RIO SALADO
DRAINAGE MASTER PLAN

Prepared for:

Rio Salado Project
and
the City of Tempe
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DRAFT

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1.0 INTRODUCTION

The Rio Salado Project is a major development in progress on the Salt River in the City of Tempe with Town Lake as its focal point. The City of Tempe, in association with selected developers and Arizona State University, proposes to develop the area between the south bank levee, Rio Salado Parkway, Mill Avenue, and the ASU Karsten Golf Course with high density commercial development (hereinafter referred to as the study area). The City has commissioned Wood/Patel to prepare a comprehensive drainage master plan for this study area to assist the city and developers in the overall development.The purpose of the drainage master plan is to describe pre-development drainage conditions affecting site development and recommend a specific plan that will; (1) provide for flood protection for the 100-year storm event, (2) provide best management practices in compliance with the City's NPDES Permit, (3) protect the water quality of Town Lake, and (4) provide for long-term solutions that are enforceable with guarantees from developers for continued operation and maintenance of stormwater facilities. To facilitate the study process five formal work sessions were conducted with City staff and developers to work out acceptable s solutions for the Rio Salado project. Input from these work sessions would then aid in the formulation and development of a specific drainage plan. Meeting minutes can be found in Appendix C.

The purpose of this report is to document the study process and the results leading to the recommendations in this report. Results of this study are conceptual, are intended to guide the individual site development process, and serve as the basis for preparing detailed system designs. As such, actual facility locations, sizes, and capacities may differ from those depicted in this study. However, the intent and development requirements would remain unchanged. Technical documentation supporting the results and recommendations within this report can be found in the appendices.

The study began with a site visit; researching all applicable city records pertaining to the study area and determining development requirements by FEMA, U.S. Army Corps of Engineers, Arizona Department of Environmental Quality, City of Tempe, Flood Control District of Maricopa County, Environmental Protection Agency, and the Rio Salado Project. We then investigated on-site and off-site hydrologic conditions affecting site development and identified alternative solutions. After considerable evaluation and discussion, a consensus of opinion was reached concerning the preferred drainage plan described herein.

2.0 HISTORY

The Rio Salado project is a major development with the Town Lake as its focal point. The City began construction of the Town Lake in July of this year with completion scheduled for the winter of 1999. The Lake should be in operation by the summer of 1999. The Town Lake project includes extension and diversion of stormwater systems around the lake. In some cases, only the "first flush" of the stormwater is being diverted with the remaining flow being discharged into the Lake. The City's existing storm drain systems are designed to carry street flows and surface flows from the downtown and north Tempe area. There is no additional capacity in these systems during peak runoff periods to handle runoff from the Rio Salado project. The east end of the town lake will be bounded by a 6' high rubber dam just upstream of the Indian Bend Wash. This rubber dam is designed to maintain a minimum lake depth and to keep low quality water nuisance flows out of the Lake. It is anticipated that a 36" pipeline bypass of the Town Lake will eventually be required due to planned upstream stormwater and reclaimed water effluent discharges into the Salt River.

The first phases of private development in the Rio Salado are being planned at the east end of the project (Peabody Hotel) and the west end (Hayden Ferry). These plans are in the early stages of development and an acceptable drainage master plan is required before the City can continue the development processing. The last segment of the Rio Salado Parkway between College and Farmer is being realigned to 1st Street and Ash Avenue, and is being designed by the consulting firm of BRW, Inc. during the course of this study.

The Rio Salado developments are planned as high density projects with limited space available for individual on-site retention. Given the proposed development plans, it is anticipated that creative solutions will be required to facilitate the proper disposal of stormwater runoff and provide 100-year protection for the property. This may include off-peak disposal of stormwater into the City's storm drain systems, construction of a parallel storm system to serve development only, onsite storage and/or filtering systems to remove stormwater pollutants, centralized retention/detention systems, and, if necessary, modification to the proposed development plans.

All requirements by FEMA have been satisfied and a Letter of Map Revision removing the site from the designated floodplain should be issued this year. LOMR's for levee systems are conditional on the successful operation and maintenance of interior drainage systems such as,storage areas, gravity outfalls, pumping stations, or a combination thereof. System design should consider the joint probability of interior and exterior facility capacities to evacuate interior floodwaters. These drainage systems will be recognized by FEMA when adequate warning systems, formal plans of operation, backup systems, and annual inspection and reporting are in place.

The Corps of Engineers has issued a 404 Permit for construction of the flood control levee and has effectively removed the study site from the jurisdictional Waters of the U.S. Therefore, further 404 Permits are not required.

The Arizona Department of Environmental Quality has issued a 401 Permit in conjunction with the 404 Permit for levee construction and Rio Salado Town Lake. An Aquifer Protection Permit (APP) has also been issued for the proposed Town Lake infiltration and recirculation system. Any proposed injection wells whose purpose is to discharge stormwater to the underlying aquifer will require application for an APP and approval by ADEQ. Therefore, drywells and on-site percolation are not believed to be appropriate for this site.

The Flood Control District of Maricopa County shares responsibility with the City of Tempe for operation and maintenance of the levee and must approve any proposed modifications to the levee.

3.0 SITE DESCRIPTION

The study area is bounded by the Salt River to the north, Rio Salado Parkway to the south, Mill Avenue to the west, and Karsten Golf Course to the east as illustrated in Figure 2. A flood control levee has been constructed along the Salt River from Mill Avenue to the Karsten Golf Course to prevent flood flows from inundating Arizona State University and other Tempe commercial and residential facilities. This has reclaimed a portion of the floodplain making it possible for waterfront development. The flood control levees have also blocked the natural flow of stormwater from entering the Salt River at four well-defined points of concentration. In essence, the physical boundaries of the levee, Mill Avenue, Tempe Butte, and Rural Road have created a reservoir area trapping the excess runoff from the upstream watershed. Fortunately, the existing depressions in the study area, (which vary from 14 to 20 feet below the top of levee) will contain most of the stormwater runoff entering the site without overtopping the levee. This however, will not be true after proposed development infills these depressions. Pertinent site data are summarized in Table 1.

Table 1. Site Data

	Units	A	B	C	D
Site Area	Acres	29	9	33	16
Off-Site Drainage Area	Acres	610	14	670	28
Average Ground Elevation	Feet	1157.0	1160.0	1147.0	1147.0
Top of Levee Elevation (Low)	Feet	1168.0	1167.0	1164.0	1161.0
Top of Levee Elevation (High)	Feet	1171.0	1168.0	1167.0	1164.0
Rio Salado Pkwy Elev. (Low)	Feet	1160.1	1160.1	1158.3	1161.0
Rio Salado Pkwy Elev. (High)	Feet	1169.6	1163.0	1163.5	1163.5
Effective Outfall Elev.	Feet	1163.5	1163.5	1163.5	1161.0
2 Yr. First Flush Runoff Volume	Ac-Ft	2.08	0.65	2.37	1.15
100 Yr. Off-Site Runoff Volume	Ac-Ft	0.00	1.50	17.00	12.00
2 Yr. First Flush Flow	CFS	34	13	40	31
100 Yr. Off-Site In-Flow	CFS	0	35	320	180
On-Site Detention Area (3' Deep)	Acres	0.69	0.22	0.79	0.38
Detention/Site Area	%	2.4%	2.4%	2.4%	2.4%

Development will fill in the depressions to the top of the levee and Rio Salado Parkway. There will remain two effective outfalls that will control the vertical location of buildings and essential facilities (transformers, pump stations, communications, but not parking lots or driveways). Referring to Figure 2, the first outfall is located at Mill Avenue and Rio Salado Parkway at elevation 1161.0. The second outfall is located at an existing summit in Rio Salado Parkway at College Street at elevation 1163.5. All buildings and essential facilities upstream (east) of these two outfall locations must be elevated above these elevations. This standard practice is analogous to elevating buildings above the highwater line around the shoreline of a lake and provides a reasonable amount of protection during catastrophic events.

As constructed, Rio Salado Parkway provides for off-site stormwater in excess of the City's storm drain capacity to be conveyed across the roadway at three locations. There is no provision for Rio Salado Parkway to convey stormwater outside the study area limits.

Where most of the City of Tempe's area north of the Superstition Freeway naturally drains to the west, most of the stormwater from this area is captured by the Ccity's storm drain system and conveyed north to the Salt River under the study area (Figure 2). stormwater runoff in excess of the storm drain system will continue to drain to the west and not into the study area (Figure 4). The remaining area drains directly to the study site (Figure 3). A portion of the stormwater from this remaining area is conveyed underground through the site. Karsten Golf Course has a significant amount of stormwater storage capacity that results in a significant reduction of off-site inflows to the eastern part of the study area.

There are three storm drain outfalls within the site that will affect the ability of proposed development to evacuate stormwater runoff. The first outfall is the South Bank Interceptor (a 54' and 66 " pipe) located between Rural Road and Mill Avenue. The second is a 60 " pipe located west of Rural Road. The third is a 78" pipe (Dorsey By-Pass) located at the east end of the site. A fourth potential outfall (the existing 66" Dorsey Drain through the levee) is being removed with the Town Lake construction and the Dorsey Drain By-Pass.

During normal operating conditions the Town Lake water surface elevation will be 1148.0. The rubber dams will deflate during flood flows and water surface elevations will be higher than the normal water elevation of 1148.0. Refer to Figure 2 for the 100-, 50-, and 10-year Salt River flows and water surface elevations as they vary from Mill Avenue to Karsten Golf Course. These water surface elevations affect the joint probability of flooding occurrence and hydraulic operation of any proposed conveyance structures through the levee.

4.0 ON-SITE DRAINAGE PLAN

The City of Tempe requires that all site development provides on-site retention/detention for the 100-year, 1-hour storm event (approximately 2.4 inches), that finished floors be elevated a minimum of 1' above the highwater elevation or 14" above the effective outfall for the site, and that best management practices be followed in accordance with the National Pollution Discharge Elimination System Permit issued by the Environmental Protection Agency.

