

File

See Per. Table 1

WORK PLAN

for the

MIDDLE NECK WATERSHED



Salem County

New Jersey

USDA Soil Conservation Service
1370 Hamilton St., P. O. Box 219
Somerset, N. J. 08873

Middle Neck Watershed, New Jersey

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November, 1963 (January, 1964)
Application for Assistance

June, 1964
Watershed Work Plan

December, 1964
Exchange of Correspondence

June, 1967
First Supplemental Watershed Work Plan Agreement

March, 1970
Final Table 1

APPLICATION FOR ASSISTANCE IN PLANNING AND CARRYING OUT WORKS OF IMPROVEMENT
IN NEW JERSEY
UNDER THE
WATERSHED PROTECTION AND FLOOD PREVENTION ACT

(PUBLIC LAW 566 - 83rd Congress)
(Amended PUBLIC LAW 1018 - 84th Congress)

TO THE HONORABLE
THE SECRETARY OF AGRICULTURE
UNITED STATES DEPARTMENT OF AGRICULTURE

The undersigned local organization(s) makes application for Federal assistance under the Watershed Protection and Flood Prevention Act in preparing and carrying out plans for work of improvement for the Middle Neck watershed.

The following information is submitted in support of the application:

1. Size of watershed: 1,902 acres.

2. Location of watershed:

a. State(s) New Jersey

b. County(ies) Salem

c. Tributary of Salem River

3. Watershed problems:

High tides causing tidegates to remain closed for prolonged periods preventing outlet channels from free flow. This results in the flooding and restricted drainage to more than 500 acres of cropland plus many acres of pasture and other agricultural land.

Storm tides also cause periodic damage to county and township roadways. November 1950, and October 15, 1954, topped and seriously damaged Sinnickson Landing Road.

In September 1960, Salem-Ft. Elfsborg Road was submerged and damaged.

Forty-Five (45) mph Northeast windstorm in March 1962, caused tides to overtop Sinnickson Landing Road which damaged road surface and also resulted in washout of packing materials between sluices causing a leakage problem.

Present drainage channels are seriously silted in which has reduced capacities to less than 15%.

Inefficient operation of tidegates and inadequate capacity of sluices also contribute to the problem of flooding and restricted drainage.

4. Works of improvement believed to be needed:

1. Widening and deepening of existing stream channels.
2. Installation of new and additional tidegates and sluices.
3. Widening and deepening of lateral ditches to provide drainage outlets.
4. Installation of land treatment for soil conservation and erosion control.

5. Benefits expected to be achieved:

1. Relieve flooding of intensively used farmland, producing vegetables, grain, hay and pasture.
2. Provide better drainage for the above agricultural land.
3. Improve woodland production.
4. Improve upland game populations through conservation practices.
5. Protect township and county roads.

6. Extent of local participation:

A. Sponsorship by the Middle Neck Meadow Company, Salem-Cumberland Soil Conservation District, Salem County Board of Chosen Freeholders, and the Elsinboro Township Committee. Middle Neck lying within the Salem River Watershed is endorsed and strongly supported by the Salem River Watershed Association.

B. Local participation will include cost-sharing, obtaining easements and rights-of-way, obtaining soil conservation district agreements. Provide an extensive public relations program.

7. Status of local organizations:

All sponsors qualify as required. State, County, Township, and the Meadow Company have the right of taxation.

Witness the signatures of the undersigned local organization(s) on the dates shown below. (Type or print all information except signature.)

Salem-Cumberland Soil Conservation District

(Name of Local Organization)

By:(Sig.) *Anton J. Layton*

Title Chairman

Date July 11, 1963

This action authorized at an official meeting

on July 11, 1963

at Woodstown, New Jersey

Attest:(Sig.) *Frank J. Collins*
~~(Secretary)~~ Treasurer

Middle Neck Meadow Company

(Name of Local Organization)

By:(Sig.) *Benj. G. Haynes Jr.*

Title manager

Date July 9, 1963

This action authorized at an official meeting

on 9 July, 1963

at Eleonore Fire House

Attest:(Sig.) *William J. ...*
(Secretary)

Salem County Board of Chosen Freeholders

(Name of Local Organization)

By:(Sig.) *B. G. ...*

Title Deputy

Date Jul 16/63

This action authorized at an official meeting

on Jul 16, 1963

at Salem, N.J.

Attest:(Sig.) *W. R. ...*
(Secretary) *Club*

Contact: The above local organizations request that all correspondence or contacts pertaining to this application be directed to:

Thomas G. Hilliard, Jr.
(Name)

97 Market Street

(Mail Address)

Salem, New Jersey

The foregoing application for Federal assistance under the Watershed Protection and Flood Prevention Act is hereby approved.

New Jersey Department of Conservation and Economic Development

By: *Walter T. ...*

Title: *State ...*

Date: *11-7-63*

Witness the signatures of the undersigned local organization(s) on the dates shown below. (Type or print all information except signature.)

Elsinboro Township

~~Warrant Board of Elsinboro Township~~

(Name of Local Organization)

By: (Sig.) Preston R. Kane

Title Mayor

Date Aug. 5, 1963

This action authorized at an official meeting

on August 5, , 1963

at Elsinboro Township

Attest: (Sig) Frank Powers
(Secretary)

Very truly yours,

John T. Gayner

John T. Gayner, President

WATERSHED WORK PLAN
MIDDLE NECK WATERSHED
Salem County, New Jersey

Prepared under the authority of the
Watershed Protection and Flood Prevention Act
(P.L. 566, 83d Cong., 68 Stat. 666 as amended)

Prepared by:

Salem-Cumberland Soil Conservation District
Salem County
Elsinboro Township
Middle Neck Meadow Company

Assisted by:

United States Department of Agriculture
Soil Conservation Service
Forest Service

June 1964

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SUMMARY OF PLAN

The Middle Neck Watershed, draining an area of 1,722 acres, lies entirely in Elsinboro Township, Salem County. It consists of two main parallel channels flowing northward and converging into one channel just before outletting into Salem River. The channels are former tidal estuaries which were diked by the Middle Neck Meadow Company about 1810. The tidal marsh was thus converted to agricultural use.

Sponsoring local organizations are the Salem-Cumberland Soil Conservation District, Salem County, Elsinboro Township and Middle Neck Meadow Company.

The principal problem is inadequacy of channels and tidegates to dispose of floodwater and to provide outlets for needed drainage systems, thus affecting about 500 acres of agricultural land.

A comprehensive plan for alleviating this problem has been prepared by the sponsors, assisted by the U. S. Soil Conservation Service and the U. S. Forest Service. Other agencies participating and consulted were the New Jersey Bureau of Forestry, the U. S. Agricultural Stabilization and Conservation Service and the U. S. Army Corps of Engineers.

This plan includes land treatment measures needed to realize benefits from the structural measures and those having a measurable effect on runoff and erosion. The plan also provides for structural measures, including 6.3 miles of stream channel improvement, a tidegate structure and raising of 1.3 miles of dikes and levees.

It is proposed to install the project over a period of 5 years. The installation cost is estimated at \$370,315. The Public Law 566 share of this cost is \$259,908. The remaining \$110,407 will be paid from other funds.

Land Treatment Measures

The estimated cost for installation of land treatment measures is \$88,631, of which \$79,924 will be paid from other funds. Public Law 566 funds amounting to \$8,707 are entirely for accelerated technical assistance, and all for use by the Soil Conservation Service.

Structural Measures

Structural measures consist of 6.3 miles of stream channel improvement, one tidegate structure, and raising of 1.3 miles of dike. The stream channel improvement and tidegate structure provide flood prevention and drainage benefits to agricultural land. The existing dike is adequate for normal tide action and needs to be raised only to provide protection against storm tides. Hence, benefits from raising the dike are flood prevention benefits.

The total installation cost is estimated at \$281,684, of which the Public Law 566 share is \$251,201. The remaining \$30,483 will be paid from other funds and includes \$1,973 for administration of contracts and \$5,535 for land, easements and rights-of-way.

Benefits

Benefits will accrue to about 500 acres of agricultural land growing truck crops, soybeans, small grain, field corn and hay. These are flood prevention and drainage benefits resulting from more intensive land use and greater yields of crops grown.

The average annual primary benefit from structural measures is \$14,659. Secondary benefits amount to \$1,310 annually.

The ratio of primary average annual benefits to average annual costs is \$14,659 to \$12,641, or 1.2 to 1.0. The ratio of primary and secondary average annual benefits to average annual costs is \$15,969 to \$12,641, or 1.3 to 1.0.

Provisions for Financing Construction

Land, easements and rights-of-way will be provided by Middle Neck Meadow Company, Elsinboro Township and Salem County. Salem County will administer contracts and will pay the local share of construction costs. The above costs amount to \$30,483, of which \$22,975 is the local share of construction costs.

Provisions for Operation and Maintenance

Salem County will assume responsibility for operation and maintenance of the structural measures. The estimated average annual cost is \$1,692. Land treatment measures will be operated and maintained by the landowners and operators under agreements with the Salem-Cumberland Soil Conservation District.

