AUGUST 1981

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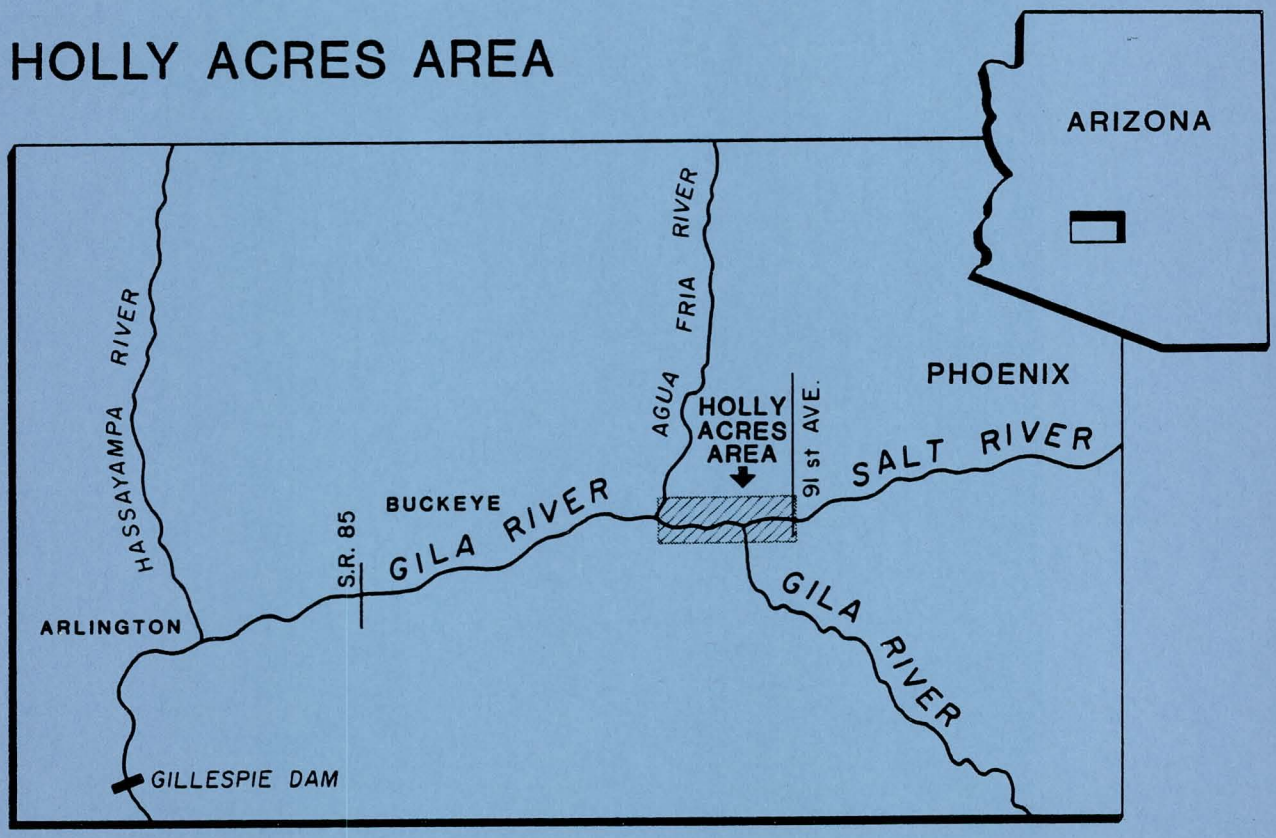
FINAL REPORT

SALT-GILA RIVER INTERIM FLOOD CONTROL WORKS

APPENDIX

HOLLY ACRES AREA



PREPARED FOR

Flood Control District of Maricopa County
Contract FCD 80-9

CDM Camp Dresser & McKee Inc

SALT-GILA INTERIM FLOOD CONTROL WORKS

HOLLY ACRES AREA

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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Section 1. Cost Calculations

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1. CHANNEL CLEARING

The channel clearing costs are based on unit costs developed by the Flood Control District (FCD) of Maricopa County, based largely on recent experience on the 91st to 123rd Ave. reach.

From 91st Ave. to 123rd Ave., approximately 180 out of 485 acres within the 1000 foot right-of-way was vegetated and needed to be cleared. This amounts to 37 percent. From 123rd Ave. to the Agua Fria, the vegetated area appears to be a similar proportion of the total area within the 1000 foot right-of-way (using FWS alignment). Therefore, say 40 percent of right-of-way needs clearing. Use $700/acre for clearing as per FCD.

FCD estimates only half of the area actually cleared will have to be maintained and that half of this area will be maintained each year. Therefore, 25% of the cleared area will be maintained each year. This amounts to 25% (40%) or 10 percent of the total right-of-way. Use $350/acre for maintenance as per FCD.

For Holly Acres Area, right-of-way is 6 miles long, 1000' wide = 727 acres

Initial clearing = 727(40%)($700) = $204,000

Maintenance = 727(10%)($350) = $25,400/year

Annual cost (25 yrs @ 3%) = .0574(204,000) + 25,400 = $37,100/yr.

2. CHANNEL EXCAVATION

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

For 1000' wide channel, cost to excavate and dispose of locally — no bank protection, land purchase, overhaul, etc.

For each 1' of depth and 1 mile, quantity = $\frac{1'(1000')(5280')}{27}$ CY

= 195,500 CY/FT/MILE

Unit cost of excavation $1.50/CY
Cost of dispose of $.25/CY
Cost/FT/MILE = 195,500 (1.75) = $342,000 /FT/MILE

With 1% O+M, annual cost for 25 years @ 3%:

(.0574 + .01)($342,000) = $23,000 /FT/MILE

This is approximately 4 times the cost of clearing and maintaining the same surface area free of phreatophytes ($6,200 /mile)

3. NORTH BANK LEVEE

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

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 project, the floodplain would not be acquired and no major costs for river crossings or utility relocation would be incurred. This reduces the cost by about 50%.
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 250,000 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 $43,857,000.
4. the O+M cost is assumed to be 1% of construction cost as documented in CAWCS.
5. Annual cost factor for 25 yrs. @ 3% is 0.0574 for 100 yrs @ 3%: 0316
6. Annual cost is $43,857,000 (.0574 + .01) = $2,956,000.
7. For 100 yr - $1,824,000/year say $3 million/year

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	B3 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				118,000
	3. Excavation				5,727,000
	4. Compacted fill				1,787,000
	5. Disposal of excess excavation				—
	6. Bank protection				10,457,000
	7. Rock stabilizers				—
	8. Concrete channels				—
	9. Service roads				162,000
	10. Interior drainage				12,180,000
	11. Esthetic treatment				—
	SUBTOTAL				30,456,000
	CONTINGENCIES, 20%				6,091,000
30	Engineering and design, 10%				3,655,000
31	Supervision and inspection, 10%				3,655,000
	TOTAL FEDERAL FIRST COST				43,857,000
	NON-FEDERAL FIRST COSTS:				
01	Lands and damages				27,420,000
02	Relocations				1,000,000
08	Roads and bridges				1,170,000
	SUBTOTAL				29,590,000
	CONTINGENCIES, 20%				5,918,000
30	Engineering and design, 10%				3,551,000
31	Supervision and inspection, 10%				3,551,000
	TOTAL NON-FEDERAL FIRST COST				42,610,000
	TOTAL FLOOD CONTROL COST				86,467,000

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: B3 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	392	Acre	300.00	118,000
3.	Excavation				
	1. Channel	1,017,800	CY	1.50	1,527,000
	2. Toe	1,680,000	CY	2.50	4,200,000
4.	Compacted fill				
	1. Channel	—	CY	0.40	—
	2. Toe	1,680,000	CY	0.80	1,344,000
	3. Levees	885,000	CY	0.50	443,000
5.	Disposal of excess excavation	—	CY		—
6.	Bank protection				
	1. Soil cement	286,500	CY	36.50	10,457,000
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	5,410	Ton	30.00	162,000
10.	Interior drainage	1	Job	L.S.	12,180,000
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 B3 300,000 cfs		DATE		DATE

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	NON-FEDERAL FIRST COSTS:				
01	Lands and damages	3,917	Acres	7,000	27,420,000
02	Relocations	1	Job	L.S.	1,000,000
08	Roads and Bridges	1	Job	L.S.	1,170,000

SPD FORM 31 AUG 60 337

4. SOUTHERN AVENUE LEVEE

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

Same as north bank levee, except the following items can be removed:

toe excavation:	$4,200,000
Toe fill:	$1,344,000
Bank protection:	$10,457,000
15% of interior drainage:	$1,827,000
	$17,828,000

this is (17,828,000/30,456,000) of north bank levee cost

60%

Therefore, use 40% of north bank levee costs:

60% ($43,857,000) ≈ $17,500,000 first cost

$175,000/yr. O+M cost

.0574 (17,500,000) + $175,000 = $1,180,000 annual cost

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

5. RING LEVEE

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

THE RING LEVEE COSTS ARE BASED ON THE RING LEVEE PLAN AND PROFILE (FIGURES 8 AND 9).

LISTED ON THE FOLLOWING PAGE IS A QUANITY TAKE-OFF SHEET WHICH SUMMARIZES THE FIRST COST OF ALL ITEMS.

CALCULATION SHEETS, FOR EACH ITEM, FOLLOW THE QUANTITY TAKE OFF SHEET.

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

TABLE VII-1

HOLLY ACRES RING 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	
HOLLY ACRES AREA		CHECKED BY PRG		CHECKED BY	
RING LEVEE AROUND HOLLY ACRES SUBDIVISION		DATE AUG 1981		DATE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FIRST COST				
1	Diversion and Control of Water	1	JOB	L.S.	1,400
2	Clear Site and Remove Obstructions	10	ACRE	300	3,000
3	Excavation				
	A. For Levee Fill	72,800	CY	1.50	109,200
	B. Toe	75,700	CY	2.50	189,300
4	Compacted Fill				
	A. Levees	63,300	CY	1.00	63,300
	B. Toe	75,700	CY	1.30	98,400
5	Vegetation Erosion Protection	3.8	ACRE	200	760
6	Filter Material	3,950	CY	18.00	71,100
7	Rock Rip-Rap	15,800	CY	18.00	284,400
8	Slide Gates	3	EA	2000	6,000
9	Interior Drainage				
	A. Collection	1	JOB	L.S.	11,000
	B. Pump Station	1	JOB	L.S.	100,000
10	Road Work				
	A. Excavation and Fill	3,540	CY	2.50	8,900
	B. Remove Pavement	93,400	SF	0.60	56,000
	C. Aggregate Base	1,355	CY	18.00	24,400
	D. Asphalt/Concrete Pavement	73,000	SF	1.00	73,000
	Total Construction Costs				1,100,000
	Contingencies, 15%				165,000
	Engineering and Design, 10%				126,500
	Supervision and Administration, 10%				126,500
11	Land Acquisition	6.6	ACRE	8000	52,800
	TOTAL FIRST COST				1,571,000

ASSUME THAT DIVERSION OF LOW FLOW IS NECESSARY AT A FLOW SPLIT UPSTREAM FROM HOLLY ACRES; FILL THE NORTHERN FORK OF THE LOW FLOW CHANNEL SO THAT FLOW IS DIVERTED TO THE SOUTHERN FORK.

ASSUME WIDTH OF LOW FLOW CHANNEL TO BE FILLED (TAKEN FROM PHOTO)

= 100 FT

ASSUME HEIGHT OF FILL = 10 FT

ASSUME WIDTH OF FILL = 25'

VOLUME OF FILL = (100FT)(10FT)(25FT)

= 25000 FT^3

25000 FT^3/27FT^3/YD = 930 YD^3

COST = (930 YD^3)($1.50/$YD^3$) = $1400

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

Clear area under and along levees and 10' on either side
avg width = 50 ft

LENGTH = 10,950' − 2350'

= TOTAL − LENGTH ALONG EL MIRAGE ROAD

= 8600 FT

AREA = (8600)(50 FT)$\left(\frac{\text{ACRE}}{43560\ \text{FT}^2}\right)$ = 9.9 ACRES

SAY 10 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.

A. FOR LEVEE FILL

EXCAVATION QUANTITIES FOR LEVEE AND ROADWAY FILL WERE CALCULATED USING A COMPUTER PROGRAM DEVELOPED BY CDM. THE OUTPUT FOLLOWS THIS SECTION.

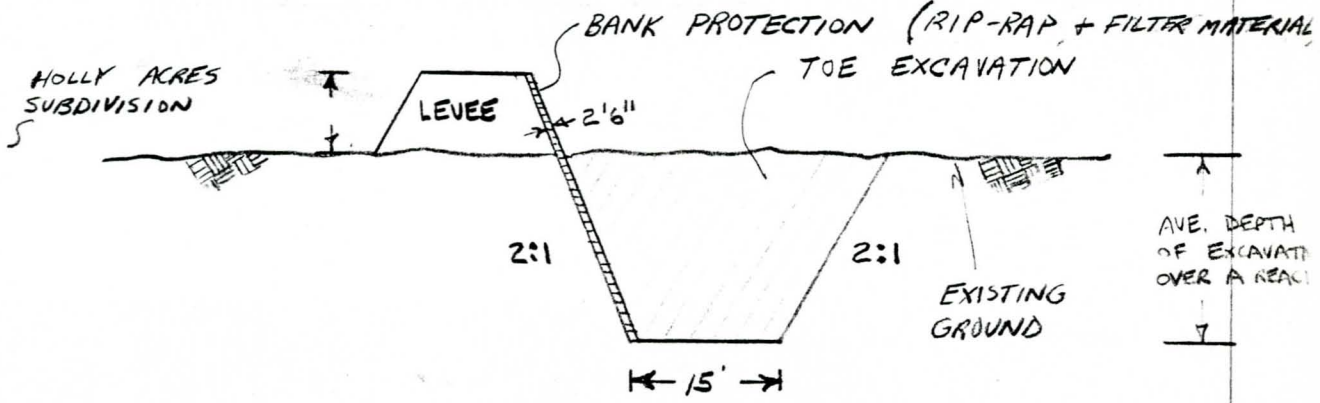
DESIGN ASSUMPTIONS REGARDING THE TOP WIDTH, HEIGHT, SIDE SLOPES, AND COMPACTION FACTOR ARE LISTED AT THE TOP OF THE COMPUTER OUTPUT.

REACH	EXCAVATION VOLUME YD^3
ALONG ST. JOHNS CANAL	8300
ADJACENT TO 121ST + ADJACENT TO THE GILA RIVER	12200
ALONG EL MIRAGE	40000
DRIVEWAY TIE-IN ALONG EL MIRAGE	11000
	1280

TOTAL EXCAVATION FOR LEVEE = 72,800 YD^3

B. TOE EXCAVATION

TOE EXCAVATION QUANTITIES WERE CALCULATED BY HAND ASSUMING THE FOLLOWING CONDITIONS.

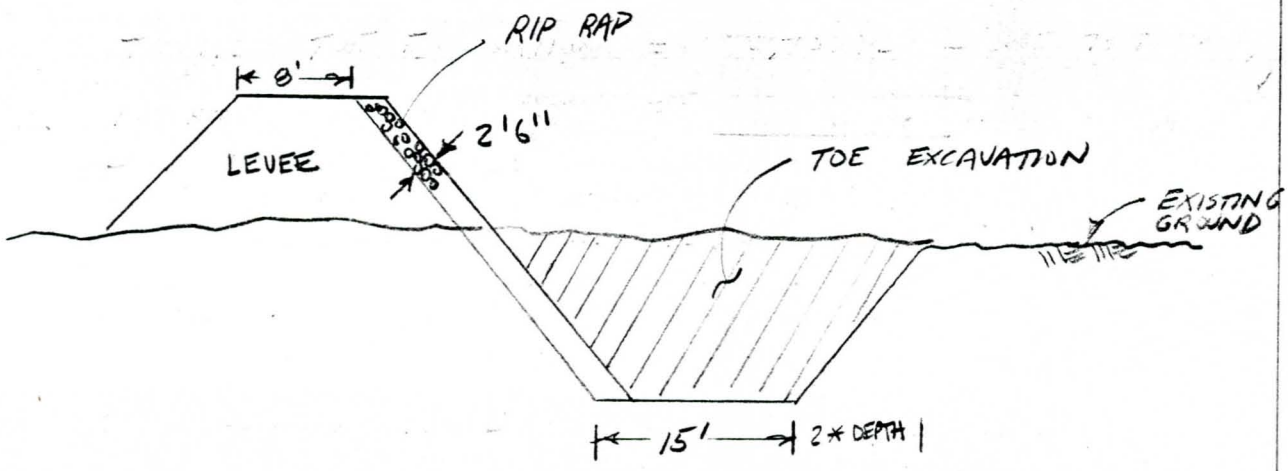


THE FOLLOWING TABLE SUMMARIZES TOE EXCAVATION QUANTITIES.

