AUGUST 1981

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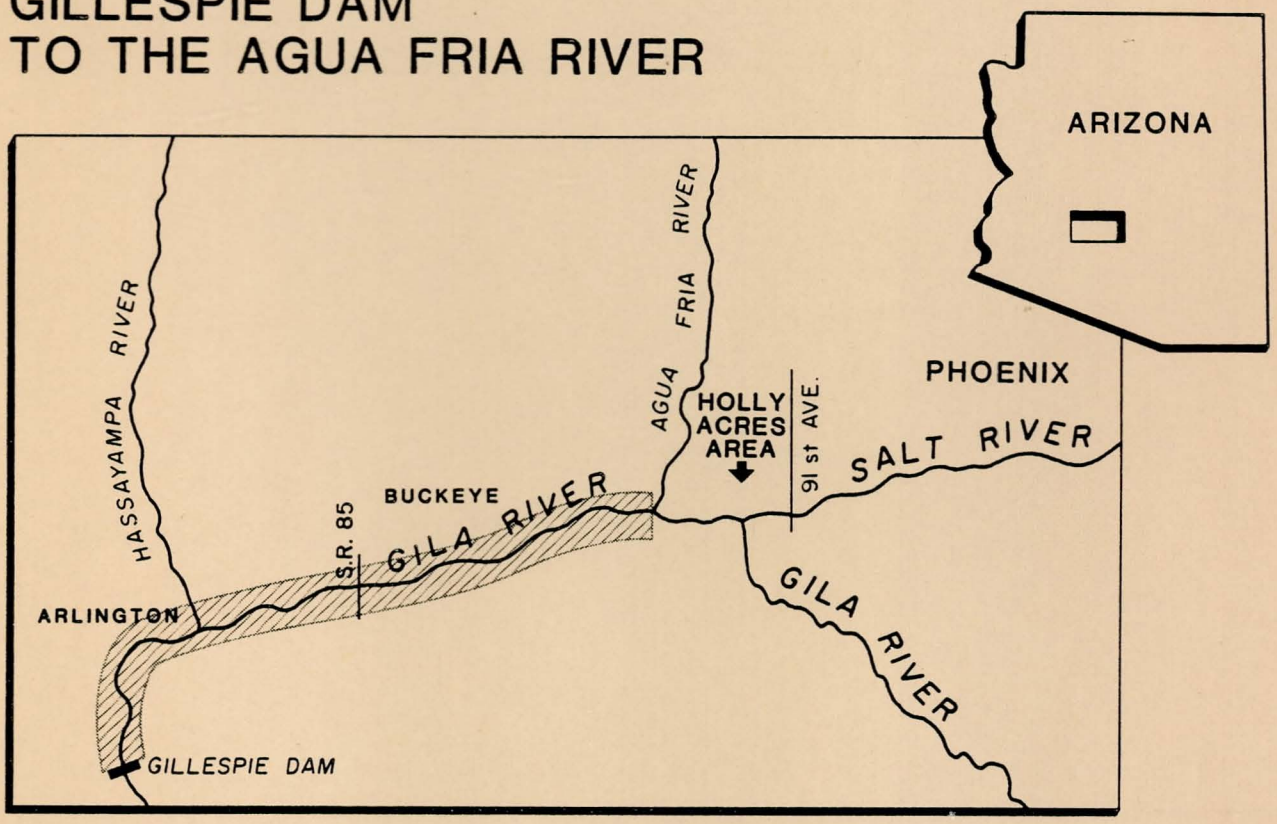
FINAL REPORT

SALT-GILA RIVER INTERIM FLOOD CONTROL WORKS

APPENDIX

GILLESPIE DAM TO THE AGUA FRIA RIVER



PREPARED FOR

Flood Control District of Maricopa County
Contract FCD 80-9

CDM Camp Dresser & McKee Inc

37.0-01-7-08/81

R-119

SALT-GILA INTERIM FLOOD CONTROL WORKS

GILLESPIE DAM TO THE AGUA FRIA RIVER

FINAL REPORT

APPENDIX

For

Flood Control District
of Maricopa County, Arizona

By

Camp Dresser & McKee, Inc.
Walnut Creek, CA

August 1981

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COST CALCULATIONS

TABLE VII-1

PERRYVILLE ROAD AREA
BANK STABILIZATION
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
PERRYVILLE ROAD AREA		CHECKED BY PRG		CHECKED BY	
BANK STABILIZATION		DATE AUG. 1981		DATE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FIRST COST				
1	Diversion and Control of Water		JOB	L.S.	56,000
2	Clear Site and Remove Obstructions	24	ACRE	300	7,200
3	Excavation				
	A. For Channel	--	CY	1.50	--
	B. For Levee Fill	--	CY	1.50	--
	C. Toe	161,000	CY	2.50	402,500
4	Compacted Fill				
	A. Levees	--	CY	1.00	--
	B. Toe	161,000	CY	1.30	209,300
5	Vegetation Erosion Protection	--	JOB	L.S.	--
6	Filter Material	11,500	CY	18.00	207,000
7	Rock Rip-Rap	46,000	CY	18.00	828,000
8	Flap Gates	--	EA	2000	--
9	Interior Drainage				
	A. Collection	--	JOB	L.S.	--
	B. Pump Station	--	JOB	L.S.	--
10	Road Work				
	A. Excavation and Fill	--	CY	2.50	--
	B. Remove Pavement	--	SF	0.60	--
	C. Aggregate Base	--	CY	18.00	--
	D. Asphalt/Concrete Pavement	--	SF	1.00	--
	Total Construction Costs				1,710,000
	Contingencies, 15%				256,500
	Engineering and Design, 10%				196,700
	Supervision and Administration, 10%				196,700
11	Land Acquisition	20	ACRE	8000	160,000
	TOTAL FIRST COST				2,520,000

BECAUSE AN EXISTING LOW FLOW CHANNEL IS LOCATED AT THE BASE OF THE NORTH BANK WHERE TOE EXCAVATION WILL OCCUR, DIVERSION LEVEES SHOULD BE CONSTRUCTED TO DIVERT THIS FLOW INTO EXISTING LOW FLOW CHANNELS WHICH DO NOT FLOW ADJACENT TO THE NORTH BANK.

A COMBINATION OF DIVERSION LEVEES AND CHANNEL EXCAVATION EAST OF STATION 1045+00 AND 2000'-3000' SOUTH OF STATION 1020+00 WOULD ACCOMPLISH THIS TASK. ASSUME DIVERSION LEVEES WOULD BE AN AVERAGE OF 10' IN WIDTH AND 10' IN HEIGHT, AND CHANNEL EXCAVATION EQUAL TO AN AVERAGE OF 100' IN WIDTH, 6 FT IN DEPTH.

LEVEE EAST OF STATION 1045:

$$(1000')(10')(10') = 100{,}000\ FT^3$$

$$\underline{\underline{3700\ YD^3}}$$

LEVEE APPROXIMATELY 2000' SOUTH OF STA 1020+00:

$$(600')(10')(10') = 60{,}000\ FT^3$$

$$\underline{\underline{2200\ YD^3}}$$

CHANNEL EXCAVATION APPROX. 2000' - 3000' SOUTH OF STATION 1020+00.

$(1500')(100')(6') = 900,000 \text{ FT}^3$

$= \underline{\underline{33,300 \text{ YD}^3}}$

COSTS:

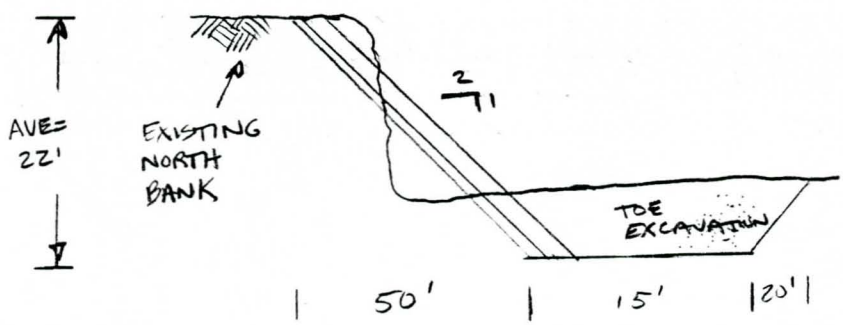
$(3700 \text{ YD}^3)(\$1.00/\text{YD}^3) = \$3700.00$

$(2200 \text{ YD}^3)(\$1.00/\text{YD}^3) = \$2200.00$

$(33,300 \text{ YD}^3)(\$1.50/\text{YD}) = \$50,000.00$

$\underline{\underline{\$55,900.00}}$

2. CLEAR SITE AND REMOVE OBSTRUCTIONS



LENGTH OF BANK PROTECTION = 12400 FT

AREA OF CLEARING $= (50' + 15' + 20')(12400')$

$= 1,054,000 \text{ FT}^3$

$= 24$ ACRES.

TOE EXCAVATION

AREA BETWEEN PERRYVILLE ROAD AND COTTON LANE.

FROM INSPECTION OF AREAL PHOTOGRAPHS IT CAN BE SEEN THAT THE LOW FLOW CHANNEL IS LOCATED ADJACENT TO THE NORTH BANK. ASSUMING THE LOW FLOW CHANNEL BOTTOM IS THE INVERT, TOE EXCAVATION IS 10 FEET BELOW THE INVERT.

DEPTH OF EXCAVATION = 10'
BOTTOM WIDTH = 15'
SIDE SLOPES, 2:1
LENGTH OF EXCAVATION = 12400

VOLUME OF EXCAVATION =

$$(12400')\left((10' * 15') + \left(2 * \tfrac{1}{2} * 20' \times 10'\right)\right)$$

$$= 4.34 \times 10^6 \ FT^3$$

$$= \underline{\underline{1.61 \times 10^5 \ YD^3}}$$

ASSUME TOE FILL EQUALS TOE EXCAVATION. EXTRA MATERIAL IS NOT REQUIRED FOR TOE FILL EVEN THOUGH THE FILL WILL BE COMPACTED. IT IS ASSUMED THAT ANY LOSS IN VOLUME THROUGH COMPACTION WILL BE BALANCED BY THE ADDITIONAL RIPRAP AND FILTER VOLUMES.

NATIONAL 42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
Made in U.S.A.

BANK PROTECTION

AREA BETWEEN PERRYVILLE ROAD AND COTTON LANE

STATION	REACH LENGTH (FT)	RIP-RAP VERT. HT. (FT)	RIP-RAP AVE. VERT. HEIGHT (FT)	RIP-RAP AREA (2.24)(H)(L) (FT^2)	RIP-RAP VOLUME (FT^3)	RIP-RAP VOLUME (YD^3)	FILTER MATERIAL VOLUME (YD^3)
920+70	4755	23	21.5	229,000	458,000	16960	4240
968+25	1175	20	22	57900	115,800	4290	1070
980+00	1000	24	24.5	54900	109,800	4065	1010
990+00	1000	25	26	58200	116400	4310	1080
1000+00	1000	27	27	60500	121000	4480	1120
1010+00	1000	27	24	53800	107 600	3990	1000
1020+00	1000	21	19.5	43700	87 400	3240	810
1030+00	1000	18	18.5	41400	82 800	3070	770
1040+00	500	19	19	21300	42600	1580	400
1045+00		19					

$\Sigma = 46\,000$ $\Sigma = 11500$

7. ROCK RIPRAP

6. FILTER MATERIAL

PERRYVILLE ROAD AREA

6. FILTER MATERIAL
7. ROCK RIPRAP

AVERAGE HEIGHT OF PROTECTION = 22FT
(INCLUDING BELOW INVERT)

LENGTH OF BANK PROTECTION = 12400FT

ASSUME AQUISITION OF 10' OF LAND
ON EACH SIDE PROTECTION.

