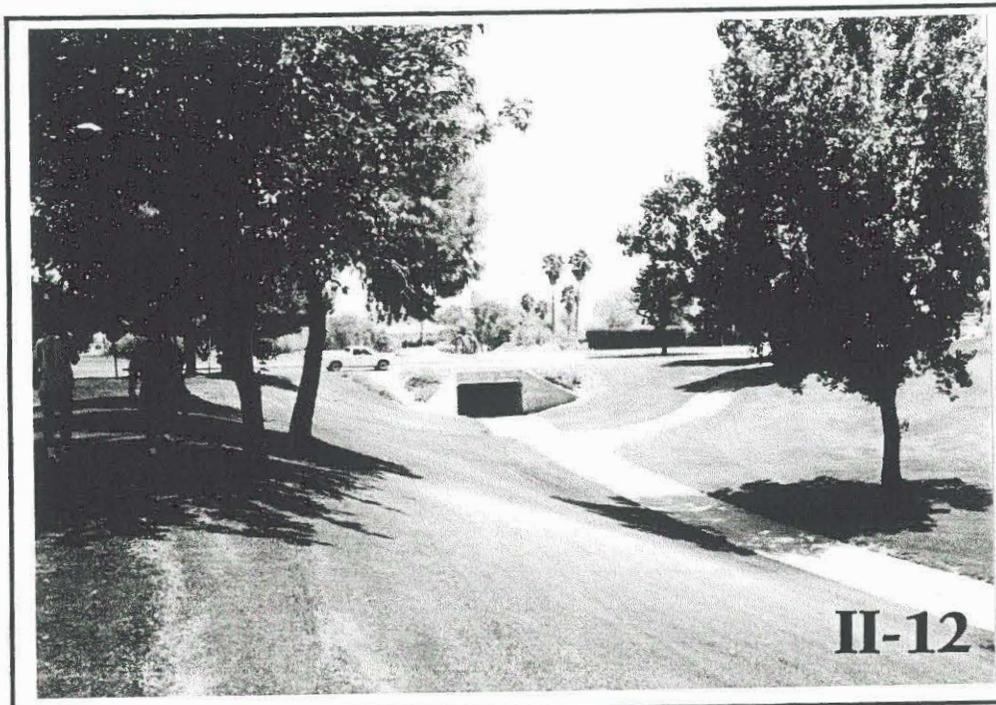
	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96

**Entellus**  
 200 E. 4th Street Suite 200  
 Phoenix, AZ 85004-2020  
 Tel: 602.944.2000  
 Fax: 602.944.2007

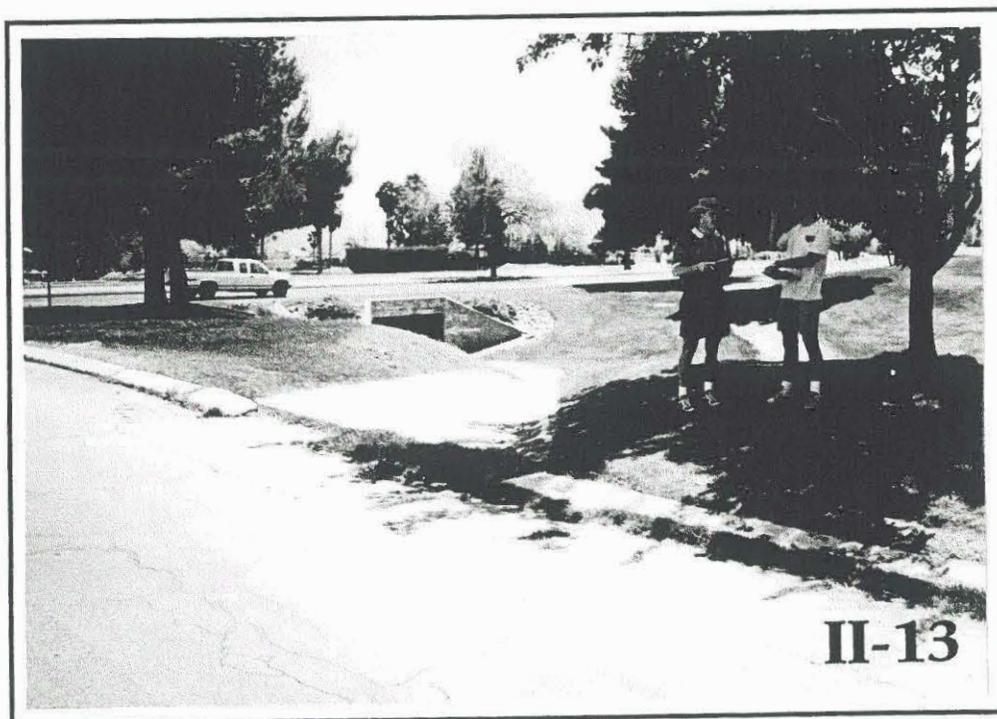
**PROFILE SHEET**  
 ADMP 22 - ALTERNATE 1

SHEET OF **2 2**

**Site 23: Saguaro Blvd. / Jacklin Wash**



Jacklin Wash Box Culvert Inlet  
*Looking Downstream*



Kingstreet Blvd. Spillway into Jacklin Wash  
*Looking Downstream from Kingstreet Blvd.*

## Field Reconnaissance Sheet

 Site No.: 23

 Roadway: Saguaro Blvd.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Jacklin Wash	480	496	

 Reason for Analysis / Existing Deficiency: Water not draining off of Kingstree Blvd. to Jacklin Wash, overtopping into Saguaro.
**Design Constraints and Considerations:**

- 1) Available head, approximately: Upstream: N/A ft. Downstream: N/A ft.
- 2) Can the <sup>spillway</sup> ~~culvert~~ be lowered:
 

Upstream?	<input checked="" type="checkbox"/> Yes, <u>21</u> ft.	<input type="checkbox"/> No
Downstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No
- 3) Is there any erosion visible:
 

Upstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No
Downstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No

**Structure Modification Constraints:**

- 4) Utilities: 8" Sewer along Kingstree (E)  
12" Water along S. side of Kingstree
- 5) Structures: Intersection of Kingstree & Saguaro  
Spillway off of Kingstree to Jacklin
- 6) Right-of-Way: May need easement from Golf Course.

- 7) Miscellaneous field notes, comments, or design ideas:
- Need to increase spillway efficiency and size
  - May be able to adjust grade of Kingstree to keep runoff out of Saguaro
  - Diversion structures possible.
    - 1- extra paving to get flow off of Kingstree
    - 2- flow blockage east of spillway
  - Slotted drains / or catch basins by Saguaro possible
  - catch basins along Kingstree, drain into Jacklin
  - can switch to one-way crown from two-way

# ALTERNATE 1

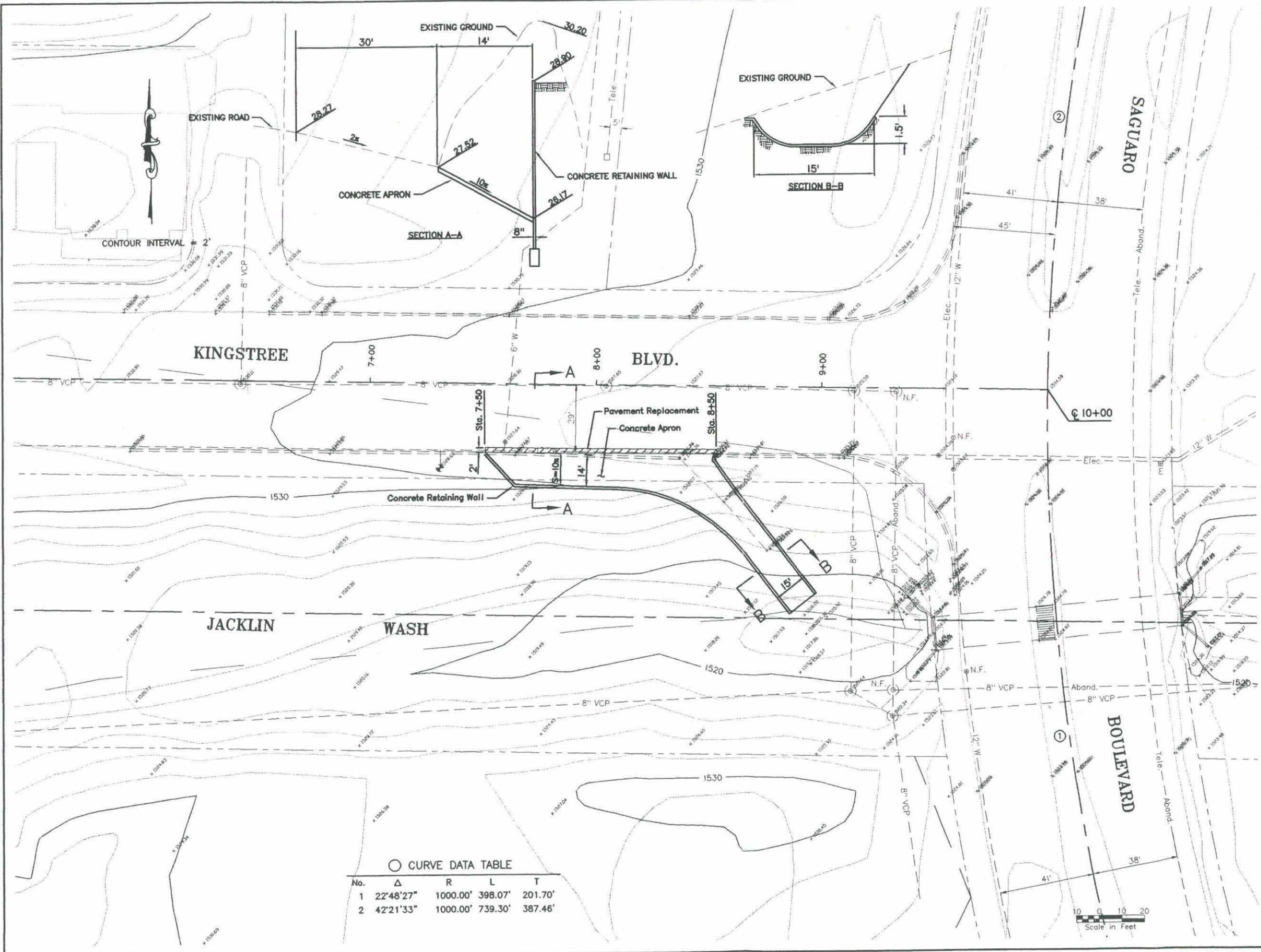
**ELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Kingtree Boulevard  
 ADMP- 23, Alternative 1: Install Side Spillway

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$255.00	1	\$255
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	22	\$31
2020020	Removal of Concrete Curb	LFT.	\$2.00	80	\$160
2020201	Saw Cutting	L.FT.	\$5.00	104	\$520
2030501	Structural Excavation	CU.YD.	\$8.00	156	\$1,248
2030506	Structural Backfill	CU.YD.	\$25.00	107	\$2,675
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	3.7	\$130
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	3.7	\$167
6010002	Structural Concrete (Class S)(F'C = 3000)	CU.YD.	\$150.00	38.2	\$5,730
6050002	Reinforcing Steel	LB.	\$0.50	2548	\$1,274
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
8050003	Seeding (class II)	ACRE	\$4,000.00	0.06	\$240
9010001	Mobilization (10%)	L.SUM	\$2,552.00	1	\$2,552
9080140	Concrete Gutter	L.FT.	\$10.00	50	\$500
9080201	Concrete Apron	SQ.FT.	\$5.00	2550	\$12,750
9240170	Contractor Quality Control (2%)	L.SUM	\$510.00	1	\$510
9250001	Construction Surveying and Layout (2%)	L.SUM	\$510.00	1	\$510
Sub-Total					\$29,751
Engineering and Contingencies (20%)					\$5,950
<b>TOTAL</b>					<b>\$35,701</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$36,000**



○ CURVE DATA TABLE

No.	Δ	R	L	T
1	22°48'27"	1000.00'	398.07'	201.70'
2	42°21'33"	1000.00'	739.30'	387.46'



NO.	REVISIONS	BY	DATE
3			
2			
1			

**FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 KINGSTREE BLVD. & SAGUARO BLVD.  
 FCD PROJECT NO. 94-16**

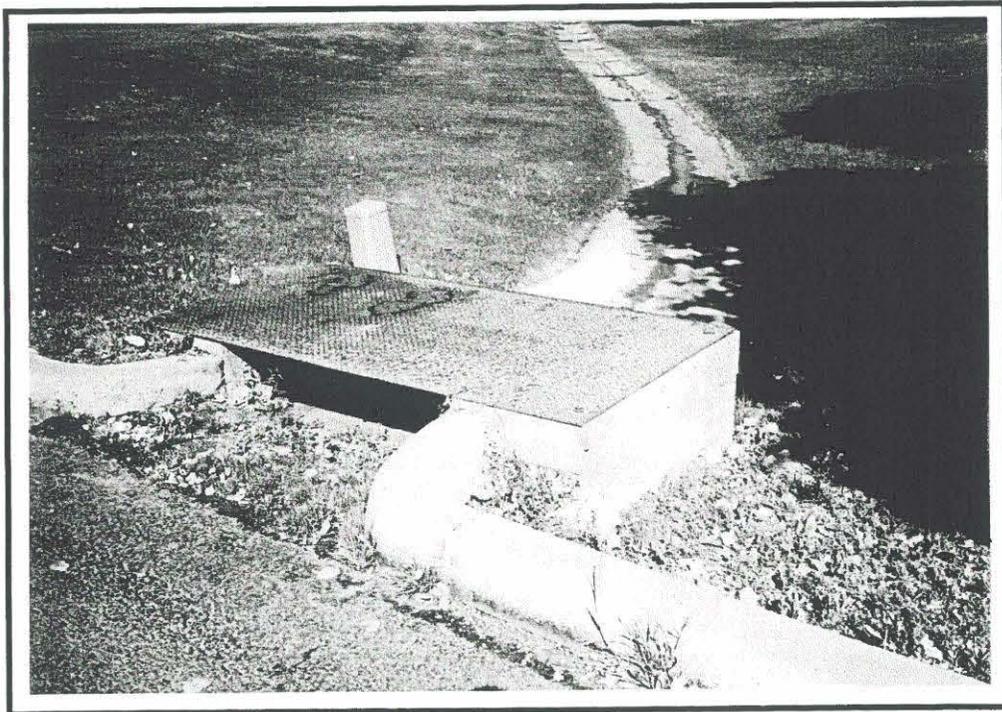
	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96



