FINAL EVACUATION PLAN
DAMBREAK ANALYSIS FOR THE
HARQUAHALA AND SADDLEBACK
FLOOD RETARDING STRUCTURES
Carter Job No. 06-016-83395-05
Project No. FCD-88-66

Prepared for:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Prepared by:
CARTER ASSOCIATES, INC.
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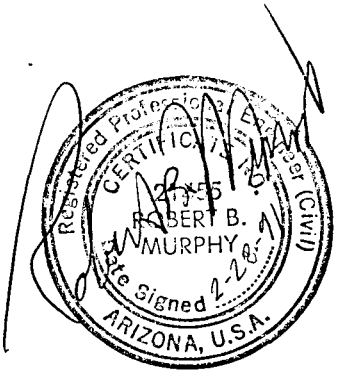
February 1991



CARTER ASSOCIATES, INC.

February 25, 1991

Mr. Steve Waters
Project Manager and Hydrologist
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
3335 W. Durango
Phoenix, AZ 85009

RE: FINAL EVACUATION PLAN - DAMBREAK ANALYSIS FOR THE HARQUAHALA AND SADDLEBACK FLOOD RETARDING STRUCTURES

Dear Steve:

Carter Associates, Inc. is pleased to submit five (5) copies of the Final Evacuation Plan for the flood inundation areas below the Harquahala Flood Retarding Structure (HQFRS) and the Saddleback Flood Retarding Structure (SBFRS).

As specified in the contract scope of work, this submittal consists of inundation maps showing the predicted areas of flood inundation, arrival times of flood waves, and elevation of flood waves. Developed areas and major structures that are impacted by flooding are located on a map and listed. Also submitted at this time are discussions of the economic and social impacts and potential evacuation routes from areas subject to flooding.

It is a continued pleasure to work with the District on this interesting project. We look forward to answering any questions you may have on our work.

Sincerely,

CARTER ASSOCIATES, INC.

Robert B. Murphy, P.E.
Senior Hydrologist/Project Manager

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CARTER ASSOCIATES, INC.

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ROBERT SANTANASTOSO, QUALITY CONTROL

SHARON TUCK, GRAPHICS

RITA HAWKINS, SENIOR WORD PROCESSOR

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MICHAEL SOMODY, INSTRUMENT MAN

KAREN SEEBER, RODMAN

TABLE OF CONTENTS

INTRODUCTION

The Flood Control District of Maricopa County ("District") conducted this dambreak analysis on the Harquahala Flood Retarding Structure (HQFRS) and the Saddleback Flood Retarding Structure (SBFRS) as part of the dam certification requirements set forth by the Arizona Department of Water Resources (ADWR). The purpose of the study was to develop an evacuation plan for residents downstream of the HQFRS and SBFRS should one of these structures fail. The analysis was be based on the available technical and structural information, hydrologic and hydraulic methodologies and current ADWR dam safety criteria. The project location can be seen on Figure 1.

The preparation of this evacuation plan required that estimates be made of the travel time and limits of flood inundation resulting from the sudden release of water due to a failure of an FRS. The limits of inundation were approximated by first estimating the one-half probable maximum flood (PMF) coming to the FRS. Second, failure hydrographs were developed by modeling dam failures (breach analysis). Third, failure hydrographs were routed through the study area (Dambreak analysis). These estimates, calculations and modeling were completed and are presented in the "Final Dambreak Analysis for the Harquahala and the Saddleback Flood Retarding Structure."

The following sections presents only the results of the Dambreak analysis on downstream areas. These results include limits of inundation, floodwave travel and social and economic impacts. Additionally, a brief discussion of potential evacuation routes is presented.

DAMBREAK FLOODING RESULTS

The following section describes the Dambreak flood characteristics on downstream areas. These characteristics include:

1. Limits of inundation along flow path of failure hydrographs through downstream locations.
2. Time from dam failure to maximum stage at downstream locations.
3. Maximum stage at downstream locations.
4. Time to flood elevation.

Limits of Inundation

The limits of inundation for each of the five routings are plotted on Figures 15 through 19. The limits of inundation were plotted based on the stages estimated at specific cross-sections along the routed failure hydrograph flow path. A separate figure showing limits of inundation was developed for each of the five routed hydrographs. Stages between cross-section longitudinally were interpolated and adjusted as appropriate. The limits of inundation

represent the surface coverage based on water surface elevation at specific cross-sections.

The longitudinal downstream limits of the study areas were selected in concurrence with District staff to be at approximately Mullens Cut. This location is approximately 24.1 miles from the west Harquahala breach location and 15.9 miles from the south Saddleback breach location.

Travel Time

The travel time or time to maximum stage (basis for limits of inundation) was estimated as the time difference between the maximum stage at the most upstream cross-section to the maximum stage at each downstream cross-section. This travel time is given on Figures 15 through 19 at the specific cross-section. The time from the start of rainfall and from the beginning of dam failure to the maximum stage at each cross-section is given in Tables 13 through 17.

Time to Flood Elevation

The time to flood elevation is also presented on Figures 15 through 19. Time to flood elevation were estimated at locations where the potential for residential/commercial flooding exists and evacuation may be necessary (Tables 13 through 17). The time to flood elevation presented is the time from the beginning of dam failure

to the time it would take the flood water to reach a specified depth at selected downstream locations. For the HQFRS DAMBRK analysis, this depth was selected to be 2 to 3 feet. The depth was selected based upon the Flood Control District's request of 2 feet, channel geometry and model stability considerations.

The SBFRS DAMBRK produces relatively small flows rates, thus the maximum stage at downstream locations does not reach 2 feet in all cross-sections. To estimate meaningful flood elevation times, the flood elevations were selected such that flow depths ranged from as low as 0.2 feet at Section 17.75 (SBFRS, North DAMBRK) and as deep as 4.2 feet for Section 24.16 (SBFRS, North and South DAMBRK). Generally, the flood depths were maintained at 2± feet.

SOCIAL AND ECONOMIC IMPACTS

The following section presents a brief overview of the potential social and economic impacts anticipated for each of the five dambreak scenarios. This overview qualitatively addresses potential damage due to the sudden failure of the Harquahala FRS or the Saddleback FRS.

CURRENT LAND USE AND DEVELOPMENT

The study area can be divided into two distinct areas (Figure 20). The area north of I-10 is undeveloped. The area south of I-10 has

extensive agricultural activity including the irrigation infrastructure associated with this activity. There is limited residential and commercial development in the area south of I-10.

IMPACTS NORTH OF I-10

The impact of the Harquahala failure scenarios on the area from I-10 north would potentially be limited to damages to I-10 and irrigation infrastructures. The east failure has the potential to significantly impact the CAP Canal, the Harquahala Floodway and I-10. The CAP, in all likelihood, would sustain significant damage and could be out of service for the length of time needed to make repairs. Because of the importance of the CAP as a water conveyor, this kind of downtime, particularly if it occurs during the critical summer months, would be significant.

The high flow rates anticipated with each of the three Harquahala failure scenarios could potentially cause significant damage to I-10. This damage is likely to require diversion of traffic for up to several weeks while interim repairs are made.

