

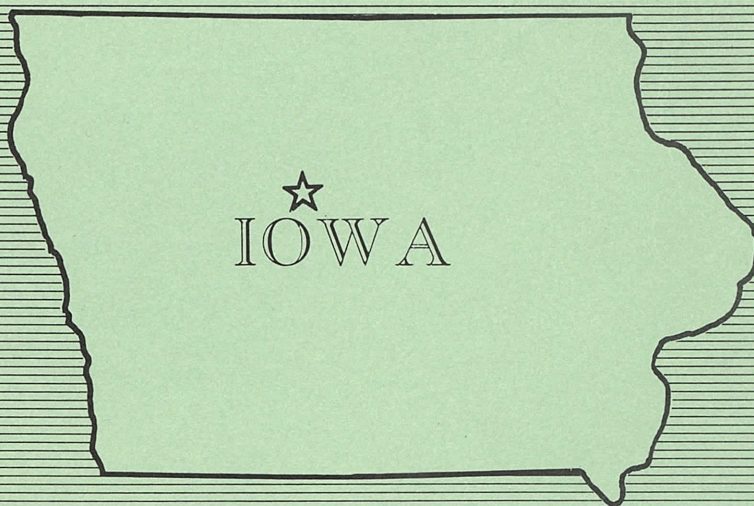
WORK PLAN

FOR WATERSHED PROTECTION AND
AGRICULTURAL WATER MANAGEMENT

WORK PROJ. NO. 608 - 2028

BEAVER WATERSHED

Webster County, Iowa



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WATERSHED WORK PLAN AGREEMENT

between the

WEBSTER COUNTY SOIL CONSERVATION DISTRICT

WEBSTER COUNTY BOARD OF SUPERVISORS

in the State of Iowa

(hereinafter referred to as the Sponsoring Local Organizations)

and the

SOIL CONSERVATION SERVICE

United States Department of Agriculture

(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organizations for assistance in preparing a plan for works of improvement for the Beaver Watershed, State of Iowa, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended; and

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

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organizations and the Service a mutually satisfactory plan for works of improvement for the Beaver Watershed, State of Iowa, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organizations and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about three years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organizations will acquire without cost to the Federal Government such land, easements, or rights-of-way as will be needed in connection with the works of improvement. (Estimated cost \$3,980).
2. The Sponsoring Local Organizations 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 works of improvement.

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

<u>Works of Improvement</u>	<u>Sponsoring Local Organizations</u> (Percent)	<u>Service</u> (Percent)	<u>Estimated Construction Cost</u> (Dollars)
Tile Drains	61.4	38.6	113,480

4. The percentages of the cost for installation services to be borne by the Sponsoring Local Organizations and the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organizations</u> (Percent)	<u>Service</u> (Percent)	<u>Estimated Installation Service Cost</u> (Dollars)
Tile Drains	0	100.0	22,290

5. The Sponsoring Local Organizations will bear the costs of administering contracts. (Estimated cost \$1,010.)
6. The Sponsoring Local Organizations will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.
7. The Sponsoring Local Organizations will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
8. The Sponsoring Local Organizations will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.
9. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

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

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

11. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto.
12. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

WEBSTER COUNTY SOIL CONSERVATION DISTRICT
Local Organization

By _____

Title _____

Date _____

The signing of this agreement was authorized by a resolution of the governing body of the Webster County Soil Conservation District adopted at a meeting held on _____ 19__.

(Secretary, Local Organization)

Date _____

WEBSTER COUNTY BOARD OF SUPERVISORS
Local Organization

By _____

Title _____

Date _____

The signing of this agreement was authorized by a resolution of the Webster County Board of Supervisors, governing body of Webster County Drainage District No. 47 adopted at a meeting held on _____ 19____.

County Auditor

Date _____

SOIL CONSERVATION SERVICE

United States Department of Agriculture

By _____

State Conservationist

Date _____

WATERSHED WORK PLAN

BEAVER WATERSHED
Webster County, Iowa

July 1964

SUMMARY OF PLAN

Participating Organizations

The Watershed Work Plan for Beaver Watershed, Webster County, Iowa, was prepared by the Webster County Soil Conservation District, hereinafter referred to as the District, and the Webster County Board of Supervisors, hereinafter referred to as the County Board, as the local sponsoring organizations. Technical assistance was provided by the Soil Conservation Service, United States Department of Agriculture, hereinafter referred to as the Service.

