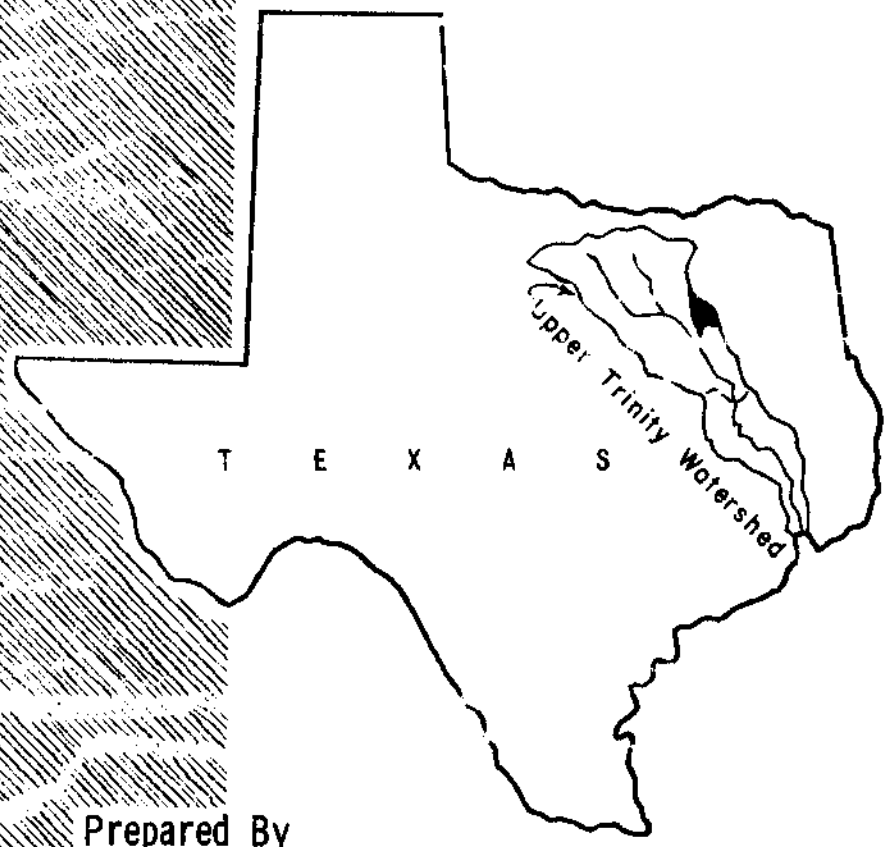
WORK PLAN

CEDAR CREEK WATERSHED

OF THE TRINITY RIVER WATERSHED
ROCKWALL, KAUFMAN, VAN ZANDT,
HENDERSON, AND HUNT COUNTIES, TEXAS



Prepared By
SOIL CONSERVATION SERVICE
U. S. DEPARTMENT OF AGRICULTURE
Temple, Texas
October 1960

WATERSHED WORK PLAN AGREEMENT

between the

Kaufman-Van Zandt Soil Conservation District
Local Organization
Trinity-Neches Soil Conservation District
Local Organization
Neches-Sabine Soil Conservation District
Local Organization

(Hereinafter referred to as the Districts)

Kaufman County Commissioners Court
Local Organization
Van Zandt County Commissioners Court
Local Organization
Rockwall County Commissioners Court
Local Organization
Henderson County Commissioners Court
Local Organization

(Hereinafter referred to as the Counties)

City of Kaufman, Texas
Local Organization

(Hereinafter referred to as the City)

In the State of Texas

and the

United States Department of Agriculture
Soil Conservation Service
(Hereinafter referred to as the Service)

Whereas, the Districts have heretofore entered into a Flood Control Supplemental Memorandum of Understanding with the Soil Conservation Service for assistance in constructing Works of Improvement for the prevention of floods in the Cedar Creek Watershed, State of Texas, under the authority of the Flood Control Act of 1944 (58 Stat. 887).

Whereas, the responsibility for carrying out all or a portion of the work of the Department on the Watershed has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Districts and the Service a mutually satisfactory plan for Works of Improvement for the Cedar Creek Watershed, State of Texas, hereinafter referred to as the Watershed Work Plan;

Whereas, the Counties will benefit from the carrying out of the plan for Works of Improvement through the reduction of damages to property, including County Roads, and bridges in the Counties that are located within the flood plain of the watershed;

It is mutually agreed that in installing and operating and maintaining the Works of Improvement described in the Watershed Work Plan:

1. The Districts and/or the Counties excepting Rockwall County 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.

2. The Districts 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 Service will provide all construction costs and installation services applicable to Works of Improvement for flood prevention.

4. The installation of structural works of improvement for which arrangements for operation and maintenance have not been completed will be delayed pending execution of satisfactory operation and maintenance agreements.

5. The Districts 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.

6. The Districts will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the Watershed Work Plan.

7. The Districts will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

8. The Districts, Counties and the City 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 Operation and Maintenance Agreements, which are to be entered into.

9. 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.

10. No member of 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.

Kaufman-Van Zandt Soil Conservation District
Local Organization

By Frank Hommon Jr

Title Chairman Board

Date 3 - 23 - 1961

The signing of this agreement was authorized by a resolution of the governing body of the **Kaufman-Van Zandt Soil Conservation District**
Local Organization

adopted at a meeting held on 3 - 23 - 1961

James I. Carter Jr.
(Secretary, Local Organization)

Date 3 - 23 - 1961

Trinity-Neches Soil Conservation District
Local Organization

By J. H. Huff

Title Chairman Board

Date 4-4 61

The signing of this agreement was authorized by a resolution of the governing body of the **Trinity-Neches Soil Conservation District**
Local Organization

adopted at a meeting held on 4 - 4 - 61

R B McLain
(Secretary, Local Organization)

4-15002 2-41

Date 4 - 4 - 61

Neches-Sabine Soil Conservation District
Local Organization

By Gale F. Wimberly

Title Chairman

Date 4/14/1961

The signing of this agreement was authorized by a resolution of the governing body of the **Neches-Sabine Soil Conservation District**
Local Organization

adopted at a meeting held on April 14, 1961

J M Wimm
(Secretary, Local Organization)

Date 4-14-61

Kaufman County Commissioners Court
Local Organization

By Floyd Thungst

Title County Judge

Date 4-17-61

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

adopted at a meeting held on April 14-1961

Jimmy Graham
(Secretary, Local Organization)
County Clerk

Date 4-17-1961

4-15002 2-61

Van Zandt County Commissioners Court
Local Organization

By [illegible]

Title Special County Judge

Date 4-3-61

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

adopted at a meeting held on 4-3-61

Bill Fisher
(Secretary, Local Organization)

Date 4-3-61

Rockwall County Commissioners Court
Local Organization

By Ralph M. Hall

Title County Judge

Date 4-10-61

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

adopted at a meeting held on 4-10-61

Co. clerk [illegible]
(Secretary, Local Organization)

4-19002 2-21

Date 4-10-61

Henderson County Commissioners Court
Local Organization

By William S. Hart

Title County Judge

Date May 1, 1961

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

adopted at a meeting held on May 1st 1961

Anna Bennett Cocke
(Secretary, Local Organization)

Date May 1, 1961

City of Kaufman, Texas
Local Organization

By W. L. Morris

Title Mayor

Date May 2 - 1961

The signing of this agreement was authorized by a resolution of the governing body of the **City of Kaufman, Texas**
Local Organization

adopted at a meeting held on May 2 - 1961

Mrs. Horace Spencer
(Secretary, Local Organization)

Date May 2, 1961

Soil Conservation Service
United States Department of Agriculture

By _____
State Conservationist

Date _____

WORK PLAN

CEDAR CREEK WATERSHED
Of the Trinity River Watershed
Rockwall, Kaufman, Van Zandt, Henderson and Hunt Counties, Texas

Plan Prepared and Works of Improvement
to be Installed Under the Authority
of the Flood Control Act of 1936
as Amended and Supplemented.

Participating Agencies

Kaufman-Van Zandt Soil Conservation District
Trinity-Neches Soil Conservation District
Neches-Sabine Soil Conservation District
Kaufman County Commissioners Court
Van Zandt County Commissioners Court
Rockwall County Commissioners Court
Henderson County Commissioners Court
City of Kaufman, Texas

Prepared By:

Soil Conservation Service
U. S. Department of Agriculture
October 1960

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SECTION 1

WORK PLAN

CEDAR CREEK WATERSHED
Of the Trinity River Watershed
Rockwall, Kaufman, Van Zandt, Henderson and Hunt Counties, Texas
October 1960

SUMMARY OF PLAN

General Data

Drainage Area:

656,600 Acres - - 1025.9 Square Miles

Location of Watershed:

Kaufman County	329,176 Acres
Van Zandt County	133,348 Acres
Rockwall County	24,832 Acres
Henderson County	169,120 Acres
Hunt County	124 Acres
Trinity-Neches Soil Conservation District	213,487 Acres
Kaufman-Van Zandt Soil Conservation District	440,576 Acres
Neches-Sabine Soil Conservation District	2,413 Acres
Upper Sabine Soil Conservation District (Not a sponsor)	124 Acres

Land Use:

Cropland	186,072 Acres
Pasture	324,374 Acres
Wooded Pasture	100,263 Acres
Miscellaneous (towns, roads, railroads, etc.)	45,891 Acres

Flood Plain Area: 64,104 Acres 1/

1/ Excludes 3,732 acres in stream channels; 18,589 acres to be inundated by the Fort Worth Reservoir; and 4,040 acres which lies below the Fort Worth Reservoir.

Flood Frequency:

A total of 121 floods occurred during the 30-year period of study (1924 through 1953), of which 60 inundated one-half, or more of the flood plain area.

Land Treatment:

Practice	Unit	Applied to Date	To be Applied October 1960 - October 1970
Conservation Cropping Systems	Acre	25,102	50,100
Contour Farming	Acre	53,923	63,004
Cover Cropping	Acre	107,082	100,096
Crop Residue Use	Acre	89,150	100,669
Rotation Hay and Pasture	Acre	11,132	20,727
Grassland Renovation	Acre	39,421	37,748
Pasture Improvement	Acre	144,366	222,746
Pasture Planting	Acre	118,261	113,245
Rotation Grazing	Acre	52,510	200,907
Wildlife Area Treatment	Acre	12,581	1,500
Brush Control	Acre	19,225	37,390
Diversion Construction	Mile	253	131
Erosion Control Structures	No.	20	120
Grassed Waterways	Acre	2,539	2,849
Pond Construction	No.	2,733	889
Terracing	Mile	2,104	2,132

Structural Measures:

	Unit	
Floodwater Retarding Structures	No.	139
Multiple Purpose Structure	No.	1
Stream Channel Improvement	Mile	113.36

Cost - Installation Period:

Item	Federal (dollars)	Non-Federal (dollars)	Total (dollars)
Land Treatment	184,500	5,871,653	6,056,153
Structural Measures	9,080,461	2,078,649	11,159,110
Work Plan Preparation	86,000	-	86,000
Total	9,350,961	7,950,302	17,301,263

Average Annual Damages and Benefits:

Item	Damage			Benefit
	Without Project (dollars)	With Land Treatment (dollars)	With Project (dollars)	Structural Measures (dollars)
Floodwater	618,614	578,304	75,629	502,675
Sediment	73,614	66,651	27,140	39,511
Erosion	6,489	5,814	506	5,308
Indirect	69,871	65,076	10,327	54,749
Land Use Change	-	-	-	23,969
Total	768,588	715,845	113,602	626,212

Benefit-Cost Ratio - Structural Measures:

Average Annual Benefits	$626,212
Average Annual Cost	$445,935
Benefit-Cost Ratio	1.4:1

Operation and Maintenance:

Land Treatment Measures - Landowners and Operators Under Agreement With:

Kaufman-Van Zandt Soil Conservation District
Trinity-Neches Soil Conservation District
Neches-Sabine Soil Conservation District
Upper Sabine Soil Conservation District
(Not a sponsor)

Structural Measures - Kaufman-Van Zandt Soil Conservation District
Trinity-Neches Soil Conservation District
Kaufman County Commissioners Court
Van Zandt County Commissioners Court
Rockwall County Commissioners Court
Henderson County Commissioners Court
City of Kaufman, Texas

Annual Cost - $35,682

DESCRIPTION OF WATERSHED

Physical Data

Cedar Creek rises in the northeastern part of Kaufman County about 8 miles northeast of Terrell, Texas, and flows in a southerly direction through parts of Kaufman, Van Zandt and Henderson Counties, entering the Trinity River approximately 2 miles southeast of Trinidad. Major tributaries are Brushy Creek which heads in Rockwall and Hunt Counties, Kings Creek and Big Cottonwood Creek which head in Kaufman County, Lacy Fork of Cedar and Twin Creeks which head in Van Zandt County, and Clear Creek and Caney Creek which head in Henderson County. The watershed has an area of 656,600 acres (1,025.9 square miles), 93.0 percent of which is in farms and ranches.

The alluvial valley of the mainstem ranges in width from more than 5,400 feet at valley section R-5 on Kings Creek (Problem Location Map, Figure 1) to about 1,400 feet near the headwaters. Valley widths on the principal tributaries range from 7,000 feet to 1,000 feet. Mean sea level elevation of the valley ranges from 470 to 335 feet at valley section R-5. Upland predominant slopes range from 1 to 5 percent, with some slopes as steep as 12 percent in the middle and lower reaches of the watershed.

Approximately 46 percent of the drainage area lies in the Blackland Prairies Land Resource Area. These soils are deep, medium to fine textured, and very slowly to slowly permeable. The principal soil series are Wilson, Crockett, Trinity, Kaufman, Hunt, Houston, Irving, and Bell. Within this area 44 percent is cropland, 45 percent is pasture, 9 percent is wooded pasture, and 2 percent is in miscellaneous uses.

Approximately 54 percent of the drainage area lies within the East Texas Timberlands Land Resource Area. These soils are deep, medium to coarse textured, and very slowly to freely permeable. The principal soil series are Norfolk, Bowie, Kirvin, Ruston, Lufkin, Tabor, Susquehanna, Boswell, Ocklockanne and Iuka. Within this area 17 percent is cropland, 58 percent is pasture, 23 percent is wooded pasture, and 2 percent is in miscellaneous uses.

The Upper Cretaceous geologic system is represented by the Taylor and Navarro groups. Only the upper marls of the Taylor group are present. The Navarro group is divided into formations composed of clays, marls, sandstones and sandy shales. Tertiary outcrops of the Midway, Wilcox and Claiborne groups comprise the eastern two-thirds of the watershed and consist of clays, glauconitic sandstones, shales, siltstones and some thin limestones.

The land use for the entire watershed is as follows:

Land Use	Acres	Percent
Cropland	186,072	28.4
Pasture	324,374	49.4
Wooded Pasture	100,263	15.2
Miscellaneous 1/	45,891	7.0
Total	656,600	100.0

1/ Includes roads, railroads, towns, and the proposed Fort Worth Reservoir site.

The flood plain considered in this plan is that area inundated by the runoff from a storm which can be expected to occur on an average of once in 25 years. This storm would produce a runoff of 5.50 inches under present conditions and inundate 64,104 acres, excluding 3,732 acres of stream channels, 18,589 acres to be inundated by the Fort Worth Reservoir, 4,040 acres on the mainstem of Cedar Creek below the Fort Worth Reservoir, and the flood plain of tributaries entering the Fort Worth Reservoir below Twin Creek, in which areas the flood damages were not calculated nor benefits claimed. The flood plain land use is:

Land Use	Acres	Percent
Cropland	18,927	29.5
Pasture	24,596	38.4
Wooded Pasture	19,707	30.7
Miscellaneous 1/	874	1.4
Total	64,104	100.0

1/ Includes towns, roads, railroads, etc.

Approximately 24 percent of the cropland in the watershed is in small grains and legumes with the remainder in row crops. The soils are in poor condition in areas where row crops predominate. Cover condition of pasture expressed as percent is as follows:

Land Use	Good	Fair	Poor
Pasture	44	51	5
Wooded Pasture	63	33	4

Most of the pastures have a grass cover which is good to excellent for erosion control. Some formerly cultivated areas have never been established in grass and are in poor condition.

The mean annual rainfall is 41.56 inches based on a 49-year Weather Bureau record at Kaufman. It is well distributed, with the wettest months being April, May and December. Individual excessive rains causing serious flood-water and sediment damage may occur in any season, but are most frequent in the spring. The recorded minimum annual rainfall was 28.95 inches; the maximum was 58.33 inches.

Mean temperatures range from 85 degrees Fahrenheit in the summer to 46 degrees in the winter with a mean annual temperature of 66 degrees. The extreme recorded temperatures are 2 degrees above zero and 111 degrees above zero. The normal frost-free period is 244 days.

Water for domestic and livestock uses in the rural areas is supplied largely by small farm ponds and shallow wells. Water for Terrell, Trinidad, Kaufman, Kemp and Mabank is supplied by reservoir storage, while the remainder of municipal water supplies is obtained from wells.

Economic Data

The watershed economy is basically agricultural with cotton, small grains, corn, and grain sorghums being the principal crops. Recent increases in livestock farming have been mainly in beef cattle production. The farms average approximately 190 acres in aize, with a value of $15,000 for land and buildings, according to the U. S. Census of 1954. Owner-operated farms are predominant.

Approximately 429 miles of hard-surfaced roads traverse the watershed. In addition, there are 1,320 miles of local or county roads. Rail service is adequate for all sections of the area.

Terrell, with an estimated population in 1957 of 13,000, is the largest town in the watershed. Others with their populations are: Kaufman, 3,500; Willa Point, 2,030; Trinidad, 550; Kemp, 881; Mabank, 896; Eustace, 450; and Athens, 7,000.

Principal industries affording employment opportunities for residents of the watershed are leather, cabinet work, trailers, brooms, ceramics, and furniture manufacturing. These industries are principally located in Terrell and Athens.

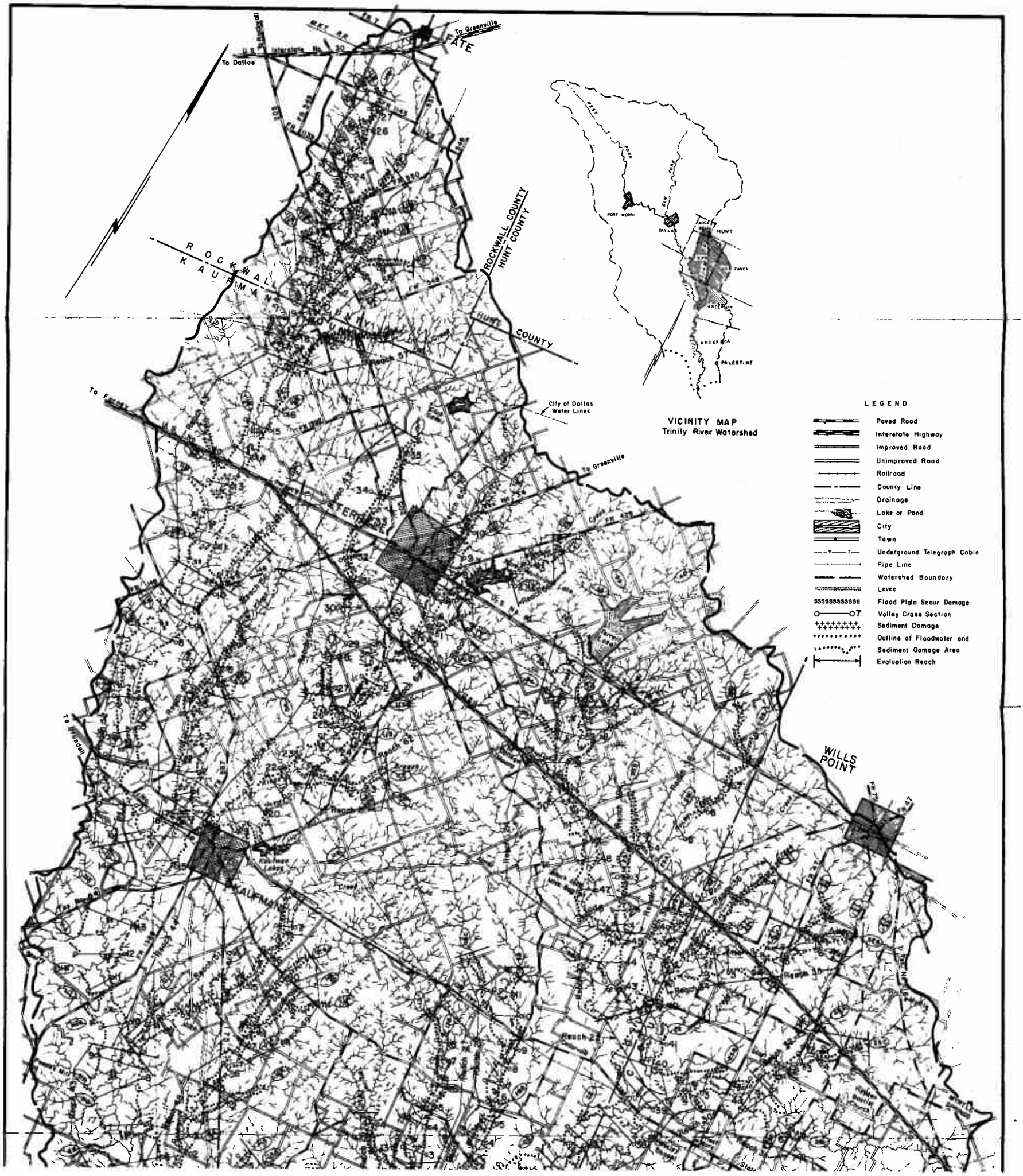
WATERSHED PROBLEMS

Floodwater Damage

Frequent flooding on Cedar Creek watershed has caused damages of considerable magnitude. Large floods have occurred on an average of twice a year. During the 30-year period studied, 1924 through 1953, there were 60 major floods (covering more than half the flood plain - Figure 1) and 61 minor floods. Forty-eight percent of the major floods and 57 percent of the amaller floods occurred during the growing season and caused heavy damage to growing cropa. A major storm of slightly less than a 25-year frequency occurred in April 1957, inundating approximately 26,800 acrea of flood plain on Kings Creek and causing damages estimated at $219,600, of which $146,500 was to crops and pastures. It is estimated that an additional 53,800 acres was inundated on the remaining portion of the watershed causing additional damages of $200,000.

The largest atorm in the evaluation series occurred in September 1936 and produced a runoff of 5.50 inches which inundated the entire flood plain. The expected frequency of occurrence of a storm of this magnitude is 25 years.

It is estimated that the average annual direct monetary floodwater damage, without project, is $618,614, of which $537,331 is crop and pasture damage, $61,702 other agricultural damages, and $19,581 damagea to roads and bridges. In addition to these, there are numerous indirect damages, such as interruption of travel, losses sustained by dealers and industries in the area, and other losaes estimated to average $69,871 annually. The average annual monetary flood damages are summarized in Table 5.


