

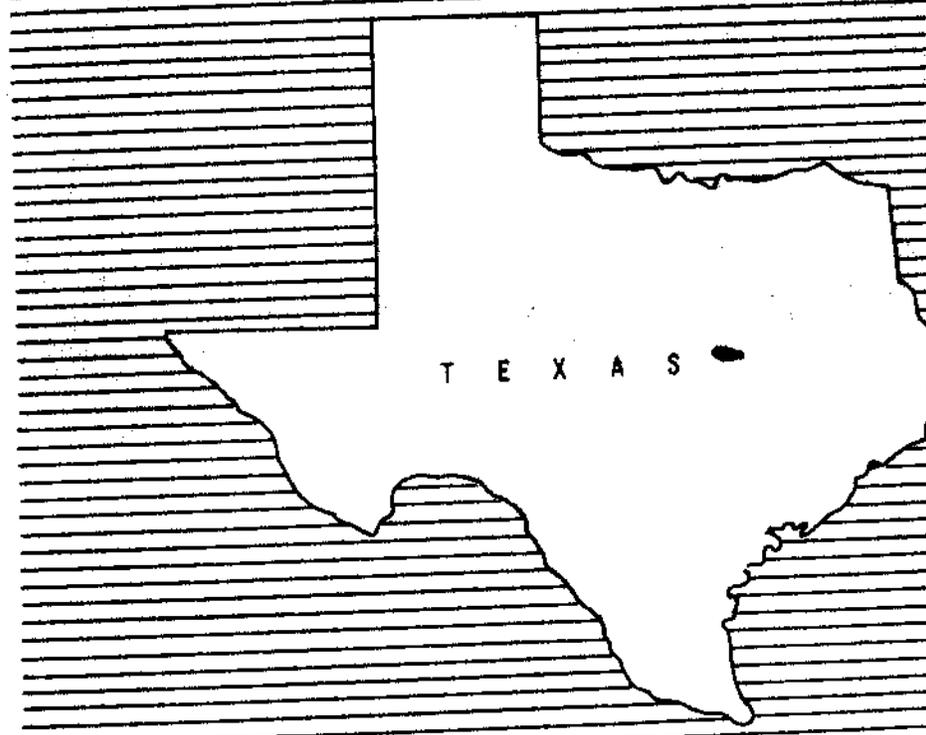
SUPPLEMENTAL

WORK PLAN

FOR
WATERSHED PROTECTION AND FLOOD PREVENTION

**NOLAN CREEK
WATERSHED**

BELL AND CORYELL COUNTIES, TEXAS



May 1966

SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT

between the

Central Texas Soil and Water Conservation District
(Formerly Central Texas Soil Conservation District)
 (Local Organization)

Bell County Water Control and Improvement District No. 6
 (Local Organization)

In the State of Texas

(Hereinafter referred to as the Sponsoring Local Organization)

and the

Soil Conservation Service
 United States Department of Agriculture

(hereinafter referred to as the Service)

Whereas, the Watershed Work Plan Agreement for the Nolan Creek Watershed, State of Texas, executed by the Sponsoring Local Organization named therein and the Service, became effective on the 9th day of April, 1963; and

Whereas, it has been found necessary to modify the Watershed Work Plan to delete floodwater retarding structure No. 6 and relocate floodwater retarding structure No. 5 because extensive urban developments have occupied the sites to a great extent since the original plan was prepared; and

Whereas, it has been found necessary to complete construction of floodwater retarding structure No. 3 through use of Public Law 566 funds since National defense requirements have prevented completion of the structure, as originally planned, by personnel of the Armed Services (Fort Hood) as a part of their regular training program; and

Whereas, a Supplemental Watershed Work Plan, which modifies the Watershed Work Plan dated December 1962 for said watershed, has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service, which plan is annexed to and made a part of this agreement.

All references to the Central Texas Soil Conservation District in the work plan agreement and the work plan are changed to read: "Central Texas Soil and Water Conservation District."

Now therefore, the Sponsoring Local Organization 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 Organization 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 \$78,491).

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

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

<u>Works of Improvement</u>	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Construction Cost</u> (dollars)
12 Floodwater Retarding Structures	0	100	1,205,268
2.81 Miles Channel Improvement	0	100	86,873

3. Paragraph numbered 4 is modified as follows:

The Service will bear the cost of all installation services applicable to structural measures for flood prevention. (Estimated cost \$286,014).

4. Paragraph numbered 5 is modified as follows:

The Sponsoring Local Organization will bear the cost of administering contracts. (Estimated cost \$6,500).

5. Tables 1, 2, 3, 4, 5, and 6 referred to in the watershed work plan are modified to conform with tables 1, 2, 3, 4, 5, and 6 (Revised) attached.

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.

All terms, conditions, and stipulations of the Watershed Work Plan Agreement and annexed Watershed Work Plan remain unchanged except as modified by this Supplemental Work Plan Agreement and annexed Supplemental Work Plan which is hereby made a part of this agreement.

