

## **2. \*BASELINE CONDITIONS / AFFECTED ENVIRONMENT**

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

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

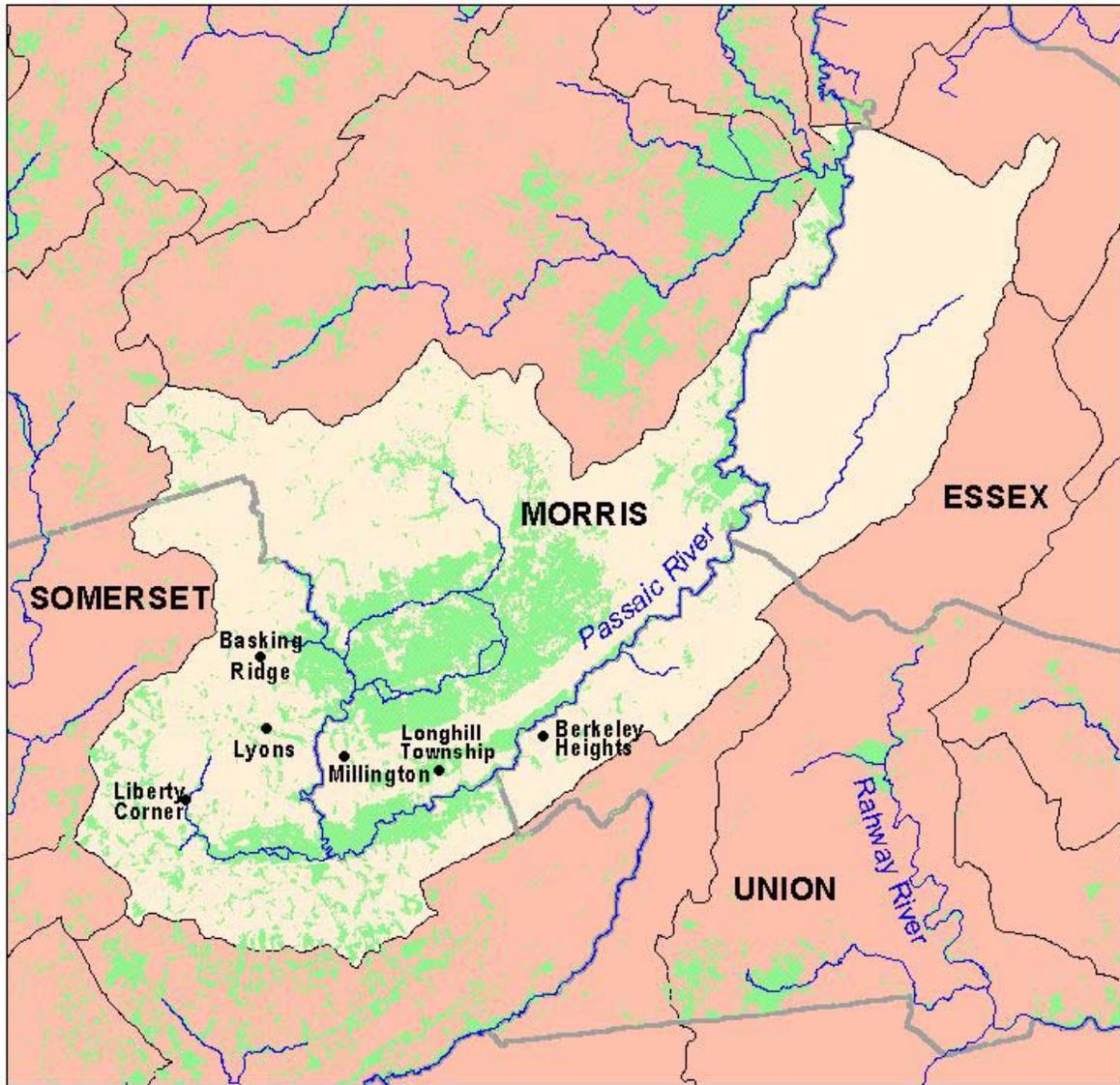
Long Hill Township is located within the Central Passaic River Basin, a flat, oval 262 square mile depression which is about 10 miles wide and about 30 miles long. The Central Basin contains 24,485 acres of natural flood storage area, including the Great Swamp National Wildlife Refuge located in the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