The damage caused by an east failure on the Harquahala Floodway could be significant but it would probably be repaired at the same time the Harquahala FRS and CAP are being repaired. This would generally mean the floodway would be in operation by the time the FRS went back into service.

A middle failure could significantly impact the CAP, I-10, the Link Canal and the Westside Canal and Dike. The downtime on the Link and West Canal would only have significant impact on agricultural operations locally if failure were to occur during the high demand summer months. The impacts on the CAP canal would be similar to those anticipated as a result of the east failure scenario. The impact on I-10 would be as discussed above.

A failure at the west end of the Harquahala FRS could significantly damage a portion of the Salome Road. The type of damage anticipated on Salome Road should be such that the road could be made temporarily passable very quickly, only causing a short term interruption in traffic. The impacts to the CAP Canal and I-10 would be similar to those anticipated as a result of the east and middle failure. The Centennial Levee could potentially sustain significant damage. This damage could be repaired at the same time other repairs are made to the CAP and I-10.

IMPACT SOUTH OF I-10

The area south of I-10 within the limits of inundation of the five failure hydrograph flow paths has extensive agricultural development. The area has limited residential and commercial development.

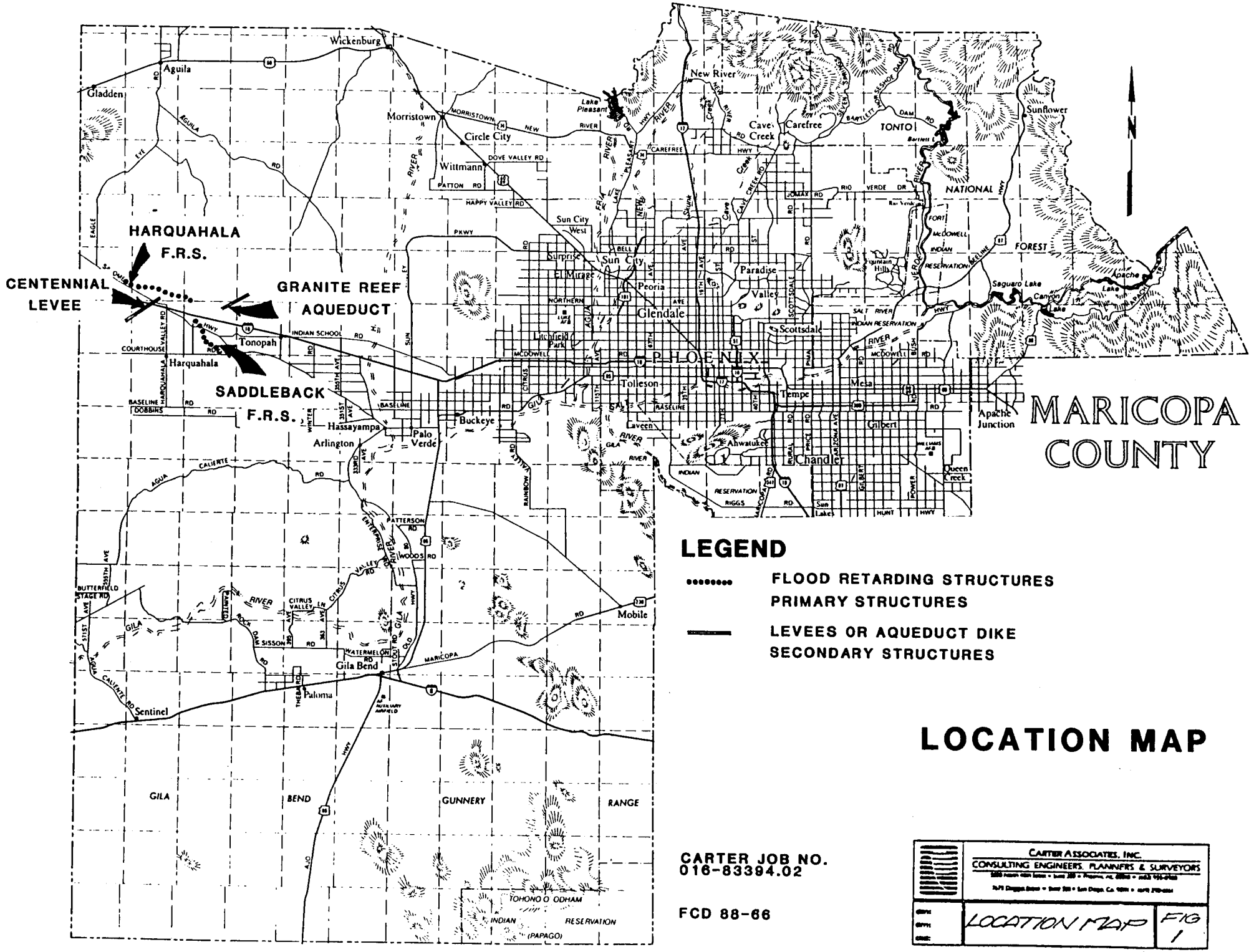
The impacts to the agricultural and range lands would potentially consist of crop damage and irrigation system damage. The

approximate area of agricultural or range land inundated during each of the five failure scenarios is listed in Table 18. The impact would be most significant if failure were to occur during the time crops were maturing.

The residential and commercial structures impacted by each of the five failure scenarios are given on Figure 20 and Table 18.

EVACUATION PLAN

The following section outlines the potential travel routes for evacuation of impacted residential and commercial structures. The routes suggested lead directly to areas our estimates indicate will be outside the limits of inundation for each of the five scenarios. These evacuation routes are only meant to provide temporary refuge until the flood stage subsides in several hours. Lists of impacted structures (Figure 20) and potential evacuation routes for each are given in Table 19.