**Site 24: Saguaro Blvd. / Cyprus Point Wash**

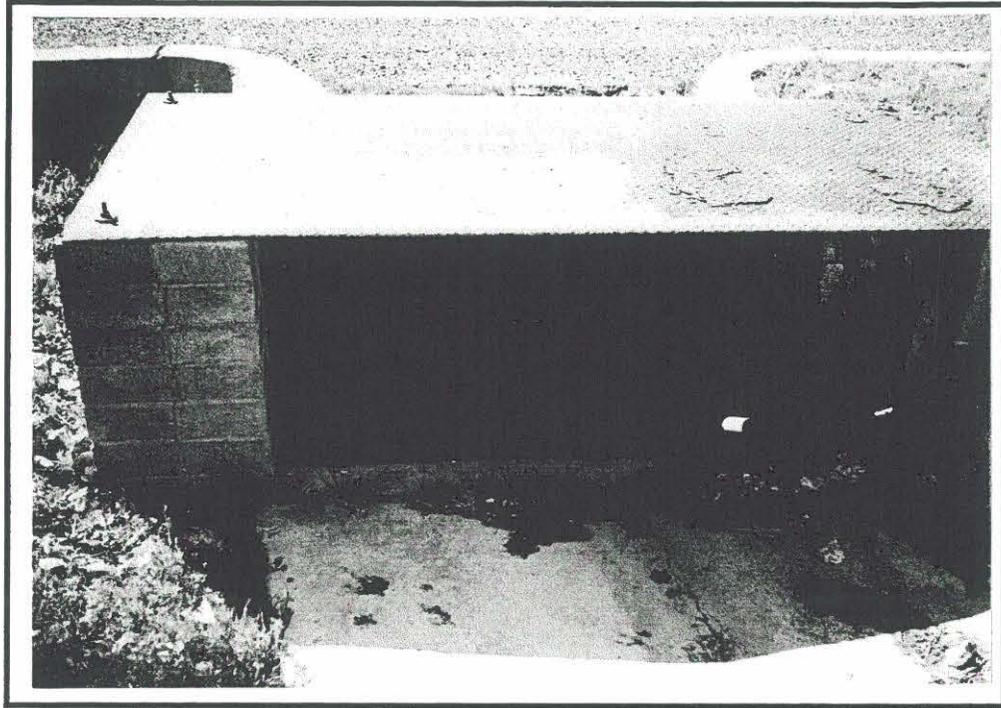


Cyprus Point Wash  
*Looking Upstream (West) across Saguaro Blvd.*



Cyprus Point Wash Inlet  
*Looking Upstream (West) from Saguaro Blvd.*

**Site 24: Saguaro Blvd. / Cyprus Point Wash (Cont'd.)**



Cyprus Point Wash Inlet Structure  
*Looking Downstream (East)*



Cyprus Point Wash Culvert Outlet  
*Looking Upstream (West)*

## Field Reconnaissance Sheet

 Site No.: 24

 Roadway: SAGUARO BLVD

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Cyprus Point Wash	303	315	48" CMP

 Reason for Analysis / Existing Deficiency: Historical Overtopping - more flow into road from Cyprus Pt. Wash than into culvert. Underdesigned.

### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 0 ft. Downstream: 2 ft.
- 2) Can the culvert be lowered:
 

Upstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No
Downstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No
- 3) Is there any erosion visible:
 

Upstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No
Downstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No

### Structure Modification Constraints:

- 4) Utilities: 8" sewer along north side of wash / 8" sewer crosses wash  
15" sewer crosses wash  
6" & 12" water lines cross wash
- 5) Structures: Drop structure / catch basin @ culvert inlet  
Junction Box (C&G) near inlet  
Small road spillway from Saguaro
- 6) Right-of-Way: \_\_\_\_\_  
 \_\_\_\_\_

### 7) Miscellaneous field notes, comments, or design ideas:

- cable TV conduit in culvert (2)
- Road slopes down to the north through Cyprus Point wash
- Probably high velocities downstream
- May need a drop inlet and multiple barrels
- culvert is skewed ± 30°

ALTERNATE 1

## CYPRUS POINT WASH @ SAGUARO BLVD. (3-48" CMP)

CURRENT DATE: 10-16-1996

CURRENT TIME: 18:31:46

FILE DATE: 10-14-1996

FILE NAME: STR10-T4

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1517.14	1514.79	191.01	3 CSP	4.00	4.00	.024	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR10-T4

DATE: 10-14-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1517.14	0	0	0	0	0	0	0	0	1
1518.43	32	32	0	0	0	0	0	0	1
1518.98	63	63	0	0	0	0	0	0	1
1519.75	95	95	0	0	0	0	0	0	1
1520.21	126	126	0	0	0	0	0	0	1
1520.60	158	158	0	0	0	0	0	0	1
1520.76	170	170	0	0	0	0	0	0	1
1521.36	221	221	0	0	0	0	0	0	1
1521.75	252	252	0	0	0	0	0	0	1
1522.89	284	283	0	0	0	0	0	0	4
1523.57	315	305	0	0	0	0	0	9	4
1522.85	282	282	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR10-T4

DATE: 10-14-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1517.14	0.00	0	0	0.00
1518.43	0.00	32	0	0.00
1518.98	0.00	63	0	0.00
1519.75	0.00	95	0	0.00
1520.21	0.00	126	0	0.00
1520.60	0.00	158	0	0.00
1520.76	0.00	170	0	0.00
1521.36	0.00	221	0	0.00
1521.75	0.00	252	0	0.00
1522.89	-0.01	284	0	0.15
1523.57	-0.00	315	0	0.05

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** Break away flow 9cfs

CURRENT DATE: 10-16-1996  
CURRENT TIME: 18:31:46

FILE DATE: 10-14-1996  
FILE NAME: STR10-T4

PERFORMANCE CURVE FOR CULVERT # 1 - 3 ( 4 BY 4 ) CSP

DIS- CHARGE FLOW (cfs)	HEAD- WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	1517.14	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
32	1518.43	1.29	1.29	1-S2n	0.93	0.93	4.73	0.93	3.59	1.03
63	1518.98	1.84	1.84	1-S2n	1.33	1.34	5.71	1.33	4.69	1.32
95	1519.75	2.32	2.61	2-M2c	1.67	1.66	6.38	1.66	5.48	1.55
126	1520.21	2.76	3.07	2-M2c	1.96	1.93	6.99	1.93	6.11	1.75
158	1520.60	3.17	3.46	2-M2c	2.25	2.17	7.55	2.17	6.65	1.93
170	1520.76	3.33	3.62	2-M2c	2.36	2.26	7.76	2.26	6.84	2.00
221	1521.36	3.99	4.22	2-M2c	2.84	2.58	8.57	2.58	7.55	2.24
252	1521.75	4.42	4.61	2-M2c	3.18	2.78	9.03	2.78	7.92	2.38
283	1522.90	4.88	5.76	6-FFn	4.00	2.93	7.51	4.00	8.27	2.51
305	1523.57	5.24	6.43	6-FFn	4.00	3.04	8.10	4.00	8.60	2.64
El. inlet face invert					1517.14 ft	El. outlet invert		1514.79 ft		
El. inlet throat invert					0.00 ft	El. inlet crest		0.00 ft		

\*\*\*\*\* SITE DATA \*\*\*\*\* CULVERT INVERT \*\*\*\*\*  
 INLET STATION (FT) 1067.00  
 INLET ELEVATION (FT) 1517.14  
 OUTLET STATION (FT) 876.00  
 OUTLET ELEVATION (FT) 1514.79  
 NUMBER OF BARRELS 3  
 SLOPE (V-FT/H-FT) 0.0123  
 CULVERT LENGTH ALONG SLOPE (FT) 191.01

\*\*\*\*\* CULVERT DATA SUMMARY \*\*\*\*\*  
 BARREL SHAPE CIRCULAR  
 BARREL DIAMETER 4.00 FT  
 BARREL MATERIAL CORRUGATED STEEL  
 BARREL MANNING'S N 0.024  
 INLET TYPE CONVENTIONAL  
 INLET EDGE AND WALL SQUARE EDGE WITH HEADWALL  
 INLET DEPRESSION NONE

CURRENT DATE: 10-16-1996  
CURRENT TIME: 18:31:46

FILE DATE: 10-14-1996  
FILE NAME: STR10-T4

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TAILWATER

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\*\*\*\*\* USER DEFINED CHANNEL CROSS-SECTION  
MAIN CHANNEL AND LT & RT OVER BANKS  
LEFT CHANNEL BOUNDARY 3  
RIGHT CHANNEL BOUNDARY 5  
MANNING N LEFT OVER BANK 0.049  
MANNING N MAIN CHANNEL 0.038  
MANNING N RIGHT OVER BAN 0.049  
SLOPE OF CHANNEL (FT/FT) 0.0170

FILE NAME: STR10-EX  
FILE DATE: 09-05-1996

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1520.84
2	5.20	1520.55
3	20.00	1515.79
4	30.34	1514.79
5	35.13	1515.38
6	49.07	1522.45

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1514.79	0.000	0.00	0.00	0.00
31.50	1515.82	0.821	1.03	3.59	0.63
63.00	1516.11	0.877	1.32	4.69	0.94
94.50	1516.34	0.912	1.55	5.48	1.18
126.00	1516.54	0.937	1.75	6.11	1.39
157.50	1516.72	0.958	1.93	6.65	1.58
170.00	1516.79	0.964	2.00	6.84	1.65
220.50	1517.04	0.988	2.24	7.55	1.91
252.00	1517.17	1.000	2.38	7.92	2.06
283.50	1517.30	1.011	2.51	8.27	2.19
315.00	1517.43	1.021	2.64	8.60	2.33

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT 2.70  
EMBANKMENT TOP WIDTH (FT) 60.00

\*\*\*\*\* USER DEFINED ROADWAY PROFILE

CROSS-SECTION COORD. NO.	X (FT)	Y (FT)
1	0.00	1530.06
2	74.92	1523.41
3	75.54	1522.85
4	81.12	1522.93
5	81.93	1523.52
6	177.26	1526.80

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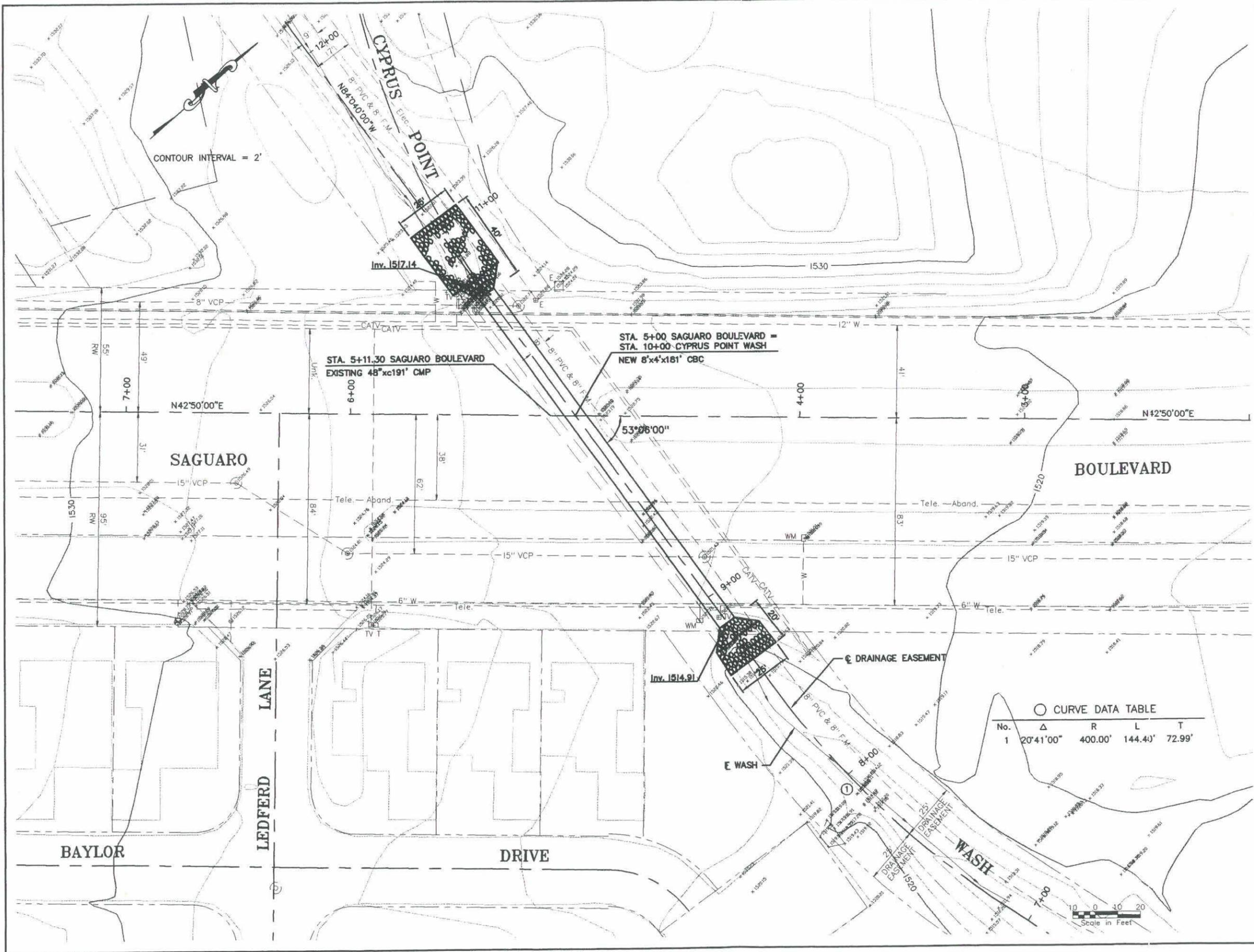
**RELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Saguaro Boulevard & Cyprus Point Wash  
 ADMP- 24, Alternative 1: Install 8'x4'x181 CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$815.00	1	\$815
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	483	\$676
2020020	Removal of Concrete Curb	LFT.	\$2.00	82	\$164
2020055	Removal and Savage (48" C.M.P.)	L.FT.	\$19.00	191	\$3,629
2020201	Saw Cutting	L.FT.	\$5.00	300	\$1,500
2030401	Drainage Excavation	CU.YD.	\$5.00	7	
2030501	Structural Excavation	CU.YD.	\$8.00	1202	\$9,616
2030506	Structural Backfill	CU.YD.	\$25.00	322	\$8,050
2050001	Grading For Pavement	SQ. YD.	\$2.50	483	\$1,208
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	81	\$2,835
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	107	\$4,815
6010002	Structural Concrete (Class S)(F'C = 3000)	CU.YD.	\$150.00	197	\$29,550
6050002	Reinforcing Steel	LB.	\$0.50	28223	\$14,112
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$3,259.00	1	\$3,259
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
9010001	Mobilization (10%)	L.SUM	\$8,147.00	1	\$8,147
9080140	Concrete Gutter	L.FT.	\$10.00	82	\$820
9130003	Riprap (Grouted)	CU.YD.	\$80.00	56	
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	56	\$3,584
9240170	Contractor Quality Control (2%)	L.SUM	\$1,629.00	1	\$1,629
9250001	Construction Surveying and Layout (2%)	L.SUM	\$1,629.00	1	\$1,629
Sub-Total					\$96,537
Engineering and Contingencies (20%)					\$19,310
<b>TOTAL</b>					<b>\$115,847</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$116,000**