TOE EXCAVATION

STATION	REACH LENGTH (FT)	DEPTH of EXCAVATION (FT)	AVE. DEPTH of EXCAVATION (FT)	VOLUME OF EXCAVATION (YD^3)
16+50		5.0		
	650		5.0	3000
23+00		5.0		
	1400		5.0	6500
37+00		5.0		
	400		7.5	3300
41+00		10.0		
	280		13.25	5700
43+80		16.5		
	120		18.25	4200
45+00		20.0		
	450		20.0	18300
49+50		20.0		
	1350	14.5	14.75	32800
63+00		15.0		
	150		10.0	11900
64+50		5.0		
			TOTAL	= 75,700

VOLUME OF EXCAVATION = (15' + (2)(AVE. DEPTH OF EXCAV.)) (AVE DEPTH OF EXCAVATION) (REACH LENGTH)



MARICOPA COUNTY INTERIM FLOOD CONTROL
STUDY - RING LEVEE QUANTITIES AROUND
HOLLY ACRES

DESIGN FLOW: 100 YEAR FLOOD, (250,000 CFS)
REACH: 0+00 TO 16+50, ALONG ST. JOHN'S CANAL
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 8.0
COMPACTION FACTOR: 1.15
RUN DATE: 13-JAN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
0.00		5.0	90.0		
	1650.0			8433.0	8433.0 ← FILL VOLUME
16.50		8.0	192.0		
	========				==========

LENGTH = 1650.0 REQUIRED EXCAVATION = 9697.9

DESIGN FLOW: 100 YEAR FLOOD, (250,000 CFS)
REACH: EXISTING LEVEE, NORTH SIDE OF ST. JOHN'S CANAL
SIDE SLOPES: 1.5:1, 1.5:1
TOP WIDTH 2.0
COMPACTION FACTOR: 1.00
RUN DATE: 13-JAN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
0.00		3.0	19.5		
	1650.0			1191.7	1191.7
16.50		3.0	19.5		
	========				==========

LENGTH = 1650.0 REQUIRED EXCAVATION = 1191.7

FILL VOLUME = VOLUME OF PROPOSED LEVEE - EXISTING LEVEE
= 8400 YD³ - 1200 YD³
= 7200 YD³

EXCAVATION VOLUME = 1.15 * 7200 YD³ = 8300 YD³

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: ALONG ST. JOHN'S CANAL, UPSTREAM OF EL MIRAGE RD.
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 8.0
COMPACTION FACTOR: 1.15
RUN DATE: 11-AUG-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
100.00		8.0	192.0		
	1200.0			8533.3	8533.3
112.00		8.0	192.0		
	950.0			3822.9	12356.2
121.50		3.0	42.0		
	========				==========
LENGTH =	2150.0	REQUIRED EXCAVATION =			14209.6

REACH: EXISTING LEVEE, NORTH SIDE OF ST. JOHN'S CANAL
SIDE SLOPES: 1.5:1, 1.5:1
TOP WIDTH 2.0
COMPACTION FACTOR: 1.00
RUN DATE: 11-AUG-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
100.00		3.0	19.5		
	1200.0			866.7	866.7
112.00		3.0	19.5	686.1	1553
	950.0	3.0 ~~0.0~~	19.5 ~~0.0~~	~~263.7~~	~~1130.4~~
121.50					
	========				==========
LENGTH =	2150.0	REQUIRED EXCAVATION =			1786 ~~1130.4~~

FILL VOLUME = VOLUME OF PROPOSED LEVEE - EXISTING LEVEE

12360 YD^3 - 1786 YD^3

FILL VOLUME = 10600 YD^3

EXCAVATION VOLUME = 1.15 * 10600 YD^3 = 12200 YD^3

MARICOPA COUNTY INTERIM FLOOD CONTROL
STUDY - RING LEVEE QUANTITIES AROUND
HOLLY ACRES

DESIGN FLOW: 100 YEAR FLOOD, (250,000 CFS)
REACH: 16+50 TO 64+50, ADJACENT TO 121st AVENUE AND THE GILA RIVER
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 8.0
COMPACTION FACTOR: 1.15
RUN DATE: 13-JAN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
16.50		8.0	192.0		
	2850.0			20266.7	20266.7
45.00		8.0	192.0		
	450.0			3544.4	23811.1
49.50		9.0	234.0		
	1300.0			10239.5	34050.6
62.50		8.0	192.0		
	180.0			724.3	34774.9 ← FILL VOLUME
64.30		3.0	42.0		
	========				==========

LENGTH = 4780.0 REQUIRED EXCAVATION = 39991.1

MARICOPA COUNTY INTERIM FLOOD CONTROL
STUDY - RING LEVEE QUANTITIES AROUND
HOLLY ACRES

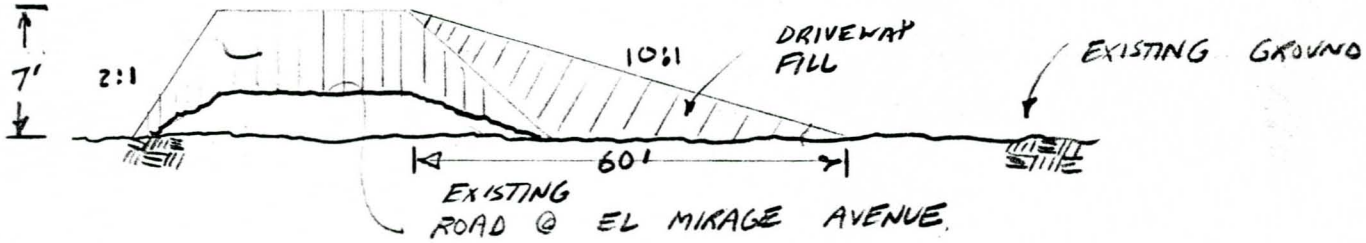
DESIGN FLOW: 100 YEAR FLOOD, (250,000 CFS)
REACH: 64+50 TO 88+00, ALONG EL MIRAGE AVENUE
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 24.0
COMPACTION FACTOR: 1.15
RUN DATE: 13-JAN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
64.50		5.5	192.5		
	100.0			713.0	713.0
65.50		5.5	192.5		
	1000.0			4450.3	5163.3
75.50		2.0	56.0		
	650.0			1749.4	6912.6
82.00		3.0	90.0		
	600.0			2633.3	9545.9 ← FILL VOLUME
88.00		4.5	148.5		
	========				==========
LENGTH =	2350.0		REQUIRED EXCAVATION =		10977.8

TIE INTO EXISTING DRIVEWAYS:

ASSUME AVERAGE HT. OF LEVEE = 7'

ASSUME DRIVE WAY GRADE IS 10% AND DRIVEWAY IS 15' WIDE



DRIVEWAY FILL PER DRIVEWAY = (15' WIDE) * ½ [(60' LONG)(7' HIGH) - (12' LONG)(7' HIGH)]

= 2520 FT^3 = (2520 FT^3) / (27 FT^3/YD^3) = 93 YD^3

DRIVEWAY FILL = (93 YD^3/DRIVE WAY) * (12 DRIVE WAYS) = **1116 YD^3**

DRIVEWAY EXCAVATION = 1116 YD^3 * 1.15 COMPACTION FACTOR = **1280 YD^3**

A. LEVEE FILL

LEVEE FILL QUANTITIES WERE CALCULATED USING A COMPUTER PROGRAM DEVELOPED BY CDM. THE OUTPUT FOLLOWS SECTION 3 OF THIS APPENDIX.

DESIGN ASSUMPTIONS REGARDING THE TOP WIDTH, HEIGHT, SIDE SLOPES, AND COMPACTION FACTOR ARE LISTED AT THE TOP OF EACH REACH'S COMPUTER OUTPUT.

LISTED BELOW IS A SUMMARY OF THE RESULTS

REACH	EXCAVATION VOLUME (YD^3)
ALONG ST. JOHNS CANAL	7200 10600
ADJACENT TO 121ST AND ADJACENT TO THE GILA RIVER	34800
ALONG EL MIRAGE AVE.	9550
DRIVEWAY TIE IN ALONG EL MIRAGE	1120

TOTAL LEVEE FILL = 63,300 YD^3

C. TOE FILL

TOE FILL = TOE EXCAVATION

= 75 700 YD^3

NOTE THAT NO EXTRA MATERIAL IS 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 RIP-RAP AND FILTER VOLUMES.

QUANTITIES WERE CALCULATED ASSUMING ERROSION PROTECTION IS NEEDED ON LEVEE BANKS WHICH ARE NOT RIP-RAPPED.

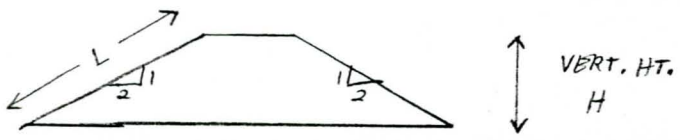
THE FOLLOWING TABLE SUMMARIZES SQUARE FOOTAGE OF BANK PROTECTION BY REACH.

AREA OF BANK PROTECTION

STATION	REACH LENGTH FT	PROTECTION VERT. HT. FT	PROTECTION AVE. VERT. HT. FT	NUMBER OF SIDES	AREA OF BANK PROTECTION FT^2
0	1650	5.0	6.5	1½	36,000
16+50	2950	8.0	8.0	1	51,100
45+00	450	8.0	8.5	1	8,600
49+50	1350	9.0	8.5	1	25,700
63+00	150	8.0	7.0	1	2350
64+50	1050	6.0	4.25	2	20000
75+00	700	2.5	3.0	2	9400
82+00	600	3.5	4.25	2	11400
88+00		5.0		TOTAL =	164,500

AREA OF BANK PROTECTION =
2.24 (AVG. VERT. HT.) (NUMBER OF SIDES) (REACH LENGTH)

AREA OF BANK PROTECTION = 164,500 FT^2 = 3.8 acres



$$L = \sqrt{H^2 + (2H)^2} = \sqrt{5H^2} = 2.24H$$

QUANTITIES WERE CALCULATED ASSUMING A 2 FT SECTION FOR RIP-RAP AND A SIX INCH SECTION FOR THE FILTER MATERIAL. DEPTH OF PROTECTION VARIES ALONG THE LEVEE DEPENDING ON THE DIRECTION AND VELOCITIES OF FLOW LIKELY TO ATTACK THE LEVEE AT A LOCATION.

THE FOLLOWING TABLE SUMMARIZES THE RESULTS.

ROCK RIP-RAP AND FILTER MATERIAL QUANTITIES

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 YD^3	FILTER MATERIAL VOLUME YD^3
16+50		13.0				
	2050		13.0	59700	4420	1100
37+00		13.0				
	400		15.5	13900	1030	260
41+00		18.0				
	280		21.2	13300	990	250
43+80		24.5				
	120		26.2	7050	520	130
45+00		28.0				
	450		28.0	28200	2090	520
49+50		28.0				
	1350		28.0	84700	6280	1570
63+00		28.0				
	150		19.5	6550	490	120
64+50		11.0				

TOTAL VOLUME OF ROCK RIP-RAP = 15,800

TOTAL VOLUME OF FILTER MATERIAL = 3,950

Slide gates are needed at three locations on St. John's Canal to prevent flood waters outside the ring levee from entering Holly Acres via the canal. One gate at either end of project and one at turnout to north.

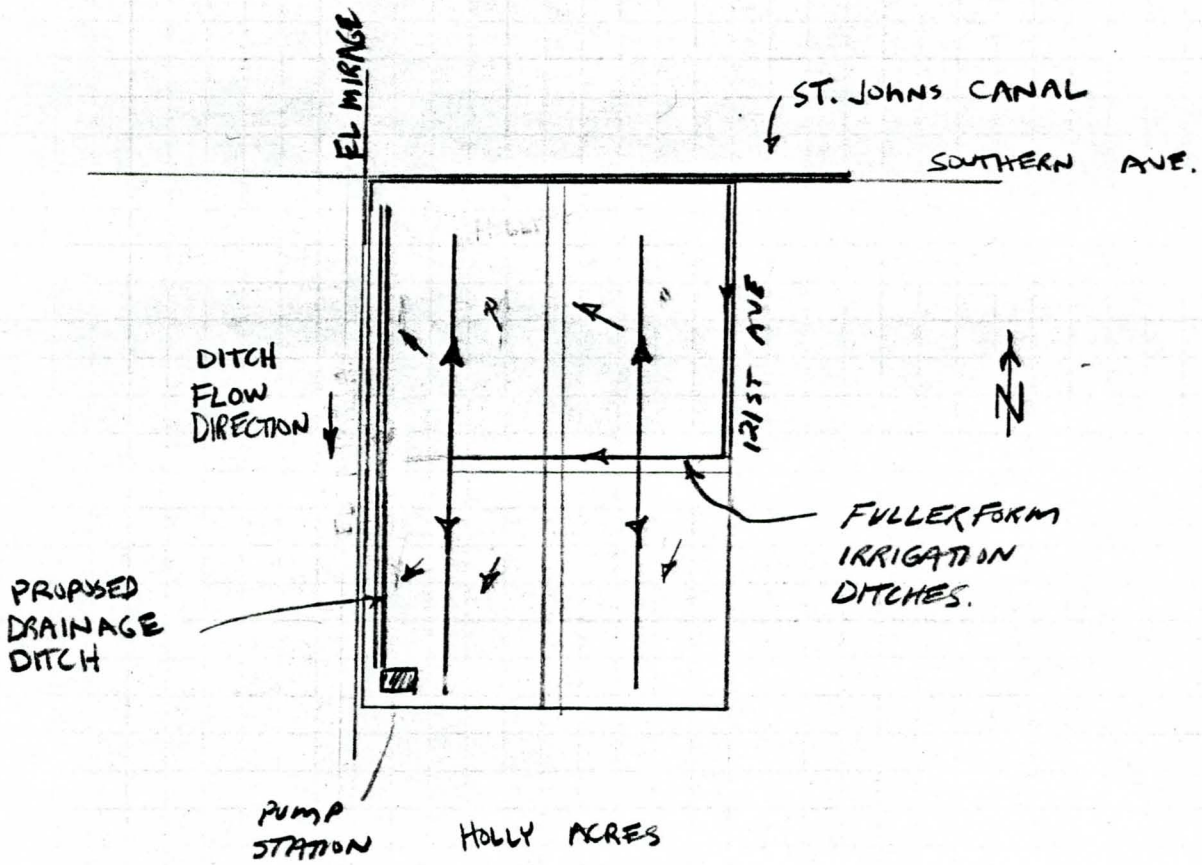
Also, for Southern Avenue - El Mirage Rd. improvements, a gate will be needed on culvert under Southern Avenue.

Since this is a minor cost item and canal details are not known, no plans were developed. A unit cost of $2000 per gate was used.

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

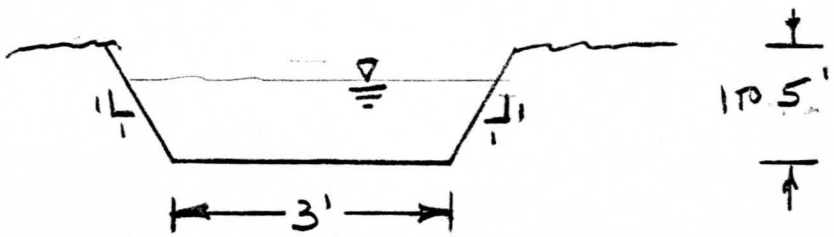
A. COLLECTION

DURING LARGE RAINFALLS, IT IS ASSUMED THAT RUNOFF WILL FLOW IN THE SAME GENERAL DIRECTIONS AS IRRIGATION WATERS. IN A FIELD INSPECTION, IT WAS DETERMINED THAT THE FLOW DIRECTIONS OF RUNOFF WERE AS FOLLOWS :



A PROPOSED DRAINAGE DITCH ADJACENT TO EL MIRAGE ROAD WOULD CONVEY RUN OFF TO THE PUMP STATION.

ASSUMED SIZE :



CHECK SIZE ASSUMPTION:

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

$n = 0.035$

$S = 0.00125$

ASSUME A 3FT DEPTH AT THE PUMPING STATION.

AREA $= (3')(3') + 2(\frac{1}{2})(3)(3) = 18 FT^2$

WETTED PERIMETER $= 11.5$ FT

HYDRAULIC RADIUS $= 18 FT^2 / 11.5 FT = 1.6$ FT

CAPACITY $Q = \left(\frac{1.49}{0.035}\right)(10)(1.6)^{2/3}(0.00125)^{1/2}$

$$\underline{\underline{Q = 20.6 \text{ cfs}}}$$

IT IS ASSUMED THAT THE DRAINAGE DITCH WILL NOT CARRY ALL OF THE RUN-OFF DUE TO A 10 YR STORM EVENT. MUCH OF THE FLOW WILL FIND ITS WAY TO THE PUMPING STATION THROUGH NATURAL DRAINAGE. THEREFORE THE DRAINAGE DITCH CAPACITY OF 20.6 cfs IS ASSUMED ADEQUATE TO HANDLE A 10 YEAR RUN OFF OF 37 cfs. QUANTITIES OF EXCAVATION ARE LISTED BELOW.

