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CONSTRUCTION SERVICES
ENGINEERING · PLANNING
SURVEYING

GUADALUPE PRE-DESIGN STUDY

FINAL REPORT

Prepared for:

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

CONTRACT NO. 94-17

Prepared By:

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May 1996

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Executive Summary

The purpose of this pre-design study is to document the drainage conditions in the Town of Guadalupe and to propose a solution(s) to alleviate the negative impacts of moderate to heavy rainfall events. Guadalupe is located in eastern Maricopa County between Phoenix and Tempe near the I-10 and U.S. 60 Interchange. This report documents that the Town experiences severe flooding during storm events with significant runoff (>2-yr.) and it also documents a proposed solution to the problem.

In recent years drainage improvements west of U.S. Interstate Highway 10 (I-10) made by the Soil Conservation Service(SCS) and others have diverted the storm runoff from the foothills of South Mountain away from the Town. More recently drainage improvements to I-10 by the Arizona Department of Transportation (ADOT) have diverted the freeway runoff away from the Town. So in terms of the severity of flooding, the plight of the Town is much improved. Severity of flooding is defined as both the depth of flow and the volume of runoff. However, the frequency of flooding and the negative impacts associated with it have decreased very little. This is true because the Town lacks infrastructure. It is built on the lower reaches of a mountain slope which has no runoff collection and conveyance features , natural or man-made. Few streets have curb and gutter. Often the homes, some of which have earthen floors, are lower than the streets so that the lots themselves become the avenues of conveyance rather than the streets. During severe storm runoff many neighborhoods have homes with several inches to a foot of standing water inside.

The flooding in Guadalupe is aggravated by the lack of any significant drainage outfalls. Runoff flows north and east through the Town and ponds behind the Highline Canal (North Branch). The water continues to pond until it overtops the canal banks and flows into the canal, but the water trapped behind the banks remains for days.

There are three possible outfalls for the Town's runoff: the City of Tempe, Salt River Project's (SRP) Highline Canal and ADOT's I-10 drainage system. The City of Tempe doesn't want to accept any of the runoff and indeed their storm drain system lacks capacity beyond the City's own needs. Tempe's system could accommodate the release of detained water after the stormwater runoff has subsided, but the issue of acceptance appears to be one of quality as well as quantity. The Salt River Project, which operates the Highline Canal, has offered to allow a bleed-off rate of five cubic feet per second (cfs). At that rate it would take seven days to drain the runoff from a 100-year storm event. Negotiations are currently underway between SRP and the District to allow the use of the Highline Canal right-of-way for the construction of collector channels. ADOT is amenable to helping but has just completed the construction of a storm drain system which drains into detention basins in the I-10 and U.S. 60 traffic interchange. The entire basin system has an allowable 100-year discharge rate of only 15 cfs. This system was evaluated for this report and it was determined that the allowable bleed-off rate into the ADOT system may be as high as 15 cfs. The system was modeled using the HEC-1 file prepared by Stanley and Assoc. to model the ADOT system and modified to include the watershed which drains to Basin A, the basin itself and a gravity bleed-off via a 24" pipe. The modeling is described in more detail in Section 5.5 and the computer output is included in the Appendix.

The Flood Control District of Maricopa County generally participates in projects of regional significance to build structures and facilities for large storm events. This participation rarely includes infrastructure improvements. Infrastructure improvements would be meaningless in any case without a drainage outfall. The solution then is to construct a drainage outfall (s) in the form of detention basins which can then be bled off into either the Highline Canal or ADOT's I-10 storm drain. After the creation of a drainage outfall(s) then the Town can add drainage infrastructure as funds become available.

The estimated costs of the preferred alternative are about $1.3 million for construction and about $3.7 million for right-of-way acquisition. There are some factors which possibly could reduce these figures substantially during the acquisition and pre-construction phases of this project. Section 7.0 of this report deals with this subject more thoroughly.

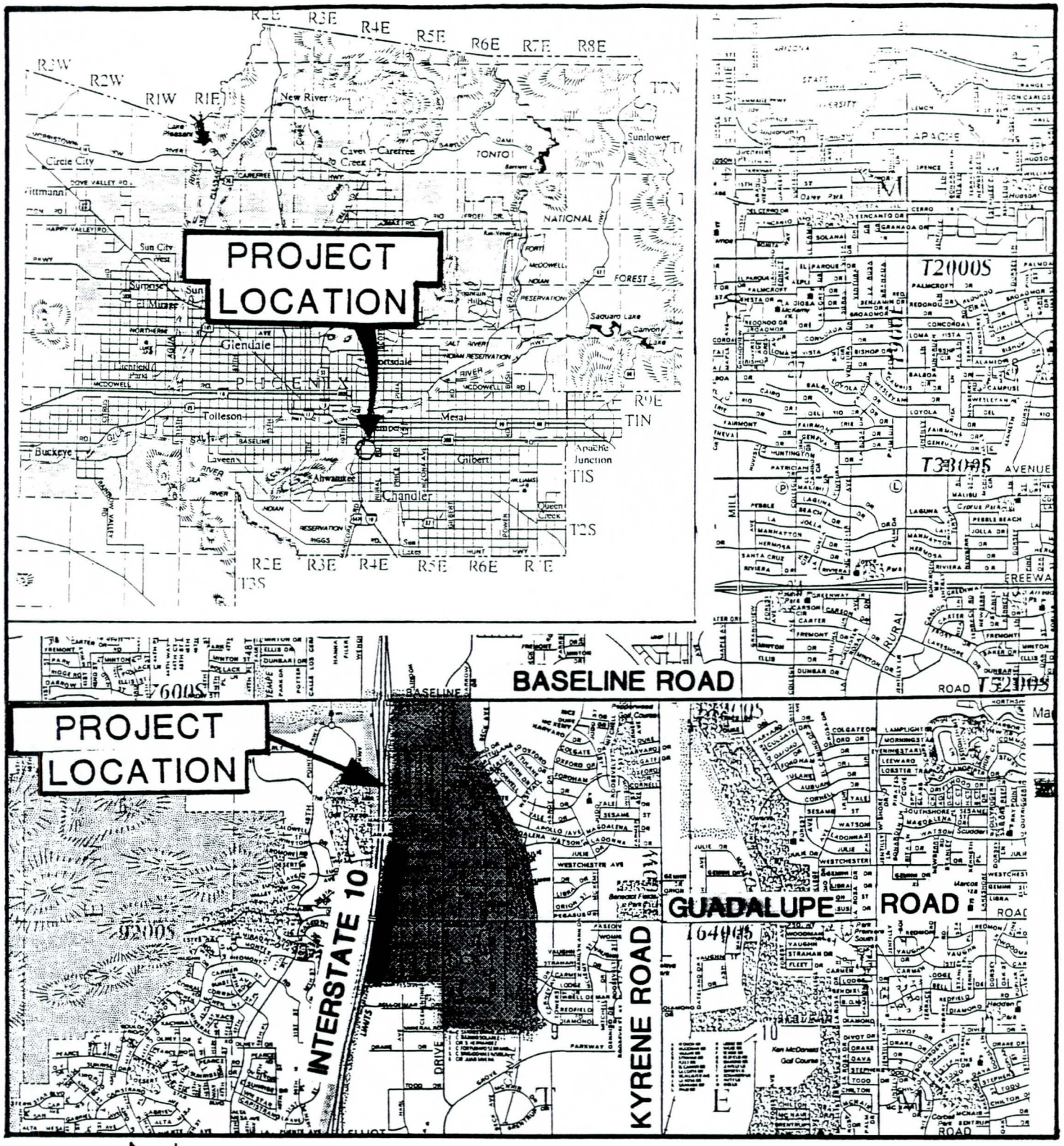
1.0 INTRODUCTION

Post, Buckley, Schuh & Jernigan, Inc. of Arizona was contracted by the Flood Control District of Maricopa County to conduct a pre-design study regarding the flooding problems in the Town of Guadalupe. The scope of work for the pre-design study consists of: conducting a hydrologic analysis of the existing conditions in the Town, computing runoff volumes, identifying flood prone areas, developing alternative solutions to flooding and locating possible outfall locations.

The Town of Guadalupe is a small "land-locked" community of almost three quarters of a square mile or about 465 acres. Guadalupe is between Tempe and Phoenix, between Baseline Road and Elliot Road. See the Vicinity Map, Figure 1. The hydrologic analysis involved modeling the Town's sub-watersheds for the 100-year, 6-hour and 24-hour storms and using the more severe of the two, in terms of runoff volumes, in the improvement alternatives analysis. Topographic mapping was provided by the District in the form of an aerial contour map with a four foot contour interval and was supplemented in selected locations by topographic ground surveys performed by the Consultant. Identification of flood prone areas was accomplished by utilizing the topographic maps and also by observation in the field during storm events with significant runoff.

2.0 HISTORY OF FLOODING

The Town as a whole is built on the lower slopes of the east end of the South Mountain Range. Historically the Town was subject to severe flooding from the runoff coming from the mountain slopes to the west. In recent years those mountain slopes, which are in the City of Phoenix, have been developed and the runoff has been channelized and contained so that no runoff enters the I-10 right-of-way.



VICINITY MAP

FIGURE 1

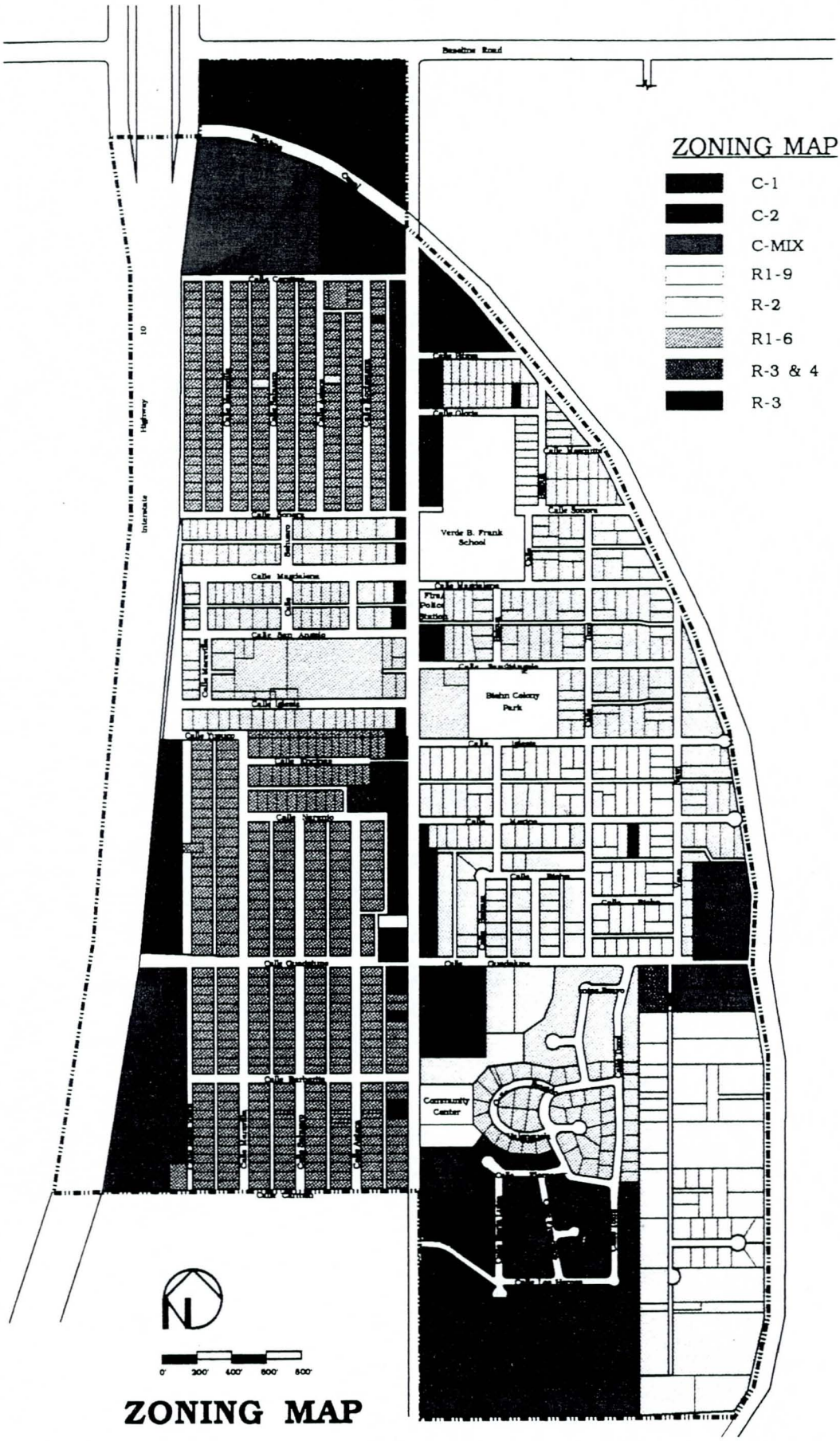
The hillside runoff that historically drained across the freeway near Guadalupe Road in a series of large pipe culverts is now diverted northward to the Guadalupe Flood Retarding Structure which is located on the grounds of The Pointe at South Mountain on the southeast corner of Baseline Road and I-10. This basin's bleedoff drains northwest away from Guadalupe.

The runoff from the I-10 right-of-way north of Guadalupe Road is now being captured in a new storm drain system and in a roadside ditch flanked by a sound barrier wall on the east right-of-way line. The runoff is conveyed north to the I-10/U.S. 60 stormwater detention system. The I-10 runoff south of Guadalupe Road is captured in either a new storm drain system which drains southward or in a series of long narrow detention basins along the east side of the right-of-way. This southern reach of I-10 eventually drains south to an abandoned gravel pit located east of the freeway about a quarter mile south of Warner Road in Tempe. The pit is owned by ADOT and leased to the City of Tempe. Both agencies use it for stormwater retention/detention.

In regards to hydrologic modeling it was decided early in the study that the true existing conditions were somewhat irrelevant in terms of designing a flood relief system for the ultimate condition. Consequently only the fully developed conditions were modeled hydrologically. The developed conditions were based on the Town of Guadalupe's Zoning Map, Figure 2. The current drainage patterns were used for flow routing because they are not expected to change significantly.

3.0 WATERSHED DESCRIPTION

The Town is bordered on the west by Interstate Highway 10 and the City of Phoenix, on the south by the City of Tempe, on the north by Baseline Road and the City of Tempe and on the east by SRP's Highline Canal (North Branch) and the City of Tempe. The Town is generally fan


ZONING MAP
C-1
C-2
C-MIX
R1-9
R-2
R1-6
R-3 & 4
R-3
Baseline Road
Interstate
10
Highway
Verde B. Frank School
Fire/Police Station
Blehn Colony Park
Community Center
0' 200' 400' 600' 800'

ZONING MAP

shaped with average slopes of 1.3 - 1.6%. The highest point in the Town is near the intersection of Guadalupe Road and I-10 and the low areas are along the east boundary adjacent to the Highline Canal and

Baseline Road. The watershed is developed about 65% residential, 20% commercial, 3% public parks and the remainder is undeveloped. The undeveloped land includes about 65 acres of native Sonoran Desert in the south part of the Town between Avenida del Yaqui and the Highline Canal just north of the Tempe City Limits.

3.1 Existing Conditions

The existing land uses in the Town of Guadalupe are primarily single family residential, commercial and undeveloped commercial lots or open desert. There are a few small light industrial lots such as a trucking business and a firewood retailer and there are some small multi-family apartment units. There is a sizeable government housing (HUD) development in sub-basin 9 which has its own detention basins.

Most of the single family housing consists of very small lot subdivisions, sometimes with an additional dwelling built behind the original one. Many homes' finished floors are no higher than the surrounding ground. As a result, the homes experience flooding even during minor storm events. The damage and loss of personal property from flooding probably deters many homeowners from making improvements. Most of the existing streets do not have curb and gutter and most are as high or higher than the finished floors of the homes. As a result the runoff tends to flow through the lots instead of down the streets. This is especially true east of Avenida del Yaqui in the lower reaches of the sub-basins.

3.2 Proposed Conditions

The proposed conditions are essentially the same as the existing conditions for the purposes of this study, except for the addition of some runoff collection improvements, detention basins and other assumptions which are listed in Section 4.1 below. The proposed or "future" conditions were used for hydrologic modeling so that the future improvements could be sized for "worst case" conditions.

Section 4.0 below gives more detailed information about the results of the runoff model.

4.0 HYDROLOGIC MODELING

The hydrologic analysis consisted of computing the peak runoff rates and volumes with HEC-1 for the 100-year, 6 and 24-hour storms. The 6-hour storm yielded the higher results for both the rates and volumes so that model is used. The hydrology has been previously submitted both as preliminary and final and was approved in September, 1995.

The corresponding watershed maps are located in the map pockets in the back of the report. The Watershed Boundary Map, Exhibit 1, denotes the locations of existing ponding during moderate to severe storm events. The map also denotes the drainage sub-basins and flow routing as they were modeled with the Corp of Engineers' HEC-1 computer hydrograph model. The complete hydrology is not presented in this report but results for the proposed conditions, as defined by the assumptions in Section 4.1 below, are given in Table 1. Table 1 lists peak flows at concentration points which are described in the right-hand column and are illustrated on Exhibit 1.

4.1 Assumptions

The following assumptions were made regarding development conditions and outfall availability for purposes of hydrologic modeling and alternative development.

