Long Island Duck Farm History
and
Ecosystem Restoration Opportunities
Suffolk County, Long Island, New York

February 2009

US Army Corps of Engineers
New York District

Suffolk County, NY

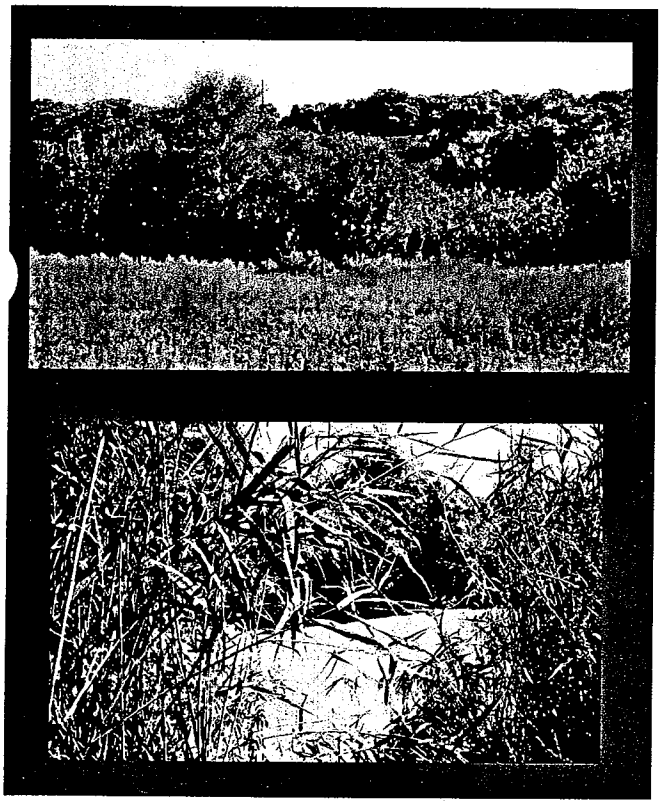
APPENDIX B

APPENDIX B

Mud Creek Section 206
Preliminary Restoration Plan

Mud Creek Watershed
Section 206 Aquatic Ecosystem Restoration Project
East Patchogue, Suffolk County, New York

Preliminary Restoration Plan, Preliminary Cost Estimate & Preliminary Project Management Plan



Prepared by:

U.S. Army Corps of Engineers
New York District

for

Suffolk County Department of Planning,
Non-Federal Project Partner

June 2002

June 28, 2002

Division: North Atlantic
District: New York

Mud Creek Watershed
Section 206 Preliminary Restoration Plan

East Patchogue, New York, Section 206 Aquatic Ecosystem Restoration Project

1. **Project:** Mud Creek Watershed Ecosystem Restoration Project

2. **Location:** The location of the considered restoration project is in East Patchogue, Town of Brookhaven, Suffolk County, New York. The project area is situated north of Montauk Highway (County Road 80), south of Patchogue-Yaphank Road (County Road 101), and on the east and west sides of Gazzola Drive (Figure 1). The East Branch of Mud Creek is the targeted restoration element of the site (Figure 2). Robinson Pond will also be evaluated as part of the restoration study to determine the potential for enhancement/restoration in that location. The East Branch and West Branch of Mud Creek are cold-water tributaries to Robinson Pond. Robinson Pond discharges into the tidal portion of Mud Creek. The tidal portion of Mud Creek flows into Patchogue Bay and the Great South Bay.

3. **Description of the Proposed Ecosystem Restoration:** The proposed project involves restoration of the habitat quality of the aquatic features (stream channel and pond network) and wetland habitat along the East Branch of Mud Creek in East Patchogue, New York. The objectives of the proposed project will be to restore aquatic invertebrate, amphibian and fisheries habitat and restore and/or enhance wetland wildlife habitat in order to reestablish healthy aquatic ecosystem interactions within this region of the Mud Creek Watershed. Secondarily, the proposed project will also evaluate potential restoration of Robinson Pond, which is the water body into which the East Branch empties.

   Background: The targeted restoration site within the Mud Creek Watershed is a parcel of land formerly utilized by private owners as a duck farm. The East Branch of Mud Creek flows through this property. Gallo Duck Farm, Inc. operated a duck farm and also conducted limited turkey production on the property from the early 1900's through the early 1980's. The average number of ducks present on the farm at one time was estimated at 70,000 ducks on 11.9 acres of pens in the early 1970's. Up to 5 crops of ducks were potentially grown per year. The farm operation not only had direct physical impacts to the environment in this location through the construction of feedlots, pens, waste lagoons and barn structures, but also had a significant adverse impact on the aquatic habitat quality of the Mud Creek Watershed due to the tremendous amount of waste produced by the millions of ducks that were raised on the farm over the decades of operation.

   Adverse offsite impacts were also very significant due to the high organic waste load discharged to the stream. During the period of duck farm operation, large

volumes of duck sludge were deposited along the streambed and in Robinson Pond, and water quality degradation (nutrients and coliform contamination) was apparent in the tidal portion of Mud Creek and Great South Bay.

During the 1970's, the Suffolk County Soil and Water Conservation District worked in cooperation with the Gallo Brothers to develop and implement a Conservation Plan for the farm (Figure 3). The plan was created to better manage the farm for improved water quality. The plan involved separation of feedlots and duck swimwater areas from the main, natural stream channel of the East Branch via dikes. The dikes were designed to prevent runoff from a 25-year storm event from reaching the natural stream corridor. Fences were also erected to prevent ducks from accessing the main stream channel. Concrete flumes were constructed east of Gazzola Drive on either side of the stream channel. Groundwater was pumped and fed through the flumes to the swimwater areas for the ducks. Excess groundwater may have been pumped at times to dilute waste and to lower levels of BOD (Biological Oxygen Demand). The main, natural stream channel was piped separately under Gazzola Drive. The waters from the swimwater areas on either side of the main stream channel, joined at the southern end of the property and were pumped to an aeration lagoon. From the aeration lagoon, the water may have been pumped to the 3 settling pits, possibly chlorinated and then released back into the natural stream heading south to Robinson Pond. The main stream channel was piped under access ways and eventually through one last set of 3-4 pipes to continue to discharge into the natural stream corridor heading south to Robinson Pond.

The development of the Gallo Duck Farm over time is illustrated through the series of aerial photographs available for the area dated 1930, 1966 and 1999 (Figures 4-6). As seen from the 1999 aerial, the lagoon and settling pits created as part of the Conservation Plan, and many of the now dilapidated farm buildings and structures are still in place today at the site. Prior to the implementation of the Conservation Plan, it is speculated that the topography of the farm site was altered through grading and use of fill material. The duck farm property was acquired by Suffolk County through the County tax lien procedures and transferred to the Suffolk County Department of Parks, Recreation and Conservation in 2001. The streambed is currently dominated by *Phragmites australis* and water quality is impaired through improper hydrologic connection, creating stagnant water through the stream and the detention ponds formed in the old swimwater areas. The local sponsor, Suffolk County, has the objectives of restoration of the environmental quality of the site and to potentially utilize the site as a passive recreation area.

As discussed above, the East Branch of Mud Creek was altered through farm development practices. The West Branch, however, has existed as a naturally forested wetland corridor and stream channel. The West Branch of Mud Creek supports a heritage population of Brook Trout. The West Branch is significant because it is the only Long Island stream system to support a naturally

reproducing brook trout population that has reportedly never been stocked. Brook trout sampled from Mud Creek were genetically tested in 1985 as part of the Heritage Brook Trout Project and were concluded to have evolved in isolation from other river basin strains of brook trout in New York (Perkins, D.L, C.C. Krueger and B. May).