Location and Size of Watershed

The Beaver Watershed is located in north central Iowa about one mile southeast of Harcourt in Webster County. The watershed is the most upstream portion of Beaver Creek which enters the Des Moines River adjacent to the Interstate Highway north of Des Moines. Beaver Watershed has an area of 3.7 square miles (2,385 acres).

Watershed Problems

Ninety-four percent of the cropland soils are either imperfectly or poorly drained. At the present time the existing tile mains do not have sufficient capacity to adequately drain the cropland. This adversely affects the timeliness of field operations, the management level of the farming operations, the choice of crops grown, and the average yields. An adequate capacity open ditch is available below the watershed for the tile outlets.

Proposed Works of Improvement

The project will be installed during a 3-year project installation period at a total cost of \$190,010. Land treatment measures for protection and enhancement of the watershed lands include 36 miles of farm tile drains as well as conservation cropping systems to use the land within its capabilities. The land treatment measures will be installed and maintained by the farmers with technical

The mean annual precipitation is about 30 inches with the winter portion occurring as an average of 39 inches of snow. The rainfall portion of the precipitation comes, generally, in the April through September period.

Land Use and Cover Conditions: Data from many of the District Cooperators' farms were studied and expanded to estimate the present and future land use and cover conditions. Land use without and with the project is: Cropland 2,240 acres and other uses (farmsteads, roads, etc.) 145 acres. The cropping pattern of the cropland both with and without project is as follows: Corn 40 percent, soybeans 40 percent, oats 10 percent, hay 5 percent, and rotation pasture 5 percent.

Economic Data

According to the United States Census of 1960, Webster County has a population of 47,810. This indicates an increase in population of 8 percent compared with the 1950 census. Harcourt, which is the nearest town, has shown a decrease of 11 percent in population since the 1950 census. The estimated population of the watershed is 84.

There are 25 farms located entirely or partially within the watershed. Approximately 35 percent are owner-operated; the same as for the county as a whole. The average size of all farms is 150 acres and for the county 203 acres. The average value of farms in the county, including land and buildings, is \$73,554 and the average per acre value is \$351.

The farms of the watershed are readily accessible by a good system of state and county roads. U. S. Highway 169 passes close to the east and north sides of the watershed and Iowa Highway 175 provides a close access a short distance north of the watershed. The Chicago and Northwestern railroad serves the towns of Harcourt and Dayton which lie near the watershed.

The Webster County Soil Conservation District was organized April 28, 1944. To date, owners of 25 farms, 2,385 acres, or 100 percent of the watershed are cooperating with the District in the application of land treatment measures. Basic farm plans have been developed on 20 farms, 2,031 acres, or 85 percent of the watershed.

WATERSHED PROBLEMS

The principal watershed problem is inadequate drainage. Nearly all farm tile drains in 1,000 acres of the watershed do not function properly due to inadequate capacities of public outlet

tile drains, or inadequate depth and capacities of both the on-farm and the public tile drains. The existing tile mains were constructed in 1908-1911. In many cases they are inadequate both as to size and depth for good drainage.

During some years, when rainfall is below normal and distribution is favorable, crop yields and income are relatively high. When rainfall is normal to excessive and poorly distributed, corn yields may be as low as 35 bushels per acre. Replanting of corn to soybeans and even a second replanting of soybeans in the potholes is sometimes required. This water management problem has a serious effect on the economic stability of the watershed residents and the community.

Water management measures for other water uses such as irrigation, municipal water supply, pollution control, etc. are not foreseen in the watershed at the present time.

PROJECTS OF OTHER AGENCIES

Webster County Drainage District No. 47 was established in accordance with Iowa drainage laws in December 1907. The County Board is the governing body of the drainage district. The improvements consisted of outlet main tile drains for the lands in the drainage district. The Beaver Watershed area is identical with that of the drainage district.