○ CURVE DATA TABLE

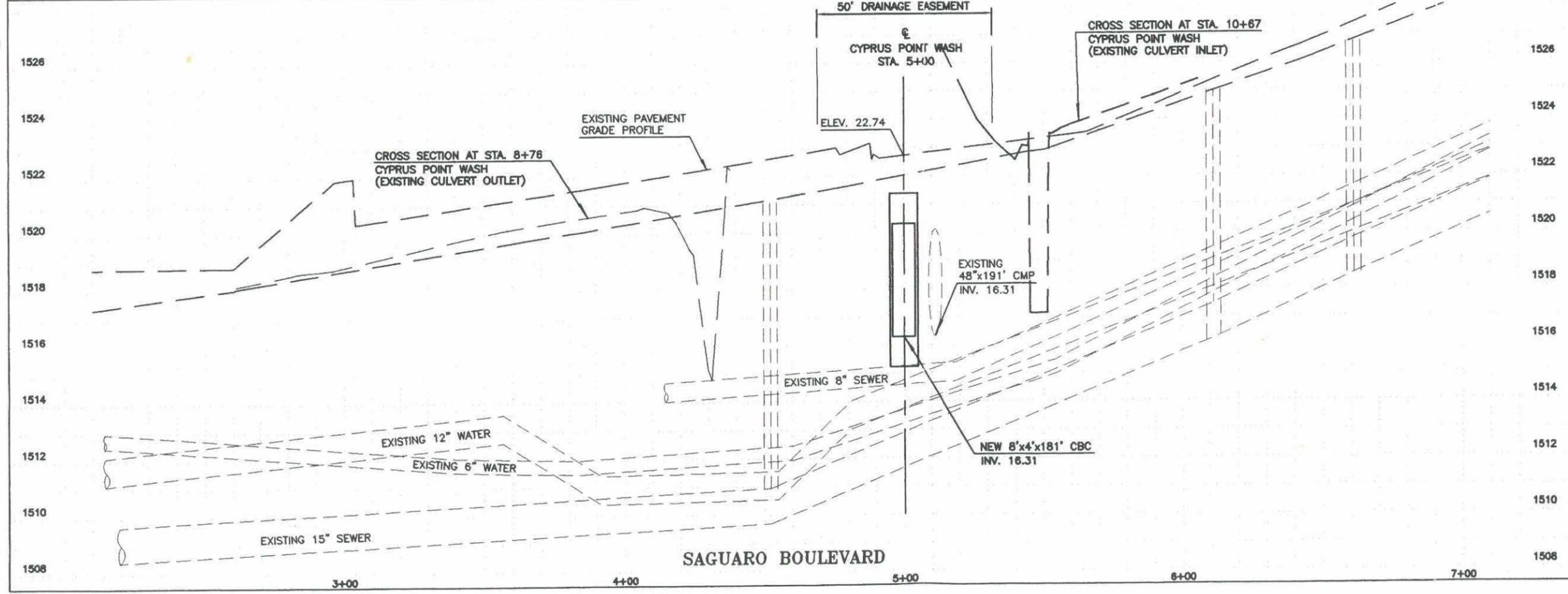
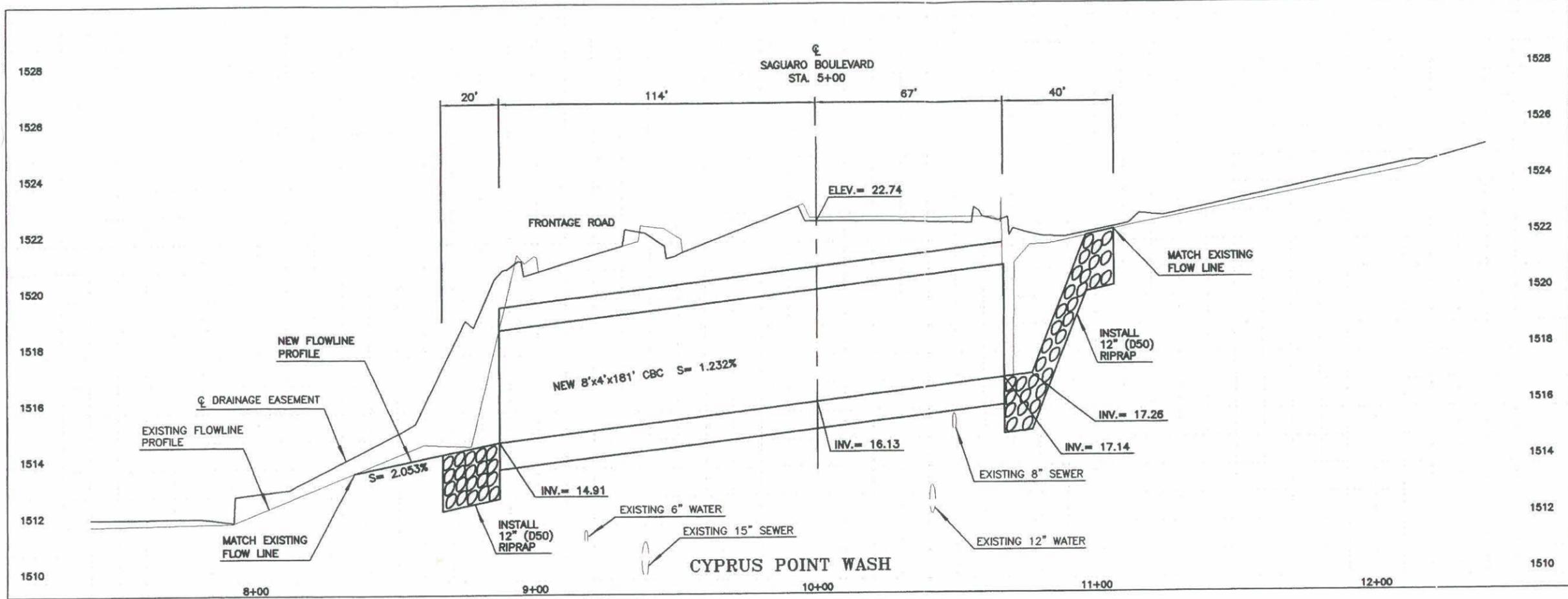
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NO.	REVISIONS	BY	DATE
3			
2			
1			

FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
CYPRUS POINT WASH & SAGUARO BOULEVARD  
FCD PROJECT NO. 94-16

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96





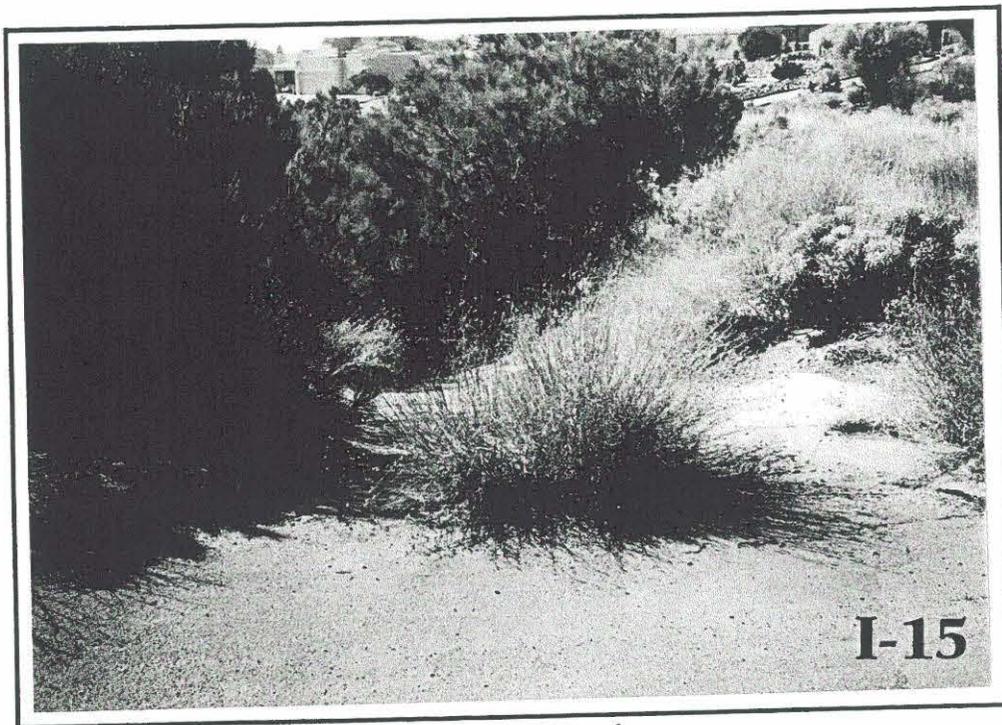
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NO.	REVISIONS	BY	DATE

FLOOD CONTROL DISTRICT  
OF MARICOPA COUNTY  
ENGINEERING DIVISION  
FOUNTAIN HILLS ADMP  
SAGUARO BOULEVARD & CYPRUS POINT WASH  
FCD PROJECT NO. 94-16

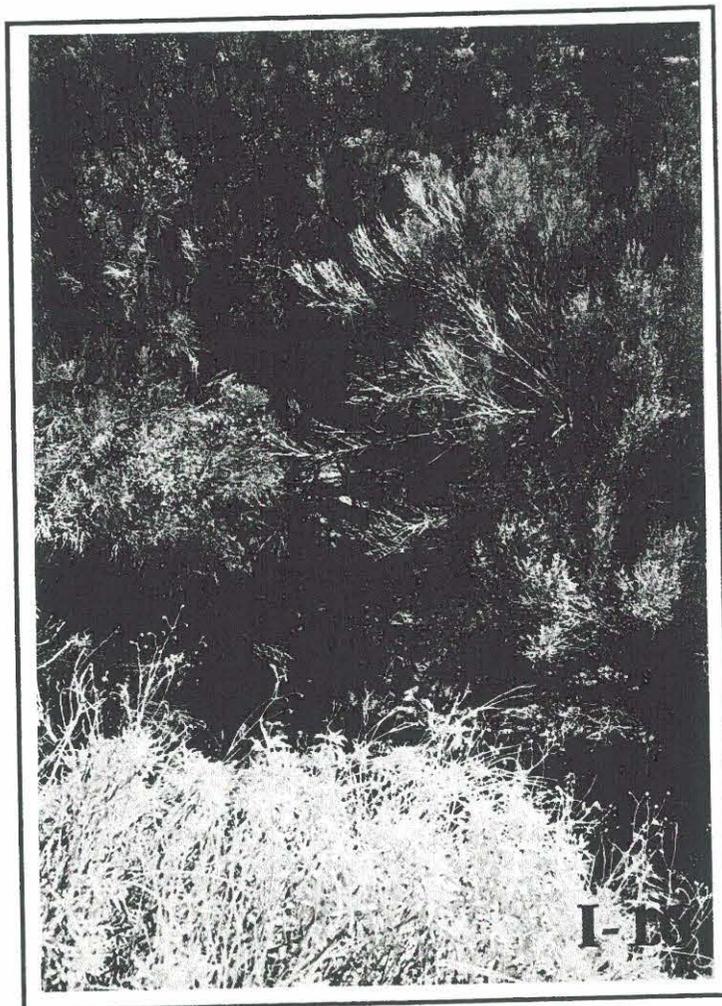
DESIGNED	HAA	DATE	11/96
DRAWN	JDS	DATE	11/96
CHECKED	SEK	DATE	11/96