The West Branch serves as a biobenchmark for the habitat quality that could be achieved at the Gallo Duck Farm site with the implementation of restoration activities. The forested wetlands north of the Gallo Duck Farm (east of Gazzola Drive) also have not been altered and support high quality habitat that can be monitored as a reference site. The East and West Branch of Mud Creek join north of Montauk Highway. The joined waters flow through a culvert under the highway and flow into Robinson Pond. The waters of Robinson Pond exit through a culvert under South Country Road and into the lower Mud Creek that is tidally influenced. The tidal portion of Mud Creek flows into Great South Bay. As mentioned previously, Robinson Pond will also be examined as part of the project to determine if waste solids remain in Robinson Pond and if removal of these solids would improve water quality and habitat conditions of the pond.

Project Outputs: The outputs of restoring the aquatic and wetland habitat along Mud Creek would include 1) improved aquatic habitat for fish (including the Brook trout), amphibians and invertebrates, 2) improved water quality in the Eastern Branch of Mud Creek and potentially Robinson Pond, and 3) increased plant diversity and habitat values of the wetland and upland habitat on site. Monitoring parameters will be directly related to these outputs, and both the restoration site and the reference site(s) north of the duck farm and along the West Branch of Mud Creek will be investigated.

LERRD and Relationship to Other Restoration Efforts: The targeted restoration area is located on Suffolk County owned property. The County and other public entities have ownership of additional properties in the Mud Creek Watershed, and the County has proposed the acquisition of several other properties to conserve the land area of both the East and West Branch of Mud Creek and its source wetland areas. The goal for acquisition is to create a contiguous undeveloped area of publicly owned land along Mud Creek and its watershed from its headwaters to Robinson Pond. Figure 7 illustrates the existing public land in the Mud Creek Watershed and Figure 8 illustrates the parcels proposed for acquisition by the County

Proposed Project Design and Alternatives: The proposed project will involve grading activities, restoration of hydrological connections, placement of clean fill or removal of fill material, removal of invasive plant material, removal of pipes and other farm structures, and planting of wetland vegetation to restore wetland and aquatic habitat in the targeted area. A minimum of two conceptual alternative plans will be considered for development of an optimal restoration plan for the site. Below are two preliminary conceptual alternatives for the area

West of Gazzola Drive and the area East of Gazzola Drive (Figure 9 and Site Photos). The District will be working closely with both the local sponsor, the New York State Department of Environmental Conservation, the U.S. Fish and Wildlife Service and other interested parties such as Ducks Unlimited and Trout Unlimited to develop a sound restoration plan for the site. The District will also be working with the Suffolk County Department of Parks, Recreation and Conservation to incorporate passive recreation features for the property.

East of Gazzola Drive:

The area east of Gazzola Drive is currently dominated by *Phragmites.* The concrete flumes are also still present on site.

Alternative 1E: Stream Channel Restoration and Phragmites Removal:
This alternative would involve the phased application of herbicide to remove Phragmites. The concrete flumes would be removed, and the site and the main stream channel would be contoured and replanted with wetland herbaceous plants, trees and shrubs.

Alternative 2E: Forested Wetland Restoration:
This alternative would focus on recreating a forested wetland condition by removing fill material from the area and by lowering the ground elevation of the site to support a saturated wetland condition. Phragmites would be removed through the phased application of herbicide. The increased soil saturation and the creation of ponded areas would be useful in preventing the return of the invasive plant species. The area would be contoured with hummocks and other microtopographical features. Wetland herbaceous plants, trees and shrubs would be planted. The concrete flumes would be removed from the site in the process of site grading.

West of Gazzola Drive:

The area west of Gazzola Drive is comprised of the central stream channel that is vegetated by Phragmites and some mature trees and shrubs. The upland portions of the site adjacent to the stream and in the dry lagoon and settling pit areas is vegetated mainly by successional young red cedar trees and weedy meadow species such as mugwort. The former swimwater areas are dominated by Phragmites, and are acting as stagnant ponds due to the lack of hydrologic connection with the stream channel.

Alternative 1W: Stream Channel Restoration
This alternative would be focused on the restoration of the East Branch of Mud Creek to a condition similar to the high quality habitat of the West Branch of Mud Creek. This restoration alternative would involve Phragmites removal through the phased application of herbicide, site re-grading, return of the East Branch stream to a natural stream-bed in areas that the stream is currently piped, re-

contouring of the stream bed and tree and shrub riparian plantings to promote a habitat type similar to the West Branch of Mud Creek. The swim water areas, that currently support stagnant ponds, would be re-graded to support emergent or forested wetland habitat. One of the main success objectives for this alternative would be to create suitable habitat for Brook trout in the East Branch. The dry settling pits and lagoon could be utilized as fill placement areas. Once filled, these areas and surrounding areas could be seeded with native warm season grass and perennial wildflower species or planted with trees. Potentially the lagoon area could be planted as a butterfly garden for added interest to the future passive recreation park. The Suffolk County Parks Department could consider planting annual native wildflowers to enhance the area for aesthetics and butterfly and bird species attraction.

Alternative 2W: Pond Restoration
This alternative would be focused on utilizing existing topography to create a pond area for waterfowl and amphibian habitat. This restoration alternative would involve Phragmites removal through the phased application of herbicide, and site re-contouring to expand upon the existing ponds on site in the former swimwater areas to support a shallow depth pond area for waterfowl habitat. The existing East Branch stream would be directed to provide water flow input and serve as an output channel to this ponded area. Similar to Alternative 1W above, the dry settling pits and lagoon could be utilized as fill placement areas. Once filled, these areas and surrounding areas could be seeded with native grass or perennial wildflower species or planted with other woody species. Potentially the filled lagoon area could be planted as a butterfly garden for added interest to the future passive recreation park.

Both of the alternatives for the restoration area west of Gazzola Drive would include removal of old pipe, concrete culvert and selected farm structures.

Robinson Pond:

The sediments and water quality of Robinson Pond will be investigated to determine if this resource area is still impaired by waste solids that may have settled out during the period of farm operation. Potential plans could include either a no-action plan or potential dredging of the pond to remove heavy nutrient laden sediments.

The area of the confluence of the East and West Branch of Mud Creek, due north of Montauk Highway, will also be explored for possible improvements in the management of stormwater runoff in that location. Better management of road runoff could enhance water quality and the aquatic habitat for the brook trout population. There may also be potential for restoration improvements to the stream channel itself, as the East Branch has migrated to the limits of the roadway. Options could be explored regarding redirection of the stream channel away from the roadway, increasing the buffer area between the stream channel

and the roadway, or similar to the discussion above, implementing stormwater management options on the roadway to prevent direct runoff into the stream channel.

Study Methodologies: The considered project area would be studied to determine baseline environmental conditions of the existing upland, wetland and aquatic habitats of the targeted area. Baseline data collection would include fish surveys, invertebrate surveys, vegetation surveys, and potentially avifauna surveys. Physical parameters such as sediment and soil type, HTRW and water quality would also be investigated A complete cultural resource assessment would be completed for considered restoration areas.