To Greenville
FATE
To Dallas
ROCKWALL COUNTY
HUNT COUNTY
ROCKWALL
KAUFMAN
HUNT COUNTY
City of Dallas Water Lines
To Greenville
To Wendell
WILLS POINT
KAUFMAN
VICINITY MAP
Trinity River Watershed
FORT WORTH
DALLAS
HUNT
ANDERSON
PALESTINE
LEGEND
Paved Road
Interstate Highway
Improved Road
Unimproved Road
Railroad
County Line
Drainage
Lake or Pond
City
Town
Underground Telegraph Cable
Pipe Line
Watershed Boundary
Levee
Flood Plain Scour Damage
Valley Cross Section
Sediment Damage
Outline of Floodwater and
Sediment Damage Area
Evaluation Reach

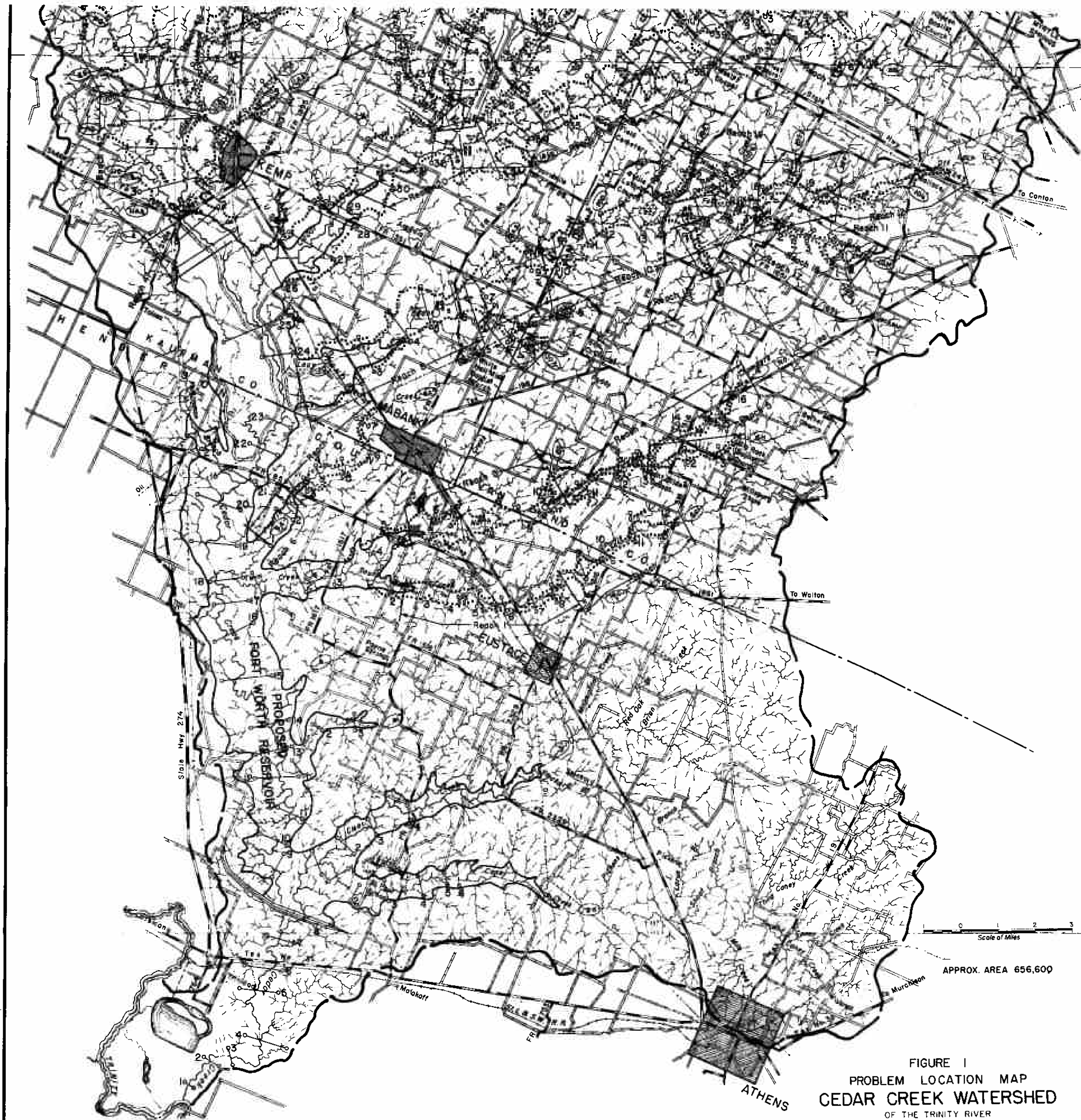


FIGURE I
PROBLEM LOCATION MAP
CEDAR CREEK WATERSHED
OF THE TRINITY RIVER
TEXAS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEMPLE TEXAS

REFERENCE			
CARTOGRAPHIC APPROVAL		TECHNICAL APPROVAL	
COMPILED	TRACED	CHECKED	DATE
	WCF	FWM	11-4-60

4-R-13,227

Revised 10/12/60 DS 5/10/49 Base 4-R-T300

Due largely to the frequency of flooding, approximately 8 percent of the cropland in the flood plain of Cedar Creek and its tributaries is idle and about 15 percent is in Johnsongrass used for hay production.

This calf made it to high ground. These farmers are looking for cattle in Cedar Creek bottom southwest of Mabank.

This flood occurred in the Spring of 1957

Severe crop and pasture damage and loss of livestock was caused by this Spring flood of 1957.

Upland Erosion

The erosion rates are low to high, ranging from 0.66 acre-foot to 3.89 acre-feet per square mile annually. In the upland areas, sheet erosion constitutes 93 percent and gully and streambank erosion 7 percent of the annual gross erosion.

The highest erosion rates in the watershed occur in Rockwall County, along the western divide of the watershed between U. S. Highways 80 and 175, and in the area between Kaufman and Kemp. These areas are characterized by a high percentage of cropland and intensive land treatment will be necessary if sediment production rates are to be reduced to a practical minimum.

Flood Plain Erosion Damage

Damage from flood plain scour is low. It is estimated that an average of 928 acres is being damaged annually by this process, as follows: 277 acres,

Crop and pasture damage on Kings Creek after a 3-inch rain in October 1959

Road and bridge damage on Muddy Cedar Creek 6 miles southeast of Terrell, Texas after a 4 inch rain in 1959.

10 percent; 301 acres, 30 percent; 190 acres, 50 percent; 109 acres, 60 percent; 41 acres, 75 percent; 10 acres, 90 percent. Examination of the scoured areas and interviews with flood plain owners and operators indicate that this type damage is in equilibrium, that is, new damage occurring each year is balanced by recovery of other damaged areas. The estimated average annual monetary damage by flood plain scour is $6,489 at long-term price levels.

Streambank erosion is negligible and no monetary value of damage was estimated.

Sediment Damage

Flood plain sediment deposition has damaged 23,406 acres, or 37 percent of the flood plain. The deposits are similar in texture and color to the original alluvium but are lower in organic matter and plant nutrients. It is estimated that the productive capacity of 17,313 acres has been reduced 5 percent, and 6,093 acres, 10 percent. As in the case of scour damage, indications are that damage due to the deposition of sediment is approximately in equilibrium. The estimated average annual monetary damage by overbank deposition is $33,901 at long-term price levels.

One major reservoir is proposed within the watershed as a supplemental municipal water supply for Fort Worth. Terrell has two municipal water supply lakes, Kaufman has two, and Kemp and Mabank one each. A club lake north of Terrell is used only for recreational purposes. The estimated annual sediment yields and the average annual monetary damage to the two Terrell municipal water supply lakes and the proposed Fort Worth municipal reservoir are as follows: Fort Worth Reservoir, 531.0 acre-feet, $38,657; Terrell Municipal Lake (old), 10.0 acre-feet, $677; and Terrell Municipal Lake (new), 5.4 acre-feet, $379.

Problems Relating to Water Management

Problems relating to water management are minor and do not warrant a detailed study at this time. There is very little activity relative to irrigation or drainage. No individual landowner or group of landowners have indicated an interest in providing additional storage capacity in any of the floodwater retarding structures for irrigation purposes. The municipality of Kaufman, Texas, has participated in the construction of a multipurpose structure (Site No. 60) and has incorporated 1,346 acre-feet of storage into its water supply system.

EXISTING OR PROPOSED WORKS OF IMPROVEMENT

There have been efforts to prevent and control floods in the watershed. Individual farmers have attempted to prevent or control floods by straightening stream channels and building levees. These efforts have had little effect in the reduction of flooding and accompanying flood damage. The city of Terrell, Texas, has constructed, and is now using, two reservoirs as a

part of its water supply system. Fort Worth Reservoir, located on Cedar Creek in the lower extremity of the watershed, is now under construction by the city of Fort Worth, Texas, and will be incorporated into its water supply system.

WATERSHED WORKS OF IMPROVEMENT

Land Treatment Measures

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, for protection and improvement such as is now being carried out by the four soil conservation districts serving the watershed, is essential 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 management practices necessary to proper land use. Emphasis will be placed on accelerating the establishment of land treatment measures which have a measurable effect on reducing floodwater and sediment damage.

The watershed is served by the Kaufman-Van Zandt, Trinity-Neches, Neches-Sabine, and Upper Sabine Soil Conservation Districts. Soil Conservation Service Work Units at Rockwall, Terrell, Wills Point, Kaufman, Mabank and Athens have assisted landowners and operators in preparing 2,075 conservation plans on 344,171 acres within the watershed. Approximately 42 percent of the needed conservation practices have been applied.

Of the total watershed area of 656,600 acres, 248,845 acres are above 2 constructed and 138 proposed structures. Land treatment is especially important to support and supplement the control provided by these structures.

Prior to work plan development, landowners and operators have established land treatment measures at an estimated non-Federal cost of $5,966,362, exclusive of Agricultural Conservation Program Service reimbursements or assistance from other Federal programs, and a Federal cost of $202,950 of flood prevention funds for accelerated technical assistance to help landowners of the watershed in planning and applying land treatment measures. During the project installation period additional land treatment measures are to be established at an estimated non-Federal cost of $5,871,653 and a Federal cost of $184,500. Land treatment measures and costs are shown in Table 1.

Most of the land treatment measures will function principally to decrease erosion damage to fields and pastures by providing improved soil cover conditions. These measures include cover cropping, rotation hay and pasture, and crop residue use for croplands and pasture planting and brush control to establish good cover on grasslands. They also include the construction of farm ponds to provide adequate livestock water, thereby preventing cover-destroying concentrations of livestock and permitting a better distribution of grazing.

In addition to the soil improvement and cover measures, land treatment includes contour farming, terracing, diversion construction, and grassed waterways to serve these measures, all of which have a measurable effect in reducing peak discharge by extending the course of runoff water. These measures also contribute to reduction in erosion damage and sediment production.

The improved physical condition of the soil and protective cover of vegetation resulting from the application and maintenance of needed land treatment measures will increase the infiltration rate of the soils and reduce the volume of sediment which would move downstream to encroach on valuable reservoir capacities provided for storage of water for municipal uses and detention of floodwater.

Structural Measures

A flood prevention work plan was developed on Big Cottonwood Creek watershed in 1954, and has been consolidated with this work plan. Big Cottonwood Creek enters Kings Creek approximately 6 miles south of Kaufman. There have been one multipurpose structure and one floodwater retarding structure (Sites 60 and 61) constructed on Big Cottonwood Creek watershed. The multipurpose structure No. 60 providing 1,346 acre-feet of storage, supplements the municipal water supply for the city of Kaufman, Texas.

A system of 139 floodwater retarding structures, 1 multipurpose structure, and 113.36 miles of stream channel improvement will provide the needed protection for flood plain land that cannot be provided by land treatment measures alone. The system of floodwater retarding structures will temporarily detain runoff from the watershed above the limits of the Fort Worth Reservoir as shown in the following table:

Tributary	Drainage Area at Entrance to Fort Worth Reservoir	Drainage Area Above Floodwater Retarding Structures	Percent Control	Runoff Detained: From Total Drainage Area	Runoff Detained: From Controlled Drainage Area
	(acres)	(acres)		(Equiv. inches)	(Equiv. inches)
Kings Creek	201,344	108,519	53.9	3.10	5.76
Cedar Creek	172,134	81,389	47.3	2.80	5.93
Lacy Fork	59,565	38,464	64.6	3.45	5.35
North Twin Creek	24,883	10,086	40.5	2.00	4.94
South Twin Creek	22,522	10,387	46.1	2.22	4.82
Total	480,448	248,845	51.8	2.94	5.68

The principal spillways of floodwater retarding structures Sites 30, 111, 114 and 135 are designed for two-stage discharge. This will dewater the flood pool more rapidly; thus preventing serious damage to highways or roads. It will also reduce the length of time of interruption in travel and the cost

of the structures. Flow from the high-stage discharge, together with the discharge from the principal spillways of the other structures, will not exceed the capacity of the existing channels.

It will be necessary to improve the stream channels of the mainstem of Cedar Creek and its principal tributaries, and Brushy, Bachelor, Kings, Little Cottonwood and Lacy Fork Creeks to meet minimum project objectives. The minimum project objectives can be met by providing sufficient capacity for the peak flow resulting from a storm producing 2.0 inches of runoff plus the release from floodwater retarding structures.

Sites for the floodwater retarding structures and stream channel improvement will be provided by local interests as were the sites for the two completed structures. The value of these sites is estimated to be $2,045.659 based on local market values. There will be an estimated $23,690 additional costs for legal fees and $88,150 additional costs for the removing of obstacles connected with obtaining these sites. The sediment pools of the 139 floodwater retarding structures will contain 1,077 acres of flood plain and 4,202 acres of upland and the detention pools will contain an additional 2,945 acres of flood plain and 11,486 acres of upland. The water supply pool of the multipurpose structure will contain 71 acres of flood plain and 279 acres of upland and the detention pool will contain an additional 49 acres of flood plain and 193 acres of upland.

Figure 2 shows a section of a typical floodwater retarding structure.

The locations of floodwater retarding structures, multipurpose structure, and stream channel improvement are shown on the Planned Structural Measures Map, Figure 3. All planned structural measures are located upstream from the upper pool limits of the Fort Worth Reservoir. The total estimated cost of establishing these works of improvement is $11,351,761, of which $2,175,227 will be borne by non-Federal interests and $9,176,534 by the Federal Government. The average annual equivalent cost is estimated to be $410,253 for installation and $35,682 for operation and maintenance, a total average annual cost of $445,935.

BENEFITS FROM WORKS OF IMPROVEMENT

The combined program of land treatment and structural measures would have prevented flood damages from 40 of the 121 floods such as occurred in the watershed from 1924 through 1953. Fifty-six of the 60 major floods would have been reduced to minor floods. The average annual flooding would have been reduced from 120,714 acres to 33,761 acres.

The estimated average annual floodwater, erosion, sediment, and indirect damage in the watershed will be reduced from $768,588 to $113,602, a reduction of 85.2 percent. About 92.0 percent of the expected reduction in average annual damage will result from the structural measures. Average annual damage reductions attributable to the project, including reduction from both land treatment and structural measures, are $464,501 in crop and

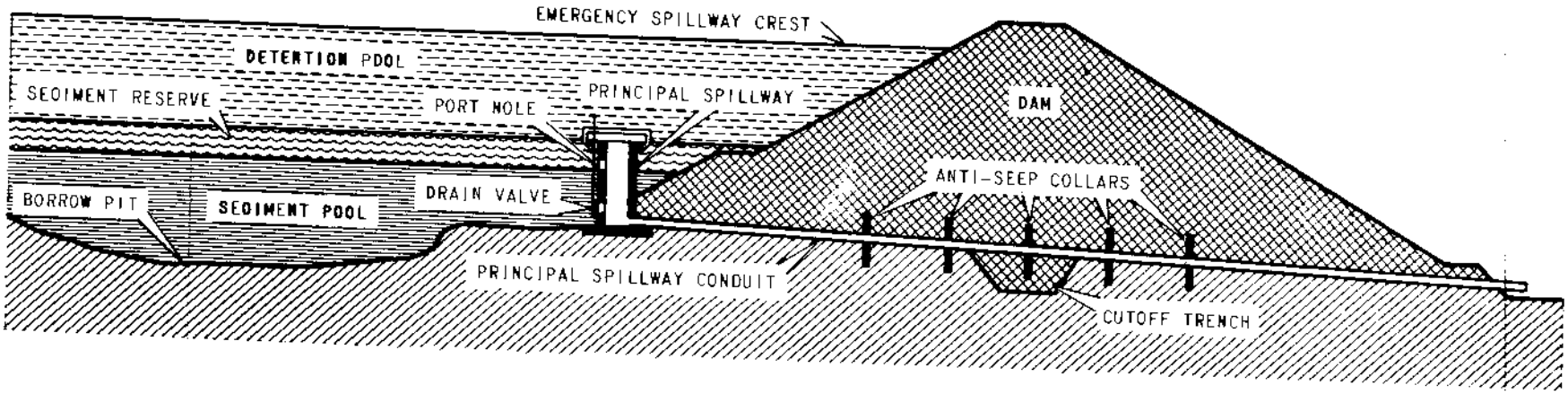
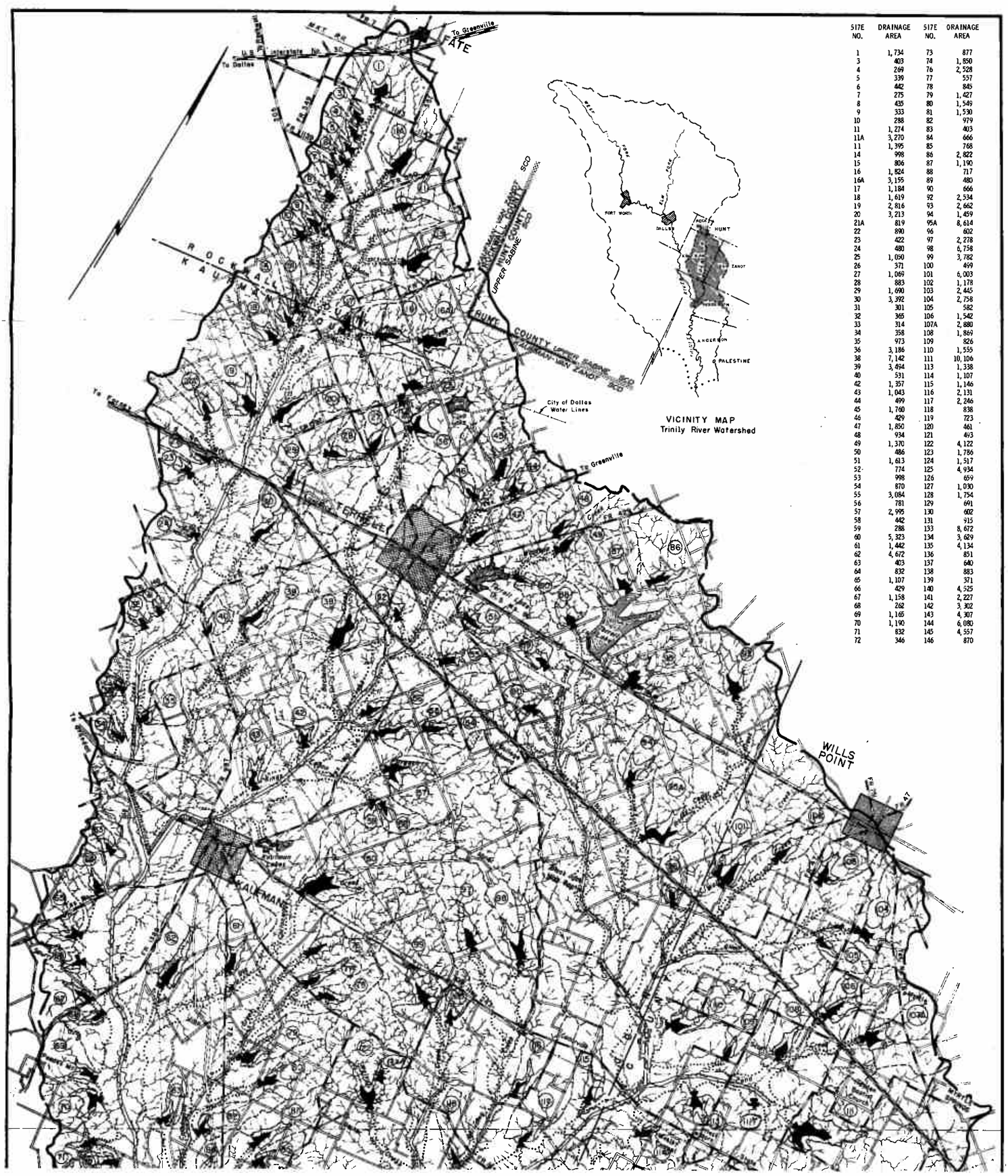


Figure 2
SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

Revised 10-31-88 N-L-10,071



517E NO.	DRAINAGE AREA	517E NO.	DRAINAGE AREA
1	1,734	73	877
3	403	74	1,850
4	269	76	2,528
5	339	77	557
6	442	78	845
7	275	79	1,427
8	435	80	1,549
9	333	81	1,530
10	288	82	979
11	1,274	83	403
11A	3,270	84	666
11	1,395	85	768
14	998	86	2,822
15	806	87	1,190
16	1,824	88	717
16A	3,155	89	480
17	1,184	90	666
18	1,619	92	2,534
19	2,816	93	2,662
20	3,213	94	1,459
21A	819	95A	8,614
22	890	96	602
23	422	97	2,278
24	480	98	6,758
25	1,050	99	3,782
26	371	100	499
27	1,069	101	6,003
28	883	102	1,178
29	1,690	103	2,445
30	3,392	104	2,758
31	301	105	582
32	365	106	1,542
33	314	107A	2,880
34	358	108	1,869
35	973	109	826
36	3,186	110	1,555
38	7,142	111	10,106
39	3,494	113	1,338
40	531	114	1,107
42	1,357	115	1,146
43	1,043	116	2,131
44	499	117	2,246
45	1,760	118	838
46	429	119	723
47	1,850	120	461
48	934	121	493
49	1,370	122	4,122
50	486	123	1,786
51	1,613	124	1,517
52	774	125	4,934
53	998	126	659
54	870	127	1,030
55	3,084	128	1,754
56	781	129	691
57	2,995	130	602
58	442	131	915
59	288	133	8,672
60	5,323	134	3,629
61	1,442	135	4,134
62	4,672	136	851
63	403	137	640
64	832	138	883
65	1,107	139	371
66	429	140	4,525
67	1,158	141	2,227
68	262	142	3,302
69	1,166	143	4,307
70	1,190	144	6,080
71	832	145	4,557
72	346	146	870

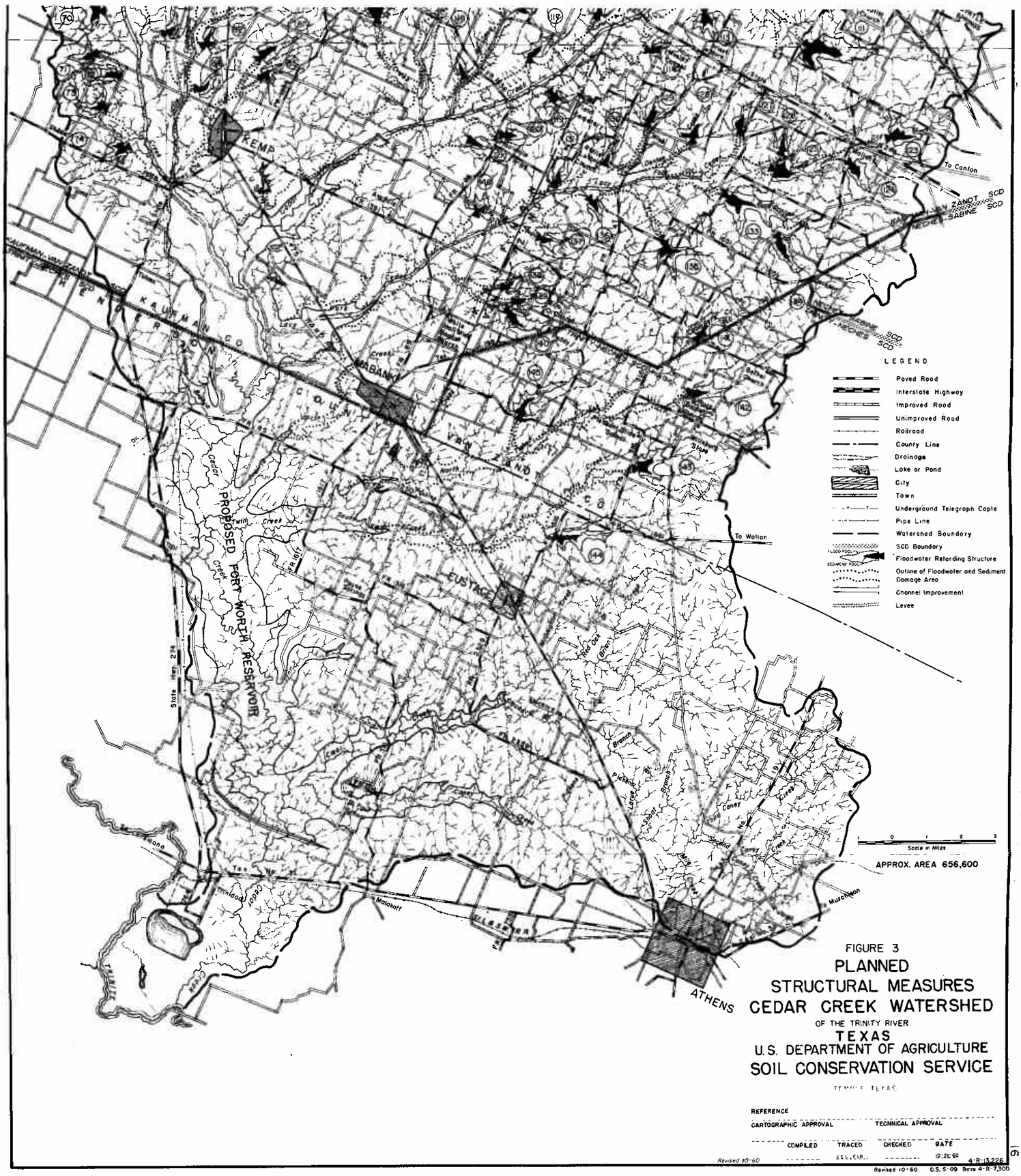


FIGURE 3
PLANNED
STRUCTURAL MEASURES
CEDAR CREEK WATERSHED
OF THE TRINITY RIVER
TEXAS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

REFERENCE
CARTOGRAPHIC APPROVAL — TECHNICAL APPROVAL
COMPILED — TRACED — CHECKED — DATE
Revised 10-60 — 4-R-13,225
Revised 10-60 U.S. S-09 Bore 4-R-7,500

pasture damage, $59,196 in other agricultural damage, $19,288 in railroad, road and bridge damage, $5,983 in damage from flood plain scour, $29,395 in damage from overbank deposition, $17,079 in damage from sediment to municipal water supply reservoirs, and $59,544 in indirect damage.

