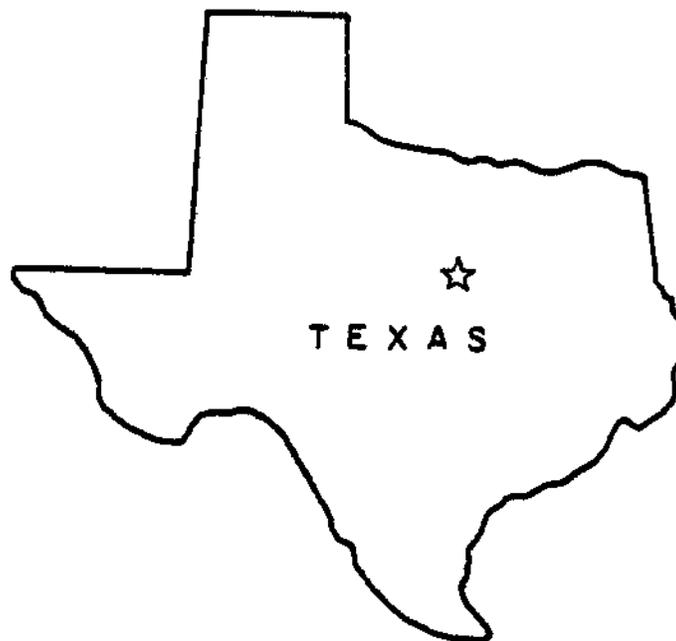


***FINAL***  
**WATERSHED PLAN**

**WEST FORK OF BUFFALO  
CREEK WATERSHED  
Johnson County, Texas**



**U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
TEMPLE, TEXAS**

**SEPTEMBER 1982**

FINAL

WATERSHED PLAN

WEST FORK OF BUFFALO CREEK WATERSHED  
Johnson County, Texas

September 1982

PREPARED BY

Sponsoring Local Organizations

City of Cleburne  
Johnson County Soil and Water Conservation District

and the

SOIL CONSERVATION SERVICE  
United States Department of Agriculture

The recommended plan will reduce the average annual flood damages to urban property in Cleburne, Texas, reduce average annual flood damage to agricultural properties, leave no apparent risk to loss of life in any building in the 100-year flood area, and improve the quality of life and social well-being of the residents of the area as a result of project installation. The recommended work of improvement is one floodwater retarding structure to be constructed during a two-year installation period. Installation of the structural measure will require 539 acres, which is comprised of 340 acres pastureland and 199 acres cropland. A "Finding of No Significant Impact" (FONSI) has been filed.

Federal assistance will be provided under authority of Public Law 83-566, 83rd Congress, 68 Stat. 666, as amended. Further inquiries may be directed to Mr. Billy C. Griffin, State Conservationist, Soil Conservation Service, W.R. Poage Federal Building, 101 South Main, P.O. Box 648, Temple, Texas 76503, telephone: 817/774-1214.

WATERSHED AGREEMENT

Between the

City of Cleburne  
Johnson County Soil and Water Conservation District  
of the State of Texas

(Referred to herein as sponsors)

and the

Soil Conservation Service  
United States Department of Agriculture

(Referred to herein as SCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by sponsors for assistance in preparing a plan for work of improvement for the West Fork of Buffalo Creek Watershed, State of Texas, under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008); and

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

Whereas, there has been developed through the cooperative efforts of the sponsors and SCS a plan for a work of improvement for the West Fork of Buffalo Creek Watershed, State of Texas, hereinafter referred to as the plan, which said plan is annexed to and made a part of this Agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through SCS, and the sponsors hereby agree on this plan and that the work of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this plan and including the following:

1. The sponsors will acquire, with other than P.L. 566 funds, such landrights as will be needed in connection with the work of improvement. (Estimated cost \$619,600).
2. The sponsors assure that uniform and equitable treatment will be given to persons displaced from their homes, businesses, or farms as required by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 as implemented by 7 CFR Part 21. The costs of relocation payments will be shared by the sponsors and SCS as follows:

	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	38.4	61.6	0 <sup>1/</sup>

<sup>1/</sup> Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost shared in accordance with the percentages shown.

3. The sponsors 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 work of improvement.

4. The sponsors will obtain all necessary Federal, State, and local permits as may be required for installation of the work of improvement.

5. The percentages of construction costs to be paid by the sponsors and by SCS are as follows:

<u>Work of Improvement</u>	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Construction Costs</u> (dollars)
One (1) Floodwater Retarding Structure	0	100	827,600

6. The percentages of the engineering costs to be borne by the sponsors and SCS are as follows:

<u>Work of Improvement</u>	<u>Sponsors</u> (percent)	<u>SCS</u> (percent)	<u>Estimated Engineering Costs</u> (dollars)
One (1) Floodwater Retarding Structure	0	100	50,480

7. The sponsors and SCS will each bear the costs of project administration that each incurs, estimated to be \$4,000 and \$120,820, respectively.

8. The sponsors will obtain agreements from owners of not less than 50 percent of the land above the floodwater retarding structure. These agreements will state that the owners will carry out conservation plans on their land and ensure that 50 percent of the land is adequately protected before construction of this dam.

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

10. The sponsors will be responsible for the operation, maintenance, and replacement of the work of improvement by actually performing the work or arranging for such work, in accordance with agreements to be entered into before issuing invitations to bid for construction work.

11. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be the actual costs incurred in the installation of work of improvement.

12. This Agreement is not a fund obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

13. A separate agreement will be entered into between SCS and the sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific work of improvement.

14. This plan may be amended or revised only by mutual agreement of the parties hereto, except that SCS may deauthorize funding at any time it determines that the sponsors have failed to comply with the conditions of this Agreement. In this case, SCS shall promptly notify the sponsors in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsors or recoveries by SCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between SCS and the sponsor(s) having specific responsibilities for the measure involved.

15. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, 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.

16. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15.1-1t.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving Federal financial assistance.

City of Cleburne

By George W. Mart

P.O. Box 657  
Cleburne, Texas 76031

Title Mayor

Address \_\_\_\_\_ Zip Code \_\_\_\_\_

Date April 26, 1983

The signing of this plan was authorized by a resolution of the governing body of the City of Cleburne

adopted at a meeting held on April 26, 1983 at City Hall

302 West Henderson

Cleburne, Tx 76031  
Address \_\_\_\_\_ Zip Code \_\_\_\_\_

Date April 26, 1983

Johnson County Soil and Water Conservation District

By Earl Friel

P.O. Box 293  
Cleburne, Texas 76031

Title Chairman

Address \_\_\_\_\_ Zip Code \_\_\_\_\_

Date April 27, 1983

The signing of this plan was authorized by a resolution of the governing body of the Johnson County Soil and Water Conservation District

adopted at a meeting held on April 27, 1983 at Cleburne, Texas

\_\_\_\_\_

P.O. Box 293  
Cleburne, Texas 76031  
Address \_\_\_\_\_ Zip Code \_\_\_\_\_

Date April 27, 1983

Soil Conservation Service  
United States Department of Agriculture

Approved by:

Billy C. Griffin  
Billy C. Griffin  
State Conservationist

**MAY 04 1983**

\_\_\_\_\_ Date

TABLE OF CONTENTS

	<u>Page</u>
Fly Sheet . . . . .	1
Agreement . . . . .	ii
Table of Contents . . . . .	vi
Introduction . . . . .	1
Project Setting . . . . .	3
Problem and Opportunity Identification . . . . .	6
Floodwater Damage . . . . .	6
Economic and Social Problems . . . . .	7
Inventory and Forecasting . . . . .	7
Analysis of Impacts . . . . .	8
Formulation of Alternatives . . . . .	9
Formulation Process . . . . .	9
Evaluation of Alternatives . . . . .	10
Risk and Uncertainty . . . . .	12
Rationale for Plan Selection . . . . .	12
Summary Comparison of Candidate Plan . . . . .	14
Recommended Plan . . . . .	15
Plan Elements . . . . .	15
Permits and Compliance . . . . .	17
Installation Costs . . . . .	19
Economic Benefits . . . . .	19
Installation and Financing . . . . .	19
Operation, Maintenance . . . . .	22
Effects of Recommended Plan . . . . .	29
Flood Prevention . . . . .	29
Visual Resources . . . . .	32
Water and Air Resources . . . . .	32
Terrestrial and Aquatic Habitat . . . . .	33
Endangered Species . . . . .	33
Cultural Resources . . . . .	33
Economic and Social . . . . .	33
Short-Term Uses Vs. Long-Term Productivity . . . . .	35
Irreversible and Irretrievable Commitments of Resources . . . . .	35
Consultation and Public Participation . . . . .	35
List of Preparers . . . . .	37
Bibliography . . . . .	40
Index . . . . .	41
Appendices	
Appendix A - Letters of Comment Received on Draft Plan (to be included in Final Plan)	
Appendix B - Watershed Figures	
Figure 1 - Flood Plain Index Map and Flood Plain Maps	
Figure 2 - Typical Section of the Floodwater Retarding Structure	
Appendix C - Project Map	

List of Tables

Table 1 - Estimated Installation Cost . . . . .	23
Table 2 - Estimated Cost Distribution . . . . .	24
Table 3 - Structural Data - Dam . . . . .	25
Table 4 - Annual Cost . . . . .	26
Table 5 - Estimated Average Annual Flood Damage Reduction Benefits	27
Table 6 - Comparison of Benefits and Costs . . . . .	28

SUMMARY

WEST FORK OF BUFFALO CREEK WATERSHED  
Johnson County, Texas  
WATERSHED PLAN

Draft

September 1982

Prepared By: City of Cleburne  
Johnson County Soil and Water Conservation District  
U.S. Department of Agriculture, Soil Conservation Service

Planned under the Authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001-1008) and in accordance with Section 102(2)(C) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq).

Installation of the recommended plan will reduce average annual flood damages to urban property in Cleburne, Texas; reduce average annual flood damage to agricultural properties; leave no apparent risk to loss of life in any building in the 100-year flood plain; and improve the quality of life and social well-being of the residents.

Average Annual Damage Reduction Benefits:

Item	:	:	:	:
	:	Projected Conditions	:	Existing Conditions
		(dollars)		(dollars)
Floodwater				
Crop and Pasture		280		280
Nonagricultural				
Railroad		200		200
Automobiles		1,980		1,980
Streets and Utilities		1,060		1,060
Urban				
Residential Property		143,550		114,940
Commercial Property		28,820		28,820
Public Property		12,250		12,250
TOTAL		188,140		159,530

Project Costs:

Measure	:	PL-566 Funds	:	Other Funds	:	Total
		(dollars)	(percent)	(dollars)	(percent)	(dollars)
One Floodwater Retarding Structure		998,900	61.6	623,600	38.4	1,622,500

Estimated Annual Installation Cost of Structural Measure: \$127,730

Estimated Annual Cost of Operation and Maintenance: \$6,310

Total Annual Cost: \$134,040

Benefit-Cost Ratio: Projected conditions 1.4:1.0  
Existing conditions 1.2:1.0

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Beneficiaries:

<u>Item</u>	<u>Number</u>	<u>Percent</u>
Farming Units	4	1.7
Urban Properties	236	98.3
<u>Total</u>	<u>240</u>	<u>100.0</u>

Average cost to benefited farming unit: \$810/unit  
Average cost to benefited urban property: \$6,760/property  
Average cost to agricultural acres benefited: \$23/acre  
Average cost to nonagricultural acres benefited: \$5,450/acre

Land Use:

	<u>Watershed</u>		<u>Flood Plain</u>	
	(acres)	(percent)	(acres)	(percent)
Cropland	3,056	40.0	55	12.5
Pastureland	2,068	27.1	87	19.8
Rangeland	500	6.5	0	0
Urban and Built-up	1,961	25.7	258	58.6
Other	55	0.7	40	9.1
<u>Total</u>	<u>7,640</u>	<u>100.0</u>	<u>440</u>	<u>100.0</u>

---

Land Ownership in Watershed: Private-99 percent; State/Local-1 percent; Federal-0 percent

Farm and Ranch Units in Watershed: 50      Average Size: 115 acres

Prime Farmland: Project will eliminate flood damages on 118 acres of prime farmland with commitment of 167 acres of prime farmland.

Wetlands: None

Endangered Species: No listed species present

Cultural Resources: None present

Responsible for Operation and Maintenance of Project Measure: City of Cleburne

WEST FORK OF BUFFALO CREEK WATERSHED

WATERSHED PLAN

Johnson County, Texas

September 1982

INTRODUCTION <sup>1/</sup>

This watershed plan for flood prevention for West Fork of Buffalo Creek Watershed has been prepared by the sponsoring local organizations (sponsors), which are comprised of the city of Cleburne (City) and the Johnson County Soil and Water Conservation District (SWCD). Technical assistance has been provided by the Soil Conservation Service (SCS), United States Department of Agriculture (USDA). Partial financial assistance in developing the plan was provided by the Texas State Soil and Water Conservation Board.