- The watershed is fully developed according to Town of Guadalupe Zoning Map.
- Existing retention /detention basins remain operative.
- New developments do not provide retention/detention basins.
- Existing drainage patterns are not altered in the future.
- SRP allows a low rate bleed-off from proposed detention basins into the Highline Canal North and South Branches.
- SRP allows the construction of drainage facilities e.g., channels and/or storm drain in the Highline Canal right-of-way.
- ADOT allows bleed-off from detention Basin A into the I-10 storm drain system.
- Detention basins will be developed as multi-use facilities.

TABLE 1

RESULTS OF HYDROLOGY

from HEC-1 File 100y6f.hc1

Project Name: Guadalupe Pre-Design Study **HEA Project No.** 94134

Project No. FCD 94-17

Conc. Point	Drng. Area (sq. mi.)	Drng. Area (ac.)	Q-100 6-hour (cfs)	Unit Runoff (cfs/ac)	Concentration Point Description
1	.031	19.8	87	4.4	C.B @ SWC of Baseline & Ave. del Yaqui
2A	.028	17.9	62	3.5	Low pt. on Calle Cerritos E. of Sahuaro
2B	.040	25.6	93	3.6	SWC of Calle Cerritos & Ave. del Yaqui
2C	.029	18.6	71	3.8	Highline Canal levee near I-17
2S	**.097**	**62.1**	**142** 213	**2.3**	**Highline Canal levee near I-17**
3A	.033	21.1	84	4.0	NEC of Calle Sonora & Ave. del Yaqui
3B	.015	9.6	44	4.6	NEC of Frank School ballfields
3C	.031	19.8	93	4.7	Highline Canal levee near Calle Pitaya
3S	**.079**	**50.6**	**195**	**3.9**	**Highline Canal levee near Calle Pitaya**
4A	.023	14.7	54	3.7	Corner of Magdalena & Ave. del Yaqui
4B	.043	27.5	111	4.0	Highline Canal levee @ Magdalena
4S	**.066**	**42.2**	**159**	**3.8**	**Highline Canal levee @ Magdalena**
5A	.020	12.8	46	3.6	NEC of Calle Iglesia & Ave. del Yaqui
5B	.021	13.4	47	3.5	Exist. scupper @ Ave. del Yaqui & Iglesia
5C	.014	9.0	40	4.5	E. end of Biehn Colony Park
5D	.017	10.9	42	3.9	Highline Canal levee @ San Angelo
5S	**.072**	**46.1**	**166**	**3.6**	**Highline Canal levee @ San Angelo**
6A	.020	12.8	36	2.8	SEC of Calle Mexico @ Ave. del Yaqui
6B	.046	29.4	113	3.8	Highline Canal levee @ C. Mexico
6S	**.066**	**42.2**	**137**	**3.2**	**Highline Canal levee @ C. Mexico**
7A	.007	4.5	19	4.2	Exist. scupper on Ave. del Yaqui
7B	.034	21.8	74	3.4	Highline Canal levee @ Guadalupe Rd.
7S	**.041**	**26.2**	**91**	**3.5**	**Highline Canal levee @ Guadalupe Rd.**
8A	.008	5.1	23	4.5	Ex. basin @ Maravilla & Guadalupe Rd.
8B	.013	8.3	33	4.0	Ex. 36" RCP @ Sahuaro & Guadalupe Rd.
8C	.025	16.0	67	4.2	C.B.'s @ Guadalupe Rd & Ave. del Yaqui
8D	.040	25.6	102	4.0	Future C.B.'s @ Barbarita & Ave. del Yaqui
8E	.030	19.2	71	3.7	Calle Tomi & Guadalupe Rd.
8F	.030	19.2	75	3.9	Highline Canal levee @ Guadalupe Rd.
8S	**.146**	**93.4**	**351**	**3.8**	**Highline Canal levee @ Guadalupe Rd.**
9	**.125**	**80.0**	**258**	**3.2**	**Highline levee +/- 1000' S. of Guad. Rd.**

4.2 Methodology

A computerized rainfall/runoff model was developed for the Town of Guadalupe using the U.S. Army Corps of Engineers Flood Hydrograph Package (HEC-1). Two separate 100-year storm events were modeled; the 100-year, 6-hour storm and the 100-year, 24 hour storm. The 100-year, 6-hour storm utilized rainfall distribution pattern no. 1.22. The 100-year, 24-hour storm was modeled using an SCS Type II rainfall distribution curve. The Maricopa County computer program MCUHP1 was used to build a basic HEC-1 input file for the Clark Unit Hydrograph, and determined the values for the Clark Storage Coefficient (R), and the time of concentration (Tc). Those values were entered on the UC record. The 6-hour and 24-hour storms both model identical drainage basins following the same schematic flow diagram as illustrated on the Watershed Boundary Map. Table A-1(Appendix) lists some of the runoff parameters compiled for each sub-basin. The parameters are used in the HEC-1 model.

The Muskingum-Cunge Routing Method was used in all instances. The flow routing was based on assumed future conditions, i.e. that there would be curb and gutter on Avenida Del Yaqui and Guadalupe Road, and graded roadside ditches on most other streets. Accurate topographic data was utilized as much as possible to define other existing drainage routes, but this data is limited to a few surveyed sites. The routing parameters are entered on the RD Record.

The Green & Ampt equation was used to simulate rainfall losses. These rainfall loss parameters are entered on the LG record. The parameters are functions of soil type, ground surface characteristics and land use. Since the computer model is to represent future conditions certain assumptions were made based on the current Town Zoning Map on which the land is divided into commercial and residential parcels. The assumption is that the land would be fully developed yielding a higher percentage of impervious cover than currently

exists. The Impervious Cover Summary, Table A-2(Appendix), details the measurements and assumptions of existing and proposed land use conditions in Guadalupe.

5.0 DISCUSSION OF ALTERNATIVES

The Town of Guadalupe is lacking significant drainage infrastructure. Most of the existing facilities are associated with Avenida del Yaqui improvements. A complete and thorough solution to the Town's drainage problems would include curb and gutter on all local, collector and arterial streets, an underground storm drain system beginning near Avenida del Yaqui and extending to the Highline Canal or some other outfall near the Town's borders, some open drainage channel which supplement to the storm drain system and a system of retention/detention basins to store the stormwater collected by the drainage infrastructure.

Four conceptual alternative solutions have been investigated to alleviate the flooding problems. All involve allowing runoff to continue to flow overland to detention basins. The alternative solutions vary in scope from eight detention basins to only three. An attempt was made to locate each basin in an area where ponding occurs now, making runoff collection relatively simple. Proposed detention sites are unoccupied or have few residences and an acceptable outfall nearby. The alternatives are shown in Figure 3 through Figure 6.

Many of the areas where ponding currently occurs are not desirable sites for detention basins because there is no nearby outfall. Others are currently occupied by residences or businesses. The assumption was made for all of the alternatives that collector channels would be constructed adjacent to the Highline Canal. Negotiations are currently underway between SRP and the District to allow the use of the Highline Canal right-of-way for the construction of collector channels.

5.1 Alternative 1

Alternative 1 is depicted in Figure 3. This alternative has eight basins. Six of the basins are located adjacent to the North Branch of the Highline Canal, a seventh is located only 200 feet from the canal and the eighth one is located west of Avenida del Yaqui between Calle Iglesia and Calle San Angelo. These basins were all sized with a maximum depth of three feet. Basins A and E are located where there are no existing structures. The six other basins are in locations occupied by residences or businesses.

This alternative has been rejected for the following reasons;

- Basin E is located in the Catholic Church festival grounds
- Numerous residences would be removed for Basins B1, B2, B3, and C
- The large number of parcels greatly increases acquisition costs
- There is no suitable outfall for Basins B1, B2 and B3.

5.2 Alternative 2

Alternative 2 has six basin locations, it is depicted on Figure 4.. Basins A, B1, B2 and B3 are identical to Alternative 1. Basins E and D are eliminated and Basin C is reduced in size compared to Alternative 1. The lost storage capacity is compensated for by increasing the depth of Basin F to six feet. This alternative is more favorable than Alternative 1 because Basin E is eliminated, Basin C only encompasses vacant property and the cost of local acquisition is reduced.

FIGURE 3

MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION

OVERALL BASIN SCHEMATIC

PROJECT NO. FCD 94-17

	BY	DATE
DESIGNED	M. MEDRANO	2/5/96
DRAWN	A. BALLESTEROS	2/5/96
CHECKED	T. BOKICH	2/5/96

PBS

ALTERNATIVE #1

PROPOSED DETENTION BASINS

SHEET 1 OF 1

This alternative has been rejected for the following reasons;

- Basins B1, B2, and B3 would require the removal of numerous residences
- There is no suitable outfall for Basins B1, B2 and B3
- The large number of parcels greatly increases the cost of acquisition

5.3 Alternative 3

This alternative is depicted on Figure 5. Alternative 3 has only five basin locations. Basins F, B2, B3 and C are identical to the same numbered basins in Alternative 2. Basin A appears to be the same but would require more depth than in Alternatives 1 and 2. The open channel shown between Calle Magdalena and Basin F would be required to capture and convey the runoff from that Highline Canal reach to Basin F. Another channel parallel to the canal would be required between Basin B2 and Basin A capture the runoff and convey it to Basin A. The Basin F channel would require a culvert or storm drain under Guadalupe Road and the Basin A channel would require a culvert or storm drain under Avenida del Yaqui.

This alternative has been rejected for the following reasons, Basins B2 and B3 would require the removal of numerous residences, there is no suitable outfall for Basins B2 and B3.

5.4 Alternative 4

This alternative is depicted in Figure 6. Alternative 4 consists of three detention basins. They are Basins A, D and F. Basin A is the same as shown in Alternative 3. Basin D is a deeper version of the basin shown in Alternatives 1 and 2. Basin F is different than shown in Alternative 1 through 3. It is deeper, more square and located further south. The location where Basin F is shown in

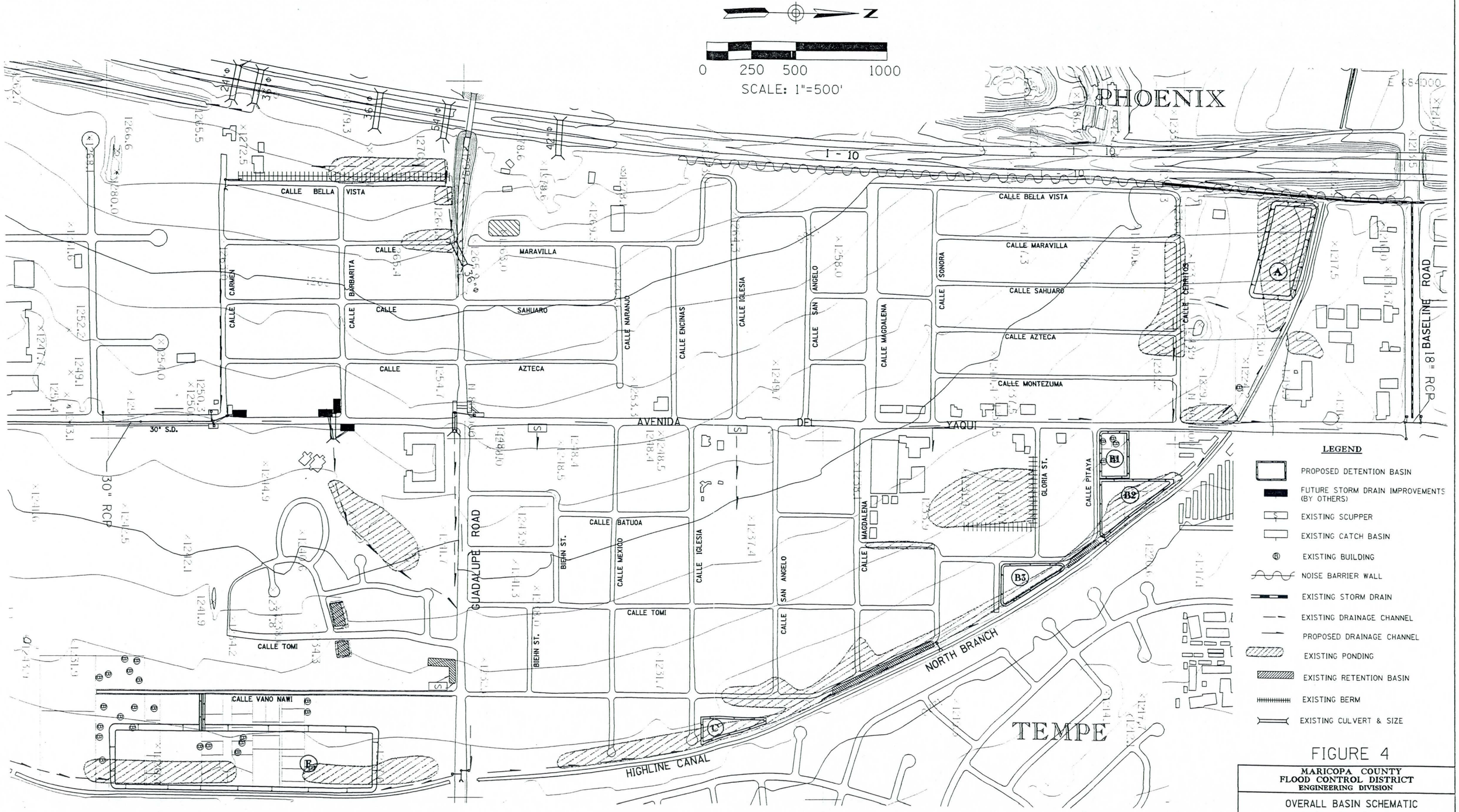


FIGURE 4

MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION

OVERALL BASIN SCHEMATIC
PROJECT NO. FCD 94-17

	BY	DATE
DESIGNED	M. MEDRANO	2/5/96
DRAWN	A. BALLESTEROS	2/5/96
CHECKED	T. BOKICH	2/5/96

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ALTERNATIVE #2

PROPOSED DETENTION BASINS

SHEET OF 1

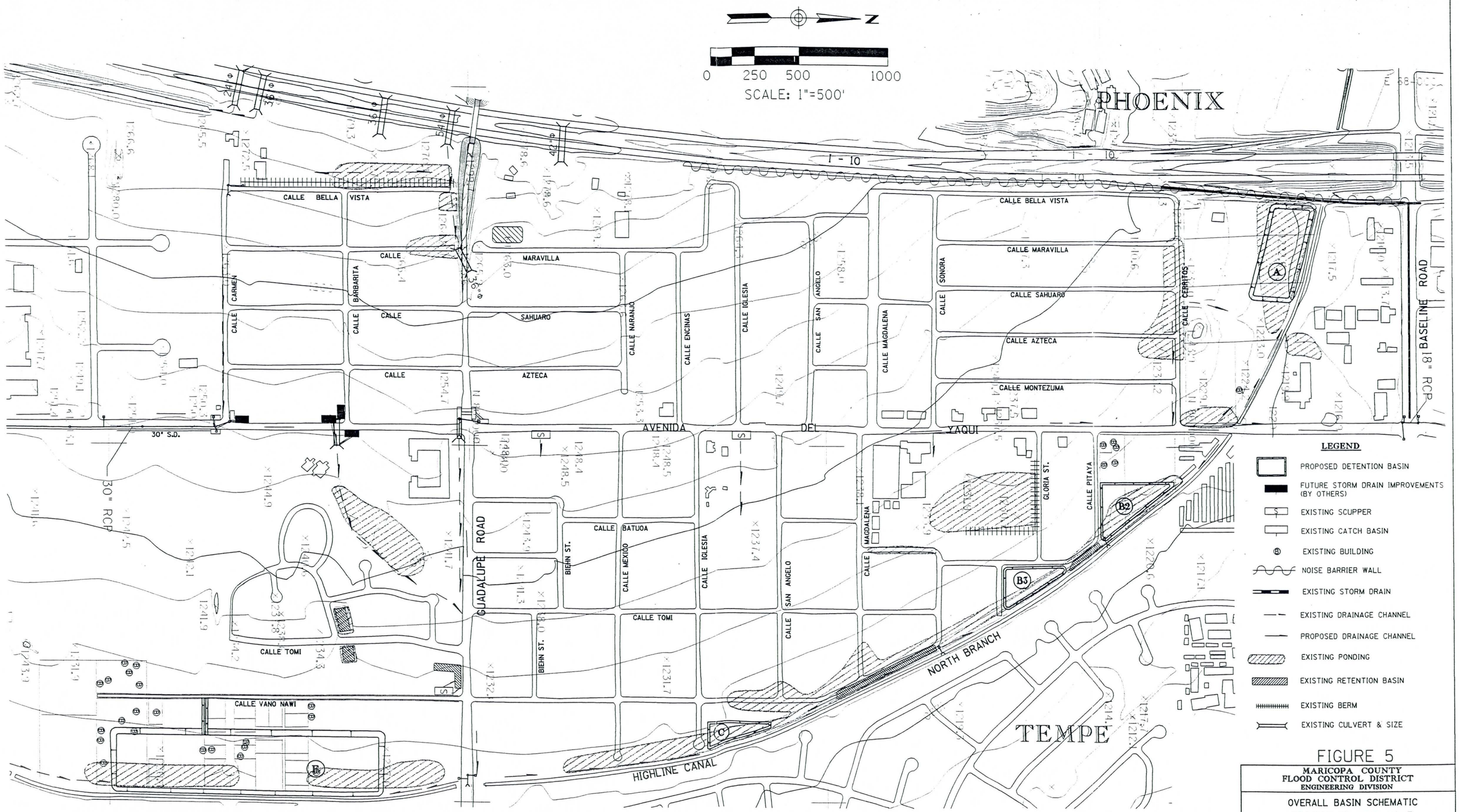

FIGURE 5

MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION

OVERALL BASIN SCHEMATIC
PROJECT NO. FCD 94-17

	BY	DATE
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DRAWN	A. BALLESTEROS	2/5/96
CHECKED	T. BOKICH	2/5/96

ALTERNATIVE #3

PROPOSED DETENTION BASINS

SHEET 1 OF 1

Alternatives 1 through 3 is currently occupied by as many as 16 residences. The location depicted in Figure 6 affects seven existing structures but none of them are believed to be occupied residences.

