May 2024

ENVIRONMENTAL RESOURCE INVENTORY
COLTS NECK TOWNSHIP
MONMOUTH COUNTY, NJ

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Preface

The primary goals and objectives of Colts Neck Township are to provide an updated Environmental Resource Inventory (ERI) report reflective of on-going municipal efforts to provide data which can be utilized for municipal planning, reference, and municipal legislation (ie. Ordinances, regulations, etc.). In addition, to provide a general knowledge of those local, County, State and Federal regulations that assist in the overall environmental integrity of the Township.

The ERI has been updated for Colts Neck Township as an inventory intended for reference purposes and discussion. As new information and/or regulations are implemented by associated agencies the document will be updated, corrected, with additional information on an annual basis. It is hoped that it will be used as a guide in protecting the high quality of Colts Neck Township's environment.

Protecting environmental resources within the Township of Colts Neck is a key factor. As development and improvements to the Township's infrastructure, roads, and designated areas are inevitable, understanding the impacts associated with those improvements is key to sustainability of the existing environment. It is the intention of this document to assist in the understanding of existing features of the Township and to provide Colts Neck's public officials the information needed to generate good land use management of the resources that the Township has to offer.

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This environmental report was written and prepared by ARH Associates, Inc., the Colts Neck Environmental Commission, & Colts Neck Green Team. Special acknowledgement and appreciation is extended to the following individuals for their contributions to the *Environmental Resource Inventory for Colts Neck Township:*

- Sue Fitzpatrick (Township Committeewoman, Environmental Commission Liaison & Green Team Liaison); Timothy Anfuso, PP (Township Planner); Brook Crossan, Ph.D., P.E. (Past Environmental Commission Member & Green Team);
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1. Introduction

An Environmental Resource Inventory (ERI) (sometimes referred to as a Natural Resource Inventory) is a collection of text and visual materials characterizing the environmental resources of a municipality. It includes detailed descriptions of the location, character and quality of those resources, which generally include wetlands, streams, aquifers, floodplains, prime agricultural soils, forests and open space. In addition, cultural and aesthetic resources—such as roads, population centers, zoning boundaries and historic sites—also influence a municipality's character and the quality and condition of its environmental resources. These elements also play an important role in the development of an ERI. This ERI provides a characterization of the environmental resources of Colts Neck Township, Monmouth County, New Jersey.

The purpose of the document is intended to be a neutral, unbiased document that reflects currently available data regarding the Township's natural resources, rather than an interpretation of that data or set of land use planning recommendations. However, in order to be a truly useful tool, an ERI must be more than an encyclopedia of facts or an atlas of natural resource features. It should serve as a complement to the municipal Master Plan and a guide for the Township's land development-related ordinances and land preservation initiatives, and other activities related to the preservation and enhancement of a community's resources.

Therefore, the content, design and accessibility of information contained within this ERI is intended to allow for the easy—but thorough—identification and assessment of sensitive ecological, aesthetic and cultural features within Colts Neck Township. A comprehensive understanding of the Township's environmental resources will facilitate a more informed decision making process regarding planning activities, environmental impact analyses, open space acquisition and preservation efforts, and other activities which may have an impact on those resources. The Colts Neck ERI is made up of individual sections, each of which focuses on a specific inventory of environmental resources. Each section includes a figure displaying the location(s) and extent of the resource discussed in the accompanying text. The figures and information are based upon the most current available geographic information systems (GIS) databases, many of which have been obtained from State and County agencies. In addition, a series of corresponding tables complements each section and figure.

In an effort to provide Colts Neck Township with a useful and "user-friendly" ERI, the electronic version of this document also includes hyperlinks that allow instant access to associated information both within the ERI and its appendices and on the Internet (including County and State websites). Together, the figures, text, tables, and weblinks provide a rich, comprehensive and site-specific description of the Township's resources in the context of the County and State physical and regulatory landscapes. The information contained within this ERI is intended to educate, guide and benefit all those interested in the long-term protection, management and preservation of the resources of Colts Neck Township. This ERI should be considered both a tool and a reference for Township to draw upon in any land development approval and/or planning process. Its use should therefore be promoted by the Environmental and Open Space Commission, Land Use Board and Township Committee, and it should be made available to residents and anyone seeking to develop lands within the Township. In addition, periodic revision of this NRI will be necessary to ensure that the information contained herein is accurate, current and reflective of ongoing changes in land use and development within the Township.

2.0 Regional Relationships

2.1 Introduction

Colts Neck in central New Jersey, western Monmouth County and is surrounded by seven other Monmouth County municipalities. In addition, the Mainside section of Naval Weapons Station (NWS), Earle occupies 20% of the area of Colts Neck, and a 17-mile-long Normandy Road/Rail Ammunition Transportation Corridor that travels from it through Colts Neck, Tinton Falls, and Middletown to the Waterfront section of NWS Earle in the Leonardo area of Middletown. There is a 2+ mile long pier into Sandy Hook Bay where Navy and Coast Guard ships are loaded with ammunition.

Since any understanding of the environmental and developed features of Colts Neck is enhanced by knowledge of the adjacent and interrelated aspects of the adjacent properties and municipalities, this chapter is an important step in that broader understanding.

2.2 New Jersey State Development and Redevelopment Plan

The current New Jersey State Development and Redevelopment Plan (SDRP) was adopted on March 1, 2001. The SDRP is a policy document to serve as a guide for public and private sector's land use, regulatory and investment decision making. The plan includes a Vision Statement, Goals and Strategies, Statewide Policies, State Plan Policy Map plus Monitoring and Evaluation. The SDRP calls for the redevelopment, maintenance and revitalization of the State's existing communities and the development of new communities in a compact form. The primary objectives of the SDRP are to direct future development to areas where infrastructure is available. To achieve this vision, the State Plan encourages the location and design of public and private investment that creates livable communities and preserves rural landscapes, farms and environmentally sensitive areas.[1]

The SDRP includes a policy map that divided the state into six Planning Areas, each with its own goals, objectives, policies, and strategies. Planning Areas are geographically delineated to reflect the state's varying levels of development, infrastructure capacities and presence of natural resources but not necessarily municipal or county boundaries.

- Planning Area 1 Metropolitan Planning Area
- Planning Area 2 Suburban Planning Area
- Planning Area 3 Fringe Planning Area
- Planning Area 4 Rural Planning Area
- Planning Area 4B Rural Environmentally Sensitive Planning Area
- Planning Area 5 Environmentally Sensitive Planning Area

Planning Areas 1 and 2 are designated as growth areas while Planning Area 3 is a limited growth area. Planning Areas 4 and 4B are agricultural areas and Planning Area 5 is a conservation area.

Colts Neck Township consists of two planning areas: PA4B, Rural Environmentally Sensitive and PA5, Environmentally Sensitive. The Planning Area 4B generally follows the Township Agricultural District (AG) with the remainder of the Township being designated PA5. The Township's designation as environmentally sensitive (PA4B and PA5) is appropriate since Colts Neck is entirely located within the watershed of three potable water supplies (Swimming River Reservoir, Glendola Reservoir and

Manasquan River Reservoir) and a trout maintenance stream (Pine Brook / Hockhockson Brook) that is a tributary to the Navesink River.

Environmentally sensitive areas contain large contiguous land areas with valuable ecosystems, geological features, and wildlife habitat. The Plan indicates that the future environmental and economic integrity of the State rests in the protection of these irreplaceable resources. The SDRP is very clear that large contiguous areas of undisturbed habitat, such as Colts Neck, should remain to protect sensitive natural resources and systems.

The SDRP establishes five types of centers as a preferred vehicle for accommodating growth. Urban Centers are generally the largest centers, offering the most diverse mix of industry, commerce, services, residences, and cultural facilities. Regional centers contain a compact mix of residential, commercial, and public uses, serving a large surrounding area and are developed at a density that makes public transportation feasible. Town Centers are traditional centers found throughout New Jersey with diverse residential neighborhoods served by a mixed-use core offering locally oriented goods and services. Villages are primarily residential centers that offer a small core with limited public facilities, consumer services and community activities. Hamlets are the smallest type of centers and are compact residential settlements organized around a community focal point such as a place of worship, small park, or civic building.

Since Colts Neck currently contains no centers, nor the infrastructure (public sewers & water) needed to support centers, the Township has not designated an existing or planned new center. Center services are provided to township residents through existing centers located in adjoining municipalities (Lincroft in Middletown Township, Marlboro Township and Freehold Township), and nearby municipalities (Red Bank and Freehold Borough). Public planned or existing sanitary sewage service is limited to The Grande at Colts Neck and Charleston Meadows, both inclusionary developments (see Section 4.x), confined to the A-4, Mixed Housing Development District situated in the southwest corner of the Township serviced by sanitary sewerage mains connected to Freehold Township (See Section 11.2, Public Sanitary Sewer Service). Existing public water service is limited to The Grande at Colts Neck, Naval Weapons Station, Earle, and an 8” main along Swimming River Road. The Grande is serviced with public water by the Veolia/Suez Water Company whose lines receive water from Freehold Township. Naval Weapons Station, Earle and the 8” main in Swimming River Road are provided with potable water from New Jersey American Water Company.

Planned new public water service is limited to the two proposed developments to partly satisfy the Township’s Third Round Affordable Housing Obligation. The first is Colts Neck Manor, which will be serviced with potable water from Gordon’s Corner Water Company through a water main extension along School Road East in Marlboro Township. The second is Charleston Meadows, which will be part of the Veolia/Suez Water Company franchise service area (See Section 10.7, Water Supply).

2.3 Monmouth County

2.3.1 Monmouth County Master Plan

The Monmouth County Growth Management Guide, adopted in 1982, designated growth and limited growth areas. Growth areas consist of Urban Centers, Town Centers, and Suburban Settlement. The plan identified five urban centers: Matawan, Red Bank, Long Branch, Asbury Park, and Freehold. Three town centers (Allentown, Roosevelt, and Farmingdale) were identified. Generally, all areas east of the Garden State Parkway and along the State Highway Route 9 corridor were classified as Suburban Settlement. All other areas, including Colts Neck, were designated Agricultural/Conservation or Limited Growth areas.[2]

The Monmouth County Growth Management Guide was replaced with the Monmouth County Master Plan in 2016. Recognizing that most of the county communities had already established their desired physical form and character, the theme of the Plan was Redevelopment, Revitalization, and Rediscovery. The County Master Plan recognizes "Home Rule" as the power granted by the U.S. Constitution, legislature, or both to municipal governments to organize themselves to carry out a range of government activities under their own authority to preserve health, safety, and general public welfare. It is the Municipal Land Use Law (N.J.S.A. 40:55D) that gives municipalities the authority to adopt Master Plans and the power to zone. In observance of Home Rule the County Master Plan is a list of suggestions, informal recommendations, and ideas for municipalities to consider when developing their land use policies.[3]

The County Master Plan is organized into the following 14 elements: 1) Introduction and Purpose; 2) Land Use; 3) Natural Resources; 4) Open Space; 5) Farmland Preservation; 6) Arts, Historic, and Cultural Resources; 7) Utilities; 8) Transportation; 9) Agriculture and Economic Development; 10) Community Development and Housing; 11) Healthy Communities; 12) Community Resiliency; 13) Sustainable Places; and 14) Planning Services, Outreach, and Coordination.

The Land Use Element of the County Master Plan contains a comparison of land use dated between 1986 and 2012. Table 2.1, "Land Use Table – 1986 to 2012," summarizes the County Master Plan's Figure 2.8. The table shows that the largest land use change is attributed to residential growth, which increased by 6.7% over this 26-year period and accounts for 32.5% of all land in the county. Residential growth during this period occurred mostly at the expense of agricultural land, which experienced a 6.4% decrease and declined from 17.3% in 1986 to 10.09% of all county land in 2012. It is interesting to note that wetlands (20.8%) and upland vegetation (16.6%) remain the second and third largest land use categories in 2012.

Table 2.1 Land Use Table 1986 to 2012

Category	1986 (acres)	Percent of land	2012 (acres)	Percent of land	Percentage change
Residential	78,332.3	25.78	101,019.5	32.5	6.7
Commercial/Service	9,732.8	3.20	12,393.3	4.0	0.8
Military	2,570.2	0.85	1,931.6	0.6	-0.2
Former Military	0	0	140.7	0	0

Transportation, Communications, and Utilities	4,759.3	1.57	7,796.7	2.5	0.9
Mixed Urban/Built Land	0	0	55.5	0	0
Other Urban/Built Land	6,297.2	2.07	8,777.3	2.8	0.8
Recreational	7,070	2.33	10,544.7	3.4	1.1
Agriculture	52,566	17.30	33,833.3	10.9	-6.4
Upland Vegetation	57,443	18.91	51,660.3	16.6	-2.3
Water	3,528.2	1.16	11,901.1	3.8	2.7
Wetlands	73,359.9	24.14	64,582.8	20.8	-3.4
Barren	4,528.1	1.49	3,464.5	1.1	-0.4

Source: Figure 2.8, Monmouth County Master Plan, 2016

Unlike the 1982 Growth Management Guide, the current Monmouth County Master Plan does not contain a map designating Growth Areas and Limited Growth Areas. This map is replaced with Figure 2.15, "Community Landscape Map, 2016." The Community Landscape Map provides an overall graphic representation of the county land cover. The Monmouth County Community Landscape Map identifies the following four landscapes in Colts Neck: 1) Rural and Natural Environment; 2) Agricultural Land; 3) Military; and 4) Commercial Business District.

2.3.2 Monmouth County Scenic Roadways

In 2001, the Monmouth County Planning Board adopted the Monmouth County Scenic Roadway Plan. The purpose of the plan is to identify those roads, or sections of roadways, that possess such a high degree of visual quality that driving, biking, or walking along these roadways is a pleasurable and enjoyable experience. The Plan offers alternative design guidelines for roadways that are identified as "scenic" for use in the Monmouth County Planning Board's development review process. The purpose and goals of the Monmouth County Scenic Roadway Plan have been incorporated as part of Section 102-70.1, Scenic Corridors of the Colts Neck Development Regulations. This section requires a scenic viewshed boundary to be established along all scenic corridors. The depth of the scenic viewshed boundary is 250 feet in the AG, Agricultural District and 150 feet in the A1 Agricultural/Residential District. The Township scenic corridors ordinance applies the following standards to the scenic viewshed boundary to maintain its rural character.[4]

(1) Existing structures such as barns, historic structures or significant older buildings should be enhanced, preserved, and incorporated into subdivision and site plan designs.
(2) Existing streets should remain with minimal widening only to eliminate dangerous and unsafe conditions. No new curbs or sidewalks should be permitted on existing streets.
(3) Natural features such as topography, vegetation, streams, ponds, and wetlands shall be preserved.
(4) Clear-cutting of wooded areas for new subdivisions and site plans is prohibited. Selective thinning of dead or diseased trees to promote a more desirable growth is permissible. Where tree removal is allowed, Section 102-80.1, tree removal of the Colts Neck Development requires 2 replacement trees for each tree removed.
(5) Placement of new principal or accessory structures resulting from subdivision or site plan applications are prohibited in the scenic viewshed boundary.

(6) All subdivisions or site plan applications along scenic corridors shall submit a plan that identifies all existing and proposed trees, shrubs, ground cover, natural and man-made features, specimen trees, open fields, scenic vistas or other natural or man-made elements. The plan shall identify items that contribute to the scenic corridor and demonstrate that the scenic corridor will remain after completion of the development.
(7) Agricultural activities on commercial farms are exempted from the scenic viewshed boundary regulations.

Monmouth County roads designated as scenic corridors include all roads identified in the Monmouth County Scenic Roadway Plan prepared by the Monmouth County Planning Board adopted September 17, 2001, and as amended by the County Planning Board.

Colts Neck roads designated as scenic corridors include; Bucks Mill Road, Boundary Road (Big Brook to Route 520), Clover Hill Lane, Clover Hill Road, Conover Road (from Heyers Mill Road to Laird Road), Creamery Road, Cross Road, Heyers Mill Road, Hillsdale Road, Hockhockson Road, Laird Road, Lakeside Avenue, Long Bridge Road, Matthews Road, Mercer Road, Montrose Road, Muhlenbrink Road, Revolutionary Road, Squankum Road, Obre Road, Water Street, Willowbrook Road and Woods End Road.

2.3.3 Monmouth County - NWS Earle Joint Land Use Study

On December 31, 2017, the Monmouth County Planning Board in cooperation with NWS Earle and thirteen surrounding municipalities published the *NWS Earle Joint Land Use Study*. One of the major purposes of the study was to investigate ways to promote community development that is compatible with NWS Earle.[5]

For Colts Neck the major outcome of the study was the Military Influence Area. NWS Earle has defined a Military Influence Area around the mainland base and Normandy Road. The Military Influence Area is a geographical planning area where military operations may impact local communities and, conversely, where local activities may affect the installation's ability to carry out its mission. The Navy monitors land use activities within this area to identify and avoid potential incompatibilities between NWS Earle and its neighbors. The Military Influence Zone surrounding the mainland base in Colts Neck is comprised of a one-mile Primary Buffer and an additional one-mile Secondary Buffer.

Section 7.1 of Public Law 1975 was amended requiring the notice of hearing on applications for approval of a major subdivision or site plan be given to military facility commanders for any properties within 3,000 feet of a military base. The Study uses this 3,000-foot boundary as the Development Review line and encourages zoning amendments to promote compatible land use development which limits densities and the types of development in proximity to base boundaries where munitions are stored. The main types of development deemed less compatible within the 3,000-foot Development Review Line are: multi-family housing, institutional uses (schools and hospitals) nursing homes/assisted living facilities and land uses involving large congregations of people for long periods of time. These uses should be directed to other locations.

In June 2022 the Monmouth County Planning Board adopted the Next Steps to Compatibility Planning Study, prepared by Michael Baker International, Inc. This is a follow-up study to the NWS Earle Joint Land Use Study. The purpose of the Next Step Study is to encourage compatible development near Earle's

base through a toolbox of land use solutions within the Military Influence Area boundary identified in the Joint Land Use Study.[6]

In Colts Neck the Steps to Compatibility Planning Study identified the A-4, Mixed Housing District, MU-1, Mixed Use Overlay District, and R-7, Residential District as less compatible zoning districts. Each of these zones were established to partially satisfy the Township's affordable housing obligation.

The commercial zones along the State Highway Route 34 corridor (B-1, B-1A, B-2, B-3) were classified as conditionally compatible districts. The report indicates NWS Earle is not opposed to development in this corridor, since it's adjacent to NWS Earle administrative areas. NWS Earle's highest risk to the public health, safety, and welfare is in the eastern portion of the Township and Normandy Road where ammunitions are stored and transported.

Section 4.0 Toolbox of Land Use Solutions in the Next Steps to compatibility Planning Study describes land use planning tools and solutions available to municipalities to help achieve a desired level of compatibility with NWS Earle's mission. The study contains simple compatibility context statements, goals, and objectives to be incorporated into municipal planning documents. For Colts Neck, the major tool is Section 4.2.3 Open Space and Farmland Preservation Integration, where municipalities incorporate NWS Earle's mission activities in their open space and farmland preservation plans.

In 2002, Congress recognized the importance of land preservation near military installations and established the Readiness and Environmental Protection Integration Program (REPI). In October 2018 the Navy signed an agreement with the County of Monmouth and the Monmouth Conservation Foundation that will allow them to pursue the preservation of land in the Military Influence Ares. The Navy has committed more than $2,000,000 in REPI funds to this effort. The County is currently in the process of developing and coordinating grant requirements with Federal and State agencies. The Federal Government (Earle), County of Monmouth, Monmouth Conservation Foundation, and Colts Neck Township have preserved the 215-acre Overbrook Farm (Block 50, Lots 4.01, 17, and 23) with REPI funding.

2.3.4 Monmouth County Parks

There are two County parks in Colts Neck: (1) Dorbrook Recreation Area is a large diversified recreation area that contains: an Activity Center & Visitor Center; fields for: soccer, lacrosse, flag football, softball, field hockey, and rockets & model airplanes; courts for: basketball, tennis, in-line skating, pickle ball; 2.3 miles of paved trails; playgrounds for children ages 2–5 and 5-12; and (2) Hominy Hill Golf Course, which was designed by Robert Trent Jones, and is often rated as New Jersey's #1 public golf course.

There are two large County parks that immediately abut Colts Neck: (1) Big Brook Park in Marlboro Township; and (2) Thompson Park in the Lincroft section of Middletown Township.

Also, there are several parks less than four miles away, including: Swimming River Park, Red Bank; Holmdel Park, Holmdel; Sunnyside Equestrian Center, Lincroft; Fort Monmouth Recreation Area, Tinton Falls; Shark River Park, Wall Township; Howell Park Golf Course and Manasquan Reservoir, Howell.

2.3.5 Monmouth County Unique Areas

The Monmouth County Unique Area Study, 1978, identified sites with exceptional environmental or ecological significance in the county. It was intended to generate an awareness of and respect for environmentally aesthetic areas and important natural resources. The study categorizes contributing resources/sites as bogs, marshes, and swamps; waterways; coastal wetlands; lakes, ponds, and reservoirs; meadows, parks, and forest; and archeological and geological areas. The public awareness of these sites has been proven successful, since a number of these sites, including Big Brook Preserve in Colts Neck, have been permanently preserved.[7] The following is a description of the Colts Neck sites identified in the study.

Big Brook

Big Brook flows from Wyncrest Road off Route 18 East to the Swimming River Reservoir. The area along Big Brook basically supports beech-water tupelo community with a large amount of willow and oak trees. Big Brook's formations are cretaceous (about 70 million years old) and are abundant with fossils, particularly in the Navesink and Mount Laurel formations. These fossils include oyster shells, belemnites (internal skeleton of squid), and shark teeth. The sediments in this formation are marine in origin and were deposited when Monmouth County was covered by open ocean.

Pine Brook

Pine Brook is a tributary of Swimming River and forms the boundary between Colts Neck and Tinton Falls Borough. The area bordering Pine Brook is dominated by a beech-maple climax forest with tide/marsh conditions at the mouth where it empties into the Swimming River. Mammals are predominantly found in forest and marsh flood plain areas.

Swimming River Reservoir

The Swimming River Reservoir lies between Normandy Road, Willow Brook Road, Brookdale Community College, and Long Bridge Road. The area supports a beech-maple community with tulip and locust trees. Common forest mammals are present throughout the area along with large populations of songbirds and waterfowl. The reservoir is a major water supply for eastern Monmouth County. The reservoir is privately owned by the New Jersey American Water Company. There is an abundance of fish, and the reservoir is large enough for boating. However, public access to the water body is restricted by the water company.

Tinton Falls

Although not in Colts Neck, Tinton Falls is located immediately to the east of the intersection of Sycamore Avenue and Tinton Avenue. The falls are about ten (10) feet in height and are the highest falls in the Atlantic Coastal Plain, which runs from New York to Florida. The falls flow over sandstone which is the youngest cretaceous formation in New Jersey. This sandstone is found only in Monmouth County where it attains a maximum thickness of 25 feet. On the north side of the falls was an iron forge and sawmill built by James Grover around 1674. This was the first iron forge in New Jersey and one of the earliest in the United States.

2.3.6 Monmouth County Solid Waste Management Plan

The New Jersey Solid Waste Management Act (N.J.S.A. 13:1E-1 et seq.) established a comprehensive system for the management of solid waste. The Act designated all 21 counties and the Hackensack Meadowlands District as Solid Waste Management Districts. The Act also mandated that each Board of County Commissioners develop comprehensive plans for waste management in their respective districts. On August 31, 1981, the NJ Department of Environmental Protection approved the Monmouth County Solid Waste Management Plan.

The Solid Waste Management Plan serves as a blueprint for how Monmouth County implements its solid waste strategy in respect to waste reduction, recycling, and disposal. It describes garbage disposal requirements for waste generators and establishes goals for keeping recycling material separate from garbage disposal. In Monmouth County all solid waste type 10 generated from within the county and not disposed out of state must be disposed of at the Monmouth County Reclamation Center in Tinton Falls Borough. Type 10 solid waste (household, commercial, and institutional) consists of household waste from private residences, commercial waste which originates in wholesale, retail, or service establishments such as restaurants, stores, markets, theaters, hotels, warehouses, and institutional waste material originating in schools, hospitals, research institutions, and public buildings.[8]

The Plan also maps all active and inactive sites in the county. The Waste Disposal Sites in Monmouth County Map depicts the locations of industrial waste sites, landfills, military landfills, scrap yards, superfund sites, and waste incinerator sites.

In Colts Neck the only active waste disposal site on the map is Bill's Auto Repair, located at 326 Swimming River Road. This site is registered as a scrap yard. However, according to the NJDEP DataMiner (search by municipality), this facility's New Jersey Pollution Discharge Elimination System (NJPDES) permit for vehicle recycling expired on September 30, 2017.

Three waste disposal sites in the Township are listed as inactive. Two sites are classified as landfills: Colts Neck Landfill on Leland Road and Shrewsbury Disposal Landfill Co. on Asbury Avenue, which closed in August 1981. It should be noted that the County of Monmouth purchased the Shrewsbury Disposal Landfill on December 20, 2013. Since this site is adjacent to the Monmouth County Reclamation Center, it is currently being land banked for future county landfill operations. The last inactive waste disposal site is the Naval Weapons Station Earle military solid waste site which closed in 1981. It should be noted that this site is also classified as a superfund site with remediation underway.

Nearby, active waste disposal sites include Monmouth County Reclamation Center and Mazza Recycling Center, both in Tinton Falls Borough, and Red Bank Recycling in Red Bank Borough. Inactive sites in adjacent municipalities near the Colts Neck boundary include Lincroft Landfill in Middletown (currently a baseball field in Middletown's Thompson Park), Philips Landfill in Holmdel, and Silverton Marine Corporation industrial waste site in Marlboro. The Silverton Marine Corporation site underwent remedial activities directed by the Monmouth County Health Department.

Note: See also Chapter 11 Waste Disposal & Contamination.

2.4 Water Resources

2.4.1 Surface Water Resources

Surface water is any body of water above the ground including creeks, rivers, ponds, lakes, reservoirs, and wetlands. Each surface water body has an associated drainage area referred to as a watershed. The vast majority of Colts Neck Township (97%) is part of the Navesink River / Lower Shrewsbury River watershed.

The Swimming River Reservoir and Pine Brook/Hockhockson Brook flow into the Swimming River, which discharges into the Navesink River. The Navesink River is approximately eight miles long and is part of the Shrewsbury River estuary. At one time the Navesink River supported a prosperous shellfish industry with a shellfish growing area of approximately 2,520 acres in size. However, due to poor water quality, this industry has faded.

According to the NJDEP, Division of Water Monitoring and Standards, Bureau of Marine Water Monitoring classifies shellfish in the western portion of the Navesink River as Prohibited (225 acres), the middle portion as Restricted (1,568 acres), and the eastern portion as Conditionally Approved (677 acres). There are no approved waters in the Navesink River. The Restricted classification means that it is prohibited to harvest shellfish from these waters to direct market and a special permit must be issued in accordance with N.J.P.C. 7:12. The Conditionally Approved waters are open to harvest from November 1st to April 30th.[9]
The New Jersey Department of Environmental Protection Reappraisal Report of Shellfish Growing Acres NE2, Navesink River, dated October 2012 found that the water quality in the urban portions of the Navesink River are impacted by rainfall accumulation above 0.3 inches, particularly right after a rain event.[10] During storm events, runoff picks up both nutrients and pollutants. While some runoff provides nutrients for plants and animals, it also carries pollutants that can contaminate waters. The various unacceptable pollutants include but are not limited to animal waste, agricultural pesticides, and bacteria from failing septic systems and municipal infrastructure. The Reappraisal Report also indicated that the 22 marinas along the Navesink River also impact the shellfish growing areas due to biological and chemical contamination.

Note: For detailed discussion on surface water, see Chapter 9 Surface Water

2.4.2 Ground Water Resources

Groundwater is water found beneath the Earth's surface. Groundwater is stored in underground formations called aquifers. These aquifers serve as underground reservoirs that supply potable water to Colts Neck resident's individual domestic wells. During periods of low rainfall, some groundwater also helps support base flow to surface waters through seepage of groundwater into streams.

In Colts Neck the first or shallowest aquifers include the Vincentown and Red Bank Sands. These aquifers range from 0 to 100 feet below ground level. The few hand dug wells still in existence are serviced by the Vincentown are Red Bank Sands aquifers.

The Wenonah-Mt Laurel formation is the next formation and varies from 30 to 80 feet in thickness. The Wenonah-Mt-Laurel is a productive water source and the majority the early to mid 19th century individual domestic wells pierce this formation.

The Englishtown aquifer is below the Wenonah-Mt Laurel and is found 50 to 300 below ground level. The aquifer ranges between 140 and 200 feet thick. This is the most productive formation for individual domestic wells in Colts Neck and depending on the size of the pump yields can exceed 100 gallons per minute. Almost all new domestic wells in Colts Neck are fed by the Englishtown aquifer.

The Raritan-Magothy formation is found below the Englishtown aquifer and lies 350 to 600 feet below ground level. In the New Jersey Coastal Plain the Raritan-Magothy aquifer is a restricted aquifer due to salt water intrusion from the Atlantic Ocean and Raritan Bay. To access this formation to existing water rights which must be purchased. In Colts Neck only large scale developments access the Raritan-Magohty. These water intensive uses include the Colts Neck High School New Jersey American Water Company, Hominy Hill Golf Club, Kevin Eyres and Trump National Golf Club

Note: For detailed discussion on groundwater, see Chapter 10. Groundwater Resources.

2.5 Contiguous Municipalities Master Plans

As previously noted, there are seven Monmouth County municipalities that abut Colts Neck.
Along the northern boundary, Colts Neck is separated from Holmdel Township and Middletown Township by the Swimming River Reservoir. There are only four places where roads cross the reservoir. Therefore, the physical separation created by the reservoir provides a significant divide that minimizes the land use conflicts from one side to the other. Colts Neck's boundary with Holmdel is commercial at the Route 34 and 520 intersections. This commercial district is known as "Holmdel Village," and is an historic district. The office and small commercial patterns along Route 34 and Route 520 are consistent with those major transportation facilities. The remainder of Holmdel is compatibility zoned R-4R: Rural Conservation District (one unit per 5 acres of gross tract area), R-4H: Hamlet Conservation District (one hamlet estate per 5 acres of gross tract area, and R-40A: Residence and Agriculture District (43,000 square feet lots). The eastern third of the Holmdel boundary consists of permanent open space in the form of Cross Farm Park and Thompson Park.[11]

Colts Neck's boundary with Middletown is also compatible, recognizing Middletown's large area for public use, including Thompson Park and Brookdale Community College. The existing residential development in Lincroft is R-45: Single Family Residence Zone Low Density (45,000 square foot lots).[12]

The eastern boundary of Colts Neck abuts the Borough of Tinton Falls. All of Tinton Falls is planned residential with either 1.0 or 1.5 units per acre along the northerly boundary, with industrial/office park zoning along Shafto Road and NWS Earle. The Colts Neck portion is largely agriculture, reflecting some

horse farms, Due Process Stables Golf Course, and equestrian-oriented residential lots along Hockhockson Brook, and low density lots along Pine Brook and NWS Earle. Both plans identify the floodplains and wet soils along Hockhockson Brook which extend into the NWS Earle property.[13]

The Township's southern boundary is shared with Wall Township and Howell Township. NWS Earle separates both communities from Colts Neck and minimizes land use conflicts. The Wall Township boundary is Zoned Office Park. The Howell portion of the border is zoned ARE-2: Agriculture Rural Estate (one unit per 2 acres).[14 & 15]

The southwest portion of Colts Neck abuts Freehold Township, which is fully developed with compatible residential uses. The northerly area abutting Colts Neck is residential R-25 (25,000 square foot lots) with the lower half zoned residential R-60 (60,000 square foot lots). The Route 18 Freeway is generally the demarcation between the suburban fringe, extending east from Freehold and the Route 9 corridor, and the beginning of the rural character in Colts Neck.[16]

Most of the Township's western boundary abuts Marlboro Township. To the north, the two municipalities are separated by Boundary Road. The southern tip is zoned A/LC Agriculture/Land Conservation (10 acres lots). Between Oak Lane and Castlehill Drive is zoned R-80: residential (80,000 square foot lots). Limited Light Industrial development, not compatible with Colts Neck zoning, exists along Boundary Road near Crine Road. Most of this zone consists of pre-existing industrial activity. However, a few vacant Light Industrial Zone sites exist. North of the Light Industrial Zone is the former Marlboro Hospital. This area is zoned ROS - Recreation and Open Space District. The southern half is developed with the Vanderburg Soccer Complex, while the northern half is the Monmouth County Big Brook Park. At Boundary Road and Route 520 is a residential area zoned LC: Land Conservation district, which encourages cluster developments at a one unit per 5 acres density. Overall, Marlboro's land use planning is consistent with Colts Neck, excluding the Light Industrial areas.[17]

2.6 References

1. New Jersey State Development and Redevelopment Plan
   New Jersey State Planning Commissions, adopted March 1, 2001

2. Monmouth County Growth Management Guide
   Prepared by the Monmouth County Planning Board, adopted in 1982

3. Monmouth County Master Plan
   Prepared by the Monmouth County Division of Planning
   adopted October 17, 2016

4. Scenic Corridors of the Township of Colts Neck
   Section 102-70.1 of the Code of the township of Colts Neck

5. NWS Earle Joint Land Use Study, Monmouth County, New Jersey
   Prepared by Maser consulting, P.A., dated December 31, 2017

6. Next Steps to Compatibility Planning Study, Monmouth County, NJ
   Prepared by Michael Baker International, Inc., dated June 2022

7. Monmouth County Unique Acre Study
   Prepared by The Monmouth County Environmental Council, dated 1978

8. Waste Disposal Site in Monmouth County
   Prepared by the Monmouth County Health Department, dated June 4, 2009

9. Department of Environmental Protection, Division of Water Monitoring

10. Reappraisal Report of Shellfish Growing Area NE2, Navesink River
    Published by the New Jersey Department of Environmental Protection
    dated October 2012

11. Zoning Map Code of the Township of Holmdel

12. Zoning Map Code of the Township of Middletown

13. Zoning Map Code of the Township of Borough of Tinton Falls

14. Zoning Map Code of the Township of Wall

15. Zoning Map Code of the Township of Howell

16. Zoning Map Code of the Township of Freehold

17. Zoning Map Code of the Township of Marlboro

3. History

A Short History of Colts Neck for the Environmental Resource Inventory 2024 utilizing a history written for the previous ERI in 1983, and updated with material from Colts Neck Planning Department (2008), Wikipedia, a booklet by Lillian Burry, and information from the Monmouth County Historical Society.

3.1 Ancient Foundations: *(from 1983 ERI history)*

Paleontologists have established that Colts Neck, as part of the Atlantic Coastal Plains, was once beneath an ancient sea. The locality of Big Brook is regarded by them as a laboratory. Students and paleontologists visit this area regularly and have found fossilized specimens dating back 70 million years.

The earliest residents of Colts Neck included the Unami Indians or Turtle Clan. Their Chief, who lived in this area, was the leader of all the Lenni Lenape "original of our people". The Lenni Lenape originated in Labrador and were a subdivision of the Delawares (Algonquin nomenclature). They often gathered together near the present Obre Road to socialize and create their monetary exchange out of seashells (wampum). At this time, New Jersey was called "Scheyichbi" or "Long Land Water." (1)

There were four great Indian trails crossing our Township: The Hackensack Trail, originating at the headwaters of the Hudson River; The Minisink Trail, originating at the Great Lakes; the Raritan-Lopotcong originating in the West; and the Crossweeksung Trail, originating in the Southwest. They all reached the Navesink River, and one of them, Crossweeksung Trail, branched into a north-south trail continuing north to Red Bank and south to Manasquan, thus ending at the seashore. The last of the Lenni Lenape Indians left Colts Neck in 1801 as the tribe became decimated by disease, the gun, and general dissatisfaction with their life amidst the "civilized" white men. (2)

Huge trees once existed in the Township. This is evident in many homes that were built before 1750. They were constructed with white pine paneling and flooring measuring from 18 to 24 inches wide and yellow pine floor joists and rafters that measured from 5 to 9 inches, with planking from 12 to 18 inches wide. This lumber was cut to order by water-powered vertical sawmills located along county streams. Crude timbers were fashioned from many other trees with broad axes. (3)

3.2 European Settlement

Between 1497 and 1609 New Jersey was claimed by various nations including the English, French, Spanish and Dutch. The Dutch influenced Monmouth County from 1614 to 1664. In 1664 King Charles II of England granted James, Duke of York, this territory and he, in turn, gave a lease and release for New Jersey to Lord John Berkeley and Sir George Carteret. On the death

of Sir Carteret, his lease rights were sold and eventually the new owners established a Board of Proprietors to administer their lands and rights.

On June 15, 1676, the minutes of the Board of Proprietors of the Eastern Division of New Jersey revealed a Bill of Sale by two Indians (Almeseke and Lamasand) for a certain neck of land lying in Monmouth County called Colts Neck. The shape of this land is formed by Yellow Brook and Mine Brook, which meet at one point. The origin of the name, "Colts Neck" has not been established by any other written record.

On June 28, 1778, Private Michael Field, of the First Regiment of Middlesex County Militia, was wounded and captured by the British. The British took him along when they retreated through Colts Neck, by way of Dutch Lane Road, onto Revolutionary Road. It was there that he was left to die. Eventually he was found by colonial forces and buried on Heyers Mill Road. In the early 1960s, a monument was erected to mark this event. The gravesite has been a parade stop on the annual Memorial Day Celebration.

3.3 Colts Neck Township Establishment

The municipality of Colts Neck Township was initially established by an act of the New Jersey Legislature as **Atlantic Township** on February 18, 1847, carved from portions of Freehold Township, Middletown Township, and Shrewsbury Township. The name was changed to "Colts Neck Township" as of November 6, 1962, based on the results of a referendum held that day.[22]

The first town meeting on record was held in Samuel Laird's Hotel (today's Colts Neck Inn) on March 9, 1847. Colts Neck was then one of five villages composing Atlantic Township. The other four were Phalanx, Scobeyville, Montrose, and Vanderburg. In 1961, by public referendum, these villages became Colts Neck Township, which now consists of 31.8 square miles of land. (4)

Revolutionary War History records a skirmish between the British and the American forces taking place on Dutch Lane in Colts Neck during the night of June 28, 1778. This is the date of the Battle of Monmouth which took place during the British retreat from Philadelphia, Pennsylvania.

Farming and Livestock *(from Colts Neck Business Association annual luncheon booklet)*

Fruit orchards, dairies, farms, and horse raising are emblems of Colts Neck's attractions. The many local farms, markets, and even vineyards attract many visitors each year. Residents from throughout the tristate area call on places like Delicious Orchards, Brock Farms, and the vineyard Four JG's for homegrown tastes and seasonal décor. The fall apple and pumpkin harvest is one of the largest draws.

Horses and horse breeding are vital to Colts Neck. The progenitor of American Thoroughbred racing, the race mare Fashion (1836-1860) was trained by Samuel Laird. Samuel was son of the

founder of Laird and Company, Robert Laird. He was also Colts Neck's first postmaster in 1824 and proprietor of the Colts Neck Tavern. Fashion is still widely credited in horse breeding history as the greatest race mare of her generation or any before. Samuel's son Joseph was called the best jockey on the entire East Coast when he competed with Fashion.

Both farms and horse breeding coincided with the construction of stately historic homes still praised for their architecture. Notable in Colts Neck are the old Dutch farmhouses and their enormous barns, but also the impressive newly constructed homes and estates. (5)

Historic Buildings *(from 1983 ERI history)*

Several historical places of note are still in existence in the Township.

Laird's Applejack was first produced in Monmouth County in 1698 by William Laird on the property now owned by the Colts Neck Inn. A fire caused the distillery to be moved to Scobeyville, where a thriving business still exists at Laird Road and Route 537. Founded by Robert Laird, Laird & Company is the oldest licensed distillery in the United States and received License No. 1 from the U.S. Department of the Treasury in 1780 The Monmouth County Historical Association in Freehold has a letter from George Washington requesting the Applejack recipe. Samuel E. Laird honored this request in 1780. Ninth generation Lisa Laird-Dunn is now president of Laird & Company, and heads America's oldest family of distillers. [*Miles, Mrs. Ann P., History of Colts Neck, Grant Printers, Red Bank, N.J. 1964 - copies are available from the Colts Neck Historical Committee.*]

The Colts Neck Tavern, first owned by Levi Hart & erected in 1717, became the Colts Neck Inn in 1812, with Samuel Laird as the Proprietor. The Tavern played a very important part in Colts Neck History. The Inn is located at the intersection of Hwy. 34 and Rte. 537. In its early history, it served as a stop on the stagecoach line, along the historic Burlington Path, between Middletown, Trenton, and Burlington. The ownership of the Inn changed when the widow Catherine Hart married Captain Joshua Huddy in 1778. A noted revolutionary figure, Captain Huddy utilized this Inn as his headquarters for planning the local resistance against the British. In the summer of 1780, a party of tories and refugees attacked the home of Huddy. He successfully fought them off, but finally had to surrender to them as the house was set on fire. He was detained on a frigate off Rumson whereupon he escaped. Two years later, March 1782, Huddy was commanding a blockhouse at Toms River when he was again captured. He was tried for a crime he did not commit and he was hanged at the Highlands shortly thereafter. It is said that George Washington stopped at the Inn when he traveled in Monmouth County. (6)

The Colts Neck General Store, also an active business today, serves residents as a grocery store as well as a nice place for breakfast or lunch in an ancient building that was constructed in 1858 by Levi Scobey. Mr. Scobey carried merchandise that ranged from chewing tobacco to fishing gear and alarm clocks.

The earliest homes of Colts Neck were built like stables or wigwams similar to those constructed by the Indians. English architecture was not adopted until about 1702. The Frederick's home on Laird Road was built in 1709. The accuracy of the ages of many of the earliest homes cannot be established because of the destruction of early records by a fire at the County Courthouse.

The home of Capt. Joshua Huddy, the hero-martyr of the Revolutionary War, once stood at the corner of Heyers Mill Road and Route 537. His home was often used as a refuge for families whose homes were plundered and burned by the British. Capt. Huddy's home was finally attacked and set on fire in September 1780, but the fire was put out, leaving the structure with marks of fire and bullet holes. The original building is gone, but the site is properly designated by an Early American signpost. The account of Capt. Huddy's patriotic efforts and sacrifices can be found in the Howes Historical Collection of New Jersey, published in 1842.

In 1843 the Van Mater Farm in Colts Neck, composed of 673 acres, was purchased by a commission representing an organization that believed in the social theory of Francois Marie Charles Fourier, a French social economist. The Farm became known as the North American Phalanx(l). Fourierism advocated the reorganization of society into small self-sufficient communities. During 1844 this community consisted of 90 persons, which included 40 children. The experiment was successful until the Fall of 1854, when a disastrous fire destroyed the most important buildings supporting the community. Bankruptcy was declared, and many former members bought the land. Further details describing this experiment in Fourierism at North American Phalanx can be found in a booklet printed by the Colts Neck Historical Society in 1964.

The Colts Neck Historical Society is actively striving to preserve and record for all time the rich heritage of Colts Neck Township. One of the Society's most successful projects was the restoration and renovation of the old Montrose School House located at the southeast corner of Montrose Road and Cedar Drive. This school was built before 1786. [*Personal communication with Mrs. Ann P. Miles, past president of Colts Neck Historical Society.*] It is now maintained in good condition and serves as a regular meeting room for the Society.

Economic History

Farming, dairying, apple jack distilling, and chicken raising were the main industries in the town since the colonial era. Over time these have transitioned to raising horses, as well as attracting retail, restaurants, and other businesses. Many large farms have developed into housing, including the construction of large estates and mansions. The population of the town has increased considerably, along with an increase in household income and real estate prices.

From the Farmland Preservation Plan, Colts Neck Township Master Plan, 2008

Since settlement began c. 1609, Colts Neck Township has had an unbroken commitment to farming and to this day continues to enjoy an identity that is strongly rooted in its agricultural

heritage. At a size of approximately 20,713 acres, or 31.7 square miles, Colts Neck is one of the larger municipalities in Monmouth County. With the advantages of extensive areas of prime agricultural soils and a broad network of streams to provide irrigation for crops, water for livestock and power for mills, the agricultural potential of Colts Neck was quickly recognized and successfully developed. For the first two and a half centuries of its history, Colts Neck saw little change. It was rural, agricultural and lightly populated having only 1,814 residents in the 1940 U.S. Census. The first major transformative event came with World War II. This was the creation of the present Naval Weapons Station Earle which covers over 4,941 acres in Colts Neck. This is almost 24% of the township.

The second major event was the expansion of the Swimming River Reservoir in 1962. The New Jersey American Water Company now owns over 658 acres of reservoir and related lands, accounting for more than 3% of Colts Neck. Together, these two largest landowners account for 5,600 acres. Of the remaining 15,113 acres, 13,801 acres or 91% of the remaining land in Colts Neck was in agricultural use in 1960. The decade of the 1960's saw the greatest increase in population in the history of Colts Neck and concurrently the greatest loss of farmland in any decade since then. Colts Neck added 834 housing units, 3,642 residents and from 1960 to 1969 lost 4,520 acres or almost 33% of its farmland. This was a rate of over 500 acres per year. Over the next 40 years the total acreage of farmland in production decreased by another 4,587 acres to a total of 4,964 acres in 2009 (based on tax year 2010 farmland assessment data). This represents 35.9% of the 1960 total and an average annual loss of just over 180 acres.

The most recent major transformation for Colts Neck was the 1986 response to the court decision that resulted in the approval of construction of The Grande affordable housing project, originally 438 units on 80 acres. Realizing that the township is not in a growth area it decided to reduce the zoning density for much of Colts Neck to one unit per 10 acres. This was the beginning of the current proactive municipal effort to preserve farmland and open space through regulatory zoning. (7)

3.4 References & Additional Information

Footnotes:

1. In a letter from the Archaeological Research Center, Seton Hall University, Professor Herbert C. Kraft, Director, states, in part: "The archaeological potential of the Big Brook area is no less significant since numerous prehistoric habitation sites are known to exist throughout the region under investigation. Of chief concern to this archaeologist is the fact that at least nine (9) projectile points made from obsidian have been found in and around the Big Brook, within the proposed complex. [*A recreational complex had been proposed for the Big Brook Green Acres site in 1974-75. Professor Kraft's letter is dated Sept. 26, 1974.*] The closest known source of obsidian used in the manufacture of projectile points is Yellowstone National Park, Wyoming. We must determine whether there are additional obsidian points in an in situ context in order to ascertain their cultural association, and to discover whether they were flaked on or near the site out of

an as yet unknown source of raw material, or whether they were traded so far east. The need for such information is heightened by the fact that a chipped knife made from obsidian has recently been excavated in a Lackawaxin component in the Upper Delaware Valley. The component in which this knife was located dates to about 3600 B.C. Examinations of the Indian artifact collections assembled from the fields adjacent to Big Brook and within the area under investigation suggest a more or less continuous prehistoric occupation dating from ca. 6000 B.C. to post-Colonial times... "Numerous historic bottles, tools and farm implements dating from pre-revolutionary times to the early 20th Century have been found in and around the Big Brook areas...."

2. Anthropological discoveries have revealed that the Great Hairy Mastodon once roamed the Township in prehistoric times. The Indians hunted wolves, bear and panthers for food and clothing. The early white settlers encouraged the destruction of these predators by offering 20 Shillings in 1730 for a full-grown wolf, 5 Shillings for a "whelp not able to prey" and 15 Shillings for a panther. Wolves were often trapped in pits covered by brush and using meat on top as a decoy. [*"Remember Old Monmouth" - Dept. of Promotion & Public Information, Hall of Records, Freehold, N.J., 1989*]
3. Fish and game were a major source of food in the first half of the 18th Century. Animal pelts were used for rugs and clothing. Deerskins were usually used as rugs. Beaver, mink, raccoon and marten were once common game. Hunters also shot rabbits, squirrels, swan, geese, ducks, pigeons, bobwhite quail, grouse, plover, snipe, rail, woodcock, wild turkey and heath hens. Marten and heath hens are now extinct, but the wild turkey can be found in the State of Texas and has now been reestablished in some New England States and in northern New Jersey. Colonial housewives used songbirds in their menus and often set traps for blackbirds and robins.
4. https://en.wikipedia.org/wiki/Colts_Neck_Township,_New_Jersey
5. Colts Neck History, Colts Neck Business Association annual luncheon booklet 2023
6. Town by Town, Impressions of Monmouth County. A publication of the Office of the Monmouth County Clerk. Freehold, NJ 2002. Written by Lillian G. Burry then Township Historian.
7. Farmland Preservation Plan, Colts Neck Township Master Plan, 2008 prepared by Colts Neck Township Planning Department, Tim Anfuso P.P., AICP https://www.nj.gov/agriculture/sadc/documents/home/genpub/Colts%20Neck%20Farmland%20Preservation%20Plan%20Adopted%20.pdf

4.0 Land Use

4.1 Introduction

Colts Neck Township is the 6th largest municipality in Monmouth County. It was established by an act of the New Jersey Legislature as Atlantic Township on February 18, 1847, from portions of Freehold Township, Middletown Township, and Shrewsbury Township. Consisting of 19,661 acres or 30.7 square miles according to the 2020 US Census, the land contained rich soils for agriculture and a broad network of streams providing irrigation for crops, water for livestock and power for mills. The population grew slowly and the 1940 Census found 1814 Colts Neck residents. (Pg. 1 Farmland Preservation Plan Element of Colts Neck Township Master Plan May 1, 2013, hereinafter 2013 Farmland Preservation or FP)

A major change to land availability occurred on December 13, 1943 when the Naval Ammunition Depot Earle (NAD Earle) was commissioned. It is located in the Monmouth County towns of Colts Neck (4,941 acres, 24% of the township), Wall, Howell, Tinton Falls and Middletown. In 1974 The name was changed to Naval Weapons Station Earle (NWS Earle) (FP Pg. 1).

The 1960s saw a great increase in Colts Neck's population and a huge loss of farmland, adding 834 housing units and 3,642 residents and a loss of 4,520 acres of farmland, almost 33% of the town's farmland. Further reduction in farmland occurred in 1962 when the Swimming River Reservoir expanded, resulting in the New Jersey American Water Company's ownership of 658 acres (3% of the town) of reservoir and related lands (FP Pg. 1). From 1960 to 2009 farmland production acreage decreased from 13,801 acres in 1960 (67%) to 4,964 acres in 2009 (24%) (FP Pg. 1). The 2021 Colts Neck Tax Records identify the number of farmland acres as 4,574.

At the present time NWS Earle occupies 5,161 acres or 26.3% of the town and New Jersey-American Water Company, Inc. formerly Monmouth Consolidated Company, owns 675 acres 3.4% of Colts Neck. (Natural Resources Inventory, 1983, hereinafter NRI, Pg. 2.1)

4.2 Land Cover / Land Classification

The Township's overall land use plan encourages agriculture and low-density single family residential housing. Future development is encouraged to utilize the design flexibility of cluster and lot size averaging developments. It is a basic goal that new growth would simulate the existing pattern of development and preserve large contiguous tracts of land for agriculture and open space.

Map 4.1 NJDEP Land Use / Land Cover is based on the NJDEP 2015 Land Use / Land Cover GIS data. This Map shows the spatial distribution of agricultural, barren land, forest,

urban, water and wetlands in Colts Neck. The Agricultural classification includes confined feeding operations, cropland, pastureland, orchards, vineyards, nurseries, and other agriculture. It should be noted that woodland management agricultural activities are shown as forest on the map and not classified as agricultural.

Table 4.1, Land Use Trends shows Colts Neck's land use composition based on the NJDEP Land Use/Land Cover GIS data from 1986, 1995/97, 2002, 2007 and 2015. In 1986 Agriculture (31%), Forest (30%), and then Urban Land (24%) were the largest categories. By 1995/1997 Urban Land accounted for 28% of the Township and Agriculture dipped to 25%. In 2002 Urban Land increased to 34% whereas Agriculture dropped to 18%. By 2007 Urban Land increased to 37%. Today, Urban Land occupies 38.5% of the Township while Agriculture has fallen to 14.5% and forest has dropped to 18.5%.

What is evident from **Table 4.1** is that over this 29-year period Urban Land grew at the greatest rate, increasing its share by 14.5%. This increase grew at the expense of agriculture, which in turn lost 16.5% of its share followed by Forest which has decreased by 11.5%. The other land use categories (Barren Land, Water and Other Wetlands) remained more stable. However, between 2007 and 2015 Wetlands grew by 16.1% which could be attributed to mapping differences.

Table 4.1 Land Use Trends

Land Use	1986 (Acres)	%	1995/ 1997 (Acres)	%	2002 (Acres)	%	2007 (Acres)	%	2015 (Acres)	%
Urban Land	4,818	23	5,792	28	7,090	34	7,890	38	7,825.5	38.5
Barren Land	122	1	225	1	410	2	70	0.3	73.3	0.4
Forest (incl. deciduous wooded wetlands)	6,064	29.3	6,725	33	6,592	32	6,503	31.4	3,750.9	18.5
Water	588	3	579	3	589	3	591	3	620.4	3.1
Other Wetlands	2,576	12.4	2,022	10	2,059	10	1,734	8.4	5,107.8	25.1
Agriculture (including Ag Wetlands)	6,230	30.1	5,055	24.4	3,658	18	3,610	17.4	2,942.6	14.5

Colts Neck Township
2024 Environmental Resource Inventory

Map 4.1
Land Use / Land Cover

HOLMDEL TWP

MIDDLETOWN TWP

MARLBORO TWP

FREEHOLD TWP

HOWELL TWP

WALL TWP

BOROUGH OF TINTON FALLS

Legend

- Earle NWS Area
- Municipal Boundary
- Road

Land Use / Land Cover

- Agriculture
- Barren Land
- Forest
- Urban
- Water
- Wetlands

GIS Data Sources:
1. Land Use / Land Cover: NJDEP (2015).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

0 3,500 7,000

ARH ASSOCIATES

Source: *NJDEP Land Use/Land Cover GIS data 1986 through 2015.*
Note: Total acreage varies per year based on mapping differences.

Table 4.2 Land Use / Land Cover – NWS, Earle v Non-Earle breaks down **Table 4.1** into Naval Weapons Station, Earle, and Non-Earle categories for the 2015 NJDEP Land Use / Land Cover GIS data. Once Earle is excluded Urban Land increases from 38.5 5 to 44.1 % of the township. The same with Agricultural which increases from 14.5% to 18.3% of the township. Two land use types decrease when NWS, Earle is omitted from the Table. Wetlands decrease from 25.1% to 18.8%. Forest also falls from 18.5% to 14.6%. Barren Land and Water basically remain unchanged with or without NWD, Earle.

Table 4.2 Land Use / Land Cover NWS, Earle v Non-Earle

Land Use	Earle Acres	Earle Percentage	Non-Earle Acres	Non-Earle Percentage
Urban Land	721.7	17.1	7,103.9	44.1
Barren Land	0.9	0.0	72.4	0.4
Forest	1,406.5	33.4	2,344.4	14.6
Water	8.0	0.2	612.4	3.8
Wetlands	2,078.4	49.3	3.029.4	18.8
Agricultural	1.3	0.0	2,941.3	18.03
Total	4,216.8	100	16,103.8	100

Source: *NJDEP Land Use/Land Cover GIS data 2015*.

Table 4.3 Property Classification by Zone is based on the 2024 Tax List. It shows the number of acres per tax assessment property classification by zone district. In terms of land area, Exempt property consists of the largest area 7,554.8 acres (38.9%) followed by Residential 5,858.1 acres (30.1%) and Farm 4,101.7 acres (21.1%). Commercial properties contained 1,252.1 acres (6.4%) and vacant land 670.3 acres (3.4%). It should be noted that exempt property is the largest classification in land area due to the 5,161 acres in Naval Weapons Station Earle.

The AG, Agricultural District is the largest by size 12,017.5 acres (61.8%), followed by the A-1, Agricultural / Residential District 5,629.4 acres (29%) and then the A-3 Residential District 504 acres (2.6%).

It should be noted that commercial land area in the AG and A-3 Districts is high. This is because the reservoir is owned by the New Jersey American Water Company and is listed as commercial property on the Tax List.

Table 4.3 Property Classification by Zone

Zone	Vacant	Residential	Farm	Commercial	Exempt	Total
A-1	393	3,253.6	680.6	24.8	1,277.4	5,629.4

A-2	1.6	383.9	0	0	3.4	389
A-3	8.5	137.8	6	320.5	31.2	504
A-4	1.5	34.9	15.9	0	9.7	62
A-5	5.6	224.4	91.7	0	8.8	330.5
A-6	38.9	0	0	0	0	38.9
A-7	4	0	33.8	0	0	37.8
AG	138.3	181.5	3,222.6	778.1	6,062.8	12,017.5
B-1	27.4	4.7	22.1	66.5	24.3	145
B-1A	0	0	0	12.5	0	12.5
B-2	0	0	0	9.1	1.6	10.7
B-3	1	3	29	19.5	0	52.5
D	0	0	0	21.1	0	21.1
D-1	50.6	0	0	0	48.1	98.7
MP	0	0	0	0	85.7	85.7
Total	670.3	5,858.1	4,101.7	1,252.1	7,554.8	19,437.1

Source: *2024 Colts Neck Township Tax List*
Note: Acreage shown based on the Tax List / Tax Map and not the 19,660.8-acre land area in the 2020 US Census.

The Township Tax List contains a Table of Aggregates. The Table lists the number of line items or parcels that are assessed at various land use classifications (vacant, residential, farm, commercial, tax exempt). Although the Table does not provide the number of acres devoted to each land use category, the parcel count is a useful tool in tracking land use changes over time. **Table 4.4**, Tax List Table of Aggregates 1974-2024 show the number of line items on the Tax List devoted to different property classes over a 50-year period.

Table 4.4 Tax List Table of Aggregates 1974-2024

Class	1974	1984	Change 1974-1984	1994	Change 1984-1994	2004	Change 1994-2004	2014	Change 2004-2014	2024	Change 2014-2024	Absolute Change
1	133	189	56	559	370	201	-358	114	-87	102	-12	-31
2	1,660	1,862	202	2,166	304	2,970	804	3,089	119	3,186	97	1,526
3B	241	321	80	399	78	316	-83	302	-14	192	-110	-49
4A	52	58	6	64	6	69	5	73	4	73	0	21
4B	1	0	-1	0	0	0	0	0	0	0	0	-1
4C	0	0	0	0	0	0	0	0	0	0	0	0
6	1	1	0	1	0	1	0	1	0	1	0	0
15A	2	2	0	2	0	3	1	4	1	4	0	2
15B	2	2	0	2	0	3	1	0	-3	10	0	-2
15C	30	79	49	127	48	158	31	170	12	180	10	150
15D	2	3	1	4	1	4	0	7	3	9	2	7
15E	4	4	0	4	0	4	0	4	0	1	-3	-3
15F	17	17	0	18	1	23	5	20	-3	22	2	5
Total	2,145	2,538	393	3,346	808	3,752	406	3,784	32	3,780	-14	1,625

Vacant land (Class 1)

Vacant land accounted for 133 properties in 1974. This category peaked in 1994 with 559 line items and dropped to 102 parcels in 2024. Although this category has an absolute change of -31 properties, the 1994 peak of 559 properties is an anomaly. This peak coincides with the development of the Township Round One Affordable Housing obligation and the 276 units under construction in The Grande at Colts Neck.

Residential properties (Class 2)

Residential properties increased by a total of 1,526 line items or 92% over this 50-year period. It should be noted that the 804 Class 2 increase experienced between 1994-2004 cohort represents 53% of this growth and immediately follows the 10-year growth experienced with vacant land because of The Grande at Colts Neck and the Township's Round One Affordable Housing obligation. Excluding this ten-year anomaly, residential growth has been relatively stable with a noticeable decline over the past twenty years.

Farm Properties (Class 3B)

Farms lost a total of 49 parcels or 20% over this 50-year period. However, the number of farm line items peak with 399 in 1994. Since that time farm line items decreased to 192 farms or a 207-parcel lost (52%) over the past 30 years. The greatest reduction of 110 farms occurred between 2014-2024.

Most of the 110 farms lost between 2014-2024 are small (less than 10 acres) and is not attributed to residential subdivision pressure. These smaller farms were lost due to 2013 amendments to the Farmland Assessment Act. The changes to the law increased the minimum annual income and mandated farms less than 7 acres submit a sketch demonstrating the locations and acreage of agricultural activity to achieve the 5-acre in agricultural use threshold. Agricultural buildings and structures (barn, sheds, animal shelters, etc.) are now excluded from the minimum 5-acre agricultural production threshold. As a result of these changes, many small farms were no longer eligible for farmland assessment.

Commercial Properties (Class 4A)

Commercial properties experienced a growth of 21 parcels or 40% over this 50-year period. The growth in this property classification has been consistent with less than 10 new line items added for each ten-year cohort on the Table.

Industrial (Class 4B)

In 1974 the Tax List contained a 4B industrial property. For the next 40 years, the Tax List contained zero industrial properties. This is an obvious reporting error because Laird & Company, LLC should have been listed as industrial property.

Apartments (Class 4C)

Zero apartment properties (4 units or more) were listed on the Tax List Table of Aggregates from 1974 through 2024.

Telephone (Class 6A)
Only one telephone personal property was listed for each year on the Tax List Table of Aggregates from 1974 through 2024.

Public Schools (Class 15A)
Two public schools were listed on the 1994, 1984, and 2004 Tax List. Three schools were reported on the 2014 Tax List. Today, the Tax List contains four public schools. (Colts Neck Elementary School, Colts Neck Secondary School, Colts Neck Middle School, and Colts Neck High School.)

Other School Property (Class 15B)
In 2024 zero other school properties are listed on the Tax List. However, in prior years 2 or 3 properties were listed. One of those listed included the Merdian Academy, which has since been converted into office use. At the time of this writing, it is unclear what other properties were classified as other school property.

Public Property (Class 15C)
The 1994 Tax List reported 30 public property line items. In 2024 the list contains 180-line items. This is an absolute change of 150 properties or 500% increase. Much of this increase can be attributed to Township greenway/open space surrounding cluster developments.

Church and Charitable Properties (Class 15D)
Between 1994 and 2004 the Tax List contained two or four churches and charitable properties. These include Saint Mary's Catholic Church, Colts Neck Reformed Church, and Colts Neck Community Church. In 2014 Church and charitable properties increased to 7 and to 9 in 2024. This is a net growth of seven line items. This growth is due to the Colts Neck Reformed Church acquisition of adjoining lots, Saint Mary's Catholic Church establishment of an off-site rectory, and a Chabad House.

Cemeteries and Graveyards (Class 15E)
From 1994 to 2014 the Tax List contained 4 cemeteries. Today, in 2024 only one cemetery is listed on the Tax List.

Other Exempted Properties (Class 15F)
Other exempted properties increased from 17 line items in 1994 to 22 line items in 2024. This is an increase of 5 properties (29%). Most of this change is due to aging Vietnam Veterans whose military related injuries are reaching 100% disabled status by the Division of Veterans Affairs, entitling the veteran to a full property tax exemption.

4.3 Farmland Preservation

Colts Neck's plan for agricultural areas is consistent with the statewide policies for agriculture published in the State Development and Redevelopment Plan as well as the "Monmouth County Farmland Preservation Plan," adopted by the Monmouth County Planning Board. In general, the Township's plan for agricultural areas is to promote agriculture and retain farmland by utilizing planning and innovative land conservation techniques. Protecting the economic viability of the agricultural industry and advising residents on the benefits and the special needs of agriculture.

In 2023 the Township prepared a Draft Comprehensive Farmland Preservation Element of the Master Plan. The draft Plan has been submitted to the NJ State Agricultural Development Committee (SADC) for review and approval. Upon approval of the Plan by the SADC, the Plan will be adopted by the Township Planning Board as an Element of the Master Plan. For a complete discussion on the Township's agricultural land base and trends, innovative planning techniques, farmland preservation by program, and agricultural economic development, see the Comprehensive Farmland Preservation Plan Element available in the office of the Planning Board. The following are excerpts from the 2023 draft Comprehensive Farmland Preservation Plan.

Residential developments in the AG, Agricultural District are encouraged to use lot size averaging designs to minimize the impact on agricultural operations as well as the potential for agricultural impacts on newly created residential lots. The ordinance allows properties to be subdivided at an overall density of one unit per ten acres. New residential lots are allowed to be as small as two acres with one large farm lot comprising the remaining acreage. Colts Neck has been extremely successful in preserving and deed restricting land through lot size averaging developments. This technique has permanently preserved over 1,799 acres of land in 20 developments shown in Table 4.5, Deed Restricted Land Lot Size Averaging Developments.

Table 4.5 Deed Restricted Land
Lot Size Averaging Developments

Application #	Name	Block	Lot	Acreage
345	Colts Neck Country Club	46	1, 1.50, 1.51 & 1.52	263.8
391	Longobardi (Laredo Drive)	7	7	30.55
421	Williamsburg Assoc.	19	12	31.27
	Williamsburg Assoc	33	2	50.49

Application #	Name	Block	Lot	Acreage
434	Robdell (Due Process)	51	2	225.5
454	Twin Lakes Estates	48	20	133.38
462	Winding Brook Farms	48	21	127.05
475	Willow Brook Manor	9	2.01, 2.07 & 2.08	63.18
486	Green Hill Estates	17	10.16	133.68
	Green Hill Estates	31	1.03 & 1.04	41.41
488	Driftwood Estates	22	10.14	62.05
449	Stavola	50.01	5.04	54.33
500	Hillcrest Manor	11	1.01 & 1.02	67.01
506	Rancho Polo	48	23.01	96.37
507	Swimming River Estates	40.05	1	70.82
ZB509	Cooke	51	1.01	45.01
532	Shadow Isle Golf Club	46	17.01 &17.02	64
546	Kureti (Dutch Lane Road)	11	3	40.30
556	Eyres	43	20.01	60.51
	Eyres	44	12.02	19.65
565	Abbatiello	40.01	7.13	64 30
700	Matzel	39	6.12	20.09
704	Mauro (The Big M)	10	2.02 & 2.09	30.28
			TOTAL	1,799.70

Source: *2023 Draft Comprehensive Farmland Preservation Element of the Master Plan*

Farmland Preservation Purchase of Development Easements

Twenty-two Township farmers have permanently preserved 1,058.99 acres through the farmland preservation program as of April 2023. As of October 2021, the County of Monmouth has preserved 15,630 acres of farmland. Of that total Colts Neck ranks third with 1,058.99 acres, only trailing Upper Freehold with 10,056 acres and Millstone Township with 1,235 acres. Table No 4.6 Farmland Preservation – Purchase of

Development Easements list the 22 farms currently enrolled in the Farmland Preservation Program.

Table 4.6
Farmland Preservation – Purchase of Development Easements

Farm	Block	Lot	Acreage
Medlin	1.01	38	6.713
Cooley	14	9	8.318
deGroot	7.30	5	22.912
Cohen	9	5	12.8
Hammond	17	19 & 20	19.784
Amdur	9	11 & 12	44.037
Cicalese	20	5	15.133
Jessop	10	8	36.02
Mosley	20	2.01	25.692
Blackburn	21	5	85.572
Ditmar	22	17	104.884
Dittmar	23	18 & 19.01	86.516
Thompson	23	15	64.668
McCrane I	34	2	72.269
McCrane II	34	18 & 19	37.654
Sessa	43	4 & 5	29.777
Barclay	34	15.01	46.53
Barclay	34	15.02	51.01
Colts Neck Twp	43	2, 2.01 & 2.02	27.314
Barney	39	6	45.567
Purdey	5	2	107.935
deGroot II	7.30	4	41.492
Druesne	39	9.01	18.397
Stivala	7.30	3.18	12.300
Feiler	23	17.02	35.700
Total			**11,058.99**

Source: *2023 Draft Comprehensive Farmland Preservation Element of the Master Plan*
Note: Some farms are listed more than once.

4.4 Residential

According to the 2020 US Decennial Census, Colts Neck contained 3,451 housing units. Ninety-two and a half percent (92.5%) of these housing units are owner-occupied. This

is a higher homeownership rate than the Monmouth County 76.2% rate. The Decennial Census also reports that 96.3% of these Colts Neck housing units are occupied and 3.7% are vacant. This is also higher than Monmouth County's 93.9% occupancy rate and 6.1% vacancy rate. Most of the Colts Neck housing units are also detached single family dwellings. Ninety four percent of the Colts Neck homes were single family dwellings as compared to the Monmouth County single family rate of 52.4%.

The 2020 US Decennial Census median value of an owner-occupied unit in Colts Neck was $847,000. This is greater than Monmouth County's median value of $576,800. As to the size of the homes, Colts Neck exceeds the County average. In 2020, 2,554 Colts Neck homes (93.9%) contained four or more bedrooms as compared to 92,176 County homes (36%) containing four or more bedrooms.

For rental units, Colts Neck's median gross rent is $2,363 per month. Again, this is more expensive than the median gross rate of $1,660 for Monmouth County.

4.5 Schools

There are three schools in Colts Neck. Conover Road Primary School and Conover Road Elementary School share the same campus. Cedar Drive Middle School is on separate location, which abuts the 61 acres of Bucks Mill Recreation Area and 57 acres of Cedar Drive School Park.

Colts Neck High School is part of the Freehold Regional School District. The district includes Colts Neck, Englishtown, Farmingdale, Freehold Borough, Freehold Township, Howell, Manalapan and Marlboro. Colts Neck High School attendees are from Colts Neck and partially from Howell and Marlboro Townships. In addition, there are magnet programs open to all District students for Law and Public Service, and Naval Junior ROTC. Colts Neck High School property is a 67-acre campus which provides fields for the various sports available to the students.

4.6 Quasi-Public

Quasi-Public uses are those that are nonprofit religious, social or other types of organizations that are open to the public on a membership basis. Quasi-public religious uses in the Township include St. Mary's Roman Catholic Church (Route 34 & Phalanx Road), Colts Neck Reformed Church (72 Route 537 West) and Colts Neck Baptist Church (25 Merchants Way). Each of these organizations offer community services or facilities beyond formal religious activities. For example, St. Mary's Church holds Alcoholic Anonymous meetings and a childcare center, Colts Neck Reformed Church contains a nursery school and has formed a partnership with Habitat of Humanity to construct an affordable single-family dwelling.

Quasi-public social organizations include Boy Scouts of America, Girl Scouts, Colts Neck Lions Club, Colts Neck Sports Foundation, Colts Neck Ladies Auxiliary, Colts Neck Business Association, Colts Neck Trail Riders Club, and Senior Citizens Club.

4.7 Recreation Areas

On June 14, 2022, the Township adopted a new Open Space and Recreation Plan Element of the Master Plan. This Plan serves as a guide for Colts Neck Township to preserve open space and create recreational opportunities for its residents. The goals contained in this Plan focus on preserving farmland, including undeveloped and environmentally sensitive land, as well as protecting potable water supplies and creating opportunities for active and passive recreation. The goals of this Plan also reflect a stronger emphasis on enhancing and upgrading existing active recreation facilities and programs. The following are excerpts from the Open space and Recreation Plan.

The Plan also satisfies the statutory requirements of N.J.S.A. 40:12-15.7 governing local governments open space, recreation and farmland historic preservation funds. The statue requires that land selected for acquisition for recreation and conservation purposes shall be in accordance with an adopted plan. See the Open Space and Recreation Element of the Master Plan for a complete analysis of the township's open space and recreation inventory, needs analysis and action plan.

The Township maintains eleven parks and open space facilities in addition to the various greenways surrounding residential cluster developments. These parks can be described in the following categories: 1) passive use nature preserves 2) active use recreation areas (large scale) and 3) Township parks (small scale).

<u>Passive-Use Nature Preserves</u>

1. ***Freer Nature Preserve*** – Located on Creamery Road, this 18.2-acre site was purchased by the Township in 1964 as a public park and was officially dedicated as a passive use nature preserve in 1977. The property is bisected by Yellow Brook and contains a mix of wetlands, upland forest, and field habitats.

2. ***Big Brook Preserve*** – Located north of Crine Road in the northwestern corner of the Township, the Big Brook Preserve consists of 233 acres of wetland and upland habitat buffering Big Brook. The site is renowned for its fossils ranging from shark teeth to rare Cretaceous marine reptiles and Ice Age mastodons.

3. ***Schlesinger Nature Preserve*** – A second habitat preserve along the Big Brook is the Schlesinger Preserve, a 39 acre mix of wetland and upland forest habitat.

4. ***Obre Road Nature Preserve*** – Acquired with Green Acres funds, the Obre Road Nature Preserve is located along the eastern boundary of the Township near Route 18.

5. ***Clover Hill Lane Preserve*** – Located at the corner of Clover Hill Lane and County Route 520, this five-acre tract was acquired with Green Acres funding in 2010

Active-Use Recreation Areas (large-scale)

There are three large-scale active-use recreational areas within Colts Neck Township. Each of the three sites serve the general recreational needs of Township residents, with each site strategically located in the eastern, central and western portions of the Township.

1. ***Bucks Mill Recreation Area*** – Acquired in 1981 with Green Acres funding, is located on Bucks Mill Road adjacent to Cedar Drive Park. The 61-acre property contains two large fields set at different grades, a wooded area, two ponds, 6,000 s.f. Community Center, block storage building, maintenance building, a playground, and a pavilion with grilling stations. The site presently includes a variety of ball fields, including one softball, two baseball, one multipurpose field and a 5,000-meter multi use trail.

2. ***Laird Road Recreation Area*** – The Laird Road site contains four baseball diamonds, two tennis courts, a snack bar and a pavilion.

3. ***Five Points Park*** – This 32-acre tract was acquired in two phases using Green Acres Funding. The original tract (Block 41, Lots 3.01 & 31) contains 26 acres and was purchased in 2001 and 2002. The center portion (Block 41, Lot 3) contains six acres and was purchased in 2019. The eastern portion of the park contains two full size soccer fields and a tot lot. A dual purpose 40/60 and 50/70 baseball field and an all-purpose artificial turf field for baseball, soccer, lacrosse and football occupy the western portion of the property.

Township Parks (small scale)

Township Parks are defined as containing active and passive use recreational facilities on a less-intense scale. Generally, these parks are smaller in size or serve limited recreational activities.

1. ***Township Hall Park (a.k.a. the "Core Site")*** – Acquired during the 1960's with Green Acres funds, this 25-acre park combines active and passive recreational activities with municipal buildings, including Town Hall, Police/Court, First Aid and the Library

2. ***Cedar Drive Park*** – This 57-acre site was acquired by the Township in 1967 using Green Acres funds. The site abuts Bucks Mill Recreation Area and contains two softball diamonds, two soccer fields, one football field, a snack shed, and one storage shed.

3. ***Memorial Park Cemetery*** – This one-acre cemetery park is located on Heyers Mill Road and contains a shaded open space. In addition to the historic Private Michael Field gravesite, the tract is used as a neighborhood picnic area and for the Township's Memorial Day services.

Table 4.7, Public, Quasi-Public, and Private Recreation Holdings lists the facility, location, ownership, acreage, and usage of major active and passive recreational holdings in the Township.

Table 4.7 Public, Quasi-Public and Private Recreation Holdings

Facility	Location	Ownership	Usage	Acreage
Federal				
NWS Earle	Route 18	US Dept of Defense	Military	5,161
Subtotal				**5,161**
State				
No State Owned Land				
County				
Dorbrook Park	Route 537	Monmouth	Active	590
Hominy Hill Golf Course	Route 537	Monmouth	Active	238
Subtotal				**828**
Township				
Freer Nature Preserve	Creamery Road	Colts Neck	Passive	18
Big Brook Nature Preserve	Boundary/Crine	Colts Neck	Passive	222
Schlesinger Nature Preserve	Crine Road	Colts Neck	Passive	39
Obre Road Nature Preserve	Obre Road	Colts Neck	Passive	15
Clover Hill Lane Preserve	Clover Hill Lane/Route 520	Colts Neck	Passive	5
Bucks Mill Recreation Area	Bucks Mill Road	Colts Neck	Active	61
Laird Road Recreation Area	Laird Road	Colts Neck	Active	59
Five Points Park	Five Points Road/Route 537	Colts Neck	Active	32
Township Hall Park	Cedar Drive	Colts Neck	Active	25

Cedar Drive Park	Cedar Drive	Colts Neck	Active	57
Memorial Cemetery	Heyers Mill Road	Colts Neck	Passive	0.5
Municipal Greenways	Various	Colts Neck	Passive	786.5
Subtotal				**1,320**
Quasi-Public				
Quasi-Public	Northern Township Border	NJ American Water	Passive	675
Subtotal				**675**
Private				
Due Process Golf Course	Route 537	Private	Active	225
Pebble Creek Golf Course	Route 537	Private	Active	133
Colts Neck Golf Course	Flock Road	Private	Active	163
Trump National Golf Course	Trump National Boulevard	Private	Active	327
Colts Neck Racquet Club	Artisan Place	Private	Active	6
Subtotal				**854**
Grand Total				**8,838**

Source: *2023 Open Space and Recreation Element of the Master Plan*
Note: State of New Jersey does not own open space or recreation lands, however, the State does own public right-of-way associated with Route 34.

