US ARMY CORPS
OF ENGINEERS
NEW YORK DISTRICT

NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION

UPPER PASSAIC RIVER AND TRIBUTARIES AT LONG HILL TOWNSHIP, NJ

FLOOD DAMAGE REDUCTION AND ECOSYSTEM RESTORATION

FINAL DETAILED PROJECT REPORT & ENVIRONMENTAL ASSESSMENT

Volume 1

October 2004

Upper Passaic River and Tributaries
At Long Hill Township, NJ

Flood Damage Reduction
And
Ecosystem Restoration

Final Detailed Project Report &
Environmental Assessment

New York District
U.S. Army Corps of Engineers

October 2004

SYLLABUS

This report presents the results of an investigation to determine the feasibility of flood damage reduction and ecosystem restoration along the Upper Passaic River at Long Hill Township. The Upper Passaic River Flood Damage Reduction Feasibility Study has been conducted by U.S. Army Corps of Engineers (Corps) with the non-Federal project sponsor, the New Jersey Department of Environmental Protection (NJDEP).

The study area includes all of Long Hill Township, which is located in Morris County, New Jersey. The Passaic River forms the southern boundary of Long Hill Township. The Township is located approximately 76 miles upstream of the mouth of the Passaic River. The study area is characterized by low-density residential land use with commercial and light-industrial development in the communities of Gillette, Meyersville, Millington, and Stirling.

Periodic storms have caused severe flooding along the Upper Passaic River at Long Hill Township. Flooding problems continue to threaten areas of Long Hill Township, and it is anticipated these problems will be exacerbated in the future by additional development in the study area and in upstream portions of the Passaic River Basin. Early in the feasibility phase, scoping and public meetings and site visits were held with NJDEP, local government, and area residents to determine the extent of flooding problems in the study area. During the reconnaissance investigation, it was determined from local coordination and initial evaluation that there are pockets of flooding problems in the study area. Flooding results in damages to residential structures and their contents, industrial facilities and their contents, commercial facilities and their contents, and public facilities and their contents. One public facility, the Long Hill Township Police Station, is subject to recurrent flooding at high frequency events. As the Police Station is also the Township's Emergency Operations Center, flooding at this facility poses an additional challenge to the already difficult task of providing emergency services during flood events.

The recommended flood damage reduction plan is the Locally Preferred Plan (LPP). The LPP will provide flood damage reduction for events with an exceedance probability of approximately one percent (to elevation +216.2 NGVD). The plan consists of one levee/floodwall construction with two sluice gate closure structures on the western side of the Township and one sluice gate closure structure and limited road raising on the eastern side of Township. The alignment of the line of protection was refined based on physical, environmental, and economic criteria. The LPP has a total average annual cost of $319,560, total average annual benefits of $576,600, a benefit-cost ratio of 1.8 to 1, and average annual net benefits of $257,040.

Plan formulation for ecosystem restoration along the Upper Passaic River at Long Hill Township considered a wide variety of restoration measures and sites to address problems of ecosystem degradation and opportunities associated with ecosystem restoration. Seven potential restoration sites were identified during the reconnaissance phase of this study. These sites were carried forward into this feasibility study. Early in the feasibility phase, additional coordination was conducted with local stakeholders and with the non-Federal project partner (NJDEP). This coordination, in conjunction with additional field investigation, confirmed that these seven sites represent the sites of greatest restoration potential within the study area. The sites range in size from four acres to 60 acres. They contain a variety of aquatic, wetland, and upland habitats that have been degraded by development. Degradation can be traced to physical disturbance (e.g.,

grading), hydrologic modification, or infestation with undesirable plant species (e.g., Common Reed - *Phragmites australis).*

The full spectrum of ecosystem restoration measures were evaluated for their applicability to the seven potential restoration sites. Restoration opportunities were identified for each site, consisting of combinations of restoration measures that appear to be most appropriate to the existing conditions and restoration potential of each site. The sites were then subjected to an initial screening to evaluate the technical, institutional, and economic feasibility of restoration. They were evaluated using the following parameters: potential ecological benefits, potential costs, methods of implementation, requirements for success, real estate considerations, and support of local stakeholders and the non-Federal project partner (NJDEP). None of the seven sites survived this initial screening. A variety of site-specific technical and institutional considerations led to the elimination of the sites from further investigation. Although the seven potential restoration sites did not survive the initial screening, there may be opportunities in the future to restore some of the sites identified in this study. The recently initiated Passaic River, New Jersey Environmental Restoration investigations may develop initiatives to include some of these sites.

The costs of project implementation for the LPP will be shared by the Federal government and the non-Federal project partner (NJDEP) on a 65 percent / 35 percent basis. All operations and maintenance costs will be borne by the non-Federal project partner. Project implementation costs ($5,437,250) will be shared as follows: $3,534,213 Federal and $1,903,037 non-Federal with annual O&M costs of $20,000 (non-Federal), less any applicable credits.

The non-Federal project partner, NJDEP, has indicated its support for the recommended plan and is willing to enter into a Project Cooperation Agreement with the Federal Government for the implementation of the plan. At this time, there are no known major areas of controversy or unresolved issues regarding the study and selected plan among agencies or the public interest.

The magnitude and complexity of the project is of a scale within a Section 205, Flood Control, Continuing Authorities Program (CAP) project. The costs, including the study and the expected construction cost are well within the limits of the ceiling under Section 205. These two factors were evaluated and it was recommended to transition this General Investigation Study to a CAP Section 205. This is detailed in the recommendations section of the report.

PERTINENT DATA

DESCRIPTION

The identified plan provides for flood damage reduction along the Upper Passaic River at Long Hill Township, New Jersey.

LOCATION

Morris County, New Jersey

FLOOD DAMAGE REDUCTION FACILITIES

Level of Protection (storm with probability of exceedance)	0.01 (100-year event)
Levee/ Floodwall	
Levee Length	61 feet
Floodwall Length	3,996 feet
Top Elevation	216.2 feet NGVD
Average Height Above Existing Ground	4 to 5 feet
Levee Crest Width	12 feet
Levee Slopes	3H:1V

REAL ESTATE REQUIREMENTS

Permanent Easement	1.55 Acres
Temporary Easement (for construction)	2.93 Acres
Fee Simple Purchase (for mitigation)	13.14 Acres
Total	17.92 Acres

ENVIRONMENTAL MITIGATION

Impacts:

Acres of Forested Wetlands	0.59
Acres of Scrub-shrub Wetlands	0.02
Acres of Open Water	0.03

Acres of Disturbed Floodplain Forest	0.29
Acres Emergent Wetlands	0.17

Conversions:

Upland Disturbed to:	0.53 acres Forested Wetlands
	Total: 0.53 acres

ECONOMICS

Initial Project Cost (May 2003 price level, includes Interest During Construction)	$4,980,280
Annualized Initial Cost (discounted at 5.625 % over a 50-year period)	$299,560
Operations and Maintenance (O&M) Costs	$20,000
Total Annual Cost (discounted at 5.625 % over a 50-year period)	$319,560
Average Annual Benefits	$576,600
Average Annual Net Benefits	$257,040
Benefit-to-Cost Ratio	1.8

COST APPORTIONMENT

Federal Project Cost (65%)	**$ 3,534,213**
Non-Federal Project Cost (35%)	
5% Cash	$ 271,863
LERRD	$ 674,661
Cash Balance	$ 956,513
Non-Federal Project Cost Total	**$ 1,903,037**
Non-Federal Compensatory Mitigation Cost	**$358,950**
Total Cost	**$ 5,796,200**

Finding of No Significant Impact (FONSI)

I. NAME OF ACTION

Upper Passaic River and Tributaries at Long Hill Township (Morris County), New Jersey, Flood Damage Reduction Project, Long Hill Township.

II. DESCRIPTION OF ACTION

a. Proposed Action: The proposed action includes the construction of 3,996± linear feet of floodwall and 61± feet of earthen levee south of residences and businesses located along the south side of Valley Road. The structures would begin 100 feet west of Poplar Drive and end 300 feet west of Passaic Avenue. The floodwall/levee would provide 100-year flood protection to the businesses and residences south of Valley Road using the least environmentally damaging alignment.

b. Alternatives: The four alternatives to the proposed project included: (1) No action, (2) Flood gate construction on Passaic River tributaries, (3) Raising Valley Road 3 to 4 feet between combined with closure structures to prevent Passaic River backwater flow along the raised section of road, and (4) Levee construction along the Passaic River.

III. ANTICIPATED ENVIRONMENTAL IMPACTS

No long-term, adverse impacts are anticipated as a result of implementing the proposed plan. The proposed plan will result in the acquisition of the project corridor in fee or easement by Long Hill Township, which is fully supported by the Township Planning and Zoning Board.

No negative impacts to surface water resources are anticipated, as no fill or excavation would take place below the ordinary high water mark of surface waters within the project corridor. Implementation of the recommended plan will result in a permanent loss of relatively degraded wetlands (1.10 acres) and upland vegetation within the project corridor to construct the floodwall and maintained right-of-way. This impact will be mitigated through a combination of restoration of degraded wetlands and creation of wetlands from uplands totaling 0.53-acres of Federal compensatory mitigation. The New Jersey Department of Environmental Protection will add 12.61 acres of mitigation in a combination of preservation, restoration and enhancement to meet the States requirements pursuant to the New Jersey Freshwater Wetlands Protection Act.

Construction of the proposed flood damage reduction measures will temporarily displace resident and transient wildlife, which will seek refuge in adjacent and nearby habitats until construction is completed. Following construction, wildlife species are expected to resume their normal habits in and around the project area. Minor and temporary construction impacts may occur to threatened and endangered species habitat (barred owl, red shouldered hawk). Construction activities would lead to the temporary displacement of these species until construction is completed. Trained biologists qualified in the identification of threatened and endangered species would inspect the project corridor prior to construction and would be on-site, as needed, during construction to ensure that no threatened and endangered species are harmed and that impacts to habitat are minimized to the greatest extent possible. Clearing, grubbing, excavation and grading activities could result in the temporary and permanent loss of habitat and possible mortality of less mobile, burrowing, and/or denning species of common wildlife.

Impacts to wildlife habitat would be compensated for through implementation of the selected mitigation plan.

During construction, there will be temporary but minor adverse impacts to the aesthetic and scenic resources due to the presence of construction equipment and the earthwork. No documented prehistoric or historical archaeological resources were noted within the project corridor; therefore, no negative impacts on cultural resources are anticipated. No adverse impacts to parks or recreation facilities are anticipated as a result of the proposed project.

Temporary interruptions to existing traffic patterns could occur during construction due to the closure of roadways. However, neither local nor regional transportation would be affected by the proposed flood damage reduction project. Minor, yet temporary impacts to air quality are projected to occur in areas immediately adjacent to the project corridor resulting from the operation of construction equipment. There will be a minor and temporary increase in noise levels in the immediate project area during construction due an increase construction related vehicular use and the operation of construction equipment. A slight change in existing topography would result from the installation of a stormwater drainage ditch and the levee/floodwall system.

IV. CONCLUSION

Given that there are minimal short term impacts and no anticipated long-term, adverse impacts associated with the implementation of the selected plan, a finding of no significant impact (FONSI) has been determined for this action. Furthermore, as the recommended plan will have no negative impacts on the quality of the environment, an environmental impact statement is not required.

Date: 26 May 2004

John B. O'Dowd
Colonel, Corps of Engineers
District Engineer

TABLE OF CONTENTS

1. INTRODUCTION 1-1

1.1 Study Authority 1-1

1.2 *Study Purpose and Need 1-2

1.3 Prior Studies, Reports, And Existing Water Projects 1-2

1.4 Study Scope 1-5

1.5 National Environmental Policy Act Requirements 1-5

1.5.1 Areas of Controversy 1-6

1.5.2 Unresolved Issues 1-6

1.6 Study Process 1-6

1.7 Report Organization 1-6

2. *BASELINE CONDITIONS / AFFECTED ENVIRONMENT 2-1

2.1 Physical Setting 2-1

2.1.1 Physiography and Geomorphology 2-3

2.1.2 Soils 2-3

2.2 Climate and Weather 2-4

2.3 Water Resources 2-4

2.3.1 Surface Waters 2-4

2.3.2 Regional Hydrogeology and Groundwater 2-6

2.3.3 Wetlands 2-6

2.3.4 Coastal Zone Management 2-10

2.3.5 Clean Water Act Section 404 (b)(1) Guidelines Compliance 2-13

2.4 Wildlife Resources 2-14

2.4.1 Mammals 2-14

2.4.2 Birds 2-15

2.4.3 Reptiles and Amphibians 2-16

2.4.4 Fish 2-17
2.5 Threatened and Endangered Species 2-18
2.5.1 Federal Species of Concern 2-19
2.5.2 State Species of Concern 2-19
2.6 Air Quality 2-26
2.7 Cultural Resources 2-26
2.8 Hazardous, Toxic, and Radioactive Waste 2-27
2.9 Socioeconomic Setting 2-27
2.10 Land Use 2-29
2.11 Parks and Recreation 2-30
2.12 Future Without-Project Conditions / No Action Alternative 2-30
2.12.1 Flood Damages 2-30
2.12.2 Ecosystem Functionality 2-31
2.12.3 Study Area Conditions That Are Unlikely To Change 2-32
2.12.4 Study Area Conditions That Are Likely To Change 2-32
3. PLAN FORMULATION – FLOOD DAMAGE REDUCTION 3-1
3.1 Problems And Opportunities 3-1
3.1.1 History of Past Flooding 3-4
3.1.2 Principal Flood Damage Reaches 3-6
3.2 Planning Objectives, Constraints, and Key Assumptions 3-11
3.2.1 Planning Goals And Objectives 3-11
3.2.2 Planning Constraints 3-11
3.2.3 Critical Assumptions Guiding Plan Formulation 3-12
3.3 Hydrologic and Hydraulic Analyses 3-12
3.4 Flood Damage Analyses 3-15
3.4.1 Existing Conditions Damages 3-16

3.5 Screening of Structural Flood Damage Reduction Measures 3-18
3.5.1 Closure Structures on Tributaries 3-18
3.5.2 Floodwater Barriers 3-19
3.5.3 Stream Modifications 3-25
3.5.4 Detention Basins 3-25
3.6 Screening of Nonstructural Flood Damage Reduction Measures 3-26
3.6.1 Acquisition of Flood-Prone Properties 3-26
3.6.2 Flood Plain Zoning 3-26
3.6.3 Floodproofing 3-26
3.6.4 Flood Warning Systems 3-27
3.7 Alternative Flood Damage Reduction Plans 3-27
3.8 Evaluation of Alternatives 3-29
3.8.1 Alternative Evaluation Economics 3-29
3.8.2 Environmental Mitigation Requirements of Alternatives 3-32
3.8.3 Comparison of Alternatives 3-35
3.9 Non-structural Features Analysis of Alternative 4 3-36
3.10 Selected Plan Optimization 3-37
3.11 Selection of the Recommended Level of Protection 3-39
4. PLAN FORMULATION – ECOSYSTEM RESTORATION 4-1
4.1 Problems and Opportunities-Ecosystem Degradation/Restoration 4-1
4.2 Planning Objectives and Constraints and Key Assumptions 4-1
4.2.1 Planning Goals And Objectives 4-1
4.2.2 Planning Constraints 4-2
4.2.3 Critical Assumptions Guiding Plan Formulation 4-2
4.3 Potential Restoration Sites 4-3
4.4 Alternative Restoration Measures 4-5
4.5 Formulation and Evaluation of Alternative Plans 4-6

4.6 Future Restoration Potential 4-8

5. THE RECOMMENDED PLAN 5-1

5.1 Line of Protection Description 5-1

5.2 Levee Design 5-6

5.3 Floodwall Design 5-7

5.4 Geotechnical Analyses 5-7

5.5 Hydrology and Hydraulics 5-8

5.5.1 Interior Runoff 5-8

5.5.2 Interior Drainage 5-10

5.6 Real Estate 5-11

5.7 Economics of the LPP 5-11

6. ENVIRONMENTAL CONSEQUENCES 6-1

6.1 Physical Setting 6-1

6.2 Climate and Weather 6-1

6.3 Water Resources 6-2

6.3.1 Surface Water Resources 6-2

6.3.2 Wetlands 6-2

6.4 Wildlife Resources 6-3

6.5 Threatened and Endangered Species 6-3

6.6 Air Quality 6-4

6.7 Cultural and Historic Resources 6-4

6.8 Hazardous, Toxic, and Radioactive Waste 6-5

6.9 Socio-Economics 6-5

6.10 Land Use 6-5

6.11 Noise 6-6

6.12 Recreation 6-6

6.13 Aesthetics 6-6

6.14 Transportation and Other Infrastructure 6-7

6.15 Environmental Mitigation 6-7

6.15.1 On-Site Mitigation 6-8

6.15.2 Off-Site Mitigation 6-11

6.16 Environmental Justice 6-12

6.17 Cumulative Impacts 6-12

7. PLAN IMPLEMENTATION 7-1

7.1 General 7-1

7.2 Local Cooperation 7-1

7.3 Cost Sharing 7-5

7.3.1 Application of Passaic River Wetlands Bank Credit 7-6

7.4 Implementation Schedule 7-7

7.5 Financial Analysis 7-7

7.6 Views of Non-Federal Partners and Other Agencies 7-8

7.7 Areas Of Concern 7-8

8. COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS 8-1

9. PERTINENT CORRESPONDENCE & PUBLIC INVOLVEMENT 9-1

10. RECOMMENDATIONS 10-1

11. REFERENCES AND CONTACTS 11-1

12. PERTINENT CORRESPONDENCE 11-4

**Sections of text marked with an asterisk are applicable to the satisfaction of NEPA requirements*

LIST OF FIGURES

Figure 2-1 – Study Area Within Passaic River Basin 2-2

Figure 2-2 NWI Wetlands 2-11

Figure 2-3 New Jersey Mapped Wetlands 2-12

Figure 3-1: Current Flood Plain Map of Study Area 3-2

Figure 3-2: Study Area Showing Passaic River Tributaries 3-3

Figure 3-3 – Aerial View of Study Area Reaches 3-7

Figure 3-4 – Aerial View of Study Area Reach 1 3-8

Figure 3-5 – Aerial View of Study Area Reach 2 3-9

Figure 3-6 – Aerial View of Study Area Reach 3 3-10

Figure 3-7: Closure Structures on Tributaries at Valley Road 3-21

Figure 3-8: Levee Along the Passaic River 3-22

Figure 3-9: Setback Levee/Floodwall South of Valley Road 3-23

Figure 4-1: Locations of Potential Study Area Restoration Sites 4-4

Figure 5-1: LPP Alignment and Plan Features 5-2

Figure 5-2: Plan View – Western End of Alignment 5-3

Figure 5-3: Plan View – Mid Alignment 5-4

Figure 5-4: Plan View – Eastern End of Alignment 5-5

Figure 5-5: Study Area With-Project Flood Plain 5-9

LIST OF TABLES

Table 2-1 Evaluation of Planned Wetlands Existing Conditions..... 2-10

Table 2-2 Mammalian Species & Habitats Identified within Study Area 2-14

Table 2-3 Avian Species & Habitats Identified within Study Area..... 2-15

Table 2-4 Reptilian & Amphibian Species & Habitats Identified within Study Area..... 2-17

Table 2-5 Fish Species Potentially Within Study Area 2-18

Table 2-6 Rare Vertebrates Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties..... 2-20

Table 2-7 Rare Invertebrates Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties..... 2-21

Table 2-8 Rare Vascular Plants Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties..... 2-23

Table 2-9 Populations of Study Area Jurisdictions 1980, 1990, 2000..... 2-28

Table 2-10 Population Forecasts for Study Area Jurisdictions 1995 – 2025..... 2-28

Table 2-11 Age Distribution of Study Area Populations 2000..... 2-28

Table 2-12 Median Household Income of Study Area Jurisdiction 1999 2-29

Table 2-13 Employment by Sector (1997) Study Area Jurisdictions 2-29

Table 3-1 Water Surface Profiles for Eight Modeled Storm Events 3-14

Table 3-2 Damages to Residential Structures and Contents Without Project Conditions..... 3-17

Table 3-3 Damages to Non-Residential Property Without Project Conditions 3-17

Table 3-4 Traffic Delay Costs..... 3-18

Table 3-5 Features of Alternative Plans..... 3-29

Table 3-6 Average Annual Damages of Alternatives 1 Through 5 ($000)..... 3-30

Table 3-7 Average Annual Benefits of Alternatives 1 Through 5 ($000) 3-30

Table 3-8 Preliminary Costs of Alternative Plans 3-31

Table 3-9 Preliminary Economics of Alternative Plans 3-32

Table 3-10 Evaluation of Alternative Plans Against Objectives and Constraints 3-36

Table 3-11 Costs of Alternative Levels of Protection – Alternative 4 3-37

Table 3-12 Benefits and Costs Comparison of Alternative Protection Levels 3-38

Table 3-13 Residual Risks of Existing Conditions and Alternative Protection Levels 3-38

Table 3-14 Benefits and Costs Comparison of the LPP and NED Plan 3-39

Table 3-15 Level of Protection and Residual Risk Comparison of the LPP and NED Plan 3-40

Table 5-1 Lands, Damages and Relocations 5-11

Table 5-2 MCACES Cost Estimate – Locally Preferred Plan 5-12

Table 5-3 Project Economic Summary for the LPP April 2003 Price Level, 5.625% Discount Rate 50 Year Period of Analysis 5-13

Table 6-1 Comparison of EPW Results for Impacted Area 6-9

Table 6-2 Estimated Construction Cost – Recommended Mitigation Plan 6-10

Table 6-3 Mitigation Analysis for Selected Alternative (Locally Preferred Plan) 6-11

Table 7-1 Fully Funded Cost Estimate – Selected Plan 7-5

Table 7-2 Cost Apportionment Federal and Non-Federal Responsibilities 7-6

Table 7-3 Cost Apportionment Federal and Non-Federal Responsibilities Including Wetlands Bank Credit 7-7

Table 9-1 Briefing/Coordination Meetings with Study Area Municipalities, Public, and Interested Parties 9-3

LIST OF APPENDICES

A Hydrology & Hydraulics

B Geotechnical Analysis & Hazardous, Toxic, and Radiological Waste

C Engineering & Design

D MCACES Cost Estimate

E Environmental Compliance & Coordination

F Economic Analyses

G Real Estate Plan

GLOSSARY OF TERMS, ACRONYMS, AND ABBREVIATIONS

CW	Civil Works Program
CEQ	Council On Environmental Quality
CFR	Code Of Federal Regulations
CMSA	Consolidated Metropolitan Statistical Area
Corps	United States Army Corps Of Engineers
dBA	Decibels
DEP	Department Of Environmental Protection (New Jersey)
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EM	Engineering Manual
EPA	United States Environmental Protection Agency
EPW	Evaluation Of Planned Wetlands
ER	Engineering Regulation
FCU	Functional Capacity Units
FCI	Functional Capacity Index
FEMA	Federal Emergency Management Agency
DPR	Detailed Project Report
DPR/EA	Detailed Project Report/Environmental Assessment
FWCA	Fish and Wildlife Coordination Act
HTRW	Hazardous, Toxic, And Radiological Wastes
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department Of Environmental Protection
NJDOT	New Jersey Department Of Transportation
NJHPO	New Jersey Historic Preservation Office
O&M	Operations And Maintenance
OMRR&R	Operations, Maintenance, Replacement, Repair, and Rehabilitation
P&G	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
PED	Preconstruction Engineering And Design
PMP	Project Management Plan
S&A	Supervision And Administration
USACE	United States Army Corps Of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish And Wildlife Service
USGS	United States Geological Survey
WES	Waterways Experiment Station
WRDA	Water Resources Development Act
WSEL	Water Surface Elevation

UPPER PASSAIC RIVER AND TRIBUTARIES AT LONG HILL TOWNSHIP, NEW JERSEY

FLOOD DAMAGE REDUCTION AND ECOSYSTEM RESTORATION

INTEGRATED DETAILED PROJECT REPORT & ENVIRONMENTAL ASSESSMENT

1. INTRODUCTION

This integrated Detailed Project Report and Environmental Assessment (DPR/EA) investigates the feasibility of alternative plans to address problems and opportunities associated with flood damage reduction and ecosystem restoration along the Passaic River in Long Hill Township, Morris County, New Jersey. This DPR/EA has been prepared by the New York District of the U.S. Army Corps of Engineers (Corps) under the General Investigations Program of the Corps. The New Jersey Department of Environmental Protection (NJDEP) is the non-Federal partner for this study and for any subsequent project implementation.

1.1 Study Authority

The Upper Passaic River, New Jersey, Flood Control and Environmental Restoration Feasibility Study is being conducted under the Corps of Engineers General Investigations program. The study was authorized by a resolution of the Committee on Transportation and Infrastructure of the U.S. House of Representatives, adopted May 7, 1997. The resolution states that:

> *"Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army is requested to review the report of the Chief of Engineers on the Upper Passaic and Tributaries in Long Hill Township (formerly Passaic Township), Morris County, New Jersey, published as House Report Number 94-1702, and other pertinent reports, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time, in the interest of water resources development, including flood control, environmental restoration and other allied purposes."*

Under this study authorization, a reconnaissance report was completed in July 1998. The reconnaissance study concluded that there is Federal interest in addressing problems and opportunities for flood damage reduction and ecosystem restoration along the Passaic River at Long Hill Township. Based on preliminary analysis, the reconnaissance report identified at least one project that would be in the Federal interest. The report recommended three flood damage reduction alternatives that appeared to have Federal interest: closure structures on culverts, road raising and embankment reconstruction, and implementation of a flood warning system (FWS). In addition, the report identified six potential mitigation/restoration sites for further evaluation of the Federal interest. On the basis of these findings, the Corps and the State of New Jersey entered into an agreement to perform a cost-shared feasibility study of the Upper Passaic and Tributaries in Long Hill Township.

1.2 *Study Purpose and Need

The purpose of the Passaic River at Long Hill Township study is to evaluate the feasibility of Federal participation in implementing solutions to problems and opportunities for flood damage reduction and ecosystem restoration along this waterway. More specifically, the study:

- Identifies problems associated with periodic flooding from storms along the Passaic River, particularly at Long Hill Township,
- Identifies opportunities for restoration of degraded ecosystems in the Passaic River basin,
- Evaluates the technical, economic, environmental, and institutional feasibility of Federal action to address flooding problems and ecosystem restoration opportunities, and
- Determines if there is local support for implementation of the recommended plan.

As part of the plan formulation process, reconnaissance phase plans were re-evaluated, and other potential flood damage reduction and ecosystem restoration measures were formulated in order to evaluate and select those plans that maximize contributions to National Economic Development (NED) and to National Ecosystem Restoration (NER). In this document, the NED plan and the NER plan have been developed to a level of engineering, economic, and environmental detail sufficient to proceed to the Preconstruction Engineering and Design (PED) phase, pending recommendation by the New York District, approval by the North Atlantic Division Commander, support by Corps Headquarters and the Assistant Secretary of the Army (Civil Works), and construction authorization by Congress.

1.3 Prior Studies, Reports, And Existing Water Projects

The Passaic River Basin is subject to frequent and severe flooding. As such, the Corps of Engineers has conducted numerous studies to identify comprehensive solutions to reduce flood damages throughout the basin. Each of the prior studies were reviewed to identify any and all information that could be used in the current feasibility study. However, with the exception of the reconnaissance study conducted prior to this feasibility investigation, none of the prior Corps studies address specific flooding problems in Long Hill Township.

Upper Passaic Flood Control and Ecosystem Restoration Reconnaissance Study, 1998. This report concluded that structural and non-structural flood damage reduction measures appeared to warrant Federal interest along portions of the upper Passaic River and its tributaries. Three alternatives: closure structures on culverts, road raising and embankment reconstruction, and implementation of a flood warning system were recommended for further study in the feasibility phase.

Phase I General Design Memorandum Passaic River Basin, New Jersey and New York, Final Report on Flood Protection Feasibility Remaining Tributaries, January 1990. The Water Resources Development Act of 1976 (Public Law 94-587) authorized the Passaic River Basin Study, a Phase I Advanced Engineering and Design Study. During the initial planning stage of the Passaic River Basin Study, the water resources related problems and

opportunities of tributary flood problem areas were identified and reviewed to determine the need for further study.

Passaic River Mainstem Feasibility Report, December 1987. A Feasibility Report and Environmental Impact Statement (EIS) for the Passaic River Main Stem was completed in December 1987 under the overall Phase 1 authority. The report recommendations were concurred in by the Board of Engineers for Rivers and Harbors in July 1988 and by the Chief of Engineers in February 1989. The Assistant Secretary of the Army transmitted the report to the Office of Management and Budget for review in October 1989. The recommended plan consisted of a 39 foot diameter, 13.5 mile long main tunnel; a 22 foot diameter, 1.2 mile long spur tunnel; 5.9 miles of channel modifications; 37.3 miles of levees and floodwalls, and preservation of 5,350 acres of flood storage. This plan would protect flood-prone areas along the Passaic, Pompton, Pequannock, Wanaque, Ramapo, Rockaway and Whippany Rivers and Deepavaal and Pinch Brooks. Preconstruction engineering and design (PED) was initiated in FY89 and was scheduled for completion in September 1995. The project never materialized due to diminished non-Federal sponsorship and funding priority changes by the non-Federal sponsor. As part of the PED effort, the study of the enhancement of the Passaic River's Flood Emergency Preparedness System resulted in a recommendation to improve the timeliness, accuracy and reliability of flood warnings throughout the Basin. The recommended plan included the establishment of local self-help programs, increased rain and stream gage density and automation, flood warning, improved computer software and flood warning hardware facilities, and enhancement of local response programs. Installation was completed in 1988 and the project is now operational. The project is operated and maintained by the Corps through a contract with the National Weather Service.

Survey Report for the Passaic River Watershed, New Jersey, June 1972. The most recent survey report prepared by the Corps of Engineers was issued in June 1972 and amended by a supplemental report in April 1973. In these reports, the District Engineer recommended for authorization a plan of improvement for flood protection and allied resources development in the Passaic River Basin. Included in this recommendation were local protection plans. The alternatives presented in the 1969 draft report were updated and revised during detailed planning, and five alternative plans of improvement and six local protection projects were presented in the 1972 survey report. The recommended plan, Plan III, included a multipurpose reservoir at Two Bridges, with a conservation pool for water supply and water quality enhancement in the Great Piece Meadows, and a multiple-purpose reservoir with conservation storage for water supply at Myers Road. It also featured channel modifications along the Passaic, Pompton, Pequannock, Wanaque, and Ramapo Rivers. The 1972 report also recommended six local protection projects located on the Saddle River at Lodi, NJ; on the Ramapo River at Pompton Lakes and Oakland, NJ; on the Rockaway River at Denville, NJ; on Nakoma Brook at Sloatsburg, NY; on the Ramapo and Mahwah Rivers at Mahwah, NJ and Suffern, NY and on Molly Ann's Brook at Haledon.

Survey Report for the Passaic River Watershed, New Jersey, 1969. Seven new Basinwide plans were formulated and presented in a 1969 draft survey report. These plans included a reclamation plan, a flood detention plan, an intermediate conservation development plan, a maximum conservation development plan, a comprehensive reservoir-tunnel plan, a tunnel plan, and a local protection plan. The intermediate conservation development plan was tentatively recommended in the 1969 draft report. It included a

multiple-purpose reservoir in the Passaic River above Two Bridges, with a conservation pool for water supply, hydropower production and pollution abatement. It also included diversions of the Pompton River into the reservoir, and levees and floodwalls along the Pompton River and along the proposed diversion channel. The plan also included protection along the lower reaches of major tributaries within the backwater influence of the Passaic River from Two Bridges to the mouth and local protection measures in the tidal reach of the lower Passaic River against the tide of record.

Survey Report for the Passaic River Watershed, New Jersey, June 1962. In June 1962, the New York District Engineer submitted an updated and revised draft survey report recommending favorable action on an alternative plan of improvement for the Passaic River watershed.

Survey Report for the Passaic River Watershed, New Jersey, October 1948. In October 1948, the New York District Engineer submitted a survey report recommending the construction of a reservoir and channel modification as a project for flood control and other purposes within the Passaic River watershed, New Jersey.

Prior Studies by Others

Passaic River Supplemental Flood Hazard Studies and Mapping State of New Jersey Department of Environmental Protection (undated). This report provided the principal source of data used to estimate flood frequencies, depths, and flood plain boundaries in the reconnaissance phase.

1995 Master Plan, Long Hill Township, NJ (and accompanying reports). This update to the 1987 Master Plan is based on the results of 10 background reports on the community, including reports on Existing Land Use, Natural Resources, Area Planning Considerations, Planning Issues, and Housing. The document presents fundamental statements of township policy regarding future development of the community and includes text and maps which relate the policy statements to a physical design. It also presents the ways and means by which the plan proposals may be achieved.

Morris County Stormwater Management Technical Guide. This report provides technical assistance and guidance to individual municipalities in the preparation of stormwater control ordinances and stormwater management plans. The guide is also used as the evaluation document in the county approval process for municipal stormwater management plans and ordinances. Recommended approaches to stormwater management and nonpoint source pollution control are accompanied by guidance for the coordinated review of development projects by agencies with regulatory authority.

Data and mapping from the Flood Hazard Studies and Stormwater technical guide were reviewed in the initial stages of the hydrology and hydraulic analyses conducted as part of this feasibility study. In addition, Long Hill Township's Master Plan was continually referenced as part of plan formulation activities to ensure that flood damage and ecosystem restoration alternatives considered were consistent with the Township's land use regulations and long-term strategy for managing growth.

1.4 Study Scope

This DPR/EA investigates the feasibility of Federal action to address flooding problems and ecosystem restoration opportunities along the Passaic River at Long Hill Township, New Jersey. It is consistent with Federal water resources policies and practices, including *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G, 1983), the Corps *Planning Guidance Notebook* (ER-1105-2-100, 22 April 2000), and *Procedures for Implementing NEPA* (ER 200-2-2, 4 March 1988). Throughout this investigation, the Corps worked closely with the non-Federal project partner, NJDEP, to (1) describe the range of potential Federal participation in flood damage reduction and ecosystem restoration along the Passaic River at Long Hill Township and (2) explain the roles and responsibilities of the Corps and the non-Federal partner in project planning and implementation.

As an integrated report, this DPR/EA also fully complies with requirements of the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.). The integration of the NEPA documentation with the feasibility report is consistent with NEPA guidance to combine required documents with other documents, when practicable.

1.5 National Environmental Policy Act Requirements

Unlike other single-topic environmental laws (e.g., Clean Air Act, or Clean Water Act), the National Environmental Policy Act (NEPA) encourages protection of all aspects of the environment. The President's Council on Environmental Quality (CEQ) has pointed out that "NEPA is distinguishable, purposefully so, from other environmental statutes. It targets no specific pollution sources or human health risks for treatment, prescribes formulation of no abetment techniques or remedial actions, and establishes neither milestones nor timetables for achieving its goals" (CEQ, 1990). Instead, NEPA requires that agencies take a systematic, interdisciplinary approach to agency decision making that will ensure the integrated use of the natural sciences, social sciences, and design arts.

An Environmental Assessment (EA) is a concise public document prepared by the federal agency to determine whether the proposed action has the potential to cause significant environmental effects (40 CFR 1508.9(a)). The purposes of an EA are to:

- Provide evidence and analysis sufficient to determine whether an EIS is required;
- Aid a federal agency's compliance with NEPA when no EIS is necessary,
- Facilitate preparation of an EIS when one is necessary, and.
- Serve as the basis to justify a finding of no significant impact (FONSI).

The CEQ NEPA regulations (40 CFR 1500-1508) do not contain a detailed discussion regarding the format and content of an EA. However, the EA must discuss:

- The need for the proposed action,
- The proposed action and alternatives,

- The probable environmental impacts of the proposed action and alternatives, and
- The agencies and persons consulted during preparation of the EA.

NEPA requires federal agencies to integrate environmental review into their planning and decision-making process. This integrated DPR/EA is consistent with NEPA statutory requirements. The report reflects an integrated planning process, which maximizes beneficial impacts on the environment resulting from ecosystem restoration and avoids, minimizes, and mitigates adverse project effects associated with flood damage reduction actions.

1.5.1 Areas of Controversy

At this time, there are no known major areas of controversy regarding the study and selected plan among agencies or the public interest.

1.5.2 Unresolved Issues

At this time, there are no known unresolved issues regarding the study and the selected plan.

1.6 Study Process

The New York District is responsible for conducting the overall feasibility study in cooperation with the non-Federal project partner, NJDEP. The feasibility study and eventual implementation of the project continue to receive strong support from NJDEP and from local governments, including Long Hill Township. Both Long Hill Township and NJDEP are committed to working with the Corps to address flooding problems and opportunities for ecosystem restoration along the Passaic River.

As will be explained in detail in this document, plan formulation for ecosystem restoration and for mitigation of adverse effects of flood damage reduction features of this project were conducted in close coordination with Federal and State of New Jersey regulatory and resource agencies, including: U.S. Fish and Wildlife Service, National Marine Fisheries Service, and NJDEP.

1.7 Report Organization

This document has been organized in a manner consistent with both Corps requirements for feasibility reports and with NEPA requirements. This report reflects an integrated planning process where positive environmental effects associated with restoration actions have been maximized and adverse environmental effects associated with flood damage reduction have been avoided, minimized, and compensated for.

The main report summarizes the results of feasibility studies and contains sections appropriate for EA documentation. Technical appendices, which present details of technical investigations conducted during the feasibility study, are attached. Some section headings are marked with an asterisk to indicate consistency with requirements of feasibility studies and NEPA documents.

2. *BASELINE CONDITIONS / AFFECTED ENVIRONMENT

This section of the report describes existing and most probable future without-project conditions in the study area. The description provides a baseline for measuring expected changes in the physical, environmental, cultural, social, and economic settings that would result from implementation of a flood damage reduction project and an environmental restoration project in the study area. The profile of existing conditions leads to two conclusions about the reach of the Passaic River through Long Hill Township: (1) large portions of Long Hill Township have been and continue to be subject to flooding from the Passaic River and (2) there has been relative ecological degradation along the Passaic River throughout the study area.

Long Hill Township is located in Morris County within the Passaic River Basin. The Passaic River flows south to Long Hill Township, where it turns to the northeast, flowing through the Central basin physiographic area. Long Hill Township is approximately 76 miles from the mouth of the Passaic River.

Long Hill Township is located within the Central Passaic River Basin, a flat, oval 262 square mile depression which is about 10 miles wide and about 30 miles long. The Central Basin contains 24,485 acres of natural flood storage area, including the Great Swamp National Wildlife Refuge located in the northeastern sector of Long Hill Township. The Passaic River is adjacent to the township and flows south along the western boundary then turns northeast, forming the southern boundary of the Township (see Figure 2-1).

Long Hill Township is a low density residential community (0.36 housing units per acre) characterized by large tracts of open space and single family residential neighborhoods. Commercial development is well established within the Valley Road business district and four neighborhood business districts: Gillette, Meyersville, Millington, and Stirling. Existing public open space within the Township covers 3,335 acres or 41.1 percent of the total land area. This predominantly undeveloped open space includes Federal (70%), State (3%), County (19%) and Township (8%) lands.

Early in the feasibility phase, scoping and public meetings, and site visits were held with NJDEP, Long Hill Township, and area residents to determine the extent of flooding problems in the study area. During the reconnaissance investigation, it was determined from this coordination and initial evaluation that there are pockets of flooding problems in the study area, and damages are incurred by residential structures and their contents, industrial facilities and their contents, commercial facilities and their contents, and public facilities and their contents. One public facility, the Long Hill Township Police Station, is subject to recurrent flooding at high frequency events. As the Police Station is also the Township's Emergency Operations Center, flooding at this facility poses an additional challenge to the already difficult task of providing emergency services during flood events.

2.1 Physical Setting

The physical characteristics of the study area are profiled below. Discussions address physiography, geomorphology, soils, and climate.

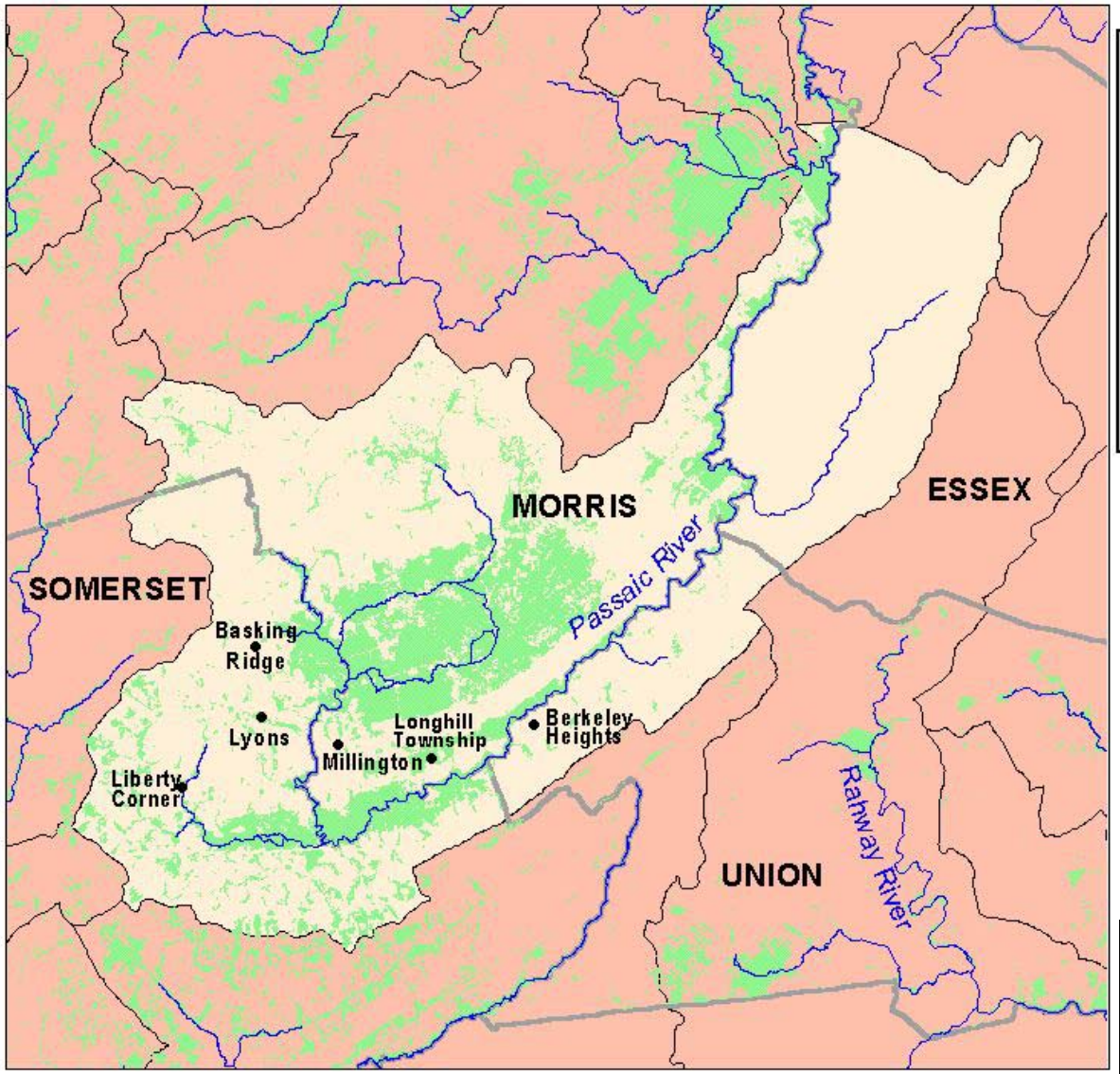


FIGURE 2-1:
Study Area Location

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study
(not to scale)

2.1.1 Physiography and Geomorphology

The study area is nearly flat with approximate elevations ranging from 212 to 215 feet Mean Sea Level (ft-msl) with small hills on the west and east ends that rise above elevation 225 ft-msl. A Public Service Electric and Gas Company (PSE&G) overhead electric transmission line crosses the study area from southwest to northeast. Three drainage ditches flow southward across the study area and into the Passaic River. Passaic Valley Road parallels the Passaic River and is the northern boundary of residential and commercial properties that occupy the areas between the road and the River.

The project area is located in within the Piedmont physiographic province. This province contains sedimentary and igneous rocks of Jurassic age, including siltstone, shale, sandstone, conglomerate and basalt. The more erosion resistant basalt has formed ridges and uplands. The Watchung Mountains, Long Hill and Hook Mountains, rising to elevations over 400 ft-msl, are comprised of this basalt. The valleys and lowlands are comprised of the sedimentary rocks that are overlain by glacial outwash. A terminal moraine from the Wisconsin glacial period is located to the northeast of the study area. Remnants of glacial outwash have formed level plains sloping from the terminal moraine. This outwash is a combination of sand and gravel deposited from glacial meltwaters and silt and clay deposited by glacial lakes. Such lakes typically form adjacent to the glaciers upon retreat. The glacial Lake Passaic is responsible for the thick deposits of silts and clays, which are found within the project area.

2.1.2 Soils

The U.S. Department of Agriculture, Soil Conservation Service (USDA/SCS) Soil Survey for Morris County, issued August 1976, shows two soil types within and one soil type adjacent to the project area. Within the project area are the Urban land-Penn complex (Um) and Urban land-Whippany complex (Uw).

The Um soil type is described as being well-drained soils that are underlain by red shale. It occurs near the bottom of slopes of the Watchung Mountains. Um soils consist of approximately 40 percent cut and fill land and 40 percent Penn soils. These types occur in a complex pattern and cannot be mapped separately.

The Uw soil type is described as somewhat poorly drained, nearly level or gently sloping clayey soils. It occurs in areas where developments extend into the bottom of the basin formerly occupied by glacial Lake Passaic. The soil is about 40 percent fill land and 40 percent Whippany soils in a complex pattern. The complex displays a water table near the surface most of the winter and spring.

Also included in the study area is the Parsippany silt loam (Ph). This soil is found adjacent to the Passaic River, and is described as deep, nearly level, and poorly drained and is on the level bottom of the basin formerly occupied by glacial Lake Passaic. Ph soils formed in stratified sediment of lacustrine (lake) origin derived mostly from red and brown shale, basalt and granitic rock. It has a perched water table at or near the surface for long periods. Because of its low position on the landscape, the soil receives runoff from adjoining higher areas.

2.2 Climate and Weather

Morris County has significant seasonal and daily temperature fluctuations. Winters are typically cool with moderate snowfall. Average temperatures in January are 30°F. Summers are moderate with hot mid-summer weather and frequent thunderstorms. Average temperatures in July are 74°F. Annual precipitation averages 44 inches with little seasonal variation in rainfall. The growing season lasts approximately 180 days beginning in late April and ending in middle to late October.

2.3 Water Resources

A description of the existing water resources (surface water, groundwater, flood plains, wetlands, and coastal zone management) in the study area is provided below.

2.3.1 Surface Waters

Surface water resources within the project corridor are classified by the Federal government as Waters of the United States (33 CFR 328) and by NJDEP as State Open Waters (NJAC 7:7A-1.4). Pursuant to the requirements Section 401 of the Federal Clean Water Act, NJDEP's Surface Water Quality Standards (NJAC 7:9B) specifies classification codes and water quality standards for New Jersey State Open Waters.

The project corridor is located in the NJDEP Watershed Management Area 6 (WMA6). WMA6 represents the area drained by waters from the upper reaches of the Passaic River Basin, including the Passaic River from its headwaters in Morris County to its confluence with the Pompton River. WMA6 is characterized by extensive suburban development and reliance upon groundwater as the primary source of public water supply in rural areas.

The Upper Passaic River Watershed is approximately 50 miles long and consists of a 200 square mile drainage area located in portions of Somerset, Morris, and Essex Counties. This section of the Passaic River is a significant source of drinking water for much of northeastern New Jersey. The Great Swamp National Wildlife Refuge is located within the Upper Passaic River Watershed. Approximately one half of this watershed consists of undeveloped or vacant land, with the remainder of the watershed occupied by residential and commercial development. This watershed is subject to frequent flooding.

The Passaic River and unnamed tributaries to the Passaic River are the major water bodies within the project corridor that would be considered Waters of the U.S. and State Open Waters pursuant to 33 CFR 328 and the New Jersey Surface Water Quality Standards respectively. All of these waters are classified as FW2-TP(C1) or "trout-production" waters (Category One) by NJDEP. The New Jersey Surface Water Quality Standards defines FW2 waters as "the general surface water classification applied to those freshwaters that are not designated as FW1 or Pinelands Waters". FW1 waters are defined as "those fresh waters….that are to be maintained in their natural state of quality and not subjected to any man-made wastewater discharges or increases in runoff from anthropogenic activities…" Further, the NJ Surface Water Quality Standards defines Trout-Production waters as waters that have been designated as areas used by trout for spawning or nursery purposes during their first summer. Category one waters means those waters designated for purposes of implementing the anti-degradation policies for protection from measurable changes in water quality characteristics because of their clarity, color, scenic setting,

and other characteristics of aesthetic value, exceptional ecological significance, or exceptional fisheries resources. These waters may include:

1. Waters originating wholly within Federal, interstate, State, county or municipal park, forests, fish and wildlife lands, and other special holdings that have not been designated as FW1.
2. Waters classified as FW2 trout production waters and their tributaries.
3. Surface waters classified as FW2 trout maintenance or FW2 non-trout that are upstream of waters classified as FW2 trout production.

The New Jersey Surface Water Quality Standards are a set of designated uses assigned to all surface waters in the State of New Jersey, that should be supported throughout the year. In New Jersey, there are 525 linear stream miles that are monitored for primary contact. Of these 525 linear stream miles, 15 percent fully support their criteria, but are designated as threatened. Even though rivers and streams in New Jersey are classified as fully supportive of recreational or biological use, they are designated as threatened because of the potential for non-point source contamination at many undetermined locations along waterways. High fecal coliform concentrations is the primary reason for not attaining primary contact status for most of the State's waterways.

Federal and State biological monitoring for all stations in WMA6 show 32 percent of monitored streams are not impaired; 55 percent are moderately impaired, and 13 percent are severely impaired. Chemical and sanitary water quality at 7 stations in WMA6 indicates that phosphorus, suspended solids and fecal coliform often do not meet New Jersey State Water Quality Standards (SWQS). Additional metal data are needed to evaluate potential exceedances of SWQS for metals.

Biological monitoring in the Upper Passaic Watershed indicates that the headwaters are either not impaired or moderately impaired. Severe impairments have been observed in Loantaka Brook, Black Brook, and the Passaic River below Chatham. Chemical and sanitary water quality monitoring results indicate that phosphorus, dissolved oxygen, suspended solids, fecal coliform and possibly metals exceed the SWQS criteria. Nitrate concentrations appear to be rising significantly within portions of WMA6.

Flood-prone area information was obtained from the Unites States Geological Survey (USGS) Flood-prone Maps and the Federal Emergency Management Agency (FEMA) flood plain information. The 89th Congress recommended the preparation of flood-prone area maps to assist in minimizing flood losses by quickly identifying the areas of potential flood hazards. This existing information shows that there is on the average about 1 percent chance that the designated areas will be inundated in any year. This initial determination was based on readily available information on past floods rather than from detailed surveys and inspections, and was used in the initial environmental baseline data collection. As the study progressed a detailed Hydrology and Hydraulic model was created utilizing additional data and a detailed survey, as described in Appendix A.