This alternative is the preferred alternative for the following reasons;

- The basin locations do not conflict with any known residences
- Having only three basins will reduce maintenance costs
- Having only three basins, which are all at least six feet deep, will reduce the land area and land acquisition costs significantly
- Each basin is located in close proximity to an acceptable outfall

5.4.1 Description of Detention Basins for Alternative #4

Basin A

The detention basin designated as "A" on Figures 6 and 6A is one of three basins which make up the preferred alternative. Basin A is located near the northern end of Guadalupe in a currently undeveloped parcel. The parcel, which is commercially zoned, is located between Avenida del Yaqui and I-10 on the east and west, respectively, on the south by Calle Cerritos and by the North Branch of the Highline Canal on the north.

The basin will be designed to contain the 100-year , 6-hour runoff from drainage areas 2, 3 and 4 which have a total contributing area of 0.24 square miles or 155 acres. The watershed boundaries for the area which will contribute to Basin A are I-10 on the west, Calle Iglesia and Calle San Angelo on the south and the Highline Canal on the north and east.

The design capacity of the basin is 26.9 acre feet (1,170,900 cu. ft.). Table 2 shows the 100-year 6-hour runoff volumes and contributing sub-basins for each of the three proposed basins of Alternative 4.

Basin D

The detention basin designated as "D" on Figures 6 and 6B is one of three basins which makeup the preferred alternative. Basin D is located along the eastern border of Guadalupe in a currently occupied parcel. The parcel, which is commercially zoned, is located between the Highline Canal on the east and a row of single family lots on Calle Vano Nawi on the west. The south limit is Guadalupe Road and the north limit is another row of single family lots along Calle Mexico.

The basin will be designed to contain the 100-year , 6-hour runoff from drainage areas 5, 6 and 7 which have a total contributing area of 0.18 square miles or 115 acres. The watershed boundaries for the area which will contribute to Basin D are I-10 on the west, Calle Iglesia and Calle San Angelo on the north, Guadalupe Road on the south and the Highline Canal on the east.

The design capacity of the basin is 18.6 acre feet (810,200 cu. ft.). Table 2 shows the 100-year 6-hour runoff volumes and contributing sub-basins for Basin D.

Basin F

The detention basin designated as "F" on Figures 6 and 6C is the southernmost and largest of three basins which make up the preferred alternative. Basin F is located near the southern end of Guadalupe in four commercially zoned parcels. The two southern parcels are mostly undeveloped while the other two have several existing structures on them which are believed to be vacant. The parcels are located about 2000 feet south of Guadalupe Road at the southern terminus of Calle Vano Nawi. The basin site is bordered on the east by the North Branch of the Highline Canal.

The basin will be designed to contain the 100-year , 6-hour runoff from drainage areas 8 and 9 which have a total contributing area of 0.27 square miles or 173 acres. The watershed boundaries for the area which will contribute to Basin F are I-10 on the west, Calle Carmen and the Tempe\Guadalupe border on the south, Guadalupe Road on the north and the Highline Canal on the east.

The design capacity of the basin is 26.9 acre feet (1,170,900 cu. ft.). Table 2 shows the 100-year 6-hour runoff volumes and contributing sub-basins for Basin F.

5.5 Outfall Alternatives

Stormwater disposal alternatives are limited and the rate-of-release is severely restricted in all of the alternatives. The following alternatives are described as they pertain to Basin Alternative #4, the preferred alternative.

The first and most convenient outfall locations, from a purely physical standpoint, are in the City of Tempe. There are four locations where stormwater could be routed into the Tempe drainage system:

1.) The storm drain in Baseline Road at Priest Drive (aka Avenida del Yaqui).
2.) The storm drain in Guadalupe Road at Kyrene Road.
3.) The storm drain in Avenida del Yaqui at Calle Carmen.
4.) The ADOT gravel pit/detention basin at Warner Road and I-10. This alternative outfall location is included in the Tempe options because ADOT has an IGA with Tempe allowing the City to use "the pit", as it is called. Tempe has the right of refusal (except to ADOT) to would be users of the outfall.

TABLE 2

SUMMARY OF RUNOFF VOLUMES

for the Alternative 4 Proposed Basins

Project Name: **Guadalupe Pre-Design Study**
Project No. **FCD 94-17**

100- Year 6-Hour

Sub-Basin	Volume (ac-ft.)	Volume (cu. ft.)	Proposed Retention Basin
1	4.47 5.00	194,713	N/A
2A			
2B			
2C			
3A			
3B			
3C			
4A			
4B	26.88 27	1,170,893	A
5A			
5B			
5C			
5D			
6A			
6B			
7A			
7B	18.60 19.0	810,216	D
8A			
8B			
8C			
8D			
8E			
8F			
9	31.23	1,360,379	F
TOTALS	81.18	3,536,201	

Note: Runoff volumes were computed with the HEC-1 model.

Tempe's reluctance to allow the use of their system involves both quantity and quality issues with quality apparently being foremost. The first two outfalls would be accessible for gravity drainage from all three of the preferred basin locations. Outfalls 3 and 4 would be accessible by a force main system only. Negotiations are currently underway with SRP and the City of Tempe to enable the District to construct a force main in the canal right-of-way to the ADOT "pit". The 1.7 mile pipeline is not included in the cost estimates of the preferred alternatives.

The next outfall alternative is SRP's Highline Canal. SRP has stated that they would allow a bleed-off from detention into the canal of about 5 cfs. Bleed-off would require a pump system.

The third and final outfall alternative is the ADOT I-10 storm drain system. ADOT's system includes a 42-inch diameter storm drain pipe located approximately 25 feet west of the east right-of-way of I-10 at the Highline Canal crossing. The pipe's invert elevation at the crossing is approximately 1212.0. The estimated lowest bottom elevation of Basin A (See Figure 6) is 1214.4. Basin A could easily gravity drain into the ADOT system. If necessary, Basins D and F could be connected to Basin A by an equalizer pipe (i.e., pipe slope = 0%+/-) and all could drain primarily to ADOT's system. Dry wells could be installed in Basins D and F to remove any standing water not drained by gravity. The equalizer pipe system and dry wells are not included in the cost estimates of the preferred alternatives.

5.6 Multi-use Options

Each of the detention basins will have the ability to be developed for recreational and/or social uses. If funds are available for landscaping and development, the basins could be developed as parks and/or athletic fields. Table 3 lists the possible athletic uses for each basin. The possible uses were determined by comparing the required dimensions for a particular field with the dimensions of the bottom of the basin.

FIGURE 6

MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION

OVERALL BASIN SCHEMATIC

PROJECT NO. FCD 94-17

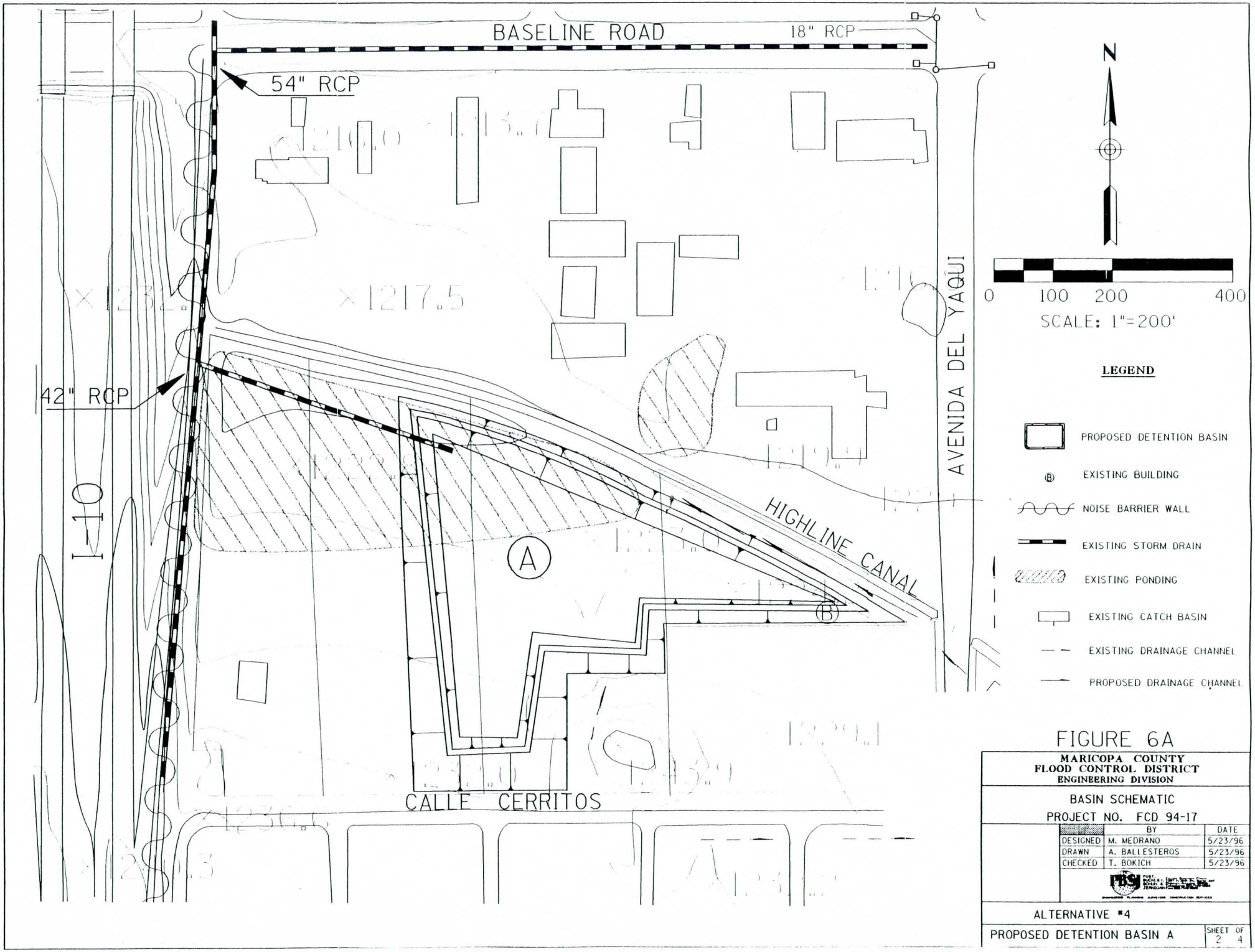
	BY	DATE
DESIGNED	M. MEDRANO	5/23/96
DRAWN	A. BALLESTEROS	5/23/96
CHECKED	T. BOKICH	5/23/96

PBSJ

ALTERNATIVE #4

PROPOSED DETENTION BASINS

SHEET 1 OF 2


BASELINE ROAD
18" RCP
54" RCP
42" RCP
AVENIDA DEL YAQUI
HIGHLINE CANAL
CALLE CERRITOS
I-10
A
B
N
0 100 200 400
SCALE: 1"=200'
LEGEND
PROPOSED DETENTION BASIN
EXISTING BUILDING
NOISE BARRIER WALL
EXISTING STORM DRAIN
EXISTING PONDING
EXISTING CATCH BASIN
EXISTING DRAINAGE CHANNEL
PROPOSED DRAINAGE CHANNEL
FIGURE 6A
MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION
BASIN SCHEMATIC
PROJECT NO. FCD 94-17
BY
DATE
DESIGNED M. MEDRANO 5/23/96
DRAWN A. BALLESTEROS 5/23/96
CHECKED T. BOKICH 5/23/96
ALTERNATIVE #4
PROPOSED DETENTION BASIN A
SHEET OF 2 4