REACH: INTERIOR DRAINAGE DITCH ADJACENT TO THE LEVEE AT EL MIRAGE AVE
SIDE SLOPES: 1.0:1, 1.0:1
BOT WIDTH 3.0
COMPACTION FACTOR: 1.00
RUN DATE: 30-JAN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
64.50		3.0	18.0		
	1050.0			1101.8	1101.8
75.00		5.0	40.0		
	700.0			775.5	1877.3
82.00		3.3	20.8		
	600.0			255.8	2133.1
88.00		1.0	4.0		
	========				==========
LENGTH =	2350.0		REQUIRED EXCAVATION =		2133.1

Excavation of ditch @ $2.50/CY, but material can be used in levees, so this reduces required excavation for levee fill @ $1.50/CY

Net cost is $2.50 - $1.50 = $1.00/CY

2100 CY x $1.00/CY = $2100

Culverts under 12 driveways @ 15' width

12 @ $750 ea in place = $9000

total collection system cost = $11,000 say $11,000

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

* 77 acres area
* Runoff coef. = 0.4
* 10 yr. rainfall

duration hr.	rainfall intensity (in/hr)	total volume A-F
.5	1.8	2.31
1	1.2	3.08
2	0.7	3.60
3	.54	4.16
5	.37	4.75
8	.26	5.35
10	.22	5.65
18	.14	6.48
24	.11	6.78

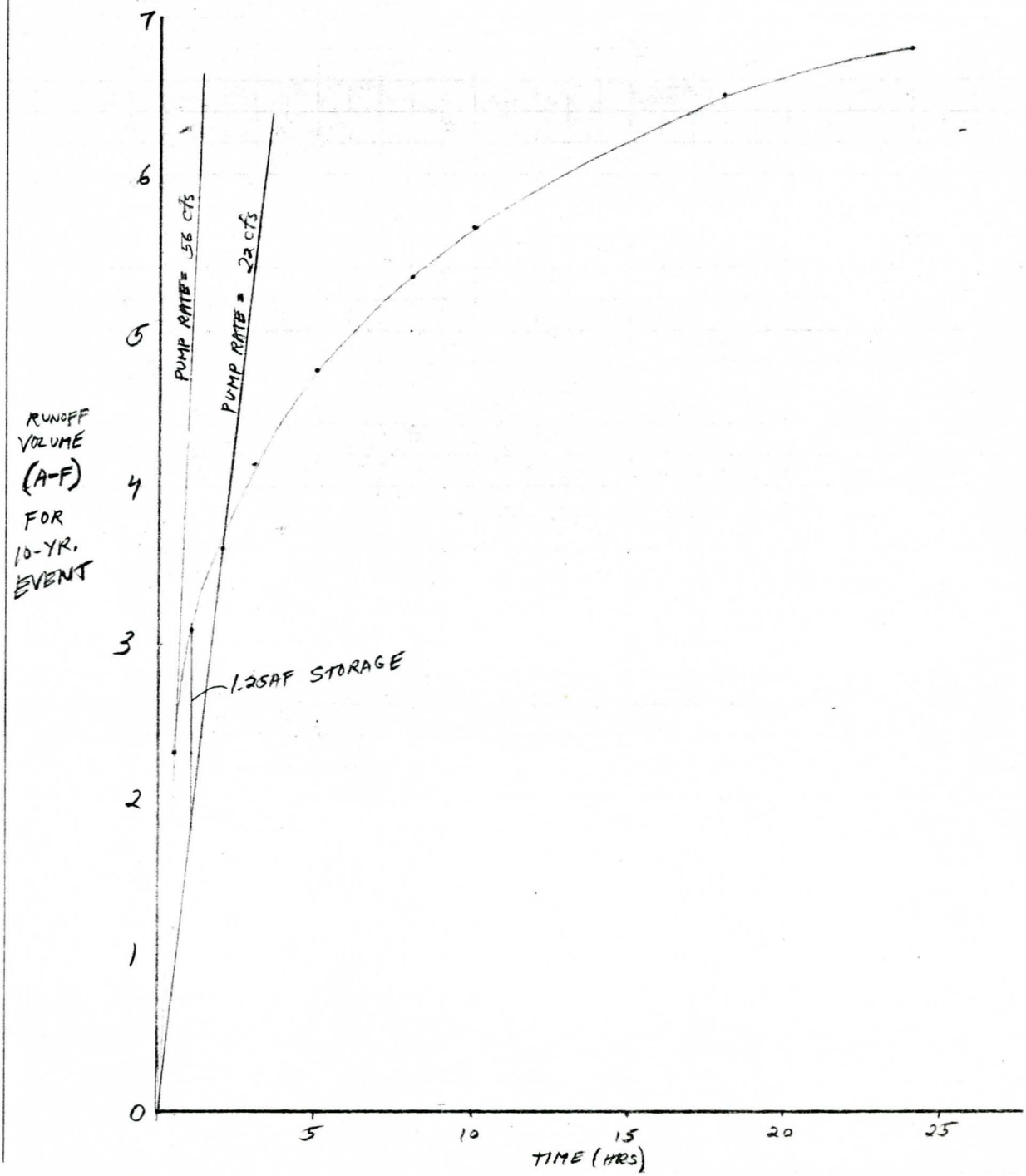
10 yr. Q = CIA 1 hr. time of concentration

= .4(1.2)(77) = 37 cfs

PUMP RATE OF 22 cfs (10,000 gpm) REQUIRES 1.25 A-F OF STORAGE (LOCAL PONDING)

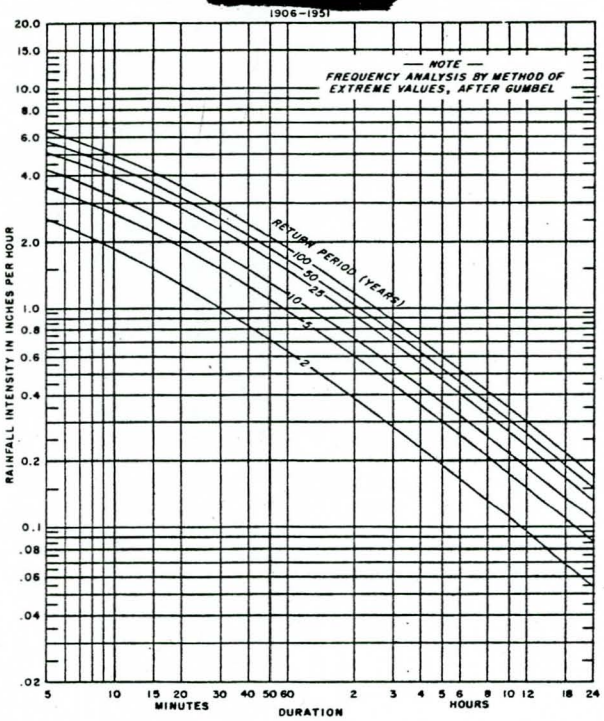
100 yr Q = .5(1.9)(77) = 73 cfs

DESIGN PUMP FOR 10,000 gpm.
DESIGN GRAVITY OUTLET FOR 73 cfs.

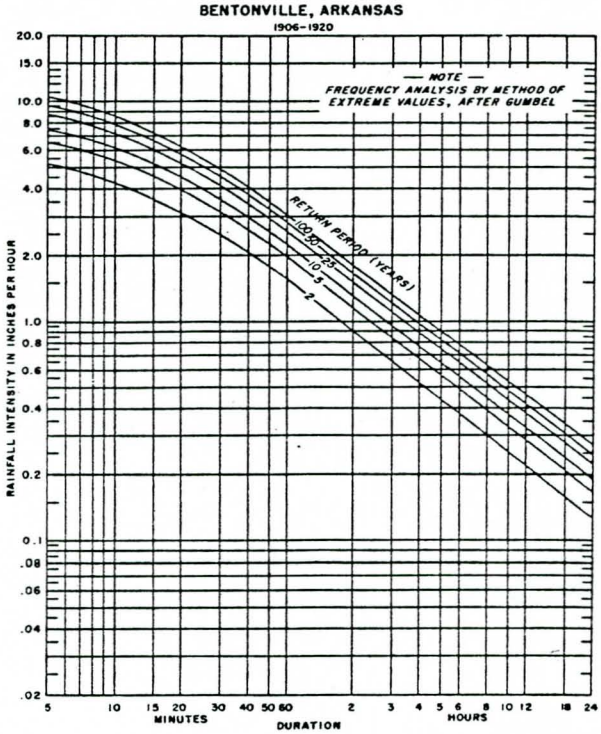


RAINFALL INTENSITY-DURATION-FREQUENCY CURVES

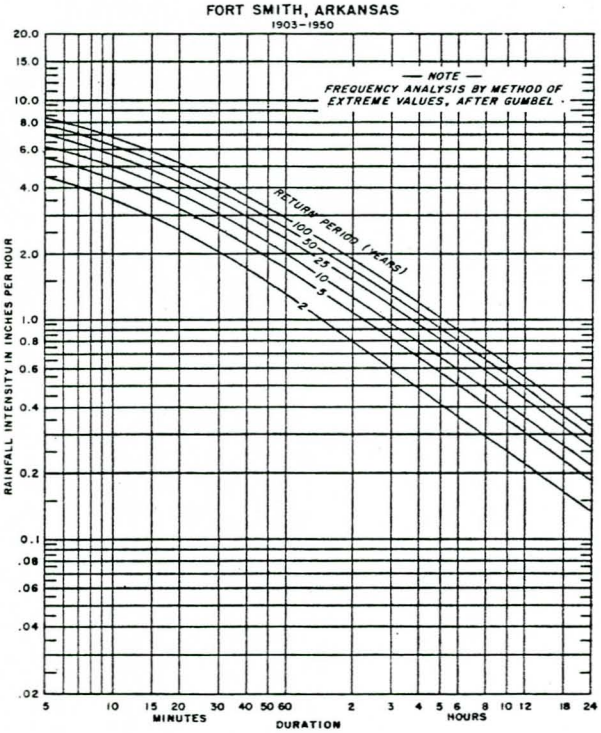
[redacted]
1906-1951



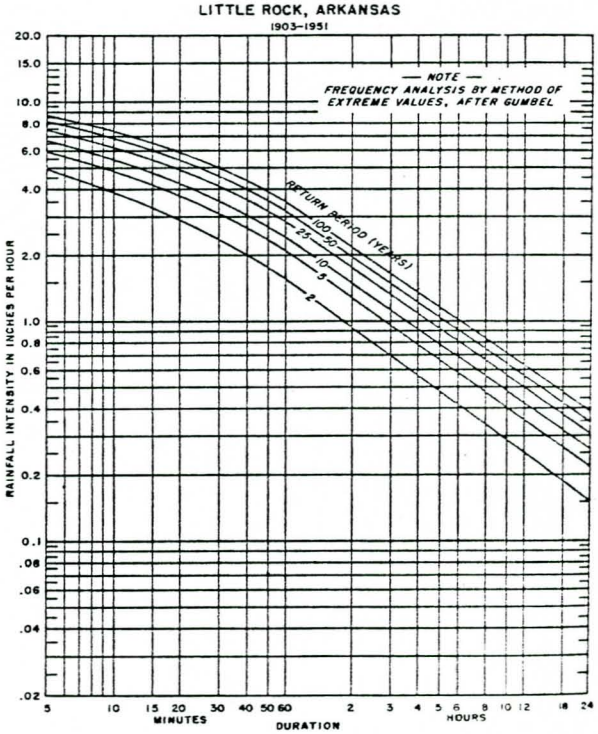
BENTONVILLE, ARKANSAS
1906-1920



FORT SMITH, ARKANSAS
1903-1950



LITTLE ROCK, ARKANSAS
1903-1951



Low head 10,000 gpm. pump w/ 70 cfs gravity outlet and flap gate

ADOT bids for similar pump stations, incl. pump house, gas driven pumps and appurtenances, sump pumps and appurtenances and electrical system: show unit cost of $6.93/gpm for a 40,000 gpm station (5-29-79). Assume 20% increase in cost since that date → $8.30/gpm.

10,000 gpm × $8.30/gpm = $83,000

Outlet (approx. 50' of 72" pipe), gate, concrete inlet and outlet headwall, rip-rap = $13,000

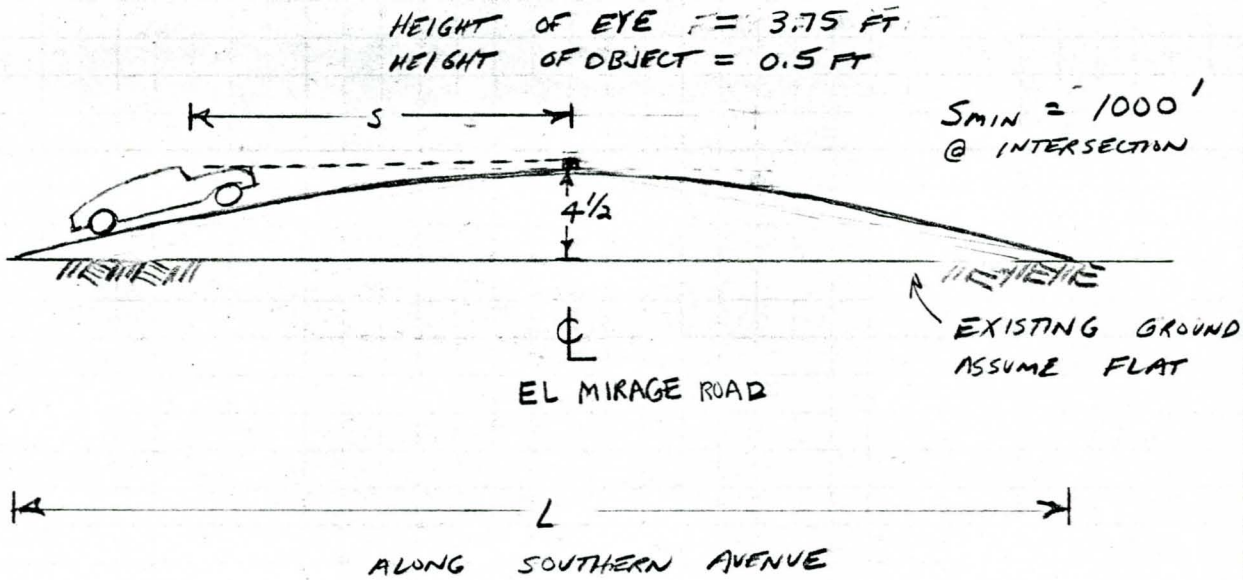
$96,000

say $100,000

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

A. EXCAVATION AND FILL

FILL AND EXCAVATION QUANTITIES WERE CALCULATED ASSUMING THAT SOUTHERN AVENUE BE RAISED 4½ FEET AT IT'S INTERSECTION WITH EL MIRAGE AVENUE. STANDARD ROAD DESIGN PRACTICES REQUIRE A 1000 FEET STOPPING SIGHT DISTANCE AT HIGHWAY INTERSECTIONS, THEREFORE REQUIRING A MINIMUM CURVE LENGTH OF 1100 FT.



LENGTH OF CURVE:

$$L = 2S - \frac{1398}{A} \qquad S > L$$

$$L = \frac{AS^2}{1398} \qquad S < L$$

A = ALGEBRAIC GRADE DIFF. %

ASSUME $S < L$:

SOLVE BY TRIAL AND ERROR

A	L	CALCULATED A
1.0	715	2.5
1.3	930	1.9
1.4	1001	1.8
1.5	1070	1.6

$L = 1100'$

FILL AND EXCAVATION QUANTITIES WERE CALCULATED USING A COMPUTER PROGRAM DEVELOPED BY CDM.

DESIGN ASSUMPTIONS AND QUANTITIES ARE LISTED IN THE COMPUTER OUTPUT BELOW

DESIGN FLOW: 100 YEAR FLOOD, (250,000 CFS)
REACH: QUANTITIES NEEDED TO RAISE ROAD AT SOUTHERN AVE AND EL MIRAGE RO
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 24.0
COMPACTION FACTOR: 1.15
RUN DATE: 13-JAN-81

	STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
RAISE SOUTHERN AVENUE	0.00		0.8	19.1		
		550.0			1336.7	1336.7
	5.50		3.8	118.1		
		550.0			1336.7	2673.4
	11.00		0.8	19.1		
		0.0			0.0	2673.4
TIE INTO EL MIRAGE ROAD	0.00		0.0	0.0		
		200.0			402.7	3076.1 ← FILL VOLUME
	2.00		3.8	118.1		
		========				==========
LENGTH =		1300.0	REQUIRED EXCAVATION =			3537.5

3.75' + 6" AGG. BASE + 3" A.C. ≈ 4½'

B. REMOVE PAVEMENT

PAVEMENT REMOVAL WILL BE REQUIRED ALONG EL MIRAGE ROAD, WHERE THE EXISTING ROADWAY WILL BE REPLACED BY A LEVEE AND RAISED, AND ALONG SOUTHERN AVENUE, 550 FT ON EACH SIDE OF EL MIRAGE ROAD.

B. REMOVE PAVEMENT (CONT.)

THE FOLLOWING TABLE SUMMARIZES PAVEMENT REMOVAL.

PAVEMENT REMOVAL

STATION, REACH	LENGTH FT	ROADWAY WIDTH FT	AREA REMOVED FT^2
64+50 TO 88+00 ALONG EL MIRAGE	2350	28	65800
RAISED SECTION OF SOUTHERN AVE. (@ INTERSECTION WITH EL MIRAGE)	1100	20	22000
EL MIRAGE TIE-INTO RAISED SOUTHERN AVENUE	200	28	5600

TOTAL AREA OF ASPHALT REMOVED = 93400 FT^2

C. AGGREGATE BASE

ASSUMED THAT A 6" AGGREGATE BASE WILL BE PLACED FOR NEW ROADWAYS.

