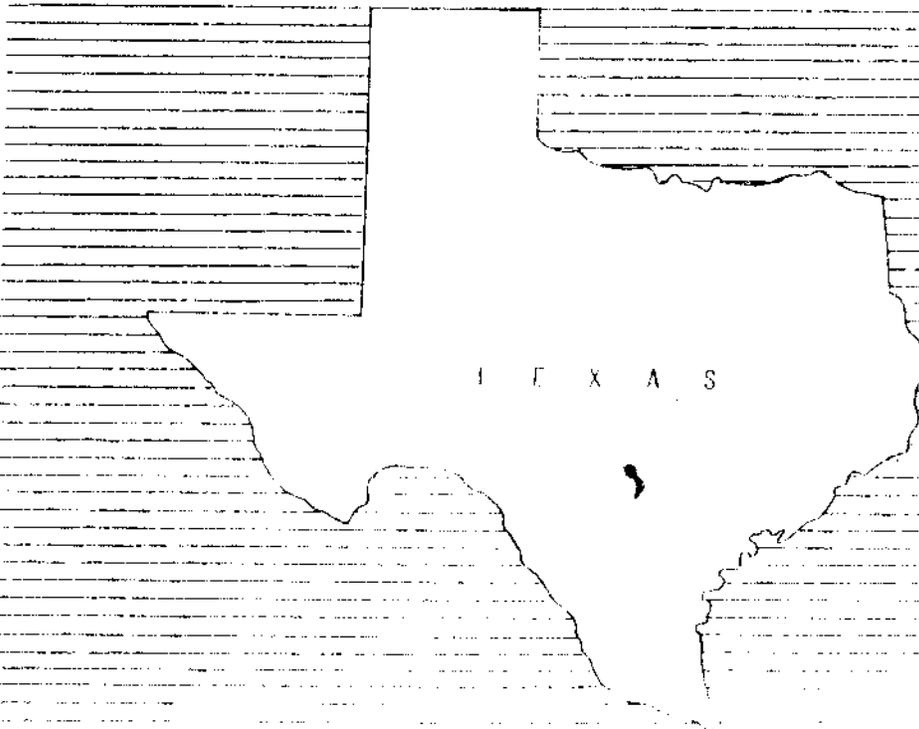


SUPPLEMENTAL
WORK PLAN

FOR WATERSHED PROTECTION AND FLOOD PREVENTION

SALADO CREEK WATERSHED

BEXAR COUNTY, TEXAS



September 1968

TABLE OF CONTENTS

	<u>Page</u>
SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT	i
PURPOSE OF THE SUPPLEMENTAL WORK PLAN	1
SUMMARY OF PLAN	1
General Summary	1
Land Treatment Measures	1
Structural Measures	2
Damages and Benefits	2
Operation and Maintenance	2
WATERSHED PROBLEMS	3
Floodwater Damage	3
Sediment Damage	3
Erosion Damage	3
WORKS OF IMPROVEMENT TO BE INSTALLED	3
Land Treatment Data	3
Structural Measures	4
EXPLANATION OF INSTALLATION COST	4
Schedule of Obligations	5
EFFECTS OF WORKS OF IMPROVEMENT	5
PROJECT BENEFITS	6
COMPARISON OF BENEFITS AND COSTS	9
PROJECT INSTALLATION	9
Land Treatment Measures	9
Structural Measures	9
FINANCING PROJECT INSTALLATION	10
PROVISIONS FOR OPERATION AND MAINTENANCE	10
Structural Measures	10
TABLES	
Revised Table 1 - Estimated Project Installation Cost	11
Revised Table 2 - Estimated Structure Cost Distribution	12
Revised Table 3 - Structure Data - Floodwater Retarding Structures	13-14
Revised Table 4 - Annual Cost	15
Revised Table 5 - Estimated Average Annual Flood Damage Reduction Benefits	16
Revised Table 6 - Comparison of Benefits and Cost for Structural Measures	17
INVESTIGATIONS AND ANALYSES	18
Project Formulation	18
Land Treatment Measures	18
Structural Measures	18
Sedimentation Investigations	19
Sediment Source Studies	19
Geologic Investigations	19
Description of Problems	19
Ground Water Recharge Investigations	20
Economic Investigations	21
Benefits from Reduction of Damage	21
Incidental Recreation Benefits	21
Incidental Benefits from Ground Water Recharge	21
Secondary Benefits	21
Appraisal of Land and Easement Values	21
FIGURES AND PLATES	
Revised Plate 5 - Project Map	

SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT

between the

Alamo Soil and Water Conservation District
(Formerly Alamo Soil Conservation District)
 (Local Organization)

San Antonio River Authority
 (Local Organization)

(Hereinafter referred to as the Sponsoring Local Organization)

located in the State of Texas

and the

Soil Conservation Service
 United States Department of Agriculture

(Hereinafter referred to as the Service)

Whereas, the Watershed Work Plan Agreement for Salado Creek Watershed, State of Texas, executed by the sponsoring local organizations named therein and the Service, became effective the 26th day of April 1962; and

Whereas, it has become necessary to modify the watershed work plan by deleting two floodwater retarding structures, adding three floodwater retarding structures, and changing storage capacities in one floodwater retarding structure because expensive improvements, including residences, a rock quarry, and important county and State roads, have occupied, to some extent, the sites of two floodwater retarding structures as originally planned; and

Whereas, modification of the watershed work plan dated March 1962 has been prepared through cooperative efforts of the Sponsoring Local Organizations and the Service, and which changes are annexed to and made a part of this agreement; and

Whereas, all references to the Alamo Soil Conservation District in the work plan agreement and the work plan are changed to read: "Alamo Soil and Water Conservation District"; and

Whereas, the project installation period has been extended from five to eight years.