LEGEND

- FLOOD RETARDING STRUCTURES
- PRIMARY STRUCTURES
- LEVEES OR AQUEDUCT DIKE
- SECONDARY STRUCTURES

LOCATION MAP

CARTER JOB NO.
016-83394.02

FCD 88-66

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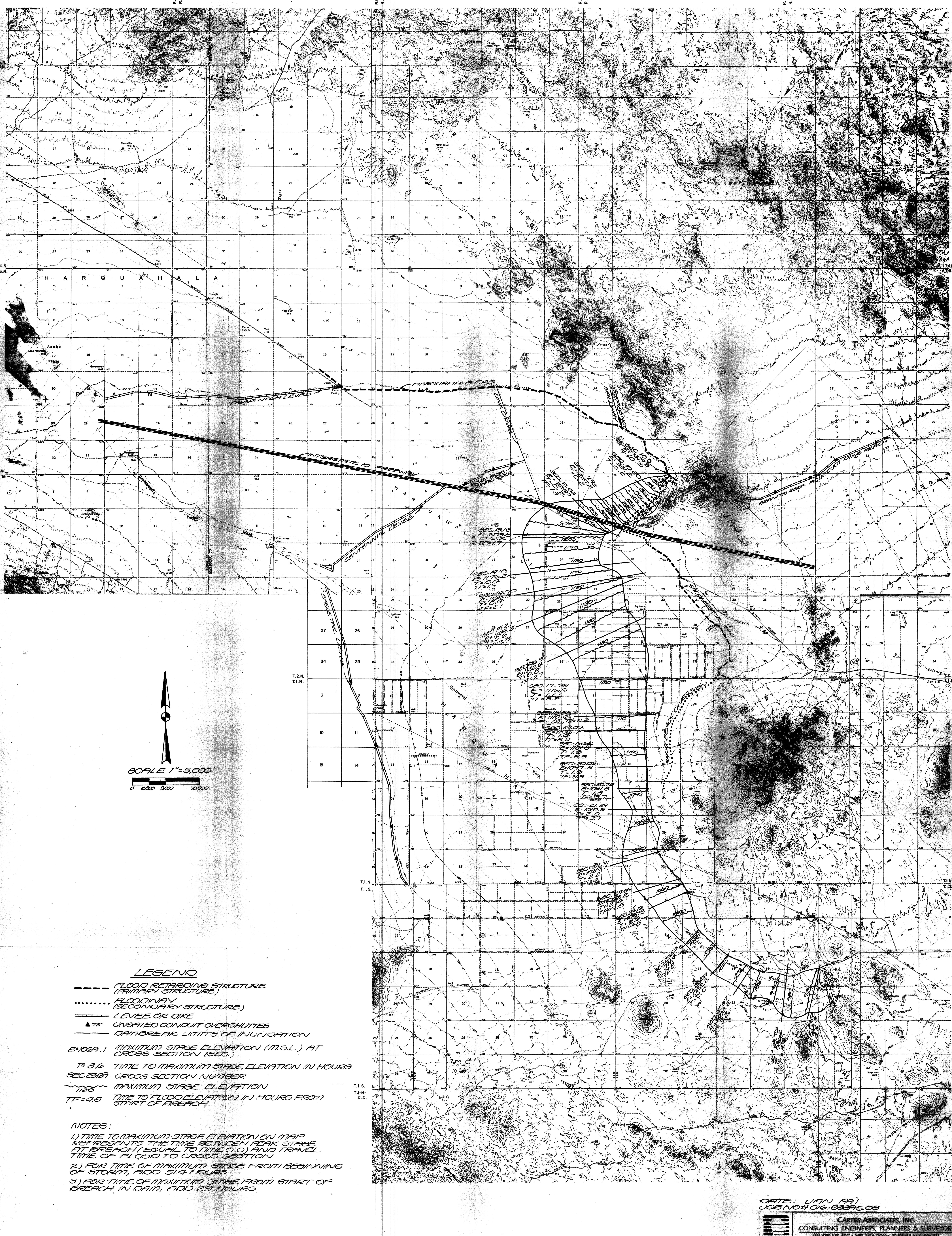
LOCATION MAP | FIG 1

DAMBREAK ANALYSIS
OF
FARWEST MARICOPA COUNTY STRUCTURES
FLOOD INUNDATION LIMITS



LEGEND

- FLOOD RETARDING STRUCTURE (PRIMARY STRUCTURE)
- FLOODWAY (SECONDARY STRUCTURE)
- LEVEE OR DIKE
- ▲72" UNGATED CONDUIT OVERSHUTTES
- DAMBREAK LIMITS OF INUNDATION

E=1069.1 MAXIMUM STAGE ELEVATION (M.S.L.) AT CROSS SECTION (SEC.)

T=3.6 TIME TO MAXIMUM STAGE ELEVATION IN HOURS

SEC 23.69 CROSS SECTION NUMBER

1120 MAXIMUM STAGE ELEVATION

TF=4.5 TIME TO FLOOD ELEVATION IN HOURS FROM START OF BREACH

NOTES:

1.) TIME TO MAXIMUM STAGE ELEVATION ON MAP REPRESENTS THE TIME BETWEEN PEAK STAGE AT BREACH (EQUAL TO TIME 0.0) AND TRAVEL TIME OF FLOOD TO CROSS SECTION

2.) FOR TIME OF MAXIMUM STAGE FROM BEGINNING OF STORM, ADD 51.4 HOURS

3.) FOR TIME OF MAXIMUM STAGE FROM START OF BREACH IN DAM, ADD 29 HOURS

DATE: JAN 1991
JOB NO# 016-83395.03

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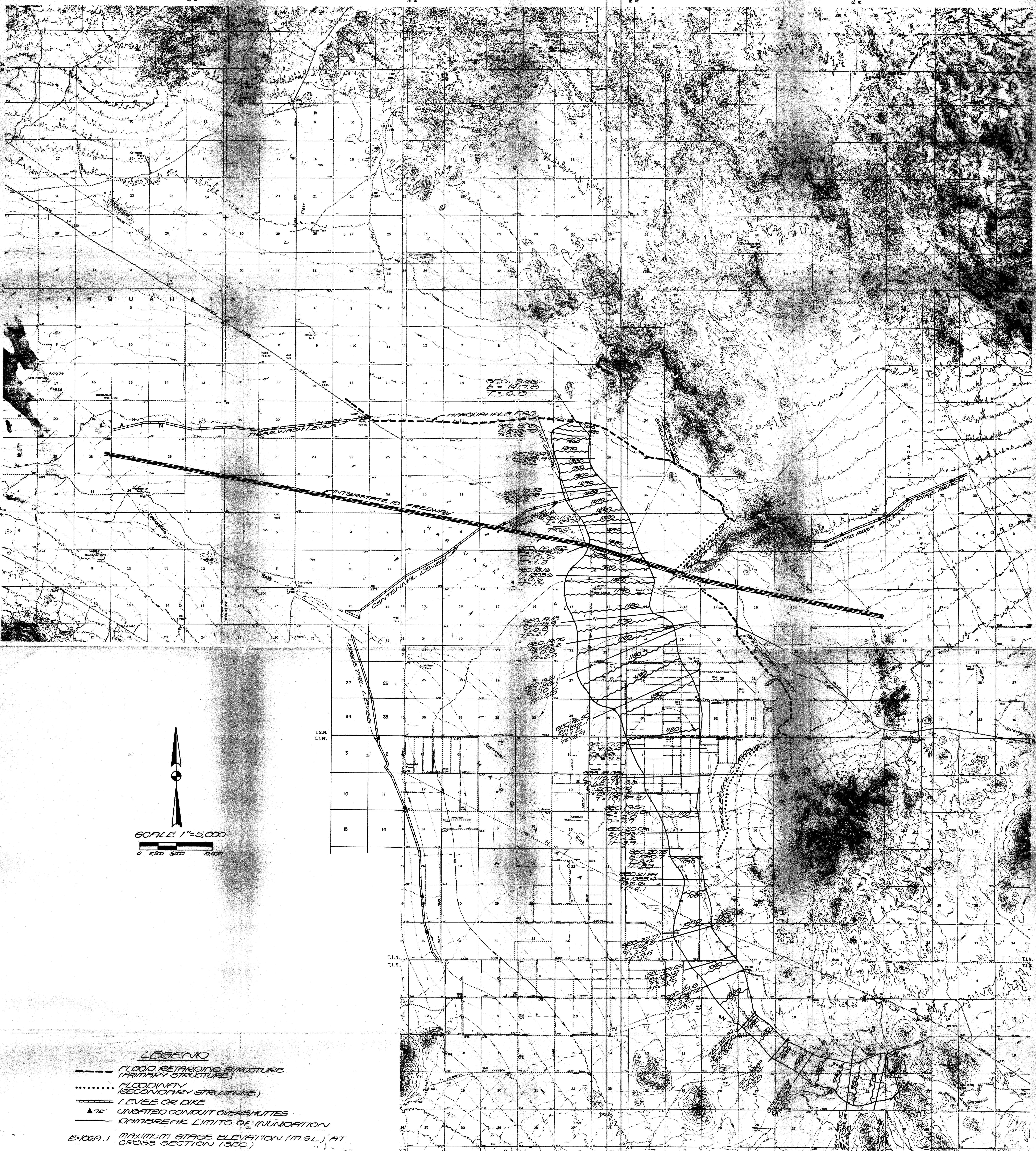
dsn:
drn:
ckd:

LIMITS OF INUNDATION
EAST BREACH
HARQUAHALA F.R.S.