Central Texas Soil and Water Conservation District
(Local Organization)

By Norbert J. Moeller
Norbert J. Moeller
Title Chairman
Date Nov 29, 1966

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

adopted at a meeting held on Nov. 29, 1966
Jerry Bedrich
(Secretary, Local Organization)
Jerry Bedrich
Date Nov. 29, 1966

Bell County Water Control and Improvement District No. 6
(Local Organization)

By R. C. Adams Jr
R. C. Adams, Jr.
Title Chairman
Date November 25, 1966

The signing of this agreement was authorized by a resolution of the governing body of the Bell County Water Control and Improvement District No. 6
(Local Organization)

adopted at a meeting held on Nov 25, 1966
Adrian Barnes
(Secretary, Local Organization)
Adrian Barnes
Date November 29, 1966

Soil Conservation Service
United States Department of Agriculture

By _____

Date _____

**SUPPLEMENTAL
WORK PLAN
FOR
WATERSHED PROTECTION AND FLOOD PREVENTION**

**NOLAN CREEK WATERSHED
Bell and Coryell Counties, 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:

Central Texas Soil and Water Conservation District
Bell County Water Control and Improvement District No. 6

With Assistance By:

U. S. Department of Agriculture
Soil Conservation Service

May 1966

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SUPPLEMENTAL WATERSHED WORK PLAN

NOLAN CREEK WATERSHED
Bell and Coryell Counties, Texas
May 1966

PURPOSE OF THE SUPPLEMENTAL WORK PLAN

Since the original Nolan Creek Watershed Work Plan was prepared, extensive urban developments have occupied, to a large extent, the proposed sites for floodwater retarding structures Nos. 5 and 6. Therefore, it has become necessary to delete these two structures and add floodwater retarding structure No. 5A in order to have a plan that can be applied and one that is economically feasible.

Also, it has become necessary to complete the construction of floodwater retarding structure No. 3 which has been partially constructed by Armed Services personnel (Fort Hood) as part of their regular training program. National defense requirements have prevented their completion of the structure.

Public Law 566 funds are to be used to complete the construction of floodwater retarding structure No. 3 which is an interrelated part of the works of improvement to be installed in the watershed.

The following are changes and modifications that are to be made in appropriate parts of the work plan to reflect the revisions as described in the three preceding paragraphs.

SUMMARY OF PLAN

General Summary

The sixth paragraph is modified to read:

"The work plan proposes installing, in a five-year period, a project for the protection and development of the watershed at a total estimated installation cost of \$2,084,083. The share of the cost to be borne by Public Law 566 funds is \$1,578,155. The share to be borne by other than Public Law 566 funds is \$488,468. In addition, the local interests will bear the entire cost of operation and maintenance."

Structural Measures

The first paragraph is modified to read:

"One floodwater retarding structure is presently located on the Fort Hood Military Reservation. It has been installed by the military establishment under a previous agreement between the Commanding General, Fort Hood Military Reservation and the Soil Conservation Service."

The second paragraph is modified to read:

"The structural measures included in this plan consist of 12 floodwater retarding structures having a total sediment storage and floodwater detention capacity of 14,873 acre-feet and 2.81 miles of channel improvement. The total cost of structural measures is \$1,663,146, of which the local share is \$84,991 and the Public Law 566 share is \$1,578,155. The local share of the cost of structural measures consists of land, easements, and rights-of-way (\$78,491), and administering contracts (\$6,500). The 12 floodwater retarding structures and 2.81 miles of channel improvement will be installed during a 5-year period."

Damages and Benefits

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

"The estimated average annual floodwater, sediment, flood plain erosion, and indirect damages without a project total \$88,794 at long-term price levels. The estimated average annual floodwater, sediment, flood plain erosion, and indirect damage with the project installed amounts to \$23,918, a reduction of 73 percent. The project includes land treatment and structural measures included in this plan, and structural measures installed on the Fort Hood Military Reservation.

"The average annual primary benefits accruing to the structural measures included in this plan are \$64,271, which are distributed as follows:

Damage reduction	\$57,302
Benefits from changed land use (Urban development)	2,794
Benefits from incidental recreation	4,175

"Secondary benefits of \$5,990 will result from the installation of structural measures included in this plan.

"The ratio of the total average annual project benefits (\$70,261) to the average annual cost of structural measures (\$53,460) is 1.3 to 1.

"Additional average annual benefits in the amount of \$4,772 will accrue to the floodwater retarding structure installed on Fort Hood Military Reservation."

Operation and Maintenance

The second and third paragraphs are modified to read:

"The Bell County Water Control and Improvement District No. 6 will be responsible for the operation and maintenance of the 12 floodwater retarding structures and 2.81 miles of channel improvement. This

includes floodwater retarding structures 1, 3, and 5A and 1.09 miles of channel improvement which are located either partially or totally on Federal land. These measures are included since benefits accrue to downstream non-Federal land. Revenue from a special district tax for operation and maintenance is adequate and available for this purpose. The estimated average annual cost of operation and maintenance of these structural measures is \$2,668.

"Fort Hood will operate and maintain the floodwater retarding structure already installed and the one under construction on the military reservation in accordance with a previous agreement between the Commanding General, Fort Hood Military Reservation and the Soil Conservation Service."

PROJECTS OF OTHER AGENCIES

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

"One floodwater retarding structure (Site No. 2) has been built on Fort Hood Military Reservation and a second (Site No. 3) has been partially built (plate 6). These structures were being installed under agreement between the Commanding General, Fort Hood Military Reservation and the Soil Conservation Service as part of the overall plan for watershed protection and flood prevention for Nolan Creek Watershed.