The environmental information contained in this plan has been prepared in compliance with Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA) and appropriate Council on Environmental Quality (CEQ) rules and regulations. In order to satisfy the intent of NEPA, this document addresses the following five major elements: (1) environmental consequences of the recommended plan; (2) any adverse environmental consequences which cannot be avoided should the recommended plan be implemented; (3) alternatives to the recommended plan; (4) relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (5) irreversible and irretrievable commitments of resources which would be involved if the proposed action is implemented.

Final rules and regulations published by CEQ on November 28, 1978, ("Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act") have been adhered to. Appropriate SCS procedures and policy for compliance with those rules and regulations have been followed. Similarly, final rules and regulations published by the Water Resources Council (WRC) on December 14, 1979, ("Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning (Level C)") were complied with.

West Fork of Buffalo Creek Watershed application for assistance under Public Law 566, as amended, was authorized for planning by the Chief of the SCS on September 30, 1981. The State Conservationist of the SCS, in his written notification of initiation of plan development, solicited information and comments from numerous Federal, State, and local agencies that might have an interest in the project. Contacts were made with several

<sup>1/</sup> All information and data in this plan, except as otherwise noted by reference to source, were collected during watershed planning investigations by the Soil Conservation Service, U.S. Department of Agriculture.

agencies and individuals to obtain information and assistance during the planning process.

The Fish and Wildlife Service (FWS) and the Texas Parks and Wildlife Department (TP&WD) participated in surveys of the watershed and furnished reports of findings and anticipated project effects. In addition, a list of endangered species which may inhabit the area was obtained from the FWS Office of Endangered Species (OES). The recommended plan has been reviewed by the SCS to determine the impacts to endangered species in accordance with Section 7 of the Endangered Species Act of 1973 (Public Law 93-205, as amended). The FWS OES has been informed that no impacts will be occasioned to any Federally listed species.

The State Historic Preservation Officer has concurred with the findings of archeological surveys. The sponsors provided the North Central Texas Council of Governments with notification of intent to apply for assistance involving Federal funds.

The Environmental Protection Agency (EPA) made a reconnaissance of the watershed during April 1981. They reported no apparent significant issues of environmental concerns within EPA's area of jurisdiction and expertise.

Meetings were held by the sponsors on numerous dates to gain opinions from individuals and inform the general public. Newspapers serving the watershed area published articles announcing public meetings and reported information and conclusions resulting from these meetings.<sup>1/</sup>

On April 2, 1981, the SCS, in conjunction with the sponsors, held a scoping meeting in Cleburne. The purpose of this meeting was to determine the scope of issues to be addressed and establish preliminary project objectives. Sixty-four persons registered their attendance. Numerous persons voiced their concern for eliminating flooding and resultant damages. During this portion of the meeting, response cards were handed out. Citizens were asked to respond in writing should they have items to be considered during the scoping process. Eight were returned in the mail. Additionally, an area landowner orally requested after the meeting that studies include an analysis of eroding areas in the watershed. During routine watershed planning investigations and analyses, it was determined that erosion problems could be resolved with the going land treatment program of the SWCD.

The scoping process which began early in planning has consisted of informational contacts with those agencies or individuals who had knowledge and data useful in assessment of impacts. Scoping has been used to address significant issues related to the formulation of alternatives.

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<sup>1/</sup> A list of meetings indicating the topics discussed and those in attendance is available for review at the State Office, Soil Conservation Service, W. R. Poage Federal Building, Temple, Texas 76503.

On August 18, 1981, a public meeting was held in Cleburne to discuss the "Preauthorization Planning Report" with sponsors and interested public. Thirty-five persons registered their attendance. The purpose of the meeting was to summarize planning studies to date and present possible solutions to watershed problems. It was explained that the use of different structural and nonstructural measures in various combinations to satisfy identified goals served as the basis for formulating alternatives and candidate plans. The available measures consisted either singularly or in combinations of the following: floodwater retarding structure, dike(s), channel work, clearing and snagging, permanent evacuation, and floodproofing. Each alternative available to the sponsors was discussed in detail and those in attendance were given an opportunity to comment. The sponsors were requested to analyze each alternative and make a decision for selection of a conceptual plan.

On August 26, 1981, the SCS formally requested authorization to plan West Fork of Buffalo Creek Watershed. This request was based in part on an economically feasible project and a favorable attitude of the public and sponsors to the alternatives presented in the Preauthorization Planning Report.

On August 31, 1981, the city of Cleburne in conjunction with the Johnson County Soil and Water Conservation District notified the Soil Conservation Service that they selected alternative 1 (See FORMULATION OF ALTERNATIVES - page 9 of this document) as the recommended plan and urged completion of planning activities.

The SCS, having considered the decisions reached by the sponsors, prepared a plan. Specialists from the State Staff and National Office reviewed this document for technical adequacy; project effectiveness; and conformance with existing policies, rules, and legislation. Following this in-service review, a revised document was prepared for public review and additional input from sponsors, affected agencies, and concerned individuals.

#### PROJECT SETTING

West Fork of Buffalo Creek Watershed is located in central Johnson County in north-central Texas. The watershed comprises an area of about 7,640 acres (11.94 square miles). The city of Cleburne is located in the southern portion of the watershed and is about 30 miles south of Fort Worth and about 50 miles southwest of Dallas. West Fork of Buffalo Creek is an ephemeral stream which heads about 7 miles north of the City, just west of the town of Joshua. The creek flows in a generally southern direction for about 6.5 miles (through the west side of Cleburne) to its confluence with East Fork of Buffalo Creek in the south part of Cleburne. From there, Buffalo Creek flows for about 5 miles south to its confluence with the Nolan River. The Nolan River, a tributary to the Brazos River Basin, is in the Texas Gulf Water Resource Region.

The topography of the watershed ranges from gently rolling in the upper portions to nearly level in the lower portion in the vicinity of Cleburne. Stream valleys are gently sloping and rather narrow. The most prominent landscape feature is the line of low hills that forms the watershed boundary for the lands to the north. Elevations in the watershed range from about 980 feet above mean sea level to about 720 feet at the confluence of East Fork of Buffalo Creek.

West Fork of Buffalo Creek Watershed is located within portions of the Grand Prairie Land Resource Area and the Cross Timbers Land Resource Area. Dominant upland soils are Sanger, Burleson, Slidell, and Medlin clays; Lott and Lewisville silty clays; and Culp and Ponder clay loams. Bottomland and flood prone soils are silty clay and clay loam of the Frio and Pursly series, respectively. All these soils are within the Grand Prairie Land Resource Area and are located over the Grayson Marl on the uplands and over Quaternary and Recent alluvium on the bottomlands. Cross Timbers soils are mostly fine sandy loams of the Crosstell and Gasil series. These soils are located generally over Woodbine Formation sandstone. A detailed soil survey of Johnson County is available and is in the process of publication.

Geologic units cropping out in the watershed are the Main Street Limestone, Grayson Marl, and the Woodbine Formation of Cretaceous age and Quaternary and Recent alluvial sediments in the vicinity of West Fork of Buffalo Creek. The Main Street Limestone is exposed in West Fork of Buffalo Creek channel and banks in the southern portion of the watershed. The Grayson Marl, which overlies the Main Street Limestone, is the dominant unit in areal extent. It crops out in all portions of the watershed except on the northwestern, northern, and eastern divides where it is overlain by sandstone of the Woodbine Formation. This sandstone, which is more resistant to erosion than the Grayson Marl, forms the low hills in the northern portion of the watershed.

Average annual rainfall at Cleburne is 33 inches. Average monthly rainfall is lowest during January and highest in April and May. The daily maximum temperature in July and August commonly exceeds 100 degrees Fahrenheit. Winter temperatures are relatively mild, with low temperatures at night usually in the mid-30's. The growing season averages 233 days annually.

Census data limited to the watershed is not available. Cleburne, an incorporated home-rule city, is the largest community in Johnson County and serves as the county seat. It has a 1980 estimated population of 19,218. The 1980 estimated population for Johnson County was 67,649 (U.S. Census, Advance Report, March 1981). Approximately 90.8 percent of Johnson County's population is white, 4.1 percent Hispanic, 2.8 percent black, 0.2 percent American Indian, 0.2 percent Asian, and 1.9 percent other. Statewide, the distribution is 57.7 percent white, 21.0 percent Hispanic, 12.0 percent black, 0.3 percent American Indian, 0.9 percent Asian, and 8.1 percent other.

The economy within the area relies primarily upon manufacturing, rail services, and agriculture, with Cleburne serving as a market center.

All of the cultivated acreage in the watershed lies to the north and west of Cleburne, where small grain, hay, and other improved pastures are grown.

Land uses within the watershed are summarized in the following tabulation:

<u>Land Use</u>	<u>Acres</u>	<u>Percent</u>
Cropland	3,056	40.0
Pastureland	2,068	27.1
Rangeland	500	6.5
Urban and Built-up*	1,961	25.7
Other	<u>55</u>	<u>0.7</u>
Total	7,640	100.0

\*Includes roads, railroads, unincorporated subdivisions, cemeteries, and educational institutions.

Present flood plain land uses are: cropland, 12.5 percent; pastureland, 19.8 percent; urban and built-up, 58.6 percent; and miscellaneous uses, 9.1 percent.

Many of the soils suitable for and used as agricultural land in Johnson County are classed as prime farmland. There are 118 acres of prime farmland in the flood plain below the planned floodwater retarding structure.

There are approximately 50 farm and ranch units, averaging about 115 acres in size, either wholly or partially within the watershed. The size of individual operating units ranges from less than 25 to more than 300 acres. About 40 percent of the agricultural land is owner-operated. Four farm and ranch units have land within the flood plain.

Approximately 22 miles of hard-surfaced Federal, State, and county roads serve the watershed residents. The Atchison, Topeka, and Santa Fe Railway Co. has loading and unloading facilities at Cleburne. The community has benefited from its highway and rail access to the transportation, commerce, and recreation facilities in north central Texas.

Johnson County is within the geographic area served by the North Central Texas Council of Governments.

West Fork of Buffalo Creek Watershed is located in the Cross Timbers and Prairies vegetational area. Generally, the native vegetation of the watershed was a grassland complex with fringes of a savannah. Typically most of the watershed in pristine condition was a true prairie. The vegetation was uniform and consisted of little bluestem, big bluestem, Indian grass, switchgrass, Canada wildrye, sideoats grama, hairy grama, tall dropseed, and Texas wintergrass.

The present vegetation reflects more of past management rather than vegetation potential. Most areas have been planted to either row crops or improved pasture or hayland. Introduced coastal and common bermudagrass are the most common plant species used for these improved pastures. Also much of the area is being developed into rural subdivisions and small ranchettes.

West Fork of Buffalo Creek Watershed is located in the approximate center of the Texan Biotic Province as described by Blair (1950). There are 49 species of mammals that have been identified in this province in recent times. In addition, 55 species of reptiles and 23 amphibians have been documented. Numerous species of raptors and songbirds also occur. Recognized wetlands do not exist in the watershed.

Currently there are no historic sites as recognized by the U.S. Department of the Interior, Heritage Conservation and Recreation Service. The SCS conducted an archeological survey on portions of the watershed that would be affected by the planned structural measure. As a result of the survey, it was determined that no known archeological sites would be affected by the planned project.

There are no existing or proposed water resource development projects of other agencies within the watershed. The work of improvement included in this plan will have no known detrimental effects on any existing or proposed downstream work of improvement, and will constitute a harmonious element in the full development of the Brazos River Basin.

The City has enacted and is enforcing a zoning ordinance to regulate development and/or expansion within their area of jurisdiction below the 100-year flood elevation. A flood warning system is being installed as part of the City's on-going flood plain management program. The flood warning system will be particularly effective to warn citizens of potential high-water hazards at the low-water crossings in the City. Residents in the watershed have the opportunity to participate in the National Flood Insurance Program. These measures will complement any watershed improvement plan.

## PROBLEM AND OPPORTUNITY IDENTIFICATION

### Floodwater Damage

The major water and related land resource problem is flooding from West Fork of Buffalo Creek in urban properties within the developed areas of Cleburne (Appendix B, Figure 1). Flooding on urban and built-up lands damages residences, public buildings, and commercial properties; impairs streets and roads; damages railroad facilities; and interrupts normal traffic patterns. Floodwaters create potential health hazards, provide vector habitat, and cause many inconveniences that tend to lower the quality of life.

Flooding on agricultural lands damages crops and pastures and farm improvements. Flooding damages fences, corrals, and other improvements. Flood prone area erosion is mostly on streambanks. Average annual flood

plain scour is minor. When the waters recede, channels are laden with debris consisting of uprooted brush and small trees, fence wire, and other trash.

Two major floods have occurred during the past 13 years. The most recent flood occurred May 3, 1979. The other flood occurred May 6-7, 1969. Both floods were estimated to have a recurrence interval of 25 years (four percent chance). With a flood of this magnitude, 346 acres of floodplain land in the watershed are inundated. Of this acreage, 209 acres are within the urban area. Damages to homes and personal property were so severe that some families were dislocated for days.

With present conditions, 102 residences, 27 commercial buildings, and 5 public buildings would be flooded by a storm equivalent to the 1979 event. Total monetary damage from such a flood is estimated to be \$1,182,210, of which \$1,181,520 is in the urban areas.