Success criteria for the project would focus on increases in biodiversity and environmental quality in the restored areas. Monitoring for success criteria would include vegetation surveys along transects, aquatic invertebrate and fish surveys, and continued water quality monitoring. The West Branch of Mud Creek would be monitored as a control for comparison with the diversity of species attracted to the restored stream/wetland area. The undisturbed wetlands north of the farm property could also serve as a biobenchmark for restored forested wetlands.

4. **Views of the Sponsor:** The proposed non-Federal sponsor is Suffolk County, New York. Suffolk County provided a letter of interest dated June 12, 2001. The Suffolk County Department of Planning has been an active sponsor for the project, providing background documentation on the history and environmental characteristics of the restoration site, mapping of the restoration site location, and through participation in meetings with the District and other agencies. Meetings were held with the local sponsor on October 2, 2001 and October 24, 2001 to discuss restoration ideas for the site and to review historical mapping and information for the site with the Suffolk County Soil and Water Conservation District Manager. The Suffolk County Soil and Water Conservation District Manager has been instrumental in obtaining old records on the operations of the former Gallo Duck Farm.

5. **Views of the Federal, State, and Regional Agencies:** The New York State, Department of Environmental Conservation (NYSDEC), Region One, participated in a field visit on October 18, 2001. Representatives from the NYSDEC Division of Fish, Wildlife and Marine Resources, as well as the Regional Natural Resource Supervisor, and the Regional Permit Administrator attended the site visit and gave their words of support for the project, as well as some preliminary design recommendations for the site. A representative of Ducks Unlimited contacted the District with interest towards involvement with the project. Other agencies, including the Fish and Wildlife Service, will be contacted during the coordination process for input on the restoration effort.

6. **Environmental Compliance Requirements:** Preparation of an Environmental Assessment in compliance with NEPA and all pertinent environmental laws that apply will be addressed during the feasibility phase. The preparation of the NEPA Document will be coordinated with the preparation of an Ecosystem Restoration Report (ERR). The ERR will outline formulated alternatives and present alternative plan layouts along with the recommended plan.

7. **Costs and Benefits: Costs and Benefits:**

In order to identify the range of potential project construction costs, a preliminary cost estimate was developed based upon a conceptual plan for Mud Creek Watershed. The below estimate is considered to be a conservative estimate, including factors for contingencies and potential cost escalation. In the preparation of the Ecosystem Restoration Report, more specific plan alternatives and cost estimates will be developed. These plans and costs will be coordinated with the local sponsor for the selection of an optimal plan.

Costs:

Estimated Federal Cost = $ 1,503,631.00
Non-Federal Cost = $ 809,648.00
Total Estimated Project Cost = $ 2,313,279.00

Benefits: The project could restore up to 1,850 linear feet of the East Branch of Mud Creek, up to 6.6 acres of wetlands and potentially restore healthy pond systems and high quality habitat for fish, invertebrates, amphibians, waterfowl and other wetland wildlife. The proposed project could also not only improve water quality conditions within the targeted restoration portion of Mud Creek, but could also improve water quality and hence habitat quality of the downstream pond and creek areas of the watershed and the connected Great South Bay ecosystem. The improvements to water quality and habitat could provide benefits to the unique heritage brook trout population found within the watershed. The acquisition of additional properties by the County within the watershed could preserve the landscape unit as a whole and provide long-term conservation of the riparian corridor for wildlife and fisheries habitat and movement.

O&M Costs: The restoration project features will be designed to be self-sustaining. Potential Operations and Maintenance (O&M) costs could include removal of Phragmites or other invasive plant species through mechanical means or by spot herbicide treatment to maintain plant diversity. O&M costs could also include maintenance of recreational features considered as part of the project design, such as trails and interpretive signs. The costs and tasks associated with these local responsibilities would be outlined in an O&M plan.

8. **Schedule:**

Action	Date (Calendar Year)
PRP	June 2002
Letter of Intent from Sponsor(s)	July 2002
Submit PRP to USACE North Atlantic Division (NAD)	September 2002
NAD Approval of PRP	October 2002
Initiation of Feasibility Study	December 2002
Completion of Draft ERR	September 2003
Completion of NEPA Compliance and ERR	December 2003
Preparation of Plans and Specs	May 2004
District Commander and Local Sponsor sign PCA	April 2004
Construction Contract Award	July 2004
Construction Completed	November 2005

9. **Supplemental Information:** The NYSDEC Bureau of Freshwater Fisheries, conducted an electrofishing survey of Mud Creek in June 2001 and prepared a follow-up report dated July 3, 2001 (Kozlowski 2001). The report clearly identified the significance of the Mud Creek Watershed as a stream system supporting a naturally reproducing population of brook trout. The summary report recommended acquisition of lands within the watershed for natural resource preservation and to fulfill goals of the South Shore Estuary Reserve Program. The report also recommended review of stormwater inputs from Montauk Highway into the stream corridor and surrounding wetlands. The 2001 survey was conducted to remove trout for display at the Cold Spring Harbor Fish Hatchery and Aquarium. During the survey, 45 brook trout were caught, ranging from 2.4 and 10 inches in size.

The NYSDEC Bureau of Freshwater Fisheries will most likely play an important role in monitoring the fish population at Mud Creek. Although plans for work-in-kind have not been finalized, Suffolk County, the local sponsor may be able to contribute to construction and participate in monitoring, most likely water quality, as an in-kind service. The U.S. Fish and Wildlife Service has conducted restoration projects at the nearby Wertheim National Wildlife Refuge in Shirley, New York, that will be useful in reviewing to determine best strategies for restoration and lessons learned for projects involving phragmites removal.

10. **Financial Data: Project Modification Costs** (all costs in thousands of dollars):

				Federal Funding Needs				
	Totals	**Non-Federal**	**Federal**	**FY02**	**FY03**	**FY04**	**FY05**	**Balance to Complete**
Feasibility/ P&S	918.68	321.54	597.14	0.70	817.98	100.00	0.00	0.00
Implementation	1,394.60	488.11	906.49	0.00	0.00	888.86	394.00	111.74*
Totals	2,313.28	809.65	1,503.63	0.70	817.98	988.86	394.00	111.74*

* Funds for post-construction environmental monitoring

11. Federal Allocation to Date:
$10,000 (PRP)

12. References:

Kozlowski, Gregory. July 31, 2001. Mud Creek Brook Trout. New York State Department of Environmental Conservation, Bureau of Fisheries.

Perkins, D.L., C.C. Krueger, and B. May. 1985. Hertiage Brook Trout Project: Summary Report to the New York State Department of Environmental Conservation. Return a Gift to Wildlife Project 29-19-19.

