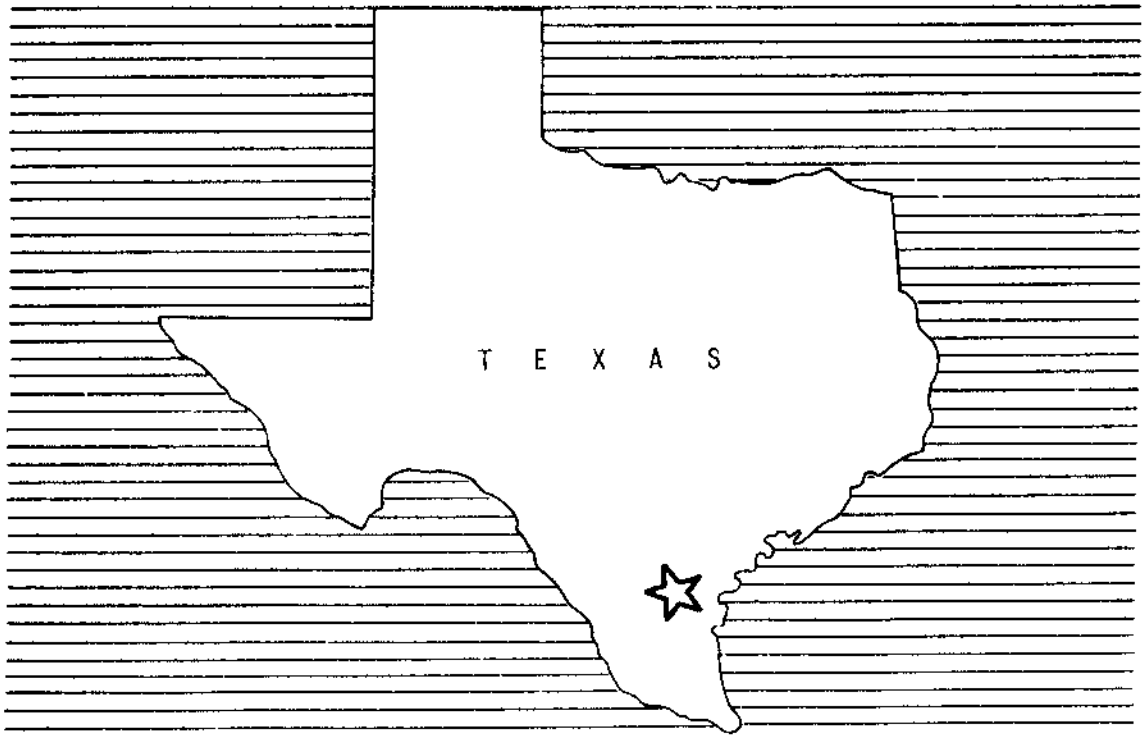
WORK PLAN

FOR WATERSHED PROTECTION AND FLOOD PREVENTION

SAN DIEGO-ROSITA CREEKS WATERSHED

DUVAL and JIM WELLS COUNTIES, TEXAS



MAY 1958

WATERSHED WORK PLAN AGREEMENT

between the

Agua Poquita Soil Conservation District
Local Organization

San Diego-Agua Dulce Soil Conservation District
Local Organization

Duval County Commissioners Court
Local Organization

Jim Wells County Commissioners Court

Nueces County Commissioners Court

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, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the San Diego-Rosita Creek Watershed, State of Texas under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended by the Act of August 7, 1956 (Public Law 1018, 84th Congress; 70 Stat. 1088); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the San Diego-Rosita Creek Watershed, State of Texas, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan will be installed, within 5 years, and operated and maintained substantially in accordance with the terms, conditions, and stipulations provided for therein.

It is mutually agreed that in installing and operating and maintaining the works of improvement described in the watershed work plan:

1. 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 $ 214,000 .)

2. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

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

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Construction Cost (dollars)
11 Floodwater Retarding Structures	0	100	1,081,367

The Sponsoring Local Organization will pay all of the costs allocated to purposes other than flood prevention, and irrigation, drainage, and other agricultural water management.

4. The Service will bear the cost of all installation services applicable to works of improvement for flood prevention. (Estimated cost $ 337,190 .)

   The Service will bear _____ percent of the cost of installation services applicable to works of improvement for agricultural water management and the Sponsoring Local Organization will bear _____ percent of the cost of such services. (Estimated cost $ None .)

   The Sponsoring Local Organization will bear the cost of all installation services applicable to works of improvement for nonagricultural water management. (Estimated cost $ None .)

5. The Sponsoring Local Organization will bear the costs of administering contracts. (Estimated cost $ 5,500 .)

6. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each floodwater retarding structure that they will carry out conservation farm or ranch plans on their land.

7. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

8. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

9. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

11. This agreement does not constitute a financial document to serve as a basis for the obligation of Federal funds, and financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the appropriation of funds for this purpose.

    Where there is a Federal contribution to the construction cost of works of improvement, a separate agreement in connection with each construction contract will be entered into between the Service and the Sponsoring Local Organization prior to the issuance of the invitation to bid. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.

13. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

Agua Poquita Soil Conservation District
Local Organization

By Henry [illegible]

Title Chairman

Date July 24, 1958

The signing of this agreement was authorized by a resolution of the governing body of the Agua Poquita Soil Conservation District
Local Organization

adopted at a meeting held on July 24, 1958

D. P. McBride
(Secretary, Local Organization)

Date July 24, 1958

San Diego-Agua Dulce Soil Conservation District
Local Organization

By W F Ballard

Title Chairman

Date July 24, 1958

The signing of this agreement was authorized by a resolution of the governing body of the San Diego-Agua Dulce Soil Conservation District
Local Organization

adopted at a meeting held on July 24, 1958.

Geo. D. Hoffman
Acting (Secretary, Local Organization)

Date July 24, 1958

Duval County Commissioners Court
Local Organization

By Dane O'Neil

Title County Judge

Date July 24, 1958

The signing of this agreement was authorized by a resolution of the governing body of the Duval County Commissioners Court
Local Organization

adopted at a meeting held on July 24, 1958

J. H. Molina Comm. #1
(Secretary, Local Organization)

Date July 24, 1958

Jim Wells County Commissioners Court
Local Organization

By Wash Storm Jr.

Title County Judge

Date **July 24, 1958**

The signing of this agreement was authorized by a resolution of the governing body of the **Jim Wells County Commissioners Court**
Local Organization

adopted at a meeting held on **July 24, 1958**

(Secretary, Local Organization)

Date **July 24, 1958**

Nueces County Commissioners Court
Local Organization

By

Title County Judge

Date **July 24, 1958**

The signing of this agreement was authorized by a resolution of the governing body of the **Nueces County Commissioners Court**
Local Organization

adopted at a meeting held on October 14, 1957

Mrs. Henry E. Gaiger
County Clerk Nueces Co. Tex
By (Secretary, Local Organization), Deputy

Date **July 24, 1958**

Soil Conservation Service
United States Department of Agriculture

By ______________________
Administrator

Date ______________________

WORK PLAN

FOR

WATERSHED PROTECTION AND FLOOD PREVENTION

SAN DIEGO-ROSITA CREEKS WATERSHED
Duval and Jim Wells Counties, Texas

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act. (Public Law 566, 83rd Congress; 68 Stat. 666 as Amended by Public Law 1018, 84th Congress; 70 Stat. 1088).

Prepared By: Agua Poquita Soil Conservation District
(Cosponsor)

San Diego-Agua Dulce Soil Conservation District
(Cosponsor)

Duval County Commissioners Court
(Cosponsor)

Jim Wells County Commissioners Court
(Cosponsor)

Nueces County Commissioners Court
(Cosponsor)

With Assistance By:

U. S. Department of Agriculture
Soil Conservation Service
May 1958

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SECTION 1

WATERSHED WORK PLAN

SAN DIEGO-ROSITA CREEKS WATERSHED
Duval and Jim Wells Counties, Texas
May 1958

SUMMARY OF PLAN

General Summary

The work plan for watershed protection and flood prevention for the San Diego-Rosita Creeks Watershed was prepared by the Agua Poquita and San Diego-Agua Dulce Soil Conservation Districts and the Commissioners Court of Duval, Jim Wells and Nueces Counties as cosponsoring organizations. Technical assistance was provided by the Soil Conservation Service of the United States Department of Agriculture.

The work plan covers an area of approximately 348 square miles, or 222,450 acres in Duval and Jim Wells Counties, Texas. Approximately 11 percent of the watershed is cropland, 87 percent is grassland, and 2 percent is in miscellaneous uses, such as stream channels, towns, roads, and railroads.

There are no Federal lands in the watershed.

The work plan proposes installing, in a 5-year period, a project for the protection and development of the watershed at a total estimated installation cost of $2,841,732. The share of this cost to be borne by other than Public Law 566 funds is $1,398,175. In addition, local interests will bear the entire cost of operation and maintenance, with a capitalized value of $48,500. Of the total project cost of $2,890,232, the other than Public Law 566 share will be $1,446,675 and the Public Law 566 share $1,443,557.

Land Treatment Measures

The cost for land treatment measures is estimated to be $1,203,675, of which the other than P. L. 566 share is $1,178,675, including $38,600 to be spent by the Soil Conservation Service under its going program for technical assistance during the project period. The Public Law 566 share, consisting entirely of accelerated technical assistance, is $25,000. The work plan includes only the land treatment measures that will be installed during the 5-year project period.

Structural Measures

The structural measures included in the plan consist of 11 floodwater retarding structures having a total sediment storage and floodwater detention capacity of 41,649 acre-feet. The total cost of structural measures, including

the capitalized value of operation and maintenance, is $1,686,557, of which the local share is $268,000 and the Public Law 566 share is $1,418,557. The local share of the total cost of structural measures includes: land, easements and rights-of-way, 79.9 percent; operation and maintenance, 18.1 percent; and administering contracts, 2.0 percent. The 11 floodwater retarding structures will be installed during a 5-year period.

Damages and Benefits

The estimated average annual floodwater, sediment, erosion and indirect damage within the watershed is $12,959 under present conditions. The estimated average annual damage with the project, including land treatment and structural measures is $4,089. The average annual primary benefit accruing to structural measures is $71,398, of which $64,024 accrue outside the watershed. The benefits are distributed as follows:

Benefits inside project area:	
Floodwater damage reduction	$ 4,126
Sediment damage reduction	1,055
Erosion damage reduction (flood plain scour)	1,458
Indirect damage reduction	735
Benefits outside project area:	
From Chiltipin-San Fernando Creeks watershed	$33,980
From Agua Dulce Creek watershed	17,271
From Agua Dulce Laterals watershed	12,773
Total	$71,398

The ratio of the average annual benefits ($71,398) to the average annual cost of structural measures ($59,465) is 1.2 to 1.

The total benefits of land treatment measures were not evaluated in monetary terms since experience has shown that these soil and water conservation measures produce benefits in excess of their costs.

Provisions for Financing Construction

The Commissioners Courts of Duval, Jim Wells and Nueces Counties have powers of taxation and eminent domain under applicable state laws. An ad valorem tax has been voted in these counties for the purpose of flood control and is presently being collected. This revenue is adequate and will be available for financing the local share of the structural cost.

Operation and Maintenance

Land treatment measures will be installed, operated, and maintained by the landowners or operators of the farms under agreements with the Agua Poquita and the San Diego-Agua Dulce Soil Conservation Districts. The 11 floodwater retarding structures will be operated and maintained jointly by the County Commissioners Courts of Duval, Jim Wells and Nueces Counties, which have legal authority to raise and expend funds for this purpose. The estimated average annual cost of operation and maintenance of the structures is $1,710.

DESCRIPTION OF WATERSHED

Physical Data

San Diego Creek (figure 1) heads approximately 12 miles northeast of Freer, Texas and flows in a southeasterly direction, through the town of San Diego, to a point approximately one mile northeast of Alice, Texas where it is joined by Chiltipin Creek to form San Fernando Creek.

San Fernando Creek flows in a southeasterly direction from the confluence of San Diego and Chiltipin Creeks for approximately three miles. At a point approximately three miles east of Alice the streamflow divides. A portion of the flow continues down San Fernando Creek in a southeasterly direction for approximately 21 miles where it discharges into an arm of Baffins Bay approximately 7 miles southeast of Kingsville, Texas. The remainder flows down Pintas Creek in an easterly direction for approximately 20 miles to the confluence with Agua Dulce Creek.

Agua Dulce Creek heads approximately 18 miles north of Alice and flows in a southeasterly direction for 46 miles where it discharges into an arm of Baffins Bay, 16 miles east of Kingsville, Texas.

This complex and interrelated drainage area has been divided into four watersheds to obtain workable units for the planning and application of works of improvement. The local sponsoring organizations have requested that these four watersheds be planned together since they are component parts of the larger watershed. The four watersheds, San Diego-Rosita Creeks, Chiltipin-San Fernando Creeks, Agua Dulce Creek, and Agua Dulce Laterals are shown on figure 1.

This work plan for watershed protection and flood prevention comprises the San Diego-Rosita Creeks portion of the interrelated watershed.

San Diego Creek, as pointed out above heads in Duval County approximately 12 miles northeast of Freer and flows in a southeasterly direction to its confluence with Chiltipin Creek one mile northeast of Alice in Jim Wells County. Rosita Creek heads two miles southeast of Freer and joins San Diego within the town of San Diego. Muerto Creek joins San Diego Creek from the north within the common San Diego-Chiltipin flood plain. Taranchua Creek joins Rosita Creek about two miles northwest of the community of Rosita.