## Site 25: Malta Drain

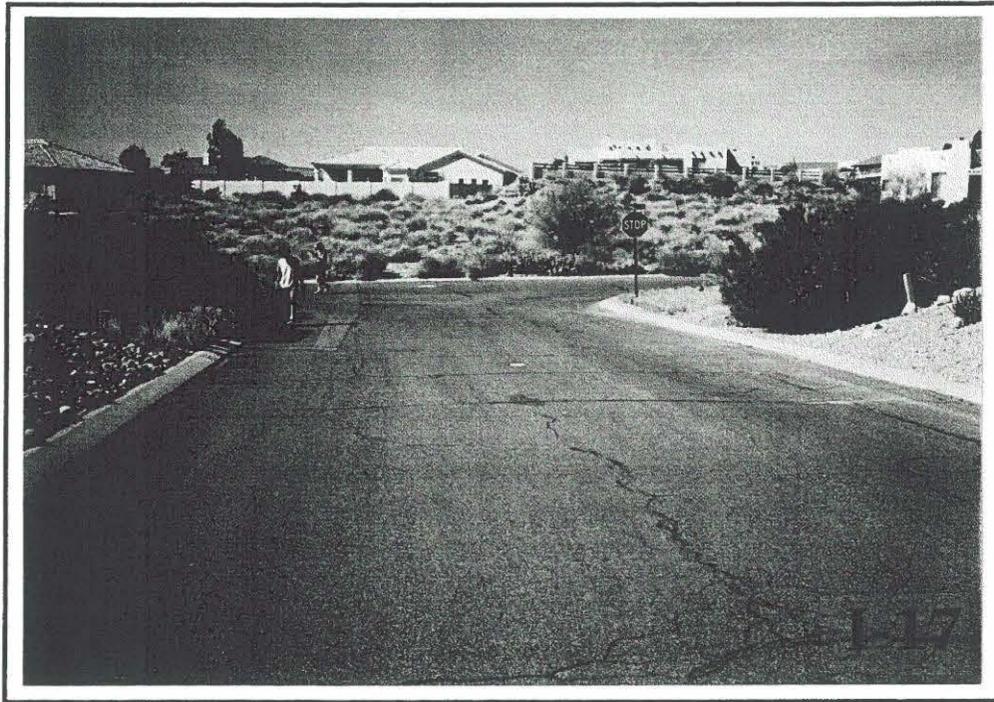


Malta Drain Inlet Chute  
*Looking Downstream from Hawk Dr.*

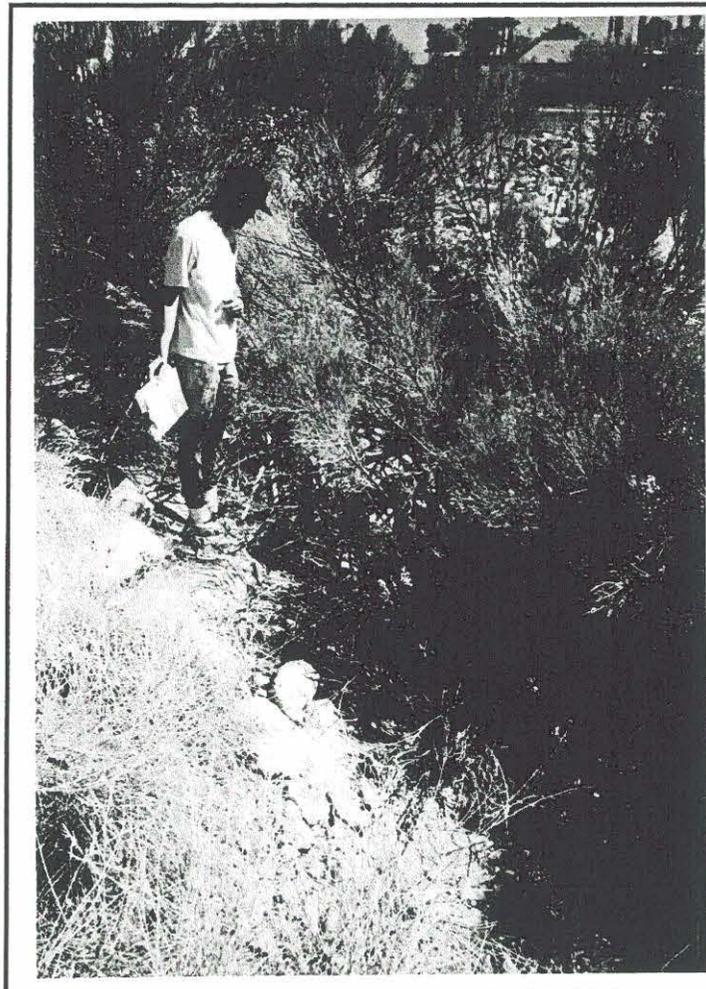


Malta Drain 200' South of Hawk Dr.  
*Looking Downstream*

**Site 25: Malta Drain (Cont'd.)**



Nightingale Circle  
*Looking Southwest towards Malta Drain*



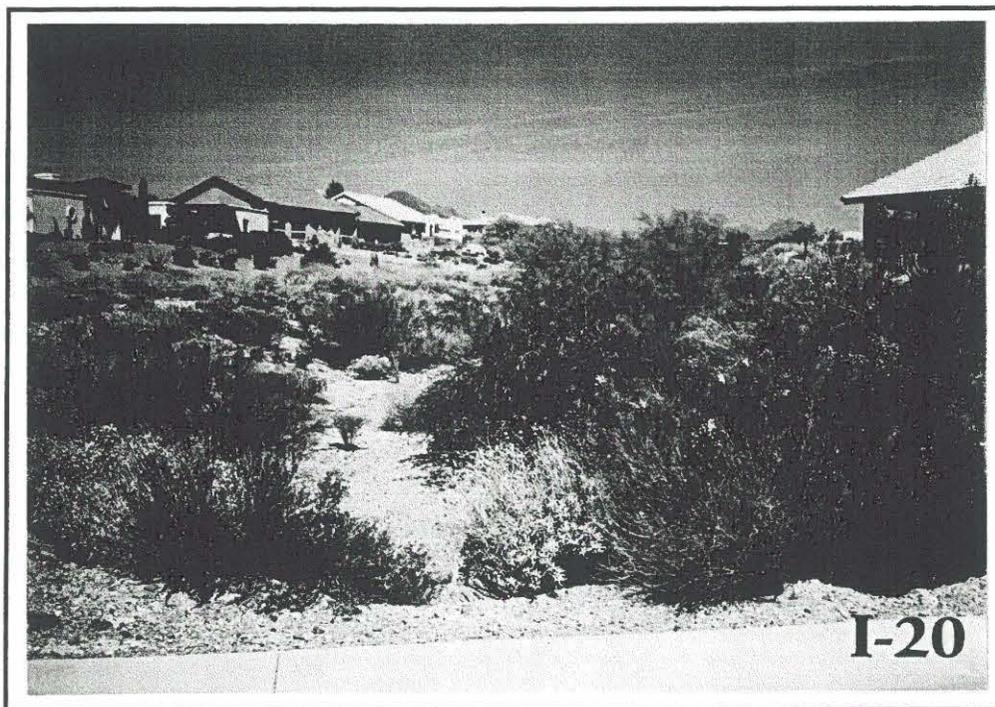
Malta Drain Culvert Outlet under Nightingale Cr.  
*Looking Upstream*

## Site 25: Malta Drain (Cont'd.)



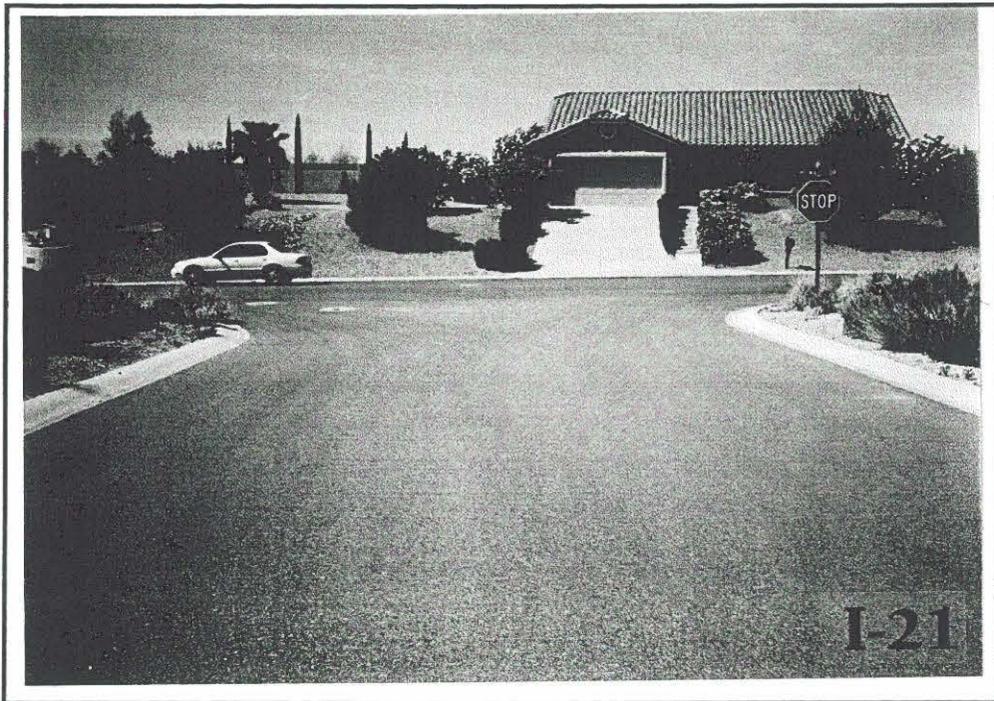
Oasis Dr.