Table 4.7 above shows Colts Neck contains 8,838 acres of public, quasi-public and private recreation, and conservation lands. This represents 45% of the Township's 19,660.8 acres of total land area. **Table 4.8** shows the various types of land ownership as a percentage of the Township's total land area and as a percentage of the Township's public, quasi-public and private recreation and conservation land holdings.

Table 4.8
Percentage of Recreation and Conservation Holdings

Ownership Type	Percentage of Township	Percentage Recreation/Conservation Lands
Federal	26	58
State	0	0
County	4	9
Township	7	15
Quasi-Public	3	8
Private	4	10
Total	**44%**	**100%**

Source: *2023 Open Space and Recreation Element of the Master Plan*

4.8 Commercial

The Township business districts are already developed commercially and are located along Route 34 bounded to the north by Yellow Brook and to the south by State Highway Route 18. The commercial area also extends a short distance along County Route 537 and is bounded to the east by Huddy's Inn Restaurant and bounded to the west by New Street (Block 29.13, Lot 14). No increase or change to the business zone boundary is anticipated in the future. The business districts' long-term goal is to provide neighborhood-oriented businesses specifically designed for Colts Neck residents and the Township's agricultural base.

The Colts Neck Business Association, Inc. (CNBA) is a non-profit corporation incorporated under the laws of the State of New Jersey Title 15H. It is the mission of the CNBA to be a dynamic regional organization striving to promote growth, prosperity, and quality of life for its members and community, and to be the voice for entrepreneurs, representing, advocating, and working to enhance the business environment in Colts Neck. Among its objectives the CNBA seeks to:

- Enhance the relationship between businesses and the Colts Neck community, maintaining the integrity of the "look and feel" that has made the township unique.
- Provide new and existing businesses with the most conducive and supportive atmosphere to contribute to their potential success.
- Present the township businesses and their owners in the best possible light to the community; and
- Network with local entrepreneurs to create greater and more profitable business opportunities.

The CNBA also hosts public events such as the annual Colts Neck Polo Classic to fund the restoration of Buck Mill Park walking and horse trails, sponsoring the Fourth of July Fireworks show, sponsoring a holiday window painting contest for the Colts Neck High School art students as well as hosting business networking luncheons and donations to Colts Neck's First Responders and many other charities.

4.9 References

Colts Neck Township Environmental Commission, 1983 *Natural Resources Inventory*

Colts Neck Township Planning Board, 2004 *Master Plan for Township of Colts Neck County of Monmouth, New Jersey*

Colts Neck Township Planning Board, 2013 *Farmland Preservation Element of the Master Plan*

Colts Neck Township Planning Board, 2022 *Draft Open Space and Recreation Element of the Master Plan*

Colts Neck Township Planning Board, 2023 *Draft Comprehensive Farmland Preservation Element of the Master Plan*

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Monmouth County Division of Planning & Monmouth County Agricultural Development Board, 2022 *Monmouth County Farmland Preservation Plan*

New Jersey State Planning Commission, 2002 *The New Jersey State Development and Redevelopment Plan*

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NJDEP Bureau of GIS. 2002 *Land Use / Land Cover GIS Data.*

NJDEP Bureau of GIS. 2007 Land Use / Land Cover GIS Data
NJDEP Bureau of GIS. 2015 Land Use / Land Cover GIS Data
United States, 2020 U.S. Decennial Census, Colts Neck, Monmouth County, New Jersey

5. Climate

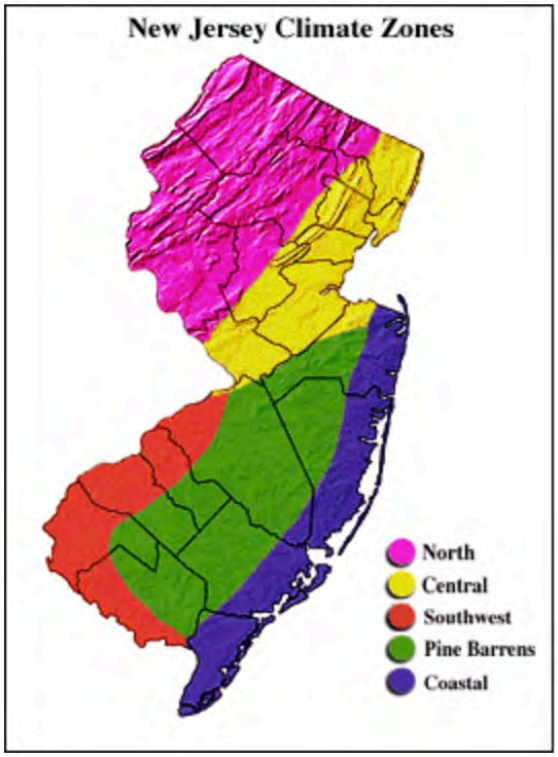
5.1 Introduction

New Jersey is located about halfway between the Equator and the North Pole, on the eastern coast of the United States. Its geographic location results in the State being influenced by wet, dry, hot, and cold airstreams, making for daily weather that is highly variable (NJ State Climatologist, 2023a).

The Garden State is 166 miles long from north to south, and its greatest width is about 65 miles. While this may seem small, there is a marked difference in climate between Cape May in the south and the Kittatinny Mountains of northwestern New Jersey (NJ State Climatologist, 2023a).

Although New Jersey is one of the smallest states in the United States (US) with a land area of 7,836 square miles, it has five distinct climate regions. The geology, distance from the Atlantic Ocean, and prevailing atmospheric flow patterns produce distinct variations in the daily weather between each of the regions. The five regions, Northern, Central, Pine Barrens, Southwest, and Coastal, are shown in Figure 5-1.

Figure 5.1 New Jersey Climate Zones



(NJ State Climatologist, 2023a)

All of Colts Neck is in the Coastal Climate Zone, except for the western-most portion, which is in the Pine Barrens. Sea breezes play a major role in the coastal climate. When the land is warmed by the sun, heated air rises, allowing cooler air at the ocean surface to spread inland. Sea breezes often penetrate 5-10 miles inland, but under more favorable conditions, can affect locations 25-40 miles inland. Colts Neck is 7 to 13 miles from the coast. The sea breezes are most common in spring and summer (NJ State Climatologist, 2023a).

According to the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC), the temperature trend (annual average) in Monmouth County is +0.3°F per decade, and the precipitation trend is +0.25 inches per decade for the period of record from 1895 to 2024, illustrated in **Figures 5.1.1 & 5.1.2**.

Figure 5.1.1 Monmouth County Average Temperature Trend

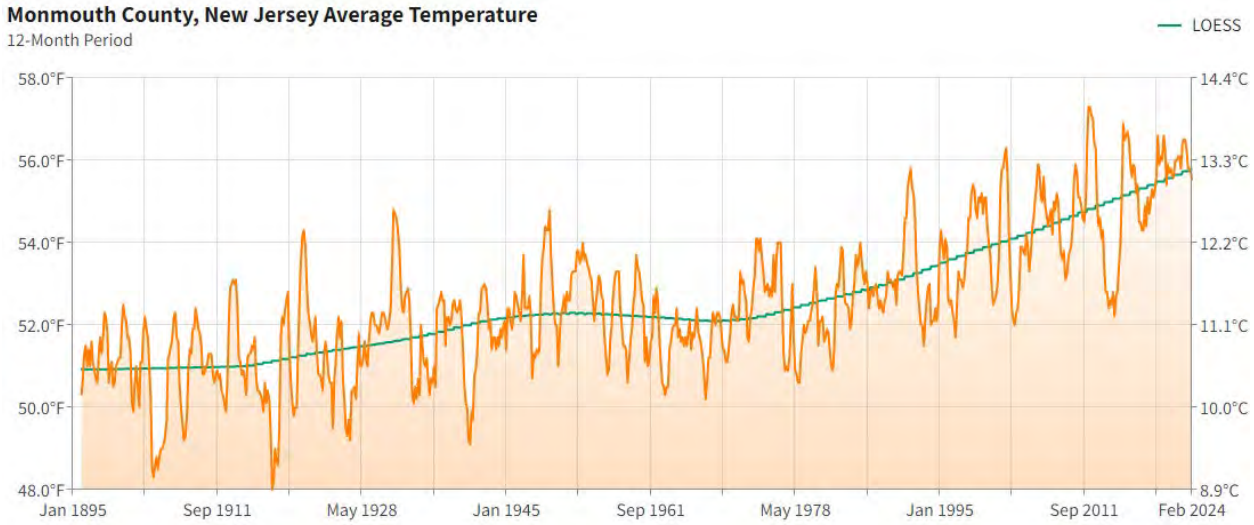
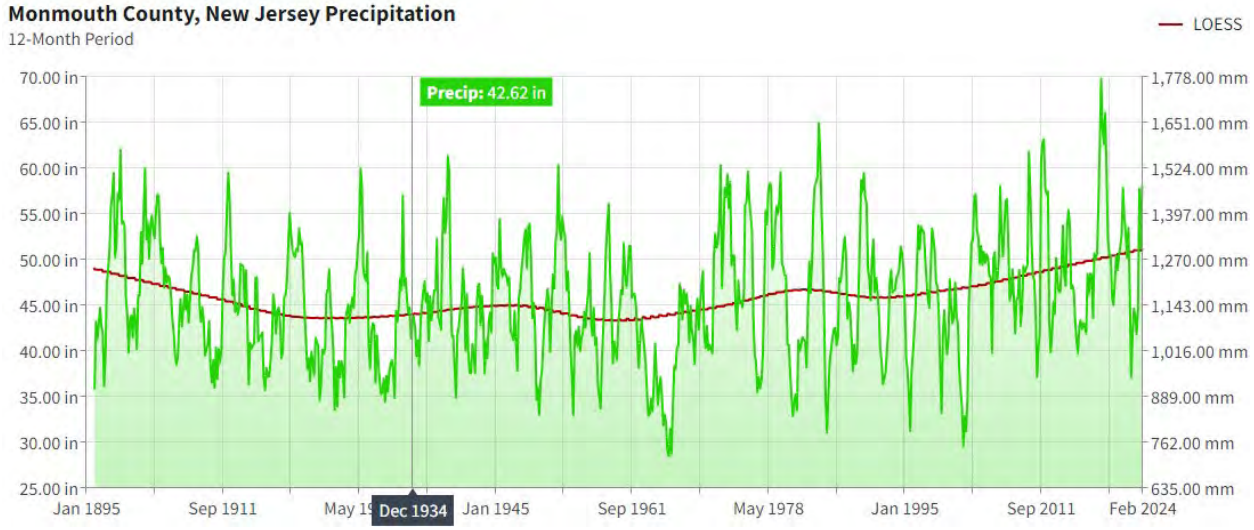


Figure 5.1.2 Monmouth County Average Precipitation Trend



(NOAA, 2024)

NOAA summarizes New Jersey's climate as follows:

- Average annual temperatures have increased by 3°F over the past century.
- Precipitation has been variable, with wetter than average conditions over the past decade.
- Sea level along the New Jersey coast has risen by more than 16 inches over the past century (Runkle et. al., 2017)

In addition, the NCDC calculates state normals (three-decade averages) of climatological variables, including temperature and precipitation. The normal maximum temperature for New Jersey has increased between 0.5 to 0.7°F for 1981-2010 compared to the 1971-2000 period. Normal minimum temperature for the state has increased 0.3 to 0.5°F (NOAA, May 16, 2011). The impacts of climate change in New Jersey may include increasing temperature, changing precipitation patterns (more intense river flooding during winter and spring, and drought during summer and fall), rising sea levels, retreating shores, saltwater intrusion, infrastructure damage, challenges for agriculture and fishing, and increased risks to human health (such as increasing respiratory ailments and diseases such as Lyme disease) (USEPA, August 2016).

5.2 Precipitation and Temperature

As the prevailing westerly winds shift north and south and vary in strength, they bring wet, dry, hot, and cold airstreams. These influence the weather throughout New Jersey, resulting in highly variable daily weather. The Office of the New Jersey State Climatologist (ONJSC) divides New Jersey into five distinct climate regions. Colts Neck Township straddles the boundary between the Coastal Zone and the Pine Barrens Zone (ONJSC, undated).

Weather in the coastal zone is determined by both continental and oceanic influences. Proximity to the Atlantic Ocean has a moderating effect on air temperatures, resulting in more gradual changes and less extreme fluctuations than elsewhere in the state. Between October and April, the coastal zone is especially prone to storms that track along the coastal plain or offshore, bringing strong winds and heavy rains to the region. The coastal zone is particularly vulnerable to tropical storms and hurricanes, which may account for a significant amount of the regional precipitation in a given year. In addition to rain and wind, damage from high tides is often associated with severe coastal storms.

Further inland, weather in the Pine Barrens zone is influenced by the porous and infertile soils. In the Pine Barrens, differing patterns of solar radiation and drier surface conditions lead to greater fluctuations in temperature and make the region more vulnerable to fire (ONJSC, undated).

The ONJSC's New Jersey Weather and Climate Network maintains weather stations which transmit real-time data and weather forecasts on the Internet. One hundred years of data from the Long Branch/Oakhurst weather station (1908-2017) is summarized in **Tables 5.3 & 5.3.1** which displays monthly average high, low, and mean temperatures, record highs and lows, and

average monthly precipitation. Current local conditions and forecasts for the area are available at https://www.njweather.org/station/3403.

Measurable precipitation falls in New Jersey on approximately 120 days per year. At the Long Branch/Oakhurst weather station, annual precipitation averaged 48.66 inches (for the period 1908-2017), which is near the higher end of the range of 40 to 51 inches in New Jersey (ONJSC, Undated; ONJSC, 2020a).

Rainfall is distributed fairly evenly throughout the year, with February being the driest month. On average, August has the highest precipitation, but conditions may appear drier because evapotranspiration exceeds precipitation (ONJSC, 2020b). The portion of Monmouth County that includes Colts Neck Township averages more than 14 days per year with precipitation one inch or greater, while precipitation levels exceeding two inches are only likely to occur two to three days per year (ONJSC, 2020c).

Snow typically contributes relatively little to the total precipitation in Howell Township (about 10" of snow equals 1" of rain). Records from the Long Branch/Oakhurst station show an average seasonal total of 18-21 inches. However, the annual snowfall totals are highly variable, ranging from 1.0 inches during the winter of 1972-1973 to 64.2 inches during the winter of 1947-1948 (ONJSC, 2020d).

The Monmouth County growing season averages about 181 days, although the season is highly variable within the county due to coastal influences. The average date for the last killing spring frost is April 20th, and the first frost of fall occurs around October 19th (USDA, 1989).

5.3 Extreme Weather

Most areas of New Jersey receive 25 to 30 thunderstorms per year, with fewer storms near the coast than farther inland. In addition, each year between 1 and 10 nor'easters bring strong winds and heavy rains to the state, particularly in the coastal zone. Approximately five tornadoes appear each year in New Jersey (usually relatively weak ones) (ONJSC, undated). Eleven tornadoes have been recorded in Monmouth County since 1950, occurring in 1952, 1955, 1960, 1964(2), 1994, 1997, 2001, 2011 and 2017 (2) and two funnel clouds have also been documented (in 2000 and 2006). During the same period, 56 hail events were recorded throughout the
County (NOAA, 2020).

Table 5.3 lists some of the highest snow and rainfall received in one month at the Long Branch/Oakhurst weather station for the period 1893 to 2019 (the most recent data available on the Internet) (ONJSC, 2020b and 2020d).

Tropical storms and hurricanes can contribute significant rainfall and can cause flooding, with the added dynamic of high wind. Some of the major storms that have affected eastern

Monmouth County are described here. Hurricane Floyd battered New Jersey on September 16, 1999, and the toll was greatest in the northern and central regions of the state. Other noteworthy tropical storms in recent years include Bertha (July 13, 1996), Isabel (September 18-19, 2003), Hanna (September 6, 2008) and Irene (August 27, 2011). Although post-tropical, Superstorm Sandy (October 28-30, 2012) was the costliest natural disaster in New Jersey, and the hardest hit areas were the coastal regions of Monmouth and Ocean Counties (NOAA, 2020). Ten days prior to the storm, eastern Monmouth County had received over two inches of rain in a 24-hour period. Sandy then delivered heavy rain, a record coastal storm surge and hurricane-force wind gusts. Some of the highest wind speeds recorded during that event were in Monmouth County (Robinson, 2012).

Table 5.3 Highest Monthly Precipitation Measured at Long Branch, NJ

Rank	Greatest Monthly Snowfall		Greatest Monthly Rainfall	
	Amount	Date	Amount	Date
1st	34.2"	March 1914	16.17"	July 1938
2nd	32.9"	December 1947	14.24"	October 2005
3rd	32.7"	February 1934	12.07"	June 2013
4th	26.5"	December 1964	11.81"	September 1938
5th	25.7"	February 1967	11.80"	August 1992
6th	24.5"	February 1979	10.49"	December 1974
Source: ONJSC, 2020b and 2020d				

The risk of coastal flooding primarily threatens Monmouth County's eastern municipalities. NJ Floodmapper (2019) does not predict any coastal flooding impacts to Colts Neck township from storms in Categories 1 to 4.

During a drought watch, voluntary water conservation measures are encouraged. During a drought warning, measures are taken to manage water supplies in order to avert a drought emergency.

A water supply emergency results in mandatory restrictions on water use in order to curtail water demand. New Jersey's longest and most severe drought occurred in the 1960s, extending from June 1961 through August 1966 (Bauersfeld et. al., 1989), and resulted in a major disaster declaration for the state (FEMA, 2017). FEMA (2017) also lists an emergency declaration for the state during the drought of June 1980 to April 1981. The most recent long-term drought of significance began in October 2001, was declared an emergency in March 2002 and ended in January 2003 for north and central New Jersey, while recent drought watches were implemented during 2010 and 2016 (NJDEP, 2019). Local rainfall records from the weather monitoring station in Long Branch indicate that average annual precipitation in the area is 47.36 inches (ONJSC, 2020b). The five years with lowest precipitation, based on long-term data from the Long Branch site, are shown in Table 5.2.

Table 5.3.1 Lowest Annual Precipitation*

Rank	Year	Amount (inches)	Deviation from Mean
1st	1988	32.63"	- 14.73"
2nd	1985	34.48"	- 12.88"
3rd	1921	35.73"	- 11.63"
4th	1963	35.83"	- 11.53"
5th	1922	36.16"	- 11.20"
*Recorded at Long Branch, NJ 1907-2019; mean = 47.36 inches			
Source: ONJSC, 2020b			

5.4 References

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https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/county/time-series/NJ-025/pcp/12/0/1895-2024?filter=true&filterType=loess

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Runkle, J., Kunkel, K., Champion, S., Frankson, R., Stewart, B., & Sweet, W. (2017). *New Jersey state climate summary* (pp. 1–4). NOAA Technical Report NESDIS 149-NJ. https://statesummaries.ncics.org/chapter/nj/
Accessed 19 November 2023

Rutgers Climate Center

New Jersey Climate Change Resource Center
https://njclimateresourcecenter.rutgers.edu

State of the Climate: New Jersey 2022
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State of the Climate: New Jersey 2021
https://njclimateresourcecenter.rutgers.edu/wp-content/uploads/2022/04/State-of-the-Climate-Report-NJ-2021-4-18.pdf

Weather

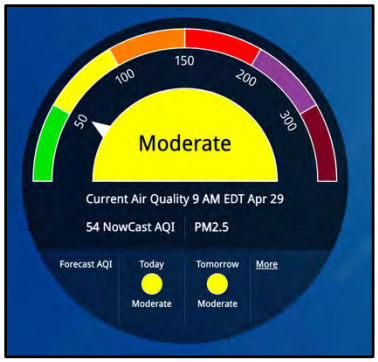
Office of NJ State Climatologist
http://climate.rutgers.edu/stateclim/?section=home&target=home

NJ Weather - current
https://www.njweather.org

NJ Climate - current
https://climate.rutgers.edu/stateclim/

Searchable Historic Daily New Jersey Weather
https://www.njweather.org/data/daily#

6. Air Quality



Air quality is a difficult environmental resource to evaluate because its sources are diffuse and regional. The causes of air pollution vary as they can include both large and small commercial businesses, manufacturing, utilities, various motor vehicle types and residential activities such as burning gas for homes.

Hundreds of scientific studies published over the past 50 years point to the harmful effects of air pollution. Adverse health effects related to air pollution exposure include hospitalizations, emergency department visits and premature death due to worsening of chronic heart and lung diseases, increased symptoms of respiratory irritation, increased asthma symptoms and medication usage, among others. Air pollution also can reduce agricultural crop yields, damage forests, ornamental and native plants, and create haze that reduces visibility. Ambient air quality standards are designed to prevent these effects (CARB, 2021).

Recognizing a need to investigate, in March 2003 the United States Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP) funded the New Jersey Comparative Risk Project to combine experts to analyze and rank chemical, physical and biological factors (stressors) according to their negative impact on human health. The study ranked several air pollutants according to the highest risk to human health, including ground-level ozone, particulate matter, radon, secondhand tobacco smoke and volatile organic compounds (VOCs).

Exposure to air pollution is a widespread problem that occurs throughout the entire state. Airborne pollutants come from a wide variety of sources, including industry, utilities, manufacturing and commercial sources, vehicles, and residential activities. On hot summer days, when pollutant levels are worse, winds in New Jersey are usually blowing from the southwest, carrying air pollution from the Washington, Baltimore, and Philadelphia metropolitan areas to New Jersey. In turn, these winds carry the pollution created there to New York, Connecticut and further to the northeast.

6.1 Criteria Pollutants

The Federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants. These commonly found air pollutants also known as "criteria pollutants'' are particle pollution or particulate matter (PM), ground-level ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead (Pb). The USEPA calls these pollutants “criteria" air pollutants and regulates them by developing human health-based and/or environmentally

based criteria for setting permissible levels. Limits based on human health are called primary standards. The Federal CAA further requires the USEPA to review and revise the NAAQS for each criteria air pollutant every five years to ensure they continue to adequately protect human health and welfare.

These six pollutants in air have been monitored for compliance with the air quality standards. Since 1970, concentrations of these six pollutants have been significantly reduced throughout the country, although there has been a slight increase in particulate matter since 2016 (USEPA 2019a and 2019b). Areas of the country where air pollution levels persistently exceed the NAAQS are designated *nonattainment.* New Jersey has never exceeded the NAAQS for NO_2 and has not exceeded the standard for lead since the 1970's. Since Pennsylvania's Portland Power Plant shut down its coal-fired units all of New Jersey is in attainment for the SO_2 standard. Portions of the state were previously nonattainment areas for 8-hour CO and ($PM_{2.5}$). Monmouth County is also a part of the Northern New Jersey-New York-Connecticut nonattainment area for the Ozone standard (NJDEP Bureau of Air Quality Planning April 4, 2019).

Table 6.1 USEPA Criteria NAAQS Limits Table

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	9.0 µg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

Pollutant [links to historical tables of NAAQS reviews]	Primary/ Secondary	Averaging Time	Level	Form
	secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (µg/m^3)

(*USEPA, 2024b*)

6.2 Air Toxics

Other air pollutants, that are not criteria pollutants, may be emitted into the air in quantities that can cause adverse health effects are classified as air toxics. The health effects cover a wide range of conditions from lung irritation to birth defects to cancer. There are no national air quality standards for these pollutants. Currently, the USEPA is working with state, local, and tribal governments to reduce air emissions of 188 toxic air pollutants to the environment (USEPA, 2024c). This list of air toxics is known as Hazardous Air Pollutants (HAPs) (USEPA, 2024d).

There is some overlap in the grouping of pollutants. Particulate matter can contain particles of air toxics, and lead is both on the HAP list and a criteria pollutant. Many of the volatile organic compounds that contribute to the formation of ozone are also HAPs. These pollutants come from a wide variety of sources, including traditional industrial and utility sources, smaller manufacturing and commercial sources, mobile sources (such as cars, trucks and buses), residential activities (such as oil burning for home heating, and painting houses), and construction equipment (NJDEP, 2021c).

6.3 Emissions Inventory

An air emission inventory is a compilation of air pollutant emissions from sources of anthropogenic (human-made) and biogenic (naturally occurring) sources. The sources are divided into five sectors, each making up one component of the inventory: point sources (large stationary), area sources (small stationary), onroad mobile sources, nonroad mobile sources and biogenic (naturally occurring). NJDEP estimates and compiles inventories that consist of actual and projected (future estimated) air emissions for the following criteria pollutants: volatile organic compounds (VOC), nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (fine $PM_{2.5}$ and course PM_{10}), sulfur dioxide (SO_2), and ammonia (NH_3). A summary of those emissions is presented below. Additional information on emission inventories, including hazardous air pollutants, can be found on USEPA's website at: https://www.epa.gov/air-emissions-inventories.

The NJDEP Emission Inventory for 2017 is summarized below. Mobile sources are the largest contributors for CO (91%) and NO_x (71%). They are important contributors for VOCs (37%) and $PM_{2.5}$ (27%), but not so for SO_2 (18%).

Table 6.3 2017 NJ Air Pollutant Emission Inventory

Pollutant Source	Pollutant % By Source					
	VOCs	CO	SO_2	NO_x	$PM_{2.5}$	NH_3
On-Road Mobile	17	43	6	42	14	25
Non-Road Mobile	20	48	12	29	13	1
Point	5	1	72	11	16	16
Area	58	8	10	18	26	58
Area Residential- wood					31	

(*NJDEP, 2021*)

Statewide anthropogenic emissions have been dropping over time. For example, from 2002 to 2017 (15 years): VOCs declined 60%; NO_2 declined 57%; and $PM_{2.5}$ declined 32%.

One can view all facilities with air quality permits with NJDEP at https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=76194937cbbe46b1ab9a9ec37c7d709b. An Air Permit is required for any operation in New Jersey, industrial or commercial, that uses equipment to release air pollutants. The facilities in Colts Neck Township with air quality permits are listed below:

Table 6.3.1 Facilities with Air Quality Permits in Colts Neck Township

Facility	Document Type	Status	Activity Number	Document Creation Date
Cingular Wireless	Permit	Approved	GEN 050001	11/29/2005
Colts Neck High School	Permit	Approved	GEN 020001	11/7/2002
Colts Neck High School	Permit	Approved	GEN 020002	4/6/2021
Colts Neck High School	Permit	Approved	GEN 020003	4/6/2021
Colts Neck TWP Public Works Dept	Permit Renewal	Renewed	PCP 960001	2/19/1998
Colts Neck TWP Schools-Cedar Drive School	Permit Renewal	Renewed	GEN 160002	10/12/2016
Colts Neck TWP Schools-Cedar Drive School	Permit	Approved	GEN 210001	5/11/2021

Facility	Document Type	Status	Activity Number	Document Creation Date
Colts Neck TWP Schools-Conover Road School	Permit	Approved	GEN 030001	9/26/2003
Colts Neck TWP Schools-Conover Road School	Permit Renewed	Renewed	GEN 150001	6/23/2015
Colts Neck TWP Schools-Conover Road School	Permit	Approved	GEN 210001	4/12/2021
Colts Neck TWP Schools-Conover Road School	Permit	Approved	GEN 010001	3/20/2001
Colts Neck TWP Schools-Conover Road School	Permit	Approved	GEN 060001	5/15/2006
Colts Neck TWP Schools-Conover Road School	Permit Renewal	Renewed	GEN 160001	10/12/2016
Colts Neck TWP Schools-Conover Road School	Permit	Approved	GEN 200001	1/28/2020
FEMA Headquarters NWS Earle	Permit	Approved	GEN 210001	1/12/2021
FEMA Headquarters NWS Earle	Permit	Approved	GEN 210002	6/24/2021
HWY 34 LLC	Permit	Approved	GEN 050001	4/1/2005
HWY 34 LLC	Permit	Approved	GEN 200001	1/21/2020
Laird & Co	Permit Renewal	Renewed	GEN 170001	4/3/2017
Laird & Co	Permit Renewal	Renewed	GEN 180001	7/30/2018
Laird & Co	Permit Renewal	Renewed	GEN 190001	4/11/2019
Laird & Co	Permit	Approved	GEN 200001	6/4/2020
Laird & Co	Permit	Approved	GEN 200002	6/4/2020
Laird & Co	Permit Renewal	Renewed	PCP 090001	1/7/2010
Naval Weapons Station Earle	Permit Renewal	Renewed	PCP 010001	8/14/2001
Naval Weapons Station Earle	Permit	Approved	BOP 200001	12/9/2020
Naval Weapons Station Earle	Permit	Approved	BOP 220001	4/26/2022

Facility	Document Type	Status	Activity Number	Document Creation Date
Naval Weapons Station Earle	Application for Permit	Pending-Providing updated Title V renewal forms, netting and equipment removal lists	BOP 220002	11/30/2022
Naval Weapons Station Earle	Permit	Approved	BOP 220003	12/1/2022
Naval Weapons Station Earle	Permit	Approved	BOP 320001	8/14/2023
Naval Weapons Station Earle	Application for Permit	Pending-Providing updated Title V renewal forms, netting and equipment removal lists	BOP 230002	8/24/2023
NEO Carriage House Cleaners	Permit	Approved	GEN 050001	7/28/2005
NEO Carriage House Cleaners	Permit	Approved	GEN 200001	7/10/2020
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 010001	3/16/2001
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 010002	3/16/2001
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 010003	3/16/2001
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 010004	3/16/2001

Facility	Document Type	Status	Activity Number	Document Creation Date
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 010005	3/16/2001
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 010006	3/16/2001
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 030001	12/29/2003
NJ American Water Swimming River Treatment Plant	Permit	Approved	GEN 230001	1/24/2023
Orchard Cleaners	Permit	Approved	GEN 050001	7/15/2005
Orchard Cleaners	Permit	Approved	GEN 210001	9/1/2021

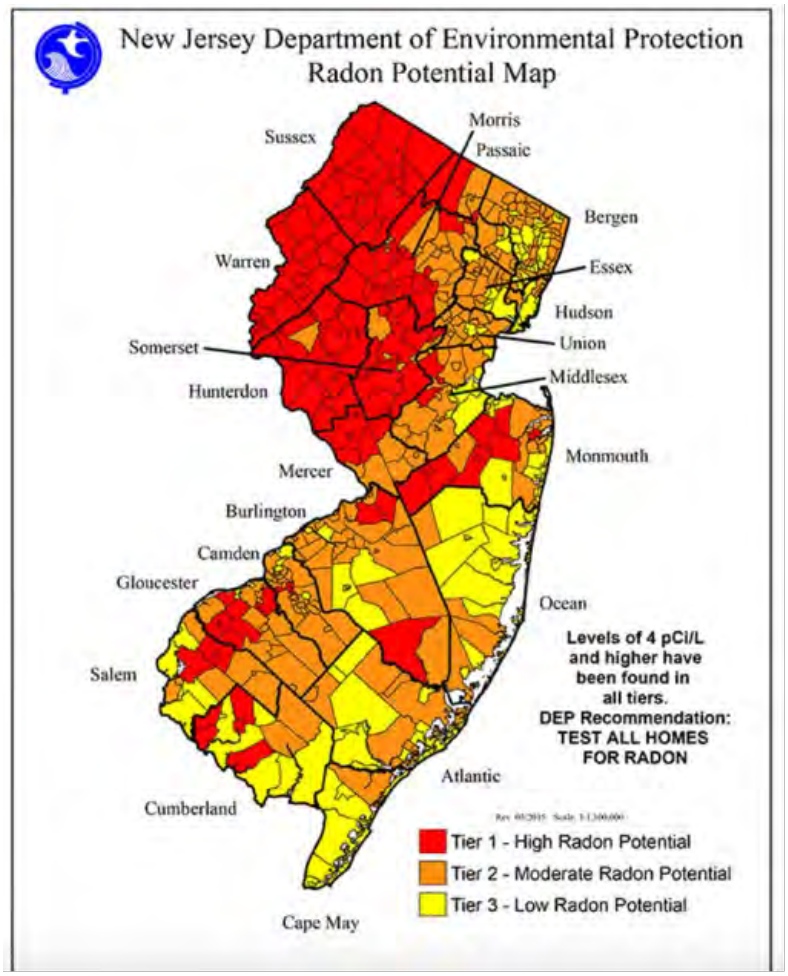
6.4 Indoor Air Quality

There are a very wide variety of air pollution sources that affect indoor air quality. They include: off-gases from products like pressed wood products, carpeting, paints and stains, clothes and other fabrics, running water (if it contains pollutants that can volatilize into the air), combustion sources (gas stoves, kerosene heaters, furnaces, fireplaces, wood burning stoves, oil lamps, and candles), aerosol sprays, cleansers and disinfectants, air fresheners, pesticides, dry cleaned clothing, printers and copiers, permanent markers, and second-hand tobacco smoke (USEPA, 2021). Indoor air quality can be worse than outdoor air quality for some air pollutants. For example, studies have found that levels of several volatile organic compounds (VOCs) average 2 to 5 times higher indoors than outdoors. (USEPA, 2021f).

6.4.1 Radon

Radon is a radioactive gas that comes from the breakdown of naturally occurring uranium in soil and rock. It is invisible, odorless, tasteless, and can only be detected by specialized tests. Radon enters homes through openings that are in contact with the ground, such as cracks in the foundation, small openings around pipes, and sump pits.
Based upon NJDEP information, radon is an air pollutant of concern in Colts Neck, as it is Tier 1 – High Radon Potential.

Radon Potential Map



(*NJDEP, 2021h*)

6.5 Ambient Air Quality

6.5.1 Air Monitoring Network

In 2019, the NJDEP Bureau of Air Monitoring (BAM) operated 32 ambient air monitoring stations around the state. The monitoring stations vary in the number and type of monitors operating at each site. There is one station in Monmouth County to measure ozone, at Monmouth University.

New Jersey Air Monitoring Sites in 2019

Source: (*NJDEP, 2020*)

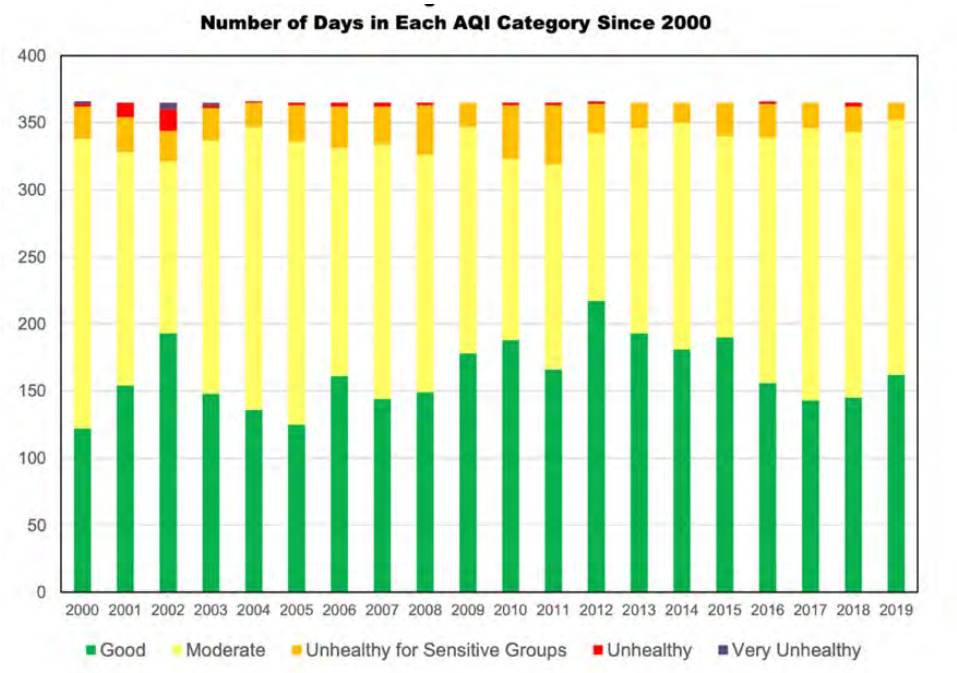
6.5.2 Air Quality Index

Every morning an air pollution forecast for the current and following day is prepared by the New Jersey Department of Environmental Protection (NJDEP) using the AQI format. The forecast is provided to USEPA and is disseminated through the Enviroflash system to subscribers who sign up to receive air quality forecast and alert emails or texts (www.enviroflash.info). Anyone can view the forecast and current air quality conditions at USEPA's AirNow website (www.airnow.gov), or at NJDEP's recently revised air monitoring webpage (https://nj.gov/dep/airmon). The actual real time concentrations can be viewed on NJDEP's website, https://www.nj.gov/dep/airmon/.

IQAir has a website (https://www.iqair.com/us/usa/new-jersey) that also reports the NJDEP monitoring data as an Air Quality Index (AQI).

The number of "Unhealthy" and "Very Unhealthy" days have clearly decreased. However, there is no upward trend in the number of "Good" days.

Figure 6.5.2



Source: (NJDEP, 2021)

6.6 Air Quality Trends

6.6.1 Criteria Pollutants

Several of the criteria pollutants in the state are in excellent shape. Air concentrations of lead have dropped dramatically since a standard was established in 1978. The phase-out of leaded gasoline, and removal of lead from paint and other products, have resulted in a significant reduction in lead concentrations. The last exceedances of the NAAQS were over 35 years ago. With the federal mandated reductions in automotive emission rates, the last exceedances of the NAAQS for carbon monoxide were over 25 years ago. After a coal-fired power plant in Pennsylvania near the Delaware River was closed, there have been no exceedances of the NAAQS in the past 5 years for sulfur dioxide.

6.6.2 Criteria Pollutants of Concern

Numerous studies over the years have documented hundreds of thousands of people in the US, and millions around the world, die prematurely annually because of high $PM_{2.5,}$ ozone, and NO_2 levels (Zhang et al., 2019, Atkinson et al., 2019, Harvard, 2021). These are the pollutants of major concern in this area:

- **PM** - Particulate matter (PM) consists of microscopic solids, or liquid droplets, that are so small that they can be inhaled and cause serious health problems. Some particulates less than 10 micrometers in diameter (PM_{10}) can get deep into your lungs and may get into your bloodstream. Particles less than 2.5 mm in diameter, known as fine particles or $PM_{2.5}$, pose the greatest risk to health. Exposure to $PM_{2.5}$ can affect both your lungs and your heart. People with heart or lung diseases, children, and older adults are the most likely to be affected by particle pollution exposure (NJDEP, 2021i and American Lung Association, 2021b).

- **O_3** - Tropospheric, or ground level ozone (O_3), is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight. Ozone is most likely to reach unhealthy levels on hot sunny days in urban environments but can still reach high levels during colder months. Ozone can also be transported long distances by wind, so even rural areas can experience high ozone levels (USEPA, 2021d).

  Depending on the level of exposure, ozone can cause coughing, make it more difficult to breathe deeply, inflame and damage the airways, aggravate asthma, emphysema, and chronic bronchitis and other negative effects. Some of these effects have been found in healthy people, but effects can be more serious in people with lung diseases such as asthma. (USEPA 2024) They may lead to increased school absences, medication use,

visits to doctors and emergency rooms, and hospital admissions. Long-term exposure to ozone is linked to aggravation of asthma and is likely to be one of many causes of asthma development. Studies in locations with elevated concentrations also report associations of ozone with deaths from respiratory causes (USEPA, 2021d; American Lung Association, 2021a; Zhang et al., 2019).

- **NO_2** – Nitrogen dioxide, or NO_2, is a gaseous air pollutant composed of nitrogen and oxygen and is one of a group of related gases called nitrogen oxides, or NO_x. NO_2 forms when fossil fuels such as coal, oil, gas, or diesel are burned at high temperatures. NO_2 and other nitrogen oxides in the outdoor air contribute to particle pollution and to the chemical reactions that make ozone. (USEPA 2024a). NO_2 can also form indoors when fossil fuels like wood, or natural gas, are burned (American Lung Association, 2021c).

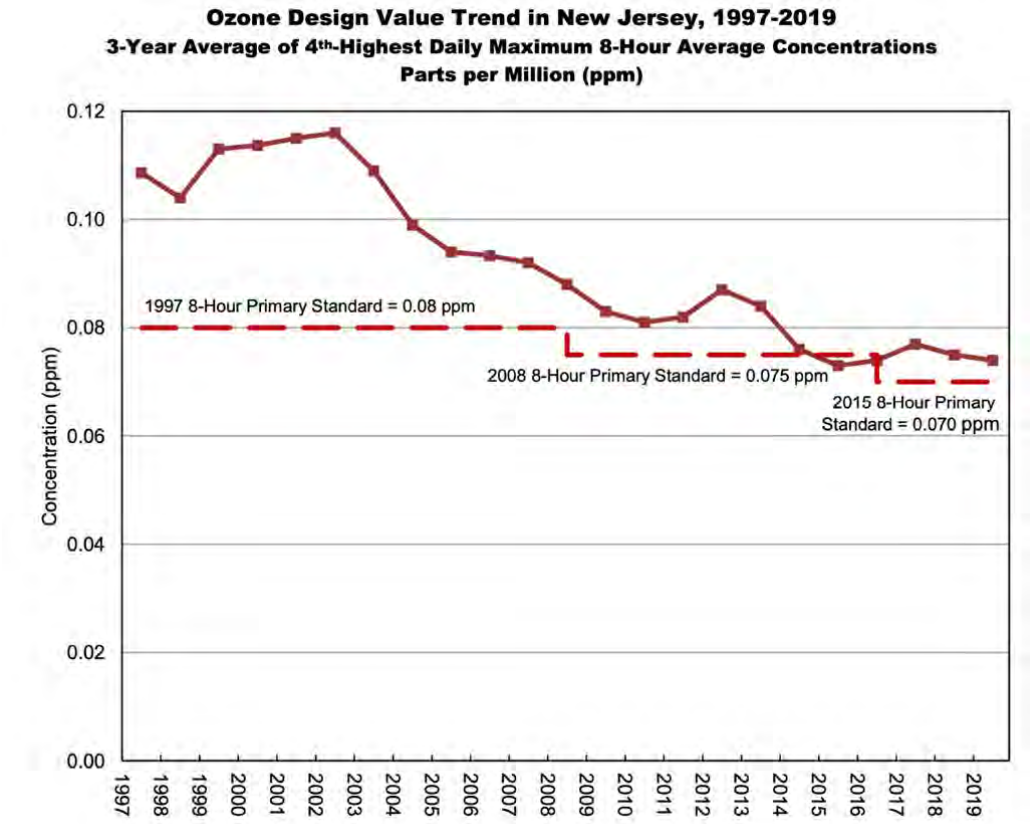
  NO_2 causes a range of harmful effects on the lungs, including increased inflammation of the airways, reduced lung function, increased asthma attacks, increased susceptibility to respiratory infections, lower birth weight in newborns, and increased risk of premature death. People with asthma, as well as children and the elderly are generally at greater risk for the health effects of NO_2 (Atkinson et al., 2018; American Lung Association, 2021c).

Table 6.6.2 New Jersey Criteria NAAQS Levels

NAAQS and New Jersey Status

Pollutant	Primary Standards			Designation
	Level	Date	Averaging Time	
Ozone	0.12 ppm	1979	1-hour	Standard revoked
	84 ppb	1997	8-hour	Nonattainment
	75 ppb	2008	8-hour	Nonattainment
	70 ppb	2015	8-hour	Nonattainment
PM2.5	15.0 µg/m3	1997	Annual	Attainment
	35 µg/m3	2006	24-hour	
	12 µg/m3	2012	Annual	Unclassifiable-Attainment
PM10	150 µg/m3	1987	24-hour	Attainment
SO2	0.03 ppm	1971	Annual	Standard revoked
	0.14 ppm	1971	24-hour	
	75 ppb	2010	1-hour	Unclassifiable-Attainment
CO	9 ppm	1971	8-hour	Attainment
	35 ppm	1971	1-hour	
	New monitor	2011		No New Requirements
NO2	53 ppb	1971	Annual	Attainment
	100 ppb and New monitor	2010	1-hour	Unclassifiable-Attainment
Lead	1.5 µg/m3	1978	Quarterly Average	Attainment
	0.15 µg/m3	2008	Rolling 3-Month Average	Unclassifiable-Attainment

Source: *(NJDEP, 2020)*



The State expects additional emission reductions of ozone precursors in the future due to existing State and federal controls that have been adopted and will be implemented. These controls include new engine standards for motor vehicle and off-road equipment, New Jersey's high electric demand day and power plant controls and the federal Tier 3 motor vehicle standards. The Federal Mercury and Air Toxics Standards (MATS) rule aimed at reducing toxic pollutants from power plants and anticipated voluntary modifications in the electric power industry due to conversions to natural gas will also have the benefit of reducing emissions of NO_x (NJDEP, 2021e).

Transported pollution has a serious impact on New Jersey's air quality. As a result, reductions in O_3 in the future will require emission reductions in both NOx and VOCs achieved over a large multi-state region, with a focus on high electric demand days and O_3 episodes (NJDEP, 2021e).

Colts Neck is about 8 miles west of the monitoring station at Monmouth University, and 17 miles southeast of the monitoring station at Rutgers University. The ozone concentrations at those two stations are compared to the values at the other 14 stations around the state below.

Table 6.6.3 New Jersey Criteria NAAQS Levels 2019 Ozone Concentrations in NJ, ppm

Monitoring Sites (16 total)	1-hr Daily Maximum	8-hr Averages			
		Highest Daily Maximum	4th Highest Daily Maximum	2017 to 2019 Average of 4th	NAAQS

				Highest Daily Maximum	
Highest conc	0.102	0.085	0.071	0.074	0.070
Rutgers	0.085	0.075	0.070	0.073	0.070
Monmouth	0.076	0.070	0.067	0.065	0.070
Lowest conc	0.073	0.062	0.058	0.061	0.070

Source: *(NJDEP, 2000)*

Rutgers and Monmouth Universities are neither the highest or the lowest concentrations in the state, and assuming that Colts Neck's concentrations are between the Rutgers and Monmouth values, Colts Neck ozone concentrations should be very close to the statewide averages.

The annual $PM_{2.5}$ concentrations are improving. $PM_{2.5}$ is not a regional pollutant like ozone. It can be very variable with a background value component over which local emissions are superimposed. Locations near major sources, such as high concentration of diesel buses, or trucks, or combustion sources such as boilers, furnaces or fireplaces, will experience higher concentrations of $PM_{2.5.}$ Given the rural nature of Colts Neck and low intensity of development, it is unlikely that such hot spots exist in Colts Neck. However, Colts Neck residents can be exposed to higher $PM_{2.5}$ concentrations when traveling to other more developed areas of the state, or other major metropolitan areas.

With respect to what levels can be expected in Colts Neck, data from three monitoring stations around the state are summarized below. All values are comfortably below the NAAQS.

Table 6.6.4 2019 $PM_{2.5}$ Concentrations in NJ, g/m^3

Monitoring Station	Annual Average		24-hr Average Highest	24-hr Average 98^{th}%ile	24hr NAAQS
	Monitored	NAAQS			
Brigantine	6.97	12	21.3	15.8	35
Rutgers	7.88	12	25.4	17.1	35
Camden Spruce Street	10.22	12	33.0	26.8	35

Source: *(NJDEP, 2020)*

6.7 Air Toxics Review

Review of the state and county average air toxic concentrations indicates that several of the pollutants are of concern in Monmouth County. Estimated health risks across that state have decreased from previous years.

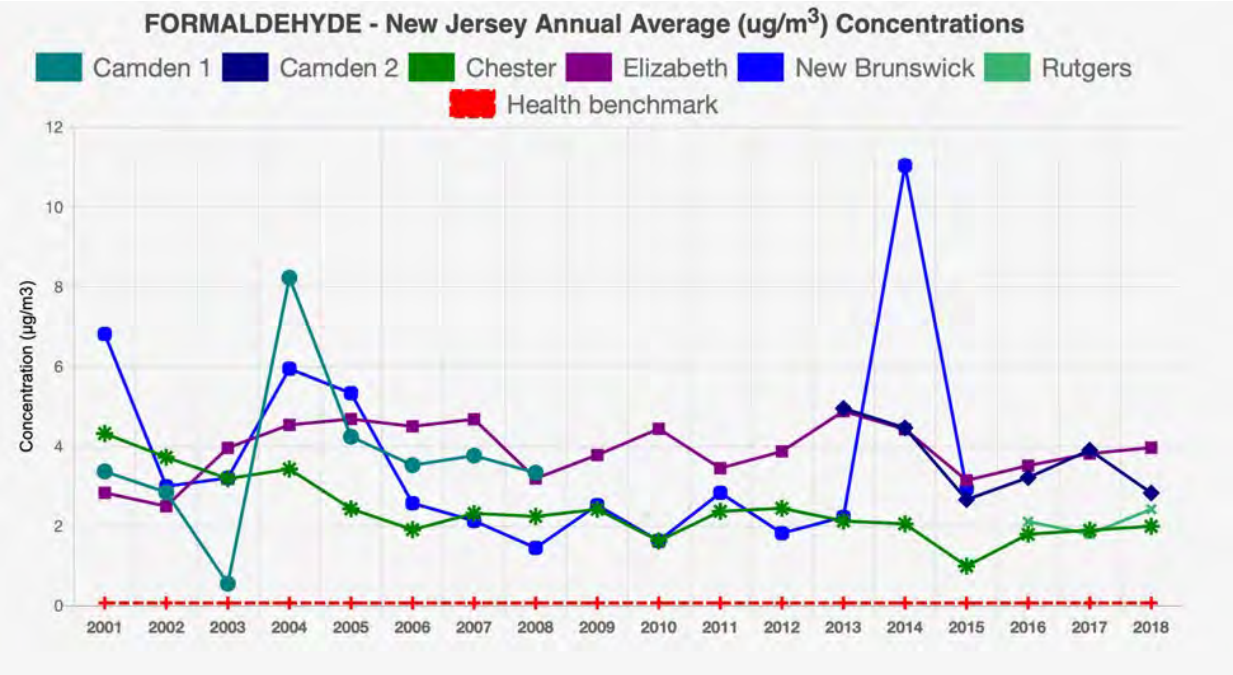
Monmouth County Average 2019 AirToxScreen Modeled Air Concentrations Compared to Health Benchmarks								
Pollutant	Modeled Air Concentration ($\mu g/m^3$)	Health Benchmark ($\mu g/m^3$)	Risk Ratio	% Contribution by Source Category				
				Point Sources	Nonpoint Sources	Onroad Mobile	Nonroad Mobile	Background & Secondary
1,3-Butadiene	0.019	0.033	0.58	4	28	36	32	0
4-4' Methylene bis(2-chloroaniline)	--	0.0023	--	--	--	--	--	--
Acetaldehyde	0.67	0.45	**1.5**	1	6	3	2	88
Benzene	0.31	0.13	**2.4**	2	36	33	29	0
Cadmium Compounds	0.000037	0.00024	0.15	44	36	0	20	0
Carbon tetrachloride	0.52	0.17	**3.1**	0	0	0	0	100
Chromium VI	0.000023	0.000083	0.28	64	26	6	4	0
Diesel Particulate	0.25	0.0033	**77**	0	0	44	56	0
Ethylene oxide	0.00019	0.0002	0.97	96	4	0	0	0
Formaldehyde	1.0	0.077	**13**	1	6	2	3	88
Naphthalene	0.029	0.029	**1.0**	4	70	15	11	0

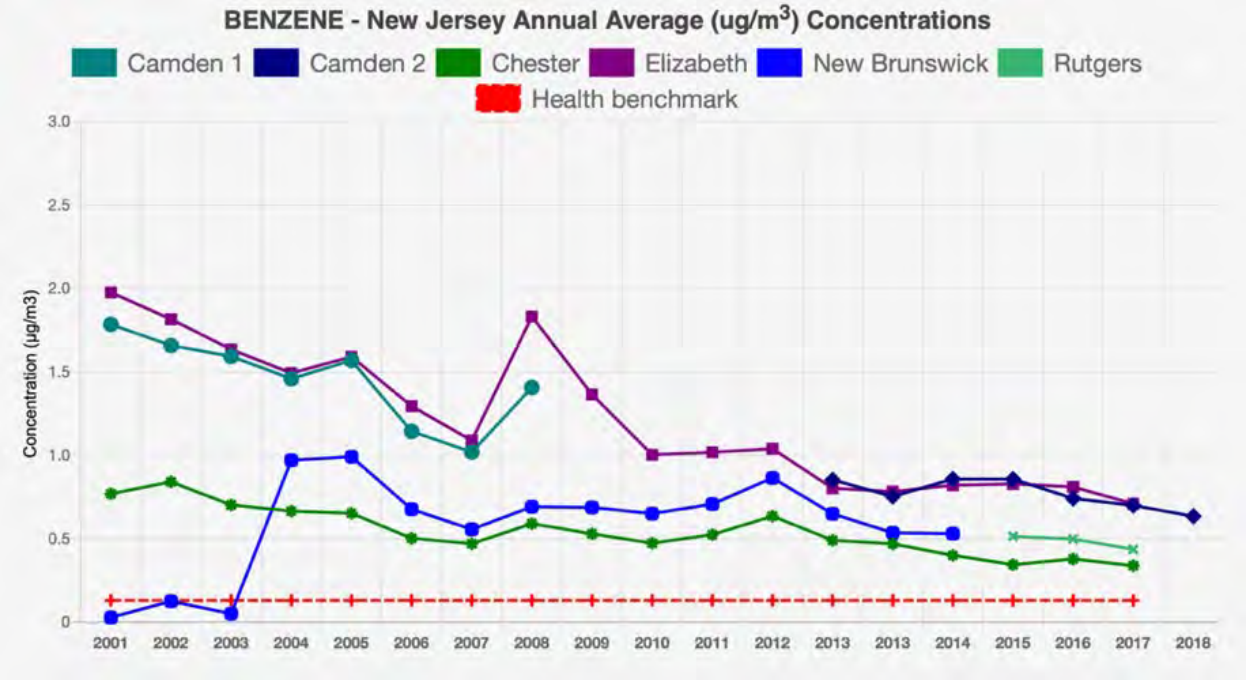
- Chemicals with risk ratios greater than or equal to 1 are in **bold**.
- Risk ratios based on noncarcinogenic effects are in *italics*.
- The symbol $\mu g/m^3$ is micrograms per cubic meter, the amount (in micrograms) of a chemical in a cubic meter of air. This is also known as a concentration.
- For diesel particulate matter, onroad and nonroad concentrations include a model-estimated background concentration.

*Acetaldehyde and formaldehyde concentration estimates include secondary formation, which is the process by which chemicals in the air are transformed into other chemicals.

(NJDEP, 2024)

The trends for two of the most important air toxics in Monmouth County are formaldehyde and benzene. Formaldehyde has remained in the same range over the past 19 years, and benzene over the last 5 years has only shown slight decreases.





(NJEPA, 2024a)

What Can Private Citizens Do?

There are numerous actions residents can take.

1. Reducing your air pollutant emissions.
2. Altering activities on high ambient air pollution.
3. Improving indoor air quality:

The USEPA has published the following tips for citizens to help reduce air pollutant emissions:

- Conserve energy - at home, at work, everywhere.
- Look for the ENERGY STAR label when buying home or office equipment.
- Carpool, use public transportation, bike, or walk whenever possible.
- Follow gasoline refueling instructions for efficient vapor recovery.
- Consider purchasing portable gasoline containers labeled “spill-proof.”
- Keep auto, boat, and other engines properly tuned.
- Be sure your tires are properly inflated.
- Use environmentally safe paints and cleaning products whenever possible.
- Mulch or compost leaves and yard waste.
- When buying or leasing new automobiles try to select models that have higher fuel efficiency, including hybrids and electric vehicles.

On Days when High Ozone Levels are Expected, take these extra steps to reduce pollution:

- Choose a cleaner commute - share a ride to work or use public transportation.
- Combine errands and reduce trips. Walk to errands when possible.

- Avoid excessive idling of your automobile.
- Refuel your car in the evening when its cooler.
- Conserve electricity and set air conditioners no lower than 78 degrees.
- Defer lawn and gardening chores that use gasoline-powered equipment, or at least wait until evening.

On Days when High Particle Levels are expected, take these extra steps to reduce pollution:

- Reduce the number of trips you take in your car.
- Reduce, or eliminate, fireplace and wood stove use.
- Avoid burning leaves, trash, and other materials.
- Avoid using gas-powered lawn and garden equipment.

When you see that the AQI is unhealthy, take simple steps to reduce your exposure:

- Choose a less strenuous activity.
- Take more breaks during outdoor activity.
- Reschedule activities to the morning or another day.
- Move your activity inside where ozone levels are usually lower.

Actions that you can take to improve indoor air quality:

- Do not allow smoking inside the house.
- Ensure proper ventilation during short-term activities that can generate high levels of pollutants, for example: painting; paint stripping; heating with kerosene heaters; cooking; or engaging in maintenance and hobby activities such as welding, soldering, or sanding. (USEPA, 2021).
- Ensure proper ventilation after bringing new carpet, drapes, or furniture into the house, painting walls and woodwork, staining or finishing floors.
- Keep your floors fresh (WebMD, 2021):
    - Vacuum with a HEPA filter to reduce concentrations of lead in your home. You can also get rid of other toxins, like brominated fire-retardant chemicals (PBDEs) as well as allergens like pollen, pet dander, and dust mites.
    - Mopping picks up the dust that vacuuming leaves behind. New microfiber mops (and dust cloths) capture more dust and dirt than traditional fibers and don't require any cleaning solution.
    - Put a large floor mat at every door. A door mat reduces the amount of dirt, pesticides, and other pollutants from getting into your home.
- Other measures (WebMB, 2021):
    - Look for fragrance-free laundry products.
    - Switch to mild cleaners that do not include artificial fragrances.
    - Stop using aerosol sprays-deodorants, hair sprays, carpet cleaners, furniture polish, and air fresheners.
    - Let in fresh air and open windows in your home.
    - Bring nature indoors with air filtering plants like a fern, spider plant, or aloe.

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7. Physiography, Geology, and Topography

7.1 Physiography

The landscape of New Jersey has formed from more than one billion years of geological processes. These include processes such as mountain building, erosion, and deposition. These have given New Jersey unique landforms which are divided into four regions known as *physiographic provinces* (New Jersey Geological Survey, 2006). *Physiography* is the study of physical features and patterns of the earth's surface and is a combination of the words "Physical" and "Geography. The contiguous United States (the 'Lower 48') are divided into physiographic provinces according to their common topography, rock type, structure, and geologic history (Physiographic divisions of the conterminous U.S., 2021). Physiographic provinces can further be divided into divisions. The *Piedmont* and the *Coastal Plain* are major physiographic divisions of the United States (Physiographic provinces, 2017) which are within the boundaries of Monmouth County in New Jersey.

Physiographic provinces in New Jersey are called the Valley and Ridge, Highlands, Piedmont, and Coastal Plain (sometimes divided into inner and outer). The first three are grouped with the larger classification of the Appalachian Highland division, and the latter with the Coastal Plain physiographic divisions of the United States (New Jersey Geological Survey, 2006). Colts Neck Township is mostly in the inner coastal plain of New Jersey. This region begins below the Piedmont region and runs along the state's southwestern border. The soil in this region is a fertile mixture of clay, sand, and silt, making it desirable for farming. It is part of the larger Coastal Plain province of New Jersey. The Coastal Plain province of New Jersey lies southeast from Trenton to Perth Amboy and covers approximately three fifths of the state (Dahlgren, 1977).

Colts Neck Township is located in Monmouth County which is bordered north by Raritan Sandy Hook Bays, west by Mercer and Middlesex Counties, and south by Burlington and Ocean counties. Monmouth County, which is in the northeast section of the Coastal Plain, shares this physiographic province with ten (10) other counties making the Coastal Plain the largest physiographic province in New Jersey (New Jersey Geological Survey, 2006). It has an area of 4,667 sq miles and occupies three-fifths of the state of New Jersey. The unconsolidated deposits of the Coastal Plain are aged from the upper Lower Cretaceous to the Miocene (90 to 10 million years old) (New Jersey Geological Survey, 2006). For extensive periods of time, the Coastal Plain of New Jersey was a shallow shelf and received sediments from the eroding Appalachian Mountains (Monmouth County Environmental Council, 1988).

The Atlantic Coastal Plain of New Jersey is part of the larger Coastal Plain Physiographic Province of the eastern United States. The Coastal Plain physiographic province is broad, with relatively low relief along the Atlantic Ocean and Gulf of Mexico of the United States. (Fennemenan 1938; Fenneman and Johnson, 1946 as cited in Ator, 2005). The portion of which,

includes New Jersey, is gently inclined from altitudes of 80 to 100 meters at the Fall Zone down to sea level. Most areas are less than 55 m above sea level, with the maximum altitude of the Coastal Plain in the Mid-Atlantic Region exceeding 175 m in south central North Carolina. The Coastal Plain is divided by major rivers and their tributaries. Their tributaries in the form of estuaries include Chesapeake Bay, Delaware bay, and Albemarle Sound (Ator, 2005).

7.2 Geology

Monmouth County has variations in its long geological history. The oldest known rocks underlying the county were deposited in a shallow sea. These sediments, consolidated under great pressures and temperatures, became sandstones and shales. These sandstones and shales were introduced to igneous rocks and altered to gneisses (pronounced nice's) folded complexly and schists. These rocks are known as the Wissahickon Formation and are generally considered to be late Precambrian (about 600 million years) in age. The Wissahickon formation was then eroded and went through nondeposition for an extended period. Nondeposition and erosion occurs when a landform lies above sea level. Streams journey across a positive landform carrying away silt and sand to a negative (below sea level) landform. Approximately 120 million years ago during the Cretaceous epoch the Appalachian Mountains to the west were uplifted and streams flowing eastward deposited sediments along the coast. Another period of nondeposition and erosion occurred and some of the early Cretaceous sediments were removed. This cycle was repeated once again during the late Cretaceous period and culminated with a complete withdrawal of the sea. Northern and central Colts Neck township formations were created during the upper Cretaceous time period, with the southern portion following later during the tertiary period specifically the Paleocene (Monmouth County Environmental Council, 1988).

Colt's Neck is located on the northern Coastal Plain of New Jersey, specifically on the border of the inner and outer coastal plain. It is mostly on the inner coastal plain within its central and northern portions, with the very southeastern portion of the township located in the outer coastal plain. *Bedrock* is consolidated (solid) rock that underlies soil and other unconsolidated materials like silt and gravel. (United States Geological Survey, 2022). In geologic maps, bedrock is often categorized into geologic formations. Underneath the surface of the Coastal Plain there lies a wedge of sands and clays, which thickens towards the coast. The different stratigraphic units that make up the wedge are divided into units called *formations*. Formations are mappable stratigraphic units that can be identified over a large area with similar characteristics (Dahlgren, 1977). They are not necessarily the same however at all locations. In the northern Coastal Plain of New jersey there is a sequence of medium to coarse grained quartz and glauconite sands called the Monmouth Group. It is divided into four bedrock formations (Nichols, 1977).

In the Monmouth group, there are a few formations that are beneath central and northern Colts Neck Township. There is the Navesink Formation, which is a large dark-colored clayey

Colts Neck Township 2024 Environmental Resource Inventory

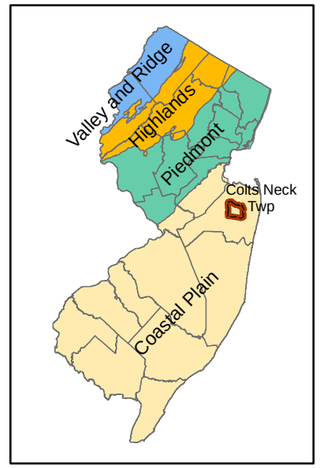

Figure 7.2 Physiography and Geology

HOLMDEL TWP
MIDDLETOWN TWP
MARLBORO TWP
FREEHOLD TWP
HOWELL TWP
WALL TWP
BOROUGH OF TINTON FALLS

0 3,500 7,000 Feet

Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Geology

- Tht- Hornerstown Formation
- Kml- Mt. Laurel Formation
- Kns- Navesink Formation
- Kt- Tinton Formation
- Krbsh- Sandy Hook Member
- Tch- Cohansey Formation
- Kw- Wenonah Formation
- Tkl- Lower Member Kirkwood Formation
- Tvt- Vincentown Formation
- Krbs- Shrewsbury Member

GIS Data Sources:
1. Bedrock Geology data: NJDEP (2006).
2. Physiographic data: NJDEP (2002).
3. Roads: NJDOT (2017).
4. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Twp.
5. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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glauconitic sand. It abruptly overlies the Mount Laurel formation throughout the New Jersey Coastal Plain. The Navesink formation connects upward to another formation of Colts Neck, the Red Bank Formation, which is divided into two members. One of these members (lower member) is dominantly dark silty sand, grading laterally into a glauconitic sand, and the other (upper member) is a light-colored fine to coarse sand. The third formation in Colts Neck is the Tinton sand formation which connects gradationally and overlays the Red Bank (Nichols, 1977).

In the southern third of Colts Neck we find formations later in age from the Tertiary period. Directly overlying the Tinton there is the Hornerstown Formation, which is highly glauconitic sand with some clay. It is marine in origin and is locally highly fossiliferous. Another formation is the Vincentown Formation with calcareous sand and quartz sand which is more developed. It is also marine in origin and created during the Paleocene period (Monmouth County Environmental Council, 1988). Specific information for all the formations found in Colts Neck Township without Naval Weapons Station (NWS) Earle (north and central Colts Neck) and NWS Earle portion (south Colts Neck) is listed below. Summarized in Table 7.2 are the acreages of the formations that outcrop in Colts Neck Township (Non-NWS Earle). The formations are illustrated in Figure 7.2.

Table 7.2 Description of Geologic Formations in Colts Neck Township (without NWS Earle acreage)

Symbol- Name	Lithologic constituents	Age (approx.)	Acres	Percent
Kml-Mt. Laurel Formation	quartz sand, fine to coarse grained, slightly glauconitic	69-71 million years ago	272	2%
Kns- Navesink Formation	glauconite sand, clayey	65-69 million years ago	892	6%
Krbs- Shrewsbury Member	quartz sand, fine to coarse grained	65-66 million years ago	4852	30%
Krbsh- Sandy Hook Member	quartz sand, fine grained, clayey, micaceous	65-66 million years ago	1128	7%
Kt- Tinton Formation	quartz sand, glauconitic, locally indurated	65-66 million years ago	5794	36%
Kw- Wenonah Formation	quartz sand, fine grained, silty, clayey micaceous	70-74 million years ago	27	<1%
Tch- Cohansey Formation	quartz sand, medium to coarse grained	5.3-23 million years ago	40	<1%
Tht- Hornerstown Formation	glauconite sand, fine to medium grained	56-66 million years ago	1156	7%
Tkl- Lower Member Kirkwood Formation	quartz sand and clay	5.3-23 million years ago	393	2%

Tvt- Vincetown Formation	quartz sand, medium grained, clayey; and glauconitic near base	56-66 million years ago	1548	10%
Sources: NJDEP Bureau of GIS in cooperation with USGS National Geologic Mapping Program. Geologic dates from: Sugarman et al., 1995; Rea, 2017.		**Total**	**16,102**	**100%**

In correlation with the formations located in Colts Neck Township, there exists aquifers which supply water through domestic wells. Within the very southernmost eastern portion of the township on the NWS Earle Base the Kirkwood and Cohansey formations contain the Kirkwood-Cohansey aquifer system, the Wildwood Belleplain Confining unit, the Rio Grande and the Atlantic City 800-foot sand aquifers (Sugarman et. al 2019). A *confining unit* is a relatively low permeability geologic unit that impedes the vertical movement of water (Carter, 2002) in comparison with an aquifer that contains porous materials allowing water to be transmitted to a well.

To the north in correlation with the Vincetown Formation is the Vincetown aquifer which supplies domestic and some industrial and public supply wells. It is a more productive aquifer in Monmouth County than Ocean County. Moving towards the north and central portion of Colts Neck there exists the Red Bank Sand aquifer which consists of the Shrewsbury Member of the Red Bank Formation. It is a minor aquifer in Monmouth County that supplies domestic wells with water in Colts Neck Township. The Tinton, Navesink and Sandy Hook member of the Red bank formation are within the Navesink-Hornerstown confining unit. Lastly, in minor areas within the north western portion of the township there exists the Wenonah-Mount Laurel aquifer which consists of the medium glauconitic sands of the Mount Laurel Formation and the fine sands of the Wenonah Formation (Nemickas, 1976). It is variable in thickness, and where the sands are thin in the upper part of the Mount Laurel Formation, approximately 100 feet separate the Wenonah-Mount Laurel aquifer and Englishtown aquifer. Where aquifer sands are thicker, separation is more limited and the two aquifers are partly interconnected. The Wenonah-Mount Laurel aquifer is a productive source of water for its area but is limited through its varied lithology and thickness (Sugarman et. al 2019).

The Englishtown aquifer underlies the Wenonah-Mount Laurel formation in Colts Neck. The Englishtown aquifer together with the underlying and overlying confining beds, constitutes the Englishtown aquifer system. This aquifer system is a subsystem of the larger Coastal Plain aquifer system of New Jersey. The overlying confining bed, which includes the Marshalltown Formation and part of the Wenonah Formation, provides the interconnection between the Englishtown subsystem and the overlying part of the larger system. The quartz sand lithofacies of the Englishtown aquifer are utilized as a source of water throughout a portion of the New Jersey Coastal Plain. It is an important source of water supply in the northeastern Coastal Plain in Monmouth County and northern Ocean County. Colts Neck Township has potable wells developed within the Englishtown aquifer system (Nichols, 1977).

Colts Neck Township Formations

**Also found in NWS Earle*

Ktrs- Tinton and Red Bank Formations (Shrewsbury member), undivided (Upper Cretaceous)

Tinton is quartz and glauconite sand, dark-gray to dark-yellow in color and locally indurated by siderite into hard, massive ledges. Sand is dark gray to dark yellow without weathering. Siderite changes color to orange brown where weathered because of iron oxides, staining the formation in exotic patterns. In the high hills of the northern coastal plain, fine gravel or large shell concentrations are found along the basal contact. The basal bed is a large, glauconitic, fine to medium-grained quartz sand with scattered gravel. The basal bed is large due to extensive bioturbation. Burrows are filled with glauconitic sand of the Tinton and project down into the quartz sand of the underlying Red Bank Formation.

The Shrewsbury member of the Red Bank Formation is quartz sand, fine to coarse grained, somewhat clayey and micaceous. It is mostly massive with local crossbedding small in size, color a light yellow to red or dark brown and slightly glauconitic at the base. The Shrewsbury is highly burrowed but does not usually contain elements of fossiliferous. It has a minor sand constituent of feldspar.

Kshn- Red Bank (Sandy Hook Member) and Navesink Formations

The Sandy Hook member of the Red Bank Formation is less in thickness than the overlying Shrewsbury Member and is a maximum of 33 ft thick. It is quartz sand, fine grained, clayey, very micaceous, dark gray, fossiliferous, with feldspar, muscovite, chlorite, and biotite as minor sand constituents.

The Navesink formation is sand, glauconite, medium-grained, clayey and silty, dark gray to dark gray-green, bioturbated, and has large calcareous shells. The upper member of the formation is clayey and has pyrite while the lower portion is coarser in texture and contains polished quartz pebbles and more glauconite than the upper member. The Navesink is marine in origin and ranges from 25-40 feet in the County.

Kml-Mount Laurel Formation (Upper Cretaceous)

The Mount Laurel Formation (Upper Cretaceous) is made up of quartz sand, is massive to crudely bedded, coarsens upward typically and is interbedded with thin clay beds. Glauconite and feldspar are minor sand constituents. Muscovite and biotite are abundant near the base. The lower part of the formation is a fine-to medium-grained, clayey, dark-gray, glauconitic (maximum 25 percent) quartz sand. It typically weathers to white or light yellow and locally stained orange brown by iron oxides. There are small pebbles scattered throughout, especially

in the west-central area. Locally it has small, rounded siderite concretions in the interbedded clay-sand sequence.

Kwmt- Wehnonah and Marshalltown Formations, undivided (Upper Cretaceous)

The Wenonah Formation is made up of quartz sand, mica, is fine-grained, silty and clayey, dark to medium gray and weathers light brown to white. It is extensively bioturbated, very micaceous, and has local high concentrations of sand-sized wood converted to lignite. It contains large burrows of the organism *Ophiomorpha nodosa*. It is marine in origin.

The Marshalltown Formation is made up of quartz sand, glauconite, is fine to medium grained, silty and clayey, weathers light brown or pale red, and is very bioturbated. It is very glauconitic, with glauconite concentration decreasing upward in the upper part of the unit, making quartz and glauconite nearly equal. Feldspar, mica, pyrite, and phosphatic fragments are minor sand constituents. Locally it is very micaceous with sparse carbonized wood fragments.

Krbs- Shrewsbury Member of the Red Bank Formation*

Its lithologic constituents include sand, quartz, fine- to coarse-grained, somewhat clayey and micaceous. It is mostly massive with local small-scale crossbedding, light-yellow to red or dark-brown, and is slightly glauconitic at the base. Feldspar is a minor sand constituent. The Shrewsbury is extensively burrowed but is otherwise not fossiliferous. Locally, small "Callianassa"-type burrows are present. Maximum thickness is over 30 m (98 ft) in the highlands near Matawan. Unit thins southwestward and pinches out near Arneytown, Ocean County. The transition to the underlying Sandy Hook Member occurs within several feet and is characterized by an increase in clay, quartz, silt, mica, and fine pieces of wood to its lower region.

Tvt- Vincetown Formation*

Lithology is primarily quartz sand, medium-grained, with clay. It is glauconitic near its base. Its color is pale yellow to gray, and weathers orange or reddish brown. Feldspar and mica are minor sand constituents. The Vincetown Formation can be up to 30 m (98 ft) thick and averages 3 to 15 m (10-49 ft) in its subcrop belt. Vincetown Fromation has unweathered sand that can be seen and is exposed intermittently along the Manasquan River near Farmingdale in Monmouth County. Generally, glauconite beds of the Vincetown are a darker gray than the glauconite beds of the Hornerstown Formation. The Vincetown typically has more quartz sand. The upper beds of the Vincetown Formation are 12 m (39 ft) thick and are mostly silty, dark-gray to green-gray, massive, glauconitic sand with a small percentage of quartz. Fossilized beds 6 to 7.5 m (20-25 ft) thick known as Calcarenite or coquina occur locally along the western bed of the Vincetown Formation.

Tkl- Lower Member Kirkwood Formation*

The lithology of the Lower member of the Kirkwood Formation is primarily sand and clay. The sand is fine to medium grained, locally crossbedded massive to thick. It is light-yellow to white in color and abundantly stained from iron-oxidation near its surface. The clay portions are massive and thin bedded, dark gray in color, with wood fragments and lignitized twigs, along with other plant debris. Where least weathered, the sands in the upper facies are principally quartz and muscovite with lower amounts of feldspar. The basal beds of this formation are very glauconitic.

Tht- Hornerstown Formation*

The Hornerstown is a highly glauconitic sand, dark gray to green and weathers to a dusky yellow or reddish brown. It is extensively bioturbated with some clay present. It possesses a small amount of quartz at its base. Glauconite grains are commonly dark green. Due to its high glauconitic content, the Hornerstown weathers easily to an iron oxide. Its reaches a maximum thickness of about 30 feet in Monmouth County. From north to south it overlies first the Tinton, then the Red Bank and Navesink. It crops out in a narrow belt throughout most of the western outcrop area. The formation is marine in origin and is locally highly fossiliferous.

Kt-Tinton Formation (Upper Cretaceous, upper Maastrichtian)*

The lithology of the Tinton is primarily quartz sand, glauconite, and clayey locally indurated siderite in the form of massive ledges. Where unweathered, the sand is dark gray to dark yellow in color. When weathered, the siderite changes color to orange-brown from iron oxidation, and the formation is stained or cemented in unconventional patterns. The Tinton formation crops out in the northern part of the central sheet from Sandy Hook in Monmouth county to the north part of the Roosevelt quadrangle nearing Perrineville. It overlies the Red Bank Formation in an unconformable fashion in the high hills of the northern Coastal plain.

Tch- Cohansey Formation*

This formation consists of white to yellow sands with local gravel and clay. The sand is medium grained, primarily derived from quartz and siliceous rock fragment. This formation receives its nickname, "water table aquifer" (Jablonski, 1967 as cited in Monmouth County Environmental Council, 1988) due to its relationship with the Kirkwood Cohansey Aquifer. It is mainly quartz sand that contains white, gray, and red kaolinitic clays interbedded with the sands. The sand is also cross stratified, contains pebbles and in places is cemented with iron oxide. The unweathered clay portion is typically dark gray and weathers white when interbedded with thin beds of ironstone. Gravel is composed of quartz with small amounts of black chert and quartzite. It has marine influenced beds, and the unit has been broadly eroded from the New Jersey Coastal Plain, especially in the central sheet where outliers are frequent. It is poorly exposed because of its loose sandy composition, causing it to erode easily. It has been widely

mined for sand due to this characteristic. The formation's age is estimated at upper Miocene in age, although no calcareous microfauna or macrofauna have been found in the formation rendering its age uncertain. It is as much as 30 feet thick in Monmouth County.

(Dalton, 2014; Monmouth County Environmental Council, 1988; United States Geological Survey, 2022)

Summarized in Table 7.2.1 are the formations that outcrop in the NWS Boundary of the township. They are in the southern portion of Colts Neck Township. These are illustrated in Figure 7.2 with the NWS Earle boundary shown.

