MUNICIPAL STORMWATER MANAGEMENT PLAN

FOR THE

TOWNSHIP OF CEDAR GROVE
ESSEX COUNTY, NEW JERSEY

CEDAR GROVE
1908 ESSEX COUNTY, NJ

FEBRUARY 28, 2006
LAST REVISED JUNE 27, 2022

NEA Project No.: CDGRMUN21.010

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Introduction

This Municipal Stormwater Management Plan ("MSWMP") documents the strategy for the Township of Cedar Grove ("the Township") to address stormwater-related impacts. The creation of this plan is required by N.J.A.C. 7:14A-25, Municipal Stormwater Regulations. This plan contains all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major developments, defined as projects that disturb one or more acres of land, or one that increases the impervious coverage by one-quarter acre or more. These standards are intended to minimize the adverse impact of stormwater runoff on water quality, water quantity, and the lost of groundwater recharge that provides base flow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A "build-out" analysis has not been included as the Township does not have one square mile of agricultural or vacant land. The plan also addresses the review and update of existing ordinances, the Township Master Plan, and other planning documents to allow for project designs that include minimal impact development techniques. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards in sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP are to:

1. Reduce flood damage, including damage to life and property

   This is to occur through the adoption of the Stormwater Control Ordinance by June 27, 2022. This ordinance will govern stormwater quantity, stormwater quality, and groundwater recharge thereby reducing flooding impacts. This is accomplished through flow and suspended solids reduction to watercourses and stormwater conveyance systems.

2. Minimize, to the extent practical, any increase in stormwater runoff from any new development

   This is to occur through the adoption of the Stormwater Control Ordinance by June 27, 2022. This ordinance will govern stormwater quantity, stormwater quality, and groundwater recharge thereby reducing stormwater runoff quantities from new development.

3. Reduce soil erosion from any development or construction project

   This is to occur through the implementation of the New Jersey's Soil Erosion and Sediment Control Standards requirements. This Plan is to be consistent with those

Standards. The requirements are also included within the Stormwater Control Ordinance to be adopted by June 27, 2022.

4. <u>Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures</u>

   This is to occur through the adoption of the Stormwater Control Ordinance by June 27, 2022. This ordinance will govern stormwater quantity, stormwater quality, and groundwater recharge thereby reducing flow and suspend solids which affect flow channels through culverts and bridges. In addition, inadequate culverts that were constructed prior to the Stormwater Control Ordinance may be updated through the Mitigation Plan section (see below).

5. <u>Maintain groundwater recharge</u>

   This is to occur through the adoption of the Stormwater Control Ordinance by June 27, 2022. Groundwater recharge requirements for all major development will be governed through the adoption of this ordinance.

6. <u>Prevent, to the greatest extent feasible, an increase in nonpoint pollution</u>

   This is to occur through the adoption of a series of ordinances by July 31, 2019, which include a pet waste and wildlife feeding ordinance.

7. <u>Maintain the integrity of stream channels for their biological functions, as well as for drainage</u>

   This is to occur through the adoption of the Stormwater Control Ordinance by June 27, 2022. This ordinance will govern stormwater quantity, stormwater quality, and groundwater recharge thereby reducing pollutants within the flow which affect biological function and drainage conveyance ability of stream channels.

8. <u>Minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water</u>

   This is to occur through the adoption of the Stormwater Control Ordinance by June 27, 2022. This ordinance will govern stormwater quantity, stormwater quality, and groundwater recharge thereby reducing pollutants. In addition, the adoption of a series of ordinances by July 31, 2019, which include a pet waste and wildlife feeding ordinance will reduce pollutants within stormwater runoff.

9. <u>Protect public safety through the proper design and operation of stormwater basins.</u>

   This is to occur through the adoption of the Stormwater Control Ordinance by June 27, 2022. A section within the adopted ordinance will address safety standards for stormwater management basins.

To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development (see Mitigation Plans section). Preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities (see Design and Performance Standards section). The plan also outlines safety standards for stormwater infrastructure to be implements to protect public safety.

<u>Stormwater Discussion</u>

Land development can dramatically alter the hydrologic cycle of a site and, ultimately, an entire watershed (see Figure C-1). Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly that natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than under natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel and turbidity of the water. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration, which, in turn, reduced stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

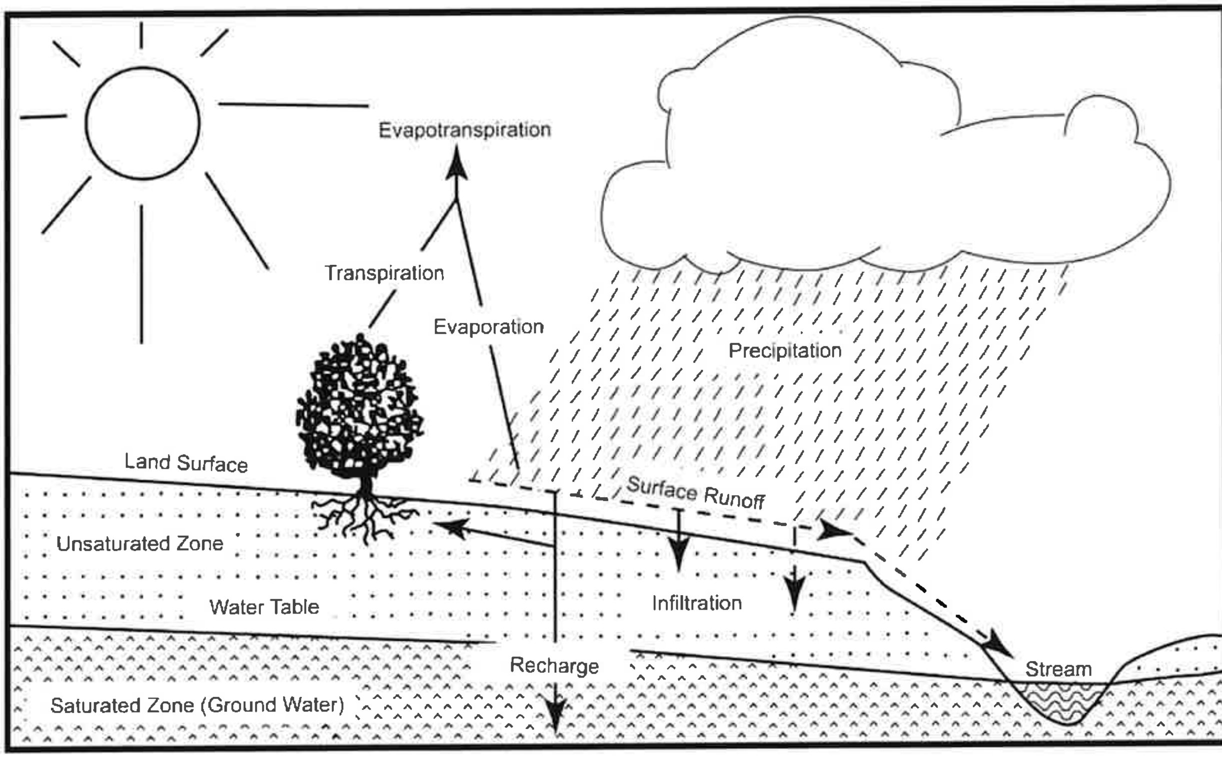

Figure C- 1 Groundwater Recharge in the Hydrologic Cycle (Ref.: NJDEP BMP Manual)

In addition to increases in runoff peaks, volumes, and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

Background

The Township of Cedar Grove is located in the northernmost portion of Essex County, approximately fifteen miles west of New York City and ten miles northwest of Newark. Cedar Grove is bordered by four other municipalities, including Montclair to the east, Verona to the south, North Caldwell to the west and the Township of Little Falls at the Passaic County boundary line to the north. Figure C-3: Boundary on USGS Quadrangle depicts the Township boundary on the USGS quadrangle maps and provides a spatial representation of the Township and surrounding features.

Cedar Grove occupies and area of 2,880 acres, or 4.5 square miles, and is situated between the First and Second Watchung Mountains. The Watchung Mountains extend in a north-south direction along the eastern and western portions of the Township. The Peckman River extends through the valley between these two mountain chains. The municipality is situated within the Passaic River Basin, a watershed encompassing portions of ten counties in two states. It extends southward from Orange and Rockland Counties in New York State to Somerset County in New Jersey, and westward from Bergen and Essex Counties to Sussex County.

Cedar Grove experienced most of its growth between 1940 and 1960 due to post World War II population growth and out-migration from the City of Newark. Like other Essex County towns, the establishment of train stations followed by widespread automobile ownership and the construction of tract housing facilitated Cedar Grove's transition from a small farming community into a vibrant residential suburb.

In accordance with U.S. Census data, Cedar Grove's population increased from 5,208 residents in 1940 to 8,022 in 1950. The post-war building boom increased that number exponentially to 14,603 residents by 1960, with a peak of 15,582 by 1970. As in Essex County and much of northeastern New Jersey, loss of industry and out-migration of citizens to south and westerly New Jersey locations in the 1970's and 1980's then led to a population decrease in the Township. Census data indicate a population of 12,600 by 1980 and just 12,053 as of 1990. The numbers since then have begun to rebound, with year 2000 Census figures indicating a population of 12,300, 12,411 by 2010, and 12,980 by 2020. Population projections for the municipality suggest a gradual increase over the next 30 years, to 13,400 residents by 2030, 14,020 by 2040, and 14,658 by 2050 (North Jersey Transportation Planning Authority, Population and Employment Forecasts, 13 September 2021).

Today, Cedar Grove is over 93% developed, with more land devoted to residential development than any other land use category. Detached single-family residential neighborhoods account for over 37% of Cedar Grove's total land area, while multi-family housing occupies roughly 3.6%. Public lands, including open space, schools, parks, and City of Newark Reservoir holdings occupy approximately 27% of the land area. Industrial and other business enterprises take up about 9% of the land area. Light industry is concentrated in the 45-acre Industrial Village and the Peckman Town Plaza, while retail businesses are located almost exclusively along Pompton Avenue.

The Township of Cedar Grove does not derive any of its drinking water from underground wells. As detailed in the New Jersey Department of Environmental Protection ('NJDEP') GeoWeb GIS service, the Essex County Utility Authority has production wells in the Hilltop Reservation area, with the Wellhead Protection Area covering a portion of the Second Watchung Mountain on the westerly side of the municipality. Additionally, a Montclair well located north of Bellevue Avenue approximately 1900 feet to the east of the Township, with the wellhead protection area encompassing a large portion of the First Watchung Mountain within the Township. The associated wellhead protection areas, also required as part of the MSWMP, are shown in Figure C-4.

The Township of Cedar Grove provides full sanitary sewer service. The Township's sanitary sewers collect waste flow throughout town, and ultimately discharge into larger interceptors, which are under the jurisdiction of the Essex County Utilities Authority. Domestic and fire water services are also provided to the Township directly.

The Township contains stormwater features which include but are not limited to drainage swales and detention basins. At this time, a detailed list of the individual stormwater features is not available.

Streams

The NJDEP has established the Ambient Biomonitoring Network ("AMNET") to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by the NJDEP on a five-year cycle. Streams are classified as either "non-impaired," "moderately impaired," or "severely impaired," based on the AMNET data and criteria. The data is used to generate a New Jersey Impairment Score ("NJIS"), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics.

There are multiple streams located within the Township of Cedar Grove, including main streams and unnamed tributaries thereto. The main streams include Taylor Brook and Peckman River.

According to a map entitled, "New Jersey's Watersheds, Watershed Management Areas, and Water Regions (NJDEP, Division of Watershed Management, February 2007), the Township of Cedar Grove is located within Watershed Management Area 4 ("WMA4"). WMA4 is also known as "Passaic River Lower (Saddle to Pompton)".

The Township of Cedar Grove also contains eight (8) different sub-watersheds, each identified with a 14-digit Hydrologic Unit Code ("HUC-14"), (refer to Figure C-6). The eight (8) HUC-14 sub-watersheds are indicated and described below:

- HUC-14 No.: 02030103120020 – Peckman River (below CG Res trib);
- HUC-14 No.: 02030103120010– Peckman River (above CG Res trib);
- HUC-14 No.: 02030103120110 – Passaic R Lwr (Goffle Bk to pump stn);
- HUC-14 No.: 02030103120100 – Passaic R Lwr (pump stn to Pompton R);
- HUC-14 No.: 02030103010180 – Passaic R Upr (Pine Bk br to Rockaway);
- HUC-14 No.: 02030103120060 – Deepavaal Brook;
- HUC-14 No.: 02030103150020 – Second River; and
- HUC-14 No.: 02030103150010– Third River.

The above-referenced streams that flow through the Township to the major rivers within the watershed are moderately impaired based on AMNET data. In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. These data show that the in-stream water quality constituents frequently exceed the state's criteria. This means that these rivers are impaired waterways and the NJDEP is required to develop a Total Maximum Daily Load (TMDL) for these pollutants for each waterway.

A TMDL is the amount of a pollutant that can be accepted by a water body without causing an exceedance of water quality standards or interfering with the ability to use a water body for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and nonpoint source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303 (d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey water is attaining water quality standards and identifies waters that are impaired. Water waterbodies are classified through the use of Sublists. Sublist 1 and 2 waterbodies are unimpaired. Sublist 3 waterbodies have limited assessment or data availability. Sublist 4 waterbodies are impaired due to pollution rather than pollutants or have had a TMDL or other enforceable management measure approved by the EPA expected to achieve Water Quality Standards. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed.

Peckman River (above CG Res trib) is on Sublist 4 (E. Coli, Phosphorus, Fecal Coliform). Peckman River (below CG Res trib) is on Sublist 4 (E. Coli, Phosphorus, Fecal Coliform) and on Sublist 5 (PCB in Fish Tissue). Passaic R Lwr (Goffle Bk to pump stn) is on Sublist 4 (E. Coli, Phosphorus) and on Sublist 5 (Arsenic, Chloride in Fish Tissue, DDT in Fish Tissue, Mercury in Fish Tissue, PCB in Fish Tissue, pH). Passaic R Lwr (pump stn to Pompton R) is not listed on either Sublist 4 or 5. Passaic R Upr (Pine Bk br to Rockaway) is on Sublist 4 (E. Coli, Phosphorus) and on Sublist 5 (Arsenic, Chloride in Fish Tissue, DDT in Fish Tissue, Mercury in Fish Tissue, PCB in Fish Tissue). Deepavaal Brook is on Sublist 4 (E. Coli, Fecal Coliform). Second River is on Sublist 5 (E. Coli, pH, Phosphorus). Third River is on Sublist 5 (Chlordane in Fish Tissue, DDT in Fish Tissue, Dioxin, Mercury in Fish Tissue, PCB in Fish Tissue, Phosphorus).

For this reason, TMDLs are required for these constituents within these watercourses. Based on inquiry to the NJDEP's TMDL Look-Up Tool, provided by the Bureau of Nonpoint Pollution, there are no applicable lake or shellfish TMDLs in the Township of Cedar Grove. However, the Township of Cedar Grove will require the following TMDLs:

- Total Maximum Daily Loads for Fecal Coliform to Address 32 Streams in the Northeast Water Region
  - Fecal Coliform - 2003 : Deepavaal Bk : View the TMDL Document
- Total Maximum Daily Loads for Fecal Coliform to Address 32 Streams in the Northeast Water Region
  - Fecal Coliform - 2003 : Passaic R at Little Falls, Passaic R below Pompton R at 2 Bridges : View the TMDL Document
- Total Maximum Daily Loads for Fecal Coliform to Address 32 Streams in the Northeast Water Region
  - Fecal Coliform - 2003 : Passaic R at Two Bridges between Whippany and Pompton Rivers : View the TMDL Document
- Total Maximum Daily Loads for Fecal Coliform to Address 32 Streams in the Northeast Water Region
  - Fecal Coliform - 2003 : Peckman River : View the TMDL Document
- Total Maximum Daily Load Report for the Non-Tidal Passaic River Basin Addressing Phosphorus Impairments
  - Total Phosphorus - 2008 : Deepavaal Brook : View the TMDL Document
- Total Maximum Daily Load Report for the Non-Tidal Passaic River Basin Addressing Phosphorus Impairments
  - Total Phosphorus - 2008 : Passaic R Lwr (Goffle Bk to Pompton R) : View the TMDL Document
- Total Maximum Daily Load Report for the Non-Tidal Passaic River Basin Addressing Phosphorus Impairments
  - Total Phosphorus - 2008 : Passaic R Upr (Pine Bk br to Rockaway) : View the TMDL Document
- Total Maximum Daily Load Report for the Non-Tidal Passaic River Basin Addressing Phosphorus Impairments
  - Total Phosphorus - 2008 : Peckman River (above CG Res trib) : View the TMDL Document
- Total Maximum Daily Load Report for the Non-Tidal Passaic River Basin Addressing Phosphorus Impairments

- Total Phosphorus - 2008 : Peckman River (below CG Res trib) : View the TMDL Document

In addition to water quality issues, the Township has exhibited water quantity problems including flooding, stream bank erosion, and diminished base flow in its streams. Many of the culverts associated with road crossings in the Township are undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream. The main area that is affected by stormwater quantity problems is the Peckman River:

- The main area of stormwater related concern in the Township is the Peckman River. The Peckman River Watershed has been the subject of an Army Corps of Engineers Flood Control and Ecosystem Restoration Project since 2000. A copy of the Final Integrated Feasibility Report & Environmental Assessment has been included as an appendix to this Plan. Excerpts from that document have been interspersed into the body of the text in this portion of the plan. The Peckman River originates in the Town of West Orange and flows northeasterly through the Borough of Verona, the Township of Cedar Grove, the Township of Little Falls, and the Borough of West Paterson to its confluence with the Passaic River. The elevation change along the river is approximately 260 feet with the majority of the drop occurring within Cedar Grove. The only other named waterways in the Township are Taylor's Brook, which originates along the southeastern side of the Second Watchung Mountain and is joined by the outfall of the Cedar Grove Reservoir to the Peckman River, and an un-named tributary of the Peckman River that emanates from southwestern side of the First Watchung Mountain and flows to the Peckman River. Neither of these features have been designated a Class 1 waterways. The Township Waterways are illustrated in Figure C-5.

  The high imperviousness of the Peckman River watershed has significantly decreased groundwater recharge, decreasing base flows in the watershed during dry weather periods. The Peckman River Basin is subject to frequent flooding from intense thunderstorms and heavy rainfall. These storms can deposit large amounts of precipitation in the watershed, producing significant runoff, which quickly surpasses the capacity of the river channel, and bridge and culvert openings. Some of the most significant floods in the Basin have occurred as the direct result of hurricanes and tropical storms (Doria in 1971 and Floyd in 1999).

  The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The Peckman River has been identified as moderately impaired. The mitigating measures that have been undertaken by the major point source discharges to the Peckman River in Cedar Grove have improved the water quality to the point where the stocking of trout in this stretch of the waterway has been an ongoing occurrence.

There is no information available regarding the tributaries that flow through the Township to the Peckman River.

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed.

The Army Corps report outlines various ecological restoration opportunities along the Peckman River corridor from Verona Park Lake to its tributary with the Passaic River. The majority of the restoration opportunities involve reducing continued environmental degradation by evaluating the existing instream features, minimizing streambank erosion through stabilization, and by enhancing the riparian buffer zone.

Design and Performance Standards

The Township will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances will be submitted to the county for review and approval.

During construction, Township inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed.

When an applicant proposes to develop or redevelop a property, the proposed improvements are reviewed for conformance with both the Stormwater Control Ordinance, and N.J.A.C. 7:8. If the development is classified as a "major development," thereby triggering the Stormwater Management Rules at N.J.A.C. 7:8, the applicant is required to submit plans and a stormwater management report to substantiate the design and operation of any proposed stormwater management facilities, including, but not limited to, detention basins, infiltration basins, water quality treatment devices, etc. Additionally, if deemed a "major development," the applicant is also required to submit a Stormwater Maintenance Manual, in accordance with N.J.A.C. 7:8-5.8. Once approved by the Planning Board, Zoning Board of Adjustments, or the Building Department, the applicant is required to notify the Township, as well any other agencies having jurisdiction thereof, that construction will be commencing. During construction of stormwater management facilities and measures, Township inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed. If the Township determines that non-compliance is occurring, the Township shall issue non-compliance citations, stop-work orders, and fines to ensure compliance.