*Looking Southwest toward Malta Drain*

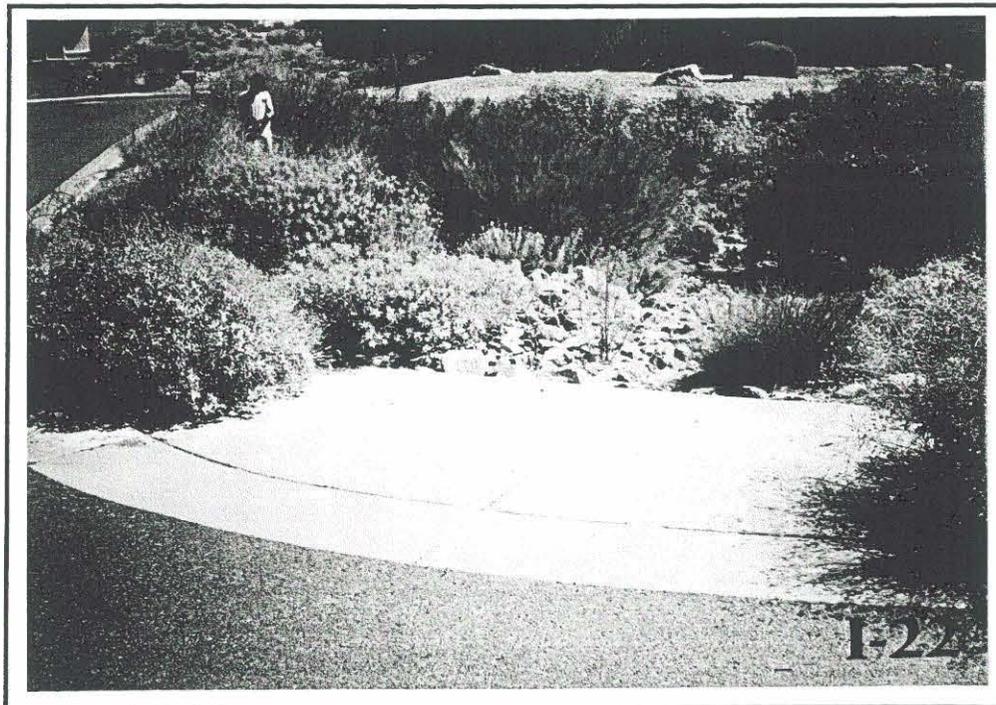


Malta Drain at Downridge Ct.  
*Looking Upstream from Downridge Ct.*

## Site 25: Malta Drain (Cont'd.)

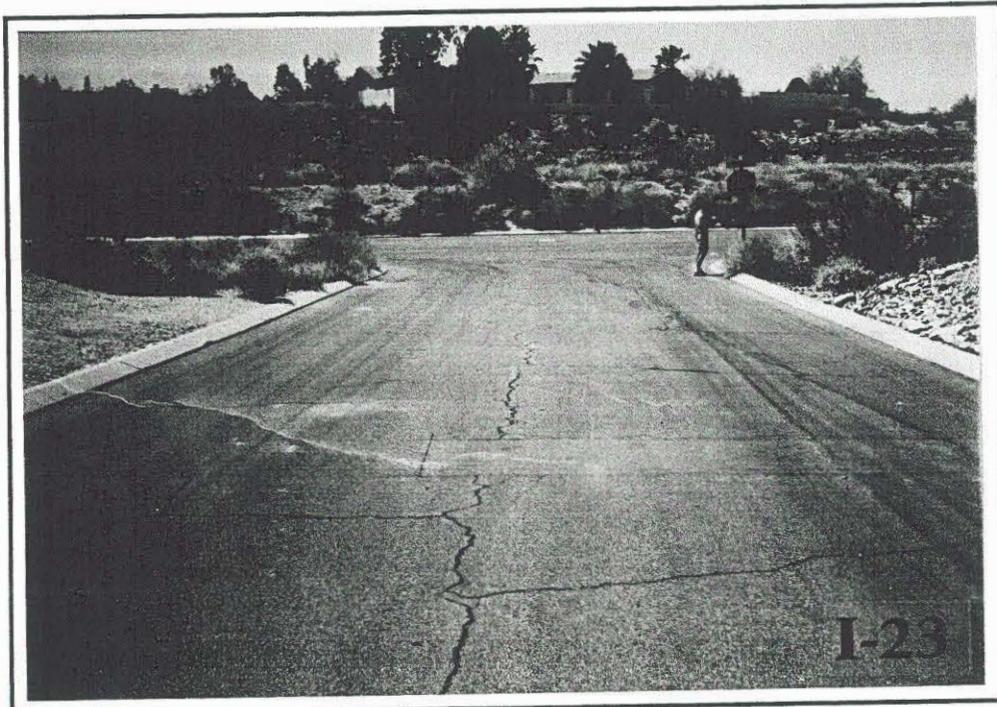


Downridge Ct.  
*Looking Southwest toward Malta Drain*

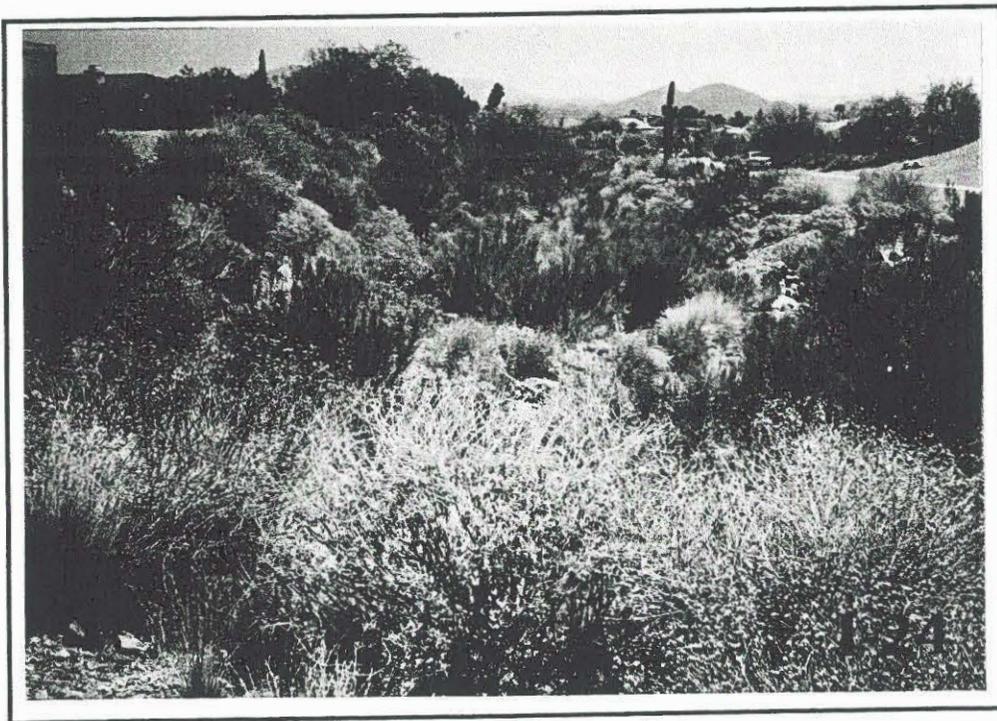


Malta Dr. Spillway  
*Looking East into Malta Drain from Malta Dr.*

**Site 25: Malta Drain (Cont'd.)**

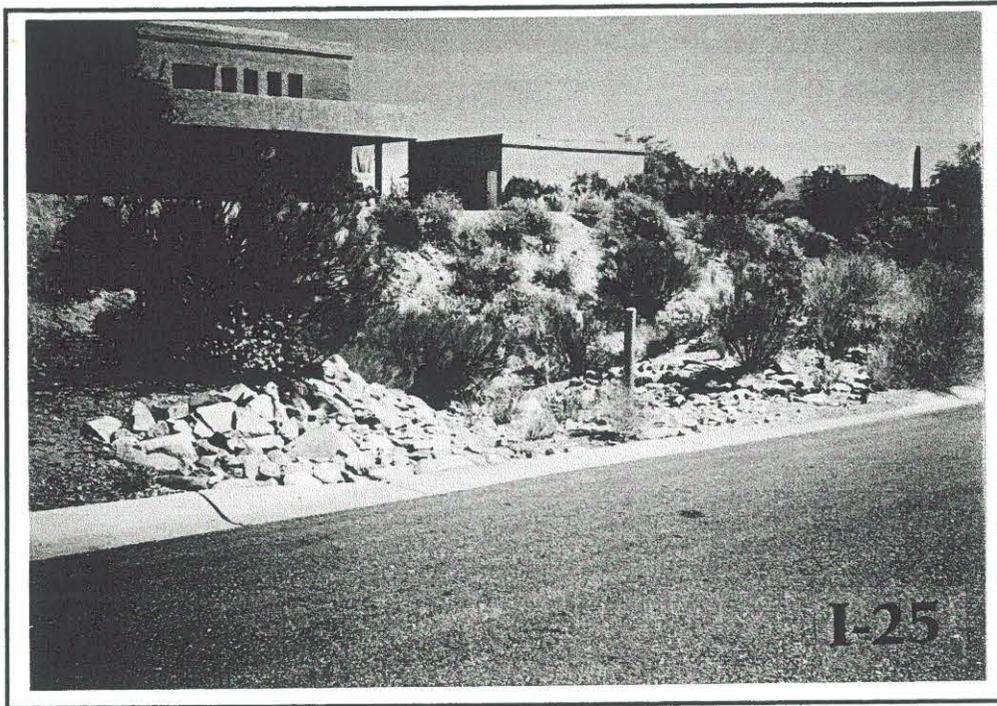


Mission Bell Ct.  
*Looking South toward Malta Drain*

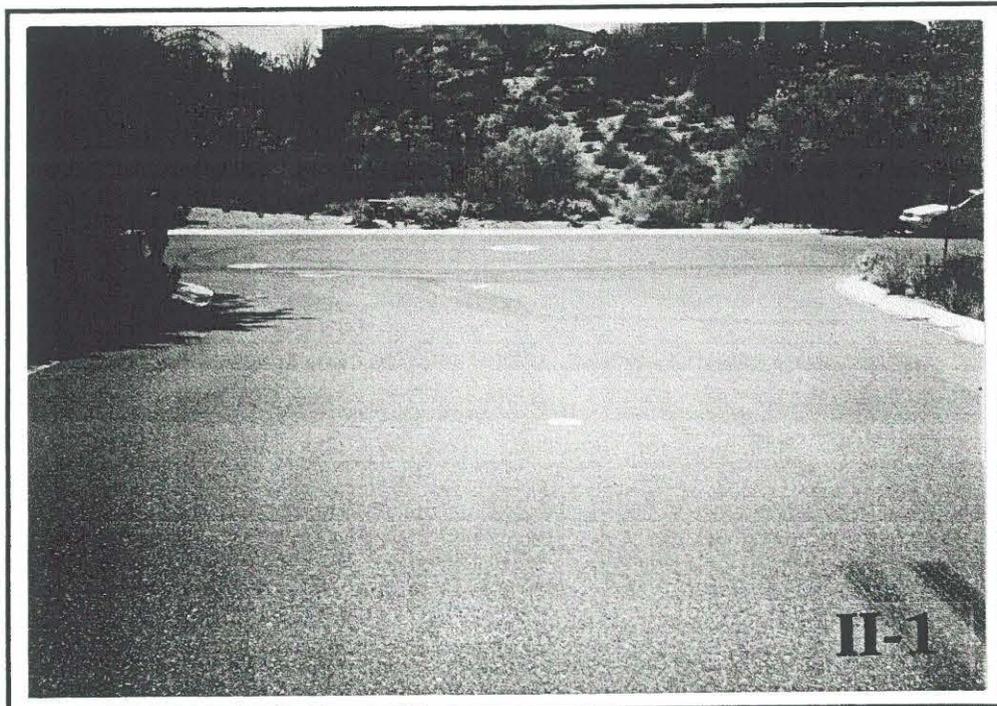


Malta Drain at Mission Bell Ct.  
*Looking Downstream from Mission Bell Ct.*

## Site 25: Malta Drain (Cont'd.)

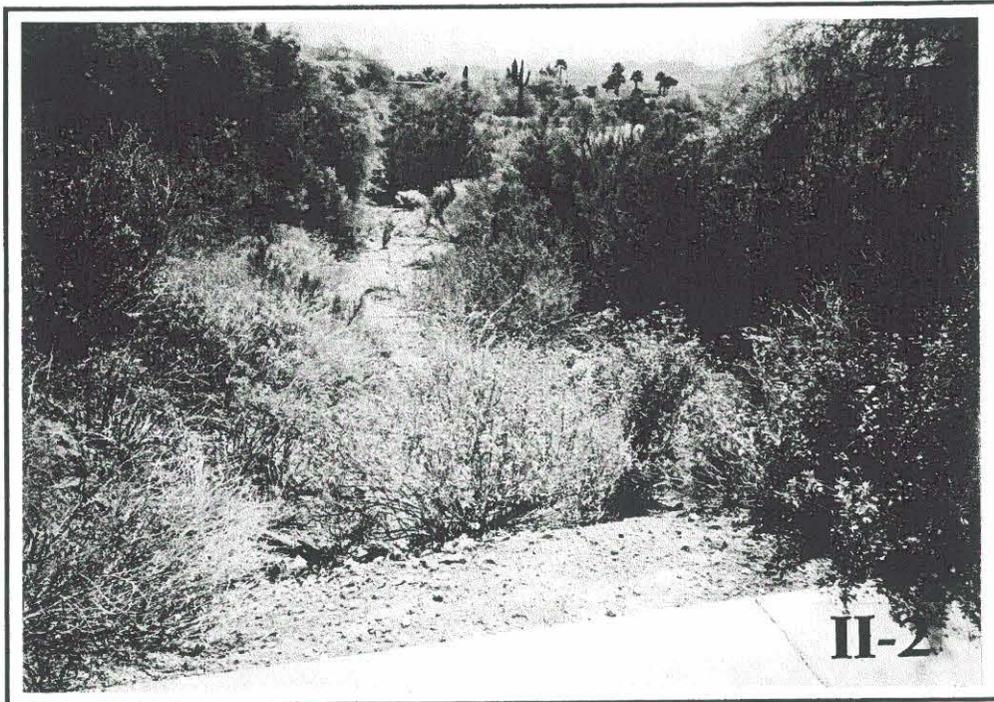


Malta Dr. Spillway  
*Looking North into Malta Drain from Malta Dr.*

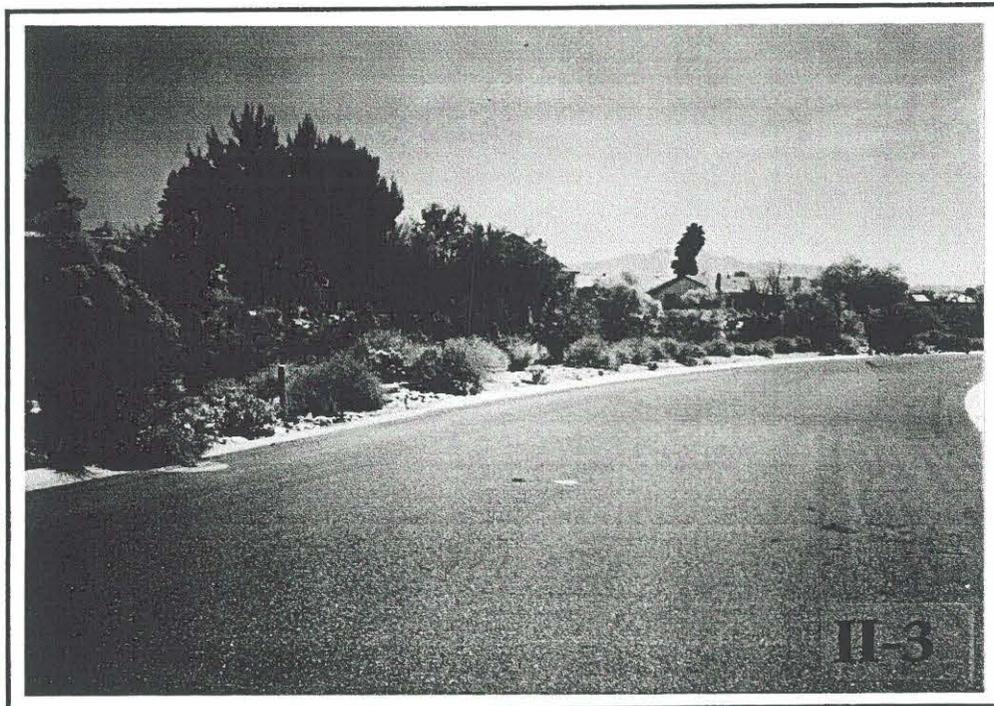


Quinto Dr.  
*Looking South toward Malta Drain*

Site 25: Malta Drain (Cont'd.)



Malta Drain at Quinto Dr.  
*Looking Downstream from Quinto Dr.*



Malta Drain Spillways (2)  
*Looking Northeast from Malta Dr.*









## Field Reconnaissance Sheet

 Site No.: 25

 Roadway: QUINTO Dr.

Name of Drainageway	Q <sub>100, FIS</sub> [cfs]	Q <sub>100, Design</sub> [cfs]	Description of Structure
Malta Drain	366	378	18" arch CMP

 Reason for Analysis / Existing Deficiency: Historical overtopping of road, spilling into Malta Dr.