Table 7.2.1 Description of Geologic Formations in NWS Earle

Symbol- Name	Lithologic constituents	Age (approx.)	Acres	Percent
Tvt- Vincetown Formation	quartz sand, medium-grained, clayey; and glauconitic near base	56-66 million years ago	2258	54%
Tkl- Lower Member Kirkwood Formation	quartz sand and clay	5.3-23 million years ago	1237	29%
Tch- Cohansey Formation	quartz sand, medium to coarse grained	5.3-23 million years ago	335	8%
Tht- Hornerstown Formation	glauconite sand, fine to medium grained	56-66 million years ago	234	6%
Kt- Tinton Formation	quartz sand, glauconitic, locally indurated	65-66 million years ago	132	3%
Krbs- Shrewsbury Member	quartz sand, fine- to coarse-grained	65-66 million years ago	22	1%
Sources: NJDEP Bureau of GIS in cooperation with USGS National Geologic Mapping Program. Geologic dates from: Sugarman et al., 1995; Rea, 2017.		**Total**	**4,218**	**100%**

7.2.1 SURFICIAL GEOLOGY

Surficial materials are materials that are on the Earth's surface or near its surface. They are the majority constituents of the ground around us. Where there aren't surficial materials there is bare bedrock which covers less than 5 percent of the US land surface. Most superficial deposits are comprised of poorly consolidated sand, silt, clay, or gravel sized sediments that are primarily formed from erosion. They are transported and deposited by water, wind, and ice and

deposited. Surficial materials are partially produced also from the weathering of bedrock in place. They are essentially the parent material for soils and overlay bedrock formations (Hunt, 1984).

Surficial deposits have characteristics important to our environment--water-bearing properties, mineral resources, and suitability as a natural foundation for buildings. They are also susceptible to flooding, erosion, ground subsidence, landslides, and earthquakes (Hunt, 1984). The characteristics of surficial geology types found in Colts Neck Township are shown in Tables 7.2.2 and 7.2.3 and depicted in Figure 7.2.1. *Historic fill* as outlined in red is material not originally from a site that has been deposited in order to alter the original topography of the site. Fill is not represented through its composition or whether it is contaminated. Most urban and suburban areas are underlain by a discontinuous layer of excavated indigenous soil mixed with varying amounts of non-indigenous material. The Brownfield and Contaminated Site Remediation Act (N.J.S.A. 58:10B-1 et seq.) requires NJDEP to maps large areas of historic fill. Mapped as shown is historic fill covering more than approximately 5 acres, displayed in Figure 7.2.1. (New Jersey Geological and Water Survey, 1996-2023).

Table 7.2.2 Characteristics of Surficial Geology found in Colts Neck Twp (without NWS Earle acreage)

Symbol-Name	Lithology	Age (approx.)	Notes	Acres	Percent
Qal ALLUVIUM	Sand, gravel, silt, minor clay and peat; reddish brown, yellowish brown, brown, gray. As much as 20 feet thick.	Holocene and late Pleistocene	Contains varying amounts of organic matter. Sediment deposited by water in commonly in modern floodplains and channels.	1489	9%
Qcal ALLUVIUM AND COLLUVIUM	Interbedded alluvium as in unit Qal and colluvium as in units Qcg, Qcb, Qcd, Qcs, Qcc, Qccb, and Qcl. As much as 20 feet thick.	Holocene and late Pleistocene	Deposited in headwater areas of valleys.	55	<1%
Qcl LOWER COLLUVIUM	Sand, silt, minor clay and pebble gravel; yellow, yellowish brown, reddish yellow, light gray. As much as 20 feet thick,	late Pleistocene	Forms aprons at the base of slopes on Coastal Plain formations. Graded to lower stream terraces or	11	<1%

	generally less than 10 feet thick.		the modern floodplain.		
Qcu UPPER COLLUVIUM	Sand, silt, minor clay and pebble gravel; pale brown, yellow, reddish yellow. As much as 20 feet thick.	middle Pleistocene	Forms aprons at the base of slopes on Coastal Plain formations. Graded to upper stream terraces.	174	<1%
Qe EOLIAN DEPOSITS	Windblown fine sand and silt; very pale brown, yellowish brown. As much as 15 feet thick.	late Pleistocene, locally of early to middle Pleistocene and Pliocene age on uplands	Transported by wind; not typically deep. Can exist as a thin layer over another parent material. Forms sand sheets and locally dunes.	283	2%
Qs SWAMP AND MARSH DEPOSITS	Peat and organic clay, silt, and minor sand; gray, brown, black. As much as 40 feet thick.	late Pleistocene and Holocene	Deposited in modern freshwater wetlands.	227	1%
Qtl LOWER STREAM TERRACE DEPOSITS	Sand, pebble gravel, minor silt and cobble gravel; reddish brown, yellowish brown, reddish yellow. As much as 30 feet thick.	late Pleistocene, late Wisconsinan	Forms nonglacial stream terraces with surfaces 5 to 20 feet above modern floodplains. Terraces grade to late Wisconsinan glaciofluvial deposits in the Delaware, Millstone, and Raritan valleys.	262	2%
Qtu UPPER STREAM TERRACE DEPOSITS	Sand and pebble gravel, minor silt and cobble gravel; yellow, reddish yellow, yellowish brown. As much as 20 feet thick.	middle to late Pleistocene	Form nonglacial stream terraces 20 to 50 feet above the modern floodplain. Topographic position and	1492	9%

			weathering characteristics are similar to Illinoian glaciofluvial deposits. Terraces grade to, or are onlapped by Cape May Formation, unit 2.		
Qwcp WEATHERED COASTAL PLAIN FORMATIONS	Exposed sand and clay of Coastal Plain bedrock formations. Includes thin, patchy alluvium and colluvium, and pebbles left from erosion of surficial deposits.	middle to late Pleistocene	Form nonglacial stream terraces 20 to 50 feet above the modern floodplain. Topographic position and weathering characteristics are similar to Illinoian glaciofluvial deposits. Terraces grade to, or are onlapped by Cape May Formation, unit 2.	11793	73%
Tg UPLAND GRAVEL	Sand, clayey sand, pebble gravel, minor cobble gravel; yellow to reddish yellow. Locally iron-cemented. As much as 20 feet thick.	middle to late Pleistocene	Includes fluvial and minor colluvial deposits in erosional remnants capping hilltops and interfluves. On grade, in places, to the Pensauken Formation.	316	2%
Tuc UPLAND COLLUVIUM	Sand, clayey sand, pebble gravel, minor silt; white, yellow, reddish yellow. As much as 15 feet thick.	middle Pliestocene	Forms aprons at the base of slopes on Coastal Plain formations. Graded to upper stream terraces.	1	<1%
			Total	**16102**	**100%**
Pliocene: 5.3 to 2.6 million years ago					

Pleistocene: 2.6 million years ago – 0.012 million years ago Holocene: 0.012 million years ago – present Wisconsin glaciation: 21,000 years ago Source: NJDEP Bureau of GIS in cooperation with USGS National Geologic Mapping Program.	

Table 7.2.3 Characteristics of Surficial Geology found in Colts Neck Twp (NWS Earle acreage)

Symbol-Name	Lithology	Age (approx.)	Notes	Acres	Percent
Qal ALLUVIUM	Sand, gravel, silt, minor clay and peat; reddish brown, yellowish brown, brown, gray. As much as 20 feet thick.	Holocene and late Pleistocene	Contains varying amounts of organic matter. Sediment deposited by water in commonly in modern floodplains and channels.	81	2%
Qcu UPPER COLLUVIUM	Sand, silt, minor clay and pebble gravel; pale brown, yellow, reddish yellow. As much as 20 feet thick.	middle Pleistocene	Forms aprons at the base of slopes on Coastal Plain formations. Graded to upper stream terraces	1258	30%
Qe EOLIAN DEPOSITS	Windblown fine sand and silt; very pale brown, yellowish brown. As much as 15 feet thick.	late Pleistocene, locally of early to middle Pleistocene and Pliocene age on uplands	Transported by wind; not typically deep. Can exist as a thin layer over another parent material. Forms sand sheets and locally dunes.	10	<1%
Qs SWAMP AND MARSH DEPOSITS	Peat and organic clay, silt, and minor sand; gray, brown, black. As much as 40 feet thick.	late Pleistocene and Holocene	Deposited in freshwater wetlands.	799	19%
Qtl LOWER STREAM TERRACE DEPOSITS	Sand, pebble gravel, minor silt and cobble gravel; reddish brown, yellowish brown, reddish	late Pleistocene, late Wisconsinan	Forms nonglacial stream terraces with surfaces 5 to 20 feet above modern	8	<1%

	yellow. As much as 30 feet thick.		floodplains. Terraces grade to late Wisconsinan glaciofluvial deposits in the Delaware, Millstone, and Raritan valleys.		
Qtu UPPER STREAM TERRACE DEPOSITS	Sand and pebble gravel, minor silt and cobble gravel; yellow, reddish yellow, yellowish brown. As much as 20 feet thick.	middle to late Pleistocene	Form nonglacial stream terraces 20 to 50 feet above the modern floodplain. Topographic position and weathering characteristics are similar to Illinoian glaciofluvial deposits. Terraces grade to, or are onlapped by Cape May Formation, unit 2.	243	6%
Qwcp WEATHERED COASTAL PLAIN FORMATIONS	Exposed sand and clay of Coastal Plain bedrock formations. Includes thin, patchy alluvium and colluvium, and pebbles left from erosion of surficial deposits.	Chiefly Pleistocene, locally Miocene and Pliocene.	None	1522	36%
Tg UPLAND GRAVEL	Sand, clayey sand, pebble gravel, minor cobble gravel; yellow to reddish yellow. Locally iron-cemented. As much as 20 feet thick.	Pliocene-early Pleistocene	Includes fluvial and minor colluvial deposits in erosional remnants capping hilltops and interfluves. On grade, in places, to the Pennsauken Formation.	53	1%

TQg UPLAND GRAVEL, LOWER PHASE	Sand, clayey sand, and pebble gravel, minor silt; yellow to reddish yellow. As much as 20 feet thick.	late Pliocene-middle Pleistocene	Includes fluvial and minor colluvial deposits in erosional remnants capping lower uplands and interfluves. Grades in places to the Cape May Formation, unit 1.	9	<1%
Tuc UPLAND COLLUVIUM	Sand, clayey sand, pebble gravel, minor silt; white, yellow, reddish yellow. As much as 15 feet thick.	Pliocene-early Pleistocene	In erosional remnants on sloping interfluves and ridgetops, graded to upland gravel deposits.	237	6%
			Total	**4218**	**100%**
Pliocene: 5.3 to 2.6 million years ago Pleistocene: 2.6 million years ago – 0.012 million years ago Holocene: 0.012 million years ago – present Wisconsin glaciation: 21,000 years ago Source: NJDEP Bureau of GIS in cooperation with USGS National Geologic Mapping Program.					

Arsenic in sediment and streams

Arsenic (As) is recognized as a toxic element and is naturally occurring. Due to the presence of elevated levels of arsenic in soils in New Jersey, a background-based Soil Remediation Standard of 19 parts per million (ppm) has been established, rather than a strictly health-based level of less than 1 ppm. Utilization of the background-based standard still results in naturally occurring arsenic being present above the standard in some locations throughout the state. Where arsenic is naturally elevated above the standard it would be impracticable to remediate to the standard, and regulation prohibits the NJDEP from requiring remediation beyond natural background levels (Barringer et. al, 2014).

Arsenic contents of streambed sediments were strongly associated with the weight percents of the phyllosilicate minerals biotite, illited/glauconite, chlorite, muscovite, and kaolinite. The inner and outer coastal plain of New Jersey differ in their geologic materials. The amount of Arsenic that is mobile in groundwater and stream water is, potentially, substantially greater in the Inner coastal plain than in the outer coastal Plain due the geologic composition of the inner coastal plain (Barringer et. al, 2014) Phyllosilicate glauconite along the inner coastal plain can be found within Colts Neck.

Colts Neck Township 2024 Environmental Resource Inventory

Figure 7.2.1 Surficial Geology

HOLMDEL TWP

MIDDLETOWN TWP

MARLBORO TWP

FREEHOLD TWP

HOWELL TWP

WALL TWP

BOROUGH OF TINTON FALLS

0 3,500 7,000 Feet

Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Historic Fill

- Area of Historic Fill
- Area with no Historic Fill

Surficial Geology

- Qal- ALLUVIUM
- Qcal- ALLUVIUM AND COLLUVIUM
- Qcl- LOWER COLLUVIUM
- Qcu- UPPER COLLUVIUM
- Qe- EOLIAN DEPOSITS
- Qs- SWAMP AND MARSH DEPOSITS
- Qtl- LOWER STREAM TERRACE DEPOSITS
- Qtu- UPPER STREAM TERRACE DEPOSITS
- Qwcp- WEATHERED COASTAL PLAIN FORMATIONS
- TQg- UPLAND GRAVEL, LOWER PHASE
- Tg- UPLAND GRAVEL
- Tuc- UPLAND COLLUVIUM

GIS Data Sources:
1. Surficial Geology: NJDEP (2006). 2. Historic Fill: NJDEP (2018).
3. Roads: NJDOT (2017).
4. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
5. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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With a history of agriculture in the New Jersey Coastal Plain, anthropogenic (human influenced) inputs of Arsenic, such as residues from former pesticide applications in soils, can amplify any Arsenic in runoff water. Such inputs contribute to an increased total Arsenic load to a stream at high stages of flow. As a result of yet another anthropogenic influence, microbes that reduce and mobilize Arsenic beneath the streambeds are stimulated by inputs of dissolved organic carbon. Arsenic concentrations may rise in groundwater with an increase of pH from wastewater inputs in developed areas (Barringer et. al, 2014). In turn, streams within the Inner and Outer Coastal Plain can receive substantially more Arsenic in groundwater discharge from developed areas than from environments where dissolved organic appears to be of natural origin.

A USGS study performed east of the Crosswicks Creek Watershed Area found that, native soils with no detectable glauconite (developed on the Englishtown Formation) were reported to contain little Arsenic (typically <5 mg/kg) of geologic origin (Barringer et. al, 1998). As stated in the Arsenic in New Jersey Coastal Plain Sediments report, “Considering results to date (2013), it appears plausible that, where the geologic substrate contains Arsenic-rich minerals such as glauconite, the natural Arsenic levels in overlying soils can be increased substantially by legacy pesticide residues” (Barringer et. al, 2014).

Common soil series containing naturally elevated levels of arsenic include: Kresson, Marlton, Freehold, Collington, Holmdel, Shrewsbury, Keyport, Adelphia and Tinton. These soils have been identified based upon experience, but this list is by no means exclusive and site-specific evaluation is recommended. The presence of glauconite and ironstone has been associated with naturally elevated arsenic. Where naturally occurring arsenic is present, levels typically remain consistent or increase with depth in the soil profile. Where sampling indicates the highest levels of arsenic to be in the surficial soils with a decrease in sub-surface results, it is likely the result of a historic topical application containing arsenic (NJDEP, 2015).

7.3 Topography

Topography depicts the relief characteristics of an area. The distinctive characteristic of a topographic map is the use of elevation contour lines to show the shape of the Earth's surface. Elevation contours are imaginary lines connecting points having the same elevation on the surface of the land above or below a reference surface, which usually means sea level. Contours make it possible to show the height and shape of mountains, the depths of the ocean bottom, and the steepness of slopes (United States Geological Survey, 2022b). Contours that are closer together demonstrate steeper slopes while contours that are farther apart demonstrate flatter slopes. *Slope* is the percent change in that elevation over a certain distance (Tompkins County Planning Department, n.d). Slope influences soil stability, sedimentation, water supply, and septic and foundation limitations. If land is extremely flat water will tend to collect after a rain and inhibit runoff (Monmouth County Environmental Council, 1988). Slope

should be considered together with vegetation and soil quality to determine the slope's ability to absorb surface runoff and its rate of erosion.

Monmouth county's topography contains a belt of prominent hills flanked by lowlands and less prominent hills. The prominent belt of hills divides the inner and outer coastal plain in Monmouth County. Both sets of hills are able to maintain their stature because they are more resistant to erosion compared to the surrounding sediments. This is due to their constituent of marls and clayey sands which offer more of this resistance to erosion than sands do. Different erosion patterns have formed the surface features that can be seen in Monmouth County. In addition, some sediment beds contain cemented "ironstone" or cemented sands that are considerably resistant to erosion (Monmouth County Environmental Council, 1988).

As part of the belt of hills in Monmouth County, there is a group of hills which stretch from Colts Neck nearly to Eatontown. This group is called the Hominy Hills and elevations range from near 200 feet to 307 feet on the NWS Earle Reservation. The Hominy Hills divide two lowlands; the Lakewood Plain to the south and the Freehold-Colts Neck lowland to the north. The Freehold-Colts Neck lowland extends from Freehold northeastward along the Hominy Hills to the Atlantic Coast lowlands. The Freehold-Colts Neck Lowland has an elevation of some 160 feet near Freehold and drops to sea level at the head of the Shrewsbury River. The northern boundary of this lowland is ill-defined as it merges with the southern slope of the Mount Pleasant Hills in Holmdel and Middletown (Monmouth County Environmental Council, 1988).

Regionally, Colts Neck Township is located in a topographic basin extending west from Long Branch through the Hominy Hills to Freehold, north to Matawan and east to Highlands. Colts Neck Topography slopes to the southeast (Colts Neck Environmental Commission, 1983). From an elevation of 260 feet in the Clover Hills (Mt. Pleasant Hills) to a low of 40 feet above mean sea level where Hockhockson Brook meets Pine Brook in the easternmost part of the Township, the average slope is about 19 feet per mile. In general, the highest points of elevations of the township are found in the northwest and south-central portions of the township. The lowest points are found within the Swimming River Network and subsequent tributaries (NJDEP Bureau of GIS, n.d).

The Clover Hills, located partially in the northwest portion of the Township, have considerable elevation. The more erosion resistant Navesink formation underlies the more easily erodible Red Bank Sand, and the streams have base leveled within the Navesink. In the southeastern part of the Township the Hominy Hills partially lie within the Naval Weapons Station Earle (Federal) lands. The Hills reach approximately 250 feet above sea level, but the slopes are gentler than those at Clover Hills, because the less-resistant Tertiary Sands (Colts Neck Environmental Commission, 1983), from the Lower Member Kirkwood and Cohansey Formations underly the area (NJDEP, 2020). A notable summit of the Hominy Hills Range is Cranberry Hill, which reaches approximately 253 ft in elevation. On the border of Howell Township and Colts Neck within the Naval Weapons Station Earle lands, a portion of the Hominy Hills reaches approximately 269 ft above sea level (NJDEP Bureau of GIS, n.d.).

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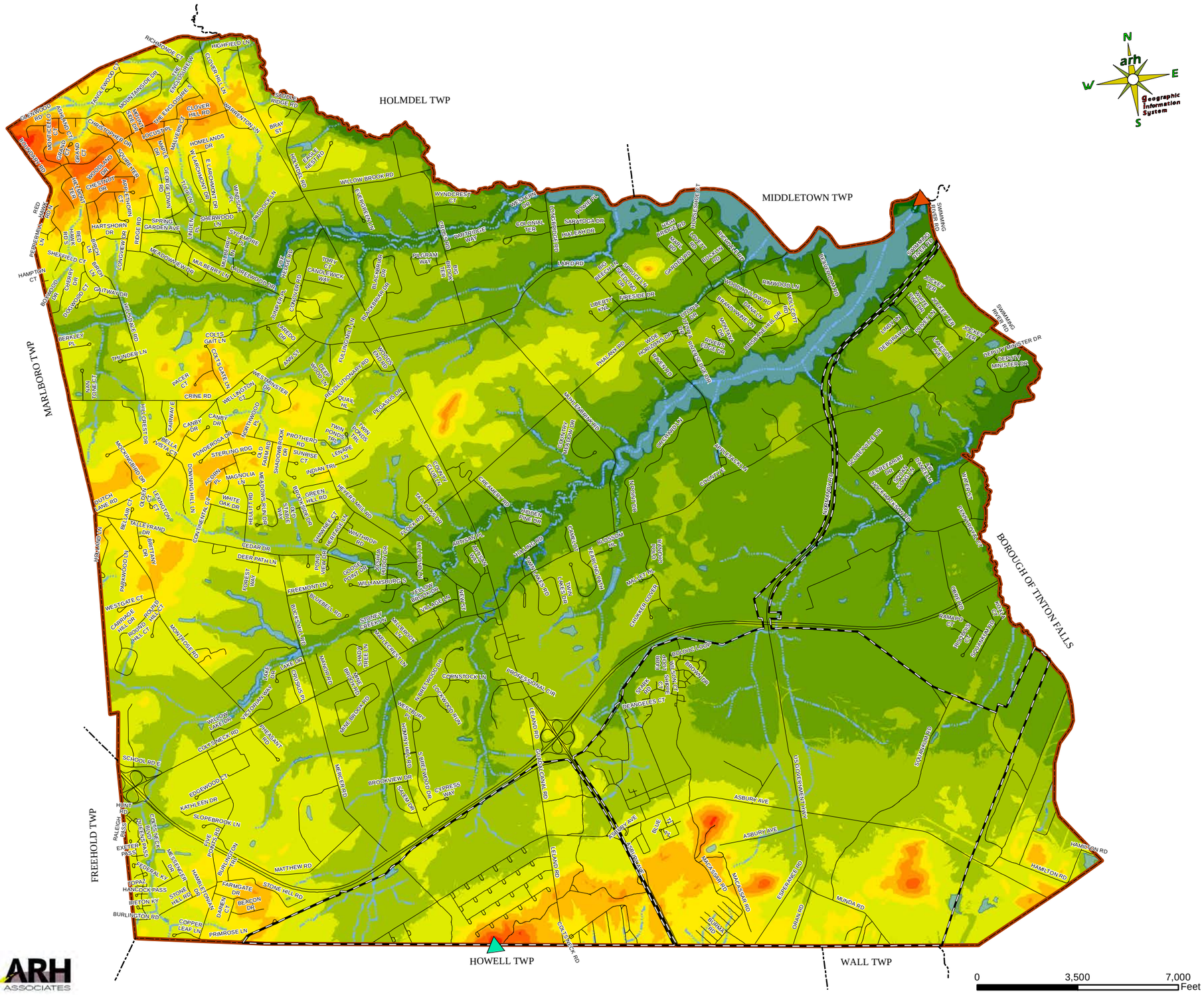

Figure 7.3 - Elevation

Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)
- Highest Elevation
- Lowest Elevation

Elevation

High : 262

Low : 0

GIS Data Sources:
1. NJ 10ft Digtial Elevation Model: NJOGIS (2021).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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The Hockhockson Swamp, lying north of the Hominy Hills, is a topographically low area and is generally flat. Due to this characteristic it is an area of poor drainage (Land Use and Physical Characteristics of Monmouth County, 1967). The high ground water level is caused by the intersection of the ground water table of the Hominy Hills with the topography, which drops to an elevation of 40 feet at the intersection of Hockhockson and Pine Brooks. The lowest level currently found within the township is at the intersection of the Swimming River Reservation in the river at Colts Neck at approximately 5 ft above sea level (NJDEP Bureau of GIS, n.d.).

Centrally located within the Township and trending northeast-southwest are three hills known, from east to west, as Sugar-Loaf with an elevation of approximately ±146 ft, Stone Hill with an elevation of approximately ±184 ft (NJDEP, 2020) and Stout Hill. Sugar Loaf, the largest, has a rise of about 70 feet above the surrounding area.

The rest of the Township consists of gently rolling hills and broad valleys. Streams tend to have a steep south bank with narrow flood plains in the upper reaches. Braided streams are not uncommon, with siltation especially heavy just above Swimming River Reservoir where stream velocity is checked. The exception is Hockhockson and Pine Brooks, which flow north into Swimming River, thence into the Navesink River. These two streams originate in the Hominy Hills and wander sluggishly through the swampy area to the north. Siltation is slow, but the streams have developed a well-defined flood plain in the higher areas (Colts Neck Environmental Commission, 1983).

The elevations given in this report are approximate only and based upon 10 ft resolution GIS Data. Properly determined elevation can be acquired through LiDAR (Light Detection and Ranging) services. LiDAR is a remote sensing method used to examine the surface of the Earth. In general, aircraft is used to target an area with a laser and measure the distance from the laser to the surface.

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8. Soils

8.1 Soil Survey Maps

Soil, as defined for this report, is a natural body composed of unconsolidated solids (minerals and organic matter), liquid, and gases that occur on the land surface. Soil occupies space and consists of horizons, or layers (Soil Survey Staff, 2014). These layers are distinguishable from the initial material as a result of both physical and biogeochemical weathering to their original parent material. Physical disintegration breaks down rock into smaller pieces eventually into sand and silt mineral particles. Mineral particles can also be decomposed chemically, which will continue to reduce particle size and can synthesize new minerals (Weil, 2017). New mineral constituents can also be absorbed by plant roots and most soils can support rooted plants in a natural environment. All soils are formed through the interaction of the five major soil-forming factors: parent material, climate, biota, topography, and time. Soils have a variety of chemical and physical processes that assist in their formation which can include exposure to sunlight, abrasion by wind and water, hydrolysis, acid reactions, dissolution and many more (Weil, 2017). Over time, these processes alter the parent material that the soil is originally derived from, affecting the soil's ability to support various types of land development.

Each soil type has a unique combination of physical, chemical, nutrient, and moisture properties. A soil survey is a detailed report on the soils of an area. It is the process of classifying soil types and their properties in a given area and geo-encoding such information. Data for the soil surveys is gathered through sampling in the field and remote sensing. Soil surveys contain maps with soil boundaries and photos, descriptions, and tables of soil properties and features. Soil mapping as part of its development utilizes geomorphology, theories of soil formation, physical geography, and land use patterns (Soil Survey Staff, 2022). For the practicality of soil survey, the lower boundary of soil is arbitrarily set at 200 cm.

Soil surveys usually identify relevant soil characteristics that determine qualities and limitations of the soil. A survey helps to assess a soils degree of suitability for a particular land use. It also assesses risks and hazards for land use. Examples of types of land use include buildings, roads, septic systems and agriculture. The information from a soil survey can be used for farmers in determining if a soil type is suitable for their crops and soil management. It also assists engineers and other related professionals in determining whether a soil is appropriate for different development purposes. Information from soil surveys can even be used by residents to maintain their yard and garden (Soil Survey Staff, 2022). The United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS) provides a Web Soil Survey which can be accessed from the USDA website. It provides soil data and maps for nearly the entire United States and is the single authoritative source of soil survey information (Soil Survey Staff, 2019).

8.2 Soil Series and Map Units

All soils have physical and chemical properties because of their development and environmental factors. These properties distinguish soil types from one another in a *map unit* that allocates areas based on the most common soil type. The name of a soil series is the common reference term, used to name soil map units (Soil Survey Staff, n.d.). Soil Series are determined by studying horizon characteristics which include the number of horizons, color, thickness, texture, erosion phase, slope, organic content, and depth to restrictive layer.

Colts Neck Township is located on the New Jersey Coastal Plain, which is one of the physical provinces of New Jersey. It is underlain by a wedge-shaped mass of unconsolidated and partly consolidated marine, marginal marine, and non-marine deposits of clay, silt, sand, and gravel. Colts Neck Township is located in Monmouth County which is on the northern portion of the coastal plain of New Jersey. This portion is mostly derived from quartz and glauconite sand, which over time have been affected by depositional patterns, sea level rise, and other soil-forming factors (Nichols, 1977).

Soil survey data information is currently available for Monmouth County through the Soil Survey of Monmouth County generated and prepared by the USDA in cooperation with the NRCS, State Soil Committee, and Rutgers University Cook College and NJ Agricultural Experiment Station. NRCS has identified the major soil series occurring within the Township of Colts Neck **(See Figure 8.2)**. 59 different soil types have been identified within the Township of Colts Neck and have been determined to occupy the following acreages and percentages of the total land area of the Township, summarized in **Table 8.3.1** and **8.3.2**. The 5 most abundant soil series make up 48.6% of the township without Naval Weapons Station (NWS) Earle and are briefly described in **Table 8.2.1**. In comparison, the portion of Colts Neck Township that is NWS Earle has its top 5 most abundant soil series briefly described in Table **8.2.2**. The areas top 5 most abundant soil series make up 70.2% of NWS Earle in Colts Neck Township. Some key differences between these areas in terms of their soil types include their textural differences, farming and development suitability, and drainage characteristics.

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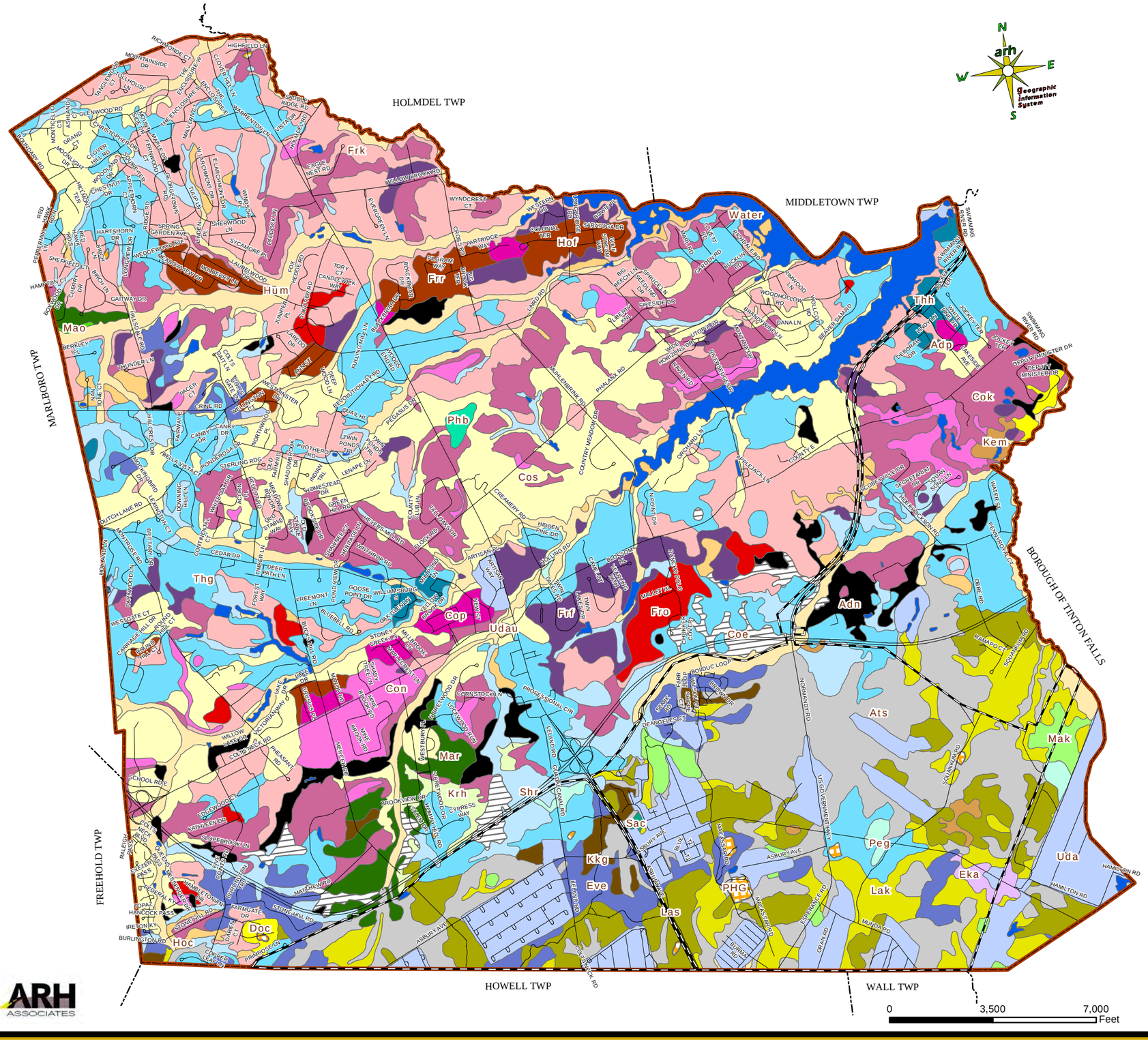
Figure 8.2 Soil Series



Legend

Earle NWS Area | Municipal Boundary | Road

NRCS Soils

- Adn - Adelphia loam
- Adp - Adelphia-Urban land
- Ats - Atsion sand
- Coe - Colemantown loam
- Cok - Collington sandy loam
- Con - Collington loam
- Cop - Collington-Urban land
- Cos - Colts Neck sandy loam
- Doc - Downer loamy sand
- Eka - Elkton loam
- Eve - Evesboro sand
- Frf - Freehold loamy sand
- Frk - Freehold sandy loam
- Fro - Freehold loam
- Frr - Freehold-Urban land
- Hoc - Holmdel sandy loam
- Hof - Holmdel-Urban land
- Hum - Humaquepts
- Kem - Keyport sandy loam
- Kkg - Klej loamy sand
- Krh - Kresson loam
- Lak - Lakehurst sand
- Las - Lakewood sand
- Mak - Manahawkin muck
- Mao - Marlton sandy loam
- Mar - Marlton loam
- PHG - Pits, sand and gravel
- Peg - Pemberton loamy sand
- Phb - Phalanx loamy sand
- Sac - Sassafras sandy loam
- Shr - Shrewsbury sandy loam
- Thg - Tinton loamy sand
- Thh - Tinton-Urban land
- Uda - Udorthents
- Udau - Udorthents-Urban land
- Water - Water

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

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Table 8.2.1: Most Abundant 5 Soil Series in Colts Neck Twp (Non-NWS Earle)

Soil Series	Map Unit Symbol	Description	Percentage
Tinton loamy sand, 0 to 5 percent slopes	ThgB	This soil series is the most common in Colts Neck Township. It is found on low hills, and gently sloping to nearly level areas. Its derived from sandy eolian deposits over glauconite bearing fluviomarine deposits. This Tinton soil is well drained. This soil is listed as Farmland of statewide importance. It is suited to pasture and common field crops, hay, and vegetables. Frequent lime and fertilizer application along with irrigation are needed. Common suited species for this soil are northern red oak, Virginia pine & shortleaf pine, white oak, and black oak.	12.7%
Freehold sandy loam, 2 to 5 percent slopes	FrkB	This soil occurs on low hills, knolls, divides and is well drained. This soil is gently sloping with moderate permeability. It is derived from glauconite bearing loamy eolian deposits and/or glauconite bearing loamy fluviomarine deposits. It is classified as prime farmland. It can have a moderate amount of organic matter, and is well suited for common field crops, hay, sod, and vegetables. It is well suited to pasture. Common suited species for this soil are northern red oak, yellow poplar, shortleaf pine, white oak, black oak and American beech.	11.6%
Collington sandy loam, 2 to 5 percent slopes	CokB	This soil occurs on broad interfluves, hills, and ridges. It is derived from glauconite bearing fluviomarine deposits. It is classified as prime farmland. It is well drained. It has moderate permeability, and is suited to common field crops, hay, sod, and vegetables. It can have a moderate amount of organic matter. In unlimed areas reaction is strongly acid to very strongly acid. Its dominant vegetation includes mixed upland oaks, sweetgum, yellow-poplar, hickory, red maple, sassafras, and American beech.	10.4%

Colts Neck sandy loam, 2 to 5 percent slopes	CosB	This soil occurs on knolls and low hills. It is a gently sloping well drained soil on divides. It is derived from glauconite bearing loamy and channery marine deposits and/or glauconite bearing loamy and channery fluviomarine deposits. It is classified as prime farmland. Nearly all Colts Neck type soils have been cleared and used for corn, small grain, hay, tree fruits, truck crops, and ornamental nurseries if not developed. Small isolated wooded areas with this soil contain dominantly oaks but in some places have yellow-poplar, American beech and scattered individual pitch or Virginia pines.	8%
Humaquepts, 0 to 3 percent slopes	HumAt	These soils are nearly level, found on flood plains along perennial and intermittent streams. Its parent material is loamy alluvim They are somewhat poorly drained to very poorly drained soils, and are classified as hydric. The apparent seasonal high water table for these soils is between the surface and 1 ½ feet. It has slow run off, with low to high organic matter content. In some areas the stratified layers in its soil profile are gravelly or mucky. Many acreages of these soils are idle or wooded due to their limitations.	5.9%

From Web Soil Survey, Monmouth County Soil Survey, and National Cooperative Soil Survey Official Soil Series Descriptions.

Table 8.2.2: Most Abundant 5 Soil Series in Colts Neck Twp (NWS Earle)

Soil Series	Map Unit Symbol	Description	Percentage
Atsion sand, 0 to 2 percent slopes, Northern Coastal Plain	AtsA	This soil series is a nearly level, poorly drained soil in depressional areas and on broad flats. It is found on flats, depressions, drainageways, and deflation flats. Its derived from sandy eolian deposits and/or fluviomarine deposits. It is poorly drained. This soil is listed as Farmland of unique importance. It is suited to specialty crops, such as blueberries. It is poorly suited for woodland production. Common species are pitch pine, black gum and red maple.	24.9%
Udorthents, 0 to 8 percent slopes	UdaB	This soil series is linear in down-slope shape, in low hills. Its parent material consists of fill and/or disturbed original soil material. It is well drained. This soil is not prime farmland. Its typical profile consists of loam and loamy sand.	17.5%
Lakewood sand, 0 to 5 percent slopes	LasB	This soil series is a nearly level, gently sloping, rapidly permeable soil found on flats, knolls and divides. It is excessively drained. It is not prime farmland. It has very slow runoff. It is suited to common field crops, hay, and vegetables and poorly suited to pasture. Woodland areas with this soil consist of pitch pine, black oak, and white oak.	11.1%
Lakehurst sand, 0 to 5 percent slopes	LakB	This soil series is a nearly level, moderately well drained soil found in flats and dunes. It is derived from sandy fluviomarine deposits. This soil is not prime farmland. Surface runoff is slow. Wooded areas of this soil are dominantly pitch pine, shortleaf pine, black and white oak, with an understory of lowbush blueberry and scrub oak.	10.7%
Atsion sand, 0 to 2 percent slopes, Northern Tidewater Area	AtsAO	This soil series is a nearly level, poorly drained soil in depressional areas and on broad flats. This soil has moderately rapid or rapid permeability. It is suited for blueberries and cranberries. Wooded areas of this soil are mostly pitch pine mixed with black gum and red maple. Undergrowth consists of highbush blueberries, sweet pepperbush, sheep laurel, and greenbrier.	6.0%

From Web Soil Survey, Monmouth County Soil Survey, and National Cooperative Soil Survey Official Soil Series Descriptions.

8.3 Soil Quality

Soil quality is defined as the measurement of a soil's ability to execute ecological functions. Functions include plant production, nutrient capacity, water holding capacity, the exchange of cations, engineering medium, among other functions. Soil quality essentially reflects a combination of a soil's chemical, physical, and biological properties. Certain properties such as mineral composition and texture are relatively unalterable (Weil, 2017). These *inherent properties* help to define a particular type of soil and are the basis for its particle size and physical capabilities. Other soil properties such as structure and organic matter content can be notably changed by soil management. These properties known as *Dynamic Properties* can indicate a soil's quality in relation to its potential (Weil, 2017). Some examples of high-quality soil characteristics include good soil tilth, sufficient but not excessive nutrient supply, adequate drainage, beneficial organisms, free of toxins, and resilience to degradation and unfavorable conditions (Kime, 2012). Maintaining a soil's health through proper soil management practices can help to preserve high-quality soils.

Urban soils are regularly influenced by human activities like shoveling, bulldozing and other activities in which the land surface is excavated and graded. Materials are sometimes imported from off-site locations and used to fill areas which results in various buried horizons of the soil. Due to their anthropogenic influence, urban soils are especially susceptible to soil degradation. For example, urban soils can become highly compacted because of the weight of structures and pavement or vehicular and human traffic while placing soil materials (Weil, 2017). When equipment runs over soil when it is too wet or if the equipment is too heavy, soil particles are pushed together. This results in *compaction* of the soil. Plant roots cannot penetrate extremely compacted soils and their growth is diminished. Soil compaction also causes reduced infiltration of water which can result in flooding. Managing soil compaction can be achieved through adding organic matter, controlling traffic, and mechanically loosening the soil (Kime, 2012).

Most soils in New Jersey are naturally acidic (Murphy, n.d). This can be attributed to its majority sandy soils and humid climate. Acidification of soils is a natural geologic process in which rainwater which contains carbonic acid from the atmosphere acidifies the soil when it infiltrates. The combustion of fossil fuels can add acidity to the atmosphere, reaching soils through acid rain (Soil, Chemistry of, 2001). Due to these reasons urban soils can have differences in pH from their natural condition. Unintentional acidification in extreme cases can come from excavation and exposure of acid-producing sediments lying in bands across New Jersey (Murphy, n.d). A significant consequence of soil acidity is the dissolution of aluminum which is toxic to plants from soil minerals. Lime (ground calcium and magnesium carbonate) is often added to acid soils to correct issues and improve the growing environment of plants (Soil, Chemistry of, 2001).

In contrast, urban soils can also be unusually alkaline due to the influence of concrete and cement. Additionally, soils are not leached of soluble constituents due to their sealed environments underneath pavements (Weil, 2017). The presence of soluble carbonates maintain

high pH values in soils. Soils high in sodium carbonate are called sodic soils. Sodic soils generally severely limit plant growth (Soil, Chemistry of, 2001). Sodic soils are significant issues in arid environments which have low precipitation rates unlike the state of New Jersey which has more of a humid climate. However, extreme causes of soil alkalinity in New Jersey are usually from excess (sodium) salt in the form of de-icing salt, soluble fertilizer, or ocean water (Kime, 2012).

8.3.1 Limitations

The Soil Survey of Monmouth County, New Jersey includes an extensive collection of the soils in its Townships, and is readily available for further soils investigation. The NRCS has both estimated and measured data on soil properties and limitations on its soil database, Web Soil Survey. The survey lists engineering and agricultural features of each soil type. These are often used to deduce a soils potential for various development purposes. Soils have natural variation and their listed characteristics may not always be similar to the characteristics of their listed soil type. Field visits coupled with proper soil profiling and lab analysis can confirm soil properties.

Soil surveys provide interpretations of the effect of soil properties on many kinds of land use. Construction engineers are particularly interested in soil properties that may require specific structural measures to overcome or special maintenance once construction is completed. Soil surveys describe important soil characteristics that affect construction. The interpretations and other information can be utilized to determine suitability for soil as a source of topsoil, sand and gravel, road fill for highway subgrade, and impermeable material. The interpretations also show the degree and kind of limitations of soils used for septic tank absorption fields, foundations for low buildings, streets, basements, and more (Soil Survey Staff, 2019).

Due to the scale and methods used to map soils originally, it is not uncommon for soil boundary lines to be mislocated by up to one hundred feet (100’) or more sometimes. This can have an effect on the developability of smaller properties, in the case that if a soil type is not verified it can lead to issues if the soil has limitations for the type of development proposed.

Another drawback can be that in many cases, intermediate or transitional soils are not mapped separately on mapped soils information from Web Soil Survey. Instead, they fall within areas designated as upland or lowland soil types. The term “Upland” is a general informal term used for the higher ground of a region in contrast with a low-lying adjacent area (Soil Survey Staff, 2019). Whenever a soil type with a 0 to 1' depth to seasonal high groundwater, for example, adjoins a soil type with a 5' or greater depth to groundwater, it is obvious that some intermediate (1½' to 5' depth to groundwater) soil has not been mapped in that transitional zone. In such cases, on-site borings are the only sure way of locating the actual extent of the intermediate soil type. Such information could be quite significant, especially if the proposed development includes the installation of a septic disposal system which requires that the seasonal high groundwater level be at least five feet (5') below the surface. In areas where public sanitary sewer is available, residential development is normally permitted in areas where the depth to seasonal high groundwater is in the intermediate range (1½' to 5'). For these reasons, the accurate location of

all soil boundaries is necessary and should be required as a standard development application requirement.

Characteristics of soils which may have limitations for certain development types have been identified and listed by NRCS Soil Survey for the Township of Colts Neck. Limitations are rated as follows:

1. Not limited- Soils in this rating do not possess limitations for the specified use. Performance should be satisfactory for a period of time acceptable for the use.

2. Somewhat limited- Soils in this rating have some set of soils with limitations. They do not have exceptional risk or cost for the specified use but they can possess undesirable properties and features.

3. Very limited- Soils in this rating have significant limitations for the specified use or management practice. This means that the limitations are those which cannot normally be overcome except with costly and/or complex measures to adapt it to a particular use. A limitation that requires removal and replacement of the soil would be rated "very limited".

(*Adapted from Soil Survey Manual*; *Chapter 8*)

Conservation practices for soils not only apply to agriculture but also apply to urban development. Examples of urban development can be seen in **Table 8.3.1** and **8.3.2**. New Jersey has its own program for managing soils that support development, called the Soil Erosion and Sediment Control Program. It has created a set of Soil Erosion and Sediment Control Standards that are to be followed by developers to successfully design erosion control practices for Construction Sites (NJ State Soil Conservation Committee, 2017). The *Standards* are a mix of agronomic science and advanced engineering practices which help to prevent issues such as excessive stormwater run off, sediment pollution of waterways, and related soil loss from construction sites. Soil loss prevention is administered prior, during, and after the construction process to protect New Jersey's natural resources (NJ State Soil Conservation Committee, 2017). The county in which the development is taking place has its own Soil Conservation District (SCD). Design plans are submitted to the SCD which reviews the sediment control design plans and determines whether they are eligible for certification. The certifications ensures that the design follows the Soil Erosion and Sediment Control standards.

Table 8.3.1: Soil Characteristics, Suitabilities, and Limitations (Colts Neck Township without NWS Earle)

Soil Series Type	Erosion Hazard (Road, Trail)	Hydric Rating	Septic Suitability+ (NJ)	Depth to Water Table (Min, Mar-Jun) (inches)	Natural Drainage*	Prime Farmland**	Foundations++	Basements+++	Acres	Percent
AdnA	Slight	5	Somewhat limited (1)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (2)	Very limited (1,2)	184.8	1.1%
AdnB	Moderate	5	Somewhat limited (1)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (2)	Very limited (1,2)	178.3	1.1%
AdpB	Moderate	5	Somewhat limited (1)	6	Moderately well drained	Not prime farmland	Somewhat limited (2,5)	Very limited (1,2)	5.3	0.0%
AtsA	Slight	95	Very limited (1,2,3)	0	Poorly drained	Farmland of unique importance	Very limited (1,3,4)	Very limited (1,3,4)	179.2	1.1%
AtsAO	Slight	95	Very limited (1,2,3)	0	Poorly drained	Farmland of unique importance	Very limited (1,3,4)	Very limited (1,3,4)	34.5	0.2%
CoeAs	Slight	90	Very limited (1,2,3,4,5)	6	Poorly drained	Not prime farmland	Very limited (1,2,3,4)	Very limited (1 2,3,4)	187.4	1.2%
CokB	Slight	4	Not limited	6	Well drained	All areas are prime farmland	Somewhat limited (5)	Not limited	1,668.9	10.4%
CokC2	Moderate	0	Not limited	30	Well drained	Farmland of statewide importance	Very limited (2,5)	Not limited	280.5	1.7%
CokD3	Moderate	0	Not limited	30	Well drained	Not prime farmland	Very limited (2,5)	Somewhat limited (5)	55.3	0.3%
ConA	Slight	0	Not limited	30	Well drained	All areas are prime farmland	Somewhat limited (2)	Not limited	443.2	2.8%
CopC	Moderate	0	Not limited	30	Well drained	Not prime farmland	Somewhat limited (2,5)	Not limited	138.8	0.9%
CosB	Slight	0	Not limited	79	Well drained	All areas are prime farmland	Not limited	Not limited	1,281.6	8.0%
CosC	Moderate	0	Not limited	79	Well drained	Farmland of statewide importance	Somewhat limited (2,5)	Not limited	105.1	0.7%
CosC2	Moderate	0	Not limited	72	Well drained	Farmland of statewide importance	Very limited (2,5)	Not limited	473.8	2.9%
CosD2	Moderate	0	Not limited	72	Well drained	Not prime farmland	Very limited (5)	Somewhat limited (5)	354.9	2.2%
CosE2	Severe	0	Not limited	72	Well drained	Not prime farmland	Very limited (2,5)	Very limited (5)	254.0	1.6%
DocB	Slight	5	Not limited	2	Well drained	Farmland of statewide importance	Not limited	Not limited	23.0	0.1%
DocC	Moderate	0	Not limited	30	Well drained	Farmland of statewide importance	Somewhat limited (1,5)	Not limited	25.9	0.2%
EkaAr	Slight	95	Very limited (1,2,3,4,5)	6	Poorly drained	Farmland of statewide importance, if drained	Very limited (1,2,3,4)	Very limited (1,2,3,4)	15.1	0.1%
EveB	Slight	10	Not limited	0	Excessively drained	Not prime farmland	Not limited	Not limited	131.4	0.8%
EveC	Moderate	0	Not limited	79	Excessively drained	Not prime farmland	Somewhat limited (5)	Not limited	54.6	0.3%
EveD	Moderate	0	Not limited	79	Excessively drained	Not prime farmland	Very limited (5)	Somewhat limited (5)	17.0	0.1%
FrfB	Slight	5	Not limited	6	Well drained	All areas are prime farmland	Not limited	Not limited	389.8	2.4%
FrfC	Moderate	0	Not limited	79	Well drained	Farmland of statewide importance	Somewhat limited (2,5)	Not limited	115.5	0.7%
FrkB	Slight	5	Not limited	6	Well drained	All areas are prime farmland	Not limited	Not limited	1,861.8	11.6%
FrkC	Moderate	0	Not limited	79	Well drained	Farmland of statewide importance	Somewhat limited (2,5)	Not limited	160.9	1.0%
FrkC2	Moderate	0	Not limited	27	Well drained	Farmland of statewide importance	Very limited (2,5)	Not limited	244.8	1.5%
FrkD	Moderate	0	Not limited	79	Well drained	Not prime farmland	Very limited (2,5)	Somewhat limited (5)	13.5	0.1%
FrkD2	Moderate	0	Not limited	79	Well drained	Not prime farmland	Very limited (2,5)	Somewhat limited (5)	115.3	0.7%
FrkE2	Severe	0	Not limited	79	Well drained	Not prime farmland	Very limited (2,5)	Very limited (5)	340.3	2.1%
FroA	Slight	5	Not limited	6	Well drained	All areas are prime farmland	Not limited	Not limited	215.0	1.3%
FrrC	Moderate	0	Not limited	79	Well drained	Not prime farmland	Somewhat limited (2,5)	Not limited	342.7	2.1%
HocA	Slight	5	Somewhat limited (1)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (1,2)	Very limited (1)	72.7	0.5%
HocB	Moderate	5	Somewhat limited (1)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (1,2,5)	Very limited (1)	105.6	0.7%
HofB	Moderate	5	Somewhat limited (1)	6	Moderately well drained	Not prime farmland	Somewhat limited (1,2)	Very limited (1)	1.3	0.0%
HumAt	Slight	100	Very limited (1,2,3)	0	Poorly drained	Not prime farmland	Very limited (1,2,3,4,6)	Very limited (1,2,3,4)	947.1	5.9%
KemB	Moderate	10	Very limited (1,2,4,5)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (2)	Very limited (1,2)	22.3	0.1%
KemC	Moderate	10	Very limited (1,2,4,5)	6	Moderately well drained	Farmland of statewide importance	Very limited (1,2,5)	Very limited (1,2)	2.5	0.0%
KkgB	Slight	10	Very limited (1,2,3)	3	Somewhat poorly drained	Farmland of statewide importance	Somewhat limited (1)	Very limited (1,2,3,4)	6.7	0.0%
KkgkB	Slight	10	Not limited	6	Somewhat poorly drained	Farmland of statewide importance	Somewhat limited (1)	Very limited (1, 2)	10.9	0.1%
KrhB	Moderate	10	Very limited (1,2,3,4,5)	6	Somewhat poorly drained	Farmland of statewide importance, if drained	Very limited (1,2,3)	Very limited (1,2,3)	70.2	0.4%
LakB	Slight	10	Somewhat limited (1)	0	Moderately well drained	Not prime farmland	Not limited	Very limited (1,3,4)	184.8	1.1%

LasB	Slight	5	Not limited	6	Excessively drained	Not prime farmland	Not limited	Not limited	141.4	0.9%
LasC	Moderate	5	Not limited	6	Excessively drained	Not prime farmland	Somewhat limited (5)	Not limited	39.4	0.2%
MakAt	Slight	100	Very limited (1,2,3)	0	Very poorly drained	Farmland of unique importance	Very limited (1,3,4,6)	Very limited (1,3,4)	32.0	0.2%
MaoC	Moderate	0	Somewhat limited (1)	30	Moderately well drained	Farmland of statewide importance	Somewhat limited (2,5)	Very limited (1,2)	3.9	0.0%
MarB	Moderate	10	Very limited (1,2,3,4,5)	6	Well drained	All areas are prime farmland	Somewhat limited (2,5)	Somewhat limited (1,2)	218.5	1.4%
PegB	Slight	5	Somewhat limited (1)	6	Moderately well drained	Farmland of statewide importance	Not limited	Very limited (1)	25.7	0.2%
PhbC	Moderate	0	Somewhat limited (6)	72	Well drained	Not prime farmland	Very limited (5)	Not limited	4.8	0.0%
PhbE	Severe	0	Somewhat limited (6)	72	Well drained	Not prime farmland	Very limited (5)	Very limited (5)	15.4	0.1%
PHG^	Not rated	0	Not rated	79	Well drained	Not prime farmland	Not rated	Not rated	5.4	0.0%
SacBO	Slight	0	Not limited	30	Well drained	All areas are prime farmland	Not limited	Not limited	0.1	0.0%
ShrA	Slight	91	Very limited (1,2)	0	Poorly drained	Farmland of statewide importance, if drained	Very limited (1,2)	Very limited (1)	720.9	4.5%
ThgB	Slight	0	Not limited	27	Well drained	Farmland of statewide importance	Not limited	Not limited	2,039.3	12.7%
ThgC	Moderate	0	Not limited	79	Well drained	Farmland of statewide importance	Very limited (5)	Not limited	459.8	2.9%
ThgE	Severe	0	Not limited	79	Well drained	Not prime farmland	Very limited (5)	Very limited (5)	145.0	0.9%
ThhB	Slight	0	Not limited	27	Well drained	Not prime farmland	Not limited	Not limited	99.8	0.6%
UdaB	Moderate	0	Not limited	79	Well drained	Not prime farmland	Somewhat limited (5)	Not limited	334.3	2.1%
UdauB	Moderate	0	Not limited	79	Well drained	Not prime farmland	Somewhat limited (5)	Not limited	0.9	0.0%
WATER	Not rated	0	Not rated	79	-	Not prime farmland	Not rated	Not rated	499.3	3.1%

+Reason for Septic Limitation (1) Depth to apparent zone of saturation (2) Not Permitted-Hydric Soil (3) Not Permitted- Flooding (4) Restrictive horizon (5) Restrictive substratum (6) Excessively coarse substratum	**++Reason for Foundation Limitation (Small Commercial Buildings)** (1) Depth to saturated zone (2) Shrink-swell potential (3) Flooding (4) Ponding (5) Slope (6) Organic matter content	**+++Reason for Basement Limitation (Dwellings)** (1) Depth to saturated zone (2) Shrink-swell potential (3) Flooding (4) Ponding (5) Slope	**Total acreage**	16,102.2	100.0%

*Natural Drainage Class definitions in **Table 8.4.2** **Prime Farmland definitions in **Table 8.5.1**

SOURCE: USDA NRCS, 2022 ^(PHG) is too variable to rate in some instances

Table 8.3.2: Soil Characteristics, Suitabilities, and Limitations (Naval Weapons Station Earle of Colts Neck Township)

Soil Series Type	Erosion Hazard (Road, Trail)	Hydric Rating	Septic Suitability+ (NJ)	Depth to Water Table (Min, Mar-Jun) (inches)	Natural Drainage*	Prime Farmland**	Foundations++	Basements+++	Acres	Percent
AdnA	Slight	5	Somewhat limited (1)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (2)	Very limited (1,2)	0.6	0.0%
AtsA	Slight	95	Very limited (1,2)	0	Poorly drained	Farmland of unique importance	Very limited (1,3,4)	Very limited (1,3,4)	1,051.5	24.9%
AtsAO	Slight	95	Very limited (12,3)	0	Poorly drained	Farmland of unique importance	Very limited (1,3,4)	Very limited (1,3,4)	253.3	6.0%
CoeAs	Slight	90	Very limited (1,2,3,4,5)	6	Poorly drained	Not prime farmland	Very limited (1,2,3,4)	Very limited (1,2,3,4)	16.3	0.4%
CokB	Slight	4	Not limited	6	Well drained	All areas are prime farmland	Somewhat limited (5)	Not limited	3.2	0.1%
CokC2	Moderate	0	Not limited	30	Well drained	Farmland of statewide importance	Very limited (2,5)	Not limited	0.2	0.0%
CosB	Slight	0	Not limited	79	Well drained	All areas are prime farmland	Not limited	Not limited	4.4	0.1%
CosE2	Severe	0	Not limited	72	Well drained	Not prime farmland	Very limited (1,2)	Very limited (5)	1.6	0.0%
EkaAr	Slight	95	Very limited (1,2,3,4,5)	6	Poorly drained	Farmland of statewide importance, if drained	Very limited (1,2,3,4)	Very limited (1,2,3,4)	22.9	0.5%
EveB	Slight	10	Not limited	0	Excessively drained	Not prime farmland	Not limited	Not limited	182.9	4.3%
EveD	Moderate	0	Not limited	79	Excessively drained	Not prime farmland	Very limited (5)	Somewhat limited (5)	150.8	3.6%
FrfB	Slight	5	Not limited	6	Well drained	All areas are prime farmland	Not limited	Not limited	2.7	0.1%
FrfC	Moderate	0	Not limited	79	Well drained	Farmland of statewide importance	Somewhat limited (2,5)	Not limited	0.9	0.0%
FrkB	Slight	5	Not limited	6	Well drained	All areas are prime farmland	Not limited	Not limited	10.7	0.3%
FrkE2	Severe	0	Not limited	79	Well drained	Not prime farmland	Very limited (2,5)	Very limited (5)	2.1	0.0%
HocA	Slight	5	Somewhat limited (1)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (1,2)	Very limited (1)	2.4	0.1%
HocB	Moderate	5	Somewhat limited (1)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (1,2,5)	Very limited (1)	2.4	0.1%
HumAt	Slight	100	Very limited (1,2,3)	0	Poorly drained	Not prime farmland	Very limited (1,2,3,4)	Very limited (1,2,3,4)	73.1	1.7%
KemB	Moderate	10	Very limited (1,2,4,5)	6	Moderately well drained	All areas are prime farmland	Somewhat limited (2)	Very limited (1,2)	25.8	0.6%

KkgB	Slight	10	Very limited (1,2,3)	3	Somewhat poorly drained	Farmland of statewide importance	Somewhat limited (1)	Very limited (1,2,3,4)	83.1	2.0%
KrhB	Moderate	10	Very limited (1,2,3,4,5)	6	Somewhat poorly drained	Farmland of statewide importance, if drained	Very limited (1,2,3)	Very limited (1,2,3)	0.2	0.0%
LakB	Slight	10	Somewhat limited (1)	0	Moderately well drained	Not prime farmland	Not limited	Very limited (1,3,4)	452.3	10.7%
LasB	Slight	5	Not limited	6	Excessively drained	Not prime farmland	Not limited	Not limited	469.5	11.1%
LasC	Moderate	5	Not limited	6	Excessively drained	Not prime farmland	Somewhat limited (5)	Not limited	93.4	2.2%
MakAt	Slight	100	Very limited (1,2,3)	0	Very poorly drained	Farmland of unique importance	Very limited (1,3,4,6)	Very limited (1,3,4)	91.1	2.2%
MarB	Moderate	10	Very limited (1,2,3,4,5)	6	Well drained	All areas are prime farmland	Somewhat limited (2,5)	Somewhat limited (1,2)	11.5	0.3%
PegB	Slight	5	Somewhat limited (1)	6	Moderately well drained	Farmland of statewide importance	Not limited	Very limited (1)	37.6	0.9%
PHG^	Not rated	0	Not rated	79	Well drained	Not prime farmland	Not rated	Not rated	26.5	0.6%
SacBO	Slight	0	Not limited	30	Well drained	All areas are prime farmland	Not limited	Not limited	5.0	0.1%
ShrA	Slight	91	Very limited (1,2)	0	Poorly drained	Farmland of statewide importance, if drained	Very limited (1,2)	Very limited (1)	143.9	3.4%
ThgB	Slight	0	Not limited	27	Well drained	Farmland of statewide importance	Not limited	Not limited	205.2	4.9%
ThgC	Moderate	0	Not limited	79	Well drained	Farmland of statewide importance	Very limited (5)	Not limited	33.8	0.8%
ThgE	Severe	0	Not limited	79	Well drained	Not prime farmland	Very limited (5)	Very limited (5)	8.9	0.2%
ThhB	Slight	0	Not limited	27	Well drained	Not prime farmland	Not limited	Not limited	6.0	0.1%
UdaB	Moderate	0	Not limited	79	Well drained	Not prime farmland	Somewhat limited (5)	Not limited	739.8	17.5%
WATER	Not rated	0	Not rated	79		Not prime farmland	Not rated	Not rated	2.7	0.1%

[+]**Reason for Septic Limitation** (1) Depth to apparent zone of saturation (2) Not Permitted-Hydric Soil (3) Not Permitted- Flooding (4) Restrictive horizon (5) Restrictive substratum (6) Excessively coarse substratum	[++]**Reason for Foundation Limitation (Small Commercial Buildings)** (1) Depth to saturated zone (2) Shrink-swell potential (3) Flooding (4) Ponding (5) Slope (6) Organic matter content	[+++]**Reason for Basement Limitation (Dwellings)** (1) Depth to saturated zone (2) Shrink-swell potential (3) Flooding (4) Ponding (5) Slope	**Total acreage:**	4,218.4	100.0%

*Natural Drainage Class definitions in **Table 8.4.2** **Prime Farmland definitions in **Table 8.5.1**

SOURCE: USDA NRCS, 2022 ^(PHG) is too variable to rate in some instances

8.4 Soil Characteristics

Soil surveys frequently identify relevant soil characteristics that determine the limitations and qualities of the soil. Soil characteristics provide the basis for determining risks and hazards when decisions are made regarding land use. Knowledge of soil landscapes, soil formation, and measurements of various soil properties are used to deduce soil characteristics and function (Soil Survey Staff, 2022). The following characteristics are particularly relevant to land development. Field investigation with proper soil profiling and lab analysis where applicable can confirm these characteristics.

8.4.1 Depth to Seasonal High Water Table

A water table refers to a saturated zone in the soil profile. A seasonal high water table (SHWT) occurs during specified months, notably during periods where there is an increase in groundwater re-charge via higher precipitation rates. It also is based upon soil permeability, geological formations, drainage patterns, anthropogenic influences, and proximity to surface bodies of water (Natural Resource Conservation Service, 2020). The *depth to seasonal high water* table is the estimate of the distance between the land surface and top of the water table in a saturated zone of the soil profile. Estimates of the upper limit are based mainly on observation of the water table in selected areas and evidence of the water table based upon gray colors and redoximorphic features.

A shallow water table can degrade water resources and restrict the capability of land to support its intended use. Seasonal high water table is an important element in land use. It factors into site decisions concerning design and operations of the site. A shallow water table can have adverse effects on the environment surrounding it. Construction on sites with shallow water table conditions can increase the risk of flooding and property damage and erosion. It also has a negative impact on stormwater management and wastewater treatment. In addition, a shallow water table creates an anaerobic environment, limiting microbial activity and diminishing soil health (Natural Resource Conservation Service, 2020).

In Colts Neck Township (not including NWS Earle), 9 of the soil units fall into the first category, with SHWTs of three inches or less. These include the Humaquepts and Shrewsbury sandy loam, among others. Together, they compromise approximately 13.9% of the township. An additional 20 units collectively make up 35.9% of the township with SHWTs of approximately half a foot. Another 10 units have SHWTS ranging between greater than half a foot and less than 2.5 feet, they compromise 20.7% of the township. The remainder 28.5% of the township is comprised of 19 soil types and water with SHWTs exceeding 2.5 feet. **Figure 8.4.1** illustrates the estimated SHWT depth for soils in Colts Neck Township during the wet season. **Table 8.3.1** lists the depths for each soil type.

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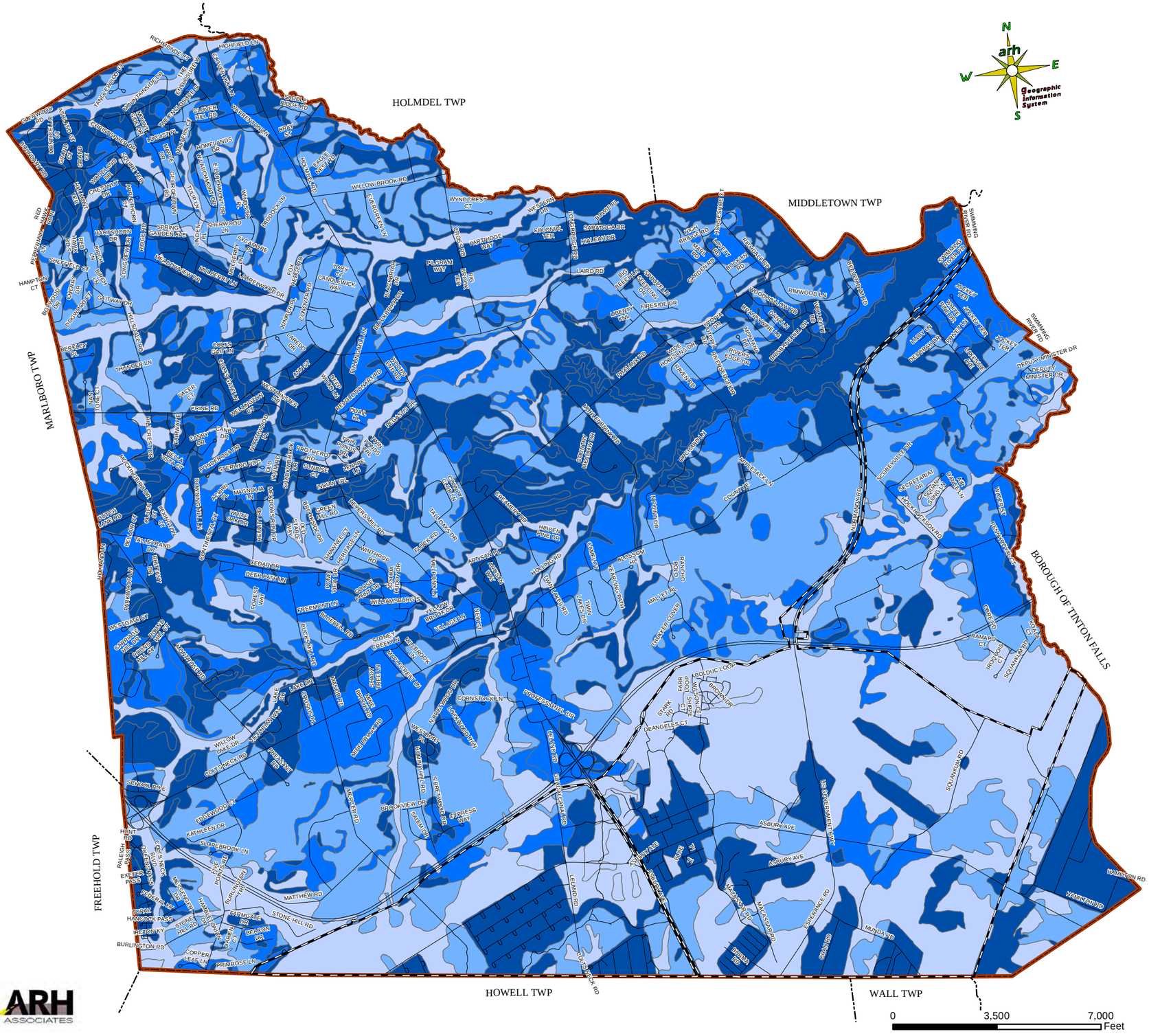

Figure 8.4.1
Depth to Seasonal High Water Table

Legend

- Earle NWS Area
- Municipal Boundary
- Road

Water Table Depth - Seasonal Minimum

- 0 - 3 inches
- 4 - 6 inches
- 7 - 30 inches
- 31 - 79 inches

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

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For the NWS Earle portion of the township, there is a higher frequency of shallow water tables. 8 soil units have SHWTs of 2.5 feet or less and make up 55.3% of the area. 14 soil units have SHWTs of half a foot, and make up 16.6% of the area. 4 of the soil units have SHWTs between 2.25 feet and 2.5 feet, and make up 5.1% of the area. The remaining 23% of the area is comprised of 8 soil units and water with SHWTs exceeding 3 feet. **Table 8.3.2** lists the depths for each soil type.

8.4.2 Drainage Classification

The permeability of a soil is the ease in which water can penetrate or pass through a layer of soil. *Soil drainage* is the frequency and duration of periods when a soil is free from saturation with water (Weil, 2017). A soil drainage class classifies soils in six classes based on the rate that water moves through the soil, as described in **Table 8.4.2**. Soils in Colts Neck township drainage classifications are described in **Table 8.3.1** and **8.3.2** and illustrated in **Figure 8.4.2**. Without Naval Weapons Station Earle, approximately 2.4% of Colts Neck Township has soils that are excessively drained, 75.9% that are well drained, 4.9% that are moderately well drained, 0.5% that are somewhat poorly drained, 12.9% that are poorly drained, and 0.2% that are very poorly drained. The remaining 3.1% is covered with water (See **Table 8.3.1** and **Figure 8.4.2**).

Table 8.4.2: Natural Drainage Classification

Drainage Classification	Description
Excessively drained	Water is removed very rapidly. Soils are commonly coarse textured with high saturated hydraulic conductivity, or are shallow.
Somewhat excessively drained	Water is removed rapidly. Soils are commonly coarse textured with high saturated hydraulic conductivity, or are shallow.
Well drained	Water is removed readily. Water is available to plant roots most of the growing season in humid regions. Wetness does not inhibit root growth and does not show redoximorphic features at shallow depths.
Moderately well drained	Water is removed somewhat slowly. Soils are wet for a short period of time within the rooting depth during the growing season. Soils commonly have moderately low or lower saturated hydraulic conductivity.
Poorly drained	Water is removed slowly enough that soil is wet at shallow depths during the growing season or for long periods of time. Most mesophytic crops cannot be grown without drainage. Soils have low or very low saturated hydraulic conductivity.

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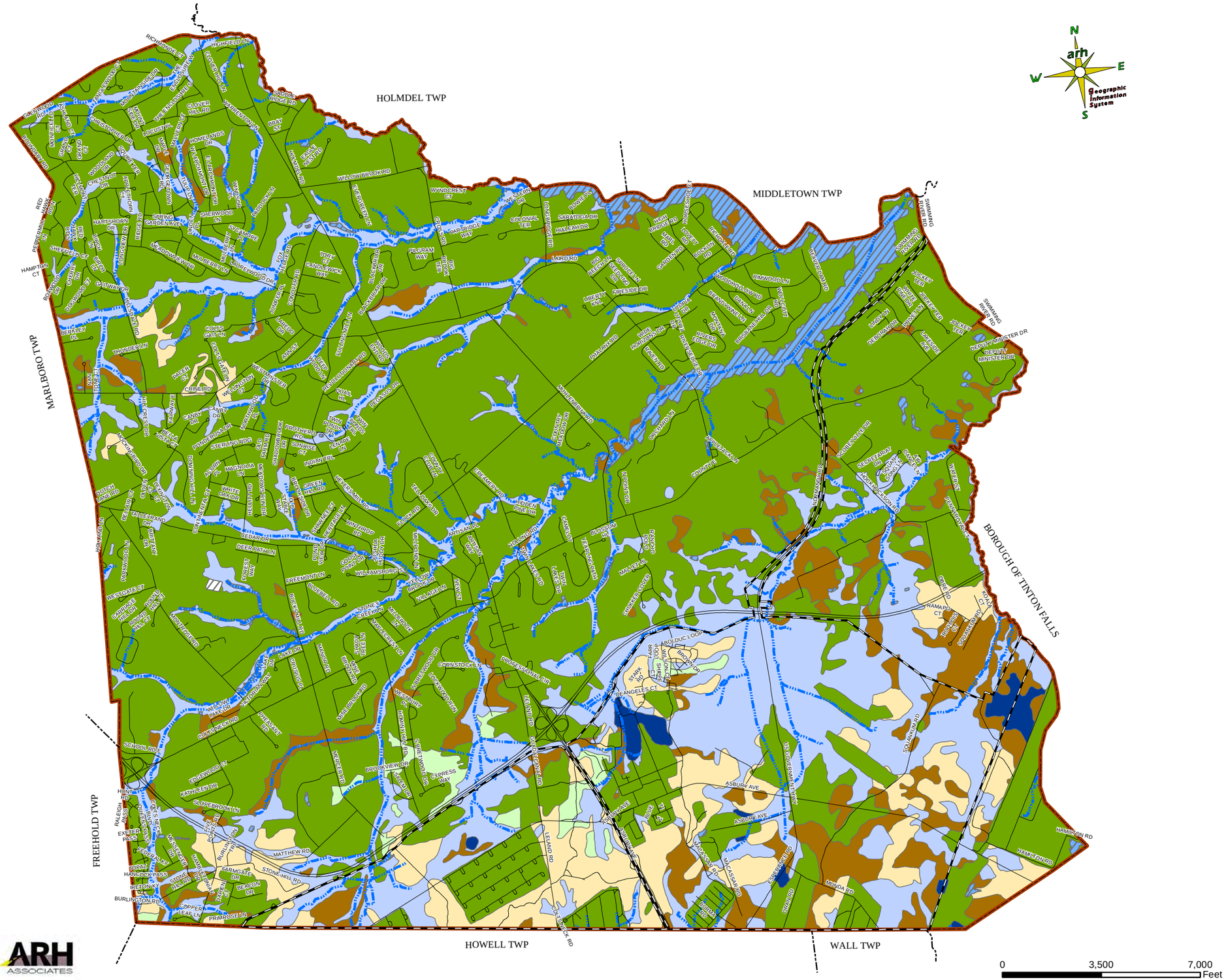

Figure 8.4.2
Drainage Class

Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Streams (NJDEP)

Drainage Class

- Excessively drained
- Moderately well drained
- Well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Not rated
- Waterbodies (NJDEP)

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

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Very poorly drained	Water is removed slowly enough that free water remains at or very near the surface during much of the growing season. Most mesophytic crops cannot be grown without drainage. Soils are commonly level or depressed and frequently ponded unless in area with frequent rainfall where slopes may be higher.
Source: Soil Survey Manual; Chapter 3	

For the portion of the township that is Naval Weapons Station (NWS) Earle, in correlation to its prevalent wetlands, has a higher percentage of poorly drained soils. The drainage classification percentages for NWS Earle are as follows; 21.3% excessively drained, 25.2% well drained, 12.4% moderately well drained, 37% poorly drained, 2% somewhat poorly drained, and 2.2% very poorly drained. The remaining 0.1% is covered with water (See **Table 8.3.2** and **Figure 8.4.2**).

8.4.3 Septic Suitability

A common type of on-site wastewater treatment for residences not connected to municipal sewage systems is a *septic tank* and its *associated drain field (absorption field).* Water carrying wastes flows into a large underground septic tank. Baffles in the tank cause the inflowing wastewater to slow down and drop most of its loaded suspended solid materials into the bottom of the tank. Organic solids are decomposed by microbes. Left over sludge is removed by pumping. Water exiting the septic tank should pass through a soil profile in which it is purified before it reaches groundwater (Weil, 2017).

The suitability of a site for septic drain field installation depends mostly on soil properties that affect water movement and ease of installation. Soil for septic systems should have good aeration to encourage microbial breakdown of wastes and destruction of pathogens. The soil should also have some fine pores of clay or organic matter to absorb and filter contaminants from the wastewater. Soil characteristics that are not suitable for the drainage of septic effluent into groundwater include impermeable layers, excess saturated conditions, steep slopes, and excessively drained sand and gravel. Unsuitable soil properties such as these can result in pollution of groundwater and underground seepage of untreated wastewater. A soil with too slow of a percolation rate can move wastewater upward rather downward (Weil, 2017). Soil with too fast of a percolation rate such as excessively drained sand does not give wastewater enough time to be purified before reaching groundwater.