It is assumed that idle land in flood plain not flooding more often than once in three years after project will be returned to crop production. A portion of the area retired to Johnsongrass, as well as formerly cultivated open pastureland, is expected to go back to higher value crops. These chsnges are considered restoration to former productivity and benefits therefrom are included as a reduction in crop and pasture damage in Table 5.

Owners and operators of flood plain lands state that, with an adequate reduction of flooding, they will change the use of some of the land to the production of higher value crops. Approximately 917 acres (4.3 percent) of pasture and wooded pasture not formerly cropland will be suitable for crop production when protection is provided by structural measures. This land is expected to be used for production of higher value crops such as small grain, sorghums and alfalfa. This shift in production is considered a change in land use. Increased net income expected from such changes will amount to $23,969 annually. These benefits are not dependent upon increases from crops presently restricted under crop allotments and have not been included with benefits from the reduction of crop and pasture damage. (See Table 5)

Application and maintenance of needed land treatment measures will reduce the volume of sediment transported to the Terrell, Kaufman, Mabank, Kemp and Fort Worth municipal water supply reservoir. The Terrell Municipal Lakes and the Fort Worth Reservoir have floodwater retarding structures planned within their drainage areas. The installation of the floodwater retarding structures will further reduce the sediment damages and thus extend the life expectancy of these reservoirs. The estimated average annual sediment yield and monetary damages to these municipal water supply reservoirs are as follows:

Reservoir	Present		With Land Treatment		With Land Treatment & Structures	
	Ac.-Ft.	Dollars	Ac.-Ft.	Dollars	Ac.-Ft.	Dollars
Fort Worth Reservoir	531.0	38,657	478.0	34,798	304.0	22,128
Terrell Municipal Lake (Old)	10.0	677	8.1	547	4.8	325
Terrell Municipal Lake (New)	5.4	379	4.8	337	2.6	181

No floodwater retarding structures are planned above the municipal water supply lakes at Kaufman, Mabank, Kemp, or the club lake at Terrell, but the present rate of sediment accumulation in these reservoirs will be reduced by application of land treatment measures.

The total flood prevention benefits, including reduction of floodwater damage; the reduction of sediment deposition on flood plain lands and in the municipal water supply reservoirs; the reduction in flood plain scour damage; the

reduction of indirect damage; and benefits from changed land use of flood plain lands, are estimated to be $678,955 annually, of which $626,212 will be the result of structural measures.

COMPARISON OF BENEFITS AND COST

The average annual equivalent cost of the structural measures (converted from total installation cost, plus operation and maintenance) is estimated to be $445,935. When the structures are completely installed, they are expected to produce average annual benefits of $626,212, a benefit of $1.40 for each dollar of cost (Table 6). There are other substantial values which will accrue from these structural measures, such as increased opportunity for recreation, improved wildlife conditions, and a sense of security, which have not been used for project justification.

ACCOMPLISHING THE PLAN

Land Treatment Measures

Land treatment measures itemized in Table 1 will be established by farmers over a 10-year period in cooperation with the Kaufman-Van Zandt, Trinity-Neches, Neches-Sabine and Upper Sabine Soil Conservation Districts. Since there are only 124 acres and no structural measures or direct benefits therefrom in the Upper Sabine Soil Conservation District, it is not considered logical to include this district as a project sponsor.

The cost of applying land treatment measures is exclusive of expected reimbursement from the Agricultural Conservation Program Service or other Federal programs, based on current program criteria, and will be borne by the owners and operators of the land. The soil conservation districts, assisted by the Soil Conservation Service, are giving assistance in the planning and application of these measures under their going programs. Accelerated assistance from the Soil Conservation Service has been made available with flood prevention funds for several years to get needed land treatment applied in conjunction with planned structural measures. This assistance will be continued to assure application of the planned land treatment measures within the 10-year installation period of the project.

The governing bodies of the soil conservation districts will encourage the landowners and operators to adopt and carry out soil and water conservation plans on their farms. District-owned equipment will be made available to the landowners in accordance with the existing arrangements for equipment usage in the districts. The district governing bodies will make periodic inspections of the completed conservation measures within the districts and follow through to see that needed maintenance is performed.

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

Farmers Home Administration clients will be encouraged to cooperate in the project.

The Agricultural Stabilization and Conservation County Committees will cooperate with the governing bodies of the soil conservation districts by selecting and recommending financial assistance for those Agricultural Conservation Program Service 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 and press releases, and using other methods of getting information to landowners and operators in the Cedar Creek watershed.

Structural Measures for Flood Prevention

The Soil Conservation Service will contract for the construction of the 138 remaining floodwater retarding structures and the 113.36 miles of stream channel improvement. Technical assistance will be provided to plan, design, prepare specifications, supervise construction, prepare contract payment estimates, make final inspections, certify completion, and perform related duties for the installation of these structural measures.

The soil conservation districts will furnish the land, easements and rights-of-way for all the structural measures at no cost to the Federal Government.

The following is a grouping of structures which can be constructed in any desired order prior to stream channel improvement as long as combined structure release flow does not exceed the existing channel capacity of the streams below the structure, each construction unit of which has a favorable benefit-cost ratio based on those benefits that will accrue within the boundary of each construction unit:

Construction Units 1/ No.	Structures	Number of Sites	Annual Benefits (dollars)	Annual Costs (dollars)	Benefit-Cost Ratio
2/ 1.	Sites 16, 16A and 17	3	6,834	6,549	1.0:1
2.	Brushy Creek Sites 1, 3 thru 11, 11A, 13 thru 15, 18 thru 20, 21A, 22 thru 35, and Unit 1	35	61,795	60,791	1.0:1
2/ 3.	Kings Creek above Bachelor Creek - Sites 44 thru 53	10	16,293	16,107	1.0:1
2/ 4.	Eagen Branch - Sites 57, 58 and 59	3	4,961	4,580	1.1:1
2/ 5.	Little Brushy Creek - Sites 39 and 40	2	4,618	4,443	1.0:1
6.	Kings Creek above Brushy Creek - Sites 36, 38, 42, 43, 54, 55 and 56; and Units 3, 4 and 5	22	44,728	42,544	1.1:1
2/ 7.	Big Cottonwood Creek - Sites 60, 61 and 62 (Sites 60 and 61 constructed in 1954)	3	19,911	10,348	1.9:1
2/ 8.	Upper Little Cottonwood Creek - Sites 76, 77 and 78	3	5,775	4,898	1.2:1
9.	Little Cottonwood Creek - Sites 79, 80, 82 and 84; and Unit 8	7	13,322	10,634	1.3:1
2/ 10.	Willow Creek - Sites 81 and 85	2	4,773	3,107	1.5:1
11.	Kings Creek - Sites 63 thru 74, and 83; and Units 2, 6, 7, 9 and 10	82	189,254	146,096	1.3:1
2/ 12.	Muddy Cedar Creek - Sites 86 thru 90, and 93	6	11,605	10,850	1.1:1
2/ 13.	Blackberry Creek - Site 102	1	3,021	1,401	2.2:1
14.	Allen Creek - Sites 103, 104, 105 and Unit 13	4	10,796	7,549	1.4:1
2/ 15.	Wolf Creek - Sites 96 and 101	2	7,040	6,666	1.1:1
16.	Cedar Creek above Cana Creek - Sites 92, 94, 95A and 110; and Units 12, 14 and 15	16	43,687	34,677	1.3:1
2/ 17.	Cana Creek - Sites 106, 107A, 108, 109, 111 and 113	6	15,712	15,750	1.0:1
18.	Cedar Creek above FM Road 1836 - Sites 114, 115, 117 and 119; and Units 16 and 17	26	70,367	55,662	1.3:1
2/ 19.	Upper Williams Creek - Sites 97 and 98	2	11,165	6,285	1.8:1
20.	Williams Creek - Sites 116, 118 and Unit 19	4	13,442	8,623	1.6:1
2/ 21.	Jones Creek - Sites 99 and 100	2	8,626	3,959	2.2:1
2/ 22.	Walnut Creek - Site 122	1	3,142	1,940	1.6:1
23.	Cedar Creek - Sites 120 and 121; and Units 18, 20, 21 and 22	35	102,267	71,932	1.4:1

(See footnotes on next page)

No.	Construction Units 1/ Structures	Number of Sites	Annual Benefits (dollars)	Annual Costs (dollars)	Benefit-Cost Ratio
2/ 24.	Upper Lacy Fork of Cedar Creek - Sites 123 thru 131, and 133 thru 137	14	26,040	25,837	1.0:1
25.	Lacy Fork of Cedar Creek - Site 146 and Unit 24	15	34,711	27,035	1.3:1
26.	Lacy Fork of Cedar Creek - Sites 138, 139, and 140; and Unit 25	18	46,735	32,711	1.4:1
2/ 27.	North Twin Creek - Sites 141, 142 and 145	3	6,135	5,405	1.1:1
2/ 28.	South Twin Creek - Sites 143 and 144	2	5,875	5,616	1.0:1
29.	Unit 11 and Stream Channel Improvement Kings Creek		296,378	210,406	1.4:1
30.	Unit 29 and Stream Channel Improvement Brushy Creek		349,097	239,604	1.5:1
31.	Unit 29 and Stream Channel Improvement Little Cottonwood Creek (Drainage 11A)		302,893	215,627	1.4:1
32.	Unit 23 and Stream Channel Improvement Cedar Creek		167,995	129,328	1.3:1
33.	Unit 32 and Stream Channel Improvement Jones Creek (Drainage 17)		174,869	132,577	1.3:1
34.	Unit 32 and Stream Channel Improvement Williams Creek (Drainage 19)		170,554	133,016	1.3:1
35.	Unit 32 and Stream Channel Improvement Cana Creek (Drainage 25)		174,304	132,932	1.3:1
36.	Unit 32 and Stream Channel Improvement Wolf Creek (Drainage 27)		168,586	130,788	1.3:1
37.	Unit 36 and Stream Channel Improvement Allen Creek (Drainage 27A)		173,697	134,764	1.3:1
38	Unit 26 and Stream Channel Improvement Lacy Fork of Cedar Creek		69,151	44,784	1.5:1

1/ Least channel capacity on Kings Creek above its confluence with Brushy Creek is 300 c.f.s. at valley section 19 (Figure 1); Kings Creek below Brushy Creek, 1,000 c.f.s. at valley section 12; Brushy Creek, 200 c.f.s at valley section 6; and Cedar Creek, 600 c.f.s. at valley section 33. The combined capacities of principal spillways of floodwater retarding structures constructed above these valley sections should not exceed the above capacities shown before channel improvement is installed. The remaining tributaries will carry structure release.

2/ Units which may be constructed independently.

All necessary land, easements, and rights-of-way will be obtained for each construction unit before Federal financial assistance is made available for installation of any part of that construction unit.

The cooperating parties have agreed on an installation schedule of 10 years for completion of the project. This schedule may be adjusted if mutually desirable and in view of appropriations and accomplishments.

The structural measures will be installed pursuant to the following conditions:

1. Flood prevention funds are available.

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

3. All land easements and rights-of-way have been secured.

4. Operation and maintenance agreements have been executed.

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

It is planned to construct structures in the following order:

INSTALLATION SCHEDULE
(October 1960 - October 1970)

Fiscal Year	Land Treatment Measures: Federal Funds (dollars)	Land Treatment Measures: Non-Federal Funds (dollars)	Land Treatment Measures: Total (dollars)	Site Numbers	Structural Measures: Federal Funds (dollars)	Structural Measures: Non-Federal Funds (dollars)	Structural Measures: Total (dollars)	Total Cost (dollars)
1st	18,450	587,166	605,616	Sites 16, 16A, 17, 39, 40, 57, 58, 59, 76, 77, 78, 81, 85, 96, 101 and 102	557,930	277,791	835,721	1,441,337
2nd	18,450	587,166	605,616	Sites 62, 79, 80, 82, 84, 86, 87, 88, 89, 90, 92, 93, 94, 95A, 97, 98, 103, 104, 105, 106, 107A, 108, 109, 110, 111, 113, 116, 118, 122 and Stream Channel Improvement on Williams Creek (4.69 miles)	1,260,848	471,685	1,732,533	2,338,149
3rd	18,450	587,166	605,616	Stream Channel Improvement on Cedar Creek (25.84 mi.)	1,279,497	43,680	1,323,177	1,928,793
4th	18,450	587,165	605,615	Sites 1, 3 thru 11, 11A, 13, 14, 15, 18, 19, 20, 21A, and 22 thru 35; and Stream Channel Improvement on Cana, Wolf and Allen Creeks (10.29 miles)	1,125,765	523,372	1,649,137	2,254,752
5th	18,450	587,165	605,615	Stream Channel Improvement on Kings Creek (23.13 Mi.)	1,397,011	31,720	1,428,731	2,034,346
6th	18,450	587,165	605,615	Sites 36, 38, 42 thru 56, 63 thru 74, and 83; and Stream Channel Improvement on Kings Creek above Bachelor Creek (5.71 miles)	1,157,479	363,418	1,520,897	2,126,512
7th	18,450	587,165	605,615	Sites 123 thru 131, and 133 thru 137; and Stream Channel Improvement on Brushy and Little Cottonwood Creeks (26.38 miles)	1,342,298	185,142	1,527,440	2,133,055
8th	18,450	587,165	605,615	Sites 143 and 144; and Stream Channel Improvement on Lacy Fork of Cedar Creek (12.59 miles)	410,517	43,875	454,392	1,060,007
9th	18,450	587,165	605,615	Sites 99, 100, 114, 115, 117, 119, 120, 121 and Stream Channel Improvement on Jones Creek (4.73 miles)	294,025	70,750	364,775	970,390
10th	18,450	587,165	605,615	Sites 138 thru 142, 145 and 146	255,091	67,216	322,307	927,922
Total	184,500	5,871,653	6,056,153		9,080,461	2,078,649	11,159,110	17,215,263

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be operated and maintained by the owners and operators of the farms and ranches on which the measures are installed, under agreements with the Kaufman-Van Zandt, Trinity-Neches, Neches-Sabine and Upper Sabine Soil Conservation Districts.

Representatives of the appropriate soil conservation district will make periodic inspections of the land treatment measures to determine maintenance needs and to encourage landowners and operators to perform needed maintenance. Equipment owned by the districts will be made available for this purpose.

Structural Measures

The 139 floodwater retarding structures, 1 multipurpose structure, and 113.36 miles of stream channel improvement will be maintained by the soil conservation district in which the structure is located and the appropriate county commissioners court. In addition the city of Kaufman, Texas, will participate in the operation and maintenance of structures No. 60 and No. 61, located on Big Cottonwood Creek.

The Kaufman-Van Zandt Soil Conservation District and the Rockwall County Commissioners Court will be jointly responsible for the operation and maintenance of floodwater retarding structures 1, 3 through 11, 11A, 13, 16 and 16A, and approximately 1.9 miles of stream channel improvement located in Rockwall County.

The Kaufman-Van Zandt Soil Conservation District and the Kaufman County Commissioners Court will be jointly responsible for the operation and maintenance of floodwater retarding structures 14, 15, 17 through 20, 21A, 22 through 36, 38 through 40, 42 through 59, 62 through 74, 76 through 90, 92 through 94, 95A, 96 through 100, 115 through 122 and 146, and approximately 100.56 miles of stream channel improvement, all located in Kaufman County.

The Kaufman-Van Zandt Soil Conservation District, the Kaufman County Commissioners Court, and the city of Kaufman, Texas, will be jointly responsible for the operation and maintenance of Multipurpose Structure No. 60 and Floodwater Retarding Structure No. 61, located in Kaufman County.

The Kaufman-Van Zandt Soil Conservation District and the Van Zandt County Commissioners Court will be jointly responsible for the operation and maintenance of floodwater retarding structures 101 through 106, 107A, 108 through 111, 113, 114, 123 through 131, 133 through 141, and approximately 10.90 miles of stream channel improvement, all located in Van Zandt County.

The Trinity-Neches Soil Conservation District and the Van Zandt County Commissioners Court will be jointly responsible for the operation and maintenance of floodwater retarding structures 142, 143 and 145 located in Van Zandt County.

The Trinity-Neches Soil Conservation District and the Henderson County Commissioners Court will be jointly responsible for the operation and maintenance of Floodwater Retarding Structure 144 located in Henderson County.

All structural measures will be inspected at least annually and after each heavy rain or heavy streamflow by representatives of the Commissioners Court and the local soil conservation district in which the structure is located. A representative of the Soil Conservation Service will participate in the annual inspection. Items of inspection will include the condition of the principal spillway and its appurtenances, the emergency spillway, the earth fill, the vegetative cover of the emergency spillway and the earth fill, and fences installed as part of the structures.

The sponsoring local organizations will maintain a written record of all maintenance inspections and work done. Reports will be prepared of inspections and maintenance performed and copies furnished to the Soil Conservation Service.

Free ingress and egress to all structural measures and appurtenances will be provided to representatives of the Soil Conservation Service and sponsoring local organizations at all times.

Based on long-term price levels, the estimated operation and maintenance cost is $35,682 annually. The necessary maintenance work will be financed by the county commissioners court of the county in which the structural measure is located from moneys appropriated for this purpose. They fully understand their obligations for maintenance and will execute specific maintenance agreements prior to the issuance of any invitation to bid.

CONFORMANCE OF PLAN TO FEDERAL AND STATE LAWS AND REGULATIONS

This project plan conforms to all Federal, State, and local laws and regulations, and will have no known detrimental effect on existing downstream projects or any that might be constructed in the future.

SECTION 2

WORK PLAN DEVELOPMENT

INVESTIGATIONS, ANALYSES, AND SUPPORTING TABLES

INVESTIGATIONS AND ANALYSES

Project Objectives

A reconnaissance survey of the watershed was made by specialists of the Planning Party and representatives of the State, Area and Work Unit offices. The purpose was to obtain sufficient information to estimate planning requirements and to furnish the local people with technical information needed for their determination of project objectives.

At a series of meetings with the local people, the flood prevention program and reconnaissance survey data were discussed. Considering this information, together with their needs and desires, it was found that a complete watershed program on Cedar Creek is desired.

The over-all objective of the people of the watershed is to establish and maintain a complete conservation program on all their lands and to reduce floodwater and sediment damage to the extent feasible on flood plain lands and improvements in the flood plain. Specific objectives of the local people are as follows:

1. Attain a reduction of at least 80 percent of average annual floodwater and sediment damage.

2. Establish remaining land treatment measures which contribute directly to flood prevention.

Land Treatment

The status of land treatment measures for the Cedar Creek watershed was secured from the records of the Kaufman-Van Zandt, Trinity-Neches, and Neches-Sabine Soil Conservation Districts. This information was expanded with assistance from personnel of the Soil Conservation Service Work Units at Rockwall, Terrell, Wills Point, Kaufman, Mabank and Athens, Texas, to represent the needed land treatment measures for the watershed. Estimates were made of the amounts of practices that will be applied during the 10-year installation period for the entire watershed (Table 1). Trends in farming operation, amounts of land treatment practices already applied, soil conditions, grassland cover conditions, and other pertinent data were used in estimating these future land treatment needs. The cost of applying the land treatment measures was based on current costs and going program criteria.

Structural Measures

Determination was then made of structural measures for watershed protection and flood prevention which would be feasible to install and still meet the objectives of the sponaoring local organizations. The procedures used in that determination were as follows:

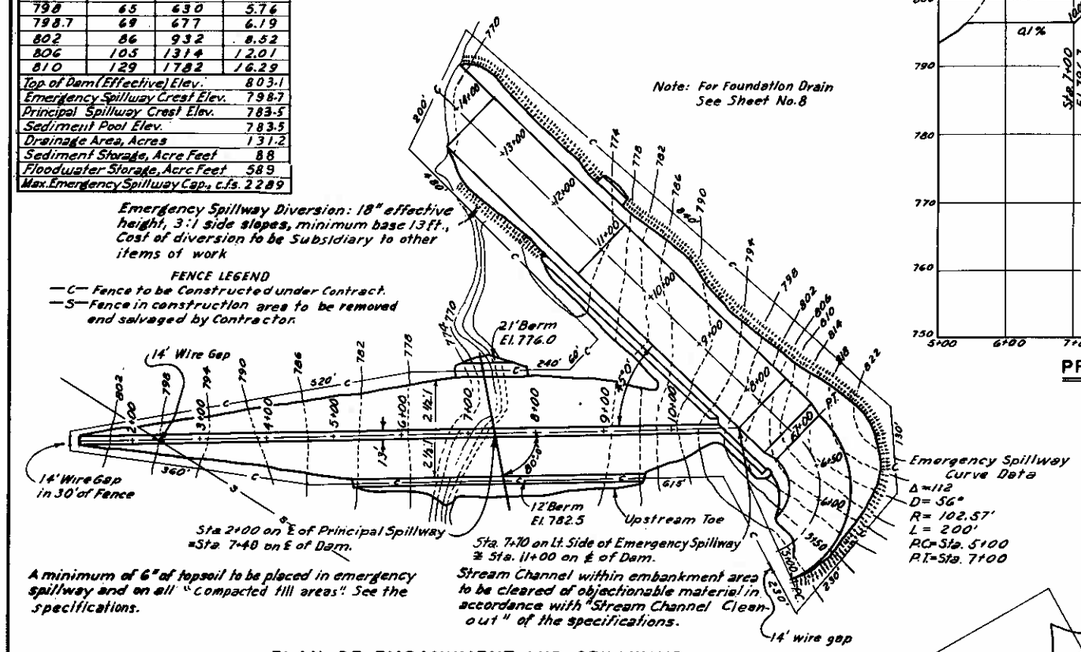
1. A base map of the watershed was prepared showing the watershed boundary, drainage pattern, system of roads, and other pertinent information. A stereoscopic study of consecutive 4-inch aerial photographs was used to locate all probable floodwater retarding structure sites, the limits and the area of the flood plain and points where valley cross sections should be taken for the determination of hydraulic characteristics of the channel and valley and for flood routing purposes. A field reconnaissance was made to substantiate further the location of these sections. 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 (Figure 1). Data developed from these cross sections permitted the computation of atage-area inundated 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 show good storage possibilities or which would inundate highways or costly improvements for which the cost of relocating could not be economically justified were dropped from further consideration. From the remaining sites a system of floodwater retarding structures was selected for further consideration and detailed survey. Plans of a floodwater retarding structure, typical of those planned for this watershed, are illustrated by Figure 4 and 4A.