When detention basins are used, stormwater ponding elevation shall be a minimum of 4 inches ← ? below the outfall, basins cannot occupy more than 67% of development frontage, basins can be greater than 3' deep without fencing, and stormwater must be evacuated in 36 hours (preferably 24 hours). Town Lake will provide the required stormwater storage capacity for the study area. However, stormwater discharged to Town Lake must not degrade the quality of lake water. Of particular concern are increased loadings of nutrients (nitrates and phosphates) that would contribute to undesirable algae growth. (NOT A CITY REQM'T)

Maintaining Town Lake water quality is a delicate operation. New development must make every reasonable effort to minimize inflow of pollutants to lake. A major project objective is to reduce 80% of pollutant loading by intercepting the "first flush" flows from the City's storm drain system and diverting these flows downstream of Town Lake. The South Bank Interceptor (SBI) is designed to intercept the "first flush" flows from the Farmer, Ash, Rural, and full flow from the Mill Avenue storm drains and discharge downstream of Town Lake. The Dorsey By-Pass is designed to intercept the "first flush" flow from the Dorsey storm drain and full flow from the Karsten storm drain and discharge to the riparian area upstream of Town Lake. The Mesa Effluent By-Pass Pump Station is designed to drain the riparian area upstream of Town Lake and discharge through a 36" pipe to the SBI at Rural Road. A flow meter sensor in the SBI stops the pump when the SBI flows exceed 52 cfs and turns the pump back on when flows stop. City storm drains are designed for the 5- and 10-year storms. Any storms greater than these will surcharge and flow overland into the study site.

A statistical analysis of 500 storms between 1977 and 1996 for the City of Tempe (ASU rain gauge) indicates that intercepting the first flush runoff (FFR) from 0.9 inches of rainfall (2-year, 1-hour storm) will treat approximately 85 percent of all long term stormwater runoff. The FFR for this site is calculated as FFR = 0.95 x 0.9" = 0.86".

The current best management practice (BMP) relies upon passive devices such as turf detention basins, Hydro Conduit's Stormceptor Moel Series 1800 (Figure 13), or McGuckin's Maxwell Plus that are designed to remove sediment and oils but not nutrients such as nitrates or phosphates. As such, it is recommended that on-site FFR not be allowed to drain into Town Lake.

Based on an on-site time of concentration of tc = 400 feet / 2 fps / 60 = 3.3 minutes and an analysis of storm drain hydrographs for multiple durations, it is Wood/Patel's opinion that there is an adequate amount of time (0.5 to 1.5 hours) before the City storm drains flow full and an ample amount of time following full flow (20 to 24 hours) to allow for discharge of the FFR directly into the SBI, Dorsey By-Pass, or City of Mesa By-Pass. This leads to a wide range of potential detention/evacuation solutions as summarized in Table 2.

Table 2. On-Site First Flush Runoff (FFR) Detention & Evacuation

	Units	A	B	C	D
Site Area	Acres	29	9	33	16
FFR Volume	Ac-Ft	2.08	0.65	2.37	1.15
FFR Flow	CFS	34	13	40	31
Average SWT Flow	CFS	0.5	0.5	0.5	0.5
Number of		Evacuation Time			
Stormwater Treatment Units		A	B	C	D
2	Hours	25	8	29	14
4	Hours	13	4	14	7
6	Hours	8	3	10	5
8	Hours	6	2	7	3
10	Hours	5	2	6	3
12	Hours	4	1	5	2
16	Hours	3	1	4	2

It is recommended that new development provide detention storage and treatment for the first flush runoff (FFR = 0.86 inches) for the entire site and discharge to City storm drain by-pass system. See Figure 12 for a schematic layout. At no time will any FFR's, treated or otherwise, be allowed to enter Town Lake.

It is also recommended to provide a storm drain system to convey excess runoff for the 10-year storm underground directly to Town Lake and to provide for overland sheet flow capacity to convey the excess runoff from the 100-year storm directly to Rio Salado Parkway where it will be combined with off-site flows, intercepted, and conveyed underground directly to Town Lake.

In accordance with the National Pollution Discharge Elimination System Permit issued by the Environmental Protection Agency, best management practices concerning new development will require that property owners execute a written operation and maintenance agreement with the City of Tempe concerning responsibilities, testing, inspections, reporting procedures, and fees

required to assure the city that best management practices are being followed in accordance with the City of Tempe NPDES permit with EPA. Best management practices are defined in the NPDES permit and are subject to changes with technological development but will include as a minimum the following:

1. Proper handling and storage of hazardous materials.

2. Periodic cleaning and proper disposal of paved areas subject to vehicle traffic and any other areas subject to spills.

3. Emergency clean-up and disposal plans.

4. Retention/recovery of fertilizers and pesticides used to maintain landscape areas.

5. Training of facility maintenance crews.

6. TREATMENT OF 1ST FLUSH BEFORE LEAVING SITE.

7. REGULARLY SCHEDULED INSPECTION/MAINTENANCE OF TREATMENT DEVICES.

5.0 OFF-SITE DRAINAGE PLAN

The City storm drains are designed for the 5- and 10-year storms. Storms greater than these will surcharge the underground drain system and will flow overland into the study site at three well- defined points of concentration as illustrated in Figure 3 and the schematic flow diagram in Figure 13. The magnitude of these off-site flows for the 100-year storm have a significant impact on-site development and are summarized in Table 3. Karsten Golf Course has a significant amount of stormwater storage capacity that results in a significant reduction of off-site inflows to the eastern part of the study area.

Table 3. Off-Site In-Flow Frequency

	Units	A	B	C	D
Site Area	Acres	29	9	33	16
Off-Site Drainage Area	Acres	610	14	670	28
2-Year Storm Event					
On-Site Overland Peak Flow	CFS	34	13	40	31
Off-Site Overland Peak Flow	CFS	0	11	82	38
Storm Drain Outlet Peak Flow	CFS	0	41	40	0
10-Year Storm Event					
On-Site Overland Peak Flow	CFS	72	28	84	63
Off-Site Overland Peak Flow	CFS	0	21	162	99
Storm Drain Outlet Peak Flow	CFS	0	99	112	108
100-Year Storm Event					
On-Site Overland Peak Flow	CFS	120	46	139	102
Off-Site Overland Peak Flow	CFS	0	34	349	170
Storm Drain Outlet Peak Flow	CFS	0	169	354	217

Current water law prohibits new development from blocking or diverting stormwater onto someone else's property without acquiring the necessary flowage or ponding easements. It is acknowledged that while construction of the levee has protected the site from flooding of the Salt River, it has also blocked the flow of off-site stormwater into the river. Any drainage outlets into the Salt River whose performance is affected by the water level must consider joint probability distribution imposed by FEMA's interior drainage requirements.

All stormwater inflow is stored on-site for the pre-development condition. Development of the site will remove this storage capacity causing overflows to downstream properties west of the site and

ponding on upstream properties south of the site. Alternative solutions must focus on either reducing the incoming flows and/or conveying these flows through the study site. Five alternative solutions were investigated as follows:

1. **Alternative 'A' (Figure 6)** - Fill depressions and elevate buildings 1-foot above high water levels at constricted outfalls. This alternative is too constrictive and causes unreasonably high fills, redirects water into the downtown area, and backs up water onto upstream properties. Discard from further consideration.

2. **Alternative 'B' (Figure 7)** - Same as Alternative 'A' plus construct by-pass channel at Tempe Butte to reduce water levels. Alternative lowers fill by 0.8 foot and decreases developable land with no change on diverted flows to downtown area or backwater onto upstream properties. Discard from further consideration.

3. **Alternative 'C' (Figure 8)** - Install three storm drains at existing low points to intercept excess flow from the 100-year storm and convey under the site directly to Town Lake. Set buildings 14 inches above effective outfalls. This minimizes the amount of required fill, significantly reduces the ponding of water on upstream properties, and eliminates diversion of water into the downtown area for storms less than the 100-year storm. Drains would require 8-, 10-, and 6-foot corridors that would restrict underground development but not above ground development (i.e., a building or plaza could be built over the top of these drains). Keep as the preferred alternative solution.

4. **Alternative 'D' (Figure 9)** - Same as Alternative 'C' except replace one of the storm drain interceptors (the middle one on Site 'C') with a 5-acre detention basin. The basin would have no effect on the other two drains, fills, backwater, or diversion into the downtown area. The only benefit would be to eliminate the need for 350 feet of X' x 4' CBC. Alternative 'D' may have merit as a development phasing alternative.

5. **Alternative 'E' (Figure 10)** - Replace the three storm drains in Alternative 'C' with channel corridors and reconstruct the west portion of Rio Salado Parkway with a maximum crest elevation of EL = 61.0 in place of the existing crest elevation of EL = 63.5. The channel corridors would eliminate the need for a portion of the storm drains but would require 30, 40, and 30 foot corridors that would restrict above

ground development. Reconstructing Rio Salado Parkway would lower finished floor elevations and reduce fill by 2.5 feet for Site 'C' and 0.5 feet for Sites 'A' and 'B'. Discard from further consideration. The channel corridors will require too much real estate and the City does not have funding for reconstructing Rio Salado Parkway.

It is recommended that Alternative 'C' (Figure 8) be used for development and that the following joint probability of occurrence be used for the hydraulic design of the three storm drain outfalls. The Flood Control District should be contacted regarding the design and possible funding for the outfall structures:

Table 4. Joint Probability of Flooding

Salt River Flood Frequency	Study Site Flood Frequency
100-year	2-year
50-year	10-year
10-year	50-year
2-year	100-year

Because all stormwater for the study site is conveyed by the City's storm drain system for the 10-year storm, the only significant design conditions are the last two (SR/SS = 10/50 and 2/100).

6.0 CONCLUSION

Following the specific drainage plan, recommendations contained in this report will provide protection from the 100-year storm event with long- term assurances from developers that NPDES best management practices of on-site stormwater systems will contribute to the protection of Town Lake and Salt River water quality. The results of this study should be updated periodically based on new data, actual development, and changes in local, state, or federal requirements.

7.0 REFERENCES

1. NPDES Permit No. AZS000005 2-14-97

2. Federal Register, vol. 51, no. 164. Rules and Regulations. Article 65.10(b), Monday, August 25,1986. Design Criteria for Levees Recognized by FEMA.

3. Wood/Patel. Red Mountain Freeway, Phase III, Final Drainage Report, McKellips Road to Country Club Drive, Dec, 1996.

4. Kaminski-Hubbard Engineering, Inc. Eric Bolze, P.E. Preliminary Drainage Report, Urban Collector Rio Salado Parkway, Farmer Avenue to Rural Road, Project No. STP-TMP-0-(5), July 19, 1994.