The topography ranges from moderately sloping in the upper portion to gently rolling or flat in the lower portion of the watershed. Elevations range from 640 feet to 200 feet above mean sea level. In the upper reaches the flood plain is rather narrow, and increases to a maximum width of 1,200 feet between San Diego and Alice.

The watershed lies within the Rio Grande Plain Land Resource Area. The soils are medium textured except those in the bottoms, which are deep and fine textured. Approximately 35 percent of the watershed is underlain at a shallow depth by soft to hard caliche.

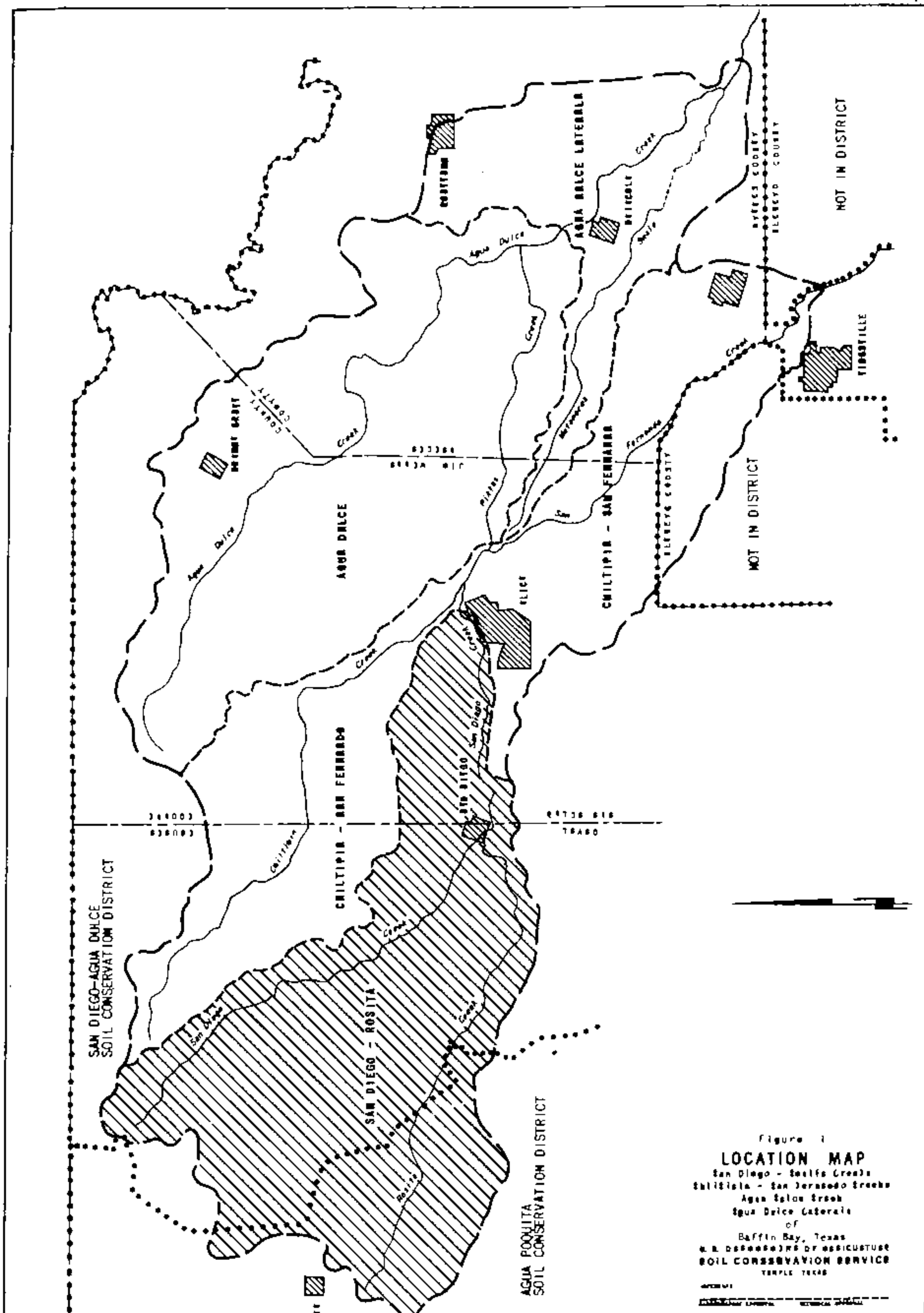


Figure 1
LOCATION MAP
Baffin Bay, Texas

Grassland occupies approximately 87 percent of the watershed of which 97.5 percent is in poor cover condition, 2.3 percent in fair cover condition, and 0.2 percent in good cover condition. Shallow soils and drouth have greatly influenced these conditions; however, under normal rainfall and with more land treatment practices applied, the condition of the cover should improve.

Physiographically, this area is known as the South Texas Coastal Plain. Formations outcropping within the watershed, from oldest to youngest, are the Catahoula, Oakville, Goliad and Lissie. The Lissie is Quaternary and the other three are Tertiary in age. These formations dip between 20 and 80 feet per mile to the east toward the Gulf of Mexico. The drainage pattern, in most cases, has been established by surface faults in the upland areas.

The overall land use for the watershed is as follows:

Land Use	Acres	Percent
Cultivation	24,397	11
Grassland	193,437	87
Miscellaneous 1/	4,616	2
Total	222,450	100

1/ Includes roads, highways, railroads, stream channels, urban areas, etc.

The principal scour damages occur on the flood plains of San Diego Creek between the towns of San Diego and Alice and Rosita Creek. San Diego Creek above the confluence of Rosita Creek suffers little damage since most of the flood plain is in brush. About 3,241 acres of the watershed is flood plain which will be benefited by the project. The flood plain as described herein is the area inundated by the 25-year frequency storm runoff. Land use in the flood plain is 28 percent cultivation, 69 percent range, brush, or pasture, and 3 percent miscellaneous.

The average annual rainfall at the Alice, Texas, gage is 26 inches according to U. S. Weather Bureau records over a period of 30 years. The monthly average ranges from 1.27 inches in February to 3.57 inches in September.

Average temperatures range from 83 degrees Fahrenheit in the summer to 61 degrees in the winter. The normal frost-free season of 289 days extends from February 26th to December 10th.

Water for livestock and domestic use is supplied from wells. Stock ponds also furnish water for livestock; however, this source is not always dependable during periods of drought.

Economic Data

The economy of the watershed is based on both agricultural production and

the production of petroleum products. Beef cattle production is the most important agricultural enterprise in the watershed. Most of the 24,397 acres of cultivated land is used for the production of feed crops as a part of the livestock enterprise. Limited amounts of maize and cotton are grown as cash crops in the lower part of the watershed.

The average size agricultural unit in the watershed is approximately 620 acres, and is sufficient for an economic unit. Almost all the land in the watershed is leased for mineral production, which furnishes additional income to farm and ranch owners.

Alice, population 23,000, and San Diego, population 4,400, are the principal towns in the watershed. These towns provide adequate marketing, educational, recreational and medical facilities for the people in the watershed.

The area is served adequately by 158 miles of state and county roads, of which 51 miles are hard surfaced. In addition, there are many miles of private, ranch and oil field roads serving the area. Adequate rail service is provided by two railroads with major shipping and loading facilities at Alice and San Diego.

WATERSHED PROBLEMS

Floodwater Damages

Flooding occurs frequently in the San Diego-Rosita Creeks watershed and causes moderate damage. Large floods have occurred on the average of once every four to five years. During the 30-year period studied, 1924 to 1953, inclusive, which is representative of normal rainfall in this area, there were 7 major floods that inundated more than half of the flood plain (figure 2), as well as 52 smaller floods.

During recent years unusually severe flooding has occurred in the San Diego-Rosita Creeks watershed. Major floods were experienced in 1949, 1951, 1953, 1955, and 1957, but due to the low damageable value of the flood plain only moderate damages resulted outside the urban area of Alice. In Alice the flood of April 1949 caused damage in excess of $590,000, and damages from the flood of September 1951 were estimated to be $390,000. The Corps of Engineers flood control project, consisting of levees and channel improvement prevented urban damage from the floods of 1955 and 1957 and would have eliminated the damage in 1949 and 1951 had it been installed.

Because of the interrelated nature of all four watersheds, floodwater and scour damages in Chiltipin-San Fernando Creeks watershed, Agua Dulce Creek watershed and Agua Dulce Laterals watershed were greatly increased by the flood flows from this watershed.

It is estimated that the average annual direct floodwater damage under existing conditions is $6,431, of which $2,055 is crop and pasture damage, $1,710 is other agricultural damage, and $2,666 is nonagricultural damage,

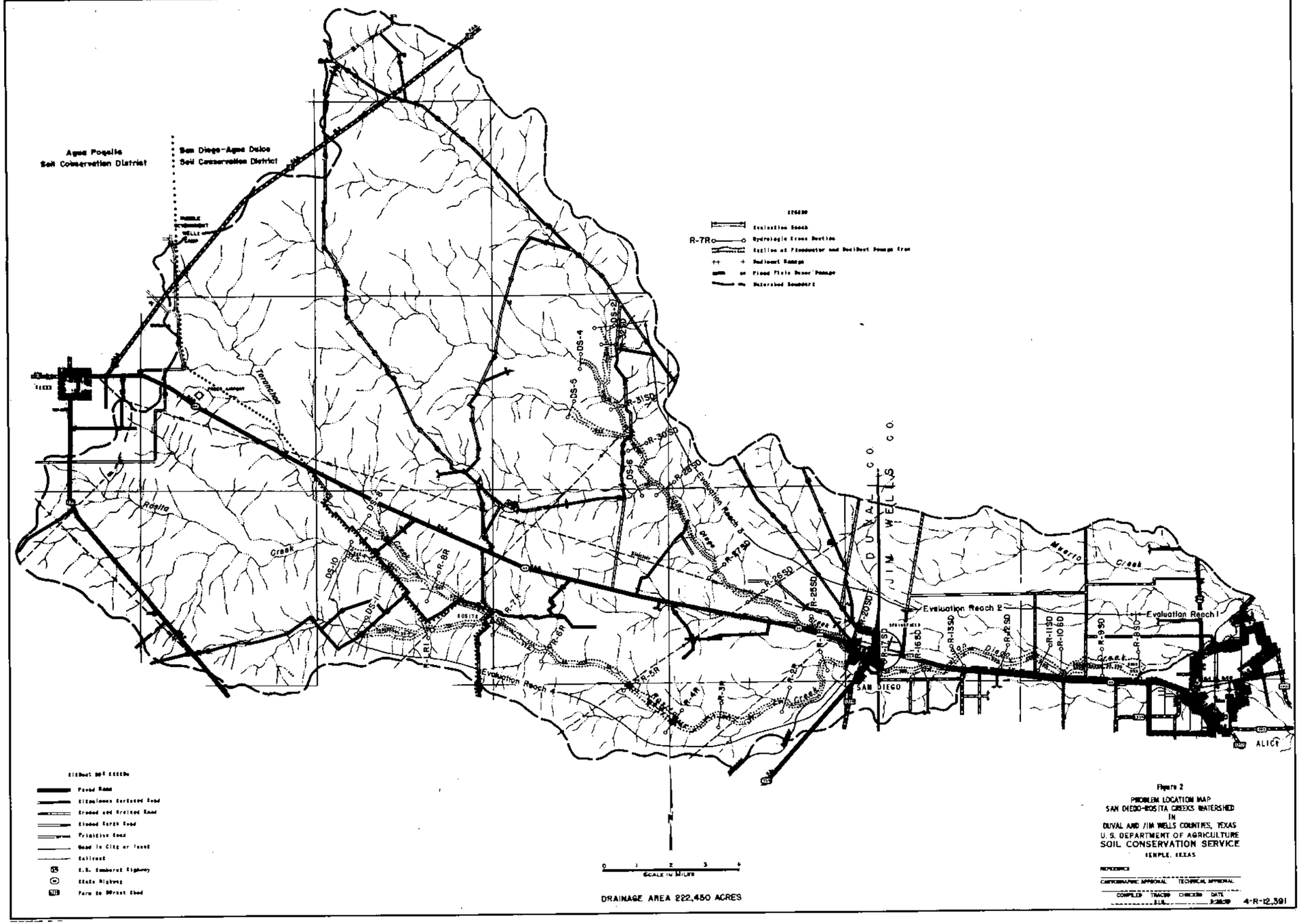


Figure 2

PROBLEM LOCATION MAP
SAN DIEGO-ROSITA CREEKS WATERSHED
IN
DUVAL AND JIM WELLS COUNTIES, TEXAS
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

4-R-12,391

primarily to roads and bridges. In addition, there are numerous indirect damages, such as interruption of travel and initial losses sustained by dealers and industries in the area, which are estimated to average $1,195 per year.

Sediment Damage

Sediment damage to the flood plain lands has been very minor in this watershed. The sediment is composed primarily of fine sand washed clean of organic matter. A large amount of the sediment is tending to fill some of the scour channels. An estimated 42 acres of agricultural land have been damaged. Crop production has been reduced 20 percent on 37 acres, with the remaining 5 acres suffering 30 to 40 percent damage. This amounts to an average annual monetary damage of $297. Within the improved channel of San Diego Creek near Alice, the present average annual loss of capacity is estimated to be 11,164 cubic yards, which represents a damage of $2,478, the annual cost for channel maintenance by sediment removal.