Once construction is complete, long-term maintenance is required for existing and future stormwater facilities to ensure long-term operation for all project governed by the requirements set forth within the Stormwater Control Ordinance. The ordinance requires the submission of an acceptable maintenance and repair plan that will provide specific preventative maintenance tasks and schedules, along with the name of the person or people responsible for preventive or corrective maintenance. The person responsible for maintenance will be required to evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed, as necessary.

To ensure proper maintenance and facility repair, the Township will notify the responsible person in writing should a stormwater facility become a danger to public safety, public health, or require maintenance or repair. Upon receipt of the written notice, the responsible person will have fourteen (14) days to perform the required maintenance and/or repair of the facility in a manner that is approved by the Township Engineer. The Township, at its discretion, may extend the time allowed for effecting maintenance and repair for good cause. If the responsible person fails or refuses to perform such maintenance and repair, the Township or County may immediately proceed to do so and shall bill the cost to the responsible person.

Plan Consistency

The Township is not within a Regional Stormwater Management Planning Area and no TMDLs have been developed for waters within the Township; therefore, this plan does not need to be consistent with any regional stormwater management plans (RSWMPs) nor any TMDLs. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent. The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The Township will utilize the most current update of the RSIS in the stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS. The Township's Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, the Hudson-Essex-Passaic Soil Conservation District inspectors will observe on-site soil erosion and sediment control measures and address any inconsistencies.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards ("RSIS") as N.J.A.C. 5:21. The municipality will utilize the most current update of the RSIS in the stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updated to the RSIS.

The Township's Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. Projects with areas of disturbance greater than our equal to 5,000 square feet require review by the Essex County Soil and Water Conservation District. During construction, Township inspectors will observe on-site erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District.

Nonstructural Stormwater Management Strategies

In 2020, the Township of Cedar Grove Planning Board, and its retained professionals, updated the Township's Master Plan, which was formally adopted on June 1, 2020. Within the Master Plan, the Township has included general guidance as to conforming with the Stormwater Control Ordinance, using both non-structural and structural stormwater management strategies. The Township's Stormwater Control Ordinance provides further guidance about non-structural strategies. Specifically, the Stormwater Control Ordinance indicates that non-structural and low-impact stormwater management measures should be explored and utilized before structural measures. The Township goes into further detail regarding specific nonstructural stormwater management strategies, and requires their implementation, to the maximum extent practicable.

Chapter 38 (Land Use Procedures), 234 (Subdivision of Land), 268 (Zoning), and 268 Article X (Site Plan Review) of the Township Code were reviewed with regard to incorporating nonstructural stormwater management strategies. Several changes will be considered to the followings Sections within these Chapters:

Chapter 234-7: Landscaping and Buffer Areas requires that natural features such as trees, shrubs, bushes, plant material, and ground cover be shown on a Landscaping Plan. This section will be amended to expand to forested areas, to ensure that leaf litter and other beneficial aspects of the forest are maintained in addition to the trees.

Chapter 268-6 Application. The Schedule of General Requirements shall apply to the uses of land requires a setback / distance from the boundary line in which a building cannot be placed. This schedule will be amended to include a note that care be taken to preserve native trees and shrubbery located within this setback area. In addition, another note will be added to the schedule that native plant species shall be planted in setback areas where feasible.

Chapter 268-39: Definitions provides requirements to subdivide a lot into smaller conforming lots. A cluster development is a subdivision option utilized to preserve land for public and agricultural purposes, to prevent development on environmentally sensitive areas, and to aid in reducing the cost of providing streets, utilities and services in residential developments. This cluster option is an excellent tool for reducing impervious roads and driveways. The option allows for small lots with smaller front and side yard setbacks than traditional development options. It also minimizes the disturbance of large tracts of land, which is a key nonstructural stormwater management strategy. This section will be amended to include a cluster development subdivision option. The option will include a percentage of the total tract to be preserved as open space for residential area. It will also include language promoting the use and / or preservation of native vegetation.

Chapter 183-3-B{1} Landscaping and Buffer Areas requires buffers for development. Buffers are an impervious coverage setback for a lot to its boundary line. This section will be amended to include a definition of a buffer which is to preserve existing natural features within this area, such as trees, brooks, swamps, hilltops, and views, and that care be taken to preserve trees to enhance soil stability and landscaped treatment of the area. The section will be amended to supplement proposed buffer areas with native landscaping. Structural buffering methods (berms, walls, fences, etc.) shall not be considered until all landscaping methods have been exhausted. Additionally, language will be included to allow buffer areas to be used for stormwater management by disconnecting imperious surfaces and treating runoff from these impervious surfaces.

Chapter 140-4 Flood Prevention Modification requires development restriction within floodplains. The section will be amended to limit improvement and maintenance within the floodplain which shall follow all applicable state regulatory requirements.

Chapter 228-4 Soil Erosion and Sedimentation Control addresses soil erosion and sediment control. This section will be amended to state that developers will not be permitted to encroach upon areas outside of the approved limit of disturbance shown on the approved Soil Erosion and Control Plan for the development.

Chapter 234-25: Streets describes the requirements for streets in the Township. The Township has several street classifications. Street paving widths are a function of the number of units served, whether a street is curbed, whether on-street parking is permitted, and whether on-site topographical constraints allow design flexibility. This section will be amended to encourage developers to limit on-street parking to allow for narrower paved widths that will conform to the New Jersey Residential Site Improvement Standards where applicable.

Chapter 268-34 Application. The Schedule of General Requirements shall apply to the uses of land has the requirement for permitted impervious coverage for zoning districts within the Township. If a developer is given a variance to exceed the maximum allowable impervious percentage, the developer must mitigate the impact of the additional impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge as described in the Township Stormwater Control Ordinance which is to be enacted.

Chapter 230-22 Street Improvements requires that concrete curb be installed along every street within and fronting on a development and parking lot. This section will be amended to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas where feasible.

Chapter 268-42 Utility Improvements describes the requirements for drainage in the Township. This section will be amended to require that all streets be provided with inlets and pipes where the same are necessary for proper drainage. In addition, this section will be amended to encourage the use of natural vegetated swales in lieu of inlets and pipes where feasible. Language will be added to allow for use of natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers.

Chapter 268-17 Off- Street Parking Requirements describes the procedure for construction of any new driveway or access way to any street. This section will be amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge where appropriate.

Chapter 268-34 Application. The Schedule of General Requirements shall apply to the uses of land requires a variance for development that exceeds the maximum percent impervious. The property owner must mitigate the impact of the additional impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge as described in the Township Stormwater Control Ordinance. A detailed description of how to develop a mitigation plan will be present in the Township Ordinance.

Chapter 268-42 Off- Tract Improvements, When Required describes that essential off-site and off-tract improvements may be required. Language will be added to this section to require that any off-site and off-tract stormwater management and drainage improvements must conform to the Township Stormwater Control Ordinance.

Chapter 268-17 Street Improvements details off-street parking, street design, and curbing requirements. All parking lots are required to have curbing around the perimeter of the parking and loading areas. This section also requires that curbing be installed around all landscaped areas within the parking lot or loading areas. This section will be amended to allow for flush curb with curb stop or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management.

Chapter 268-17 Off- Street Parking and 18-6.9 Other Design Standards provides guidance on minimum parking space requirements. These requirements are based on the number of dwelling units, gross floor area, and / or other designated requirements (seats, etc.). The section will be amended to allow a developer to demonstrate that fewer spaces would be required, provided area is set aside for additional spaces if necessary. This section was amended to allow pervious paving to be used in areas to provide overflow parking, vertical parking structures, smaller parking stalls, and shared parking if feasible.

Chapter 146-11 Refuse Collection and Storage provides pollution source control. It will be amended that all materials and wastes that might create a pollutant or a hazard be enclosed in appropriate containers.

Chapter 246-9 On-Tract Improvements, When Required states that shade trees may be required as part of a proposed development. This section will be amended to restrict and control the removal of matures trees throughout the Township. This revision is to recognize that the preservation of matures trees and forested areas are a key strategy in the management of environmental resources, particularly watershed management, air quality, and ambient heating and cooling. This complies with minimizing land disturbance, which is a nonstructural stormwater management strategy.

Chapter 230-18 Street Improvements describes sidewalk requirements for the Township. Although sidewalks are not required along all streets, the Township can require them in areas where the probable volume of pedestrian traffic, the development's location in relation to other populated areas and high vehicular traffic, pedestrian access to bus stops, schools, parks and other public places, and the general type of improvement intended indicate the advisability of proving a pedestrian way. Sidewalks are to be a minimum of four feet wide and constructed of concrete. Language will be added to this section to require developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces or use permeable paving materials where appropriate.

Chapter 228-5 Utility Improvements addresses stormwater runoff and will be amended by referencing the Township's Stormwater Control Ordinance which will be updated to include all requirements outlined in N.J.A.C. 7:8-5.

Land Use / Build-Out Analysis

The Township of Cedar Grove adopted a new Master Plan in June 2020. In preparation of this, a vacant land analysis was prepared and concluded that approximately 82.11 acres (0.128 square miles) of land is considered developable, but vacant land within the Township (refer to Table 1 (below). Additionally, the Township of Cedar Grove does not consist of any land that is used for agricultural purposes. Therefore, the total area of vacant and agricultural land is approximately 0.128 square miles, which is far below the threshold of one (1) square mile which would require a Land Use/Build-Out Analysis. As such, a Land Use/Build-Out Analysis has not been provided.

Existing Land Use
Township of Cedar Grove

Land Use	*Parcels*	*Percent*	*Acres*	*Percent*
Civic	6	0.15%	32.49	1.30%
Commercial	125	3.04%	88.79	3.56%
County Parkland	18	0.44%	358.81	14.37%
Fire Dept	1	0.02%	0.42	0.02%
Hospital	2	0.05%	15.87	0.64%
House of Worship	16	0.39%	41.97	1.68%
Industrial	53	1.29%	135.90	5.44%
Mixed Use	18	0.44%	0.75	0.03%
Multi Family	269	6.55%	164.12	6.57%
Municipal Parkland	32	0.78%	140.59	5.63%
Newark Watershed	4	0.10%	116.23	4.66%
Nursing Home	2	0.05%	27.84	1.12%
Pipeline	6	0.15%	21.48	0.86%
Private Recreation	1	0.02%	7.015	0.28%
Public	21	0.51%	50.18	2.01%
Public School	5	0.12%	62.84	2.52%
Railroad - Class I	3	0.07%	10.88	0.44%
Rehabilitative Housing	2	0.05%	6.25	0.25%
Semi Public	1	0.02%	7.81	0.31%
Single Family (1 to 4 Family Homes)	3457	84.13%	1087.09	43.54%
Single Family PD	4	0.10%	35.13	1.41%
Vacant	60	1.46%	82.11	3.29%
Water Tank	3	0.07%	1.892	0.08%

Source: Township of Cedar Grove Tax Records, 2019-2020

Table 2: Existing Land Use Table (Ref.: Township of cedar Grove Tax Records)

Mitigation Plans

This mitigation plan is provided for a proposed development that is granted a variance or exemption from the stormwater management design and performance standards. Presented below is a hierarchy of preferred options:

Mitigation Project Criteria

1. The mitigation project must be implemented in the same drainage area as the proposed development. The project must provide additional groundwater recharge benefits, or protection from stormwater runoff quality and quantity from previously developed property that does not currently meet the design and performance standards outlined in the Municipal Stormwater Management Plan. The developer must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual.

   The applicant can select one of the following projects listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the projects and a list of additional projects can be obtained from the Township Engineer. Listed below are some projects that can be used to address the mitigation requirement. A possible project (at the discretion of the Township and its engineer) is to provide a detailed study to determine additional mitigation projects within the Township.

   Groundwater Recharge

   - Reconstruct lawn inlets within those areas of the Township where Type 'B' or better soils exist with sump bottoms to provide additional annual groundwater recharge and the collection of solids. Given the topography of the Township and historical groundwater intrusion problems into residential dwellings, consideration should be given to reconstructing these structures in areas that will not impact adjacent residential properties.

     The area of the Township determined to be most conducive to groundwater recharge by the Township's Environmental Commission is that area between Pompton Avenue and the Peckman River, in the Commerce Drive area, where the Township's Environmental Inventory dated December 2002 indicates glacial deposits of the Boonton soil series are prevalent.

   - Retrofit the Canfield-Morgan farm complex with drywells to recharge stormwater runoff.

   - Retrofit the North End School (subject to Board of Education approval) with drywells for roof runoff where appropriate.

Water Quality

- Retrofit the existing parking area at the Municipal Building to provide the removal of 80 percent of total suspended solids. Due to site constraints, the retrofit BMP must be installed underground and cannot reduce the existing limited number of parking spaces.

- Retrofit the Township Department of Public Works outfalls to provide for the removal of 80 percent of total suspended solids.

- Disconnect the impervious surfaces in the Community Park Pool parking lot by introducing vegetated filter strips within the parking lot and installing the requisite underdrain system to connect to the storm system on site.

- Retrofit existing headwall discharges to receiving bodies with appropriately sized water quality structures.

- Retrofit existing upstream headwalls and embankments identified within the Township's 'Stormwater Outfall Condition' list (being updated by the Engineering Department) with trash grates and streambank stabilization measures similar to the recently completed Hilltop Drive project.

- Provide goose management measures, including public education at the various Community Park and Board of Education facilities.

Velocity Reduction

- Provide the requisite end of pipe treatments to existing discharges as contained in the Township's 'Stormwater Outfall Condition' list (currently being updated by the Township Engineering Department). Treatments include the installation or reconstruction headwalls and flared end sections and the installation or refurbishment of scour holes or rip rap stabilization pads.

2. If a suitable site cannot be located in the same drainage area as the proposed development, as discussed above, the mitigation project may provide mitigation that is not equivalent to the impacts for which the relief is sought, but that addresses the same issue. In Figure C-6, Hydrologic Unit Code (HUC) depicts the separate drainage areas within the Township as determined by the USGS and shown on NJDEP iMap. The United States Geological Survey (USGS) defines a hydrologic unit as "A geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the U. S. Geological Survey on State Hydrologic Unit Maps. Each hydrologic unit is assigned a hierarchical hydrologic unit code consisting of 2 digits for each successively smaller drainage basin unit". For those projects that lie within a HUC that drains away from the township, coordination with the adjacent municipalities may be required for the completion of any mitigation projects.

   The Township is cognizant that there may be limited opportunities for groundwater recharge in any of the undeveloped areas of the municipality, or on Township owned properties. The municipality may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified in a Municipal Stormwater Management Plan, or towards the development of a Regional Stormwater Management Plan. The funding must be equal to or greater than the cost to implement the mitigation outlined above, including costs associated with purchasing the property or easement for mitigation, engineering and permitting, and the cost associated with the long-term maintenance requirements of the mitigation measure.

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Peckman River Basin, New Jersey
Flood Risk Management Feasibility Study
Final Integrated Feasibility Report & Environmental Assessment

February 2020

U.S. Army Corps of Engineers
North Atlantic Division, New York District
In partnership with the
New Jersey Department of Environmental Protection

Woody debris and erosion left in the aftermath of Hurricane Floyd (September 1999).

Cover Page Images

Left image: High flows & water levels due to Hurricane Floyd at a bridge abutment along the Peckman River (Little Falls Historical Society, 1999).

Top right image: Pedestrian bridge over Great Notch Brook during the June 30, 2009 storm (USACE, 2009).

Middle right image: Damage from Hurricane Doria to a road adjacent to the Peckman River (Little Falls Historical Society, 1971).

Lower right image: Damaged contents being disposed of due to Peckman River flood damage from Hurricane Floyd (Little Falls Historical Society, 1999).

Peckman River Basin, New Jersey
Flood Risk Management Feasibility Study
Final Integrated Feasibility Report & Environmental Assessment

This report was prepared by the
New York District, North Atlantic Division of the
U.S. Army Corps of Engineers
in partnership with the
New Jersey Department of Environmental Protection

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Executive Summary

The U.S. Army Corps of Engineers (USACE), North Atlantic Division, New York District (District) has partnered with the New Jersey Department of Environmental Protection (NJDEP) to undertake the Peckman River Basin, New Jersey flood risk management feasibility study. This final integrated feasibility report and environmental assessment (FIFR/EA) presents the results of the study team's evaluation of various alternatives to manage the risk of damages caused by frequent fluvial flooding. Benefits, costs, and impacts caused by implementation of the Recommended Plan are described in this report. The optimized Recommended Plan, Alternative 10b-40, is fully described in this report.

This report fulfills the requirements of the National Environmental Policy Act of 1969 (NEPA), and was written in accordance with the President's Council on Environmental Quality Rules and Regulations for Implementing NEPA (Title 40, Code of Federal Regulations, Sections 1500-1508), USACE's Procedures for Implementing NEPA (Engineer Regulation 200-2-2), and other applicable Federal and state environmental laws.

Commercial and residential development in the Peckman River watershed has reduced the water holding capacity of the landscape and altered the natural dynamics of the river system. Storm events deposit large amounts of precipitation in the watershed, producing significant runoff. This quickly surpasses the capacity of the river channel, and bridges and culvert openings, resulting in flooding that first begins to occur at the ten percent flood event frequency. The most intense flooding conditions occur in the Borough of Woodland Park and the Township of Little Falls. During Hurricane Floyd (1999), flood waters reportedly reached three to four feet of overbank flow, causing an estimated $12,100,000 (Fiscal Year 2019 [FY19] price level [P.L.]) in flood-related losses to communities in the Peckman River Basin. Residents, businesses, and infrastructure in the Peckman River Basin continue to experience repeated, and significant flood damage due to flash flooding in the Peckman River and its tributaries, and overbank and backwater flooding from the Passaic River. Flooding has resulted in millions of dollars in damages, and the deaths of at least two residents in the basin.

The project's purpose is to manage the risk of flooding from the Peckman River. USACE considered a range of nonstructural and structural measures that could potentially manage flood damages in Woodland Park and Little Falls, the basin's most frequently flooded and densely populated areas. Through an iterative plan formulation process, potential fluvial flood risk management measures were identified, evaluated, and compared.

The Recommended Plan includes a combination of a diversion culvert connecting the Peckman and Passaic Rivers; associated weirs; levees and floodwalls; channel modifications; and nonstructural measures within the ten percent floodplain upstream of Route 46. The plan is designed to manage flood risk up to the two percent flood event. The plan would provide $9,440,000 in average annual benefits (FY 20 P.L.). The benefit-to-cost ratio of the plan is 1.5. The Recommended Plan will manage the risk of fluvial flooding in the project area.

The Recommended Plan would not have significant adverse cumulative impacts to land use; topography, geology or soils; state and/or Federal endangered, threatened and special concern species; historic properties; existing demographics, economy, housing and Environmental Justice communities; aesthetic and scenic resources; transportation; and air quality. Flood risk management measures contribute to water quality and aquatic habitat improvements by reducing the amount of manmade debris and pollutants introduced into waterways during flood events. Implementation of the Recommended Plan will result in short-term minor and long-term moderate adverse impacts to upland and wetland vegetation within the project area. The conversion of approximately 0.48 acres of forested wetlands to floodwall/levee and the modification of 1,848 feet of Peckman River will contribute to cumulative losses of riverine or wetland values and functions within the watershed. However, this impact will be minimized through compensatory riverine and wetland mitigation. The riverine compensatory mitigation consists of restoration of 1,848 linear feet of the Peckman River through the installation of three bendway weir fields along the outer bends of the river where severe bank erosion is occurring and the stabilization of 0.85 acres of streambank with native vegetation. The wetland compensatory mitigation will be achieved through either the purchase of credits at a state approved mitigation bank or through off-site restoration of 0.96 acres of forested wetlands. It will also result in short term park closures and other construction-related disruptions to recreation, but these impacts will have negligible cumulative impacts. The Recommended Plan will introduce short-term increases in the noise environment from construction. These changes will have a negligible cumulative effect. There will be no adverse long term cumulative impacts on the existing environment once construction is completed.