Figure 8.4.3 illustrates the general suitability of soil types for septic systems. **Tables 8.3.1** and **8.3.2** list the suitability of soils in Colts Neck Township for septic suitability characteristics. Proper field evaluation and testing is needed to verify these characteristics, as with all soil characteristics. Approximately 14.7% of the township (Non-NWS Earle) soils are rated as very limited for septic systems. This is due to reasons such as hydric rating, flooding frequency, depth to zones of saturation like seasonal high water tables, restrictive horizons and similar. 4.9% of the township is rated as somewhat limited, 76.9% is rated as not limited, and the

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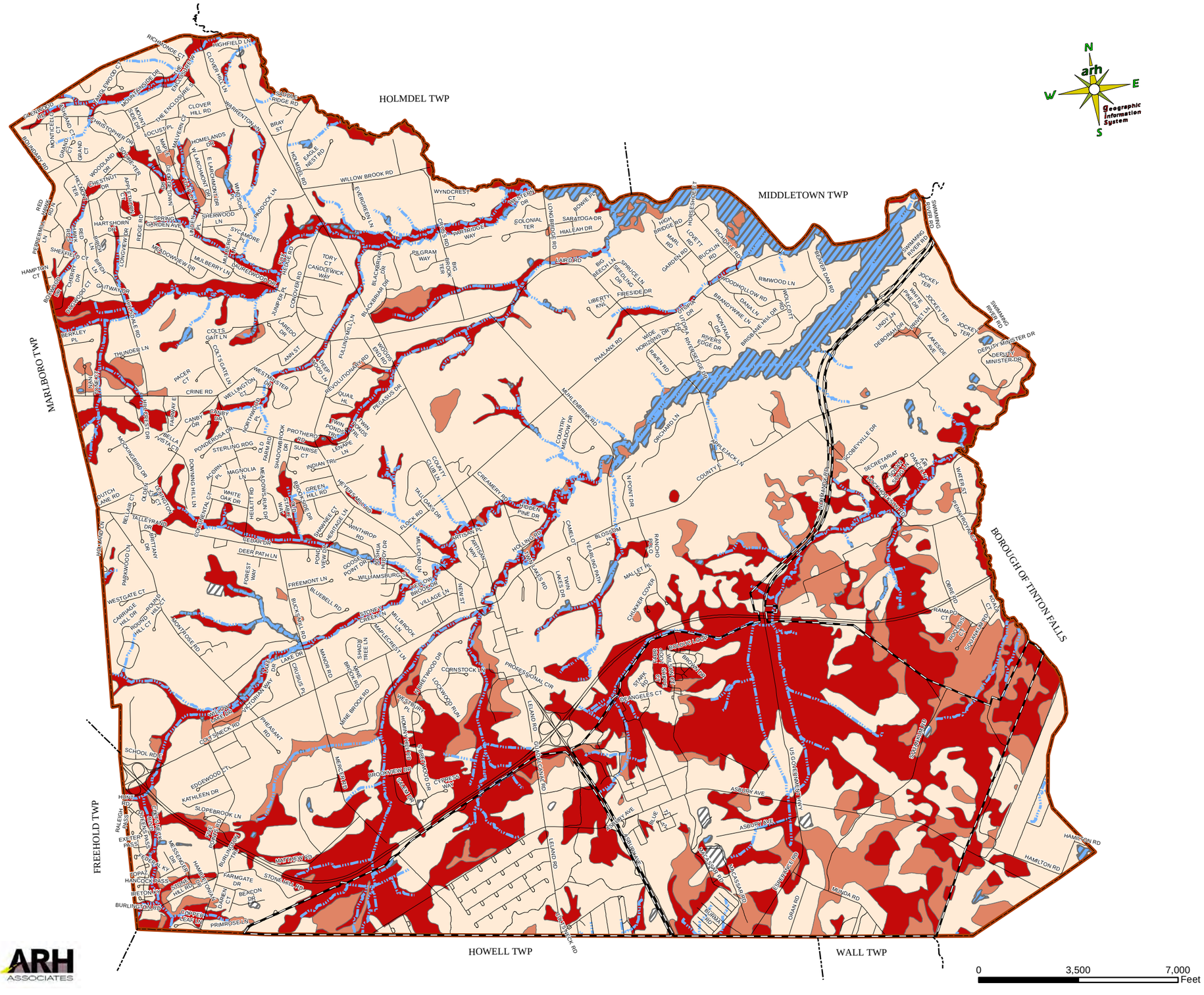
Figure 8.4.3 Septic Suitability



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Septic Suitability

- Not rated
- Not limited
- Somewhat limited
- Very limited

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

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remaining 3.1% is not rated water and PHG (Human disturbed pits, sand and gravel). For the portion of the township that is NWS Earle, 42.0% of the area is rated as very limited, 11.7% of the area is somewhat limited, 45.5% of the area is not limited. The remaining 0.7% is not rated water and PHG.

8.4.4 Erosion Hazard

Soil erosion is the removal of soil particles, nutrients, and organic matter from the surface soil (Muckel, 2022). The most common forces that cause soil erosion are water and wind. Although construction activities possibly impact only a relatively small acreage of land in a watershed, they can be a major source of sediment and increased water runoff. Construction activities often leave the soil disturbed, bare, and exposed to the abrasive action of wind and water. These conditions greatly accelerate erosion, which produces large amounts of sediment (Soil Quality Institute, 2000).

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion (Muckel, 2022). The ratings for Erosion Hazard (Road, Trail) shown in **Table 8.3.1** and **8.3.2** indicate the hazard of erosion loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and rock fragment content (Soil Survey Staff, 2019).
Erosion factor (K) indicates the susceptibility of uncovered soil to sheet and till erosion (Soil Survey Manual, 2017).

Soil survey information is used to assess the hazard of wind and water erosion, evaluate erosion rate, estimate soil loss tolerance, and to assist in the design of erosion-control practices (Muckel, 2022). There is a myriad of management practices utilized to protect soil from erosion. Some examples are adding mulch, seeding, sod, diverting water from disturbed areas, and minimizing slop gradients (Soil Quality Institute, 2000). **Figure 8.4.4** shows the erosion hazard for unsurfaced roads and trails in Colts Neck Twp. Rating hazards are designated as “slight,” “moderate,” or “severe.” A rating of “slight” shows that erosion is seldom or unlikely. “Moderate” shows that erosion is somewhat likely, and roads and trails may require maintenance on occasion and simple erosion-control measures should be put in place. “Severe” shows that substantial erosion is expected, and that roads or tails require maintenance frequently, and that significant erosion-control measures are needed (Soil Survey Staff, 2019).

Approximately 4.7% of Colts Neck Township (Non-NWS Earle) soils are rated as severe for erosion hazard for unsurfaced roads and trails. Approximately 24.5% of soils are rated as moderate. This is mainly due to the soil type’s slopes and erodibility. 67.7% have a slight rating for erosion hazard. The remaining 3.1% is not rated, and is either water or PHG (Human disturbed pits, sand and gravel). For the portion of the township that is NWS Earle, only 0.3% is rated as severe for soil erosion hazard, 25.1% is rated as Moderate, and 73.9% is rated as slight. The remaining 0.7% is not rated, and is either water or PHG.

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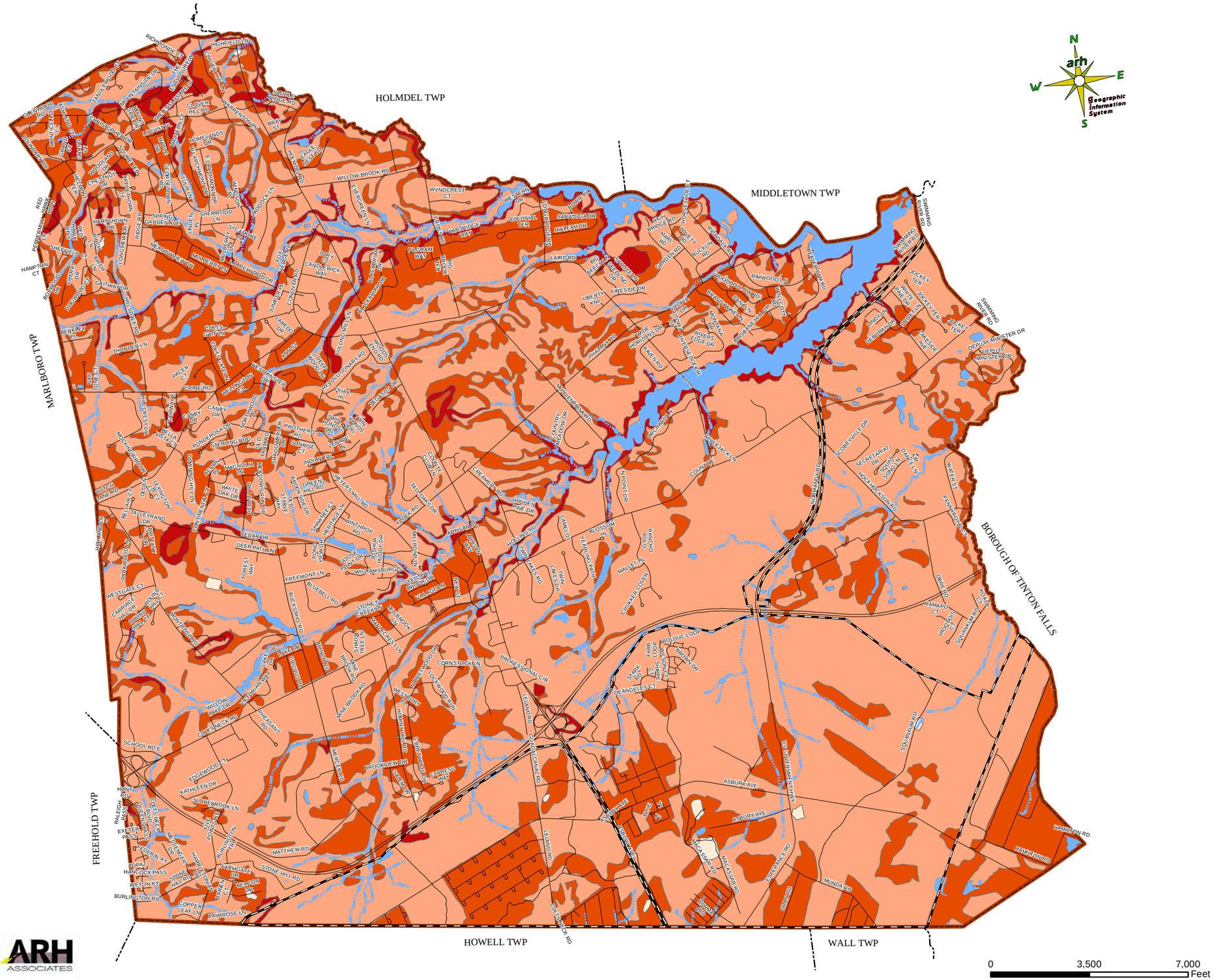
Figure 8.4.4 Erosion Hazard



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Erosion Hazard - Road/Trail

- Not rated
- Slight
- Moderate
- Severe

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

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8.5 Agricultural Characteristics

Soil surveys conducted in agricultural areas identify soil characteristics that are used to determine suitability and potential of soils for farming. Soils suitable for farming are identified through soil management group classification and properties that pertain to agriculture. These are properties such as crop production, application of conservation practices, yield potential, saturated hydraulic conductivity, slope gradient, salinity, and sodium absorption ratio, and more (Soil Science Division Staff, 2017). Farmland classification in Colts Neck identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland, as defined in **Table 8.5.1**. It identifies the location and extent of the soils that are optimally suitable for various crops. A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be cultivated as easily (Soil Survey Staff, 2019).

Table 8.5.1: Prime Farmland Descriptions

Farmland Classification	Description
Prime	Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, 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. It is not frequently inundated or saturated with water during the growing season, is permeable to water and air, and is not excessively erodible.
Unique	Land other than prime farmland used to produce specific high-value food and fiber crops. Crops can include citrus, tree nuts, olives, cranberries and other fruits and vegetables. These require a special combination of soil quality, moisture supply, air drainage and other specific conditions with a dependable water supply of adequate quality.
Statewide	Land other than prime or unique farmland that meets the appropriate State agencies criteria. Typically when this land is managed according to acceptable farming conditions it will economically produce high-yields of crops. Statewide importance farmland may also include areas of land that have been designated for agriculture by State law.
Local	Land that has been identified by local agencies as having importance to produce food, feed, fiber, forage, and oilseed crops. It may also include areas designated for agriculture by local ordinance.
Source: *NRCS Web Soil Survey*	

Colts Neck Township without NWS Earle has 41.3% of its area as Prime Farmland Soils including the soil types of Colington sandy loam, Colts Neck sandy loam, and Freehold sandy loam. Farmland of statewide importance soils make up 24.7% and include Tinton loamy sand. Farmland of statewide importance if drained makeup 5% and include Shrewsbury sandy loam.

Farmland of unique importance make up 1.5% and include the Atsion sand series. The remaining 27.5% of the area is not Prime Farmland. Colts Neck Township Farmland (without NWS Earle) acreages are shown in **Table 8.5.2.** 11,672.9 acres has soils suitable for farmland, as illustrated in **Figure 8.5**. Individual soil series suitability can be seen in in **Table 8.3.1**.

Table 8.5.2: Farmland soils of Colts Neck Township (Non-NWS Earle)

Farmland Classification	Acreage	Percentage
All areas are Prime Farmland	6,642.5	41.3%
Farmland of Statewide Importance	3,978.5	24.7%
Farmland of Statewide Importance, if drained	806.2	5.0%
Farmland of Unique Importance	245.7	1.5%
Not Prime Farmland	4,429.3	27.5%
***Total:**	16,102.2	100.0%
**All Values rounded to the nearest tenth.*		

In contrast, the NWS Earle portion of the township has significantly less prime farmland. It has only 1.6% prime farmland. This can be attributed to its poorly drained soils, seasonal high water tables, and prevalent amount of hydric soils to name a few. The acreages of soils suitable for farmland are shown in **Table 8.5.3,** and they are illustrated in **Figure 8.5**.

Table 8.5.3: Farmland of Colts Neck Township (NWS Earle)

Farmland Classification	Acreage	Percentage
All areas are prime farmland	68.7	1.6%
Farmland of Statewide Importance	360.8	8.6%
Farmland of Statewide Importance, if drained	167.0	4.0%
Farmland of Unique Importance	1,395.9	33.1%
Not Prime Farmland	2,225.9	52.8%
***Total:**	4,218.3	100.0%
**All Values rounded to the nearest tenth.*		

Colts Neck Township contains extensive areas of prime agricultural soils and broad networks of streams that provide irrigation for crops, water for livestock, and power for mills historically. However, the greatest increase in population of Colt's Neck Township happened in the 1960's coinciding with the greatest loss of farmland in any decade since then. Colts Neck has made efforts to maintain its rural character and its agricultural history. Recently, Colts Neck has been active in implementing state and county farmland preservation programs, which has resulted in many additional acres as permanently deed restricted farmland. When there are residential developments in the AG (Agricultural) zone of the township, lot size averaging designs are encouraged to be used (Anfuso, 2013). This allows and limits new residential lots at a lower density of acreage, so that large farm lots can compromise the remaining acreage. The

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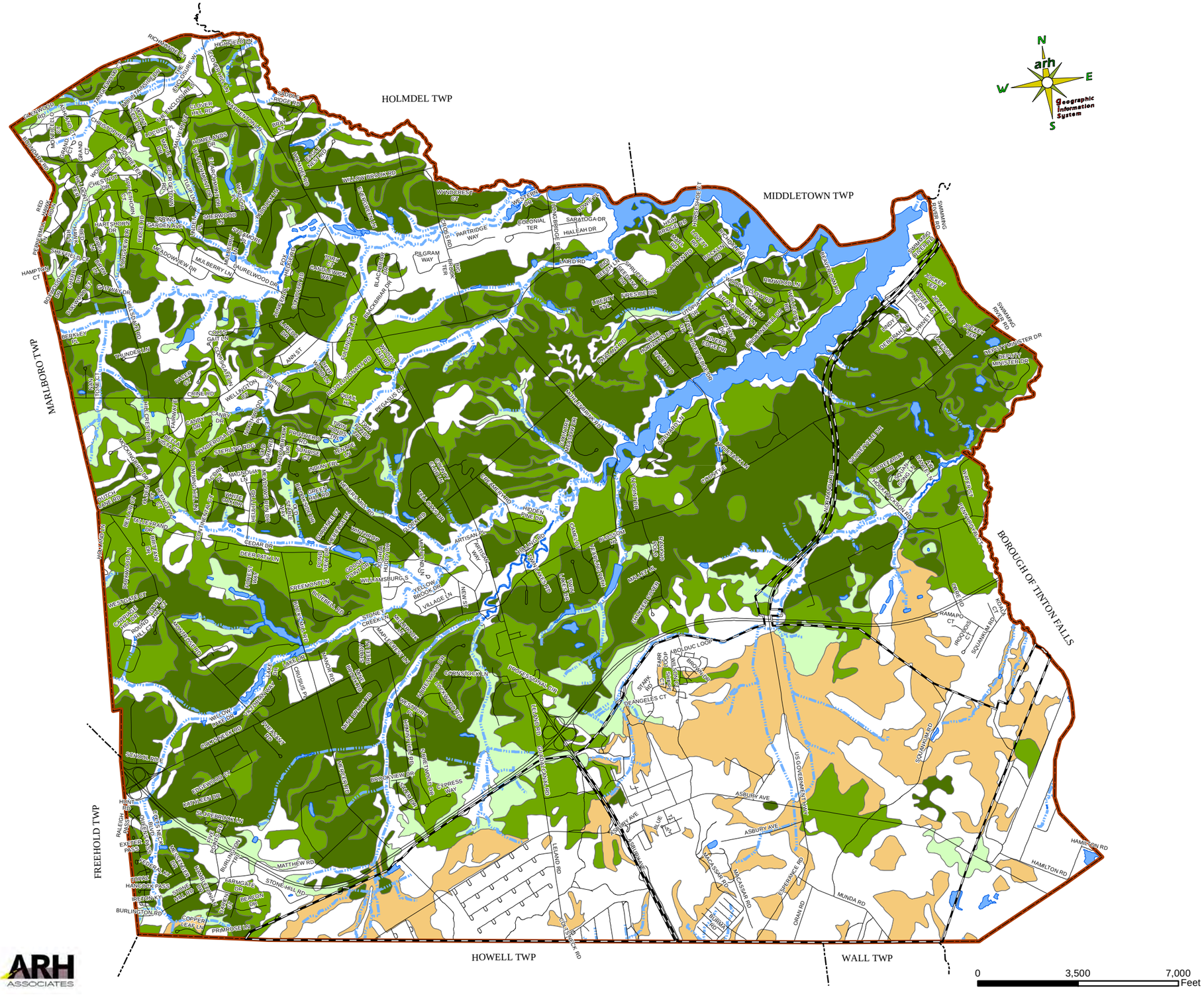
Figure 8.5 Prime Farmland



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Farmland Soils

- All areas are prime farmland
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of unique importance
- Not prime farmland

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

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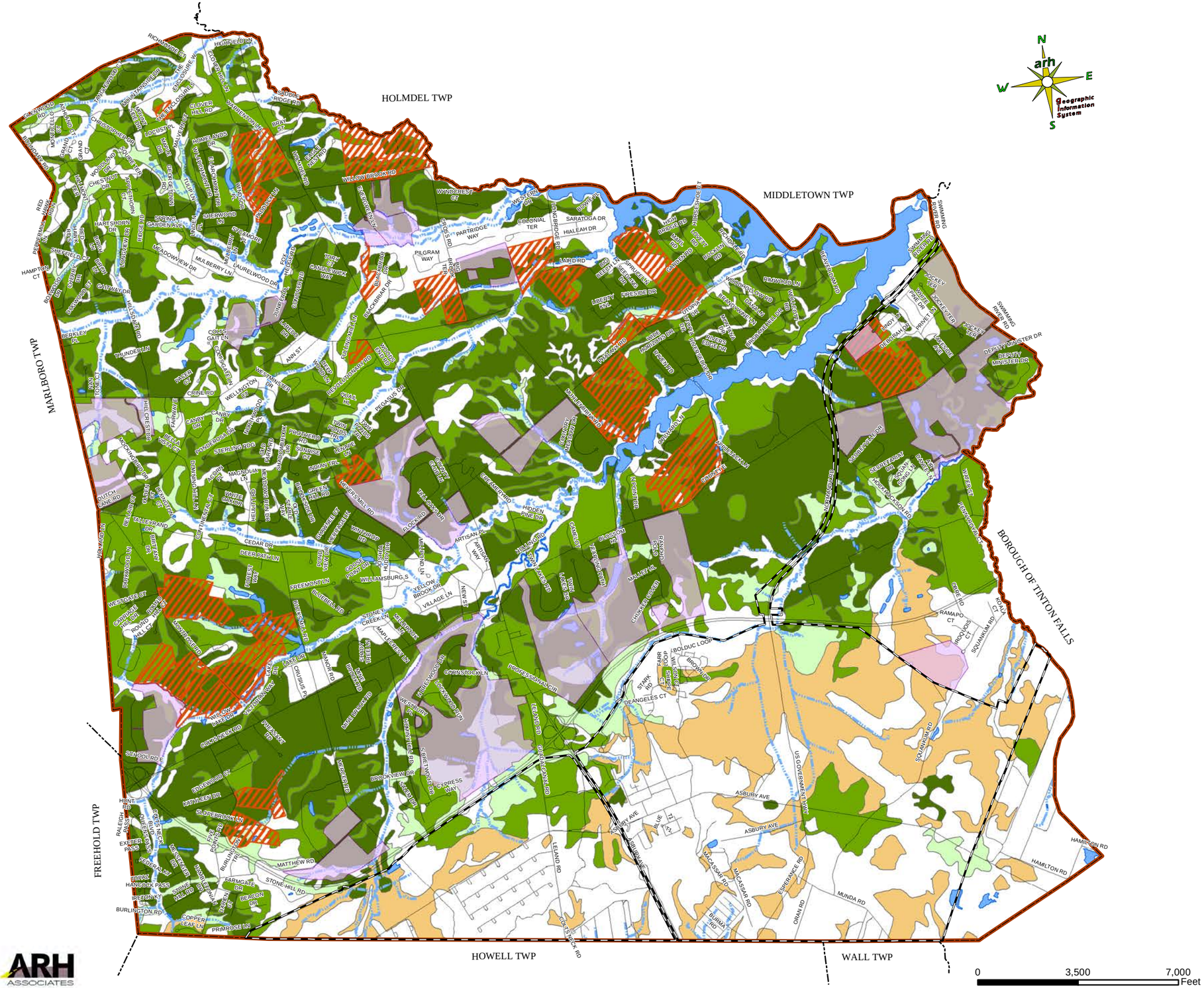
Figure 8.5.4 Farmland



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)
- Lot Size Averaging Developments
- Preserved Farmland

Farmland Soils

- All areas are prime farmland
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of unique importance
- Not prime farmland

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. Preserved Farmland and Lot Size Averaging Developments were derived from tabular data from Colts Neck Township.

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township has been extremely successful in preserving and deed restricting land throughout Colts Neck (Anfuso ,2013). Preserved farmland of Colts Neck Township is shown over top of prime farmland soils in **Figure 8.5.4**. Deed restricted land with development whose lot size has been averaged in acreages is also shown in **Figure 8.5.4**. **Table 8.5.4** below shows the total preserved farmland and deed restricted land with development in acres for Colts Neck Township.

Table 8.5.4: Farmland preservation acreage of Colts Neck Township

Farmland Type	Total Acres
*Preserved Farmland	1,072.90
**Lot Size Averaging Developments (Deed Restricted Land)	1,713.29
*For Preserved Farmland, Feiler was omitted as tabular data noted easement was not recorded. **For LSAD, Abbatiello was omitted as Block 40.01 Lot 5.13 is no longer a lot. Kureti was updated to Lot 3.02 as tax parcel data suggests update.	

8.6 Hydric Soils

Hydric soils can be defined as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Vasilas et. al, 2018). The longer the presence of water in a given area and the more frequent of the flooding events, the more pronounced its effect on the soils. The development of wet soils can occur from certain landscape positions and landforms. These include depressions, flood plains, toes of slopes, drainage ways, seepage slopes and more. A soil's supply of oxygen from the air is depleted when it is saturated with water periodically. Inundation of the soil eliminates gas exchange between the atmosphere and the soil, leaving existing oxygen in soil pores to be consumed by microbes creating *anaerobic* conditions (Tiner, 2017).

Soil microbes are responsible for necessitating oxidation-reduction reactions in the soil. Soils experiencing saturation display morphological evidence of reduction such as redoximorphic features (Tiner, 2017) which can be utilized for their identification. It is important to note that identification of these soils is not exclusively reliant on redoximorphic features. There are many features used in combination with redox features such as organic matter accumulation and color that contribute to a soil's identification and classification as hydric.

Hydric soils can pose severe limitations on development. Issues with drainage can arise and can affect buildings, septic systems, local roads and streets, and flooding in basements. In Web Soil Survey, the rating for a hydric soil is based upon the percentage of hydric components of a given map unit. **Figure 8.6** shows the hydric rating for soils in Colts Neck Township. There are seven (7) hydric soils map units found within Colts Neck Township that are generally hydric greater than or equal to 90% of the time. These are Atsion Sand; Northern Coastal Plain (AtsA) and Northern Tidewater Area (AtsAO), Colemantown loam (CoeAs), Elkton loam (EkaAr), Humaquepts (HumAt),

Colts Neck Township 2024 Environmental Resource Inventory

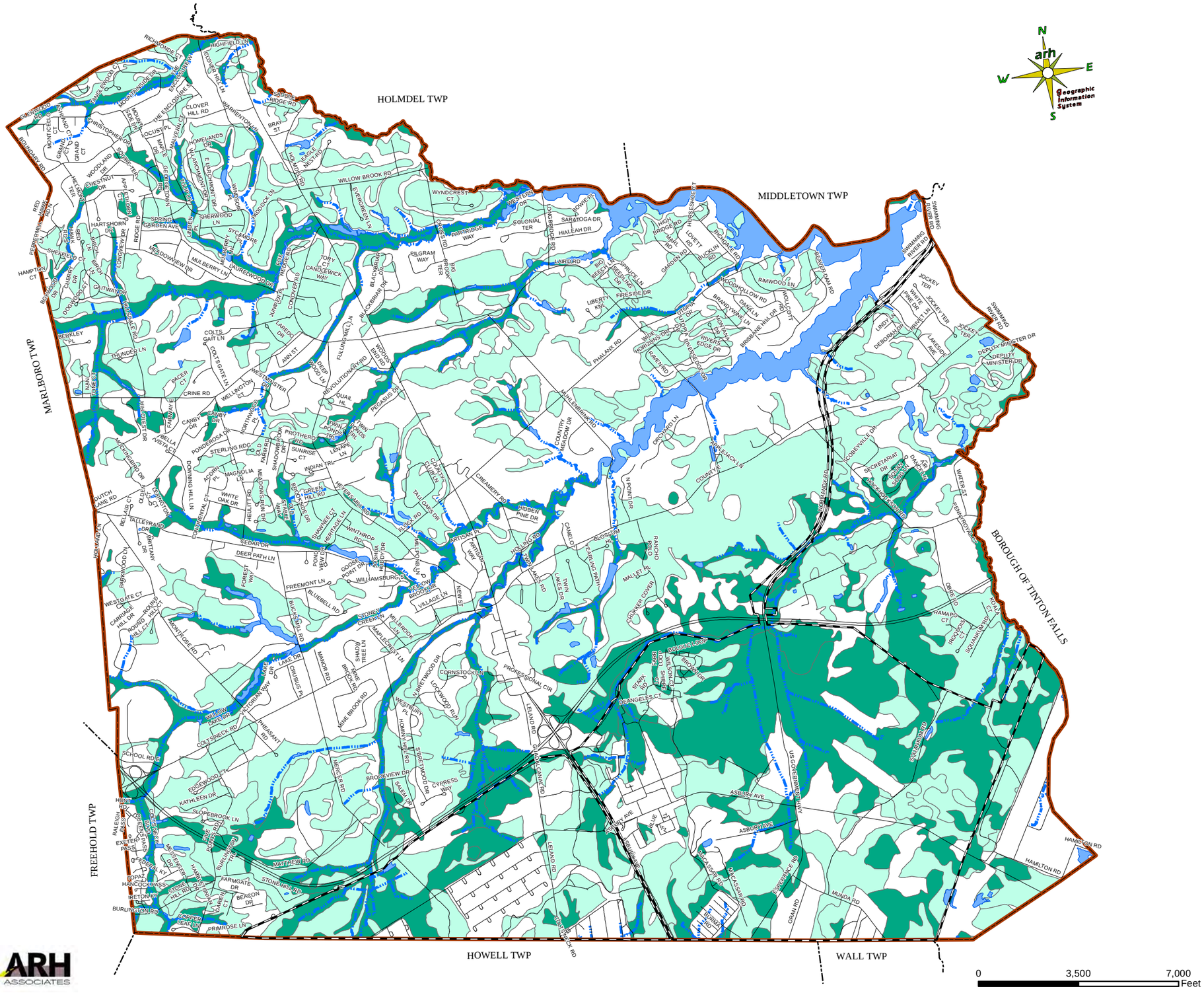

Figure 8.6
Hydric Soils (Percent of Map Unit)

Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Hydric Soils

- Not Hydric
- 4% to 10% Hydric
- 90% to 100% Hydric

GIS Data Sources:
1. Soils: NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.

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Manahawkin muck (MakAt), and Shrewsbury sandy loam (ShrA). See **Table 8.6.1** and **8.6.2** for the percentage of hydric soils found within the Township.

Table 8.6.1 Hydric Soils of Colts Neck Township (Non-NWS Earle)

Hydric Rating of Map Unit in percent	Acres	Percent of Colts Neck Township (Non-NWS Earle)
0	7,927.8	49.2
4-10	5,561.1	34.5
90-100	2,116.8	13.2
WATER	499.4	3.1
Total	16,105.1	**100**

Table 8.6.2: Hydric Soils of Colts Neck Township (NWS Earle Portion)

Hydric Rating of Map Unit in percent	Acres	Percent of NWS Earle portion of Colts Neck Township
0	1,185.4	28.0
4-10	1,378.8	32.8
90-100	1,652.4	39.10
WATER	2.7	0.10
Total	4,219.3	**100**

Table 8.6.1

8.7 References

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9. Surface Water Resources

9.1 Watersheds & Surface Waters

New Jersey is the fifth smallest, but most densely populated state in the Nation. NJ is also one of the most geologically and hydrogeologically diverse states (NJDEP, 2022). New Jersey has a variety of surface waterbody types that range from intermittent streams to large river systems (a significant number of which are tidally influenced); acres of lakes, ponds, and reservoirs; and miles of estuarine and coastal (ocean) waters. Wetlands are found near most surface waterbodies, and are discussed in detail in Chapter 15.

New Jersey's surface water systems are located in a wide variety of geologic settings, from the past glaciated regions of northern New Jersey to the coastal plain, and include ecologically unique and/or protected areas such as the Coastal, Pinelands and the Highlands regions. Colts Neck, in the Atlantic Coastal Plain, has extensive water resources which warrant attention and protection.

Resources	Extent*
State Total Area (square miles)	8,772
State Total Land Area (square miles)	7,254
Rivers and Streams:	
Miles of Nontidal Rivers and Streams	13,695
Miles of Tidal Rivers and Streams	5,730
Miles of Rivers and Streams (total)	19,425
Border Miles Shared Rivers	197
Lakes, Ponds and Reservoirs:	
Total Acres of Lakes and Ponds and Reservoirs	47,620
Number of Reservoirs	43
Acres of Reservoirs	14,970
Estuaries and Ocean:	
Square Miles of Estuaries	650
Miles of Ocean Coast (linear miles)	127
Square Miles of Ocean (jurisdictional waters)	470
Wetlands:	739,160
Acres of Freshwater Wetlands	209,269
Acres of Tidal Wetlands	948,429
Total Acres of Wetlands	

* Spatial extents shown in this table are calculated based on 1:24,000 scale from the Department's GIS coverages for the applicable water resource including the National Hydrography Dataset (NHD), surface water quality classification, lakes, coastal waters, and wetlands (2002).

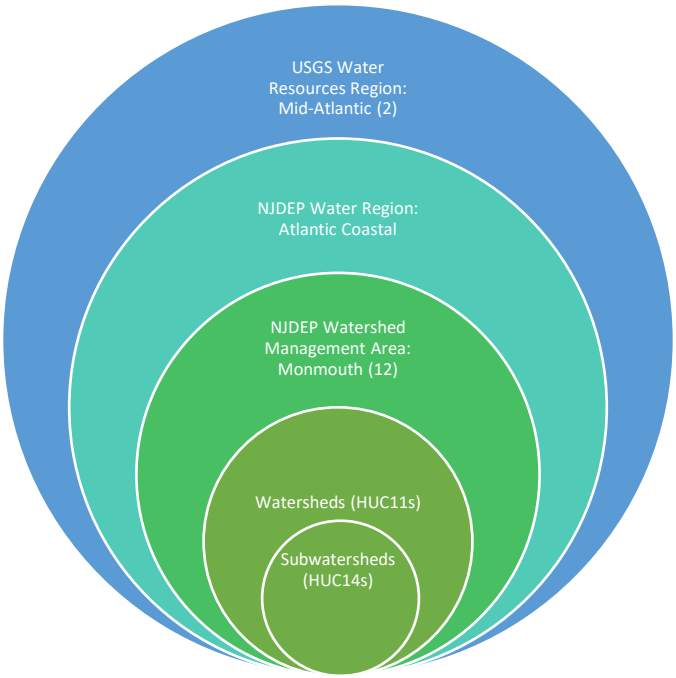
9.1.1 Definition of Watersheds and Subwatersheds

Water connects us all. Surface water bodies such as rivers, streams, lakes and reservoirs receive water either via surface runoff from precipitation events and/or subsurface baseflow provided by groundwater. Each surface water body has an associated drainage area, also referred to as a watershed; for any given watershed, a drop of water which falls to the ground will eventually make its way to the associated surface water body. Watersheds are based purely on topography and surface water features, with no regard for political or municipal boundaries. Therefore, Colts Neck shares responsibility for its watersheds, rivers and lakes with several near and far neighbors.

Mississippi River Watershed

Watersheds can be mapped on several scales; the Mississippi River, for example, has a contributing watershed on the order of 1.2 million square miles, encompassing all or parts of 32 states, two Canadian provinces, and approximately 40% of the continental United States. But within that massive drainage area, contributing rivers each have their own respective watersheds, and within those watersheds smaller tributaries each have their own sub-watersheds. Similarly, in Colts Neck Township the Navesink River / Lower Shrewsbury River Watershed (commonly referred to as the Navesink River Watershed) encompasses several smaller subwatersheds (including Yellow Brook, Swimming River and Pine Brook among others), as detailed below.

At a national level, the U.S. Geological and Water Survey (USGS) designates watersheds and subwatersheds at varying scales. On a state level, the NJDEP does the same. The following graphic provides an outline of the terminology used in the following sections and the applicable designations.

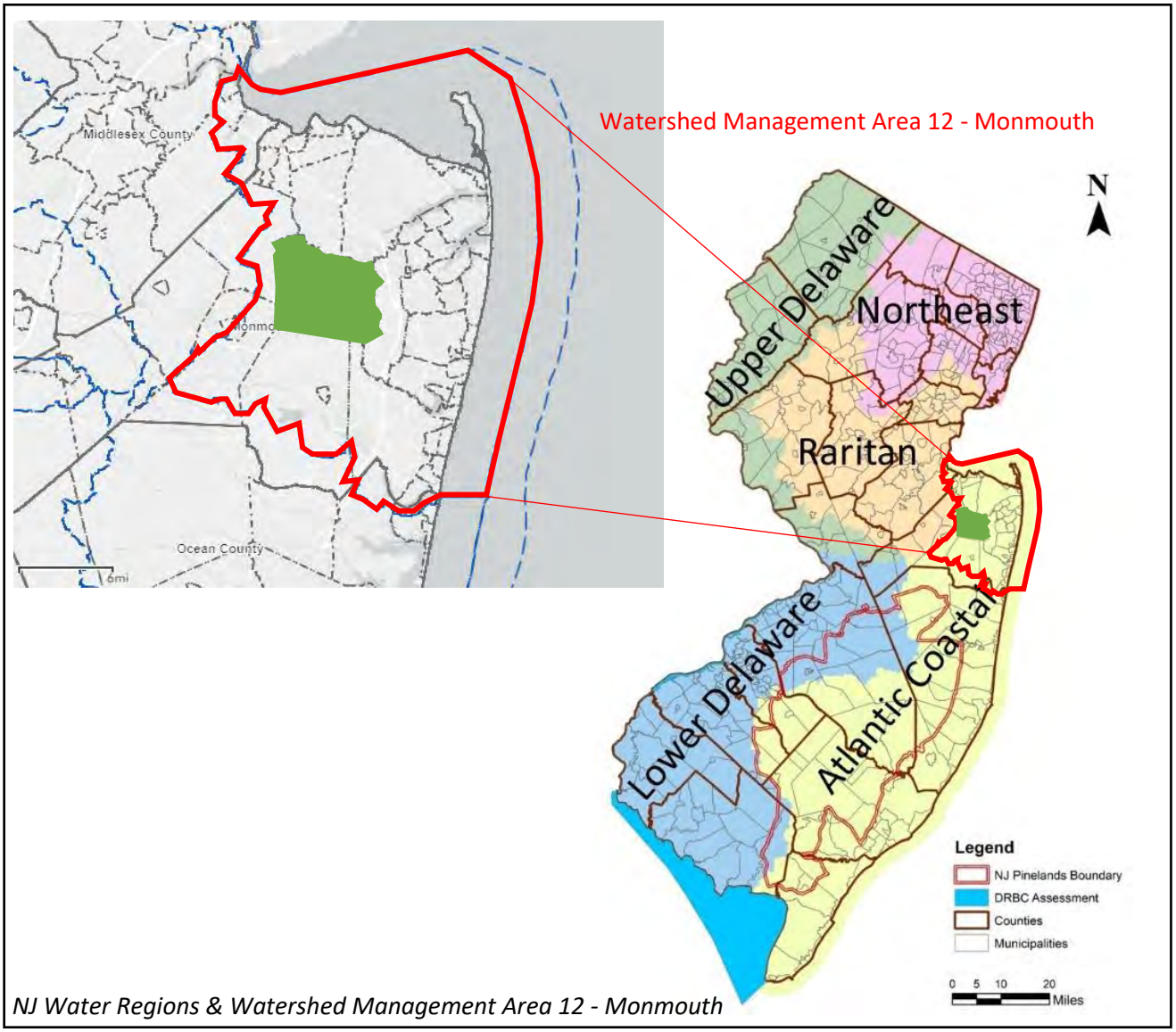


State and Federal Watershed Designations

9.1.2 NJDEP Water Regions & Watershed Management Areas

New Jersey is divided into five (5) Water Regions as shown in the graphic below; as mentioned above, Colts Neck is part of the Atlantic Coastal Water Region, all of which drains to the Atlantic Ocean.

The state is further divided into a series of twenty (20) Watershed Management Areas for purpose of maintaining the physical, chemical, and biological integrity of New Jersey's waters. These are large-scale watersheds which all contribute to either a major river or directly to the Atlantic Ocean. Within the Atlantic Coastal Water Region, Colts Neck is centrally located in Watershed Management Area 12 (WMA 12) – Monmouth; the coastal area of WMA 12 stretches from Manasquan Borough to the south all the way up to South Amboy City to the north. Activities which impact surface water quality and quantity in Freehold, Marlboro and Holmdel, in addition to Colts Neck and many others, can potentially impact surface water downstream.



NJ Water Regions & Watershed Management Area 12 - Monmouth

9.1.3 Colts Neck Watershed and Subwatersheds

Colts Neck Township encompasses several watersheds and subwatersheds within WMA 12, all of which run east to the Atlantic Ocean (see Figure 9.1). Watersheds are designated by their Hydrologic Unit Code or HUC; larger drainage areas are characterized by an 11-digit number (referred to as "HUC-11's"), while smaller, sub-drainage areas are characterized by 14-digit numbers (HUC-14's). The USGS created this hierarchical numbering system in which the first two (2) digits of the code refer to the USGS Water Resources Region (i.e., a HUC beginning with "02" is in the Mid-Atlantic Region, which encompasses all of Colts Neck Township). Watershed and subwatershed names provided here are those used by NJDEP and USGS, and sometimes may be referred to be different names locally.

Table 9.1. Hydrologic Unit Codes for Colts Neck Township's Subwatersheds

Watershed Name	HUC-14[1]	Subwatershed Name[2]	Acres in Colts Neck Twp.
Navesink River / Lower Shrewsbury River (commonly referred to as Navesink River)	02030104070010	Hop Brook (also known as Ramanessin Brook)	2
	02030104070020	Willow Brook	760
	02030104070030	Big Brook	3012
	02030104070040	Yellow Brook (above Bucks Mill)	1758
	02030104070050	Mine Brook (Monmouth Co)	2603
	02030104070060	Yellow Brook (below Bucks Mill)	1965
	02030104070070	Swimming River Reservoir / Slope Brook	3938
	02030104070080	Pine Brook / Hockhockson Brook[3]	5570
	02030104070100	Poricy Brook/Swimming River (below Swimming R Rd)	34
Whale Pond Br / Shark R / Wreck Pond Brook	02030104090040	Shark River (above Remsen Mill gage)	276
Manasquan River	02030104100060	Mingamahone Brook (above Asbury Rd)	402

[1] 14-Digit Hydrologic Unit Code

[2] Names reflect the exact names in use by NJDEP and are generally named to reflect stream segments between, above (upstream of), or below (downstream of) roads, bridges, or coordinates (e.g., Bucks Mill).

[3] This is the only subwatershed within Colts Neck Township that does not have Category 1 waters (see further discussion below).

Source: *(NJDEP GeoWeb, 2023)*

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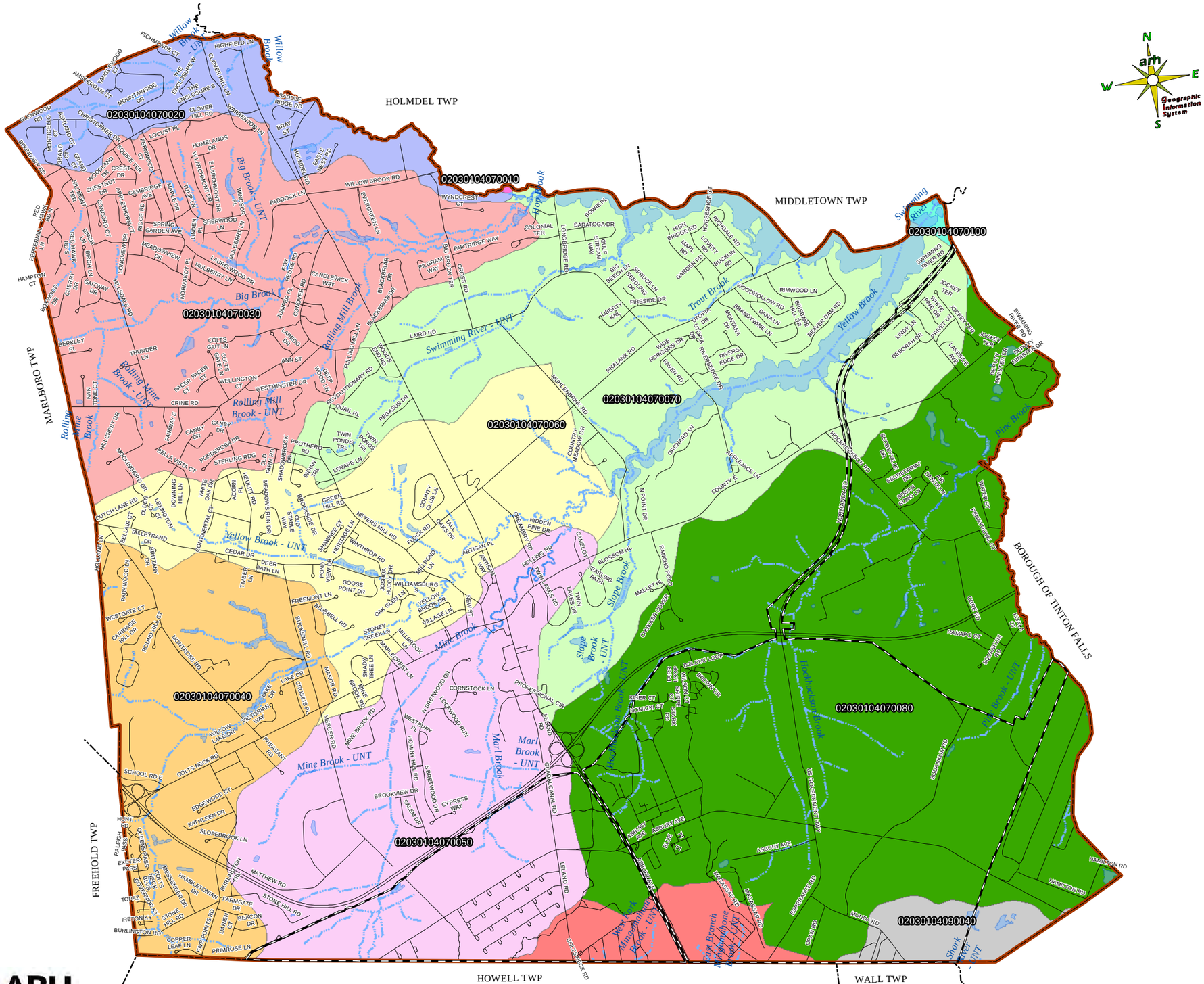
Figure 9.1 - Subwatersheds & Surface Water Features



GIS Data Sources:
1. HUC14, Edition 20160309 GIS data came from NJDEP.
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

Note: Most of the HUC14 subwatersheds belong to the NAVESINK RIVER / LOWER SHREWSBURY RIVER watershed with the exception of Mingamahone Brook (MANASQUAN RIVER watershed) and Shark River (WHALE POND BK / SHARK RIVER / WRECK POND BK watershed).

0 3,500 7,000 Feet

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The vast majority of Colts Neck Township (97%) is part of the Navesink River / Lower Shrewsbury River watershed (HUC-11 02030104070). The Navesink River / Lower Shrewsbury River watershed is bounded by the Atlantic Ocean to the east, into which it drains, and generally extends west from Long Branch to Freehold, north to Matawan and east to Highlands. Within the Navesink Watershed, most of Colts Neck is upstream of the Swimming River Reservoir, in a drainage area commonly referred to as the "Upper Navesink Watershed". Subwatersheds within the Township which fall outside of the Upper Navesink Watershed area:

- Pine and Hockhockson Brooks along the eastern side of the Township, which drain ±27% of the Township to the Swimming River downstream of the reservoir within the Lower Navesink Watershed;
- Shark River at the southeastern corner of the Township, belongs to the Whale Pond Br / Shark R / Wreck Pond Brook Watershed (HUC-11 02030104090040), draining ±1% of the Township area, and
- Mingamahone Brook, part of the Manasquan River Watershed (HUC-11 02030104100060), draining approximately 2% of the Township.

NWS Earle occupies portions of the Pine Brook/Hockhockson Brook, Shark River, and Mingamahone Brook watersheds, respectively. Therefore, surface runoff from the facility is not anticipated to enter Swimming River Reservoir.

9.1.4 Streams, Rivers and Brooks

Within each of the three (3) watersheds comprising Colts Neck, there are several primary, secondary, and tertiary streams around which these drainage areas are based. Looking at each watershed in turn, the surface waters can be described as follows:

- **Navesink River/ Lower Shrewsbury River Watershed**

  Historical Colts Neck ERI's have included the following detailed discussions of these major stream corridors within the watershed (from northwest to southeast):

  Willow Brook forms the northwestern boundary of the Township, joining **Hop Brook** (also known as **Ramanessin Brook**) just upstream of the **Swimming River Reservoir**. The northern arm of the Reservoir serves as the Township boundary to its discharge point.

  Big Brook runs easterly across the northern portion of the Township. It is a beautiful, generally clear stream with a gentle gradient. It is base-leveled on the Navesink formation causing a wide flood plain and, over much of its course, dual streams within its relatively wide bed.

  Yellow Brook and its tributaries, principally **Mine** and **Slope Brooks**, drain the southwestern and central part of the Township and drain east into the Swimming River Reservoir. Excepting for the upper reaches of Yellow Brook and tributaries, the stream is narrowly confined with steep banks, narrow flood plains and few swamps. Its course

drains much of the soft Tertiary and uppermost Cretaceous unconsolidated sediments and is, except during the dry season, rapidly eroding the area of its drainage.

Hockhockson Brook originates in a swamp of the same name which lies principally within the Naval Weapons Station Earle. Its flow northeasterly to join Pine Brook, where both flow into Swimming River below the Reservoir Dam. Hockhockson Brook has a low gradient and, because it drains a topographically low area, is sluggish with low-lying, marshy banks over most of its course.

Pine Brook forms much of the eastern boundary of the Township. It, like Hockhockson Brook, originates in the swampy areas of Naval Weapons Station Earle, where it flows north into Swimming River. Characteristics of the two streams are quite similar.

The major water body in Colts Neck Township is the **Swimming River Reservoir**, discussed in detail below.

- **Manasquan River Watershed (2%)**

  Mingamahone Brook in the Manasquan River watershed has a number of minor tributaries reaching into the southern side of Colts Neck Township, draining an area almost equally divided between residential development and NWS Earle.

- **Shark River Watershed (1%)**

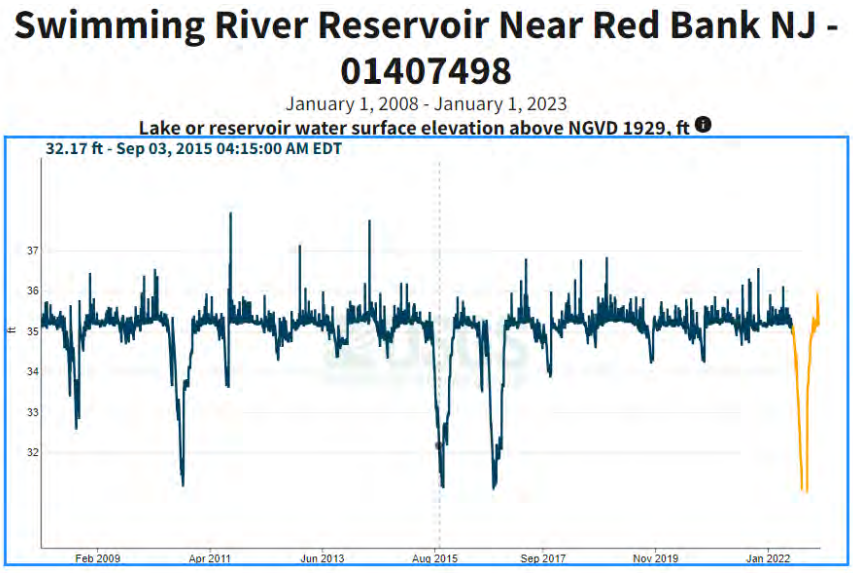
  The southeastern corner of Colts Neck forms the upper reach of the Shark River watershed, approximately two thirds of which falls within NWS Earle.

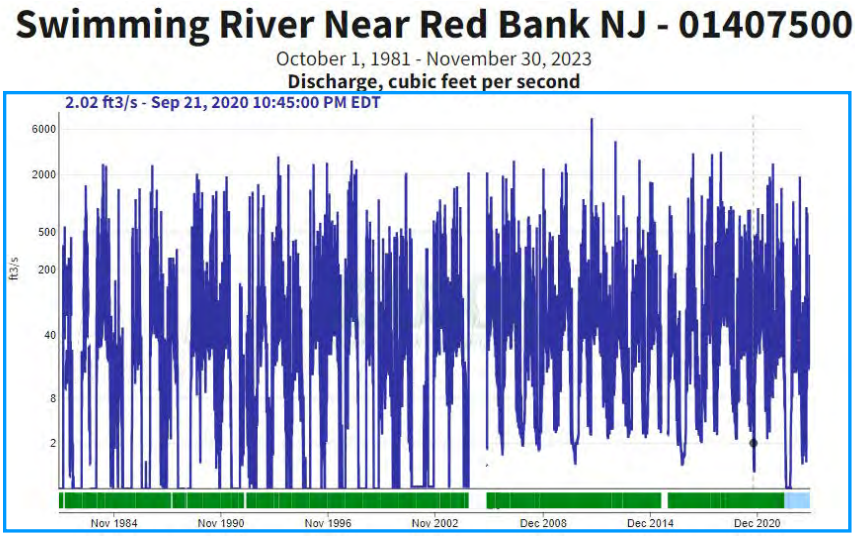
9.1.5 Swimming River Reservoir

The 577 acre Swimming River Reservoir was developed as a source of drinking water in 1901 via a dam erected by the Tintern Water Company; the dam was replaced in 1958. Swimming River Reservoir has a capacity of 2.6 billion gallons, and is managed by the New Jersey American Water Company. As a source of drinking water for much of Monmouth County, water quality in Swimming River Reservoir must be protected. The Reservoir is surrounded by trails and open space, but as discussed above, Reservoir water quality is impacted by activities stretching for miles. NJAW – Monmouth System's source water also comes from these other surface water sources: Shark River, Jumping Brook, Glendola Reservoir (NJWSA Manasquan System), and Glendola Reservoir (Shark River). Despite drawing from water resources in Colts Neck Township, NJAW – Monmouth County does not service Colts Neck Township itself with the exception of a connection along Esperance Road / Asbury Avenue, connecting NJAW to Earle, and a small area south of Swimming River Reservoir (a total of 7 residents).

The USGS* has maintained a water level gage on the Swimming River Reservoir near Red Bank since 2007 (gage number 01407498) as well as in the Swimming River just downstream of the dam (gage number 01407500). The graph below shows fluctuations in reservoir level since 2008 (USGS, 2023a & b); the smaller, shorter fluctuations are attributable to rainfall events. In typical water bodies, not used for drinking water, we see seasonal fluctuations (i.e., low water levels in the summer, and high water levels in the winter). Withdrawals from Swimming River Reservoir

for drinking water alter the “normal” variability, which can be seen in the graph of flow rates over time also shown below. During drier years, the water level in the reservoir drops several feet as dry weather coincides with highest demand (see e.g., 2011, 2015, 2016 and 2022). However, in the past 25 years, the baseline water surface elevation has remained relatively constant at approximately 35.3 feet (NGVD29). *US Geological Survey





9.2 Surface Water Quality

9.2.1 Watershed Impacts on Surface Water Quality

Activities throughout a watershed have significant impacts on water quality downstream or downgradient (i.e., downhill). Surface runoff quantity and quality are highly impacted by the amount of impervious surface (such as asphalt, concrete, and roofs), as well as the presence of industrial chemicals, road salts, pesticides, herbicides and plastics among others. Anything that comes in contact with rainwater or surface water has the potential to end up in downstream lakes, rivers, and groundwater. A 2011 Rutgers study indicated that impervious cover for all of Colts Neck is 10.4%, ranging from a minimum of ±7% (in Shark River and Pine Brook/Hockhockson Brook) to a peak of 32.4% (Poricy Brook) (Rutgers Cooperative Extension Water Resources Program, 2021).

In 2016, Clean Ocean Action prepared a report of pathogen pollution in the downstream Navesink River downstream of Colts Neck providing a comprehensive summary of the "Upper Navesink Watershed" (Lees, 2016) which encompasses most of Colts Neck Township. The report stated,

> *The Upper Navesink Watershed is defined as the land area located above the Colts Neck Swimming River Dam. According to a 1982 report by NJDEP, "The headwaters of the Navesink generally flow through moderately sloping, sparsely developed rural / agricultural lands, whereas the mainstem of the river traverses densely populated areas as it approaches the coast." In 2011, a Rutgers Equine Science Center funded study found that open space and agricultural land comprise 44.2% of the total upper watershed, followed by wetland and open waters at 26.5% and then developed residential and commercial properties at 29.3%.*

The study found that the overall health of the upper watershed was "relatively good", and that the preservation of agricultural areas and open space was immensely valuable both economically, and ecologically in the critical roles these open spaces play in the health of both the upper and lower watersheds.

> *Basically, the overall health and natural resource wealth of the Upper Navesink Watershed is relatively good. Residential communities are amply spaced and their lawns do not appear to be excessively fertilized. Equine operations are largely in compliance with best management practices with few exceptions, although pasture management can always be improved everywhere. It remains difficult to manage the ever-growing deer and goose populations, but several programs are in progress.*

However, the authors of the study also acknowledge the impacts of increased development in the watershed, and increased sedimentation and absence of macroinvertebrates as a result:

> *The largest threat to this watershed is that of increased development creating increased impervious surfaces, atop an elevated, sloping watershed; leading to more stormwater runoff, increased stream velocity, more erosion and concentration of non-*

point source pollutants. As this report indicates, an increase of impervious surfaces leads to a decrease of groundwater recharge along with the well-known increase in soil movement through erosion. Some evidence of this problem is already occurring as noted in the lack of macroinvertebrates in these highly sedimented rivers. While this has not yet led to increased nutrient loading that is the next probable step to occur in the process of environmental degradation. In addition, if the environmental integrity of the upper watershed region is not protected, the more significant issues facing the lower watershed region will be exacerbated.

As the Rutgers Agricultural study succinctly states, "The extensive conversion of land-use from open space, forest, fields and farms to suburban sprawl and urban development that has characterized New Jersey's historic growth creates a continuing threat to the further contamination of this extraordinarily rich and beautiful ecosystem."

Historically, contamination in the Lower Navesink Watershed (below the dam) has received ongoing attention for good reason. It is important to note that surface water quality in the majority of Colts Neck, above the dam, has not been identified as a source of the downstream contamination as interaction between the upper and lower regions appears limited.

Municipal Stormwater Planning

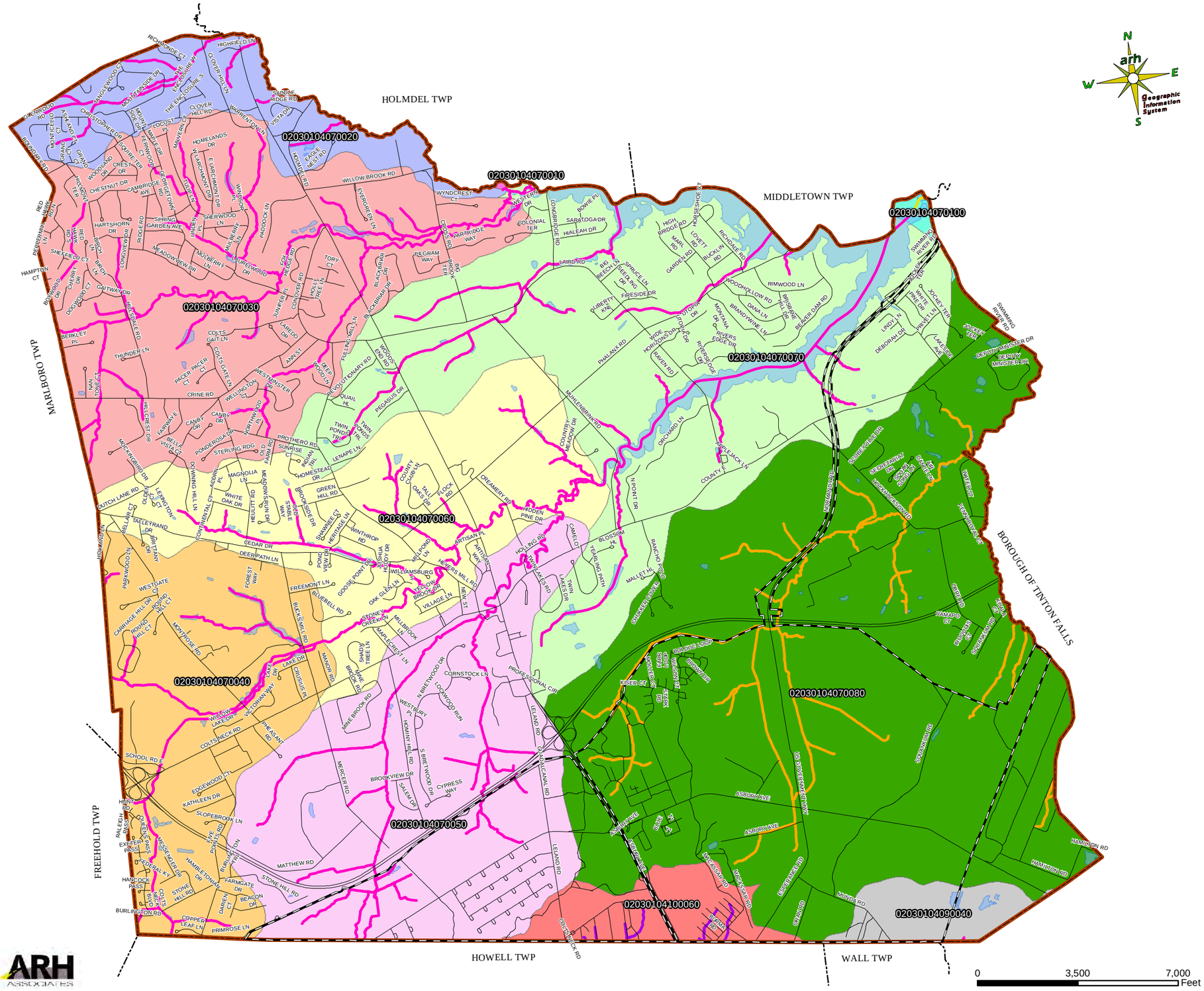
Municipal Stormwater Regulations provide for the creation of a Regional Stormwater Management Plan (RSWMP); "a technical planning procedure and regulatory process meant to address watershed wide stormwater impacts." (NJAC 7:8-3). According to Chapter 3 of NJDEP's Stormwater Best Practices Manual, a RSWMP "creates a combination of regulations and actions tailored to the specific needs of a drainage area, but it does not reduce environmental protection. Rather, it allows regulations more flexibility to match the concerns, conditions, and features of regions that are connected by a common drainage area."

The first step to creating an RSWMP is the creation of a broadly representative regional planning committee. From the same Clean Ocean Action Report,

> *Monmouth County Planning Board led efforts to create a Navesink/Swimming River Regional Stormwater Management Plan Committee (RSWMP) through the NJDEP Division of Watershed Management framework as early as 2005. NJDEP stated that "support of the municipalities in the planning area is critical to the development of a RSWMP." Any one municipality's opposition to the plan can halt implementation, even after years of development. By 2007, it was clear that there would be no consensus among the municipalities. A March of 2007 letter by the Township of Colts Neck affirmed their "unanimous continued opposition to the creation of a Regional Stormwater Management Plan." While a draft RSWMP for the Swimming and Navesink River exists, no official document was finalized and [as of 2016] efforts to create a plan have been abandoned.*

Colts Neck Township 2024 Environmental Resource Inventory

Figure 9.2 - Surface Water Quality Standards (SWQS)



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)

SWQS Category

- FW2-NT
- FW2-TM
- FW2-NTC1
- FW2-TMC1

HUC14

- 02030104070010, Hop Brook
- 02030104070020, Willow Brook
- 02030104070030, Big Brook
- 02030104070040, Yellow Brook (above Bucks Mill)
- 02030104070050, Mine Brook (Monmouth Co)
- 02030104070060, Yellow Brook (below Bucks Mill)
- 02030104070070, Swimming River Reservoir / Slope Bk
- 02030104070080, Pine Brook / Hockhockson Brook
- 02030104070100, Poricy Bk/Swimming R(below SwimmingR Rd)
- 02030104090040, Shark River (above Remsen Mill gage)
- 02030104100060, Mingamahone Brook (above Asbury Rd)

GIS Data Sources:
1. SWQS, Edition 20200327 GIS data came from NJDEP.
2. HUC14, Edition 20160309 GIS data came from NJDEP.
3. Roads: NJDOT (2017).
4. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
5. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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9.2.2 Surface Water Quality Standards

NJDEP has developed a set of Surface Water Quality Standards (SWQS), N.J.A.C. 7:9B, to establish the policies, stream classifications and surface water quality criteria necessary to protect the quality of New Jersey's surface waters. From NJDEP,

> *The SWQS establish designated uses (e.g., drinking water supply, recreation, etc.) to the State's surface waters, classify surface waters based on those uses (e.g., FW1, FW2-TP, etc.), and set water quality criteria that protect the designated uses for each water classification* (NJDEP, 2023).

Surface waters are classified based on the type of waterbody and the designated use of the waterbody.

- **Type** New Jersey has both fresh and saline waters, and classifications differ between the two. In addition, some waters near the coast have dual classifications (e.g., FW2-NT/SE1), which indicate that the waters change from freshwater to saline water as they drain into the estuary or ocean. Classifications are summarized in the table below.
- **Designated Use** New Jersey's surface water classifications identify the designated uses applicable to each surface waterbody in New Jersey. Designated uses consist of existing and any potential uses that each type of surface waters can support, for example, all New Jersey freshwaters are designated for potable (drinking) water supply use. The designated uses of New Jersey waters established under the SWQS include:

  • Public potable water supply (after conventional treatment);
  • Recreation;
  • Fish consumption;
  • Shellfish harvesting;
  • Maintenance, migration, and propagation of fish;
  • Agricultural and Industrial water supplies; and
  • any other reasonable uses.

The "SWQS Maps" tab on the SWQS website can be used to access digitized maps of New Jersey's surface water classifications for all surface waters of the State (NJDEP Division of Water Monitoring and Standards, 2023). Table 9.2 below outlines all of the SWQS designations, indicating which apply in Colts Neck. Table 9.3 details which SWQS apply to each Colts Neck stream.

In general, the Swimming River Reservoir and all of its upstream contributing rivers and streams are classified by NJDEP as **Category one** or **C1 waterways** which are "protected from any measurable change to existing water quality." The upper reaches of the Mingamahone Brook and Shark River tributaries across the southern Township limit are also classified as **C1**[1]. All are shown in Figure 9.2.

[1] All of these streams are within the NJAW – Monmouth Source Water Assessment Area.

Table 9.2. Surface Water Quality Standards Classification

Category	Definition
Freshwater General Surface Water Class	
Surface waters are classified based on the type of waterbody and the designated use of the waterbody. New Jersey has both fresh (FW) and saline (S) waters.	
FW1	**FW1** means those fresh waters, as designated in N.J.A.C. 7:9B-1.15(j), 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 human activities. These waters are "set aside for posterity" because of their clarity, color, scenic setting, other characteristic of aesthetic value, unique ecological significance, exceptional recreational significance, exceptional water supply significance or exceptional fisheries resource(s). **There are no FW1 waters within Colts Neck Township.**
FW2	**FW2** means the general surface water classification applied to those fresh waters that are not designated as FW1 or Pinelands (PL) Waters[2]. Designated uses in all FW2 waters are: 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 (as defined by NJDEP) and disinfection; and 5. Any other reasonable uses. **All Colts Neck Township streams are designated as FW2.**
Saline Waters	
SE	**SE** means the general surface water classification applied to saline waters of estuaries. When combined with a freshwater (FW) category, it means a waterway in which there may be a salt water/freshwater interface. The exact point of demarcation between the fresh and saline waters must be determined by salinity measurements (saline is > 3.5 parts per thousand at mean high tide). **There are no SE waters within Colts Neck Township.**
Trout Water Status - this is for information only and does not affect the water quality criteria for those waters.	
TP	***Trout production*** means waters designated at N.J.A.C. 7:9B-1.15I through (i) for use by trout for spawning or nursery purposes during their first summer.
TM	***Trout maintenance*** means waters designated at N.J.A.C. 7:9B-1.15I through (i) for the support of trout throughout the year.
NT	***Nontrout waters*** means fresh waters that have not been designated in N.J.A.C. 7:9B-1.15I through (h) as trout production or trout maintenance. These waters are generally not suitable for trout because of their physical, chemical, or biological characteristics, but are suitable for a wide variety of other fish species.
	All Colts Neck Township streams are either TM or NT.

[2] Pinelands waters are not discussed further here as Colts Neck is not within the New Jersey Pinelands Area.

Antidegradation Designations	
The SWQS establish antidegradation policies for all surface waters of the State (see N.J.A.C. 7:9B-1.5(d)). The antidegradation policies require that all existing and designated uses shall be maintained and protected for all surface waters of the State; impaired waters must be restored to meet SWQS; and existing water quality shall be maintained. There are three tiers of antidegradation designations, which are described below[3].	
ONRW	***Outstanding National Resource Waters*** This tier of antidegradation designation is the most protective and applies to surface waters classified as FW1 waters, also known as nondegradation waters, and PL waters (Pinelands). PL waters must be maintained in their natural state. The only changes to water quality allowed in PL waters are those that restore natural water quality. **There are no ONRW within Colts Neck Township.**
FW1/Non degrad-ation	***Nondegradation waters*** means those waters set aside for posterity because of their clarity, color, scenic setting, other characteristic of aesthetic value, unique ecological significance, exceptional recreational significance, or exceptional water supply significance. These waters include all waters designated as FW1. **There are no FW1/Nondegradation waters within Colts Neck Township.**
C1	***Category one waters*** This tier of antidegradation designation applies to surface waters designated as C1 waters (see N.J.A.C. 7:9B-1.4). C1 waters are protected from any measurable change to existing water quality because of their exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resources. C1 waters have more stringent antidegradation requirements than Category Two waters. **The majority of Colts Neck Township streams are C1.**
C2	***Category two waters*** are those waters not designated as Outstanding National Resource Waters or Category One at N.J.A.C. 7:9B-1.15 for purposes of implementing the antidegradation policies set forth at N.J.A.C. 7:9B-1.5(d). This tier of antidegradation designation applies to surface waters designated as C2 waters (see N.J.A.C. 7:9B-1.4). Some lowering of existing water quality may be allowed in C2 waters based upon a social and/or economic justification. However, all existing and designated uses must be protected in all cases and waterbodies that are generally not meeting criteria must be improved to meet water quality criteria. All waterbodies not designated as ONRW or Category One receive the Category Two antidegradation designation. **Some Colts Neck Township streams outside of the Upper Navesink Watershed are C2.**

Source: *(NJDEP, August 18, 2023)*

As seen in Table 9.3 below, 77% of the streams in Colts Neck (61.7 miles) are FW2-NT C1, most due to protection as source waters for the Swimming River Reservoir.

[3] Additional information is provided in the Antidegradation/Category One Fact Sheet (https://www.state.nj.us/dep/wms/bears/docs/FactSheet-AntidegCat1-2020.pdf). https://www.state.nj.us/dep/wms/bears/swqs-tools.htm provides access to access digitized maps showing antidegradation designations for all surface waters of the State.

Table 9.3. Colts Neck Streams - Surface Water Quality Standards Classification

Category	Streams in Colts Neck	Stream Length in Colts Neck (Miles)
FW2-NT C1	Big Brook & Tributaries	12.23
	Bucks Pond	1.30
	Marl Brook & Tributaries	3.56
	Mine Brook & Tributaries	7.92
	Navesink River Tributaries	4.59
	Rolling Mill Brook & Tributaries	2.00
	Rolling Mine Brook & Tributaries	1.66
	Shark River Brook Tributaries	0.04
	Slope Brook	1.53
	Swimming River Reservoir	5.17
	Trout Brook	1.01
	Willow Brook & Tributaries	4.42
	Yellow Brook & Tributaries	16.24
FW2-TM C1	Mingamahone Brook Tributaries*	1.10
FW2-TM	Hockhockson Brook & Tributaries	13.80
	Pine Brook & Tributaries	3.23
FW2-NT	Swimming River & Tributaries	0.13
Total Length of Streams in Colts Neck		**79.93**

*The uppermost ±700 feet of the East Branch Mingamahone Brook Tributary are unclassified.

The SWQS also establish water quality criteria (numeric or narrative descriptions) that must be attained to support the existing and designated uses applicable to each surface water classification (see N.J.A.C. 7:9B-1.14). Numeric criteria establish maximum concentrations or levels of chemicals and other parameters, including toxic pollutants. Narrative criteria establish instream conditions to be attained/maintained or avoided.

There are many NJDEP Ambient Water Quality Data Exchange points within the Township with historical data that can be accessed (most not current). Detailed analysis and evaluation of this data in comparison to SWQS water quality criteria is beyond the scope of this study. A list of water quality monitoring stations in Colts Neck is provided in Table 9.4 and are shown on Figure 9.5.

Table 9.4 Water Quality Monitoring Stations in Colts Neck

HUC-14	HUC-14 Name	Program	Station	Location	Municipality
02030104070020	Willow Brook	AMNET Bio	AN0468	Willow Brook Road	Colts Neck
02030104070030	Big Brook	AMNET Bio	AN0470	Cross Road	Colts Neck
02030104070040	Yellow Brook	AMNET Bio	AN0471	Route 537	Colts Neck
02030104070060	Yellow Brook	AMNET Bio	AN0472	Creamery Road	Colts Neck
02030104070050	Mine Brook	AMNET Bio	AN0473	Creamery Road	Colts Neck
02030104070070	UNT to Swimming R	AMNET Bio	AN0473B	Longbridge Road	Colts Neck
02030104070080	Hockhockson Brook	AMNET Bio	AN0475	Hockhockson Road	Colts Neck
Sources: NJDEP, June 6, 2017; NJDEP, September 30, 2019; NWQMC, 2020; USGS, 2020.					

9.2.3 Integrated Water Quality Assessment Results

The New Jersey Integrated Water Quality Assessment Report (Integrated Report) (NJDEP, 2020) is a compilation of information about the quality of New Jersey's surface waters. NJDEP prepares the Integrated Report as a biennial assessment of statewide water quality that identifies and prioritizes waters for protection, restoration, and additional monitoring or research. The Integrated Report serves as an effective tool for enhancing, maintaining, and restoring water quality in all surface waters of the State to support their use for aquatic life, recreation, water supply, fish consumption, and shellfish harvest for consumption.

The primary purpose of the water quality assessment program is to determine the health of New Jersey's water resources so the appropriate steps can be taken to restore, maintain and protect our water resources and their designated uses (such as recreation and water supply). Water quality standards, monitoring, and assessment provide the scientific foundation for the integrated assessment that supports protection of New Jersey's water resources and implementation of the federal Clean Water Act, the New Jersey Water Quality Planning Act, and the New Jersey Water Pollution Control Act.

The NJDEP initiates a new water quality assessment cycle every two years. All existing and readily available data is evaluated to ensure that it meets established data quality requirements. A different water region is selected each assessment cycle, on a rotating basis. As part of the Atlantic Coastal Water Region, Colts Neck waters were last evaluated using data from 2008-2012 and compiled in the 2014 Integrated Report (BEARS Water Quality Assessment Team, 2017). This region will be re-evaluated again in 2024.

NJDEP employs this integrated approach to assessing water quality by compiling a vast amount of water monitoring data and related information collected by numerous sources throughout the state. While the principal contributor of water quality data used for assessment purposes is generated by the NJDEP, numerous monitoring organizations and other partners also collect relevant data (such as those listed in Table 9.4). These include federal and county government agencies, regional commissions (e.g., Pinelands Commission), watershed associations and other voluntary citizen monitoring, and utility organizations. All monitoring data is vetted for quality assurance by NJDEP prior to use; databases used in the 2014 Integrated Report (BEARS Water Quality Assessment Team, 2017) are presented in Table 9.5.

Table 9.5 Databases Used in the 2014 Integrated Report

The Water Quality Portal (WQP)	Primary water quality data portal. All data collected by the DEP and other monitoring organizations is accessed through the WQP. Does not include continuous data. https://www.waterqualitydata.us/
DEP Continuous Data Monitoring	Access continuous data collected by the DEP https://njdep.rutgers.edu/continuous/
USGS Continuous Data Monitoring	Access continuous data collected by the USGS https://waterdata.usgs.gov/nj/nwis/qw
Recreational Beach Conditions	Find current beach status, water quality sample results, reports of beach advisories and beach closings, and information on other events that affect beaches. https://njbeaches.org/
Shellfish Harvesting Conditions	Find current shellfish harvesting classification including data from monitoring stations. https://www.nj.gov/dep/bmw/nssphome.html

NJDEP compiles the raw data collected and categorizes its water quality assessments of each HUC-14 into three statuses[4]:

- **Fully Supported**, indicating that the level of a given parameter (e.g., dissolved oxygen, phosphorus or pH) is sufficient for a particular use;
- **Not Supported**, indicating that the level of a given parameter inhibits a particular use, or
- **Insufficient Data** for assessment.

Table 9.6 provides a summary of the statuses of all Colts Neck HUC-14s for all designated uses (such as general aquatic life or fish consumption). Details for each station are provided in Appendix 9A. A narrative summary for each designated use is provided below.

Table 9.6. Colts Neck 305(b) Water Quality Inventory

HUC-14		Designated Use					
	HUC-14 Name	General Aquatic Life	Aquatic Life Trout	Fish Consumption	Water Supply	Primary Recreation	Shellfish
02030104070010	Hop Brook	Non Support	Non Support	Insufficient Data	Non Support	Non Support	NA
02030104070020	Willow Brook	Non Support	NA	Insufficient Data	Full Support	Non Support	NA
02030104070030	Big Brook	Non Support	Non Support	Insufficient Data	Non Support	Non Support	NA
02030104070040	Yellow Brook (above Bucks Mill)	Non Support	NA	Insufficient Data	Full Support	Non Support	NA
02030104070050	Mine Brook	Non Support	NA	Insufficient Data	Non Support	Non Support	NA
02030104070060	Yellow Brook (below Bucks Mill)	Non Support	NA	Insufficient Data	Insufficient Data	Non Support	NA
02030104070070	Swimming River Reservoir / Slope Bk	Non Support	NA	Non Support	Full Support	Non Support	NA
02030104070080	Pine Brook / Hockhockson Brook	Non Support	Non Support	Insufficient Data	Non Support	Non Support	Non Support
02030104070100	Poricy Bk/Swimming R (below Swimming R Rd)	Non Support	NA	Non Support	Insufficient Data	Non Support	Non Support
02030104090040	Shark River (above Remsen Mill gage)	Non Support	Non Support	Non Support	Non Support	Non Support	NA
02030104100060	Mingamahone Brook (above Asbury Rd)	Non Support	Non Support	Insufficient Data	Full Support	Non Support	NA

[4] Interactive maps for each designated use are available at this link: https://njdep.maps.arcgis.com/apps/MapSeries/index.html?appid=b5d39074f9ab424689caa8ec387dcef7

Data for Colts Neck Township may be best understood with a series of questions associated with each designated use.