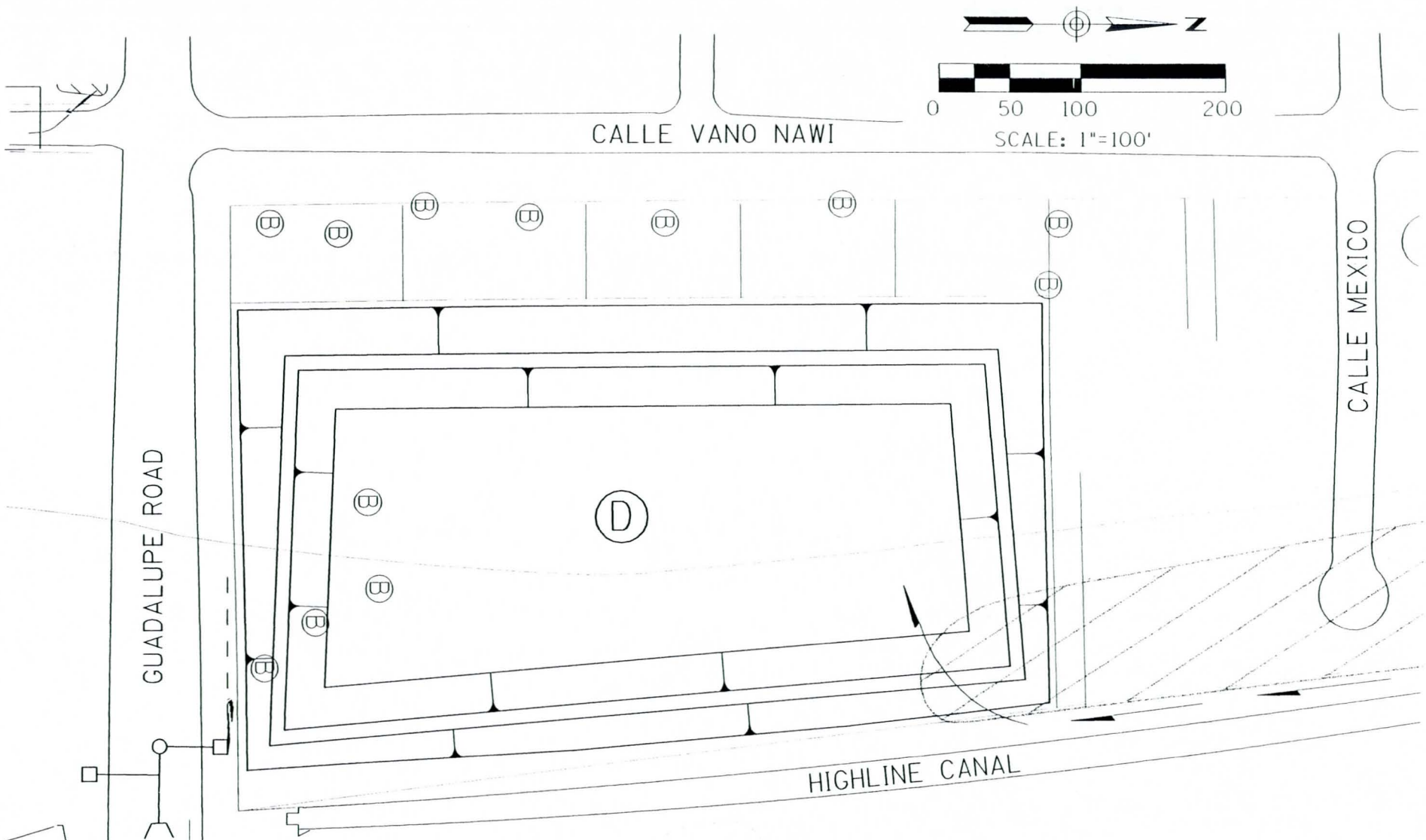


FIGURE 6B

MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION

BASIN SCHEMATIC

PROJECT NO. FCD 94-17

	BY	DATE
DESIGNED	M. MEDRANO	2/5/96
DRAWN	A. BALLESTEROS	2/5/96
CHECKED	T. BOKICH	2/5/96

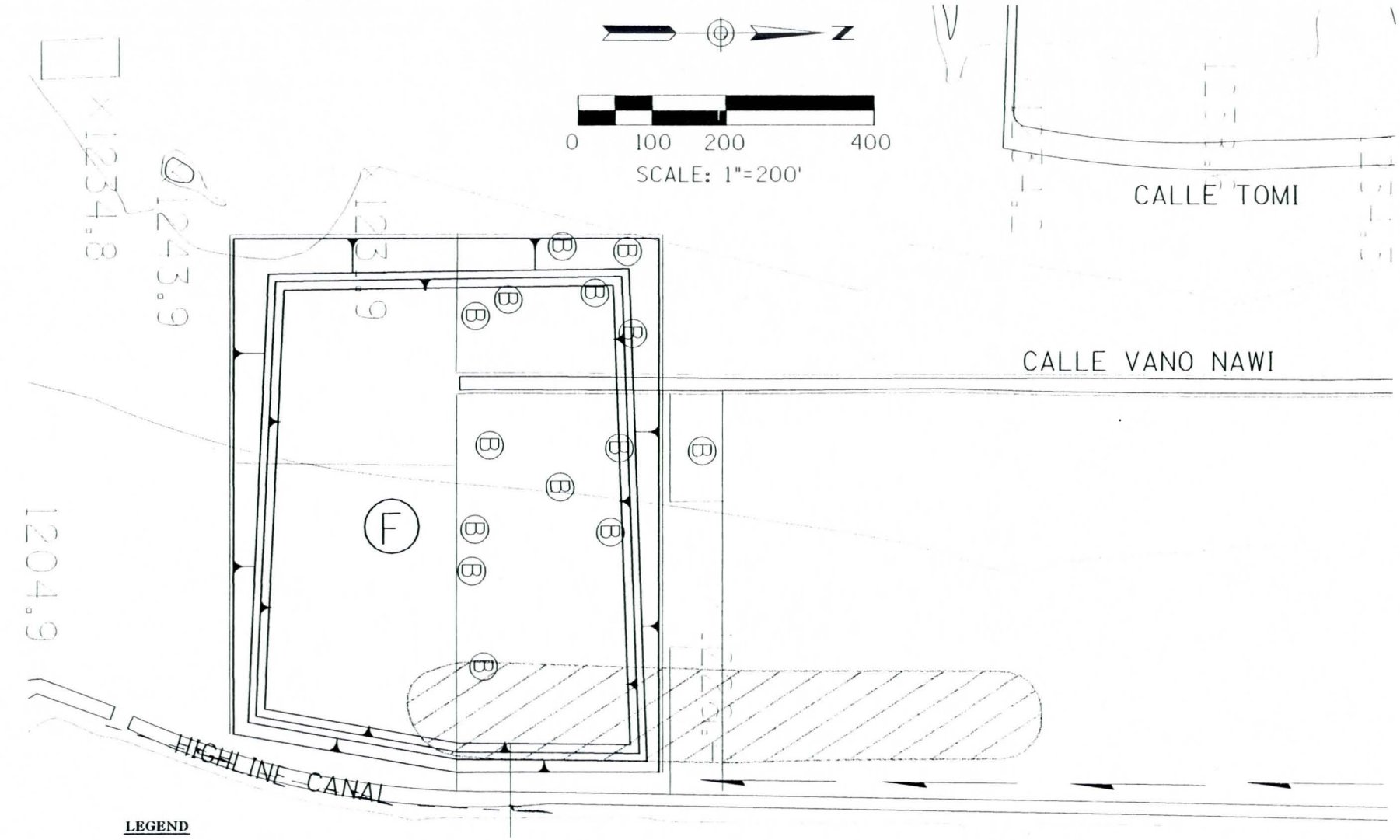
ALTERNATIVE #4

PROPOSED DETENTION BASIN D

SHEET 3 OF 4

LEGEND

- PROPOSED DETENTION BASIN
- FUTURE STORM DRAIN IMPROVEMENTS (BY OTHERS)
- PROPOSED DRAINAGE CHANNEL
- EXISTING DRAINAGE CHANNEL
- EXISTING CATCH BASIN
- Ⓑ EXISTING BUILDING
- EXISTING PONDING



LEGEND

- PROPOSED DETENTION BASIN
- PROPOSED DRAINAGE CHANNEL
- EXISTING DRAINAGE CHANNEL
- (B) EXISTING BUILDING
- EXISTING PONDING

FIGURE 6C

MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION

BASIN SCHEMATIC
PROJECT NO. FCD 94-17

	BY	DATE
DESIGNED	M. MEDRANO	2/5/96
DRAWN	A. BALLESTEROS	2/5/96
CHECKED	T. BOKICH	2/5/96

ALTERNATIVE #4

PROPOSED DETENTION BASIN F

SHEET 4 OF 4

TABLE 3

DETENTION BASIN MULTI-USE OPTIONS
for Alternative #4

DETENTION BASIN	BASIN BOTTOM DIMENSIONS (ft.)	MULTI-USE * OPTIONS
A	640 X 240	SOCCER, FOOTBALL, SOFTBALL, BASKETBALL, PLAYGROUND, PARK, TENNIS, RACKETBALL
D	428 X 158	BASKETBALL, PLAYGROUND, PARK TENNIS, RACKETBALL
F	562 X 444	SOCCER, FOOTBALL, BASEBALL, SOFTBALL, BASKETBALL, PLAYGROUND, PARK TENNIS, RACKETBALL

* The multi-use options are suggested possibilities only. The Flood Control District will not construct or maintain recreational facilities.

I:\94134\excel\BASIN1.XLS

6.0 BIBLIOGRAPHIES OF OTHER STUDIES

At least three other drainage studies have considered the unique situation in Guadalupe and proposed solutions for the problems encountered there. The following bibliographies of those studies are offered here for the purpose of presenting some historical background and as comparison to the conclusions of this study.

A. *Storm Water Drainage and Management Report for the Town of Guadalupe* - Flood Control District of Maricopa County, February 1993.

Purpose - To provide the Town of Guadalupe with an analysis of current flooding problem and a means to develop a stormwater program.

Conclusions - "The Town of Guadalupe has severe flooding problems which are caused by off-site drainage, inadequate drainage improvements, inadequate catchment facilities, and the unavailability of a natural outlet for stormwater runoff."

Comments

The community's plight has improved considerably since the conclusion of this and other previous studies concerning the flooding of Guadalupe. Through the efforts of the Flood Control District and the Arizona Department of Transportation, the stormwater runoff from the slopes of South Mountain and the I-10 right-of-way is now being diverted elsewhere. Currently all the runoff in Guadalupe is from precipitation that falls in Guadalupe. Other drainage conditions relative to Guadalupe are unchanged.

B. *Town of Guadalupe, Arizona - CAPITAL IMPROVEMENT PROGRAM*

Arizona State University, American Society of Civil Engineers, May 1991.

Purpose - To prepare a comprehensive infrastructure report which would study and make recommendations for improvements to such things as: drainage, environmental water distribution, pavement, traffic, urban quality issues.

Drainage Recommendations

1. The installation of curb and gutter in various parts of each drainage area will aid in the control of runoff to the proposed retention basins.

2. The acquisition of land for the proposed retention areas is necessary.

3. A drainage channel should be constructed along the east boundary of the town to provide drainage retention areas throughout the eastern boundary of town.

4. An investigation concerning the retention of all the runoff generated from the freeway (I-10) by the Arizona Department of Transportation (ADOT) should be initiated.

5. Increase the capacity of the existing detention basins by excavating and cleaning out debris (garbage).

6. All future development should incorporate on-site retention for a 100-year, 2-hour storm.

Comments

Item 1 above is a very good suggestion but it is beyond the scope of a regional solution which is generally the District's focus. This item could have also included a storm drain system.

Items 2 and 3 are the preferred alternatives of this report.

Item 4 has already been accomplished as discussed previously in this report.

Item 5 is a non-issue if Items 2 and 3 are achieved.

Item 6 is purportedly being enforced on most new developments.

C. *Hydrologic Analysis for the Town of Guadalupe, Arizona* -
Willdan Associates, 1980

Purpose - The primary purpose of the report is to analyze the storm runoff in the Town; identify drainage problems for the Town; and make recommendations for eliminating the problem areas; and establish a means of dispersing storm drainage runoff; compile cost estimates and outline priorities for construction.

Drainage Recommendations

1. Construction of curb and gutter and reconstruction of certain streets will prevent ponding and the eventual overflow onto private property.

2. Drainage pipes should be installed under street crossings or, street intersections should be built with valley gutters to provide positive drainage to retention basins. In some cases, both types of facilities are needed.

3. The acquisition of land and the construction of retention basins will be necessary in order to implement the recommendations of this study.

4. The construction of a channel, east of and parallel to the I-10 freeway, from Calle Guadalupe to an outfall point north of Calle Cerritos will eliminate the surface drainage runoff from the I-10 Freeway from entering the residential portions of the town.

5. A drainage channel should be constructed along the east boundary of the town to provide a drainage way to retention areas throughout the eastern boundary of town.

Comments

These items are very similar to those of the other two reports and hence they invoke the same comments. A common thread in the conclusions and recommendations of all three of the above reports is that the construction of retention basins is required in order for other improvements to function properly.

6.1 Other Studies and Reports

The following studies and reports were not intended to be comprehensive drainage studies of the Town but are instead more specific to roadway improvements projects in and near the Town.

- Arizona Department of Transportation, *Superstition TI-Baseline Road TI*, Unit 1, 1992, Arizona

- Brooks, Hersey & Associates, Inc., *Town of Guadalupe, Mains Street Redevelopment, Ph. 2*, 1990; Phoenix, Arizona.

- Brooks, Hersey & Associates, Inc., *Town of Guadalupe, Street Redevelopment, Ph IV*, 1992; Phoenix, Arizona.

- Dava & Associates, Inc., Town of Guadalupe, *Main Street Redevelopment, Ph. 1*, 1980, Arizona

- Dava & Associates, Inc., *Town of Guadalupe, Calle Guadalupe & Avenida del Yaqui Improvement Plans*, 1990, Arizona.

7.0 COST ESTIMATES

Preliminary construction and right-of-way acquisition cost estimates have been prepared for the preferred alternative. Table 4 is a comprehensive estimate for all parts of the recommended solution. Tables 5, 6 and 7 represent the cost breakdown for each of the detention basins separately. Table 5 is an estimate of the cost of construction and right-of-way acquisition for Basin A. The estimate includes such things as channel excavation, culvert, pavement removal and

replacement, etc. Preliminary basin design requires a collector channel beginning at Calle Magdalena and the Highline Canal which drains northwesterly under Avenida Del Yaqui (hence the culvert and pavement replacement) to Basin A. Tables 6 and 7 present the estimated costs for Basins D and F, respectively.

The cost of commercially zoned property in Guadalupe was originally thought to be about $45,000 per acre. However, through recent inquiries about the subject parcels it was discovered that the asking price varies considerably according to location

A significant cost savings can possibly be achieved by taking a nonconventional approach to basin excavation. If the site is advertised as a borrow source for other construction projects, it may be possible to have the earthwork performed at little cost to the District or perhaps even at a slight profit. The proposed shopping mall located just north of Guadalupe in Tempe at I-10 and Baseline Road is a potential source for disposal. Another use for some of the excavated earth may be as fill for new home and business sites in Guadalupe. If a location were found to temporarily stockpile dirt it could be made available on an as-needed basis to ensure that new homes and businesses are constructed with finished floors above the current flood levels. The preliminary cost estimate for construction of all basins is about $2.1 million. The basin excavation will cost an estimated $1.3 million if it is carried out in the conventional manner.

The total cost for construction and right-of-way acquisition is estimated to be about $7.3 million with right-of-way accounting for $5.2 million. The actual construction costs are only 30 percent of the total cost of the project.

8.0 CONCLUSIONS

The Town of Guadalupe has serious flooding problems for many of its residences due to a lack of drainage infrastructure and an absence of drainage outfalls. The infrastructure needs are streets with curb and gutter, culverts, drainage channels and/or an underground storm drainage system.

TABLE 4

CONSTRUCTION and RIGHT-OF-WAY COST ESTIMATE
ALL BASINS

FCD 94-17 **Guadalupe Pre-Design Study**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
105801	Construction Surveying and As-Builts	1	LS	$15,000.00	$15,000.00
215001	Channel/Drainage, Grading & Excavation	18,598	CY	$5.50	$102,289.00
215002	Basin Grading & Excavation	231,900	CY	$5.50	$1,275,450.00
220403	Plain Riprap, D50 = 10"	30	CY	$40.00	$1,200.00
310106	6" ABC	115	SY	$6.00	$690.00
321202	Asphalt Concrete Pavement, 2" AC (C-3/4")	115	SY	$60.00	$6,900.00
340123	Concrete Cutoff Wall 6" Wide x 2' Deep	2,800	LF	$6.00	$16,800.00
350001	Saw Cut and Remove AC Pav't and Base	1,115	SY	$2.00	$2,230.00
350801	Misc. Removals and Other Work	1	LS	$18,000.00	$18,000.00
401001	Traffic Control	1	LS	$13,000.00	$13,000.00
440002	Backflow Preventer with Cage(1 1/2")	3	EA	$2,550.00	$7,650.00
440800	Landscaping Irrigation System	210,000	SF	$0.50	$105,000.00
505106	Catch Basin - MAG Det 535	4	EA	$1,500.00	$6,000.00
505463	Culvert Wingwalls & Headwalls ADOT Std.	1	LS	$6,940.00	$6,940.00
505901	Reinforced Concrete Box Culvert (12' x 4' x 80')	1	LS	$29,840.00	$29,840.00
505902	Misc. Concrete Structures (Hdwls., Spillways, etc.)	1	LS	$30,000.00	$30,000.00
525016	Pneumatically Placed Mortar (4")	4,000	SY	$20.00	$80,000.00
621036	24" RGRCP	390	LF	$60.00	$23,400.00
640401	Utility Relocations	1	LS	$30,000.00	$30,000.00
	Construction Subtotal				$1,770,389.00
	ROW Acquisitions	20.4	AC	NA	$5,153,748.00
	Subtotal				$6,924,137.00
	Construction Contingency @ 20%				$354,077.80
	CONSTRUCTION and ROW TOTAL				**$7,278,214.80**

TABLE 5

CONSTRUCTION and RIGHT-OF-WAY COST ESTIMATE
BASIN A

FCD 94-17 **Guadalupe Pre-Design Study**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
105801	Construction Surveying and As-Builts	1	LS	$5,000.00	$5,000.00
215001	Channel/Drainage, Grading & Excavation	7,830	CY	$5.50	$43,065.00
215002	Basin Grading & Excavation	80,100	CY	$5.50	$440,550.00
220403	Plain Riprap, D50 = 10"	10	CY	$40.00	$400.00
310106	6" ABC	70	SY	$6.00	$420.00
321202	Asphalt Concrete Pavement, 2" AC (C-3/4")	70	SY	$60.00	$4,200.00
340123	Concrete Cutoff Wall 6" Wide x 2' Deep	800	LF	$6.00	$4,800.00
350001	Saw Cut and Remove AC Pav't and Base	70	SY	$2.00	$140.00
350801	Misc. Removals and Other Work	1	LS	$4,000.00	$4,000.00
401001	Traffic Control	1	LS	$6,000.00	$6,000.00
440002	Backflow Preventer with Cage(1 1/2")	1	EA	$2,550.00	$2,550.00
440800	Landscaping Irrigation System	70,000	SF	$0.50	$35,000.00
505106	Catch Basin - MAG Det 535	2	EA	$1,500.00	$3,000.00
505463	Culvert Wingwalls & Headwalls ADOT Std.	1	LS	$6,940.00	$6,940.00
505901	Reinforced Concrete Box Culvert (12' x 4' x 80')	1	LS	$29,840.00	$29,840.00
505902	Misc. Concrete Structures (Hdwls., Spillways, etc.)	1	LS	$10,000.00	$10,000.00
525016	Pneumatically Placed Mortar (4")	1,500	SY	$20.00	$30,000.00
621036	24" RGRCP	150	LF	$60.00	$9,000.00
640401	Utility Relocations	1	LS	$10,000.00	$10,000.00
	Construction Subtotal				$644,905.00
	ROW Acquisitions	6.86	AC	$247,800.00	$1,699,908.00
	Subtotal				$2,344,813.00
	Construction Contingency @ 20%				$128,981.00
	CONSTRUCTION and ROW TOTAL				**$2,473,794.00**

TABLE 6

CONSTRUCTION and RIGHT-OF-WAY COST ESTIMATE
BASIN D

FCD 94-17 **Guadalupe Pre-Design Study**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
105801	Construction Surveying and As-Builts	1	LS	$5,000.00	$5,000.00
215001	Channel/Drainage, Grading & Excavation	3,160	CY	$5.50	$17,380.00
215002	Basin Grading & Excavation	46,000	CY	$5.50	$253,000.00
220403	Plain Riprap, D50 = 10"	10	CY	$40.00	$400.00
310106	6" ABC	45	SY	$6.00	$270.00
321202	Asphalt Concrete Pavement, 2" AC (C-3/4")	45	SY	$60.00	$2,700.00
340123	Concrete Cutoff Wall 6" Wide x 2' Deep	800	LF	$6.00	$4,800.00
350001	Saw Cut and Remove AC Pav't and Base	45	SY	$2.00	$90.00
350801	Misc. Removals and Other Work	1	LS	$10,000.00	$10,000.00
401001	Traffic Control	1	LS	$5,000.00	$5,000.00
440002	Backflow Preventer with Cage(1 1/2")	1	EA	$2,550.00	$2,550.00
440800	Landscaping Irrigation System	50,000	SF	$0.50	$25,000.00
505106	Catch Basin - MAG Det 535	2	EA	$1,500.00	$3,000.00
505902	Misc. Concrete Structures (Hdwls., Spillways, etc.)	1	LS	$10,000.00	$10,000.00
525016	Pneumatically Placed Mortar (4")	1,000	SY	$20.00	$20,000.00
621036	24" RGRCP	120	LF	$60.00	$7,200.00
640401	Utility Relocations	1	LS	$10,000.00	$10,000.00
	Construction Subtotal				$376,390.00
	ROW Acquisitions	4.8	AC	$415,500.00	$1,977,780.00
	Subtotal				$2,354,170.00
	Construction Contingency @ 20%				$75,278.00
	CONSTRUCTION and ROW TOTAL				**$2,429,448.00**

TABLE 7

CONSTRUCTION and RIGHT-OF-WAY COST ESTIMATE
BASIN F

FCD 94-17 **Guadalupe Pre-Design Study**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITIES	UNIT	UNIT PRICE	TOTAL AMOUNT
105801	Construction Surveying and As-Builts	1	LS	$5,000.00	$5,000.00
215001	Channel/Drainage, Grading & Excavation	7,608	CY	$5.50	$41,844.00
215002	Basin Grading & Excavation	105,800	CY	$5.50	$581,900.00
220403	Plain Riprap, D50 = 10"	10	CY	$40.00	$400.00
340123	Concrete Cutoff Wall 6" Wide x 2' Deep	1,200	LF	$6.00	$7,200.00
350001	Saw Cut and Remove AC Pav't and Base	1,000	SY	$2.00	$2,000.00
350801	Misc. Removals and Other Work	1	LS	$4,000.00	$4,000.00
401001	Traffic Control	1	LS	$2,000.00	$2,000.00
440002	Backflow Preventer with Cage(1 1/2")	1	EA	$2,550.00	$2,550.00
440800	Landscaping Irrigation System	90,000	SF	$0.50	$45,000.00
505902	Misc. Concrete Structures (Hdwls., Spillways, etc.)	1	LS	$10,000.00	$10,000.00
525016	Pneumatically Placed Mortar (4")	1,500	SY	$20.00	$30,000.00
621036	24" RGRCP	120	LF	$60.00	$7,200.00
640401	Utility Relocations	1	LS	$10,000.00	$10,000.00
	Construction Subtotal				$749,094.00
	ROW Acquisitions	8.76	AC	$168,500.00	$1,476,060.00
	Subtotal				$2,225,154.00
	Construction Contingency @ 20%	5		$415,500.00	$149,818.80
	CONSTRUCTION and ROW TOTAL				**$2,374,972.80**

The drainage outfalls which are needed would be locations where 100-year peak flows as large as 600 cfs can be accommodated. There simply aren't any such outfalls. In fact, there aren't any which can handle anything remotely close to that figure. The infrastructure needs are extremely expensive and time consuming for both design and construction. Additionally, the infrastructure improvements would be of little value without a place to dispose of the stormwater, i.e. an outfall, once it has been collected and conveyed to the low lying parts of Town.