DESCRIPTION OF THE WATERSHED

Physical Data

The Middle Neck Watershed takes in 1,722 acres, all of which lie in Elsinboro Township. It is located south of the City of Salem and drains northward into the mouth of Salem River. The drainage system consists of two main channels which parallel one another for about 2½ miles before joining near the outlet into Salem River.

The topography is flat to very gently rolling. Elevations range from 2 feet below mean sea level to 16 feet above mean sea level. Very little of the drainage area is above 10 feet. About 700 acres of the watershed is below 3.0 feet mean sea level, which is the level of the

average daily high tide in this area.

The channels were tidal estuaries until the year 1810, when they were diked by the newly organized Middle Neck Meadow Company.

The average daily tide fluctuates from -2.4 to +3.0 feet mean sea level. The average maximum yearly high tide ranges from 5.5 to 6.0 feet above mean sea level. The highest tide of more than 30 years of record, 8.5 feet, occurred November 25, 1950.

The average annual precipitation is 44 inches, the greatest amounts occurring during July and August. The remainder is fairly evenly distributed throughout the year. The average annual temperature is 53 degrees. The monthly average ranges from 31 degrees in February to 75 degrees in July. The frost free period is generally from mid April to late October.

Domestic water is obtained from shallow wells. The supply is adequate.

Geologic Data

According to the geologic map of New Jersey (rev. 1950) the watershed is underlain by three unconsolidated Coastal Plain formations, Eocene in age. The oldest one is the Mount Laurel-Wenonah medium to fine sand along Salem River. Next are the Navesink-Hornerstown glauconitic clays across the central part and finally the Vincentown fine sands under the southern end. The next formation, the Kirkwood clay and fine sand, may cut across the southern tip.

The whole area is covered by a mantle of Quaternary sands and silty sands, 10-30 feet deep. In the "guts" or tidal channels traversing these formations but parallel to the Delaware River, gray silty alluvium of more recent origin is found. In spots deep organic deposits also occur. These old, silted stream channels probably bottom on the slowly permeable glauconitic formations which dip 30-40 feet per mile toward the south. These buried channels become more narrow and shallow toward the south.

Soils Data

Soils in the watershed generally belong to the Sassafras, Woodstown and Fallsington catena along with the Mattapex-Othello catena. These are generally good cropland soils. There are areas of Galestown loamy sand to the north. Large areas of tidal marsh (generally shallow to sand) are found at the northern end of the watershed. These have been used extensively as salt hay and pasture in the past, many even as cropland.

Much of the cropland and pasture is now somewhat poorly to poorly

drained, especially near the southern end. The need for adequate drainage of farmland is evident.

Economic Data

This watershed is entirely rural. There are about 28 landowners in the Watershed and 13 active farms. Some of the farms are 100 percent truck farms, whereas most combine dairy and truck farming. Farms range from about 75 to 200 acres in size and \$20,000 to \$50,000 in value. All the farms are owner operated.

Principal crops grown are asparagus, tomatoes, field corn, soybeans, barley and hay.

Most of the farm products are processed in Salem, Swedesboro and Bridgeton. Some go to Camden and Philadelphia. Swedesboro and Bridgeton are each about 17 miles away, and Philadelphia about 50 miles. Bridgeton which has a population of 22,000, has been designated as a 5A area by the Area Redevelopment Administration. Highway transportation to market areas is excellent.

Forest land is of the mixed hardwood types, making up about 12 percent of the watershed area. All of the land is in private ownership. Protection and managed use will increase the over-all productivity of these lands.

Adequate fire protection is provided by the New Jersey Bureau of Forestry in cooperation with the U. S. Forest Service under the Clarke-McNary Cooperative Fire Control Program. Other Federal-State cooperative forestry programs include: Cooperative Forest Management (CFM), Cooperative Forestation (C-M4), and Cooperative Forest Insect and Disease Control.

Present land use in the watershed is tabulated below:

<u>Land Use</u>	<u>Acres</u>	<u>Percent</u>
Cropland	912	53
Grassland	207	12
Woodland	200	12
Marsh and Other	403	23
Total	1,722	100

WATERSHED PROBLEMS

The Middle Neck Meadow Company was organized under authority of State Law in 1810. It is one of many such groups organized in coastal areas of New Jersey about this time.

The Middle Neck Meadow Company was organized for the purpose of converting several hundred acres of tidal marsh to agricultural land. This was accomplished by construction of about 5,800 feet of earth dike across the mouth of the tidal estuary, thus preventing inundation by tidewater. Gravity disposal of upland water was provided by tidegates, allowing interior runoff to get out while preventing tidewater from entering.

The system of dike and tidegates functioned for many years. Maintenance of the system was accomplished by the Middle Neck Meadow Company through assessment of its members.

The storm of August 1933 severely breached the dike and clogged drainage channels with sediment and debris. Occuring in the height of the depression era, the Middle Neck Meadow Company could not finance the needed repairs. Salem County repaired the damage, and has since maintained the dike as a county road. The channels have never been adequately repaired and have undergone additional clogging with vegetation since 1933.

Flooding occurs annually, with the most severe storms coming between July and November. These are often associated with hurricanes. The flood hazard, combined with poor drainage, affects 500 acres of agricultural land. They are affected both in the limitations on choice of crops and in the yield and quality of crops grown. Landowners are unable to take advantage of Agricultural Conservation Program assistance in installation of on-farm drainage systems because of inadequate outlets. The soils are Matapex, Woodstown, Fallsington and Othello, which are highly productive and adaptable to a wide variety of crops when adequately drained.

Erosion and sedimentation from upland runoff are not serious problems, due to the gentle terrain.

PROJECTS OF OTHER AGENCIES

Since this project is within the Delaware River Basin, it must be submitted to the Delaware River Basin Commission for review.

BASIS FOR PROJECT FORMULATION

The sponsors desire fair agricultural drainage of low land to be used for hay and pasture and excellent agricultural drainage for higher land to be used primarily for truck crops. Hence, the channels and tidegate capacity were designed for "D" curve drainage for the low land and "B" curve drainage for the higher land.

The sponsors also wish to raise the dike to an elevation that will not be overtopped, even in the large tidal storms. The design height will be based on the four percent chance of occurrence with allowance for freeboard and wave action. Thus, the top of dike will vary between 9.5 and 11.5 feet above mean sea level, depending on the degree of exposure to wave action.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures

In order to realize the benefits from improved stream channels and tidegates, it is necessary for individual landowners to install on-farm drainage systems. The Salem-Cumberland Soil Conservation District will accelerate this phase of the land treatment program, including supplemental measures resulting in high productivity and efficiency of farming operations. Also accelerated will be measures that will reduce runoff and erosion.

Land treatment is summarized in Table 1 by acres to be treated.

Cropland - Applicable land treatment measures include conservation cropping systems, contour farming and drainage field ditches.

Grassland - Applicable land treatment measures include pasture and hay land planting, rotation grazing and drainage field ditches.

Forest land - The forest land treatment program consists of 3 acres of tree planting and 11 acres of hydrologic cultural operations. Both measures favor the production of litter, humus and forest cover.

Structural Measures

About 7,000 feet of existing dikes will be raised about 1.5 to 5.5 feet. The elevation of the top of the dike will vary from 9.5 to 11.5 feet above mean sea level, depending on the degree of exposure to wave action. The dike will be constructed of mineral soil, having a top width of 8 feet and 2:1 side slopes. The side slope exposed to wave action will be rip rapped with stone from station 10+50 to 47+80. Refer to Project Map for location and stationing. Figure 1 shows typical cross sections of the dikes and levees.

The existing tidegate structure is inadequate and will be replaced by a structure consisting of four 48 inch diameter pipes, equipped with flap gates. The invert elevation will be -6.0 feet

mean sea level. The normal water level just inside the dike will vary between -2.0 and -2.5 feet. The design high water is +1.0 feet. The maximum capacity of the tidegate will be 420 cubic feet per second. See Figure 2 for a typical cross section of the tidegate structure.

In order to facilitate proper functioning of the tidegate, 600 feet of outlet channel, having a 30 foot bottom width and 2:1 side slopes will be constructed from the tidegate to Salem River. The channel will have a capacity of 420 cubic feet per second.

Also, about 6.2 miles of stream channels inside the dike will be improved by widening, deepening and straightening. Channels will be designed with sufficient capacity to provide fair agricultural drainage ("D" curve) in the low lying areas to be used for hay and pasture and excellent agricultural drainage ("B" curve) in the higher areas used for truck crops. Bottom widths will range from 3 to 24 feet.

Amwellbury Road crosses 2 forks of East Branch. One fork has a bridge which will require underpinning and the other has a culvert which will require replacement.

The total installation cost for structural measures is estimated at \$281,684. This includes necessary vegetative protection of the dike. See Tables 1, 2, 3 and 3A for details of costs, quantities and design features. See Project Map for location of structures.

EXPLANATION OF INSTALLATION COSTS

Land Treatment Costs

Costs for installation of land treatment measures are estimated at \$88,631. Of this, \$88,281 will be for measures to be installed under supervision of the U. S. Soil Conservation Service and \$350 under supervision of the New Jersey Bureau of Forestry in cooperation with the U. S. Forest Service. The Public Law 566 share is for technical assistance. This amounts to \$8,707, all of which is for use by the Soil Conservation Service.