### Design Constraints and Considerations:

- 1) Available head, approximately: Upstream: 3 ft. Downstream: 3 ft.
- 2) Can the culvert be lowered:
 

Upstream?	<input checked="" type="checkbox"/> Yes, <u>at least</u> ft.	<input type="checkbox"/> No
Downstream?	<input checked="" type="checkbox"/> Yes, <u>down</u> ft.	<input type="checkbox"/> No
- 3) Is there any erosion visible:
 

Upstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No
Downstream?	<input type="checkbox"/> Yes, _____ ft.	<input checked="" type="checkbox"/> No

### Structure Modification Constraints:

 4) Utilities: 8" ~~water~~ sewer line crossing drain  
6" water line crossing drain  
Electrical J-Box - NW corner

 5) Structures: Intersection of Quinto & Malta  
2 spillways downstream of Quinto

 6) Right-of-Way: \_\_\_\_\_  
 \_\_\_\_\_

 7) Miscellaneous field notes, comments, or design ideas:  
- Floodways seem to be best option  
- Shallow channel downstream of Quinto  
- extra barrel possible  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# ALTERNATE 1

**MALTA DRAIN @ NIGHTINGALE CR. (1-10'X3'RCB)**

CURRENT DATE: 01-31-1997

CURRENT TIME: 14:49:31

FILE DATE: 07-11-1996

FILE NAME: STR11AB3

FHWA CULVERT ANALYSIS  
HY-8, VERSION 4.1

C U L V	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	1606.74	1605.98	47.01	1 RCB	10.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

## SUMMARY OF CULVERT FLOWS (CFS)

FILE: STR11AB3

DATE: 07-11-1996

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1606.74	0	0	0	0	0	0	0	0	1
1607.90	38	38	0	0	0	0	0	0	1
1608.59	76	76	0	0	0	0	0	0	1
1609.18	114	114	0	0	0	0	0	0	1
1609.73	152	152	0	0	0	0	0	0	1
1610.31	190	190	0	0	0	0	0	0	1
1610.97	228	228	0	0	0	0	0	0	1
1611.74	266	266	0	0	0	0	0	0	1
1612.64	304	304	0	0	0	0	0	0	1
1613.66	342	342	0	0	0	0	0	0	1
1614.83	380	380	0	0	0	0	0	0	1
1615.84	410	410	0	0	0	0	0	0	OVERTOPPING

## SUMMARY OF ITERATIVE SOLUTION ERRORS

FILE: STR11AB3

DATE: 07-11-1996

HEAD ELEV (FT)	HEAD ERROR (FT)	TOTAL FLOW (CFS)	FLOW ERROR (CFS)	% FLOW ERROR
1606.74	0.00	0	0	0.00
1607.90	0.00	38	0	0.00
1608.59	0.00	76	0	0.00
1609.18	0.00	114	0	0.00
1609.73	0.00	152	0	0.00
1610.31	0.00	190	0	0.00
1610.97	0.00	228	0	0.00
1611.74	0.00	266	0	0.00
1612.64	0.00	304	0	0.00
1613.66	0.00	342	0	0.00
1614.83	0.00	380	0	0.00

&lt;1&gt; TOLERANCE (FT) = 0.010

&lt;2&gt; TOLERANCE (%) = 1.000

**Conclusions:** 10-yr ok. 100-yr no overtopping



CURRENT DATE: 01-31-1997  
 CURRENT TIME: 14:49:31

FILE DATE: 07-11-1996  
 FILE NAME: STR11AB3

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TAILWATER

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\*\*\*\*\* REGULAR CHANNEL CROSS SECTION \*\*\*\*\*  
 BOTTOM WIDTH (FT) 10.00  
 SIDE SLOPE H/V (X:1) 2.0  
 CHANNEL SLOPE V/H (FT/FT) 0.024  
 MANNING'S N (.01-0.1) 0.045  
 CHANNEL INVERT ELEVATION (FT) 1605.98  
 CULVERT NO.1 OUTLET INVERT ELEVATION 1605.98 FT

\*\*\*\*\* UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	1605.98	0.000	0.00	0.00	0.00
38.00	1606.79	0.791	0.81	4.04	1.24
76.00	1607.19	0.814	1.21	5.07	1.84
114.00	1607.50	0.825	1.52	5.77	2.32
152.00	1607.76	0.832	1.78	6.30	2.72
190.00	1607.99	0.836	2.01	6.73	3.08
228.00	1608.20	0.839	2.22	7.10	3.40
266.00	1608.40	0.842	2.42	7.43	3.69
304.00	1608.57	0.844	2.59	7.72	3.97
342.00	1608.74	0.846	2.76	7.98	4.22
380.00	1608.90	0.848	2.92	8.22	4.46

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ROADWAY OVERTOPPING DATA

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WEIR COEFFICIENT	3.00
EMBANKMENT TOP WIDTH (FT)	31.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	1615.84

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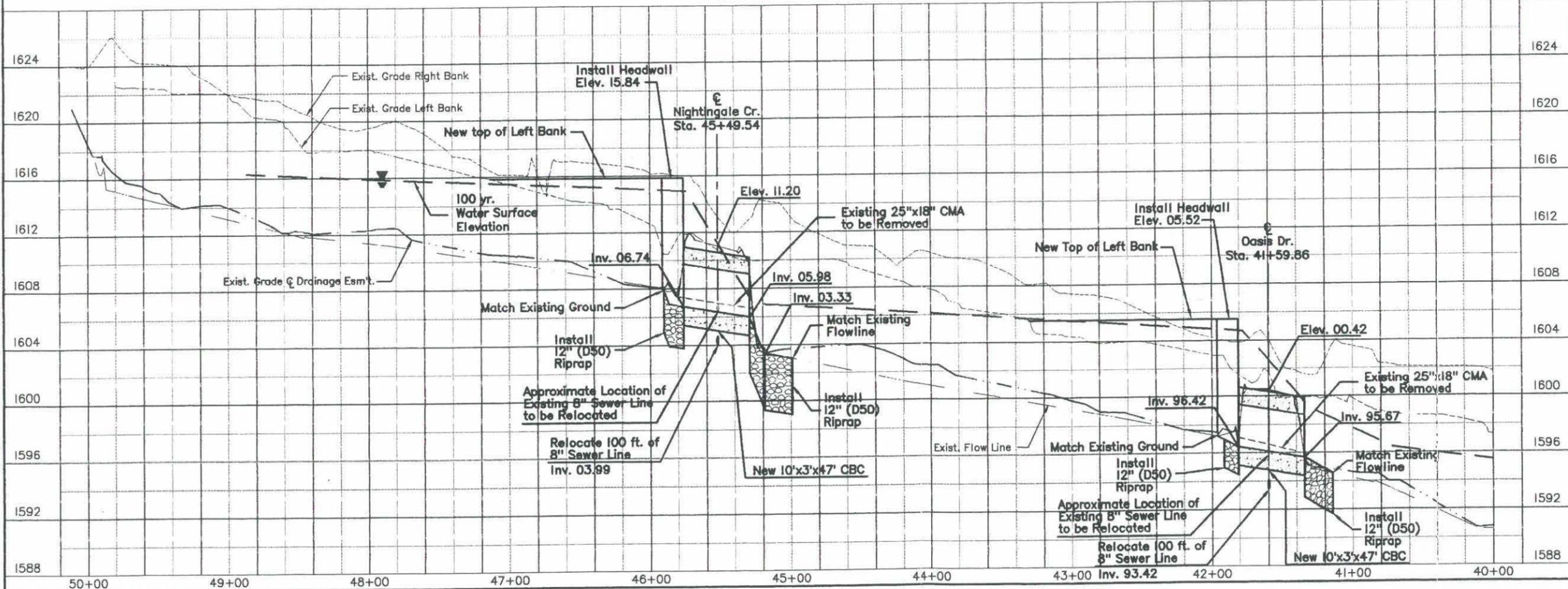
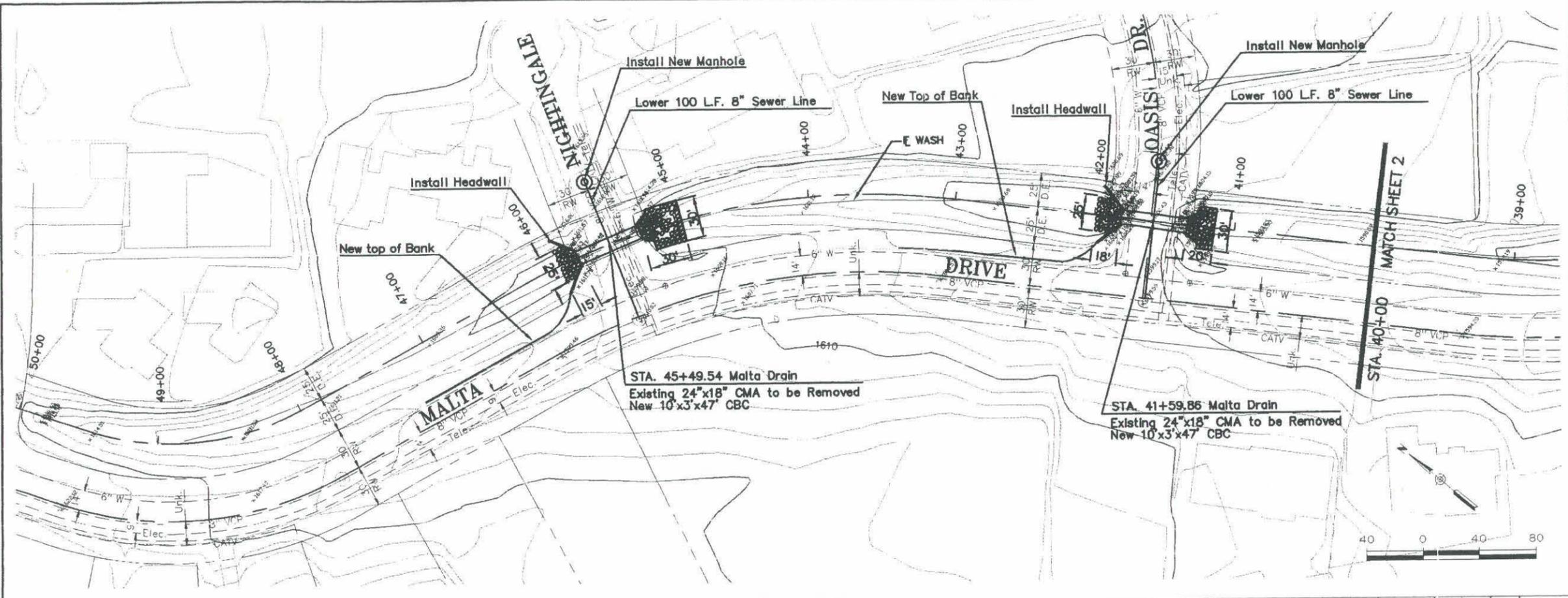
**ELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Malta Drain  
 ADMP- 25, Alternative 1: Install 1-10'x3'x47 CBC

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Clearing And Grubbing (1%)	L.SUM	\$313.00	1	\$313
2020029	Removal of A.C. Pavement	SQ.YD.	\$1.40	93	\$130
2020020	Removal of Concrete Curb	LFT.	\$2.00	56	\$112
2020055	Removal and Savage (48" C.M.P.)	L.FT.	\$19.00	47	\$893
2020201	Saw Cutting	L.FT.	\$5.00	60	\$300
2030401	Drainage Excavation	CU.YD.	\$5.00	30	\$150
2030501	Structural Excavation	CU.YD.	\$8.00	272	\$2,176
2030506	Structural Backfill	CU.YD.	\$25.00	93	\$2,325
2030902	Borrow (Channel Bank)	CU.YD.	\$8.00	45	\$360
2050001	Grading For Pavement	SQ. YD.	\$2.50	93	\$233
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
3030022	Aggregate Base, Class 2	CU.YD.	\$35.00	16	\$560
4090003	Asphaltic Concrete (Miscellaneous Structural)	TON	\$45.00	11	\$495
6010002	Structural Concrete (Class S)(F'C = 3000)	CU.YD.	\$150.00	79	\$11,850
6050002	Reinforcing Steel	LB.	\$0.50	9565	\$4,783
7010001	Maintenance and Protection of Traffic 4%	L.SUM	\$1,254.00	1	\$1,254
7010006	Furnish And Install Temporary Traffic Control Devices	L.SUM	\$400.00	1	\$400
9010001	Mobilization (10%)	L.SUM	\$3,135.00	1	\$3,135
9080140	Concrete Gutter	L.FT.	\$10.00	60	\$600
9130003	Riprap (Grouted)	CU.YD.	\$80.00	45	\$3,600
9130008	Riprap (Dumped) (12" Dia., D50)	CU.YD.	\$64.00	37	\$2,368
9240170	Contractor Quality Control (2%)	L.SUM	\$627.00	1	\$627
9250001	Construction Surveying and Layout (2%)	L.SUM	\$627.00	1	\$627
Sub-Total					\$37,390
Engineering and Contingencies (20%)					\$7,480
<b>TOTAL PER CROSSING</b>					<b>\$44,870</b>
<b>TOTAL PER 5 CROSSINGS</b>					<b>\$224,351</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$225,000**