"Construction of the two floodwater retarding structures was being accomplished by military personnel and equipment headquartered at Fort Hood to provide training in engineering surveys and earth fill embankment construction. Detailed plans and specifications, inspection services, and assistance in foundation investigations were furnished by the Soil Conservation Service.

"The completed structure (Site No. 2) will control a drainage area of 5.31 square miles and have a total sediment storage and floodwater detention capacity of 2,077 acre-feet."

BASIS FOR PROJECT FORMULATION

The fifth paragraph is modified to read that agreement was reached to reduce urban damages in Killeen by not less than 90 percent and in Belton by not less than 83 percent instead of the 90 percent reduction, as stated in the original plan.

The last paragraph, first sentence, is modified to add the word "revised" between the words "recommended" and "system."

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Second paragraph, first sentence, the "24,821" is changed to "22,951."

Structural Measures

The first paragraph is modified to read:

"A system of 12 floodwater retarding structures and 2.81 miles of channel improvement having an installation cost of \$1,663,146 will be installed to afford the needed protection to flood plain lands and to urban areas in Belton and Killeen."

In the third paragraph the word "revised" is added between "the" and "project".

The fourth and fifth paragraphs are modified to read:

"This system of floodwater retarding structures will detain runoff from approximately 31.2 percent of the entire watershed. The 12 floodwater retarding structures will have a total floodwater detention capacity of 12,209 acre-feet and will detain an average of 6.39 inches of runoff from the watershed area above them.

"These 12 structures in conjunction with the one already constructed on Fort Hood Military Reservation will detain runoff from 35.8 percent of the entire watershed. The 13 floodwater retarding structures will have a total floodwater detention capacity of 14,147 acre-feet and will detain an average of 6.41 inches of runoff from the watershed area above them."

The last paragraph is modified to read:

"Refer to revised tables 1, 2, 3, and 3A for details on quantities, costs, and design features of the structural measures."

EXPLANATION OF INSTALLATION COSTS

The second paragraph is modified to read:

"The required local cost for structural measures consisting of the value of lend easements (\$44,391); change in utilities (\$9,100) and roads (\$700); removal and relocation of improvements (\$18,300); legal fees (\$6,000); and administration of contracts (\$6,500) are estimated at \$84,991. The Board of Directors of the Bell County Water Control and Improvement District No. 6 provided estimates of these costs."

The fourth paragraph is modified to read:

"The entire construction cost for structural measures amounting to \$1,292,141 will be borne by Public Law 566 funds. In addition, the installation services cost of \$286,014 will be a Public Law 566 expense. This is a total Public Law 566 cost of \$1,578,155 for the installation of structural measures."

The table in the seventh paragraph is modified to read:

Fiscal Year	Measures	Public Law 566 Funds (dollars)	Other Funds (dollars)	Total (dollars)
1st	Sites 1, 3, and 5A Land Treatment	451,885 4,356	32,800 80,697	484,685 85,053
2nd	Channel Improvement and Site 7 Land Treatment	212,113 3,276	21,028 80,695	233,141 83,971
3rd	Sites 8, 9, and 10 Land Treatment	399,108 3,276	13,300 80,695	412,408 83,971
4th	Sites 11 and 12 Land Treatment	278,684 3,276	10,263 80,695	288,947 83,971
5th	Sites 13, 14, and 15 Land Treatment	236,365 3,276	7,600 80,695	243,965 83,971
Total		1,595,615	488,468	2,084,083

EFFECTS OF WORKS OF IMPROVEMENT

The first paragraph is modified to read:

"After installation of the combined program of land treatment and structural measures described above and the floodwater retarding structure installed on the Fort Hood Military Reservation, average annual flooding will be reduced 2,269 acres to 1,505 acres, a reduction of 33 percent."

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

"The area on which sediment damage from overbank deposition will occur is expected to be reduced from 80 acres to 57 acres, a 28 percent reduction.

"The area on which flood plain scour damage will occur is expected to be reduced from 637 acres to 312 acres, a reduction of 51 percent.

"The land treatment measures will reduce the average annual gross erosion from 230 to 176 acre-feet per year. Sediment yield from the watershed will be reduced from 46 to 36 acre-feet annually as a result of the combined program."

The tables in the sixth paragraph are modified to read:

Average Annual Area Inundated					
Evaluation:		:	:	:	
Reach :		:	Without :	With :	
(Plate 1) :	Location	:	Project :	Project :	
			(acres)	(acres)	
				Reduction	
				(percent)	
A	Bottom of Watershed to U. S. Highway No. 81		117	55	53
B	U. S. Highway No. 81 to Valley Cross Section No. 10 (Belton)		54	30	44
C	Valley Cross Section No. 10 to North Nolan Creek		352	172	51
D	North Nolan Creek		111	8	93
E	North Nolan Creek to Farm Road 2410		1,531	1,224	20
F	Farm Road 2410 to U. S. Highway No. 190 (Killeen)		67	15	78
G	U. S. Highway No. 190 to Farm Road No. 440 (Killeen)		37	1	97
	Total		2,269	1,505	33

Evaluation:	Area Inundated							
	Average Recurrence Interval							
	2 Year		10 Year		25 Year		100 Year	
Reach	Without:	With	Without:	With	Without:	With	Without:	With
(Plate 1):	Project:	Project:	Project:	Project:	Project:	Project:	Project:	Project:
	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
A	69	27	198	94	298	145	434	239
B	34	23	70	39	99	55	159	76
C	252	114	478	315	544	401	633	517
D	45	0	174	24	268	45	368	94
E	1,111	891	1,829	1,628	2,000	1,834	2,182	2,094
F	46	15	97	31	105	44	114	82
G	29	0	68	0	85	8	106	23
Total	1,586	1,070	2,914	2,131	3,399	2,532	3,996	3,125

The ninth paragraph, last two sentences are changed to read:

"A total of 301 acres of upland in the sediment pools will be retired from agricultural production. Only 52 acres of this is suitable for cultivation."