Areas adjacent to the two unnamed tributaries to the Passaic River within the project corridor are classified as documented flood prone areas. The area between the two tributaries is classified as undocumented flood prone areas. FEMA classifies almost the entire length of the project corridor as being located in a 100-year floodplain.

2.3.2 Regional Hydrogeology and Groundwater

Sole-source aquifers are aquifers that contribute more than 50 percent of the drinking water to a specific area and contain water, which would be impossible to replace if the aquifer were contaminated. Sole-source aquifers are defined by the Environmental Protection Agency (EPA) in the Safe Drinking Water Act of 1974 (Section 1424(e)). The EPA defines three different regions as part of its sole-source aquifer program. The three areas are the recharge zone, the stream-flow source zone, and the project review area. The recharge zone is the area through which water recharges the aquifer. The stream-flow source zone is an area upstream of the sole-source aquifer that contributes stream flow to the aquifer. The project review area, as defined by EPA, is the area in which the EPA will actually review projects.

Most of the study area is located in the Buried Valley Sole Source Aquifer. The recharge zone is defined by the outside boundaries of Bernards Township, Warren Township, Berkeley Heights, New Providence, Summit, Millburn, Livingston, Roseland, Essex Fells, Caldwell, West Caldwell, North Caldwell, Fairfield, Montville, Parsippany-Troy Hills and Harding Township. Totally included in the recharge zone are Long Hill Township, Chatham Borough, Chatham Township, Madison Borough, Florham Park, Morristown, Hanover, East Hanover, and Morris Plains. The stream-flow source zone is defined by those portions of the Passaic, Rockaway, and Whippany River watersheds basins that drain to the recharge zone. EPA's project review area is both the recharge zone and the stream-flow source zone.

The NJDEP and USGS Ambient Ground Water Quality Monitoring Program characterizes the relationship between geology and natural groundwater quality in major aquifers. Results are reported in the biannual Statewide Water Quality Inventory Report and the USGS Water Year Report. Results from these reports indicate that the natural quality of groundwater from locations throughout WMA6 is consistent with New Jersey groundwater and drinking water standards.

However, in some areas, gross alpha radiation, sodium, total dissolved solids, hardness, iron, manganese, aluminum, sulfate, and low pH may exceed secondary drinking water criteria, but do not adversely affect the potability of the water. Groundwater quality in some locations is affected by volatile organic chemicals and other pollutants. These pollutants are thought to arise from contaminated sites such as underground storage tanks, commercial septic systems, drum storage, and coal gasification facilities. Elevated concentrations of chloride from road salting and nitrogen compounds from fertilization can also affect the quality of groundwater. However, accurate monitoring and assessment of groundwater quality is very difficult due to the complex geology of WMA6.

2.3.3 Wetlands

Federal (33 CFR 328.3(b); EO 11990) and State (NJAC 7:7A1.4) definitions of wetlands are similar, identifying wetlands as "*those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions*." As defined above, wetlands generally include swamps, marshes, bogs and similar areas.

The Corps' Civil Works (CW) Program recognizes that many wetlands are important natural resources that contribute significant benefits to both the natural and human environments as transitional areas between terrestrial and aquatic ecosystems. As transitional areas wetlands possess features of both aquatic and terrestrial systems. Consequently wetlands are generally areas of great natural productivity, hydrologic utility, and biodiversity, providing natural flood control, and contributing to improved water quality, flow stabilization of streams and rivers and habitat for fish and wildlife resources. Unnecessary alteration or destruction of wetlands is discouraged by the Corps as contrary to the public interest, as these wetlands perform functions important to the public interest. As a result, the Corps' CW Program follows a policy of no net loss of wetlands, and looks to increase the quality and quantity of the Nation's wetlands when possible.

The initial investigation of wetlands in the study area focused on the identification of wetland systems utilizing secondary sources of Federal and State information, such as National Wetland Inventory (NWI) maps (See Figure 2-2), New Jersey Freshwater Wetland Maps (See Figure 2-3), and NJDEP Geographic Information System (GIS) information. These information sources do not necessarily identify smaller wetland systems, (e.g., drainage ditch wetlands too small to be depicted at the scale of the map), and are not always accurate for identifying wetlands subject to Federal and/or State regulatory authority. Nevertheless, they are effective tools for focusing field efforts.

It is important to note that New Jersey assumed jurisdiction over the Federal Section 404 Program. Therefore, all freshwater wetlands and proposed impacts to those wetlands fall under the jurisdiction of the NJDEP and the New Jersey Freshwater Wetlands Protection Act. A wetland delineation was conducted within the project corridor during November 2002. The methodology detailed in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1987) was used to delineate the wetland/upland boundary line in the field. The methodology outlined in this manual is currently accepted by the Corps of Engineers and the NJDEP to delineate jurisdictional wetland areas. As outlined in the 1987 Federal Manual, jurisdictional wetland areas are comprised of the following three criteria:

1. Predominance of Hydrophytic Vegetation
2. Hydric Soils
3. Wetland Hydrology

Wetlands were identified within the project corridor where all three identifying criteria were observed.

Evaluation of Planned Wetlands:

The seven potential restoration sites and the project corridor were subject to an Evaluation of Planned Wetlands functions and values assessment. The Evaluation of Planned Wetlands (EPW) assessment method, developed by Environmental Concern, Inc., (Bartoldus, *et al.*, 1994) was used to characterize the functional capacity of both existing and planned wetlands. EPW provides a technique for determining the capacity of a wetland to perform certain ecological and watershed functions by evaluating elements of seven major wetland functions. Within each function, numerous elements (*i.e.*, physical, chemical, biological characteristics) are evaluated in

order to identify a wetland's capacity to perform a given function. The elements assessed for each function are listed on the data forms for each assessment area in the supporting EPW report.

An element score is a unitless number ranging in value from 0.0 to 1.0 (where 1.0 represents the optimal score) that is assigned to each element based on a visual assessment of wetland characteristics within a wetland assessment area (WAA) as outlined in the EPW manual (Bartoldus *et al.* 1994). Element scores are combined based on equations presented on an EPW calculation worksheet to produce a Functional Capacity Index (FCI) value from 0.0 to 1.0, which provides a relative index of a WAA's capacity to perform a given function. Size *(i.e.,* acreage) of the WAA is then multiplied by the FCI value to produce a wetland functional capacity unit (FCU), which represents the WAA's capacity to perform each wetland function (Bartoldus, *et al.,* 1994) and accounts for wetland size. In this methodology an FCU is not calculated for the uniqueness/heritage (UH) function, as the size of the area is not considered to affect the value of this function. FCUs are used as the quantitative basis for wetland comparisons.

The wetland functions assessed during this evaluation include shoreline bank erosion control (SB), sediment stabilization (SS), water quality (WQ), wildlife (WL), fish—non-tidal Stream/River and Lake/Pond (FS and FP), and uniqueness/heritage (UH). The following provides a brief description of each of the functions assessed (Bartoldus, *et al.,* 1994).

***Shoreline Bank Erosion Control* (SB) -** The SB function provides a relative measure of the wetland's capacity to provide erosion control and to dissipate erosive forces at the shoreline bank.

***Sediment Stabilization* (SS) -** The sediment stabilization function provides a measure of the wetland's capacity to stabilize and retain previously deposited sediments.

***Water Quality* (WQ) -** The water quality function provides a relative measure of the wetlands capacity to retain and process dissolved or particulate materials.

***Wildlife* (WL) -** The wildlife function provides a measure of the degree to which a wetland functions as habitat for wildlife as described by habitat complexity *(i.e.,* wetland edge, vegetation structure).

***Fish, non-tidal Stream/River and Pond/Lake* (FS and FP) -** The fish function provides a relative measure of the degree to which a wetland habitat meets the food/cover, reproductive, and water quality requirements of fish.

***Uniqueness/Heritage* (UH) -** The uniqueness/heritage function indicates the presence of characteristics that distinguish a wetland as unique, rare, or valuable. Elements for this function are based on background data collection, not field observations.

The specific functions evaluated for each assessment site varied depending on the features of the site. For example, restoration site 2 (Warren Township Golf Course) included both a stream and pond, therefore it was assessed for all seven functions, while restoration site 4 (Morristown Road) had no surface water features and so was assessed only for SS, WQ, WL, and UH. A complete description of the assessment site evaluation is included in the Evaluation of Planned Wetlands Data and Documentation Report (USACE, 2002).

Field Sampling

A Senior Biologist experienced in wetland and aquatic ecology and wetland delineations conducted the field data collection on 24 October 2002. Field notes, site location maps and photographs are provided in the supporting EPW report. The field assessment methodology followed the EPW manual.

The dominant habitat cover within the project corridor is forested floodplain wetlands with localized areas of disturbance including the PSE&G Right-of-Way. The seven potential restoration sites provided a wider range of wetland and habitat cover types including open water, emergent, scrub-shrub and forested wetlands. Potential Restoration Site No. 2 was used as the reference condition for proposed mitigation scoring. This site exhibited the characteristics of intact floodplain forest which included habitat for barred owl and red shouldered hawk. Each functional element was visually evaluated following the methods and conditions outlined in the EPW manual. Assessments were based on the average conditions observed within the project corridor that would be potentially impacted by any proposed project.

Analysis of EPW Scores

The project corridor generally parallels Valley Road to the south of the existing commercial and residential properties between Poplar Drive and the assisted living facility at the western terminus of the project. Most of the project corridor consists of deciduous, floodplain, forested wetlands. Within the forested areas the canopy cover is nearly 100 percent complete limiting sunlight penetration to the forest floor. Due to the limited light penetration, the understory and groundcover are generally sparse. Several engineered tributaries/drainage ditches transect the project corridor generally in a north – south direction. These drainage features typically exhibit eroded, steep sided, bare earthen banks ranging between 4 and 6 feet deep cut into the relatively flat forest floor. The project corridor is also transected by a high pressure gas pipeline and power utility Right-of-Way in the vicinity of Warren Avenue. The Right-of-Way is dominated by a dense stand of common reed (*Phragmites australis*) with smaller emergent areas dominated by cattail (*Typha latifolia*), scrub-shrub, and forested wetland. Evidence of trash dumping and household waste was observed in a number of locations within the project corridor.

The EPW field assessment for the project corridor evaluated six wetland functions (SB, SS, WQ, WL, FS, and UH). The capacity of these wetlands to perform SB, WL and FS functions is relatively low; FCI values are less than 0.27. The SS and WQ functional capacity is moderate at 0.44 and 0.46, respectively. The UH capacity is high due to the observation of both red-shoulder hawk and barred owl; both are State listed as threatened in New Jersey by the Natural Heritage and Endangered Species Program.

Table 2-1 shows FCI and FCU values calculated for the project corridor. The total FCU value for the project corridor was based on a total wetland area of 3.3 acres. Each function's FCI was multiplied by the project corridor wetland area to yield a function specific FCU. All function specific FCUs were then added to calculate the total project corridor FCU's at 5.35. Anticipated lost function FCU's due to proposed wetland impacts were calculated and are discussed in Section 6.15 of this document.

Table 2-1
Evaluation of Planned Wetlands
Existing Conditions

Function	FCI Value	Acres	FCU Value	Total FCUs
Shoreline bank erosion control	0.25	3.3	0.83	
Sediment stabilization	0.44	3.3	1.45	
Water quality	0.46	3.3	1.52	
Wildlife	0.20	3.3	0.66	
Fish-non-tidal stream/river	0.27	3.3	0.89	
Uniqueness/heritage*	0.90			
				5.35

*An FCU for the UH Function if not calculated because the size of the area is not considered to affect the value of this function.

2.3.4 Coastal Zone Management

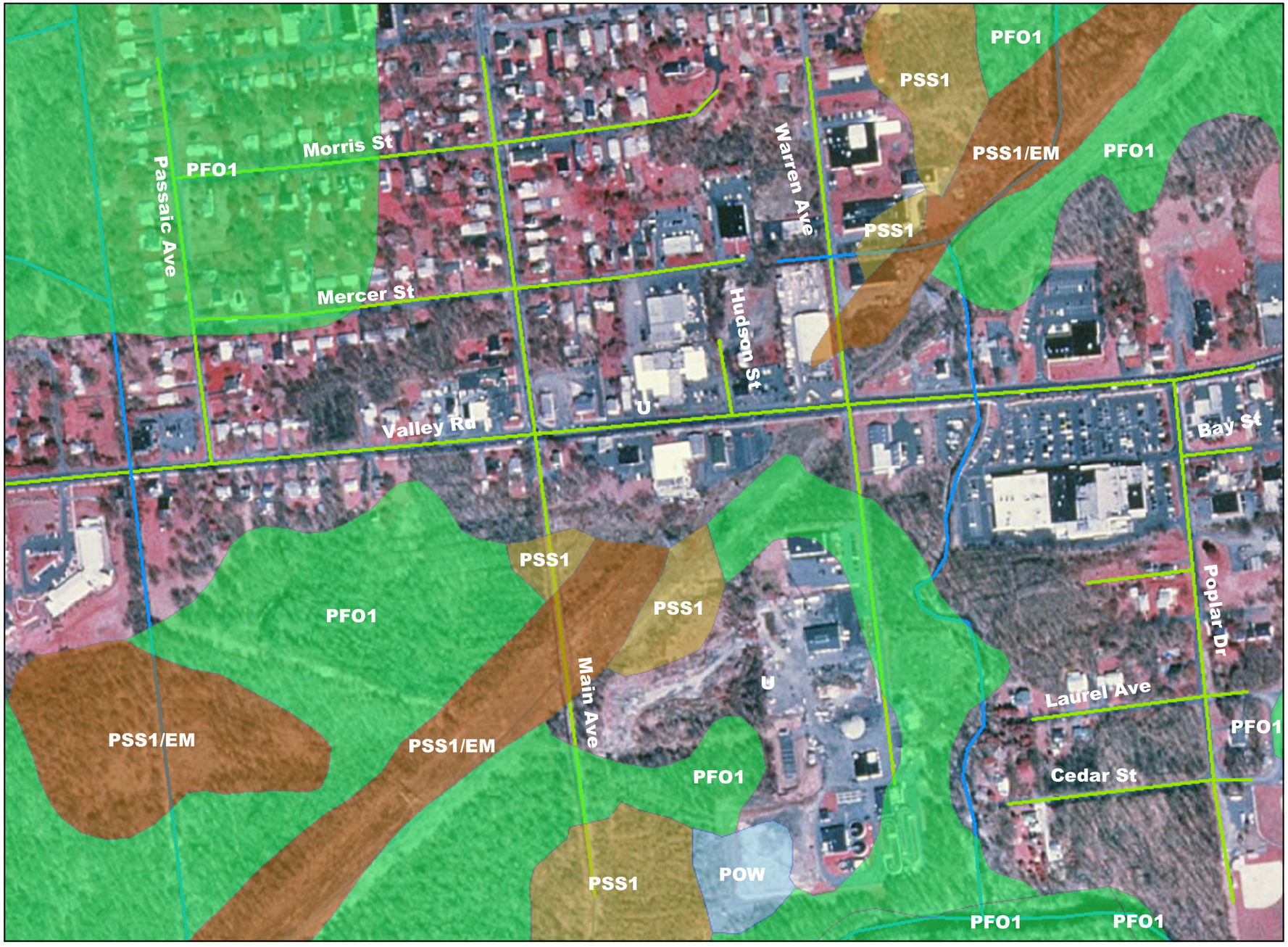
New Jersey State's Coastal Zone Management (CZM) program is based on a set of standards and procedures designed to guide coastal development throughout the State. The New Jersey Coastal Management Program is designed to protect coastal resources while accommodating coastal-related development. The program consists of three primary components:

- Definition of the coastal boundary;
- A set of coastal policies making up the management plan for protecting coastal resources while accommodating appropriate development; and
- A management system for implementation.

The CZM program is a land-use planning tool to ensure that coastal resources are preserved, protected, enhanced, and, where necessary, restored. The program's detailed standards apply to different land uses, including transportation facilities and navigational facilities and systems. New Jersey's coastal zone extends from the New York border on the Hudson River south to Cape May Point and then north along the Delaware River to the head of tide in Trenton. The Department's authority is defined in the Coastal Area Facility Review Act (CAFRA), the Wetland Act of 1970 (N.J.S.A 13:9A-1) and the Waterfront Development Law (N.J.S.A. 12:5-3). The latter of these laws controls all development on or adjacent to navigable tidal waterways.

According to EP 1165-2-1, (30 July 1999), federal Civil work projects, within or outside of the coastal zone, that are reasonably likely to affect any land or water use or natural resource of the coastal zone, must be consistent, to the maximum extent practicable, with the approved state programs.

The coastal zone consists of tidal waters and varying widths of land areas adjacent to these waters. The State's coastal zone jurisdiction generally is limited to the area between a river and the first paved public road. However, the boundary of the regulated area is no less than 100 feet and no greater than 500 feet from the river's mean high water line. The mean high water line is



0 250 500 1,000 1,500 2,000 Feet

Figure 2-2
Project Corridor
NWI Wetlands

Upper Passaic River & Tributaries Flood Damage Reduction & Environment Restoration Feasiblity Study

Legend

STREAM
PFO1
POW
PSS1
PSS1/EM

N
W E
S

U.S. Army Corps of Engineers
New York District
Planning Division
26 Federal Plaza
New York, New York 10278

0 250 500 1,000 1,500 2,000 Feet

Figure 2-3
Project Corridor
NJ Mapped Wetlands

Upper Passaic River & Tributaries Flood Damage Reduction & Environment Restoration Feasiblity Study

Legend

- STREAM
- MODL
- MODR
- PFO1B
- PFO1C
- POWHh
- PSS1B
- R2OW

N W E S

U.S. Army Corps of Engineers
New York District
Planning Division
26 Federal Plaza
New York, New York 10278

defined as the tidal datum that is the arithmetic mean of the high water observed over a specific 19-year cycle (the National Tidal Datum Epoch).

Within the coastal zone, the NJDEP is the regulating body with authority to oversee land and water uses that may affect coastal resources. The proposed project area is not located within the State of New Jersey's Coastal Zone Management (CZM) District.

2.3.5 Clean Water Act Section 404 (b)(1) Guidelines Compliance

Section 404 of the Clean Water Act established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (e.g., levees), infrastructure development, and conversion of wetlands to uplands for farming and forestry.

The primary Federal requirement of the 404 (b)(1) evaluation is to obtain a State 401 Water Quality Certificate (WQC). The 404 (b)(1) evaluation was conducted in accordance with the CW planning guidance (ER 1105-2-100, Appendix C), 40 CFR 1500 – 1508 and 33 CFR 230. Typically, State environmental requirements are addressed during the 401 coordination process, as this document will serve to satisfy 404(b)(1) guidelines, 40 CFR 1500 – 1508 and 33 CFR 230 (NEPA/CEQ Requirements & CE Procedures for Implementing NEPA). The Federal cost share partner, the State of New Jersey, will obtain all necessary State environmental permits (e.g. Freshwater Wetlands and Stream Encroachment) required to authorize the proposed project and issuance of the 401 WQC.

In accordance with 33 CFR 230.10 no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. Section 6 of this document (Environmental Consequences) addresses anticipated temporary, permanent and cumulative impacts that would result from constructing the proposed project. This section concludes that the anticipated environmental impacts will be predominantly be temporary and minor and that minor temporary impacts will be compensated for through the implementation of the selected mitigation plan.

33 CFR 230.10 (4) requires the evaluation of alternative plans, which is thoroughly addressed in Section 3 of this document (Plan Formulation – Flood Damage Reduction). The alternatives analysis presented in Section 3 satisfies the requirements of both NEPA and the 404(b)(1) guidelines with respect to choosing the least environmentally damaging alternative. No special aquatic sites are located within the project corridor therefore the project as proposed is in compliance with 33 CFR 230.10 (3). Additionally, the Section 208 Coastal Zone Management program does not apply to the geographic area in which the project is proposed (see Section 2.3.4). Therefore the project is in compliance with 33 CFR 230.10 (4).

In compliance with the Section 404 (b)(1) guidelines and 33 CFR 230, all steps to avoid wetland impacts where practicable have been taken and all anticipated impacts to wetlands have been minimized to the greatest extent possible. Additionally, steps to provide compensatory mitigation for any remaining unavoidable impacts will be executed pursuant to Federal laws, regulations and CW planning guidance for compensatory wetland mitigation. As the Federal cost share partner, the State of New Jersey would be responsible for meeting the mandated

compensatory mitigation ratios pursuant to the NJ Freshwater Wetlands Protection Act. It is important to note that ample mitigation opportunities are present within the project corridor to satisfy both Federal and State requirements. Section 6.15 of this document provides a detailed presentation of proposed environmental mitigation, and the 404(b)(1) analysis document is located in Appendix E.

2.4 Wildlife Resources

Field research was conducted from September 2002 through June 2003. Research included reviews of published data and field inspections. Wildlife throughout the study area is the typical mix of suburban and natural aquatic, terrestrial, and avian biota that would be expected, given the dominant plant communities observed within the project area. Below are lists of species observed in the study area during field reconnaissance or noted during reviews of published data of species expected to utilize the study area over the course of any given year. Note that the tables presented below list both wildlife observed during field investigations and wildlife species likely to occur within and adjacent to the project corridor based on the presence of suitable habitat. Direct evidence of, or actual wildlife observed during field investigations is marked with an asterisk in each of the tables provided throughout this section.

2.4.1 Mammals

Observations included the evidence that Gray Squirrel *(Sciurus carolinensis)*, Eastern Cottontail *(Sylvilagus floridanus)*, Woodchuck *(Marmota monax)*, Opossum *(Didelphis virginiana)*, White-footed Mouse *(Peromyscus leucopus)*, House Mouse *(Mus musculus)*, Raccoon *(Procyon lotor)*, and WhitetailDeer *(Odocoileus virginianus)* exist within the study area. These species are included with other mammalian species likely to be found in the study area listed in Table 2-2.

Table 2-2
Mammalian Species & Habitats Identified within Study Area

Meadow Vole *(Microtus pennsylvanicus)*	House Mouse *(Mus musculus)*
Little Brown Myotis *(Myotis lucifugus)*	Big Brown Bat *(Eptesicus fuscus)*
*Eastern Chipmunk *(Tamias striatus)*	Woodchuck *(Marmota monax)*
*Striped Skunk *(Mephitus mephitus)*	*Gray Squirrel (*Sciurus carolinensis*)
Muskrat *(Ondatra zibethicus)*	*Eastern Cottontail *(Sylvilagus floridanus)*
Opossum *(Didelphis virginiana)*	White-footed Mouse *(Peromyscus leucopus)*
*Raccoon *(Procyon lotor)*	Norway Rat *(Rattus norvegicus)*
Masked Shrew (*Sorex cinerus*)	Smoky Shrew (*Sorex fumeus*)
Short-Tailed Shrew (*Blarina brevicauda*)	Red Squirrel (*Tamiasciurus hudsonicus*)
Starnose Mole (*Condylura cristata*)	Southern Flying Squirrel (*Glaucomys volans*)
Red Bat (*Lasiurus borealis*)	Gapper's Redback Vole (*Clethrionomys gapperi*)
Longtail Weasel (*Mustela frenata*)	Pine Vole (*Micotus pinetorum*)
Mink (*Mustela vison*)	Meadow Jumping Mouse (*Zapus hudsonius*)

Table 2-2
Mammalian Species & Habitats Identified within Study Area

River Otter (*Lutra Canadensis*)	Woodland Jumping Mouse (*Napaeozapus insignis*)
*Red Fox (*Vulpes vulpes*)	*Whitetail Deer (*Odocoileus virginianus*)

2.4.2 Birds

Avian life appeared to be the most notable and obvious wildlife user group recorded within the project area. The majority of sightings within the project area were of common and abundant species such as Rock Dove *(Columba livia)*, European Starling *(Sturnus vulgaris)*, English House Sparrow *(Passer domesticus)*, and Mourning Dove (*Zenaida macroura*). During a May 2003 field investigation, project biologists observed a barred owl (*Strix varia*) south of the project corridor in the PSE&G Right-of-Way. Barred owl is State listed as threatened pursuant to the New Jersey Endangered Species Act. The study area is adjacent to Great Swamp National Wildlife Refuge, and Morris and Somerset County parkland. These areas provide nesting habitat and a source of food for numerous avian species. The species identified above are included in Table 2-3 along with a list of birds observed in the field and other birds that might utilize portions of the study area.

Table 2-3
Avian Species & Habitats Identified within Study Area

*Great Blue Heron (*Ardea herodias*)	Green Heron (*Butorides virescens*)
Mute Swan (*Cygnus olor*)	*Canada Goose (*Branta Canadensis*)
Wood Duck (*Aix sponsa*)	*Black Vulture (*Coragyps atratus*)
*Turkey Vulture (*Cathartes aura*)	*Red-Shouldered Hawk (*Buteo lineatus*)
*Red-Tailed Hawk (*Buteo jamaicensis*)	American Kestrel (*Falco sparverius*)
Virginia Rail (*Rallus limicola*)	*Wild Turkey (*Meleagris gallopavo*)
*Killdeer (*Charadrius vociferous*)	Spotted Sandpiper (*Actitis macularia*)
Common Snipe (*Gallinago gallinago*)	American Woodcock (*Scolopax minor*)
*Ring-billed Gull (*Larus delawarensis*)	*Herring Gull (*Larus argentatus*)
*Rock Dove *(Columba livia)*	*Mourning Dove *(Zenaida macroura)*
Eastern Screech Owl *(Otus asio)*	Great Horned Owl (*Bubo virginianus*)
*Barred Owl (*Strix varia*)	Chimmney Swift (*Chaetura pelagica*)
*Belted Kingfisher (*Ceryle alcyon*)	Red-Headed Woodpecker (*Melanerpes erthrocephalus*)
*Red-Bellied Woodpecker (*Melanerpes carolinus*)	*Downy Woodpecker *(Picoides pubescens)*
*Hairy Woodpecker (*Picoides villosus*)	*Northern Flicker *(Colaptes auritus)*
Pileated Woodpecker (*Dryocopus pileatus*)	*Eastern Wood-Pewee (*Contopus virens*)
Great Crested Flycatcher (*Myiarchus crinitus*)	Eastern Kingbird *(Tyrannus tyrannus)*
*Tree Swallow *(Iridoprocne bicolor)*	*Barn Swallow *(Hirundo rustica)*
*Blue Jay *(Cyanocitta cristata)*	*American Crow *(Corvus brachyrynchos)*
*Black-capped Chickadee *(Parus atricapillus)*	*Tufted Titmouse (*Baeolophus bicolor*)
Carolina Wren (*Thryothorus ludovicianus*)	House Wren *(Troglodytes aedon)*

Table 2-3
Avian Species & Habitats Identified within Study Area

Marsh Wren (*Cistothorus palustris*)	Golden-Crowned Kinglet (*Regulus satrapa*)
*Ruby-Crowned Kinglet (*Regulus calendula*)	Blue-Gray Gnatcatcher (*Polioptila caerulea*)
Eastern Bluebird (*Sialia sialis*)	Veery (*Catharus fuscescens*)
Hermit Thrush (*Catharus guttatus*)	Wood Thrush (*Hylocichla mustelina*)
*American Robin *(Turdus migratorius)*	*Gray Catbird *(Dumetella carolinensis)*
*Northern Mockingbird *(Mimus polyglottos*	Brown Thrasher (*Toxostoma rufum*)
*Cedar Waxwing (*Bombycilla cedrorum*)	*European Starling *(Sturnus vulgaris)*
Red-eyed Vireo (*Vireo olivaceus*)	Blue-Winged Warbler (*Vermivora pinus*)
*Yellow Warbler (*Dendroica petechia*)	*Yellow-Rumped Warbler (*Dendroica coronata*)
Black and White Warbler (*Mniotilta varia*)	American Redstart (*Setophaga ruticilla*)
Ovenbird (*Seiurus aurocapillus*)	Common Yellowthroat (*Geothlypis trichas*)
Scarlet Tanager (*Piranga olivacea*)	*Northern Cardinal *(Cardinalis cardinalis)*
Rose-Breasted Grosbeak (*Pheucticus ludovicianus*)	Eastern Towhee (*Pipilo erythrophthalmus*)
*White-Breasted Nuthatch (*Sitta carolinensis*)	American-Tree Sparrow (*Spizella arborea*)
Chipping Sparrow (*Spizella passerine*)	Field Sparrow (*Spizella pusilla*)
*Song Sparrow *(Melospiza melodia)*	*Swamp Sparrow (*Melospiza georgiana*)
*White-throated Sparrow *(Zonotrichia albicollis)*	*English House Sparrow *(Paser domesticus)*
*Dark-eyed Junco *(Junco hyemalis)*	*Red-winged Blackbird *(Agelaius phoeniceus)*
*Common Grackle *(Quiscalis quiscula)*	*Brown-headed Cowbird *(Molothrus ater)*
Northern Oriole *(Icterus galbula)*	*House Finch *(Carpodacus mexicanus)*
*American Goldfinch *(Carduelis tristis)*	

2.4.3 Reptiles and Amphibians

Several species of common reptiles and amphibians were observed during field investigations. Table 2-4 provides a list of species that were observed or are likely to be found in the Upper Passaic Watershed area and have been documented in the Great Swamp National Wildlife Refuge. A Phase I bog turtle habitat survey was completed in May 2003 in accordance with the US Fish and Wildlife Service (USFWS) guidelines for Phase I surveys. Potential bog turtle (*Clemmys muhlenbergi*) habitat was identified by the USFWS and project biologists within the PSE&G Right-of-Way between Warren Avenue and Main Avenue south of the project corridor. In May and June 2003, Phase II presence or absence surveys were conducted to determine if bog turtles occurred within the area(s) identified as potential habitat during the Phase I survey. While indicator vegetative species were found through the site, the hydrology and substrate were found to be inconsistent with that of known bog turtle habitat. Further, no bog turtles were found during four survey events. Therefore it was concluded that there are no bog turtles present in the project corridor.

Table 2-4
Reptilian & Amphibian Species & Habitats Identified within Study Area

*American Toad *(Bufo americanus*)

Northern Gray Treefrog *(Hyla versicolor)*

*Northern Spring Peeper *(Pseudacris crucifer crucifer)*

*Green Frog *(Rana clamitans melanota)*

New Jersey Chorus Frog (Pseudacris triseriata kalmi)

*Northern Leopard Frog (Rana pipiens)

Blue-Spotted Samamander (Ambystoma laterale)

Red-Spotted Newt (Notophthalmus viridescens)

Northern Slimy Salamander (Plethodon glutinosus)

Five-Lined Skink (Eumeces fasciatus)

Northern Brown Snake (Storeria dekayi)

Eastern Milk Snake *(Lampropeltis triangulum*

Eastern Worm Snake (*Carphophis amoenus*)

Smooth Green Snake (Opheodrys vernalis)

*Eastern Ribbon Snake (Thamnophis sauritus)

Eastern Hognose Snake (Heterodon platirhinos)

Eastern Box Turtle *(Terrapene Carolina Carolina)*

*Snapping Turtle (*Chelydra serpentine*)

Common Musk Turtle (*Sternotherus odoratus*)

Eastern Mud Turtle (*Kinosternon subrubrum*)

Fowler's Toad (*Bufo woodhousii fowleri*)

Northern Cricket Frog (*Acris crepitans*)

*Bull Frog *(Rana catesbeiana)*

Upland Chorus Frog (*Pseudacris triseriata feriarum*)

Wood Frog (Rana sylvatica)

Pickerel Frog (Rana palustris)

*Redback Salamander (Phethodon cinereus)

Northern Dusky Salamander (Desmognathus fuscus)

Four-Toed Salamander (Hemidactylium scutatum)

Northern Water Snake (Nerodia sipedon)

*Eastern Garter Snake (Thamnophis sirtalis)

Northern Ringneck Snake (*Diadophis punctatus edwadsii*)

Northern Black Racer (*Coluber constrictor*)

Black Rat Snake (Elaphe obsolata)

Smooth Earth Snake (Virginia valeriae)

Wood Turtle (Clemmys insculpta)

Spotted Turtle (*Clemmys guttata*)

Bog Turtle (*Clemmys muhlenbergii*)

Eastern Painted Turtle (*Chrysemys picta*)

2.4.4 Fish

The Great Swamp National Wildlife Refuge has conducted fish surveys of the Upper Passaic Watershed. Table 2-5 provides a listing of potential fish species which may occur in the study area.

Table 2-5
Fish Species Potentially Within Study Area

White Sucker (*Castostomus commersoni*)	Tersselated Darter (*Etheostoma olstedi*)
Creek Chubsucker (*Erimyzon oblongus*)	Redbreasted Sunfish (*Lepomis auritus*)
Carp (*Cyprinus carpio*)	Fallfish (*Semotilus corpoalis*)
Golden Shiner (*Notemigonus crysoluecas*)	Common Shiner (*Notropis cornutus*)
Brown Bullhead (*Ictalurus nebulosus*)	Spottail Shiner (*Notropis hudsonicus*)
Chain Pickerel (*Esox niger*)	Yellow Bullhead (*Ictalurus natalis*)
Eastern Mudminnow (*Umbra pygmaea*)	Bluespotted Sunfish (*Enneacanthus gloriosus*)
Redfin Pickerel (*Esox americanus*)	Satinfish (*Notropis analostanus*)
American Ell (*Anguilla rosttrata*)	Mud Sunfish (*Acantharchus pomotis*)
Smallmouth Bass (*Micropterus dolomieui*)	Spotfin Shiner (*Notropis spilopterus*)
Largemouth Bass (*Micropterus salmoides*)	Green Sunfish (*Lepomis cyanellus*)
Banded Sunfish (*Enneacanthus obesus*)	Blacknose Dace (*Rhinichthys atratulus*)
Pumpkinseed (*Lepomis gibbosus*)	Creek Chub (*Semotilus atromaculatus*)
Bluegill (*Lepomis macrochirus*)	Brook Trout (*Salvelinus frontinalus*)
Black Crappie (*Pomoxis nigromaculatus*)	

2.5 Threatened and Endangered Species

This section addresses the potential for the presence of threatened and endangered species, and their habitat within the study area. Section 7 of the Endangered Species Act requires Federal agencies to ensure that their actions will not adversely impact the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of such species. Consultation with, and the assistance of, the Secretaries of the Interior and Commerce is required to obtain information about listed or proposed threatened or endangered species and critical habitats found within the project area. The authority to conduct consultations has been delegated to the Director of the USFWS by the Secretary of the Interior.

The NJDEP Endangered, Nongame and Exotic Wildlife (N.J.A.C 7:25) and Endangered Plant Species Program (N.J.A.C. 7:5C) requires applicants to avoid adverse impacts to State listed species of plants and animals or their habitats. Consultations are conducted with NJDEP's Division of Fish and Wildlife, Non-Game Fish and Wildlife Program. The programs mission is to actively conserve New Jersey's biological diversity by maintaining and enhancing endangered and non-game wildlife populations within healthy ecosystems.

The identification of such species was carried out through consultation with staff of the New Jersey Natural Heritage Database (NJNHD), and the USFWS. The NJNHD was consulted to determine the threatened and endangered plant and animal species that have been identified historically within the region. The areas of sightings were noted on applicable USGS maps prepared prior to conducting the field investigations of the study area.

2.5.1 Federal Species of Concern

Information on the potential presence of endangered or threatened species and critical habitat within the study area was prepared by the USFWS and the NJNHP. The USFWS identified the possibility of bog turtle (*Clemmys muhlenbergii*) within one mile of the project site. As stated above, the presence of potential bog turtle habitat was confirmed through a Phase I bog turtle habitat survey. A Phase II presence or absence survey found that indicator vegetative species was present, but suitable hydrology and substrate were not present. That, with no bog turtles identified during any of four surveys, led to the conclusion that bog turtles are not present in the project corridor. Therefore, except for the possibility of transient bald eagles (*Haliaeetus leucocephalus*), no other Federally listed or proposed threatened or endangered flora or fauna under USFWS jurisdiction are known to occur within the project corridor.

2.5.2 State Species of Concern

The New Jersey Natural Heritage Data Base identified blue-spotted salamander, great blue heron, red-shouldered hawk, and wood turtle in habitat patches that are located on some of the potential restoration sites and other areas near the proposed project sites. Project biologists observed great blue heron (*Ardea herodias*) and barred owl (*Strix varia*), near the project corridor during 2002-2003 field investigations. Refer to Appendix E for NJNHD and USFWS responses.

The New Jersey Natural Heritage Data Base lists rare vertebrates, invertebrates, vascular plants, and natural communities as occurring in the study area. Natural communities presently recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties are:

- Black Spruce Swamp
- Glacial Bog
- Hardwood-Conifer Swamp
- Bat Hibernaculum
- Flood Plain Forest

The project area list for rare vertebrates is shown below in Table 2-6. Rare invertebrates are shown in Table 2-7, and rare vascular plants are shown in Table 2-8. Each of the tables provides the species common name, scientific name, Federal status, and State status. Federal Codes used in the table are:

- LE Taxa formally listed as endangered.
- LT Taxa formally listed as threatened.

New Jersey State codes used in the tables are as follows:

- EX Extirpated species- a species that formerly occurred in New Jersey, but is not now known to exist within the state.
- E Endangered species- an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
- T Threatened species- a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
- D Declining species- a species which has exhibited a continued decline in population numbers over the years.
- S Stable species- a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
- INC Increasing species- a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
- P Peripheral species- a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
- U Undetermined species- a species about which there is not enough information available to determine the status.
- I Introduced species- a species not native to New Jersey that could not have established itself here without the assistance of man.

New Jersey status for animals separated by a slash (/) indicate a dual status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Table 2-6
Rare Vertebrates Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties

Common Name	Scientific Name	Federal Status	State Status
Cooper's Hawk	*Accipiter cooperii*		T/T
Northern Goshawk	*Accipiter gentilis*		E/E
Blue-Spotted Salamander	*Ambystoma laterale*		E
Grasshopper Sparrow	*Ammodramus savannarum*		T/S
Great Blue Heron	*Ardea herodias*		S/S
Long-Eared Owl	*Asio otus*		T/T
Upland Sandpiper	*Bartramia longicauda*		E
American Bittern	*Botaurus lentiginosus*		E/S
Red-Shouldered Hawk	*Buteo lineatus*		E/T
Northern Harrier	*Circus cyaneus*		E/U
Sedge Wren	*Cistothorus platensis*		E
Wood Turtle	*Clemmys insculpta*		T

Table 2-6
Rare Vertebrates Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties

Common Name	Scientific Name	Federal Status	State Status
Bog Turtle	*Clemmys muhlenbergii*	LT	E
Timber Rattlesnake	*Crotalus horridus horridus*		E
Bobolink	*Dolichonyx oryzivorus*		T/T
Longtail Salamander	*Eurycea longicauda longicauda*		T
Bald Eagle	*Haliaeetus leucocephalus*	LT	E
Least Bittern	*Ixobrychus exilis*		D/S
Migrant Loggerhead Shrike	*Lanius ludovicianus m*igrans		E
Bobcat	*Lynx rufus*		E
Red-Headed Woodpecker	*Melanerpes erythrocephalus*		T/T
Eastern Small-Footed	*Myotis leibii*		U
MyotisIndiana Bat	*Myotis sodalis*	LE	E
Allegheny Woodrat	*Neotoma magister*		E
Osprey	*Pandion haliaetus*	T/T	
Savannah Sparrow	*Passerculus sandwichensis*	T/T	
Cliff Swallow	*Petrochelidon pyrrhonota*	S/S	
Vesper Sparrow	*Pooecetes gramineus*	E	
Pied-Billed Grebe	*Podilymbus podiceps*	E/S	
Barred Owl	*Strix varia*		

Table 2-7
Rare Invertebrates Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties

Common Name	Scientific Name	Federal Status	State Status
Mottled Darner	*Aeshna clepsydra*		
Spatterdock Darner	*Aeshna mutata*		
Black-Tipped Darner	*Aeshna tuberculifera*		
Dwarf Wedgemussel	*Alasmidonta heterodon*	LE	E
Triangle Floater	*Alasmidonta undulata*		
Brook Floater	*Alasmidonta varicosa*		
Pepper And Salt Skipper	*Amblyscirtes hegon*		
Lilypad Clubtail	*Arigomphus furcifer*		
Arogos Skipper	*Atrytone arogos arogos*		
Pipevine Swallowtail	*Battus philenor*		
Silver-Bordered Fritillary	*Boloria selene myrina*		

Table 2-7
Rare Invertebrates Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties

Common Name	Scientific Name	Federal Status	State Status
Appalachian Blue	*Celastrina neglectamajor*		
Harris' Checkerspot	*Chlosyne harrisii*		
Silvery Checkerspot	*Chlosyne nycteis*		
Tiger Spiketail	*Cordulegaster erronea*		
Arrowhead Spiketail	*Cordulegaster obliqua*		
Double-Striped Bluet	*Enallagma basidens*		
New England Bluet	*Enallagma laterale*		
Northern Pearly Eye	*Enodia anthedon*		
Spine-Crowned Clubtail	*Gomphus abbreviatus*		
Sable Clubtail	*Gomphus rogersi*		
Leonard’s Skipper	*Hesperia leonardus*		
Yellow Lampmussel	*Lampsilis cariosa*	T	
Eastern Lampmussel	*Lampsilis radiata*		
Southern Pygmy Clubtail	*Lanthus vernalis*		
Bronze Copper	*Lycaena hyllus*		
Ash Sphinx	*Manduca jasminearum*		
Coastal Bog Metrarranthis	*Metarranthis pilosaria*		
Mitchell's Satyr	*Neonympha mitchelliimitchellii*	LE	E
Umber Shadowdragon	*Neurocordulia obsoleta*		
Brook Snaketail	*Ophiogomphus aspersus*		
Maine Snaketail	*Ophiogomphus mainensis*		
Sunflower Borer Moth	*Papaipema necopina*		
Giant Swallowtail	*Papilio cresphontes*		
Long Dash	*Polites mystic*		
Southern Grizzled Skipper	*Pyrgus wyandot*		
Acadian Hairstreak	*Satyrium acadicum*		
Edwards' Hairstreak	*Satyrium edwardsii*		
Brush-Tipped Emerald	*Somatochlora walsh*ii		
Williamson's Emerald	*Somatochlora williamsoni*		
Regal Fritillary	*Speyeria idalia*		

Table 2-8
Rare Vascular Plants Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties

Common Name	Scientific Name	Federal Status	State Status
Black Maple	*Acer nigrum*		
Climbing Fumitory	*Adlumia fungosa*		
Yellow Giant-Hyssop	*Agastache nepetoides*		
Large Water-Plantain	*Alisma triviale*		E
Bog Rosemary	*Andromeda glaucophylla*		E
Hairy Angelica	*Angelica venenosa*		
Virginia Snakeroot	*Aristolochia serpentaria*		
Red Milkweed	*Asclepias rubra*		
Bradley's Spleenwort	*Asplenium bradleyi*		E
Mountain Spleenwort	*Asplenium monta*num		
Willow-Leafed Aster	*Aster praealtus*		E
Low Rough Aster	*Aster radula*		E
Leathery Grape Fern	*Botrychium multifidum*		E
Blunt-Lobe Grape Fern	*Botrychium oneidense*		
Side-Oats Grama Grass	*Bouteloua curtipendula*		E
Erect Bindweed	*Calystegia spithamaea*		E
Slender Toothwort	*Cardamine angustata*		
Purple Bittercress	*Cardamine douglassii*		
Meadow Cuckoo-Flower	*Cardamine pratensis var palustris*		
Round-Spike Brownish	*Carex brunnescens*		E
Sedge Crawford’s Sedge	*Carex crawfordii*		
Soft-Leaf Sedge	*Carex disperma*		
Frank’s Sedge	*Carex frankii*		
Cloud Sedge	*Carex haydenii*		E
Fine-Nerve Sedge	*Carex leptonervia*		E
Mud Sedge	*Carex limosa*		E
Louisiana Sedge	*Carex louisianica*		E
Pale Sedge	*Carex pallescens*		
Variable Sedge	*Carex polymorpha*		E
Hillside Sedge	*Carex siccata*		E
Cat-Tail Sedge	*Carex typhina*		
Bottle-Shaped Sedge	*Carex utriculata*		
Willdenow’s Sedge	*Carex willdenowii var willdenowii*		
Scarlet Indian-Paintbrush	*Castilleja coccinea*		
Redbud	*Cercis canadensis*	E	
Hairy Lipfern	*Cheilanthes lanosa*		

Table 2-8
Rare Vascular Plants Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties

Common Name	Scientific Name	Federal Status	State Status
Purple Clematis	*Clematis occidentalis var occidentalis*		
Dotted Hawthorn	*Crataegus punctata*		
Buttonbush Dodder	*Cuscuta cephalanthi*	E	
Wild Comfrey	*Cynoglossum virginianum var virginianum*		
Leatherwood	*Dirca palustris*		
Meadow Horsetail	*Equisetum pratense*	E	
Variegated Horsetail	*Equisetum variegatum*	E	
Slender Cotton-Grass	*Eriophorum gracile*	E	
Rough Cotton-Grass	*Eriophorum tenellum*	E	
Sheathed Cotton-Grass	*Eriophorum vaginatum var spissum*	E	
American Manna Grass	*Glyceria grandis*	E	
Winged Cudweed	*Gnaphalium macounii*	E	
Oak Fern	*Gymnocarpium dryopteris*		
Swamp-Pink	*Helonias bullata*	LT	E
Small-Flower Halfchaff	*Hemicarpha micrantha*	E	
Sedge			
Canada Hawkweed	*Hieracium kalmii*	E	
Featherfoil	*Hottonia inflata*	E	
Large-Leaf Holly	*Ilex montana*	E	
Pale-Laurel	*Kalmia polifolia*	E	
Labrador Tea	*Ledum groenlandicum*		
Star Duckweed	*Lemna trisulca*		
Wood Lily	*Lilium philadelphicum varphiladelphicum*		
Water Lobelia	*Lobelia dortmanna*	E	
Wild Lupine	*Lupinus perennis*		
Northern Bog Club-Moss	*Lycopodiella inundata*		
Stiff Club-Moss	*Lycopodium annotinum*	E	
Tufted Loosestrife	*Lysimachia thyrsiflora*		
Bayard Long's	*Malaxis bayardii*	E	
Adder's-Mouth			
Green Adder's-Mouth	*Malaxis unifolia*		
Virginia Bunchflower	*Melanthium virginicum*	E	
Tall Millet Grass	*Milium effusum*	E	
Winged Monkey-Flower	*Mimulus alatus*		
Whorled Water-Milfoil	*Myriophyllum verticillatum*	E	
Small Yellow Pond-Lily	*Nuphar microphyllum*	E	
Floatingheart	*Nymphoides cordata*		
Virginia Pennywort	*Obolaria virginica*		

Table 2-8
Rare Vascular Plants Presently Recorded in the New Jersey Natural Heritage Database in Morris and Somerset Counties

Common Name	Scientific Name	Federal Status	State Status
Northern Panic Grass	*Panicum boreale*	E	
Northern Beech Fern	*Phegopteris connectilis*		
Downy Phlox	*Phlox pilosa*	E	
Hooker's Orchid	*Platanthera hookeri*	E	
Purple Fringed Orchid	*Platanthera psycodes*		
Northern Pondweed	*Potamogeton al*pinus	E	
Illinois Pondweed	*Potamogeton illinoensis*	E	
Blunt-Leaf Pondweed	*Potamogeton obtusifolius*	E	
Robbin's Pondweed	*Potamogeton robbinsii*	E	
Eel-Grass Pondweed	*Potamogeton zosteriformis*	E	
Tall Cinquefoil	*Potentilla arguta var arguta*		
Marsh Cinquefoil	*Potentilla palustris*	E	
Smooth Rattlesnake-Root	*Prenanthes racemosa*	E	
Allegheny Plum	*Prunus alleghaniensis*	E	
Low Sand Cherry	*Prunus pumila var depressa*		
Torrey's Mountain-Mint	*Pycnanthemum torrei*	E	
Water-Plantain Spearwort	*Ranunculus ambigens*		
Early Buttercup	*Ranunculus fascicularis*	E	
Low Spearwort	*Ranunculus pusillus var pusillus*		
Rhodora	*Rhododendron canadense*	E	
Shining Willow	*Salix Lucida ssp lucida*		
Bog Willow	*Scheuchzeria palustris*	E	
Three-Leaf False	*Smilacina trifolia*	E	
Solomon's-Seal	*Smilacina racemosa*		
Prairie Goldenrod	*Solidago rigida*		E
Narrow-Leaf Burr-Reed	*Sparganium angustifolium*	E	
Small Burr-Reed	*Sparganium minimum*	E	
Small Rush-Grass	*Sporobolus neglectus*	E	
Boreal Starwort	*Stellaria borealis*		E
Foamflower	*Tiarella cordifolia*	E	
Fraser's St. John's-Wort	*Triadenum fraseri*		
Three Birds Orchid	*Triphora trianthophora*	E	
Spreading Globe Flower	*Trollius laxus ssp laxus*	E	
Flat-Leaf Bladderwort	*Utricularia intermedia*		
Purple Bladderwort	*Utricularia purpurea*		
Narrow-Leaf Vervain	*Verbena simplex*		E

2.6 Air Quality

EPA assesses overall air quality according to the National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM), and sulfur dioxide (SO2). Commonly cited sources of criteria pollutants include automobile exhaust emissions, fossil fuel (coal and oil) fired power plants, oil refineries, ore smelters, storage and transfer operations involving solvents, and industrial emissions, among others (USEPA 1998).

The study area is located in the New York-Northern New Jersey-Long Island Consolidated Metropolitan Statistical Area (CMSA). According to the National Air Quality and Emissions Trends Report (USEPA 1998), the New York-Northern New Jersey-Long Island CMSA is considered a nonattainment maintenance area for CO and is classified as an extreme/severe nonattainment area for O3 (NJDEP 1999b).

The EPA's Pollution Standards Index (PSI) is a measure of community-wide air quality based on daily measured concentrations of six criteria pollutants. The PSI index corresponds to a health descriptor that ranges between 0 and 500: 0-50 is good, 50-100 is moderate, 100-200 is unhealthful, 200-300 is very unhealthful, and >300 is hazardous. PSI values reported for Middlesex County in 2001, exceeded 100 only two times out of 182 reported values for that year. The air quality in Middlesex County was "good" for 79 percent of the reported data during 2001.

2.7 Cultural Resources

Background research for the project area and vicinity was conducted at the New Jersey State Library, the New Jersey State Museum, the New Jersey State Historic Preservation Office, and the Long Hill Township Historical Society. The Long Hill Township Historic Preservation Advisory Committee and the Morris County Heritage Commission were also contacted. This research indicated that there were no previously identified cultural resources within the immediate project area.