Erosion Damage

Erosion rates are low to moderate within this watershed. This is due, primarily, to slopes ranging from moderate to nearly flat and to only 11 percent of the land being in cultivation. Sheet erosion accounts for 88.9 percent of the total gross erosion. Scour channels in the flood plain produce 5.6 percent, with erosion from streambanks, gullies, and dirt roads accounting for 2.3, 1.7, and 1.5 percent, respectively, of the total gross erosion.

Flood plain scour has damaged 819 acres, or 13.9 percent of the flood plain. Removal of surface soil ranges from 0.3 to 1.7 feet in depth, and has caused the following damages: 458 acres, 10 percent; 255 acres, 20 percent; 62 acres, 30 percent; 40 acres, 40 percent; and 4 acres, 50 percent, in terms of reduced productivity. The estimated average annual damage by scour is $2,558.

Problems Relating to Water Management

There is very little activity relative to drainage or irrigation in the watershed. No individual landowner or group of landowners has indicated an interest in providing additional storage in any of the floodwater retarding structures for irrigation purposes. The city of Alice did, however, indicate interest in providing additional storage for municipal water supply. City officials studied engineering and hydrologic data and determined that additional storage for municipal water supply was not feasible because of the distance from Alice or inadequate storage possibilities.

EXISTING OR PROPOSED WORKS OF IMPROVEMENT

The San Diego-Rosita Creeks watershed is served by Soil Conservation Service work units at Alice and Benavides assisting the San Diego-Agua Dulce Soil Conservation District and the Agua Poquita Soil Conservation District. These

work units have assisted farmers and ranchers in preparing 191 soil and water conservation plans on 142,824 acres (66 percent of the agricultural land) within the watershed and in giving technical assistance in establishing and maintaining planned measures.

Efforts to prevent or to control flooding of agricultural lands in the San Diego-Rosita Creek watershed have been minor. However, the city of Alice, having suffered heavy urban monetary damage, has made an active and concerted effort to control or eliminate flooding in town. A Corps of Engineers' flood control project on San Diego Creek was completed in 1954. This project consists of 3.25 miles of channel enlargement and levee where the creek flows through the northern edge of the city, and affords protection to the urban area of Alice. The works of improvement as proposed in this plan will increase the effectiveness of the existing channel project. In addition, a material reduction in maintenance will result from installation of the planned land treatment measures and the system of floodwater retarding structures. Under present conditions an estimated 11,164 cubic yards of sediment are being deposited in the channel project area annually. The combined land treatment measures and floodwater retarding structures are expected to reduce this amount by 64 percent.

WORKS OF IMPROVEMENT TO BE INSTALLED

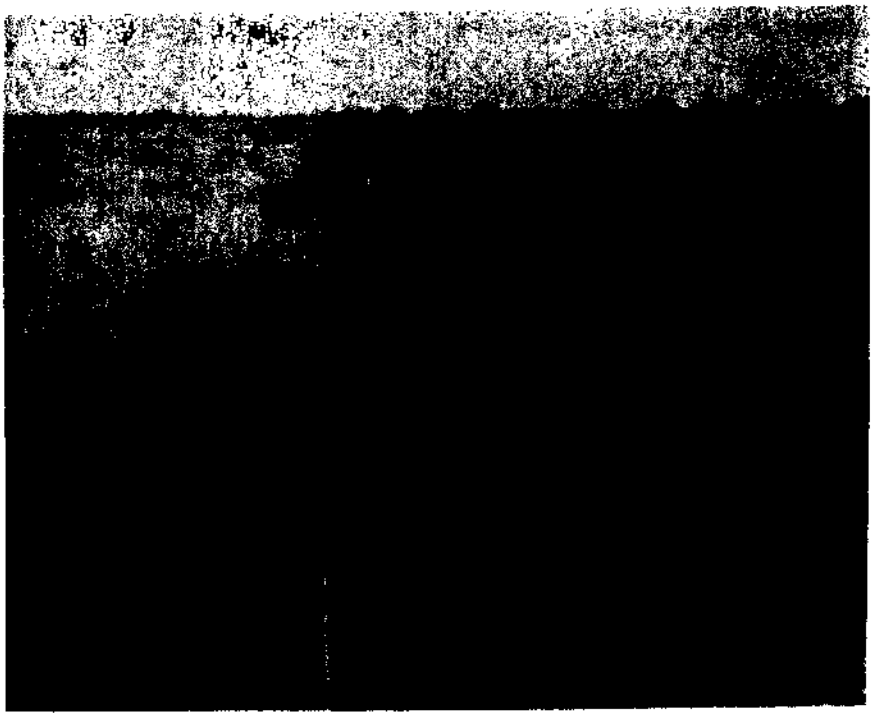
Land Treatment Measures for Watershed Protection

An effective conservation program based upon the use of each acre of agricultural land within its capabilities and its treatment in accordance with its needs, such as is now being carried out by the San Diego-Agua Dulce and Agua Poquita Soil Conservation Districts, is necessary for a sound flood prevention program on the watershed. Basic to reaching this objective is the establishment and maintenance of all applicable soil and water conservation and plant management practices essential to proper land use. Emphasis will be placed on accelerating the establishment of land treatment practices which have a measurable effect on the reduction of floodwater and sediment damages.

Of the total watershed area of 222,450 acres, 119,112 acres lie above planned floodwater retarding structures. Land treatment is especially important for protection of these watershed lands to support and supplement the structural measures. There are another 100,097 acres of upland in the watershed for which no structural control has been planned and for which the establishment of land treatment constitutes the only planned measures in this plan. Land treatment measures on the 3,241 acres of flood plain are also important in reducing floodwater, sediment, and erosion damage.

The amounts and estimated costs of the measures that will be installed by the landowners and operators are shown in table 1. The estimated total cost of planning and installing these measures is $1,203,675, including $25,000 from Public Law 566 funds during the 5-year installation period

Brush control by root plowing, range seeding and deferment.



Brush control by roller cutter and deferment.

for the acceleration of technical assistance to landowners and operators to speed up the planning and application of conservation practices. Landowners and operators will maintain these measures in accordance with provisions of the farmer-district cooperative agreements.

Land treatment measures will decrease erosion damage and sediment production from fields, range areas, and pastures by providing improved soil-cover conditions. These measures include cover cropping, use of rotation hay and pasture, crop residue utilization for cropland, and pasture planting to establish good cover on grassland and formerly cultivated lands. They also include range seeding and brush control to allow grass stands to replace the poor brushy cover; construction of farm ponds to provide watering places to prevent cover-destroying, seasonal concentrations of livestock; and proper use of rangelands to provide improvement, protection and maintenance of grass stands. These measures also effectively improve soil conditions which allow rainfall to soak into the soil at a more rapid rate.

In addition to the soil improvement and cover measures, land treatment includes contour farming, terracing, diversion construction, and waterway development to serve these measures, which in combination have a measurable effect in reducing peak discharge by slowing runoff water from fields. These measures also help the soil improvement and cover measures to reduce erosion damage and sediment production.

Structural Measures

A system of 11 floodwater retarding structures will be installed in the San Diego-Rosita Creeks watershed in conjunction with the works of improvement to be installed in the other interrelated watersheds, to afford the needed protection to flood plain lands in these watersheds which cannot be provided by land treatment measures alone.

The 11 floodwater retarding structures will have a total floodwater detention capacity of 38,956 acre feet, and will temporarily detain runoff from 54 percent of the total watershed. An average of 3.91 inches of runoff will be detained from the watershed area above the planned structures. This is the equivalent of 2.10 inches of runoff from the entire 222,450-acre watershed.

Figure 3 shows a section of a typical floodwater retarding structure.

The locations of the structural measures are shown on the Planned Structural Measures map, figure 4.

The total estimated cost of establishing these works of improvement is $1,638,057, of which $219,500 will be borne by local interest and $1,418,557 by Public Law 566 funds (table 1). The average annual equivalent cost is estimated to be $57,755 for installation and $1,710 for operation and maintenance, a total annual cost of $59,465.

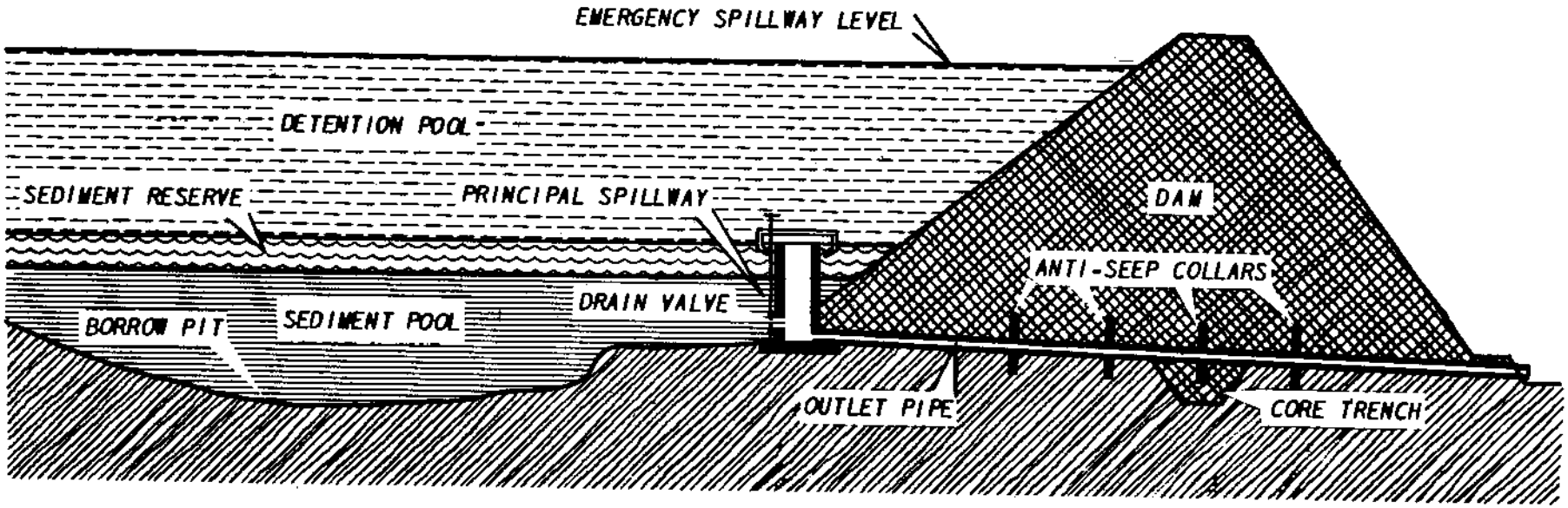


Figure 3

SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

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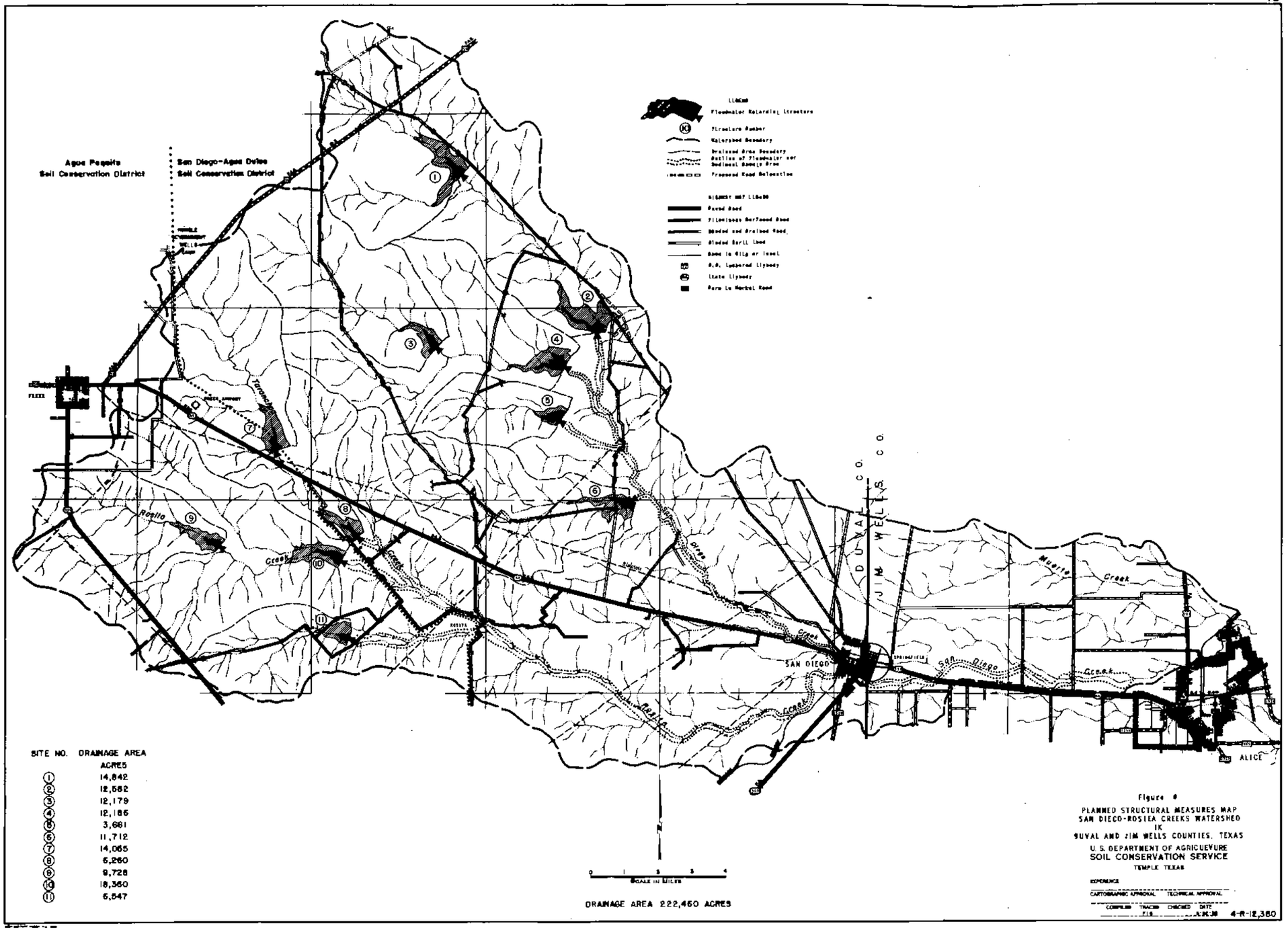