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

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

### **2.1 Physical Setting**

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



**FIGURE 2-1:**  
Study Area Location

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

### **2.1.1 Physiography and Geomorphology**

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

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

### **2.1.2 Soils**

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

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

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

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

## **2.2 Climate and Weather**

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

## **2.3 Water Resources**

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

### **2.3.1 Surface Waters**

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

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

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

The Passaic River and un-named tributaries to the Passaic River are the major water bodies within the project corridor that would be considered Waters of the U.S. and State Open Waters pursuant to 33 CFR 280 and the New Jersey Surface Water Quality Standards respectively. All of these waters are classified as FW2-TP(C1) or "trout-production" waters (Category One) by NJDEP. The New Jersey Surface Water Quality Standards defines FW2 waters as "the general surface water classification applied to those freshwaters that are not designated as FW1 or Pinelands Waters". FW1 waters are defined as "those fresh waters...that are to be maintained in their natural state of quality and not subjected to any man-made wastewater discharges or increases in runoff from anthropogenic activities..." Further, the NJ Surface Water Quality Standards defines Trout-Production waters as waters that have been designated as areas used by trout for spawning or nursery purposes during their first summer. Category one waters means those waters designated for purposes of implementing the anti-degradation policies for protection from measurable changes in water quality characteristics because of their clarity, color, scenic

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

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

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

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

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

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

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

### 2.3.2 Regional Hydrogeology and Groundwater

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

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

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

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

### 2.3.3 Wetlands

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

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

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

It is important to note that New Jersey assumed jurisdiction over the Federal Section 404 Program. Therefore, all freshwater wetlands and proposed impacts to those wetlands fall under the jurisdiction of the NJDEP and the New Jersey Freshwater Wetlands Protection Act. A wetland delineation was conducted within the project corridor during November 2002. The methodology detailed in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989) was used to delineate the wetland/upland boundary line in the field. The methodology outlined in this manual is currently accepted by the Corps of Engineers and the NJDEP to delineate jurisdictional wetland areas. As outlined in the 1989 Federal Manual, jurisdictional wetland areas are comprised of the following three criteria:

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

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

### ***Evaluation of Planned Wetlands:***

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

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

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

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

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

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

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

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

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

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

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

## **Field Sampling**

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

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

## **Analysis of EPW Scores**

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

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

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

**Table 2-1**  
**Evaluation of Planned Wetlands**  
**Existing Conditions**

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

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

### 2.3.4 Coastal Zone Management

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

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

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

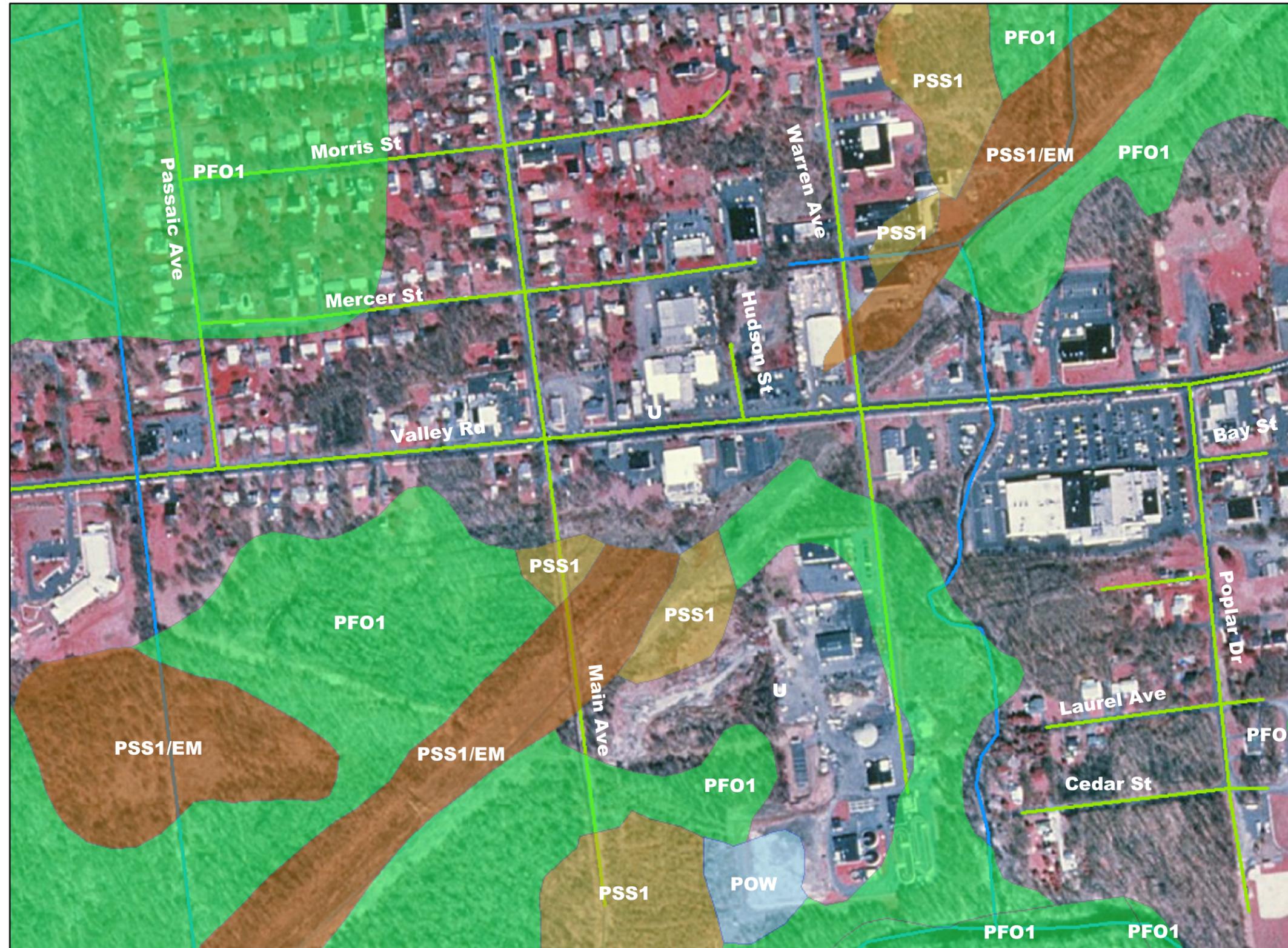
According to EP 1165-2-1, (30 July 1999), federal Civil work projects, within or outside of the coastal zone, that are reasonably likely to affect any land or water use or natural resource of the coastal zone, must be consistent, to the maximum extent practicable, with the approved state programs.