FIG. 15

F.C.D. 88-66

DAMBREAK ANALYSIS
OF
FARWEST MARICOPA COUNTY STRUCTURES
FLOOD INUNDATION LIMITS



LEGEND

- FLOOD RETARDING STRUCTURE (PRIMARY STRUCTURE)
- FLOODWAY (SECONDARY STRUCTURE)
- LEVEE OR DIKE
- ▲72" UNGATED CONDUIT OVERSHUTTES
- DAMBREAK LIMITS OF INUNDATION

E=1069.1 MAXIMUM STAGE ELEVATION (M.S.L.) AT CROSS SECTION (SEC.)

T=3.6 TIME TO MAXIMUM STAGE ELEVATION IN HOURS

SEC 23.69 CROSS SECTION NUMBER

~1090~ MAXIMUM STAGE ELEVATION

TF=4.5 TIME TO FLOOD ELEVATION IN HOURS FROM START OF BREACH

NOTES:

1.) TIME TO MAXIMUM STAGE ELEVATION ON MAP REPRESENTS THE TIME BETWEEN PEAK STAGE AT BREACH (EQUAL TO TIME 0.0) AND TRAVEL TIME OF FLOOD TO CROSS SECTION.

2.) FOR TIME OF MAXIMUM STAGE FROM BEGINNING OF STORM ADD 51.2 HOURS.

3.) FOR TIME OF MAXIMUM STAGE FROM START OF BREACH IN DAM, ADD 2.7 HOURS.

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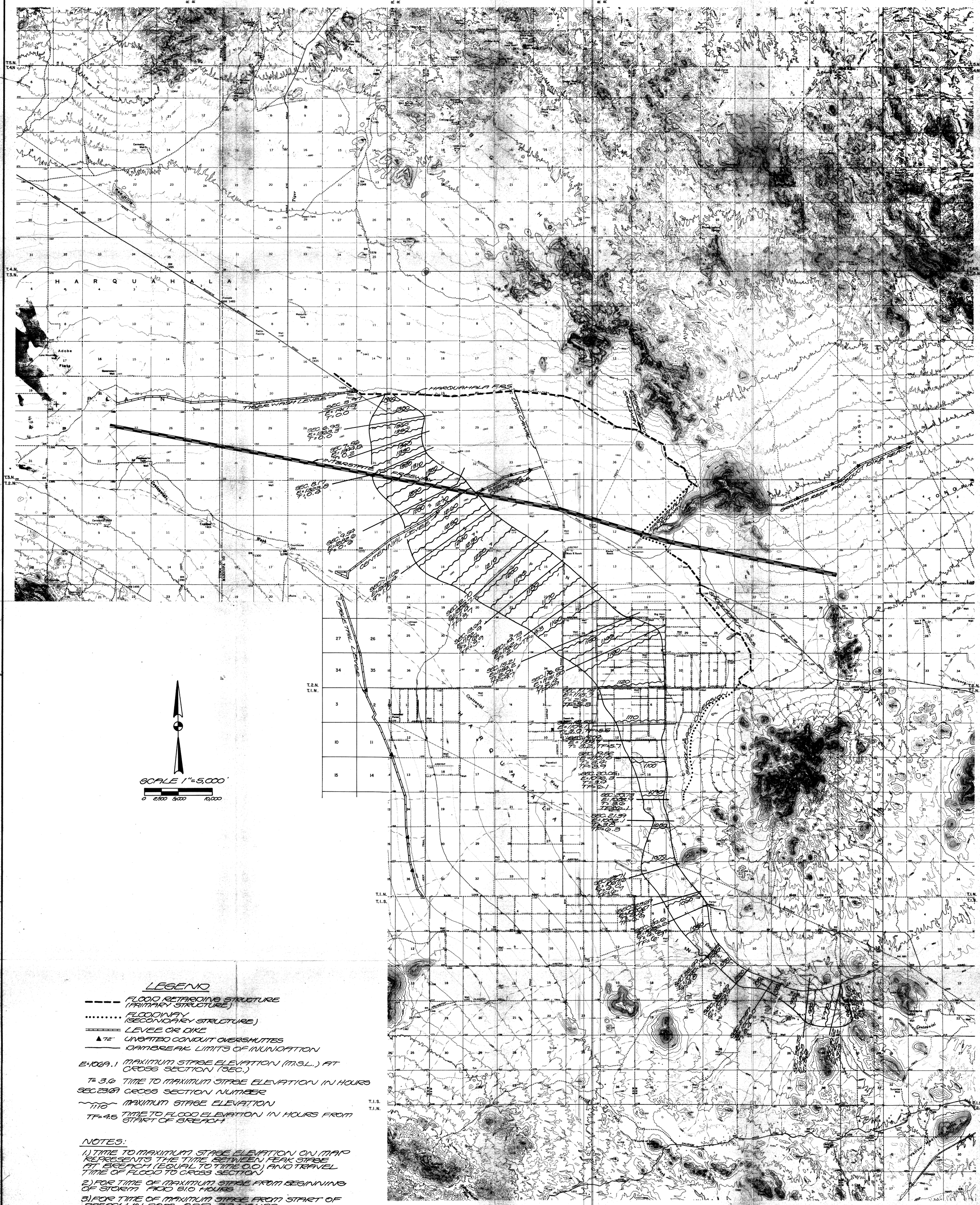
LIMITS OF INUNDATION
MIDDLE BREACH
HARQUAHALA F.R.S.