5. CH_2M Hill. Mesa Effluent Bypass Pump Station and Pipeline, Memo,9/15/95.

6. CH_2M Hill. Rio Salado Town Lake Design Report, Section 11. Stormwater Management, March 1995.

7. City of Tempe. Engineering Design Criteria, January 1994.

Appendix

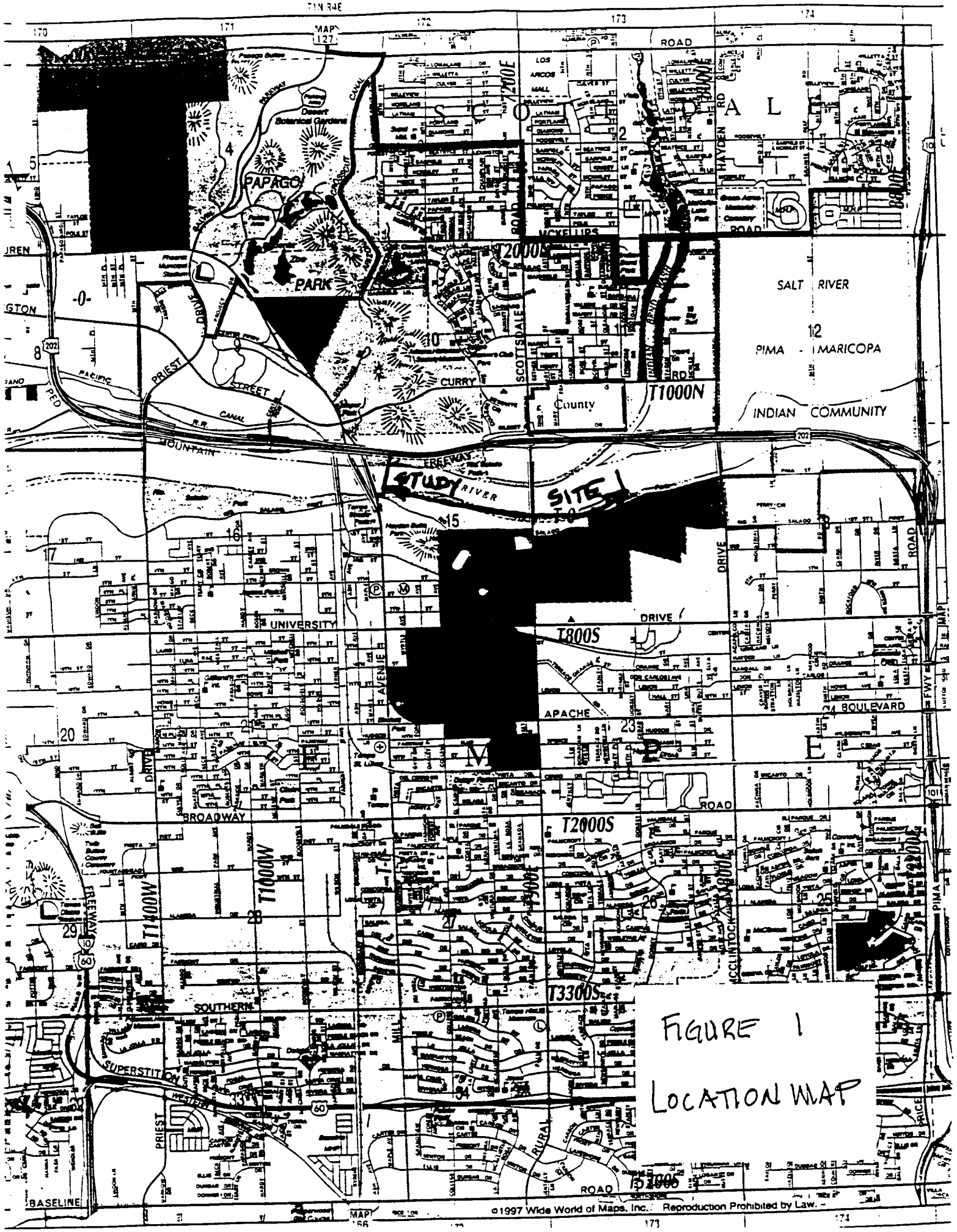

FIGURE 1

LOCATION MAP

CONTROLLING WATER SURFACE ELEVATION IN SALT RIVER THAT AFFECTS STORM DRAIN DESIGNS

SALT RIVER

LAKE HW=1148.0

(TOWN LAKE)

RIO SALADO PARKWAY

ASH AVE

MILL AVE

RURAL ROAD

D
16 Ac
+ LOW 47

C
33 Ac
+ LOW 47

B
9 Ac
+ LOW 60

A
29 Ac
+ LOW 57

100 YR Q=215,000; 50 YR 160,000; 10 YR 93,000

100 YR 56.97 | 50 YR 53.61 | 10 YR 48.17

100 YR 58.00 | 50 YR 54.61 | 10 YR 49.17

100 YR 60.50 | 50 YR 57.00 | 10 YR 51.50

100 YR 64.99 | 50 YR 61.32 | 10 YR 55.88

100 YR 63.00 | 50 YR 59.44 | 10 YR 54.00

100 YR 62.09 | 50 YR 58.53 | 10 YR 53.10

54"SD

24"SD

66"SBI

54"SBI

60"SD

78"SD

30"SD

63.0

61.0

66.0

65.0

63.50

58.3

320 AF

38.5 AF

CONTROLLING OUTFALL EL= 61.00

CONTROLLING OUTFALL EL= 63.50

OUTFALL EL=63.0

CONTROLLING OUTFALL EL= 63.00

ARIZONA STATE UNIVERSITY

KARSTEN GOLF COURSE

L=4,300'

L=4,000'

CONTROL

LEVEE

DORSEY BY-PASS

CITY OF MESA BY-PASS

F1.000

N

FIGURE 2
RIO SALADO DRAINAGE MASTER PLAN
PRE-DEVELOPMENT SITE PLAN

WP #97644

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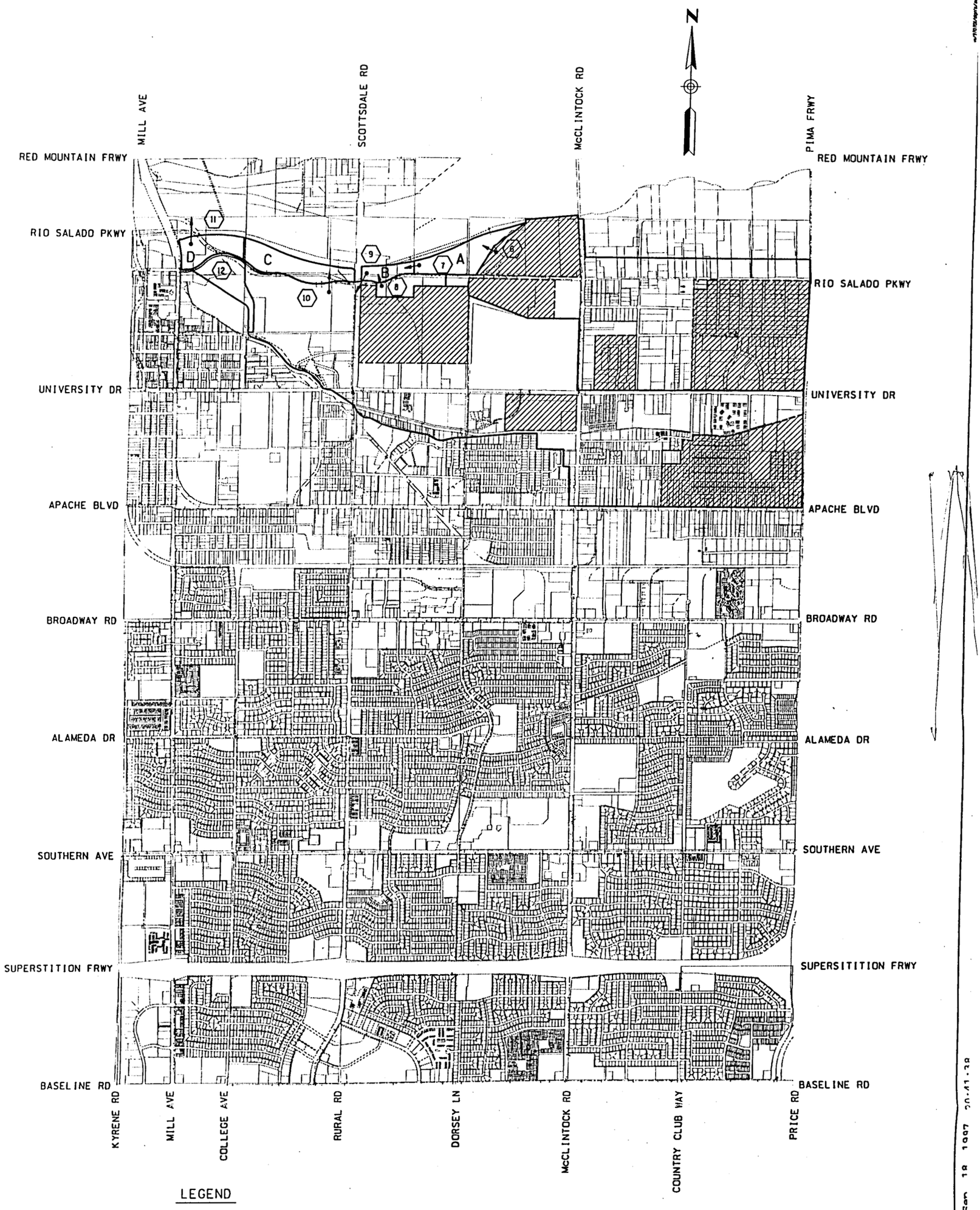

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FIGURE 3
RIO SALADO DRAINAGE MASTER PLAN
DRAINAGE AREA MAP
SURFACE RUNOFF