BASIS FOR PROJECT FORMULATION

About fifteen years ago the people in Drainage District No. 47 and the County Board began to develop plans to improve the drainage system that had been originally installed. Through the years, detailed plans and cost estimates have been prepared for installing relief tile mains to increase the drainage system capacity.

The agreed upon project objectives are to install these needed relief tile main outlets to benefit all of the inadequately drained lands in the watershed. These relief tile drains will provide supplemental capacity to the existing public tile drains so that existing farm tile drains will function properly and so that additional needed tile can be installed. Extensions of existing tile drains will also be provided so that all farms will be served with a public outlet tile drain of adequate depth and capacity.

The installation of farm tile drains in cropland areas in need of drainage was expressed as a goal of most farmers when the adequate outlets become available.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

Land treatment measures are the basic element of a watershed project. They are planned, installed, and maintained by individual or groups of landowners and/or operators to protect and improve the soil and water resources of individual farms. These measures are included in the farm conservation plans.

Farm tile drains are underground tile of suitable size with a planned grade and depth, laid with open joints to collect and convey excess water from the soil. About 36 miles are planned to be installed. Approximately 80 miles have been installed to date.

In addition to the installation of the farm tile drains, the project includes the increased use of conservation cropping systems on cropland areas. An effort will be made to improve the farmstead windbreaks and to include shrubs, such as honeysuckle, for low ground cover to improve cover for upland game, primarily pheasant.

The estimated total cost of installing the land treatment measures is \$49,250 and includes costs to landowners, cost sharing from going agricultural programs, and technical assistance from P.L. 46, State and P.L. 566 funds (Table 1).

Structural Measures

Structural measures are those requiring group action for their installation and are eligible for direct financial assistance from P.L. 566 funds. The plan provides for 6.95 miles of public outlet tile drains for drainage. A high percent of these will parallel and supplement the capacity of present inadequate public tile outlet systems and thus serve as relief tile. The remainder will provide outlets for additional lands not now served by a public type outlet system. The location of the public outlet tile is shown in Figure 1.

The installation costs are \$140,760 for the public tile drains for drainage (Table 1).

Tables 1, 2, and 3 set forth data pertaining to costs, construction quantities, and design features of the structural measures.

Description of Structural Measures

Public Tile Drains: Public tile drains are closed, underground conduits installed with a planned depth, grade, and size. Inlets are sometimes provided for the entrance of the surface waters. The public tile drains are generally the larger sizes of tile which serve as outlet mains for two or more landowners. Those public tile drains that are designed to relieve, or add supplemental capacity to the presently overloaded outlet mains, will in most cases, be made an integral part of the present system by a physical connection to the present system at regular intervals so that the hydraulic head on each line will be equalized. The main outlet structure will consist of a section of corrugated metal pipe through the roadway and into the open drainage ditch that serves as the outlet for this watershed.

EXPLANATION OF INSTALLATION COSTS

The project installation costs, as used in this work plan, include all P.L. 566 and other funds, in cash or its equivalent, for installing all works of improvement for the project purposes of watershed protection and agricultural water management (drainage).

Land Treatment Measures

The costs of installing land treatment measures consist of the costs of technical assistance and the costs of construction. The total estimated costs are \$49,250 and include costs to farmers, cost sharing from going agricultural programs, and technical assistance, from P.L. 46 and P.L. 566 funds. This is divided into \$3,840 from P.L. 566 funds and \$45,410 from other funds (Table 1).

Structural Measures

Construction costs are the contract costs for constructing structural measures for the project purposes and consist of the engineers' cost estimate and a contingency cost which provides for unforeseeable increases in construction costs. Based upon experience to date in watershed work, the contingency cost was estimated to be 12 percent of the engineers' estimate.

The total construction cost is estimated to be \$113,480. Of this P.L. 566 funds will bear \$43,820 and other funds \$69,660 (Table 1).

Installation services include both engineering and other services for structural measures. Engineering services include all costs for the services of engineers utilized in the design and installation of the structural measures. This includes the cost of construction surveys and investigations, necessary inspections, installation assistance, preparation and interpretation of plans and specifications, and similar services in carrying out construction. Other installation services include all overhead costs for structural measures as well as direct costs for installation services provided by other than engineers and geologists. The total installation services are estimated to be \$22,290 (Table 1). These costs will be provided from P.L. 566 funds.