THE FOLLOWING TABLE SUMMARIZES QUANTITIES OF AGGREGATE BASE.

C. AGGREGATE BASE (CONT.)

AGGREGATE BASE 6"

STATION, REACH	LENGTH FT	ROADWAY WIDTH FT	VOLUME YD^3
64+50 TO 88+00 ALONG EL MIRAGE	2350	20	870
RAISED SECTION OF SOUTHERN AVE. (@ INTERSECTION WITH EL MIRAGE)	1100	20	410
EL MIRAGE TIE-INTO RAISED SOUTHERN AVENUE.	200	20	75

TOTAL VOLUME OF AGGREGATE BASE = 1355 YD^3

D. ASPHALTIC CONCRETE

ASPHALT CONCRETE - 3IN. HOT MIX

STATION, REACH	LENGTH FT	ROADWAY WIDTH FT	AREA ASPHALTED FT^2
64+50 TO 88+00	2350	20	47000
RAISED SECTION OF SOUTHERN AVE (@ INTERSECTION WITH EL MIRAGE)	1100	20	22000
EL MIRAGE TIE-INTO RAISED SOUTHERN AVENUE.	200	20	4000

TOTAL AREA ASPHALTED = 73000 FT^2

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

REACH 0+00 TO 16+50, ALONG ST JOHNS CANAL:

ASSUMED THAT LEVEE WILL INCORPORATE THE NORTH BANK OF ST JOHN'S CANAL, THEREFORE NO LAND NEED BE ACQUIRED.

REACH 16+50 TO 49+50 ADJ. TO 121ST AVE.:

AVERAGE LEVEE HEIGHT = 7.5'

BASE OF LEVEE = 37.5'

LENGTH OF REACH = 3300'

ASSUME 10' OF RIGHT OF WAY ON EACH SIDE OF LEVEE,

37.5' + 20.0' = 57.5'

AREA OF AQUISITION = (57.5')(3300)

= 190,000 FT²

REACH 49+50 TO 64+50 ALONG THE GILA RIVER:

AVERAGE LEVEE HEIGHT = 7.5'

BASE OF LEVEE = 44'

ASSUME 10' OF RIGHT OF WAY ON EACH SIDE OF LEVEE.

LENGTH OF REACH = 1500'

AREA OF AQUISITION = (64')(1500')

= 96,000 FT²

REACH 64+50 TO 88+00 ALONG EL MIRAGE AVE.:

AVERAGE LEVEE HEIGHT = 4.0'
BASE OF LEVEE = 40.0'

ASSUME 10' RIGHT OF WAY ON EACH SIDE OF LEVEE

BASE OF LEVEE + RIGHT OF WAY = 60'
+ 20' = 60'

FROM AREAL PHOTO, ROAD APPEARS TO BE 60 ± FEET WIDE. THEREFORE ASSUME THAT THE LEVEE WILL BE LOCATED ON TOP OF THE ROAD AND WILL NOT REQUIRE LAND AQUISITION.

NO LAND ACQUISITION FOR LOCAL DRAINAGE

LAND AQUISITION FOR PUMP STATION:

ASSUME NEED 50' x 30' AREA

= 1500 FT²

TOTAL LAND AQUISITION:

	FT²
REACH 0+00 – 16+50	0
REACH 16+50 – 49+50	190,000
REACH 49+50 – 64+50	96,000
REACH 64+50 – 88+00	0
PUMP STATION	1500
TOTAL =	287,500

NUMBER OF ACRES = (287,500)/(43560 FT²/ACRE)
= 6.6 ACRES

6. ROAD IMPROVEMENTS

ROAD IMPROVEMENT COSTS WERE CALCULATED ASSUMING THAT SOUTHERN AVENUE BE RAISED 2.0' AT ITS INTERSECTION WITH EL MIRAGE RD. THIS IS THE HEIGHT NECESSARY TO STOP FLOOD WATERS FROM ENTERING INTO THE DEVEPED AREA NORTH - WEST OF THE HOLLY ACRES SUBDIVISION.

LISTED ON THE FOLLOWING PAGE IS A QUANTITY TAKE-OFF SHEET WHICH SUMMARIZES THE FIRST COST OF ROAD IMPROVEMENTS.

CALCULATION SHEETS FOLLOW THE QUANTITY TAKE-OFF SHEET.

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TABLE VII-2

SOUTHERN AVE.-EL MIRAGE RD. IMPROVEMENTS COST ESTIMATE

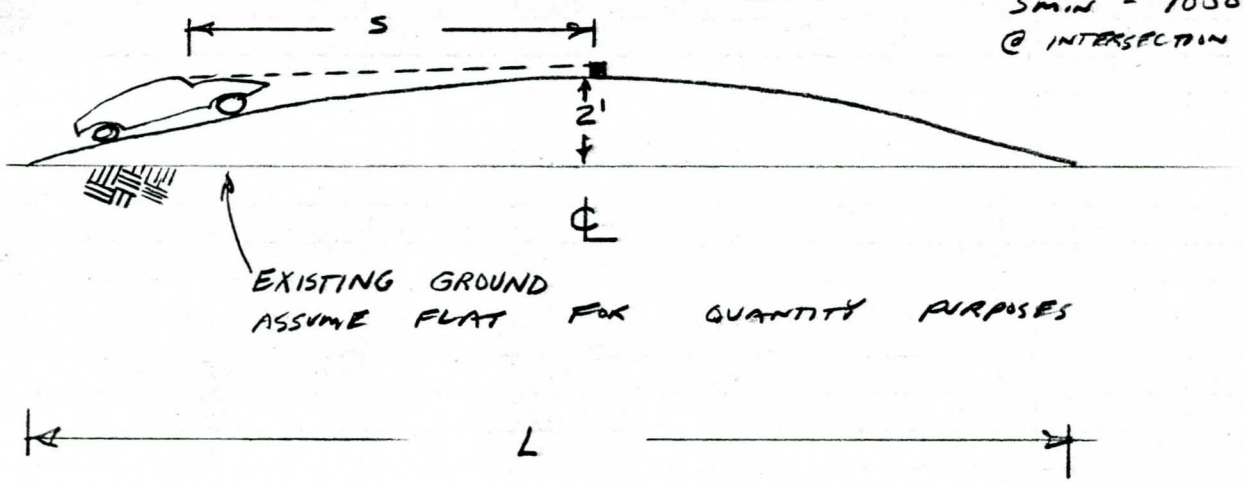
QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
HOLLY ACRES AREA		CHECKED BY PRG		CHECKED BY	
SOUTHERN AVE.-EL MIRAGE RD. IMPROVEMENTS		DATE AUG 1981		DATE	
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT COST	TOTAL COST
	FIRST COST				
1	Diversion and Control of Water		JOB	L.S.	
2	Clear Site and Remove Obstructions		ACRE	300	
3	Excavation				
	A. For Levee Fill		CY	1.50	
	B. Toe		CY	2.50	
4	Compacted Fill				
	A. Levees		CY	1.00	
	B. Toe		CY	1.30	
5	Vegetation Erosion Protection		ACRE	200	
6	Filter Material		CY	18.00	
7	Rock Rip-Rap		CY	18.00	
8	Slide Gates	1	EA	2000	2,000
9	Interior Drainage				
	A. Collection		JOB	L.S.	
	B. Pump Station		JOB	L.S.	
10	Road Work				
	A. Excavation and Fill	1,390	CY	2.50	3,500
	B. Remove Pavement	26,200	SF	0.60	15,700
	C. Aggregate Base	430	CY	18.00	7,700
	D. Asphalt/Concrete Pavement	23,000	SF	1.00	23,000
	Total Construction Costs				51,900
	Contingencies, 15%				7,800
	Engineering and Design, 10%				6,000
	Supervision and Administration, 10%				6,000
11	Land Acquisition		ACRE	8000	--
	TOTAL FIRST COST				72,000

A. EXCAVATION AND FILL

FILL AND EXCAVATION QUANTITIES WERE CALCULATED ASSUMING THAT SOUTHERN AVENUE BE RAISED 2.0' AT ITS INTERSECTION WITH EL MIRAGE AVE. STANDARD ROAD DESIGN PRACTICES REQUIRE A 1000 FEET STOPPING SIGHT DISTANCE AT HIGHWAY INTERSECTIONS, THEREFORE REQUIRING A MINIMUM CURVE LENGTH OF 750 FEET. THE ROAD SHOULD BE RAISED 2 FEET TO BE LEVEL WITH THE BANKS OF ST. JOHNS CANAL.

HEIGHT OF EYE = 3.75 FT
HEIGHT OF OBJECT = 0.50 FT

S_{min} = 1000' @ INTERSECTION



LENGTH OF CURVE :

$$L = 2S - \frac{1398}{A} \qquad S > L$$

$$L = \frac{AS^2}{1398} \qquad S < L$$

A = ALGEBRAIC GRADE DIFF. %

ASSUME $S > L$, $L = 2S - \frac{1398}{A}$

SOLVE BY TRIAL AND ERROR

A	L	CALCULATED A %
0.75	136	6.0
0.95	530	1.5
1.10	730	1.09

SAY L = 750 FT

FILL AND EXCAVATION QUANTITIES WERE CALCULATED USING A COMPUTER PROGRAM DEVELOPED BY COM.

DESIGN ASSUMPTIONS AND QUANTITIES ARE LISTED IN THE COMPUTER OUTPUT BELOW.

DESIGN FLOW: 100 YEAR FLOOD (250,000 CFS)
REACH: QUANTITIES OF FILL REQUIRED TO RAISE ROAD AT SOUTHERN AVENUE
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 24.0
COMPACTION FACTOR: 1.15
RUN DATE: 14-JAN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
0.00		0.8	19.1		
	375.0			460.1	460.1
3.75		1.3	33.1		
	375.0			361.7	821.8 ← FILL VOLUME
7.50		0.8	19.1		
	========				==========

LENGTH = 750.0 REQUIRED EXCAVATION = 945.0

1.25' + 6" AGG. BASE + 3" A.C. = 2.0'

DESIGN FLOW: 100 YEAR FLOW (250,000 CFS)
REACH: QUANTITIES REQUIRED TO TIE EL MIRAGE ROAD INTO SOUTHERN AVENUE
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 24.0
COMPACTION FACTOR: 1.15
RUN DATE: 14-JAN-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
0.00		0.8	19.1		
	200.0			192.9	192.9
2.00		1.3	33.1		
	0.0			0.0	192.9
0.00		0.0	0.0		
	0.0			0.0	192.9
0.00		0.8	19.1		
	200.0			192.9	385.8 ← FILL VOLUME
2.00		1.3	33.1		
	========				==========

LENGTH = 400.0 REQUIRED EXCAVATION = 443.7

TOTAL EXCAVATION = 945 + 445 = 1390 YD^3

B. REMOVE PAVEMENT

PAVEMENT REMOVAL WILL BE REQUIRED WHERE THE ROAD IS RAISED. THIS INCLUDES; ALONG SOUTHERN AVENUE, 375 FT ON EACH SIDE OF EL MIRAGE ROAD, AND WHERE EL MIRAGE TIES INTO SOUTHERN AVE (200 FT EACH SIDE)

THE FOLLOWING TABLE SUMMARIZES PAVEMENT REMOVAL.

PAVEMENT REMOVAL

STATION REACH	LENGTH FT	ROADWAY WIDTH FT	AREA REMOVED FT²
RAISED SECTION OF SOUTHERN AVE. (@ INTERSECTION WITH EL MIRAGE)	750	20	15000
EL MIRAGE TIE-INTO RAISED SOUTHERN AVENUE. (2 SIDES)	200	28	5600
	200	28	5600

TOTAL AREA OF ASPHALT REMOVED = 26 200 FT²

C. AGGREGATE BASE

ASSUMED A 6" AGGREGATE BASE WILL BE PLACED FOR NEW ROADWAYS.

THE FOLLOWING TABLE SUMMARIZES QUANTITIES OF AGGREGATE BASE.

C. AGGREGATE BASE (CONT.)

AGGREGATE BASE 6"

REACH	LENGTH FT	ROADWAY WIDTH FT	VOLUME YD^3
RAISED SECTION OF SOUTHERN AVE. (@ INTERSECTION WITH EL MIRAGE)	750	20	280
EL MIRAGE TIE-INTO RAISED SOUTHERN AVE.	200	20	75
(2 SIDES)	200	20	75

TOTAL VOLUME OF AGGREGATE BASE = 430 YD^3

D. ASPHALTIC CONCRETE

ASPHALT CONCRETE 3 INCH HOT MIX

REACH	LENGTH FT	ROADWAY WIDTH FT	AREA ASPHALTED FT^2
RAISED SECTION OF SOUTHERN AVE. (@ INTERSECTION WITH EL MIRAGE)	750	20	15000
EL MIRAGE TIE-INTO RAISED SOUTHERN AVE.	200	20	4000
(2 SIDES)	200	20	4000

TOTAL AREA ASPHALTED = 23000 FT^2

7. 91ST AVE. TO 95TH AVE. BANK

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

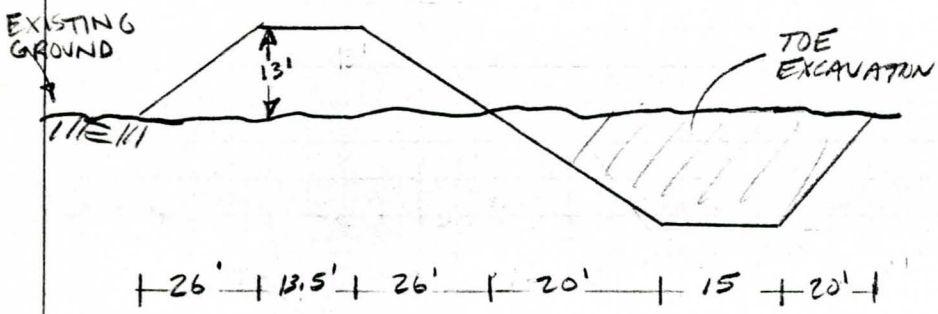
TABLE VII-3

BANK STABILIZATION, 91st TO 95th AVENUE
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
HOLLY ACRES AREA BANK STABILIZATION		CHECKED BY PRG		CHECKED BY	
91st TO 95th AVENUES		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	12	ACRE	300	3,600
3	Excavation				
	A. For Channel	27,400	CY	1.50	41,100
	B. For Levee Fill	18,400	CY	1.50	27,600
	C. Toe	118,000	CY	2.50	295,000
4	Compacted Fill				
	A. Levees	16,000	CY	1.00	16,000
	B. Toe	118,000	CY	1.30	153,400
5	Vegetation Erosion Protection		JOB	L.S.	500
6	Filter Material	2,840	CY	18.00	51,100
7	Rock Rip-Rap	11,300	CY	18.00	203,400
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	9,300	SF	1.00	9,300
	Total Construction Costs				801,000
	Contingencies, 15%				120,200
	Engineering and Design, 10%				92,100
	Supervision and Administration, 10%				92,100
11	Land Acquisition	7	ACRE	8000	56,000
	TOTAL FIRST COST				1,161,000

91ST TO 95TH	2. CLEAR SITE AND REMOVE OBSTRUCTIONS	MARICOPA CO.	CDM SWJ

LEVEE:



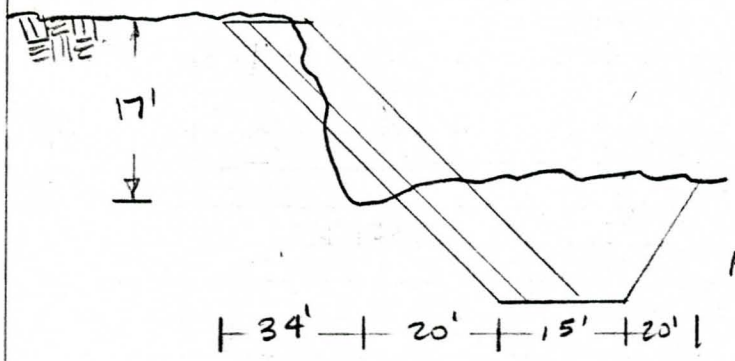
WIDTH OF CLEAR SITE = 120.5 FT

LENGTH = 1140 FT

AREA = (120.5')(1140') = 137400 FT^2

= 3.1 ACRES

BANK:



WIDTH OF CLEAR SITE = 99 FT

LENGTH = 1470 FT

AREA = (99)(1470') = 130,930 FT^2

= 3 ACRES

LOW FLOW CHANNEL:

LENGTH = 2500 FT

WIDTH = 100 FT

AREA = (100')(2500') = 250000 FT^2

= 5.7 ACRES

TOTAL = 3.1 + 3 + 5.7

= 11.8 ACRES

EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: LEVEE QUANTITIES, 91st TO 95th AVE
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
996.40		0.0	0.0		
	140.0			1215.9	1215.9
997.80		16.0	640.0		
	260.0			5822.7	7038.6
1000.40		15.0	570.0		
	60.0			810.3	7848.9
1001.00		8.0	192.0		
	300.0			2363.0	10211.9
1004.00		9.0	234.0		
	250.0			3610.9	13822.8
1006.50		15.0	570.0		
	100.0			1869.1	15691.9
1007.50		13.0	442.0		
	50.0			304.7	15996.6
1008.00		0.0	0.0		
	========				==========

LENGTH = 1160.0 REQUIRED EXCAVATION = 18396.1

3.B EXCAVATION FOR LEVEE FILL

4.A COMPACTED LEVEE FILL

LOW FLOW CHANNEL EXCAVATION:

AVERAGE DEPTH OF CHANNEL = 6'
AVERAGE WIDTH = 112'
LENGTH OF EXCAVATION = 1100'

VOLUME OF EXCAVATION = (112')(6')(1100')
= 739,200 FT^3

3.A EXCAVATION FOR CHANNEL = 27,400 YD^3

TOE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: TOE CUT QUANTITIES, 91st TO 95th AVE
SIDE SLOPES: 2.0:1, 2.0:1
BOT WIDTH 15.0
COMPACTION FACTOR: 1.00
RUN DATE: 14-APR-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
996.70		26.0	1742.0		
	110.0			4071.4	4071.4
997.80		11.0	407.0		
	260.0			4209.7	8281.2
1000.40		12.0	468.0		
	160.0			3583.1	11864.3
1002.00		16.0	752.0		
	70.0			1848.9	13713.3
1002.70		15.0	675.0		
	130.0			3250.0	16963.3
1004.00		15.0	675.0		
	250.0			4668.1	21631.3
1006.50		10.0	350.0		
	70.0			1056.9	22688.2
1007.20		12.0	468.0		
	80.0			2386.5	25074.7
1008.00		21.0	1197.0		
	100.0			5206.1	30280.9
1009.00		25.0	1625.0		
	600.0			36111.1	66392.0
1015.00		25.0	1625.0		
	200.0			12467.9	78859.9
1017.00		26.0	1742.0		
	100.0			6674.7	85534.6
1018.00		27.0	1863.0		
	470.0			32430.0	117964.6
1022.70		27.0	1863.0		
	========				==========

LENGTH = 2600.0 REQUIRED EXCAVATION = 117964.6

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.