Now, therefore, the Sponsoring Local Organizations and the Service hereby agree upon the following modifications of the terms, conditions, and stipulations of said watershed work plan agreement:

1. Paragraph numbered 1 is modified to read as follows:

The Sponsoring Local Organizations will acquire without cost to the Federal Government such land, easements, or rights-of-way as will be needed in connection with the works of improvement. (Estimated cost \$341,870)

2. Paragraph numbered 3 is modified to read as follows:

The percentages of construction costs of structural measures for flood prevention to be paid by the Sponsoring Local Organizations and by the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization (percent)</u>	<u>Service (percent)</u>	<u>Estimated Construction Cost (dollars)</u>
17 Floodwater Retarding Structures	0	100	3,229,502

3. Paragraph numbered 4 is modified to read as follows:

The Service will bear the cost of all installation services applicable to works of improvement for flood prevention. (Estimated cost \$585,928)

4. Paragraph numbered 5 is modified to read as follows:

The Sponsoring Local Organizations will bear the costs of administering contracts. (Estimated cost \$8,500)

5. Paragraph numbered 14 is added and reads as follows:

The program conducted will be in compliance with all requirements respecting non-discrimination as contained in the Civil Rights Act of 1964, and the regulations of the Secretary of Agriculture (7 C.F.R. Sec. 15.1-15.13), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participating in, be denied the benefits of, or be subjected to discrimination under any activity receiving Federal financial assistance.

Alamo Soil and Water Conservation District
Local Organization

By Johnny Dudek Jr.
JOHNNY DUDEK, JR.
Title Chairman, Board of Supervisors

Date January 7, 1969

The signing of this agreement was authorized by a resolution of the governing body of the Alamo Soil and Water Conservation District
Local Organization

adopted at a meeting held on January 7, 1969

Elmer Pape
(Secretary, Local Organization)
ELMER PAPE

Date January 7, 1969

San Antonio River Authority
Local Organization

By Leslie R. Neal
LESLIE R. NEAL
Title Chairman of the Board of Directors

Date January 15, 1969

The signing of this agreement was authorized by a resolution of the governing body of the San Antonio River Authority
Local Organization

adopted at a meeting held on January 15, 1969



Hugh B. Ruckman Jr.
(Secretary, Local Organization)
HUGH B. RUCKMAN, JR.

Date January 15, 1969

Soil Conservation Service
United States Department of Agriculture

By _____
State Conservationist

Date _____

SUPPLEMENTAL
WORK PLAN
FOR
WATERSHED PROTECTION AND FLOOD PREVENTION
SALADO CREEK WATERSHED
Bexar County, Texas

Prepared Under the Authority of the Watershed
Protection and Flood Prevention Act, (Public Law
566, 83rd Congress, 68 Stat. 666), as amended.

Prepared By:

Alamo Soil and Water Conservation District
(Sponsor)

San Antonio River Authority
(Sponsor)

With Assistance By:

U. S. Department of Agriculture
Soil Conservation Service
September 1968

SUPPLEMENTAL
WATERSHED WORK PLAN

SALADO CREEK WATERSHED

Bexar County, Texas
September 1968

PURPOSE OF THE SUPPLEMENTAL WORK PLAN

It has become necessary to modify the watershed work plan, dated March 1962, because extensive developments have occurred in the pool areas of planned floodwater retarding structure sites Nos. 13 and 14. Sites Nos. 13A, 13B, and 15A are to be added to the plan, and sites Nos. 13 and 14 are to be deleted. Planned structure No. 15 is re-designed as No. 15 (Rev.) as a result of the addition of Site No. 15A upstream. Land treatment to be applied during project installation period has been updated.

There will be no change in drainage area controlled by structural measures, and there will be no significant change in reductions of damages that will result from project installation. Damages and benefits have been updated to reflect adjusted normalized prices.

The following are changes and modifications that are to be made in appropriate parts of the work plan:

SUMMARY OF PLAN

General Summary

The fifth paragraph is modified to read:

"The work plan proposes installing, in an 8-year period, a project for the protection and development of the watershed at a total estimated installation cost of \$5,029,211. The share of this cost to be borne by Public Law 566 funds is \$3,828,280. The share to be borne by other than Public Law 566 funds is \$1,200,931. In addition, the local interests will bear the entire cost of operation and maintenance."

Land Treatment Measures

The paragraph is modified to read:

"The cost for land treatment measures is estimated to be \$863,411, of which the other than Public Law 566 share is \$850,561, including expected reimbursements from ACPS and \$30,970 to be spent by the Soil Conservation Service under its going program for technical assistance during the project installation period. The Public Law 566 share, consisting entirely of accelerated technical

assistance, is \$12,850. The work plan includes only the land treatment that will be installed during the 8-year period."

Structural Measures

The paragraph is modified to read:

"The structural measures included in the plan consist of 17 floodwater retarding structures having a total sediment storage and floodwater detention capacity of 47,982 acre-feet. The total cost of structural measures is \$4,165,800, of which the local share is \$350,370 and the Public Law 566 share is \$3,815,430. The local share of the cost of structural measures includes land easements and rights-of-way, 97.6 percent, and administering contracts, 2.4 percent. The 17 floodwater retarding structures will be installed during an 8-year period."

Damages and Benefits

The second, third, and fourth paragraphs are modified to read:

"The estimated average annual floodwater, sediment, flood plain erosion, and indirect damages without the project total \$106,174. The estimated average annual floodwater, sediment, flood plain erosion, and indirect damages with the project installed, including land treatment and structural measures amount to \$13,617, a reduction of approximately 87 percent.

"The average annual benefits accruing to structural measures are \$681,731, which are distributed as follows:

Floodwater damage reduction	\$ 75,127
Sediment damage reduction	1,401
Flood plain erosion damage reduction	1,070
Indirect damage reduction	14,515
Benefits from changed land use (Urban development)	58,746
Benefits outside project area (Reduction of damages on mainstem San Antonio River)	9,215
Benefits from incidental ground water recharge	21,000
Benefits from incidental recreation	440,000
Secondary benefits	60,657

The ratio of the average annual benefits (\$681,731) to the average annual cost of structural measures (\$144,537) is 4.7:1.0."

Operation and Maintenance

The second and third paragraphs, first sentences are modified to read:

"The San Antonio River Authority will be responsible for the operation and maintenance of the 17 floodwater retarding structures."

"The estimated average annual cost of operation and maintenance of all structural measures is \$3,400."

WATERSHED PROBLEMS

Floodwater Damage

The seventh paragraph is modified to read:

"For the floods expected to occur during the evaluation period, which includes floods up to the 100-year frequency, the total direct floodwater damage is estimated to average \$86,138 annually at adjusted normalized price levels (table 5) of which \$5,092 is crop and pasture damage, \$7,623 is other agricultural damage, \$20,000 is nonagricultural damage to roads and bridges, and \$53,423 is to urban and other nonagricultural development."

The eighth paragraph, last sentence, is modified to read:

"The total average annual value of such damages is estimated to be \$16,175."