AREA OF AQUIZITION =

$$((22FT)(2.24) + 20FT)(12400FT)$$

$$= 859,100 \ FT^2$$

$$= \underline{\underline{19.7 \ ACRES}}$$

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE Made in U.S.A.

PERRYVILLE ROAD AREA LIMITED BANK STABILIZATION

COSTS FOR CONSTRUCTING A LIMITED LEVEE FROM STA 1000 TOO TO STA 1020 TOO ARE CACLULATED AS A PORPORTION OF THE FULL LEVEE COSTS. THE PORPORTION IS EQUAL TO THE LENGTH OF THE LIMITED PROJECT DIVIDED BY THE LENGTH OF THE FULL PROJECT. THE EXCEPTION TO THIS IS THE COST OF DIVERSION AND CONTROL OF WATER, WHICH IS THE SAME FOR BOTH PROJECTS.

$$\left(\frac{2{,}000'}{12{,}400'}\right) = 0.16$$

ITEM	COST
1. DIVERSION AND CONTROL OF WATER	
NO CHANGE	$55,900
2. CLEAR SITE	
(0.16)($7,200) =	$1,150
3. EXCAVATION	
(0.16)($402,500) =	$ 64,400
4. COMPACTED FILL	
(0.16)($209,300) =	$ 33,500
6. FILTER MATERIAL	
(0.16)($207,000) =	$ 33,100
7. ROCK RIPRAP	
(0.16)($828,000) =	$ 132,500
SUBTOTAL	320,600
CONTINGENCIES, ENGR & DESIGN, SUPERV. & ADMIN	121,800
11. LAND ACQUISITION	
(0.16)(160,000) =	$ 25,600
TOTAL =	$468,000

TABLE VII-2

PERRYVILLE ROAD AREA
CHANNEL EXCAVATION
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
PERRYVILLE ROAD AREA		CHECKED BY PRG		CHECKED BY	
CHANNEL EXCAVATION		DATE AUG. 1981		DATE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FIRST COST				
1	Diversion and Control of Water		JOB	L.S.	3,700
2	Clear Site and Remove Obstructions	6	ACRE	300	1,800
3	Excavation				
	A. For Channel	930,000	CY	1.50	1,395,000
	B. For Levee Fill	28,600	CY	1.50	42,900
	C. Toe	31,100	CY	2.50	77,800
4	Compacted Fill				
	A. Levees	24,900	CY	1.00	24,900
	B. Toe	31,100	CY	1.30	40,400
5	Vegetation Erosion Protection	--	JOB	L.S.	--
6	Filter Material	1,990	CY	18.00	35,800
7	Rock Rip-Rap	7,960	CY	18.00	143,300
8	Flap Gates	--	EA	2000	--
9	Interior Drainage				
	A. Collection	--	JOB	L.S.	--
	B. Pump Station	--	JOB	L.S.	--
10	Road Work				
	A. Excavation and Fill	--	CY	2.50	--
	B. Remove Pavement	--	SF	0.60	--
	C. Aggregate Base	--	CY	18.00	--
	D. Asphalt/Concrete Pavement	19,200	SF	1.00	19,200
	Total Construction Costs				1,784,800
	Contingencies, 15%				267,700
	Engineering and Design, 10%				205,300
	Supervision and Administration, 10%				205,300
11	Land Acquisition	7	ACRE	8000	56,000
	TOTAL FIRST COST				2,519,000

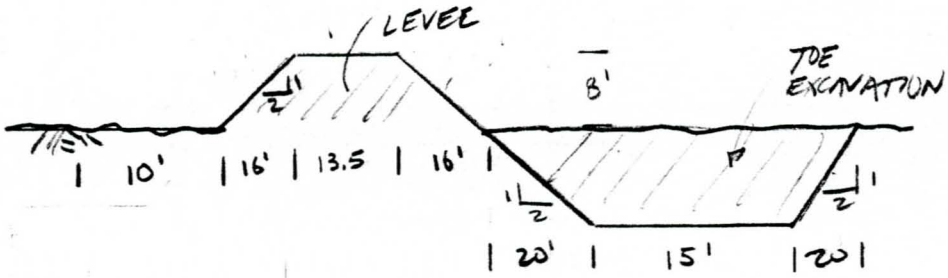
A TEMPORARY DIVERSION LEVEE IS NEEDED UPSTREAM OF THE PERMANENT DIVERSION LEVEE TO FACILITATE LEVEE CONSTRUCTION AND TOE EXCAVATION. ASSUME THE AVERAGE WIDTH OF THE TEMPORY LEVEE TO BE 10 FT AND THE AVERAGE HEIGHT OF THE LEVEE TO BE 10 FT. ASSUME A LENGTH OF 1000 FT.

$$\text{VOLUME} = (10')(10')(1000') = 100{,}000\ FT^3$$
$$= \underline{\underline{3700\ YD^3}}$$

$$(3700\ YD^3)(\$1.00/YD) = \underline{\underline{\$3700.0\ YD^3}}$$

2. CLEAR SITE AND REMOVE OBSTRUCTIONS.

AVERAGE HEIGHT OF DIVERSION LEVEE = 8 FT
DEPTH OF RIPRAP = 10 FT
LENGTH OF DIVERSION LEVEE = 2400 FT



WIDTH OF CLEARING
$= 16' + 13.5' + 16' + 20' + 15' + 20'$
$= \underline{\underline{105\ FT}}$

$$\text{AREA} = (2400\ FT)(100\ FT) = 240000\ FT^2$$
$$= \underline{\underline{5.5\ ACRES}}$$

CHANNEL EXCAVATION

FROM INSPECTION OF AREAL STEREO PHOTOGRAPHS, THE DEPTH OF CHANNEL EXCAVATION IS ESTIMATED TO BE 6 FEET.

LENGTH OF EXCAVATION = 13500 FT

AVERAGE WIDTH OF EXCAVATION = 310 FT

AVERAGE ESTIMATED DEPTH = 6 FT

VOLUME OF EXCAVATION =

$$(6')(310')(13500') = 2.51 \times 10^7 \text{ FT}^3$$

$$= \underline{\underline{930{,}000 \text{ YD}^3}}$$

EXCAVATION FOR LEVEE

A LEVEE IS NEEDED UPSTREAM OF COTTON-LANE TO DIVERT FLOW INTO THE NEWLY EXCAVATED LOW FLOW CHANNEL. ASSUME THAT THE AVERAGE LEVEE HEIGHT IS 10 FEET. THE LENGTH OF THE LEVEE IS APPROXIMATELY 2400 FT.

VOLUME OF EXCAVATION REQUIRED FOR LEVEE FILL =

$$\left((8' * 10') + (2 * \tfrac{1}{2} * 20 * 10)\right) * (2400 \text{ FT}) \times 1.15$$

$$= 773{,}000 \text{ FT}^3$$

$$= \underline{\underline{28{,}600 \text{ YD}^3}}$$

TOE EXCAVATION

ASSUME AVERAGE EXCAVATION IS 10 FT.

$$\left((10' * 15') + \left(2 * \tfrac{1}{2} * 10' * 20'\right)\right) * 2400'$$

$= 840{,}000\ FT^3$

$= \underline{31{,}100\ YD^3}$

4. COMPACTED FILL

COMPACTED LEVEE FILL = LEVEE EXCAVATION / 1.15

$= 28{,}600\ YD^3 / 1.15$

$= \underline{\underline{24{,}900\ YD^3}}$

COMPACTED TOE FILL = TOE EXCAVATION

$= \underline{\underline{31{,}100\ YD^3}}$

ASSUME TOE FILL EQUALS TOE EXCAVATION. EXTRA MATERIAL IS NOT REQUIRED FOR TOE FILL EVEN THOUGH THE FILL WILL BE COMPACTED. IT IS ASSUMED THAT ANY LOSS IN VOLUME THROUGH COMPACTION WILL BE BALANCED BY ADDITIONAL RIPRAP AND FILTER VOLUMES.

ASSUME PROTECTION TO 10' BELOW INVERT

VOLUME OF BANK PROTECTION =

$20' * 2.24 * 2' * 2400' = 215,040 \text{ FT}^3$

ROCK RIPRAP = $\underline{\underline{7960 \text{ YD}^3}}$

FILTER MATERIAL = $\underline{\underline{1990 \text{ YD}^3}}$

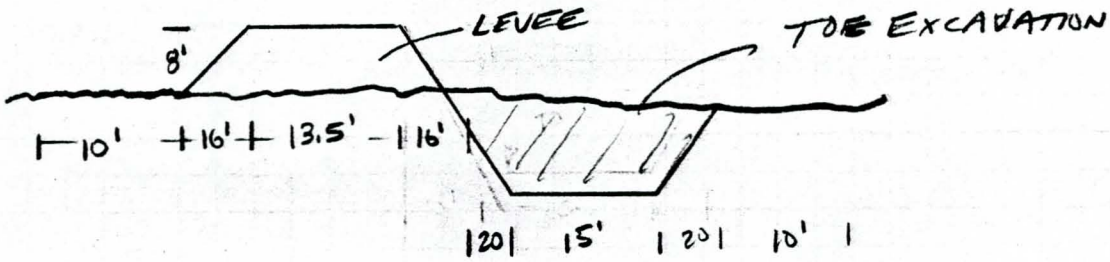
10. ROAD WORK

LEVEE LENGTH = 2400 FT

$(8')(2400') = \underline{\underline{19,200 \text{ FT}^2}}$

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
Made in U.S.A.
NATIONAL

ASSUME WIDTH OF ACQUISITION INCLUDES 10' ON EACH SIDE OF LEVEE.



WIDTH OF CLEARING = 10' + 16' + 13.5 + 16' + 20' + 15' + 20' + 10'

= 120.5 FT

AREA OF ACQUISITION = (2400 FT)(121 FT)

= 290,400 FT^2

= <u>6.7 ACRES</u>

BENEFIT CALCULATIONS

DAMAGES ASSUMED TO OCCUR FOR ANY FLOOD OVER 50,000 cfs

DAMAGES INCLUDE: 1. EROSION OF LAND ALONG BANK @ $8000/acre
2. DAMAGE TO SO. EXTENSION OF BUCKEYE CANAL @ 160,000/mile, BASED ON 1980 REPAIR COST OF $48,000 FOR 1600 FT.
3. LOSS OF HOMES ALONG BANK @ $50,000 ea.