Costs for installation of land treatment measures were based on current costs of supervision, labor, equipment and materials.

Costs for technical assistance in installation of land treatment measures were based on an analysis of local records of the Soil Conservation Service and the New Jersey Bureau of Forestry.

Structural Measures

The installation cost for structural measures is estimated at \$281,684, of which \$251,201 will be paid from Public Law 566 funds and \$30,483 from other funds.

Construction costs for structural measures were based on calculated quantities of major bid items and estimated unit costs were obtained from recent bid prices for similar construction items in this area. The construction cost estimates include an allowance of 12 percent for contingencies.

Installation services include costs for geologic investigations, engineering surveys, final designs, supervision and inspection, and administrative overhead.

The cost for geologic investigations was based on estimates of time and equipment rental rates. Costs for engineering surveys, designs and supervision and inspection were based on estimates of man days to complete this phase of installation. Administrative costs were based on records kept by the state fiscal office for similar projects. Installation services costs amount to 39.9 percent of the construction cost estimates.

Land, easements and rights-of-way costs were obtained from the local tax assessor. Land values range from \$50 per acre for marsh land to \$300 per acre for good agricultural land. Costs for installation of a new culvert were obtained from the county engineer.

The estimated costs for administration of contracts were obtained from the local contracting organization, based on past experience.

Since the existing dike is adequate for normal tides, the need for raising the dike is brought about by the need for protection from storm tides. Hence, the installation cost of raising the dike was allocated to flood prevention. Installation cost for the tidegate structure and stream channel improvement measures was allocated by using the second alternative described in Section 1132.212 of the Watershed Protection Handbook. This resulted in allocating 76.3 percent to flood prevention and 23.7 percent to agricultural water management. Construction costs for flood prevention will be paid entirely from Public Law 566 funds. Construction costs for agricultural water management will be shared on a "fifty-fifty" basis between Public Law 566 and other funds. Installation services costs will be paid from Public Law 566 funds, and the costs for land, easements and rights-of-way from local funds. The Public Law 566 share of the installation costs for flood prevention is 98.0 percent and for agricultural water management, 60.9 percent.

The following is the proposed schedule of obligations:

Year	Structural Measures		Land Treatment		Total	
	P.L. 566	Other	P.L. 566	Other	P.L. 566	Other
1st	226,201	27,483	1,000	6,000	227,201	33,483
2nd	25,000	3,000	2,000	20,000	27,000	23,000
3rd			2,000	20,000	2,000	20,000
4th			2,000	20,000	2,000	20,000
5th			1,707	13,924	1,707	13,924
TOTAL	251,201	30,483	8,707	79,924	259,908	110,407

EFFECTS OF WORKS OF IMPROVEMENT

The proposed structural measures will provide more rapid disposal of runoff and adequate outlets for farm drains on 392 acres of cropland, 108 acres of grassland, and 138 acres of woodland. About 13 landowners will be directly benefited by increased net income brought about by more intensive use of the land and greater yields of crops now grown. Major crops benefited will be asparagus, tomatoes, soybeans, barley, field corn, mixed hay and alfalfa. Low lying areas now used for pasture will receive only minor benefits, since these areas will be utilized for storage during storms. It is not expected that there will be any new land brought into production.

The local economy will be stimulated by the project. Local labor, equipment and materials will be utilized in construction of structural measures. Increased agricultural production will result in increased utilization of labor, equipment and materials in the production, processing and sale of farm products. Improved efficiency of farm operations will be realized by farm families affected by the project.

PROJECT BENEFITS

The proposed structural measures will provide flood prevention and agricultural water management benefits to 392 acres of cropland and 108 acres of grassland. The capacity of improved channels and tidegate will be sufficient to adequately dispose of storm runoff. Channels will be deep enough to provide outlets for drainage mains and laterals. Benefits are based on increased yields and net income from truck crops, soybeans, field corn and hay. Annual direct identifiable benefits amount to \$14,659, of which \$11,185 are flood

prevention and \$3,474 are agricultural water management benefits. Secondary agricultural benefits amount to \$1,310, and are included for project justification. Secondary benefits fall in two categories, those stemming from the project and those induced by the project. Those stemming from the project include benefits from increased activities associated with increased production. These are of a local nature. Secondary benefits from a national view point were not considered pertinent to the economic evaluation.

Other benefits, although not evaluated, will be realized from the project. About 138 acres of woodland will be enhanced by less flooding and improved drainage. It is believed that mosquito control benefits will be substantial. About 0.8 miles of public road will be benefited in the form of decreased maintenance costs.

Redevelopment benefits were not computed, hence were not used for project justification.

COMPARISON OF BENEFITS AND COSTS

Average annual primary benefits are estimated at \$14,659, as compared to \$12,641 estimated average annual costs, a benefit-cost ratio of 1.2 to 1.0.

Average annual benefits including local secondary benefits from all structural measures are estimated at \$15,969, as compared to average annual costs of \$12,641 a benefit-cost ratio of 1.3 to 1.0.

See Table 5 for details on benefit-cost computations.

PROJECT INSTALLATION

The Salem-Cumberland Soil Conservation District will cooperate with landowners and operators in carrying out the accelerated land treatment program over a period of 5 years. Technical assistance will be provided by the Soil Conservation Service to District cooperators. Forest land treatment measures will be installed by the landowners with technical assistance furnished by the New Jersey Bureau of Forestry in cooperation with the U. S. Forest Service.

The Salem County Agricultural Stabilization and Conservation Committee will provide financial assistance to landowners and operators, in line with needs and funds available, for installation of those measures which will accomplish the conservation objectives.

The Farmers Home Administration will provide soil and water conservation loans to all eligible landowners requesting them.

The Soil Conservation Service will provide technical assistance in the design of structural measures, preparation of specifications,

supervision of construction, preparation of contract payment estimates, final inspection, execution of certificates of completion, and performance of related activities in the establishment of the planned structural measures.

The New Jersey Agricultural Extension Service, through the Salem County Agricultural Extension Agent, will assist the sponsors in carrying out an information and education program designed to get full understanding and appreciation of the overall objectives.

The Middle Neck Meadow Company has the authority to install the proposed structural measures within its boundaries.

Salem County has the authority to raise the dike, since the dike is a public thoroughfare maintained by the County.

The upper reaches of the stream channel improvement measures are outside of the Middle Neck Meadow Company jurisdiction. Elsinboro Township will obtain easements for these measures.

Salem County will provide the local share of construction cost for the structural measures and will administer contracts.

The sponsoring local organizations have the power of eminent domain and have agreed to use such powers, if necessary, to acquire the necessary land, easements and rights-of-way.

FINANCING PROJECT INSTALLATION

Federal assistance for carrying out the works of improvement as described in the work plan will be provided under the authority of the Watershed Protection and Flood Prevention Act, Public Law 566 (83d Cong., 68 Stat. 666), as amended.

The estimated cost for installation of land treatment measures is \$88,631, of which \$88,281 is for agricultural land and \$350 for forest land. Of the \$88,281 for agricultural land, \$11,607 is for technical assistance, \$8,707 to be provided by the Soil Conservation Service with Public Law 566 funds and \$2,900 by the going program of Soil Conservation Service assistance to Districts. The remaining \$76,674 will be paid by landowners. Of the \$350 for forest land treatment measures, \$150 will be for technical assistance. This amount will be shared by the State and Federal government through the Cooperative Forest Management Program. The remaining \$200 will be borne by the landowners.

Cost sharing assistance for installation of land treatment measures will be made available to eligible landowners and operators, consistent with needs and funds available, through the Agricultural Conservation Program.

The Middle Neck Meadow Company controls the land rights necessary for installation of structural works of improvement within its boundaries. These are valued at about \$2,400.

Salem County will install a new culvert, estimated to cost \$1,500, from funds budgeted for that purpose. The County has the necessary rights, valued at \$235, to raise the dike.

Elsinboro Township will obtain all other land, easements and rights-of-way, valued at \$1,400. It is expected that these will be donated.

Salem County will provide the non-Federal share of construction costs from funds budgeted for that purpose.

The Public Law 566 share of the construction cost is estimated at \$174,336. Technical assistance for installation of accelerated land treatment measures will be made available from Public Law 566 funds. Federal financial assistance is contingent upon funds appropriated under the Act.

PROVISIONS FOR OPERATION AND MAINTENANCE

Land treatment measures will be operated and maintained by landowners and operators under cooperative agreements with the Salem-Cumberland Soil Conservation District. Forest land treatment measures will be operated and maintained by the landowners. Technical assistance will be provided by the New Jersey Bureau of Forestry in cooperation with the U. S. Forest Service through the Cooperative Forest Management Program.

Maintenance of structural measures will consist of repair of any damage to the dike; repair of any damage to the tidegate structure, including replacement of damaged or worn out parts when this becomes necessary for proper operation; removal of debris that may prevent proper operation of the tidegate; and periodic removal of sediment, vegetation and debris clogging channels in order to maintain design capacity.

Salem County will assume responsibility for operation and maintenance, estimated to cost \$1,692 annually. Maintenance of channel improvement measures will be done with County equipment and personnel. Funds will be budgeted for other maintenance costs.