3. A topographic map was made of the pool area of each of the proposed sites to determine the storage capacity of the site, 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 storage volume needed to detain temporarily the runoff from the design storm and to provide the additional storage needed for sediment, with due consideration to site differences and minimization of costs. The limits of the detention pools and sediment pools of all satisfactory sites and the flood plain of the streams were drawn to scale on a copy of the base map. Structure data tables were developed to show, for each structure, the

Elevation	Surface Acres	Storage Acre Feet	Storage Inches
774	1	2	.02
778	7	18	.16
782	12	56	.51
783.5	15	76	.69
786	21	122	1.12
790	34	232	2.12
794	50	400	3.66
798	65	630	5.76
798.7	69	677	6.19
802	86	932	8.52
806	105	1314	12.01
810	129	1782	16.29

Top of Dam (Effective) Elev.	803.1
Emergency Spillway Crest Elev.	798.7
Principal Spillway Crest Elev.	783.5
Sediment Pool Elev.	783.5
Drainage Area, Acres	131.2
Sediment Storage, Acre Feet	88
Floodwater Storage, Acre Feet	589
Max. Emergency Spillway Cap., c.f.s.	2289

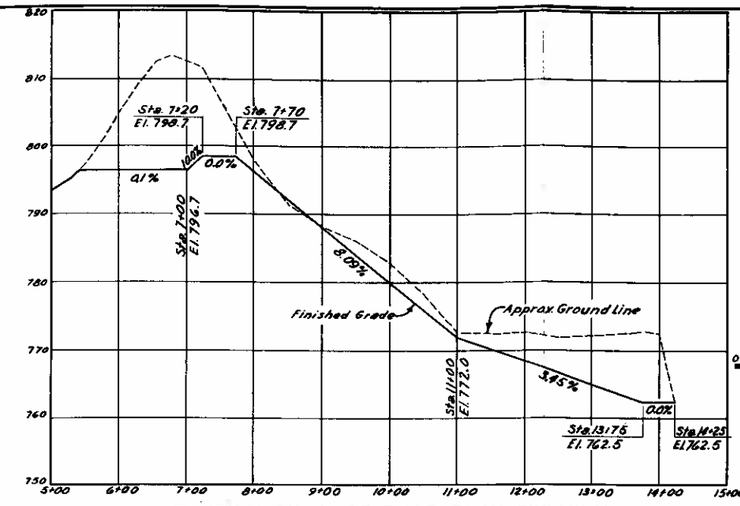


A minimum of 6" of topsoil to be placed in emergency spillway and on all "compacted till areas". See the specifications.

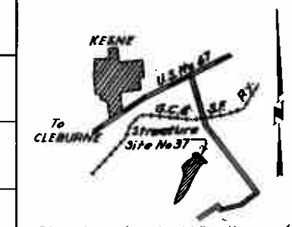
Stream Channel within embankment area to be cleared of objectionable material in accordance with "Stream Channel Clean-out" of the specifications.

PLAN OF EMBANKMENT AND SPILLWAYS

0 100 200 300 400 500
SCALE IN FEET



PROFILE ON ℄ OF EMERGENCY SPILLWAY

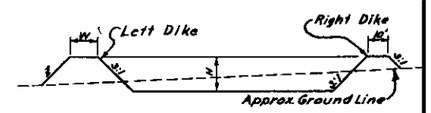


Structure located 1.5 miles southeast of Keene, Johnson County, Texas.

For Ownership see General Plan of Reservoir.

VICINITY MAP

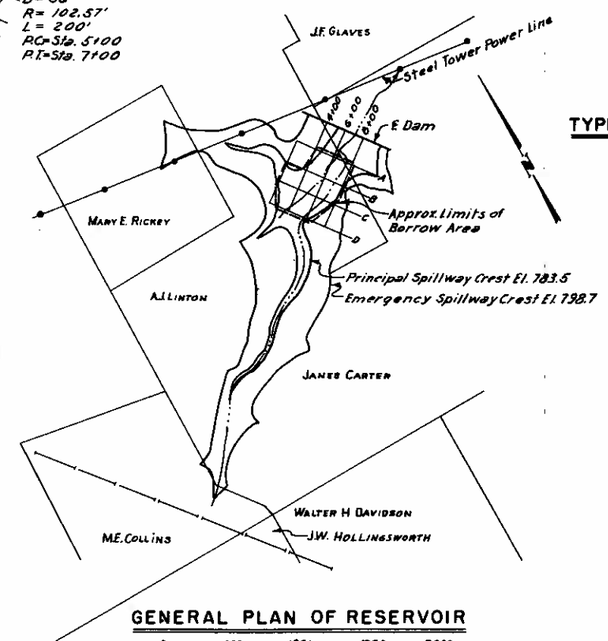
0 1 2 3 4
SCALE IN MILES



Right Dike: Sta. 11+25 to Sta. 11+75, H = 3.0'

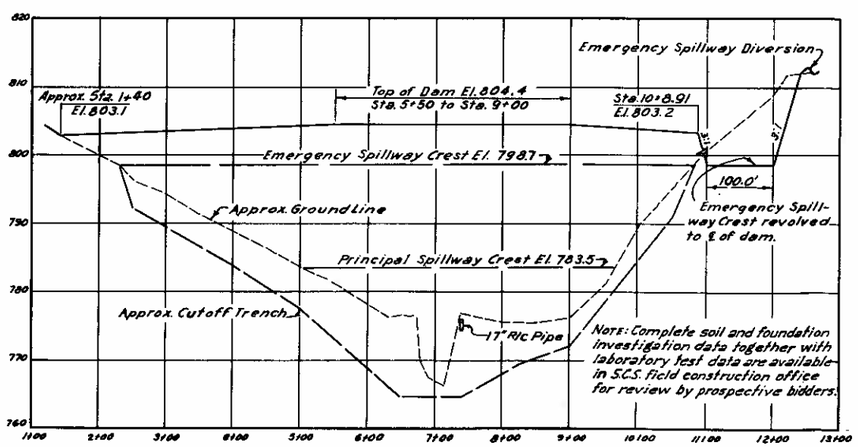
Left Dike: Sta. 7+00 to Embankment Top El. 803.2, W=13, Z=2.5:1. From Embankment to Sta. 11+50, W=10.0' Z=3:1 and H=3.0' above grade.

TYPICAL SECTION - EMERGENCY SPILLWAY



GENERAL PLAN OF RESERVOIR

0 660 1320 1980 2640
SCALE IN FEET

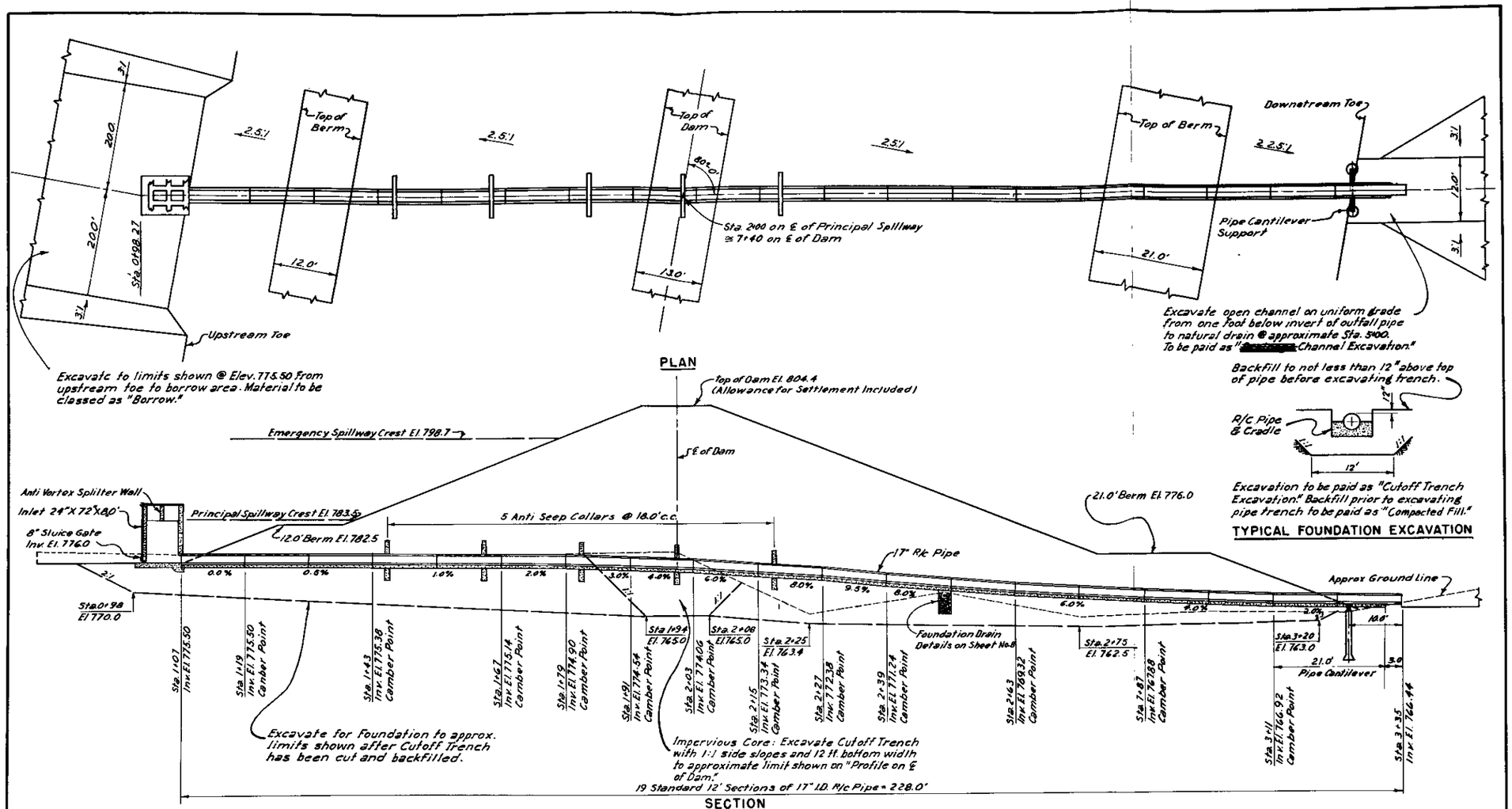


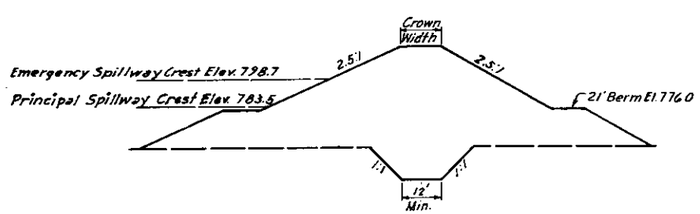
PROFILE ON ℄ OF DAM

Figure 4
TYPICAL
FLOODWATER RETARDING STRUCTURE
GENERAL PLAN AND PROFILE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date	
Designed	W.E.C.	3-60	Approved by
Drawn	W.E.C. & F.C.S.	4-60	
Traced	F.C.S.	4-60	
Checked	W.E.C. & G.W.T.	4-60	Sheet No. 2 of 8 — Drawing No. 4-R-14489





TYPICAL SECTION

EMBANKMENT SECTION		REQUIRED COMPACTION DATA								
		SOURCE OF FILL MATERIAL			LAB. TEST		COMPACTION REQUIREMENTS			Lab. Curve
			Ave. Depth Feet		Modified		Min. Dry Density	Moisture Range		
Sec. No.	Description	Location	From	To	Max. Dry Den.	Opt'm Moist	Lbs. Per Cu. Ft.	Percent From	Percent To	No.
	Cutoff Trench or Center Section	Borrow Zone B	1	6	119.0	14.0	107.0	13	up	3
		Emergency Spillway	1	5	117.0	14.5	105.0	13	up	4
		Emergency Spillway	5	Grade	119.5	13.0	107.0	12	up	5
	Outside Section	Cutoff Excavation	1	6	126.0	10.5	113.0	9	up	1
		Borrow Zone A	2	11	126.0	10.5	113.0	9	up	2

Note: Material represented by Curve 2 is to be used in conjuction with Foundation Drain see sheet No. 8 See Geologic Investigations, Sheet No. 1 for Borrow Zones.

If the material being placed in the fill contains ¼ inch or larger material in amounts differing from the percentages found in the laboratory sample, the minimum dry density and moisture requirement shown above will be corrected for this variation.

EMBANKMENT DATA

Figure 4A
TYPICAL
FLOODWATER RETARDING STRUCTURE
STRUCTURE PLAN AND SECTION

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

		Date
Designed	W.E.C.	3-60
Drawn	W.E.C. & F.C.S.	4-60
Traced	F.C.S.	4-60
Checked	W.E.C. & G.W.T.	4-60

Approved by: MEAD, FOUNDERING & WATKINS, PLANNING CONSULTANTS, FORT WORTH, TEXAS
STATE CONSERVATIONIST, EMITSCH S. C. S.
STAMFORD, TEXAS
Sheet No. 3 of 8
Drawing No. 4-R-14489

drainage area, the storage capacity needed for floodwater detention and for sediment storage in acre-feet and in inches of runoff from the drainage areas, the release rate of the principal spillway, the acres inundated by the sediment and detention pools, the volume of fill in the dams, the width and depth of flow of the emergency spillways, and the estimated cost of the structures (Tables 1, 2 and 3).

4. Damages resulting from floodwater, sediment and erosion were determined from damage schedules and field surveys of flood plain areas and flood routing under present conditions. Reductions in these damages resulting from the proposed works of improvement were estimated on the basis of reduction of area inundated and depth of inundation as determined by flood routing under future conditions, assuming that the works of improvement had been installed. Benefits so determined were allocated to individual measures or groups of interrelated measures on the basis of the effect of each on reduction of damages. In this manner it was determined that a system of floodwater retarding structures on Cedar Creek could be economically justified. By further analysis, those individual floodwater retarding structures and interrelated structures which had favorable benefit-cost ratios were determined. These were included in the plan. Those which were unfavorable were dropped from further consideration. Evaluation of this system of floodwater retarding structures with planned land treatment measures would not reduce average annual flood damages sufficiently to meet the project objective of 80 percent reduction. This was due to small existing stream channels and large uncontrolled drainage areas. In some areas release rates from structures would cause prolonged flooding.

5. To meet project objectives, stream channel improvement was planned to provide sufficient capacity to carry the peak runoff from a storm producing 2 inches of runoff from uncontrolled areas plus principal spillway releases from floodwater retarding structures.

6. Studies were made to select the most economical combination of floodwater retarding structures and stream channel improvement that would meet project objectives.

When the land treatment measures and those 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 for all the needed measures represented the estimated cost of the planned flood prevention project (Tables 1 and 2). 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 4).

Hydraulic and Hydrologic Investigations

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

1. Basic meteorologic and hydrologic data were tabulated and analyzed.

2. Engineering surveys were made to collect information on selected stream reaches, including valley cross sections, channel capacities and other hydraulic characteristics, and on proposed structure sites to collect data used in design.

3. The present hydrologic condition of the watershed was determined by a study and analysis of land treatment, hydrologic soil groups, cover conditions, and crop distribution obtained by a representative sampling procedure. The future hydrologic condition was determined by obtaining from work units the changes in land use and treatment that could be expected with an accelerated land treatment program during the installation period.

4. Determination was made of the rainfall-runoff relationship, using the soil-cover complex data. This was then compared to actual gaged runoff. The frequency of occurrence of meteorologic events and the relationship of precipitation to runoff, peak discharge, flood stage, and area inundated were determined.

5. Determination was made of peak discharges and area inundated under conditions which would exist due to:

   a. Present condition of the watershed.

   b. Effect of land treatment measures.

   c. Effect of land treatment measures and floodwater retarding structures.

   d. Effect of land treatment measures, floodwater retarding structures and stream channel improvement.

   e. Consideration of alternative projects and measures.

6. Inflow hydrographs for structure sites were developed.

From a graph showing cumulative departures from normal precipitation, the rainfall for the period 1924 to 1953, inclusive, was selected as most representative of a normal rainfall period for the watershed.

After analysis of the meteorologic, hydraulic, hydrologic, geologic, and economic data, it was determined that a structural program was feasible.

The largest runoff-producing rain considered during the 30-year period of study was a storm of 7.87 inches, approximately 25-year frequency, extending over a 3-day interval. A rain of this magnitude, assuming Moisture Condition II, would produce 5.5 inches of runoff, under present conditions, and would inundate 64,104 acres, the entire flood plain. If such a rain were to occur after land treatment measures had been applied, it is estimated that the area inundated would be reduced to 63,754 acres. With land treatment measures applied and structural measures installed, it is estimated that the area inundated would be reduced to 47,027 acres, not including the 4,142 acres of flood plain in the pools of the proposed floodwater retarding structures.

From a study of the relationship between runoff and flood stage for this watershed, it was found that a runoff of 0.10 inch was the minimum that would cause flooding to a depth of 6 inches at the smallest cross section. Due to changes in runoff-producing characteristics at different antecedent moisture conditions, rains of 0.50 inch to 2.00 inches would be required, on an average, to cause 0.10 inch of runoff and produce a discharge of 828 cubic feet per second at the stream gage near Mabank. The peak discharge at this point from the largest runoff-producing rain in the 30-year period used in the evaluation study, under present conditions, is 45,540 cubic feet per second. After installation and full functioning of the planned measures, the discharge from the same storm at this point would be reduced to 25,586 cubic feet per second.

In accordance with criteria set forth in Washington Engineering Memorandum SCS-27, the minimum floodwater detention volume was determined using Yarnell's 6-hour, 25-year rainfall for Class (a) structures and 50-year rainfall for Class (b) structures. The expected runoff ranged from 2.66 to 3.83 inches for Class (a) structures and from 3.61 to 4.67 inches for Class (b) structures, depending on the soil-cover complex and size of the drainage area of each structure.

The minimum floodwater detention volume as specified in the Texas State Manual Supplement 2441 and determined by the method set up in the Fort Worth Engineering and Watershed Planning Unit Hydrology Memorandum EWP-2 ranges from 4.46 to 6.16 inches for Class (a) structures and from 6.46 to 8.36 inches for Class (b) structures, depending on the soil-cover complex and the size of the drainage area of each structure.

The detention volumes for Sites 17, 19, 20, 24, 42, 48, 49, 53, 55, 76, 82, 95A, 96, 100, 103, 108, 109, 121, and 142 do not meet the recommended requirements of Texas State Manual Supplement 2441 because of site limitations. Sites 60 and 61, constructed in 1954 under criteria existing at

that time, also do not meet present Texas State minimum requirements for detention volume. All these structures do exceed the minimum requirements of Washington Engineering Memorandum SCS-27.

Inflow hydrographs for structure design were developed using the runoff that would be produced by a point rain of 14.5 to 14.8 inches in a period of 6 hours, assuming Moisture Condition II. A hydrograph of runoff was routed through each structure to determine the emergency spillway width and depth of flow. Frequency of use of the emergency spillway was based on gage analysis for a 2-day duration storm and in all cases will exceed 25 years for Class (a) structures and 50 years for Class (b) structures based on a 6-hour duration storm.

Sedimentation Investigations

Field surveys to determine sedimentation and related damages in the watershed were made according to methods described in the "Sedimentation Investigations in Work Plan Development," Watersheds Memorandum EWP-7, dated August 21, 1959. Field studies included reconnaissance surveys of geology and soils, studies of overbank deposits, flood plain scour, streambank erosion, and the nature of channels and valleys on or near valley cross sections.

Estimates of sediment production in the watershed were made according to standard procedures, and predictions were made for future sedimentation rates based on a realistic estimate of the amount of effective land treatment measures that will be installed. Detailed sediment production rates were computed for 35 percent of the sites. This information for the remaining sites was estimated, using the detailed sites as a guide. The sediment derived from sheet erosion was determined by the method presented in "Suggested Criteria for Estimating Gross Sheet Erosion and Sediment Delivery Rates for the Blackland Prairies Problem Area in Soil Conservation," Soil Conservation Service, Region 4, February 1953. The formula is based on watershed surveys including the following data:

1. Soil unit in acres, by slope in percent, slope length in feet, and land use (cropland, pasture or wooded pasture).

2. Average farming practices (percent row crops and/or percent small grains, terracing, etc.).

3. Cover condition classes on pasture and wooded pasture.

4. Maximum 30-minute rainfall intensity to be expected once in 2 years.

Estimates also were made of sediment derived annually from gully and streambank erosion.

The average annual rate of sediment deposition in all structures is 1.10 acre-feet per square mile.

Cropland produces most of the sediment in the watershed, but pasture with poor cover is an important contributor in some areas.

Land damaged by flood plain acour and overbank deposition will become productive again after it has been protected from flooding and the needed soil-improving measures have been applied.

The estimates of the present annual rates of sediment deposition to Fort Worth Reaervoir (under construction) and the two Terrell City Lakes are based on a detailed study of sediment sources and the use of existing delivery rate curves. It is estimated that the present annual rate of sediment deposition to Fort Worth Reservoir is 0.52 acre-foot per square mile and that with a complete watershed program installed and functioning effectively the rate will be reduced to 0.30 acre-foot per square mile annually. The estimated annual rates of sediment deposition are 1.08 acre-foot per square mile to the Terrell Municipal Lake (old) and 0.45 acre-foot per square mile to the Terrell Lake (new). With the complete watershed program installed and functioning effectively, the rates of sediment deposition will be reduced to 0.52 and 0.22 acre-foot per square mile, reapectively.

Geologic Investigations

Preliminary geologic dam site inveatigations were made at 86 of the 138 floodwater retarding structures to be installed. These included studies of valley slopes, alluvium, channel banks and exposed geologic formations. Borings with a hand auger were made to obtain preliminary information on the nature and extent of embankment material and emergency spillway excavation that might be encountered in construction.

Upper Cretaceous formations of the Taylor and Navarro groups and Lower Eocene formations of the Midway, Wilcox and Claiborne groups crop out in the watershed.

The Upper Taylor group consists of chalky marls and calcareous clays. The soils, as claasified by the Unified Soil Classification System, are CL, CH, and CL-CH. The soils are usually montmorillonitic and sometimes moderately dispersed and of low shear atrength. Based on considerable previous experience in these formations, construction problems should not be serious. Sites 1, 3-11, 11A, 13-15, 17-20, 21A, 22-24, and 31-33 are located in these formations.

The Navarro group ia divided into the Neylandville, Nacatoch, Corsicana and Kemp formations. The Neylandville formation is composed of gray, sandy calcareous clays and marls. Soils are classified as CL, CH, ML, and SM with some gypseous materials preaent. Previous construction experience indicates that some structures may need flatter back slopes to increase shear strength of the embankments. No other conatruction problems are anticipated. The 12 sites within this formation are 16, 16A, 25-30, 34, 35, 39 and 40.