EXTENT OF DAMAGE BASED ON ONE POSSIBLE SCENARIO:

1. EROSION OF 1.5 AC NEAR BEND AND 1.5 AC ELSEWHERE = $24,000
2. CANAL BREACH OF 1000 FT = $30,000
3. LOSS OF 2 HOMES = $100,000

$154,000

PROBABILITY OF A FLOOD GREATER THAN 50,000 cfs IN ANY ONE YEAR = .18

ANNUAL DIRECT BENEFIT: $154,000 (.18) = $27,720 say $28,000/yr

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(28,000) = $32,200

LIMITED BANK PROTECTION PROJECT

PROTECT ONLY ABOUT 2000 FT AT BEND

DAMAGES: 1.5 AC = $12,000
1000 FT OF CANAL = 30,000
42,000

ANNUAL DIRECT BENEFIT = 42,000 (.18) = 7,560 say $7,500/yr

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(7,500) = $8,600

SECTION 2. TUTHILL ROAD AREA

Cost Calculations

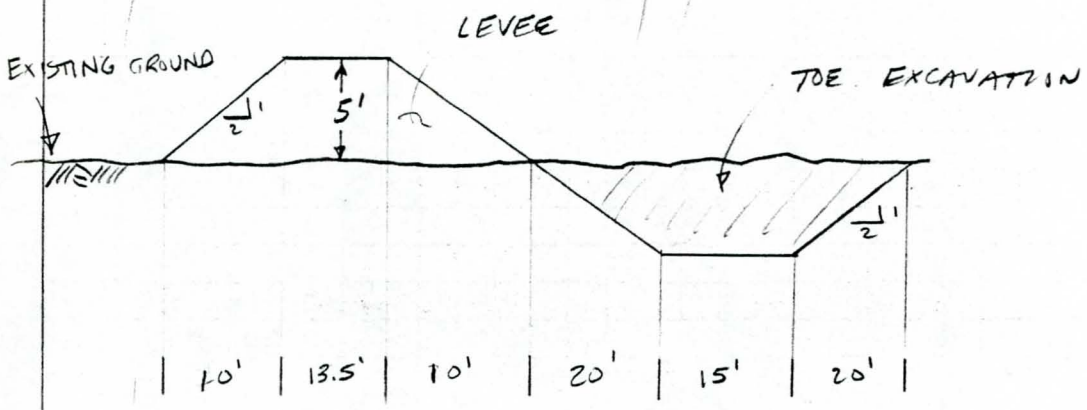
Benefit Calculations

COST CALCULATIONS

TABLE VIII-1

TUTHILL ROAD AREA LEVEE
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
TUTHILL ROAD AREA LEVEE		CHECKED BY PRG		CHECKED BY	
		DATE AUG. 1981		DATE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FIRST COST				
1	Diversion and Control of Water	--	JOB	L.S.	--
2	Clear Site and Remove Obstructions	8	ACRE	300	2,400
3	Excavation				
	A. For Channel	--	CY	1.50	--
	B. For Levee Fill	14,000	CY	1.50	21,000
	C. Toe	68,900	CY	2.50	172,300
4	Compacted Fill				
	A. Levees	12,100	CY	1.00	12,100
	B. Toe	68,900	CY	1.30	89,600
5	Vegetation Erosion Protection		JOB	L.S.	500
6	Filter Material	2,300	CY	18.00	41,400
7	Rock Rip-Rap	9,200	CY	18.00	165,600
8	Flap Gates	1	EA	2000	2,000
9	Interior Drainage				
	A. Collection	--	JOB	L.S.	--
	B. Pump Station		JOB	L.S.	269,000
10	Road Work				
	A. Excavation and Fill	--	CY	2.50	--
	B. Remove Pavement	--	SF	0.60	--
	C. Aggregate Base	--	CY	18.00	--
	D. Asphalt/Concrete Pavement	34,600	SF	1.00	34,600
	Total Construction Costs				810,500
	Contingencies, 15%				121,600
	Engineering and Design, 10%				93,200
	Supervision and Administration, 10%				93,200
11	Land Acquisition	10	ACRE	8000	80,000
	TOTAL FIRST COST				1,199,000



WIDTH OF SITE CLEARING = 10' + 13.5' + 10' + 20' + 15' + 20

= 88.5 FT

LENGTH OF LEVEE = 4000 FT

AREA OF SITE CLEARING = (88.5')(4000')

= 354,000 FT^2

= 8.1 ACRES

LEVEE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: LEVEE QUANTITIES, TUTHILL ROAD BRIDGE AREA
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 8.0
COMPACTION FACTOR: 1.15
RUN DATE: 14-APR-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
956.70		0.0	0.0		
	1730.0			1708.0	1708.0
974.00		4.0	64.0		
	1600.0			5372.7	7080.6
990.00		6.0	120.0		
	1000.0			5061.7	12142.3
1000.00		7.0	154.0		
	========				==========
LENGTH =	4330.0	REQUIRED EXCAVATION =			13963.7

3.B EXCAVATION FOR LEVEE FILL

4.A COMPACTED FILL FOR LEVEE

TOE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: TOE CUT, TUTHILL ROAD BRIDGE AREA
SIDE SLOPES: 2.0:1, 2.0:1
BOT WIDTH 15.0
COMPACTION FACTOR: 1.00
RUN DATE: 08-JUN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
974.00		15.0	675.0		
	1600.0			37817.2	37817.2
990.00		14.0	602.0		
	1000.0			31073.2	68890.4
1000.00		20.0	1100.0		
	0.0			0.0	68890.5
1000.00		20.0	1100.0		
	1300.0			57665.3	126555.7
1013.00		22.0	1298.0		
	2700.0			129800.0	256355.7
1040.00		22.0	1298.0		
	900.0			46788.8	303144.5
1049.00		24.0	1512.0		
	========				==========
LENGTH =	7500.0		REQUIRED EXCAVATION =		303144.5

3.C AND 4.B TOE EXCAVATION AND FILL.

NATIONAL 42-381 [redacted] EETS 5 [redacted]
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
Made in U.S.A.

BANK PROTECTION

AREA OF TUTHILL ROAD BRIDGE

STATION	REACH LENGTH FT.	RIP-RAP VERT HT. FT.	RIP-RAP AVE. VERT HEIGHT FT.	RIP-RAP AREA (2.24)(H)(L) FT^2	RIP-RAP VOLUME FT^3	RIP-RAP VOLUME YD^3	FILTER MATERIAL VOLUME YD^3
974+00	1600	20	20	71700	143400	5300	1330
990+00	1000	20	23.5	52600	105200	3900	980
						9200	2310
1000+00	0	27	—	—	—	—	—
1000+00	1000	44	38.5	86200	172400	6390	1600
1010+00	640	33	32.5	46600	93200	3450	860
1016+40	360	32	32.0	25800	51600	1910	480
1020+00	1000	32	32.0	71700	143400	5310	1330
1030+00	1000	32	32.5	72800	145600	5390	1350
1040+00	900	33	33.0	66500	133000	4930	1230
1049+00		33					

$\Sigma = 36580$ $\Sigma = 9160$

6. FILTER MATERIAL

7. ROCK RIPRAP

VEGETATIVE PROTECTION:

LENGTH OF LEVEE = 4330 FT

AVERAGE HEIGHT OF LEVEE = 5 FT

AREA OF PROTECTION = (4330 FT)(5 FT)(2.24)
= 48500 FT^2
= 1.1 ACRES

SAY $500.00 FOR STARTUP AND PLACEMENT

8. FLAP GATES

ASSUME 1 FLAP GATE WILL BE NEEDED FOR INTERIOR DRAINAGE OF THE AREA NORTH OF THE PROPOSED LEVEE.

9. INTERIOR DRAINAGE

ASSUME AREA TO BE DRAINED = 255 ACRES
(AREA FROM LEVEE TO SOUTH EXTENSION OF BUCKEYE CANAL)

RUNOFF COEF. = 0.4

ASSUME 10 YR RUNOFF

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE Made in U.S.A.

DURATION HR	INTENSITY IN/HR	TOTAL VOLUME A-F
.5	1.8	7.64
1	1.2	10.2
2	0.7	11.9
3	0.54	13.8
5	0.37	15.7
8	0.26	17.7
10	0.22	18.7
18	0.14	21.4
24	0.11	22.4

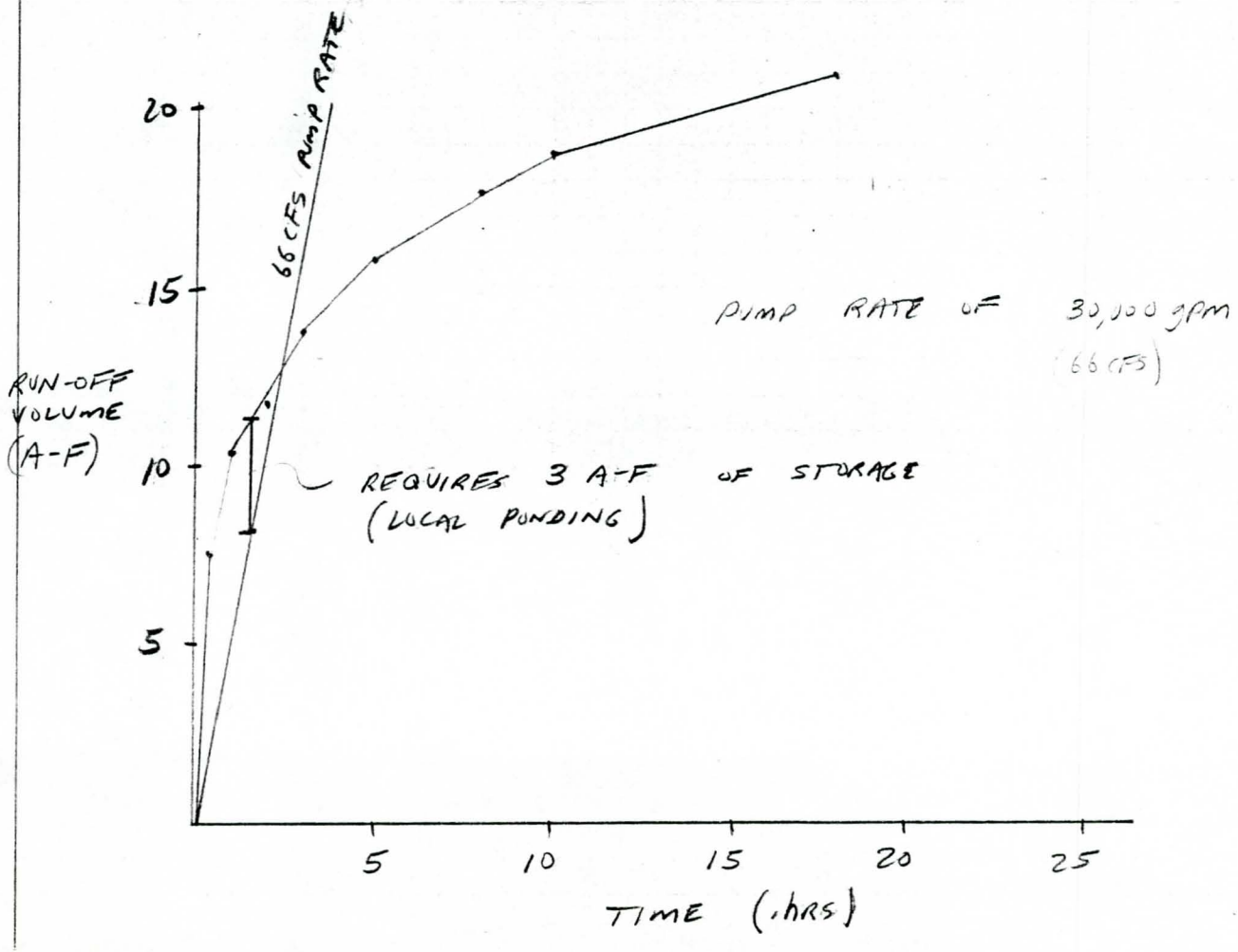
TIME OF CONCENTRATION = 5000 FT / 1 FT/SEC

= 1 1/2 hrs

10 YR $Q = CIA$

$Q = (0.4)(0.95)(255)$

$Q = 97$ cfs



DESIGN LOW HEAD 30,000 gpm PUMP WITH A 210 cfs GRAVITY OUTLET AND FLAP GATE.