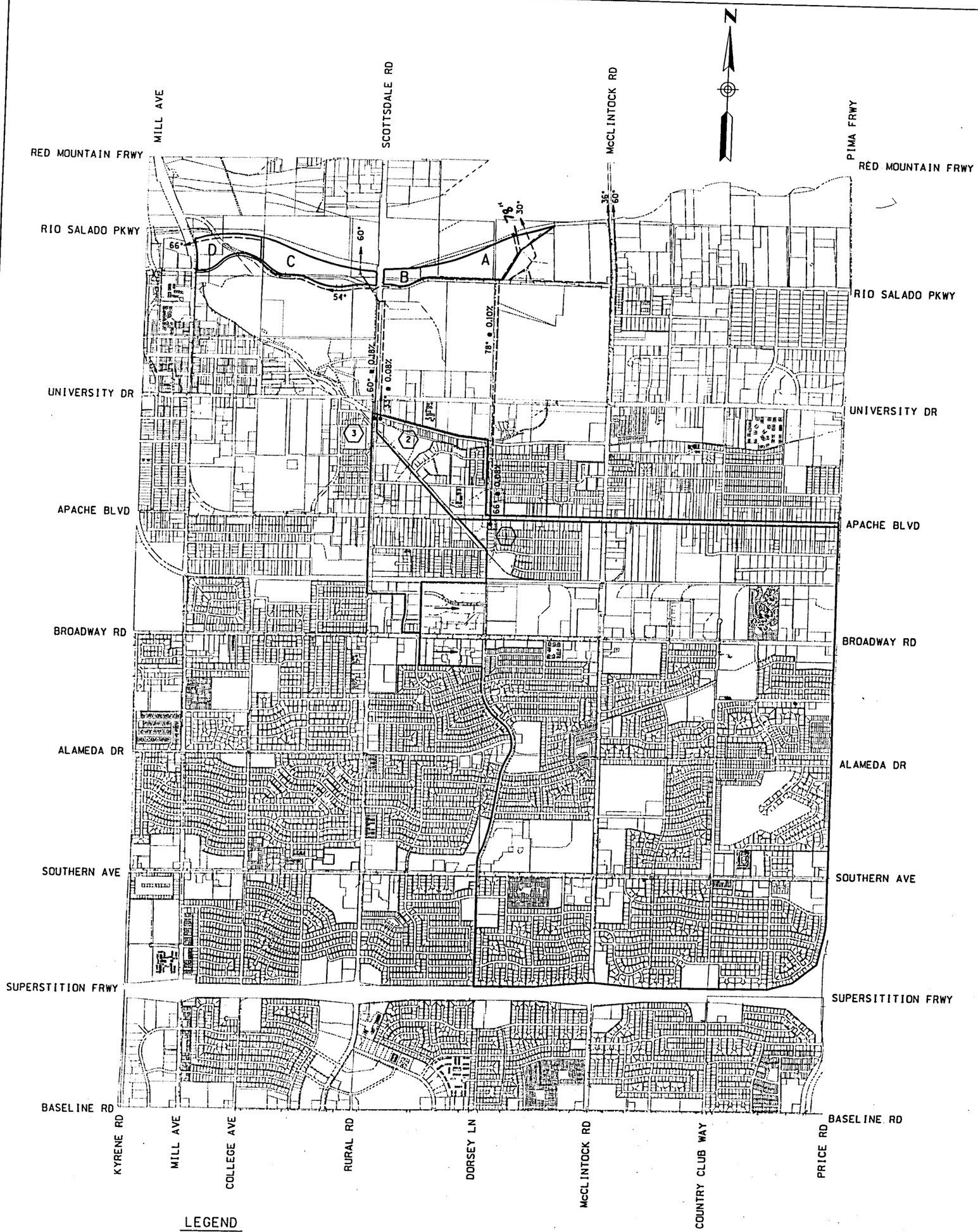

FIGURE 4
RIO SALADO DRAINAGE MASTER PLAN
OFF-SITE STORM DRAINS

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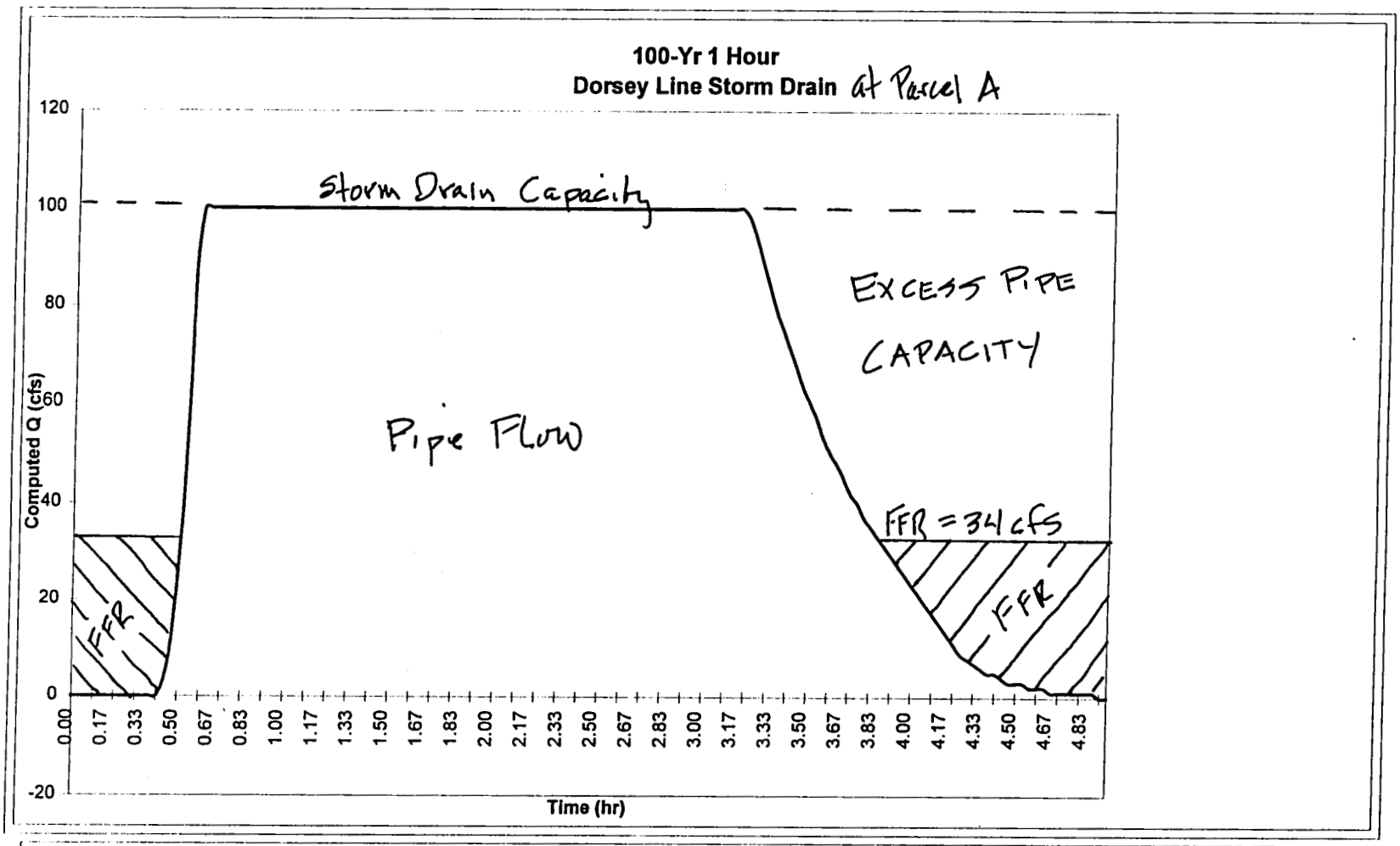