It is important to note that any **non support** designations for aquatic life (general or trout) do not imply that there is no aquatic life in those water bodies, rather that conditions for aquatic life are impaired and could be improved. By decreasing concentrations of certain parameters, the ecosystems would be healthier and aquatic life would better thrive under improved conditions.

General Aquatic Life: ***Can these waters support a healthy ecosystem?***

No. All Township HUC-14 streams are designated as **non support** for general aquatic life.

Parameters used to evaluate general aquatic life are listed here, along with the number of HUC-14 streams which are **non support** for that parameter if tested in Colts Neck: biological data[5] (8), dissolved oxygen (1), total phosphorus (4), temperature (0), pH (2), total suspended solids or TSS (4), turbidity (1), ammonia (0), chloride (0), metals (4), chlorpyrifos (0), and malathion (0).

Aquatic Life – Trout: ***Can species of trout thrive in these waters?***

No. The five (5) Township waters evaluated for trout support were designated as **non support**.

Parameters used to evaluate aquatic life – trout are listed here, along with the number of HUC-14 streams which are **non support** for that parameter if tested in Colts Neck: Biological data (8), dissolved oxygen (1), total phosphorus (4), temperature (0), pH (2), total suspended solids or TSS (4), turbidity (1), ammonia (0), chloride (0), metals (4), chlorpyrifos (0), and malathion (0).

Fish Consumption: ***Can we eat fish from these waters?***

Not the three (3) Township waters assessed, which were designated as **non support**: Swimming River Reservoir, Poricy Brook/Swimming River (below Swimming River Road), and Shark River (above Remsen Mill gage).

Parameters used to evaluate fish consumption if tested: fish tissue (mercury (2), chlordane (2), PCB (3), DDT & metabolites (3)) & metals (1), toxins (0).

Water Supply: ***Can we use these waters as sources for drinking water?***

Yes... Swimming River Reservoir, Willow Brook, Yellow Brook (above Bucks Mill), and Mingamahone Brook (above Asbury Road) can **fully support** water supply.

[5] Aquatic life use impairment is attributed to "cause unknown" when biological data shows impairment, but chemical data is either unavailable or does not exceed applicable water quality standards; therefore, the pollutant cause of aquatic life use impairment is unknown.

And no. The others are deemed **non support** largely due to high arsenic levels, which is naturally occurring. As stated by NJDEP, "Even though these are natural conditions, EPA policies on carcinogens requires these waters to be listed as impaired and are represented as 5A on the 303(d) List."

Parameters used to evaluate water supply are listed here, along with the number of HUC-14 streams which are **non support** for that parameter if tested in Colts Neck: Nitrate (0), total dissolved solids or TDS (0), sulfate (0), chloride (0), metals (4), toxins (0).

Primary Recreation: ***Can we swim, water ski, surf or do other submergible activities in these waters?***

No. All Township streams evaluated are designated as **non support**.

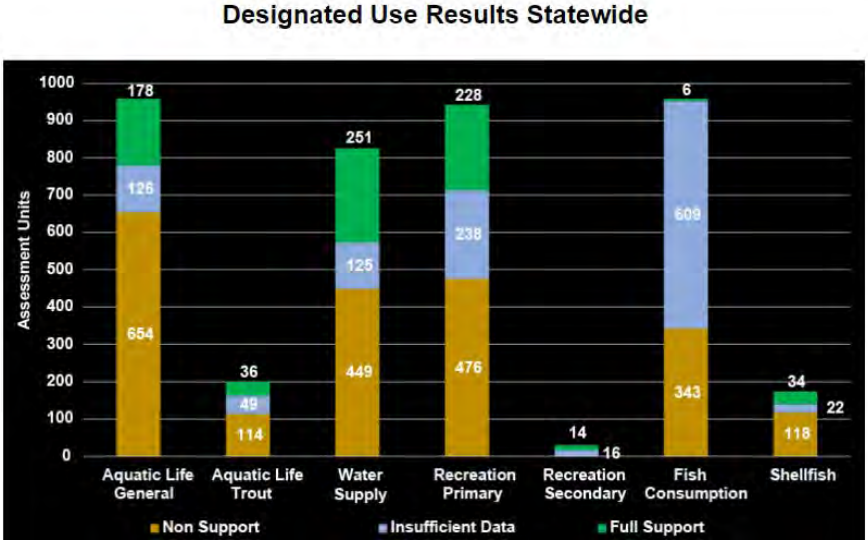
Parameters used to evaluate primary recreation are listed here, along with the number of HUC-14 streams which are **non support** for that parameter if tested in Colts Neck: E. coli (11) or Enterococcus (1).

Shellfish: ***Can we eat clams, oysters or mussels from these waters?***

No. Only Pine Brook/ Hockhockson Brook and Poricy Bk/Swimming R (below Swimming R Rd) were assessed, both of which were designated **non support**.

The only parameter used to evaluate shellfish is fecal coliform, and E. coli was **non support** in both streams.

Looking at the state data as a whole, the majority of streams are **non support** for all designated uses with the exception of fish consumption (for which there is a majority categorized as "insufficient data") as shown below as of 2020[6].



[6] Assessment units are HUC-14's in Colts Neck. Note that secondary recreation is a new category that was not included in the 2014 Integrated Report.

It will be important to observe changes in water quality over time as TMDLs and other strategies are implemented to improve water quality. A 2016 statewide USGS Report found that "levels of total nitrogen and total phosphorus, which fuel algae blooms, declined or stayed the same at most stream sites between the 1970s and 2011," a positive observation (Hickman & Hirsch, 2017). However, the closest monitoring stations to Colts Neck were in Manalapan Brook and Toms River. Toms River was one of the few sites that showed an upward trend in nitrogen, and Manalapan was either decreasing or unchanged depending on the analysis methodology. In addition, the same report found that, "At all sites studied, chlorides from road salt increased" over the study period.

If the level of a parameter results in a designated use being **Not Supported**, NJDEP will evaluate the implementation of a regulated limit to that parameter in the form of a Total Maximum Daily Load or TMDL. Per the USEPA,

> *A TMDL is the calculation of the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet water quality standards for that particular pollutant. A TMDL determines a pollutant reduction target and allocates load reductions necessary to the source(s) of the pollutant* (USEPA, 2023).

In New Jersey, TMDL's have been used to address pathogens (e.g., fecal coliform, *E. coli*) which impact recreation and shellfish harvest for consumption, total phosphorus which impacts aquatic life, and mercury which has impacts across the board. Existing Colts Neck TMDLs are shown in Figure 9.4.

Based on EPA guidance, these three statuses (**Fully Supported**, **Not Supported**, or **Insufficient Data**) are placed in sublists as described in Table 9.7 below.

Table 9.7 Water Quality Category Sublists

Sublist 1 / Sublist 2	An assessment unit (or HUC-14) is **Fully Supporting** designated uses and no uses are threatened.
Sublist 3	**Insufficient Data** and information to determine if the designated use is fully supported or not supported.
Sublist 4	One or more designated uses are **Not Supported** or are threatened but TMDL development is not required because of one of the following reasons:
Sublist 4A	A TMDL has been completed for the parameter causing designated use non-support.
Sublist 4B	Other enforceable pollutant control measures are reasonably expected to result in fully supporting the designated use in the near future.
Sublist 4C	Non-support of the designated use is caused by something other than a pollutant.
Sublist 5 (303(d))[7]	One or more designated uses are **Not Supported** or are threatened by a pollutant(s), that requires development of a TMDL.
Sublist 5A	Arsenic does not attain standards, but concentrations are below those demonstrated to be from naturally occurring conditions.
Sublist 5L	Designated use impairment is caused by a "legacy pollutant" that is no longer actively manufactured or discharged by a point source.

[7] Sublist 5 also identifies the priority ranking for TMDL development (High, Medium, Low). TMDLs for pollutants identified on Sublists 5A, 5L and 5R are assigned a low priority for TMDL development since alternative restoration measures are being pursued.

Sublist 5R	Water quality impairment is not effectively addressed by a TMDL, such as nonpoint source pollution that will be controlled under an approved watershed restoration plan or 319(h) Watershed Based Plan.

Subparts are added to Sublist 4 and Sublist 5 to help clarify the response strategy for impairments**.** If a designated use is **Not Supported**, the parameter is then evaluated to determine whether it:

- Is addressed by an existing TMDL (Sublist 4A);
- Does not require a TMDL (Sublist 4B or 4C), or
- Needs a new TMDL and is therefore placed on the 303(d) List (Sublist 5 et al.).

All Colts Neck Waters have one or more designated uses that are Not Supported, and parameters that qualify as either Sublist 4A, Sublist 5, or Sublist 5L.

Additional data from the Integrated Report is provided in the Appendices. In summary:

- Appendix 9B B-1 tabulates Sublist 5 Colts Neck waters and priority ranking for TMDL development. None are ranked as high priority, but many are ranked medium (primarily for pH, phosphorus, and TSS). All Sublist 5L parameters are low priority as discussed above.
- Appendix 9C lists the sources causing use impairment for every problem parameter within each HUC-14. Primary sources throughout the Township are urban runoff/storm sewers and agriculture, with some constituent levels attributed to golf courses, contaminated sediments, and other sources.
- Appendix 9D lists existing TMDLs for Township streams (all Sublist 4A), also shown in Figure 9.4. All current TMDLs are bacterial (e.g., E. coli, fecal coliform) with the exception of mercury (in fish tissue) in two water bodies (Swimming River Reservoir and Shark River) and phosphorus in Shark River.
- Finally, Appendix 9E tabulates delisted waters, and Appendix 9F any causes of final decisions to not list.

9.2.4 Surface Water Quality Takeaways

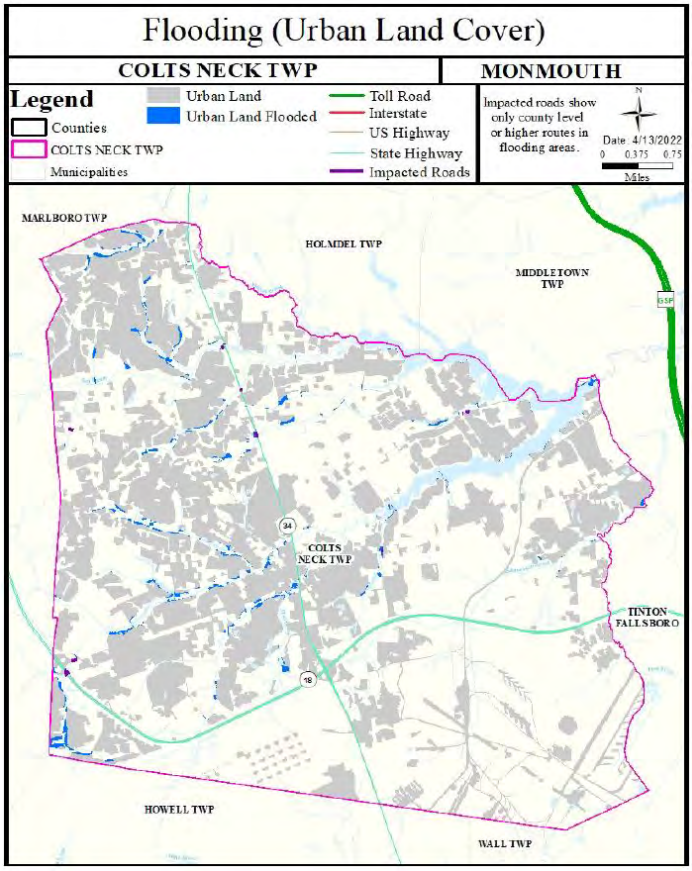
Surface water quality in Colts Neck, as evaluated by NJDEP per EPA protocols, needs improvement. The State has implemented TMDLs in several water bodies in an effort to improve specific parameter levels, and is poised to add more TMDLs based on ongoing sampling results. However, a TMDL itself does not make the water clean; it is only a step in a long process which requires cooperation and efforts of multiple agencies (state and local) and public participation to be successful (Michigan Department of Environment, Great Lakes, and Energy, 2023). Because most of the parameters of concern in Colts Neck are attributable to urban runoff/storm sewers as a primary source (73%) and agriculture as a secondary source (69%), nonpoint source pollution that is entrained by or dissolved into water flowing over the ground to collector bodies is a primary concern. Colt's Neck, along with six other communities in Monmouth County, have

already designated Pesticide Free Zones in parks. Any measures that the Township or its residents can take to minimize erosion (resulting in total suspended solids and turbidity), excess fertilization (phosphorus), or washout of other wastes would be beneficial.

9.3 Flooding

The 2022 NJ Healthy Community Planning Report for Colts Neck Township states that only 1% of the urban land use area in the Township was flooded in 2021 (compared to 11.1% in Monmouth County and 12% for the State of New Jersey). As stated in the 2022 report,

> *Urban Flooding occurs when water inundates land that's normally dry, which can happen due to storms, broken levees, increased river volume, clogged drainage systems, sea level rise, rapid melting of snow or ice, or the rapid accumulation of rain. Urban floods are exacerbated by increased impervious surfaces (such as roads and buildings) which prohibit water absorption. Urban floods can develop at varying speeds from a few days to just a few minutes and can vary in size impacting a few houses to entire river basins* (NJ Environmental Public Health Tracking, 2022).



The report goes on to state that flooding is New Jersey's most common natural disaster and can result in property loss, serious injury, and death. "Urban floods can impair power generation and transmission causing problems for critical infrastructure such as water treatment plants and hospitals. Garbage, sewage, and other contaminants caught in flood waters increase the risk of waterborne illnesses. Water can seep into buildings, affect sewer pipes, and cause indoor mold growth. Severe flooding can damage roads impeding aid, emergency care, and access to food."

The data cited in the Healthy Community Report supports the observation that Colt's Neck is not at high risk of flooding; FEMA Flood Hazard mapping shows no significant 1% (100-year) or 0.2% (500-year) flood hazard areas inundating inhabited or developed areas.

> *A flood hazard area is the land and space above land that could be impacted by flooding. FEMA bases its flood hazard area on the 1% annual-chance event, commonly referred to as the 100-year flood. NJ typically regulates a slightly larger flood hazard area. A 100-year flood does not occur every 100 years, but instead has a 1% chance of occurring each year. FEMA also maps the 0.2% annual-chance floodplain, or the*

500-year flood. While these maps do not fully account for climate change, they are a surrogate for climate resilience planning in non-tidally influenced areas. FEMA recently updated its 100-year flood hazard for tidal area to reflect climate-driven inland, riverine flooding and 5 feet of sea level rise. Combining these maps with mapped urban land use helps communities planning for climate change.

Urban areas are especially prone to worsening flooding because these areas lack healthy vegetation to absorb water and prevent erosion that floods can cause. The absence of vegetation adjacent to surface waters also reduces filtration of stormwater runoff and degrades water quality.

Unless properly managed, development within flood hazard areas exacerbates the intensity and frequency of flooding. Structures that are improperly built or rebuilt in flood hazard areas are subject to flood damage and threaten the health, safety, and welfare of users.

Based on existing mapping and studies of Colt's Neck Township[8], widespread flooding does not appear to pose an ongoing problem for Township residents, but this issue should be revisited as time goes on. The official "Flood Insurance Rate Maps" for the Township of Colts Neck were most recently updated in September 2009, and were originally published in 1982. The original calculated floodplain areas, depths and flows from 1982 remain unchanged. From the FEMA Preliminary Flood Insurance Study for Monmouth County (2014), "In the Township of Colts Neck, floodplain boundaries between cross sections were interpolated using topographic maps of 1:2,400 scale with a 5-foot contour interval."

Detailed FEMA studies of streams in Colt's Neck are limited to the upper reaches of Willow Brook, Yellow Brook, Mine Brook and Marl Brook, the middle reaches of Big Brook, and the downstream reach of Hockhockson Brook (east of Hockhockson Road) as shown in Figure 9.3. All other flood hazard areas in the Township are designated as Zone A (including Swimming River Reservoir), indicating that no calculations have been completed.

Infrastructure within FEMA-studied areas is noted below. From a historical perspective, the 1982 Colts Neck ERI stated, "Although flood plains are well developed along many streams, only a few structures have been built where they could be endangered by even the highest recorded flood level. The most damage involved would be flooded basements or partially inundated sheds and outbuildings. Township ordinances no longer permit building on flood plains." The structures

[8] Flood Insurance Rate Maps, Township of Colts Neck, Monmouth County, Community-Panel Numbers 34025C0153F, 34025C0154F, 34025C0158F, 34025C0159F, 34025C0178F, 34025C0161F, 34025C0162F, 34025C0163F, 34025C0164F, 34025C0167F, 34025C0168F, 34025C0169F, 34025C0186F, and 34025C0188F, Federal Emergency Management Agency, Effective Date: 9/25/2009.

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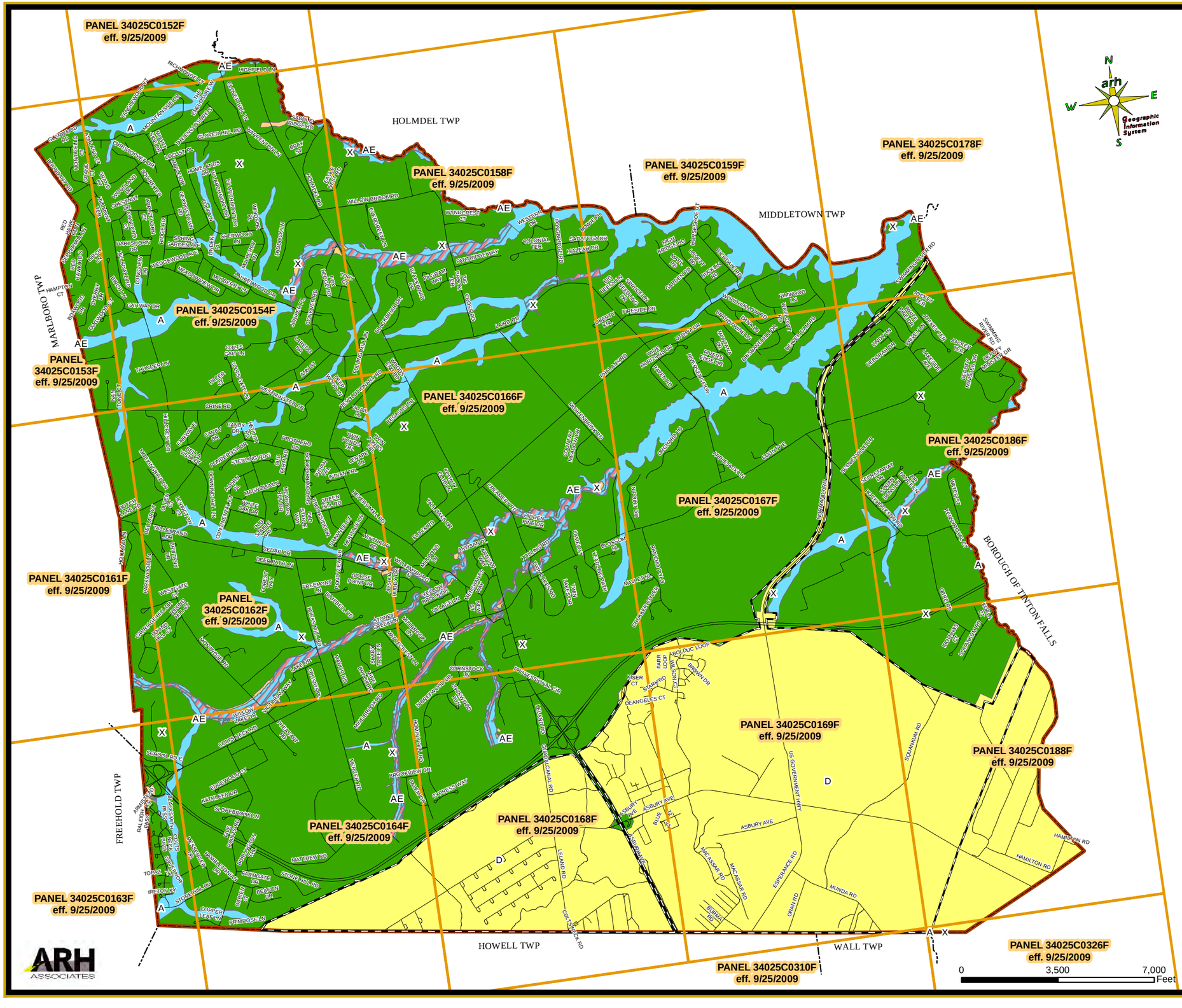
Figure 9.3 - FEMA Flood Map



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- FEMA FIS Panels

FEMA Flood Hazard Zones

- A, 1% Annual Chance Flood
- AE, 1% Annual Chance Flood Hazard
- AE, Floodway
- D, Area of Undetermined Flood Hazard
- X, 0.2% Annual Chance Flood
- X, Area of Minimal Flood

GIS Data Sources:
1. FEMA Flood Hazard Zones GIS data, (6/15/2022), came from FEMA / U.S. Department of Homeland Security.
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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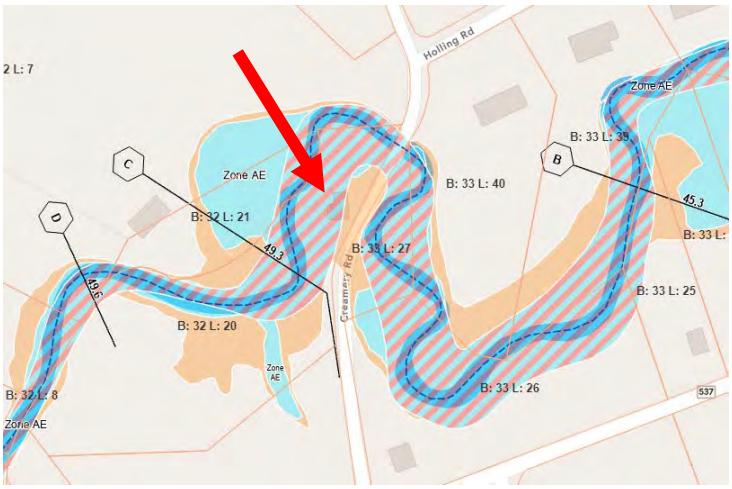
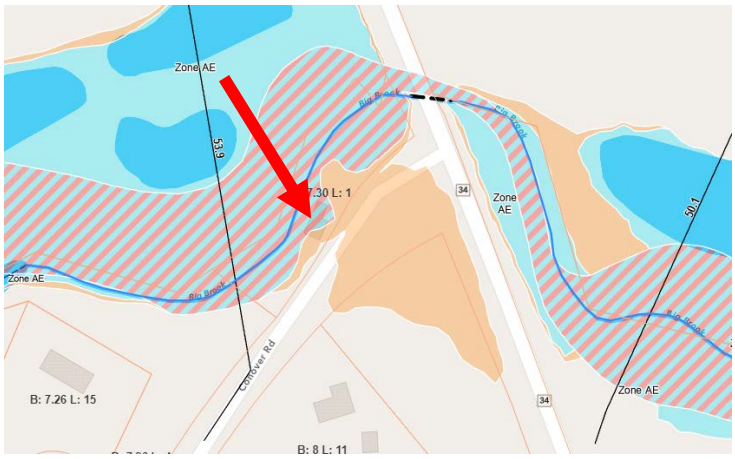
below were noted as being within the floodplain or even the floodway, which is characterized by higher concentrations of flow and water velocity.

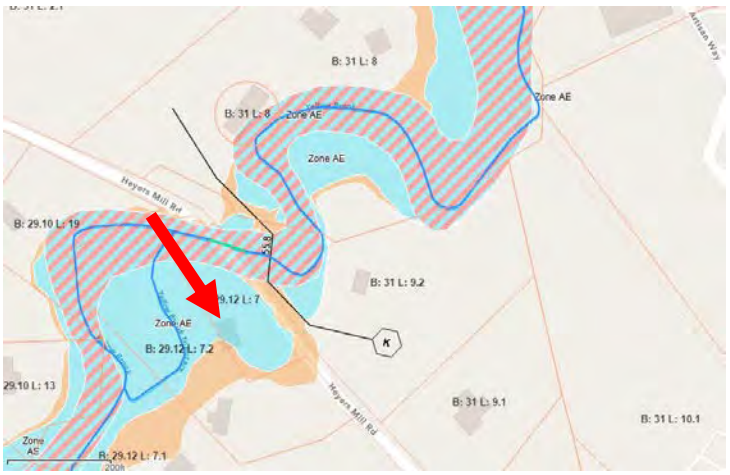
1. 73 Creamery Road
   (floodway of Mine Brook)



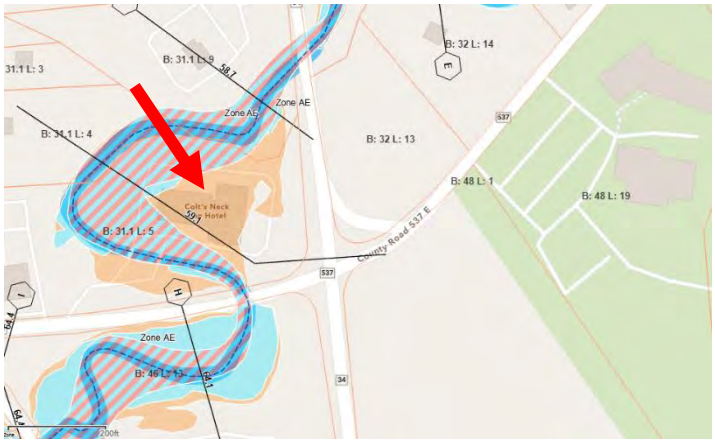
2. 109 Conover Road
   (floodway of Big Brook)



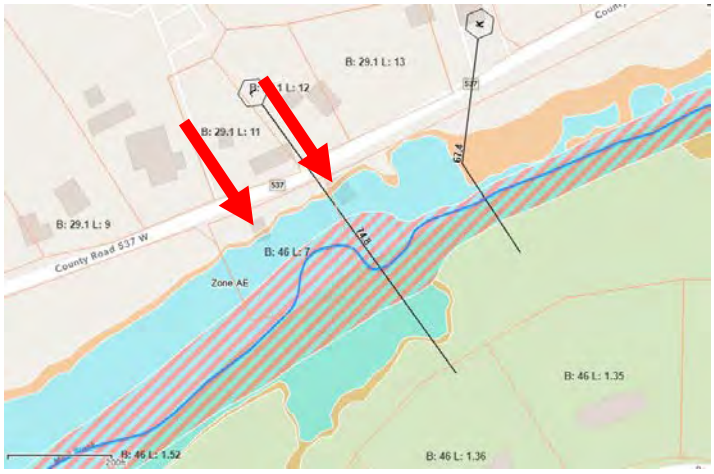
3. 49 Heyers Mill Road
   (100-year floodplain of Yellow Brook)



4. Colt's Neck Inn Hotel, 191 County Rd 537
(500-year floodplain of Mine Brook)



5. 130 Route 537 and adjacent residence on Trump National property
(100-year floodplain of Mine Brook)



It is important to note that NJDEP Flood Hazard Area Control Act Rules also regulate development in flood hazard areas and riparian zones, imposing stringent standards on infrastructure which may impact riverine flows or flood storage (e.g., dams, bridges, changes in topography), and has recently updated its regulations to account for changes in precipitation duration and intensity as part of its NJ Protecting Against Climate Threats (NJPACT) initiative. In addition, the National Flood Insurance Program (NFIP) requires compliance with the NJ Flood Hazard Area Control Act Rules.

NJDEP has also developed an Extreme Precipitation Prediction Tool[9] and a Flood Mapping Tool[10] to assist in predicting (with a level of uncertainty) future hydrologic changes. Unfortunately, the Flood Mapping Tool is only available for coastal waters and does not extend upstream of the Swimming River Reservoir dam. However, any future Township development should take into consideration changes in rainfall events, localized flooding, and the impact of regulatory changes on development or other activities impacted by precipitation duration and intensity.

[9] https://njprojectedprecipitationchanges.com/
[10] https://www.njfloodmapper.org/

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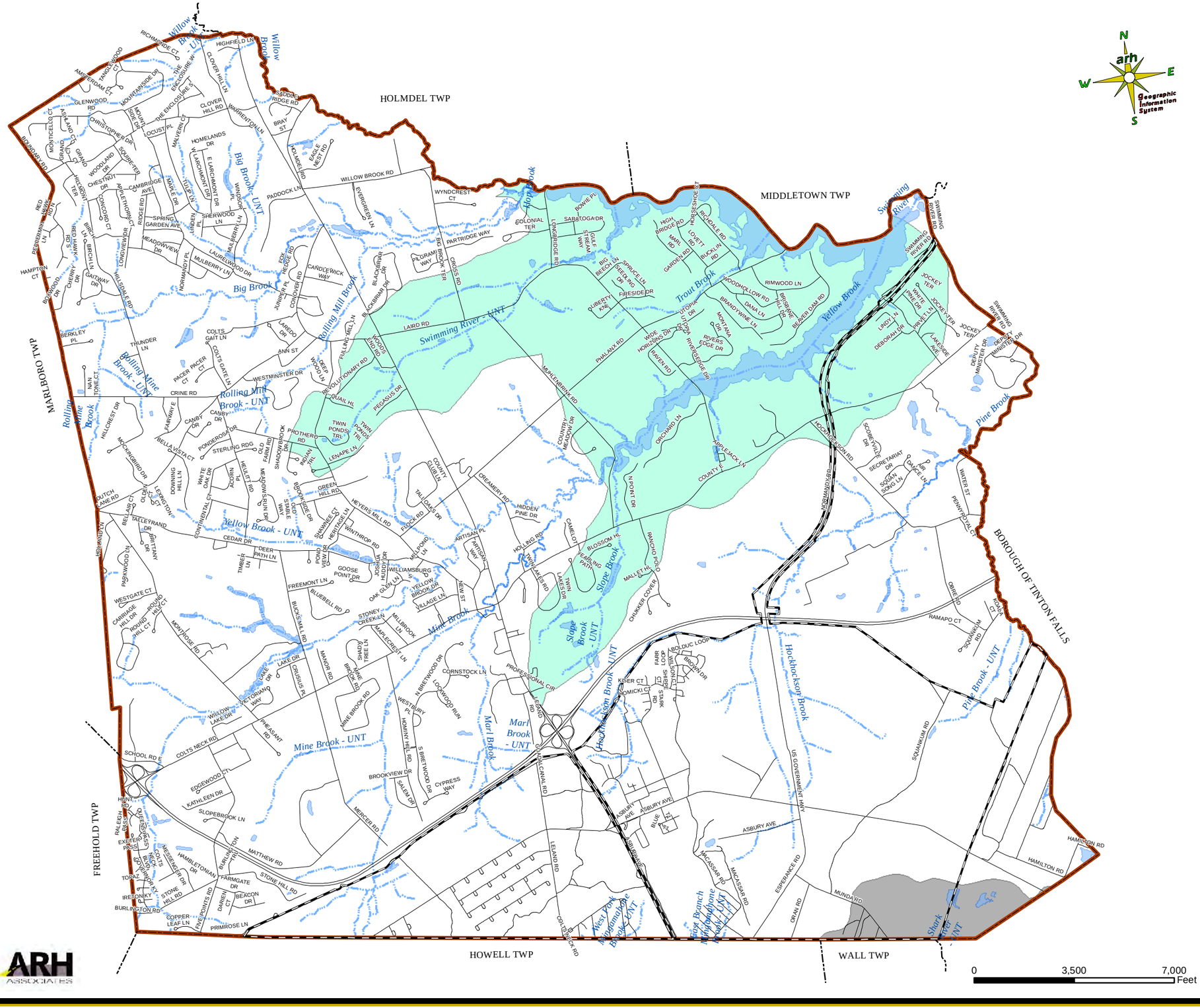
Figure 9.4 - Total Maximum Daily Loads (Streamsheds)



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Streamsheds Sites

- Shark River (above Remsen Mill gage)
- Swimming River Reservior / Slope Bk

GIS Data Sources:
1. Total Maximum Daily Loads (TMDL) for Streamsheds in NJ, Edition 20210121 GIS data came from NJDEP.
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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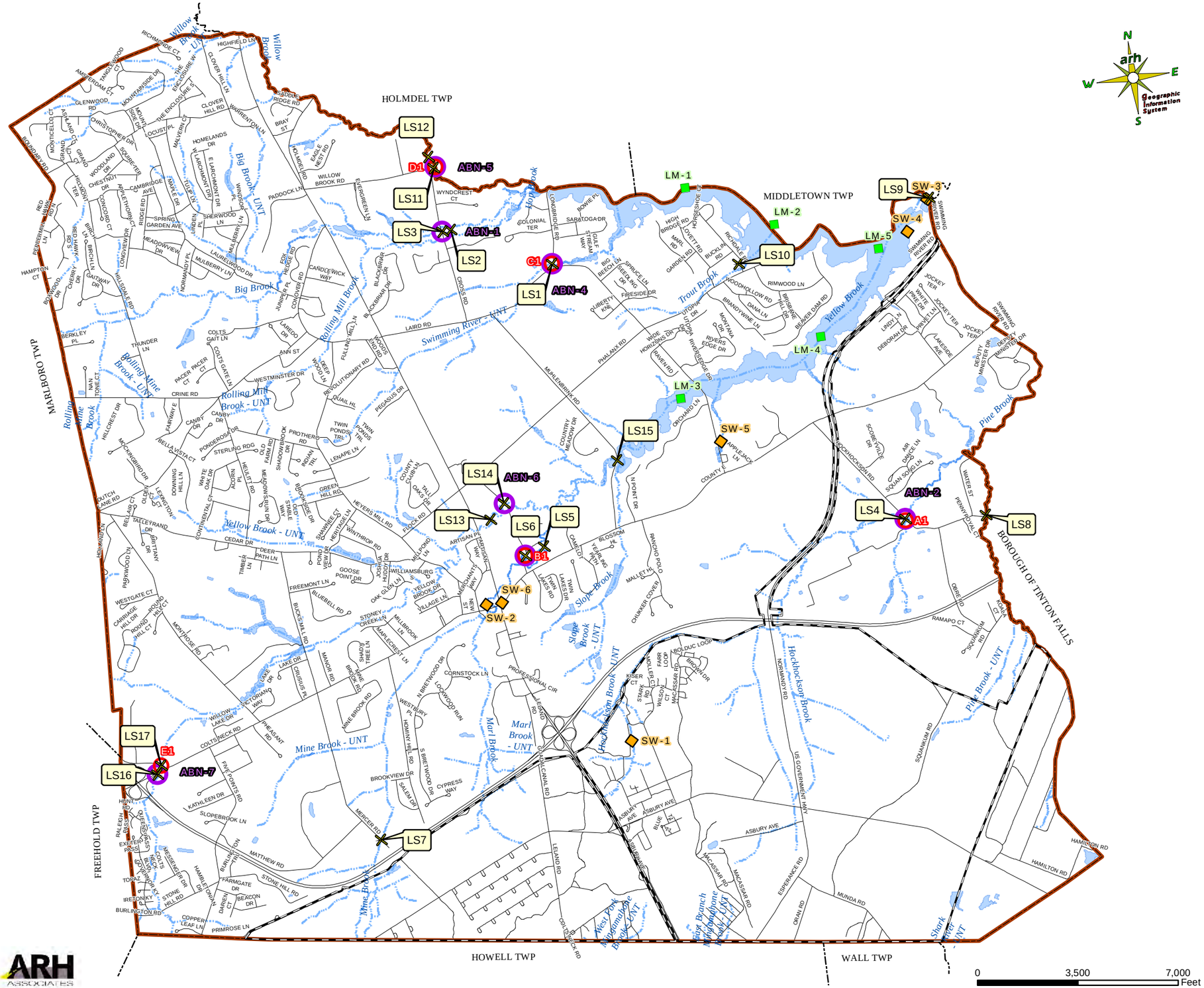
Figure 9.5 - Surface Water Quality Monitoring Locations



Legend

- Lake Monitoring Sites
- General Aquatic Life Station
- NJPDES Surface Water Discharges
- Ambient Stream Quality Monitoring Sites
- Ambient Biomonitoring Network (AMNET)
- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

GIS Data Sources:

1. Lake Monitoring Locations by date (2005-2021) in NJ, Edition 20230119 GIS data came from NJDEP.
2. General Aquatic Life Station data came from 2016 NJ Integrated Report - Station Recreation Assessment, Edition 20200428 GIS data (NJDEP).
3. NJPDES Surface Water Discharges in NJ, Edition 20230131 GIS data came from NJDEP.
4. Ambient Stream Quality Monitoring Sites in NJ, Edition 1998-2019 GIS data came from NJDEP.
5. AMNET in NJ, Edition 20230320 GIS data came from NJDEP.
6. Roads: NJDOT (2017).
7. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
8. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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Waterbody	02030104070010-01	02030104070020-01	02030104070030-01	02030104070040-01	02030104070050-01	02030104070060-01	02030104070070-01
Name	Hop Brook	Willow Brook	Big Brook	Yellow Brook (above Bucks Mill)	Mine Brook	Yellow Brook (below Bucks Mill)	Swimming R Reservoir / Slope Brook
GENERAL WATER QUALITY							
Biological (Cause Unknown)*	Non Support	Non Support	Non Support	Non Support	Non Support	Non Support	I/D
Biological Trout (Cause Unknown)*	Non Support	N/A	N/A	N/A	N/A	N/A	N/A
Dissolved Oxygen	I/D	I/D	Full Support	Full Support	Full Support	I/D	Full Support
Dissolved Oxygen Trout	Full Support	N/A	N/A	N/A	N/A	N/A	N/A
Temperature	I/D	Full Support	Full Support	Full Support	Full Support	Full Support	Full Support
Temperature Trout	Full Support	N/A	N/A	N/A	N/A	N/A	N/A
pH	Non Support	Full Support	Non Support	I/D	Full Support	Full Support	Full Support
Total Phosophorus	Non Support	Non Support	Non Support	Full Support	Non Support	Full Support	Non Support
Nitrate Total	Full Support	Full Support	Full Support	Full Support	Full Support	I/D	Full Support
TSS	Non Support	Non Support	Full Support	Full Support	Full Support	Full Support	Non Support
TDS	Full Support	Full Support	Full Support	Full Support	Full Support	I/D	Full Support
Turbidity	Full Support	Full Support	Full Support	I/D	Full Support	Full Support	Full Support
Unionized Ammonia	Full Support	Full Support	Full Support	I/D	Full Support	I/D	Full Support
Unionized Ammonia Trout	Full Support	N/A	N/A	N/A	N/A	N/A	N/A
Chloride Sulfate	Full Support	I/D	Full Support	I/D	Full Support	I/D	Full Support
Sulfate	Full Support	I/D	Full Support	I/D	Full Support	I/D	I/D
E.coli	Non Support	Non Support	Non Support	Non Support	Non Support	Non Support	Non Support
Enterococcus	N/A	N/A	N/A	N/A	Full Support	N/A	N/A
Total Coliform	N/A	N/A	N/A	N/A	Full Support	N/A	N/A
Beach Closing (enterococcus)	N/A	N/A	N/A	N/A	Full Support	N/A	N/A
METALS							
Arsenic- Human Health (HH)	Non Support	I/D	Non Support	I/D	Full Support	I/D	I/D
Cadmium HH	I/D	I/D	Full Support	I/D	Full Support	I/D	I/D
Chromium HH	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Copper HH	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Lead HH	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Mercury HH	I/D	I/D	Non Support	Full Support	Full Support	I/D	I/D
Nickel HH	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Selenium HH	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Silver HH	I/D	I/D	Full Support	I/D	Full Support	I/D	I/D
Thallium HH	I/D	I/D	Full Support	I/D	I/D	I/D	I/D
Zinc HH	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Arsenic - Aquatic Life (AQL)	I/D	I/D	Full Support	I/D	Full Support	I/D	I/D
Cadmium- AQL	I/D	I/D	Full Support	I/D	Full Support	I/D	I/D
Chromium- AQL	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Copper- AQL	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Lead-AQL	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Mercury- AQL	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Nickel-AQL	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Selenium- AQL	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Silver-AQL	I/D	I/D	Full Support	I/D	Full Support	I/D	I/D
Zinc-AQL	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Arsenic AQLc	I/D	I/D	Full Support	I/D	Full Support	I/D	I/D
Cadmium AQLc	I/D	I/D	Full Support	I/D	I/D	I/D	I/D
Chromium AQLc	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Copper AQLc	I/D	I/D	Full Support	Full Support	I/D	I/D	I/D
Lead AQLc	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Mercury AQLc	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Nickel AQLc	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Selenium AQLc	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
Zinc AQLc	I/D	I/D	Full Support	Full Support	Full Support	I/D	I/D
TOXICS (Non Support)							
Toxics (Non Support)							
FISH TISSUE							
Fish- Mercury	I/D	I/D	I/D	I/D	I/D	I/D	Non Support
Fish-Dioxin	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Fish- Chlordane	I/D	I/D	I/D	I/D	I/D	I/D	Non Support
Fish-PCB	I/D	I/D	I/D	I/D	I/D	I/D	Non Support
Fish-DDT and metabolites	I/D	I/D	I/D	I/D	I/D	I/D	Non Support

* Aquatic life use impairment is attributed to “cause unknown” when biological data shows impairment but chemical data is either unavailable or does not exceed applicable water quality standards; therefore, the pollutant cause of aquatic life use impairment is unknown (see 2014 Methods Document, available on the Department’s Web site at http://www.state.nj.us/dep/wms/bears/2014_integrated_report.htm).

HH = Human Health

I/D = Insufficient Data

N/A = Not Applicable

Waterbody	02030104070080-01	02030104070100-01	02030104090040-01	02030104100060-01
Name	Pine Brook / Hockhockson Brook	Poricy Brook / Swimming R (below SwimmingR Rd)	Shark River (above Remsen Mill gage)	Mingamahone Brook (above Asbury Rd)
GENERAL WATER QUALITY				
Biological (Cause Unknown)*	Full Support	I/D	Non Support	Non Support
Biological Trout (Cause Unknown)*	Full Support	N/A	Non Support	Non Support
Dissolved Oxygen	I/D	Non Support	Full Support	I/D
Dissolved Oxygen Trout	I/D	N/A	Full Support	Full Support
Temperature	Full Support	Full Support	Full Support	I/D
Temperature Trout	Non Support	N/A	Full Support	Full Support
pH	Full Support	Full Support	Full Support	Full Support
Total Phosophorus	Non Support	I/D	Non Support	Full Support
Nitrate Total	Full Support	I/D	Full Support	Full Support
TSS	Full Support	I/D	Full Support	Non Support
TDS	I/D	I/D	Full Support	Full Support
Turbidity	Full Support	Full Support	Full Support	Non Support
Unionized Ammonia	Full Support	I/D	Full Support	Full Support
Unionized Ammonia Trout	I/D	N/A	Full Support	Full Support
Chloride Sulfate	I/D	I/D	Full Support	Full Support
Sulfate	I/D	I/D	Full Support	Full Support
E.coli	Non Support	Non Support	Non Support	Non Support
Enterococcus	I/D	Non Support	N/A	N/A
Total Coliform	Non Support	Non Support	N/A	N/A
Beach Closing (enterococcus)	N/A	N/A	N/A	N/A
METALS				
Arsenic- Human Health (HH)	Non Support	I/D	Non Support	I/D
Cadmium HH	I/D	I/D	Full Support	I/D
Chromium HH	I/D	I/D	Full Support	I/D
Copper HH	Full Support	I/D	Full Support	I/D
Lead HH	Full Support	I/D	Full Support	I/D
Mercury HH	Full Support	I/D	Full Support	I/D
Nickel HH	Full Support	I/D	Full Support	I/D
Selenium HH	I/D	I/D	Full Support	I/D
Silver HH	Full Support	I/D	I/D	I/D
Thallium HH	I/D	I/D	I/D	I/D
Zinc HH	Full Support	I/D	Full Support	I/D
Arsenic - Aquatic Life (AQL)	I/D	I/D	Full Support	I/D
Cadmium- AQL	I/D	I/D	I/D	I/D
Chromium- AQL	I/D	I/D	Full Support	I/D
Copper- AQL	Full Support	I/D	Full Support	I/D
Lead-AQL	Full Support	I/D	Full Support	I/D
Mercury- AQL	Full Support	I/D	Full Support	I/D
Nickel-AQL	Full Support	I/D	Full Support	I/D
Selenium- AQL	I/D	I/D	Full Support	I/D
Silver-AQL	Full Support	I/D	I/D	I/D
Zinc-AQL	Full Support	I/D	Full Support	I/D
Arsenic AQLc	I/D	I/D	Full Support	I/D
Cadmium AQLc	I/D	I/D	I/D	I/D
Chromium AQLc	I/D	I/D	Full Support	I/D
Copper AQLc	Full Support	I/D	Full Support	I/D
Lead AQLc	Full Support	I/D	Full Support	I/D
Mercury AQLc	Full Support	I/D	Full Support	I/D
Nickel AQLc	Full Support	I/D	Full Support	I/D
Selenium AQLc	I/D	I/D	Full Support	I/D
Zinc AQLc	Full Support	I/D	Full Support	I/D
TOXICS (Non Support)				
Toxics (Non Support)				
FISH TISSUE				
Fish- Mercury	I/D	I/D	Non Support	I/D
Fish-Dioxin	I/D	I/D	I/D	I/D
Fish- Chlordane	I/D	I/D	Non Support	I/D
Fish-PCB	I/D	Non Support	Non Support	I/D
Fish-DDT and metabolites	I/D	Non Support	Non Support	I/D

* Aquatic life use impairment is attributed
does not exceed applicable water quality
(see 2014 Methods Document, available

HH = Human Health

I/D = Insufficient Data

N/A = Not Applicable

Appendix 9B: 2014 Final 303(d) List of Water Quality Limited Waters with Sublist 5 Subpart and Priority Ranking for TMDL Development

Assessment Unit Number	Assessment Unit Name	Parameter	Station Number	Cycle 1st Listed	Designated Use	Sublist 5 Subpart (A, R, L)	Priority Ranking for TMDL
02030104070010-01	Hop Brook	Arsenic	1407210	2008	Water Supply		Low
		pH	MCHD-53, 01407210	2014	Aquatic Life, Aquatic Life - Trout		Medium
		Phosphorus (Total)	01407210, MCHD-53	2006	Aquatic Life, Aquatic Life - Trout		Medium
		Total Suspended Solids (TSS)	01407210, MCHD-53	2006	Aquatic Life, Aquatic Life - Trout		Medium
02030104070020-01	Willow Brook	Phosphorus (Total)	MCHD-52	2002	Aquatic Life		Medium
		Total Suspended Solids (TSS)	MCHD-52	2006	Aquatic Life		Medium
02030104070030-01	Big Brook	Arsenic	01407280, 01407320	2012	Water Supply		Low
		Mercury in Water Column	1407320	2014	Water Supply		Low
		pH	01407320 01407280, MCHD-21	2010	Aquatic Life		Medium
		Phosphorus (Total)	01407320, MCHD-21	2002	Aquatic Life		Medium
02030104070040-01	Yellow Brook (above Bucks Mill)	Cause Unknown	AN0471	2008	Aquatic Life		Low
02030104070050-01	Mine Brook	Arsenic	01407450	2012	Water Supply		Low
		Phosphorus (Total)	01407450, MCHD-58	2012	Aquatic Life		Medium
02030104070060-01	Yellow Brook (below Bucks Mill)	Cause Unknown	AN0472	2006	Aquatic Life		Low
02030104070070-01	Swimming R Reservoir/Slope Bk	Chlordane in Fish Tissue	Swimming River Reservoir, Marlu Lake (Thompson Park)	2010	Fish Consumption	L	Low
		DDT and its metabolites in Fish Tissue	Swimming River Reservoir, Marlu Lake (Thompson Park)	2010	Fish Consumption	L	Low
		PCB in Fish Tissue	Swimming River Reservoir, Marlu Lake (Thompson Park)	2010	Fish Consumption	L	Low
		Phosphorus (Total)	MCHD-56	2002	Aquatic Life		Medium
		Total Suspended Solids (TSS)	MCHD-56	2006	Aquatic Life		Medium
02030104070080-01	Pine Brook/Hockhockson Brook	Arsenic	01407520	2012	Water Supply		Low
		Phosphorus (Total)	MCHD-34, MCHD-75	2014	Aquatic Life, Aquatic Life - Trout		Medium
		Temperature, Water	AN0475	2012	Aquatic Life - Trout		Medium
02030104070100-01	Poricy Bk/Swimming R (below SwimmingR Rd)	DDT and its metabolites in Fish Tissue	Navesink River at Fairhaven	2006	Fish Consumption	L	Low
		Oxygen, Dissolved	MCHD-41	2006	Aquatic Life		Medium
		PCB in Fish Tissue	Navesink River at Fairhaven	2006	Fish Consumption	L	Low
02030104090040-01	Shark River (above Remsen Mill gage)	Arsenic	01407670	2012	Water Supply		Low
		Chlordane in Fish Tissue	Shark River at Belmar	2006	Fish Consumption	L	Low
		DDT and its metabolites in Fish Tissue	Shark River at Belmar	2006	Fish Consumption	L	Low
		PCB in Fish Tissue	Shark River at Belmar	2008	Fish Consumption	L	Low
02030104100060-01	Mingamahone Brook (above Asbury Rd)	Total Suspended Solids (TSS)	1408009	2006	Aquatic Life, Aquatic Life - Trout		Medium
		Turbidity	1408009, MCHD-23	2006	Aquatic Life, Aquatic Life - Trout		Medium

Appendix 9C: Sources of Parameters Causing Use Impairment (Sublists 4 and 5)

Waterbody	Name	Parameter	Source1	Source2	Source3	Sublist
02030104070010-01	Hop Brook	Arsenic	Package Plant or Other Permitted Small Flows Discharges	Agriculture	Urban Runoff/Storm Sewers	5
		E. Coli	Urban Runoff/Storm Sewers	Agriculture		4
		pH	Urban Runoff/Storm Sewers	Agriculture		5
		Phosphorus	Package Plant or Other Permitted Small Flows Discharges	Agriculture	Urban Runoff/Storm Sewers	5
		TSS	Agriculture	Urban Runoff/Storm Sewers	Package Plant or Other Permitted Small Flows Discharges	5
02030104070020-01	Willow Brook	E. Coli	Urban Runoff/Storm Sewers			4
		Phosphorus	Urban Runoff/Storm Sewers	Agriculture	Package Plant or Other Permitted Small Flows Discharges	5
		TSS	Urban Runoff/Storm Sewers	Agriculture	Package Plant or Other Permitted Small Flows Discharges	5
02030104070030-01	Big Brook	Arsenic	Urban Runoff/Storm Sewers	Agriculture		5
		E. Coli	Urban Runoff/Storm Sewers	Agriculture		4
		Mercury in Water Column	Atmospheric Deposition - Toxics			5
		pH	Urban Runoff/Storm Sewers	Agriculture		5
		Phosphorus	Urban Runoff/Storm Sewers	Municipal Point Source Discharges	Package Plant or Other Permitted Small Flows Discharges	5
02030104070040-01	Yellow Brook (above Bucks Mill)	Cause Unknown	Source Unknown			5
		E. Coli	Urban Runoff/Storm Sewers	Agriculture		4
02030104070050-01	Mine Brook	Arsenic	Urban Runoff/Storm Sewers			5
		E. Coli	Urban Runoff/Storm Sewers			4
		Phosphorus	Urban Runoff/Storm Sewers			5
02030104070060-01	Yellow Brook (below Bucks Mill)	Cause Unknown	Source Unknown			5
		E. Coli	Urban Runoff/Storm Sewers	Agriculture		4
02030104070070-01	Swimming R Reservoir /Slope Bk	Chlordane in Fish Tissue	Contaminated Sediments	Source Unknown		5
		DDT in Fish Tissue	Contaminated Sediments			5
		E. Coli	Urban Runoff/Storm Sewers			4
		Mercury in Fish Tissue	Atmospheric Deposition - Toxics			4
		PCB in Fish Tissue	Contaminated Sediments	Source Unknown		5
		Phosphorus	Urban Runoff/Storm Sewers	Agriculture		5
		TSS	Urban Runoff/Storm Sewers	Agriculture		5
02030104070080-01	Pine Brook/Hockhockson Brook	Arsenic	Urban Runoff/Storm Sewers	Agriculture	NPS Pollution from Military Base Facilities (other than port facilities)	5
		E. Coli	Urban Runoff/Storm Sewers	Agriculture		4
		Phosphorus	Urban Runoff/Storm Sewers	Agriculture		5
		Temperature	Urban Runoff/Storm Sewers	Agriculture	Loss of Riparian Habitat	5
		Total Coliform	Urban Runoff/Storm Sewers	Agriculture		4
02030104070100-01	Poricy Bk/Swimming R (below SwimmingR Rd)	DDT in Fish Tissue	Contaminated Sediments	Source Unknown		5
		Dissolved Oxygen	Urban Runoff/Storm Sewers			5
		E. Coli	Urban Runoff/Storm Sewers			4
		Enterococcus	Urban Runoff/Storm Sewers			4
		PCB in Fish Tissue	Contaminated Sediments	Source Unknown		5
		Total Coliform	Urban Runoff/Storm Sewers			4
02030104090040-01	Shark River (above Remsen Mill gage)	Arsenic	Urban Runoff/Storm Sewers	Agriculture	Landfill	5
		Chlordane in Fish Tissue	Contaminated Sediments	Source Unknown		5
		DDT in Fish Tissue	Contaminated Sediments	Source Unknown		5
		E. Coli	Urban Runoff/Storm Sewers			4
		Mercury in Fish Tissue	Atmospheric Deposition - Toxics			4
		PCB in Fish Tissue	Contaminated Sediments	Source Unknown		5
		Phosphorus	Urban Runoff/Storm Sewers	Agriculture		4
02030104100060-01	Mingamahone Brook (above Asbury Rd)	E. Coli	Urban Runoff/Storm Sewers			4
		TSS	Urban Runoff/Storm Sewers	Golf Course		5
		Turbidity	Urban Runoff/Storm Sewers	Golf Course		5

Appendix 9D: Assessment Unit/Pollutant Combinations Addressed by A USEPA-approved TMDL (Sublist 4A)

Assessment Unit Number	Assessment Unit Name	Parameter	TMDL Number	Cycle 1st Listed	Designated Use	Sublist 4 Type
02030104070010-01	Hop Brook	E. coli	10990	2006	Recreation	A
02030104070020-01	Willow Brook	Fecal Coliform	31392	2006	Recreation	A
02030104070030-01	Big Brook	Fecal Coliform	11003	2006	Recreation	A
02030104070040-01	Yellow Brook (above Bucks Mill)	Fecal Coliform	10996	2006	Recreation	A
02030104070050-01	Mine Brook	E. coli	31392	2012	Recreation	A
02030104070060-01	Yellow Brook (below Bucks Mill)	E. coli	10996	2012	Recreation	A
02030104070070-01	Swimming R Reservoir/Slope Bk	E. coli	11002	2006	Recreation	A
		Mercury in Fish Tissue	37909	2010	Fish Consumption	A
02030104070080-01	Pine Brook/Hockhockson Brook	Fecal Coliform	10619	2006	Recreation	A
		Total Coliform	31392	2014	Shellfish	A
02030104070100-01	Poricy Bk/Swimming R (below SwimmingR Rd)	Enterococcus	31392	2012	Recreation	A
		E. coli	10996	2006	Recreation	A
		Total Coliform	31392	2006	Shellfish	A
02030104090040-01	Shark River (above Remsen Mill gage)	Fecal Coliform	11095	2006	Recreation	A
		Mercury in Fish Tissue	40821	2006	Fish Consumption	A
		Phosphorus (Total)	12329	2008	Aquatic Life, Aquatic	A
02030104100060-01	Mingamahone Brook (above Asbury Rd)	Fecal Coliform	10999	2006	Recreation	A

Appendix 9E: 2014 Final Causes Removed from the Sublist 5/303(d) List (Delisted Waters)

Assessment Unit Number	Assessment Unit Name	Parameter	Original Listing Station	Delisting Reason	Explanation
02030104070050-01	Mine Brook	E. coli	01407450,MCHD-58	TMDL Approved or established by EPA (4a)	Covered by TMDL
02030104090040-01	Shark River (above Remsen Mill gage)	Phosphorus (Total)	01407670,MCHD-30/70	TMDL Approved or established by EPA (4a)	TP TMDL

Appendix 9F: 2014 Final Decisions to Not List Causes on the 2014 303(d) List

Assessment Unit Number	Assessment Unit Name	Station Number	Station Name	Parameter	Sublist	Explanation	Total Samples	Total Exceedances
02030104070030-01	Big Brook	1407320	Big Brook at Cross Rd in Colts Neck	TSS	1	Only 1 exceedance,MCHD-57 also had 1 exceedance, exceedances on consequtive days, 01407280 in HUC is full attain, do not list	21	1

10. GROUNDWATER RESOURCES

10.1 Hydrology & Drinking Water Primer

Where does drinking water come from? There are two basic sources of drinking water: groundwater and surface water.

Groundwater is water found beneath the Earth's surface. Shallow groundwater comes from rain and snow seeping into rock and soil. Groundwater is stored in underground formations called aquifers. Aquifers supply wells and springs. Wells in Colts Neck range from about 50 feet to over 500 feet deep.

Surface water (see Chapter 9) is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies. Groundwater can also seep into a stream, river or other surface water body, recharging surface water bodies even in the absence of rain. Likewise, under some circumstances, surface water can seep into an underlying aquifer.

Potable or drinking water can come from 1) wells drilled into the ground that pump out groundwater; 2) devices called surface water intakes placed on a river, stream, reservoir; or 3) both. In Colts Neck Township, residents have private groundwater wells to supply their drinking water. Outside of NWS Earle, public water supply is limited to the 272 units in the Grande serviced by Freehold Township, the 365 units in Colts Neck Manor serviced by Gordons Corner Water company as well as a few isolated dwellings fronting on Swimming River Road which connect to the NJ American Water Company main located in Tinton Falls.

What factors may affect water quality and the quality of your drinking water source? A variety of conditions and activities may affect the quality of a drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (e.g., for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills.

What steps are being taken now to ensure water quality? The NJDEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered by public community and public non-community water systems for human consumption meets NJDEP's stringent health-based drinking water standards. Additionally, NJDEP has permitting, waste management, and cleanup programs in place to avoid and control potential contamination. Finally, the Private Well Testing Act requires all private wells to be tested prior to sale or change in ownership.

Source: (NJDEP Division of Water Supply, 2005)

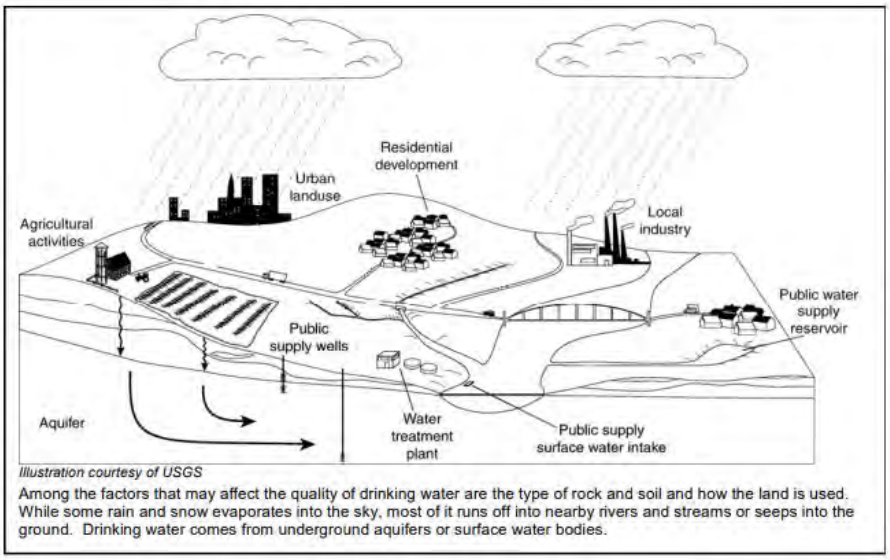


Illustration courtesy of USGS

Among the factors that may affect the quality of drinking water are the type of rock and soil and how the land is used. While some rain and snow evaporates into the sky, most of it runs off into nearby rivers and streams or seeps into the ground. Drinking water comes from underground aquifers or surface water bodies.

10.2 Colts Neck Groundwater Resources

Colts Neck Township, by virtue of its location within the outer portion of the Atlantic Coastal Plain, possesses abundant water resources, both on the surface and underground. The region's rainfall, averaging approximately 40 inches annually falls on porous, sandy soils which effectively filter and store vast quantities of high quality fresh water beneath the surface of the ground. Figure 10.1 shows the groundwater recharge areas throughout the Township, where higher values reflect more precipitation reaching the underlying formations described below.

In recent years climate change has resulted in more frequent prolonged wet and dry periods, including intense storms which can exceed the infiltration capacity of the subsurface and/or local stormwater systems. Monthly historical averages are not always an accurate reflection of the variability we see from year to year. As a result, groundwater resources must be managed carefully in order to ensure a safe, adequate supply during both wet and dry periods.

The solid bedrock foundation beneath Colts Neck lies at a depth of about 2,000 feet below the surface. Overlying these sedimentary rocks are numerous layers of sand, gravels and clays. These unconsolidated, water bearing formations are known as aquifers which can range in thickness from a few feet to hundreds of feet. They may underlie several acres or many square miles and can be classified as follows:

1. **Confined aquifers** exist when groundwater is confined between impermeable layers of rock or clay. When the hydrostatic pressure within a confined aquifer is great enough, water may flow naturally from a well-constructed in that formation in what is known as an artesian condition.

2. Unlike confined aquifers, **unconfined aquifers** are not overlain by an impermeable layer of clay or rock. As a result, groundwater in unconfined aquifers forms a water

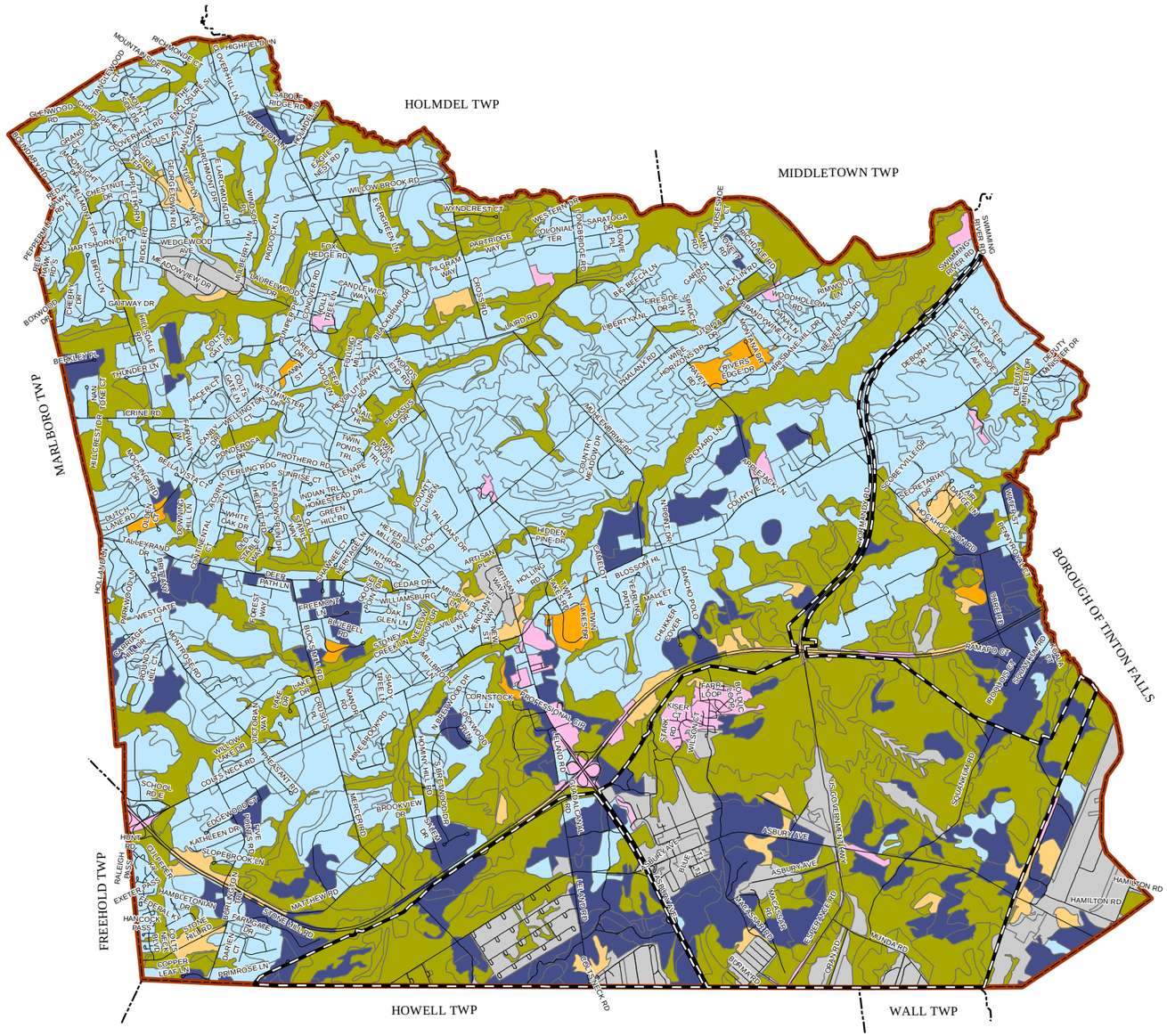
Colts Neck Township 2024 Environmental Resource Inventory

Figure 10.1 - Recharge Areas

250272--
Marlboro
1 Obs

*NOTE: 230104--
Morrell 1 Obs located
~3.4 miles West of here.

250250--
Village
215 Obs



250353-- Fort
Monmouth
1-Nco Obs

0 4,500 9,000 Feet

Legend

- Observation Wells
- Earle NWS Area
- Municipal Boundary
- Road

Recharge (drought)

- 0 in/yr
- 1 to 7 in/yr
- 8 to 10 in/yr
- 11 to 15 in/yr
- 16 to 23 in/yr
- hydric soil-no recharge calulated
- wetlands, open water-no recharge calculated

GIS Data Sources:
1. NJDEP Groundwater Recharge Areas, Series DGS02-3, Edition 200605.
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

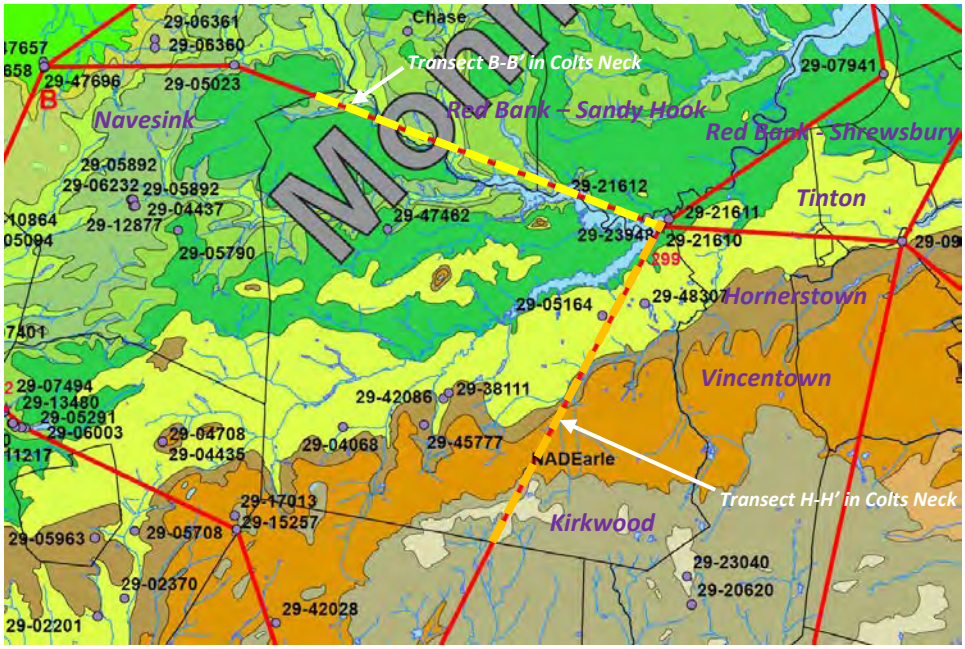
table which is at near atmospheric pressure; the depth to the water table represents the depth from the surface to the zone of saturation within the formation.

The most significant aquifer formations in Colts Neck, detailed below, are confined aquifers which lie between layers of impermeable clay or silty clay. Aquifer outcrop areas are those areas where the geologic formation comprising the aquifer is exposed at the surface. It is the rainwater falling over outcrop areas and percolating through the soil which recharges the groundwater reservoir. In general, the greater the area of outcrop, the greater the quantity of water an aquifer can yield. Unconfined aquifers are also recharged directly by infiltration from the surface, and confined aquifers are often replenished through slow seepage through their overlying confining layers and/or discontinuities in the overlying confiners.

Colts Neck Township is uniquely situated along the outcrop area of several underlying geologic formations. From the southeast corner to the northwest, geologic formations outcropping in the Township are as follows (Sugarman et. al, 2019):

- Kirkwood
- Vincentown
- Hornerstown
- Tinton
- Red Bank – Shrewsbury
- Navesink & Red Bank – Sandy Hook (along the Willow Brook corridor)

These geologic formations are shown in the graphic below, which also indicates well locations (e.g., 29-05164) and transects (solid red lines). NJGWS utilized well logs at these locations to generate profiles of aquifer formations across Monmouth County (Sugarman et. al, 2019):



Geologic Formations, Well Locations & Transects

Two of the transects that traverse Colts Neck Township are B-B' (running east-west along the northern Township border) and H-H' (running north-south) as shown below. These are a good illustration of the variability of aquifer formations available for Colts Neck water supply wells. Aquifers underlying Colts Neck are described by NJGWS in GMS 13-1 as follows (from shallowest to deepest) as shown in the following transect graphics (Sugarman et. al, 2019):

- Vincentown Aquifer

  The Vincentown aquifer is limited within its outcrop area to approximately 10 miles downdip, where it grades into a clay-silt confining bed. It supplies domestic and some industrial and public-supply wells. It is dominantly a quartz sand with minor amounts of glauconite sand and shells. Its thickness is variable and reaches a maximum of 140 feet near Long Branch. It is a more productive aquifer in Monmouth County than in Ocean County. In Monmouth County, the aquifer is restricted to a narrow 10-miles belt extending from Long Branch southwest to New Egypt. In Ocean County, withdrawal of water is limited to outcrop areas from New Egypt to Bennetts Mills and yields of domestic wells are less than 50 gallons per minute (gpm).

  In Colts Neck, the Vincentown aquifer outcrops within NWS Earle in the southeastern corner of the Township. The Vincentown aquifer ranges from ±0-100 feet below ground surface, with a thickness of ±0-60 feet.

- Red Bank Sand

  The Red Bank Sand aquifer is a very minor aquifer in Monmouth County that supplies domestic wells with 2 to 25 gallons per minute (gpm). The Red Bank Sand aquifer consists of the Shrewsbury Member of the Red Bank Formation, and is a medium to coarse quartz sand.

  In Colts Neck Township, the Red Bank Sand, where it exists in the northeastern area of the Township, is encountered from ±0-100 feet below ground level.

- Wenonah-Mt Laurel Aquifer

  The Wenonah-Mount Laurel (WML) aquifer mainly consists of slightly glauconitic medium sands of the Mount Laurel Formation and the fine sands of the Wenonah Formation. Its thickness is variable and commonly ranges from 30 to 80 feet. Where the sands are thin and located primarily in the upper part of the Mount Laurel Formation, nearly 100 feet separate the WML aquifer and the Englishtown aquifer system. Where the aquifer sands are thicker and more extensive, separation between the WML and the upper Englishtown aquifer is more limited, and the two aquifers are partly interconnected [as in the upper northeast corner of Colts Neck Township]. The WML aquifer is separated from the Englishtown aquifer system by silts and clays of the Wenonah and Marshalltown Formation. The WML is a productive source of water [in Monmouth County], although its varied lithology and thickness, and relatively low capacity for transmitting water, indicate why it is less productive than the confined aquifers underlying it.

In Colts Neck Township, the WML aquifer is ±0-200 feet below ground level and has a thickness of ±30-100 feet. Based on the profiles shown below, the WML aquifer and the Englishtown aquifer formation are separated by only 20-40 feet.

- Englishtown Aquifer System

  The Englishtown Aquifer System is a single aquifer in updip areas…but two distinct aquifers separated by a clay-silt confining bed in downdip areas in…southeastern Monmouth County. Where the two aquifers occur, most production is from the upper sand. The most intensive use of the Englishtown aquifer system is in the coastal communities of Monmouth and northeastern Ocean Counties where static-water levels have been lowered significantly, but have since recovered due to restrictions in pumping. The aquifer is 140 feet thick near Red Bank, and more than 200 feet thick at Point Pleasant. The Englishtown aquifer system is separated from the Magothy aquifer by a thick clay-silt confining bed composed primarily of the Woodbury and Merchantville Formations.

  In Colts Neck Township, the Englishtown aquifer system is a single aquifer ±50-300 feet below ground level depending on location, with a thickness of approximately 130 feet (thinner toward the south of the Township).

- Magothy Aquifer

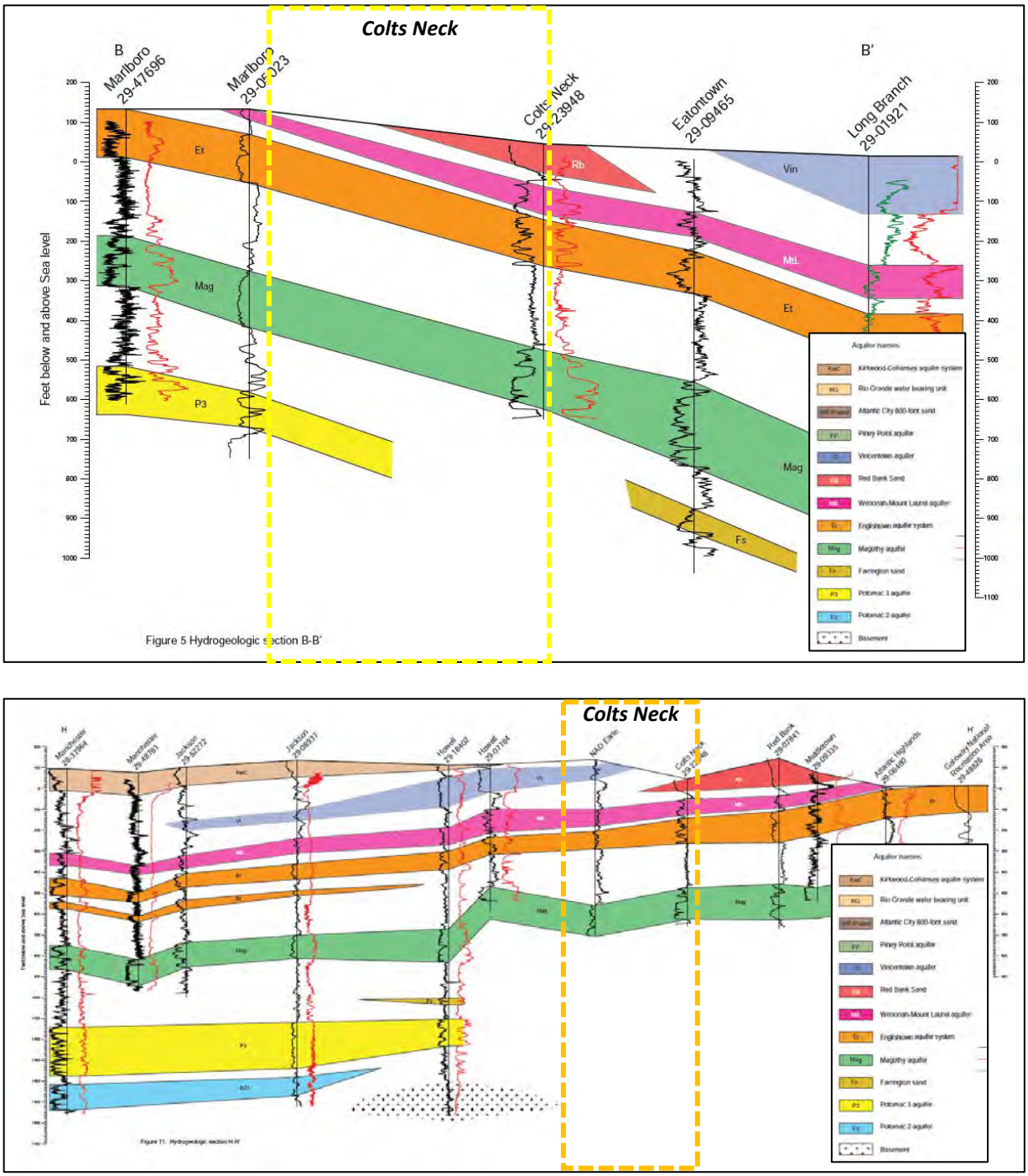
  The Magothy aquifer consists of fine-to-coarse sand interstratified with dark, carbonaceous clay. It is a thick, continuous aquifer in Monmouth [County]. In the New Jersey Coastal Plain, the Magothy aquifer is thickest in Monmouth County, where it exceeds 200 feet along the coast. It is correlative with the Upper Aquifer of the Potomac-Raritan-Magothy aquifer system, and the Magothy Formation. The Magothy Formation include several informal members including the Cliffwood and Morgan Beds, Amboy Stoneware Clay, Old Bridge Sand, and South Amboy Fire Clay. The Magothy aquifer is primarily equivalent to the Old Bridge Sand, and may include the Sayreville Sand Member of the Raritan Formation. Cross sections show the maximum thickness of the Magothy, the most productive aquifer in Monmouth County.