Sediment Damage

The first paragraph, last sentence is modified to read:

"This damage amounts to an average of \$1,938 (table 5) at adjusted normalized price levels."

Erosion Damage

The second paragraph, last sentence, is modified to read:

"This represents an average annual monetary damage of \$1,923 (table 5) at adjusted normalized price levels."

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Data

The third paragraph is modified to read:

"The amounts and estimated costs of measures that will be installed by landowners and operators during the 8-year installation period are shown in revised Table 1. The local people will continue to install and maintain land treatment measures needed after the 8-year installation period."

Structural Measures

The first, third, fourth, and seventh paragraphs are modified to read:

"A system of 17 floodwater retarding structures having an installation cost of \$4,165,800 will be installed to afford the needed protection to flood plain lands and urban property which cannot be provided by land treatment measures alone."

"The location of the structural measures are shown on the revised Project Map, Plate 5. Structural measures were not found to be feasible on Beitel and Rosillo Creeks because of adverse physical and economic conditions."

"This system of structures will detain runoff from approximately 54 percent of the entire watershed and 75 percent of the area above U. S. Highway 81. The 17 floodwater retarding structures will have a total floodwater detention capacity of 41,886 acre-feet and will detain an average of 6.70 inches of runoff from the watershed area above them. The sediment storage provided in the 17 floodwater retarding structures will be adequate for 100-year accumulation."

"Refer to revised tables 1, 2, and 3 for details on quantities, costs, and design features of the floodwater retarding structures."

EXPLANATION OF INSTALLATION COST

The first paragraph, first and third sentences are modified to read:

"Public Law 566 funds are expected to provide technical assistance in the amount of \$12,850 during the 8-year installation period to accelerate the installation of land treatment measures included in the plan for watershed protection."

"Local interests will install these measures at an estimated cost of \$819,591, which includes ACPs payments based on present program criteria (revised table 1)."

The second and third paragraphs are modified to read:

"The required local costs for structural measures consisting of the value of land easements (\$256,430); changes in utilities (\$23,000) and roads (\$46,340); removal and relocation of improvements (\$12,400); legal fees (\$3,700); and administration of contracts (\$8,500) are estimated at \$350,370. Representatives from the county and city governments, real estate interests, ranchers, and businessmen provided these estimated costs."

"The entire construction cost for structural measures amounting to \$3,229,502 will be borne by Public Law 566 funds. In addition the installation services of \$585,928 will be a Public Law 566

expense. This is a total Public Law 566 cost of \$3,815,430 for the installation of structural measures."

The sixth paragraph, first sentence and schedule of obligations are modified to read:

"The estimated schedule of obligations for the 8-year installation period, covering installation of land treatment and structural measures, is as follows:

<u>Schedule of Obligations</u>				
Fiscal :		: Public Law :	Other :	
Year :	Measure	: 566 Funds :	Funds :	: Total
		(dollars)	(dollars)	(dollars)
1st	Structures Nos. 1 and 2	517,694	27,015	544,709
	Land Treatment	1,606	106,320	107,926
2nd	Structures Nos. 8 and 9	392,351	28,250	420,601
	Land Treatment	1,606	106,320	107,926
3rd	Structures Nos. 12 and 13A	392,952	33,770	426,722
	Land Treatment	1,606	106,320	107,926
4th	Structures Nos. 13B and 11	360,003	20,400	380,403
	Land Treatment	1,606	106,320	107,926
5th	Structures Nos. 10 and 4	437,336	22,180	459,516
	Land Treatment	1,606	106,320	107,926
6th	Structures Nos. 3, 5, and 6	808,926	63,400	872,326
	Land Treatment	1,606	106,320	107,926
7th	Structures Nos. 7 and 15A	467,925	67,330	535,255
	Land Treatment	1,607	106,320	107,927
8th	Structures Nos. 15(Rev.) and 16	438,243	88,025	526,268
	Land Treatment	1,607	106,321	107,928
Total		3,828,280	1,200,931	5,029,211

EFFECTS OF WORKS OF IMPROVEMENT

Paragraph added after ninth paragraph:

"Incidental recreation benefits will result from the installation of floodwater retarding structure No. 15 (Rev.). The city of San Antonio has spent in excess of \$500,000 to purchase 713 acres of land for a recreational complex around the proposed location of the structure. The Department of Parks and Recreation of the city

of San Antonio is presently developing the area, known as Northeast Preserve, in anticipation of the installation of floodwater retarding structure No. 15 (Rev.). Approximately \$200,000 has been spent on roads, picnic areas, nature trails, and sanitary facilities. It is estimated that an additional \$1,200,000 will be spent on completing the planned recreational developments when floodwater retarding structure No. 15 (Rev.) is installed. The city of San Antonio plans to increase the size of the sediment pool from the planned 58 surface acres to approximately 90 surface acres. This will be accomplished by excavating around the proposed sediment pool to a minimum depth of two feet. Some excavation has been done around the proposed sediment pool. The present use of Northeast Preserve is estimated at 350,000 visitors annually. With the completion of the proposed structure, attendance is expected to increase to one million visitors annually.

The tenth paragraph is modified to read:

"Additional incidental water management benefits will result from the installation of floodwater retarding structures numbers 3, 4, 5, 6, 8, 9, 10, 11, 12, 13A, and 13B. It is estimated that these structures, which are located on the Edwards outcrop will increase the ground water recharge into the Edwards and associated limestones by an average of 3,000 acre-feet annually during the evaluation period."

Paragraph added after tenth paragraph:

"Secondary benefits, including increased business activity and improved economic conditions in the San Antonio area, will result from the installation of the project. Sales and services in connection with recreational activities will be increased. The operation and maintenance of the project measures will provide some employment opportunities for local residents."

PROJECT BENEFITS

The first paragraph is modified to read:

"The estimated average annual monetary floodwater, sediment, erosion, and indirect damages (table 5) within the watershed will be reduced from \$106,174 to \$13,617 by the proposed project. This is a reduction of 87 percent, 99 percent of which will result from the system of floodwater retarding structures."