The Town of Guadalupe cannot afford such improvements and the District's funding of flood control improvements is limited to regionally significant projects. The creation of outfalls in the form of detention basins must logically be the first step in the overall solution to the problem unless some agreement with the City of Tempe can be negotiated to share existing facilities or create new outfalls outside the Town Limits.

9.0 REFERENCES

1. Arizona Department of Transportation, *Superstition TI-Baseline Rd. TI, Unit 1,* 1992, Arizona.

2. Arizona State University Student Chapter American Society of Civil Engineers, *Town of Guadalupe, Arizona, Capital Improvement Program;* May, 1991; Arizona.

3. Brooks, Hersey & Associates, Inc., *Town of Guadalupe, Main St. Redevelopment, Ph. 2,* 1990; Phoenix, Arizona.

4. Brooks, Hersey & Associates, Inc., *Town of Guadalupe, Street Redevelopment, Ph. IV,* 1992; Phoenix, Arizona.

5. Dava & Associates, Inc., *Town of Guadalupe, Calle Guadalupe & Avenida del Yaqui Improvement Plans,* 1990, Arizona.

6. Willdan Associates, *Hydrologic Analysis for the Town of Guadalupe,* 1980, Phoenix, Arizona.

7. Leedshill-Herkenhoff, Inc., *Analysis of Design of South Tempe Storm Water Management System,* 1985, Phoenix, Arizona.

8. Flood Control District of Maricopa County, *Watershed Workplan for Guadalupe Watershed, Maricopa County, Arizona,* January, 1971.

9. Flood Control District of Maricopa County, *Stormwater Drainage and Management Report for the Town of Guadalupe,* Maricopa County, Arizona, February, 1993.

10. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology,* January, 1995.

11. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Volume II, Hydraulics,* 1994.

12. Greiner, Inc., *Dambreak Study for Guadalupe Flood Retarding Structure,* Phoenix, Arizona, April, 1990.

13. Creegan and D'Angelo, *Retention Basin Analysis Final Report,* Phoenix, Arizona, August, 1989.

14. Harza Engineering Company, *56th Street Storm Drain Elliot to Warner,* Phoenix, Arizona, 1988.

15. Elwyn E. Seilye, *Data Bank for Civil Engineers Design,* New York, New York, 1960.

APPENDIX

TABLE A-1

HYDROLOGY TABLE

for HEC-1 Data Compilation

Project Name: Guadalupe Pre-Design Study **HEA Project No.** 94134

Project No. FCD 94-17 **Existing Conditions**

Conc. Point	Drng. Area (sq. mi.)	L (mi.)	Top Elev. (ft.)	Conc. Pt. Elev. (ft.)	Slope (ft/mi.)	Surface Types	Kb	Concentration Point Description
1	.031	.29	1220.0	1207.0	44.8	A	0.032	C.B @ SWC of Baseline & Ave. del Yaqui
2A	.028	.39	1256.0	1232.5	60.3	A	0.032	Low pt. on Calle Cerritos E. of Sahuaro
2B	.040	.42	1250.0	1227.0	54.8	A	0.031	SWC of Calle Cerritos & Ave. del Yaqui
2C	.029	.27	1234.0	1220.0	51.9	B	0.063	Highline Canal levee near I-17
3A	.033	.34	1266.0	1239.0	79.4	A	0.032	NEC of Calle Sonora & Ave. del Yaqui
3B	.015	.15	1240.0	1230.5	63.3	A	0.034	NEC of Frank School ballfields
3C	.031	.17	1234.0	1223.0	64.7	A, B	0.032	Highline Canal levee near Calle Pitaya
4A	.023	.32	1270.0	1242.0	87.5	A, B	0.033	Corner of Magdalena & Ave. del Yaqui
4B	.043	.32	1244.0	1224.0	62.5	A	0.031	Highline Canal levee @ Magdalena
5A	.020	.34	1276.0	1249.0	79.4	A, B	0.033	NEC of Calle Iglesia & Ave. del Yaqui
5B	.021	.36	1276.0	1247.0	80.6	A, B	0.033	Exist. scupper @ Ave. del Yaqui & Iglesia
5C	.014	.15	1248.0	1235.0	86.7	A	0.034	E. end of Biehn Colony Park
5D	.017	.21	1236.0	1224.0	57.1	A	0.041	Highline Canal levee @ San Angelo
6A	.020	.45	1278.0	1250.0	62.2	A, B	0.033	SEC of Calle Mexico @ Ave. del Yaqui
6B	.046	.38	1250.0	1227.0	60.5	A	0.031	Highline Canal levee @ C. Mexico
7A	.007	.15	1262.0	1250.0	80.0	A	0.036	Exist. scupper on Ave. del Yaqui
7B	.034	.36	1250.0	1226.0	66.7	A, B	0.053	Highline Canal levee @ Guadalupe Rd.
8A	.008	.12	1278.0	1266.0	100.0	A, B	0.056	Ex. basin @ Maravilla & Guadalupe Rd.
8B	.013	.19	1277.0	1265.0	63.2	B	0.055	Ex. 36" RCP @ Sahuaro & Guadalupe Rd.
8C	.025	.25	1265.0	1251.0	56.0	A	0.032	C.B.'s @ Guadalupe Rd & Ave. del Yaqui
8D	.040	.30	1278.0	1249.0	96.7	A, B	0.058	Future C.B.'s @ Barbarita & Ave. del Yaqui
8E	.030	.27	1249.0	1237.0	44.4	A, B	0.053	Calle Tomi & Guadalupe Rd.
8F	.030	.28	1237.0	1227.0	35.7	A, B	0.032	Highline Canal levee @ Guadalupe Rd.
9	.125	.55	1247.0	1226.0	38.2	A, B	0.047	Highline Canal levee +/- 1000' S. of Guad. Rd.

2/7/96

L:\94134\EXCEL\HC1DAT.XLS

TABLE A-2

SUMMARY OF IMPERVIOUS COVER ESTIMATES

for Existing and Future Conditions

Project Name: Guadalupe Pre-Design Study
Project No. FCD 94-17

		Existing Condition					Future Condition *				
Sub-Basin	Sub-Basin Area (s.f.)	SFD's	Other Impervious Cover Area (s.f.)	Other Impervious Cover Type	Total Impervious (s.f.)	**Percent Impervious (%)**	SFD's	Other Impervious Cover Area (s.f.)	Other Impervious Cover Type	Total Impervious (s.f.)	**Percent Impervious (%)**
1	864,200	-	20,000 455,000	street commercial	475,000	**55%**	-	20,000 583,000	street commercial	603,000	**70%**
2A	780,600	74	101,400	street commercial	205,000	**26%**	88	101,400	street commercial	224,600	**29%**
2B	1,115,000	132	132,600 28,000	street commercial	345,400	**31%**	140	132,600 35,000	street commercial	363,600	**33%**
2C	808,500	-	7,600	street commercial	7,600	**1%**	-	566,000	street commercial	566,000	**70%**
3A	920,000	83	139,400 19,500	street commercial	275,100	**30%**	84	139,400 42,000	street commercial	299,000	**33%**
3B	418,200	3	- 92,000	street commercial	96,200	**23%**	-	- 136,500	street commercial	136,500	**33%**
3C	864,200	32	65,000 60,500	street commercial	170,300	**20%**	49	65,000 137,500	street commercial	271,100	**31%**
4A	641,200	30	43,000 5,800	street commercial	90,800	**14%**	30	43,000 6,000	street commercial	91,000	**14%**
4B	1,198,800	55	51,000 88,500	street commercial	216,500	**18%**	68	51,000 107,500	street commercial	253,700	**21%**
5A	557,600	17	34,000 48,000	street commercial	105,800	**19%**	34	44,000 71,000	street commercial	162,600	**29%**
5B	585,400	30	51,000 8,000	street commercial	101,000	**17%**	35	59,000 17,500	street commercial	125,500	**21%**
5C	390,300	4	22,000	street commercial	27,600	**7%**	12	22,000	street commercial	38,800	**10%**

		Existing Condition					Future Condition *				
Sub-Basin	Sub-Basin Area (s.f.)	SFD's	Other Impervious Cover Area (s.f.)	Other Impervious Cover Type	Total Impervious (s.f.)	**Percent Impervious (%)**	SFD's	Other Impervious Cover Area (s.f.)	Other Impervious Cover Type	Total Impervious (s.f.)	**Percent Impervious (%)**
5D	473,900	30	45,500	street commercial	87,500	**18%**	36	45,500	street commercial	95,900	**20%**
6A	557,600	30	42,500	street commercial	84,500	**15%**	48	49,000 32,500	street commercial	148,700	**27%**
6B	1,282,400	63	102,000	street commercial	190,200	**15%**	87	102,000 70,000	street commercial	293,800	**23%**
7A	195,100	14	6,800	street commercial	26,400	**14%**	12	6,800 35,000	street commercial	58,600	**30%**
7B	947,900	32	77,000 17,500	street commercial	139,300	**15%**	61	77,000 179,500	street commercial	341,900	**36%**
8A	223,000	-	6,300 8,000	street commercial	14,300	**6%**	8	17,000 75,000	street commercial	103,200	**46%**
8B	362,400	15	21,500	street commercial	42,500	**12%**	18	21,500 122,000	street commercial	168,700	**47%**
8C	697,000	74	98,000 17,500	street commercial	219,100	**31%**	96	98,000 70,300	street commercial	302,700	**43%**
8D	1,115,100	80	125,000	street commercial	237,000	**21%**	105	125,000 112,000	street commercial	384,000	**34%**
8E	836,400	8	44,000 133,000	street commercial	188,200	**23%**	28	55,000 198,000	street commercial	292,200	**35%**
8F	836,400	11 18	95,000	street commercial	157,200	**19%**	17 18	120,000 111,000	street commercial	301,600	**36%**
9	3,484,800	28 36	83,000	street commercial	215,800	**6%**	160 36	190,000 700,000	street commercial	1,207,600	**35%**

Assumptions: 1). 1400 square feet of impervious cover per SFD (single family dwelling/lot).
2). 70% of commercial property is impervious cover when fully developed.

* Future condition = fully developed conditions for land uses as shown on the Zoning Map obtained from the Town of Guadalupe.

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  05/27/1996  TIME  11:59:10 *
*                                      *
****************************************
```

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

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

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

FCD 94-17

50 YEAR 6 HOUR STORM

BASIN 'A' WATERSHED &

ADOT'S I-10 STORM DRAIN/

DETENTION BASIN SYSTEM

FILENAME = BASA50.HC1

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

  1           ID        GUADALUPE PRE-DESIGN STUDY    FCD CONTRACT NO. 94-17
  2           ID        50 YEAR 6-HOUR STORM BY SCS DIMENSIONLESS HYDROGRAPH METHOD
  3           ID        RAINFALL LOSSES COMPUTED USING GREEN & AMPT METHOD
  4           ID        ***************************************************************
  5           ID        **FUTURE** FULLY DEVELOPED CONDITIONS.  THIS RUN SERVES TO
  6           ID        DETERMINE THE EFFECTS OF BLEEDING OFF BASIN 'A' INTO THE ADOT
  7           ID        I-10 & SUPERSTITION TI DETENTION BASIN SYSTEM.  NOTE THAT HGL
  8           ID        EFFECTS IN THE ADOT STORM DRAIN SYSTEM HAVE NOT BEEN CONSIDERED.
  9           ID        ***************************************************************
 10           ID        STUDY BY PBS&J                                    TAB   5-12-96
 11           ID        FILENAME = BASA50.HC1
 12           ID        ***************************************************************
 13           ID        ***************************************************************
 14           ID        THIS FILE WAS ADAPTED FROM A COMBINATION OF THE GUADALUPE FILE
 15           ID        100Y6F.HC1 AND THE FOLLOWING DESCRIBED FILE:
 16           ID        ******
 17           ID        I10/SUPERSTITION/BASELINE
 18           ID        STANLEY CONSULTANTS # 10591
 19           ID        ORIGINAL FILENAME : ULT50a       DATE : 28 APR 1992
 20           ID        ORIGINAL DESIGN FREQUENCY = 50YR
 21           ID        SCS DIMENSIONLESS UNIT HYDROGRAPH
 22           ID        AREAS TAKEN FROM STANLEY FINAL DESIGN
 23           ID        ADOT LETTER OF 12-12-90:
 24           ID            * 6HR RAINFALL DISTRIBUTION USING PH RECORD
 25           ID            * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
 26           ID            * BASIN AREA = C * A; 100% IMPERVIOUS
 27           ID
 28           ID        ************************************************************
 29           ID        THE GUADALUPE DESIGN STORM WAS CHANGED TO THE 50 YEAR EVENT
 30           ID        TO MODEL THE ADOT DETENTION BASIN SYSTEM DURING ITS DESIGN
 31           ID        STORM.
 32           ID        ************************************************************
 33           ID
 34           ID
              *DIAGRAM
 35           IT       2                    181
 36           IO       5

 37           KK     SB1     Runoff from sub-basins 22-87,Dtn.Basin 1 @ HDW9
 38           BA   0.104
 39           PH                    .68    1.32    2.35    2.55    2.69    2.95
 40           LS            100     100
 41           UD  0.2601

 42           KK      2A
 43           KM   SUB-BASIN 2A
 44           KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
 45           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
 46           BA    .028
 47           LG    .180    .250   4.100    .380  29.000
 48           UC    .183    .203
 49           UA       0       5      16      30      65      77      84      90      94      97
 50           UA     100
```

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

  51          KK    RT2P
  52          KM   ROUTE SUBBASIN 2A THROUGH REACH 2P
  53          RD     750    .013    .030            TRAP       5       3

  54          KK      2B
  55          KM   SUB-BASIN 2B
  56          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  57          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  58          BA    .040
  59          LG    .176    .250   4.100    .380  33.000
  60          UC    .192    .185
  61          UA       0       5      16      30      65      77      84      90      94      97
  62          UA     100

  63          KK    RT2Q
  64          KM   ROUTE SUBBASIN 2B THROUGH REACH 2Q
  65          RD     250    .006    .020            TRAP      .2      50

  66          KK      2B
  67          KM   DIVERT FLOW FROM SUB-BASIN 2B
  68          DT      2U
  69          DI       0      20      40      60      80     100
  70          DQ       0      20      40      53      63      73

  71          KK    RT2R
  72          KM   ROUTE SUBBASIN 2B THROUGH REACH 2R
  73          RD     700   .0017    .030            TRAP      20      15

  74          KK      2C
  75          KM   SUB-BASIN 2C
  76          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  77          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  78          BA    .029
  79          LG    .100    .250   4.100    .380  70.000
  80          UC    .229    .190
  81          UA       0       5      16      30      65      77      84      90      94      97
  82          UA     100