91ST TO 95TH AVENUE

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)
916+70	110	27	27	6650	13300	490	120
997+80	420	27	27	25400	50800	1880	470
1002+00	200	27	26.5	11870	23750	880	220
1004+00	250	26	26	14560	29120	1080	270
1006+50	250	26	25.5	14280	28560	1060	265
1009+00	600	25	25.5	34270	68540	2540	635
1015+00	200	26	26	11650	23300	860	215
1017+00	170	26	26.5	10090	20180	750	190
1018+70	400	27	27.0	24190	48380	1790	450
1022+70		27					

$\Sigma = 11300\ YD^3$ 7. ROCK RIPRAP

$\Sigma = 2840\ YD^3$ 6. FILTER MATERIAL

91ST TO 95TH

6. FILTER MATERIAL
7. ROCK RIPRAP

MARICOPA CO.

CDM SWT

LENGTH OF LEVEE = 1160 FT

AVERAGE HEIGHT OF LEVEE = 12 FT

AREA = (1160')(12')(2.24) = 31200 FT^2

= 0.7 ACRES

ASSUME START-UP COSTS AND INSTALLATION = $500.00

10. ROAD WORK

ASPHALT CONCRETE PAVEMENT

LENGTH OF LEVEE = 1160 FT

AREA OF A.C. = (1160')(8')

= 9280 FT^2

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

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

FROM ITEM 2, SITE CLEARING, THE WIDTH OF CLEARING FOR THE LEVEE = 120.5 FT AND THE WIDTH of CLEARING FOR THE BANK STABILIZATION = 89 FT. LEVEE LENGTH = 1140 FT. STABILIZATION = 1470 FT.

LAND ACQUISITION AREA = $(120.5' + 20')(1140') + (89' + 20')(1470')$

$= 320{,}400\ FT^2$

$= 7.3$ 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.

8. 101ST AVE. to 109TH AVE. BANK

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

TABLE VII-4

BANK STABILIZATION, 101st TO 109th AVENUES
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
HOLLY ACRES AREA BANK STABILIZATION		CHECKED BY PRG		CHECKED BY	
101st TO 109th AVENUE		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	14	ACRE	300	4,200
3	Excavation				
	A. For Channel	--	CY	1.50	--
	B. For Levee Fill	4,530	CY	1.50	6,800
	C. Toe	147,500	CY	2.50	368,800
4	Compacted Fill				
	A. Levees	3,940	CY	1.00	3,900
	B. Toe	147,500	CY	1.30	191,800
5	Vegetation Erosion Protection		JOB	L.S.	500
6	Filter Material	4,190	CY	18.00	75,400
7	Rock Rip-Rap	16,700	CY	18.00	300,600
8	Flap Gates	3	EA	2000	6,000
9	Interior Drainage				
	A. Collection		JOB	L.S.	9,000
	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	36,200	SF	1.00	36,200
	Total Construction Costs				1,006,900
	Contingencies, 15%				151,000
	Engineering and Design, 10%				115,800
	Supervision and Administration, 10%				115,800
11	Land Acquisition	16	ACRE	8000	128,000
	TOTAL FIRST COST				1,518,000

A DIVERSION LEVEE IS NEEDED UPSTREAM OF THE PROJECT TO DIVERT FLOW AWAY FROM THE LOW FLOW CHANNEL WHICH IS LOCATED ADJACENT TO THE NORTH BANK. A LARGER LOW FLOW CHANNEL IS LOCATED TO THE SOUTH. ASSUME A MAXIMUM HEIGHT OF 10', AN AVERAGE WIDTH OF 10' AND A LENGTH OF 400 FT

$$\text{VOLUME} = (10')(10')(400')$$
$$= 40\,000\ FT^3$$
$$= \underline{\underline{1480\ YD^3}}$$

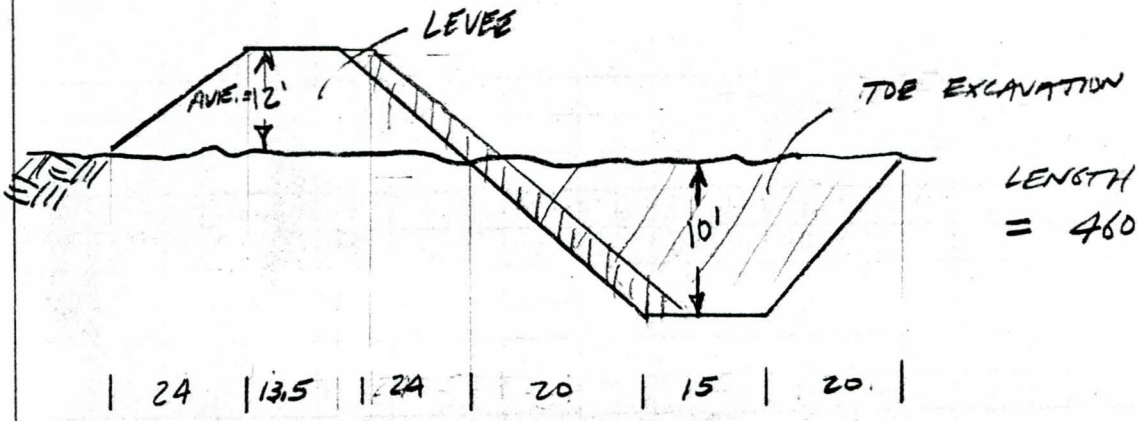
$$\text{COST} = (1480\ YD^3)(\$2.50\ /YD^3)$$
$$= \underline{\underline{\$3700.00}}$$

INCLUDES COST OF EXCAVATION AND PLACEMENT

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

101ST TO 109TH	2. CLEAR SITE AND REMOVE OBSTRUCTIONS	MARICOPA CO.	SWJ CDM

LEVEE :

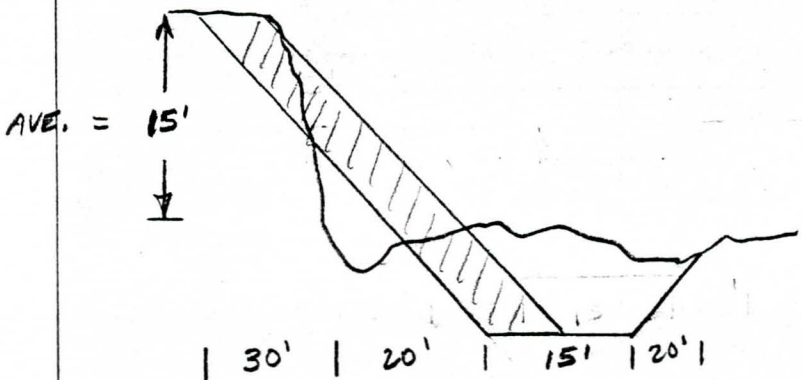


LENGTH OF LEVEE
= 4600 FT

WIDTH OF SITE CLEARING = 24' + 13.5' + 24' + 20' + 15' + 20'
= 116.5'

AREA = (116.5')(4600') = 535900 FT^2
= 12 ACRES

BANK PROTECTION



LENGTH OF BANK PROTECTION
= 740 FT

WIDTH OF SITE CLEARING = 30' + 20' + 15' + 20'
= 85'

AREA = (85')(740') = 62900
= 1.5 ACRES

TOTAL = 12 + 1.5 = 13.5 ACRES

LEVEE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: LEVEE QUANTITIES, 101st TO 109th AVE
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
986.70		0.0	0.0		
	680.0			268.6	268.6
993.50		2.0	24.0		
	1060.0			942.2	1210.8
1004.10		2.0	24.0		
	1190.0			1439.7	2650.5
1016.00		3.0	42.0		
	400.0			622.2	3272.7
1020.00		3.0	42.0		
	1000.0			666.4	3939.2
1030.00		0.0	0.0		
	========				==========

LENGTH = 4330.0 REQUIRED EXCAVATION = 4530.1

3.B EXCAVATION FOR LEVEE FILL

4.A COMPACTED FILL FOR LEVEE

TOE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: TOE CUT QUANTITIES, 101st TO 109th AVE
SIDE SLOPES: 2.0:1, 2.0:1
BOT WIDTH 15.0
COMPACTION FACTOR: 1.00
RUN DATE: 14-APR-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
986.70		10.0	350.0		
	680.0			8814.8	8814.8
993.50		10.0	350.0		
	1060.0			13740.7	22555.6
1004.10		10.0	350.0		
	1190.0			15425.9	37981.5
1016.00		10.0	350.0		
	0.0			0.0	37981.5
1016.00		19.0	1007.0		
	400.0			14918.5	52900.0
1020.00		19.0	1007.0		
	1000.0			42573.9	95473.9
1030.00		22.0	1298.0		
	1000.0			51987.6	147461.4
1040.00		24.0	1512.0		
	========				==========

LENGTH = 5330.0 REQUIRED EXCAVATION = 147461.4

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.

AVERAGE HEIGHT OF LEVEE = 2.5 FT

LENGTH OF LEVEE = 4530 FT

AREA = (4530')(2.5')(2.24) = 25400 FT^2

= 0.6 ACRES

THE UNIT COST IS \$ 200.00 /ACRE.

BECAUSE 0.6 ACRES IS A SMALL AREA, ASSUME START-UP COSTS INCREASE COST BY \$300.00.

(0.6 ACRES) (\$200/ACRE) + \$300.00

= ~~\$ 420.00~~ USE \$500.00

8. FLAP GATES

ASSUME FLAP GATES ARE NEEDED AT 103RD, 105TH, AND 107TH STREETS FOR LOCAL DRAINAGE. ASSUME DRAINGE WILL BE HANDLED THROUGH EXISTING DRAINAGE SYSTEMS ALONG WITH A SMALL EARTH DITCH TO BE CONSTRUCTED ADJACENT TO THE PROPOSED LEVEE.

9. INTERIOR DRAINAGE

3 INLETS FOR FLAP GATES @ \$3000 EA

(3)(\$ 3000.00) = \$9000.00

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

101ST TO 109TH AVE

STATION	REACH LENGTH (FT)	RIP-RAP VERT. HT (FT)	RIP-RAP AVE. VERT. HEIGHT (FT)	RIP-RAP AREA (2.24)(H)(L) FT²	RIP-RAP VOLUME FT³	RIP-RAP VOLUME YD³	FILTER MATERIAL VOLUME YD³
987.00	650	27	25	36400	72800	2700	680
993+50	60	24	24.5	3290	6590	240	60
1004+10	1190	25	23	61310	122600	4540	1140
1016+00	400	22	22	19710	39400	1460	370
1020+00	1000	22	23	51520	103040	3820	960
1030+00	1000	23	23.5	52640	105300	3900	980
1040+00		24					

$\Sigma = 16660$ $\Sigma = 4190$

7. ROCK RIPRAP 6. FILTER MATERIAL

6. FILTER MATERIAL
7. ROCK RIPRAP

MARICOPA CO. COM
SWT

A.C. PAVEMENT :

LENGTH OF LEVEE = 4530'

AREA OF A.C. = (4530')(8')

= 36240 FT²

11. LAND ACQUISITION

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

FROM ITEM 2, CLEAR SITE, THE WIDTH OF CLEARING FOR THE LEVEE = 116.5 FT AND FOR THE BANK STABILIZATION = 95' THE LEVEE LENGTH = 4600 FT, THE STABILIZATION = 740 FT.

LAND ACQUISITION = (116.5' + 20')(4600') + (95' + 20')(740')

= 705,600 FT²

= 16 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.

9. 113TH AVE. TO 119TH AVE. BANK

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

TABLE VII-5

BANK STABILIZATION, 113th to 119th AVENUES
COST ESTIMATE

QUANTITY TAKE-OFF				_____ ESTIMATE	
MARICOPA COUNTY FLOOD CONTROL DISTRICT				JOB NO.	
SALT-GILA INTERIM FLOOD CONTROL WORKS		COMPUTED BY SWJ		PREPARED BY	
HOLLY ACRES AREA BANK STABILIZATION		CHECKED BY PRG		CHECKED BY	
113th TO 119th AVENUES		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.	1,480
2	Clear Site and Remove Obstructions	9	ACRE	300	2,700
3	Excavation				
	A. For Channel	17,200	CY	1.50	25,800
	B. For Levee Fill	16,200	CY	1.50	24,300
	C. Toe	106,400	CY	2.50	266,000
4	Compacted Fill				
	A. Levees	14,100	CY	1.00	14,100
	B. Toe	106,400	CY	1.30	138,300
5	Vegetation Erosion Protection		JOB	L.S.	500
6	Filter Material	3,320	CY	18.00	59,800
7	Rock Rip-Rap	13,300	CY	18.00	239,400
8	Flap Gates	2	EA	2000	4,000
9	Interior Drainage				
	A. Collection		JOB	L.S.	6,000
	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	23,000	SF	1.00	23,000
	Total Construction Costs				805,400
	Contingencies, 15%				120,800
	Engineering and Design, 10%				92,600
	Supervision and Administration, 10%				92,600
11	Land Acquisition	11	ACRE	8000	88,000
	TOTAL FIRST COST				1,199,000

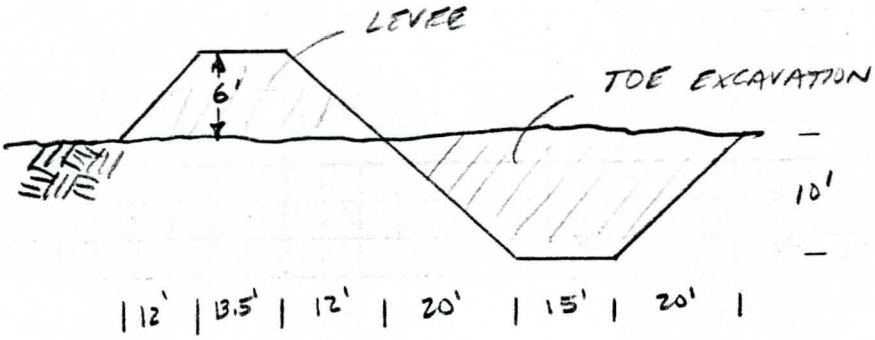
A DIVERSION LEVEE IS NEEDED UPSTREAM OF THE PROJECT TO DIVERT FLOW AWAY FROM THE LOW FLOW CHANNEL WHICH IS LOCATED ADJACENT TO THE NORTH BANK. A LARGER LOW FLOW CHANNEL IS LOCATED TO THE SOUTH. ASSUME A MAXIMUM HEIGHT OF 10', AN AVERAGE WIDTH OF 10' AND A LENGTH OF 400 FT.

$$\text{VOLUME} = (10')(10')(400')$$
$$= 40000\ FT^3$$
$$= \underline{\underline{1480\ YD^3}}$$

$$\text{COST} = (1480\ YD^3)(\$1.00/YD^3)$$
$$= \underline{\underline{\$\ 1480.00}}$$

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

LEVEE :