FIG. 16

F.C.D. 88-66

DAMBREAK ANALYSIS
OF
FARWEST MARICOPA COUNTY STRUCTURES
FLOOD INUNDATION LIMITS



SCALE 1"=5,000'

0 2,500 5,000 10,000

LEGEND

- ---- FLOOD RETARDING STRUCTURE (PRIMARY STRUCTURE)
- ..... FLOODWAY (SECONDARY STRUCTURE)
- ═══ LEVEE OR DIKE
- ▲ 72" UNGATED CONDUIT OVERSHUTTES
- —— DAMBREAK LIMITS OF INUNDATION
- E=1069.1 MAXIMUM STAGE ELEVATION (M.S.L.) AT CROSS SECTION (SEC.)
- T= 3.6 TIME TO MAXIMUM STAGE ELEVATION IN HOURS
- SEC 23.07 CROSS SECTION NUMBER
- ~1110~ MAXIMUM STAGE ELEVATION
- TF=4.5 TIME TO FLOOD ELEVATION IN HOURS FROM START OF BREACH

NOTES:

1) TIME TO MAXIMUM STAGE ELEVATION ON MAP REPRESENTS THE TIME BETWEEN PEAK STAGE AT BREACH (EQUAL TO TIME 0.0) AND TRAVEL TIME OF FLOOD TO CROSS SECTION

2) FOR TIME OF MAXIMUM STAGE FROM BEGINNING OF STORM ADD 81.0 HOURS

3) FOR TIME OF MAXIMUM STAGE FROM START OF BREACH IN DAM, ADD 3.3 HOURS

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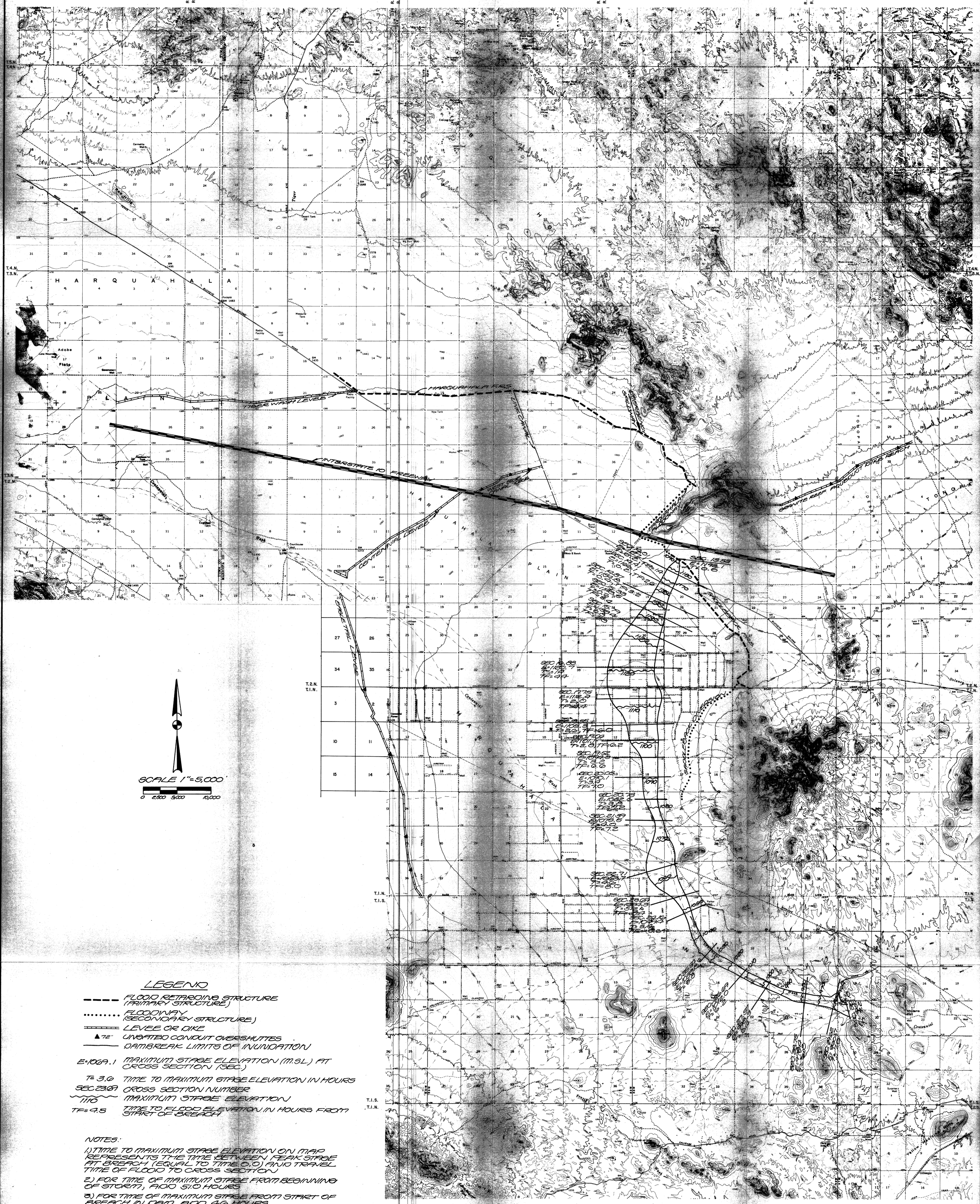
LIMITS OF INUNDATION
WEST BREACH
HARQUAHALA F.R.S.

FIG. 17

FCD 83-66

DAMBREAK ANALYSIS
OF
FARWEST MARICOPA COUNTY STRUCTURES
FLOOD INUNDATION LIMITS



LEGEND

- FLOOD RETARDING STRUCTURE (PRIMARY STRUCTURE)
- FLOODWAY (SECONDARY STRUCTURE)
- LEVEE OR DIKE
- ▲72" UNGATED CONDUIT OVERSHUTTES
- DAMBREAK LIMITS OF INUNDATION
- E=1069.1 MAXIMUM STAGE ELEVATION (M.S.L.) AT CROSS SECTION (SEC.)
- T=3.6 TIME TO MAXIMUM STAGE ELEVATION IN HOURS
- SEC 23.89 CROSS SECTION NUMBER
- 1110 MAXIMUM STAGE ELEVATION
- TF=4.5 TIME TO FLOOD ELEVATION IN HOURS FROM START OF BREACH

NOTES:

1) TIME TO MAXIMUM STAGE ELEVATION ON MAP REPRESENTS THE TIME BETWEEN PEAK STAGE AT BREACH (EQUAL TO TIME 0.0) AND TRAVEL TIME OF FLOOD TO CROSS SECTION