The tenth paragraph is modified to read:

"Additional incidental recreational benefits will result from the installation of the 12 floodwater retarding structures included in this plan. Sediment pools of these structures will have a total surface area of 221 acres at the 50-year sediment storage elevation or 200 acre-foot capacity, whichever is less. All of these pools are ideally located in relation to the rapidly expanding population in the watershed and will serve as outdoor recreational facilities for fishing, swimming, hunting, and boating. It is conservatively estimated that these pool areas will attract about 6,150 visitors annually."

PROJECT BENEFITS

The first paragraph is changed to show the estimated average annual damages (revised table 5) will be reduced to \$23,918 instead of \$12,198. The last sentence in the paragraph is changed to read: "This is a reduction of 73 percent, 95 percent of which will result from the system of interrelated floodwater retarding structures and channel improvement."

The tabulations in the second paragraph are changed to read:

		Average Annual Damage		
Evaluation:		:	:	:
Reach :		:	Without :	With :
(Plate 1):	Location	:	Project :	Project :
		(dollars)	(dollars)	Reduction (percent)
A	Bottom of Watershed to U. S. Highway No. 81	750	318	58
B	U. S. Highway No. 81 to Valley Cross Section No. 10 (Belton)	42,464	7,168	83
C	Valley Cross Section 10 to North Nolan Creek	5,750	2,748	52
D	North Nolan Creek	1,432	126	91
E	North Nolan Creek to Farm Road No. 2410	18,399	12,637	31
F	Farm Road No. 2410 to U. S. Highway No. 190 (Killeen)	3,977	882	77
G	U. S. Highway No. 190 to Farm Road No. 440 (Killeen)	16,022	39	99
Total		88,794	23,918	73

Direct Monetary Floodwater Damage

Valuation: 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	380	150	1,189	495	1,805	747	2,958	1,482
B	3,000	1,500	63,000	5,000	160,500	19,500	689,580	93,000
C	3,548	1,373	8,055	4,370	9,900	6,002	12,283	9,266
D	457	0	1,984	135	3,566	374	6,898	1,103
E	8,977	6,270	27,200	18,519	57,346	29,216	109,257	92,260
F	340	145	10,625	1,630	21,850	3,750	47,298	13,700
G	600	0	25,000	0	56,000	0	130,500	1,500
Total	17,302	9,293	137,053	30,014	310,967	59,589	998,774	212,261

The "\$4,988" at the end of the fourth paragraph is changed to "\$4,175".

The "\$6,625" in the first sentence of the fifth paragraph is changed to "\$5,990".

The "\$78,251" at the end of the first sentence of the seventh paragraph is changed to "\$70,261".

COMPARISON OF BENEFITS AND COSTS

The first and second paragraphs are modified to read:

"The average annual cost of the structural measures (converted from total installation cost, plus operations and maintenance) is estimated to be \$53,460. The structural measures are expected to produce average annual primary benefits of \$64,271, or about \$1.20 for each dollar of cost.

"The ratio of the total average annual project benefits (\$70,261) to the average annual cost of structural measures (\$53,460) is 1.3 to 1 (revised table 6)."

PROJECT INSTALLATION

Structural Measures

The fourth paragraph, first sentence, is changed to read:

"A portion of floodwater retarding structure Number One and floodwater retarding structures Numbers 3 and 5A are located on Fort Hood Military Reservation."

The sixth paragraph is changed to read:

"The 12 floodwater retarding structures and 2.81 miles of channel improvement will be constructed during the 5-year project installation period in the general sequence of Sites 1, 3, 5A, 2.81 miles of channel improvement, Sites 7, 8, 9, 10, 11, 12, 13, 14, and 15."

FINANCING PROJECT INSTALLATION

The "\$105,000" at the end of the third paragraph is changed to \$63,000."

Paragraph numbered 3.a. is deleted.

PROVISIONS FOR OPERATION AND MAINTENANCE

Structural Measures for Flood Prevention

The second sentence of the first paragraph is changed to read:

"This includes floodwater retarding structures Nos. 1 and 5A and 1.09 miles of channel improvement which are located either partially or totally on Federal land."

In the fourth paragraph, first line, the words "two floodwater retarding structures" are changed to "floodwater retarding structure."