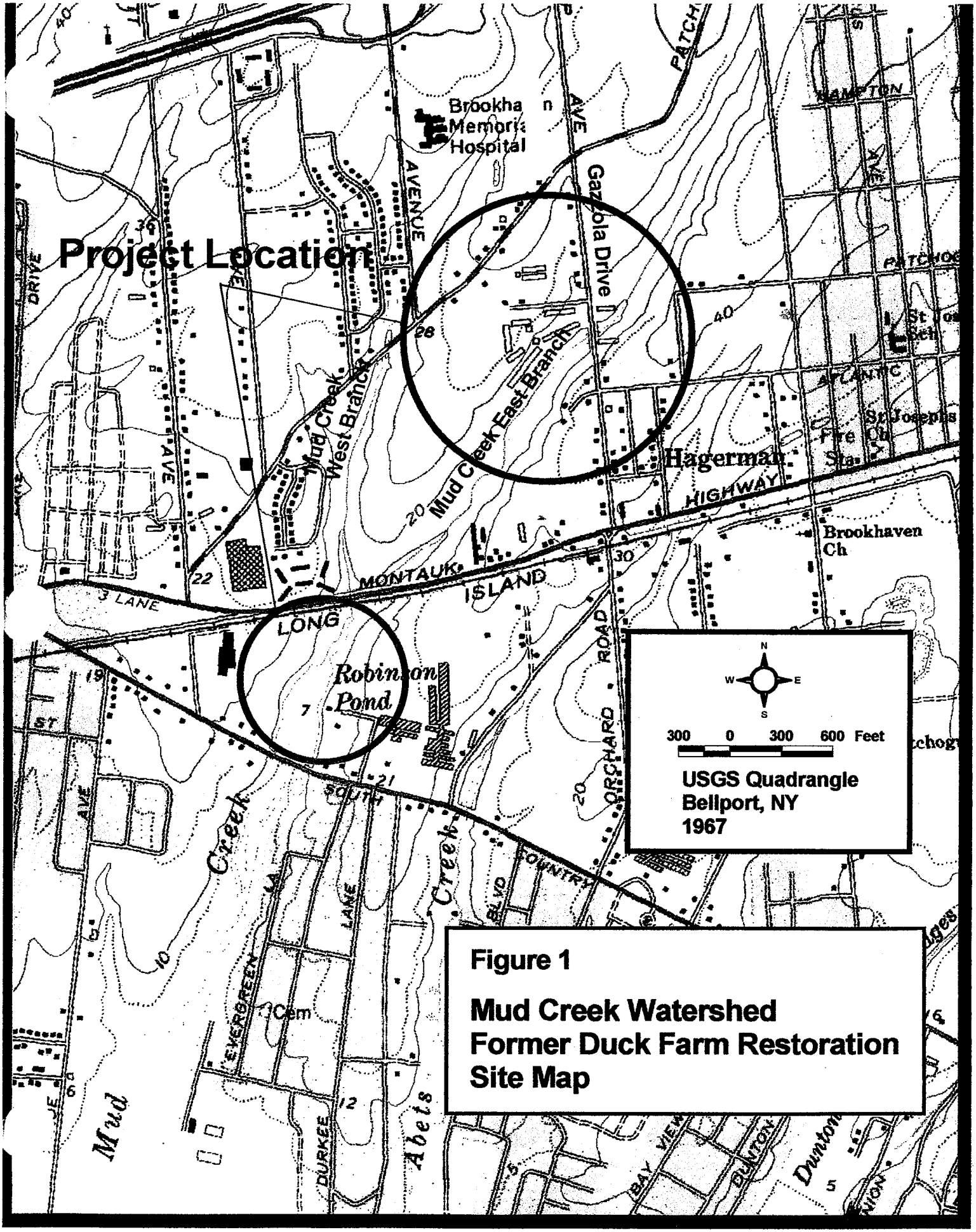
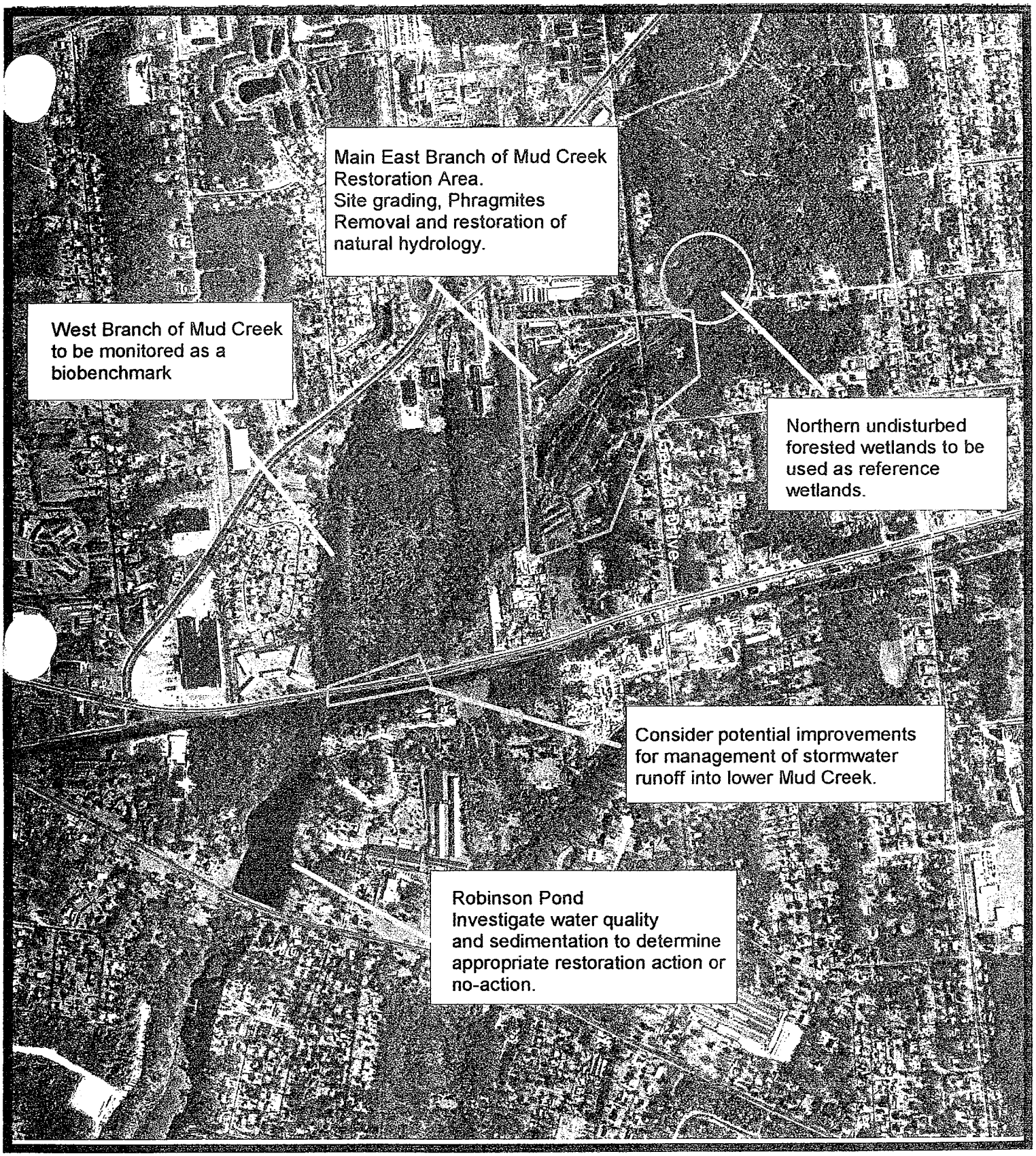


Figure 1

Mud Creek Watershed
Former Duck Farm Restoration
Site Map



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NYS DEC DOQ
Source Image 1994

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Overview of Mud Creek Watershed
Restoration Areas and Reference Wetlands/Biobenchmarks