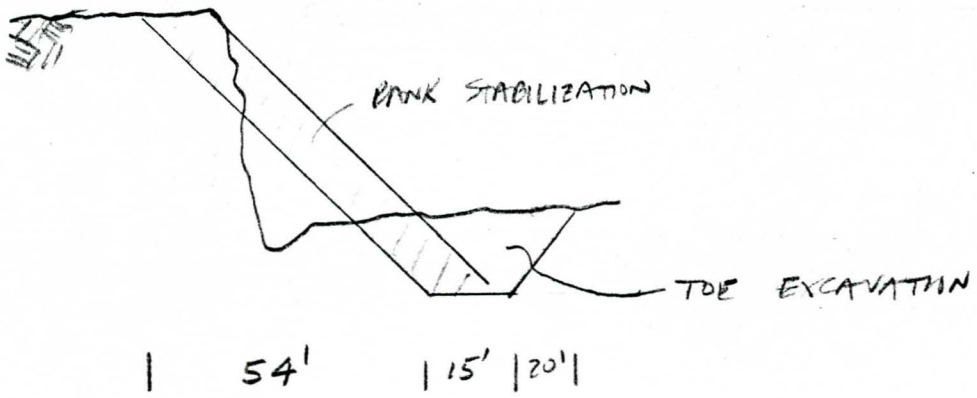
WIDTH OF CLEARING = 92.5 FT

LENGTH OF LEVEE = 3400 FT

AREA = (92.5') (3400') = 314,500 FT^2

= 7.2 ACRES

BANK :



WIDTH OF CLEARING = 89 FT

LENGTH OF BANK PROTECTION = 800 FT

AREA = (800 FT) (89 FT) = 71200 FT^2

= 1.6 ACRES

TOTAL = 1.6 + 7.2 = 8.8 ACRES

LEVEE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL

REACH: 113th TO 119th AVENUES
SIDE SLOPES: 2.0:1, 2.0:1
TOP WIDTH 8.0
COMPACTION FACTOR: 1.15
RUN DATE: 24-MAR-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
973.70		0.0	0.0		
	1370.0			5409.0	5409.0
987.40		10.0	280.0		
	220.0			1370.1	6779.0
989.60		4.5	76.5		
	330.0			2584.5	9363.6
992.90		12.0	384.		
	710.0			4486.1	13849.7
1000.00		2.0	24.0		
	100.0			88.9	13938.6
1001.00		2.0	24.0		
	140.0			169.4	14108.0
1002.40		3.0	42.0		
	0.0			0.0	14108.0
1002.40		0.0	0.0		
	========				==========
LENGTH =	2870.0		REQUIRED EXCAVATION =		16224.2

3.B EXCAVATION for LEVEE FILL

4.A COMPACTED FILL FOR LEVEE

LOW FLOW CHANNEL EXCAVATION:

ESTIMATED DEPTH OF EXCAVATION = 8'

LENGTH OF EXCAVATION = 500'

AVERAGE WIDTH OF EXCAVATION = 116'

VOLUME OF EXCAVATION = $(8')(500')(116')$

$= 4.64 \times 10^5 \ FT^3$

3.A. $= \underline{\underline{1.72 \times 10^4 \ YD^3}}$

TOE EXCAVATION

MARICOPA COUNTY INTERIM FLOOD CONTROL STUDY

REACH: TOE CUT, 113th TO 119th AVE
SIDE SLOPES: 2.0:1, 2.0:1
BOT WIDTH 15.0
COMPACTION FACTOR: 1.00
RUN DATE: 14-APR-81

STATION #	LENGTH ft	HEIGHT ft	AREA sqft	VOLUME cuyd	CUMM. VOLUME cuyd
973.50		22.0	1298.0		
	1390.0			47806.9	47806.9
987.40		14.0	602.0		
	220.0			6487.1	54294.1
989.60		19.0	1007.0		
	330.0			8379.8	62673.9
992.90		11.0	407.0		
	710.0			19102.8	81776.8
1000.00		20.0	1100.0		
	100.0			4074.1	85850.8
1001.00		20.0	1100.0		
	140.0			3586.1	89436.9
1002.40		10.0	350.0		
	610.0			7907.4	97344.3
1008.50		10.0	350.0		
	700.0			9074.1	106418.4
1015.50		10.0	350.0		
	========				==========

LENGTH = 4200.0 REQUIRED EXCAVATION = 106418.4

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.

113TH TO 119TH AVENUES

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)
973+50	1390	0	11.5	35800	71600	2650	660
987+40	220	23	23	11300	22700	840	210
989+60	330	23	23.5	17000	34000	1260	315
992+90	710	23	22.5	35800	71600	2650	660
1000+00	100	22	22.0	4900	9800	360	90
1001+00	140	22	22.0	6900	13800	510	130
1002+40	1310	22	23.0	67500	135000	5000	1250
1015+50		24					

$\Sigma = 13300$ $\Sigma = 3315$

7. ROCK RIPRAP 6. FILTER MATERIAL

6. FILTER MATERIAL
7. ROCK RIPRAP

MARICOPA CO. COM

5. VEGETATION EROSION PROTECTION

AVERAGE LEVEE HEIGHT = 6'

AREA = (6')(2.24)(2870')

= 38570 FT^2

= 0.9 ACRES

UNIT COST IS \$200.00/ACRE. BECAUSE 0.9 ACRES IS A SMALL AREA, ASSUME START-UP COSTS INCREASE COST BY \$300. (1 ACRE)(\$200/ACRE) + \$300 = COST.

= \$500.00

8. FLAP GATES

ASSUME TWO FLAP GATES, ONE AT 113TH AVENUE AND ONE AT 115TH AVENUE FOR LOCAL DRAINAGE. TWO INLETS FOR FLAP GATES @ \$3000.00 EACH.

10. ROAD WORK

ASPHALT CONCRETE PAVEMENT:

LENGTH OF LEVEE = 2970'

AREA OF A.C. = (2970')(9')

= 22960 FT^2

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

ASSUME ACQUISITION OF 10' OF LAND ON EACH SIDE OF THE LEVEE OR BANK PROTECTION. FROM ITEM 2, SITE CLEARING, LEVEE WIDTH = 92.5' AND BANK STABILIZATION WIDTH = 89'.

AREA FOR ACQUISITION =

$$(92.5' + 20')(3400') + (89' + 20')(800')$$

$$= 469{,}700 \text{ FT}^3$$

$$= \underline{\underline{10.8 \text{ ACRES}}}$$

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

Section 2. Benefit Calculations

1. Flood Depths
2. Damage Calculation Sheets
3. Summary of Damages
4. Annual Benefits

1. FLOOD DEPTHS

* Flood depths are given by section (1 square mile).
* Section are identified by river mile: mile 1 is from 91st Ave to 99th Ave
  mile 2 is from 99th Ave to 107th Ave
  etc.
* Sections are further identified by miles north of Baseline:

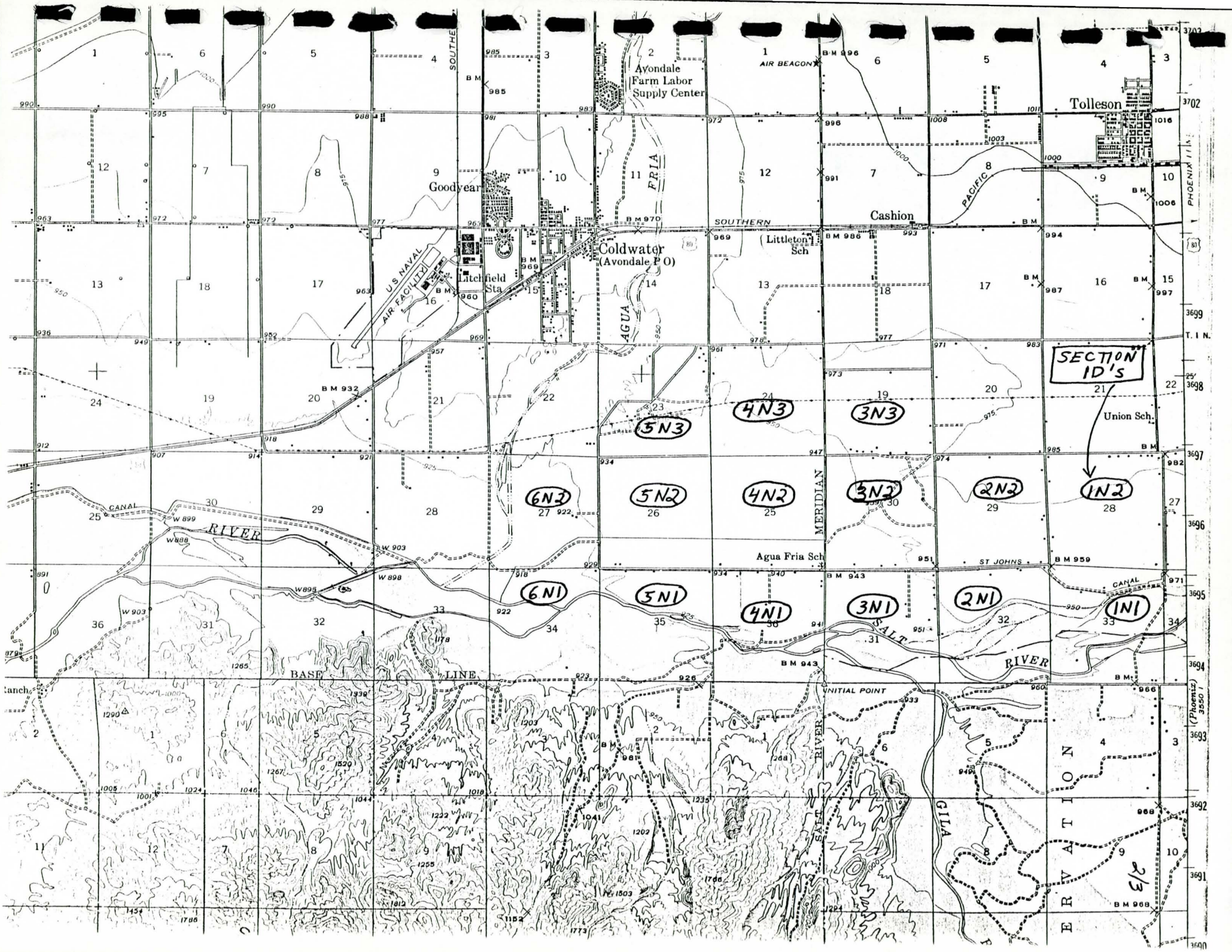
  1N1 : river mile 1, first section north of Baseline
  4N3 : river mile 4, third section north of Baseline

  SEE MAP ON NEXT PAGE

  note that Southern avenue divides the first and second sections north of Baseline

* Water surface elevations were computed using HEC-2 for an assumed cleared channel condition. Elevations of homes were estimated from topo maps, assuming first floor elevations about 1 foot higher than ground elevations. Where elevations vary substantially within a section, the elevation of most of the homes was taken. Flood depth is simply the difference between water surface and first floor elevations.

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


Avondale Farm Labor Supply Center
Tolleson
Goodyear
Cashion
Coldwater (Avondale P O)
Litchfield Sta
U S NAVAL AIR FACILITY
SOUTHERN PACIFIC
Littleton Sch
AGUA FRIA
SOUTHE
AIR BEACON
PHOENIX
T. 1 N.
SECTION ID's
Union Sch.
4N3
3N3
5N3
6N2
5N2
4N2
3N2
2N2
1N2
6N1
5N1
4N1
3N1
2N1
1N1
MERIDIAN
Agua Fria Sch
ST JOHNS
CANAL
RIVER
SALT RIVER
GILA
BASE LINE
INITIAL POINT
(Phoenix) 3550 I
2/3

SECTION \ FLOW	50,000	100,000	200,000	320,000	
1N1	0	0	0	0	
1N2	NO HOMES				
2N1	0	0	0	0	
2N2	0	0	0	0	
3N1	0	0	1	3	
3N2	0	1*	3*	4	
3N3	NO HOMES				
HOLLY ACRES SUBD. 4N1	0	1	3	5	
4N2	0	1*	3*	4	
4N3	NO HOMES				
5N1	0	1	3	5	
5N2	0	1**	3**	5	BACKWATER AFFECTED
5N3	NO HOMES				
6N1	0	1	3	5	
6N2	0	1	3	5	BACKWATER AFFECTED

* ST. JOHN'S CANAL LEVEE PROTECTS

** PROBABLY FLOODS DUE TO FLOW OVER (AND UNDER) SOUTHERN AVE. AFFECTS AT LEAST THE UPSTREAM HOMES

Notes:

1. All areas south of Southern (_N1 sections) can flood when W.S exceeds first floor elevation.
2. For 50,000 and 100,000 cfs, flow is contained south of Southern Ave. (no flow in _N2 sections) except at breaks
3. For 320,000 cfs, assume flow is unrestricted by Southern Ave.
4. For 200,000 cfs, it does not appear that flow can easily flow north of Southern Ave (_N2 sections) in general. The St. John's Canal is high enough to prevent flow from overtopping (it did not overtop at 170,000 cfs and no clearing in 1980) Backwater downstream (around Lyman Ave.) may flood some homes. Since it appears that overtopping of the canal would occur very close to 200,000 cfs, it will be assumed that all flows between 200,000 and ∞ cfs flood north of Southern Ave

2. DAMAGE CALCULATION SHEETS

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

JAN 8 1981

IN1

REV. 6/25/81

PRG

Section 33, T 1N., R 1E.

DAMAGE CATEGORY \ FLOW	50,000 c.f.s.			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)	12.0			20.0			30.0			45.0	4 / 180.0	4 / 180.0
2. BLOCK HOMES (NO.)	12.0			20.0			30.0			45.0		
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0	14 / 56.0	14 / 56.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)	0.25			0.25	30 / 7.5	15 / 3.8	0.25	60 / 15	30 / 7.5	0.25	220 / 55	220 / 55
6. PASTURE LAND (AC.)	0.1	40 / 4.0	20 / 2.0	0.1	40 / 4.0	20 / 2.0	0.1	40 / 4.0	20 / 2.0	0.1	40 / 4.0	40 / 4.0
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76	1/2 / 11.88	1/4 / 6.0	23.76	1/2 / 11.9	1/2 / 11.9	23.76	2 / 47.52	2 / 47.52
9. CANALS (MILES)	5.0			5.0			5.0			5.0	1 / 5.0	1 / 5.0
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	1 1/2 / 27.0	1 1/2 / 27.0
13. DIRT ROADS (MILES)	6.0			6.0			6.0	1 / 6	1 / 6	6.0	2 / 12.0	2 / 12.0
14. CROP LOSSES (AC.)	0.025			0.1			0.14	60 / 8.4	30 / 4.2	0.14	220 / 30.8	220 / 30.8
		4.0	2.0		23.4	11.8		45.3	31.6		417.3	417.3

*IN THOUSANDS OF DOLLARS

Section 28, T 1N, R 1E

1N2

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)										16.0	1 / 16.0	
2. BLOCK HOMES (NO.)										16.0	2 / 32.0	1 / 16.0
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0	1 / 4.0	1 / 4.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0	1 / 23.0	
5. CULTIVATED LAND (AC.)										0.15	360 / 54	160 / 24
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0	1 / 50.0	
8. FARM DITCHES (MILES)	23.76			23.76			23.76			23.76	3 1/2 / 83.16	2 / 47.52
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	1 1/4 / 22.5	3/4 / 13.5
13. DIRT ROADS (MILES)	6.0			6.0			6.0			6.0	3 1/4 / 19.5	2 / 12.0
14. CROP LOSSES (AC.)										0.14	360 / 50.4	160 / 22.4
											354.6	139.4

*IN THOUSANDS OF DOLLARS

2N1

Section 32, T 1N, R 1E

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)	12.0			20.0			30.0			45.0	5 / 225.0	4 / 180.0
2. BLOCK HOMES (NO.)	12.0			20.0			30.0			45.0	7 / 315.0	5 / 225.0
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0	2 / 8.0	
4. FARMSTEADS (NO.)	23.0			23.0			23.0	1 / 23.0		23.0	1 / 23.0	1 / 23.0
5. CULTIVATED LAND (AC.)	0.2			0.25	40 / 10	20 / 5	0.25	40 / 10	20 / 5	0.25	240 / 60	230 / 57.5
6. PASTURE LAND (AC.)	0.1	67 / 6.7	67 / 6.7	0.1	67 / 6.7	67 / 6.7	0.1	67 / 6.7	67 / 6.7	0.1	67 / 6.7	67 / 6.7
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76	1/2 / 11.88	1/8 / 2.97	23.76	1/2 / 11.88	1/8 / 2.97	23.76	4 / 95.04	4 / 95.04
9. CANALS (MILES)	5.0			5.0	1/8 / 0.63		5.0	1/8 / 0.63		5.0	1/8 / 0.63	
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0	1/4 / 4.5	1/8 / 2.25	18.0	1/4 / 4.5	1/8 / 2.25	18.0	1 / 18.0	1 / 18.0
13. DIRT ROADS (MILES)	6.0	1/8 / 0.75		6.0	1 / 6.0	1/2 / 3.0	6.0	1 / 6.0	1/2 / 3.0	6.0	3 / 18.0	3 / 18.0
14. CROP LOSSES (AC.)	0.25			0.1	40 / 4	20 / 2	0.14	40 / 5.6	20 / 2.8	0.14	240 / 33.6	230 / 32.2
		7.45	6.7		43.7	22.0		68.3	22.7		803.0	655.4