Figure 9

PLANNED STRUCTURAL MEASURES MAP
SAN DIEGO-ROSITA CREEKS WATERSHED
IK
DUVAL AND JIM WELLS COUNTIES, TEXAS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE, TEXAS

CONFIDENCE

CARTOGRAPHIC APPROVAL | TECHNICAL APPROVAL

COMPILED | TRACED | CHECKED | DATE

4-R-12,380

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST 1/
San Diego-Rosita Creeks Watershed, Texas
Price Base: 1957

Installation Cost Item	Unit	No. to be Applied Non-Federal Land	Estimated Cost Public Law 566 Funds (dollars)	Other Funds (dollars)	Total (dollars)
AND TREATMENT FOR					
Watershed Protection					
Soil Conservation Service					
Contour Farming	Acre	1,910	-	955	955
Cover Cropping	Acre	3,749	-	29,992	29,992
Crop Residue Utilization	Acre	11,524	-	23,048	23,048
Rotation Hay & Pasture	Acre	2,142	-	12,852	12,852
Brush Control	Acre	60,000	-	600,000	600,000
Proper Use	Acre	88,232	-	220,580	220,580
Range Seeding	Acre	50,000	-	220,000	220,000
Pasture Planting	Acre	571	-	3,426	3,426
Diversion Construction	Mile	5	-	3,422	3,422
Pond Construction	Each	16	-	12,800	12,800
Terraces	Mile	60	-	12,000	12,000
Waterway Development	Acre	50	-	1,000	1,000
Technical Assistance			25,000	38,600	63,600
SCS Subtotal			25,000	1,178,675	1,203,675
OTAL LAND TREATMENT			25,000	1,178,675	1,203,675
TRUCTURAL MEASURES					
Soil Conservation Service					
Floodwater Retarding Structures	No.	11	1,081,367	-	1,081,367
SCS Subtotal			1,081,367	-	1,081,367
Subtotal - Construction			1,081,367	-	1,081,367
nstallation Services					
Soil Conservation Service					
Engineering Service			196,612	-	196,612
Other			140,578	-	140,578
SCS Subtotal			337,190	-	337,190
Subtotal - Installation Services			337,190	-	337,190
ther Costs					
Land, Easements & R/W			-	214,000	214,000
Administration of Contracts			-	5,500	5,500
Subtotal - Other			-	219,500	219,500
OTAL STRUCTURAL MEASURES			1,418,557	219,500	1,638,057
OTAL PROJECT			1,443,557	1,398,175	2,841,732
MMARY					
Subtotal SCS			1,443,557	1,398,175	2,841,732
OTAL PROJECT			1,443,557	1,398,175	2,841,732

1/ No Federal lands involved.

May 1958

Floodwater detention structure.

Sufficient detention storage can be developed at all structure sites to make possible the use of vegetative spillways, thereby effecting a substantial reduction in cost over concrete or similar types of spillways.

All applicable state water laws will be complied with in the design and construction of the floodwater retarding structures.

BENEFITS FROM WORKS OF IMPROVEMENT

The combined program of land treatment and structural measures described above would prevent flood damage from 21 of the 59 floods, such as occurred in the watershed from 1924 to 1953, inclusive. All of the seven major floods would be reduced to minor floods, each inundating less than one-half of the flood plain. Average annual flooding throughout the watershed would be reduced from 1,392 acres to 461 acres.

The area on which sediment damage from overbank deposition will occur annually can be expected to be reduced from 42 acres to 5 acres, a

reduction of 88 percent. Land treatment will effect 38 percent of the reduction and structural measures the remaining 62 percent.

The area on which flood plain scour damage will occur can be expected to be reduced from 819 acres to 262 acres, a reduction of 68 percent.

With the planned land treatment and structural measures installed, total gross erosion from the watershed will be reduced from 256 acre-feet annually to 173 acre-feet annually.

The estimated average annual flood, erosion, sediment and indirect damage within the watershed would be reduced from $12,959 to $4,089, a 68 percent reduction. No benefits from restoration of flood plain lands to former production levels are included in the above values. About 83 percent of the expected reduction in the average annual damage would result from the system of floodwater retarding structures. With the project installed, the flood plains of San Diego Creek and Rosita Creek will be flood-free for all storms that can be expected to occur no more frequently than once in two years. However, flooding occurring at this frequency will be limited to areas of extremely low damageable values such as unimproved rangeland. Areas of significant damageable value will be essentially flood-free for all storms that can be expected to occur no more frequently than once in five years.

Average annual benefits of $33,980 will accrue to the planned structural measures in the San Diego-Rosita Creek watershed from reduction of damages on the mainstem of San Fernando Creek below its confluence with San Diego Creek. Average annual benefits to the project in the amount of $17,271 will accrue from the flood plains of Pintas Creek and Agua Dulce Creek below the confluence of Agua Dulce Creek and Pintas.

Additional average annual benefits of $12,773 will be derived from the flood plain of the Agua Dulce Laterals watershed. These benefits from the Agua Dulce Laterals watershed will be from both the mainstem flood plain of Agua Dulce Creek below the lower limits of Agua Dulce watershed and the flood plain of Matamoros Swale from a point where it receives overflow from San Fernando Creek to where it joins the flood plain of Agua Dulce Creek. (See figure 1 for watershed delineations). The total flood prevention benefits accruing to works of improvements in the San Diego-Rosita Creek watershed from reduction in flood damages are estimated to be $71,398 annually.

COMPARISON OF BENEFITS AND COSTS

The average annual cost of the structural measures (converted from total installation cost, plus operation and maintenance) is estimated to be $59,465. When the project is completely installed, it is expected to produce average annual benefits of $71,398. The project, therefore, will produce benefits of $1.20 for each dollar of cost. In addition to the direct monetary benefits, there are other substantial values which will

accrue from the project, such as increased opportunity for recreation, improved wildlife conditions, better living conditions, a sense of security, and an indeterminable benefit from ground water recharge, none of which have been used for project justification.

ACCOMPLISHING THE PLAN

Federal assistance for carrying out the works of improvement on non-Federal land, as described in this work plan will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress; 68 Stat. 666, as amended by Public Law 1018, 84th Congress; 70 Stat., 1088).

Land Treatment Measures

The land treatment measures itemized in table 1 will be established by farmers and ranchers in cooperation with the San Diego-Agua Dulce and the Agua Poquita Soil Conservation Districts over a 5-year period. These two Districts are giving assistance in the planning and application of these measures under their going programs. This assistance will be accelerated to assure application of the planned measures within the 5-year installation period for the project.

The governing bodies of the San Diego-Agua Dulce and the Agua Poquita Soil Conservation Districts, with assistance from the watershed association, will arrange for meetings according to a definite schedule. By this means, and by individual contacts, they will encourage landowners and operators within the watershed to adopt and carry out soil and water conservation plans on their farms and ranches. District owned equipment will be made available to the landowners in accordance with the existing arrangements for equipment usage in the district. The soil conservation district governing bodies will make, or cause to be made, periodic inspections of the completed conservation measures within the watershed. The Soil Conservation Service will provide additional technical assistance to the San Diego-Agua Dulce and the Agua Poquita Soil Conservation Districts to assist landowners and operators cooperating with the districts in accelerating the preparation and application of soil, plant and water conservation plans.

The soil and water conservation loan program of the Farmers Home Administration is available to all eligible individual farmers and ranchers in the area. Educational meetings will be held in cooperation with other agencies to outline the services available and eligibility requirements. Present FHA clients will be encouraged to cooperate in the program.

The County ASC Committee will cooperate with the governing bodies of the soil conservation districts by selecting and providing financial assistance for those ACPS practices which will accomplish the conservation objectives in the shortest possible time.

The Extension Service will assist with the educational phase of the program by conducting general information and local farm meetings, preparing radio, television and press releases, and using other methods of getting information to landowners and operators in the San Diego-Rosita Creeks watershed. This activity will help to get the land treatment practices and the structural measures for flood prevention carried out.

Structural Measures for Flood Prevention

Land, easements, rights-of-way, and road and utility changes necessary for the construction of all structures will be provided by the County Commissioners Court of Duval County. The necessary improvement of low water road crossings to make them passable during prolonged release flow from the structures will be provided by the respective County Commissioners Court of Duval or Jim Wells Counties. Revenue from an ad valorem tax, which has heretofore been voted in these counties for flood control, shall be available for these costs. The easements will be dedicated jointly to Duval County and the soil conservation district involved, either Agua Poquita or San Diego-Agua Dulce.

Under an agreement that has been executed by the Commissioners Courts of Nueces, Jim Wells, and Duval Counties, the Nueces County Commissioners Court will be the contracting agency and will let and service all contracts for the 11 floodwater retarding structures included in this work plan. The costs of administering contracts will be shared as follows: Nueces County, 50 percent; Jim Wells County, 30 percent; and Duval County, 20 percent. These costs will be paid from revenue from the ad valorem tax, which has been voted in each county for the purpose of flood control.

All works of improvement in this watershed and the Chiltipin-San Fernando Creeks watershed are interrelated and interdependent; however, floodwater retarding structures Nos. 1 through 8 can be constructed without the prolonged release flow greatly exceeding the channel capacities downstream in this or any of the other interrelated watersheds. Any construction beyond these 8 structures is dependent upon the completion of the channel improvement in the Chiltipin-San Fernando Creeks and Agua Dulce Creeks watersheds.

The estimated schedule of obligation for the complete 5-year installation period, covering installation of both land treatment and structural measures, is as follows:

Fiscal Year	Measure	P.L. 566 Funds	Other Funds	Total
1st	Sites 1, 2, and 3	$ 396,865	$ 77,723	$ 474,588
	Land Treatment	5,000	235,735	240,755
2nd	Sites 4, 5, 6, 7, and 8	657,285	91,340	748,625
	Land Treatment	5,000	235,735	240,735

Fiscal Year	Measure	P.L. 566 Funds	Other Funds	Total
3rd	Land Treatment	$ 5,000	$ 235,735	$ 240,735
4th	Land Treatment	5,000	235,735	240,735
5th	Sites 9, 10, and 11	364,407	50,437	414,844
	Land Treatment	5,000	235,735	240,735
Total		$1,443,557	$1,398,175	$2,841,732

This schedule will be adjusted from year to year on the basis of any significant changes in the plan found to be mutually desired, and in the light of appropriations and accomplishments actually made.

The structural measures will be scheduled for construction within a 5-year period pursuant to the following conditions:

1. The required land treatment in the drainage area above structures has been installed or is in the process of being installed.

2. The necessary easements have been obtained.

3. Court orders have been obtained from the appropriate Commissioners Court showing that county roads affected by structural works of improvement will either be closed; raised two feet above emergency spillway crest elevation at no cost to the Federal Government; relocated; or permission granted to temporarily inundate the road if equal alternate routes can be provided and definitely designated.

4. Court orders have been obtained from the appropriate Commissioners Court showing that they will designate equal alternate routes, if available, for use during periods when low water road crossings are impassable due to prolonged flow from the principal outlets of floodwater retarding structures. If equal alternate routes are not available, the court order will specify that necessary improvements will be made, at no cost to the Federal Government, to make the crossings passable during prolonged periods of structure releases.

5. The contracting agency is equipped to handle its responsibilities.

6. Operation and maintenance agreements have been executed.

7. Public Law 566 funds are available.

Technical assistance will be provided by the Soil Conservation Service to

assist in planning, design, preparation of specifications, supervision of construction, preparation of contract payment estimates, final inspection, execution of certificates of completion, and related tasks for the establishment of the planned structural measures for flood prevention.

The various features of cooperation between the cooperating parties have been covered in appropriate memoranda of understanding and work agreements.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be maintained by the landowners or operators of the farms and ranches on which the measures are applied, under agreement with the San Diego-Agua Dulce and Agua Poquita Soil Conservation Districts. Representatives of the soil conservation districts will make periodic inspections of the land treatment measures to determine maintenance needs and encourage landowners and operators to perform maintenance. They will make district-owned equipment available for this purpose.

Structural Measures for Flood Prevention

The 11 floodwater retarding structures will be operated and maintained by the Commissioners Courts of Duval, Jim Wells and Nueces Counties since benefits to all counties will accrue from this project. Each County Commissioners Court will be responsible for the performance of proper maintenance on structural works of improvement located within that County. The costs of operation and maintenance will be borne by the three Counties in these proportions; Nueces County, 50 percent; Jim Wells County, 30 percent; and Duval County, 20 percent. Funds for this purpose will come from an ad valorem tax, which has heretofore been voted in each County for the purpose of flood control.