A 100-year frequency flood (one percent chance) would cause floodwater damages estimated at \$3,080,660. Of that amount, flood damages in the urban areas are estimated at \$3,079,720, based upon present conditions. Floodwaters would inundate 440 acres. About 258 acres of flood plain are urban and built-up land, 142 acres are agricultural land, and 40 are in miscellaneous uses. In the urban portion, approximately 171 residences, 55 commercial establishments, and 10 public buildings are subject to flood damage.

#### Economic and Social Problems

Residents of Cleburne who suffer from flood damages are burdened with flood losses that lower the standard of living. Monetary losses, apparent risk to loss of life, and displacement from homes or businesses are three major problems. Other problems are the control of vectors and the cleanup of debris which is spread throughout the flood plain by floodwaters.

#### INVENTORY AND FORECASTING

During the scoping process, analyses of impacts on a broad range of environmental, economic, and social factors were made; and the significance of these impacts to decisionmaking was evaluated. From these analyses, it was found that the proposed project would have either minimal or no impacts on erosion and sedimentation, streams, wetlands, ground water, fish and wildlife, water quality, endangered or threatened plants and animals, protected nongame species, air quality, mineral resources, or cultural resources. Significant environmental, social, and economic factors were used to compare alternatives and to present impacts of the recommended plan. Following is a list of factors that were studied during project planning and the degree of impacts expected from project action:

Analysis of Impacts

<u>Economic, Environmental, and Social Factors</u>	<u>Degree of Significance <sup>1/</sup></u>	<u>Remarks</u>
-Floodwater	High	
-Risk to Loss of Life	High	
-Erosion and Sedimentation	Low	
-Prime Farmland	High	
-Streams	Low	
-Wetlands	None	
-Ground Water	None	
-Wildlife	Low	
-Fish	None	
-Water Quality	Low	
-Visual Resources	Medium	
-Endangered or Threatened Animals	None	Project will not affect
-Endangered or Threatened Plants	None	
-Protected Nongame Species	Low	
-Transportation	Low	
-Employment	None	
-Air Quality	Low	
-Mineral Resources	None	
-Cultural Resources of National Significance	None	None present of national significance

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<sup>1/</sup> High - Must be considered in the analysis of alternatives  
Medium - May be affected by some alternative solutions  
Low - Consider, but not too significant  
None - Need not be considered in analysis

## FORMULATION OF ALTERNATIVES

### Formulation Process

The overall objective of the project is the reduction of floodwater damages in the watershed. Specific project goals were identified in terms of three co-equal planning objectives: National Economic Development (NED) - increased production of goods and services; Environmental Quality (EQ) - enhancement of physical, ecological, and aesthetic characteristics; and Other Social Effects (OSE) - improvement of the social well-being for all who use the watershed.

An initial study was made by representatives of the SCS and the sponsors to determine watershed resource problems and potentials, identify basic goals, and examine possible solutions. Preliminary goals were established through public involvement, with technical input from State and other Federal agencies and resource inventories and evaluation.

The goals reflect the assistance available under provisions of Public Law 566. The following is a listing of the goals:

<u>Objective</u>	<u>Goal</u>
NED	1. Eliminate or reduce substantially average annual flood damages to urban property in the flood plain.
	2. Obtain a reduction in average annual flood damages to agricultural flood plain lands.
	3. Increase public funds available for community services by elimination or substantial reduction of urban flood damages.
	4. Provide opportunities for public water-based recreation for Cleburne and vicinity.
	5. Provide opportunities for municipal and industrial water supply.
OSE	6. Leave no apparent risk to loss of life from the 100-year frequency flood in any building in the flood hazard area.
	7. Improve community environment and social well-being of flood plain residents by reducing overbank flooding in the urban area.
EQ	8. Reduce the potential for health problems from diseases and vectors caused by flooding in the urban area.

As planning progressed, it became apparent that not all of the project goals could be addressed. Reducing average annual flood damages to urban property and agricultural flood plain lands has continued to be the

primary NED goals expressed by the sponsors. Investigations during planning activities revealed that recreation as a project goal was not feasible because of the lack of a suitable site location. The proposed location for a floodwater retarding structure is not conducive to recreation because of topography (no additional storage available). Sufficient opportunities for public water-based recreation are available to watershed and area residents nearby at Lake Pat Cleburne, Cleburne State Park, Lake Granbury, and Lake Whitney. In addition, there are opportunities provided by the city of Cleburne in the city park system. Provisions for adding municipal and industrial water storage were eliminated from consideration after a cursory analysis indicated that no additional storage is available.

The Water Resources Council has mandated that agencies formulate and identify alternatives that maximize contributions to the NED, EQ, and OSE objectives. Additionally, one of the alternatives must be a primarily nonstructural solution. Therefore, alternatives considered during detailed plan formulation were those which would satisfy goals identified by the sponsors and public for NED, EQ, and OSE. The use of different structural and nonstructural measures in combination to satisfy goals serves as the basis for formulating alternatives and candidate plans and is presented in the Summary of Project Formulation (page 13). The available measures consisted either singularly or in combinations of the following: floodwater retarding structure, dike(s), channel work, clearing and snagging, permanent evacuation, and floodproofing.

Formulation of a separate alternative which would maximize contributions to the EQ and OSE objectives was not possible. It was recognized that a structural measure would be necessary to reduce floodwater damages to urban and agricultural flood plains. By reducing flood damages, the major EQ and OSE goals of improving community environment and reducing the potential for health problems were accomplished.

#### Evaluation of Alternatives

Using available measures, seven alternatives were formulated as the basis for project action. Each alternative was formulated to meet four tests: Completeness, effectiveness, efficiency, and acceptability. All reasonable considerations were given to the widest practical range of alternative plans. Of the seven alternative plans, only two (including no action) were identified as candidate plans. The other alternatives investigated failed to provide net benefits in excess of cost or were impractical to implement and offered no overriding environmental or other social effects. It is from the candidate plans that a recommended plan is selected for approval and implementation or a decision is made to take no action.

The two candidate plans consistent with remaining goals and developed from available measures are described below. An incremental analysis was used to identify the alternative that produced the greatest net benefits. Economic, environmental, and social impacts recognized to be of greatest significance to decisionmaking are presented in the tabulation, Summary and Comparison of Candidate Plans (page 14). Alternative solutions developed from expressed project goals are as follows:

Alternative 1 - This alternative consists of a floodwater retarding structure installed on West Fork of Buffalo Creek just above the urban area (Appendix C, Project Map). Installation of this alternative would substantially reduce, but not eliminate, flood damages in the urban area. Flooding would still occur to 29 properties from the 100-year flood. With the project installed, no apparent risk to loss of life from the 100-year flood would remain in any residence, building, or other improvement.

Alternative 2 - This alternative consists of foregoing the implementation of a project. Flooding would continue on urban and built-up lands, agricultural lands, and the transportation system. The need to commit land for construction and operation and maintenance activities with resultant adverse impacts would be eliminated.

During the preauthorization planning phase, five other alternatives were examined to determine the full range of possible solutions.

The third alternative consists of clearing and snagging in selective areas on about 3.3 miles of channel. The affected area extends from the confluence with East Fork of Buffalo Creek to a point upstream of the road crossing of State Highway 171. Implementation of this measure would remove the major obstructions in the channel that impede flow. Flood damages would be reduced, but not eliminated. The apparent risk to loss of life from the 100-year flood would remain. Damages would still occur to the transportation and utility systems and agricultural land. This alternative failed to produce economic benefits in excess of costs.

The fourth alternative consists of nonstructural treatment of those properties that are economically feasible to treat. The planned treatment is permanent evacuation of eight residential properties and floodproofing six other properties, four residential and two commercial. Damages from flooding would continue to be a problem in the remaining 222 urban properties. Damages would still occur to the transportation and utility systems and agricultural land. The apparent risk to loss of life from the 100-year flood would remain in many flooded properties. This alternative was impractical to implement because only a small number of the total properties flooded could be protected.

The fifth alternative would provide protection and flood damage reduction by construction of the same floodwater retarding structure as described for alternative 1. The flood plain properties with remaining flood damages were investigated to receive either nonstructural or structural treatment such as permanent evacuation, floodproofing, channel work, clearing and snagging, or dikes. An analysis of costs indicated that any additional treatment would not be economically feasible for the properties involved.

The sixth alternative consists of channel work on West Fork of Buffalo Creek from a point beginning upstream of Highway 171 downstream to the confluence with East Fork of Buffalo Creek, a distance of about three miles. Channel work through the urban area of Cleburne would involve modification or relocation of at least 15 bridges or crossings and about the same number of public utilities. Two sizes of channel were considered, the first providing 100-year protection and the second providing 25-year protection. The design for the 25-year channel was narrower with less landrights and construction costs than the 100-year channel design. Because anticipated flow velocities exceeded the safe limits for vegetated earthen channels, armor plating with rock riprap or similar protection was considered in cost estimates. The estimated average annual cost exceeded the average annual benefits, thus ruling out this solution as a candidate plan.

The seventh alternative investigation for solving the identified flooding problems was a dike system through the urban area. Dike(s) would be built parallel to the channel of West Fork of Buffalo Creek. The system would confine and convey floodwater through the affected urban area of Cleburne. Implementation of this plan would require substantial landrights and relocation of many homes and businesses. The dike system would provide protection in the urban area, but agricultural land would continue to flood. An analysis of this plan failed to produce benefits in excess of costs.

#### Risk and Uncertainty

One area of sensitivity in each of the candidate plans involved the projection of future value of residential contents. Using OBERS regional growth rate for per capita personal income as the basis, increases in residential contents damages were accounted for. These increases were based on the assumption that residential contents values will increase in the future proportionately as per capita personal income increases. Increases in residential contents damages were computed only through project year 35, or the year 2020 (the extent of OBERS projections).

Another area of sensitivity is project feasibility based upon projections. All of the candidate plans are feasible under existing conditions. The risk and uncertainty of projections does not affect project feasibility.

#### Rationale for Plan Selection

Recommended plan selection was made from the two candidate plans (alternatives 1 and 2) previously discussed. The sponsors considered the merits and adverse effects of each and chose alternative 1 as the recommended plan. Of the two alternatives, only alternative 1 was acceptable to both the sponsors and SCS.

The "Summary and Comparison of Candidate Plans (page 14) presents impacts of each alternative to major planning objectives and environmental concerns. An analysis of the tabulation indicates the following rationale:

Alternative 1 (NED plan) provides a significant reduction to urban damages and complements the goals expressed for EQ and OSE.

Alternative 2 does not achieve any of the expressed goals and is not acceptable to the sponsors.

SUMMARY OF PROJECT FORMULATION

	Goals 1/							
	1. Reduce : average annual flood; damages to urban property	2. Reduce : average annual flood; damages to agricultural lands	3. Increase : public funds; available for recreation; community services	4. Provide : opportunities for recreation; water supply	5. Provide : opportunities for water supply	6. Leave no apparent risk to life and well-being	7. Improve : community environment; and social well-being	8. Reduce : the potential for health problems
<b>CANDIDATE PLANS</b>								
<u>(economically feasible)</u>								
No. 1 - Floodwater Retarding Structure	+	+	+	-	-	+	+	+
No. 2 - No Action	-	-	-	-	-	-	-	-
<b>ALTERNATIVES</b>								
<u>(economically non-feasible)</u>								
No. 3 - Clearing and Snagging Channel	+	-	+	-	-	-	+	+
No. 4 - Partial Permanent Evacuation and Floodproofing	-	-	-	-	-	-	-	-
No. 5 - Floodwater Retarding Structure and Additional Treatment for 29 Properties	+	+	+	-	-	+	+	+
No. 6 - Channel Work	+	-	+	-	-	+	+	+
No. 7 - Dike(s)	+	-	+	-	-	+	+	+

(+) Meets goal  
 (-) Does not meet goal

1/ For a more detailed listing of goals refer to narrative of this document  
 2/ Relates to 100-year frequency flood in every building in flood hazard area

Summary and Comparison of Candidate Plans

		Anticipated Effects	
Economic and Environmental Factors	Goal (Desired Effects)	Alternative 1 Recommended Plan	Alternative 2 <u>1/</u>
Average Annual Flood Damage Reduction (Percent)			
Urban	Maximize	96.2	-
Agriculture	Maximize	100	-
Total Cost (\$)			
Public Law 566		1,622,500	-
Other (Local)		998,900	-
		623,600	-
Average Annual Cost (\$)		<u>4/</u> 134,040	-
Projected Average Annual Damage Reduction Benefits (\$)		188,140	-
Projected Average Annual Net Benefits (\$)		54,100	-
Risk to Loss of Life <u>6/</u>	Eliminate	Eliminate	No Effect
Floodwater Damage on Prime Farmland	Reduce	Eliminate	No Effect
Community Environment and Social Well-Being	Improve	Improve	No Effect
Potential for Health Problems	Reduce	Reduce	No Effect

1/ No action - future without project

2/ Price Base: 1981 prices

3/ 100 years at 7.625 percent interest plus operation, maintenance and replacement

4/ Includes compound interest at the current discount rate (7.625 percent) during installation period

5/ Benefits evaluated from damages resulting from floods up to and including a 100-year frequency flood for agriculture and 500-year frequency flood on urban areas.