The tabulations following the second paragraph are modified to read:

Average Annual Damage			
Evaluation:		: Without :	With :
Reach :		: Project :	Project :
(Plate 1) :	Location	: <u>1/</u> :	: <u>1/</u> : Reduction
		(dollars)	(dollars) (percent)
A	Salado Creek-Bottom of Watershed to Rosillo Creek (Cross Section 13 and R-1)	5,302	426 92
B	Rosillo Creek to U. S. Highway No. 87	19,228	982 95
C	U. S. Highway No. 87 to U. S. Highway No. 90	16,639	505 97
D	U. S. Highway No. 90 to Rittiman Road (Cross Section 58)	17,543	2,407 86
E	Rittiman Road to U. S. Highway No. 81 (Cross Section 58 to 65)	3,685	284 92
F	U. S. Highway No. 81 to Nacogdoches Road (Cross Section 65 to 71)	15,583	625 96
G	Nacogdoches Road to Mud Creek confluence (Cross Section 71 to 81)	1,744	98 94
H	Salado Creek and Tributaries above Mud Creek	10,481	191 98
I	Mud Creek and Tributaries	8,283	857 90
	Subtotal	98,488	6,375 94
X	Rosillo Creek <u>2/</u>	5,915	5,580 6
Y	Beitel Creek <u>2/</u>	1,771	1,662 6
	Total	106,174	13,617 87

1/ Based on adjusted normalized prices, April 1966.

2/ Includes damages on Rosillo Creek and Beitel Creek for which no structural control is planned.

Direct Monetary Floodwater Damage								
Evaluation: Reach (Plate 1)	Average Recurrence Interval							
	2-Year		10-Year		25-Year		100-Year	
	Without Project	With Project	Without Project	With Project	Without Project	With Project	Without Project	With Project
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
A	567	123	2,757	328	22,609	335	68,262	816
B	2,074	291	39,330	1,008	74,000	1,452	99,667	3,795
C	1,760	110	30,999	834	57,058	1,507	107,623	3,686
D	5,169	1,199	28,149	3,368	39,882	4,376	69,601	6,368
E	1,658	0	5,679	628	7,235	962	14,518	2,287
F	4,397	253	16,270	1,020	44,221	1,641	131,949	2,884
G	488	51	3,706	121	4,870	158	6,049	234
H	6,898	48	23,704	485	27,436	758	29,665	1,191
I	5,805	241	12,253	444	15,267	797	17,118	1,518
Subtotal	28,816	2,316	162,847	8,236	292,578	11,986	544,452	22,779
X <u>1/</u>	4,049	3,804	9,710	9,316	11,939	11,596	16,296	15,798
Y <u>1/</u>	1,070	960	3,690	3,553	4,793	4,706	5,410	5,366
Total	33,935	7,080	176,247	21,105	309,310	28,288	566,158	43,943

1/ Includes damages on Rosillo Creek and Beitel Creek for which no structural control is planned.

The third and fourth paragraphs are modified to read:

"It is estimated that the net increase in income from the lands being converted to urban use will amount to \$58,746 (at adjusted normalized price levels) annually.

Benefits averaging \$9,215 annually will accrue to the planned structural measures from reduction of floodwater damages on the mainstem flood plain of the San Antonio River below its confluence with Salado Creek."

Paragraph added after fourth paragraph:

"The annual monetary value of the incidental recreational benefits from use of the sediment pool of structure No. 15 (Rev.) is estimated to be \$440,000. Benefits were based on a gross value of \$1.00 per visitor-day for the expected increase in visitation, less associated costs for development, operation, and maintenance."

Paragraph added after fifth paragraph:

"It is estimated that the project will produce local secondary benefits, which excludes indirect benefits in any form, averaging \$60,657 annually. Secondary benefits from a national viewpoint were not considered pertinent to the economic evaluation."

The sixth paragraph, first sentence, is modified to read:

"The total flood prevention benefits as a result of structural measures are estimated to be \$681,731 annually."

COMPARISON OF BENEFITS AND COSTS

The paragraph is modified to read:

"The total average annual cost of structural measures (amortized total installation cost, plus operation and maintenance) is \$144,537. These measures are expected to produce average annual benefits, excluding secondary benefits, of \$621,074, resulting in a benefit-cost ratio of 4.3:1.0. The ratio of total average annual project benefits, accruing to structural measures (\$681,731) to the average annual cost of structural measures (\$144,537) is 4.7:1.0 (revised table 6)."

PROJECT INSTALLATION

Land Treatment Measures

The first paragraph, first and second sentences are modified to read:

"The land treatment measures, itemized in revised table 1, will be established on non-Federal land by farmers and ranchers over an 8-year period in cooperation with the Alamo Soil and Water Conservation District, which is giving technical assistance in the planning and application of these measures under its going program. The assistance will be accelerated with Public Law 566 funds to assure application of the planned measures within the 8-year project installation period."

Structural Measures

The last paragraph is modified to read:

"The 17 floodwater retarding structures will be constructed during the 8-year project installation period in the general sequence of Sites 1, 2, 8, 9, 12, 13A, 13B, 11, 10, 4, 3, 5, 6, 7, 15A, 15(Rev.), and 16."

FINANCING PROJECT INSTALLATION

The fourth paragraph is modified to read:

"The structural measures will be constructed during an 8-year installation period pursuant to the following conditions:"

The fourth paragraph, item 3 is modified to read:

"3. Court orders have been obtained from the Bexar County Commissioners Court to temporarily impound water against the road bed of Bitters Road by floodwater retarding structure No. 7."

PROVISIONS FOR OPERATION AND MAINTENANCE

Structural Measures

The first paragraph is modified to read:

"The 17 floodwater retarding structures will be operated and maintained by the San Antonio River Authority."

The third paragraph, first sentence is modified to read:

"The estimated average annual cost of operation and maintenance of all structural measures is \$3,400."