  In Colts Neck Township, the Magothy aquifer is ±120-150 feet thick and ±350-600 feet below ground level depending on location.

- Potomac 3 Aquifer

  The Potomac Unit 3 aquifer (P3) consists of fine-to-coarse sand, and sparse gravel, interbedded with white or variegated clay. Although its thickness varies, it reaches a thickness of approximately 400 feet in central Ocean County. Sand units assigned to the Potomac unit 3 aquifer in this study have been correlated with the Farrington Sand aquifer in earlier studies…and the middle aquifer of the Potomac-Raritan-Magothy aquifer system. In the study area, it is a major aquifer, and its use is mainly limited by its depth and the possibility of producing brackish water containing high chlorides exceeding the 250 mg/L isochlor (U.S. EPA for National Secondary Drinking Water Standards).

In Colts Neck Township, P3 could be encountered anywhere from 700-800 feet to over 1000 feet below ground level in wells drilled deep enough to detect it, and is expected to be ±100-150 feet thick (Sugarman et. al, 2019).



Transects Showing Aquifer Formations Underlying Colts Neck (Sugarman et. al, 2019).

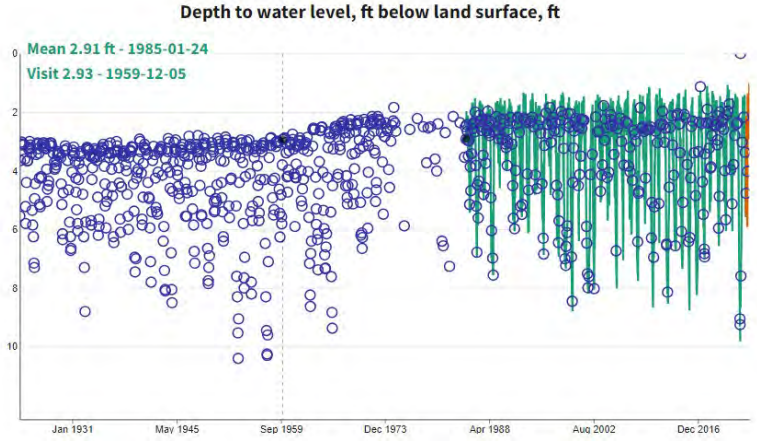
The wells within Colts Neck Township utilized in the GMS 13-1 are summarized in the table below. Ground elevations (using datum NAVD88) range from 33 to 139, and well depths from 280 to 836 feet. Wells are typically screened in the formation at maximum depth, such that "NADEarle" and "29-23948" are screened in the Magothy aquifer, "29-47462" is likely in the Englishtown, etc. The only aquifer test performed within Colts Neck detailed in this report was on the NJAW Swimming River Well 1 (299), an aquifer storage and recovery (ASR) well in the leaky/confined Magothy aquifer with recorded parameters as follows: Transmissivity=4000 ft^2/day, Storativity=0.0023, Leakance=0.00009 day (NJDEP, 2017).

Well ID	Total Depth/Bottom Elevation (ft/NAVD88)	Ground Surface Elevation (GSE) (NAVD88)
29-47462	280 / -172	108
29-38111	294 / -192	102
29-48307	380 / -307	73
29-05164	600 / -519	81
29-45777	602 / -514	88
29-04068	675 / -573	102
29-21611	677 / -644	33
29-21612	682 / -640	42
29-23948	691 / -646	45
29-21610	691 / -647	44
29-42086	714 / -628	86
NADEarle	836 / -697	139

In addition, the USGS has several observation wells throughout the state in which water levels are monitored. Although the USGS has no observation wells within Colts Neck Township, four (4) are within close proximity as shown in Figure 10.1. Fluctuations in ground water elevations in each of those four wells are shown in the plots below from the 1970's through the present day, or in the case of the Morrell 1 Observation well, since the 1930's. Seasonal fluctuations are visible at this scale, as are long-term trends (see Critical Area 1 discussion below). Results are shown below going from the shallowest well to the deepest.

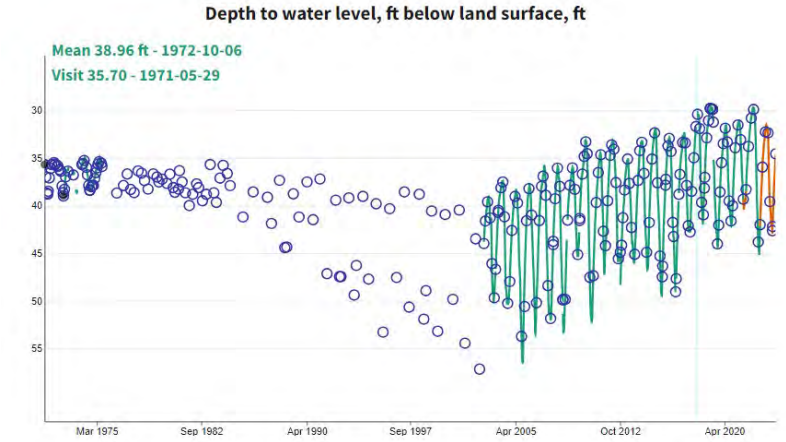
230104-- Morrell 1 Obs - 402143074185201

(11 feet deep in the Unconfined Englishtown Formation. GSE = 76.8 (NGVD29))



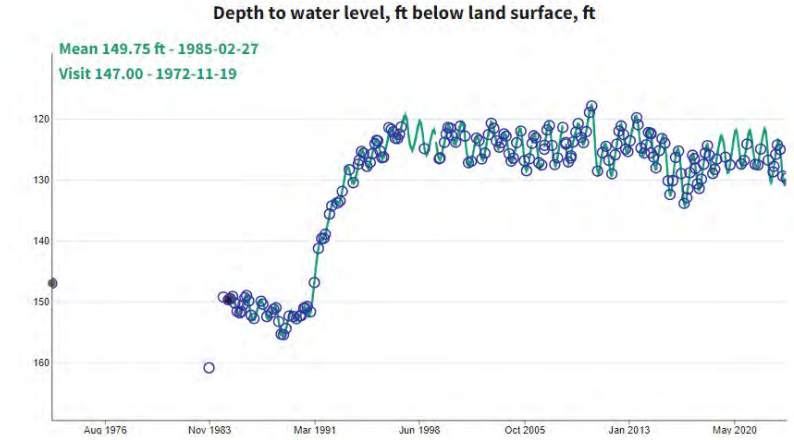
250250-- Village 215 Obs - 401906074151401

(215 feet deep in the Englishtown formation. GSE = 138.6)



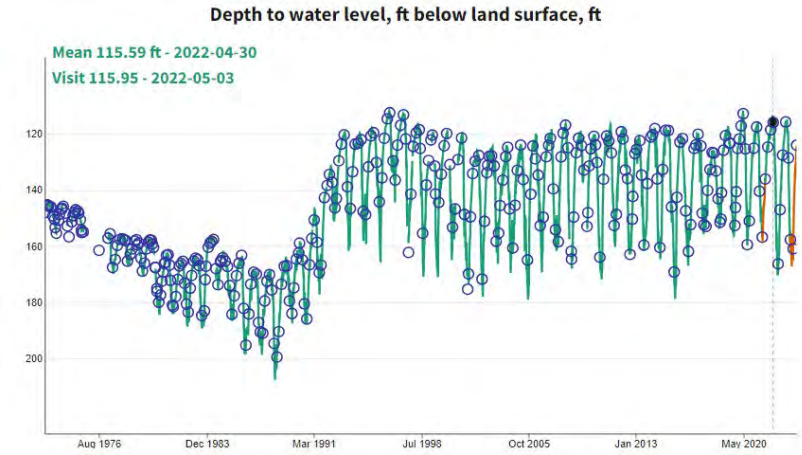
250353-- Fort Monmouth 1-Nco Obs - 401542074053001

(327 feet deep in the Wenonah-Mount Laurel Formation. GSE = 140.0)

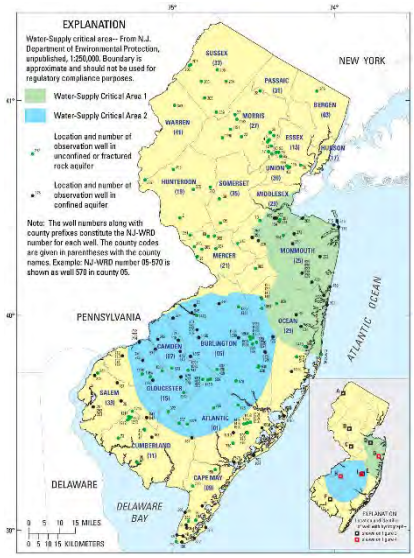


250272-- Marlboro 1 Obs - 402208074145201

(680 feet deep in the Farrington Sand Member of the Raritan Formation. GSE = 116.9)



10.3 Water Supply Critical Area 1



Colts Neck Township is within Water Supply Critical Area 1, an NJDEP-established boundary defining and delineating a depleted zone[1]. During the 1980's and 1990's, the State responded to progressive water level declines and saltwater intrusion within confined aquifers in the northern coastal plain by declaring an area of "critical waters supply concern." Within Water Supply Critical Area 1, the State mandated reductions in use, imposed restrictions on future use, and offered surface water alternatives to replace groundwater supply.

The principal confined aquifers in Critical Area 1 consist of the Potomac-Raritan-Magothy (PRM) aquifer system, the Englishtown aquifer system, the Wenonah-Mount Laurel aquifer, and the Vincentown aquifer. These, of course, are the primary aquifers in Colts Neck Township. The Englishtown aquifer system is most prolific in its northern extent, within Critical Area 1. The WML is less productive in Critical Area 1. The Vincentown aquifer supplies localized needs but is constrained geographically, in its potential yield, and in its potential to impact surface water.

NJDEP re-examined Critical Area 1 in 2001. The additional studies conducted lead to the conclusion that, "the regional water-supply alternatives identified in the 1996 NJSWSP will continue to be endorsed, that a small amount of additional groundwater may be available from confined aquifers in Critical Area 1 at optimum locations, and that additional water may be available to meet seasonal water-supply needs through redistribution of annual pumping schemes and use of aquifer storage and recovery methods."

Conditions have certainly improved; from the inception of Critical Area 1 limits to 2008, water levels recovered from lows measured during 1983-`988 by as much as 67, 150, and 187 feet in the Middle PRM aquifer, WML aquifer, and Englishtown aquifer system, respectively. However, the NJ Water Supply report for 2022 indicates that no additional water is available from the existing wells in the PRM, Englishtown and MLW aquifers. NJDEP does not intend to make changes to critical area aquifer allocated amounts at this time. It should be noted, however, that withdrawals outside of Critical Area 1 may impact water levels inside; if significant cones of depression develop just outside the critical area, then NJDEP may take additional action to prevent adverse impacts.

The USGS generated a story map depicting groundwater conditions in the New Jersey Coastal Plain, including those in Critical Area 1 (USGS, n.d.).

Planning Region	Aquifer	Availability	Limitations
Water Supply Critical Area 1	General	Users should investigate the selected Critical Area water-supply alternatives, which are the Manasquan Reservoir and the Middlesex County pipeline. Also, transfer of base allocation within Critical Aquifers.	Remaining availability of safe yield from Manasquan Reservoir. Geographic feasibility of connecting to pipeline. Transfer of base allocation requires DEP approval, conditioned on need in growth area, lack of available alternatives, or resulting environmental improvement.
	All aquifers	Up to 1 mgd additional water may be available from Englishtown, Wenonah-Mount Laurel, and middle PRM aquifer, depending location of proposed withdrawal	Availability dependent of location of proposed well and impact in relation to environmental limitations, including drawdown near Raritan Bay, drawdown elevation, and drawdown within the Critical Area.
	Vincentown aquifer	Additional small-scale public supplies	Availability constrained by limited geographic distribution, low yields in places, and interaction with surface water near outcrop.
	Wenonah-Mount Laurel Aquifer	Less than 5 mgd available at optimum locations.	Not available in some geographic areas. Depends on additional withdrawals from other available aquifers.
	Englishtown Aquifer	Less than 5 mgd available at optimum locations.	Not available in some geographic areas. Depends on additional withdrawals from other available aquifers.
	Middle PRM aquifer	Less than 2 mgd available at optimum locations.	Geographic availability highly limited. Depends on additional withdrawals from other available aquifers.

10.4 Public Community, Non-Community, and Other Major Water Users

Although Colts Neck Township itself does not have its own public community water supply system, there are several potable water suppliers throughout the Township which are regulated by NJDEP based on the population they supply and/or the amount of water withdrawn. These users are summarized in the tables below in an effort to quantify water usage outside of the private supply wells.

Figure 10.2 illustrates the public water purveyors or providers in Colts Neck Township, and also shows the wellhead protection areas associated with both public community and public non-community wells. Wellhead protection areas delineate the horizontal extent of groundwater captured by a well pumping at a specific rate over 2-, 5-, and 12-year periods, thereby providing an approximate area of influence for any given well.

PUBLIC COMMUNITY WATER SYSTEMS SERVING COLTS NECK

"Public community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. In Colts Neck, these systems correspond to NWS Earle, the Grande at Colts Neck, Brandywine Assisted Living, and a few residences served by NJAW. The "Freehold Township Water Department" system listed below could not be identified.

PWSID	Water System Name	Maximum Population Served	Water System Type
1309001	US NAVAL WEAPONS STATION	1200	Community
1309002	VEOLIA WATER NEW JERSEY - COLTS NECK[1]	640	Community
1309415	BRANDYWINE ASSISTED LIVING AT COLTS NECK	85	Community
1316001	FREEHOLD TWP WATER DEPT	831	Community
1345001	NJ AMERICAN WATER - COASTAL NORTH	7	Community

[1]The Grande at Colts Neck

PUBLIC NON-COMMUNITY WATER SYSTEMS

From NJDEP,

> *A noncommunity water system is a public water system used by individuals other than year around residents for at least sixty days of the year. A noncommunity water system can be*

either transient or nontransient. A nontransient noncommunity water system serves at least twenty-five of the same people over a period of six months during the year, such as schools, factories, and office buildings. A transient noncommunity water system is a system that serves year around for at least sixty days of the year, but does not serve the same individuals during that time period. Transient noncommunity water systems include rest stop areas, restaurants, and motels.

As shown in the table below, there are a vast array (total of 51) of public non-community water systems registered in Colts Neck, ranging from restaurants and offices to churches and schools.

PI Number	Water System Name	Max Population Served	Water System Type
1309302	CEDAR DRIVE MIDDLE SCHOOL	524	Noncommunity Non-transient
1309303	COLTS NECK GENERAL STORE	102	Noncommunity Transient
1309304	COLTS NECK INN & RESTAURANT	115	Noncommunity Transient
1309305	COLTS NECK RACQUET CLUB	315	Noncommunity Transient
1309306	COLTS NECK REFORMED CHURCH	116	Noncommunity Non-transient
1309307	CONOVER RD ELEM SCHOOL	437	Noncommunity Non-transient
1309309	COLTS NECK PUB	75	Noncommunity Transient
1309310	HOMINY HILL GOLF COURSE-	271	Noncommunity Transient
1309311	LAIRD AND COMPANY	40	Noncommunity Non-transient
1309313	COLTS NECK TWP MUN BLDG	67	Noncommunity Transient
1309315	ST MARYS CHURCH	303	Noncommunity Transient
1309316	COLTS NECK PIZZERIA	104	Noncommunity Transient
1309319	COLTS NECK PROFESSIONAL PLAZA	80	Noncommunity Non-transient
1309320	ABERATION CORPORATION	164	Noncommunity Transient
1309323	SUN NATIONAL BANK	55	Noncommunity Transient
1309324	COLTS NECK COMMUNITY CHURCH	101	Noncommunity Transient
1309325	VILLAGE INN	303	Noncommunity Transient
1309327	COLTS NECK SHOPPING CTR	575	Noncommunity Non-transient
1309328	DELICIOUS ORCHARD MARKET	2725	Noncommunity Non-transient
1309330	COLTS NECK HOTEL	160	Noncommunity Transient
1309333	THE COURT YARD	35	Noncommunity Transient
1309336	COLTSTOWN GROUP	78	Noncommunity Non-transient
1309337	COLTS NECK HIGH SCHOOL	2100	Noncommunity Non-transient
1309338	COLTS NECK LIBRARY	55	Noncommunity Transient
1309339	COLTS NECK GOLF CLUB	74	Noncommunity Transient
1309340	PEBBLE CREEK GOLF CLUB @ COLTS NECK	105	Noncommunity Transient
1309409	DORBROOK PARK VISITOR CENTER	3187	Noncommunity Transient
1309410	THE ORCHARDS AT COLTS NECK	950	Noncommunity Non-transient
1309411	MORELLO BUILDING LLC	145	Noncommunity Transient
1309412	CONOVER ROAD PRIMARY SCHOOL	412	Noncommunity Non-transient
1309413	THE ATLANTIC BUILDING	44	Noncommunity Transient
1309414	FAIRWAYS PROFESSIONAL PLAZA	78	Noncommunity Non-transient
1309416	FAIRWAYS PROFESSIONAL PLAZA #5	78	Noncommunity Non-transient
1309417	COLTS NECK COMMONS	170	Noncommunity Transient
1309418	MEADE BUILDING	45	Noncommunity Transient

PI Number	Water System Name	Max Population Served	Water System Type
1309419	GATELY BUILDING	60	Noncommunity Non-transient
1309422	CHASE NJ1- 0072	57	Noncommunity Transient
1309423	COLTS NECK ANIMAL CLINIC	27	Noncommunity Transient
1309424	TRUMP NATIONAL GOLF CLUB @ COLTS NECK SNACK BAR	121	Noncommunity Transient
1309425	TRUMP NATIONAL GOLF CLUB @ COLTS NECK CLUBHOUSE	115	Noncommunity Non-transient
1309426	BROCK FARMS COLT NECK	117	Noncommunity Transient
1309427	PLEASANT VALLEY LLC BUILDING A	30	Noncommunity Transient
1309428	PLEASANT VALLEY LLC BUILDING B	32	Noncommunity Transient
1309429	COLTS NECK CITGO	203	Noncommunity Transient
1309430	HUDDYS RESTAURANT	70	Noncommunity Transient
1309431	COLTS NECH REFORMED CHURCH MINISTRY CENTER	55	Noncommunity Transient
1309432	304 ROUTE 34	80	Noncommunity Transient
1309433	SOURCE BREWERY	215	Noncommunity Transient
1309434	COLTS NECK TEMP POLICE STATION	73	Noncommunity Transient
1309435	COLTS NECK MUNICIPAL/POLICE DEPARTMENT	87	Noncommunity Non-transient

WATER USE REGISTRATIONS SERVING COLTS NECK

A Water Use Registration is required for any person with the capability to divert in excess of 100,000 gallons of water per day, but who diverts less than this quantity. There are ten (10) non-agricultural WUR's in Colts Neck:

PI Number	PI Name	Activity Number
10093W	LAIRD & CO	WUR930001
10346W	EARL SWIFT PROPERTIES	WUR930001
10368W	MACK-CALI	WUR170001
10898W	CONOVER RD SCHOOL & CEDAR DRIVE SCHOOL	WUR130001
10921W	PEBBLE CREEK AT COLTS NECK INC	WUR170001
11070W	COLTS NECK GOLF CLUB	WUR010001
11284W	COLTS NECK VILLAGE MERIDIAN ASSISTED LIVING	WUR070001
11325W	COLTS NECK HIGH SCHOOL	WUR090001
11494W	SHOWPLACE FARMS	WUR210001
11501W	EQUESTRA @ COLTS NECK CROSSING HOMEOWNERS	WUR220001

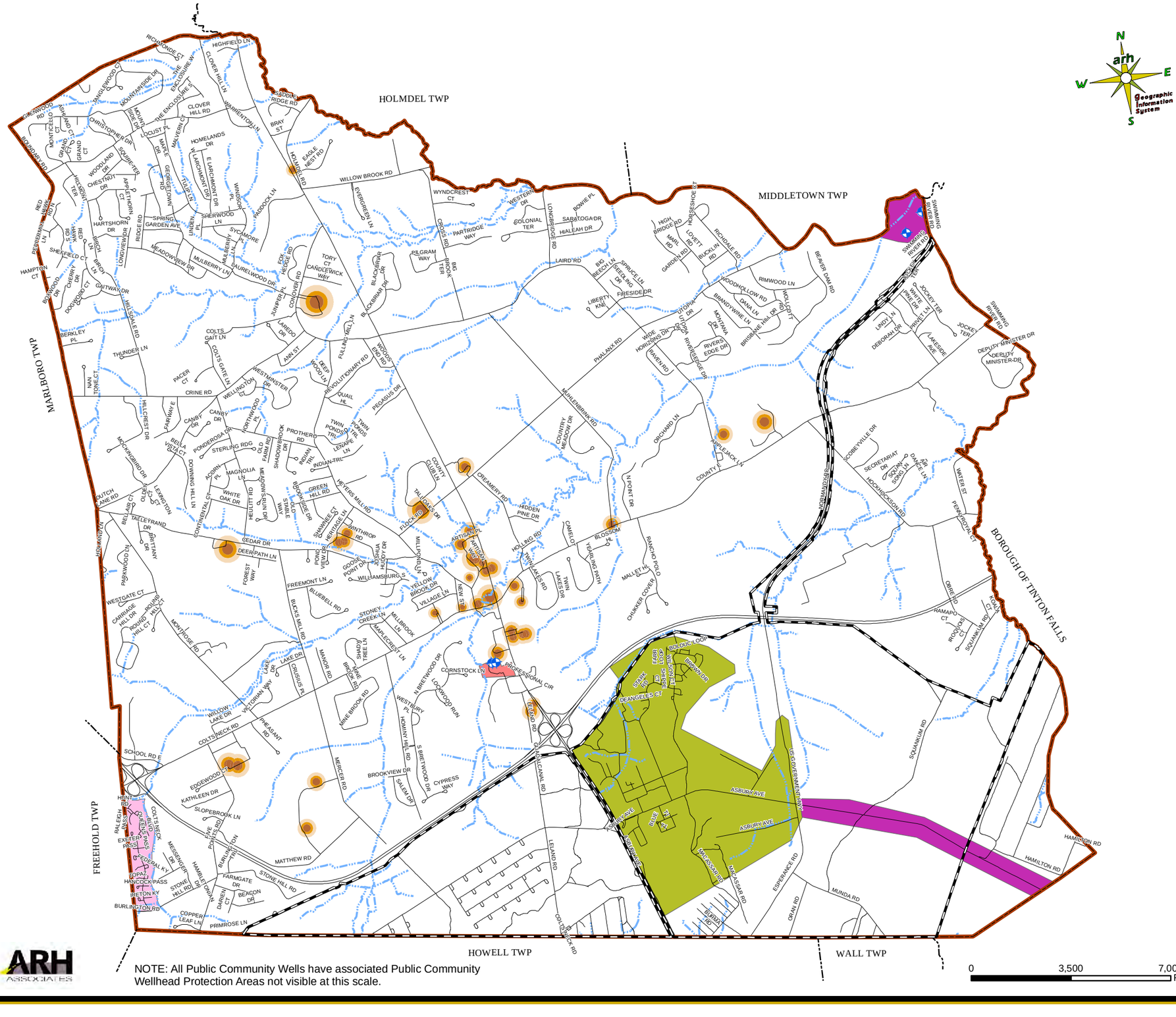
AGRICULTURAL WATER USE CERTIFICATIONS AND REGISTRATIONS IN COLTS NECK

An Agricultural Water Usage Certification or Agricultural Water Use Registration must be obtained from the County agricultural agent if a person has the capability to divert ground and/or surface water in excess of 100,000 gallons per day for agricultural, aquacultural or horticultural purposes. Per NJDEP records, there are fifteen (15) such permits in Colts Neck:

Program Interest ID	Program Interest Name	Activity Number	Activity Type Description
MN0065	ABBATIELLO FARM	AGC140001	Agricultural Certification - Renewal
MN0020	BROCK FARMS	AGC220001	Agricultural Certification - Renewal
MN0012	EASTMONT ORCHARDS	AGC210001	Agricultural Certification - Renewal
MN0076	STATILE NURSERIES	AGC170001	Agricultural Certification - Renewal
MN0089	AVENTURA LLC HUTCHINSON FARM	AGC210001	Agricultural Certification - Renewal
MN0088	CAROL GROSSMAN LLC	AGC210001	Agricultural Certification - Renewal
MN0081	INFANTE FARM BALDACHINO PROPERTY	AGC190001	Agricultural Certification - Renewal
MN0004	INFANTE FARMS	AGC200001	Agricultural Certification - Modification
MN0080	INFANTE FARMS	AGC190001	Agricultural Certification - Renewal
MN0045	MCDOWELL FARM / BLUEBERRY ACRES	AGC150001	Agricultural Certification - Renewal
MN0061	PA FARMS INC	AGC190001	Agricultural Certification - Renewal
MN0062	PA FARMS INC	AGC190001	Agricultural Certification - Renewal
MN0026	SHARON VALLEY FARMS	AGC160002	Agricultural Certification - Renewal
MN0087	S & R FARMS	AGC220001	Agricultural Certification - Renewal
MN073R	WALLSTEN FARM	AGR010001	Agricultural Registration - New

Colts Neck Township 2024 Environmental Resource Inventory

Figure 10.2 - Public Purveyor Areas & Wells



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Streams (NJDEP)
- Public Community Wells

Public Non-Community Wellhead Protection Areas

- Tier 1, Travel time: 2 year
- Tier 2, Travel time: 5 year
- Tier 3, Travel time: 12 year

Purveyor Name

- Brandywine Assisted Living at Colts Neck
- NJ American - Coastal North
- SUEZ Water NJ Colts Neck
- US Naval Weapons Station

GIS Data Sources:

1. NJDEP Public Community Water Purveyor Service Areas, Edition 20220302.
2. Public Community Well Locations: centroids of NJDEP Well Head Protection Areas For Public Community Water Supply Wells in NJ, Edition 20180517.
3. Public Non-Community Wellhead Protection Areas: NJDEP Well Head Protection Areas For Public Non-Community Water Supply Wells in NJ, Edition, Series DGS04-5, Edition 20150219.
4. Roads: NJDOT (2017).
5. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
6. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

10.5 Unconfined Groundwater & Unregulated Surface Water Depletion

Many major water supply issues were identified and resolved in WMA 12 during the 1990's. As discussed above, due to excessive water use of the confined aquifers in this region, the Department declared a Critical Water Supply Area in 1985 and required significant cutbacks in withdrawal rates. These cutbacks in Critical Area No. 1 and near-term demand increases were mitigated by the development of the Manasquan Reservoir in WMA 13 by the NJ Water Supply Authority and the conveyance of surface water supplies from WMA 9 to WMA 12 through the Middlesex Water Company's South River Pipeline.

Because Colts Neck does not have a public community water supply system, it was not impacted by these developments. However, as shown in the table below, each of the three watersheds encompassing the Township provides groundwater for several public community water systems serving greater than 1,000 people. This information reiterates the interconnectivity of communities that share a watershed, regardless of whether or not they share a water supply system.

HUC11	Watershed Name	Public Community Water Systems (>1,000 people)	
02030104070	Navesink River / Lower Shrewsbury River	Atlantic Highlands WD UNW Earle Freehold Boro WD Freehold Twp WD Gordon's Corner WC	Marlboro Twp MUA Shorelands WC Inc Red Bank WD NJAW – Coastal North
02030104090	Whale Pond Br / Shark R / Wreck Pond Brook	Avon by the Sea WD Belmar WD Manasquan WD Sea Girt WD NJAW – Coastal North	Lake Como WD Spring Lake WD Boro of Spring Lake Heights WD Wall Twp WD
02030104100	Manasquan River	Brielle Boro WD UNW Earle Farmingdale WD Freehold Boro WD	Freehold Twp WD Parkway Water Co Manasquan WD

In order to minimize groundwater depletion and associated impacts on surface water and wetlands, NJDEP has developed a methodology in which the quantity of water withdrawn from a given HUC-11 will be restricted to 20% of the stream low flow margin or LFM, calculated in millions of gallons per day (MGD) (NJDEP, 2017). Using these metrics, NJDEP is attempting to maintain unconfined groundwater and surface water in order to sustain both water supply and ecological conditions.

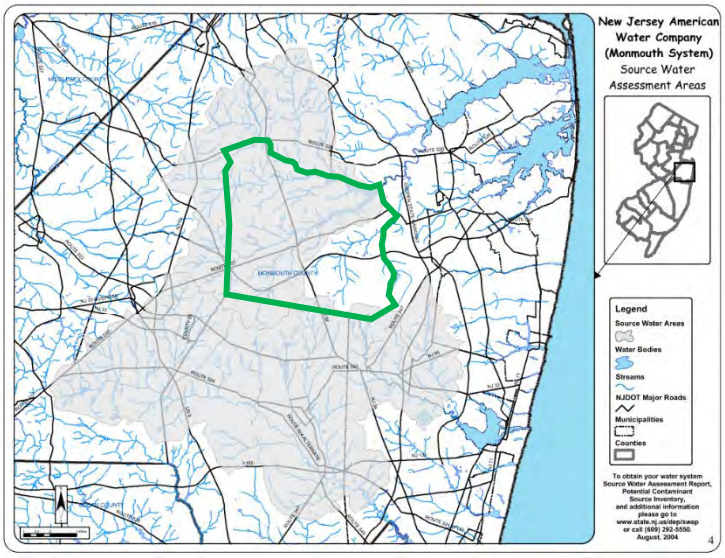
The table below indicates the current remaining available water, calculated by projecting water

usage into the future based on both existing usage and water allocation (the maximum amount permitted to be withdrawn by NJDEP). The Colts Neck watersheds all have sufficient water to sustain the LFM at current and projected usage rates.

HUC11	Watershed Name	Low Flow Margin (MGD)	Current Remaining Available Water (MGD)	Largest Current Use	Largest Use at Max Allocation
02030104070	Navesink River / Lower Shrewsbury River	24.5	4.3	Confined Aquifer Leakage	Potable
02030104090	Whale Pond Br / Shark R / Wreck Pond Brook	13.5	2.8	Non-Ag Irrigation	Non-Ag Irrigation
02030104100	Manasquan River	20.2	3.4	Potable	Potable

10.6 Groundwater Quality

Key NJDEP drinking water protection initiatives will be phased-in over time in Source Water Assessment areas to advance existing program protections for public water supply. Although Colts Neck does not have its own public community water supply, much of the Township is within the New Jersey American Water – Monmouth Source Water Assessment Area (see graphic left). With the exception of Hockhockson Brook and Pine Brook watersheds, the remainder of the Township is encompassed within the NJAW – Monmouth Source Water Assessment Area.



A Noncommunity Source Water Assessment was completed for Colts Neck Township in 2005, assessing the 33 noncommunity water systems in the Township (with 37 wells). In general, the wells were found to have high susceptibility to radionuclides, medium susceptibility to nutrients, pesticides, radon (naturally occurring) and disinfection by products or DBPs (formed between chlorination and organics), and low susceptibility to pathogens, volatile organic compounds (VOCs) and inorganics (NJDEP, 2005).

Ultimately, the water quality of private wells is the responsibility of the well owner. NJDEP has recently instituted the Private Well Testing Act (PWTA). The PWTA requires that, when property with certain types of drinking water wells is sold or leased, the well water must be tested for contaminants. The results of the water testing must be reviewed by both the buyer and seller, or

in the case of a leased property, by the lessee. Recent PWTA results for Colts Neck are tabulated below; the most frequent exceedance was iron, which is naturally occurring, and was detected at levels exceeding the drinking water standard in over 80% of the wells tested (NJDEP, 2023).

Percent of Exceedances in Colts Neck Township & Number of Wells Tested Under the PWTA

Nitrate	0.1% (1,350 wells sampled)
Iron	82.9% (1,349 wells sampled)
Manganese	14.6% (1,349 wells sampled)
VOC	0.3% (1,349 wells sampled)
Fecal Coliform	0.8% (1,348 wells sampled)
pH	7.6% (1,349 wells sampled)
Arsenic	0% (367 wells sampled)
Gross Alpha	0.2% (1,206 wells sampled)
Mercury	0.1% (1,342 wells sampled)
SOC	0% (311 wells sampled)
PFOA	0% (49 wells sampled)
PFOS	0% (49 wells sampled)
PFNA	0% (49 wells sampled)
At least one PFAS exceeded	0% (49 wells sampled)
Uranium	Testing not required under PWTA

10.7 Colts Neck Groundwater Assessment

Since Colts Neck Township is largely served by private wells, a comprehensive evaluation of all Township wells is outside the scope of this report. However, a few observations may be made:

1. Colts Neck is a recharge area for aquifers that are used by the Township and by other towns. As discussed above, major aquifers used for water supply in NJ stretch vast distances under numerous municipalities. These aquifers recharge in uplands areas which are scattered throughout the various watersheds which overlie them. However, surface recharge is more critical to surficial aquifers like the Kirkwood than to deeper, confined formations like the Magothy.
   Colts Neck is in an interesting position as several different aquifers outcrop or surface across the Township as shown in the graphics above. Every location at which an aquifer outcrops or interconnects with another aquifer that does, it is being recharged from the surface. So theoretically, recharge within Colts Neck into any of those formations can potentially impact water withdrawn from those same formations elsewhere (most often downgradient).
   Increasing impervious cover will result in increased runoff and decreased aquifer recharge of surficial aquifers. However, new stormwater management rules mandate that any new major development minimize those kinds of impacts by designing a stormwater management system to capture and recharge as much groundwater as possible.
2. Saltwater intrusion does not appear to be impacting aquifer formations in Colts Neck at this time. Saltwater intrusion becomes a concern if groundwater levels of sodium chloride reach 250 mg/L. No saltwater intrusion has yet to be recorded in any aquifer besides the Potomac-Raritan-Magothy aquifer formations in portions of South Jersey (south of Manahawkin, Forked River, and in the Lower Delaware for the Upper, Middle, and Lower PRM, respectively). Restrictions on confined aquifer withdrawals within Critical Area 1 have likely staved off saltwater intrusion in the deeper formations.

Protecting Water Quality

What can you and others do to help ensure water quality? Federal law requires each state to establish and implement a Source Water Assessment Program for public community water supply. Private wells cannot be managed in the same way. While government at the state and local levels can do their part, there are actions that you and your neighbors in homes and businesses can take now to help protect our precious and shared natural resource.

Here are just a few ways you and others can help ensure clean and plentiful water for Colt's Neck – now and in the future.

In your home or business:

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.
- Conserve water: limit irrigation, don't run the faucet while brushing your teeth, and invest in flow-limiting fixtures and appliances.
- Maintain your septic system – septic systems are designed to recharge treated wastewater to the ground, removing organics through biodegradation and solids in a settling tank. A well operated septic system is critical to maintaining good groundwater quality.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses in high well density areas. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Source: NJDEP Source Water Assessment (NJDEP, 2005)

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11. Waste Disposal and Contamination

11.1 Wastewater Treatment

Sanitary sewage treatment in Colts Neck is predominantly provided by individual on-site subsurface disposal systems (septic systems). Septic systems use a combination of nature and proven technology to treat wastewater produced from bathrooms, kitchens, and laundries. John Mouras was granted a patent for his septic tank design in 1881 using concrete and clay pipes to funnel wastewater from his home (City of North Point, n.d.). Not much has changed in the past 142 years.

A typical septic system consists of a septic tank and disposal field. Wastewater flows from the dwelling or structure into the septic tank. During the time in the tank, anerobic bacteria begin to break down the organic matter. As the bacteria digests, liquids (oils and grease) separate from solid material. The overflow liquid, known as effluent, then flows from the septic tank to a disposal field. This field consists of a series of perforated pipes in a stone bed. The effluent flows through the pipes and stone bed and is slowly released to the soil and groundwater. While percolating through the soil, the effluent is filtered by the soil to remove harmful bacteria and viruses before reaching the groundwater (City of North Point, n.d.). The design, construction, and operation of septic systems is governed by the Standards of Individual Subsurface Sewage Disposal Systems, N.J.A.C. 7:9A, commonly called Chapter 199. The Colts Neck Board of Health and the Colts Neck Health Officer are responsible for enforcing Chapter 199. The design plans for new, alteration, or repair of septic systems are approved by the Health Officer who also oversees its installation.

Large properties generating more than 2,000 gallons per day of sanitary sewage flow are required to obtain a NJDEP Treatment Works Approval. This is still treatment via a septic and discharge to a large disposal field. Higher sanitary flow producers such as restaurants or retail centers are required to provide on-site sewage treatment through individual package plants that treat the effluent prior to discharge to a disposal field.

Properties containing NJDEP Treatment Works Approval and generating 2,000 gallons or more per day of effluent include:

- Colts Neck Elementary School;
- Colts Neck Primary School;
- Cedar Drive Middle School;
- Colts Neck Golf Club;
- Saint Mary's Church;
- Colts Neck Shopping Center;
- Colts Neck Reformed Church;

- Delicious Orchards;
- Colts Towne Plaza;
- Colts Neck Pub; and
- Colts Neck Motel.

Properties containing on-site individual package plants include:

- Colts Neck High School;
- Colts Neck Inn / Hotel;
- Orchards Shopping Center;
- Huddy's Inn Restaurant;
- Brandywine Assisted Living; and
- Trump National Golf Club.

It should be noted that Colts Neck Manor (Block 22, Lot 18) is approved for 360 residential rental units consisting of 288 market rate rental units and 72 affordable rental units, not yet developed, that will be serviced by an on-site individual package plant.

11.2 Public Sanitary Sewer Service

Public sanitary sewer service in Colts Neck is limited to the Grande at Colts Neck. This is an inclusionary development consisting of 188 single family dwellings and 88 multifamily affordable units. Future planned public sanitary sewerage service is limited to Charleston Meadows (Block 42, Lot 4). This is a 68 unit multifamily development consisting of 54 market rate units and 15 affordable rental units. The project received Preliminary Approval by the Township but is currently seeking DEP approval for the sanitary sewerage extension. Both the Grande at Colts Neck and Charleston Meadows are zoned A-4, Mixed Housing District and are located in the southwest corner of the Township adjacent to public utilities in Freehold Township. No other property is planned or anticipated to be serviced with public sanitary sewerage through Freehold Township.

Naval Weapons Station, Earle contains a sanitary sewerage system which is treated through an on-site package plant. This sewerage system is currently limited to the base and existing Naval operations. However, this system may be extended into the MU-1, Mixed Use Overlay District along State Highway Route 34 south of County Route 537 to fulfill future affordable housing obligations.

11.3 Solid Waste Collection

Colts Neck does not provide its residents and businesses with curbside collection of solid waste. Individual households and businesses are responsible for contracting directly with a cartage company for household solid waste removal (Colts Neck Township, 2023a). While the Township

does not recommend specific cartage companies, neighborhoods are encouraged to retain a common company to minimize noise and wear and tear to Township streets.

The vast majority of the solid waste generated is transported to the Monmouth County Reclamation Center where it will stay forever. Only about 52% of the county's solid waste is recycled and the remaining 48% is permanently landfilled. Established in 1976, the Monmouth County Reclamation Center encompasses approximately 900 acres and is centrally located in Tinton Falls. The Center has two "Gas to Energy" facilities to collect methane, reducing landfill emissions while creating reusable energy (Monmouth County Reclamation Center, Recycling, 2023) (See section 11.5).

11.4 Brush and Leaf Collection

Each year the Colts Neck Department of Public Works provides brush collection services to Township residents who wish to dispose of their tree and shrub prunings. Brush collection occurs by zone. The spring collection occurs one week per month during April and May. No collection occurs in June, July, or August. The fall brush collection resumes in September and October. Residents can also dispose of brush at the Public Works Yard on Mondays, Wednesdays, Friday, or Saturdays from 8:00 AM to 1:30 PM. Landscapers/contractors must purchase an annual permit to drop off their Colts Neck customers' brush at the Public Works Yard (Colts Neck Township, 2023b).

Only brush up to four (4) inches in diameter and no longer than eight (8) feet in length will be collected. Brush mixed with foreign materials such as bamboo, stumps, roots, leaves, grass, lumber or oversized material will not be collected. No more than 20 cubic yards of brush (approximately 5 feet high, 8 feet wide, and 14 feet in length) will be collected. The Township's brush collection is a convenience to residents for pruning disposal and is not a land clearing or tree removal service. It is also important to note state and local laws prohibit the placement of brush closer than 10 feet to a storm drain or stream (Colts Neck Township, 2023c & 2023d).

All brush collected by the Public Works Department is transported to Mazza Recycling in Tinton Falls where it is chipped and resold.

Each fall Colts Neck Public Works provides leaf collection to Township residents. Leaf collections occur by zone. Each zone receives two collections per year. Leaf collection starts at the end of October and concludes in mid-December.

Only leaves shall be placed along the side of the road for collection. Leaves shall be placed at the curbline or edge of pavement in a neat, loose row to facilitate collection by leaf vacuum machines. Leaves shall not extend onto the paved portion of the street further than three feet and shall not impede traffic or create a safety hazard. Notwithstanding the three-foot encroachment into the street above, no pile of leaves shall be placed to so occupy a street as to interfere with or interrupt the passage of cars or vehicles. Leaf vacuum machines only pick up

loose leaves; therefore, leaves shall not be in bags or mixed with any other debris such as grass, limbs, brush, tree stumps, roots, lumber, branches or twigs. Any leaf pile mixed with debris will not be collected by the Township. It is the property owner's responsibility to dispose of leaf piles mixed with debris. It is important to note, state and local laws prohibit the placement of leaves closer than 10 feet to a storm drain or stream (Colts Neck Township, 2023c).

All leaves collected by the Township are transported to Mazza Recycling in Tinton Falls, composted, and resold as soil additive.

In January each year the Public Works Department collects Christmas trees. Each zone receives one collection. Only bare Christmas trees are collected. No artificial trees, decorated trees, wreaths, or other debris will be collected (Colts Neck Township, 2023a).

11.5 Recycling

Waste reduction and recycling are important in two ways. First, the reuse of materials through recycling reduces the amount of raw materials that need to be extracted from the earth, which reduces adverse impacts to the environment. Second, the reduction of waste, either through efficiency or through recycling, reduces the amount of waste that goes to landfills and has the potential to contaminate groundwater and air resources.

The recycling of waste and used materials has become a required practice in the State of New Jersey. The Municipal Land Use Law was amended to provide for a Recycling Plan Element within municipal Master Plans. The State of New Jersey passed a Voluntary Recycling Act in 1981, and then passed the New Jersey Statewide Mandatory Source Separation and Recycling Act in 1987 which mandated the creation of a municipal recycling program and the adoption of a recycling ordinance.

Mandatory recycling items (as per Monmouth County and Colts Neck Township) (Colts Neck Township, 2023a & Monmouth County Recycling, 2023) include:

- glass bottles and jars,
- metal cans (aluminum, tin, and bi-metal),
- plastic containers (#1 or #2) with a “pourable’ neck smaller than the body,
- paper and cardboard, but NO pizza boxes,
- NO aluminum foil or containers.

In 2023 Colts Neck contracted with Republic Services to provide curbside recycling collection. Each residence receives two bi-weekly collections per month. This is a single stream (comingled) recycling program. All acceptable material must be placed in a green 96 gallon wheeled recycling cart for collection. **Figure 11.5**, Acceptable and Unacceptable Materials for Recycling is a public educational recycling flyer obtained from the Public Works page on the

Township website. Only contents within the cart are collected. No items outside the cart, leaning against the cart, or placed in other types of bins will be collected.

The following is a listing of the rules for placing single stream recycling items in carts for curbside collection.

- Cardboard must be flattened and placed in the cart.
- No plastic bags of any kind will be collected.
- No food waste may be placed inside the curbside cart.
- Rinse all recyclable items that contained food or beverages.
- No liquids of any type shall be placed with recyclables.
- No chemicals, liquid paints, pesticides, herbicides, reactive polishes or cleaners, cleaning or automotive products, or other hazardous waste shall be placed with recyclables.

Colts Neck residents can also dispose of metal (washers, dryers, etc.) at the Public Works Yard. However, the Township cannot accept any metal products containing freon.
The Recycling Convenience Center days/hours:
Monday, Wednesday, Friday 8:00 a.m. – 1:30 p.m.; Tuesday & Thursday – CLOSED
Saturday Hours will resume April through November

Figure 11.5

ACCEPTABLE AND UNACCEPTABLE MATERIALS FOR RECYCLING

	**Aluminum, Tin, & Bimetal Cans**	**ACCEPTABLE**: All disposable cans made of aluminum used for food or beverages. All disposable cans made of tin, steel or a combination of metals, including but not limited to, containers commonly used for food products. **MUST BE RINSED!** **UNACCEPTABLE:** Aluminum foils, pie tins, trays, cookware and other aluminum products. Cans which contain toxic products, such as paints and oils
	**Cleaned Mixed Paper & Newspaper**	**ACCEPTABLE:** High-grade bond paper, mixed office papers and school papers, such as stationary, construction paper and writing tablets, including computer printouts, magazines, gift-wrapping paper, softcover books, junk mail and single-layer cardboard (chipboard). Newspaper includes paper of the type commonly referred to as "newsprint" and includes any inserts which are normally included in the newspaper. **UNACCEPTABLE:** Carbon papers, hardcover books (unless cover and binder are removed), paper cups and plates, food products, and paper products used for personal hygiene, such as tissues. Newspaper used for household projects and crafts such as painting or papier-mache projects or used for cleanup of pet waste.
	**Corrugated Cardboard**	**ACCEPTABLE:** Layered cardboard, including the waffled section between the layers, of the type commonly used to make boxes and cartons. **MUST BE FLATTENED!** **UNACCEPTABLE:** Waxed cardboard and cardboard contaminated by direct contact with food, such as pizza boxes.
	**Glass Bottles and Jars**	**ACCEPTABLE:** Transparent or translucent contains made from silica or sand, soda ash and limestone and used for packaging or bottling of various products. **UNACCEPTABLE**: Dishware, light bulbs, window glass, ceramics, and other glass products.
	**Pourable Plastic Containers**	**ACCEPTABLE:** Plastic bottles that have a neck that is smaller than the body of the container; limited to plastic resin Type No. 1 PET and plastic resin Type No. 2 HDPE. **UNACCEPTABLE:** Resin types No. 2 through No. 7 and not bottle plastic containers such as margarine tubs and other consumer items and packages, such as film plastics, blister packaging, boxes, baskets, toys and other products. **NO PLASTIC BAGS!**

Source: Colts Neck Township (2023e)

11.6 Hazardous Waste Disposal

The Monmouth County Household Hazardous Waste Facility (HHW) is part of the Monmouth County Reclamation Center and is a free service for Monmouth County residents. Proof of residency is required. A driver's license, a tax or utility bill showing the home address is sufficient. Residents do not need to make an appointment to dispose of items. The facility is open Monday through Saturday.

The following is a listing of acceptable items that residents can dispose of at the Monmouth County HHW (Monmouth County Recycling, 2023):

- Liquid paint (oil base, enamel, spray paint)
- Mercury containing devices (thermostats, thermometers)
- Gasoline (transported in a certified gas can ONLY)
- Motor oil and other automotive fluids
- Used oil filters
- All herbicides
- All pesticides
- Kerosene
- Insecticides
- DDT
- Muriatic acid
- All solvents
- Wood preservatives
- Oxygen tanks
- Fire extinguishers
- Rechargeable batteries, button batteries, car batteries
- Any household cleaners
- Stains
- Unbroken fluorescent tubes
- Fertilizers
- Freon
- Anti-Freeze
- Photographic chemicals

items not accepted by the Monmouth County HHW include:

- General household trash
- Carpeting
- Wood (Pressure treated, untreated, railroad ties)
- Grout mix
- Portland Cement
- Lime
- Latex Paint
- Asbestos waste
- Rock salt
- Any household debris
- Any furniture
- Insulation
- Grass or leaves
- Trees and shrubs
- Household batteries
- Ceramic tile
- Joint compound (Spackle)
- Refrigerators and freezers
- All electronics and computer equipment
- Tires or car parts
- CFL lightbulbs (accepted at local home improvement stores, e.g. Lowes)
- Medical waste

All items not accepted by the Monmouth County HHW can be disposed of at the Monmouth County Reclamation Center for a fee.

11.7 Composting

In the United States, 12.7% of the total municipal solid waste is derived from food scraps. Nearly two thirds of the solid waste stream is comprised of organic materials such as yard trimmings, food scraps, wood waste, and paper/paperboard products. Many progressive communities require trash receptacles with three components to separate trash, recyclables, and organic waste. A municipality can limit the amount of organic material entering the solid waste stream by implementing a multi-faced composting policy. The Township could increase its composting rates through a public education campaign to inform residents and business owners about the benefits of composting, how composting works, and best practices on integrating composting into the home or business.

Composting is an essential tool in the organic farmer or home gardener toolkit. Made from organic waste like kitchen scraps, paper, leaves, and yard waste, compost is an effective way to recycle and reduce solid waste, while creating a valuable byproduct that feeds plants for healthy growth. Composting is a controlled, aerobic (oxygen-required) process that converts organic materials into a nutrient rich soil additive or mulch through natural decomposition. The end product is a dark, moist, earthy smelling material. Microorganisms feed on the materials added to the compost pile during the composting process (Rodale Institute, 2019).

Backyard Residential

Composting is nature's way of recycling. It is one of the most powerful ways a homeowner can reduce trash and rebuild healthy soil. By turning residential food scraps, leaves, and grass clippings into compost, a homeowner can transform food and yard waste into a beneficial value-added soil additive. The benefits of residential backyard composting include (Rutgers Cooperative Research & Extension, 2003):

- Resourceful way to recycle food scraps and yard waste to manage residential household solid waste more sustainably,
- Reduce the volume of material that otherwise will be disposed in landfills,
- Composting involves minimum effort, equipment, expense, and expertise,
- Save money by producing a free high quality soil additive to reduce your use of fertilizers,
- Composting of leaves is the most cost-effective method of leaf collection because it avoids municipal costs of collection, tipping fees, and permitting,
- Composting home gardens builds healthier soil, prevents soil erosion, conserves water, and improves plant growth.

Backyard residential composting can be made in open piles. However, to help keep a pile neat and maintain conditions needed for rapid decomposition, it is recommended that simple homemade or store bought bin be used. Homemade bins can be made from wood pallets or snow fencing. Store purchased bins are usually durable plastic bins, roughly 50 to 100 gallons in size. In the past, Rutgers Cooperative Extension and local gardening clubs have hosted seminars on backyard composting and have given plastic compost bins to participants.

Organic farming, also know as ecological farming or biological farming, is an agricultural practice that uses fertilizers of organic origin such as compost.

The NJDEP allows farmers to accept leaves for composting with a simplified permit (notification requirement) if the volume is less than 20,000 cubic yards or can receive leaves to be mulched into the soil at no greater than a six-inch depth on the soil and within seven days from delivery without a need for a permit (Rutgers Cooperative Research & Extension, 1995). This requires that the leaves be incorporated into the soil no later than the next tillage season. Only leaves can be composted. Leaves must be removed from bags or boxes and cannot be mixed with branches or tree parts. Slope Brook Farm receive leaves from out-of-town municipalities that are tilled with the topsoil to improve moisture holding capacity and fertility, The Squillare Farm and Overbrook Farm also receive out of town leaves that are composted and sold to others as mulch or a soil additive.

11.8 Historic Pesticide Contamination

Since settlement began c. 1700, Colts Neck Township has had a strong history of agriculture throughout the township. In 1960, over 90% of the land not part of NWS Earle or owned by the New Jersey American Water Company was agricultural (Colts Neck Township Planning Department, 2013).

The agricultural community has routinely and consistently applied pesticides to control pests and increase crop yield over the past 100 years. Crop recommendations have been published by the US Department of Agriculture and the NJ Agricultural Experiment Station since the late 1800s. These crop recommendations specified the types and application rates of pesticides that could be used for specific problems with specific crops. Early in the century there were very few products available to fight crop destroying pests besides arsenical pesticides (Hayes and Laws, 1991 as quoted in Historic Pesticide Contamination Task Force, 1999). As the organochlorine pesticides emerged, more products became available and the use of arsenical pesticides began to be phased out. The newer pesticides came with benefits. Such as they were effective at lower application rates, making them less expensive to use, and they were generally less persistent (Historic Pesticide Contamination Task Force, 1999).

The Historic Pesticide Contamination Task Force (1999) has made several recommendations, including the following:

- Sampling of former agricultural areas, and any necessary remediation, should be conducted prior to site development.
- The Department should provide an appropriate sampling methodology specifically designed for the investigation of pesticide residues in soil at agricultural properties.
- The Department should authorize a remedial alternative involving soil blending for pesticide residues in soil in former agricultural areas when it is protective of human health.

Historic pesticide contamination is a major concern to Colts Neck. The Township has enacted Ordinances requiring site investigation and soil sampling as well as Preliminary Assessments for all major residential subdivisions and site plans prior to Board approval. The purpose is to determine if contamination is present at levels that exceed the Technical Requirements for Site Remediation, N.J.A.C. 7:26E et seq. and the New Jersey Department of Environmental Protection Residential Direct Contact Remediation Standard (RDCRS) (N.J.A.C. 7:26D et seq.). The Board Engineer and Environmental Commission review all soil testing results. Any contamination found must be remediated and a response action outcome (ROA) must be filed with the NJDEP prior to site development. If a residential lot is sold prior to the NJDEP's audit and final approval of the ROA, the contract of sale must contain a disclosure notice to be initialed by the purchaser indicating that the pending NJDEP audit and final approval may result

in the modification or rejection of the ROA. To date, no sites have been identified as contaminated due to historic pesticide applications from agricultural activities. However, properties have been identified with elevated arsenic levels which have been classified as naturally occurring and associated with the Tinton Soil Series.

A Preliminary Assessment (Phase I) is required for all applications for preliminary major subdivision or site plan approval. This applies to residential as well as commercial developments, unlike the soil sampling and site investigation which is only required for residential development. The Preliminary Assessment must be conducted in accordance with the NJDEP requirements and standards set forth in N.J.A.C. 7:26E3.1 and 7:26E-3.2. If the Preliminary Assessment identifies potential environmental hazards, further investigation or a Phase 2 will be required. All remediation must be completed and a response action outcome (ROA) must be filed with the NJDEP prior to site development.

11.9 Soil & Groundwater Contaminated Sites

The 2009 Site Remediation Reform Act established the Licensed Site Remediation Professional program which fundamentally changed the process for how sites are remediated in the state. The primary goal of the program is to reduce the threat of contamination to the general public and the environment. The 2009 law established the NJ Site Remediation Professional Licensing Board whose oversees the issuance of Site Remediation Professional Licenses. The license confers upon the Site Remediation Professional that they have demonstrated education and experience sufficient to qualify them to independently conduct site remediations and issue response action outcomes in compliance with applicable New Jersey statues and regulations. According to the NJDEP Site Remediation and Waste Management Program home page, at the end of 2021, the Site Remediation and Waste program reported 14,461 contaminated sites. Of these sites, 11,205 were active Licensed Remediation Professional cases.

The NJDEP Site Remediation and Waste Management home page has a link to the programs community corner where a GIS layer has been created to identify all Immediate Environmental Concern locations with response action performed or overseen by the NJDEP The link to NJ-Geoweb map is found at:

https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=25d1cd0ae75048b1a7867971392b6995

The interactive map has several layers users can search for contaminated sites which include but not limited to Deed Notices, Groundwater Contamination, Known Contaminated Sites, and Underground storage tanks.

The NJDEP Site Remediation Program resource for Underground Storage Tanks: https://www.nj.gov/dep/srp/bust/bmon.htm

Superfund sites: https://www.homefacts.com/environmentalhazards/superfunds/New-Jersey/Monmouth-County/Colts-Neck-Township/07722.html?searched=1.

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12. Radiation

12.1 Background

The average resident of New Jersey is exposed to approximately 125 millirems per year of "background" ionizing radiation (A "rem" is a unit of ionizing radiation exposure, a "millirem" is one-one thousandth of a rem.) Of this, about 50 millirems per year is due to cosmic rays, the balance is from trace amounts of naturally occurring radioactive elements in the soil, building materials, air, and food. There are no known unusual naturally occurring sources of radioactivity within Colts Neck Township.

We are all bombarded daily with electromagnetic fields from home appliances, cell phones, Wi-Fi, radio, and even remote controls. The exposure from some appliances is even higher than power lines, but brief. Power lines emit a low-frequency EMF (electromagnetic field), which is considered relatively safe compared to high-frequency EMF, such as x-ray radiation. Concerns about power lines and cancer heightened after a 1979 study found a relationship between power lines and childhood cancer. However, other studies in the 2000s did not find an association or found an association only in homes with very high levels of magnetic forces, which is rare, according to the National Cancer Institute. Since there do exist some high-voltage power lines in Colts Neck, residents can call the local power company to schedule a reading at their home if concerned about exposure to electromagnetic fields.

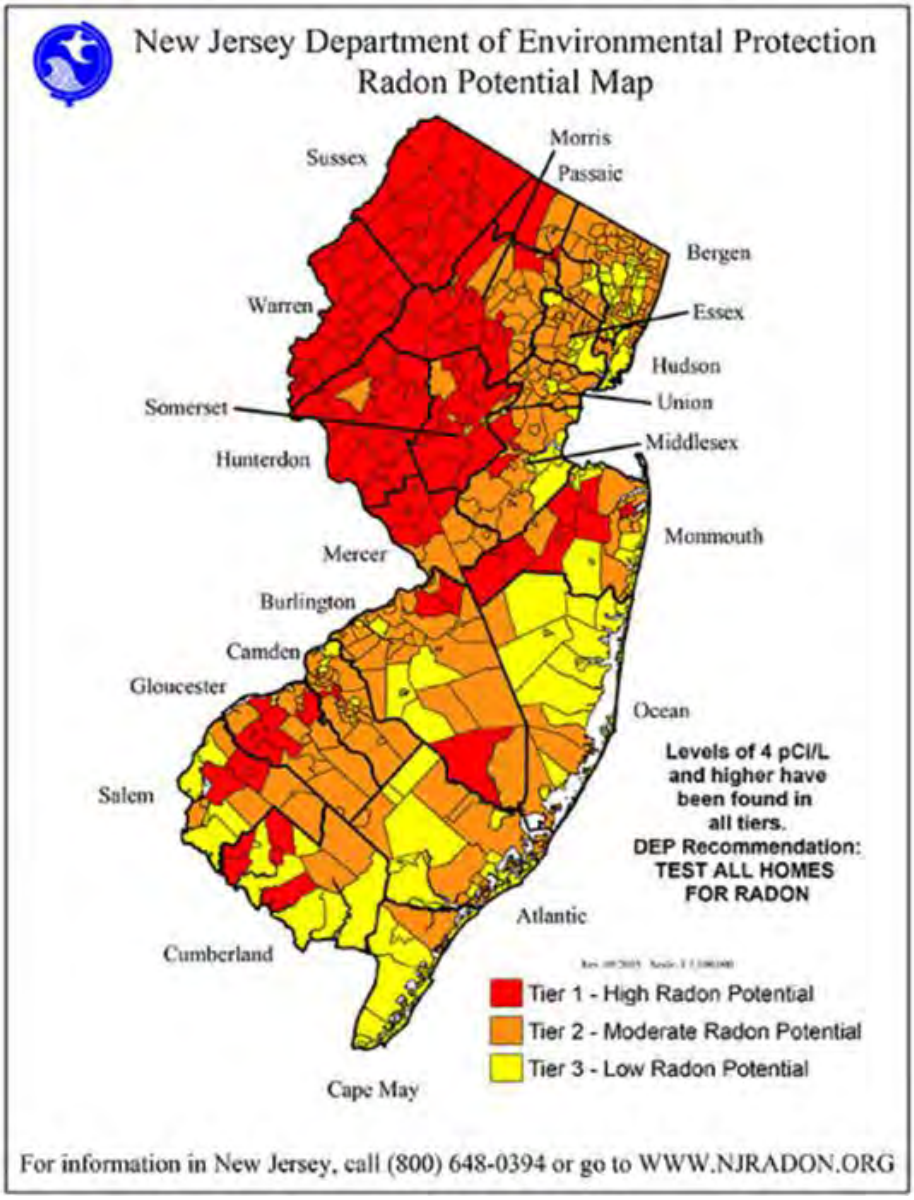
There are three nuclear units operated by PSEG Nuclear in Salem County, New Jersey. Collectively, the combined Salem and Hope Creek generating sites produce approximately 40% of the state's electricity and more than 90% of its carbon-free energy, making it a critical component of New Jersey's long-range clean energy objectives and climate change efforts. During normal operation, nuclear power plants emit an amount of radiation that is negligible compared to background radiation. In case of a serious accident, the release of radiation could present a significant threat to the population of Colts Neck. While Naval Weapons Station Earle has existed in Colts Neck since 1943, it is not publicly known whether or not nuclear weapons exist on site.

12.2 Radon

Radon is a radioactive gas that comes from the breakdown of naturally occurring uranium in soil and rock. It is invisible, odorless, and tasteless, and can only be detected by specialized tests. Radon enters homes through openings that are in contact with the ground, such as cracks in the foundation, small openings around pipes, and sump pits. It is a byproduct of the decay of radium, which in turn comes from the decay of uranium in soil and rock. Uranium is ubiquitous (in low concentrations) in the earth's crust. Outdoors, radon dissipates harmlessly. When it seeps into a house, however, it can collect in hazardous concentrations. The radioactive

byproducts of radon cling to minute dust particles in the air. These particles can lodge in the small passages of the lung and, thereby, increase the risk of lung cancer.

Figure 12.2 NJDEP Radon Potential



Municipalities are classified as having high, moderate, or low potential for indoor radon based on the percentage of homes with radon concentrations greater than or equal to 4 picocuries/liter (pCi/L). Colts Neck has a Tier 1 Assignment.

- Tier 1: High potential – at least 25 homes tested with 25% or more having radon concentrations greater than or equal to 4 pCi/L
- Tier 2: Moderate potential – at least 25 homes tested with 5 to 24% having radon concentrations greater than or equal to 4 pCi/L
- Tier 3: Low potential – at least 25 homes tested with less than 5% having radon concentrations greater than or equal to 4 pCi/L.

Regardless of the Tier designation, the NJDEP recommends that all homeowners test for radon. Radon concentrations can vary widely within a tier location, depending upon the geology and amount of uranium in the soil. Homes in low or moderate radon potential areas can have elevated radon concentrations. Both the NJDEP and the USEPA recommend that residents take action to mitigate their homes if test results indicate radon levels of 4.0 pCi/L or higher.

Radon is the number one cause of lung cancer among non-smokers, according to EPA estimates. Overall, radon is the second leading cause of lung cancer. Radon is responsible for about 21,000 lung cancer deaths every year. About 2,900 of these deaths occur among people who have never smoked. On January 13, 2005, Dr. Richard H. Carmona, the U.S. Surgeon General, issued a national health advisory on radon to urge Americans to prevent this silent radioactive gas from seeping into their homes and building up to dangerous levels.

The DEP has established a toll-free Radon Information Hotline, 1-800-648-0394. The DEP and the Colts Neck Health Department (462-5470) provide free information packets that includes a listing of companies offering radon testing and radon remediation services. Since the concentrations can vary greatly from week to week, short term tests should be avoided. The testing should be done during the winter months, when the house is "buttoned up".

If a test result exceeds 4 pCi/l, the Radon Hotline can be called to request a free confirmatory test by DEP. The results should also be reported to the Colts Neck Health Department, at 462-5470. Simple remedial actions, such as the closing of entry points and ventilation, and painting hollow-core concrete block basement walls with a liberal coating of latex can usually correct a radon problem.

12.3 References

American Society of Clinical Oncology (ASCO). March 2022. Cancer.net. American Society of Clinical Oncology (ASCO).

Colts Neck Environmental Commission, 1983. *Natural Resources Inventory*. Colts Neck Township.

Energy Central News. 2021. *Energy Central News*, *PSE&G*. Energy Central. energycentral.com.

EPA, US Environmental Protection Agency. February 2024. *Health Risk of Radon*. United States Environmental Protection Agency. www.epa.gov/radon/health-risk-radon.

New Jersey Environmental Public Health Tracking. 2022. *2022 Healthy Community Planning Report, Monmouth County Colts Neck*. New Jersey Department of Health. http://www.nj.gov/hcpnj.

13. Vegetation

13.1 Native Vegetation

The 2015 Land Use/Land Cover (LU/LC) data layer from NJDEP contains data for different types of Land Use within the State and was used as the source layer for the vegetation data presented in this Chapter. Approximately 22% of Colts Neck Township contains forest, shrub/scrub land, old field, and brushland. The percentage of total natural vegetation, which translates into 4,409.36 acres of the 20,322.26-acre Township, is displayed visually in **Figure 13.1**.

The first visit to Monmouth County from a European boat crew in September of 1609 described the vegetation there as majestic forest-trees and strange wildflowers and fruits (Ellis, 1663). Originally, much of Colts Neck Township was forested. Mature, large trees once existed in the Township which is evident in many homes predating the 18th century, with different pine paneling, flooring, and rafters of great widths. The lumber was cut to order by water-powered vertical sawmills located along County streams. Crude timbers were fashioned from many other trees with broad axes (Colts Neck Environmental Commission, 1983). As agriculture became an important industry in Colts Neck Township, the amount of forest lands declined. From the 1950s into the 1970s many of Colts Neck's heavily wooded areas were developed into large colonial and ranch-style houses on acre-sized lots. In the 1980s and continuing into the 2000s much of the Township's farmland has been replaced with larger residential homes (Colts Neck Township, New Jersey Facts for Kids, 2023.)

Deciduous forest (including protected wooded deciduous wetlands) takes up the majority of the forest areas in Colts Neck. The most commonly occurring forest species within the Township consists of a mixed oak forest which can be found in areas where there is rich moisture holding soil. A sizable amount of the Township's forested areas are located within the boundary of Naval Weapons Station Earle, with the remaining scattered in more fragmented portions throughout the Township. **Table 13.1** includes an expansive list of all the vegetation cover found in Colts Neck Township in comparison to Figure 13.1 which exhibits general areas of natural vegetation.

Colts Neck Township 2024 Environmental Resource Inventory

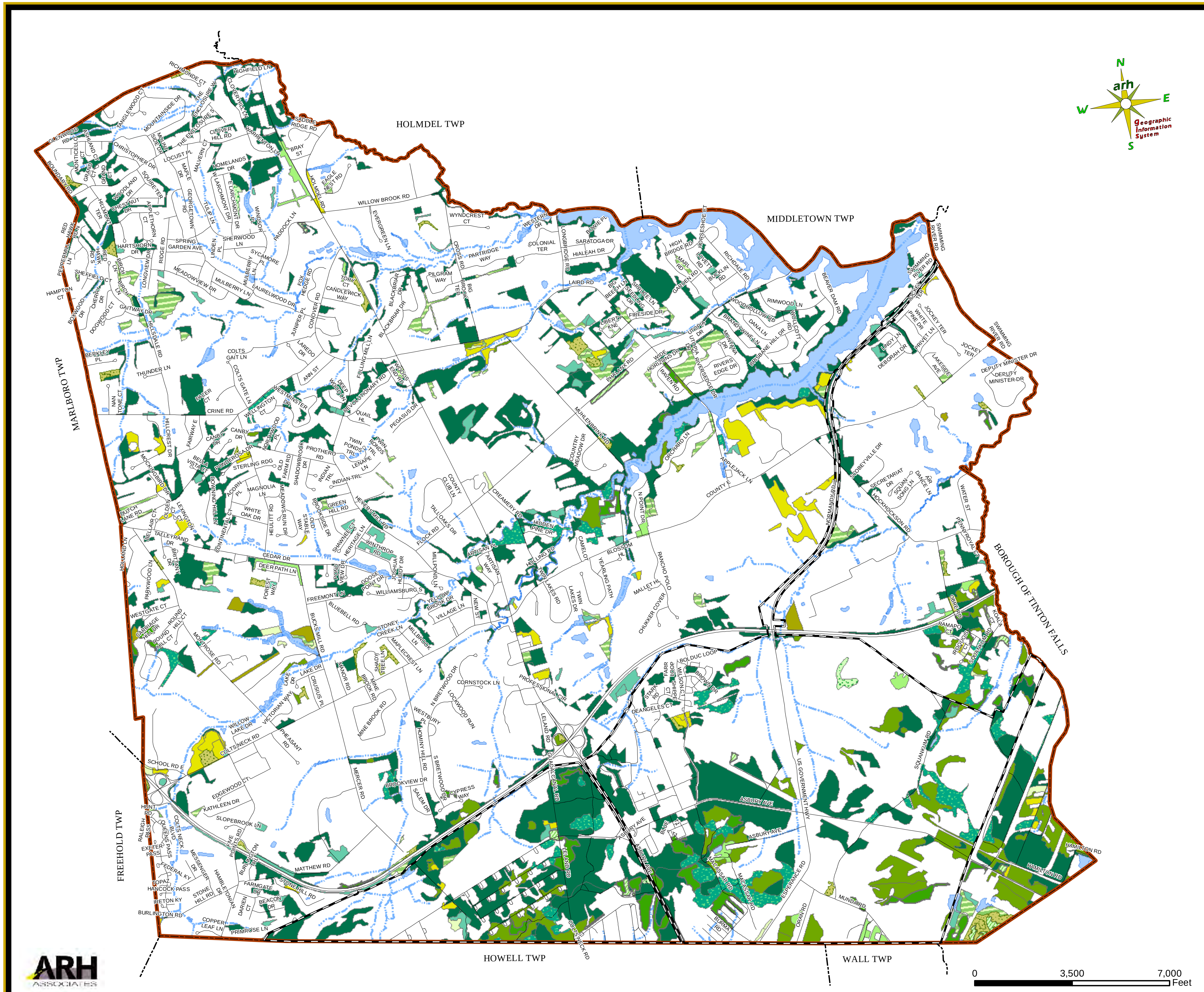


Figure 13.1 - Forest Types

Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Forest Land Cover (2015)

- 4110 - DECIDUOUS FOREST (10-50% CROWN CLOSURE)
- 4120 - DECIDUOUS FOREST (>50% CROWN CLOSURE)
- 4210 - CONIFEROUS FOREST (10-50% CROWN CLOSURE)
- 4220 - CONIFEROUS FOREST (>50% CROWN CLOSURE)
- 4230 - PLANTATION
- 4311 - MIXED FOREST (>50% CONIFEROUS WITH 10-50% CROWN CLOSURE)
- 4312 - MIXED FOREST (>50% CONIFEROUS WITH >50% CROWN CLOSURE)
- 4321 - MIXED FOREST (>50% DECIDUOUS WITH 10-50% CROWN CLOSURE)
- 4322 - MIXED FOREST (>50% DECIDUOUS WITH >50% CROWN CLOSURE)
- 4410 - OLD FIELD (< 25% BRUSH COVERED)
- 4420 - DECIDUOUS BRUSH/SHRUBLAND
- 4430 - CONIFEROUS BRUSH/SHRUBLAND
- 4440 - MIXED DECIDUOUS/CONIFEROUS BRUSH/SHRUBLAND

GIS Data Sources:
1. Forest Types came from NJDEP (Land Use Land Cover GIS 2015).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

Table 13.1 Colts Neck Township Vegetation Cover

Type of Vegetation	Acres	% of Township Area
Wetlands	**5745.36**	**28.27%**
DECIDUOUS WOODED WETLANDS	2995.40	14.74%
MIXED WOODED WETLANDS (DECIDUOUS DOMINANT)	891.46	4.39%
AGRICULTURAL WETLANDS (MODIFIED)	445.14	2.19%
MIXED WOODED WETLANDS (CONIFEROUS DOMINANT)	441.86	2.17%
DECIDUOUS SCRUB/SHRUB WETLANDS	223.81	1.10%
MANAGED WETLAND IN BUILT-UP MAINTAINED RECREATION AREAS	200.39	0.99%
CONIFEROUS WOODED WETLANDS	164.74	0.81%
HERBACEOUS WETLANDS	107.63	0.53%
FORMER AGRICULTURAL WETLAND (BECOMING SHRUBBY, NOT BUILT-UP)	82.28	0.40%
WETLAND RIGHTS-OF-WAY	76.48	0.38%
DISTURBED WETLANDS (MODIFIED)	34.13	0.17%
MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE	26.87	0.13%
MIXED SCRUB/SHRUB WETLANDS (DECIDUOUS DOM.)	18.01	0.09%
ATLANTIC WHITE CEDAR WETLANDS	11.25	0.06%
CONIFEROUS SCRUB/SHRUB WETLANDS	10.86	0.05%
PHRAGMITES DOMINATE INTERIOR WETLANDS	9.70	0.05%
MIXED SCRUB/SHRUB WETLANDS (CONIFEROUS DOM.)	5.34	0.03%
Forest (Upland)	**3855.18**	**18.97%**
DECIDUOUS FOREST (>50% CROWN CLOSURE)	2487.56	12.24%
CONIFEROUS FOREST (>50% CROWN CLOSURE)	641.53	3.16%
MIXED FOREST (>50% DECIDUOUS WITH >50% CROWN CLOSURE)	271.12	1.33%
MIXED FOREST (>50% CONIFEROUS WITH >50% CROWN CLOSURE)	166.32	0.82%
DECIDUOUS FOREST (10-50% CROWN CLOSURE)	152.35	0.75%

MIXED FOREST (>50% CONIFEROUS WITH 10-50% CROWN CLOSURE)	97.51	0.48%
CONIFEROUS FOREST (10-50% CROWN CLOSURE)	24.62	0.12%
MIXED FOREST (>50% DECIDUOUS WITH 10-50% CROWN CLOSURE)	14.18	0.07%
Brush/Shrubland (Upland)	**2206.03**	**10.8%**
CROPLAND AND PASTURELAND	1680.38	8.27
DECIDUOUS BRUSH/SHRUBLAND	191.35	0.94
OLD FIELD (< 25% BRUSH COVERED)	191.30	0.94
MIXED DECIDUOUS/CONIFEROUS BRUSH/SHRUBLAND	107.31	0.53
CONIFEROUS BRUSH/SHRUBLAND	35.69	0.18
Some Other Agriculture	**1383.06**	**6.8%**
OTHER AGRICULTURE	1082.66	5.33
ORCHARDS/VINEYARDS/NURSERIES/HORTICULTURAL AREAS	271.87	1.34
PLANTATION	28.53	0.14
TOTAL	**13189.62***	**64.90%**

Source: NJDEP (2015 Land use Land cover) Note: Total acres of vegetation is not equivalent to total Township area

13.1.1 Plant Communities

Oak Forests, Oak-Pine Forests and Pine-Oak Forests occur on dry sites and are a mix of trees that are designated based upon the basis of whether oaks or pines are the predominant tree species. Below are the various plant populations that are found within Monmouth County. Colts Neck Township's vegetative community can contain any of the forest components listed below, the canopy closure for Colts Neck Township is displayed in **Figure 13.1.1** . As stated from the article, *Select Forest Communities of Monmouth County parks:*

1. Chestnut Oak Forests (Central Oak-pine)
Chestnut oaks are the dominant component of this forest type. These forests can be found on poor and dry soils that are often found at the top of ridges and hilltops. Their community is usually dominated by evergreen mountain laurel in the understory. The sandy soils are protected from erosion by pebbles and sand consolidated by iron oxide. These areas are subject to extremes in climate, destructive weather, and fires. These impacts can result in trees with broken tops and multiple trunks from re-sprouting. Evidence of fire can often be seen at the uphill side at the base of trunks where flames burn the hottest. The shrub layer is equally tolerant of extremes; for example, mountain laurel readily re-sprouts after a burn. Some of the chestnut oaks can reach significant age of up to 135 years old.