ADOT BIDS FOR SIMILAR PUMP STATIONS, INCLUDING PUMP HOUSE, GAS DRIVEN PUMPS AND APPURTENANCES, SUMP PUMPS AND APPURTENANCES AND ELECTRICAL SYSTEMS HAVE A UNIT COST OF $6.90/gpm FOR A 40,000 gpm STATION (5-29-79). ASSUME A 20% INCREASE IN COST SINCE THEN.

USE $8.30/gpm

$$(30{,}000\,gpm)(\$8.30/gpm) = \$249{,}000$$

OUTLET (APPROX 50' OF 120" PIPE), GATE CONCRETE INLET AND OUTLET, HEADWALL, AND RIPRAP. SAY $20,000

TOTAL COST = $249,000
$20,000
$269,000

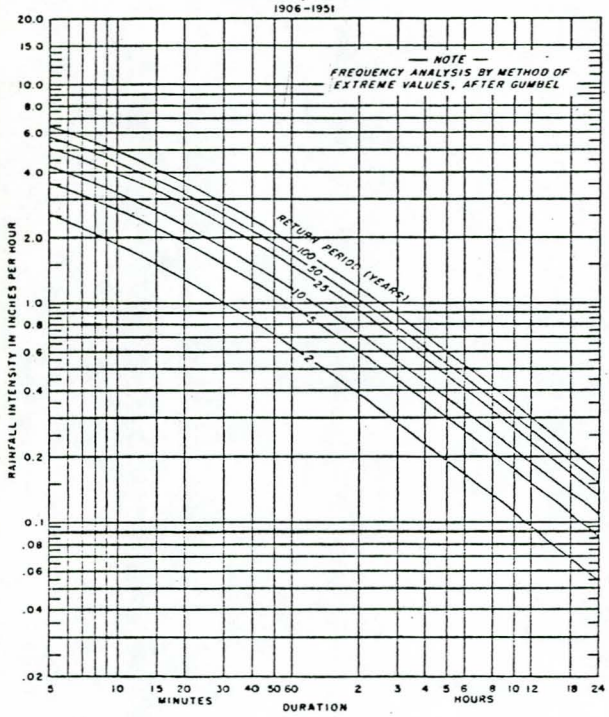
ASSUME COLLECTION IS BY EXISTING DITCHES AND BY A EARTH CHANNEL CONSTRUCTED ADJACENT TO THE PROPOSED LEVEE. THE COST OF THE DITCH IS INCLUDED IN THE COST OF EXCAVATION FOR THE LEVEE MATERIAL.

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE Made in U.S.A.

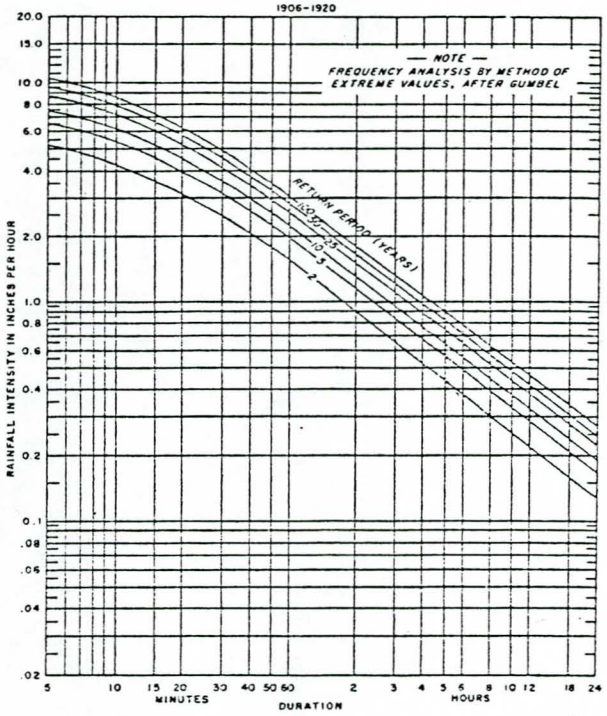
5/6
9/10

RAINFALL INTENSITY-DURATION-FREQUENCY CURVES

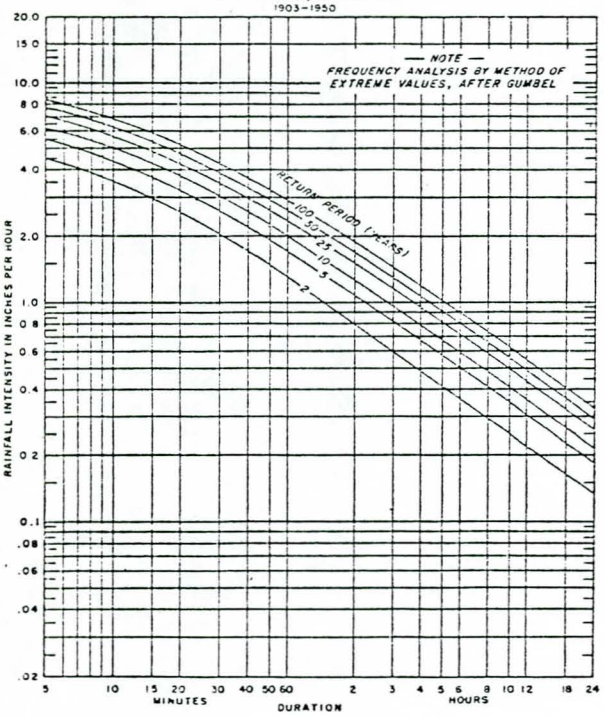
PHOENIX, ARIZONA
1906-1951



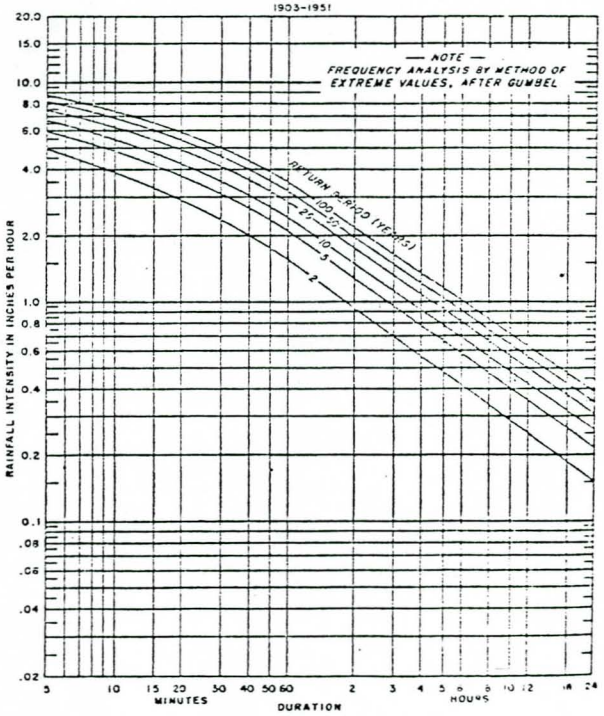
BENTONVILLE, ARKANSAS
1906-1920



FORT SMITH, ARKANSAS
1903-1950



LITTLE ROCK, ARKANSAS
1903-1951



ASPHALT CONCRETE PAVEMENT:

LENGTH OF LEVEE = 4330 FT

AREA = (4330')(18') = 34640 FT²

11. LAND ACQUISITION

ASSUME ACQUISITION OF 10 FT OF LAND ON EACH SIDE OF THE LEVEE.

FROM PREVIOUS PAGE WIDTH OF SITE CLEARING = 88.5 FT

WIDTH OF LAND ACQUISITION = 88.5 FT + 20 FT
= 108.5 FT

AREA OF LAND ACQUISITION =
(108.5')(4000') = 434,000 FT²
= 10 ACRES

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

BENEFIT CALCULATIONS

BENEFITS ARE RELATED TO FLOOD DAMAGES AVOIDED BY LEVEE, ASSUMING TUTHILL BRIDGE AND APPROACH ROAD ARE BUILT.

AREA REMOVED FROM FLOODING BY LEVEE = AREA PONDED WITHOUT LEVEE.

DISCHARGE (CFS):	50,000	100,000	150,000	HIGHER DISCHARGES WILL NOT BE CONTAINED
PONDED AREA (AC):	170	340	470	
APPROX DEPTHS (ft):	1	3	4	
BENEFITS:				
RE-GRADING * @ $150/acre:	25,500	51,000	70,500	
CROP LOSS ** @ $100/AC (50,000) $140/AC (100-150,000):	17,000	47,600	65,800	
DAMAGES TO STRUCTURES *** 50,000 - $16/ac 100,000 - $68/ac 150,000 - $85/ac:	2,700	23,100	40,000	
TOTAL DIRECT BENEFITS:	45,200	121,700	176,300	

ANNUAL BENEFITS

	30,000 - 50,000	50-100	100-150	150 UP
AVG. BENEFITS:	22,600	83,500	149,000	NO BENEFITS
FREQUENCY:	.03	.087	.049	
INCREMENTAL DAMAGES:	680	7260	7300	TOTAL DIRECT BENEFITS: $15,200/yr.

TOTAL BENEFIT = DIRECT BENEFITS + INDIRECT BENEFITS = 1.15(15,200) = $17,500/yr.

* GRADING BASED ON ESTIMATES BY GREAT WESTERN RESEARCH, BUCKEYE IRRIGATION COMPANY AND CAWCS. VALUES ARE HIGHER FOR AREAS SUBJECT TO GULLYING. THE TUTHILL ROAD APPROACH WILL PREVENT GULLYING.