A maintenance fund will be kept available by the Commissioners Courts of Duval, Jim Wells, and Nueces Counties, consisting of $1,000 per structure for the 11 structures. This will amount to $11,000.

All structural measures will be inspected at least annually and after each heavy rain by representatives of the Commissioners Courts of Duval, Jim Wells, and Nueces Counties, and the Agua Poquita and the San Diego-Agua Dulce Soil Conservation Districts. A Soil Conservation Service representative will participate in these inspections at least annually. For the floodwater retarding structures, items of inspection will include, but not be limited to, the conditions of the principal spillway and its appurtenances, the emergency spillway, the earth fill, the vegetative cover of the earth fill and the emergency spillway, and fences and gates installed as a part of the floodwater retarding structures.

The Soil Conservation Service, through the Agua Poquita and the San Diego-Agua Dulce Soil Conservation Districts, will participate in the operation and maintenance only to the extent of furnishing technical assistance to

aid in inspection and furnishing technical guidance and information necessary for the operation and maintenance program.

Provisions will be made for free access of representatives of the cosponsoring organizations and Federal representatives to inspect and provide maintenance for all structural measures and their appurtenances at any time.

The cosponsoring local organizations will maintain a record of and report to the Soil Conservation Service all maintenance inspections made and maintenance performed.

The cosponsoring local organizations fully understand their obligations for maintenance and will execute specific maintenance agreements prior to the issuance of invitation to bid on construction of the structural measures.

The estimated annual operation and maintenance cost of all structural measures is $1,710, based on long-term prices. The necessary maintenance work will be accomplished either by contract or force account.

COST-SHARING

Public Law 566 funds will provide technical assistance in the amount of $25,000 during the 5-year installation period to accelerate the installation of land treatment measures included in the plan for watershed protection. These measures will be installed through funds other than Public Law 566 at an estimated cost of $1,178,675 (table 1). This cost includes SCPS payments based on present program criteria and technical assistance under the going district program. The required local costs for structural measures, consisting of the value of land, easements, and rights-of-way, $214,000), the capitalized value of operation and maintenance of works of improvement ($48,500), and the cost of administering contracts ($5,500), are estimated at $268,000.

The entire cost of constructing structural measures, amounting to $1,081,367, will be borne by Public Law 566 funds. In addition, the installation services cost of $337,190 will be a Public Law 566 expense. This is a total Public Law 566 cost of $1,418,557 for the installation of structural measures.

The total project cost of $2,890,232, including the capitalized value of structure operation and maintenance, will be shared 49.9 percent ($1,443,557) by Public Law 566 funds and 50.1 percent ($1,446,675) by other than Public Law 566 funds.

CONFORMANCE OF PLAN TO FEDERAL LAWS AND REGULATIONS

This project plan conforms to all Federal laws and regulations and will have no known detrimental effects on any downstream projects which are now in existence or that might be constructed in the future.

SECTION 2

INVESTIGATIONS, ANALYSES, AND SUPPORTING TABLES

INVESTIGATIONS AND ANALYSES

Land Treatment

Soil Conditions

The soils in the San Diego-Rosita Creeks watershed are generally in poor condition with small areas in fair and good condition. A large percentage of the soils are shallow or very shallow. The deep soils range from fine to medium textured and are moderately to very slowly permeable.

Cover Conditions and Range Site

The watershed was divided into three segments; the Catahoula, Range and Transitional, for sampling of cover conditions and range sites. Each segment was relatively homogeneous in land use, topography and soils. Approximately 3 percent of the watershed is in the Catahoula area, of which 21 percent was sampled. The Range area comprises 89 percent of the watershed, of which 8.6 percent was sampled. The Transitional area includes the remaining 8 percent of the watershed, of which 11 percent was sampled.

Samples were selected at random within each segment and mapped to show land use, cover condition, crop distribution, land treatment, and hydrologic soil groups and conditions. This information was used to develop the soil-cover complex conditions in the watershed. The needed land treatment was projected to develop the expected future soil-cover complex condition.

Five range sites were mapped and are described as follows:

Deep Sand Site (0.2 percent of rangeland)

The soils are deep sands and loamy sands that take water readily, on very gently sloping to low rolling terrain. Root penetration and movement of air and water are fair to good. These soils have little tendency to crust, consequently runoff and erosion susceptibility is less than on other sites. Some of the better grasses found on this site are Seacoast bluestem, Tanglehead, Switchgrass, and Crinkleawn.

Mixed Sandyland Site (10.7 percent of rangeland)

Deep, medium textured soils on very gently sloping to low rolling terrain comprise this site. These soils absorb water very well, root penetration and movement of air and water are good. Some of the better grasses found

on this site are Trichloris, Cottontop, Tall bristlegrass, and Lovegrass tridens.

Hardland Site (32.3 percent of rangeland)

This site includes deep clay and clay loam soils that take water slowly to very slowly, usually occurring as broad flats or on very gently sloping to low rolling terrain. Movement of air and water and root penetration are moderate to poor. Drouthy characteristic of this site may be offset by runoff water from adjacent hill land. Some of the better grasses found on this site are Trichloris, Lovegrass tridens, Tall bristlegrass, Vine mesquite, Green sprangletop, Cottontop, and Pinhole bluestem.

Shallow Ridge Site (32.3 percent of rangeland)

The soils are less than 20 inches deep, underlain with caliche and drouthy and occur on rolling to steep slopes. They take water moderately fast but hold very little water because of their shallow depth. Movement of air and water and root penetration are poor. Some of the better grasses found on this site are Cottontop, Plains bristlegrass, Lovegrass tridens, and Sideoats grama.

Mixed Land Lime Site (24.5 percent of rangeland)

Crumbly loam or clay loam soils, usually occurring on very gently sloping to low rolling terrain, characterize the site. The surface soils, when dry, is light gray in color and markedly powdery and fluffy. The structure of the top soil, immediately below the powdery surface, is of fine, hard, blocky peds. The subsoil is characteristically very powdery to floury, is very strongly calcareous, contains soft lumps of calcium carbonate, and is quite subject to erosion when exposed. This site is inclined to be drouthy due to permeability and high lime content. Some of the better grasses found on this site are Trichloris, Lovegrass trident, Tall bristlegrass, Green sprangletop, and Cottontop.

The range condition of these areas is shown on the following table:

Range Site and Condition Class		
Condition Class	Acres	Percent For Site
	Deep Sand Site	
Good	0	0
Fair	0	0
Poor	246	100
Total	246	100

	Mixed Sandyland Site	
Good	328	1.6
Fair	546	2.6
Poor	19,833	95.8
Total	20,707	100.0
	Hardland Site	
Good	0	1.0
Fair	1,498	2.4
Poor	61,072	97.6
Total	62,570	100.0
	Shallow Ridge Site	
Good	0	0.0
Fair	789	1.3
Poor	61,788	98.7
Total	62,577	100.0
	Mixed Land Lime Site	
Good	0	0.0
Fair	1,522	3.2
Poor	45,815	96.8
Total	47,337	100.0
	All Sites	
Good	328	0.2
Fair	4,355	2.3
Poor	188,754	97.5
Total	193,437	100.0

Land Use and Treatment Needs

The needed land treatment for the San Diego-Rosita Creeks watershed, as shown in table 1, was developed by the Soil Conservation Service work units in Alice and Benavidas. Conservation needs data were compiled for the entire watershed and computed for each land treatment practice to be applied during the 5-year installation period.

Program Determination

Flood problems and program objectives were reviewed with representatives of the Agua Poquita and the San Diego-Agua Dulce Soil Conservation Districts and the Commissioners Courts of Duval and Jim Wells Counties.

The Corps of Engineers, cooperating with the city of Alice, has enlarged the channel of San Diego Creek through the northern part of Alice for the protection of urban property from floodwaters. It was determined that this project, supplemented by the upstream flood prevention project, would afford the city of Alice protection from flood damages from a 100-year frequency storm.

Determination was made, first of the needed land treatment measures, based on current needs, which remain to be applied in the watershed and which contribute directly to flood prevention. The hydraulic, hydrologic, sedimentation and economic investigations provided data as to the effects of these measures in terms of the reduction of flood damages resulting from such treatment. Although significant benefits would result from application of these needed land treatment measures, it was apparent that other flood prevention measures would be required to attain the degree of watershed protection and flood damage reduction desired by the local people.

Determination was then made of structural measures for flood prevention which would be feasible to install. The study made and the procedures used in that determination were as follows:

1. A base map of the watershed was prepared showing the watershed boundary, drainage pattern, system of roads and railroads, and other pertinent information. A stereoscopic study of 4-inch consecutive aerial photographs located all probable floodwater retarding structure sites, the limits and the area of the flood plain, and points where valley cross sections should be taken for the determination of hydraulic characteristics and for flood-routing purposes. This information was placed on the watershed base map for use in field surveys. Cross sections of the flood plain were surveyed at the selected locations. Data developed from these cross sections permitted the computation of peak discharge-damage relationships for various flood flows. A map was prepared of the flood plain on which land use, cross section locations, and other pertinent information were recorded.

2. A field examination was made of all probable floodwater retarding structure sites previously located stereoscopically. Sites which did not have sufficient storage capacities were dropped from further consideration. From the remaining sites, a system of floodwater retarding structures were selected for further consideration and detail survey. Site Nos. 1 and 2, 3 and 4, 7 and 8, and 9 and 10, were placed in series because no other sites were available to give the needed degree of control and because of the limited storage capacities of Sites 2, 4, 7 and 9. The release rates of the principal spillways of Sites 2, 4, 7 and 9 will be increased so that frequency of use of the emergency spillways will be reduced to once in 25 years. Plans of a floodwater retarding structure, typical of those planned for the watershed, are illustrated by figures 5 and 5A.

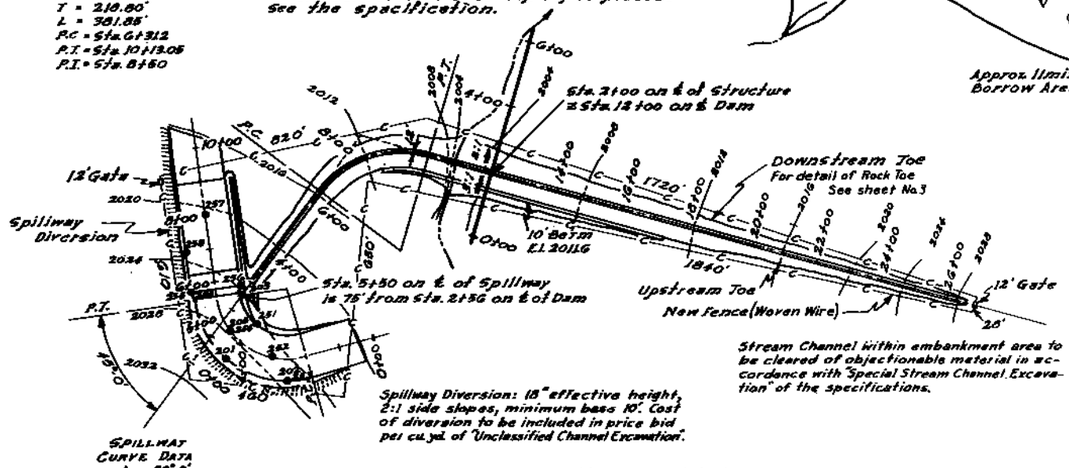
Clay
Silt
Limestone
Flagstone & Cobbles
Lime

C.	Clay	Clayey	Cal.	Calcareous
Si.	Silt	Silty	Vug.	Vugular
Ch.	Chalk	Chalky	Fc.	Fractured
S.	Sandy	Sandy	Fri.	Friable
Gr.	Gravel	Gravelly	Fi.	Firm
M.	Marl	Marly	Vf.	Very
Ls.	Limestone		So.	Soft
Flg.	Flagstone		H.	Hard
Mas.	Massive		Cob	Cobbles
Mat	Matrix			

LEGEND OF BORINGS

EMBANKMENT CURVE DATA
Δ = 69°-0'
D = 18°-04.3'
R = 318.36'
T = 218.80'
L = 381.85'
P.C. = Sta. 6+31.2
P.T. = Sta. 10+13.05
P.I. = Sta. 8+60

A minimum of 6" of topsoil to be placed in spillway and on all embankment, dike, spillway slopes and waste area except where rock is encountered or rock rip rap is placed. See the specification.

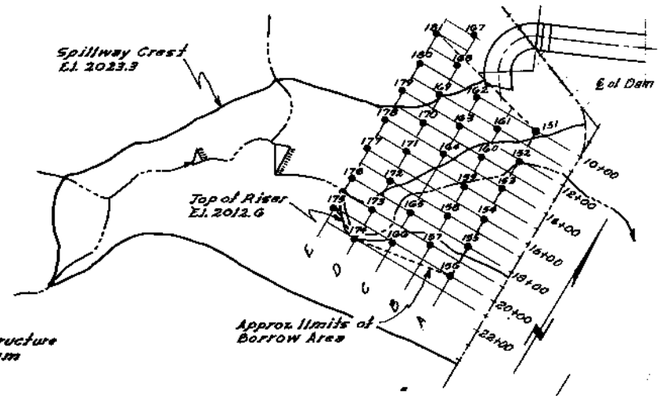


Spillway Diversion: 18" effective height, 2:1 side slopes, minimum base 10'. Cost of diversion to be included in price bid per cu. yd. of "Unclassified Channel Excavation".