  83          KK   SUM2S
  84          KM   COMBINE HYDROGRAPHS 2A,2B,2C
  85          HC       3

  86          KK      3A
  87          KM   SUB-BASIN 3A
  88          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  89          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  90          BA    .033
  91          LG    .175    .250   4.100    .380  33.400
  92          UC    .158    .141
  93          UA       0       5      16      30      65      77      84      90      94      97
  94          UA     100
```

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

  95          KK     3A
  96          KM   DIVERT FLOW FROM SUB-BASIN 3A
  97          DT     3U
  98          DI      0      20      40      60      80     100
  99          DQ      0      10      20      30      40      50

 100          KK    RT3P
 101          KM   ROUTE SUBBASIN 3A THROUGH REACH 3P
 102          RD    1750    .009    .020            TRAP      .2      50

 103          KK     3U
 104          KM   RETRIEVE DIVERTED HYDROGRAPH 3U
 105          DR     3U

 106          KK    RT3T
 107          KM   ROUTE RETRIEVED HYDROGRAPH 3U THROUGH REACH 3T
 108          RD     800    .011    .030            TRAP      10      10

 109          KK     3B
 110          KM   SUB-BASIN 3B
 111          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
 112          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
 113          BA    .015
 114          LG    .153    .250   3.600    .460  33.700
 115          UC    .117    .082
 116          UA      0       5      16      30      65      77      84      90      94      97
 117          UA    100

 118          KK   SUM3Q
 119          KM   COMBINE HYDROGRAPHS 3B,DIVERTED FLOW 3U
 120          HC      2

 121          KK     3C
 122          KM   SUB-BASIN 3C
 123          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
 124          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
 125          BA    .031
 126          LG    .162    .250   4.100    .380  25.900
 127          UC    .121    .062
 128          UA      0       5      16      30      65      77      84      90      94      97
 129          UA    100

 130          KK   SUM3V
 131          KM   COMBINE HYDROGRAPHS 3A,FLOW FROM 3R,3C
 132          HC      3

 133          KK   SUM 3
 134          KM   COMBINE HYDROGRAPHS from ALL SUB-BASINS OF D.A. 3
 135          HC      2
```

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

 136          KK      4A
 137          KM   SUB-BASIN 4A
 138          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
 139          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
 140          BA    .023
 141          LG    .180    .250   4.100    .380  14.000
 142          UC    .150    .155
 143          UA       0       5      16      30      65      77      84      90      94      97
 144          UA     100

 145          KK    RT4P
 146          KM   ROUTE SUBBASIN 4A THROUGH REACH 4P
 147          RD    1500     .01    .020            TRAP      .2      50

 148          KK      4B
 149          KM   SUB-BASIN 4B
 150          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
 151          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
 152          BA    .043
 153          LG    .169    .250   4.100    .380  21.000
 154          UC    .158    .116
 155          UA       0       5      16      30      65      77      84      90      94      97
 156          UA     100

 157          KK   SUM4Q
 158          KM   COMBINE HYDROGRAPHS 4A,4B
 159          HC       2

 160          KK  SUM2+3+4
 161          KM   COMBINE HYDROGRAPHS FROM AREAS 2, 3 &4
 162          HC       2

 163          KK   BAS A
 164          KM   DETENTION BASIN FOR BASIN AREAS 2 + 3 + 4
 165          RS       1    STOR      -1
 166          SV       0   0.488    1.50   6.409   9.302   9.726  12.007  16.734  21.686  24.247
 167          SE  1214.4  1215.4  1215.9  1217.4  1218.2  1218.3  1218.8  1219.8  1220.8  1221.3
 168          SQ       0     5.5     8.6    10.9    12.8    14.5    15.5
 169          SE  1214.4 1215.73 1216.73 1217.73 1218.73 1219.73 1220.40

 170          KK    RT A
 171          KM   ROUTE DETENTION BASIN A OUTFLOW TO ADOT DETENTION BASIN 1
 172          RK    3400   .0126    .012            CIRC     4.0

 173          KK   SUM 1
 174          KM   COMBINE HYDROGRAPHS FROM BASIN 'A' OUTLET AND I-10 BASINS 22-87
 175          HC       2

 176          KK     DB1     Route flow through Dtn. Basin 1
 177          KM             (Elev - disch based on BPR inlet control nomograph)
 178          RS       1    STOR      -1
 179          SA  2.0432  2.5195  3.2197
 180          SE    1170    1175    1180
 181          SQ       0      28      45
```

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

 182          KK    CP2A     Route flow from Basin 1 to Basin 2A
 183          RK     282  0.0027   0.012            CIRC     2.0

 184          KK    SB2A     Runoff into and from Dtn.Basin 2A
 185          BA  0.0145
 186          LS             100     100
 187          UD  0.0955

 188          KK   SUM2A     Add routed flow and runoff from sub-basin DB2A
 189          HC

 190          KK    DB2A     Route combined flow through Dtn. Basin 2A
 191          KM             (Elev - disch based on BPR inlet control nomograph)
 192          RS       1    STOR      -1
 193          SA  1.1387  1.2688  1.3988  1.5289
 194          SE  1162.5  1163.5  1164.5  1165.5
 195          SQ       0       4      13      20

 196          KK    SB3A     Runoff at Dtn. Basin 3A
 197          BA  0.0096
 198          LS             100     100
 199          UD  0.0723

 200          KK    DB3A     Route flow through Dtn. Basin 3A
 201          KM             (Elev - disch based on BPR inlet control nomograph)
 202          RS       1    STOR      -1
 203          SA  0.2732  0.7886  1.0101  1.2317  1.4532  1.6749
 204          SE    1171  1172.8  1174.6  1176.4  1178.2    1180
 205          SQ       0      11      24    32.5      40      43

 206          KK    CP3B     Route flow from Basin 3A to Basin 3B
 207          RK     260  0.0160   0.012            CIRC     2.0
 208          RK     222  0.0165   0.012            CIRC     2.0

 209          KK    SB3B     Runoff from Dtn. Basin 3B
 210          BA  0.0348
 211          LS             100     100
 212          UD  0.1387

 213          KK   SUM3B     Add routed flow and runoff from sub-basin SB3B
 214          HC

 215          KK    DB3B     Route combined flow through Dtn. Basin 3B
 216          KM             (Elev - disch based on BPR inlet control nomograph)
 217          RS       1    STOR      -1
 218          SA  0.1700  0.2134  0.2741  0.3347  0.3954  1.1500  1.1865  1.2590
 219          SE    1162    1163  1164.4  1165.8  1167.2  1168.5    1169 1169.75
 220          SQ       0     4.5      16      24      30      35      37      40
```

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

 221          KK   SB131     Runoff from Sub-basins 124-31
 222          BA  0.0164
 223          LS             100     100
 224          UD  0.0542

 225          KK    SB2B     Runoff at Dtn.Basin 2B
 226          KM             NOTE - contrib area includes Southern Ave pump station
 227          BA  0.0225
 228          LS             100     100
 229          UD  0.1691

 230          KK   SUM2B     Add routed and local flows
 231          HC       4

 232          KK    DB2B     Route combined flow through Dtn. Basin 2B
 233          KM             (Elev - disch based on outlet control)
 234          RS       1    STOR      -1
 235          SA  3.7764  3.9830  4.1896  4.3962  4.6028  4.8095  5.0275  5.2456
 236          SE    1157    1158    1159    1160    1161    1162    1163    1164
 237          SQ       0     4.5      13      14    15.1    16.2    17.3    18.4

 238          KK    MH43     Route flow from Basin 2B to MH43
 239          RK     455  0.0015   0.012            CIRC     2.0
 240          RK     404  0.0030   0.012            CIRC     2.0
 241          RK     250  0.0036   0.012            CIRC     2.0

 242          KK    SB43     Runoff from off-roadway areas to Southern Ave basin
 243          BA  0.0016
 244          LS             100     100
 245          UD  0.0392

 246          KK     DB4     Route flow through Southern Ave. det basin
 247          KM             (Elev - disch based on combined capacities of existing 16 inch
 248          KM             pipe at east end of basin and proposed surface inlet grate at
 249          KM             west end)
 250          RS       1    STOR      -1
 251          SA  0.0356  0.2594  0.7071  1.1548  1.6024  2.0500
 252          SE  1158.5    1159    1160    1161    1162    1163
 253          SQ       0       5      15      22      28      33

 254          KK  DVTDB4     Split hydrograph DB4.
 255          KM             NOTE - New inlet grate at west end of Southern Ave det basin
 256          KM                    is opened up after Unit 2 is constructed.
 257          DT   TEMPE
 258          DI       0       5      15      22      28      33
 259          DQ       0       0       3       7      10      12

 260          KK   SUM43     Sum hydrographs MH43 and DVTDB4
 261          HC
```

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

 262          KK    MH63     Route SUM43 to DMJM tie-in at 8152+00,119'lt.
 263          RK     124  0.0037   0.012            CIRC     2.0
 264          RK     299  0.0040   0.012            CIRC     2.0

 265          KK  SUB135     Runoff from sub-basin 135 (DMJM)
 266          BA   0.002
 267          LS             100      100
 268          UD    0.10

 269          KK  SUM135     Sum hydrographs SUB135 and MH63
 270          HC

 271          KK    RCHE     Route SUM135 to DMJM det basin E near Bell Butte
 272          RK     300  0.0030   0.012            CIRC     2.0
 273          RK     350  0.0030   0.012            CIRC     2.5
 274          RK     450  0.0030   0.012            CIRC     2.5
 275          RK     246  0.0020   0.012            CIRC     4.0
 276          RK     331  0.0010   0.012            CIRC     4.0
 277          RK     361  0.0010   0.012            CIRC     4.5
 278          RK     322  0.0025   0.012            CIRC     5.0
 279          RK    1442  0.0010   0.012            CIRC     5.0

 280          KK    SUBE  RUNOFF FROM SUB-BASIN E
 281          BA   0.064
 282          LS             100      100
 283          UD    0.20

 284          KK    SUME     Sum hydrographs SUBE and RCHE
 285          HC       2
 286          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  37        SB1
              .
              .
  42          .          2A
              .           V
              .           V
  51          .        RT2P
              .           .
              .           .
  54          .           .          2B
              .           .           V
              .           .           V
  63          .           .        RT2Q
              .           .           .
              .           .           .
  68          .           .           .------->      2U
  66          .           .          2B
              .           .           V
              .           .           V
  71          .           .        RT2R
              .           .           .
              .           .           .
  74          .           .           .          2C
              .           .           .           .
              .           .           .           .
  83          .        SUM2S.......................
              .           .
              .           .
  86          .           .          3A
              .           .           .
              .           .           .
  97          .           .           .------->      3U
  95          .           .          3A
              .           .           V
              .           .           V
 100          .           .        RT3P
              .           .           .
              .           .           .
 105          .           .           .           .<-------      3U
 103          .           .           .          3U
              .           .           .           V
              .           .           .           V
 106          .           .           .        RT3T
              .           .           .           .
              .           .           .           .
 109          .           .           .           .          3B
              .           .           .           .           .
              .           .           .           .           .
 118          .           .           .       SUM3Q............
              .           .           .           .
              .           .           .           .
 121          .           .           .           .          3C
              .           .           .           .           .
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                .          .          .          .          .
130             .          .      SUM3V.......................
                .          .          .
                .          .          .
133             .      SUM 3............
                .          .
                .          .
136             .          .         4A
                .          .          V
                .          .          V
145             .          .       RT4P
                .          .          .
                .          .          .
148             .          .          .         4B
                .          .          .          .
                .          .          .          .
157             .          .      SUM4Q............
                .          .          .
                .          .          .
160             .     SUM2+3............
                .          V
                .          V
163             .      BAS A
                .          V
                .          V
170             .       RT A
                .          .
                .          .
173         SUM 1............
                V
                V
176          DB1
                V
                V
182         CP2A
                .
                .
184             .       SB2A
                .          .
                .          .
188         SUM2A............
                V
                V
190          DB2A
                .
                .
196             .       SB3A
                .          V
                .          V
200             .       DB3A
                .          V
                .          V
206             .       CP3B
                .          .
                .          .
209             .          .       SB3B
                .          .          .
                .          .          .
213             .      SUM3B............
                .          V
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            .          V
215         .       DB3B
            .          .
            .          .
221         .          .       SB131
            .          .          .
            .          .          .
225         .          .          .        SB2B
            .          .          .          .
            .          .          .          .
230      SUM2B.................................
            V
            V
232      DB2B
            V
            V
238      MH43
            .
            .
242         .       SB43
            .          V
            .          V
246         .       DB4
            .          .
            .          .
257         .          .-------->   TEMPE
254         .     DVTDB4
            .          .
            .          .
260      SUM43............
            V
            V
262      MH63
            .
            .
265         .     SUB135
            .          .
            .          .
269     SUM135............
            V
            V
271      RCHE
            .
            .
280         .       SUBE
            .          .
            .          .
284      SUME............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  05/27/1996  TIME  11:59:10 *
*                                      *
****************************************
```

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

```
GUADALUPE PRE-DESIGN STUDY    FCD CONTRACT NO. 94-17
50 YEAR 6-HOUR STORM BY SCS DIMENSIONLESS HYDROGRAPH METHOD
RAINFALL LOSSES COMPUTED USING GREEN & AMPT METHOD
*****************************************************************
**FUTURE** FULLY DEVELOPED CONDITIONS.  THIS RUN SERVES TO
DETERMINE THE EFFECTS OF BLEEDING OFF BASIN 'A' INTO THE ADOT
I-10 & SUPERSTITION TI DETENTION BASIN SYSTEM.  NOTE THAT HGL
EFFECTS IN THE ADOT STORM DRAIN SYSTEM HAVE NOT BEEN CONSIDERED.
*****************************************************************
STUDY BY PBS&J                                    TAB   5-12-96
FILENAME = BASA50.HC1
*****************************************************************
*****************************************************************
THIS FILE WAS ADAPTED FROM A COMBINATION OF THE GUADALUPE FILE
100Y6F.HC1 AND THE FOLLOWING DESCRIBED FILE:
******
I10/SUPERSTITION/BASELINE
STANLEY CONSULTANTS # 10591
ORIGINAL FILENAME : ULT50a       DATE : 28 APR 1992
ORIGINAL DESIGN FREQUENCY = 50YR
SCS DIMENSIONLESS UNIT HYDROGRAPH
AREAS TAKEN FROM STANLEY FINAL DESIGN
ADOT LETTER OF 12-12-90:
    * 6HR RAINFALL DISTRIBUTION USING PH RECORD
    * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
    * BASIN AREA = C * A; 100% IMPERVIOUS

*************************************************************
THE GUADALUPE DESIGN STORM WAS CHANGED TO THE 50 YEAR EVENT
TO MODEL THE ADOT DETENTION BASIN SYSTEM DURING ITS DESIGN
STORM.
*************************************************************
```

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

   IT          HYDROGRAPH TIME DATA
                      NMIN          2  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1   0  STARTING DATE
                     ITIME       0000  STARTING TIME
                        NQ        181  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      1   0  ENDING DATE
```

```
                NDTIME        0600  ENDING TIME
                ICENT           19  CENTURY MARK

          COMPUTATION INTERVAL     .03 HOURS
              TOTAL TIME BASE    6.00 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

WARNING --- ROUTED OUTFLOW (     20.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     20.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     20.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     20.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE

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WARNING --- ROUTED OUTFLOW (     23.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE
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WARNING --- ROUTED OUTFLOW (     25.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SB1	265.	3.30	33.	33.	33.	.10		
HYDROGRAPH AT	2A	61.	3.17	6.	6.	6.	.03		
ROUTED TO	RT2P	61.	3.20	6.	6.	6.	.03		
HYDROGRAPH AT	2B	92.	3.17	8.	8.	8.	.04		
ROUTED TO	RT2Q	91.	3.20	8.	8.	8.	.04		
DIVERSION TO	2U	69.	3.20	7.	7.	7.	.04		
HYDROGRAPH AT	2B	23.	3.20	1.	1.	1.	.04		
ROUTED TO	RT2R	18.	3.33	1.	1.	1.	.04		
HYDROGRAPH AT	2C	72.	3.20	8.	8.	8.	.03		
3 COMBINED AT	SUM2S	136.	3.23	14.	14.	14.	.10		
HYDROGRAPH AT	3A	88.	3.13	7.	7.	7.	.03		
DIVERSION TO	3U	44.	3.13	3.	3.	3.	.03		
HYDROGRAPH AT	3A	44.	3.13	3.	3.	3.	.03		
ROUTED TO	RT3P	44.	3.27	3.	3.	3.	.03		
HYDROGRAPH AT	3U	44.	3.13	3.	3.	3.	.00		
ROUTED TO	RT3T	44.	3.20	3.	3.	3.	.00		
HYDROGRAPH AT	3B	50.	3.10	3.	3.	3.	.01		
2 COMBINED AT	SUM3Q	85.	3.13	6.	6.	6.	.01		
HYDROGRAPH AT	3C	111.	3.10	6.	6.	6.	.03		
3 COMBINED AT	SUM3V	202.	3.13	16.	16.	16.	.08		
2 COMBINED AT	SUM 3	323.	3.17	30.	30.	30.	.18		
HYDROGRAPH AT	4A	56.	3.13	4.	4.	4.	.02		
ROUTED TO	RT4P	57.	3.23	4.	4.	4.	.02		
HYDROGRAPH AT	4B	121.	3.13	8.	8.	8.	.04		
2 COMBINED AT	SUM4Q	157.	3.20	12.	12.	12.	.07		
2 COMBINED AT	SUM2+3	478.	3.17	42.	42.	42.	.24		

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

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RT2P	MANE	2.00	61.32	192.00	1.83	2.00	61.32	192.00	1.83

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2732E+01 EXCESS= .0000E+00 OUTFLOW= .2730E+01 BASIN STORAGE= .5198E-02 PERCENT ERROR= -.1

RT2Q	MANE	1.21	91.95	191.31	1.89	2.00	91.45	192.00	1.89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4036E+01 EXCESS= .0000E+00 OUTFLOW= .4033E+01 BASIN STORAGE= .4006E-02 PERCENT ERROR= .0