2) FOR TIME OF MAXIMUM STAGE FROM BEGINNING OF STORM, ADD 51.0 HOURS

3) FOR TIME OF MAXIMUM STAGE FROM START OF BREACH IN DAM, ADD 4.6 HOURS

DATE: JAN. 1991
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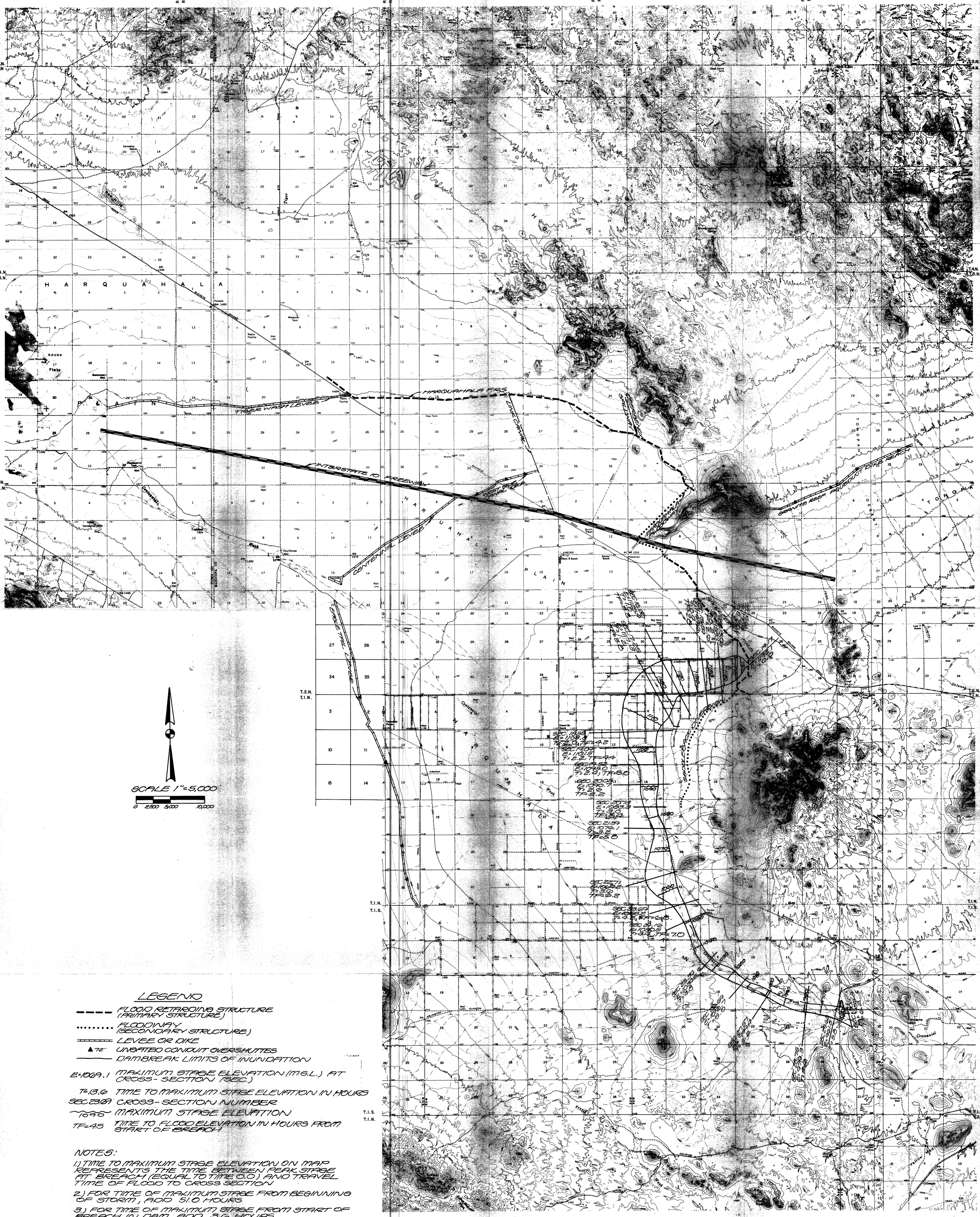
LIMITS OF INUNDATION
NORTH BREACH
SADDLEBACK F.R.S.

FIG. 18

F.C.D. 88-66

DAMBREAK ANALYSIS
OF
FARWEST MARICOPA COUNTY STRUCTURES
FLOOD INUNDATION LIMITS



SCALE 1"=5,000'

0 2,500 5,000 10,000

LEGEND

- ---- FLOOD RETARDING STRUCTURE (PRIMARY STRUCTURE)
- ..... FLOODWAY (SECONDARY STRUCTURE)
- ═══ LEVEE OR DIKE
- ▲ 72" UNGATED CONDUIT OVERSHUTTES
- ——— DAMBREAK LIMITS OF INUNDATION
- E=1069.1 MAXIMUM STAGE ELEVATION (M.S.L.) AT CROSS-SECTION (SEC.)
- T=13.6 TIME TO MAXIMUM STAGE ELEVATION IN HOURS
- SEC 23.69 CROSS-SECTION NUMBER
- ~1066 MAXIMUM STAGE ELEVATION
- TF=4.5 TIME TO FLOOD ELEVATION IN HOURS FROM START OF BREACH

T.I.S.
T.I.N.

NOTES:

1.) TIME TO MAXIMUM STAGE ELEVATION ON MAP REPRESENTS THE TIME BETWEEN PEAK STAGE AT BREACH (EQUAL TO TIME 0.0) AND TRAVEL TIME OF FLOOD TO CROSS SECTION

2.) FOR TIME OF MAXIMUM STAGE FROM BEGINNING OF STORM, ADD 51.0 HOURS

3.) FOR TIME OF MAXIMUM STAGE FROM START OF BREACH IN DAM, ADD 3.6 HOURS

DATE: JAN-1991
JOB NO.# 016-83335.03

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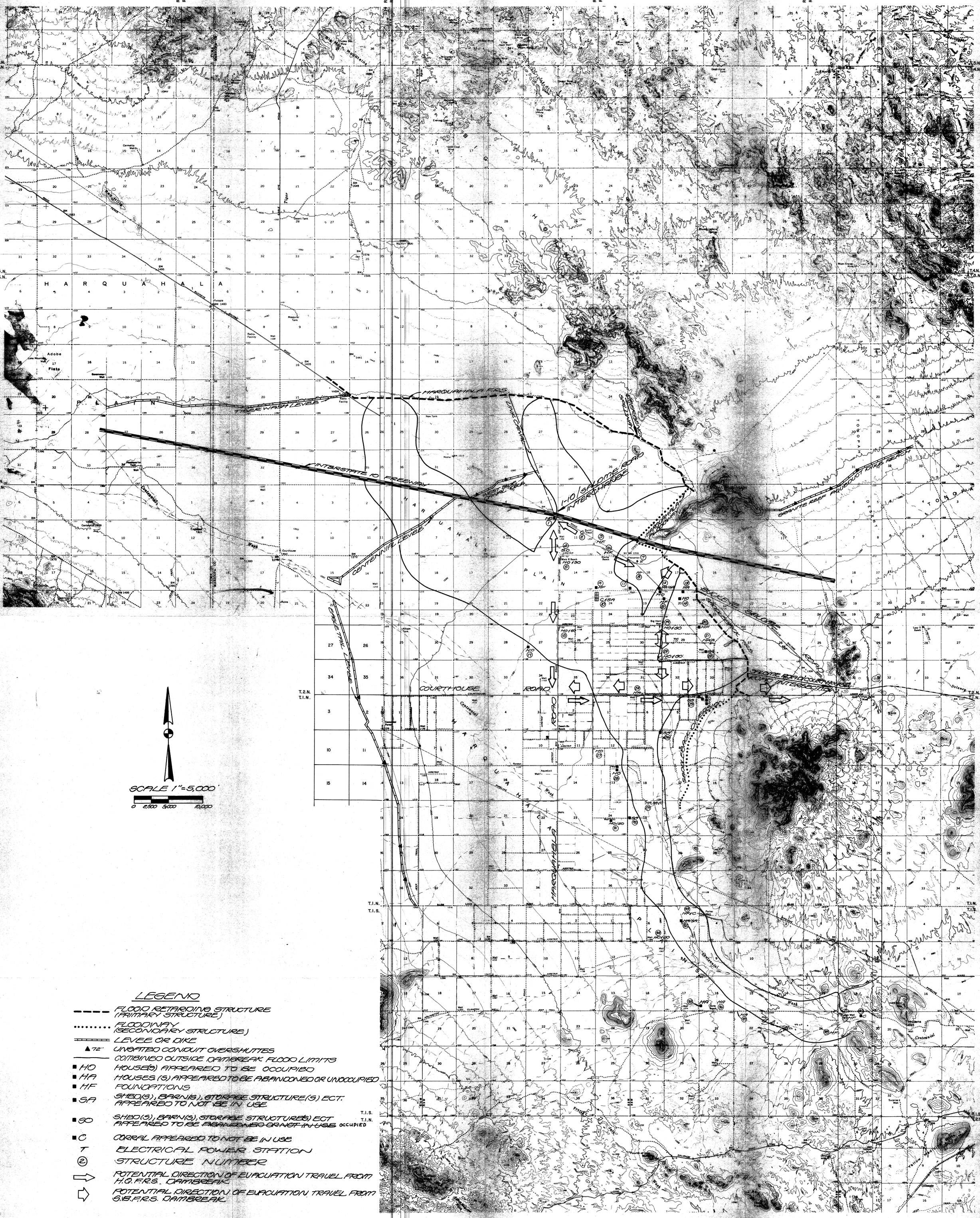
LIMITS OF INUNDATION
SOUTH BREACH
SADDLEBACK F.R.S.