The site files held by the New Jersey State Museum indicated seven recorded prehistoric and historic archaeological sites within one mile of the project corridor. The site nearest the project corridor was identified approximately 1500 feet from the project corridor located to the east of Western Boulevard. No data were available on this site. Two properties listed on the National Register of Historic Places are within one mile of the project corridor. One of the structures, the Smalley/Wormser House is located ¾ of a mile from the project corridor. The other property, the Millington Railroad Station, is one mile away. These historic properties are in no danger of impact based on plans as presently proposed.

The sensitivity for Native American resources was considered low due to the fact that the project area is low-lying and wet, having been formed from the draining of glacial Lake Passaic. Native American sites identified near the Passaic River in the project vicinity through other studies were located on terraces or knolls above the low-lying land. There are no natural areas of high ground within the study area and all dry land was found to consist of man-made fill. Historic map research indicated no structures within the project area suggesting that the potential for historic archaeological sites was limited.

2.8 Hazardous, Toxic, and Radioactive Waste

As required by ER 1165-2-132 (Hazardous, Toxic and Radioactive Waste Guidance for Civil Works, 26 June 1992), an assessment of hazardous, toxic and radioactive waste (HTRW) was conducted in the project corridor. HTRW is defined as any "hazardous substance" regulated under Comprehensive, Environmental Response, Compensation, Liability Act (CERCLA), 42 U.S.C. 9601 et seq, including "hazardous wastes" under Section 3001 of the Resource Conservation and Recovery Act (RCRA), 42 U. S. C. 6921 et seq.

The principal HTRW concern in the project corridor relates to asbestos. There was a Federal Superfund site located in Long Hill Township. The main source of contamination at this Superfund site was asbestos. Asbestos was used to make shingles and siding. Surplus product and/or waste was left onsite or was used as fill material in lowlands adjacent the Passaic River floodplain in the communities of Gillette, Stirling and Millington. The source of this asbestos has been remediated and stopped, but small piles of shingles containing asbestos can be found throughout the Township and in the upper fringe areas of the flood plain.

2.9 Socioeconomic Setting

Long Hill Township is a rural and low density residential community characterized by large tracts of open space, attractive single family residential neighborhoods, tree-lined streets and a general absence of large non-residential land uses. The Township is one of the least dense and most scenic municipalities in Morris County, and its proximity to New York City allows it to serve as a suburban community. The population of New Jersey, Morris County, and Long Hill Township has undergone a change in growth over the past decade, as shown in Table 2-9. The rate of growth in the State, County, and Township currently all outpace the population growth of the nation as a whole. New Jersey Department of Labor projections of population for 2000 to 2010 (see Table 2-10) continue to be in the double digits for both Morris County and Long Hill Township, whereas projections for the State over the same period are at 6 percent per year.

Age distribution of the State of New Jersey, Morris County, and Long Hill Township are shown in the Table 2-11. Age distributions and median age for the State, County and Township are quite similar, with only minor differences in composition. Given the increase in population and higher portion of persons of age 18 and under and a higher median age, Long Hill Township may be a community in transition from a more mature residential community to a younger residential community.

Median household incomes for New Jersey, Morris County, and Long Hill Township are provided in Table 2-12. As indicated in this table, Long Hill Township has a significantly higher median household income than either the County or the State.

Employment by economic sector for Long Hill Township is summarized in Table 2-13. The sectors with the largest shares of employment in the Township are Education, Health, Social Services (18.3 percent); Manufacturing (14.6 percent), and Finance, Insurance, and Real Estate (12.9 percent).

Long Hill Township is well served by a variety of transportation facilities. Interstates 287 and 78 are located adjacent to the Township, providing ready access to the rest of New Jersey, the New York metropolitan area, and other origins/destinations on the eastern seaboard. Local and

express bus service is provided from Long Hill Township to New York City and local points. Rail and air transportation are easily accessible from the township.

Table 2-9
Populations of Study Area Jurisdictions 1980, 1990, 2000

	1980 Population	1990 Population	% Change 1980-1990	2000 Population	% Change 1990-2000
State of New Jersey	7,365,011	7,730,188	5.0%	8,414,350	8.9%
Morris County	407,360	421,353	3.4%	470,212	11.6%
Long Hill Township	7,275	7,826	7.6%	8,777	12.2%

Source: U.S. Bureau of the Census.

Table 2-10
Population Forecasts for Study Area Jurisdictions 1995 – 2025

	2000	2005	2010	2015	2020	2025
New Jersey*	8,414,350	8,392,000	8,658,000	8,924,000	9,241,000	9,558,000
Morris County*	470,212	500,500	512,500	545,400	564,774	584,148
Long Hill Township***	8,777	9,333	9,556	10,170	10,531	10,892

* Sources: U.S. Bureau of the Census; New Jersey State Data Center
** 2005-2025 Forecasts Estimated Using County Growth Rates

Table 2-11
Age Distribution of Study Area Populations 2000

Age Distribution	Under 18	18-24	25-44	45-64	65 and Over	Median Age
State of New Jersey	24.8%	8.0%	31.2%	22.7%	13.2%	36.7
Morris County	24.8%	6.4%	31.9%	25.3%	11.6%	37.8
Long Hill Township	26.3%	4.4%	31.2%	25.4%	12.6%	39.2

Source: U.S. Bureau of the Census.

Table 2-12
Median Household Income of Study Area Jurisdiction
1999

New Jersey	$55,146
Morris County	$77,340
Long Hill Township	$84,532

Source: U.S. Bureau of the Census

Table 2-13
Employment by Sector (1997) Study Area Jurisdictions

	Employees	Percent
Agriculture, Forestry, Fishing/Hunting, Mining	19	0.4
Construction	244	5.5
Manufacturing	647	14.6
Wholesale Trade	175	3.9
Retail Trade	378	8.5
Transportation	134	3.0
Information	338	7.6
Finance, Insurance, and Real Estate	573	12.9
Professional, Scientific, Mgmt	513	11.6
Education, Health, Social Services	810	18.3
Arts, Entertainment, Recreation, Accommodation, Food Service	295	6.7
Other Services (except Public Administration)	165	3.7
Public Administration	140	3.2
Total	4,431	100 .0

2.10 Land Use

Land use in Long Hill Township is primarily suburban. Residential land uses includes older homes clustered in the communities of Gillette, Meyersville, Millington, and Stirling. Commercial and light industrial land uses are primarily located along Valley Road. Most of the undeveloped land is found in the riparian corridor of the Passaic River and in wetland areas associated with tributary streams.

The future development potential of Long Hill Township is based on development of approved projects not yet built and future development of vacant land. Owners of the remaining few

vacant tracts of land are encouraged by the Township Planning Board to develop them in a manner that will be compatible with the surrounding area, as outlined in the Township Master Plan, with input from the Planning Board and from the Environmental Commission.

2.11 Parks and Recreation

The Great Swamp National Wildlife Refuge is located approximately 1.5 miles north of the study area. Morris County Parks Commission owns the majority of the land adjacent to the Passaic River. This land is kept in its nature set and passive recreation (hiking, canoeing, and fishing) is allowed in these areas. Long Hill Township has several recreational sites located adjacent to the study area. A baseball facility is located at the end of Poplar Drive. A larger recreational facility is located south of Valley Road across from Morristown Road. The facility consists of soccer fields, tennis courts, a small maintenance building, basketball court, and bocce courts.

2.12 Future Without-Project Conditions / No Action Alternative

Future without-project conditions were determined by projecting conditions in the study area over a 50-year period of analysis (2010-2059). In the absence of Federal action, flooding problems associated with storms in the study area are expected to continue, and ecosystems within the study area will continue to exhibit limited functionality.

2.12.1 Flood Damages

The no-action alternative reflects the continuation of existing economic, social, and environmental conditions and trends within the affected area. Implicit in taking no action would be the continuation of Federally subsidized flood insurance coverage for property owners that is currently available through the National Flood Insurance Program and the enforcement of local flood plain zoning ordinances.

Failure to provide Long Hill Township with flood damage reduction measures could, in the predictable occurrence of a significant flood, contribute to loss of life and physical as well as environmental damage to study area communities. Significant flooding can result in the overtopping of sewage treatment works, contamination of drinking water supplies, dispersion of HTRW and dispersion of large quantities of solid waste. Experience has shown that vast quantities of debris (e.g., homes, vehicles, mobile homes, etc.) and sediment must be removed from the floodplain after a flood event. The physical removal of the debris from the flood plain typically involves large, heavy equipment and requires the removal of trees and vegetation to provide points of ingress and egress for the cleanup equipment. Hauling the collected debris to the local municipal landfill requires significant transportation resources, and involves huge quantities of solid waste that fill available landfill space.

2.12.2 Ecosystem Functionality

Executive Order 11990, Protection of Wetlands, Civil Works (CW) Planning Guidance and NEPA directs Corps of Engineers (federal agencies) to avoid, minimize, and if unavoidable to compensate for adverse, project related, environmental impacts including but not limited to the loss or degradation of wetlands. The CW Planning Guidance states that Corps activities that may result in environmental impacts must be conducted using an ecosystem approach while maintaining the traditional Corps watershed focus on water and related land resources.

This ecosystem approach consists of restoring and/or protecting the structure and function of an ecosystem, or parts thereof, recognizing that all its components are interrelated. The ecosystem approach also recognizes and seeks to address the problems of habitat fragmentation and the piecemeal restoration and mitigation efforts that have been previously applied in dealing with the Nation's natural resources. However, this portion of the ecosystem approach is in contradiction to CW guidance and NJ Freshwater Wetlands Protection Act regulations regarding wetland mitigation, which should be conducted on the same wetland or waterway as the impacts if possible, which may take the form of “piecemeal restoration”. Further, the ecosystem approach also recognizes that existing and planned infrastructure is a legitimate feature of the human environment and should co-exist and benefit (restore and protect) the natural features of the ecosystems in which they are placed. Projects should also be conceived and operated in a more comprehensive, holistic context.

As discussed in Section 2.3 (Water Resources), Section 2.4 (Wildlife Resources), and the Environmental Appendix the Upper Passaic River has significant natural resources, including (1) aquatic habitat in the river and its tributaries, and (2) wetland and upland habitats in the riparian corridors of these waterways. However, development has reduced the extent of these natural systems within the Valley Road corridor and has limited their functionality. Historic development within the study area has resulted in the loss of wetland acreage, streambank erosion, and sediment aggradation in the river channel. Aquatic resources are compromised as acreage of wetlands to filter runoff is reduced, and streams aggrade destroying benthic and fish habitat. Streams become more shallow with consequent increases in ambient temperature and reductions in dissolved oxygen levels.

Indirect development-related impacts include increased impervious surface area in the basin and nonpoint-source pollution associated with urban and suburban land uses. Changes in basin hydrology associated with increased impervious cover includes: more rapid runoff during storms, reduced groundwater infiltration and aquifer recharge, and conveyance of stormwater pollutants directly to surface waters within the study area.

Water quality and the quality of aquatic habitat in the mainstem of the Passaic River has been degraded by development in the basin. Construction projects, especially in and near waterways, have contributed excessive amounts of sediment to the Passaic River’s stream systems and wetlands. Utility corridors have modified the natural vegetative community by creating monocultures of R-selected, invasive species through fragmentation of forest stands.

2.12.3 Study Area Conditions That Are Unlikely To Change

Some existing conditions are not expected to undergo significant change during the period of analysis (2010-2059). For example, most aspects of the physical setting are expected to remain largely unchanged over the planning period, specifically: geology, physiography, topography, and soils. In addition, no significant changes are anticipated for cultural and historic resources, air quality, noise, HTRW, aesthetics, and infrastructure.

2.12.4 Study Area Conditions That Are Likely To Change

It is likely that other aspects of existing conditions are likely to change during the period of analysis. In particular, it is likely that several study area conditions related to flooding would undergo some changes over time. Ongoing urbanization of the Passaic River watershed could exacerbate flood risks by accelerating runoff from the watershed during storms. Growth and development in the study area communities could increase the number of people and value of property at risk of flooding, although future increases in vulnerability would be mitigated by municipal flood plain management ordinances.

In addition to continuing development of the study area communities, the principal socioeconomic change in the study area would be continuing growth of recreation demand. Demand for recreation opportunities is expected to result from increases in population, income, and leisure time.

3. PLAN FORMULATION – FLOOD DAMAGE REDUCTION

Plan formulation for the Passaic River at Long Hill Township feasibility study has been conducted in accordance with the six-step planning process described in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (1983) and the *Planning Guidance Notebook* (1105-2-100, dated April 2000, as amended). The six steps in the iterative plan formulation process are:

1. Specify the water and related land resources problems and opportunities of the study area;
2. Inventory and forecast existing conditions;
3. Formulate alternative plans;
4. Evaluate alternative plans;
5. Compare alternative plans; and
6. Select the recommended plan.

The basis for selection of the recommended plan(s) is fully documented below, including the logic used in the plan formulation and selection process.

3.1 Problems And Opportunities

The primary water resources problem within the Long Hill Township portion of the Passaic River basin is persistent, recurring flooding. Flood damages are primarily attributable to backwater flooding from the Passaic River into a series of smaller tributaries which enter damage areas throughout Long Hill Township. Damages from past flood events have included structural damages to buildings and their contents; limitations on the uses of property because of the threat of flooding; impacts of flood-related interruptions in road transport on business and interstate commerce; and threats to public safety. In addition to residential and commercial flooding, many major thoroughfares are impacted by floodwaters, requiring roads to be closed to traffic during flood events. The Long Hill Township Police Station is located within the 100-year flood plain. Emergency flood protection measures in 1996 and 1999 prevented significant damage; however, the police station and related communications centers nearly were evacuated, which would greatly have hampered rescue and recovery efforts. The current flood plain for the Long Hill Township reach of the Passaic River is shown on Figure 3-1.

Five primary tributaries provide local drainage for the Township into three tributaries that empty into the Passaic River. The tributaries are depicted in Figure 3-2. Gradient along the tributaries ranges from 10 percent near the Long Hill Ridge north of the Township to nearly flat in the wetland area located between Gillette and Stirling. During low magnitude, high frequency rainfall events, the tributary system is sufficient to provide drainage for the township. During high magnitude, low frequency regional rainfall events, high stages on the Passaic River reduce the discharge capacity and effectiveness of the tributary drainage system. As stages on the Passaic River continue to rise, the tributary system becomes the pathway for floodwater from the Passaic River to enter the developed areas of the Township. Water surface elevations along the tributaries rise coincident with stages on the Passaic River.

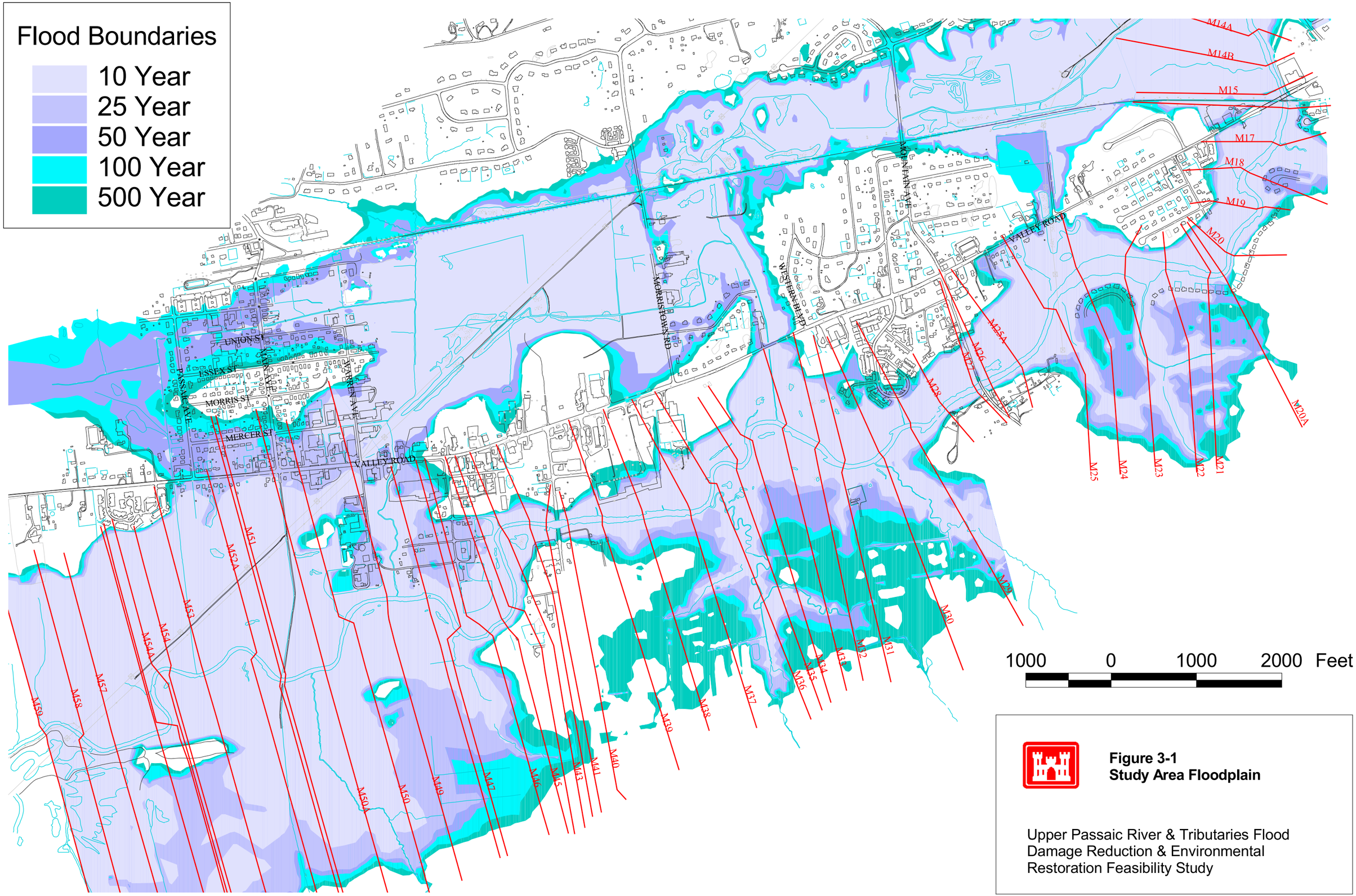


Figure 3-1
Study Area Floodplain

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study

FIGURE 3-2
Study Area with Tributaries Shown

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)

3.1.1 History of Past Flooding

Recent major floods on the Passaic River (1968, 1971, 1977, 1984, 1996, and 1999) have impacted the Passaic River Basin and caused several billions of dollars in damages. The following is a brief listing of the most recent floods that directly affected Long Hill Township.

September 16 1999: Tropical Storm Floyd caused extensive flooding throughout the east coast of the United States. Morris County was among nine New Jersey Counties declared Federal and State Natural Disaster Areas. The peak discharge and stage during Tropical Storm Floyd was recorded at 2,210 cubic feet per second (cfs) and elevation 201.11 feet. At Millington, the peak discharge was recorded at 1,590 cfs with a water surface elevation of 224.51 feet. These peak discharges correspond to an event with a return period of approximately 33 years.

October 19, 1996: A rainfall of 9.63 inches in a two day period resulted in a 2 percent chance frequency (50-year recurrence interval) flood event. Reported damages from this flood were estimated at between $1 million and $3 million (reported to state of New Jersey Emergency Operations Center vs. newspaper reports), with impacts spread over 20 percent of the township. A description of six representative damage areas is provided below.

1. Crossing of a Passaic River tributary with Bungalow Terrace. A small unnamed tributary of the Passaic River passes underneath Bungalow Terrace just west of the intersection with Old Forge Road. A culvert carries the flow underneath Bungalow Terrace. Flooding occurs in the area due to backwater flow through the culvert. As the waters of the Passaic River rise, the flow in the tributaries changes direction and volume of flow increases. The water then remains in the tributaries and retards natural drainage from the surrounding wetlands. Houses located on the north side of Bungalow Terrace and along Old Forge Road were flooded as a result of the October 19, 1996 storm. Flood depths were greatest to the north beyond Bungalow Terrace. Flooding decreased to the south along Old Forge Road. Flooding was reported to reach four (4) feet in some areas.

2. Crossing of a Passaic River tributary with Morristown Road. A small unnamed tributary of the Passaic River passes underneath Morristown Road just north of the road's intersection with Madison Street. The flow is conveyed under Morristown Road through a culvert. Between the tributary and the Madison Street intersection is a wastewater pump station. After the October 19, 1996 storm, residential areas along Morristown Road and Madison Street experienced severe flooding. Along Morristown Road, stalled cars remained inundated for up to seven (7) days. This tributary is a headwater connection to the tributary that runs under Valley Road near its intersection with Warren Avenue.

3. Mountain Avenue bridge over the Passaic River. The Passaic River is conveyed under a single lane bridge along Mountain Avenue. After the October 1996 storm, the water levels continued to rise, overtopping the bridge. Water depths required closure of the bridge and Mountain Avenue.

4. Crossing of a Passaic River tributary with Valley Road. Another small tributary of the Passaic River passes underneath Valley Road between Warren Avenue and Poplar Drive. This area is part of the business district. Many local businesses suffered extensive damage as a result of the October 19, 1996 storm. One business was inundated up to the bottom of its windows and incurred damages totaling $60,000.

5. Along the Passaic River at the South End of Main Avenue. South of Valley Road, Main Avenue turns into a dirt road which terminates prior to intersecting the Passaic River. The river at this point is shallow and wide, and debris is scattered along the river bottom. Local officials stated that the entire area from this point on the Passaic River extending north to Mercer Street was flooded as a result of the October 1996 storm. As the water level in the river rises, the water can be seen getting closer to Main Avenue. The area between the Passaic River and Valley Road is a non-residential wooded area. However, the area north of Valley Road is populated with residential and commercial buildings.
6. Long Hill Township Sewer Treatment Plant. The wastewater treatment plant that services the township is located on Cedar Avenue, just north of the Passaic River. As a result of the elevated stage of the river following the October 1996 storm, inundation occurred up to approximately 2 to 3 feet on the exterior wall of the treatment plant. Due to the impending hazard of the high waters, the plant had to shut down. Local officials stated that after a 2 to 3 inch rain, water begins to impact the plant property.

April 1984: A severe flood occurred when a two-day storm, which brought approximately five inches of rainfall, combined with snowmelt runoff from a 12-inch snowfall, which had occurred during the previous week. The flooding was the worst to occur in 45 years throughout the Passaic River Basin. This event was approximately a 10 percent chance exceedance event, causing roughly $740,000 in damages at current price levels.

November 1977: The storm of November 1977 caused extensive flooding throughout northeastern New Jersey, Particularly in Bergen County. In the Passaic River Basin, the main tributaries of the Basin, which included the Saddle, Ramapo and Pompton rivers, were hardest hit. Residences and businesses in Long Hill Township incurred minor damages from this 20 percent chance exceedance event. Only minimal damages were recorded

August 1971: The storm of August 1971 caused extensive flooding on the tributary system of the Passaic River. Except for the 1996 flood, this event was considered to be the most recent major flood in the Township. The 1971 flood was larger (50-year event); however, upstream development since 1971 has exacerbated flooding. At Long Hill Township, this storm was approximately a 25 year event, causing just over $3 million in damages.

May 1968: The flooding of May 1968 caused widespread damage over the Passaic River Basin. Flooding occurred on the main stem and all major and most minor tributaries from the headwaters to the City of Passaic, about 12 miles upstream of the mouth. Damage records were unavailable for this 12 year event, though current estimates would show between $800,000 and $1 million in damages.

Other major floods have been recorded on the Passaic River between 1902 and 1968. Based on the magnitudes of the floods and the flood prone areas within the township, it is believed that the study area would have been impacted. Since the study area was mostly undeveloped, flood damages would have been minimal. In response to past and potential flooding problems in Long Hill Township, this community has participated in the National Flood Insurance Program (NFIP) for at least 20 years. As required for NFIP participation, the community has enacted municipal ordinances regulating flood plain development.

3.1.2 Principal Flood Damage Reaches

The Upper Passaic River at Long Hill Township study area was divided into three reaches based on location and flooding pathways. Figure 3-3 shows an aerial photograph of the general study area with the locations of reaches 1, 2, and 3 identified. Closer views of Reaches 1, 2, and 3 are shown on Figures 3-4, 3-5, and 3-6. These reaches were used to evaluate the costs of structural and nonstructural flood damage reduction measures and to estimate the benefits of the alternative plans, based on the corresponding reduction in flood damages.

Reach 1: South of Valley Road. Reach 1 is bounded by Valley Road to the north and the Passaic River to the south (see Figure 3-4). Flooding in this reach causes inundation of roadways, public works, commercial and industrial structures, and residential structures. The flood pathway for all damageable property in this reach is via direct inundation by the Passaic River. The reach contains the Shop Rite Shopping Center, which is a multipurpose retail strip mall, a wastewater treatment plant, several restaurants, and about twenty residential structures. Flooding begins for structures in this reach at elevation +213 NGVD, which corresponds to roughly a 7 year event, though most damages begin to occur between the 10 and 15 year events. With the exception of the Shop Rite Shopping Center, all of the structures located within this reach are inundated between the 25 and 50 year events.

Reach 2: North of Valley Road. Reach 2 includes Valley Road and the area north of Valley road (see Figure 3-5). Similar to Reach 1, flooding in this reach damages residential property, roadways, public buildings, and commercial and industrial property. The Long Hill Township Police Department, the Township's Emergency Operations Center, is located within this reach. Floodwaters first inundate this reach due to backwater flow through the Passaic River tributaries that serve to drain stormwater flow from the reach. As the waters of the Passaic River rise, the flow in the tributaries changes direction and volume of flow increases as floodwaters are conveyed into the reach through culverts that cross beneath Valley Road.

Reach 3: Madison Avenue off of Mountain Road. Reach 3 is an isolated area of flood-prone properties, consisting solely of residential structures (see Figure 3-6). Floodwaters approach this reach through the drainage culvert that joins a Passaic River tributary. As the tributary fills with back flow from the Passaic, the flow in the culvert changes direction and floodwaters enter the reach. This isolated pocket contains less than ten structures at risk from flooding. After an examination of measures and alternatives (discussed later in this section), Reach 3 was combined with Reach 2. The principal reason for combining these reaches was that the measures that would protect Reach 2 also would protect Reach 3.

With- and without-project future conditions for the flood-prone reaches assume a stable level of development. Because flood plain regulations restrict new construction in areas that are subject to damage by a 100-year flood event, it was assumed that development of new residential, commercial, and industrial uses in the flood plain is not likely.

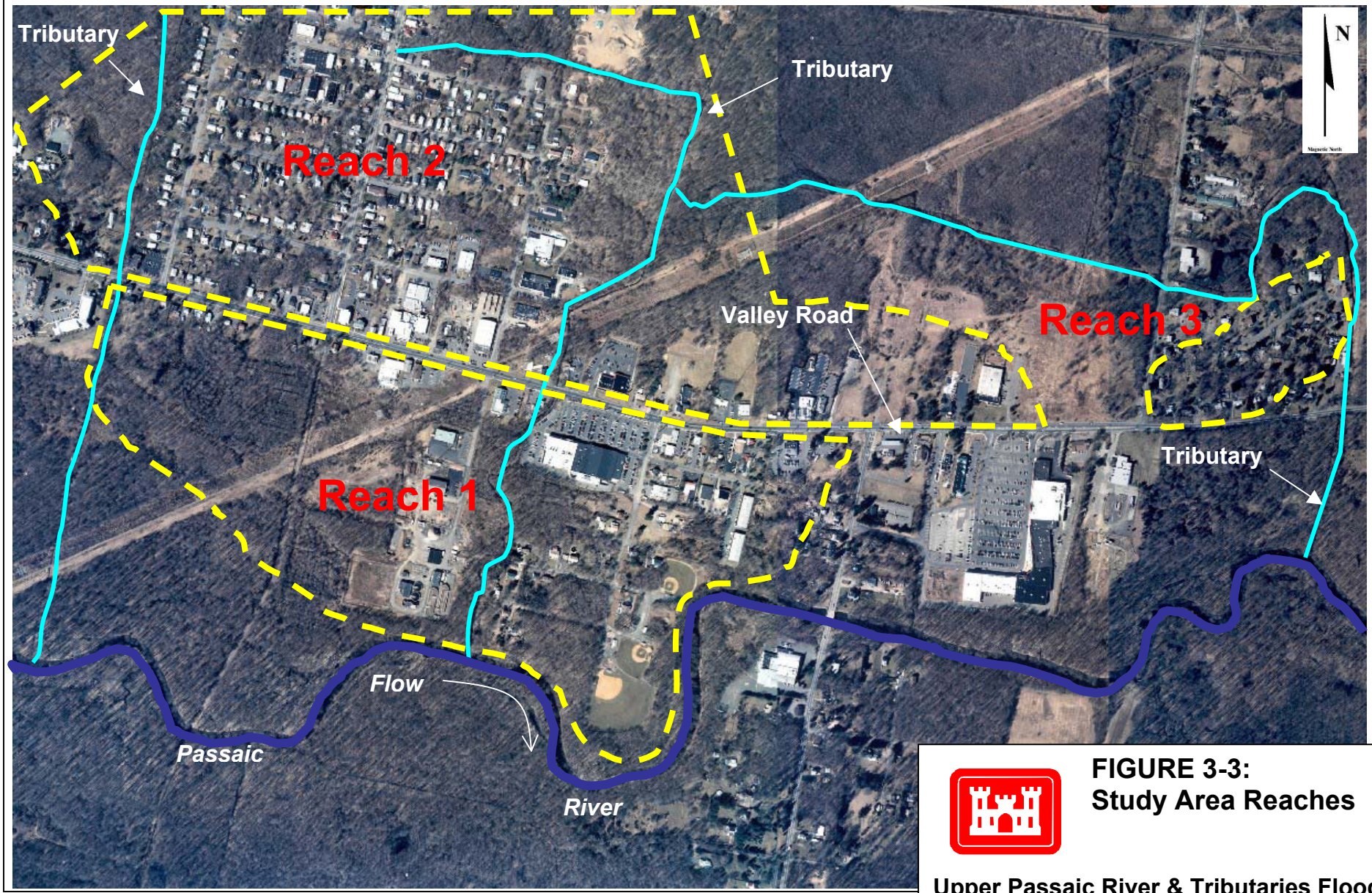


FIGURE 3-3:
Study Area Reaches

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)

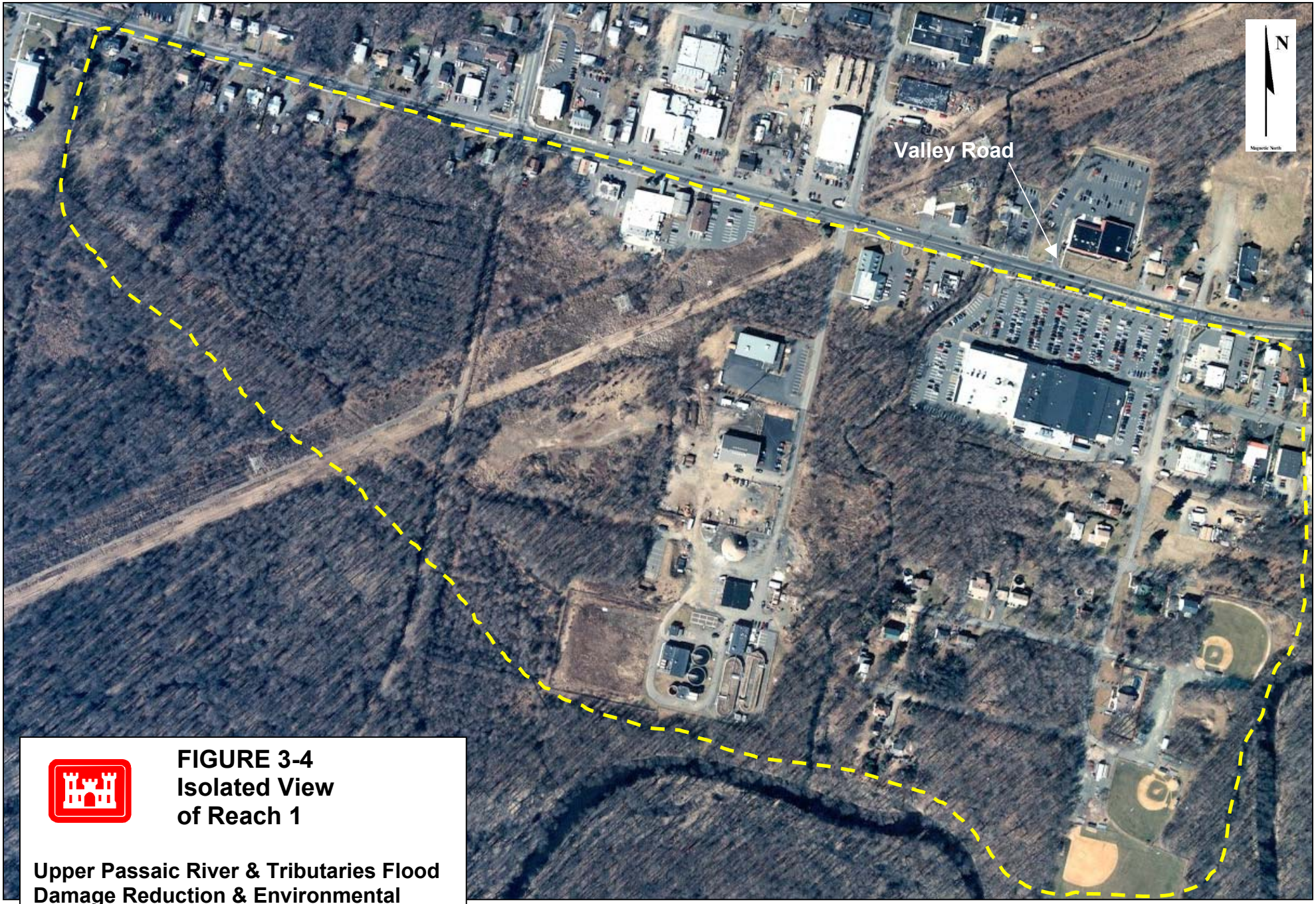


FIGURE 3-4
Isolated View of Reach 1

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)

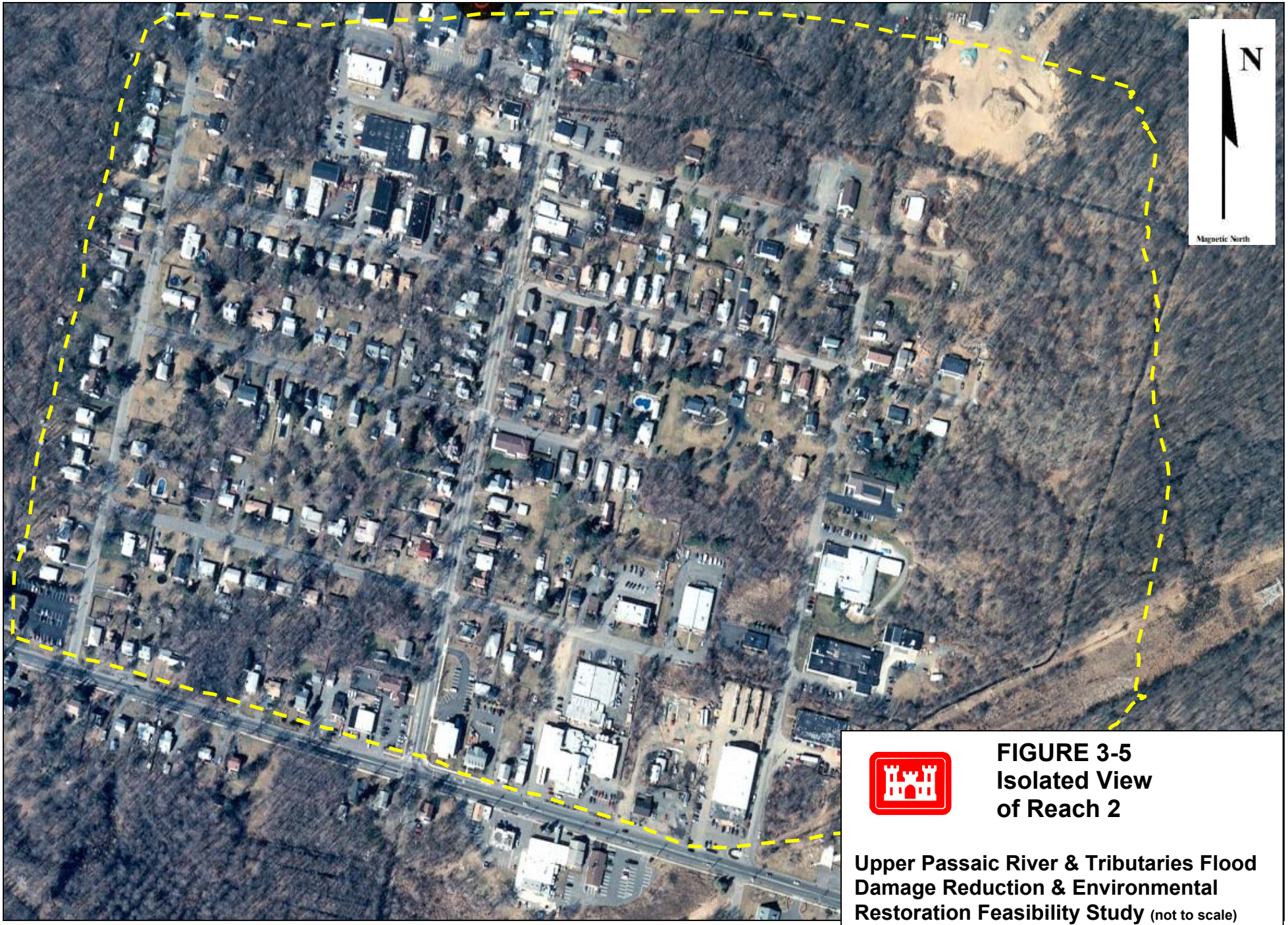


FIGURE 3-5
Isolated View of Reach 2

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)

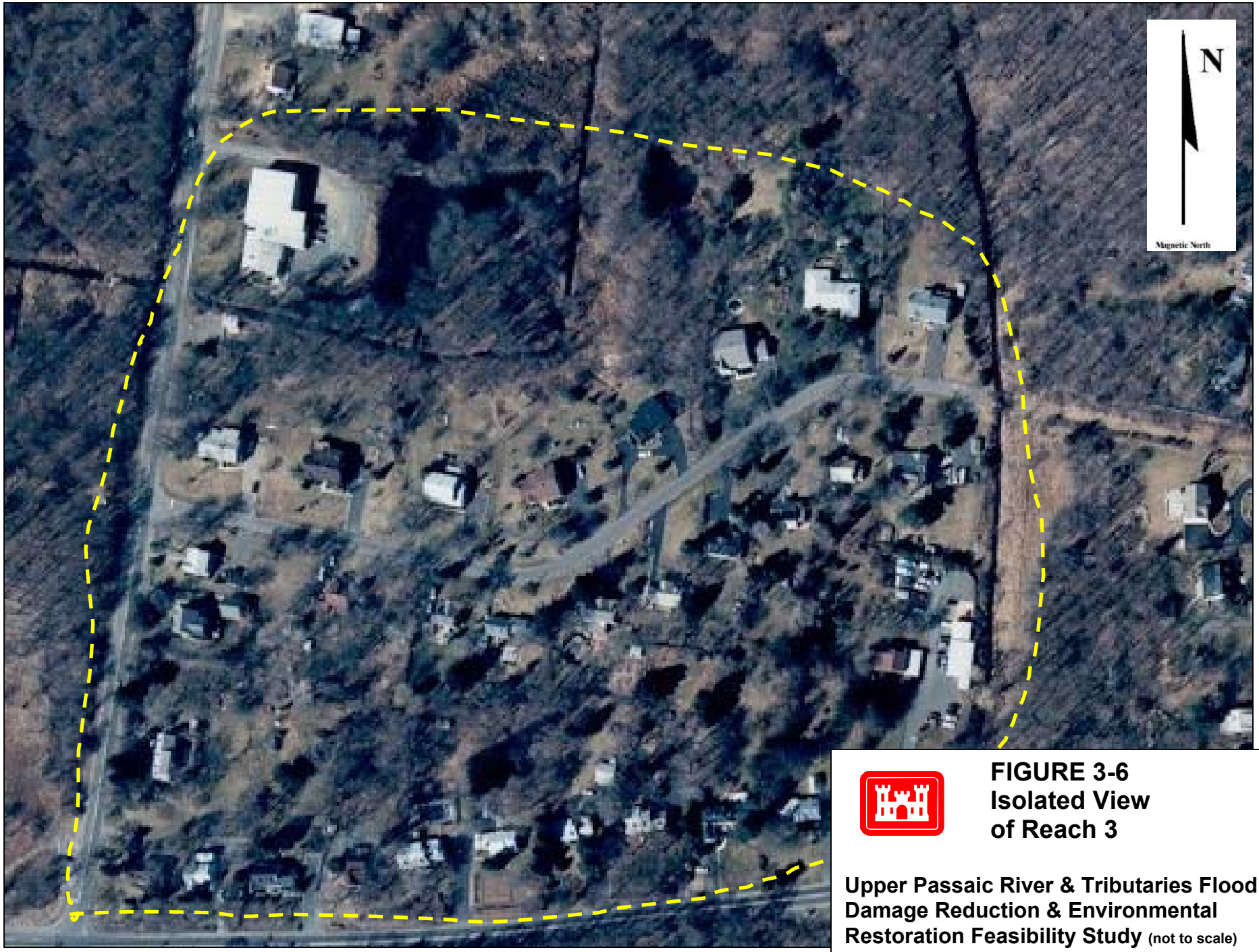


FIGURE 3-6
Isolated View of Reach 3

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)

3.2 Planning Objectives, Constraints, and Key Assumptions

The following discussions identify critical objectives, constraints, and assumptions used during formulation of alternative plans to address problems and opportunities of Federal interest in flood damage reduction along the Passaic River at Long Hill Township.

3.2.1 Planning Goals And Objectives

The Federal objectives in making investments in flood damage reduction projects are to contribute to National Economic Development (NED). The pursuit of planning objectives must be consistent with Federal, State and local laws and policies, and technical, economic, environmental, regional, social, and institutional considerations. Recommended plans should avoid, minimize, and then mitigate, if necessary, adverse project impacts to the environment. They should also maximize net economic benefit, avoid adverse social impacts, and meet local preferences to the fullest extent possible.

In pursuit of the goal to reduce flooding damages in the study area, the following objectives for flood damage reduction at Long Hill Township were established:

- Provide protection from frequent, low-level recurring floods in order to protect and maintain traffic corridors and ensure the operability of emergency and rescue facilities during storm events.
- Reduce the frequency and severity of backwater flooding from the Passaic River into the principal tributaries within the study area.
- Provide a plan that is compatible with future flood damage reduction and economic development opportunities.
- Avoid and minimize adverse environmental impacts.

3.2.2 Planning Constraints

The formulation and evaluation of alternative plans was constrained by a variety of considerations. The planning constraints used to guide the feasibility study are listed below:

- Technical constraints include the need for plans to be: (1) sound, safe, and acceptable solutions, (2) in compliance with sound engineering practice, (3) realistic and state-of-the-art, (4) consistent with existing local plans, and (5) complete and not dependent on future projects.
- Economic constraints include: 1) the need for flood damage reduction features to be efficient (*i.e.*, average annual benefits exceed average annual costs); and 2) the requirement to select the flood damage reduction plan that maximizes net excess benefits (*i.e.*, the NED plan) unless there are overwhelming reasons to select a different plan and an exception is granted by the Assistant Secretary of the Army (Civil Works).
- Environmental constraints affecting the formulation and selection of flood damage reduction features include the need for plans to: (1) avoid unreasonable impacts to

environmental resources, and (2) first consider avoidance followed by minimization, mitigation, and replacement.

- Regional and social constraints include the need for plans to: (1) weigh the interests of State and local public institutions and the public at large, and (2) consider the potential impacts of the project on other areas and groups.
- Institutional constraints include the need for plans to: (1) be consistent with existing Federal, State and local laws, (2) be locally supported, (3) provide public access to the project in accordance with Federal and State laws and regulations, and (4) find overall support in the region and state.

3.2.3 Critical Assumptions Guiding Plan Formulation

Critical assumptions guiding plan formulation for flood damage reduction features include the following:

- Economics of the project will be evaluated using a 50-year period of analysis.
- A Preconstruction Engineering and Design phase that will include development of a Design Documentation Report and Plans and Specifications will follow the feasibility phase.
- Prevailing Federal discount rate (5.625 percent) will be utilized in cost and benefit estimates.
- The line of protection and interior drainage features are separately formulated and optimized.
- Flood damages in the study area will worsen in the absence of Federal action.

3.3 Hydrologic and Hydraulic Analyses

Hydrologic, hydraulic, and statistical analysis were performed to develop existing conditions stage-frequency curves. Risk and uncertainty analyses were then conducted to quantify the uncertainty in discharge-frequency, stage-discharge, and stage-damage functions. This analysis progressed in the following steps:

- Statistical analysis of currently existing stream gage records, including confidence limits (Bulletin 17B)
- Development and calibration of existing conditions hydrologic model (HEC-HMS)
- Development and calibration of existing conditions hydraulic model (HEC-RAS)
- Uncertainty analysis of hydraulic data
- Development of existing conditions Hydraulic Engineering Center's Interior Flood Hydrology (HEC-IFH) models
- Assessment of stability of existing channel

Below is brief discussion of each of the steps.

Statistical Analysis of Currently Existing Stream Gage Records. Flood frequency analyses were updated for three gaging stations on the Passaic River:

- the Millington gage (drainage area 55.4 square miles);
- the Chatham gage (drainage area 100 square miles); and
- the Little Falls gage (drainage area 762 square miles).

The Corps developed frequency curves during the Passaic River Flood Damage Reduction Project in 1995 for the Chatham and Little Falls gages. This analysis used data through 1994. The Millington gage was not evaluated in 1995. Frequency curves were updated to the 2000 water year for Chatham and Little Falls. By extending the record to year 2000, two significant flood events were included in the record that caused substantial damage – October 1996 and September 1999. Frequency curves were developed using data through the 2000 water year for the Millington gage. Annual peak data prior to 1965 was adjusted for urbanization using the same approach employed in the 1995 Passaic River Flood Damage Reduction analysis.

Development and Calibration of Existing Conditions Hydrologic Model. The 1995 Passaic River Flood Damage Reduction Project model above Chatham was used as the basis for the existing conditions hydrologic model. The HEC-HMS model was modified to reflect changes in the study area since 1995. The model uses the year 2000 as the base year. Boundaries for the 14 subbasins used in the model were referenced to sub areas obtained from the New Jersey Department of Environmental Protection (NJDEP). Current land use in the watershed was developed from NJDEP 1995 aerial photography, from community master plans, and from previous Corps studies. The existing conditions model was divided into two areas for calibration. An upper watershed model was developed for calibration against observed stream flow at the Millington gage, and a lower watershed model was developed for calibration against observed stream flow at the Chatham gage.

Development and Calibration of Existing Conditions Hydraulic Model. A HEC-RAS model was developed for the Upper Passaic River along the study reach to develop standard project water surface elevations for the 2-, 5-, 10-, 25-, 50-, 100-, 250-, and 500-year frequency storm events. Cross-section geometry for the flood plains and the main channel was surveyed in the summer of 2000 and incorporated into the model. Geometric data and hydraulic parameters for all bridge and culvert crossings was also surveyed in 2000 and incorporated into the model. The existing conditions HEC-RAS model was calibrated to high water marks in Stirling (Long Hill Township) from Tropical Storm Floyd.

Uncertainty analysis of hydraulic data. Risk-based analyses for flood control projects require the quantification of the uncertainty in discharge-frequency, stage-discharge, and stage-damage functions. Uncertainty was characterized for 3 reference points (Millington, Chatham, and Little Falls) regarding discharge (Bulletin #17B). The uncertainty in stage was assessed using the standard deviation of the estimate of roughness in terms of Manning's "n" in Manning Equation (EM1110-2-1619). Risk-based analyses followed the procedures outlined in EM1110-2-1619, Risk-based Analysis for Flood Damage Reduction Studies.

After calibration was complete, the hydraulic model was used to develop the water surface profiles for 50 HEC-RAS river stations for all design storm events, using discharge values

determined by the HEC-HMS model. Water surface profiles for the eight modeled design storm events are provided in Table 3-1 below. Cross sections are shown for stations in the immediate vicinity of the damage centers, and can be seen in Figure 3-1 (shown previously).

Table 3-1
Water Surface Profiles for Eight Modeled Storm Events

	Water Surface Elevation (NGVD)							
Cross Section	**2-Yr**	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**	**250-Yr**	**500-Yr**
48	210.4	212.2	213.4	214.5	215.2	216.2	216.9	217.6
49	210.5	212.2	213.5	214.6	215.3	216.2	216.9	217.6
50	210.6	212.3	213.5	214.6	215.3	216.3	217.0	217.6
50a	210.6	212.3	213.5	214.6	215.3	216.3	217.0	217.6
51	210.7	212.4	213.5	214.6	215.3	216.3	217.0	217.6
52	210.7	212.4	213.5	214.6	215.3	216.3	217.0	217.6
52a	210.7	212.4	213.6	214.6	215.3	216.3	217.0	217.6
53	210.7	212.4	213.6	214.7	215.3	216.3	217.0	217.6

Development of Existing Conditions HEC-IFH Models. Several small tributaries drain through the study area and flow into the Passaic River. The upstream drainage boundaries of these tributaries are Long Hill Ridge. These tributaries do not have large drainage areas (1 to 2 square miles). Rainfall on Long Hill runs off quickly, discharging into low-lying areas at the base of Long Hill to the east and west of the central Stirling business district. The timing of interior drainage with flooding on the Passaic River is an important factor. Local officials report that coincident flooding is likely. However, given the large drainage area and long time of concentration of the Passaic River (84 square miles) compared to the relatively small drainage area and short time of concentration of the tributaries (1 to 2 square miles), coincident flooding appears unlikely, or at least would have a very low probability of occurrence. In addition, runoff from the upper Passaic River basin will be attenuated by the large storage volume in the Great Swamp. This will further delay and attenuate the peak discharge on the Passaic River. HEC-IFH models were developed for various initial storages in Sterling and various tailwater elevations on the Passaic River. Model results show that the Passaic River controls flooding within the interior area.

Detailed information on water surface elevations are presented in the Hydrology and Hydraulics Appendix (Appendix A). This appendix also includes detailed discussions of statistical procedures used to determine the uncertainty in water surface elevations associated with specific exceedance probabilities storm events.

For future watershed conditions (projected to year 2050), estimates of future land use for the planning period 2050 were obtained from the Corps 1995 Feasibility Report of the (lower) Passaic River Flood Control Project and were adjusted based on current information. The future conditions 100-year discharges will increase approximately 3% resulting in only 0.1 to 0.2 foot (average 0.15 foot) increase in flood elevations throughout the study reach.

3.4 Flood Damage Analyses

Flood damages under future with- and without-project conditions were estimated through: (1) an inventory of flood plain development, (2) estimation of depreciated structure replacement costs and content damages, (3) preparation of generalized stage-damage functions, and (4) combination stage/frequency relationships and stage/damage relationships into frequency/damage relationships. The process and results of damage estimation for the Passaic River at Long Hill Township are described in detail in the Economics Appendix (Appendix E), and are summarized below.