SM, SC and CL soils occur within the Nacatoch formation and are underlain

by fine-grained, soft sandstones and sandy shales. Major problems consist of controlling excessive erosion of emergency spillways and the need for foundation drainage measures should the clay content be sufficiently low for the sand to become an aquifer. Sites within the outcrop are 36, 38, 42, 43, and 63-69.

The Corsicana marl formation crops out in a narrow strip about one mile in width. Soils are classified as CL and CH. No major construction problems are expected. The eight sites located within this formation are 44-46, 52, 56, 62, 70 and 71.

Blue to black sandy shales and thin sandstone beds comprise the Kemp formation. Soils for embankment purposes are classified as CL and CH and some are of low shear strength. One floodwater retarding structure, Site 61, and one multipurpose structure, Site 60, have been constructed near the city of Kaufman. Sites within this formation are 47, 48, 51, 53-55, 57-59, 72-74, 76-85, and 90.

The Midway group is represented by the Kincaid and Wills Point formations. The strata of the Kincaid formation consists of glauconitic sandstones, soft gypsiferous clays and hard limestone lentils. The Luling-Mexia fault system occurs in the formation generally in a northeast-southwest trend. The principal spillways should not be located over faults. The soils are classified as CL, CH and SM and some materials are gypseous or of low density. Sites located in the formation are 49, 50, 86-89, 92-94, 97-100, and 122.

The outcrop of the Wills Point formation is second to the Wilcox group in surface area in the watershed. The formation is divided into members consisting of thin, glauconitic sandstones and gray silty or sandy clays and shales. The soils classify as CL, ML, SC, SM and SP with some soils that are dispersed. Sites within this outcrop are 95A, 96, 101-106, 108-110, 113-121, 129, 131, 137-139, and 146.

The Wilcox group is composed of sandstones, siltstones, sandy clays and some lignite lentils. Springs are common and potential aquifers are present, which may require deep cutoffs, relief wells, foundation drains, or other measures necessary to insure stability of the structure. Ground water recharge from the sediment pools will be negligible due to rapid facies change from pervious to impervious materials. The soils are classified as CL, ML, SM, SC and SP. Soils may be moderately dispersed or of low density as indicated by previous construction experience in this formation. Sites located in this formation are 107A, 111, 123-128, 130, 133-136, and 140-145.

No sites are located in the Carizzo formation of the Claiborne group which occurs in the eastern extremities of the watershed.

Detailed investigations, including exploration with core drilling equipment, will be made at all floodwater retarding structure sites prior to construction. Laboratory tests will be made to determine suitability and handling

of the available embankment materials and the best solution for design problems.

Economic Investigations

Flood damage schedules for approximately 61 percent of the flood plain area of Cedar Creek and its tributaries were obtained from owners and operators. Information on these schedules included land use and crop distribution, yields, and historical data on flooding and flood damages. Flood plain land use was mapped in the field and estimates of normal yields were based on field data contained in schedules, supplemented by information from other agricultural workers with experience in the area.

Since land use and value of production varied considerably, and due to drainage pattern of the watershed, the flood plain was divided into 63 evaluation reaches, each with its own damageable value and characteristics of flooding. Analysis of the information obtained formed the basis for determining crop and pasture damage rates for various depths and seasons of flooding. Applicable rates of damage were applied to each flooding event recorded in the historical series and adjustment was made for recurrence of flooding within the same crop year.

Damages to other agricultural property, such as fences, livestock, levees, and farm equipment, were evaluated from the damage schedules taken from farmers. These damages were correlated with depth and size of floods. The major items of nonagricultural damage were roads, bridges, and railroads. Although locations of road and bridge damage were often obtained from farmers, estimates of these damages were obtained from county commissioners, and highway department and railroad company personnel.

The monetary value of damage from flood plain scour and overbank deposition was based on the value of production lost, taking into account the lag for the recovery of productivity.

Damage to the Fort Worth Reservoir and to both new and old Terrell Municipal Lakes was determined by the straight-line depreciation method. The total cost of the Fort Worth Reservoir, including pumping facilities, as estimated by consulting engineers, was used to determine the cost per acre-foot of storage lost by sediment deposition. Available data on costs on installing the Terrell Municipal Reservoirs was used to determine the cost per acre-foot in these two existing lakes.

All damages were calculated under conditions without the project and those which will prevail after installation of each progressive phase of the project. Benefits from reduction of floodwater damages and flood plain scour resulted from the combined effects of a smaller area flooded and reduced depth of inundation. Reductions in sediment yield and in area flooded were jointly responsible for benefits from reduction of damage by overbank deposition. Benefits attributed to structural measures were prorated according to degree of protection afforded by the structures. All calculations of damages and benefits were determined at 1956 prices which

were projected to long-term levels (U.S.D.A., ARS, September 1957). (The September 1957 projections were not available at the time the watershed study was begun.)

Indirect damages involve such items as disruption of travel to markets, extra farming expense such as extra costs of purchasing feed for livestock, and losses in business sustained by dealers and industry in the area. Based on information obtained and data for watersheds previously analyzed, it was determined that 10 percent of the direct damage would be an equitable estimate for the indirect damage.

Areas that will be inundated by the sediment and detention pools of floodwater retarding structures were excluded from calculation of damages due to flooding. Although it is considered that there will be no production in the sediment pools after construction of floodwater retarding structures and that the land covered by detention pools will be converted to grassland under project conditions, it was determined that the annual loss of production within structure sites at long-term price levels will be less than the amortized current values of land in pool areas. Consequently, the higher figure was used in the economic evaluation of the project in order to assure a conservative benefit-cost analysis.

During the course of field investigations, farmers were asked to state the changes made in the use of their flood plain lands as a result of past flooding. They were also asked what change they would make if flooding were reduced 50 percent. Analysis of these responses provided the basis for estimating both the benefits from restoration of flood plain lands to their former use and the expected change in land to a more intensive use than had formerly been possible. Additional factors considered in this analysis were the size and location of the areas affected, land capability, acreage allotment restrictions, existence of available markets, and reduction in frequency of flooding. All benefits from change in flood plain land use were discounted over a 5-year buildup period, following the installation period, to allow for lag in installation. No increases were calculated for crops under acreage allotments. Associated restoration and development expenses, and added damage expected from remaining floods to the more intensive use, were deducted as associated costs to obtain the net benefits.

Details of the procedures used in the investigations are described in the Soil Conservation Service Economic Guide for Watershed Protection and Flood Prevention, revised December 1958. Methods described therein for use with the historical series were applied to the economic analysis for this work plan.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Cedar Creek Watershed, Texas
(Trinity River Watershed)
Price Base: 1957

Applied Prior to October 1960

Item	Unit	Number Applied	Estimated Cost 1/ Federal (dollars)	Non-Federal 2/ (dollars)	Total (dollars)
AND TREATMENT FOR:					
Watershed Protection					
Soil Conservation Service					
Conservation Cropping Systems	Acre	25,102	-	-	-
Contour Farming	Acre	53,923	-	53,923	53,923
Cover Cropping	Acre	107,082	-	963,738	963,738
Crop Residue Use	Acre	89,150	-	89,150	89,150
Rotation Hay and Pasture	Acre	11,132	-	100,188	100,188
Grassland Renovation	Acre	39,421	-	778,565	778,565
Pasture Improvement	Acre	144,366	-	288,732	288,732
Pasture Planting	Acre	118,261	-	2,335,655	2,335,655
Rotation Grazing	Acre	52,510	-	52,510	52,510
Wildlife Area Treatment	Acre	12,581	-	62,905	62,905
Brush Control	Acre	19,225	-	100,931	100,931
Diversion Construction	Mile	253	-	69,575	69,575
Erosion Control Structures	No.	20	-	17,000	17,000
Grassed Waterways	Acre	2,539	-	209,468	209,468
Pond Construction	No.	2,733	-	650,454	650,454
Terracing	Mile	2,104	-	193,568	193,568
Technical Assistance (Accel.)			202,950	-	202,950
SCS Subtotal			202,950	5,966,362	6,169,312
TAL LAND TREATMENT			202,950	5,966,362	6,169,312
RUCTURAL MEASURES					
Soil Conservation Service					
Multipurpose Structure	No.	1	52,599	15,425	68,024
Floodwater Retarding Structure	No.	1	20,465	-	20,465
Subtotal - Construction			73,064	15,425	88,489
stallation Services					
Soil Conservation Service					
Engineering Services			14,616	2,303	16,919
Other			8,393	-	8,393
Subtotal - Installation Services			23,009	2,303	25,312
ner Costs					
Land, Easements, and R/W			-	78,550	78,550
Legal Fees			-	300	300
Subtotal - Other			-	78,850	78,850
TAL STRUCTURAL MEASURES			96,073	96,578	192,651
k Plan Preparation Cost			-	-	-
TAL PROJECT			299,023	6,062,940	6,361,963
MMARY					
Subtotal SCS			299,023	6,062,940	6,361,963
TAL PROJECT			299,023	6,062,940	6,361,963

Flood Prevention funds, including accelerated funds.
Excludes $1,834,905 that was reimbursed from other Federal Funds to private interest.

October 1960

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Cedar Creek Watershed, Texas
(Trinity River Watershed)
Price Base: 1957

Installation Period 1/
October 1960 - October 1970

Item	Unit	Number to be Applied	Estimated Cost 2/ Federal (dollars)	Non-Federal (dollars)	Total (dollars)
ND TREATMENT FOR:					
atershed Protection					
Soil Conservation Service					
Conservation Cropping Systems	Acre	50,100	-	-	-
Contour Farming	Acre	63,004	-	63,004	63,004
Cover Cropping	Acre	100,096	-	900,864	900,864
Crop Residue Use	Acre	100,669	-	100,669	100,669
Rotation Hay and Pasture	Acre	20,727	-	186,543	186,543
Grassland Renovation	Acre	37,748	-	745,523	745,523
Pasture Improvement	Acre	222,746	-	445,492	445,492
Pasture Planting	Acre	113,245	-	2,236,559	2,236,559
Rotation Grazing	Acre	200,907	-	200,907	200,907
Wildlife Area Treatment	Acre	1,500	-	15,000	15,000
Brush Control	Acre	37,390	-	196,298	196,298
Diversion Construction	Mile	131	-	36,025	36,025
Erosion Control Structures	No.	120	-	102,000	102,000
Grassed Waterways	Acre	2,849	-	235,043	235,043
Pond Construction	No.	889	-	211,582	211,582
Terracing	Mile	2,132	-	196,144	196,144
Technical Assistance (Accel.)			184,500	-	184,500
SCS Subtotal			184,500	5,871,653	6,056,153
TAL LAND TREATMENT			184,500	5,871,653	6,056,153
RUCTURAL MEASURES					
Soil Conservation Service					
Floodwater Retarding Structures	No.	138	3,754,771	-	3,754,771
Stream Channel Improvement	Mile	113.36	3,385,360	-	3,385,360
Subtotal - Construction			7,140,131	-	7,140,131
stallation Services					
Soil Conservation Service					
Engineering Services			1,297,915	-	1,297,915
Other			642,415	-	642,415
Subtotal - Installation Services			1,940,330	-	1,940,330
her Costs					
Land, Easements and R/W			-	2,055,259	2,055,259
Legal Fees			-	23,390	23,390
Subtotal - Other			-	2,078,649	2,078,649
TAL STRUCTURAL MEASURES			9,080,461	2,078,649	11,159,110
rk Plan Preparation Cost			86,000	-	86,000
TAL PROJECT			9,350,961	7,950,302	17,301,263
MMARY					
Subtotal SCS			9,350,961	7,950,302	17,301,263
TAL PROJECT			9,350,961	7,950,302	17,301,263

1/ At time of work plan preparation; does not include prior expenditures of Flood Prevention funds or accomplishments resulting therefrom.

2/ Excludes $2,639,515 that may be available from other Federal funds to reimburse

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Cedar Creek Watershed, Texas
(Trinity River Watershed)
Price Base: 1957

Item	Unit	Number Applied and to be Applied	Estimated Cost 2/ Federal (dollars)	Estimated Cost 3/ Non-Federal (dollars)	Total 1/ Total (dollars)
AND TREATMENT FOR:					
Watershed Protection					
Soil Conservation Service					
Conservation Cropping Systems	Acre	75,202	-	-	-
Contour Farming	Acre	116,927	-	116,927	116,927
Cover Cropping	Acre	207,178	-	1,864,602	1,864,602
Crop Residue Use	Acre	189,819	-	189,819	189,819
Rotation Hay and Pasture	Acre	31,859	-	286,731	286,731
Grassland Renovation	Acre	77,169	-	1,524,088	1,524,088
Pasture Improvement	Acre	367,112	-	734,224	734,224
Pasture Planting	Acre	231,506	-	4,572,214	4,572,214
Rotation Grazing	Acre	253,417	-	253,417	253,417
Wildlife Area Treatment	Acre	14,081	-	77,905	77,905
Brush Control	Acre	56,615	-	297,229	297,229
Diversion Construction	Mile	384	-	105,600	105,600
Erosion Control Structures	No.	140	-	119,000	119,000
Grassed Waterways	Acre	5,388	-	444,511	444,511
Pond Construction	No.	3,622	-	862,036	862,036
Terracing	Mile	4,236	-	389,712	389,712
Technical Assistance (Accel.)			387,450	-	387,450
SCS Subtotal			387,450	11,838,015	12,225,465
TAL LAND TREATMENT			387,450	11,838,015	12,225,465
RUCTURAL MEASURES					
Soil Conservation Service					
Multipurpose Structure	No.	1	52,599	15,425	68,024
Floodwater Retarding Structures	No.	139	3,775,236	-	3,775,236
Stream Channel Improvement	Mile	113.36	3,385,360	-	3,385,360
Subtotal - Construction			7,213,195	15,425	7,228,620
stallation Services					
Soil Conservation Service					
Engineering Services			1,312,531	2,303	1,314,834
Other			650,808	-	650,808
Subtotal - Installation Services			1,963,339	2,303	1,965,642
her Costs					
Land, Easements and R/W			-	2,133,809	2,133,809
Legal Fees			-	23,690	23,690
Subtotal - Other			-	2,157,499	2,157,499
TAL STRUCTURAL MEASURES			9,176,534	2,175,227	11,351,761
rk Plan Preparation Cost			86,000	-	86,000
TAL PROJECT			9,649,984	14,013,242	23,663,226
MMARY					
Subtotal SCS			9,649,984	14,013,242	23,663,226
TAL PROJECT			9,649,984	14,013,242	23,663,226

Includes total watershed needs.
Flood Prevention funds, including acceleration funds.

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION 1/
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Structure Site Number	Federal Installation Cost					Total Non-Federal Installation Cost 2/	Estimated Total Cost
	Construction		Installation Services		Total Federal		
	Engineer's Estimate	Contin-gencies	Engineer-ing	Other			
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Floodwater Retarding Structures							
1	25,848	2,585	5,170	2,558	36,161	13,220	49,381
3	18,396	1,840	3,679	1,821	25,736	5,940	31,676
4	17,586	1,759	3,517	1,740	24,602	4,740	29,342
5	18,288	1,829	3,657	1,810	25,584	4,960	30,544
6	7,380	738	1,476	730	10,324	6,560	16,884
7	13,158	1,316	2,632	1,302	18,408	3,840	22,248
8	22,590	2,259	4,518	2,236	31,603	6,760	38,363
9	17,856	1,786	3,571	1,767	24,980	4,540	29,520
10	16,848	1,685	3,370	1,667	23,570	4,760	28,330
11	23,299	2,330	4,660	2,306	32,595	21,050	53,645
11A	31,788	3,179	6,358	3,146	44,471	46,900	91,371
13	19,440	1,944	3,888	1,924	27,196	28,160	55,356
14	27,072	2,707	5,415	2,679	37,873	14,020	51,893
15	17,971	1,797	3,594	1,779	25,141	12,880	38,021
16	18,492	1,849	3,699	1,830	25,870	31,880	57,750
16A	21,816	2,182	4,363	2,159	30,520	35,275	65,795
17	25,884	2,588	5,177	2,562	36,211	13,980	50,191
18	30,492	3,049	6,098	3,018	42,657	17,660	60,317
19	37,260	3,726	7,452	3,688	52,126	24,600	76,726
20	34,416	3,442	6,883	3,406	48,147	33,960	82,107
21A	17,640	1,764	3,528	1,746	24,678	10,260	34,938
22	19,404	1,940	3,881	1,920	27,145	14,910	42,055
23	12,107	1,210	2,422	1,198	16,937	8,440	25,377
24	18,907	1,890	3,782	1,871	26,450	9,940	36,390
25	20,009	2,001	4,002	1,980	27,992	34,280	62,272
26	10,944	1,094	2,189	1,083	15,310	8,280	23,590

(See footnotes on last page)

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION 1/ - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Structure Site Number	Federal Installation Cost: Construction: Engineer's Estimate	Construction: Contingencies	Installation Services: Engineering	Installation Services: Other	Total Federal	Total Non-Federal Installation Cost 2/	Estimated Total Cost
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Floodwater Retarding Structures							
27	21,960	2,196	4,392	2,173	30,721	26,080	56,801
28	21,780	2,178	4,356	2,156	30,470	55,520	85,990
29	19,278	1,928	3,856	1,908	26,970	29,840	56,810
30	19,260	1,926	3,852	1,906	26,944	32,475	59,419
31	13,334	1,333	2,667	1,320	18,654	4,543	23,197
32	12,600	1,260	2,520	1,247	17,627	4,745	22,372
33	12,564	1,256	2,513	1,244	17,577	3,298	20,875
34	16,110	1,611	3,222	1,594	22,537	3,803	26,340
35	35,323	3,532	7,065	3,496	49,416	9,668	59,084
36	30,384	3,038	6,077	3,007	42,506	34,925	77,431
38	67,392	6,739	13,478	6,670	94,279	51,265	145,544
39	35,720	3,572	7,144	3,535	49,971	47,423	97,394
40	8,086	809	1,617	800	11,312	9,248	20,560
42	32,112	3,211	6,423	3,178	44,924	10,615	55,539
43	21,154	2,115	4,231	2,094	29,594	8,043	37,637
44	20,160	2,016	4,032	1,995	28,203	7,740	35,943
45	32,584	3,258	6,517	3,225	45,584	17,020	62,604
46	21,200	2,120	4,240	2,098	29,658	5,400	35,058
47	25,128	2,513	5,025	2,487	35,153	17,440	52,593
48	17,568	1,757	3,513	1,739	24,577	10,640	35,217
49	24,984	2,498	4,997	2,473	34,952	11,720	46,672
50	18,785	1,879	3,757	1,859	26,280	4,820	31,100
51	28,343	2,834	5,669	2,805	39,651	14,160	53,811
52	18,864	1,886	3,773	1,867	26,390	6,980	33,370
53	18,353	1,835	3,671	1,816	25,675	8,685	34,360
54	23,990	2,399	4,798	2,374	33,561	10,170	43,731
55	32,220	3,222	6,444	3,189	45,075	24,800	69,875
56	19,584	1,958	3,917	1,938	27,397	7,300	34,697

(See footnotes on last page)

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION 1/ - Continued

Cedar Creek Watershed, Texas
(Trinity River Watershed)

Structure Site Number	Federal Installation Cost: Construction: Engineer's Estimate	Construction: Contingencies	Installation Services: Engineering	Installation Services: Other	Total Federal	Total Non-Federal Installation Cost 2/	Estimated Total Cost
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Floodwater Retarding Structures							
57	41,292	4,129	8,258	4,087	57,766	26,705	84,471
58	13,270	1,327	2,654	1,313	18,564	4,860	23,424
59	5,191	519	1,038	514	7,262	4,070	11,332
3/ 60 (Multipurpose Struc.)	52,599	-	9,116	6,042	67,757	4/88,578	156,335
3/ 61	20,465	-	5,500	2,351	28,316	8,000	36,316
62	33,750	3,375	6,750	3,340	47,215	39,005	86,220
63	19,706	1,971	3,941	1,950	27,568	4,133	31,701
64	25,902	2,590	5,180	2,564	36,236	8,045	44,281
65	19,645	1,965	3,929	1,944	27,483	12,220	39,703
66	15,480	1,548	3,096	1,532	21,656	5,445	27,101
67	18,832	1,883	3,766	1,864	26,345	9,463	35,808
68	9,659	966	1,932	956	13,511	2,315	15,826
69	25,441	2,544	5,088	2,518	35,591	8,265	43,856
70	22,471	2,247	4,494	2,224	31,436	12,358	43,794
71	18,317	1,832	3,663	1,813	25,625	7,823	33,448
72	15,430	1,543	3,086	1,527	21,586	4,698	26,284
73	20,005	2,000	4,001	1,980	27,986	9,880	37,866
74	50,220	5,022	10,044	4,970	70,256	17,055	87,311
76	25,560	2,556	5,112	2,530	35,758	20,535	56,293
77	16,898	1,690	3,380	1,672	23,640	7,690	31,330
78	23,112	2,311	4,623	2,287	32,333	8,120	40,453
79	17,352	1,735	3,471	1,717	24,275	14,085	38,360
80	23,364	2,336	4,673	2,312	32,685	15,700	48,385
81	25,020	2,502	5,004	2,476	35,002	14,240	49,242
82	19,008	1,901	3,802	1,881	26,592	7,690	34,282
83	9,270	927	1,854	917	12,968	4,315	17,283
84	14,980	1,498	2,996	1,483	20,957	6,755	27,712

(See footnotes on past page)

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION 1/ - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Structure Site Number	Federal Installation Cost: Construction: Engineer's Estimate (dollars)	Construction: Contingencies (dollars)	Installation Services: Engineering (dollars)	Installation Services: Other (dollars)	Total Federal (dollars)	Total Non-Federal Installation Cost 2/ (dollars)	Estimated Total Cost (dollars)
Floodwater Retarding Structures							
85	16,776	1,678	3,355	1,660	23,469	8,275	31,744
86	17,532	1,753	3,507	1,735	24,527	20,720	45,247
87	23,101	2,310	4,620	2,286	32,317	11,580	43,897
88	17,640	1,764	3,528	1,746	24,678	7,540	32,218
89	14,076	1,408	2,815	1,393	19,692	4,900	24,592
90	19,555	1,956	3,911	1,935	27,357	8,295	35,652
92	26,712	2,671	5,342	2,644	37,369	26,040	63,409
93	57,060	5,706	11,412	5,647	79,825	23,880	103,705
94	20,509	2,051	4,102	2,030	28,692	11,460	40,152
95A	33,757	3,376	6,751	3,341	47,225	46,860	94,085
96	19,872	1,987	3,974	1,967	27,800	5,440	33,240
97	33,689	3,369	6,738	3,334	47,130	16,055	63,185
98	46,865	4,687	9,373	4,638	65,563	40,175	105,738
99	36,108	3,611	7,222	3,573	50,514	27,275	77,789
100	17,237	1,724	3,447	1,706	24,114	2,645	26,759
101	80,881	8,088	16,176	8,005	113,150	33,080	146,230
102	20,945	2,095	4,189	2,073	29,302	6,970	36,272
103	34,362	3,436	6,872	3,401	48,071	24,865	72,936
104	34,211	3,421	6,842	3,386	47,860	15,480	63,340
105	15,768	1,577	3,154	1,560	22,059	4,280	26,339
106	36,684	3,668	7,337	3,631	51,320	11,520	62,840
107A	42,660	4,266	8,532	4,222	59,680	15,400	75,080
108	24,674	2,467	4,935	2,442	34,518	10,145	44,663
109	24,833	2,483	4,967	2,458	34,741	4,860	39,601
110	34,168	3,417	6,833	3,382	47,800	10,565	58,365
111	93,870	9,387	18,774	9,290	131,321	29,265	160,586

(See footnotes on last page)