Figure 2

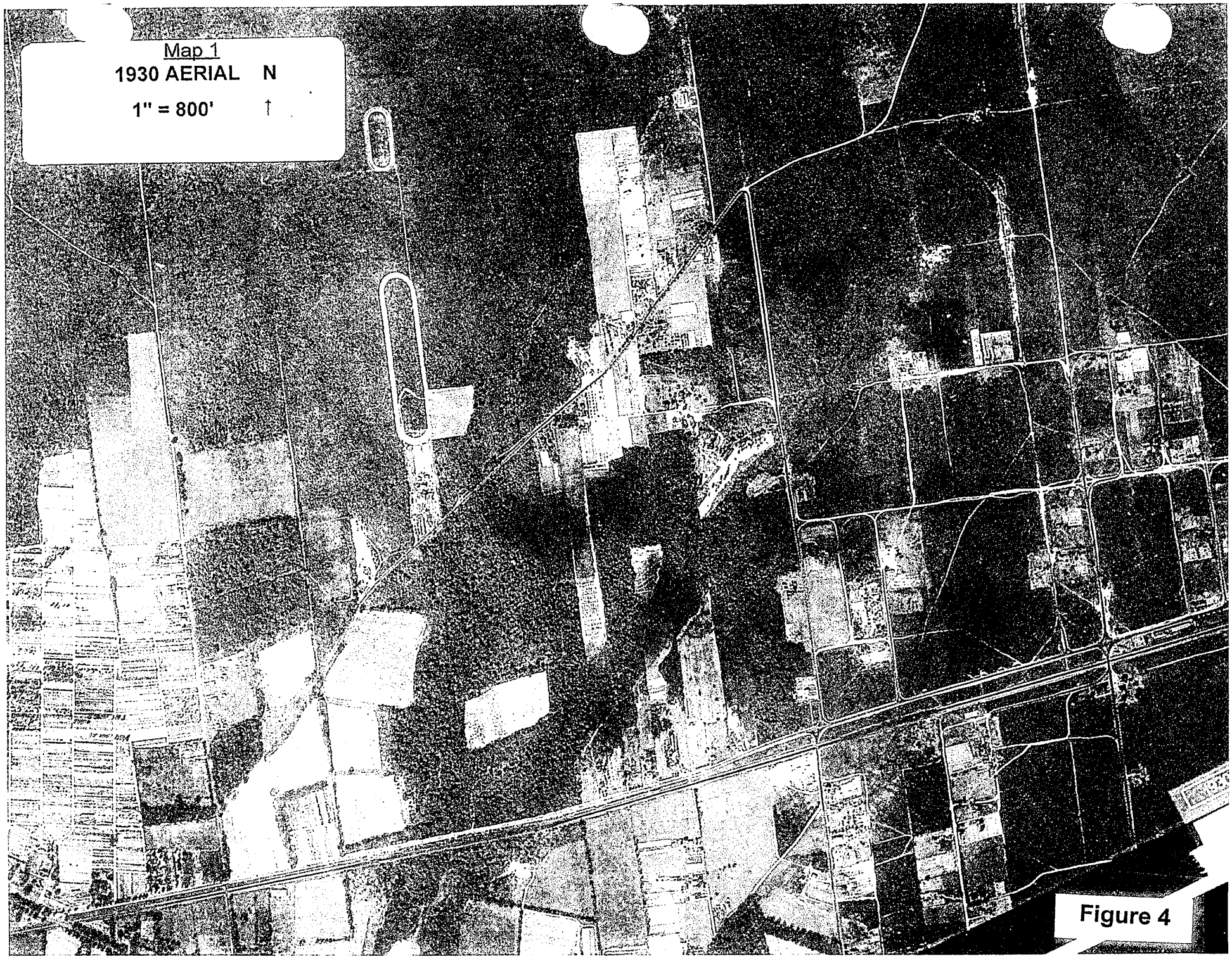


Figure 4

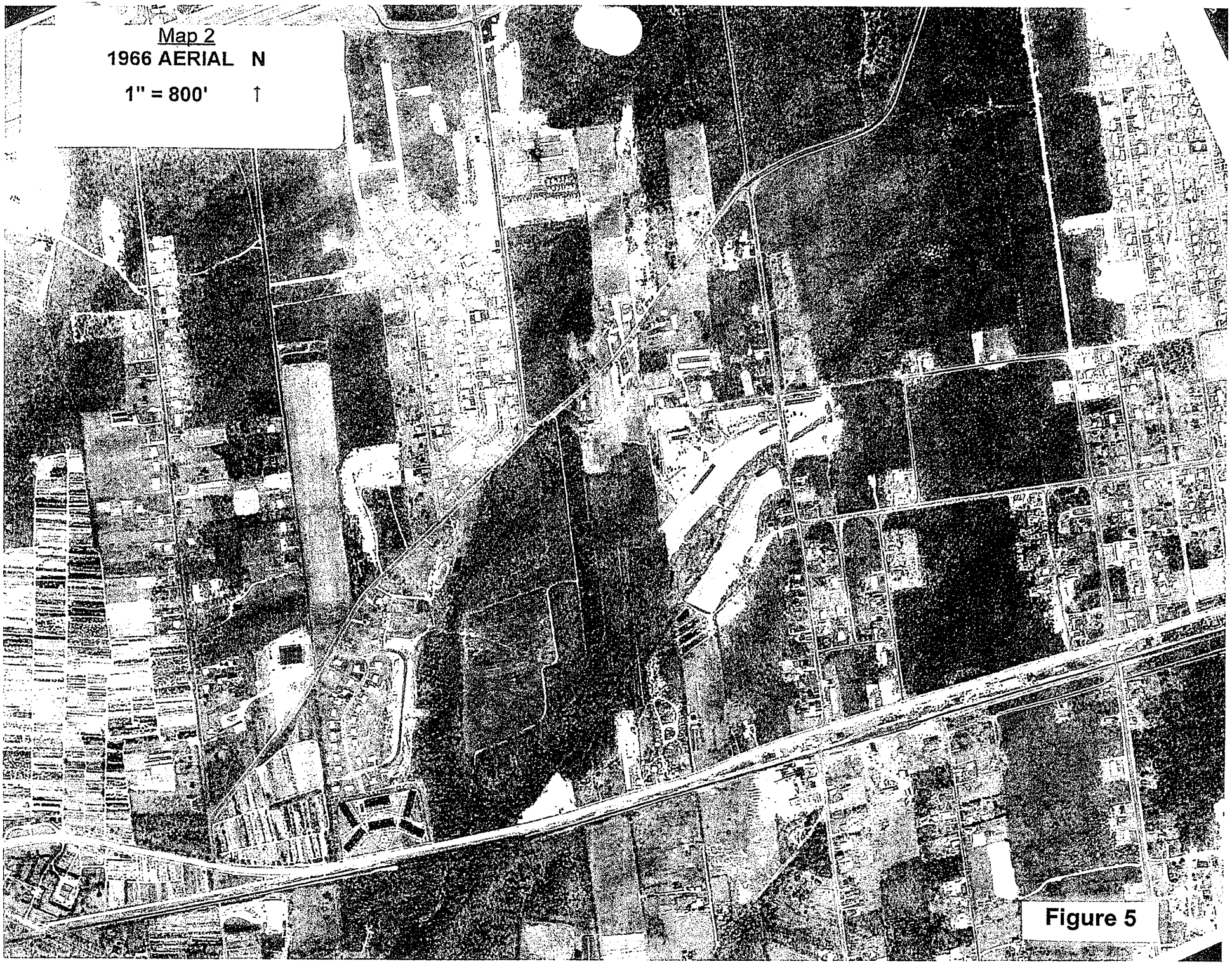


Figure 5

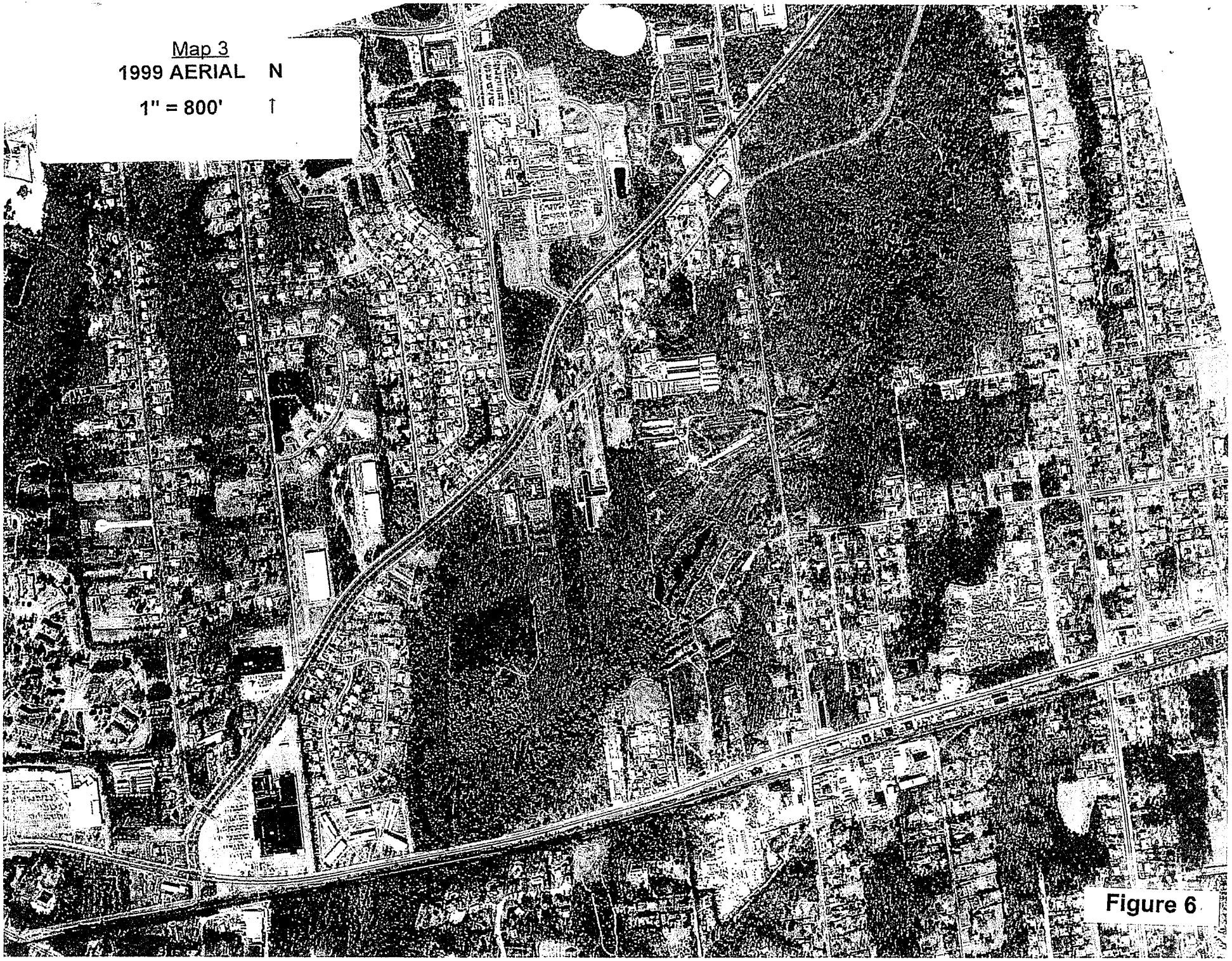


Figure 6