Structural measures will be inspected after each major storm, and at least once a year. A written inspection report will be prepared by the County and made available to the Soil Conservation Service at any time. Representatives of the County will make the annual inspection jointly with the Soil Conservation Service. They will jointly determine needed maintenance measures. The Soil Conservation Service will

provide design information and technical assistance that may be needed and available in performing maintenance work.

An operation and maintenance agreement between the Soil Conservation Service and the County will be executed prior to invitations to bid.

TABLE 1 - PROJECT INSTALLATION COST

Middle Neck Watershed, New Jersey

March 1, 1970

Installation Cost Item	Acres Treated	Unit	No.	Cost (Dollars)		
				P.L. 566	Other	Total
<u>LAND TREATMENT</u>						
Soil Conservation Service						
Cropland	1,308				57,936	57,936
Grassland	20				800	800
Technical Assistance				4,136	244	4,380
SCS Subtotal	1,328			4,136	58,980	63,116
<hr/>						
Forest Service						
Forest Land	15				215	215
Technical Assistance					161	161
FS Subtotal					376	376
<hr/>						
TOTAL LAND TREATMENT				4,136	59,356	63,492
<hr/>						
<u>Structural Measures</u>						
Soil Conservation Service						
Stream Channel Improvement		Mi.	6.3	17,880	21,467	39,347
Tide Gate Structure		No.	1	41,186		41,186
Dikes & Levees		Mi.	0.7	33,335		33,335
Subtotal - Construction				92,401	21,467	113,868
<hr/>						
<u>Installation Services</u>						
Soil Conservation Service						
Engineering				40,598		40,598
Other				34,427		34,427
Subtotal - Installation Services				75,025		75,025

TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

Middle Neck Watershed, New Jersey

Measures	Unit	Applied to Date	Total Cost (Dollars)
Cover and Green Manure	Acre	300	2,700
Conservation Cropping System	Acre	250	-
Crop Residue Use	Acre	65	260
Hay and Pasture Planting	Acre	50	2,000
Tree Planting	Acre	1	55
Hydrologic Cultural Operations	Acre	1	50
TOTAL	-	-	5,065

TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Middle Neck Watershed, New Jersey

(Dollars) 1/

Structure	Installation Cost - P.L. 566 Funds				Installation Cost - Other Funds			Total Installation Cost	
	Construction	Installation Engineering	Services Other	Total P.L. 566	Construction	Other Admin. of Land, Easements & R/W Contracts	Total Other		
Stream Channel Improvement <u>2/</u>	68,925	18,843	16,449	104,217	22,975	919	5,300	29,194	133,411
Dikes and Levees	105,411	22,704	18,869	146,984	1,054	235		1,289	148,273
GRAND TOTAL	174,336	41,547	35,318	251,201	22,975	1,973	5,535	30,483	281,684

1/ 1964 Price Base

2/ Includes tidegate structure

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

Middle Neck Watershed, New Jersey

(Dollars) ^{1/}

Item	Purpose		Total
	Flood Prevention	Drainage	
<u>COST ALLOCATION</u>			
Stream Channel Improvement	66,705	66,706	133,411
Dikes and Levees	148,273		148,273
TOTAL	214,978	66,706	281,684
<u>COST SHARING</u>			
P. L. 566	210,580	40,621	251,201
Other	4,398	26,085	30,483
TOTAL	214,978	66,706	281,684

^{1/} Price Base 1964

TABLE 3 - STRUCTURAL DATA

DIKE AND TIDEGATE

Middle Neck Watershed, New Jersey

Item	Unit	Total
Length	feet	7,000
Maximum Height	feet	12.8
Elevation, Top of Dike		
Station 0+00 to Station 10+50	feet (m.s.l.)	10.0 to 11.5
Station 10+50 to Station 47+80	feet (m.s.l.)	11.5
Station 47+80 to Station 68+00	feet (m.s.l.)	11.5 to 9.5
Station 68+00 to Station 70+00	feet (m.s.l.)	9.5 to 8.2
Top Width	feet	8.0
Side Slopes	XXXX	2:1
Volume of Fill	cu.yd.	64,117
Average High Tide	feet (m.s.l.)	3.0
Average Low Tide	feet (m.s.l.)	- 2.4
Design Water Elevation	feet (m.s.l.)	7.5
Highest Tide of Record	feet (m.s.l.)	8.5
Average Capacity of Tidegate Structure	cfs	187.5 <u>2/</u>
Maximum Discharge Through Tidegate Structure	cfs	420.0 <u>3/</u>
Size of Opening of Tidegate Structure	sq.ft.	50.28
Elevation of Tidegate Structure Invert	feet (m.s.l.)	- 6.0

1/ Four percent chance of occurrence

2/ Required "B" Drainage Curve discharge

3/ Based on tidegate capacity at low tide with inside water level of +1.03 ft. m.s.l. ("B" curve)

TABLE 3A - STRUCTURE DATA
Channels
Middle Neck Watershed, New Jersey

Manning's "n" Value Design	Channel Design		Design Water Surface Elev. (MSL Datum)		Design Depth (ft.)	Flow Area At Design Depth (sq. ft.)	Planned Hydraulic Gradient (ft./ft.)	Channel Velocity Design Depth (fps)	Planned Cap. At Design Depth (cfs)	Volume of Excavation (1000 Cu. Yds.)
	Bottom Width (ft.)	Side Slopes	Foot	Head						
0.035	24	2:1	-1.00	-0.86	5.0	170.0	0.00024	1.58	268.0	1.57
0.035	10	2:1	-0.86	-0.60	5.0	100.0	0.00016	1.13	113.0	3.31
0.035	3	2:1	-0.60	-0.53	4.9	62.7	0.00005	0.56	35.1	1.67
Bridge - Ft. Elfsborg Road - Head loss due to bridge neglected										
0.035	3	2:1	-0.53	-0.30	4.3	49.9	0.00005	0.52	25.9	4.46
0.035	3	2:1	-0.30	-0.20	3.3	31.7	0.00005	0.44	13.9	2.49
✓										
0.035	16	2:1	-0.86	-0.41	5.0	130.0	0.00015	1.18	153.4	8.44
0.035	5	2:1	-0.41	-0.31	4.3	58.5	0.00007	0.63	36.9	1.16
Bridge - Ft. Elfsborg Road - Head loss due to bridge neglected										
0.035	4	2:1	-0.31	+0.34	3.7	42.2	0.00011	0.72	30.4	4.94
0.035	3	2:1	+0.34	+0.39	3.8	40.3	0.00005	0.48	19.3	1.68
Bridge - Amwellberry Road - Head loss due to bridge neglected - Bridge to be underplanned										
0.035	3	2:1	+0.39	+2.02	1.49	8.9	0.00165	1.64	14.6	2.05
0.035	3	2:1	+2.02	+3.88	0.87	4.1	0.00165	1.24	5.1	0.63
0.035										
0.035	3	2:1	+0.34	+0.40	3.2	30.1	0.00005	0.43	12.9	1.85
CMP under Amwellberry Road. Head loss = 0.11' - New culvert										
0.035	3	2:1	+0.51	+2.42	1.42	8.3	0.0092	1.33	11.0	3.66
0.035	3	2:1	+2.02	+4.50	0.57	2.3	0.0017	1.00	2.3	2.23
0.035	30	2:1	-2.40	-2.20	4.2	161.3	0.000333	1.72	277.4	1.86

Based on the above design. Design water elevation at Sta. 16+50 is +1.03 and is based on 'B' drainage
 re maximum discharge is 420.0 cfs with an inside water level of +1.03 and mean low tide outside.

- 4/ Confluence with East Branch
 - 5/ Max. discharge proportioned by ratio of drainage areas
 - 6/ Normal depth
 - 7/ Slope at normal depth
- inside water level of minus
 outside (Max. discharge)

TABLE 4 - ANNUAL COST
Middle Neck Watershed, New Jersey
(Dollars) ^{1/}

EVALUATION UNIT	AMORTIZATION OF ^{2/} INSTALLATION COST	OPERATION AND ^{3/} MAINTENANCE	TOTAL
Stream Channel ^{1/} Improvement ^{4/} and Dikes & Levees	10,949	1,692	12,641
TOTAL	10,949	1,692	12,641

^{1/} 1964 Price Base
^{2/} Amortized 50 yrs. @ 3%
^{3/} Long term prices as projected by ARS September, 1957
^{4/} Includes tidegate

TABLE 5 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Middle Neck Watershed, New Jersey

(Dollars) 1/

Evaluation Unit	AVERAGE ANNUAL BENEFITS			Average Annual Cost	Benefit Cost Ratio	
	Flood Prevention More Intensive Land Use	Agricultural Water Management Drainage	Secondary <u>2/</u> Benefits			Total Benefits
Stream Channel Improvement <u>3/</u> and Dikes & Levees	11,185 <u>1210</u> <u>12495</u>	3,474	1,310	15,969	12,641	1.3:1.0

1/ 1964 Price Base for installation. Long-term prices as projected by ARS September, 1957 used for operation and maintenance.
2/ Used for project justification
3/ Includes tidegate structure

INVESTIGATION AND ANALYSIS

Hydrology and Hydraulics

The hydrologic and hydraulic design of the tidegate structure and stream channels was based on providing fair agricultural drainage for low lying areas to be used for grassland and excellent agricultural drainage for higher areas used more intensively for truck and other crops. "D" curve drainage criteria was applied for the low lying grassland areas. The hydraulic gradient resulting from superimposing the "B" curve drainage criteria on the "D" curve design was used in determining the benefits accruing to the higher, more intensively farmed areas.