*IN THOUSANDS OF DOLLARS

Section 29, T 1N, R 1E

2NZ

DAMAGE CATEGORY \ FLOW	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)										16.0	4 / 64.0	3 / 48.0
2. BLOCK HOMES (NO.)										16.0	4 / 64.0	3 / 48.0
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0	4 / 16.0	2 / 8.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0	2 / 46.0	
5. CULTIVATED LAND (AC.)										0.15	140 / 21	120 / 18
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1	20 / 2.0	20 / 2.0
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76			23.76			23.76	2 / 47.52	1 1/2 / 35.64
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	3/4 / 13.5	1/2 / 9.0
13. DIRT ROADS (MILES)	6.0			6.0			6.0			6.0	1 1/2 / 9.0	1 / 6.0
14. CROP LOSSES (AC.)										0.14	140 / 19.6	120 / 16.8
											302.6	191.4

*IN THOUSANDS OF DOLLARS

Section 31, T 1N, R 1E

3N1

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)	12.0	1 / 12.0	1 / 12.0	20.0	5 / 100	5 / 100	30.0	5 / 150.0	5 / 150.0	45.0	5 / 225.0	5 / 225.0
2. BLOCK HOMES (NO.)	12.0	1 / 12.0	1 / 12.0	20.0	5 / 100	5 / 100	30.0	5 / 150.0	5 / 150.0	45.0	7 / 315.0	7 / 315.0
3. MOBILE HOMES (NO.)	4.0	1 / 4.0	1 / 4.0	4.0	2 / 8.0	2 / 8.0	4.0	2 / 8.0	2 / 8.0	4.0	2 / 8.0	2 / 8.0
4. FARMSTEADS (NO.)	23.0	2 / 46.0	1 / 23.0	23.0			23.0			23.0	2 / 46.0	2 / 46.0
5. CULTIVATED LAND (AC.)	0.25	80 / 20	45 / 11.3	0.25	130 / 32.5	130 / 32.5	0.25	260 / 65	260 / 65	0.25	260 / 65	260 / 65
6. PASTURE LAND (AC.)	0.1	60 / 6.0	35 / 3.5	0.1	66 / 6.6	66 / 6.6	0.1	66 / 6.6	66 / 6.6	0.1	66 / 6.6	66 / 6.6
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76	3/4 / 17.82	3/4 / 17.82	23.76	2 / 47.5	2 / 47.5	23.76	4 / 95.04	4 / 95.04	23.76	4 / 95.04	4 / 95.04
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0	1/3 / 6.0	1/4 / 4.5	18.0	3/4 / 13.5	3/4 / 13.5	18.0	1 1/4 / 22.5	1 1/4 / 22.5	18.0	1 1/4 / 22.5	1 1/4 / 22.5
13. DIRT ROADS (MILES)	6.0	3/4 / 4.5	1/2 / 3.0	6.0	1 1/2 / 9	1 1/2 / 9	6.0	3 / 18.0	3 / 18.0	6.0	3 / 18.0	3 / 18.0
14. CROP LOSSES (AC.)	0.025	80 / 2	45 / 1.1	0.1	130 / 13	130 / 13	0.14	260 / 36.4	260 / 36.4	0.14	260 / 36.4	260 / 36.4
TOTAL		130.3	92.2		330.1	330.1		551.5	551.5		837.5	837.5

*IN THOUSANDS OF DOLLARS

Section 30, T 1N, R 1E

3NZ

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)										16.0	48 / 768.0	48 / 768.0
2. BLOCK HOMES (NO.)										16.0	56 / 896.0	56 / 896.0
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0	20 / 80.0	20 / 80.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0	1 / 23.0	1 / 23.0
5. CULTIVATED LAND (AC.)										0.15	85 / 12.8	60 / 9
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1	40 / 4.0	40 / 4.0
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76			23.76			23.76	3 / 71.28	2 / 47.52
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0	1 / 10.0	1 / 10.0
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	1 / 18.0	1 / 18.0
13. DIRT ROADS (MILES)	6.0			6.0			6.0			6.0	4 / 24.0	4 / 24.0
14. CROP LOSSES (AC.)										0.14	85 / 11.9	60 / 8.4
											1919.0	1887.9

*IN THOUSANDS OF DOLLARS

Section 19, T 1N, R 1E

3N3

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)										16.0	7 / 112.0	2 / 32.0
2. BLOCK HOMES (NO.)										16.0		
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0	2 / 8.0	
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)										0.15		
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76			23.76			23.76		
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0	1 / 10.0	
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	1/8 / 2.3	1/16 / 1.13
13. DIRT ROADS (MILES)	6.0			6.0			6.0			6.0		
14. CROP LOSSES (AC.)										0.14		
											132.3	33.3

*IN THOUSANDS OF DOLLARS

4N1

Section 36, T 1N, R 1W

DAMAGE CATEGORY \ FLOW	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS	1000 FT. CLEARING UNITS	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS	1000 FT CLEARING UNITS	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS	1000 FT. CLEARING UNITS	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS	1000 FT. CLEARING UNITS
		DAMAGE*	DAMAGE*		DAMAGE*	DAMAGE*		DAMAGE*	DAMAGE*		DAMAGE*	DAMAGE*
1. FRAME HOMES (NO.)	12.0			20.0	26	26	30.0	26	26	45.0	26	26
					520.0	520.0		780.0	780.0		1170.0	1170.0
2. BLOCK HOMES (NO.)	12.0			20.0	34	34	30.0	34	34	45.0	34	34
					680.0	680.0		1020.0	1020.0		1530.0	1530.0
3. MOBILE HOMES (NO.)	4.0			4.0	4	4	4.0	4	4	4.0	4	4
					16.0	16.0		16.0	16.0		16.0	16.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)	0.25			0.25	180	180	0.25	180	180	0.25	180	180
					45	45		45	45		45	45
6. PASTURE LAND (AC.)	0.1			0.1	75	75	0.1	75	75	0.1	75	75
					7.5	7.5		7.5	7.5		7.5	7.5
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76	4	4	23.76	4	4	23.76	4	4
					95.04	95.04		95.04	95.04		95.04	95.04
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0	1/2	1/2	18.0	1/2	1/2	18.0	1/2	1/2
					9.0	9.0		9.0	9.0		9.0	9.0
13. DIRT ROADS (MILES)	6.0			6.0	3	3	6.0	3	3	6.0	3	3
					18.0	18.0		18.0	18.0		18.0	18.0
14. CROP LOSSES (AC.)	0.025			0.10	180	180	0.14	180	180	0.14	180	180
					18.0	18.0		25.2	25.2		25.2	25.2
					1408.5	1408.5		2015.7	2015.7		2915.7	2915.7

*IN THOUSANDS OF DOLLARS

Section 25, T 1N, R 1W

4N2

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)										16.0	5 / 80.0	5 / 80.0
2. BLOCK HOMES (NO.)										16.0	7 / 112.0	7 / 112.0
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0	11 / 44.0	11 / 44.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0	3 / 69.0	3 / 69.0
5. CULTIVATED LAND (AC.)										0.15	590 / 88.5	560 / 84
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1	17 / 1.7	17 / 1.7
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0	1 / 50.0	1 / 50.0
8. FARM DITCHES (MILES)	23.76			23.76			23.76			23.76	6 / 142.56	4 / 95.04
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	2 / 36.0	1 1/2 / 27.0
13. DIRT ROADS (MILES)	6.0			6.0			6.0			6.0	4 / 24.0	3 / 18.0
14. CROP LOSSES (AC.)										0.14	590 / 82.6	560 / 78.4
											730.4	659.1

*IN THOUSANDS OF DOLLARS

Section 24, T 1N, R 1W

4N3

DAMAGE CATEGORY \ FLOW	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)										16.0		
2. BLOCK HOMES (NO.)										16.0		
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0		
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)										0.15	120 18	100 15
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76			23.76			23.76	2 47.52	1 23.76
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	1/8 2.25	1/8 2.25
13. DIRT ROADS (MILES)	6.0			6.0			6.0			6.0	1 6.0	1/2 3.0
14. CROP LOSSES (AC.)										0.14	120 16.8	100 14.0
											90.6	58.0

*IN THOUSANDS OF DOLLARS

5N1

Section 35, T 1N, R 1W

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)				20.0	2 / 40.0	2 / 40.0	30.0	2 / 60.0	2 / 60.0	45.0	2 / 90.0	2 / 90.0
2. BLOCK HOMES (NO.)				20.0	2 / 40.0	2 / 40.0	30.0	2 / 60.0	2 / 60.0	45.0	2 / 90.0	2 / 90.0
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0		
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)				0.25	120 / 30.0	120 / 30.0	0.25	120 / 30.0	120 / 30.0	0.25	120 / 30.0	120 / 30.0
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76	2 / 47.52	2 / 47.52	23.76	2 / 47.52	2 / 47.52	23.76	2 / 47.52	2 / 47.52
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0	1/2 / 9.0	1/2 / 9.0	18.0	1/2 / 9.0	1/2 / 9.0	18.0	1/2 / 9.0	1/2 / 9.0
13. DIRT ROADS (MILES)	6.0			6.0	2 / 12.0	2 / 12.0	6.0	2 / 12.0	2 / 12.0	6.0	2 / 12.0	2 / 12.0
14. CROP LOSSES (AC.)				0.10	120 / 12.0	120 / 12.0	0.14	120 / 16.8	120 / 16.8	0.14	120 / 16.8	120 / 16.8
					190.5	190.5		235.3	235.3		295.3	295.3

*IN THOUSANDS OF DOLLARS

Section 26, T 1N, R 1W

5N2

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)				8.0	12 / 96	12 / 96	12.0	7 / 84	7 / 84	16.0	7 / 112.0	7 / 112.0
2. BLOCK HOMES (NO.)				8.0			12.0	46 / 552	46 / 552	16.0	46 / 736.0	46 / 736.0
3. MOBILE HOMES (NO.)	4.0			4.0			4.0	10 / 40	10 / 40	4.0	10 / 40.0	10 / 40.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)				0.15	20 / 3.0	20 / 3.0	0.15	200 / 30.0	200 / 30.0	0.15	430 / 64.5	410 / 61.5
6. PASTURE LAND (AC.)	0.1			0.1			0.1	37 / 3.7	37 / 3.7	0.1	37 / 3.7	37 / 3.7
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76	1/4 / 5.94	1/4 / 5.94	23.76	2 / 47.52	2 / 47.52	23.76	4 / 95.04	4 / 95.04
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0	1/8 / 2.25	1/8 / 2.25	18.0	1 3/4 / 31.5	1 3/4 / 31.5	18.0	2 / 36.0	1 3/4 / 31.5
13. DIRT ROADS (MILES)	6.0			6.0	1/4 / 1.5	1/4 / 1.5	6.0	3 / 18	3 / 18	6.0	6 / 36.0	6 / 36.0
14. CROP LOSSES (AC.)				0.10	20 / 2.0	20 / 2.0	0.14	200 / 28.0	200 / 28.0	0.14	430 / 60.2	410 / 57.4
					110.7	110.7		834.7	834.7		1183.4	1173.1

*IN THOUSANDS OF DOLLARS

Section 23, T 1N, R 1W

5N3

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)				8.0			12.0			16.0		
2. BLOCK HOMES (NO.)				8.0			12.0			16.0		
3. MOBILE HOMES (NO.)	4.0			4.0			4.0			4.0		
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)				0.15			0.15			0.15	130 / 19.5	60 / 9.0
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76			23.76			23.76	2 / 47.52	1 / 23.76
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0	1/8 / 2.25	1/8 / 2.25
13. DIRT ROADS (MILES)	6.0			6.0			6.0			6.0	1 / 6.0	3/4 / 4.5
14. CROP LOSSES (AC.)				0.10			0.14			0.14	130 / 18.2	60 / 8.4
											93.5	47.9

*IN THOUSANDS OF DOLLARS

Section 34, T 1N, R 1W

6N1

DAMAGE CATEGORY \ FLOW	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)	12.0	2 / 24.0	1 / 12.0	20.0	2 / 40.0	2 / 40.0	30.0	2 / 60.0	2 / 60.0	45.0	2 / 90.0	2 / 90.0
2. BLOCK HOMES (NO.)	12.0	3 / 36.0	2 / 24.0	20.0	3 / 60.0	3 / 60.0	30.0	3 / 90.0	3 / 90.0	45.0	3 / 135.0	3 / 135.0
3. MOBILE HOMES (NO.)	4.0	1 / 4.0	1 / 4.0	4.0	1 / 4.0	1 / 4.0	4.0	1 / 4.0	1 / 4.0	4.0	1 / 4.0	1 / 4.0
4. FARMSTEADS (NO.)	23.0	2 / 46.0	1 / 23.0	23.0	2 / 46.0	2 / 46.0	23.0	2 / 46.0	2 / 46.0	23.0	2 / 46.0	2 / 46.0
5. CULTIVATED LAND (AC.)	0.25	60 / 15	50 / 12.5	0.25	60 / 15	60 / 15	0.25	60 / 15	60 / 15	0.25	60 / 15	60 / 15
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76	1 / 23.76	1 / 23.76	23.76	1 / 23.76	1 / 23.76	23.76	1 / 23.76	1 / 23.76	23.76	1 / 23.76	1 / 23.76
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0			18.0			18.0		
13. DIRT ROADS (MILES)	6.0	1 / 6.0	1 / 6.0	6.0	1 / 6.0	1 / 6.0	6.0	1 / 6.0	1 / 6.0	6.0	1 / 6.0	1 / 6.0
14. CROP LOSSES (AC.)	0.025	60 / 1.5	50 / 1.25	0.10	60 / 6.0	60 / 6.0	0.14	60 / 8.4	60 / 8.4	0.14	60 / 8.4	60 / 8.4
		156.3	106.5		200.8	200.8		253.2	253.2		328.2	328.2

*IN THOUSANDS OF DOLLARS

Section 27, T 1N, R 1W

6N2

FLOW / DAMAGE CATEGORY	50,000 c.f.s			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.)				8.0	2 / 16.0	1 / 8.0	12.0	5 / 60.0	3 / 36.0	16.0	5 / 80.0	4 / 64.0
2. BLOCK HOMES (NO.)				8.0	3 / 24.0	2 / 16.0	12.0	7 / 84.0	5 / 60.0	16.0	7 / 112.0	6 / 96.0
3. MOBILE HOMES (NO.)	4.0			4.0	4 / 16.0	2 / 8.0	4.0	8 / 32.0	6 / 24.0	4.0	11 / 44.0	9 / 36.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)				0.15	40 / 6.0	30 / 4.5	0.15	100 / 15.0	80 / 12.0	0.15	430 / 64.5	370 / 55.5
6. PASTURE LAND (AC.)	0.1			0.1	30 / 3.0	30 / 3.0	0.1	30 / 3.0	30 / 3.0	0.1	30 / 3.0	30 / 3.0
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76	1/2 / 11.88	1/2 / 11.88	23.76	1 / 23.76	1 / 23.76	23.76	2 / 47.52	2 / 47.52
9. CANALS (MILES)	5.0			5.0	1 / 5.0	1 / 5.0	5.0	1 / 5.0	1 / 5.0	5.0	1 / 5.0	1 / 5.0
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0	3/4 / 13.5	3/4 / 13.5	18.0	4 / 72.0	3 1/2 / 63.0	18.0	4 / 72.0	4 / 72.0
13. DIRT ROADS (MILES)	6.0			6.0	2 / 12.0	2 / 12.0	6.0	4 / 24.0	3 1/2 / 21.0	6.0	4 / 24.0	4 / 24.0
14. CROP LOSSES (AC.)				0.10	40 / 4.0	30 / 3.0	0.14	100 / 14.0	80 / 11.2	0.14	430 / 60.2	370 / 51.8
					111.4	84.9		332.8	259.0		512.2	454.8

*IN THOUSANDS OF DOLLARS

HOLLY ACRES SUBDIVISION [redacted]ITH [redacted]RIN[redacted]EV[redacted]

Section 36, T 1N, R 1W

4N1 (PARTIAL)

FLOW / DAMAGE CATEGORY	50,000 c.f.s NO DAMAGE			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s.		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.) + BLOCK HOMES				20.0		45 / 900.0	30.0		45 / 1350.0	45.0		45 / 2025.0
~~2. BLOCK HOMES (NO.)~~												
3. MOBILE HOMES (NO.)	4.0			4.0		1 / 4.0	4.0		1 / 4.0	4.0		1 / 4.0
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)				0.25		10 / 2.5	0.25		10 / 2.5	0.25		10 / 2.5
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76		1 / 23.76	23.76		1 / 23.76	23.76		1 / 23.76
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0		1/2 / 9.0	18.0		1/2 / 9.0	18.0		1/2 / 9.0
13. DIRT ROADS (MILES)	6.0			6.0		1 1/2 / 9.0	6.0		1 1/2 / 9.0	6.0		1 1/2 / 9.0
14. CROP LOSSES (AC.)				0.10		10 / 1.0	0.14		10 / 1.4	0.14		10 / 1.4
TOTAL						949.3			1399.7			2074.7

*IN THOUSANDS OF DOLLARS

[redacted]DEVELOPMENT[redacted]NORTHWEST[redacted]OF[redacted]SOUTHERN AVE - 41 MILE INTERSECTION[redacted]

Section 26, T 1N, R 1W

5N2 (PARTIAL)