REVISED TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Nolan Creek Watershed, Texas

Installation Cost Items	Number to be Applied		Estimated Cost (Dollars) 1/							
	Federal		Public Law 566 Funds		Other Funds		Total	Total		
	Land	Non-Federal	Land	Non-Federal	Land	Non-Federal				
Unit	Land	Non-Federal	Land	Non-Federal	Land	Non-Federal	Land	Non-Federal	Total	
LAND TREATMENT										
Soil Conservation Service										
Conservation Cropping System	Acres	7,632	-	-	-	-	-	-	-	-
Contour Farming	Acres	900	-	-	-	-	-	-	-	1,900
Cover and Green Manure Crops	Acres	2,544	-	-	-	-	-	-	-	137,460
Crop Residue Use	Acres	7,632	-	-	-	-	-	-	-	62,811
Pasture Planting	Acres	1,200	-	-	-	-	-	-	-	28,800
Pasture Renovation	Acres	400	-	-	-	-	-	-	-	9,600
Pasture Proper Use	Acres	6,926	-	-	-	-	-	-	-	27,916
Range Deferred Grazing	Acres	3,180	-	-	-	-	-	-	-	6,470
Range Proper Use	Acres	9,541	-	-	-	-	-	-	-	39,903
Range Seeding	Acres	961	-	-	-	-	-	-	-	11,532
Brush Control (Range)	Acres	1,809	-	-	-	-	-	-	-	36,180
Olivations	Feet	2,280	-	-	-	-	-	-	-	228
Grassed Waterway	Acres	25	-	-	-	-	-	-	-	2,500
Farm Ponds	No.	39	-	-	-	-	-	-	-	17,550
Terraces, Gradient	Feet	36,960	-	-	-	-	-	-	-	1,848
Terraces, Parallel	Feet	15,840	-	-	-	-	-	-	-	1,109
Technical Assistance										17,670
SCS Subtotal			17,460		17,460			403,477		403,477
TOTAL LAND TREATMENT			17,460		17,460			403,477		420,937
STRUCTURAL MEASURES										
Soil Conservation Service										
Floodwater Retarding Structures	No.	3 2/	12	254,472	910,796	1,205,268	-	-	-	1,205,268
Stream Channel Improvement	Mile	1.09 3/	2.81	19,166	67,707	86,873	-	-	-	86,873
SCS Subtotal				313,638	978,503	1,292,141				1,292,141
Subtotal - Construction				313,638	978,503	1,292,141				1,292,141
Installation Services										
Soil Conservation Service										
Engineering Services				39,968	134,297	174,265	-	-	-	174,265
Other				26,954	84,795	111,749	-	-	-	111,749
SCS Subtotal				66,922	219,092	286,014				286,014
Subtotal - Installation Services				66,922	219,092	286,014				286,014
Other Costs										
Land, Easements, and Rights-of-Way				-	-	-	900	77,591	78,491	78,491
Administration of Contracts				-	-	-	917	5,083	6,500	6,500
Subtotal - Other				-	-	-	1,817	82,674	84,991	84,991
TOTAL STRUCTURAL MEASURES				380,560	1,197,595	1,578,155	1,817	82,674	84,991	1,663,146
TOTAL PROJECT				380,560	1,215,055	1,578,155	1,817	486,151	488,468	2,084,083
SUMMARY										
Subtotal SCS				380,560	1,215,055	1,578,155	1,817	486,151	488,468	2,084,083
TOTAL PROJECT				380,560	1,215,055	1,578,155	1,817	486,151	488,468	2,084,083

1/ Price Base - 1962.
 2/ Two sites located entirely on Federal land and one site located partially on Federal land.
 3/ 0.63 mile channel improvement located entirely on Federal land and 0.46 mile channel improvement located partially on Federal land.
 May 1966

REVISED TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION

Nolan Creek Watershed, Texas
(Dollars) 1/

Structure Site Number	Installation Cost - Public Law 566 Funds		Installation Cost-Other Funds		Total Installation Cost	
	Construction	Installation Services	Public Law 566	Other		
			Total	Adm. of	Easements and	Total
			Engineering	Contracts	R/W	Other
Floodwater Retarding Structures						
1 2/	212,512	21,251	17,813	500	31,300	31,800
3 3/	82,888	10,775	7,137	500	-	500
5A 3/	81,101	11,354	7,054	500	-	500
7	77,634	10,869	6,744	500	4,538	5,038
8	103,145	13,409	8,881	500	3,175	3,675
9	105,701	13,741	9,101	500	3,400	3,900
10	119,340	15,514	10,276	500	5,225	5,725
11	140,314	15,435	11,868	500	3,900	4,400
12	91,330	11,873	7,864	500	5,363	5,863
13	82,456	10,719	7,100	500	2,300	2,800
14	42,703	7,685	3,840	500	2,125	2,625
15	66,144	9,922	5,796	500	1,675	2,175
Subtotal	1,205,268	152,547	103,474	6,000	63,001	69,001
Channel Improvement 2/	86,873	21,718	8,275	500	15,490	15,990
GRAND TOTAL	1,292,141	174,265	111,749	6,500	78,491	84,991

1/ Price Base: 1962
2/ Located partially on Federal Land.
3/ Located on Federal Land.