REVISED TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Salado Creek Watershed, Texas

Installation Cost Item	Number to be Applied		Estimated Cost (Dollars) 1/		Public Law 566 Funds		Other Funds	
	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal
Unit	Land	Land	Land	Land	Land	Land	Land	Land
Land Treatment								
Soil Conservation Service								
Conservation Cropping Systems	-	11,483	-	11,483	-	-	-	-
Contour Farming	-	617	-	617	-	-	1,650	1,650
Cover and Green Manure Crops	-	11,483	-	11,483	-	-	12,375	12,375
Crop Residue Use	-	11,483	-	11,483	-	-	21,900	21,900
Brush and Weed Control	7,000	39,153	-	46,153	50,100	-	401,270	451,370
Range Deferred Grazing	7,300	33,370	-	40,670	5,759	-	20,568	26,327
Diversions	-	79,200	-	79,200	-	-	1,500	1,500
Farm Ponds	10	80	-	80	6,600	-	45,000	51,600
Grassed Waterway or Outlet	-	8	-	8	-	-	216	216
Pasture and Hayland Management	-	6,515	-	6,515	-	-	22,500	22,500
Pasture and Hayland Planting	-	6,515	-	6,515	-	-	12,600	12,600
Range Proper Use	3,075	10,897	-	13,972	17,276	-	61,703	78,979
Range Seeding	1,000	2,633	-	3,633	10,000	-	26,330	36,330
Range Rotation-Deferred Grazing	-	4,000	-	4,000	-	-	6,250	6,250
Terraces, Gradient	-	295,680	-	295,680	-	-	7,200	7,200
Terraces, Parallel	-	42,240	-	42,240	-	-	2,544	2,544
Trough or Tank	12	151	-	151	7,500	-	78,750	86,250
Technical Assistance	-	-	-	-	856	-	30,114	30,970
SCS Subtotal	-	-	-	12,850	12,850	-	752,470	863,411
TOTAL LAND TREATMENT	-	-	-	12,850	12,850	-	752,470	863,411
STRUCTURAL MEASURES								
Soil Conservation Service								
Floodwater Retarding Structures No.	3 2/	14	17	490,789	2,738,713	-	-	3,229,502
Subtotal - Construction	-	-	-	490,789	2,738,713	-	-	3,229,502
Installation Services								
Soil Conservation Service	-	-	-	51,370	298,331	-	-	349,701
Engineering Services	-	-	-	35,784	200,443	-	-	236,227
Other	-	-	-	87,154	498,774	-	-	585,928
SCS Subtotal	-	-	-	87,154	498,774	-	-	585,928
Subtotal - Installation Services	-	-	-	87,154	498,774	-	-	585,928
Other Costs								
Land Easements and Rights-of-Way	-	-	-	-	-	32,414	309,456	341,870
Administration of Contracts	-	-	-	-	-	1,150	7,350	8,500
Subtotal - Other	-	-	-	-	-	33,564	316,806	350,370
TOTAL STRUCTURAL MEASURES	-	-	-	577,943	3,237,487	33,564	316,806	350,370
TOTAL PROJECT	-	-	-	577,943	3,250,337	3,828,280	1,069,276	1,200,931
SUMMARY	-	-	-	577,943	3,250,337	3,828,280	1,069,276	1,200,931
Subtotal - SCS	-	-	-	577,943	3,250,337	3,828,280	1,069,276	1,200,931
TOTAL PROJECT	-	-	-	577,943	3,250,337	3,828,280	1,069,276	1,200,931

1/ Price Base - 1967

2/ Two sites located entirely on Federal land and one site located partially on Federal land.

REVISED TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES

Salado Creek Watershed, Texas

Item	STRUCTURE NUMBER								
	1	2	3	4	5	6	7	8	9
Drainage Area	Sq. Mi.	5.74	10.88 1/	5.51	8.86	4.74 1/	5.81 1/	11.18	2.37 1/
Storage Capacity	Ac. Ft.	264	182	70	174	59	121	250	68
Sediment in Borrow Excavation	Ac. Ft.	199	197	85	198	73	122	196	85
Sediment Pool	Ac. Ft.	114	29	-	33	-	-	101	-
Sediment Reserve (Below Riser)	Ac. Ft.	25	18	6	14	5	8	24	6
Sediment in Detention Pool	Ac. Ft.	3,851	3,766	1,891	3,048	1,658	2,355	3,857	867
Floodwater Detention	Ac. Ft.	4,453	4,192	2,052	3,467	1,795	2,606	4,428	1,026
Total									
Surface Area	Acres	37	27	16	28	11	23	43	16
Sediment Pool (Top of Riser)	Acres	251	247	138	218	107	230	232	84
Floodwater Detention Pool	Cu. Yd.	483,330	306,600	250,660	322,310	261,270	307,500	335,430	153,470
Volume of Fill	Foot	1162.1	1035.3	1052.6	1099.3	920.9	852.6	1077.1	978.1
Elevation Top of Dam	Foot	73	54	53	58	58	44	61	48
Maximum Height of Dam	Foot	1146.7	1018.3	1041.7	1089.1	910.9	838.4	1065.6	964.5
Emergency Spillway	Foot	200	300	200	400	600	350	400	300
Crest Elevation	Type	Rock	Rock	Rock	Rock	Veg.	Rock	Rock	Rock
Bottom Width	-	1	1	1	1	1	1	1	1
Type	-	76	77	76	76	76	82	77	77
Percent Chance of Use 2/									
Average Curve No. -Condition 11									
Emergency Spillway Hydrograph									
Storm Rainfall (6-hour) 3/	Inch	13.31	13.40	13.40	13.40	12.77	12.45	13.27	13.15
Storm Runoff	Inch	10.15	10.24	10.24	10.33	9.63	10.15	10.25	10.14
Velocity of Flow (Vc) 5/	Ft./Sec.	8.8	7.8	8.0	7.6	7.4	8.0	8.4	8.5
Discharge Rate 5/	C.F.S.	4,287	3,140	3,145	5,441	7,409	5,651	7,388	5,904
Maximum Water Surface Elevation 5/	Foot	1151.0	1154.6	1045.3	1092.4	913.9	842.0	1069.3	968.6
Freeboard Hydrograph									
Storm Rainfall (6-hour) 4/	Inch	30.78	31.00	31.00	31.00	29.54	28.80	30.69	30.41
Storm Runoff	Inch	27.28	27.50	27.50	27.50	26.06	26.33	27.37	27.09
Velocity of Flow (Vc) 5/	Ft./Sec.	16.5	9.5	14.1	13.9	13.6	16.4	14.5	16.3
Discharge Rate 5/	C.F.S.	28,137	19,043	47,221	32,900	52,860	46,151	38,000	40,564
Maximum Water Surface Elevation 5/	Foot	1162.1	1162.1	1052.6	1099.3	920.9	852.6	1077.1	978.1
Principal Spillway									
Capacity - low stage	C.F.S.	113	57	55	89	191	249	112	136
Capacity Equivalents									
Sediment Volume	inch	1.00	1.73	0.55	0.89	0.54	0.81	0.96	1.26
Detention Volume	inch	6.39	6.55	6.44	6.45	6.55	7.60	6.48	6.85
Spillway Storage	inch	8.40	5.72	6.39	5.71	4.33	14.93	4.93	12.59
Class of Structure	xxx	C	C	C	C	C	C	C	C

(Footnotes on last page of Table 3.)