Map 4. Proposed S.C. Acquisitions - Mud Creek East Patchogue, Town of Brookhaven

SUFFOLK COUNTY

Planning

DEPARTMENT

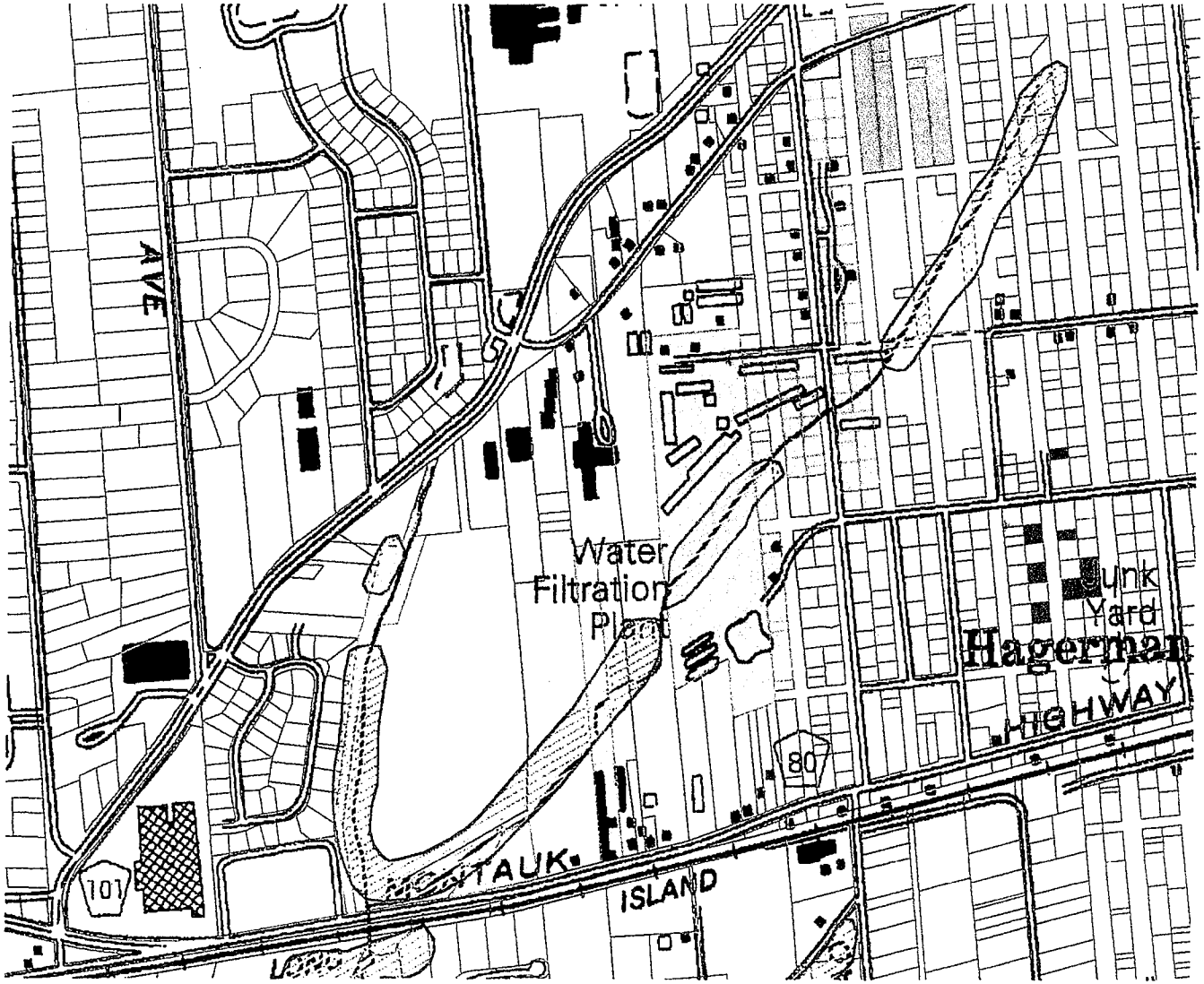
Proposed S.C. Acquisitions
Transfer to S.C. Parks
SCRPTM Base