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REVISED TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES

Nolan Creek Watershed, Texas

Item	Unit	STRUCTURE NUMBER						
		1	3	5A	7	8	9	
Drainage Area	Sq. Mi.	5.49	8.79	2.00	1.77	2.77	3.57	
Storage Capacity								
Sediment Pool (50-year or 200 ac.-ft. limit)	Ac.Ft.	199	166	69	74	114	86	
Sediment Reserve (below riser)	Ac.Ft.	445	-	63	72	112	85	
Sediment in Detention Pool	Ac.Ft.	50	-	13	12	18	14	
Floodwater Detention	Ac.Ft.	2,566	3,524	545	482	1,019	975	
Total	Ac.Ft.	3,260	3,690	690	640	1,253	1,158	
Surface Area								
Sediment Pool (50-year or 200 ac.-ft. limit)	Acres	35	24	20	17	15	16	
Sediment Reserve Pool (Top of Riser)	Acres	86	-	30	27	28	25	
Floodwater Detention Pool	Acres	255	280	97	70	84	91	
Volume of Fill	Cu. Yd.	390,290	199,500	80,830	133,130	192,430	135,980	
Elevation Top of Dam	Foot	912.8	741.2	858.5	800.7	773.1	749.0	
Maximum Height of Dam	Foot	45	60	27	29	41	37	
Emergency Spillway								
Great Elevation	Foot	906.4	734.0	853.0	795.6	797.8	745.2	
Bottom Width	Foot	350	140	120	200	250	500	
Type	xxx	Veg.	Rock	Veg.	Veg.	Veg.	Veg.	
Purpose/Change of Use	1/	1.0	1.5	3.7	3.8	2.0	3.6	
Average Curve No. - Condition II	xxx	82	78	82	82	82	81	
Emergenc. Spillway Hydrograph								
Storm Rainfall (6-hour) 2/	Inch	13.50	6.60	10.00	10.99	10.81	10.70	
Storm Runoff	Inch	11.18	4.20	7.70	8.73	8.56	8.31	
Velocity of Flow (Vc) 4/	Ft./Sec.	6.0	-	5.7	5.8	5.0	5.4	
Discharge Rate 4/	C.F.S.	2,360	-	700	1,282	1,022	3,164	
Maximum Water Surface Elevation 4/	Foot	908.7	-	885.0	797.8	769.5	747.1	
Freeboard Hydrograph								
Storm Rainfall (6-hour) 2/	Inch	31.00	16.27	21.50	25.05	24.65	24.41	
Storm Runoff	Inch	28.52	13.32	19.08	22.60	22.21	21.81	
Velocity of Flow (Vc) 4/	Ft./Sec.	10.7	11.8	10.0	9.6	9.8	8.5	
Discharge Rate 4/	C.F.S.	13,800	7,300	3,860	5,532	7,522	11,754	
Maximum Water Surface Elevation 4/	Foot	912.8	741.2	858.5	800.7	733.1	749.0	
Principal Spillway								
Capacity - Low Stage	C.F.S.	55	143	20	18	28	36	
Capacity Equivalents								
Sediment Volume	Inch	2.37	0.35	1.36	1.67	1.65	0.97	
Detention Volume	Inch	8.76	7.55	5.11	5.11	6.90	5.11	
Spillway Storage	Inch	6.87	4.90	6.98	4.62	3.87	1.83	
Class of Structure	xxx	C	A	B	B	B	B	

(Footnotes on last page of Table 3.)

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

Item	STRUCTURE NUMBER														
	10	11	12	13	14	15	Total								
Unit	3.70	2.81	1.60	1.12	0.90	1.34	35.86								
Drainage Area	Sq.Mi.														
Storage Capacity															
Sediment Pool (50-year or 200 ac.-ft. limit)	Ac.Ft.	195	79	67	42	37	74								
Sediment Reserve (Below Riser)	Ac.Ft.	196	78	67	42	38	72								
Sediment in Detention Pool	Ac.Ft.	30	12	10	7	5	11								
Floodwater Detention	Ac.Ft.	714	766	597	422	245	366								
Total	Ac.Ft.	1,135	935	741	513	325	523								
Surface Area	Ac.														
Sediment Pool (50-year or 200 ac.-ft. limit)	Ac.	34	14	17	8	9	12								
Sediment Reserve Pool (Top of Riser)	Ac.	44	23	25	13	15	15								
Floodwater Detention Pool	Ac.	97	87	84	49	31	44								
Volume of Fill	Cu.Yd.	254,500	205,780	173,680	116,470	67,310	139,730								
Elevation Top of Dam	Foot	689.1	705.7	670.9	654.8	698.8	828.3								
Maximum Height of Dam	Foot	29	38	29	39	27	38								
Emergency Spillway	Foot	685.1	700.8	665.7	651.1	694.1	823.7								
Crest Elevation	Foot	400	350	150	200	75	100								
Bottom Width	Veg.														
Type	Veg.	7.1	3.6	2.0	2.0	4.0	4.0								
Percent Chance of Use	%	82	81	82	82	81	82								
Average Curve No. - Condition 11															
Emergency Spillway Hydrograph															
Storm Rainfall (6-hour) ^{2/}	Inch	7.14	10.80	11.03	11.15	7.47	7.39								
Storm Runoff	Inch	5.05	8.41	8.77	8.89	5.24	5.28								
Velocity of Flow (V _e) ^{4/}	Ft./Sec.	4.8	5.8	5.2	4.3	2.5	1.0								
Discharge Rate ^{4/}	C.F.S.	1,363	2,152	670	514	70	12								
Maximum Water Surface Elevation ^{4/}	Foot	686.7	703.0	667.5	652.5	694.9	824.1								
Freeboard Hydrograph															
Storm Rainfall (6-hour) ^{2/}	Inch	17.29	24.62	25.13	25.43	18.09	17.88								
Storm Runoff	Inch	14.91	22.02	22.68	22.98	15.55	15.49								
Velocity of Flow (V _e) ^{4/}	Ft./Sec.	8.5	9.4	9.6	8.0	9.4	9.1								
Discharge Rate ^{4/}	C.F.S.	7,500	9,262	4,250	3,239	1,951	2,397								
Maximum Water Surface Elevation ^{4/}	Foot	689.1	705.7	670.9	654.8	698.8	828.3								
Principal Spillway															
Capacity - Low Stage	C.F.S.	37	28	16	11	9	13								
Capacity Equivalents															
Sediment Volume	Inch	2.13	1.13	1.69	1.52	1.68	2.20								
Detention Volume	Inch	3.62	5.11	7.00	7.07	5.11	5.11								
Spillway Storage	Inch	4.23	2.21	5.99	3.47	3.91	3.12								
Class of Structure		A	B	B	B	A	A								