Plant Components
Trees

Common Name	Scientific Name
chestnut oak	***Quercus prinus***
northern red oak	***Quercus rubra***
black oak	***Quercus velutina***
scarlet oak	***Quercus coccinea***
chestnut oak	***Castanea dentata***
black birch	***Quercus velutina***
hickory	***Carya spp.***
shortleaf pine	***Pinus echinata***

Shrubs

Common Name	Scientific Name
mountain laurel	***Kalmia latifolia***
pinxter flower	***Rhododendron periclymenoides***
lowbush blueberry	***Vaccinium angustifolium & V. pallidum***
black huckleberry	***Gaylussacia baccata***

maple-leaved Viburnum	***Viburnum acerifolium***

Herbs

Common Name	Scientific Name
spotted wintergreen	***Chimaphila maculata***
wintergreen	***Gaultheria procumbens***
path sedge	***Juncus tenuous***
wild sarsparilla	***Aralia nudicaulis***
bracken fern	***Pteridium aquilinum***
Pennsylvania sedge	***Carex pensylvanica***
white wood aster	***Eurybia divaricata***
white moss	***Leucobryum glaucum***

(*Select Forest Communities of Monmouth County parks, n.d., pg 1, & The Nature Conservancy, 2018).*

2. Beech – Oak Forest

American Beech dominated forests are found within the Inner Coastal Plain of New Jersey. These forests also include tall canopies of mixed oak species, tulip trees, and American holly. Beech can often be found in oak-dominated forest making it difficult to distinguish one community from the other. Typical species of these forests consists of American beech with any combination of the oak species listed below with tulip tree and black birch elements. The well-drained soils support arrowwood and maple-leaved viburnum with some herbaceous species.

Plant Components

Trees

Common Name	Scientific Name
American beech	***Fagus grandifolia***
white oak	***Quercus alba***
chestnut oak	***Quercus prinus***
black oak	***Quercus velutina***
tulip tree	***Liriodendron tulipifera***
American holly	***Ilex opaca***
black cherry	***Prunus serotina***
sassafras	***Sassafras albidum***

Shrubs

Common Name	Scientific Name
maple-leaved viburnum	***Viburnum acerifolium***
arrowwood	***Viburnum dentatum***
black huckleberry	***Gaylussacia baccata***
pinxter flower	***Rhododendron periclymenoides***
mountain laurel	***Kalmia latifolia***
lowbush blueberry	***Vaccinium pallidum***
sweet pepperbush	***Clethra alnifolia***
bayberry	***Myrica pensylvanica***
greenbrier	***Smilax spp***
dewberry	***Rubus flagellaris***
Japanese honeysuckle	***Lonicera japonica***
poison Ivy	***Toxicodendron radicans***

Herbs

Common Name	Scientific Name
rattlesnake weed	***Hieracium venosum***
spotted wintergreen	***Chimaphila maculata***
Solomon's-seal	***Polygonatum biflorum***
false Solomon's seal	***Maianthemum racemosa***
Canada Mayflower	***Maianthemum canadense***
beech drops	***Epifagus virginiana***
pink lady's-slipper	***Cypripedium acaule***
Pennsylvania Sedge	***Carex pensylvanica***

(*Select Forest Communities of Monmouth County parks, n.d., pg 3).*

3. Pine-Dominated Forest

Pine-dominated forests are representative of the southern coastal portions of Monmouth County and south to the Pine Barrens. Pitch pine and short leaf pines are most common in the Pineland Areas. These forests are dominated by fire resistant pitch pine with components of shortleaf pine, black huckleberry, and lowbush blueberry. A combination of sandy, infertile soils and a fire disturbance regime influences the types of plants growing here. This type of disturbance clears the forest floor of leaf litter and detritus, allowing pine seedlings to become established.

Plant Components

Trees

Common Name	Scientific Name
pitch pine	***Pinus rigida***
shortleaf pine	***Pinus echinata***
black oak	***Quercus velutina***
chestnut oak	***Quercus prinus***
white oak	***Quercus alba***
scarlet oak	***Quercus coccinea***
post oak	***Quercus stellata***
sassafras	***Sassafras aldbidium***

Shrubs

Common Name	Scientific Name
scrub oak	***Quercus ilicifolia***
blackjack oak	***Quercus marilandica***
mountain laurel	***Kalmia latifolia***
black huckleberry	***Gaylussacia baccata***
early lowbush blueberry	***Vaccinium pallidum***
staggerbush	***Lyonia mariana***
dangleberry	***Gaylussacia frondose***
glaucous greenbrier	***Smilax glauca***

Herbs

Common Name	Scientific Name
golden heather	***Hudsonia ericoides***
bracken fern	***Pteridium aquilinum***
little bluestem	***Schizachyrium scoparium***
Pennsylvania sedge	***Carex pensylvanica***
wild indigo	***Baptisia tinctoria***
goat's rue	***Tephrosia virginiana***
frostweed	***Helianthemum canadense***
sweet goldenrod	***Solidaga odora***
Pine Barrens sandwort	***Arenaria caroliniana***
rattlesnake weed	***Hieracium venosum***
ipecac spurge	***Euphorbia ipecacuanhae***

stiff aster	***Ionactis linariifolius***

(*Select Forest Communities of Monmouth County parks, n.d., pg 5).*

4. Red Maple Dominated Swamp Forest (Coastal Basin Swamp)

Located within the Inner Coastal Plain region of Monmouth County, red maple is the dominant part of the upper canopy in these freshwater wetland areas. Skunk cabbage is a significant understory component. Black gum and green ash area are also relevant components of this community as well. This type of wetland forest can be found in poorly drained depressions, valleys, and floodplains. Red maple swamps have seasonally high-water tables with poorly drained soils with high amounts of organic matter. This creates a favorable environment for the hydrophytic composition of the community.

Plant Components

Trees

Common Name	Scientific Name
red maple	***Acer rubrum***
black gum	***Nyssa sylvatica***
green ash	***Fraxinus pennsylvanica***
sweetgum	***Liquidambar straciflua***

Herbs

Common Name	Scientific Name
skunk cabbage	***Symplocarpus foetidus***

(*Select Forest Communities of Monmouth County parks, n.d., pg 7).*

5. Emergent freshwater marsh

A freshwater emergent or submergent marsh has mostly herbaceous vegetation and occurs along isolated basins, edges of streams, and drainageways of slopes. Their typical plants include cattails, marsh ferns, pickerelweed, and tall rushes. The species that occur within these habitats are adapted for sustained water inundated conditions and generally do not persist throughout the winter. They are often flat-bottomed and shallow, and can be associated with forested or shrubby swamps, peatlands, and/or open water.

Herbs

Common Name	Scientific Name
whorled pennywort	***Hydrocotyle verticillata***

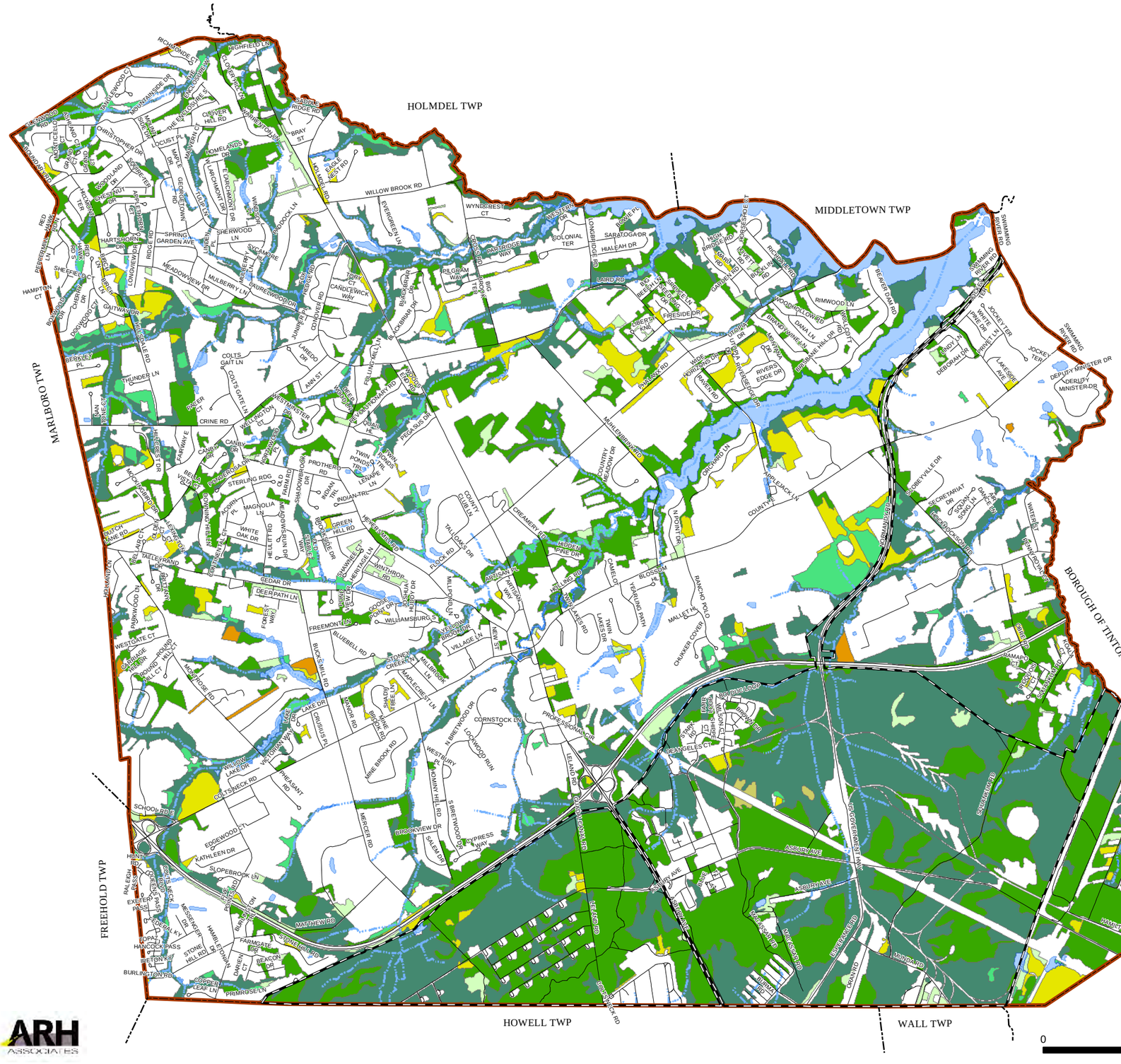
s

Robbins' spikerush	***Eleocharis robbinsii***
sago pondweed	***Potamogeton pecinatus***

(*The Nature Conservancy 2018, and Tiner, 2009*)

Colts Neck Township 2024 Environmental Resource Inventory

Figure 13.1.1 - Canopy Closure



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Canopy Closure

- Brush, shrub, scrub, old fields
- Forested Uplands, 10-50% crown closure
- Forested Uplands, >50% crown closure
- Plantation
- Atlantic White Cedar Wetlands
- Forested Wetlands
- Scrub/Shrub Wetlands

GIS Data Sources:
1. Canopy Closure came from NJDEP 2015 LULC GIS data.
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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13.2 Threatened & Endangered Species

13.2.1 Biodiversity in Colts Neck Township

Biodiversity is the variety of genetic composition within a species population, the variety of species (plants, animals, microorganisms) within a habitat, and the variety of ecosystems within a given Region. Biodiversity allows for greater adaptation, resistance against disease, and improving a species' chance of survival during environmental changes. A diversity of plant and animal species is important for healthy human environments, productive landscapes, and flourishing ecosystems. Although not always recognized, organisms on the lower level of the food chain facilitate nutrient recycling, decomposition of organic matter, soil rehabilitation, pest and disease regulation, pollination, and water filtering. These types of organisms are arthropods and detritivores such as earth worms. Biodiversity is needed at the lowest levels to support the higher-level food chain flora and fauna. When biodiversity declines, it is extremely difficult for an ecosystem to recover or replace species.

Colts Neck supports numerous types of natural habitats, all of which are important for maintaining biodiversity. Wetlands, which support plants that require saturated soils, are the most abundant type of vegetative cover in Colts Neck Township. Swamps are poorly drained, and act as a catchment for seasonal flooding. Freshwater marshes, which are associated with lakes, ponds, and slow-moving streams, act as an ecotone between freshwater bodies and land, providing habitat to various herptiles and herbaceous wetland species while also acting as a buffer. Scrub-shrub wetlands can be identified as shrub swamps and wet meadows. These areas are commonly flooded for the growing season but do not have standing water throughout the season. These habitats have a patchwork of shrub and herb dominance, typical species including willow, tall sedges, rushes, buttonbush, and grasses. Oak-pine Hardwood forests support healthy shrub layers, with the pine component usually an indication of past human disturbance (The Nature Conservancy, 2018). A relevant issue facing habitats such as these is fragmentation due to development. Fragmentation limits mobility for species to interact with one another and their environment. This impairs key ecosystem functions by decreasing biomass and altering nutrient cycles (Haddad et. al, 2015).

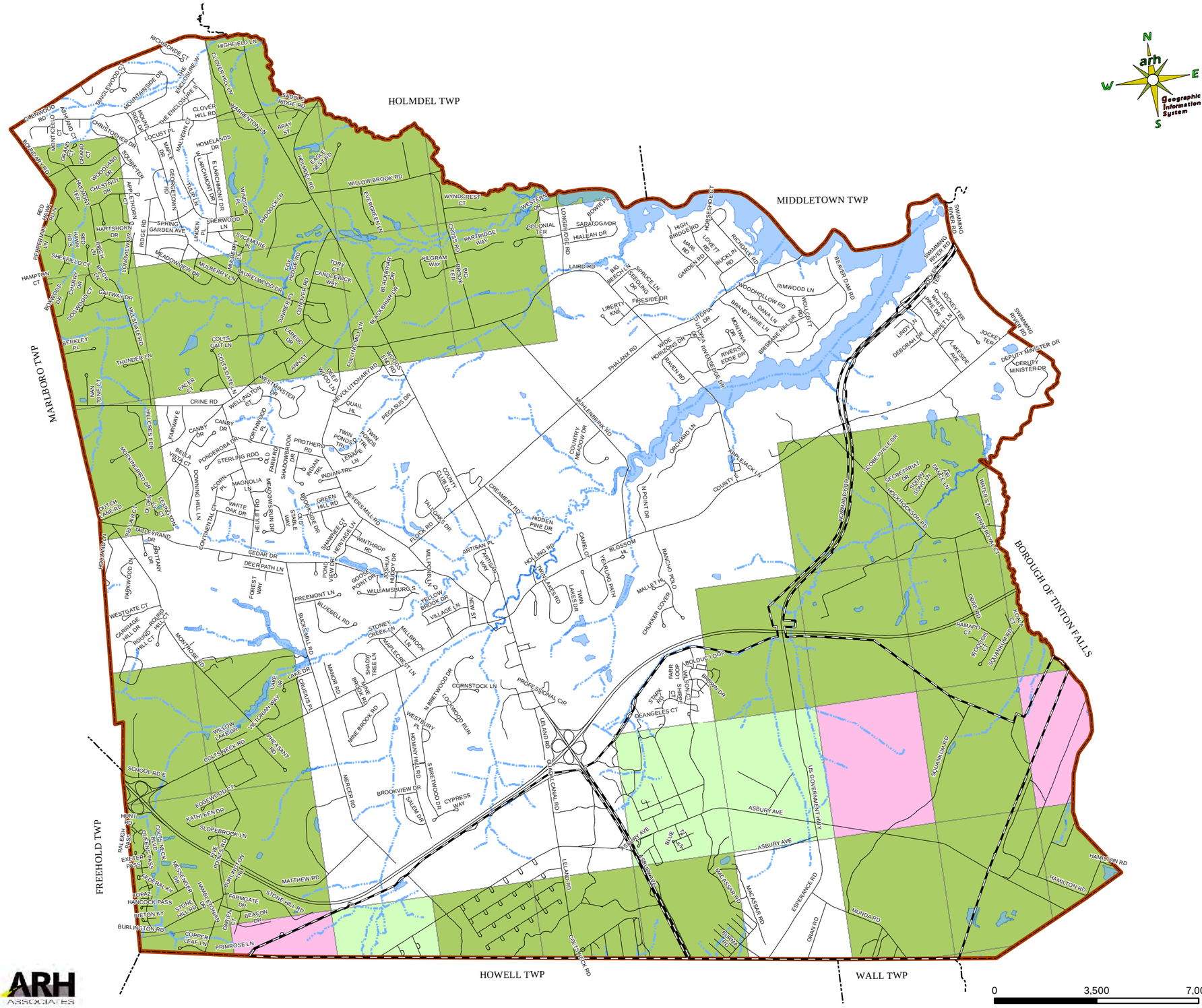
13.2.2 Rare, Threatened, and Endangered Communities

Endangered species are plants and animals that are in immediate danger of extinction throughout all or a significant portion of their range. Their demise may result from destruction of habitat, modifications in habitat, over exploitation, predation, or an adverse interspecific competition such as invasive species or disease. Threatened species are species that are likely to become endangered in the foreseeable future.

Colts Neck Township 2024 Environmental Resource Inventory

Figure 13.2.2 - Natural Heritage Grid

Generalized Locations of Rare Plant Species & Ecological Communities.



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Natural Grid Precision

- S - Documented Location Known Precisely
- M - Documented Location Known to be within 1.5 Miles (less precise)
- Both - Both Precisely and Less Precise occurrences of Documented Locations

GIS Data Sources:
1. Natural Heritage Grid version Nov. 2009 came from NJDEP (updated 2021).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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A database search through the New Jersey Natural Heritage Program was completed and the response dated February 14, 2023, provided a list of known or possible threatened and/or endangered species located in the Town boundaries. The database search provides information gathered from the Natural Heritage Database and the Landscape Project (Version 3.3) for the entire area of Colts Neck Township. The report provides an overall listing of rare plant species, ecological communities, or rare wildlife species or wildlife habitat as documented for this region. Also included is **Figure 13.2.2**, which shows the grid in which these rare plant species and ecological communities can be found. The Natural Heritage Grid Map was created using New Jersey Natural Heritage Data. The Natural Heritage Priority Sites coverage was created to identify critically important areas to conserve New Jersey's biological diversity, with particular emphasis on rare plant species and ecological communities.

Based on the database search, the following vascular plants have been found to occur within Colts Neck Township at some point in time:

Table 13.2.2 Rare and Endangered Plants from Colts Neck Township

Scientific Name	Common Name	Federal Status	State Status
Helonias bullata	swamp-pink**	LT	E
Regional Status LP, HL	**Global Rank** G3	**State Rank** S3	
Description: Reaches 24", pick flowers, basal leaves.			
Habitat found in Colts Neck: Central Oak-Pine Hardwood Forest, Coastal Plain Swamp, Wet Hardwood Forest, Emergent Marsh			
Image: Steve Croy, USDA Forest Service https://www.fs.usda.gov/wildflowers/Rare_Plants/profiles/TEP/helonias_bullata/index.shtml Description: *Supplement to the Field Guide to Tidal Wetland Plants*			

Scientific Name	Common Name	Federal Status	State Status
Juncus caesariensis	New Jersey rush**	-	E
Regional Status LP, HL	**Global Rank** G2G3	**State Rank** S2	
Description: Reaches 36", or a few flower stems arising from a short crownlike rhizome; firm, separate rough leaves (round in cross-			

section); inflorescence to 7” long with ascending branches greatly overtopping a short subtending leaf; July to October; OBL wetland species.

Habitat found in Colts Neck: Coastal Plain Pitch pine lowlands, Coastal Plain Basin Swamps

Image: Kerry Wixted, Maryland Biodiversity: https://www.marylandbiodiversity.com/view/1862License: https://creativecommons.org/licenses/by-nc/2.0/legalcode

Description: *Supplement to the Field Guide to Tidal Wetland Plants*

Scientific Name	Common Name	Federal Status	State Status
Dirca palustris	leatherwood	-	-
Regional Status HL	**Global Rank** G4	**State Rank** S2	

Description: A short, dense shrub, usually 3-6 ft. tall, with solitary or few short trunks and ascending, candelabra-like branching. Narrow, yellow, bell-shaped flowers hang in pendulous clusters and last a long time. Leaves are dark green in summer, turning a clear yellow for fall.

Habitat found in Colts Neck: Bottomland forest, moist upland forests, terraces above streams and rivers, shady bases and ledges of bluffs.

Image:*The botanical register* by Sydenham Teast Edwards and others. London, James Ridgeway, 1818, volume 4 (plate 292).

Scientific Name	Common Name	Federal Status	State Status
Juncus greenei	Greene’s Rush	-	-
Regional Status HL	**Global Rank** G5	**State Rank** S2	

Description: Threadlike basal leaves to 8 inches long and a compact inflorescence.

Habitat found in Colts Neck: Sandy road shoulders, dry fields, disturbed sites and wet meadows

Image: Katy Chayka, Minnesota Wildflowers https://www.minnesotawildflowers.info/grass-sedge-rush/greenes-rush

Description: *Field Guide to Tidal Wetland Plants*

Scientific Name	Common Name	Federal Status	State Status

Luzula acuminata var. acuminata	hairy wood-rush	-	E-Endangered
Regional Status LP HL	**Global Rank** G5T5	**State Rank** S1	
Description: Leaves are grass-like, basal and alternate, the basal leaves 2 to 12 inches long, up to ½ inch wide. 5 to 20 flowers, single at the tips of slender stalks, radiating in a rounded cluster from the tip of the stem.			
Habitat found in Colts Neck: Streambanks, Wet Hardwood Forest			
Image: Peter M. Dziuk, Minnesota Wildflowers Description: https://www.minnesotawildflowers.info/grass-sedge-rush/hairy-woodrush			

Scientific Name	Common Name	Federal Status	State Status
Zigadenus leimanthoides	death-camus**	-	E
Regional Status LP, HL	**Global Rank** G4Q	**State Rank** S1	
Description: A tall smooth stem rising from a fibrous-coated bulb and bearing an elongated, branching cluster of small, cream to yellowish to greenish, star-like flowers.			
Habitat found in Colts Neck: Sandy pinelands and bogs and wet woods on the coastal plain. FACW.			
Image: Larry Allain, U.S. Geological Survey. https://warcapps.usgs.gov/PlantID/Species/Details/2557 Description: https://www.wildflower.org/plants/result.php?id_plant=ZILE			

Scientific Name	Common Name	Federal Status	State Status
Rhynchospora knieskernii	Knieskern's beaked-rush**	LT	E
Regional Status LP, HL	**Global Rank** G2	**State Rank** S2	
Description: From (0.6 to 24 inches), with slender stems branching from the base, and short, narrowly linear leaves. Small spikelets (flower clusters) are numerous and occur at distant intervals along the entire length of stem. Obligate wetland species.			
Habitat found in Colts Neck: Coastal Plain Swamps			
Image: *An Illustrated Flora of the United States and Canada: 2nd Edition* Description: https://www.nrc.gov/docs/ml0719/ML071970339.pdf			

***Also found in Naval Weapons Station Earle*

*** Key to Status Codes used in Natural Heritage Reports**

GLOBAL (G) Element Ranks		FEDERAL Status Codes	
G1	Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction	**LE**	Taxa formally listed as endangered.
G2	Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.	**LT**	Taxa formally listed as threatened.
G3	Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; with the number of occurrences in the range of 21 to 100.		
G4	Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.		
G5	Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.		
GQ **G5T5**	Elements containing a "Q" in the global portion of Q in its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level. A range is indicated by combining two ranks (e.g., G1G2, S1S3).		
STATE (S) Element Ranks		**REGIONAL Status Codes**	

S1	Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.	**LP**	Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan
S2	Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.	**HL**	Indicates taxa or ecological communities protected by the Highlands Water Protection and Planning Act within the jurisdiction of the Highlands Preservation Area.
		STATE Status Codes	
S3	Rare in state with 21 to 100 occurrences (plant species and ecological communities in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences	**E**	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.
**Not all codes are listed* Taken from New Jersey Natural Heritage Program Website, USFWS Codes, Last revised March 2010. https://nj.gov/dep/parksandforests/natural/heritage/database.html		**T**	Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.

13.3 Invasive Species

Approximately more than half of non-native species currently documented in the United States are plants (Williams and Meffe 1998). Invasive nonindigenous plants cause substantial ecological and economic problems. They threaten biodiversity, when they replace or cause the decline of native species, or when they fundamentally alter the structure and composition of plant communities and ecosystems. Non-native species frequently compete with native populations and are at an advantage due to their non-establishment within the ecosystem structure. This is in contrast with native species which are generally in reasonable ecological balance with their associates and competitors which limit their abundance. Non-native species lack these checks such as predators, diseases, and competitors that they evolved with in other ecosystems or because of more efficient mechanisms of reproduction, dispersal, or use of resources. Since they lack these checks, they quickly can spread and dominate the areas they invade (Morse, et. al 1999).

Friends of Hopewell Valley Open Space is an accredited non-profit land trust, dedicated to preserving the Hopewell Valley area's natural resources and land. It operates an Invasive Species Strike Team. The Invasive Species Strike Team focuses on preventing the spread of newer invasive species throughout the state (FoHVOS, 2020). The strike team page offers links to fact sheets which provide information regarding identification, threat levels and control measures for each species tracked in their system. Although their focus is on eradicating newly introduced species before they can establish and spread, fact sheets are also available for many of the widespread invasives. Native plant nurseries can also provide planting information to encourage the application of indigenous species.

Invasive species can cause devastating ecological impacts. **Table 13.3** lists current invasive plant species that are either confirmed in Colts Neck Township or have been confirmed within surrounding townships by the Invasive Species Strike Team. Due to the invasive nature of nonindigenous species, there is high probability that any of the species could be found in Colts Neck Township.

Table 13.3 Invasive Species in the vicinity of Colts Neck Township

Scientific Name	Common Name	Problems Caused	
Acer platanoides	Norway maple	The dense shade produced by the canopy decreases understory plant diversity.	 Photo:

Miscanthus sinensis	Chinese silvergrass	Creates large patches displacing native plants. The grass is also very flammable and increases the fire risks of invaded areas.	
Callitriche stagnalis	European waterstarwort	Creates dense mats of vegetation that may crowd out native aquatic vegetation.	
Rosa multiflora	multiflora rose	Can produce dense, impenetrable monocultures that exclude indigenous plants and restrict the movement of some animals. It can inhibit the growth of commercial crops.	

Alliaria petiolata	garlic mustard	Dominates understories, reducing herb diversity and habitat for native animals. Can have allelopathic effects on neighboring plants, preventing their growth.	
Microstegium vimineum	Japanese stiltgrass	Due to its rapid and dense growth, it alters light and moisture regimes and likely affects seed germination of native species.	
Ailanthus altissima	tree-of-heaven	Outcompetes indigenous plants for underground resources with its long taproot. Trees produce a toxin that accumulates in the soil, harming native trees. It disrupts the process of natural plant succession due to its rapid growth.	

Sources: Snyder, David and Sylvan R. Kaufman. 2004. An overview of nonindigenous plant species in New Jersey. New Jersey Department of Environmental Protection, Division of Parks and Forestry, Office of Natural Lands Management, Natural Heritage Program, Trenton, NJ. 107 pages; The University of Georgia - Center for Invasive Species and Ecosystem Health and the National Park Service. (n.d.). *European waterstarwort*. European waterstarwort: Callitriche Stagnalis (plantaginales: Plantaginaceae): Invasive plant atlas of the United States. https://www.invasiveplantatlas.org/subject.html?sub=11538; Nuzzo, V. 2000. Element Stewardship Abstract for Alliaria petiolata. The Nature Conservancy, Arlington. Available online: http://tncweeds.ucdavis.edu/esadocs/allipeti.html.; Rowe, P. and J.M. Swearingen. 1998. Garlic Mustard. NPCI Exotic Plant Working Group Fact Sheet. Available online: http://www.nature.nps.gov/npci/epwg/alpe1.htm; Daviees-Dubois-Martin Invasive Plant Partnership. (n.d). *Alternatives to Chinese Silvergrass*. Clean water Indiana; Knapp, L.B. and C.D. Canham. 2000. Invasion of an old-growth forest in New York by Ailanthus altissima: sapling growth and recruitment in canopy gaps. Bulletin of the Torrey Botanical Society 127: 307-315.4.

Photo sources: (Norway Maple) Leslie J. Mehrhoff, University of Connecticut, Bugwood.org; (Chinese silvergrass) John Ruter, University of Georgia, Bugwood.org; (European waterstarwort) Leslie J. Mehrhoff, University of Connecticut, Bugwood.org; (multiflora rose) Rob Routledge, Sault College, Bugwood.org; (garlic mustard) Rob Routledge, Sault College, Bugwood.org; (Japanese stiltgrass) Chris Evans, University of Illinois, Bugwood.org; (tree-of-heaven) Richard Gardner, Bugwood.org.

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Japanese stiltgrass: : https://www.invasive.org/browse/detail.cfm?imgnum=2119019

tree-of-heaven: https://creativecommons.org/licenses/by-nc/3.0/us/legalcode

13.3.1 Insect and Disease Threats Specific to Trees

In addition to invasive plants, tree pests can include fungi, bacteria, pathogenic infections, insects, and nematodes. These tree pests can negatively affect a tree's potential to improve air quality, provide shade, aerate, structuralize soil, and serve as wildlife habitat. Some tree pests that currently threaten the health of forest ecosystems are native to the United States but have historically been kept in check by natural predators and habitat constraints. In other cases, forest pests have been inadvertently introduced from other countries. These exotic organisms typically have few natural predators in their new habitat and can therefore rapidly reach epidemic levels within a forest. The sudden influx of an unknown pest can result in severe forest degradation, causing a decrease in both economic and ecological health. Due to the increased threat, Forest Pest Management has become an important factor in preserving the health and integrity of forest habitats (NJ Audubon Society, 2013). Preventative methods along with proper management can help preserve the health of New Jersey forests while reducing the risk of forest pests (NJ Audubon Society, 2013).

Some pests, such as the invasive Emerald Ash Borer, which is native to Asia, will target certain species. It targets true ash species (*Fraxnius.*) and is responsible for the death of millions of trees in the United States. This is the same for a tree disease native to NJ, called Bacterial leaf

scorch, which targets mainly the red oak family, such as northern red oak, pin oak, and scarlet oak. Other pests, such as the invasive spotted lantern fly, will target a wide range of over 70 different tree and plant species (New Jersey Forest Service, 2023). In addition to preventative measures, early detection and rapid response to existing outbreaks is an efficient and effective way to minimize damage to trees (NJ Audubon Society, 2013). The Colts Neck Township Shade Tree Commission provides practical management responses to the Emerald Ash Borer as well as resource links for how to deal with the spotted lantern fly if observed (Shade Tree Commission, 2021). **Table 13.3.1** contains pests and diseases potentially in Monmouth County that threaten the health of tree habitats and should be monitored for their presence in Colts Neck Township:

Table 13.3.1 Potential insect and disease threats to trees in Colts Neck Township

Pests		Susceptible species	Signs of infestation
Insects			
gypsy moth	*Lymantria dispar*	Mainly oaks, also deciduous trees and shrubs	Presence of any life stage of the LDD (adult moth, caterpillar, or egg mass), defoliation, oval egg masses, caterpillars.
hemlock wooly adelgid	*Adelges tsugae*	Eastern hemlock	Small white woolly cotton-like balls on the underside of hemlock branches, branch dieback, crown thinning.
emerald ash borer	*Agrilus planipennis*	White ash, green ash, black ash, pumpkin ash.	D-shaped exit holes, woodpecker flecking on bark, larval galleries under the bark, branch and crown dieback, epicormic sprouts on trunk or base of tree.
spotted lantern fly	*Lycorma deliculata*	Mainly the invasive tree-of-heaven but also over 70 different plant species	Any life stage of the insect is visible feeding on plants, sooty mold, heightened activity from wasps, hornets, ants, and bees.
brown marmorated stinkbug	*Halyomorpha halys*	Fruit producing trees, agricultural crops, and ornamentals.	Distortion of fruit rendering it unmarketable, scarred, sunken areas, and tissue damage of fruits.
Pathogens			
Beech leaf disease	caused by *Litylenchus crenatae mccannii.*	American, European, and oriental beech.	Dark banding on the leaves visible on green and brown leaves, leaf edges can start to curl and become leathery in texture, leaf necrosis, thinning crown from the bottom up.
Bacterial leaf scorch	*Xylella fastidiosa*	Red oak family (northern red, pin, scarlet, willow, black, and southern red),	Brown discoloration along leaf margins in August/September.

		maple, sycamore, elm.	
Dutch elm disease	*Ophiostoma ulmi, O. himal-ulmi, O.novo-ulmi*	Elm species (Notably Ulmus americana and Ulmus rubra).	Wilting and/or yellowing of leaves that begins at the top of the tree and moves downward toward the trees base
Sources: (New Jersey Forest Service, 2023), (NJ Audubon Society, 2013), (Skvarla, M.J., 2023)			

13.4 Impacts of Climate Change

Historically, the populations of native pests have been stable or limited by habitat constraints and natural predators; however, recent changes in weather patterns and the landscape have afforded some pests the opportunity to expand their range into forests that lack these protections, including forests in New Jersey (NJ Audubon Society, 2013). Warmer winters can lead to harmful insects active for longer periods of time. Their populations may not be reduced by severe winter cold as they once were. Rising temperatures also encourage the northward spread of pests and weeds from the southern states (NJ Climate Change Resource Center, 2020). New Jersey's forest composition is expected to change dramatically over the next century due to climate change as species in general will migrate northward and upward. Several models predict that current oak/hickory forests, which are the most prevalent in the State, will recede and be replaced with oak/pine/loblolly pine forests. Species at the southern end of their species range like the maple/beech/birch mix will shift northward, and the brilliant reds, oranges and yellows produced by those species may all but disappear in New Jersey (The Nature Conservancy, 2005).

13.4.1 Wildfires

A wildfire can be defined as any non-structured fire in wildland. There is naturally occurring wildfire, human-induced wildfire, and prescribed wildfire. Wildfires can occur in forest areas, semi-forested areas, and less developed areas. Naturally occurring wildfires can be caused by lightning, while human-induced fires can be caused by human campfires, arson, carelessness with ignited products, and utility lines. Human induced wildfires are the most frequently occurring wildfires within New Jersey. With increased temperatures and changes in precipitation, New Jersey and other states in the Northeast are projected to experience a 10 to 20 percent increase in the risk of forest fires. This could cause increased loss of life and severe damage to wildlife habitats and real estate (The Nature Conservancy, 2005).

While wildfires in other parts of the State rarely attain the intensity as found in the Pine Barrens, northern New Jersey fires spread rapidly in dry leaf litter and downed, gypsy moth-killed hardwoods. Slope becomes a significant factor in both the spread and the difficulty in suppressing these fires. These higher intensity fires, or those fires that burn during drought conditions, consume the soil organic layers and can be damaging to the relatively thin-barked

trees. Adding to the temperature intensity are the various species of rhododendron and laurel that are found on soils with high iron content (State of New Jersey Office of Emergency Management, 2019). The chestnut-oak forest community found in Colts Neck is influenced by occasional fires and may undergo change when fire is suppressed. The environment is usually very sandy and sloped, so erosion can be significant if the vegetative cover is compromised by poor trail or roadway design or by extensive disturbances from windstorm or catastrophic fires (Select Forest Communities of Monmouth County parks, n.d.).

Wildfire events can have both positive and negative effects on the environment. The loss of vegetation, biodiversity, and habitat is at stake. However, occasional wildfire can have a positive effect on the environment by clearing dead brush, which attracts wildlife and can create a variety of habitats and ecotones. Prescribed burning, which is a method of forest management that allows foresters to manage forests, if done responsibly, clears thick forest litter reducing potential for intense, destructive fires. In addition, a controlled burn acts as the catalyst for new growth in forests, and sets back forest succession, just as a natural wildfire would. Although prescribed burning has many benefits, a landowner cannot accomplish this on his own. The burning must be recommended by a forester or forest fire specialist. Since open burning is not allowed without a plan in New Jersey, the landowner must obtain the proper permit. Forestry Services will hire the fire crews, plow the fire lines, and supervise the burning. They are careful to choose a day on which the fire will be easy to control (Boerner, 1982).

13.5 Public Lands

The diverse open space holdings of Monmouth County include open fields, beaches, waterways, forests, indoor and outdoor recreation facilities. All these facilities fall under the classification of “County Park.” Based on the type and nature of the facilities, different resources within these parks meet different needs and require different management strategies. The acquisition, improvement and management of this interrelated system are made possible with the Park Classification System. Dividing open space areas and park facilities into categories provides an operational framework for the Monmouth County Park System. The classification categories used by the Monmouth County Park System are as follows:

- Regional Parks
- Regional Recreation Areas
- Special Use Areas
- Conservation Lands
- Open Lands
- Golf Courses
- Greenways

The County has followed the lead of the New Jersey Department of Environmental Protection (NJDEP) in adopting the Balanced Land Use approach to estimate long-term goals for County

and municipal land acquisition for public recreation (Statewide Comprehensive Outdoor Recreation Plan, 2003, NJDEP). The Balanced Land Use guidelines are used as a guide to calculate minimum future recreational land needs as a community approaches build-out. The Monmouth County Municipal Open Space Grant Program is the main method in which Monmouth County assists municipalities with the recreational needs of residents. The grant program was authorized by the Monmouth County Board of Chosen Freeholders in 2003 with an allocation of funds a year from the County Open Space Trust Fund for cooperative projects within Monmouth County municipalities. The funding assists municipalities with local open space acquisition for recreation, conservation, historic preservation purposes or redevelopment for these purposes. Colts Neck has utilized the Monmouth County Municipal Open Space Program to develop a fitness walking trail within the pack area of the Municipal Complex and has also used the funding to acquire land for open space. (Monmouth County Park System, 2019).

Funding for open space can come from a variety of sources, including municipal, County, State and Federal sources and private land trusts. Farmland preservation has preserved multiple different farms within Colts Neck Township. The Monmouth County Conservation Foundation, which is a non-profit accredited land trust, has preserved farms within Colts Neck Township, ensuring that fertile soils and open lands are available for future farming. While public access is not granted without permission from the owner, these areas protect Colts Neck Township's agricultural community and preserve its history for future generations.

Colts Neck is distinctively characterized by its large residential estates, preserved farmland, equestrian farms, and open space. **Figure 13.5** displays the open space found within Colts Neck Township. Agricultural and open lands include old fields, pastures, croplands, and orchards that are located throughout the township. According to GIS Data, Colts Neck Township contains a grand total of approximately 2,078 acres of municipal and county park, open space (green acres included) and golf course. With the exception of preserved farmland, these areas allow for public access. With these acreage numbers, Colts Neck Township far exceeds the long and short-term municipal open space benchmarks. The Green Acres (GA) encumbered lands are owned in fee simple interest by either the State, County, municipality, or a nonprofit agency and have either received funding through the Green Acres State or Local Assistance Program or are listed on a Green Acres approved Recreation and Open Space Inventory (ROSI) (NJDEP Bureau of GIS, 2023). **Table 13.5** summarizes the acreages of open space managed by the township, county, and the acreages receiving Green Acres funding:

Table 13.5 Acres of Public Open Space in Colts Neck Township

Township Owned and Managed (GA Encumbered)	% Receiving Green Acres Funding	Township Owned and Managed (GA Non Encumbered)
1130 Acres	45%	119 Acres
County Owned and Managed (All Encumbered)	**% Receiving Green Acres Funding**	Source: NJDEP GIS Data, 2023

829.58 Acres	42%	

Dorbrook Recreation Area and Hominy Hills Golf Course are the current Park System Holdings by Monmouth County in Colts Neck Township. Dorbrook Recreation area is approximately 535 acres. Most of the property is actively managed for recreational activities and agriculture. A small portion of forest remains near the northern edge of the property along Swimming River Reservoir. The forests of the park were surveyed in June of 2012. The survey results identified upland forest communities of varying successional stages, with beech - oak communities occurring most frequently. The data from the survey classifies the average forest of Dorbrook Recreation Area as a quality natural area. (Monmouth County Park System, n.d.).

Invasive species were observed in 67% of sampled plots. The most frequently occurring non-natives were garlic mustard and Japanese honeysuckle. Non-native species are a serious threat to forest health. Deer browse was not observed in the forests of Dorbrook Recreation Area, although given the forested area's proximity to agricultural land use, deer could be expected along the edge of these habitats (Monmouth County Park System, n.d.).

The following unique vegetation communities are confirmed within Dorbrook Recreation Area in Colts Neck Township:

1. **Beech-Oak forest**

Beech–Oak forests are late successional communities. Some of these mature forests have been standing for over a century. American Beech, Northern Red Oak and White Oak are the characteristic species in this forest in Dorbrook. These forests, found on low slopes and stream terraces, support unique species which may take a long time to become established (Monmouth County Park System, n.d.)

Another characteristic feature is the abundance of mountain laurel, can be identified through its shiny evergreen leaves and twisted trunks. Upper-canopy typically above the mountain laurel is a canopy of American beech mixed with one to several species of oaks. Most conspicuously mixed is the white oak, black oak, and chestnut oak. Other tree species common in the Mid-Atlantic Piedmont are also usually present in the canopy or subcanopy, such as tuliptree (also known as yellow-poplar and tulip poplar), red maple, various hickories, black gum, sassafras, dogwood, and serviceberry. In addition, American holly is a common member of this community in the inner coastal plain. Some examples of this community may have a variety of other shrubs including pink azalea, blueberries, and black huckleberry. (NatureServe and The National Park Service National Capital Region, n.d)

Trees

Scientific Name	Common name
American beech	***Fagus grandifolia***
white oak	***Quercus alba***
northern red oak	***Quercus rubra***
tuliptree	***Liriodendron tulipifera***
black oak	***Quercus velutina***
southern red oak	***Quercus falcata***
scarlet oak	***Quercus coccinea***
sweetgum	***Liquidambar styraciflua***
red maple	***Acer rubrum***
black gum	***Nyssa sylvatica***
mockernut hickory	***Carya tomentosa***
pignut hickory	***Carya glabra***
white ash	***Fraxinus americana***
flowering dogwood	***Cornus florida***
sassafras	***Sassafras albidium***

Shrubs

Scientific Name	Common name
American holly	***Ilex opaca***
arrowwood viburnum	***Viburnum dentatum***
strawberry bush	***Eonymus americanus***
highbush blueberry	***Vaccinium corymbosum***
hillside blueberry	***Vaccinium pallidum***

Herbs

Scientific Name	Common name
Christmas fern	***Polystichum arostichoides***
New York fern	***Thelypteris noveboracensis***
perfoliate bellwort	***Uvularia perfoliate***
pink lady's slipper	***Cypripedium acaule***
partridgeberry	***Mitchella repens***
crane-fly orchid	***Tipularia discolor***
Virginia creeper	***Parthenocissus quinquefolia***
cat greenbriar	***Smilax glauca***
poison ivy	***Toxicodendron radicans***
white wood aster	***Eurybia divaricata***

(*NatureServe and The National Park Service National Capital Region, n.d*) and (*Sneddon, 2022*)

2. **Tuliptree – Northern Spicebush Ruderal Forest**

Tuliptree–Northern Spicebush forests are often found at sites which had historically been farmed or clearcut. Eventually, slower growing, longer-lived species, such as oaks, will form a mature forest. These forests are prone to invasive species (Monmouth County Park System, n.d). Examples are common across large areas of the upland landscape which have previously been disturbed. Soils usually exhibit evidence of disturbance and may have little to no organic horizon development. Environmental setting is variable, ranging from level to gently sloping uplands to well-drained floodplains and stream terraces (Andreu and Weakley, 2011.). The canopy of this ruderal upland association is dominated by tuliptree.

Trees

Common name	Scientific Name
tuliptree	***Liriodendron tulipifera***
sweetgum	***Liquidambar styraciflua***
sugar maple	***Acer saccharum***
yellow buckeye	***Aesculus flava***
American sycamore	***Platanus occidentalis***
northern red oak	***Quercus rubra***
red maple	***Acer rubrum***
black locust	***Robinia psuedoacacia***
black walnut	***Juglans nigra***
common silverbell	***Halesia tetraptera***
white ash	***Fraxinus americana***
American beech	***Fagus grandiflora***

Shrubs

Common name	Scientific name
northern spicebush	***Lindera benzoin***
coralberry	***Symphoricarpos orbiculatus***
pawpaw	***Asimina triloba***
eastern red cedar	***Juniperus virginiana***
multiflora rose	***Rosa multiflora***
wineberry	***Rubus phoenicolasius***

Japanese honeysuckle	***Lonicera japonica***
American witch-hazel	***Hamamelis virginiana***
lowbush blueberry	***Vaccinium pallidium***

Herbs

Common name	Scientific name
Japanese stiltgrass	***Microstegium vimineum***
garlic mustard	***Alliaria petiolata***
ivy-leaded speedwell	***Veronica hederifolia***
blue cohosh	***Caulophyllum thalictroides***
Canadian honewort	***Cryptotaenia canadensis***
fragrant bedstraw	***Galoium triflorum***
Canadian wood nettle	***Laportea canadensis***
yellow jewelweed	***Impatiens pallida***
black bugbane	***Actaea racemosa***
deer-tongue	***Dichanthelium clandestinum***
fourleaf yam	***Dioscorea quaternata***

(*Andreu and Tukman, 1995*) and (*Andreu and Weakley, 2011*)

Hominy Hills Golf Course, a County park in Colts Neck with an area of 262 acres, has hosted two USGA National Amateur Public Links championships and numerous regional championship tournaments. The course has also been rated as New Jersey's #1 public golf course historically (The Board of Recreation Commissioners, n.d.). In addition to the golf course, the property also contains a preserved natural area in its southwest corner. Just over 50 acres of forests cover the natural area. This area was sampled as part of the Park System's forest health survey during the field season of 2009. At lower elevations, hardwood wetland forests are the dominant community. While at higher elevations, the later succession beech-oak forests are found (Monmouth County Park system, n.d.).

3. Red Maple-Blackgum Saturated Forest

Just as in parks with hundreds of acres of forests, the same threats to forest health were observed in this small forest stand. Deer browse was observed at every sample location. Japanese stiltgrass was the only invasive species reported in the surveys and it was only observed in one of the sample plots (Monmouth County Park System, n.d.). In addition to the above referenced Beech-Oak habitat, the Hominy Hills Park System has the following the Red Maple – Blackgum Saturated Forest habitat which is a deciduous swamp forest with a well developed shrub layer and variable herbaceous later. There is usually peat overlying mineral soils:

Trees

Common name	Scientific name
trident maple	***Acer rubrum var. trilobum***
black gum	***Nyssa sylvatica***
red spruce	***Picea rubens***
swamp birch	***Betula alleghaniensis***
eastern hemlock	***Tsuga canadensis***
eastern white pine	***Pinus strobus***
sweetgum	***Liquidambar styraciflua***
sweetbay magnolia	***Magnolia virginiana***

Shrubs

Common name	Scientific name
sweet pepperbush	***Clethra alnifolia***
winterberry	***Ilex verticillata***
northern spicebush	***Lindera benzoin***
mountain holly	***Ilex murconata***
swamp azalea	***Rhodendron viscosum***
highbush blueberry	***Vaccinium corymbosum***
northern wild raisin	***Viburnum nudum var. cassinoides***

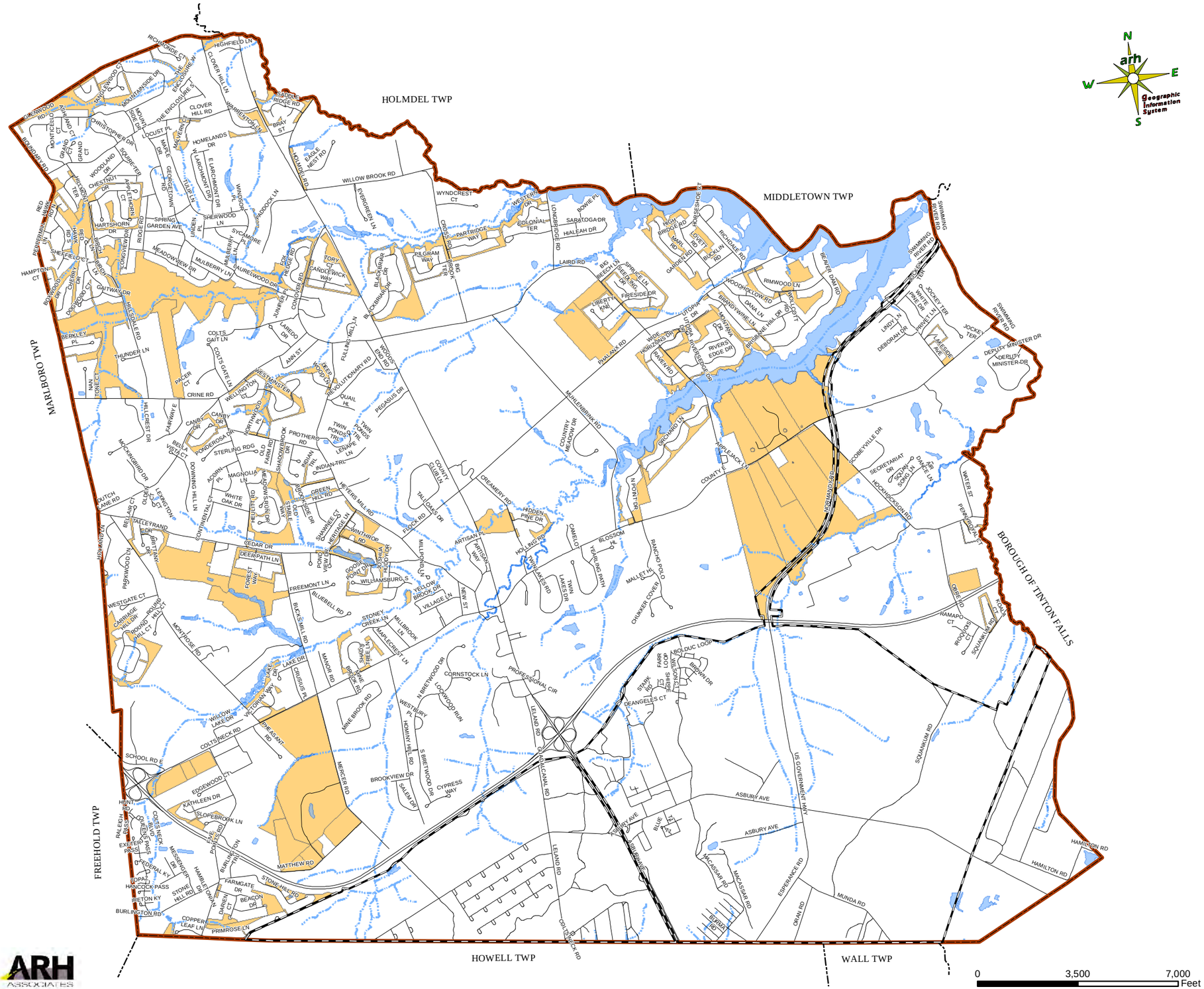
Herbs

Common name	Scientific name
northern long sedge	***Carex folliculate***
bladder sedge	***Carex intumescens***
threeleaf goldthread	***Coptis trifolia***
cinnamon fern	***Osmunda cinnamomea***
royal fern	***Osmunda regalis***
eastern skunk cabbage	***Symplocarpus foetidus***
Sphagnum mosses	***Sphagnum spp.***

(*Vogelmann, 1976*)

Colts Neck Township 2024 Environmental Resource Inventory

Figure 13.5 - Open Space



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)
- Open Space

GIS Data Sources:
1. Open Space GIS data came from NJDEP (2023).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

13.6 Greenways

Greenways are linear, continuous strips of land and/or water under Public control through ownership, easement, or other agreement, that serve both conservation and recreation needs. Greenways can improve bicycle, pedestrian, canoe and kayak access throughout the region by providing trail and river linkages between existing parks and neighborhoods, thereby improving public health by providing safe and accessible places to bike, hike, run and paddle.

They also help link habitat areas, create wildlife corridors, and provide much needed buffer areas for streams and rivers, reducing runoff, filtering pollutants and lowering water temperatures allowing for better stream health. Greenways can contribute to the cost-effective protection of potable water supplies, maintain surface water quality and sustainability, and provide important protections for floodplains and floodways. Existing natural corridors, streams, and ridgelines, as well as manmade corridors, railroad, and utility rights-of-way, often guide the location of greenways. Within both its County Parks and Municipal Parks, greenways can be found within Colts Neck. Significant patches of Century Forest located along the Marlboro, Holmdel, and Colts Neck border are considered greenways. These forested creek beds and ridgelines of the Willow Brook, Hopp Brook, and Big Brook headwaters, are largely located in leftover habitats from suburban subdivisions. Controlled by HOAs or municipalities, these are regional resources that could be protected and improved by coordination of municipal partners through easement and access agreements. Greenways can be stream valleys, regional trails, bikeways, rails-to-trails projects, park connectors, and canoe/kayak trails (Monmouth County Open Space Plan, 2019).

Colts Neck has numerous municipal parks including Five Point Park, Freer Nature Preserve, Laird Road Recreational Area, Memorial Park, Big Brook Preserve, Obre Road Preserve, and Schlesinger Preserve. Freer Nature Preserve is located along eastern Colts Neck Township within the Raritan Basin. It drains into the Navesink and Shrewsbury Rivers. Yellow Brook stream winds through the preserve, enters the Swimming River Reservoir which in turn enters the Navesink River. The preserve contains an interpretive trail system established by the township (Colts Neck Recreation Committee, 2019). Freer Nature Preserve contains approximately thirty varieties of woody plants and shrubs, and an indeterminate number of herbaceous species.

<u>The following can be seen within each of the trails in Freer Nature Preserve:</u>
Northeast trail- Canadian hemlock, mountain laurel
East Flood Plain trail- Northern red oak, Alder
Overlook trail- Swamp maple, teaberry, American beech, sassafras, black oak, shadbrush, hickory species, Norway spruce, black walnut, spicebush, Jack-in-the-pulpit, mapleleaf viburnum
West floodplain trail-Azalea, American hornbeam, blackgum
Firelane trail- Grey birch, hickory species, locusts, red cedar, white pine, shagbark hickory

(Colts Neck Environmental Commission, n.d)

Preservation of habitat for plants and animals and natural corridors for migration is critical to the ecological diversity of the municipality, the enrichment of human life, and the understanding of our natural environment. The stream valleys in Colts Neck are significant greenways that are highlighted below with their vegetative communities:

Swimming River Reservoir- The Reservoir which is located between Normandy and Willow Brook Roads, and also along Laird Road in Colts Neck provides not only natural habitat but recreational value. It is a significant river for the township and is virtually associated as a source for many of the township's tributaries. Activities that can be done along this stream in various areas include swimming, canoeing, and fishing. Its supports a beech-maple community with large numbers of tulip trees and locusts. Other species found include sassafras, ironwood, sycamore, ash, sumac, blackberry, and inkberry growing near the water. Marsh grasses, phragmites and rushes are prevalent (Monmouth County Environmental Council, 1978).

Pine Brook Ecosystem- Pine Brook is a tributary of swimming river, and forms a boundary between Tinton Falls and Colts Neck. The area bordering this stream is dominated by beeches and maples. It has tidal marsh conditions at its mouth, with spartina and Phragmites present. The area has locust, pine, oak, black walnut, and hackberry species for trees. Shrubs and herbaceous species include sumac, wild rose, mountain laurel, wild grapes, inkberry, and various types of grasses (Monmouth County Environmental Council, 1978).

Big Brook Ecosystem- Big Brook drains into the Swimming River Reservoir. This ecosystem, inside Big Brook Nature Preserve, is associated with the Big Brook Stream. Its most characteristic feature is perhaps its historic archaeological artifacts, as shark teeth and other fossils of marine specimens have been found here (Colts Neck Recreation Committee, 2019). It contains rolling hills and open meadows, which provide a worthwhile experience for hiking, biking, and wildlife observation. Species include American beech, white oak, tulip poplar, goldenrod, and other perennials. The park offers ideal access to the southern extension of the Henry Hudson Trail (The Board of Recreation Commissioners, n.d.).

13.7 References

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14. Wildlife and Wildlife Habitat

Across New Jersey and the east coast, a wide variety of faunal species exist and establish themselves in both natural and anthropogenic areas. Each species prefers their own specific habitat. In New Jersey, these habitats include but are not limited to deciduous and coniferous forests, grasslands, beaches, estuaries, wetlands, lakes, municipal parks, suburban areas, natural corridors along highways and within neighborhoods. Sometimes, species will have a different habitat during the winter than during the summer, as well as a different occupied habitat during the breeding season. There are many species of wildlife that can be observed in Colts Neck Township; however it may be difficult to observe them due to their behavior. Some species are *crepuscular*, or are active either very early in the morning, or very late in the evening. Others are *nocturnal* or only active at night. Perhaps the most observable species are *diurnal* or active during the day (Monmouth County Park System, n.d.d). As time passes, changes in the landscape will necessarily produce changes to the wildlife of the area. Certain species are rather hidden and may be rarely seen by humans, even though substantial populations may exist. Others adapt readily to human presence, and still others are attracted to disturbed sites or suburban environments.

Despite being the most densely populated state in the nation, and the fourth smallest in area, New Jersey provides habitat for more than 400 species of land-dwelling vertebrate wildlife, as well as 134 freshwater fish species, 336 marine fish species, and thousands of terrestrial and aquatic invertebrate species. The New Jersey Division of Fish and Wildlife actively conserves New Jersey's biological diversity by maintaining and enhancing rare, endangered, threatened and nongame wildlife populations within healthy, functioning ecosystems.

New Jersey's five physiographic provinces are split up into six landscape regions for habitat and their preservation. Colts Neck Township is within the Piedmont Plains Landscape Region, which is dominated by the Delaware and Raritan Rivers. It is characterized by farmed areas, extensive grasslands, fragmented woodlands, and productive tidal marshes (NJDEP Division of Fish and Wildlife, 2023).

14.1 Native Wildlife and Habitat

Colts Neck Township's expansive grasslands and agricultural areas, portions of oak-pine, beech-oak, and mixed-oak forests, as well as hardwood swamps, provide suitable habitat for the Township's native vertebrate and invertebrate wildlife. Colts Neck contains extensive flood hazard riparian areas through the entire landscape of the Township, associated with the Swimming River Reservoir, which provides important foraging habitat for threatened avian species. NWS Earle provides a wetland habitat sanctuary for a variety of threatened selection of native birds and amphibious species as noted in associated mappings provided.

14.1.1 Mammals

Mammals are distinguished from other animals by the presence of hair or fur (as compared with feathers on birds, hairless skin on reptiles and amphibians, and scales on fish). In addition, only mammals possess mammary glands by which they provide their young with milk. All mammals have a highly developed brain, hair, or fur, are warm-blooded and possess a four-chambered heart (Monmouth County Park System, n.d.d). **Table 14.1.1** provides a Habitat Vegetation Association with Mammal Species that are likely to be found within Colts Neck Township.

Table 14.1.1 Mammals

Species Name	Habitat Types											
Common, Scientific	**Pine-Oak**	**Oak-Pine**	**Deciduous (Non- Pine)**	**Hardwood Swamp**	**Water**	**Bog**	**Marsh**	**Agricultural**	**Urban**	**Non-Forested**	**Borrow Pit**	**Old-Fields**
Eastern cottontail rabbit, *Sylvilagus floridanus*	X	X	X					X				X
Groundhog/woodchuck, *Marmota monax*				X			X					X
Red fox, *Vulpes vulpes*	X	X	X	X				X				X
Gray fox, *Urocyon cinereoargenteus*	X	X		X								X
White-tailed deer, *Odcolieus virginianus*	X	X	X	X				X	X			X
Striped skunk, *Mephitis mephitis*	X	X	X	X		X	X	X	X			X
River otter, *Lutra canadensis*					X	X	X				X	
Racoon, *Procyon lotor*	X	X	X	X		X	X	X	X			X
Eastern coyote, *Canis latrans*	X	X	X	X				X	X			X
Mink, *Mustela vison*	X	X	X	X		X	X	X				X
Longtail weasel, *Mustela frenata*	X	X	X	X		X	X	X				X
Beaver, *Castor canadensis*				X	X	X		X				
Muskrat, *Ondatra zibethica*					X	X	X	X				
Southern flying squirrel, *Glaucomyus volans*	X	X	X	X				X				
White-footed mouse, *Peromyscus leucopus*	X	X		X				X				X

Species Name	Habitat Types											
Common, Scientific	**Pine-Oak**	**Oak-Pine**	**Deciduous (Non- Pine)**	**Hardwood Swamp**	**Water**	**Bog**	**Marsh**	**Agricultural**	**Urban**	**Non-Forested**	**Borrow Pit**	**Old-Fields**
Eastern mole, *scalopus aqauticus*						X		X	X			X
Eastern chipmunk, *Tamias striatus*	X	X	X	X				X	X			X
Gray squirrel, *Sciurus carolinensis*		X	X	X				X	X			
Red squirrel, *Tamiasciurus hudsonicus*	X	X										
Porcupine, *Erethizon dorsatum*	X			X								
Oppossum, *Didelphis virginiana*	X	X	X	X		X	X	X	X			X
Big brown bat, *Eptesicus fuscus*	X	X	X	X				X	X	X	X	X
Little brown bat, *Myotis lucifugus*	X	X	X	X				X	X	X	X	X
Northern short-tailed shrew, *Blarina brevicauda*	X	X		X		X						X
Masked shrew, *Sorex cinerus*	X	X		X		X		X				X
Smokey shrew, *Sorex fumeus*	X	X	X	X		X		X				X
Least shrew, *Cryptotis parva*						X	X					X
Starnose mole, Condylura cristata				X	X	X	X			X		X
Meadow jumping mouse, *Zapus hudsonius*				X		X						X
Red-backed vole, *Clethrinonomys gapperi*	X	X		X								
Meadow vole, *Microtus pennsylvanicus*				X		X	X					
Pine vole, *Pitymys pinetorum*	X	X		X		X						
Southern bog lemming, *Synaptomys cooperi*				X		X	X					
House mouse, *Mus muscullus*								X	X			X

Species Name	Habitat Types											
Common, Scientific	**Pine-Oak**	**Oak-Pine**	**Deciduous (Non- Pine)**	**Hardwood Swamp**	**Water**	**Bog**	**Marsh**	**Agricultural**	**Urban**	**Non-Forested**	**Borrow Pit**	**Old-Fields**
Norway rat, Rattus norvegicus								X	X			X

(*Monmouth County Park System, n.d.d.),* (*N.J. Pinelands Comprehensive Management Plan*), (*Forman, 1979*), (*Hammerson, G. 2010*), (*Monmouth County Environmental Council, 1988*)

14.1.2 Birds

In New Jersey, there are between 300-500 avian species, an impressive number for the State's small size. It serves as an important sojourn for migratory birds flying south for the winter to warmer climates in Central and South America. The New Jersey Atlantic Coast and Delaware Bay are major parts of the Eastern Flyway (established migratory air route) in North America. The greatest variety of birds can be seen during the migration season. In spring, the best time to search is during the latter half of April and the first half of May, when most songbirds migrate through eastern North America (Bull J. & Farrand, J. Jr. 2000). There are an estimated 360 species of birds that have been recorded in Monmouth County, therefore only a few select prominent species are listed. Monmouth County Parks offer a haven for species that depend on rapidly diminishing grasslands (Monmouth County Park System, n.d.b). This includes the Big Brook Region Grasslands which consist of a mixture of habitats located on the border of Colts Neck and Marlboro in Monmouth County, which has been identified as an important bird area for certain species (NJ Audubon Society, n.d.). **Table 14.1.2** provides a habitat and description for Avian species that are likely to be found within Colts Neck Township. Colts Neck Township's grasslands within its agricultural and park areas are important habitats and touch-down areas for notable grassland dependent migratory species.

Table 14.1.2 Birds

Species Name	Status	Description	General Habitat
Common, Scientific	**B= Breeding; M= Migrant; W=Winter; R= Year-round Resident (Monmouth County) *Historic, †Introduced**		
Northern cardinal *Cardinalis cardinalis*	**R**	Males are bright red with crest, black face, stout red bill. Females are buff-brown, tinged with red on crest, wings, and tail.	Woodland edges, thickets, brushy swamps, gardens.
Tufted titmouse *Parus bicolor*	**R**	Sparrow sized, gray above and whitish below, with rust colored sides and conspicuous gray crest.	Swampy or moist woodlands, shade trees in villages and parks, feeders in winter
Carolina chickadee *Parus carolinensis*	**R**	Some white edging of folded wing feathers and sharply defined black bib. Best identified by voice, a buzzy *chickadee-dee-dee-dee*.	Deciduous woodlands and residential areas.
Carolina wren *Thryothorus ludovicianus*	**R**	Rich brown above, buff below, with conspicuous white eyebrow.	Woodland thickets, ravines, and rocky slopes covered with brush.
American crow *Corvus brachyrhynchos*	**R**	Stocky black bird with stout bill and fan-shaped tail.	Woodlands, farmlands, and suburban areas.
Blue jay *Cyanocitta cristata*	**R**	Bright blue above with white and black in the wings and tail; dingy white below; black facial markings; prominent crest	Mainly oak forest, but also city parks and suburban yards with prevalent oak trees.

Species Name	Status	Description	General Habitat
Common, Scientific	**B= Breeding; M= Migrant; W=Winter; R= Year-round Resident (Monmouth County) *Historic, †Introduced**		
Red-bellied woodpecker *Melanerpes carolinus*	**R**	Barred black and white above; pale buff below and on face. Males with red crown and nape, females with red nape only.	Open and swampy woodlands, feeders in winter
Downy woodpecker *Picoides pubescens*	**R**	Sparrow-sized woodpecker. Black and white, with small red path on nape in males.	Woodlands, parks, and gardens
Cedar waxwing *Bombycilla cedrorum*	**R**	Sleek, crested, and brown. Has a black mask, yellow tips on tail feathers, and hard red wax-like tips on secondary wing feathers.	Open woodlands, orchards, and residential areas.
American goldfinch *Spinus tristis*	**R**	Males are bright yellow during breeding season with white rump and yellow at bend of wing. Travels in flocks.	Brushy thickets, weedy grasslands, and nearby trees.
Northern bobwhite Colinus virginianus	**R**	Small, full in appearance, and brown. Its underparts are pale and streaked. Usually seen in groups called coveys.	Brushy pastures, grassy roadsides, farmlands, and open woodlands.
American woodcock *Scolopax minor*	**R**	Chunky, quail-sized, with a very long bill and rounded wings. Eyes large, bulging, and located close to the back of the head.	Moist woodlands and thickets near open fields.
Brown thrasher *Toxostoma rufum*	**B**	Rufous-brown above, white below with dark brown streaks. Curved bill, long tail; yellow eye.	Thickets, fields with scrub. Woodland borders.
Eastern towhee *Pipilo erythrophthalmus*	**R**	Male has black head and upper, white under. Bright rufous patches on flanks. Female same but warm brown upper & head.	Thickets and brushy woodland edges.
Eastern wood-pewee *Contopus virens*	**B**	Olive -brown with noticeable eye ring.	Forests, open woodlands, orchards, and shade trees in parks and along roadsides.
Field sparrow *Spizella pusilla*	**R**	Bright pink bill, rufous cap, white eye ring, plain buff breast.	Abandoned fields and pastures with weeds, scattered bushes, small saplings.
Blue-winger warbler *Vermivora pinus*	**B**	Mostly bright yellow with blue-gray wings. 2 white wing bards and black line through eye. Greenish back and tail.	Abandoned fields and pastures grown to saplings, forest clearings and edges.
Pine warbler *Dendroica pinus*	**B**	Unstreaked olive above, with yellow throat and breast. Blurry streaking below, white belly; inconspicuous eye stripe.	Pine forests.
Prairie warbler *Dendroica discolor*	**B**	Olive above, bright yellow below, with black spots and streaks along sides. Male has chestnut streaks on back.	Mixed pine-oak open forest, old pastures, hillsides, open scrub.
Hooded warbler *Wilsonia citrina*	**B**	Olive above, yellow below with white tail spots. Males have black hood and throat. Females lack hood or only have a trace.	Mature, moist forests, with thick understories, ravines, wooded swamps.
Yellow warbler *Dendroica petechia*	**B**	Bright yellow with light olive-green tinge on back. Yellow spots on tail.	Moist thickets and swampy areas, alongside marshes, ponds, and streams.
Black-and-white warbler *Mniotilta varia*	**B**	Black and white stripes, including crown. Male has black throat; females throat is white.	Mainly deciduous forest. During migration, wooded parks and gardens.

Species Name	Status	Description	General Habitat
Common, Scientific	**B= Breeding; M= Migrant; W=Winter; R= Year-round Resident (Monmouth County) *Historic, †Introduced**		
Magnolia warbler *Dendroica magnolia*	**M**	Males are bright yellow below with heavy black streaks, black facial patch, large white wing patch and yellow rump.	During migration, almost any place with shrubs or trees.
Northern parula *Parula americana*	**M**	Small warbler, blue above with yellow-green "saddle" on back. Yellow throat and breast, and white belly with 2 white wing bars.	Widespread during migration, frequenting various trees.
Wood thrush *Hylocichla mustelina*	**B**	Brown above, bright rusty color on head. White below with large blackish spots. Other brown thrushes have finer spotting.	Moist, deciduous woodlands with a thick understory. Planted parks and gardens.
American redstart *Setophaga ruticilla*	**B**	Male black with bright orange patches on wings and tail; white belly. Females and young birds dull olive-brown above.	Second growth woodlands, thickets with saplings.
Common yellowthroat *Geothylpis trichas*	**B**	Olive-brown above, bright yellow on throat and upper breast. Male has bold black mask. Females and young lack face mask.	Moist thickets and grassy marshes.
Wood duck *Aix sponsa*	**R**	A beautiful, crested, multicolored bird. Males have iridescent greens, purples, and blues with white chin. Females are grayish with blue and purple tips of wings.	Wooded rivers, ponds, and swamps. Freshwater marshes in fall and late summer.
Pied-bill grebe *Podilymbus podiceps*	**B, W**	Pigeon sized. Stocky, uniformly brown, with stout whitish bill, that has a black ring around it during breeding season.	Marshes, ponds, saltwater in winter if freshwater habitats freeze.
Snow goose *Chen caerulescens*	**M, W**	Pure white with black wing tips, bill is pink with black "lip". Legs are pink. Young birds have dark bills and mottled brownish gray.	Winters in marshy salt coastal bays, freshwater marshes, and fields.
Mallard *Anas platyrhynchos*	**R**	Males have a green head, white neck ring, chestnut breast, and grayish body with metallic purplish-blue speculum. Females are mottled brown with purplish-blue speculum.	Ponds, lakes, and marshes. Semi-domesticated birds may be found on almost any body of water.
Northern pintail *Anas acuta*	**W**	Slim and graceful, with a slender neck. Males have a brown head and white neck, black tail feathers. Females are mottled brown.	Marshes, prairie ponds, and tundra. Sometimes salt marshes in winter.
Canada goose *Branata canadensis*	**R, W***	Brownish body with black head, long black neck, and white cheek patch. Historically would winter, now common year-round due to changing habitats.	Lakes, bays, marshes, rivers. Often feeds in grasslands and fields. Molting flocks can be found on lawns and golf courses.
Mute swan *Cygnus olor*	**R†**	Adults are all white, with orange bill and black knob at base. Creates a graceful S-curve with neck.	Ponds, rivers, coastal lagoons, and bays.
American Wigeon *Anas americana*	**W**	Male is brownish w/ white crown, green ear patch, & bold white shoulder patches. Female is mottled brown w/ grayish head.	Marshes, ponds, and shallow lakes.
Red-tailed Hawk *Bueto jamaicensis*	**R**	A large stocky hawk. Typical light phase birds have whitish breast and rust colored tail.	Deciduous forest and open country of plains, farmlands, tundra, and more.

Species Name	Status	Description	General Habitat
Common, Scientific	**B= Breeding; M= Migrant; W=Winter; R= Year-round Resident (Monmouth County) *Historic, †Introduced**		
Cooper's Hawk *Accipiter cooperii*	**R**	A crow-sized hawk, with long tail and short rounded wings. Adult slate-gray above, with dark cap, finely rusted barred below.	Deciduous and less often, coniferous forests, especially those with clearings.
Peregrine falcon *Falco peregrinus*	**R**	A large robust falcon with a black hood and wide black "mustaches". Adults are slate gray and pale below.	Open country, especially along rivers. Also near lakes and along coasts.
Great Horned Owl *Bubo virginianus*	**R**	A large owl, varying in color from white in the Arctic to dark brown and gray. Mottled and streaked, ear tufts, yellow eyes.	Forests, deserts, open country, swamps, and even city parks.
Barred Owl *Strix varia*	**R**	A large, stocky, dark eyed owl, gray-brown with cross barring on neck and breast, and streaks on belly; no ear tufts, brown eyes.	Lowland wet woods, swampy forests.
Bald Eagle *Haliaeetus leucoephalus*	**W, R**	A large blackish eagle with a white head and tail and a heavy yellow bill. Young birds lack the white head and tail.	Along lakes, rivers, marshes, and seacoasts.
Turkey vulture *Cathartes aura*	**R**	A large blackish bird. In flight, weeks are held upward in a wide V. Flight feathers silver below. Head small, reddish, and bare.	Mainly deciduous forests and woodlands; also adjacent farmlands.
Black vulture *Coragyps atratus*	**R**	Black with white patch near each wing tip, conspicuous in flight; head bare, grayish; feet extended beyond short tail.	Open country, breeds in light woodlands and thickets.
Wild turkey *Meleagris gallopavo*	**R**	Dusky brown with iridescent bronze sheen and barred with black, head and neck naked. Tail fan-shaped, with chestnut tips.	Oak woodlands, and pine-oak forests.
Eastern meadowlark *Sturnella magna*	**R**	Robin-sized bird. A stocky, brown-streaked bird with a white edged tail; bright yellow throat and breast.	Meadows, pastures, grasslands. During migration in open country generally.
Grasshopper sparrow *Ammodramus savannarum*	**B**	A small chunky grassland sparrow with clear buff breast and dark rufous upperparts with a scaly pattern. Pale central stripe on crown. Tail short and pointed.	Open grassy and weedy meadows, grasslands, pastures, and plains.
Field Sparrow *Spizella pusilla*	**R**	Bright pink bill, rufous cap, white eye ring and unstreaked buff breast.	Abandoned fields and pastures grown to weeds, scattered bushes, saplings.
Upland sandpiper *Bartramia longicauda*	**M**	A sandpiper with long yellowish legs, slender neck, and small head, and short bill. Upper parts are brown and scaly in pattern.	Open grasslands, prairies, and hayfields. Open country generally during migration.
Vesper sparrow *Pooecetus gramineus*	**B, W**	A grayish, streaked sparrow with white outer tail feathers, slim white eye ring, and small patch of chestnut on wing bend.	Fields, pastures, and roadsides in farming country.
Bobolink *Dolichonyx oryzivorus*	**B**	Males are largely black with white rump and back, dull yellow nape. Female and winter male rich buff yellow.	Prairies and meadows; marshes during migration.

Species Name	Status	Description	General Habitat
Common, Scientific	**B= Breeding; M= Migrant; W=Winter; R= Year-round Resident (Monmouth County) *Historic, †Introduced**		
Savannah sparrow *Passerculus sandwichensis*	**B, W**	Pale and streaked, with yellowish eyebrow and pinkish legs. Tail notched; other grassland sparrows have shorter, more pointed tails.	Fields, prairies, salt marshes, grassy dunes.
Osprey *Pandion haliaetus*	**B**	A large, long-winged "fish hawk." Brown above and white below; head white with dark line through eye and side of face.	Lakes, rivers, and seacoasts.
Great blue heron *Ardea herodias*	**R**	A large, grayish heron with a pale or yellowish bill. Often mistaken for a Sandhill Crane, but flies with its neck folded.	Lakes, ponds, rivers, marshes.
Snowy egret *Egretta thula*	**B**	A small, delicate, white heron with a slender black bill, black legs, and yellow feet.	Marshes, ponds, swamps, and mudflats.

(Bull J. & Farrand, J. Jr. 2000), (Cornell University, 2023), (NJ Audubon Society, n.d), (Monmouth County Park System, n.d.b)

14.1.3 Reptiles

Reptiles, including snakes, turtles, and lizards are generally animals that are ectothermic (cold blooded), lay eggs, and have bodies covered with scales or hard parts. Since these animals are cold-blooded, like amphibians, they must spend large portions of the year in a dormant state when air temperatures are too low to warm their bodies. New Jersey is home to 71 species of reptiles and amphibians, and NJDEP Fish and Wildlife takes extensive measures to protect some imperiled species of these animals. All snakes perform an integral ecological role in their control of rodents, black bears, coyotes, bobcats, other snakes, hawks and owls. Snakes are not slimy or wet, rather actually dry to the touch. Their jaws are loosely hinged so that the mouth can be extended to swallow objects several times larger than the snake's head (NJ Division of Fish and Wildlife, n.d.). New Jersey hosts some 23 species of snake, 18 of which can be found in Monmouth County (Monmouth County Park System, n.d.f).

Turtles, also reptiles, carry part of their skeletons on the outside of their bodies. Their life spans can reach up to 80 years in some local species. Like other reptiles, they are ectothermic and use their surroundings to regulate their body temperature. It is not uncommon to see a turtle basking on a rock, log, or ledge in local ponds and lakes. In the summer they bask, in the winter they hibernate, and to cool off they can be seen burrowing in the mud and hiding under vegetation (Monmouth County Park System, n.d.e). Threats to turtles have caused NJDEP to develop several regulations that protect certain species, such as the Bog Turtle, from becoming extirpated in the state. **Table 14.1.3** lists some common reptiles of Monmouth County, with potential to be found in Colts Neck Township.