The estimated project first cost is $146,188,000 (FY 20 P.L.). In accordance with the cost share provisions of Section 103 of the Water Resources Development Act of 1986, as amended (33 U.S. Code 2213), the Federal share of the project first cost is estimated to be $95,022,000 and the non-Federal share is estimated to be $51,166,000, which equates to 65 percent Federal and 35 percent non-Federal (FY 20 P.L.). The non-Federal costs include the value of lands, easements, rights-of-way, relocations, and dredged or excavated material disposal areas estimated to be $5,273,000 (FY 20 P.L.). The non-Federal study sponsor, NJDEP, has indicated its support for the Recommended Plan and is willing to enter into a Project Partnership Agreement with the Federal government for the implementation of the plan. The design of the project will be refined during pre-construction engineering and design based on site-specific information.

Pertinent Data

Description & Location

The Recommended Plan includes a combination of a diversion culvert connecting the Peckman and Passaic Rivers; associated weirs; levees and floodwalls; channel modifications; and nonstructural measures within the ten percent floodplain upstream of Route 46. The plan is designed to manage flood risk up to the two percent flood event. The project will reduce the risk of flooding for those flood events that have up to a two percent chance of occurring in a given year. The project area includes the Township Little Falls and Borough of Woodland Park, which are located in Passaic County, New Jersey in the northern part of the state.

Plan Features

A 1,500-foot long, 40-foot diameter double box diversion culvert would be constructed between the Peckman and Passaic Rivers to divert floodwater from the Peckman into the Passaic River. The inlet at the Peckman River includes two weirs to manage flow and create a pool near the inlet. Channel modifications would be constructed along the Peckman River near the inlet. Approximately 2,170 linear feet of levees and/or floodwalls at a height up to +145 feet North American Vertical Datum of 1988 (NAVD88), would be built upstream and downstream of the ponding weir. In addition, 1,207 linear feet of levees and/or floodwalls would be constructed in the vicinity of Little Falls High School, between the track and baseball fields. These levees and/or floodwalls would be constructed at a height up to +145 feet NAVD88. Up to sixteen structures would be elevated so that their main floor elevations would be to a final height of one foot above the base flood elevation. The plan also includes up to 38 structures to be wet floodproofed and four structures to be dry floodproofed. All nonstructural plan elements are situated within the ten percent floodplain, and will be implemented based on the voluntary willingness of owners. Compensatory mitigation due to unavoidable temporary or permanent environmental impacts to forested wetland, riparian habitat, and stream restoration will be completed.

Economics

Costs (FY 20 P.L.)

Total Project Cost	$176,598,000[1]
Initial Project Cost	$146,188,000[2]
Annual Investment Cost	$5,609,000
Annual OMRR&R	$575,000
Total Annual Cost	$6,184,000

Benefits (FY 20 P.L.)

Average Annual Benefits	$9,440,000
Average Annual Net Benefits	$3,292,000
Benefit-to-Cost Ratio	1.5

Costs and benefits are annualized at 2.75 percent over a 50-year period of analysis (2027 through 2076).

Real Estate Requirements

The project would impact up to 29 parcels (17 privately-owned and 12 publicly-owned). The project would necessitate the acquisition of 5.84 acres of property. Permanent easements totaling 11.35 acres, and 6.20 acres of temporary easements would also be required. In some instances, more than one estate may be required to be obtained over the lands of the same owner. Required Lands, Easements, and Rights-of-Way total 23.39 acres.

Cost Apportionment[3] (FY 20 P.L.)

Cost Category	Federal Share	Non-Federal Share	Total
Total Project Cost	$114,789,000[1]	$61,809,000	$176,598,000
Initial Project Costs	$95,022,000[2]	$51,166,000	$146,188,000
Real Estate Costs[4]	$0	$5,273,000	$5,273,000
Cash Contribution	$0	$4,907,000	$4,907,000

[1] The Total Project Cost is the basis for the Project Partnership Agreement, and is based upon the midpoint of construction (January 2026). [2] Does not include interest during construction. [3] Construction is cost shared 65 percent Federal/35 percent non-Federal. [4] LERRDs are a non-Federal sponsor responsibility creditable towards the 35 percent non-Federal cost share.

Peckman River Basin, New Jersey
Flood Risk Management Feasibility Study
Final Integrated Feasibility Report & Environmental Assessment

Table of Contents

** Sections marked with an asterisk are applicable to the satisfaction of National Environmental Policy Act requirements*

Figures

Tables

Appendices

Acronyms

AAB	Average Annual Benefits
AAC	Average Annual Costs
AAD	Average Annual Damages
ACM	Asbestos-Containing Material
APE	Area of Potential Affect
AQXRs	Air Quality Control Regions
BFE	Base Flood Elevation
BMP	Best Management Practices
CAA	Clean Air Act of 1963
CAP	Continuing Authorities Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response Compensation and Liability Information System
CDBG-DR	USHUD Community Development Block Grant Disaster Recovery Program
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
DBA	Weighted Decibel
District	United States Army Corps of Engineers, New York District
DIFR/EA	Draft Integrated Feasibility Report and Environmental Assessment
DPW	Department of Public Works
EAD	Equivalent Annual Damages
ECB	Engineering and Construction Bulletin
EMS	Emergency Medical Service
EO	Executive Order
ER	Engineering Regulation
EPA RBP	U.S. Environmental Protection Agency Rapid Bioassessment Protocol
EPW	Evaluation of Planned Wetlands
ESA	Endangered Species Act of 1973
ETL	Engineering Technical Letter
EQ	Environmental Quality
FCSA	Feasibility Cost-Sharing Agreement
FEMA	Federal Emergency Management Agency
FHACAR	New Jersey Flood Hazard Area Control Act Rules
FIA	Flood Insurance Administration
FIFR/EA	Final Integrated Feasibility Report and Environmental Assessment
FIS	Flood Insurance Study
FWCAR	Fish and Wildlife Coordination Act Report
FY	Fiscal Year
GDM	General Design Memorandum
GHG	Greenhouse Gases
GIS	Geographic Information System
HEC-FDA	Hydrologic Engineering Center-Flood Damage Analysis model
HEC-RAS	USACE Hydrologic Engineering Center River Analysis System model
HMP	Hazard Mitigation Plan
HSI	Habitat Suitability Index
HTRW	Hazardous, Toxic and Radioactive Waste
IBA	Important Bird Area
ICA	Incremental Cost Analysis
KCS	Known Contaminated Sites
LBP	Lead-Based Paint

LDN	Day-Night Noise Level
LER	Land, Easements, and Rights-of-Way
LERRDS	Land, Easements, Rights-Of-Way, Relocation, and Disposal Areas
LOI	Letters of Interpretation
LPP	Locally Preferred Plan
NAAQS	National Ambient Air Quality Standards
NNBFs	Natural and Nature-Based Features
NAVD88	North American Vertical Datum of 1988
NED	National Economic Development
NEPA	National Environmental Policy Act of 1969
NFIP	National Flood Insurance Program
N.J.A.C	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJDEP BFBM	New Jersey Department of Environmental Protection, Bureau of Freshwater and Biological Monitoring
NJFHACA	NJ Flood Hazard Area Control Act
NJHPO	New Jersey Historic Preservation Office
NNBF	Natural and Nature-Based Feature
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NRDCSRS	Non-Residential Direct Contact Soil Remediation Standard
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OMRR&R	Operation, Maintenance, Repair, Replacement, and Rehabilitation
OSE	Other Social Effects
P&G	1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
PCB	Polychlorinated Biphenyl
PED	Pre-Construction Engineering and Design
PL	Price Level
PL	Public Law
PM	Particulate Matter
PMP	Project Management Plan
PPA	Project Partnership Agreement
RCRA	Resources Conservation and Recovery Act of 1976
RCRIS	Resource Conservation and Recovery Information System
RED	Regional Economic Development
SEM	Superfund Enterprise Management System
SIP	State Implementation Plan
SVOA	Semi-Volatile Organics
TRIS	Toxic Release Inventory System
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	US Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USHUD	U.S. Department of Housing and Urban Development
VOA	Volatile Organics

Chapter 1: Introduction

1.1 Introduction to This Report

The U.S. Army Corps of Engineers (USACE), New York District (District) prepared this final integrated feasibility report and environmental assessment (FIFR/EA) for the Peckman River Basin, New Jersey, flood risk management feasibility study. It includes a description of the costs and benefits of an optimized Recommended Plan for managing flood risk within the Peckman River Basin, New Jersey. The Peckman River Basin is located in portions of Essex and Passaic Counties, New Jersey.

The Federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with managing and reducing risk to the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements (Principles and Guidelines [P&G], 1983). Water and related land resources projects are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. Pursuant to this, the FIFR/EA: (1) summarizes the problems, needs, and opportunities for flood risk management in the Peckman River Basin; (2) presents and discuss the results of the plan formulation for flood risk management; (3) identifies specific details of the Recommended Plan, including inherent risks; and (4) will be used to assist in determining the extent of the Federal interest and local support for the plan.

USACE has evaluated an array of structural and nonstructural alternatives, and natural and nature-based features including levees, floodwalls, channel modifications, structure elevation, floodproofing, and buyouts. The design of the project will be refined during the pre-construction engineering and design (PED) phase based on site-specific information.

1.2 National Environmental Policy Act Requirements

This FIFR/EA was prepared pursuant to the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality's (CEQ) Guidance Regarding NEPA Regulations, and the USACE's Procedures for Implementing NEPA (Engineering Regulation [ER] 200-2-2). NEPA requires USACE to integrate environmental values into its decision making processes by considering the environmental impacts of its proposed actions, and reasonable alternatives to those actions. Federal regulations to implement NEPA are found in Title 40 Code of Federal Regulations (CFR) Parts 1500-1508. The intent of NEPA is to ensure that information is made available to public officials and citizens about major actions taken by Federal agencies, and to identify and consider public concerns and issues. "Any environmental document in compliance with NEPA may be combined with any other agency document to reduce duplication and paperwork" (40 CFR §1506.4). The purpose of an EA is to demonstrate a Federal agency's compliance with NEPA. This FIFR/EA must discuss:

- the need for the proposed action
- the proposed action and alternatives
- the probable environmental impacts of the proposed action
- the agencies and persons consulted during preparation of the FIFR/EA

This integrated report is consistent with NEPA statutory requirements. The report reflects an integrated planning process, which avoids, minimizes, and mitigates adverse project effects associated with flood risk management actions. Sections of text marked with an asterisk are applicable to the satisfaction of NEPA requirements.

1.3 Study Authority & Non-Federal Sponsor

In response to frequent significant flooding in the Peckman River Basin, the study was authorized by a resolution of the U.S. House of Representatives, Committee on Transportation and Infrastructure Resolution Docket 2644 adopted on June 21, 2000. This authority states:

> "*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 Passaic River Mainstem project, New Jersey and New York, published as House Document 163, 101st Congress, 1st Session, and other pertinent reports to determine whether 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 protection, stream bank restoration, and other allied purposes for the Peckman River and tributaries, New Jersey.*"

A Feasibility Cost Sharing Agreement (FCSA) for the study was executed in October 2002 with the NJDEP as the study non-Federal sponsor.

1.4 Study Purpose, Scope & History

The purpose of the study is to determine if there is a technically feasible, economically justified, and environmentally acceptable recommendation for Federal participation in flood risk management for the Peckman River Basin. The study team evaluated potential solutions to the frequent fluvial flooding problems within the Peckman River Basin and assessed the Federal interest in participating in flood risk management plans. The study team identified and recommended a plan in coordination with NJDEP, as described in Chapters 4 and 10. This report documents the study and constitutes an interim response to the study authority.

Following authorization of the study in June 2000, a Reconnaissance Study was initiated to examine flooding in the Peckman River Basin. The Peckman River Basin, New Jersey, Reconnaissance Report (USACE, 2002) recommended a comprehensive basin-wide study to further examine the feasibility of Federal participation in a project that could provide flood risk management and ecosystem restoration in the basin. Based on the recommendation and approval of the Reconnaissance Report, the FCSA for the current study was executed in October 2002 between USACE and NJDEP. Although ecosystem restoration is an authorized study purpose and the approved Reconnaissance Report indicates Federal interest in both flood risk management and ecosystem restoration, NJDEP has indicated its preference to currently focus only on the flood risk management component of the authorization.

As described in Section 3.1, the Peckman River Basin experiences economic damages due to flash flooding in the Peckman River and its tributaries, and overbank and backwater flooding from the Passaic River (Figure 1). USACE and NJDEP are currently completing an analysis of backwater flooding from the Passaic River, under the authorization for the Passaic River Basin flood risk management study. Because of this, the scope of this study is limited to addressing flooding caused by the Peckman River and its tributaries.

The feasibility phase has progressed from its initiation following execution of the FCSA as funding has been made available. By 2014, a suite of measures to address flood risk within the primary damage centers of the Township of Little Falls and the Borough of Woodland Park were developed. At this point NJDEP requested that a Locally Preferred Plan (LPP) be considered. Due to this request, the study was paused between November 2014 to August 2017 to allow time for a revision to the scope and cost necessary for study completion. Following study resumption more alternatives were developed and evaluated. Based on the alternatives update, the National Economic Development (NED) plan became the selected plan. No LPP is being pursued at this time.

Figure 1. Flooded shopping mall parking lot in Woodland Park, New Jersey.

1.5 Study Area: The Peckman River Basin

The Peckman River Basin is located in Passaic and Essex Counties, New Jersey within New Jersey's 8th Congressional District (Figure 2). It is located in northern New Jersey approximately 15 miles west of Manhattan, New York City. Its drainage area is approximately 9.8 square miles. The basin is typified by suburban development.

The Peckman River Basin is one of the sub-watersheds of the Passaic River (Figure 3). The confluence of the Peckman River with the Passaic River is located within the central section of the Passaic River Basin.

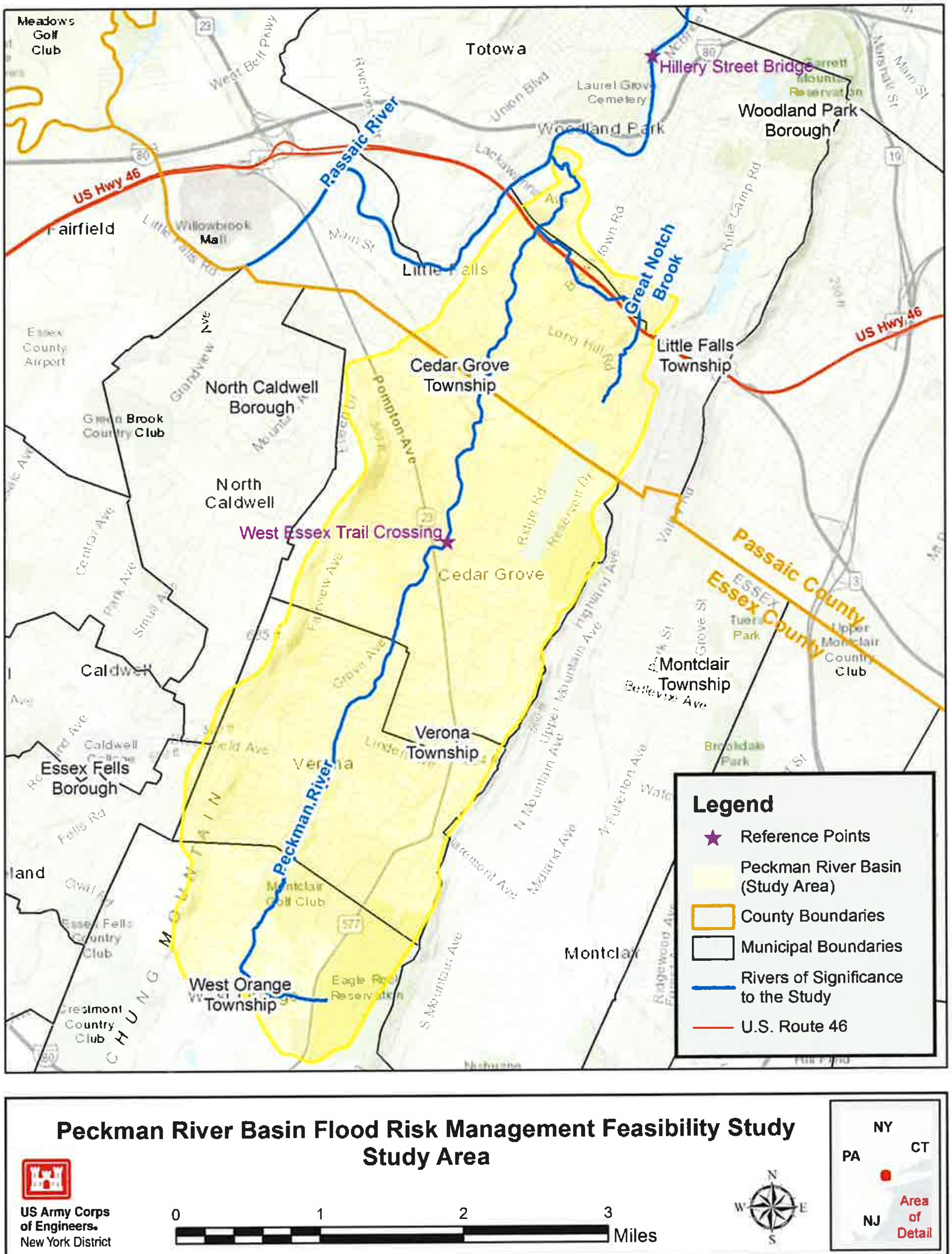

Figure 2. The Peckman River Basin (study area).

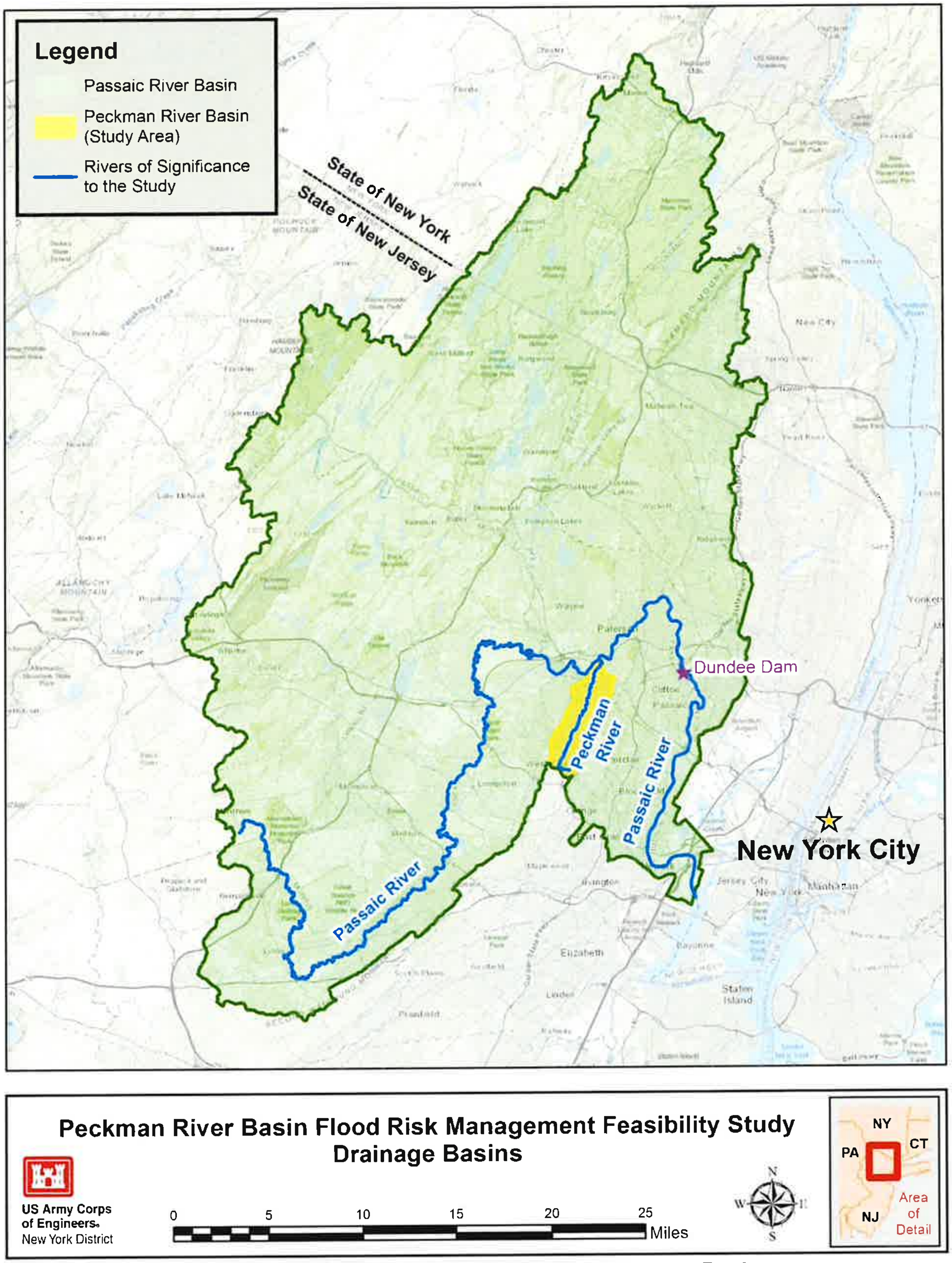

Figure 3. Relationship of the Peckman and Passaic Basins.