1/ Based on regional analysis of gaged runoff and in all cases exceeds the requirements set forth in Engineering Memorandum SCS-27.
 2/ Minimum 6-hour precipitation for emergency spillway hydrograph for Class C structures. 0.5 P reduced to controlling drainage area on all Class A structures. 0.75 P reduced to controlling drainage area on all Class B structures.
 3/ Probable maximum 6-hour precipitation from U. S. Department of Commerce, Weather Bureau, TP Number 40, for Class C structures.
 4/ 1.01 P reduced to controlling drainage area on all Class A structures. 1.71 P reduced to controlling drainage area on all Class B structures. Maximum during passage of hydrograph.

REVISED TABLE 4 - ANNUAL COST

Nolan Creek Watershed, Texas
(Dollars)

Evaluation Unit	Amortization of Installation Cost <u>1/</u>	Operation and Maintenance Cost <u>2/</u>	Total
Floodwater Retarding Structures 1, in combination with channel improvement, 3, 5A, and 7 through 15 <u>3/</u>	50,792	2,668	53,460
TOTAL	50,792	2,668	53,460

1/ Price Base: 1962 prices amortized for 100 years at 2.875 percent.

2/ Long-term prices as projected by ARS, September 1957.

3/ Interrelated measures.

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**REVISED TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD
DAMAGE REDUCTION BENEFITS**

Nolan Creek Watershed, Texas

(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater			
Crop and Pasture	6,239	4,054	2,185
Other Agricultural	10,058	6,123	3,935
Nonagricultural			
Urban	48,883	6,133	42,750
Transportation	6,503	3,340	3,163
Subtotal	71,683	19,650	52,033
Sediment			
Overbank Deposition	368	265	103
Erosion			
Flood Plain Scour	1,415	689	726
Indirect	15,328	3,314	12,014
Total	88,794	23,918	64,876 <u>2/</u>

1/ Price Base: Long-term prices as projected by ARS, September 1957.

2/ Includes damage reductions attributed to the floodwater retarding structure installed on Fort Hood Military Reservation under agreement between Commanding General, Fort Hood Military Reservation and Soil Conservation Service.

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

Nolan Creek Watershed, Texas
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS ^{1/}				Total	Average Annual Cost	Benefit Cost Ratio
	Changed	Recreation	Urban	Secondary			
Floodwater Retarding Structures 1, in combination with channel improvement, 3, 5A, and 7 through 15 ^{4/}	57,302	2,794	4,175	5,990	70,261	53,460	1.3:1
GRAND TOTAL	57,302 ^{5/}	2,794	4,175	5,990	70,261 ^{6/}	53,460	1.3:1

^{1/} Price Base: Long-term prices as projected by ARS, September 1957.
^{2/} Benefits from recreation incidental to installation of floodwater retarding structures.
^{3/} From table 4.
^{4/} Interrelated measures.
^{5/} In addition, it is estimated that land treatment measures will provide flood damage reduction benefits of \$3,164 annually.
^{6/} Additional benefits in the amount of \$4,772 (\$4,410 from damage reduction and \$362 from secondary sources) are allocated to floodwater retarding structure installed on Fort Hood Military Reservation.

INVESTIGATIONS AND ANALYSIS

Project Formulation

Structural Measures

Numbered 8 paragraph is changed to show "(revised tables 2 and 3)" instead of "(tables 2 and 3)" at the end of the paragraph.

In the last paragraph, the words "(table 2)", "(table 1)", and "(table 4)" are changed to read "(revised table 2)", "(revised table 1)", and "(revised table 4)".

Geologic Investigations

Description of Problems

The two columns of numbers in the fifth paragraph are changed as follows:

Add an "A" to number "5" and delete the number "6" under the "Site Number" column.

Delete the number "20" which is the third number from the top of the column under "Percent Rock".

Economic Investigations

Incidental Recreation Benefits

First paragraph, third sentence, the "450" is changed to "331", and in the fifth sentence, the "245" is changed to "221". The "7,350" in the next to last sentence in the paragraph is changed to "6,150".

At the end of the last paragraph, the "\$4,988" is changed to "\$4,175".