Land, easements, and rights-of-way costs include all expenditures made in acquiring land, easements, and rights-of-way or their value as estimated by the local organization with concurrence of the Service. These required non-Federal costs are estimated to be \$3,980 (Table 1).

The costs of administration of contracts include all local costs for administrative, legal, and clerical services incurred by the contracting local organizations in carrying out contracts. These required non-Federal costs are estimated to be \$1,010 (Table 1).

Cost Allocation

All of the structural improvements are public tile drains for agricultural water management. State policies provide that tile drains for this purpose will be allocated 100 percent to drainage. Hence, all of the structural improvements (tile drains) have been allocated to drainage.

Basis for Cost Sharing

State policies have been established which provide that construction costs allocated to drainage will be cost shared 40 percent from P.L. 566 funds and 60 percent from local or other funds, except that the excess of construction costs of installing tile larger than 30 inches in diameter will all be paid from local or other funds; i.e. the difference between the estimated construction cost (contract cost) of installing, say a 34-inch diameter tile as compared to a 30-inch tile will be a local cost; the remaining cost will be cost-shared 40-60 as described above. All installation services costs for the drainage improvements will be provided from P.L. 566 funds.

Costs of all necessary land, easements and rights-of-way and administration of contracts for the project will be provided by other or local funds.

Excess costs of \$3,920 for planned tile larger than 30 inches are included in the project construction costs. These costs are included as part of the other or local share of the cost.

The P.L. 566 share of construction costs for structural improvements is \$43,820 and the other or local share is \$69,660.

Cost sharing calculations in accordance with the stated policies were made of several tile sizes larger than 30-inch and were found to be as follows:

Size of Tile	Cost Sharing	
	P.L. 566	Local
30" or less	40.0%	60.0%
32"	36.6%	63.4%
34"	31.6%	68.4%
36"	30.4%	69.6%

The cost sharing percentages shown above can then be used to determine cost sharing for any of those applicable segments of the project.

As estimated schedule of Federal and non-Federal obligations, by fiscal years, for both land treatment and structural measures is tabulated below:

Fiscal Year	P.L. 566	Other	Total
1	\$25,000	\$35,000	\$ 60,000
2	30,000	40,000	70,000
3	14,950	45,060	60,010
Totals	\$69,950	\$120,060	\$190,010

EFFECTS OF WORKS OF IMPROVEMENT

The farm drain tile will lower the water table within their zone of influence and allow farming operations to be more timely. They will stabilize the productive capacity of the land during the normal and above normal rainfall years so that the farm operators will be able to employ better management measures and techniques in the production of crops, and thus increase net returns. Present adequately drained lands in this and in other watersheds are being managed in that manner.

Existing farm tile drains in the watershed are now limited in their effectiveness by inadequate outlet capacities. This problem will be eliminated. Farmers have not been able to add additional needed tile in many of the croplands due to inadequate capacities of the outlets; also, due to lack of depth of outlets for the depressional areas. These will be installed when adequate outlets become available. A total of about 2,000 acres of cropland will thus benefit from the project.

The wildlife habitat in the watershed will not be significantly affected by the project.

Secondary benefits will accrue within the immediate zone of influence of the project. They include (1) the transporting, processing and marketing of goods and services that produce the primary benefits and (2) the supplying of additional materials and services required to make possible the increased net returns which result from the installation of the project. These benefits accrue primarily to processors and merchants providing services to farmers.

No adverse downstream effects are anticipated from installation of the project.

PROJECT BENEFITS

Direct primary project benefits accrue from increases in net crop income due to increased crop yields. The project measures will permit more timely planting of crops, will reduce the need for frequent crop replanting, and will prevent reduction of yields due to inadequate soil drainage. These measures will bring about a higher level of management to be used on the land. These more intensive use of land benefits will have a significant effect on increasing the economic stability of the watershed community.

Secondary benefits are entirely of a local nature and will accrue within the immediate zone of influence of the project. Secondary benefits accruing from a National viewpoint were not considered pertinent to the economic evaluation.