1.5.1 Municipalities within the Peckman River Basin

There are five municipalities in the Peckman River Basin (Figure 2). The Township of West Orange is situated in the central portion of Essex County and contains approximately 12.2 square miles with easy access to the Garden State Parkway and the New Jersey Parkway. It lies in northern New Jersey within the New York Metropolitan Area, and is easily accessible to the highway and rail network which serves the northern New York-New Jersey metropolitan complex. As the region grew, West Orange was able to capitalize on its proximity to emerge as a manufacturing economy in the early 1800s which continued into the early 20th century. Today, manufacturing in West Orange has been replaced by service, financial, and retail enterprises. The Township borders on nine developed suburban municipalities. These include: Montclair, Verona, Essex Falls, Roseland, Livingston, Millburn, Maplewood, South Orange, and Orange.

Moving to the northeast, the Township of Verona, also in Essex County, lies between two mountains, the First and Second Watchung Mountains, with the Peckman River flowing at the bottom of the valley. According to the United States Census Bureau, the township has a total area of 2.8 square miles, of which almost 99.3 percent is land and the remainder is water. Verona is bordered by Cedar Grove, Montclair, West Orange, Essex Fells and North Caldwell. The Township of Verona also provides easy access to the Garden State Parkway and the New Jersey Parkway

The Township of Cedar Grove is located further to the northeast in Essex County. Access to Cedar Grove is provided by a number of county and regional highways, including the Garden State Parkway to the east.

Towards the northeast, the Township of Little Falls covers 2.75 square miles within the southern border of Passaic County, adjacent to Essex County (Figure 4). The township is bordered by six municipalities, including the Borough of Woodland Park, the City of Clifton, the Town of Montclair, the Township of Cedar Grove, the Township of North Caldwell, and the Township of Wayne.

Figure 4. Little Falls, New Jersey (2018).

Little Falls is characterized by relatively hilly terrain in its eastern portion, containing suburban residential developments and institutional uses (Montclair State University). The western portion of the township contains a less topographically diverse terrain; most of the land area in closer proximity to the Passaic River is flat. State Highway Route 46 (Route 46) comprises the eastern border of the Township, while the Passaic River comprises the north/northwest border of the Township (Figure 2). Great Notch Brook, a tributary to the Peckman River, is located in eastern Little Falls, and enters the river just downstream of Route 46. Areas of Little Falls in the vicinity of the Passaic River are flood hazard areas that have been prone to flooding in the past.

The Borough of Woodland Park (formerly West Patterson) is one of 16 municipalities in Passaic County (Figure 5). The borough is located in the northeastern section of New Jersey and the lower end of the county, about 20 miles west of New York City. Highway access is provided by U.S. Interstate 80 in the northern edge of the city and Route 46 along its southern border. Natural features such as Garret Mountain on the east and the Passaic River on the west, form the Borough's other two borders. Woodland Park is situated to the north of the Township of Little Falls and is approximately three square miles in size. Though a highly urbanized and developed municipality, with a mixture of residential, retail, office, and industrial properties, a significant portion of the borough remains open space due to municipal parkland, two County parks, and two reservoirs: the Great Notch Reservoir and the New Street Reservoir. Both of these reservoirs are managed by the Passaic Valley Water Commission. These reservoirs are for storage of drinking water, not for stormwater management purposes.

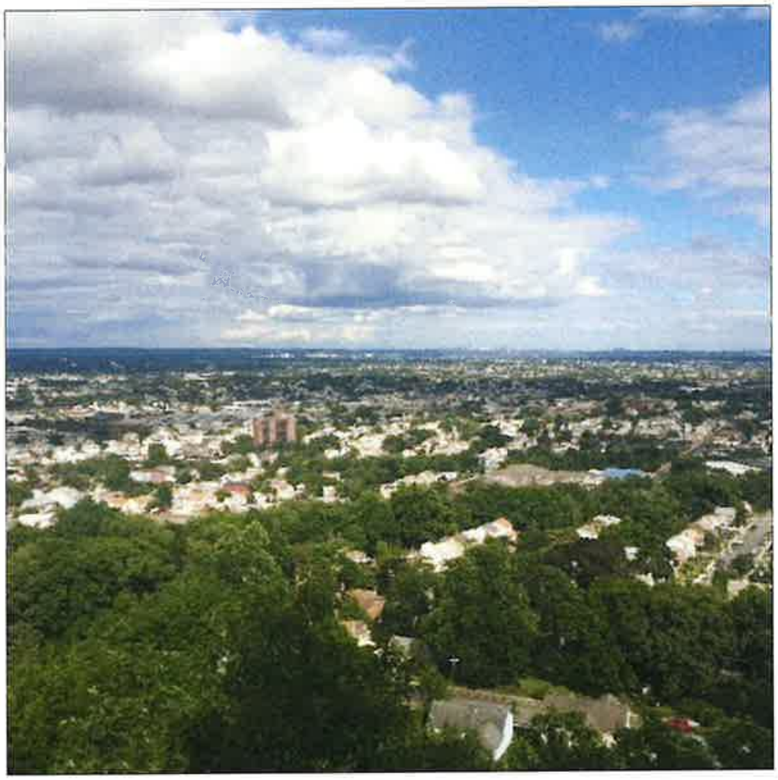

Figure 5. Woodland Park, New Jersey (2016).

1.5.2 Waterways within the Peckman River Basin

Tributaries of the Peckman River include Great Notch Brook, which enters the Peckman River just downstream of Route 46, and two un-named tributaries that discharge into the Peckman River in Cedar Grove. Great Notch Brook is the largest of the three Peckman River tributaries. The Peckman River is a tributary of the Passaic River.

Peckman River

The Peckman River originates in the southernmost, upstream municipality in the Passaic River Basin, the Township of West Orange, New Jersey, and flows northeasterly through the Township of Verona, the Township of Cedar Grove, the Township of Little Falls, and the Borough of Woodland Park to its confluence with the Passaic River. Figure 6 represents roughly the midpoint of the stream (see location of this point in Figure 2). The length of the Peckman River is approximately 8.5 miles. The elevation change along the river is approximately 260 feet, with the sharpest elevation change occurring within Cedar Grove.

The downstream portion of the Peckman River in Woodland Park is within close proximity to Dowling Brook, which is also a tributary to the Passaic River. During extraordinary flooding events, natural diversion of flow from the Peckman River across Woodland Park to Dowling Brook has been reported.

Figure 6. The Peckman River at the West Essex Trail crossing (2018).

Great Notch Brook

Great Notch Brook is a tributary to the Peckman River. Originating in a residential neighborhood in the eastern portion of Little Falls, Great Notch Brook flows north and then west for approximately 1.5 miles before discharging into the Peckman River just south of Route 46 in Woodland Park. The drainage basin for Great Notch Brook is approximately 0.6 square miles, with its confluence on the Peckman River immediately downstream of the Route 46 Bridge. Flash flooding from the brook occurs often, as the tributary carries essentially all local stormwater runoff.

Passaic River

The Passaic River (Figure 7) originates in southern Morris County, New Jersey. It flows for 90 miles before discharging into Newark Bay (Figure 3). The Passaic River runs parallel to the Peckman River upstream of Route 46. The Passaic River Basin drains an area of 935 square miles, of which 787 square miles are in New Jersey and 148 square miles are in New York. There are three distinctly different regions that comprise the Passaic River Basin. The mountainous and heavily wooded Highland Area is 500 square miles in extent, 13 miles wide and 38 miles long. The Central Basin is 262 square miles in extent, nine miles wide and 30 miles long. The Passaic River passes out of the Central Basin through the narrow rock gorge restriction at Little Falls. The study area is within the Central Basin. The Lower Valley is 173 square miles in extent, about seven miles wide and 24 miles long. Heavily urbanized and densely populated, the valley has rolling sides and a comparatively wide rolling bottom land that narrows down to about three-quarters of a mile below Dundee Dam.

Areas downstream of Dundee Dam (Figure 3) are subject to high water levels from tidal events, as well as from flow in the Passaic River. The Dundee Dam is built upon a natural falls; originally seven feet high, it was raised to support historic commercial uses in 1861 to a level of 20 feet high, plus a one-foot high cap of locally-mined sandstone. The dam is the upstream boundary of tidal influence in the Passaic River Basin. It is also the upriver boundary of the U.S. Environmental Protection Agency (USEPA) Lower Passaic River Study Area for the Diamond Alkali Superfund Site, and the upstream limit of the study area for the USACE Passaic River Tidal coastal storm risk management feasibility study. In addition, approximately 7.5 miles upstream of the Dundee Dam is the Great Falls at Paterson. The Great Falls is 77 feet high and is the second largest waterfall by volume east of the Mississippi, with Niagara Falls being the largest. The Peckman River confluence with the Passaic River is located approximately 10.5 miles upstream of the Dundee Dam.

The USACE Passaic River Tidal, New Jersey coastal storm risk management feasibility study, the USEPA Superfund study, and the USACE Passaic River Mainstem, New Jersey flood risk management study are all being conducted under separate authorizations different than that for the Peckman River Basin, New Jersey flood risk management study. The Passaic River Tidal study was completed with the approval of the Chief of Engineer's Report in 2019. The Superfund study is currently underway. The Passaic River Mainstem study is currently suspended.

Figure 7. The Passaic River and the Hillery Street Bridge near Woodland Park, New Jersey (2009). The location of this bridge is marked in Figure 2.

1.6 Project Area: Communities at Greatest Flood Risk

The narrow floodplain in the municipalities of West Orange, Verona and Cedar Grove heavily limits the number of structures affected by damages. The Peckman River floodplain generally remains narrow as it flows through upstream municipalities (Figure 8). The ten percent, one percent, and 0.2 percent floodplains tend to overlap in these municipalities and appear to be constrained by steep slopes in some areas. In other areas that are less steep, the floodplain widens slightly, and these wider areas appear to be open space, parkland or wetland/riparian corridors without any structures to be damaged. The result of this is that a limited number of structures in West Orange, Verona and Cedar Grove lie within the floodplain. The number of structures in the 0.2 percent floodplain is 12 in West Orange, 120 in Verona, and 60 in Cedar Grove. The number of structures in the one percent floodplain is less than 12 in West Orange, 90 in Verona, and 36 in Cedar Grove. The number of structures in the ten percent floodplain is six in West Orange, 12 in Verona and six in Cedar Grove. There are too few structures within the Peckman River floodplain in Cedar Grove, Verona, or West Orange to justify looking into nonstructural measures in these municipalities.

The communities of Little Falls and Woodland Park are at greatest risk of flooding due to their geography, topography, and relatively dense development. The floodplain is wide and flat, with a significant number of structures within the 10 percent, one percent (Figure 8) and 0.2 percent floodplains. These communities are hydrologically connected since there are no physical barriers that constrain floodwaters. These relatively low-lying lands are subject to frequent flooding from the Peckman and Passaic Rivers, as detailed in Sections 3.1 and 3.2. These two communities have a combined 273 structures in the 10 percent floodplain, 471 structures in the one percent floodplain, and 549 structures in the 0.2 percent floodplain that are impacted from Peckman River flooding.

The ten percent floodplain includes 200 residential structures with an aggregate depreciated replacement value of approximately $46,272,000 (Fiscal Year 2019 [FY19] price level [P.L.], and 73 non-residential structures (commercial/municipal/institution) with an aggregate depreciated replacement value of approximately $142,133,000 (FY19 P.L.).

The one percent floodplain includes 346 residential structures with an aggregate depreciated replacement value of approximately $90,978,000 (FY19 P.L.), and 125 non-residential structures (commercial/ municipal/ institutional) with an aggregate depreciated replacement value of approximately $226,179,000 (FY19 P.L.).

The 0.2 percent floodplain includes 407 residential structures with an aggregate depreciated replacement value of approximately $104,525,000 (FY19 P.L.), and 142 non-residential structures (commercial/ municipal/ institutional) with an aggregate depreciated replacement value of approximately $254,613,000 (FY19 P.L.).

The project area is defined as the area that is considered when formulating plans. The study team has focused its plan formulation and technical analysis within the boundaries of Little Falls and Woodland Park, because they are at significantly greater risk of flooding than other communities in the Peckman River Basin (Figures 8, 9, and 10). The discussion of environmental and economic impacts and benefits of alternative plans presented in Chapter 2, Chapter 5, and Chapter 6 are limited to the boundaries of the project area (Figure 11).

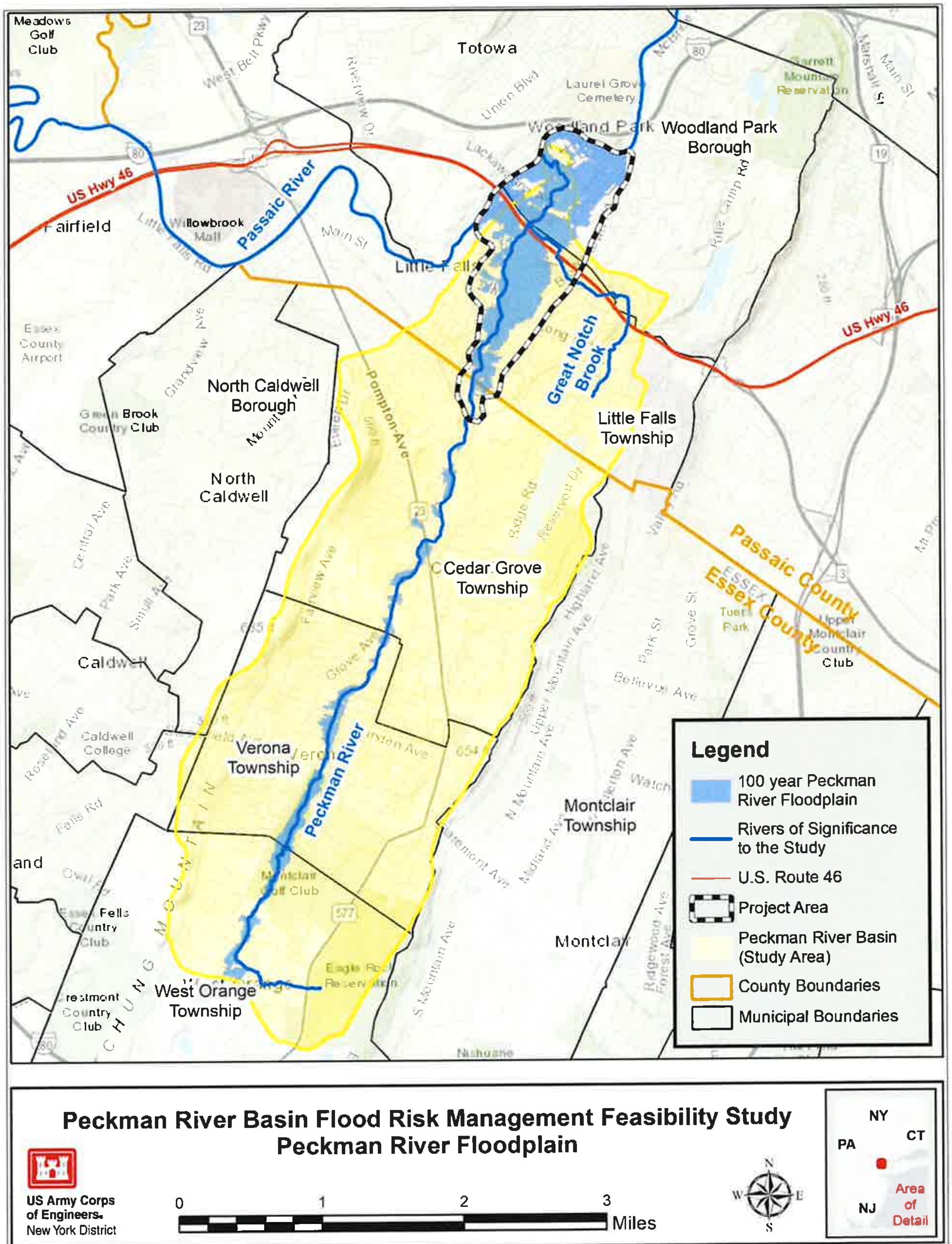

Figure 8. The one percent Peckman River floodplain.

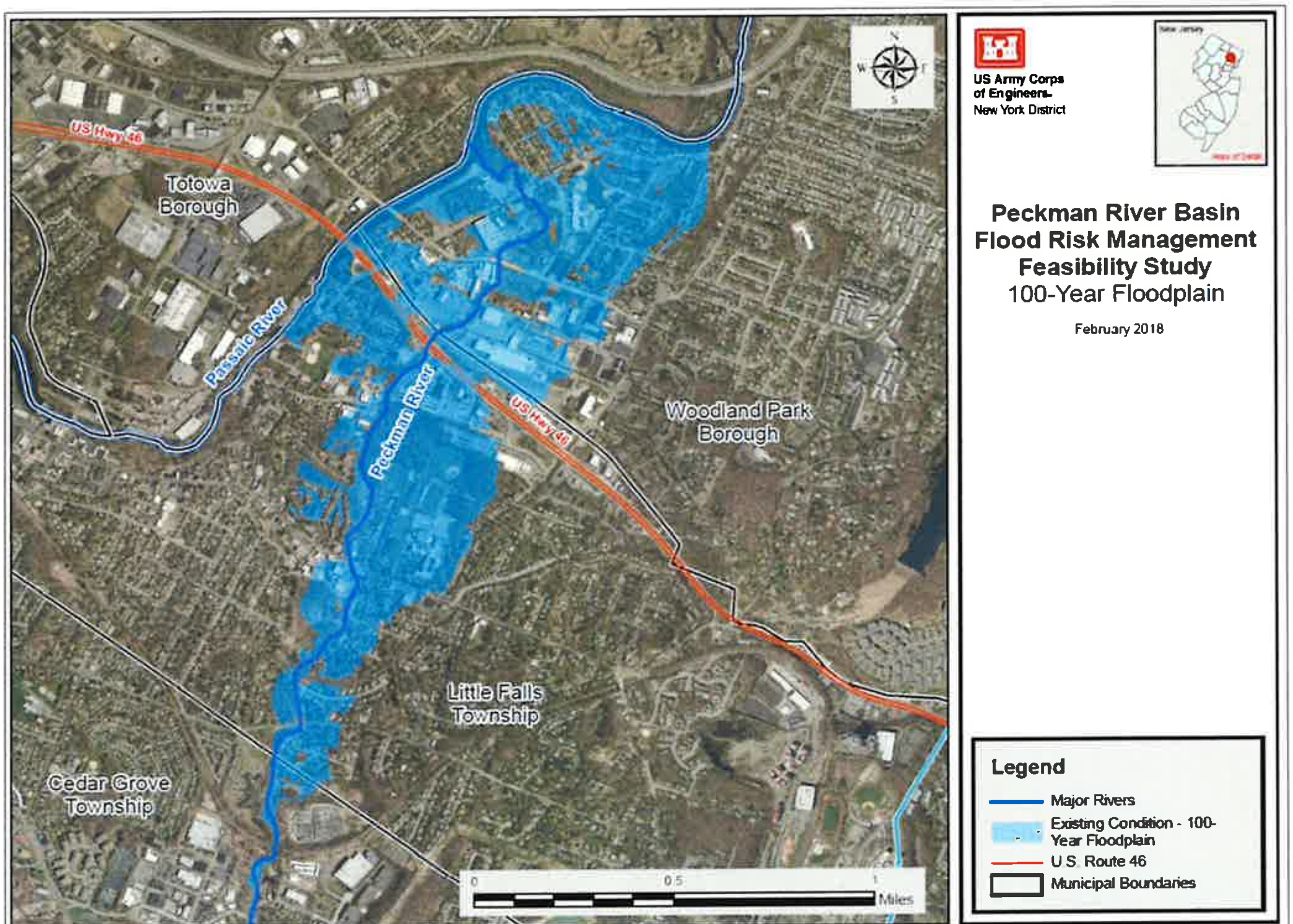

Figure 9. The one percent floodplain of the Peckman River in the Township of Little Falls and the Borough of Woodland Park. Note the Passaic River floodplain is not shown.