Secondary Benefits

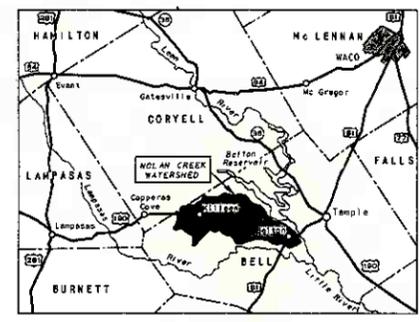
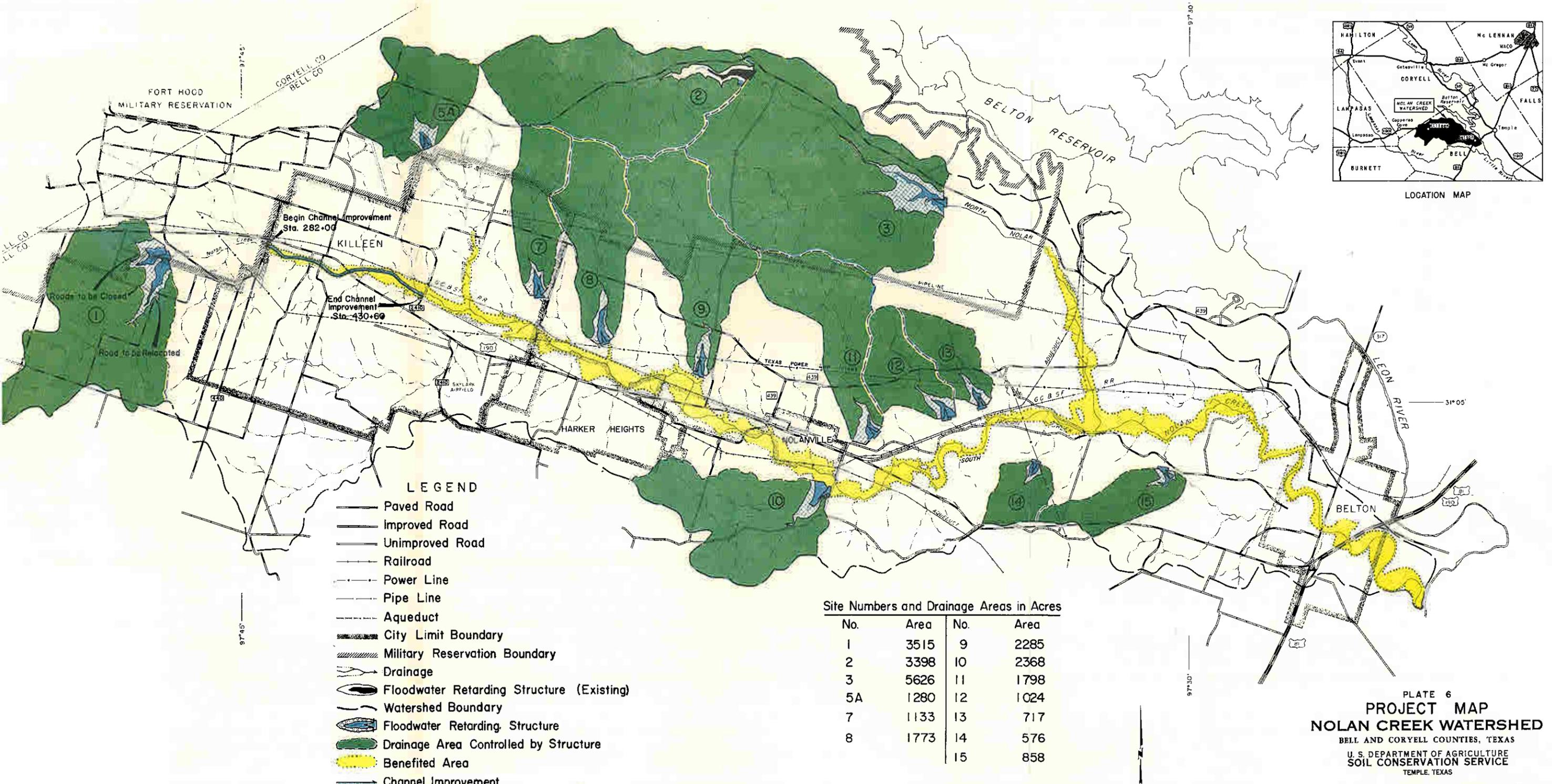
The last paragraph is changed to read:

"The total annual value of secondary benefits resulting from structural measures included in this plan are estimated to be \$5,990 of which \$4,732 stem from the project and \$1,258 are induced by the project."

Allocation of Benefits

The second paragraph is changed to read:

"Benefits allocated to the floodwater retarding structure constructed by Fort Hood is estimated to average \$4,772 annually. Total annual cost of the structure, including installation cost and operation and maintenance, is estimated at \$5,281."



- LEGEND**
- Paved Road
 - Improved Road
 - Unimproved Road
 - Railroad
 - Power Line
 - Pipe Line
 - Aqueduct
 - City Limit Boundary
 - Military Reservation Boundary
 - Drainage
 - Floodwater Retarding Structure (Existing)
 - Watershed Boundary
 - Floodwater Retarding Structure
 - Drainage Area Controlled by Structure
 - Benefited Area
 - Channel Improvement
 - ⑦ Site Number

Site Numbers and Drainage Areas in Acres

No.	Area	No.	Area
1	3515	9	2285
2	3398	10	2368
3	5626	11	1798
5A	1280	12	1024
7	1133	13	717
8	1773	14	576
		15	858

PLATE 6
PROJECT MAP
NOLAN CREEK WATERSHED
 BELL AND CORYELL COUNTIES, TEXAS
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 TEMPLE, TEXAS



Approximate Area - 73,600 Acres

Base compiled from USGS Quads and Uncontrolled Mosaic 4-R-16717.

Rev. 7-66 Revised 7-64 11-62 4-R-17366
 Revised 11-62 4-R-11885