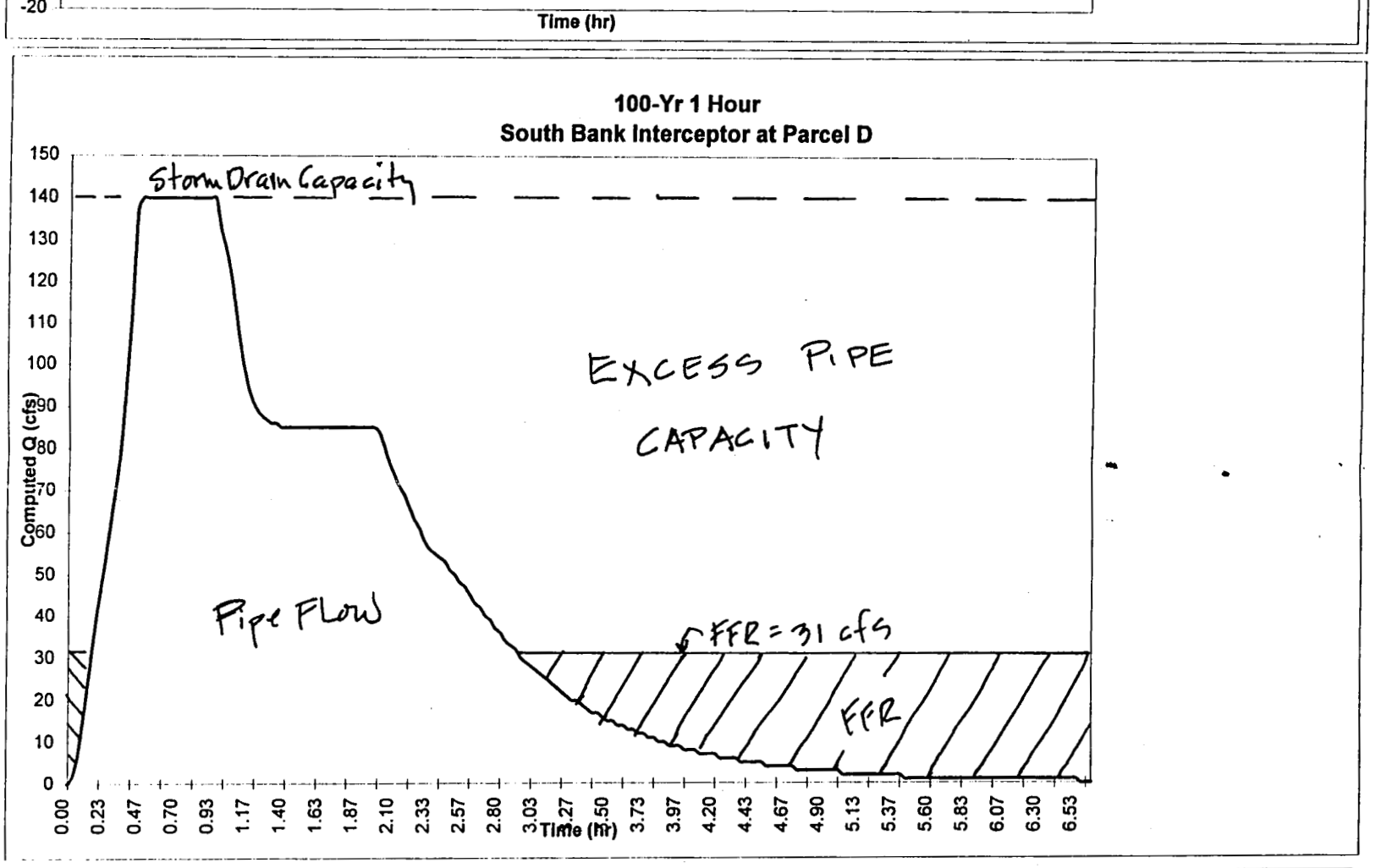

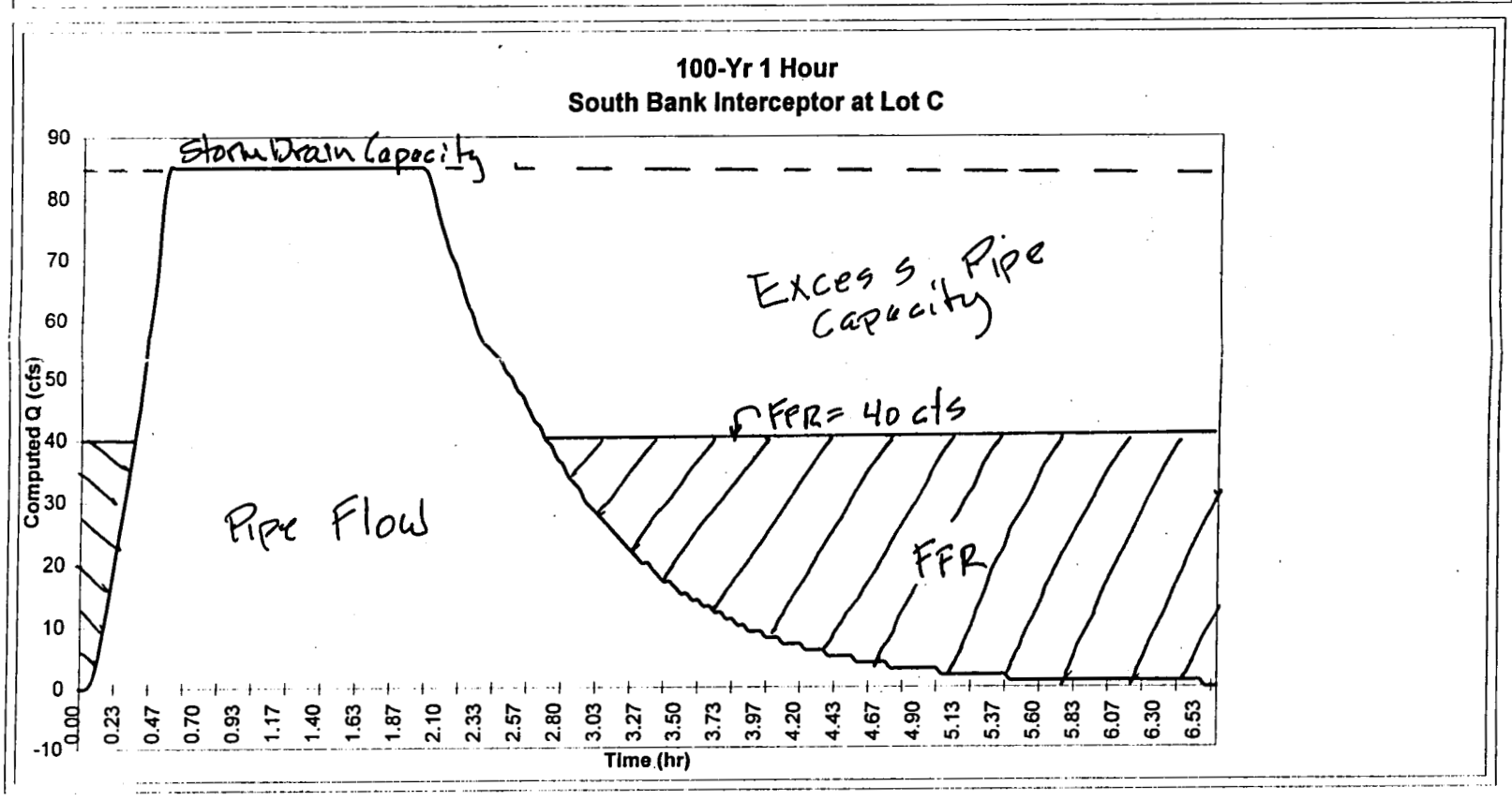

FIGURE 5
INFLOW HYDROGRAPH ANALYSIS

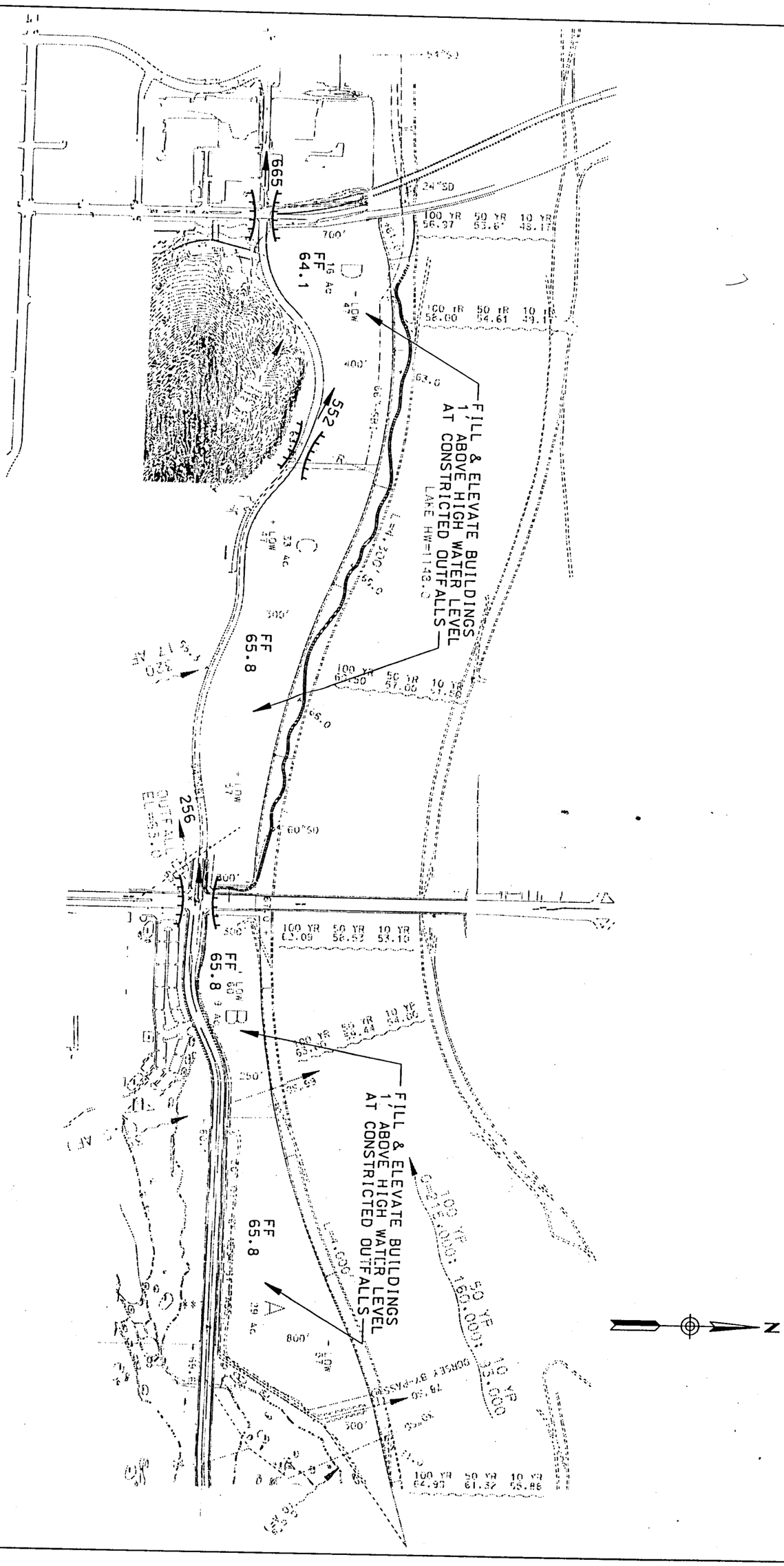

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FIGURE 6
RIO SALADO DRAINAGE MASTER PLAN
OFF-SITE ALTERNATIVE A

WP #97644

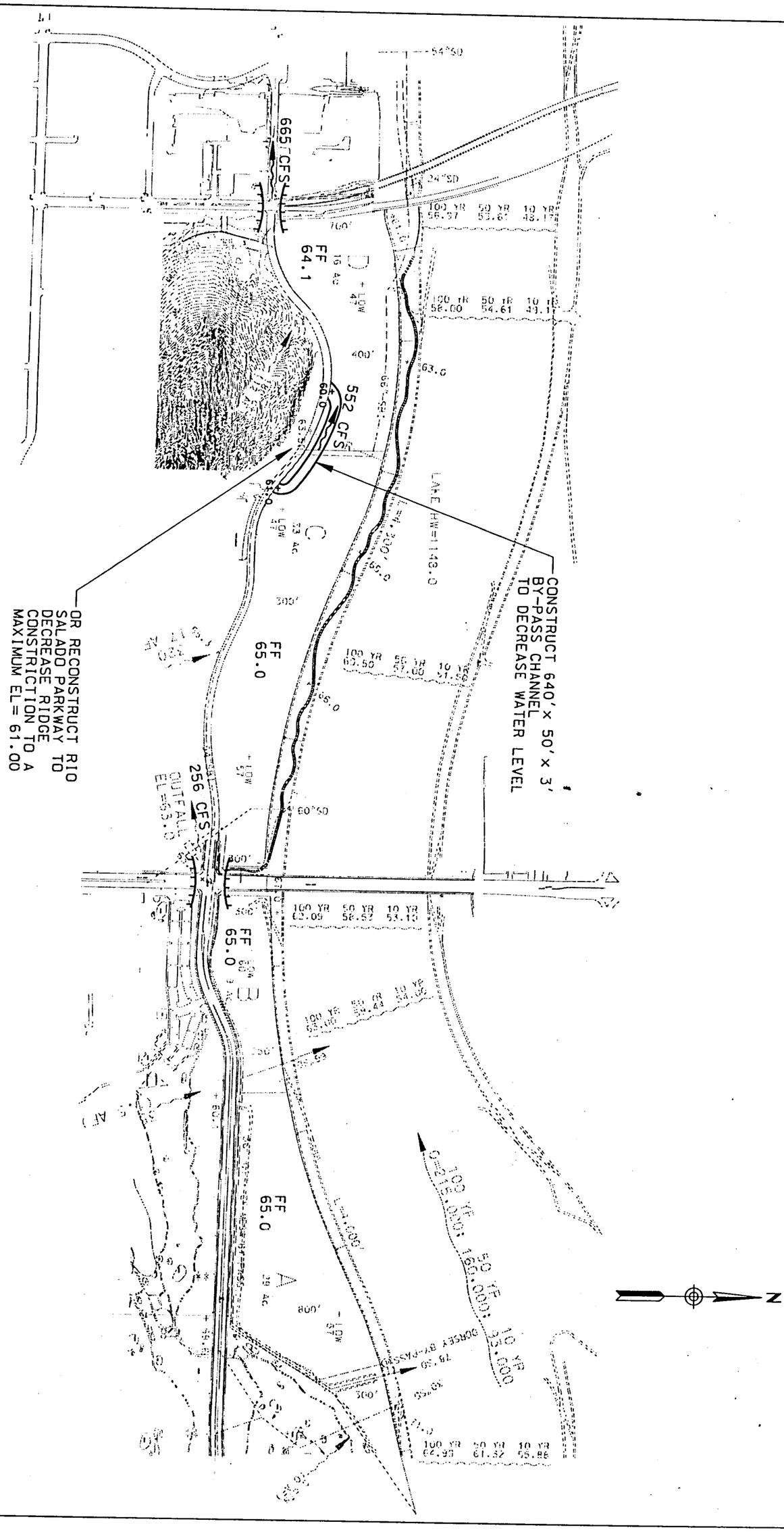

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FIGURE 7
RIO SALADO DRAINAGE MASTER PLAN
OFF-SITE ALTERNATIVE B

WP #97644

INSTALL STORM DRAINS TO INTERCEPT EXCESS FLOWS FROM THE 100 YR STORM AND CONVEY UNDER SITE. SET BUILDINGS AT 14" ABOVE EFFECTIVE OUTFALL

8'x 4'

LAKE HW=1148.0

L=4,200'

36"

48"

6'x 3'