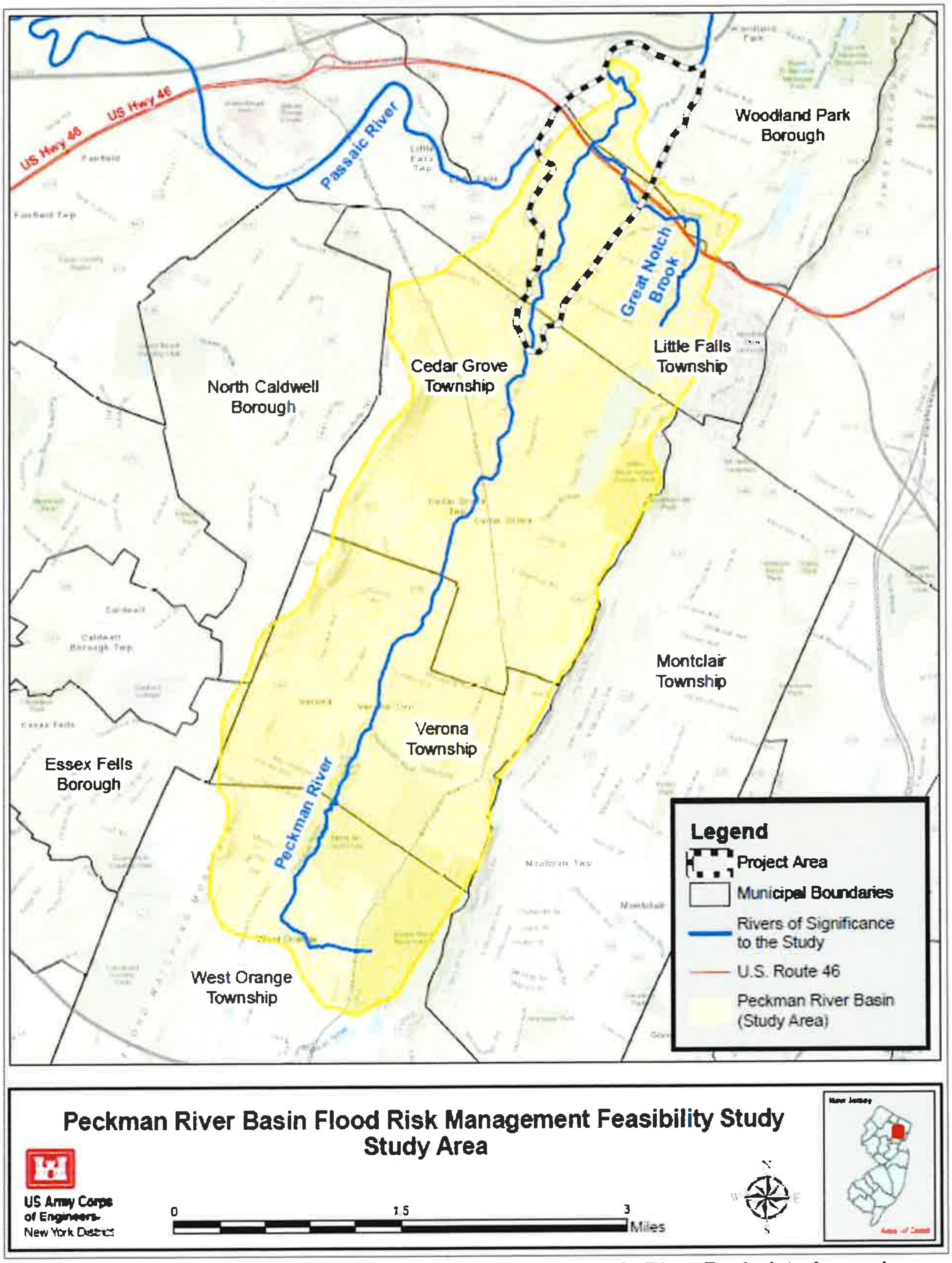

Figure 10. Location of the project area within the Passaic River Basin (study area).

Figure 11. Project area.

1.7 Need for Action*

Residents, businesses, and infrastructure in the Peckman River Basin experience repeated, significant flood damage due to flash flooding in the Peckman River and its tributaries, and overbank and backwater flooding from the Passaic River. Extensive development of the basin has led to the interrelated problems of flooding and ecosystem degradation. The majority of the watershed is heavily developed. Half of the basin is dominated by residential housing. Undeveloped areas of remaining forest reservoirs, and wetlands along the river corridor comprise only 29 percent of the basin. Commercial and residential development in the watershed has reduced the water holding capacity of the landscape and altered the natural dynamics of the river system. Storms deposit large amounts of rain in the watershed, producing significant runoff. This quickly surpasses the capacity of the rivers, streams, and bridges and culvert openings, resulting in flooding that first begins to occur at the ten percent flood event. Marked degradation of the river basin ecology has occurred, with areas impacted by stream bank erosion, loss of riparian habitat, and the occurrence of invasive species.

Some of the most severe flood damages in the Peckman River Basin have been caused by hurricanes and tropical storms. Hurricane Floyd (1999) caused an estimated $12,100,000 (FY19 P.L.) in flood-related losses to communities in the Peckman River Basin, and resulted in the death of one resident (Figures 12 and 13). Hundreds of homes and businesses in Little Falls and Woodland Park were affected by flooding. The Woodland Park business district was one of the hardest hit areas, with over three feet of flood water inundating structures and roads. In Little Falls, businesses were inundated with over four feet of water, and the Jackson Park residential area suffered extensive flooding. Almost all of Hurricane Floyd flood damages to areas within the Peckman River Basin were a result of Peckman River flooding, as flooding from the Passaic River in this area was of a much lesser magnitude. Hurricane Doria in August 1971 caused an estimated $12,000,000 (FY19 P.L.) in flood-related damages (Figure 14). A storm event in May 1968 caused an estimated $18,600,000 (FY19 P.L.) in flood related losses. A storm event in July 1945 resulted in one death within the project area.

Figure 12. Repairs being performed on a property due to Peckman River flood damage from Hurricane Floyd (1999).

Figure 13. Damaged contents being disposed of due to Peckman River flood damage from Hurricane Floyd (1999).

Figure 14. Damage from Hurricane Doria to a road adjacent to the Peckman River (1971).

1.8 Prior Studies & Reports

Many USACE reports have been produced in support of the study. The reports listed below are the most pertinent to the evolution of the study.

Detailed Project Report for the Peckman River, Township of Little Falls, Section 205 of the 1948 Flood Control Act (September 1981). An evaluation of flood risk along the Peckman River in Woodland Park, Little Falls, Cedar Grove, and Verona was conducted in 1981. Part of the evaluation included a determination as to whether a study of flood risk management for Little Falls alone would be more favorable than pursuing a basin-wide solution. Nine flood risk management alternatives (six structural and three nonstructural) were considered for the basin, primarily in Little Falls. Woodland Park was determined to be subject to backwater flooding from the Passaic River, and was therefore not considered for flood risk management under this study because the problem of backwater flooding is the focus of the Passaic River Basin flood risk management study. Cedar Grove and Verona were deemed not to warrant economically-justified flood risk management due to limited flood damages. It was concluded at the time that structural and nonstructural alternatives for flood risk management on the Peckman River in Little Falls were not in the Federal interest based on benefit-cost ratios that ranged from a low of 0.10 to a high of 0.27. However, the basis of the hydrologic and hydraulic analysis used in the report is unclear. Changes to the reliability of available hydrologic and hydraulic data has been enhanced by the installation of a USGS gage in Verona, which has recorded stream flow data from 1979 to the present. This updated stream flow data has informed the basin-wide USACE Passaic River Mainstem, New Jersey flood risk management study; the study is currently suspended.

Passaic River Basin, New Jersey and New York, Phase 1 General Design Memorandum, Flood Protection Feasibility Study, Main Stem Passaic River (December 1987). The report detailed a recommendation for flood risk management in the Passaic River Basin. The Recommended Plan detailed in this 1987 report consists 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, 5,200 of which are wetlands. This plan would protect flood-prone areas along the Passaic, Pompton, Pequannock, Wanaque, Ramapo, Rockaway and Whippany Rivers, and Deepavaal and Pinch Brooks.

Three measures identified as possible basin-wide interim projects were also studied under the Passaic River Basin Phase I Advanced Engineering and Design authorization.

- **Emergency Preparedness.** A study on flood emergency preparedness, including a flood warning system was conducted under the authority of the Continuing Authorities Program (CAP), Section 205 of the Flood Control Act of 1948. The plan was to improve the timeliness, accuracy, and reliability of flood warnings throughout the basin. It included the establishment of local self-help programs; increased rain and stream gage density and automation; improved flood warning systems and flood hazard mapping; improved computer software and flood warning hardware facilities; and enhanced local response programs. The report was approved by the Chief of Engineers in September 1984. The installation was completed in 1988 and the project is now operational. The project will be the primary data source governing the operation of the USACE Passaic River Mainstem, New Jersey flood risk management project if constructed; the Passaic River Mainstem study is currently suspended.
- **Preservation of Natural Flood Storage.** The study resulted in a recommendation for no interim action, but for further consideration as an early action measure in conjunction with the USACE Passaic River Mainstem, New Jersey flood risk management study, which is currently suspended. The authorized flood risk management project contains preservation of key Central Basin natural flood storage areas as a nonstructural project element. To date, the Preservation of Natural Storage Areas project has authorized for the purchase of up to 5,350 acres; 3,400 have been bought to date, and the project is ongoing.

The authorized Passaic River Mainstem, New Jersey project evolved from more than 150 plans presented in public meeting in the early 1980s consisting of combinations of channel modifications, levees and floodwalls, upstream reservoirs, floodplain evacuation (buyout), floodproofing of structures, raising structures, diversion tunnels, and other measures. In June 1984, NJDEP Commissioner developed criteria for plan selection and determined that a dual inlet tunnel plan best met those criteria. NJDEP asked USACE to proceed into feasibility design of this plan in 1988, and then-New Jersey Governor Kean committed the State to working with USACE on the project to ensure project authorization and resolve fine-tuning decisions during the design of the plan. The project was authorized by the Resources Development Act (WRDA) of 1990 and WRDA 1992.

General Design Memorandum (GDM), Passaic River Flood Risk Management Project (September 1995). The purpose of the GDM study was to refine the analysis and design of the aforementioned 1987 Recommended Plan, which included the construction of a flood tunnel for diversion of Passaic River flood waters. Implementation of the Recommended Plan was expected to significantly reduce Passaic River flooding in areas of Woodland Park that are subject to inundation from both the Passaic and Peckman Rivers. In the GDM as well as a 1981 Detailed Project Report, the Passaic River was assumed to be the primary source of flooding for Woodland Park; therefore, preliminary indications were that a reduction in flooding from the Passaic River would significantly reduce flood damage in Woodland Park. No detailed analysis was performed on how the project would have affected Peckman River flooding within Woodland Park due to the reduction of backwater influence. Although the specific dependence or independence of Passaic River and Peckman River flooding events was not analyzed as part of the GDM study, the hydrology and hydraulics data developed for the report indicates the Peckman River is a more significant source of flooding in Woodland Park and Little Falls than previously detailed in the GDM, Flood Insurance Studies (FIS), or the 1981 Detailed Project Report.

Peckman River Basin, New Jersey Section 205 Initial Appraisal Report (July 2001). The purpose of the CAP Section 205 study was to conduct an appraisal for flood risk management opportunities, and to evaluate the potential for Federal interest in flood risk management within the Peckman River Basin. Structural alternatives providing flood risk management up to approximately the two percent flood design level were evaluated. Alternative plans considered include diversion of flood waters from the Peckman River to the Passaic River, earthen levees and concrete floodwalls, and channel modifications to increase channel capacity. The estimated costs (FY 01 P.L.) of the structural alternatives considered in this analysis ranged from approximately $16,000,000 for the diversion culvert, to $30,000,000 for channel modifications, and $40,000,000 for levees and floodwalls. It was expected that the annual benefits of one or more of these alternatives would exceed the estimated annual costs. The diversion culvert alternative appears to be the most economically viable of the alternatives evaluated. The conclusion in the Initial Appraisal Report was that benefits of flood risk management measures would exceed the project costs resulting in net economic contributions.

Peckman River Basin, New Jersey, Reconnaissance Report 905(b) (January 2002). The purpose of the Section 905(b) preliminary analysis was to study flood risk management and ecosystem restoration opportunities along the Peckman River, and to evaluate the Federal interest for a potential flood risk management within the Peckman River Basin. Specific objectives of the reconnaissance study were to: (1) determine if the water resources problem(s) warrant Federal participation in feasibility studies; (2) define the Federal interest; (3) complete a Section 905(b) preliminary analysis; (4) prepare a Project Management Plan (PMP); (5) assess the level of interest and support from non-Federal entities; and (6) negotiate and execute a FCSA.

The 905(b) report detailed that Federal interest existed for flood risk management in the Peckman River Basin. It was also concluded that significant local support for flood risk management existed, and that it was expected that a non-Federal sponsor would be willing and able to cost-share feasibility studies and project implementation. Furthermore, a preliminary ecosystem evaluation of the basin resulted in the identification of numerous opportunities for ecosystem restoration and/or enhancement. It was recommended that the 905(b) report be approved as the basis for completing a PMP for a cost-shared feasibility phase.

Other Reports. USACE produced the following studies and reports related to flood risk management:

- Report on the Flood of August 1973 (circa 1974)
- Passaic River Basin Historical Flood Damage Report: Rockaway and Passaic Rivers, New Jersey (circa 1980)
- Report for Flood Protection Feasibility, Main Stem Passaic River, New Jersey (December 1987)
- Passaic River, New Jersey Buyout Study (September 1995)
- Passaic River, New Jersey Buyout Study Update (August 2005)
- Passaic River, New Jersey Buyout Study Update (February 2017)
- Tropical Storm (Hurricane) Floyd, September 16, 1999, Post-Flood Report (July 2000)
- Peckman River Basin, New Jersey Flood Risk Management Feasibility Study Integrated Feasibility Report and Environmental Assessment (May 2018)

Numerous studies and reports were produced by other agencies. These include:

- Federal Emergency Management Agency (FEMA), Flood Insurance Administration (FIA), Repetitive Loss Data for Woodland Park and Little Falls (2013)
- New Jersey Department of Environmental Protection (NJDEP), Flood Hazard Area Maps (circa 1975)
- FEMA, FIA, FIS for Verona (August 1979), Cedar Grove (August 1979), Little Falls (February 1981), and West Paterson (June 1981), and subsequent updates
- Natural Resources Conservation Service (NRCS), Peckman River Streambank Restoration, Emergency Watershed Protection, Borough of West Paterson, Passaic County, Engineering Report (March 1999)
- Passaic County, Bridge Reconstruction Plans: Lackawanna Avenue (1994) and McBride Avenue (2000), West Paterson
- NJDEP, Bureau of Water Monitoring, Ambient Biomonitoring Network (2018)
- Township of Little Falls, New Jersey Master Plan (2008)
- Borough of Woodland Park, New Jersey Master Plan (2010)

Figure 15 shows the locations of projects completed and ongoing studies in the Passaic River basin by USACE within the Passaic River Basin.

- Molly Ann's Brook – construction completed 2007
- Lower Saddle River – ongoing study
- Long Hill Township – deferred study
- Jackson Brook – ongoing study
- Malapardis Brook – ongoing project design
- Ramapo River at Mahwah/Suffern – deferred study
- Joseph Minish Waterfront Park – ongoing construction
- Floodway Buyout – awaiting approval for construction
- Ramapo River at Oakland – construction completed 2007
- McKeel Brook – construction complete 2004
- South First Street Floodwall at Harrison – study deferred
- Lower Passaic River Restoration Project – ongoing study, conducted jointly between USACE and USEPA
- Newark Bay Superfund Study – ongoing study by USEPA
- USACE Passaic River Tidal, New Jersey coastal storm risk management feasibility study – draft feasibility report released in 2017

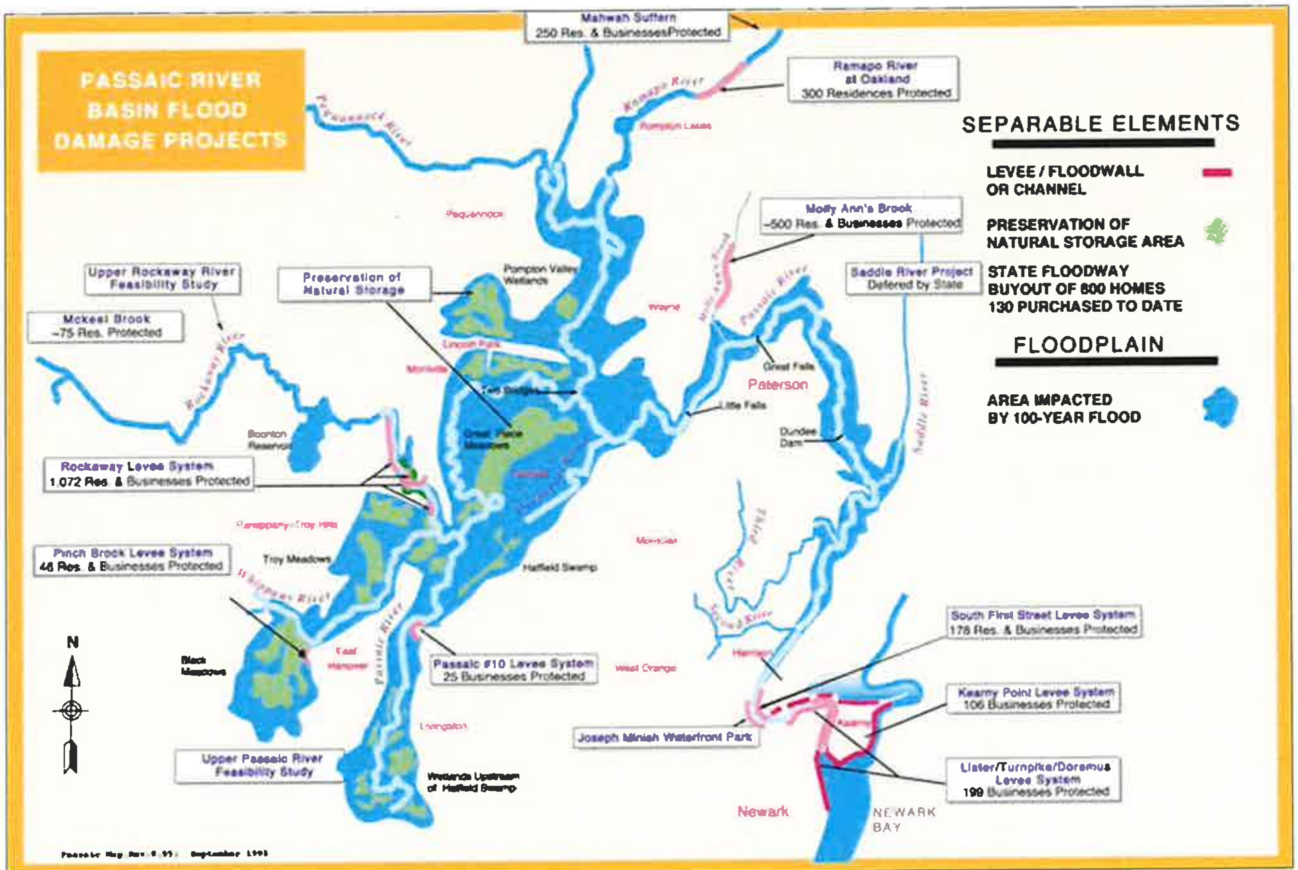

Figure 15. USACE projects and studies within the Passaic River Basin.