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION 1/ - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Structure Site Number	Federal Installation Cost: Construction: Engineer's Estimate (dollars)	Construction: Contingencies (dollars)	Installation Services: Engineering (dollars)	Installation Services: Other (dollars)	Total Federal (dollars)	Total Non-Federal Installation Cost 2/ (dollars)	Estimated Total Cost (dollars)
Floodwater Retarding Structures							
113	22,280	2,228	4,456	2,205	31,169	6,935	38,104
114	19,260	1,926	3,852	1,906	26,944	5,305	32,249
115	14,530	1,453	2,906	1,438	20,327	7,320	27,647
116	18,616	1,862	3,723	1,842	26,043	9,050	35,093
117	21,330	2,133	4,266	2,111	29,840	12,105	41,945
118	14,436	1,444	2,887	1,429	20,196	4,425	24,621
119	19,800	1,980	3,660	1,960	27,400	5,670	33,070
120	12,326	1,233	2,465	1,220	17,244	2,625	19,869
121	14,796	1,480	2,959	1,464	20,699	2,825	23,524
122	22,957	2,296	4,591	2,272	32,116	19,075	51,191
123	47,261	4,726	9,452	4,678	66,117	10,475	76,592
124	21,834	2,183	4,369	2,161	30,547	7,065	37,612
125	36,252	3,625	7,251	3,588	50,716	22,108	72,824
126	10,278	1,028	2,056	1,017	14,379	3,030	17,409
127	21,899	2,190	4,380	2,167	30,636	6,000	36,636
128	37,188	3,719	7,438	3,680	52,025	9,855	61,880
129	18,432	1,843	3,687	1,824	25,786	5,930	31,716
130	16,092	1,609	3,218	1,593	22,512	4,645	27,157
131	44,514	4,451	8,903	4,406	62,274	5,305	67,579
133	32,616	3,262	6,523	3,228	45,629	32,803	78,432
134	29,970	2,997	5,994	2,966	41,927	14,683	56,610
135	27,248	2,725	5,450	2,697	38,120	20,223	58,343
136	19,973	1,997	3,995	1,977	27,942	4,995	32,937
137	14,929	1,493	2,986	1,478	20,886	3,485	24,371
138	27,000	2,700	5,400	2,672	37,772	6,408	44,180
139	16,398	1,640	3,280	1,623	22,941	2,680	25,621

(See footnotes on last page)

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION 1/ - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Structure Site Number	Federal Installation Cost: Construction: Engineer's Estimates	Construction: Contingencies	Installation Services: Engineering	Installation Services: Other	Total Federal	Total Non-Federal Installation Cost 2/	Estimated Total Cost
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
Floodwater Retarding Structures							
140	44,928	4,493	8,986	4,447	62,854	16,945	79,799
141	26,446	2,645	5,289	2,617	36,997	9,675	46,672
142	16,459	1,646	3,292	1,629	23,026	9,725	32,751
143	42,253	4,225	8,451	4,182	59,111	12,720	71,831
144	43,589	4,359	8,718	4,314	60,980	17,595	78,575
145	33,109	3,311	6,622	3,277	46,319	16,315	62,634
146	18,000	1,800	3,600	1,782	25,182	5,468	30,650
Subtotal	3,486,494	341,341	697,011	346,218	4,871,064	2,023,247	6,894,311
Stream Channel Improvement							
Kings Creek	998,600	99,860	199,720	98,831	1,397,011	31,720	1,428,731
Tributary No. 11A	84,400	8,440	16,880	8,353	118,073	11,140	129,213
Tributary No. 11-U	104,200	10,420	20,840	10,313	145,773	5,680	151,453
Brushy Creek	496,600	49,660	99,320	49,149	694,729	23,400	718,129
Cedar Creek	914,600	91,460	182,920	90,518	1,279,498	43,680	1,323,178
Lacy Fork	207,600	20,760	41,520	20,546	290,426	13,560	303,986
Tributary (Jones Creek) No.17	55,000	5,500	11,000	5,443	76,943	4,980	81,923
Tributary (Williams Cr.) No.19	62,800	6,280	12,560	6,215	87,855	5,080	92,935
Tributary (Cana Creek) No. 25	61,000	6,100	12,200	6,037	85,337	5,560	90,897
Tributary (Wolf Creek) No. 27	25,400	2,540	5,080	2,514	35,534	1,220	36,754
Tributary (Allen Creek)No. 27A	67,400	6,740	13,480	6,671	94,291	5,960	100,251
Subtotal	3,077,600	307,760	615,520	304,590	4,305,470	151,980	4,457,450
GRAND TOTAL	6,564,094	649,101	1,312,531	650,808	9,176,534	2,175,227	11,351,761

1/ Does not include work plan preparation cost.
2/ Includes easements, rights-of-way, legal fees, and removing obstacles.
3/ Constructed.
4/ Includes $15,425 contract cost and $2,303 installation services allocated to municipal water storage and paid for by city of Kaufman.

October 1960

TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 1	3	4	5	6	7	8	9	10	11	11A
Drainage Area	Sq.Mi.	2.71	0.63	0.42	0.53	0.69	0.43	0.68	0.52	0.45	1.99	5.11
Storage Capacity												
Sediment Pool	Ac.Ft.	200	68	46	56	71	44	67	54	54	200	199
Sediment Reserve Below Riser	Ac.Ft.	73	0	0	0	0	0	0	0	0	7	264
Sediment in Detention Pool	Ac.Ft.	22	5	4	5	5	4	5	4	4	17	35
Floodwater Detention	Ac.Ft.	762	216	135	162	222	126	199	147	155	673	1,493
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	1,057	289	185	223	298	174	271	205	213	897	1,991
Surface Area												
Sediment Pool 2/	Acre	59	15	11	14	19	10	18	13	14	49	125
Floodwater Detention Pool	Acre	172	44	36	35	46	28	49	32	33	145	343
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	71,800	51,100	48,850	50,800	20,500	36,550	62,750	49,600	46,800	64,720	88,300
Elevation Top of Dam	Foot	561.8	559.0	556.0	550.0	539.0	540.1	526.4	524.1	531.0	535.5	535.5
Maximum Height of Dam 3/	Foot	27	28	25	24	20	22	19	26	21	21	18
Emergency Spillway												
Crest Elevation	Foot	558.3	556.0	553.5	547.0	536.0	537.5	523.3	521.0	528.5	532.0	532.5
Bottom Width	Foot	120	60	40	50	50	70	50	50	50	50	260
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		4.0	3.5	4.0	4.0	3.6	3.3	4.0	3.8	3.3	3.5	4.0
Average Curve No. - Condition II		80	82	82	80	80	79	79	78	81	82	82
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.6	7.0	7.0	6.9	6.9	6.9	6.9	7.2	7.0	6.7	6.4
Storm Runoff	Inch	4.3	4.9	4.9	4.6	4.6	4.8	4.7	4.7	4.8	4.6	4.4
Velocity of Flow (V_t) 6/	Ft./Sec.	0	0	0	0	0	0	0	0	0	0	0
Discharge Rate	C.F.S.	0	0	0	0	0	0	0	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	-	-	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	15.9	16.6	16.8	16.7	16.6	16.7	16.6	17.3	16.8	16.0	15.4
Storm Runoff	Inch	13.2	14.3	14.4	14.0	13.9	14.2	14.1	14.4	14.2	13.7	13.0
Velocity of Flow (V_c) 6/	Ft./Sec.	7.9	7.3	6.5	7.3	7.3	6.6	7.4	7.4	6.5	7.9	7.3
Discharge Rate	C.F.S.	1,850	718	336	600	580	760	725	700	420	770	3,150
Maximum Water Surface Elev. 6/	Foot	561.8	559.0	556.0	550.0	539.0	540.1	526.4	524.1	531.0	535.5	535.5
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	51	8	8	8	8	8	8	8	8	25	96
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	1.89	2.03	2.07	1.99	1.92	1.95	1.84	1.93	2.25	1.95	1.70
Sediment in Detention Pool	Inch	0.15	0.16	0.16	0.16	0.15	0.16	0.15	0.15	0.18	0.16	0.13
Floodwater Detention	Inch	5.27	6.42	6.01	5.73	6.03	5.50	5.50	5.30	6.47	6.34	5.48
Spillway Storage 8/	Inch	4.90	4.39	5.56	4.58	4.22	3.60	4.71	4.15	4.10	6.00	4.47
Class of Structure		A	A	A	A	A	A	A	A	A	A	A

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 13	14	15	16	16A	17	18	19	20	21A	22
Drainage Area	Sq.Mi.	2.18	1.56	1.26	2.85 1/	4.93	1.85	2.53	4.40	5.02 1/	1.28	1.39
Storage Capacity												
Sediment Pool	Ac.Ft.	200	173	124	200	200	145	197	200	200	65	118
Sediment Reserve Below Riser	Ac.Ft.	42	0	0	0	165	0	0	119	150	0	0
Sediment in Detention Pool	Ac.Ft.	30	13	10	26	45	12	15	26	27	8	10
Floodwater Detention	Ac.Ft.	739	486	405	1,005	1,614	396	835	1,049	1,216	429	408
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	1,011	672	539	1,231	2,024	553	1,047	1,394	1,593	502	536
Surface Area												
Sediment Pool 2/	Acre	75	42	32	67	102	37	42	67	83	21	27
Floodwater Detention Pool	Acre	206	97	83	230	367	90	134	178	250	81	72
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	54,000	75,200	49,920	51,368	60,600	71,900	84,700	103,500	95,600	49,000	53,900
Elevation Top of Dam	Foot	525.5	497.5	495.5	498.1	514.0	498.5	493.5	477.8	478.6	487.5	472.5
Maximum Height of Dam 3/	Foot	18	22	19	20	19	22	28	26	20	28	24
Emergency Spillway												
Crest Elevation	Foot	523.0	494.5	492.5	495.1	510.5	495.3	490.0	474.0	475.0	484.5	469.2
Bottom Width	Foot	110	80	90	80	80	200	120	260	300	90	80
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		3.7	3.5	3.9	3.2	3.8	8.0	3.7	6.6	6.1	3.8	4.0
Average Curve No. - Condition II		84	78	82	83	83	83	82	81	80	83	79
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.7	6.9	6.8	6.6	6.5	6.7	6.7	6.5	6.3	6.8	6.8
Storm Runoff	Inch	4.8	4.4	4.8	4.7	4.5	4.8	4.6	4.4	4.2	4.9	4.4
Velocity of Flow (Vc) 6/	Ft./Sec.	0	0	0	0	0	0.9	0	0.4	0.5	0	0
Discharge Rate	C.F.S.	0	0	0	0	0	181	0	56	28	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	496.3	-	474.6	475.2	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	16.0	16.5	16.4	15.1	15.6	16.1	16.0	15.5	15.1	16.4	16.3
Storm Runoff	Inch	14.0	13.6	14.0	12.9	13.3	13.9	13.6	13.2	12.6	14.2	13.4
Velocity of Flow (Vc) 6/	Ft./Sec.	6.5	7.3	7.4	7.3	7.9	7.6	7.8	8.2	8.0	7.2	7.7
Discharge Rate	C.F.S.	924	940	1,058	1,100	1,200	3,131	1,800	5,254	5,508	1,059	1,306
Maximum Water Surface Elev. 6/	Foot	525.5	497.5	495.5	498.1	514.0	498.5	493.5	477.8	475.2	487.5	472.5
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	27	20	16	36	62	19	32	44	50	16	17
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	2.08	2.08	1.84	1.32	1.39	1.47	1.46	1.36	1.31	0.95	1.60
Sediment in Detention Pool	Inch	0.26	0.16	0.15	0.17	0.17	0.12	0.11	0.11	0.10	0.12	0.13
Floodwater Detention	Inch	6.36	5.84	6.03	6.61	6.14	4.01	6.19	4.47	4.54	6.28	5.50
Spillway Storage 8/	Inch	5.90	4.57	4.13	6.50	6.10	3.43	4.24	3.66	4.05	4.05	3.97
Class of Structure		A	A	A	A	A	A	A	A	A	A	A

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 23	24	25	26	27	28	29	30	31	32	33
Drainage Area	Sq.Mi.	0.66	0.75	1.64	0.58	1.67	1.38 1/	2.64 1/	5.30 1/	0.47	0.57	0.49
Storage Capacity												
Sediment Pool	Ac.Ft.	50	84	138	48	119	110	199	200	55	73	58
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	0	0	0	22	114	0	0	0
Sediment in Detention Pool	Ac.Ft.	4	6	11	6	15	8	18	25	4	6	4
Floodwater Detention	Ac.Ft.	193	196	513	202	767	618	1,127	1,538	150	178	144
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	247	286	662	256	901	736	1,366	1,877	209	257	206
Surface Area												
Sediment Pool 2/	Acre	14	21	63	22	58	93	62	95	14	19	10
Floodwater Detention Pool	Acre	42	45	172	42	202	450	222	275	37	35	27
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	33,630	52,520	55,580	30,400	61,000	60,500	53,550	53,500	37,040	35,000	34,900
Elevation Top of Dam	Foot	477.7	453.1	511.0	506.7	503.2	492.4	477.4	457.7	441.5	442.0	428.4
Maximum Height of Dam 3/	Foot	19	21	18	12	15	23	25	23	21	21	25
Emergency Spillway												
Crest Elevation	Foot	474.9	450.0	508.5	504.5	500.0	489.0	474.0	455.0	439.0	439.0	425.4
Bottom Width	Foot	60	100	50	50	100	140	300	400	50	60	50
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		3.8	6.1	4.0	3.5	1.7	1.8	1.9	4.0	3.7	4.0	3.7
Average Curve No. - Condition II		78	82	81	83	83	83	82	83	82	81	80
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.9	6.9	6.8	7.0	10.2	10.3	10.1	6.4	7.0	7.0	7.0
Storm Runoff	Inch	4.3	4.8	4.6	5.0	8.1	8.2	7.7	4.3	4.9	4.8	4.7
Velocity of Flow (Vc) 6/	Ft./Sec.	0	0.4	0	0	0	0	0	0	0	0	0
Discharge Rate	C.F.S.	0	12	0	0	0	0	0	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	450.4	-	-	-	-	-	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	16.6	16.7	15.2	12.7	23.1	22.7	22.8	14.9	16.8	16.8	16.7
Storm Runoff	Inch	13.6	14.4	12.7	10.9	20.8	20.4	20.2	12.4	14.4	14.3	14.0
Velocity of Flow (Vc) 6/	Ft./Sec.	7.0	7.4	6.4	6.0	7.5	7.8	7.7	6.8	6.5	7.2	7.3
Discharge Rate	C.F.S.	662	1,432	400	325	1,289	2,170	4,140	4,240	432	687	682
Maximum Water Surface Elev. 6/	Foot	477.7	453.1	511.0	506.7	503.2	492.4	477.4	457.7	441.5	442.0	428.4
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	8	8	21	8	21	38	71	138	8	8	8
High Stage	C.F.S.	-	-	-	-	-	-	-	205	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	1.43	2.10	1.58	1.56	1.33	1.49	1.57	1.11	2.17	2.40	2.23
Sediment in Detention Pool	Inch	0.11	0.16	0.12	0.19	0.17	0.11	0.13	0.09	0.17	0.19	0.17
Floodwater Detention	Inch	5.50	4.89	5.86	6.55	8.61	8.40	8.00	5.44	5.99	5.85	5.50
Spillway Storage 8/	Inch	3.36	4.05	6.14	4.90	9.50	8.80	6.50	3.16	4.57	4.04	3.60
Class of Structure		A	A	A	A	B	B	B	A	A	A	A

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 34	35	36	38	39	40	42	43	44	45	46
Drainage Area	Sq.Mi.	0.56	1.52	4.98	11.16 1/	5.46	0.83	2.12	1.63	0.78	2.75	0.67
Storage Capacity												
Sediment Pool	Ac.Ft.	65	68	189	197	200	51	130	35	67	76	51
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	595	187	0	0	0	0	0	0
Sediment in Detention Pool	Ac.Ft.	5	9	24	101	50	7	17	6	8	10	6
Floodwater Detention	Ac.Ft.	163	482	1,548	3,535	1,776	218	539	550	350	940	292
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	233	559	1,761	4,428	2,213	276	686	591	425	1,026	349
Surface Area												
Sediment Pool 2/	Acre	13	21	58	161	118	21	26	11	20	26	13
Floodwater Detention Pool	Acre	30	76	335	506	365	84	80	80	76	154	54
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	44,750	98,120	84,400	187,200	99,250	22,460	89,200	58,760	56,000	90,510	53,889
Elevation Top of Dam	Foot	423.8	418.0	527.3	468.5	458.5	440.4	441.1	427.5	526.8	418.5	513.0
Maximum Height of Dam 3/	Foot	23	22	20	30	25	10	28	27	23	27	26
Emergency Spillway												
Crest Elevation	Foot	421.0	414.0	524.0	465.0	455.5	438.0	437.0	424.0	524.0	415.0	510.0
Bottom Width	Foot	100	40	70	400	130	100	90	80	120	100	100
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		4.0	4.0	4.0	3.8	3.5	3.8	6.2	3.5	2.0	3.5	2.0
Average Curve No. - Condition II		78	82	82	B3	81	81	81	82	84	83	83
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	7.0	6.8	6.5	6.1	6.4	6.9	6.7	6.8	10.4	6.7	10.4
Storm Runoff	Inch	4.7	4.7	4.4	4.2	4.3	4.9	4.7	4.7	8.4	4.7	8.3
Velocity of Flow (Vc) 6/	Ft./Sec.	0	0	0	0	0	0.7	0.6	0	0	0	0
Discharge Rate	C.F.S.	0	0	0	0	0	110	28	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	43B.3	437.5	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	16.8	16.3	15.6	14.3	15.4	16.6	16.1	16.3	23.9	16.0	23.7
Storm Runoff	Inch	14.1	13.9	13.2	12.1	12.9	14.3	13.8	13.9	21.8	13.8	21.4
Velocity of Flow (Vc) 6/	Ft./Sec.	7.0	8.6	7.7	7.8	7.2	6.3	8.6	7.9	7.9	7.9	7.9
Discharge Rate	C.F.S.	972	775	988	5,760	1,495	905	2,098	1,232	1,025	1,540	1,162
Maximum Water Surface Elev. 6/	Foot	423.8	418.0	527.3	468.5	458.5	440.4	441.1	427.5	526.8	418.5	513.0
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	8	19	62	202	68	8	21	20	10	35	8
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	2.19	0.84	0.71	1.33	1.33	1.15	1.15	0.40	1.60	0.52	1.42
Sediment in Detention Pool	Inch	0.17	0.11	0.09	0.17	0.17	0.15	0.15	0.07	0.19	0.07	0.18
Floodwater Detention	Inch	5.46	5.94	5.83	5.94	6.10	4.93	4.77	6.33	8.36	6.41	8.20
Spillway Stotage 8/	Inch	3.18	4.41	5.77	3.51	4.65	4.93	3.83	4.55	6.50	4.65	6.00
Class of Structute		A	A	A	A	A	A	A	A	B	A	B

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 47	48	49	50	51	52	53	54	55	56	57
Drainage Area	Sq.Mi.	2.89 1/	1.46	2.14	0.76	2.52	1.21	1.56	1.36	4.82 1/	1.22	4.68
Storage Capacity												
Sediment Pool	Ac.Ft.	179	75	102	32	179	35	100	115	200	71	200
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	0	0	0	0	0	196	0	152
Sediment in Detention Pool	Ac.Ft.	21	9	13	4	23	5	8	15	53	9	47
Floodwater Detention	Ac.Ft.	930	428	535	247	782	419	449	592	1,109	390	1,397
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	1,130	512	650	283	984	459	557	722	1,558	470	1,796
Surface Area												
Sediment Pool 2/	Acre	49	27	32	11	44	15	26	31	110	22	93
Floodwater Detention Pool	Acre	168	105	114	48	144	77	89	103	218	74	262
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	69,800	48,800	69,400	52,180	78,730	52,400	50,980	66,640	89,500	54,400	114,700
Elevation Top of Dam	Foot	492.0	523.6	518.4	506.5	486.0	468.5	476.9	468.9	449.8	449.0	460.0
Maximum Height of Dam 3/	Foot	25	22	19	22	26	26	25	29	22	22	23
Emergency Spillway												
Crest Elevation	Foot	488.5	520.5	515.0	503.5	482.5	465.0	473.7	465.0	444.0	446.0	456.0
Bottom Width	Foot	130	100	140	50	110	50	100	100	300	100	100
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		3.9	4.9	6.4	3.7	4.0	3.7	6.2	2.0	6.7	4.0	4.0
Average Curve No. - Condition II		83	82	82	81	82	84	81	83	82	83	80
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.6	6.8	6.7	6.9	6.7	6.9	6.8	10.3	9.8	6.9	6.1
Storm Runoff	Inch	4.7	4.9	4.8	4.8	4.7	5.0	4.7	8.2	7.6	4.9	4.3
Velocity of Flow (V_c) 6/	Ft./Sec.	0	0	0.3	0	0	0	0	0.6	0	0	0
Discharge Rate	C.F.S.	0	0	28	0	0	0	0	11	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	515.6	-	-	-	-	465.2	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	15.9	16.3	16.1	16.7	16.1	16.4	16.3	23.4	21.9	16.4	15.6
Storm Runoff	Inch	13.7	14.1	13.9	14.1	13.8	14.4	13.9	21.0	19.5	14.2	13.1
Velocity of Flow (V_c) 6/	Ft./Sec.	7.9	7.4	7.8	7.3	8.0	7.9	7.5	8.5	10.5	7.2	8.6
Discharge Rate	C.F.S.	1,966	1,380	2,428	605	1,750	755	1,320	1,911	9,700	1,070	1,948
Maximum Water Surface Elev. 6/	Foot	492.0	523.6	518.4	506.5	486.0	468.5	476.9	468.9	449.8	449.0	460.0
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	46	15	22	10	32	15	20	17	60	15	51
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	1.16	0.96	0.89	0.80	1.33	0.54	1.20	1.59	1.54	1.09	1.41
Sediment in Detention Pool	Inch	0.14	0.12	0.11	0.10	0.17	0.08	0.10	0.21	0.21	0.14	0.19
Floodwater Detention	Inch	6.03	5.50	4.69	6.10	5.82	6.50	5.40	8.15	4.31	6.00	5.60
Spillway Storage 8/	Inch	4.37	5.02	4.21	4.25	4.48	5.76	4.23	6.45	6.36	3.92	4.85
Class of Structure		A	A	A	A	A	A	A	B	B	A	A