COMPARISON OF BENEFITS AND COSTS

The total estimated average annual primary and local secondary benefits from the project are \$43,920. Of this amount, \$38,800 are primary, and \$5,120 are local secondary benefits (Table 6). The average annual cost is estimated to be \$5,670 (Table 4). The ratio of benefits to costs, with local secondary benefits

excluded, is 6.8 to 1.0. The ratio of benefits to costs with local secondary benefits included is 7.7 to 1.0 (Table 6).

PROJECT INSTALLATION

Federal assistance for installing the works of improvement will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666, as amended).

The project will be installed during a three-year project installation period. The local sponsoring organizations and the Service will coordinate the installation of the structural measures in the project with the planning and application of land treatment measures on the individual farms. The planning and application of land treatment tile drains should progress as rapidly as resources and adequate outlets are available to realize the economic benefits that were evaluated for the project.

Land Treatment Measures

A sound and effective land treatment program will be planned and installed on a majority of the farms in the watershed. The District governing body will schedule meetings to aid in carrying out the planned program, set priorities of farmers to be assisted, make periodic checks on completed measures and maintenance needs, and otherwise assist to further the land treatment phase of the watershed project. Details of each individual landowner's portions of the planned land treatment measures will be defined in the cooperator's basic conservation farm plan.

Land treatment measures will be installed by the individual farmer or small groups of farmers working together. The current Agricultural Conservation Program will be utilized along with such technical assistance as may be available for those practices eligible for cost-sharing assistance. Service technicians working with the District will assist with the planning and application of land treatment measures.

The current land treatment program is being planned and applied by the farmers and District with technical assistance provided by the Service under authority of P.L. 46. It is planned that additional technical assistance be made available from P.L. 566 funds to insure that the planned measures will be applied at an accelerated rate and within the proposed project installation period. Emphasis will be placed on establishing those land treatment measures that assist in bringing about the evaluated economic returns to the project, and those measures that provide habitat for wildlife.

Additional land treatment measures will more completely protect and enhance the remaining watershed lands. It is anticipated that such measures will be installed by the landowners in the years following the project installation period. It is expected that the normal going program assistance will be available to assist the landowners in completing this work.

Structural Measures

The County Board, the District, and the Service will jointly discuss and mutually agree upon schedules and a sequence for installing the improvements. Such schedules will periodically be reviewed and if necessary revised as needed to provide for an orderly and most advantageous progression of accomplishment. In general, the work will start at the downstream outlet and progress upstream.

The appointment of an engineer, the filing and examination of plans, the holding of hearings, the classification of lands and damage appraisals, and other matters in need of attention to further the progress and meet the requirements of State laws will be the responsibility of the County Board with such assistance as the District may be able to provide.

The Service will provide, or contract for, installation services which include surveys, site investigations, layout, design, preparation of specifications, consultations, inspection of construction, and related forms of technical assistance and other administrative overhead and facilities for all structural measures since they have been designed for the agricultural water management (drainage) purposes.

All structural measures will be installed by contract. The County Board, acting for the drainage district, will contract for and administer the installation of the structural measures.

A "Project Agreement for Construction of Structural Measures" will be executed for each contract unit of work prior to the issuance of invitations to bid. These agreements will be executed by the Service, the County Board, and the District for all structural measures. Each agreement will set forth details pertaining to the responsibilities of each party, including cost sharing of construction costs.

Land, easements, and rights-of-way for the structural measures will be obtained from the local landowners in accordance with Iowa laws pertaining to drainage districts.

FINANCING PROJECT INSTALLATION

The local share of the project installation costs will be obtained by a levy of assessments in the Webster County Drainage District No. 47 against each 40 acre tract, or portion thereof, to be benefited by the project. The classification of lands in the drainage district for the levy of assessments was accomplished at the time of its establishment and will be used in accordance with Iowa drainage law for distributing assessments for this project. These levies will be made by the County Board. Payments of assessments may be spread over up to a 20 year period.

It is anticipated that a watershed loan may be secured by the drainage district from the Farmers Home Administration to finance their share of the construction costs. Verbal inquiries have been made by the drainage district to the Farmers Home Administration.