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



**Figure 2-2**  
**Project Corridor**  
**NWI Wetlands**

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



**Legend**

-  STREAM
-  PFO1
-  POW
-  PSS1
-  PSS1/EM



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



### Figure 2-3 Project Corridor NJ Mapped Wetlands

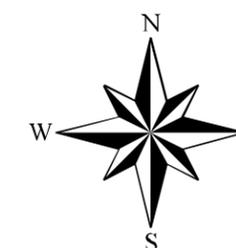
Upper Passaic River & Tributaries Flood  
Damage Reduction & Environment  
Restoration Feasibility Study



#### Legend

STREAM

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



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

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

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

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

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

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

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

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

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

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

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

## 2.4 Wildlife Resources

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

### 2.4.1 Mammals

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

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

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

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

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

## 2.4.2 Birds

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

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

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

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

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

### 2.4.3 Reptiles and Amphibians

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

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

*American Toad ( <i>Bufo americanus</i> )	Fowler's Toad ( <i>Bufo woodhousii fowleri</i> )
Northern Gray Treefrog ( <i>Hyla versicolor</i> )	Northern Cricket Frog ( <i>Acris crepitans</i> )
*Northern Spring Peeper ( <i>Pseudacris crucifer crucifer</i> )	*Bull Frog ( <i>Rana catesbeiana</i> )
*Green Frog ( <i>Rana clamitans melanota</i> )	Upland Chorus Frog ( <i>Pseudacris triseriata feriarum</i> )
New Jersey Chorus Frog ( <i>Pseudacris triseriata kalmi</i> )	Wood Frog ( <i>Rana sylvatica</i> )
*Northern Leopard Frog ( <i>Rana pipiens</i> )	Pickerel Frog ( <i>Rana palustris</i> )
Blue-Spotted Salamander ( <i>Ambystoma laterale</i> )	*Redback Salamander ( <i>Phethodon cinereus</i> )
Red-Spotted Newt ( <i>Notophthalmus viridescens</i> )	Northern Dusky Salamander ( <i>Desmognathus fuscus</i> )
Northern Slimy Salamander ( <i>Plethodon glutinosus</i> )	Four-Toed Salamander ( <i>Hemidactylium scutatum</i> )
Five-Lined Skink ( <i>Eumeces fasciatus</i> )	Northern Water Snake ( <i>Nerodia sipedon</i> )
Northern Brown Snake ( <i>Storeria dekayi</i> )	*Eastern Garter Snake ( <i>Thamnophis sirtalis</i> )
Eastern Milk Snake ( <i>Lampropeltis triangulum</i> )	Northern Ringneck Snake ( <i>Diadophis punctatus edwadsii</i> )
Eastern Worm Snake ( <i>Carphophis amoenus</i> )	Northern Black Racer ( <i>Coluber constrictor</i> )
Smooth Green Snake ( <i>Opheodrys vernalis</i> )	Black Rat Snake ( <i>Elaphe obsoleta</i> )
*Eastern Ribbon Snake ( <i>Thamnophis sauritus</i> )	Smooth Earth Snake ( <i>Virginia valeriae</i> )
Eastern Hognose Snake ( <i>Heterodon platirhinos</i> )	Wood Turtle ( <i>Clemmys insculpta</i> )
Eastern Box Turtle ( <i>Terrapene Carolina Carolina</i> )	Spotted Turtle ( <i>Clemmys guttata</i> )
*Snapping Turtle ( <i>Chelydra serpentine</i> )	Bog Turtle ( <i>Clemmys muhlenbergii</i> )
Common Musk Turtle ( <i>Sternotherus odoratus</i> )	Eastern Painted Turtle ( <i>Chrysemys picta</i> )
Eastern Mud Turtle ( <i>Kinosternon subrubrum</i> )	