6/ 100-year frequency flood

## RECOMMENDED PLAN

### Plan Elements

The recommended plan element consists of one floodwater retarding structure to be installed during a two-year installation period. Location of the structural measure is presented on the Project Map (Appendix C). Details on quantities, cost, and design are presented on Tables 1, 2, and 3.

#### Floodwater Retarding Structure

The floodwater retarding structure will be an earth dam with a principal spillway and plunge basin, emergency spillway, a sediment pool, and a floodwater retarding pool (Appendix B, Figure 2). This structure will retard 5.03 inches of runoff from 7.08 square miles of drainage area. Total capacity will be 2,494 acre-feet, of which 1,901 acre-feet will be for floodwater retardation and 593 acre-feet will be for sediment storage. The structure is designed to store both aerated and submerged sediment. The structure will detain the runoff from a storm having a predicted recurrence interval of once in every 100 years (one percent chance).

Crest of the principal spillway will be installed at the elevation of the 100-year sediment pool.

Water in the sediment pool at the lowest ungated outlet will occupy 57 acres. The floodwater detention pool will cover 368 acres at the elevation of the emergency spillway. The floodwater retarding structure will require 139 acres of easement for the dam and emergency spillway and an additional 400 acres for temporary and permanent water impoundment.

#### Embankment Classification

Classes of Dams. Dams (floodwater retarding structures) are classified according to the potential hazard to life and property should the dam suddenly breach or fail. Existing and future flood plain development, including controls for future development, must be considered when classifying the dam. The classification of a dam is determined only by the potential hazard from failure, not by the criteria used in design of the dam.

Class (a) - Dams located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.

Class (b) - Dams located in predominantly rural or agricultural areas where failure may damage isolated homes, main highways, or minor railroads or cause interruption in service of relatively important public utilities.

Class (c) - Dams located where failure may cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads.

Hazard Classification of Structural Measures. The recommended structural alternative for West Fork of Buffalo Creek Watershed consists of a class (c) floodwater retarding structure. The floodwater retarding structure is class (c) due to its proximity to the urban area and the damage it would inflict if breached.

A map delineating the area inundated by a breach of the dam is available from SCS.

#### Design and Construction Prerequisites

There are no active faults known in the watershed vicinity. The Algermissen Seismic Risk Map (based on the distribution of recorded damaging earthquakes) shows this area of Texas to be located within Zone 0, which is defined as having no reasonable expectancy of earthquake damage. Therefore, seismic activity was not a consideration in floodwater retarding structure design.

The minimum landrights required will be those necessary to construct, operate, maintain, and inspect all structural measures. Installation may require changes in location or modification of known existing facilities as follows:

Floodwater Retarding Structure No. 1 - Stock ponds, barns, water well, power lines, buried telephone cables, fences, shed, and a county road.

Sanitary facilities intended for use by construction workers will be provided in conformance with Federal, State, and local water pollution control regulations. Special provisions in the construction contract will be incorporated by reference to Occupation Safety and Health Administration (OSHA) Part 1926, Construction Standards and Interpretations, and with SCS Supplement to Part 1926. Further, the contractor will be required to comply with Section 114 of the Air Act, as amended (42 U.S.C. 1985 et seq.) and Section 308 of the Water Act, as amended (33 U.S.C. 1251 et seq.).

All applicable State laws will be complied with in the design and construction of the structural measures. Construction contracts will require contractors to adhere to strict standards controlling soil erosion and water and air pollution during construction. Measures to control erosion will be specified at the work site and will include, as applicable, use of temporary vegetation, mulches, diversions, mechanical retardation of runoff, and sediment traps. Harmful dust and other pollutants inherent to the construction process will be held to minimum practical limits. Provisions will be made to protect against pollutants such as fuel, lubricants, and chemicals. Clearing and disposal of brush and vegetation will be carried out in accordance with applicable laws, ordinances, and regulations.

The emergency spillway will be cut below finished grade, backfilled with topsoil, and vegetated for protection from erosion. Similarly, the embankment and areas where vegetation is destroyed during construction and not subsequently inundated by impoundment in the sediment pool will be vegetated immediately after construction. A combination of multiple-use plants, adapted to prevailing conditions and effective for erosion control and wildlife food and cover, will be established. These plantings will be sited and planned in detail during the final design stage in consideration of specific site conditions. The selection of exact species to be used will be from seed and plant stock available at the time of construction.

### Wildlife Compensation

Habitat losses attributable to installation of the structural measure will be compensated for by fencing areas adjacent to and including the dam and emergency spillway and managing for wildlife. Additional wildlife benefits will include the use of multiple-purpose vegetative plantings on disturbed areas. The management will consist of restricting livestock grazing unless it is determined by SCS biologists that limited grazing is desirable for wildlife.

### Permits and Compliance

No Federal permits will be required for implementation of the recommended plan. The recommended plan is in full compliance with applicable Federal policies and statutes. Compliance with the Water Resource Council's designated environmental statutes is summarized in the following tabulation:

Compliance of the Recommended Plan with  
WRC - Designated Environmental Statutes

<u>Federal policies</u>	<u>Compliance 1/</u>
Archeological and Historic Preservation Act, 16 U.S.C. 469 et seq.	Full Compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7 et seq.	Full Compliance
Clean Water Act (Federal Water Pollution Control Act) 33 U.S.C. 1251 et seq.	Full Compliance
Coastal Zone Management Act, 16 U.S.C. 1451 et seq.	Not Applicable
Endangered Species Act, 16 U.S.C. 1531 et seq.	Full Compliance
Estuary Protection Act, 16 U.S.C. 1221 et seq.	Not Applicable
Federal Water Project Recreation Act, 16 U.S.C. 460-1(12) et seq.	Not Applicable
Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq.	Not Applicable
Land and Water Conservation Fund Act, 16 U.S.C. 460/-460/-11 et seq.	Not Applicable
Marine Protection, Research and Sanctuary Act, 33 U.S.C. 1401 et seq.	Not Applicable
National Environmental Policy Act, 42 U.S.C. 4321 et seq.	Full Compliance
National Historic Preservation Act, 16 U.S.C. 470a et seq.	Full Compliance
Rivers and Harbors Act, 33 U.S.C. 403 et seq.	Not Applicable
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001 et seq.	Full Compliance
Wild and Scenic Rivers Act, 16 U.S.C. 1271 et seq.	Not Applicable

- 1/ a. Full Compliance. Having met all requirements of the Statute for the current stage of planning (either preauthorization or postauthorization.)  
 b. Not Applicable. No requirements for the statute required compliance for the current stage of planning.

### Installation Costs

Total project cost of the measure is estimated to be \$1,622,500, of which \$998,900 will be borne by Public Law 566 funds and \$623,600 will be borne by other funds (Table 1). Cost-sharing arrangements relative to installation are presented in the WATERSHED AGREEMENT and in Table 2 of this document.

Public Law 566 costs include \$827,600 for construction, \$50,480 for engineering services, and \$120,820 for project administration. Local costs include \$619,600 for landrights (\$512,000 for land values; \$104,600 for stock ponds, barns, water well, powerlines, buried telephone cables, fences, shed, and a county road; and \$3,000 for legal fees), and \$4,000 for project administration.

The construction cost estimate was based on the unit cost of structural measures in similar areas modified by special conditions inherent to the site locations. Ten percent of the estimate was added as a contingency to provide funds for unpredictable construction costs. Engineering services cost consists of, but is not limited to, detailed surveys, geologic investigations, laboratory analysis, reports, designs, and cartographic services. The SCS and the City will each pay the administrative cost which they incur. Those costs shown in the plan represent preliminary estimates. Public Law 566 project administration costs consist of construction inspection, contract administration, and maintenance of the SCS State Office records and accounts. Other costs for project administration include the City's cost related to contract administration overhead and organization administrative costs and construction inspection they may desire to make at their own expense. In finally determining the costs to be borne by each party, the actual costs incurred by the installation of the measure will be used.

The values of landrights used in the plan were determined by representatives of the sponsors.

### Economic Benefits

The total average annual benefits from projected flood damage reduction are \$188,140 (Table 5). The total average annual cost of the structural measure (amortized total installation and project administration costs including compound interest during the installation period, plus operation, maintenance, and replacement) is \$134,040 (Table 4). This results in a benefit-cost ratio of 1.4:1.0 with projected conditions (Table 6).

The average annual benefits without projections are \$159,530. The benefit-cost ratio would be 1.2:1.0.

### Installation and Financing

The following is the estimated schedule of obligations for a two-year installation period:

Fiscal Year :	Item	Public Law : 566 Funds :	Other : Funds :	Total :
		(dollars)	(dollars)	(dollars)
First	Acquisition of Landrights	-	619,600	619,600
	Engineering Services			
	(Surveys and Designs)	50,480	-	50,480
	Project Administration	3,890	2,000	5,890
	Subtotal	54,370	621,600	675,970
Second	Construction of Floodwater			
	Retarding Structure	827,600	-	827,600
	Project Administration			
	(Construction Inspection)	49,660	2,000	51,660
	(Other)	67,270	-	67,270
	Subtotal	944,530	2,000	946,530
<b>TOTAL</b>		<b>998,900</b>	<b>623,600</b>	<b>1,622,500</b>

This schedule may be changed to conform with appropriations, accomplishments, and any mutually desirable changes between the sponsors and SCS.

Watershed assessments indicate that 63 percent of the land above the planned floodwater retarding structure is adequately protected against soil erosion and that the ongoing program of land treatment will maintain this level of protection.

Acquisition of landrights will be completed during the first year of a two-year installation period and the floodwater retarding structure will be constructed during the second year. Vegetation on disturbed areas will be established during the second year.

Technical assistance will be provided by the SCS in preparation of plans and specifications, construction inspection, preparation of contract payment estimates, final inspection, execution of certificate of completion, and related tasks necessary to install the structural measure.

The City will represent the sponsors in coordination with the SCS on matters concerning construction of the floodwater retarding structure and will have the following responsibilities:

1. Obtain the necessary landrights.
2. Provide for any needed changes in location or modification of stock ponds, barns, water well, power lines, buried telephone cables, fences, shed, a county road, and other similar structural features.
3. Determine and certify legal adequacy of easements and State permits for construction of the floodwater retarding structure.

Landrights for the structural measure are to be secured before any construction begins. Project installation will begin when the plan is approved for operations.

The sponsors have requested the SCS to administer the contracts.

Under present conditions there will be no apparent displacements or relocations of persons, businesses, or farm operations as a result of installation of the structural measure. If relocations or displacements become necessary, they will be carried out under the provisions of Public Law 91-646, Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

The floodwater retarding structure will be installed pursuant to the following conditions:

1. Certification that land treatment requirement in the drainage area of the floodwater retarding structure has been satisfied.
2. All needed landrights and State permits have been obtained.
3. Project agreements have been executed.
4. Operation and maintenance agreements have been executed.
5. Flood plain management regulations will continue in effect.

The structural measure will not affect any known archeological sites. The State Historic Preservation Officer has concurred with the findings of the archeological surveys.

If previously unidentified evidence of significant cultural values is discovered prior to or during construction, the procedures in Public Law 93-291 will be followed. There will be no change in the existing responsibilities of the SCS under Executive Order 11593. Mitigation will be accomplished as set forth in Title 7, Code of Federal Regulations, Part 656, "Procedures for the Protection of Archeological and Historical Properties Encountered in SCS-assisted Programs."

Funds allocated under Public Law 566 for financial and technical assistance are contingent upon the fulfillment of applicable laws and regulations and availability of appropriations for this purpose.

Funds for the local share of the installation of the floodwater retarding structure will be provided by the City through existing tax revenues. Operation and maintenance funds will be provided from the general fund of the City. Each year the City will budget sufficient funds for its responsibility.

The sponsors have the financial ability to carry out their responsibilities of project installation and operation and maintenance.

### Operation and Maintenance

The City will assume responsibility for operation and maintenance of the measure upon completion of its installation. This responsibility shall continue throughout the actual life of the installed project measure or as required by local, State, or Federal regulations or laws. The estimated cost of operation and maintenance (O&M) for the proposed measure is estimated to be \$6,310 annually.

Sponsors will secure easements that will provide for unrestricted access by their representatives and SCS for inspection and operation and maintenance in accordance with the O&M agreement.

The sponsors will maintain a record of all maintenance inspections, maintenance applied, and the cost of such maintenance and have it available for inspection by SCS personnel. Also, the sponsors are responsible for maintaining any other records required by local, State, or Federal regulations or laws.

The installed structural measure will be inspected by a qualified engineer at initial filling, after major storms, and annually for the first three years after construction. A safety inspection will be made periodically by a qualified engineer in conformance with legal requirements and/or requirements set forth in the O&M agreement. The SCS will participate only to the extent of furnishing technical assistance as resources permit. The City or its representative will perform promptly all maintenance of the structure as needed, including that required to prevent soil erosion and water pollution.