The mean high tide (+3.0 feet mean sea level) and the mean low tide (-2.4 feet mean sea level) were obtained from the Corps of Engineers Delaware River mean tide curve for a station located at the entrance of C&D Canal (Reedy Point), Delaware.

The highest allowable water elevation on the upstream side of the tidegate structure for an average inflow of 65.5 cubic feet per second ("D" curve) was set at -1.0 feet mean sea level. The required area of opening in the tidegate structure was determined from Figure 6 in Technical Release, EWP No. 6. The discharge through the tidegate structure will be zero at high tide and a maximum of 266 cubic feet per second at low tide. The outlet channel, 3,000 feet of inlet channel on East Branch, and 2,200 feet of inlet channel on West Branch were designed to carry the maximum discharge.

Application of "B" curve drainage criteria to the above design resulted in a water elevation of 1.0 feet mean sea level on the upstream side of the tidegate structure. The average discharge through the tidegate is 187.5 and the maximum 420.0 cubic feet per second.

The hydraulic gradients for "B" and "D" curve drainage criteria were computed by Mannings' formula. More detailed water surface profile computations will be used for final design.

Economics

Economic justification was based entirely on agricultural benefits. The benefits were based on increased net income brought about by increased yields of asparagus, tomatoes, soybeans, field corn, barley, mixed hay and alfalfa.

The benefit area for the relatively low lying grassland was determined from the present and future "D" curve hydraulic gradient, and for the higher and more intensively used cropland from the "B" curve hydraulic gradient. Under present conditions the water gets out of bank, flooding the low flat grassland and encroaching upon the more

intensively cropped agricultural land. The water remains out of bank for extended periods of time due to insufficient tidegate and channel capacity.

The designed hydraulic gradients were delineated on a contour map (aerial photograph) of the problem area. The limits of influence of the hydraulic gradients were also delineated. Thus, with the aid of overlays, the areas of II and III drainage soils falling within these limits were planimetered and the benefit acres determined.

Interviews with local landowners, the Work Unit Conservationist, and the County Agricultural Agent were made to determine crop distribution and crop yields under present conditions as compared to conditions with the project installed. Following is a table summarizing agricultural benefits:

SUMMARY OF AGRICULTURAL BENEFITS

Land Use	Without Project			With Project			Net Increase With Project
	Acres	Yield Per Acre	Net Income	Acres	Flood Free Yield	Net Income	
Asparagus	10	1,800 lbs.	540	10	2,200 lbs.	880	340
Tomatoes	43	15 T.	3,251	65	20 T.	9,841	6,590
Soybeans	173	25 bu.	4,282	264	35 bu.	11,919	7,637
*Barley	91	35 bu.	446	136	70 bu.	5,427	4,981
Field Corn	101	50 bu.	2,322	40	75 bu.	2,280	- 42
Alfalfa	-	-	-	49	4 T.	5,625	5,625
M. Hay	173	1.5 T.	1,976	72	2.5 T.	2,348	372
TOTAL	500	-	12,817	500	-	38,320	25,503

*Double crop - Acreage included with soybeans

Associated costs of farm drainage and increased use of fertilizer were deducted from increased net income in determining primary project benefits.

The benefits were discounted for a 5 year lag in accrual. Also, it was estimated that 10 percent of the benefits would not be realized because of failure to install drainage systems.

Secondary benefits stemming from the project were based on 10 percent of the primary direct benefits. Also, 10 percent of the associated costs were taken as secondary benefits induced by the project.

All prices for commodities were converted to long term prices as projected in ARS pamphlet, "Agricultural Price and Cost Projections," September 1957.

Engineering

Channels and Tidegate

Bench level surveys, based on mean sea level datum, were made throughout the entire watershed in order to establish permanent bench marks. Aerial photographs (scale 1" = 660') were used for horizontal control. A topographic map was prepared by first plotting surveyed spot elevations and valley cross-sections on an aerial photograph and then sketching the contours directly on the photograph in the field.

Channel cross-sections were taken at approximately 850 foot intervals along the 6.3 miles of proposed stream channel improvement. The stream channel profile used in design was obtained by plotting the centerline elevation of each cross section.

Spot elevations were taken in the fields adjacent to the proposed stream channel improvement in order to determine the control points for drainage.

All the existing bridges and culverts are adequate with the exception of the two under Amwellbury Road. The concrete floor of the bridge over the East Branch will have to be lowered 1.5 feet. The existing 30 inch culvert that conveys lateral #1 under Amwellbury Road will be replaced by a 36 inch corrugated metal pipe culvert. The new culvert will be 2.8 feet lower than the existing one.

The volume of channel excavation was computed by plotting the design section on the surveyed stream channel cross-section and planimetrying the area to be excavated. This area was then multiplied by the length of reach to determine the estimated quantity of earthwork. The total earthwork estimate includes one foot of overdigging in the areas where the materials being excavated are fine silty sands. The channels are being overdug to insure design capacity following the

initial period of the side slope stabilization. If final geologic data show the banks to be unstable the side slopes will be changed to 1:1 in final design.

More detailed stream channel surveys will be made prior to the final design.

The existing tidegates, located at Station 18+90 along the centerline of the dike, do not have the required capacity and have a history of frequent and costly maintenance; therefore, they will be removed and replaced by a new tidegate structure.

Dikes and Levees

A profile and cross-sections of the proposed dike were surveyed. The cross-sections were spaced at 500 foot intervals except where more detail was required, such as at the tidegate structure.

The elevation of the top of the dike was established by using the criteria from Engineering Memorandum SCS-46, National Standards for Engineering Practices.

The design water elevation used to determine the top elevation of the dike was 7.5 feet mean sea level. This is the elevation of the four percent chance of occurrence of high tides in the vicinity of Salem Cove according to an analysis by the Army Corps of Engineers. A freeboard of one foot plus an allowance for wave height was added to the design water elevation to determine the elevation of the top of the dike. The wave freeboard varies from one to three feet depending on the amount of exposure to wind driven storm tides.

Two possible dike locations were considered. The first possibility is to construct the new dike directly on Sinnickson Landing Road. Traffic will have to be maintained after construction so the dike in this location was designed with a 35 foot top width, the present road width. The second alternative is to locate the new dike on the edge of the road utilizing as much of the existing fill as possible. This dike was designed with an 8 foot top width, reinforced by a 10 foot berm from 20+00 to 40+00, where poor foundation conditions justify such reinforcement. The berm will slope towards the landside from elevation 4.0' to 3.0' for drainage. Rip rap was considered around the tidegate structure in both cases; however, the design of the dike described in the second alternative also provided for rip rap from station 10+50 to station 47+80 to protect the slope from wave erosion. Both alternatives were designed with 2:1 side slopes.

Assumptions had to be made pertaining to the allowance for settlement prior to computing earth fill estimates. First, it was assumed that the existing road fill had settled to a point half-way into the soft alluvial silt layer shown in the soils investigation.

The second assumption was that the existing road fill will settle an additional distance equal to the height of the new fill being added.

The estimated volume of earth fill was computed using the average end area method. The end areas were obtained by plotting the design section, including the allowance for settlement, on the surveyed cross-section and planimentering the area of fill.

Cost estimates were prepared for both dike locations. An analysis of these cost estimates shows that a dike constructed on the edge of the road is the more economical of the two alternatives.

Geology

Channels

Soil borings were made along the proposed stream channel improvement at approximately 2,500 foot intervals. The soils to be excavated are alluvial silts, sandy silts, and silty sands, with a few isolated areas of peat and organic silt. The upper reaches of both the East and West Branch, and both laterals are predominately silty sands. There is also a reach of East Branch extending 3,000 feet upstream from the Fort Elfsborg Road where similar soils prevail. These soils are saturated from 3 to 4 feet below the ground surface and, consequently, are very unstable.

Dikes and Levees

Seven borings were made along the proposed dike site. The existing road fill could not be penetrated so the borings were made 30-50 feet from the inside toe of the roadway slope to try to determine the original foundation conditions and to form a basis for the assumptions made to estimate the amount of settlement. The investigation was made with a twist auger so that samples from various depths could be examined. The results of the investigation are tabulated below:

<u>Station</u>	<u>Depth of Probe (Feet)</u>	<u>Remarks</u>
13+00	8	7.5 feet of soft silty alluvium to hard sand
15+00	10	8.5 feet of soft silty alluvium to hard sand
18+25	19	10 feet of soft silty alluvium, 9 feet of very firm silty alluvium to hard sand
22+00	20	3 feet of topsoil, 11 feet of soft silty alluvium, 6 feet of very firm silty alluvium
27+50	25	2 feet of topsoil, 13 feet of soft silty alluvium, 10 feet of very firm silty alluvium
33+00	20	1.5 feet of topsoil, 13.5 feet of soft silty alluvium, 5 feet of very firm silty alluvium
37+50	11	2 feet of topsoil, 5 feet of soft silty alluvium, 4 feet of silty alluvium with sand lenses to hard sand

A detailed soils investigation, including several drill holes through the centerline of the road fill, will be made prior to the final design.