RT2R	MANE	.90	18.18	199.80	.19	2.00	18.18	200.00	.19

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4477E+00 EXCESS= .0000E+00 OUTFLOW= .4154E+00 BASIN STORAGE= .1333E-02 PERCENT ERROR= 6.9

RT3P	MANE	2.00	44.37	196.00	.95	2.00	44.37	196.00	.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1673E+01 EXCESS= .0000E+00 OUTFLOW= .1666E+01 BASIN STORAGE= .1274E-01 PERCENT ERROR= -.4

RT3T	MANE	2.00	43.82	192.00	-1.00	2.00	43.82	192.00	-1.00

RT4P	MANE	2.00	56.60	194.00	1.60	2.00	56.60	194.00	1.60

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1963E+01 EXCESS= .0000E+00 OUTFLOW= .1960E+01 BASIN STORAGE= .7005E-02 PERCENT ERROR= -.2

RT A	MANE	1.49	15.01	247.84	.31	2.00	15.01	248.00	.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4083E+01 EXCESS= .0000E+00 OUTFLOW= .4037E+01 BASIN STORAGE= .6528E-01 PERCENT ERROR= -.5

CP2A	MANE	.36	31.10	252.77	.40	2.00	31.10	252.00	.40

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7402E+01 EXCESS= .0000E+00 OUTFLOW= .7393E+01 BASIN STORAGE= .1374E-01 PERCENT ERROR= -.1

CP3B	MANE	.22	10.00	202.20	2.71	2.00	10.00	202.00	2.71

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1390E+01 EXCESS= .0000E+00 OUTFLOW= .1389E+01 BASIN STORAGE= .4917E-03 PERCENT ERROR= .0

ROUTED TO	BAS A	15.	4.03	8.	8.	8.	.24	1220.07	4.07
ROUTED TO	RT A	15.	4.10	8.	8.	8.	.24		
2 COMBINED AT	SUM 1	277.	3.30	41.	41.	41.	.35		
ROUTED TO	DB1	31.	4.20	15.	15.	15.	.35	1175.91	4.20
ROUTED TO	CP2A	31.	4.20	15.	15.	15.	.35		
HYDROGRAPH AT	SB2A	55.	3.10	5.	5.	5.	.01		
2 COMBINED AT	SUM2A	66.	3.13	19.	19.	19.	.36		
ROUTED TO	DB2A	25.	6.00	9.	9.	9.	.36	1166.18	6.00
HYDROGRAPH AT	SB3A	40.	3.10	3.	3.	3.	.01		
ROUTED TO	DB3A	10.	3.37	3.	3.	3.	.01	1172.64	3.37
ROUTED TO	CP3B	10.	3.37	3.	3.	3.	.01		
HYDROGRAPH AT	SB3B	118.	3.17	11.	11.	11.	.03		
2 COMBINED AT	SUM3B	127.	3.17	14.	14.	14.	.04		
ROUTED TO	DB3B	37.	3.57	13.	13.	13.	.04	1168.93	3.57
HYDROGRAPH AT	SB131	73.	3.07	5.	5.	5.	.02		
HYDROGRAPH AT	SB2B	70.	3.20	7.	7.	7.	.02		
4 COMBINED AT	SUM2B	156.	3.13	35.	35.	35.	.44		
ROUTED TO	DB2B	14.	6.00	7.	7.	7.	.44	1160.41	6.00
ROUTED TO	MH43	14.	5.97	7.	7.	7.	.44		
HYDROGRAPH AT	SB43	7.	3.07	1.	1.	1.	.00		
ROUTED TO	DB4	5.	3.13	1.	1.	1.	.00	1158.97	3.13
DIVERSION TO	TEMPE	0.	3.13	0.	0.	0.	.00		
HYDROGRAPH AT	DVTDB4	5.	3.13	1.	1.	1.	.00		
2 COMBINED AT	SUM43	15.	5.97	7.	7.	7.	.45		
ROUTED TO	MH63	15.	5.97	7.	7.	7.	.45		
HYDROGRAPH AT	SUB135	8.	3.13	1.	1.	1.	.00		
2 COMBINED AT	SUM135	17.	3.17	8.	8.	8.	.45		
ROUTED TO	RCHE	16.	3.20	8.	8.	8.	.45		
HYDROGRAPH AT	SUBE	185.	3.23	20.	20.	20.	.06		
2 COMBINED AT	SUME	202.	3.23	28.	28.	28.	.51		

```
          MH43  MANE          .31     14.45    359.73       .14      2.00     14.44    358.00         .14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3288E+01 EXCESS= .0000E+00 OUTFLOW= .3279E+01 BASIN STORAGE= .6245E-02 PERCENT ERROR=    .1

          MH63  MANE          .36     14.51    357.85       .15      2.00     14.51    358.00         .15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3527E+01 EXCESS= .0000E+00 OUTFLOW= .3517E+01 BASIN STORAGE= .6883E-02 PERCENT ERROR=    .1

          RCHE  MANE         1.75     16.52    192.78       .16      2.00     16.46    192.00         .16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3829E+01 EXCESS= .0000E+00 OUTFLOW= .3754E+01 BASIN STORAGE= .7146E-01 PERCENT ERROR=    .1


*** NORMAL END OF HEC-1 ***
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****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
* RUN DATE  05/27/1996  TIME  11:58:36 *
*                                      *
****************************************
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```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
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X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X               X
XXXXXXX  XXXX    X       XXXXX   X
X     X  X       X               X
X     X  X       X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

100 YEAR 6 HOUR STORM

FCD 94-17

BASIN 'A' WATERSHED & ADOT'S I-10 STORM DRAIN/ DETENTION BASIN SYSTEM

FILENAME = BASA100.HC1

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

  1           ID        GUADALUPE PRE-DESIGN STUDY    FCD CONTRACT NO. 94-17
  2           ID        100 YEAR 6-HOUR STORM BY SCS DIMENSIONLESS HYDROGRAPH METHOD
  3           ID        RAINFALL LOSSES COMPUTED USING GREEN & AMPT METHOD
  4           ID        ***************************************************************
  5           ID        **FUTURE** FULLY DEVELOPED CONDITIONS.  THIS RUN SERVES TO
  6           ID        DETERMINE THE EFFECTS OF BLEEDING OFF BASIN 'A' INTO THE ADOT
  7           ID        I-10 & SUPERSTITION TI DETENTION BASIN SYSTEM.  NOTE THAT HGL
  8           ID        EFFECTS IN THE ADOT STORM DRAIN SYSTEM HAVE NOT BEEN CONSIDERED.
  9           ID        ***************************************************************
 10           ID        STUDY BY PBS&J                                    TAB   5-12-96
 11           ID        FILENAME = BASA100.HC1
 12           ID        ***************************************************************
 13           ID        ***************************************************************
 14           ID        THIS FILE WAS ADAPTED FROM A COMBINATION OF THE GUADALUPE FILE
 15           ID        100Y6F.HC1 AND THE FOLLOWING DESCRIBED FILE:
 16           ID        ******
 17           ID        I10/SUPERSTITION/BASELINE
 18           ID        STANLEY CONSULTANTS # 10591
 19           ID        ORIGINAL FILENAME : ULT50a       DATE : 28 APR 1992
 20           ID        ORIGINAL DESIGN FREQUENCY = 50YR
 21           ID        SCS DIMENSIONLESS UNIT HYDROGRAPH
 22           ID        AREAS TAKEN FROM STANLEY FINAL DESIGN
 23           ID        ADOT LETTER OF 12-12-90:
 24           ID            * 6HR RAINFALL DISTRIBUTION USING PH RECORD
 25           ID            * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
 26           ID            * BASIN AREA = C * A; 100% IMPERVIOUS
 27           ID
 28           ID        ************************************************************
 29           ID        THE STORM WAS CHANGED TO THE 100 YEAR EVENT TO MODEL THE
 30           ID        GUADALUPE DESIGN STORM.
 31           ID        ************************************************************
 32           ID
 33           ID
              *DIAGRAM
 34           IT       2                    181
 35           IO       5

 36           KK     SB1     Runoff from sub-basins 22-87,Dtn.Basin 1 @ HDW9
 37           BA   0.104
 38           PH                     .75    1.46    2.60    2.83    2.98    3.27
 39           LS             100     100
 40           UD  0.2601

 41           KK      2A
 42           KM   SUB-BASIN 2A
 43           KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
 44           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
 45           BA    .028
 46           LG    .180    .250   4.100    .380  29.000
 47           UC    .183    .203
 48           UA       0       5      16      30      65      77      84      90      94      97
 49           UA     100
```

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

  50          KK    RT2P
  51          KM   ROUTE SUBBASIN 2A THROUGH REACH 2P
  52          RD     750    .013    .030            TRAP       5       3

  53          KK      2B
  54          KM   SUB-BASIN 2B
  55          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  56          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  57          BA    .040
  58          LG    .176    .250   4.100    .380  33.000
  59          UC    .192    .185
  60          UA       0       5      16      30      65      77      84      90      94      97
  61          UA     100

  62          KK    RT2Q
  63          KM   ROUTE SUBBASIN 2B THROUGH REACH 2Q
  64          RD     250    .006    .020            TRAP      .2      50

  65          KK      2B
  66          KM   DIVERT FLOW FROM SUB-BASIN 2B
  67          DT      2U
  68          DI       0      20      40      60      80     100
  69          DQ       0      20      40      53      63      73

  70          KK    RT2R
  71          KM   ROUTE SUBBASIN 2B THROUGH REACH 2R
  72          RD     700   .0017    .030            TRAP      20      15

  73          KK      2C
  74          KM   SUB-BASIN 2C
  75          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  76          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  77          BA    .029
  78          LG    .100    .250   4.100    .380  70.000
  79          UC    .229    .190
  80          UA       0       5      16      30      65      77      84      90      94      97
  81          UA     100

  82          KK   SUM2S
  83          KM   COMBINE HYDROGRAPHS 2A,2B,2C
  84          HC       3

  85          KK      3A
  86          KM   SUB-BASIN 3A
  87          KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  88          KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  89          BA    .033
  90          LG    .175    .250   4.100    .380  33.400
  91          UC    .158    .141
  92          UA       0       5      16      30      65      77      84      90      94      97
  93          UA     100
```

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

 94           KK      3A
 95           KM   DIVERT FLOW FROM SUB-BASIN 3A
 96           DT      3U
 97           DI       0      20      40      60      80     100
 98           DQ       0      10      20      30      40      50

 99           KK    RT3P
100           KM   ROUTE SUBBASIN 3A THROUGH REACH 3P
101           RD    1750    .009    .020            TRAP      .2      50

102           KK      3U
103           KM   RETRIEVE DIVERTED HYDROGRAPH 3U
104           DR      3U

105           KK    RT3T
106           KM   ROUTE RETRIEVED HYDROGRAPH 3U THROUGH REACH 3T
107           RD     800    .011    .030            TRAP      10      10

108           KK      3B
109           KM   SUB-BASIN 3B
110           KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
111           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
112           BA    .015
113           LG    .153    .250   3.600    .460  33.700
114           UC    .117    .082
115           UA       0       5      16      30      65      77      84      90      94      97
116           UA     100

117           KK   SUM3Q
118           KM   COMBINE HYDROGRAPHS 3B,DIVERTED FLOW 3U
119           HC       2

120           KK      3C
121           KM   SUB-BASIN 3C
122           KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
123           KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
124           BA    .031
125           LG    .162    .250   4.100    .380  25.900
126           UC    .121    .062
127           UA       0       5      16      30      65      77      84      90      94      97
128           UA     100

129           KK   SUM3V
130           KM   COMBINE HYDROGRAPHS 3A,FLOW FROM 3R,3C
131           HC       3

132           KK   SUM 3
133           KM   COMBINE HYDROGRAPHS from ALL SUB-BASINS OF D.A. 3
134           HC       2
```

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

  135         KK      4A
  136         KM   SUB-BASIN 4A
  137         KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  138         KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  139         BA    .023
  140         LG    .180    .250   4.100    .380  14.000
  141         UC    .150    .155
  142         UA       0       5      16      30      65      77      84      90      94      97
  143         UA     100

  144         KK    RT4P
  145         KM   ROUTE SUBBASIN 4A THROUGH REACH 4P
  146         RD    1500     .01    .020            TRAP      .2      50

  147         KK      4B
  148         KM   SUB-BASIN 4B
  149         KM   6-HOUR RAINFALL, PATTERN NO. 1.22 WAS USED TO FIND TC & R FOR THIS BASIN
  150         KM   THIS BASIN USED RAINFALL REDUCTION FACTOR OF .991
  151         BA    .043
  152         LG    .169    .250   4.100    .380  21.000
  153         UC    .158    .116
  154         UA       0       5      16      30      65      77      84      90      94      97
  155         UA     100

  156         KK   SUM4Q
  157         KM   COMBINE HYDROGRAPHS 4A,4B
  158         HC       2

  159         KK  SUM2+3+4
  160         KM   COMBINE HYDROGRAPHS FROM AREAS 2, 3 &4
  161         HC       2

  162         KK   BAS A
  163         KM   DETENTION BASIN FOR BASIN AREAS 2 + 3 + 4
  164         RS       1    STOR      -1
  165         SV       0   0.488    1.50   6.409   9.302   9.726  12.007  16.734  21.686  24.247
  166         SE  1214.4  1215.4  1215.9  1217.4  1218.2  1218.3  1218.8  1219.8  1220.8  1221.3
  167         SQ       0     5.5     8.6    10.9    12.8    14.5    15.5
  168         SE  1214.4 1215.73 1216.73 1217.73 1218.73 1219.73 1220.40

  169         KK    RT A
  170         KM   ROUTE DETENTION BASIN A OUTFLOW TO ADOT DETENTION BASIN 1
  171         RK    3400   .0126    .012            CIRC     4.0

  172         KK   SUM 1
  173         KM   COMBINE HYDROGRAPHS FROM BASIN 'A' OUTLET AND I-10 BASINS 22-87
  174         HC       2

  175         KK     DB1     Route flow through Dtn. Basin 1
  176         KM             (Elev - disch based on BPR inlet control nomograph)
  177         RS       1    STOR      -1
  178         SA  2.0432  2.5195  3.2197
  179         SE    1170    1175    1180
  180         SQ       0      28      45
```

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

 181          KK    CP2A     Route flow from Basin 1 to Basin 2A
 182          RK     282  0.0027   0.012            CIRC     2.0

 183          KK    SB2A     Runoff into and from Dtn.Basin 2A
 184          BA  0.0145
 185          LS             100     100
 186          UD  0.0955

 187          KK   SUM2A     Add routed flow and runoff from sub-basin DB2A
 188          HC

 189          KK    DB2A     Route combined flow through Dtn. Basin 2A
 190          KM             (Elev - disch based on BPR inlet control nomograph)
 191          RS       1    STOR      -1
 192          SA  1.1387  1.2688  1.3988  1.5289
 193          SE  1162.5  1163.5  1164.5  1165.5
 194          SQ       0       4      13      20

 195          KK    SB3A     Runoff at Dtn. Basin 3A
 196          BA  0.0096
 197          LS             100     100
 198          UD  0.0723

 199          KK    DB3A     Route flow through Dtn. Basin 3A
 200          KM             (Elev - disch based on BPR inlet control nomograph)
 201          RS       1    STOR      -1
 202          SA  0.2732  0.7886  1.0101  1.2317  1.4532  1.6749
 203          SE    1171  1172.8  1174.6  1176.4  1178.2    1180
 204          SQ       0      11      24    32.5      40      43

 205          KK    CP3B     Route flow from Basin 3A to Basin 3B
 206          RK     260  0.0160   0.012            CIRC     2.0
 207          RK     222  0.0165   0.012            CIRC     2.0

 208          KK    SB3B     Runoff from Dtn. Basin 3B
 209          BA  0.0348
 210          LS             100     100
 211          UD  0.1387

 212          KK   SUM3B     Add routed flow and runoff from sub-basin SB3B
 213          HC

 214          KK    DB3B     Route combined flow through Dtn. Basin 3B
 215          KM             (Elev - disch based on BPR inlet control nomograph)
 216          RS       1    STOR      -1
 217          SA  0.1700  0.2134  0.2741  0.3347  0.3954  1.1500  1.1865  1.2590
 218          SE    1162    1163  1164.4  1165.8  1167.2  1168.5    1169 1169.75
 219          SQ       0     4.5      16      24      30      35      37      40
```

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

 220          KK   SB131     Runoff from Sub-basins 124-31
 221          BA  0.0164
 222          LS              100      100
 223          UD  0.0542

 224          KK    SB2B     Runoff at Dtn.Basin 2B
 225          KM             NOTE - contrib area includes Southern Ave pump station
 226          BA  0.0225
 227          LS              100      100
 228          UD  0.1691

 229          KK   SUM2B     Add routed and local flows
 230          HC       4

 231          KK    DB2B     Route combined flow through Dtn. Basin 2B
 232          KM             (Elev - disch based on outlet control)
 233          RS       1    STOR      -1
 234          SA  3.7764  3.9830  4.1896  4.3962  4.6028  4.8095  5.0275  5.2456
 235          SE    1157    1158    1159    1160    1161    1162    1163    1164
 236          SQ       0     4.5      13      14    15.1    16.2    17.3    18.4

 237          KK    MH43     Route flow from Basin 2B to MH43
 238          RK     455  0.0015   0.012            CIRC     2.0
 239          RK     404  0.0030   0.012            CIRC     2.0
 240          RK     250  0.0036   0.012            CIRC     2.0