N
W E
S

1000 0 1000 2000 3000 4000 Feet

Figure 7

Map 5. - Publicly Owned Properties - Mud Creek East Patchogue, Town of Brookhaven



SUFFOLK COUNTY

Planning

DEPARTMENT

- Freshwater Wetland
- SCRPTM Base
- Central School District No.4
- Town of Brookhaven
- Suffolk County
- Excess S.C. Properties

N

W E

S

1000 0 1000 2000 3000 4000 Feet

Figure 8

Panoramic view of abandoned duck farm.

Stagnant water portion of Mud Creek at abandoned duck farm.

Dilapidated farm buildings on former duck farm west of Gazzola Drive.

Abandoned farm building on former duck farm east of Gazzola Drive.

Looking north on Gazzola Drive where former duck farm and Mud Creek straddle road.

Pond on west side of abandoned duck farm.

Former duck farm waste disposal lagoon.

Former duck farm waste disposal lagoon.

Undisturbed portion of Mud Creek between former duck farm and Montauk Highway.

Mud Creek looking south to Great South Bay from South Country Road.

CONTINUING AUTHORITIES PROGRAM
PROJECT MANAGEMENT PLAN

Mud Creek Watershed
East Patchogue, New York

Section 206 – Aquatic Ecosystem Restoration

CONTINUING AUTHORITIES PROGRAM
PROJECT MANAGEMENT PLAN

Mud Creek, Great South Bay,
East Patchogue, New York

I. DOCUMENT PURPOSE – This Project Management Plan (PMP) details the scope, schedule, and budget for study tasks through the initial assessment phase, as well as the division of responsibilities.

II. PROJECT DESCRIPTION

A. Authority/ (PWI#): Section 206, Water Resources Development Act of 1996, as amended. (174286)

B. Congressional District: NY – 1st (Grucci)

C. Project Location: The project area is located along Mud Creek, a tributary to Great South Bay, in East Patchogue, Town of Brookhaven in Suffolk County.

D. Problem Description: The goal of this effort would be to rehabilitate degraded properties that were previously used for a private duck farm operation, which produced millions of ducks during the period from 1930 to 1980. The environmental impacts of duck farm operation at the site were extensive (woodland converted into pens and open feedlots; streambed altered to create pond areas for duck used; surface water quality degradation; waste disposal lagoons; offensive odors). Adverse offsite impacts were also very significant due to the discharge of duck waste laden sediments into the stream and the Great South Bay, with their high coliform, nutrient, biological oxygen demand and suspended solids content.

E. Status of Local Cooperation: The local sponsor, Suffolk County, requested the NYD to initiate an ecosystem restoration study by letter dated 12 June 2001. The County has acquired the project area land for restoration purposes and intends to manage the area as a multi-purpose conservation area and parkland for passive recreation activities, such as hiking.

III. SCOPE OF WORK

A. Overall Scope. The overall scope of this project is to restore and protect the natural ecosystem structure, function and processes to a less degraded, more natural state if in the public interest and cost effective and in a manner that minimizes cost, maximizes benefits, is environmentally acceptable, and complies with guidance, procedure, policy and law.

B. Current Fiscal Year. This phase of the project will include all studies and work tasks required in preparation of Preliminary Restoration Plan (PRP).

IV. SIGNIFICANT ISSUES

The West Branch of Mud Creek supports a heritage population of Brook Trout.

V. PROJECT SCHEDULE

C-1B	Initiate Study	Feb 02
C-2A	Submit PRP/IAR	Sep 02

VI. PROJECT FUNDING

A. Total Funds Required (000s):

Project Cost	10.0
Allocated to Date	10.0
Required to Complete	0.0

B. Funds Available Current FY (000s):

FY01 Carry-Over	0.0
FY02 Budgeted	10.0

V. PROJECT DELIVERY TEAM

Project Manager	Stephen Couch, CENAN-PL-F
	Steven Yandrich, CENAN-PL-F
Environmental Resources	Megan Grubb, CENAN-PL-E
Engineering	Marty Goff, CENAN-EN-M
Local Sponsor	Thomas Isles, Suffolk County Planning Department

VI. PROJECT DELIVERY TEAM ENDORSEMENT

Stephen Couch, CENAN-PL-F
Project Manager

Roselle Henn, CENAN-PL-E
Team Leader, Environmental

for

Steven Yandrich, CENAN-PL-F
Project Manager

Megan Grubb, CENAN-PL-E
Environmental Resources

Christopher Ricciardi, CENAN-PL-E
Cultural Resources

Marty Goff, CENAN-EN-M
Team Leader, Engineering

Mud Creek Watershed Section 206 - Preliminary Estimate

For Internal Use only by USACE and Project Sponsor

	Phase I Feasibility and P&S			
TASKS	Responsibility proposed	Phase I Total	Phase I Total - Federal	Phase I Total - Non-Federal
Existing & With-Project Conditions Analysis		**546.0**	**354.9**	**191.1**
Engineering		**191.0**	**124.2**	**66.9**
Surveying and Mapping	EN/OP-SS	50.0	32.5	17.5
Site Inspections	EN-HH	2.0	1.3	0.7
Groundwater monitoring wells - project/reference sites and stream water guages w/monitoring (*including water quality)	EN-HH	84.0	54.6	29.4
Existing Conditions Hydrology (Water Budget)	EN-HH	8.0	5.2	2.8
Existing Conditions and W/Project Hydrodynamic Modeling (HEC-RAS)*	EN-HH	24.0	15.6	8.4
With-Project - Sediment Transport *	EN-HH	2.0	1.3	0.7
Geotechnical Analysis and Report	EN-DS	21.0	13.7	7.4
Environmental		**250.0**	162.5	87.5
Existing Conditions / Delineate Wetland	PL-E	13.0	8.5	4.6
Existing Vegetation & Species Usage	PL-E	65.0	42.3	22.8
With-Project Vegetation & Species Usage	PL-E	25.0	16.3	8.8
Reference Site Development	PL-E	25.0	16.3	8.8
Existing HTRW Report Evaluation	PL-E	5.0	3.3	1.8
Soil and Sediment Contaminant Testing	PL-E	87.0	56.6	30.5
FWCA Report	USFWS	30.0	19.5	10.5
Institutional Studies		**2.0**	1.3	0.7
Existing, Baseline Institutional Conditions	PL-F	2.0	1.3	0.7
Cultural Resources Investigation		**80.0**	52.0	28.0
Existing Conditions Cultural Resources Analysis	PL-E	80.0	52.0	28.0
Real Estate		**23.0**	15.0	8.1
Real Estate Mapping	RE-A1	3.0	2.0	1.1
Rights of Entry	RE-A	5.0	3.3	1.8
Real Estate Gross Appraisal	RE-A	15.0	9.8	5.3