REVISED TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES
Salado Creek Watershed, Texas

Item	STRUCTURE NUMBER										Total
	10	11	12	13A	13B	15A	15 (Rev.)	16	17	18	
Drainage Area	Sq. Mi.	4.78 1/	6.56	12.70	3.28 1/	2.53	6.67	9.76 1/	4.50	117.17	
Sediment in Borrow Excavation	Ac. Ft.	73	66	140	-	-	-	202	164	2,075	
Sediment Pool	Ac. Ft.	97	84	169	62	35	71	200	199	2,271	
Sediment Reserve (Below Riser)	Ac. Ft.	-	-	-	66	38	78	51	36	616	
Sediment in Detention Pool	Ac. Ft.	8	7	14	15	B	21	19	17	234	
Floodwater Detention	Ac. Ft.	1,846	2,505	4,552	1,298	1,012	2,444	3,405	1,526	41,886	
Total	Ac. Ft.	2,024	2,662	4,875	1,441	1,093	2,614	3,877	1,942	47,982	
Surface Area	Acre	15	17	28	26	16	43	58	42	468	
Sediment Pool (Top of Riser)	Acre	117	178	273	161	92	196	394	156	2,887	
Ploodwater Detention Pool	Cu. Yd.	281,420	357,470	387,780	125,500	177,930	305,810	388,580	243,360	5,080,490	
Volume of Fill	Foot	878.5	894.8	945.2	886.4	866.4	814.7	775.6	774.4	XXX	
Elevation Top of Dam	Foot	74	58	62	42	43	43	44	36	XXX	
Maximum Height of Dam	Foot	855.9	877.8	936.2	877.0	878.4	806.3	761.6	768.5	XXX	
Emergency Spillway	Foot	150	75	600	600	150	400	600 5/	400	XXX	
Creast Elevation	Type	Rock	Rock	Veget.	Veget.	Rock	Rock	Rock	Veget.	XXX	
Bottom Width	-	1	1	1	1	1	1	1	1	XXX	
Type	-	81	81	79	81	81	79	78	75	XXX	
Percent Chance of Use 2/	-	81	81	79	81	81	79	78	75	XXX	
Average Curve No. - Condition 11	-	81	81	79	81	81	79	78	75	XXX	
Emergency Spillway Hydrograph	-	81	81	79	81	81	79	78	75	XXX	
Storm Rainfall (6-hour) 3/	Inch	12.82	13.40	13.20	13.10	13.50	13.50	11.18	13.40	XXX	
Storm Runoff	Inch	10.37	10.93	10.47	10.64	11.03	10.76	8.41	10.09	XXX	
Velocity of Flow (Vc) 5/	Ft./Sec.	10.1	9.6	7.6	7.4	7.5	7.8	8.5	5.8	XXX	
Discharge Rate 5/	C.F.S.	5,027	2,160	7,963	7,490	1,985	5,933	11,402	2,455	XXX	
Maximum Water Surface Elevation 3/	Foot	861.5	882.8	939.3	880.1	881.6	809.7	765.6	770.7	XXX	
Freeboard Hydrograph	-	861.5	882.8	939.3	880.1	881.6	809.7	765.6	770.7	XXX	
Storm Rainfall (6-hour) 4/	Inch	29.67	31.00	30.54	30.19	31.12	31.12	25.77	31.00	XXX	
Storm Runoff	Inch	27.03	28.36	27.57	27.55	28.48	28.14	22.67	27.33	XXX	
Velocity of Flow (Vc) 5/	Pt./Sec.	20.4	18.5	13.3	10.7	12.4	12.8	16.5	10.3	XXX	
Discharge Rate 5/	C.F.S.	39,217	13,884	44,073	47,040	9,000	25,133	87,202	14,155	XXX	
Maximum Water Surface Elevation 5/	Foot	878.5	894.8	945.2	886.4	886.4	814.7	775.6	774.4	XXX	
Principal Spillway	-	878.5	894.8	945.2	886.4	886.4	814.7	775.6	774.4	XXX	
Capacity - low stage	C.P.S.	183	66	127	160	25	67	598	45	XXX	
Capacity Equivalents	-	183	66	127	160	25	67	598	45	XXX	
Sediment Volume	Inch	0.70	0.45	0.48	0.82	0.60	0.48	0.91	1.73	XXX	
Detention Volume	Inch	7.24	7.16	6.72	7.42	7.50	6.87	6.54	6.36	XXX	
Spillway Storage	Inch	14.61	10.59	4.37	12.15	6.49	5.35	16.91	4.32	XXX	
Class of Structure	XXX	C	C	C	C	C	C	C	C	XXX	

1/ Exclusive of area controlled by other structures. The entire area considered in the emergency spillway design.
 2/ Based on regional analysis of gaged runoff.
 3/ Minimum 6-hour precipitation for emergency spillway hydrograph for Class C structures reduced to controlling drainage area.
 4/ Probable maximum 6-hour precipitation from U. S. Department of Commerce, Weather Bureau, TP Number 40, reduced to controlling drainage area.
 5/ Maximum during passage of hydrograph.
 6/ Spillways on each end of dam, combined bottom width shown.

September 1968

REVISED TABLE 4 - ANNUAL COST

Salado Creek Watershed, Texas

(Dollars) 1/

Evaluation Unit	: Amortization of		: Total
	: Installation Cost <u>2/</u>	: Operation and Maintenance Cost	
Floodwater Retarding Structures			
1 through 12, 13A, 13B, 15A, 15(Rev.), and 16 <u>3/</u>	141,137	3,400	144,537
TOTAL	141,137	3,400	144,537

1/ Price Base: Installation - 1967, O&M - Adjusted normalized prices, April 1966.

2/ 100 years at 3.25 percent interest.

3/ Interrelated measures.

September 1968

REVISED TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Salado Creek Watershed, Texas

(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater			
Crop and Pasture	5,092	2,240	2,852
Other Agricultural	7,623	3,412	4,211
Nonagricultural			
Urban	51,778	1,901	49,877
Transportation	20,000	3,074	16,926
Other	1,645	48	1,597
Subtotal	86,138	10,675	75,463
Sediment			
Overbank Deposition	1,938	490	1,448
Erosion			
Flood Plain Scour	1,923	843	1,080
Indirect	16,175	1,609	14,566
Total	106,174	13,617	92,557

1/ Price Base: Adjusted normalized prices, April 1966.