FLOW / DAMAGE CATEGORY	50,000 c.f.s NO DAMAGE			100,000 c.f.s.			200,000 c.f.s.			320,000 c.f.s. DAMAGES WOULD OCCUR EVEN WITH PROJECT - NOT SHOWN		
	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT*	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*	DAMAGE PER UNIT	NO. CHAN. CLEARING UNITS / DAMAGE*	1000 FT. CLEARING UNITS / DAMAGE*
1. FRAME HOMES (NO.) + BLOCK HOMES				8.0		12 / 96.0	12.0		25 / 300			
~~2. BLOCK HOMES (NO.)~~												
3. MOBILE HOMES (NO.)	4.0			4.0			4.0		1 / 4.0	4.0		
4. FARMSTEADS (NO.)	23.0			23.0			23.0			23.0		
5. CULTIVATED LAND (AC.)				0.15		20 / 3.0	0.15		70 / 10.5			
6. PASTURE LAND (AC.)	0.1			0.1			0.1			0.1		
7. DAIRIES & FEED LOTS (NO.)	50.0			50.0			50.0			50.0		
8. FARM DITCHES (MILES)	23.76			23.76		1/4 / 5.94	23.76		1/2 / 11.88	23.76		
9. CANALS (MILES)	5.0			5.0			5.0			5.0		
10. COMM. BLDGS. (NO.)	10.0			10.0			10.0			10.0		
11. PUBLIC BLDGS. (NO.)	76.0			76.0			76.0			76.0		
12. PAVED ROADS (MILES)	18.0			18.0		1/8 / 2.25	18.0		1/4 / 4.50	18.0		
13. DIRT ROADS (MILES)	6.0			6.0		1/4 / 1.50	6.0		1/2 / 3.0	6.0		
14. CROP LOSSES (AC.)				0.10		20 / 2.0	0.14		70 / 9.8			
TOTAL						102.7			343.7			

*IN THOUSANDS OF DOLLARS

3. SUMMARY OF DAMAGES

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

SALT - GILA
INTERIM FLOOD CONTROL WORKS

HOLLY ACRES
SUMMARY OF DAMAGES

REV. 6/23/81 PAG
1/9/81
PJM

1/1

THOUSANDS OF DOLLARS

SECTION	ID.	50,000 CFS NO CHAN. CLEARING	50,000 CFS 1000 FT. CLEARING	100,000 CFS NO CHAN. CLEARING	100,000 CFS 1000 FT. CLEARING	200,000 CFS NO CHAN CLEARING	200,000 CFS 1000 FT. CLEARING	320,000 CFS NO CHAN. CLEARING	320,000 CFS 1000 FT. CLEARING
33	1N1	4.0	2.0	23.4	11.8	45.3	31.6	417.3	417.3
28	1N2							354.6	139.4
32	2N1	7.45	6.70	43.7	22.0	68.3	22.7	803.0	655.4
29	2N2							302.6	191.4
31	3N1	130.3	92.2	330.1	330.1	551.5	551.5	837.5	837.5
30	3N2							1919.0	1887.9
19	3N3							132.3	33.30
36	4N1			1408.5	1408.5	2015.7	2015.7	2915.7	2915.7
25	4N2							730.4	659.1
24	4N3							90.6	58.0
35	5N1			190.5	190.5	235.3	235.3	295.3	295.3
26	5N2			110.7	110.7	834.7	834.7	1183.4	1173.1
23	5N3							93.5	47.9
34	6N1	156.3	106.5	200.8	200.8	253.2	253.2	328.2	328.2
27	6N2			111.4	84.9	332.8	259.0	512.2	454.8
TOTAL		298.1	207.4	2419.1	2359.3	4336.8	4203.7	10,915.6	10,094.3
Δ TOTALS			90.7		59.8		133.1		821.3
1N1 - 3N3		141.8	100.9	397.2	363.9	665.1	605.8	4766.3	4162.2
Δ			40.9		33.3		59.3		604.1
4N1 - 6N2		156.3	106.5	2021.9	1995.4	3671.7	3597.9	6149.3	5932.1
Δ			49.8		26.5		73.8		217.2

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

4. ANNUAL BENEFITS

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

NO CHANNEL CLEARING

DISCHARGE RANGE	AVG. DAMAGES	FREQ.	INCR. DAMAGES	TOTAL DAMAGES	TOTAL 1-6
REACHES 1,2,3					
40,000-50,000	70,900	.020	1,418		
50,000-100,000	269,500	.092	24,794		
100,000-200,000	531,100	.069	36,646		
200,000-320,000	2,715,700	.0072	19,553		
320,000-∞	4,766,300	.0018	8,579	90,990	
REACHES 4,5,6					
30,000-50,000	78,200	.030	2,346		
50,000-100,000	1,089,100	.087	94,752		
100,000-200,000	2,846,800	.073	207,816		
200,000-320,000	4,910,500	.0164	80,532		
320,000-∞	6,149,300	.0036	22,137	407,583	$498,600

1000' CHANNEL CLEARING

REACHES 1,2,3					
40,000-50,000	50,500	.020	1,010		
50,000-100,000	232,400	.092	21,381		
100,000-200,000	484,900	.069	33,458		
200,000-320,000	2,384,000	.0072	17,165		
320,000-∞	4,162,200	.0018	7,492	80,506	
REACHES 4,5,6					
30,000-50,000	53,300	.030	1,599		
50,000-100,000	1,051,000	.087	91,437		
100,000-200,000	2,796,700	.073	204,159		
200,000-320,000	4,765,000	.0164	78,146		
320,000-∞	5,932,100	.0036	21,356	396,697	$477,200

DIRECT BENEFIT OF 1000' CHANNEL CLEARING PROJECT = $21,400
INDIRECT BENEFIT ASSUMED TO BE 15 PERCENT OF DIRECT BENEFIT
TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(21,400) = $24,600

DIRECT BENEFIT OF LEVEE ALONG NORTH BANK PROJECT = $477,200
TOTAL BENEFIT = 1.15(477,200) = $548,800

HOLLY ACRES RING LEVEE

DISCHARGE RANGE	AVG. DAMAGES* PREVENTED	FREQ.	INCR. DAMAGES	TOTAL DAMAGES
50,000 - 100,000	526,000	.087	45,762	
100,000 - 200,000	1,397,700	.073	102,032	
200,000 - 320,000	1,909,000	.0164	31,308	
320,000 - ∞	2,074,700	.0036	7,469	186,600

*50,000 - 0 = 0
100,000 - 949,300 (south of Southern) + 102,700 (north of Southern) = 1,052,000
200,000 - 1,399,700 + 343,700 = 1,743,400
300,000 - 2,074,700 + 0 (area north of Southern floods anyway) = 2,074,700

DIRECT BENEFIT OF RING LEVEE PROJECT = $186,600
TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(186,600) = $214,600

SOUTHERN AVENUE-ELMIRAGE RD. IMPROVEMENTS

50,000 - 100,000	51,400	.087	4472	
100,000 - 200,000	223,200	.073	16,294	
200,000 - 320,000	171,900	.0164	2,819	
320,000 - ∞	0	.0036	0	$23,600

DIRECT BENEFIT OF PROJECT = $23,600
TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(23,600) = $27,100

LEVEE ALONG SOUTHERN AVENUE

REACHES 1, 2, 3

40,000 - 50,000	0	.020	0	
50,000 - 100,000	0	.092	0	
100,000 - 200,000	0	.069	0	
200,000 - 320,000	1,126,000	.0072	8107	
320,000 - ∞	2,252,000	.0018	4054	$12,200

REACHES 4, 5, 6

30,000 - 50,000	0	.030	0		
50,000 - 100,000	97,800	.087	8500		
100,000 - 200,000	644,700	.073	47,100		
200,000 - 320,000	1,743,300	.0164	28,600		
320,000 - ∞	2,392,900	.0036	8,600	$92,800	$105,000 =DIRECT BENEFIT

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(105,000) = $120,800

91st AVE. - 95th AVE. BANK

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

DAMAGES INCLUDE:
1. EROSION OF LAND ALONG BANK @ $8000/ACRE
2. DAMAGE TO ST. JOHNS CANAL @ 160,000/MILE
   BASED ON 1980 REPAIR COST OF $48,000 FOR 1600 FT.
   ON SO. EXTENSION OF BUCKEYE CANAL

EXTENT OF DAMAGE BASED ON ONE POSSIBLE SCENARIO:

1. EROSION OF 2 ACRES OF LAND = $16,000
2. CANAL BREACH OF 1000 FT. = $30,000

$46,000

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

ANNUAL DIRECT BENEFIT: $46,000 (.18) = $8,300/yr.

INDIRECT BENEFIT ASSUMED TO BE 15 PERCENT OF DIRECT BENEFIT

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(8,300) = $9500

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

101ST AVE. - 109TH AVE. BANK

DAMAGES ARE NOT SIGNIFICANT BELOW 100,000 cfs IN THIS AREA (ASSUMING CHANNEL CLEARING IS PERFORMED)

BETWEEN 100,000 cfs AND 250,000 cfs, LEVEED BANK WILL PREVENT FLOW FROM DIRECTLY FLOODING NORTH OVERBANK. BACKWATER MAY STILL POND IN SOME AREAS. ABOVE 250,000 cfs, ASSUME NO BENEFITS.

DISCHARGE (cfs)	101st-111st FLOODED AREA W/O PROJECT (AC)	PONDED AREA W/ PROJECT (AC)	PROTECTED AREA W/ PROJECT (AC)	DEPTH OF PONDING (ft)	HOMES W/O PROJECT	HOMES PONDED W/ PROJECT
150,000	144	110	34	1	0	0
200,000	200	166	34	2	6	6
250,000	234	220	14	3	8	8

UNIT DAMAGE VALUES

RE-GRADING*

$250/ac. IF FLOW RUNS THROUGH
$150/ac. FOR PONDING
$0/ac IF PROTECTED
} APPLIES TO ALL FLOWS

CROPS**

$140/ac FOR ALL AREA THAT GETS WET - 200,000, 250,000 cfs
$100/ac " " " " " " - 150,000

STRUCTURES***

150,000 - $16/ac
200,000 - $34/ac
250,000 - $68/ac
} THESE VALUE APPLY TO AVERAGE FLOODING (MOSTLY PONDING) FOR FLOWING AREAS, ASSUME DOUBLE VALUES SHOWN

HOMES****

	FLOWING WATER	PONDED WATER
150,000 -	NO HOMES FLOODED	
200,000 -	$20,000	$8,000
250,000 -	$25,000	$10,000

* BASED ON GREAT WESTERN RESEARCH, BUCKEYE IRRIGATION CO. AND CAWCS VALUES.

** CROP LOSSES BASED ON CAWCS (DEPTH DEPENDENT)

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

**** HOMES CONSIDERED IN ADDITION TO STRUCTURES DUE TO THE GREATER THAN NORMAL NUMBER OF HOMES IN THIS AREA. HOMES ASSUMED TO BE 1' ABOVE GROUND

BENEFIT COMPUTATIONS

* 150,000 cfs:

RE-GRADING:

AREA CHANGED FROM FLOWING TO PONDING
110 ac @ $100/ac = 11,000
AREA CHANGED FROM FLOWING TO DRY
34 ac @ 250/ac = 8,500

CROPS:

AREA PROTECTED
34 ac @ 100/ac = 3,400
AREAS STILL PONDED: NO BENEFIT

STRUCTURES:

AREA CHANGED FROM FLOWING TO PONDING
110 ac @ $16/ac = 1,800
AREA CHANGED FROM FLOWING TO DRY
34 ac @ 32/ac = 1,100

HOMES:
NO BENEFITS

TOTAL BENEFITS = $25,800

* 200,000 cfs:

RE-GRADING:
166 ac @ 100/ac = 16,600
34 ac @ 250/ac = 8,500
CROPS:
34 ac @ 140/ac = 4,800
STRUCTURES:
166 ac @ 34/ac = 5,600
34 ac @ 68/ac = 2,300
HOMES:

6 @ (20,000 − 8,000) = 72,000

TOTAL BENEFITS = 110,000

* 250,000 cfs:

RE-GRADING:

220 ac @ 100/ac	=	22,000
14 ac @ 250/ac	=	3,500
CROPS:		
14 ac @ 140/ac	=	2,000
STRUCTURES:		
220 ac @ 68/ac	=	15,000
14 ac @ 136/ac	=	1,900
HOMES:		
8 @ (25,000 - 10,000)	=	120,000
TOTAL BENEFITS	=	164,400

ANNUAL BENEFITS

	100 - 150,000 cfs	150 - 200,000 cfs	200 - 250,000 cfs	250,000 cfs UP
AVG. BENEFITS	12,900	68,000	137,000	NONE
FREQUENCY	.025	.01	.0044	
INCREMENTAL DAMAGES	320	680	600	TOTAL DIRECT BENEFIT = $1600

INDIRECT BENEFIT ASSUMED TO BE 15 PERCENT OF DIRECT BENEFIT

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(1600) = $1800

113TH AVE.-119TH AVE. BANK

LEVEE AND BANK STABILIZATION WILL DIRECT FLOWS TO THE SOUTH AND AWAY FROM HOLLY ACRES SUBDIVISION. THE LEVEE WILL BE OVERTOPPED AT 130,000 cfs. OVER 200,000 cfs, ASSUME FEW BENEFITS, SINCE A CONSIDERABLE AMOUNT OF FLOW COULD FLOW OVER AND AROUND THE LEVEE. BELOW 30,000 cfs, THERE ARE NO SIGNIFICANT DAMAGES.

THEREFORE, BENEFITS OCCUR BETWEEN 30,000 cfs AND 200,000 cfs. ONLY A SMALL AMOUNT OF THE BENEFITS WOULD BE IN THE FORM OF TOTAL PROTECTION OF THE AREA BEHIND THE LEVEE. MOST OF THE BENEFIT WOULD BE REDUCTION OF FLOW VELOCITIES IN THE NORTH OVERBANK FROM 115TH AVE. TO THE AGUA FRIA RIVER.

ONE WAY TO ROUGHLY ESTIMATE BENEFITS WOULD BE TO RE-CALCULATE THE FLOOD DAMAGES FROM 115TH AVE. TO THE AGUA FRIA BASED ON PONDED RATHER THAN FLOWING WATER. SPECIFICALLY, THE DAMAGES PREVIOUSLY CALCULATED WOULD BE CHANGED AS FOLLOWS:

IN SECTIONS 4N1, 5N1 AND 6N1 ONLY AND FOR 50,000, 100,000 AND 200,000 cfs

* REDUCE DAMAGE TO HOMES FROM:		TO:	BENEFIT
50,000	12,000	NONE*	12,000 ea.
100,000	20,000	8,000	12,000 ea.
200,000	30,000	12,000	18,000 ea.

* ASSUME LEVEE SUCCESSFULLY INCREASES CONVEYANCE IN CLEARED CHANNEL SUCH THAT DAMAGES IN HOLLY ACRES ARE ELIMINATED

* REDUCE RE-GRADING FROM $250/ac. TO $150/ac $100/ac BENEFIT

* REDUCE STRUCTURAL DAMAGES 50%
SUM OF ALL OTHER CATEGORIES EXCEPT CROP LOSSES

* NO CHANGE IN CROP LOSSES

	50,000 cfs			100,000 cfs			200,000 cfs		
CATEGORY	BENEFIT/UNIT	UNITS	BENEFIT	BEN/UNIT	UNITS	BEN.	BEN/UNIT	UNITS	BEN.
1. F. HOMES	12,000	1	12,000	12,000	30	360,000	18,000	30	540,000
2. B. HOMES	12,000	2	24,000	12,000	39	468,000	18,000	39	702,000
3. M. HOMES	2,000	1	2,000	2,000	5	10,000	2,000	5	10,000
4. FARMSTEADS	12,000	1	12,000	12,000	2	24,000	12,000	2	24,000
5. CULT. LAND	100	50	5,000	100	360	36,000	100	360	36,000
6. PASTURELAND	50	—	—	50	75	4,000	50	75	4,000
7. DAIRIES	25,000	—	—	25,000	—	—	25,000	—	—
8. DITCHES	12,000	1	12,000	12,000	7	84,000	12,000	7	84,000
9. CANALS	2500	—	—	2500	—	—	2500	—	—
10. COM. BLDGS	5000	—	—	5000	—	—	5000	—	—
11. PUB. BLDGS	38,000	—	—	38,000	—	—	38,000	—	—
12. PAVED RDS.	9,000	—	—	9,000	1	9,000	9,000	1	9,000
13. DIRT RDS.	3,000	1	3,000	3,000	6	18,000	3,000	6	18,000
TOTAL			70,000			1,013,000			1,427,000

ANNUAL BENEFITS

	30,000-50,000	50-100,000	100-200,000	200,000 UP
AVG. BENEFITS	35,000	542,000	1,220,000	—
FREQUENCY	.030	.087	.073	
INCREMENTAL BENEFITS	1,000	47,100	89,100	

TOTAL DIRECT BENEFIT = $137,200

INDIRECT BENEFIT ASSUMED TO BE 15 PERCENT OF DIRECT BENEFIT.

TOTAL BENEFIT = DIRECT BENEFIT + INDIRECT BENEFIT = 1.15(137,200) = $157,800

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