A vegetative cover will be established to protect the floodwater retarding structure from erosion and for wildlife habitat. Fertilization and noxious weed control will be carried out to maintain a desirable cover. As a wildlife compensation measure, grazing by domestic livestock will be restricted unless it is determined by SCS biologists that limited grazing is desirable for wildlife and species composition.

The city of Cleburne will be responsible for development of an emergency action plan to be used in the event of a project failure. A specific operation and maintenance agreement will be prepared for the measure and will be executed prior to signing a project agreement. The operation and maintenance agreement will include a detailed plan for operation and maintenance and specific provisions for retention and disposal of property acquired or improved with Public Law 566 financial assistance. The agreement will set forth specific details on procedures in line with recognized assignments of responsibility and will be in accordance with SCS technical specifications.

**TABLE 1 - ESTIMATED INSTALLATION COST**

**West Fork of Buffalo Creek Watershed, Texas**

<u>Installation Cost Item</u>	<u>Unit</u>	<u>Estimated Cost (Dollars) <sup>1/</sup></u>			<u>Total</u>
		<u>Public Law</u>			
		<u>Number</u>	<u>566 Funds</u>	<u>Other</u>	
		<u>Non-Federal</u>	<u>Non-Federal</u>	<u>Non-Federal</u>	
		<u>Land</u>	<u>Land</u>	<u>Land</u>	
<b><u>STRUCTURAL MEASURES</u></b>					
Floodwater Retarding Structure	No.	1	998,900	623,600	1,622,500
<b>TOTAL PROJECT</b>			<b>998,900</b>	<b>623,600</b>	<b>1,622,500</b>

**1/ Price Base: 1981**

**September 1982**

**TABLE 2 - ESTIMATED COST DISTRIBUTION  
STRUCTURAL AND NONSTRUCTURAL MEASURES**

West Fork of Buffalo Creek Watershed, Texas

(Dollars) 1/

Item	Installation Costs			Installation Costs			Total		
	Construction	Engineering	Project Administration	Construction	Engineering	Project Administration			
No. 1	827,600	50,480	170,820	998,900	-	619,600	4,000	623,600	1,622,500
TOTAL	827,600	50,480	170,820	998,900	-	2,619,600	4,000	623,600	1,622,500

1/ Price Base: 1981

2/ Includes \$512,100 for land values, \$82,600 for modification or relocation of power or telephone lines, \$15,000 for relocation of county road, \$5,000 for stock ponds, \$7,000 for fence relocation or modification, and \$3,000 for legal fees.

September 1982

**TABLE 3 - STRUCTURAL DATA - DAM**

West Fork of Buffalo Creek Watershed, Texas

Item	Unit	Structure	
		Number	Total
Class of Structure		C	xxx
Seismic Zone		0	xxx
Total Drainage Area	Sq. Mi.	7.08	7.08
Runoff Curve No. (1-day) (AMC I+5(II-I))		74	xxx
Time of Concentration (T <sub>c</sub> )	Hrs.	3.26	xxx
Elevation Top of Dam	Ft.	842.7	xxx
Elevation Crest Emergency Spillway	Ft.	834.7	xxx
Elevation Crest High Stage Inlet	Ft.	826.2	xxx
Elevation of Lowest Ungated Outlet	Ft.	822.3	xxx
Emergency Spillway Type		veg.	xxx
Emergency Spillway Bottom Width	Ft.	380	xxx
Emergency Spillway Exit Slope	Ft./Ft.	.022	xxx
Maximum Height of Dam	Ft.	35	xxx
Volume of Fill	Cu. Yd.	282,000	282,000
Total Capacity <u>1/</u>	Ac. Ft.	2,494	2,494
Lowest Ungated Outlet <u>2/</u>	Ac. Ft.	200	200
Sediment Submerged	Ac. Ft.	552	552
Sediment Aerated	Ac. Ft.	41	41
Floodwater Retarding	Ac. Ft.	1,901	1,901
Surface Area			
Lowest Ungated Outlet	Acres	57	57
Sediment Pool	Acres	118	118
Floodwater Retarding Pool <u>1/</u>	Acres	368	368
Principal Spillway Design			
Rainfall Volume (1-day)	In.	9.50	xxx
Rainfall Volume (10-day)	In.	13.60	xxx
Runoff Volume (10-day)	In.	9.18	xxx
Capacity of High Stage (Max.)	cfs	287	xxx
Dimensions of Conduit	In. Diam.	48	xxx
Frequency Operation-Emergency Spillway <u>3/</u>	% chance	1.0	xxx
Emergency Spillway Hydrograph			
Rainfall Volume	In.	12.90	xxx
Runoff Volume	In.	9.47	xxx
Storm Duration	Hrs.	6.0	xxx
Velocity of Flow (V <sub>s</sub> )	Ft./Sec.	4.85	xxx
Max. Reservoir Water Surface Elevation	Ft.	837.2	xxx
Freshet Hydrograph			
Rainfall Volume	In.	30.00	xxx
Runoff Volume	In.	26.16	xxx
Storm Duration	Hrs.	6.0	xxx
Max. Reservoir Water Surface Elevation	Ft.	842.1	xxx
Discharge Per Foot of Width (Q <sub>s</sub> /b)	Ac. Ft.	18.7	xxx
Bulk Length	Ft.	880	xxx
Capacity Equivalents			
Sediment Volume	In.	1.57	xxx
Floodwater Retarding Volume	In.	5.03	xxx

- 1/ Crest of emergency spillway  
2/ Capacity included in sediment submerged  
3/ Based on volume-duration-probability data

TABLE 4 - ANNUAL COST

West Fork of Buffalo Creek Watershed, Texas  
(Dollars) 1/

Evaluation Unit	Amortization	Operation, Maintenance, and Replacement	Total
	of Installation Cost <u>2/ 3/</u>	Cost	
Floodwater Retarding Structure No. 1	127,730	6,310	134,040

1/ Price Base: 1981

2/ 100 years at 7.525 percent interest.

3/ Includes compound interest at the current discount rate (7.525 percent) during installation period.

September 1982

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

West Fork of Buffalo Creek Watershed, Texas

(Dollars) 1/ 2/

Item	: Estimated Average Annual Damage :		: Damage : Reduction : Benefits
	: Without : Project	: With : Project	
Floodwater			
Crop and Pasture	280	0	280
Nonagricultural			
Railroad	200	0	200
Automobiles	1,980	0	1,980
Streets and Utilities	1,060	0	1,060
Urban			
Residential Property <u>3/</u>	150,430	6,880	143,550
Commercial Property	29,080	260	28,820
Public Property	12,560	310	12,250
<b>TOTAL</b>	<b>195,590</b>	<b>7,450</b>	<b>188,140</b>

1/ Price Base: Crop and pasture damages September 1980 current normalized prices, all other 1981.

2/ Evaluation of damages resulting from floods up to and including a 500-year frequency flood on urban areas and 100-year frequency flood for all others.

3/ Includes projections.

September 1982

**TABLE 6 - COMPARISON OF BENEFITS AND COSTS**

West Fork of Buffalo Creek Watershed, Texas

(Dollars)

Evaluation Unit	: AVERAGE ANNUAL BENEFITS <u>1/</u> :		Average	:
	: Damage	: Reduction	: Annual	: Benefit
	: <u>2/ 3/</u>	:	: <u>4/</u>	: Cost
				: Ratio
Floodwater Retarding Structure No. 1	188,140		134,040	1.4:1.0

1/ Price Base: Crop and pasture September 1980 current normalized prices, all other 1981.

2/ From Table 5

3/ Damage reduction benefits for existing conditions are \$159,530. Benefit cost ratio for existing conditions is 1.2:1.0.

4/ From Table 4

September 1982

## EFFECTS OF RECOMMENDED PLAN

A broad range of environmental, economic, and social factors were considered during the environmental assessment process. Areas of potential impact were evaluated and an analysis made of the significance of the impact to decision-making (INVENTORY AND FORECASTING, page 12).

The effects of the recommended plan are presented in the following discussion. Appropriate baseline data has been included to establish needed perspective.

### Flood Prevention

Installation of the recommended structural measure will achieve the project objective of flood damage reduction. The recommended plan will prevent flooding from the 100-year frequency flood originating from West Fork of Buffalo Creek to all but 29 existing urban properties in Cleburne. It will leave no apparent risk to loss of life in any building in the flood hazard area from the 100-year storm event. It will directly benefit four owners and operators of agricultural land in the flood plain. Average annual flooding will be reduced from 143 acres to 14 acres.

The recommended plan will substantially reduce flood damages on 142 acres of agricultural land, of which 118 acres are prime farmland. Remaining flood damages to agricultural land are very minimal and considered insignificant on an average annual basis.

The 500-year flood plain without project conditions consists of approximately 373 acres, 354 acres of which are of urban and built-up land. With project, the 500-year flood plain will consist of approximately 188 acres of urban and built-up land.

Population data limited to the 500-year flood plain is not available. An essential service in the affected area of Cleburne is the city municipal building. This building will flood from the 500-year frequency event, with and without project conditions.

Without the project, the 500-year frequency flood would produce maximum water depths of approximately 7.6 feet and average flood plain velocities of 1.3 feet per second in a building. With the project, the same flood would produce maximum water depths of 3.8 feet and average flood plain velocities of 0.9 feet per second in the urban area in a building.

Debris content from the 500-year flood without the project consists of pavement, trees and brush, silt and sediment, etc. Debris content with the project will consist of similar items; however, the total amount should be less since the anticipated depths and velocities would not be as great.

If the recommended plan had been installed at the time of the 1979 flood and with existing conditions, acres flooded would have been reduced from 346 acres to 67 acres, a reduction of 80.7 percent. Area inundated in each evaluation reach without and with the project by various frequency floods are presented in the following tabulation:

Area Inundated by Selected Recurrence Intervals (Acres)

Evaluation: Reach <u>1/</u>	Recurrence Interval							
	5-Year		25-Year		50-Year		100-Year	
	: Without Project	: With : Recom- mended Plan						
1 <u>2/</u>	99	10	209	61	237	94	273	122
2	81	5	137	6	154	7	167	7
<b>Total</b>	<b>180</b>	<b>15</b>	<b>346</b>	<b>67</b>	<b>391</b>	<b>101</b>	<b>440</b>	<b>129</b>

1/ Project Map

2/ Without Project: Acres flooded by 500-year frequency storm = 373  
 With Recommended Plan: Acres flooded by 500-year frequency storm = 188

The average annual area inundated in each evaluation reach without and with the project is presented in the following tabulation:

Evaluation: Reach <u>1/</u>	Average Annual Area Inundated (Acres)		
	Without Project	With Recommended Plan	Reduction
1	58	11	81.0
2	85	3	96.5
<b>Total</b>	<b>143</b>	<b>14</b>	<b>90.2</b>

1/ Project Map

Urban properties inundated without project (W.O.P.) and with recommended plan (W.R.P.) by various frequency floods is presented in the following tabulation:

Urban Properties Flooded Without Action (W.O.A.) and  
With Recommended Plan (W.R.P.) by Selected Recurrence Intervals  
and Various Depth Increments

Depth (ft.)	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
	:W.O.A.:W.R.P.:	:W.O.A.:W.R.P.:	:W.O.A.:W.R.P.:	:W.O.A.:W.R.P.:	:W.O.A.:W.R.P.:	:W.O.A.:W.R.P.:
<u>Residential</u>						
0-1	19	-	38	-	45	8
1.1-2	-	13	-	38	47	-
2.1-3	-	1	-	13	31	-
3.1-4	-	-	-	1	9	-
4.1-5	-	-	-	-	1	-
5.1-6	-	-	-	-	-	-
6.1-7	-	-	-	-	-	-
7.1-8	-	-	-	-	-	-
Subtotal	19	52	-	102	133	8
					171	25
					284	92
<u>Commercial</u>						
0-1	1	-	6	-	16	-
1.1-2	-	2	-	6	16	-
2.1-3	-	-	-	1	4	-
3.1-4	-	-	-	1	1	-
4.1-5	-	-	-	-	1	-
5.1-6	-	-	-	-	-	-
6.1-7	-	-	-	-	-	-
7.1-8	-	-	-	-	-	-
Subtotal	1	8	-	27	38	-
					55	3
					76	18
<u>Public</u>						
0-1	1	-	2	-	3	-
1.1-2	-	-	-	2	3	-
2.1-3	-	-	-	-	2	-
3.1-4	-	-	-	-	3	-
4.1-5	-	-	-	-	2	-
5.1-6	-	-	-	-	-	-
Subtotal	1	2	-	5	8	-
					10	1
					14	5
TOTAL	21	62	0	134	179	8
					236	29
					374	115

### Visual Resources

The construction site for the floodwater retarding structure is in a rural area characterized by gently rolling hills with a vegetative cover of mainly coastal bermudagrass. The structure, when completed, will be visible from State Highway 171, an infrequently traveled county road, and at least four residences. The viewshed from all residences and the highway will be changed slightly from open fields of coastal bermudagrass to include a dam with similar vegetation. Visibility from these vantage points will be impacted only slightly.