Flood Damage Surveys. A structure inventory was compiled by conducting field surveys of structures in the 500-year flood plain during February and March of 2002. There are approximately 175 total structures within the 500-year flood plain, including 2 municipal and 41 non-residential structures. Each structure was assigned a unique structure identification number. First floor and low opening elevations (measured off of known benchmarks using a transit) and street addresses were recorded for all structures. Structure information required to compute depreciated replacement values was collected for residential structures based on Means Real Estate Valuation Guide. Data collected included the following categories: structure type, style, construction material, quality, condition, effective age, finished floor area, and other exterior characteristics. Content values were estimated at 50 percent of the structure value. Interviews were held (spring 2002) with owners/operators of non-residential flood plain properties, including municipal and major industrial facilities. Actual damage information from the 1996 flood was obtained from the township and was used to calibrate depth-damage functions. Public emergency costs were calculated as a percentage of total damages based on local damage reports provided by the Long Hill Township Police Department (which also serves as the Township's Emergency Operations Center).

Depth-Damage Relationships. Depth-damage functions from Economic Guidance Memorandum 01-03 - Generic Depth-Damage Relationships (augmented with FEMA structure type specific basement depth-damage curves) were applied to the inventory of flood plain properties in order to develop depth-damage relationships. Current HEC-RAS output (discharge-frequency-water surface elevations) was combined with the depth-damage data in order to calculate average annual damages under existing conditions.

Structure and Content Damages. Given the relatively low number of structures in this analysis, a risk-based spreadsheet model (MS Excel running statistical modeling software) was used to estimate flood damages to non-residential and residential structures and contents. Structure specific information (identification number, structure type, value, first floor elevation, zero damage level, and reach designation) was included in a structure inventory database for input to the model. Residential structures were classified as one of five types: one-story with a basement, one-story without a basement, split-level, two-story with a basement, and two-story without a basement. The model used depth-percent damage curves corresponding to the structure type to relate flood depth to percent damage for residential and selected non-residential structures and their contents. Each structure was referenced to two cross sections which were used to determine the water surface elevations for the storm frequency events of 2-, 5-, 10-, 25-, 50-, 100-, 250- and 500-year return intervals.

Transportation Delay Costs. Traffic delays on Valley and Morristown Roads are common following floods in excess of the 10 percent chance exceedance event, which require partial or

full roadway closures. Closure of Valley Road results in the diversion of east- and west-bound traffic along a route north to Long Hill Road. This additional distance is approximately 4.0 miles, and will add about 10 minutes to the motorists' travel time (25 miles per hour plus an allowance for congestion). Traffic delay damages for each impacted motorist are calculated as the sum of the opportunity cost of the additional time spent driving due to speed reductions or detours. Traffic count data published by Morris County in April of 2002 indicated that an average of 20,364 vehicles travel Valley Road on a daily basis.

Opportunity cost of time estimates are based upon the duration of the delay and the estimated annual wage of the motorist. The hourly wage ($41.57) was calculated from the Bureau of the Census 1999 estimate of median family income for Morris County[1] ($77,340) and adjusted to 2003 dollars using the Bureau of Labor Statistics Inflation Calculator. IWR Report 91-R-12 "Value of Time Saved for Use in Corps Planning Studies" indicates that the hourly opportunity cost for automobile trips delayed less than five minutes should be valued at 6.4% of the motorist's hourly wage. For delays greater than five minutes but less than 15 minutes the opportunity cost is valued at 32.2% of the motorist's hourly wage. Conducting the calculations indicates that the opportunity cost of time partial closure is $13.39 per person per hour delayed ($41.57 * 0.322 = $13.39) for all flood events that close Valley Road. The U.S. Bureau of Transportation Statistics estimates that there are 1.6 persons per vehicle on average. Using this occupancy estimate, the opportunity cost of time for a closure of valley road is $21.42 per vehicle per hour detoured around Valley Road during flood events.

Risk and Uncertainty. Planning guidance requires that risk and uncertainty be incorporated into flood damage reduction studies. Statistical modeling software and Microsoft Excel were used to incorporate uncertainty from damage input variables into the analysis. The evaluation process uses Monte Carlo Simulation to compute the expected value of damages while incorporating the variability associated with each input variable.

Variability in depth-damage curves were incorporated into the model by using standard deviations for specific damage percents taken directly from depth-damage functions provided in Economic Guidance Memorandum 01-03. Water surface elevations were allowed to vary based on the standard deviations for specific return events taken directly from the hydrologic and hydraulic analyses conducted as part of this feasibility study. Additional variability in first floor survey error (5 percent), and depreciated replacement values (estimated as a percent of the range shown in Means Cost Estimating Guides) were captured in the damage model.

3.4.1 Existing Conditions Damages

Damages begin for residential structures at the 20 percent chance exceedence (5-year reoccurrence interval) flood event, impacting twenty residential structures and five nonresidential structures with total estimated damages at cost of approximately $480,000. As shown in Tables 3-2 and 3-3, the 100-year event affects 132 structures and results in approximately $7.9 million in damages (of which, $3.4 million are damages to residential structures). Average annual damages to property through the 500-year event amount to over $700,000.

[1] Median family income for Long Hill Township was not used because much of the traffic on Valley Road is assumed to be motorists transiting through the township with an alternate destination point.

Table 3-2
Damages to Residential Structures and Contents
Without Project Conditions

	Reach 1		Reach 2	
Recurrence Interval	**Structures Damaged**	**Damages ($1,000)**	**Structures Damaged**	**Damages ($1,000)**
2-year	0	0	0	0
5-year	6	83	14	148
10-year	12	234	29	550
25-year	18	444	38	1,244
50-year	18	591	50	1,734
100-year	20	833	72	2,579
250-year	20	1,011	78	3,326
500-year	20	1,231	94	3,955

Table 3-3
Damages to Non-Residential Property
Without Project Conditions

	Reach 1		Reach 2	
Recurrence Interval	**Structures Damaged**	**Damages ($1,000)**	**Structures Damaged**	**Damages ($1,000)**
2-year	0	0	0	0
5-year	0	0	5	249
10-year	10	154	18	736
25-year	10	366	21	1,656
50-year	12	524	23	2,391
100-year	14	802	26	3,670
250-year	16	1,008	30	4,748
500-year	18	1,229	34	5,575

Table 3-4 provides information on traffic delay costs that result from the closure of Valley Road during times of flooding. As shown in the table below, road closures begin between the 5- and 10-year events. Closure times were obtained from data provided in the Hydrology and Hydraulics Appendix, and range from 25 hours for a 10-year event to 130 hours for a 500-year event. While the detour around the flooded areas of Valley Road is brief (expected to take less than ten minutes), the road's typical traffic volume yields total delay costs that range from $72,700 to $378,000. Average annual traffic delay costs for the intervals shown on the table amount to $51,650 through the 500-year event, and $48,200 through the 100-year event.

Table 3-4
Traffic Delay Costs

Return Frequency	Closure Duration	Additional Travel Time	Vehicles Delayed	Delay Time Cost ($)
2	None	None	0	0
5	None	None	0	0
10	25 hrs	9.6 min	21,213	72,700
25	70 hrs	9.6 min	59,395	203,500
50	90 hrs	9.6 min	76,365	261,700
100	110 hrs	9.6 min	93,335	319,900
250	120 hrs	9.6 min	101,820	348,900
500	130 hrs	9.6 min	110,305	378,000

3.5 Screening of Structural Flood Damage Reduction Measures

Based on the physical layout of the study area, the flood hydrology, and the profiles of structures at risk, the following structural flood damage reduction measures were considered for application to flooding problems in the study area: (1) closure structures on tributaries; (2) floodwalls and levees, (3) stream modifications, and (4) detention basins. These structural measures and the results of the initial screening are described below.

The screening of flood damage reduction measures includes an assessment of the potential engineering, economic, environmental, institutional, public, financial, and institutional feasibility of implementing each measure. Those measures that are not entirely screened out are carried forward for more detailed analysis as alternative plan components.

3.5.1 Closure Structures on Tributaries

Backwater flow from the Passaic River is the primary source of flooding in Long Hill Township. Closure structures for culverts on tributaries along Valley Road and Morristown Road would

provide flood protection up to the existing roadway elevations. The lowest elevation, which would provide protection is the roadway elevation of +213.7 NGVD, is located at the intersection of South Main and Valley Road.

Tributary closure structures would be required at the following locations:

- Valley Road east of Passaic Avenue,
- Valley Road between Poplar and Warren Roads, and
- Valley Road Between Morristown Road and Western Boulevard.

Locations of the tributary closure structures are shown on Figure 3-7. Each of the culverts would be enhanced with sluice gate-like closures. Under normal flow conditions and for small storm events, the gates would remain open. During flood events, the gates would be closed by emergency management personnel. The implementation of a flood warning system for the township would provide the required information for operation of the closure system. The closure structures would protect Long Hill Township residential and nonresidential property up gradient of Valley and Morristown Roads through a 10-year event, which is the approximate elevation of the road surfaces.

This measure would provide protection up to +213.7 NGVD (approximately the 10 percent chance exceedance event) to residential and non-residential structures and their contents located in damage reaches north of Valley Road. Properties located south of Valley Road would continue to be inundated, Valley Road will continue to be flooded, and blocked during lower frequency events.

Minor, yet temporary impacts to wetlands will occur as a result of constructing the tributary closures. The construction of the closure structures will require the temporary disturbance of approximately 0.68 acres (30,000 sq. ft.) of previously disturbed riparian wetlands (e.g., wetlands currently maintained as lawns). Construction of the closure structures would result in earth moving and excavation in the construction work area. However, no long-term impacts to wetlands are anticipated. All temporarily disturbed areas will be restored to their pre-construction condition upon the completion of construction. Furthermore, construction of the tributary closures would allow a controlled volume of water to migrate to upstream wetlands.

Additionally, best management practices for erosion and sediment control would be implemented to minimize the potential for soil erosion during land clearing and foundation excavation. Impacts would be avoided or minimized to the greatest extent possible and all activities would be performed in accordance with the NJDEP Freshwater Wetlands Protection Act (N.J.A.C. 7:7A) rules and regulations.

While closure structures on tributaries provide a relatively low level of protection, this measure is, however, carried forward as a potential component of alternative plans.

3.5.2 Floodwater Barriers

Floodwater barriers, (e.g., floodwalls and levees) confine flood flows to the existing channel footprint, prevent breakout of floodwaters, and provide protection against flooding to homes, commercial buildings, municipal buildings, roadways and tributary bridges. While floodwalls

and levees provide a cost-effective means to prevent flooding of low-lying areas, interior drainage facilities are often required to handle stormwater ponding behind them. Three vastly different floodwater barrier configurations were evaluated as potential flood damage reduction measures: a levee along the Passaic River; a setback levee/floodwall located south of Valley Road, and raising Valley Road itself.

Levee Along the Passaic River. Creation of an earthen levee and concrete floodwall along the Passaic River was evaluated as a measure to protect the entire study area from recurring flood damages. The levee would be located along the Passaic River (shown in Figure 3-8) with its eastern terminus tied into high ground at elevation +216 NGVD between Plainfield Road and Poplar Drive (between surveyor's cross sections 42 and 43). The western terminus would be located behind the Loudenberry Meadow Senior Condominium, also tied to high ground at elevation +216 NGVD.

Three closure structures would be incorporated into the levee to prevent backwater flooding. To provide flood damage reduction up to the 1 percent chance exceedance event, approximately 7,600 linear feet of levee at an average height of 7.5 feet would be required, resulting in an average width 57 feet, and a footprint of 9.94 acres, the majority of which is assumed to be located on State jurisdictional wetlands.

While a more efficient levee/floodwall alignment may be achieved through a close examination of benefits, real estate, footprint, and environmental mitigation requirements, the full-scale levee was carried forward as a component in alternative plans.

Setback Floodwall/Levee South of Valley Road. This measure consists of a 3,650 linear foot combination floodwall and levee located south of Valley Road. The floodwall and levee system would protect residential and commercial structures, local roadways (including Valley Road), and other public infrastructure from flood events up to the 1 percent chance exceedance event. The eastern terminus of the alignment was tied into existing high ground located west of Poplar Drive and at the western terminus of the alignment was tied into existing high ground west of Passaic Avenue (Shown in Figure 3-9).

The alignment was adjusted to minimize impacts to residential areas, community infrastructure, and roadways crossed by the floodwall/levee. The alignment bisects the Warren Road access road to the wastewater treatment plant and a gravel road extension of Main Avenue. At these locations, the alignment will be tied into road surfaces raised as part of the measure.

The top of the floodwall and levee would be constructed to elevation +216 NGVD, and protrude three to four feet from the existing terrain. Levee sections were designed using the standard Corps levee design with 3:1 horizontal:vertical slopes as the primary levee design. Vertical floodwalls were incorporated in areas where it was important to minimize the impact footprint and maintenance costs. Installation of the levee and floodwall was assumed to require a 20-foot wide construction right-of-way corridor to facilitate vehicle and equipment access.

Two closure structures would be required to restrict Passaic River backwater flow through small tributaries that are crossed by the alignment. At each tributary location, the floodwall would extend to within several feet of the top of bank of one side of the tributary and will continue at a location within several feet of the top of bank on the opposite side of the tributary. Alterations to

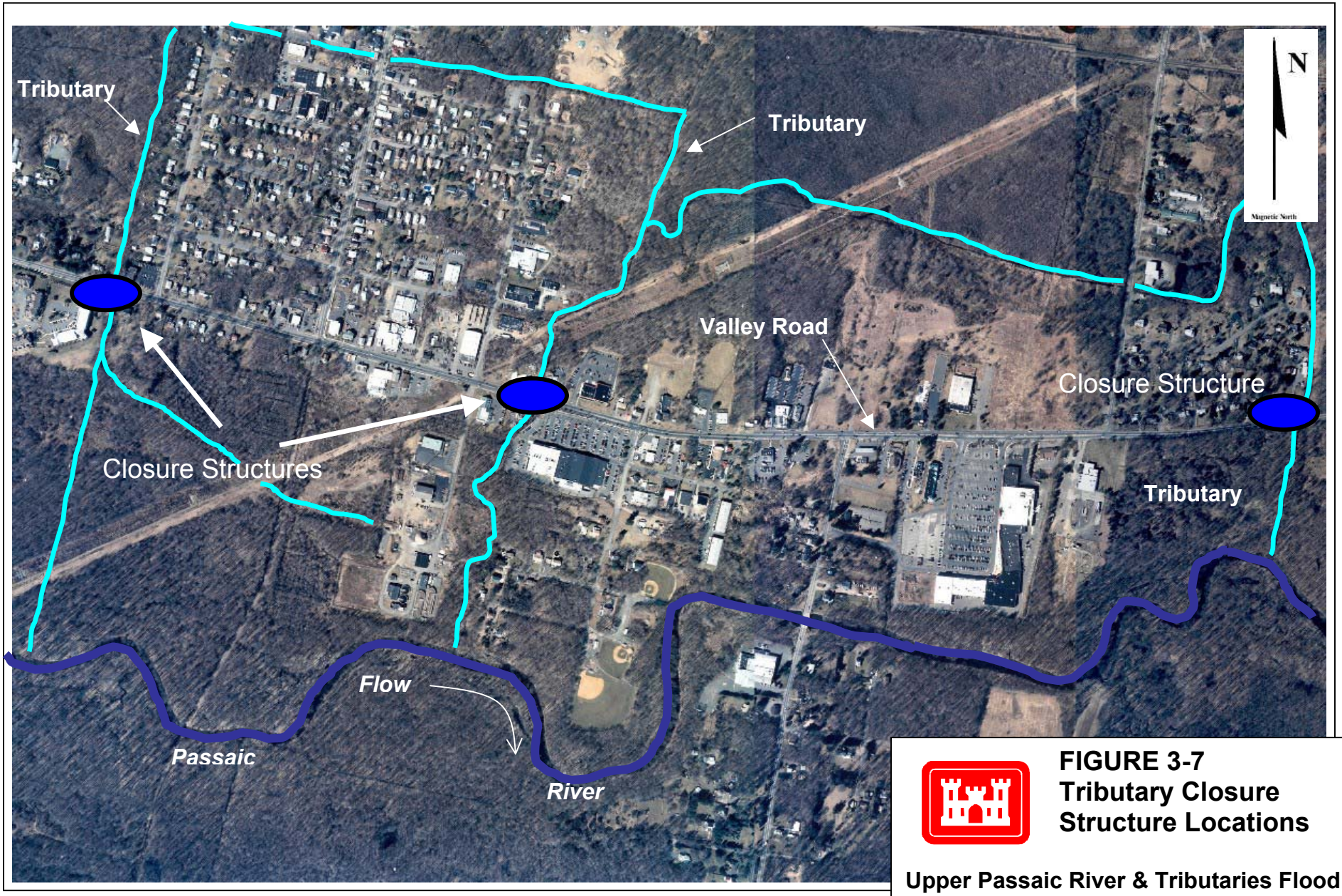


FIGURE 3-7
Tributary Closure Structure Locations

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)

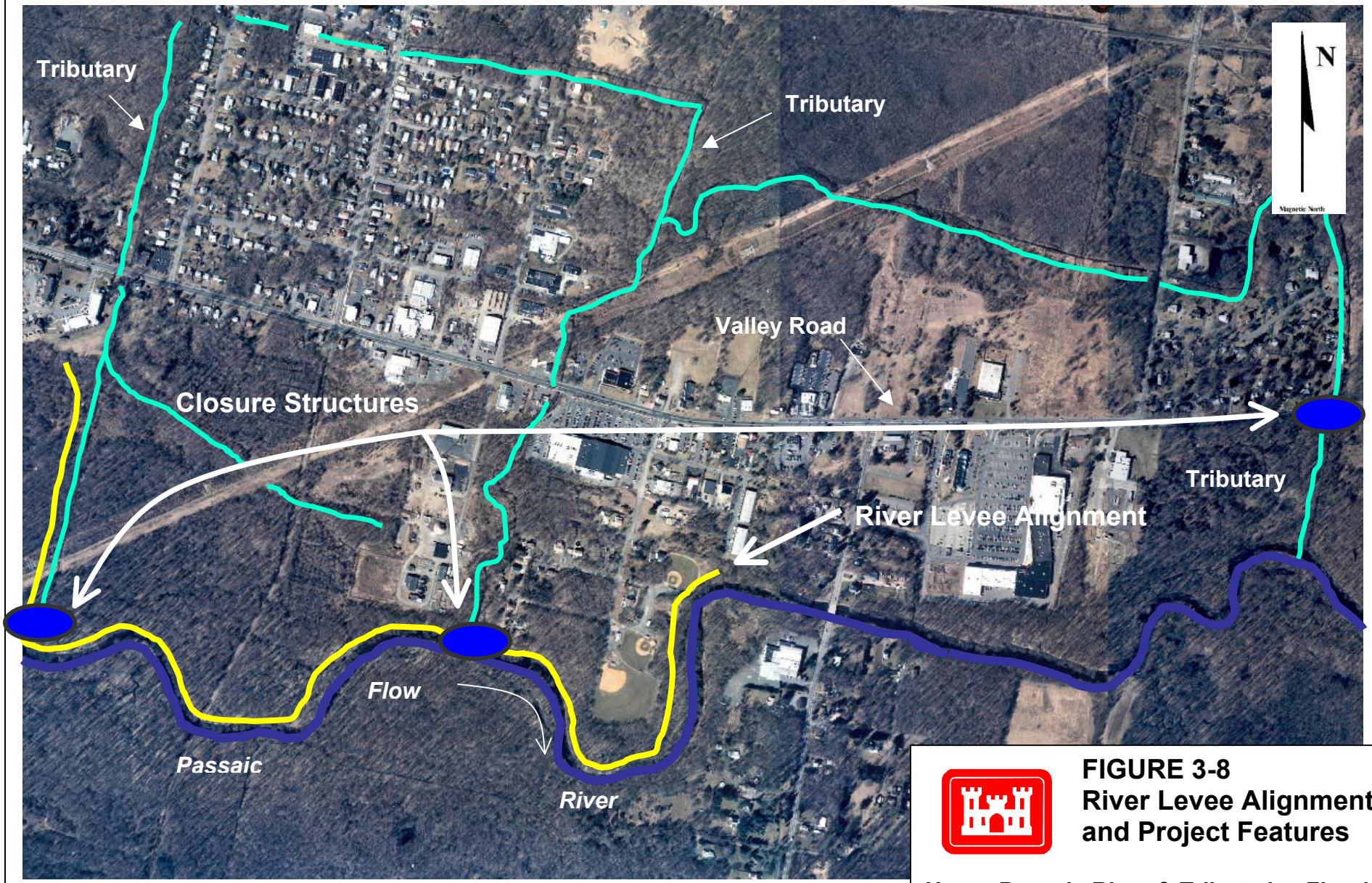
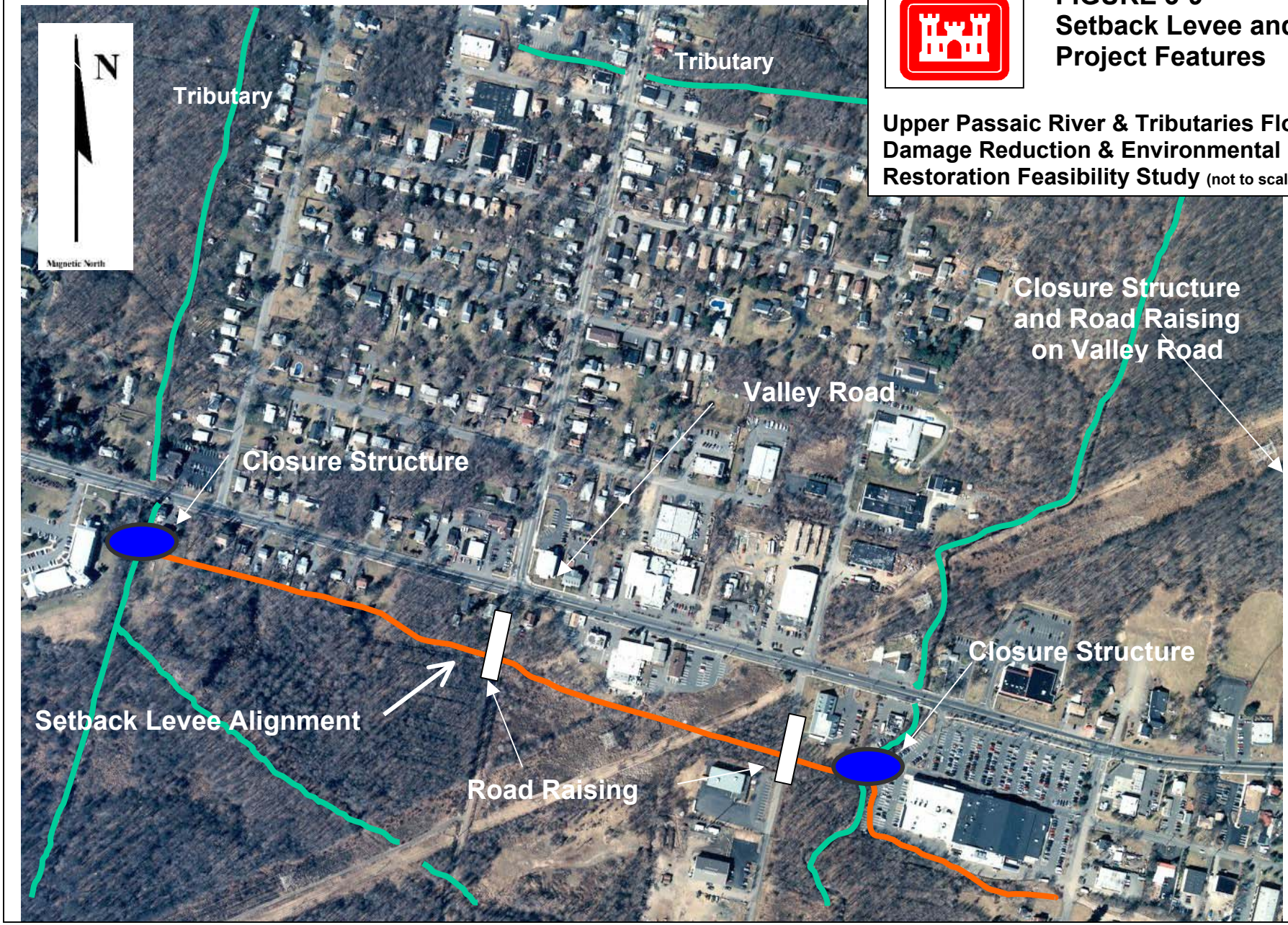


FIGURE 3-8
River Levee Alignment and Project Features

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)

FIGURE 3-9
Setback Levee and Project Features

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)



the stream channel will be required to construct a vertically hinged gate that will be closed during a flooding event. A section of stream channel upstream and downstream of the floodwall will require concrete lining with vertical sides at the gate location and trapezoidal sides as the stream discharge is diverted from the natural channel towards the floodwall/gate location.

It was assumed that pump facilities would not be required at each tributary crossing location to deliver the natural discharge of the tributary to the "wet" side of the floodwall. Passive drainage will be required along the entire length of the floodwall and can be achieved by the installation of gated weep holes in low lying areas to allow for minor surface drainage. The weep holes will be sized according to the expected low flow discharge associated with high frequency precipitation events that would not normally cause backwater flooding. The weep hole gates would then be closed during flood events. The weep hole gates also will allow flood waters from high frequency events to flow to wetlands in the area protected by the levee and floodwall to minimize environmental impacts of the flood damage reduction measure. It was estimated that this flood damage reduction measure would result in approximately 1.17 acres of State jurisdictional wetland impacts.

The setback levee/floodwall appears to be an efficient flood damage reduction measure. It was designed to have a minimum impact on wetlands, provides protection from the 1 percent chance exceedance event for the majority of damageable property, and requires less than two acres of land for implementation. This measure was carried forward as a potential component in flood damage reduction alternative plans.

Raise Valley Road. Valley Road would be raised between its intersection with Poplar Drive and to a point approximately 300 feet west of Passaic Avenue to provide a barrier to flood waters at the 100-year flood level. The road would be raised between 3 and 4 feet above its current elevation and require a significant amount of grading to achieve stable side slopes. The exiting two-lane road would be raised a vertical height of approximately three feet in order to provide 100-year level of protection. Roadway work for this project would include the raising of 2,200 linear feet of asphalt road at a standard two-lane width of 32 feet. Construction of this project would begin with the demolition of the existing roadway and the backfill and subgrade preparation in order to attain a new roadway centerline that is three feet higher in elevation than the existing roadway. Borrow material for the structural backfill subgrade would be brought to the site, installed and compacted in preparation to receive the subbase and base course layers. The subgrade thickness will depend on road design parameters such as prevailing soil conditions, climate, vehicle design loadings and type of bituminous pavement to be used.

Construction of the roadway shoulder includes removal of topsoil from the existing grade and the installation of subgrade material to provide a 20-foot inclined slope from the proposed edge of pavement to the existing grade (each side of roadway).

Each roadway entrance and crossing would be assumed to extend 100 feet from the edge of pavement of the proposed surface course to a location that will tie into the existing grade. Construction would include removal of existing entrance paving, stockpiling subbase materials, installation of subgrade structural backfill, and final grading for a 3.5-inch thick asphalt pavement overtop nine inches of base course materials.

Three closure structures constructed as part of the measure would restrict Passaic River backwater flow along the road raising alignment. Like the setback levee/floodwall, stream

channel modifications also would be required for construction of the closures. Portions of the stream channels upstream and downstream of the closure structure would be concrete lined with vertical sides at the gate location and trapezoidal sides. Pump stations were not assumed to be required to deliver the natural discharge of the tributary to the "wet" side of the road raising. It was estimated that this flood damage reduction measure would result in approximately 0.25 acres of permanent wetland impacts from the grading of new side slopes, and 0.65 acres of temporary impacts from installing the three floodgates.

While implementation of this measure would disrupt local traffic patters by closing this section of Valley Road for a period of 6-12 months during construction, it was carried forward as a potential component in alternative flood damage reduction plans.

3.5.3 Stream Modifications

Stream modifications are used to protect communities against riverine flooding and stream blockages. Stream modifications can include dredging, channel deepening and widening, as well as modification of bridge and culvert openings. Decreases in water surface elevations and flood damages throughout Long Hill Township would be achieved through a reduction in channel blockages resulting from high sediment loads and bank material transported during flood events. Minor snagging and clearing would not have a measurable impact on flood stages because even moderate decreases in water surface elevations would require significant channel deepening and widening for perhaps dozens of miles downstream of Long Hill Township. In addition, because of extremely flat channel slopes in this area, the channel would require significant widening and deepening to increase conveyance. It is likely that implementation of stream modifications would result in widespread destruction of wetlands and impacts to jurisdictional waters. Environmental mitigation costs would be extremely high, and operations and maintenance costs associated with the extensive stream modifications would be significant.

While stream modifications can be an effective means to reduce flood damages in some cases, it was determined that stream modifications would be neither effective nor economically justified given the relatively small study area and the comparatively immense drainage area of the Passaic River. For these reasons, stream modifications were dropped from further consideration as a flood damage reduction measure.

3.5.4 Detention Basins

Detention basins are used to attenuate the peak flow rate of run-off by temporarily storing large volumes of stormwater, then releasing them at a controlled rate of flow. This alternative was considered as a means to create flood storage areas in the flood plain by enclosing a large area with a dike. During floods, the floodwaters would overflow into the storage area. Stored floodwaters would then be released slowly through a downstream outlet. Preliminary investigations based on flood flows determined that placing flood control storage areas in the flood plain would require an extensive amount of land to achieve any measurable water surface elevation reductions.

The only large undeveloped area is within the Great Swamp National Wildlife Refuge and cannot be developed as a reservoir because of adverse impacts to the hydrology and flora and fauna of the Wildlife Refuge that would result from detaining additional floodwaters. In addition, there are several buildings along the perimeter of the Wildlife Refuge that would be

impacted by increased flood levels in the swamp. Environmental impacts of this option would be substantial. Potential downstream negative effects could include changes in the quality of water flowing out of the reservoir behind a dam and changes in downstream water temperatures. Downstream wetland and riparian areas that are dependent on overbank flows for recharge would probably experience reductions in size. Finally, given the level of existing conditions damages (see Section 3.4 above), economic justification was determined to be highly unlikely for alternatives that rely on detention basins. For these reasons, detention basins were dropped from further consideration.

3.6 Screening of Nonstructural Flood Damage Reduction Measures

Nonstructural measures were fully considered in plan formulation. However, full-scale nonstructural measures were screened out early in plan formulation due to the number, age, condition, and location of flood-prone structures in the study area as identified through the inventory of flood-prone structures. Some nonstructural measures were identified as potentially applicable to flood damage reduction in the study area, including: (1) acquisition of flood-prone property, (2) flood plain zoning, (3) floodproofing, and (4) flood warning systems. Analysis of the nonstructural measures to reduce flood damage reduction eliminated most of these measures as potential stand-alone alternatives. However, some measures were carried forward as potential complements to structural measures. The screening of nonstructural measures is summarized below.

3.6.1 Acquisition of Flood-Prone Properties

Permanent evacuation of the flood plain involves acquisition of land and structures by fee purchase or by exercising powers of eminent domain. Following acquisition, all structures and improvements are demolished or relocated. With about 125 structures in the 100-year flood plain, the depreciated replacement cost of structures (approximately $21.6 million) and relocation costs make wholesale acquisition prohibitively expensive.

3.6.2 Flood Plain Zoning

Through proper land use regulation, flood plains can be managed to ensure that their use is compatible with the severity of a flood hazard. Several means of regulation are available, including zoning ordinances, subdivision regulations, and building and housing codes. Their purpose is to reduce losses by controlling the future use of flood plain lands. As stated above, Long Hill Township already participates in the National Flood Insurance Program and manages flood plain land uses consistent with the program. Most of the buildings in the study area flood plain were built prior to the adoption of zoning and are not subject to current flood plain zoning regulations. Therefore, zoning can not be considered independently of as a long-term mitigation solution for flood damage reduction to existing structures. However, it is a necessary component of a comprehensive flood damage reduction plan.

3.6.3 Floodproofing

Floodproofing reduces flood damages through adjustments to structures and location of building contents. Floodproofing techniques involve keeping water out of the structure, as well as

reducing the effects of inundation. Nonstructural adjustments, such as the elevation of structures, can be applied by an individual or as part of a collective action either when flood-prone buildings are under construction or through retrofitting of an existing structure. Floodproofing alone was found to be prohibitively expensive, since a majority of structures would require costly raising. While eliminated as a major element in the formulation of alternative plans, limited floodproofing was retained as a flood damage reduction measure as a part of other comprehensive alternative plans.

3.6.4 Flood Warning Systems

Flood warning systems can be utilized to warn property owners of pending floods and provide time for safe evacuation and relocation of movable property subject to flood damage.

The local Flood Warning System for Long Hill Township would be an expansion of the current Passaic River Flood Warning System which provides flood estimates at Millington (upstream of the study area) and Chatham (downstream of the study area). The existing conditions no-project hydrologic and hydraulic models were run for a range of storm durations and intensities to permit the estimation of lead times and threshold precipitation levels that would trigger alarms in a Flood Warning System (FWS). With this information, rainfall thresholds were established for 1-, 3-, 6-, 12-, 24-, and 48-hour storms for four levels of alert:

- Level 0- No Flooding;
- Level 1- Possible Flooding;
- Level 2- Probable Flooding; and
- Level 3- Imminent Flooding.

System requirements include a PC base station at the Long Hill Township Police Station, an additional stream gage at the Plainfield Road bridge, radio or telephone links to receive the rainfall and stream gage data that are currently in the Passaic River Flood Warning System, and Diad Storm Watch software to store and analyze rainfall data and initiate actions such as paging the Mayor, Police Chief, and Director of Emergency Management in Long Hill Township. A Concept of Operations description is included in the H&H Appendix includes a description of the proposed FWS, Institutional Roles and responsibilities, system network description, equipment needs, and installation and operating costs. Rainfall thresholds based on the HEC-HMS are also included in the Hydrology and Hydraulics Appendix as well as a description of how the FWS is to be used.

Although a state-of-the-art flood warning system would increase the awareness of the citizenry and allow for a more orderly evacuation of residents, a warning system alone would not provide sufficient time to significantly reduce flood damages. This flood damage reduction measure, while important as a project feature, was eliminated from consideration as a stand-alone alternative.

3.7 Alternative Flood Damage Reduction Plans

As the next step in the plan formulation process, flood damage reduction measures which survived the initial screening were developed in greater detail. The initial screening of flood

damage reduction measures resulted in the following structural and nonstructural measures being carried forward for more detailed investigations:

- tributary closure structures;
- levee along the Passaic River;
- setback levee/floodwall south of Valley Road;
- raise Valley Road;
- acquisition of flood-prone properties,
- floodproofing, and
- flood warning system.

Alternative plans were developed incorporating one or more of these flood damage reduction measures to create various flood damage reduction alternative plans. Components of the alternative plans are described below and shown in Table 3-5.

Alternative 1: No Action.

Alternative 2: Install closure structures on Passaic River tributaries, implement limited nonstructural armoring and structure raisings, and install flood warning system.

Alternative 3: Construct a levee along the Passaic River with tributary closure gates, install a tributary closure structure outside of the levee/floodwall line of protection, implement limited nonstructural armoring and structure raisings, and install flood warning system.

Alternative 4: Construct a setback levee/floodwall south of Valley road, install tributary closure gates along the levee/floodwall, install a tributary closure structure outside of the levee/floodwall line of protection, implement limited nonstructural armoring and structure raisings, and install flood warning system.

Alternative 5: Raise Valley Road, install closure structures on Passaic River tributaries, implement limited nonstructural armoring and structure raisings, and install flood warning system.

Table 3-5
Features of Alternative Plans

	Alternative Plans				
Plan Features	**1**	**2**	**3**	**4**	**5**
No Action	✓				
Tributary Closure Structures		✓	✓	✓	✓
Raise Valley Road to +216.2 NGVD					✓
Levee & Floodwall Along Passaic			✓		
Setback Floodwall & Levee				✓	✓
Structure armoring & raising				✓	✓
Flood Warning System		✓	✓	✓	✓

3.8 Evaluation of Alternatives

The no action plan (Plan 1) and four alternative plans (Plans 2-5) are evaluated and compared in this section of the report. The comparison of alternatives focuses on the differences between each plan in terms of their beneficial and adverse impacts and contributions to the planning objectives.

3.8.1 Alternative Evaluation Economics

This section of the report presents the results of the economic and engineering studies that were conducted to quantify the benefits and costs of the alternatives developed to reduce flood damages along the Passaic River at Long Hill Township.

Flood Damage Reduction Benefits

Corps procedures calculate benefits based on the difference between the expected annual damages with and without alternative flood protection plans. The implicit assumption incorporated into this procedure is that the reduction in flood damages is directly translatable into increased net income to flood plain land uses. Benefits from Flood Damage Reduction measures on the Passaic River at Long Hill Township focused on inundation reduction benefits resulting from reduction of physical damages to structures and contents, emergency services cost savings, and traffic delay savings.

Without-project average annual flood damages and with-project average annual residual flood damages are shown in Table 3-6. Average annual damages under without-project conditions equal $780,500 (February 2003 price levels). Average annual residual damages range from $627,500 (Alternative 2) to $172,900 (Alternative 3). The reduction in average annual damages provided by the alternatives ranges from 20% (Alternative 2) to 78% (Alternative 3).

Average annual benefits of the alternatives, which are equal to the difference between residual damages under each alternative and damages under the without project condition are shown in Table 3-7.

Table 3-6
Average Annual Damages of Alternatives 1 Through 5
($000)

Damage Category and Reach	Alt 1 Without-Project Condition	Alt 2	Alt 3	Alt 4	Alt 5
Reach 1 Residential	94.1	94.1	16.9	47.9	94.1
Reach 1 Non-residential	63.6	63.6	20.7	20.7	63.6
Reach 2 Residential	223.5	206.9	48.6	48.6	48.6
Reach 2 Non-residential	325.7	244.1	78.1	78.1	78.1
Traffic Delay Costs	51.7	51.7	3.5	3.5	19.3
Emergency Svcs Costs	21.9	18.8	5.1	6.0	8.8
Total Damages	780.5	679.2	172.9	204.8	312.5
Reach 1 percent Damage Reduction	N/A	0%	76%	56%	0%
Reach 2 percent Damage Reduction	N/A	18%	77%	77%	77%
Total Percent Damage Reduction	N/A	13%	78%	74%	60%

Table 3-7
Average Annual Benefits of Alternatives 1 Through 5
($000)

Damage Category and Reach	Alt 1 Without-Project Condition	Alt 2	Alt 3	Alt 4	Alt 5
Reach 1 Residential	0.0	0.0	77.2	46.2	0.0
Reach 1 Non-residential	0.0	0.0	42.9	42.9	0.0
Reach 1 NFIP Admin Savings	0.0	0.0	2.7	1.3	0.0
Reach 2 Residential	0.0	16.6	174.9	174.9	174.9
Reach 2 Non-residential	0.0	81.6	247.6	247.6	247.6
Reach 2 NFIP Admin Savings	0.0	0.0	9.0	9.0	0.0
Transportation Cost Savings	0.0	0.0	48.2	48.2	32.4
Emergency Services Savings	0.0	3.1	16.8	15.9	13.1
Total Benefits	0.0	101.3	619.3	586.0	468.0

Flood Damage Reduction Cost Estimates

Preliminary cost estimates used to screen alternative plans were prepared using February 2003 price levels. Cost estimates for flood damage reduction alternatives were based on calculated quantities and unit prices. Operations and maintenance (O&M) costs were estimated based on the anticipated conditions over a 50-year project life. Preliminary estimates of wetland mitigation costs and land acquisition for feature footprints costs were included. Estimated wetland mitigation costs of $100,000 per acre of wetlands directly impacted by plan features were included.

Preliminary costs of the alternative plans, which include construction costs, real estate acquisition, engineering and design, environmental mitigation, and interest during construction are shown in Table 3-8. Average annual costs were calculated based on the FY04 Federal discount rate of 5.625 percent and an analysis period of 50 years. Interest during construction was calculated assuming an 18 month construction period for all alternatives except Alternative 3, for which a 24 month construction period was assumed. Annualized costs of the alternatives range from $74,000 (Alternative 2 – Tributary Closure Structures Only) to nearly $1.5 million (Alternative 3 – Levee Along the Passaic River with Tributary Closure Structures). Alternatives 4 and 5 have similar annualized costs of $334,700 and $374,300, respectively.

Table 3-8
Preliminary Costs of Alternative Plans

	Alternative Plans			
	2	**3**	**4**	**5**
Construction Cost, LERRD, PED	940,700	22,330,500	5,019,600	5,651,900
Interest During Construction	39,690	982,700	211,800	238,400
Annual O&M Costs	15,000	65,000	20,000	20,000
Annualized Cost	74,000	1,467,300	334,700	374,300

A preliminary economic comparison of the costs, benefits, residual damages, benefit-to-cost ratios, and net benefits of the alternatives is shown in Table 3-9. Based on the results of the preliminary analysis, the National Economic Development (NED) Plan is Alternative 4 (Setback Levee/Floodwall South of Valley Road), as this alternative provides the highest benefit-to-cost ratio and the highest net benefits. Alternatives 2 and 5 also are economically justified, with benefit-to-cost ratios of 1.37 and 1.25, respectively.

Table 3-9
Preliminary Economics of Alternative Plans

	Alternative Plans				
	1	**2**	**3**	**4**	**5**
Annualized Cost	0	$ 74,000	$ 1,467,300	$ 334,700	$ 374,300
Total Annual Benefits	0	$ 101,300	$ 619,300	$ 586,000	$ 468,000
Total Residual Damages	$ 780,500	$ 679,200	$ 172,900	$ 204,800	$ 312,500
Benefit-to-Cost Ratio	0.00	1.37	0.42	1.75	1.25
Net Benefits	$0	$ 27,300	$(848,000)	$ 251,300	$ 93,700

3.8.2 Environmental Mitigation Requirements of Alternatives

As this project is a cost-shared feasibility study under the Civil Works (CW) program, the actions of this project must be in compliance with all applicable Federal and State laws and regulations with regard to environmental compliance (ER 1105-2-100 (2-7)). Therefore, according to Federal and State regulations regarding mitigation and restoration of wetlands, the recommended plan chosen by this feasibility study includes all practical measures to avoid wetland impacts, and to minimize those impacts that are unavoidable. When impacts to jurisdictional wetlands are unavoidable, Federal and State guidelines and regulations require compensatory mitigation, on-site or along the same wetland or waterbody as the proposed impacts where feasible and practicable. Ample mitigation opportunities are present within the project corridor to satisfy both Federal and State requirements. Therefore, although off-site mitigation alternatives were investigated the recommended plan focused on mitigation opportunities located within the project corridor.

It is important to note that any State mitigation required in excess of the required Federal mitigation would be the State of New Jersey's responsibility to locate, finance, implement and monitor. In the event that none of the on-site mitigation opportunities proves feasible due to potential difficulties with private, adjacent lands acquisition, as a last resort, mitigation could be accomplished through off-site mitigation banking.

For purposes of this report, Federal mitigation requirements were calculated by determining the anticipated functional loss using EPW (see below and Sections 2.3.3 and 6.15) an then by determining the amount of mitigation required to off-set those losses on a function for function basis.

Alternative 1

The No Action Plan (without project condition) does not result in any environmental impacts.

Alternative 2

The Closure Structures Only Alternative consists of installing closure structures on the three major tributaries to the Passaic River that are located within the project corridor. A 100 x 100

square foot area of disturbance would be required to install the closure structures on each of these tributaries, resulting in 10,000 square feet of temporary impact to state jurisdictional freshwater wetlands and state open waters. A total of 30,000 square feet of temporary impacts to wetlands, bank, channel bed and open water would result from implementing this alternative. A temporary stream diversion would be necessary in order to install each of the closure structures.

A flowing stream diversion would be installed to convey water around the work areas to an in-channel location downstream. The flowing stream diversion consists of two sets of wooden, framed, wing-walls connected to a flexible, bag-like PVC tube that is used to convey flowing water around a work area. The premise of the flowing stream diversion is to create a dry work environment without interrupting flow in the target channel. These systems allow wetland dependant and aquatic wildlife to pass both upstream and downstream of the work zone during construction.

The stream diversion would be installed prior to the initiation of construction. The stream diversion would be laid in a channel that would be excavated adjacent to the culvert that conveys stream flow beneath Valley Road. The downstream end of the diversion would be installed in the downstream section of channel first. The upstream end of the diversion would then be installed with a set of wing walls into the upstream end of the channel. Water would flow through the stream diversion and bypass the work area. Flow would be restored to the work area portion of the channel once the tributary closure structure installation is complete.

Proposed mitigation for this alternative would consist of restoring any bed or bank areas disturbed during construction. Mitigation activities may include minor grading, installation of temporary/permanent erosion control measures and planting/seeding with native riparian vegetation. Any restoration efforts would be monitored in accordance with State permit performance standards and monitoring requirements.

Alternative 2	Wetland Impacts	Rest. Area
Total For Alternative 2	**0.69***	**0.69***

*All temporary wetland impacts will be restored, in-situ, to their pre-construction condition.

Alternative 3

A 7,600 linear feet, 57-foot wide levee along the Passaic River would begin approximately 100 feet west of Poplar Drive and would run south toward the river turning west and running along the Passaic then turning north and ending approximately 300 feet west of Passaic Avenue along Valley Road. Using this alignment would result in approximately 9.5 acres of Federal jurisdictional wetland impacts. The levee is by far the most environmentally damaging and most costly compensatory wetland mitigation alternative considered.

Alternative 3	Wetland Impacts	FCU Impact	Rest. Area	Rest. FCU's
Total For Alternative 3	**9.5**	**32.30**	**9.5**	**32.30**

This alternative was rejected during the formulation process on the basis of cost and considerable environmental and wetland impacts. An actual mitigation plan was not formulated. The numbers that appear in the right hand column are for informational purposes only and represent the type specific required mitigation areas based on a wetland impact area of 9.5 acres

Alternative 4

The setback floodwall and levee alignment was designed to avoid and minimize wetland impacts to the greatest extent possible. In earlier iterations of the floodwall/levee alignment and configuration a levee was designed to bisect lots 18.0 and 18.01 to avoid aesthetic impacts. This resulted in 1.17 acres of wetland impacts. The levee portion of the wall was changed to floodwall which resulted in a 0.07 acre reduction in wetland impacts. Using this alignment/configuration would result in approximately 1.10 acres of Federal jurisdictional wetland impacts. This alternative also includes the installation of tributary closure structures, for which mitigation would be as described above under Alternative 2.

As compensation for the wetland impacts that would result from implementing this alternative, restoration of degraded emergent wetland to forested wetlands and creation of forested wetlands from uplands would be proposed. Approximately 0.53 acres of degraded wetlands and uplands would be converted to forested wetlands on Lots 16.04, 18.0 and 18.01.

The proposed restoration and creation would consist of excavation and grading followed by planting/seeding with native wetland vegetation. The restoration and creation efforts would be monitored and maintained in accordance with the Federal performance standards for compensatory wetland mitigation. Permanent easements would have to be obtained or the properties would have to be purchased from the current land owners. If the land owners are not willing to cooperate, off-site compensatory mitigation would be considered as a last resort.

Alternative 4	Wetland Impacts	FCU Impact	Rest. Area	Rest. FCU's
Total For Alternative 4	**1.10**	**1.77**	**0.52**	**1.77**

See Section 6.15 for a more detailed presentation of the proposed mitigation plan.

Alternative 5

Alternative 5 would result in approximately 0.25 acre of permanent wetland impacts resulting from the grading of new side slopes. This alternative also includes the installation of three tributary closure structures (see discussion of Alternative 2 above). Although executing this option would result in lower wetland, State open waters and transition area impacts, than the other floodwater barrier alternatives (Alternatives 3 and 4), it would significantly disrupt local traffic patters by closing this section of Valley Road for a period of 6-12 months during construction.

If this alternative were pursued the mitigation proposal would consist of restoring approximately 0.12 acres of degraded emergent wetlands to forested wetlands on what is presently a residential lawn. The proposed restoration would be located on Block 1, Lot 16.04.

The degraded wetland areas located on Lot 16.04 are comprised of residential lawn. The proposed restoration would consist of limited excavation/grading followed by planting/seeding with native wetland vegetation. It is important to note that Lot 16.04 is privately owned. Therefore, permanent easements would have to be obtained or the lot would be subdivided and the mitigation areas purchased. A maintenance and monitoring plan would be implemented the Federal performance standards for compensatory wetland mitigation.

Alternative 5	Wetland Impacts	FCU Impact	Rest. Area	Rest. FCU's
Total For Alternative 5	**0.25**	**0.41**	**0.12**	**0.41**

3.8.3 Comparison of Alternatives

The alternative plans also were compared against the planning objectives and constraints set forth previously in this section. Table 3-10 provides a summary of whether the plan satisfactorily meets the objective or complies with a constraint (designated as "●"), marginally meets the objective or complies with a constraint (designated as "◐"), or fails to meet the objective or comply with the constraint (designated as "○"). The objectives and constraints evaluated against the alternatives are designated in the matrix as A through I, and correspond to:

A. Provide protection from frequent, low-level recurring floods to Reach 1

B. Provide protection from frequent, low-level recurring floods to Reach 2

C. Protect and maintain traffic corridors and ensure the operability of emergency and rescue facilities during storm events.

D. Reduce the frequency and severity of backwater flooding from the Passaic River into the principal tributaries within the study area.

E. Provide a plan that is compatible with future flood damage reduction and economic development opportunities.

F. Minimize potential impacts of the project on other areas and groups.

G. Be likely to receive local support.

H. Avoid and minimize adverse environmental impacts.

I. Average annual economic benefits exceed average annual costs.

Table 3-10
Evaluation of Alternative Plans Against Objectives and Constraints

Objective / Constraint	Alternative Plans				
	1	2	3	4	5
A	○	○	●	●	○
B	○	◉	●	●	●
C	○	○	●	●	●
D	○	◉	●	●	●
E	○	○	●	●	○
F	●	●	○	●	○
G	○	◉	◉	●	○
H	●	●	○	●	●
I	○	●	○	●	●

As shown in the table, Alternative 4, the Setback Floodwall/Levee, is the only alternative that meets all of the planning objectives and satisfies the constraints set forth at the outset of the formulation process. It is the plan which maximizes net benefits (i.e., the preliminary NED plan) and is an alternative that is successful in avoiding and minimizing environmental impacts. Consequently, Alternative 4 is selected as the plan under which incremental justification for non-structural measures will be attempted, and is the plan for which an optimal level of protection will be analyzed.