Stream Channel within embankment area to be cleared of objectionable material in accordance with "Special Stream Channel Excavation" of the specifications.

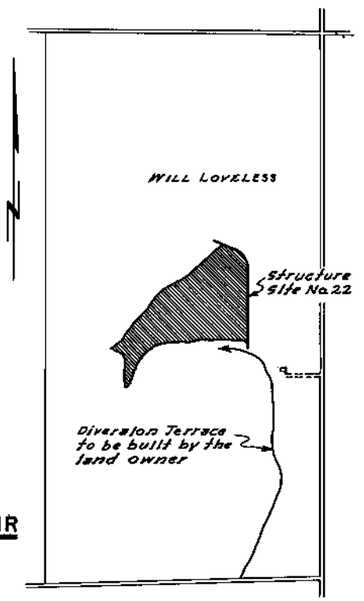
PLAN OF EMBANKMENT AND SPILLWAY

0 200 400 1000
SCALE IN FEET



GENERAL PLAN OF RESERVOIR

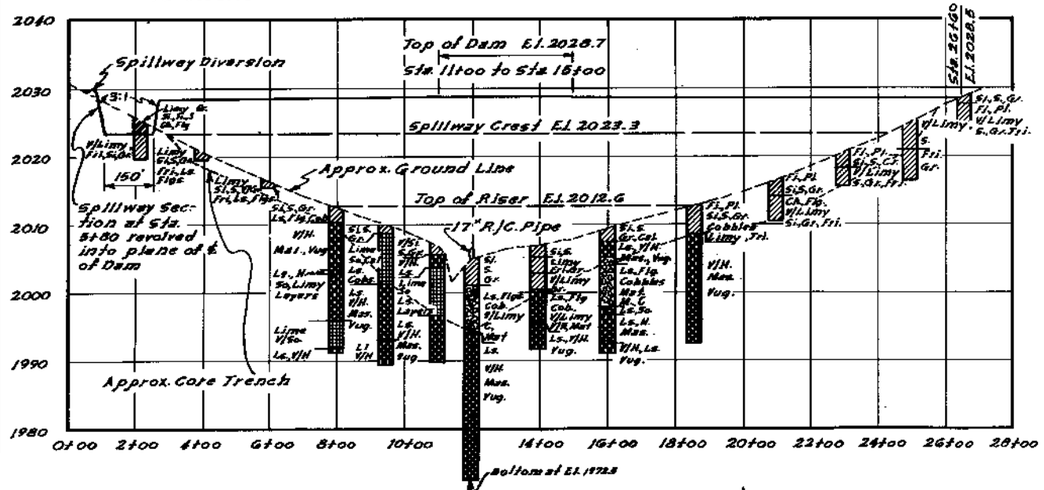
0 400 800 1600
SCALE IN FEET



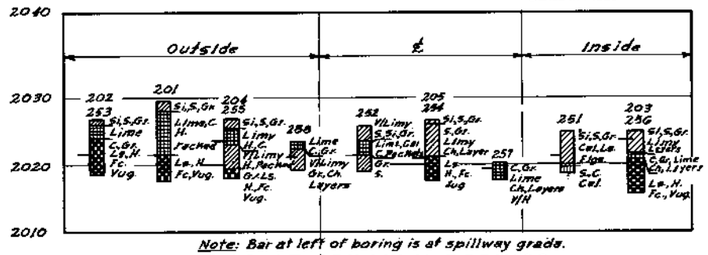
Located 6½ mi. East and 4 mi. South of Eden, Concho County, Texas

VICINITY MAP

0 ½ 1
SCALE IN MILES



PROFILE ON ℄ OF DAM



Note: Bar at left of boring is at spillway grade.

LOG OF SPILLWAY BORINGS

SEE PLAN OF EMBANKMENT AND SPILLWAY

Elevation	Surface Acres	Storage Acre Ft.	Storage Inches
2012.6	16.84	51.70	0.50
2016.0	30.76	132.66	1.28
2020.0	54.21	302.60	2.92
2023.3	74.94	515.68	5.00
2024.0	79.33	569.68	5.50
2028.0	108.17	944.68	9.13

Top of Dam (Effective) Elev.	2028.5
Spillway Crest Elev.	2023.3
Top of Riser Elev.	2012.6
Sediment Pool Elev.	2012.6
Drainage Area, Acres	1282.0
Sediment Storage, Ac. Ft.	51.7
Floodwater Storage, Ac. Ft.	666.0

Figure 5
TYPICAL
FLOODWATER RETARDING STRUCTURE
PLAN AND PROFILE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	H.C.N.	8-56	Approved by: W. M.
Drawn	H.C.N. & G.R.	8-56	NEAR EMBANKMENT & WATERSHED PLANNING UNIT, TEMPLE, TEXAS
Traced	G.R.	8-56	STATE CONSERVATIONIST, TEMPLE, TEXAS
Checked	H.C.N. & H.H.I.	9/56	Sheet No. 2 of 7

Drawing No. 4-E-10, T60

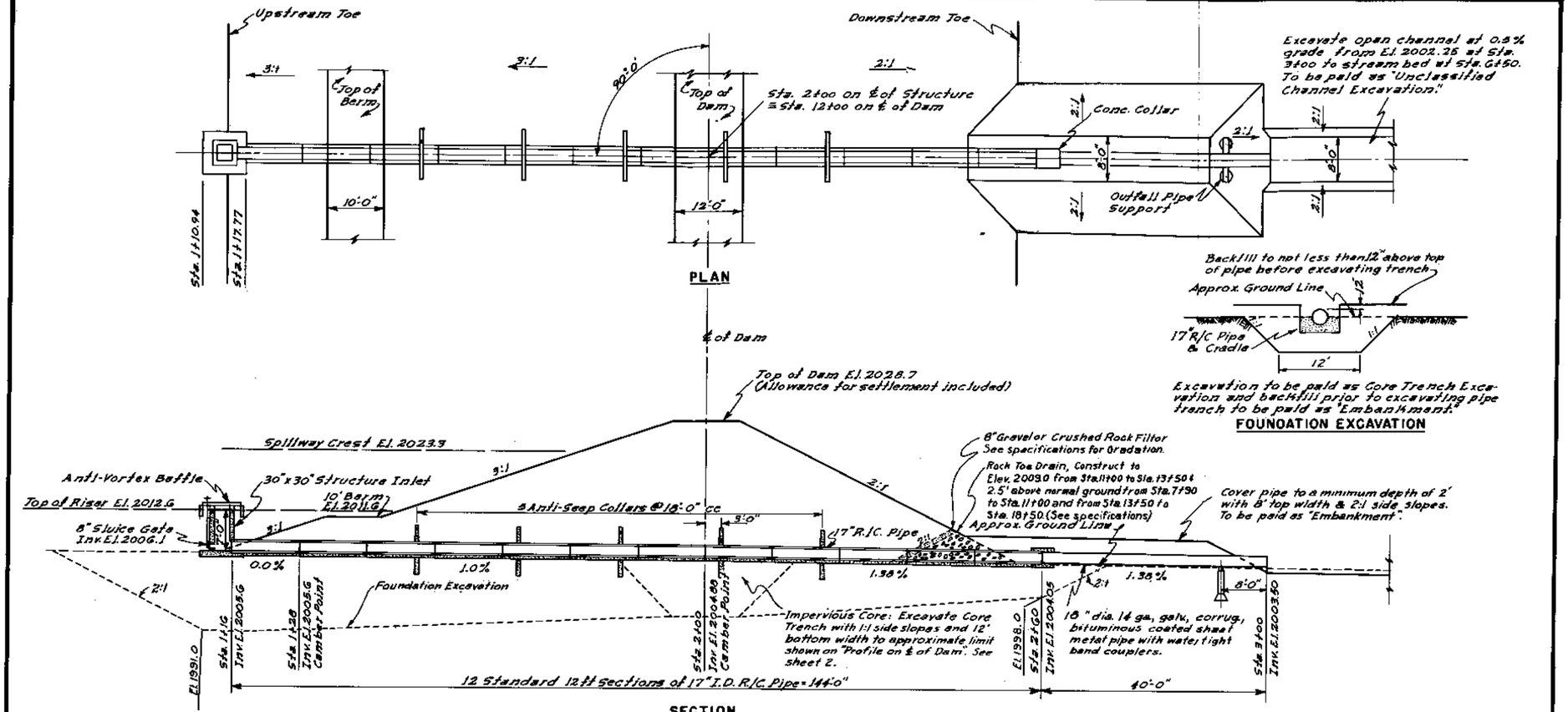


Figure 5A
TYPICAL
FLOODWATER RETARDING STRUCTURE
STRUCTURE PLAN AND SECTION

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed H.C.N.	Date 8-56	Approved by [illegible]	
Drawn H.C.N. & G.R.	8-56	[illegible]	
Traced G.R.	8-56	[illegible]	
Checked H.C.N. & H.H.L.	9/56	Sheet No. 3 of 7 sheets	Drawing No. 4-E-10, T60

3. A topographic map was made of the pool area and the dam and spillway areas of each of the proposed sites in order to determine the storage capacity of the sites, the estimated cost of the dam and the areas of flood plain and upland that would be inundated by the sediment and detention pools. The heights of the dams and the sizes of the pools were determined by the criteria outlined in Washington Engineering Memorandum No. 3, Revised. The limits of the detention pools and sediment pools of all satisfactory sites and of the flood plain of the stream were drawn to scale on a copy of the base map. Structure data tables were developed to show for each structure, the drainage area, the capacity needed for floodwater detention and for sediment storage in acre-feet and in inches of runoff from the drainage area, the release rate of the principal spillway, the acres of flood plain and upland inundated by the sediment and detention pools, the volume of fill in the dam, the estimated cost of the structure, and other pertinent data (tables 2 and 3).

4. A detailed analysis was made of county, private, and ranch roads that cross the streams below the floodwater retarding structures, and which have low-water crossings as the only access across the streams. Where there are no other alternate routes and undue hardships would be caused by the inability to cross the streams, as a result of the release from the structures, determinations were made of the requirements to provide passage during periods of prolonged release flows.

5. Damages resulting from floodwater, sediment and erosion were determined from damage schedules, surveys of sample areas and observations of actual flood events. Reductions in these damages resulting from the proposed works of improvements were estimated on the basis of reduction of area inundated and depth of inundation of various runoff depths in inches, as determined by flood routings. These flood routings were made for conditions without the project and for future conditions assuming that the proposed works of improvements had been installed. Benefits so determined were allocated to individual measures, or groups of interrelated measures on the basis of the effects of each on reduction of damages. Benefits from outside the project area were calculated and those benefits accruing to structural works in this watershed were assigned to the system of floodwater retarding structures. Further analysis indicated that, due to the distance of benefits outside project area, in relation to structures from whence they derive, it would not be feasible to allocate benefits to individual structures on a drainage area controlled basis. Therefore, all structures considered and evaluated in the San Diego-Rosita Creeks watershed were considered as a group of interrelated-interdependent structures. Alternate sites and groups of sites were investigated until a system of floodwater retarding structures, which would give a desirable degree of control and maximize net benefits, was developed.

When the structural measures for flood prevention had been determined, a table was developed to show the total cost of each type of measure. The summation of the total costs of all works of improvement represented the estimated cost of the planned watershed protection and flood prevention project (table 1). A second cost table was developed to show separately the annual installation cost, annual maintenance cost and total annual cost of the structural measures (table 6).

Hydraulic and Hydrologic Investigations

The following steps were taken as part of the hydrologic investigations and determinations:

1. Basic meteorologic and hydrologic data were tabulated from Climatological Bulletins, U. S. Weather Bureau and Water Supply Papers and U. S. Geological Survey. These data were analyzed to determine average precipitation depth-duration relationships, seasonal distribution of precipitation, the historical flood series to be used in the evaluation of the program, rainfall-runoff relationships, runoff-peak discharge relationships, and the relationship of geology, soils and climate to runoff depth frequency for single storm events.

2. Engineering surveys were made of channel and valley cross sections selected to represent adequately the stream hydraulics and flood plain area. Preliminary locations for cross sections were made by stereoscopic examination of aerial photographs of the flood plain. The final locations were selected on the ground, giving due consideration to the needs of the economist and sedimentation specialist. The evaluation reaches were delineated in conference with the economist and sedimentation specialist. The composite acre damageable values are homogeneous within each evaluation reach.

3. The present hydrologic condition of the watershed was determined by surveying the soil-cover condition of approximately a 10 percent random sample of the watershed. The future hydrologic condition of the watershed was determined by obtaining from the work unit conservationists the changes in cover conditions that could be expected, with an accelerated land treatment program, during the installation period. Runoff curve numbers were computed from the soil-cover complex data and used with figure 3.10-1, National Engineering Handbook, Section 4, Supplement A, to determine the depth of runoff from individual storms in the historical storm series. Seasonal soil moisture indices were used. The computed average annual runoff compared favorably with the best available gage runoff data. Furthermore, computed peak discharges, at various hydrologic cross sections, compared favorably with actual peak discharges at these same sections for weighted rainfall from seven storms observed during the evaluation study.