Visual aspects of the watershed may be enhanced, deteriorated, or unchanged, depending upon the personal observation and feeling of the viewer. However, the presence of a body of impounded water may give the observer an esthetically pleasing feeling. The observance of pleasing sights and sounds serve to promote a tranquil atmosphere and enhance a quality environment.

### Water and Air Resources

A maximum initial reduction in average annual runoff of 134 acre-feet is expected because of evaporation from the sediment pool of the floodwater retarding structure. Average annual volume of watershed runoff will be reduced from 2,210 acre-feet to 2,076 acre-feet, or about six percent. This initial water loss will be reduced as sediment accumulates in the sediment pool over the life of the project.

Installation of the floodwater retarding structure will cause a change in the flow regime. During periods of runoff, the depth, velocity, and duration of out-of-channel flows will be reduced downstream from this structure. The duration of the low flows will be increased. This change in flow regime will reduce downstream flooding and associated flood damages.

The structure is designed to store a total of 593 acre-feet of sediment during a 100-year period. Presently, there are no major pollution sources which drain directly into the structure. Functioning of the structure should have a slight effect on downstream water quality by reducing sediment concentration in floodwaters. The quantity and timing of water passing the structure will be changed slightly.

Installation and functioning of the floodwater retarding structure is not expected to have an appreciable impact on ground water.

The construction site is in a rural area. During construction of the structural work of improvement, air and water pollution will increase slightly from dust and sediment inherent to the construction process. There will be an increase in pollutants such as dust and chemicals from equipment exhausts during these phases. During the project installation period, it may be possible to record some increases in suspended particulates and/or gaseous pollutants caused by construction activities. These increases are local and temporary and will not result in long-term impacts to the surrounding area. Also, there will be an increase in

noise levels as a result of these activities. This increase will be kept within tolerable limits. Noise during construction activities will be a temporary nuisance.

#### Terrestrial and Aquatic Habitat

The impacts on the land use and vegetation in the area of potential disturbance was investigated by biologists from the Texas Parks and Wildlife Department, Fish and Wildlife Service, and Soil Conservation Service. It was agreed by all parties that since the proposed site was comprised primarily of coastal bermudagrass pastures and cropland, significant impacts upon habitat critical to wildlife were not apparent.

Any losses to wildlife habitat attributed to this project will be compensated for by fencing selected areas adjacent to the dam, spillway, and water areas. The protected area will be planted to multiple-purpose herbaceous and woody species and managed for wildlife by controlling grazing.

#### Endangered Species

In accordance with Section 7 of the Endangered Species Act of 1973 (Public Law 93-205, as amended), the FWS Office of Endangered Species (OES) was requested to furnish a list of endangered or threatened species that might be affected by project action. The SCS was notified by the FWS OES that no listed or proposed species would be affected by the recommended plan.

#### Cultural Resources

Presently, there are no known locations of historic significance in the watershed that would be affected by installation of the project. The State Historic Preservation Officer has concurred with the findings of the archeological surveys.

#### Economic and Social

With this project installed, the estimated monetary floodwater damages, with existing conditions that would result from a 100-year frequency flood, would be reduced from \$3,080,660 to \$127,660. Under these same conditions, the damages experienced in the May 1979 flood, estimated to be a 25-year event, would have been eliminated. Monetary floodwater damages for each evaluation reach by recurrence intervals are presented in the following tabulation:

Monetary Floodwater Damages

Evaluation:	Recurrence Interval								
	5-Year		25-Year		50-Year		100-Year		
	Without	With	Without	With	Without	With	Without	With	
Reach <u>1/</u>	:Project	:Project	:Project	:Project	:Project	:Project	:Project	:Project	:Project
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
<u>2/</u> 1	57,890	0	1,181,760	0	2,055,240	18,410	3,080,060	127,660	
2	220	0	450	0	510	0	600	0	
<b>Total</b>	<b>58,110</b>	<b>0</b>	<b>1,182,210</b>	<b>0</b>	<b>2,055,750</b>	<b>18,410</b>	<b>3,080,660</b>	<b>127,660</b>	

1/ Project Map

2/ Monetary damages in the urban areas as a result of the 500-year frequency storm would be \$6,082,410 without the project and \$1,014,660 with the project.

The estimated average annual floodwater damages for current conditions will be reduced from \$165,620 to \$6,090, a reduction of 96.3 percent. Total flood damage reduction benefits will be \$159,530. The project is economically feasible under existing conditions. The estimated average annual floodwater damages for projected conditions will be reduced from \$195,590 to \$7,450, a reduction of 96.2 percent. Total flood damage reduction benefits will be \$188,140. Average annual damages and benefits attributed to the structural measure for current and projected conditions are presented in the following tabulation:

Evaluation:	Average Annual Damages and Benefits					
	Current Conditions			Projected Conditions <u>2/</u>		
	Without	With	Benefits	Without	With	Benefits
Reach <u>1/</u>	:Project	:Project	:Benefits	:Project	:Project	:Benefits
	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)
1	165,400	6,090	159,310	195,370	7,450	187,940
2	220	0	220	220	0	220
<b>Total</b>	<b>165,620</b>	<b>6,090</b>	<b>159,530</b>	<b>195,590</b>	<b>7,450</b>	<b>188,140</b>

1/ Project Map

2/ Includes projections of an increase in residential content values only. These projections were computed through year 2020.

Average annual flood damage reduction with the installation of the recommended alternative is presented in the following tabulation:

Average Annual Damage Reduction in Percent				
Evaluation	:	Crop and	:	:
Reach <u>1/</u>	:	Pasture	:	Nonagricultural
				Total
1		100.0		96.2
2		100.0		100.0
<hr/>				
Total		100.0		96.2

1/ Project Map

With the installation of the recommended plan, flooding will occur in 29 buildings. The hazard at low water crossings will be reduced substantially.

With the reduction of flood damages, owners of flood plain properties will have an incentive to improve the properties. Private funds now being used to repair flood damage can be used to raise the standard of living; also the opportunity to shift public funds from flood damage to the investment in schools and other public facilities will be available.

The recommended plan will have no adverse impacts on any minority group.

#### SHORT-TERM USES VS. LONG-TERM PRODUCTIVITY

The long-term habitability and contribution to the economic well-being of the area will be improved with only minimal detriment to a few features of the existing environment. The natural environment of the area will be benefited over that which would exist in the long-term without project action.

#### IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Installation of the measure will require 539 acres of agricultural land, which is comprised of 340 acres of pastureland and 199 acres of cropland.

The floodwater retarding structure will permanently commit 167 acres of prime farmland which is currently used as cropland and pastureland.

The commitment of labor and material resources for installation of the measure will be irretrievable. No other permanent commitment of resources is known to be required for the recommended alternative.

#### CONSULTATION AND PUBLIC PARTICIPATION

The watershed plan was developed in full consultation and cooperation with all interested agencies and individuals. Prior to initiation of planning activities, informational meetings were held with local organizations in Cleburne. It was recognized that favorable public opinion

toward a watershed project was needed before submitting an application for planning assistance to the Texas State Soil and Water Conservation Board. It was also emphasized at these meetings that under the auspices of Public Law 566, a watershed project would be a local endeavor with Federal assistance. The Texas State Soil and Water Conservation Board approved the application with a high priority for planning assistance.

West Fork of Buffalo Creek Watershed application for assistance under Public Law 566, as amended, was authorized for planning by the Administrator of the SCS on September 30, 1981. The SCS State Conservationist of Texas, in his written notification of initiation of plan development, solicited information and comments from numerous Federal, State, and local agencies that might have an interest in the project. Contacts were made with several agencies and individuals to obtain information and assistance during the planning process.

The Fish and Wildlife Service (FWS) and the Texas Parks and Wildlife Department (TP&WD) participated in wildlife surveys of the watershed and furnished reports of findings and anticipated project effects. In addition, a list of endangered species which may inhabit the area was obtained from FWS Office of Endangered Species (OES). The recommended alternative has been reviewed by the SCS to determine the impacts to endangered species in accordance with Section 7 of the Endangered Species Act of 1973 (Public Law 93-205, as amended). The FWS OES has been informed that no impacts will be occasioned to any Federally listed species. The State Historic Preservation Officer has concurred with the findings of archeological surveys. The sponsors provided the North Central Texas Council of Governments with notification of intent to apply for assistance involving Federal funds.

The following Federal agencies were requested to review this document and submit comments and recommendations:

Environmental Protection Agency - Regional office  
Department of the Army - District Engineers office  
Fish and Wildlife Service - Regional and Field offices  
Deputy Assistant General Council, Natural Resource Division, Office of  
General Counsel, USDA  
Forest Service, USDA

The following State and local agencies were requested to review this document and submit comments and recommendations:

Governor of Texas and State Clearinghouse: Budget and Planning Office  
Regional Clearinghouse: North Central Texas Council of Governments.

Responses were received from six agencies, none of which made substantive comments. Copies of all comments received are included in Appendix A.

## LIST OF PREPARERS

### SCS Watershed Planning Staff

Colwick, Allan B. Staff Leader. B.S. Agricultural Engineering, Texas Tech University. Environmental Development, Colorado State University.

Mr. Colwick served as civil and hydraulic engineer, Watershed Planning Staff, for 14 years. He has served as watershed planning staff leader from 1974 to present.

Mr. Colwick is a member of the Soil Conservation Society of America, American Society of Agricultural Engineers, and National Association of Conservation Districts. He is a registered Professional Engineer in Texas.

Baird, F. Charles. Civil Engineer. B.S., Agricultural Engineering, Texas Tech University.

For 11 years Mr. Baird worked in various locations in Texas as agricultural engineer and area engineer. He has experience in irrigation, grade stabilization, drainage, livestock waste management, terracing, and livestock water development. From 1976 to present, he has served as planning engineer on the watershed planning staff.

Mr. Baird is a member of the Soil Conservation Society of America and American Society of Agricultural Engineers. He is a registered Professional Engineer in Texas.

Berry, Buford G. Agricultural Economist. B.S., Agronomy, Louisiana State University.

Mr. Berry has served over 28 years with the Soil Conservation Service at various locations in Louisiana and Texas. He has held positions as an area soil scientist and a soil conservationist on the river basin staff. For the past 15 years he has served as an agricultural economist on the watershed planning staff.

Bircket, Max D. Geologist. B.S., Geology, Oklahoma State University. Environmental Development, University of Georgia.

Mr. Bircket has seven years experience as a microbiology laboratory technician. For the past 12 years he has served as watershed planning staff geologist, working on projects throughout Texas with principal responsibilities concerning erosion, sedimentation, ground water, and engineering geology.

He is a member of the Association of Engineering Geologists.

Bryant, H. Harold. Soil Conservationist. B.F., Forestry/Range Management, Stephen F. Austin State University. M.S., Range Management/Biology, Sul Ross State University. Environmental Development, University of Georgia.

Mr. Bryant served both government and private industry with a broad range of experience in environmental sciences prior to joining the Soil Conservation Service. For the last seven years, he has served as resource conservationist, analyzing resource data and writing environmental impact statements.

He is a member of the Society for Range Management, Soil Conservation Society of America, and Texas Organization for Endangered Species.

Featherston, James'W. Agricultural Economist. B.S., Agricultural Economics, Texas A&M University.

Mr. Featherston has served over three years with the Soil Conservation Service in Texas. Since 1978, he has served as an agricultural economist on the watershed planning staff.

Hailey, James L. Hydraulic Engineer. B.S. and M.S., Agricultural Engineering, Texas A&M University. Soil Mechanics and Foundation Engineering, Utah State University. Statistical Methods in Hydrology, University of Maryland. Flood Plain Hydrology and Hydraulics, University of Texas.

For six years Mr. Hailey has served as agricultural engineer and civil engineer at various locations in Texas. He has served as hydraulic engineer on the watershed planning staff from 1977 to present.

Mr. Hailey is a member of the American Society of Agricultural Engineers and Soil Conservation Society of America. He is a registered Professional Engineer in Texas.

Haynes, Arthur B. Civil Engineering Technician. Texas Tech University. Advance study courses, "Hydraulics" and "Computations and Quantities."

For the past 22 years, Mr. Haynes has served as engineering aid, surveying aid, supervisory surveying aid, engineering aid general, and civil engineering technician.

He is a member of the Soil Conservation Society of America and is a Certified Civil Engineering Technician with the Institute for the Certification of Engineering Technicians.

McPherson, Jr., William T. Biologist. B.S., Wildlife Management/Range Management, University of Arizona.

For four years, Mr. McPherson worked for the Soil Conservation Service in various locations in Texas serving as a soil conservationist and range conservationist. From 1975 to the present he has served as a biologist on the watershed planning staff.

Mr. McPherson is a member of the Wildlife Society, Texas Chapter of American Fisheries Society, and Texas Organization for Endangered Species. Certification as a Professional Wildlife Biologist is pending.

Peevy, Buel L. Civil Engineering Technican.

Mr. Peevy has three years experience as a surveyor for oil exploration. For the past 20 years he has served as an engineering aid, surveying technician, and civil engineering technician on a watershed planning staff. Mr. Peevy periodically serves as an instructor for the Basic Surveying Course at the South Technical Service Center in Fort Worth.