Individual farmers will assume the cost of installing the land treatment measures with such cost sharing assistance as may be available under the provisions of the Agricultural Conservation Program or any other going agricultural cost sharing programs. Technical assistance for the planning and application will be provided by the Service from P.L. 46 and P.L. 566 funds in accordance with established policies of the District.

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

PROVISIONS FOR OPERATION AND MAINTENANCE

Land Treatment Measures

Land treatment measures will be maintained by the individual landowners and/or operators as prescribed in the conservation farm plans developed between the farmers and the District. Technical assistance will be made available through the District by the Service.

Structural Measures

Structural measures included in this project are planned and designed to serve project objectives. The total benefits to be derived from the installation of structural measures

cannot usually be realized unless the measures are operated and maintained in such a manner that they will serve the purpose for which they were installed. An active program for operation and maintenance is essential and consists of:

1. An agreed-to plan which provides adequate and sound arrangements for proper operation, timely inspection, and prompt and appropriate performance of needed maintenance, financing the costs of operation and maintenance, and the maintaining of records reflecting the actions required and taken.
2. The carrying out of the provisions of the agreed-to plan in a manner consistent with the spirit, intent, and purpose of the plan and project.

The responsibility for operation and maintenance of structural measures will be assumed by the County Board and the District. The County Board, in its capacity as governing body of the drainage district, has authority to levy special taxes in the drainage district for repairs and needed maintenance or improvement of the structural measures.

Inspection of the structural measures will be made annually by the local sponsoring organizations and the Service between May 1 and June 30 of each year, and following extremely heavy rains or other unusual conditions that may affect the maintenance requirements of the structural measures.

The Service will participate in operation and maintenance only to the extent of (1) furnishing technical assistance to aid in inspections and (2) furnishing technical design information necessary for the operation and maintenance. When operation and maintenance is not properly carried out, as found from inspections by the Service, the matter will be brought to the attention of the sponsoring local organizations.

An "Operation and Maintenance Agreement(s)" setting forth all details in connection with responsibilities for operation and maintenance of the structural measures will be executed by the Service, the County Board, and the District. The estimated average annual operation and maintenance costs are \$200 (Table 4).

SUMMARY OF REQUIREMENTS

The following list of requirements summarizes pertinent provisions of law, regulations, and policies which shall be met prior to issuance of invitation to bid on any portion of construction of the structural measures:

1. Mutual agreement on the schedule of construction and on plans and specifications shall be reached. Terms of contracts and all matters pertaining to contracts or to works of construction shall be mutually satisfactory in accordance with Federal technical and administrative specifications.
2. Land, easements, and rights-of-way shall be secured at no cost to the Federal Government.
3. Full conformance with State and Federal laws and regulations shall be the responsibility of the non-Federal interests, and shall be secured at no cost to the Federal Government, and reasonable evidence of conformity shall be presented to the mutual satisfaction of all parties.
4. Project agreements for construction of structural measures and operation and maintenance agreements will be executed for all structural measures.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST

Beaver Watershed, Iowa

Installation Cost Item (1)	: Acres : to be : Treated : (2)	: Estimated Cost (Dollars) 1/ : P.L. 566: : Funds : Other : Total : (3) : (4) : (5)
<u>ND TREATMENT MEASURES</u>		
Soil Conservation Service		
Cropland	450	- 45,000 45,000
Technical Assistance		3,840 410 4,250
<u>TOTAL LAND TREATMENT</u>		<u>3,840 45,410 49,250</u>
<u>STRUCTURAL MEASURES</u>		
Soil Conservation Service		
Single Purpose Public		
Tile Drains	Mi. 6.95	43,820 69,660 113,480
<u>total - Construction</u>		<u>43,820 69,660 113,480</u>
<u>INSTALLATION SERVICES</u>		
Soil Conservation Service		15,200 - 15,200
Other		7,090 - 7,090
<u>total - Installation Services</u>		<u>22,290 - 22,290</u>
<u>OTHER COSTS</u>		
Land, Easements and R/W		- 3,980 3,980
Administration of Contracts		- 1,010 1,010
<u>total - Other Costs</u>		<u>4,990 4,990</u>
<u>TOTAL STRUCTURAL MEASURES</u>		<u>66,110 74,650 140,760</u>
<u>O T A L P R O J E C T</u>		<u>69,950 120,060 190,010</u>