FIG. 19

F.C.D. 88-66

DAMBREAK ANALYSIS
OF
FARWEST MARICOPA COUNTY STRUCTURES



LEGEND

- FLOOD RETARDING STRUCTURE (PRIMARY STRUCTURE)
- FLOODWAY (SECONDARY STRUCTURE)
- LEVEE OR DIKE
- ▲72" UNGATED CONDUIT OVERSHUTTES
- COMBINED OUTSIDE DAMBREAK FLOOD LIMITS
- ■ HO HOUSE(S) APPEARED TO BE OCCUPIED
- ■ HA HOUSES (S) APPEARED TO BE ABANDONED OR UNOCCUPIED
- ■ HF FOUNDATIONS
- ■ SA SHED(S), BARN(S), STORAGE STRUCTURE(S) ECT. APPEARED TO NOT BE IN USE
- ■ SO SHED(S), BARN(S), STORAGE STRUCTURE(S) ECT APPEARED TO BE ~~ABANDONED OR NOT IN USE~~ OCCUPIED
- ■ C CORRAL APPEARED TO NOT BE IN USE
- T ELECTRICAL POWER STATION
- ② STRUCTURE NUMBER
- POTENTIAL DIRECTION OF EVACUATION TRAVEL FROM H.Q.F.R.S. DAMBREAK
- POTENTIAL DIRECTION OF EVACUATION TRAVEL FROM S.W.B.F.R.S. DAMBREAK

DATE: JAN - 1991
JOB NO.# 016-83395.03

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STRUCTURE LOCATION MAP

FIG. 20

FCD 88-66

TABLE 13
TIMES TO MAXIMUM FLOOD STAGE & FLOOD ELEVATION
FOR HARQUAHALA FRS-EAST BREACH

CROSS-SECTION NO.	MAXIMUM FLOOD STAGE			FLOOD ELEVATION
	FROM START OF STORM (hrs.)	FROM START OF BREACH (hrs.)	FROM MAXIMUM STAGE AT BREACH (hrs.)	FROM START[1] OF BREACH (hrs.)
10.0	51.4	2.9	0.0	
10.8	51.4	2.9	0.0	
11.92	51.6	3.1	0.2	
12.55	51.6	3.1	0.2	1.3
13.16	51.6	3.1	0.2	1.7
14.18	51.8	3.3	0.4	1.9
14.70	51.8	3.3	0.4	2.1
15.21	52.0	3.5	0.6	2.3
16.50	52.2	3.7	0.8	2.7
17.75	52.5	4.0	1.1	3.1
18.55	52.6	4.1	1.2	3.3
19.04	52.8	4.3	1.4	3.3
19.52	53.0	4.5	1.6	3.5
20.05	53.0	4.5	1.6	3.5
20.73	53.2	4.7	1.8	3.7
21.39	53.4	4.9	2.0	3.9
22.71	53.6	5.1	2.2	4.3
23.69	53.8	5.3	2.4	4.3
24.16	54.0	5.5	2.6	4.5
25.54	54.2	5.7	2.8	
26.69	54.6	6.1	3.2	
27.57	54.6	6.1	3.2	
28.75	55.0	6.5	3.6	
29.62	55.2	6.7	3.8	
30.10	55.4	6.9	4.0	

[1]For selected sections only.

TABLE 14
TIMES TO MAXIMUM FLOOD STAGE & FLOOD ELEVATION
FOR HARQUAHALA FRS-MIDDLE BREACH

CROSS-SECTION NO.	MAXIMUM FLOOD STAGE			FLOOD ELEVATION
	FROM START OF STORM (hrs.)	FROM START OF BREACH (hrs.)	FROM MAXIMUM STAGE AT BREACH (hrs.)	FROM START[1] OF BREACH (hrs.)
8.62	51.2	2.7	0.0	
8.92	51.2	2.7	0.0	
9.64	51.4	2.9	0.2	
10.53	51.4	2.9	0.2	
11.67	51.6	3.1	0.4	
12.52	51.8	3.3	0.6	1.3
13.16	51.8	3.3	0.6	1.9
14.18	52.0	3.5	0.8	2.1
14.7	52.0	3.5	0.8	2.3
15.21	52.2	3.7	1.0	2.5
16.5	52.4	3.9	1.2	2.9
17.75	52.8	4.3	1.6	3.3
18.55	53.0	4.5	1.8	3.5
19.04	53.0	4.5	1.8	3.7
19.52	53.2	4.7	2.0	3.7
20.05	53.4	4.9	2.2	3.9
20.73	53.6	5.1	2.4	3.9
21.39	53.8	5.3	2.6	4.1
22.71	54.0	5.5	2.8	4.5
23.69	54.4	5.9	3.2	4.7
24.16	54.4	5.9	3.2	4.7
25.54	54.6	6.1	3.4	
26.69	55.0	6.5	3.8	
27.57	55.2	6.7	4.0	
28.75	55.4	6.9	4.2	
29.62	55.8	7.3	4.6	
30.10	55.8	7.3	4.6	

[1]For selected sections only.