PONDING AREA
PL= 58.00

OUTFALL
EL= 61.0

FF
62.2

OUTFALL
EL=63.50

10'x 4'

42"

30"

8'x 4'

FF
64.7

OUTFALL
EL=55.0

PONDING AREA
PL= 60.50

N

100 YR
Q=215,000; 50 YR
160,000; 10 YR
93,000

L=4,000'

10-YEAR
FLOW (TYP)

8'x 4'

42"

36"

60"

FF
64.7

FF
64.7

PONDING AREA
PL= 63.00

FIGURE 8
RIO SALADO DRAINAGE MASTER PLAN
OFF-SITE ALTERNATIVE C

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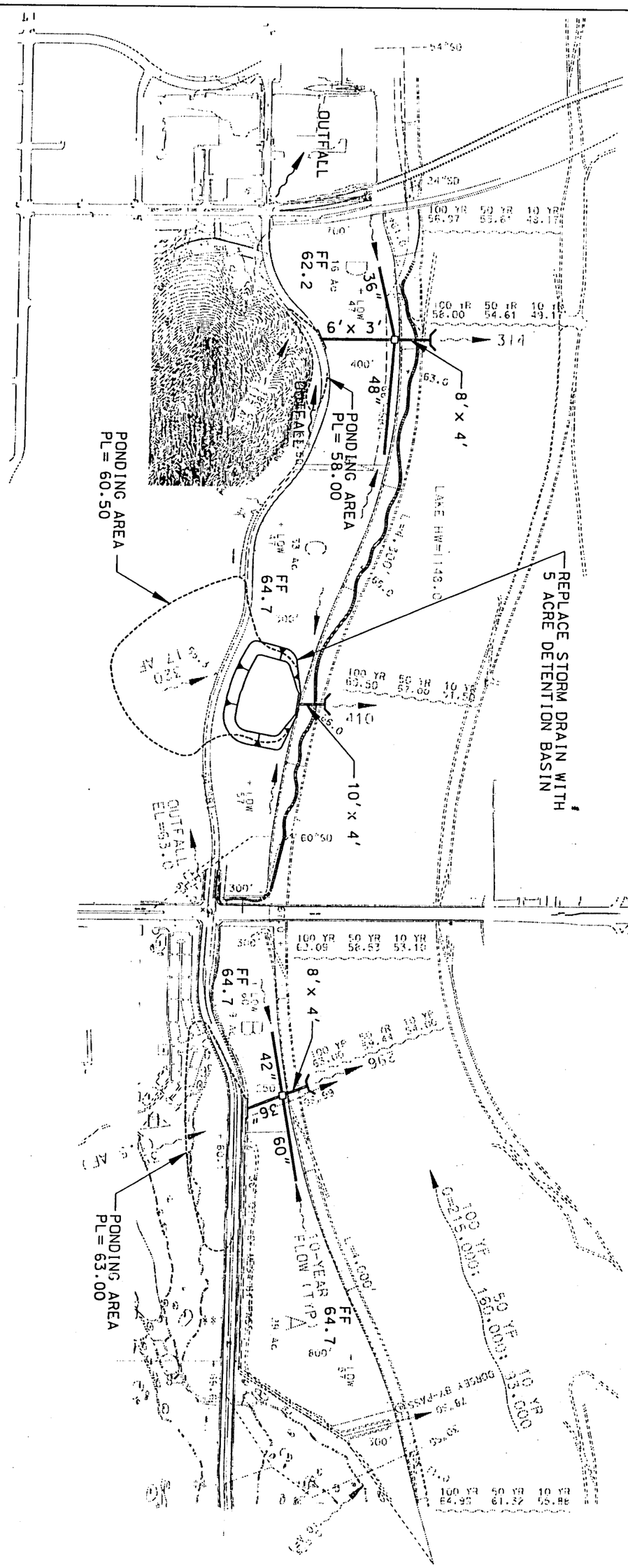

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FIGURE 9
RIO SALADO DRAINAGE MASTER PLAN
OFF-SITE ALTERNATIVE D

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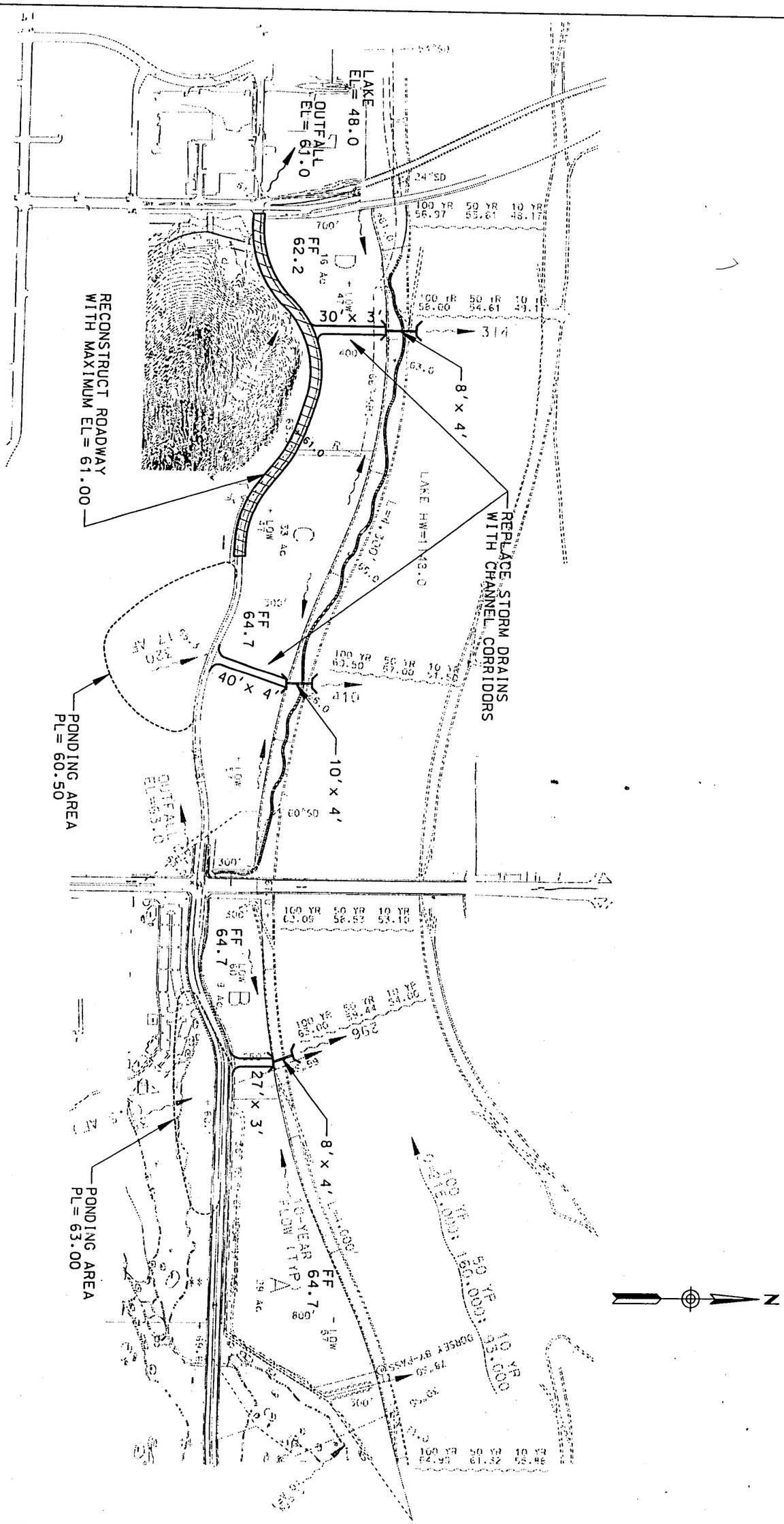