4. Cross section rating curves were computed from field survey data collected in 2 above by solving water surface profiles for various discharges. The water surface profiles were computed by the Doubt method described on page 3.14-7-13, NEH, Section 4, Supplement A.

5. The theory of concordant flow was used to determine the relationship of peak discharge and drainage area. The exponent of the concordant flow equation was determined from good highwater marks left by three recent floods and from the runoff computed from available rainfall records.

6. Stage-area inundation curves for incremental depths of flooding were developed from field survey data for each portion of the valley represented by a cross-section. Composite runoff-area inundation curves for incremental depths of flooding were developed for each evaluation reach by routing incremental volumes of runoff down stream by concordant flow and summating the area flooded for each portion of the valley represented by a cross section in the evaluation reach. Similarly, a family of runoff-area inundation curves were developed to reflect the effect of the proposed system of floodwater retarding structures.

7. The 30 years of precipitation records collected by the U. S. Weather Bureau at Alice, Bishop and Freer, Texas, supplemented by unofficial records in the watershed were used to prepare a graph showing cumulative departure from normal precipitation. From this graph the period 1924 to 1953, inclusive, was selected as the most representative of normal precipitation on the San Diego-Rosita Creeks watershed and was the period from which the historical evaluation flood series was developed.

8. Determinations were made of the area, by depth increments, that would have been inundated by each storm in the evaluation series under conditions that would exist due to:

   a. The present conditions of the watershed remaining static.

   b. The installation of land treatment measures for watershed protection.

   c. The installation of land treatment measures and floodwater retarding structures.

9. The appropriate spillway design storm and storm pattern was selected from figures 3.21-1 and 3.21-4 of National Engineering Handbook, Section 4, Supplement A, in accordance with criteria contained in Washington Engineering Memorandum No. 3, Revised.

10. Spillway design storm hydrographs were developed for each of the floodwater retarding structures by the distribution graph method. The combination of emergency spillway width, depth, and elevation for the most economical structure was determined approximately by an empirical equation. The final preliminary design was obtained by the Goodrich flood routing method described on page 5.8-12 of National Engineering Handbook, Section 5.

The largest rain recorded in the 30-year period was 12.05 inches on September 14-15, 1951. It produced a runoff of 6.61 inches. The annual flood frequency line developed from 30 years record indicates a frequency of 100 years for the above mentioned storm. The next largest rain and the largest one normally expected to occur in the evaluation series was 8.50 inches on June 28-29, 1931. With a moisture condition No. 1, it produced a calculated runoff of 3.72 inches. Under present conditions this storm would inundate 3,241 acres of flood plain. If such a rain were to occur after land treatment measures are applied, it is estimated that the area inundated would be reduced to 3,133 acres. With land treatment measures and the planned system of structural measures in operation, 823 acres of flood plain would be inundated.

The detention volume in the floodwater retarding structures was determined in accordance with Washington Engineering Memorandum No. 3, Revised, using Yarnell's 6-hour, 25 year frequency rainfall amount. The following table shows the minimum detention required and the actual detention planned for each structure.

Site No.	Structure Classification	Minimum Floodwater Detention Required	Actual Floodwater Detention Planned
1	A	3.15	4.04
2	A	3.06	4.03
3	A	3.15	3.64
4	A	3.25	4.03
5	A	3.15	3.80
6	A	3.83	3.93
7	B	4.20	4.20
8	A	3.64	4.00
9	A	3.34	3.66
10	A	3.44	3.74
11	A	3.40	4.00

Emergency spillway capacities were designed in accordance with Washington Engineering Memorandum No. 3, Revised, and Section 3.21 of the Hydrology Guide. Runoff from the maximum recorded 6-hour storm used for Class A structures range from 7.03 to 9.14 inches. Runoff from the maximum recorded 6-hour storm used for the Class B structure was 9.93 inches.

Sedimentation Investigations

The field survey of the sedimentation problems of the San Diego-Rosita Creeks watershed was made in accordance with methods prescribed in the "Sedimentation Section of Procedures for Developing Flood Prevention Work Plans", Water Conservation - 6, SCS, Region 4, Revised February 1954. Field studies of overbank deposits, flood plain scour, streambank erosion and the nature of the channels and valleys were made. In the area between the towns of San Diego and Alice, areal mapping procedures of sample sections of the flood plain were used. Above the town of San Diego, representative cross sections were studied and expanded to the total area of the flood plain. The nature and thickness of the sediment deposits were studied and classified as to percent loss of productivity. These figures were used by the economist as the basis for calculating monetary damages.

Sediment Source Studies

The sediment derived from sheet erosion was estimated by the use of a formula shown in "Suggested Criteria for Estimating Gross Sheet Erosion and Sediment Delivery Rates for the Blackland Prairie Problem Area in Soil Conservation", Soil Conservation Service, Region 4, February 1953.

The sediment derived from gully, streambanks, dirt roads, and flood plain scour was estimated by field studies and the use of aerial photographs. These estimates were made by using a 25-percent sample of the drainage areas of 7 of the 11 proposed floodwater retarding structures. These figures were expanded to the total watershed area. The average gross erosion rate per square mile is .74 acre-feet annually.

No allocation of sediment in the detention pool is ordinarily recommended when sediment yields are less than 0.5 inch (table 3). However, since the drainage areas of most of the proposed structures are unusually large, a 30 percent allocation was made when more than 200 acre-feet of sediment storage was required. Land treatment practices to be applied above the floodwater retarding structures during the 5-year installation period were astimated in determining the sediment storage required.

Effect of Watershed Treatment on Sediment Yields

Areas damaged by overbank deposition and flood plain scour should regain full productivity after installation of works of improvement if damage has not exceeded 30 percent. After installation of the land treatment measures shown in table 1, the total gross erosion will be reduced approximately 28 percent. With installation of both land treatment practices and floodwater retarding structures, total reduction in gross erosion will be 64 percent.

An 18-percent delivery rate of the total gross erosion as determined from a similar watershed, was used to estimate the sediment delivered to the improved section of the San Diego Creek channel. Estimating 15 percent of the delivery as bedload remaining in the improved channel, the present

average annual deposition was figured. Reductions of sediment deposition due to land treatment practices and floodwater retarding structures will be appreciable in this portion of the watershed.

Geological Investigations

Reconnaissance geologic investigations were made at all of the planned floodwater retarding structure sites. These investigations included brief lithologic and stratigraphic studies of the valley slopes, alluvium, channel banks, and exposed geological formations. Borings with a hand auger were made in the spillways, channel beds and representative areas of the borrow and foundation of the dam.

Description of Problems

The watershed is underlain by the Catahoula, Oakville, Goliad, and Lissie formations. The first three formations are in the Tertiary System while the fourth is classified as Quaternary. The regional dip, between 20 and 80 feet per mile, is east and southeast toward the Gulf of Mexico.

None of the floodwater retarding structures will be located within the Catahoula or Lissie formations. Four sites, Nos. 3, 4, 7 and 9 (figure 4), will be located within the Oakville formation and the remaining seven sites will be within the Goliad formation.

The Oakville is characterized by massive cross-bedded sandstone containing clay balls, some gravel, and sandy or ashy clay. This formation weathers into deep,medium textured moderately permeable soils. The topography consists of wide, flat valleys and gently sloping hills. Borrow pits in excess of six feet in depth will usually allow seepage into the formation. In some cases foundation drains and relief wells will be needed. Preliminary investigations indicate that little rock will be encountered in spillway excavation.

The Goliad formation is characterized by caliche at or near the surface. This is a secondary deposit and is thought to have occurred by percolating waters, high in calcium corbonate, evaporating near the surface and leaving the evaporite to harden from heat and age. Generally the hard caliche is in the form of a hard resistive caprock from one to two feet in thickness. Therefore, it has greatly influenced the topography which is gently undulating and in places shows pot hole like depressions. The caprock in most places is found only at the higher elevations, while the flood plain and other low areas have clays and fine sands at the surface. These are underlain by unweathered Goliad sands. Foundation drains and relief wells will be required on most of the sites in this formation. The caprock to be removed from the spillways can be used as riprap where sufficient quantities are available. The underlying material in the spillway is hard, calcareous fine sand and calcareous sandy clay. Mud balls are often present to give the formation a motley or conglomerate appearance.

Numerous rock quarries and roadside cuts were useful in determining the geology of the sites. Before construction, detailed investigations with core drilling equipment on all sites will be made. Laboratory tests will be made to determine stability of foundation strata and the suitability and methods of handling the materials to be used in the embankment.

Ground Water Recharge Investigations

Nonagricultural water management, such as ground water recharge due to construction of the floodwater retarding structures, was considered and investigated in the planning stages. Four of the planned sites will be in the Oakville formation, which is generally composed of fine to coarse grained sandstone containing considerable clay. In some areas the sandstone is thin-bedded and firmly cemented. Anticipated recharge from structural measures in the Oakville formation is low to fair.

Seven floodwater retarding structures will be located in the Goliad formation. Caliche caprock at, or near, the surface on much of the uplands is impervious. The valley alluvium soils are underlain by medium to fine grained sandstone and are high in clay content and very calcareous. Clay members are quite common. Anticipated recharge from structural measures in this formation is low. The sandy water carrying members often are pinched out by impervious materials.

Although some ground water recharge will occur, the total volume will be small. Also, it is impossible to determine the locations and quantities of recovery. Therefore no credit was claimed for benefits arising from any ground water recharge due to construction of planned structural measures.

Economic Investigation

Determination of Annual Benefits from Reduction in Damage

Damage schedules covering approximately 57 percent of the flood plain area of San Diego Creek, Rosita Creek and their major tributaries were obtained from landowners or operators. These schedules covered land use and crop distribution, yields, and historical data on flooding and flood damages. Analysis of the information contained therein formed the basis for determining damage rates for various depths and seasons of flooding. In the calculation of crop and pasture damage, expenses saved, such as cost of harvesting, were deducted from the gross value of the damage.

In addition to the above information obtained, seven actual flood events were observed during the work plan development. These flood events ranged from very minor floods to floods of considerable magnitude. During observation of actual flood events rainfall, runoff, and peak flow data were obtained and correlated; areas actually flooded were delineated and referenced to hydraulic cross sections; and damages of all types were observed and calculated under actual conditions. These data were correlated

with information obtained by the normal procedures and adjustments were made as needs indicated to obtain representative damage rates to be applied. Factual information was obtained on types of damage other than crop and pasture. These damages were correlated with size of flood and, in conjunction with data obtained from damage schedules, formed the basis for estimating other agricultural and nonagricultural damages from flood events in the storm series.

Owners and operators of flood plain lands were asked what changes had been made in their land use and cropping patterns as a result of past floods. They were also asked whether they would make land use changes if they were given flood protection. After analysis of their replies and consideration of related information such as land capability, markets, size and location of tracts affected, and the types of agricultural enterprises concerned, it was determined that land use changes as a result of flood protection would be insignificant. Therefore no benefits from restoration of land productivity or from land use changes were considered to occur in this watershed.

The proper rates of damage were applied, flood by flood, to the floods covering the historical period, 1924 to 1953, inclusive, and adjustments were made to take into account the effect of recurrent flooding when more than one flood occurred within the same year. The flood plain land use was mapped in the field. Estimates of normal, flood free, yields were based on data obtained from the schedules, supplemented by information obtained from other agricultural workers in the area.

In analyzing flood plain land use and yields, it was found that significant variations existed with respect to location within the watershed. Therefore the flood plain was divided into four evaluation reaches, each with its own damageable value. Reach No. 1 covered that portion of the flood plain that passes through the city of Alice and includes the channel improvement project of the Corps of Engineers. Reach No. 2 covers the portion of the flood plain extending from the upper limit of the improved channel at Alice to the confluence of San Diego and Rosita Creeks at San Diego. Reach No. 3 is that portion of the San Diego Creek flood plain above its confluence with Rosita Creek. Reach No. 4 is the flood plain of Rosita Creek above its confluence with San Diego Creek.

The monetary value of the physical damage to the flood plain from erosion and deposition of sediment was based on the value of the production lost, taking into account the time lag for recovery and the cost of operations necessary to speed recovery.

Indirect damages in this watershed involved extra farming expense, such as, additional travel time for farmers and extra costs of purchasing additional feed for livestock, high cost delays in oil well drilling and additional travel and time lost by those engaged in petroleum production. Information regarding damages of this type was obtained from local residents, farm and ranch operators, and persons engaged in the petroleum industry.

Floodwater, scour and sediment damages were calculated under present conditions and under conditions which will prevail after the installation of each class of measures included in the planned project. The difference between average annual damages at the time of initiation of each class of measures and those expected after its installation constitutes the benefit brought about by that group through reduction of damages. Benefits from reduction of crop and pasture damages and flood plain scour resulted from the combined effects of reduction in area inundated and reduced depth of inundation. Benefits from reduction of valley sediment damages derived from each class of measures were determined on the basis of estimated reduction in rate of sediment production and in area flooded after installation of each class of measure.

Areas that will be inundated by the sediment and detention pools of floodwater retarding structures were excluded from the damage calculations. An estimate was made, however, of the value of production lost in these areas after the installation of the program. In this appraisal it was considered that there would be no production in the sediment pools. The land covered by the detention pools was assumed to be converted to grassland under project conditions. The costs of land, easements, and rights-of-way for the 11 floodwater retarding structure sites were determined by individual appraisal in conjunction with representatives of the sponsoring organizations. Floodwater retarding structure site costs were based on full land value for the sediment pools and one-half value for the detention pools, since the latter will remain in use as grazing land. The average annual net loss in production, based on long-term prices, within the sites was calculated and this value compared with the amortized cost of the structure sites. To assure a conservative evaluation, the larger amount was used in the economic evaluation of the program.