 241          KK    SB43     Runoff from off-roadway areas to Southern Ave basin
 242          BA  0.0016
 243          LS              100      100
 244          UD  0.0392

 245          KK     DB4     Route flow through Southern Ave. det basin
 246          KM             (Elev - disch based on combined capacities of existing 16 inch
 247          KM             pipe at east end of basin and proposed surface inlet grate at
 248          KM             west end)
 249          RS       1    STOR      -1
 250          SA  0.0356  0.2594  0.7071  1.1548  1.6024  2.0500
 251          SE  1158.5    1159    1160    1161    1162    1163
 252          SQ       0       5      15      22      28      33

 253          KK  DVTDB4     Split hydrograph DB4.
 254          KM             NOTE - New inlet grate at west end of Southern Ave det basin
 255          KM                    is opened up after Unit 2 is constructed.
 256          DT   TEMPE
 257          DI       0       5      15      22      28      33
 258          DQ       0       0       3       7      10      12

 259          KK   SUM43     Sum hydrographs MH43 and DVTDB4
 260          HC
```

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

 261          KK    MH63     Route SUM43 to DMJM tie-in at 8152+00,119'lt.
 262          RK     124  0.0037   0.012            CIRC     2.0
 263          RK     299  0.0040   0.012            CIRC     2.0

 264          KK  SUB135     Runoff from sub-basin 135 (DMJM)
 265          BA   0.002
 266          LS             100      100
 267          UD    0.10

 268          KK  SUM135     Sum hydrographs SUB135 and MH63
 269          HC

 270          KK    RCHE     Route SUM135 to DMJM det basin E near Bell Butte
 271          RK     300  0.0030   0.012            CIRC     2.0
 272          RK     350  0.0030   0.012            CIRC     2.5
 273          RK     450  0.0030   0.012            CIRC     2.5
 274          RK     246  0.0020   0.012            CIRC     4.0
 275          RK     331  0.0010   0.012            CIRC     4.0
 276          RK     361  0.0010   0.012            CIRC     4.5
 277          RK     322  0.0025   0.012            CIRC     5.0
 278          RK    1442  0.0010   0.012            CIRC     5.0

 279          KK    SUBE  RUNOFF FROM SUB-BASIN E
 280          BA   0.064
 281          LS             100      100
 282          UD    0.20

 283          KK    SUME     Sum hydrographs SUBE and RCHE
 284          HC       2
 285          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

 36          SB1
               .
               .
 41            .          2A
               .           V
               .           V
 50            .        RT2P
               .           .
               .           .
 53            .           .          2B
               .           .           V
               .           .           V
 62            .           .        RT2Q
               .           .           .
               .           .           .
 67            .           .           .-------->      2U
 65            .           .          2B
               .           .           V
               .           .           V
 70            .           .        RT2R
               .           .           .
               .           .           .
 73            .           .           .          2C
               .           .           .           .
               .           .           .           .
 82            .        SUM2S.......................
               .           .
               .           .
 85            .           .          3A
               .           .           .
               .           .           .
 96            .           .           .-------->      3U
 94            .           .          3A
               .           .           V
               .           .           V
 99            .           .        RT3P
               .           .           .
               .           .           .
 104           .           .           .          .<--------      3U
 102           .           .           .         3U
               .           .           .          V
               .           .           .          V
 105           .           .           .        RT3T
               .           .           .           .
               .           .           .           .
 108           .           .           .           .          3B
               .           .           .           .           .
               .           .           .           .           .
 117           .           .           .        SUM3Q............
               .           .           .           .
               .           .           .           .
 120           .           .           .           .          3C
               .           .           .           .           .
```

```
          .          .          .          .          .
129       .          .      SUM3V.......................
          .          .          .
          .          .          .
132       .      SUM 3............
          .          .
          .          .
135       .          .         4A
          .          .          V
          .          .          V
144       .          .       RT4P
          .          .          .
          .          .          .
147       .          .          .         4B
          .          .          .          .
          .          .          .          .
156       .          .      SUM4Q............
          .          .          .
          .          .          .
159       .     SUM2+3............
          .          V
          .          V
162       .      BAS A
          .          V
          .          V
169       .       RT A
          .          .
          .          .
172    SUM 1............
          V
          V
175     DB1
          V
          V
181     CP2A
          .
          .
183       .       SB2A
          .          .
          .          .
187    SUM2A............
          V
          V
189     DB2A
          .
          .
195       .       SB3A
          .          V
          .          V
199       .       DB3A
          .          V
          .          V
205       .       CP3B
          .          .
          .          .
208       .          .       SB3B
          .          .          .
          .          .          .
212       .      SUM3B............
          .          V
```

```
            .          V
214         .        DB3B
            .          .
            .          .
220         .          .       SB131
            .          .          .
            .          .          .
224         .          .          .        SB2B
            .          .          .          .
            .          .          .          .
229      SUM2B.................................
            V
            V
231      DB2B
            V
            V
237      MH43
            .
            .
241         .        SB43
            .          V
            .          V
245         .        DB4
            .          .
            .          .
256         .          .-------->   TEMPE
253         .      DVTDB4
            .          .
            .          .
259      SUM43............
            V
            V
261      MH63
            .
            .
264         .      SUB135
            .          .
            .          .
268     SUM135............
            V
            V
270      RCHE
            .
            .
279         .        SUBE
            .          .
            .          .
283      SUME............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            SEPTEMBER 1990            *
*             VERSION 4.0              *
*                                      *
*  RUN DATE  05/27/1996  TIME  11:58:36 *
*                                      *
****************************************
```

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

```
GUADALUPE PRE-DESIGN STUDY     FCD CONTRACT NO. 94-17
100 YEAR 6-HOUR STORM BY SCS DIMENSIONLESS HYDROGRAPH METHOD
RAINFALL LOSSES COMPUTED USING GREEN & AMPT METHOD
*****************************************************************
**FUTURE** FULLY DEVELOPED CONDITIONS.  THIS RUN SERVES TO
DETERMINE THE EFFECTS OF BLEEDING OFF BASIN 'A' INTO THE ADOT
I-10 & SUPERSTITION TI DETENTION BASIN SYSTEM.  NOTE THAT HGL
EFFECTS IN THE ADOT STORM DRAIN SYSTEM HAVE NOT BEEN CONSIDERED.
*****************************************************************
STUDY BY PBS&J                                    TAB   5-12-96
FILENAME = BASA100.HC1
*****************************************************************
*****************************************************************
THIS FILE WAS ADAPTED FROM A COMBINATION OF THE GUADALUPE FILE
100Y6F.HC1 AND THE FOLLOWING DESCRIBED FILE:
******
I10/SUPERSTITION/BASELINE
STANLEY CONSULTANTS # 10591
ORIGINAL FILENAME : ULT50a       DATE : 28 APR 1992
ORIGINAL DESIGN FREQUENCY = 50YR
SCS DIMENSIONLESS UNIT HYDROGRAPH
AREAS TAKEN FROM STANLEY FINAL DESIGN
ADOT LETTER OF 12-12-90:
    * 6HR RAINFALL DISTRIBUTION USING PH RECORD
    * TABULATION INTERVAL = 2MIN; 181 HYDROGRAPH ORDINATES
    * BASIN AREA = C * A; 100% IMPERVIOUS

*************************************************************
THE STORM WAS CHANGED TO THE 100 YEAR EVENT TO MODEL THE
GUADALUPE DESIGN STORM.
*************************************************************
```

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

   IT        HYDROGRAPH TIME DATA
                    NMIN          2  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1   0  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        181  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      1   0  ENDING DATE
                  NDTIME       0600  ENDING TIME
```

```
                ICENT          19  CENTURY MARK

            COMPUTATION INTERVAL     .03 HOURS
                TOTAL TIME BASE    6.00 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

WARNING --- ROUTED OUTFLOW (     20.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     20.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE

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WARNING --- ROUTED OUTFLOW (     22.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE

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WARNING --- ROUTED OUTFLOW (     24.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE
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WARNING --- ROUTED OUTFLOW (     24.) IS GREATER THAN MAXIMUM OUTFLOW (     20.) IN STORAGE-OUTFLOW TABLE
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	SB1	293.	3.30	36.	36.	36.	.10		
HYDROGRAPH AT	2A	69.	3.17	6.	6.	6.	.03		
ROUTED TO	RT2P	69.	3.20	6.	6.	6.	.03		
HYDROGRAPH AT	2B	104.	3.17	9.	9.	9.	.04		
ROUTED TO	RT2Q	103.	3.20	9.	9.	9.	.04		
DIVERSION TO	2U	75.	3.20	8.	8.	8.	.04		
HYDROGRAPH AT	2B	29.	3.20	1.	1.	1.	.04		
ROUTED TO	RT2R	24.	3.33	1.	1.	1.	.04		
HYDROGRAPH AT	2C	80.	3.20	9.	9.	9.	.03		
3 COMBINED AT	SUM2S	159.	3.23	16.	16.	16.	.10		
HYDROGRAPH AT	3A	99.	3.13	8.	8.	8.	.03		
DIVERSION TO	3U	49.	3.13	4.	4.	4.	.03		
HYDROGRAPH AT	3A	49.	3.13	4.	4.	4.	.03		
ROUTED TO	RT3P	50.	3.27	4.	4.	4.	.03		
HYDROGRAPH AT	3U	49.	3.13	4.	4.	4.	.00		
ROUTED TO	RT3T	49.	3.20	4.	4.	4.	.00		
HYDROGRAPH AT	3B	56.	3.10	3.	3.	3.	.01		
2 COMBINED AT	SUM3Q	97.	3.13	7.	7.	7.	.01		
HYDROGRAPH AT	3C	125.	3.10	7.	7.	7.	.03		
3 COMBINED AT	SUM3V	230.	3.13	18.	18.	18.	.08		
2 COMBINED AT	SUM 3	367.	3.17	34.	34.	34.	.18		
HYDROGRAPH AT	4A	64.	3.13	5.	5.	5.	.02		
ROUTED TO	RT4P	64.	3.23	5.	5.	5.	.02		
HYDROGRAPH AT	4B	136.	3.13	9.	9.	9.	.04		
2 COMBINED AT	SUM4Q	179.	3.20	14.	14.	14.	.07		
2 COMBINED AT	SUM2+3	545.	3.17	48.	48.	48.	.24		

ROUTED TO	BAS A	16.	4.07	9.	9.	9.	.24	1220.66	4.10
ROUTED TO	RT A	16.	4.13	9.	9.	9.	.24		
2 COMBINED AT	SUM 1	305.	3.30	45.	45.	45.	.35		
ROUTED TO	DB1	33.	4.23	16.	16.	16.	.35	1176.45	4.23
ROUTED TO	CP2A	33.	4.23	16.	16.	16.	.35		
HYDROGRAPH AT	SB2A	61.	3.10	5.	5.	5.	.01		
2 COMBINED AT	SUM2A	73.	3.13	21.	21.	21.	.36		
ROUTED TO	DB2A	26.	6.00	10.	10.	10.	.36	1166.42	6.00
HYDROGRAPH AT	SB3A	44.	3.10	3.	3.	3.	.01		
ROUTED TO	DB3A	11.	3.37	3.	3.	3.	.01	1172.81	3.37
ROUTED TO	CP3B	11.	3.37	3.	3.	3.	.01		
HYDROGRAPH AT	SB3B	131.	3.17	12.	12.	12.	.03		
2 COMBINED AT	SUM3B	140.	3.17	15.	15.	15.	.04		
ROUTED TO	DB3B	38.	3.57	15.	15.	15.	.04	1169.27	3.57
HYDROGRAPH AT	SB131	81.	3.07	6.	6.	6.	.02		
HYDROGRAPH AT	SB2B	78.	3.20	8.	8.	8.	.02		
4 COMBINED AT	SUM2B	171.	3.10	39.	39.	39.	.44		
ROUTED TO	DB2B	15.	6.00	7.	7.	7.	.44	1160.78	6.00
ROUTED TO	MH43	15.	5.97	7.	7.	7.	.44		
HYDROGRAPH AT	SB43	8.	3.07	1.	1.	1.	.00		
ROUTED TO	DB4	5.	3.13	1.	1.	1.	.00	1159.01	3.13
DIVERSION TO	TEMPE	0.	3.13	0.	0.	0.	.00		
HYDROGRAPH AT	DVTDB4	5.	3.13	1.	1.	1.	.00		
2 COMBINED AT	SUM43	15.	5.97	7.	7.	7.	.45		
ROUTED TO	MH63	15.	5.97	7.	7.	7.	.45		
HYDROGRAPH AT	SUB135	8.	3.13	1.	1.	1.	.00		
2 COMBINED AT	SUM135	19.	3.17	8.	8.	8.	.45		
ROUTED TO	RCHE	18.	3.20	8.	8.	8.	.45		
HYDROGRAPH AT	SUBE	205.	3.23	22.	22.	22.	.06		
2 COMBINED AT	SUME	223.	3.23	30.	30.	30.	.51		

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

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RT2P	MANE	2.00	69.44	192.00	2.10	2.00	69.44	192.00	2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3134E+01 EXCESS= .0000E+00 OUTFLOW= .3131E+01 BASIN STORAGE= .5628E-02 PERCENT ERROR= -.1

RT2Q	MANE	1.17	103.73	191.42	2.16	2.00	103.27	192.00	2.16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4615E+01 EXCESS= .0000E+00 OUTFLOW= .4612E+01 BASIN STORAGE= .4351E-02 PERCENT ERROR= .0

RT2R	MANE	1.10	23.69	199.10	.27	2.00	23.66	200.00	.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .6153E+00 EXCESS= .0000E+00 OUTFLOW= .5809E+00 BASIN STORAGE= .1628E-02 PERCENT ERROR= 5.3

RT3P	MANE	2.00	49.90	196.00	1.08	2.00	49.90	196.00	1.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1913E+01 EXCESS= .0000E+00 OUTFLOW= .1905E+01 BASIN STORAGE= .1383E-01 PERCENT ERROR= -.3

RT3T	MANE	2.00	49.37	192.00	-1.00	2.00	49.37	192.00	-1.00

RT4P	MANE	2.00	64.14	194.00	1.86	2.00	64.14	194.00	1.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2281E+01 EXCESS= .0000E+00 OUTFLOW= .2279E+01 BASIN STORAGE= .7573E-02 PERCENT ERROR= -.2

RT A	MANE	1.47	15.88	248.28	.33	2.00	15.88	248.00	.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4334E+01 EXCESS= .0000E+00 OUTFLOW= .4264E+01 BASIN STORAGE= .6843E-01 PERCENT ERROR= .0

CP2A	MANE	.35	32.93	254.39	.43	2.00	32.93	254.00	.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7889E+01 EXCESS= .0000E+00 OUTFLOW= .7871E+01 BASIN STORAGE= .1451E-01 PERCENT ERROR= .0

CP3B	MANE	.22	11.05	202.04	3.01	2.00	11.05	202.00	3.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1541E+01 EXCESS= .0000E+00 OUTFLOW= .1540E+01 BASIN STORAGE= .5369E-03 PERCENT ERROR= .0

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          MH43  MANE          .30     14.85    359.80       .14      2.00     14.84    358.00         .14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3411E+01 EXCESS= .0000E+00 OUTFLOW= .3402E+01 BASIN STORAGE= .6492E-02 PERCENT ERROR=    .1

          MH63  MANE          .33     14.92    357.75       .15      2.00     14.92    358.00         .15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3677E+01 EXCESS= .0000E+00 OUTFLOW= .3667E+01 BASIN STORAGE= .7504E-02 PERCENT ERROR=    .1

          RCHE  MANE         1.70     18.49    192.67       .17      2.00     18.38    192.00         .16

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4013E+01 EXCESS= .0000E+00 OUTFLOW= .3957E+01 BASIN STORAGE= .7339E-01 PERCENT ERROR=   -.4


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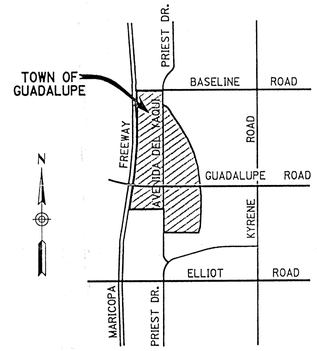

VICINITY MAP
NTS

8P	ROUTED HYDROGRAPH
8Q	DIVERTED HYDROGRAPH
8R	COMBINE HYDROGRAPHS
8S	RESERVOIR HYDROGRAPH
	FUTURE STORM DRAIN IMPROVEMENTS
S	EXISTING SCUPPER
	EXISTING CATCH BASIN
	FLOW SPLIT
	EXISTING RETENTION BASIN
	EXISTING BERM
	DRAINAGE DIRECTION
	EXISTING CULVERT & SIZE
	NOISE BARRIER WALL
	CITY LIMIT LINE
	TRIBUTARY AREA BOUNDARY
	SUB-AREA BOUNDARY
3B	DRAINAGE SUB AREA HYDROGRAPH

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
FLOOD CONTROL DISTRICT
ENGINEERING DIVISION

WATERSHED BOUNDARY MAP
GUADALUPE PRE-DESIGN STUDY
PROJECT NO. FCD 94-17

	BY	DATE
DESIGNED	M. MEDRANO	5/23/96
DRAWN	A. BALLESTEROS	5/23/96
CHECKED	T. BOKICH	5/23/96

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.
ENGINEERING · PLANNING · SURVEYING · CONSTRUCTION SERVICES

EXHIBIT 1

SHEET 1 OF 1

PREDSGN.dgn
Mar 16, 1994
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