TYPICAL CROSS-SECTIONS OF MIDDLE NECK DIKE

Figure 1

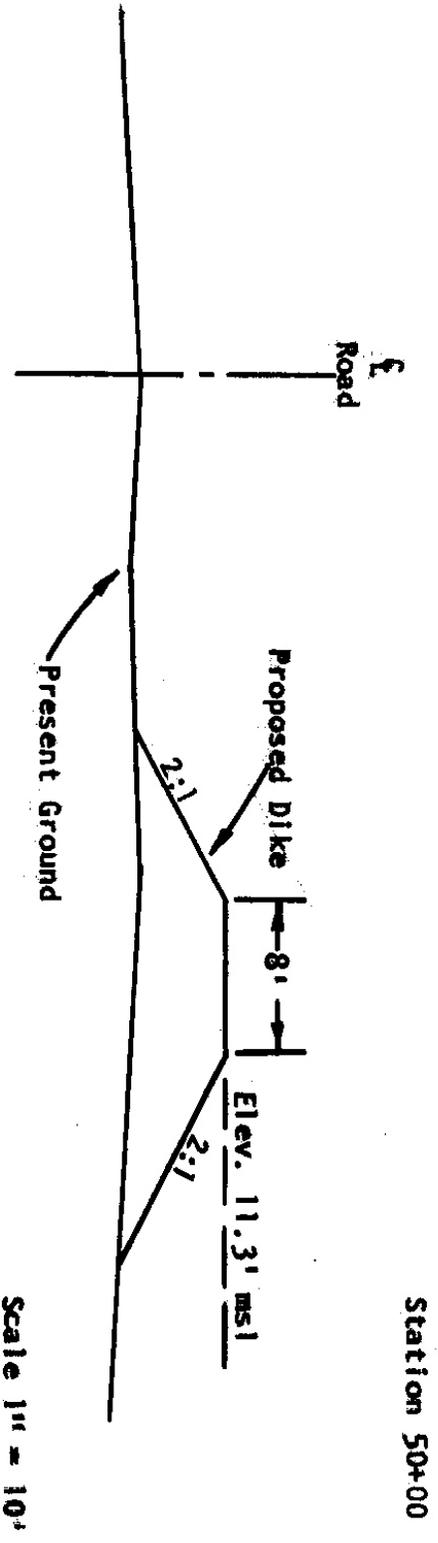
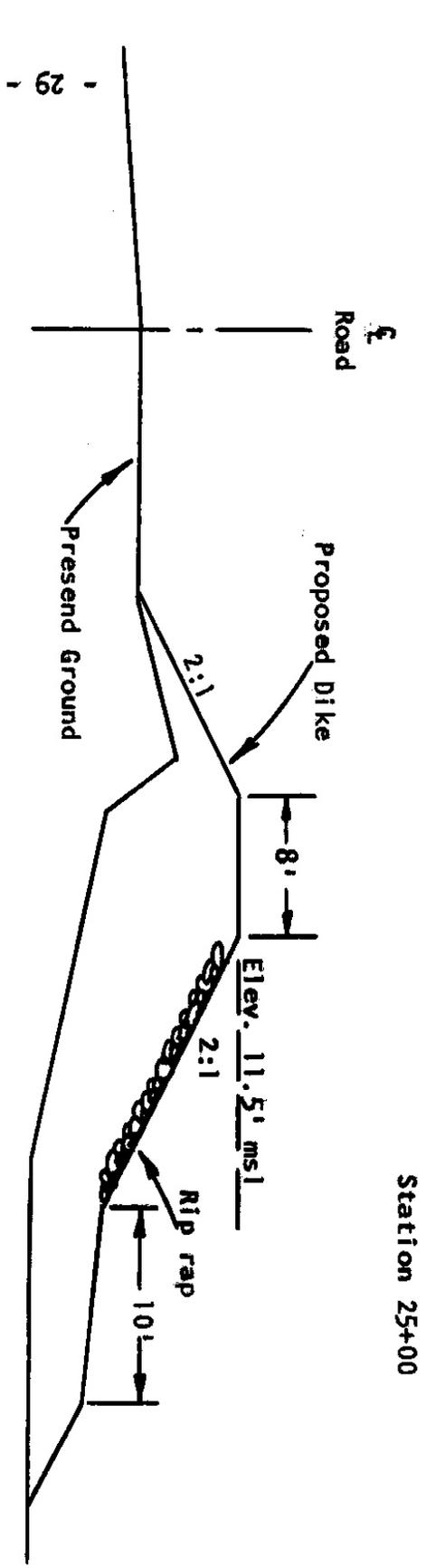
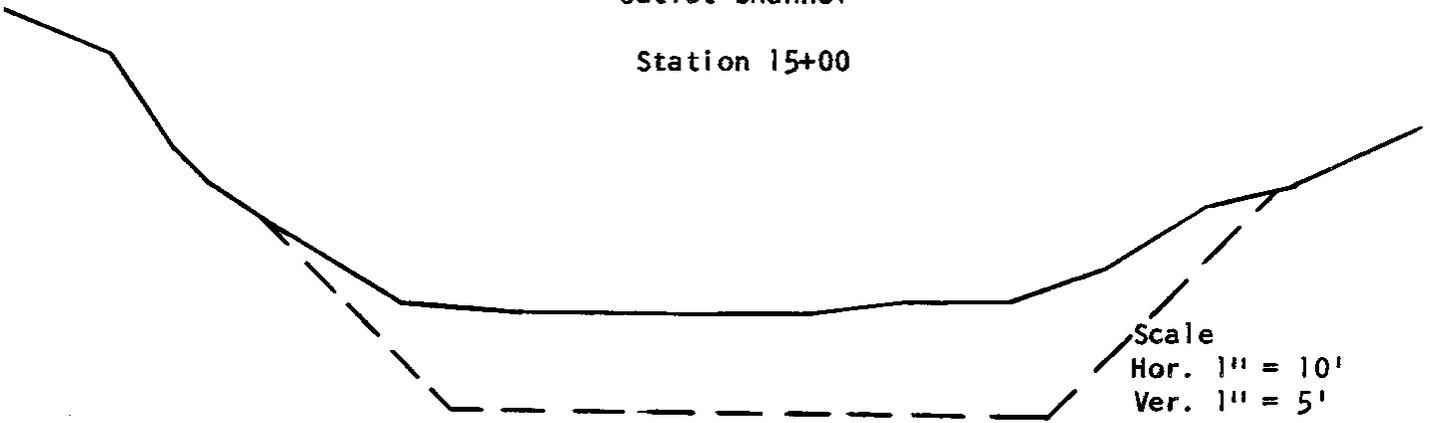