Chapter 2: Existing Conditions/Affected Environment*

This description of the environment that may be affected is in accordance with the requirements of National Environmental Policy Act (NEPA) and serves as the baseline for Chapters 5 and 6, which contain the Integrated Environmental Assessment. Photographs of the project area are included in Appendix G. Additional details regarding environmental setting can be found in in Appendix A-1. For the purposes of consistent orientation during discussions related to streambanks, the banks will be referred to as left or right based on a downstream viewpoint.

The discussion of environmental and economic impacts and benefits of alternative plans presented in Chapters 2, 5, and 6 are limited to the boundaries of the project area (Figure 11).

2.1 Topography, Geology & Soils

2.1.1 Geology & Topography

The project area is located within the Piedmont Physiographic Province. Generally, the Piedmont Province is characterized by interbedded sandstone, shale, conglomerate, basalt, and diabase (Lewis, Jason, and Wieben, undated). The bedrock geology of the Peckman River from its origination at Eagle Rock Reservation to the Essex/Passaic County Line is comprised of Orange Mountain Basalt which is a dark-greenish-gray to black, fine-grained dense hard basalt. From the Essex/Passaic County line north, the bedrock geology is composed of the Feltville Formation, which consists of reddish, fine to coarse grained sandstone, shales, and mudstone (Volkert, 2006). Elevations range from approximately + 360 feet NAVD88 in Verona to + 180 feet NAVD88 in Little Falls (Volkert, 2006).

The surface geology of the Passaic and Peckman Rivers within the project area is comprised of post-glacial alluvium consisting of moderately to well-sorted sand, silt, and pebble to cobble gravel that contains variable amounts of organic matter, demolition debris, and trash (Stanford, 2003). Through the majority of the project area, the surface geology of the Peckman River corridor includes artificial fill, defined as "artificially emplaced sand, gravel, silt, clay, and rock fragments, and man-made materials including cinders, ash, brick, concrete wood, slag, asphalt, metal, glass, and trash" that is variable in color but generally dark brown, gray, or black. The thickness of the fill is generally less than 20 feet but can be as much as 60 feet (Stanford, 2003). Appendix C-3 includes information about project area-specific soils, which will be used during project design to ensure appropriate site-specific design.

The project area topography is defined by a sharp 100-foot slope traveling approximately a mile from south to north (Figure 16). The Peckman River travels down this gradient to the relatively shallow areas close to the Passaic River. The project area is bounded to the east by steep cliffs. The area's topography speaks to its flood risk. In the south, flash floods are common because of the sharp change in elevation along the Peckman River. The relatively low elevation northern parts of the project area are most affected by overbank and backwater flooding from the Passaic River.

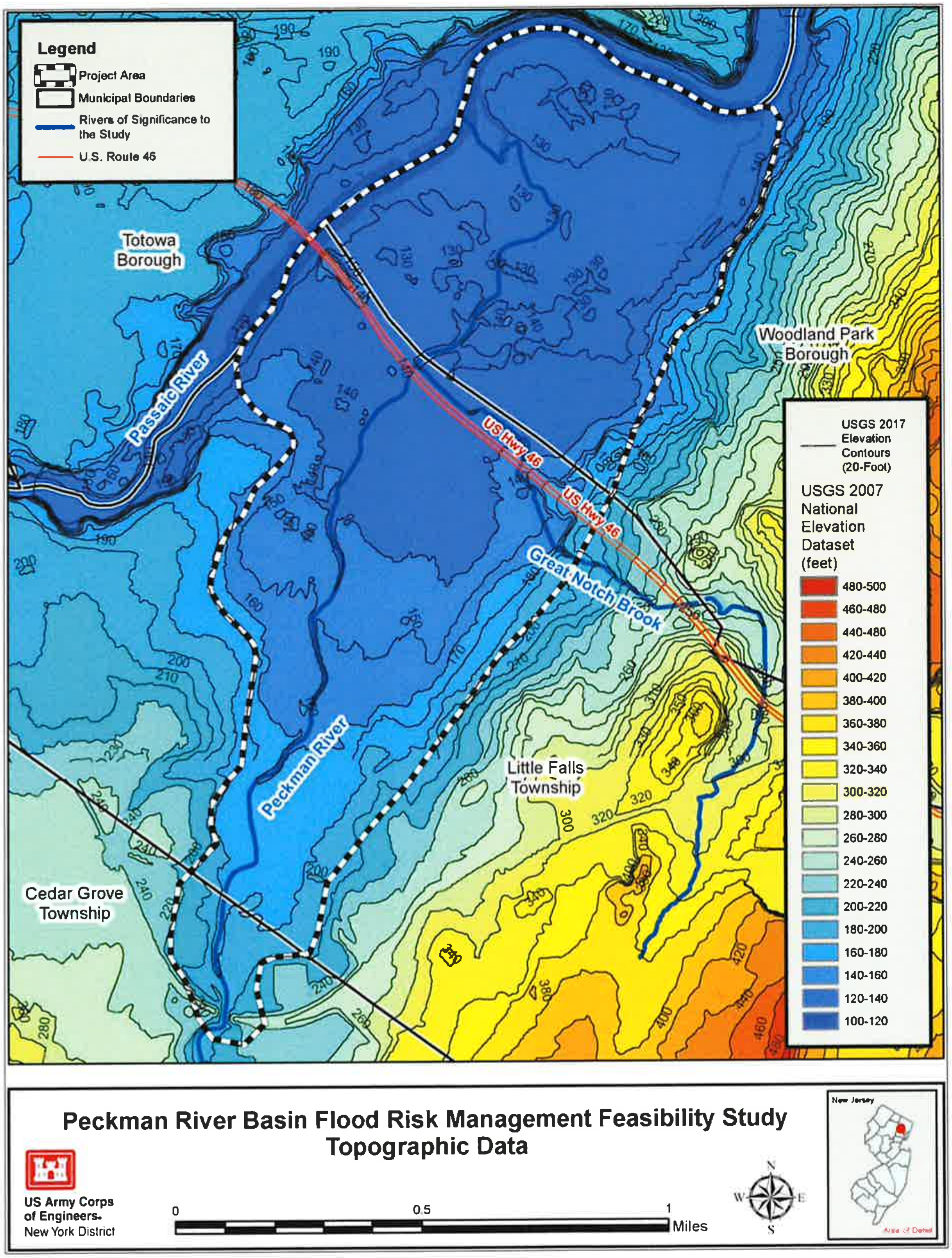

Figure 16. Topography of project area.

2.1.2 Soils

Dominant soil types within the project area consist of the Urban Land-Knickerbocker complex, Boonton loam, Boonton-Urban land complex, the Parsippany, Preakness and Pompton series, fluvaquents, and Udorthents.

Urban land is classified as land mostly covered by streets, parking lots, buildings and other structures of urban areas with slopes ranging from zero to eight percent. The Knickerbocker series consists of very deep, well and somewhat excessively drained soils formed in sandy outwash. The Knickerbocker series is typically found on nearly level to steep soils on lake plains and terraces. The potential for surface runoff is low to high. This soil type does not typically flood or pond (NRCS, 2002a).

The Boonton series is formed in glacial till consisting primarily of red to brown shale, sandstone, basalt and some granitic gneiss. This series is typically found on gently sloping to very steep uplands. The Boonton series is moderately well to well drained (NRCS, 2018).

The Parsippany series consists of fine glaciolacustrine deposits derived from basalt, shale and granitic gneiss material. This soil type is typically found on floodplains on outwash plains on slopes ranging from zero to three percent. Parsippany soils are poorly drained, and frequently flood and pond. A seasonal zone of water saturation is at six inches during January, February, March, April, May, October, November, and December (NRCS, 2002b).

The Pompton series consists of coarse-loamy outwash derived from gneiss, sandstone and basalt typically located on outwash plains and terraces in waterways. Slopes range from zero to three percent. Pompton soils are moderately well drained and somewhat poorly drained and have a low to very low surface runoff. This series does not typically flood or pond and the groundwater table is within 12 inches of the surface in the late winter and early spring (NRCS 2009).

The Preakness series consist of sandy loam on outwash plains and terraces. Slopes range from zero to three percent. Preakness soils are poorly to very poorly drained, and frequently flood in the spring and pond in winter (NRCS, 2002c).

Both Fluvaquents and Udifluvents have zero to three percent slopes. Fluvaquents have parent material consisting of recent alluvium and are commonly found on floodplains and in river valleys. The natural drainage class is somewhat poorly drained and is frequently flooded. Parent material of Udifluvents soil consists of alluvium and is typically consistent in outwash plains and floodplains. The drainage class is moderately well drained and is frequently flooded (NRCS, 2007).

The Udorthents soil type is typically identified in areas where the original in-situ soils have been altered through human activity. Substratums included within this series includes refuse substratum, where areas have been used for refuse disposal (e.g. landfill), and loamy substratum, where the in-situ soil has either been removed and/or covered with a loamy fill material. These soils typically consist of moderately deep to deep well drained to somewhat poorly drained soils. Within the project area, Udorthents are found on slopes ranging from zero to eight percent (NRCS, 2018).

A preliminary geotechnical investigation was performed for in January 2012. The work included a total of 23 geotechnical borings drilled along the Peckman River Basin. Twenty one borings were completed in Little Falls and two borings were drilled in Cedar Grove. The borings indicate that surficial soils are comprised of fill and recent river alluvium overlying glacial deposits that are underlain by bedrock. See Appendix C-3 for the results of the preliminary subsurface investigation results within the project area.

Hydric Soils

Fluvaquents-Udifluvents, Parsippany, Pompton, and Preakness series are included on the list of hydric soils for New Jersey developed by the NRCS. Soils with this classification are those saturated through natural or artificial means sufficiently enough to support the growth and regeneration of hydrophytic vegetation (NRCS, 2018a).

Prime Farmland Soils

Prime farmland soils are defined by the United States Department of Agriculture (USDA) as land that has the best combination of characteristics for producing food. It can have any land use ranging from cultivated land, pastureland, forest, or other; however it is usually not urban or water areas. The USDA states that, "the soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management and acceptable farming methods, are applied." The Boonton and Pompton soils are defined as prime farmland soils and/or soils of statewide importance (NRCS, 2018b).

2.2 Climate

The climate of the Peckman River Basin is characteristic of the entire Middle Atlantic seaboard. Marked changes of weather are frequent, particularly during the spring and fall. The winters are moderate in temperature and snowfall. The summers are moderate with hot and humid weather and the potential for frequent thunderstorms. Rainfall is moderate and well distributed throughout the year. The relative humidity is high. The average annual temperature is 52 degrees Fahrenheit at Little Falls, with extremes from 11 degrees Fahrenheit below zero to 105 degrees Fahrenheit above zero. The growing season averages 167 days. The mean annual relative humidity is 65 percent. Prevailing winds are from the northwest, with an annual average velocity of ten miles per hour at nearby Newark, New Jersey. The number of days with precipitation average about 122 inches per year.

The Peckman River basin is best represented by a precipitation station at Little Falls. The location of the station is at Latitude 40 degrees 53 minutes north and Longitude 74 degrees 14 minutes west. The elevation of the station is 150 feet. This station is used for historic precipitation records for this study.

The mean annual snowfall is 21.4 inches at Little Falls. The mean annual precipitation in the Peckman River watershed is approximately 51.5 inches, as derived from the records of the Little Falls station. The observed highest daily value at this station was 12.79 inches (September 17, 1999 during Hurricane Floyd). The monthly extremes were 17.85 inches in September 1999 and 0.36 inches in November 1976. The distribution of precipitation throughout the year is fairly uniform, with higher amounts occurring during the summer months.

2.3 A History of Flooding

The storms that occur over the northeastern states have their origins in or near the Pacific and the South Atlantic oceans and may be classified as: extratropical storms, which include thunderstorms; cyclonic (transcontinental) storms; and tropical storms, which include the West Indies hurricanes. The extratropical storms, which, due to rapid convective circulation when a tropical marine air mass is lifted suddenly on contact with hills and mountainous terrain, cause heavy rains, usually in the summer and fall seasons. The thunderstorms, due to rapid convective circulation, usually in July, are limited in extent and cause local flooding on flashy streams. The cyclonic storms, containing transcontinental air mass movements with attendant "highs" and "lows," usually occur in the winter or early spring and are potential flood producers over large areas because of their widespread extent. The West Indies hurricanes, of tropical origin, proceed northward along the coastal areas accompanied by extremely violent winds and torrential rains of several days duration.

These storms sometimes cause large scale rain events that result in flooding of the Peckman River Basin. As described in Section 3.1, flash flooding in the Peckman River, and backwater and overbank flooding from the Passaic River frequently and significantly impact the basin. The study area is impacted by both types of flooding, though typically not concurrently. Two lives have been reported to have been lost within the basin due to flooding, one in a July 1945 storm event and one due to Hurricane Floyd in 1999. The flood damage and life loss experienced in the study area underscore the need for a project to reduce flood damages, including communicating residual risk that remains with flood risk management projects and programs in place.

2.3.1 Past Storms & Historical Floods

The following is a description of major floods that have impacted the Peckman River Basin. Detailed information about storm stage elevations, frequencies, and gage data can be found in Appendix C-1 and Appendix C-2.

July 1945 Event

In July 1945 there were several consecutive days of heavy rainfall in the study area. This rainfall was unrelated to any tropical storms or hurricanes. Sometime before July 22, 1945, the dam in the Essex county Park at Verona Lake gave way, sending floodwaters down the Peckman in to Little Falls. This flood caused massive erosion that washed out roads (Figure 17), removed the earth supporting the Erie Railroad tracks over the Peckman (Figure 18), and removing houses from their foundations (Figure 19). One death occurred during this event when a house was washed off its foundation with a woman who lived there inside.

Figure 17. A road that was washed out in Little Falls during the 1945 flood. Photo courtesy of the Little Falls Historical Society. Photographed July 22, 1945.

Figure 18. Erie Railroad tracks suspended in the air after the Peckman River flood of July 1945 washed away the earth supporting the bridge for the tracks. Courtesy of the Little Falls Historical Society. Photographed July 22, 1945.

Figure 19. The Riker family house on Cedar Grove Road in Little Falls, NJ after it had been destroyed by the Peckman River flood of 1945. The house was split down the middle and collapsed. The house was washed from its foundation and collapsed, killing a woman who lived there. Courtesy of the Little Falls Historical Society. Photographed July 22, 1945.

Tropical Storm Doria (August 25-28, 1971)

Tropical Storm Doria was the costliest tropical cyclone in the 1971 Atlantic hurricane season (Figure 20). The storm developed from a tropical wave on August 20 to the east of the Lesser Antilles. It made landfall near Morehead City, North Carolina. It turned to the northeast, and moved through the mid-Atlantic and New England into Maine. The storm dropped heavy precipitation in New Jersey, peaking at 10.29 inches in Little Falls (Roth, 2017). This rainfall lead to record-breaking river levels and flooding in many houses. Hurricane Doria was estimated to have a four percent annual chance of occurrence, and caused an estimated $2,000,000 (FY18 P.L) in flood-related damages.

Hurricane Floyd (September 18-19, 1999)

Hurricane Floyd began as a Cape Verde type hurricane east of the Lesser Antilles. The storm made landfall on September 16 near Cape Fear, North Carolina with Category 2 winds of 105 miles per hour. After crossing eastern North Carolina and Virginia, it weakened to a tropical storm. Its center moved offshore along the coasts of the Delmarva Peninsula and New Jersey. On September 17, 1999 the storm moved over Long Island, New York, making landfall again roughly at the Queens County-Nassau County border, and headed towards New England where it became extra-tropical.

Figure 20. Damage from Hurricane Doria to a bridge abutment & road along the Peckman River (1971).

One of the most damaging floods of record in the basin resulted from Hurricane Floyd, causing an estimated $11,600,000 (FY19 P.L.) in flood-related losses. Hurricane Floyd resulted in new flood peaks of record at as many as sixty stream gages within the portions of New Jersey and New York within the District's civil works boundaries.

Hundreds of homes and businesses were affected by flooding in Little Falls and Woodland Park (Figure 21). The Woodland Park business district situated north of Route 46 was one of the hardest hit areas, with over three feet of flood water. In Little Falls, businesses south of Route 46 were inundated with over four feet of water, and the Jackson Park residential area suffered extensive flooding from flood waters diverting from the Peckman River to the west and into the Passaic River. Almost all of Hurricane Floyd flood damages to areas within the Peckman River Basin were a result of Peckman River flooding. Flooding from the Passaic River and subsequent backwater flooding of the Peckman River, was of a much lesser magnitude during the storm. This was due to the Passaic River water levels not rising to a height that would cause backwater or overbank flooding in Little Falls or Woodland Park.

Figure 21. High flows and water levels due to Hurricane Floyd at a bridge abutment along the Peckman River (1999).

April 2007 Nor'easter

The April 2007 nor'easter was not a significant event for the Peckman River Basin, however, communities within the floodplain of the mainstem of the Passaic River were inundated with flood waters. Areas within the Peckman River Basin subject to backwater flooding from the Passaic River had impassable streets and some minor structure flooding. The storm underscored that there is no firm or reliable relationship between high water on the Passaic and Peckman Rivers.

Hurricane Irene (August 27-28, 2011)

Hurricane Irene was the first major hurricane of the 2011 Atlantic Hurricane season. The storm began east of the Lesser Antilles and was designated as Tropical Storm Irene on August 20, 2011. The storm passed through St. Croix and Puerto Rico, and then made landfall in the continental United States on August 27, 2011 on the Outer Banks of North Carolina. Irene moved from land to Atlantic Ocean several times, affecting Florida, South Carolina, North Carolina, Virginia, Maryland, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Massachusetts, Rhode Island, Vermont, and Maine, as well as Canada. Hurricane Irene caused widespread destruction and at least 49 deaths. Due to record rainfall, severe river flooding occurred in the Raritan, Millstone, Rockaway, Rahway, Delaware and Passaic Rivers (Figure 22). Hurricane Irene caused flooding on both the Peckman and Passaic Rivers, and breaking records for peak discharges. The Peckman River peaked on August 28, 2011 at a gage height of 9.16 feet and a discharge of 2,010 feet^3/s (USGS, 2018a). The Passaic River peaked on August 30, 2011at Little Falls at a gage height of 14.19 feet. and a discharge of 20,800 feet^3/s (USGS, 2018b). Both of these peaks were substantially above flood stage. Flooding was caused by both rivers, first the Peckman, and then roughly two days later, the Passaic. In Woodland Park, approximately 500 structures were flooded during this event. First floor flooding was common, with chest-deep waters inundating many structures. The Borough estimates that its residents incurred approximately $5,000,000 (FY19 P.L.) in damage from the storm.

Figure 22. Flood damage in Little Falls, New Jersey after Hurricane Irene (2011).

August 2018 Flood Event

On August 11, 2018, the Peckman River Basin received five inches of rain in a matter of hours. Overbank flooding substantially damages neighborhoods and commercial areas in Little Falls and Woodland Park (Figure 23 and Figure 24). Many homes and businesses were impacted by flash flooding. Bank erosion caused debris to cause hydraulic bottlenecks at road overpasses, exacerbating flooding in many areas. The communities continue to recover from the flood event.

The study team considered the flood dynamics observed during the August 2018 flood event during planning. The storm's effects prompted the study team to update engineering models that informed decision making. Chapter 3 describes this effort and resulting planning decisions.

Figure 23. Peckman River erosion in Little Falls, New Jersey (August 2018).

Figure 24. Clean Up in Little Falls, New Jersey (August 2018).

2.4 Land Use & Zoning

From the data obtained from NJDEP (Table 1 and Table 2), land use in Woodland Park is predominantly residential, followed by open space and commercial area. Similarly, land use in Little Falls is predominantly residential, followed by public and commercial uses. Current land uses in the project area are shown in Figure 25.

Table 1. Land use in Woodland Park (NJDEP, 2017).

Land Use	Parcels	Acres (rounded)	Percentage (rounded)
Residential	3,968	763	45%
Commercial	424	211	12%
Industrial	65	44	3%
Public	56	45	3%
Open Space	70	521	31%
Others	93	112	7%
Total	**4,676**	**1,696**	**100%**

Table 2. Land use in Little Falls (NJDEP, 2017).