** CROP LOSSES ARE BASED ON CAWCS ANALYSIS. LOWER VALUE FOR 50,000 cfs IS RELATED TO LOW DEPTH AND DURATION OF FLOODING.

*** STRUCTURES INCLUDE HOMES, DITCHES, ROADS, WELLS, ETC. VALUES FROM CAWCS, BASED ON DEPTH.

SECTION 3. S.R. 85 AREA

Cost Calculations

Benefit Calculations

COST CALCULATIONS

TABLE IX-1

SR-85 AREA
CHANNEL EXCAVATION
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY		PREPARED BY	
S.R. 85 CHANNEL CLEARING AND EXCAVATION		CHECKED BY		CHECKED BY	
		DATE		DATE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FIRST COST				
1	Diversion and Control of Water		JOB	L.S.	5,600
2	Clear Site and Remove Obstructions	5	ACRE	300	1,500
3	Excavation				
	A. For Channel	31,900	CY	1.50	48,000
	B. For Levee Fill		CY	1.50	
	C. Toe		CY	2.50	
4	Compacted Fill				
	A. Levees		CY	1.00	
	B. Toe		CY	1.30	
5	Vegetation Erosion Protection		JOB	L.S.	
6	Filter Material		CY	18.00	
7	Rock Rip-Rap		CY	18.00	
8	Flap Gates		EA	2000	
9	Interior Drainage				
	A. Collection		JOB	L.S.	
	B. Pump Station		JOB	L.S.	
10	Road Work				
	A. Excavation and Fill		CY	2.50	
	B. Remove Pavement		SF	0.60	
	C. Aggregate Base		CY	18.00	
	D. Asphalt/Concrete Pavement		SF	1.00	
	Total Construction Costs				55,100
	Contingencies, 15%				8,300
	Engineering and Design, 10%				--
	Supervision and Administration, 10%				--
11	Land Acquisition		ACRE	8000	--
	TOTAL FIRST COST				63,400

DIVERSION AND CONTROL OF WATER WILL BE NECESSARY TO FACILITATE EXCAVATION OF THE NORTH BANK AREA. BECAUSE FLOW IN THE GILA WILL PROBABLY BE LOW WHEN THE EXCAVATION TAKES PLACE, IT IS SAFE TO ASSUME THAT THE LOW FLOW CAN BE CONTAINED IN THE EXISTING LOW FLOW CHANNEL WITH A SMALL DIVERSION TYPE LEVEE OVER THE LENGTH OF THE EXCAVATION. A HEIGHT AND WIDTH OF 10 FT WOULD BE A CONSERVATIVE ESTIMATE OF THE SIZE OF SUCH A LEVEE. THE LENGTH OF THE LEVEE WOULD BE AT MOST 1500 FT.

VOLUME =

$$(10')(10')(1500') = 150{,}000\ FT^3$$

$$= 5560\ YD^3$$

$$COST = (5560\ YD^3)(\$1.00/YD^3\ \text{COST})$$

$$= \$5600$$

2. CLEAR SITE AND REMOVE OBSTRUCTIONS

FROM MEASURING AREA TO BE EXCAVATED:

AREA = 4.6 ACRES

RECOMMENDED EXCAVATION VOLUMES AT THE PROPOSED SR 85 EXTENSION.

EXCAVATION OF THE EXISTING SOUTH BANK IN THE VICINITY OF SR 85 IS RECOMMENDED TO INCREASE FLOW CAPACITY THROUGH THE EXISTING BRIDGE AND PROPOSED EXTENSION. EXCAVATION QUANTITIES WERE ESTIMATED FOR THE AREA UPSTREAM AND DOWNSTREAM OF THE PROPOSED EXTENSION. DOWNSTREAM EXCAVATION VOLUMES WERE CALCULATED USING CROSS-SECTION DATA PROVIDED BY ADOT. UPSTREAM EXCAVATION QUANTITIES WERE ESTIMATED USING A 400FT = 1IN TOPOGRAPHICAL MAP OF THE GILA RIVER IN CONJUNCTION WITH STEREO-GRAPHIC PHOTOGRAPHS OF THE S.R. 85 VICINITY, TAKEN 3/90. SEE THE DRAWING LABELED, S.R. 85 VICINITY RECOMMENDED PLAN, FOR THE LOCATION OF THE RECOMMENDED EXCAVATION.

EXCAVATION DOWNSTREAM OF SR 85 :

EXCAVATION QUANTITIES WERE CALCULATED USING CROSS-SECTIONS PROVIDED BY ADOT AND REVISED BY SWJ. THE ADOT CROSS-SECTIONS WERE EXPANDED TO THE SOUTH TO INCLUDE ALL OF THE AREA SHOWN AS RECOMMENDED EXCAVATION ON THE SR 85 VICINITY RECOMMENDED PLAN. THE TABLE BELOW SUMMARIZES EXCAVATION QUANTITIES.

EXCAVATION DOWNSTREAM OF S.R. 85

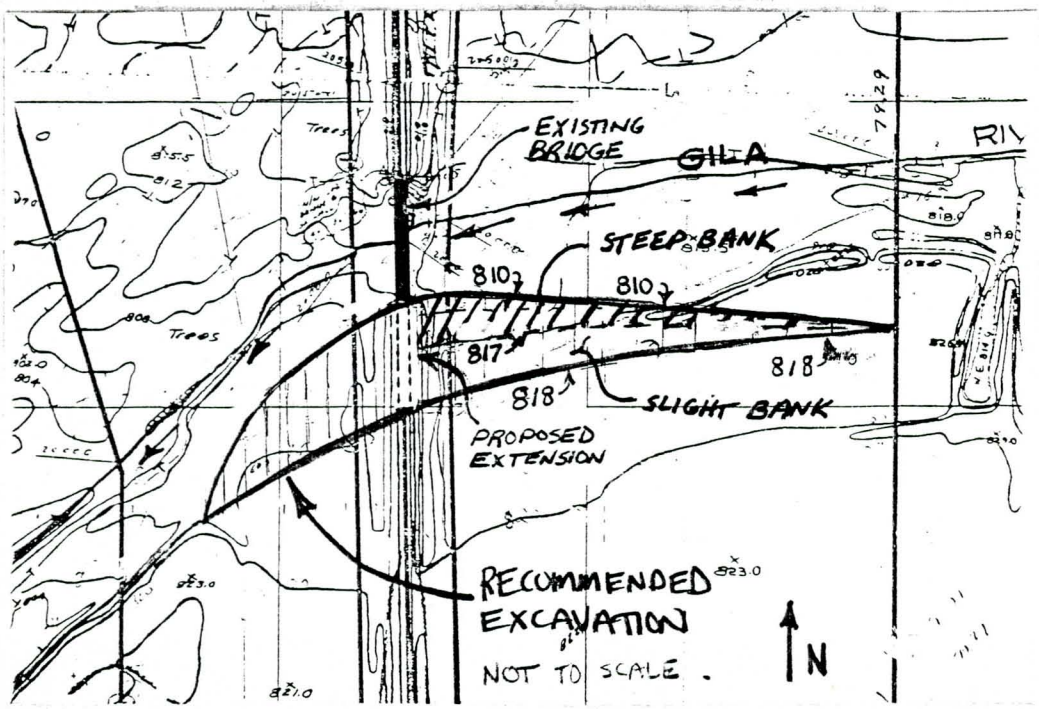
DISTANCE FROM ℄ OF BRIDGE (FT)	DISTANCE BETWEEN CROSS-SECTIONS (FT)	CROSS-SECTION AREA (FT^2)	EXCAVATION (FT^3)
0		5600	
	100		390,000
100		2165	
	100		210,000
200		2070	
	100		190,000
300		1570	
	100		150,000
400		1340	
	100		112,000
500		900	
	100		45,000
600		0	

$\Sigma = 1,097,000\ FT^3$

$= \underline{40,000\ YD^3}$

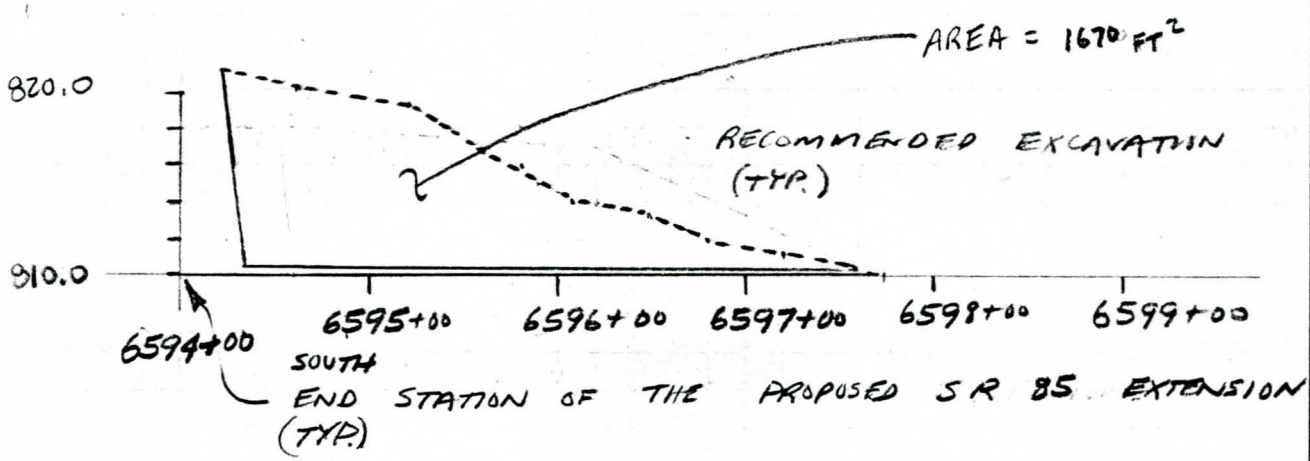
EXCAVATION QUANTITY UPSTREAM OF SR 85

EXCAVATION QUANTITIES WERE ESTIMATED USING A 1976 TOPOGRAPHICAL MAP AND STEREO PHOTOGRAPHS TAKEN AFTER THE FEBRUARY 1980 FLOOD. FROM THESE TWO SOURCES, THE APPROXIMATE GROUND ELEVATION OF THE AREA UPSTREAM OF SR 85 WAS DETERTERMINED. THE AREA OUTLINED IN THE FIGURE BELOW SHOWS THE APPRIXIMATE BOUNDRIES OF THE RECOMMENDED EXCAVATION AND ESTIMATED ELEVATIONS. ESTIMATED CROSS-SECTION CONFIGURATIONS AND A TABLE SUMMARIZING EXCAVATION QUANTITIES FOLLOW.