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1			
NO.	REVISIONS	BY	DATE

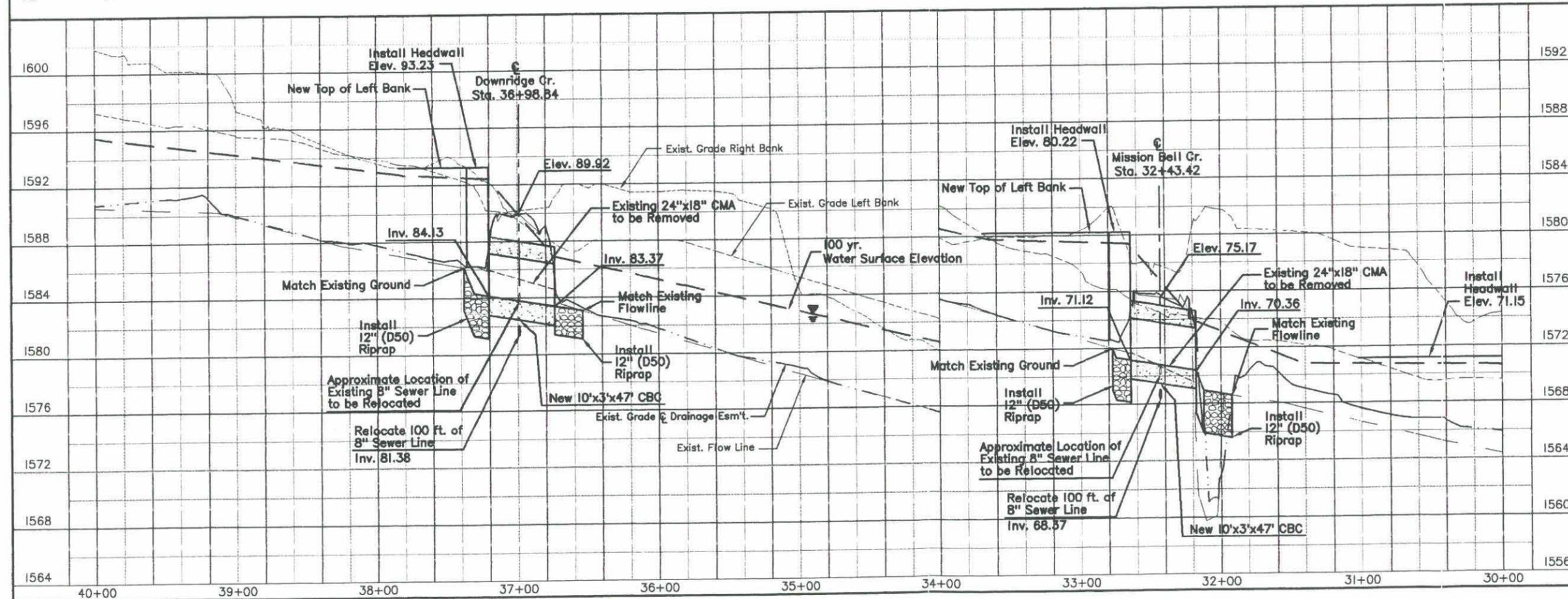
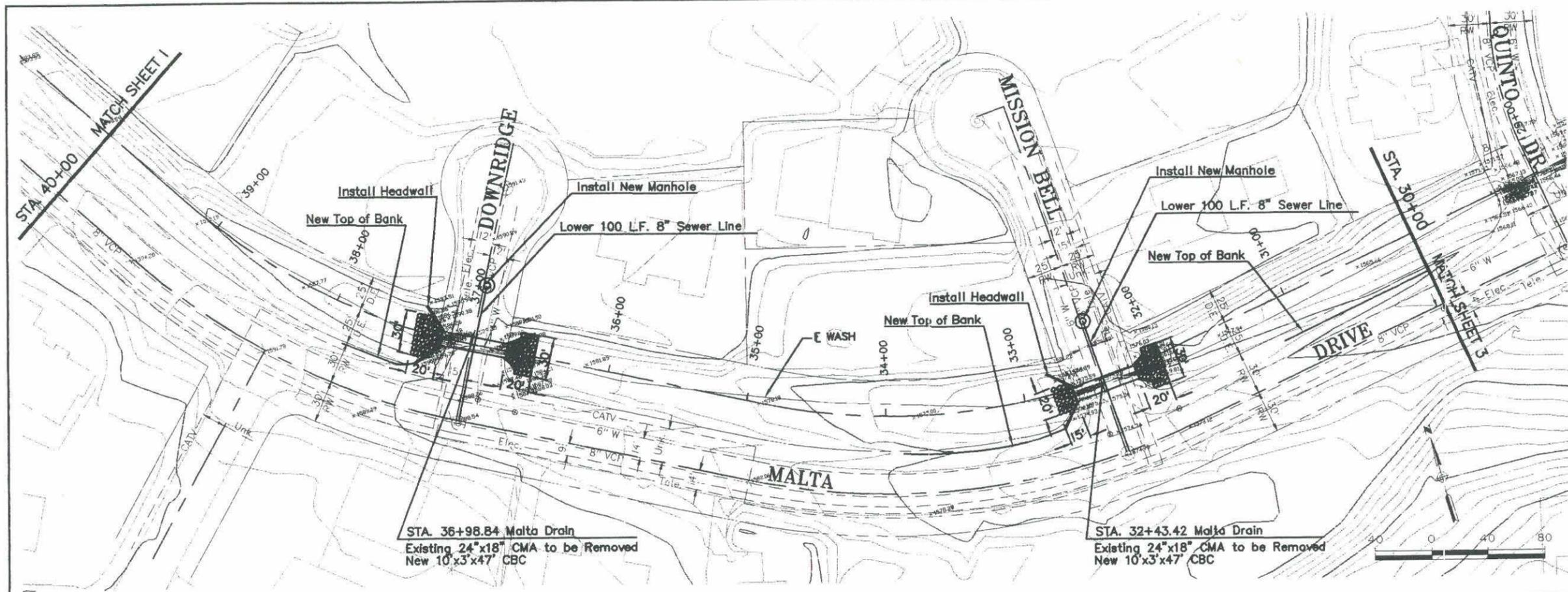
**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**  
 ENGINEERING DIVISION  
**FOUNTAIN HILLS ADMP**  
**MALTA DRAIN STA. 40+00 - STA. 50+00**  
**FCD PROJECT NO. 94-16**

DESIGNED	HAA	DATE	11/96
DRAWN	JDS	DATE	11/96
CHECKED	SEK	DATE	11/96

**Entellus**  
225 N. 4th Street Suite 200  
 Phoenix, AZ 85004-2200  
 Tel: 602.944.2200  
 Fax: 602.944.2201

**PLAN AND PROFILE SHEET**  
 ADMP 25

SHEET OF  
**1 3**



REVISIONS		BY	DATE
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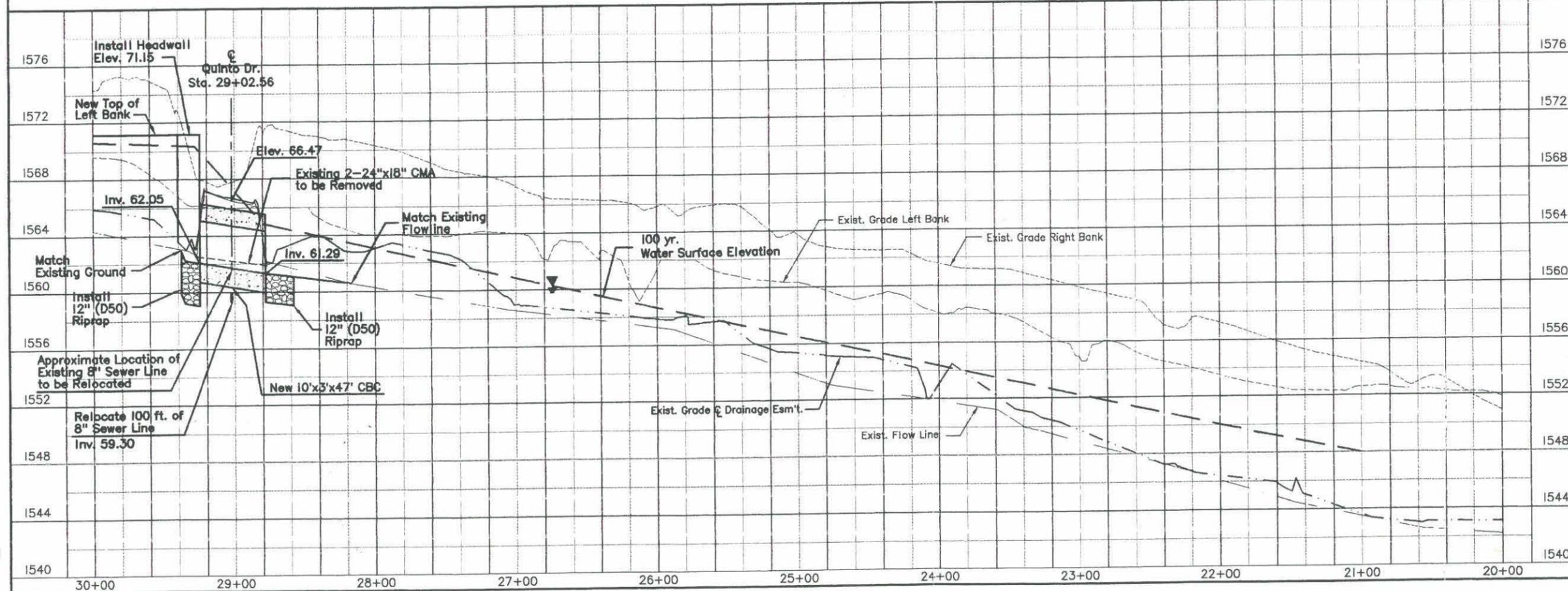
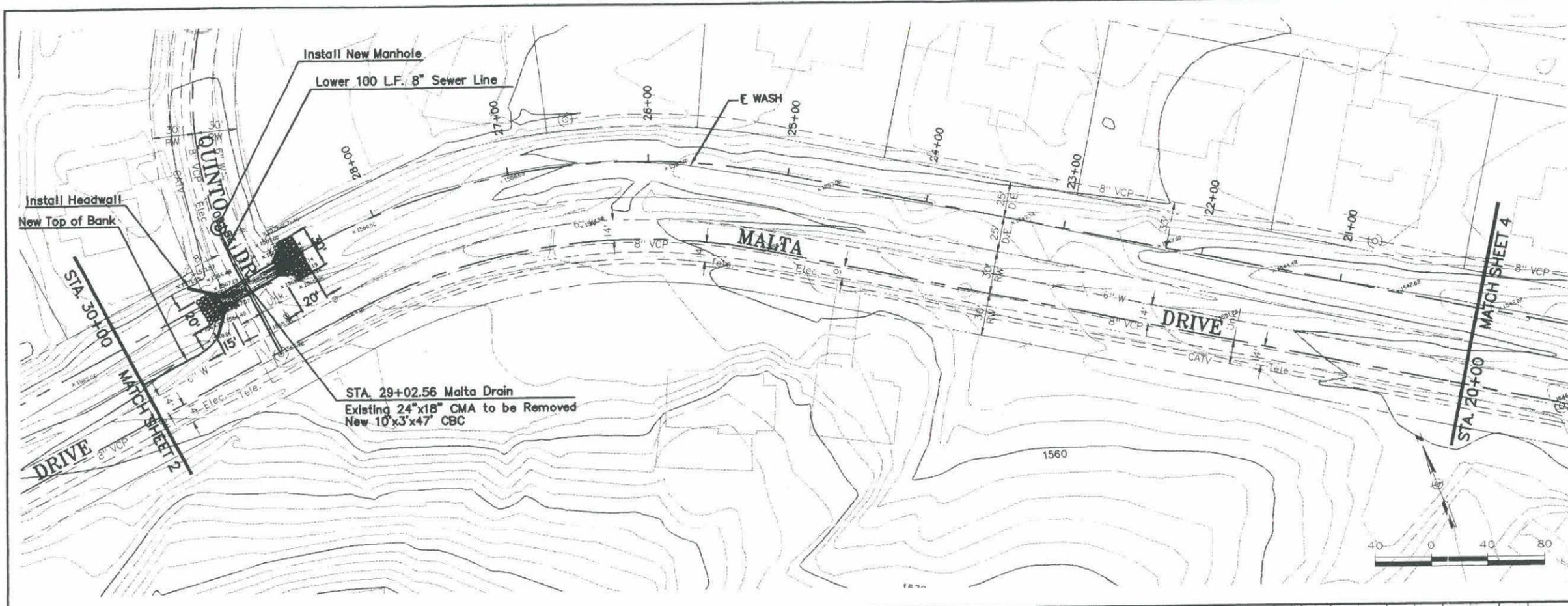
**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**  
 ENGINEERING DIVISION  
**FOUNTAIN HILLS ADMP**  
**MALTA DRAIN STA. 30+00 - STA. 40+00**  
**FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96


**Entellus**  
2505 N. 44th Street Suite 200  
 Phoenix, AZ 85018-2279  
 Tel: 602.944.2200  
 Fax: 602.944.2207

**PLAN AND PROFILE SHEET**  
 ADMP 25

SHEET OF  
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NO.	REVISIONS	BY	DATE
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**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY**  
 ENGINEERING DIVISION  
**FOUNTAIN HILLS ADMP**  
**MALTA DRAIN STA 30+00 – STA. 20+00**  
**FCD PROJECT NO. 94-16**