He is a Certified Senior Civil Engineering Technican with the Institute for the Certification of Engineering Technicans and is a member of the American Society of Certified Engineering Technicians.

#### SCS Field Office

Ballard, Jimmy D. District Conservationist. B.S., General Agriculture, East Texas State University. M.S., General Agriculture/Biology, East Texas State University.

Mr. Ballard has served over 16 years with the Soil Conservation Service at various locations in Texas. He has held previous positions as a soil conservationist. For the past six years he has served as district conservationist in Cleburne.

He is a member of the Soil Conservation Society of America and the National Association of Conservation Districts.

#### SCS Technical Support Staff

Cole, Nancy J. Archeologist. B.A. and M.A., Anthropology, University of Texas at Austin.

Ms. Cole has participated in numerous archeological field schools and contract archeological survey work. Since 1976 she has served as staff archeologist for the Soil Conservation Service and periodically serves as an instructor for archeological courses at Temple Junior College.

She is a member of the Society of Professional Archeologists, Society for American Archeology, American Anthropological Association, Council of Texas Archeologists, Texas Archeological Society, and Texas State Historical Society.

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INDEX

	Page
Acres required-----	15, 25, 35
Alternatives-----	1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15, 29, 30, 33
Archeological-----	2, 6, 21, 33, 36
Candidate plans-----	3, 10, 12, 14
Census data-----	4
Channel work-----	3, 12, 13
Compensation-----	17, 22, 23
Compliance-----	1, 2, 3, 16, 17, 18, 21
Consultation-----	1, 2, 3, 35, 36
Costs-----	11, 12, 14, 19, 20, 22, 23, 24, 26, 28
Cultural resources-----	7, 8, 21, 33
Dike-----	3, 11, 12, 13
Economic benefits-----	14, 19, 27, 28, 34
Emergency action plan-----	22
Employment-----	8
Endangered species-----	2, 8, 33, 36
Environmental consequences-----	1, 2, 32, 33
Environmental quality (EQ)-----	1, 9, 10, 12
Flood insurance program-----	6
Flood plain ordinance-----	6, 21
Flood warning system-----	6
Floodwater damages-----	2, 6, 7, 8, 9, 10, 11, 13, 14, 27, 29, 30, 31, 33, 34, 35
Floodwater retarding structure-----	3
	11, 13, 15, 16, 17, 19, 20, 21
	22, 23, 24, 25, 26, 28, 32, 35
Geologic units-----	4
Goals-----	9, 10, 13
Hazard classification-----	15
Historic sites-----	6, 36
Impacts-----	2, 7, 8, 10, 12, 13, 14, 29, 30, 31, 32, 33, 34, 35
Incremental analysis-----	10
Irreversible and irretrievable commitment of resources-----	1, 35
Land rights-----	12, 16, 19, 20, 21
Landscape-----	4
Land use-----	5
Location-----	3, 4, 5, 6, 15
Long-term productivity-----	3, 5
M&I water-----	9, 10, 13
Meetings-----	2, 3, 35, 36
Minority group-----	35
Mitigation-----	21

National Economic Development (NED)	1, 9, 10, 12
Nonstructural measures	3, 10, 11, 15
Other social effects (OSE)	9, 10, 12
Plan formulation	2, 3, 9, 10, 11, 12, 13
Prime farmland	5, 8, 14, 29, 35
Projections	12, 34
Recommended plan	1, 2, 3, 10, 12, 14, 15, 29, 30, 31, 35, 36
Recreation	9, 10, 13
Relocations	12, 16, 20, 21
Scoping	2, 7
Sensitivity	12
Short-term use	1, 12, 35
Soils	4, 5
Structural measures	3, 6, 10, 15, 16, 17, 19, 20, 21, 22, 23, 24, 29, 34
Vegetation	5, 6, 16, 17, 22
Visual resources	32
Water and air resources	6, 32
Wildlife habitat	17, 22, 33
Wetlands	6, 7, 8

APPENDIX A

Letters of Comment Received on Draft Plan



**UNITED STATES  
DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE**

Ecological Services  
9A33 Fritz Lanham Building  
819 Taylor Street  
Fort Worth, Texas 76102

January 12, 1983

Mr. George C. Marks  
State Conservationist  
Soil Conservation Service  
P.O. Box 648  
Temple, Texas 76501

Dear Mr. Marks:

We have been requested by our Regional Office to review and comment on the Draft Watershed Plan for West Fork of Buffalo Creek Watershed, Texas.

As you know, we have been involved in this Watershed Plan since the early stages. We believe this document is consistent with previously agreed upon considerations for fish and wildlife resources.

We also believe that significant impacts to fish and wildlife resources will be minimal. In fact, diversity may be improved somewhat. Therefore, we concur with the work plan.

Thank you for the opportunity to comment.

Sincerely,

*David A. Carter*  
for/ Jerome L. Johnson  
Field Supervisor

cc: Regional Director, Fish and Wildlife Service,  
Albuquerque, NM  
Texas Parks and Wildlife Department, Austin, TX



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION VI  
1201 ELM STREET  
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December 27, 1982

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Soil Conservation Service  
U.S. Department of Agriculture  
P.O. Box 648  
Temple, Texas 76503

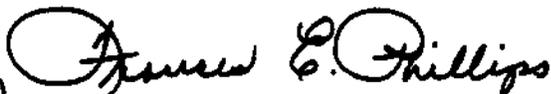
Dear Mr. Marks:

Thank you for your letter of November 4, 1982 transmitting a copy of the draft Watershed Plan for West Fork of Buffalo Creek Watershed, Texas for our review. We have the following comments regarding construction impact for your consideration.

Erosion and sediment runoff can be effectively controlled if adequate plans are made prior to initiation of construction. Effective plans should consider proper scheduling and coordination of construction activities and the provision of adequate maintenance of control measures to ensure pollution prevention. A combination of fitting the development to site conditions, limiting the grading and exposure of base soils, and applying adequate control measures and techniques at proper times will prove the most effective nonpoint source control mechanism.

If you have any questions, please contact Russell Bowen of my staff at (214) 767-8989. Thank you for the opportunity to review the Watershed Plan.

Sincerely,

  
f Dick Whittington  
Regional Administrator, P.E.



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT  
FORT WORTH SERVICE OFFICE  
221 WEST LANCASTER AVENUE  
P.O. BOX 2905  
FORT WORTH, TEXAS 76113

REGION VI

IN REPLY REFER TO:

November 23, 1982

Mr. George C. Marks  
State Conservationist  
Soil Conservation Service  
United States Department of Agriculture  
P.O. Box 648  
Temple, TX 76503

Dear Mr. Marks:

This will acknowledge and thank you for your solicitation of our comments on the draft Watershed Plan for West Fork of Buffalo Creek Watershed in Johnson County, Texas.

We are asking our Dallas Area Office to furnish you directly such comments thereon as it may see fit to make.

Sincerely,

  
jr

Victor J. Hancock  
Environmental Clearance Officer



U.S. Department of Housing and Urban Development  
Dallas Area Office, Region VI  
1403 Slocum Street  
Post Office Box 10050  
Dallas, Texas 75207

January 12, 1983

Mr. George C. Marks  
State Conservationist  
Soil Conservation Service, USDA  
PO Box 646  
Temple, TX 76503

Dear Mr. Marks:

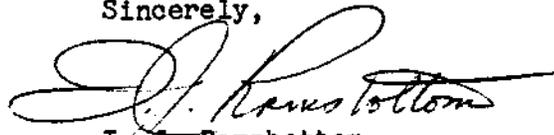
SUBJECT: Draft Watershed Plan, West Fork of Buffalo Creek Watershed  
Johnson County, Texas

By a memorandum dated November 23, 1982, our Fort Worth Regional Office asked that this office comment upon the draft subject plan.

This office endorses Alternative 1 which substantially reduces, but does not eliminate, flood damage within the City of Cleburne. Although the flooding is not eliminated, when the retarding structure is installed, there will be no apparent risk or loss of life from a 100-year flood to any residence, building or other improvement.

We appreciate the opportunity of reviewing your Draft Watershed Plan for the West Fork of the Buffalo Creek Watershed.

Sincerely,



L. J. Ramsbottom  
Environmental Clearance  
Officer, 6.1SS



DEPARTMENT OF THE ARMY  
FORT WORTH DISTRICT, CORPS OF ENGINEERS  
P. O. BOX 17300  
FORT WORTH, TEXAS 76102

REPLY TO  
ATTENTION OF:

December 21, 1982

Planning Branch,  
Engineering and Planning Division

Mr. George C. Marks  
State Conservationist  
Soil Conservation Service  
Post Office Box 648  
Temple, Texas 76503

Dear Mr. Marks:

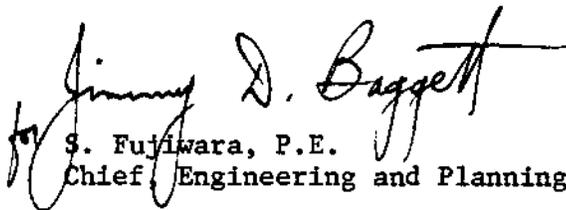
This is in response to your letter dated November 4, 1982, requesting comments regarding the draft Watershed Plan for West Fork of Buffalo Creek Watershed, Texas. As a result of our review of this document, the following comments are provided.

In 1974 the Fort Worth District, Corps of Engineers conducted an interim study of flood control improvements along Buffalo Creek at Cleburne, Texas. The study concluded that channel improvements of the East and West Forks of Buffalo Creek at Cleburne could not be economically justified. Other investigations also indicated that other alternative plans, such as reservoirs, were either not practical or not economically feasible. Subsequently, the Army Engineers from Fort Hood, utilizing an on-the-job training program for their personnel, cleared and removed debris from the West Fork which reduced damages due to small floods.

It should also be noted that the Corps of Engineers has the responsibility for regulating the discharge of dredged and fill material into waters of the United States and adjacent wetlands under Section 404 of the Clean Water Act. It appears that your project will be authorized under a general permit issued on a nationwide basis for the discharge of fill material above the headwaters, provided it complies with the conditions listed on the attached sheet.

The opportunity to review this document is welcomed and appreciated. I look forward to our continued association.

Sincerely,

  
S. Fujiwara, P.E.  
Chief, Engineering and Planning Division

Enclosure

## DISCHARGES INTO CERTAIN WATERS OF THE UNITED STATES

The U.S. Army Corps of Engineers regulates the *discharge of dredged and fill material* into the waters of the United States under authority of *Section 404* of the Clean Water Act (Public Law 95-217, dated 27 December 1977). A general permit has been issued on a nationwide basis for the placement of dredged and fill material into *certain waters* of the United States. These include: nontidal rivers, streams, and their impoundments, including their adjacent wetlands all of which are located above the headwaters of the stream. *Headwaters* is defined as that point on a nontidal stream above which the average annual flow is less than five cubic feet per second. This permit also authorizes discharges into other nontidal waters of the United States that are not part of a surface tributary system to interstate waters or navigable waters of the United States. Activities authorized under this nationwide permit are subject to the following conditions:

- (1) That the discharge will not be located in the proximity of a public water supply intake;
- (2) That the discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or destroy or adversely modify the critical habitat of such species;
- (3) That the discharge will consist of suitable material free from toxic pollutants in toxic amounts;
- (4) That the fill created by the discharge will be properly maintained to prevent erosion and other nonpoint sources of pollution;
- (5) That the discharge will not occur in a component of the National Wild and Scenic Rivers Systems;  
and
- (6) That the best management practices listed on the reverse side should be followed to the maximum extent practicable.

If your project is to be constructed within the terms of these criteria no further administrative action is necessary. If the project does not fit the criteria you should make application for an individual permit. Application should be made to the **District Engineer; ATTN: Chief, Operations Division, SWFOD-O; P.O. Box 17300; Fort Worth, Texas 76102**. If you have any further questions you may contact the **Permits Section at 817-334-2681**.

Encl

## BEST MANAGEMENT PRACTICES

In addition to the conditions specified in the nationwide permit, the management practices listed below should be followed to the maximum extent practicable, in the discharge of dredged or fill material allowed under the permit. These practices will minimize the adverse effects of the discharges on the aquatic environment. Failure to comply with these practices may result in action to suspend authorization under the nationwide permit and require an individual permit.

(1) Discharges of dredged or fill material into the waters of the United States should be avoided or minimized through the use of other practical alternatives.

(2) Discharges in spawning areas during the spawning season shall be avoided.

(3) Discharges shall not restrict or impede the movement of aquatic species indigenous to the waters or the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters).

(4) If the discharge creates an impoundment water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow shall be minimized.

(5) Discharges in wetlands areas shall be avoided.

(6) Heavy equipment working in wetlands shall be placed on mats.

(7) Discharges into breeding and nesting areas for migratory waterfowl shall be avoided.

(8) All temporary fills shall be removed in their entirety.