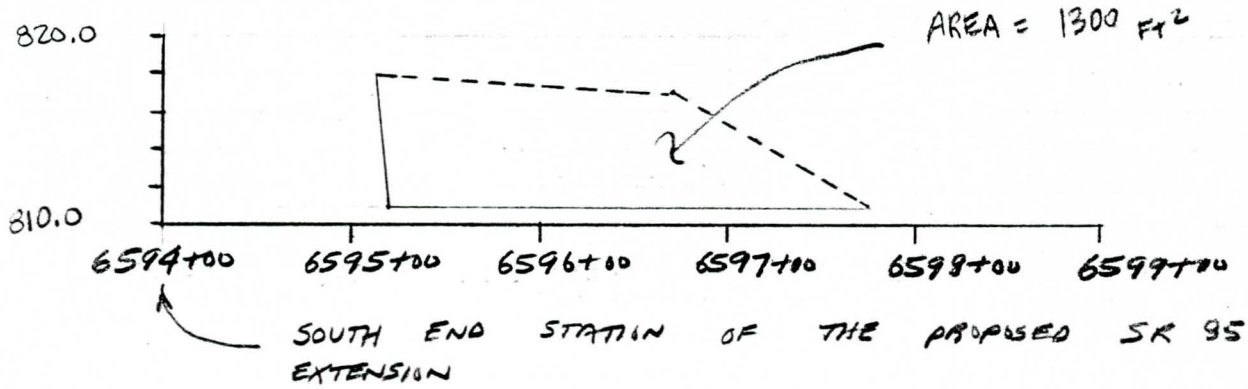


ESTIMATED CROSS-SECTION CONFIGURATIONS

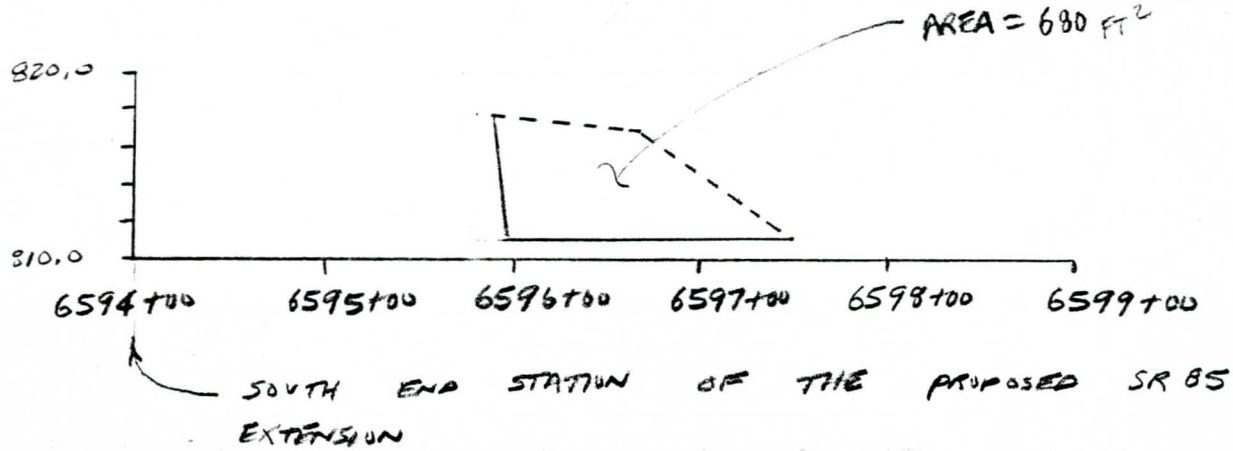
100 FT UPSTREAM OF BRIDGE:



400 FT UPSTREAM OF BRIDGE:

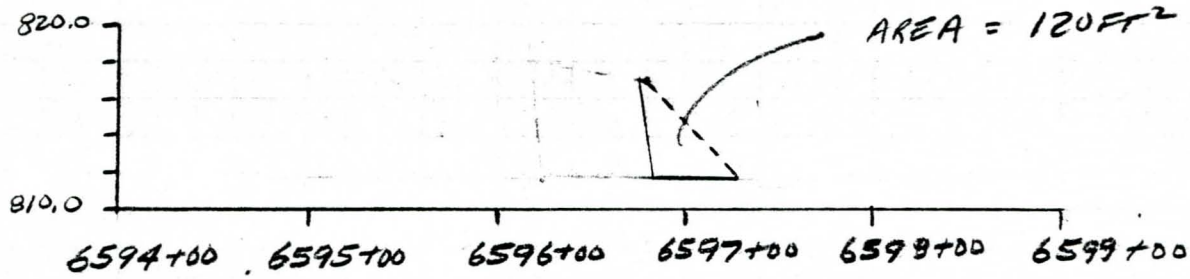


700 FT UPSTREAM OF BRIDGE:



ESTIMATED CROSS-SECTION CONFIGURATIONS (CONT.)

1000 FT UPSTREAM OF BRIDGE:



EXCAVATION UPSTREAM OF SR 85:

DISTANCE FROM ℄ OF BRIDGE (FT)	DISTANCE BETWEEN CROSS-SECTIONS (FT)	CROSS-SECTION AREA (FT²)	EXCAVATION (FT³)
~~0~~	~~100~~	~~5600~~	~~360,000~~
~~100~~ 125*	275 ~~300~~	1670	410,000 ~~450,000~~
400	300	1300	300,000
700	300	680	120,000
1000	500	120	30,000
1500		0	

CHANGES PER DICK PERAULT, STATE WILL EXCAVATE 125' UPSTREAM OF S.R 85 BRIDGE.

Σ = ~~1,260,000~~ 860,000 FT³

= ~~47,000~~ YD³

31,900 YD³

TOTAL RECOMMENDED EXCAVATION AT SR 85:

= 40,000 YD³ + ~~47,000~~ 31,900 YD³ = ~~87,000~~ 71,900 YD³

BENEFIT CALCULATIONS

BENEFIT OF INCREASING CAPACITY OF SR. 85 BRIDGE ACROSS GILA RIVER.

ASSUME:

1. Capacity of new bridge with no clearing or excavation is 32,500 cfs
2. Capacity with channel clearing is 48,000 cfs
3. Capacity with channel clearing and excavation is 70,000 cfs.
4. Benefits are limited to floods which peak at between 32,500 and 70,000 cfs. Smaller floods will not close bridge and larger floods will close the bridge regardless of clearing and excavation.
5. Benefits related to land and structures are small and were not included.
6. Damage to the bridge for floods of 32,500 to 70,000 cfs was assumed to be minor and was ignored.
7. If the bridge is closed, it remains closed for 17 days; 3 days are allowed for recession of floodwaters and 14 days for bridge repair or dip crossing construction. These values apply to floods less than 70,000 cfs and are based on CAWCS assumptions.
8. If bridge is closed, traffic must take old U.S. 80 to the west via Arlington, cross the Gila near Gillespie Dam and rejoin SR 85 at the first cross-road. The alternate route is 27 miles and the direct route is 12 miles, for a penalty of 15 miles due to bridge closure.
9. The old U.S. 80 bridge near Gillespie Dam can withstand at least 70,000 cfs and remain open. The bridge has recently withstood flows of 100,000 to 180,000 cfs with no problems. (Phil Epstein, Maricopa Co. Highway Dept.)

10. An average of 7000 vehicles per day crossing the bridge was assumed. This is an average of the 1980 and 2000 estimates by MAG, reduced by 7% to account for reduced traffic during floods. Values from Arnold Burnham of MAG.

11. An average of 1.4 passengers per car was used. This is an increase from 1.3 that applies during normal (non-flood) conditions. Data based on MAG studies.

12. All vehicles are assumed to take old U.S 80. Local traffic that could use Tuthill Bridge is not known, but assumed to be a small portion of SR 85 traffic.

13. The average speed of vehicles on SR 85 and old U.S. 80 is assumed to be 55 mph in both cases. Although SR 85 is a better road, there is only a short stretch of old U.S. 80 that would require reduced speeds. (Phil Epstein)

14. Costs associated with the extra mileage and time are 11.25 cents per vehicle mile and $5.89 per passenger hour. (CAWCS)

15. The annual probability of a flood with a peak flow between 32,500 and 70,000 cfs is 0.09, based on Corps of Engineers 1980 hydrology. The events are roughly 5 year and 8 year events.

16. The probability of a flood between 32,500 cfs and 48,000 cfs is 0.05.

17. The probability of a flood between 48,000 cfs and 70,000 cfs is 0.04.

SR-85 BENEFIT
CALCULATIONS:

VEHICLE MILES:

= 7000 vehicles/day × 15 extra miles × 17 days closure

= 1,785,000 extra vehicle miles for each bridge closure

VEHICLE MILE COST:

= 1,785,000 vehicle miles × 11.25 cents per mile

= $200,800.

PASSENGER HOURS:

$= 1{,}785{,}000 \text{ vehicle miles} \times 1.4 \frac{\text{passengers}}{\text{vehicle}} \times \frac{1 \text{ hour}}{55 \text{ miles}}$

= 45,440 extra passenger hours for each bridge closure

PASSENGER HOUR COST:

= 45,440 passenger hours × $5.89 per hour

= $267,600.

ANNUAL DIRECT BENEFIT:

.09 × ($200,800 + $267,600)

= <u>$42,200/year</u> for clearing and excavation

.05 × ($200,800 + $267,600)

= <u>$23,400/year</u> for clearing alone

.04 × ($200,800 + $267,600)

= <u>$18,700/year</u> for excavation, assuming clearing already done.

ASSUME TOTAL BENEFIT = DIRECT BENEFIT (NO INDIRECT BENEFIT)

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE Made in U.S.A.

SECTION 4. ARLINGTON AREA

Cost Calculations

- Comprehensive Levee
- Limited Levee

Benefit Calculations

- Comprehensive Levee
- Limited Levee

COST CALCULATIONS

The comprehensive levee cost is based on work previously done by CDM for the Corps of Engineers on the Central Arizona Water Control Study (CAWCS).

The following changes to the CAWCS cost estimate are appropriate:

1. Costs labelled "NON-FEDERAL" do not apply because of differences in criteria. For the interim measures, the floodplain would not be acquired and no major costs for river crossings or utility relocations would be incurred. This reduces the cost by about 75%
2. Unit costs vary somewhat from those used in the other interim measures. Also, the CAWCS costs are for approximately 1 year earlier. These factors would tend to increase the cost of the interim levees by some 15%. However, this increase would be offset by the lower design discharge of 235,000 cfs versus 300,000 cfs and the fact that the contingency factor used by the Corps was very high (20%). Cost reductions in these and other areas would easily equal 15%. Therefore, the CAWCS estimate was used with only the reductions noted above in 1. as a first approximation.
3. The cost for construction is $23,842,000.
4. O&M cost is assumed to be 1% of construction cost.
5. Annual cost factor for 25 yrs. @ 3% is 0.0574
   " " " for 100 yrs. @ 3% is 0.0316
6. Annual cost is $23,842,000 (.0574 + .01) = $1,607,000 /yr. (25 yr)
   " " " $23,842,000 (.0316 + .01) = $992,000 /yr. (100 yr)

QUANTITY TAKE-OFF				_____ ESTIMATE
PROJECT CENTRAL ARIZONA WATER CONTROL STUDY				JOB NO.
STRUCTURAL FLOOD CONTROL ALTERNATIVES		COMPUTED BY		PREPARED BY
ALTERNATIVE LEVEES		CHECKED BY		CHECKED BY
REACH B1 300,000 cfs		DATE		DATE

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	COST SUMMARY				
	FEDERAL FIRST COSTS:				
09,11	Channels and Levees				
	1. Diversion and control of water				25,000
	2. Clear site and remove obstructions				229,000
	3. Excavation				2,619,000
	4. Compacted fill				814,000
	5. Disposal of excess excavation				—
	6. Bank protection				6,899,000
	7. Rock stabilizers				—
	8. Concrete channels				—
	9. Service roads				101,000
	10. Interior drainage				5,870,000
	11. Esthetic treatment				—
	SUBTOTAL				16,557,000
	CONTINGENCIES, 20%				3,311,000
30	Engineering and design, 10%				1,987,000
31	Supervision and Administration, 10%				1,987,000
	TOTAL FEDERAL FIRST COST				23,842,000
	NON-FEDERAL FIRST COSTS:				
	Lands and damages				53,320,000
	Relocations				150,000
	Roads and bridges				—
	SUBTOTAL				53,470,000
	CONTINGENCIES, 20%				10,694,000
	Indirect charges				3,235,000
	TOTAL NON-FEDERAL FIRST COST				67,399,000
	TOTAL FLOOD CONTROL COST				91,241,000

SPD FORM 31 AUG 60 337

QUANTITY TAKE-OFF

_____ ESTIMATE

PROJECT: CENTRAL ARIZONA WATER CONTROL STUDY

JOB NO.