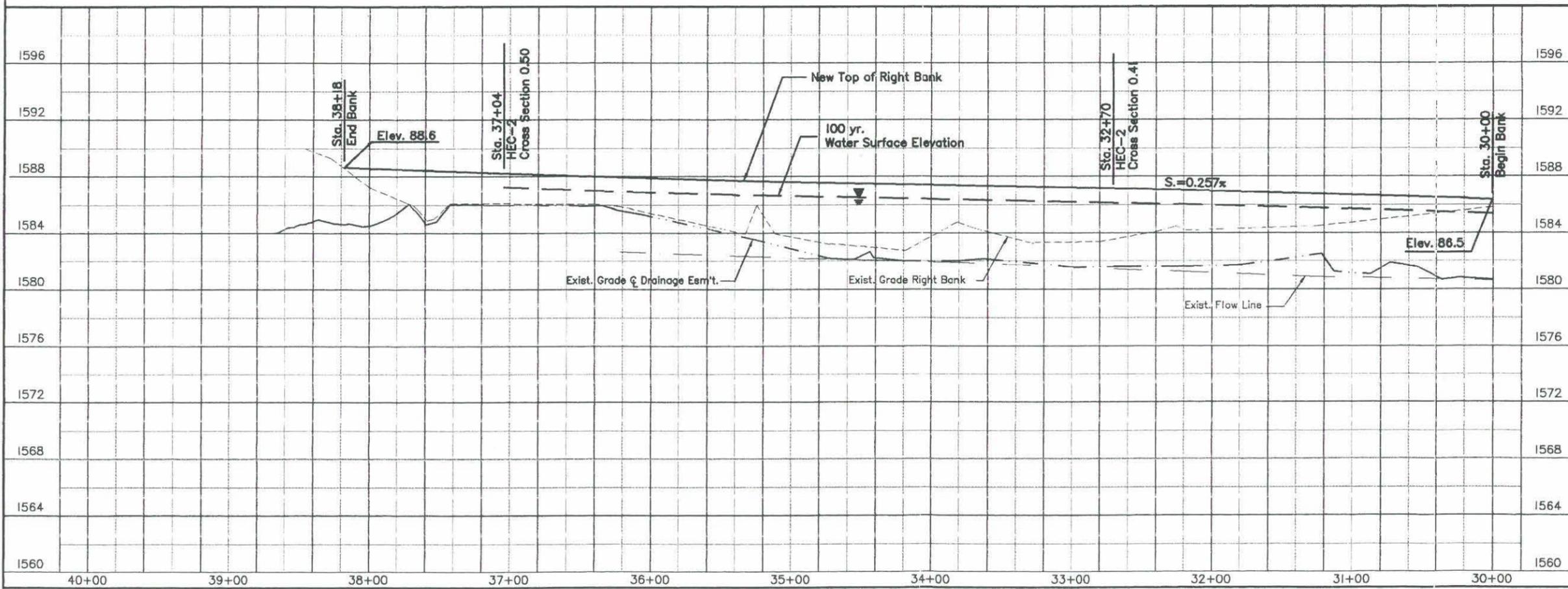
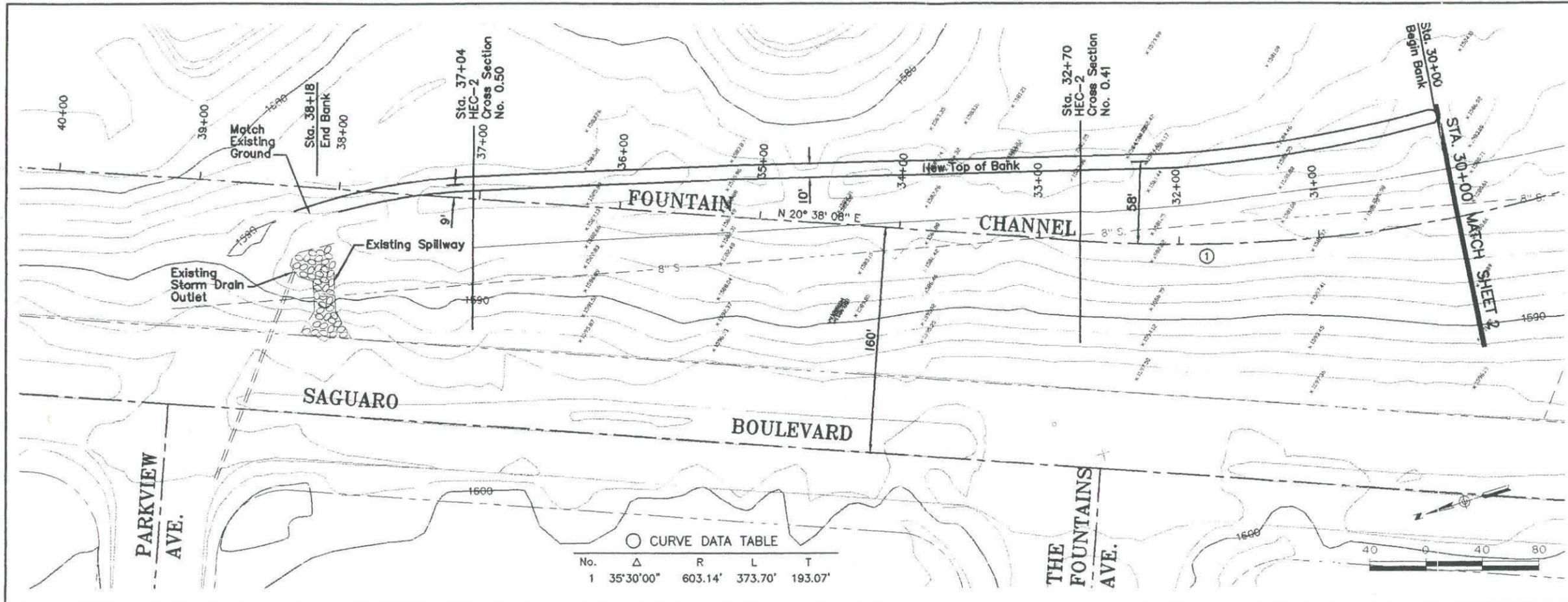
	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96


**Entellus**  
2500 N. 44th Street Suite 100  
 Phoenix, AZ 85018-2070  
 Tel: 602.944.0000  
 Fax: 602.944.0007

**PLAN AND PROFILE SHEET**  
 ADMP 25

SHEET OF  
**3 3**

# ALTERNATE 1



NO.	REVISIONS	BY	DATE
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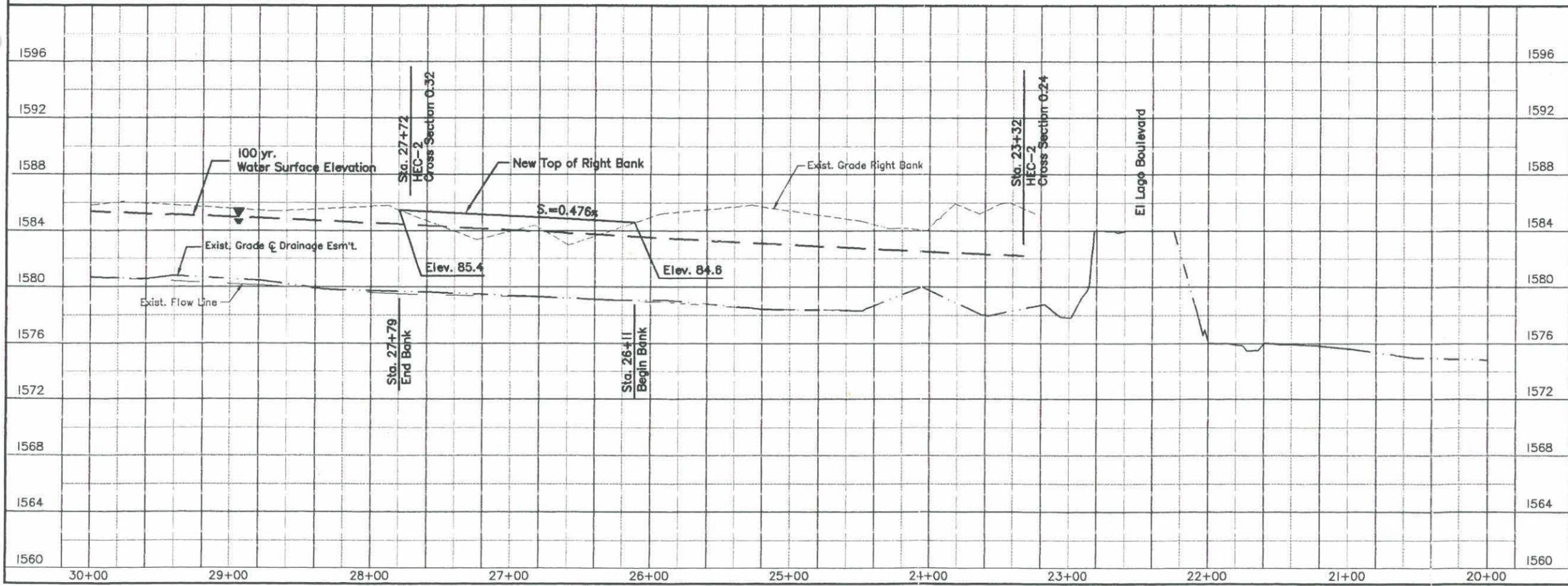
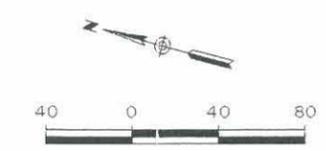
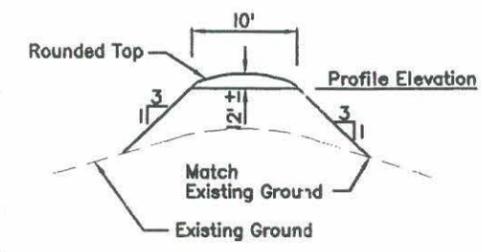
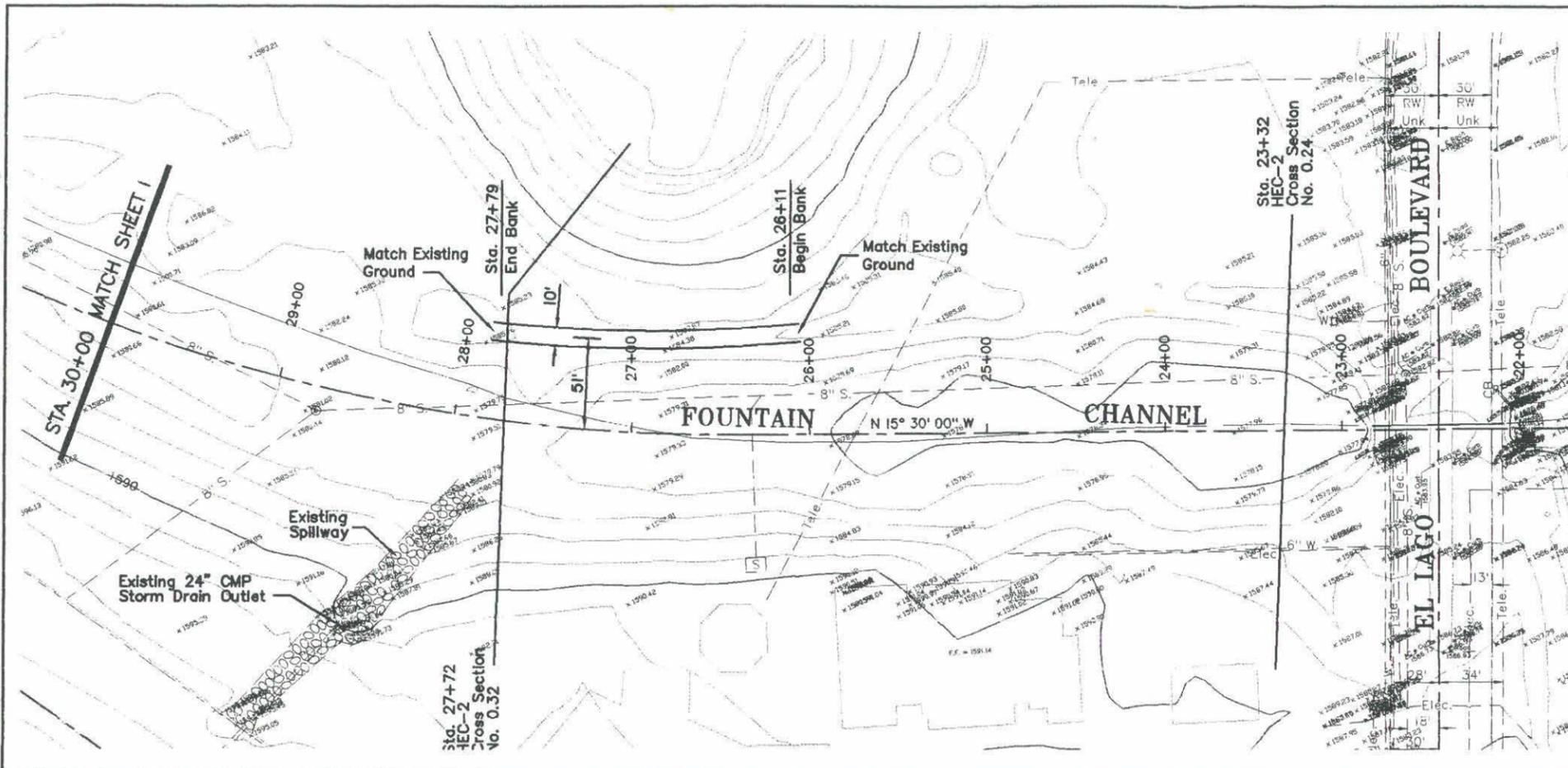
**FLOOD CONTROL DISTRICT  
 OF MARICOPA COUNTY  
 ENGINEERING DIVISION  
 FOUNTAIN HILLS ADMP  
 FOUNTAIN CHANNEL STA. 30+00-STA. 40+00  
 FCD PROJECT NO. 94-16**

	BY	DATE
DESIGNED	HAA	11/96
DRAWN	JDS	11/96
CHECKED	SEK	11/96

**Entellus**  
2005 N. 44th Street Suite 200  
 Phoenix, AZ 85018  
 Tel: 602.954.2000  
 Fax: 602.954.2001

**PLAN AND PROFILE SHEET**  
 ADMP 26

SHEET OF  
**1 2**



3			
2			
1			
NO.	REVISIONS	BY	DATE
<b>FLOOD CONTROL DISTRICT OF MARICOPA COUNTY</b> ENGINEERING DIVISION <b>FOUNTAIN HILLS ADMP</b> <b>FOUNTAIN CHANNEL STA. 20+00-STA. 30+00</b> <b>FCD PROJECT NO. 94-16</b>			
	DESIGNED	HAA	11/96
	DRAWN	JDS	11/96
	CHECKED	SEK	11/96
	BY		DATE
	Entellus <sup>®</sup>		
	3205 N. 44th Street, Suite 200		
	Phoenix, AZ 85018-2270		
	Tel: 602.964.2000		
	Fax: 602.964.2007		
PLAN AND PROFILE SHEET			SHEET OF
ADMP 26			2 2

**.ELIMINARY DETAILED COST ESTIMATE - 30%**

Contract No.: FCDMC 94-16  
 Project Name: FOUNTAIN HILLS ADMP  
 Project Location: Fountain Hills, Arizona  
 Fountain Channel  
 ADMP- 26, Alternative 1

ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	AMOUNT
2010001	Site Preparation	ACRE	\$4,000.00	1.5	\$6,000
2030902	Borrow (Channel Bank)	CU.YD.	\$8.00	877	\$7,016
2070001	Dust Palliative	M.GAL.	\$100.00	1	\$100
8050003	Seeding (class II)	ACRE	\$4,000.00	1.5	\$6,000
9010001	Mobilization (10%)	L.SUM	\$1,312.00	1	\$1,312
9240170	Contractor Quality Control (2%)	L.SUM	\$262.00	1	\$262
9250001	Construction Surveying and Layout (2%)	L.SUM	\$262.00	1	\$262
Sub-Total					\$20,952
Engineering and Contingencies (20%)					\$4,190
<b>TOTAL</b>					<b>\$25,142</b>

**TOTAL FUNDING REQUIRED FOR ALTERNATIVE**

**\$26,000**