TABLE 15
TIMES TO MAXIMUM FLOOD STAGE & FLOOD ELEVATION
FOR HARQUAHALA FRS-WEST BREACH

CROSS-SECTION NO.	MAXIMUM FLOOD STAGE			FLOOD ELEVATION
	FROM START OF STORM (hrs.)	FROM START OF BREACH (hrs.)	FROM MAXIMUM STAGE AT BREACH (hrs.)	FROM START[1] OF BREACH (hrs.)
5.97	51.85	3.3	0.0	
6.95	51.8	3.3	0.0	
7.56	52.0	3.5	0.2	
8.17	52.2	3.7	0.4	
9.54	52.4	3.9	0.6	
11.06	52.8	4.3	1.0	
12.70	53.2	4.7	1.4	3.7
13.64	53.4	4.9	1.6	3.9
14.73	53.8	5.3	2.0	4.3
15.21	53.8	5.3	2.0	4.7
16.50	54.2	5.7	2.4	4.9
17.75	54.4	5.9	2.6	5.3
18.55	54.8	6.3	3.0	5.5
19.04	55.0	6.5	3.2	5.7
19.52	55.2	6.7	3.4	5.9
20.05	55.2	6.7	3.4	6.1
20.73	55.4	6.9	3.6	6.1
21.39	55.6	7.1	3.8	6.3
22.71	55.8	7.3	4.0	6.7
23.69	56.2	7.7	4.4	6.9
24.16	56.4	7.9	4.6	6.9
25.54	56.6	8.1	4.8	
26.69	57.0	8.5	5.2	
27.57	57.2	8.7	5.4	
28.75	57.4	8.9	5.6	
29.62	57.6	9.1	5.8	
30.10	57.6	9.1	5.8	

[1]For selected sections only.

TABLE 16
TIMES TO MAXIMUM FLOOD STAGE & FLOOD ELEVATION
FOR SBRRS-NORTH BREACH

CROSS-SECTION NO.	MAXIMUM FLOOD STAGE			FLOOD ELEVATION
	FROM START OF STORM (hrs.)	FROM START OF BREACH (hrs.)	FROM MAXIMUM STAGE AT BREACH (hrs.)	FROM START[1] OF BREACH (hrs.)
13.53	51.0	4.6	0.0	
14.01	51.2	4.8	0.2	1.4
14.41	51.2	4.8	0.2	2.6
14.87	51.4	5.0	0.4	3.2
15.33	51.6	5.2	0.6	3.4
15.79	51.8	5.4	0.8	3.8
16.88	52.4	6.0	1.4	4.4
17.75	53.0	6.6	2.0	4.4
18.55	53.6	7.2	2.6	6.0
19.04	53.8	7.4	2.8	6.2
19.52	54.2	7.8	3.2	6.6
20.05	54.4	8.0	3.4	7.0
20.73	54.8	8.4	3.8	7.2
21.39	55.0	8.6	4.0	7.2
22.71	55.6	9.2	4.6	8.0
23.69	56.2	9.8	5.2	8.4
24.16	56.4	10.0	5.4	8.6
25.54	56.8	10.4	5.8	
26.69	57.2	10.8	6.2	
27.57	57.4	11.0	6.4	
28.75	57.8	11.4	6.8	
29.62	58.0	11.6	7.0	
30.10	58.2	11.8	7.2	

[1]For selected sections only.

TABLE 17
TIMES TO MAXIMUM FLOOD STAGE & FLOOD ELEVATION
FOR SBRRS-SOUTH BREACH

CROSS-SECTION NO.	MAXIMUM FLOOD STAGE			FLOOD ELEVATION
	FROM START OF STORM (hrs.)	FROM START OF BREACH (hrs.)	FROM MAXIMUM STAGE AT BREACH (hrs.)	FROM START[1] OF BREACH (hrs.)
14.17	51.0	3.6	0.0	
14.61	51.2	3.8	0.2	2.2
15.06	51.2	3.8	0.2	2.6
15.54	51.4	4.0	0.4	2.8
16.66	52.0	4.6	1.0	3.2
17.25	52.2	4.8	1.2	3.8
18.55	53.0	5.6	2.0	4.2
19.04	53.2	5.8	2.2	4.4
19.52	53.4	6.0	2.4	5.0
20.05	53.6	6.2	2.6	5.2
20.73	54.0	6.6	3.0	5.4
21.39	54.2	6.8	3.2	5.6
22.71	54.6	7.2	3.6	6.2
23.69	55.2	7.8	4.2	6.8
24.16	55.4	8.0	4.4	7.0
25.54	55.8	8.4	4.8	
26.69	56.0	8.6	5.0	
27.57	56.2	8.8	5.2	
28.75	56.6	9.2	5.6	
29.62	56.8	9.4	5.8	
30.10	57.2	9.8	6.2	

[1]For selected sections only.

TABLE 18
AREA OF FLOODED AGRICULTURAL AND RANGE LAND*

Dambrk Scenario	Agricultural Area (ac)	Range Land Area (ac)
HQFRS East	8100	6000
HQFRS Middle	7900	5900
HQFRS West	6500	11940
SBFRS North	2700	2800
SBFRS South	2500	2800

*All areas are from I-10 south to end of project.

TABLE 19

RESIDENTIAL AND COMMERCIAL STRUCTURES

Structure No.[A]	Structure Description	Appeared Occupied	Appeared Abandoned	Within Flood-limits[B]	Evac-uation Route(s)[C]
1	Trailor/Shed	X	-	6	A
2	Corral	-	x	1,2	
3	Foundation	-	x	1,2	
4	Shed	x	-	1,2	A
5	House/Shed	x	-	1,2	A
6	Foundation	-	x	1,2	
7	Transformer	-	-	7	
8	Foundation	-	x	7	
9	Foundation	-	x	1,2	
10	Shed/Corral	-	x	1,2,3	
11	Shed	-	-	1,2	
12	Trailer/Shed	-	x	4	
13	House	-	x	7	
14	House	x	-	7	A or B
15	House	-	x	4	
16	Trailer	x	-	4	A or B
17	House	x	-	3	A
18	House/Shed	x	-	1,2,3	A
19	House/Shed	x	-	4	A or B
20	Foundation	-	x	7	
21	House	-	x	7	
22	Shed	-	x	7	
23	House/Shed	x	-	1,2,3,4,5	B
24	House	-	x	1,2,3,4,5	
25	House/Shed	x	-	5	B
26	Shed	-	x	1,2,3,4,5	
27	House	x	-	N/A	
28	House/Shed	x	-	N/A	
29	House/Shed	-	x	1,2,3,4,5	
30	Shed	-	x	N/A	
31	House/Shed	x	-	N/A	
32	House/Shed	-	x	1,2,3,4,5	
33	Foundation	-	x	1,2,3	
34	House/Shed	x	-	N/A	
35	House/Shed	-	x	N/A	
36	House/Shed	-	x	N/A	
37	House	-	x	N/A	
38	Foundation	-	x	1,2,3	

TABLE 19 (continued)

RESIDENTIAL AND COMMERCIAL STRUCTURES

Structure No.[A]	Structure Description	Appeared Occupied	Appeared Abandoned	Within Flood-limits[B]	Evac-uation Route(s)[C]
39	Foundation	-	x	1,2,3	
40	Corral	-	-	1,2,3,4,5	

[A] Structure location given on Figure 7.

[B] Floodlimits:
1. HQFRS - East
2. HQFRS - Middle
3. HQFRS - West
4. SBFRS - North
5. SBFRS - South
6. HQFRS - Dambreak other locations
7. SBFRS - Dambreak other locations

[C] Potential evacuation routes:
1. Travel north to I-10/Salome Road interchange or south and east to Salome Road/Courthouse Road interchange.
2. Travel south and west to Harquahala Road/Courthouse Road interchange or south and east to Salome Road/Courthouse Road interchange.