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 58	59	60 9/	61 9/	62	63	64	65	66	67	68
Drainage Area	Sq.Mi.	0.69	0.45	8.32	2.25	7.30	0.63	1.30	1.73	0.67	1.81	0.41
Storage Capacity												
Sediment Pool	Ac.Ft.	57	38	488	120	199	30	58	48	25	69	17
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	0	319	0	0	0	0	0	0
Sediment in Detention Pool	Ac.Ft.	5	3	0	0	66	2	5	4	2	13	3
Floodwater Detention	Ac.Ft.	211	145	2,420	662	2,172	203	561	557	209	549	122
Water Supply	Ac.Ft.	0	0	1,346 10/	0	0	0	0	0	0	0	0
Total	Ac.Ft.	273	186	4,254	782	2,756	235	624	609	236	631	142
Surface Area												
Sediment Pool 2/	Acre	17	12	156	39	128	12	19	23	11	24	6
Floodwater Detention Pool	Acre	47	42	592	119	375	35	88	105	51	83	20
Water Supply	Acre	0	0	350	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	36,860	14,420	224,700	64,000	93,750	54,740	71,950	54,570	43,000	52,310	26,830
Elevation Top of Dam	Foot	460.5	452.4	443.7	413.5	395.7	398.0	397.5	391.0	386.5	393.5	389.1
Maximum Height of Dam 3/	Foot	16	16	35	31	31	16	20	19	20	22	18
Emergency Spillway												
Crest Elevation	Foot	457.5	450.0	436.7	407.0	391.7	395.0	394.5	387.5	383.5	389.6	386.0
Bottom Width	Foot	50	50	200	150	90	60	200	70	50	110	50
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		3.9	3.2	5.2	5.4	4.0	3.9	1.9	3.8	4.0	4.0	3.5
Average Curve No. - Condition II		79	80	83	83	82	82	81	81	81	81	81
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.9	7.0	6.3	6.7	6.4	7.0	10.3	6.8	7.0	6.9	7.1
Storm Runoff	Inch	4.5	4.7	4.4	4.8	4.3	4.9	7.9	4.6	4.8	4.7	4.9
Velocity of Flow (V_c) 6/	Ft./Sec.	0	0	0	0	0	0	0	0	0	0	0
Discharge Rate	C.F.S.	0	0	0	0	0	0	0	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	-	-	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	16.7	16.8	15.2	16.2	15.2	16.8	23.3	16.3	16.8	16.6	17.0
Storm Runoff	Inch	13.9	14.2	13.0	14.0	12.9	14.4	20.8	13.8	14.3	14.1	14.5
Velocity of Flow (V_c) 6/	Ft./Sec.	8.6	6.4	11.7	11.2	8.4	7.3	7.3	7.9	7.3	8.4	7.4
Discharge Rate	C.F.S.	583	392	9,940	6,660	1,690	726	2,350	1,078	605	2,337	700
Maximum Water Surface Elev. 6/	Foot	460.5	452.4	441.0	411.3	395.7	398.0	397.5	391.0	386.5	393.5	389.1
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	8	8	42	12	91	8	16	22	8	23	8
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	1.56	1.57	1.10	1.00	1.33	0.90	0.84	0.52	0.70	0.72	0.77
Sediment in Detention Pool	Inch	0.12	0.13	0.00	0.00	0.17	0.07	0.07	0.04	0.06	0.13	0.13
Floodwater Detention	Inch	5.72	6.10	5.46	5.52	5.58	6.05	8.09	6.04	5.84	5.69	5.60
Spillway Storage 8/	Inch	4.50	4.67	11.00	7.00	5.32	3.78	4.00	4.75	4.75	3.98	3.20
Class of Structure		A	A	A	A	A	A	B	A	A	A	A

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 69	70	71	72	73	74	76	77	78	79	80
Drainage Area	Sq.Mi.	1.82	1.86	1.30	0.54	1.37	2.89	3.95	0.87	1.32	2.23	2.42
Storage Capacity												
Sediment Pool	Ac.Ft.	86	110	64	48	122	200	200	86	118	199	200
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	0	0	57	135	0	0	11	39
Sediment in Detention Pool	Ac.Ft.	11	9	5	4	10	20	44	7	9	28	19
Floodwater Detention	Ac.Ft.	534	545	395	173	454	925	769	292	445	695	781
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	631	664	464	225	586	1,202	1,148	385	572	933	1,039
Surface Area												
Sediment Pool 2/	Acre	22	30	20	14	34	54	83	24	25	56	61
Floodwater Detention Pool	Acre	72	111	63	39	78	140	190	78	83	131	147
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	70,670	62,420	50,880	42,860	55,570	139,500	71,000	46,940	64,200	48,200	64,900
Elevation Top of Dam	Foot	399.2	380.3	390.6	373.5	378.5	359.0	430.7	428.6	438.2	395.4	407.0
Maximum Height of Dam 3/	Foot	31	25	25	24	22	23	24	20	26	24	24
Emergency Spillway												
Crest Elevation	Foot	395.3	376.6	386.6	370.5	375.5	355.5	427.0	426.0	434.5	392.0	404.0
Bottom Width	Foot	110	80	80	50	120	160	210	60	50	120	150
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		4.0	4.0	4.0	3.8	3.5	3.7	9.3	3.8	3.6	4.0	3.6
Average Curve No. - Condition II		79	78	80	81	81	81	83	83	82	82	81
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.8	6.9	7.0	7.0	6.9	7.0	6.7	7.0	6.9	6.8	6.7
Storm Runoff	Inch	4.6	4.5	4.8	4.8	4.7	4.5	4.7	5.0	4.8	4.8	4.6
Velocity of Flow (Vc) 6/	Ft./Sec.	0	0	0	0	0	0	0.7	0	0	0	0
Discharge Rate	C.F.S.	0	0	0	0	0	0	110	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	-	427.8	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	16.4	16.6	16.7	16.9	16.5	16.1	16.0	16.9	16.5	16.2	16.2
Storm Runoff	Inch	13.9	13.7	14.2	14.3	13.9	13.6	13.7	14.6	14.1	13.9	13.6
Velocity of Flow (Vc) 6/	Ft./Sec.	8.5	8.2	8.5	7.3	7.3	8.0	8.3	6.6	8.2	8.2	7.3
Discharge Rate	C.F.S.	2,317	1,571	1,762	600	1,435	2,514	4,130	530	858	2,040	1,815
Maximum Water Surface Elev. 6/	Foot	399.2	380.3	390.6	373.5	378.5	359.0	430.7	428.6	438.2	395.4	407.0
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	23	19	16	8	17	36	40	11	17	28	30
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	0.89	1.11	0.93	1.67	1.67	1.67	1.59	1.85	1.67	1.77	1.85
Sediment in Detention Pool	Inch	0.11	0.09	0.07	0.13	0.13	0.13	0.21	0.15	0.13	0.23	0.15
Floodwater Detention	Inch	5.50	5.50	5.69	6.00	6.22	6.00	3.65	6.30	6.32	5.85	6.05
Spillway Storage 8/	Inch	3.50	4.50	4.20	4.40	3.33	3.50	4.75	5.58	3.48	4.35	4.35
Class of Structure		A	A	A	A	A	A	A	A	A	A	A

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued

Cedar Creek Watershed, Texas

(Trinicy River Watershed)

Item	Unit	STRUCTURE NUMBER 81	82	83	84	85	86	87	88	89	90	92
Drainage Area	Sq.Mi.	2.39	1.53	0.63	1.04	1.20	4.41	1.86	1.12	0.75	1.04	3.96
Storage Capacity												
Sediment Pool	Ac.Ft.	200	134	42	70	109	85	102	37	24	54	101
Sediment Reserve Below Riser	Ac.Ft.	3	0	0	0	0	0	0	0	0	0	0
Sediment in Detention Pool	Ac.Ft.	17	17	5	9	8	14	13	5	3	7	19
Floodwater Detention	Ac.Ft.	785	339	198	329	386	1,336	619	370	253	346	1,759
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	1,005	490	245	408	503	1,435	734	412	280	407	1,879
Surface Area												
Sediment Pool 2/	Acre	44	33	11	22	28	33	34	18	9	20	45
Floodwater Detention Pool	Acre	144	69	46	67	81	225	110	76	52	89	280
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	69,500	52,800	25,750	41,610	46,600	48,700	64,170	49,000	39,100	54,320	74,200
Elevation Top of Dam	Foot	398.3	372.7	377.1	365.0	392.2	531.0	529.0	513.0	501.0	490.3	537.9
Maximum Height of Dam 3/	Foot	27	21	19	19	25	24	20	21	20	20	30
Emergency Spillway												
Crest Elevation	Foot	395.0	369.0	374.5	362.0	389.0	527.5	526.0	510.0	498.0	487.5	534.0
Bottom Width	Foot	90	125	60	82	70	200	140	80	60	50	200
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		3.7	8.0	3.7	4.0	3.8	4.0	3.7	3.8	3.6	3.9	1.8
Average Curve No. - Condition II		82	83	82	82	81	81	82	82	82	83	83
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.7	6.8	7.0	6.9	6.9	6.5	6.8	6.9	7.0	7.0	9.9
Storm Runoff	Inch	4.7	5.0	4.9	4.9	4.8	4.5	4.6	4.8	4.9	5.0	7.8
Velocity of Flow (Vc) 6/	Ft./Sec.	0	1.3	0	0	0	0	0	0	0	0	0
Discharge Rate	C.F.S.	0	184	0	0	0	0	0	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	370.1	-	-	-	-	-	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	16.2	16.4	16.8	16.6	16.5	15.7	16.2	16.6	16.7	16.7	20.3
Storm Runoff	Inch	13.8	14.3	14.4	14.3	14.1	13.3	13.9	14.2	14.3	14.5	18.1
Velocity of Flow (Vc) 6/	Ft./Sec.	7.6	8.2	6.6	7.3	7.5	7.9	7.3	7.3	7.3	7.0	8.6
Discharge Rate	C.F.S.	1,195	2,369	980	955	915	3,505	1,622	954	686	530	3,800
Maximum Water Surface Elev. 6/	Foot	398.3	372.7	377.1	365.0	392.2	531.0	529.0	513.0	501.0	490.3	537.9
Principal Spillway Capacity (Maximum)												
Low Scage	C.F.S.	30	15	8	13	15	55	23	14	9	13	50
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalencs												
Sediment Below Riser	Inch	1.59	1.64	1.24	1.26	1.70	0.36	1.03	0.62	0.59	0.98	0.48
Sediment in Detention Pool	Inch	0.13	0.21	0.16	0.16	0.13	0.06	0.13	0.08	0.07	0.12	0.09
Floodwater Detention	Inth	6.16	4.15	5.90	5.93	6.03	5.68	6.24	6.20	6.34	6.23	8.33
Spillway Storage 8/	Inch	4.52	3.80	4.43	4.10	3.14	3.80	3.98	4.70	4.50	5.27	6.28
Class of Structure		A	A	A	A	A	A	A	A	A	A	B

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 93	94	95A	96	97	98	99	100	101	102	103
Drainage Area	Sq.Mi.	4.12	2.28	13.46 1/	0.94	3.56	10.56	5.91	0.78	9.38	1.84	3.82
Storage Capacity												
Sediment Pool	Ac.Ft.	116	105	194	50	112	200	200	25	200	87	200
Sediment Reserve Below Riser	Ac.Ft.	0	0	79	0	0	25	83	0	110	0	0
Sediment in Detention Pool	Ac.Ft.	15	19	50	6	21	56	35	4	40	11	24
Floodwater Detention	Ac.Ft.	1,729	705	4,989	255	1,109	3,165	1,904	209	2,991	607	1,076
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	1,860	829	5,312	311	1,242	3,446	2,222	238	3,341	705	1,300
Surface Area												
Sediment Pool 2/	Acre	45	41	83	14	43	80	75	9	99	25	78
Floodwater Detention Pool	Acre	253	111	541	58	170	453	286	38	501	126	222
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	158,500	56,970	93,796	55,200	93,580	130,180	100,300	47,880	224,670	58,180	95,450
Elevation Top of Dam	Foot	511.6	490.0	472.8	450.9	469.0	454.0	441.5	435.0	458.0	488.0	481.6
Maximum Height of Dam 3/	Foot	33	27	40	23	28	26	28	25	33	21	28
Emergency Spillway												
Crest Elevation	Foot	507.7	486.0	467.8	448.0	465.0	450.0	438.0	432.0	454.0	485.0	478.0
Bottom Width	Foot	320	80	500	100	120	240	260	70	200	90	150
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		2.0	3.8	2.5	5.7	3.9	4.0	3.7	5.7	3.8	3.7	5.3
Average Curve No. - Condition II		82	80	81	82	81	81	82	81	83	82	83
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.1	6.7	9.1	7.0	6.6	6.2	6.5	7.0	6.3	6.8	6.6
Storm Runoff	Inch	4.1	4.4	6.9	5.1	4.5	4.1	4.4	4.9	4.4	4.9	4.7
Velocity of Flow (V_c) 6/	Ft./Sec.	0	0	0	0.5	0	0	0	0.2	0	0	0.5
Discharge Rate	C.F.S.	0	0	0	31	0	0	0	7	0	0	42
Maximum Water Surface Elev. 6/	Foot	-	-	-	448.6	-	-	-	432.5	-	-	478.6
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	22.4	16.1	20.3	16.8	15.9	14.9	15.5	16.8	15.1	16.3	15.9
Storm Runoff	Inch	20.0	13.5	17.8	14.7	13.4	12.5	13.1	14.4	12.8	14.0	13.7
Velocity of Flow (V_c) 6/	Ft./Sec.	8.5	8.5	9.6	7.1	8.5	8.5	7.9	7.3	8.5	7.3	8.0
Discharge Rate	C.F.S.	5,700	1,510	13,800	1,240	2,260	4,488	3,930	980	3,850	1,089	2,822
Maximum Water Surface Elev. 6/	Foot	511.6	490.0	472.8	450.9	469.0	454.0	441.5	435.0	458.0	488.0	481.6
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	52	29	218	10	45	132	74	8	117	23	38
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	0.53	0.86	0.38	0.99	0.59	0.40	0.90	0.61	0.62	0.89	0.98
Sediment in Detention Pool	Inch	0.07	0.16	0.07	0.12	0.11	0.10	0.11	0.09	0.08	0.11	0.12
Floodwater Detention	Inch	7.87	5.80	6.95	5.09	5.84	5.62	6.04	5.02	5.98	6.18	5.28
Spillway Storage 8/	Inch	5.33	4.10	4.50	4.00	4.31	3.88	3.75	3.63	4.72	4.62	4.62
Class of Structure		B	A	B	A	A	A	A	A	A	A	A

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 104	105	106	107A	108	109	110	111	113	114	115
Drainage Area	Sq.Mi.	4.31	0.91	2.41	4.50	2.92	1.29	2.43	15.79	2.09	1.73	1.79
Storage Capacity												
Sediment Pool	Ac.Ft.	200	56	137	149	195	86	173	194	110	64	88
Sediment Reserve Below Riser	Ac.Ft.	11	0	0	0	0	0	0	25	0	0	0
Sediment in Detention Pool	Ac.Ft.	25	7	17	26	23	10	21	42	19	7	8
Floodwater Detention	Ac.Ft.	1,363	322	1,079	1,567	623	352	853	3,588	662	480	587
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	1,599	385	1,233	1,742	841	448	1,047	3,849	791	551	683
Surface Area												
Sediment Pool 2/	Acre	55	17	40	40	58	20	47	70	25	19	26
Floodwater Decention Pool	Acre	225	59	168	236	125	68	144	457	100	76	106
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	95,030	43,800	101,900	118,500	68,540	68,980	94,910	260,750	61,890	53,500	40,360
Elevation Top of Dam	Foot	484.0	472.0	477.0	487.0	440.0	432.9	419.0	452.0	423.5	410.3	401.0
Maximum Height of Dam 3/	Foot	33	29	27	28	22	24	29	33	28	25	24
Emergency Spillway												
Crest Elevation	Foot	480.0	469.0	473.0	482.5	436.5	430.0	415.0	448.0	419.5	406.8	398.0
Bottom Width	Foot	100	70	180	290	220	150	80	400	70	110	100
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		4.0	3.2	1.7	2.0	7.5	5.6	3.3	4.0	3.6	4.0	3.6
Average Curve No. - Condition II		82	82	82	74	82	82	83	73	80	79	81
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.6	7.0	10.1	9.9	6.7	6.9	6.8	6.0	6.8	6.8	6.8
Storm Runoff	Inch	4.6	4.9	7.9	6.7	4.6	5.0	4.9	3.1	4.5	4.4	4.6
Velocity of Flow (Vc) 6/	Fc./Sec.	0	0	0	0	0.4	0.3	0	0	0	0	0
Discharge Race	C.F.S.	0	0	0	0	143	20	0	0	0	0	0
Maximum Water Surface Elev. 6/	Fooc	-	-	-	-	437.1	430.5	-	-	-	-	-
Freehoard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	15.8	16.8	22.9	22.5	16.0	16.7	16.3	14.5	16.4	16.4	16.3
Scorm Runoff	Inch	13.5	14.4	20.5	18.7	13.7	14.4	14.0	10.8	13.7	13.6	13.8
Velocity of Flow (Vc) 6/	Ft./Sec.	8.6	7.3	8.5	9.0	7.9	7.1	7.3	8.6	8.6	8.0	7.3
Discharge Rate	C.F.S.	1,985	847	3,435	6,700	3,338	1,857	968	1,940	1,348	1,750	1,210
Maximum Water Surface Elev. 6/	Foot	484.0	472.0	477.0	487.0	440.0	432.9	419.0	452.0	423.5	410.3	401.0
Principal Spillway Capacicy (Maximum)												
Low Scage	C.F.S.	54	11	30	56	37	13	30	197	26	22	22
High Stage	C.F.S.	-	-	-	-	-	-	-	384	-	43	-
Capacicy Equivalents												
Sedimeot Below Riser	Inch	0.92	1.16	1.07	0.62	1.25	1.25	1.34	0.26	0.99	0.69	0.92
Sediment in Detention Pool	Inch	0.11	0.14	0.13	0.11	0.15	0.15	0.16	0.05	0.17	0.08	0.08
Floodwater Detention	Inch	5.93	6.63	8.40	6.53	4.00	5.12	6.58	4.26	5.94	5.20	6.15
Spillway Storage 8/	Inch	5.00	4.17	5.80	5.44	3.30	3.35	5.24	2.58	4.25	3.40	4.05
Class of Structure		A	A	B	B	A	A	A	A	A	A	A

(See foocnotes on last page)

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 116	117	118	119	120	121	122	123	124	125	126
Drainage Area	Sq.Mi.	3.33	3.51	1.31	1.13	0.72	0.77	6.44	2.79	2.37	7.71 1/	1.03
Storage Capacity												
Sediment Pool	Ac.Ft.	71	75	36	38	38	29	200	77	67	165	22
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	0	0	0	44	0	0	0	0
Sediment in Detention Pool	Ac.Ft.	18	19	6	4	3	4	31	10	9	41	6
Floodwater Detention	Ac.Ft.	1,021	1,123	401	365	228	168	2,027	1,075	657	2,179	302
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	1,110	1,217	443	407	269	201	2,302	1,162	733	2,385	330
Surface Area												
Sediment Pool 2/	Acre	20	21	10	14	11	14	69	25	29	55	7
Floodwater Detention Pool	Acre	142	142	69	64	36	37	276	164	98	310	47
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	51,710	59,250	40,100	55,000	34,240	41,100	63,770	131,280	60,650	100,700	28,550
Elevation Top of Dam	Foot	410.0	394.5	380.1	386.0	395.5	375.3	408.5	499.0	485.4	454.1	467.0
Maximum Height of Dam 3/	Foot	30	34	24	22	28	19	29	30	23	30	25
Emergency Spillway												
Crest Elevation	Foot	406.5	391.5	377.0	383.0	392.5	372.0	404.0	495.0	481.5	449.5	464.0
Bottom Width	Foot	150	250	100	100	70	90	160	200	85	300	70
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		3.8	3.7	4.0	3.6	3.9	7.3	3.9	1.8	3.6	3.5	3.5
Average Curve No. - Condition II		80	81	80	80	81	81	82	76	74	74	74
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.6	6.6	6.9	6.9	7.0	7.0	6.4	10.2	6.7	6.4	6.9
Storm Runoff	Inch	4.3	4.5	4.7	4.6	4.8	4.8	4.4	7.2	3.8	3.6	4.0
Velocity of Flow (V_c) 6/	Ft./Sec.	0	0	0	0	0	0.6	0	0	0	0	0
Discharge Rate	C.F.S.	0	0	0	0	0	17	0	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	372.3	-	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	15.9	15.9	16.6	16.6	16.9	16.9	15.4	23.0	16.2	14.8	16.6
Storm Runoff	Inch	13.3	13.4	14.0	14.0	14.4	14.4	13.1	19.6	12.6	11.3	13.2
Velocity of Flow (V_c) 6/	Ft./Sec.	7.9	7.3	7.4	7.3	7.3	7.7	9.1	8.5	8.5	9.1	6.9
Discharge Rate	C.F.S.	2,268	2,893	1,417	1,210	847	1,242	3,840	3,865	1,601	7,270	1,015
Maximum Water Surface Elev. 6/	Foot	410.0	394.5	380.1	386.0	395.5	375.3	408.5	499.0	485.4	454.1	467.0
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	42	44	13	14	8	8	80	35	30	161	10
High Stage	C.F.S.	-	-	-	-	-	-	-	-	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	0.40	0.40	0.51	0.63	0.99	0.71	0.71	0.52	0.53	0.40	0.40
Sediment in Detention Pool	Inch	0.10	0.10	0.09	0.07	0.08	0.09	0.09	0.07	0.07	0.10	0.10
Floodwater Detention	Inch	5.74	6.00	5.75	6.06	5.93	4.10	5.90	7.22	5.20	5.30	5.50
Spillway Storage 8/	Inch	3.34	2.58	3.55	3.69	3.30	3.50	4.25	5.33	3.55	4.10	3.15
Class of Structure		A	A	A	A	A	A	A	B	A	A	A

(See footnotes on last page)

October 1960

TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued

Cedar Creek Watershed, Texas

(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 127	128	129	130	131	133	134	135	136	137	138
Drainage Area	Sq.Mi.	1.61	2.74	1.08	0.94	1.43	13.55 1/	5.67	6.46	1.33	1.00	1.38
Storage Capacity												
Sediment Pool	Ac.Ft.	81	162	75	63	82	195	121	138	57	62	91
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	0	0	94	0	0	0	0	0
Sediment in Detention Pool	Ac.Ft.	13	28	9	8	10	72	30	21	7	7	11
Floodwater Detention	Ac.Ft.	442	770	347	311	494	3,416	1,663	1,605	442	336	443
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	0	0	0
Total	Ac.Ft.	536	960	431	382	586	3,777	1,814	1,764	506	405	545
Surface Area												
Sediment Pool 2/	Acre	24	38	21	21	21	83	33	46	17	14	21
Floodwater Detention Pool	Acre	84	139	85	62	74	484	206	233	62	49	72
Water Supply	Acre	0	0	0	0	0	0	0	0	0	0	0
Volume of Fill	Cu.Yd.	60,830	103,300	51,200	44,700	123,650	90,600	83,250	75,690	55,480	41,470	75,000
Elevation Top of Dam	Foot	455.0	444.0	447.0	414.0	399.0	439.5	467.9	439.1	419.5	404.0	404.5
Maximum Height of Dam 3/	Foot	24	25	20	26	26	30	37	29	30	22	25
Emergency Spillway												
Crest Elevation	Foot	452.0	440.5	444.0	411.0	396.0	435.0	464.0	435.1	416.5	401.0	401.5
Bottom Width	Foot	100	100	60	60	100	300	150	220	110	80	90
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.
Percent Chance of Use 4/		3.9	3.6	4.0	3.8	3.6	3.9	3.0	3.5	3.7	3.7	3.9
Average Curve No. - Condition II		74	75	83	82	83	74	74	73	82	82	82
Emergency Spillway Hydrograph												
Storm Rainfall (6-hour) 5/	Inch	6.8	6.7	6.9	7.0	6.9	6.1	6.6	6.5	6.9	6.9	7.0
Storm Runoff	Inch	4.0	3.9	4.9	4.9	4.9	3.3	3.6	3.5	4.9	4.9	4.8
Velocity of Flow (Vc) 6/	Ft./Sec.	0	0	0	0	0	0	0	0	0	0	0
Discharge Rate	C.F.S.	0	0	0	0	0	0	0	0	0	0	0
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	-	-	-	-	-	-
Freeboard Hydrograph												
Storm Rainfall (6-hour) 7/	Inch	16.4	16.1	16.6	16.7	16.5	14.2	15.8	15.5	16.5	16.6	16.7
Storm Runoff	Inch	12.8	12.7	14.4	14.3	14.3	10.8	12.2	11.8	14.1	14.3	14.2
Velocity of Flow (Vc) 6/	Ft./Sec.	7.3	8.0	7.3	7.3	7.3	9.0	8.7	8.5	7.3	7.3	7.3
Discharge Rate	C.F.S.	1,200	1,556	726	726	1,210	7,128	3,170	4,060	1,330	970	1,060
Maximum Water Surface Elev. 6/	Foot	455.0	444.0	447.0	414.0	399.0	439.5	467.9	439.1	419.5	404.0	404.5
Principal Spillway Capacity (Maximum)												
Low Stage	C.F.S.	16	34	14	12	18	192	72	81	17	13	17
High Stage	C.F.S.	-	-	-	-	-	-	-	162	-	-	-
Capacity Equivalents												
Sediment Below Riser	Inch	0.94	1.11	1.30	1.25	1.07	0.40	0.40	0.40	0.81	1.16	1.23
Sediment in Detention Pool	Inch	0.16	0.19	0.16	0.15	0.13	0.10	0.10	0.06	0.10	0.14	0.15
Floodwater Detention	Inch	5.15	5.27	6.02	6.20	6.48	4.73	5.50	4.66	6.24	6.30	6.02
Spillway Storage 8/	Inch	3.87	4.03	5.42	4.40	3.32	3.57	7.70	3.28	2.92	3.17	4.32
Class of Structure		A	A	A	A	A	A	A	A	A	A	A