Figure 3

TYPICAL CROSS-SECTIONS

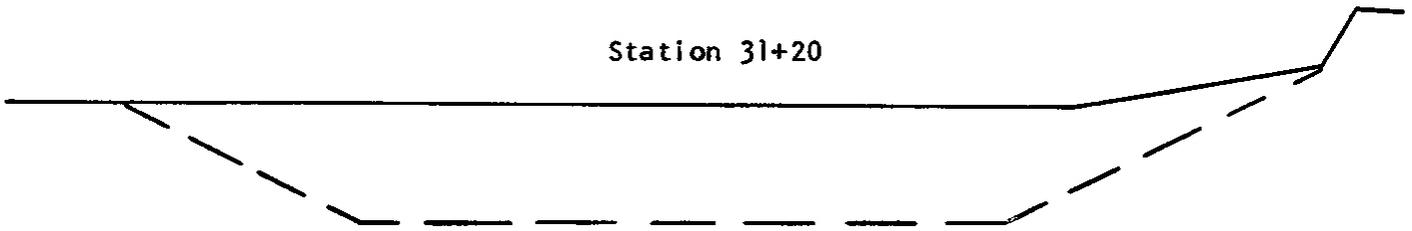
Outlet Channel

Station 15+00



East Branch

Station 31+20



West Branch

Station 78+70



Lateral #1

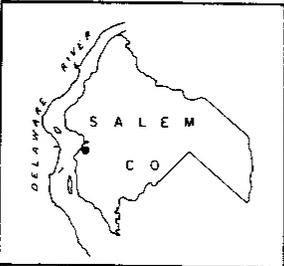
Station 22+20



LEGEND

- Existing Ground
- - - - Design Channel

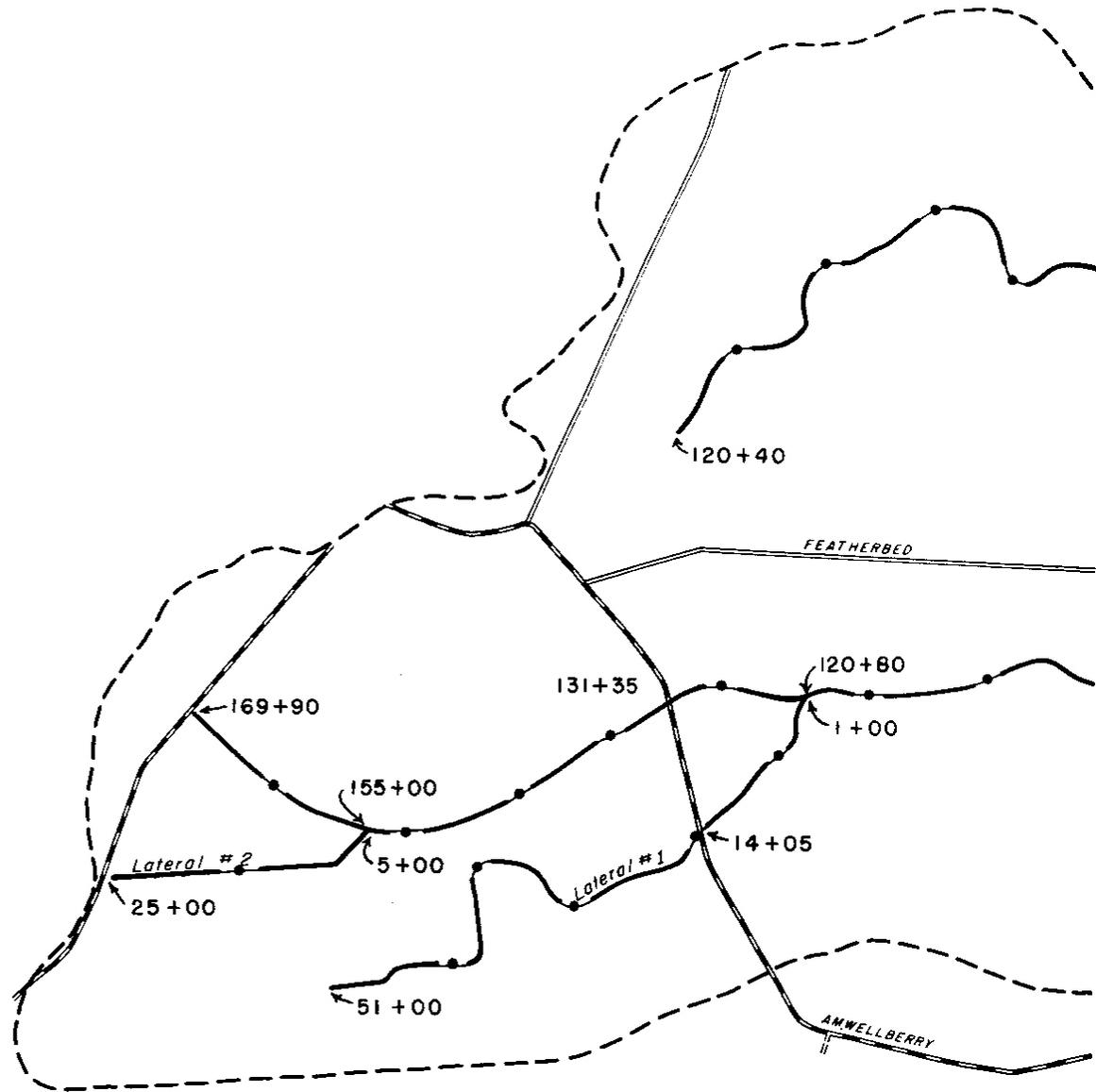
Scale 1" = 5'
(except where noted)



LOCATION MAP

39°32'30"

75°30'00"



LEGEND

- First Class Roads
- == Second Class Roads
- === Third Class Roads
- - - - Watershed Boundary
- ~ ~ ~ Streams

- ▲▲▲▲ Dikes & Levees
- • — Channel Impr. (flood)
- Tidegate Structure
- Benefited Area



WATERSHED WORK PLAN AGREEMENT

between the

Salem-Cumberland Soil Conservation District
Local Organization

Salem County
Local Organization

Elsinboro Township
Local Organization

Middle Neck Meadow Company
Local Organization

(hereinafter referred to as the Sponsoring Local Organization)

State of New Jersey

and the

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

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the Middle Neck Watershed, State of New Jersey, 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 Organization and the Service a mutually satisfactory plan for works of improvement for the Middle Neck Watershed, State of New Jersey, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree

that the works of improvement as set forth in said plan can be installed in about 5 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 Organization will acquire without cost to the Federal Government such land, easements, or rights-of-way as will be needed in connection with the works of improvement. Estimated cost \$5,535.
2. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to State law as may be needed in the installation and operation of works of improvement.
3. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization</u> (Percent)	<u>Service</u> (Percent)	<u>Estimated Construction Cost</u> (Dollars)
Stream Channel Imp. (Including Tidegate)	25	75	91,900
Dikes & Levees		100	105,411

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

<u>Works of Improvement</u>	<u>Sponsoring Local Organization</u> (Percent)	<u>Service</u> (Percent)	<u>Estimated Installation Service Cost</u> (Dollars)
Stream Channel Imp. (Including Tidegate)		100	35,292
Dikes & Levees		100	41,573

5. The Sponsoring Local Organization will bear the costs of administering contracts. Estimated cost \$1,973.
6. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of

the land treatment measures shown in the watershed work plan.

7. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
8. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.
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 the construction cost of works of improvement, a separate agreement in connection with each construction contract will be entered into between the Service and the Sponsoring Local Organization prior to the issuance of the invitation to bid. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

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.

Salem-Cumberland
Soil Conservation District
Local Organization

By Newton S. Lupton
Title Chairman
Date 6-24-64

The signing of this agreement was authorized by a resolution of the governing body of the Salem-Cumberland Soil Conservation District Local Organization adopted at a meeting held on June 24, 1964

Mark S. Cook
(Secretary, Local Organization)
Date June 24, 1964



Salem County
Local Organization
By B. Howard Smith, Sr.
Title Director
Date 6-22-64

The signing of this agreement was authorized by a resolution of the governing body of Salem County Local Organization adopted at a meeting held on June 17, 1964

Walter R. Swerley, Clerk
(Secretary, Local Organization)
Salem County Board of Chosen Freeholders
Date June 23, 1964

Elsinboro Township
Local Organization

By John A. Davis

Title Township Committee

Date 6-24-64

The signing of this agreement was authorized by a resolution of the governing body of Elsinboro Township

Local Organization

adopted at a meeting held on June 15, 1964

Frank P. Sowers
(Secretary, Local Organization)

Date 6-24-64

Middle Neck Meadow Company
Local Organization

By Ben J. Harvey, Jr.

Title Manager

Date 6-24-64

The signing of this agreement was authorized by a resolution of the governing body of the Middle Neck Meadow Company

Local Organization

adopted at a meeting held on June 15, 1964

A. D. Williard, Jr.
(Secretary, Local Organization)

Date 6-24-64

Soil Conservation Service
United States Department of Agriculture

By Walter Lee Haskin
Title State Conservationist
Date 6-29-64

Central files
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FIRST SUPPLEMENTAL WATERSHED WORK PLAN AGREEMENT

between the

Salem Soil Conservation District
Local Organization

Salem County
Local Organization

Elsinboro Township
Local Organization

Middle Neck Meadow Company
Local Organization

(hereinafter referred to as the Sponsoring Local Organizations)

State New Jersey

and the

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

Whereas, the Watershed Work Plan Agreement for the Middle Neck Watershed, State of New Jersey, executed by the Sponsoring Local Organization named therein and the Service, became effective on the 29th day of June, 1964; and

Whereas, in order to carry out the Watershed Work Plan for said Watershed, it has become necessary to modify said Watershed Work Plan Agreement;

Now, therefore, the Sponsoring Local Organization and the Service hereby agree upon the following modifications of the terms, conditions and stipulations of said Watershed Work Plan Agreement:

The Salem Soil Conservation District, having been newly organized to replace the Salem-Cumberland Soil Conservation District in Salem County, New Jersey, hereby assumes all obligations once vested in the now defunct Salem-Cumberland Soil Conservation District in carrying out the provisions of the Middle Neck Watershed Work Plan.

The Sponsoring Local Organization and the Service further agree to all other terms, conditions and stipulations of said Watershed Work Plan Agreement not modified herein.

Salem Soil Conservation District
Local Organization

By Newton S. Layton

Title Chairman

Date 6/13/67

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

adopted at a meeting held on 6/13/67

Richard deWille
(Secretary, Local Organization)

Date 6/13/67



Salem County
Local Organization

By B. K. Goff

Title Deputy

Date 6/13/67

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

adopted at a meeting held on JUN 21 1967

W. R. Jamieson
(Secretary, Local Organization)

Date 6/21/67

Elsinboro Township
Local Organization

By Preston R. Hare

Title Mayor

Date 6-7-67

The signing of this agreement was authorized by a resolution of the governing body of Elsinboro Township
Local Organization
adopted at a meeting held on JUNE 7, 1967

Thomas W. Wilson
(Secretary, Local Organization)

Date 6/7/67

Middle Neck Meadow Company
Local Organization

By Benji S. Haynes Jr.

Title Chairman

Date 6-7-67

The signing of this agreement was authorized by a resolution of the governing body of Middle Neck Meadow Company
Local Organization
adopted at a meeting held on 6-7-67

Thomas S. Williams Jr.
(Secretary, Local Organization)

Date 6-7-67

Soil Conservation Service
United States Dept. of Agriculture

By Richard W. Okley
(Administrator or
State Conservationist)

Date 6/30/67

file

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Middleneck Watershed

P. O. Box 670
New Brunswick, N. J.
08903

December 30, 1964

The Sponsors of the Middle Neck Watershed Project
Gentlemen:

As a result of more detailed surveys and investigation in the design stage the works of improvement outlined in the Middle Neck Watershed Work Plan can be modified at a substantial saving in construction cost without reducing the expected benefits.