STRUCTURAL FLOOD CONTROL ALTERNATIVES

COMPUTED BY

PREPARED BY

ALTERNATIVE: LEVEES

CHECKED BY

CHECKED BY

REACH: B1 300,000 cfs

DATE

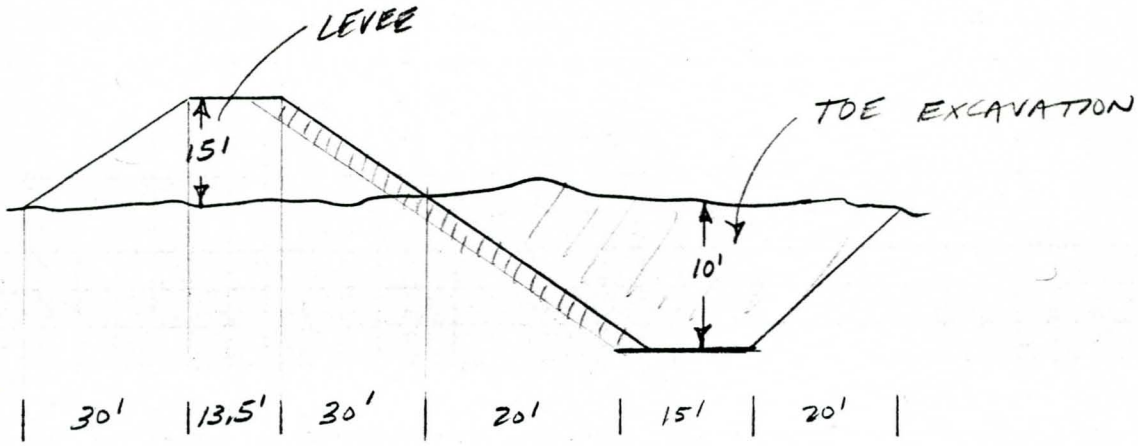
DATE

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FEDERAL FIRST COSTS:				
09,11	Channels and Levees				
1.	Diversion and control of water	1	Job	L.S.	25,000
2.	Clear site and remove obstructions	762	Acre	300.00	229,000
3.	Excavation				
	1. Channel	537,100	CY	1.50	806,000
	2. Toe	725,000	CY	2.50	1,813,000
4.	Compacted fill				
	1. Channel	—	CY	0.40	—
	2. Toe	725,000	CY	0.80	580,000
	3. Levees	467,000	CY	0.50	234,000
5.	Disposal of excess excavation	—	CY		—
6.	Bank protection				
	1. Soil cement	189,000	CY	36.50	6,899,000
7.	Rock stabilizers				
	1. Grouted stone	—	CY	100.00	—
	2. Filter material	—	CY	16.00	—
8.	Concrete channels				
	1. Concrete, invert	—	CY	54.00	—
	2. Concrete, side slopes	—	CY	104.00	—
	3. Portland cement	—	CWT	6.00	—
	4. Reinforcing steel	—	LB	0.40	—
	5. Subdrain system	—	LF	27.00	—
9.	Service roads				
	1. A.C. paving	3,370	Ton	30.00	101,000
10.	Interior drainage	1	Job	L.S.	5,870,000
11.	Esthetic treatment	—	Job	L.S.	—

QUANTITY TAKE-OFF					_____ ESTIMATE
PROJECT CENTRAL ARIZONA WATER CONTROL STUDY					JOB NO.
STRUCTURAL FLOOD CONTROL ALTERNATIVES		COMPUTED BY			PREPARED BY
ALTERNATIVE LEVEES		CHECKED BY			CHECKED BY
REACH B1 300,000 cfs		DATE			DATE
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	NON-FEDERAL FIRST COSTS:				
	Lands and damages	7,617	Acres	7,000	53,320,000
	Relocations	1	Job	L.S.	150,000
	Roads and Bridges	—	Job	L.S.	—

TABLE X-1
ARLINGTON AREA LIMITED LEVEE
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
ARLINGTON AREA LIMITED LEVEE		CHECKED BY PRG		CHECKED BY	
		DATE AUG. 1981		DATE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FIRST COST				
1	Diversion and Control of Water		JOB	L.S.	--
2	Clear Site and Remove Obstructions	32	ACRE	300	9,600
3	Excavation				
	A. For Channel	--	CY	1.50	--
	B. For Levee Fill	251,700	CY	1.50	377,600
	C. Toe	338,000	CY	2.50	845,000
4	Compacted Fill				
	A. Levees	218,900	CY	1.00	218,900
	B. Toe	338,000	CY	1.30	439,400
5	Vegetation Erosion Protection	8	JOB	L.S.	1,600
6	Filter Material	13,900	CY	18.00	250,200
7	Rock Rip-Rap	55,600	CY	18.00	1,000,800
8	Flap Gates	5	EA	2000	10,000
9	Interior Drainage				
	A. Collection		JOB	L.S.	15,000
	B. Pump Station	--	JOB	L.S.	--
10	Road Work				
	A. Excavation and Fill	--	CY	2.50	--
	B. Remove Pavement	--	SF	0.60	--
	C. Aggregate Base	--	CY	18.00	--
	D. Asphalt/Concrete Pavement	--	SF	1.00	--
	Total Construction Costs				3,168,000
	Contingencies, 15%				475,200
	Engineering and Design, 10%				364,300
	Supervision and Administration, 10%				364,300
11	Land Acquisition	36	ACRE	8000	288,000
	TOTAL FIRST COST				4,660,000



WIDTH OF SITE CLEARING =

$30' + 13.5' + 30' + 20' + 15' + 20'$

$= \underline{\underline{128.5' \text{ FT}}}$

LENGTH OF LEVEE = 10700 FT

AREA OF CLEARING $= (128.5')(10700')$

$= \underline{\underline{1374950 \text{ FT}^2}}$

$= \underline{\underline{31.6 \text{ ACRES}}}$

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
NATIONAL Made in U.S.A.

LEVEE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: LEVEE FILL, ARLINGTON AREA (UPSTREAM OF GILLESPIE DAM)
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 8.0
COMPACTION FACTOR: 1.15
RUN DATE: 11-MAY-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
1000.00		0.0	0.0		
	30.0			233.2	233.2
1000.30		15.0	570.0		
	720.0			15200.0	15433.2
1007.50		15.0	570.0		
	1250.0			26388.9	41822.1
1020.00		15.0	570.0		
	1650.0			34833.3	76655.4
1036.50		15.0	570.0		
	1150.0			33987.9	110643.3
1048.00		21.0	1050.0		
	1360.0			40194.3	150837.6
1061.60		15.0	570.0		
	1240.0			24646.9	175484.5
1074.00		14.0	504.0		
	1400.0			24508.6	199993.1
1088.00		13.0	442.0		
	660.0			10804.4	210797.5
1094.60		13.0	442.0		
	240.0			2542.0	213339.5
1097.00		7.0	154.0		
	950.0			5418.5	218758.1
1106.50		7.0	154.0		
	50.0			112.3	218870.3
1107.00		0.0	0.0		
	========				==========

LENGTH = 10700.0 REQUIRED EXCAVATION = 251700.9

3.B EXCAVATION FOR LEVEE FILL

4.A COMPACTED FILL FOR LEVEE

TOE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: ARLINGTON AREA, UPSTREAM OF GILLESPIE DAM
SIDE SLOPES: 2.0:1, 2.0:1
BOT WIDTH 15.0
COMPACTION FACTOR: 1.00
RUN DATE: 01-MAY-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
1000.00		17.0	833.0		
	750.0			23138.9	23138.9
1007.50		17.0	833.0		
	1250.0			29729.2	52868.1
1020.00		12.0	468.0		
	1650.0			28600.0	81468.1
1036.50		12.0	468.0		
	1150.0			25753.9	107221.9
1048.00		16.0	752.0		
	1360.0			41992.0	149213.9
1061.60		18.0	918.0		
	1240.0			42160.0	191373.9
1074.00		18.0	918.0		
	1400.0			47600.0	238973.9
1088.00		18.0	918.0		
	660.0			23519.6	262493.5
1094.60		19.0	1007.0		
	240.0			12072.3	274565.8
1097.00		26.0	1742.0		
	950.0			63409.5	337975.3
1106.50		27.0	1863.0		
	========				==========

LENGTH = 10650.0 REQUIRED EXCAVATION = 337975.3

3.C TOE EXCAVATION

4.B. ASSUME TOE FILL EQUALS TOE EXCAVATION. EXTRA MATERIAL IS NOT REQUIRED FOR TOE FILL, EVEN THOUGH THE FILL WILL BE COMPACTED. IT IS ASSUMED THAT ANY LOSS IN VOLUME THROUGH COMPACTION WILL BE BALANCED BY ADDITIONAL RIPRAP AND FILTER VOLUMES.

NATIONAL 42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
Made in U.S.A.

ARLINGTON AREA

STATION	REACH LENGTH (FT)	RIP-RAP VERT. HEIGHT (FT)	RIP-RAP AVE. VERT. HEIGHT (FT)	RIP-RAP AREA (2.24)(H)(L) (FT^2)	RIP-RAP VOLUME AREA × 2' (FT^3)	RIP-RAP VOLUME (YD^3)	FILTER MATERIAL VOLUME (YD^3)
1000+00	30	22	27	1810	3620	134	34
1000+30	750	32	32	57360	114700	4250	1060
1007+50	1250	32	29.5	82600	165200	6120	1530
1020+00	1650	27	27.5	101640	203280	7530	1880
1036+50	1150	28	29.5	75990	151980	5630	1410
1048+00	1360	31	32.0	97480	194960	7220	1800
1061+60	1240	33	33.0	91660	183320	6790	1700
1074+00	1400	33	32.0	100350	200700	7430	1860
1088+00	1600	31	33.0	118270	236540	8760	2190
1104+1	100	35	34.5	7730	15460	570	143
1105+00	200	34	34.5	15460	30920	1140	290
1107+00		35					

Σ = 55580 → 13900

7. ROCK RIPRAP → 6. FILTER MATERIAL

6. FILTER MATERIAL
7. ROCK RIPRAP

MARICOPA CO.

SWT
CDM

5/7

AVERAGE HEIGHT OF LEVEE = 15 FT

LENGTH OF LEVEE = 10700 FT

AREA = (10700')(15')(2.24) = 360,500 FT^2

= 8.3 ACRES

(9 ACRES) ($200/ACRE) = $1600.00

8. FLAP GATES

ASSUME FLAP GATES ARE NEEDED AT THE WASTE DITCH FROM ARLINGTON CANAL (NEAR STA 1100+00) AND AT APPROXIMATELY 1/4 MILE INTERVALS UNTIL STA 1050+00. AFTER STA 1050+00, A NATURAL LOW FLOW CHANNEL, LOCATED NORTH OF THE PROPOSED LEVEE, WILL TRANSMIT RUN-OFF AND WASTE AGRICULTURAL FLOWS.

STA 11.00+00 - 1050+00 = 5000 FT

5000 FT / 1320 FT ≈ 4 FLAP GATES
↑ 1/4 MI.

1 FLAP GATE AT ARLINGTON WASTE CANAL

4 FLAP GATES, ONE APPROX. EVERY 1/4 MI.

TOTAL = 5 FLAP GATES

ASSUME 5 INLETS FOR 5 FLAP-GATES. FROM STA 1050+00 TO STA 1100+00, ASSUME DRAINAGE WILL BE HANDLED THROUGH EXISTING DRAINAGE SYSTEMS AND BY A SMALL EARTH DITCH TO BE CONSTRUCTED ADJACENT TO THE PROPOSED LEVEE.