Land Use	Parcels	Acres (rounded)	Percentage (rounded)
Residential	3,538	821	46%
Commercial	181	191	11%
Industrial	46	19	1%
Public	11	453	26%
Open Space	370	100	6%
Others	0	176	10%
Total	**4,146**	**1760**	**100%**

The project area is most densely developed along the Passaic River, with the oldest neighborhoods located along the river. Most residential development is made up of detached single-family homes.

The project area's two main commercial districts are located between Browertown Road and the Passaic River in Woodland Park, and along Main Street/East Main Street in Little Falls. Passaic Valley High School, with its track and baseball fields, is located at the eastern edge of the Main Street commercial corridor. The commercial districts are largely surrounded by residential development.

Relatively small parks including Peckman Preserve provide recreational opportunities and open space for residents. There are parks abutting the Passaic River that provide access to the water for residents and wildlife alike.

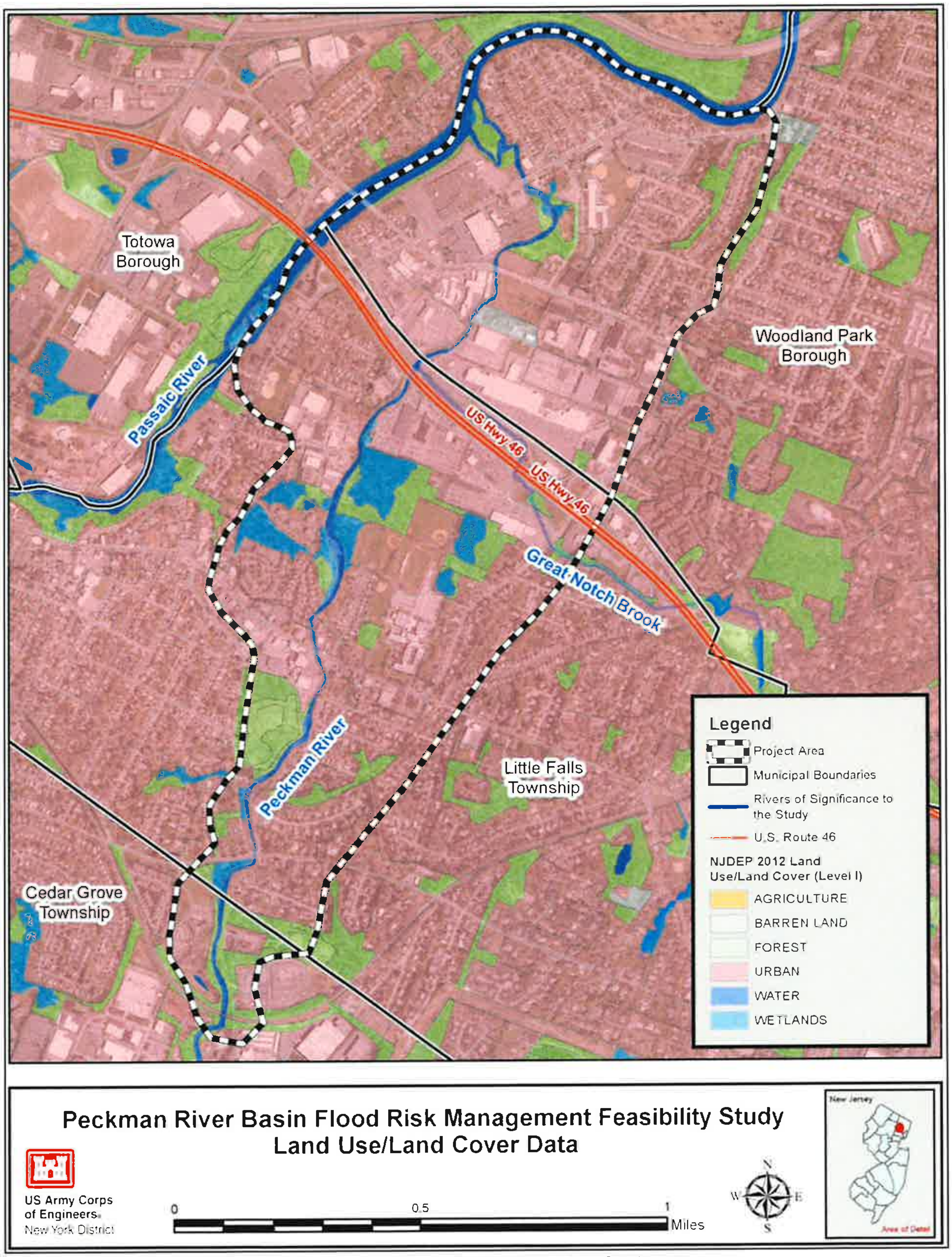

Figure 25. Land use within the project area.

2.5 Socioeconomics

Socioeconomics is the study of how economic activity affects and is shaped by social processes. In general, it analyzes how societies may change because of their local or regional economy, or the global economy.

2.5.1 Demographics

According to the 2010 U.S. Census, the population of the municipalities in the project area has increased since 2000. Table 3 presents a summary of the population data for the project area.

Table 3. Population of New Jersey, Little Falls, and Woodland Park (U.S. Census, 2010).

Location	2000 Census	2010 Census	% Change (rounded)
New Jersey	8,414,350	8,791,894	5%
Little Falls	10,855	14,432	33%
Woodland Park	10,987	11,819	8%

Income: Both of the municipalities of Woodland Park and Little Falls have a higher than average median household income for Passaic County, but are fairly representative of the average median household income of New Jersey. The median household income for Woodland Park is $70,000, which is 13 percent higher than the average for Passaic County ($62,000), but 5% lower than the average for the state of New Jersey ($74,000). For Little Falls, the median household income is higher, at $79,000. This is 27 percent higher than the average for Passaic County and 7 percent higher than the average for the state of New Jersey.

Labor Force: The unemployment rates for Woodland Park (4.1 percent) and Little Falls (5.9 percent) are lower than that for Passaic County. Management, professional, and related occupations form the largest segment of the working population for both Woodland Park (39.5 percent) and Little Falls (43.7 percent). Sales and office occupations ranked second for Woodland Park (28.6 percent) and Little Falls (32.4 percent). These employment sectors are also ranked first and second for Passaic County and the State of New Jersey, respectively.

2.5.2 Environmental Justice

USEPA defines environmental justice as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development implementation and enforcement of environmental laws, regulations and policies. Fair treatment means no group of peoples should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies". "Environmental justice is achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work" (USEPA, 2019).

EO 12898 "Federal Actions to address Environmental Justice in Minority and Low Income Populations" mandates that each Federal agency identify and address potential disproportionately high and adverse effects of its activities, programs, and policies on minority populations and low income populations. Specifically, adverse effects that pertain to human health and the environment must be identified and addressed. According to EO 12898, minority populations exist where the percentage of minorities exceeds 50 percent or where the minority population percentage in the affected area is meaningfully greater than in the general population. EO 12898 does not provide criteria to determine if an affected area consists of a low-income population.

A cursory analysis was conducted to determine the potential applicability of environmental justice issues. The analysis took into account a comparison of the percentage of low income and minority populations occurring in each municipality within the counties in which they are located. Those municipalities where the combined minority populations and/or the low income populations are higher than the county would be subject to environmental justice considerations.

The combined minority population of Passaic County is 57.6 percent (US Census, 2019a). The percentage of individuals living below the poverty line is 17 percent, and the percentage of families living below the poverty line is 15.3 percent (US Census, 2019b). Little Falls has a combined minority population of 21.3 percent (US Census 2019c), which is lower than Passaic County overall. In addition, the percentage of individuals and families living below the poverty level is lower than Passaic County overall at 6.5 percent and 4.5 percent respectively (US Census 2019d).

Woodland Park has a combined minority population of 40.6 percent, which is lower than Passaic County (US Census 2019e) and below 50 percent. The percentage of individuals and families living below the poverty level is less than Passaic County at 6.2 percent and 5.0 percent, respectively (US Census, 2019f). Based on this analysis, there are no communities within the project area that warrant environmental justice considerations.

2.6 Existing Water Resource Projects

Local stakeholders have implemented efforts on their own to reduce flood risk in the project area. The Township of Little Falls has bought out approximately 59 residential structures, with more buyouts planned. However, these structures are impacted by Passaic River flooding, not Peckman River flooding. This flooding is caused by Passaic River overbank flooding within Little Falls, not Passaic backwater flooding up the Peckman River.

The Borough of Woodland Park has bought out several properties within its municipality due to flooding from the Peckman River. One residential property on Radcliffe Avenue was bought out using funding from the Blue Acres Program, an NJDEP buyout program for properties that have suffered flooding in their history. Buyouts of three residential properties on Bergen Boulevard were implemented using U.S. Housing of Urban Development (USHUD) Community Development Block Grant-Disaster Recovery (CDBG-DR) funding. One residential structure on Bergen Boulevard was demolished utilizing CDBG-DR funding.

There have been a few clearing and snagging efforts within the portion of Peckman River that traverses Little Falls and Woodland Park. Little Falls and Woodland Park have received a $150,000 grant to buy an excavator to allow The Township of Little Falls and the Borough of Woodland Park to conduct their own snagging and clearing of the Peckman River, subject to engineering approval and the necessary permitting. The next snagging and clearing effort is currently being planned.

The U.S. Geological Survey (USGS) is currently installing water level gages within the Peckman River as part of a flood warning system. Two gages were installed in Little Falls in May 2017, with a third planned for installation. The flood warning system will provide information about water levels that can inform local leaders and residents about potential flooding in the project area.

Chapter 10 includes a table summarizing existing and planned water resource projects.

2.7 Critical Infrastructure

Elements of critical infrastructure lie within the project area (Figure 26). The elements inside the one percent floodplain are those that are most at risk in the event of a flood. Flooding may cut off access to these entities, and subsequently increase the risk of loss of life and property damages to residents.

The critical infrastructure elements within the project area are: Route 46, an emergency medical service, two fire stations, three schools, and at least three gas stations. Route 46 is one of the most significant critical infrastructure elements because it is the major transportation corridor in and out of Woodland Park and Little Falls. In the event of an emergency, residents will evacuate via Route 46. In the event that this route is inaccessible due to flooding, residents will need to use a detour, usually smaller surface streets are able to be traveled. Flooded roadways pose significant life safety risks by impeding access for emergency vehicles and travel to safety. The Pulse Medical Transportation Emergency Medical Service (EMS) is a first responder service for injured residents. If flooded, this EMS facility may not be able to respond, or may have delayed response times to injured persons. The Passaic Valley Hose Company Two fire station is a critical public service for the area. If Passaic Valley Hose Company Two was unable to respond to a fire or other emergency situation, there would be only one other fire station within the project area that could respond.

Three school facilities are located in the project area - Woodland Park Public Schools district office, Memorial Middle School (serving 482 students [Great Schools 2017]), and the Passaic Valley High School (serving 1,301 students [National Center for Education Statistics 2018]). These are some of the major schools in the area, and would affect many families if inoperable. Additionally, children cannot evacuate on their own, and are considered a vulnerable population. Evacuation of schools, daycare centers, hospitals, and senior care centers pose the greatest risk to already vulnerable populations.

At least three gas stations lie within the project area. There are several additional gas stations in the surrounding area, but the loss of the three gas stations would increase demand at the surrounding stations and could also precipitate an environmental incident.

Outside of the project area, but nearby, there is more critical infrastructure, including a potable water treatment plant, an electrical substation, eight EMS facilities, five gas stations, four fire stations, an oil and natural gas pipeline, two police stations, and four schools. When the project area is flooded, extra stress is put upon these critical infrastructure elements, and access to and from these elements could be compromised. The Verona Waste Water Treatment Plant, is upstream of the river, and would require an extraordinary event to be impacted. Two nursing homes - Alaris Health at Cedar Grove, and St. Vincent's Healthcare and Rehabilitation Center) - could face some real challenges during a flood. Should the elderly residents need to be evacuated, it may be difficult for the residents to receive their normal care and cause medical hardship for the residents, the staff, and emergency responders.

2.8 Transportation

Vehicle: The project area is connected to major population centers, including New York City, through a network of highways, railways, and bridges. Route 46 functions as the dividing line between Woodland Park and Little Falls. Other major roads of note are Paterson Avenue and Browerton Road, which both run north-south on the east side of the Peckman River starting from Main Street/East Main Street and converging at the northeastern tip of the project area near the Passaic River (Paterson Avenue becomes McBride Avenue). There are four bridges along Route 46 and five bridges on the Peckman River (Figure 27). The bridge at McBride Avenue is a 69-foot wide vehicular bridge. It is located immediately before the Peckman River's discharge into Passaic River. South of the McBride Avenue bridge is another 64-foot wide vehicular bridge. It is located along Lackawanna Avenue. Another bridge in the project area is the one the runs along Route 46. It is 142 feet wide and provides both pedestrian and vehicular access. South of the Route 46 is a 57-foot wide bridge running along the East Main Street. It provides both pedestrian and vehicular access. Additionally, a bridge is located at Francisco Avenue right next to its intersection with Cedar Grove Road. It is a 57-foot wide vehicular bridge. There are seven additional bridges just outside the project area. Also nearby are U.S. Interstate 80 and the Garden State Parkway.

Figure 26. Critical infrastructure in and around the Project Area. See Figure 21 for transportation infrastructure.

Rail: Both the Little Falls station and Montclair State University station of NJ Transit serve Little Falls, offering service on the Montclair-Boonton Line to Hoboken Terminal in Hoboken, or from Montclair State University Station on Midtown Direct trains to New York City's Pennsylvania Station in Midtown Manhattan via the Secaucus Junction. Outside the project area but nearby are five NJ Transit train stations.

2.9 Water Resources

2.9.1 Surface Water

Three water bodies are located within the project area; the Peckman River, Great Notch Brook and the Passaic River. See Section 1.5.2 for a detailed description of their geography and topography.

Peckman River

Along with receiving point and non-point discharges related to stormwater runoff and treated sewage water, the Peckman River has experienced modifications associated with recreation, development of infrastructure and erosion control. The Peckman River was dammed in Verona in 1814 to create Verona Lake, initially to provide water power for a grist mill. In later years, the lake was converted to recreational use. As part of the conversion to a lake, the river was channelized via a stone wall for approximately 480 feet below the dam. Sewage treatment plants in Cedar Grove and Verona discharge treated waste water into the Peckman River. Numerous bridge crossings have been constructed across the Peckman River, and a review of historic maps indicate that the river has been realigned to accommodate road construction.

Within the project area, development, particularly north of Route 46 in the Borough of Woodland Park, has occurred within feet of the streambanks. In several locations, the streambanks have been replaced with concrete retaining walls. In other locations, one or both river banks have been stabilized with rip-rap. Remnants of an abandoned dam spillway located in the river in Little Falls were removed in 2011 to help reduce flooding. A portion of the dam spillway is still embedded within the left bank of the river. In addition, the Passaic Valley Sewer Authority performs semi-routine gravel and debris removal in the Peckman River to assist in flood mitigation. The most recent effort occurred in January 2017 (Kelleher, 2017).

The average channel width of the Peckman River within the project area ranges from 20-40 feet with an average depth of one foot to one and one-half feet. Based on field investigations, the substrate consists predominantly of cobble and gravel with a lower presence of sand, silt and clay (USACE, 2010b).

Great Notch Brook

Great Notch Brook originates within a residential development immediately north of Francisco Street between Ridge and Long Hill Roads in Little Falls (Figure 2 in Appendix A-1). From there, it meanders through mostly residential areas until just before its confluence with the Peckman River, where the land use transitions to commercial use. Within the project area, Great Notch Brook resembles a large drainage ditch, having undergone significant modifications to accommodate construction of Route 46 and commercial development. In two locations, the brook flows subsurface for several hundred feet. The first location is at Browertown Road, where the brook flows under it and Rose Street for approximately 300 feet before daylighting into an area that serves as a stormwater retention pond adjacent to the eastbound side of Route 46. Great Notch Brook then flows from there under Route 46 for approximately 250 feet before daylighting into a large shopping center parking lot located on the westbound side of Route 46. Within the shopping center, the stream banks are predominantly maintained lawn with a few trees and small shrubs. Flow within the brook is relatively uniform and does not exhibit any significant aquatic habitat features such as pool and riffle complexes. Based on general observations during site visits, the substrate of Great Notch Brook is predominantly fine sediment with lesser amounts of cobble and gravel.

Figure 27. Important transportation routes.

Passaic River

Within the project area, the Passaic River flows in a northerly direction. The width of the river ranges between 150 to 250 feet with the exception of where a large vegetated gravel bar has established and has reduced the channel width to approximately 55-60 feet. Channel substrate is comprised of cobbles, gravel, and sand (NJDEP, 2012). The portion of the right bank of the Passaic River within the project area includes a modest riparian corridor vegetated with mature deciduous trees. Similar to the Peckman River, development has occurred within feet of the top of the river banks. The river within and near the vicinity of the project area has been subject to modifications related to industry. For example, the historic Beattie's Mill Dam is located approximately 1.4 miles upstream from the Passaic River's confluence of the Peckman River (Refer to Figure 2 in Appendix A). In addition, the Passaic River is used as a water supply for the water treatment plant and intake system located within the vicinity of project area in Totowa, New Jersey, just below Beattie's Dam.

2.9.2 Water Quality & Habitat

Peckman River

The Peckman River and its tributaries, including Great Notch Brook, are designated as FW2-NT by NJDEP. By definition, designated uses for FW2 waters include: 1) maintenance, migration and propagation of the natural and established biota; 2) primary contact recreation; 3) industrial and agricultural water supply; 4) public potable water supply after conventional filtration treatment and disinfection; and 5) any other reasonable uses. Non-trout (NT) waters are those "not generally suitable for trout because of their physical, chemical, or biological characteristics but are suitable for a wide variety of other fishes" (NJDEP, 2016).

The NJDEP Bureau of Freshwater and Biological Monitoring (BFBM) conducts monitoring of surface water quality through a combination of chemical analyses and surveys of macroinvertebrates and/or fish surveys. Two NJDEP BFBM macroinvertebrate monitoring stations have been established in within the Peckman River; one in Cedar Grove (Station AN0275A) and one at McBride Avenue in Woodland Park near the confluence of the Peckman and Passaic Rivers (Station AN0275). In addition, two fish sampling stations are established within the Peckman River in Cedar Grove (NJS11-10) approximately 0.35 miles from the northern border of the project area, and in Woodland Park (NJS11-156-R3) within the project area.

Based on the composition of species found in NJDEP fish and macroinvertebrate surveys, the water quality of the Peckman River is indicative of a system that has experienced moderate to major changes in structure of the biological community, and moderate changes in ecosystem function. It is not attaining the designated aquatic life uses. Therefore, it falls below the acceptable regulatory range and is considered impaired based on Federal Clean Water Act standards (NJDEP BFBM, 2013; NJDEP BFBM, 2011; Miller, 2012) .

Evaluations of the habitat within the macroinvertebrate and fish monitoring stations conducted by NJDEP BFBM during fish and benthic surveys noted characteristics consistent with a stressed aquatic communities. These characteristics included sediment deposition, channel modifications, severe bank erosion, and a limited riparian zone. In addition, water testing indicated high conductivity, which can be an indicator of a high level of dissolved solids often times attributed to stormwater runoff in urban areas (NJDEP BFBM, 2011).

The District conducted macroinvertebrate and fish surveys following the NJDEP survey methods within the Peckman River in September 2010. Based on species collected, the conclusion regarding the water quality reached by the District was the same as the NJDEP BFBM: the Peckman River is impaired. As part of these surveys, the District also conducted a stream habitat assessment of approximately 3,700 feet of the Peckman River using the USEPA's Rapid Bioassessment Protocols (EPA RBP) for wadeable streams. The EPA RBP stream assessment method was selected by the District for use because the NJDEP BFBM utilizes it as part of their fish and macroinvertebrate sampling procedures. This stream assessment method employs a habitat rating scale of optimal, sub-optimal, marginal, or poor as it relates to a river system having the habitat structure required to support and maintain a diverse aquatic resource community.