3.9 Non-structural Features Analysis of Alternative 4

Twelve residential structures and the Township's wastewater treatment plant are not protected by the preliminary NED plan (Alternative 4). Low opening elevations of ten of the twelve residential structures are located below the 100 year flood plain. The combined average annual damages of the ten residential structures amounts to approximately $67,500 at elevation +216.2 (the 100 year water surface elevation). Six of the ten structures would be candidates for floodproofing without raising the structures to a higher elevation. Utilities would be relocated to an attached utility shed placed at an elevation one foot higher than the 100 year water surface elevation (to elevation +217.2 NGVD), and basements (if any) would be filled with concrete. Four of the ten structures would need be raised out of the 100 year flood plain, as the first floor elevations of these structures are lower than +216.2 NGVD. Based on current New York District experience, the cost of these types of non-structural measures amounts to roughly $70,000 per residence for general floodproofing, and $135,000 per residence for floodproofing and raising.

Total costs of the non-structural measures amount to $960,000, and average annual costs are $87,250. The average annual cost of this project feature was calculated over a 30 year horizon (period adjusted), and includes contingencies and interest during construction. The benefit-to-cost ratio for the non-structural measures is 0.77 to 1, and net benefits are negative at $19,750.

Because incremental economic justification will not be achieved, the non-structural element of Alternative 4 was eliminated from further consideration.

3.10 Selected Plan Optimization

The NED Plan is the plan the Corps of Engineers must recommend unless there is an overriding reason for choosing another plan, which might include local support for an alternative plan. In that case, the Corps would cost-share in construction of the Locally-Preferred Plan (LPP) on the basis of their cost-share in the NED plan.

Economic analysis was used to optimize the level of protection of the selected plan (Alternative 4). The plan would provide protection all structures in Reach 2, most structures in Reach 1, and would protect Valley Road during flood events. Costs were developed for the selected plan with alternative levee/floodwall heights of +215.2, +216.2, +216.9, and +217.6 NGVD. These levels of protection correspond to the 50-year, 100-year, 250-year, and 500-year recurrence intervals without risk and uncertainty adjustments. Costs for the levee/floodwall at the four levels of protection are shown in Table 3-11. Average annual costs were calculated based on the FY04 Federal discount rate of 5.625 percent and an analysis period of 50 years. Interest during construction was calculated assuming an 18 month construction period.

In Table 3-12, the costs and benefits of four levels of protection for the selected plan are compared. As shown in the table, the level of protection with the greatest net benefits was determined to be elevation +217.6 NGVD, which would provide protection from 500-year floods. This NED plan would provide average annual benefits of $685,500 with average annual costs estimated at $396,100. Annual net benefits are estimated to be approximately $289,400, and the benefit-cost ratio is anticipated to be 1.73 to 1.

Table 3-11
Costs of Alternative Levels of Protection – Alternative 4

	Probability of Exceedance			
	0.02	0.01	0.004	0.002
Levee/Floodwall Height (feet NGVD)	215.2	216.2	216.9	217.6
Construction Cost, LERRD, PED	4,715,700	5,019,600	5,336,400	5,759,800
Interest During Construction	199,000	211,800	225,100	243,000
Annualized First Cost	295,600	314,700	334,500	361,100
Annual O&M Cost	20,000	20,000	20,000	35,000
Total Annual Costs	315,600	334,700	354,500	396,100

Table 3-12
Benefits and Costs Comparison of Alternative Protection Levels

Exceedance Probability	Average Annual Damages Prevented	Reduced Annual FIA & Emgcy Costs	Reduced Traffic Delay Costs	Total Average Annual Benefits	Average Annual Costs*	Average Annual Net Benefits	BCR
0.02	352,200	13.0	32.4	397,600	315,600	82,000	1.26
0.01	511,600	25.8	48.2	585,600	334,700	250,900	1.75
0.004	562,600	28.0	49.7	640,300	354,500	285,800	1.81
0.002	605,300	28.5	51.7	685,500	396,100	289,400	1.73

Residual risk of the four levels of protection considered for Alternative 4, along with the without-project condition are shown in Table 3-13. The table shows the expected annual probability of each level of protection being exceeded, and the equivalent long-term risk of exceedance over 10, 20, 30, 40, and 50 years. Examination of equivalent long-term risk for the without-project condition shows that the probability of a damaging flood occurring over the next 10 years is about 89 percent (relative certainty) and increases to 100 percent (absolute certainty) over the next 40 years. These long-term risks are consistent with the flood risk that Long Hill Township currently faces. The table also shows a decrease in long-term risk for all levels of protection being considered for Alternative 4, though none of the levels of protection provide a complete elimination of risk. For example, the table shows that even the 500 year level of protection (protection from a flood with a 0.2 percent chance of occurring in any year) does not eliminate the risk of a damaging flood event. Over a 50 year period of analysis there is still a 9.5 percent chance that a damaging flood will occur with a 500 year level of protection.

Table 3-13
Residual Risks of Existing Conditions and Alternative Protection Levels

	Expected Annual Probability of Design Being Exceeded	Equivalent Long-Term Risk (Probability of Exceedance Over Time Period)				
		10 Years	20 Years	30 Years	40 Years	50 Years
Without-Project	.20	0.893	0.988	0.999	1.000	1.000
50 Year Levee	.02	0.183	0.332	0.455	0.554	0.636
100 Year Levee	.01	0.096	0.182	0.260	0.331	0.395
250 Year Levee	.004	0.039	0.077	0.113	0.148	0.182
500 Year Levee	.002	0.020	0.039	0.058	0.077	0.095

3.11 Selection of the Recommended Level of Protection

Although the NED plan could potentially be implemented, the NED plan does not have the support of the local sponsor. A change in the FEMA flood hazard mapping will hamper the Township's ability to regulate growth. In addition, the height of the levee/floodwall will be obtrusive at a maximum height above ground of 6.4 feet. The sponsor has identified a preferred level of protection at +216.2 NGVD (100-year level). At this elevation, the levee/floodwall would not block the viewshed (maximum height 5.4 feet), and additional development in the flood plain would not be expected.

Table 3-14 shows the economic differences between the two plans. Average annual benefits of the LPP are $99,900 lower than the NED plan, attributable to a corresponding reduction in residual damages of $99,900 when moving from the level of protection provided by the LPP to the level of protection provided by the NED Plan. Also shown in the table are differences in costs and average annual costs. The increase in construction costs of $740,200 when moving from the LPP to the NED Plan translates to an increase of $61,400 in average annual costs (discounted at 5.625 percent over 50 years after accounting for interest during construction and O&M costs). Additional net benefits of $38,500 would be attained if the NED Plan were selected over the LPP.

Table 3-14
Benefits and Costs Comparison of the LPP and NED Plan

Plan	Average Annual Benefits	Average Annual Residual Damages	Construction Costs	Average Annual Costs*	Average Annual Net Benefits	BCR
LPP	585,600	194,900	5,019,600	334,700	250,900	1.75
NED	685,500	95,000	5,759,800	396,100	289,400	1.73
Difference:	-99,900	99,900	-740,200	-61,400	-38,500	-0.02

Differences in level of protection and residual risk between the LPP and NED Plan are shown in Table 3-15. As would be expected, the table shows a reduction in risk when moving from the LPP level of protection to the NED Plan level of protection. For any given 10 year period, the probability of incurring a damaging flood with the NED Plan in place is 2 percent. The residual risk of a damaging event being incurred with the LPP in place increases to 9.6 percent over the same time period. Were the NED Plan constructed, the risk of incurring a damaging flood event over a 50 year period would be 9.5 percent. Residual risks over 50 years increases to 39.5 percent with the LPP in place.

Table 3-15
Level of Protection and Residual Risk Comparison of the LPP and NED Plan

	Expected Annual Probability of Design Being Exceeded	Equivalent Long-Term Risk (Probability of Exceedance Over Time Period)				
		10 Years	20 Years	30 Years	40 Years	50 Years
LPP	.01	0.096	0.182	0.260	0.331	0.395
NED	.002	0.020	0.039	0.058	0.077	0.095
Decrease in Residual Risk from LPP to NED Plan		0.076	0.143	0.202	0.254	0.300

The sponsor's selection of a locally preferred plan (LPP) over the NED plan is permitted under guidance stated in *Planning Guidance Notebook* (ER-1105-2-100, 22 April 2000, as amended). The residual risk of the LPP is acceptable to the Sponsor, and the LPP provides greater net benefits than the smaller scale, 50-year level of protection plan. Additional analysis and design of the LPP is provided in Section 5 of this Feasibility Report.

4. PLAN FORMULATION – ECOSYSTEM RESTORATION

Plan formulation for ecosystem restoration along the Passaic River at Long Hill Township was conducted simultaneously with flood damage reduction plan formulation. Restoration plan formulation was also performed in accordance with the six-step planning process of the P&G, as well as other Corps policies and planning guidance. The below discussions of restoration plan formulation describe the results of each step in the planning process. Discussions begin with specification of problems and opportunities for ecosystem restoration along the Upper Passaic at Long Hill Township.

4.1 Problems and Opportunities-Ecosystem Degradation/Restoration

As discussed in Section 2 of this Feasibility Report, the Upper Passaic River Basin has significant natural resources, including (1) aquatic habitat in the river and its tributaries, and (2) wetland and upland habitats in the riparian corridors of these waterways. However, development has significantly reduced the extent of these natural systems and has limited their functionality.

4.2 Planning Objectives and Constraints and Key Assumptions

The following discussions identify critical objectives, constraints, and assumptions used during plan formulation for ecosystem restoration along the Upper Passaic River at Long Hill Township.

4.2.1 Planning Goals And Objectives

The Federal objective in ecosystem restoration activities is to contribute to National Ecosystem Restoration (NER). The restoration of habitats to less-degraded, more-natural conditions must be consistent with Federal, State and local laws and policies, and technical, economic, environmental, regional, social, and institutional considerations. Recommended plans should avoid, minimize, and then mitigate, if necessary, adverse project impacts to the environment. They should also maximize the efficiency and effectiveness of restoration expenditures, avoid adverse social impacts, and meet local preferences to the fullest extent possible. In pursuit of the goal to restore degraded ecosystems in Long Hill Township, the following restoration objectives were established:

- Increase biodiversity of habitat;
- Restore under-represented habitat;
- Restore habitat for rare or special-interest species;
- Stabilize/protect existing desirable wetland habitats;
- Reduce common reed *(Phragmites australis)*;
- Improve water quality; and
- Increase recreational opportunities (as a secondary consequence of restoration activities).

4.2.2 Planning Constraints

The formulation and evaluation of restoration options was constrained by a variety of considerations. As with flood damage reduction plan formulation, plan formulation for ecosystem restoration must recognize the following constraints:

- Technical Constraints: including the need for restoration options to be: (1) sound, safe, and acceptable solutions, (2) based on sound engineering practice, (3) realistic and state-of-the-art, (4) consistent with existing local plans, and (5) complete and not dependent on future projects.
- Economic Constraints: including the need to the requirement to conduct a cost effectiveness and incremental cost analysis to identify the plans which are the most efficient means to achieve various levels of restoration outputs (i.e., the "best buy" plans).
- Environmental Constraints: including the need to maximize the positive outcomes of restoration action and the need to avoid, minimize, and mitigate adverse effects. Environmental constraints also include the need for plans to: 1) be evaluated in a systems context in order to improve the ability of the features to function as self-sustaining systems; 2) be formulated in consideration of intended and unintended effects, both on and off of the project site; and 3) be formulated recognizing the attainable restoration state, given the influences of human activities and culturally induced changes in the landscape which are likely to persist and influence system conditions after project completion.
- Regional and Social Constraints: including the need for plans to: (1) weigh the interests of State and local public institutions and the public at large, and (2) consider the potential impacts of the project on other areas and groups.
- Institutional Constraints: including the need for plans to: (1) be consistent with existing Federal, State and local laws, (2) be locally supported, (3) provide public access to the project in accordance with Federal and State laws and regulations, and (4) find overall support in the region and state.

4.2.3 Critical Assumptions Guiding Plan Formulation

Critical assumptions guiding plan formulation for ecosystem restoration are similar to those described in Section 3 for flood damage reduction:

- The project will be designed based on a 50-year project life.
- A Preconstruction Engineering and Design phase that will include development of a Design Documentation Report and Plans and Specifications will follow the feasibility phase.
- Prevailing Federal discount rate (5.625) will be utilized in cost/benefit estimation.
- Ecosystem degradation will continue in the absence of Federal action.

4.3 Potential Restoration Sites

Seven potential restoration sites were identified during the reconnaissance phase of this study. These sites were carried forward into this feasibility study. Early in the feasibility phase, additional coordination was conducted with local stakeholders and with the non-Federal project partner (NJDEP). This coordination in conjunction with additional field investigation confirmed that these seven sites represent the sites of greatest restoration potential within the study area. These sites are profiled below, and their locations are shown in Figure 4-1.

Site 1: South of Rolling Hill Road. The South of Rolling Hill Road site is a former swim club with a small artificial lake (approximately 1-acre in size) and a smaller drainage retention basin located northeast of the lake. The site is approximately 10 acres in size. A forested wetland area is located to the south of the site. The area adjacent to the lake has been modified. Soil piles were observed on the northeastern and southeastern sides of the lake. The discharge from the lake has also been modified. Vegetation adjacent to the eastern and southern sides of the lake consists of small trees and shrubs. The northern and western sides of the lake consist of the former beach areas and have been highly disturbed.

Site 2: Warren Township Former Golf Course. This site is located in Warren Township, Somerset County, New Jersey. The site is a former golf course, which has been unused for approximately 25 years. The site is approximately 60 acres in size. The twenty acres located adjacent to the Passaic River are suitable for potential restoration activities. Warren Township and the County of Somerset own the property on either side of this site. The southern two-thirds of the site consists of a mixture of wetland/upland fields and small forested areas. The northern third of the site consists of ponded areas adjacent to the Passaic River and a utility right-of-way, which crosses the site in a northeast to southwestern direction.

Site 3: Poplar Drive, Laurel and Cedar Avenues. The Poplar Drive, Laurel and Cedar Avenues site consists of the area South of Laurel Avenue and west of Popular Drive. The area consists of wetland and upland forest. The closer to the Passaic River the more mature and wetter the flood plain forest becomes. There are three residential dwellings on the southern side of Laurel Avenue and two residential dwellings on the western end of Cedar Avenue. Vegetation has been disturbed in the areas adjacent to these dwellings. The majority of this site consists of undeveloped forested area, which floods on a regular basis.

Site 4: Morristown Road. The Morristown Road Site consists of the area south of the railroad tracks, southeast of the utility right-of-way, west of Morristown Road and north of a forested area. The site is predominantly covered with wet fields surrounded by a tree/shrub line. A utility road cuts across the northern section of the site.

Site 5: Passaic River Reach. The Passaic River Reach site starts northern side of the Passaic River, opposite the Warren Township site and runs along the Passaic River to the north to approximately 1,000 feet east of Main Avenue. This area consists of mature flood plain forested wetlands along the entire reach except utility right-of-way, which consists of modified wetlands. This site consists of mature flood plain forest and is presently owned and preserved by the County of Morris.

Site 6: Valley Road/Warren Road Utility Corridor. The Valley Road/Warren Road Utility Corridor site consists of a utility right-of-way starting at the intersection of Valley Road and Warren Avenue and continuing southwest to Main Avenue. The site consists of modified

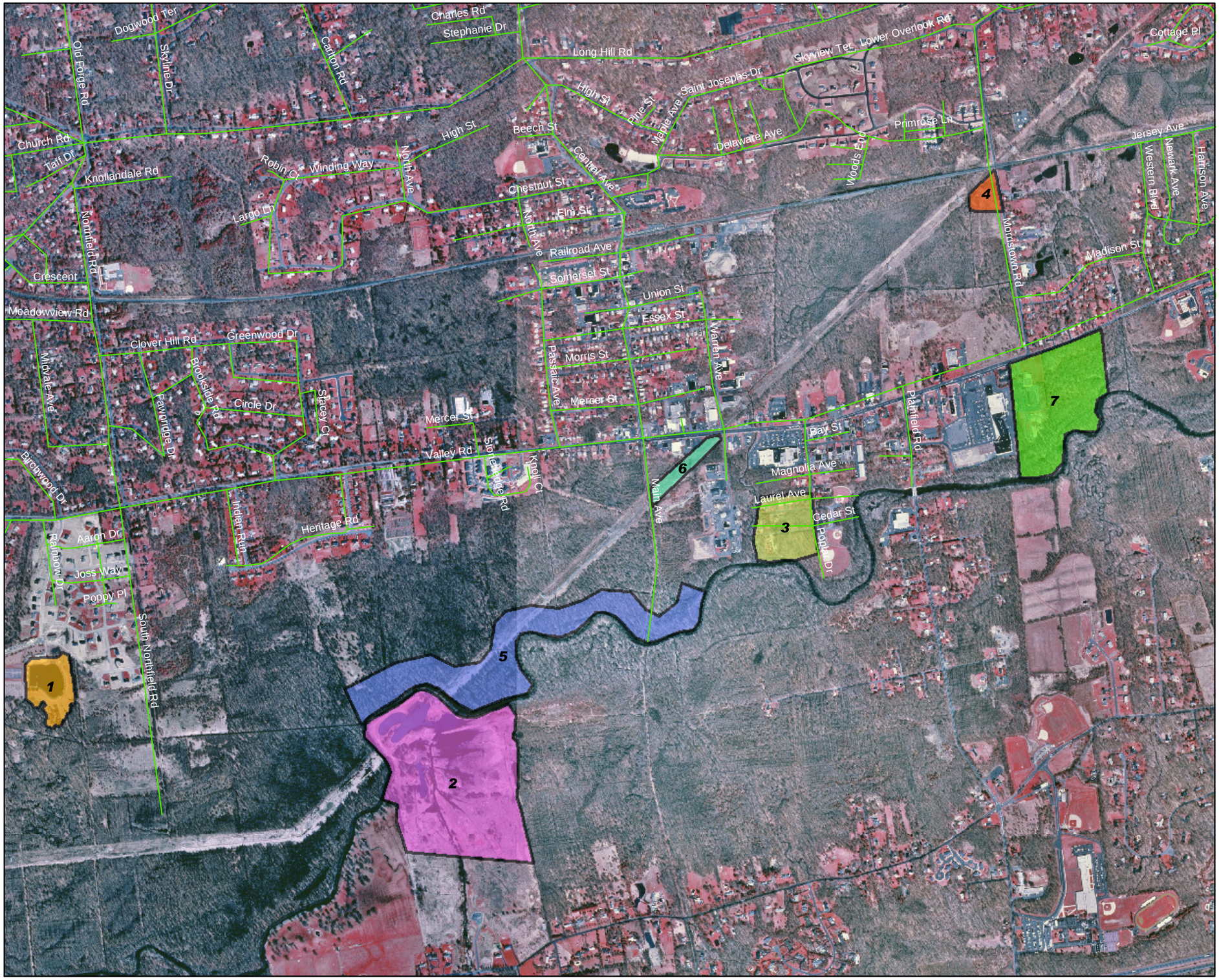


Figure 4-1
Potential Restoration Areas

Upper Passaic River & Tributaries Flood Damage Reduction & Environment Restoration Feasiblity Study

Legend

- 1 - South of Rolling Hill Road
- 2 - Warren Township Former Golf Course
- 3 - Popular Drive, Laurel and Cedar Avenue
- 4 - Morristown Road
- 5 - Passaic River Reach
- 6 - Valley Road/Warren Road Utility Corridor
- 7 - New Long Hill Township Town Hall

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U.S. Army Corps of Engineers
New York District
Planning Division
26 Federal Plaza
New York, New York 10278

emergent and scrub-shrub wetlands. The site is approximately 3.75 acres in size. The majority of the site consists of emergent wetlands, with a small area of scrub/shrub wetlands at the southwestern terminus. This site offers good ecological restoration potential, however, may be restricted due to its current and long term use as a utility ROW. The site is presently over grown with common reed (*Phragmites australis*).

Site 7: Long Hill Township, New Town Hall. The Long Hill Township Town Hall site consists of the new Town Hall, which is presently under construction, adjacent parking areas, recreational fields (soccer/football fields, basketball court, and tennis courts) and a maintenance building. The rest of the site consists of a disturbed area located between the parking lot and the forested area adjacent to the Passaic River. The disturbance was caused by construction activities related to the development of the site.

4.4 Alternative Restoration Measures

There are a variety of restoration measures which could be employed at the seven potential sites to restore degraded ecosystems. As specified in *Ecosystem Restoration in the Civil Works Program* (ER 1105-2-210), Corps restoration planning should place emphasis on engineering measures to achieve restoration objectives, and hydrologic control rather than land acquisition is also emphasized. Restoration measures that are often employed in combination at Corps restoration projects include the following:

- **Modification of Hydrology**: Hydrologic controls are typically used to restore or enhance degraded wetlands or reduce streambank erosion.

- **Regrading**: Sites can be regraded to maximize desired habitat. Biobenchmark analysis can be employed to develop a grading plan, often in conjunction with hydrologic controls.

- **Bank Stabilization**: A variety of bioengineering techniques can be employed to stabilize streambanks or other slopes that are eroding into surface waters with consequent degradation of aquatic habitats.

- **Control of Undesired or Non-Native Vegetation**: Infestations of undesired or non-native plant species is commonly employed at Corps restoration sites. In particular, common reed (*Phragmites australis*) infestations are often addressed by repeated spraying and burning.

- **Planting of Native Vegetation**: Following clearing of undesired or non-native vegetation, native plants can be planted on restoration sites. Wetland species are also frequently planted in created/enhanced wetlands, often in conjunction with site regrading and/or hydrologic controls.

- **Dredging and Filling**: In some circumstances environmental dredging can be conducted to remove undesired material from restoration sites. This material can be removed from the site or placed and graded at locations appropriate for wetland enhancement.

4.5 Formulation and Evaluation of Alternative Plans

The full spectrum of ecosystem restoration measures were evaluated for their applicability to the seven potential restoration sites along the Upper Passaic River at Long Hill Township. Preliminary restoration options were developed for each site, consisting of combinations of restoration measures that appear to be most appropriate to the existing conditions and restoration potential of each site. The preliminary options for sites were then subjected to an initial screening to evaluate the technical, institutional, and economic feasibility of restoration action at these sites. They were evaluated using the following parameters: potential ecological benefits, potential costs, methods of implementation, requirements for success, real estate considerations, and support of local stakeholders and the non-Federal project partner (NJDEP).

None of the seven sites survived this initial screening. A variety of site-specific technical and institutional considerations led to the elimination of the sites from further investigation. The preliminary restoration options and the considerations that led to their elimination are summarized below.

Site 1: South of Rolling Hill Road. The existing wetlands in the vicinity of the lake may be enhanced and enlarged through hydrologic modification, increasing the area exposed to frequent saturation and inundation. The addition of native emergent wetland vegetation will also enhance function, diversity and overall quality. The area surrounding the stormwater basin could be re-graded to facilitate the development of additional wetland acreage. These newly created wetlands could be designed to provide enhanced water quality treatment and other wetland functions. An enhanced hydrologic connection to the Passaic River flood plain would help to sustain an expanded riparian corridor, provide additional flood surge capacity and improve water quality and habitat. The remaining area between the newly created wetlands and the existing forested area to the south would provide a functioning natural transition to the existing forest. In the future this area would succeed to mature hardwood forest, creating a larger contiguous forest, enhancing the overall wildlife and water quality value of the Passaic River corridor. A second option could include the potential restoration of the southern side of the lake. This would include the removal of existing soil piles, restoration of the former discharge channel into the wetland areas adjacent to the south side of the lake and modification of existing vegetation along the eastern and southern boundaries of the lake.

The lake and drainage basin areas are privately owned. The potential restoration site is privately owned as a recreational facility for the housing development located to the northeast of the site. Permits have been obtained from the New Jersey Department of Environmental Protection for certain regulated activities on the northern and western sides of the lake. Since this property is under private ownership the proposed restoration activities may not be in the interests of the current owners of the site due to the fact that the area is part of their stormwater management plan. For these reasons this site was eliminated from consideration as a restoration area.

Site 2: Warren Township Former Golf Course. The area adjacent to the ponds consists of upland and wetland forested, scrub shrub and emergent wetlands. The water column in the existing ponds was observed to be very turbid. A small stream, Cory's Brook, bisects the site in a south to north direction. The southern two-thirds of the site consists of fallow fields and discrete areas of mature trees and shrubs. Most of the fields consist of native vegetation with little to no invasive/exotic species -- common reed (*Phragmites australis*) purple loosestrife

(Lythrum salicaria). No viable restoration opportunities exist for ecological enhancement in this area.

The northern third of the site, approximately 20 acres in size and consists of former ponds and a utility crossing. Potential for ecological enhancement exists in this portion of the site. The pond area could be deepened and widened to provide enhanced wildlife and vegetation habitats.

The ponds are full of silt and are filled only when the Passaic River and its tributary, Corys Brook, flow at high stages. Improved flow through these ponds could be accomplished by opening of the banks to allow the Passaic River to flow through these ponded areas during normal stages of flow. Additional planting around the pond area would improve the stability of the banks, improve wildlife habitats, and reduce erosion. Corys Brook could also be widened and deepened to allow recreational assess to the Passaic River.

Initial meetings and subsequent communication indicated that Warren Township, which owns the property, was not interested in pursuing restoration activities on the site at this time. Therefore this site was dropped from further consideration.

Site 3: Poplar Drive, Laurel and Cedar Avenues. Proposed restoration options would include the removal of the existing residential dwellings and the restoration of forested wetlands in those areas. Due to the local land use no compatible opportunities exist for ecological enhancement in this area.

Site 4: Morristown Road. The site is chiefly undisturbed except for the section adjacent to the railroad track and utility service road where dumping of landscaped material was observed. The majority of this site is a wet field; no restoration would be required. Small piles of landscape material (grass, leaves, and wood chips) were observed in the wetland area. These piles could be removed to enhance the wetland areas. This site should be acquired and left in its natural state and combined with the properties to the south, which consist of wetland forest and open field. The site represents excellent habitat for local flora and fauna. Because acquisition for purposes of preservation is not economically feasible and local sponsor interest is minimal, this site was dropped from further consideration as a restoration area.

Site 5: Passaic River Reach. The Passaic River Coalition and other local environmental groups were contacted by the U.S. Army Corps of Engineers with regard to any potential restoration site located adjacent to the Passaic River. Environmental groups indicated that the Passaic River is in very good ecological condition throughout this river reach. Therefore, no restoration potential exists in this area, and the site was dropped from further consideration.

Site 6: Valley Road/Warren Road Utility Corridor. Restoration opportunities include replacement of the monotypic stand of Common Reed with a more diverse wetland plant community. Enhancement of the vegetative community would result in significant improvements to wildlife habitat in this section of the Passaic River Flood Plain. This site is located at a higher elevation than many of the other possible ecological enhancement sites. Its landscape position allows for more direct influence on the upland community. Its water quality enhancement and treatment function would be high, since it is located closer to possible point and non-point sources, such as roadway runoff.

Were this site chosen for restoration, the utility company would have be involved as they own the right-of-way and continued access is needed to service the towers supporting the high-tension

wires and the underground gas pipeline. This area would be restored with emergent vegetation or a combination of emergent/scrub-shrub vegetation.

This site remains as a potential restoration site for future basin-wide opportunities. However, there are logistical problems with the existing utility right-of-way and there is no local proponent for sponsorship of restoration. This site was dropped from further consideration.

Site 7: Long Hill Township, New Town Hall. The potential exists to establish either a continuation of the adjacent forested wetlands or to develop a transitional habitat (grassland or scrub/shrub) within this disturbed area. The forested area consists of mature forested wetlands. This area possesses some restoration potential. This site remains as a potential restoration site for future basin-wide opportunities. There is, however, no local proponent for sponsorship of restoration and the site was dropped from further consideration.

4.6 Future Restoration Potential

Although the seven potential restoration sites did not survive the initial screening of alternatives, there may be opportunities in the future to restore some of the sites identified in this study. The recently initiated Passaic River, New Jersey Environmental Restoration Study may develop basinwide initiatives that could include some of these sites. For most of the sites, it is likely that restoration action would be feasible (technically, economically, and institutionally). However, a lack of local support for restoration action (by landowners, stakeholders, or potential project partners) and the limited scale of the potential sites led to elimination of most of the restoration sites considered in this investigation.

5. THE RECOMMENDED PLAN

Alternative 4 is the Locally Preferred Plan (LPP) and the recommended plan. The LPP will provide flood damage reduction for events with an exceedance probability of approximately 1 percent (100-year event). The plan consists of one levee/floodwall system with two sluice gate closure structures on the western side of the Township and a sluice gate closure structure and a limited road raising on the eastern side of Township. The alignment of the line of protection was refined based on physical, environmental, and economic criteria. The optimal alignment was identified by:

- Avoiding and minimizing adverse effects on study area wetlands,
- Following high ground to the extent possible to minimize floodwall/levee costs, and
- Protecting flood-prone structures, which are located in high-density concentrations.

This section of the report describes the design, project costs, and benefits of the LPP.

5.1 Line of Protection Description

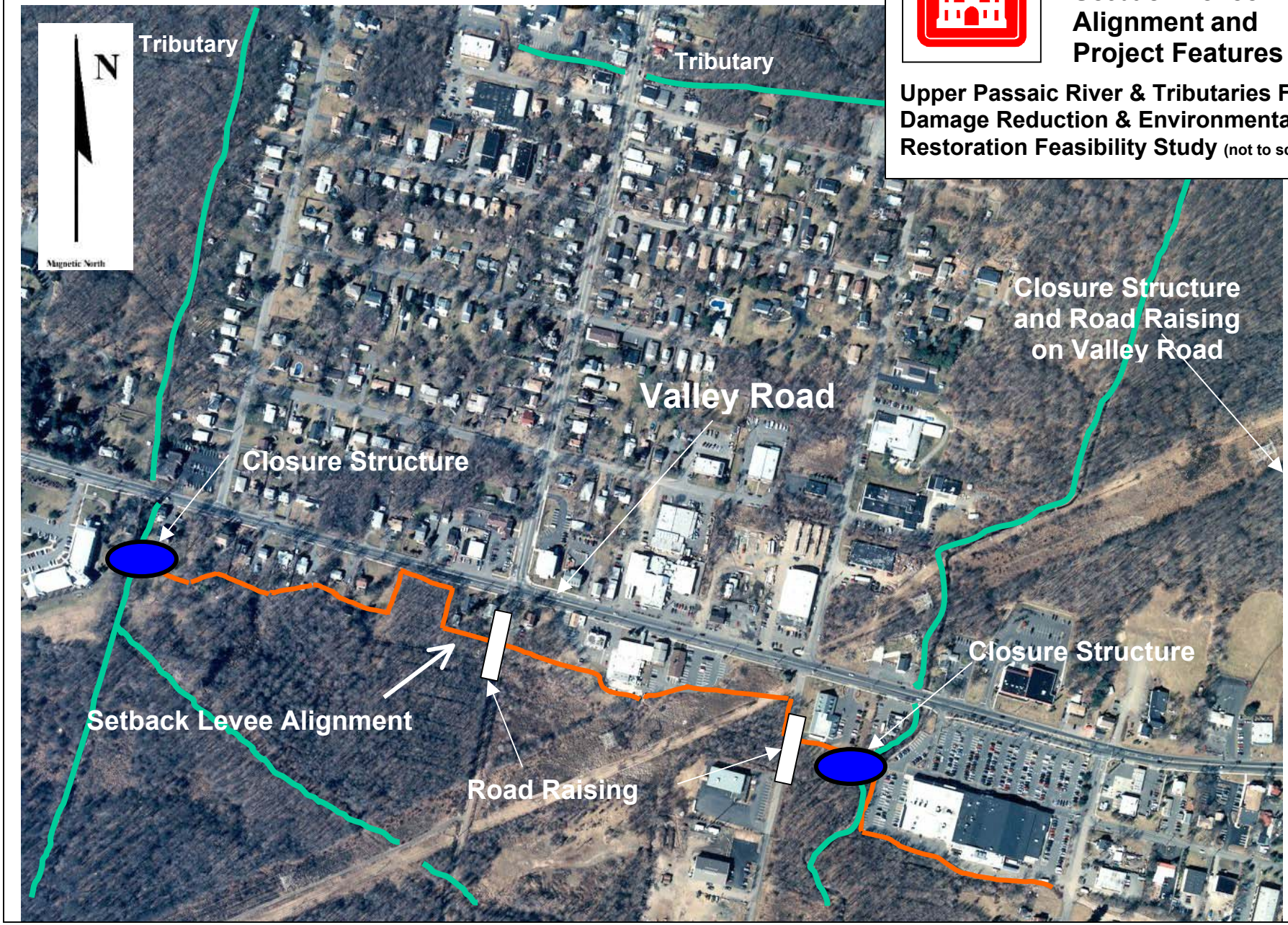
The two elements of the project are designated as: the Western Segment and the Eastern Segment. Because the protected areas are not subject to interior flooding from surface runoff from rainfall, no interior drainage facilities are provided other than drainage swales located along the levee/floodwall. The location of each of the elements and associated features are described below. Figures 5-1, 5-2, 5-3, and 5-4 show the project features. Figure 5-1 is an aerial overview of the alignment, and plan views shown in Figures 5-2 through 5-4 beginning at the westernmost portion of the alignment proceeding to the east.

Western Segment: The Western Segment of the line of protection is located south of Passaic Valley Road and runs roughly parallel Passaic Valley Road between the Loudenberry Meadow Senior Condominium Development and Poplar Avenue. Top of protection is at elevation +216.7 ft and 216.2 ft NGVD, depending on location. The grade elevations along the entire line of protection range between +210.8 and +214 ft. NGVD excusive of the ends. The height of protection above grade ranges between 2.2 feet and 5.4 feet going to 0 feet at either end. The levee section has a 12-ft. wide crest with side slopes of 3 ft. horizontal to 1.0 ft. vertical and a maximum height of 4.5 feet. Due to its relatively low height, no core or cutoff wall is required. The floodwall reaches consist of continuous watertight vinyl or steel sheet pile driven 10 feet into the soil.

The 4,057 linear foot line of protection has a total of 3,996 feet of floodwall and 61 feet of levee. The line of protection begins at Station 0+00 at the northwestern end as a levee starting at a point approximately 280 feet south of Passaic Valley Road in the Loudenberry Meadow Senior Condominium Development. There will be maintenance vehicle access to the top of the levee at this point. The levee then extends in an easterly direction to a stream channel which also corresponds to the edge of the condominium property. The top of levee is at +216.7 NGVD. A sluice gate structure housing a 4ft x 4ft sluice gate in a concrete structure will be located adjacent to the levee, and will extend through the channel to a point approximately 15 feet east of the channel. At the eastern terminus of the first sluice gate, the line of protection continues as a floodwall (selected to minimize damage to wetlands). The wall runs in an easterly direction for

FIGURE 5-1
Setback Levee Alignment and Project Features

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study (not to scale)



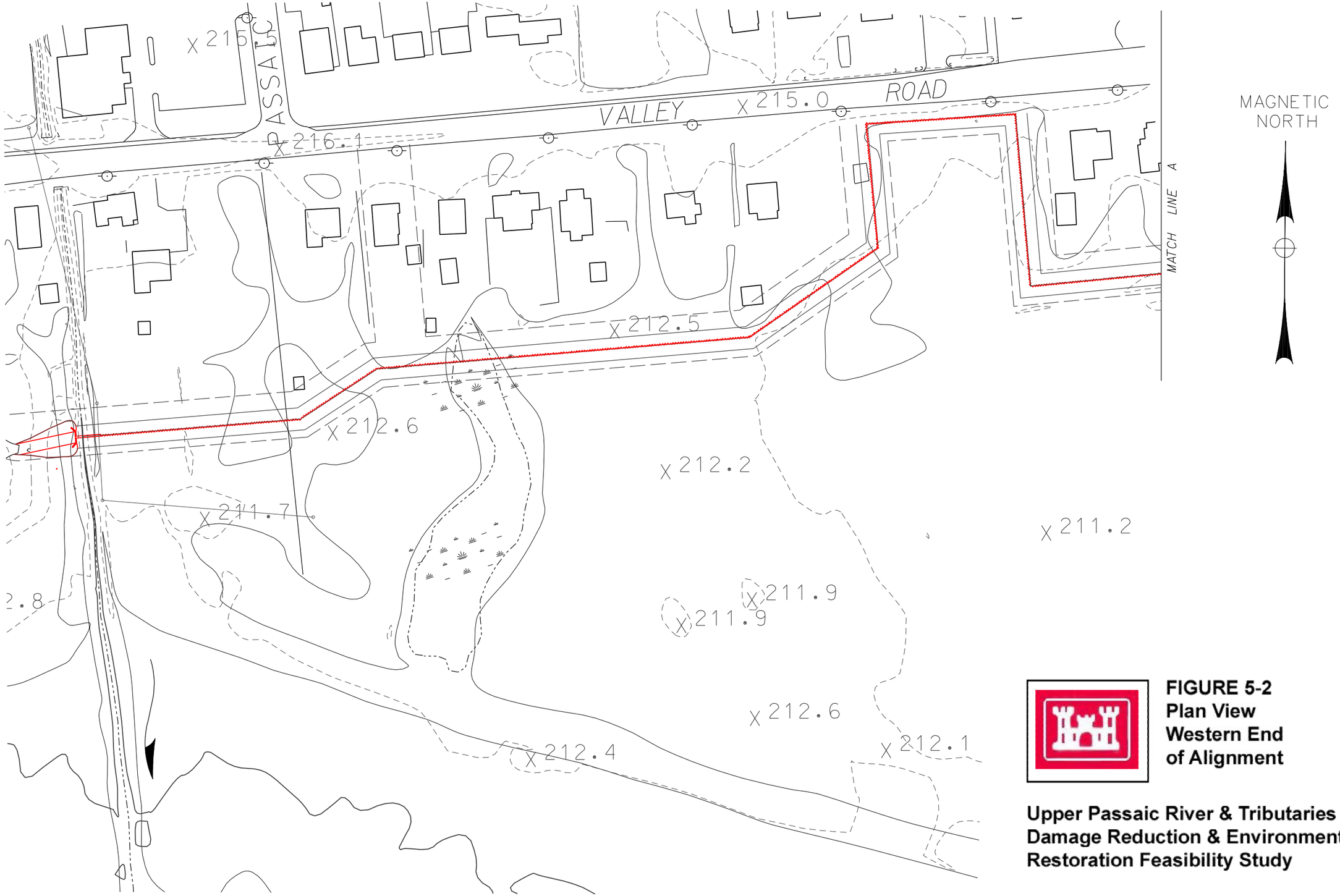


FIGURE 5-2
Plan View
Western End
of Alignment

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study

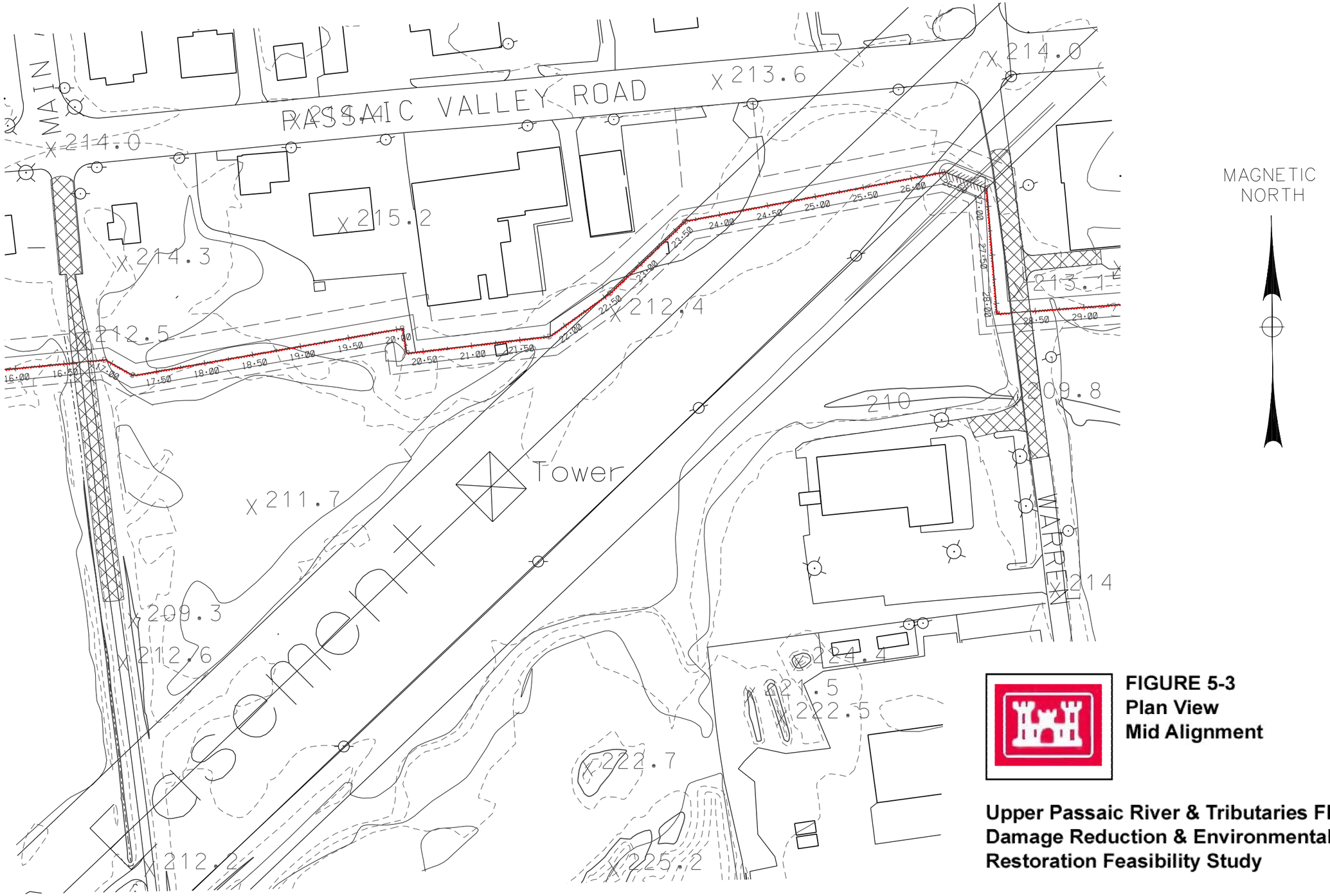


FIGURE 5-3
Plan View
Mid Alignment

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study

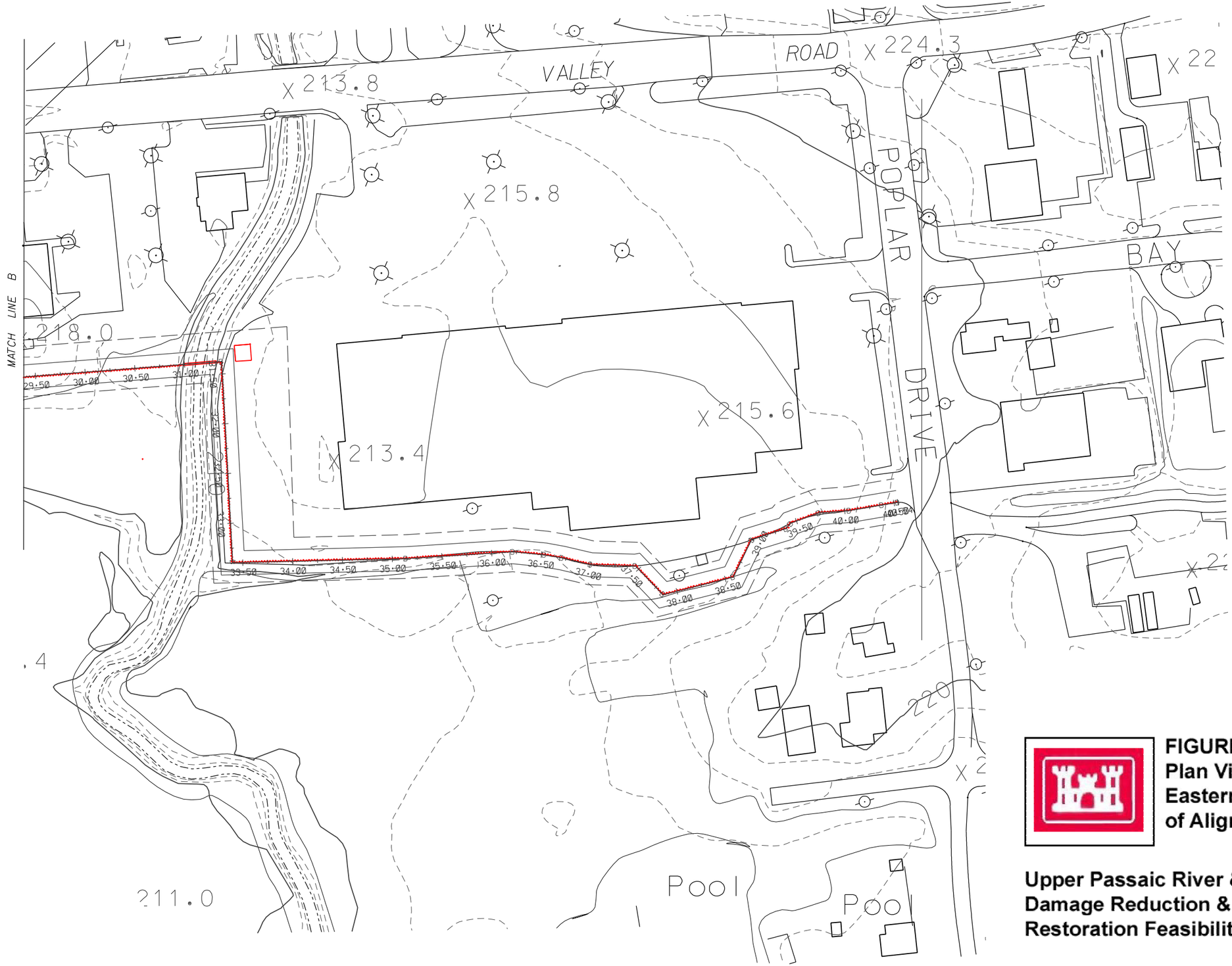


FIGURE 5-4
Plan View
Eastern End
of Alignment

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study

approximately 210 feet where it turns to the northeast and continues on for 90 feet. The wall then turns back to an easterly direction for approximately 145 feet before turning back to the northeast for approximately 130 feet then back to an easterly direction for 210 feet. At that point, the wall turns north for approximately 135 feet to a point 15 feet south of Passaic Valley Road. Up to this point, the top of wall elevation is +216.7 NGVD. Upon reaching this point, the wall turns east for 220 feet before turning south. This segment of the wall is at elevation +216.2 NGVD and is an overflow section. After turning south, the wall elevation returns to +216.7 NGVD and continues south for 180 feet then turns east for 245 feet, crossing South Main Street.

At South Main Street, the road is raised to cross over the wall to provide vehicular access. The elevation of the road crossing is +216.2 NGVD. Fifteen feet east of South Main, the wall turns to the southeast for 30 feet before turning back to an easterly direction for 270 feet. At this point, the wall elevation changes to +216.2 NGVD and turns to a southerly direction for 25 feet then turning in an easterly direction for 140 feet. The wall then turns to the northeast for 175 feet then turning in an easterly direction for 265 feet through the PSE&G easement.

Upon entering the Transco Gas Pipeline easement, the wall ends and a 40 foot levee segment crosses the easement, running in a southeasterly direction. The levee segment allows crossing of the pipeline and is at elevation +216.7 to limit damage due to erosion in the event of an overtopping. Upon exiting the easement, the floodwall resumes, and continues in a southerly direction for 125 feet, parallel to Warren Avenue. The wall elevation is +216.2 NGVD. The wall then turns easterly for 270 feet to a 16 foot wide concrete sluice gate structure containing 2 5ft x 7ft sluice gates.

Warren Avenue is raised over the wall to provide access to Municipal facilities south of the wall. The floodwall resumes heading south from the sluice gate structure for 195 feet along the western edge of the supermarket parking lot. The wall then turns in an easterly direction for the final 714 feet, generally following the edge of the parking lot with the exception of a shift to the south to allow the inclusion of an electric transformer.

Eastern Segment: The Eastern Segment of the line of protection is located along Valley Road, east of Western Boulevard. This segment consists of a 12 foot long concrete sluice gate structure on the stream with vinyl or steel sheet piling to tie it into the road embankment. Valley Road is raised to a minimum elevation of +216.2 NGVD to act as a levee. In order to achieve proper roadway vertical curve geometry, 780 feet of Valley Road will be repaved, along with portions of two driveways and a parking area.

5.2 Levee Design

The height of the levee will vary from one to five feet. A five foot high typical levee structure with 3H:1V side slopes and a 15 feet wide top was analyzed for slope stability using the STABL program. Rapid draw down conditions were assumed for the worst-case hydrologic conditions, although these conditions may be unrealistically conservative for typical flooding which is likely to be too brief to fully saturate the embankment. The preliminary location of the levee is between Station 0+00 and Station 3+50. Seepage below the levee will be negligible because of the low permeability clay foundation. Seepage through the levee will also be negligible if locally available clay is used as borrow material. Engineered fill consisting of clay typical of the area was the assumed embankment material. The simulated conditions yielded a global factor of

safety of 3.1 under static conditions, well above the required 1.5 factor of safety generally required for embankments.

5.3 Floodwall Design

Vinyl or steel sheet piling, driven by means of a protective mandrel, was evaluated for use as a floodwall structure. Actual wall height will vary from one foot to a maximum of five feet.

The section analyzed consisted of a five feet high freestanding wall segment, reaching from the ground elevation of +212 NGVD to a top-of-wall elevation at +217 NGVD. The buried segment of the wall penetrates to eleven feet below the assumed ground surface to a tip elevation of +201 NGVD. The water level was assumed to be at the top-of-wall for the simulated worst-case conditions, using the properties of 950 vinyl sheet piling in the failure analysis. The maximum moment induced on the sheet piling was well within the allowable range. With an embedment depth of 10.8 feet, the deflection of the freestanding segment, with no tiebacks, was slightly over 1.0 inches. A typical retaining wall section and the extent of the proposed floodwall structure and associated calculations are provided in the Geotechnical Appendix of this Feasibility Report.

To prevent leakage in the joints between the sheeting, a gasket or sealant can be used. Hydrophilic sealers are applied before pile installation and expand when in contact with water. The longevity of these sealers needs to be investigated further in the PED phase.

Given the relatively low height of the levee/floodwall, it is not expected that its presence will block the viewshed. In addition, wooden fencing will be installed along the dry side of the floodwall in order to provide a less obtrusive view of the structure, and maintain the residential character of the project area.

5.4 Geotechnical Analyses

A Test Drilling Program was performed on 29-30 October 2002, in which eight (8) test borings were completed along the proposed levee/floodwall alignment, totaling 179 lineal feet (specific locations and test boring records are provided in the Geotechnical Appendix). The boring depths varied from 14.0 to 25.0 feet. Continuous and representative samples of each soil type were collected in a clear plastic liner for general examination and laboratory testing. Groundwater depths, if encountered, were noted on the test boring records. Test borings were backfilled with bentonite and cement upon completion, and no undisturbed samples were taken for this phase of the project.