Price Base 1963

Date: July 1964

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT
(at time of Work Plan Preparation)

Beaver Watershed, Iowa

Measures (1)	Unit (2)	Applied to Date (3)	Total Cost (Dollars) <u>1/</u> (4)
<u>LAND TREATMENT</u>			
Tile Drains	mile	80	100,000
Wildlife Area	acre	1.5	150
Conservation Cropping Systems	acre	1,690	1,690
Farmstead Windbreaks	acre	5	750
<u>STRUCTURAL MEASURES</u>			
Mains and Laterals	mile	6.4	71,810
TOTAL	xxx	xxx	174,400

1/ Price base 1963

Date: July 1964

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION

Beaver Watershed, Iowa

(Dollars) 1/

Structure Site Number (1)	: Installation Cost - F.L.566 Funds				: Installation Cost - Other Funds				Total Instal. Cost (10)
	: Installation		: Other		: Other		: Total		
	: Construc- tion (2)	: Engineer: ing (3)	: Services Other (4)	: Total : P.L.566 (5)	: Construc: tion (6)	: Adm.of Con- tracts: (7)	: Ease- ments & R/W (8)	: Total Other (9)	

Total Project					
Tile Drains	43,820	15,200	7,090	66,110	69,660
				1,010	3,980
					74,650
					140,760

1/ Price base - 1963

Date: July 1964

TABLE 3 - PUBLIC TILE DRAIN DATA

Beaver Watershed, Iowa

Lineal Feet of Tile by Sizes

Tile: Line: le ze	Main	Lateral 1A	Lateral 1	Lateral 2	Lateral 3	Totals
6"			60			60
8	34		1736	44	548	2362
10			400	200	1100	1700
12	308		400	996		1704
14		662				662
16		1300		4400		5700
18	1900		1400	174	950	4424
20					2550	2550
22	4900					4900
24			1300		1200	2500
26			2300			2300
32	2000					2000
34	1852					1852
36	4000					4000
TOTALS	14,994	1,962	7,596	5,814	6,348	36,714

Date: July 1964

TABLE 4 - ANNUAL COSTS

Beaver Watershed, Iowa

(Dollars) 1/

Evaluation Unit	: Amortization of : Operation :		
	: Installation : and :		Total
	: Cost : Maintenance :		
(1)	: (2) : (3) :		(4)
Total Project	5,470	200	5,670

1/ Price base: Installation costs are based on 1963 price level and are amortized at 3.0 percent over 50 years. Operation and maintenance costs are based on projected long-term prices.

Date: July 1964

TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Beaver Watershed, Iowa

(Dollars) 1/

Evaluation Unit	AVERAGE ANNUAL BENEFITS				Average Annual Cost	Benefit Cost Ratio
	Agr.	Water	Secondary	Total		
	Mgmt.	Benefits				
(1)	(2)	(3)	(4)	(5)	(6)	
Total Project	38,800	5,120	43,920	5,670	7.7:1.0	

1/ Price base: Projected long-term price level for benefits;
1963 price level for costs.

Date: July 1964

INVESTIGATIONS AND ANALYSES

Geologic Investigations

The previous installation of the similar existing measures indicates that the soils are firm and therefore no installation problems of a geologic nature are anticipated except perhaps minor sand pockets and a few glacial boulders.

Engineering Design and Cost Estimates

In 1948, a complete plan for the installation of a relief system was made. This plan included the profiles of all tile lines, the location of the watershed divides, the planned depth of cut for all relief lines as well as a planned size and grade for all lines.

Since that time the design has been refined and the unit costs of the items of work involved brought up to date. The design and cost estimates of the structural measures are therefore in more detail than would be the case for most work plans.

The topography is such that this is basically an area of depressional areas which require a drainage coefficient of one-half inch in 24 hours. However, only the upstream portions were designed on a one-half inch coefficient or up until the contributing drainage area was about 500 acres. As the drainage area increased from 500 to 1200 acres, the drainage coefficient was decreased uniformly from one-half to three-eighths inch. A drainage coefficient of three-eighths inch was used to design all the tile drain mains with a contributing drainage area over 1200 acres. These design criteria were established in consideration of the arrangement of the lateral tiles versus the main, and the timing of the peak flow events.