Table 14.1.3 Reptiles

Species	General Habitat
Turtles	
Eastern box turtle *Terrapene carolina*	During dry weather burrow beneath logs or rotting vegetation. Brief summer showers usually bring them out of hiding. Sometimes will soak in mud or water.
Common snapping turtle *Chelydra serpentina*	Permanent bodies of freshwater, large or small. Also known to live in brackish habitats. Usually found buried in the mud in shallow water.
Eastern painted turtle *Chrysemys picta*	Any standing body of water.
Red bellied turtle *Psuedemys rubiventris*	Ponds, rivers, ditches, and sloughs.
Bog turtle *Clemmys muhlenbergii*	Bogs, swamps, clear, slow-moving meadow streams with muddy bottoms. Sedge tussocks, skunk cabbage, cattail, jewelweed, and smartweed are common habitat plants.
Spotted turtle *Clemmys guttata*	Marshy meadows, bogs, swamps, small ponds, ditches and other shallow bodies of water.
Musk turtle *Sternotherus odoratus*	Shallow waters of lakes, ponds, rivers, and canals. Basks on fallen trees and branches.
Eastern mud turtle *Kinosternon subrubrum*	Prefer shallow water. Found in ditches, wet meadows, small ponds, and marshes.
Northern diamondback terrapin *Malaclemys terrapin*	Coastal marshes, estuaries, coves, tidal flats, and inner edges of barrier beaches.
Wood turtle *Clemmys insculpta*	Riparian species, requires clean streams running through meadows, woods, and farmland.
Lizards	
Five-lined skink *Eumeces fasciatus*	Damp habitats, cutover woods in rotting logs, under boards, or in rock piles.
Northern fence lizard *Sceloporus undulatus*	Often seen on rotting logs, stumps, and fences.
Snakes	
Eastern garter snake *Thamnophis sirtalis*	Usually near water. Also in woods, fields, & suburban neighborhoods.
Black rat snake *Elaphe 10onmouth*	Woodlands, rocky hillsides, and meadows.
Northern water snake *Nerodia sipedon*	Can be found in any river, stream, pond, lake, swamp, marsh & bog.
Northern brown (DeKay's) snake *Storeria dekayi*	Prefers moist upland and lowland habitats; may be found in relatively unpolluted suburban areas. Hides under debris on the ground.
Northern black racer *Coluber constrictor*	Common in fields, open woodlands, occasionally in suburban areas.
Coastal plain milk snake *L. t. 10onmouth10m x L. t. elapsoides*	Found in habitats like that of the eastern milk snake, including woodlands, riverbanks, and outbuildings like barns.
Eastern smooth earth *Virginia valeriae*	Hides under debris. Found in deciduous woodlands, and also in pitch pine forests in NJ.
Eastern hognose *Heterodon platyrhinos*	Most often found in a variety of habitats with sandy substrate.

Eastern ribbon snake *Thamnophis sauritus*	Usually found in or near water; prefers slow-moving or quiet waters, swamps, bogs, and other wetlands.
Eastern king-snake *Lampropeltis getula*	Dry and humid woodlands, also near water.
Eastern milk snake *Lampropeltis triangulum*	Broad range of habitats, including fields, wooded areas, riverbanks, rocky hillsides.
Eastern worm snake *Carphophis amoenus*	Hides under rock or debris, in rotting logs, or burrows underground. Prefers moist ground. Goes underground in dry or cold weather.
Northern redbelly *Storeria occipitomaculata*	Shy species that prefers wooded areas and bogs.
Northern ringneck *Diadophis punctatus*	Found in woodland areas, typically hiding beneath logs, bark slabs, stones, or even trash.
Northern scarlet *Cemophora coccinea*	In or near damp woodlands.
Southern ringneck *Diadophis punctatus*	Typically found sheltering under woody or rocky debris. Most active at night.
Rough green *Opheodrys aestivus*	An arboreal species, frequently found in vegetation overhanging water.

(Monmouth County Park System, n.d.e), (*Monmouth County Park System, n.d.f*), (*Gessner J, & Stiles, E. 2001*), (*NJ Division of Fish and Wildlife, n.d.b*)

14.1.4 Amphibians

Amphibians are ectothermic (cold-blooded) land and water vertebrates that can breathe with lungs, gills, or through scale-less skin, and who generally lay their jelly-like eggs in water. The young, different in appearance than adults, will remain in the water until they metamorphosis into adult form. Adults spend their time between land and water and tend to stick near water or areas of high humidity, and *Vernal pools*. *Xernal pools* are confined depressions, either natural or man-made, that hold water for at least two consecutive months out of the year and are devoid of breeding fish populations. Vernal pools provide habitat for many species of amphibians, insects, reptiles, plants, and other wildlife. The absence of fish defines these ecosystems, as these ecosystems are safe havens for amphibian eggs away from fish who are highly predatory on amphibian eggs and larvae. NJDEP'S Land Use Regulation Program protects vernal pools by cross-referencing land use permit applications with mapping of certified vernal pools. When a permit is applied for, LURP staff will review maps showing all locations of certified vernal pools. Projects proposed within or surrounding vernal pools may need to be redesigned to avoid adversely impacting them or the permit may potentially be denied. However, this protection can only be applied to vernal pools that have been previously certified. Thus, vernal pool protection in New Jersey is highly dependent upon the generation of a comprehensive map of all the certified vernal pools in the state (Tesauro, n.d.). There are 26 vernal pool habitats found within Colts Neck Township outside of NWS Earle, and 11 vernal pool habitats found within the boundaries of NWS Earle in the Township according to the database search through the New Jersey Natural Heritage Program. Using NJDEP's Vernal Pool layer, **Figure 14.1.4** displays the vernal pools found in Colts Neck Township and **Table 14.1.4** lists them.

Table 14.1.4 Vernal Habitat Area

Vernal Pool Habitat Area ID	Quantity of Pools within Area	Habitat Area (Acres)
1539	1	56.93
1540	1	25.54
1541	7	205.42
1546	1	69.87
1551	2	131.47
1553	1	69.87
1554	0	19.24
1558	1	52.99
1564	7	232.82
1568	1	69.87
1569	4	112.78
1576	1	69.87
1577	1	69.87
1578	1	69.87
1580	1	69.87
1581	0	39.93
1582	1	69.87
1583	1	69.87
1584	1	69.87
1588	1	69.87
1591	1	69.87
1593	0	7.1
1602	1	69.87
1603	1	69.87
1605	7	224.22
1612	0	43.97
1623	1	32.98
1641	0	9.04

Source: NJDEP GIS Landscape 3.3 Data for Vernal Habitats of New Jersey

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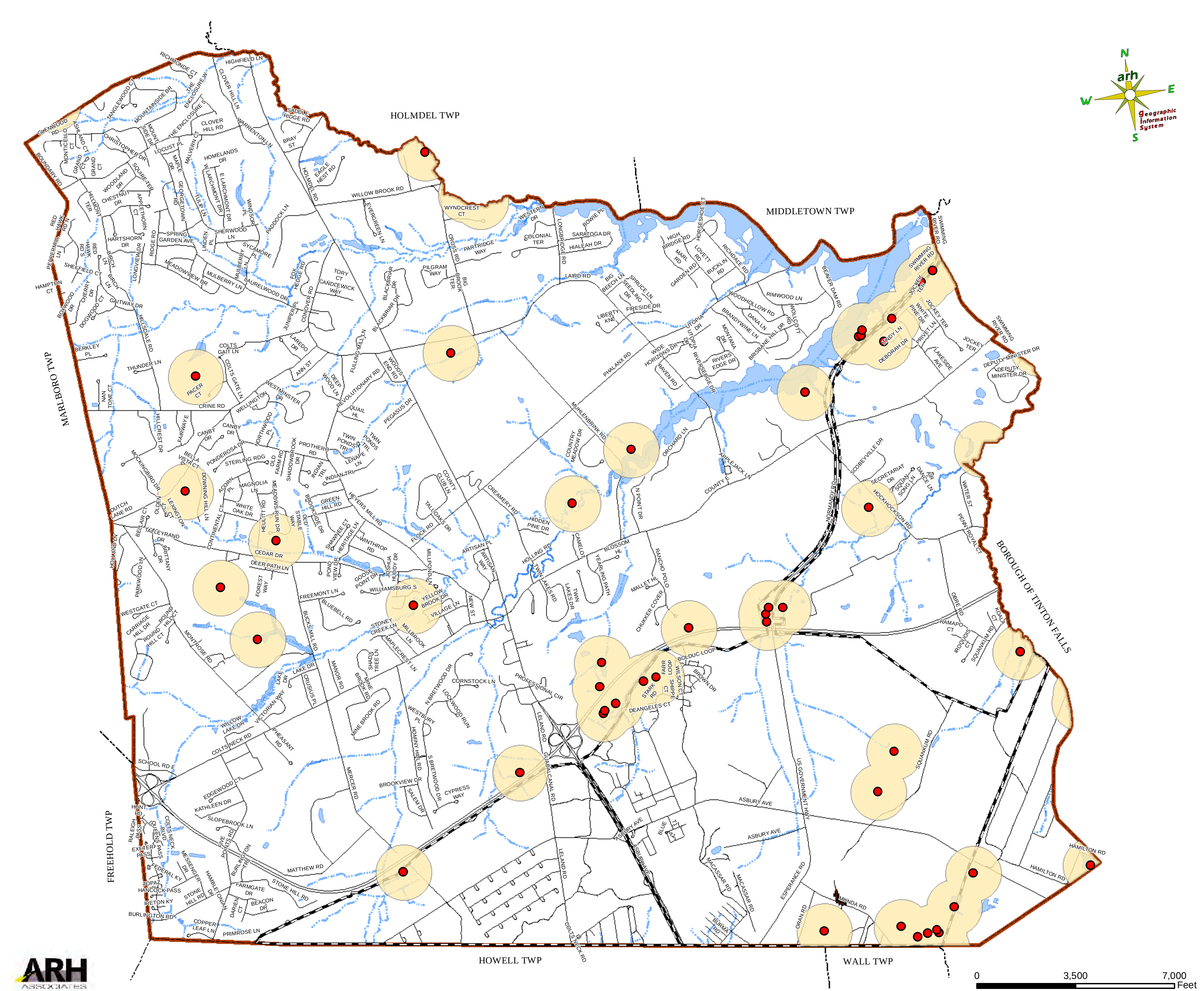

COLTS NECK TOWNSHIP
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Figure 14.1.4 - Vernal Habitat

Legend

- Potential Vernal Pool Location
- Potential Vernal Habitat Area
- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

GIS Data Sources:
1. Vernal Pools and Vernal Habitat, Version 3.3, GIS data came from NJDEP (2017).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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Amphibians play an important role in the environment, controlling insect pests, providing food for larger species, and are often the first affected in changes to the environment due to their unique sensitivity of environmental conditions. Species such as the Pine Barrens Tree Frog which can also be found in Monmouth County, have been listed as threatened due to pollution of their waters, causing their populations to decrease (Monmouth County Park System, n.d.a). **Table 14.1.4** lists the amphibians found in Monmouth County, of which any can potentially be spotted in Colts Neck Township, especially around bodies of water and vernal habitats.

Table 14.1.4 Amphibians

Species	General Habitat
Frogs and Toads	
Eastern spadefoot toad *Scaphiopus holbrookii*	Sandy or loose soil habitats.
Fowler's toad *Bufo woodhousii*	Sandy habitats, breed in vernal ponds, ditches, & shallow edges of lakes and ponds.
Northern cricket frog *Acris crepitans*	Shallow areas of permanent bodies of water vegetated with shrubs and trees.
Northern spring peeper *Pseudacris crucifer*	Standing water with trees and shrubs. Near swamps and vernal ponds, cutover woods.
Northern gray treefrog *Hyla versicolor*	High in trees & near water during breeding. Mixed forest wetlands most of year.
New Jersey chorus frog *Pseudacris kalmi*	Variety of habitats, including dry areas or those disturbed by human activity.
Pine Barrens tree Frog *Hyla andersonii*	Atlantic white-cedar acidic swamps and bogs.
Bullfrog *Rana catesbeiana*	Permanent, fish-inhabited bodies of water. Lakes, bogs, ponds & slower sides of streams.
Carpenter frog *Rana virgatipes*	Sphagnum bogs, emergent vegetation of acidic waters.
Green frog *Rana clamitans*	Any body of freshwater
Wood frog *Rana sylvatica*	Moist, wooded areas
Southern leopard *Rana utricularia*	Shallow freshwater, brackish water near the coast. Shade of nearby grasses and vegetation.
Pickerel frog *Rana palustris*	Variety of habitats, clear waters, and ravines. Brown turbid waters in the coastal plain.
Salamanders and Newts	
Marbeled salamander *Ambystoma opacum*	Moist woodlands, sandy areas of dry hillsides by overturning logs and rocks.
Spotted salamander *Ambystoma maculatum*	Breeds in vernal breeding ponds. Under logs in wet weather during autumn and spring.
Northern dusky salamander *Desmoganthus fuscus*	Locally abundant in brooks, springs, and seepage areas where there is debris that provides shelter.
Redback salamander *Plethedon cinereus*	Wooded areas under logs, bark, stones, and even trash.
Northern slimy salamander *Plethedon glutinosus*	Moist woodland ravines or hillsides.
Four-toed salamander *Hemidactylium scutatum*	Aquatic as adults, usually found in sphagnum bogs.

Northern red salamander *Pseudotriton ruber*	Cool, clean, flowing water that is not stagnant. Hide under moss and stones. Favor gravel, sand, or rock bottoms.
Northern two-lined salamander *Eurycea bislineata*	Typically found under rocks and logs at water's edge, near springs and seepage areas. In warmer wet weather, can be found farther from the water into the woodlands.
Red-spotted newt *Notophtalmus viridescens*	Swimming, resting, or crawling through vegetation in ponds, marshes, small lakes, and ditches.

(Gessner & Stiles, 2001), (Monmouth County Park System, n.d.a)

14.1.5 Fish

Fish are an important ecological link in the food chain, feeding on insects and shellfish and serving as prey for larger fish, birds, and other wildlife. They also indicate water quality and ecosystem health. Monmouth County is home to over 80 species that inhabit the County's lakes and ponds, and miles of rivers and creeks. Freshwater, which is generally defined as having less than 1% salt content, is available from two sources –still bodies of water such as lakes, ponds, and inland wetland and non-tidal portions of flowing water and creeks. Some waterways also contain fish that will travel from the ocean into the non-tidal portions of streams and rivers, such as Striped Bass and Herring. Fish such as the ones mentioned, are considered anadromous. The fish migrate from salt-water to freshwater to spawn (Monmouth County Park System, n.d.c). In Colts Neck, the Swimming River Reservoir has a possibility to contain fish species (Monmouth County Environmental Council, 1988.).

Table 14.1.5 Fish

Species	General Habitat
Freshwater	
Largemouth bass *Micropterus salmoides*	Found all over NJ and highly adaptable, although lakes and slow-moving rivers are preferred.
Smallmouth bass *Micropterus salmoides*	Cool and warm, generally clear, small to large rivers with gravel and rocky substrates.
Common carp *Cyprinus carpio*	Muddy pools of small to large rivers; lakes and ponds. Also brackish waters.
Channel catfish *Ictalurus punctatus*	Deep pools and runs over sand or rocks in small to large rivers; lakes reservoirs, and ponds.
White crappie *Pomoxis annularis*	Sand and mud bottomed pools and backwaters of creeks and small to large low-gradient rivers.
Tiger muskie *Esox masquinongy x Esox Lucius*	A hybrid species, can be found in lakes and rivers.
Yellow perch *Perca flavescens*	Clear lakes, ponds, and pools of low-gradient creeks and small to large rivers.
Chain pickerel *Esox niger*	Vegetated lakes, swamps, and backwaters of quiet pools of creeks and small to medium rivers.
Northern pike *Esox lucius*	Cool, clear, shallow, vegetated lakes; quiet pools and backwaters of low-gradient rivers.

Banded sunfish *Enneacanthus obesus*	Heavily vegetated lakes, ponds, sluggish sand or mud bottomed pools & backwaters of creeks.
Bluegill sunfish *Lepomis macrochirus*	Fertile lakes, ponds, & reservoirs with extensive littoral areas. Deeper water for overwintering.
Pumpkinseed sunfish *Lepomis gibbosus*	Shallow vegetated lakes, ponds, bays of large reservoirs, and quiet pools of low gradient creeks.
Rainbow trout *Oncorhynchus mykiss*	Clear, cold lotic systems with a close ratio of pools to riffles, also slow-moving silt free waters.
Anadromous	
Brown trout *Salmo trutta*	Clear, cool to cold rivers that have rocky substrate and are relatively silt free. Riverine habitat.
Striped bass *Morone saxatilis*	Enclosed bays, small marsh estuaries, river mouths, and off the open coast.
Blueback Herring *Alosa aestivalis*	Continental shelf in ocean, ascends lower reaches of coastal rivers to spawn. Coastal ponds.

(Monmouth County Park System, n.d.c), (*CT Fishtalk, n.d*), (*NJDEP Division of Fish and Wildlife, 2022*)

14.2 Threatened and Endangered Species

Wildlife populations face an array of interconnected pressures that hinder their ability to maintain themselves in the state. These include invasive species, chemical contaminants, road mortality, human disturbance, and perhaps most prevalently, habitat loss, fragmentation, and degradation. Some species rely on very specific environmental conditions for their survival, and degradation of environmental habitat and its conditions can cause them to become *threatened* and eventually *endangered*. A *threatened* species means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. An *endangered* species means any species which is in danger of extinction throughout all or a significant portion of its range (United States, 1983).

Version 3.3 of the Landscape Project developed by NJDEP is a special method for delineating imperiled and special concern wildlife habitat through mapping. Landscape project maps display habitat patches that animals use and that are needed to support local populations. Species-specific habitat patches are classified, or "valued" based on the status of the species present. Since imperiled species are typically not abundant across the landscape, a single occurrence may represent a significant portion of the local population. It often indicates the presence of a larger population within a habitat patch. The Landscape Project habitat patch mapping approach is designed to capture and represent the habitat needed to support the local population indicated by a species occurrence area (NJDEP Division of Fish and Wildlife, 2017a). The species-specific habitat patches with at least one documented occurrence of a threatened and endangered species in Colts Neck Township are displayed in **Figure 14.2** and their acreages in the township are listed in **Tables 14.2.2** and **14.2.3**. Furthermore, Bald Eagle Foraging Habitat is also denoted in **Figure 14.2** especially along the Swimming River Reservoir and its tributaries. Habitat ranking explanations for the Landscape Project are listed in **Table 14.2**.

Table 14.2 Ranking Definitions

Ranking	Definition
Rank 1	Assigned to species-specific habitat patches that meet **habitat-specific suitability** requirements such as minimum size or core area criteria for endangered, threatened or special concern wildlife species, but that do not intersect with any confirmed occurrences of such species. Rank 1 habitat patches without documented occurrences are not necessarily absent of imperiled or special concern species. Patches with a lack of documented occurrences may not have been systematically surveyed. Thus, the Rank 1 designation is used for planning purposes, such as targeting areas for future wildlife surveys
Rank 2	Assigned to species-specific habitat patches containing one or more occurrences of species considered to be species of **special concern**.
Rank 3	Assigned to species-specific habitat patches containing one or more occurrences of **State threatened** species.
Rank 4	Assigned to species-specific habitat patches containing one or more occurrences of **State endangered** species.
Rank 5	Assigned to species-specific habitat patches containing one or more occurrences of a **Federally listed** endangered or threatened species.

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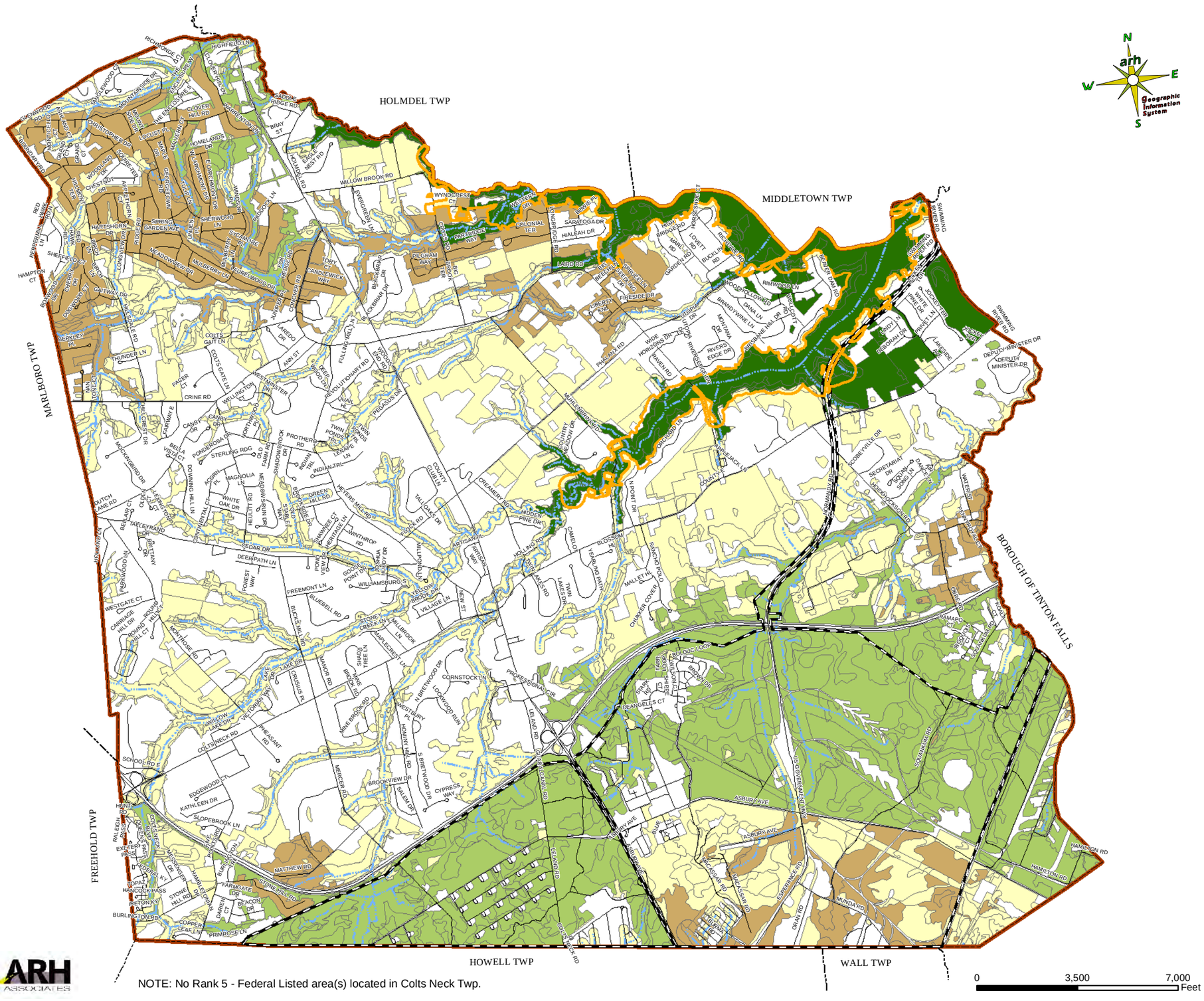

NOTE: No Rank 5 - Federal Listed area(s) located in Colts Neck Twp.

Figure 14.2 - Landscape Project, Version 3.3

Legend

- Bald Eagle Foraging
- Earle NWS Area
- Municipal Boundary
- Road
- Streams (NJDEP)

Rank

- Rank 1 - Habitat specific requirements
- Rank 2 - Special Concern
- Rank 3 - State Threatened
- Rank 4 - State Endangered

GIS Data Sources:
1. Bald Eagle Foraging GIS data and Landscape Project, version 3.3, GIS data came from NJDEP.
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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(*NJDEP Division of Fish and Wildlife, 2017a*)

Table 14.2.2 Non-Earle Imperiled and Special Wildlife Habitat

Piedmont Region Landscape Project Habitat Ranking - Acreage in Non-Earle Area (Colts Neck Twp)			
Rank	**Rank Name**	**Area (Acres)**	**Percent**
1	Habitat specific requirements	4,455.4	28%
2	Special Concern	1,637.0	10%
3	State Threatened	1,240.4	8%
4	State Endangered	1,088.8	7%
Total Ranked Acres		8,421.7	52%
Totals within Non-Earle Area		16,102.2	100%

Landscape Project Version 3.3 NJDEP GIS Data

Table 14.2.3 Earle Imperiled and Special Wildlife Habitat

Piedmont Region Landscape Project Habitat Ranking - Acreage in Earle Area (Colts Neck Twp)			
Rank	**Rank Name**	**Area (Acres)**	**Percent**
1	Habitat specific requirements	659.0	16%
2	Special Concern	375.4	9%
3	State Threatened	2,520.8	60%
4	State Endangered	9.6	0%
Total Ranked Acres		3,564.9	85%
Totals within Earle Area		4,218.4	100%

Landscape Project Version 3.3 NJDEP GIS Data

As shown in the above tables, without NWS Earle, Colts Neck Township is minimal in its threatened species habitat. Interestingly, the most Rank 4 endangered species habitat found within the Township is outside of NWS Earle. Without NWS Earle, approximately half (52%) of the Township is some type of ranked habitat, the most being Rank 1 Habitat. For the NWS Earle portion of the Township, its most significant Habitat is Rank 3, State Threatened. The state threatened habitat makes up approximately 60% of NWS Earle within the Township. Combined, there is close to 12,000 acres of ranked wildlife habitat within the entirety of Colts Neck Township.

A database search through the New Jersey Natural Heritage Program was completed and the response dated February 14, 2023, provided a list of known or possible threatened and/or endangered species located in the Township boundaries. The database search provides information gathered from the Natural Heritage Database and the Landscape Project (Version 3.3) for the entire area of Colts Neck Township. The report provides an overall listing of rare plant species, ecological communities, or rare wildlife species or wildlife habitat as documented for this region. Rare, threatened, and endangered wildlife identified which have been confirmed in Colts

Neck Township at some point in time are listed in Table **14.2.3**. The table is divided into the Township without NWS Earle and only the NWS Earle section. The key to the status codes used in the Natural Heritage Program can be found in section 13.2.2 of the vegetation chapter.

Table 14.2.3 Rare and Endangered Wildlife from Colts Neck Township

Common Name, Scientific	Rank	State Status	State Element	Global Rank	Feature Type
Without NWS Earle					
BIRDS					
American Kestrel, *Falco sparverius*	3	Threatened	S2B, S2N	G5	Non-breeding sighting
Bald Eagle *Haliaeetus leucocephalus*	4	Endangered	S1B, S2N	G5	Foraging, Nest
Barred Owl *Strix varia*	3	Threatened	S2B, S2N	G5	Breeding sighting
Common Tern *Sterna hirundo*	2	Special Concern	S3B, S4N	G5	Foraging
Great Blue Heron *Ardea Herodias*	2	Special Concern	S3B, S4N	G5	Foraging
Osprey *Pandion haliaetus*	3	Threatened	S2B, S4N	G5	Foraging
Wood Thrush *Hylocichla mustelina*	2	Special Concern	S3B, S4N	G4	Breeding sighting, confirmed
INVERTEBRATES					
A Noctuid Moth *Apamea apamiformis*	NA	NA	S2S4	G4	NA
A Noctuid Moth *Chytonix sensilis*	NA	NA	S1S3	G4	NA
NWS Earle portion of Colts Neck					
AMPHIBIANS					
Pine Barrens Treefrog *Hyla andersonii*	3	Threatened	S2	G4	Vernal Pool Breeding
BIRDS					
Bald Eagle *Haliaeetus leucocephalus*	4	Endangered	S1B, S2N	G5	Foraging, Nest
Barred Owl *Strix varia*	3	Threatened	S2B, S2N	G5	Breeding Sighting
Common Tern *Sterna hirundo*	2	Special Concern	S3B, S4N	G5	Foraging
Osprey *Pandion haliaetus*	3	Threatened	S2B, S4N	G5	Foraging

Wood Thrush *Hylocichla mustelina*	2	Special Concern	S3B, S4N	G4	Breeding Sighting
INVERTEBRATES					
A Noctuid Moth *Chytonix sensilis*	NA	NA	S1S3	G4	NA

14.3 Current Threats

New Jersey wildlife and their habitats face thousands of threats to their persistence and well-being. *Habitat loss* and *fragmentation* are the two most serious threats to wildlife populations (NJDEP Division of Fish and Wildlife, 2017b). The increase of deforestation, largely due to sprawling residential development, has led to urban land surpassing forested land as the most prominent land type covering New Jersey as of 2007 (NJDEP Division of Fish and Wildlife, 2017a). Much of the habitat that does remain after deforestation is left unsuitable for imperiled wildlife, as many of these species require large, contiguous tracts of habitat (NJDEP Division of Fish and Wildlife, 2017a). *Habitat loss* results from permanent or long-term alterations of the landscape and is essentially the destruction of habitat. *Habitat fragmentation* is the degradation, destruction, or alteration of once continuous habitat (Conserve Wildlife Foundation of New Jersey, 2023) where large patches of natural habitat turn into smaller parcels, which increases edge habitat while disproportionately reducing interior habitat. Fragmentation also results in the loss of essential wildlife travel corridors. Examples of degradation include pollution such as debris and chemicals, stream channel alterations, hydrology or temperature changes, erosion, dredging, and off-road vehicular traffic.

Connecting Habitat Across New Jersey (CHANJ)

Accidental deaths and collisions pose considerable threats to vulnerable species. Vehicles strike birds, deer, squirrels, and other wildlife when driving along roads. Large buildings, towers, and wind turbines also injure or kill many different species of wildlife (Conserve Wildlife Foundation of New Jersey, 2023). In response to the significant threat posed by increasing habitat loss and fragmentation, the state's dense road network, and a changing climate, the Division of Fish and Wildlife formed the working group called Connecting Habitat Across New Jersey (CHANJ) in 2012. CHANJ is made up of representatives from more than 40 agencies across the state, including the New Jersey Department of Transportation (DOT) and other state, federal, local, academic, and nonprofit organizations. The group has been assisting the Endangered and Nongame Species Program (ENSP) for a strategic plan for wildlife conservation that will identify key areas and the actions needed for preserving and restoring habitat connectivity for terrestrial wildlife in New Jersey. Core teams (Mapping, Guidance Document, and Communication) have developed a mapping system and a guidance document. These products allow land-use, conservation, and transportation planners to operate in a more collaborative way to increase road safety, streamline

permit efficiency, and ultimately improve the prospects for the long-term sustainability of New Jersey's terrestrial wildlife.

The Roads and Wildlife Working Group made up of CHANJ partners from the New Jersey DOT, the USFWS, and the NJDEP's Land Use have focused on developing and implementing strategies to reduce the impact of roads on wildlife. CHANJ is essentially a tool to help address habitat fragmentation and connectivity issues (ENSP Staff et. al, 2017). **Figure 14.3** displays the CHANJ areas analyzed in Colts Neck Township. As can be seen in the figure, NWS Earle is part of a major core in the Township, which spans outside of the Township. Core areas are patches of contiguous natural land cover (land and water) at least 78.5 hectares in size, which are likely to meet the habitat needs (shelter, forage/prey, reproduction) of most terrestrial wildlife species, especially if functionally linked to other cores. The corridor gradients on the east and west sides of the Township displayed appear to connect the core southeast portion of Colts Neck Township to its northern portion. Corridor gradients are continuous swaths of habitat representing the most efficient movement routes between cores. The Corridors are displayed in color gradients (1-5) based on a cost-weighted distance analysis. Gradient 1 (lightest color) represents the most optimal move-through habitat, whereas gradient 5 (darkest color) is the most marginal. While not displayed in **Figure 14.3,** road segments represent segments of roads within cores and corridors, not adjacent to urban areas. CHANJ stepping stones are contiguous areas of natural land cover at least 12.56 hectares in size that occur within CHANJ corridors and may provide "live-in" habitat for smaller, less mobile species (New Jersey Division of Fish and Wildlife, 2019).

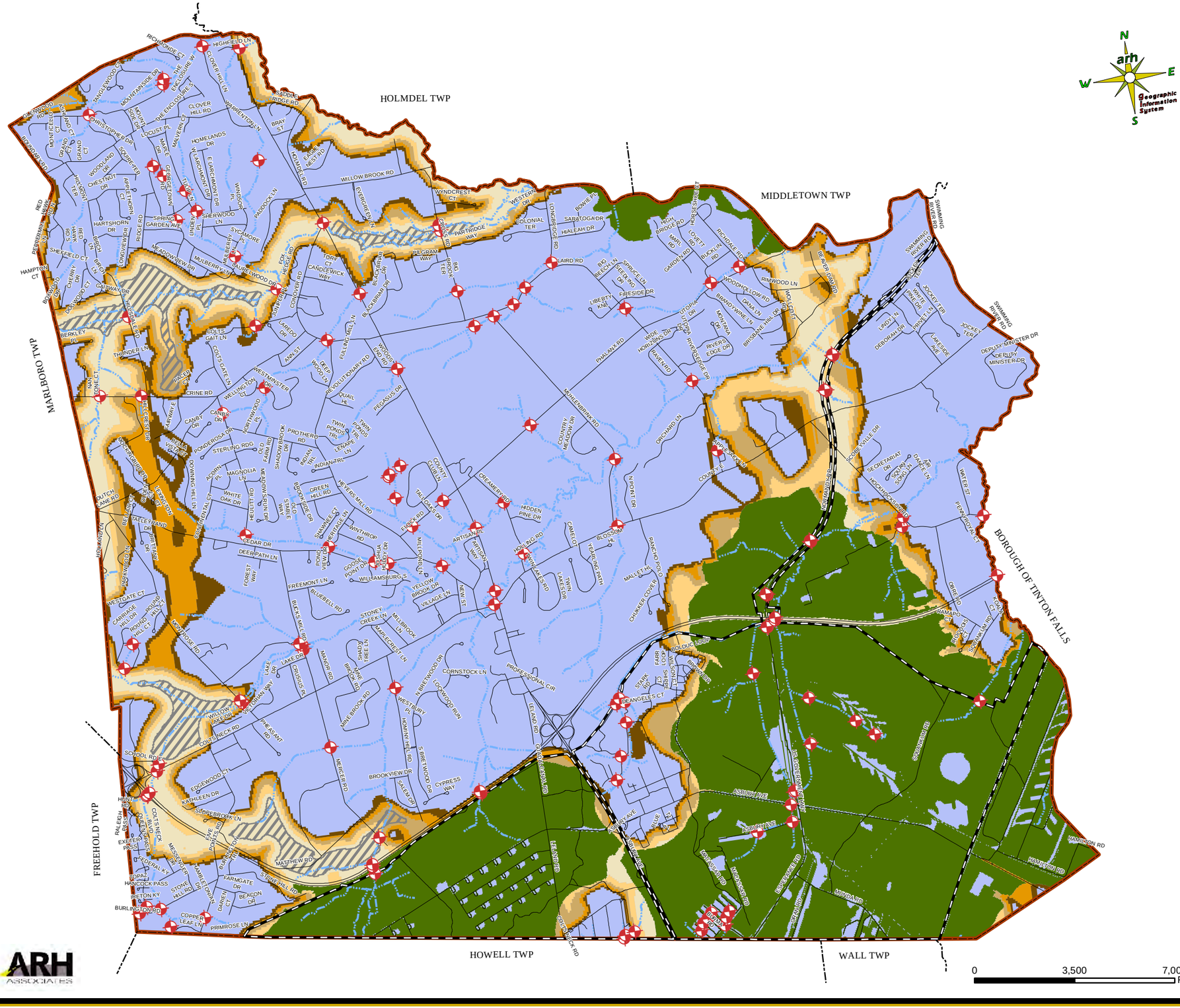
White-tailed Deer and Landscape Impacts

The white-tailed deer (*Odocoileus virginianus*) is a large, hooved native mammal that occupies a wide range throughout New Jersey. The species is adaptable to a variety of habitats, including forests, open grasslands, agricultural fields, wetlands, and suburban land. Deer are herbivores which feed primarily on grasses, herbaceous plants, fruits, legumes, and are active throughout the year. Their numbers declined in the early 1900s, however recovery efforts were implemented thereafter, which proved to be successful. An important part of the native ecosystem, deer are traditionally prey to large predators such as gray wolves, cougars, bobcats, and coyotes. Overexploitation of these large predators, some of which were heavily hunted, has increased the population of the white-tailed deer. In addition, development has fragmented forest tracts and created more open "edge' habitats in which the white-tailed deer population thrives. In combination with the alterations in land, agricultural production, and predator decrease, the deer population has experienced exponential growth which has been detrimental to forest health and ecosystem balance. It has also negatively impacted human activity through deer/vehicle collisions and the health of the local deer populations in areas with high deer density (NJ Audubon, 2019).

Large herds of deer can quickly forage through a forest floor until it is void of native species. Invasive species will take advantage of these gaps and establish. Thus, deer create a competitive advantage for invasive plants. They also act as a catalyst for their spread, as they can transport their seeds through their fur, hooves, and excrement. Apart from facilitating invasive plant growth, dense deer populations impair forest regeneration and natural succession. When gaps

Colts Neck Township 2024 Environmental Resource Inventory

Figure 14.3 - Connecting Habitat Across NJ (CHANJ)



Legend

- NAACC Terrestrial Organism Passage
- Earle NWS Area
- Municipal Boundary
- Road
- Streams (NJDEP)
- Terrestrial Wildlife Habitat Stepping Stones
- CHANJ Action Regions

Terrestrial Wildlife Habitat Cores and Corridors (CHANJ)

- Core
- Corridor, 1, Easier movement
- Corridor, 2
- Corridor, 3
- Corridor, 4
- Corridor, 5, More difficult movement

GIS Data Sources:
1. CHANJ and Terrestrial GIS data came from NJDEP.
2. NAACC stands for the North Atlantic Aquatic Connectivity.
3. Roads: NJDOT (2017).
4. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
5. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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are created in a forest canopy from natural causes, seedlings and saplings will take advantage of the openings and begin to grow. When deer populations are over-abundant, the repetitive browsing of the mid-canopy prevents new native seedlings from recolonizing. Deer also negatively impact agricultural crops and ornamental landscape plants as their diets are less restrictive (NJ Audubon, 2019).

Management options for white-tailed deer exist and are essential for achieving sustainability and forest health. A Forest Stewardship Plan can present the best options based on a landowner's goals and current site conditions. Deer barriers such as fence can exclude deer from browsing plant cover but allow other animals to use resources such as nesting birds. There are methods such as seedling protection through mesh or plastic, tubing, and chemical deer repellents which can repel deer from browsing native vegetation (NJ Audubon, 2019). Guidelines for developing a plan to both reduce the impacts of an existing deer population and manage herd size may be found in *An Overview of White-Tailed Deer Status and Management in New Jersey* (Maslo et. al, 2013) and *the Community Based Deer Management Manual for Municipalities* (NJDEP Division of Fish and Wildlife, n.d).

In addition, hunting is a very effective tool for controlling white-tailed deer populations when managed correctly. It not only benefits humans and forest health, but also keeps the deer populations at a healthy balance allowable for habitats to properly support them. The New Jersey Division of Fish and Wildlife (NJDFW) offers a program called Deer Management Assistance Program (DMAP) that assists with issues of overabundance of white-tailed deer. Through DMAP, hunters can acquire permits to harvest additional antlerless deer in specified zones (NJ Audubon, 2019). The state is divided into Deer Management Zones (DMZ's) with varying deer hunting regulations. The NWS Earle portion of the Township falls within DMZ 39, which has its own set of regulations. Without NWS Earle, the remainder of Colts Neck Township is found within Zone 50 which utilizes mainly regulation set 8. Regulations sets are dynamic and posted annually on the state Division of Fish and Wildlife website (NJDEP Division of Fish and Wildlife, 2017).

Climate Change

Colts Neck Township is in the Piedmont Plains Landscape Region of New Jersey. The Piedmont Plains Landscape continues to be greatly influenced by human settlement. Most of this region has been logged, farmed, and developed, resulting in contaminated wetlands, fragments of even-aged forest, large fields planted in corn, soybean, or cool-season hay, a plethora of exotic invasive plants, a collection of roads and residential areas, and ideal sanctuaries for white-tailed deer (ENSP Staff et. al, 2017).

As plotted by the National Oceanic and Atmospheric Administration, a slight increase in the average annual temperature of Monmouth County can be seen over the last century (NOAA, 2023). Changes in climate will affect the Piedmont Plains Region in specific ways. However, the effects of climate change on this region can be mitigated with the proper adaptation strategies. Shifting temperatures and altered precipitation patterns will shuffle species compositions of ecological communities at the southern edges of their ranges, altering habitat for dependent

wildlife species. A strategy that can be used to mitigate this is to undertake site-specific and landscape-level programs to maintain and recreate connectivity between key habitats and areas of high geophysical diversity. Higher temperatures and altered precipitation patterns could warm rivers, streams, wetlands, and other aquatic systems. This has negative consequences for freshwater mussels, turtles, amphibians, and invertebrates. A strategy that can be used to adapt to this change in conditions is to maintain and restore riparian vegetation, which will increase areas of shade. Another strategy is to limit and remove impervious surfaces near waterways to reduce their warming effect on runoff. During droughts, water withdrawal should be limited so that cold groundwater inputs are not reduced (ENSP Staff et. al, 2017).

More frequent storm events can lead to more flooding and erosion in streams and rivers. Floodplains can be restored and maintained to slow runoff, development be guided away from flood-prone areas, and soil erosion and sediment control best management practices can be integrated to mitigate the effects of intense precipitation. If water levels in rivers and streams lower, this can impede fish access to spawning and overwintering areas. Water conservation strategies should be implemented during droughts to maintain flows, barriers should be removed that impede movement during low flows. Vegetated buffers should be maintained around vernal pools to increase their resiliency. Finally, warmer winter weather temperatures will allow less-cold tolerant species, including problematic invasives and pathogens to expand and impact native wildlife and their habitats in New Jersey. Sites can be managed to limit the establishment of invasives and control their spread (ENSP Staff et. al, 2017).

14.4 Invasive Species

Invasive species, both plant and animal, often out-compete and crowd out native species, leaving behind less diverse ecosystems. A species is considered invasive when it disrupts the form and function of native communities. Invasive animals, insect pests, and pathogens cause significant damage through the degradation of whole native systems or through competition and predation of native species. Priority conservation actions include identifying routes through which invasive species are introduced, improving monitoring within and beyond New Jersey, and implementing management and eradication efforts (NJDEP Division of Fish and Wildlife, 2008). Section 13.3.1 of the Environmental Resource Inventory (ERI) lists disease threats and pathogens specific to trees in the Township. The remaining categories of invasive insects and animals which are found in Monmouth County and potentially within Colts Neck Township are listed in **Table 14.4**.

Table 14.4 Invasive faunal species identified in Monmouth County

Common Name	Scientific Names
Invertebrates	
corn earworm	*Helicoverpa zea*
European corn borer	*Ostrinia nubilalis*
brown marmorated stink bug	*Halyomorpha halys*
spotted lanternfly	*Lycorma delicatula*

multicolored Asian lady beetle	*Harmonia axyridis*
hemlock woolly adelgid	*Adelges tsugae*
spongy moth (formerly gypsy moth)	*Lymantria dispar*
large aspen tortrix	*Choristoneura conflictana*
wandering broadhead planarian	*Bipalium adventitium*
fall armyworm	*Spodoptera frugiperda*
southern pine beetle	*Dendroctonus frontalis*
mile-a-minute weevil	*Rhinoncomimus latipes*
Japanese beetle	*Popillia japonica*
emerald ash borer	*Agrilus planipennis*
European pine shoot moth	*Rhyacionia buoliana*
Chinese mystery snail	*Cipangopaludina chinensis*
banded elm bark beetle	*Scolytus schevyrewi*
bark beetle	*Hylastes opacus*
Japanese cedar longhorn beetle	*Callidiellum rufipenne*
imported willow leaf beetle	*Plagiodera versicolora*
pine false webworm	*Acantholyda erythrocephala*
viburnum leaf beetle	*Pyrrhalta viburni*
rustic jumping worm	*Amynthas agrestis*
Amphibians	
red-eared slider	*Trachemys scripta elegans*
Birds	
house finch	*Carpodacus mexicanus*
mute swan	*Cygnus olor*
brown-headed cowbird	*Molothrus ater*
house sparrow	*Passer domesticus*
European starling	*Sturnus vulgaris*
Fish	
common carp	*Cyprinus carpio*

Source: (*NJ Invasive Species Strike Team, 2022*), (*University of Georgia- Center for Invasive Species and Ecosystem Health, n.d*)

There are numerous government and private groups conducting control of invasive species throughout New Jersey. Specific management techniques, strategies, as well as ways to prevent invasive species can be reviewed in the "New Jersey Strategic Management Plan for Invasive Species" (New Jersey Invasive Species Council, 2009). As stated in Chapter 13 Vegetation, Colts Neck Township Shade Tree Commission provides resources for practical management responses for the Emerald Ash Borer, an invasive woodborer causing rapid, widespread ash tree mortality, formation of canopy gaps, and accumulation of coarse woody debris in forest ecosystems as well as another tree pest, the spotted lanternfly. Monmouth county also has several active projects involving the large-scale removal of invasive plants. But, since invasive species are blind to property boundaries and ownership, a community-wide effort is crucial to stopping their spread. The Monmouth County Parks System provides through their *Nature Series* an invasive species sheet outlining ac ons that residents can undertake to help prevent the spread of non-indigenous flora and fauna.

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15. Wetlands

15.1 Wetland Classification

Wetlands are environments that have permanent or recurring inundation of water or saturation of soils enough for the establishment of *hydrophytes* or plants adapted to water and/or *hydric soils* which are soils that are saturated long enough to develop anaerobic conditions (Tiner, 2017). New Jersey defines a freshwater wetland as, "An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation; provided however, that the department, in designating a wetland, shall use the three-parameter approach enumerated in the 1989 Federal Manual… these include tidally influenced wetlands which have not been included on a promulgated map pursuant to the Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq" (NJAC 7:7A, 2022). This is the State's inland or freshwater wetland definition according to the New Jersey Freshwater Wetlands Protection Act.

Wetlands can form from their position as depressional areas, low-lying areas around waterbodies such as rivers and streams, shallow water of embayments, slow flowing channels, and flat or sloping areas below sites of groundwater discharge (Tiner, 2017) among many other positions. NJDEP' GIS Bureau maps bogs, herbaceous swamps, wet meadows, forested wetlands, scrub/shrub, and brush covered wetlands, vegetated pond margins, and inter tidal marshes, among others. Although not normally thought of as occupying saturated areas, vegetated dune communities are also included under the wetlands category to highlight their importance. Categories for the non-tidal wetlands are mapped in much greater detail than the categories for tidal wetlands. This is because the delineations of non-tidal wetlands were originally done under a mapping program developed to support the New Jersey Freshwater Wetlands Legislation. The classification used in the freshwater mapping program was the Cowardin classification system used by the US Fish and Wildlife Service (USFWS). This system allows a more detailed division of wetland types than does the Anderson system. The delineations from the NJFWW program were integrated into the baseline land use/land cover data set, with all the detail of the original maps intact. These non-tidal wetlands can be analyzed according to the more generalized Anderson codes, as well as the more detailed original codes (NJDEP, n.d).

Tidal wetlands are routinely flooded by the tides of the ocean, rivers, streams, and bays in New Jersey's Coastal Zone and are usually referred to as coastal wetlands. The water in coastal wetlands can be saltwater or a mix of salt and freshwater (NJDEP, 2023). Tidal wetlands are especially beneficial to humans due to their ability to filter upland runoff and remove pollutants. They prevent erosion of waterfront establishments, homes, and businesses. They also act as flooding buffers during hurricanes and related intensive storms (Wetlands Watch, n.d). They are a vital habitat for brackish adapted species such as big cordgrass (*Spartina cynosuroides*), various

sedges (*Scirpus spp*.), salt marsh fleabane (*Pluchae purpurascens*), swamp rose mallow (*Hibiscus moscheutos*) and more along New Jersey's coast (Barnegat Bay Estuary Program, 2001). They provide a habitat for tidal seabirds and provide hatchery and nurse areas for fish (Wetlands Watch, n.d).

15.2 Regulations Related to Wetlands

The Clean Water Act (CWA) enacted in 1948, originally called the Water Pollution Act, establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. It was greatly reorganized and expanded in 1972 (EPA, 2023). Section 404 of the Clean Water Act (CWA) instituted a program to regulate the discharge of dredged or fill material into Waters of the United States, including wetlands (EPA, 2015). New Jersey has assumed the Federal Clean Water Act's Section 404 program, and thereby issues State Permits that satisfy state and federal requirements (National Association of Wetland Managers, 2023).

The Freshwater Wetlands Protection Act of New Jersey (FWPA) (N.J.S.A. 13:9B-1 et seq.) protects wetlands from development but authorizes disturbances under certain circumstances. The Freshwater Wetlands Protection Act rules at N.J.A.C. 7:7A establish the procedures by which the Department reviews applications for permits to conduct regulated activities in wetlands and/or their associated transition areas (a transition area is a "buffer" area of up to 150 feet wide adjacent to a freshwater wetland) (NJDEP, 2009).

Wetland buffers are areas that surround a wetland and reduce adverse impacts to wetland functions and values from adjacent development. Buffers reduce wetland impacts by moderating the effects of stormwater runoff including soil stabilization for erosion protection; filtering suspended solids and nutrients, harmful or toxic substances; and moderating water level fluctuations. Buffers also provide important habitat for wetland-associated species for use in feeding, roosting, breeding and rearing of young, and protection. Finally, buffers reduce the adverse impacts of human disturbance on wetland habitats including blocking noise and glare; reducing sedimentation and nutrient intake; buffering human debris, vegetation disturbance; and providing visual separation. Wetland buffers are essential for wetlands protection (Castelle et. al, 1992).

Throughout New Jersey, wetland buffers have levels of protection. In general, the State regulates wetlands based off resource value. According to NJDEP 7:7A-2.4 and 2.6, freshwater wetlands shall be divided into three (3) classifications based on resource value. A freshwater wetland of exceptional resource value, is a freshwater wetland which: discharges into a FW1 or FW2 trout production water or tributary, is a present habitat for threatened and endangered species; or is a documented habitat for threatened or endangered species, and remains suitable for breeding, resting, or feeding the species during their normal use of the habitat. An onsite wetland delineation using the wetland delineation method as described in the 1989 Wetland Delineation

Manual is key in determining on-site wetlands in the field for New Jersey. The NJDEP accepts this widely used method from this interagency manual. The manual was created in cooperation with the US Army Corps of Engineers, Natural Resource Conservation Service, US Fish and Wildlife Service, and US Environmental Protection Agency. The manual lists the mandatory technical criteria for Wetland identification. According to the 1989 manual, “Wetlands possess three essential characteristics: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology." These characteristics and their technical criteria for identification purposes are described in the manual, and these three parameters must be met for an area to be identified as a wetland (Federal Interagency Committee for Wetland Delineation, 1989).

An official document from NJDEP, called a Letter of Interpretation (LOI) can verify the presence, absence, or boundaries of freshwater wetlands and buffers on a site. In addition to defining the boundary of the wetland, the LOI establishes the value of the wetland, which will determine the width of the regulated buffer area. Ordinary Value wetlands, such as man-made drainage ditches and swales, have a 0 foot buffer. Intermediate Value wetlands have a 50 foot buffer, which includes those wetlands not included in the definitions of ordinary or exceptional value. Exceptional Value wetlands have a 150 foot buffer width. Exceptional Value wetlands include wetlands that provide habitat for endangered and threatened species (NJAC 7:7A, 2022). A determination of threatened and endangered species habitat is provided by using the Landscape Project data.

15.3 Wetlands in Colts Neck

According to NJDEP’s 2015 Land Use GIS data, there are ±5,099 acres of wetlands in the entirety of Colts Neck Township, covering ±25% of the Township. Without Naval Weapons Station (NWS) Earle, the Township has ±3,020 acres of wetlands, or ±18% cover. NWS Earle has ±2,079.13 acres of wetlands, and approximately ±49% of NWS Earle is wetlands. It is important to note that due to the protected nature of NWS Earle, more wetlands have been able to be protected from development within the boundaries of Earle. The wetlands shown in **Figure 15.3** were determined by selecting all wetlands from the Land Use layer. As can be seen mapped, Naval Weapons Station Earle has a sizeable amount of the Township’s wetlands. The map is intended to serve as a resource for analysis and not for regulatory delineation purposes since the wetlands mapped were not derived from on-site investigations and delineations.

For both the Earle and the Non-Earle area of the Township, deciduous wooded wetlands are the most common type of wetland that can be found. Without Earle, approximately 57% of the wetlands in the Township are deciduous wooded wetlands, with modified agricultural wetlands designation making up approximately 17%, and approximately 7% remaining as deciduous scrub/shrub wetland areas.

For Naval Weapons Station Earle, approximately 43% of the wetlands are deciduous wooded wetlands, with 34% being deciduous dominant mixed wooded wetlands, and 13% coniferous

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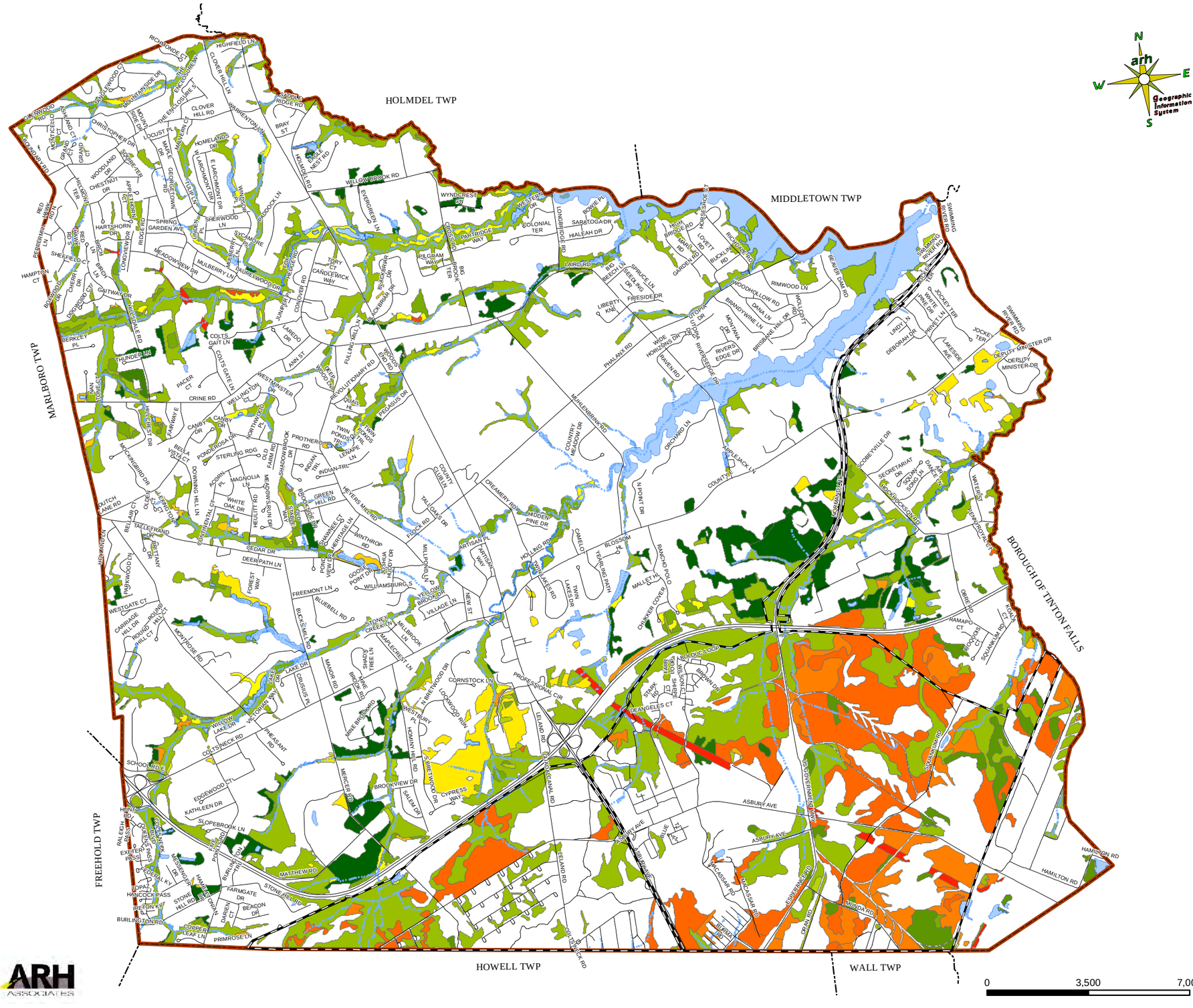
Figure 15.3 - Wetlands



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

Wetlands (NJDEP 2015)

- AGRICULTURAL WETLANDS (MODIFIED)
- ATLANTIC WHITE CEDAR WETLANDS
- CONIFEROUS SCRUB/SHRUB WETLANDS
- CONIFEROUS WOODED WETLANDS
- DECIDUOUS SCRUB/SHRUB WETLANDS
- DECIDUOUS WOODED WETLANDS
- DISTURBED WETLANDS (MODIFIED)
- FORMER AGRICULTURAL WETLAND (BECOMING SHRUBBY, NOT BUILT-UP)
- HERBACEOUS WETLANDS
- MANAGED WETLAND IN BUILT-UP MAINTAINED REC AREA
- MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE
- MIXED SCRUB/SHRUB WETLANDS (CONIFEROUS DOM.)
- MIXED SCRUB/SHRUB WETLANDS (DECIDUOUS DOM.)
- MIXED WOODED WETLANDS (CONIFEROUS DOM.)
- MIXED WOODED WETLANDS (DECIDUOUS DOM.)
- PHRAGMITES DOMINATE INTERIOR WETLANDS
- WETLAND RIGHTS-OF-WAY

GIS Data Sources:
1. Wetlands GIS data came from NJDEP (2015).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

dominant wooded wetlands. **Table 15.3** lists the acreages for each of the Wetland Types found within the Township.

Table 15.3 Wetland Types found within Colts Neck Township, Non Earle and Earle Areas

Wetlands	Acres	% of Wetlands	% of Total Area
Wetlands for Colts Neck Township (without NWS Earle)	**3020.54**	**100%**	**18.75% of Non Earle Area**
DECIDUOUS WOODED WETLANDS	1721.45	57.0%	10.69%
AGRICULTURAL WETLANDS (MODIFIED)	515.67	17.07%	3.20%
DECIDUOUS SCRUB/SHRUB WETLANDS	212.27	7.03%	1.32%
MANAGED WETLAND IN BUILT-UP MAINTAINED REC AREA	200.39	6.63%	1.24%
HERBACEOUS WETLANDS	98.23	3.25%	0.61%
MIXED WOODED WETLANDS (DECIDUOUS DOM.)	97.48	3.23%	0.61%
MIXED WOODED WETLANDS (CONIFEROUS DOM.)	47.49	1.57%	0.29%
CONIFEROUS WOODED WETLANDS	25.50	0.84%	0.16%
MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE	24.20	0.80%	0.15%
DISTURBED WETLANDS (MODIFIED)	20.98	0.69%	0.13%
WETLAND RIGHTS-OF-WAY	19.53	0.65%	0.12%
MIXED SCRUB/SHRUB WETLANDS (DECIDUOUS DOM.)	17.80	0.59%	0.11%
CONIFEROUS SCRUB/SHRUB WETLANDS	10.86	0.36%	0.07%
MIXED SCRUB/SHRUB WETLANDS (CONIFEROUS DOM.)	3.99	0.13%	0.02%
PHRAGMITES DOMINATE INTERIOR WETLANDS	3.81	0.13%	0.02%
FORMER AGRICULTURAL WETLAND (BECOMING SHRUBBY, NOT BUILT-UP)	0.89	0.03%	0.01%
Wetlands for NWS Earle within Colts Neck Township	**2,079.13**	**100%**	**49.29% of Earle Area**
DECIDUOUS WOODED WETLANDS	903.42	43.45%	21.42%
MIXED WOODED WETLANDS (DECIDUOUS DOM.)	718.33	34.55%	17.03%
MIXED WOODED WETLANDS (CONIFEROUS DOM.)	278.97	13.42%	6.61%
CONIFEROUS WOODED WETLANDS	121.54	5.85%	2.88%
WETLAND RIGHTS-OF-WAY	35.25	1.70%	0.84%
ATLANTIC WHITE CEDAR WETLANDS	11.25	0.54%	0.27%
DISTURBED WETLANDS (MODIFIED)	6.19	0.30%	0.15%
DECIDUOUS SCRUB/SHRUB WETLANDS	2.18	0.10%	0.05%
MIXED SCRUB/SHRUB WETLANDS (CONIFEROUS DOM.)	1.35	0.07%	0.03%
HERBACEOUS WETLANDS	0.43	0.02%	0.01%
AGRICULTURAL WETLANDS (MODIFIED)	0.21	0.01%	0.00%
TOTAL Acres and Percent for *Wetlands of Colts Neck Township*	**5,099.67**	**25.09% of Entire Township**	

Source: NJDEP (2015 Land use Land cover), Values rounded to the nearest tenth

15.4 Wetland Characteristics

In 1995, the Natural Research Council, under funding from the Environmental Protection Agency, made several recommendations for improvement, including improved sensitivity to regional differences in climate, hydrologic and geologic conditions, and other wetland characteristics. Based on this recommendation, a new and consistent system of wetland delineation by regions was established. Regions are based on natural boundaries such as ecoregions or land resource regions, rather than political boundaries. According to this system, Colts Neck, New Jersey would be in the Atlantic and Gulf Coastal Plain region of the United States (Army Corps of Engineers, n.d). When searching for wetland indicators in Colts Neck, keeping in mind its location in the Atlantic and Gulf Coastal Plain region, primary and secondary indicators can be deduced utilizing *The Atlantic Gulf and Coastal Plain supplement* to the *1987 Wetland Delineation Manual* created by the Army Corps of Engineers, in conjunction with the *1989 Federal Interagency Manua*l (US Army Corps of Engineers, n.d).

As discussed, wetlands are commonly identified in New Jersey using the three-parameter approach. If an area of land is found to exhibit wetland hydrology, hydrophytic vegetation, and hydric soils, it can be considered a wetland. The three defining characteristics for wetlands are discussed in more detail below.

Wetland hydrology describes the frequency, duration, and temporal order of water into an area of land. It examines prolonged inundation of water, which creates marshes, swamps, bogs, and other frequently wet areas. Wetlands throughout New Jersey have fluctuating water levels seasonally, as well as periods of dryness. The timing of when water is present, and for how long it is present, inherently shapes the structure and creation of a wetland. Significantly, groundwater and surface water are connected, and many wetlands depend on both sources for their existence. For wetland delineation purposes, the U.S Army Corps of Engineers has separated wetland hydrology indicators into two basic categories: primary and secondary. Primary indicators are considered stronger indicators of wetland hydrology. Only one primary indicator needs to be present for verifying wetland hydrology. Two secondary indicators need to be present for verifying wetland hydrology. In the absence of a primary indicator, at least two secondary indicators are sufficient for a positive determination of wetland hydrology (Tiner, 2017). Some examples of primary wetland hydrology indicators in the Atlantic and Gulf Coastal Plain include surface water presence, high water table, water marks, and saturation of the land. Secondary indicators include surface soil cracks and marl deposits (U.S. Army Corps of Engineers, 2010).

Hydric Soils are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA NRCS, 2018). Generally, most hydric soils exhibit characteristic morphologies that result from repeated periods of saturation or inundation that last for more than a few days. Saturation, in combination with microbial activity in the soil, will deplete oxygen from the soil. Depleted oxygen

creates anaerobic (absence of free oxygen) conditions which promote biogeochemical processes. These include the accumulation of organic matter and the reduction, translocation, or accumulation of iron and other reducible elements. These processes create distinctive characteristics in the soil profile that can be used as indicators to determine if the soil is hydric. The National Technical Committee for hydric soils has created a guide to identifying hydric soils in the field using these indicators, called *Field Indicators of Hydric Soils in the United States*. The indicators are relevant for the region they are located within. Colts Neck Township is mostly in the 'S' Land Resource Region (LRR). Only a small portion of southeastern Colts Neck within NWS Earle is within the 'T' Land resource Region. These regions are displayed in **Figure 15.4.1**. They are further grouped into Major Land Resource Areas (MLRA) with specific names. Knowing regional location is crucial when searching for hydric soil indicators in the guide. Indicators can include reduced iron or manganese, low-chroma colors, and accumulated organic matter in the upper part of the soil profile. More specific depths and requirements are listed in the guide for these characteristics, and if an indicator requirement is met, the soil is considered hydric. The indicators are used to identify the hydric soil component of wetlands; however, there are some hydric soils that lack any of the currently listed indicators. Therefore, the lack of any listed indicator does not prevent classification of the soil as hydric (USDA NRCS, 2018.). Furthermore, as can be seen in **Figure 15.4.2**, mapped wetlands have a high correlation of being in the same location of mapped hydric soils since their identification is dependent on the presence of hydric soils. On the other hand, hydric soils can exist alone in land areas not classified as wetlands, which Figure 15.4.2 displays as the stand-alone gray areas. As previously mentioned, mapping is based on preliminary data and may not be completely accurate with conditions found in the field.

Hydrophytic vegetation or simply *hydrophytes* are plants that grow in water, soil, or on a substrate that is at least periodically deficient in oxygen because of excessive water content (Federal Interagency Committee for Wetland Delineation, 1989). Most plants growing in wetlands have a broad ecological ability, tolerance, and adaptability to ranging environmental conditions (Tiner, 2017). Many plant species growing in wetlands also grow in non-wetlands. Wetland plants exhibit a wide range of morphological features which have been developed in response to frequent, prolonged flooding and waterlogging. Some adaptations to look for include buttressed trunks in trees, shallow root systems and adventitious roots in trees and herbs among many others. Trees such as red maple exhibit shallow root systems, and black gum and green ash exhibit adventitious roots (arising from stem above ground), and buttressed (swollen) tree trunks. Many wetland herbs have hollow stems which favor growth in wetlands. These stems are common in grasses and are also prevalent in many rushes and sedges (Crawford, 1983). These morphological adaptations oftentimes assist the plant in receiving oxygen more readily than it would need in normal oxygenated conditions. There are also interior adaptations which cannot be seen and are not usually used for identification purposes, such as Aerenchyma or air-filled tissue in many wetland herbs, in particular marsh plants, which help these plants grow in anaerobic soils. An internal system of large air spaces is needed to transport oxygen to the roots, creating an oxidized environment for the roots or an *oxidized rhizosphere* (Tiner, 2017). In general, physical adaptations which can be readily seen are used in the field for identification of a wetland plant. There are some plants that are more adapted to

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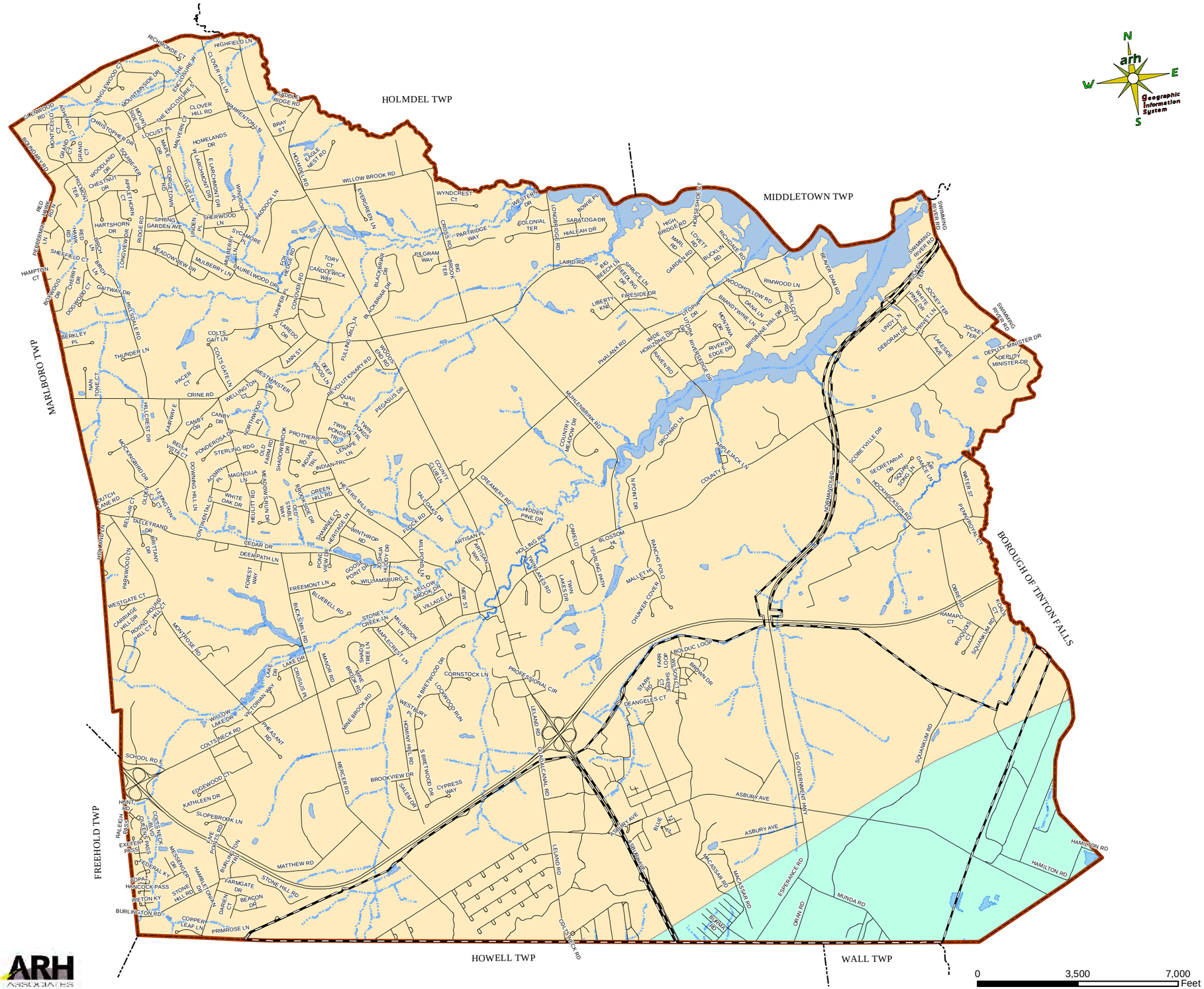
Figure 15.4.1 - Major Land Resource Areas (MLRA)



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)

MLRA, LRR

- Northern Coastal Plain, S
- Northern Tidewater Area, T

GIS Data Sources:
1. Major Land Resource Area (MLRA) GIS data came from National Resources Conservation Service - NRCS (2022).
2. Roads: NJDOT (2017).
3. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
4. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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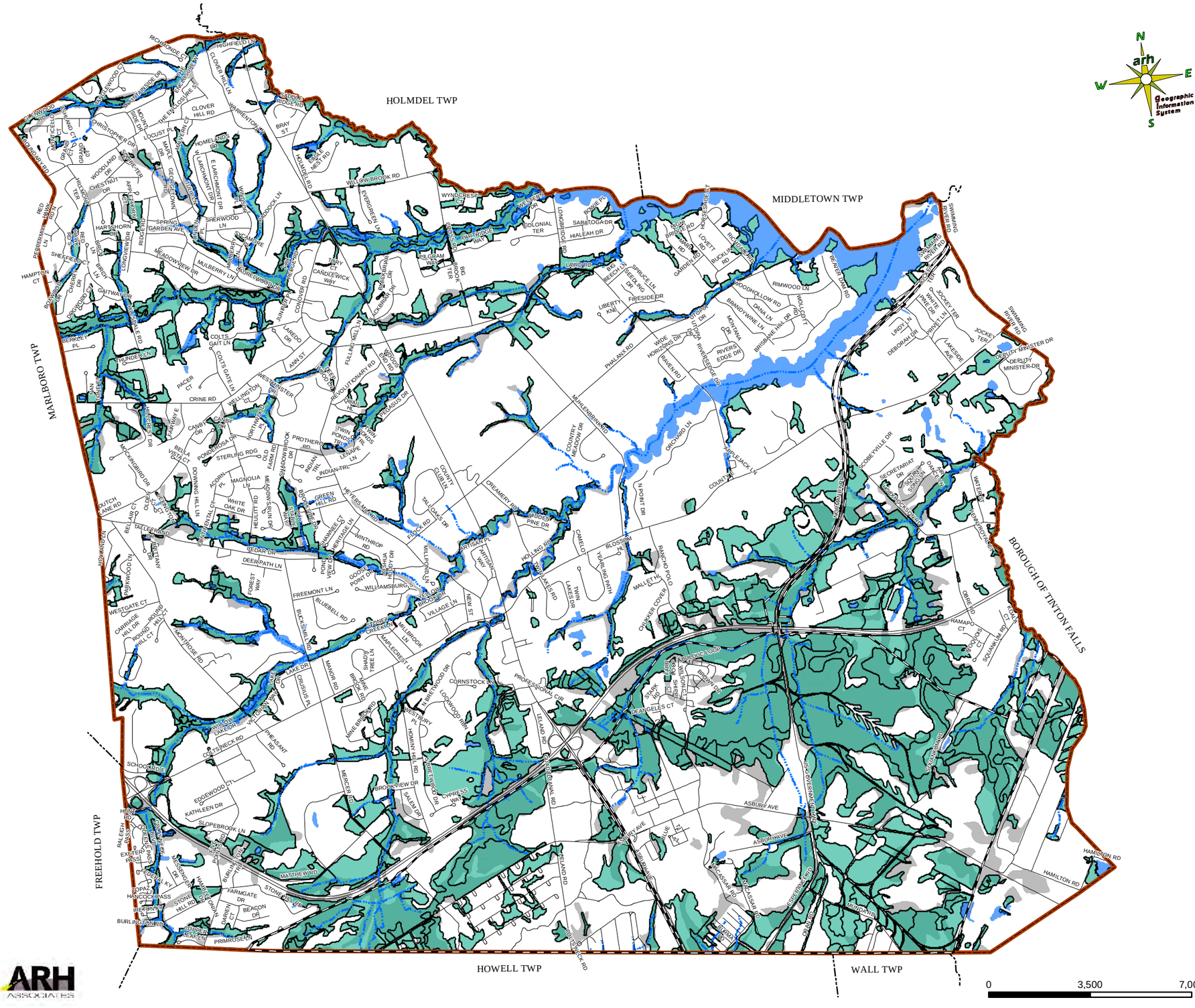
Figure 15.4.2 - Wetlands & Hydric Soils



Legend

- Earle NWS Area
- Municipal Boundary
- Road
- Waterbodies (NJDEP)
- Streams (NJDEP)
- Wetlands (NJDEP 2015)

Hydric Soils

- 90% to 100% Hydric

GIS Data Sources:
1. Wetlands GIS data came from NJDEP (2015).
2. Hydric Soils GIS data came from NRCS (2022).
3. Roads: NJDOT (2017).
4. Earle Area: Derived from Department of Defense and has been realigned to match the 2022 tax GIS data for Colts Neck Township.
5. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized or endorsed.

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growing in wetlands than others and some which even favor water-logged conditions such as aquatic plants although not as common.

There are four wetland indicator categories used in U.S. wetlands assigned among plant species across regions based on their differences in expected frequency of occurrence in wetlands. These are OBL (obligate), FACW (facultative wetland), FAC (facultative), and FACU (facultative upland). Plants not found in wetlands are considered upland plants (UPL). It is important to note that the wetland plants listed in **Table 15.4** are not sole indicators of wetland conditions. To meet the hydrophytic vegetation parameter, a percent threshold of wetland plants (FAC or wetter) must be present in a defined area. Common plants found in wetlands in Colts Neck Township are displayed below along with their statuses. There are many more species present in addition to those listed below:

Table 15.4 Select Plants in Wetlands found in Colts Neck Township

Common Name and Scientific Name	Wetland Indicator Status (Atlantic Gulf Coastal Plain)
Trees	
red maple (*Acer rubrum*)	FAC
black gum (*Nyssa sylvatica*)	FAC
green ash (*Fraxinus pennsylvanica*)	FACW
sweetgum (*Liquidambar styraciflua*)	FAC
eastern hemlock (*Pinus strobus*)	FACU
Shrubs	
sweet pepperbush (*Clethra alnifola*)	FACW
winterberry (*Ilex verticilata)*	FACW
northern spicebush (*Lindera benzoin*)	FACW
swamp azalea (*Rhododendron viscosum*)	OBL
highbush blueberry (*Vaccinium corymbosum*)	FACW
Herbs	
eastern skunk cabbage (*Symplocarpus foetidus*)	OBL
bladder sedge (*Carex intumescens*)	FACW
cinnamon fern (*Osmunda cinnamomea*)	FACW
royal fern (*Osmunda spectabilis*)	OBL
threeleaf goldthread (*Coptis trifolia*)	FACW

(Federal Manual, 1989), (The Nature Conservancy, 2018) , (US Army Corps of Engineers, 2020) (Vogelmann, 1976)

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