The portions of river evaluated included two reference reaches approximately 1.7 and 2.4 miles, respectively, upstream of the project area in Cedar Grove, and two reaches within the project area in the vicinity of the Peckman Preserve and the Passaic Valley High School (Refer to Appendix A-2 for survey locations). The reference reaches had more extensive pool and riffle complexes than the two project area reaches. The 2010 stream assessment determined that all four reaches surveyed exhibited "suboptimal" habitat. Factors contributing to the suboptimal rating include alterations to the river channel, a high level of embeddedness, and moderate sediment deposition, and a lack of riparian zone (District, 2010b).

Great Notch Brook

Biological surveys and habitat assessments were not conducted within Great Notch Brook. However, based on general field investigations conducted by the District, aquatic habitat in Great Notch Brook within the project area is considered minimal for fish and macroinvertebrates due to the lack of riffle pool complexes and vegetative cover, and the high level of embeddedness of finer sediments within the cobble and gravel substrate.

Passaic River

Similar to the Peckman River, the Passaic River is designated as FW2-NT. The District did not conduct surveys and habitat assessments within the Passaic River. NJDEP BFBM has a macroinvertebrate monitoring station (ANO274) located within the project area. Based on the composition of species found during a 2008 macroinvertebrate survey conducted by NJDEP BFBM, the Passaic River is considered impaired based on Federal Clean Water Act standards (Miller, 2012).

2.9.3 Wetlands

Federal (33 CFR 328.3(b); EO 11990) and State (N.J.A.C. 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.

A review of New Jersey's geographic information system (GIS) environmental mapping database (NJ Geoweb) and the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps was conducted to assess potential wetlands within the project area (Figure 1 in Appendix A-1). Both the NJ Geoweb and the USFWS NWI maps indicate the presence of several forested wetland complexes along the Peckman River ranging from approximately half an acre to nine acres in size. The Township of Little Falls hired a consultant in 2013, to perform a wetland delineation on Township-owned property north of the Passaic Valley High School. The wetland delineation confirmed the presence of a forested wetland complex approximately two acres in size with several smaller wetlands less than 0.25 acres in size near the larger complex. The wetland delineation is included as Figure 3 in Appendix A-1.

NJ Geoweb and the USFWS NWI mapping databases also indicate the presence of a three acre forested wetland complex on the right bank of the Passaic River. No wetland complexes were indicated along Great Notch Brook by either mapping databases.

2.10 Vegetation

2.10.1 Uplands & Riparian Corridor

Uplands

Vegetation within the project area is predominantly limited to landscaped lawns with a few forested sections along the Peckman River and Passaic River. The largest tract of undeveloped forested land is located immediately north of the Passaic Valley High School in Little Falls.

The majority of uplands within the project area have been developed with two exceptions: a tract of land located on the left side of the Peckman River approximately 12 acres in size known as the Peckman Preserve and a forested tract approximately 18 acres in size on the eastern side of the Peckman River located on the northern boundary of the Passaic Valley High School. Shrub and tree species native to New Jersey that have been observed within the upland and riparian areas are indicated in Table 4.

Table 4. Tree and Shrub Species Observed within Upland and Riparian Zones within the Project Area.

Common Name	Scientific Name	Growth Form
Spice bush	*Lindera benzoin*	Shrub
Black haw	*Viburnum prunifolium*	Shrub
Box elder	*Acer negundo*	Understory Tree
American hornbeam	*Carpinus caroliniana*	Understory tree
Red maple	*Acer rubrum*	Tree
Silver maple	*Acer saccharinum*	Tree
Sugar maple	*Acer saccharum*	Tree
Bitternut hickory	*Carya cordiformis*	Tree
American beech	*Fagus grandifolia*	Tree
Green ash	*Fraxinus pennsylvanica*	Tree
White ash	*Fraxinus Americana*	Tree
Black walnut	*Juglans nigra*	Tree
Tulip tree	*Liriodendron tulipifera*	Tree
Eastern white pine	*Pinus strobus*	Tree
Sycamore	*Platanus occidentalis*	Tree
Black cherry	*Prunus serotina*	Tree
Northern red oak	*Quercus rubra*	Tree
Pin oak	*Quercus palustris*	Tree
Black Locust	*Robinia pseudoacacia*	Tree
Black Willow	*Salix nigra*	Tree
American basswood	*Tilia Americana*	Tree
American elm	*Ulmus Americana*	Tree
Slippery elm	*Ulmus rubra*	Tree

Riparian Zone

The New Jersey Flood Hazard Area Control Act Rules, N.J.A.C. 13 (FHACAR) establishes and requires the preservation of riparian zones. The width of the established riparian zone is based on the environmental resources being protected and can range from 50, 150 or 300 feet as measured from the side of surface waters. Given that the Peckman and Passaic Rivers, and Great Notch Brook are designated FW2-NT and do not support habitat critical to the survival of any threatened or endangered species, the riparian zones for each waterbody is 50 feet, as described in N.J.A.C. 7:13-4.1(c) 3.

In general, the average width of the riparian zone along the Peckman River within the project area south of Route 46 ranges between 20 feet to greater than the 50 feet. However, the riparian zone along the Peckman River north of Route 46 has been particularly subject to disturbance related to development and has been reduced to an average width of five to ten feet.

Japanese knotweed (*Fallopia japonica*) essentially occurs as a monoculture along the Peckman River riparian zone within the project area. Upstream of the Peckman Preserve, Japanese knotweed was observed to be commonly present and locally dominant, but not as monotypic as the downstream area.

The riparian corridor along Great Notch Brook has been significantly disturbed and is predominantly maintained lawn with the exception of a small cluster of deciduous trees on the side of Route 46 near Browertown Road. The riparian zone width along the Passaic River ranges between five to 50 feet, and is characterized by steep slopes and mature deciduous trees.

2.10.2 Wetlands

Herbaceous and fern species noted within wetlands include skunk cabbage (*Symplorcarpus foetidus*), clearweed (*Pilea pumila*), touch-me-knot (*Impatiens capensis*), sensitive fern (*Onoclea sensibilis*), and royal fern (*Osmunda spectabilis*). Tree and shrub species observed include green ash, sycamore, silver maple, American elm and spice bush (Table 4).

2.11 Aquatic Resources & Wildlife

2.11.1 Fisheries

Fish collected by NJDEP BFBM at the monitoring station during their most recent survey include (in order of abundance), longnose dace (*Rhinichthys cataractae*), tessellated darter (*Etheostoma olmstedi*), eastern silvery minnow (*Hybognathus regius*), pumpkinseed (*Lepomis gibbosus*), white sucker (*Catostomus commersoni*), redbreast sunfish (*Lepomis auritus*), blacknose dace (*Rhinichthys atratulus*), common carp (*Cyprinus carpio*), American eel (*Anguilla rostrata*), smallmouth bass (*Micropterus dolomieu*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macochirus*), yellow bullhead (*Ameirus nebulosus*), goldfish (*Carassius auratus*), banded killifish (*Fundulus diaphanous*), western mosquitofish (*Gambusia affinis*), and largemouth bass (*Micropterus salmoides*). Dominant species included longnose dace, tessellated darter, and eastern silvery minnow (*Hybognathus regius*) (NJDEP BFBM, 2013).

Species collected during a 2011 survey at the monitoring station in Cedar Grove include (in order of abundance) creek chub, white sucker, blacknose dace, largemouth bass, golden shiner, American eel, green sunfish, banded killifish, eastern silvery minnow, redbreast sunfish and tessellated darter. Dominant species included creek chub, white sucker, and blacknose dace (NJDEP BFBM, 2011).

The District conducted a fish survey within the project area in July 2010 (Refer to Figure 2 in Appendix A-2) to characterize fish species inhabiting the project area. Species caught included white sucker, blacknose dace, creek chub, American eel, bluegill, common carp, green sunfish, smallmouth bass, and white sucker, banded killifish, green sunfish and largemouth bass. Fish survey results indicated that the Peckman River is inhabited predominantly of species considered as generalists that can tolerate degraded conditions (USACE, 2010c).

Fish surveys were not conducted by the District within the Passaic River or Great Notch Brook. However, it is expected that they would contain similar species as the Peckman River given their interconnection. The New Jersey Division of Fish and Wildlife stocks the Passaic River with northern pike within the project area (Refer to Figure 4 in Appendix A-1).

2.11.2 Benthic Resources

The dominant family of invertebrates collected during the District's 2010 macroinvertebrate survey belonged to the family midges (*Chironomidae*). The second most dominant family was net-spinning caddisflys (*Hydropsychidae*). Other groups caught included danceflies (*Empididae*), snail (*Planorbidae*), amphipods (*Crangonyctidae*), and oligochaete worms (*Tubificidae*) (USACE, 2011).

Dominant benthic species collected at the biological monitoring station in Cedar Grove during the NJDEP BFBM 2008 water quality survey included caddisfly in the family Hydropscychidae, and microcaddisfly in the family Hydroptilidae. Other groups of species captured include amphipods (*Gammaridae*), flatworm (*Dugesiidae*), cranefly (*Limoniidae*), midges, freshwater clam (*Sphaeriidae*), and beetle (*Elmidae*).

Dominant benthic species collected at the biological monitoring station in Woodland Park during the NJDEP BFBM 2008 water quality survey included amphipods, and midges. Other groups of species captured included black fly (*Simuliidae*), freshwater isopods (*Asellidae*), a type of crustacean, flatworm (*Dugesiidae*), damselfly (*Coenagrionidae*), leech (*Glossiphoniidae*), and mayfly (*Baetidae*) (Miller, 2012).

A biomonitoring station (ANO274) is established in the Passaic River within the project area. Dominant benthic species collected at the Passaic River biological monitoring station during the NJDEP BFBM 2008 water quality survey included amphipods, net-spinning caddisfly and midges. Other groups of species captured include blackfly, mayfly (*Heptigeniidae*), snail, fingernail clam (*Sphaeriidae*), and freshwater clam (*Corbiculidae*) (Miller, 2012).

2.11.3 Birds

Commonly occurring bird species include mallard (*Anas platyrhynchos*), Canada goose (*Branta canadensis*), crow (*Corvus brachyrhynchos*), goldfinch (*Carduelis tristis*), robin (*Turdus migratorius*), black capped chickadee (*Parus atricapillus*), hairy woodpecker (*Leuconotopicus villosus*), downy woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), and chipping sparrow (*Spizella passerine*).

The Garret Mountain Reservation and Rifle Camp Preserves are located approximately two miles and 1.5 miles east, respectively, from the project area (refer to Figure 2 in Appendix A-1). The areas are designated as an Important Bird Areas (IBA) by the National Audubon Society. IBAs are sites that support habitat necessary for breeding, overwintering, or migration. The goal of the IBA Program is "to stop habitat loss by setting science-based priorities for habitat conservation and promoting positive action to safeguard vital bird habitats." The National Audubon Society considers these two areas as a significant migratory stopover for various bird species. Over 200 species have been recorded in the Garret Mountain Reservation, and over 100 species have been recorded in Rifle Camp Park (E-bird, 2018). It would therefore be expected that species utilizing the parks could also occur within the project area.

2.11.4 Mammals

Site specific surveys to document mammal species have not been conducted, although white tailed deer (*Odocoileus virginianus*) were observed in the project area during a field visit in 2017. Given the level of urbanization within the majority of the project area, species expected to occur within the area are those that are adapted to urban environments. Such species include red fox (*Vulpes vulpes*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), skunk (*Conepauts mesoleucus*), eastern chipmunk (*Tamias striatus*), and woodchuck (*Marmota monax*).

2.12 Reptiles and Amphibians

Site specific surveys were not conducted to identify reptile and amphibian species. Due to the fact that the project area is more urbanized, reptile and amphibian species that are more adapted to this type of environmental setting include American toad (*Bufo americanus*), bullfrog (*Rana catesbeiana*), garter snake (*Thamnophis sirtalis*), and eastern box turtle (*Terrapene Carolina*).

2.13 Threatened & Endangered Species

Section 7 of the Endangered Species Act (ESA) of 1973 requires a Federal agency to ensure that any action authorized, funded or carried out by the agency does not jeopardize Federally-listed endangered and threatened species or result in the destruction or adverse modification of designated critical habitat of a Federally-listed species.

State-listed endangered, threatened and special concern species are protected under the New Jersey Endangered Species Conservation Act of 1973.

2.13.1 Federal Endangered, Threatened & Special Concern Species

The District received a Draft Fish and Wildlife Coordination Act Report regarding the study in 2014 that noted the Federally-endangered Indiana bat (*Myotis sodalist*) as potentially occurring within the project area.

Due to the time that has passed between the submission of the draft Fish and Wildlife Coordination Act Report (FWCAR) and publication of the October 2019 Revised DIFR/EA, the District obtained an official list of endangered and threatened species that may occur within the project area on November 16, 2017 (USFWS, 2017a). Included in the list is the Indiana bat, and the Federally threatened northern long-eared bat (*Myotis septentrionalis*), which was listed in 2015. As the official lists are only valid for three months, an additional list was obtained October 8, 2019 where there were no changes to the species listed. No other Federally endangered or threatened species were identified in the list. The list is located in Appendix A-4 of the report.

Information provided in the list was further supplemented by a review of the "New Jersey Municipalities with Hibernation or Maternity Occurrence of Indiana bat or Northern Long-eared bat" list (USFWS, 2017b). Based on this list, Woodland Park has a known northern long-eared bat maternity colony. In addition, municipalities within a five mile radius of the project area with known northern long-eared bat maternity colonies include the City of Paterson, the Township of Wayne, and the Boroughs of Haledon and Totowa.

Brief descriptions of the species habitat preferences are below:

Indiana Bat

Indiana bats spend the winter hibernating in caves and mines, with hibernation beginning in late October and emergence occurring typically in April. The Hibernia Mine located in Hibernia, New Jersey is a known Indiana bat hibernaculum and is located approximately 21 miles from the project area.

During the summer months, numerous female bats roost together in maternity colonies under the loose bark of dead or dying trees within riparian, floodplain, and upland forests. Maternity colonies use multiple roosts in both living and dead trees. Adult males usually roost in trees near maternity roosts, but some males remain near the hibernaculum.

Tree species commonly used as roost sites include American elm, slippery elm, shagbark hickory, silver maple, and green ash. Adult males usually roost in trees near maternity roosts, but some remain near the hibernaculum. Preferred foraging areas include streams, associated floodplain forests, and impounded bodies of water such as ponds and reservoirs. However, Indiana bats have been observed in upland forests, pastures, and clearings with early successional vegetation, cropland borders, and wooded fencerows (USFWS, 2007).

Northern Long-Eared Bat

Similar to the Indiana bat, the northern long eared bat hibernates in caves and abandoned mines with hibernation generally beginning in October/November and emergence typically occurring in April. Northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live and dead trees. Unlike Indiana bats, northern long-eared bats have also been observed in manmade structures such as buildings, barns, sheds, cabins, under eaves of buildings, and bat houses. Preferred foraging areas are in forested habitats (USFWS, 2015).

Other Species

The USFWS listed the rusty patched bumble bee (*Bombus affinis*) as endangered under the Endangered Species Act in January 2017. However, based on a Fish and Wildlife Coordination Act Report prepared for another USACE study in the region, the USFWS presumed that this species is extirpated in New Jersey although more research and field studies are warranted in the state (USFWS, 2017).

In addition, the USFWS is currently evaluating the little brown bat (*Myotis lucifugus*), and the tricolored bat (*Perimyotis subflavus*) to determine if listing under the ESA is warranted (USFWS, 2017c).

Studies conducted by the NJDEP Division of Fish and Wildlife in 2018 identified one active American bald eagle nest in Paterson which is approximately 2.5 miles from the project area (Smith and Clark, 2018). Although the bald eagle was removed from the Federal List of Endangered and Threatened Wildlife in 2007, it remains protected through the Bald and Golden Eagle Protection Act of 1940, and the Migratory Bird Treaty Act of 1918.

2.13.2 State Endangered, Threatened & Special Concern Species

Based on comments received by NJDEP Division of Fish and Wildlife during the NEPA scoping period, there are no state endangered, threatened or special concern wildlife species or significant nongame wildlife habitats within the project area (refer to Appendix A-7). A review of the Landscape Project layer on NJ-Geoweb indicates suitable foraging habitat for the Great blue heron (*Ardea herodias*) within the project area.

2.14 Hazardous, Toxic & Radioactive Waste

A Phase I Environmental Site Assessment was prepared and is included in Appendix A-12. Based on a review of databases, including the National Priorities List (NPL), the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS), the Superfund Enterprise Management System (SEM), Resource Conservation and Recovery Information System (RCRIS), NJDEP Known Contaminated Sites (KCS), and the Toxic Release Inventory System (TRIS), there are no known contaminated sites within the project area.

A geotechnical survey, consisting of 23 soil borings, was completed in September and October 2011 along the Peckman River. Borings were conducted using a direct push ("GeoProbe") and truck mounted rotary type drill rig. Soil samples were collected from surface to top of bedrock or 25 feet below ground surface, whichever was encountered first.

The 23 soil borings collected were analyzed for: 1) volatile organics+15 (VOA); 2) semi-volatile organics+25 (SVOA); 3) pesticides; 4) polychlorinated biphenyls (PCBs); and 5) Resource Conservation and Recovery Act (RCRA) metals. Analytical results were compared to the NJAC -7:26D – Non-Residential Direct Contact Soil Remediation Standard, 2017 (NRDCSRS). The reason for using this standard is that no residential areas were/are adjacent to these boring locations and the potential location of the flood control structures in these areas.

Of the five categories analyzed, VOAs, pesticides, and PCBs were found at levels below threshold levels or non-detect. Four SVOA compounds were detected but they did not exceed NRDCSRS thresholds. There was no pattern to the distribution of these detections and levels found. The soil borings where the SVOAs were detected were taken from the Township of Little Falls Department of Public Works (DPW) yard and the off-ramp from Route 46. Of the eight RCRA metals, only two, arsenic and lead, were detected in two samples. One sample came from a parking lot for a commercial office building and the other from the DPW yard. The arsenic detect barely exceeds the NJDEP threshold (22 parts per million verses NJDEP limit of 19 ppm). The lead detects from the DPW yard is 600 ppm and from the commercial office building parking lot was 403 ppm, both below the NJDEP threshold of 800 ppm. The detects at the DPW yard is likely the result of the activities undertaken at the yard and the presence of fill in this area. Similarly, the detect at the office building is most likely from backfill used at time of construction.

A number of structures are fifty years or older and are likely to have lead-based paint (LBP) and/or asbestos-containing materials (ACM).

2.15 Cultural Resources

As a federal agency, USACE has certain responsibilities for the identification, protection and preservation of cultural resources that may be located within the Area of Potential Effect (APE) associated with the proposed project (also known as the undertaking). Present statutes and regulations governing the identification, protection and preservation of these resources include the National Historic Preservation Act of 1966 (NHPA), as amended; the National Environmental Policy Act of 1969; Executive Order 11593; and the regulations implementing Section 106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*, August 2004). Significant cultural resources include any material remains of human activity eligible for inclusion on the National Register of Historic Places (NRHP). This work is done in coordination with the New Jersey Historic Preservation Office (NJHPO), federally-recognized Tribes and interested parties.

For the current study, a Phase I cultural resources investigation was completed that included a review of previous surveys including the 1982 survey of the Peckman River conducted by the US Army Corps of Engineers (Kraft 1979; Archaeological Survey Consultants 1981; Hunter et. al. 1982). The Phase I investigation that was completed for the current study also included documentary research, an architectural survey of 81 structures, and 80 shovel tests (Figure 28) (Hartgen Archeological Associates 2013). The survey compiled a list of archaeological sites within two miles of the study area and of previously documented historic properties within the study area boundaries (Table 5).

Archaeological Sites and Historic Properties

There are 26 previously recorded archaeological sites within a two mile radius of the study area. None of the previously recorded sites are located within the study area. Most are located at the northern end of the study area along the Passaic River. Based on the existing site information and results of previous surveys, the study area is considered archaeologically sensitive for Native American sites, as well as sites related to the historic development of the region. However, some portions of the study area have undergone prior disturbance from historic and recent development as well as rechanneling of the river (Hartgen Archaeological Associates, 2013).

Four historic properties were identified within the study area that are listed on or determined eligible for the New Jersey State and National Registers of Historic Places within the study area (Figure 29). These properties include:

- The Morris Canal (National Register-listed): A 102-mile long canal linking Phillipsburg to the west and Jersey City to the east dating to 1836-1920s. The canal crosses the Peckman River via an aqueduct about one-half mile south of Main Street.