September 1968

REVISED TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Salado Creek Watershed, Texas

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/					Secondary	Total	Average Annual Cost 4/	Benefit Cost Ratio
	Damage Reduction	Urban	Use	Incidental	Other				
Floodwater Retarding Structures Nos. 1 through 12, 13A, 13B, 15A, 15(Rev.), and 16	92,113	58,746	461,000	9,215	60,657	681,731	144,537	4.7:1.0	
GRAND TOTAL	92,113	58,746	461,000	9,215	60,657	681,731	144,537	4.7:1.0	

1/ Price Base: Adjusted normalized prices, April 1966.

2/ Includes \$21,000 benefits from ground water recharge and \$440,000 benefits from recreation.

3/ Benefits from reduction in damages to San Antonio River flood plain.

4/ From Table 4.

5/ In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$444 annually.

September 1968

INVESTIGATIONS AND ANALYSES

Project Formulation

Land Treatment Measures

The third sentence is modified to read:

"The quantity of each land treatment practice which contributes directly to watershed protection and flood prevention that will be applied during the 8-year installation period was estimated (revised table 1)."

Structural Measures

Item 3, second paragraph is modified to read:

"After review of these locations by the sponsoring local organizations, they requested that an alternate system, to include 17 structures, be investigated. This investigation was made, and it was determined that the alternate system including 17 structures would provide the same level of protection and that the installation cost compared favorably with the original system."

Item 4, second paragraph is modified to read:

"The structure classification, floodwater detention required, and actual floodwater detention planned for all structures are shown in the following table:

Structure Number	Classification	Floodwater Detention Required ^{1/} (inches)	Actual Floodwater Detention Planned (inches)
1	C	6.39	6.39
2	C	6.55	6.55
3	C	6.49	6.49
4	C	6.44	6.44
5	C	6.45	6.45
6	C	6.55	6.55
7	C	7.60	7.60
8	C	6.48	6.48
9	C	6.85	6.85
10	C	7.24	7.24
11	C	7.16	7.16
12	C	6.72	6.72
13A	C	7.42	7.42
13B	C	7.50	7.50
15A	C	6.87	6.87
15 (Rev.)	C	6.54	6.54
16	C	6.36	6.36

1/ 100-year frequency based on regional analysis of gaged runoff.

Item 8, last sentence is modified to read:

"This system consisted of 17 interrelated floodwater retarding structures necessary to provide the desired degree of protection for the urban area of San Antonio."

Sedimentation Investigations

Sediment Source Studies

The first paragraph; first sentence and items 1 and 4 are modified to read:

"Sediment source studies to determine the 100-year sediment storage requirements were made in the drainage areas of planned floodwater retarding structures according to the following procedures:

1. Detailed investigations were made in the drainage areas above eight of the planned floodwater retarding structures. Estimates of sediment rates were made for the remaining nine planned structures based on similarity of their drainage areas to those surveyed in detail.
4. Estimating annual gross erosion in the drainage areas of the nine planned structures not surveyed in detail consisted of mapping land use and applying erosion rates of similar areas which were surveyed in detail."

Geologic Investigations

The first paragraph, third sentence is modified to read:

"In addition, more detailed investigations with core drilling equipment and bull dozer were made at Sites 4, 8, 9, 13A, and 13B."

Description of Problems

The first paragraph is modified to read:

"Predominant formations which crop out at dam sites in the watershed are the Glen Rose, Edwards, Austin, and Anacacho of the Cretaceous system, and Recent flood plain alluvial deposits. Other formations, such as the Eagle Ford, Georgetown, Grayson, and Buda are present in site vicinities but in small outcrop areas."

The third paragraph; second, third, and fourth sentences are modified to read:

"Sites 3, 4, 5, 6, 8, 9, 10, 11, 12, 13A, and 13B are located on the Edwards outcrop. Preliminary estimates of rock excavation in emergency spillways range from 0 to 100 percent and average 80 percent for these 11 sites. Other problems include: grouting of caverns and fractures in foundations and abutments; long haul distances, ranging from 2,000 to 9,000 feet, caused by scarcity of embankment materials; and difficult keying into hard limestones of abutments and foundations."

The fourth paragraph is deleted.

The fifth paragraph; second, third, and fourth sentences are modified to read:

"Sites 7 and 15A are located on the Austin outcrop. Preliminary estimates of rock excavation in emergency spillways are 50 percent for Site 7 and 90 percent for Site 15A. Sufficient volumes of suitable soils for embankment purposes are available within moderate distances from dam sites."

The sixth paragraph is modified to read:

"The Anacacho formation consists of brittle, marly limestone with beds of marl and clay. Sites 15 (Rev.) and 16 are located on the Anacacho outcrop. The preliminary estimate of rock excavation in the emergency spillway of Site 15(Rev.) is about 15 percent. No rock excavation is expected in the emergency spillway of Site 16.

Materials suitable for embankment purposes are available in sufficient quantity within sediment pool areas. The soils are primarily CL at Site 16 and CL, GC, and GP at Site 15 (Rev.)."

The seventh paragraph, first sentence is modified to read:

"Thick deposits of Recent gravel, interbedded with clay, overlie limestone and/or shale at Sites 7 and 15 (Rev.)."

Ground Water Recharge Investigations

The third paragraph, item 3, first and second sentences are modified to read:

"Structure Sites 3, 4, 5, 6, 8, 9, 10, 11, 12, 13A, and 13B are located on the outcrop of the Edwards formation. After construction of these 11 structures, an increase in recharge can be expected due to impoundment of water and sustained release flows over porous limestones."

Economic Investigations

Benefits from Reduction of Damage

The third paragraph is modified to read:

"Analysis of this report indicated that an average annual San Antonio River benefit of \$0.22 per acre-foot of detention capacity (at adjusted normalized prices) could be credited to the Salado Creek watershed project."

Section added after Enhancement Type Benefits:

"Incidental Recreation Benefits

Incidental recreation benefits are expected to accrue to floodwater retarding structure No. 15 (Rev.). A value of \$1.00 per visitor-day was used to evaluate the 650,000 visitor days of recreation attributable to the sediment pool. Associated costs of development, including replacement, operations, and maintenance, were deducted from the gross value of benefits. Benefits were calculated allowing for full level of use for 40 years, with a gradual diminishing of use and attractiveness during the next 10 years to zero by the end of 50 years and for the balance of the evaluation period."