Preliminary Alternative Development		**98.0**	63.7	34.3
Development of Restoration Alternatives		**18.0**	11.7	6.3
Development of Alternative Scenarios	PL	3.0	2.0	1.1
Preliminary Plan Layout (Cut and Fill)	EN-HH	10.0	6.5	3.5
Preliminary Vegetation Plans	PL-E	5.0	3.3	1.8
Evaluation of Alternatives		**23.0**	15.0	8.1
Preliminary Volumes & Costs	EN-HH	8.0	5.2	2.8
Restoration "Benefits" and Success Criteria	PL-F/PL-E	5.0	3.3	1.8
Incremental Cost Analysis	PL-F	4.0	2.6	1.4
Plan Coordination	PL	3.0	2.0	1.1
Plan Selection	PL/SC	3.0	2.0	1.1
Final Design		**57.0**	37.1	20.0
Final Plan Layout (Cut and Fill Plans)	EN-DS	24.0	15.6	8.4
Vegetation Plans	PL-E	5.0	3.3	1.8
Monitoring and Maintenance Plans	PL/EN	2.0	1.3	0.7
Final (MCACES) Costs	EN-C	24.0	15.6	8.4
Final Restoration "Benefits"	PL-F	2.0	1.3	0.7
Documentation, Permitting, and Coordination		**128.0**	83.2	44.8
Documentation		**53.0**	34.5	18.6
Feasibility Report Preparation	PL-F	15.0	9.8	5.3
NEPA Documentation	PL-E	20.0	13.0	7.0
Engineering Appendix	EN-HH	10.0	6.5	3.5
Cost Appendix	EN-C	2.0	1.3	0.7
Economics Appendix	PL-F	2.0	1.3	0.7
Real Estate Appendix	RE-A	2.0	1.3	0.7
Cultural Resources Appendix	PL-E	2.0	1.3	0.7
Permitting		**6.0**	3.9	2.1
404(b)1 Report	PL-E	2.0	1.3	0.7
ESA Coordination	PL-E	2.0	1.3	0.7
Water Quality Certificate	PL-E	2.0	1.3	0.7
Coordination		**69.0**	44.9	24.2
Agency Coordination	PL-E	5.0	3.3	1.8
Public Involvement	PL-E/SC	4.0	2.6	1.4
Plan Formulation	PL-F	10.0	6.5	3.5
Independent Technical Review	NYD	8.0	5.2	2.8
Study Management	PL-F	10.0	6.5	3.5
Programs and Project Management	PP-C	2.0	1.3	0.7
Engineering Technical Management	EN-MM	10.0	6.5	3.5
Engineering Technical Review	EN-HH	5.0	3.3	1.8
Washington Level Review	USACE	10.0	6.5	3.5
Geographic Information System Support	PL-E	5.0	3.3	1.8
			0.0	0.0
Subtotal		**772.0**	501.8	270.2
Contingency		**115.8**	75.3	40.5
Escalation		**30.9**	20.1	10.8
			0.0	0.0
TOTAL - PHASE I		**918.7**	597.1	321.5

KEY to RESPONSIBILITY ABBREVIATIONS
SC = Suffolk County
USFWS = U.S. Fish and Wildlife Service
USACE = U.S. Army Corps of Engineers
EN-C = Engineering Division, Cost Engineering Branch
EN-DS = Engineering Division, Design Branch, Structural Section
EN-HH = Engineering Division, Civil Resources Branch, Hydraulic & Hydrology Section
EN-MM = Engineering Division, Management Branch, Metro Section
OP-SS = Operations Division, Support Branch, Survey Section
PL-E = Planning Division, Environmental Analysis Branch
PL-F = Planning Division, Plan Formulation Branch
PP-C = Programs and Project Management Division, Civil Resources
RE-A = Real Estate Division, Acquisition Branch

Mud Creek Watershed Section 206
Duck Farm Restoration Estimate of Costs
for Internal Use only by USACE and Project Sponsor

Construction Estimate

Task/Purchase Item	Cost per unit	unit	# of units	Total	Notes
Shrubs (3-4")	$35.00	shrub	60	$2,100.00	
Trees (Deciduous)	$70.00	tree	240	$16,800.00	
Trees (Evergreen)	$70.00	tree	20	$1,400.00	
Trees (Specimen 1" dbh)	$200.00	tree	15	$3,000.00	
Herbaceous plant plugs	$7.00	plug	100	$700.00	
Wetland seed mix	$125.00	pound	100	$12,500.00	1lb/2500sq ft
Grass seed mix	$16.00	pound	100	$1,600.00	25lbs/acre
Wildflower seed mix	$180.00	pound	20	$3,600.00	2lbs/acre/sp.
Fencing	$10.00	linear foot	424	$4,240.00	
Timber for parking area	$10.00	linear foot	460	$4,600.00	
Crushed Stone for parking area/staging area, trail	$10.00	cubic yard	289	$2,890.00	
Inerpretive Signs	$3,000.00	sign	8	$24,000.00	
Signs (carry-in/carry-out, park rules)	$150.00	sign	5	$750.00	
Benches	$1,000.00	bench	4	$4,000.00	
Miscellaneous park amenities	$10,000.00	lump sum	1	$10,000.00	
Silt Screen	$2.00	linear foot	3,600	$7,200.00	
Soil amendment/fertilizer	$0.50	square yard	256,786	$128,393.00	
Water/mulch	$1,346.00	acre	9	$11,696.74	
Vegetation Installation	$2,000.00	acre	7	$14,000.00	
Phragmites removal (stripping and herbicide)	$5,000.00	acre	14	$70,000.00	
Topsoiling (4" thick)	$3.00	square yard	11,000	$33,000.00	
Building demolition and removals	$40,000.00	action	1	$40,000.00	
Earth movement	$60,000.00	action	7	$420,000.00	
Mobilization/Demobilization	$60,000.00	action	1	$60,000.00	
Construction Management (Corps)	$30,000.00	labor funds	1	$30,000.00	
Contracting Labor (Corps)	$5,000.00	labor funds	1	$5,000.00	
			SUBTOTAL	**$911,469.74**	
Contingency (25% of Estimated Construction Cost)				$227,867.44	
EDCC (0.5% of Estimated Construction Cost)				$4,557.35	
S&A (10.5% of Estimated Construction Cost)				$95,704.32	
			TOTAL	**$1,239,598.85**	
Cultural Resources Costs for Construction					
In-house labor* Construction monitoring	$10,000.00				
Environmental Costs for Construction and Post-Construction					
In-house labor (technical)	$15,000.00				
Monitoring (fish, invertebrates, bird, veg, wq.)	$120,000.00				
Public Relations	$5,000.00				
Team leader/Project Management	$5,000.00				
Total Cultural and Environmental Costs (Construction/Post-Const.)	**$155,000.00**				
TOTAL CONSTRUCTION AND POST-CONSTRUCTION				**$1,394,598.85**	

Mud Creek Watershed Section 206
Duck Farm Restoration Estimate of Costs
for Internal Use only by USACE and Project Sponsor

SUMMARY OF TOTAL PROJECT COSTS

	Total	Federal	Non-Federal
Total Phase I Feasibility and P&S	$918,680	$597,142	$321,538
Total Construction Cost	$1,394,599	$906,489	$488,110
PROJECT COST TOTAL	$2,313,279		

Total Federal Govt. Share (65%)	$1,503,631
Total Non-Federal Sponsor (35%)	$809,648