Topsoil was absent in three (3) borings, reached a maximum of 1.0 ft in an additional boring. One boring encountered 0.5 ft of buried topsoil, classified as Peat, at a depth of 2 feet. Glacio-lacustrine deposits, sediments deposited from glacial Lake Passaic, were encountered in all of the borings and ranged from 7.0 ft thick to at least 25.0 ft thick (total depth of boring) in three additional borings. The glacio-lacustrine deposits were described as either silt, silty clay or clay. A notable change in color of the glacio-lacustrine deposit occurred between depths of 13.5 and 17.5 feet three borings. The soil changes from a reddish brown, above, to gray and grayish brown, below. The reddish brown soils ranged from medium stiff to hard, whereas the gray and grayish brown soils ranged from soft to very stiff. The average range of consistency of the soils was stiff to very stiff. Moisture contents varied from moist to wet, with an average condition as moist.

5.5 Hydrology and Hydraulics

The hydrology and hydraulics were reviewed and modified for the with-project floodwall/levee conditions and existing watershed conditions. The with-project flood plain is shown on Figure 5-5. The top of the floodwall is at the 100-year water surface elevation of 216.2 (the 100-year WSELs actually vary between 216.3 on the upstream end to 216.1 on the downstream end which will be accounted for in final design). A HEC-HMS model was developed to measure the impact of removal of the flood plain storage behind the floodwall (approximately 1,490 acre-feet) for floods up to the 100-year event. (the storage removed is approximately 4.35 % of the total runoff volume from the 100-year storm). Resulting increases in discharge vary between 2-3% downstream of Stirling. These higher discharges were incorporated in a HEC-RAS model which confined the flow to south of the floodwall (revised effective flow area) and resulted in maximum 100-year water surface increases of 0.1 feet which meets New Jersey Department of the Environment allowable increases for encroachment in the flood plain.

Because there is no freeboard on the floodwall, it can not be said with any certainty that the floodwall will prevent flooding from the 100-year event. Therefore, it may not be credited as providing protection from the base flood shown on FEMA's Flood Insurance Rate Maps.

For future watershed development based on a 2050 planning period, it is expected that 100-year flood elevations will increase flood by 0.1 to 0.2 feet. Therefore, the level of protection provided by the floodwall is not expected to be seriously compromised in the future. If desired, the top elevation of the floodwall can be increased by this amount without any significant costs to the project.

For the with-project condition (floodwall), Passaic River floodwaters will be allowed to enter into the interior drainage areas through the opened sluice gates to flood wetland areas up to the 3-year Passaic River flood level of 211.0. The flood warning system will be used help in making decision about opening or closing the sluice gates by estimating determine the severity of an occurring event. If it is predicted that a storm will significantly exceed the 3-year event, then the sluice gates must be closed immediately to reserve storage of interior runoff. During periods of dry weather, the sluice gates could be closed to pond water from interior runoff to help hydrate the wetlands in the interior areas.

5.5.1 Interior Runoff

Several small tributaries drain through the study area and flow into the Passaic River. The upstream drainage boundaries of these tributaries are Long Hill Ridge. These tributaries do not have large drainage areas (1 to 2 square miles). Rainfall on Long Hill runs off quickly, discharging into low-lying areas at the base of Long Hill to the east and west of the central Stirling business district. Channels currently exist that interconnect the low-lying areas, allowing stormwater to "mix" from several of the tributaries during heavy rainfall events.

Valley Road acts as a barrier to local stormwater flowing to the Passaic River. Tributaries discharge to three culverts that pass the local storm flows beneath Valley Road. These tributaries continue 1,000 to 2000 feet below Valley Road to the Passaic River in small natural channels. An additional culvert under Mountain Road conveys tributary flow east to the Passaic River.

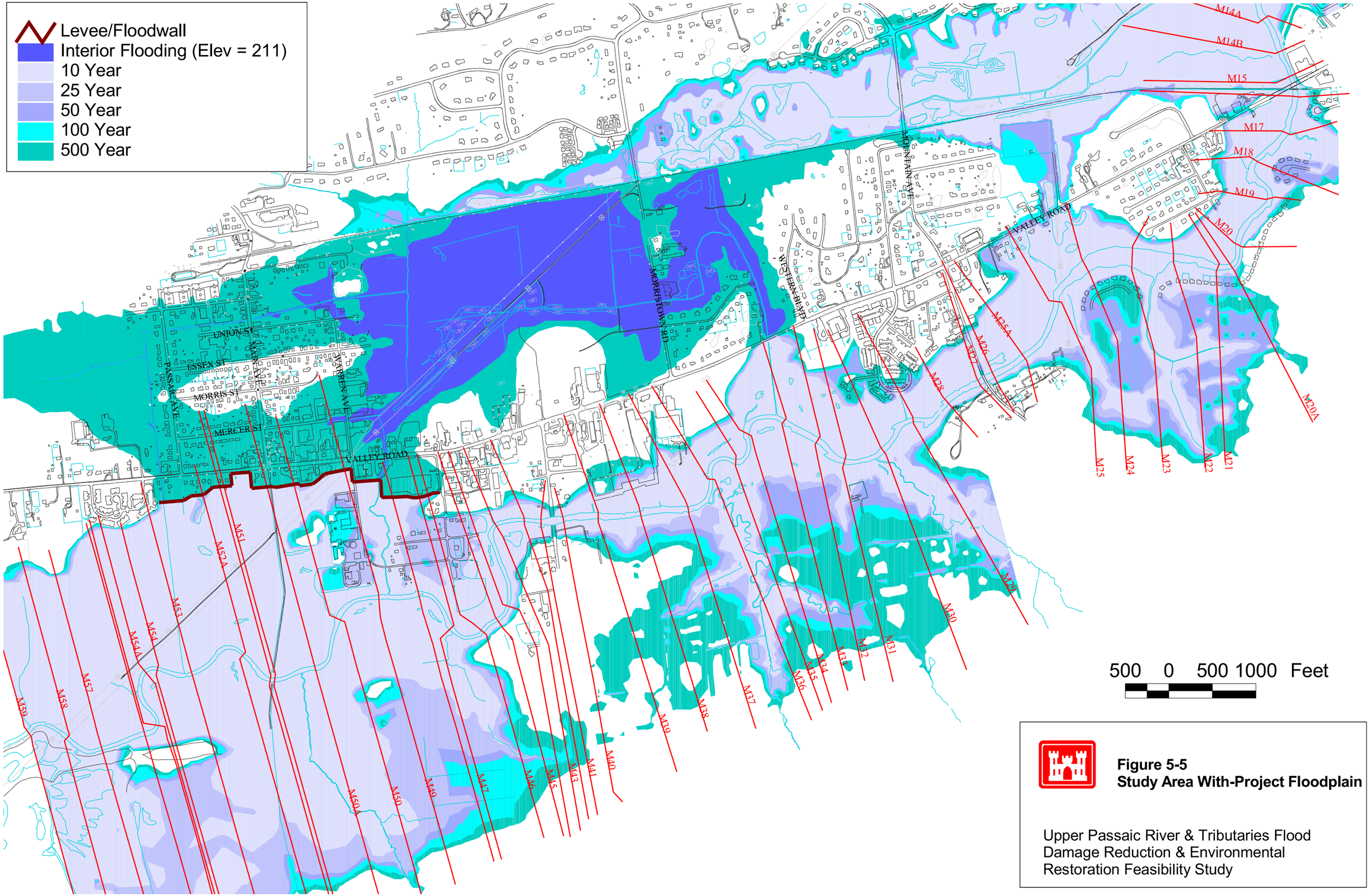


Figure 5-5
Study Area With-Project Floodplain

Upper Passaic River & Tributaries Flood Damage Reduction & Environmental Restoration Feasibility Study

The timing of interior drainage with flooding on the Passaic River is an important factor. Local officials report that coincident flooding is likely. However, given the large drainage area and long time of concentration of the Passaic River (84 square miles) compared to the relatively small drainage area and short time of concentration of the tributaries (1 to 2 square miles), coincident flooding appears unlikely. Further, runoff from the upper Passaic River basin will be attenuated by the large storage volume in the Great Swamp. This will further delay and attenuate the peak discharge on the Passaic River. The local floodwaters coming off of Long Hill are attenuated in the low-lying areas at the base of the hills.

Hydraulic analyses (see Appendix A) determined that interior runoff in the absence of tailwater from the Passaic River does not cause flooding. The analyses also showed that the peak flow in Passaic River near Stirling occurs about 24 hours after the initiation of rainfall. The peak stage occurs on the Passaic about 60 hours after rainfall.

The analyses demonstrated that minimum facilities would be sufficient for interior drainage. The interior elevation peaks at about 24 hours, and takes up to 55 hours to recede for the condition of no tailwater - the interior water surface elevations will have receeded by the time the Passaic River peaks. The strategy outlined in EM 1110-2-1413 follows the premise that interior facilities will be planned and evaluated separately from the line-of-protection, and should provide adequate drainage at least equal to that of the existing infrastructure. The LPP as designed represents the minimum drainage facilities required to implement the line-of-protection plan.

5.5.2 Interior Drainage

The interior drainage facilities were planned and evaluated separately from the line-of-protection in accordance with Engineering Manual (EM) 1110-2-1413, *Hydrologic Analysis of Interior Areas*. First, the minimum drainage facility plan or minimum facilities plan was identified. The minimum facilities are the starting point from which additional interior drainage facilities were compared. The EM states that the minimum facilities should provide interior flood relief such that during low exterior stages, the storm drainage system will function as it did without flood protection in place. The minimum facilities represent the drainage conditions required so that no flooding is induced by construction of the line-of-protection.

Closure structures are necessary to control backflow from the Passaic River beyond the line-of-protection. Under normal conditions the closure structures will remain open and the tributaries will drain normally. During times of Passaic River flooding, the tributary closure gates will be closed to prevent backflow from the Passaic River behind the line-of-protection. Closed control structures will trap local runoff behind the line-of-protection.

An analysis was performed of the interior drainage with the floodwall in-place. The analysis showed that the 50- and 100-year interior flood elevations without any pumping or gravity drainage are 211.5 and 211.9, respectively. The pump requirements to lower the interior flood elevations to the elevation where interior damages begin (211.0) for the 50- and 100-year are 25 cfs (11,220 gpm) and 55 cfs (24,685 gpm), respectively. Both these analyses (with and without pumping) assume no gravity outflow. In reality, the interior drainage runoff nearly always peaks before the Passaic River peaks allowing some gravity drainage before the river stages are too high to allow gravity drainage. Therefore, these numbers (interior flood elevations and pumping requirements) are conservatively high. To provide facilities for local improvements, a small

concrete pad will be provided at one or more of the sluice gate locations to accommodate portable pumps.

5.6 Real Estate

As described in the Real Estate Plan (Appendix G) and summarized in Table 5-1, the estimated total acreage required for the LPP is approximately 18 acres, comprised of approximately 25 affected tracts and 18 affected ownerships. Costs were estimated using a April 2003 valuation (Gross Appraisal). Project real estate requirements would be met using permanent easements and fee simple purchase. Mitigation real estate requirements[2] would be met via fee simple purchase.

Table 5-1
Lands, Damages and Relocations

Permanent Easement	1.554 acres	$ 15,100
Temporary Easement (for construction)	2.933 acres	$ 52,200
Severance Damages		$ 26,800
Fee Simple Purchase (for mitigation)	13.14 acres	$ 79,200
Subtotal	17.92 acres	$ 173,300
Facility Relocations (Road Raisings to act as closure structures)		$ 163,738
	Administrative Costs	$ 151,100
Contingency (25% of lands & damages and administrative costs)		$122,035
	Total (17.92 acres)	**$610,173**

5.7 Economics of the LPP

A detailed cost estimate was developed for the LPP using the Microcomputer Aided Cost Engineering System (MCAES) program. Project implementation costs include: pre-construction engineering and design (PED); real estate acquisition; project construction; construction management / supervision and administration (S&A); wetlands mitigation; cultural mitigation; escalation; and contingencies. A summary of the cost estimate for the LPP is provided in Table 5-2. The change in costs for the LPP from those shown in Table 3-6 reflect the final feasibility level design and MCACES cost estimate prepared for the LPP. The detailed MCACES cost estimate is included in the Cost Engineering Appendix provided with this report. The costs of the LPP and mitigation plan are summarized below.

[2] While land requirements for mitigation are introduced here, the mitigation plan is part of Section 6: Environmental Consequences

Table 5-2
MCACES Cost Estimate – Locally Preferred Plan

Item	Cost	Contingencies	Total Cost
01 Lands & Damages	324,400	81,100	405,500[3]
02 Roadway Relocations	163,700	40,900	204,600
03 Mobilization & Site Prep	234,000	58,400	292,400
06 Wetlands Mitigation	325,600	81,400	407,000[4]
11 Levees and Floodwalls	1,579,300	394,900	1,974,200
15 Tributary Closures	437,600	109,400	547,000
30 Engineering and Design	750,000	187,500	937,500
31 Construction Management	300,000	75,000	375,000
Total Cost of LPP	4,114,600	1,028,600	5,143,200

Table 5-3 shows the project economic summary for the LPP. The plan has total average annual costs of $ 319,560, total average annual benefits of $576,600, a benefit-cost ratio of 1.8 to 1, and annual net benefits of $ 257,040.

[3] Includes $119,700 for NJDEP compensatory mitigation real estate requirements, which are not considered part of Total Project Costs. See Section 6.15 for a discussion of mitigation requirements.
[4] Includes $203,250 for NJDEP compensatory mitigation construction costs, which are not considered part of Total Project Costs. See Section 6.15 for a discussion of mitigation requirements.

Table 5-3
Project Economic Summary for the LPP
April 2003 Price Level, 5.625% Discount Rate
50 Year Period of Analysis

Costs	
Total Costs	$ 5,143,200
Less: NJDEP Compensatory Mitigation[5]	$ 322,950
Total Project Costs	$ 4,820,250
Interest During Construction[6]	$ 160,030
Total Investment Costs	**$ 4,980,280**
Annualized Investment Costs	$ 299,560
Annual Operations & Maintenance Costs	$ 20,000
Total Average Annual Costs	**$ 319,560**
Benefits	
Residential Damage Reduction	221,100
Non-Residential Damage Reduction	290,500
Emergency Savings	16,800
Transportation Cost Savings	48,200
Total Average Annual Benefits	**576,600**
Benefit to Cost Ratio	**1.80**
Net Benefits	**257,040**

[5] See Section 6.15.1 for a discussion of mitigation requirements.
[6] Calculated on Total Project Costs, which are equal to Total Costs minus NJDEP compensatory mitigation costs.

6. ENVIRONMENTAL CONSEQUENCES

Consistent with CW Planning Guidance (EP1165-2-1, ER1105-2-100), EO 11990, NEPA and CEQ regulations, plan formulation of flood damage reduction features have avoided adverse project effects (project implementation or O&M) to the fullest extent practicable. When adverse effects could not be avoided, they were minimized. The minimal adverse effects resulting from project implementation or O&M will be mitigated in accordance with guidelines and regulations listed above in addition to Section 401 of the Clean Water Act, the NJ Flood Hazard Area Control Act and the NJ Freshwater Wetlands Protection Act. Following is a summary of anticipated adverse effects of the environmental consequences anticipated to accompany the recommended alternative for flood damage reduction.

The discussion of environmental effects of flood damage reduction alternatives focuses on the selected flood damage reduction plan. The discussions describe the anticipated effects of this plan relative to benchmarks provided by the no-action alternative.

Direct impacts to wetlands resulting from the levee/floodwall installation would be limited to the footprint of the floodwall/levee and its associated rights-of-way. The levee/floodwall design includes closure structures on tributaries that would continue to allow hydraulic flow to the wetland areas located on the un-protected side of the levee/floodwall. The only time the hydrology of these wetland areas would be affected is during lower frequency storm events when the closure structures would be activated to prevent flooding on the protected side of the levee/floodwall. No long term changes to the existing hydroperiod of the wetlands located south of the proposed flood control structure are anticipated. Consequently, impacts to these wetland areas would be temporary and minor, and would not require mitigative measures.

The ponding areas were designed to maximize use of existing wetland and/or low-lying areas. Impacts associated with the interior drainage areas may result in a conversion in wetland cover type but not a loss of wetlands. The following sections identify the temporary and long-term beneficial and adverse impacts associated with the selected flood damage reduction measures.

6.1 Physical Setting

Impacts on geology, topography, and soils resulting from construction and maintenance of the selected alternative are expected to be minimal. No impacts on geology will occur because bedrock elevations would be below the depth of proposed excavation, fill, and structure foundations. A change in topography would occur, but is expected to be minimal. The levee/floodwall would be constructed of clean fill to a height of +216 NGVD.

Soil erosion is expected to be minimal during construction because the surrounding topography is flat, reducing stormwater runoff capability. No significant or long-term impacts would occur on native soil grain size, structure, nutrient status, or organic matter content, because only clean material will be used for levee construction. In addition, soil erosion and sedimentation would be minimized during construction through the use of a soil erosion and sediment control plan.

6.2 Climate and Weather

Climate and weather will not be adversely affected by construction and maintenance of the flood damage reduction measures.

6.3 Water Resources

Construction and maintenance of the proposed flood damage reduction measures would have no adverse impact to regional hydrogeology and groundwater resources, as no fill or excavation would take place below the ordinary high water mark.

6.3.1 Surface Water Resources

Surface water quality will be temporarily impacted during construction of the tributary closure structures, and levees/floodwalls because of increased suspended sediments in the water column. However, best management practices for erosion and sediment control will be implemented during construction to reduce any potential runoff, sedimentation or turbidity into the tributaries or the Passaic River as a result of the proposed project.

Closure Structures: A temporary running stream diversion would be installed prior to the closure structure installation. This stream diversion will continue to convey flowing water around the work area during construction, which allows aquatic and wetland dependant wildlife continued passage during construction.

Levee / Floodwall: Implementation of the levee/floodwall would result in no greater depths and duration of flooding south of the floodwall/levee for any flood event that would have inundated this area at its present elevation. No impact will occur to the hydroperiod and/or vegetative composition of the flood plain forest and other wetland habitats located south of the floodwall/levee.

6.3.2 Wetlands

Long-term effects of the selected flood damage reduction plan include changes to vegetation cover types due to the construction and maintenance of the levee/floodwall and tributary closure structures. Specifically, a total of 1.10 acres of wetland habitat will be permanently impacted in order to construct the floodwall/levee, closure structures and permanent access and maintenance right-of-way.

In accordance with Section 401 of the CWA, National Environmental Policy Act, CEQ, CW Planning Guidance, EO 11990, stream encroachment, and NJ Freshwater Wetlands Protection Act regulations, the project was designed such that the levees/floodwalls would avoid and minimize impacts to wetland areas to the maximum extent practicable. Several iterations of the selected plan were developed during the mitigation process. Each iteration successively reduced overall freshwater wetland. Additionally, the final two iterations were designed to avoid impacts to highly functional and valuable forested wetlands and direct unavoidable impacts to less functional wetland areas within the project corridor. The selected plan removed all but the western 61 linear feet of levee and replaced it with floodwall. Although this change served to increase aesthetic impacts to lots 18 and 18.01 and overall project cost, it reduced the total wetland impacts by .07-acres. Therefore, the selected plan was designed such that the levees/floodwall would avoid and minimize impacts to wetland areas to the maximum extent practicable. However, there were several areas where it was not possible to avoid wetland impacts due to engineering constraints. The proposed mitigation plan will offset these impacts (see Section 6.15).

6.4 Wildlife Resources

Construction of the proposed flood damage reduction measures could have minor, short-term impacts on fish and wildlife habitat and populations occurring within the project corridor. During construction, the clearing and grading of work areas could result in the loss of aquatic, vegetative, and some subsurface cover due to the excavation and movement of soil. These construction activities could result in the temporary and permanent loss of habitat and possible mortality of less mobile, burrowing, and/or denning species of common wildlife such as small rodents, snakes, turtles, and amphibians. During the construction period resident species and transient wildlife may seek refuge in adjacent habitats until the project is completed. Following construction, wildlife species are expected to resume their normal habits consistent with post-construction habitat availability in and around the study area. In addition, impacts to wildlife will be compensated through implementation of the selected mitigation plan.

6.5 Threatened and Endangered Species

Minor and temporary impacts to State threatened and endangered species habitat (barred owl and red-shoulder hawk) may occur due to the construction of the proposed levee/floodwall and tributary closures. Additionally, the proposed floodwall is situated adjacent to an area that was identified as "potential" bog turtle (*Clemmys mulhenbergii*) habitat by the FWS.

The results of the Phase I and Phase II Bog Turtle Surveys indicated that there is not a population of bog turtles located within the project corridor. Furthermore, the results of these surveys indicated that the potential bog turtle habitat identified by FWS is not suitable for bog turtle and went on to state that " It would be almost impossible for bog turtles to nest anywhere along the right-of-way or in the surrounding hardwood floodplain forest due to the hydrologic influence of the Passaic River…". Although these conclusions were reached, the floodwall was re-configured to reduce impacts to the *Phragmites* dominated emergent wetlands identified as potential bog turtle habitat. An inspection of this portion of the floodwall corridor would be completed by a qualified herpetologist prior to construction. Such a herpetologist may also be present on-site during construction of this portion of the floodwall if required by FWS. Furthermore, the construction of this portion of the floodwall will not take place during the turtles dormant season (September 15 – April 15)

The Phase I and II bog turtle survey was conducted in accordance with the USFWS requirements for bog turtle habitat and presence/absence surveys. The results of these surveys were accepted by FWS and NJDEP non-game fish and wildlife. The State of New Jersey and the ACE will continue to coordinate with FWS regarding residual bog turtle issues during construction.

Barred owl (*Strix varia*) was observed approximately 1,000 feet south of the proposed floodwall alignment. This species prefers wooded environs for perching, nesting, and feeding. Therefore the floodwall alignment has been adjusted to avoid impacts to intact upland and wetland forest. Individual barred owl's may be displaced temporarily during construction. Impacts to the owl's habitat are not anticipated and temporary construction impacts to individuals is expected to be minimal due to their high tolerance of human presence and the presence of large areas of suitable habitat located adjacent to the project corridor.

In some cases, the disturbance created by construction activities would lead to the temporary displacement of these species (e.g., red shouldered hawk, wood turtle) which would necessitate

their finding refuge elsewhere until construction is completed. In other cases, impacts to habitat would lead to permanent displacement, which would necessitate their finding refuge elsewhere. Trained biologists qualified in the identification of threatened and endangered species will inspect the project corridor prior to construction and will also be on-hand during the construction phase. During construction, biologists will ensure that no threatened and endangered species are harmed and that impacts to habitat are minimized to the greatest extent possible.

6.6 Air Quality

Minor, yet temporary impacts to air quality are projected to occur in areas immediately adjacent to the site of the proposed flood damager reduction project. The primary source of air pollution will result from construction equipment. Construction related air quality impacts would be temporary; as they will be confined to the time required to construct the proposed improvements and will not continue during the operational phase. Additional air quality controls will be instituted throughout the life of the proposed action to minimize any potential adverse effects. Construction related air pollution is not anticipated to pose a significant environmental impact to the surrounding area.

6.7 Cultural and Historic Resources

A cultural resources investigation was undertaken to bring the selected flood damage reduction plan into compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. As a Federal agency, the Corps has certain responsibilities concerning the identification, protection and preservation of significant cultural resources within the Area of Potential Effects (APE) of any proposed project. Significant cultural resources are any material remains of human activity that are listed on, or eligible for inclusion on, the National Register of Historic Places (NRHP). Other statutes and regulations authorizing the Corps to undertake these responsibilities include Section 101 (b) (4) of the National Environmental policy Act of 1969 and the Advisory Council Procedures for the Protection of Cultural Properties (36 CFR Part 800).

Background research indicated that there are no previously identified cultural resources within the project area. The sensitivity for Native American resources was considered low due to the fact the area was low-lying and wet, having been formed from the draining of Glacial Lake Passaic. Native American sites identified near the Passaic River in the project vicinity through other studies were located on terraces or knolls above the low-lying land. There are no natural areas of high ground within the study area and all dry land was found to consist of man-made fill. Historic map research indicted no structures within the project area suggesting that the potential for historic archaeological sites was limited.

Fieldwork was conducted on November 15 and 16, 2002, and was carried out by Corps staff under the supervision of the project archaeologist. Soils were excavated in accordance with the encountered stratigraphy and taken to natural subsoil. In certain instances impenetrable fill was present and it was not possible to excavate to subsoil. All soils were screened through 1/4-inch hardware mesh. All cultural materials recovered were modern and were noted and discarded in the field. No artifacts were retained. A total of 21 shovel tests were excavated along the recommended levee/floodwall alignment. Most of the tests encountered water within a few inches of the ground surface. Soils consisted primarily of clays. No significant cultural materials were encountered.

The proposed levee/floodwall alignment runs behind houses and commercial/industrial structures that front on Valley Road. East of the South Main Street is primarily commercial/industrial in nature. Modern businesses with their parking lots line Valley Road. To the west are mid-20th century dwellings.

A closure structure is proposed for an unnamed tributary at its crossing with Valley Road. The tributary is located ¾ of a mile east of the proposed levee/floodwall. The present structure is a 54-inch concrete pipe. There is evidence of stone in the area around the culvert but nothing is set in courses. Any evidence of previous structure to carry the watercourse beneath the road was destroyed with the installation of the new culvert.

No significant archaeological resources were identified. There are no historic structures within the project area. It is the Corps opinion that this project will have no effect on cultural resources and no further work is required if project plans remain as proposed. The New Jersey State Historic Preservation Officer concurred with this opinion on 28 February 2003. While unlikely, if cultural resources are encountered during construction, all work will be halted and the find reported to the Corps project archaeologist. Construction will not resume until an assessment of the resources involved has been carried out by the project archaeologist and coordination with the New Jersey Historic Preservation Office (NJHPO) has been completed.

6.8 Hazardous, Toxic, and Radioactive Waste

No HTRW issues are anticipated to arise during project implementation. Should any concerns arise during the construction phases, procedures for this contingency will be specified in the construction contract.

6.9 Socio-Economics

The flood damage reduction measures would not have significant growth-inducing, or growth-inhibiting, impacts on existing or future demographic characteristics because the area is almost completely developed. The Project will have no impact on the number, density, or racial composition of residents living within the Long Hill Township area.

The selected flood damage reduction plan would have a direct positive economic impact on existing business in the study area due to reduced potential for future flood and to access to businesses during storm events. There also will be a minor, indirect beneficial economic impact on the local economy during construction as a result of the introduction of construction workers and the resulting purchase of supplies and food during the construction phase.

The Project will have a direct positive impact on housing and structures in the study area due to a reduction in the potential for future flood damage to existing properties, and the subsequent reduction in associated costs to repair such damages. The Plan also will have a positive impact on residential property values along the Passaic River at Long Hill Township due to the reduced probability of flood damages.

6.10 Land Use

Construction of the selected flood damage reduction measures will not adversely affect the current land use in the Passaic River at Long Hill Township study area. The area's economic

growth and development will not be restricted by the levees/floodwalls since they have been specifically located in areas that are not suitable for residential, commercial, or industrial use. Implementation of the selected plan will benefit the current and future land uses in the Long Hill Township area by offering improved protection to homes, businesses, roads, churches, schools, parks, stores, and various other provided services.

6.11 Noise

Construction of the flood damage reduction measures would result in a temporary, but minor increase in noise as a result of the use of construction equipment. Minor short-term impacts on noise levels would result from the construction phase. Site preparation (generally two weeks prior to construction), construction activities, and the necessary heavy equipment are likely to produce noise levels in the 70 to 90 dBA range (50 feet from the source). These noises would be masked by the high background levels of traffic and community activity or dissipated by distance.

Noise impacts are projected to occur in areas immediately adjacent to the site of the proposed flood control improvements. While residential sensitive receptors have been identified within 100 feet of the proposed action, construction related noise is not anticipated to pose a significant environmental impact to the surrounding area.

Additional noise abatement controls will be instituted throughout the life of the proposed action to minimize potential adverse effects of construction related noise. Additional abatement can be provided through careful staging of noise intensive construction activities during daylight hours and the use of less noise intensive construction practices when possible. Construction related noise is not anticipated to pose a significant environmental impact to the surrounding area.

The projected maximum construction noise levels will not exceed the New Jersey Noise Regulation limits applicable to daytime construction. Noise generated during daytime construction would not exceed State limits, as daytime is the least sensitive period for residential land use. Other operational restrictions such as limiting simultaneous impact work to both sides will also reduce total noise levels. Equipment noise limits, which specify the use of mufflers and temporary noise barriers/curtains, may also be used if necessary. Operation and maintenance of the proposed closure structures, floodwalls, and levees would have no impact on noise.

6.12 Recreation

No long-term direct or indirect impacts to any existing or planned recreational areas after construction of the proposed flood damage reduction measures. Minor, temporary impacts associated with bird watching and hiking may occur during construction activities. Once construction is complete, there will be additional recreational opportunity such as walking, running, or biking on the easement areas adjacent to the levee/floodwall. Additional beneficial impacts include a decrease in lost recreation time as a result of flooding events.

6.13 Aesthetics

Due to the highly developed nature of the study area, the proposed flood damage reduction measures would not adversely impact the aesthetic and visual character of the Passaic River at

Long Hill Township study area. However, the earthen levee and the floodwall will create a raised linear landscape element that is different from the surrounding natural environment. The vegetation cover for the earthen levee will be different from the adjacent plant communities, and the floodwall will be a man-made feature in what was once a natural environment, creating an abrupt edge effect in both color and texture. Visual impacts of the floodwall portion of the project will be minimized by the installation of wooden fencing along the dry side of the floodwall. The fencing will provide a less obtrusive view of the structure, and will be consistent with the residential character of the project area. Additional impacts to the viewshed were minimized by limiting the height of the levee/floodwall (see plan optimization in Section 3 above)

6.14 Transportation and Other Infrastructure

Construction activities will result in minor, temporary impacts to traffic flow and volume. An increase in large slow-moving construction vehicles needed for floodwall/levee and closure structures construction will decrease traffic flow and increase traffic volume in the area. To help alleviate the temporary impacts associated with construction activities, flagmen could be available and construction signs will be posted. Upon completion of construction, no adverse impacts to local transportation systems would occur. As a project benefit, the recommended alternative will allow the local roadways to remain accessible during storm and flood events, including routine and emergency access to and from residences and businesses.

6.15 Environmental Mitigation

In accordance with both Federal guidance and Federal and State regulations, wetland mitigation is a three step process as follows: 1) avoidance of impact; 2) minimization of unavoidable impact; and, 3) compensation for unavoidable impacts. Every attempt has been made to avoid and minimize impacts to jurisdictional wetlands, transition areas, and waters of the U.S. However, implementation of the selected plan would result in 1.10-acres of unavoidable wetland impacts.

As this project is cost-shared under the Civil Works (CW) program, it is subject to the planning guidance presented in EP 1165-2-1 (30 July 99), EO 11990 on Protection of Wetlands and ER 1105-2-100 (April 2000, C.7). As such, the actions of this project must be in compliance with all applicable Federal and State laws and regulations with regard to environmental compliance. Further, it is a goal of the Corps' CW water resources development program to increase the quality and quantity of the Nation's wetlands with no net loss. Therefore, in compliance with Federal and State regulations (Section 404 and 401 of the Clean Water Act, 40 CFR 1500-15808, 33 CFR 230 and the NJ Freshwater Wetlands Protection Act) regarding mitigation and restoration of wetlands, and Section 306 of WRDA 1990 (Public Law 101-640), the recommended plan chosen by this feasibility study included all practical measures to avoid wetland impacts. Where wetland impacts were unavoidable they were minimized through shifting the proposed alignment of the floodwall and converting some distance of proposed levee to floodwall.

Both Federal guidelines and regulations and State regulations require compensatory mitigation to be provided for unavoidable impacts to jurisdictional wetlands. The Federal and State requirements also dictate that mitigation must be performed prior to or concurrent with the

proposed impacts. Another common and important requirement of both the Federal and State requirements is that mitigation must be provided on-site or along the same wetland or waterbody as the proposed impacts where feasible and practicable. Each of the seven (7) potential restoration sites described in Section 4 was evaluated for the potential to provide compensatory mitigation within the same watershed and in some cases within the same floodplain of the Passaic River. The results of the feasibility study indicated that none of the seven (7) sites examined provided viable opportunities for restoration. Therefore, a greater emphasis was placed on locating compensatory mitigation within or nearby the project corridor, given the results of the feasibility study and the Federal mandate to locate on-site mitigation where possible. CW plan guidance also requires the Corps to evaluate the least cost alternative for proposed mitigation. As such, purchasing credits form a nearby was mitigation bank was evaluated from an environmental, cost and regulatory feasibility standpoint. Although purchasing credits from a mitigation bank would be least costly, the proposed mitigation plan detailed below reflects the least cost alternative for on-site mitigation.

The estimated costs for completing off-site (banking) and the proposed mitigation are summarized below and presented in detail in Appendix D. It is important to restate that the CW program is obligated to comply with the Federal and State regulations that mandate on-site mitigation where feasible. According to the research conducted as part of this study, adequate on-site mitigation opportunities exist adjacent to the project corridor. If followed, this requirement limits the viable mitigation options for this project. Additional limitations include the chemical, biological and physical site constraints that typically dictate a successful wetland restoration design.

There is a difference between providing on-site mitigation and purchasing credits in a mitigation bank, where on-site mitigation is more expensive. However, the least cost alternative based on a function for function, value for value, on-site, compensatory mitigation strategy is reflected in the selected plan. The text presented below clearly indicates that the proposed mitigation features are justified and do not equate to over compensation for actual losses or unjustified increases in the Federal cost share.

6.15.1 On-Site Mitigation

As stated above, it was determined that enough on-site mitigation, pursuant to both Federal and State requirements, is available to compensate for proposed wetland impacts. The CW guidance and EO 11990 state that for Federal projects no net loss of wetlands should be met through the compensation of lost functions and values and not on an acre for acre or set area ratio basis. This evaluation was completed by using a functional wetland assessment to determine what functions would be lost as a result of implementing the selected plan and the Federal compensatory mitigation requirement.

Federal Compensatory Mitigation Analysis

An Evaluation of Planned Wetlands (EPW) functional assessment was conducted within the project corridor and on a reference wetland site (potential Restoration Site No. 2). The EPW analysis evaluated the capacity of wetlands within the project corridor to provide specific functions and values. A Functional Capacity Index (FCI) value was developed for each function that the wetlands within the project corridor provide. Functional Capacity Units (FCU) were

then developed to evaluate the potential loss of function associated with the proposed 1.10 acres of wetland impacts (see Table 6-1 below). The required federal compensatory mitigation was calculated by evaluating the functional capacity of a reference forested wetland (Restoration Site No. 2) and determining what mitigation acreage would be required to offset the potential loss using the FCIs from the reference site. Table 6-1 below provides a comparison of potential functional loss within the project corridor to proposed mitigation to compensate for the proposed loss.

The EPW assessment results served as a baseline reference for estimating the functional loss associated with proposed wetland impacts and to calculate the area of compensatory mitigation required pursuant to Federal regulations and Civil Works (CW) planning guidance. Estimated mitigation costs are presented in detail in Appendix D. More detailed cost estimates will be developed in the plans and specifications phase of the project.

Table 6-1
Comparison of EPW Results for Impacted Area

Proposed Functional Loss/Wetland Impact				
Function	FCI Value	Acres	FCU Value	Total FCUs
Shoreline bank erosion control	0.25	1.10	0.28	
Sediment stabilization	0.44	1.10	0.48	
Water quality	0.46	1.10	0.50	
Wildlife	0.20	1.10	0.22	
Fish-non-tidal stream/river	0.27	1.10	0.29	
Uniqueness/heritage	0.90			
				1.77
Proposed Compensatory Mitigation				
Function	FCI Value	Acres	FCU Value	Total FCUs
Shoreline bank erosion control	0.29	0.53	0.15	
Sediment stabilization	0.95	0.53	0.49	
Water quality	0.86	0.53	0.45	
Wildlife	0.82	0.53	0.43	
Fish-non-tidal stream/river	0.48	0.53	0.25	
Uniqueness/heritage	0.95			
				1.77

As a result of the EPW comparison, it was determined that 0.53 acres of wetlands would need to be restored or enhanced to compensate for the project related loss according to Federal regulations and CW planning guidance. This is based on the FCI values of the mitigation area, which most closely resemble the impacted area, i.e., a nearby forested wetland. A summary of the estimated cost of constructing the 0.53 acres of Federal compensatory mitigation (exclusive of real estate costs) is shown below in Table 6-2.

Table 6-2
Estimated Construction Cost – Recommended Mitigation Plan

Item	*Estimated Cost*
Erosion and Sediment Control	$9,200
Clearing and Grubbing	$14,800
Dewatering	$5,900
Excavation and Grading	$17,300
Hauling and Disposal	$32,800
Place Compost	$25,800
Woody Plants	$20,400
Herbaceous Plants	$16,500
Watering and Mulching	$4,700
Fencing	$15,600
Total	**$163,000**

NJDEP Compensatory Mitigation

In addition to the Federal mitigation requirements, mitigation alternatives were evaluated in accordance with the NJ Freshwater Wetlands Protection Act rules and guidelines regarding compensatory wetland mitigation. The NJDEP mandates on-site mitigation as the preferred option where feasible and practicable. On-site mitigation is performed on or adjacent to the project impact location or if not possible on the same waterbody within the same watershed as the impact location. If a suitable on-site opportunity exists for compensatory mitigation then the applicant is normally encouraged or directed, by the NJDEP, to satisfy their requirements in this manner. On-site mitigation opportunities do exist within the project corridor, though most of these opportunities exist on private property. Permanent easements would need to be obtained or these areas would need to be purchased from the property owner. If property ownership is such

that land is not available, on-site mitigation options may not be viable mitigation alternatives. In that case, off-site mitigation would be implemented in the form of mitigation banking.

Table 6-3
Mitigation Analysis for Selected Alternative (Locally Preferred Plan)

Selected Alternative 4	Wetland Impacts	Federal Mitigation Area	Raw State Mitigation Area	State Mitigation Area w/ Ratio Applied	Difference in raw acreage required by DEP
Total For Alternative 4	**1.10**	**0.53**	**13.15**	**1.04**	**12.61**

Comparison between Federal and State Compensatory Mitigation

The difference between the CW program mitigation requirements and the State requirements lies in the establishment of compensatory mitigation ratios and thus how the proposed mitigation is cost shared with the local sponsor. The CW program compensates for lost function and value while the NJDEP calculates compensatory mitigation through set area for area ratios based on mitigation type. Additionally, the CW program's reliance on compensation for lost function and value precludes the use of preservation as compensatory mitigation where in combination with other mitigation types preservation is an acceptable form of mitigation to NJDEP. As shown in Table 6-3, there is a 12.61 acre difference between CW program and NJDEP mitigation requirements.

As a result of the Federal mitigation requirements, the Corps' CW Program is responsible for their cost shared portion (65%) of 0.53 acres of compensatory mitigation. This would result in no net loss of function or value based on a comparison of equivalent FCU values as discussed above. NJDEP would be responsible for covering the cost associated with their share (35%) of the 0.53 acres of compensatory mitigation in addition to the remaining 12.61 acres required to satisfy the requirements of the NJ Freshwater Wetlands Protection Act.

6.15.2 Off-Site Mitigation

The seven restoration sites that were evaluated during the preliminary screening efforts for ecosystem restoration were subsequently evaluated for off-site mitigation potential. Each of the seven sites is described in Section 4 of this report. None of the sites offer viable compensatory mitigation either in terms of proximity to proposed impacts, ecological lift and/or overall area.

If efforts to locate or secure on-site mitigation or nearby off-site mitigation fail, an additional option, used only as a last resort, would be to purchase wetland mitigation credits from the C & C Builder's Bank. The service area for C & C Builders Bank covers the Passaic River Drainage Basin, which includes portions of Passaic, Bergen Morris, Essex, Sussex, Hudson and Somerset Counties. The bank is currently selling freshwater wetland mitigation credits for 175,000 per acre credit. Sale of the fill credits is limited to within the Central Passaic Basin. The 188-acre bank is located in Fairfield Township, Essex County, NJ. The bank includes forested, scrub-shrub and emergent wetland habitat types. The amount of wetland bank credits required to satisfy Federal mitigation requirements would have to be evaluated through an EPW functional wetland assessment of the bank. Additionally, the purchase of wetland bank credits would have

to be approved by the NJDEP as compensatory mitigation in order to authorize issuance of the 401 WQC.

6.16 Environmental Justice

In order to have potential environmental justice impacts, a proposal must have potential for disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes. This action has been evaluated for potential disproportionately high environmental effects on minority and low-income populations and there would not be a high human health or environmental impact on minority and low-income populations. The minority population within the affected area does not exceed 50 percent and there are not more minorities in the affected area than other areas of the community. Implementing any of the alternatives would not result in any change to environmental resources that individuals involved in subsistence fishing or hunting utilize. None of the alternatives would involve the release of hazardous, toxic, or radioactive materials to which minority or low-income populations could be exposed. As such, the context nature of the alternative being considered precludes the potential to create disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes.

6.17 Cumulative Impacts

Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time frame. Therefore, the cumulative impacts of an action can be viewed as the total effects on a resource or ecosystem of that action and all other activities affecting that resource regardless of the entity (federal, non-federal, or private) taking the actions. CEQ's regulations require that cumulative impacts be considered along with temporary and long term impacts in order to ensure that the range of actions considered in NEPA documents includes not only the proposed action, but also all actions that could contribute to cumulative impacts.

The direct impact of the recommended project would be to 1.10 acres of freshwater wetlands located along the project corridor. Other actions within the project corridor that have also caused adverse impacts to forested and emergent freshwater wetlands and surrounding transitional habitats included the historic construction of approximately 46 single family homes, Loudenberry Commons, several commercial facilities including the ShopRite Plaza along Valley Road within the project corridor. In addition, the Department of Public Works building complex and the wastewater treatment plant were constructed south of Valley Road on Warren Avenue. The construction of the Riverside Recreation Park, and the new Longhill Township Town Hall caused small impacts to forest, floodplain forest and wetland habitats including minor impacts to barred owl habitat.

However, like the proposed project, these actions took steps to avoid or minimize impacts, including the planting of a buffer zone along the eastern edge of Riverside Park. Ongoing wetland impacts within the project corridor take the form of manicuring jurisdictional wetlands into lawns and backyards plus maintenance of the PSE&G right-of way. Many residential dwellings have planted and maintain lawns in wetland areas. The PSE&G right-of-way was floodplain forest at one time, presently woody vegetation is prevented from re-establishing by ongoing maintenance activities. At this time, this represents a loss of wetlands in the project

corridor. Overall, these impacts have not resulted in a significant loss of wetland habitat in the project corridor.

Future potential impacts lie in plans for a strip mall east of the proposed flood wall, and several small multi-home developments on the south side of Valley Road. These projects may result in additional freshwater wetland losses, depending on their design and level of permittability. Permanent impacts include the conversion of 1.10 acres of degraded wetlands floodwall, levee and maintained right-of-way. These impacts would be compensated for by implementing the proposed wetland mitigation plans outlined in Section 6.15 above. Therefore, the limited amount of direct and indirect impacts, which will be mitigated for and the few number of projects in the area that will have impacts, it is anticipated that the cumulative impacts to the project area will be minimal.

7. PLAN IMPLEMENTATION

This report was originally prepared under the authority and budgeting criteria for General Investigations, but it is being recommended for approval as a Section 205, Flood Control, Continuing Authorities Program (CAP) Detailed Project Report. This recommendation is based on the reasons outlined below.

1. The total cost of the feasibility studies, design, and construction is within the limits of the Section 205 Continuing Authorities Program.
2. Design is expected to be approximately 18 months in duration and construction is expected to have a duration of less than one year
3. The implementation schedule would be accelerated by at least one year with a move from the standard General Investigations schedule to the Construction General authority and appropriations schedule.

As non-Federal project partner, NJDEP must sign a Project Cooperation Agreement that will carry the project through the completion of construction, which includes development of Plans and Specifications (P&S). Funds must be budgeted by the Federal Government and the non-Federal partner to support these activities. A Project Management Plan (PMP) has been prepared to identify tasks, responsibilities, and financial requirements of the Federal Government and the non-Federal partner through completion of construction. A project schedule will be established based on reasonable assumptions for the design and construction schedules.

7.1 General

The completion of this Detailed Project Report and recommendation by the District Engineer is the first step toward implementing construction of the Passaic River at Long Hill Township Flood Control project. The New York District will complete a Quality Control / Quality Assurance review, respond to comments from other agencies and interested parties, and then submit the final version of the Detailed Project Report to the North Atlantic Division Commander for approval. The project will be considered for inclusion in the president's budget on the basis of national priorities, magnitude of the Federal commitment, economic and environmental feasibility, level of local support, willingness of the non-Federal partner to fund its share of the project cost, and budgetary constraints that may exist at the time of funding.

7.2 Local Cooperation

In accordance with Section 105 (a)(l) of WRDA 1986, the Passaic River at Long Hill Township Feasibility Study was cost shared 50 percent between the Federal Government and the State of New Jersey. The fact that funds were contributed by the non-Federal project partner, NJDEP, indicates their intent to support a project for flood control at Long Hill Township, New Jersey.

A fully coordinated Project Coordination Agreement (PCA) package, which will include the non-Federal partner's financing plan, would have to be prepared subsequent to the approval of the feasibility phase. It will reflect the recommendations of this Detailed Project Report. The non-Federal partner, NJDEP, has indicated support for recommendations presented in this Detailed Project Report and its desire to execute a PCA for the selected plan. Other non-Federal interests, such as Long Hill Township, New Jersey, has indicated their support of the project.

As the non-Federal project partner, NJDEP must comply with all applicable Federal laws and policies and other requirements, including but not limited to:

- Provide all lands, easements, rights-of-way, and relocations and disposal/borrow areas (LERRD) uncontaminated with hazardous and toxic wastes.
- If the value of the sponsor's LERRD contributions, plus the 5 percent minimum cash contribution, do not equal at least 35 percent of the total project cost, then the sponsor is required to provide an additional cash contribution necessary to equal a total of 35 percent. The sponsor is required to pay the additional cash contributions during construction at a rate proportional to Federal expenditures. If the value of the sponsor's LERRD contributions, plus the 5 percent minimum cash contribution, exceeds 35 percent of the total project cost, then the Federal contribution is reduced accordingly. If the value of the sponsor's LERRD contributions, plus the 5 percent minimum cash contribution, exceeds 50 percent of the total project cost, the project is cost shared at 50 percent Federal, 50 percent non-Federal cost.
- Provide of all improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the project.
- For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, including mitigation features, at no cost to the Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and any specific directions prescribed by the Government in the Operations, Maintenance, Replacement, Repair and Rehabilitation (OMRR&R) manual and any subsequent amendments thereto.
- Provide the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal project partner, now or hereafter, owns or controls for access to the Project for the purpose of inspection, and, if necessary after failure to perform by the non-Federal project partner, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Federal Government shall operate to relieve the non-Federal project partner of responsibility to meet the non-Federal project partner's obligations, or to preclude the Federal Government from pursuing any other remedy at law or equity to ensure faithful performance.
- Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.
- Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Codes of Federal regulations (CFR) Section 33.20.

- Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law (PL) 96-510, as amended, 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the construction, operation, and maintenance of the Project. However, for lands that the Federal Government determines to be subject to the navigational servitude, only the Federal Government shall perform such investigations unless the Federal Government; provides the non-Federal project partner with prior specific written direction, in which case the non-Federal project partner shall perform such investigations in accordance with such written direction.
- Assume complete financial responsibility, as between the Federal Government and the non-Federal project partner for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the Project.
- As between the Federal Government and the non-Federal project partner, the non-Federal project partner shall be considered the operator of the project for the purpose of CERCLA liability. To the maximum extent practicable, operate, maintain, repair, replace and rehabilitate the Project in a manner that will not cause liability to arise under CERCLA.
- Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1790, Public Law 91-646, as amended by Title IV of the Surface Transportation and Unifom1 Relocation Assistance Act of 1987 (Public Law 100-17),and the Unifom1 Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the construction, operation, and maintenance of the Project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.
- Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense directive 5500.11 issued pursuant thereto, as well as Army regulation 600- 7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."
- Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement.
- Participate in and comply with applicable Federal flood plain management and flood insurance programs and comply with the requirements in Section 402 of the Water Resources Development Act of 1986, as amended.
- Not less than once each year inform affected interests of the extent of protection afforded by the Project.

- Publicize flood plain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with the protection provided by the project.
- Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms.
- Provide, during construction, any additional funds needed to cover the non-Federal share of costs.
- Grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the non-Federal project partner owns or controls for access to the project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing or rehabilitating the project.
- Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal project partner has entered into a written agreement to furnish its required cooperation for the project or separable element.
- Prevent obstructions of or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) which might hinder its operation and maintenance, or interfere with its proper function, such as any new development on project lands or the addition of facilities which would degrade the benefits of the project.
- Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government.
- Participate in and comply with applicable Federal flood plain management and flood insurance programs.
- Do not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

In an effort to keep the non-Federal project partner involved and the local government informed, meetings were held throughout the feasibility phase. Coordination efforts will continue, including coordination of this study with other State and Federal agencies. It is currently anticipated that public meetings will be held upon release of the Draft and Final Detailed Project Reports. As the project proceeds from design and into construction, regular public meetings will

be scheduled to provide a continued opportunity for the non-Federal sponsor and the affected public to provide input to the design process.

7.3 Cost Sharing

The fully funded cost of the Project, escalated to the base year of 2007 is shown in Table 7-1. Table 7-2 displays the apportionment of cost sharing responsibilities between the Federal government and the non-Federal sponsor, NJDEP. The table includes costs associated with flood damage reduction features and environmental mitigation features. The total project first costs - including Lands, Easements, Rights-of-way, Relocations, and Disposal areas (LERRD) - are shared on a 65 percent basis by the Federal government and a 35 percent basis by the non-Federal partner. As indicated in Table 7-2, the Federal share of the entire project's total first cost is $3,534,213; the non-Federal share is $1,903,037. The Federal Government will design the project, prepare detailed plans/specifications and construct the project, exclusive of those items specifically required of the non-Federal partner.

The non-Federal partner is responsible for all LERRD costs, mitigation costs for the State's required compensatory mitigation, which are not considered total project costs; and all O&M costs. The LERRD costs are applicable to the non-Federal share of the initial project costs. For example, the total project LERRD costs of $542,700 (total of Accounts 01 and 02 minus escalated real estate costs from the NJDEP Compensatory mitigation: $674,700 – $132,000) borne by the non-Federal partner are applicable to the $1,903,037 share of total initial non-Federal project costs.