Data concerning the costs of the different items of the proposed improvements were based on the past experience in and around the watershed involving similar structural and land treatment measures.

The design of the structural improvements was based on applicable Service criteria and design procedures. These include Service Washington and State Engineering Handbooks as well as the Iowa Drainage Guide and other engineering material.

Land Use and Treatment Studies

An inventory of present land use was developed for the entire watershed area. This inventory included the present major

classification of use, such as cropland, pasture, woodland, etc. This information was developed, from information of record, by the work unit conservationist.

A total conservation needs study was then made of the watershed area to determine the amount and type of land treatment measures that would be required to accomplish a complete conservation job.

The land treatment measures to be applied during the project installation period represent the expected accomplishments of the sponsors and farmers. The planned land treatment measures and those installed at the present time are shown in Table 1 and Table 1A respectively. Costs are based on 1963 price levels and include Agricultural Conservation Program (ACP) payments.

Economic Investigations

A study was made of soil survey photos to determine the degree and extent of drainage needs. The three major soil types are Okoboji silt loam, Webster silty clay loam, and Nicolett loam. Minor amounts of Clarion loam, Glencoe silty clay loam, and Harpster loam are also found in the watershed.

Information from farm plans and local Service technicians was used to arrive at cropping patterns and rotations used both with and without the project.

Crop yield studies were made using Special Report No. 25, "Estimated Crop Yields on Iowa Soils", April 1960, developed jointly by Iowa State University and the Service, yield records of farms in the watershed, and local Service field technicians. These crop yields were the basis for determining the economic returns with and without adequate tile drains. The crop yields were determined to be as follows:

<u>Crop</u>	<u>Without Project</u>	<u>With Project</u>
Corn	55 bu.	80 bu.
Soybeans	20 bu.	30 bu.
Oats	30 bu.	50 bu.
Hay	1.8 T	3.0 T
Pasture	85 cpd	120 cpd

The net per acre income was then determined. The percent distribution of the various categories by soils were determined and weighted economic returns were computed in a composite acre net return with and without the project. The weighted net income per acre with adequate tile drains was

found to be \$51.80 and without adequate tile drains \$27.40, giving a net benefit of \$24.40 per composite acre.

Associated costs of the farm tile drains were deducted from the gross per acre benefits. These costs, amortized at 3 percent for a 50-year period, were \$3.89 per acre. The net annual benefits are \$20.51 per acre before discounting.

About 2,000 acres of existing cropland will benefit from project measures. Of this, 1,000 acres are presently tiled but will realize immediate relief through increased main capacity. The remaining 1,000 acres will benefit from installation of new farm tile lines which cannot be installed without project improvements.

All benefits that will accrue from tile drains installed during the 15 years following the three-year project installation period were discounted using the straight line method as shown in the SCS Economics Guide, Appendix A. The net annual value after discounting, is \$19.40 per acre.

Other Benefits: Local secondary benefits that will accrue within the immediate zone of influence of the project were considered in computing the benefits accruing to the project. These were estimated to be about 13 percent of the direct primary benefits. Secondary benefits from a national viewpoint were not considered to be pertinent to the economic evaluation.

General: Costs incurred for installation of land treatment farm tile drains were considered as associated costs. Associated costs are those costs incurred which are not connected directly with the installation of the structural measures, but are necessary to realize the benefits claimed for the structural measures.

The costs of the land, easements, and rights-of-way were computed for the land disturbed by tile installation. It was estimated that two acres of cropland per mile of tile mains would be disturbed during the year that these improvements were installed. The value of the crops lost was based on present land use and crop yields.

All monetary values have been converted to an average annual base. All costs, including associated costs, were amortized at three percent based on a 50-year project life.

Projected long-term prices were used for computing operation and maintenance costs and for all benefits. Current (1963) prices were used to estimate the costs of

installing all structural and land treatment measures.

Primary benefits together with secondary benefits were used in computing the benefit-cost ratios of structural measures.

R 29 W	R 28 W
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