The modifications are as follows:

1. The bridge on Lateral #2 of the East Branch does not need underpinning. The underpinning of this bridge is deleted from the plan.
2. Location of the dike is changed to the center line of Sinnickson Landing Road, making possible the following changes in dimensions and quantities.
 - A: Top elevation of the dike will be reduced to 8.5 feet M.S.L.
 - B. Length of the dike will be reduced to 3,800 feet.
 - C. Top width of dike will be increased to 36 feet to accommodate a new Sinnickson Landing Road.
 - D. Estimated quantity of fill material, suitable for a road base, will be reduced from about 64,000 cu. yds. to approximately 25,000 cu. yds.

All surfacing or erection of guard rails on the new road will be done by Salem County at no expense to the Federal Government.

3. Paragraph 4, Page 12 of the Work Plan is changed to read:

Salem County will provide the non-Federal share of construction costs on a work-input basis at a negotiated price per cubic yard. The County's Mosquito Commission, using its own

Salem-Cumberland Soil Conservation District

By: [Signature]
Title: Chairman
Date: 1/16/65

Salem County

By: [Signature]
Title: Director
Date: 1/16/65

Elsinboro Township

By: [Signature]
Title: Township Committeeman
Date: 1-13-65

Middle Neck Meadow Company

By: [Signature]
Title: Manager
Date: 1-13-65

This action authorized at an official meeting of Salem-Cumberland SCD on 17 day of Jan, 1965, at Bridgeton State of New Jersey.

[Signature]
(Signature)
Secretary
(Title)

This action authorized at an official meeting of the County Freeholders on 17 day of Jan, 1965, at Bridgeton State of New Jersey.

[Signature]
(Signature)
Clerk
(Title)

This action authorized at an official meeting of the Township Committee on 13 day of Jan, 1965, at Salem State of New Jersey.

[Signature]
(Signature)
Township Clerk
(Title)

This action authorized at an official meeting of the Meadow Company on 8 day of December, 1964, at Salem, State of New Jersey.

[Signature]
(Signature)
Secretary
(Title)

The Sponsors of the Middle Neck Watershed Project

equipment, operators and incidental labor, will excavate enough of the channels to offset 25% of the total cost of constructing the channels and tidegate structure.

Your approval on the signature sheet provided, will constitute agreement to this modification and will be binding by and between the Sponsors and the Soil Conservation Service.

Very truly yours,

(Sgd.) Selden Lee Tinsley

SELDEN LEE TINSLEY
State Conservationist

1 copy - each Sponsor

FINAL**TABLE 1 - PROJECT INSTALLATION COST**

Middle Neck Watershed, New Jersey

March 1, 1970

Installation Cost Item	Acres Treated	Unit	No.	Cost (Dollars)		
				P.L. 566	Other	Total
LAND TREATMENT						
Soil Conservation Service						
Cropland	1,308				57,936	57,936
Grassland	20				800	800
Technical Assistance				4,136	244	4,380
SCS Subtotal	1,328			4,136	58,980	63,116
Forest Service						
Forest Land	15				215	215
Technical Assistance					161	161
FS Subtotal					376	376
TOTAL LAND TREATMENT				4,136	59,356	63,492
Structural Measures						
Soil Conservation Service						
Stream Channel Improvement		Mi.	6.3 ⁵	17,880	21,467	39,347
Tide Gates Structure		No.	4 8	41,186		41,186
Dikes & Levees		Mi.	0.7 ^{1.3}	33,335		33,335
Subtotal - Construction				92,401	21,467	113,868
Installation Services						
Soil Conservation Service						
Engineering				40,598		40,598
Other				34,427		34,427
Subtotal - Installation Services				75,025		75,025
Other Costs						
Land, Easements & R/W					5,535	5,535
Administration of Contracts					1,973	1,973
Subtotal - Other Costs					7,508	7,508
TOTAL STRUCTURAL MEASURES				167,426	28,975	196,401
TOTAL PROJECT				171,562	88,331	259,893

NEW JERSEY

Middle Neck Watershed Project (P.L. 566) Salem County

The Project in Brief. Authorized June 29, 1964. Estimated completion in fiscal year 1969. Area - 1,722 acres all privately owned. Sponsors - Salem-Cumberland Soil Conservation District, County of Salem, Elsinboro Township, and Middle Neck Meadow Company. Estimated total cost \$370,300 (\$259,900 P.L. 566, \$110,400 other). Principal problems - inadequate channels dikes and tidegates to dispose of floodwater and prevent flooding by storm tides. Land ownership and use -- all farms are owner operated and contain 900 acres cropland, 200 acres grassland, 200 acres of woodland, and 400 acres of marsh and other.

Progress in Land Treatment. These will consist of conservation cropping systems, contour farming, drainage field ditches, pasture and hay land planting, rotation grazing and forestry measures such as tree planting and hydrologic cultural operations. None of these practices have been installed.

Progress in Structural Measures. The structural measures consist of 7,000 feet of existing dike improvement, a tidegate structure of 4-48" pipes, 600 feet of outlet channel and 6.2 miles of stream channel improvement.

The total installation cost of the structural measures is estimated at \$281,684 including necessary vegetative protection. None of these measures have been installed.

NEW JERSEY

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The Project in Brief. Authorized June 29, 1964. Estimated completion - in fiscal year 1969. Area - 1,722 acres all privately owned. Sponsors - Salem-Cumberland Soil Conservation District, County of Salem, Elsinboro Township, and Middle Neck Meadow Company. Estimated total cost \$370,300 (\$259,900 P.L. 566, \$110,400 other). Principal problems - inadequate channels dikes and tidegates to dispose of floodwater and prevent flooding by storm tides. Land ownership and use - all farms are owner operated and contain 900 acres cropland, 200 acres grassland, 200 acres of woodland, and 400 acres of marsh and other.

Progress in Land Treatment. There are 18 district cooperators covering 1,619 acres and 7 basic plans on 519 acres.

Practices on the land as of June 30, 1965:

Conservation Cropping System - 150 acres	Drainage Main - 15,000 feet
Clearing and Snagging - 6,000 feet	Pasture & Hayland Planting - 20 acres
Contour Farming - 27 acres	Stream Channel Improvement - 17200 feet
Cover Crops - 40 acres	Drainage Field Ditches - 3,000 feet
Farm Ponds - 1 each	Tile Drain - 1,000 feet

Forestry accomplishments consist of 11 acres marked for improvement or harvest, 11 acres harvested and one management plan prepared involving 4 acres. Technical assistance was provided to 4 landowners and one operator.

Progress in Structural Measures. The structural measures consist of 7,000 feet of existing dike improvement, a tidegate structure of four 48" pipes, 600 feet of outlet channel and 6.2 miles of stream channel improvement.

The total installation cost of the structural measures is estimated at \$281,684 including necessary vegetative protection. Four contracts were let in May 1964 but no work has been completed. It is expected that all work will be completed by December 1965.

Progress in Obtaining Easements and Rights-of-Way. All easements have been obtained.

NEW JERSEY

Middle Neck Watershed Project (P.L. 566) Salem County

The Project in Brief. Authorized June 29, 1964. Estimated completion - in fiscal year 1969. Area - 1,722 acres all privately owned. Sponsors - Salem-Cumberland Soil Conservation District, County of Salem, Elsinboro Township, and Middle Neck Meadow Company. Estimated total cost - \$370,300 (\$259,900 P.L. 566, \$110,400 other). Principal problems - inadequate channels dikes and tidegates to dispose of floodwater and prevent flooding by storm tides. Land ownership and use - all farms are owner operated and contain 900 acres cropland, 200 acres grassland, 200 acres of woodland, and 400 acres of marsh and other.

Progress in Land Treatment. There are 23 district cooperators covering 2,077 acres and 12 basic plans on 1,086 acres.

Practices on the land as of June 30, 1966:

Conservation Cropping System - 150 acres	Drainage Main - 15,000 feet
Clearing and Snagging - 6,000 feet	Pasture & Hayland Planting - 20 acres
Contour Farming - 27 acres	Stream Channel Improvement - 17,200 feet
Cover Crops - 40 acres	Drainage Field Ditches - 3,000 feet
Farm Ponds - 1 each	Tile Drain - 1,000 feet

Forestry accomplishments consist of 11 acres marked for improvement or harvest, 11 acres harvested and 2 management plans prepared involving 134 acres. Technical assistance was provided to 5 landowners and one operator.

Progress in Structural Measures. The structural measures consist of 7,000 feet of existing dike improvement, a tidegate structure of four 48" pipes, 600 feet of outlet channel and 6.2 miles of stream channel improvement.

The total installation cost of the structural measures is estimated at \$281,684 including necessary vegetative protection. Four contracts were let in May 1965 and all work was completed in February 1966.

Progress in Obtaining Easements and Rights-of-Way. All easements have been obtained.