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FIGURE 10
RIO SALADO DRAINAGE MASTER PLAN
OFF-SITE ALTERNATIVE E

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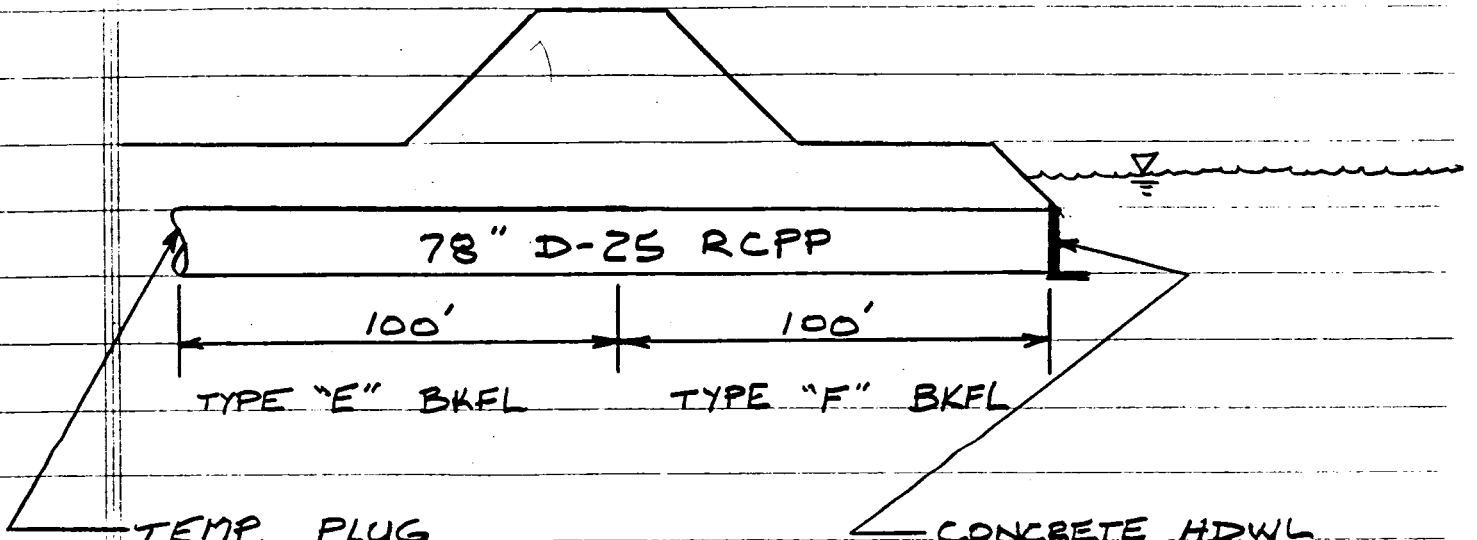
COST EST. FOR EA. PENETRATION:



TYPICAL SECTION

TYPE "E" BKFL: COMPACTED NATIVE MAT'L W/4" ABC CAP

TYPE "F" BKFL: SAME AS "E" + GABION MATTRESS & GEOTEXTILE FILTER FABRIC

PIPE W/ "E" BKFL: 100 LF @ $500/LF =	$50,000
PIPE W/ "F" BKFL: 100 LF @ $700/LF =	70,000
OUTLET: 1 EA. @ $10,000 =	10,000
FLAPGATE: 1 EA @ $15,000 =	15,000
TEMP. PLUG: 1 EA @ $1,000 =	1,000
SUBTOTAL =	$146,000
NO. OF LOCATIONS = 3	x 3
SUBTOTAL =	$438,000
10% 10% 5% 5% 5% CONTINGENCY, DSGN, STAKE, TEST, INSP	x 1.35
TOTAL	$591,300
USE	$600,000

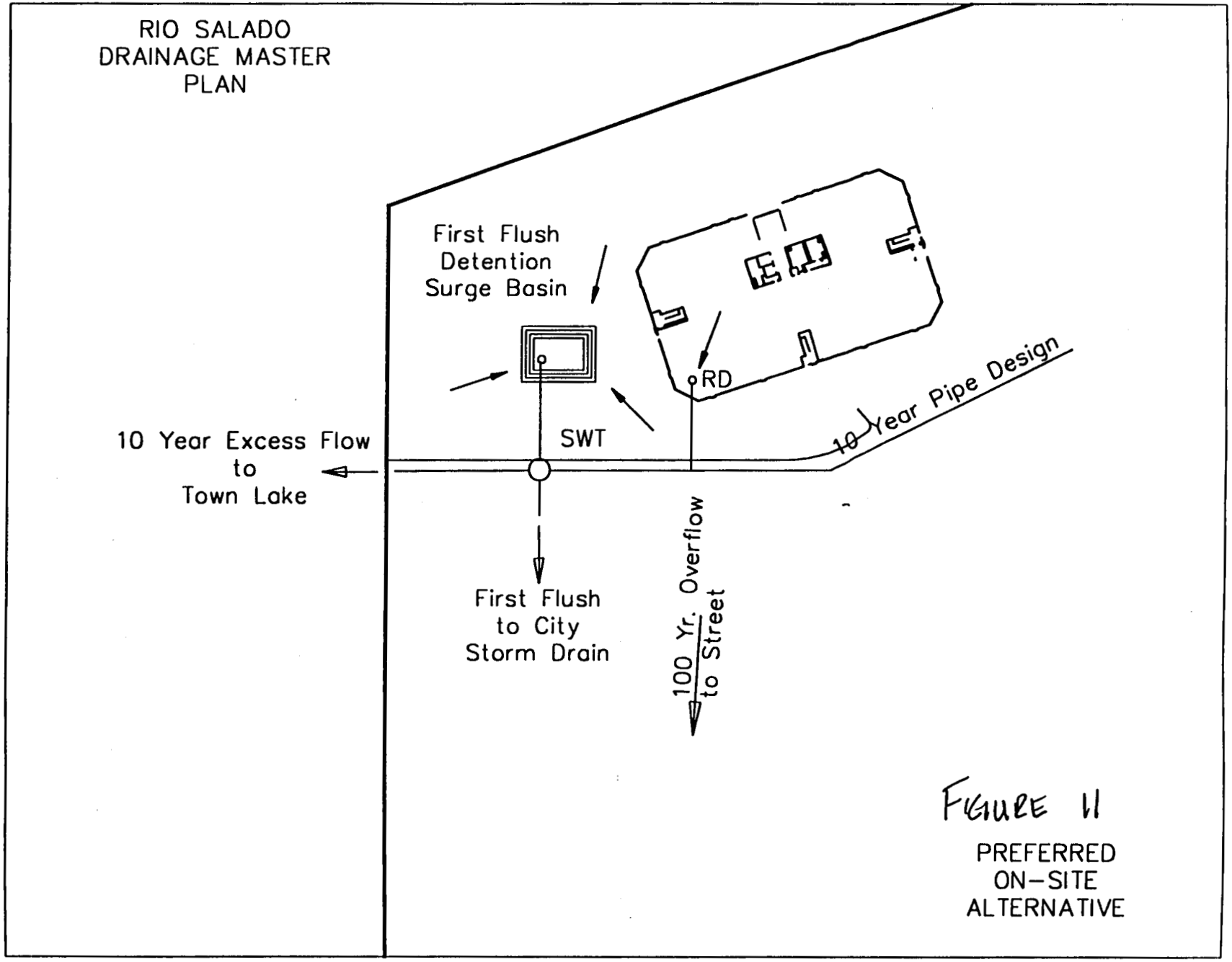
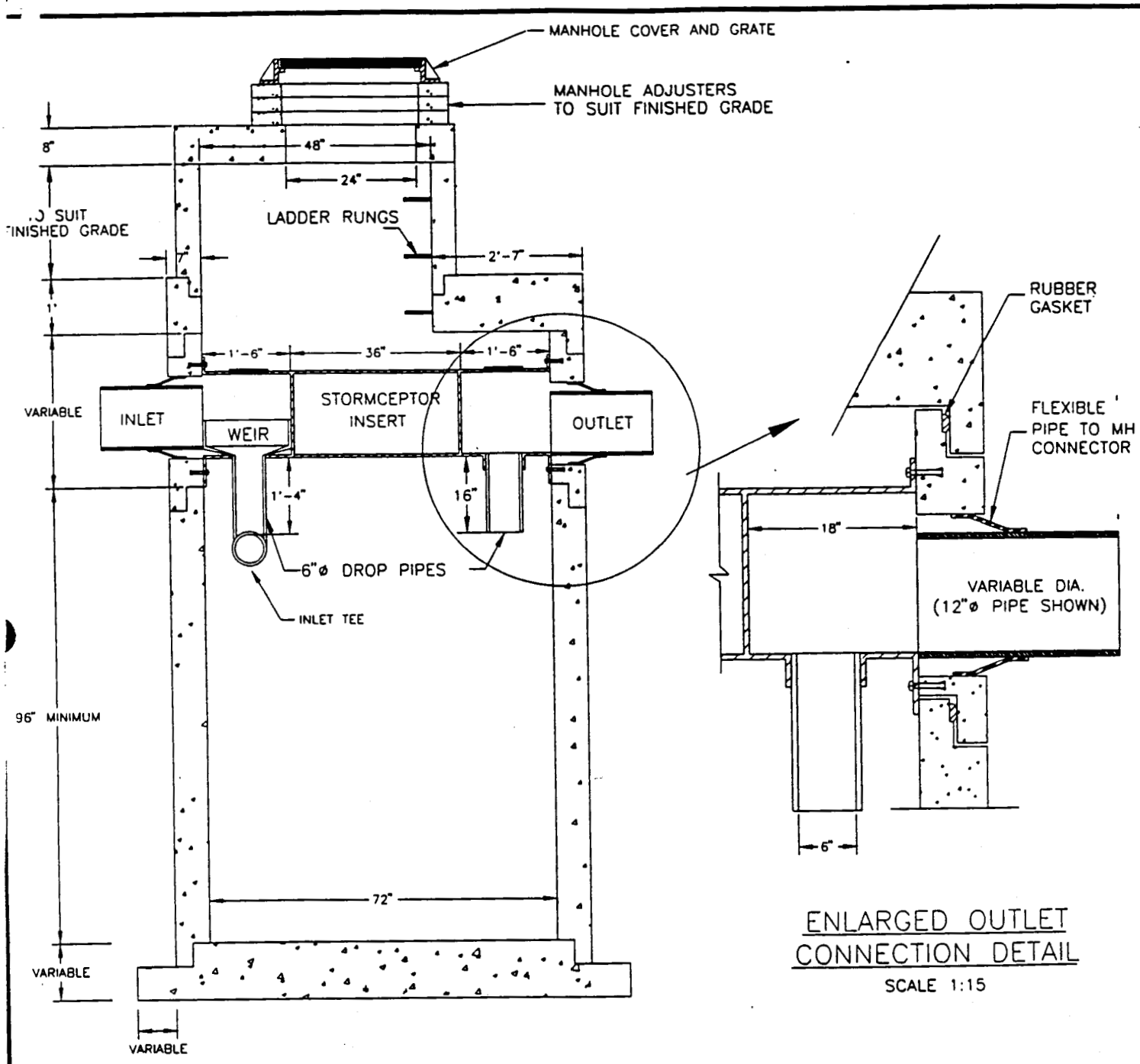


FIGURE 11

PREFERRED
ON-SITE
ALTERNATIVE

Hydro Conduit



ENLARGED OUTLET CONNECTION DETAIL
SCALE 1:15

NOTE : Variable base slab width dependent on field conditions.