(See footnotes on last page)

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TABLE 3 - STRUCTURE DATA - FLOODWATER RETARDING STRUCTURES - Continued

Cedar Creek Watershed, Texas

(Trinity River Watershed)

Item	Unit	STRUCTURE NUMBER 139	140	141	142	143	144	145	146	Total
Drainage Area	Sq.Mi.	0.58	7.07	3.48	5.16	6.73	9.50	7.12	1.36	388.82
Storage Capacity										
Sediment Pool	Ac.Ft.	44	200	95	140	144	198	194	72	15,945
Sediment Reserve Below Riser	Ac.Ft.	0	0	0	0	0	5	0	0	3,126
Sediment in Detention Pool	Ac.Ft.	5	26	16	25	35	51	34	9	2,329
Floodwater Detention	Ac.Ft.	189	2,036	984	1,114	1,701	2,467	2,050	442	117,721
Water Supply	Ac.Ft.	0	0	0	0	0	0	0	0	1,346
Total	Ac.Ft.	238	2,262	1,095	1,279	1,880	2,721	2,278	523	140,467
Surface Area										
Sediment Pool 2/	Acre	12	62	25	32	33	52	47	21	5,435
Floodwater Detention Pool	Acre	36	245	148	143	219	265	246	72	20,102
Water Supply	Acre	0	0	0	0	0	0	0	0	350
Volume of Fill	Cu.Yd.	45,550	124,800	73,460	45,720	117,370	121,080	91,970	50,000	9,765,503
Elevation Top of Dam	Foot	406.5	406.4	471.7	467.3	438.5	405.5	401.5	385.0	xxx
Maximum Height of Dam 3/	Foot	25	29	29	34	36	34	32	26	xxx
Emergency Spillway										
Crest Elevation	Foot	403.5	402.5	468.0	463.0	434.5	401.0	397.5	382.0	xxx
Bottom Width	Foot	50	250	100	200	250	200	250	100	xxx
Type		Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	Veg.	xxx
Percent Chance of Use 4/		3.7	3.7	3.4	5.3	3.7	3.7	3.7	3.6	xxx
Average Curve No. - Condition II		81	76	73	72	72	72	77	80	xxx
Emergency Spillway Hydrograph										
Storm Rainfall (6-hour) 5/	Inch	7.0	6.4	6.7	6.6	6.5	6.3	6.5	6.9	xxx
Storm Runoff	Inch	4.8	3.8	3.8	3.6	3.4	3.2	3.9	4.6	xxx
Velocity of Flow (V_c) 6/	Ft./Sec.	0	0	0	0	0	0	0	0	xxx
Discharge Rate	C.F.S.	0	0	0	0	0	0	0	0	xxx
Maximum Water Surface Elev. 6/	Foot	-	-	-	-	-	-	-	-	xxx
Freeboard Hydrograph										
Storm Rainfall (6-hour) 7/	Inch	16.9	15.3	16.1	15.8	15.6	15.2	15.5	16.6	xxx
Storm Runoff	Inch	14.3	12.3	12.6	12.1	11.7	11.5	12.4	13.9	xxx
Velocity of Flow (V_c) 6/	Ft./Sec.	7.3	8.4	8.2	8.9	8.5	8.3	8.6	7.3	xxx
Discharge Rate	C.F.S.	605	5,300	1,940	5,038	4,810	4,066	4,963	1,210	xxx
Maximum Water Surface Elev. 6/	Foot	406.5	406.4	471.7	467.3	438.5	405.5	401.5	785.0	xxx
Principal Spillway Capacity (Maximum)										
Low Stage	C.F.S.	8	71	35	52	84	119	89	18	xxx
High Stage	C.F.S.	-	-	-	-	-	-	-	-	xxx
Capacity Equivalents										
Sediment Below Riser	Inch	1.43	0.53	0.51	0.51	0.40	0.40	0.51	0.99	xxx
Sediment in Detention Pool	Inch	0.17	0.07	0.09	0.09	0.10	0.10	0.09	0.12	xxx
Floodwater Detention	Inch	6.10	5.40	5.30	4.05	4.74	4.87	5.40	6.09	xxx
Spillway Storage 8/	Inch	4.30	2.90	3.70	2.70	2.81	2.63	2.72	3.52	xxx
Class of Structure		A	A	A	A	A	A	A	A	xxx

1/ Excludes area from which runoff is controlled by other structures.

2/ Surface area at top of riser. For Site No. 60, surface area at top of design sediment storage.

3/ Measured from centerline of stream channel to effective top of dam.

4/ Based on regional stream gage analysis and soil-cover complex characteristics of the watershed of the individual structure.

5/ For Class A structures, 0.5P adjusted to drainage area; for Class B structures, 0.75P adjusted to drainage area. Value of P from Figure 3.21-1, Supplement A, Section 4, National Engineering Handbook.

6/ Maximum during passage of hydrograph.

7/ 1.2P for Class A structures adjusted to drainage area; 1.7P for Class B structures adjusted to drainage area. Reference: Figure 3.21-1, Supplement A, Section 4, National Engineering Handbook, as modified by Hydrology Memorandum EWP-3, dated June 8, 1959.

8/ Storage from emergency spillway crest to top of dam.

9/ Constructed in 1954 under criteria current at that time.

10/ Municipal water supply for the City of Kaufman, Texas.

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TABLE 3A - STRUCTURE DATA

STREAM CHANNEL IMPROVEMENT

Cedar Creek Watershed, Texas

(Trinity River Watershed)

Station Numbering For Reach: Station	Station	Watershed Area 1/ (acre)	Planned Channel Capacity (c.f.s.)	Bottom Width (feet)	Side Slope	Depth (feet)	Fall (ft./ft.)	Velocity at Design Depth (ft./sec.)	Volume of Excavation (1000 cu.yd.)
Kings Creek									
0 + 00	220 + 00	89,740	7,770	70	2:1	15.0	.0008	5.18	1,222
220 + 00	328 + 40	78,636	7,205	64	2:1	15.0	.0008	5.11	573
328 + 40	435 + 80	75,660	7,024	62	2:1	15.0	.0008	5.09	549
435 + 80	608 + 00	66,426	6,489	56	2:1	15.0	.0008	5.03	823
608 + 00	739 + 00	62,669	6,300	54	2:1	15.0	.0008	5.00	611
739 + 00	793 + 65	29,523	4,343	32	2:1	15.0	.0008	4.67	188
793 + 65	863 + 80	28,525	4,167	30	2:1	15.0	.0008	4.63	234
863 + 80	903 + 30	28,275	4,044	30	2:1	14.0	.0010	4.98	119
903 + 30	985 + 40	20,620	3,184	26	2:1	13.0	.0010	4.71	206
985 + 40	1,057 + 20	16,986	2,798	26	2:1	12.2	.0010	4.55	164
1,057 + 20	1,112 + 60	15,168	2,678	24	2:1	11.5	.0013	4.95	111
1,112 + 60	1,196 + 65	12,589	2,313	22	2:1	11.0	.0013	4.78	151
1,196 + 65	1,221 + 35	11,226	2,181	20	2:1	11.0	.0013	4.72	42
								Subtotal	4,993
Tributary 11A (Little Cottonwood Creek)									
0 + 00	157 + 15	7,034	1,868	20	2:1	10.0	.0014	4.67	233
157 + 15	203 + 65	6,118	1,748	18	2:1	10.0	.0014	4.60	65
203 + 65	252 + 65	3,846	1,311	18	2:1	8.2	.0017	4.65	51
252 + 65	334 + 80	2,874	1,046	14	2:1	8.0	.0017	4.36	73
								Subtotal	422
Tributary 11U (Upper Kings Creek)									
0 + 00	65 + 00	11,456	2,449	24	2:1	11.0	.0013	4.84	122
65 + 00	117 + 50	10,547	2,313	22	2:1	11.0	.0013	4.78	94
117 + 50	226 + 10	9,766	2,181	20	2:1	11.0	.0013	4.72	186
226 + 10	259 + 90	8,582	2,046	18	2:1	11.0	.0013	4.65	55
259 + 90	301 + 40	7,642	1,914	16	2:1	11.0	.0013	4.58	64
								Subtotal	521

1/ Uncontrolled area below floodwater retarding structures.

October 1960

TABLE 3A - STRUCTURE DATA - Continued

STREAM CHANNEL IMPROVEMENT
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Station Numbering For Reach: Station	Station	Watershed Area 1/ (acre)	Planned Channel Capacity (c.f.s.)	Bottom Width (feet)	Side Slope	Depth (feet)	Fall (ft./ft.)	Velocity at Design Depth (ft./sec.)	Volume of Excavation (1000 cu.yd.)
Tributary 11M (Brushy Creek)									
0 + 00	76 + 50	29,562	4,838	42	2:1	15.0	.0007	4.48	306
76 + 50	110 + 16	28,640	3,922	35	2:1	14.3	.0007	4.31	113
110 + 16	149 + 10	28,262	3,879	35	2:1	14.2	.0007	4.30	275
149 + 10	252 + 04	26,381	3,758	35	2:1	12.5	.0011	5.01	141
252 + 04	306 + 82	25,043	3,603	33	2:1	12.5	.0011	4.97	147
306 + 82	356 + 02	23,693	3,451	31	2:1	12.5	.0011	4.93	128
356 + 02	405 + 52	23,136	3,378	30	2:1	12.5	.0011	4.91	126
405 + 52	458 + 98	21,587	3,222	28	2:1	12.5	.0011	4.86	131
458 + 98	514 + 42	20,186	3,140	27	2:1	12.5	.0011	4.83	133
514 + 42	577 + 00	17,856	2,924	24	2:1	12.5	.0011	4.77	142
577 + 00	625 + 84	16,186	2,725	22	2:1	12.4	.0011	4.69	105
625 + 84	670 + 18	15,373	3,632	22	2:1	12.2	.0011	4.65	93
670 + 18	722 + 98	14,048	2,545	22	2:1	12.0	.0011	4.61	108
722 + 98	870 + 82	11,725	2,328	20	2:1	11.8	.0011	4.52	282
870 + 82	915 + 36	10,048	2,208	20	2:1	11.5	.0011	4.46	82
915 + 36	1,005 + 80	8,147	2,180	20	2:1	10.0	.0019	5.45	134
1,005 + 80	1,058 + 20	2,112	816	12	2:1	7.2	.0019	4.27	37
								Subtotal	2,483

1/ Uncontrolled area below floodwater retarding structures.

October 1960

TABLE 3A - STRUCTURE DATA - Continued

STREAM CHANNEL IMPROVEMENT

Cedar Creek Watershed, Texas

(Trinity River Watershed)

Station Numbering For Reach		Watershed Area 1/	Planned Channel Capacity	Bottom Width	Side Slope	Depth	Fall	Velocity at Design Depth	Volume of Excavation
Station	Station	(acre)	(c.f.s.)	(feet)		(feet)	(ft./ft.)	(ft./sec.)	(1000 cu.yd.)
Cedar Creek									
0 + 00	173 + 50	87,322	6,455	58	2:1	15.0	.0075	4.89	848
173 + 50	239 + 50	84,154	6,282	56	2:1	15.0	.0075	4.87	315
239 + 50	303 + 50	72,358	5,760	50	2:1	15.0	.0075	4.80	285
303 + 50	429 + 45	61,696	5,332	45	2:1	15.0	.0075	4.74	525
429 + 45	496 + 20	63,494	5,427	50	2.5:1	13.0	.0010	5.06	265
496 + 20	550 + 80	61,325	5,191	45	2.5:1	13.2	.0010	5.04	208
550 + 80	607 + 40	58,701	5,038	45	2.5:1	13.0	.0010	5.00	211
607 + 40	656 + 90	58,285	4,961	42	2.5:1	13.0	.0010	5.00	183
656 + 90	699 + 10	45,472	4,438	30	2.5:1	13.9	.0010	4.93	140
699 + 10	743 + 90	44,250	4,381	30	2.5:1	13.0	.0010	4.92	148
743 + 90	792 + 10	43,654	4,381	30	2.5:1	13.0	.0010	4.92	159
792 + 10	848 + 70	31,501	3,563	30	2.5:1	12.5	.0010	4.65	161
848 + 70	903 + 40	29,478	3,408	30	2.5:1	11.5	.0013	5.04	137
903 + 40	952 + 20	28,666	3,351	30	2.5:1	11.4	.0013	5.02	121
952 + 20	997 + 00	25,139	3,442	28	2.5:1	11.8	.0013	5.07	113
997 + 00	1,042 + 70	24,115	3,386	28	2.5:1	11.7	.0013	5.05	113
1,042 + 70	1,097 + 30	23,366	3,351	30	2.5:1	11.4	.0013	5.04	135
1,097 + 30	1,149 + 10	21,491	3,174	30	2.5:1	11.1	.0013	4.95	123
1,149 + 10	1,201 + 60	19,674	2,979	28	2.5:1	11.0	.0013	4.88	119
1,201 + 60	1,258 + 00	18,195	2,848	26	2.5:1	11.0	.0013	4.84	123
1,258 + 00	1,313 + 60	7,539	1,788	20	2:1	10.0	.0013	4.47	82
1,313 + 60	1,364 + 10	6,746	1,541	20	2:1	8.5	.0018	4.91	59
								Subtotal	4,573

1/ Uncontrolled area below floodwater retarding structures.

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TABLE 3A - STRUCTURE DATA - Continued

STREAM CHANNEL IMPROVEMENT

Cedar Creek Watershed, Texas

(Trinity River Watershed)

Station Numbering For Reach: Station	Station	Watershed Area 1/	Planned Channel Capacity	Bottom Width	Side Slope	Depth	Fall	Velocity at Design Depth	Volume of Excavation
		(acre)	(c.f.s.)	(feet)		(feet)	(ft./ft.)	(ft./sec.)	(1000 cu.yd.)
Tributary 10 (Lacy Fork)									
0 + 00	120 + 00	21,446	3,030	24	2:1	12.0	.0014	5.26	256
120 + 00	167 + 30	20,077	2,881	22	2:1	12.0	.0014	5.22	97
167 + 30	210 + 05	17,952	2,724	20	2:1	12.0	.0014	5.16	84
210 + 05	249 + 90	15,558	2,565	18	2:1	12.0	.0014	5.09	74
249 + 90	292 + 30	14,336	2,410	16	2:1	12.0	.0014	5.02	75
292 + 30	332 + 20	13,754	2,253	14	2:1	12.0	.0014	4.94	67
332 + 20	374 + 90	12,326	2,096	14	2:1	11.4	.0015	4.99	66
374 + 90	418 + 45	10,778	1,863	14	2:1	10.8	.0015	4.84	62
418 + 45	493 + 05	10,099	1,791	14	2:1	10.6	.0015	4.79	103
493 + 05	540 + 85	7,040	1,380	14	2:1	9.4	.0015	4.48	55
540 + 85	588 + 00	5,165	1,115	14	2:1	8.5	.0015	4.24	46
588 + 00	628 + 00	3,386	775	14	2:1	7.2	.0015	3.80	30
628 + 00	664 + 85	2,618	626	14	2:1	6.4	.0015	3.64	23
								Subtotal	1,038
Tributary No. 17 (Jones Creek)									
0 + 00	65 + 00	9,312	2,220	32	2:1	8.0	.0024	5.78	92
65 + 00	100 + 05	5,331	1,782	24	2:1	8.0	.0024	5.57	42
100 + 05	139 + 25	4,960	1,672	22	2:1	8.0	.0024	5.50	44
139 + 25	180 + 65	4,122	1,455	18	2:1	8.0	.0024	5.35	42
180 + 65	216 + 05	3,424	1,250	14	2:1	8.0	.0024	5.21	31
216 + 05	249 + 75	2,406	949	14	2:1	7.0	.0024	4.84	24
								Subtotal	275

1/ Uncontrolled area below floodwater retarding structures.

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TABLE 3A - STRUCTURE DATA - Continued

STREAM CHANNEL IMPROVEMENT

Cedar Creek Watershed, Texas
(Trinity River Watershed)

Station Numbering For Reach: Station	Station	Watershed Area 1/ (acre)	Planned Channel Capacity (c.f.s.)	Bottom Width (feet)	Side Slope	Depth (feet)	Fall (ft./ft.)	Velocity at Design Depth (ft./sec.)	Volume of Excavation (1000 cu.yd.)
Tributary No. 19 (Williams Creek)									
0 + 00	145 + 90	7,584	1,804	16	2:1	10.0	.0017	5.01	195
145 + 90	176 + 90	6,406	1,648	16	2:1	9.6	.0017	4.89	39
176 + 90	247 + 65	5,670	1,447	16	2:1	9.0	.0017	4.73	80
								Subtotal	314
Tributary No. 25 (Cana Creek)									
0 + 00	68 + 00	9,414	2,000	20	2:1	10.0	.0016	5.00	101
68 + 00	101 + 50	8,461	1,873	18	2:1	10.0	.0016	4.93	47
101 + 50	147 + 50	7,450	1,750	16	2:1	10.0	.0016	4.86	61
147 + 50	191 + 50	6,336	1,625	14	2:1	10.0	.0016	4.78	55
191 + 50	237 + 50	3,174	1,015	14	2:1	8.0	.0016	4.23	41
								Subtotal	305
Tributary No. 27 (Wolf Creek)									
0 + 00	66 + 00	12,966	2,761	32	2:1	10.0	.0016	5.31	127
								Subtotal	127
Tributary No. 27A (Allen Creek)									
0 + 00	65 + 00	10,003	2,516	26	2:1	10.0	.0018	5.47	111
65 + 00	109 + 15	9,274	2,384	24	2:1	10.0	.0018	5.42	72
109 + 15	149 + 65	6,470	1,850	16	2:1	10.0	.0018	5.14	54
149 + 65	192 + 35	5,293	1,720	14	2:1	10.0	.0018	5.06	54
192 + 35	239 + 55	3,450	1,225	14	2:1	8.5	.0018	4.64	46
								Subtotal	337
								GRAND TOTAL	15,388

1/ Uncontrolled area below floodwater retarding structures.

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TABLE 4 - ANNUAL COSTS 1/

Cedar Creek Watershed, Texas
(Trinity River Watershed)

Measures	Amortization of Installation Costs 2/			Operation & Maintenance Costs 3/	Total
	Federal	Non-Federal	Total	Total Non-Federal	
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
loodwater Retarding Strucures 1, 3 through 11, 11A, 3 through 16, 16A, 17 rough 20, 21A, 22 through 6, 38 through 40, 42 through 4, 76 through 85; and tream Channel Improvement, ings Creek	177,568	48,877	226,445	18,379	244,824
loodwater Retarding Strucures 86 through 90, 92 rough 94, 95A, 96 through 06, 107A, 108 through 111, 13 through 122; and tream Channel Improvement, edar Creek	97,150	19,454	116,604	12,725	129,329
loodwater Retarding Strucures 123 through 131, 133 rough 140, 146; and tream Channel Improvement, acy Creek	48,740	7,895	56,635	4,128	60,763
loodwater Retarding Strucures 141, 142 and 145 North Twin Creek)	3,843	1,291	5,134	270	5,404
loodwater Retarding Strucures 143 and 144 (South win Creek)	4,340	1,095	5,435	180	5,615
TOTAL	331,641	78,612	410,253	35,682	445,935

/ Does not include work plan preparation cost.
/ Amortization period, 50 years; Federal and non-Federal interest rate, 2-5/8 percent; based on 1957 prices.
/ Based on long-term price levels as projected by ARS, September 1957.

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TABLE 5 - MONETARY BENEFITS FROM STRUCTURAL MEASURES

Cedar Creek Watershed, Texas
(Trinity River Watershed)
Price Base: Long-Term 1/

Item	Estimated Average Annual Damage: Without Project	After Land Treatment For W/S Protection	With Project	Average Annual Monetary Benefits
	(dollars)	(dollars)	(dollars)	(dollars)
Floodwater Damage				
Crop and Pasture	537,331	506,555	72,830	433,725
Other Agricultural	61,702	54,902	2,506	52,396
Nonagricultural	19,581	16,847	293	16,554
Subtotal	618,614	578,304	75,629	502,675
Sediment Damage				
Overbank Deposition	33,901	30,969	4,506	26,463
Reservoirs 2/	39,713	35,682	22,634	13,048
Subtotal	73,614	66,651	27,140	39,511
Erosion Damage				
Flood Plain Scour	6,489	5,814	506	5,308
Subtotal	6,489	5,814	506	5,308
Indirect Damage	69,871	65,076	10,327	54,749
Total, All Damage	768,588	715,845	113,602	602,243
Changed Land Use to Crop Production	xxx	xxx	xxx	23,969
TOTAL FLOOD PREVENTION BENEFITS	xxx	xxx	xxx	626,212
TOTAL PRIMARY BENEFITS	xxx	xxx	xxx	626,212
TOTAL MONETARY BENEFITS	xxx	xxx	xxx	626,212

1/ USDA, ARS, September 1957.

2/ Assuming Fort Worth Reservoir in place.

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TABLE 6 - BENEFIT-COST ANALYSIS
Cedar Creek Watershed, Texas
(Trinity River Watershed)

Measures	AVERAGE ANNUAL BENEFITS 1/ Flood Prevention						Average Annual Cost 2/	Benefit-Cost Ratio
	Flood-water	Sediment	Erosion	Indirect	Changed Land Use	Total		
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	
Floodwater Retarding Structures Nos. 1, 3 through 11, 11A, 13 through 16, 16A, 17 through 20, 21A, 22 through 40, 42 through 74, and 76 through 85, and Stream Channel Improvement Kings Creek	284,046	20,418	3,298	30,777	17,073	355,612	244,824	1.5:1
Floodwater Retarding Structures Nos. 86 through 90, 92 through 94, 95A, 96 through 106, 107A, 108 through 111, and 113 through 122; and Stream Channel Improvement Cedar Creek	153,294	12,427	1,494	16,720	5,504	189,439	129,329	1.5:1
Floodwater Retarding Structures Nos. 123 through 131, 133 through 140, and 146; and Stream Channel Improvement Lacy Creek	57,090	4,539	416	6,206	900	69,151	60,763	1.1:1
Floodwater Retarding Structures Nos. 141, 142 and 145 North Twin Creek	3,930	1,612	36	557	-	6,135	5,404	1.1:1
Floodwater Retarding Structures Nos. 143 and 144 South Twin Creek	4,315	515	64	489	492	5,875	5,615	1.1:1
TOTAL	502,675	39,511	5,308	54,749	23,969	626,212	445,935	1.4:1

1/ Long-term price levels, as projected by ARS, September 1957.
2/ Derived from installation costs based on 1957 price levels and operation and maintenance cost based on long-term prices, as projected by ARS, September 1957; work plan preparation cost not included.

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