Determination of Annual Benefits Outside Watershed Resulting from Project

Benefits from reduction in damages in the Chiltipin-San Fernando Creeks watershed, Agua Dulce Creek watershed and Agua Dulce Laterals watershed accrue to works of improvements in this watershed. In determining benefits from outside the project area, produced by works in this project, complete hydraulic, hydrologic, and economic investigations were made for each watershed affected by such works of improvement. Standard procedures as outlined previously under "Hydraulic and Hydrologic Investigations", and "Economic Investigations" were followed in calculating damages and benefits in each of the watersheds outside the project area. Benefits from the reduction of these damages were apportioned back to the floodwater retarding structures in San Diego-Rosita Creeks watershed in proportion to the reduction in flooding resulting from them.

Details of Methodology

Details of the procedures used in the investigations are described in the Interim Economics Guide for Watershed Protection and Flood Prevention, Revised April 1, 1956.

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION

San Diego-Rosita Creeks Watershed, Texas
Price Base: 1957

Structure Site No.	Public Law 566 Installation Cost					Other Installation Cost			Estimated Total Cost
	Construction		Installation Services		Total Public Law 566	Adm. of Contracts	Easements and R/W	Total Other Cost	
	Engineering Estimates (dollars)	Contingencies (dollars)	Engineering (dollars)	Other (dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
1	64,169	6,417	12,834	9,176	92,596	500	31,105	31,605	124,201
2	92,784	9,278	18,557	13,268	133,887	500	30,123	30,623	164,510
3	118,075	11,807	23,615	16,885	170,382	500	14,995	15,495	185,877
4	105,171	10,517	21,034	15,039	151,761	500	16,045	16,545	168,306
5	45,234	4,523	9,047	6,468	65,272	500	6,410	6,910	72,182
6	166,946	16,695	33,389	23,873	240,903	500	31,080	31,580	272,483
7	106,522	10,652	21,305	15,233	153,712	500	19,895	20,395	174,107
8	31,626	3,163	6,325	4,523	45,637	500	15,410	15,910	61,547
9	82,775	8,278	16,555	11,837	119,445	500	10,805	11,305	130,750
10	114,567	11,457	22,913	16,383	165,320	500	18,336	18,836	184,156
11	55,192	5,519	11,038	7,893	79,642	500	19,796	20,296	99,938
GRAND TOTAL	983,061	98,306	196,612	140,578	1,418,557	5,500	214,000	219,500	1,638,057

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TABLE 3 - STRUCTURE DATA

FLOODWATER RETARDING STRUCTURES

San Diego-Rosita Creeks Watershed, Texas

Item	Unit	STRUCTURE NUMBER 1	2	3	4	5	6	7	8	9	10	11	Total
Drainage Area	sq.mi.	23.19	19.66	19.03	19.04	5.72	18.30	21.96	9.78	15.20	24.00	10.23	186.11
Storage Capacity													
Sediment pool	ac.ft.	200	200	173	200	79	200	200	156	200	200	164	1,972
Sediment reserve below riser	ac.ft.	-	-	-	-	-	74	69	-	-	69	-	212
Sediment in detention pool	ac.ft.	62	52	41	51	-	68	82	-	76	77	-	509
Floodwater detention	ac.ft.	4,996	4,225	3,704	4,095	1,159	3,835	4,919	2,087	2,967	4,787	2,182	38,956
Total	ac.ft.	5,258	4,477	3,918	4,346	1,238	4,177	5,270	2,243	3,243	5,133	2,346	41,649
Surface Area													
Sediment pool (top of riser)	acre	80	68	72	83	35	75	63	45	38	108	55	722
Floodwater detention pool	acre	578	574	415	515	187	445	530	319	322	540	305	4,730
Maximum Height of Dam	foot	26	24	29	27	19	34	36	24	33	26	24	xxx
Volume of Fill	cu.yd.	183,340	213,670	253,220	188,350	119,240	327,520	288,920	90,360	236,500	204,820	157,690	2,263,630
Emergency Spillway													
Type	-	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	xxx
Frequency of use	year	29	29	25	29	25	27	50	25	25	25	26	xxx
Design storm rainfall													
Duration	hour	6	6	6	6	6	6	6	6	6	6	6	xxx
Total	inch	10.4	9.7	10.5	10.5	11.5	10.5	10.4	11.2	10.8	9.7	11.1	xxx
Bottom width	foot	350	350	418	400	328	400	300	400	450	600	400	xxx
Design depth	foot	3.1	3.1	3.9	4.3	3.0	4.0	3.9	2.9	3.8	3.7	3.5	xxx
Design capacity	c.f.s.	5,130	5,000	9,000	9,800	4,492	8,700	6,400	5,100	9,300	11,700	7,000	xxx
Freeboard	foot	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	xxx
Total capacity	c.f.s.	8,160	8,150	13,200	13,900	7,314	12,800	9,100	8,500	13,350	15,300	10,800	xxx
Principal Spillway													
Capacity	c.f.s.	162	300	95	190	29	183	220	317	76	196	51	xxx
Capacity Equivalents													
Sediment volume	inch	0.21	0.24	0.21	0.25	0.26	0.35	0.30	0.30	0.34	0.27	0.30	xxx
Detention volume	inch	4.04	4.03	3.64	4.03	3.80	3.93	4.20	4.00	3.66	3.74	4.00	xxx
Spillway storage	inch	2.25	2.65	2.55	3.12	2.94	2.54	3.20	2.84	2.17	2.37	4.54	xxx
Class of Structure	-	A	A	A	A	A	A	B	A	A	A	A	xxx

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TABLE 4 - SUMMARY OF PHYSICAL DATA

San Diego-Rosita Creeks Watershed, Texas

Item	Unit	Quantity Without Project	Quantity With Project
Watershed Area	Sq.Mi.	347.58	xxx
Watershed Area	Acre	222,450	xxx
Area of Cropland	Acre	24,397	24,397
Area of Range and Grassland	Acre	193,437	193,437
Area of Miscellaneous Use	Acre	4,616	4,616
Overflow Area Subject to Damage 1/	Acre	3,241	823
Overflow Area Damaged Annually By:			
Sediment	Acre	2/ 42	3/ 5
Flood Plain Scour	Acre	2/ 819	3/ 262
Streambank Eroaion	Acre	.95	.95
Annual Rate of Erosion			
Sheet	Acre-Foot	228	156
Gully	Acre-Foot	4.29	3.75
Streambank	Acre-Foot	5.95	5.95
Scour	Acre-Foqt	14.40	3.40
Dirt roads and ditches	Acre-Foot	3.70	3.70
Sediment Production Rate 4/	Acre-Foot/Year	39.22	14.12
Average Annual Rainfall	Inch	26.00	xxx

1/ Area inundated from the runoff from a 25-year frequency storm.
2/ Acres on which some loss of production is occurring each year.
3/ The area on which production loss will occur each year after all recovery has taken place and equilibrium has been reached. This applies to all flooding up to the area inundated by the size storm listed under 1/.
4/ Volume or rate of sediment leaving watershed.

TABLE 5 - SUMMARY OF PLAN DATA

San Diego-Rosita Creeks Watershed, Texas

Item	Unit	Quantity
Years to Complete Project	Year	5
Total Installation Cost		
Public Law 566 Funds	Dollar	1,443,557
Other	Dollar	1,398,175
Annual O & M Cost		
Federal	Dollar	0
Non-Federal	Dollar	1,710
Average Annual Monetary Benefits 1/	Dollar	71,398
Agricultural	Percent	79.9
Nonagricultural	Percent	20.1
Structural Measures		
Floodwater Retarding Structures	Each	11
Area Inundated by Structures		
Flood Plain		
Sediment Pool	Acre	0
Sediment reserve pool	Acre	0
Detention Pool	Acre	0
Upland		
Sediment Pool	Acre	722
Detention Pool	Acre	4,008
Watershed Area Above Structures	Acre	119,110
Reduction of Floodwater Damage	Dollar	4,604
By Land Treatment Measures		
Watershed Protection	Percent	7.4
By Structural Measures	Percent	64.2
Reduction of Sediment Damage	Dollar	1,846
By Land Treatment Measures		
Watershed Protection	Percent	28.5
By Structural Measures	Percent	38.0
Reduction of Erosion Damage	Dollar	1,595
By Land Treatment Measures		
Watershed Protection	Percent	5.4
By Structural Measures	Percent	57.0
Flood Prevention Benefit From Changed Land Use	Dollar	0

1/ Includes benefits from Chiltipin-San Fernando Creeks watershed; Agua Dulce Creek watershed and Agua Dulce Laterals watershed accruing to works of improvement in this watershed.

TABLE 6 - ANNUAL COSTS

San Diego-Rosita Creeks Watershed, Texas

Measures	Amortization of Installation Costs 1/	Operation and Maintenance Costs 2/			Total
		Federal	Other	Total	
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Floodwater Retarding Structures					
1 through 11	57,755	0	1,710	1,710	59,465
TOTAL	57,755	0	1,710	1,710	59,465

1/ Price Base 1957 prices amortized for 50 years at 2.5 percent.

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

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TABLE 7 - MONETARY BENEFITS FROM STRUCTURAL MEASURES

San Diego-Rosita Creeks Watershed, Texas
Price Base: Long-Term 1/

Item	Estimated Average Annual Damages: Without Project	After Land Treatment for W/S Protection	With Project	Average Annual Monetary Benefits
	(dollars)	(dollars)	(dollars)	(dollars)
Floodwater Damage				
Crop and Pasture	2,055	1,917	610	1,307
Other Agricultural	1,710	1,573	342	1,231
Nonagricultural				
Road and Bridge	2,439	2,263	874	1,389
Other	227	200	1	199
Subtotal	6,431	5,953	1,827	4,126
Sediment Damage				
Overbank deposition	297	200	37	163
Channel filling (Improved channel, Alice, Texas)	2,478	1,784	892	892
Subtotal	2,775	1,984	929	1,055
Erosion Damages				
Flood plain scour	2,558	2,421	963	1,458
Subtotal	2,558	2,421	963	1,458
Indirect Damage	1,195	1,105	370	735
Total, All Damages	12,959	11,463	4,089	7,374
Benefits Outside Project Area 2/	xxx	xxx	xxx	64,024
TOTAL FLOOD PREVENTION BENEFITS	xxx	xxx	xxx	71,398
TOTAL PRIMARY BENEFITS	xxx	xxx	xxx	71,398
TOTAL MONETARY BENEFITS	xxx	xxx	xxx	71,398

1/ As projected by ARS, September 1957.

2/ Includes $33,980 damage reduction on the San Fernando Creek flood plain; $17,271 damage reduction on Agua Dulce Creek watershed flood plain, and $12,773 damage reduction on the Agua Dulce Laterals watershed flood plain.

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TABLE 8 - BENEFIT COST ANALYSIS

San Diego-Rosita Creek Watershed, Texas

Measures	AVERAGE ANNUAL BENEFITS 1/ Flood Prevention						Average Annual Cost 2/	Benefit Cost Ratio
	Floodwater	Sediment	Erosion	Indirect	Other 3/	Total		
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	
STRUCTURAL MEASURES FOR FLOOD PREVENTION								
Floodwater Retarding Structures								
1 through 11 4/	4,126	1,055	1,458	735	64,024	71,398	59,465	1.2:1
GRAND TOTAL	4,126	1,055	1,458	735	64,024	71,398	59,465	1.2:1

1/ Price base: Long-term prices, as projected by ARS, September 1957.
2/ Derived from installation costs based on 1957 price level and operation and maintenance cost based on long-term price levels, as projected by ARS, September 1957.
3/ Includes benefits from reduction in damages to the Chiltipin-San Fernando Creek flood plain below Chiltipin Creek, reduction in damages to the Agua Dulce Creek watershed flood plain below Pintas Creek, and reduction in damages to the Agua Dulce Laterals flood plain.
4/ All floodwater retarding structures are interdependent.

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TABLE 9 - COST SHARING SUMMARY

San Diego-Rosita Creeks Watershed, Texas
Price Base: 1957 1/

Type of Cost	P. L. 566 Funds : Dollars	P. L. 566 Funds : Percent	Other : Dollars	Other : Percent	Total Cost : Dollars	Total Cost : Percent
nd Treatment						
Non-Federal Land For Watershed Protection	25,000	2.1	1,178,675	97.9	1,203,675	41.6
Subtotal	25,000	2.1	1,178,675	97.9	1,203,675	41.6
ructural Measures Installation Flood Prevention	1,418,557	86.6	219,500	13.4	1,638,057	56.7
Subtotal	1,418,557	86.6	219,500	13.4	1,638,057	56.7
tal Installation Cost	1,443,557	50.8	1,398,175	49.2	2,841,732	98.3
eration and Maintenance 2/	-	0	48,500	100.0	48,500	1.7
tal Structural Cost	1,418,557	84.1	268,000	15.9	1,686,557	58.4
TAL PROJECT COST	1,443,557	49.9	1,446,675	50.1	2,890,232	100.0

1/ Except operation and maintenance which is based on long-term prices, as projected by ARS, September 1957.

2/ Capitalized for 50 years at 2.5 percent.

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