Table 7-1
Fully Funded Cost Estimate – Selected Plan

Item	Cost	Contingencies	Escalation	Fully Funded Cost
01 Lands & Damages	324,400	81,100	41,500	447,000
02 Roadway Relocations	163,700	40,900	23,100	227,700
03 Mobilization & Site Prep	234,000	58,400	32,800	325,200
06 Wetlands Mitigation	325,600	81,400	47,400	454,400
11 Levees and Floodwalls	1,579,300	394,900	222,000	2,196,200
15 Tributary Closures	437,600	109,400	61,500	608,500
30 Engineering and Design	750,000	187,500	155,000	1,092,500
31 Construction Management	300,000	75,000	69,700	444,700
Total Cost of Selected plan	4,114,600	1,028,600	653,000	5,796,200
Less NJDEP Compensatory Mitigation Costs	258,360	64,590	36,000	358,950
Total Project Cost of Selected Plan	**3,856,240**	**964,010**	**617,000**	**5,437,250**

Table 7-2
Cost Apportionment
Federal and Non-Federal Responsibilities

Federal Project Cost (65%)	**$ 3,534,213**
Non-Federal Project Cost (35%)	
5% Cash	$ 271,863
LERRD	$ 674,661
Cash Balance	$ 956,513
Non-Federal Project Cost Total (35%)	**$ 1,903,037**
Total Project Cost (100%)	**$ 5,437,250**
Non-Federal Compensatory Mitigation Cost	$ 358,950
Total Cost	**$ 5,796,200**

7.3.1 Application of Passaic River Wetlands Bank Credit

The New Jersey Department of Environmental Protection (NJDEP), as non-Federal sponsor has indicated via a letter dated 16 April 2003 (presented in Section 9 of this Feasibility Report) that it intends to use credits available in the Passaic River Wetlands Bank for the Upper Passaic River and Tributaries, Long Hill, New Jersey project. The credit is applicable to this project as per Section 101 (a)(18)(C) of the Water Resources Development Act of 1990 (Public Law 101-640) as amended by Section 102(p) of the Water Resources Development Act of 1992 (Public Law 102-580).

The NJDEP currently has sufficient approved credit in the Passaic River Wetlands Bank to apply to the Upper Passaic River and Tributaries, Long Hill, New Jersey project. The cost apportionment for the project including this credit is shown in Table 7-3 below.

Table 7-3
Cost Apportionment Federal and Non-Federal Responsibilities
Including Wetlands Bank Credit

Federal Project Cost (65% plus credit)	**$ 4,490,726**
Non-Federal Cost (35% less credit)	
5% Cash	$ 271,863
LERRD	$ 674,661
Cash Balance	$0
Non-Federal Project Cost Total (35% Less Credit)	**$ 946,254**
Total Project Cost	**$ 5,437,250**
Non-Federal Compensatory Mitigation Cost	$ 358,950
Total Cost	**$ 5,796,200**

It should be noted that the costs presented are estimated and that actual costs and credits will be determined based upon financial accounting as stipulated in the construction Project Cooperation Agreement that will be executed with the NJDEP prior to actual construction of the recommended plan.

7.4 Implementation Schedule

A preliminary implementation schedule was developed for the selected plan. The schedule is based on information available to date, and is largely dependent on whether the Project is funded in the Continuing Authorities Program, under Section 205 for Flood Control. The estimated implementation schedule is provided below:

- Plans and Specifications Development – April 2004 to July 2005
- Project Cooperation Agreement Execution – April 2005 - July 2005
- Real Estate Acquisition - July 2005 – April 2006
- Construction - May 2006 – April 2007

7.5 Financial Analysis

For purposes of executing the Project Cooperation Agreement (PCA), the New Jersey Department of Environmental Protection (NJDEP) has stated its intention to act as the non-Federal partner. The state will provide funds in increments appropriate to the proportion of the amount of Federal funds to be expended on the project each year. State funds will be derived through the State's annual budget process. The State has indicated its intent to enter into a PCA at the conclusion of this study. The State of New Jersey has secured funding for the first year of the construction phase.

7.6 Views of Non-Federal Partners and Other Agencies

The selected plan has received strong support from the non-Federal project partner, NJDEP, as well as other agencies of the State of New Jersey. The affected local government, Long Hill Township, New Jersey also has expressed their support for the project. This support is documented in Section 9 of this Feasibility Report. Through project planning and NEPA scoping, a variety of other Federal agencies have been involved in this investigation.

7.7 Areas Of Concern

There are no outstanding areas of concern regarding the selected plan for the Passaic River at Long Hill Township flood damage reduction. The plan is fully supported by the non-Federal project partner, NJDEP, as well as affected local governments and interested Federal agencies. These parties have full confidence in the anticipated performance of the selected plan in terms of flood damage reduction and impacts on the environment.

8. COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Preparation of this Integrated Feasibility Report and Environmental Assessment has included coordination with appropriate Federal and State resource agencies. For this stage of the planning process, compliance was met for all environmental quality statutes and environmental review requirements. Following is a list of Federal and State environmental quality statutes to which this planning process and recommended plan are in compliance:

- National Environmental Policy Act of 1969,
- Fish And Wildlife Coordination Act Of 1958,
- Endangered Species Act Of 1973,
- National Historic Preservation Act Of 1966,
- Clean Water Act Of 1972 (see Appendix E),
- Clean Air Act Of 1972,
- Farmland Protection Policy Act Of 1981,
- Wild And Scenic River Act Of 1968,
- Federal Water Project Recreation Act Of 1965,
- Resource Conservation And Recovery Act Of 1976,
- Toxic Substances Control Act Of 1976,
- E.O. 11988, Flood plain Management,
- E.O. 11990, Protection Of Wetlands,
- E.O. 12898, Environmental Justice, and
- Freshwater Wetland Protection Act (NJSA 13:9B-1 et seq.).
- New Jersey Line Verification Letter of Interpretation (LOI)

Permits that may be required by the State include an individual freshwater wetlands permit, a general permit (e.g., general permit 16 – for habitat creation and enhancement), or a transition area waiver. The applications for these permits will be submitted upon finalization of the design for the recommended plan. Issuance of the individual permit would be contingent upon the compliance of the proposed project with New Jersey's Endangered & Nongame Species Conservation Act of 1973 (NJAC 7:7A-1.4) and NJDEP's Flood Hazard Area Control Act (NJSA 58:16A-50 et seq.)

During construction, best management procedures will be followed to maintain compliance with Standards for Soil Erosion and Sediment Control in New Jersey (NJAC 2:90), and NJDEP Water Quality Certifications (NJAC 7:7A-2.1(d)).

9. PERTINENT CORRESPONDENCE & PUBLIC INVOLVEMENT

Public involvement and citizen participation are an integral part of this feasibility study. Coordination by the Army Corps of Engineers and the New Jersey Department of Environmental Protection with the local sponsor, municipalities adjacent to the study area, other agencies, and interested parties has occurred on a regular basis since the beginning of the study.

Meetings with officials and residents of Long Hill Township and other interested parties were conducted in groups and on an individual basis. The purpose of carrying out coordination with officials, citizens and other interested parties is to ensure that the study addresses all pertinent questions from the public, is of the highest quality, and ultimately meets the needs of the people it will serve. The table below summarizes the significant meetings where a municipality, group, or agency was briefed on the study.

Numerous meetings and coordination activities were conducted to gather data, conduct field studies, and notify property owners in the study area of the work being conducted. The contacts and meetings for data gathering and coordination are too numerous to mention herein, but are summarized in the next paragraphs.

As required for the New Jersey Department of Environmental Protection's Application for a Letter of Interpretation (LOI), over one hundred property owners in the study area were contacted or notified of the application as it relates to the study. These contacts and notifications are documented in the LOI application. Coordination with environmental and cultural resource agencies is also documented in the integrated Main Report Environmental Assessment.

Property owners within the proposed alignment of the plan alternatives were contacted and rights-of-entry were requested from them for the purposes of conducting environmental and geotechnical field studies. Approximately 20 property entries were requested and nearly all of them were returned with the owner allowing access to the property. Further coordination relating to the real estate activities being conducted is presented in the Real Estate Appendix.

Besides the coordination with Long Hill Township and municipalities adjacent to the study area, contacts with various Federal, State, and local agencies were also made. They include the U.S. Fish and Wildlife Service, Federal Emergency Management Agency, United States Geological Survey, NJ Transit, New Jersey Department of Transportation, Morris County Parks, Morris County Engineer, public utilities, and others. Coordination with elected representatives at the Federal, State, and local level has also been integral to the process.

Pertinent letters of correspondence are provided below. The correspondence presented indicates the non-Federal sponsor's formal position on the feasibility report and Long Hill Township's Position. A copy of the notice that was also issued to inform interested parties of the public information meeting held prior to the release of the report is also presented. Correspondence relating to general requests for information, questions, letters of invitation, technical, environmental, cultural, real estate rights-of-entry, permits and other matters are too numerous to be present here. Correspondence relating to those matters number in the hundreds.

During the public review of this draft feasibility report the public, agencies, and all interested parties were asked to comment on the report. All relevant comments in letter and e-mail form are published in this report as part of the public record. Responses are provided where appropriate.

A second public information meeting was held on March 8, 2004 during the review of the draft feasibility report. It should be further noted that the public involvement process never ends. Meetings will continue to be held after the feasibility report is completed, through the design effort and through construction.

Table 9-1
Briefing/Coordination Meetings with Study Area Municipalities, Public, and Interested Parties

DATE	AGENCY(S) / GROUP(S)/ ORGANIZATION (S)	PURPOSE	LOCATION
23-May-00	Long Hill Township - Mayor Long Hill Police & Emergency Op. Manager Long Hill Township - Administrator Long Hill Environmental Commissioner USACE	Feasibility Study Kick-off	Long Hill Township Police Station
7-Feb-02	Bernard Township USACE	Recreation areas questions and address residential concerns	Bernard Township
11-Feb-02	Morris County Parks Commission USACE	Briefing on USACE studies/projects in Morris County including Upper Passaic River and Tributaries at Long Hill Township	Morris County Parks Commission, Morristown
13-Mar-02	Long Hill Township Administrator Long Hill Township Mayor Chief of Police USACE	Study progress update	Long Hill Township
22-May-02	Warren Township Administrator Warren Environmental Commission Chair USACE	Brief Administrator and Environmental Commission	Warren Township
20-Jun-02	USACE Representative, Berkeley Heights Environmental Commission	Site visit meeting on flooding around Chaucers Brook, Dell Lane, Park Ave	Berkeley Heights Township

Table 9-1
Briefing/Coordination Meetings with Study Area Municipalities, Public, and Interested Parties

DATE	AGENCY(S) / GROUP(S)/ ORGANIZATION (S)	PURPOSE	LOCATION
26-Jun-02	NJDEP Long Hill Township Chief of Police Long Hill Township Administrator Long Hill Township Mayor Long Hill Twsp Office of Emergency Mgmt Long Hill Twsp Environmental Commissioner USACE	Status update on study including hydrology, economics, coordination, alternatives	Long Hill Township Police Station
12-Sep-02	Warren Township Council USACE	Brief Council on study and request approval to access Town Properties for environmental restoration field work	Warren Township Municipal Building
23-Sep-02	Morris County MVA - Environmental Specialist Passaic River Coalition RVRSA - Manager of Operations NJDEP USEPA - Watershed Coordinator Rockaway River Watershed Cabinet WRWAC TBSA	Update on USACE studies/projects in WMA #6 including Upper Passaic River and Tributaries	Rockaway Valley Sewer Authority Offices, Boonton, New Jersey
2-Dec-02	NJDEP Long Hill Township Chief of Police Long Hill Township Administrator Long Hill Township Mayor Long Hill Twsp Office of Emergency Mgmt Long Hill Twsp Environmental Commissioner USACE	Status update on study including hydrology, economics, engineering, real estate, plan alternatives, upcoming public information meeting	Long Hill Township Police Station

Table 9-1
Briefing/Coordination Meetings with Study Area Municipalities, Public, and Interested Parties

DATE	AGENCY(S) / GROUP(S)/ ORGANIZATION (S)	PURPOSE	LOCATION
30-Jan-03	Public Information Meeting - attended by town officials, public (approximately 50 individuals in attendance) USACE NJDEP	Overview provided on study to date, questions answered, and input solicited from public	Millington School, Long Hill Township
13-May-03	NJDEP Long Hill Township Chief of Police Long Hill Township Administrator Long Hill Township Mayor Long Hill Twsp Office of Emergency Mgmt. Long Hill Twsp Environmental Commissioner USACE	Status update on draft feasibility report findings	Long Hill Township Department of Public Works
13-May-03	Friends of Long Hill Twsp USACE NJDEP	Discussion of study plan details including hydrology, hydraulics, environmental, costs, schedule	Meyersville Grange Hall
12-Aug-03	Congressman Ferguson's Representative Warren Township committee members Warren Township Engineer Warren Township Environmental Commission Members Passaic River Coalition NJDEP USACE	Provide briefing on study and potential alternatives	Congressman Ferguson's Martinsville's office
28-Aug-03	Long Hill Mayor Long Hill Administrator NJDEP USACE	Status update on study and draft feasibility report	Long Hill Township Town Hall

Table 9-1
Briefing/Coordination Meetings with Study Area Municipalities, Public, and Interested Parties

DATE	AGENCY(S) / GROUP(S)/ ORGANIZATION (S)	PURPOSE	LOCATION
15-Sep-03	Warren Township committee members Warren Township Engineer Warren Twsp Envir Commission Members NJDEP USACE	Field visit to Warren Township to discuss clearing and snagging of Passaic River and check flood elevations	Warren Township
18-Sep-03	Morris County Planning Board USACE	Status update on study and draft feasibility report as part of overall briefing on Morris County projects	County Planning Office, Morristown
26-Feb-04	Warren Township	Status update on study and draft feasibility report, as requested by Warren Township	Warren Township
3-Mar-04	Long Hill officials	Status update on study and draft feasibility report as part of overall briefing to local sponsor	Long Hill Township Municipal Building
8-Mar-04	Public Information Meeting (100 people)	Public briefing announcing Draft Report	Long Hill Township Municipal Building
10-Mar-04	Morris County Freeholders	Status update on study and draft feasibility report as part of overall briefing on Morris County projects	Morris County offices
6-May-04	Meeting with property owners	Status update on study and draft feasibility report meeting with affected property owners	Long Hill Township Municipal Building

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection

Natural and Historic Resources
Office of Engineering & Construction

Bradley M. Campbell
Commissioner

JUN 2 3 2004

Mr. Paul Tumminello, P.E.
U.S. Army Corps of Engineers, New York District
26 Federal Plaza
New York, NY 10278

Dear Mr. Tumminello:

This letter is a follow up to our ongoing coordination with you on the Upper Passaic River, Long Hill Township, New Jersey Flood Control and Environmental Restoration Feasibility Project.

Both the New Jersey Department of Environmental Protection and Township of Long Hill support the project. The commitment by the Township of Long Hill has been clearly demonstrated by Council resolution of support which was adopted May 26, 2004 (copy enclosed).

We look forward to continue coordination with you as we enter the final design phase of this flood control project.

Very truly yours,

John H. Moyle, P.E.
Manager
Bureau of Dam Safety and Flood Control

c: Kevin Sluka, Long Hill Township
Clark D. Gilman, P.E.
Charles Defendorf, P.E.

E-Mail Address: DamSafety@dep.state.nj.us
Internet Address: www.state.nj.us/dep/damsafety
Mailing Address: 501 East State Street, P.O. Box 419, Trenton, NJ 08625-0419
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RESOLUTION 04 - 183
ENDORSING THE UPPER PASSAIC RIVER AND TRIBUTARIES FLOOD PROTECTION & ECOSYSTEM RESTORATION PROJECT

WHEREAS, on November 12, 2003, the Township of Long Hill, County of Morris, State of New Jersey passed Resolution 03-383, supporting the Upper Passaic River and Tributaries Flood Protection & Ecosystem Restoration Project subject to review by Township Officials, Township Committee and residents to be conducted at a public hearing; and

WHEREAS, on March 8, 2004, a public meeting was hosted at Town Hall and the Army Corps of Engineers conducted a presentation outlining the scope of work, and provided an overview of the project; and

WHEREAS, the New Jersey Department of Environmental Protection, Consulting Engineers and two members of the Township Committee were on hand to assist with questions related to the project; and

WHEREAS, on May 5, 2004, the Township hosted a follow up meeting requested by a member of the public to be attended by selected residence to further discuss the project and its potential impact; and

WHEREAS, on May 5, 2004, the meeting was attended by the Army Corps of Engineers, the New Jersey State Department of Engineers, Engineering Consultants and one member of the Township Committee

WHEREAS, flooding in the Township of Long Hill has caused extensive damage to businesses, residences and infrastructure to the Township of Long Hill, impacting thoroughfares, requiring road closures and impacting Police Headquarters during flood events; and

WHEREAS, the United States House of Representatives authorized a study to be conducted by the United States Army Corps of Engineers with the cooperation of the Township of Long Hill; and

WHEREAS, the Township of Long Hill hosted the first public meeting to discuss the study on January 30, 2003 at the Millington School in cooperation with the United States Army Corps of Engineers and the New Jersey Department of Environmental protection and its consultants; and

WHEREAS, the Township Committee has reviewed the study and participated in public discussion throughout the process; and

WHEREAS, the public has been provided access to review the study all public meeting requirements have been satisfied:

NOW, THEREFORE BE IT RESOLVED that the Township Committee of the Township of Long Hill, in the County of Morris, State of New Jersey endorses and fully supports the Upper Passaic River and Tributaries Flood Protection and Ecosystem Restoration Project.

Approved as to Form and Legality

Township Attorney

Adopted by Township Committee on May 26, 2004

Mayor

Municipal Clerk

INTRODUCED	SECONDED	COMMITTEE	AYE	NAY	ABSTAIN	ABSENT
	✓	HOPCRAFT	✓			
		NERGAARD				✓
		NEVILLE	✓			
✓		WELCH	✓			
		DAPKINS	✓			

I, Diane J. Gavitt, Municipal Clerk of the Township of Long Hill, hereby certify the foregoing to be a true and exact copy of a resolution adopted by the Township Committee at a duly convened meeting held on May 26, 2004.

Diane J. Gavitt, RMC
Municipal Clerk

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection
Natural and Historic Resources
Division of Engineering & Construction

Bradley M. Campbell
Commissioner

NOV 1 4 2003

Mr. Paul Tumminello, P.E.
U.S. Army Corps of Engineers, New York District
26 Federal Plaza
New York, NY 10278

Dear Mr. Tumminello:

This letter is a follow up to our ongoing coordination with you on the Upper Passaic River, Long Hill Township, New Jersey Flood Control and Environmental Restoration Feasibility Study.

Both the New Jersey Department of Environmental Protection and Township of Long Hill support the project. The commitment by the Township of Long Hill has been clearly demonstrated by Council resolution of support which has passed last Wednesday evening (copy enclosed).

We look forward to continued coordination with you as the pace of work on this important project accelerates.

Very truly yours,

John H. Moyle, P.E.
Acting Administrator
Bureau of Dam Safety and Flood Control

C: Kevin Sluka, Long Hill Township
Clark D. Gilman, P.E.
Charles Defendorf, P.E.

E-Mail Address: DamSafety@dep.state.nj.us
Internet Address: www.state.nj.us/dep/damsafety
Mailing Address: 501 East State Street, P.O. Box 419, Trenton, NJ 08625-0419
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RESOLUTION 03 - 383
SUPPORTING THE UPPER PASSAIC RIVER AND TRIBUTARIES FLOOD PROTECTION & ECOSYSTEM RESTORATION PROJECT

WHEREAS, Flooding in the Township of Long Hill has caused extensive damage to businesses, residences and infrastructure to the Township of Long Hill, impacting thoroughfares, requiring road closures and impacting Police Headquarters during flood events; and

WHEREAS, the United States House of Representatives authorized a study to be conducted by the United States Army Corps of Engineers with the cooperation of the Township of Long Hill; and

WHEREAS, the Township Committee of the Township of Long Hill supported the Upper Passaic River and Tributaries Flood Protection and Ecosystem Restoration Study; and

WHEREAS, the Township of Long Hill hosted a public meeting to discuss the study on January 30, 2003 at the Millington School in cooperation with the United states Army Corps of Engineers and the New Jersey Department of Environmental protection and its consultants; and

WHEREAS, the study is intended to identify the flooding problem, identify the means necessary to reduce flooding, identify opportunities for restoration of the ecosystem, evaluate the technical, economic, environmental and feasibility to address the flooding problem; and

WHEREAS, the results of the study is currently being reviewed by the Army Corps of Engineers at the Washington D.C. District office and

WHEREAS, the Township will host a public meeting to review and evaluate the results of the study upon the release of the documents from the Army Corps of Engineers; and

WHEREAS, subject to review and comment by the public and the Township Committee, the Township of Long Hill supports the Upper Passaic River and Tributaries Project and urges the continued Federal and State funding of this project:

NOW, THEREFORE BE IT RESOLVED that the Township Committee of the Township of Long Hill, in the County of Morris, State of New Jersey supports the Upper River and Tributaries Flood Protection & Ecosystem Restoration Project subject to public comment and review:

Approved as to Form and Legality

Township Attorney

Adopted by Township Committee on November 12, 2003

Mayor

Township Clerk

INTRODUCED	SECONDED	COMMITTEE	AYE	NAY	ABSTAIN	ABSENT
		FALZARANO	✓			
	✓	NERGAARD	✓			
✓		SADOWSKI	✓			
		WELCH	✓			
		DAPKINS	✓			

I, Diane J. Gavitt, Township Clerk of the Township of Long Hill, hereby certify the foregoing to be a true and exact copy of a resolution adopted by the Township Committee at a duly convened meeting held on November 12, 2003.

Diane J. Gavitt, RMC
Municipal Clerk

State of New Jersey
Department of Environmental Protection
Natural and Historic Resources
Division of Engineering & Construction

James E. McGreevey
Governor

Bradley M. Campbell
Commissioner

APR 16 2003

Colonel John O'Dowd, Commander,
U.S. Army Corps of Engineers, New York District
26 Federal Plaza,
New York, NY 10278

Dear Colonel O'Dowd:

This letter is a follow up to our ongoing coordination with you on the Upper Passaic River, Long Hill Township, New Jersey Flood Control and Environmental Restoration Feasibility Study. We have reviewed the preliminary draft feasibility reports' project cost estimate and understand our responsibility as the non-Federal sponsor.

This letter will serve as our notification to you that in accordance with the provisions of Section 101 (a)(18) of the Water Resources Development Act of 1990 as amended in 1992 and the Passaic River Wetlands Bank established by us in 1998 and approved by you, we will be applying credits available in the Wetlands Bank to our share of project costs.

We look forward to continued coordination with you and please be assured of our interest and support in this matter and our desire to get this project implemented.

Very truly yours,

John H. Moyle, P.E.
Acting Administrator
Bureau of Dam Safety and Flood Control

c: Clark D. Gilman, P.E.
Charles E. Defendorf, P.E.
Paul A. Tumminello, P.E., U.S. Army Corps of Engineers

E-Mail Address: DamSafety@dep.state.nj.us
Internet Address: WWW.state.nj.us/dep/damsafety
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State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection
Natural and Historic Resources
Division of Engineering & Construction

Bradley M. Campbell
Commissioner

APR 16 2003

Colonel John O'Dowd, Commander,
U.S. Army Corps of Engineers, New York District
26 Federal Plaza,
New York, NY 10278

Dear Colonel O'Dowd:

This letter is a follow up to our ongoing coordination with you on the Upper Passaic River, Long Hill Township, New Jersey Flood Control and Environmental Restoration Feasibility Study. We have reviewed the preliminary draft feasibility report and understand that it is subject to an internal Corps review followed by a public review before it is finalized.

The New Jersey Department of Environmental Protection supports the recommendations that are included in the feasibility report as it stands today. We will continue to work with you and your staff to finalize the feasibility report. Please be assured of our interest and support in this matter and our desire to get this project implemented.

Very truly yours,

John H. Moyle, P.E.
Acting Administrator
Bureau of Dam Safety and Flood Control

c: Clark D. Gilman, P.E.
Charles E. Defendorf, P.E.
Paul A. Tumminello, P.E., U.S. Army Corps of Engineers

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DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

January 14, 2003

To Potentially Interested Parties:

The U.S. Army Corps of Engineers is currently conducting a feasibility study for flood protection and environmental restoration for the Upper Passaic River and Tributaries in Long Hill Township, New Jersey. The study is being conducted in partnership with the New Jersey Department of Environmental Protection.

The study was authorized in a resolution of the Committee on Transportation and Infrastructure of the United States House of Representatives, adopted May 7, 1997.

Studies were initiated with the release of a public notice on June 30, 1999. Activities to date have included the preparation of a topographic survey of the study area in Long Hill Township, the modeling of the hydrology and hydraulics of the Upper Passaic River and its tributaries, environmental studies, cultural resources studies, economic analyses of flood damages, geotechnical investigations, and the formulation of plan alternatives to address the flooding in Long Hill Township.

Long Hill Township is hosting an information meeting at 7PM, January 30, 2003 at the Millington School located at 91 Northfield Road, Millington. Representatives from the Army Corps of Engineers and the New Jersey Department of Environmental Protection will be present to provide an overview on the studies conducted to date, describe the potential alternatives for flood protection, and answer questions related to the study.

If have questions related to the study and cannot attend the meeting you may contact Paul A. Tumminello, P.E., Project Manager at 212-264-0437 or paul.tumminello@usace.army.mil

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection
Natural and Historic Resources
Division of Engineering & Construction

Bradley M. Campbell
Commissioner

NOV 2 2 2002

Mr. Paul Tumminello, P.E.
Programs and Project Management Division
New York District, Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Tumminello:

This letter is a follow up to our coordination of the Upper Passaic River, New Jersey Flood Control and Environmental Restoration Feasibility Study.

At this time, I would like to reiterate that the New Jersey Department of Environmental Protection supports the recommendations that are included in the draft P-7 document and are due to be included in the final report for the Upper Passaic River, New Jersey Flood Control and Environmental Restoration Feasibility Study within Long Hill Township.

We will continue to work with you and your staff to finalize the recommended flood damage reduction structure design. Please be assured of our interest and support in this matter and our desire to get this project to completion.

Very truly yours,

John H. Moyle, P.E.
Acting Administrator
Bureau of Dam Safety and Flood Control

c: Clark D. Gilman, P.E.
Charles E. Defendorf, P.E.

E-Mail Address: DamSafety@dep.state.nj.us
Internet Address: www.state.nj.us/dep/damsafety
Mailing Address: 501 East State Street, P.O. Box 419, Trenton, NJ 08625

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10. RECOMMENDATIONS

In making the following recommendations, I have given consideration to all significant aspects in the overall public interest, including environmental, social and economic effects, engineering feasibility and compatibility of the project with the policies, desires and capabilities of the State of New Jersey and other non-Federal interests.

I recommend that the selected plan for flood control (and associated mitigation) along the Passaic River at Long Hill Township, New Jersey project, as fully detailed in this integrated detailed project report and environmental assessment, be approved as a Federal project for flood control, Section 205 of the Continuing Authorities Program, subject to such modifications as may be prescribed by the Chief of Engineers.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified. The non-Federal project partner (the New Jersey Department of Environmental Protection) interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

I recommend approval of the selected flood control plan for the Passaic River at Long Hill Township, New Jersey with such modifications thereof as in the discretion of the Commander, HQUSACE, as may be advisable. These recommendations are made with the provisions that local interests will:

a. Provide to the United States all necessary lands, easements, rights-of-way, relocations, and suitable borrow and/or disposal areas deemed necessary by the United States for initial construction and subsequent maintenance of the project.

b. Hold and save the United States free from claims for damages which may result from construction and subsequent maintenance, operation, and public use of the project, except damages due to the fault or negligence of the United States or its contractors.

c. Maintain continued public ownership and public use of the areas upon which the amount of Federal participation is based during the economic life of the project.

d. Maintain, repair, rehabilitate, and replace the protective measures and/or structures during the economic life of the project as required to serve the intended purposes at their design levels of flood damage reduction and in accordance with regulations prescribed by the Secretary of the Army.

e. Provide and maintain necessary access roads, parking areas, and other public use facilities open and available to all on equal terms.

f. Contribute the local share of non-Federal costs for initial construction and operation and maintenance over the economic life of the project, as required to serve the intended purposes.

g. Upon completion of each project feature, acquire, rehabilitate, repair, replace, operate and maintain easements for public access to areas created or enhanced by the project. The cost of the operation, and maintenance of these easements will be the responsibility of the non-Federal sponsor.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of highest review levels within the Executive Branch. Consequently, the Chief of Engineers may modify the recommendations. The sponsor, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

John B. O'Dowd
Colonel, Corps of Engineers
District Engineer

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LIST OF STUDY TEAM MEMBERS AND REPORT PREPARERS

The following individuals were primarily responsible for the preparation of this integrated feasibility report and environmental assessment.

Individual	Responsibility
Ronald Brattain	Project Planner
Melissa Alvarez	Biologist; National Environmental Policy Act Compliance; Mitigation
Paul Tumminello	Project Manager
Robert Greco	Engineering & Design
John Chew	Cost Engineering
Norman Blumenstein	Economics
Lynn Rakos/ Carissa DeRooy	Cultural Resources
Richard Dabal	Hazardous, Toxic, and Radioactive Wastes
Mary Daly	Real Estate
Ellen Simon	Office of Counsel

PUBLIC CORRESPONDENCE

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

Planning Division

22 June 2004

Mr. Carl Andreassen, Principal Hydraulic Engineer
Department of Public Works, Engineering Division
County of Somerset
P.O. Box 3000
Somerville, New Jersey 08876

Re: Upper Passaic River and Tributaries, Long Hill Township, New Jersey
Flood Control Project

Dear Mr. Andreassen:

Thank you for your letter of March 30, 2004 regarding the Upper Passaic River and Tributaries, Long Hill, New Jersey Flood Control project. In your letter, you express support for the concerns of the residents of Warren Township, operational issues of the project, and the tie-in of the Somerset County Flood Information System (SCFIS) to the proposed Flood Warning System of the Passaic River.

We realize there are real concerns with induced flooding. As is the case with all Federally cost-shared flood control projects, this project is required to document and provide mitigation for any induced flooding, whether upstream or downstream of the project area. In the course of mitigating the 0.1-foot surface elevation rise to the Passaic River; a survey of the structures within the 100-year flood plain, including those along Charles Street and at the WWTP will be performed to verify the first floor elevations of at-risk structures that may be included in any non-structural flood-proofing measures.

The operation and maintenance (O&M) of the project will be the joint responsibility of the New Jersey Department of Environmental Protection (NJDEP) and Long Hill Township. Local O&M requirements will be detailed in the O&M manual that will be generated during the plans and specifications phase. Of course, if there were any measures, other than non-structural that may be implemented as part of the verification of at-risk structures along Charles Street or at the WWTP, this responsibility would need to be coordinated with NJDEP. Additional measures to refine the recommended plan may be further developed and included during the P&S design phase, as warranted and in agreement with sponsor preferences.

As part of the non-structural component to this project, the Passaic River Flood Warning System (PRFWS) will be fully coordinated with the Somerset County Flood Information System. The PRFWS set up in Long Hill Township will be tied into the National Weather Service's (NWS's) Passaic River Flood Warning System administered

in State College, Pennsylvania, and Mount Holly, New Jersey. Data from the PRFWS stream gage will be provided to the NWS through their stream-gaging network.

We look forward to your continued participation in advancing this flood damage reduction project and alleviating flooding in the broad study area. As always, we are available to provide technical assistance through the Flood Plain Management Services (FPMS) program to help local communities in developing a Flood Plain Management Plan.

If you should have any further questions on this matter, please contact me or Mr. Ron Brattain, Project Planner, at 212-264-5315.

Thomas J. Hodson

Thomas Hodson, Ph.D., J.D.
Acting Chief, Plan Formulation Branch

CF:
Mr. Christian M. Kastrud, P.E., Warren Township Engineer
Mr. Mark Krane, Warren Township Administrator
Mr. Charlie Defendorf, NJDEP

Director of Public Works/
County Engineer
MICHAEL J. AMOROSA
(908) 231-7024
FAX (908) 231-7170
TDD (908) 231-7168

Supervisor of Public Works Operations
DENNIS J. KOSENSKY
(908) 541-5012

Assistant County Engineer
DAVID L. LORIMER
(908) 231-7024

COUNTY OF SOMERSET
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
COUNTY ADMINISTRATION BUILDING, 20 GROVE STREET
P.O. BOX 3000
SOMERVILLE, NJ 08876 - 1262

Facilities & Services Director
STEPHEN J. KRACHUN

Supervisor of Roads and Bridges
PAUL L. MCCALL

Emergency Services Coordinator
LEROY GUNZELMAN, III

Director of Planning
ROBERT P. BZIK

Recycling Superintendent
WILLIAM J. SALLER

Supervisor, Traffic Safety Services
HERBERT R. PETERSON

Transportation Director
YVONNE C. MANFRA

Vehicle Maintenance Supervisor
LOUIS J. NICKOLOPOULOS

Somerset Union Soil Conservation
District Manager
ERNEST THURLOW

March 30, 2004

Paul A. Tumminello, P.E.
U.S. Army Corps of Engineers, New York District
26 Federal Plaza
Programs and Project Management Division, Room 2127
New York, NY 10278

Re: Flood Control Project
Long Hill Township, Morris County, NJ

Dear Mr. Tumminello:

At the request of Warren Township officials, we have reviewed the proposed Flood Control Project for Long Hill Township, Morris County, NJ, with respect to its impact on Warren Township. Our review is based on meetings with Warren Township officials, attendance at the public hearing in Long Hill Township on March 8, 2004, and review of the *Draft Detailed Project Report* for the *Upper Passaic River and Tributaries at Long Hill Township, NJ, Flood Damage Reduction and Ecosystem Restoration project.* We have received a copy of Warren Township's letter detailing their concerns about the project, and generally concur with their findings.

The proposed project appears to have a negligible impact on Warren Township properties. However, there is concern that any future flood events may be perceived by the public to be exacerbated by the Long Hill Project. We suggest that the ACOE provide adequate documentation to address this issue, including any operational issues with the Warren Township sewage treatment plant.

The proposed project includes a river stage gage that will be tied into the Passaic Flood Warning System. The gage should also be tied into the Somerset County Flood Information System (SCFIS), with data and calibration to assist Somerset County personnel in providing timely and effective notification to Warren Township officials.

Thank you for the opportunity to review the *Draft Detailed Project Report*. Based on the information provided, it appears that the project will have a minimal impact on Warren Township.

Yours truly,

Carl Andreassen
Principal Hydraulic Engineer

Cc: Christian M. Kastrud, P.E., Warren Township Engineer
Mark Krane, Warren Township Administrator
Charlie Defendorf, NJDEP

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

Planning Division

22 June 2004

Mr. Christian M. Kastrud, P.E.
Warren Township Engineer
46 Mountain Boulevard
Warren, New Jersey 07059

Re: Upper Passaic River and Tributaries, Long Hill Township, New Jersey
Flood Control Project

Dear Mr. Kastrud:

Thank you for your letter of March 29, 2004 regarding the Upper Passaic River and Tributaries, Long Hill, New Jersey Flood Control project. In your letter, you express concerns of Warren Township and its residents. Specifically, those concerns regarding the mapping of structures in the flood plain, stream gage implementation, legal and technical support in the event of any future litigation related to induced flooding, and flood proofing at the waste water treatment plant (WWTP). Let me take up these concerns in the order in which you have raised them.

The structures in the post-project 100-year flood plain are indicated on Figure 4.6.1 of Appendix A, Volume 2, Hydrology and Hydraulics of the subject report. Updated surveys (30-scale mapping) are included in the scope of the follow on phase (plans and specifications). In the course of that phase, a verification of impacted structures will be performed.

As part of the non-structural component to this project, the Passaic River Flood Warning System (PRFWS) will be fully coordinated with the Somerset County Flood Information System. The PRFWS set up in Long Hill Township will be tied into the National Weather Service's (NWS's) Passaic River Flood Warning System administered in State College, Pennsylvania, and Mount Holly, New Jersey. Data from the PRFWS stream gage will be provided to the NWS through their stream-gaging network.

You have expressed your concern that Warren Township may be held responsible for future flood events on the Passaic River and therefore requested assurance that you will be provided with appropriate legal and technical support in such a circumstance. As a federal agency, we cannot provide a local governmental entity with legal advice or litigation support. Warren Township may request access to technical information regarding this project pursuant to the Freedom of Information Act (5 U.S.C. § 552) or through the non-Federal sponsor, the New Jersey Department of Environmental Protection.

We realize there are real concerns with induced flooding. As is the case with all Federally cost-shared flood control projects, this project is required to document and provide mitigation for any induced flooding, whether upstream or downstream of the project area. In the course of mitigating the 0.1-foot surface elevation rise to the Passaic River, a survey of the structures within the 100-year flood plain, including those along Charles Street and at the WWTP will be performed to verify the first floor elevations of at-risk structures that may be included in any non-structural flood-proofing measures.

The operation and maintenance (O&M) of the project will be the joint responsibility of the New Jersey Department of Environmental Protection (NJDEP) and Long Hill Township. Local O&M requirements will be detailed in the O&M manual that will be generated during the plans and specifications phase. Of course, if there were any measures, other than non-structural that may be implemented as part of the verification of at-risk structures along Charles Street or at the WWTP, this responsibility would need to be coordinated with NJDEP. Additional measures to refine the recommended plan may be further developed and included during the P&S design phase, as warranted and in agreement with sponsor preferences.

We look forward to your continued participation in advancing this flood damage reduction project and alleviating flooding in the broad study area. As always, we are available to provide technical assistance through the Flood Plain Management Services (FPMS) program to help local communities in developing a Flood Plain Management Plan.

If you should have any further questions on this matter, please contact me or Mr. Ron Brattain, Project Planner, at 212-264-5315.

Thomas J. Hodson

Thomas Hodson, Ph.D., J.D.
Acting Chief, Plan Formulation Branch

CF:
Mr. Mr. Mark Krane, Warren Township Administrator
Mr. Charlie Defendorf, NJDEP
Mr. Carl Andreassen, Somerset County Engineering
Mayor DiNardo & Warren Township Committee

Township of Warren

Somerset County
46 Mountain Boulevard Warren, New Jersey 07059
(908) 753-8000 • Fax: (908) 757-9173 • www.warrennj.org

March 29, 2004

Attn: Paul A. Tumminello, P.E.
U.S. Army Corps of Engineers, New York District
26 Federal Plaza
Programs and Project Management Division, Room 2127
New York, NY 10278

Re: Flood Control Project
Long Hill Township, Morris County, NJ

Dear Mr. Tumminello:

I would like to extend our gratification with the procedure that you set forth during the design of the Flood Control Project in Long Hill Township, Morris County, New Jersey. It was a pleasure meeting you last year in August at Congressman Fergusson's office to discuss the project with your team of professionals. It was also informative to meet later that year and perform a site visit of the area in Warren Township that would be impacted by the project.

Since that time you have invited us to a public hearing in Long Hill Township which we attended, as well as submitted a draft report for our review. The Township of Warren has reviewed the *Draft Detailed Project Report* for the *Upper Passaic River and Tributaries at Long Hill Township, NJ, Flood Damage Reduction and Ecosystem Restoration* project. While the Township of Warren does not have specific objections to the proposed project, it is noted that Warren Township will be impacted by it.

There are several structures within Warren Township that are located within the floodplain of the Passaic River opposite the proposed Long Hill Township project. While Warren Township agrees that the impact is relatively minor (0.2 foot rise in water surface elevation for the 100-year design storm), it is nonetheless an impact. As such, Warren Township requests that the ACOE provide additional details and information, as follows:

The mapping provided in the *Draft Detailed Project Report & Environmental Assessment*, including Figure 5-5, does not show all of the structures that are within the floodplain on the Warren Township side of the Passaic River. This omission makes it difficult to assess the impacts on Warren Township properties. The mapping should be updated to include all structures within the floodplain on the Warren Township side of the Passaic River.

It is our understanding that the proposed plan includes providing a stream stage gage at or near the Stirling Road Bridge. Details of this installation should be provided, including how it will be calibrated to coincide with National Weather Service crest stage forecasts, and details of its

incorporation into the operational procedures of both the Passaic Flood Warning System and the Somerset County Flood Information System (SCFIS).

While Warren Township recognizes that the 0.2 foot rise in water surface elevation predicted by the project's construction is relatively minor, Warren Township is concerned that any future flood events on the Passaic River may be "blamed" on the Long Hill project. Warren Township requests that the project sponsors provide assurance that Warren Township will be provided with appropriate legal and technical support to defend any litigation related to induced flooding.

Based on the meeting and site visit on September 15, 2003, Warren Township understands that the ACOE will be providing additional details on the impact of the proposed project on structures located within the floodplain on the Warren Township side of the Passaic River. This includes impacts to the functionality of the Warren Township sewage treatment plant, and the potential for including flood proofing of the maintenance building at the treatment plant as part of the Long Hill project.

Again I would like to thank you for including Warren Township's Committee, professionals, and residents in your design process. We trust that these comments are not only helpful, but upon being addressed will make for a safer and more thorough project.

Sincerely,

Christian M. Kastrud, P.E.
Warren Township Engineer

C: Mark Krane, Township Administrator
Carl Andreassen, Somerset County Engineering
Mayor DiNardo & Warren Township Committee

04-103
C:\Documents and Settings\admin\My Documents\Warren Township\General Letters\Long Hill USACE Flood Control Response, 2004-03-29.doc

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

Programs and Project Management Division

February 20, 2004

To Potentially Interested Parties:

The U.S. Army Corps of Engineers and our non-Federal sponsor, the New Jersey Department of Environmental Protection are pleased to announce the release of the draft report for the Upper Passaic River and Tributaries at Long Hill Township, New Jersey, Flood Damage Reduction and Ecosystem Restoration Study.

The report documents the studies, surveys, analyses, findings, and recommendations for flood protection and environmental restoration in Long Hill, Township, New Jersey as authorized in a resolution of the Committee on Transportation and Infrastructure of the United States House of Representatives, adopted May 7, 1997 and under Section 205 of the Flood Control Act of 1948 as amended. The enclosed summary fact sheet provides a brief overview of the recommendations of the report.

If you are interested in reading the report, it is available on the U.S Army Corps of Engineers, New York District Web Page at: http://www.nan.usace.army.mil/project/newjers/njflood.htm. Hardcopies are available at the Long Hill Township Public Library and Municipal Building. You may also request a copy of the Main Report and/or Technical Volumes. Copies are available on CD in a pdf format and requestors are encouraged to utilize the CD format. Hardcopies are also available.

The full report consists of three volumes:

- Volume I (~300 pages) - Main Report and Environmental Assessment including Appendix E – Environmental Compliance and Coordination

- Volume II (~175 pages) – Technical Appendix A - Hydrology & Hydraulics

- Volume III (~250 pages) –

    - Technical Appendix B - Geotechnical Report
    - Technical Appendix C – Engineering and Design
    - Technical Appendix D - Cost Estimate
    - Technical Appendix F – Economic Analyses
    - Technical Appendix G – Real Estate

Long Hill Township will host an information meeting on the study at 7:00PM on March 8, 2004 at the Town Hall located at 915 Valley Road, Gillette. Representatives from the Army Corps of Engineers and the New Jersey Department of Environmental Protection will be present to

provide an overview on the report, its recommendations, and answer questions related to the study.

If you would like to provide written comments on the report, correspondence should be sent to:

U.S. Army Corps of Engineers, New York District
26 Federal Plaza
Programs and Project Management Division, Room 2127
New York, NY 10278

Attn: Paul A. Tumminello

or via e-mail to Paul A. Tumminello, P.E., Project Manager at: paul.tumminello@usace.army.mil

All written and e-mail comments must be received by the Corps no later than March 30, 2004 in order to be included in the final report, which is to be issued in April 2004. All correspondence including e-mails must contain the sender's full name and street address.

Questions on matters relating to the study should be directed to Paul A. Tumminello, P.E., Project Manager at 212-264-0437.

CENAN-PP-C May 5, 2004

MEMORANDUM FOR THE RECORD

SUBJECT: Upper Passaic River and Tributaries, Long Hill, New Jersey Flood Protection, Meeting with Property Owners – May 5, 2004

1. A meeting was held with property owners at the Long Hill Township Municipal Building to discuss the subject project. A list of attendees is attached. This memorandum focuses on the discussion relating to properties where the floodwall is to be constructed.

2. Summarized below are potential changes to the project that are to be addressed during the plans and specifications phase of the project.

- The floodwall will be straightened out along the back of Block 1 Lot 18.01 from approximate Station 3+00 to approximate Station 4+00.

- The floodwall will be moved away from Valley Road from approximate Station 11+00 to approximate Station 12+50 where it runs on Block 1 Lot 24 and 25 so that it is flush with the front of the home located on Block 1 Lot 25. This is done for safety purposes relating to site distances for driveways accessing Valley Road in the vicinity of Station 11+00 to 12+50 as well as likely zoning set back requirements. The corners of the floodwall will also be rounded at approximate Station 11+00 and approximate Station 12+50.

- It should be noted that within the floodwall alignment and the construction easement tree removal is generally required. During the plans and specifications phase, the floodwall alignment may be adjusted by up to three feet in order to avoid the removal of a large tree within the easements. Site visits and coordination with property owners will be conducted to identify trees, which could potentially be saved.

- Survey points in the beds of the tributaries will be presented at future coordination meetings to show the hydraulic inter-connection of the tributary network within Long Hill Township.

3. The above potential changes will need to be analyzed to determine if the environmental mitigation requirements of the project continue to be met.

4. It should be noted that none of the plan drawings presented in this final Detailed Project Report show the potential changes to the project alignment. The changes will be addressed where possible during the plans and specifications phase.

Paul Tumminello
Project Manager

This memorandum is based upon the author's recollection of the topics discussed and any changes or comments should be made to the author in writing.

US Army Corps of Engineers®
New York District

Upper Passaic River and Tributaries, Long Hill Twsp, NJ Flood Protection and Environmental Restoration Feasibility Study
Meeting with Long Hill Residents

May 5, 2004

Name	Office/Title/Address	Phone/Fax/E-mail
MARY DALY	USACE, Balto, MD	410-962-5136
David Welcht	Twsp Comm.	DWELCHL@AOL.C
CHARLES DEEENDORF	NJDEP	609-292-2296
Paul A. Tummineilo	USACE	212-264-0437
Anil Varghese	USACE-NY District	
Janice Arnett	NJDEP - Land Use	609-633-9277
Olympia Buttrey		908-647-1848
Barbara Sauk	840 Valley Rd	908-647-1848 or 908-265-4677
Franklin Clark	1311 Valley Rd	908-626-0336
Antonio Battilono	1335 & 1367 Valley Rd	718-317-7794
Felix Ruiz	126 Laurel Ave	908-626-0689
Dan O'Lunahin	1355 Valley Rd	908-647-6264
Joyce Brandt	1373 Valley Road	908-647-5987
Frederick Muller	96 Magnolia Ave Stirling NJ	908647 5589
Lynda & Jim Lorello	1341 Valley Rd Stirling NJ	908-903-1159
Dan O'Mullan	848 Valley Rd Millette NJ	908-647-6521
Rob Lattanzio	129 Laurel Ave. Stirling NJ	(908) 642-3146
JOHN LOMBARDO	72 POPLAR DR STIRLING NJ	(908) 903-1071
KEVIN PERRUSO	125 CEDAR AVE. STIRLING NJ	(908) 604-4674
MICHAEL SEDITA	73 MAGNOLIA AVE. STIRLING N.J.	(908) 647-5110
Christian Kubick	1387 Valley Rd Stirling NJ	908 580-0002
Anne Marie Rossero	117 Laurel Ave. Stirling NJ	908 647-7742
Leonard Forte	86 Magnolia Ave Stirling NJ	908-604-8930

TOWNSHIP OF LONG HILL

COUNTY OF MORRIS

GILLETTE, HOMESTEAD PARK, MEYERSVILLE, MILLINGTON, STIRLING

TOWNSHIP OFFICES:
915 Valley Road
Gillette, NJ 07933
(908) 647-8000
FAX (908) 647-4150

Wednesday, March 24, 2004

Paul Tumminello
United States Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Tumminello:

Enclosed please find a copy of letter from Mr. & Mrs. Bott in support of the Upper Passaic River Floodwall Project.

Sincerely,

Kevin Sluka
Administrator

George & Lynne Bott
44 Meadowview Road
Millington, NJ 07946

March 23, 2004

Mr. Kevin Sluka
Township Administrator
Township of Long Hill
915 Valley Road
Gillette, NJ 07933

Dear Kevin:

We are writing to express our support for the Army Corps of Engineers' proposed Flood Damage Reduction and Ecosystem Restoration project here in Long Hill Township. As residents of Long Hill Township for over 10 years, we realize what a serious potential for flooding the downtown Stirling area faces. We've seen the devastation caused by Stirling being under water twice in that time. We also know what a hazard it can be to have whole sections of town unreachable by our emergency personnel.

We were in attendance at the Army Corps' informational meeting on March 8, 2004. We listened to the presentation and spoke personally with Mr. Tumminello, the Project Manager. Although there were many negative comments from the audience, we feel that the proposed plan for flood reduction is sound, and that it will greatly benefit the town as a whole, particularly those in the downtown Stirling area. It is unfortunate that the plan can't benefit everyone, but the presentation clearly explained why that cannot be helped. We own a property at 1320 Valley Road in Stirling that we use for our plumbing business that should benefit from the proposed plan. We'd like to point out that our residence in Millington has flooded during the two major storms in the last 10 years and even though the proposed plan won't prevent that from happening again, we still support it.

It is important for the town to take advantage of all of the expertise and funding that is being offered to us at this time. We will probably never have this opportunity again. Please feel free to share our opinion with the Township Committee members. We are available for comment at (908) 647-5548. Thanks very much.

Sincerely,

George C. Bott

Lynne Bott

George & Lynne Bott

Dear

April 2, 2004

Geraldine Wesley-Ruhl
323 Mercer St.
Stirling, N.J. 07980

U.S. Army Corps. of Engineers, etc.

Attn: Paul A. Tumminello, P.E. Project MGR.

Dear Mr. Tumminello:

I (and several other Mercer St. residents) attended the meeting on March 8 at Long Hill Township regarding the Flood Reduction Study. Unfortunately, I wasn't feeling well and had to leave before the meeting ended, thus, didn't have an opportunity to introduce myself.

I am enclosing extensive documentation regarding mine, and other residents, situation on Mercer St. for your review. If, at all possible, I would request the return of the enclosed. As you will agree, this situation far outweighs the opposition to abort this plan, as obviously would be the desire of the residents in and near Poplar Drive.

As always, I appreciate your kind consideration to the severity of this problem.

Sincerely,

Geraldine Wesley-Ruhl

Encl.

Geraldine Wesley-Ruhl
323 Mercer Street
Stirling , NJ 07980

September 12, 2002

Township of Long Hill
1802 Long Hill Road
Millington, NJ 07946

Att: Mr. Erenest DelGuercio
Tax Assessor

Ref: Block #87 Lot #11-Wesley

Dear Sir,

With the reference to the above, I am quite upset with the increase in my property taxes for the new period 2002-2003 for the following reasons.

I have been the original owner of this property since September 6, 1963 (39 years) and hence have seen many neighbors come and go. Throughout all of these years, my taxes have steadily increased and I feel the property my home is on has steadily decreased in value due to the ever-increasing flooding problem, natural erosion that I have always endured compounded with the increase of construction in Long Hill Township i.e., antiquated drainage systems in the township,which have never been modernized to accommodate the current population. (Please see attached documentation, photos, news clipping, etc:

My property is the lowest elevation on Mercer Street and to date is still the only property that has total "waste land" in place of a backyard.