OFFICE OF THE GOVERNOR

WILLIAM P. CLEMENTS, JR.  
GOVERNOR

December 22, 1982

Mr. George C. Marks  
State Conservationist  
U.S. Department of Agriculture  
Soil Conservation Service  
W. R. Poage Federal Building  
101 South Main  
Temple, Texas 76503

Dear Mr. Marks:

The Draft Watershed Plan pertaining to the West Fork of Buffalo Creek Watershed prepared by U.S. Department of Agriculture, Soil Conservation Service, has been reviewed by the Budget and Planning Office and interested state agencies. Copies of the review comments are enclosed for your information and use. The State Environmental Impact Statement Identifier Number assigned to the project is 2-11-50-008.

The Budget and Planning Office appreciates the opportunity to review this project. If we can be of any further assistance during the environmental review process, please do not hesitate to call.

Sincerely,

A handwritten signature in cursive script that reads "William C. Hamilton".

William C. Hamilton, Manager  
General Government Section  
Budget and Planning Office

msw

Enclosures: Comments by State Department of Highways  
and Public Transportation  
Texas State Soil and Water  
Conservation Board  
Texas Department of Water Resources

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DEC 6 1982

Budget/Planning



COMMISSION

ROBERT H. DEDMAN, CHAIRMAN  
A. SAM WALDROP  
JOHN R. BUTLER, JR.

STATE DEPARTMENT OF HIGHWAYS  
AND PUBLIC TRANSPORTATION

DEWITT C. GREER STATE HIGHWAY BLDG.  
AUSTIN, TEXAS 78701

ENGINEER-DIRECTOR  
MARK G. GOODE

December 1, 1982

IN REPLY REFER TO  
FILE NO.

D8-E 854

EIS # 2-11-50-008  
Buffalo Creek, West Fork of  
Johnson County

Dr. Jarvis E. Miller, Director  
Governor's Budget & Planning Office  
Sam Houston Building, 7th Floor  
Austin, Texas

Dear Dr. Miller:

Thank you for the opportunity to review the draft environmental statement describing the proposed flood control work on the West Fork of Buffalo Creek in and near Cleburne.

The proposed flood control work will reduce the flood discharge rate at existing bridges on the State highway system. The proposed floodwater retarding structure and detention pond located just upstream from the urban area will be taken into consideration during the Department's planning for future S.H. 174 improvements.

Sincerely yours,

M. G. Goode  
Engineer-Director

By:

*Marcus L. Yancey, Jr.*  
Marcus L. Yancey, Jr.  
Deputy Engineer-Director

TEXAS DEPARTMENT OF WATER RESOURCES

1700 N. Congress Avenue  
Austin, Texas



Harvey Davis  
Executive Director

TEXAS WATER DEVELOPMENT BOARD

Louis A. Beecherl, Jr., Chairman  
George W. McCleskey, Vice Chairman  
Glen E. Roney  
W. O. Bankston  
Lonnie A. "Bo" Pilgrin  
Louie Welch

TEXAS WATER COMMISSION

Lee B. M. Biggart, Chairman  
Felix McDonald  
John D. Stover

November 18, 1982

RECEIVED

NOV 23 1982

Budget/Planning

Dr. Jarvis E. Miller, Director  
Governor's Budget & Planning Office  
Sam Houston Building, 7th Floor  
Austin, Texas 78711

Dear Dr. Miller:

Subject: U. S. Department of Agriculture (Soil Conservation Service): WATERSHED PLAN, WEST FORK OF BUFFALO CREEK WATERSHED, JOHNSON COUNTY, TEXAS (Draft). September 1982. (State File Reference: EIS #2-11-50-008.

In response to your November 10 memorandum, the Texas Department of Water Resources (TDWR) offers the following staff review comments on the subject report on the proposed Soil Conservation Service/Johnson Soil and Water Conservation District/City of Cleburne flood protection project for West Fork Buffalo Creek Watershed, involving the construction of a 2,494 acre-foot-capacity, Class C flood-water retarding structure and the installation of related land treatment and management measures, at an estimated total initial cost of \$1,622,500 (Federal share: \$998,900; non-Federal share: \$623,600):

1. We find that the proposed recommended plan described on pages 15 to 28, is consistent with TDWR's statewide water resources planning, development, and management objectives, policies, and programs;
2. We concur that the proposed reservoir, the related land treatment measures, and the agricultural water management practices complement each other to reduce surface runoff, soil erosion, and sediment yield damages from the treated watershed areas, in addition to conserving soil and water; and

Dr. Jarvis E. Miller, Director  
Page 2  
November 18, 1982

3. We concur in the decision to regard the proposed floodwater retarding structure as a Class C structure (reference: page 15, "Embankment Classification"), since the major objective of the project is the protection of a major portion of the urbanized built-up area in the flood plain of the City of Cleburne. (Reference: Summary, page 2; page 5; and pages 6-8).

Sincerely yours,



Harvey Davis  
Executive Director *for*

RECEIVED

DEC 2 1982

Budget/Planning



TEXAS STATE SOIL AND WATER CONSERVATION BOARD

1002 First National Building

P. O. Box 658

Temple, Texas 76503

Area Code 817, 773-2250

December 1, 1982

Dr. Jarvis E. Miller, Director  
Governor's Budget & Planning Office  
Section Attention: General Government  
P.O. Box 13561  
Austin, TX 78711

Dear Dr. Miller:

We have reviewed the draft Watershed Plan for the West Fork of Buffalo Creek Watershed, Johnson County, Texas, prepared by the USDA, Soil Conservation Service.

The State Soil and Water Conservation Board received the application for assistance on this project on June 11, 1980. Since that time we have worked with the local sponsors on numerous occasions attempting to ensure that their objectives would receive federal assistance. This agency granted a planning priority on this project on November 20, 1980.

Our involvement with the sponsors and the Soil Conservation Service staff leads us to believe that the objectives of the sponsors will be satisfied by this work plan and that the project measures called for in the work plan are the best practicable solution to the watershed problems. We urge all associated with the project from this point forward seek expedient implementation of the plan.

Sincerely yours,

A handwritten signature in cursive script that reads "John W. Millican".

John W. Millican  
Acting Executive Director

JWM/JMM/vd



United States  
Department of  
Agriculture

Office of  
General  
Counsel

Washington,  
D.C.  
20250

NOV 29 1982

George C. Marks  
State Conservationist  
Soil Conservation Service  
P.O. Box 648  
Temple, Texas 76503

Dear Mr. Marks:

Subject: Draft Watershed Work Plan  
West Fork of Buffalo Creek Watershed,  
Johnson County, Texas

We have reviewed the proposed draft watershed work plan for the above-mentioned watershed, and are of the opinion that the plan is legally unobjectionable.

The draft watershed work plan is returned herewith.

Sincerely,



JOSEPH D. CUMMINGS  
Deputy Assistant General Counsel  
Natural Resources Division

Enclosure

APPENDIX B

Watershed Figures

Figure 1 - Flood Plain Index Map and Flood Plain Maps - Sheets 1 through 4

Figure 2 - Typical Section of the Floodwater Retarding Structure

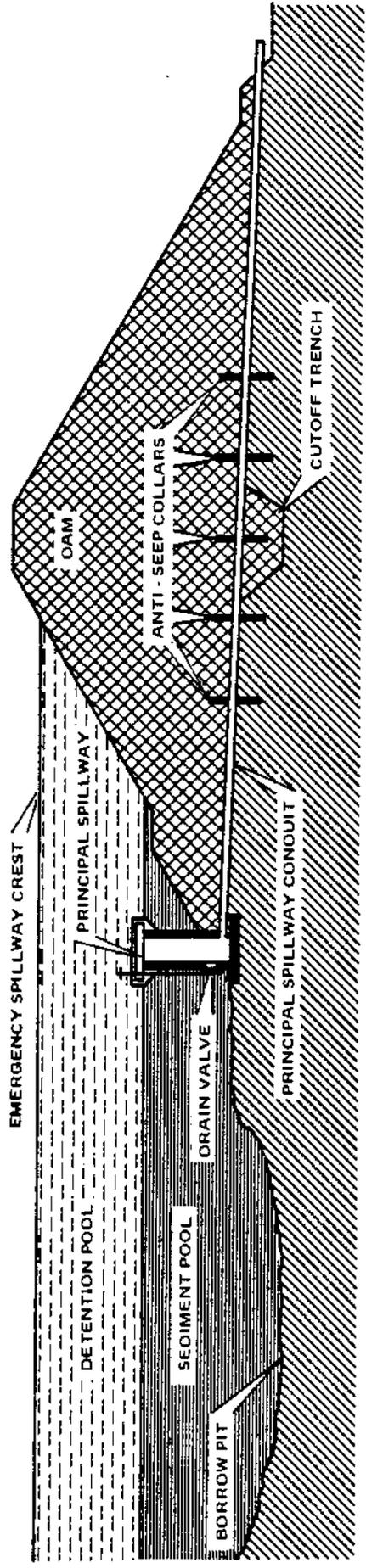
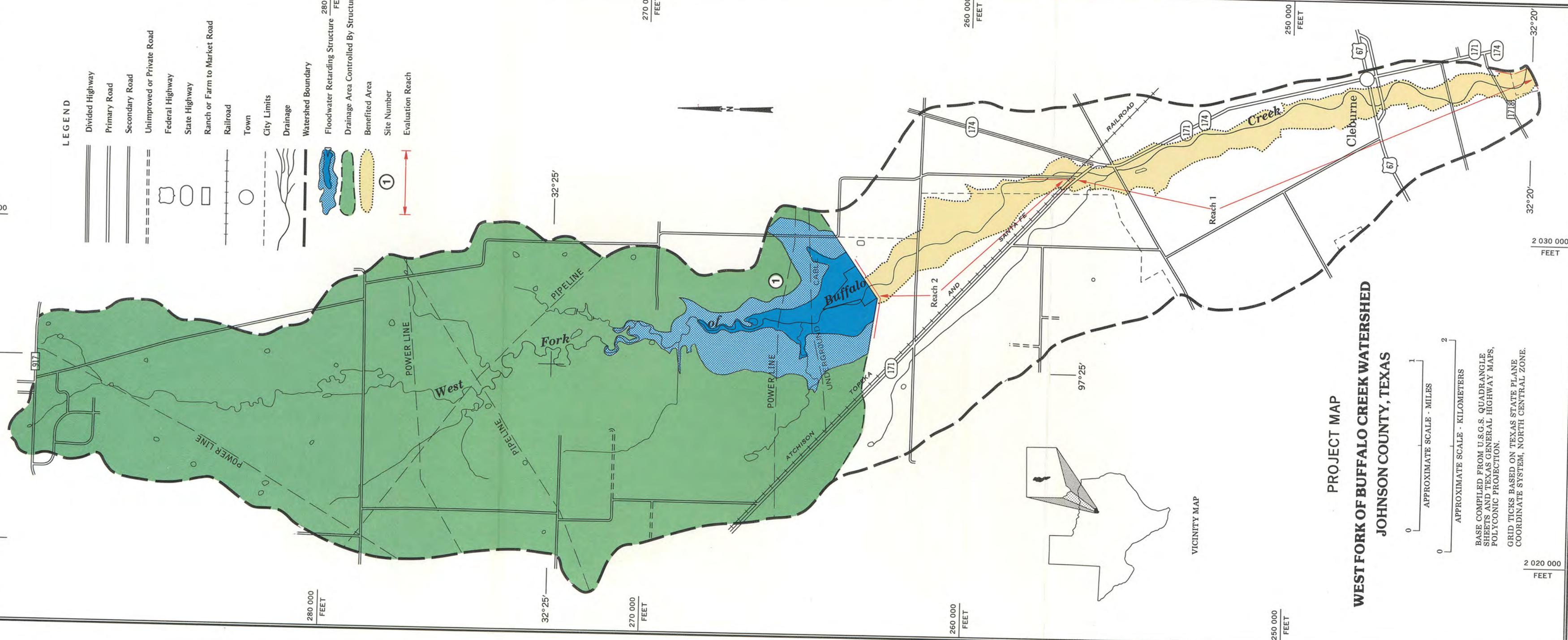


Figure 2  
SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

## Appendix C

Project Map

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LEGEND

- Divided Highway
- Primary Road
- Secondary Road
- Unimproved or Private Road
- Federal Highway
- State Highway
- Ranch or Farm to Market Road
- Railroad
- Town
- City Limits
- Drainage
- Watershed Boundary
- Floodwater Retarding Structure
- Drainage Area Controlled By Structure
- Benefited Area
- Site Number
- Evaluation Reach

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FEET

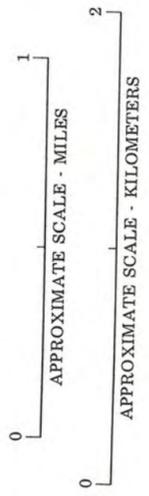
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PROJECT MAP  
**WEST FORK OF BUFFALO CREEK WATERSHED**  
**JOHNSON COUNTY, TEXAS**



BASE COMPILED FROM U.S.G.S. QUADRANGLE SHEETS AND TEXAS GENERAL HIGHWAY MAPS, POLYCONIC PROJECTION.

GRID TICKS BASED ON TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE.

2 020 000  
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VICINITY MAP



2 030 000  
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32°20'