Incidental Benefits from Ground Water Recharge

The first paragraph, first sentence is modified to read:

"Ground water recharge will occur incidental to the installation of floodwater retarding structures numbers 3, 4, 5, 6, 8, 9, 10, 11, 12, 13A, and 13B, which are located on the Edwards limestone outcrop."

Paragraph added after Incidental Benefits From Ground Water Recharge:

"Secondary Benefits

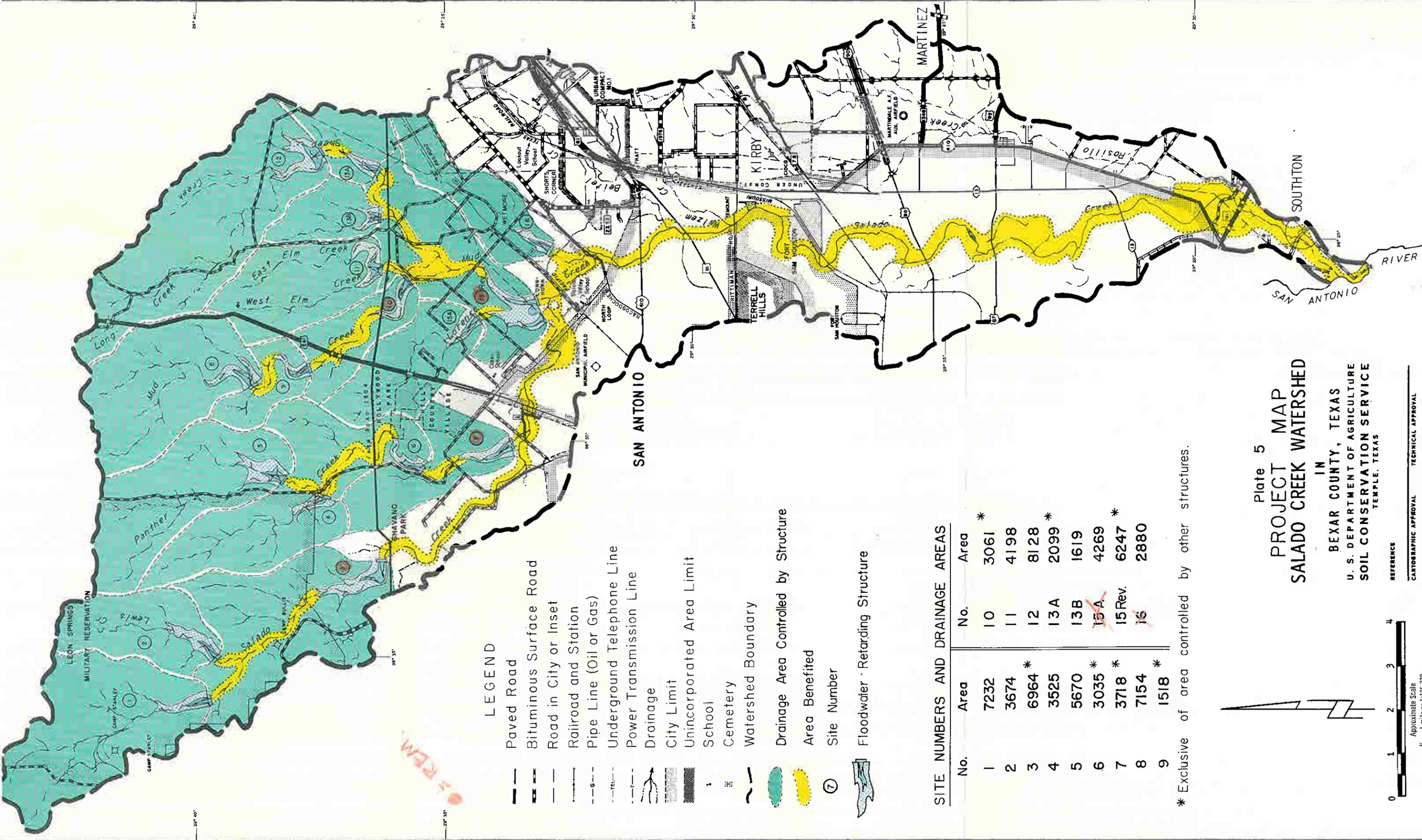
The value of local secondary benefits stemming from the project were estimated to be equal to 10 percent of direct primary benefits, including those from reduction of damages, incidental benefits, and changed urban land use benefits. This excludes all indirect benefits from the computation of secondary benefits."

Appraisal of Land and Easement Values

The first paragraph, fifth and seventh sentences are modified to read:

"The cost of land easements and rights-of-way for the 17 floodwater retarding structures was determined by individual appraisal in cooperation with representatives of the sponsoring local organizations."

"The average annual net loss in production, based on adjusted normalized prices, within the sites was calculated and this value compared with the amortized cost of the structure sites."



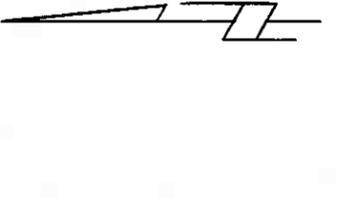
LEGEND

- Paved Road
- Bituminous Surface Road
- Road in City or Inset
- Railroad and Station
- Pipe Line (Oil or Gas)
- Underground Telephone Line
- Power Transmission Line
- Drainage
- City Limit
- Unincorporated Area Limit
- School
- Cemetery
- Watershed Boundary
- Drainage Area Controlled by Structure
- Area Benefited
- Site Number
- Floodwater Retarding Structure

SITE NUMBERS AND DRAINAGE AREAS

No.	Area	No.	Area
1	7232	10	3061 *
2	3674	11	4198
3	6964 *	12	8128
4	3525	13A	2099 *
5	5670	13B	1619
6	3035 *	15A	4269
7	3718 *	15 Rev.	6247 *
8	7154	16	2880
9	1518 *		

* Exclusive of area controlled by other structures.



Approximate Scale
 1/2" = 1 mile or 1:126,720
 Approximate Area 139,808 Acres

**Plate 5
 PROJECT MAP
 SALADO CREEK WATERSHED
 IN
 BEXAR COUNTY, TEXAS
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 TEMPLE, TEXAS**

REFERENCE

CARTOGRAPHIC APPROVAL	TECHNICAL APPROVAL
COMPILED	TRACED
CHECKED	DATE