As I write this letter, I look out back across all of the yards on Mercer Street and everyone else has as assortment of picnic tables, tents, gazebos, swing/gym sets, dog runs, above-ground pools, terraces, flower and vegetable gardens, dog houses, tools sheds,etc., all the normal things one would find in a backyard to utilize the property they so greatly take pride in and pay dearly for their taxes. I, on the other hand, literally have NO functional backyard at all, although my property extends from front to 200 feet in the rear. I consider rendering the yard completely worthless.

Throughout the years, due to normal erosion and all the facts listed above in conjunction with numerous heavy rains and hurricanes, I have suffered extreme financial loss, resulting in my poured concrete foundation split open in four places during Hurricane Floyd. We have spent thousands and thousands of dollars trying to rectify a permanent condition, which has become our permanent lifestyle. We can never put an extra toilet in

the basement and my one time beautiful rec-room now serves no purpose, due to years of destruction from water damage. However, most of my neighbors on Mercer Street, had a second bathroom and needless to say, functional backyards. I pay taxes on ground that can never be used for anything but retention for Mercer Street's water problem.

Consequently, we live in five rooms because we can not use our basement , garage or yard for anything or any type of storage due to unexpected flooding conditions. Last week we cemented up the basement windows half-way because flood waters have poured in them.

We certainly have taken all the necessary precautions we could think of and made all the necessary repairs, but we still live in fear if we are away from home and have an unannounced flash-flood warning – good by yard again!

A few years ago we again attended the town council meeting and practically begged the township to institute some follow-up with Flood Control Projects as other near by towns such as Bound Brook, Manville, New Providence etc., definitely took notice of the urgency of their residents needs and acted upon a solution.

Subsequent to that meeting, certain people on the board, including the Mayor, came to our house and advised us thusly that the situation, as on going as it is, is virtually hopeless and we should consider the following options.

1. Move out of the area (our home is finally paid for-my husband is retired-this is out of the questions.)
2. Raise the house (very expensive to do)
3. Have FEMA buy the house. We could probably expect an hilarious selling price of about $100,000.00 to $150,000.00.

I must mention that you requested in your letter of January 10,2002, that I need to give supporting evidence of fair market values such as recent sales of similar properties in my area.

There have not been many sales over the years on Mercer Street, but the Trimble house on the end of Mercer Street was finally sold for $250,000.00. Mr. John Seibert, 339 Mercer Street had his house listed on the market for three years at $199,000.00. He finally took it off the market permanently because he could not sell it and even his yard does not get as bad as ours.

I feel I am in a no win-situation and the increase in my property taxes adds insult to injury.

You will note my prior assessed valuation of land was; 40,500
Improvement 55,300=TOTAL 95,800

The current new assessment; Land 135,100
Improvement 100,700=TOTAL 235,800

This new assessment has almost tripled.

I feel unjustly recognized given all the above facts and feel my taxes should have been decreased, if anything.

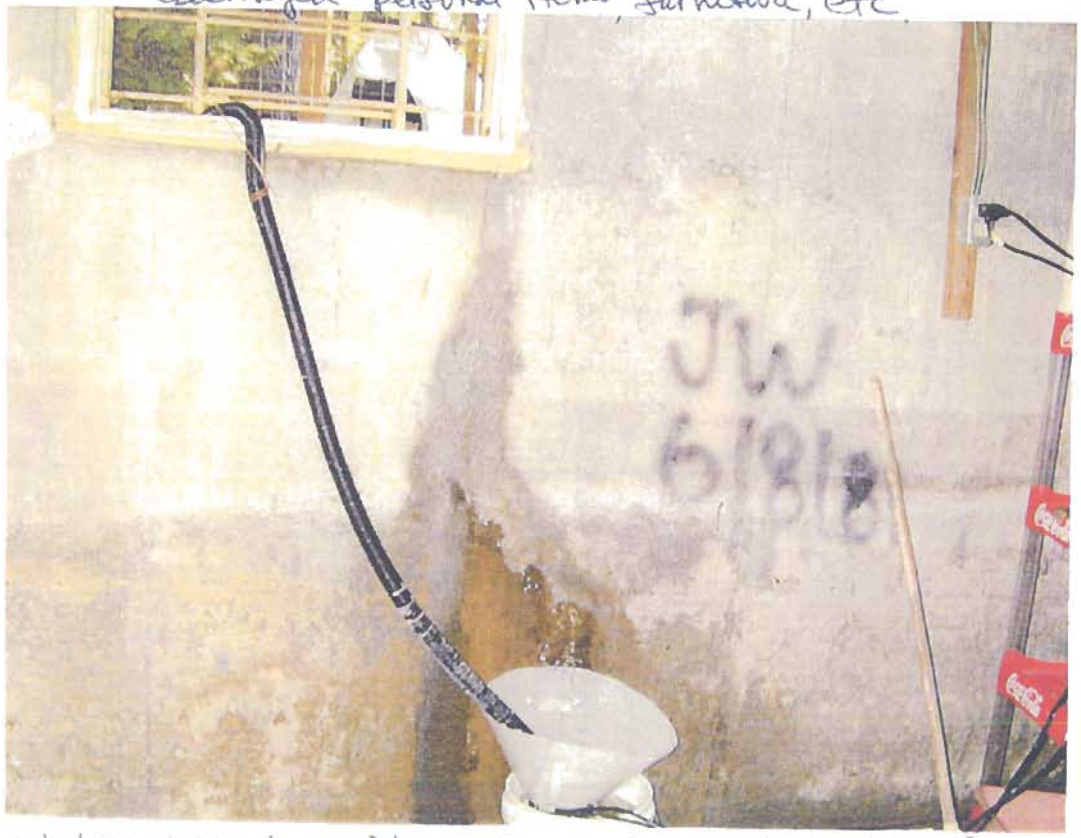
I have attached photos and news clippings pertinent to all of the above and would greatly appreciate a reconsideration of our needs.

Thank you in advance for all of your consideration to the above.

Geraldine Wesley Ruhl
908-647-9093

our driveway. Taking out destroyed personal items, furniture, etc

Backyard - Flooded



Water [illegible]uring into Foundation and being p[illegible]d

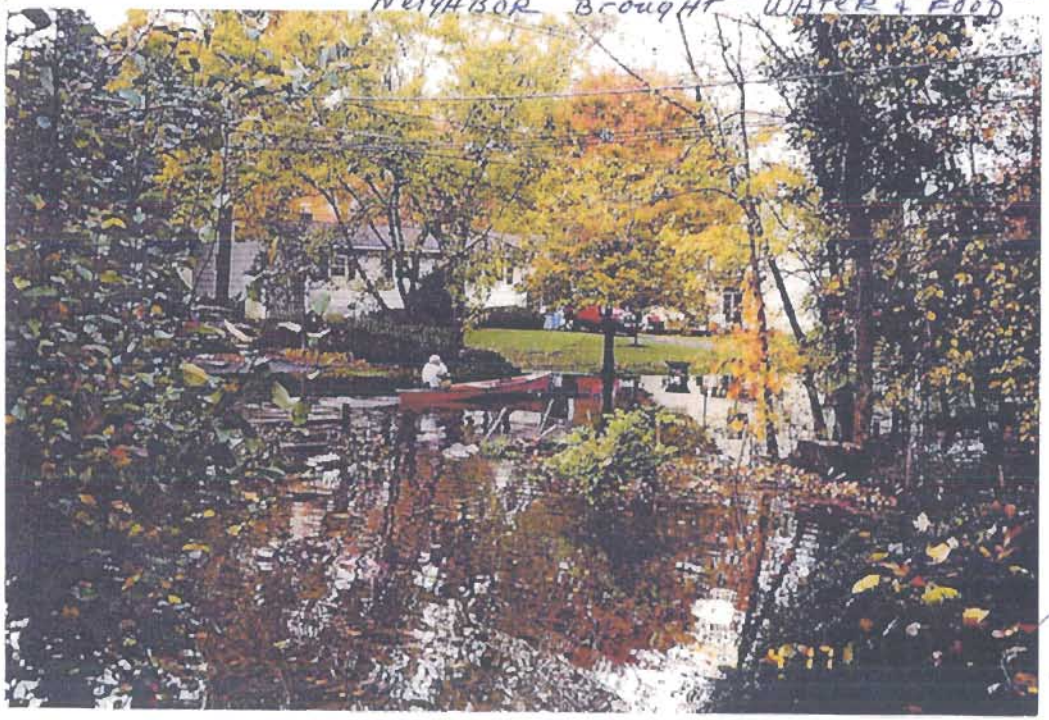
Yard with 4' Water in it

Destroyed Furniture

Neighbor trying to bring us food in a BOAT.

Our House

Neighbor brought water + food



Below - Side of House - Destroyed Air conditioner

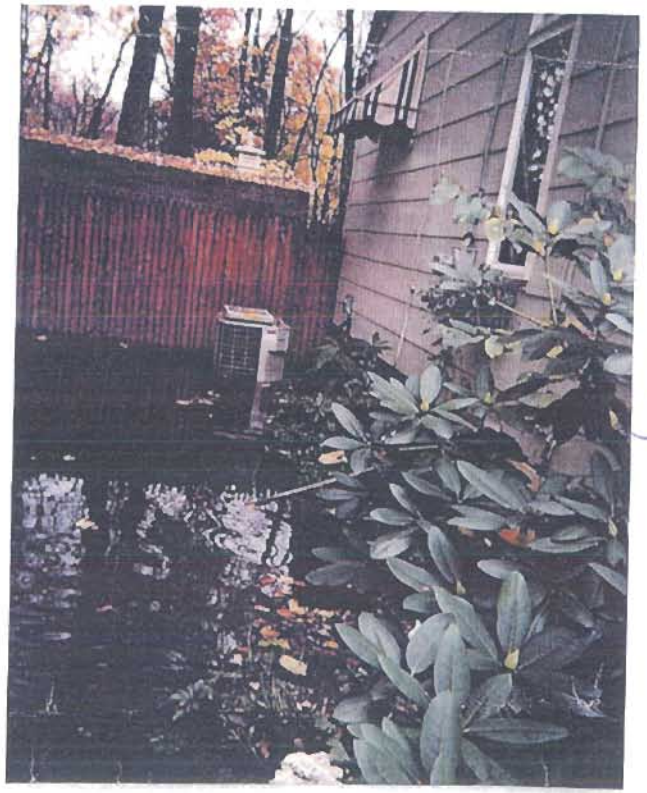
sump pumps going out window

4 sump pumps trying to keep up with wat

Back yard - Floating

Backyard - Floating picnic table

Floating to the wall



'99
Floyd
our
central
A.C.
outside
again
Destroyed

Back yard

5 pumps in Generator going at once on generator. "Floyd" 99

Water Poured in Windows and split foundation walls in 4 places

Front of House

Nor' Easter STORM 9-16-99

Front of House / mercer St

2:00 A.m Stirling Fire Dept. Pumping

Back Yard - 3 DAYS AFTER Flood

Front of House

FRONT of House

1 week after

We lost all Contents in Rec Room
Basement New furnace Hot water

Open a window. We put a funnel and pump out water outside poured in windows. But soon we couldn't keep up.

FRONT of House

FRONT of House

our Driveway

Front of House.

323 Mercer St. Stirling, NJ

1984

Front of House

Back yard

1964

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

Programs and Project
Management Division

October 1, 2004

Mr. Christian Kubick and Mrs. Daniela Kubick
1387 Valley Road
Stirling, NJ 07980

Dear Mr. and Mrs. Kubick:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, a response is provided to the comments you sent us in your correspondence during the public review of the report earlier this year. The response and a copy of your correspondence are enclosed. They will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments and hope that our responses are satisfactory. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

Letter Received From Christian and Daniela Kubick

Thank you for your comments regarding the project and the formulating of plans to address the flooding in Long Hill Township. The formulation of a water resources project involves analyzing several alternatives and then selecting the plan that provides the maximum protection, minimal environmental and social impact at a reasonable cost. The feasibility report documents the plans that were analyzed and the rational for selecting the recommended plan.

We are sensitive to your concerns regarding the recommendation to construct a floodwall across a portion of your property. To this end, every attempt at minimizing the impact to not only the environment but to personal property as well has been evaluated to reduce the impact of the project. As noted in the report, the portion of your property that will be utilized for the project will be acquired from you by purchase or easements and you will be compensated for at fair market value be maintained.
As presented in the Environmental Analysis, on which EPA concurred, long-term noise impacts are not expected as a result of this project. Due to the height of the wall, its distance from traffic, other barriers such as cars, houses and sheds, and the presence of landscaping in the area it is unlikely that any reflection of sound waves would occur from Valley Road traffic.

Interior drainage is always a concern and an issue that is addressed in every design effort for flood control projects. Moreover, it should be noted that the gates would only be closed when there is an imminent threat of flooding from the Passaic River. At that time, water levels in the tributaries will be rising due to the river, and the gates will be closed to prevent this flooding from occurring. Also, the water that flows to the wall will be intercepted by a drainage swale on the dry side of the wall. This swale will either take the runoff to a tributary or to a small pumping facility that will pump the water over the wall. This will prevent local flooding behind the wall.

As noted in the report, there may be an opportunity for the local community to incorporate some form of public access to the project. As is the case with many levees, they have become jogging/bike paths for those who wish to exercise in a less congested and safer environment from vehicular traffic. Since there is only a minimal length of levee and most of the alignment is floodwall, this scenario does not appear reasonable as an outcome. Ultimately the decision to allow public access rests with the Township and access may be restricted.
The operation and maintenance of the floodwall, and appurtenant features, including tributary clean out will be a non-Federal responsibility to be borne by the State and Township. The USACE will periodically inspect the site to ensure local compliance. The project should not induce flooding on your property, subject to municipal adherence to operation and maintenance requirements for the project.

In summation, thank you for your comments and for understanding that the plan formulation and NEPA process seeks to weave all critical study inputs together to arrive at the best solution.

Also as a follow-up to our meeting with you in June 2004, we are looking at an alignment revision that you proposed as part of the plans and specifications effort. The detailed plans and specifications survey effort was recently completed and we are reviewing your proposal utilizing the new survey. The proposal is also being coordinated our partner, the New Jersey Department of Environmental Protection. Once we have finished the review we will communicate with you as to whether the proposal can be accommodated.

U.S. Army Corps of Engineers, New York Division
26 Federal Plaza
Programs and Project Management Division, Room 2127
New York, NY 10278

Attn: Paul A. Tumminello

Re: Draft Report for the Upper Passaic River and Tributaries at Long Hill Township, New Jersey, Flood Damage Reduction and Ecosystem Restoration Study

March 24, 2004

Dear Paul A. Tumminello:

We, the Kubick family, home owners living at 1387 Valley Road appose the levee/floodwall structure the way it is being proposed. For a project that cost million's of dollars, the study did not take into consideration the very people it is negatively affecting the most. We are not opposed to a flood control measure that is designed to benefit the town, however we feel that this plan is an abuse of power. It is aggressively planned to sever our lawn in order to help future projects for the township and to avoid mitigation.

Our home is out of the flood zone. We are not required to pay flood insurance. Our house has never in 6 years been flooded, and our former owner never had water damage to either dwelling on our property. This levee/floodwall structure will cut through our backyard. We have a beautiful mowed lawn, surrounded by gorgeous old trees. This proposal would devastate the appearance of our property. It would devalue our property immensely. One of the main reasons we bought this land was for its beauty and expansive scenery. It is a piece of land that provides us with great pride and joy. It brings us together with nature. It is our piece of heaven. We had our wedding celebration on land you propose to drive a steel sheet ten feet in to the ground.

The proposed structure will also create an acoustical barrier that reflects all the road noise generated from valley road. The magnified sounds, generated by echoing sound waves bouncing off the proposed floodwall, may force us to move out of our home. If we wanted to sell our home, this wall cutting through our lawn would stop prospective homebuyers in their tracks. Before they even stepped inside our beautiful home, they would ask what this wall is for. We would tell the homebuyers that this is a flood wall. The homebuyer would get back in their car and drive away.

One of the tributaries runs right along our property. For seven years we cannot recall one scheduled clean up of the tributaries brush, garbage and debris, by the town. It is obvious that poor drainage can only exacerbate a flooding problem, yet the town has done nothing. A town representative said that the boy scouts have asked several times to voluntarily clean up the tributaries; the town has denied them. It is proposed that after the

levee/floodwall has been built, the tributaries and construction will be periodically maintained by the township. The township has proven over the past several years that they are not capable of such a responsibility.

This proposed levee/floodwall system inhibits the natural draining of water sloping away from our home. In addition, in the eventuality that the closure structures on the tributaries are shut, the water from those tributaries will need to flow downhill. Our property and others similarly located "receive runoff from adjoining higher areas" according to the Draft Report, vol. 1 p. 2-3. This water will seek the lowest point; as a result, it will have no other place to be than our yard, driveway, and home. This water will drain eventually, but will be dammed up by this structure, impeded from completing its flow downhill to the river.

The levee/floodwall structure will negatively impact home owners 365 days a year. An extraordinary rain event that causes a flood may happen once every decade. Statistically two separate heavy rains are more probable then a rain event that would cause flooding to the entire town. The tributary closures would close when the water back flows with the first rain event, the second rain event would turn our properties into a bathtub. When the floodwall becomes a dam that inhibits the natural draining process, the upland and road runoff waters will negatively impact our lifestyles, and our property.

The Draft Report suggests, "Once construction is complete, there will be additional recreational opportunity such as walking, running, or biking on the easement areas adjacent to the levee/flood wall." (vol. 1, p. 6-6) Our lawn should not be a public access thoroughfare. We could never have a private barbecue, family gathering, or even an hour of private relaxation in our back yard again without having the possibility of strangers jogging, biking, or walking through. This is a violation of privacy of the worst sort and raises many home security concerns. However, it would be impossible for us to support this proposed structure if this recreational trail will run right next to our home and invade our privacy.

This floodwall as it has been proposed to us will negatively impact our lifestyles and property value in many ways. We do not support the construction of a project that will detract from the value of our investment and the ability to enjoy our home as a peaceful sanctuary; change the proposal and move the wall back for the benefit of all. Flooding is a problem for the entire area; find a solution that works for everyone and hurts no one. Propose a solution that will help all the residents of our community. When monetary cost to benefit ratios are more important then people and their rights to live in peace and privacy, the government made a poor calculation on what is important.

Sincerely,

Christian and Daniela Kubick
1387 Valley Road
Stirling, New Jersey 07980

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

October 1, 2004

Mr. Franklin Clark and Mrs. Abigail Clark
1311 Valley Road
Stirling, NJ 07980

Dear Mr. and Mrs. Clark:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, a response is provided to the comments you sent us in your correspondence during the public review of the report earlier this year. The response and a copy of your correspondence are enclosed. They will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments and hope that our responses are satisfactory. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

Letter Received From Franklin and Abigail Clark

Thank you for your comments regarding the project and the formulating of plans to address water resources problems follows a structured, rational and iterative approach. It is often a challenge to respond to complex interrelated social, economic, cultural, environmental processes in developing solutions for flood damage reduction measures. Invariably, as with most complex technical decisions, there is a trade-off to be made that strikes a balance between achieving the goal of flood protection, minimizing environmental and social impacts.

As presented in the Environmental Analysis, on which EPA concurred, long term noise impacts are not expected from this project. Due to the height of the wall, its distance from traffic, other barriers such as cars, houses and sheds, and the presence of landscaping in the area it is unlikely that any reflection of sound waves would occur from Valley Road traffic.

Additionally, the wall will have a wood façade giving it the appearance of a fence rather than a wall. As such, wood is an acoustically absorptive material that will reduce the amount of noise reflected. Since the wall behind your home is over 200 feet from the road, the noise from the road will be attenuated by distance before reaching the wall. This wall will only be slightly higher than 4 feet high behind your home, well below window elevation, so what little noise might be reflected of the wall will not enter your home. While the wall will be running parallel to your driveway, it will terminate approximately 20 feet from Valley Road, before the sidewalk. At this point it will be only about 3.5 feet high. This height, 20 feet off the road, should not hamper your visibility when exiting from your driveway.

Interior drainage is always a concern and an issue that is addressed in every design effort for flood control projects. Moreover, it should be noted that the gates would only be closed when there is an imminent threat of flooding from the Passaic River. At that time, water levels in the tributaries will be rising due to the river, and the gates will be closed to prevent this flooding from occurring. Also, the water that flows to the wall will be intercepted by a drainage swale on the dry side of the wall. This swale will either take the runoff to a tributary or to a small pumping facility that will pump the water over the wall. This will prevent local flooding behind the wall.

As noted in the report, there may be an opportunity for the local community to incorporate some form of public access to the project. As is the case with many levees, they have become jogging/bike paths for those who wish to exercise in a less congested and safer environment from vehicular traffic. Since there is only a minimal length of levee and most of the alignment is floodwall, this scenario does not appear reasonable as an outcome. Upon implementation, this project becomes public domain; however the local authority may restrict access for safety reasons.

The operation and maintenance of the floodwall, and appurtenant features, including tributary clean out will be a non-Federal responsibility to be borne by the State and Township. The USACE will periodically inspect the site to ensure local compliance. The project should not induce flooding on your property, subject to municipal adherence to operation and maintenance requirements for the project.

In summation, thank you for your comments and for understanding that the plan formulation and NEPA process seeks to weave all critical study inputs together to arrive at the best, albeit not perfect, water resources plan of improvement.

U.S. Army Corps of Engineers, New York District
26 Federal Plaza
Programs and Project Management Division, Room 2127
New York, NY 10278

Attn: Paul A. Tumminello

Re: Draft Report for the Upper Passaic River and Tributaries at Long Hill Township, New Jersey, Flood Damage Reduction and Ecosystem Restoration Study

March 24, 2004

Dear Paul A. Tumminello:

As home owners living on the south side of Valley Road directly where the proposed levee/floodwall structure is planned to be built, we, the Clark family of 1311 Valley Road have many concerns about this project that have not been adequately addressed in either the Draft Report or in the informational meetings held in town. In general we are not opposed to a flood control measure that benefits the common good, however we feel that this plan is disproportionately helping some residents, while severely detracting from others. This proposed structure is planned to be constructed too close to our home for comfort, depriving us of our lands and the recreational opportunities they offer us. Additionally, this proposed levee/floodwall is designed to protect certain homes, however it will impact certain residences negatively because they are located on the unprotected side of this proposed structure. We cannot support the construction of any project that will effect our investments or those of our neighbors in a negative manner.

This proposed levee/floodwall system inhibits the natural draining of water sloping away from our home. In addition, in the eventuality that the closure structures on the tributaries are shut, the water from those tributaries will need to flow downhill. Our property and others similarly located "receive runoff from adjoining higher areas" according to the Draft Report, vol. 1 p. 2-3. This water will seek the lowest point; as a result, it will have no other place to be than our yard, driveway, and basement. This water

will drain eventually, but will be dammed up by this structure, impeded from completing its flow downhill to the river. When the floodwall becomes a dam that inhibits the natural draining process, the upland and road runoff waters will negatively impact our lifestyles, and our property value.

This proposed structure is planned to be built too near our home and as a result will effect the value of our property and our lifestyles. We have spent two years hard at work extensively repairing our home. We have spent countless hours and invested much money to create an attractive homesite. We have cleaned, sanded, painted, repaired, and restored to bring beauty to our home and neighborhood. It is devastating to think that the location of this proposed structure will negatively impact everything we have tried to accomplish. We have been told that our lands are wanted for wetlands mitigation, because they are pristine. The reason our lands are so beautiful is that we have worked to make them so. Since we purchased the property, we have tirelessly removed old tires, empty bottles, discarded toys, broken tools, automotive parts, etc. Our lands are pristine, because we cared enough to clean up the litter of previous owners, renters, and passersby. We have invested time, money, and personal effort to improve both our home and the natural landscape around it. The only reason this project is designed to take so greedily of our lands is financial concerns relating to the cost of mitigation, that reason is not good enough when weighed against all we have worked to achieve.

As we have become familiar with our land, we have discovered what we believe to be an old blueberry farm. There are many six foot tall abundantly producing blueberry trees growing over several acres of our property. We hope to reinstate this agricultural venture in an environmentally friendly way. Our grandparents and parents are from rural farming backgrounds; we respect and appreciate nature's bounty. We want to cultivate these plants and enjoy their harvest for years to come. If the proposed floodwall is constructed, it would prevent us from ever realizing this dream.

Our home and yard, according to the proposal, will be surrounded on two sides by this floodwall structure. In other words, according to the plan, fifty percent of our property's perimeter will be hedged in by the proposed floodwall cutting off some of our valuable road front property and running right along our existing driveway. This part of the floodwall design will decrease visibility, creating a driving hazard for cars leaving our

driveway. Valley Road is a busy street and the intersection with Main Avenue is only one house away from our home. The proposed structure will create an acoustical barrier that reflects all the road noise and sounds generated from the auto repair shop across the street. The magnified sounds generated by echoing sound waves bouncing off the proposed floodwall may very well make our home unlivable.

The Draft Report suggests that "Once construction is complete, there will be additional recreational opportunity such as walking, running, or biking on the easement areas adjacent to the levee/flood wall." (vol. 1, p. 6-6) Our lawn should not be a public access thoroughfare. We could never have a private barbecue, family gathering, or even an hour of private relaxation in our back yard again without having the possibility of strangers jogging, biking, or walking through. This is a violation of privacy of the worst sort and raises many home security concerns. At the town meeting, when this issue was raised, it was merely glossed over as a side issue for future discussion. However, it would be impossible for us to support this proposed structure if this recreational trail will run right next to our home and invade our privacy.

This floodwall as it has been proposed to us will negatively impact our lifestyles and property value in many ways. We do not support the construction of a project that will detract from the value of our investment and the ability to enjoy our home as a peaceful sanctuary; change the proposal and move the wall back for the benefit of all. Flooding is a problem for the entire area; find a solution that works for everyone and hurts no one. Propose a solution that will help us and all the residents of our community.

Sincerely,

Franklin E. Clark
Abigail L. Clark

Franklin E. and Abigail L. Clark
1311 Valley Road
Stirling, New Jersey 07980

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

October 1, 2004

Mr. Robert Brandt and Mrs. Joyce Brandt
1373 Valley Road
Stirling, NJ 07980

Dear Mr. and Mrs. Brandt:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, a response is provided to the comments you sent us in your correspondence during the public review of the report earlier this year. The response and a copy of your correspondence are enclosed. They will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments and hope that our responses are satisfactory. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

Email From Robert C. and Joyce H. Brandt

Thank you for your comments regarding the project. The formulating of plans to address water resources problems follows a structured, rational and iterative approach. It is often a challenge to respond to complex interrelated social, economic, cultural, environmental processes in developing solutions for flood damage reduction measures. Invariably, as with most complex technical decisions, there is a trade-off to be made that strikes a balance between achieving the goal of flood protection, minimizing environmental and social impacts
The operation and maintenance of the floodwall, and appurtenant features, including tributary clean out will be a non-Federal responsibility to be borne by the State and Township. The USACE will periodically inspect the site to ensure local compliance. The project should not induce flooding on your property, subject to municipal adherence to operation and maintenance requirements for the project.

Interior drainage is always a concern and an issue that is addressed in every design effort for flood control projects. With this said, it should be noted that the gates will only be closed when there is an imminent threat of flooding from the Passaic River. At that time, water levels in the tributaries will be rising due to the river and the gates will be closed to prevent this flooding from occurring. Secondly, the water that flows to the wall will be intercepted by a drainage swale on the dry side of the wall. This swale will either take the runoff to a tributary or to a small pumping facility that will pump the water over the wall. This will prevent local flooding behind the wall.

Tumminello, Paul NAN02

From: Joyce Brandt ,
Sent: Monday, March 29, 2004 10:23 PM
To: Tumminello, Paul
Subject: Stirling NJ floodwall

3/30/04

Dear Mr. Tumminello

We are the owners of the property located at 1373 Valley Rd. Stirling, N.J. & designated on the tax map as Block 1/Lot18.01.
When we received notice of the proposed floodwall which will affect our property, we went to town hall & obtained a copy of the map showing the configuration of the wall as planned by the Army Corps of Engineers.
We are quite upset to see that the wall will cut our lot in half & at an angle through the lowest point of the property.
Our immediate concerns are: 1} The reduction of wetland on the Valley Rd. side of the wall which now absorbs normal rainfall & runoff.: 2} The potential overflow of the nearby tributary when the sluice gate is closed.
We would appreciate the opportunity to discuss these matters with you and the possibility of moving the wall further back on higher ground running straight across rather than at an angle. Having a wall so close to our dwellings is a concern to every affected property owner along Valley Rd.

Sincerely,

Robert C. & Joyce H. Brandt

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

October 1, 2004

Mr. Larry Mammone and Mrs. Robin Mammone
111 Laurel Avenue
Stirling, NJ 07980

Dear Mr. and Mrs. Mammone:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, a response is provided to the comments you sent us in your correspondence during the public review of the report earlier this year. The response and a copy of your correspondence are enclosed. They will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments and hope that our responses are satisfactory. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

Email From Larry and Robin Mammone

The Township will have an agreement in place for the operation and maintenance of the floodwall, which should include tributary, clean out. The USACE will periodically inspect the project to ensure compliance with the agreement.

Interior drainage is always a concern and an issue that is addressed in every design effort for flood control projects. With this said, it should be noted that the gates will only be closed when there is an imminent threat of flooding from the Passaic River. At that time, water levels in the tributaries will be rising due to the river and the gates will be closed to prevent this flooding from occurring. Secondly, the water that flows to the wall will be intercepted by a drainage swale on the dry side of the wall. This swale will either take the runoff to a tributary or to a small pumping facility that will pump the water over the wall. This will prevent local flooding behind the wall.

Tumminello, Paul NAN02

From: larry mammone

Sent: Monday, March 29, 2004 6:13 PM

To: Tumminello, Paul

Subject: Flood Control in Long Hill Township,NJ

Dear Mr. Tumminello, My name is Larry Mammone and I live at the end of Laurel Ave in Stirling, NJ. One of the creeks that will be effected by your flood control levee is on my property. On several occasions, this creek fills up and over until it reaches the corner of my house. I have concerns about what will happen after this levee and or berm is constructed. First and foremost, I am concerned for the safety of my children. Secondly,the damage to my property and home. The value of my house also concerns me. I have been to the town meetings and I know I share these views with my neighbors. I have been also reassured that this project will have almost or no effect to our flood situation. I am not totally convinced of this and I just want to go on the record by saying that I am highly opposed to this levee and if this levee is built and actually does have an impact on my property, atleast you know where I stand on this prior to it being built.

Thanks: Larry and Robin Mammone
111 Laurel Ave
Stirling, NJ. 07980
908-626-0393

Please realize that I mean no disrespect, I'm sure if you were in my shoes you might feel the same way.
Pease feel free to contact us if you would like to respond to this e-mail. Thanks Again

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

October 1, 2004

Mr. Dan O'Mullan
848 Valley Road
Stirling, NJ 07933

Dear Mr. O'Mullan:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, a response is provided to the comments you sent us in your correspondence during the public review of the report earlier this year. The response and a copy of your correspondence are enclosed. They will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments and hope that our responses are satisfactory. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

Email From Dan O'Mullan

The Township will have an agreement in place for the operation and maintenance of the floodwall, which should include tributary, clean out. The USACE will periodically inspect the project to ensure compliance with the agreement

Interior drainage is always a concern and an issue that is addressed in every design effort for flood control projects. With this said, it should be noted that the gates will only be closed when there is an imminent threat of flooding from the Passaic River. At that time, water levels in the tributaries will be rising due to the river and the gates will be closed to prevent this flooding from occurring. Secondly, the water that flows to the wall will be intercepted by a drainage swale on the dry side of the wall. This swale will either take the runoff to a tributary or to a small pumping facility that will pump the water over the wall. This will prevent local flooding behind the wall.

The design of the road raising will take into account the changed hydraulic condition after it is constructed and any changes to the existing condition will be addressed in the upcoming plans and specifications phase. In addition, a more detailed survey will be conducted to accurately determine the movement of water and any ponding situations that may occur. To answer your question about meeting with us, at our next field visit, we generally are in Longhill Township every few months for updates and briefings, we will coordinate a meeting with you to address this issue of ponding being caused by Valley Road.

Tumminello, Paul NAN02

From: Daniel O'Mullan [domullan@ob-law.com]

Sent: Monday, March 29, 2004 10:10 AM

To: Tumminello, Paul

Cc: ksluka@longhillnj.org

Subject: Upper Passaic/Long Hill Project/GilletteSluice Gate Road

Mr. Tumminello:

I reside at 848 Valley Rd.,Gillette. My neighbor, Olympia Butkowski of 840 Valley, and I share a concern as to the proposed road raising in front of our homes (see your maps C-4 and C-5) in connection with the Gillette sluice gate installation. Unless carefully designed it will aggravate an existing condition, The natural topo causes surface water to flow southeasterly down the side of a hill at an approximately 45 degree angle to Valley Road,across up hill properties, including mine, to a relatively flat area (mostly in the front yard of 840 Valley Rd). It tends to pond up against the road. The raising of the road at point 48.50 on your drawing from 216.00 existing to 217.41 proposed and the associated proposed raising of the driveways will serve to exaggerate the current damming effect unless specifically designed for. Mrs Butkowski already has difficulty with surface water flowing down her drive into her attached garage and basement.

Would it ber possible to meet with someone from the design team to discuss our specific concerns. I have reason to believe that the property at 834 Valley ,adjacent to the stream/ditch will have similar concerns. None of us received notices by mail of prior public sessions. I would ask to be included on any mailing list for future meetings.

Thank you.

Dan O'Mullan

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

Programs and Project
Management Division

October 1, 2004

Ms. Geraldine Wesley-Ruhl
323 Mercer Street
Stirling, NJ 07980

Dear Ms. Wesley-Ruhl:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, we acknowledge your correspondence indicating support for the project a part of the public review of the report earlier this year. As per your request, the original photos you sent us are being returned to you. A copy of your correspondence will be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

October 1, 2004

Mr. Felix Ruiz
126 Laurel Avenue
Stirling, NJ 07980

Dear Mr. Ruiz:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, we acknowledge your objections to the study recommendations in your correspondence to us during the public review of the report earlier this year. A copy of your correspondence is enclosed. It will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

Tumminello, Paul NAN02

From: Ruiz, Felix [Felix.Ruiz@pseg.com]
nt: Tuesday, March 09, 2004 11:28 AM
o: 'paul.tumminello@usace.army.mil'
Cc: 'administrator@longhillnj.org'
Subject: Long Hill Project Meeting March 8,2004

Dear Mr.Tumminello

Think you so much for taking the time to explaining the proposed Flood Project at Long Hill Township last night. By listening to your own comments last night I don't think the meeting went as you thought it was going to be or as you where lead to believe by the Board Members. As you witness for yourself last night the proposal by Majority has NO public backing at all. There are just to many unforeseen conclusion. Example: The amount of rise (1" or so) of water to the area but also the amount the area covered by the by that 1". I know economically this proposal is the way to go but not everything is measured in dollars and cents.

I thought that my neighbors and I where the only ones being affected by this plan but I was totally wrong after listening to everyone complain last night I know now that it affects much more then my little neighborhood. After the meeting last night allot of us got together to discuss your presentation. We all came to the conclusion that if the Town Board does not take our opines to hart when they vote on this matter then we would have to get legal representation.

It's was a shame that not all of the Board members where on hand to hear the complaints and concerns of the town residents.

Thank you
Sincerely
Jorge Felix Ruiz
126 Laurel Ave.
Stirling NJ 07980
jfelixruiz@msn.com
felix.ruiz@pseg.com

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DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

October 1, 2004

Mr. Antonio Battiloro
395 Rathbun Avenue
Staten Island, NY 10312

Dear Mr. Battiloro:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, we acknowledge your objections to the study recommendations in your correspondence to us during the public review of the report earlier this year. A copy of your correspondence is enclosed. It will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

March 24, 2004

RE: Flood Wall Location
Long Hill Township
New Jersey

Mr. Paul A. Tumminello
U.S. Army Corps of Engineers
New York District
26 Federal Plaza, Room 2127
New York, New York 10278

Dear Mr. Tumminello:

Upon review of the draft Detailed Project Report for Flood Damage Reduction and Ecosystem Restoration at Long Hill Township, New Jersey, I, as the owner of Lots 19 and 24, hereby object to the proposed location of the flood wall as shown in the design documents.

Please consider an alternate location for the proposed flood wall, in which it will minimally, if at all, affect my lots.

Sincerely,

Antonio Battiloro

Antonio Battiloro

cc: Kevin Sluka, Town Administrator
Long Hill Township

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Programs and Project
Management Division

October 1, 2004

Mr. George Bott and Mrs. Lynne Bott
44 Meadowview Road
Millington, NJ 07946

Dear Mr. and Mrs. Bott:

The Detailed Project Report and Environmental Assessment for the Upper Passaic River and Tributaries at Long Hill Township, NJ Flood Damage Reduction and Ecosystem Restoration Study is being finalized. As part of the preparation of the final report, we acknowledge your correspondence indicating support, which was forwarded to us by Mr. Kevin Sluka, the Long Hill Township Administrator during the public review of the report earlier this year. A copy of your correspondence is enclosed. It will also be included in the final report along with all the relevant comments that were received during the public review of the draft report. The final report is scheduled to be issued in the near future.

I would like to thank you for the time that you took to provide us comments. If you should have any additional questions, please feel free to contact me at (212) 264-0437.

Sincerely,

Paul A. Tumminello, P.E.
Project Manager

Enclosure

CENAN-PL-F-HES 4 June 2004

MEMORANDUM FOR THE RECORD

SUBJECT: Upper Passaic River and Tributaries Feasibility Study – Meeting with Mr. And Mrs. Kubick of 1387 Valley Road, Stirling, NJ 07980 – 4 June 2004.

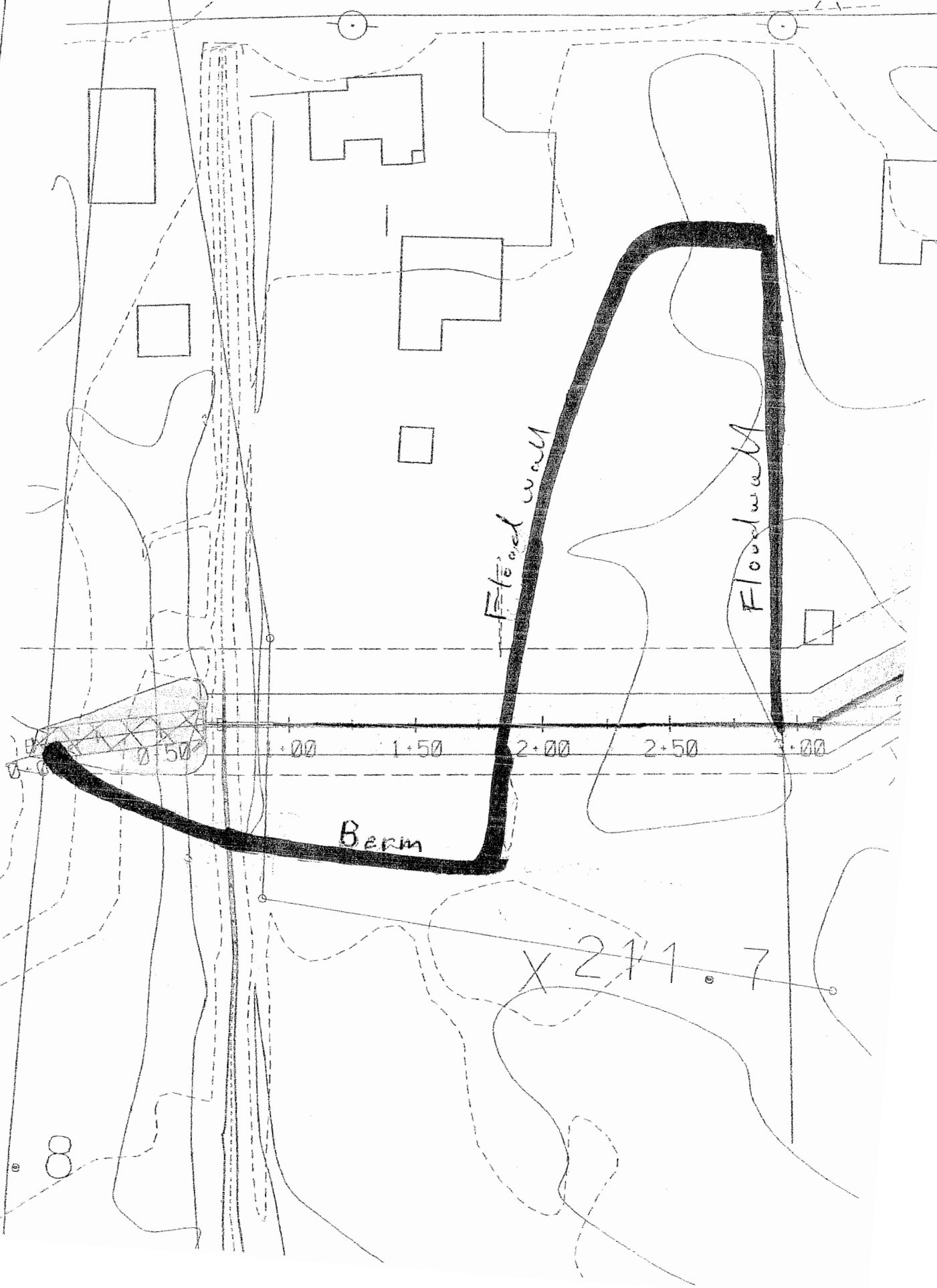
1. In attendance at this meeting were Mr. And Mrs. Kubick, Charlie Defendorf, NJDEP, Paul Tumminello, USACE, and Ron Brattain, USACE.

2. The meeting was arranged to address the Kubick's concern with the alignment of the proposed project and how it will impact their property. Suggestions for moving or shifting the alignment were discussed and a markup of the location is attached to graphically represent the re-alignment discussion. The drawing represents the concession the Kubick's are willing to make in providing additional lands for the purpose of moving the alignment. The area in question is not used by the property owner nor is there any plan for future activity on this land.

3. The commitment by the team to the Kubick's is that the alignment will be re-evaluated for shifting during the plans and specifications phase and any changes to the alignment will be coordinated with them prior to implementation and construction of the project. Also, any future access to their property by project team members, to include survey members, shall be coordinated in advance with the Kubick's via telephone 24 hours prior to arrival and access.

Ronald V Brattain
Project Planner

Kubick Proposal



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REPLY TO
ATTENTION OF
Programs and Project Management Division

March 22, 2004

David Schiavi
63 Poplar Drive
Stirling, NJ 07980

Dear Mr. Schiavi:

Thank you for your e-mail of March 9, 2004 regarding the Upper Passaic River and Tributaries, Long Hill, New Jersey project. You asked a number of questions regarding historic flooding in the project area. I answered using the numbering system in your e-mail.

1a) 215.2 feet (or approximately two hundred fifteen feet and two inches). This elevation was estimated based on an anecdotal account of personnel at the police station who indicated the high water for the 1996 flood was about 0.5 feet higher than the 1999 flood based on water levels on the fire hydrant outside the station.

1b) 214.8 feet (or approximately two hundred fourteen feet and ten inches). This is also an estimated elevation based upon a high water mark. High water marks recovered by survey crews in Stirling varied by 0.5 feet.

2) *50-year water surface elevation (WSEL) 215.2 feet (or approximately two hundred fifteen feet and two inches). The one-inch increase is for the 100-year event, which is 216.2 feet (or approximately two hundred sixteen feet and two inches). Smaller floods such as the 1996 flood (approximately a 50-year flood) and the 1999 flood (approximately a 30-year flood) have less than a one-inch increase.*

3) We do not have high water marks for this event.

I hope this answers your questions. If you should have further questions on this matter you can direct them to me at (212) 264-0437.

Sincerely,

Paul Tumminello
Project Manager

Attachment: Original e-mail

CF: Charlie Defendorf, New Jersey Department of Environmental Protection

Tumminello, Paul NAN02

From: David Schiavi [dschiavi@metlife.com]
nt: Tuesday, March 09, 2004 9:21 AM
: Tumminello, Paul
Subject: What happened to the Web site/ couple of questions / comment

Paul,
What happened to all the new information that was put on the web site for the Upper Passaic River Tributary study.
The web site seems to have reverted back to the old interface the way it was before the new information was posted.
I was going to mention it last night but you had enough other comments to address.

Specific Questions. Maybe your hydraulics people can answer.

1.) What was the exact height above sea level in Feet and Inches for the Water in Stirling at the crest of
a.) 1996 Noreaster storm) ?
b.) 1999 Hurricane Floyd) ?

2.) On your maps you show 50 yr and 25 yr events marked by darker and lighter shades of purple respectively.
what is the height above sea level (ft / inches) that the min level of the darker purple (50 yr evnt) it measured at ?

I would just like to know these facts because the water was in our yard, surrounding the house, but not in the house, and according to your maps r house sits right on the edge of the 50yr event. Just want to make sure ıore inch wouldn't have caused us to flood in the same events of the last storms.

3.) Also do you know the height at the crest from Tropical storm Doria in 1971 ?
(that one got us.)

Just a comment .
If you think the people were extra cynical last night, its not just because your the Feds, They have lived in a town with poor drainage and engineering.
for many years. The Township has a history of neglect in these areas, and where there is new construction, they screw it up more.
So to ask many to understand how your proposal will stop flooding in a big storm by closing off access to the river , all they see is a small storm , bad drainage, and water in their yards now, and every time something is built nearby it gets worse.
I can show you a drainage pipe for Poplar Drive / Laurel Ave that is supposed to drain run-off but its about 2 feet in the air, (in other words the water in the ditches and property that feed to this pipe is always 2 feet high before it can even start draining , so there is almost always a lake on the right side of Poplar drive. This was from the geniuses who put the in BALLFIELDS, Which BY THE WAY were built in Wetlands.)

Thank you for your time
David Schiavi
Poplar Drive
rling NJ 07980

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REPLY TO
ATTENTION OF
Programs and Project Management Division

March 22, 2004

John Yetsko and Leslie Yetsko
371 Sussex Avenue
Stirling, NJ 07980

Dear Mr. & Mrs. Yetsko:

Thank you your email dated March 10, 2004 regarding the Upper Passaic River and Tributaries, Long Hill, New Jersey project. Our hydrology and hydraulics personnel have reviewed your questions and concerns about interior drainage and how the proposed floodwall and gates will affect local drainage. Answers to your questions and concerns are provided below.

Rain that falls in Stirling drains through the tributaries to the Passaic River when the Passaic River is at or below normal levels. If the drainage is slow or inadequate then it will cause localized flooding within Stirling even though the Passaic River is not flooding. The proposed flood control project does not correct any local drainage problems that currently exist. The tributaries must be maintained to handle local rain runoff by keeping them clear of debris and vegetation.

The proposed flood control project is designed to protect against major flooding from the Passaic River such as the floods that occurred from Tropical Storm Floyd in 1999 and the storm in 1996. Storms such as these create flooding in the Stirling area by the backflow of Passaic River floodwaters that come from drainage of the entire upstream Passaic River watershed (approximately 85 square miles), and not just local rainfall events in the local drainage area around Stirling (approximately 1.5 square miles). These major floods on the Passaic River have much greater flood damage potential than flooding from inadequate interior drainage. In other words, interior drainage by itself cannot create flood levels that are as high as the potential flood levels from the Passaic River.

The proposed project will have gates that cross the tributaries and these gates will be operated to prevent flooding from the Passaic River from passing through the proposed floodwall. The flood protection project will have no positive or negative impact on drainage of local rainfall runoff because the gates will remain open during a localized rainfall event. It is only when the Passaic River starts to rise and begins to backflow into the Stirling area that the gates will be closed. The gates will only be reopened when the Passaic River recedes. Consequently, there is a reduction in the interior flooding because the floodwall is protecting the Stirling area from the higher Passaic River flood levels.

As noted above, in order for the local drainage problems to be minimized, the ditches or tributaries and storm drainpipes must remain clear of debris and vegetation so that local rainfall runoff can flow to the Passaic River. It should also be understood that minor flooding will still occur if the local Stirling area experiences a severe localized rainfall event such as thunderstorm because this flood control project is not designed to protect against that type of flooding. While this project does not solve all flooding problems, the net impact is a significant reduction in overall flood damage potential in Stirling from events like those experienced in 1996 and 1999 with no adverse impact to any other areas.

I hope this answers your questions. If you have further questions, please contact me via e-mail or at (212) 264-0437.

Sincerely,

Paul Tumminello
Project Manager

Attachment: Original e-mail

CF: Charlie Defendorf, New Jersey Department of Environmental Protection

Tumminello, Paul NAN02

From: Leslie Yetsko
ıt: Wednesday, March 10, 2004 11:24 AM
Tumminello, Paul
ɔubject: Flood damage reduction project- Stirling, New Jersey

Dear Mr. Tumminello,

My name is Leslie Yetsko and I reside at 371 Sussex Avenue, Stirling, NJ with my husband and daughter. The west tributary runs through my property. We have lived in our home for almost nine years and have done substantial drainage work on our property to help alleviate our flooding problem. On at least three occasions we have had four (4) feet of standing water in our back yard. Once we had about two(2) feet in our basement. We were not consulted or interviewed at any time during the planning stages of this project and believe should have been given an opportunity given our proximity to the west tributary. I was told that our land was "walked", but how do you know what our land is like unless you speak to the people that live there and experience it on a daily basis? Was it walked during a heavy rain, after a rainfall or during a dry spell?

I was at the meeting held last evening, March 8, and came away with a feeling of being torn about this project. I did spend some time with your hydrology and hydraulics representative after the meeting and things l become more clear, but I still have more estions. I should also point out that this is a very diverse community which was evident at the meeting. I believe that the people there did not come away with a warm fuzzy feeling because many of the answers given were not explained clearly, but the issue touched on a skirted around.

At the meeting, I along with several others inquired as to what happens when the gates close at the tributaries. I should note that I completely understand that the gates will not close until the river begins to crest, I don't believe that all the people understand this point. If the water is not yet finished draining from above won't we be susceptible to flooding and more water in our yards then before? I thought I heard that if the gates close then the tributaries would flow back into the wet land area along Long Hill Road. I would like to know how the water would flow backwards against it's natural course downhill into this wet land area?

There was much talk of the "model" used to determine if this project would be of benefit to the community, but we were never told of what the model was comprised of, how all scenarios were tested and what was the result. I think you'll agree that the report is very lengthy and in engineering speak, perhaps if these ings were explained in layman's terms to the mmunity a better understanding could be gained.

As I stated previously, I spent some time with the hydrology and hydraulics representative of your team

after the meeting. I believe it would have been beneficial to have this man address the meeting as he certainly seemed to have better answers for me and the others standing around him. Again, this is all very technical information and he seemed to be able to create a level of understanding that those of us who are not engineers by trade could more fully grasp. This was not achieved in the meeting.

My husband and I are concerned for the well being of our family and our home. We do not wish to see more problems created for us or those one hundred (100) other families who live in the area behind our home. We have seen the water and its devastation not only to us, but the others as well. We ask to have our questions adequately answered in order for us to gain a complete understanding of what this project truly means to us and our property.

Respectfully submitted,

John and Leslie Yetsko

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