COST = (5) ($3000 / INLET)

= $15000

11. LAND ACQUISITION

ASSUME ACQUISITION OF 10' OF LAND ON EACH SIDE OF THE LEVEE.

FROM ITEM 2, CLEAR SITE, THE AVERAGE WIDTH OF CLEARING FOR THE LEVEE = 128.5 FT.

THE LENGTH OF THE LEVEE = 10700 FT

LAND ACQUISITION = (128.5' + 20') (10700')

= 1,588,950 FT^2

= 36.4 ACRES

BENEFIT CALCULATIONS

COMPREHENSIVE LEVEE

COMPUTE BENEFITS USING GREAT WESTERN RESEARCH DATA BY SQ. MILE SECTIONS. COMPREHENSIVE LEVEE WILL ELIMINATE DAMAGES FROM THE FOLLOWING SECTIONS (SEE MAP FOLLOWING):

1, 2, 7, 8, 9, 14, 15, 16

TABULATE UNITS IN EA. CATEGORY AND APPLY UNIT BENEFITS, FOR FLOWS OF 50,000, 200,000 AND 320,000 cfs.

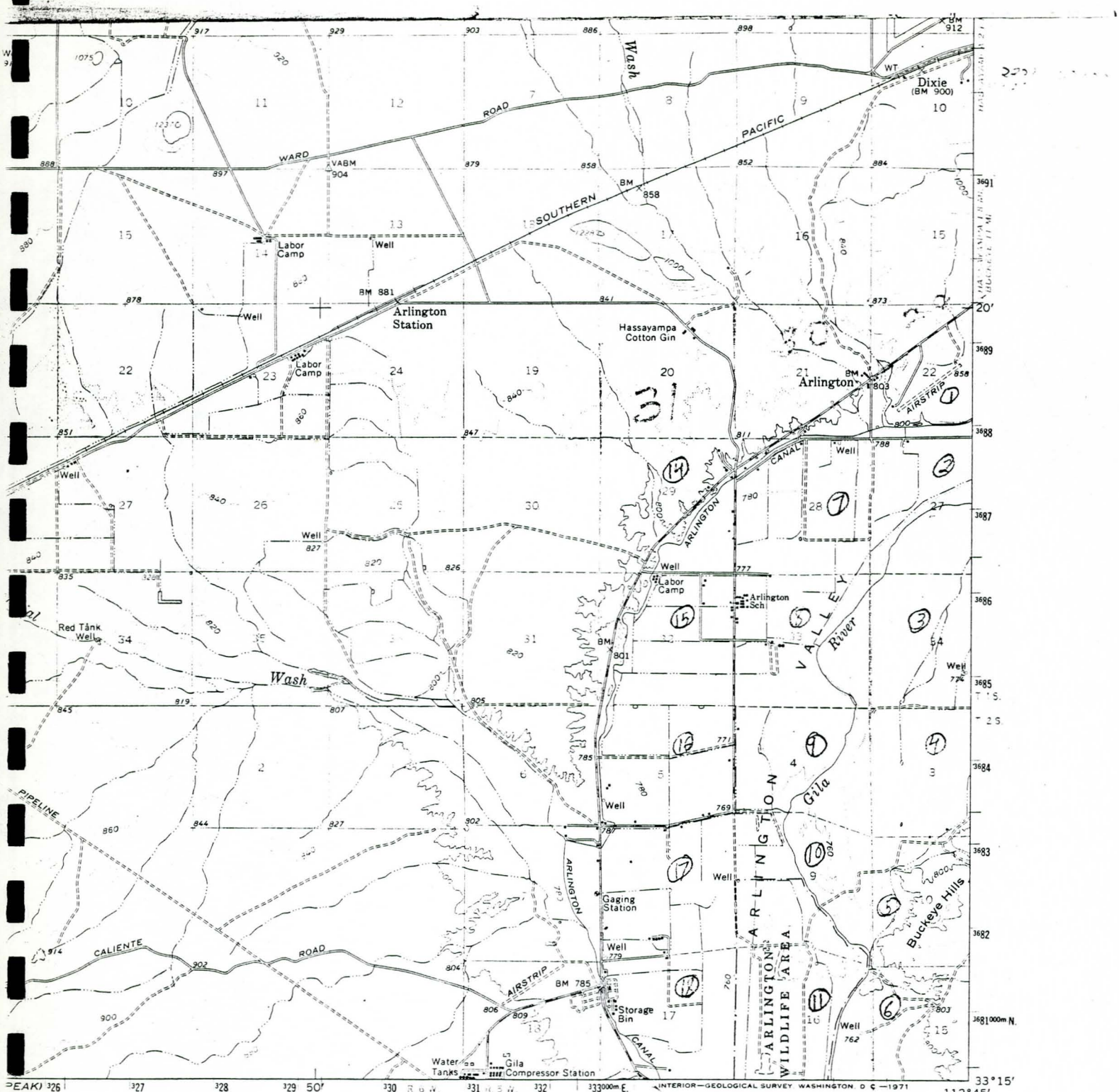
	50,000 CFS			200,000 CFS			320,000 CFS		
CATEGORY	DAMAGE/UNIT	UNITS	DAMAGE	DAM/UNIT	UNITS	DAMAGE	DAM/UNIT	UNITS	DAMAGE
1. F. HOMES	—	1	—	12,000	2	24,000	20,000	2	40,000
2. B. HOMES	—	—	—	12,000	5	60,000	20,000	5	100,000
3. M. HOMES	4,000	1	4000	4,000	2	8,000	4,000	3	12,000
4. FARMSTEADS	23,000	—	—	23,000	—	23,000	23,000	1	23,000
5. CULT. LAND	250	675	169,000	250	1830	457,500	250	2075	518,800
6. PASTURE LAND	100	5	500	100	11	1,100	100	11	1,100
7. DAIRIES	50,000	1	50,000	50,000	1	50,000	50,000	1	50,000
8. DITCHES	24,000	8	192,000	24,000	20	480,000	24,000	24	576,000
9. CANALS	5,000	—	—	5,000	—	—	5,000	—	—
10. COM. BLDGS	10,000	—	—	10,000	—	—	10,000	—	—
11. PUB. BLDGS.	76,000	—	—	76,000	1	76,000	76,000	1	76,000
12. PAVED RDS.	18,000	1	18,000	18,000	3	54,000	18,000	3½	63,000
13. DIRT RDS.	6,000	9	54,000	6,000	23	138,000	6,000	24	144,000
14. CROPS	140	675	94,500	140	1830	256,200	140	2075	290,500
TOTAL			582,000			1,627,800			1,894,400

ANNUAL BENEFITS

	40-50,000	50-200,000	200-320,000	320,000 UP
AVG. DAMAGES	291,000	1,105,000	1,761,000	1,761,000
FREQ	.025	.15	.012	.0027
INCREMENTAL DAMAGES	7,300	165,800	21,100	4,700

TOTAL DIRECT BENEFITS: $198,900

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(198,900) = $228,700



INTERIOR—GEOLOGICAL SURVEY WASHINGTON, D. C.—1971

2 3 4 MILES

12000 15000 18000 21000 FEET

3 4 5 KILOMETERS

40 FEET
FOOT CONTOURS
LEVEL

ROAD CLASSIFICATION

Medium-duty Light-duty

Unimproved dirt

QUADRANGLE LOCATION

MAP ACCURACY STANDARDS
LORADO 80225 OR WASHINGTON, D. C. 20242
SYMBOLS IS AVAILABLE ON REQUEST

ARLINGTON, ARIZ.

N3315—W11245/15

1962

AMS 3450 IV—SERIES V798

LIMITED LEVEE

PRIMARY BENEFIT WILL BE TO PREVENT FLOWS FROM BREAKING OUT AT THE BEND AND DIRECTING FLOW INTO CLEARED CHANNEL. THIS WILL REDUCE VELOCITIES IN THE OVERBANK. FURTHERMORE, SOME OF THE LAND BEHIND THE LEVEE WILL BE TOTALLY PROTECTED. MOST OF THE AREA WILL STILL BE SUBJECT TO PONDING.

ROUGH BENEFIT ESTIMATE IS BASED ON REDUCTION OF DAMAGES FROM THOSE COMPUTED FOR COMPREHENSIVE LEVEE. REDUCTIONS ARE:

* REDUCE DAMAGES TO HOMES FROM:		TO:	BENEFIT
200,000	12,000	6,000	6,000
320,000	29,000	8,000	12,000

* REDUCE REGRADING FROM $250/acre TO $150/ac — $100/ac BENEFIT

* REDUCE ALL OTHER DAMAGES 50% EXCEPT CROP LOSSES

* NO CHANGE IN CROP LOSSES

* FOR AREA TOTALLY PROTECTED (NO PONDING), REDUCE DAMAGES TO 0.
AREA TOTALLY PROTECTED BEHIND LEVEE:

50,000 – 150 acres CROPLAND – NO HOMES
200,000 } – small area – assume none
320,000 }

	50,000 CFS			200,000			320,000 cfs		
CATEGORY	BENEFIT/UNIT	UNITS	BENEFIT	BENEFIT/UNIT	UNITS	BENEFIT	BENEFIT/UNIT	UNITS	BENEFIT
1. F. HOMES	—	1	—	6000	2	12,000	12,000	2	24,000
2. B. HOMES	—	—	—	6000	5	30,000	12,000	5	60,000
3. M. HOMES	2000	1	2000	2000	2	4,000	2000	3	6,000
4. FARMSTEADS	12,000	—	—	12,000	—	—	12,000	1	12,000
5. CULT. LAND	100	675	67,500	100	1830	183,000	100	2075	207,500
6. PASTURE	50	5	250	50	11	550	50	11	550
7. DAIRIES	25,000	1	25,000	25,000	1	25,000	25,000	1	25,000
8. DITCHES	12,000	8	96,000	12,000	20	240,000	12,000	24	288,000
9. CANALS	2500	—	—	2500	—	—	2500	—	—
10. COM. BLDGS	5000	—	—	5000	—	—	5000	—	—
11. PUB. BLDGS	38,000	—	—	38,000	1	38,000	38,000	1	38,000
12. PAVED RDS	9000	1	9,000	9000	3	27,000	9000	3½	31,500
13. DIRT RDS	3000	9	27,000	3000	23	69,000	3000	24	72,000
ADJUSTMENT FOR TOTAL PROTECTION									
150 ac × [$150 (GRADING) + 140 (CROPS) + 130 (STRUCT)]			= 48,000						
TOTAL BENEFIT =			274,800			628,600			767,600

ANNUAL BENEFITS

	40,000-50,000	50-200,000	200-320,000	320,000 UP
AVG. BENEFIT	137,400	451,700	696,600	764,600
FREQ	.025	.15	.012	.0027
INCREMENTAL BENEFITS	3,500	67,800	8,400	2,100

TOTAL DIRECT BENEFITS: $81,800

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(81,800) = $94,100

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
NATIONAL