#### 2.4.4 Fish

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

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

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

## 2.5 Threatened and Endangered Species

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

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

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

### 2.5.1 Federal Species of Concern

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

### 2.5.2 State Species of Concern

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## **2.6 Air Quality**

The EPA assesses overall air quality according to the National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM), and sulfur dioxide (SO<sub>2</sub>). Commonly cited sources of criteria pollutants include automobile exhaust emissions, fossil fuel (coal and oil) fired power plants, oil refineries, ore smelters, storage and transfer operations involving solvents, and industrial emissions, among others (USEPA 1998).

The study area is located in the New York-Northern New Jersey-Long Island Consolidated Metropolitan Statistical Area (CMSA). According to the National Air Quality and Emissions Trends Report (USEPA 1998), the New York-Northern New Jersey-Long Island CMSA is considered a nonattainment maintenance area for CO and is classified as an extreme/severe nonattainment area for O<sub>3</sub> (NJDEP 1999b).

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

## **2.7 Cultural Resources**

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

The site files held by the New Jersey State Museum indicated seven recorded prehistoric and historic archaeological sites within one mile of the project corridor. The site nearest the project corridor was identified approximately 1500 feet from the project corridor located to the east of Western Boulevard. No data were available on this site. Two properties listed on the National Register of Historic Places are within one mile of the project corridor. One of the structures, the Smalley/Wormser House is located  $\frac{3}{4}$  of a mile from the project corridor. The other property, the Millington Railroad Station, is a mile away. These historic properties are in no danger of impact based on plans as presently proposed.

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

## **2.8 Hazardous, Toxic, and Radioactive Waste**

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

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

## **2.9 Socioeconomic Setting**

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

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

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

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

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

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

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

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

Source: U.S. Bureau of the Census.

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

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

\* Sources: U.S. Bureau of the Census; New Jersey State Data Center

\*\* 2005-2025 Forecasts Estimated Using County Growth Rates

**Table 2-11**  
**Age Distribution of Study Area Populations 2000**

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

Source: U.S. Bureau of the Census.

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

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

Source: U.S. Bureau of the Census

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

	Employees	Percent
Agriculture, Forestry, Fishing/Hunting, Mining	19	0.4
Construction	244	5.5
Manufacturing	647	14.6
Wholesale Trade	175	3.9
Retail Trade	378	8.5
Transportation	134	3.0
Information	338	7.6
Finance, Insurance, and Real Estate	573	12.9
Professional, Scientific, Mgmt	513	11.6
Education, Health, Social Services	810	18.3
Arts, Entertainment, Recreation, Accommodation, Food Service	295	6.7
Other Services (except Public Administration)	165	3.7
Public Administration	140	3.2
Total	4,431	100.0

## 2.10 Land Use

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

The future development potential of Long Hill Township is based on development of approved projects not yet built and future development of vacant land. It is not anticipated that any

radically different land use concepts would dramatically change the character of the community. Owners of the remaining few vacant tracts of land are encouraged by the Township Planning Board to develop them in a manner that will be compatible with the surrounding area, as outlined in the Township Master Plan with input from the Planning Board and from the Environmental Commission.

## **2.11 Parks and Recreation**

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

## **2.12 Future Without-Project Conditions / No Action Alternative**

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

### **2.12.1 Flood Damages**

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

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

## **2.12.2 Ecosystem Functionality**

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

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

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

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

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

## **2.12.3 Study Area Conditions That Are Unlikely To Change**

Some existing conditions are not expected to undergo significant change during the period of analysis (2010-2059). For example, most aspects of the physical setting are expected to remain largely unchanged over the planning period, specifically: geology, physiography, topography,

and soils. In addition, no significant changes are anticipated for cultural and historic resources, air quality, noise, HTRW, aesthetics, and infrastructure.

#### **2.12.4 Study Area Conditions That Are Likely To Change**

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

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