SECTION
SCALE 1:30

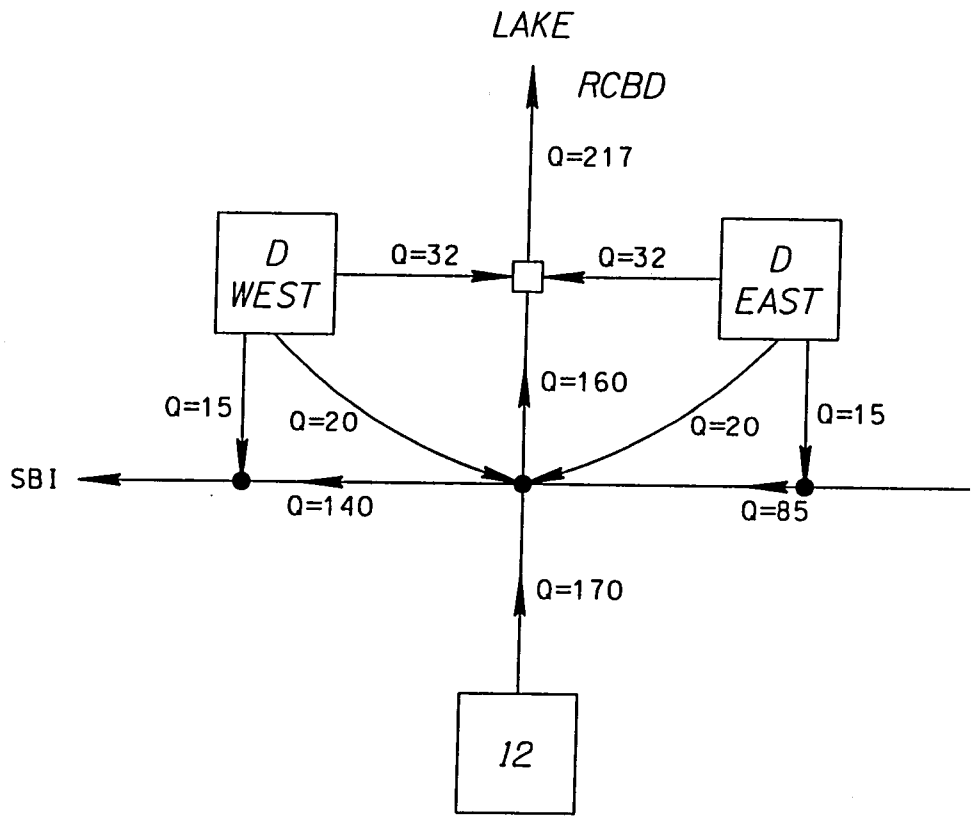
FIGURE 12

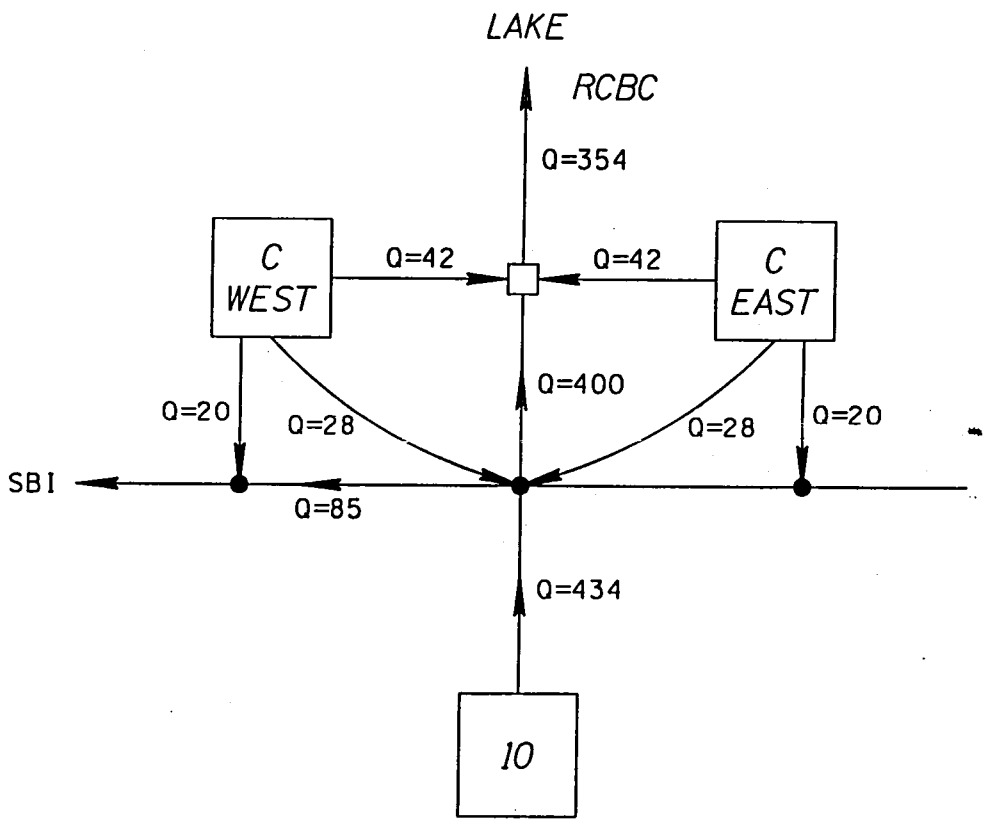
Design Specifications:

1. ASTM C 478

REV.	D.B G.B.	S.B
DATE 06/27/95	SCALE 1:30	UNITS Imperial

STC 1800 PRECAST CONCRETE STORMCEPTOR
1800 US GALLON CAPACITY





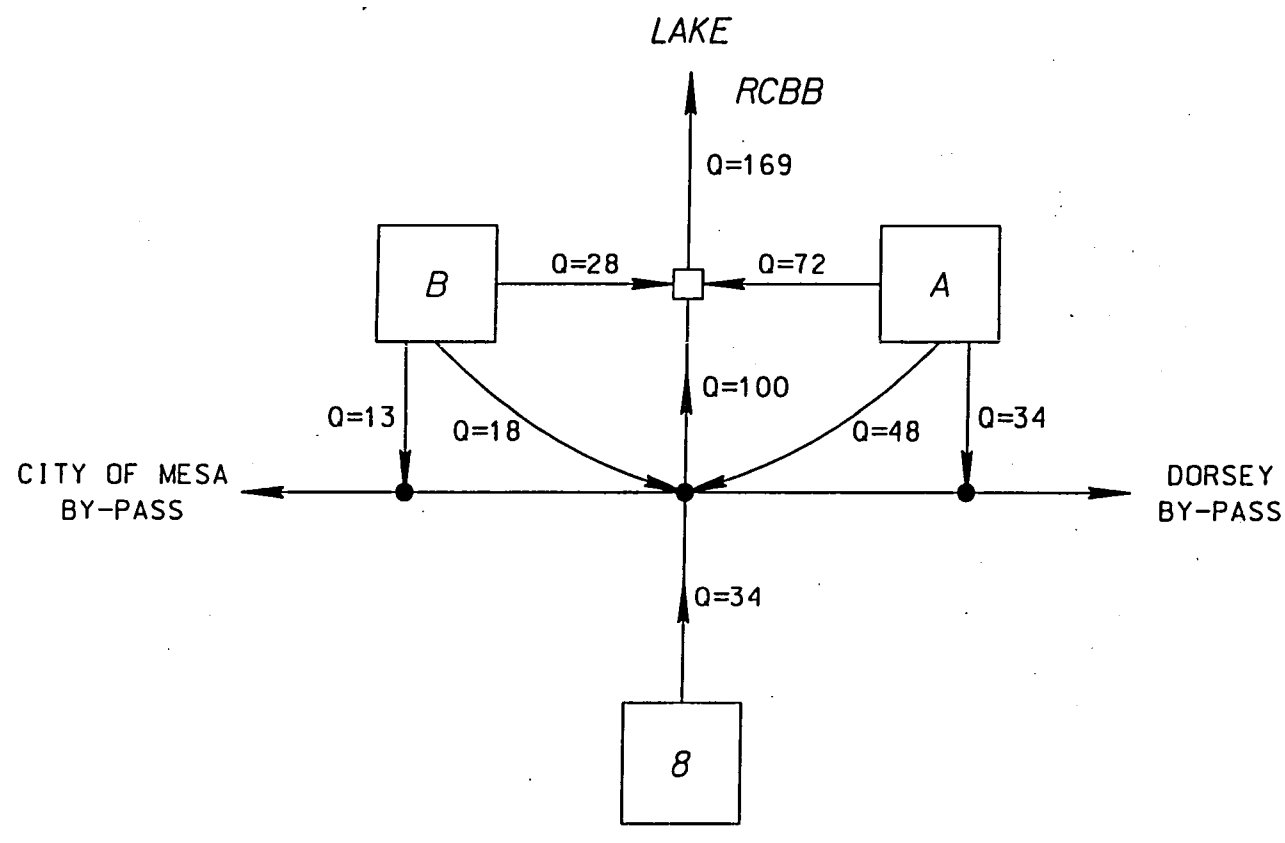


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FIGURE ~~14~~ 13
RIO SALADO DRAINAGE MASTER PLAN
100-YEAR SCHEMATIC FLOW DIAGRAMS

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